

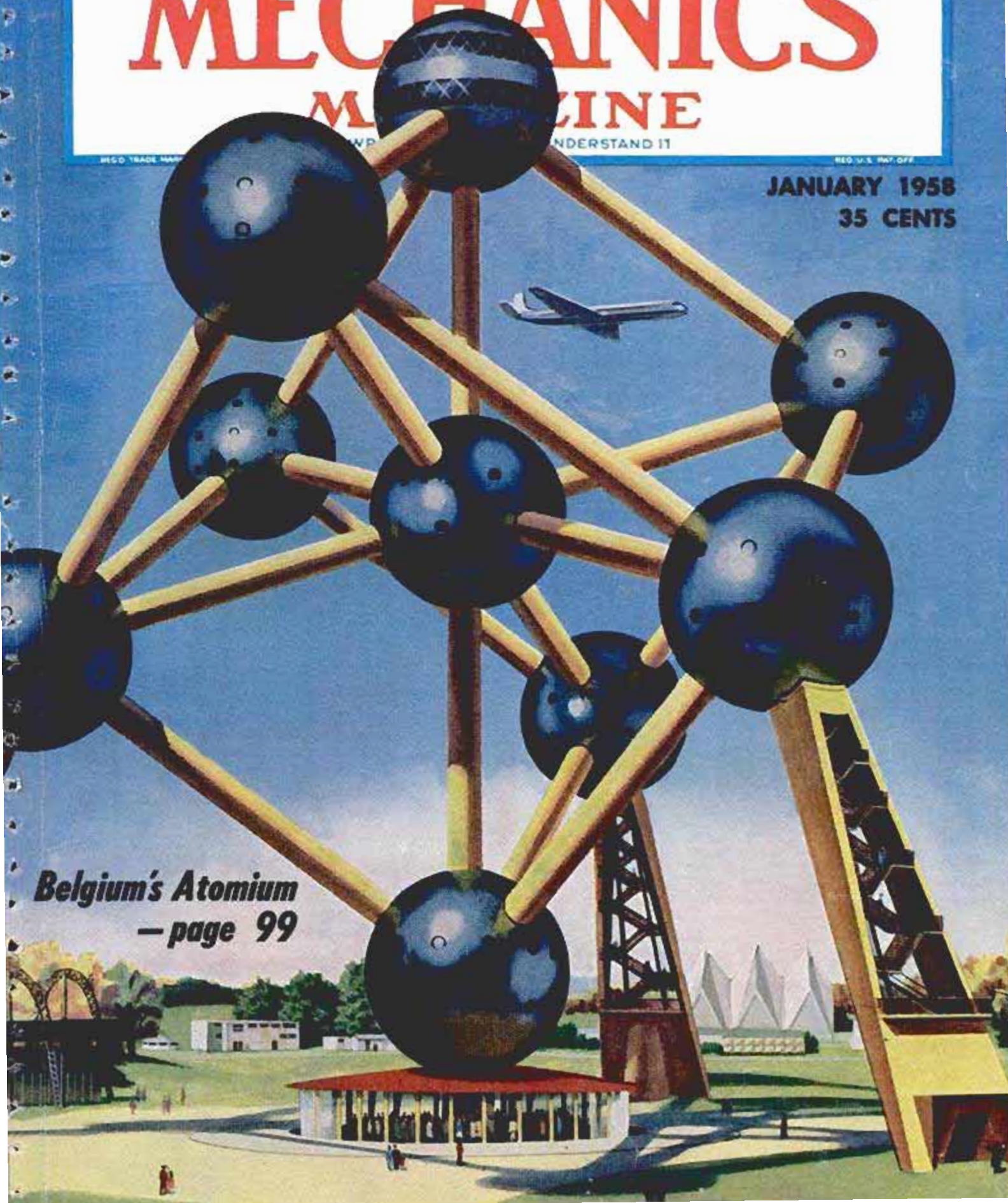
# POPULAR MECHANICS

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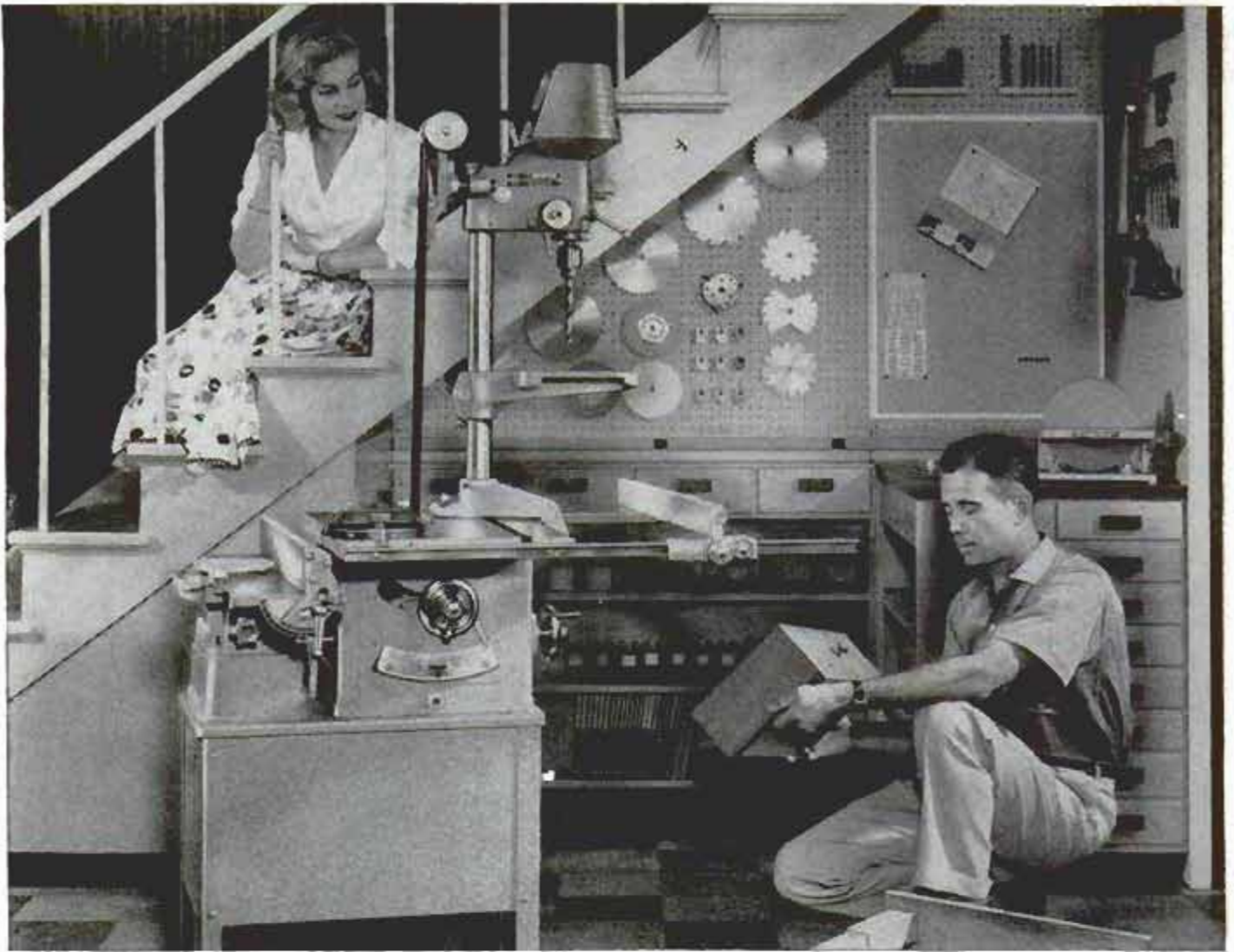
UNDERSTAND IT

JANUARY 1958  
35 CENTS

*Belgium's Atomium*  
— page 99







# **BIG IDEA FOR SMALL SPACE**

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Combination of 4 full size tools does 95% of all workshop jobs—yet takes space only 3 feet square!

If you want a *real* shop, but don't have a lot of space, the DELTASHOP is for *you*. It's the most *practical* all-purpose combination tool built!

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The best reasons a man could possibly have for "**aimed light**" when he drives at night!

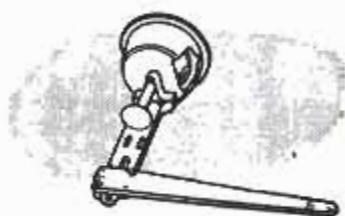


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**GUIDE T-3**

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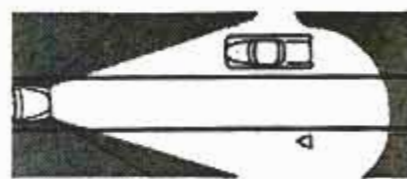
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EASY adjustment without even having to turn headlamps on . . . assures perfect alignment and placement of light on the road.



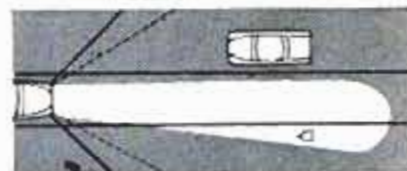
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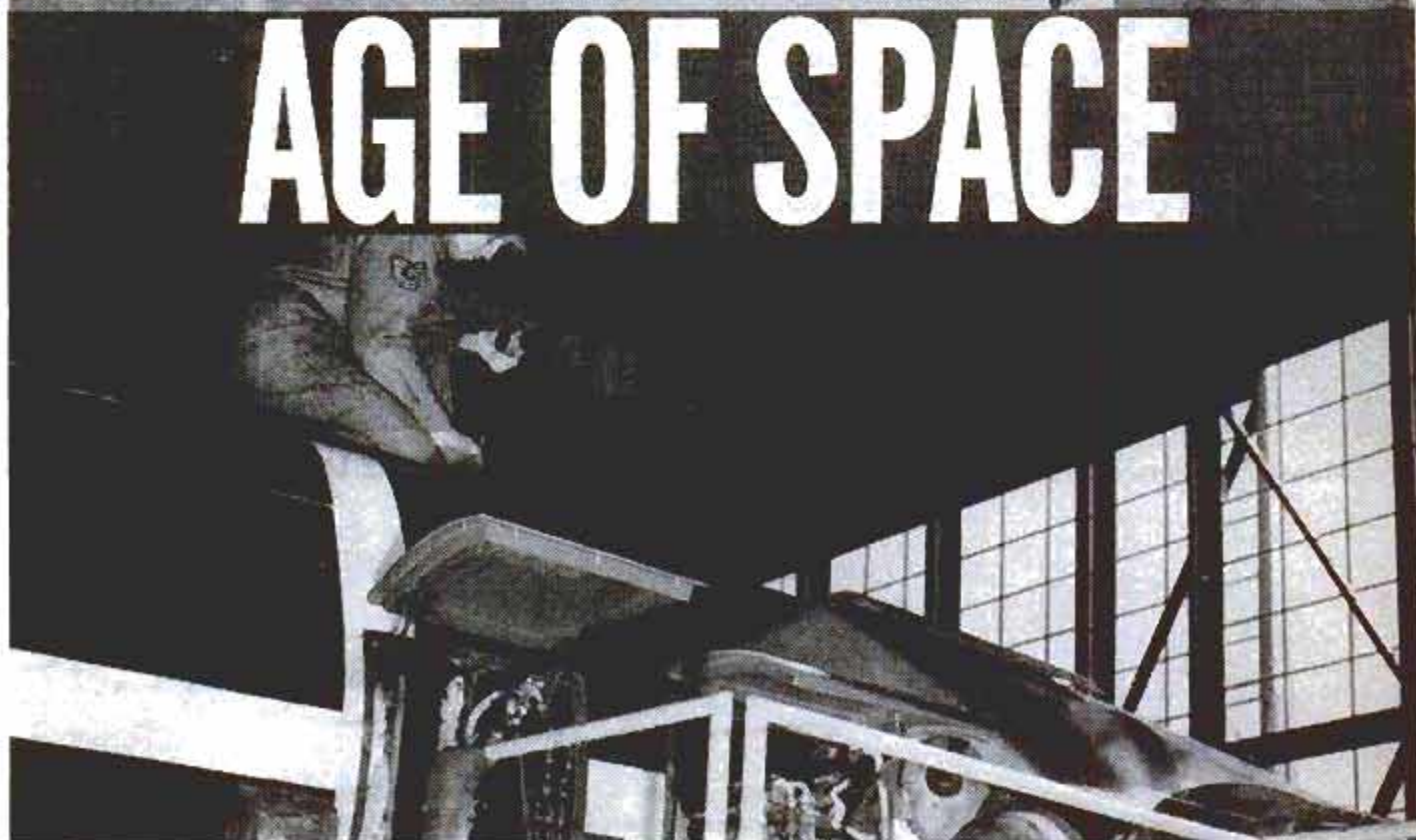
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Volume 109

JANUARY 1958

Number 1

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## In This Issue...

A New Landmark for Brussels . . . The Atomium	99
PM Tests the 1958 Chevrolet, Ford and Plymouth	108
I Drove Through Russia—Part II	116
TV Trickery	127
I Led the Thunderbirds	131
Forecast: A Sky Full of Satellites	138
The Army Adopts a New Rifle	146
The Battle of Donner Pass	155
White Alice Starts Talking	162
How to Build Physical Fitness	171

## For the Craftsman...

Binding Tape Is Versatile	183
"Dream" Darkroom Takes Little Space	186
Modernize With Ceramic Tile	200
Spark Plugs Hot and Cold	215
Push-Button Painting	220
Power in Your Hand	225
Using Drill-Press Vises	234

## Regular Departments...

Detroit Listening Post	126	Solving Home Problems	196
Keeping Up With the Atom	130	On the Market	223
What's New for Your Home	144	Shopping for Tools	236
Radio, TV and Electronics	179	Clinic for Homemakers	242

Turn to detailed index on page 92. Sources of additional information on items in this issue are shown on the Where-to-Buy-It List, available without charge by writing the Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

## Next Month...

**BIGGEST SHIP** ever built, the atomic supercarrier will be driven by eight separate nuclear power plants. She's just one of a new breed of ships—merchantmen, carriers, cruisers and subs—powered by the atom. In the February issue you'll see an exciting preview of this strange fleet

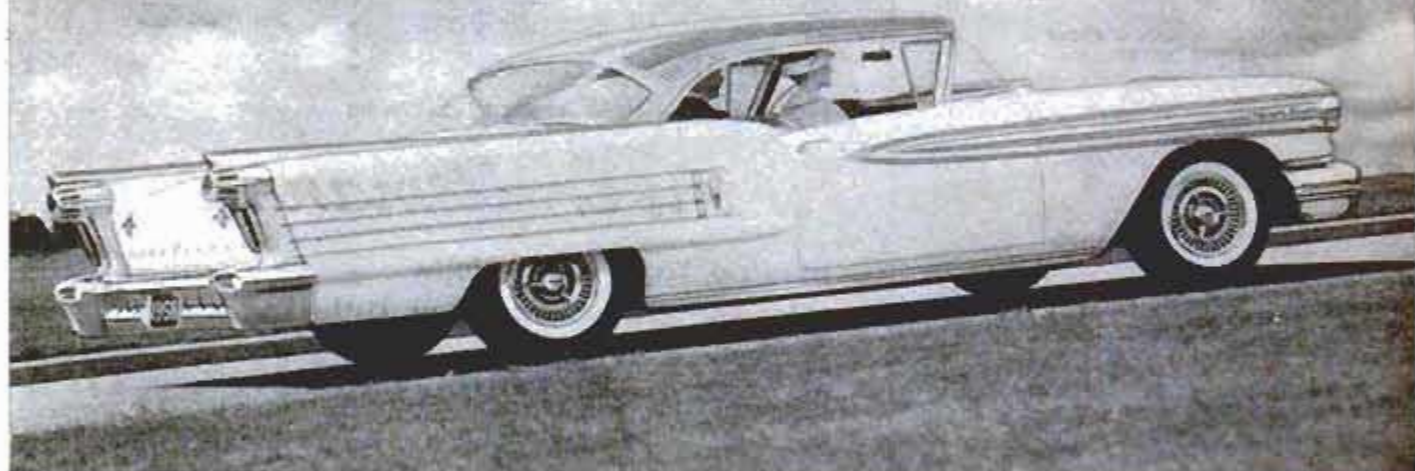




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Luckily for me, I was only forty when Betty began to worry about our future. "You're going to want to slow up in a few years," she'd say. And I'd laugh. Because I felt fine. "But you won't always want to work," she'd say. "Well, I still have fifteen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

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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.

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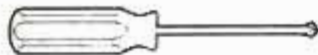
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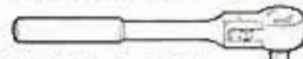
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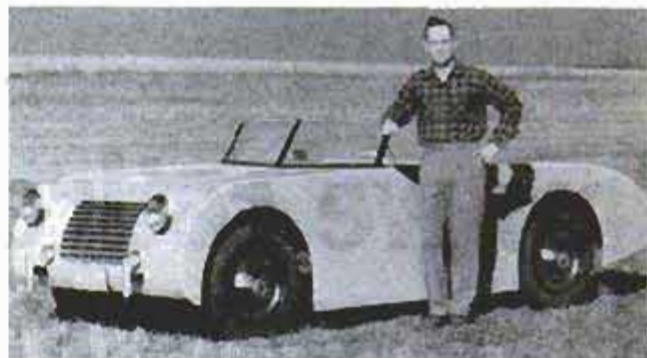
DIVISION OF TOOL INDUSTRIES

## ACROSS THE DESK



### To the Editor:

The photo shows my version of "The Bug" that your February and March 1957 magazines showed how to build. Mine is built on a Henry J chassis and drives like a dream, mainly due to nearly 50-50 weight



distribution and a very low center of gravity. It is 47 inches high to the top of the windshield, 164 inches long, 61 inches wide and weighs 2000 pounds. It cost \$265, not counting the original chassis. Not being a member of the "big fin" fraternity, I built it without those needless appendages.

Zane Altenburg,  
Kings, Ill.

### To the Editor:

I'm mad! It was all because our newest little son, Peter Joseph, the sixth of the tribe, and his wonderful mother were coming home from the hospital that I decided to spruce up our bedroom by doing over the floor. A quart of shellac purchased on Saturday night was carefully applied. Upon surveying my handiwork on the following morning, I was convinced that another coat was in order. Being Sunday, it was not possible to purchase another quart, so I started scouting around the cellar. Sure enough, there was a half gallon of the stuff correctly stored in a glass bottle—some two or three years ago—and the medicine chest contributed the necessary alcohol. It was lavishly applied and looked great. Several hours later I was aware of my first frustration when I came up to examine the glossy surface and found that it not only was undried, but bore a close resemblance to molasses! Five hours, six hours, ten hours later, the situation had not changed. As bedtime approached, I made my way to the bed through a sea of shellac and, as I walked with a squish-squish, had

(Continued to page 8)

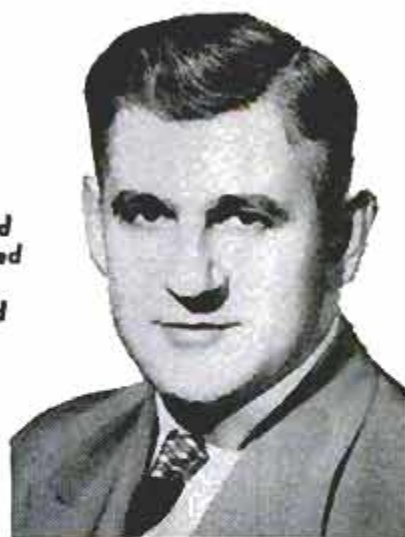


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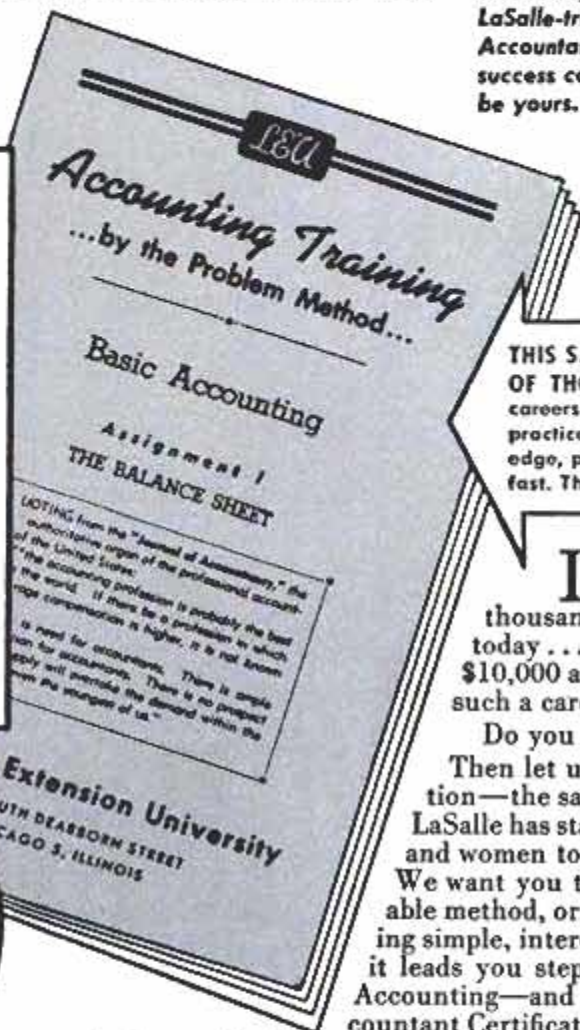


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## Geophysical Year Scope

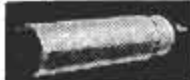
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(Continued from page 6)

the shoes taken off my feet by the gummy adhesive underfoot.

It was a hot and humid night, so all the windows were opened and several fans placed around the room. Several hours of this were to no avail, and this cure was promptly abandoned. Next, wielding a brush and several rags, a pajama-clad do-it-yourselfer was on hands and knees generously applying a coat of fresh alcohol to the rebellious floor.

For the moment, it looked as if this was it! It seemed to harden up, lose all its tackiness and the problem appeared to be solved. Five minutes after I had laid my weary bones down to rest with a great sigh of relief, a rigid finger informed me that the stickiness had returned. Two more coats of alky, and the same results. About 3 a.m., I decided that what this situation called for was heat. The windows therefore were tightly closed and two portable heaters strategically placed on opposite sides of the room. I almost died with the ovenlike atmosphere, but endured it with the hope that springs eternal. A couple of hours of this and I felt like a roast (well done), but the gooey old floor was still the same, if not worse.

There was nothing to do but inform my wife, when she was dressing the little fellow for his homecoming, of my all-night battle with the floor, and the net results. Her reaction was magnificent! "With people being murdered and wandering homeless all over the world," said she, "we won't let a thing like this disturb us." The crib, bassinet and other paraphernalia were transferred to the living room, together with a folding bed. For the next week or so, this was our "workshop" with our new baby while we tried to solve the problem of the errant floor.

An "expert" was called in. He estimated a cost of \$25 to remove the offending shellac. It was then that I hit upon the idea of putting down a new floor and covering it with rubber tile. Then came a couple of days of measuring, sawing and nailing hardboard. (Be sure to put the rough side up, nail every six inches, the man said, but nobody told me to use "untempered" board, did they?) Then came the laying of the rubber tile. It's easy, the man said—just use this trowel and scrape it along the floor. The black stuff was generously applied and the tiles laid carefully, as per instruction, from the center out. (But nobody told me only a light film of mastic was all that was necessary, did they?) The mastic—it was everywhere. Splotches appeared on wallpaper, in the hallway, on

(Continued to page 10)





# What's your boss saying about you?

The door is usually open. Today it's closed. They're talking about you . . . about your future. You don't have to hear to know what they're saying. Because there's nobody who knows more about you and your present job than you.  
*O.K. . . . So you have "experience." Five years on the same job.*

Have you *mastered* the job . . . learned everything there is to know about it? If your answer is "yes," success is right around the corner. But if the answer is "no," then your experience doesn't amount to much. And chances are these things are true about you: you just "coast" along with things . . . you do nothing and go

home all tired out. **BEWARE!** Those are danger signals. Unless you take a fresh look at things, you'll be doing the same job at the same salary for the next five years. And the next five.

### What you can do about your future

If you want to succeed . . . make more money, earn the respect of your family and community . . . you have to take the bull by the horns. Success doesn't just come along. You have to meet it halfway. So act **NOW** and make your experience mean something. Add I. C. S. *training* to your record and start going places. Do it at home, in your spare time, for a few cents a day.

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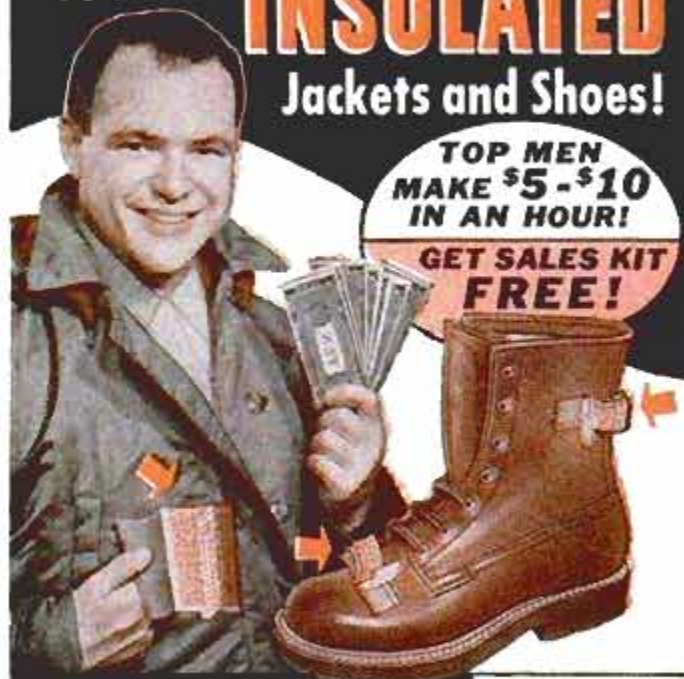
- Without cost or obligation, send me "HOW TO SUCCEED" and the opportunity booklet about the field BEFORE which I have marked X (plus sample lesson):
- |  |  |  |  |   |
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| <p><b>ARCHITECTURE and BUILDING CONSTRUCTION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Air Conditioning</li> <li><input type="checkbox"/> Architecture</li> <li><input type="checkbox"/> Arch. Drawing and Designing</li> <li><input type="checkbox"/> Building Contractor</li> <li><input type="checkbox"/> Building Estimator</li> <li><input type="checkbox"/> Carpentry and Millwork</li> <li><input type="checkbox"/> Carpenter Foreman</li> <li><input type="checkbox"/> Heating</li> <li><input type="checkbox"/> Interior Decoration</li> <li><input type="checkbox"/> Painting Contractor</li> <li><input type="checkbox"/> Plumbing</li> <li><input type="checkbox"/> Reading Arch. Blueprints</li> </ul> <p><b>ART</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Commercial Art</li> <li><input type="checkbox"/> Magazine &amp; Book illus.</li> <li><input type="checkbox"/> Show Card and Sign Lettering</li> <li><input type="checkbox"/> Sketching and Painting</li> </ul> <p><b>AUTOMOTIVE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Automobiles</li> <li><input type="checkbox"/> Auto Body Rebuilding and Refinishing</li> <li><input type="checkbox"/> Auto Engine Tuneup</li> <li><input type="checkbox"/> Auto Technician</li> </ul> | <p><b>AVIATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aero-Engineering Technology</li> <li><input type="checkbox"/> Aircraft &amp; Engine Mechanic</li> </ul> <p><b>BUSINESS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Accounting</li> <li><input type="checkbox"/> Advertising</li> <li><input type="checkbox"/> Business Administration</li> <li><input type="checkbox"/> Business Management</li> <li><input type="checkbox"/> Cost Accounting</li> <li><input type="checkbox"/> Creative Salesmanship</li> <li><input type="checkbox"/> Managing a Small Business</li> <li><input type="checkbox"/> Professional Secretary</li> <li><input type="checkbox"/> Public Accounting</li> <li><input type="checkbox"/> Purchasing Agent</li> <li><input type="checkbox"/> Salesmanship</li> <li><input type="checkbox"/> Salesmanship and Management</li> <li><input type="checkbox"/> Traffic Management</li> </ul> <p><b>CHEMICAL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Analytical Chemistry</li> <li><input type="checkbox"/> Chemical Engineering</li> <li><input type="checkbox"/> Chem. Lab. Technician</li> <li><input type="checkbox"/> Elements of Nuclear Energy</li> <li><input type="checkbox"/> General Chemistry</li> <li><input type="checkbox"/> Natural Gas Prod. and Trans.</li> <li><input type="checkbox"/> Petroleum Prod. and Engr.</li> <li><input type="checkbox"/> Professional Engineer (Chem)</li> <li><input type="checkbox"/> Pulp and Paper Making</li> </ul> | <p><b>CIVIL ENGINEERING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Civil Engineering</li> <li><input type="checkbox"/> Construction Engineering</li> <li><input type="checkbox"/> Highway Engineering</li> <li><input type="checkbox"/> Professional Engineer (Civil)</li> <li><input type="checkbox"/> Reading Struc. Blueprints</li> <li><input type="checkbox"/> Structural Engineering</li> <li><input type="checkbox"/> Surveying and Mapping</li> </ul> <p><b>DRAFTING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aircraft Drafting</li> <li><input type="checkbox"/> Architectural Drafting</li> <li><input type="checkbox"/> Drafting Machine Design</li> <li><input type="checkbox"/> Electrical Drafting</li> <li><input type="checkbox"/> Mechanical Drafting</li> <li><input type="checkbox"/> Sheet Metal Drafting</li> <li><input type="checkbox"/> Structural Drafting</li> </ul> <p><b>ELECTRICAL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Electrical Engineering</li> <li><input type="checkbox"/> Elec. Engr. Technician</li> <li><input type="checkbox"/> Elec. Light and Power</li> <li><input type="checkbox"/> Practical Electrician</li> <li><input type="checkbox"/> Practical Lineman</li> <li><input type="checkbox"/> Professional Engineer (Elec)</li> </ul> <p><b>HIGH SCHOOL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> High School Diploma</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Good English</li> <li><input type="checkbox"/> High School Mathematics</li> <li><input type="checkbox"/> Short Story Writing</li> </ul> <p><b>LEADERSHIP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Industrial Foremanship</li> <li><input type="checkbox"/> Industrial Supervision</li> <li><input type="checkbox"/> Personnel-Labor Relations</li> <li><input type="checkbox"/> Supervision</li> </ul> <p><b>MECHANICAL and SHOP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Diesel Engines</li> <li><input type="checkbox"/> Gas-Elec. Welding</li> <li><input type="checkbox"/> Industrial Engineering</li> <li><input type="checkbox"/> Industrial Instrumentation</li> <li><input type="checkbox"/> Industrial Metallurgy</li> <li><input type="checkbox"/> Industrial Safety</li> <li><input type="checkbox"/> Machine Design</li> <li><input type="checkbox"/> Machine Shop Practice</li> <li><input type="checkbox"/> Mechanical Engineering</li> <li><input type="checkbox"/> Professional Engineer (Mech)</li> <li><input type="checkbox"/> Quality Control</li> <li><input type="checkbox"/> Reading Shop Blueprints</li> <li><input type="checkbox"/> Refrigeration and Air Conditioning</li> <li><input type="checkbox"/> Tool Design</li> <li><input type="checkbox"/> Tool Making</li> </ul> <p><b>RADIO, TELEVISION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> General Electronics Tech.</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Industrial Electronics</li> <li><input type="checkbox"/> Practical Radio-TV Eng'g</li> <li><input type="checkbox"/> Practical Telephony</li> <li><input type="checkbox"/> Radio-TV Servicing</li> </ul> <p><b>RAILROAD</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Car Inspector and Air Brake</li> <li><input type="checkbox"/> Diesel Electrician</li> <li><input type="checkbox"/> Diesel Engr. and Fireman</li> <li><input type="checkbox"/> Diesel Locomotive</li> </ul> <p><b>STEAM and DIESEL POWER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Combustion Engineering</li> <li><input type="checkbox"/> Power Plant Engineer</li> <li><input type="checkbox"/> Stationary Diesel Engr.</li> <li><input type="checkbox"/> Stationary Fireman</li> </ul> <p><b>TEXTILE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Carding and Spinning</li> <li><input type="checkbox"/> Cotton Manufacture</li> <li><input type="checkbox"/> Cotton Warping and Weaving</li> <li><input type="checkbox"/> Loom Fixing Technician</li> <li><input type="checkbox"/> Textile Designing</li> <li><input type="checkbox"/> Textile Finishing &amp; Dyeing</li> <li><input type="checkbox"/> Throwing</li> <li><input type="checkbox"/> Warping and Weaving</li> <li><input type="checkbox"/> Worsted Manufacturing</li> </ul> |
|--|--|--|--|---|

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**TOP MEN  
MAKE \$5-\$10  
IN AN HOUR!**

**GET SALES KIT  
FREE!**

**Same Type Subzero Insulation  
as in U.S. Army Coldbar Suit!  
QUICK CASH IN SPARE TIME!**



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INDEFINITELY!**

Now! Start a highly profitable business without investing a cent! Act quick, be **FIRST** in town to take orders for sensational new Mason **INSULATED** Jackets and Shoes... results of a remarkable scientific discovery: a new miracle insulation with thousands of vinyl air cells that provide perfect "dead air space" insulation! ● **Keeps you WARM** even at Arctic temperatures! ● **DRY** in downpours (can't absorb water)! ● **Protected from strong WINDS!** It's the same type miracle insulation used in famous U.S. Army Coldbar Suit! Because Mason products are not sold in stores, folks must buy from YOU!

Take orders for just 2 Insulated Shoe & Jacket combinations a day in spare time and you'll earn \$90 Extra Income in one week!

**"Miracle" Features Make Money for You FAST!**

Your friends, fellow workers, truck drivers, gas station, construction men — hundreds right around home will fill your pockets with cash! Lightweight jacket covered with water-repellent Nylon, has detachable hood. Both boots, shoes are rugged leather, feature Air Cushion innersoles, Neoprene Cush-N-Crepe outsoles. With this miracle combination, walk out in cold, wet, snowy or windy weather and stay warm and dry! **ADDED FEATURE!** Men wearing, Insulated Jacket & Shoes plus Mason's Insulated **Pants** can float in water indefinitely! Outdoorsmen will buy all **THREE** from you!

### **190 OTHER Money-makers!**

You'll have 190 **OTHER** fast-selling shoes, jackets to help you build a big, repeat-order business! **EVERYBODY** needs shoes, jackets. Nationally advertised Mason products sell **fast**. You offer 170 styles for men, women: dress, sport, work shoes, boots, 28 jacket styles. **You actually feature more shoes in a greater range of sizes, widths than any store in your town!**

To start this exciting business **right away**, rush coupon NOW. You'll receive **FREE** a powerful Jacket & Shoe Sales Kit including Air Cushion demonstrator. How-to-make-Big-Money Booklet, **everything** else you need to start making **BIG CASH PROFITS** the very first hour!

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Yes! I want to be **FIRST** to take orders and make **QUICK CASH** in spare time with Mason's amazing new Insulated Jackets & Shoes! Rush my powerful **FREE** Sales Kit!

NAME.....  
ADDRESS.....  
TOWN..... STATE.....

the towels in the bathroom, our clothes, baby's things. After many hours, the last tile was placed and it looked beautiful.

Ah! A happy ending! But no! The next day the black mastic began oozing up through every crack. Rub, rub, rub with the steel wool, and abrasive and clear water, hours on end. And up it came behind me, more, more and more. Walking on the floor left mastic on the feet and, lo and behold, the squish, crackle, squish was still with us. In attempting to move our four-poster bed for the cleanup job, a corner was ripped from its moorings and the end of the bed fell to the floor. The bed was disassembled and, two hours and \$10 later, it was as good as new.

To make a long story short, friends, drop around sometime to see my new wall-to-wall carpeting (which I am having installed next week by an "expert").

Walter F. Loehfelm,  
Brooklyn 10, N. Y.

*Two things he did wrong:*

1. Shellac that's three years old should never be used.
2. Rubbing alcohol is excellent for the back, but is not a substitute for denatured alcohol when it comes to a thinner for shellac.—Ed.

### **Looking for a Free Movie?**

Our Shop editors were treated to an interesting 15-minute sound film recently



and we're passing the news on to clubs, schools and other groups interested in home workshops. The color film, *You Can't*

(Continued to page 16)





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\*writes one customer

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**L**earn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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2032



(Continued from page 10)

Put a Price on It, was produced by Supreme Products Corporation as a service to the power-tool industry and maybe, gentlemen, it will convince your wife you can profitably and pleasurably invest in a better workshop at home. The movie is available without charge by writing Supreme Products Corporation, 380 Madison Ave., New York City 17.

**To the Editor:**

I must say that your article ("They Find Water on the Desert," PM, August 1957) on the induced-polarization method has had a very large response with us. We have received inquiries from a great number of engineers, as well as lay people, about this kind of work. I have told some of our people who are inclined to seek out "high-brow" journals as a publication medium, that if they really want to reach their peers, they should publish in *Popular Mechanics*.

E. J. Workman, President,  
New Mexico Institute of  
Mining and Technology,  
Socorro, N. Mex.

**Beg Your Pardon**

On page 112 of our October 1957 issue, we referred to a "steam-heated runway" built by the American Hydrotherm Corp.

Instead of steam, the pipes under the runway are heated by "circulating high temperature liquid heat transfer media," according to the company.

☆☆☆

Recognize our December cover painting of the USS *Carronade*? Here Thomas E. Stimson, Jr., PM Western Editor at Los Angeles, presents the original of the painting to Vice Admiral Carl F. Espe, Commander, Amphibious Force, U.S. Pacific Fleet, at his headquarters at Coronado, Calif.



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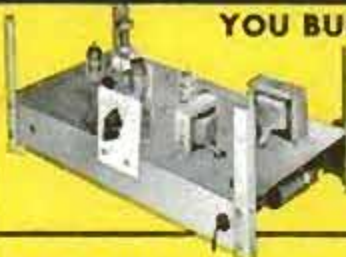


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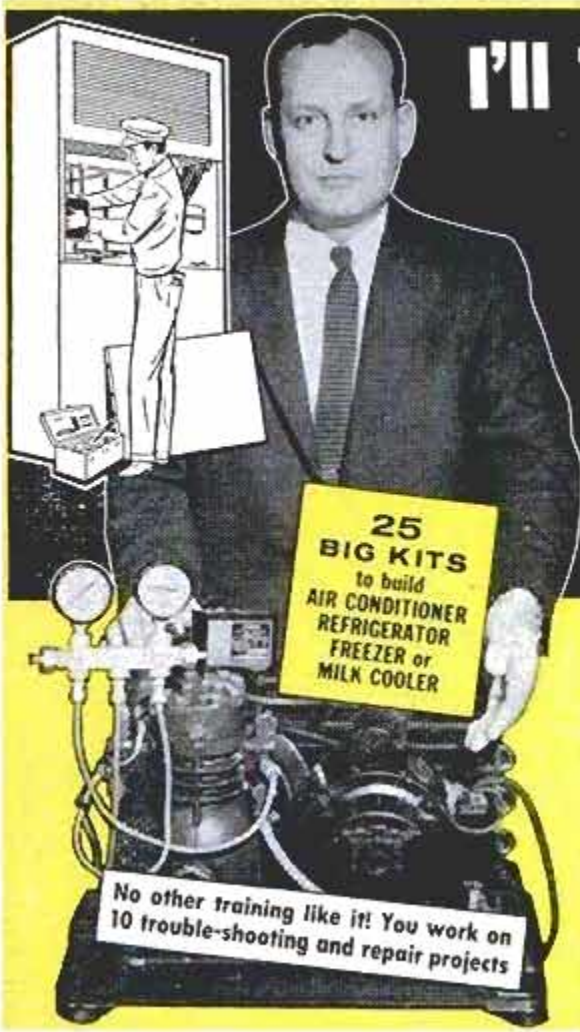


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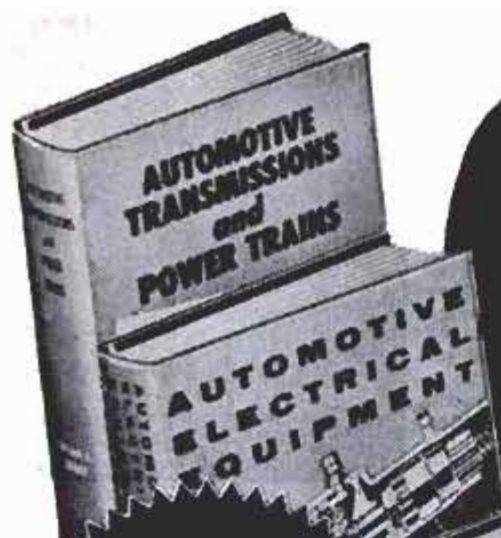
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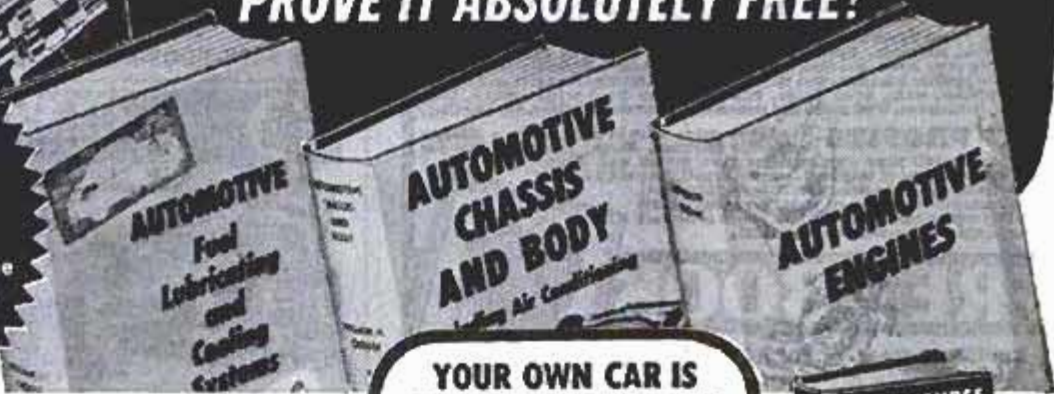


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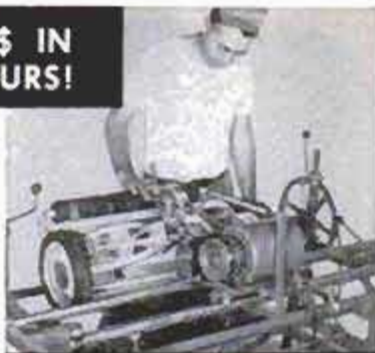
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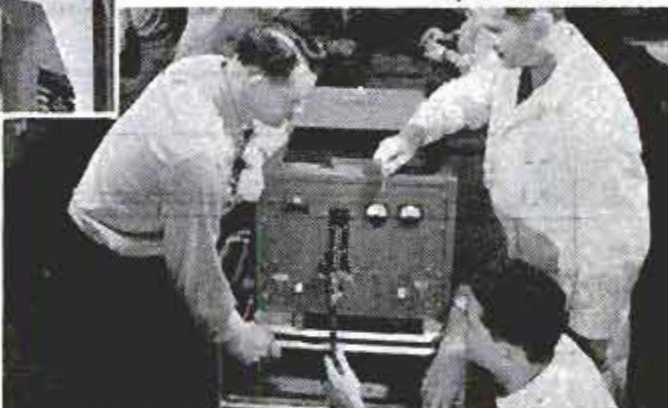
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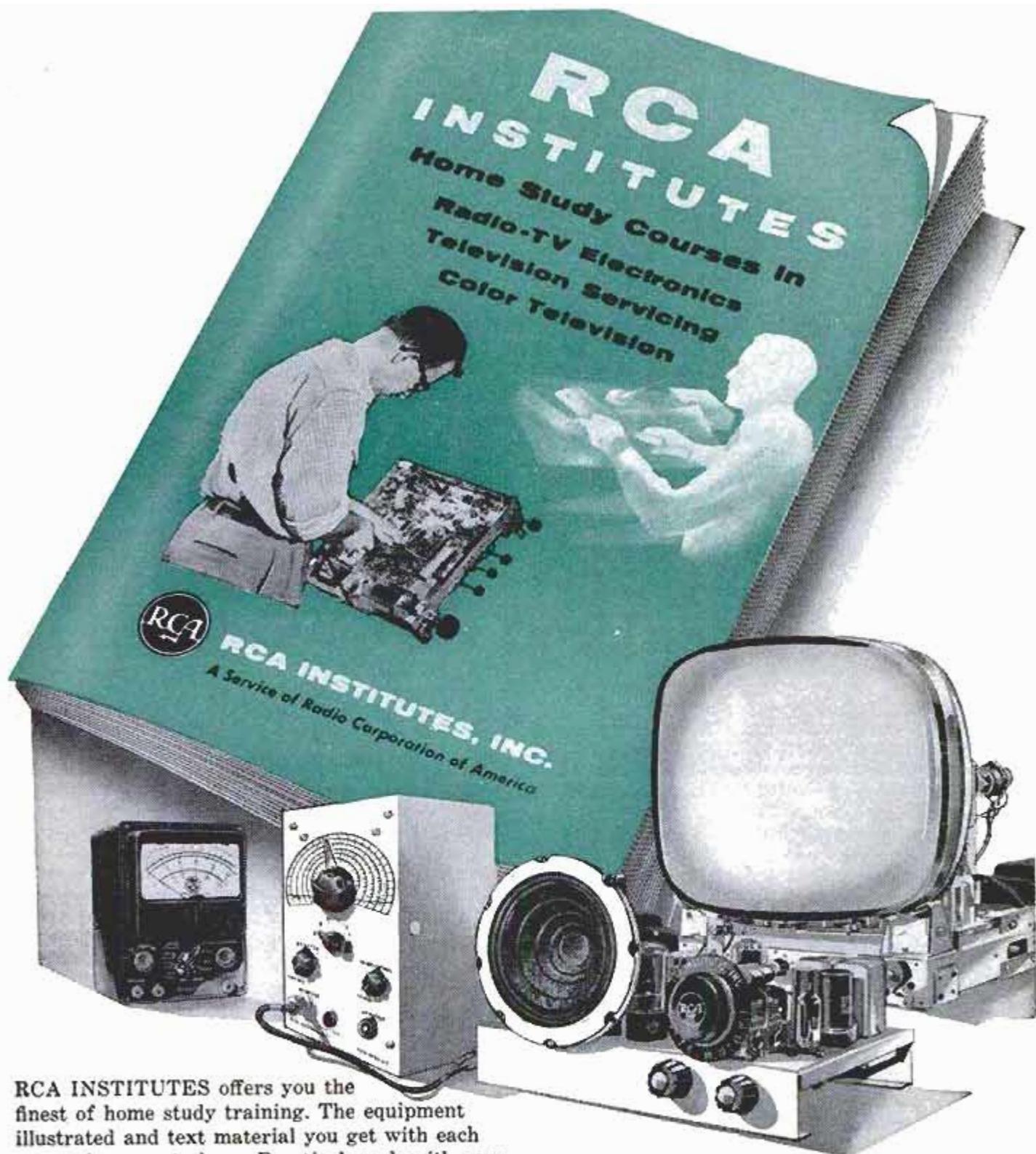
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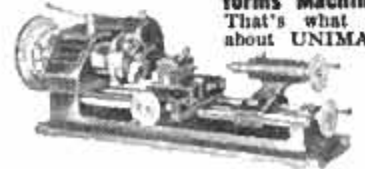
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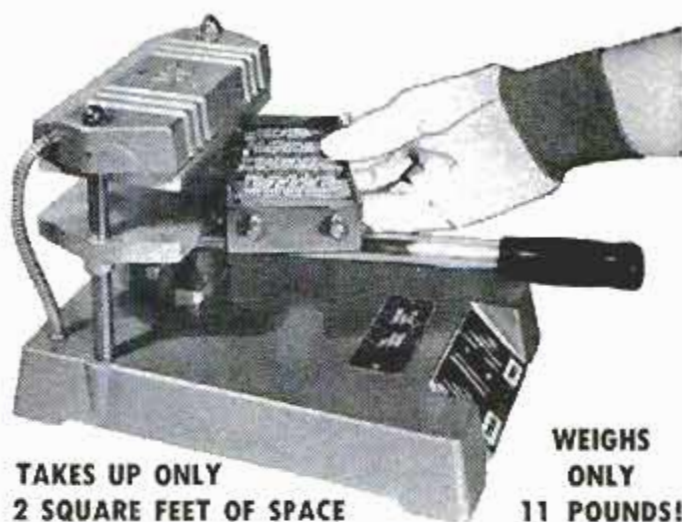
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I'd been on the same job for 8 long years. A whole string of younger men were passing me by.

And it seemed that life itself was passing me by.

Then, one day I marched into the boss's office and asked him, "Why am I stuck in my job? What's wrong with me? I've worked hard for this outfit."

"Charlie," he said, "you're doing a good job . . . but you need training to step into a supervisor's job. Experience alone isn't enough."

I was steamed. But he was right . . . my education was pretty skimpy. Still, what chance did I have for special training at this stage of the game?

That night I went home feeling whipped, wondering if we'd ever have the money to give the kids the advantages we'd hope to give them.

That same night an article in the *Dispatch* caught my eye. It said that learning power actually increases until you're past middle age. It said that correspondence schools reported that older students often have a better grasp of their studies than college-age people.

That article gave me the idea. The next day I mailed an I.C.S. coupon. It was the smartest thing I ever did. Today, after only 18 months as an I.C.S. student, I'm a supervisor.

I'm not a guy who believes in miracles, but if you want to help yourself, I.C.S. can give you the educational advantages you may have missed. For someone in my position with a wife, kids and a job, I.C.S. is a sure-fire way to break out of the rut.

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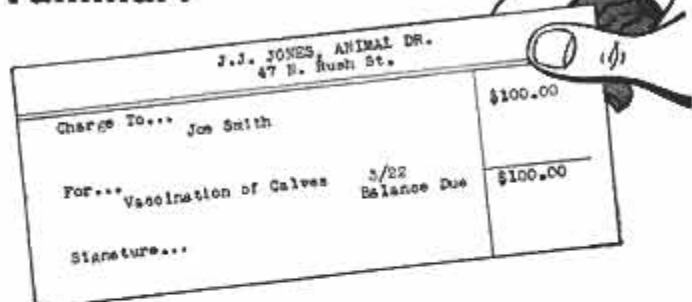
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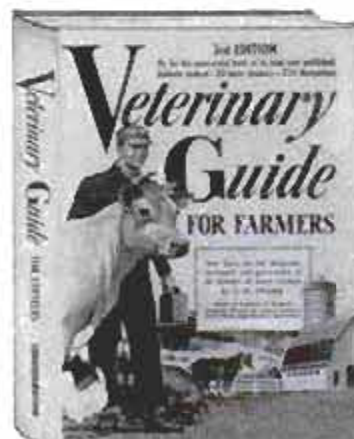
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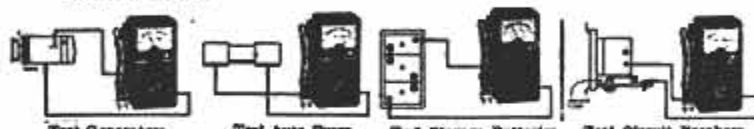
Small electric fan motor indicates 90 ohms (normal resistance).



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Manual supplied with Model 70 shows meter needle moves to right when test leads are connected to pins 3 and 4 of this 6AU6 tube. Procedure for testing all tubes used in TV are detailed in manual.



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"You see, this idea has caught on like wildfire in my town. Not a day goes by without my phone ringing with women calling for appointments. The beauty of it is that once a woman becomes my customer, she calls back year after year. Not only that, she tells her friends, too, and they call me. Before I know it I'm swamped with work. (And at \$7.50 an hour net profit it doesn't take long before my bank account is really mushrooming.)

"Funny thing, but back last year, before I started, I never realized the money there was in this business waiting for someone to come along and collect it. Just think: every house in town has furniture and most have rugs or carpeting. I concentrate on just the better homes and have more work than I can handle. You know why? Because women are fussy about their furnishings. Can't stand to see them dirty. That's why they call me over every year.

"The average job is worth \$25.00 to me and takes a little over 2 hours. Out of this, after paying for materials, advertising and other expenses I net about \$15.00 clear profit. This means I need just 3 jobs a day to clear \$11,250.00 in a year. Frankly, since this will be my first full-time year I'll be glad to hit the \$10,000 mark. But after that this business should grow larger each year until I have to hire men to help me handle the business.

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"As a Duraclean dealer I make money with four other services, too: **Duraproof** . . . which makes furnishings immune to moth and carpet beetle damage (it's backed by a six year warranty). **Durashield**, a brand new dirt-delaying treatment. It coats fabrics with an invisible film that keeps dirt out. **Duraguard**, another new service, flameproofs draperies, upholstery and carpets to reduce charring

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"One of the nicest things about being a Duraclean dealer is that I get continuous help from Duraclean Headquarters. My services are nationally advertised in famous magazines like *McCall's*, *House Beautiful* and many others. I also get a complete advertising kit prepared by experts. (There's even a musical commercial!) I get a monthly magazine full of methods to build business and I can meet with other dealers at Duraclean conventions. I'm also backed by insurance. In fact there are over 25 regular services I get under their unique System.

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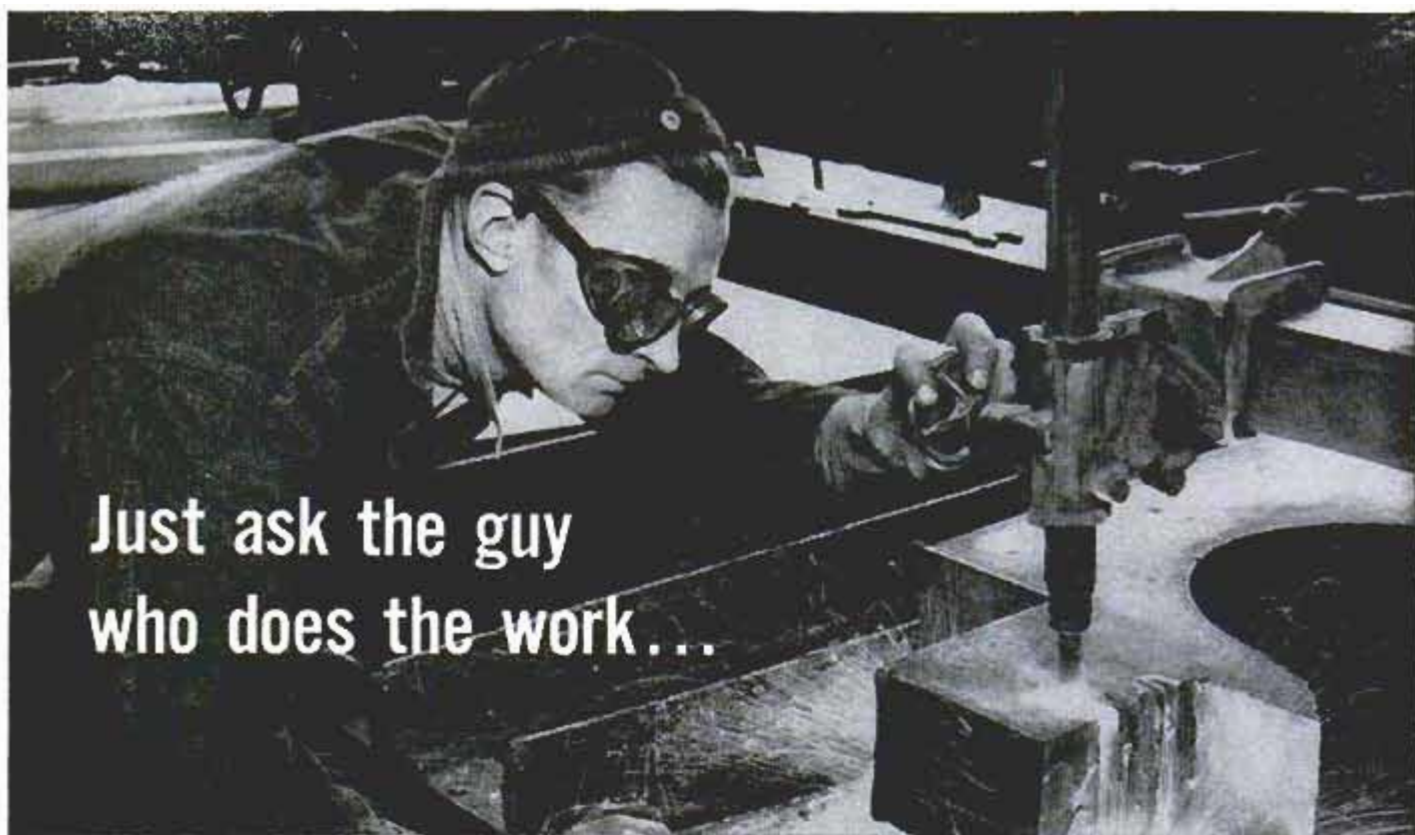
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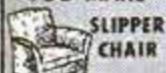
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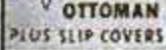
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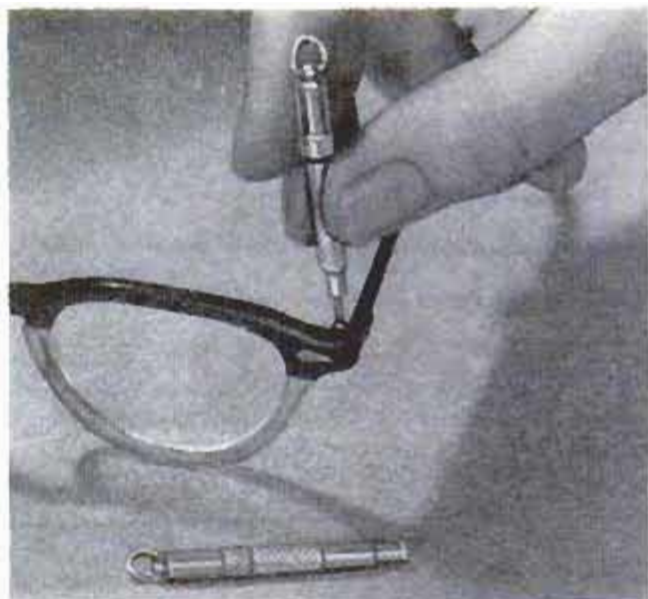
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## SKILLS *for* AMERICA

# SCIENCE and INDUSTRY MOBILIZE FOR THE FUTURE—What Part Will You Play In This Technical Age?

Much has been said about the economic health of our nation and the period of singular prosperity we are living in today. It's true that at no other time has it been possible for so many of us to enjoy the fruits of our own labor to the extent that we do today. Our standard of living is a credit to the determination and energy with which we live and work, and the strength of our nation is the proof of it.

This is the situation of the present. What of the future? International developments in science and technology exhibited recently indicate that the future is moving toward us much faster than we have realized. Our country and its industries are moving to meet this challenge by mobilizing for research and development our best business, scientific and military minds to assure our leadership in science and technology. But at the same time it is imperative that each of us as responsible citizens consider very carefully what contribution we as individuals can and are willing to make in helping America maintain its role of leadership.

The same advanced technology which has built our prosperity and the power of America has in turn created a serious shortage of skilled technical brainpower. This comes at a time when we are shoulders deep in a technical age that feeds upon technical brainpower. Large scale programs of industrial development, research, invention, increased production, defense requirements, new products—all have increased our consumption of technically trained and skilled personnel to the point where our available supply is no longer sufficient to meet the demands.

The skilled manpower shortage is a problem that has been dramatized very graphically through the press, radio and television by leaders of both business and government. However, it's one thing to read about the shortage and admit it to be true; it's more vitally important that we do something about it! Readers of Popular Mechanics who have technical or mechanical aptitudes can take positive action to help alleviate the shortage and make a contribution to the security and future development of America and its technology. Many of our readers are already engaged in scientific, technical or skilled fields of work. Others could, with adequate training,

prepare for any one of the hundreds of important skilled occupations that are needed.

Perhaps your abilities or interests lean toward mechanical or technical fields. If so, why not develop them by training for one of the skills America needs now and from all evidence will continue to need throughout your lifetime. The opportunities ahead of you hold exciting prospects and challenge!

**Industrial manpower needs and employment will continue to grow in the scientific professions, technician, and skilled craftsman occupations.** For instance, competent sources estimate that by 1980 we will have about 1,700,000 engineers and scientists in our working population—but by that time we will actually need close to 3,000,000! Thus there will be by 1980 an even greater shortage than exists today, unless more people go into scientific and engineering professions. The opportunity is obvious! This field of work is now the fastest growing occupational group and will continue to be.

**Even more rapid growth in employment is expected in technical and related occupations.** Between 1940 and 1950 alone, the number of technicians employed in this country increased by 132%! In related technical occupations such as radio operators, the increase was 160%; surveyors, 90%; draftsmen, 68%. The growth in employment of technicians is being stimulated by the continuing shortage of competent engineers and scientists, and the critical need to release this professional personnel from routine duties so they can devote more time to creative thinking, research and development. From 5 to 7 technicians are needed for each engineer employed, but we are far short of the necessary supply. Due to the increasingly complicated nature of present day technology and the emphasis placed on research and development, the shortage of technicians will continue to grow, unless more people enter this interesting field of work. Employment and advancement opportunities are particularly promising for you here!

**There will also be an upward trend in the employment of skilled craftsmen** brought about by increased production, more automated methods of manufacturing, and a general increase in business activity including construction. Presently, craftsmen and foremen repre-



sent about 1 out of 8 employed workers, a higher proportion than at any other period during the past half-century. The ability of our country to produce, build, and operate the complex machinery of industry depends on the skilled worker. Their skills transform the ideas of the scientists and the plans of the engineers into goods and services.

*The skilled trades provide excellent opportunities for all those planning future careers.* Industry is experiencing shortages in certain vital skilled occupations right now. Mechanics and repairmen are needed in unprecedented numbers to install and maintain new automatic machinery and electronic equipment in factories and large business establishments. Sales and service companies need skilled help to install and service the electrical and mechanical equipment of the modern household, including the 62,000,000 automobiles in use today.

In the skilled trades a man has a wide selection of jobs depending on his interests, ability and training. Furthermore, he has the excellent opportunity of becoming self-employed in one of the machining or metal-working trades, mechanics or repairman services, or as an independent contractor or builder.

Another skilled occupation in utmost demand now is the tool and die maker, a very exacting trade requiring high levels of skill. Nearly every manufacturing operation involves the tool and die maker who must construct the jigs, fixtures and accessories that hold the work being machined and the dies that are used in stamping, pressing and forging.

**Future prospects are especially favorable for carpenters, bricklayers, cement and concrete masons.** Employment growth in these trades will continue to expand to handle our highway programs, plant expansion, and the millions of new homes that must be built to house our growing population.

**Semi-skilled occupations such as machine operators over the next ten years will offer steady employment,** but without the growth opportunities of the more highly skilled trades. Automated manufacturing and broader application of machine power production will gradually replace the need for semi-skilled workers. The same eventuality will befall the unskilled worker to an even greater degree. Men now engaged in semi and unskilled work should acquire more training and experience to prepare for the changes in skill requirements which will be brought on by automation.

*America needs the support of every citizen with mechanical or technical ability, and its industries are urgently calling for men gifted with these abilities. America's future progress and safety in the onrush of world scientific achievement depends entirely on the contribution each one of us makes to the advancement of our own science and technology.*

Have you considered that possibly you could play an active role in helping to shape our future? Look carefully at your interests, your own abilities. Are you mechanically inclined? Do you enjoy working with tools to see wood or metal take shape under your own skillful guidance? Perhaps you are interested

in experimenting with engines, electronics, or chemistry in your spare time. Do you like to work out technical or mathematical problems? If you have any one of these or similar mechanical or technical interests, *it's entirely possible that you have within you potentials which if developed through education and training could lead to a very worthwhile career in a scientific, technical or skilled field!*

Measure your aptitudes and interests in relation to the hundreds of skilled occupations our nation is calling on its citizens to supply. Find out what training or education is required to become experienced in the career of your choice. *Take action now!* Training takes time, and industry wants trained men. Only through education and training can you thoroughly acquire a skill, and only through further education can you continue to advance in your field.

Today school administrators, engineers, scientists are urging people to continue their education. They say: If you are in high school now, by all means stay there until you graduate. If it's possible, continue on through college. If you are even slightly inclined toward technical subjects, by all means take science or engineering courses in an engineering school or one of the fine technical institutes. And anyone can improve his skills through trade, vocational schools or good correspondence courses.

**Educational requirements are rising in a great number of skilled occupations.** It's a well known fact today that the more education a person has, the higher his income is likely to be, the better his chances are for advancement, and the better equipped he will be to assume responsibility.

You will need all the training you can get to be successful in our modern technology. That's why we urge you to start preparing now for the skill of your choice. Study the occupation thoroughly. Find out what type of work is involved, what your duties would be, what training you will need to be the best in your field. Check working conditions, earnings and employment outlook in the occupation you've selected. Popular Mechanics will gladly help you do this by means of our newly published career guidance booklet, "SKILLS for AMERICA". Write for a free copy of this booklet to Dept. SFA-18, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

The next and most important step in planning your career is to get the best training possible. Select courses with care. Choose the engineering or technical institute, trade or vocational school that is right for you. This issue of Popular Mechanics can help you. Within our advertising pages are some of the finest technical and trade schools in the land. They will be glad to serve you—to help you plan your career and select the best program of study. Write to them. Ask their advice. Then start your training at once.

You can make a personal contribution to the future progress and security of your country and enrich your life with the satisfaction of achievement if you are willing to. Won't you do your part to help develop skills for America?



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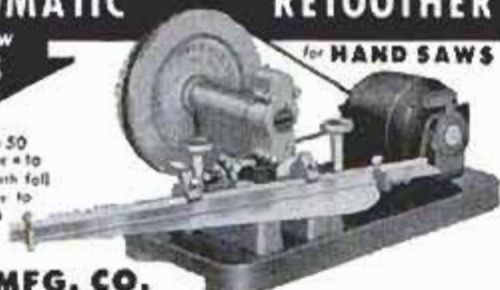
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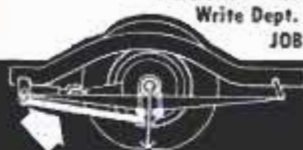
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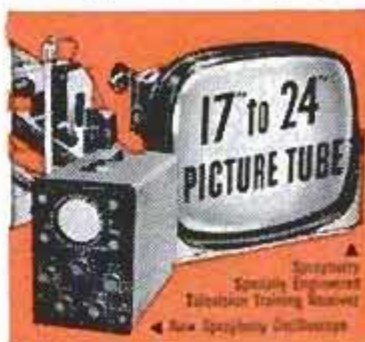
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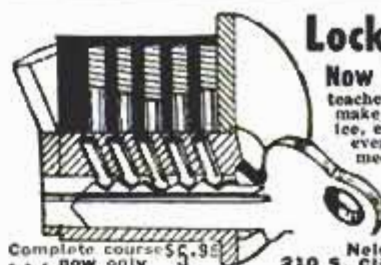
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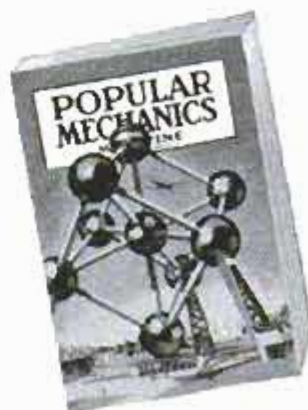
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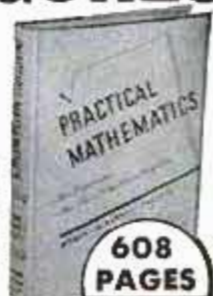
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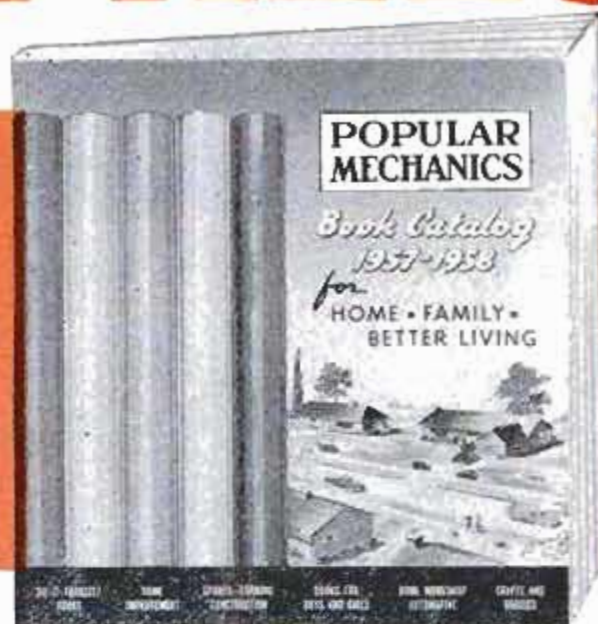
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BOOKKEEPERS, Accountants. Operate a bookkeeping service. Part or full time. Amazing simplified system. Wonderful money-making opportunities. Complete information free. National Bookkeeping Publishing Co., Suite 307, 3435 Broadway, Kansas City 11, Mo.

WE Pay \$3.50 lb. dried. Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We have 25,000 customers. Free book. Washington Mushroom Ind., Dept. 172, 2954 Admiral Way, Seattle, Wash.

\$250 WEEK Cleaning venetian blinds. Patented machinery. Free literature. Robinson, 7213B, Indianapolis 1, Indiana.

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

I Want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

INTERNATIONAL Mailorder business. Complete setup service—Not just instructions. Hermes, 152 West 42, New York City 36.

PLASTERCRAFT Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply, Blue Rapids, Kansas.

MARY-Mac agency—motorized vibrator. Cushions, chairs, tables, belts. Mary-Mac Factory, 1012 Powhattan, Dallas, Texas.

FREE Folio "\$5,000-\$45,000, Unlimited Vacations." No merchandise. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

FREE Folder. "How to Make \$3,000 Yearly. Sparetime, Backyard, Raising Earthworms!" Oakhaven 38, Cedar Hill, Texas.

MAKE \$46 From square foot plywood; jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

\$5,000 YEARLY, Spare time at home. Nothing to buy. No local selling. Dignified. Guaranteed. Home Harvest, Rt. 3, Box 3491-A, Albuquerque, New Mexico.

DRIVE-In restaurants make big money! Investigate—Read Drive-In Magazine. \$3.00 subscription shows how. Box 312, Pratt, Kansas.

MAKE Extra money. Cash commissions. Everybody buys easy-to-sell advertising book matches. Union label. All sizes. Cuts for all businesses. Powerhouse selling kit free. Steady repeat business. No experience necessary. Superior Match Co., Dept. MX-158, 7528 S. Greenwood, Chicago 19.

LET Me sell your products nationally. I'll send you free information on how to establish sparetime-full time Cascraft business. You build! We sell! Everything supplied. Abarsi, 807-SG Sunset, Los Angeles 12, Calif.

GROW A living miniature forest or orchard (only inches high), that bears tasty tiny fruit at home. Learn amazing dwarfing secrets! Sensational fascinating hobby, profitable home-business opportunity. Free details! Miniature Nurseries, Dept. JY, Gardena, California.

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\$250.00 WEEK Spare time profit possible. Earn at home with new fascinating printing method. \$5 starts you. Send no money now. Free confidential facts and valuable samples. Screen-Print, JY, Los Angeles 61.

BREED Rare tropical fish at home. Earn big money! Learn secrets! Help fill huge demand. Amazing opportunity! Free plan. Tropical Fish Breeders, Los Angeles 61, Calif.

HOME-Import mail order business—Import profitable items below wholesale. Experience and product investment unnecessary. Full, spare time. Famous world trader guides you. Free list "157 Imports," details. Mellinger, P701, Los Angeles 24.

GROW Expensive herbs for us! Big profits home-business of your own. Year around profitability! We supply everything necessary! Send for free amazing facts and revealing plan. National Herb Exchange, Box JY, Gardena, California.

NEW Dollar dishwasher. Latest home convenience. Lightning dollar seller. Makes dishes gleam. Samples sent on trial. Kristee 115, Akron, Ohio.

MINIATURE Golf plans \$1.00. Lil-Putt, Box 294, Rock Island, Illinois.

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START Your own business on credit. Your own boss. 1527 dealers sold \$5,000 to \$32,000 in 1956. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. A-U-PPM, Freeport, Ill.

EARN \$10,000 Yearly raising Angora rabbit wool for us. Information 25¢ coin. American Angora Company, Malta 12, Montana.

IMPORTING. Modern dropship method. Details free. The Hazen Company, 6601M—8th Avenue N. St. Petersburg 10, Florida.

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**\$100.00 WEEKLY** Spare room. Raise redworms soilless way. Odorless. Charlie Morgan, Box 116E, Bushnell, Florida.

**"HOW To Start a Business"** booklet sent free! If you know any trade, go into business for yourself! Learn the 9 easy steps to follow. We've guided 5,000 others to success. Revealing free booklet yours for the asking! Write! National Business Consultants, Office JY, Los Angeles 61, Calif.

**FREE Polio.** Work at home. Sparetime! Send stamp. Jackson, Box 37215-PM, Los Angeles 37, Calif.

**250 MARKETS** For your photographs \$1.00. Guaranteed. Feather, Greenville, Penna.

**FINANCING.** Our booklet, "Venture Financing," explains modern methods of financing small business. Send \$1.00 to Business Publications, 526 1st Ave. North, Seattle 9, Washington.

**STAY Home!** Get cash orders in your mail. Big profits. We supply everything—Fill your orders. Write: E. E. Allen Mail Service, 2038 Hazel, Detroit, Michigan.

**MAIL Order** advertising agency executive reveals sensational no-risk advertising and merchandise methods. Start in office or home; minimum capital; positive profits. Free details: Impact! 3407 Prospect Avenue, Dept. 11-1, Cleveland 15, Ohio.

**ABUNDAVITA** Means better living, bigger bank balances! Campo, 391-A Grand, Long Beach 14, California.

**MAKE \$3 To \$5** hour sharpening saws, lawnmowers sparetime at home. Free book. Victor B. Foley Co., Columbia Heights, Minn.

**MAKE** Strange plastic building material of waste, easily. Water, fire, wear and termite resistant. Bays Laboratory, Oklahoma City, 9.

**BIG Garden tractors** \$109.00. Sells for \$242.00 retail Universal Mfg. Co., 324 West Tenth, Indianapolis 2, Indiana.

**TYPIST** Operate profitable mail-order business. Stamp brings details. General Sales, 336 Roosevelt St., Creve Coeur, Ill.

**YOUR Photo** on stamps. No investment—No stock. Big profits. Free samples. Miniature Photostamps, Box 44-M, New York City 67.

**BUY Wholesale!** Name brand products. Free catalog! United Wholesalers, 1265-F Broadway, New York 1, N. Y.

**WE Establish** you in your own mail order discount business. Sell appliances, gifts, books, housewares, watches, jewelry, cookware, tableware, dinner, cutlery, etc., at discount to 75%. No stock needed. We ship orders under your name. Self-selling catalogs printed with your name, advertising postcards, circulars, names of mail order buyers supplied. Catalog, details free. Topval Corp., Lindenhurst 918, N. Y.

**BECOME** Factory distributor of aluminum windows, doors, jalousies, awnings, etc. Sell wholesale and retail. Small investment. Starlight Mfg. Co., R. D. #1, Box 605, Lakewood, N. J.

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**EARN \$50 To \$60** daily repairing typewriters, write New England Training Service, Carmel 2, Maine.

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**"MAIL-A-Way"** books. Profits galore. Free details. Script System, Box 4076, St. Petersburg, Florida.

**RUBACREAM!** Concentrated latex cream! Makes molds quicker! Thicker! Instructive literature free! Castcraft Studios, 508-PM Marion St., Brooklyn 33, N. Y.

**OPERATE** Mail-order printing brokerage. Details free. Advisory Service, Hartsdale, N. Y.

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**WE Love** our mailman—He leaves over \$1000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the Ranch Mailorder Method. Operates anywhere. Inquire: Eveningshade Ranch, Boerne, Texas.

**BUILD** Fascinating hobby-business engraving plastics! Profits to \$5 hour! Sample, details 25¢. Engraved aluminum door emblems \$1.00. Desco Distr's., 5262-J Van Nuys, Van Nuys, California.

**BUY** At wholesale prices! Resell at big profits. Brand name merchandise—Appliances, cookware, housewares, watches, jewelry, rings, dry goods, clothing, luggage, tools, sporting goods, toys, gifts, etc. Free 1958 color catalog. Write today. Merit Home Products, Dept. PM-1, 107 Manhattan Ave., Brooklyn 6, New York.

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**BE** Appointed state notary public now. Write, Stationers, Boerne, Texas.

**LEARN** Landscaping—The growing, use, maintenance and profit in ornamentals. Start in a small way, work into a profitable business. We show you how. Earn your diploma studying at home. Write for free booklet National Landscape Institute, Dept. M-18-C, 11826 San Vicente Blvd., Los Angeles 49, Calif.

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**INTERNATIONAL** Mail order items: Only Globetrotter's datasheet gives you both foreign suppliers names plus risk free selling methods. Send one dollar (cash, check, moneyorder) to Globetrotter, 1951 Richmond, Houston 6, Texas.

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**"MAIL Order Business"** magazine. Most comprehensive mail trade journal in the world! 3 sample issues \$1. Refunded if unsatisfactory. Box 591, CP, Lynn, Mass.

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**SEA-Gro:** Revolutionary soil, feed additive. Nothing like it. Big profits. Repeat business. Sea-Gro, Paramount, Calif.

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**START** Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM2A, Chicago 26, Ill.

**TAPE** Recording—Fabulous new business! \$500.00 monthly spare time! Entire country wide-open. Free facts. Dixieland Publishers, Asheboro 2A, N. C.

**137 BUSINESS** Plans collection. For home or outside, sparetime possible. Little or no capital, big profits potential, practical, diversified. Mandy and Tous, 216 West Jackson Boulevard, Chicago 6.

**KNOW** How pays! 600 secret, successful plans, tips, sources, hows. Stanley, 258 N. Freeman, Inglewood 3, California.

**FABULOUS** German synthetic gems! White. Brilliant. Hard! Titania's replacement. \$2.00 carat. MexTex, 721PM, El Paso, Texas.

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

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**IMPORT!** Make big profits. Details. Warner, Box 6, Fort Scott, Kansas.

**HOTTEST** Mail order plan ever! Sell photos, films, art novelties. Huge proven profits! Free details! Profits Unlimited, Dept. 1E, 15015 Ventura Blvd., Sherman Oaks, California.

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**MAKE** Money, mailing sample business cards. Vosacek Printing, 4444 Ute, San Diego 17, Calif.

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**WE** Pay \$3.50 lb. dried. Grow mushrooms, Cellar, shed and outdoors. Spare, full time, year round. We have 25,000 customers. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Wash.

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

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

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

**PLEXIGLAS**, Acetate, vinylite, polyester, fiberglass, epoxy, styrofoam, mold materials. 28 page instructive, informative wholesale-retail catalog. 25¢. Gem-O-Lite, 5527 Cahuenga Blvd., North Hollywood, California.

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**CHEMISTRY**—Science magazines. Literature free. Lankton, Box 5128-C7, Lansing 6, Michigan.

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**CHEMICALS**, Glassware. Catalog 25¢. Laboratory Sales, Box 161-A Brighton, Mass.

**AMAZING** New Book of Science. Experiments, formulas, and catalogue of laboratory supplies. Only 25¢. National Scientific Co., Dept. PM-1, 500 West Road, Lombard, Illinois.

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**EXPERIMENTERS:** Bargains catalog, 25¢ (refundable). Hagenow Laboratories, 2414 Clarck, Manitowoc, Wisconsin.

**ILLUSTRATED** Catalog: Chemistry, mineralogy, biology 25¢. Tracey Laboratories, Evanston, Illinois.

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**AMAZING** Greeting card money-maker—Make \$75.00 on 100 deluxe \$1.25 assortments. Newest 21 for \$1 tall cards, gift novelties, 133 fast sellers. Gift bonuses besides biggest profits. Experience unnecessary. Stationery samples free, others on approval. \$1.25 gift for prompt action. Creative Cards, 4401 Cermak, Dept. 514-H, Chicago 23.

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**FOG-Stop** windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee 74, Akron, Ohio.

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**PRINTING**, Advertising salesmen—Excellent moneymaking sideline selling decalcomania name plates, small quantities. Automobile initials, sign letters. Free samples. Ralco, XL, Boston 19, Mass.

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**\$500.00 EXTRA** In spare time! Show friends Sunshine's outstanding nationally advertised 24 card "everyday" ensemble (tall, petite, and square cards). Sells for only \$1.00, worth much more, cannot be purchased in stores. Luxurious cards sell on sight. Special fund raising plan for churches, clubs, etc. Write for details and samples on approval! Sunshine Art Studios, Inc., 13 Warwick, Springfield 1, Mass.; (West of Rockies, write Pasadena 1, Calif.).



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**DAMASCENE Earrings!** Exotic oriental-ism. Huge profit. Ohga, PM 103, Sigakenkusatu, Japan.

**NEW Self-watering flower pot.** Write for free literature. T. H. Greenwood Company, North Hills, Penna.

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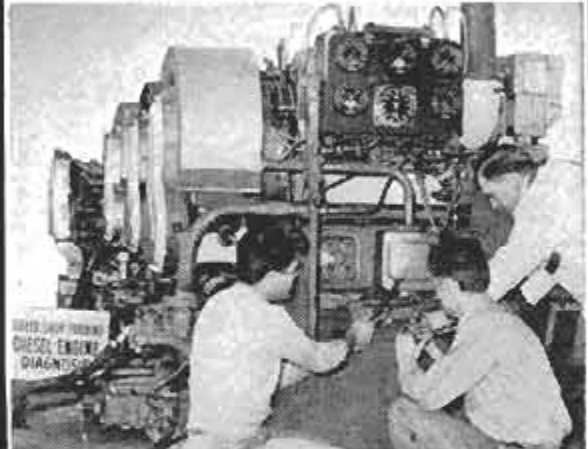
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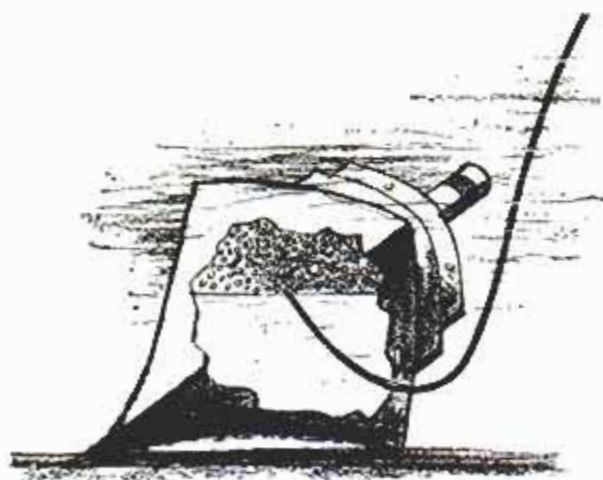
# OUR BUSY INVENTORS



**BATTERY VEST** was invented by Hermann H. Bly of Wanamassa, N. J., to extend the life of dry-cell batteries in regions of extreme cold. Ordinary radio batteries last only two hours at temperatures colder than 65 degrees below zero Fahrenheit. Vest, worn under parka, allows body heat to warm dry cells, extending life to 20 hours



**PLASTIC-FOAM GENERATOR** could be used to salvage a sunken ship without first making the ship airtight, according to its inventor, Barclay M. Ivanek of Grand Rapids, Mich. Liquid thermo-plastic foam would congeal into hard, buoyant bubbles when pumped into water. Continued pumping would raise the ship

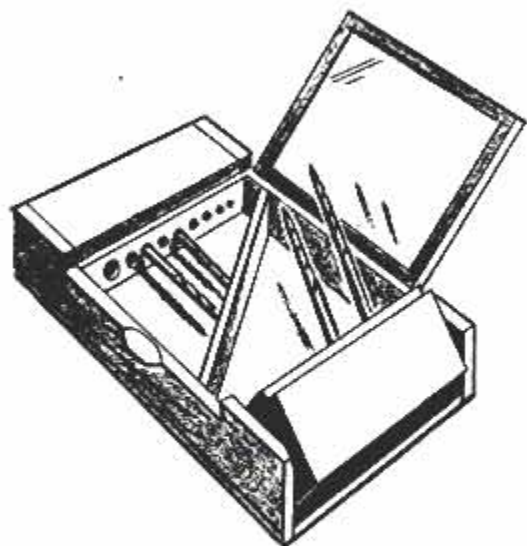


**TOOTHPASTE DISPENSER** suggested by Mrs. E. L. Enochs of Modesto, Calif., could be attached to the bathroom wall by a metal or plastic holder. Pushing a plunger on the top of the glass or plastic container would dispense the desired amount of paste on the toothbrush. The dispenser would eliminate the problems of removing and replacing tube caps and unsightly twisted tubes in the medicine cabinet



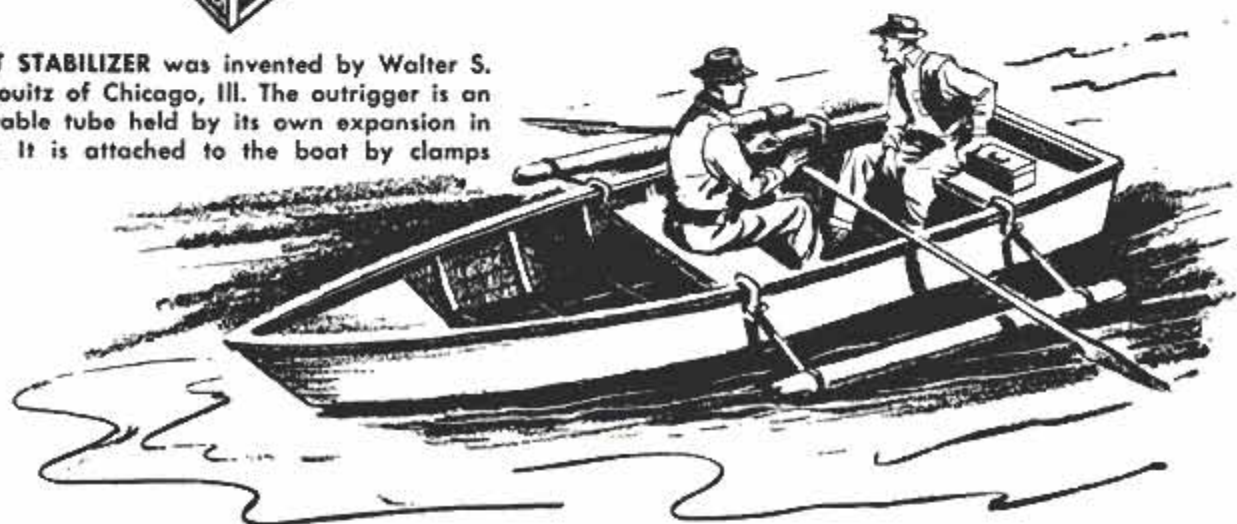


**TOOL CASE** with pivoted end members was patented by Vittorio Rocchetti of Rovereto, Italy. End members with tool-receiving holes swing upward on pivots in side walls of box

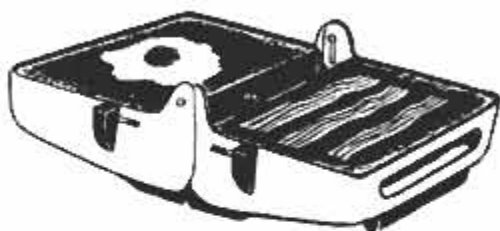


**TILTING GLASSES** of special value to machinists, dentists and others who do precision work, swing out of the line of vision by turning a small knob on the frame. The inventor, Louis Zanetti of Coral Gables, Fla., suggests that tilting frames could be adapted for dark lenses to be worn at the beach or for drivers who need them intermittently on trips

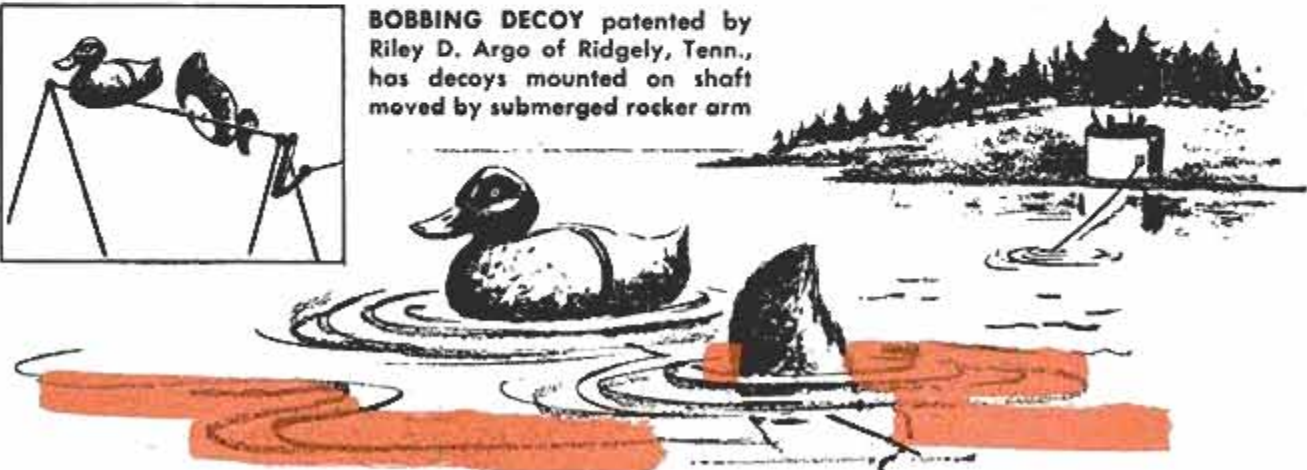
**BOAT STABILIZER** was invented by Walter S. Gaskovitz of Chicago, Ill. The outrigger is an inflatable tube held by its own expansion in rings. It is attached to the boat by clamps



**TOASTER-GRILL** invented by W. S. Taylor of Arlington, Va., could be used as a conventional toaster or turned on its side and used as a sandwich grill. Folding out both sides converts the appliance into a skillet



**BOBBING DECOY** patented by Riley D. Argo of Ridgely, Tenn., has decoys mounted on shaft moved by submerged rocker arm





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**WHERE-TO-BUY-IT INDEX**

**AUTOMOTIVE**

Detroit Listening Post.....126  
Baby car goes anywhere on low-pressure tires (Atwood Vacuum Machine Co., Rockford, Ill.).....143  
School bus has elevator for handicapped pupils.....143

**AVIATION**

Army helicopter bristles with rockets and machine guns for test.....106  
Research helicopter for Army has four small rotors.....107  
Jet-plane model makes bomb run.....154

**BOATS**

Outboard boats go "around the world in 34 1/2 days" (Kiekhaefer Corp., Fond du Lac, Wis.).....105  
Three-cylinder outboard develops 60 horsepower (Scott-Atwater Mfg. Co., 2901 E. Hennepin Ave., Minneapolis 13, Minn.).....106  
Fishing dory climbs out of water—it's amphibious.....115

**FARMING**

Tractor takes slick surfaces with 24 by 24-inch tires (Atwood Vacuum Machine Co., Rockford, Ill.).....152  
Tractor hoppers spot borer poison (Niagara Chemical Div., Food Machinery and Chemical Corp., Middleport, N. Y.).....154  
Haymaking is one-man operation with automatic equipment (John Deere Co., Moline, Ill.).....160

**MISCELLANEOUS**

Thin tube foretells wall TV and sky view for air pilot (Kaiser Aircraft and Electronics Corp., 1924 Broadway, Oakland 12, Calif.; Douglas Aircraft Co., Inc., El Segundo Div., Santa Monica, Calif.; Allen B. Dumont Laboratories, Inc., 450 Bloomfield Ave., Clifton, N. J.; Bell Helicopter Corp., P. O. Box 482, Fort Worth, Tex.).....104  
Interchangeable engine fits model plane, boat or car (Wen-Mac Corp., 11511 Tennessee Ave., Los Angeles 64, Calif.).....105  
Liquid insulation foams into place (Bakelite Co., 269 Madison Ave., New York City 16).....107  
Tractor "battering ram" demolishes concrete (Emaco Concrete Cutting Co., 2751 E. 11th St., Los Angeles, Calif.).....115  
Huge "swamp buggy" powered by airplane engines.....122  
Shutterless camera makes wide-angle pictures (Perkins-Elmer Corp., Norwalk, Conn.).....122  
"Chemical" bomber for SAC.....123  
Flying Swiss ski lift puts tourists on glacier top.....123  
Exhaust flare of rocket salvo lights up sky.....137  
Round pool table teaches coordination.....137  
Turn on the windows—it's getting dark.....137  
Circular hospital eliminates dead-end corridors.....151  
Adhesive will bond plastic to rubber and metal (Bell Telephone Laboratories, 463 West St., New York City).....152  
Air-tube suit makes floating easy as falling off a log.....152  
Students' teaching machine repeats questions missed.....152  
This pipeline delivers fuel by remote control.....153  
Model U. S. capitol built with pearls.....154  
Plywood will serve as church in Korea.....160  
Giant heat-treating furnace bakes guided-missile parts.....166  
Ramjets on copter blades fight frost in California.....166  
One man trains 32 horses with exerciser.....167  
Snooper TV camera probes pipelines.....167  
Steam engine built from auto parts.....167  
Cabana home . . . and one for the road.....168  
Plastic sailfish rivals nature (Joe Williams, Florida Game-fish Co., Miami, Fla.).....170  
Pocket-size slide rule has plastic-coated scales (Arthur F. Smith Co., 311 Alexander St., Rochester 4, N. Y.).....170  
Sling totes any rifle (J-K Co., P. O. Box 1173, Sacramento, Calif.).....170  
Egg assembly line separates yolks from whites (Seymour Foods, Inc., 609 Quincy St., Topeka, Kans.).....177  
Four hundred tons of church go for ride.....178  
Portable wash basin for campers.....254  
Slide "popping" eliminated by automatic projector (Bausch and Lomb Optical Co., Rochester, N. Y.).....256

**SCIENCE**

Canned milk holds flavor for months.....106  
Solar-heat collector used for drying grain.....115  
Keeping up With the Atom.....130  
A prediction in 1910—nears reality in '58.....142  
Pitch and roll machine tests submarine equipment.....143  
Carbon filters cut smog symptoms.....264  
Doctors operate on "cold" brain.....270

**WHAT'S NEW FOR YOUR HOME?**

Burglar alarm doubles as fire alarm.....144  
Disappearing clothesline.....144  
Temperature alarm.....144  
Vacuum-cleaner tool caddy.....144  
Automatic vegetable peeler.....145  
Clothes sprinkler.....145  
Shaver-cord reel.....145  
Silver-storage drawer.....145  
Swivel magnifying mirror.....145

**Radio-Television, Electronics**

Build your own Tel-Amp.....179

**Craftsman and Shop Notes Index**

**HOUSE AND HOME**

Drapery extensions "enlarge" windows.....194  
Appliance data stored in "picture cabinet".....195  
(Continued to page 94)



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- Ch. 4 — Operating the circular saw
- Ch. 5 — Dado-head techniques
- Ch. 6 — Drill-press operations
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Spice cabinets add charm to room.....	204
Replacing ceramic tile on wall or floor.....	207
Installing inside-wall vent fan.....	212
Ornate cast-iron brackets are support for novelty shelf.....	214

### HOUSEHOLD HINTS

Cleaning bone knife handles.....	189
Solving Home Problems—	
Avoid splintering of chair or table leg when shortening it.....	196
Easy to make liquid soap.....	196
Extra compartment spaces in drawer.....	196
Measuring linoleum.....	196
Shoehorn used as trowel for small plants.....	196
Sorting garments in a clothes closet.....	196
Easily located coaster.....	197
How to keep a small child from pulling lamp from table.....	197
Keep garments from slipping off hangers.....	197
Make a spool-and-bobbin rack.....	197
To remove a tight-fitting ring.....	197
White, opaque jars make decorative containers.....	197
Kitchen memo pad.....	206
Decorative receptacle for lunch bags.....	214

### MISCELLANEOUS

Aluminum-foil favor cups.....	189
Combination mailbox-signpost.....	189
Enameled nameplates.....	190
Card makes pinless badges.....	191
Reflector is mailbox flag.....	191
Repairing torn book pages.....	191
ABC of stains.....	192
Coiled extension cords don't become tangled when stored.....	194
Arrow on platen tells typist when end of paper is reached.....	198
Olive oil removes paper.....	198
Spring reduces trap losses.....	198
Draw freehand curves.....	203
"No spill" birdseed dispenser.....	203
Special leash holds small dog on car seat.....	203
Supercage for parakeet assembled from wooden dowels.....	207
Personalized headboards.....	208
Eliminate water-tap thump.....	214
Quick ball-point pen repair.....	214
Fishing float on address tags prevents pulling out.....	218
Improved carrying handle from rubber hose.....	218
Better typewriter performance.....	224
3 voltages from one battery.....	231
This surfacer combines three machines in one.....	234
Lever-operated gate latch saves stooping.....	238
Multiple V-belt drive for farm feed grinder.....	238

### ON THE MARKET

Electric plug projects 5/16 in. from wall.....	223
Hardwood dowels in diameters under 1/4 in.....	223
Natural reeds woven together form matting.....	223
Nonflammable paint remover.....	223

### PHOTOGRAPHY

Flashlight slide viewer.....	191
Glass strip is dodging tool.....	195
Flashlight is camera aid.....	198
Plastic juice containers speed film processing.....	199
"Preview" 35-mm. negatives.....	203
Faster photochemical mixing.....	207
Talcum powder will remove fingerprints from negatives.....	210
Low-cost film editor.....	211
Light seals for Graflarger.....	224

### SHOPPING FOR TOOLS

Bench-saw table.....	236
Insert-type roller die.....	236
Manually powered fastening tool.....	236
Miter calculator.....	236
Plumber's pliers.....	236
Shop lamp can be moved to any point.....	236
Three-way lock washer has barbs.....	236
Tiny jet pump is self-priming.....	236

### WORKSHOP HINTS

Better turning of softwood.....	189
"Dry cutting" sheet rubber.....	189
Tool for freeing sash.....	189
Identifying receptacle plates.....	194
Undercut hole holds wood filler.....	194
Tool for removing light bulbs.....	198
Miniature shop "bellows".....	207
Marking locations on cylinder.....	210
Notched block is "vise".....	210
Testing level for accuracy.....	210
Wood rasp improvised from taped hacksaw blades.....	210
Cementing wood-chisel handles.....	224
Drop-dispensing "oil can".....	224
Guide aids knife sharpening.....	224
Bandsaw makes jigsaw blades.....	230
V-block from lengths of hose.....	230
Holder keeps tools handy.....	234
Turning true-radius fillets.....	234
Saw blades stored in albums.....	238
Simulated polished finish on turned cast iron.....	238

**NOTICE**—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.



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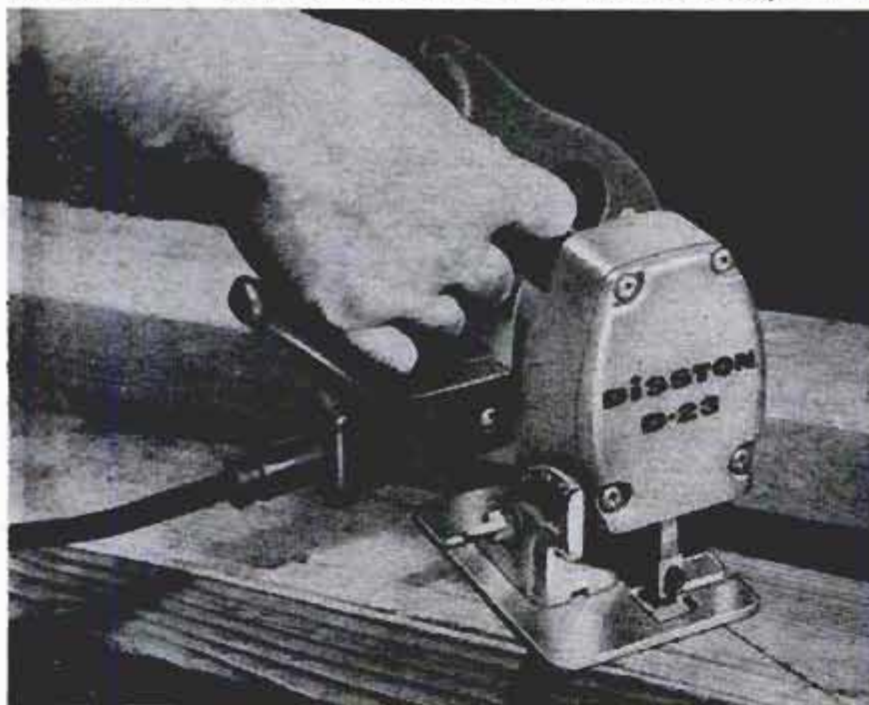
Measuring the amount of oxygen isotopes in rock surrounding valuable mineral deposits may be a future aid to prospecting. Millions of years ago when the earth was being formed intense heat accompanied the formation of ore deposits, causing chemical changes in the rocks around them. Now, scientists of California Institute of Technology are using a special mass spectrometer to locate gold, lead and zinc by an analysis of oxygen in neighboring rock formations. The system is the equivalent of having a geochemical thermometer capable of taking temperatures that existed about 250 million years ago.

### Big Lignite Field Found in India

One of the world's largest fields of lignite has been discovered in southern India. It extends over 100 square miles in a thick layer about 180 feet beneath the ground. Geologists estimate the field contains 2000 million tons of lignite, with easily workable deposits of 200 million tons in a 5½-square-mile area.



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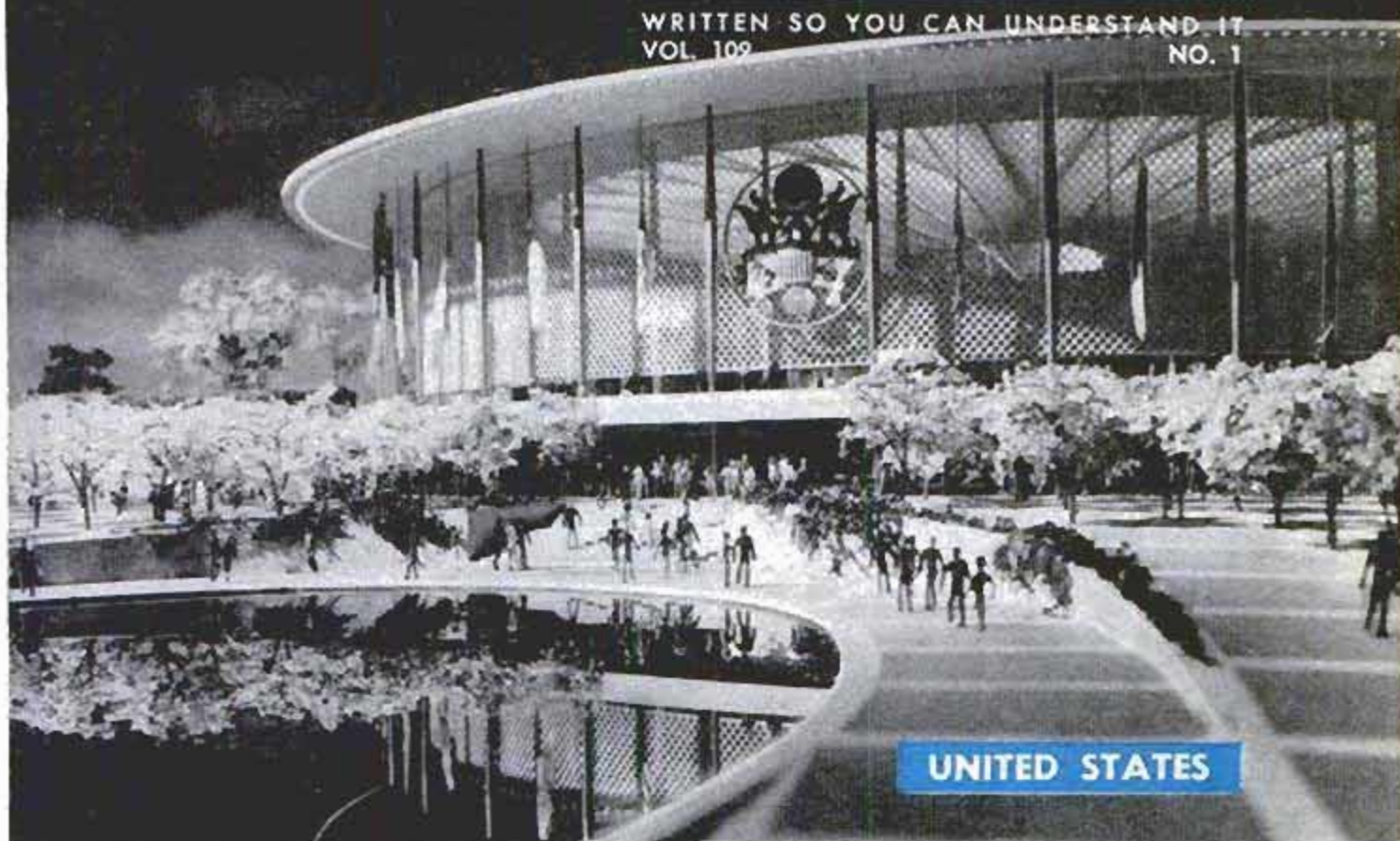
A. Champions give full-firing power. Put new Champions in your car every 10,000 miles. You'll get an *immediate* boost in horsepower...and save gasoline, too!



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**CHAMPION**





"Crystal and gold palace" is what the Belgians call the U.S. pavilion at the 1958 world's fair in Brussels



## A NEW LANDMARK FOR BRUSSELS...

# THE ATOMIUM

By G. H. Davis

SINCE THE DAYS of the Great Exhibition in London in 1851, every large world's fair has had some spectacular piece of architecture as a central attraction. The 1851 exhibition had its Crystal Palace, the 1889 exhibition in Paris produced the Eiffel Tower, the 1939 fair in New York had the Trylon and Perisphere, and now the Brussels Universal and International Exhibition of 1958 will have its Atomium—probably the strangest structure of them all.

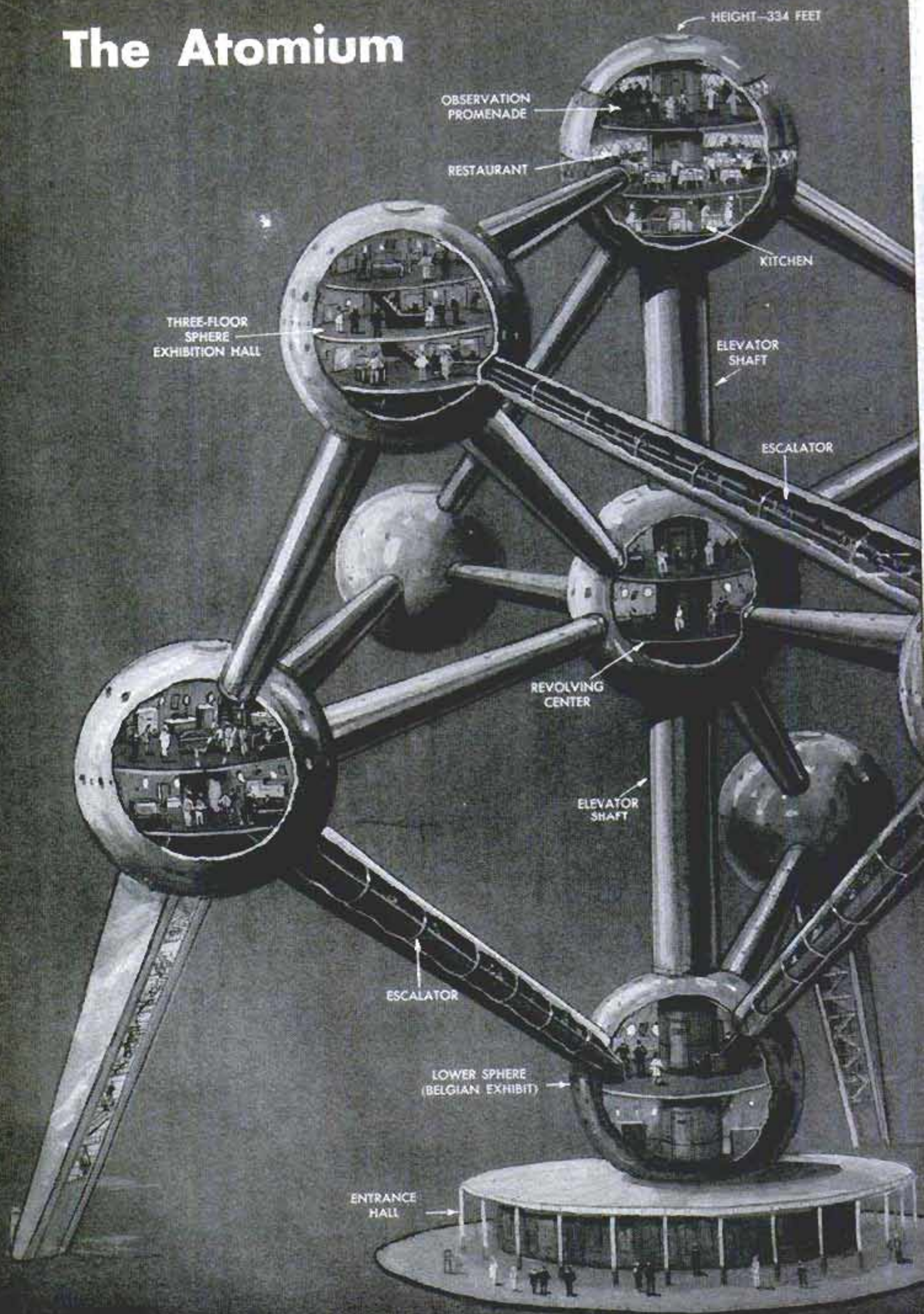
This oddity, to symbolize the atom age, will be 334 feet high and represents a metal

crystal enlarged about 200 billion times. It was originally designed to be 460 feet high but this plan had to be abandoned because of the danger to aircraft.

The nine spheres of the Atomium will be connected to each other by large tubes containing Escalators or stairways to reach the spheres. To make the tubes less noticeable, they will be covered with a paint camouflage while the spheres of highly polished aluminum will shine brightly. It is proposed to have flashing lights around each sphere to represent the orbits of

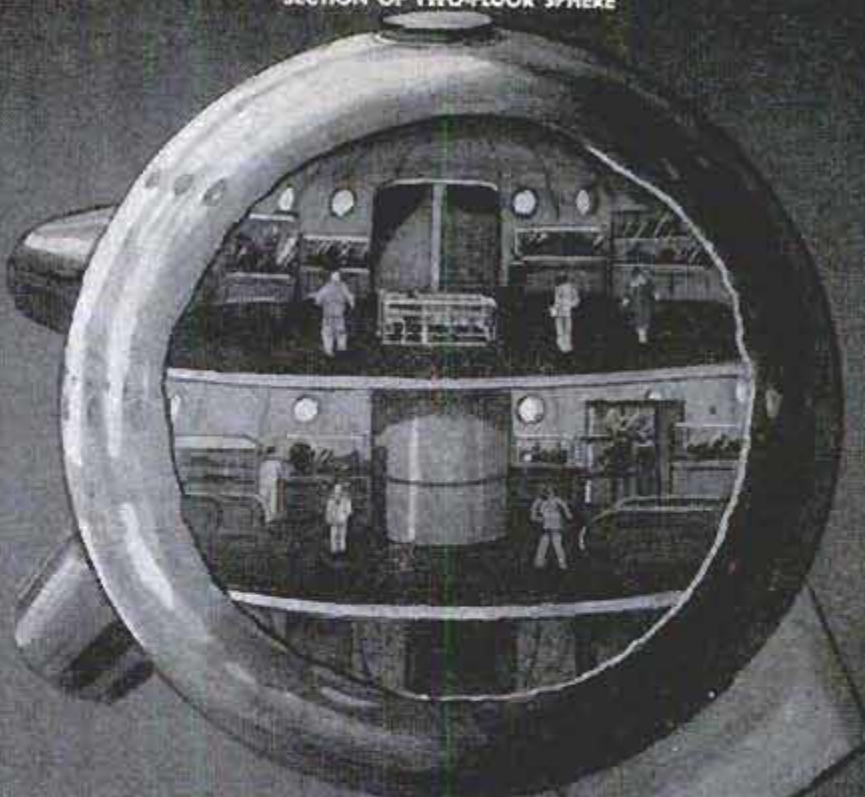


# The Atomium





SECTION OF THREE-FLOOR SPHERE

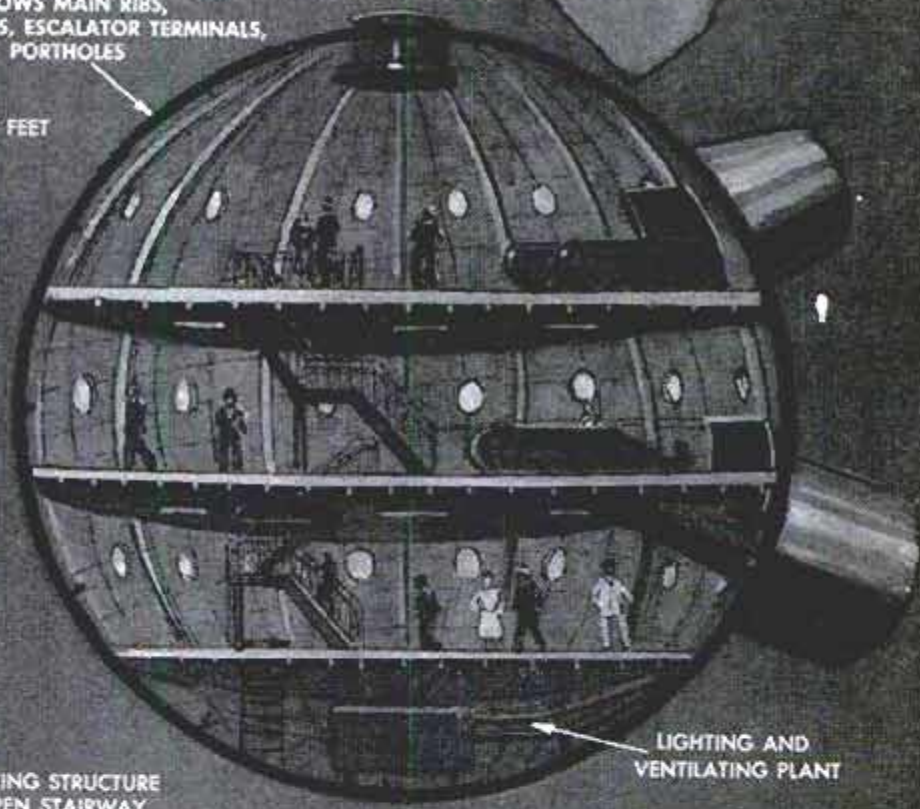


STAIRWAYS  
INSIDE SHAFT

CAFE OR  
EXHIBITION  
HALLS

CUTAWAY OF THREE-FLOOR SPHERE  
SHOWS MAIN RIBS,  
INNER STAIRS, ESCALATOR TERMINALS,  
PORTHOLES

DIAMETER OF SPHERES—59 FEET



LIGHTING AND  
VENTILATING PLANT

SUPPORTING STRUCTURE  
HAS OPEN STAIRWAY

INTERIOR OF MAIN ENTRANCE HALL







## SWITZERLAND

Swiss pavilion is put together like a honeycomb with a lake in center to plug "the playground of Europe"

electrons around the atom nucleus. Each sphere will be 59 feet in diameter, some being provided with two floors and others with three. Inside the majority of the spheres will be exhibitions available to the public.

Up the central shaft will run an elevator capable of carrying about 20 persons per trip. This elevator will carry people to the topmost sphere where they will find a first-class restaurant and a magnificent view. From here they will be able to see not only the entire fair grounds but the beautiful wooded country around Brussels, the Royal Palace of Laeken and, in the far distance, the field of Waterloo.

The Atomium will have a complete system of ventilation as the interior of the spheres would otherwise get very hot on summer days. Each sphere will be electrically lighted and there will be glass-fiber portholes to let in daylight.

Both the United States and Russia have

French designers went all-out modern with exhibition hall made of steel and prefab concrete panels



## FRANCE

reserved spheres in which they will show atomic energy for peace in many phases. Great Britain, France, Italy and many other countries will be exhibiting in other spheres, while the base sphere will be used for a Belgian exhibit.

Many engineering problems have had to be overcome in the designing and building of the Atomium, particularly the main foundation at the base of the central shaft. At one time rumors were circulated that there had been a serious cave-in, but the engineers on the spot assured me that this was untrue and that the foundations were fully capable of supporting nearly double the weight of the finished structure and a big crowd in the spheres. Certainly, the shaft stood solid and straight to the sky when I viewed it, though it only had its lowest sphere in position at the time.

### Will Resist Gale Winds

The designers also had to guard against wind pressures which may be considerable on such an unconventional structure. Again I was assured that wind-tunnel tests have proved conclusively that the finished building will be well able to withstand gale-force winds of 112 miles per hour, far greater than any ever experienced in the area. At night the Atomium spheres will provide a glittering and beautiful spectacle with the gigantic globes sparkling with a vast number of points of light.

Of all the foreign exhibits that will be temporarily planted on Belgian soil during this world's fair, the largest area will be occupied by the United States with a pavilion and adjacent grounds covering 29,700 square yards. The great circular pavilion will be the largest free-span circular building in the world. The pavilion is 340



feet in diameter and 90 feet high and has an adjacent theater that will seat about 1000 persons.

This "crystal and gold palace," as the pavilion has been described, will be constructed chiefly of plastic and steel and topped with a plastic suspended roof resembling a bicycle wheel. The roof will be attached only to a rim connected with an inner metallic ring by steel cables in tension. The ceiling, also suspended, will be of metal mesh permitting light to flood the pavilion.

The outer ring of this huge "bicycle wheel" will rest upon two concentric rows of gilded steel columns. The walls will be hung between the columns and made of cellular-plastic "honeycomb," sealed with an undulating plastic cover. Present plans also suggest there will be hanging gardens around the building.

### Classic Simplicity

The second floor will present an uninterrupted space about 60 feet wide overlooking the interior garden on one side and directly connected with exterior gardens and a balcony. The classic simplicity of the pavilion will be enhanced by The Great Seal of the United States, of enormous dimensions, placed over the main entrance. A colorful note will be the flags of all the states flying from the building.

The pavilion is circular to conform with the shape of the site and was designed by Edward D. Stone of New York.

The United States pavilion has been called dignified and impressive, possibly because it does not follow the "weird and wonderful" modernistic designs of several of the other countries. The exhibit is costing approximately \$15,000,000.

The Swiss section of the exhibition will take the form of a group of pavilions joined like the cells of a beehive. A small lake in the center of the pavilions reminds visitors of the lakes and other vacation features of Switzerland. Inside the Swiss buildings will be more reminders of the rugged grandeur of a land that has been called "the playground of Europe." The exhibits will also include products of Swiss industry

(Continued to page 252)



VATICAN

For the first time in history, the Vatican is taking part in a world's fair with this church of unique triangular design. The timber framework is 190 feet high and can be dismantled



SOVIET RUSSIA

Russian building of steel, aluminum and concrete, has Victorian solidity. The structure is built around a gigantic statue of Lenin

Canadian pavilion will house industrial as well as agricultural products, also big movie theater and coffeshouse



CANADA





Here's how 21-inch TV set may look in near future. Model is held by its inventor, William Ross Aiken



Used in airplane cockpit, picture of area in which pilot is flying appears on TV tube in front of him

## Thin Tube Foretells Wall TV and Sky View for Air Pilot

BECAUSE OF NEW TECHNIQUES in the field of electronics, airplane instrument panels and home television sets may soon have something in common—a rectangular picture tube less than three inches thick. The thin cathode-ray tube was invented by William Ross Aiken and developed in the Kaiser Aircraft and Electronics Corporation laboratories. Military uses for the new TV tube were developed for the Douglas Aircraft Company. For the aircraft pilot,

Another model of the thin-tube TV set is mounted in a piece of modern furniture. It also could be installed in any wall



the thin TV tube will serve as an electronic windshield, showing an artificial picture of the terrain and sky conditions about him. For the TV viewer at home, the new picture tube may result in new designs for sets, with screens mounted in any wall or hung like picture frames. The picture tube, only  $2\frac{5}{8}$  inches thick, is made of two rectangular pieces of plate glass with about an inch of space between them. The edges are sealed with powdered-glass solder to hold the vacuum. The surface of the thin tube is the equivalent of a 21-inch conventional screen. In the thin tube, the electron beam is injected at the bottom of one side. Deflection plates along the bottom edge bend the beam upward between the front and back glass walls. The inside of the front wall is coated with a new transparent phosphor which is said to improve the contrast. The thin TV tube also is reported to have sharper focusing properties. A new method of printing electrode elements on the inside surfaces of the glass eliminates the need for assembled metal parts. Printed circuits are used in the tube controls. The thin tube will replace many of the instruments needed for blind flying of an airplane and can be operated by a small electronic computer. A similar control system was developed by Allen B. Dumont Laboratories, Inc., for Bell Helicopter Corp.





## Outboard Boats Go "Around the World in 34½ Days"

Two boats powered by outboard motors recently completed a trip "around the world in 34½ days." The 25,000-mile run was made around a closed course on a lake in Florida in a test of the endurance of modern outboard motors. The boats, five-place runabouts with stock 60-horsepower Mercury motors, made continuous night-and-day runs and were refueled and driv-

ers changed while under way. The average speed of the lead boat was 30.2 miles per hour and gas consumption averaged 7.9 miles per gallon. Calculations show that each engine crankshaft made 225 million revolutions and each ignition system produced 1350 million sparks. The 25,000-mile distance is estimated to be the equivalent of 10 years of normal use.

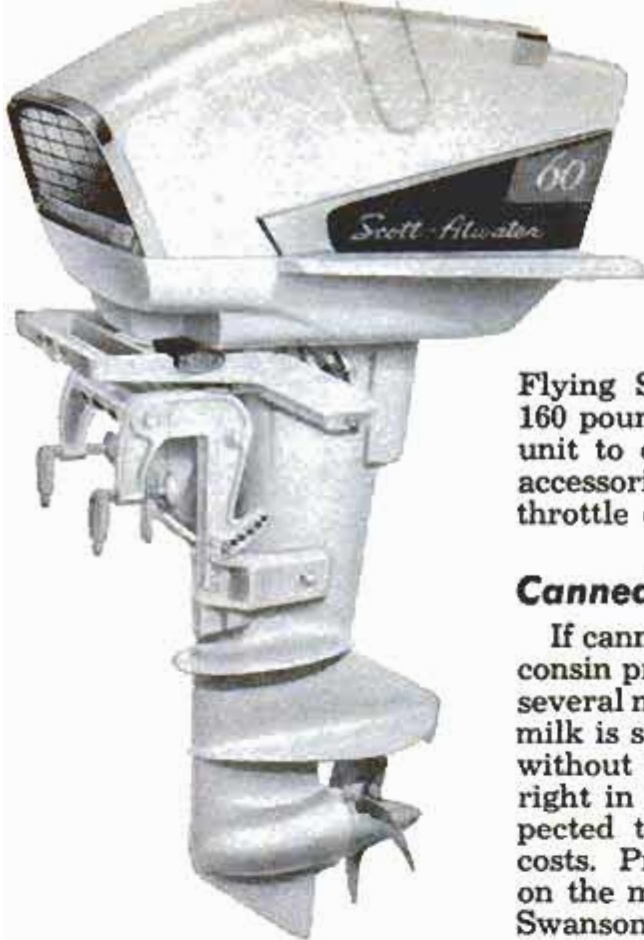
## Interchangeable Engine Fits Model Plane, Boat or Car

Young model enthusiasts now can obtain a boat, an airplane and a racing car all powered by the same engine. A kit contains the three models with one engine which can be switched from model to model depending upon whether the youngster wants to operate on land, sea or in the air. The tethered racing car will attain speeds

of 40 miles per hour, and the boat, which has controls for straightaway or circular racing, makes 20 knots. The engine is the new recoilable type, started by pulling on a finger loop, much as an outboard motor is started by a rope pull. The kit includes a starting battery and cables, fuel and a control line for the plane model.







## Three-Cylinder Outboard Develops 60 Horsepower

Something new in outboard motors this year is a three-cylinder, 60-horsepower model. Though three-cylinder, in-line models have been available in Europe for some time, this is the first modern production model in this country. Called the Flying Scott, the Scott-Atwater motor weighs only 160 pounds. One innovation is a slightly offset lower unit to counteract the propeller's torque. Two new accessories are available, a single-lever shift and throttle control, and a powered tilt mechanism.

## Canned Milk Holds Fresh Flavor for Months

If canning tests announced by the University of Wisconsin prove successful, it will be possible to purchase several months' supply of canned milk at one time. The milk is said to retain its freshness for months with or without refrigeration. Concentrated and sterilized right in dairy plants, the new canning system is expected to broaden markets and reduce distribution costs. Processing equipment to do the job is already on the market, according to H. E. Calbert and A. M. Swanson, who had charge of the research project.

## Army Helicopter Bristles With Rockets and Machine Guns for Test

Undergoing tests for the Army at Fort Benning, Ga., is a heavily armed H-34 Choctaw helicopter. The armament fittings, specially installed by Sikorsky Aircraft, in-

clude forty 2.75 rockets, two 5-inch anti-tank and antisubmarine rockets, two 20-millimeter cannon, three .50-caliber and six .30-caliber machine guns.







U. S. Army photo

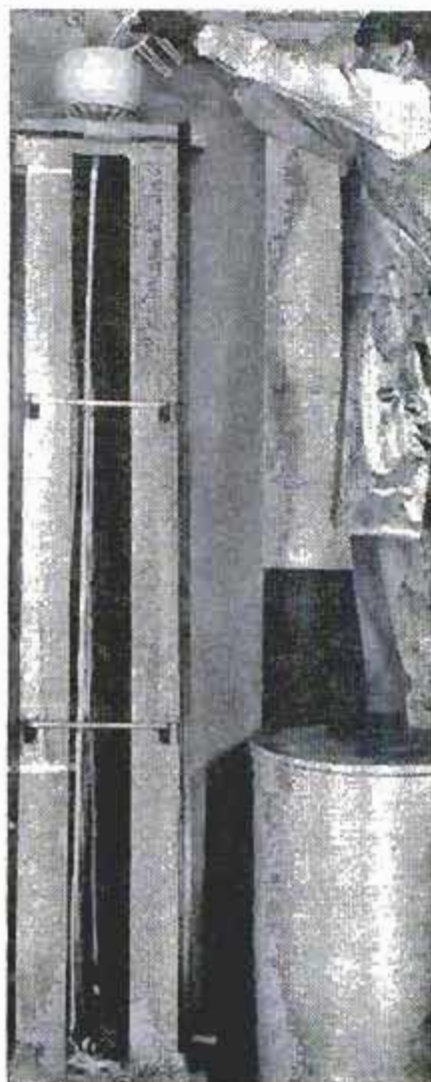
## Research Helicopter Has Four Small Rotors

Instead of one or two big rotors, a novel helicopter under test by the Army has four small ones. Called the Quadrotor, the helicopter has two sets of spars to support the

four rotors. Tests are under way to determine possible costs and operational advantages. Convertawing, Inc., has been awarded an Army contract to continue research.

### Liquid Insulation Foams Into Place

Insulation may be "foamed" into place in your next home. Bakelite chemists are producing fast-setting foams which fill narrow cavities, simulating the space between studs in a wall, to a uniform density. Two liquid ingredients are mixed and poured immediately into the cavity. The mixture foams up and hardens into a cellular structure within 60 seconds. Because the liquid is converted into a foam of 200 times greater volume, the new insulating technique is expected to save shipping as well as labor costs. The insulating value of the phenolic foam compares favorably with the values of current insulating materials. Although the foam can be applied at the building site, it is expected to be particularly applicable to prefabricated buildings.





# AN ENGINEER'S ANALYSIS

By Dale Kelly, SAE  
Registered Professional Engineer

# 1958 CHEVROLET

**MODEL TESTED:** 1958 Bel Air four-door sedan with new 348-cubic-inch V8 engine, four-barrel carburetor, dual exhausts, Powerglide transmission. Rear-axle ratio: 3.36 to 1. Wheelbase: 117.5 inches. Tires: 7.50 by 14. Weight: 3753 pounds with gas tank half full (55 percent on front wheels, 45 percent on rear). Mileage on car at time of test: 350 miles. Barometer: 29.12 inches. Temperature: 81 degrees F. Payload: 200 pounds.

## ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Regular gasoline.....	2.7	5.4	10.2	18.2	17.8
Premium gasoline.....	2.4	4.9	9.1	16.2	17.0
Super-premium gasoline.....	No improvement shown				

(All tests in Drive range. Gasoline had the following octane ratings by Research method: Regular 90; Premium 97; Super-premium 105.)

## FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	17.2	15.0	12.2	10.2
Premium gasoline.....	19.1	15.4	13.5	9.65

(In traffic test car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

Estimated average

**ANNUAL GASOLINE BILL: \$230 for 10,000 miles**

(Based on exclusive use of premium gas at 33 cents a gallon.)

## SPEEDOMETER ERROR (miles per hour)



Speedometer reading .....	20	30	40	50	60	70	80
True speed .....	20	30	40	49	58	67	76

## ODOMETER ERROR (miles traveled)

Odometer registered 103.5 miles for actual distance of 100 miles.



## DRIVER'S VISION

Driver could see part of road 15.5 feet in front of car, full width of road 18.0 feet in front of car.



## GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....23-ft. radius  
Worst hump that could be crossed...14-ft. radius  
Deepest rut that could be negotiated.....6.5 in.  
Curb clearance for door opening.....14 in.

## MISCELLANEOUS

### STEERING

Steering-wheel turns for 100-ft. circle...0.85 turn  
Curb-to-curb turn-circle diameter.....38.5 feet  
Wall-to-wall turn-circle diameter.....41.5 feet  
Steering-wheel turns, lock-to-lock.....5.3 turns

### TRUNK CAPACITY

16 cartons (one cubic foot each)

### CENTER OF GRAVITY

22.2 inches

### WATER RESISTANCE

Splash-pan test: No leaks, no ignition trouble  
High-pressure test: Doors leaked badly

## OBSERVATIONS

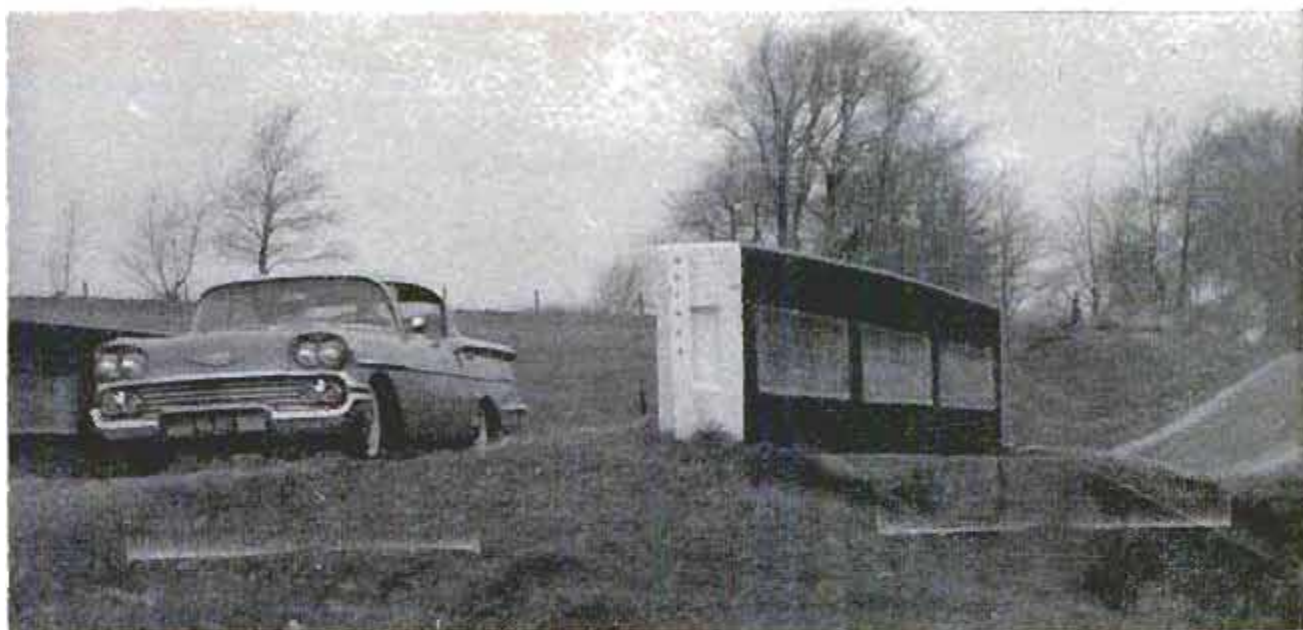
Chevrolet has new X-frame and turn-circle diameter is very short (three feet less than in 1957). Center of gravity an inch lower than 1957. Foot-operated park brake easier to set than previous hand brake. It easily held car on a 14-percent grade.

Two of the four small lights in front grille are dummies.

High-temperature (180-degree) cooling-system thermostat is standard. Hotter water means more heat from car heater and should increase engine life. Owners who use alcohol-type antifreeze will have to replace thermostat with cooler version.

Gasoline tank filled satisfactorily. First 2½ gallons put into an empty tank did not register on the gauge.





On undulating roads, Chevy's air suspension provides a firm, pleasant ride without nauseating oscillation

## PM Tests the 1958 Chevrolet, Ford, Plymouth

By Arthur R. Railton

**A**RE THEY LIKE three peas in a pod? Are they equally good in all respects? Or are there enough differences so that only one (the Chevrolet, the Ford or the Plymouth) is the car for you?

PM is trying to help you answer these questions. Dale Kelly's engineering analysis in this issue gives scientific data on which to base your choice. This article tries to help by giving carefully considered judgments of each car's important features.

In subsequent issues, the owners themselves will tell you their experiences in the PM Owners Report series.

Certainly there are areas where the cars are so similar that it's hard to separate them. Riding quality is such an area.

PM gave a blindfold test to four men (none had been in a 1958 car previously). The test covered a short ride over a smooth city street and then later a longer ride over a rough road with sharp dips taken at higher-than-normal speeds.

The riders were asked to list the three cars in order of riding quality.

What happened? The front-seat rider in each case rated Ford best, Plymouth second best and Chevrolet third best.

The three rear-seat riders (and it's fair to add that rear-seat ride is apt to be less comfortable than front-seat ride) gave a clear victory to Chevrolet on the rough road, and a tie for Chevrolet and Plymouth on the smooth road. Both times, the three rear-seat riders ranked Ford lowest.

The test Chevrolet was equipped with air suspension (an extra-cost option).

Neither the Ford nor Plymouth had air bags. With the air ride, Chevrolet got top billing in the rough ride, but on the boulevard it did not seem to make enough difference to beat out Plymouth.

The four test riders agreed that differences among the three cars are minor indeed. None was outstandingly better or outstandingly worse in ride than the others.

If you sit in each of the cars in rapid succession you will notice a difference in seating position and comfort. Ford and Chevrolet have the most comfortable driving position. You sit upright and seem to assume a better control position than you do in the Plymouth. Plymouth's front seat is low and its vertical cushion tilts backward at an angle that is tiring in traffic situations when an alert driver tends to lean forward. Passengers, however, may prefer the Plymouth's relaxed seat posture.

Another comfort factor is leg position, especially for the driver—he cannot shift his legs around the way passengers can. Chevrolet and Ford rate about equal, with a slight margin for Chevrolet. The driver's leg position on the Plymouth is less comfortable because of the very low front seat. There is no support for the thigh of the gas-pedal leg unless the seat is moved to its extreme back position. Left-foot brakemen may find Plymouth less convenient because the most comfortable position for the left leg requires the foot to be far away from the excellently shaped brake pedal.

The distance between the dimmer switch and the brake pedal on the Plymouth is



## AN ENGINEER'S ANALYSIS

By Dale Kelly, SAE

Registered Professional Engineer

# 1958 FORD

**MODEL TESTED:** 1958 Ford Fairlane 500 four-door sedan with 352-cubic-inch V8 engine, four-barrel carburetor, dual exhausts, Cruis-O-Matic transmission, power brakes, power steering and power seat. Rear-axle ratio: 2.69 to 1. Wheelbase: 118 inches. Tires: 8.00 by 14. Weight: 3874 pounds with gas tank half full (57 percent on front wheels, 43 percent on rear). Mileage on car at time of test: 447 miles. Barometer: 29.17 inches. Temperature: 68 degrees F. Payload: 200 pounds.

### ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline.....	2.9	6.4	11.2	20.1	18.4
Premium gasoline.....	2.8	5.9	10.2	18.7	17.8
Super-Premium gasoline.....	No significant improvement				

(All tests in D<sub>1</sub> range. Gasoline had the following octane ratings by Research method: Regular 90; Premium 97, Super-premium 105.)

### FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	17.0	14.5	12.6	9.1
Premium gasoline.....	17.0	13.5	12.4	8.9

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

Estimated average

**ANNUAL GASOLINE BILL: \$256 for 10,000 miles**

(Based on exclusive use of premium gas at 33 cents a gallon.)

### SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70	80
True speed.....	19	28	37	46	56	65	75

### ODOMETER ERROR (miles traveled)

Odometer registered 102 miles for actual distance of 100 miles.



### DRIVER'S VISION

Driver could see part of road 16 feet in front of car, full width of road 24 feet in front of car.



### GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....25-ft. radius  
 Worst hump that could be crossed...19-ft. radius  
 Deepest rut that could be negotiated.....7.25 in.  
 Curb clearance for door opening.....12 in.

### MISCELLANEOUS

#### STEERING

Steering-wheel turns for 100-ft. circle...0.90 turns  
 Curb-to-curb turn-circle diameter.....41.5 feet  
 Wall-to-wall turn-circle diameter.....44.0 feet  
 Steering-wheel turns, lock-to-lock.....4.5 turns

#### TRUNK CAPACITY

13 cartons (one cubic foot each)

#### CENTER OF GRAVITY

21.9 inches

#### WATER RESISTANCE

Splash-pan test: Insignificant leaks. No ignition trouble.  
 High-pressure test: Slight door leaks.

### OBSERVATIONS

In general, an entirely satisfactory car. Front-seat headroom, trunk capacity and curb clearance under the doors could stand improvement. Ford has combined a big engine displacement with an economy-ratio rear axle.

The new Cruis-O-Matic is a three-speed transmission practically identical with Fordomatic except for controls. With control in normal drive (D<sub>1</sub>) position, it starts in First regardless of accelerator-pedal position. For safer starting in snow or ice, the control can be shifted to D<sub>2</sub> position which starts it in Second. With accelerator pedal against the floorboard, the test car shifted from First to Second at 50 miles per hour,

from Second to Third at 80 miles per hour. With a light pedal pressure, it shifted at 12 miles per hour and 32 miles per hour. A thoughtless driver could drive the car indefinitely in Second at 30 miles per hour. At any speed under 70 you can downshift into Second by flooring the pedal to give extra power for passing. Below 35 miles per hour, it downshifts into First.

Gasoline tank filled satisfactorily. First 1 1/2 gallons put into an empty tank did not register on the gauge.

Power brakes had enough reserve vacuum to make four stops after the engine was turned off.





**Ford has lots of power and its automatic transmission combines positive action with extreme smoothness**

great and when both are being used frequently, as they could be in some situations, the left foot has to move around constantly.

Ford's rear floor has two deep stepdowns that are too small to accommodate all six feet of three rear-seat passengers (or even four feet of two riders for long periods). Some have to ride with one foot up on a hill, the other foot down in the valley.

Chevrolet also has two stepdowns in the rear, but they are much more roomy. However, there is a high tunnel that requires an uncomfortably wide leg spread by the center rear-seat passenger (much wider than on the other two cars).

Plymouth has no stepdown and therefore has the lowest tunnel and the most comfortable leg position for the center rear-seat rider, but the center seat cushion is thinly padded. The brace for the stub center post of the four-door hardtop cuts into rear-seat legroom of the Plymouth more than in the others.

To the driver, Ford seems to be bigger than the others and, consequently, it is less easily wheeled around in traffic. There is a lot to the state of mind in driving in traffic and the bigger the car "feels," the less easy it is to maneuver.

Although it feels bigger, Ford is actually two inches shorter than Chevrolet and only an inch longer than Plymouth.

Despite being biggest, Chevrolet feels smallest of the three. Many things combine to create this sensation. The steering-wheel position is such that you feel to be in complete control—it has a little of the sports-car feel to it. The upright front seat provides better vision and emphasizes the feeling of mastery. Plymouth's low front seat somewhat offsets its outstanding han-

dling qualities and the driver feels he has less control than with the Chevrolet.

The Chevrolet is more maneuverable in fact, than the others. It turns around in a 37.4-foot circle. Ford's circle is four feet larger, Plymouth's almost five feet larger.

Plymouth's excellent (and fast) power steering makes up in large part for its reduced maneuverability. The driver feels he can put it (and the Chevrolet also) in a smaller space than he can put the Ford. If the front of the Plymouth came to a sharp point (heaven forbid), the driver feels he could run it into the eye of a needle, that's how precise the steering is.

Fast cornering is a pleasure in the Plymouth, which is a joy to take over winding roads. Ford is poorest in this respect.

Chevrolet's dashboard is most convenient by a narrow margin. Instruments are well shaped and easily read, day or night. Plymouth's instrument layout is equally good, but the rest of the dash is less desirable. Ford's speedometer is excellent in the daytime, but at night the numbers are not easy to read. Ford, however, has the best lighting of knobs and controls. There are no secrets on the Ford dash, every knob is clearly labeled and lighted.

Neither Ford nor Chevrolet has windshield reflections at night, but Plymouth does have one annoying reflection across the top of the curved glass.

Mounted far to the right, the Chevrolet clock is of no use at all to the driver. This is the only poor feature of the dashboard. Plymouth sensibly installs its clock in the instrument panel right in front of the driver and Ford's is about halfway over, visible but not easily so.

To reach into the Plymouth glove compartment, the driver has to leave his place



# AN ENGINEER'S ANALYSIS

By Dale Kelly, SAE  
Registered Professional Engineer

# 1958 PLYMOUTH

**MODEL TESTED:** 1958 Belvedere four-door sedan with 318-cubic-inch V8 engine, two-barrel carburetor, single exhaust, TorqueFlite transmission, power brakes, power steering, power seat and windows. Rear-axle ratio: 3.18 to 1. Wheelbase: 118 inches. Tires: 7.50 by 14. Weight: 3832 pounds with gas tank half full (55 percent on front wheels, 45 percent on rear). Mileage on car at time of test: 750 miles. Barometer: 29.3 inches. Temperature: 64 degrees F. Payload: 200 pounds.

## ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Regular gasoline .....	1.9	6.4	12.3	24.0	18.85
Premium gasoline .....	2.0	6.0	12.1	24.0	18.7
Super-premium gasoline.....	No improvement shown				

(All tests in Drive range. Gasoline had following octane ratings; by Research method: Regular 90; Premium 97; Super-premium 105.)

## FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline .....	20.8	17.4	12.8	10.8
Premium gasoline .....	20.0	16.0	13.4	10.8

(In traffic test car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

Estimated average

**ANNUAL GASOLINE BILL: \$207 for 10,000 miles**

(Based on assumption that premium gas at 33 cents a gallon and regular gas at 30.5 cents a gallon will both be used.)

## SPEEDOMETER ERROR



Speedometer reading .....	20	30	40	50	60	70	80
True speed .....	20	29	38	47	55	64	72

## ODOMETER ERROR

Odometer registered 105 miles for actual distance of 100 miles

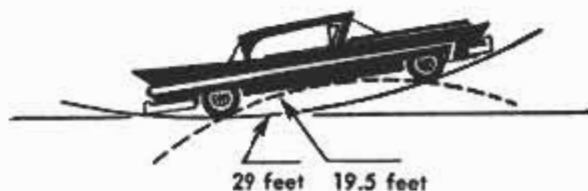
## DRIVER'S VISION

Driver could see part of road 19 feet in front of car, full width of road 25 feet in front of car.



## GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....29-ft. radius  
Worst hump that could be crossed .....19.5-ft. radius  
Deepest rut that could be negotiated.....7 in.  
Curb clearance for door opening.....13 in.



## MISCELLANEOUS

### STEERING

Steering-wheel turn for 100-ft. circle...0.70 turn  
Curb-to-curb turn-circle diameter.....42.0 feet  
Wall-to-wall turn-circle diameter.....45.0 feet  
Steering-wheel turns, lock-to-lock.....3.6 turns

### TRUNK CAPACITY

18 cartons (one cubic foot each)

### CENTER OF GRAVITY

23.0 inches

### WATER RESISTANCE

Splash-pan test: No leaks, no ignition trouble  
High-pressure test: Slight door leaks

## OBSERVATIONS

Distortion in windshield corners a little worse than most.

Transmission was the three-speed TorqueFlite, Chrysler Corporation's newest model. With light accelerator pressure, it shifted from first to second at 12 miles per hour, to third at 18. With wide-open throttle, it shifted at 25 and 50. When pushed past the detent to the floorboard, it

shifted at 35 and 70.

Park brake held easily on 14-percent grade. Brake reserve tank permitted two or three applications with engine dead.

Gasoline tank filled satisfactorily. First 2 gallons in empty tank did not register on the gauge.

Power steering excellent, requiring little winding.





**Fast cornering is a treat in a Plymouth. It takes curves like this one almost as flat as a sports car does**

behind the wheel and slide over to the right. Both Chevrolet and Ford have glove compartments where they can be reached from the driver's seat.

Both control knobs on the Plymouth radio are on the driver's side of the dial, making it unnecessary to reach across the dash to tune in a station. This is an improvement that others could use.

Windshield wipers are good on all three cars. Ford's leaves the largest unwiped area in the center—a triangle about five inches wide at its narrowest point. The other two have wipers that leave less than two inches unwiped. Ford's vacuum wipers are fastest and have a desirable infinitely adjustable speed range, the other two have dual-speed electric wipers. Electric wipers have the advantage of constant speed, the disadvantage of limited speed adjustment.

Chevrolet's rear-view mirror arrangement is best, Plymouth's poorest. Ford and Plymouth mount outside rear-view mirrors on the front fenders ahead of the windshield. They must be viewed through the distorted curve in the wrap-around glass. The mirrors on these two are useless in rain or snow because that part of the windshield is not wiped.

Chevrolet's rear mirror is mounted on the door, just to the left of the steering wheel, and provides excellent rear vision under all conditions.

All three test cars had small body noises, a normal situation in a new car. Ford's was a minor rattle in the trunk area, Chevy's was around the steering column and dash, Plymouth's was in the left front door. Except for these infrequent noises, all are extremely quiet, pleasant cars to travel in. It's difficult to believe that any car at any price could offer very much more than

these three in comfortable high-speed traveling over good roads.

Automatic transmissions on all are excellent although Plymouth's does have some jerkiness, especially at full throttle. Chevrolet's is smoothest, Ford's the most positive. Plymouth's seems to require the most engine windup on acceleration. In fact, Plymouth was the least responsive of the three test cars. However, since all have more response than the driver has any use or need for, this is an academic point.

Four headlights are standard on all and they provide excellent illumination down the road on high beam. But most of the time high beam cannot be used because of approaching traffic.

The back seat of the Plymouth is the most awkward to enter and leave. Chevrolet's is easiest.

Heaters on all work well. All give heat within a mile or so from a cold start on a moderate morning. No extreme cold days were experienced so no complete test could be made. Heater controls are simplest on Plymouth and Chevrolet, more complex and stiffer on the Ford.

Exterior styling is for you to judge. Each to his own taste. However, it is unfortunate that each of the cars mounts a potentially deadly decoration on its front fenders.

Chevrolet's are most dangerous, being knife-edge wind splits that would slice into the flesh on impact. Plymouth's are similar and only slightly less sharp. Ford's are round but perhaps equally dangerous.

In summary, the ideal car would be one that had the roominess and maneuverability of the Chevrolet, the exceptional road sense and handling ease of the Plymouth, with the power and automatic transmission of the Ford.

★ ★ ★



COMING IN FEBRUARY

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You'll want to clip and frame the eight-page color section devoted to these sixteen outstanding automobiles



### YOU'LL FIND:

Details and specs on all 1958 cars  
Pictures and data on popular foreign cars  
Industry production data and trends



### YOU'LL GET ANSWERS TO:

Is half a car better than none?  
Which gasoline is best for your car?  
Will success spoil Volkswagen?

**NEXT MONTH—JOIN CARWISE PEOPLE COAST TO COAST  
WHO READ PM'S FAMED ANNUAL AUTOMOTIVE SECTION**



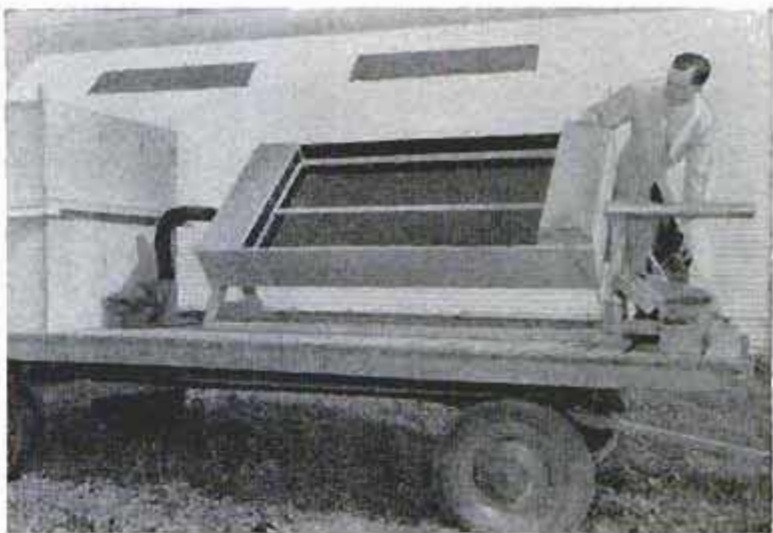
## Tractor "Battering Ram" Demolishes Concrete

Tearing up miles of solid-concrete retaining wall is easy with a tractor-mounted compressed-air "battering ram." Jackhammers are difficult to handle horizontally, but this rig is operated easily by one man. Air is supplied by a 300-cubic-foot portable compressor. The device, boasting a three-foot-long stroke, was built by a California concrete-wrecking firm working on the widening of Cahuenga Pass in Hollywood.



## Solar-Heat Collector Used for Drying Grain

Agricultural engineers at Michigan State University are experimenting with methods of using solar-heat devices on the farm. One outfit is a scale-model heat collector made of sheet metal painted with black asphalt and covered with a sheet of glass. Air heated by the collector is blown into a bin where it dries grain. Engineers figure a collector with 1000 square feet of surface can heat air as warm as a furnace burning two gallons of fuel per hour.



## Fishing Dory Climbs Out of Water—It's Amphibious

Taking a cue from wartime amphibious craft, Harvey Smith of Pacific City, Ore., has converted his surf dory into an eight-knot boat and a 15-miles-per-hour land vehicle. It is powered by a 95-horsepower inboard engine. The rear-axle assembly of an automobile is mounted above the en-

gine with a chain drive to the two wheels. One clutch engages the wheels, another the propeller. The stern steering wheel under the rudder is from an old airplane. An offset in the boat's stern had to be extended 30 inches to accommodate the equipment. One man can operate it.

Engine drives rear axle through a chain and sprocket, which powers chain-driven wheels outside the boat





*Kept...  
P/M Highlights*



Parked on Red Square, Victor drew sight-seers. In background are towers of nine churches that form St. Basil's Cathedral

# I DROVE THROUGH RUSSIA

By David Scott

## PART II

**WE HAD BEEN** two days in Russia, two days of driving down a broad, virtually empty highway. After a stopover at Smolensk we headed once more for our goal, that city of paradoxes, Moscow. In the back seat, as always, was Vladimir, the 22-year-old interpreter assigned to us by Intourist, the Soviet travel agency.

Mid-afternoon of this third day brings a change of scenery. About 30 miles from Moscow we start seeing clusters of houses. Most of

Traffic moves fast on the broad avenues of central Moscow. Dotted center strips are a refuge for pedestrians







**Moscow paradox: Century-old houses sprouting TV antennas stand in shadow of massive new apartments**

them are wooden shanties, but every one sprouts a TV antenna. Occasionally we pass a factory. At the city outskirts, huge apartment houses stand amid a forest of building cranes. Then the traffic really starts—few cars, but an endless stream of green trucks, like an army on the move.

New impressions tumble in. The road is being sprinkled by water tankers, then swept by mechanical brushes to clean up the muddy tracks deposited by trucks from adjacent building sites. Vladimir tells us you can be fined for driving a dirty car in Moscow. It's also an offense to blow your horn or drop a cigarette butt in the street.

Our first stop on this broad belt of concrete is for a bewildering set of four traffic lights. Normally you can turn right on red, but a left-turn is allowed only on a double green light. Overhead hangs a row of circular signs indicating lanes, prohibited vehicles, permitted turns and other regulations. The usual system for left-turns on main avenues is to proceed straight across

an intersection to the U-turn sign halfway up the block, then swing around into the oncoming traffic and cut across to be in position for the next right-turn.

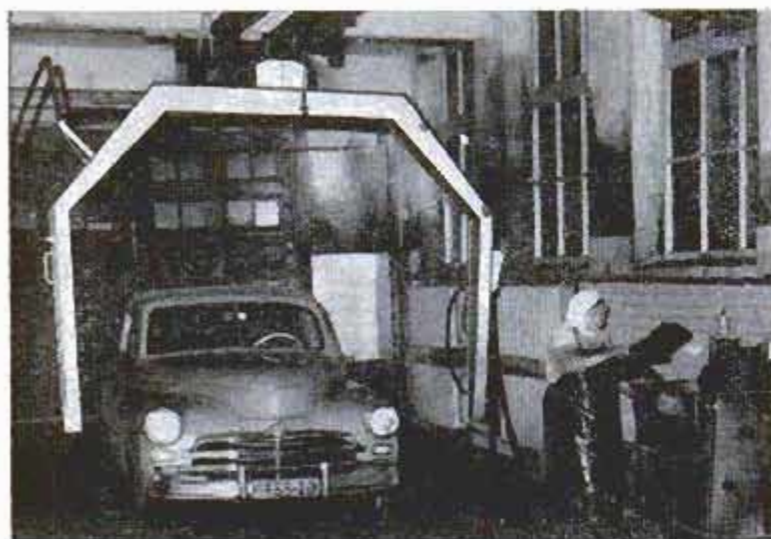
In the center of the city there's a running battle between cars and pedestrians, although the Muscovite walker (usually runner) stranded in midstream has enough sense to stand dead still as the traffic rushes past him. It's a rat race to the uninitiated, but the militiamen (Russian for cops) seem unconcerned. Immaculately garbed in military-type uniforms, they often control traffic merely with a jerk of the head or repeated whistle blasts. Experiencing this continuous war of man vs. machine, we recalled the laconic advice of the English-language guide to motorists in the U.S.S.R.: "When necessary, the car should be stopped in time to avoid an accident."

At the vast permanent Agricultural and Industrial Exhibition in Moscow we had a close look at the cars the Russian can buy. Most popular is the four-seater Moskvitch,





Editor of a Russian science magazine is regular reader of *Popular Mechanics*. His job is to indoctrinate youth in science



It's illegal to drive a dirty car along Moscow streets, but a complete car wash by this sturdy woman costs only 50 cents

Factory for Moskvitch automobiles has an automated line which turns out an average of 185 cars a day



similar in appearance to more than one British model and costing the ruble equivalent of \$1500. This represents more than one year's average wages and must be paid in cash—there's no consumer credit. Outwardly the car is conventional, with integral body-chassis, a 35-horsepower L-head engine and three-speed manual transmission. Radio and heater are standard.

Beneath the surface the Moskvitch bristles with features that reflect the arduous Soviet driving conditions and weather. For example, the engine has two separate oil filters and a radiator shutter. A towing hook is fitted in case you get bogged down, and the seats fold flat to form a double bed for when you're stranded miles from nowhere. The toolkit would equip a small garage, including no fewer than 20 different wrenches.

We also had a look at the larger Volga that sells for \$3000. It is powered by one of Russia's first overhead-valve gas engines—a four-cylinder unit rated at 70 horsepower. Initially it was to have an automatic transmission, but this gave so much trouble that the idea was shelved. It is a pleasantly styled machine—a compromise between American and European designs.

A visit to the Moskvitch plant gave us a glimpse of how the Soviets make cars. Daily output





In a near-disaster in Poland, woman cyclist shown at right was struck by author's car, shattering windshield



Russians eagerly replaced windshield with plastic. Then, when replacement pane arrived, they installed it free

there is 185, amounting to half the country's total annual production of 110,000 units. Machinery is modern by European standards, with a considerable number of automatic transfer lines for the engine block and cylinder head, manifold, transmission housing and other large components. Automation is applied widely to special-purpose machines for making smaller parts such as pistons and universal joints.

Russia's production figure for trucks is more impressive, since the country's trans-

port system relies heavily on fleets of rugged machines. Almost all these trucks are heavy-duty jobs with pay-load ratings from 2½ to 40 tons, and current output is some 370,000 a year. Although this is only about half of America's production in the same load category, it is over three times the combined output of Britain, West Germany and France.

At the ZIL plant in Moscow we saw one four-tonner or a heavier six-by-six version rolling off the assembly lines every 2½ minutes. Over 20 automatic lines are used

Russian Moskvitch, costing \$1500, is rugged car designed for bad roads, has towing hook, two oil filters

Volga sedan, larger car with better styling, sells for \$3000—more than two years' wages for most Russians







Russian factories have fine equipment. This is an automatic transfer line for machining cylinder blocks at Moskvitch plant



Here's the author at work in hotel overlooking Kremlin, St. Basil's Cathedral. Cost was \$11.25 a day with meals and interpreter

Apartment houses go up in a hurry on outskirts of Moscow. Road is being widened into a six-lane highway



for machining engine and transmission parts, and production is keyed to a high pitch. In addition to trucks, the factory turns out 11 coaches a day, with 1500 bicycles and 30 refrigerators as sidelines. I was struck by the number of women workers (nearly a third of the 40,000 employees), and especially by the way they held every type of man's job.

I had a unique chance at both these factories to sample personally the Russians' technical proficiency and zeal, since the Victor reached Moscow somewhat bruised after an accident. Near-disaster had struck us in the middle of Poland—a country where travelers to Russia must reckon with peasants asleep at the reins of horse-drawn carts, small children teetering about on man-sized bicycles, animals grazing along the roadway and other hazards.

This time it was a woman on a bicycle who cut across my path just as I was about to overtake her. Despite frantic horn blasts and shrieking tires she never once looked around. Braking furiously and swinging far to the left in a flanking movement, I hit her. She rolled over the hood, snapped the radio antenna, smashed the windshield and bounced forward in a series of somersaults on the road. By some miracle she was not killed—not even any bones broken.

Shaken, but glad to have escaped so lightly, we had driven on slowly to Warsaw with the wind buffeting our faces. A Warsaw





Parked outside his hotel, the author's GM-built Victor always attracted a group of car-hungry Russians

garage had fastened a flat piece of plastic in place to serve as a windshield, but the wrap-around corners remained exposed to the elements. At the end of 800 drafty miles it was heartening to find in Moscow a cable from the Vauxhall factory in England (which had loaned me the car) announcing that a new piece of glass was on the way.

Before it arrived we visited the ZIL factory where the chief engineer insisted that his experimental shop improve the repair, despite my protests that a replacement windshield was coming by air. At the end of the day the Victor was returned to us looking almost like new. Corner sections of plastic had been shaped and bent in the

(Continued to page 268)



There are no billboards along Russian roads, but plenty of propoganda posters extolling Communism

Painted lanes guide traffic through empty acres of a square in central Moscow. The Kremlin is at right







## Huge "Swamp Buggy" Powered by Airplane Engines

Like a giant swamp buggy, the U. S. Navy ship YAG 37 is powered by "fans." They are T-34 turboprop airplane engines, two fore and two aft on gun mounts. The engines drive the ship up to eight knots and, since the gun mounts will turn in

a complete circle, she can go in any direction—even sideways. The engines are the former Liberty ship's only source of power, her propellers and all steam equipment having been removed. The Navy has not divulged the purpose of the experiment.



## Shutterless Camera Makes Wide-Angle Pictures

Panoramic photographs like an aerial view of Long Island (at left) are made by a new lightweight camera that has no shutter. The image is recorded on the film as it moves over a slit in the camera. The 53-pound unit is only slightly wider than the 70-millimeter film it uses. A rotating glass prism provides a horizon-to-horizon sweep as it scans across, rather than along, the flight path of an airplane carrying it. Besides its military uses, the tracking camera will be valuable for studies of unexplored areas, timber reserves or highway routes.







## Flying Swiss Ski Lift Puts Tourists on Glacier Top

One of the highest airfields in the world is a landing strip recently completed 9000 feet above sea level, on the edge of Switzerland's Diablerets Glacier. The airport was built primarily for tourists who want to be

able to land near the mountain peak and ski down the glacier bank. There is a telephone link with the top station on Mount Pillon to provide both skiers and pilots with the latest weather conditions.

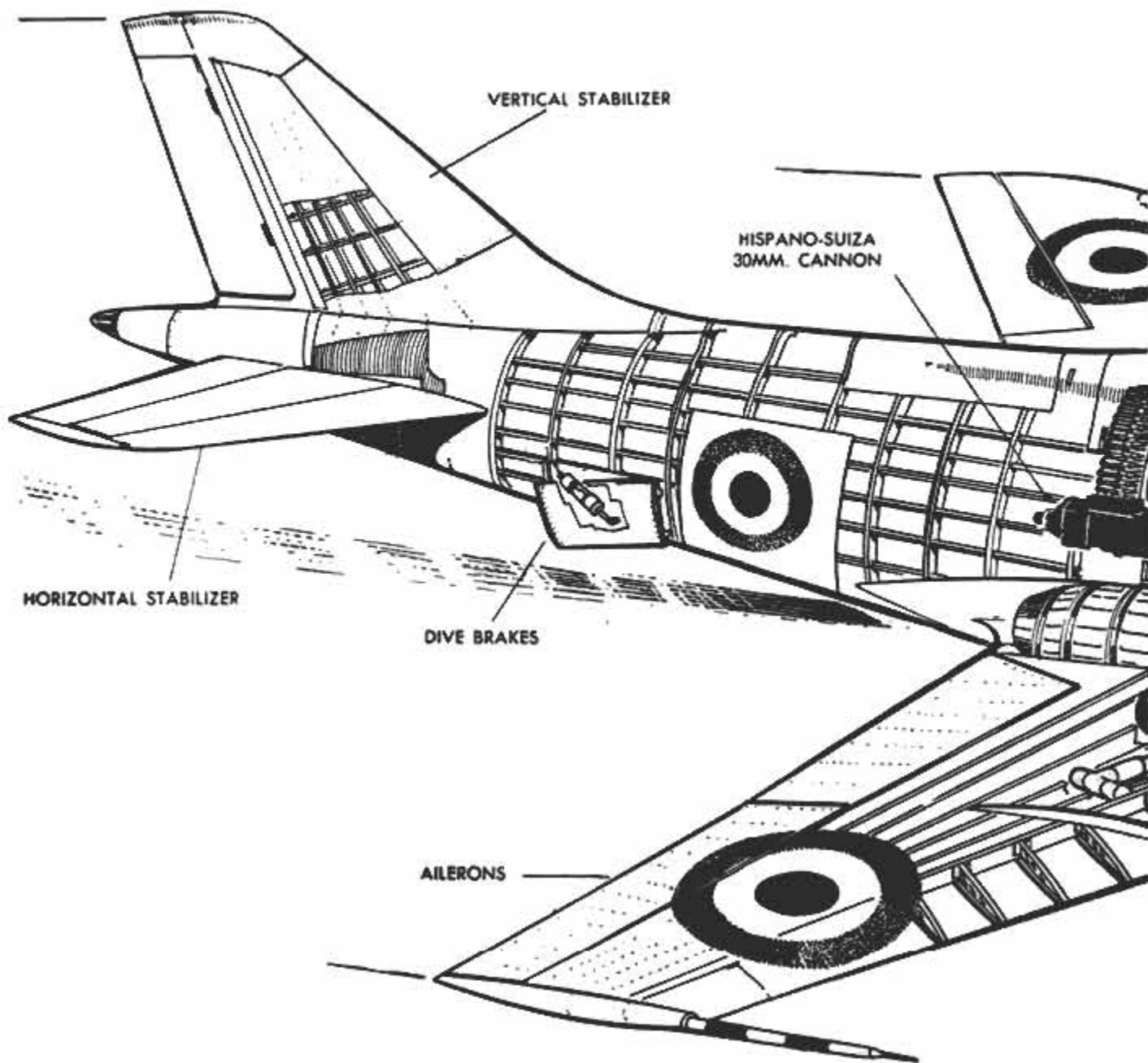
## "Chemical" Bomber for SAC

By Murray Q. Smith

With missiles now coming into their own in the armed forces, what is the future of the Strategic Air Command? Will it give way to a missile force? The answer is no. Present long-range ballistic missiles are not geared to make last-minute flight-path changes if an enemy target is moved. For such missions the Strategic Air Command will use a manned aircraft that looks very much like a missile. Designated the WS-110 (Weapon System 110), the aircraft will not burn conventional jet-plane fuel but instead will use what are termed the "exotic" fuels, special chemicals that oxidize at fantastically high temperatures and with amazing rapidity. The plane will resemble the X-10 test vehicle built by North American Aircraft recently to test aerodynamic configuration and controls systems for the Navaho intercontinental winged-missile test program. The WS-110 "chemical" bomber will be long, sleek and needle-nosed with two little elevator tabs at the nose. The main delta wing will be near the tail. Six chemical-fuel engines will provide enough thrust to carry it to alti-

tudes of over 100,000 feet at speeds three times that of sound. The WS-110 will be built almost completely of steel and titanium. And the titanium and stainless-steel skin will be stretched and stressed like a tight drum. Another reason the Air Force still needs manned bombers is the factor of reliability. If one small part of an electronic control weapon goes wrong, the whole equipment malfunctions. A pilot, on the other hand, can make compensations to suit particular situations. Lt. Gen. Clarence S. Irvine, Air Force Chief of Materiel, probably will select the main contractor for the WS-110 as an over-all management head and specify that smaller subcontractors be used to provide chemical-bomber components. The powerful exotic-fuel engines will be built by General Electric. There are only three large aircraft companies now in position to build chemical bombers—Convair, Boeing and North American. The WS-110 will be used as a replacement for the present SAC mainstay, the Boeing B-52. It will outfly any manned aircraft the Air Force now has, including the B-58.





**WITHOUT FANFARE**, another small, lethal interceptor, built to suit NATO requirements, has shuddered through the sound barrier in dives to become Italy's first supersonic daytime fighter.

The new mighty midget is the Sagittario 2. Tipping the scales at 7276 pounds "soaking wet" makes this plane less than half the weight of U. S. aircraft with the same speed potential. It is cheap and easy to produce. The "banshee wail" of its Rolls-Royce Derwent jet engine sends it rocketing at speeds up to Mach 1.2 in a flashy display of maneuverability provided by a one-piece wing of transsonic Italian design, with dramatic 45-degree sweepback.

Primarily, the job of the Sagittario 2 will be as an assault aircraft or pure interceptor. The plane is curious in many respects. Contrary to all the other single-engined military jet aircraft flying today, its engine is forward instead of behind the pilot. This

"wrinkle" cuts down the weight associated with conventional air-intake ducts and long exhaust pipes.

The centrifugal-compressor section of the engine is bulbous, almost filling the forward fuselage. Its small-diameter jet pipe is kinked under the pilot's cockpit and exhausts its jet stream beneath the mid-fuselage.

Flow of air to the jet engine is via a ram intake in the nose, through to the engine-bay plenum chamber where the double-sided impeller draws its supply.

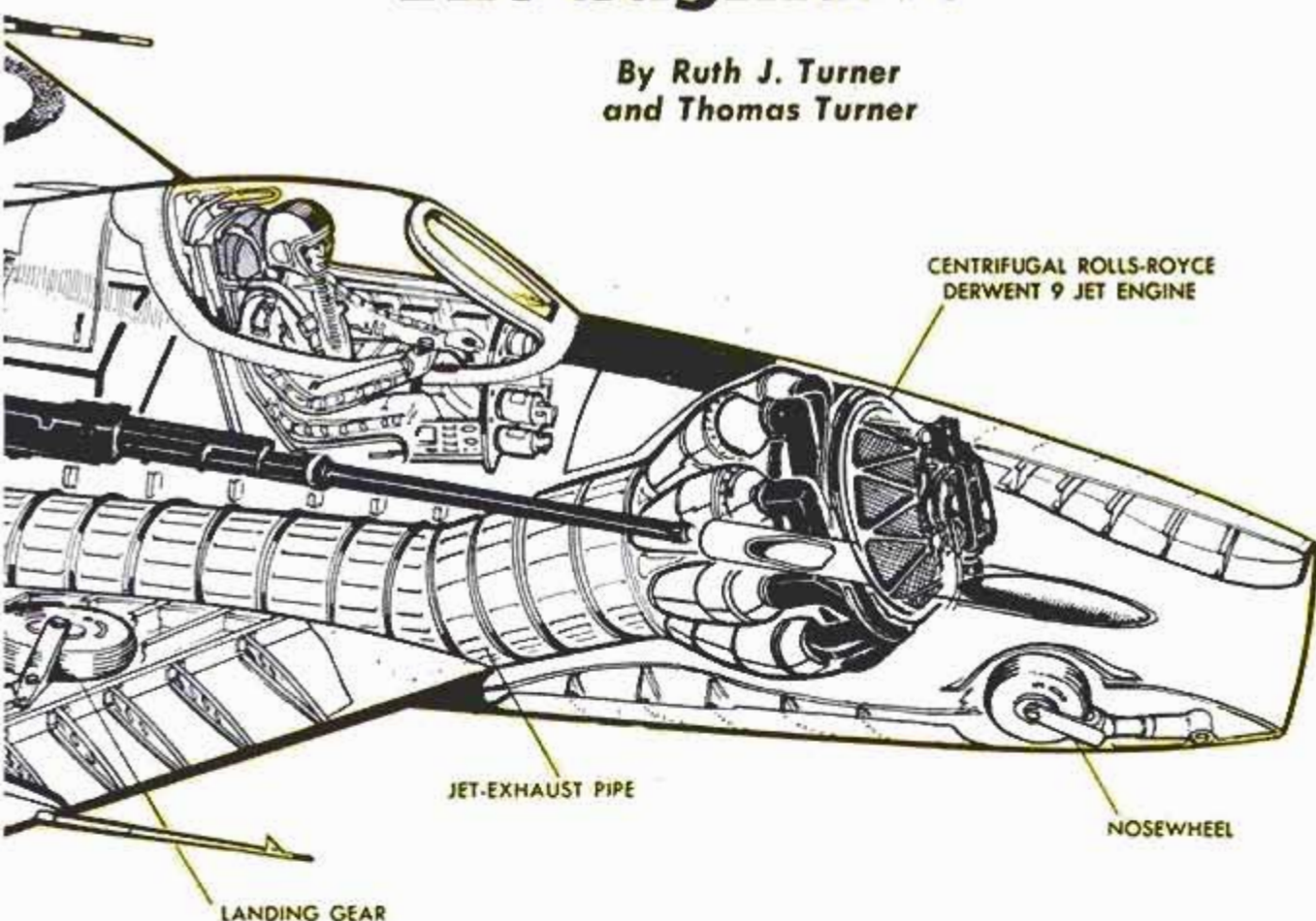
Armament consists of two Hispano-Suiza 30-millimeter cannon, one on each side of the fuselage. The plane may also carry a choice of two 500-pound bombs, two 715-pound napalm tanks, two 500-pound guns or 12 three-inch rockets.

The 3638 pounds of engine thrust permit the Sagittario to climb to 40,000-foot altitude in 10 minutes. Its level-flight speed is



# Italy's First Supersonic Fighter— The Sagittario

By Ruth J. Turner  
and Thomas Turner

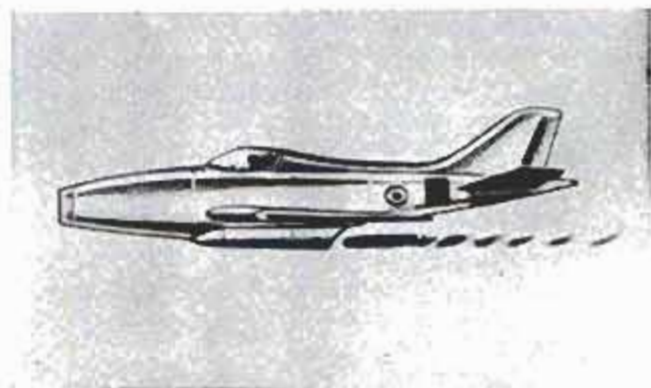
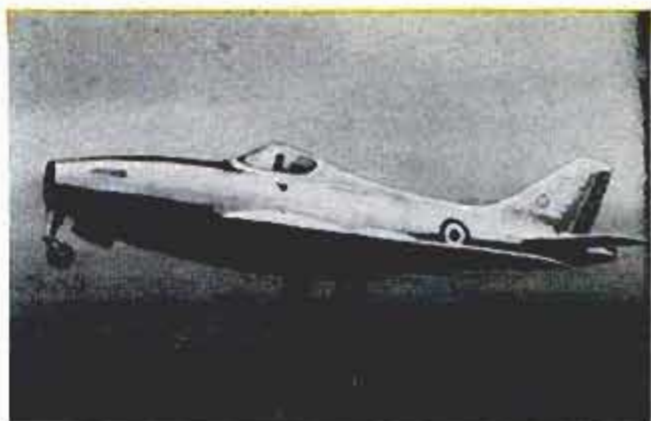


Sagittario 2, shown in take-off and flight aspects  
dives at Mach 1.2, flies level at 567 miles per hour

567 miles per hour. And in a nose dive the Mach potential of 20 percent above the speed of sound is reached. Power-to-weight ratio associated with this lightweight fighter enables it to take off and land in restricted areas, a necessary advantage in these days of nuclear vulnerability associated with large airfields and runways.

The Sagittario's pilot sits far back from the nose entry and is provided with an upward-ejection seat and back-type parachute. The windshield side panels and canopy are integrated into a single unit, providing larger vision area than the conventional cockpit transparencies. Increase in vision is due to elimination of windshield side members. On many present-day interceptors these constitute a blind spot.

Other characteristics of the aircraft are: Wingspan, 24.6 feet; length, 31.27 feet; wing loading, 46.49 pounds per square foot; and empty weight, 5071 pounds. ★ ★ ★







## LISTENING POST

By Art Railton

**T**HE HOLE AT the bottom gets bigger.

Again this year the upgrading of models and prices continues, leaving a wider price range for the imports to prosper in.

A new price line has been crossed. There is no Ford, Chevrolet or Plymouth today that sells for under \$2000. Even the plainest, simplest, lowest-powered version of these cars has a base price of over \$2000.

One year ago the bottom price line was about \$1900, two years ago about \$1800, three years ago about \$1600.

Chevrolet's Impala (added this year) is a luxury car by any standard. Ford, winner of the 1957 sales sweepstakes, dropped its low-priced Customline.

But there are two mavericks in the crowd. Like mavericks generally, they are not being taken seriously by the rest of the industry. One is Studebaker with its \$1800 Scotsman. The other (and it is coming out in January) will be the American Motors' American. This low-priced series will jump into that vast emptiness between \$1600 and \$2000. Exactly where it will land is unknown right now, but it will probably come in below the Scotsman.

### New But Old

This American is a slightly (and very slightly, it is) modified version of the 1955 Rambler two-door sedan. On a 100-inch wheelbase, it comes in two versions—plain and fancy. Obviously those are not the names American Motors will use. They will call them something like Deluxe and Superdeluxe—nothing is "plain" in this business.

The engine will be the same L-head six used previously with slightly higher compression. It develops 90 horsepower, same as before. The increased compression could mean better gas mileage.

Over-all, it is 15 feet long, about a foot or so shorter than present Ramblers.

It looks now as though the Studebaker-Packard affiliation with the tiny Goggomobil is off. It would have been good for the S-P dealers. Such a novelty would

have created lots of floor traffic, something everybody needs these days and especially Studebaker-Packard dealers.

The real trouble with S-P is the extreme spread of its models. It has more series, more different designs than many of the big companies. It's hard to see how there can be any profit with such a diversification of production.

### Air for Torsionaire?

Neither Chrysler nor American Motors has air suspension at this writing, but if rumors are correct (and rumors *are* correct sometimes) things may be different shortly.

Chrysler denies any interest in air, but the rumor persists that it will offer optional air bags on the rear wheels late in the 1958-model run or perhaps not until the 1959 cars come out. This system will not replace the leaf springs, but will augment them. It will provide a means of leveling the rear end for constant height regardless of load. By this combination of torsion bars in front, air in the rear, the expression "Torsionaire ride" will have real meaning. Up until then, the only air in Torsionaire is in the tires.

American Motors, too, is expected to offer an air-bag option before the winter's over. Its design is such that the bags can be mounted inside the rear coil springs, requiring little retooling. A compressor maintains pressure to keep the car level.

Other rumors from Detroit are that Chrysler is getting close to a central hydraulic system and may have it in time for 1959. It may need a big splash in 1959 to keep its third-year body shell selling until "suddenly-it's-1960" comes around.

Part of the system may be hydraulically powered brakes instead of the vacuum-powered in use today. It may also be possible to increase braking action by using the torque converter's pumping action to slow down the car. If you can make a car go by pumping oil, you can slow it down the same way. When you apply the brakes you would operate a valve to force the converter to work against itself, slowing down the car.

Much the same system operates today when you put the transmission in Low to hold you back in descending a hill. If the control is hooked up with the brake pedal, there would be less work for the brake bands to do. And, it is generally agreed that the brakes in all cars have not kept pace with the horsepower and speed.

Cadillac has just about reached the end of the power road with its engine so, the story is, next year may bring out a new and bigger V8, possibly with an all-aluminum block, the first in the industry, a claim Cadillac often can make. ★ ★ ★



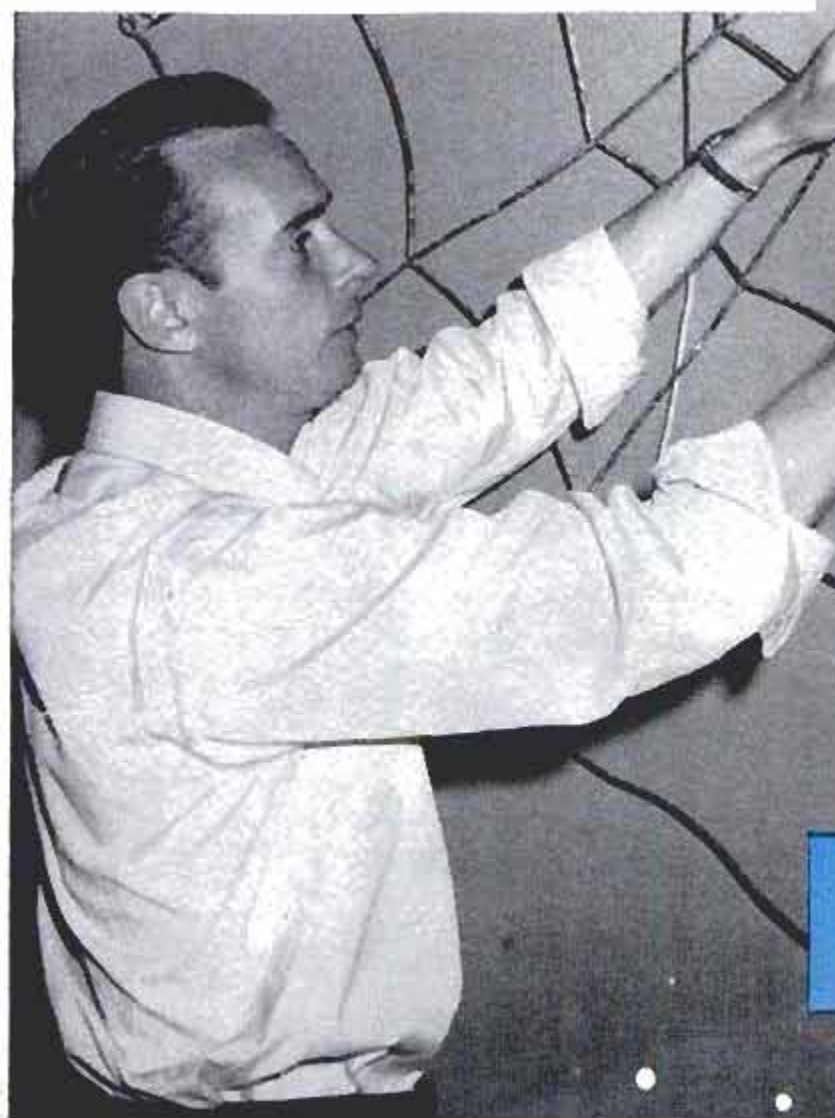
*When a man-size spider walks a giant web, when scissors draw the villain's blood or a lobster spits in the waiter's eye, put it down to*

## **TV TRICKERY**

*By Jack B. Kemmerer*

**S**EATED AT A SIDEWALK TABLE in a Paris cafe, a customer watched in fascination a huge, freshly cooked lobster placed in front of him by the waiter. Each time he reached for the lobster the huge shellfish swiftly moved its large claws protectingly over its head. Reaching for a hammer, the would-be diner attempted to hit the lobster but each time the claws parried the blow. The man finally called the waiter to see what he could do with the reluctant lobster. As the waiter bent over to inspect the lobster and its strange actions more closely a stream of water hit him in the eye.

Actually the customer and the waiter weren't too surprised. They had rehearsed this particular scene numerous times before it was used on one of Ed Sullivan's TV shows. The belligerent lobster had been ordered from the special-effects

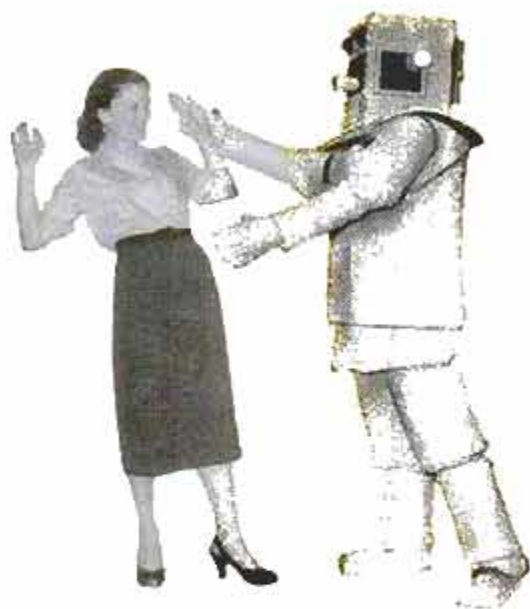


Special-effects man for a television studio makes adjustment on huge spider that moves across web during show





Special-effects man checks the prop lobster and finds it works perfectly. Man hidden by tablecloth operates lobster



Robots on live-TV shows have a man inside; mechanical robots sometimes go haywire

department to do just that and it had carried out its orders to perfection.

Constructing such a lobster wasn't too difficult a job for the special-effects gang of Columbia Broadcasting System, for they specialize in building trick sight props and their TV department in Hollywood is the largest of its kind in the country. Robert Waugh, Hollywood head of special effects for CBS, has had to produce such unusual props as spiders that crawl across webs, dragons that emit smoke and fire, cross-bows that shoot tomatoes, barrels that spurt "beer" through a bullet hole, numerous false snakes, phony oil wells and anything else gag writers dream up for their clients.

On most ideas, ample time is allowed for

building a prop but occasionally the writers or directors dream up a new gag on the very eve of the show. "That happened to us once," Waugh said, "when Red Skelton's director came in with an idea to use a huge diamond ring—about nine inches tall and at least that in diameter. Yet the ring still had to be light enough in weight so that Red's guest star, Carol Channing, could wear it on her finger."

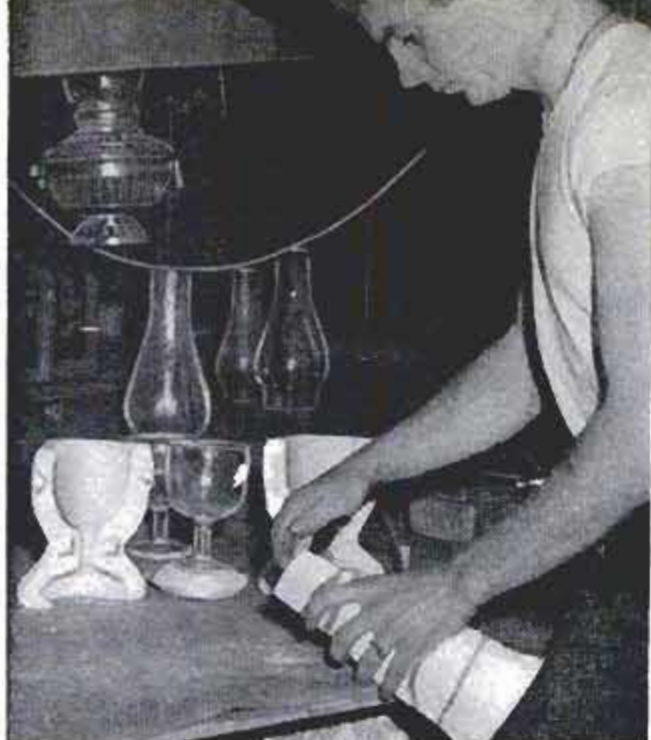
To do this, the special-effects team designed the ring, grabbed a chunk of balsa wood and went to work. About six hours later, the "million-carat diamond" ring was ready.

"That was an easy one," Waugh grinned. "A sight prop we made for Playhouse 90 was a lot harder. They wanted a pair of

It looks like bullet-punctured keg but close-up shows how soapy water is pumped through prepared hole





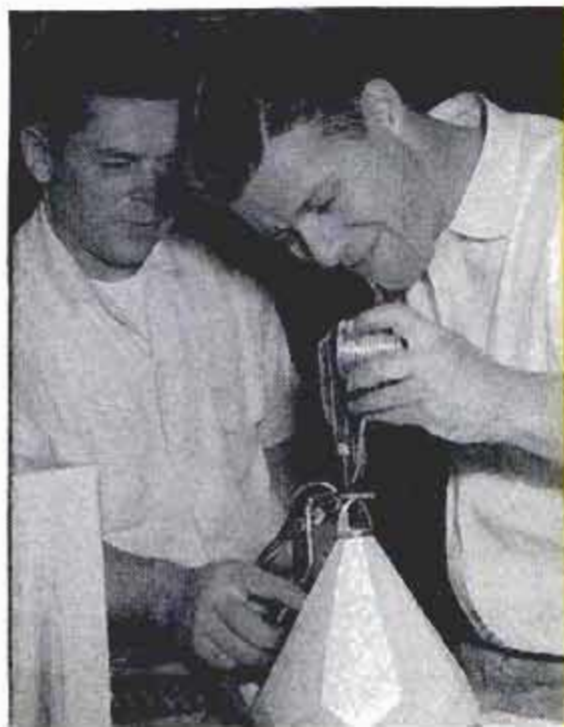


Special-effects "glass factory" makes realistic prop "glass" by molding resin which shatters safely

shears that would 'bleed' on cue." The shears were made from wood and painted to look exactly like any ordinary pair of shears. A plastic tip was attached to the end of the blade with a tube running from the plastic tip up through the blade to the locknut that holds the shears together. Here a small rubber ball was inserted and filled with make-believe blood. In the TV show, the actress would pick up the shears to stab the villain but he would force the shears against her cheek, cutting a long bleeding gash. Actually, the actress squeezed the bulb in the shears and the "blood" appeared to flow from her cheek.

Special-effects men often are asked to make "breakaways" of different kinds. One

How to make a "million-carat diamond" ring. Huge gem is shaped from big hollow block of balsa wood



Fake blood oozes from plastic tip of wooden shears when rubber bulb is squeezed during TV fight scene

most frequently used is glass. But the "glass" used in TV bottles and windowpanes actually is a resin called PS-2. A plaster mold is made of the object and the resin is melted and poured into the mold. Temperature is important because if the resin is too cool it won't pour properly and if it's too hot it acquires a yellow color and doesn't photograph properly. The molded resin shatters like glass, but without the danger of cutting the TV performers.

★ ★ ★







# Keeping up with the ATOM

**THAT SILVER EGG** looming against the sky at right is the dome of the first West German reactor station. Located at Garching, near Munich, the station recently received a shipment of uranium bars—its source of power—from the United States. The reactor, resplendent in its silver dome, was built for use by the atomic-research department of Munich Technical University.

☆☆☆

**SPEAKING OF REACTORS**, Dr. Paul F. Gast of the General Electric Company's Hanford Laboratories has estimated that a major reactor disaster could kill about 50 persons, seriously injure as many as 1000 and cause up to several hundred million dollars in damage to land. Dr. Gast emphasizes that these are theoretical estimates and could be either over or under by a factor of three.

In a major accident to a reactor, the chief hazard is not from the explosion itself, but from the radioactive materials scattered by the explosion. Most fission products would be contained within the reactor building, but a small fraction would escape and would sift slowly to earth as fallout. These could cause death to anyone within 10 to 50 miles downwind from the reactor.

As a counterbalance to these rather pessimistic observations, Dr. Gast reports that



the chances of such an uncontrolled explosion are believed to be "vanishingly small."

☆☆☆

**HERE'S A DRAMATIC** example of what the atomic age has produced in the way of useful radioactive products. Recently the most powerful radiation source ever shipped for the use of private industry left Oak Ridge, Tenn. It was bound for the Linden, N. J., laboratories of the Esso Research and Engineering Company, where it will be used in research on the application of atomic energy to the oil industry. The shipment consisted of about 15,000 curies of radioactive cobalt. In radioactivity, this is equivalent to about 33 pounds of pure radium. This is more than seven times the world's supply of refined radium!

☆☆☆

**ATOMIC NOTES:** A packaged nuclear power plant produced in England is said to be competitive anywhere in the world where a firm pays \$19.60 a ton or more for coal. . . . The AEC has suspended development work on the food irradiation reactor for the Army. . . . The Veterans Administration is using radioactive tracers to find the cause of mental illness and the action of tranquilizing drugs.

☆☆☆

**THE GENERAL ELECTRIC** biologist at left is piping a dose of highly active radiocesium into an experimental pond. Biologists are studying the effects of this isotope on the fish and insect life of a typical pond.







Top-notch USAF aerobatic team has thrilled millions of spectators with their breath-taking maneuvers

# *I Led the Thunderbirds*

By Maj. Jacksel M. Broughton

UNITED STATES AIR FORCE

**B**ILL POGUE, a black speck seven miles away in the sky, mushroomed to life size in just about 15 seconds as we approached and passed each other, wing tip to wing tip, at a closing speed of more than 1400 miles per hour. Twenty-five feet below us, the wingmen of our foursome were doing the same—at right angles to our track. Everyone was on time. In this maneuver, called the “bomb burst,” our tight diamond formation climbs 10,000 feet straight-up, then each plane breaks out and away in a wide rolling loop. Diving for the ground at some 700 miles per hour from the four points of the compass, we all intersect over the same point simultaneously (if we’re on the ball), stacking ourselves a few feet apart to avoid the possibility of colliding.

This particular crossover was made about 800 feet in front of a swarming crowd at Daytona Beach, Fla. As Bill’s F-100 flashed by, I suddenly realized this

was the last time I’d hunt the sky for three specks, in order to time our split-second pass so we’d cross just in front of the crowd. This was my last show with the “T-birds.” For 2½ years I was the leader of this unique group. Taken together, they are the world’s first supersonic aerobatic

Author Broughton, who led the “T-birds” 2½ years, is also a West Pointer and veteran of Korean fighting







This Thunderbird team includes, from left: Sam Johnson, solo pilot; Doug Brenner, right wingman; Robby Robinson, leader; Bart Bartley, left wingman, and Bill Pogue, "slot" man

team, and probably the hottest team of precision-information pilots going. Individually, each is a great guy, a devoted officer and a top pilot—with combat ribbons and bravery decorations to prove it.

The Thunderbirds were organized as the United States Air Force's official aerobatic team in May 1953. Their job was to show the public how a first-line supersonic jet fighter becomes the most destructive weapon imaginable in the hands of today's highly skilled, team-trained Air Force pilots. Since its activation, the team, which is constantly changing as older members rotate to new assignments and new pilots replace them, has dazzled more than 10 million spectators in some 280 demonstrations involving 425,000 miles of travel across both Americas.

When I joined the Thunderbirds in October 1954, the boys were flying Republic F-84G Thunderjets—straight-winged, maneuverable but subsonic planes with fuel pods on the wing tips. A year later, Republic sweptback our wings with the faster, more powerful Thunderstreak. But it wasn't until June 1956 that we got the North American F-100C Super Sabres that the team flies today. The single-place fighter, distinguished by the rakish 45-degree sweepback of its low wings and tail surfaces, has been clocked at 822.135 miles per hour—straight and level. A clamshell canopy gives the pilot 360-degree visibility and allows for pressurization at altitudes up to the plane's 50,000-foot ceiling. Besides ejection seat, each plane carries a drag chute for safe stops on short or icy runways. Ordinarily, this formidable fighting craft mounts four 20-millimeter cannon, but for the team's work, these have been removed. Our "armament" is a smoke tank containing 20 gallons of engine oil that feeds out into the exhaust stream to produce spectacular trails of white smoke, tracking maneuvers across the sky.

On the road, the "Birds" travel with seven Super

Trailing smoke to show flight paths, 700-mile-per-hour T-birds break away in "bomb burst," their most spectacular maneuver



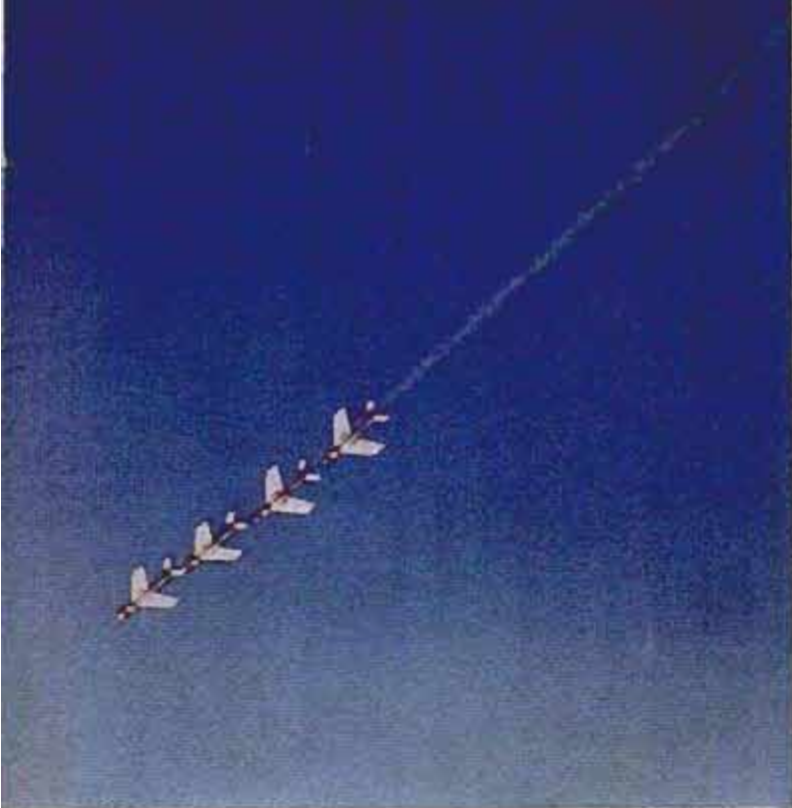


In diamond-formation five-G pull-out, planes traveling faster than sound buzz crowd gathered along beach



Team's new commander, Major Robinson, is at right with Major Broughton, in front of F-100 Super Sabre lead plane





"Thunderbirds . . . now!" is the formation battle cry of the precision fliers, as they play follow-the-leader. Sometimes they are only a few feet apart. Below, the beginning of a "four-leaf-clover" maneuver



Sabres painted a dazzling red, white and blue pattern. Along with the team goes a two-place T-33 Shooting Star observer plane, and two C-119 Packets carrying the parts and crew to maintain the planes. In all, some 40 men make up the Thunderbird unit. Each is hand-picked. About 25 go on a trip, and of these only five are pilots who fly in the show. Four of them, flying Sabres in a tight diamond formation at speeds up to 750 miles per hour—wing tips overlapping with five-foot vertical separation—perform loops, corkscrew rolls, vertical turns and other precision maneuvers shown on these pages.

So close are the separation tolerances in this formation flying, that the "slot" man, bringing up the rear of the diamond, has to have the leading edge of his tailfin washed down after each show to remove the carbon from the lead plane's jet exhaust. Yet, if he ever allowed that 3000-degree blast to drop a few feet and engulf his canopy during those loops and rolls, it would melt the canopy—and him. Actually, the slot man follows his 700-miles-per-hour teammates far closer than any sane auto driver would tail another car at 20 miles per hour on a highway.

Between formation maneuvers during the shows, a solo pilot roars past the crowd at 750 miles per hour, producing a sonic boom as he goes. He does four-point and eight-point barrel rolls, with hesitations like the sweep hand on a stop watch. He makes a pass upside-down. On his last run, he rockets in at nearly sonic speed, pulls into a vertical climb, and bores into the sky rolling as he goes until he vanishes.

All this takes precision timing and coordination of the highest caliber. Every Thunderbird must be so familiar with every detail of every maneuver that he can anticipate another man's action before the fellow thinks of it. We like the fellow who was overheard informing his friend at one of our shows: "One man flies one plane, and his electronic stuff flies all them other planes." Equally complimentary was the "doubting Thomas" who wanted to know where all the wires were that held the planes together.

The real answer, of course, is that it's done by men who know their business. Last February when I got my orders to move on, the team consisted of myself, leading the diamond; Lt. (now Capt.) D. D. "Doug" Brenner as right wing; Lt. (now Capt.) R. D. "Bob" Anderson as left wing; and Lt. W. R. "Bill" Pogue in the slot position. Capt. J. M. "Bart" Bartley was our solo man.

Probably the best way to describe the problems and techniques involved in fly-



Thunderbird aerobic maneuvers, right, require split-second timing. Each man must anticipate the others' actions before they are made, or —disaster

ing high-precision formation aerobatics, is to go through some of the highlights in a typical Thunderbird show like the one at Daytona.

Before any show, we "Monday-morning quarterback" the last show. Each man points out his partners' errors, then has to listen to his own. New ideas to forestall errors and improve precision on tough turns are hacked over. Local wind and weather are carefully studied. Wind can mean a lot in timing for the bomb burst, for instance, where every man is going in a different direction but must arrive back at a given point with everyone else. Every man is thoroughly briefed on obstacles over the course. In Caracas, Venezuela, the bomb burst had to be executed beside a sheer 7000-foot mountain. It required plenty of judgment for the man who looped over and roared down in a dive only a few hundred feet above the slope all the way. Even flat Daytona Beach had a tower nearby that was higher than our 100-foot flight path. Every T-bird had that tower's precise location pegged in his brain. Another hazard at Daytona was sea gulls. One gull in a jet intake could mean the end of a Thunderbird. Bart solved that one. On his first pass, before our arrival, he roared down the beach skimming the sand, lighting and relighting his afterburner and sounding like a mortar battalion. The crowd thought it was a thriller for them. Actually, he was scaring away the birds. The system worked—no sea gulls stayed around the area that day.

While Bart did this, we made a customary inspection of our planes and ran through a 10 to 15-minute warm-up. Our "mech" crew, headed up by M/Sgt. Ray Mather, is tops. No show has ever been canceled.

Flying diamond formation at about 20 feet, our "entrance" is usually made from behind the crowd to surprise them. At Daytona this pass took us seaward. Capt. Bill Scott, our narrator, was busy down on the beach, as usual, directing the crowd's attention elsewhere via PA system to build the surprise even more.

Out over the water our routine began with a "change-over whifferdill"—a group roll performed while the boys shift up into trail formation. They watch for my nose to rise. Usually I'll give them a blast on the intercom radio: "Nose coming up. Bob, you call the shift." Bob Anderson, second man in file, watches the rim of my intake lift over the horizon. "Thunderbirds, now!" he says, creeping up under my left wing,



VERTICAL 360° TURN



"WHIFFERDILL"



'BOMB BURST"



SINGLE "CLOVERLEAF"



"CORKSCREW" ROLL





Taking off wing tip to wing tip, "Birds" practice constantly; despite dangers have had no serious accidents

while Doug roars up under the right, Bill guns into the slot and we all go over on our backs. Once more around and we're flying trail straight and level. Radio chatter goes on between team members constantly throughout the show—sometimes to coordinate a crucial maneuver, sometimes just so we all know we're still there. I may call a row of orders just to set the stage so no one has any doubts about who does what, or when.

For instance, as we prepare to swoop into a "cloverleaf"—a plain inside loop with slight roll to left or right at the vertical point to give us a 90-degree change in direction—I may call all the shots even though everyone knows what to do with

his eyes shut. It would sound like this: "This will be a cloverleaf to the left . . . I'll call the smoke, break and roll . . . Thunderbirds, smoke on now! . . . break—now! . . . and rolling!"

At other times, precision depends on one of the men behind me who may have to start a maneuver by speeding up, dropping back or shifting position before the rest of us can budge. Then the ball is thrown to the key man in the maneuver.

What the Thunderbirds call a whifferdill, for example, is a vertical U-turn in which the formation climbs steeply, rolls to the left, swoops in a high arch upside down and levels off right side up going in the

(Continued to page 244)

Team rolls in a "whifferdill." Slot plane's tailfin is washed after flight to remove exhaust of lead jet







## Exhaust Flare of Rocket Salvo Lights Up Sky

Full blast of exhaust from the 24-rocket salvo of a Convair F-102A Delta Dagger makes the all-weather jet interceptor appear to be afire. The 2.75-inch folding-fin rockets leave their tubes in the missile-bay doors two at a time in 12 rapid pulses. Heat-resistant enamel protects the aircraft

from rocket-blast corrosion and the fiery burst is so momentary that only a thin film of dust will remain on the F-102A. A half dozen of the supersonic missiles can be seen streaking past the nose of the plane. A high-speed-sequence camera froze the rockets in their flight.

## Turn on the Windows— It's Getting Dark

Homes of the future may have windows that provide light at night as well as during the day. Westinghouse scientists are experimenting with a transparent phosphor placed between two sheets of glass and having an electrical conducting charge. This allows the window to be used in the customary manner, but at night electricity is turned on and the transparent phosphors emit light. The process, called electroluminescence, also can be applied to glass ceilings, coffee-table tops, murals and in various architectural designs.

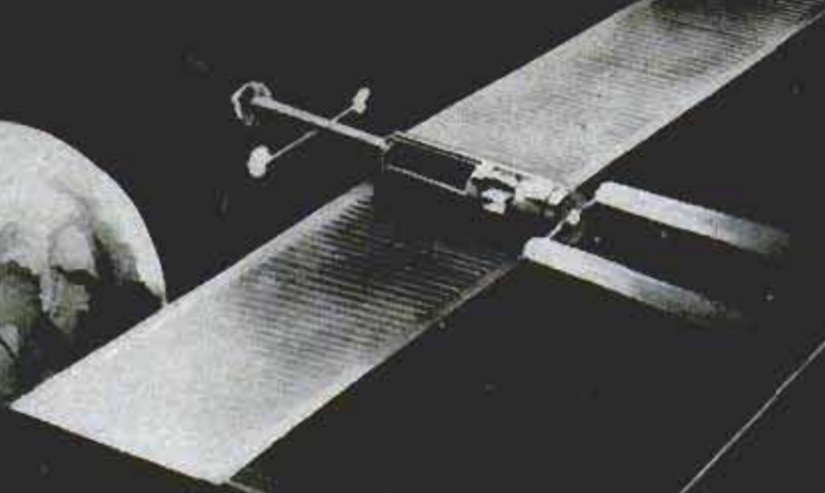


## Round Pool Table Teaches Coordination

U. S. Navy pilots are using a round pool table not only for amusement, but also to help the training of their coordination. It was designed by Capt. James A. Niforopilos of San Francisco, Calif. Playing the game requires directional coordination similar to flying an airplane. Seven balls are used, and the five pockets are 72 degrees apart.





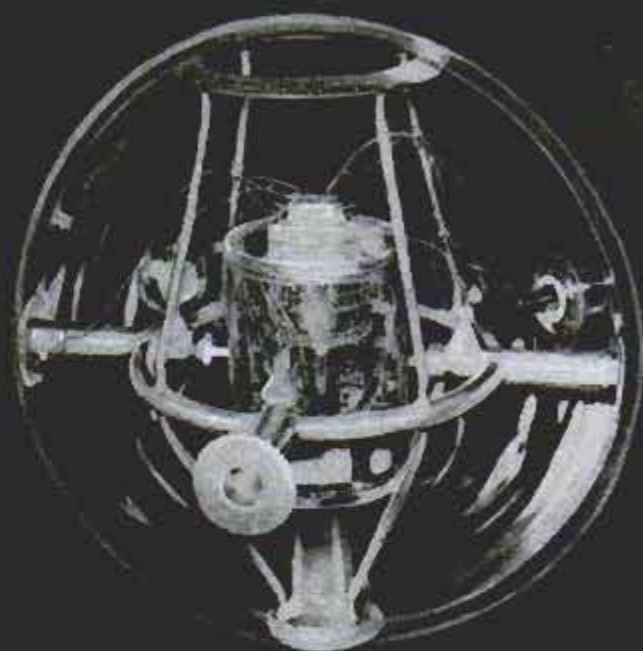


TRAIL OF ROCKET  
WITH SPUTNIK

ION-PROPELLED  
SPACE VEHICLE



BALLOON-LAUNCHED  
FARSIDE ROCKET  
SOARS 4000 MILES



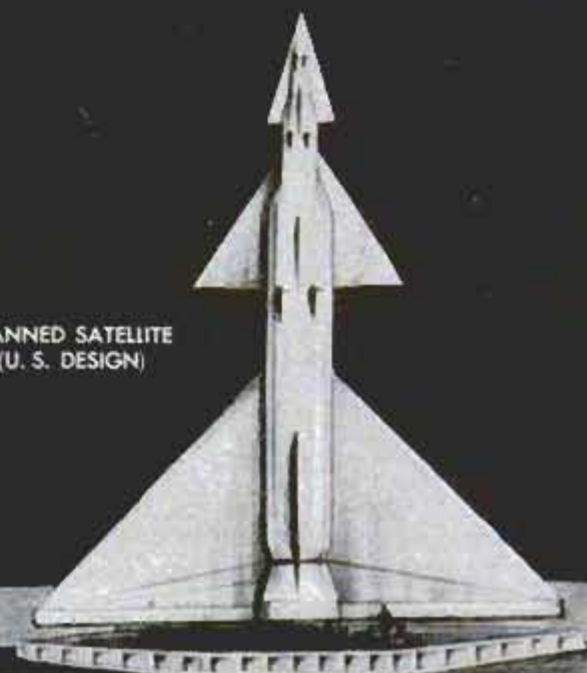
U. S. SATELLITE



FARSIDE ROCKET



MANNED SATELLITE  
(U. S. DESIGN)







*Forecast:*

# A SKY FULL OF SATELLITES

Based on a drawing from Convair (Astronautics) Division of General Dynamics Corporation

By Richard F. Dempewolff

**M**AN'S GREAT DREAM of stepping off his island in the universe to explore the spangled reaches of space took a giant step toward realization on October 4, 1957. That date marks the exclamation point in history when a 184-pound moon, boosted by a mighty rocket smashing skyward from an airfield on the Caspian Sea, was programmed into an 18,000-mile-per-hour orbit around the earth.

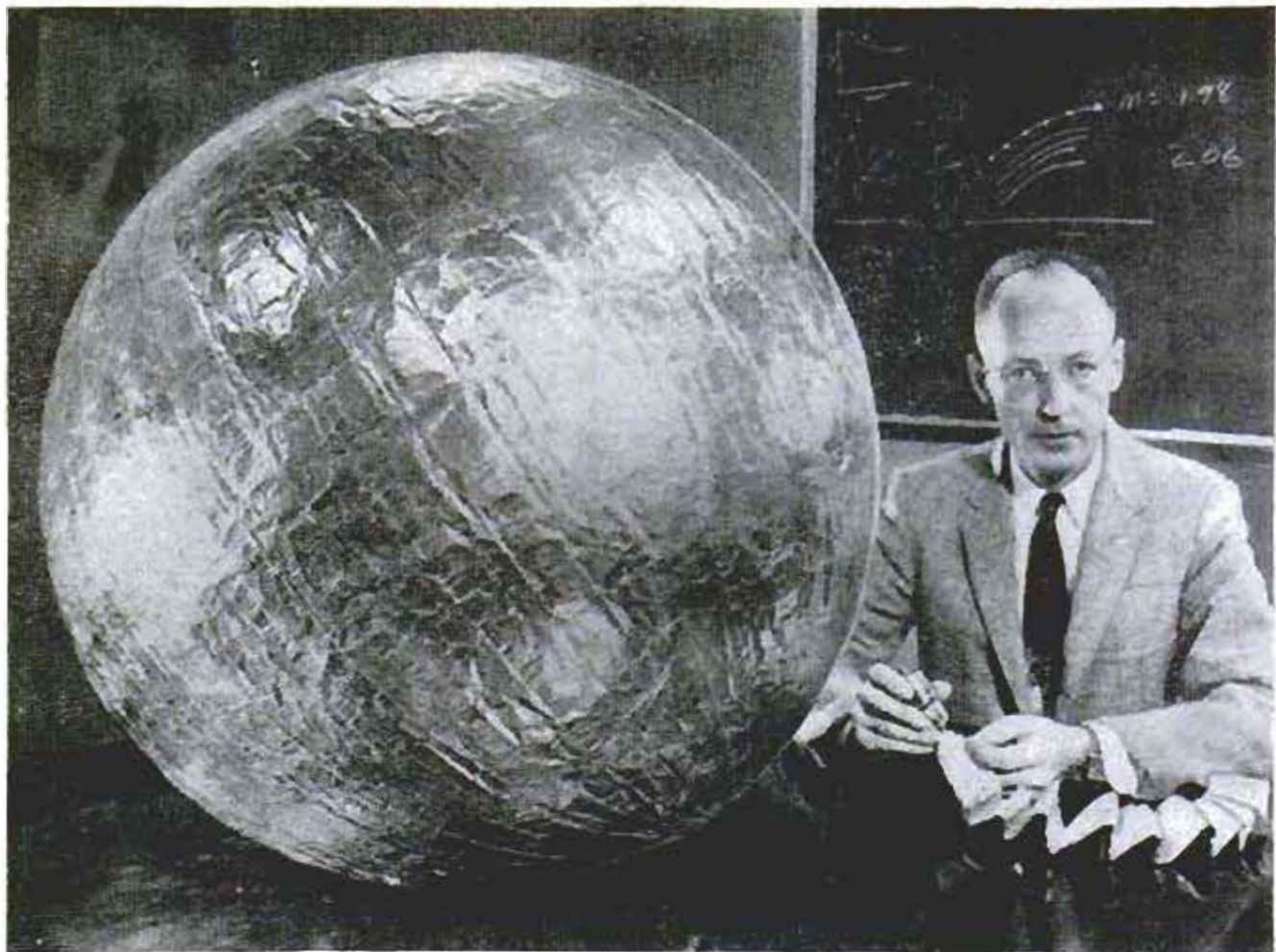
Roaring unmanned space vehicles already capable of reaching up to splash visible blots of potassium or metallic sodium across the real moon's face 239,000 miles away, and manmade baby satellites plaintively beeping back messages about temperature, cosmic rays, the intensity of meteorite showers and other unknown conditions "out there," are advance scouts for man's own expeditions into the void. But the day Earth's first space "Viking," clad in a still-to-be-designed "Buck Rogers" pressure suit, steps to the surface of another world from a still-to-be-designed spaceship capable of weathering still-to-be-discovered storms and hazards of outer space, is many moons (and many rockets) away.

Some of those moons and rockets, however, are already in the hardware stage and about to be fired into orbit. Parts of others—more elaborate space platforms with TV cameras aboard—are under test in laboratories where they are being sub-

jected to conditions of outer space to make sure they'll stand up when subjected to the real thing. Still more advanced space stations and vehicles are on the drawing boards—proven in theory, but waiting for word from the "advance scouts" before money and manpower are thrown into their actual construction. During the next few months and years, according to experts involved in both the United States and the Russian space programs, we soon will witness a sky full of satellites, all orbiting around our globe like Jupiter's moons.

At Vanguard headquarters in Washington's Naval Research Laboratory, nearly half a hundred glittering satellites are already built. Most are being used for test in huge vacuum chambers simulating conditions of outer space. Many of the weird-looking spheres are covered with metal cups, beneath which heat or cold can be applied to any portion of the satellite's skin, just as it will be in the burning sun and polar frigidities beyond the atmosphere. Of all this hardware, four baby spheres weighing 4½ pounds and carrying only a tiny transmitter powered by solar batteries, may be orbiting by the time you read this. Four larger ones, measuring 21 inches in diameter and weighing 21½ pounds, are scheduled for launching in March. Meanwhile the Russians have been launching heavier satellites. Their Sputnik II, sent aloft early in November, was



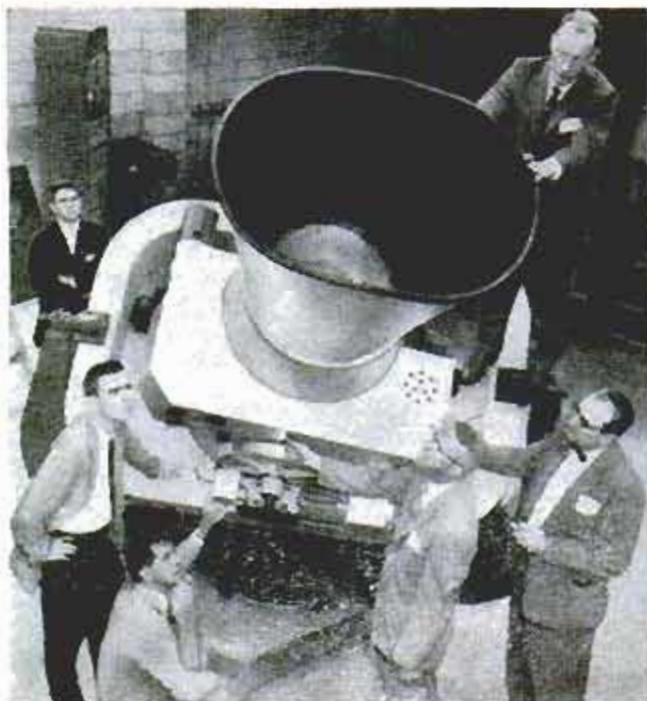


Inflatable baby satellite is covered with aluminum foil. Scientist holds deflated ball and inflating cartridge

reported to weigh 1120 pounds with maximum altitude of 1056 miles. This satellite carried the first living creature, a dog, into outer space.

In the labs along the Naval Research Laboratory's off-limits corridors, you can

Giant satellite-tracking camera is so accurate it can photograph a golf ball 60,000 feet in the air



see technicians at work on 10-pound plastic-encased instrument cores for the U. S. spheres. The cylindrical package, a masterpiece of miniaturization, looks like a stack of plump pancakes. "Unlike Russia's first sputnik which, as far as we know, contained only a transmitter," says Dr. John P. Hagen, Vanguard director, "ours has instruments to perform many jobs." Some of the things our orbiting satellites will do: An ionization chamber in the sphere's shell will pick up and record amounts and types of radiation from the sun; sensitive skin instruments will count particles of meteoric dust colliding with the sphere as it whisks along; a strip "thermistor," stuck on the satellite's magnesium hide like a Band-Aid, will record the outdoor temperatures of space; baby microphones will pick up and count sounds of collisions with larger meteorites—a hazard of space that may make it prohibitive for men to travel there; cosmic-ray counters will tally particle bombardments, and shoot each strike to an amplifier for boosting. A tiny electronic brain, regulated by solar power, will store all the data from these instruments, correlate it, send it to a coder and then out over the sphere's minitrack transmitter for broadcast to earth. "The signal," says a Vanguard technician, "is much more





*21000 Brookpark, Cleveland, Ohio*

Courtesy of Lewis Flight Propulsion Laboratory, National Advisory Committee for Aeronautics

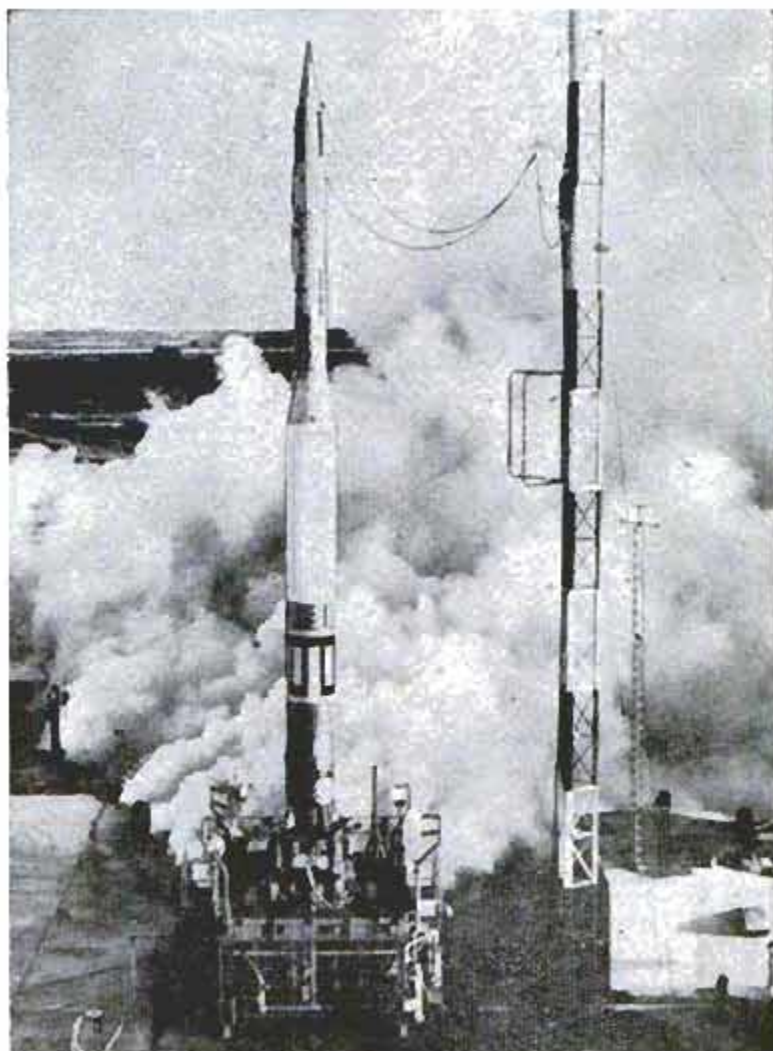
Ion-propulsion model is operated in near-vacuum chamber to simulate conditions to be found in outer space

musical than that of Sputnik I—a series of high, low, long and short tones almost like a melody.”

Though the United States Air Force refuses to deny or admit it, an elaborate space-platform program called Project Pied Piper (also known as Big Brother because of its watchdog implication) is reported well under way. A globe-circling reconnaissance satellite, orbiting at an altitude between 300 and 1000 miles, Pied Piper would carry TV cameras and transmitters, and radar or infrared scanning systems which could sweep all corners of the earth once every 24 hours, monitor global events such as weather, atom-bomb tests, undue massing of ship or aircraft fleets, and so on. Taken with telephoto lenses, pictures would carry detail as sharp and clear as an aerial photo taken at 5000 feet. Target date for an unmanned version of Big Brother is estimated about 1960; manned version, about 1965. Some of the tough problems that still need solving: Electronic coding of picture data so it can be transmitted to earthlings, some kind of motorized gimbal mount to keep the camera pointed at earth while the satellite spins its way through

(Continued to page 262)

U.S. satellite launcher, three-stage Vanguard rocket, gets a static test of first-stage rocket at Florida missile center





## A Prediction in 1910—

SOMETIMES the most outlandish prophecies come true. Away back in 1910, *Popular Mechanics* printed the prediction of "a Michigan inventor" that the telephone would one day convert a conversation from one language to another by "some mysterious mechanism yet to be designed."

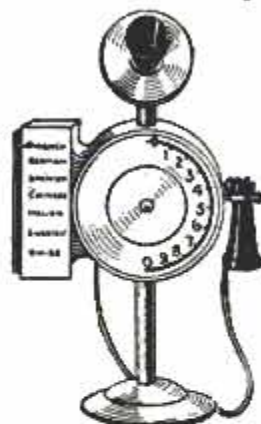
Cagily, the editor of that day called it a "very distant likelihood."

The item, as published in our issue of February 1910, is reproduced in the opposite column. It came to us from Arthur D. Preston, a contributor. He remembered it the other day when he read of the 1958 actuality—an electronic machine that will interpret four foreign languages and automatically print the translation in English. Writing us from Preston Cottages, Laguna Beach, Fla., Preston recalled the item of nearly 50 years ago and said "it would be interesting to read it and compare with" the electronic device of today.



## AN INTERPRETING TELEPHONE

The reader must not be led to think by the above head that any such wonderful device has yet been invented, or



that there is anything but a very distant likelihood of such a device in the future. Yet, every great invention has appeared impossible to the many and difficult to most before its arrival, and very simple afterwards.

The interpreting telephone, however, is nothing more or less than the prophecy of a Michigan inventor, who believes the time will come when a person at one end of the line can speak one language and that any language can be heard at the other end. That is, any language the telephone is provided with. The drawing shows the Michigan man's idea of how it is to be accomplished. Attached to the side of an ordinary telephone receiver is a box in which the different languages are stored. If the man answering the phone is Chinese, he will move the indicator opposite the Chinese language, and then some mysterious mechanism yet to be designed will receive the English words coming over the wire and convert them into Chinese.

## Nears Reality In '58

The man who made the dream come true is Peter Toma, 32-year-old Hungarian physics teacher at a California technical school. He uses a Datatron electronic computer to do the job of interpreting Russian, French, German and Spanish — automatically typing out English translations. Toma, who fled Communist Hungary in 1945 and speaks eight languages, primed his electronic linguist by first transmitting to its magnetic memory drum condensed dictionaries in the four languages. These were punched on paper tape in numerical computer code along with translating instructions. The computer converts the code into alphabetic characters and types out a page of English translation.

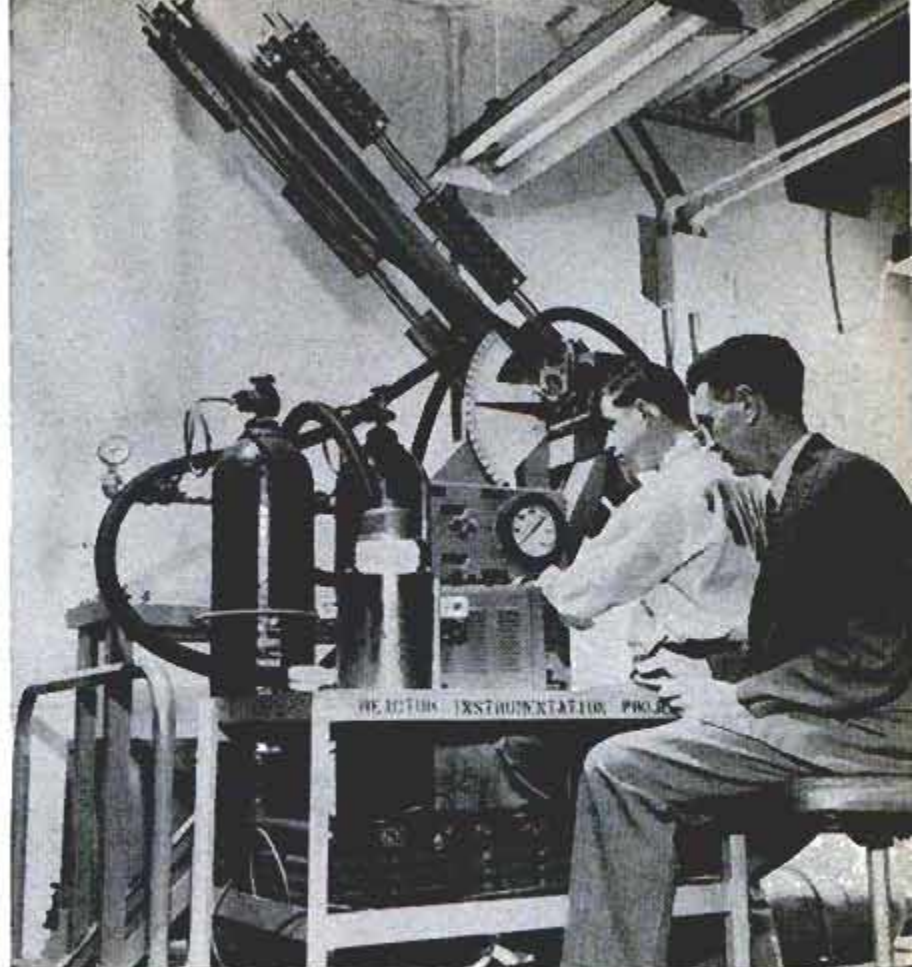


## Pitch and Roll Machine Tests Submarine Equipment

Now you can get seasick without going to sea. A machine that simulates the pitch and roll of a ship has been developed to test power-plant instruments for the atomic submarine *Triton*. The machine, dubbed "Rough Rider," also reproduces the effect of a rolling sea on the pressure and liquid level in the radioactive coolant loop of the *Triton's* atomic power plant.

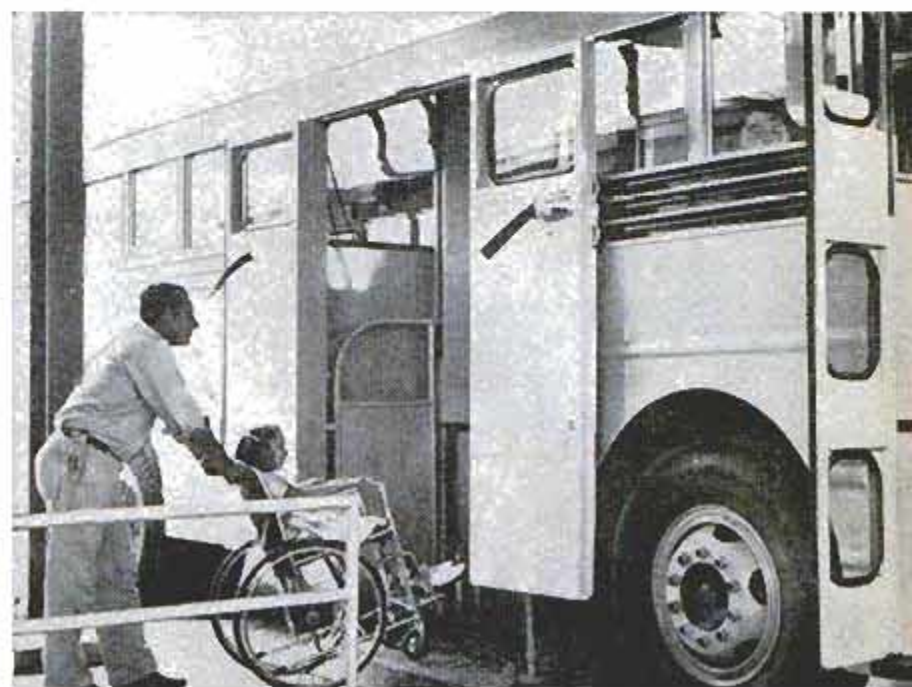
## Baby Car Goes Anywhere On Low-Pressure Tires

Excelling in off-highway use, as on golf courses or construction projects, a tiny personal car has supersoft tires of only seven pounds air pressure. Its three wheels are fitted with Terra-Tires to carry it through snow, ice, mud or sand without bogging down. Power comes from either an 8½-horsepower gasoline engine or a powerful electric motor run by a set of storage batteries.



## School Bus Has Elevator For Handicapped Pupils

Powered by a large battery which is independent of the engine, an elevator helps the driver put handicapped children aboard a school bus in San Lorenzo, Calif. The elevator is enclosed within the bus and affords special protection for the children's feet while their wheel chairs are raised or lowered. The \$14,000 bus also has floor anchors to hold the chairs while the bus is moving, and safety belts for the children. The novel bus travels about 112 miles per day.





# WHAT'S NEW FOR Your Home

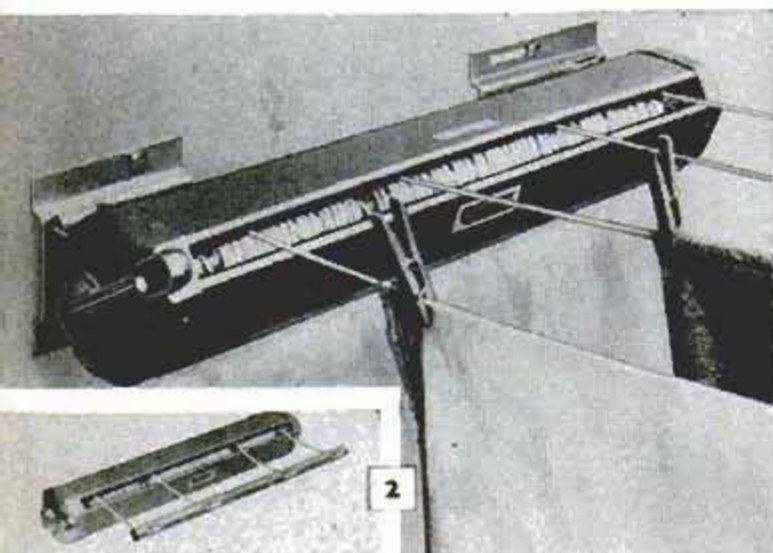


- 1 VACUUM-CLEANER TOOL CADDY** keeps attachments within easy reach because they move with the cleaner. The cleaner has large wheels which give the appliance mobility and easy ascent on stairs. Opening a door at front of cleaner automatically detaches disposable dust bag. Unit weighs only 17 pounds

Westinghouse Electric Corp., 240 Fourth St., Mansfield, Ohio

- 2 DISAPPEARING CLOTHESLINE** can be used in outdoor or indoor drying area without disrupting table-tennis or patio schedules. When not in use, unit can be closed so that only the aluminum casing is seen on the wall. Models of two sizes hold either four 25-foot or five 30-foot lengths of plastic line

McClintock Mfg. Co., 802 W. Whittier Blvd., Whittier, Calif.

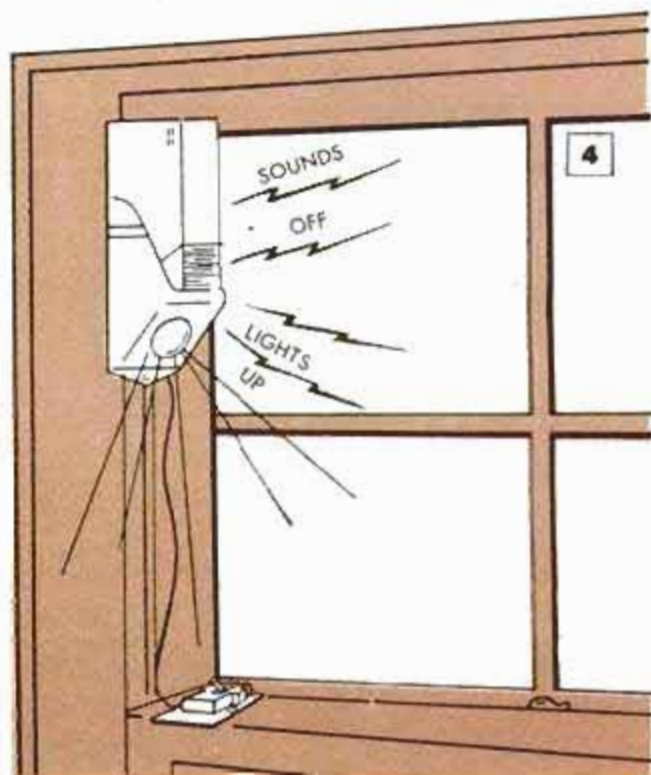


- 3 TEMPERATURE ALARM** saves burned fingers and scorched tongues by ringing a bell when the baby bottle, soup or sauce is as warm as you want it. The device operates like a bimetal thermostat which responds to heat faster on one side than the other. The stainless-steel base can be cleaned in hot water

Ding-Go, Div. Wells Mfg. Co., Comptche, Calif.

- 4 BURGLAR ALARM** that doubles as a fire alarm not only sounds off with a piercing shriek but throws a light beam. In the event of fire, the spotlight also serves as a safety light. The battery-powered master unit is about the size of a shoe box and it can be installed by anyone who can handle a screwdriver

Growler Alarm Corp., 30 W. 36th St., New York City 18





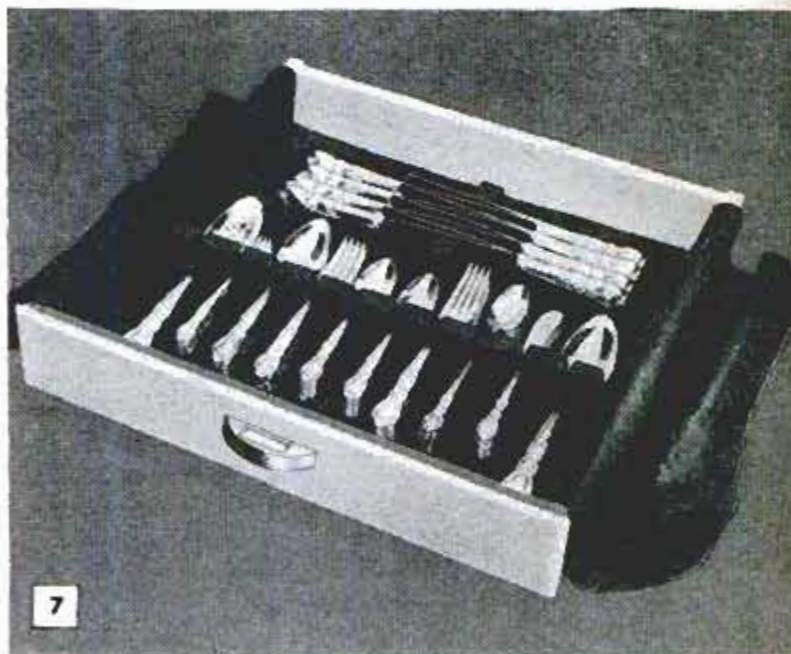


- 5 SHAVER-CORD REEL** holds five feet of cord but only amount you need is extended. When you're finished shaving, the entire length automatically retracts into the plastic caddy. Cord reel works with all electric shavers and in any standard socket. It can be left in outlet
- E. Joseph Cossmann & Co., 7015 Sunset Blvd., Hollywood 28, Calif.



- 6 CLOTHES SPRINKLER**, built into iron, eliminates the need to presprinkle clothes. Press a button on top of the iron handle and a fine spray of warm water is released onto stubborn wrinkles or pressed-in creases. The combination steam and dry iron has special deionizing unit for use with hard water
- General Electric Co., 1285 Boston Ave., Bridgeport, Conn.

- 7 SILVER-STORAGE DRAWER** is made from any cabinet drawer with the help of a kit consisting of a base pad 17½ by 20 inches, one long riser divider and a short one. When silver is stored in the converted drawer it is covered with a cloth which is treated to prevent tarnishing. The unit holds 140 pieces
- International Silver Co., 169 Colony St., Meriden, Conn.



- 8 AUTOMATIC VEGETABLE PEELER** works on water pressure. With this device you can peel potatoes or scrape carrots or cucumbers without the problem of disposing of peelings. You simply slip the rubber hose on faucet and turn on water. A chrome-plated scraper fine-cuts peelings which are washed away
- Elton, Inc., 225 W. Erie St., Chicago 10

- 9 SWIVEL MAGNIFYING MIRROR** has a rubber suction-cup base which holds it securely to bathroom wall, a window pane, dressing table or any smooth surface. It can be carried in glove compartment of the car so members of the fair sex can check their make-up without changing position of rear-view mirror
- Knickerbocker Rubber Co., 6101 S. May St., Chicago 21





## THE NEW WEAPONS SYSTEM



M15

M14

M60

Rifles are alike, except M15 has heavier barrel, bipod. M60 can be hand-fired or on two types of mounts



Army's sleek and rugged M14 is lightweight, fires both full and semiautomatic

These weapons are familiar to veterans of three wars. The machine guns and BAR date back to World War I

## OLD WEAPONS BEING REPLACED



BAR

M3 SUBMACHINE GUN

CARBINE

M1

LIGHT  
MACHINE GUNS

HEAVY  
MACHINE GUN



**It's Good-By to the Garand and BAR.  
Despite Guided Missiles and Sputniks—**

# **THE ARMY ADOPTS A NEW RIFLE**

**By William D. Perkins**

**M**ILLIONS OF AMERICAN MEN carried it billions of miles all over the world, had to care for it like a baby, loved and hated it, slept with it, fought and saved their lives with it, won two wars with it. But soon it will be a relic of the past.

For the U. S. Army is retiring its famed "best friend" of the infantryman—the M1 Garand rifle. Also three other longtime favorites of ex-GIs from Normandy to Korea — the BAR (Browning automatic rifle), the M2 carbine and the M3 submachine gun.

Taking their place is a pair of sleek and versatile new rifles. In an age of Sputniks, hydrogen bombs and ICBMs, the Army still is intent on improving the foot-soldier's basic weapon.

By 1960 the infantryman will either carry the Army's newly adopted M14 rifle (a

lighter modification of the M1) or the same rifle with a heavier barrel and a bipod, the M15.

The editors of *Popular Mechanics* wanted to know the details of the new rifles, how they compare with the weapons they are replacing and, most important of all, how they "feel" to the nonmilitary man who would have to enter or re-enter the service in the event of another all-out war.

So the author, a combat infantryman of World War II, visited the Army's Aberdeen Proving Ground in Maryland, talked to a number of experts, fired both the old and the new weapons, and spent a footsore day walking through the maze of the Pentagon in Washington, D. C., gathering additional information.

The most significant advantage of the new weapons system is that one basic

M14 is one inch longer due to flash suppressor, weighs less even with 12 more rounds and magazine, is said to be more reliable, accurate







BAR

Author found M14 fired the same as M1 except for additional firepower, M15 was uncontrollable on automatic



BELGIAN FN

Controversial Belgian FN rifle, adopted by other NATO powers, lost out in U.S. competition with M14-15



M60

Army's 23-pound all-purpose machine gun, shown with bipod, rounded out streamlining of infantry weapons



New weapons fire NATO cartridge at right; M1, left

#### THE ARMY'S OLD AND NEW RIFLES

	M1	M14	BAR	M15
WEIGHT, WEAPON ALONE*	9.3	8.2	20	13.1
LOADED*	10.57	10.16	22	14.15
LENGTH*	43.6	44.4	47.81	44.14
NUMBER OF PARTS	88	102	150	114
FIELD-STRIPPING TIME, IN SECONDS	30	40	80	50
ASSEMBLY	60	40	140	100
MAXIMUM RATE OF FIRE, ROUNDS PER MINUTE	16 to 32	16 to 32 and 700	300 to 350 and 600	16 to 32 and 700

\* Weight and length in pounds and inches, and tenths of pounds and inches



combat firearm, with two types of barrels, is replacing four. This will greatly simplify the Army's all-important problems of mass manufacturing, large-scale training, costs, maintenance and supply.

The important change in the weapons system itself is that the M14-15 can be adjusted to both full and semiautomatic fire using 20-cartridge magazines. The M1 with its eight-round clip and the carbine with a 10-round magazine were converted to both forms of fire at the end of World War II; only the carbine was standardized.

The new rifle will fire 700 rounds per minute automatically. Like the M1, it is .30-caliber, gas-operated and will fire 16 to 32 rounds per minute semiautomatically, depending on the capabilities of the individual rifleman. The BAR with its 20-round magazine fires 300 to 350 rounds per minute on its slow rate-of-fire adjustment, and 600 rounds on fast fire. The M14-15 is not adjustable to a slower rate of fire, and is changed from semiautomatic to automatic fire by turning a lever located on the upper right-hand side of the receiver.

#### Ammunition Is Standardized

Standardization of ammunition is another advantage of the Army's modernized weapons system. The M14-15 uses a new 7.62-millimeter cartridge that is interchangeable with the weapons of our North Atlantic Treaty Organization (NATO) allied countries. The 7.62 is the European metric equivalent of .30 caliber. The NATO cartridge is one half inch shorter and has the same velocity as the round used in the M1 and BAR. But 160 rounds weigh a pound less. The cartridge also is fired in the Army's new machine gun, the 23-pound M60, which will replace the three types of machine guns in use since 1919.

Weight was another vital factor in the selection of the M14-15. The M14 unloaded weighs a pound less than the M1. Loaded, although with 12 more rounds and a magazine, it still weighs less than the M1. With the heavy barrel, bipod and hinged butt plate to hold it down on the shoulder, the M15 loaded weighs eight pounds less than the BAR.

A valuable improvement in the barrels of the M14-15 is a slotted flash suppressor

that almost does away with the light of ignited muzzle gases in nighttime firing. Although the M14 itself is shorter than the M1, due to a smaller receiver using the NATO cartridge, with the addition of a flash suppressor it is an inch longer. The M15 is almost four inches shorter than the BAR.

A surprising feature of some limited-production-run models of the M14 is the absence of a bayonet stud, indicating the possibility that the Army has at last decided hand-to-hand fighting is a thing of the past. At this time Army officials have not standardized other attachments, such as a grenade launcher, for the M14.

The M14-15 has more individual parts than the M1, but less than the BAR. However, the M14-15 action parts are fewer and simpler in design. Essential field-stripping is a little slower with the M14 compared to the M1, but field-stripped assembly is faster and both are faster with the M15 than with the BAR.

There is little metallurgical improvement in the M14-15 barrels, so they will not be longer-lasting. Their maximum range of 3500 yards and effective range of 500 yards are the same as the M1 and BAR.

Accuracy has been improved with the new weapons system compared to the old, according to Army officials, although the combat-simulation and field-test reports by the Continental Army Command are classified "secret" and details are not available.

The M14-15 is reported to be more reliable under extreme combat conditions than the other weapons. The new rifles passed all tests with flying colors. Both in



Grimace on face of "lefty" soldier firing M14 automatically indicates force of its 700-round-per-minute capacity. Note absence of bayonet stud





the laboratory and in the field their endurance was superior. They are said to be more rugged in taking a beating under all adverse conditions. But again, the details are classified. All the Army officials would say is that the M14-15 performed "as good or better" than the other weapons.

When the M14-15 has fired 10 or more rounds, it may be reloaded without changing magazines by inserting a "charger" in the receiver. Otherwise, additional characteristics of the rifles, such as sights, stock and bolt action, are similar to the M1.

At Aberdeen, I fired the combat weapons of the basic infantry unit — the M1 and BAR of the past and present, and the M14-15 of the future.

It was a familiar feeling once again to handle the M1, for the first time in 12 years. It fired with the same old jolt, acrid smell of burned powder and back-breaking, arm-bending methods of doing it "by the book."

Firing the M1 must be like riding a bicycle — once learned, it's not forgotten. With a zeroed-in M1 at 100 yards, I fired a small target pattern inside the bull's-eye and two hits just outside it. This included both slow fire and fast-as-possible firing.

The M14 on semiautomatic fire handled exactly the same as the M1. My target pattern was a little larger, but this included more and faster "snap" shots to see if the additional available firepower could be used effectively. Apparently it can. The M14 "hefted" a little better than the M1, indicating it has better balance.

With the BAR I had a fair pattern in and around the bull's-eye on both slow and fast fire. And, it's still the same old BAR with its tendency to malfunction.

The heavy-barrel M15 on automatic fire, however, was an entirely different matter.

To me, it was uncontrollable. It climbed fast at one o'clock. Trying to hold it down made it fire into the ground in front of the target. Only the first and second shots hit in and above the bull's-eye. I missed the target 10 out of 20 times. Short bursts weren't effective either, because the fastest snap of the trigger gets off four or five rounds.

You really have your hands full trying to hold on target a bucking, sight-blurring lightweight rifle throwing lead at a rate of over 11 rounds per second.

An expert rifleman did better, though. He is a member of the Aberdeen Ordnance engineering staff, and firing rifles is his job. His average target pattern was at nine o'clock with one in the bull's-eye, 18 scattered in the next two rings and one miss.

Other expert riflemen told me they thought the M14-15 is "totally ineffective as an automatic weapon." They pointed out the old theory that for every pound you decrease the weight of an automatic weapon and for every round you increase its firepower, you decrease its accuracy proportionately.

"What we really need," said another expert, "is an automatic rifle with the dependability and the ruggedness of the M14-15, but with the slow-fire feature of the BAR."

"What you can't see you can't hit," remarked another expert, "and one thing's sure—you can't see what you're shooting at with the M14-15 on automatic."

They said firing the rifle from the hip is almost impossible, and trying to fire it from the shoulder standing is downright dangerous. The rifle was so "hot" that, lacking familiarity, I did not fire it in these positions.

(Continued to page 266)



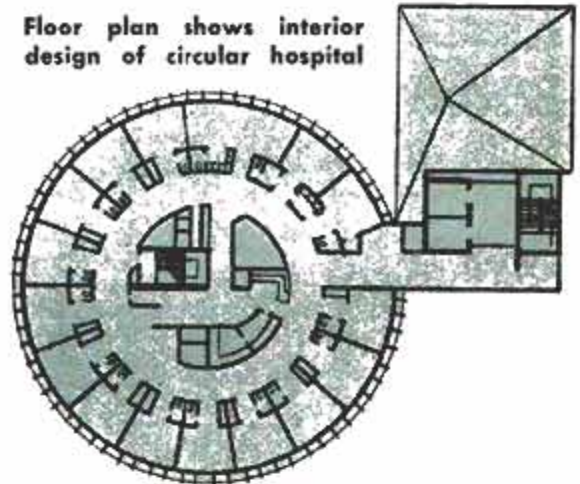


All patients have outside rooms in 66-bed circular unit. Nurses' area and utility rooms are in the center

## Circular Hospital Eliminates Dead-End Corridors

**NURSES WILL SAVE** one step in every three while attending patients in the new circular Valley Presbyterian Hospital in Van Nuys, Calif. The round floor plan is designed to eliminate dead-end corridors, provide each room with some sun each day and to save 37 percent of the steps that nurses have to make in conventional hospitals. Patients' rooms are on the outside perimeter of the building and the nurses' work area is in the center of each floor. Each room is to have a television set on the wall in front of the bed, with bedside push-button controls and a speaker available to each patient. Each patient can control his share of the window area, from bright sunlight to darkness.

Floor plan shows interior design of circular hospital



Rectangular structure at right will contain operating rooms, X-ray rooms, laboratory and pharmacy areas







### Adhesive Will Bond Plastic To Rubber and Metal

So strong is a new adhesive that for the first time polyethylene plastic can be successfully bonded to rubber, brass or brass-plated metals. The adhesive has a bond strength of about 1000 pounds per square inch, thus requiring 2000 pounds to pull apart a two-inch-diameter "sandwich" of polyethylene, rubber and brass.

### Tractor Takes Slick Surfaces With 24 by 24-Inch Tires

Designed for traction on mud, sand, snow or wet surfaces is a new 2800-pound tractor equipped with tires that are 24 inches wide and 24 inches in diameter. Air pressure is five pounds for front tires, seven for rear tires. Front wheels are unpowered, have individual suspension. Rear wheels are powered through a locking differential.



### Air-Tube Suit Makes Floating Easy as Falling Off a Log

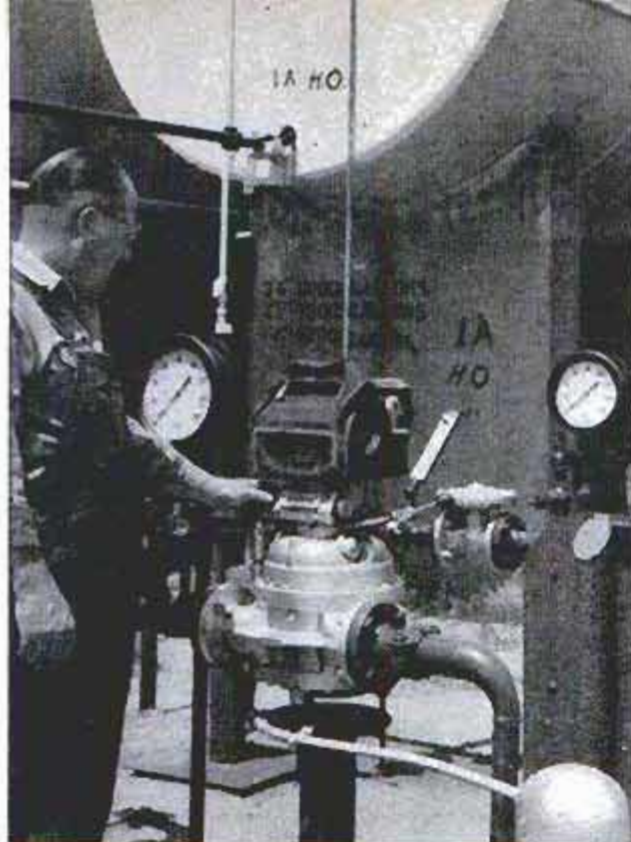
Demonstrations of a new safety suit have proved that timberworkers can survive an accidental plunge into a stream or pond. The logger floats like a log because of air tubes inside his specially designed waterproof jacket and trousers. Two large air tubes keep the legs on the surface. The tubes are attached with slide fasteners.

### Students' Teaching Machine Repeats Questions Missed

High-school and college students can test themselves with a machine that repeats questions about lessons as often as needed to produce correct answers. When the student has a right answer, he advances a lever which reduces the number of times the particular question will recur. Questions are printed on a disk which revolves.







Plant agent at Colon, Mich., sets meter for number of gallons of fuel to be sent from Whiting, Ind.



Plant agent telephones dispatcher in Whiting. Line also connects to automatic equipment beside agent

## This Pipeline Delivers Fuel by Remote Control

RISING COSTS of gasoline and fuel oil are causing oil companies to seek less-expensive patterns of operation. The Standard Oil Company of Indiana has already effected substantial savings by using automation and unattended pipeline facilities. Further economies are now expected with remote-controlled delivery of fuels from pipelines to bulk plants which supply the retailer.

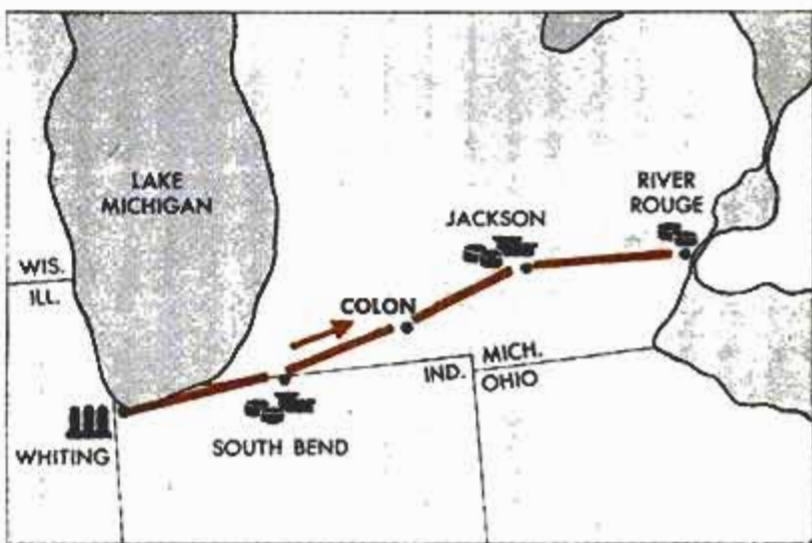
To gather experimental data, Standard's bulk plant at Colon, Mich., has been equipped with automatic devices which permit unattended delivery of fuel from pipeline to storage tank. This is accomplished by the pipeline dispatcher at Whiting, Ind., who telephones a series of code signals which activate automatic plant equipment in Colon.

The plant agent in Colon has little to do after gauging his tanks for the amount of fuel to be delivered. He telephones this information to the pipeline dispatcher, who determines how much fuel is available. When the order is approved, the plant agent aligns the proper tank valves, sets the delivery quantity on a meter, then inserts a ticket in a printer to

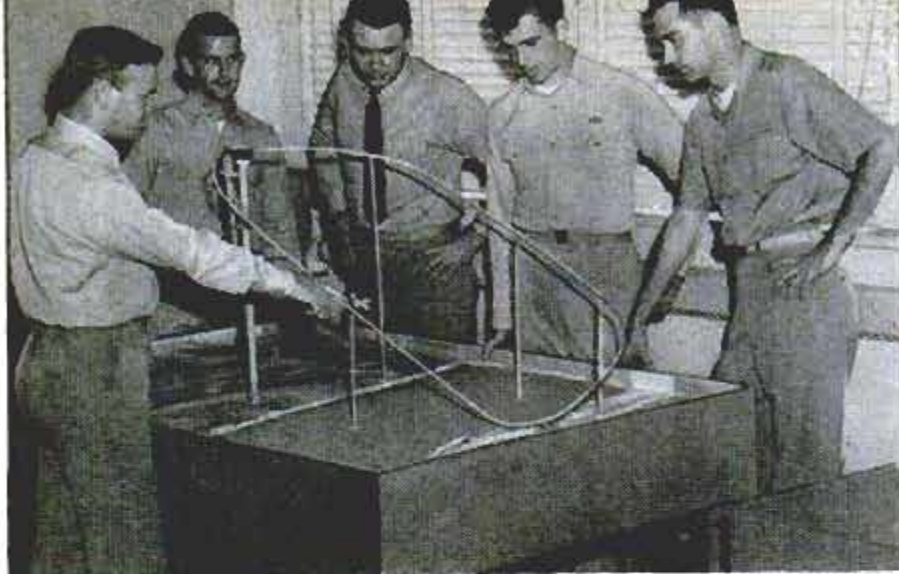
make a record of the amount of gasoline or fuel oil that has been delivered.

The dispatcher in Whiting can tell by the amount of fuel in the pipeline when the fuel oil has arrived at Colon. He then telephones a series of code signals that put a purge pump in operation and open a solenoid-piloted valve to begin delivery of the fuel. Another telephone signal starts a flashtester which automatically stops the flow of heating oil if even a trace of gasoline is detected.

Map below shows location of Colon, selected for automation test because it is near mid-point of Whiting-River Rouge pipeline







## Jet-Plane Model Makes Bomb Run

How to make a dive-bombing run with a jet aircraft is demonstrated with a miniature plane mounted on a tubing track at the Naval Air Station at Pensacola, Fla. Electrically operated, a set of gears make the plane increase speed on the bomb run, decrease speed on the pull-out, and turn and bank.



## Model U. S. Capitol Built With Pearls

Approximately 200,000 cultured pearls were used to construct a model of the U. S. Capitol. The scale model, valued at \$250,000, was made in Japan. It was shipped to the United States where it will be exhibited during a three-year tour.

☐ Deepest producing oil well in the world, bringing oil up from 21,465 feet below the surface, has been brought in at Plaquemines Parish, La.



## Tractor Hoppers Spot Borer Poison

Better control of corn borers is claimed for a granular applicator which drops dry DDT directly into the leaf whorls where the first brood of borers do most of their damage. Since the spreaders below the chemical hoppers spot the DDT where it's needed most, the applicator reportedly is more economical than spraying devices, which apply the insecticide over wide areas where it's not needed. The tractor mounting frame permits adjustment of the applicator to the height of the corn, with a maximum of approximately six feet of ground clearance. The agitator is chain-driven.





Tiny white square on state map represents area in relief map

# The Battle of Donner Pass

By Thomas E. Stimson, Jr.

PHOTOS: CALIFORNIA DIVISION OF HIGHWAYS; HAL ROTH

**L**ADY, THE ROAD IS CLOSED because there's a bad blizzard about two miles ahead. What? Yes, I know it's a nice morning and there isn't a cloud in the sky. But up at Horseshoe there's a 70-mile wind. It's blowing 100 miles per hour in the gusts. Snow is driving across the road so thick

you just can't see where you are going."

All during the preceding night when the snow was coming down better than a foot per hour the highway crews had battled to keep the road open. The three most critical miles across Donner Summit were cleaned off every 10 minutes. Armond

Rotary plow opening road after it had been buried by a heavy storm. Overhanging snow must be removed







Looking along U. S. 40 as it winds through snow-covered Sierra Nevada Mountains toward Donner Summit

Motorists are required to use tire chains on slick pavement. Wind gusts sometimes start cars skidding



Close, foreman at Donner, had kept three pieces of equipment on this stretch of road all night long. First was a grader with a blade that pushed the fresh snow toward the side of the road. A mile behind was a plow, and another mile to the rear was a big rotary that scooped up the collected snow and hurled it far from the roadside.

Close used eight additional plows and rotaries on the other 14 miles of his section. East beyond Donner Lake, west toward Yuba Gap, other crews had kept their sections open. Traffic was light and not a car spun out, not one big highway truck and trailer jackknifed into a snowbank to tie up the road.

The storm ended at daybreak and then



the howling gale swooped down, whipping up the fresh snow and driving it across the road in blinding clouds. Traffic was halted for an hour; later, vehicles equipped with chains were allowed to creep across the summit. The wind was still strong and the chains were a precaution against gusts that otherwise might skate a car sideways across the pavement.

Donner Summit, 7135 feet above sea level, is the highest point attained by U. S. 40 on its way across the Sierra Nevada mountains in California. This transcontinental highway is the main route to San Francisco from the east, the road that the California Division of Highways strives to keep open all winter long. Commercial travelers, military traffic, the big over-the-road merchandise trucks, all depend on U. S. 40.

Half-a-dozen roads cross the mountains, to be sure, but most of them are higher or longer or too narrow and steep for some of the traffic. No attempt is made to keep all of them plowed open. Any time the snow crews lose their battle on Highway 40 there's often only one practical detour to the coast, via southern California 300 miles to the south.

Twenty feet of snow falls on Donner Summit during a mild winter, and the average is closer to 40 feet. The record is the 65 feet that fell six years ago. That was the heartbreak winter in which the snow fighters lost the road and didn't get it open again for 28 long days. Equipment broke down, men wore themselves out, and tremendous slides of earth and rock fell across portions of the road that are cut into the cliffs on the east side of the pass.

One storm followed after another so rapidly that winter that the crews never had



Driver of a rotary snowplow patiently guides his machine at two miles per hour through roadside drifts

a chance to clean up after one snowfall and prepare for the next. Ordinary working shifts of eight hours were stretched out to 12 hours plus. Trees fell across the road and were buried in the snow and had to be cut out with saws and axes. One rotary plow "went blind" when its windshield wipers broke and snow banked up against the glass. The driver managed to keep going by following the directions that were radioed to him by another snow fighter in a pickup truck right behind him.

Another rotary went out of action for a

**When a truck jackknifes across the highway, everything stops. The flagman patiently tries to keep order**







Rotary plows working in parallel paths to open highway after a storm produce strange wafers of packed snow

time when a boulder crashed down on its hood, smashing the windshield and doing other damage. A third developed a faulty fuel pump at the peak of one storm. In the midst of all this, a streamlined passenger train became snowbound near Yuba Gap. A rescue train with a snowplow in front was buried under a snowslide en route to the streamliner and couldn't be moved. Not until the highway crews cut a path through 10-foot drifts were the 200 passengers on the train rescued.

By the time that winter was over, highway plows and rotaries from as far as 500

miles away had been diverted to the High Sierra section and put to work.

Fighting the winter snows is actually an all-year task. During the summer months all the snow-removal equipment is sent down to the Sacramento shops for complete overhaul and repairs, and meanwhile the crews repair winter damage to the road itself. Usually there are miles of pavement to be resurfaced. Frost bumps that are caused by water getting under the pavement and then freezing are cut out and repaved, culverts and gutters are cleaned of gravel and debris. Food, gasoline and

With short-wave radio, road information can be relayed, equipment ordered, drivers, mechanics shifted

When rotary auger picks up a stone or board, shear pin snaps and crewman has to get out and replace it





other supplies are trucked to the maintenance stations. Radio equipment on each truck and plow is checked over.

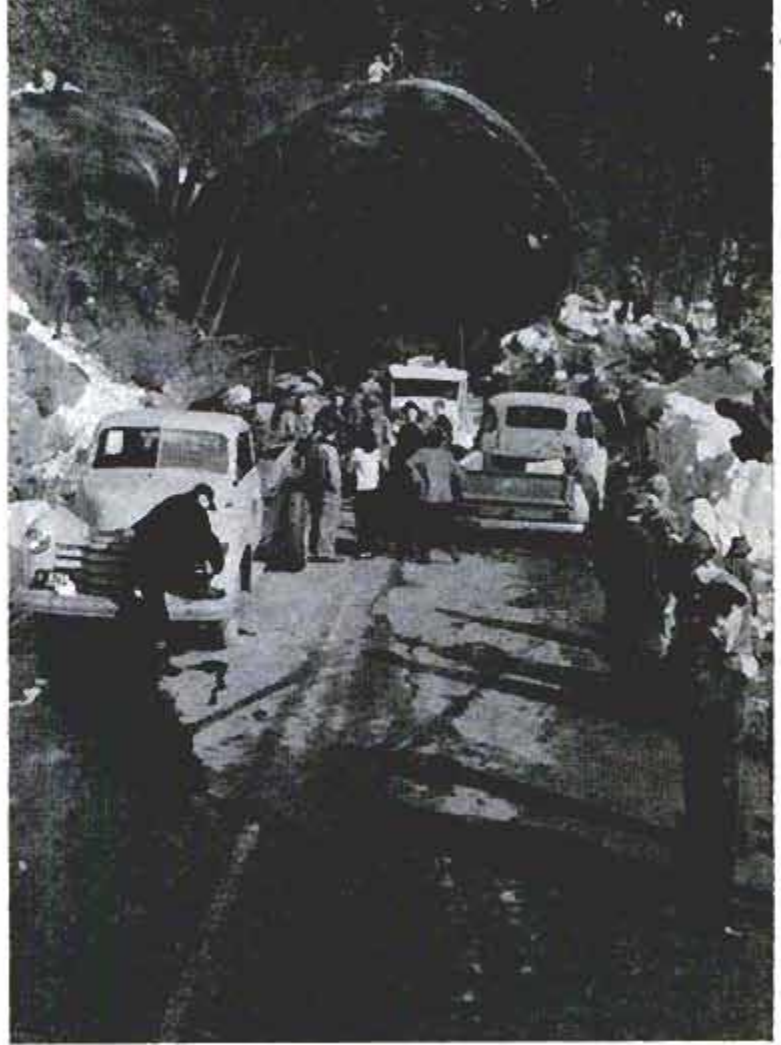
Beginning in October the thousands of orange-colored snowstakes are planted along the edges of the highway. These 12 and 14-foot-tall markers will guide the drivers of the snow-removal equipment and keep them from driving off a cliff at times when visibility is down to a matter of just a few feet.

By November, the Donner snow camp, closed in the summer, is occupied. The 40-man crew eats and sleeps on the second floor, the first floor is a heated garage in which the snow vehicles are stored and where emergency repairs can be made.

Highway 40 uses the same route over the Sierra that Fremont's party pioneered in 1844 and that later became the main trail for the gold seekers of '49. Donner Summit and Donner Lake to its east are named for the ill-fated Donner party that was trapped by an eight-foot snowfall in the early days while trying to cross the mountains.

During the gold-rush days a wagon road was completed over the summit and more recently the road was widened and paved to accommodate the growing number of automobiles. Not until 30 years ago was any attempt made to keep the road open all through the winter.

Today the highway is a good mountain road but it's far from adequate for the enormous amount of traffic that uses it. Up



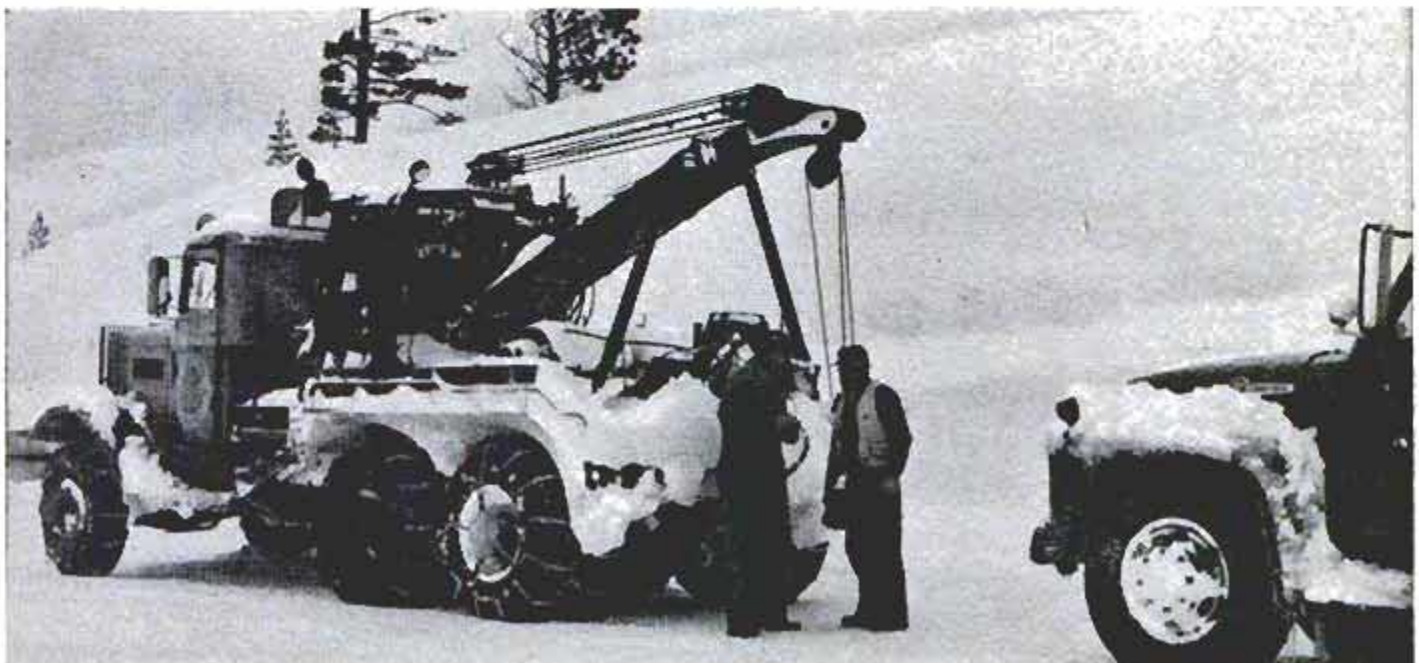
Boulder loosened by thawing snow blocks U. S. 50, a highway used as alternate route when blizzards rage in Donner Pass

at Donner, Armond Close has seen seven miles of cars lined up on a Saturday morning, trying to get into the parking areas around the ski resorts. That's an exception, of course, and yet traffic causes more tie-ups on the road than anything else.

Chains are mandatory for all traffic

(Continued to page 248)

Tow rigs designed especially for mountain highways are needed when big semitrailers get stuck in the snow







## Plywood Dome Will Serve as Church in Korea



All the building materials for the igloo-shaped sanctuary in the photograph above could be carried in a large pickup truck. The 39-foot hemisphere, built from 134 sheets of  $\frac{1}{4}$ -inch exterior-grade plywood, will be used as a church at Naju, South Korea. Using the geodesic-dome design of architect Buckminster Fuller, the building gets its strength from the geometric pattern of the 4 by  $6\frac{1}{2}$ -foot sheets of plywood on 2 by 2-inch ribbing. It was erected in 16 hours, left, with much of the work done by small boys. The building weighs 3500 pounds.

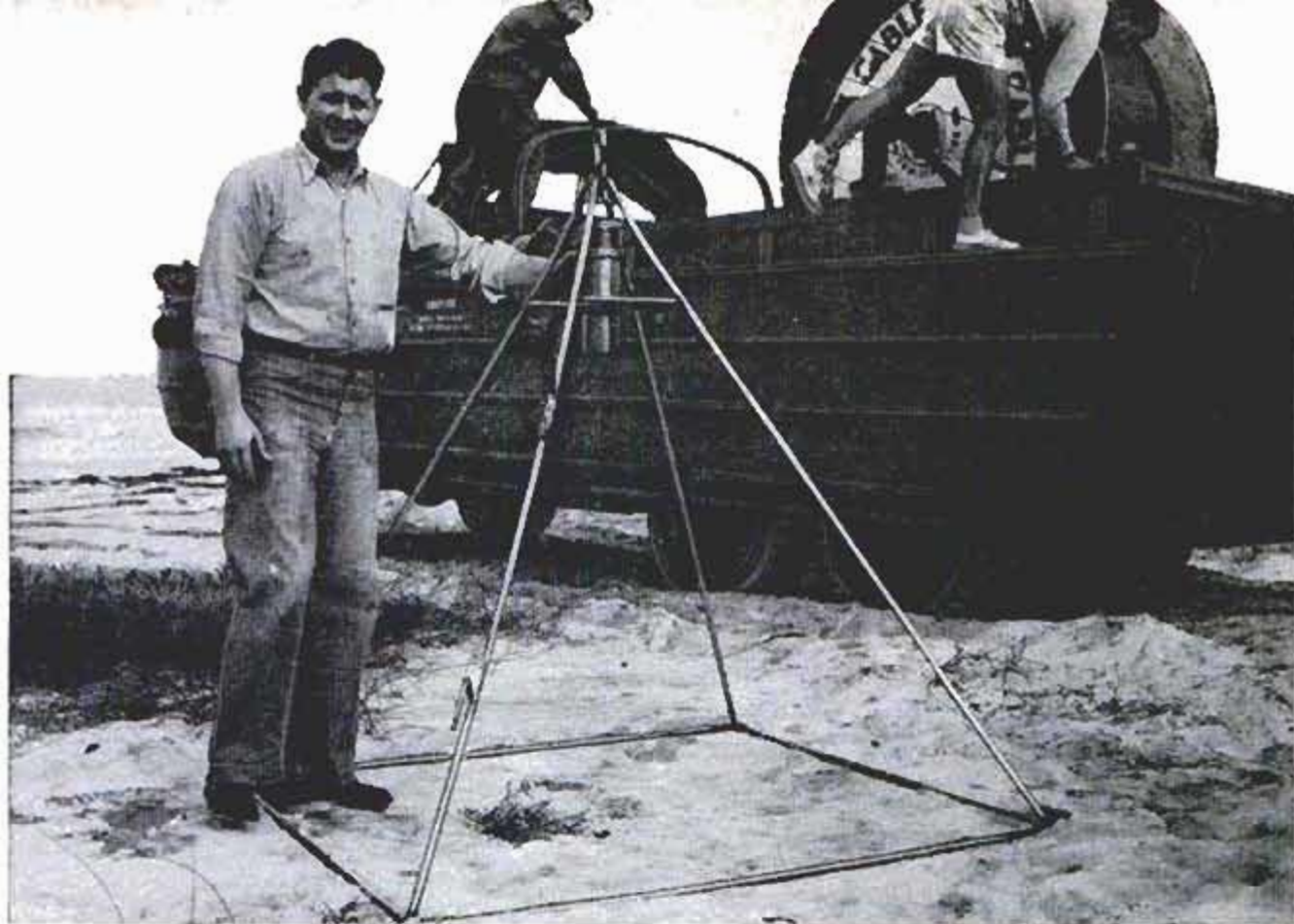
## Haymaking Is One-Man Operation With Automatic Equipment

Into the high-sided wagon, below, goes a bale of hay, tossed out of a twine-tie baler by a newly developed ejector attachment. The attachment eliminates the need for bale pickup men or men on the wag-

on. When the load is delivered to the barn, it can be dumped into an automatic elevator and conveyor system that will distribute the bales in the loft. The half-size bales do not have to be stacked.



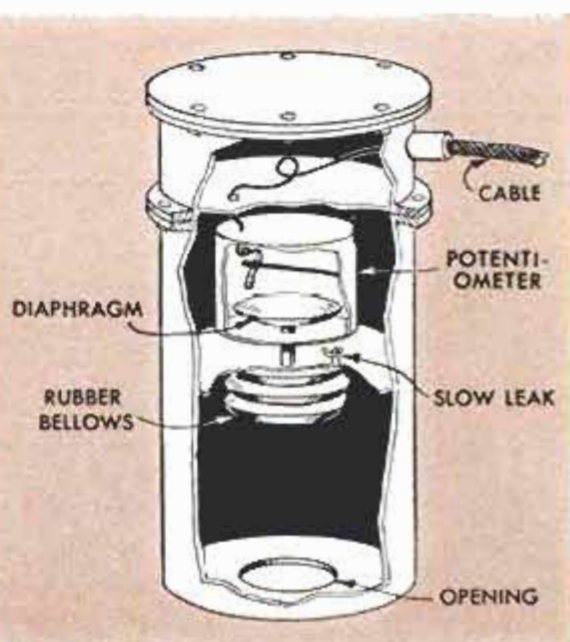
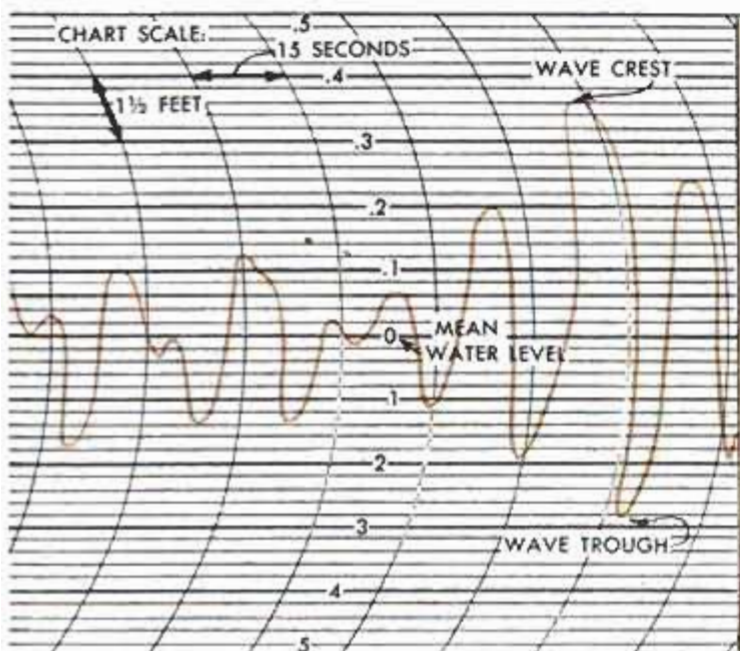




## How the Navy Measures an Ocean Wave

INSTALLED BENEATH the Pacific Ocean, west of Monterey Peninsula, is an instrument that keeps a written report for the U. S. Navy on the size of ocean waves. The device, called a Shore Wave Recorder, consists of a brass cylinder about a foot long and four inches in diameter. As waves on the surface, some 40 feet above, rise and fall, they cause the water pressure to increase and drop. These variations in pressure activate a rubber bellows in the low-

er chamber of the instrument. The motion of the bellows activates a potentiometer in the middle chamber and produces a varying electrical current. The electrical impulses are transmitted through a cable to a recording instrument on shore which makes a continuous ink trace. The "slow leak" device between the chambers of the pressure head, shown in the diagram, compensates for slow changes in water level which might complicate the record.





# White Alice Starts Talking

By Thomas E. Stimson, Jr.

**L**OOKING LIKE MONSTROUS kinds of vegetation from another planet, some strange manmade objects are sprouting from the tundra in the frozen North.

Some of the weird shapes resemble giant loudspeakers standing on tall steel legs. Some look like huge outdoor movie screens. Still others are toothpicklike towers with grotesque metal "foliage" on their tops.

In addition there are big domes that sometimes are mounted on stilts and that sometimes emerge from the tops of "trains," the long, low, scientifically designed structures inside of which men can live comfortably during sub-zero Arctic winters.

Some of the objects go by the name of White Alice, others are known as DEW Line.

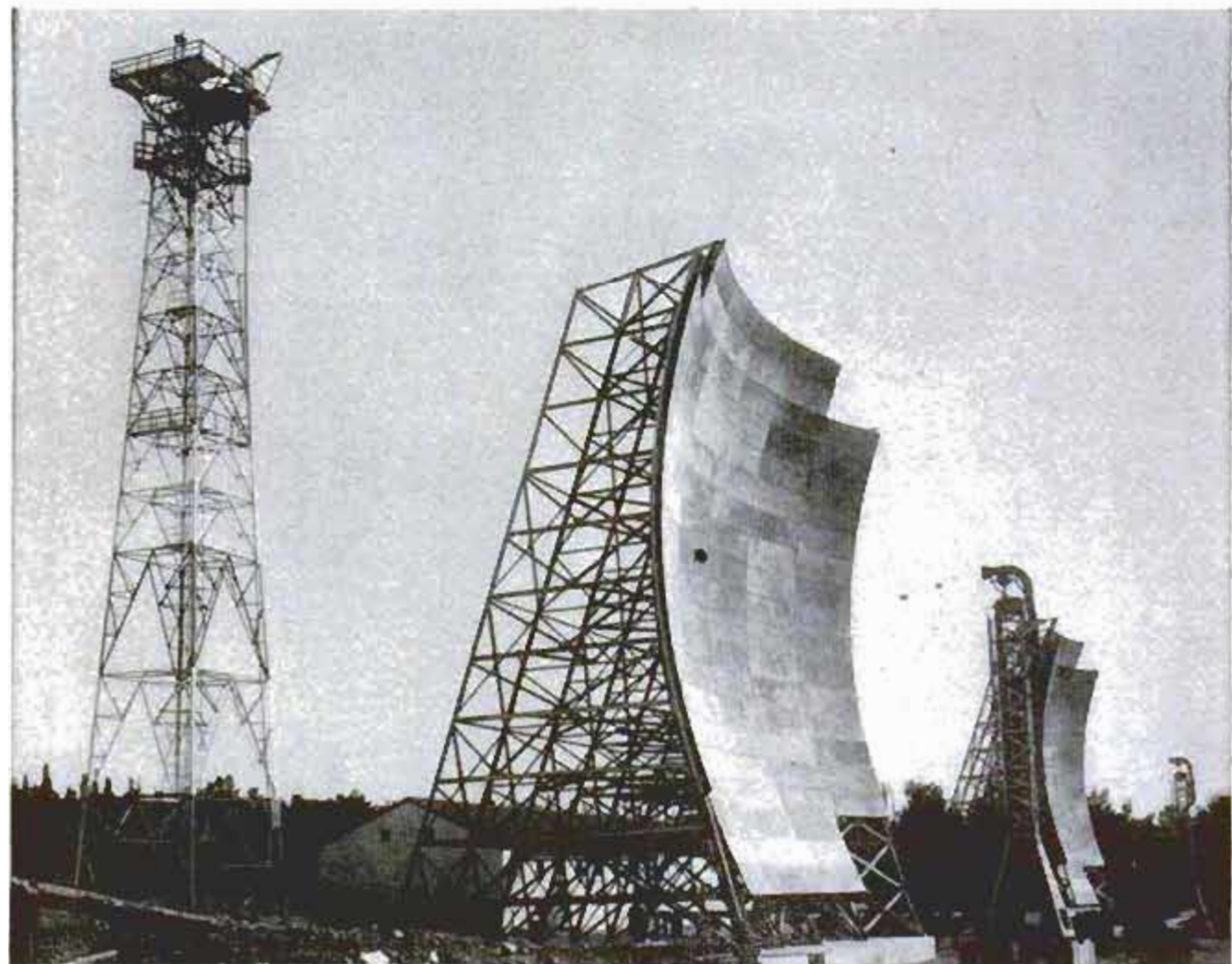
DEW (Distant Early Warning) Line is the chain of radar stations that the United States and Canada have built across the

top of the continent, from Point Barrow to Baffin Island. DEW Line would give the first warning of any hostile bombers en route across the top of the world to North America. The big domes that characterize the main DEW Line stations are radomes, protective canopies inside of which the long-range search equipment is operated.

White Alice is the code name for a new and revolutionary radio system just being completed in Alaska. It hurdles mountain ranges, goes around the curvature of the earth and links remote Alaskan outposts together for the first time. At Anchorage, it ties in with the existing long-distance telephone facilities to the United States.

White Alice isn't affected by auroras or other atmospheric phenomena that can tie up ordinary radio communication in the North for hours or days at a time. Its circuits carry up to 132 voice channels and it spans

New Alaskan radio system uses "tropo-scatters," foreground, that deflect and receive beams off troposphere







F-89 pilot "scrambles," as White Alice provides communication between Air Force bases and early warning stations

distances of several hundred miles at a jump, as compared to the approximately 40-mile range of standard microwave radio.

The engineers call it "tropo-scatter" or, more technically, "forward-propagation tropospheric scatter." It uses what was once thought to be a freak condition: The occasional bouncing of a TV program into a shadow area, the occasional long-distance hop of a line-of-sight UHF transmission.

Some such radio reflections come from dust and moisture particles in the atmosphere, even from variations in air density several miles up. Scientists of the Bell Telephone Laboratories and Western Electric Company found they could put this phenomenon to work and tried it first on an experimental basis between Florida and Cuba, and later for the military.

White Alice is the first large telephone network to use tropo-scatter. Its 33 stations in Alaska cover 3100 route miles and are being completed at a cost of \$100,000,000. It is for use by the public as well as by the Air Force and other government agencies.

Communication engineers expect a big future for the tropo-scatter system. They say it can bring reliable long-distance phone service to remote areas that are now impractical to reach. By hopping from island to island they think high-fidelity tropo-scatter can circle the whole earth. New improvements

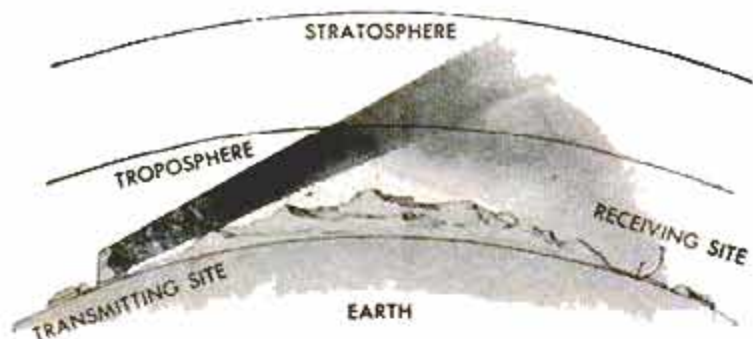


Spotted are most of the 33 Alice stations, covering 3100 miles. Certain details are omitted for security reasons





This is a White Alice station main radar-search antenna, without its usual protective dome of plastic



One ten-trillionth "bounced" signal may be received hundreds of miles away, and yet it is sufficient

White Alice stations would continue operating if generators failed, using 12-volt storage batteries



now being worked on will allow 600 voice channels, plus one color-TV circuit and one black-and-white TV circuit to be carried on one beam. Engineers expect that with these improvements, continent-to-continent television broadcasts will be possible on an everyday basis. Tropo-scatter is frequency-modulated, single side-band, ultra-high-frequency.

The objects on the Alaskan landscape that resemble huge loudspeakers are the medium-range antennas of the White Alice system. The curved steel 60-foot "drive-in movie screens" likewise are antennas, used for the longest jumps.

A feed-horn mounted on a tower sprays its energy against the parabolic surface of the screen, and the screen focuses the power into a narrow beam that shoots far across the horizon. In effect the curved antenna is a big radio "searchlight."

Far beyond the horizon, tiny amounts of the energy are deflected or scattered downward by the dust and inequalities of the troposphere. A screen-type receiving antenna picks up some of the deflected energy, concentrates it and conducts it to powerful amplifiers. The incoming energy may only be one ten-trillionth of the transmitted signal, but this minute amount is enough to be amplified and retransmitted without distortion.

A big-screen antenna not only must be built with great accuracy, it must be designed to withstand tremendous wind forces. The White Alice screens are able to take 120-knot winds without deflection. Each screen weighs 100 tons and is anchored to a reinforced-concrete foundation weighing 300 tons and extending 20 feet below the surface of the ground. In areas where ice and snow are severe, the antennas have their own de-icers; the rear structure that supports the screen is enclosed and warm air circulates inside.

For its shortest line-of-sight jumps and in populated areas, White Alice uses microwave relays instead of tropo-scatter.

White Alice was built on a "crash" basis, in approximately two years, because of the need for reliable communication by the aircraft control and warning stations that guard Alaska's west coast. DEW Line, farther north, is not served by White Alice. Instead, it uses a somewhat different scatter system that bounces its waves off the ionosphere rather than the troposphere.

The advantage of ionospheric scatter is that distances of up to 1200 miles can be spanned without relays. But it has limited channel capacity and is troubled by meteors. The ionized trails of meteors are very good reflectors of radio waves, hence signal strength goes up and down depending on the number of meteors that are



plunging through the upper atmosphere. Neither tropo-scatter nor ionospheric-scatter communication can be jammed by other transmitters.

DEW Line is 3000 miles long and is built entirely within the Arctic Circle, with some stations within 1200 miles of the North Pole. It consists of more than 50 radar sites, some of which are main stations using long-range rotating antennas, with auxiliary "gap filler" stations between to complete the coverage.

Its radar equipment can detect and track low-flying aircraft, as well as planes at high altitudes. It is fitted with the best available "antijamming" circuitry to help it locate aircraft even when its signals are deliberately being jammed. DEW Line uses automatic alarms that alert its operators whenever a bomber-sized aircraft is detected.

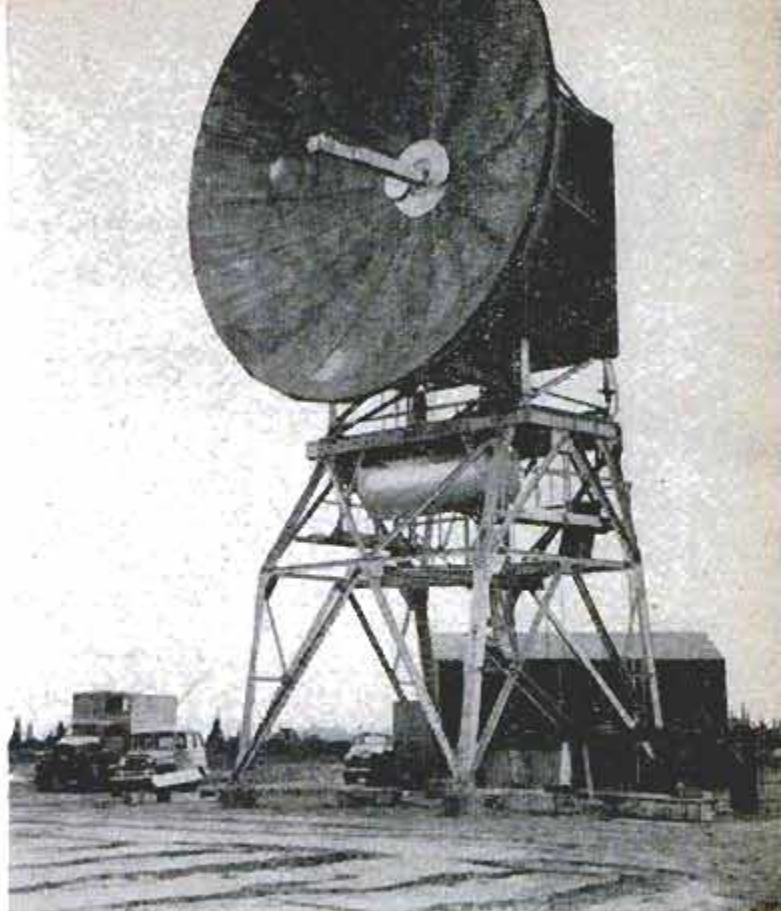
The construction of this electronic fence in a period of 32 months is one of the great engineering feats of the century. The total cost was \$600,000,000. Much of the work was done in secret, all of it in a calculated hurry. Western Electric and the Bell System were the prime contractors.

Not only was it necessary to transport and install the huge yet delicate radar systems themselves, all sorts of auxiliary structures were required. Living quarters, supply warehouses, fuel tanks, towers, airfields, hangars, even roads had to be built at the sites.

The Arctic summer lasts no more than a couple of months, and only for a few weeks are the Arctic shores relatively free of ice. Fleets of supply ships from Halifax and Seattle dashed north during the ice-free periods to deliver 200,000 tons of cargo on beaches across the top of the continent, areas for which no navigation charts exist.

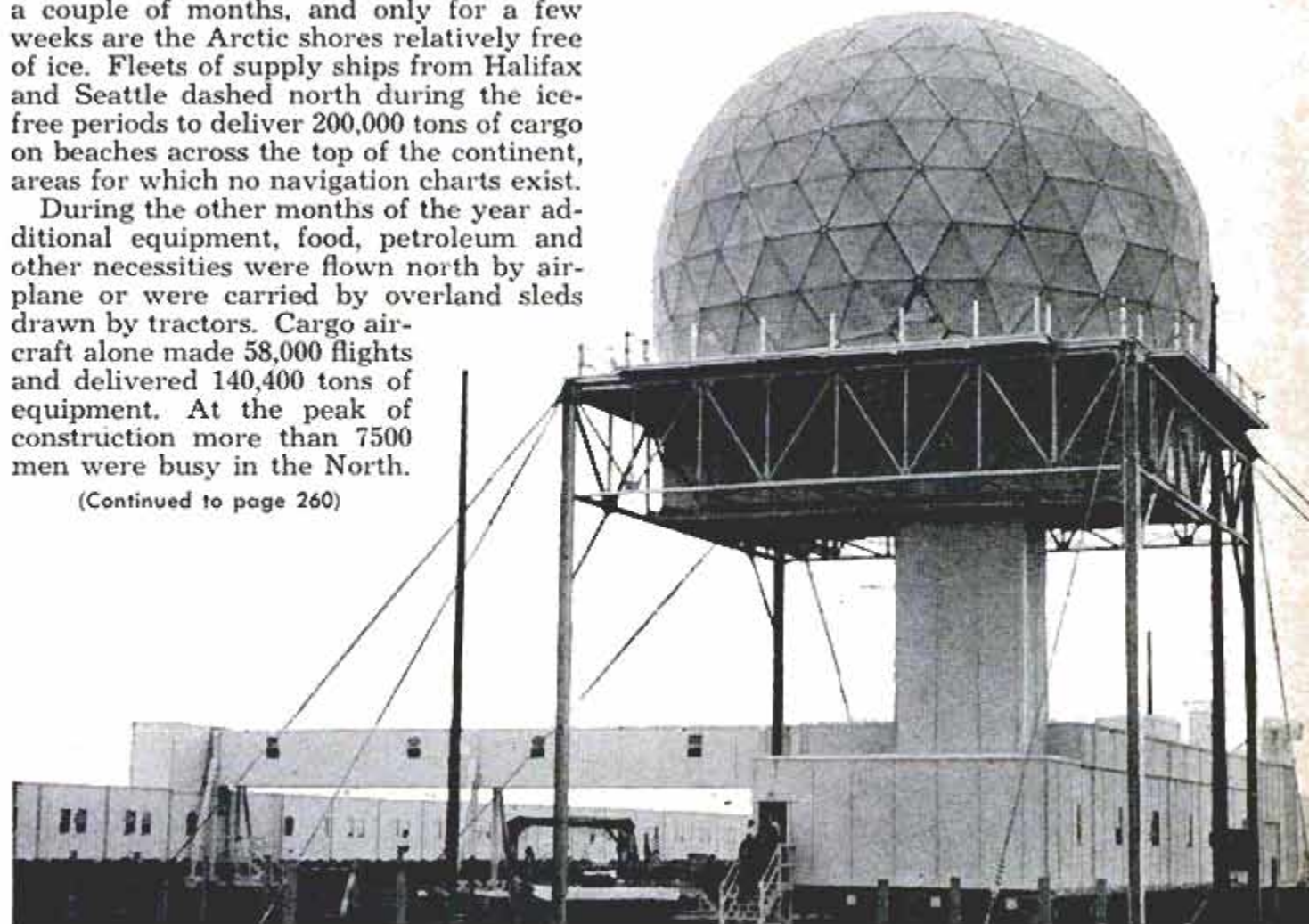
During the other months of the year additional equipment, food, petroleum and other necessities were flown north by airplane or were carried by overland sleds drawn by tractors. Cargo aircraft alone made 58,000 flights and delivered 140,400 tons of equipment. At the peak of construction more than 7500 men were busy in the North.

(Continued to page 260)

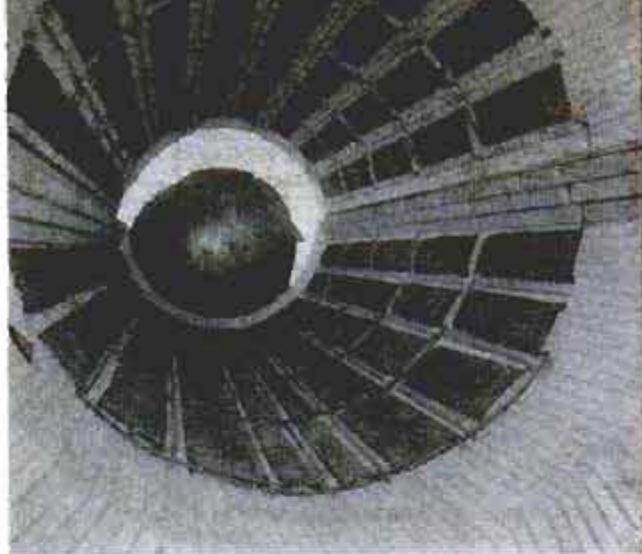
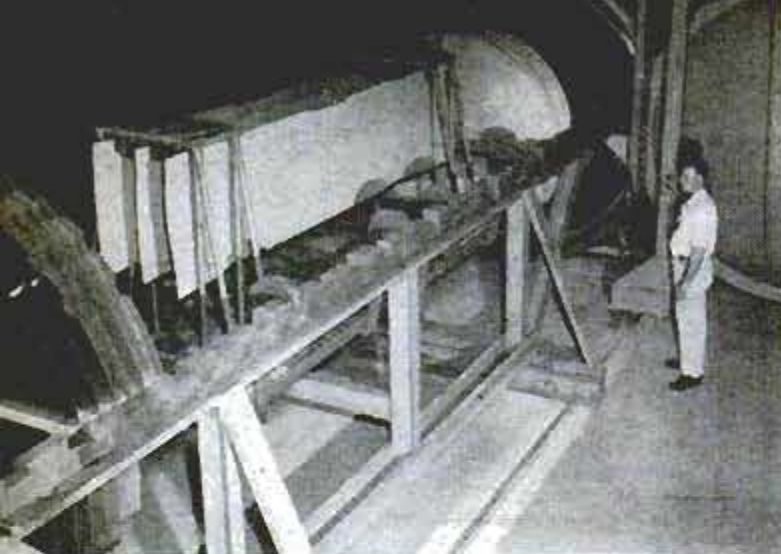


Another type of equipment used is a dish-like radio antenna that concentrates transmission beams. White Alice was built on a "crash" basis in two years

Typical DEW Line station, with plastic dome protecting search and radio equipment. Crews live in "train" of buildings with most of the comforts of home







Titanium parts for supersonic guided missiles are rolled on rails, left, into giant electric furnace at right

## Giant Heat-Treating Furnace Bakes Guided-Missile Parts

Temperatures up to 2100 degrees F. are produced in a vacuum furnace built to process titanium parts for guided missiles. The 1400-cubic-foot furnace uses enough electric power to light a town of 1500 popula-

tion. The high temperature and vacuum remove hydrogen impurities which would cause titanium to become brittle and crack under stress. Previously, titanium sheets had to be cut down to fit smaller furnaces.

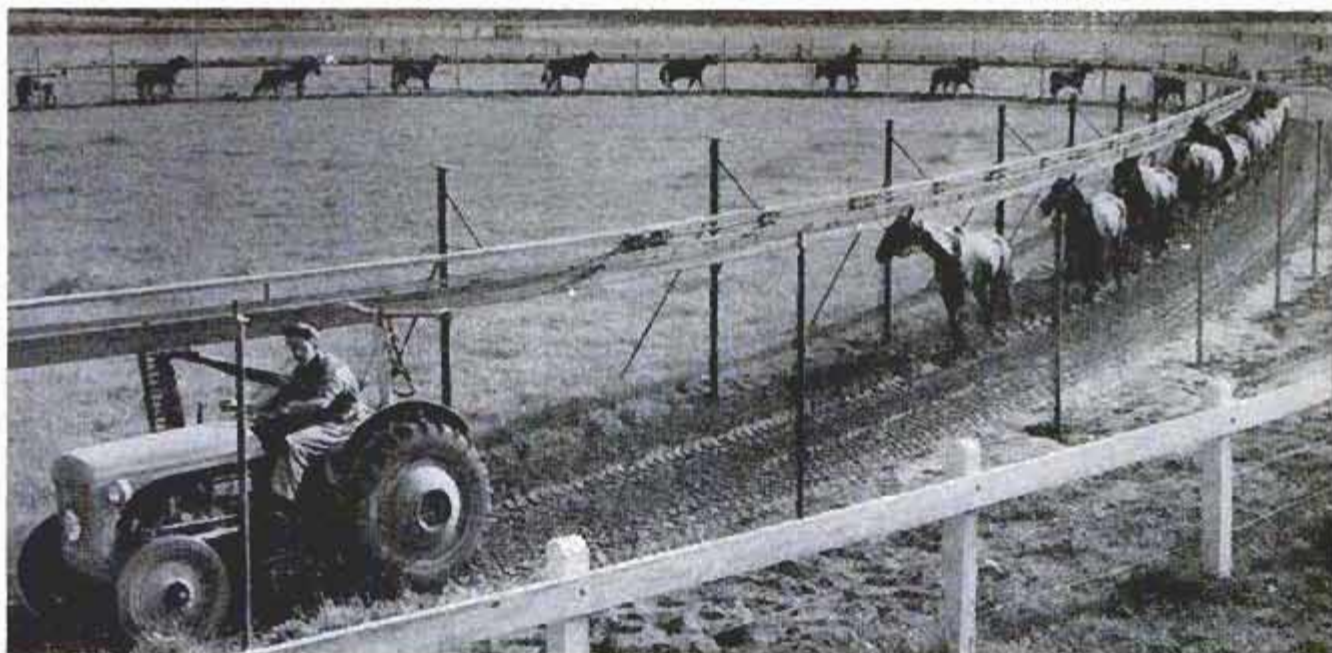


## Ramjets on Copter Blades Fight Frost in California

Simple ramjet motors mounted on the tips of helicopter rotor blades are being tested in California as "frost control" machines. When the helicopter hovers 35 to 40 feet over an orchard, lower left, heat produced by the motors has proved sufficient to raise the orchard temperature as much as four degrees. The experiments so far have been limited to 15 minutes apiece because the ramjet motors consume two gallons of gasoline per minute and the aircraft's tank holds only 30 gallons. The helicopters also are being tested for spraying or dusting crops. The photograph below shows the spectacular effect of the ramjets belching yellow flame when they are started. During normal operation, only a circle of blue light is produced by the whirling pods. The ramjet helicopter is started by engaging a small gasoline engine to the rotor drive shaft.







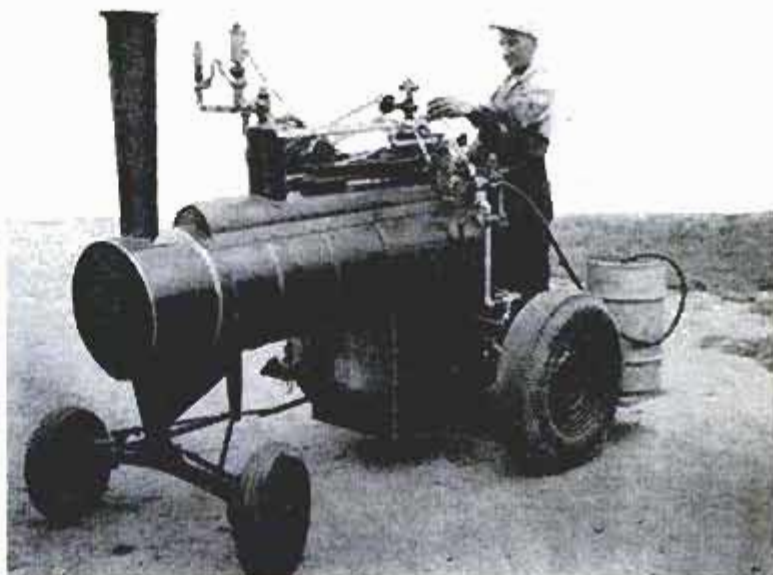
## One Man Trains 32 Horses With Exerciser

Training and exercising 70 horses every day without help was the problem solved by a riding master in the Netherlands. Facing a shortage of trainers, he built a hitch conveyor to help do the job. The

hitches are on wheels and move on double rails. The horses are tied to the hitches which are connected by rods and pulled by tractor. Up to 32 horses at a time can be exercised by one man.

## Steam Engine Built From Auto Parts

Joseph Mohr of Marathon, Wis., built a 2½-horsepower steam-engine locomobile from salvaged auto parts. With a boiler jacket made of oil drums, he can get up 120 pounds of steam in 20 minutes and travel 10 miles per hour. The fuel is wood, and extra water is carried on the rear platform. The driving cylinder on top of the boiler is connected to an automotive transmission by a chain drive and pinion gear. This permits the usual forward speeds and reverse to maneuver the vehicle.

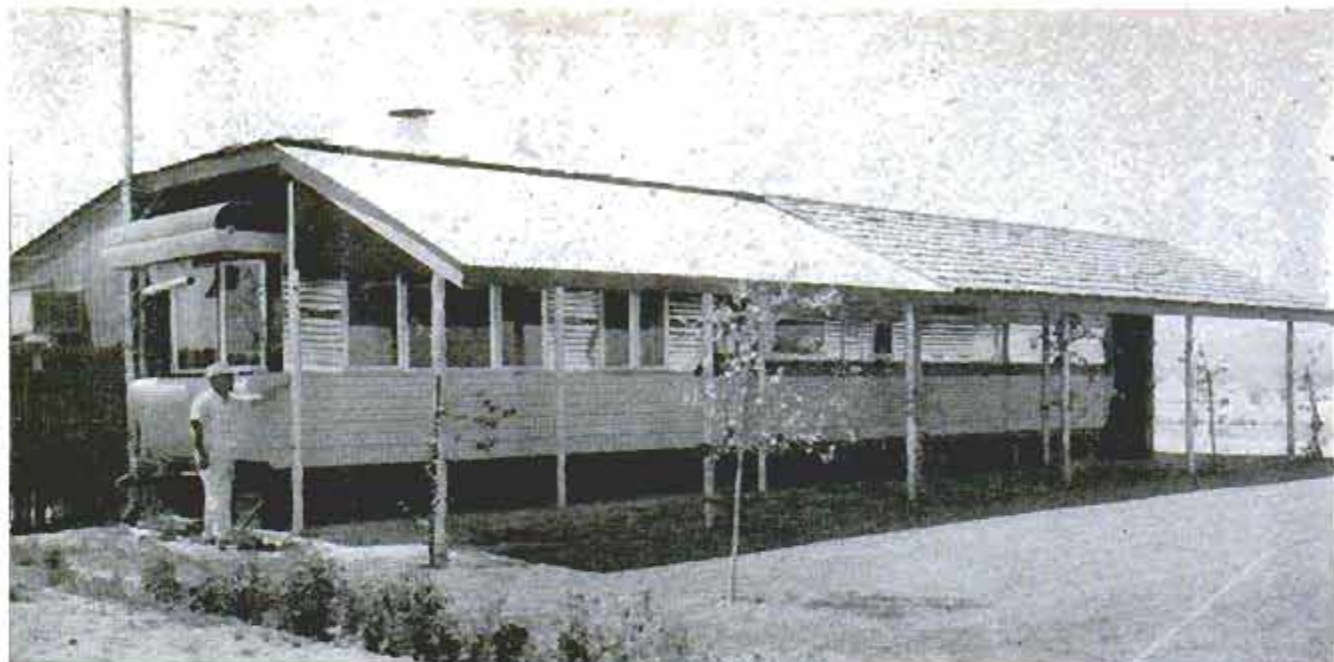


## Snooper TV Camera Probes Pipelines

German engineers have developed a small television camera to examine the inside of oil pipelines. Guiding wheels suspend the camera inside the pipe. Light from four bulbs enables the camera to "see" in a complete circle through a revolving mirror mounted at an angle in front of the lens. On the receiving end, special TV screens have been developed with sufficient clarity to see any defects on the inside walls.







The Mullens of Phoenix, Ariz., built their house around their big trailer with removable connecting doors

## CABANA HOME . . . *and one for the road*

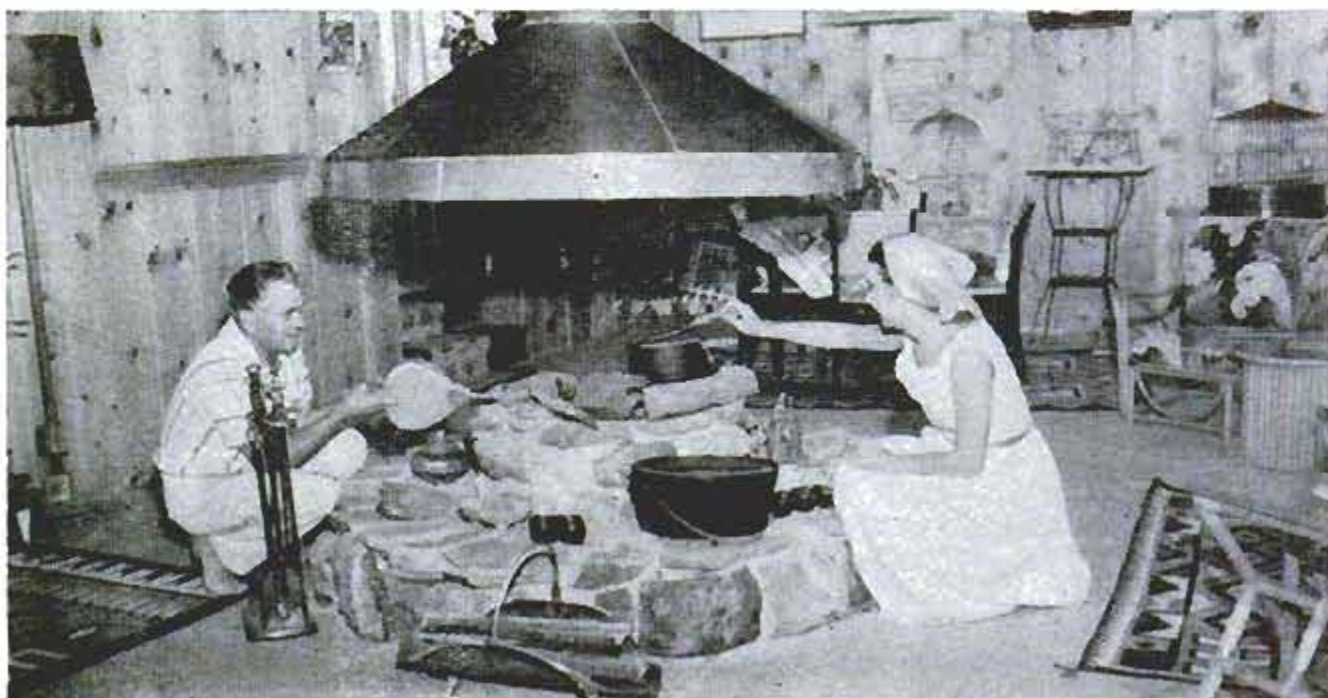
**Y**EAR-ROUND MOBILITY was the goal of the C. Thad Mullens of Phoenix, Ariz., when they planned their semimobile home which provides both mobility and a place where they can hang their hats between trips.

To achieve this dual purpose, the Mullens bought a trailer and a three-quarter-acre site about 15 miles out of Phoenix. Then Mullen built a cabana

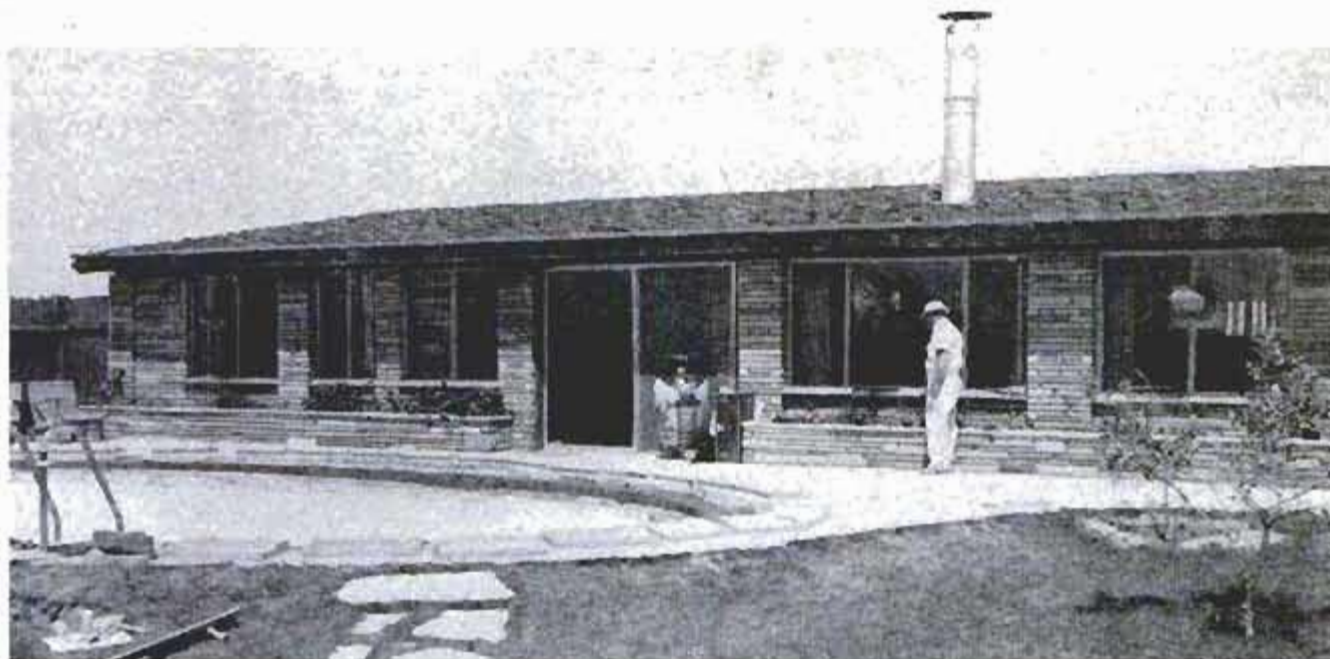
around the trailer for a permanent home. By simply removing 16 screws from the inside doors and removing the wall on one side, Mullen can haul his trailer out and be on his way.

Unlike most trailerites, Mullen demanded a cabana with such adjoining luxuries as a large back yard and a floodlighted pool. The cabana has connecting doors to the trailer which give the feeling of a

Immovable side of house boasts this hooded fireplace. Steps back of fireplace lead to trailer part of home







Front of the home looks almost conventional with stone siding and cedar-shake roof. Patio extends to pool

single unit. The 50-foot-long, 18-foot-wide home has sides of red-wood while the front wall is sandstone. Twelve steel columns support the slanting roof.

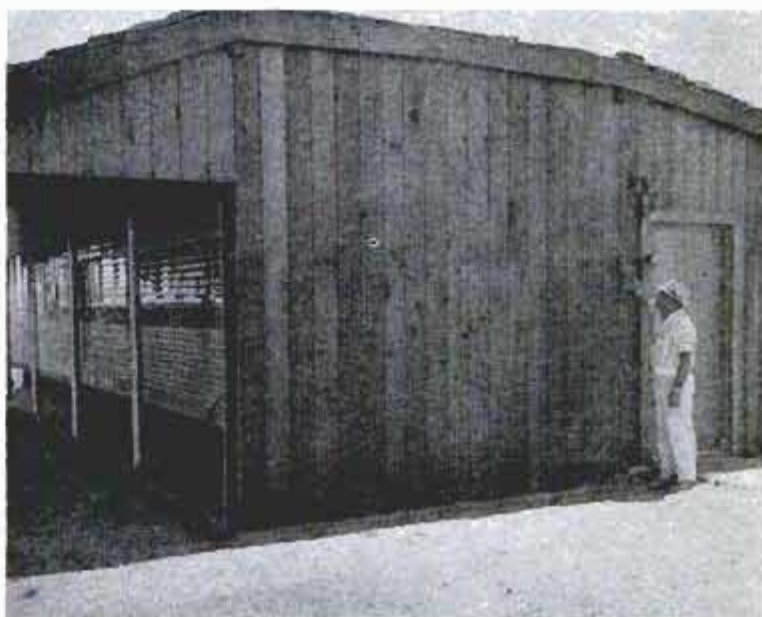
The trailer is separated from the cabana proper by about four inches. Connecting frames were inserted in this gap along with glass-fiber insulation.

The 36 by 18-foot living room has knotty-pine walls and built-in storage cabinets with sliding doors. The den, or office, is 14 by 14 feet and is also finished in knotty pine.

The Mullens take great pride in their hooded fireplace located in the center of the living room. Made of native Arizona rock, the fireplace has a five-foot base and a firebox that is 2½ feet in diameter. It is 36 inches from the base to the copper hood. The smokestack is 18 inches in diameter. Mullen has placed concrete in the base of the galvanized-iron baffle, which he claims keeps the baffle cooler.

He estimates the cost of the cabana at about \$10,000. To keep the place comfortably cool, he uses a two-ton refrigeration unit in each of the two sections. With fewer refinements, Mullen thinks the home could be built for much less. The Mullens say their six-room home gives them the feeling of solid roots—yet retains the mobility of a trailer. ★ ★ ★

Above at right, Mullen points to the removable wall where tow car can be backed up. Right, steps lead up into trailer rooms

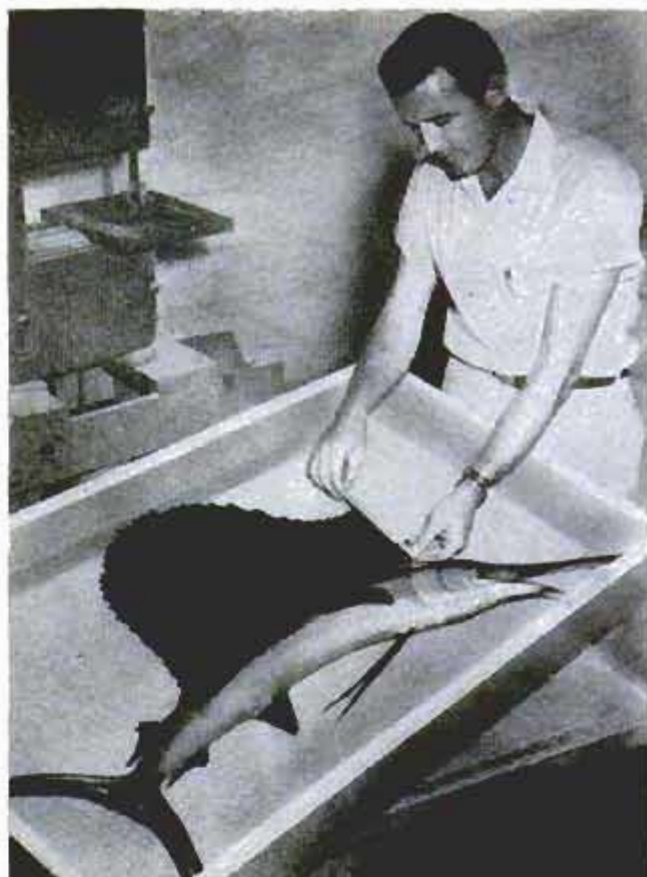






### Sling Totes Any Rifle

Hands and arms are free with a new sling that fits any make or model shoulder weapon. Not a permanent attachment to the gun, an adjustable strap holds it at the butt and at the muzzle with a protective cover. It can be quickly attached and removed from the gun.



### Plastic Sailfish Rivals Nature

Manufacturing lifelike small sailfish is a hobby-turned-business of Jim Williams of Miami, Fla. The four-foot reproductions are molded in a special plastic material to the exact specifications of a real fish, and each of the replicas is hand-painted in realistic colors.



### Pocket-Size Slide Rule Has Plastic-Coated Scales

Engineers and others using slide rules can carry a new six-inch model in their pocket. It has the graduations and five-place readability of a 66-inch instrument. Plastic-coated spiral scales are enclosed in a metal case and cannot lose their accuracy due to warping. The rule operates in three simple movements, and is used to solve all types of mathematical problems.





**YOU CAN'T BECOME** physically fit overnight, nor can you do it without hard physical effort. But if you have no serious physical defects, you can develop enough strength and stamina to sail through a normal day's work with buoyancy and alertness—and still have enough reserve energy to enjoy leisure and to meet unexpected emergencies. And that, by definition, is physical fitness.

But you won't accomplish much in a single burst of violent activity. Several businessmen in Oregon learned this the hard way a few months ago. A brisk, vigorous workout, they decided, would clear the cobwebs from their minds and the kinks from their joints. So one evening they gathered at a school gymnasium and plunged headlong into a rough-and-tumble basketball game.

For days afterward, these men hobbled through their work nursing stiff joints, sore muscles, backaches and body bruises. Never before had the business world in Oregon harbored such a grim collection of "cripples!"

And no wonder! Too many sedentary adults approach exercise with the same kind of reckless abandon—and with the same unfortunate results. These men had been inactive for years. They simply were not in condition for the rugged



Jumping jack is typical calisthenic necessary in slowly increasing exercise level

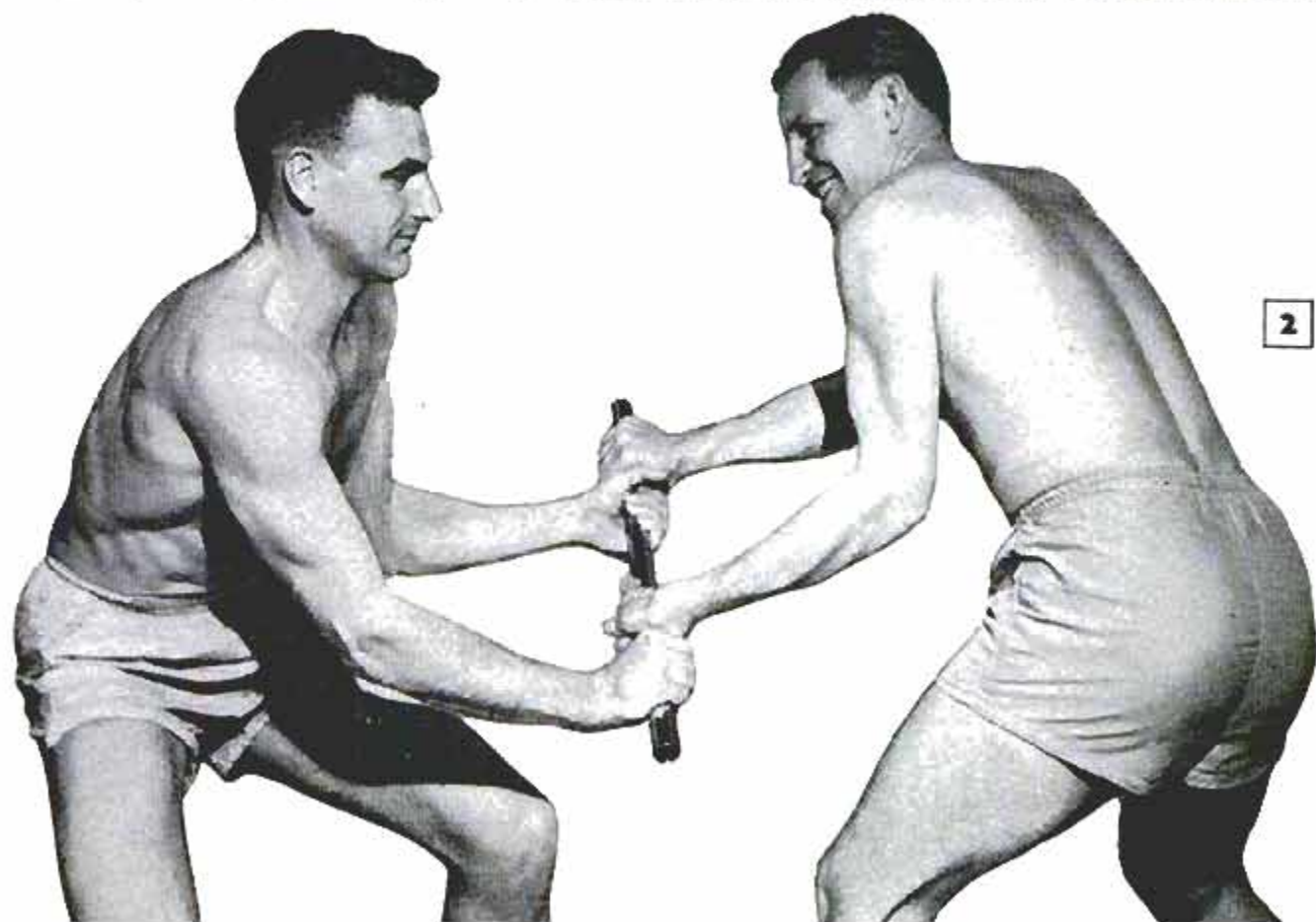
# How to Build Physical Fitness

By *Dr. H. Harrison Clarke*

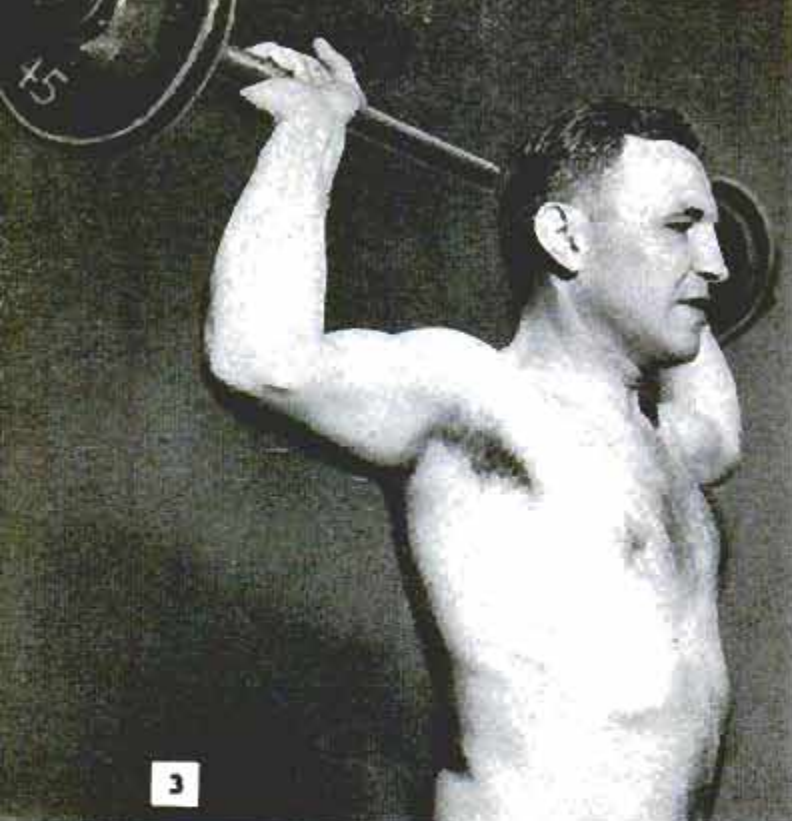
RESEARCH PROFESSOR, SCHOOL OF HEALTH AND PHYSICAL EDUCATION, UNIVERSITY OF OREGON

As told to *Ken Metzler*

Twist stick, wrestling stick from opponent, and other competitive games require top physical conditioning







Overhead press involves raising bar bell from back of shoulders to full extent of arms. Exercises must be strenuous, although within limits of strength

physical exertion of basketball. Had they systematically developed an adequate level of physical fitness first, they never would have suffered the painful aftermath. And they probably would still be playing basketball and other games, instead of dismissing exercise as something just for youngsters.

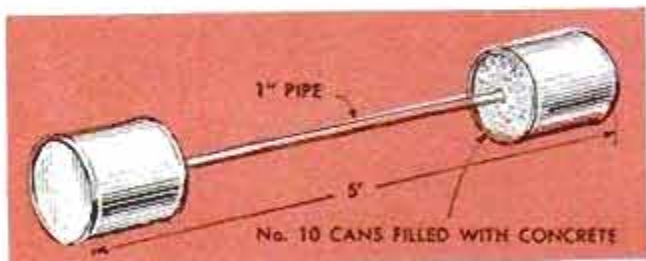
They would have felt and looked better, too. Physical fitness is closely related to



Modified chinup with doorway bar. When 20 of these can be accomplished without undue exertion, bar should be moved up to arm's length for full chinups



Forearm curl calls for standing with feet apart, holding weight straight out and raising it to chest by forearm action, without moving upper arms or body

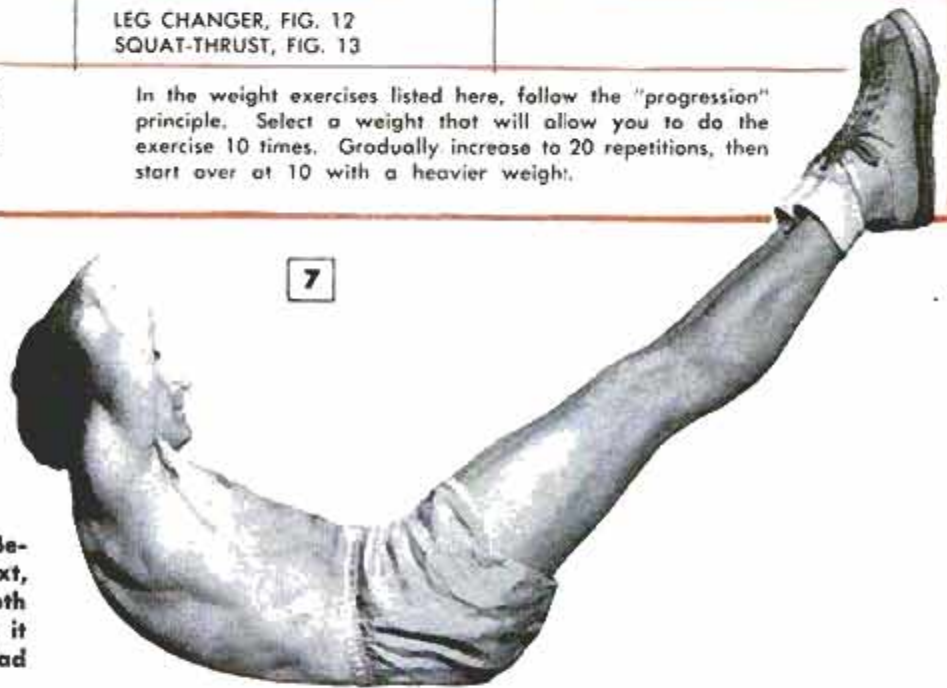


Above, bar bells are easy, inexpensive to make. Size of cans, amount of cement determine weight. Left, in side bends, place bar bell over shoulders, bend from side to side, keeping knees rigid, feet flat



## EXERCISE CHART

BODY AREA	CALISTHENICS	WEIGHT EXERCISES
Warmup	"JUMPING JACK," FIG. 1	
Arm and Shoulder EXTENSION FLEXION	PUSHUPS CHINUPS, FIG. 4	OVERHEAD PRESS, FIG. 3 CURLS, FIG. 5
Trunk LATERAL ABDOMINAL  BACK  FLEXIBILITY	SIDE BENDS SITUPS LEG LIFTS, FIG. 7 "SWAN," FIG. 8 "BOWSTRING," FIG. 9 FORWARD BENDS TRUNK STRETCHER, FIG. 10	SIDE BENDS WITH WEIGHTS, FIG. 6 SITUPS WITH WEIGHT ON CHEST  FORWARD BENDS WITH WEIGHTS
Legs	DEEP KNEE BENDS	KNEE BENDS WITH WEIGHTS, FIG. 11
Agility	LEG CHANGER, FIG. 12 SQUAT-THRUST, FIG. 13	
<b>COMBATIVE EXERCISES</b> HAND WRESTLE, FIG. 14 PULL ACROSS LINE, FIG. 15 "TWIST STICK," FIG. 2 "ROOSTER FIGHT," FIG. 16		In the weight exercises listed here, follow the "progression" principle. Select a weight that will allow you to do the exercise 10 times. Gradually increase to 20 repetitions, then start over at 10 with a heavier weight.



Leg lifts should be gradual. Begin by raising legs only. Next, with arms extended, raise both legs and shoulders. Then try it with hands clasped behind head

general health and well-being. Many studies have shown that fitness, mental ability and social adjustment go hand-in-hand. Before you can work effectively with people, you must be physically fit.

Vigorous and sustained physical activity tones up flabby muscles and enhances strength, poise, coordination and vitality. In building physical fitness, however, you must adhere to three basic principles.

First is "exercise tolerance." Your physical activity must be well within the limits of your strength and endurance. It is unnecessary—and undesirable—to strain to your uppermost limit to build fitness. Keep your activity at a reasonable—though strenuous—pace.

Second is the "overload" concept. This term means simply that the muscles should be worked harder than they usually perform in a normal day's activities—but always within the tolerance limits.

The final principle is "progression." You

must not only maintain a regular schedule of exercise, but you must progressively increase its severity to keep up with your growing strength and endurance.

The situp exercise is a good illustration of the progression principle. (In situps you lie on your back, raise your trunk off the floor and as far forward as possible.) With your arms extended in front of you, do 10 situps a day for three days. Increase them to 11 for several days, then gradually to 20. Then start again at 10, but with your hands clasped behind your neck to make the exercise more difficult. Finally, try holding a 10-pound weight on your chest or doing situps from an inclined board (head lower than feet).

Three further concepts should govern any program for physical-fitness development. First, determine through an appropriate test whether you measure up to a reasonably adequate standard of physical development. Second, if you are not up to

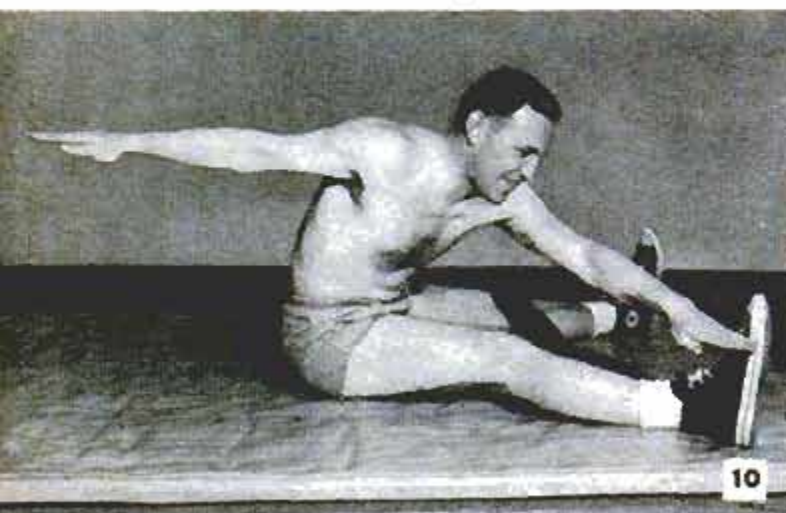




Swan exercise with hands behind back; force them up and back, raise legs and chest. Force elbows in



Bowstring should be slowly increased to 20 times. Grasp feet, pull with arms, raise chest off floor



Trunk stretcher is effective all-around exercise. Secret is to stretch hand to and beyond opposite foot



Do knee bends with weight after first practicing without it. Stand and squat until upper legs are parallel to floor

par, find out why. And then start to work on corrective measures.

If you are considerably below par, you may know it already, for the symptoms are readily apparent. You come home from work day after day too fatigued for anything but the easy chair. Perhaps your back aches. You're breathless after climbing a couple of flights of stairs. You have trouble getting things done and chances are you have "fatigue posture"—protruding abdomen, slumped shoulders and a sway (hollow) back.

Just how fit should you be? The Navy, in its "Standard Physical Fitness Test," figures that the average sailor should be able to do a squat-thrust, Fig. 13, 28 times in 60 seconds. He should also do 36 situps (hands behind neck), 27 pushups and 9 chinups. You're doing fair if you can do 20 squat-thrusts in a minute, 24 situps, 15 pushups and five chinups. (To avoid sore muscles, it's wise to practice these exercises a few weeks before going all-out in this test.) Older men should also aim for these goals.

The causes of poor fitness vary widely with each person. Often it is a combination of factors with, as you might suspect, lack of exercise at the top of the list. Other causes may be poor nutrition, illnesses, overweight tendencies, emotional disturbances and faulty health habits, such as not getting enough sleep.

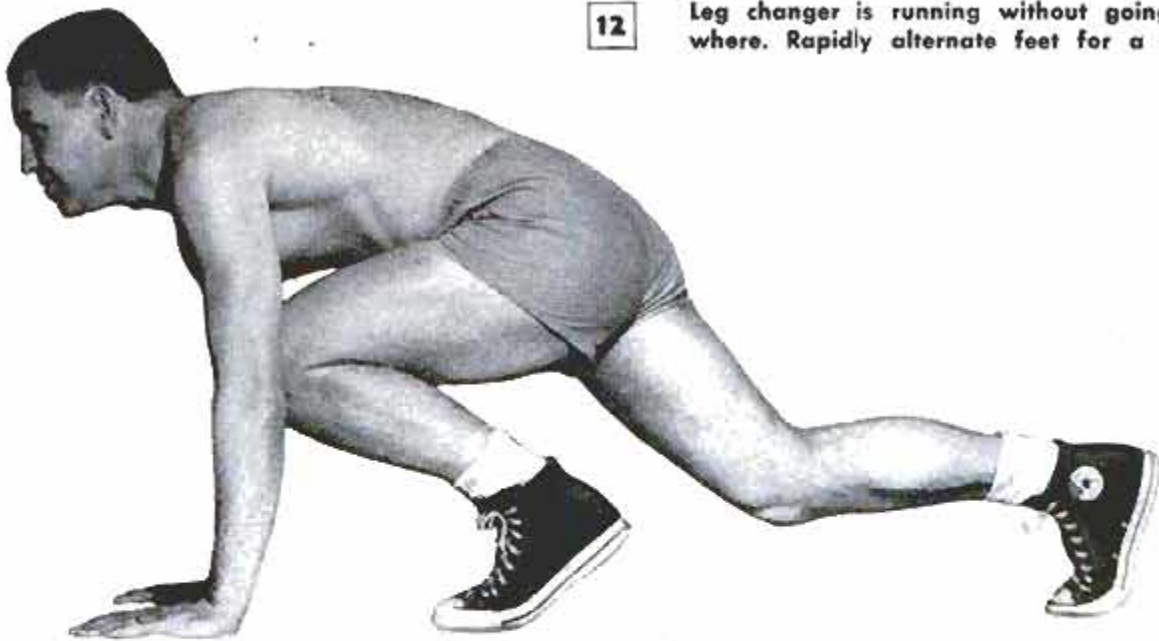
Before delving into a program of fitness development, it's a good idea to see your physician. He can identify and treat any defects or organic disturbances that may be draining away your strength. In a few cases, he may advise only moderate exercise until certain conditions are cleared up. A person with a heart ailment should, of course, follow his doctor's advice.

Individuals also differ greatly in their need for specific types of physical activity. For this reason, physical educators who work with substrength individuals like to prescribe exercise much the same as a physician prescribes treatment. Some people, for instance, should devote more effort



12

Leg changer is running without going anywhere. Rapidly alternate feet for a minute



to develop their arm and shoulder muscles. College and military-fitness tests have shown an appalling lack of strength in these muscles.

Thus no single set of exercises is appropriate for everyone. But those listed in the accompanying chart are basic and designed to cover the major muscle groups and to provide for agility and flexibility.

Some would argue with the need for flexibility. But in a study of 5000 cases of low back pain, Dr. Hans Kraus, a New York physician, found a strong relationship between their pains and the ability to pass six simple strength and flexibility tests. Most failures were in the flexibility test (bending over, knees rigid, and touching the floor). When these people developed

themselves enough to pass the tests, their backaches usually disappeared.

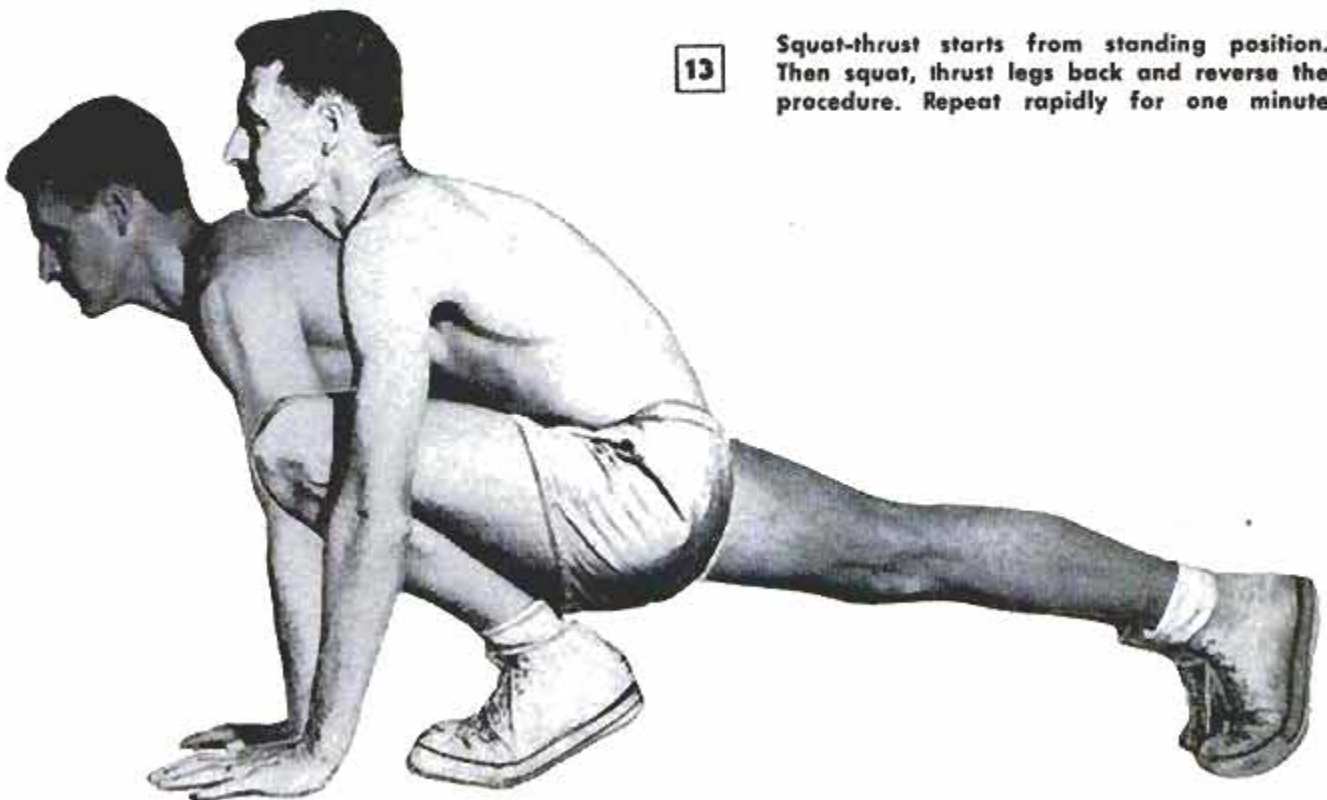
In choosing exercises to fit your own needs, select those which offer the greatest resistance to the muscles, but are within your tolerance limits. Resistance can be applied by parts of the body (calisthenics), by inanimate objects (weight lifting) and by other individuals (combatives). At first, it is best to stick to calisthenics and weight lifting. Combatives are fun and beneficial, but the competitive element may lead you to overstrain if not in good condition.

You can expect slight muscle soreness after your first exercises, but it will disappear quickly after the muscles develop to handle the new stresses placed on them.

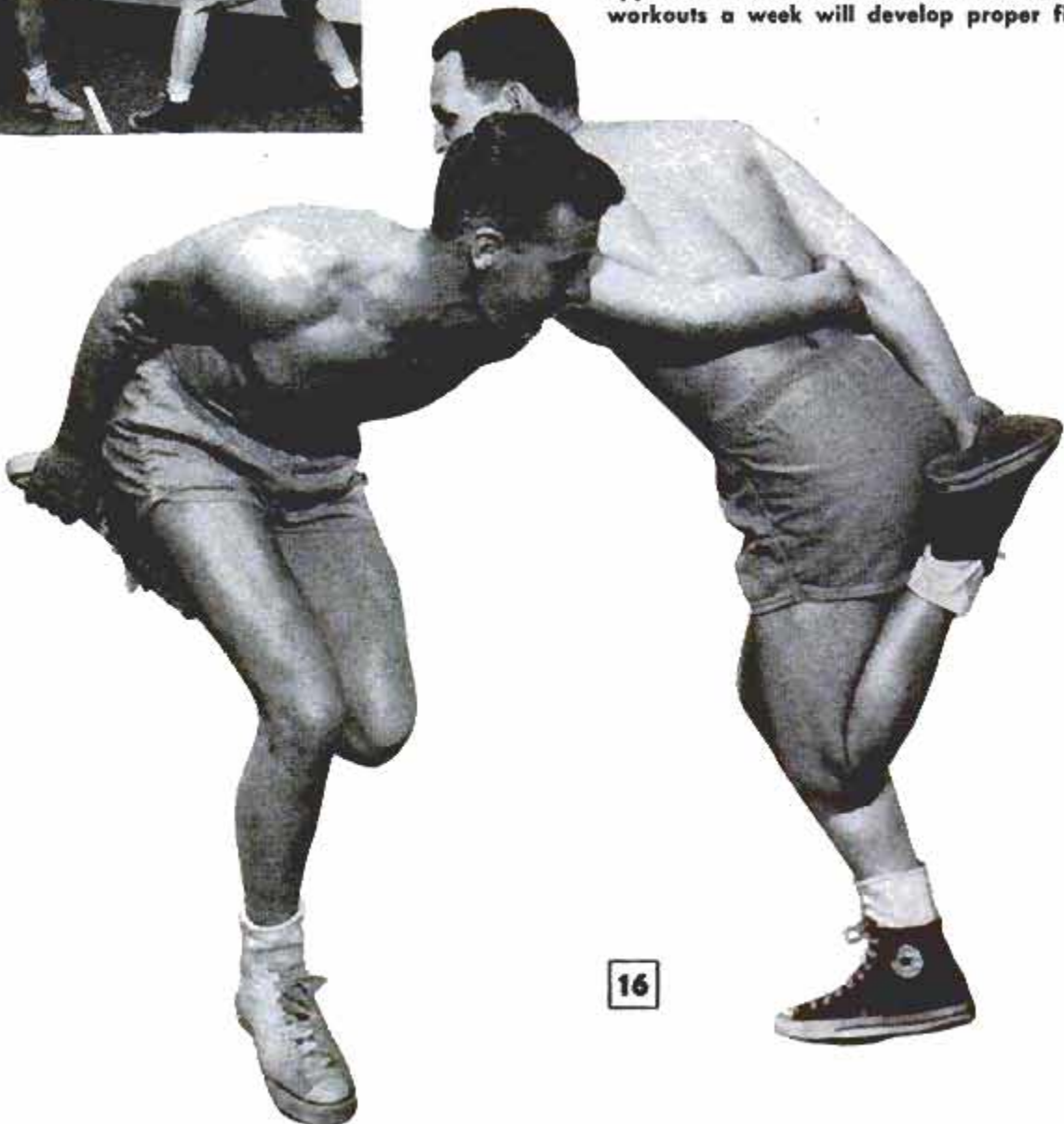
A regular exercise schedule of three

13

Squat-thrust starts from standing position. Then squat, thrust legs back and reverse the procedure. Repeat rapidly for one minute







half-hour periods a week is sufficient to develop good physical condition, so long as you stay with it and progressively increase the load. Even after you have developed a good level of fitness, you must maintain an exercise schedule.

These exercises build up muscle fibers, develop previously unused fibers, enlarge the muscles and open up better circulation to supply energy-producing oxygen.

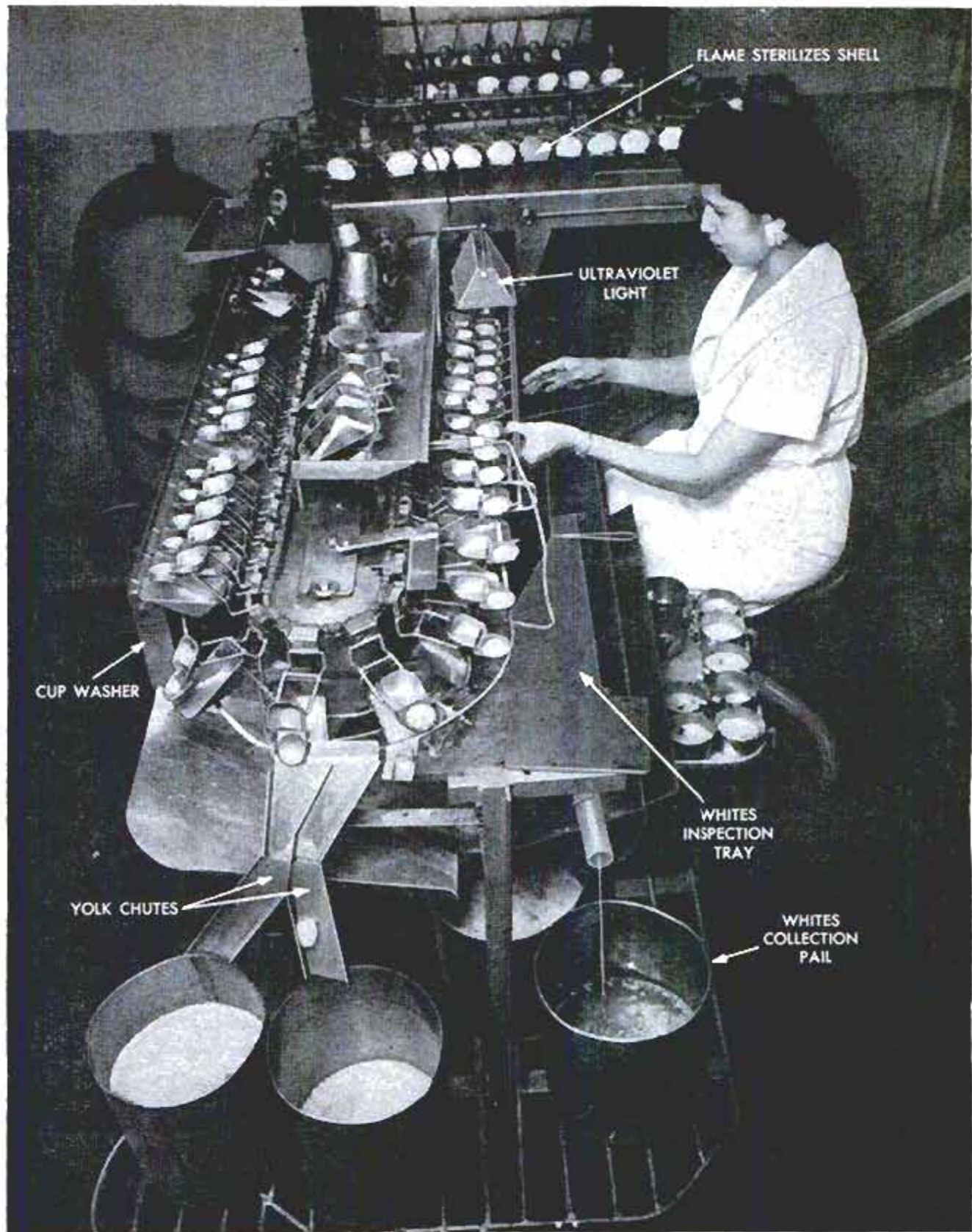
But in addition to muscular strength, you should work on "circulatory respiratory" endurance—the ability to keep going for long periods. The best exercises for this are recreational activities: Hiking, running, bicycling, swimming, skiing and others. Vigorous sports like tennis, soccer, basketball and handball are valuable—when you're in condition.

These exercises develop the heart and lungs much the same as calisthenics build up individual muscle groups. In sedentary adults, much of the lung capacity is never used. Exercise enlarges the lung capacity to feed more oxygen into the blood stream. It also increases the number of blood cells and their

(Continued to page 256)

Hand wrestling, Fig. 14, pull across line, Fig. 15, and rooster fight, Fig. 16, are combative exercises, with purpose of making opponent lose his balance. Three half-hour workouts a week will develop proper fitness



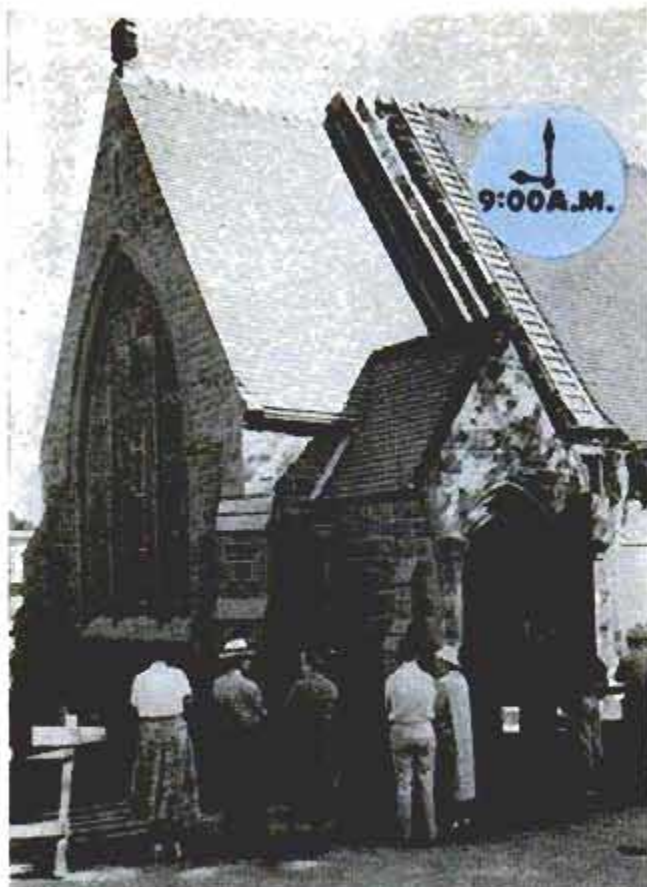


## Egg Assembly Line Separates Yolks From Whites

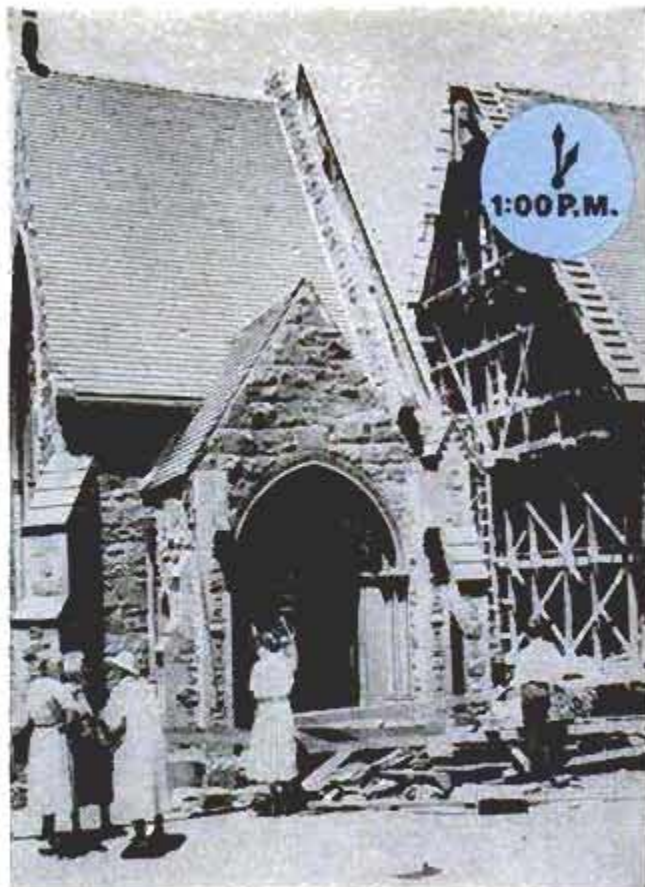
AMONG THINGS MACHINES CAN DO better than people are breaking eggs and separating the yolks from the whites. One machine also washes and sterilizes the shells before they are broken. The contents are dropped into separating cups and the empty shells are carried away on a conveyor. The cups carry the whites and yolks

under an ultraviolet light which makes certain bacteria appear fluorescent. The machine operator removes inedible eggs or broken yolks. Whites flow over a shallow inspection tray and into a collection pail. Yolks are separated electronically for light or dark color above a divided chute. Cups are washed before receiving another egg.





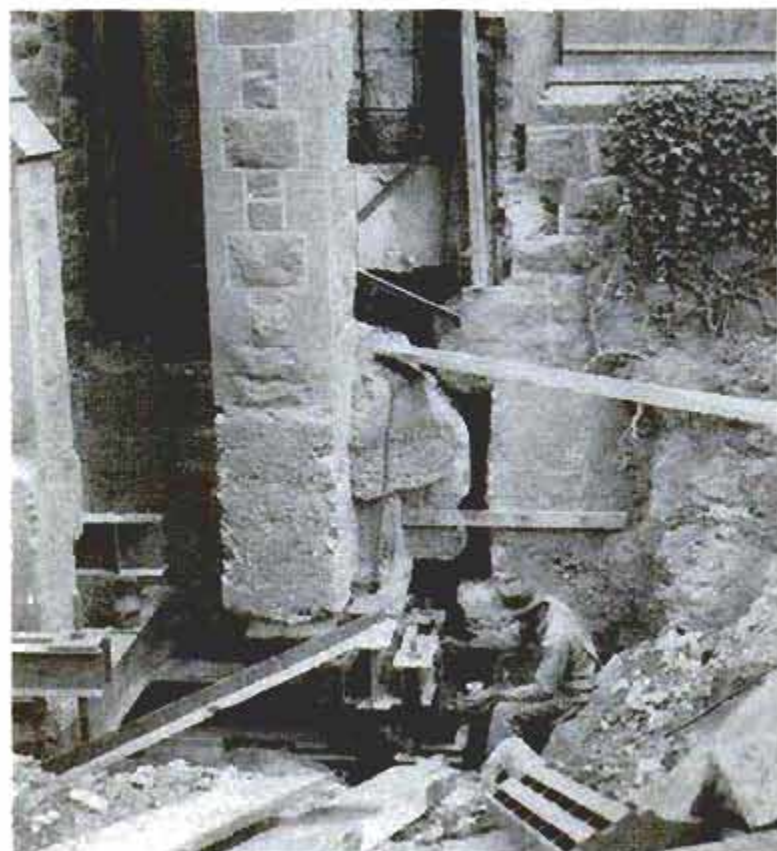
At 9 a.m., gap appears between main church structure and front section being pushed by hydraulic jacks



Four hours later, massive chunk of building has moved about 20 feet at rate of an inch per minute

## Four Hundred Tons of Church Go for Ride

Church section rides on I-beams as workman checks thrust of hydraulic jacks. Jacks had to be coordinated to push evenly



RATED AS ONE of the most difficult projects attempted by building movers, the 400-ton front section of the Episcopal Church of St. Matthew, in San Mateo, Calif., was rolled 30 feet without a hitch. Moving the four-story-high section of the 91-year-old church was particularly risky because it contained a stained-glass window valued at \$80,000. Purpose of the move was to add length to the structure so the seating capacity could be increased. It was estimated that moving the front section 30 feet from the main structure, and building the addition in the space between, would cost \$50,000 less than razing and rebuilding part of the church. The moving operation was so closely planned that a sinkage allowance of one inch was made to line up the floor which will be laid between the two sections. The front section was rolled on heavy I-beam tracks supported by cement-filled caissons sunk more than 25 feet in the earth.



# Radio TELEVISION Electronics

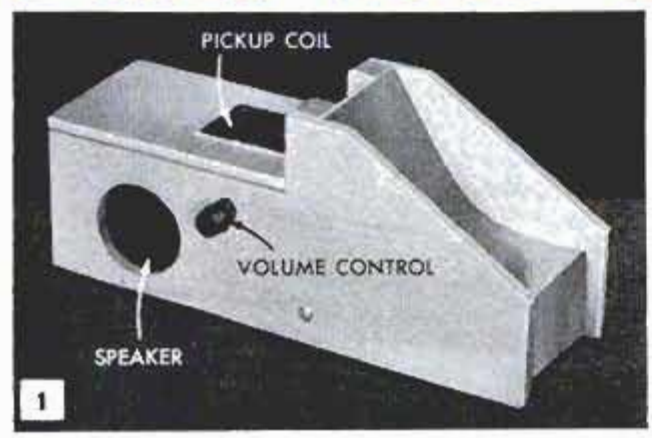
X 15 A



*For Family or Business Telephone Conferences—*

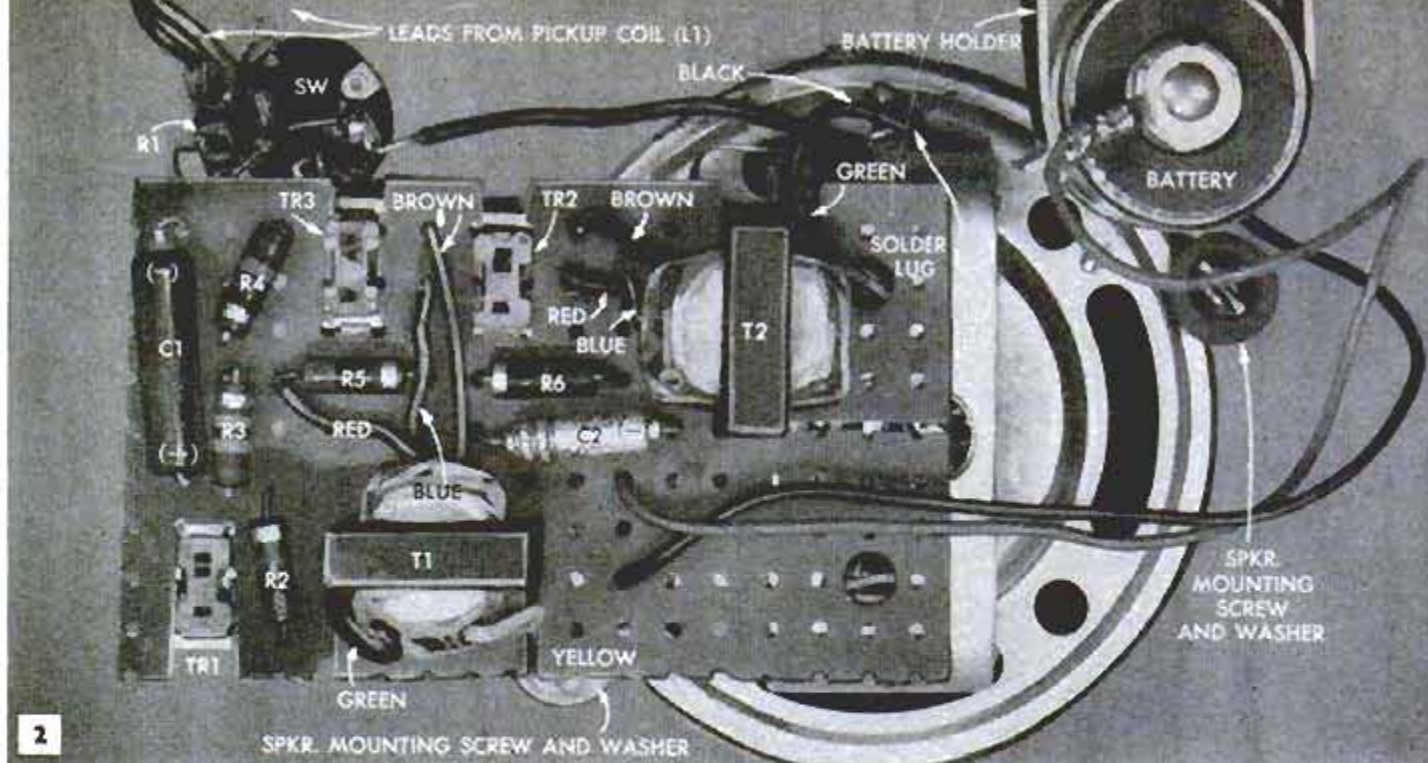
## Build Your Own TEL-AMP

*By Lou Dell*



THERE IS NO DOUBT that the "private listening" feature of the telephone serves a very useful and important function, but there are times when it is just a plain nuisance. When you call home from the office, for example, or perhaps from some out-of-town location, it would certainly be convenient to talk to the whole family at the same time rather than carry on a number of separate and repetitive conversations. Here's a telephone accessory





you can build yourself which will permit you to do just that. It won't get you in trouble with the phone company, either, because it requires no electrical connection to the telephone. When the phone rings, merely lift the receiver off the hook, place it on the Tel-Amp, and with the flick of a switch the caller on the other end of the line is "brought into the room" to participate in any group conversation.

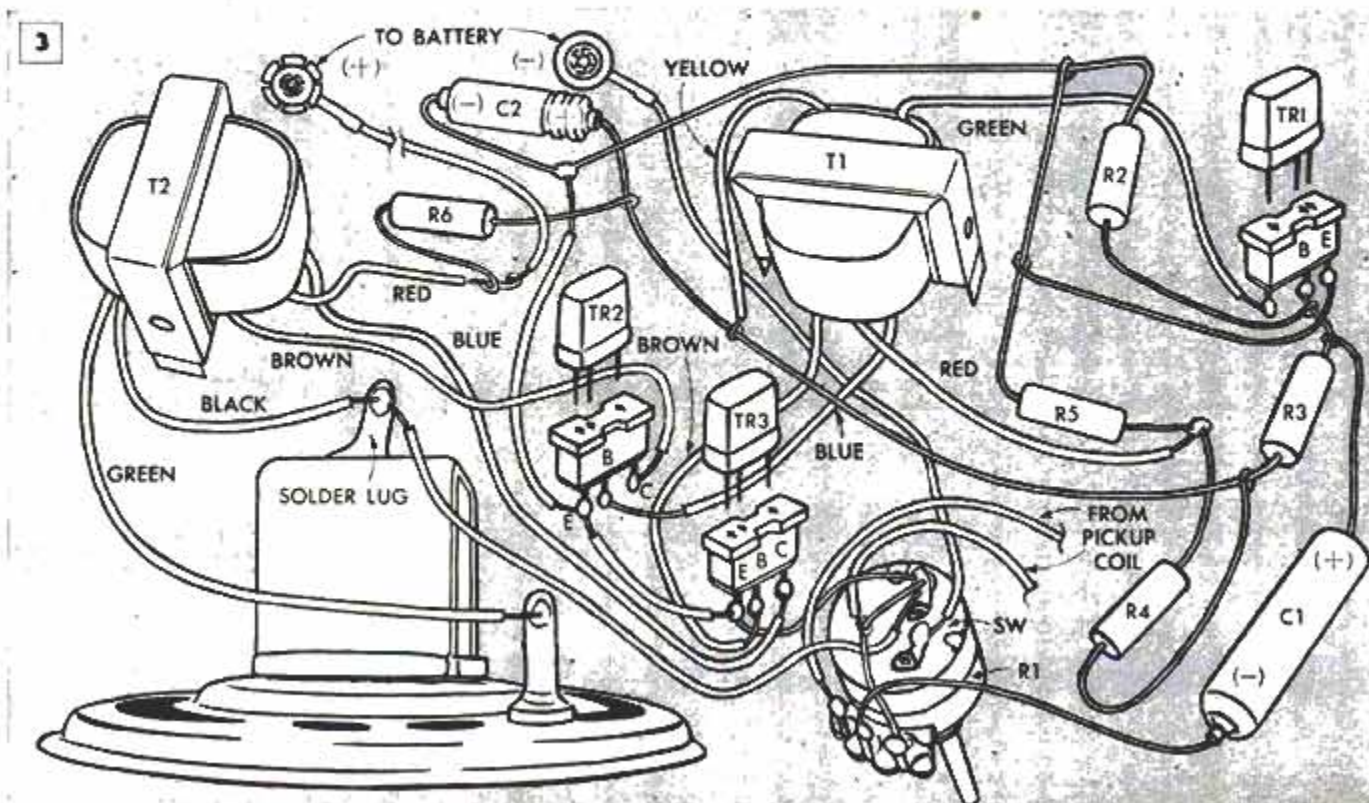
This, of course, is not the only convenience offered by the handy little Tel-Amp. When your arm gets tired, or your neck begins to ache from prolonged use of the conventional shoulder rest, you can just set the receiver on the Tel-Amp and carry on your conversation in the normal manner. At the same time, your hands are free

to take notes, or thumb through files, and you can even take a walk across the room with never an interruption.

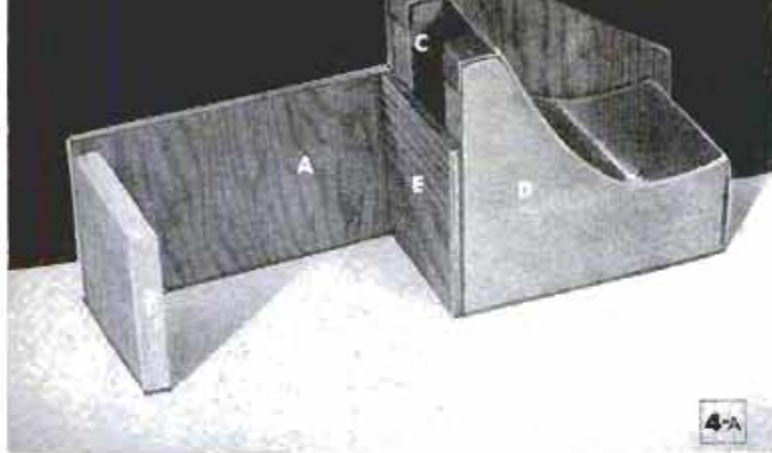
### How It Works

A photograph of the completed Tel-Amp is shown in Fig. 1. Principally, it consists of a magnetic pickup, a transistorized amplifier for increasing the volume of incoming speech to a loudspeaker level, and an aluminum reflector which gathers the energy from oncoming sound waves and directs it towards the microphone part of the telephone handset.

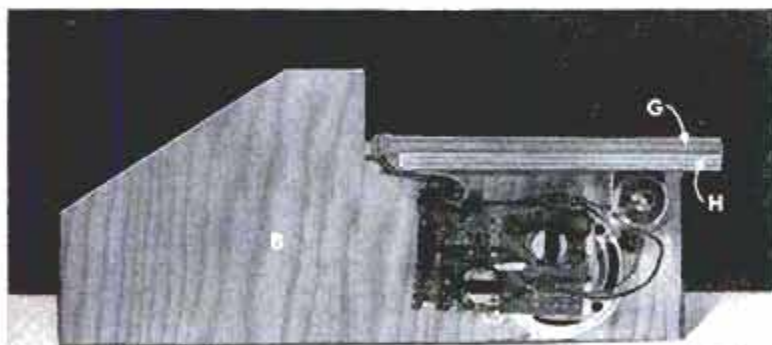
The amplifier is a rather simple affair (see schematic diagram in Fig. 7), consisting of three transistors and the necessary associated small parts. It draws very little







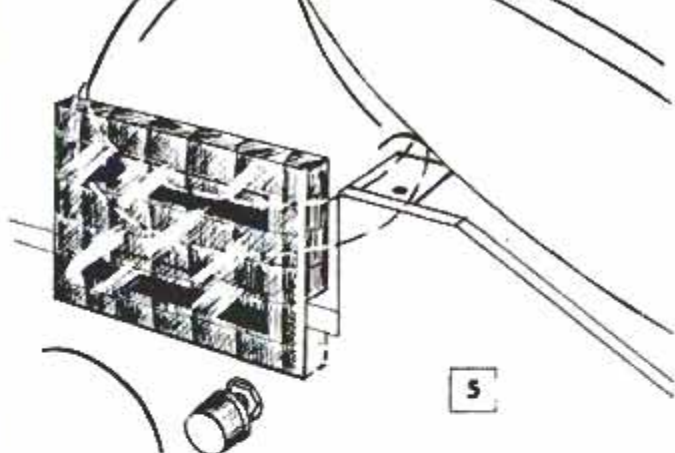
4-A



4-B

current and the single 9-volt battery, which furnishes all the operating power, will last almost as long as it would on the dealer's shelf, providing that you remember to turn the unit off after a call has been completed.

In use, the receiving portion of the telephone handset is placed on or near the magnetic pickup coil, L1. When the person on the other end of the line speaks, an electric current flows through a set of coils located in the earpiece. This current sets up an alternating magnetic field around the coils which varies in strength and frequency in exact accordance with the cur-



5

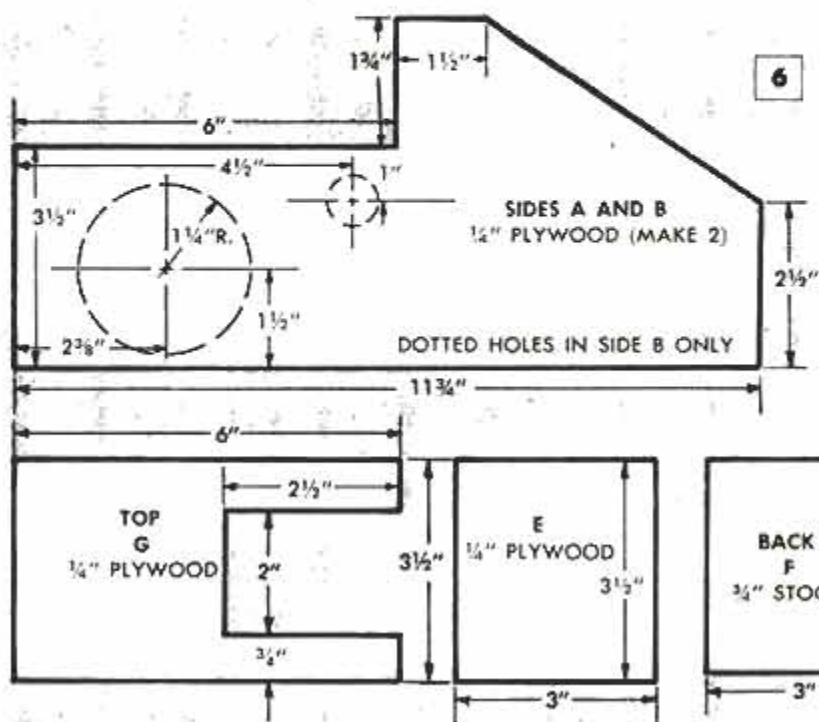
rent. This varying magnetic field induces a voltage in the pickup coil which corresponds to the original signal current.

In the amplifier, the feeble voltages induced in the pickup are amplified by transistor TR1 and transformer-coupled to the push-pull-connected output transistors TR2 and TR3. These provide sufficient power to drive the loudspeaker to ordinary room-volume levels. All parts used in the amplifier are standard and readily available from most radio-parts distributors.

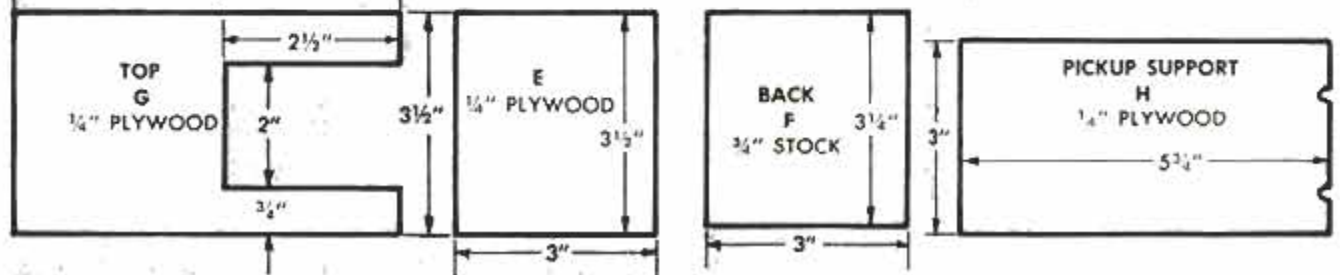
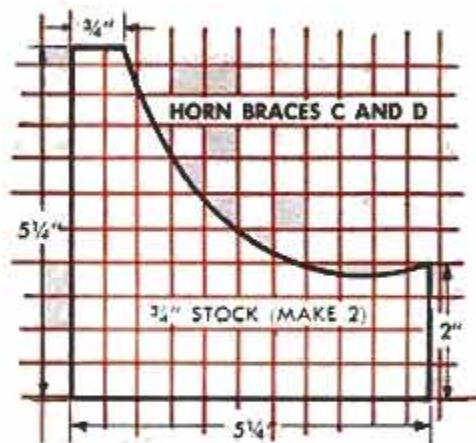
### Construction

The magnetic pickup is made from a salvaged output transformer. Satisfactory performance could probably be obtained with one of the commercially available telephone pickups, but it is far more satisfying, and less expensive, to wind your own. Any old radio transformer, or any inexpensive replacement-type unit will do the job.

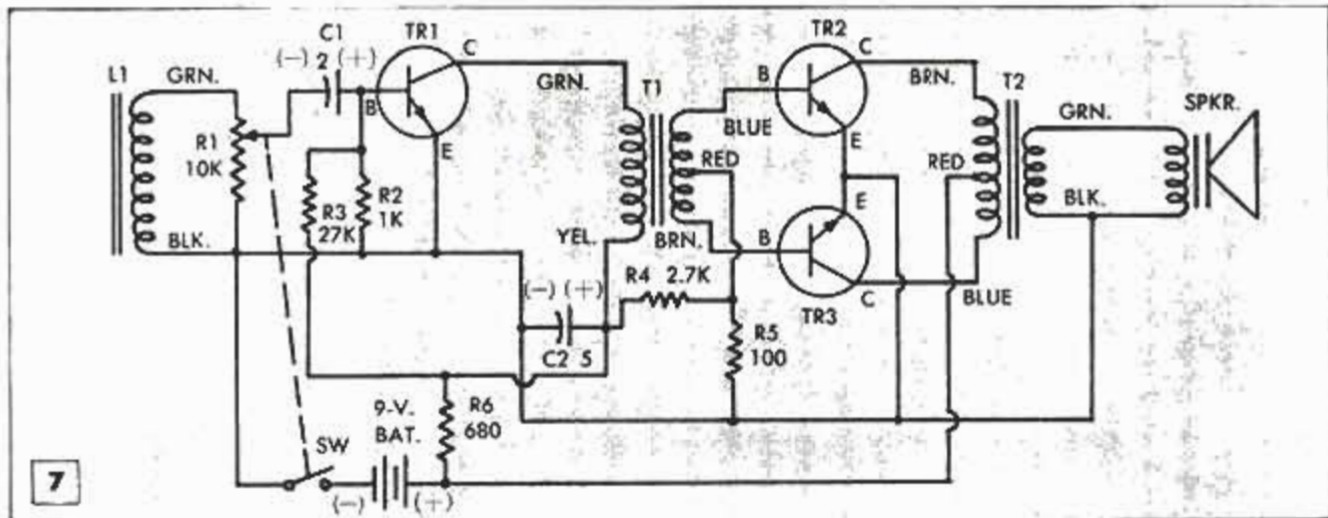
The three parts of the transformer—the E-shaped laminated core, the coil bobbin and the frame—are disassembled as shown in Fig. 8-A, and the core is split into two equally thick portions. (The thin laminations are held together only with wax, and can easily be split with a pocketknife or



6







similar instrument.) Then the two portions of the core are butted together end-to-end, Fig. 8-B, and tightly wrapped with several layers of cellulose tape. The tape must cover all edges in order to insulate the coil, which will be wound around the circumference, from the core.

Now comes the most tedious, though not necessarily difficult, part of the job—winding the coil. Tear the outer paper cover from the transformer bobbin and remove and discard the primary transformer winding which is made of relatively heavy wire. This exposes the fine-wire secondary which is used for winding the pickup. The hookup wire soldered to the ends of the fine-wire leads should be torn off to simplify coil winding, even though these will have to be resoldered later.

Tape two or three inches of the fine wire to the flat side of the core and wind the remainder of the wire around the core circumference as shown in Fig. 8-C. This is not as difficult as it looks because the wire is wax-impregnated and will stay in place pretty well. If some strands do tend to slide off the edge, they can be secured with a little cellulose tape.

After all the wire from the bobbin has been transferred to the core (you may be surprised at the large amount) wrap the entire coil tightly with cellulose tape to

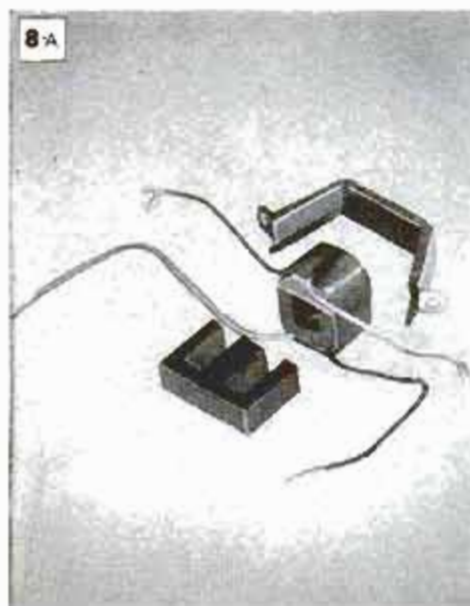
#### LIST OF MATERIALS

TR1, TR2, TR3=Sylvania 2N35, NPN transistors.  
 R1=10,000-ohm potentiometer, audio taper, with s.p.s.t. on-off switch.  
 R2=1000-ohm, ½-watt carbon resistor.  
 R3=27,000-ohm, ½-watt carbon resistor.  
 R4=2700-ohm, ½-watt carbon resistor.  
 R5=100-ohm, ½-watt carbon resistor.  
 R6=680-ohm, ½-watt carbon resistor.  
 C1=2-mfd. miniature electrolytic capacitor.  
 C2=5-mfd. miniature electrolytic capacitor.  
 T1=5000:7500 CT-ohm transistor driver transformer, Thordarson TR2 or equiv.  
 T2=825CT:3.4-ohm transistor output transformer, Thordarson TR29 or equiv.  
 L1=Magnetic pickup coil (see text).  
 Speaker=2¼-in. FM loudspeaker, RCA-type 222S1.  
 Battery=9-volt transistor battery with matching snap-on connectors.  
 Miscellaneous: Perforated Bakelite board (see text), battery holder, transistor sockets with mounting clips (3), knob for volume control, thin aluminum (see text), solder lug, assorted wood and machine screws and metal washers, hookup wire, rosin-core solder, material for cabinet (see Fig. 6).

prevent its eventual unraveling. Scrape the enamel insulation from the ends of the fine wire with steel wool and resolder the two hookup leads to the ends.

**Wiring the Amplifier.** If you've ever done any radio wiring, you'll have no trouble with this amplifier. A perforated Bakelite board, 3⅜ x 1⅞ x ⅛ inch, serves as a chassis for mounting the small parts. Fig. 2 shows the parts layout on top of the board. Note that the transformers and transistor

(Continued to page 258)





# BINDING TAPE

## *is Versatile*

By Walter E. Burton



**A**DHESIVE-COATED cloth tape is sold for use as a binding for the cut ends of carpets and rugs and for patching torn fabric, but there are numerous other uses for the material around the home and shop as illustrated in this article. Applied with a warm or hot iron, depending upon the product, the tape can be made to adhere quickly to various fabrics. Some types are coated with a special adhesive that will stick to metal, wooden and glass surfaces. Be sure to check the manufacturer's directions before purchasing tape, since not all products are suitable for all applications.

Cloth tape is sold in a variety of colors, making it useful for a number of decorative purposes, and for replacing letters and emblems missing from pennants and other items. Some types of cloth tape are excellent for making lightweight hinges and latches that must be attached to surfaces into which nails or screws could not be conveniently driven. Other applications may occur once you are aware of the ease with which the product can be handled and its durability when used to perform jobs normally reserved for metals, plastics and other materials of high-tensile strength.

Here is how most types of adhesive-coated cloth tape should be applied. First, make sure that the surfaces to which it is applied are free of dust and all emulsion-forming materials, such as grease and oils. The manufacturer's directions should be carefully followed, especially instructions concerning the temperature of the iron or other heated metal tool used to bond the adhesive properly. When specific instructions are lacking, tests can be made to determine the best temperature and other important factors or conditions necessary for proper bonding of the material.

When tape is bonded to new wood, as in making small cloth hinges and latches,

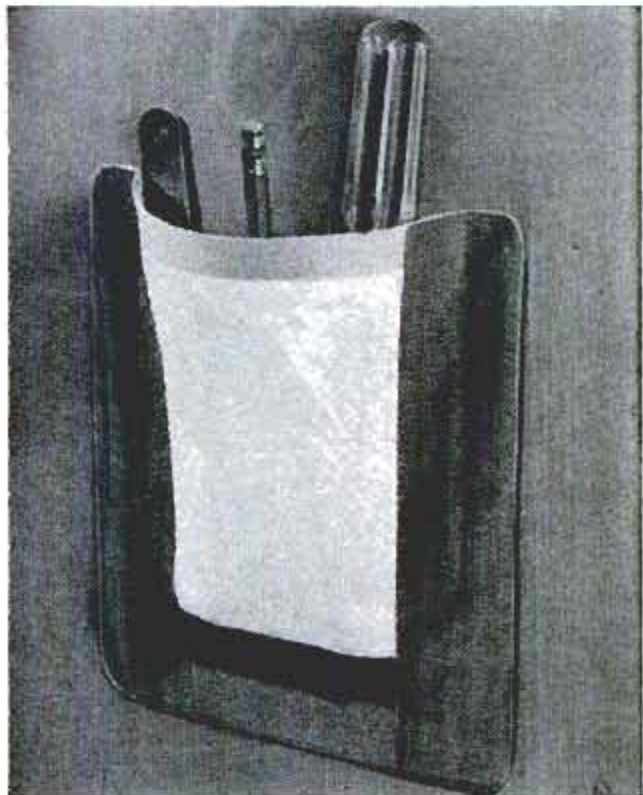
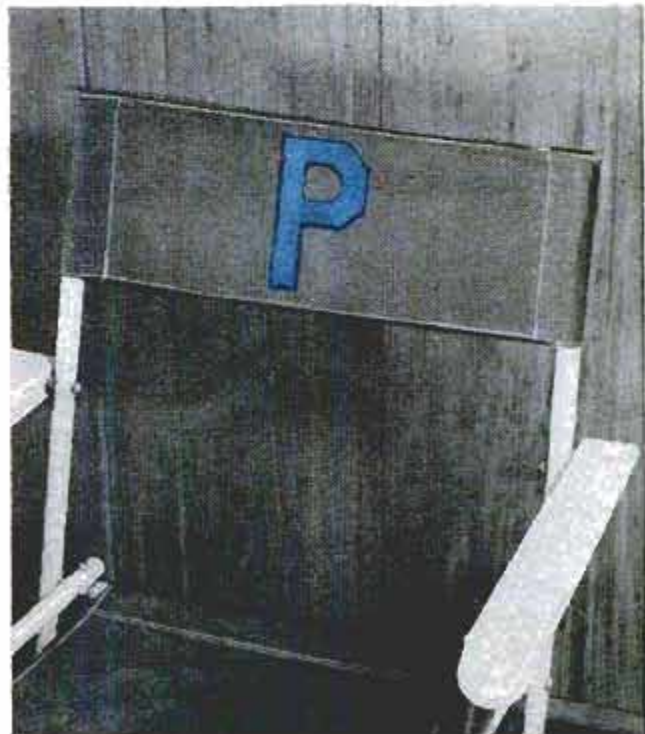


Fig. 1, handy cloth pocket is ironed on inside of tent wall with 1½-in.-wide tape at bottom and sides. Fig. 2 below, decorative monogram applied on canvas back of deck chair is made of colored tape strips





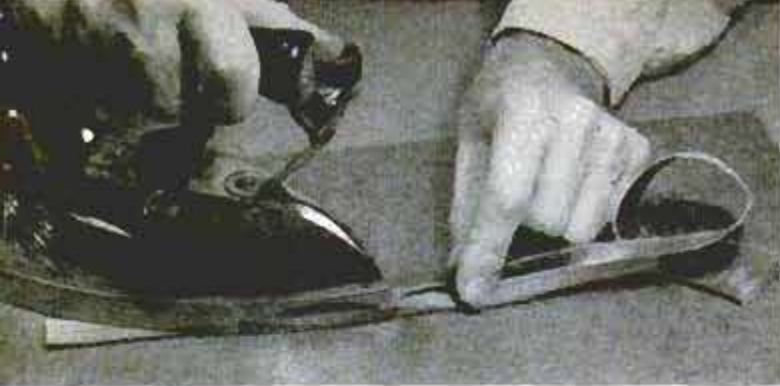


Fig. 3, strap for camera case is made by ironing tape that has the sides folded in on adhesive



Fig. 4, damaged front edge of small shelf is concealed by covering it with tape of blending color

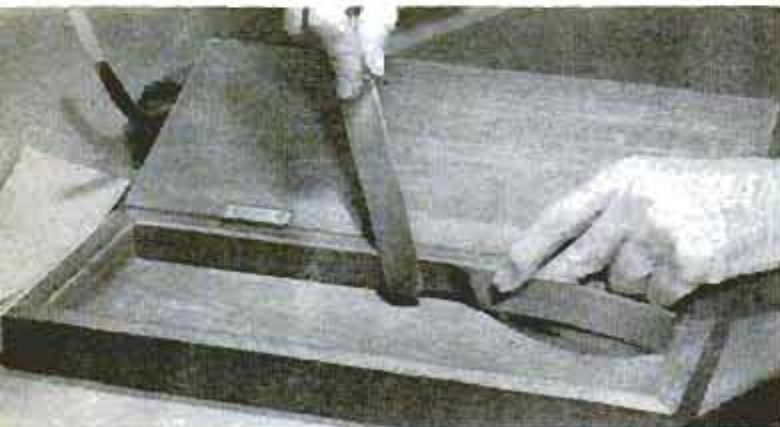


Fig. 5, narrow-width rug tape is used for lining sides of jewelry box, wide width is used on bottom

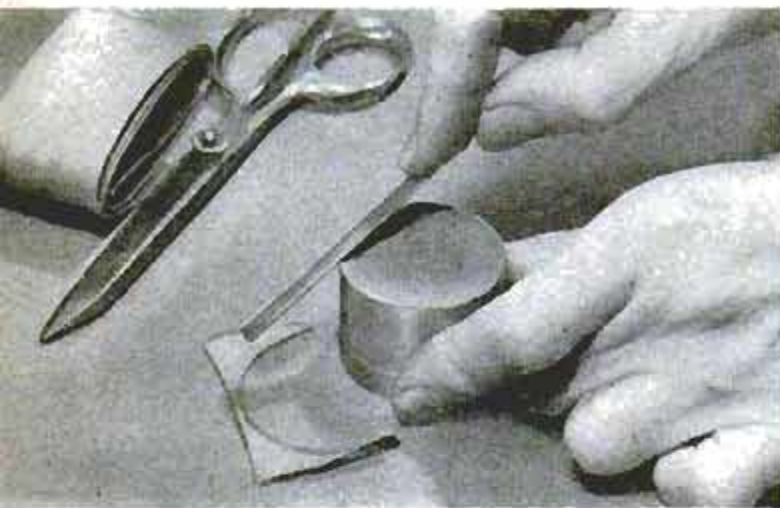


Fig. 6, when tape is used to provide scuffproof base on metal object, trim tape edges with emery board

Fig. 7, used as "piano hinge," tape is ironed on lid and box as indicated in hinge-methods detail



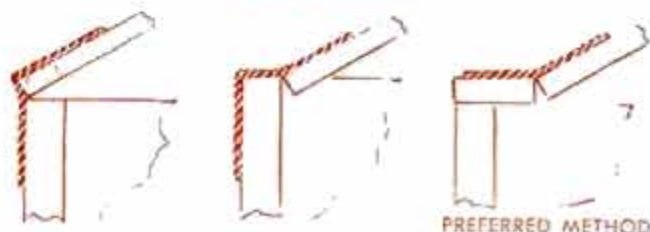
Figs. 7 and 8 and accompanying details, care should be taken to avoid damaging or discoloring the tape upon applying the finish. Since adhesion is of primary importance in this particular application, be sure to provide a completely dustfree, smooth surface to secure a good bond.

One of the most useful widths of carpet-binding and similar cloth tapes that must be applied with a heated iron is the 1½-in. width, obtainable at the notion counters of most department stores. Rug bindings also are available in 2¼, 3¾, and 5¾-in. widths, with the latter two widths especially suitable for covering large areas, such as lining a small box, Fig. 5.

When cutting tape into narrow strips and odd shapes, a pair of sharp scissors or a sharp knife and straightedge should be used. When installing tape on an object with no surface irregularities and ample workspace, a conventional electric pressing iron can be used to apply pressure and the required heat as shown in Fig. 7. Various other devices and tools may be used for applying heat to the tape, such as the blade of a dinner knife as in Fig. 5. For special jobs, variously shaped pieces of cast iron, steel and other metals may be adapted for use and heated in the flame of a torch or gas stove. A pair of clamp-type pliers can be used for holding these improvised "irons" when heating and using them for this purpose.

Until you learn to judge the proper degree of heat to be used for bonding the adhesive on the tape, it is wise to place a sheet of paper between the iron and tape. This simple precaution prevents the hot iron from scorching the tape. Since an electrically heated iron affords a greater measure of temperature control, with its adjust-

#### HINGE METHODS





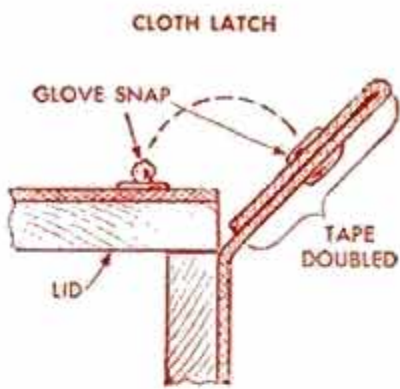


Fig. 8, above, cloth latch for lightweight box is made by installing parts of snap fastener on tape tabs that are ironed on lid and box. Tab on box is doubled, as shown in detail, for greater strength

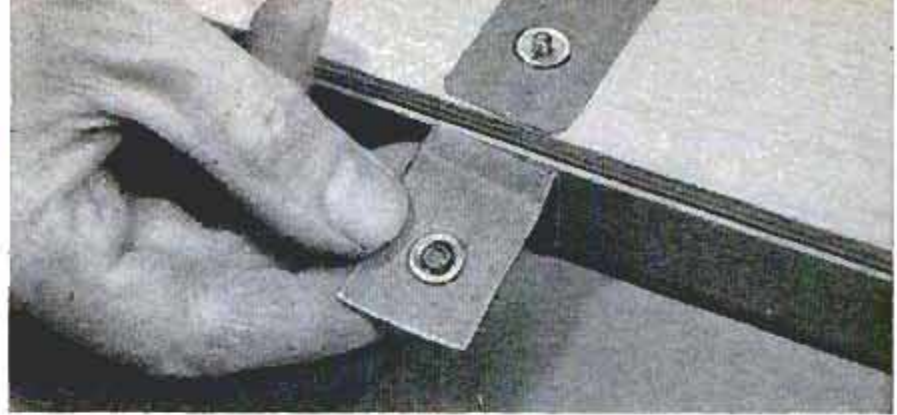
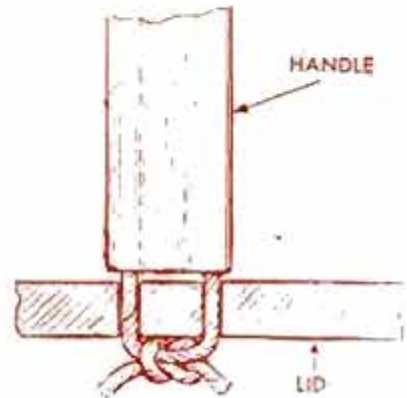
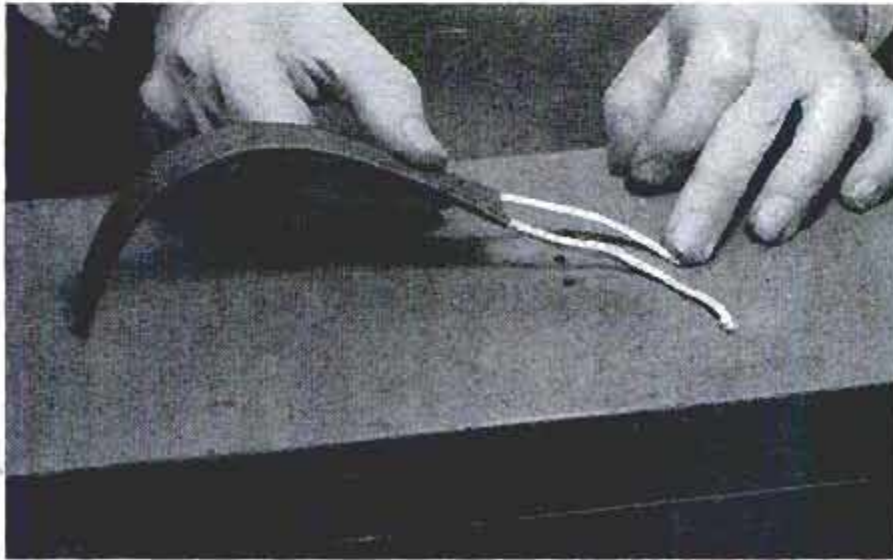


Fig. 9, photo and detail below, strong cords sealed in tape folds are inserted in holes in box lid and knotted. Cords are sealed in tape folded as in Fig. 3, by using heated rod to apply pressure and heat



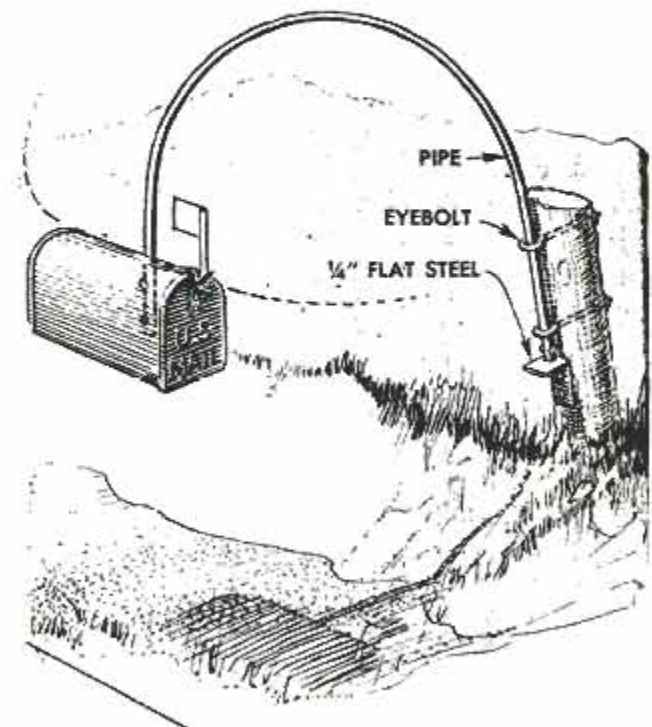
able thermostat and polished work surface, this appliance should be used for applying tape whenever possible. If a protective sheet of paper cannot be used on work as explained above, you can avoid scorching

the tape by testing the heated iron on a small piece of the tape or a piece of cloth of similar thickness. When metal fasteners are attached to tape, it should be doubled for greater strength, Fig. 9. ★ ★ ★

## Rural Mailbox Swings on Arm

This pivoting mount for a rural mailbox is ideal for country roads. When concealed by snowdrifts, a passing snowplow will not damage or dislodge it as would be the case with a conventional post mounting adjacent to the road. Instead, the pivoting mailbox moves with the force of the plow and swings into position once the plow has passed. To make the mount, simply set a post on the bank of the roadway so that it leans slightly toward the road and is located about 8 ft. from it. Then, form a large U-shape from  $\frac{3}{4}$ -in. pipe, mount one end on the post as shown, and bolt the mailbox to the other end.

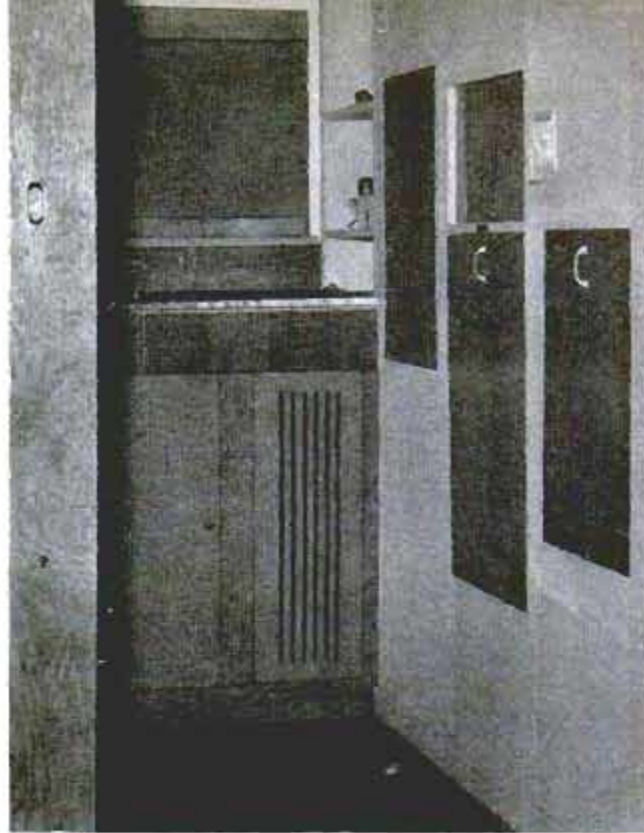
Remember that a surface to be painted must be clean or the paint may chip off. Also remember that a varnished or shellacked surface must be roughened with steel wool or sandpaper before painting.







Paper cutter is located in recessed cabinet at right end of sink. Ferrotypes storage racks are below sink



View of the right side of the darkroom through the sliding door shows neat appearance of flush cabinets

## "Dream" Darkroom Takes Little Space

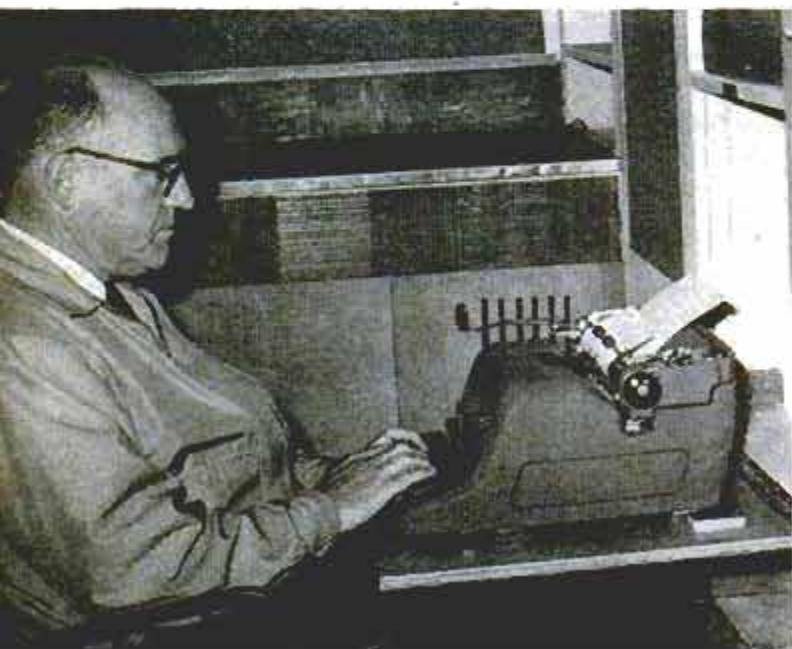
PhotoKinks 58 + WTM 59

By William G. Waggoner

1614 CARAMAY WAY, SACRAMENTO, CALIF.

AFTER YEARS of using makeshift darkrooms in kitchens or bathrooms, I finally built a "dream" darkroom, in which were incorporated ideas worked out during the many frustrating hours spent with my improvised setups. A portion of a garage, an area measuring 8 x 10 ft., was used for the darkrooms, although any small area could be remodeled in a similar manner. Because nothing projects from the walls except the enlarger, a minimum amount

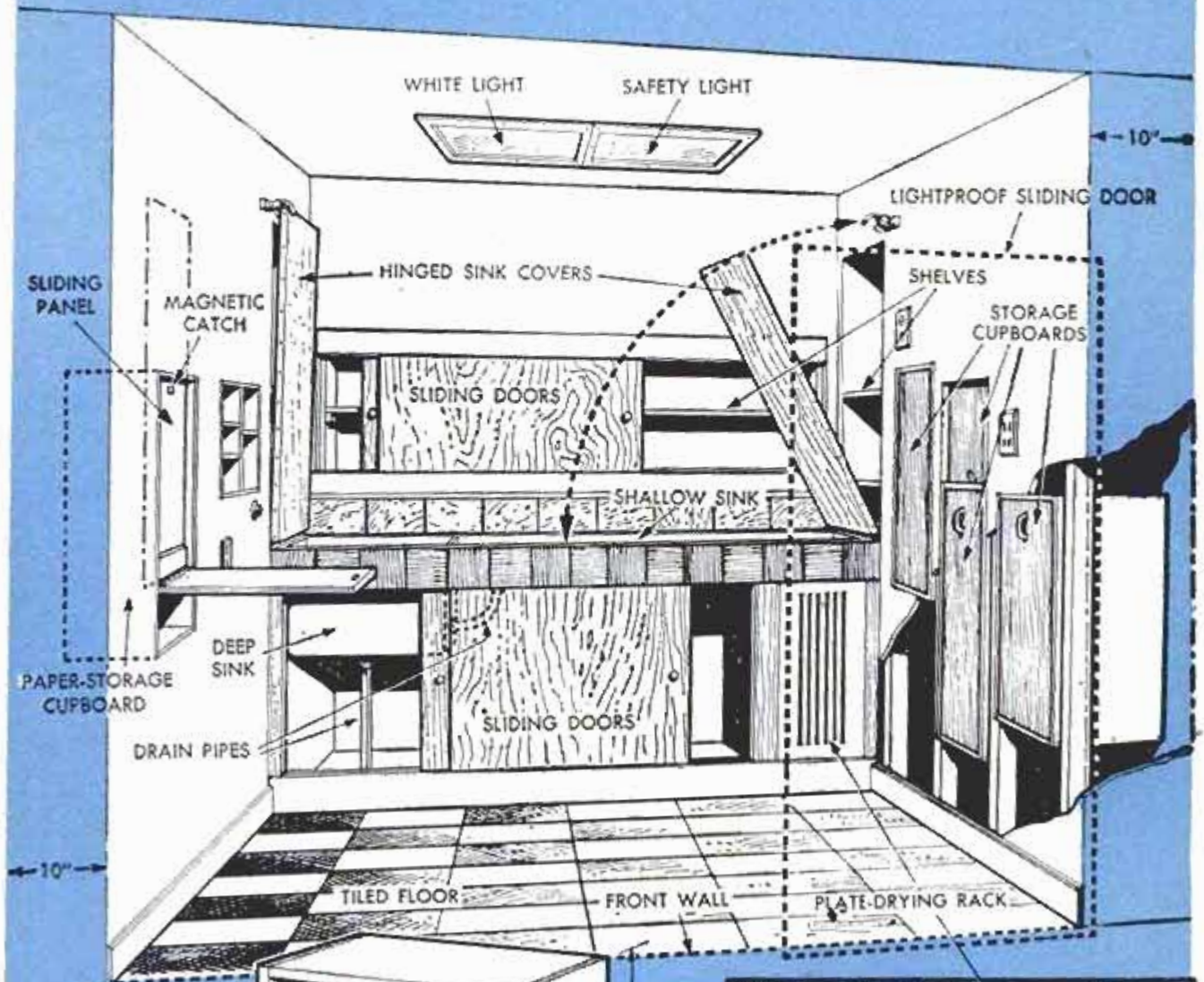
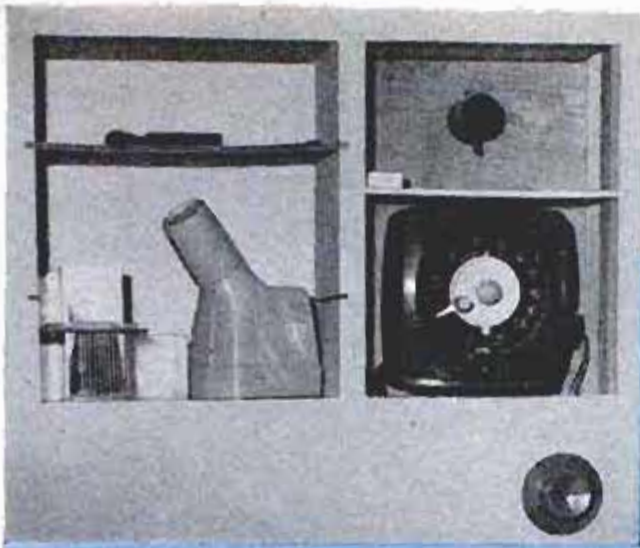
Typewriter was included in equipment in original darkroom, stationery is stored in cabinet above it



of floor space is required for the dark room.

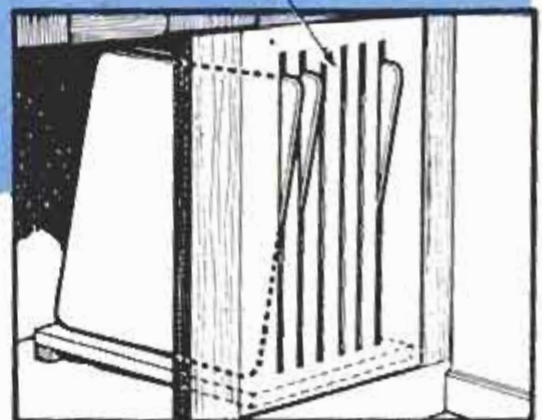
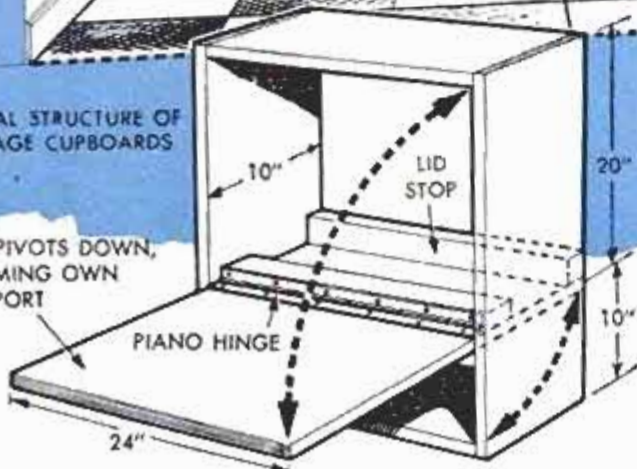
First step in construction is to build false walls 10 in. out from the original back and side walls. In this 10-in. space are located all the cabinets for storing equipment and supplies. Dimensions for all cabinets must be determined before the false-wall framing is erected, as the wall studs must be spaced to accommodate the widths of the various cabinets. All cabinets are built as indicated in the lower left-hand detail on the facing page, each one being simply a box assembled with glue and screws and screwed to the wall studs. The front edges of each cabinet project beyond the face of the studs the thickness of the material to be used as a wall covering. When the covering is applied, the cabinets will be flush with the surface. Dimensions shown on the cabinet in the detail are for one make of standard typewriter. Each cabinet must be dimensioned to accommodate the material or piece of equipment it is to contain. Note in the detail that the desk lid of the cabinet, cut from  $\frac{5}{8}$  or  $\frac{3}{4}$ -in. plywood, is fitted with a piano-type hinge that is screwed to a cross piece attached just inside the front edges of the cabinet. The distance from the hinge center to the bottom of the cabinet is the same as the



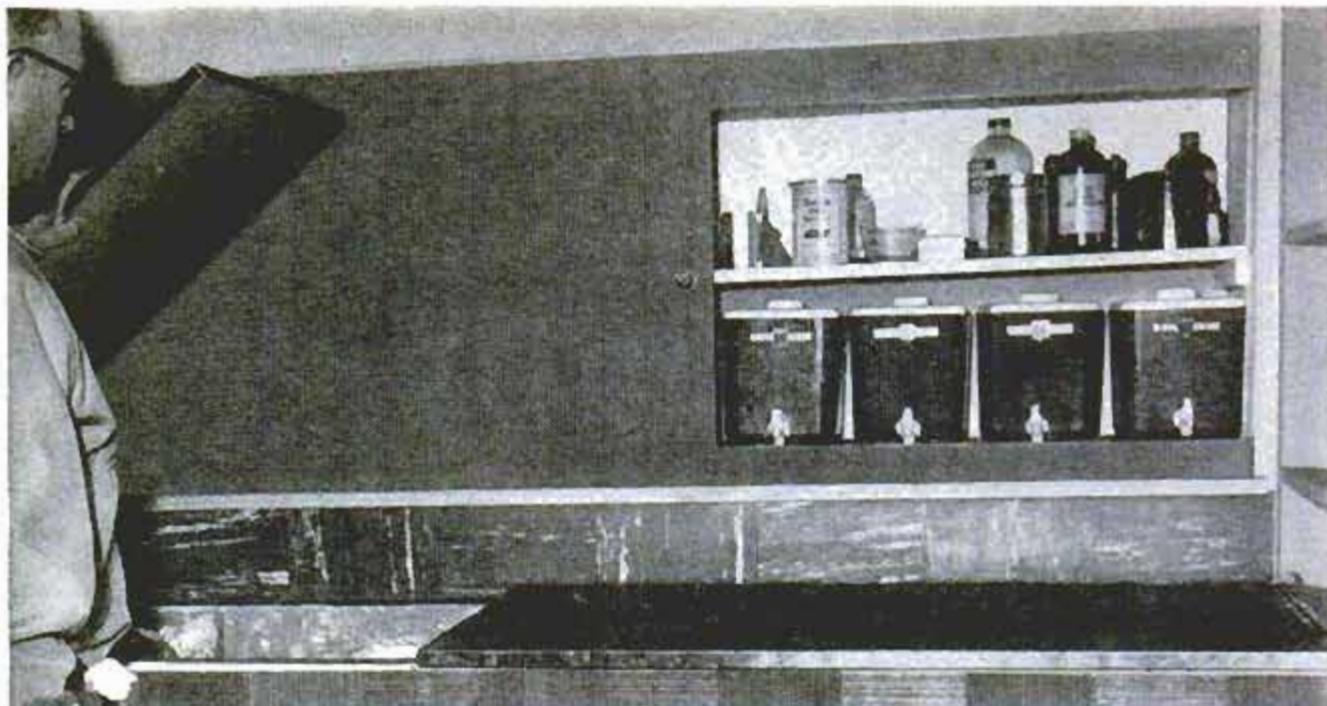


TYPICAL STRUCTURE OF STORAGE CUPBOARDS

LID PIVOTS DOWN, FORMING OWN SUPPORT







Hinged covers drop down to make sink a worktable. Cabinets are back of sink, shelves are at each end

distance from the front edge of the cabinet to the inside surface of the cabinet back. Thus, when the door pivots on the hinge, the lower end of the door rests against the underside of a stop at the back of the cabinet. With this setup, the cabinet lid is self-supporting, requiring no external braces or legs to keep it in a horizontal position. When equipment is fastened to the inside surface of the doors, as is the typewriter in the lower left-hand photo, page 186, weight of the equipment will keep the door in the closed position without need of any sort of latch. The paper-storage cabinet, upper right-hand photo, page 187, differs from the other cabinets by having an inner, light-tight door. It slides in grooves cut in the sides of the cabinet and through a slot cut in the top. Because no equipment is attached to the door, a magnetic latch is used to hold it closed.

### Spacesaving Features

Another spacesaving feature of the darkroom is a combination sink-worktable. Two hinged covers of  $\frac{3}{4}$ -in. plywood, covered with linoleum or plastic laminate, form the worktable that swings up out of the way when the sink is used. Screen-door closers are used to hold them against the walls. The sink was custom-made at a sheet-metal shop, and is painted with liquid rubber on the inside. It has a deep and a shallow basin. The deep basin has a perforated pipe coiled in the bottom through which water is run, causing tiny jets of water to keep the tank water agitated for thorough print washing. Depth of the water in both basins is controlled by standpipes that consist of lengths of plastic tubing

cemented in holes cut in sink stoppers. Water flowing in the shallow basin serves as a water-temperature control for the developer, stop bath and fixer chemicals that are in floating trays. Water from the shallow basin drains into the deep basin.

Cabinets under the sink have sliding doors that run on T-shaped tracks. Track of this type is available at most building-supply and some hardware stores. At one end of the sink cabinet is a storage rack for ferrotype plates, as indicated in the lower right-hand detail on page 187. Above the sink at the back and ends are shelves and cabinets for storage of equipment and supplies, as shown in the photo at the top of this page. Here again, the 10-in. space is used to good advantage. Sliding doors also are used on the cabinets back of the sink, open shelves are located at each end. Near the center of the left-hand wall of the darkroom is a shelf on which the enlarger is located. To its right are recessed shelves on which is kept material used with it. A timer is wired into an outlet box at the back of one shelf, which eliminates the need for any exterior wiring. The only cord showing is the one from the enlarger. A white light and a safelight are installed in boxes built flush with the ceiling. The door of the darkroom is a sheet of plywood that is suspended on nylon rollers from an overhead track. A cornice over the track, a recess at one side and at the bottom of the door, plus a felt strip along the other side, makes it light-tight. No recess is required for the full door, as it slides along the wall inside the darkroom. A hinged door also could be used, made light-tight and opening outward. ★ ★ ★



## Combination Mailbox-Signpost

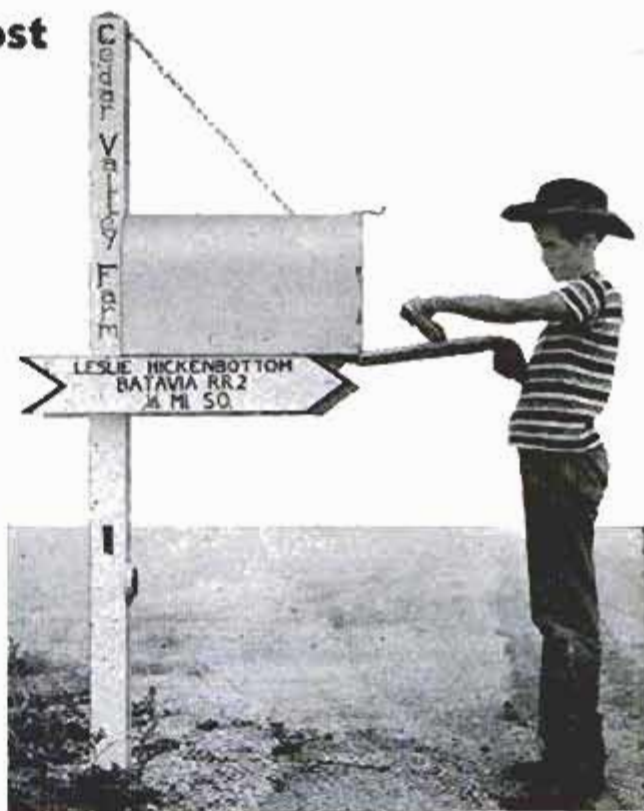
This combination mailbox-signpost located on the highway adjacent to a farm road clearly indicates the name of the owner as well as the name of the farm.

A. M. Wettach, Mt. Pleasant, Iowa

## Better Turning of Softwood



Next time you turn a piece of softwood in a lathe, first apply some sodium silicate or water glass around the dead-center hole of the turning. It will impregnate the wood and harden upon drying to provide a smooth bearing surface. Keep the dead center oiled.

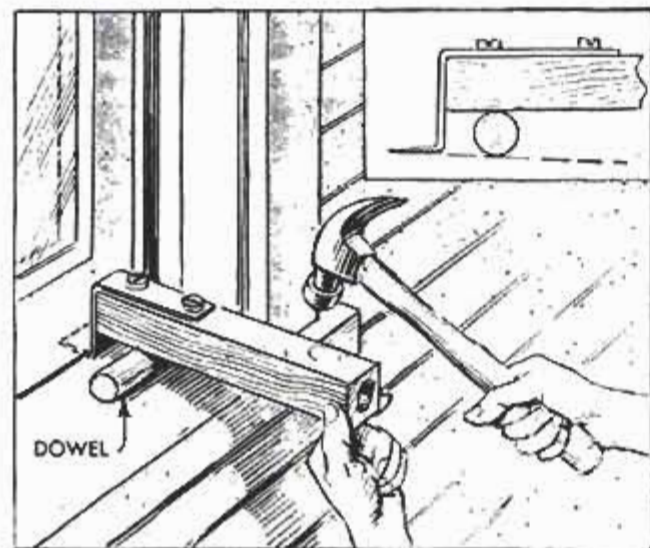


## "Dry Cutting" Sheet Rubber

Instead of dipping scissors in water to aid in cutting sheet rubber, place a piece of acetate film on both sides of the rubber along the line of the cut. The acetate prevents the rubber from creeping and assures a clean cut. The acetate film from a package of cigarettes is large enough for most small jobs.

## Tool for Freeing Sash

Jammed double-hung sash are freed quickly with this simple tool. It consists of a 10-in. length of 1½-in.-sq. stock, on the end of which is screwed a Z-shaped length of ½-in. flat steel. The end of the flat is filed to a knife-edge. A short length of dowel, used as a fulcrum, is stored in a hole bored in the end of the tool.



## Cleaning Bone Knife Handles

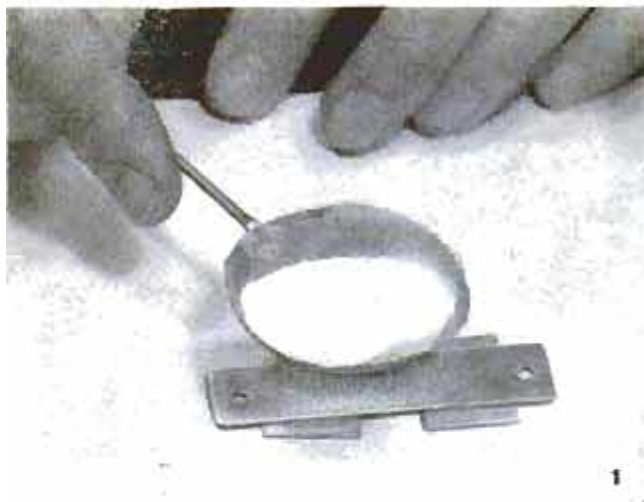
White bone handles on knives and other kitchen utensils can be cleaned of stains and given a "like new" appearance by rubbing them with a flannel cloth that has been dipped in peroxide. For deeply embedded stains, soak the bone for a few minutes in a solution of water and household bleach. Rinse and then wipe dry.

## Aluminum-Foil Favor Cups

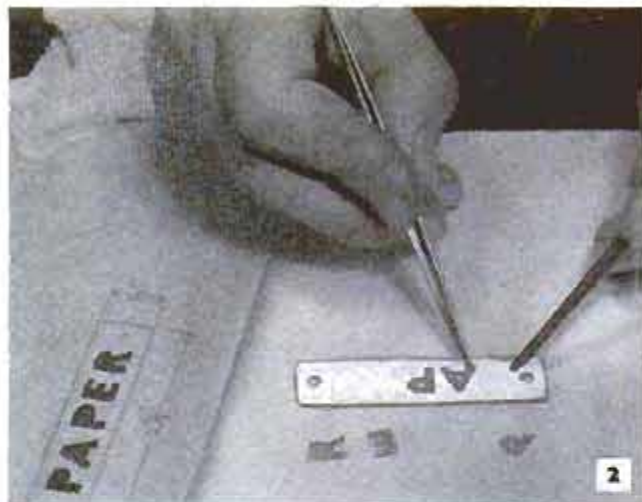
Unique little favor cups for a party can be made from aluminum foil, using two water tumblers or individual gelatin molds as "dies." Shape the foil over one tumbler, press the second down over the first, and the cup is formed. Trim the edge and add a pipe-cleaner handle as on the finished cup in the photo.



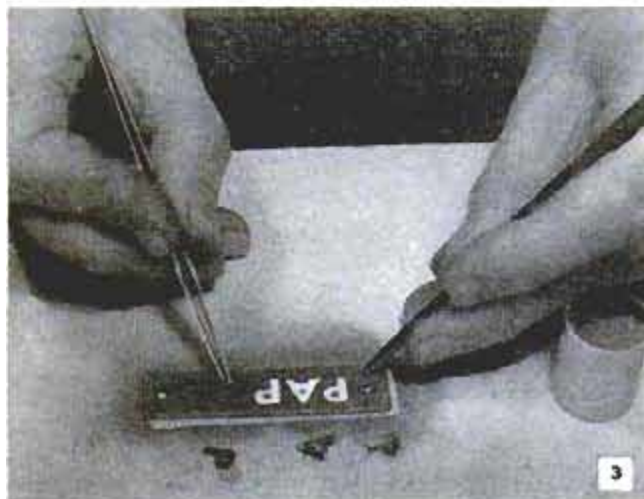




To make sign weatherproof, both sides are enameled. Back is sprinkled with enamel powder and fired first



After front is fired, cutout letters are spaced on sign and powder is sprinkled over letters and sign



Tweezers are used to lift letters to which tab is attached, thus removing powder from letter spaces



Finally, firing hardens last coat of enamel of contrasting color and attractive sign is ready for use

## Enameled

WTM 59

## NAMEPLATES

MANY PEOPLE whose hobby is enameling ornamental objects, such as ash trays, pins and brooches, overlook more prosaic but equally useful items like nameplates and signs. The fired enamel is fadeproof and highly resistant to weathering and wear, which makes it an ideal material for signs to be used in outdoor locations. Described in this article is a sign with the word "paper" enameled on it, to be used over the door of a built-in receptacle on an enclosed porch. It will no doubt suggest other signs of similar type for other uses. One such application would be a sign over the milk door, which is a feature of some homes as a precaution against delivered milk being frozen in winter weather or providing neighborhood cats with breakfast. An address and nameplate near the front door would be well done in enameled letters and numbers.

Both sides of the signplates are to be enameled, so apply the enameling powder to the back, Fig. 1, and fire it in a kiln. The plate may be slightly curved when removed from the kiln, but will straighten when enamel is applied to the front. On the front side of the sign now apply and fire a layer of enamel of the color the letters are to be. Letters for the sign are made by drawing, or by tracing them from a newspaper or book. Cut the letters from fairly stiff paper, then attach a tab of cellulose tape to each one. Place the letters on the enameled background, Fig. 2, then sprinkle enamel powder of contrasting color over the sign and letters. Next, using tweezers, lift the letters by the tabs, Fig. 3. Remove any powder that falls in the letter spaces. Finally, fire the piece and your sign is completed, as in Fig. 4, ready for many years of service.



## Card Makes Pinless Badges

Ribbon badges worn by officials and delegates to conventions and similar meetings need not be pinned to shirts or coats if they are stapled to pieces of cardboard cut to fit the pocket. Besides permitting the badges to be removed quickly, the cardboard eliminates pinholes in garments.

## Eraser Used as Scouring Pad

A typewriter eraser with wedge-shaped ends can be used with or without scouring powder to remove small burned spots on metal pans, and to clean between the tines of forks. The nonabrasive end of the eraser can be used on enamelware pans and on dishes.

## Flashlight Slide Viewer

Color transparencies can be viewed with the aid of a flashlight if a bracket is provided to hold a magnifying glass over the light as shown. Cut the bracket from sheet metal and secure it to the flashlight with a rubber band. The rim of the magnifying glass is supported by the bracket, while the handle rests on your hand. If the light beam is uneven, cover the flashlight lens with tissue paper for a diffuser.



## Reflector Is Mailbox Flag

The usual red-painted flags on rural mailboxes are difficult to see in poor light, whether in the raised or lowered position. To assure easier visibility, as well as eliminate the need for frequent repainting of the flag, one farmer attached a large bicycle reflector in its place. The flag was cut off and the arm was drilled to accommodate a bolt which was used to attach the reflector. An added advantage of the reflector is that it gives warning of the mailbox location to passing cars and thereby reduces possible damage.

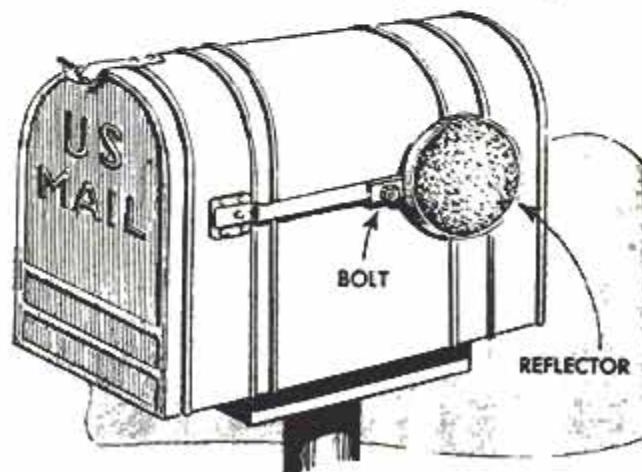
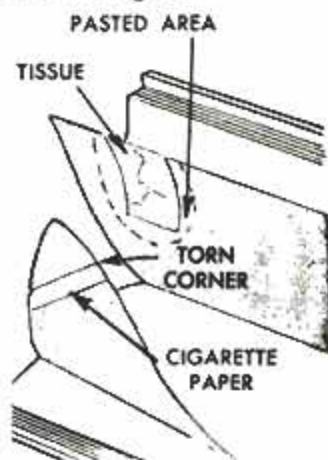
JANUARY 1958



## Repairing Torn Book Pages

Thinned library paste and white tissue paper are ideal for mending tears in book pages. First, place wax paper under the tear and spread the torn edges with paste. Brush paste on an area around the tear and press on a piece of the tissue. Pat the paper dry, wipe off excess paste and sprinkle on talcum. Repeat the operation on the opposite side of the page. For replacing the corners of pages that have been broken off, use cigarette paper. Cut a triangle of the paper slightly larger than necessary and paste it on the corner. Turn the page over and paste a similar triangle on the opposite side. Then trim the triangles.

Emma A. Musculus, Manistee, Mich.



191





Chloroform applied with cotton balls cleans grease-spots on delicate fabrics without leaving rings

# ABC

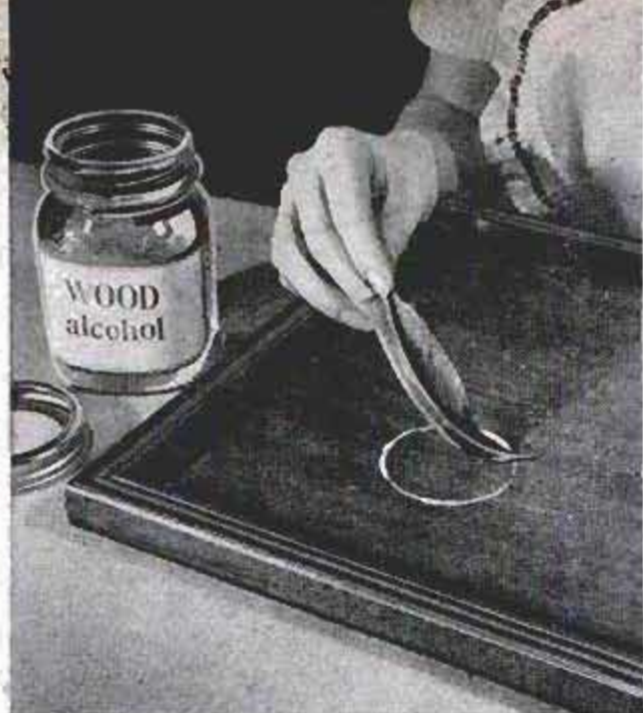
## OF STAINS



**M**ANY STAINS that are considered difficult or impossible to remove, simply require application of the correct cleaning agent for removal of the discoloration. If the stain is removed within a short time, cleaning is made much easier since most liquids that stain readily set or dry with time. The cleaning hints shown on these pages will aid you in removing stains from various materials. ★ ★ ★

Stains on felt hat, if not caused by perspiration, usually are only on surface. Such stains are best removed by rubbing them gently with fine sandpaper

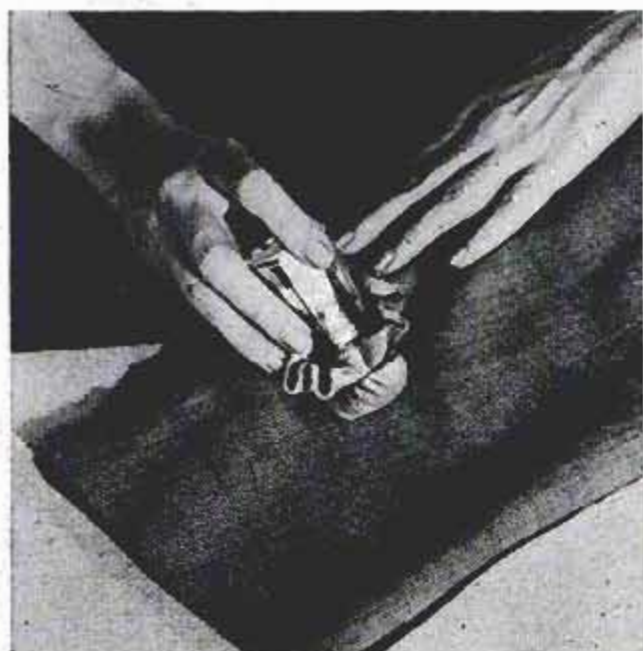




Ring on varnished surface is made less apparent by brushing it with a feather dipped in wood alcohol



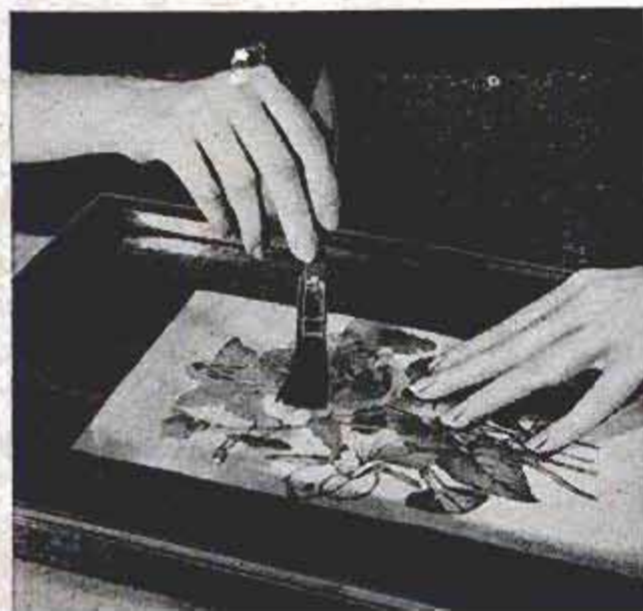
Remove inkstains by sponging with oxalic acid, then wiping with cotton balls saturated with ammonia



Above, spot remover made from salt shaker has cap filled with cotton, covered with cloth. Shaker is filled with solvent. Below, wood surface too stained for repair is covered with cloth print and shellacked

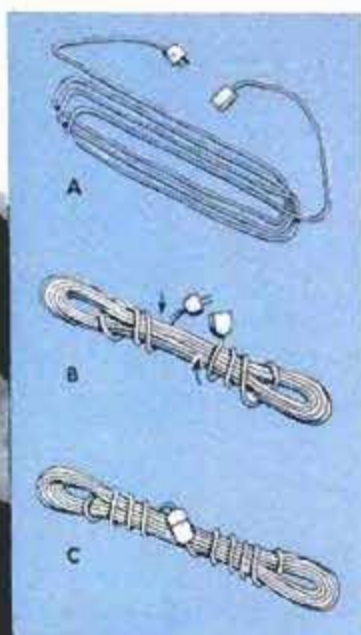


Above, sponge paintspots with turpentine, allow to soak. Repeat until softened paint can be removed. Below, nap on suede leather is restored by buffing shiny spots with emery board from manicure kit



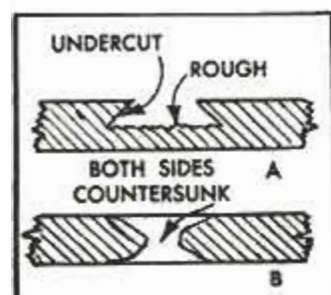


## Coiled Extension Cords Don't Become Tangled When Stored



To prevent extension cords from becoming tangled when stored, one homeowner coils them as shown. To do this, coil each cord on your arm so that about 15 in. of cord at each end is left uncoiled, detail A. Then, bring each end through the coil loop nearest to it and tightly wrap them around the coil. One end is wrapped in a clockwise direction and the other in the opposite direction but with the turns of each directed toward the center of the coil, detail B. After the plugs are joined together, detail C, the coil cannot unwind.

## Undercut Hole Holds Wood Filler

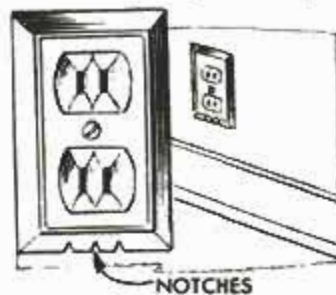


When filling a hole in plywood or wood, the filler is more likely to remain intact if the hole is undercut and prepared as shown in detail A of the drawing. If the hole should extend through the material, both sides of it should be countersunk as in detail B.

C. A. Phillips, Corning, N. Y.

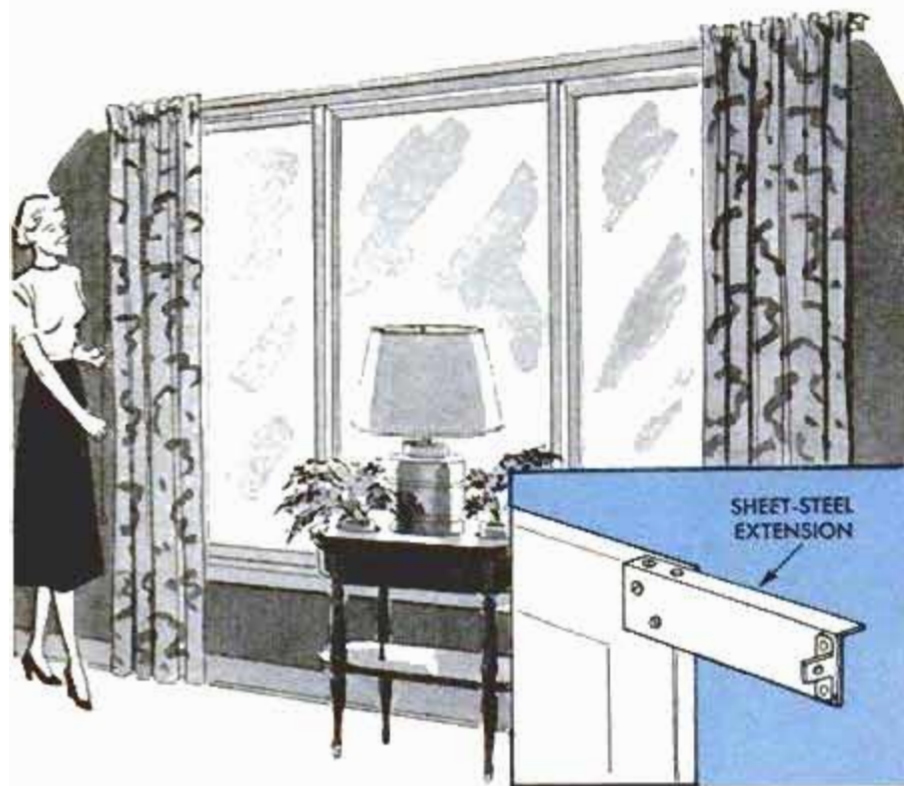
extend through the material, both sides of it should be countersunk as in detail B.

## Identifying Receptacle Plates



For easy identification of the circuit to which an electrical circuit is connected, one home craftsman files a certain number of notches in each wall plate as shown in the

drawing. The number of notches in each case corresponds to the circuit number to which the receptacle is connected.

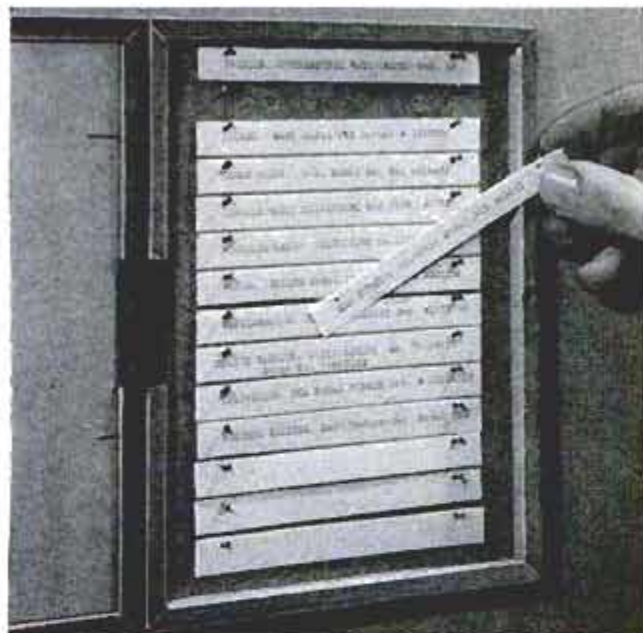
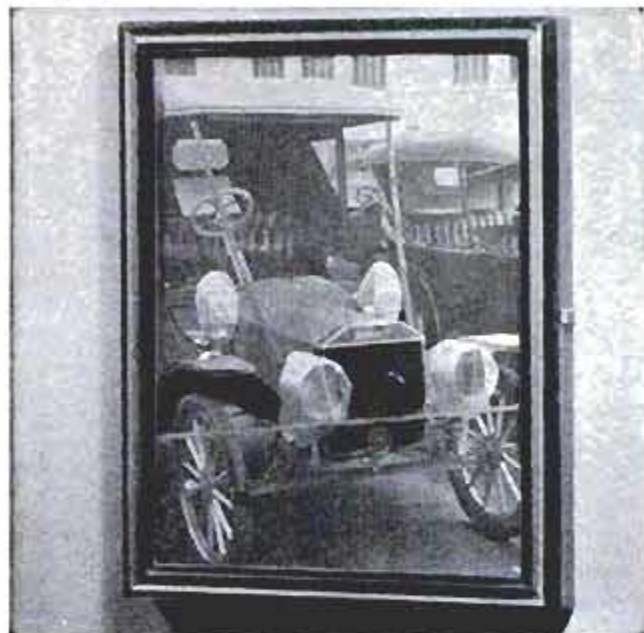


## Drapery Extensions "Enlarge" Windows

Windows appear larger and admit more light when the drapery hardware is mounted on extensions made of sheet steel as shown. This permits the draperies to be pulled open so that nearly all of the window is open to view. The extensions are formed from 16-ga. sheet steel and screwed to the window frame, one on each side to extend about 6 in. from the frame as shown in the detail. The old drapery brackets are removed from the window casing and bolted to the ends of the extensions.

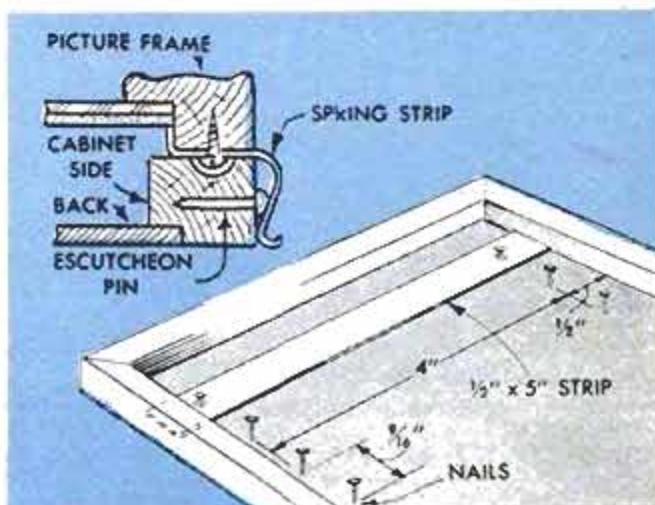


# Appliance Data Stored In "Picture Cabinet"



Above, appliance-data cabinet appears to be ordinary picture. However, picture frame is door of shallow cabinet that contains cards with important data on home appliances typed on them, upper right

Model and serial numbers of household appliances are kept conveniently at hand by one homeowner, by recording this data on small cards and filing them in the camouflaged cabinet shown in the photos above. The cabinet is a shallow wall box with a hinged picture frame attached to function as a door. Since the over-all thickness of the frame and cabinet is less than 1 in., the unit looks like an ordinary picture. To make the cabinet, obtain a small picture frame with outside measurements of about 6 x 8 in. Then, make a shallow cabinet the same size as the picture frame as shown in the drawing and detail. For the sides of the cabinet,  $\frac{3}{16}$  x  $\frac{9}{16}$ -in. pine, oak, walnut or other suitable wood can be used and  $\frac{1}{8}$ -in.-thick plywood or hardboard can be used for the back. The picture frame swings on a 2 x  $\frac{3}{4}$ -in. butt hinge mortised into the frame and cabinet as shown. For an inconspicuous means of keeping the door closed, a length of spring brass is bent to form a friction-type catch and screwed to the frame as in the detail.



An escutcheon pin, driven into the side of the cabinet frame as shown, holds the catch when the door is closed. The data cards or strips are cut from 3 x 5-in. file cards and holes are punched near the ends of each so that they can be hung on nails as shown in the drawing. The nails should be slanted upward to keep the cards in place. When an appliance is replaced by a new one, a new card is made up and placed on the nails over the old one so that a complete service record is maintained. Finish cabinet to match the picture frame.

## Glass Strip Is Dodging Tool

The next time you make a print that requires dodging (underexposing selected areas of a print), try using a strip of glass with the desired shape of the mask painted on it as shown. Use any water-soluble paint for this purpose so that the mask can be removed and a different mask applied for each subsequent use. A strip of clear plastic can be used instead of glass.

Richard Hanscom, Elmhurst, Ill.







**SORTING GARMENTS** in a clothes closet is easy if you use a wooden bar pivoted to a shelf as indicated above



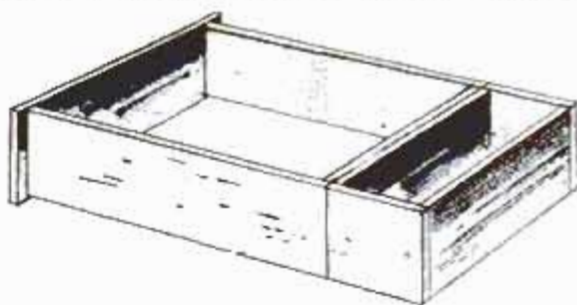
**UNROLLING A PIECE OF LINOLEUM** to measure it is unnecessary if it is pulled out to spiral one end as above. This exposes the turns of rolled linoleum so that a tape can be used for measuring it

**WHEN WORKING WITH PLANTS** in small pots, try using a shoehorn as a trowel. You will find it ideal for this purpose. In some cases, it may be necessary to bend the horn slightly for the job

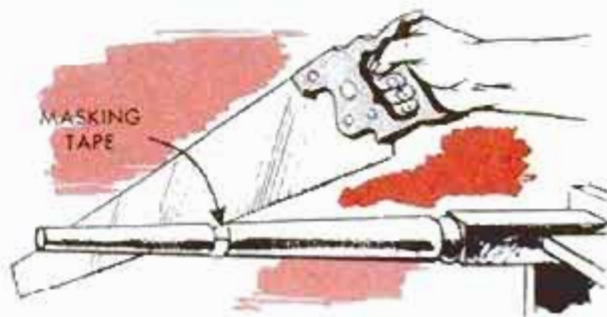


# Solving HOME PROBLEMS

**IF YOU NEED SOMEPLACE** to hide valuables, look at the back of some of the drawers in your home. If space permits, a wooden pocket may be glued to the back of a drawer to provide a secret hiding place



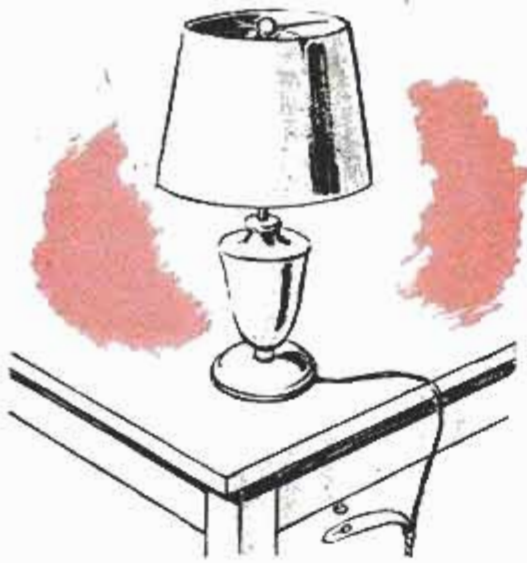
**SPLINTERING** of a chair or table leg when shortening it will be avoided if masking tape is used as shown below. Wind the tape on the leg so that one edge is flush with the cutting line on the leg



**LIQUID SOAP** is easy to make by breaking up cake soap and dissolving it in a water-filled canning jar as shown below. This is a good way to utilize small pieces of cake soap that are often discarded



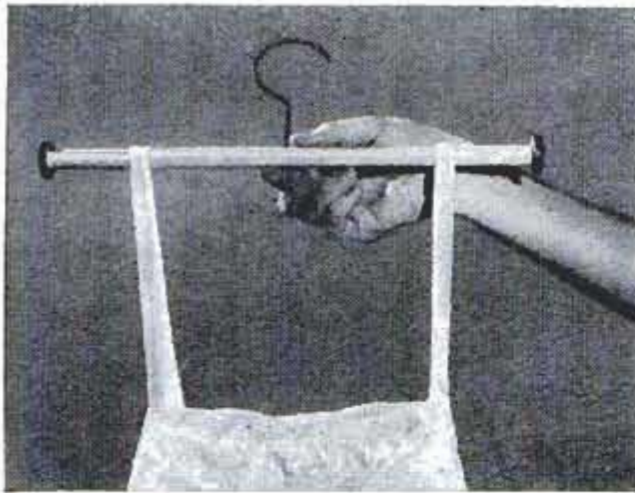




**A SMALL CHILD** can't pull a lamp from a table if the cord is attached to the table as above. Just cut a keyhole in a leather strap and tape it to the cord



**WHITE, OPAQUE JARS** that contained shampoo, cosmetic creams or similar substances may be used as decorative containers on a dressing table, or in the bathroom or kitchen. Clean the jars and then decorate the covers with enamel and decals



**GARMENTS HUNG BY SHOULDER STRAPS** will not slip off this hanger, which is merely a length of  $\frac{1}{2}$  or  $\frac{3}{4}$ -in. dowel fitted with a wire hook. Wooden disks of slightly larger diameter are screwed to the ends

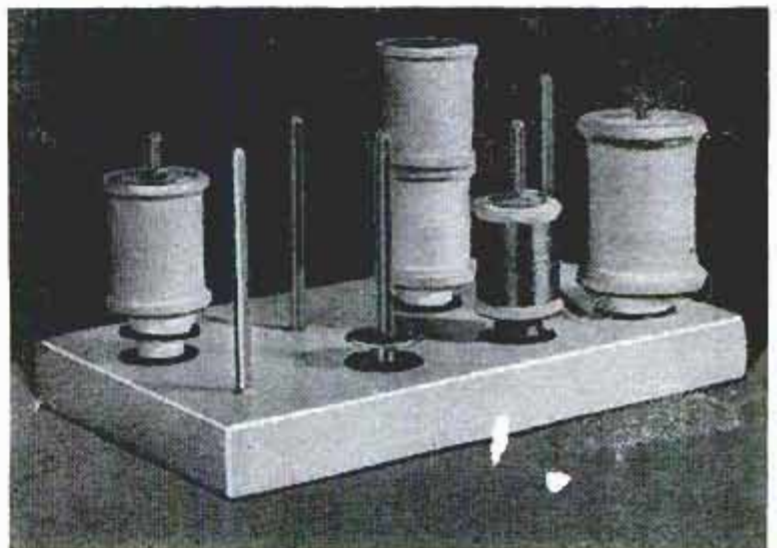


**DO YOU HAVE DIFFICULTY** using a coaster in a dimly illuminated room while watching TV? Try ordinary paper plates. They provide table protection, and are easily located without distracting attention

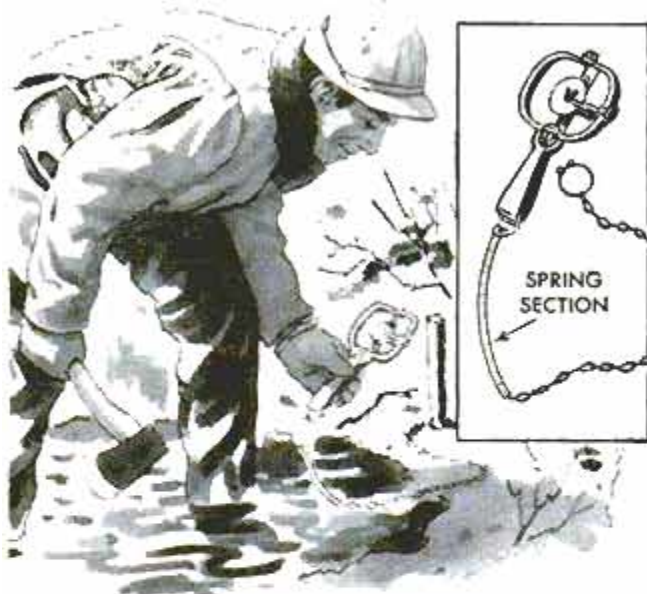
**IF USUAL METHODS** have failed to remove a tight-fitting ring, use aluminum foil. Wrap it snugly around your finger and over the knuckle; slide the ring over it



**WITH A  $\frac{3}{4}$ -IN. WOODEN BLOCK** and a few 16d nails you can make this spool-and-bobbin rack in a few minutes. Drive the nails through the block and file off the points. It is a good idea to drill pilot holes for the nails to avoid splitting the wood







### Spring Reduces Trap Losses

To prevent animals from jerking free of chained-down traps, one trapper fits a length of screen-door spring between each trap and chain. Pulling on the trap then causes the spring to extend and act as a "shock absorber," so an animal cannot brace against the trap and pull itself free.

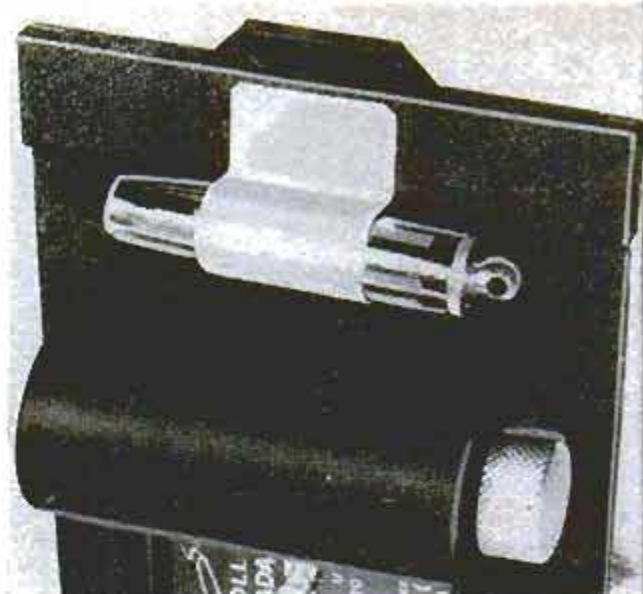
H. W. Swope, Danville, Pa.

### Tool for Removing Light Bulbs

Removing and replacing out-of-reach light bulbs is no problem with a tool made from the bulb clamp cut from a lamp shade. It is attached to the end of a dowel or broomstick and wrapped with a few turns of friction tape. Bend the clamp so it squeezes firmly on a bulb to both rotate and hold it.

### Arrow on Platen Tells Typist When End of Paper Is Reached

To determine when you are near the lower end of the paper in a typewriter, try the following method: First, paint a thin white line straight across the roller. After the paint dries, insert a sheet of standard typewriter paper and align the upper edge with the line. Then, mark the front edge of the paper at the bottom where you normally type the last line. Run the paper through the platen until the mark appears



### Flashlight Is Camera Aid

Attached to the side of a camera, a penlight will prove handy for focusing and aiming when taking shots in dim light. The bracket for the light is bent from a piece of light sheet metal, then soldered or screwed to the camera case and painted to match the camera.

John J. Rea, Urbana, Ill.

### Olive Oil Removes Paper

Paper that has become stuck to a polished wood surface can be removed without damage to the finish by using olive oil. Place a few drops of the oil onto the paper and wait until the paper absorbs it. This will loosen the paper, after which it can be peeled off. The excess oil now can be wiped up with a soft cloth.

on the roller and paint an arrow on the platen pointing to it. To use the markings, align a sheet of paper as mentioned above, start typing and when you observe that the sheet is nearly completed and the arrow appears as shown in the photo, you have space for one more line. You'll find that the arrow makes two revolutions per sheet of typing paper.

Robert L. Hay, Rochester, N. Y.





# Plastic Juice Containers Speed Film Processing

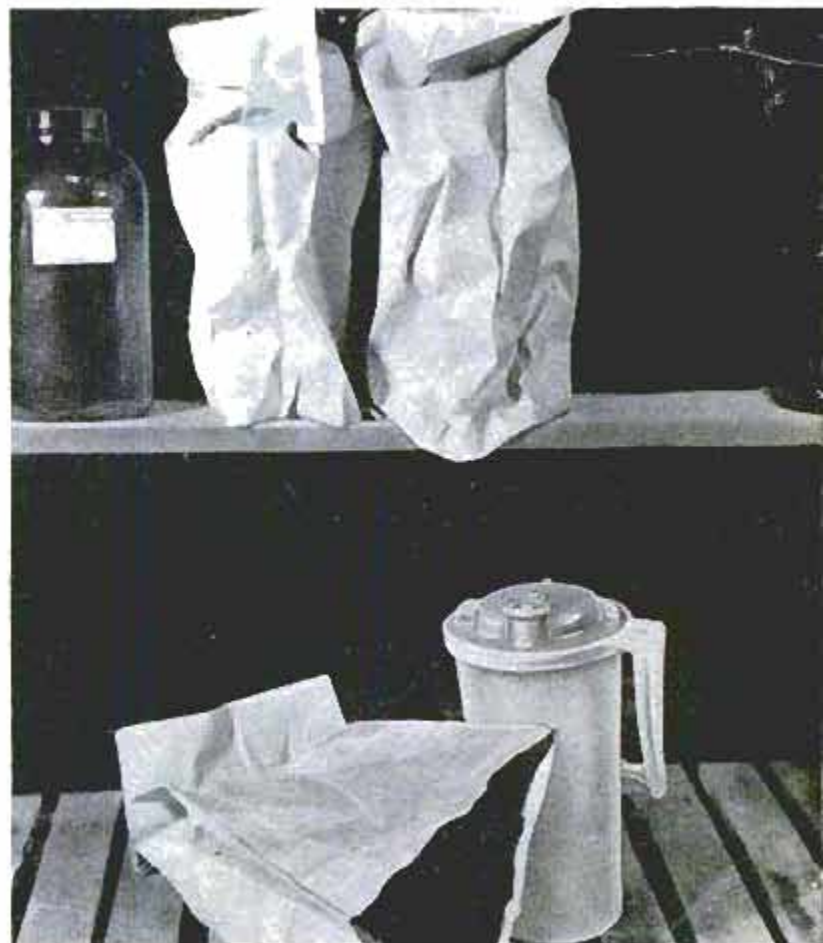
By Karl Mickelson



Above, plastic juice containers permit accurate developing of three reels of film at one time. Below, paper bags protect solutions from light damage when stored in same containers as used for developing

WHEN USING a rapid developer (1 min.) for processing roll film, plastic juice containers such as the ones shown, permit instant transfer of film from developer to short-stop solution. This reduces the chance of overdeveloping negatives, as when a daylight-type tank is used, with the attendant lapse of time necessary to pour the developer from the tank and refill it with the short stop.

Also, multiple reels of film can be processed at one time by bending a tee on one end of a 20-in. length of stainless-steel wire and stacking the reels on it as shown in the photo above. Besides being a timesaver, this idea is useful for making a comparison check between different rolls of film developed for the same length of time. Solutions need not be removed from the plastic containers for storage after each time of use as when a daylight developing tank is used. Simply replace the airtight lids and slip a paper bag over each of them as shown, to prevent light damage.







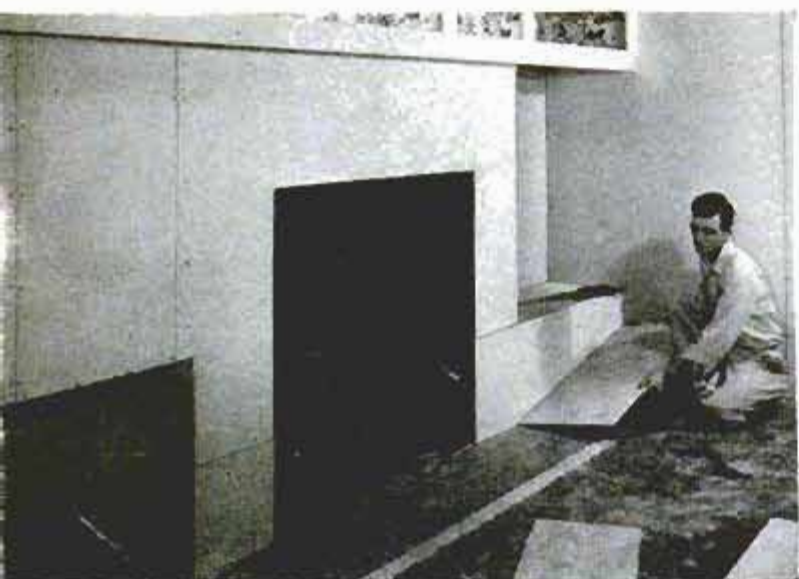
AFTER

BEFORE



Above, before and after photos show dramatic difference resulting from application of ceramic tile

Below, wallboard and plywood are nailed to fireplace, walls and floor to provide surfaces for tile



## X 160 WTM 59 Modernize

INSTEAD OF CONSIDERING an old-fashioned brick fireplace a problem when remodeling and modernizing a home, make it an eye-catching center of attraction with the aid of ceramic tile. Available in more than 200 colors, and a wide variety of shapes, sizes, textures and patterns, one or more types of tile can be chosen to match or contrast with any decor, whether it be modern or period.

Necessary alterations to permit the installation of tile consist of providing smooth surfaces on which it can be attached with adhesives, lower left-hand photo. Adjacent to the fireplace opening, fireproof asbestos wallboard or gypsum wallboard is cemented and nailed to the brick with masonry nails. Away from the opening, wallboard and plywood nailed over wood framing are used for surfacing materials. All joints in the surfacing materials should be taped, plastered and sanded smooth. If the hearth directly in front of the fireplace is brick, it is covered with a coating of mortar so it is flush with the plywood used to cover the floor on either side, upper left-hand photo, opposite page. During the remodeling, overhead storage cabinets can be installed, and space provided for storing firewood. On the fireplace shown, unglazed mosaic tiles were used on the vertical surfaces, larger-sized glazed tiles were used on the horizontal surfaces. Glazed tiles require soaking overnight, mosaics do not.





Mortar over brick hearth brings it flush with plywood nailed to floor on both sides of fireplace



Toothed spreader is used to spread adhesive smoothly and evenly over surfacing material for attaching tile

## With Ceramic Tile

since they absorb little water. Adhesive is troweled on the surfacing material, the tiles are installed and time allowed for the adhesive to set. Next, grout is applied and the excess removed with a squeegee. The tiles are wiped with a damp cloth, then finally polished with a dry cloth. To assure thorough curing, the grout should be kept moistened for the first eight hours. For cutting either glazed or unglazed tile, a regular cutter does the best job. However, glazed tiles can be scored with a glass

Mosaic tiles come in 1 x 2-ft. sections, pasted on a sheet of paper, which permits faster application

cutter on the face, then tapped on the back side to crack them. Unglazed tiles are "cut" by breaking with pliers or pincers. Cut edges are smoothed with a dry oil-stone. Photographs on these pages show a step-by-step installation of tile on a typical fireplace. Dimensions and locations of storage areas and seats will vary with each individual fireplace and choice of decor. But in all cases, the finished product will be beautiful, and requires only occasional cleaning with a damp cloth. ★ ★ ★

After adhesive has set for about 1 hr., paper on mosaic tiles is moistened, peeled off as shown







Glazed tiles are used to cover floor and hearth, as well as walls of firewood-storage space. These tiles require overnight soaking before they are installed



Glazed tiles can be cut by scoring on face with ordinary glass cutter, using another tile as straightedge. Score should be parallel with ribs on tile back

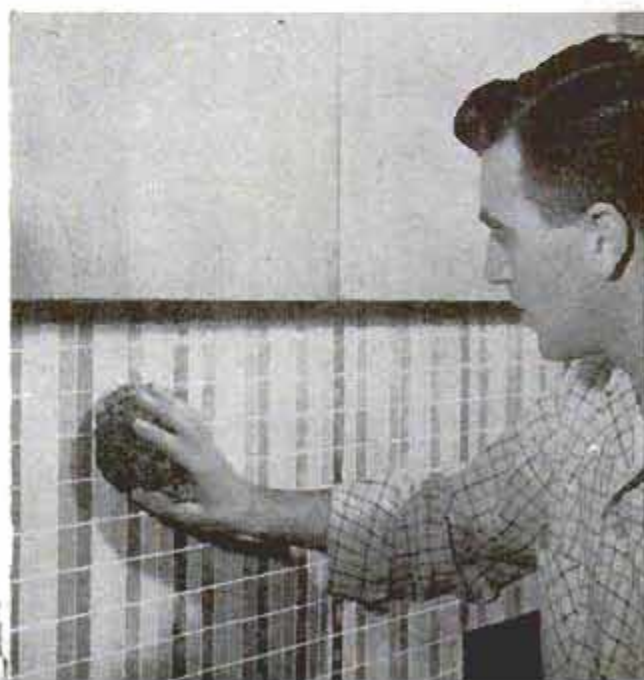
Below, tapping scored tile on back fractures it on score line. Regular tile cutters are available, make the job easier and assure that fewer tiles are wasted

Below, grout is forced into joints, using either hands or a sponge. Grout should be consistency of heavy cream to assure complete filling of joints



Below, after grout is applied, excess is removed by using rubber squeegee. Action of squeegee also tends to compact grout more firmly into the joints

Below, damp sponge is used for final cleanup, after grout has set firmly. Powder film left after moisture dries is polished away with soft, dry cloth





# Special Leash Holds Small Dog on Car Seat

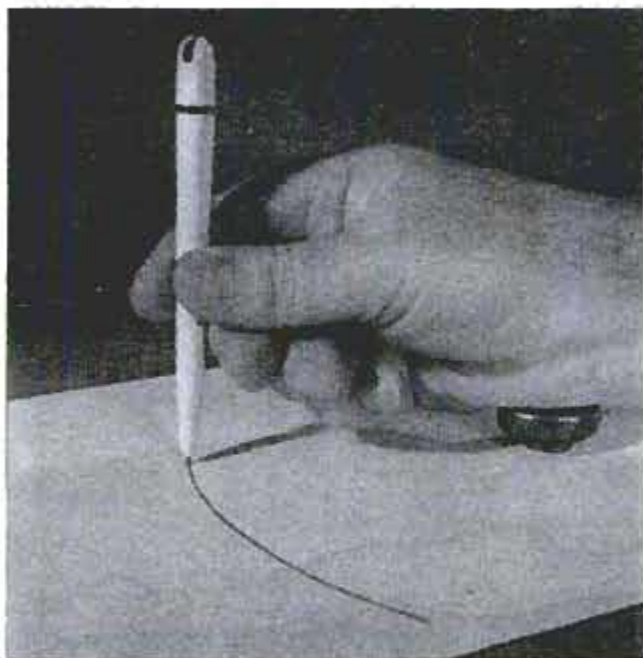
To prevent injury to a small dog that rides on the front seat of the car, one dog owner secures the dog's leash to a sponge-rubber ball that is wedged between the back and seat cushions as shown. A short leash is used for this purpose so that the dog cannot slide off the seat at a sudden stop. Restricting the dog's movements in this manner also saves the instrument panel from claw scratches.

## "No Spill" Birdseed Dispenser

For a handy container for filling seed or gravel cups, one bird fancier removes the top from a table-salt container of the type that is fitted with a metal pouring spout and fills it with the desired material. After the top is replaced on the dispenser, masking tape is used to reseal it. All traces of salt must be removed from the container before using it for this purpose. — Mrs. Joyce R. Pelella, Highland Falls, N. Y.

## Draw Freehand Curves

With a little practice, curves of large radii can be drawn freehand using a pen or pencil and a bearing for an axis as shown in the photo. To do this, simply place a small roller bearing under your wrist or forearm, depending upon the radius of arc desired. Then, hold a pencil between the thumb and index finger and rotate the entire arm to draw the arc desired.



☞ You can help your children keep their rock and shell collection neatly stored, yet within reach when they want it, by providing them with empty egg cartons for storing the items.



## "Preview" 35-mm. Negatives

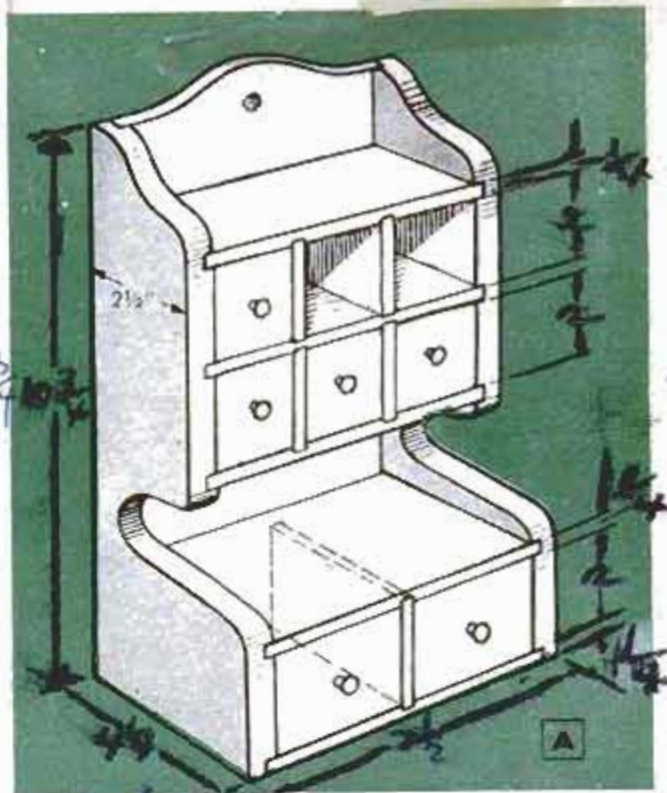
A small slide viewer of the type shown provides an excellent means of examining 35-mm. and other small negatives in roll form when selecting frames from which enlargements or prints are to be made. For easier feeding of negatives through a plastic viewer, enlarge the slot at the bottom to provide proper clearance.

H. Leeper, Canton, Ohio.



☞ When purchasing a paintbrush, keep in mind that the bristles of the best brushes have long tapered tips and split ends. The bristles are of different lengths and are formed to a full head.





Quaint and charming as grandmother's kitchen, this spice cabinet still goes well with modern decor

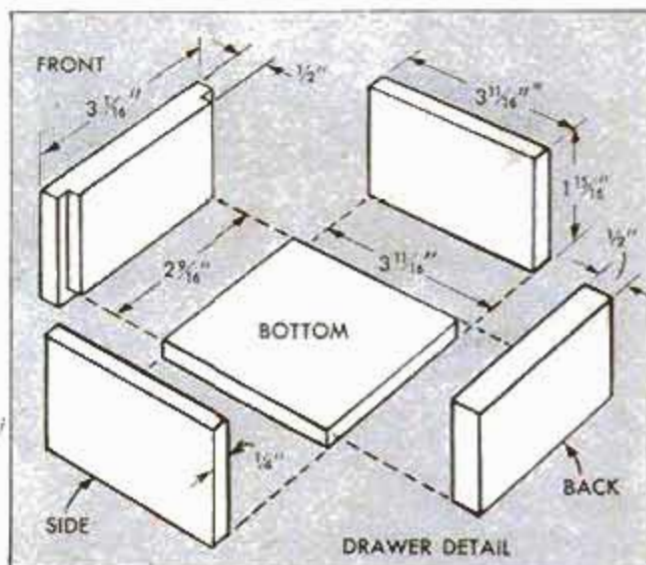
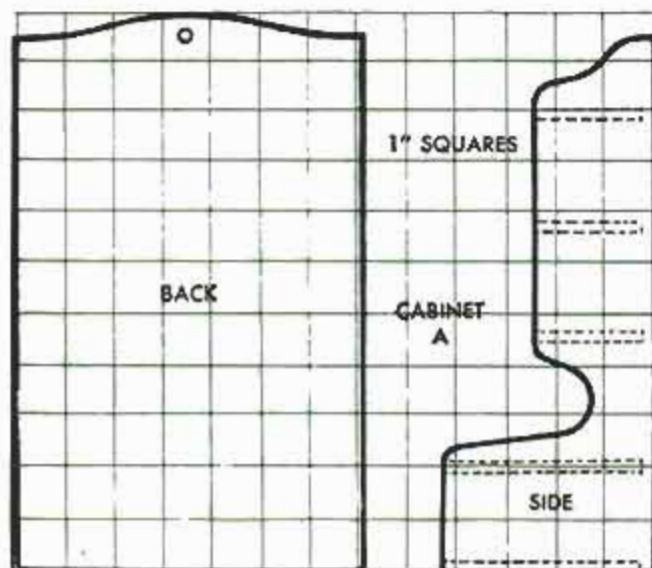
# Spice Cabinets Add Charm to Room

By Don C. Skillman

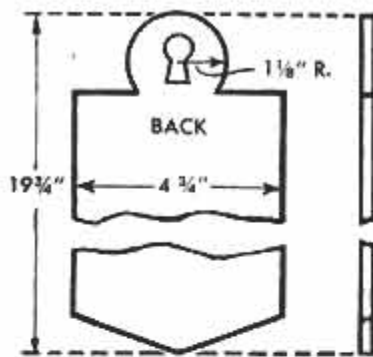
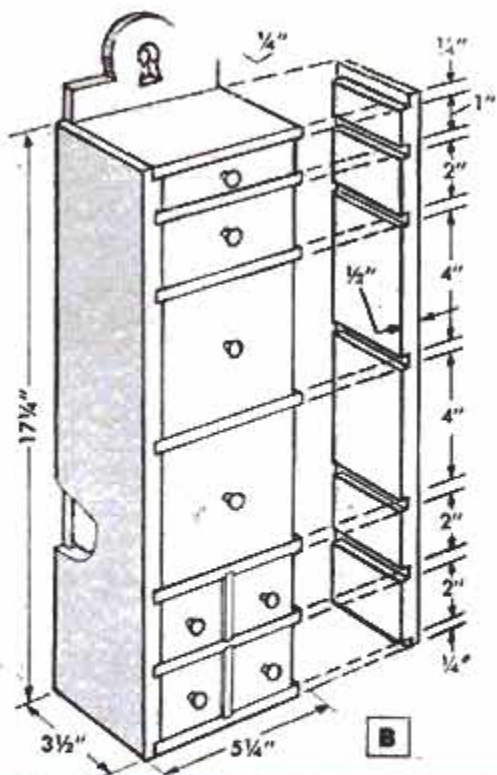
ALTHOUGH MODERN packaged spices have made spice cabinets somewhat obsolete, the charm of these little pieces of furniture has increased over the years. If your home decor is colonial or Early American, the designs of typical spice cabinets, as represented by the three details, A, B, C, are especially appropriate. But even in a modern decor the cabinets make fine conversation pieces, as well as being good showpieces for knickknacks and storage space for small odds and ends.

Patterns for two of the cabinets are made

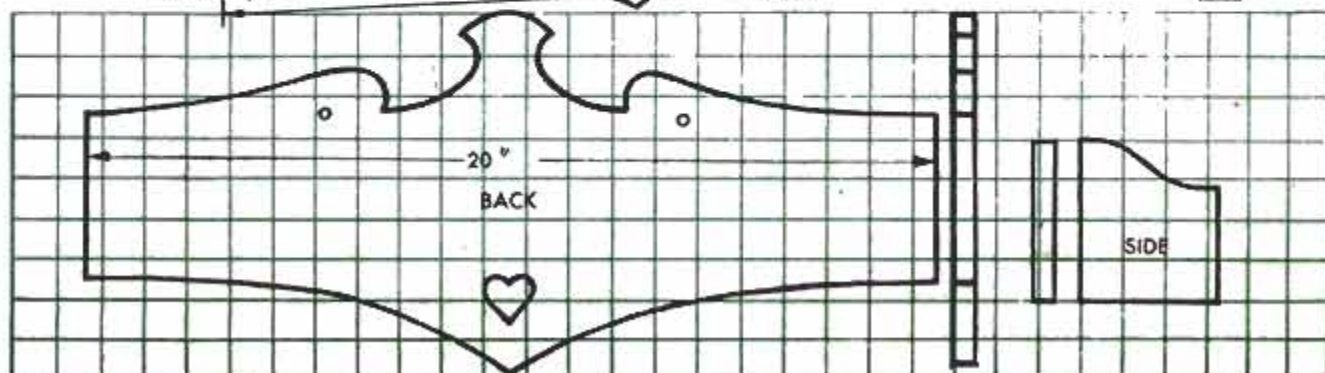
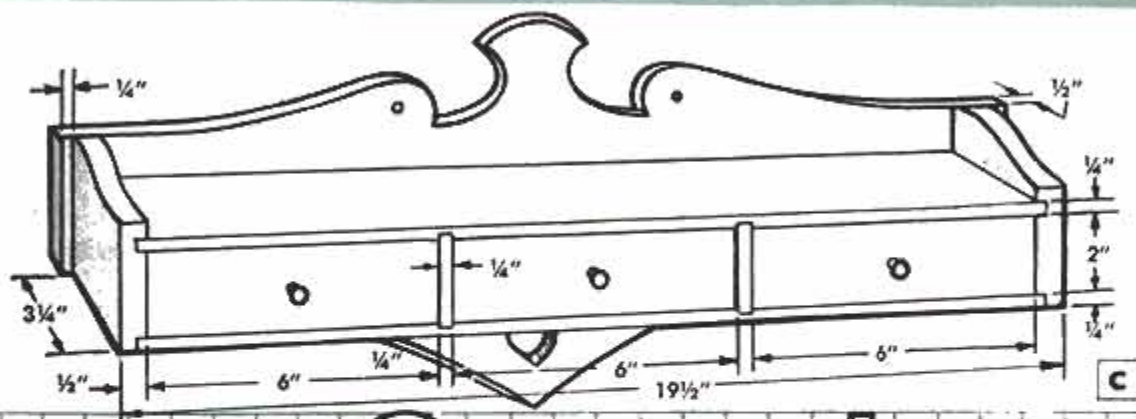
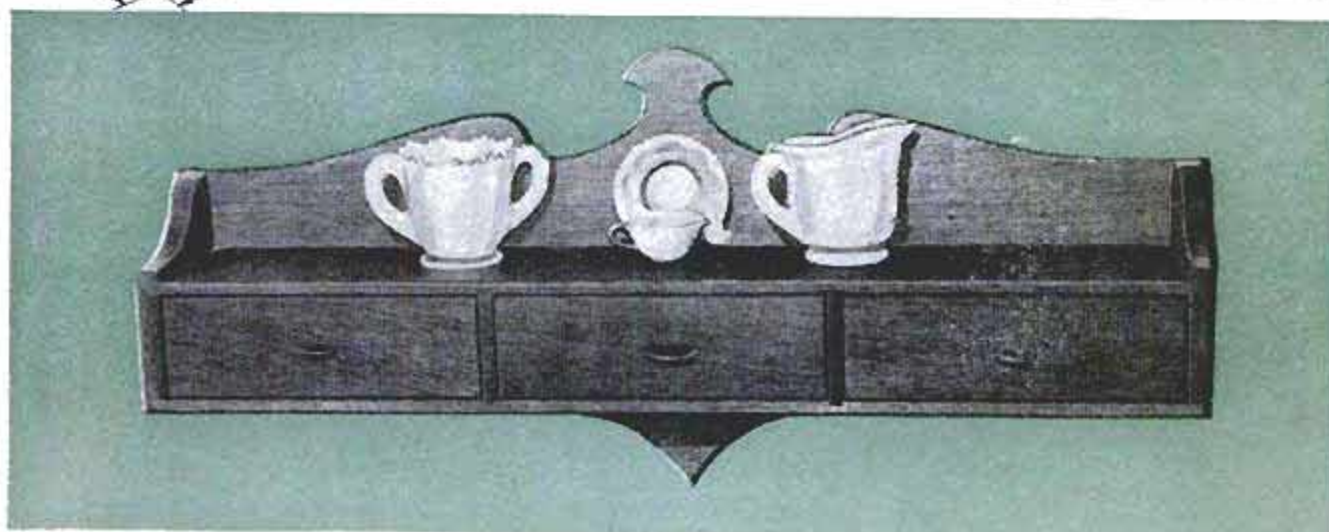
by enlarging the squared drawings, the third cabinet has no curves except for the circular keyholed projection at the upper end of the cabinet back. All joints in the cabinets are glued and nailed with small brads. Use care when cutting the small pieces for the drawers. For greater safety on a circular saw, rip a length of stock to the right width, then "slice" off pieces of the right lengths for the drawer sides and backs. Use the same method for the drawer fronts, cutting rabbets on a length of stock, then cutting it up. ★ ★ ★







Depending on whether your selected wall space is vertical or horizontal, one of the two cabinets on this page will meet your requirements. Horizontal cabinet has more space for knickknacks on its top; vertical cabinet has more drawer storage space. Either cabinet is an attractive and practical decoration



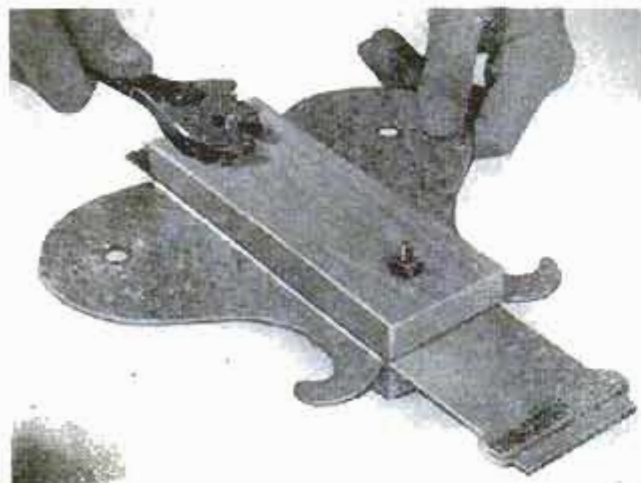


# KITCHEN MEMO PAD

By Bertram Brownold

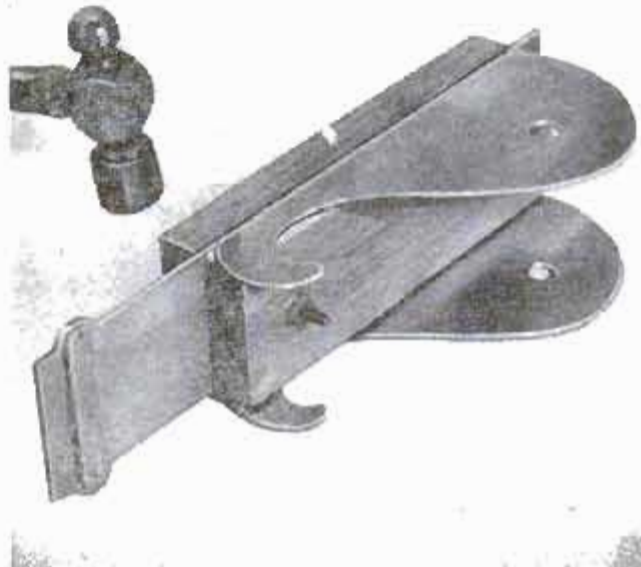
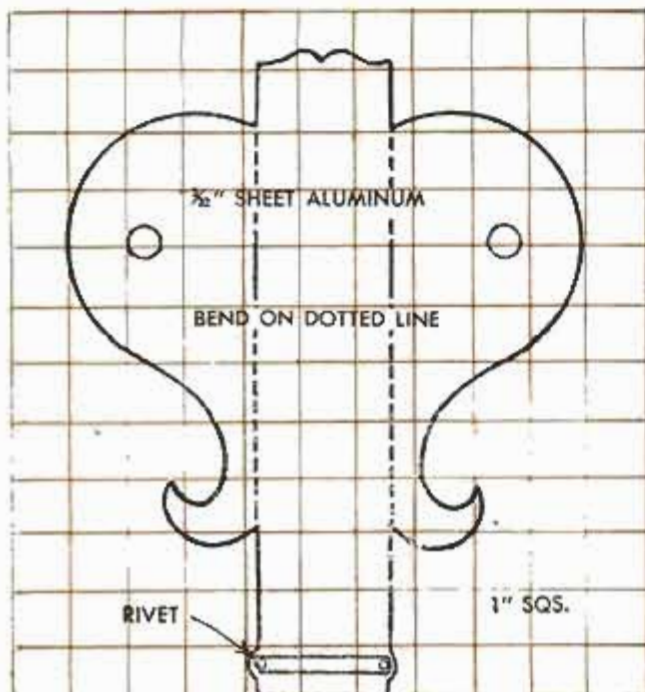


Below, aluminum cutout is sandwiched between two blocks of wood, drilled for bolts and then clamped



HUNTING FOR SLIPS of paper to jot down grocery lists, family notes and other reminders is a thing of the past for the lucky housewife whose husband makes this roll-type memo pad. A 3000-in. roll of adding-machine tape, which rotates on a shaft mounted between two arms of the holder, provides a goodly supply of note paper. Make a full-size pattern from the squared drawing and trace it on a 9 x 12-in. sheet of soft aluminum. Note that both sides of the wing portions of the cutout are given a hammered finish after the aluminum is cut out and before the sides are bent at right angles. A ball-peen hammer is used to produce the hammered dimple finish. Two blocks of wood clamped to the center portion of the cutout by drilling two holes in the aluminum for bolts, permit sharp bends to be made. A brass rod threaded at the ends for cap nuts, serves as a shaft for the roll of tape and makes it easy to refill the holder with a new roll of tape. A strip of flat aluminum is riveted to the holder at the bottom for tearing off the paper. Two small washers under the strip and over the rivets will permit the paper to pass underneath. The upturned scrolls on the sides of the holder form a rack for a pencil. A hanging hole is provided at the top of the holder for attaching it with a screw.

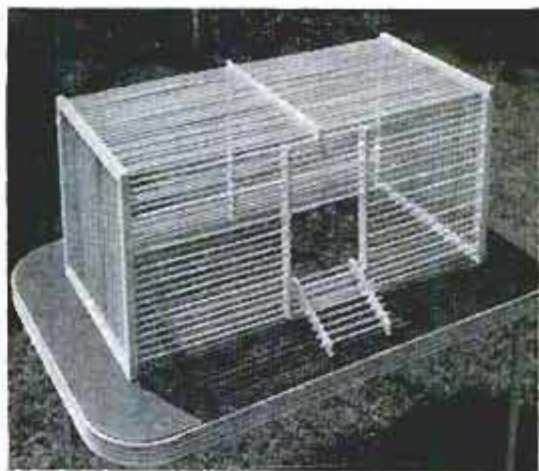
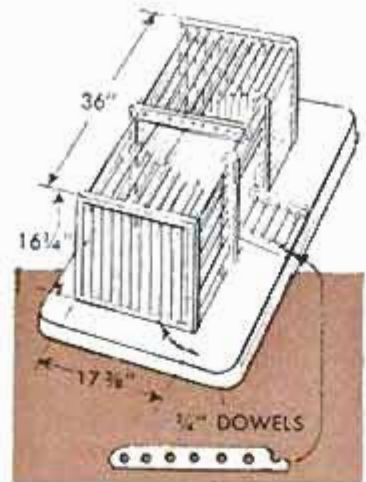
Below, sharp bends in sides of holder are made by hammering metal against wooden clamping blocks





### Supercage for Parakeet Assembled From Wooden Dowels

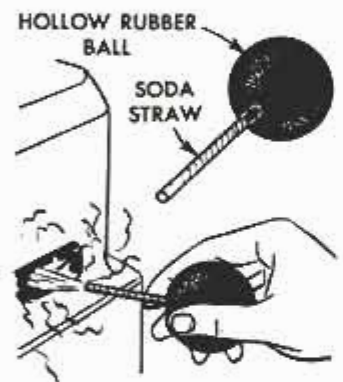
Here is a king-size cage that will let a parakeet or canary flutter about in grand style. It is made primarily from 86 standard 1/4 x 36-in. dowels. Two dowel-fitted end frames are made of 1 x 2s ripped down the middle. Blind holes are drilled 3/4 in. on centers on adjacent faces of the members to receive the dowels. Drilled strips of lattice stock support the dowels at the center of the cage and form a doorway 7 1/2 in. square. The combination door and ladder pivots on a dowel and the slight spring to the dowels



holds it shut. The swing-down door makes it easy for a bird to re-enter the cage when permitted to fly about the house.

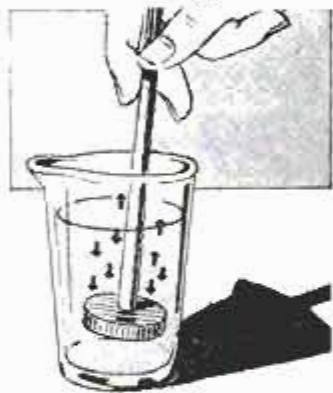
### Miniature Shop "Bellows"

Consisting of a soda straw stuck in a hollow rubber ball, this miniature "bellows" is ideal for blowing dust and dirt from difficult-to-reach locations. Blowing such debris with your mouth always invites the risk of having foreign particles blown into your eyes and causing trouble.



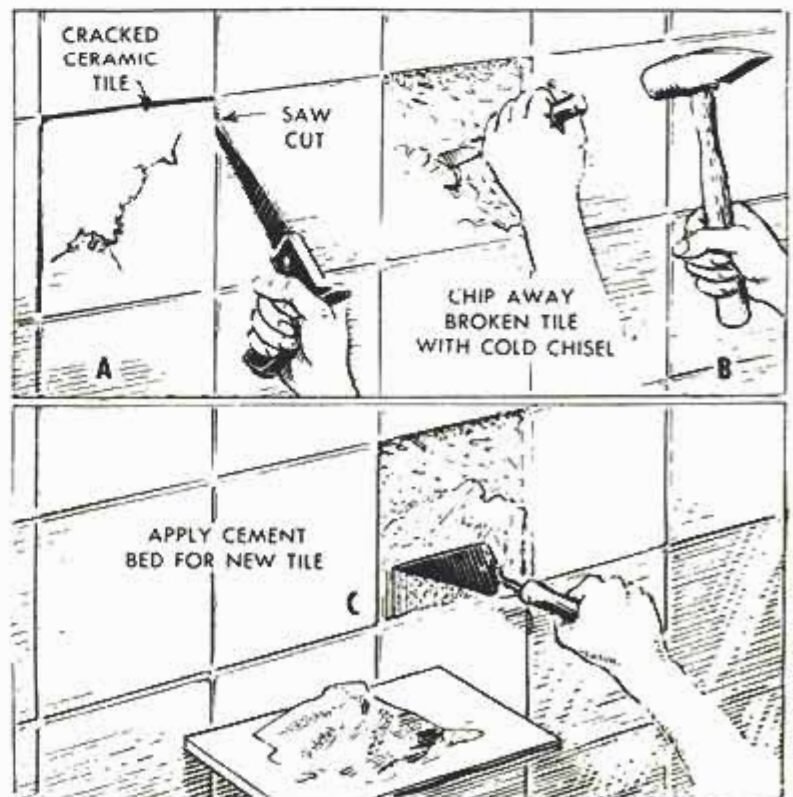
### Faster Photochemical Mixing

For more rapid mixing of photochemicals, use a "piston" rather than a stirring rod. The piston is a plastic disk, drilled and forced onto the end of a plastic penholder. The metal insert in the end of the penholder is removed. When the piston is plunged up and down in the liquid, it creates rapid circulation.

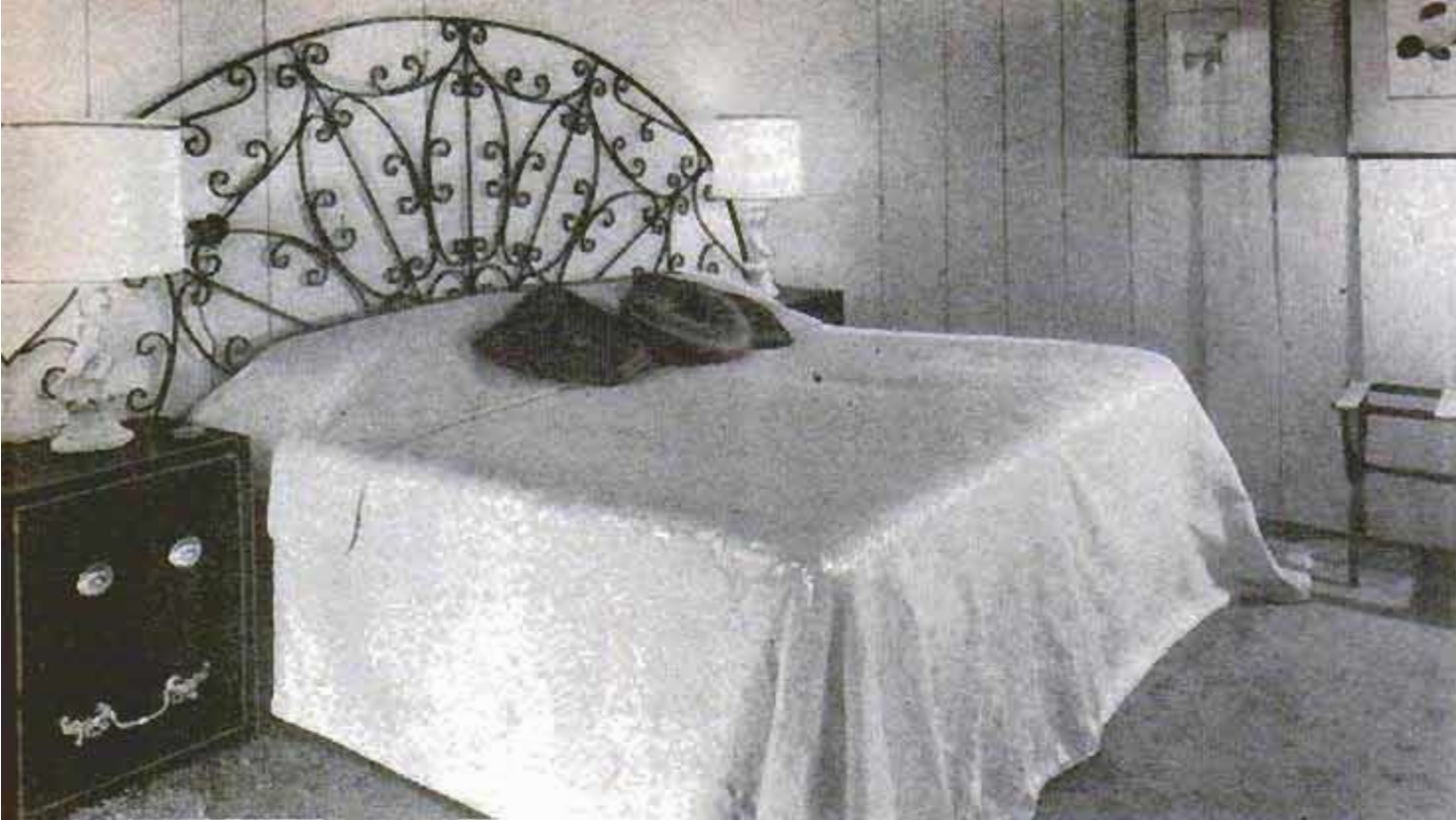


### Replacing Ceramic Tile On Wall or Floor

No special skill is involved in replacing a cracked ceramic tile on a bathroom floor or wall. First, cut a groove in the mortar joint completely around the tile to be removed, using a metal-cutting keyhole saw, detail A. Then chip away the broken tile with a hammer and chisel, starting from the center of the tile, detail B. Avoid hitting or prying on adjacent tiles to prevent damaging them. If the new tile is to be reset in adhesive, it is not necessary to chisel out the old mortar bed. However, this will be necessary if the tile is to be reset in a new portland-cement bed. In most cases, the surface should be completely dry when adhesive is used. For mortar, the old cement must be moistened before applying the new.







Black wrought iron, suggestive of New Orleans and Deep South plantations is used for this headboard

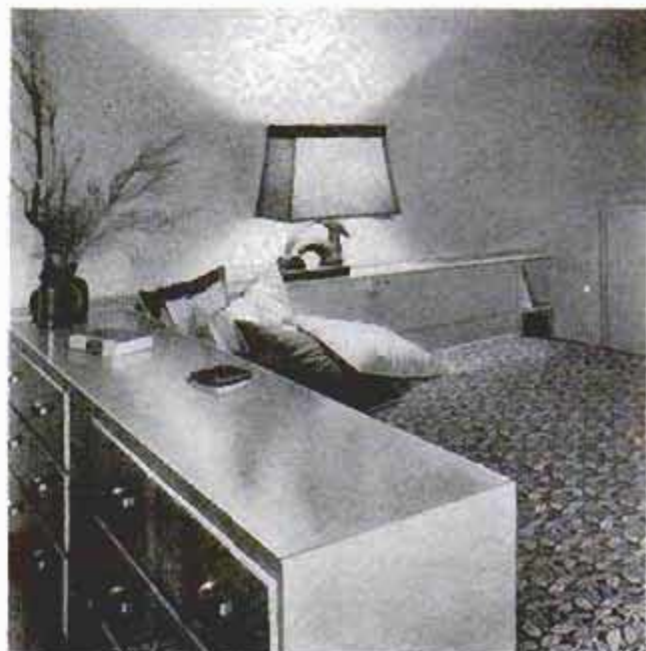
## WTM 59 Personalized Headboards

**D**OWN THROUGH THE CENTURIES, headboards have had a fascination for mankind, reflecting his station in life, his wealth and his superstitions. Kings used a full wall, draped with silks and satins to show their royalty. Hand-carved, jewel-encrusted headboards proved that a man had the wealth to afford such luxuries. And the four-poster with its draperies provided the sleepers with privacy and kept

Colonial is the motif here, maple the wood used in this headboard that has a touch of Early American

out the "dangerous" night air. Even today, headboards can show a facet of a person's personality. Driftwood is for dreamers of a wide expanse of sea and sun-drenched beaches. Frilly materials and soft colors reflect the femininity of the owner. A headboard with lights, bookcase and radio shows a person with a practical mind. On these two pages are shown headboards as individual as the owners. ★ ★ ★

Modern and functional is this headboard, combined with a double dresser to provide an L-shaped unit







Closet and storage space are combined in this wall-sized headboard that includes windows in its design



Framed in alcove, padded white headboard has its feminine look enhanced by pull-back white draperies



Early American is the design, maple the wood, used in this headboard that complements the room's decor



Tailored draperies hung from cornice change this fairly conventional bedstead to interesting headboard

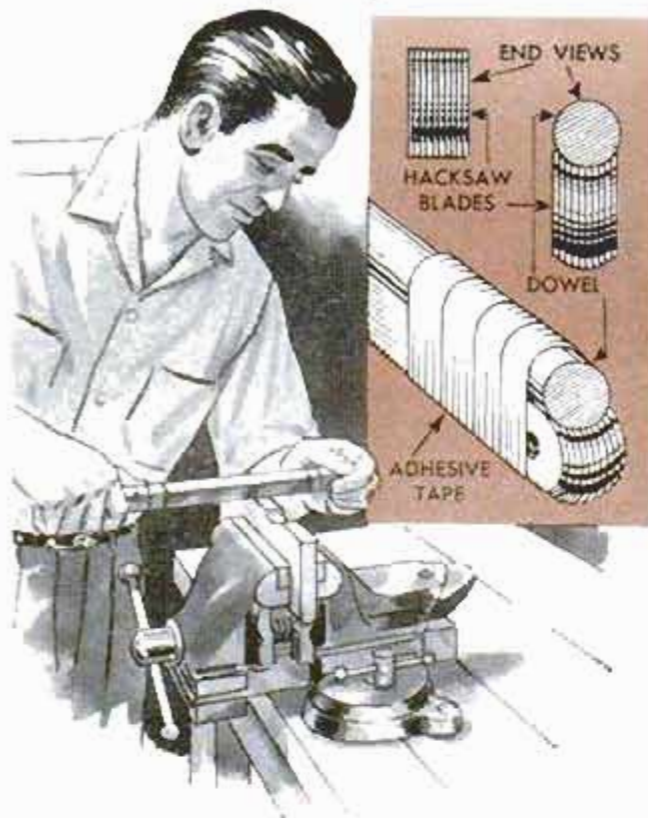
Both headboard and matching picture frame are made of sea-polished driftwood in "skipper's" room

Rustic, but modern in natural finish, this headboard has a scrollwork frame over vertical planks





## Wood Rasp Improvised From Taped Hacksaw Blades



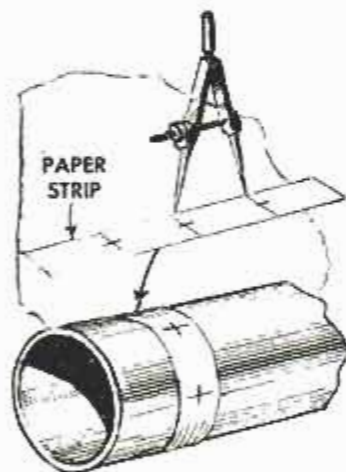
Several hacksaw blades taped together at the ends make an efficient, improvised wood rasp. If the alternate blades are reversed so the teeth point in opposite directions, the rasp will cut in both directions. For a flat rasp, simply tape the blades together. If a "half round" rasp is needed, tape the blades to a dowel as indicated. "Handles" are formed on the rasps by the tape. Make the tape wrappings long enough to provide a comfortable grip.

Frank Shore, New York City.

### Testing Level for Accuracy

If you have a doubt as to the accuracy of a level, here is a quick method of testing it. Tape a sheet of paper to a vertical surface and mark on it along one edge of the level when the bubble is positioned between the marks to indicate it is truly horizontal. Now reverse the instrument end-for-end and mark along the same edge again. If the marks are parallel, the level is true, if not it must be adjusted.

### Marking Locations on Cylinder



Marking the locations of a number of holes to be drilled equidistant on the circumference of a cylinder is done quickly with a strip of paper and a compass. Measure the circumference, using a strip of paper. Then, unroll the paper and step off the proper number of holes with

a compass. Finally, rewind the paper strip on the cylinder and mark off the holes.

### Notched Block Is "Vise"



Finish-filing or rounding the ends of small diameter rods, dowels or pins when they are hand-held is extremely difficult because the object or small part shifts under file pressure. To overcome this problem, use a block of wood with a notch cut in one end and clamped in a vise

as indicated. The object to be filed then is held firmly in the notch and will not shift.

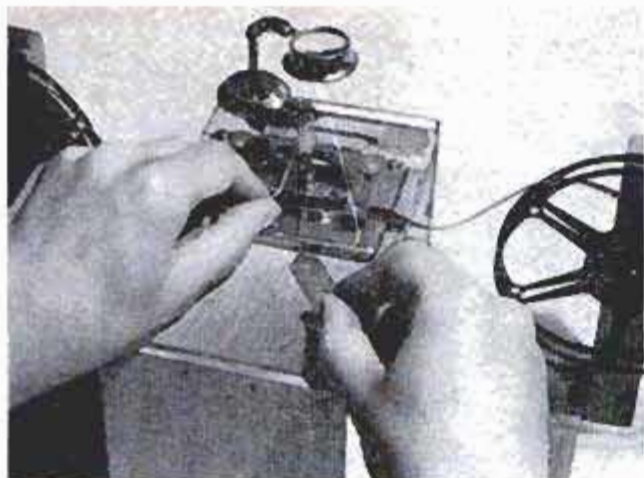
### Talcum Powder Will Remove Fingerprints From Negatives



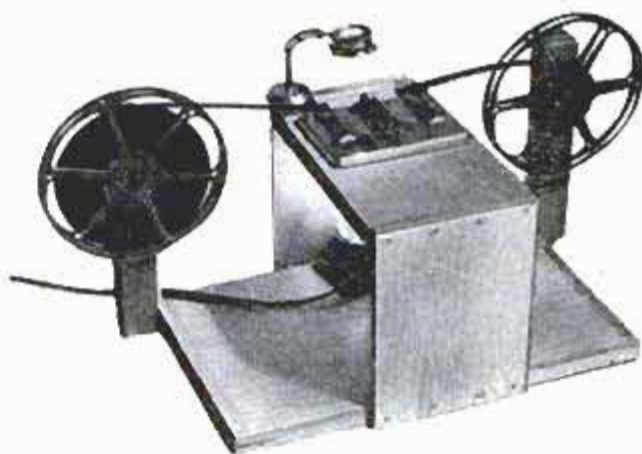
The slightest trace of a fingerprint on a negative can ruin an otherwise flawless print. Where regular film cleaners will not completely remove a stubborn fingerprint, I have found that talcum powder dusted lightly on the negative and rubbed with a bit of cotton will do the trick. This method also works equally well for removing waterspots from negatives. In each case, the important thing to remember is always to work with the film placed on a clean, smooth surface and, of course, to do the polishing on the emulsion side of the film.

Eugene M. Hanson, Los Angeles, Calif.





Main component of editor is film splicer that permits cutting and splicing of film as it is edited

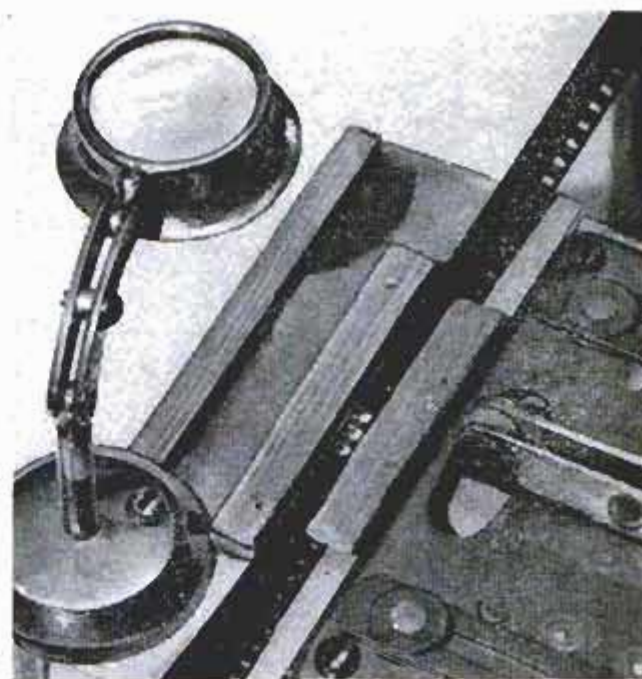


With reels pushed forward on spindles, film then is fitted in slide over light and examined with glass

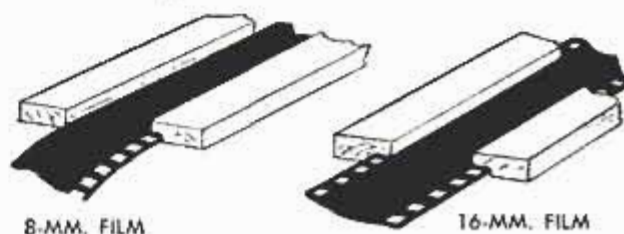
## Low-Cost Film Editor

By Russ Whitaker

IF THERE IS ANY SECRET to making home movies really entertaining and interesting, it is proper editing. When several different subjects are on the same reel—a child at play, people at a party, then an auto race—viewers quickly lose interest because they cannot concentrate on one subject for any length of time. And blank spots in a film are of interest to no one. If cost has kept you from owning an editor, here is an inexpensive unit that can be assembled for the price of a low-cost film splicer, an extra film reel and some odds and ends from the workshop. No dimensions are given as they will vary with the components used. Also, while the unit shown was built to edit 8-mm. film, only slight modifications are required to permit it to be used for 16-mm. film. A surface-mounted porcelain socket is screwed to the plywood base to hold a 10-watt frosted lamp that shines up through a  $\frac{3}{8}$ -in.-dia. hole in the top surface of the editor ( $\frac{3}{4}$  in. for 16-mm. film). The film splicer is screwed to the surface just behind the light opening as shown. Two strips of wood, one with a rabbet on its lower edge, as in the detail, are positioned so that film pulled between them passes over the light. The overhang of the rabbet should not extend past the sprocket perforations in the film. The rabbet helps to hold the film down on the editor, and also shields the sprocket holes so that light does not shine through them. As shown in the detail, two rabbeted strips are suggested when 16-mm. film is edited. However, one strip must be movable to permit the film to be lifted out for cutting and splicing. This movable strip can be held by two screws on which wing nuts are turned for easy loosening. Slots

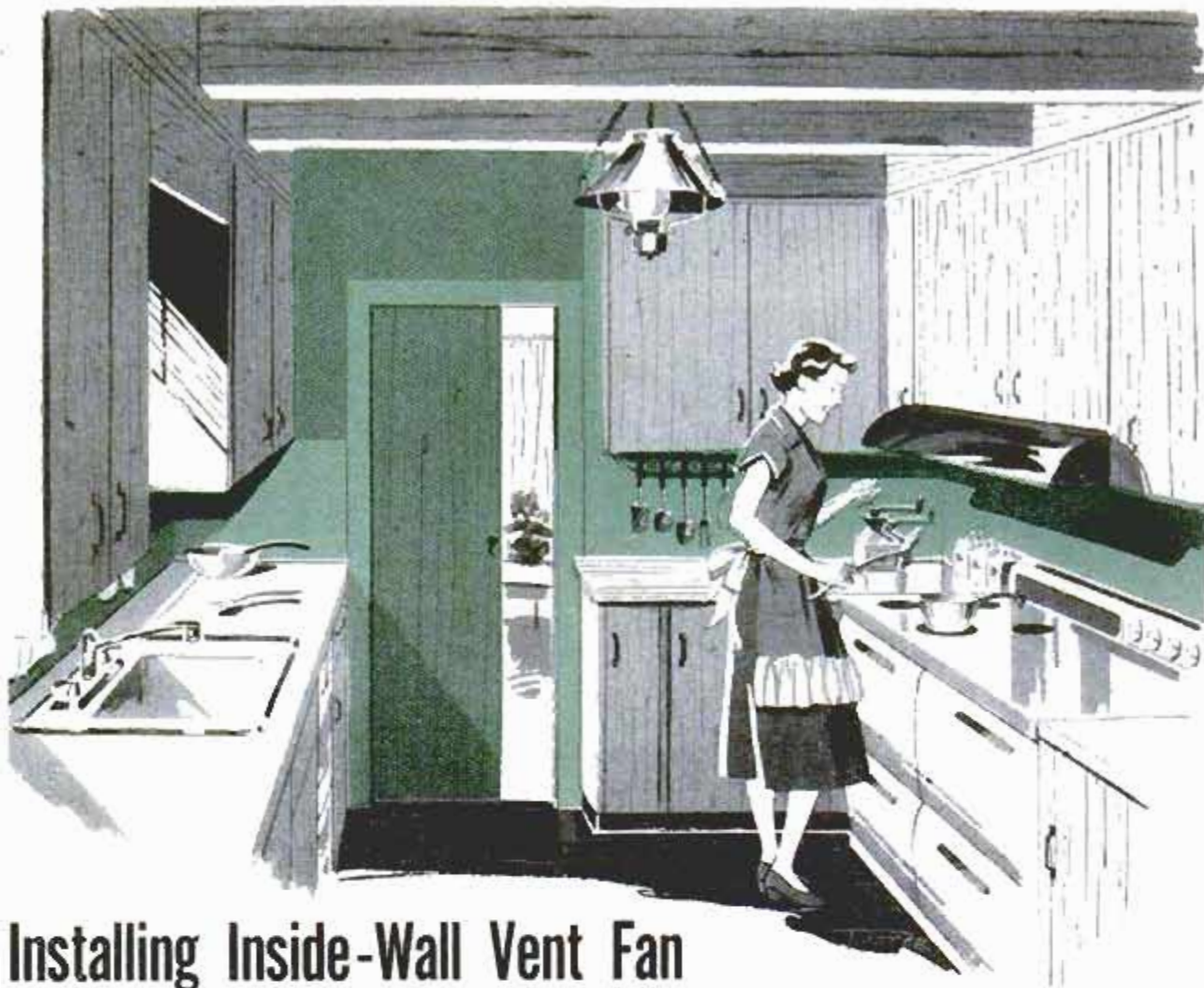


Above, film in slide with light shining through it. Below, two types of slides for two sizes of film



in the editor, under the strip, will allow it to be moved back for removal of the film, then repositioned and held in place when the film is pulled through it. All surfaces of the hold-down strips that contact the film should be sanded smooth so the film will not be scratched. For easier examination of the film, mount an adjustable magnifying glass over the light opening as indicated. The two brackets for holding the reels are fitted with 2-in. machine screws on which the reels can slide back and forth as the film is pulled from the hold-down strips and moved to the splicer.





## Installing Inside-Wall Vent Fan

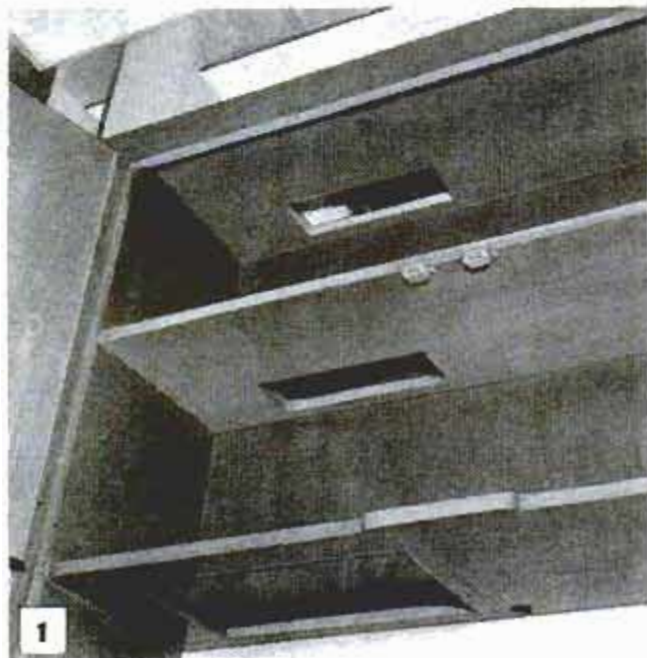
**W**HEN a kitchen range is located on the inside wall of a two-story house, installing a vent fan might seem to be a problem if there is no way of running ducts up between the wall studs. Actually the installation is fairly simple, and also can add

First step in installation is to make cutouts in cabinet shelves for duct. Soffit also is opened

to the appearance of the kitchen. The ducting is routed up through wall cabinets over the range, then through a false ceiling beam to the outside wall. Photographs on this and the facing page give a step-by-step description of a typical installation. ★ ★ ★

Next step, as shown below, is to attach vent hood, complete with fan and motor, to bottom of cabinet

Photos courtesy Western Pine Association



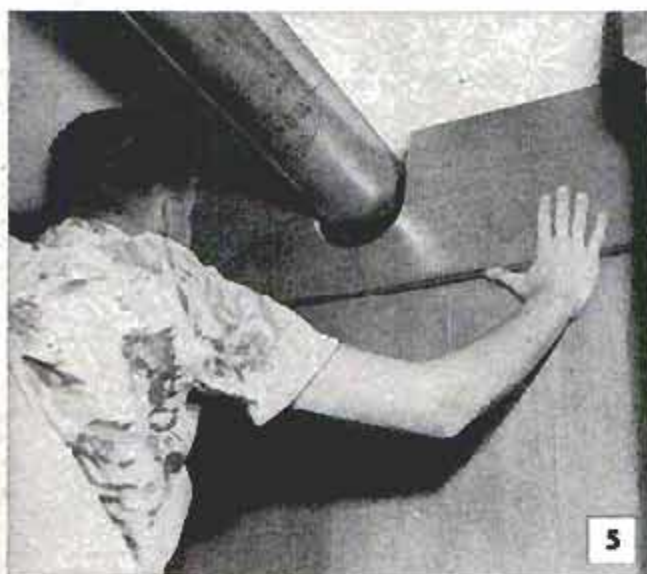




After hood is attached and ductwork run up through cabinet, right-angle elbow is installed in soffit space to route ducting horizontally across ceiling



Installation is now complete up to ceiling. Horizontal lengths of ducting now are fitted and run to opening that has been cut through outside wall



After ductwork across ceiling has been fitted and run to outside-wall opening, soffit face is cut out to accommodate ducting, then is replaced on soffit



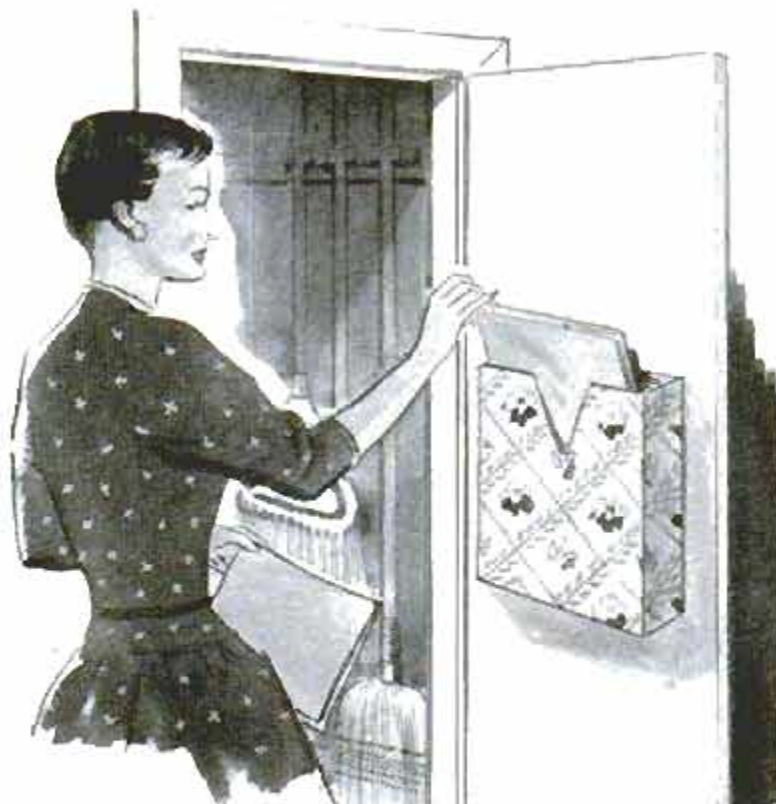
Centered over the horizontal duct, a length of 1-in. stock is nailed to the ceiling to provide a means of supporting the "beam" to be fitted around the duct

Three sides of box that form simulated beam now are nailed around duct. Lower corners of box are mitered so assembled box will appear as solid wooden beam

Before horizontal run of ducting is installed, hole is cut through outside wall. End of duct then is protected by weatherproof louver or other device







## Decorative Receptacle For Lunch Bags

This attractively decorated receptacle, made from a clothing box, is handy for storing grocery bags for later use as lunch bags and other purposes. Attached to the inner side of a broom-closet door, the container remains out of sight yet within easy reach. To make the receptacle, first remove one end of the upper and lower halves of a box of suitable size and cut a V-slot in the front as shown. Then, reinforce all corners with mending tape and cover the exposed sides of the box with gift-wrapping paper. Thumbtacks hold the paper-bag receptacle on the door. It may also be mounted on a pantry wall or other location with clear cellulose tape.—R. M. Woodbury, Natick, Mass.

## Quick Ball-Point Pen Repair

If the retracting mechanism in your ball-point pen fails to extend and retract the point when desired, try this quick repair. Simply remove the ink cartridge and spring and stretch the latter about  $\frac{1}{2}$  in. to provide greater tension on the release mechanism and reassemble the pen. Take care not to break the spring.

John W. Nestler, Tampa, Fla.

## Eliminate Water-Tap Thump

That thump you hear each time a water tap is closed abruptly might be caused by the displacement of air by water in the standpipes of the system. Usually this can be corrected, or at least minimized, by draining the system with all taps open and the main valve closed. Then, close taps and open the main valve.

Burton H. Kleinman, Highland Park, Ill.

## Ornate Cast-Iron Brackets Are Support for Novelty Shelf



Here is an ornate novelty shelf that any one can make in a few minutes. Three cast-iron brackets brazed together at right angles to each other support the shelf top as shown in the photos. For the top, two cut-outs of  $\frac{3}{8}$ -in. plywood are glued together and screwed to the bracket assembly by means of metal clips clamped over the legs of the brackets. To provide a "molded" edge, the bottom cutout is made slightly smaller than the top one. Two brass cornerplates screwed to the underside of the shelf at the back attach the shelf to the wall as shown.—Otto Merker, Chicago.

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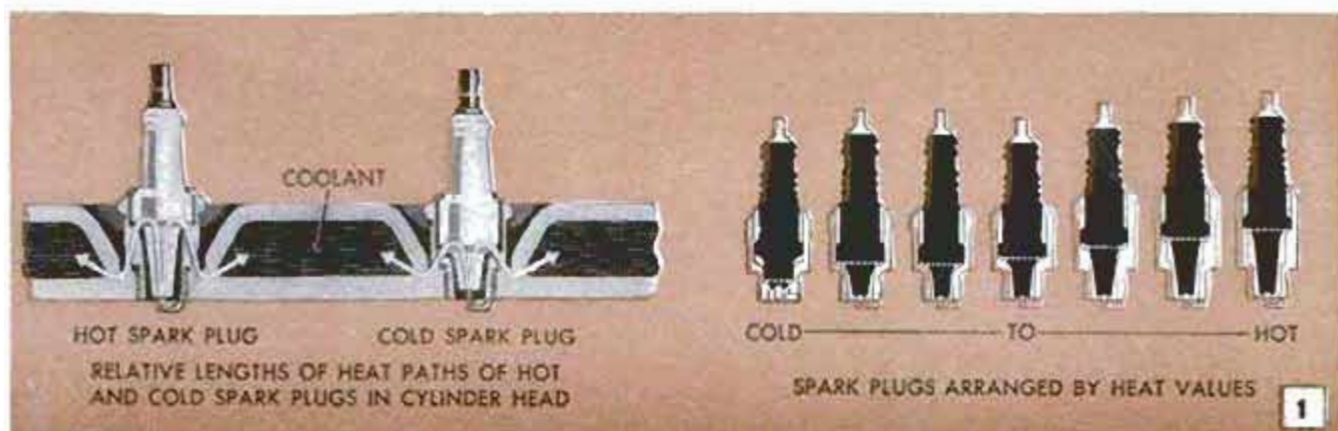
## Spark Plugs Hot and Cold

By Morton J. Schultz

**YOUR AUTOMOBILE ENGINE** will produce maximum performance and economy only when the spark plugs meet a number of conditions. First, they must be the correct plugs for that particular engine. That is, they must be of the right heat range. Then, they must be clean, properly gapped and in good condition. Service stations, garages and auto-supply stores have charts showing the correct type of plug for any engine. The only reason for using a plug of a colder or hotter heat range than that specified is if your driving is done under certain conditions.

The terms "hot" and "cold" spark plugs may seem somewhat confusing, when it is considered that an automobile engine generally is quite hot when it is operating.

Actually, the term refers to the ability of the insulated tip of a spark plug to dissipate heat rapidly or slowly. The difference in the two types of plugs is illustrated in the left-hand detail, Fig. 1. When a spark plug is considered hot, the insulated tip around the electrode is long and the heat must travel farther from the tip of the plug to reach the engine coolant. When a plug is cold, the tip is short and heat reaches the coolant quickly. The right-hand detail in Fig. 1 shows how spark plugs range in type from very cold to extremely hot. Also note that in no case does the insulated tip project below the end of the threaded portion of the spark plug. When a spark plug is screwed into the head of an engine it becomes, in effect, a part of the combustion







**2** When removing wires from spark plugs, grasp connectors to prevent loosening connectors from wires



**3** Use proper spark-plug wrench to avoid damaging plug removed, as well as porcelains of adjacent plugs



**4** After plugs have been loosened, clean dirt from around plugs, so that it does not fall into cylinders



**5** To check on condition of each cylinder, fit plugs into drilled block, numbered to match engine cylinders

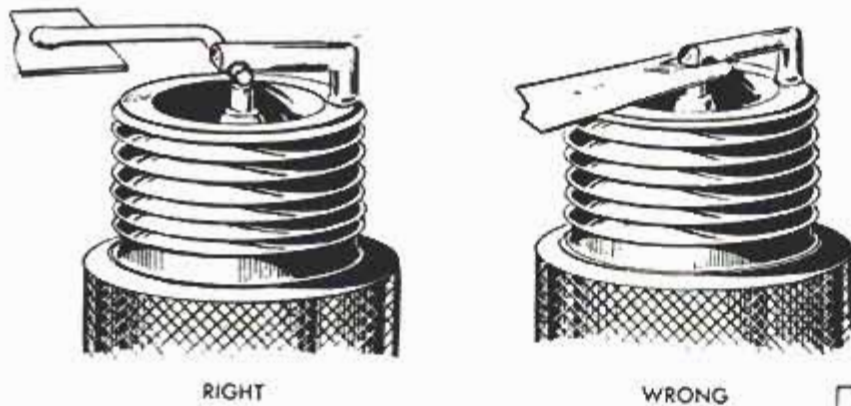
chamber. Should it project into the chamber, it would immediately become glowing hot and would burn away in a short time. This is the reason that spark-plug gaskets must always be used. Without a gasket, a plug will extend too far into the combustion chamber and cause a change in the spark characteristics designed into the combustion chamber.

When combustion-chamber temperatures are relatively low, the longer lasting heat of hot spark plugs assures complete combustion. Thus, hotter plugs should be used when a car is consistently driven at low speeds around town, if much stop-and-start driving is done, or if the car is operated in abnormally cold areas. Examination of the spark plugs after a few thousand miles of driving will tell you if you need hotter plugs. Details A, B and C in Fig. 7 show three conditions that can result from plugs that are too cold. Detail A is an extreme example, showing what happens when a car is driven only on short trips where the engine never reaches operating temperature. This condition also will occur when worn piston rings allow an

excess amount of oil to be forced into the combustion chambers. Hotter spark plugs will help prevent fouling due to this latter condition, but the only genuine cure is to have new rings installed in the engine. Details B and C in Fig. 7 are various degrees of the same problem encountered with much slow driving, and where a hotter plug would be an aid to more efficient operation.

The opposite conditions and problems occur when a normal plug is too cold for the type of driving done. If a car is driven almost constantly at high speeds, pre-ignition may occur. This condition is caused when the spark-plug tip remains hot enough to cause the fuel-air mixture entering a cylinder to ignite before the plug fires. Sometimes incorrectly called "spark knock," pre-ignition can seriously damage an engine if allowed to continue for any length of time. (True spark knock occurs when a distributor is adjusted for too much advance, and ignition occurs before a piston reaches top dead center. The reaction and results, however, are similar to those of pre-ignition.) Colder plugs are





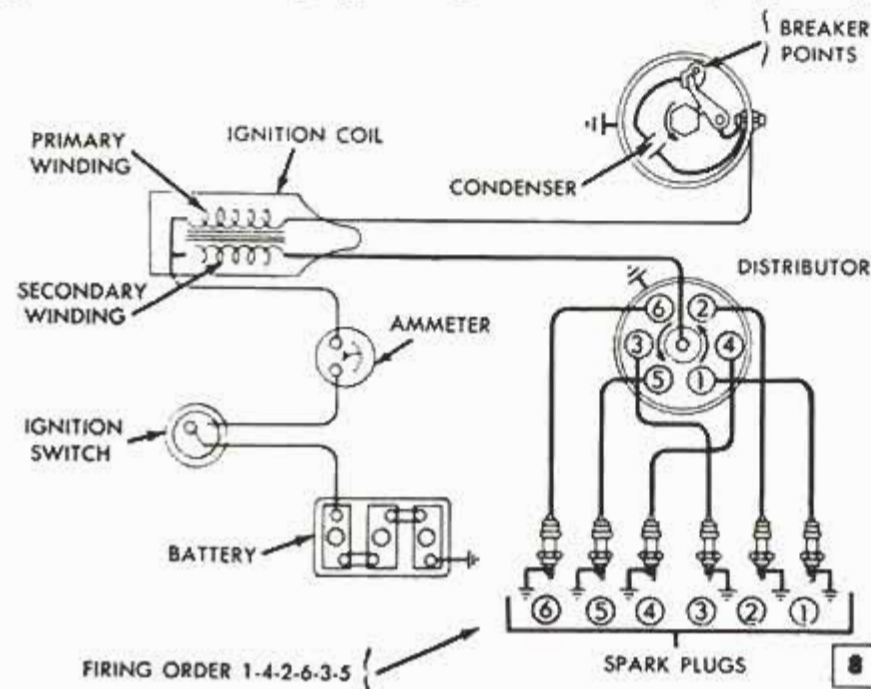
6

Exaggerated drawing shows reason that round feeler gauge is more accurate than a flat one when adjusting gap of used spark plugs

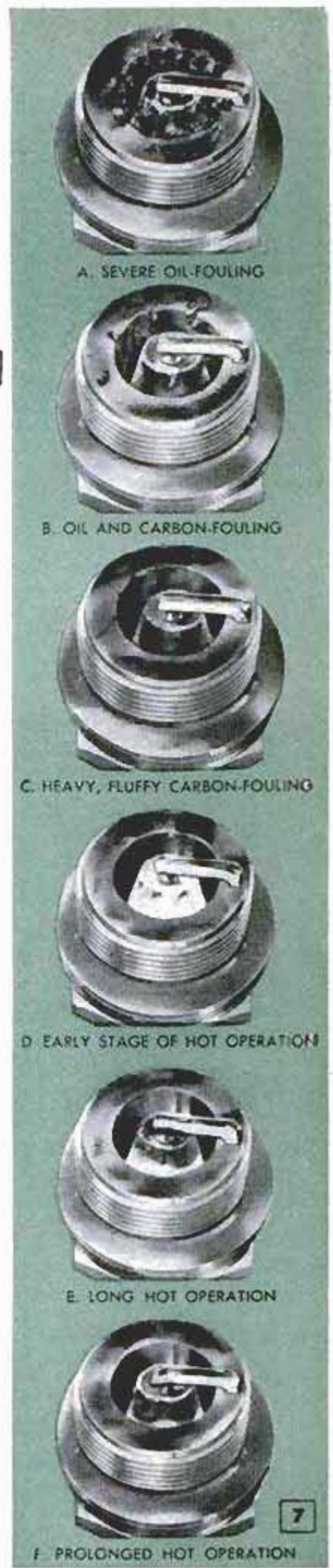
indicated in cases of preignition. If examination of the spark plugs in your engine discloses the tips to be white, blistered or burned, as indicated in details D, E and F in Fig. 7, the plugs should be replaced with a set with a colder heat range. The need for colder plugs also occurs when a car is driven mostly in abnormally hot areas, or when much hill or mountain driving is done. Under these latter conditions any automobile engine will operate at higher temperatures, and preignition occurs readily.

In all conditions where a colder or hotter plug seems indicated, use a plug only one range colder or hotter to avoid going to extremes. If there is any doubt as to whether a colder or hotter plug is required, take your car to an experienced mechanic. He can tell quickly what type of plug is needed.

If you clean and regap the spark plugs yourself, there are several precautions to be observed when removing and installing them. Figs. 2 through 5 show the steps in removing the plugs. To remove the wires, grasp the connector when possible rather than the wire, to assure that the wire is not loosened in the connector, Fig. 2. Use a spark-plug wrench or deep socket, Fig. 3, to loosen the plugs. Do not use an open-end or box-end wrench or pliers to remove a plug. The porcelain of the plug being

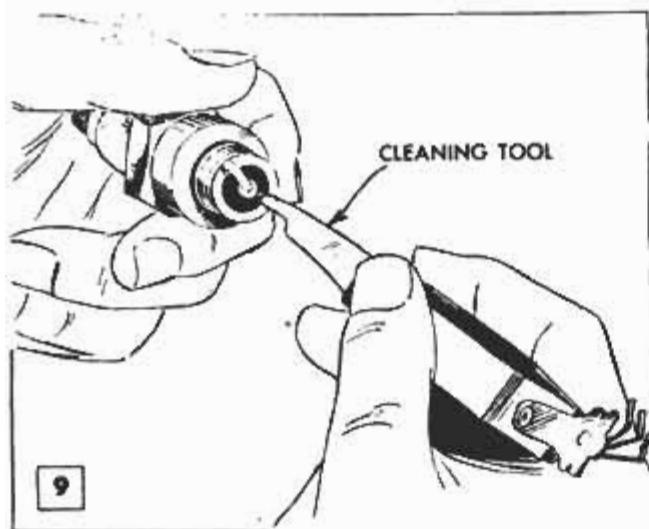


8



7





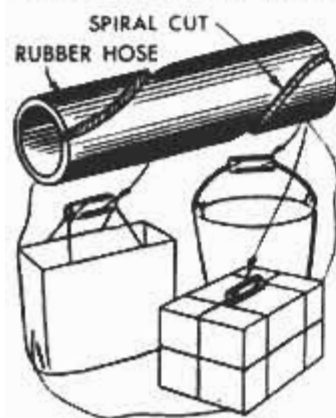
removed, or the porcelain of an adjacent plug, may be damaged. When the plugs are loosened, use compressed air, if available, to blow loose dirt from the spark-plug depressions in the engine head. If no air is available, use a cloth or a dry paintbrush to clean the depression. Then remove the plugs and fit them in a block of wood drilled to receive them. Number the plugs to correspond with the cylinders from which they were removed. Examination of the plugs then can tell you which of the cylinders is pumping oil, or otherwise malfunctioning. If a plug from one cylinder seems to be missing, although it appears to be all right, and then is switched to another cylinder where it continues to miss, you know it is the plug rather than the cylinder that is at fault. A malfunctioning spark plug must be replaced.

When a feeler gauge is used to regap plugs, Fig. 6, a round gauge is best. As shown in exaggeration in the left-hand detail, the ground contact burns away in

the area of the spark in a somewhat semi-circular fashion. When a flat gauge is used, it contacts the flat, unburned surface of the ground electrode, and the actual gap then is too wide. This precaution refers to plugs that have been in use. New plugs can be set with a flat gauge. When plugs are removed from an engine, they should be placed in a container of gasoline or other solvent to remove any oily film on the porcelain body, and wiped dry. The film on the porcelain may absorb moisture and cause a plug to short out. Any oil on the lower end of the plug also will be removed. Sandblasting machines will clean the insulated tip of a plug, but a cleaning tool, such as shown in Fig. 9, also should be used to dig out any carbon or compacted oil. In some cases, sand grains from the sandblaster will become embedded in the compacted oil in a plug, and later drop into the cylinder when the plug is reinstalled in the engine. The sand can cause scoring of the cylinder walls and damage to the valve seats and faces, and possibly to the main and connecting-rod bearings.

When new plugs are installed in an engine, or the old ones are cleaned and regapped, new gaskets should be used. Also, new distributor points should be installed. As shown in the diagram of a representative ignition system in Fig. 8, the spark plugs are at the end of the system, and any ignition component not operating properly will affect plug operation. Distributor points that are burned and pitted will cause spark plugs to misfire. When new points are installed, you can be sure that any plug that misfires is malfunctioning in itself, or because of some trouble in the cylinder. ★ ★ ★

### Improved Carrying Handle From Rubber Hose



Lengths of rubber hose, temporarily slipped over the handles of pails, shopping bags and cord-wrapped packages to afford a more comfortable grip, will stay in place more easily if they are cut spirally. Grips so cut do not

tend to slip off cords or bails during use, and thus defeat their purpose, like those that are cut straight across. For a permanent grip, wrap the hose with a few turns of tape.

### Fishing Float on Address Tags Prevents Pulling Out



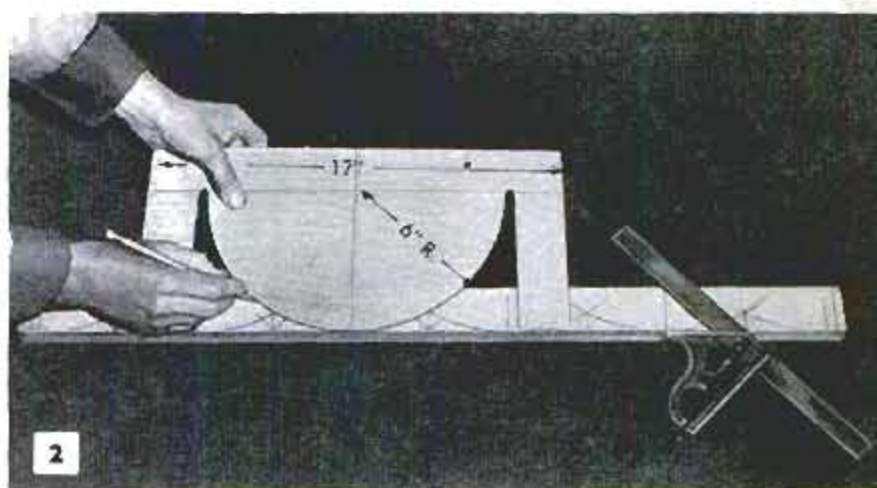
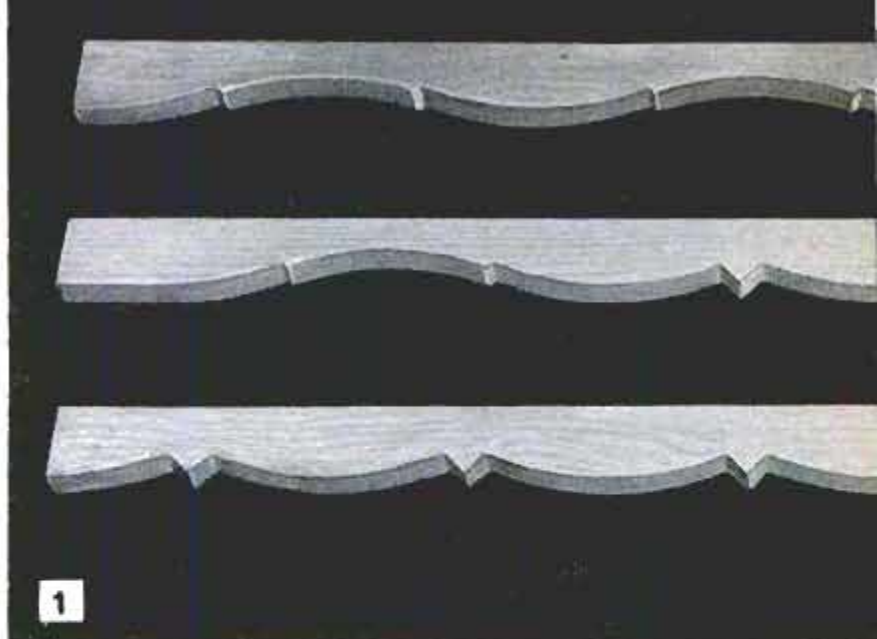
If you use a two-tag address method for mailing laundry, one tag being enclosed in the case, and the other exposed to show the address, a cork fishing float can be used as an aid to assure prompt delivery. The connecting twine or wire between the tags is inserted through a hole in the float. The cork prevents the inside tag from being accidentally pulled out of the case and lost.



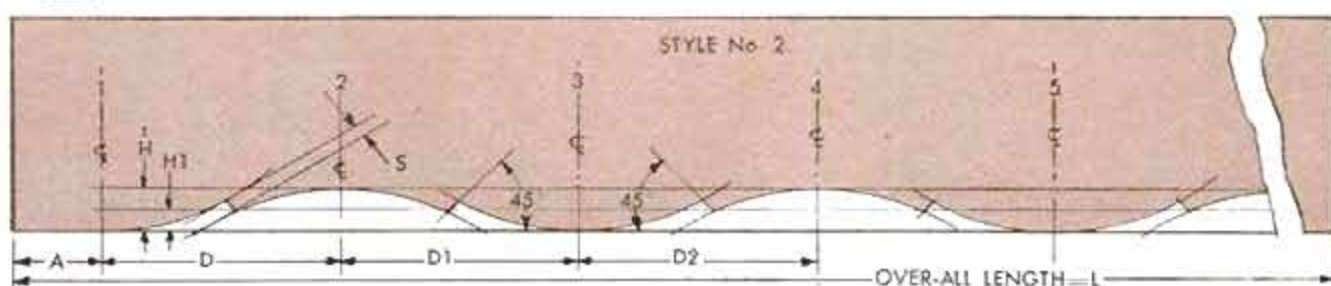
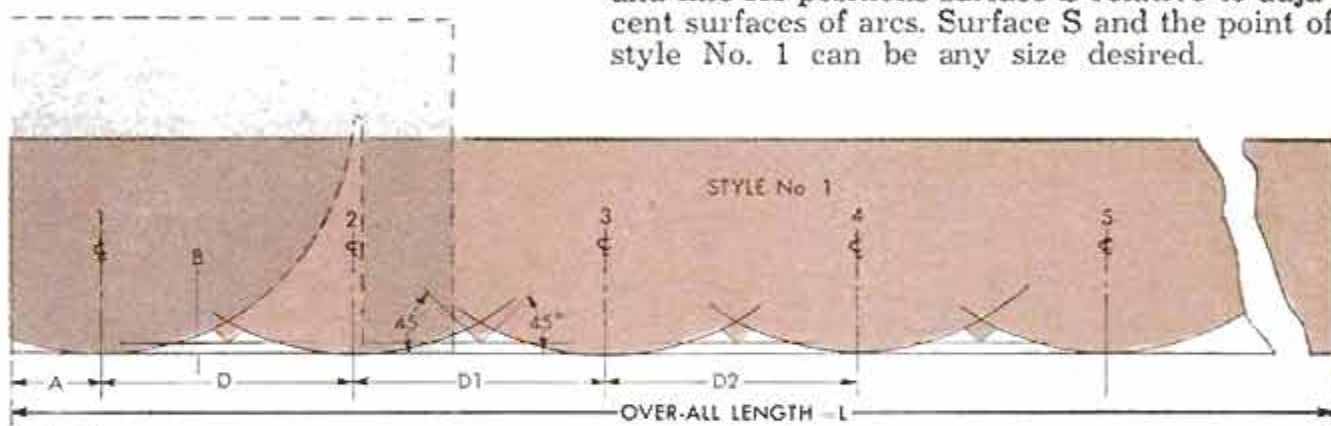
# Layout Template For Scalloped Trim

MAKING SCALLOPED trim for valances and kitchen cabinets is easy for W. G. Tilsher of South San Gabriel, Calif., who uses a template as in Fig. 2, to scribe the desired design on stock that is to be scalloped. The same template is used for all three designs or styles shown in Fig. 1. Templates with larger or smaller radii may be used to create a variety of distinctive scallop designs.

Templates are cut from  $\frac{1}{8}$ -in. plywood as indicated in Fig. 2. The first step, before scribing any design on stock to be scalloped, is to divide the length of it by the radius of the template used to obtain the number of equal spaces into which the piece is divisible, as D, D1, etc., Fig. 3. The remainder, if any, is divided by two for dimension A, which centers the scallop pattern on the stock. Should the remainder be greater than 3 in., subtract from the divisor or add to it an amount not to exceed 1 in. After center lines 1, 2, 3, etc. are drawn on the stock, style No. 1, the template is placed on the center lines, one at a time, and the arcs that form the scallops are scribed as indicated. The 45-deg. angles that form the points between the arcs are drawn with a combination square as in Fig. 2. A line drawn parallel to the edge of the stock determines the size of the points.



The procedure for outlining the scallop, style No. 2, is the same as for the first one, except that the template is reversed for the second arc. Line H determines the positioning of the inverted arc and line H1 positions surface S relative to adjacent surfaces of arcs. Surface S and the point of style No. 1 can be any size desired.

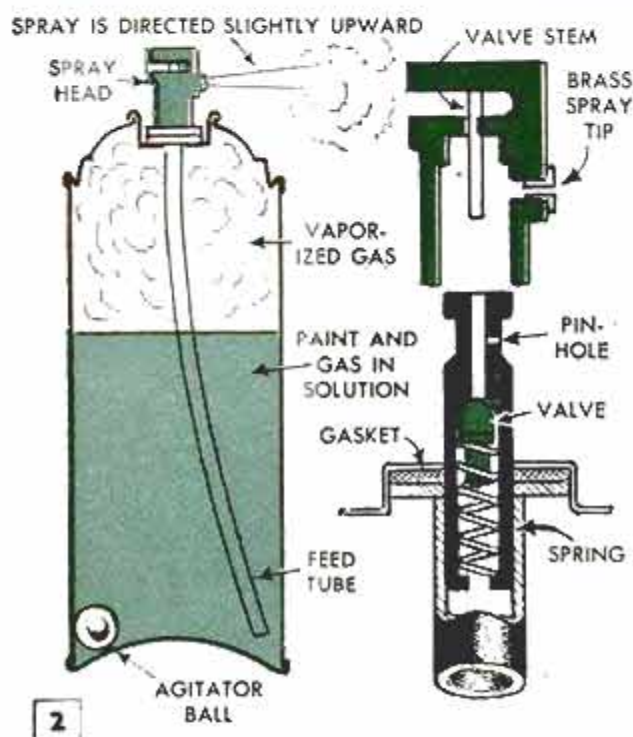




# PUSH-BUTTON



IF YOU LIKE push-button magic, you'll enjoy doing touch-up and small painting jobs with pressurized spray paint. Lacquer and enamel paints are made in a variety of colors, finishes and brands and sold in handy 12 and 16-oz. cans, Fig. 1. Also available, are clear and opaque plastics, lacquers and varnishes that are ideal for spraying photographs, drawings, flowers, electrical circuits and other objects with a protective film to guard against moisture and dust damage. Any child can paint with the cans, and, with a little practice, you can turn out first-class professional work.



This is how most types of spray cans work: The main body of each can is pressurized with a liquid gas, usually Freon or Genetron. The gas vaporizes and develops a pressure of about 30 lb. per sq. in., forcing the liquid up the feed tube, ready to be released at the touch of your finger. The liquid gas in solution with the paint contributes to atomization by giving the paint particles a kind of explosive action, producing a fine mistlike spray. The gas itself is harmless, vaporizing instantly on exposure to air. Fig. 2 shows a typical valve and spray head, although there are numerous variations. The spray head itself can be removed for cleaning.

The table, Fig. 3, gives data on some of the various products available. The clear acrylic solution contains no pigment and

3 TYPE OF PAINT	GENERAL USE	WORK DISTANCE	DRYING TIME	APPLICATION AND REMARKS
CLEAR ACRYLIC	CLEAR PROTECTIVE FILM FOR ALL METALS. ALSO GOOD FOR DRAWINGS, MAPS	10 TO 16 IN.	5 TO 10 MIN.	One coat covers. Have work well-lighted so that you can see the transparent coating. Spray a full wet coat. Work should be 70° F. or warmer to prevent clouding. Wipe polished metal with cleaner before spraying
METALLIC	FOR ANY SURFACE WHERE A GOLD, COPPER, ALUMINUM OR CHROME FINISH IS DESIRED	10 TO 14 IN.	10 MIN. TO 1 HR.	Usually covers in one coat. Paint must be sprayed wet to avoid chalking (rubbing off when dry). Some brands and a few types will chalk slightly even though applied correctly and are suitable only for work that is not to be handled
LACQUER ENAMEL	FOR TOUCH-UP OR COMPLETE FINISH. WIDE VARIETY OF COLORS, BLACK AND WHITE	8 TO 12 IN.	15 MIN.	Dries fast. Low pigment content usually requires two or three coats which can be applied in rapid succession. Most products formulated with nonlifting solvents which are safe over any previous finish including varnish
PAINT ENAMEL	GENERAL PURPOSE PAINT, TOUGH AND DURABLE FOR INSIDE OR OUTSIDE WORK, ALL COLORS	12 TO 18 IN.	1 HR. TO 4 HRS.	Cheapest of the various products. Usually requires two coats, the first coat being a light coat followed by a second, heavier coat in about 10 min. Paint remains tacky a long time and tends to clog spray tip

AVERAGE COST ABOUT \$2 PER 16-OZ. CAN (ABOUT 1/2 PINT LIQUID)



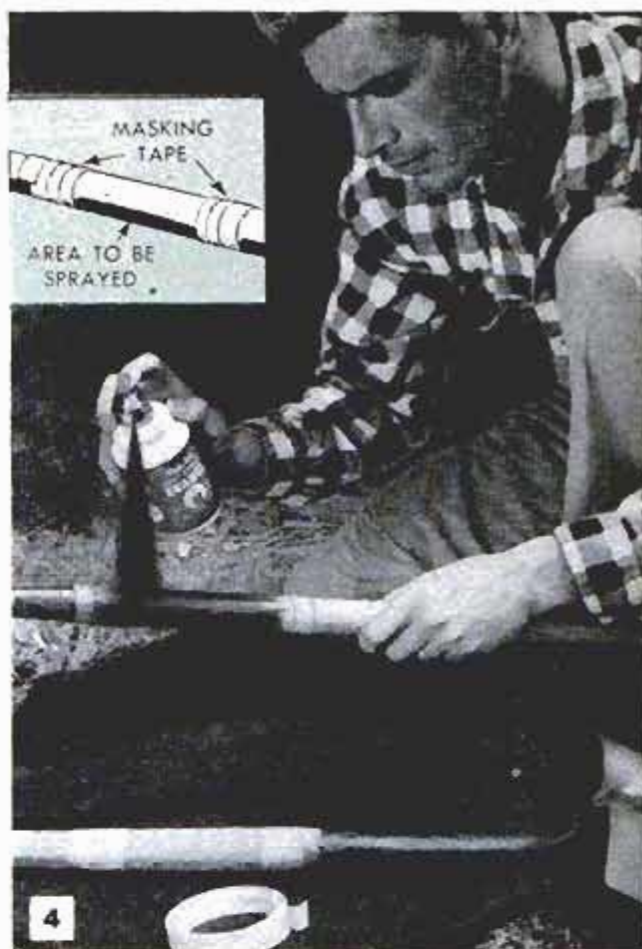
# PAINING

needs no mixing; all others contain a pigment that settles out of solution and requires agitation to mix it properly. The metallics have the most hiding power and will cover most surfaces with one coat. Also, this paint is available in blue, green and red. Metallics should be sprayed wet, since a dry, dusty spray (overspray) of itself causes chalking.

The lacquer products are slightly more expensive than others but have the advantage of fast drying. The least expensive of the various products and also the poorest by virtue of very slow drying, are the paint enamels. However, if you can be patient, the resulting finish is tough and durable. The pigment content of general-purpose paints is very low and will not cover in one coat. The correct procedure for applying these products is to spray a fine coat at 15 to 18 in. from work. Allow 10 min. for this to dry and then apply a second, heavier coat at about 12 in. from the work.

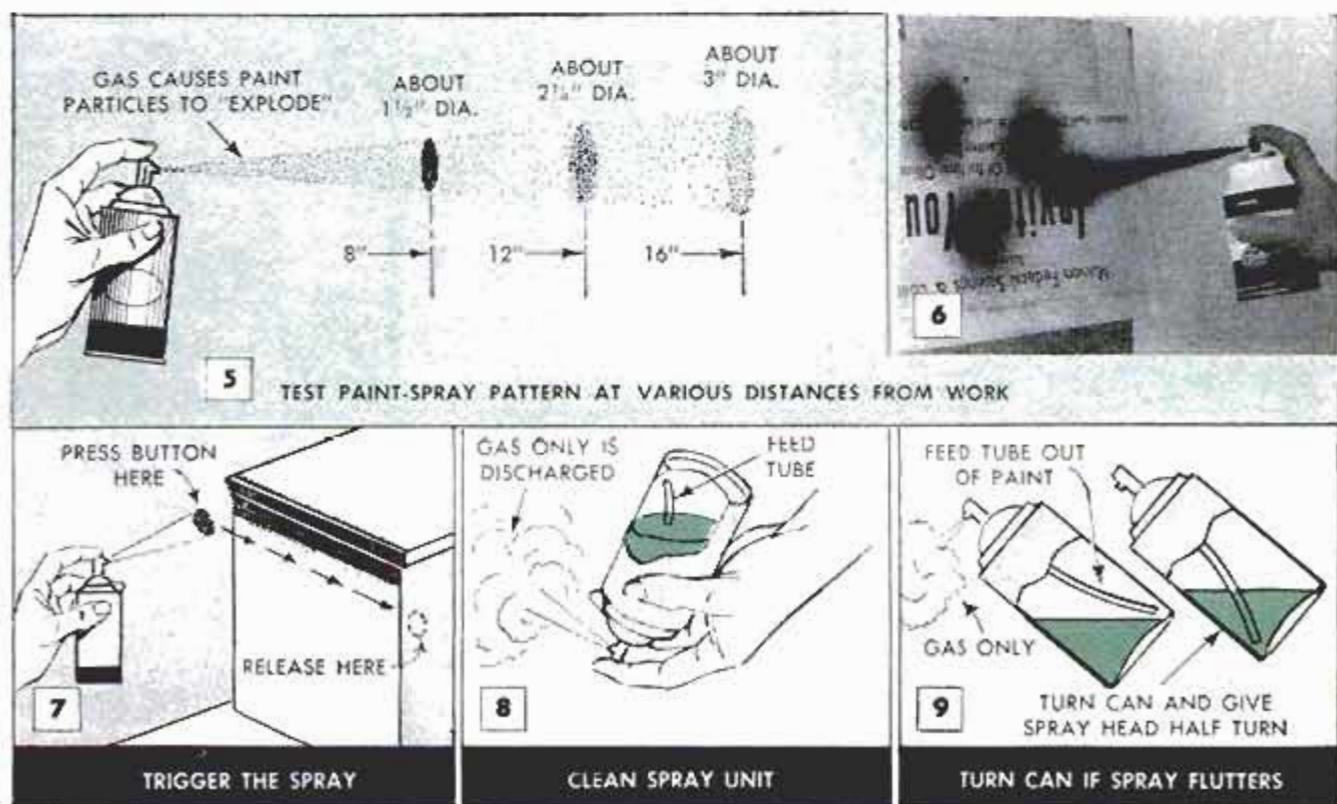
Spray concentration for various working distances is shown in Figs. 5 and 6. The minimum working distance is 8 in., since this space is needed to let the gas escape from the paint which otherwise would erupt, causing pinholes.

As far as spraying technique is concerned, the main idea is to get the paint on—you'll learn by practice. For most work, the spray should be constantly trig-

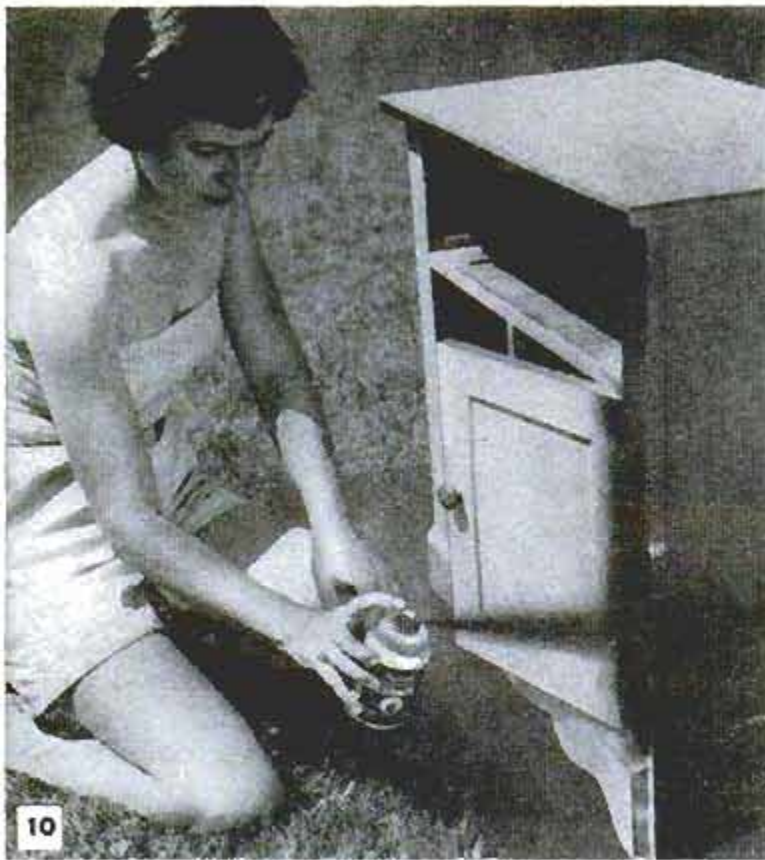


Color bands sprayed on tool handles preserve wood, remind forgetful neighbor to return borrowed tools

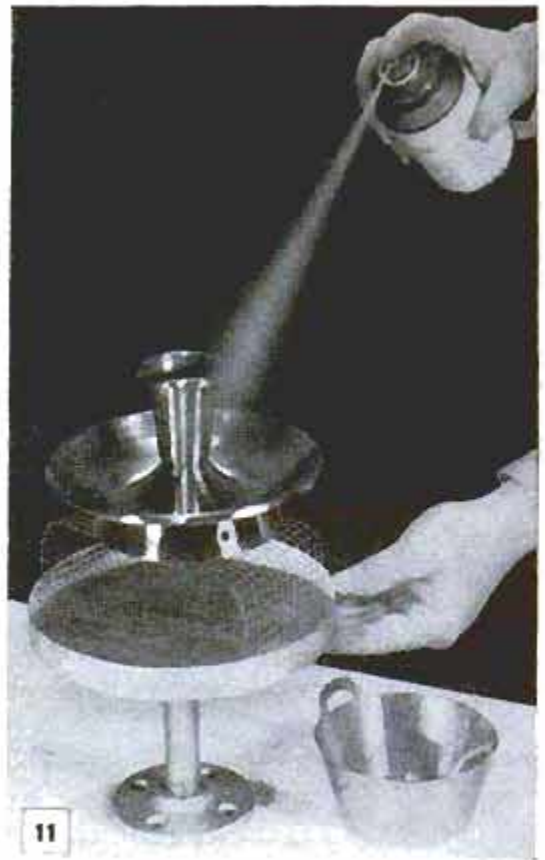
gered so that you start and end the spray stroke off the work, Fig. 7. Edges should be sprayed with an oblique stroke, Fig. 10, that covers part of the adjoining surface. You then minimize overspray by starting







10 Edges are sprayed with oblique stroke that covers part of adjoining surface to reduce overspray when painting flat surface



11 Mesh of hardware-cloth support prevents overspray from being deflected onto work

and stopping spray strokes just inside the edges when doing the flat surface. All flat surfaces should be sprayed by starting at the near edge, letting the overspray drift forward on work not yet coated as in Figs. 12 and 13.

### Avert Clogging of Tip

After every job, invert the can and depress the button three or four times until you hear the hissing sound of gas only being discharged, Fig. 8. Add to this the simple precaution of wiping the spray tip and you will seldom be bothered with clogging. If the spray tip appears to be clogged, remove the spray head and push a fine wire through the spray hole. If the can has a valve, such as the one shown in Fig. 2, also clean the small hole in the valve body. Spray heads can be switched from can to

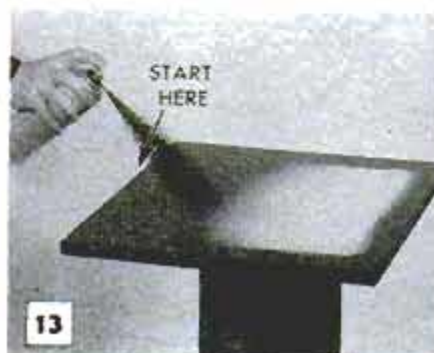
can, if they are of the same design. A clogged inner valve can be freed by removing the spray head and placing a drop or two of paint thinner in the valve body.

Don't neglect work preparation. The temperature of the paint should be between 60 and 90 deg. F. If it is too cold, the can of paint can be placed in a pan of warm water and heated to the required temperature. The recommended room temperature and atmospheric conditions are the same for this work as apply to other types of painting. If you paint outdoors, use a cover to keep paint off the surrounding area, Fig. 10. An ideal support for small jobs is hardware cloth, Fig. 11, because its open surface allows overspray to escape without settling on the work. When only a part of a surface is to be painted, the adjacent surfaces are masked, Fig. 4. ★ ★ ★

Figs. 12 and 13, flat surfaces are painted by starting at near end, allowing overspray to drift forward on work not yet coated. Fig. 14, cold paint is warmed by placing can in a pan of 90 to 100-deg. water



12



13



14



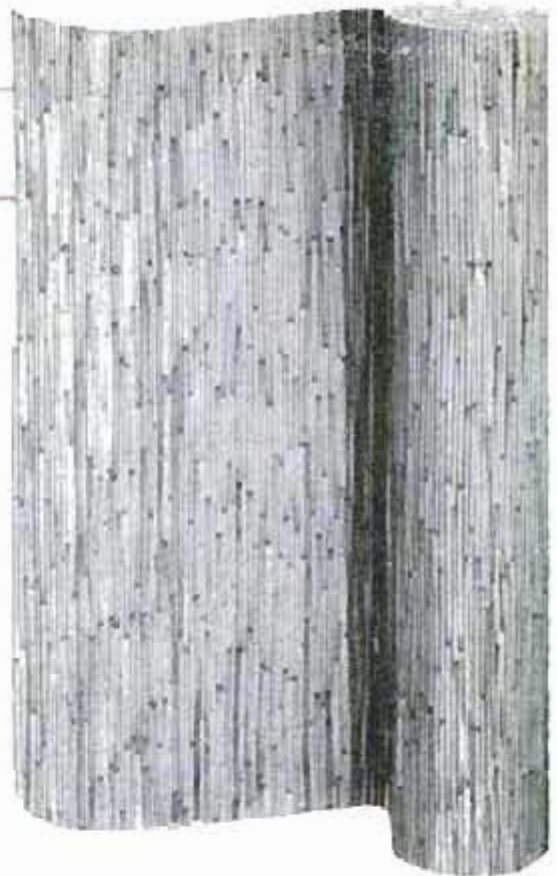


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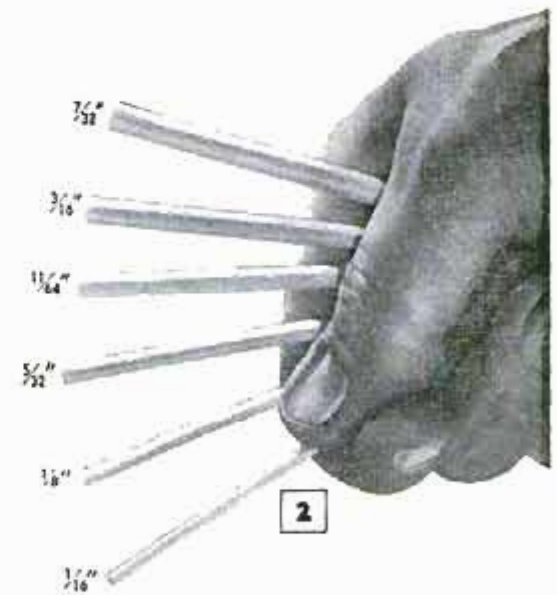
# On the MARKET

for Do-It-Yourselfers

**1. NATURAL REEDS** are woven tightly together with strands of nonrusting steel wire to form a matting which comes in rolls 6 ft. wide and 18 ft. long. Widely accepted by decorators and architects for both interior and exterior use for patio covers, shades, room dividers and fences  
 Rattanraft, 312 W. Fifth St., Los Angeles 13, Calif.



**2. HARDWOOD DOWELS** in diameters under 1/4 in. have been made available in a hobby package containing 365 dowels ranging in size from 1/16 to 7/32 in. inclusive. Also available in packages of 40 and 100 pieces. All sizes are 36 in. long. Just the thing for making detail parts  
 Cleveland Dowel Pin Co., 12703 Triskott Rd., Cleveland 11, Ohio



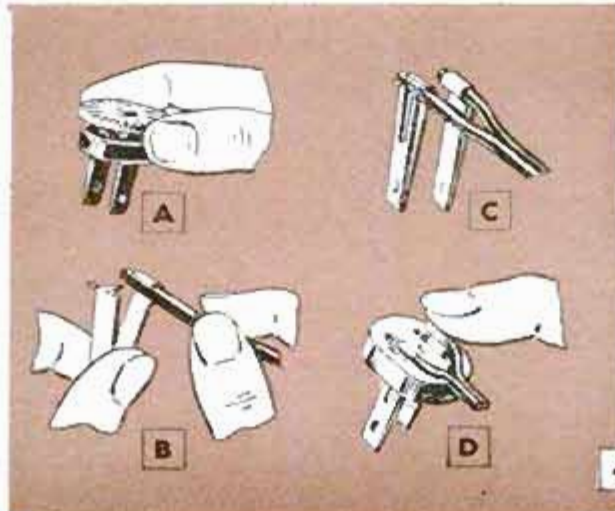
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**3. NONFLAMMABLE PAINT REMOVER** softens almost any common finishing material, including latex-base paints. It is based on an emulsifying formula which means that both remover and softened finish can be washed off with water. Remover is fast acting and requires no neutralizer  
 The Kleen Strip Co., Inc., P. O. Box 10085, Memphis 6, Tenn.

**4. ELECTRIC PLUG** projects only 5/16 in. from the cover plate of the wall receptacle. Cord hangs nearly flush with wall, rather than curving outward and down. Comes in two decorator colors, brown and ivory. Details A to D, inclusive, show recommended procedure in wiring plug  
 Ball & Socket Mfg. Co., Cheshire, Conn.



3



4





## Guide Aids Knife Sharpening



Maintaining a constant angle between an oilstone and the blade of a pocketknife when sharpening it is no problem when an "angle guide" is used. The guide consists of a paper clip slipped over the back edge of the blade. Hold both blade and clip against the stone when honing the blade and the angle will remain constant.

## Light Seals for Graflarger

If there is too much of a light leak between the negative carrier and slide when a Graflarger is used on the back of a Speed Graphic camera, the risk of fogging sensitive paper can be reduced by installing light seals along the edges. The seals are strips of plush cut from the light trap of a film-pack container as indicated.

Harrison Neustadt, New York City.



## Better Typewriter Performance

After a period of time the platen, or rubber roller, on a typewriter becomes hard and pitted from the constant hammering of the keys. To assure more legible typing, soften the surface of the platen by wiping it with a cloth dipped in acetone. Do not let the acetone touch a painted surface as it will damage the paint.

## Drop-Dispensing "Oil Can"

When the maintenance directions for a small motor call for a specific number of drops of oil at definite periods of time, use a medicine dropper as an "oil can." The medicine dropper will permit you to apply precisely the number of drops required.

Sam Fenn, Skokie, Ill.

## Cementing Wood-Chisel Handles

Wooden handles that loosen easily from the sockets of wood chisels can be kept firmly in place by using adhesive of the type used to cement sandpaper disks to a disk sander. Warm either the chisel handle or adhesive before applying.





# SHOP NOTES

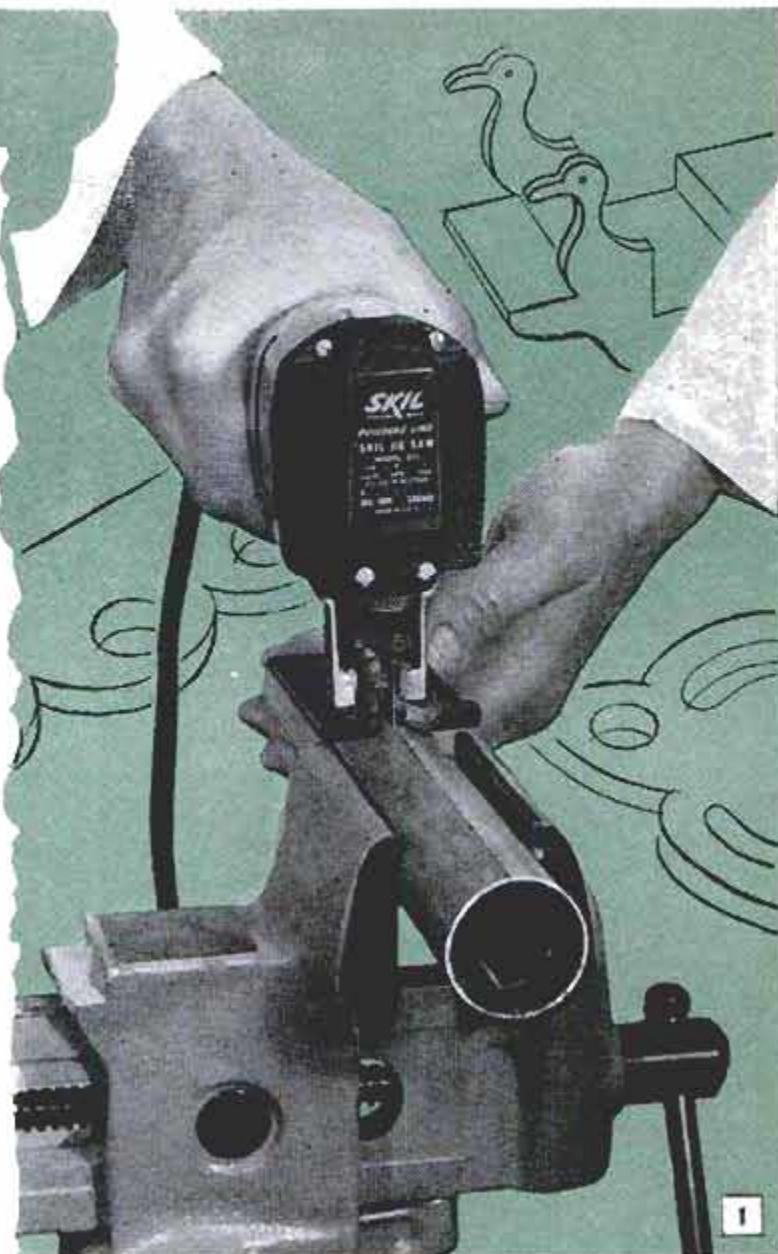
## POWER IN YOUR HAND

*Portable jigsaws will cut almost any common material, in any position*

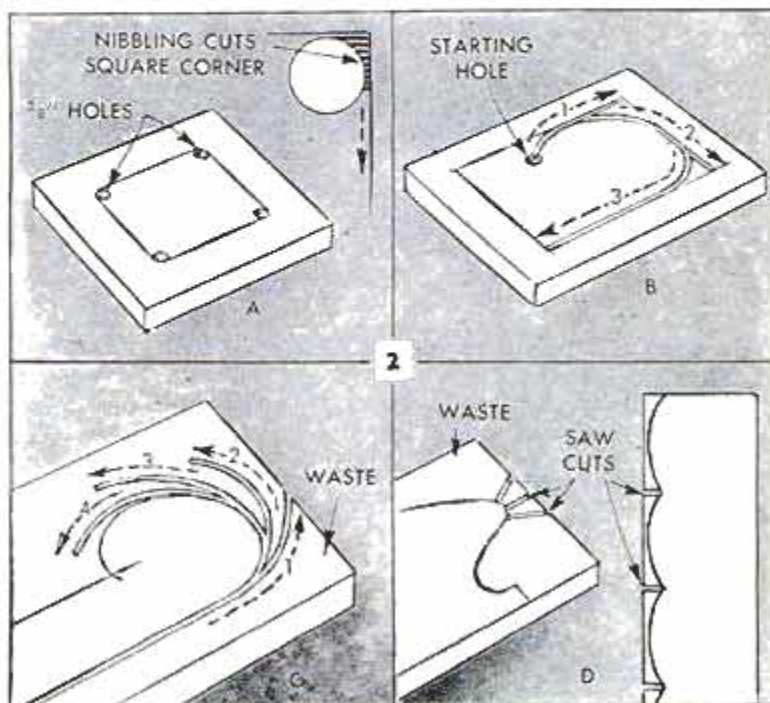
By Sam Brown

WITH ONLY a few exceptions a portable jigsaw will handle any job you can do on a conventional jigsaw or even a small band-saw. You carry the saw to the work, not the work to the saw. This means you can cut round, square or rectangular openings in panels too large to be conveniently worked on a stationary jigsaw. A cut can be started at any point on a board or plywood panel without running in from the edge or even drilling a starting hole. Just place the saw with the blade inside the line, in the waste. Start the motor and lower it slowly into the wood. It will cut through  $\frac{3}{4}$ -in. stock in a few seconds. And, of course, the portable jigsaws will rip, crosscut and run any curved cut down to about a 1-in. radius. This limitation in making curved cuts is due to the heavy-gauge saber blade used in the portable units. In addition to making the regular cuts in wood, portable jigsaws will cut soft metals, Fig. 1, sheet steel, plastics, rubber and fabrics. A special knife-edged blade is used when cutting the latter two materials. A small table is available from several manufacturers of portable jigsaws which is so designed that the portable unit can be inverted and clamped or screwed to the underside of the table to make an efficient stationary saber saw.

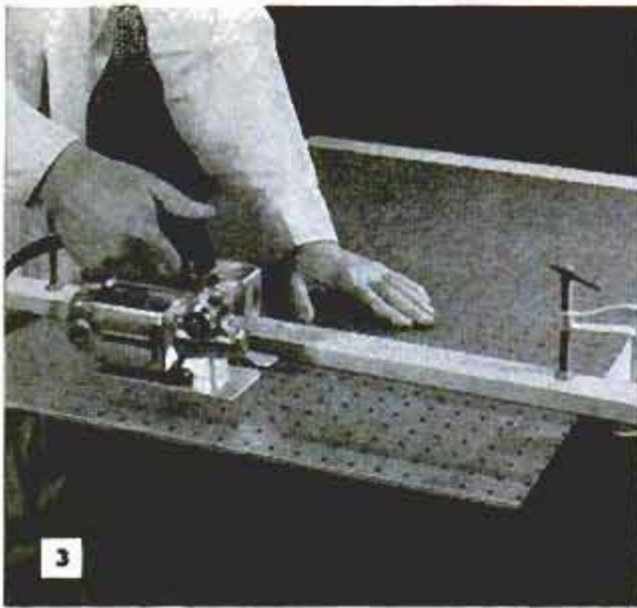
When laying out work which is to be cut with the portable jigsaw, the radius limitations of the blade should be kept in mind. When the job calls for an opening made to a given size with straight, smooth edges, then it is best to drill  $\frac{3}{8}$ -in. holes in the corners of the pattern



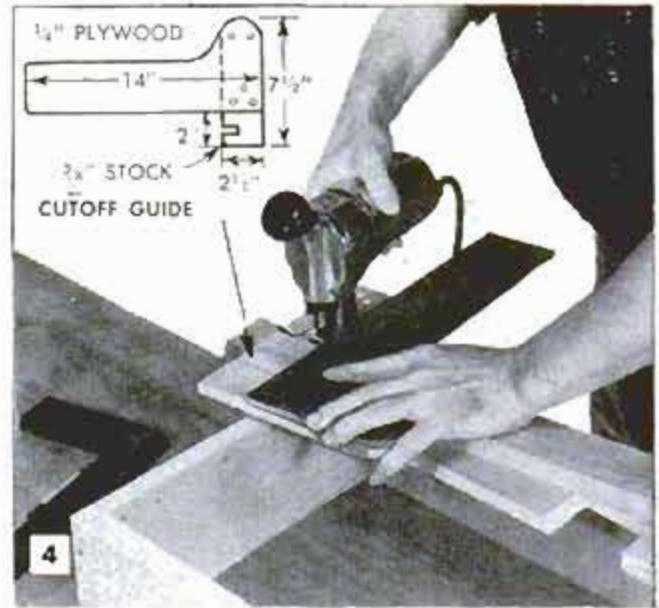
When slotting tubing in the manner pictured above it may be necessary to cut the blade to obtain sufficient clearance. Below, details cover four important points in sawing technique



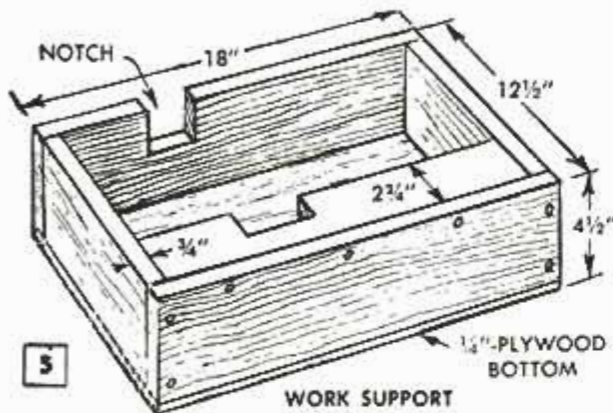




Straight cuts should be made with the soleplate of saw bearing against a straightedge. In this way you assure accuracy equal to that of a circular saw

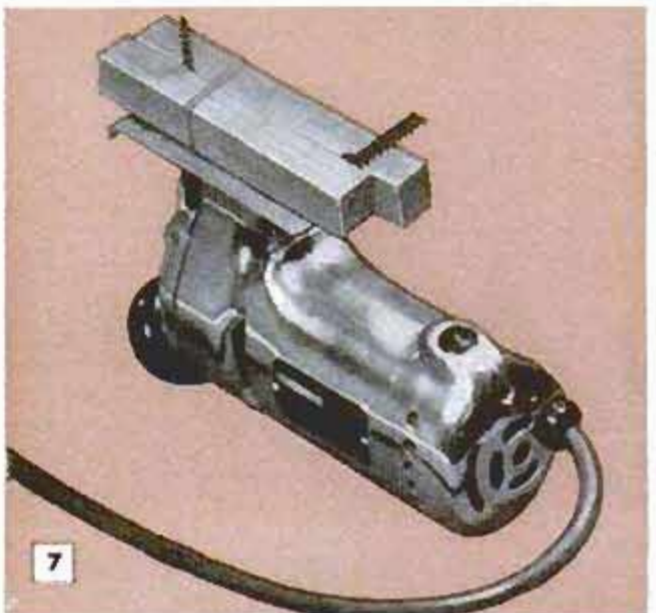
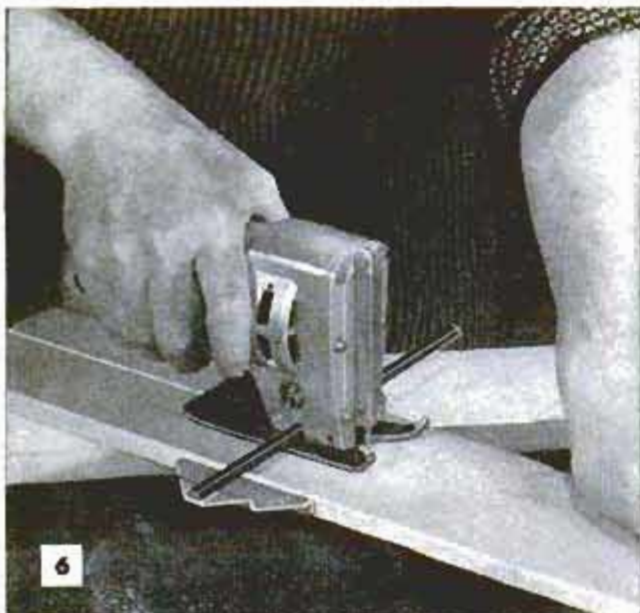


When you require an accurate cut across grain, use cutoff guide. Guide is held against the edge of stock in the same way as you would hold a T-square



When the job calls for cutting and ripping a number of small pieces you'll save time by making a work support on which stock can be placed and held firmly

Some types of portable jigsaws are provided with a ripping guide either as an accessory or regular equipment. It enables you to rip stock to exact width



layout for insertion of the blade, Fig. 2, detail A. After cutting out the waste, the corners are squared up by nibbling cuts. Another method requiring the drilling of only one starting hole is shown in Fig. 2, detail B. Here successive cuts are run to the corners of the layout from a starting hole drilled in the waste. The method will produce an opening through the stock with square corners, provided, of course, the work is done with care. Two methods of handling comparatively short-radius cuts are shown in Fig. 2, details C and D. A third method which saves time is shown at the right in detail D. When cutting scallops, run cuts in from the edge of the stock to the pattern lines at the points shown. This preliminary step will permit running

On straight cuts it's important to have the blade aligned with the edge of the soleplate. This is done with two strips of wood, a blade and a rubber band



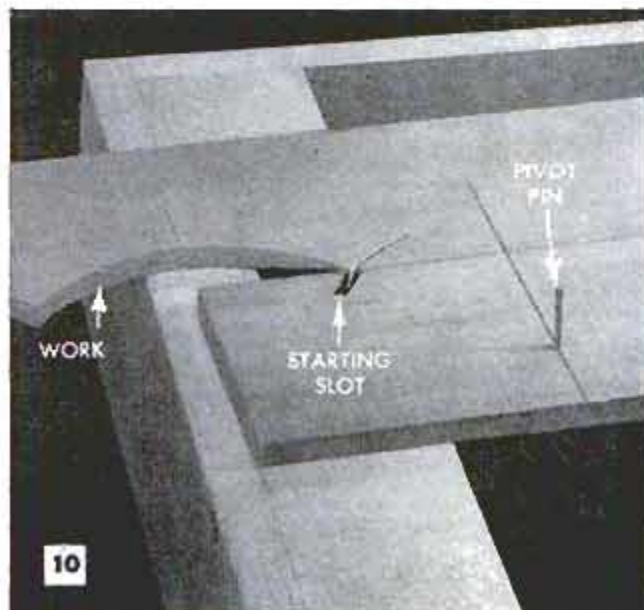
curved cuts continuously in one direction.

When you require a straight ripping cut through wood or a composition material, such as hardboard, clamp a straightedge to the work as in Fig. 3. Determine the width to be cut off, measure the distance from the edge of the soleplate on the jigsaw to the blade and set the straightedge accordingly. For cutting off, or crosscutting, make the guide detailed in Fig. 4. Some portable jigsaws are supplied with a ripping-fence accessory, Fig. 6.

Due to the projection of the blade below the stock when the jigsaw is in operation, it's handy to have a work support when jigsawing small pieces of stock. One design which has a wide range of applications is detailed in Fig. 5. It's simply a sturdy box made to the dimensions indicated, or larger if desired, and having one side notched. An insert having a second notch of the same size is nailed inside the box as indicated, the notches being aligned. In use, the box, or support, is placed on the bench and the work located so that the waste overhangs the edge as in Fig. 4. Or, if you are ripping a short piece, turn the box around, center the work over the notch in the side of the box and into the notch in the insert, without danger of cutting into the bench top or the support.

When the saw is guided in either ripping or crosscutting, it is essential that the blade be aligned with the edge of the soleplate. Fig. 7 shows a way to do this quite accurately by placing a square strip of wood on each side of the blade, clamping

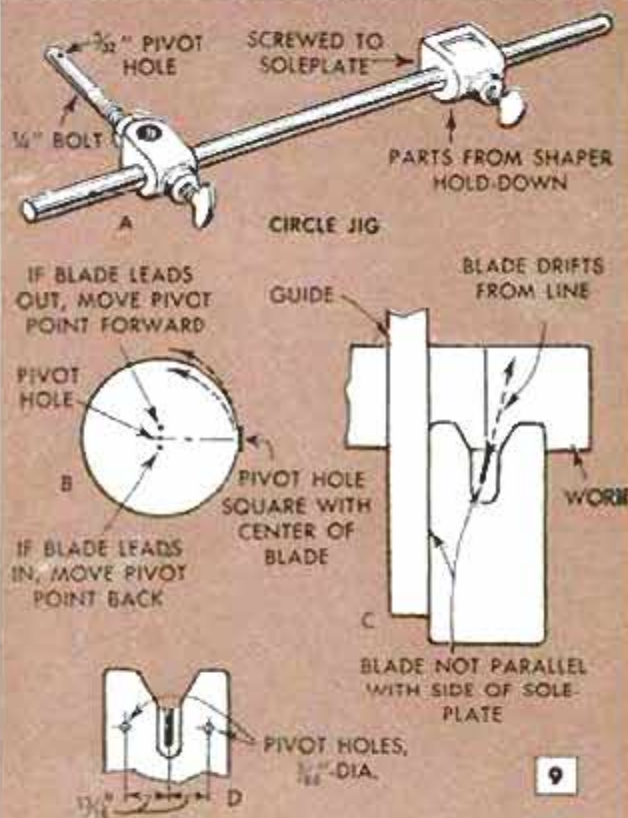
Concave scallops are cut freehand or with a jig pivoting on a pin driven into a second strip of stock. Strip is notched to provide starting slot for blade



JANUARY 1958



SEE DETAIL A, FIG. 9

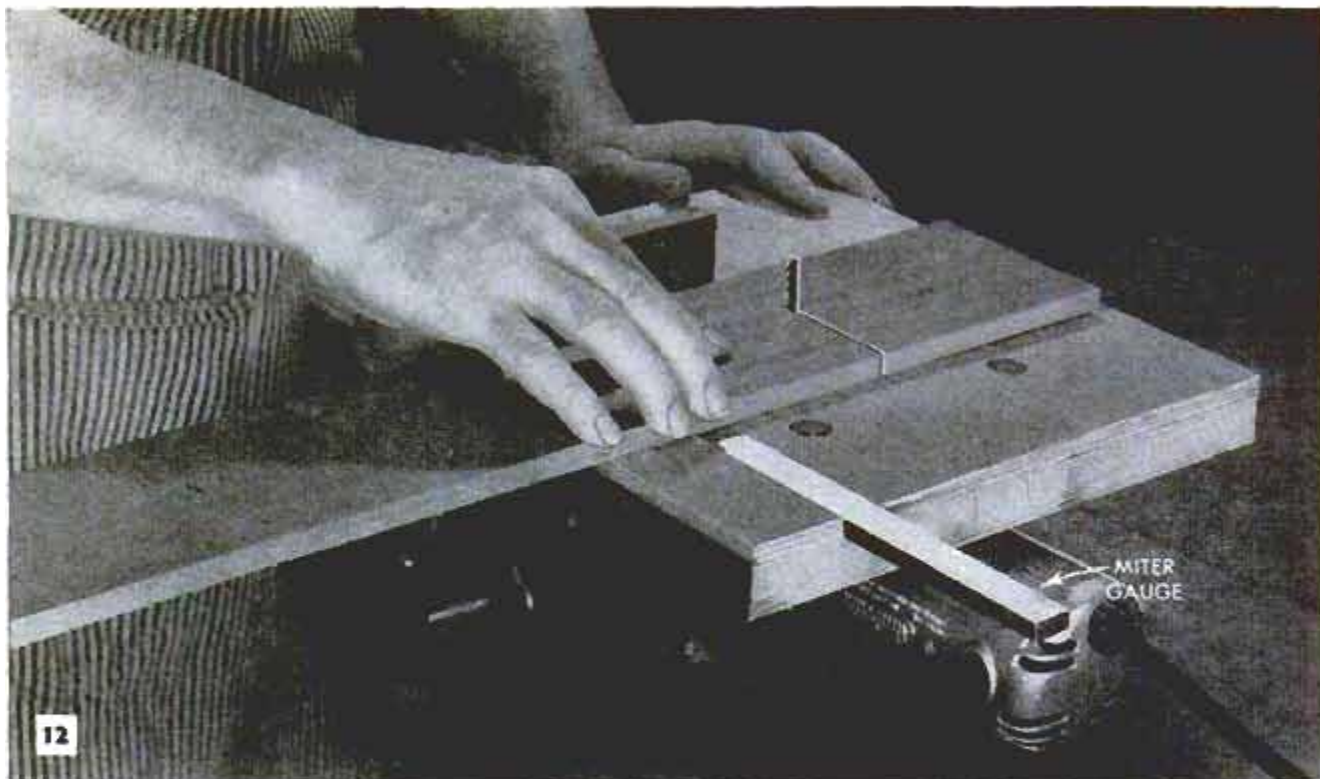


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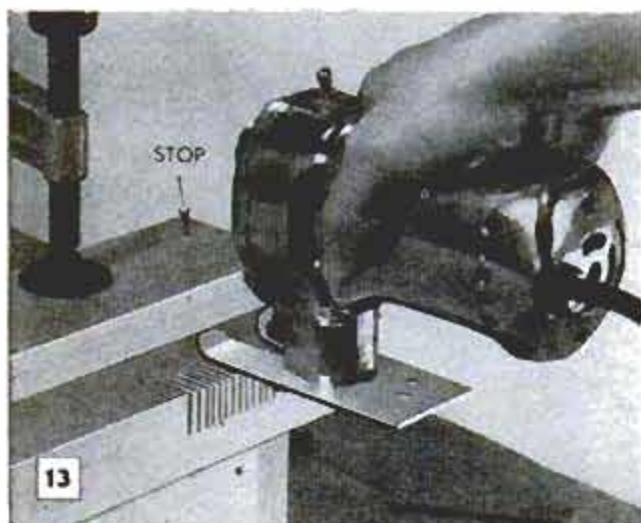


SEE DETAIL D, FIG. 9

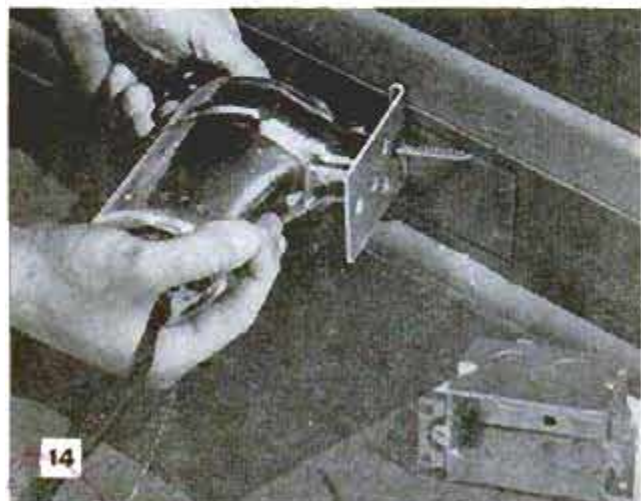




Some manufacturers of portable jigsaws provide an accessory table which converts the portable unit into a stationary saber saw. Or, you can improvise the table pictured above by following details in Fig. 17



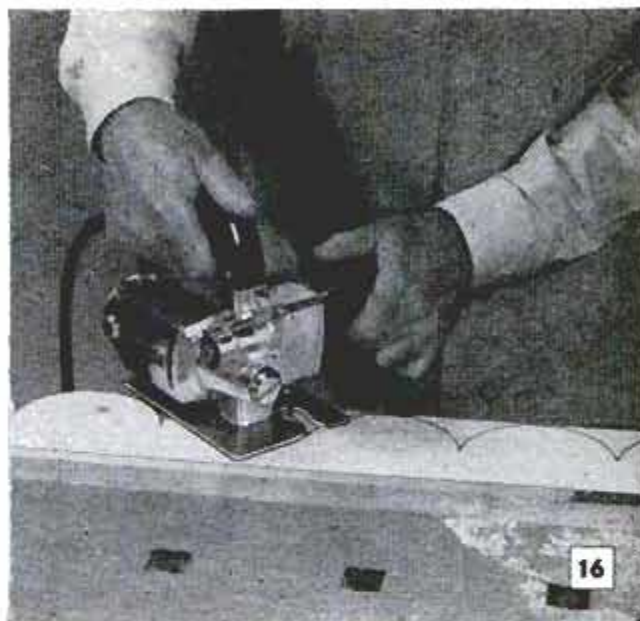
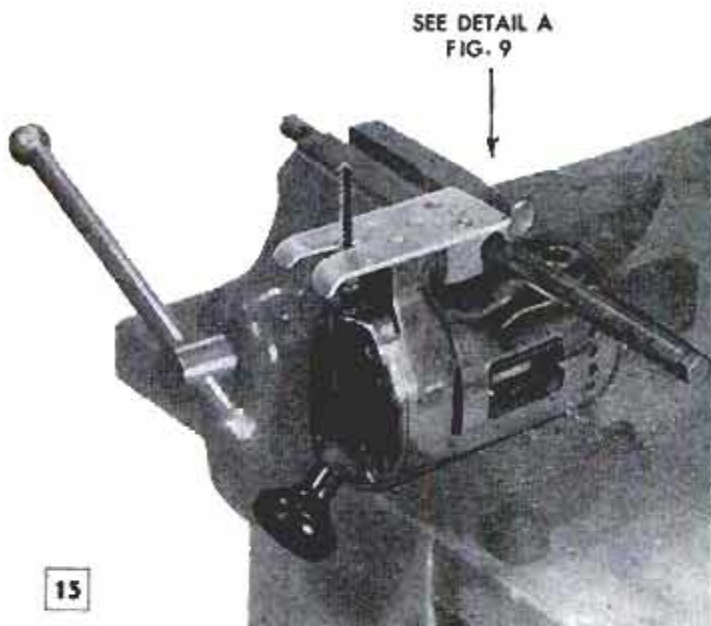
Above, square recessing from edge of stock is easy. Cut blade to a length that will give the depth required, clamp a stop to work and make adjacent cuts. Below, making a pocket cut with jigsaw



the strips together with a rubber band. A second blade is inserted between the strips as pictured to serve as a spacer. Release the blade-clamping screws in the plunger and move the strips right or left until the edge of one aligns with the edge of the soleplate. Then tighten the clamping screws, making sure that the blade does not shift as the screws are tightened. Note detail C, Fig. 9, which shows how the blade tends to drift from a guided cut if it is out of line with the soleplate.

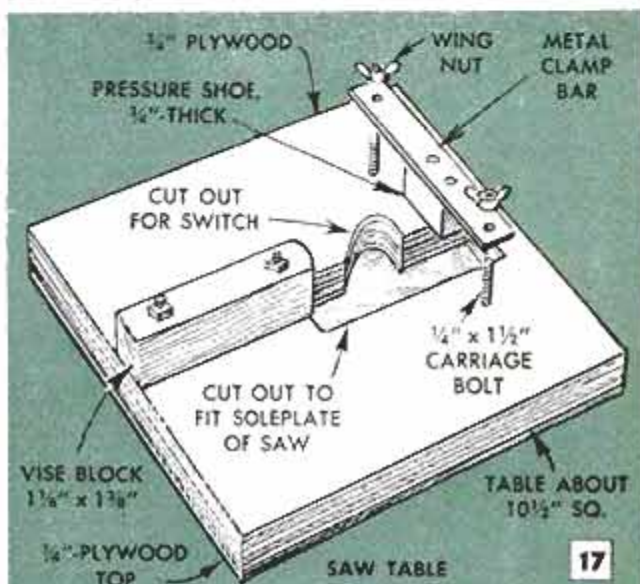
Circle cutting is a common operation with the portable jigsaw and in order to do the job accurately it is necessary to improvise a swiveling jig. Fig. 9, detail A, shows such a jig assembled from parts of a small shaper hold-down. Fig. 8 shows this improvised jig in use. In setting up such a jig for circle cutting it may be necessary to change the location of the pivot as in detail B, Fig. 9. Cutting scallops also can be done with a circle jig using the setup shown in Fig. 10, and the work support detailed in Fig. 5. Another problem involving the cutting of short-radius scallops is pictured in Fig. 11 and detailed in D, Fig. 9. Here the saw pivots on a pin (a small brad will do) on a  $1\frac{3}{16}$ -in. radius. This is permissible as the blade is only made to cut a quarter circle. Two small holes are drilled in the soleplate as in detail D, Fig. 9, and the saw is placed against the stock with the pin entering one of the holes. After the first cut is made to the pattern line, the saw is lifted off the pin and turned in the opposite direction, the pin entering the second hole. A second





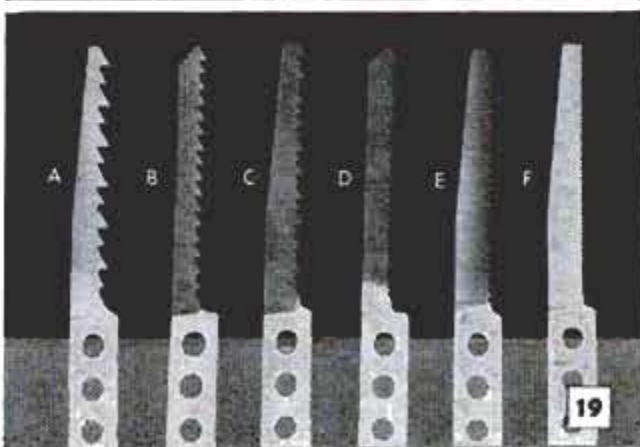
cut finishes the semicircle. Larger scallops can be run freehand as in Fig. 16.

By making a plywood table, as in Fig. 17, you can convert almost any type of portable jigsaw into a table saw, or saber saw. The table detailed in Fig. 17 is shown in use in Fig. 12. Of course, in order to adapt the table to various makes of saws you will have to make some variations from the type detailed in Fig. 17. For saber sawing small pieces you can do very well with the setup shown in Fig. 15, using two of the three parts of the shaper hold-down, detail A, Fig. 9. One lug of the hold-down is screwed to the soleplate and the rod is locked in the vise. The soleplate of the saw serves as a table.

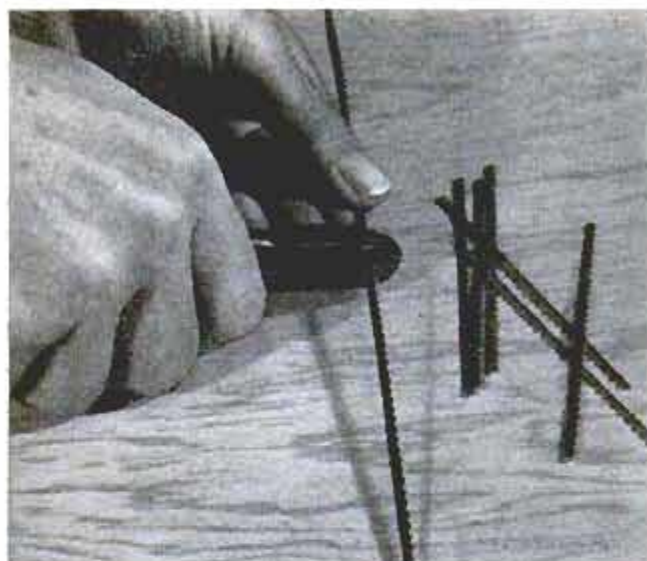


Recesses can be run in from the edge of a board simply by cutting the blade off to give the depth of cut required. Ordinarily, the blade projects about 2 in. below the soleplate at the end of the downstroke. Cut off the blade to give a 1-in. or 3/4-in. projection and it will cut a recess, or even a blind mortise, 1 in. or 3/4 in. deep. The setup for this job is made as in Fig. 13, clamping a stop to the work as indicated. Make adjacent cuts and remove the waste with a sharp chisel. One of the most novel of portable jigsaw operations is pocket cutting, Fig. 14. Make the layout with scribed lines on the work, then tilt the saw as pictured, start the motor and swing the blade into the work. It will cut through in seconds. A similar job is blind mortising, but in this case the blade must be cut off to give the required mortise depth. The table, Fig. 18, outlines a general classification of average work done with portable jigsaws and the blades best suited to the job. Entries under "blade" in the table refer to the various blades pictured in Fig. 19. The assortment of six blades does not include the knife-edged blade. ★ ★ ★

18	WORK	BLADE
	GENERAL SAWING IN WOOD	BLADE A, 6 OR 7 TEETH PER INCH. 5/16" WIDE
	SCROLL CUTS	BLADE A. ALSO B, 8 TEETH PER INCH. 1/4" WIDE FOR INTRICATE CUTS
	FOR SMOOTHEST CUT	BLADE C, 10 TEETH, 3/16" WIDE. ALSO D, 14 TEETH, 1/4" WIDE
	THIN METALS, PLASTICS	HIGH-SPEED BLADES E AND F. WITH 14 TO 24 TEETH PER INCH



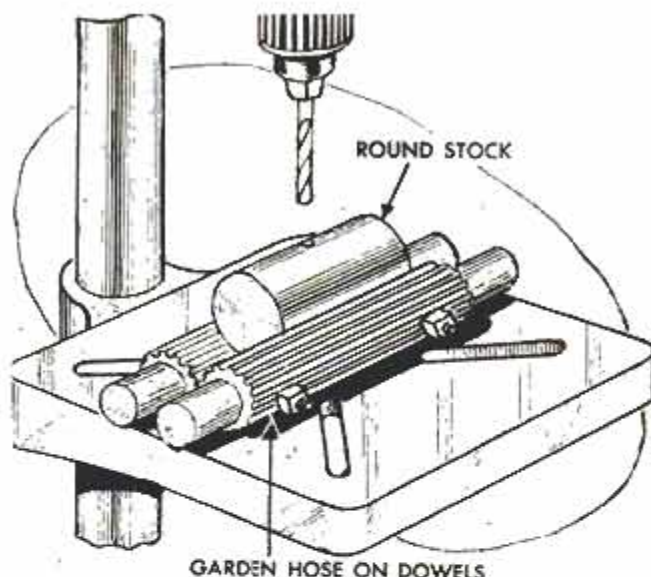




### Bandsaw Makes Jigsaw Blades

Don't throw away the bandsaw blade that breaks before it has served its full period of usefulness, especially a narrow one  $\frac{3}{8}$  in. or less in width. It will make excellent jigsaw blades when cut to the proper lengths. The set of the teeth is just right for jigsawing and they are shaped for fast, clean cutting on either curved or straight work. The narrow blades are easily cut with nippers. Grind ends square.

R. J. DeCristoforo, Los Altos, Calif.



### V-Block From Lengths of Hose

When you have only an occasional piece of round work to drill, the purchase of a V-block is hardly justified. Where the work does not require extreme accuracy you can improvise a substitute quickly and easily. Just cut two 5-in. lengths of garden hose, press a length of  $\frac{3}{8}$ -in. dowel through each piece and bolt the two together. A V-block made this way won't slip, and also prevents the work from turning with the drill.

G. B. Hendrickson, Argyle, Wis.

## PM Books for Boys and Girls to help them know about Science

**MR. WIZARD'S SCIENCE SECRETS**, by Don Herbert. The star of the famous TV program seen coast-to-coast weekly on more than 60 stations has written this educational and entertaining book that will help in school and through a whole lifetime. The book is just like his unusual program and just as intriguing. It contains more than 150 of his television experiments, in word and picture. Answers thousands of "how" and "why" questions children ask on the human body, gravity, flight, heat and radiation, electricity, etc. It's facts with fun—so fascinating and interesting children never tire of learning.

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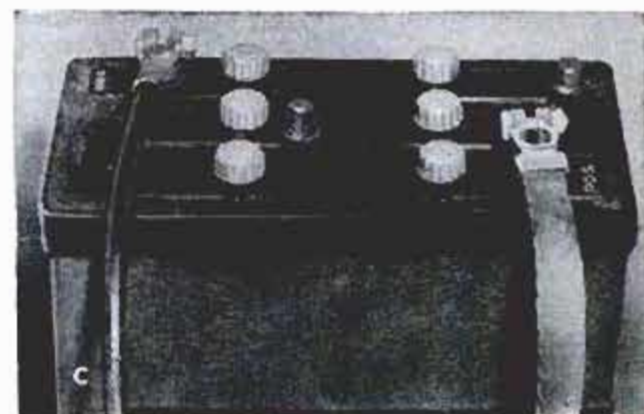
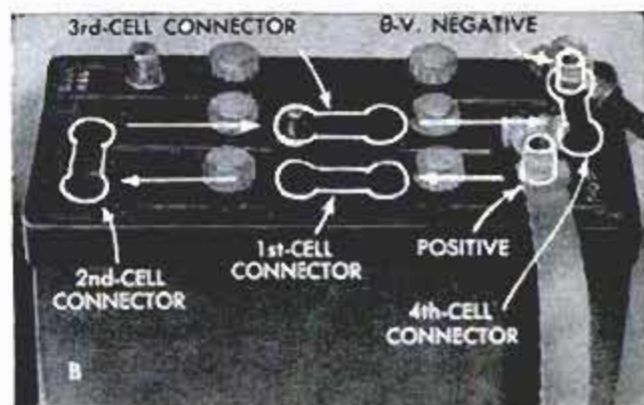
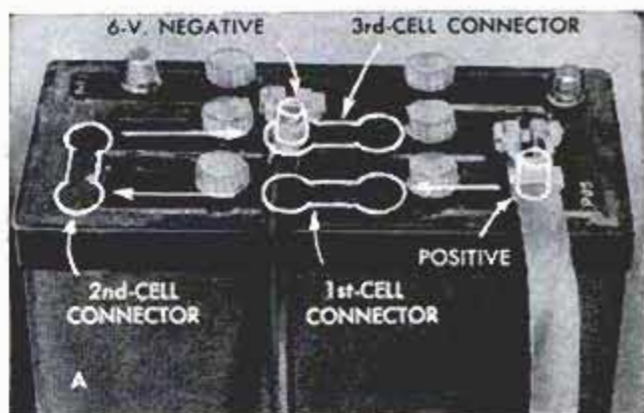


## 3 VOLTAGES From One Battery

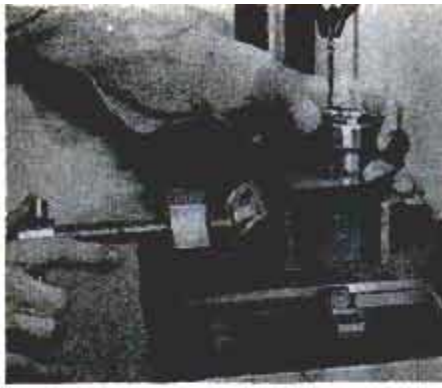
HERE'S THE WAY one auto serviceman altered a conventional 12-volt battery to supply 6, 8 and 12-volt current when required for starting stalled cars. In cold weather the 8-volt hookup will start a car readily when its 6-volt battery is low. Photo A shows the hookup of the ground strap and cable for taking off 6-volt current. Photo B shows the hookup for 8-volt current and photo C pictures the battery in the normal hookup. To make provision for taking off 6 and 8-volt current, two terminal posts are added. Clean the ends of the 3rd and 4th-cell connectors and roughen the cleaned surface slightly so that new lead will bond to the old when poured. Then melt lead and pour the two additional posts in a negative-post mold. Care must be taken to locate the posts so that there is ample clearance. Also, it is advisable to make sure that the clamps fit the posts.

Of course, the battery is also capable of supplying 12-volt current for the later model cars with 12-volt systems. Ordinarily the battery is charged as a 12-volt unit, but if current is drawn heavily from the 6-volt hookup, it can be recharged as a 6-volt unit by hooking the charger to the positive post and the 3rd-cell negative post.

Ken Hadenfeldt, Storm Lake, Iowa.

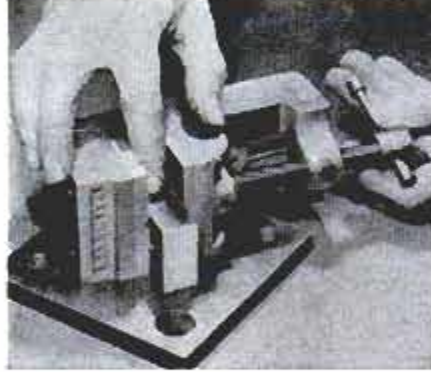
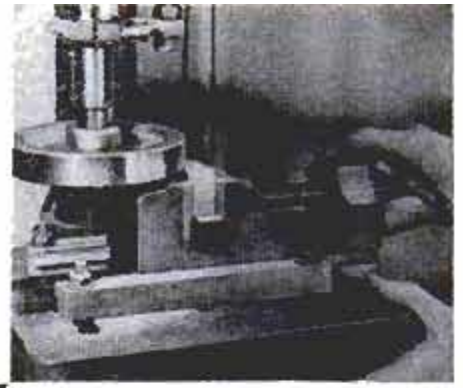






**V-BLOCK** clamped in vise, above, holds round work of larger diameter than  $\frac{1}{2}$  in. Use of V-block assures greater accuracy than would be possible with shallow vees milled in vise jaws. Note that in this setup the vise is held in position with strap clamps which engage grooves milled in sides of vise

**SURFACE GRINDING**, right, is done with a high degree of accuracy by placing the work on a parallel bar and clamping in a drill-press vise. In this instance, the vise is fitted in slides bolted to the drill-press table. This setup permits movement of work under abrasive, thus eliminating the grind marks



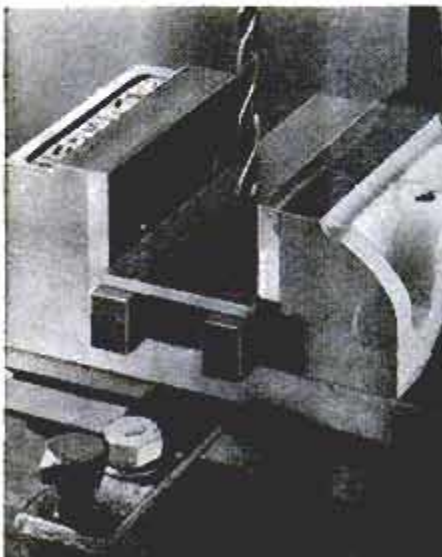
**POSITION WORK** having perpendicular surfaces, left, by placing the vise on its side on a surface plate or the drill-press table. Place the work in position and tighten the clamp screw. Procedure assures that work is aligned with sides and bottom of vise. Work can be drilled in position shown if desired

# YOUR DRILL-PRESS VISE HAS

By *Walter E. Burton*

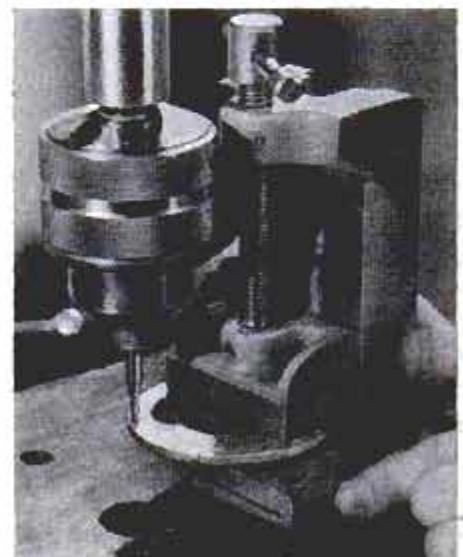
**A DRILL-PRESS VISE** is something more than a simple device for holding parts in position. It's milled flat on the bottom, usually the end and the sides, also the top of both the fixed and movable jaws. The faces of the jaws are milled square with the flats on the base and top. In addition, vees usually are milled in the fixed jaw and on some uni's grooves are milled along both sides of the frame, making it possible to mount the vise in metal slides, or hold it in a fixed position with strap clamps. Some models of drill-press vises also are mounted on special bases having a pivot and sliding clamp arms which per-

mit tilting the vise for angular work. Thus in addition to serving as a vise for holding parts, the unit fills in as a positioning jig or a fixture for work on round, square, rectangular, hexagonal and octagonal work, also work of irregular shape. Photos above, below and on the opposite page show operations on the drill-press table which are typical of the wide range of usefulness of the tool. The flats permit it to be placed in any of the positions shown with assurance that it will produce accurate work, provided certain precautions are taken when placing it in position on the machine. Be sure table is clear of chips. ★ ★ ★



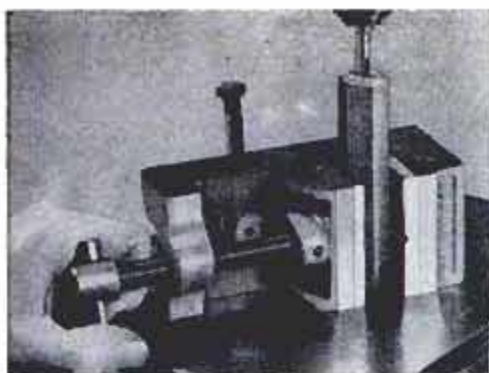
**ACCURATE DRILLING** of metal less than  $\frac{1}{4}$  in. thick, left, can be done by placing the work on ground-steel parallels and then tightening the vise jaws lightly. This precaution eliminates possibility of work springing under pressure of drilling

**WISE** also can be used on end as shown at the right. End of fixed jaw is milled perpendicular to bottom, permitting edge-slotting of the aluminum ring with a router bit. Vise and ring are moved as a unit and forced lightly against rotating bit

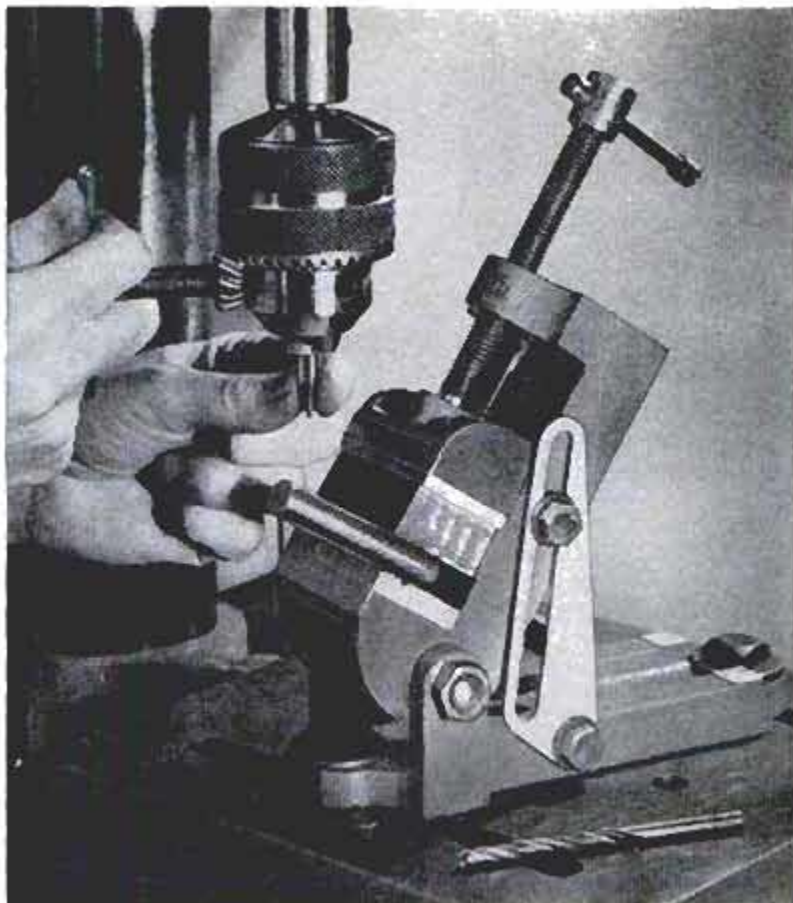


*WFA  
SN 59*



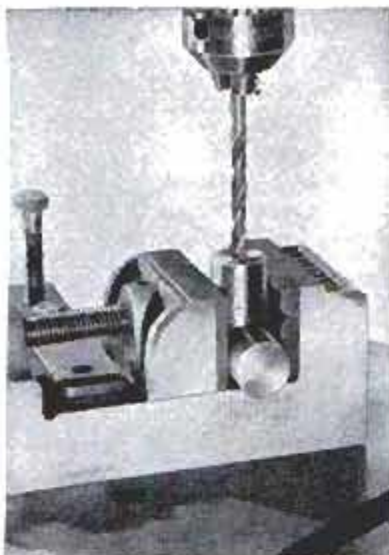


**DRILL VISE** can be used in almost any convenient position on the drill-press table with the jaws in the normal position, on the right or left side, or on end. In the photo above, the vise is being used on its side to hold a short length of hex stock for center-drilling end. Note stop behind vise. This is simply a bolt attached to drill-press table with two nuts to prevent the vise from turning.



## MANY USES

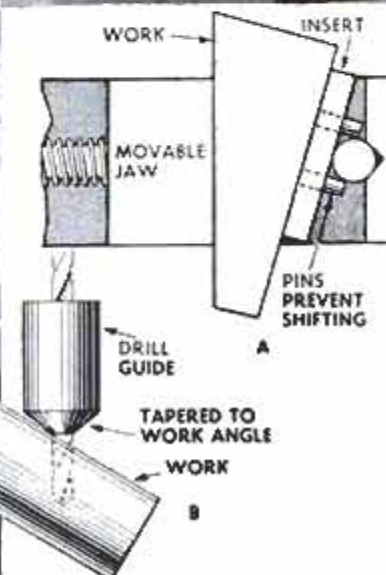
**CENTERING** a transverse hole through round stock can be done by making a drill guide from stock of same diameter as that to be drilled. Then both pieces are clamped in vise as in photo at the right, centering the guide automatically. Note that vise is held in position with a strap clamp which prevents its shifting.



**ANGLE DRILL VISE**, above, comes with special base and slotted brackets that permit vise to be set at any practical working angle. Can be locked rigidly in desired position. Unit also is handy on the bench for holding small parts.

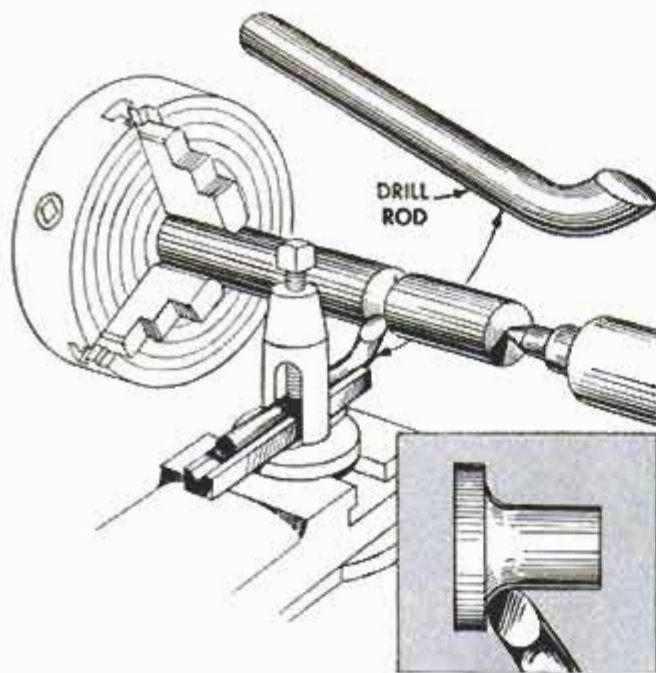
**ANGLE DRILLING**, below, can be done with essentially the same setup as that pictured at the right. End of the drill guide is tapered to the work angle, detail B. When the two parts are clamped in the vise, drill bit will enter the work without drifting. Work must be centered under drill and vise clamped to table.

**TAPERED WORK**, such as the Morse tapered shank pictured below, can be held in regular drill vise by using a round and a length of flat steel as backing. Work having a steeper angle, or taper, can be held in a similar manner, see detail A.





# This Surfacer



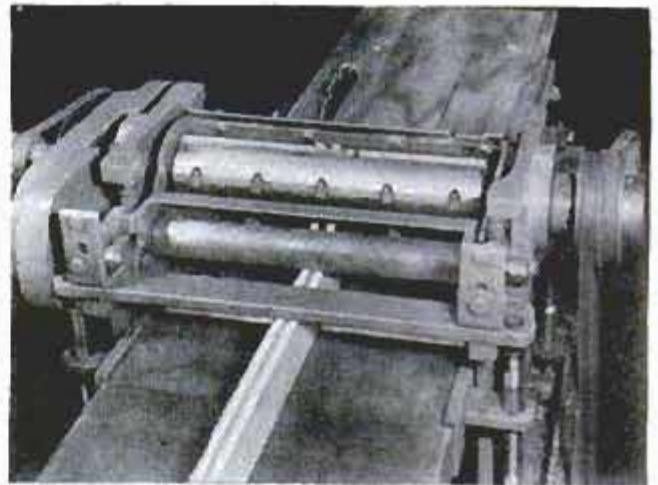
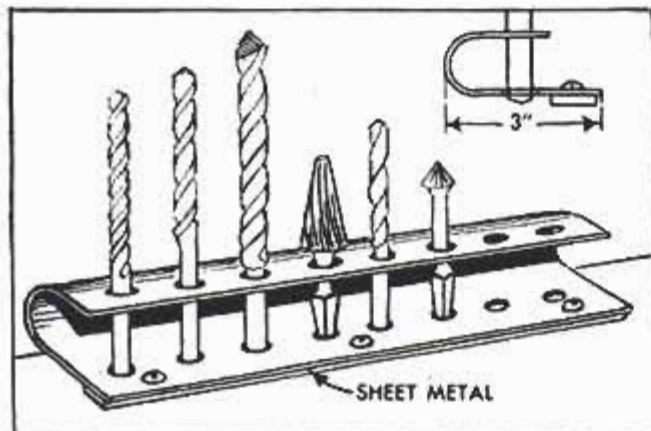
## Turning True-Radius Fillets

Turning true-radius fillets and grooves on duplicate work can be speeded up with a turning tool made especially for the purpose. By using drill rod for the tool, a size can be selected to give the radius desired. Heat one end to a bright red and bend to 45 deg. Then grind roughly to about a 5-deg. rake angle. Then harden and draw the temper to give a good cutting edge. Finish-grind and hone to remove all marks of the coarse grinding. Mill or file a half-round holder to support the tool. Grind a flat on the straight section of the tool to form a seat for the tool-post screw.

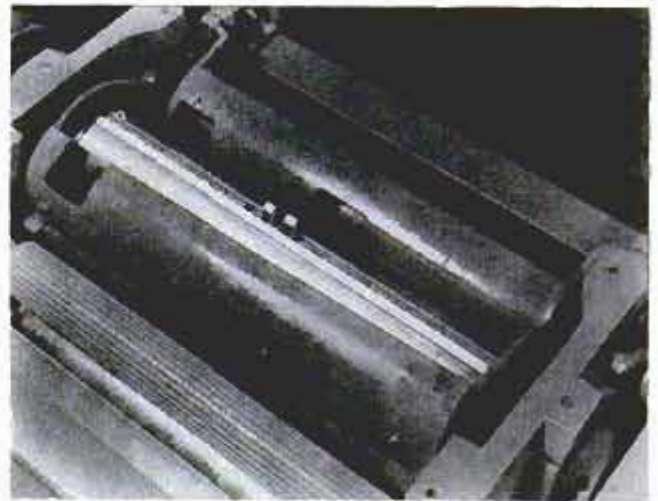
C. W. Woodson, Chicago.

## Holder Keeps Tools Handy

By taking time to make this durable holder you'll eliminate many a lengthy search for misplaced tools. It's made from heavy sheet metal and can be screwed to the bench top or to the top of the tool panel. Drill a row of holes near each edge to take the tool shanks, sweat solder a strip to one edge as shown and bend over a piece of pipe.—Luke Williams, Columbus, Ohio.

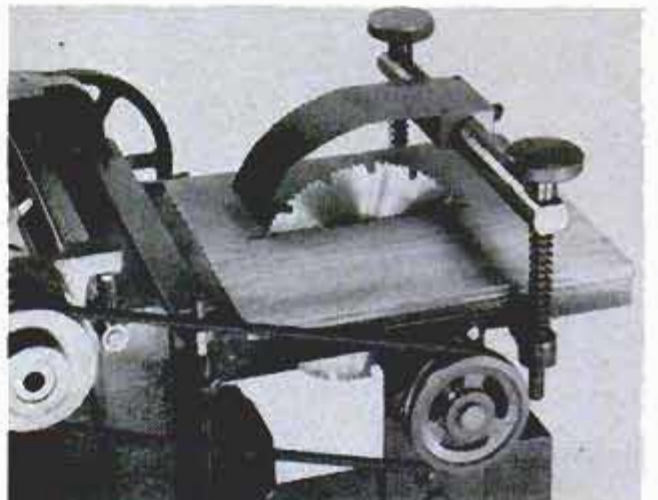


Cutterhead is pictured with guards removed and molding cutters fitted for cutting tongue on edge of stock. Matching tongue-and-groove cutters are used



Tongue cutter is in position at center of head. Also can be placed at end of cutterhead. Note clearance openings. A variety of cutter shapes are available

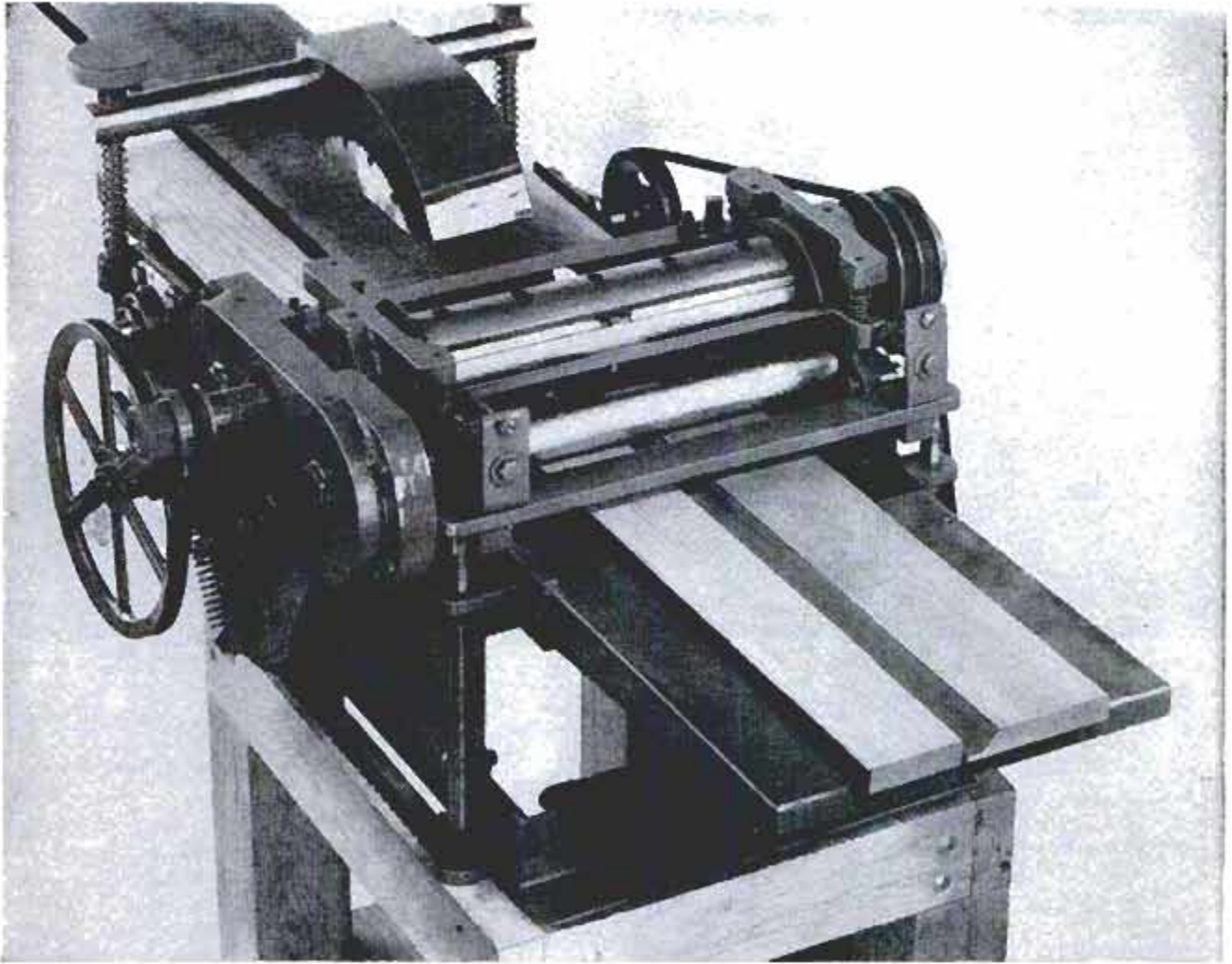
Ripsaw is driven from cutterhead shaft. Can be shifted right or left to rip stock to desired width. Stock is hand-fed to saw, power-fed through the surfer





ETA 57

# Combines Three Machines in One

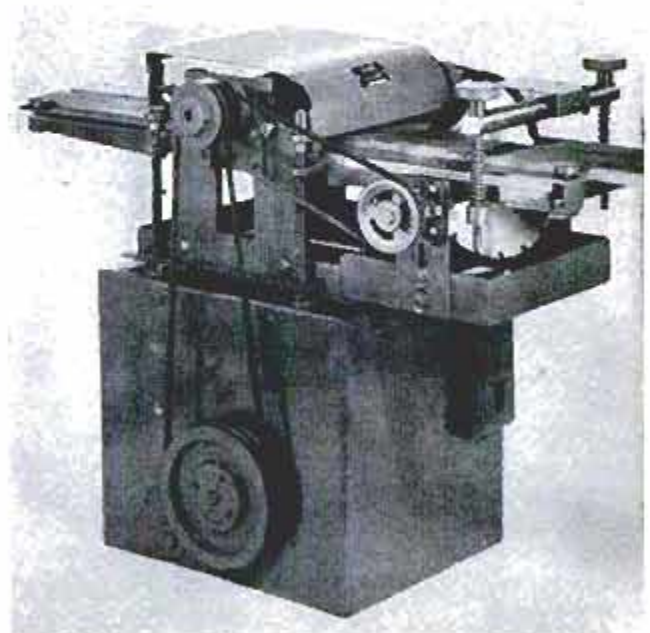


Here machine is set up to perform three operations, ripping to width, surfacing to thickness and molding one edge of stock. Takes material 12¼ in. wide and up to 4 in. thick under cutterhead. Guards have been removed

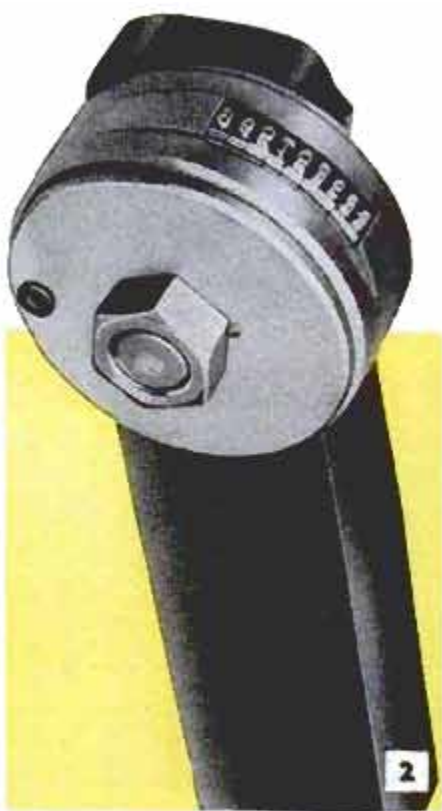
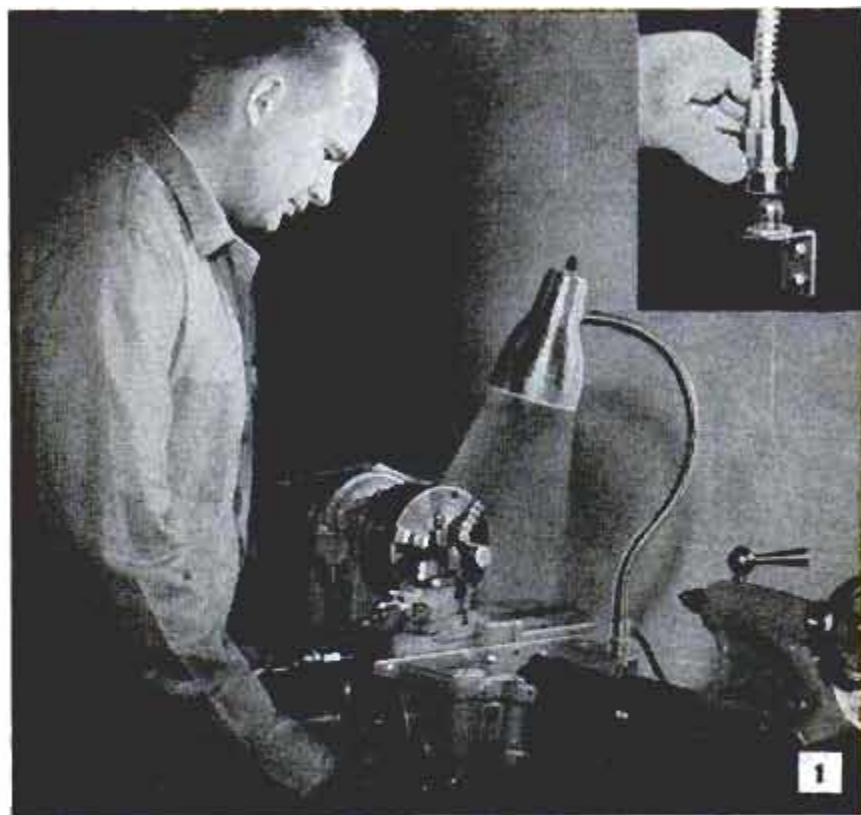
**I**T'S A SURFACER, rip saw and shaper, all in one. This new machine by Belsaw rips the board to width, surfaces it smooth on one side and cuts a molding on the edge. Note the setup in the photo above and you'll see how all three operations are finished in just one pass of the stock. As the first operation, the rip saw cuts the board to width. The cutterhead carries both surfacing and molding cutters and performs the two remaining operations of surfacing and molding simultaneously.

Photos on the opposite page show how cutters are mounted in the head. In the setup in the upper photo, opposite page, the machine is adjusted to form a tongue on the edge of the stock. Only the molding cutters are used in this operation. Remove the saw blade and molding cutters and you have a single surfacer, or planer, as these machines are sometimes referred to in the shop. Or, raise the cutterhead to give clearance underneath, replace the blade, clamp a guide fence to the infeed table and you have an efficient rip saw. ★ ★ ★

With guards in place and mounted on a special steel stand, machine becomes the compact, efficient unit pictured below. Motor is mounted in steel stand







# SHOPPING FOR TOOLS

**1. SHOP LAMP** can be moved to any point where light must be concentrated. Comes with special mounting brackets which are installed at bench, on machines or any other point where light is required. Available with 18 and 24-in. flexible arms and "cool" shades. Inset above pictures special mounting bracket which can be screwed to wall, machine or bench

Moffatt Products, Inc., 4824 Triton Dr., Minneapolis 22, Minn.

**3. MANUALLY POWERED FASTENING TOOL** utilizes a hammer blow to drive a fastener through steel up to  $\frac{1}{4}$  in. thick. Seats a variety of fasteners in any kind of building materials. Special hand guard and leveling plate protect user from injury. Plate is detachable, making it possible for fasteners to be placed in corners and other hard-to-reach places

Ramset Fasteners, Inc., 12117 Berea Rd., Cleveland 11, Ohio

**5. TINY JET PUMP IS SELF-PRIMING**, handles 450 gal. per hr. Compact size requires the minimum of space for installation. Mounted on a suitable base with electric motor or gas engine, the unit is easily portable. Suitable for filling overhead tanks, draining flooded basements or for small sprinkling or irrigating systems. Comes complete, ready to install

Jacuzzi Bros., Richmond, Calif.

**7. BENCH-SAW TABLE** is designed for man whose requirements do not warrant the outlay for a larger and heavier unit. Steel table has ground and polished working surface measuring 12 x 13 in. Blade rips and crosscuts stock 2 in. thick. Double locking fence and conventional miter gauge are regular equipment. Arbor tilts 45 deg.; raises and lowers

Roeca Products, Inc., 2916-4th Ave., S., Minneapolis, Minn.

**2. INSERT-TYPE ROLLER DIE** for lathes and screw machines features a spring return which returns marking unit to starting position after part has been marked. Can be supplied with one or more lines of lettering or any number of characters, with a part of lettering permanent, or with all letters interchangeable. Special symbols also can be supplied

M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, Pa.

**4. PLUMBER'S PLIERS** come with soft-jaw inserts for work on plated plumbing fixtures and decorative nuts and screws of various types. Jaw openings are adjustable from  $\frac{1}{4}$  to  $2\frac{1}{2}$  in. by sixteenths. Jaw liners, or inserts, can be supplied in brass or nylon, the latter material being recommended for work on chrome-plated fittings. Either type is attached with screws

P & C Tool Co., P. O. Box 5926, Portland 22, Ore.

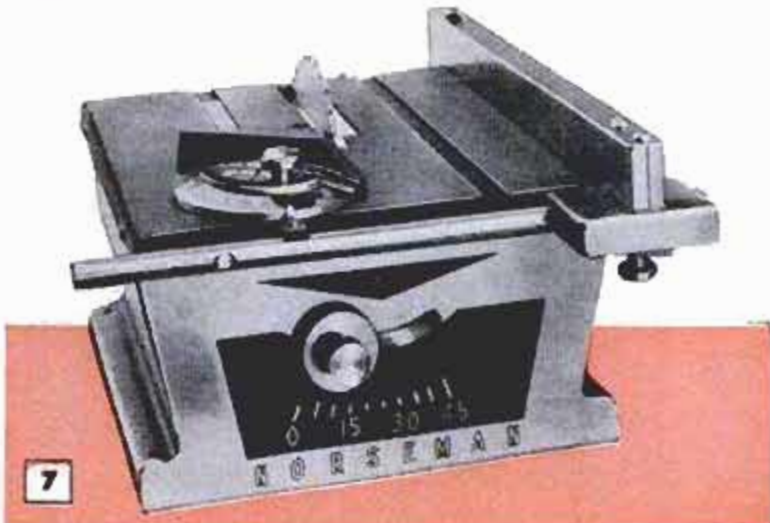
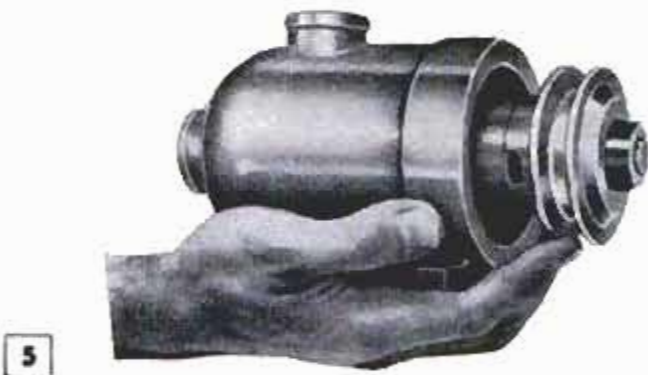
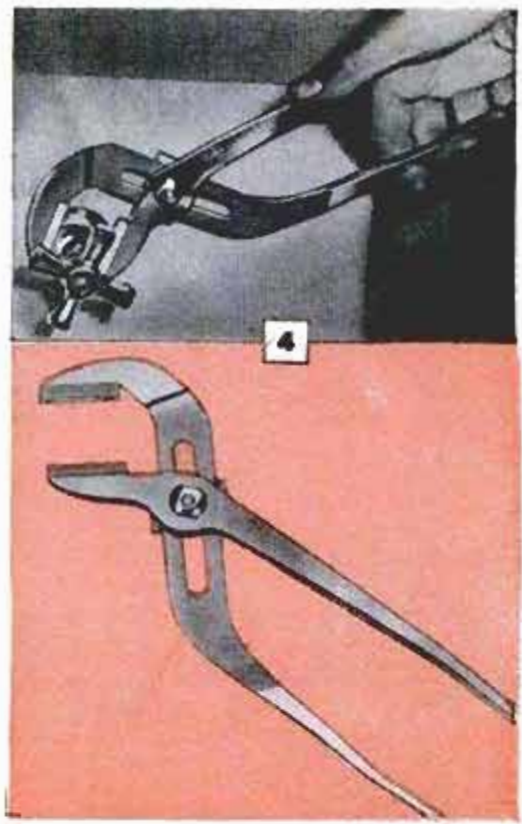
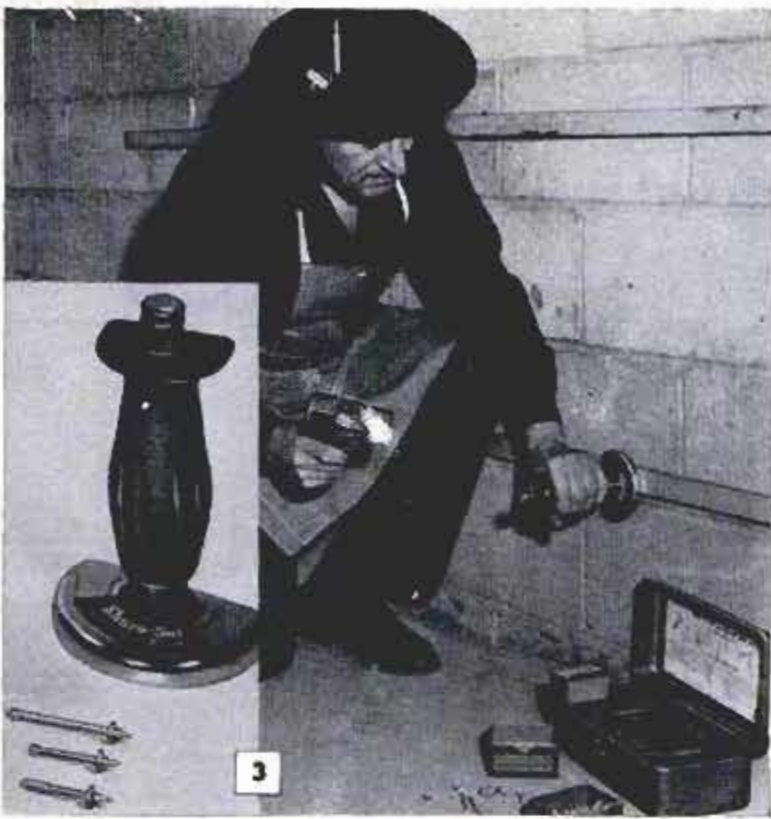
**6. THREE-WAY LOCK WASHER HAS BARBS**, or teeth, on both faces to engage the nut and metal on which it is seated. This feature gives a vertical, rotary and horizontal locking effect that will withstand excessive vibration without loosening. Barbs are hardened to enable them to embed in all but the hardest metals. Available in various common sizes

Hi-Standard Stamping & Mfg. Co., 18228 James Couzens, Detroit 35, Mich.

**8. MITER CALCULATOR** gives the correct compound-angle settings at a glance. Saves both time and wasted stock when cutting various forms of the so-called hopper joint. To use, you determine work angle and align scale with predetermined work angle. Correct settings for saw-blade tilt and miter-gauge angle appear in windows on the right and left sides of scale

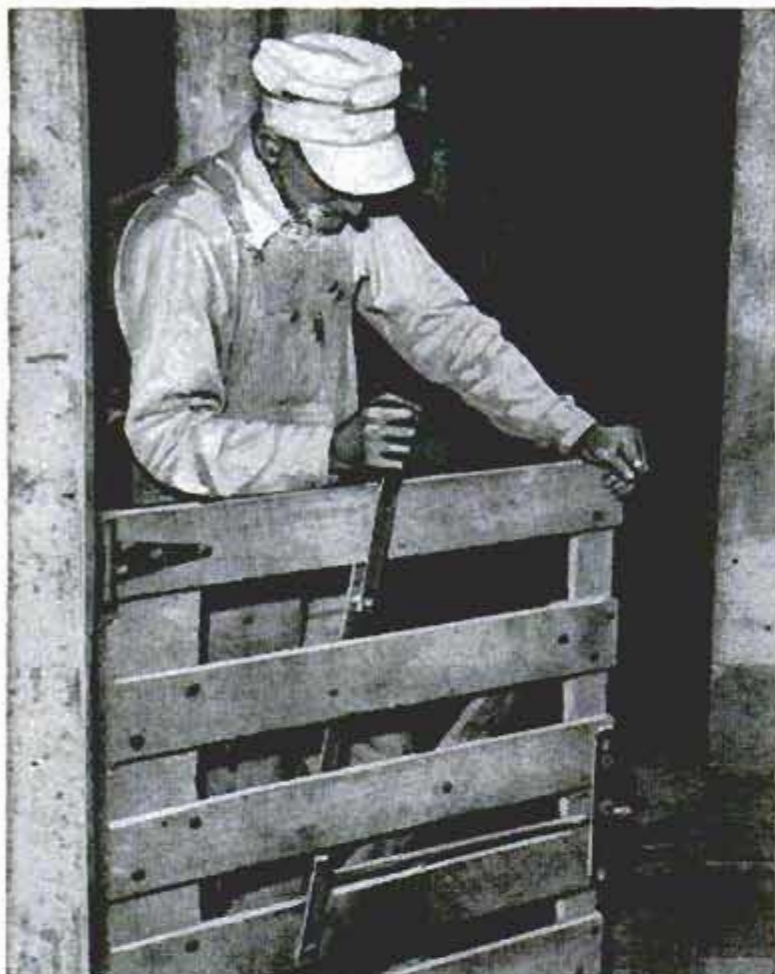
Miterite, 1459 Patio Dr., Campbell, Calif.







# Lever-Operated Gate Latch Saves Stooping



Pivoted to a lever that extends above the gate, this heavy bolt latch is operated from either side of the gate. The lever is bent just above its pivot point to the opposite side of the gate, then extends above the gate. The upper end of the lever is bent double and bolted to itself so that it completely encircles the top rail of the gate. The slide bolt for the latch is a length of steel rod pivoted to the lever at the point where it passes through the gate. A length of flat steel bolted to adjacent cross members of the gate serves as a retainer.

## Saw Blades Stored in Album

Circular-saw blades can be safely stored in an ordinary record album. You'll always know where they are and they'll keep in perfect condition over long periods of time if you take certain precautions. Coat the blade on both sides with a light oil and place between two sheets of heavy oiled paper. Fold the corners of the paper over and seal with tape.

## Simulated Polished Finish On Turned Cast Iron

Occasionally it is desirable to finish cast iron to a high polish after turning in the metal lathe. There's an easy way to do this by simulating the polished finish, using a file as the "polisher." Grind the end of the file square across and to a bevel of 3 to 5 deg. Hone to a sharp edge. Then turn the toolholder approximately parallel with the lathe axis, set the top edge at center and use as a tool rest for the file. Take very light cuts to avoid scoring.

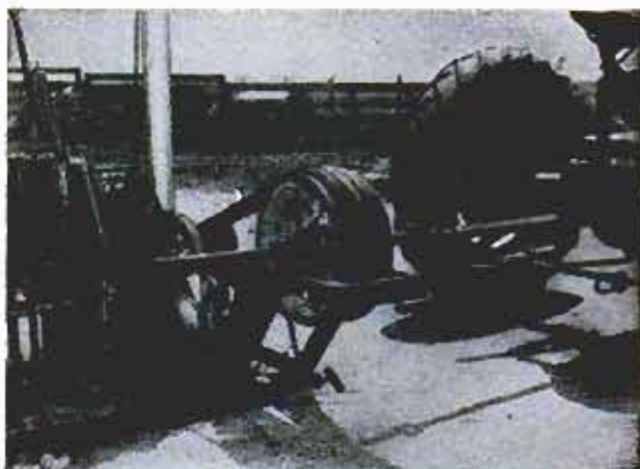
Frank L. Rush, Columbus, Ohio.



## Multiple V-Belt Drive For Farm Feed Grinder

To eliminate trouble caused by slippage of a flat-belt drive from tractor to hammer mill, one farmer replaced the flat pulley on the grinder with a multiple V-pulley. Then he mounted an 18-in. flat pulley on an angle-steel bracket as pictured, the pulley shaft extending beyond the pillow-block bearings far enough to engage the power take-off shaft direct from the tractor. Then matched V-belts are placed side by side to form the efficient drive shown.

John Fitzpatrick, New London, Iowa.







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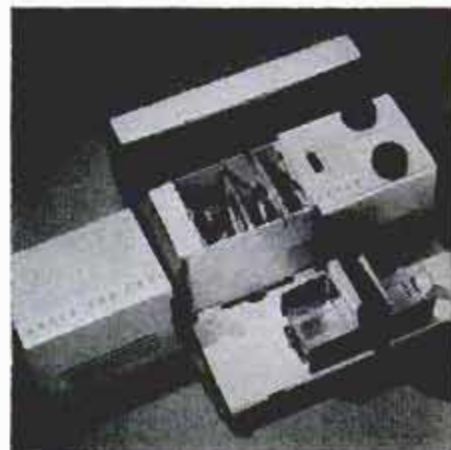
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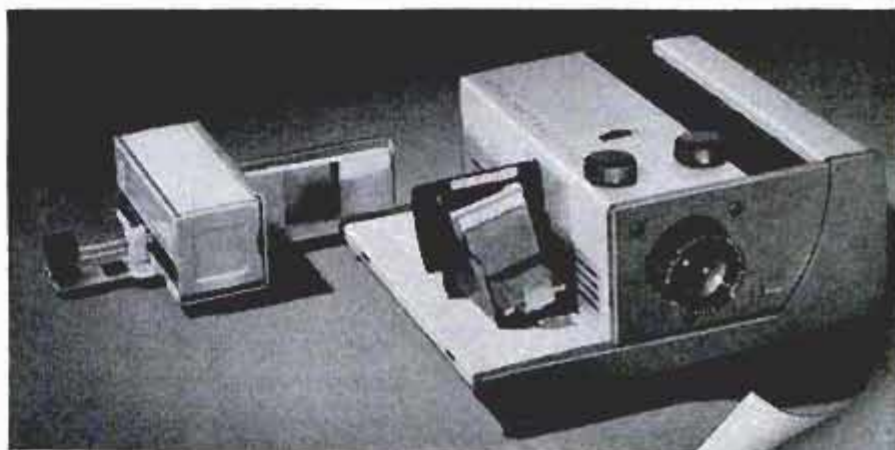


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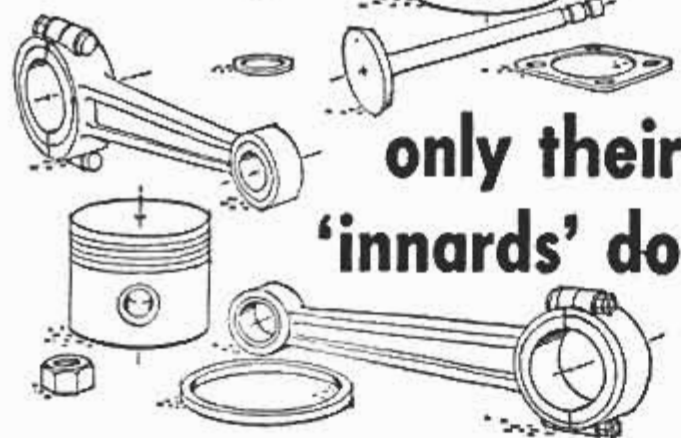


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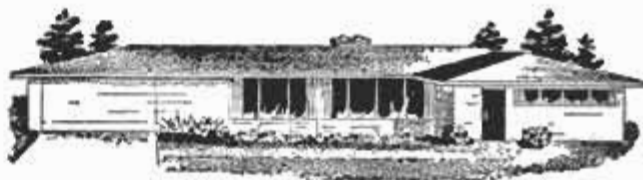
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### Stained Exterior Door Turns White



**Q**—Two doors in my home are stained a light-oak color and then varnished two coats. This was done a year ago. Lately during the cold weather I have noticed grayish-white spots on the finish, irregular in shape but covering a sq. ft. or less in area. There are several of these on each door. The spots are on the inside, not the outside. What is this, and how can I restore the finish—R.H., Mich.

**A**—We assume, of course, you are referring to outside doors. It is not possible to say with certainty what has caused the grayish-white spots you describe, but we would be inclined to say it is due to moisture condensation. In cold weather the temperature at the surface of the door on the room side is much lower than that of the air in the room. This causes the moisture in the air to condense on the colder surface. Ordinary varnish or shellac would eventually be affected by this condition. However, there is one other possibility that should be considered. If the doors are unprotected, that is, by an awning or porch roof, water may seep through the joints where the rails join the stiles and work through the wood, or the joint, to a point under the varnish film. This also can cause the defect you describe. Of course, the remedy depends on the cause. If the discoloration is due to condensation, then we would suggest that you remove the old finish from the inside of the doors, restain if desired, and apply an outside clear finish which is especially compounded to withstand weathering. If it can be determined that the discoloration is due to seepage of water through the joints, then, of course, the openings at the joints must be sealed with a calking compound or putty.

### Removing Old Paint From Plaster

**Q**—I want to remove several layers of old paint from a small plastered area, about 20 sq. ft. Is there anything faster than an ordinary paint and varnish remover? If so, what?—H. M., Pa.

**A**—There are perhaps faster solvents but we couldn't recommend them for the purpose you have outlined. A paint and varnish remover is the safest and in the end, we believe, the surest. You should use the paste type of remover which will stick to a wall or ceiling. Take time to apply it uniformly with a wide puttyknife or a spreader of the type used to apply tile cement. Give the remover plenty of time to work. A small amount of clear lacquer of the spray grade will tend to speed the action of the remover somewhat. Add about one-eighth pint to a quart of remover.



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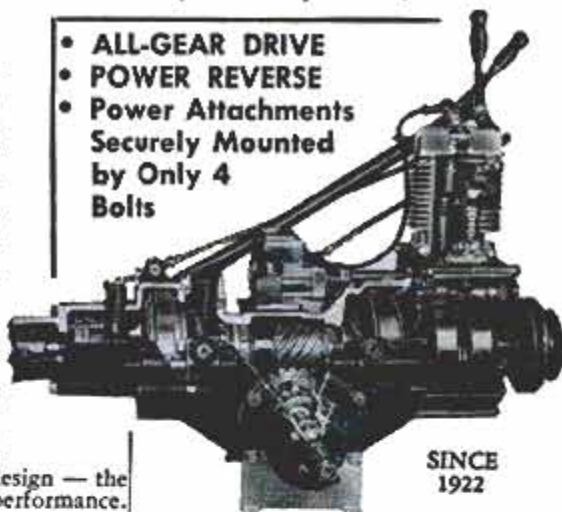
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FIELD-TESTED SINCE 1922



## I Led the Thunderbirds

(Continued from page 136)

opposite direction. It's a simple, graceful way of turning around. But it's tough when we use it to change from diamond to trail formation. The slot man must back off first so the wingmen can slip back behind me in proper order, so Bill Pogue is the lad on whom the maneuver depends. If you listened in on our frequency during this one, you'd hear something like this going on upstairs: "Thunderbirds, come up to AB (afterburner) range . . . ABs now! . . . this'll be a change-over whifferdill . . . Bill Pogue, you call the change. . . ."

With four roaring afterburners going, the diamond rolls into the arch as Bill takes over: "Roger . . . Thunderbirds, now!" Pogue eases throttle, Doug's right wing lifts as he slides back on Bill's nose, Bob's left wing rises as he slides in behind me. In two seconds we're pulling out of the whifferdill single file at 700 miles per hour, streaming long columns of smoke.

### Sounds Like Card Players

And so it goes. One fellow who did hear us on his radio during a show said we sounded like a bunch of guys sitting around playing cards. Actually we could probably fly the show without talking—and nearly did one day at Maxwell Field. Ed "Lucky" Palmgren, then my slot man, broke his throttle cable during our vertical climb into the bomb burst. I heard him tell me as he rolled out of formation and dove for the strip. Then I discovered I couldn't call a signal. My transmitter was dead. Lucky landed safely, and the three of us went on with the show. At first the wingmen flew by watching me—then they took over and called the turns between them. Nobody knew the difference.

Anticipating the leader's every move is the real secret of tight-formation aerobatics, and the T-birds are crackerjacks at it. One of the trickiest pieces of timing is, of course, the crossover following the bomb burst. Each man, looping and rolling in an opposite direction from his opposing partner at the 10,000-foot-altitude breakaway, must spot all three of the other planes as he begins to flatten out. Then, the four pilots, approaching each other from the four points of the compass at sonic speed, must gauge distance, timing and altitude to arrive at the same point at the same time—allowing just enough difference in elevation to avoid the most colossal head-on crash imaginable. The boys are so hot on this, from endless practice, that their tolerances become infinitely small. At one show

over Bolling Field, former wingmen Burt Spalding and Bill Creech gave the customers a real thrill. Zooming down from four miles high, Spalding flattened out only four feet above ground, roaring south at crossover point; Creech shot past him going north at three feet of altitude. Every photographer in sight was flat on his stomach as they crossed.

On most maneuvers the wingmen work hardest. In order to put a formation through rolls and turns as though the four ships were a single unit, these pilots must continually play the throttle and follow the movement of the leader's wing tips—maintaining constant position beneath them. "We're working and pulling the stick against nose-down trim like mad the whole time," Bob Anderson will tell you. "I work under a constant four-to-five G pull throughout the show." This is the reason newcomers to the team spend two weeks massaging sore arm muscles.

### Stand on Wing Tips

You get the idea when you visualize the wingman's position in something like the 360-degree vertical turn, when the entire diamond stands on its wing tips, roaring in a tight circle at nearly the speed of sound. Bob explains it this way: "On the roll-out, the outside wingman is like the guy at the end of a string of skaters cracking the whip. Afterburner exploding, I swing wider and faster than anyone else to stay in position. I'm pulling more than five Gs. If my hand slipped off the stick it would weigh so much I couldn't lift it."

### G-Suit Offsets Gravity

Every T-bird has a pressurized G-suit to offset the pulling strains of gravity, but few of us care for the added encumbrance, and they're seldom worn. They also add one more thing that can foul up. In the middle of a maneuver one day, the intake valve on mine let go. The suit blew up like a balloon, squeezing me like the coils of a boa constrictor. I grabbed the hose, yanked it loose and deflated it before it throttled me. I finished the show without it.

With all hazards and split-second precision required in formation aerobatics, it would be remarkable if the Thunderbirds didn't have an incident to remember.

Bill Pogue won't forget the day when his entire electrical system went out during a show, leaving him without anything—including landing-gear power. He dropped away, shot a flame-out pattern and landed hot. On top of everything else, his drag chute failed. Fortunately he made the runway, which was a long one, and skidded

(Continued to page 246)

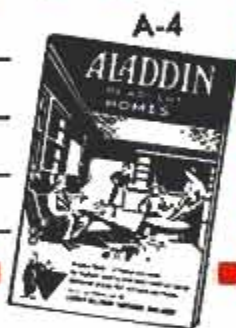




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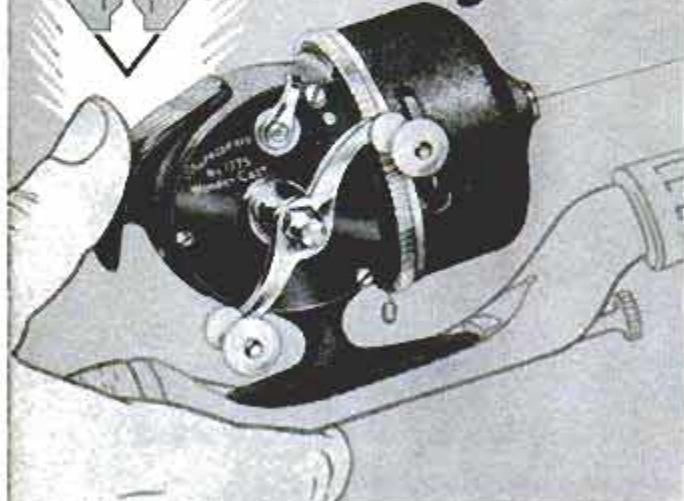


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to a halt just a few feet from the end. "Hairiest" of all was the day when Lucky Palmgren flamed out at 5000 feet during practice near Maxwell Air Force Base in Alabama. He dove for the nearest open patch—a tiny cornfield—while we all watched, knowing the field was too small. It was. But Lucky didn't get his nickname for nothing. He rocketed in, skimmed over one set of telephone wires, ducked under another, ran out of cornfield still going 100 miles per hour, roared across a railroad, sheared off his landing gear on a road embankment, over which he bounded, bashed through a fence leaving his tail assembly behind, knocked off a wing at the butt on a phone pole, thumped to a stop, climbed out, and flew a show the next day.

### No Serious Mishaps

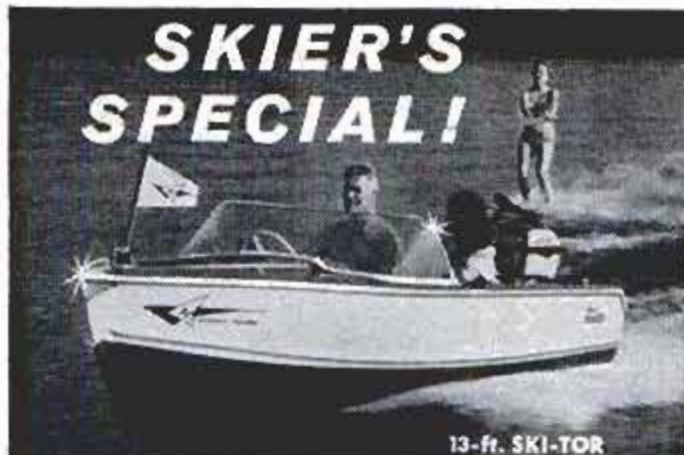
An interesting fact, of which every Thunderbird is proud, is that no serious mishaps have ever occurred due to pilot goofs. At our home base, Nellis in Nevada, the team practices twice a day, going through routines repeatedly until each maneuver is letter perfect. At briefings, the slightest errors are ruthlessly hashed over. T-birds know how to take criticism, or they'd never become Thunderbirds. Most of it is good-natured, anyway. On his first show, Doug Brenner turned the wrong way on the bomb-burst breakaway and came in ten seconds late on the crossover. He picked up the tab on all T-bird entertainment for several days as a result. Bart found himself confronted with a little pile of entertainment chits, too, until he licked the habit of scraping his tail skid on sharp take-offs. The system works better than fines. Thunderbirds like expensive entertainment when a teammate is paying.

If you see the Thunderbirds perform this year, not all the boys mentioned in this article will be up there. Maj. J. A. "Robby" Robinson will be in the lead plane calling the shots. Doug Brenner will still be manning that right wing. Bob Anderson, now a captain, has been moved along to other assignments after nearly two years of top Thunderbirding, but Bart Bartley, our old solo man, is up there holding down the left wing in his place. Bill Pogue is still in the slot catching jet exhaust on his tailfin, and Capt. S. R. "Sam" Johnson has moved in to take over Bart's former solo job. Capt. Bob McIntosh is spare pilot and engineering officer, eager and ready to move up to the solo position when the next team member completes his tour and moves on.

But nobody, not even a former Thunderbird, will be able to tell the difference. All these lads are as hot as they come in a jet pilot's saddle. ★ ★ ★



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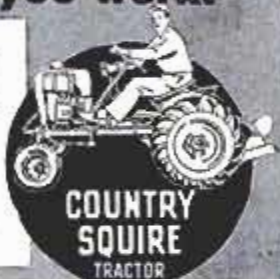
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## The Battle of Donner Pass

(Continued from page 159)

during storms and afterward until snow that the plows didn't scrape off is thawed with salt and is pushed off the pavement. Some drivers protest about the rule on chains, but this is a wet snow that is much more slippery than the dry powder of the Rockies and the Midwest.

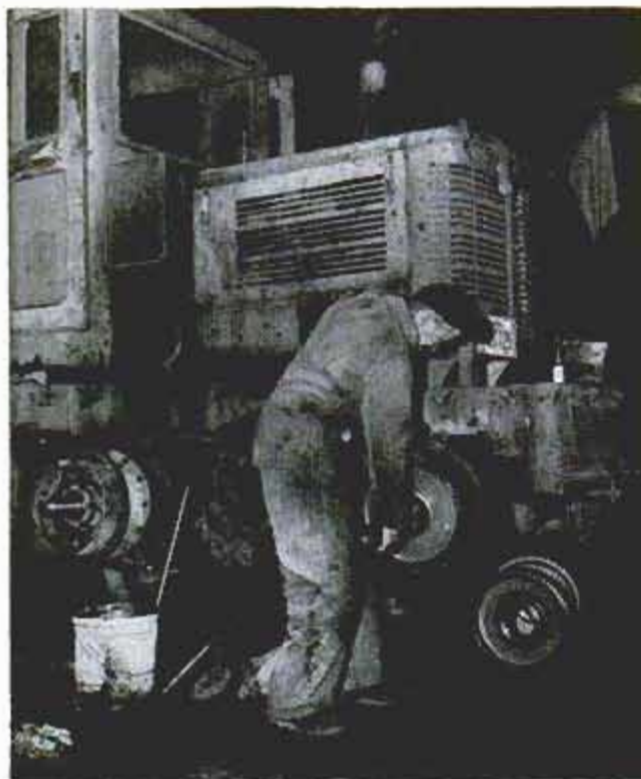
Every winter a permanent chain-control gate is established on the east side of the mountains near Donner Lake; on the west side of the mountains a truck is parked by the roadside to serve as a chain-control point. The truck moves uphill when chains are required only across the summit; then is driven downhill again below the snow line when a fresh storm moves in.

### Radio Summons Help

When a big truck slides into a snow-bank in spite of its tire chains, traffic is slowed down or may be halted completely while a radio message is relayed to the nearest commercial garage for a wrecking truck. In the Donner area these calls go to Truckee, 12 miles to the east, where the Thornton garage maintains two big wrecking rigs especially designed for mountain-highway work. Originally the wreckers were military tank retrievers. Now they are fitted with 25-ton winches and are short-coupled so they can back and turn on narrow roads.

Some of the trucking companies have

Front-drive mechanism of grader is fixed at repair shop highway department set up at Donner Summit



Cab of this rotary snowplow has reinforced steel plate over cab to protect driver from rockslides

taken a tip from railroads that use a helper engine for boosting a heavy train up steep grades. Instead of taking a chance on a truck spinning out in the snow, the companies employ Thornton to tow their trucks and trailers or big tankers up the steepest grades all the way to the summit.

### Open Highways Are Vital

Modern commerce and modern tourists are so dependent on highway transportation that the California Division of Highways makes a daily radio roundup of highway conditions in California and adjoining states, then teletypewrites these reports to newspapers, radio stations and automobile clubs.

On a typical winter morning the daily report may include such information as "U. S. 40, chains required over Donner Summit for eastbound traffic; U. S. 50, chains required 12 miles east of Placerville; U. S. 99, road icy at Dunsmuir, carry chains; U. S. 199, one-way traffic north of Patrick's Creek due to slide; Carson Pass, Ebbetts Pass, Tioga Pass, roads closed on account of snow."

This road information is also available by phoning any of the branch offices of the division of highways. At night and on week ends an automatic phone-answering device in each of the offices repeats the information when the office phone number is dialed.

(Continued to page 250)



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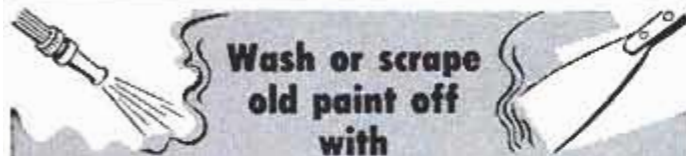


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Now anyone can make perfect cabinet finished stock from low-cost rough lumber... any size up to 12 1/4 inches wide and 6 inches thick. Turn out high grade finished material at a fraction of the cost you pay lumber yards. Big 42-inch-long bed makes it easy to plane heavy, wide and long pieces... BELSAW self-feeds at 14 to 34 feet per minute.

USE THIS ONE LOW-COST MACHINE for Planing, Jointing, Sawing, Milling, Tongue and Groove.

You can easily make flooring, siding and many other popular patterns with your Belsaw. Your Belsaw quickly pays for itself with savings on raw materials and profits on finished stock... a highly profitable machine for custom work. Compare Belsaw with any 12-inch planer on the market... Belsaw gives you more essential features—yet costs you \$50 to \$125 less than others.

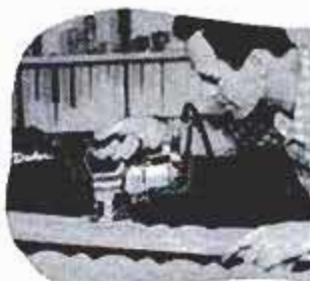
Send Today for Free Literature on the Belsaw Multi-Duty Planer.

BELSAW MACHINERY CO 2058 Field Bldg. Kansas City 11, Mo.



## IT'S MAGIC!

### Turn your Black & Decker Electric Drill into...



a Jig Saw  
for just \$19<sup>95</sup>

B&D Jig Saw Attachment is perfect for straight, curved or irregular cuts in lumber, plastics, metal, other sheet material.

or a Screwdriver for \$10<sup>45</sup>



or a Sander  
for only \$16<sup>95</sup>

B&D Orbital Sanding Attachment gives professional satin-smooth finish. Does an hour's sanding in five minutes.

or a Hedge Trimmer  
for \$19<sup>95</sup>



or a Saw  
for just \$14<sup>95</sup>

B&D Saw Attachment—world's safest—has all adjustment features of professional saws. Cutting depth of 1 1/2".

or do many other jobs,  
thanks to the magic of

**Black & Decker**  
attachments...

...engineered to give you  
top performance with all  
B&D 1/4" Utility Drills.

Insist on  
B&D's U-3  
1/4" Drill.  
Packs more power  
to do more jobs.



## Black & Decker

World's Largest Maker of  
Electric Tools



Look under "Tools-Electric"



## NEW OAK FLOORING LAYS LIKE TILE over concrete, wood or old tile floor



## Bruce Laminated Oak Block

Modernize your home by installing this beautiful hardwood floor over your old floors. Or use low-cost Bruce Laminated Blocks to create new living space in attic, basement or addition.

**Easy to lay** — Just apply adhesive (Bruce Everbond Coldstik) and lay blocks. Tongues and grooves assure tight fit. No nailing . . . and no sanding or finishing either, because Bruce Laminated Blocks are completely prefinished at the factory. Your new floor is ready to be used and admired as soon as you lay it.

**Moisture-resistant** — Blocks are 9" square and only 1/2" thick. The three oak plies are laminated under heat and pressure with waterproof glue to prevent expansion and contraction. Ask your lumber dealer for a cost estimate. Mail coupon for color literature on Bruce Laminated Blocks.

### SEND FOR COLOR FOLDER

E. L. Bruce Co.  
Box 397-N, Memphis 1, Tenn.

Send complete information on Bruce Laminated Oak Block Floors.

Name \_\_\_\_\_

Address \_\_\_\_\_



**Bruce LAMINATED Oak Block Floors**

By the world's largest hardwood flooring maker

All the roads over the rugged Sierra Nevada range are being steadily improved and within a few years you'll be able to breeze across the mountains on a divided four-lane expressway. U. S. 40 measures 211 miles from the Nevada state line to its terminus in San Francisco, and 139 miles of this distance are already of freeway status or are being improved to four wide lanes. The Donner section of the freeway will be one of the last built, and present plans are to route it somewhat north of the present summit to avoid the cliffs and provide easier grades. Even so, the 10 miles of relocation will cost \$1,000,000 per mile. The present road will be retained as a route to the existing ski resorts.

### Melt the Snow Off?

For a time the highway engineers hoped they could eliminate the need of constant snow removal during winter storms after the new freeway is built. They had visions of keeping the pavement hot so that snow would melt as soon as it fell and then flow off the edges of the road. But the idea wasn't practicable. Aside from the enormous cost of steam plants and steam lines, there were other obstacles.

Present plans are to build a big new snow camp at a sheltered point on the new expressway, large enough to house 100 men. It will require that many snow fighters, and twice as much equipment as at present.

When the expressway is completed you'll be able to cross the Sierra at 60 miles per hour in the summer, though during the snow season you may still have to put on your chains and hold your speed down to 25 miles per hour. Even at that, you'll be breezing across one of the highest and most rugged mountain ranges in the country, in the middle of the winter, in comfort and safety. ★ ★ ★

### Glycerin Added to Water Reduces Cooking Time

Three-minute eggs can be prepared in 1½ minutes and the cooking time for other foods greatly reduced by adding harmless glycerin to water. This was discovered by a 14-year-old Maryland science student, Brenda Gail Kanegis. When glycerin, which is highly soluble, is added to water at the weight ratio of 60-percent glycerin and 40-percent water, a 10-degree C. rise in boiling temperature is obtained. The technique also could replace fats and oils in the frying of many foods, according to Miss Kanegis' research, which has been recognized by the American Chemical Society.



# GIVE YOURSELF A RAISE in '58

## Make \$20 to \$30 a Week Extra Income in Spare Time

Here comes 1958—are you going to get ahead faster next year? How—ask the boss for a raise? That doesn't always work. Here's an idea—be your own boss in spare time and give yourself a raise. \$20 to \$30 a week extra money is easily possible with the machine and the plan offered in this ad.

## Earn up to \$3 or \$5 an Hour with FOLEY SAW FILER

Here is a steady repeat CASH business you can start in your own basement or garage and make up to \$3 or \$5 an hour in your spare time. You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eye-strain—and you can start right away to turn out perfect cutting saws.

"My spare time saw filing business has made me \$952 these first ten months."

—R. T. CHAPMAN

"I made \$756 last year filing saws, and it sure comes in handy. I do this work in my spare time."

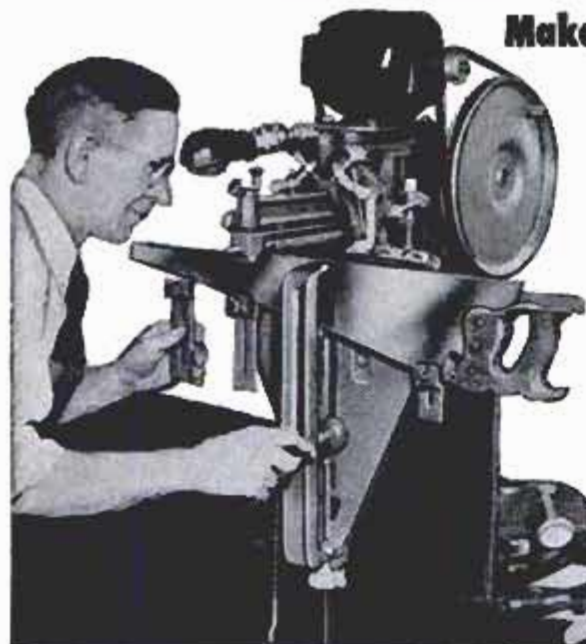
—JAMES B. WILLIAMS

"Last year's profit amounted to \$3,000. Not so bad for a one-man outfit."

—CHARLES C. HOUGH

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back with repeat orders."

—LEN CREGO



## Send Today For FREE BOOK "MONEY MAKING FACTS"

"MONEY MAKING FACTS" explains how you can get business from hardware stores, homeowners, farmers, carpenters, schools, mills, factories, etc. Get the facts—send coupon today for this practical, money-making plan. No salesman will call.

**FOLEY MFG. CO.** 116-8 Foley Bldg., Minneapolis 18, Minn.

Send me free book "MONEY MAKING FACTS"

Name \_\_\_\_\_

Address \_\_\_\_\_

## NEW, IMPROVED CALCULATOR FOR WOODWORKERS only 25c

Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods. 6" diameter heavily varnished cardboard. Send 25c, no stamps, please to Greenlee Tool Co., 2101 Columbia Avenue, Rockford, Illinois.



## U-MAK-IT BOAT KITS



30 years of boat kit pioneering. 30 models. Prams, Rowboats, Outboards, Cabin Cruisers and Skiffs.

### SEND FOR ILLUS. CATALOG

Showing all models from 8' to 23'. Const. details, paints, access., etc. All you need to build your own.

MAIL 35c (coin) for Postage & Handling.

## NEW LAPSTRAKE SKIFF KITS

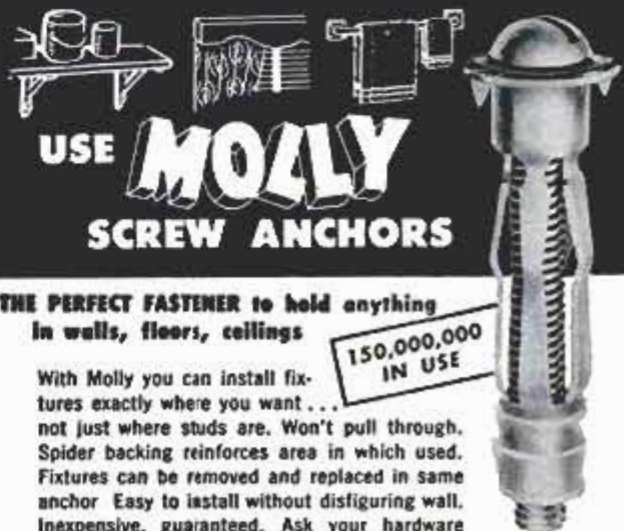
Now added to our great line of kits, new easy to assemble Lapstrake Skiffs.



**U-MAK-IT** products

DELAND, FLORIDA — DEPT. 12

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# USE MOLLY SCREW ANCHORS

THE PERFECT FASTENER to hold anything in walls, floors, ceilings

With Molly you can install fixtures exactly where you want... not just where studs are. Won't pull through. Spider backing reinforces area in which used. Fixtures can be removed and replaced in same anchor. Easy to install without disfiguring wall. Inexpensive, guaranteed. Ask your hardware dealer for genuine Molly... the name is stamped on the cap.

150,000,000 IN USE

SEND \$1.00 FOR SAMPLE BOX OF 12



200 N. 5th ST. • READING, PA.

Enclosed is \$1.00 for which please send me a sample box of 12 Mollys postpaid.

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You'll agree-  
it's the  
**HANDIEST  
PLIER  
OF THEM  
ALL**

**CHAN NEL LOCK**  
No. 420

You'll like the all 'round usefulness of the Channellock No. 420 . . . its terrific gripping power . . . its quick, non-slip adjustability up to 1-3/4" size. And you'll find it easy to use in hard-to-get-at places because of its compact design. Mechanics everywhere say no other plier does so many jobs so well. You'll say so, too!

**CHAMPION DEARMENT  
TOOL COMPANY  
MEADVILLE, PENNSYLVANIA**



**ASK YOUR  
TOOL SUPPLIER  
FOR  
CHANNELLOCK  
PLIERS**

**Be sure its a genuine CHANNELLOCK  
Look for the trademark on the handle**

## A New Landmark for Brussels . . . The Atomium

(Continued from page 103)

(especially watchmaking) and the wonders of its civil engineering in building enormous dams and tunnels high in the mountains. Considerable space will be devoted to agriculture and also the culture and history of the country.

The French building, of somewhat bizarre design, will be made of metal and prefabricated concrete panels. It is designed to give an impression of columns and wires and tends toward the modern trend in French architecture. The chief architect is M. Guillaume Gillet.

The interior of the French pavilion will hold exhibits of engineering, handicrafts and agriculture as well as cultural displays. Special space will be devoted to Paris and a typical high-class French restaurant.

Canada's exhibit will be housed in an almost square pavilion that will contain a movie theater, a large restaurant, cocktail lounges and a coffeehouse. Sixty Canadian students will be in attendance to explain to visitors all the numerous exhibits, both agricultural and industrial. Canada, long regarded as an agricultural country, will put special emphasis on its rapid industrial development and great mineral wealth.

Just across the way from the United States section of the exhibition will be the square glass-roofed U.S.S.R. building. This massive concrete, steel and aluminum structure will surround a gigantic statue of Lenin. The pillared entrance to the pavilion will have wide steps and above it a large hammer and sickle.

When I viewed the partly constructed Russian building it gave me the impression of rather unimaginative solidity compared with the lighter touch introduced by many of the other nations. It seems to typify the heavy decorative type of architecture of the Victorian era which is so characteristic of the present architecture of many of the large buildings in Moscow.

The Russians, with their usual reticence, have not announced much detail of what their building will contain, but it has been stated unofficially that many items will be exhibited that have not previously been released for exhibition or shown to the Western World. There will be tremendous emphasis on Russian progress in civil engineering, atomic energy (this will also be shown in one of the spheres of the Atomium) and the arts and sciences. It is probable that some material will be included on the Russian satellite.

(Continued to page 254)



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WITH **MILESMASTER**<sup>®</sup>



**FUEL  
PRESSURE  
REGULATOR**

For smooth running, quick starting, better mileage . . . install a genuine MILESMASTER. Prevents flooding. Only \$6.95  
**MILESMASTER, INC., Dept. K, Exeland, Wisconsin**



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You'll Make It, Too, With A

### HULL AUTO COMPASS

For 25 Years, America's Favorite  
Motoring and Boating Guide

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**HULL MFG. CO., P. O. BOX 246-D-1, WARREN, OHIO**

### ONE-MAN SAWMILL LOW \$50<sup>00</sup> DOWN AS . . .

**FREE BOOK**

Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for home and farm—sell to local yards—make up to \$50 a day custom sawing for neighbors. BELSAW lasts a lifetime. No crew needed. Power with tractor or auto engine. Beginners get excellent results. Send today for FREE BOOK.

**BELSAW MACHINERY CO**  
P.O. 3458 Field Bldg. Kansas City 11, Missouri

for the man  
who wants the  
**BEST**

### TURNER<sup>®</sup> Propane TORCH

- Solder
- Remove paint and putty
- Lay tile
- Light charcoal
- Thaw pipes

Only  
**\$5.95**

### MULTI-TORCH CHEST

Includes 1 Turner Torch, 1 heavy duty burner, 1 chisel point soldering tip, 1 flame spreader. All in heavy steel chest.



\$13.85 value only **\$9.99**

TURNER Propane Gas  
CAMP LIGHT  
**\$12.95**



TURNER PROPANE  
GAS STOVE  
**\$24.95**



At hardware, automotive and sporting goods stores

**TURNER BRASS WORKS**  
Sycamore, Illinois

**Beat High Building Costs . . .**

## Build a Beautiful Liberty Home yourself ...or direct its construction! SAVE THOUSANDS OF DOLLARS



### 46 MODERN DESIGNS

The 3 bedroom Woodlawn

Spacious, rambling homes of all types including split levels. Some with attached garages. 2, 3 and 4 bedroom plans, 1 and 1½ baths. Large living areas, family rooms and kitchens. Build with basement or utility room. Brick, siding or shake exteriors available. Designs for wide or narrow lots.

### HERE'S WHAT YOU GET

Liberty Homes are ready-cut homes . . . a complete package of ready to assemble materials including all framing lumber, finish lumber, trim, nails, hardware, paints, windows, doors, roofing, siding, etc., including complete plans for easy construction.

### FINANCING IS EASY

Liberty Homes are approved by Banks and Savings & Loan Associations throughout the country . . . acceptable for FHA or VA financing. Liberty's own 5-year Payment Plan is also available, requiring only 10% DOWN to finance Liberty materials.

Your savings on a Liberty Home can amount from \$2000.00 to \$5000.00 depending on the home you buy and the amount of work you do yourself. That's because you save many ways: *You save on material costs. You save on contracting costs. You save on labor costs. You save all material waste. You save all middle-man's profit. You save all architect's fees.*

### IRON-CLAD GUARANTEE

Liberty Homes guarantee, in writing, to supply highest quality materials in sufficient quantity to complete your Liberty Home.

**MATERIALS SHIPPED FREIGHT PREPAID**

Send 50c for big, colorful 56-page catalog.



### LIBERTY HOMES

Lewis Manufacturing Co. • 1281 Lafayette Ave. • Bay City, Michigan  
Enclosed is 50c for your big Liberty Homes Catalog.

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STREET or RFD \_\_\_\_\_

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**IT'S EASY  
TO BLOND  
FINISH  
OLD OR NEW  
SURFACES  
WITH...**



**Nine Lustrous Wood Tone  
FINISHES**

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Los Angeles, Calif.

*Also distributed in Canada*

**NORTH STAR Paint and Varnish Co.**  
St. Paul 14, Minnesota

Another structure that will no doubt become one of the outstanding features of the Brussels fair is the large footbridge which traverses the foreign section of the exhibition. It is divided into two walks with a central open space which is 39 feet wide. The bridge will be 49 feet high and 1312 feet long.

### Widespread Building Program

In addition to organizing the fair, industrious Belgians are feverishly constructing new highways, bridges and railroads to handle the traffic. They are also encouraging international exhibitions in Brussels which cannot be accommodated at the fair. Coincident with the world's fair but separate from it will be the annual International Inventors' Exhibition, opening on June 6 for a month. Its president, Paul Quintin, recently toured the United States inviting American inventors to submit their entries and said he expects some 1000 inventions to be accepted for exhibit and for sale or license to manufacturers attending the show.

One thing is certain—all roads in Europe this year will lead to the great world's fair in Brussels. ★ ★ ★



**Portable  
Wash  
Basin**

**for  
Campers**



Designed for camping trips, as well as for physicians, is a portable wash basin, complete with water, soap and towel. One side of the case has a reservoir with a capacity of approximately 10 quarts of water.



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SATISFACTION GUARANTEED

BRAND NEW

## WALKER 5-TON HYDRAULIC LIFT KIT

ITEM #KW-116



FOR — • SNOW PLOWS • TO DUMP FARM WAGONS • ADJUST DEPTH OF PLOWS • HYDRAULIC PRESS • HYDRAULIC JACK.

THE COMPLETE KIT CONSISTS OF: 1—Walker Hydraulic Hand Pump—Rated 1500 lbs. per sq. inch with 2 gal. hydraulic reservoir • Release valve • Filler plug and air vent

• 28" steel handle. Fine for hydraulic presses; snow plows, jacks. Dimensions: 6" Diameter, 29" long with 3/4" pipe thread port. Pump Assembly Item #P449. . . . . 23.50

1—6 Ft. length double wire braid rubber covered hydraulic hose—tested to 20,000 lbs. Item #27B4. . . . . 3.95

1—Hydraulic Cylinder, 3" bore, 6" stroke. Husky 3/4" solid steel shaft. Will lift 10,000 lbs. using 1500 lbs. of pump pressure. Clevis mountings that take 3/4" diameter pins. May be used for single or double action service. Overall length 17 1/4"—retracted. Item #C419. . . . . 12.50

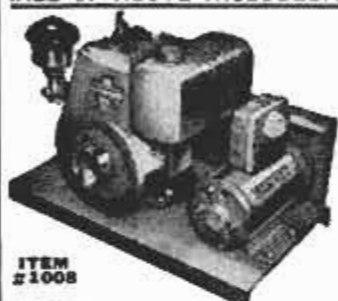
1-Gallon hydraulic fluid furnished free with each kit. Plus all necessary hydraulic fittings. Total ship. wt.—60 lbs.

COMPLETE KIT PRICE . . . . . 38.95 F.O.B. CHICAGO

(ALL OF ABOVE INCLUDED)

PORTABLE

## 1000 WATT A.C. LIGHT PLANT



Electricity For Your Comfort

COMPACT — Fits in the trunk of your car FAST STARTING

ENGINE: CLINTON 3.6 H.P. Manual Start  
GENERATOR: Ball bearing construction 1000 Watts, 115 Volts A.C. 60 cycles.

SAME AS HOUSEHOLD CURRENT

SIZE: 20 1/2" x 12" x 16" Shipping Weight 100 lbs. boxed

PRICE: Save \$110.00 from \$259.50 list price. Now! F.O.B. Chicago . . . . . 149.50

## GROBAN FOUR-WAY OPEN CENTER HYDRAULIC CONTROL VALVE

ITEM #126—Four-way open center control valve, with built-in adjustable relief valve factory set at 1000 P.S.I. Spring loaded neutral position. For use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Can be used as single unit or mounted in series. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Finger grip handle. Ship. wt. 10 1/2 lbs.

AN OUTSTANDING BUY! F.O.B. Chicago . . . . . 23.50

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ITEM #383—USE FOR:  
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FEATURES • Needle Bearing Construction • 1 1/2" Pipe Thread Inlet, 1 1/4" Hose Outlet • Standard 3/4" Keyed Shaft • All Bronze Body & gears, Monel Shaft • Equipped with Drain Cocks, Grease Cup, Internal Drive Gears for long, trouble free service. • Four mounting feet.

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MULTI-PURPOSE

## HYDRAULIC PUMP OR MOTOR

ITEM #55



Silent, high efficiency, Helical Gear Type Ball Bearing, Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M.—Delivers 1000 P.S.I. Using 8 H.P.—Reversible Rotation—3/4" Pipe Thread Inlet and Outlet Ports—1/4" Drain Port—3/4" shaft with keyway and flat for either direct or pulley drive. Dimensions—5 3/4" high, 7 1/4" long, 5 1/2" wide. Shipping weight 18 lbs. F.O.B. Chicago. . . . . 52.50

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ITEM #G-476 — 400 amps., 30 volts D.C., using up to 20 H.P. 3700/7200 R. P. M. Rotation counter-clockwise. 3/4" spline shaft. Dimensions: 18 1/2" long x 7 1/4" deep. Shipping weight 75 lbs.



47.50 F.O.B. Chicago

SHAFT DRIVE-COUPLING from 3/4" spline to 3/4" standard. . . . . 3.95

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GROBAN BUILDING  
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NEW 1958 CATALOG

200 MODELS—SAVE 2/3

## BOAT KITS

EASY TO BUILD—Designed for the amateur. Over 200

Models. Plans to Cruisers, 8 to 21 ft. Formed hulls Semi and Custom finished. Save 50%... Now NEW Sea Ray Molded FIBERGLAS BOAT KITS. Truly professional results. NO upkeep. SAVE 2/3 assembly time. 12 to 16 ft. Utilities and Runabouts. SEND 35c for 64 page Boat Kit & 24 page Sea Ray Catalogs. SEND \$1.00 for both plus "Boating Handbook". Dealers inquire for franchise.

BOAT PLANS & PATTERNS  
Frame-Pac Kits

World's largest selection: over 200 plans, full-size patterns, frame-pac kits! Designed strictly for amateurs! All types: prams, kayaks, racers, runabouts, catamarans, houseboats, cruisers • Inboard-outboard 6-40' wood-plywood-steel! Send 35c for PLAN CATALOG Catalog PLUS "Boatbuilding Handbook" \$1.00

WRITE NOW! CUSTOM CRAFT, BUFFALO 7L, N.Y.



The Modern PLASTIC for lasting Home Repairs

PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. The big 4-lb. can is obtainable from your lumber, paint or hardware dealer at \$1.25; or will be shipped direct postpaid (in U. S.) for \$1.50. Complete satisfaction guaranteed or your money refunded.

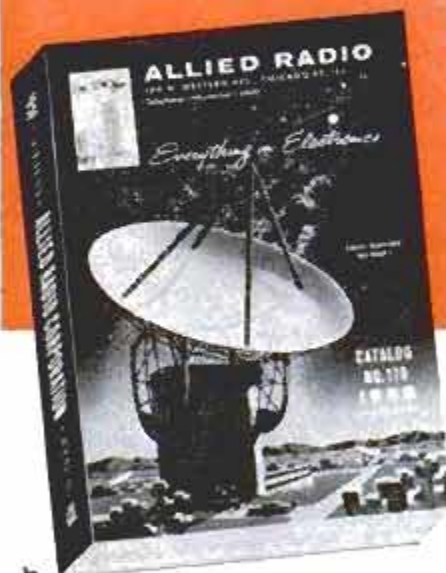
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## How to Build Physical Fitness

(Continued from page 176)

capacity to carry oxygen. The heart is stronger from exercise and thus able to pump more blood with each stroke.

Dr. Paul D. White, Boston's famed heart specialist, is as avid a hiking, bicycling and climbing enthusiast as you'll find. "It's the luxury—not the stress and strain—that is stopping the hearts in this country," says this 70-year-old physician.

President Eisenhower exercises an hour each day—doctor's orders. So did the last three occupants of the White House, Presidents Hoover, Roosevelt and Truman.

Many others have found ways to keep physically active. In Oregon, a 45-year-old surgeon runs the mile nearly every day of the week. Countless persons elect to walk as much as two or three miles to and from work each day. A 70-year-old man who bands eagles as a hobby (a task that requires climbing tall trees) figures that he is not ready to go to work until he can chin himself 15 times.

These men have realized the benefits of hard exercise in an era in which mechanization has taken over many of the functions that muscle-power once handled. We'd never want to return to the horse and buggy, but our increased leisure and softer living demand greater responsibility in keeping physically fit. ★ ★ ★

## Slide "Popping" Eliminated By Automatic Projector

Described as a fully automatic slide projector, this model is designed to eliminate the need for refocusing. Once the first slide has been focused on the screen, no further adjustment is necessary for successive slides. A time-cycling device on the control panel can be set to show each slide for any period between 4 and 60 seconds. Each slide is then advanced automatically. The projector will handle all 2 by 2 slides mounted in cardboard, plastic, metal or glass, or intermixed in the same tray.



POPULAR MECHANICS



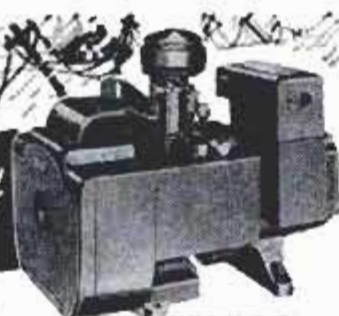
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power interruptions  
with an...

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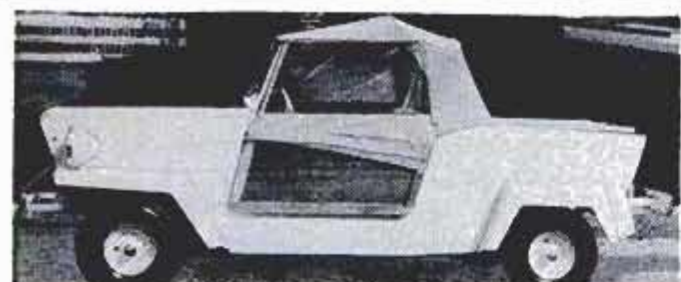
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## Build Your Own Tel-Amp

(Continued from page 182)

sockets are mounted in slots which have been cut in the board with a hacksaw or coping saw. This eliminates the need for complicated cutouts.

When all parts are mounted, fasten the board to the rear of the speaker frame. The speaker recommended in the parts list has two tapped holes in the frame specifically for this purpose. Place a long solder lug on the top mounting screw, between the board and the speaker.

Final wiring is shown in the pictorial diagram of Fig. 3. Pay close attention to the polarity (+ and -) of the electrolytic capacitors, the color coding of the transformer leads and the pin spacing of the transistor sockets. Carefully route the wires on the bottom of the board to prevent short circuits between any two bare wires. Use spaghetti (varnished insulating tubing) wherever necessary. Be sure to solder all junctions, but apply only enough heat to make a good solder connection. Excessive heat may damage the fragile parts.

The volume control, R1, and the pickup coil should be connected to the amplifier with pieces of hookup wire long enough to permit their ultimate placement in the proper position in the case. This applies also to the battery leads.

**Preliminary Tests.** After the wiring has been completed and the transistors have been inserted in the sockets, the performance of the amplifier should be checked. Because the ultimate position of the pickup depends upon the orientation of the coils in the telephone handset, the tests should be conducted with the particular phone for which it is intended.

As a test, call up a friend, or perhaps a number which gives continuous time or weather information and, with the Tel-Amp volume control turned to maximum, place the receiver end of the handset on the pickup coil. If a howl is heard through the speaker, turn the volume down until the howl disappears. Now, change the position of the handset with respect to the coil to determine the required position for maximum volume. Don't be alarmed if maximum volume, before an annoying howl appears, is somewhat limited. This will be greatly improved when the amplifier is installed in the cabinet.

During tests on the original model, it was found that the latest handsets gave best performance with the earpiece placed directly against the flat portion of the pickup. With other types, best results were obtained with the pickup in an upright

position against the side of the receiver.

**A Little Woodwork.** Figs. 4-A and 4-B show the two preassembled sections of the case used in the original model. Detailed plans for the individual parts are given in Fig. 6. (This case was designed so that the earpiece will rest directly on top of the coil as shown in the title illustration. If preliminary tests show that your phone works best with the coil in an upright position, the design of the case must be modified slightly to permit vertical coil mounting, see Fig. 5.)

The cutout in the cabinet top, part G, should provide a snug fit for the pickup coil. If the dimensions of your coil are not  $2 \times 2\frac{1}{2}$  in. this cutout must be changed accordingly.

Assemble pieces A, C, E, D and F in that order, as in Fig. 4-A, using a good wood glue and finishing nails. Then, cut a thin piece of do-it-yourself aluminum (available from hardware stores) to the required size and nail it to the horn braces, parts C and D, following the contour of these pieces.

Now, construct the subassembly of Fig. 4-B, using parts G, H and B. Mount the battery holder, the volume control and the speaker-amplifier assembly as illustrated in Fig. 2. Note that the speaker is rim-mounted to side B with a couple of wood screws and metal washers. Press the pickup coil into the cutout of part G and fit its connecting leads into the two small notches of part H, so that the leads will not interfere with the final assembly.

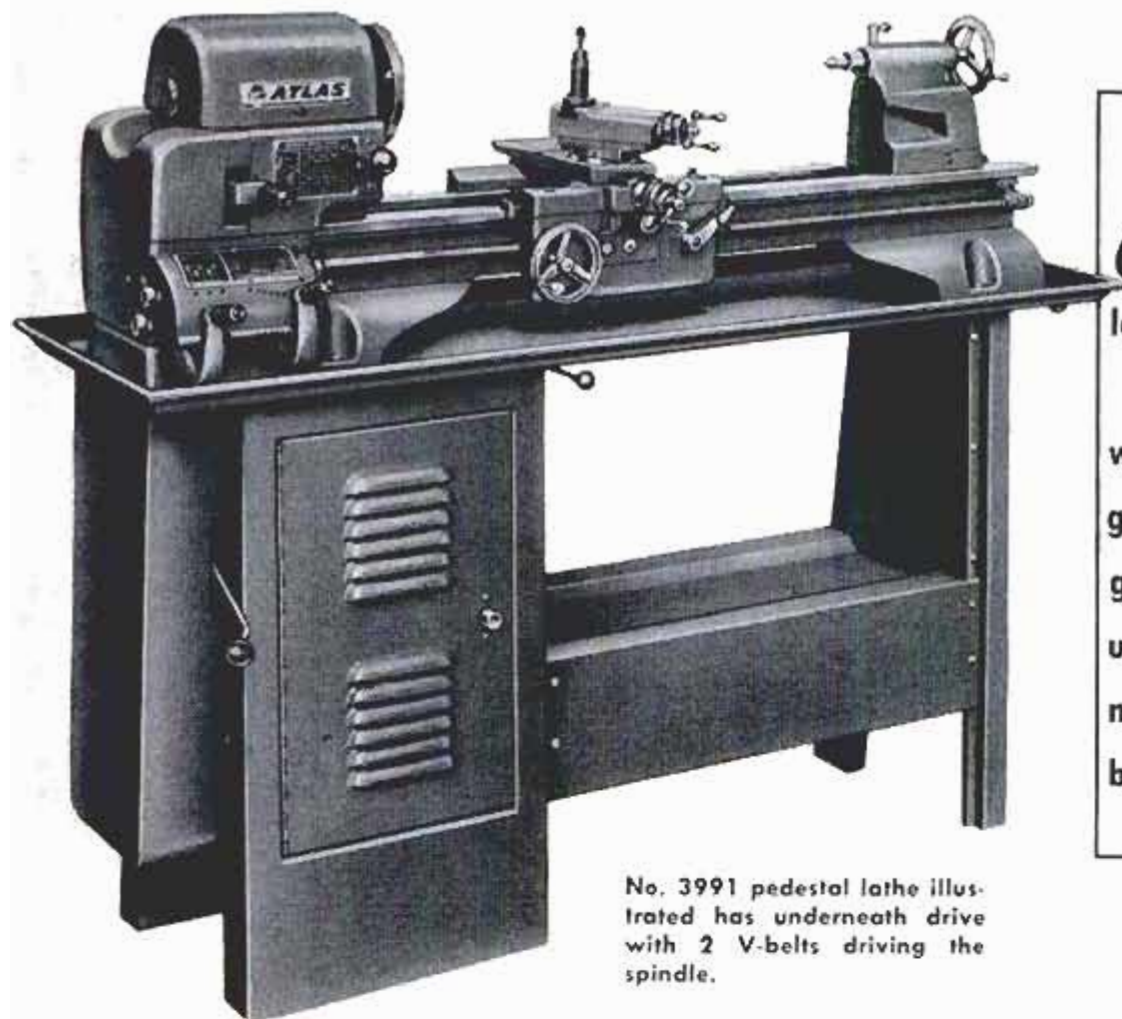
Final assembly consists of fastening together the two subassemblies of Figs. 4-A and 4-B. Use wood screws rather than nails to permit easy disassembly in the event of possible trouble. If all wood pieces have been cut to the correct size, a tight-fitting final assembly will result. The entire unit, reflector and all, may be given a coat of paint to match the surroundings.

### Possible Modifications

Transistorized and battery-operated, the Tel-Amp requires no connection to the a.c. line and is ready for instant use the moment the switch is turned on. However, the unit should be turned off at the end of a conversation to prevent undue battery wear. This minor inconvenience could be eliminated by replacing the on-off switch, SW, with a separate, leaf-spring-type, snap-action switch. This unit can be positioned so that the weight of the handset, when placed in position, will close the switch and apply power to the amplifier. When the handset is removed, the switch would open automatically and disconnect the battery from the circuit. ★ ★ ★



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No. 3991 pedestal lathe illustrated has underneath drive with 2 V-belts driving the spindle.

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## White Alice Starts Talking

(Continued from page 165)

DEW Line operates in conjunction with the Mid-Canada and Pine Tree radar screens to its south and with the coastal and offshore-radar alert systems on both sides of the continent. Its long-range radio-communication system feeds information directly to CONAD (Continental Air Defense) in Colorado Springs, to the Strategic Air Command and to the newly formed ADCANUS (Air Defense, Canada-United States).

Ultimately it will supply information not only to human military commanders, but to a huge electronic thinking machine as well. Known as SAGE (Semi-Automatic Ground Environment), this robot computer will correlate all available information about an oncoming enemy force with the characteristics of the defending weapons, then tell the defending commanders what to do. Modern weapons are so complex and are of so many different types that the human mind can't always make split-second decisions that would use all weapons to the best advantage. SAGE, remembering everything it is told, will make the decisions.

DEW Line is being operated for the Air Force by 600 technicians of Federal Elec-

tric Corporation. The radar crews are literally insulated from the Arctic climate by the heated trains in which they live and work. Named for their long shape, this type of building was chosen both for ease of fabrication and because any accidental fire could be most easily isolated and extinguished. Inside the buildings, the men enjoy virtually all the comforts of home.

A few years ago, only a well-organized expedition could do much traveling above the Arctic Circle. The country had been explored only superficially and the best maps were far from accurate. White Alice crews, for instance, found that some mountains were actually 10 miles from their map locations and sometimes 1000 feet taller than indicated.

Today the North is becoming well-mapped and even well-populated. Even the most remote areas have airstrips and communication facilities. Travel is so easy that tourists from Fairbanks think little of flying by chartered plane to watch the Eskimo dances at Point Barrow. Petroleum and numerous minerals have been found in the North, even though exploration is still incomplete.

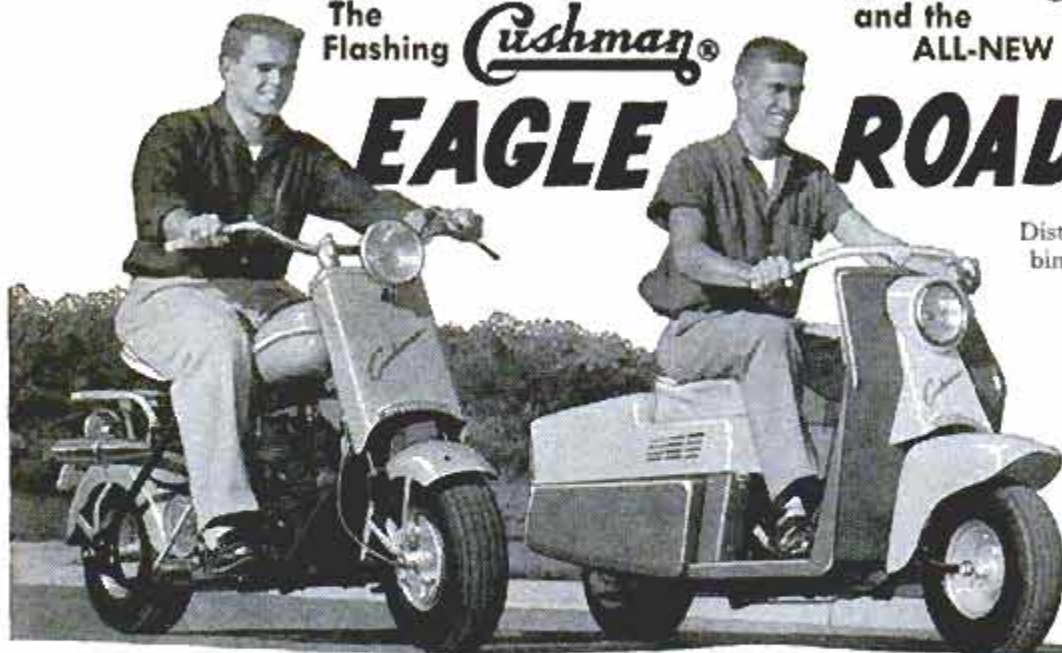
DEW Line is strictly a military project but, at the same time, DEW Line and White Alice are playing a vital part in opening up the Far North. ★ ★ ★

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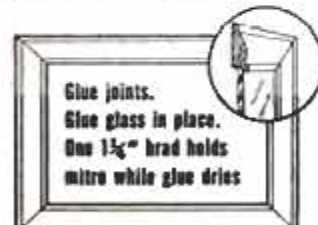
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## A Sky Full of Satellites

(Continued from page 141)

space, a rocket powerful enough to get the big satellite up there.

What keeps a satellite in the sky anyway? Why does our four-stage Farside rocket fall back after penetrating 4000 miles into space, while a sputnik can get a mere 170 miles up and stay put? The secret lies in speed and direction. Farside goes straight up until gravity stops it. Earth's gravitational field extends infinitely. Dr. Fred Whipple, director of Harvard's Smithsonian Astrophysical Observatory, explains it simply, graphically: "The sputniks were steered to a flat course at 18,000 miles per hour. They keep trying to shoot off at a tangent to the earth with exactly the same force that gravity is tugging them downward. Hence, they orbit around and around the globe, forever falling earthward but never getting there." Put any object above earth's atmosphere, traveling horizontally at a speed great enough to offset gravity (18,000 miles per hour at 600 miles; less speed at higher altitudes), and presto! — you have a satellite.

### Easier to Hit Moon

Shooting a powerful rocket straight up to slap the moon's face is headline material, but takes less tricky rocketry than precisely steering a satellite into orbit. Our Navy's project Farside, a four-stage complex of rockets with one stage nested inside the other, is lifted 20 miles by a helium-filled polyethylene balloon. There, above most of earth's atmosphere, the rocket takes off—right through the balloon—to soar thousands of miles, collecting data and radioing it back to earth via 3½-pound transmitters in each stage's nose cone. The name Farside, according to the project's liaison officer, Comdr. Tom Wilcox, has nothing to do with the other side of the moon and never did. "It was thought up by a secretary in my office, and everyone liked it, that's all," he says. A few alterations to Farside's assembly, according to American rocket expert Willy Ley, are all that's necessary to give it an escape velocity of 25,000 miles per hour and make it a moon rocket. The job of converting Sputnik I for moon-target practice is even simpler, since a 30-pound reduction in weight and slight increase in final speed would do the job.

But to send a satellite into orbit is something else. Our 21½-pound sphere needs a three-stage rocket with 27,000 pounds of thrust to get up there, and must be fired eastward to take advantage of the earth's spin. Russia's Sputnik I, if her rocketry

resembles ours, had to have a massive, multistage vehicle weighing 150 tons and capable of a 300,000-pound shove to throw the 184-pound sphere into orbit. Intricate self-contained guidance systems of gyroscopes, pendulums and computers steer the big rocket, and program it into a course parallel to the earth's surface. Delicate plumbing and instruments, sandwiched between the rocket's glowing 4000-degree skin (from friction with air) and tanks of liquefied gas at 350 degrees below zero, must still function perfectly or the launching is a bust. "The trouble with liquid fuels," grumbles a noted rocket engineer, "is you've got to tote along both fuels and oxidizer—a touchy combination." The advantage is the ability to control the flow of fuel, changing thrust to keep the rocket going in the right direction. Solid propellants, though easier to handle, burn erratically. Farside rocket components, using solid fuel in a new form, however, have restored hope for solid propellants in future rocketry.

### Future Propulsion Fantastic

Some of tomorrow's rocket-propulsion systems may be truly fantastic. In laboratories of the National Advisory Committee for Aeronautics, scientists are poring over ion engines that they predict will propel and control future satellites in their orbits. In these tiny motors, charged bits of atoms formed in an electrical discharge are accelerated by a magnetic field, producing a high-speed jet-stream of ions at temperatures up to 20,000 degrees F. NACA engineers see the day when that little jet will be used, in the vacuum of outer space where air-breathing engines can't operate, to move a satellite from its orbit and send it on a course to other worlds.

An atomic rocket, already designed by the Atomic Energy Commission, carries a supply of liquid-hydrogen propellant that explodes into voluminous mass as it circulates through a uranium furnace in the nose.

All these items are, actually, a prelude to the day when man himself steps off into the void beyond the atmosphere — a day that, until last October 4, was considered a pure fantasy coddled by a few fanatics. Today, it is frighteningly close to reality. Prof. Kirill Stanyukovich, who is a leading Russian rocket expert, has casually predicted manned flight to the moon in three years; to Mars in 13 years. Willy Ley more conservatively sees a manned spaceship six years away, a big manned space station in a dozen years, and a manned moonship assembled at the station a few years later.

(Continued to page 264)



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**?? SHOP QUIZ ??**

**Question 1** \_\_\_\_\_

What's the **EASIEST** way to drive wood screws?

**Question 2** \_\_\_\_\_

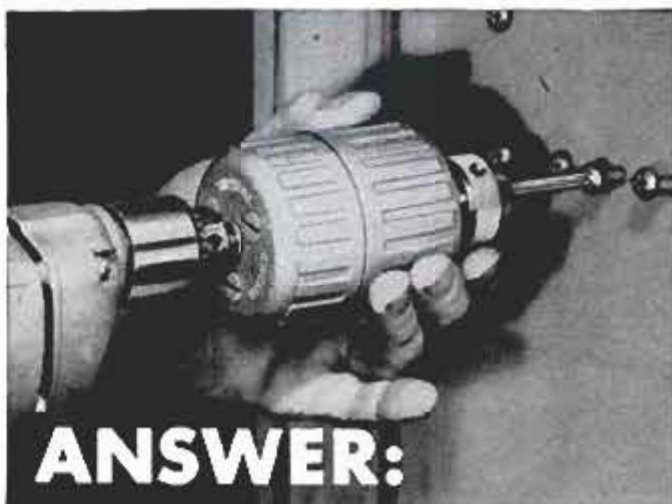
What's the **EASIEST** way to remove wood screws?

**Question 3** \_\_\_\_\_

What's the **EASIEST** way to run nuts or bolts on or off?

**Question 4** \_\_\_\_\_

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The Goodyear Corporation has released plans for a three-man satellite designed to orbit at a maximum altitude of 500 miles. This satellite would be launched by a three-stage ferry rocket developed by the company and called Meteor Junior.

One of the biggest problems of space travel is getting people back safely. Their vehicles, traveling at 18,000 to 20,000 miles per hour, would melt down to a glowing lump of tubing if they plunged into the atmosphere at such speeds. Dr. Wernher von Braun, chief of development at the Army's guided-missile center in Huntsville, Ala., has suggested a winged-glider arrangement that would enable the vehicle to orbit through the atmosphere, slowing gently and finally landing like any aircraft. Actually, the first men to fly into space probably will get there not in satellites, but in craft similar to our present ramjet and rocket-driven high-altitude research planes. In fact, it's a good bet North American Aviation's test pilot Scott Crossfield will be the world's first space pilot this year, if he flies the nearly completed X-15 rocket plane to its design potential of 4500 miles per hour at 100 miles altitude. While Crossfield won't get into orbit, he will be a mere 70 miles from sputnik's track at perigee (point of orbit nearest to the earth) and higher than any human has ever been. Flights like this will pave the way for tomorrow's spaceship pilots.

#### Space Stations Seen

Most fascinating of all satellite prospects for the near future are the manned space stations, due within a dozen years according to experts. Such a massive satellite, capable of housing a crew of 50 to 75 men, might be a huge cylinder with a vast disk of solar batteries at one end or, as Ley and von Braun have visualized it, a doughnut-shaped affair in which men work and live in corridor-type rooms filled with instruments. The station, Ley says, would orbit at an altitude of about 1000 miles.

First, according to von Braun, space-ships carrying half a dozen men at a time will enter the orbit. Other rockets from earth will ferry structural parts, prefabricated sections and nylon bags full of small equipment up to them each day. All these things, dumped out into the orbit on arrival will actually be individual satellites larruping around the earth like the sputnik's final-stage rockets. Lashed together to keep them from kiting all over the universe, they will comprise a loose stockpile from which the builders can construct their home in the sky. Men in space, wearing pressure suits, will propel themselves in any direction by tiny rocket motors.

Once the big satellite is finished and a crew installed, assembly of moonships and outer-planet ships will be accomplished the same way. Advantage of launching space-ships from such an island in space is great. Fantastic speeds can be achieved, Ley points out, since a rocket in space accelerates continuously at phenomenal rates as long as its fuel holds out. Using earth as a launching pad, most of the fuel is burned pushing the massive vehicle through the atmosphere.

#### No Friction in Space

Since friction is no problem in space, interplanetary spaceships need no streamlining. They will, according to Ley and von Braun, consist mostly of one huge spherical or cylindrical fuel tank. Small rocket motors and living quarters will be tied to the tank by metal girders. Spidery legs will provide something to land on. Taking off from the space station, they will move through the solar system like monstrous insects at six-figure speeds.

The men, says Willy Ley, will probably stay out only six weeks or so before returning to earth. Most of their work will be done aboard the space station, which probably will be man's most valuable space tool for years to come. Most of us will be around to see it in operation. But in the next few years, dozens of unmanned platforms will provide plenty of interesting surprises. Some of these satellites will be sent aloft soon to study aurora, to forecast weather, to learn the mysteries of radiation in the upper layers and to photograph the surface of other planets in the clear unfuzzy light of outer space. Dr. Hagen wants to see a telescope-observatory satellite circling the earth every three hours at an altitude of 2500 miles. There probably will be a microwave-relay satellite, operating on solar batteries, to bounce TV signals to anyplace in the world.

If everyone who should know is right, we will see a sky full of satellites in short order. ★ ★ ★

---

#### Carbon Filters Cut Smog Symptoms

Irritation resulting from smog may be reduced by activated-carbon filters in air-conditioning systems, according to engineers at the University of California at Los Angeles. Activated-carbon filters were tested in offices of a downtown Los Angeles building without the knowledge of the workers. The workers complained less of eye, throat and nose irritation on days when the carbon filters were used to purify the air.



**WAR SURPLUS BARGAINS SAVE UP TO 90%**

**FAMOUS NAVY MK14 AIR COMPRESSOR**

Great for paint and tree spraying, air brushing, filling tires, etc. Dual and remote control electrical receptacles. 115V 60 cycle AC 1/3 H.P. Westinghouse Motor. Direct drive. Draws 10" of vacuum. Water- and Explosion-proof. Built-in air filter, adjustable pressure setting up to 45 lbs. Built-in pressure gauge. Self-contained switch. Mounting brackets. Wt. 66 lbs. gross. Approx. GOVT. COST \$585. Like NEW. Only \$19.95.



**EXPLOSIVE RIVET & BLOW TORCH KIT**

Contains 300 assorted Dupont Explosive Rivets, 1 set of 3 fractional drills, 1 Butane Blow Torch with extra cartridge—everything needed for blind riveting. Torch can also be used for precision soldering, brazing, etc. 3500° pinpoint flame. Approx. GOVT. COST on rivets alone, \$90. Complete kit \$8.95 ppd.

**DUPONT EXPLOSIVE RIVETS**

Essential wherever blind riveting required. 1/8", 5/32", 3/16". Round & flat heads. Approx. GOVT. COST 32c ea. 1,000 assorted for only \$5.00 ppd.



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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, Rheostat, Electrode Holder, Toggle Switch, Welder's Shield, Wiring Diagram for kit. Wt. under 100 lbs. Approx. GOVT. COST \$650. Kit—\$39.75. Navy NEA-5 Gen. as above, purchased separately, \$27.50.

**P2 GENERATOR KIT \$29.95**

Build your own complete make-up package incl. 1 Gen., 24 V., 200-250 Amps; Rheostat, Toggle Switch, Welder's Shield, 30' new welding cable. Voltage Reg. Electrode Holder, Wiring diagram for hookup as welder. Wt. under 100 lbs. Approx. GOVT. COST \$550. NEW, \$29.95. P2 GEN. as above, purchased separately — \$24.95.

**R1 GENERATOR KIT**

Jack & Heints or GE. Rated 300 Amps. 24-32 V. With same items as above. Approx. GOVT. COST \$800. Complete 80 lb. kit — \$39.95.

**M1 GENERATOR**

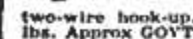
Great for trucks, boats, battery charging & other DC equipment. 50 Amps. 24-32 V. 2000-4000 RPM. Wt. 45 lbs. Approx. GOVT. COST \$200. NEW, Only \$19.50.

**CHRONOMETRIC TACHOMETER**

Built to U.S. Navy & Air Force specs. Standard brand. For counting revolutions per min. for any rotating shaft. Can be used on speeds up to 3000 RPM. Accuracy to 1/10 of 1%. Complete with male & female tips & shock-proof case. GOVT. COST \$87.50. NEW, Only \$21.95 ppd.

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**140-1 REDUCTION GEAR**

For beaching boats, winches, hoists. Ideal for motor in golf or boys electric car. Built-in (removable) DC motor & clutch. Hi torque, lo speed. Runs on 6-12 or 24 V. Wt. 65 lbs. gross. Approx. GOVT. COST \$300. Like NEW, \$12.00. \*225-1 REDUCTION GEAR, as above — \$13.50.



**HEAVY-DUTY RHEOSTAT**

Ideal for regulating voltage on electric welders. Rated 5.75 Ohms. 100 Watts with double windings & dual female 25 amp, 125 V. receptacles. 7" hi x 3 1/4" x 1 3/4" D. Shpg. wt. 2 1/2 lbs. Approx. GOVT. COST \$25. Brand New. \$1.95. 2 for \$3.50.

**B-16 KOLLSMAN AIRCRAFT COMPASS**

Ideal for boats, cars, etc. Grad. in 5° increments. Liquid-filled. Lighted. Poly-plane compensator. Panel mounting. 3 1/2" dia. face; 4 1/2" deep. Checked & tested in our own lab. Approx. GOVT. COST \$150. Like NEW, \$12.95 ppd.

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Used by USAF & commercial airlines. Makes pelorus & azimuth circle for air or marine navigators. Great for astronomers. Incl. carrying case. Tested for accuracy in our own lab. Approx. GOVT. COST \$400. Now \$10.95.

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Compact unit that fits in small places. 2 1/4 HP. 24-32 V. DC. Spline shaft. Pnd mounting. Fan cooled. RPM up to 4000. Famous brand. Wt. 20 lbs. Approx. GOVT. COST \$250. NEW, \$9.50.



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Black crackle finish frame. Easy-to-read graduations in .001. NEW. 0-1" cap. \$2.69 ppd. 1-2" cap. \$3.79 ppd.

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New Large Size Carbon U.S. Navy Surplus Production Drills. National Brands.

No. 3 Taper		No. 4 Taper	
1 1/32"	\$4.50	1 5/16"	\$7.95
1 1/16"	\$4.60	1 11/16"	\$8.15
1 3/32"	\$4.80	1 13/32"	\$8.50
1 1/8"	\$4.90	1 7/16"	\$8.75
1 5/32"	\$5.00	1 15/32"	\$9.25
1 3/16"	\$5.50	1 19/32"	\$9.95
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QUALITY POWER TOOLS SINCE 1934  
DREMEL MFG. CO., Dept. 127A, Racine, Wis.

## The Army Adopts A New Rifle

(Continued from page 150)

Army officials, however, say the purpose of the M14-15 on automatic fire is to deliver area fire, as with a shotgun, rather than point fire at an individual target. It will be used to pin down the enemy during an advance, for close-in fighting, harassing fire, in assaults and other combat situations calling for heavy, concentrated firepower.

For these uses, the experts agree it is an effective weapon. How much accuracy a soldier can achieve with it will depend on the length and type of his training, and such physical characteristics as strength and coordination. The Army doesn't even know the answers to some of these problems, because it hasn't mass-trained soldiers with the rifles.

Strange as it may seem, in wagon-before-the-horse fashion, the Army developed and adopted the NATO cartridge before it did the M14-15 and the M60 machine gun. Several rifles were proposed as a standardized NATO weapons system to use the cartridge, but the field narrowed down to the M14-15 and the Belgian FN rifle, named after its manufacturer, Fabrique National d'Armes de Guerre.

The British, Canadian and Belgian armies adopted the FN rifle. So did a non-NATO country, Australia. However, the U. S. Army was dubious.

Initially, the FN rifle did not pass several U. S. Army tests. But after modifications, both the M14-15 and the FN rifles were declared suitable for Army acceptance.

The Army picked the M14-15, saying in an official announcement that it was because of the lighter weight difference and because the M14-15 "is considered better suited for American transition to both mass production and training."

Certainly the M14-15 is a better, more dependable all-purpose weapons system than the one it is replacing. The criticism against its full-automatic feature is offset by the fact that it can be fired semiautomatic, too.

The only problems will be ammunition supply and the most effective tactical use of the weapon in combat. With the new lightweight cartridges, the individual soldier will be able to carry more ammunition. But with an automatic rifle in his hands, it will be human nature for him to want to use it that way most of the time. How will the individual soldier be able to carry, and be supplied with enough ammunition to keep up with heavy use? It will call for the strictest discipline in the combat firing of the weapon on the part of the individual soldier and his unit leaders. ★ ★ ★

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ALUMINUM ALLOY TANKS

UNLIMITED USES FOR LAND  
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These rugged aluminum alloy tanks are light, safe, extremely buoyant and can easily be adapted to hundreds of uses. They are non-corrosive and require no upkeep. You can make rafts for swimming, power craft for river and lake fun. They can be used for liquid storage and supply tanks. The possibilities are unlimited and you can have more fun than you ever imagined.



### SPECIFICATIONS

Tough aluminum alloy. 110 gal. capacity. Wt. 60 lbs. Lgth. 11½ ft. Dia. Max. 18". Crates 60" x 42" x 23". Support 700 lbs. each. Cad. plated steel brackets welded to tank for assembly.

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## MANNLICHER CARCANO CARBINE

Late model Mannlicher Carcano carbines: caliber 7.35mm barrel, 6 shot magazine, bolt action, very good condition. An inexpensive rifle for the hunter, \$12.95. Special select grade as new \$17.95. Military issue ammunition on clips, 54 rounds, \$3.40. Softnose ammunition for hunting, \$2.85 per 20.

**\$12.95**



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Genuine original Remington high power single shot rolling block rifle, Model 1902; 30" nitro-proof, hi-carbon steel barrels, caliber 7mm Mauser. Fair condition but in serviceable shooting order, \$9.95. Military ammunition, \$7.50 per 100 rds.

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## SAW SHARPENING IS EASY

Super Filer No. 11 joints and sharpens hand and circular saws 6" to 10" with all teeth correct in height, depth, pitch, bevel. When file hits steel roller, teeth are finished. Saw runs true with no side pull. Includes 8" file.

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700 watt (A712) Shpg. wt. 77 lbs..... **\$143.50**  
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Edges 5 feet  
per second  
and trims in  
the hard to  
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Changes  
from edger  
to trimmer  
in just 3  
seconds



Russian schoolgirls try out a new sidecar bicycle,  
one of the exhibits at the Polytechnical Museum

## I Drove Through Russia

(Continued from page 121)

complex form for a perfect fit. A new head-  
light unit was installed and the whip an-  
tenna brazed on. Touch-up paint covering  
body scratches exactly matched the un-  
usual shade of red. As a bonus, the car  
was washed and greased. After collecting  
the new windshield from the airport we  
hopefully took it with us to the Moskvitch  
plant—but there was no need to ask, they  
offered to put it in.

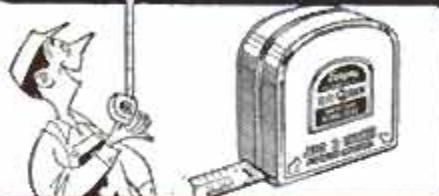
These small examples of technical enter-  
prise link up with the success of projects  
such as the earth satellite in this formerly  
backward country. On different scales,  
both represented a challenge to Russians  
who from childhood had been steeped in  
science as the key to their future.

This was dramatized for me in Moscow's  
Polytechnical Museum, where 20,000 ex-  
amples of working models of modern ma-  
chinery and equipment are crammed into  
50 halls and sections: gas turbines, blast  
furnaces, hydroelectric power stations and  
electronic computers. When I went there  
it was filled with conducted groups of  
school children, and it was an eye opener to  
see 10-year-old girls in pigtailed intently  
studying a steel-rolling mill or complicated  
machine tools.

I had another glimpse of this scientific fer-  
vor when I visited the offices of *Tekhnika  
Molodezhi* (*Technology for the Young*).  
Backed by state funds, this monthly has a  
half-million circulation—limited only by  
paper supplies. It presents advanced de-  
velopments, such as in nuclear physics or  
high-speed metal-cutting with ceramic  
tools, in simple terms and with humorous

(Continued to page 270)

**MEASURES UP!**  
ONLY  
**\$2.39**  
(10 FT.)  
the *Evans*  
**KING-SIZE  
TAPE**  
IT STANDS UP STRAIGHT  
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Evans King Size. Blade is a full 3/4" wide...  
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## STORAGE BATTERY WINCH

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• Marvellous new condition engine driven high-capacity (100,000 BTU) heater-blower. Burns gasoline—tremendous output heated air. • Wonderful for drying farm grains, heating warehouses, contractors, etc. • starting froze-up equipment, etc. Complete with long flexible heat ducts. Size 30"x48"x34". Wt. 198 lbs. Govt. cost \$525. **SALE \$92.70 FOB**

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• Variable hydraulic speed reducer. Any speed from 0 to 750 rpm by simply throwing a lever. Handle up to 1 1/2 h.p. Use for midget cars, shop band saws, etc. Instant reverse. Govt. cost \$400. **SPECIAL \$47.81 FOB**

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For painting, cleaning, tires, control termites. Assemble your own outfit. Lowest prices in U.S. • DeLuxe Kit. Compressor, tank, gauge, regulator, paint gun, fittings. How to build instructions. List \$52. **SALE \$39.49 FOB**. • Compressor 1-cyl. \$19.95; 2-cyl. \$49.95; Govt. Air Tank, \$8.79; Regulators, \$3.95; Pop Off \$1.95; Gauge \$1.89. Finest paint gun \$11.95. Auto switch \$4.75. All prepaid.



## DIAL TELEPHONE

• Modern hi-efficiency attractive dial phone. Use for extension to main line on private system. Use several for complete private system, etc. Complete with ringer, dial, etc. Work on any system. Govt. cost \$25.50. **SALE \$9.95 Ppd.**



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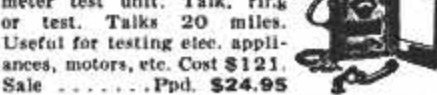
• Hand operated AC generator signal unit. Voltages up to 110. Ideal for signal bells, fish worm getter, experiments, many other uses. Cost over \$11.00. **SALE \$3.49 Ppd.**

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• Runs on 12 volt battery. Centrifugal type. Many uses. Fine boat pump, fish ponds, etc. Govt. cost \$64. **Ppd. \$9.95**

## ARMY PHONE & TEST UNIT

• Consists of field phone and meter test unit. Talk, ring or test. Talks 20 miles. Useful for testing etec. appliances, motors, etc. Cost \$121. **Sale \$24.95 Ppd.**



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STICKS ALMOST ANYTHING TO ANYTHING



Russian policeman directs traffic from center circle. Another in tower in background operates signals

cartoons. A few years ago science fiction was shunned as "unrealistic," but now there is a special "Fantastic Editor" concerned with stories about rocketships and interplanetary travel.

The last thing we saw on the Moscow sky line as we drove westward was the tower above the 32-story "Palace of Science"—claimed to be the tallest building in Europe. This is the new university, conceived on a massive scale with 150 lecture halls and 1000 laboratories to take care of 17,000 students. But the paradoxes of Russia re-emerged with the first sight of the wooden shacks and broken-down trucks.

Politics aside, this country with nearly three times the area of America appears to have the pioneering spirit of the Midwest 100 years ago, along with a massive appetite for 20th-century technology. ★ ★ ★

### Doctors Operate on "Cold" Brain

Cold blood is being used by research physicians to perform heretofore impossible brain operations. Experimenting on dogs, the doctors found a way to recirculate oxygen-supplied chilled blood until a brain is lowered from the normal 100 degrees F. to 50 degrees. At this point a brain no longer needs blood and oxygen. So the doctors operate on a virtually bloodless brain to correct such conditions as faulty brain arteries, now considered inoperable, or even pump in a chemical solution to stop or slow the growth of a tumor. The experiments are being conducted at Duke University Medical Center.

☐ About 440,000 million gallons of water per day are used in the U. S.—an increase of 34 percent between 1950 and 1955.



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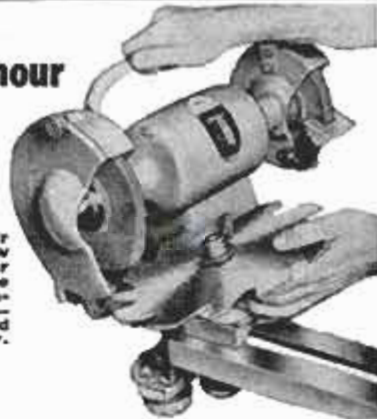
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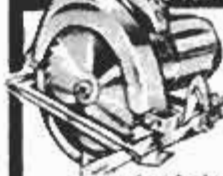


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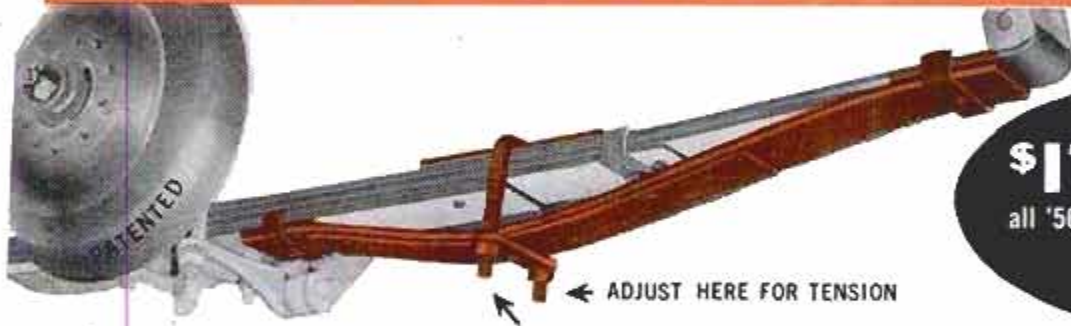
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### Shooting Stars Formed "Recently"

Meteorites falling on earth possibly came from a gigantic collision of planets or asteroids comparatively recently in the scale of celestial time, according to a newly developed theory. Scientists say the parent planets or asteroids were formed at about the time of the earth's formation, 4½ billion years ago. However, studies of meteorites falling on the United States indicate they probably were traveling in space for only 240 to 280 million years.

### Coating Reduces Frost

Defrosting a refrigerator may be easier in the future because of a tasteless, odorless and nontoxic chemical coating recently invented to retard frost accumulation on cold surfaces.

### Drug May Counteract Convulsions

British scientists may have found a new drug that will allow Navy frogmen to stay underwater for long periods without suffering convulsions caused by oxygen poisoning, although the material has been tested only on animals.



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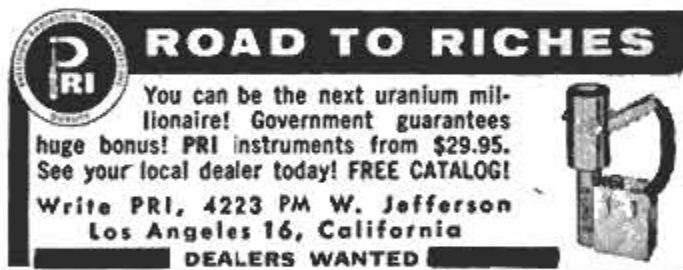


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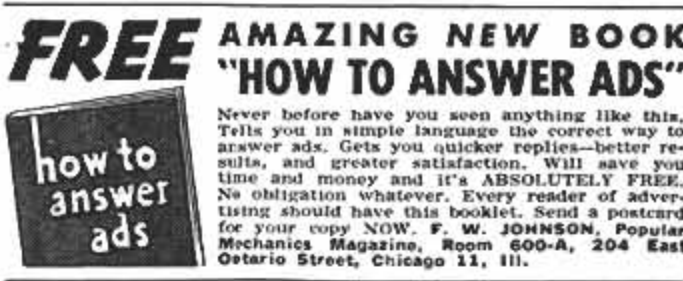
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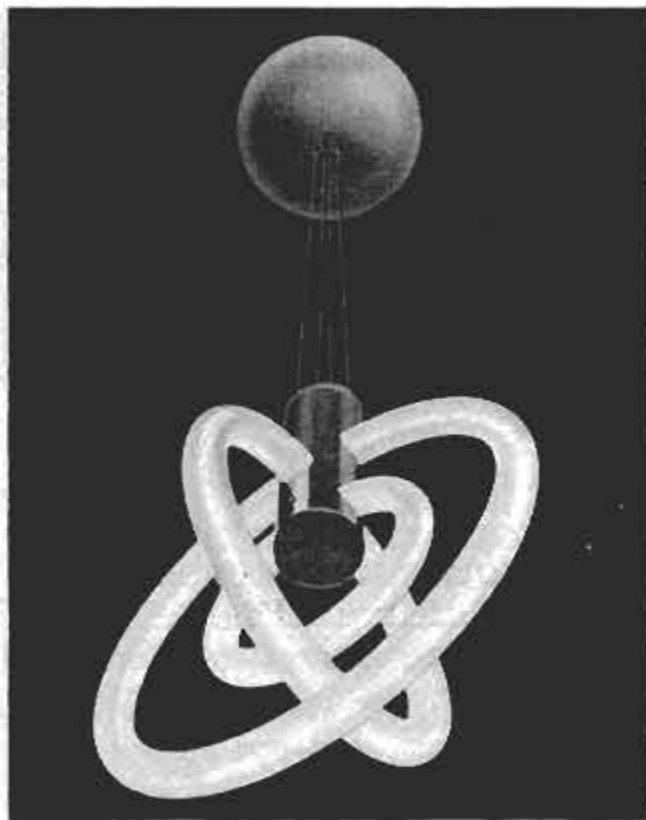
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### Futuristic Light Fixture Uses Fluorescent Rings

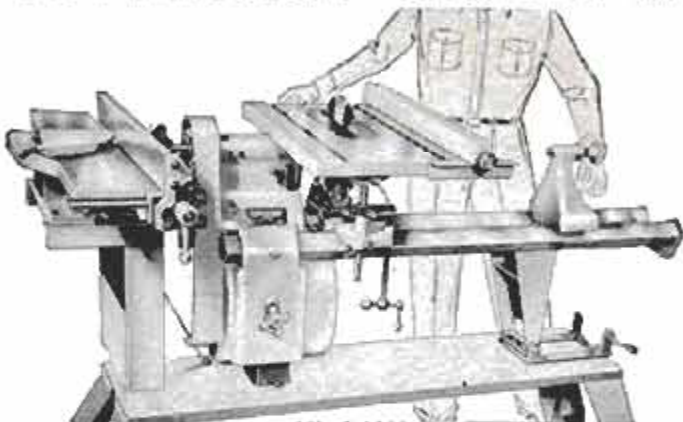
Resembling satellite orbits, three circular fluorescent tubes are part of the modern design of a chandelier manufactured in West Germany. The light fixture was designed to provide illumination over a wide area of rooms with high ceilings.

### Five-Ounce Jet-Engine Model Develops Four-Pound Thrust

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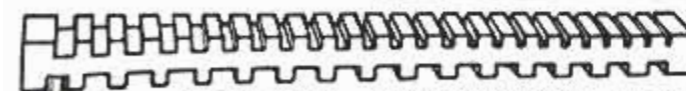
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**FREE!** Send for free descriptive booklet. Arbor sizes 1/2", 3/8", 3/4", 1". See your dealer or write direct.

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Dept. 21, Box 98, North End Station, Detroit, Mich.

ONLY  
**\$4.95**  
SET

**STOP WASTING MONEY**  
on worn-out piston rings

Get **HASTINGS**  
STEEL-VENT

### NEW! FOR FINISHING WOOD EDGES



#### WELDWOOD FLEXIBLE WOOD TRIM

Real wood veneer, paper-backed, in handy rolls, for edging plywood, lumber. Many decorative uses. Apply with Contact Cement, or Presto-Set Glue. Oak, birch, African mahogany, walnut, fir, Sonora.® At your lumber dealer's.

**SAVE!** Get 89¢ sample roll, 8' x 1", specify wood. Send this ad with 50¢ to: United States Plywood Corp., Dept. PM1, 55 W. 44th St., N.Y. 36, N.Y.

### BARRON Drill Press TOOLS



Broaden the usefulness of your drill press with our Rotary Planer, Surface and Drum Sanders, Router and Mortising Bits Molding Cutters . . . other essential accessories. Complete catalog and price list mailed on request.

**BARRON TOOL CO. INC.**  
310 Architects Bldg., Detroit 1, Mich.

WRITE  
FOR  
FREE  
WORKSHOP  
GUIDE



*Southern*  
SCREWS AND BOLTS  
CAN MAKE A

**BIG DIFFERENCE**  
in the permanence and quality of  
your workshop projects.

QUALITY MAKES THE DIFFERENCE

BUY *Southern*

BUY 'EM BY THE NAME . . .

BUY 'EM BY THE BOX  
AND SAVE!



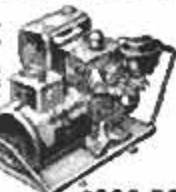
Ask for them at your hardware or building supply store



## LESS THAN WHOLESALE

### 1500 WATT PLANT

115v. 60 cyc. AC Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22) Wt. 110 lbs. Reg. \$475 value. Factory price...



**\$239.50**

**1750 Watt Plant** Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price...

**\$279.50**

**2500 WATT PLANT**—Push Button Start (Item 21) 110/120 v. 60 cyc. A.C. A rugged powerful plant. Reg. \$645. Spec.

**\$329.50**

**3500 Watt Plant Push Button Start** (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. \$760. Factory Price...

**\$379.50**

**DUAL VOLTAGE** 110/220 for Item 21 or 23 —\$30 additional.

We make every type and size of light plants —Write, giving us your requirements!

### BATTERY CHARGING GENERATOR

#### Push Button Start

A husky, 750 watt plant (designed for battery charging only) that will charge 6 or 12 volt batteries in just minutes! When mounted with two 6 volt batteries it provides a terrific cold weather motor starting unit, as well as a fast charger! Charges all batteries anywhere — no in-line current needed. Ideal for service stations, garages and farms. Comes complete with ammeter and cutout. (Item 821) Wt. 120 lbs. Regularly \$295. Our special, only...



**\$119.50**

### 9 TON HYDRAULIC PRESS

A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crank shafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small anvils and jigs to straighten any kind of curve or bend. (Item 464) Wt. 110 lb. Actual list price \$365. Our special close-out price...

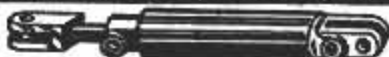


**\$69.50**

**SCREW TYPE PRESS.** Nine ton capacity. See Sept. Pop. Mech's. ad for details—or write. Complete, Wt. 150 lbs. (Item 797)...

**\$49.50**

### 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 3/4" O.D. with 6 1/2" stroke—standard heavy duty clevises on both ends. Has standard 1 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..... 534.00  
10" stroke — 3" bore..... 34.80  
16" stroke — 3" bore..... 43.00  
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, finger tip control. Wt. 16 lbs. (Item 822).....

**\$21.95**

### HYDRAULIC KIT



**BUY**  
at dealer prices

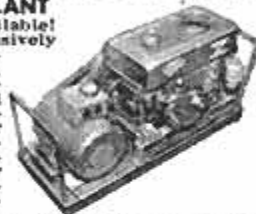
direct from  
**MASTER MECHANIC'S**  
factory

**EXCLUSIVE! NEW!**

### LIGHTWEIGHT WATER COOLED DIESEL GENERATOR PLANT

Never before available! Now offered exclusively by Master Mechanic. A low priced, lightweight, continuous duty Diesel generator set. Powered by a super rugged, exceptionally smooth running, one cylinder Diesel engine. Operates at conservative 1750 r.p.m. and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs. representing a triumph of Diesel Engineering. Complete with fuel filter, oil pressure gauge, control box with duplex receptacle and voltmeter. (Item 830) Special factory price.....

**\$399.50**



### JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it! built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. Special factory price.....

**\$349.50**



### HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM.)  
8" Pipe, wt. 5 lb..... \$6.85  
9" Pipe, wt. 6 lb..... \$7.85  
10" Pipe, wt. 7 lb..... \$8.85  
12" Pipe, wt. 8 lb..... \$9.85



### "RIGID" PIPE STRAP WRENCH

The harder you pull, the tighter it grips. Rig 12" handle and 1 1/2"x24" heavy web strap—will last a lifetime! Wt. 3 lbs. (Item 383) Reg. \$3.95. Our special...  
Super 15" model—larger for more leverage and bigger fittings. (Item 383A).....

**\$1.95**

**\$2.95**



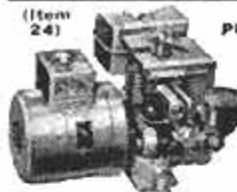
### JET FLOW BLOWER

Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unobtainable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth extraction. Operates with any 110v.



## PORTABLE LIGHT PLANTS

(Item 24)



### 700 WATTS PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2.2 HP easy starting Briggs engine. No wiring necessary! Just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radio. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. (If prepared if storm knocks out power lines. Reg. \$275 value).....

**\$143.50**

**1200 Watt Plant** (Item 45) same as Item 24 but larger generator and engine with 50% greater output.....

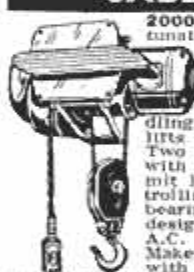
**\$199.50**

### CABLE HOIST

**2000 lb. CAPACITY.** A fortunate purchase from the Air Force enables us to offer these powerful 2000 lb. electric cable hoists at a fraction of their value. Perfect for material handling, boat hoists, elevators, lifts on assembly lines, etc. Two separate 22 ft. lift cables with independent controls permit leveling the load and controlling it perfectly. Rugged ball bearing motors of geared down design 110 volts. Available for A.C. or D.C. Please specify. Makes a terrific portable hoist with our 275 D.C. light plant at \$99.75. Offered at less than 33% of regular cost! Hook not included. Wt. 145 lbs. A.C. Model, Item 847A.....  
D.C. Model, Item 847.....

**\$149.50**

**\$129.50**



### FAUCET WATER HEATER

Instant hot water from any faucet for just pennies—sounds unbelievable—but it's true! You just slip MASTER MECHANIC'S new Faucet Water Heater over any water faucet, plug it in a wall outlet and you've got steaming hot running water instantly for dishes, shaving, washing baby's bottle, etc. Simple and safe—operates on ordinary 110v. house current—costs only 2 1/2 cents per hour for hot water. Ideal for homes, barns, cabins, trailers, etc. Easily regulated from lukewarm to full hot. Fully guaranteed! (Item 408) Wt. 2 lbs. Factory price F.O.B. Burlington, only.....

**\$4.95**

### 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 1/4" thick. Overall length 40". Wt. 23 lbs. (Item 156) Regular \$40.50. While they last.....

**\$14.95**

### MASTER D.C. ARC WELDER

Easy To Use  
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—easy to use.

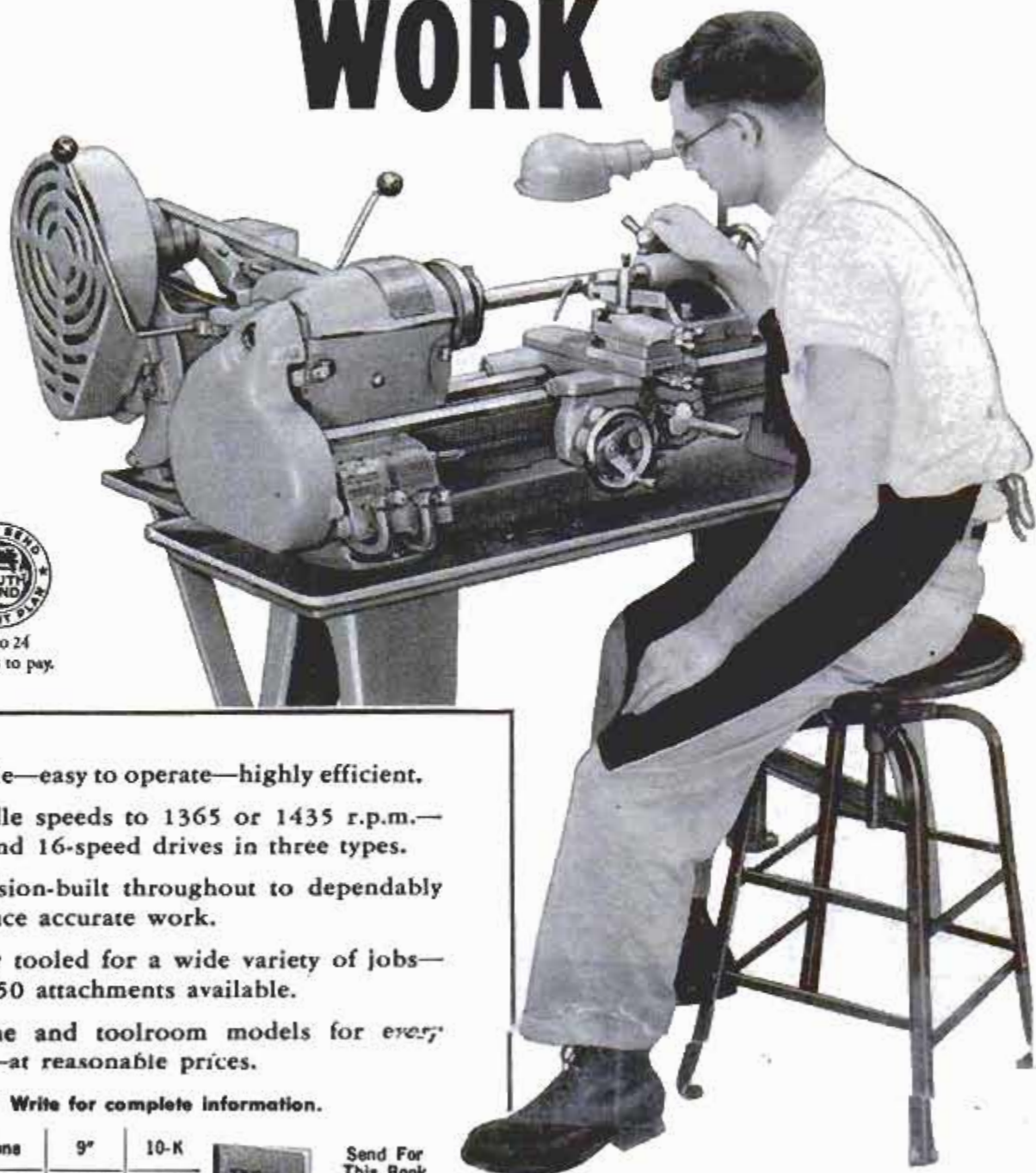


(Item 280)



Why SOUTH BEND 9" and 10K Lathes?

# FAST They're built for ACCURATE WORK



Up to 24  
months to pay.

- Simple—easy to operate—highly efficient.
- Spindle speeds to 1365 or 1435 r.p.m.—12- and 16-speed drives in three types.
- Precision-built throughout to dependably produce accurate work.
- Easily tooled for a wide variety of jobs—over 50 attachments available.
- Engine and toolroom models for every need—at reasonable prices.

Write for complete information.

Specifications	9"	10-K
Swing over bed	9 $\frac{3}{4}$ "	10 $\frac{1}{8}$ "
Between centers	16"-34"	16"-34"
Collet capacity	$\frac{1}{2}$ "	$\frac{3}{8}$ "
Base price, from	\$280	\$388



Send For  
This Book  
"How to Run  
a Lathe"—128  
pages of help-  
ful instruc-  
tions. 50¢  
postpaid.

## SOUTH BEND LATHE

South Bend 22, Indiana

Builders of Lathes, Milling Machines,  
Shapers, Drill Presses, Pedestal Grinders



# Making as High as \$1,000 A Month

A message to all men who are looking for a way to make more money faster, with one of America's greatest inventions wanted by millions

Folks Are Amazed when you Tell Them This New Kind of Protection Costs Only

**\$4.95**



**Here's Your Opportunity to Get into the BIG MONEY CLASS FASTER with Sensational PRESTO FIRE EXTINGUISHER. Over 3,000,000 sold for Homes, Offices, Autos, Service Stations, Stores, Farms, Boats**

Wouldn't you like to be making as much as \$1,000 in a month? Of course not everybody makes such profits starting out, but look at these profit reports: A Florida salesman earned \$600 in 1 month. An Ohio man earned \$2100 in 2 months. A New

York salesman earned \$1500 in one month. A New Hampshire man added the Presto as a sideline and picked up an extra \$1800 in 20 months. Men everywhere, even in off hours, are rolling up amazing profits. How about you?

## WHAT'S THE SECRET?

PRESTO contains an amazing new chemical—"Chlorobromomethane" or "C.B." The Germans developed "C.B." as a secret defense against fire during the war. After the war, a famous American firm, The Dow Chemical Company, acquired the formula from the U. S. Government and began manufacturing it here. Then we (Merlite Industries) designed a handy, yet amazingly effective, fire extinguisher to contain and release this new wonder-chemical. In comparing the effectiveness of "C.B." in fighting fires, The Dow Chemical Company's report states, "It has been proved that 'C.B.' is about 1.5 to 6 times as effective as other common extinguishing agents on an equal weight basis." This means that Presto can be made light and handy so even a woman or child can use. No pumping, no heavy tank. Just twist the knob, and flames disappear!

## WHY LARGE PROFITS ARE EASY

Everyone is terrified by FIRE! Every year fires kill more than 11,000 persons, destroy over SEVEN BILLION DOLLARS of property. Millions of people have been waiting for this sure, simple, inexpensive safeguard. Most people who see the dramatic, five-second demonstration want one or more, at the low price of \$4.95. You make as much as \$2.70 on every one. Get started in this rich new field now. Don't put it off. Every day you hesitate may cost you \$10, \$15, or even \$50 you could otherwise be making. Get the facts FREE. Simply mail postcard in this ad—no stamp needed. But do it now!

### Only Presto Has ALL These Features

-  Ends Fire as Fast as 2 Seconds
-  Chemical Contents 1.5 to 6 times More Effective than Others
-  Weighs Less Than 3 Lb.
-  Easily Held in One Hand—Even by a Child
-  Needs No Inspection or Re-Charging—Does Not Corrode or Deteriorate
-  Costs Only \$4.95—Yet Outperforms Bulky Extinguishers Costing Several Times as Much
-  Automatic Pressure—No Pumping
-  Guaranteed for 20 Years—Certificate is Packed With Every Presto

## Big Money Like This Even in Spare Time



**Charles Kama Reports \$1,000 in One Month**  
"I think I've succeeded pretty well. I'm making more than \$1,000 a month, and I haven't touched bottom yet."  
Charles Kama, Texas

**William F. Wydallis Reports \$15.20 an Hour**

"For every hour I devoted to the Presto, I find I have earned an average of \$15.20 an hour."



William F. Wydallis, Ohio



**Walter Gable Reports \$75 to \$80 a Week**

"My selling time has averaged less than a day or two a week. These part time sales have brought me as much as \$75 to \$80 a week."

Walter Gable, Md.

**FREE** Full Details of this Truly Amazing Money-Making Opportunity  
**JUST MAIL CARD BELOW**

**IMPORTANT!** Be sure to print your name and address in space on card below. Then simply cut out this card along dotted lines and drop in the mail box. No stamp necessary. We'll rush all facts to you at once, free and without obligation.

**PRINT YOUR NAME and ADDRESS HERE**

**BE SURE TO PRINT YOUR NAME AND ADDRESS ON SPACES BELOW**

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114 EAST 32ND STREET

NEW YORK 16, N. Y.

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NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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PERMIT  
NO. 52914  
NEW YORK, N. Y.

**MERLITE INDUSTRIES, INC.** DEPT. X-15E  
114 E. 32nd ST. NEW YORK, N. Y.





IN TOWN TRAFFIC . . . some spark plugs, designed for high speeds, become fouled and cause misfiring and loss of power.



ON THE HIGHWAY . . . some spark plugs, designed for low speeds, invite destructive pre-ignition or misfire causing power loss. Why gamble when . . .

## Auto-Lite Spark Plugs with **POWER TIP** "Fire Up" your engine\* at all speeds!



If you drive both at town-traffic and at highway speeds, here's why you should use Power Tip . . . the first spark plug ignition-engineered for today's engines and today's driving

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away *clean*. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it operates cooler to effectively *check* power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite Spark Plugs . . . the *only* spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at *all speeds*.

\*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all these cars—Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Plymouth, Ford, Hudson, Imperial, Lincoln, Mercury, Nash, Oldsmobile, Packard, Pontiac, Rambler, Studebaker.

YOU CAN SEE  
THE BIG NEW  
DIFFERENCE IN  
SPARK PLUGS!



Ordinary Tip    Power Tip

Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at all speeds.

# AUTO-LITE® SPARK PLUGS WITH **POWER TIP**

Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Small-Engine, Transport, Aircraft, and Diesel-Starting.