

# POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND



**COLOR TV IS HERE**

*See page 129*

Try Your Hand at Modeling the  
**USS *MIDWAY*** — page 206

**WHAT OWNERS THINK OF  
REAR-ENGINE CARS**

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times more solution above the plates means filling only 3 times a year in normal use.

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Double Eagle—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

This One



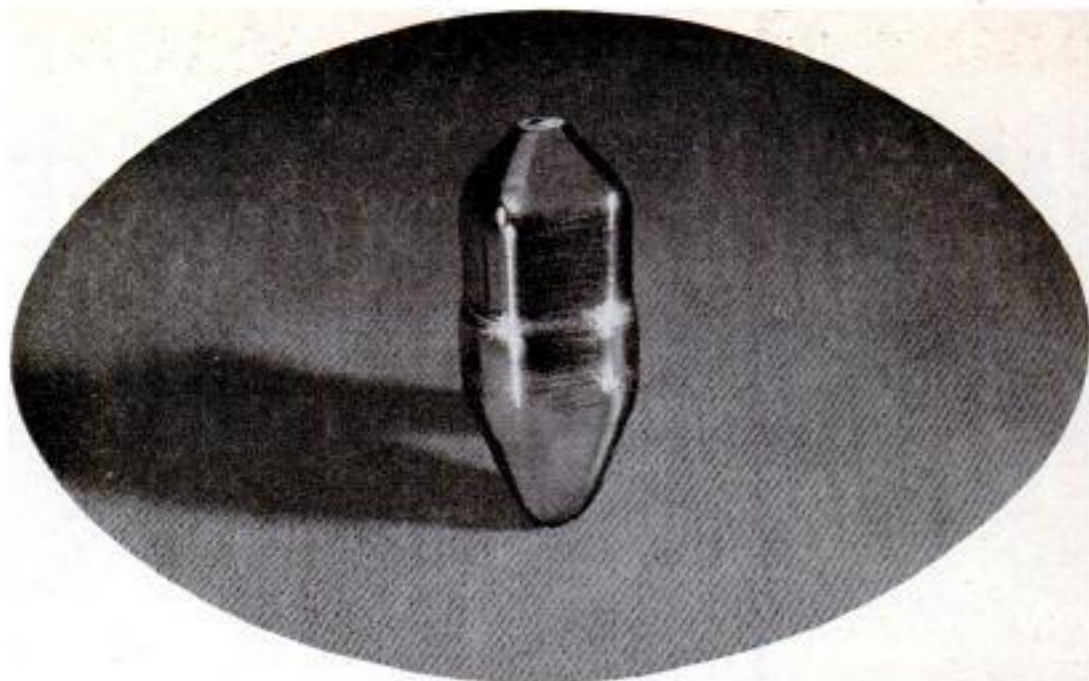
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JANUARY 1954

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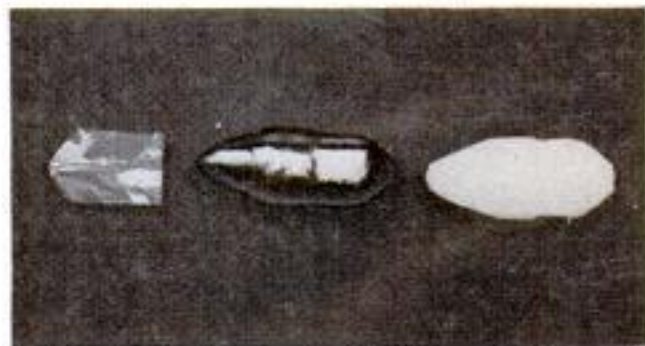
Germanium crystal grown at Bell Telephone Laboratories (half size). It is sliced into hundreds of minute pieces to make *Transistors*. Transistor action depends on the flow of positive current-carriers as well as electrons, which are negative. Arsenic—a few parts per 100,000,000—added to germanium produces prescribed excess of electrons. With gallium added, positive carriers predominate. Latest junction type *Transistor* uses both kinds of germanium in the form of a sandwich.

## THEY GREW IT FOR TRANSISTORS

Heart of a *Transistor*—Bell Telephone Laboratories' new pea-size amplifier—is a tiny piece of germanium. If *Transistors* are to do their many jobs well, this germanium must be of virtually perfect crystalline structure and uniform chemical composition. But it doesn't come that way in nature.

So—Bell scientists devised a new way to grow the kind of crystals they need, from a melt made of the natural product. By adding tiny amounts of special alloying substances to the melt, they produce germanium that is precisely tailored for specific uses in the telephone system.

This original technique is another example of the way Bell Laboratories makes basic discoveries—in this case the *Transistor* itself—and then follows up with practical ways to make them work for better telephone service.



Section of natural germanium, left, shows varying crystal structure. At right is sectioned single crystal grown at Bell Laboratories.

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# Popular Mechanics Magazine

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H. H. WINDSOR, Founder

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



## this month's cover

**COLOR TV IS HERE!** For years we've been hearing miraculous claims for color television—but it's always been sometime in the nebulous future. This month, color TV is a reality. Starting with the Tournament of Roses on New Year's Day, when cameras will capture all the breathtaking hues of the colorful spectacle, networks will beam color telecasts regularly. Full-color TV has been held up by conflicting systems, but now manufacturers have agreed on a single broadcasting system, though they may use different types of equipment. Best part of the agreement is that your black-and-white set won't be outmoded. You can still see the color telecasts in black and white on your present receiver. Chances are, though, you'll be wanting a color set soon, for the colors are as vivid as they appear on our cover, where a cameraman is making a pretelecast color check. For a full report on color TV today, turn to page 129

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## IN THIS ISSUE

<b>Look How Your Mail Gets There!</b> - - - -	<b>97</b>
<b>Perpetual Motion Just Isn't</b> - - - -	<b>108</b>
<b>The Battle of the Sagebrush Busters</b> - - -	<b>114</b>
<b>Deep-Sea Sentinels Guard Our Harbors</b> - -	<b>124</b>
<b>Color Television Is Here</b> - - - - -	<b>129</b>
<b>Owners Report on Three Rear-Engine Cars</b> -	<b>134</b>
<b>Sensitive House</b> - - - - -	<b>148</b>
<b>Oh, for the Life of a Human Mole!</b> - - -	<b>152</b>
<b>Relax!</b> - - - - -	<b>162</b>
<b>Salmon Fishing on the Night Shift</b> - - -	<b>169</b>
<b>Radio, TV and Electronics</b> - - - - -	<b>177</b>

## For the Craftsman

<b>Room Divider Features Writing Desk</b> - - -	<b>181</b>
<b>Extension Cords</b> - - - - -	<b>188</b>
<b>Aluminum as a New Craft Material</b> - - -	<b>197</b>
<b>Try Your Hand at Modeling the Midway</b> - -	<b>206</b>
<b>How Your Brakes Work</b> - - - - -	<b>213</b>
<b>Jigsaw From Small Engine</b> - - - - -	<b>219</b>
<b>Milling-Machine Setups</b> - - - - -	<b>224</b>
<b>Farm Trailer Made From Auto Chassis</b> - -	<b>230</b>
<b>Clinic for Homemakers</b> - - - - -	<b>240</b>

Other items, and manufacturers of available products described, are listed on pages 16, 18 and 20





THE LE MANS 24-HOURS (France) saw Champion-equipped cars take the first seven places at record times for this event.



SEBRING 12-HOUR RACE was won by top U. S. road-racing team of John Fitch-Phil Walters in a Cunningham.

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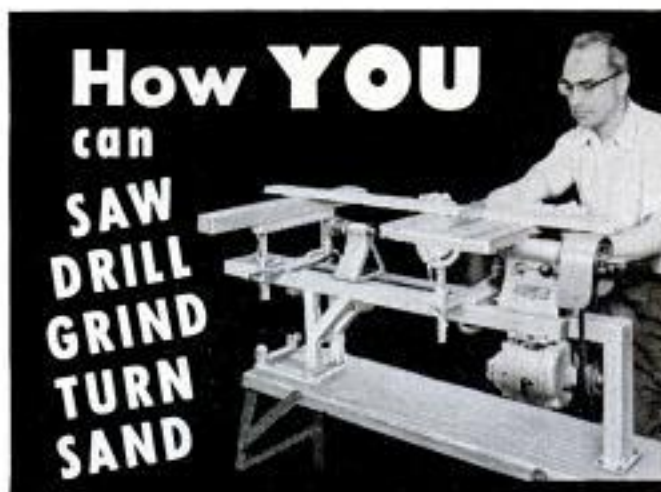


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in this corner.....

**THE EDITORS**



**USS Midway Project**

In this issue our Craft Editors present a new project for the thousands of ship-model hobbyists—detailed plans for construction of a model of the USS *Midway*,



Paul Strayer with his miniature of the USS *Midway*

famed aircraft carrier. Paul Strayer, originator of the plans, is first of all an artist in oil, best known for his magazine illustrations and cover paintings and for his marine



Strayer's oil painting of *Midway* shows jet takeoff

paintings. But he is also a great ship-model builder, often constructs a painstakingly accurate miniature of a famous sailing vessel or warship as a prelude to painting its portrait. We picture him here with the *Midway* model he built. The oil painting of the *Midway*, also Strayer's, depicts a Grumman F9F-6 Cougar jet fighter being catapulted from the carrier's deck. The *Midway* model project begins on page 206 of this issue.

(Continued to page 12)



# 5 reasons why ACCOUNTANCY



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- |  |  |   |  |
|--|--|---|--|
| <p><b>ART</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Commercial Art</li> <li><input type="checkbox"/> Magazine Illustrating</li> <li><input type="checkbox"/> Fashion Illustrating</li> <li><input type="checkbox"/> Cartooning</li> <li><input type="checkbox"/> Sketching and Painting</li> <li><input type="checkbox"/> Show Card and Sign Lettering</li> </ul> <p><b>AUTOMOTIVE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Automobile, Mechanic</li> <li><input type="checkbox"/> Auto Elec. Technician</li> <li><input type="checkbox"/> Auto Body Rebuilding and Refinishing</li> <li><input type="checkbox"/> Diesel-Gas Engines</li> </ul> <p><b>AVIATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aeronautical Engineering Jr.</li> <li><input type="checkbox"/> Aircraft Engine Mechanic</li> <li><input type="checkbox"/> Airplane Drafting</li> </ul> <p><b>BUILDING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Architecture</li> <li><input type="checkbox"/> Arch. 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<li><input type="checkbox"/> Business Correspondence</li> <li><input type="checkbox"/> Letter-writing Improvement</li> <li><input type="checkbox"/> Personnel and Labor Relations</li> <li><input type="checkbox"/> Advertising</li> <li><input type="checkbox"/> Retail Business Management</li> <li><input type="checkbox"/> Managing Small Business</li> <li><input type="checkbox"/> Ocean Navigation</li> <li><input type="checkbox"/> Sales Management</li> <li><input type="checkbox"/> Short Story Writing</li> <li><input type="checkbox"/> Creative Salesmanship</li> <li><input type="checkbox"/> Traffic Management</li> </ul> <p><b>CHEMISTRY</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Electrical Engineering</li> <li><input type="checkbox"/> Chemistry</li> <li><input type="checkbox"/> Analytical Chemistry</li> </ul> | <p><input type="checkbox"/> Petroleum-Nat'l Gas</p> <p><input type="checkbox"/> Pulp and Paper Making</p> <p><input type="checkbox"/> Plastics</p> <p><b>CIVIL, STRUCTURAL ENGINEERING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Civil Engineering</li> <li><input type="checkbox"/> Structural Engineering</li> <li><input type="checkbox"/> Surveying and Mapping</li> <li><input type="checkbox"/> Structural Drafting</li> <li><input type="checkbox"/> Highway Engineering</li> <li><input type="checkbox"/> Reading Blueprints</li> <li><input type="checkbox"/> Construction Engineering</li> <li><input type="checkbox"/> Sanitary Engineering</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"/> Electrical Drafting</li> <li><input type="checkbox"/> Mechanical Drafting</li> <li><input type="checkbox"/> Structural Drafting</li> <li><input type="checkbox"/> Sheet Metal Drafting</li> <li><input type="checkbox"/> Ship Drafting</li> <li><input type="checkbox"/> Mine Surveying and 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"/> Electrician</li> <li><input type="checkbox"/> Electrical Maintenance</li> </ul> | <p><input type="checkbox"/> Electrical Drafting</p> <p><input type="checkbox"/> Electric Power and Light</p> <p><input type="checkbox"/> Lineman</p> <p><b>HIGH SCHOOL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> High School Subjects</li> <li><input type="checkbox"/> Mathematics</li> <li><input type="checkbox"/> Commercial</li> <li><input type="checkbox"/> Good English</li> </ul> <p><b>MECHANICAL AND SHOP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Mechanical Engineering</li> <li><input type="checkbox"/> Industrial Engineering</li> <li><input type="checkbox"/> Industrial Supervision</li> <li><input type="checkbox"/> Foremanship</li> <li><input type="checkbox"/> Mechanical Drafting</li> <li><input type="checkbox"/> Machine Design-Drafting</li> <li><input type="checkbox"/> Machine Shop Practice</li> <li><input type="checkbox"/> Tool Design</li> <li><input type="checkbox"/> Industrial Instrumentation</li> <li><input type="checkbox"/> Machine Shop Inspection</li> <li><input type="checkbox"/> Reading Blueprints</li> <li><input type="checkbox"/> Toolmaking</li> <li><input type="checkbox"/> Gas-Electric Welding</li> <li><input type="checkbox"/> Heat Treatment-Metallurgy</li> <li><input type="checkbox"/> Sheet Metal Work</li> <li><input type="checkbox"/> Sheet Metal Pattern Drafting</li> <li><input type="checkbox"/> Refrigeration</li> </ul> <p><b>POWER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Combustion Engineering</li> <li><input type="checkbox"/> Diesel-Electric</li> <li><input type="checkbox"/> Electric Light and Power</li> <li><input type="checkbox"/> Stationary Steam Engineering</li> <li><input type="checkbox"/> Stationary Fireman</li> </ul> <p><b>RADIO, TELEVISION COMMUNICATIONS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Practical Radio-TV Eng'ing</li> <li><input type="checkbox"/> Radio Operating</li> <li><input type="checkbox"/> Radio and TV Servicing</li> <li><input type="checkbox"/> Television-Technician</li> <li><input type="checkbox"/> Electronics</li> <li><input type="checkbox"/> Telephone Work</li> </ul> <p><b>RAILROAD</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Locomotive Engineer</li> <li><input type="checkbox"/> Diesel Locomotive</li> <li><input type="checkbox"/> Air Brakes</li> <li><input type="checkbox"/> Car Inspector</li> <li><input type="checkbox"/> Railroad Administration</li> </ul> <p><b>TEXTILE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Textile Engineering</li> <li><input type="checkbox"/> Cotton, Rayon, Woolen Mfg.</li> <li><input type="checkbox"/> Carding and Spinning</li> <li><input type="checkbox"/> Warping and Weaving</li> <li><input type="checkbox"/> Loom Fixing</li> <li><input type="checkbox"/> Throwing</li> <li><input type="checkbox"/> Finishing and Dyeing</li> <li><input type="checkbox"/> Textile Designing</li> </ul> |
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Name \_\_\_\_\_ Age \_\_\_\_\_ Home Address \_\_\_\_\_

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

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

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## Our 40th Year

NRI training is thorough, practical, up-to-date. When you enroll with NRI you benefit from our 40 years of successful experience training men at home.

*J. E. Smith*

President  
National Radio Institute  
Washington, D. C.



# I'll Train You RADIO-

## You Practice Broadcasting with Parts I Send



As part of my Communications Course I send you parts to build low-power Broadcasting Transmitter at left, and other equipment. Use it to get practical experience. You put this station "on the air," perform procedures demanded of station operators. An FCC Commercial Operator's License can be your ticket to a bright future. My Course trains you to get your license. Mail Coupon now!



## Television Is Today's Good Job Maker

Television now reaches from coast-to-coast. More than 25 million Television sets are already in use and require servicing; thousands more sets are being sold every week. About 200 TV stations are now on the air with hundreds more being built. This means new jobs, more jobs, better pay for trained men. The time to act is NOW! Start learning Radio-Television servicing or communications.

## You Practice Servicing with Parts I Send

Nothing takes the place of PRACTICAL EXPERIENCE. NRI training is based on LEARNING BY DOING. You use parts I send to build many circuits common to Radio and TV. You build the modern radio at right. Use Multi-tester you build to make money fixing sets. Many students make \$10, \$15 a week extra fixing neighbors' sets in spare time, starting soon after enrolling. All equipment I send is yours to keep.



## Make Extra Money in Spare Time While Learning

Keep your job while training. Many NRI students make \$10, \$15 and more a week extra fixing neighbors' Radios in spare time. The day you enroll I start sending you special booklets that show you how to service sets. Multi-tester you build helps discover and correct Radio troubles, gives PRACTICAL EXPERIENCE on circuits common to radio and TV. Mail coupon today.

## I Trained these Men at Home



Laborer  
Finds  
Success in  
Radio-TV

"I was a laborer with no future. Now I have a position that pays well. My spare time servicing pays good money, too. Thanks to NRI."—Robert Ford, Johnstown, Pa.



Switched  
to TV  
Servicing

"I recently switched from studio work and am now holding a position as TV service technician. Enjoy my work more and more."—Norman Ward, Ridgefield Park, N. J.



Paid for  
Course, Car  
in Spare  
Time

"By the time I graduated I had paid for my course, a car and testing equipment. I can handle any job in Radio-TV."—E. J. Streitenberger, New Boston, Ohio



\$10 to \$15  
Week  
Spare Time

"Four months after enrolling, was able to service Radios . . . averaged \$10 to \$15 a week spare time. Now have full time business."—W. Weyde, Brooklyn, N. Y.



Employed as  
Transmitter  
Operator

"A former employer recommended NRI training to me. Now employed as transmitter operator in Harrisburg."—Albert Herr, New Cumberland, Penna.



# AT HOME for Good Jobs in TELEVISION

**There is Success-Good Pay-Security for You in America's Fast Growing Industry**



## NRI Training Leads to These Jobs in RADIO-TELEVISION

### BROADCASTING

Chief Technician  
Chief Operator  
Power Monitor  
Recording Operator

### SERVICING

Home and Auto Radios  
Television Receivers  
P.A. Systems

### MANUFACTURING

Design Technician  
Service Manager  
Tester  
Research Assistant

### SHIP AND HARBOR RADIO

Chief Operator  
Radiotelephone Operator  
Assistant Operator

### GOVERNMENT RADIO

Operator in Army, Navy, Marine Corps  
Airways Operator  
Forestry Dispatcher

### AVIATION RADIO

Transmitter Technician  
Airport Transmitter Operator

### TELEVISION

Pick-up Operator  
Television Technician  
Remote Control Operator  
Service and Maintenance Technician

### POLICE RADIO

Transmitter Operator  
Receiver Serviceman

DO YOU want good pay, a job with a bright future, security? Would you like to have a profitable business of your own? If so, find out how you can realize your ambition in the fast-growing RADIO-TELEVISION industry. Even without Television, the industry is bigger than ever before. Just think, over 115 million home and auto Radios, 3000 Radio Broadcasting Stations, plus 25 million Television sets and about 200 Television Broadcasting Stations. Expanding use of Aviation and Police Radio, Micro-wave Relay, Two-way Radio for busses, taxis etc., are making opportunities for Servicing and Communications technicians and FCC Licensed Operators.

## My Training Includes Television

You get practical experience by working on circuits common to both Radio and Television. My graduates are filling jobs, making good money in both Radio and Television. Many NRI trained men start their own Radio and Television servicing business with capital earned in spare time. Let me show you how you can be your own boss; earn \$10 to \$15 a week extra even while still learning. Now is the time to get ready for success in Radio-Television. Coupon below brings you Actual Lesson and 64-page book.

## Find Out What Radio-Television Offers You

What will YOU be doing one year from today? Decide now that you are going to know more and earn more. ACT NOW. Send the coupon below NOW for my FREE DOUBLE OFFER. You get Actual Servicing Lesson. Also my 64-page Book, "How to Be a Success in Radio-Television." Read what my graduates are doing, earning, see equipment you practice with at home. Mail coupon now. Send in envelope or paste on postal. J. E. SMITH, President, Dept. 4AA, National Radio Institute, Washington 9, D. C. Our 40th Year.

**Actual Lesson and 64-page Book BOTH FREE**

The ABC's of SERVICING

**MAIL THIS NOW!**

MR. J. E. SMITH, President, Dept. 4AA  
National Radio Institute, Washington 9, D. C.

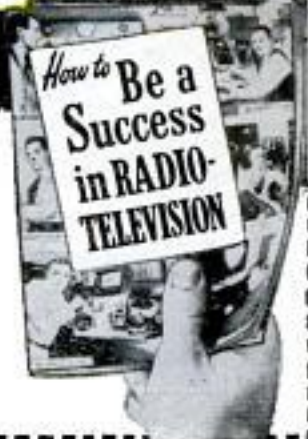
Mail me Sample Lesson and 64-page Book, FREE. (No salesman will call. Please write plainly.)

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

Address.....

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

**VETS** write in date of discharge.....



Control Operator, Station WEAN

"Received my License and worked on ships. Now with Station WEAN. NRI Course is as complete as any radio course can be."  
—Raymond E. Arnold, Rumford, L. I.

Available to **VETERANS** under G. I. Bills





# BIG NEWS!

Both Inch-Pound and Foot-Pound Models of Amazing **PROTO Torquer** Now Available!

Announced in January! Over 30,000 bought by March 31!! That's the whirlwind success story of the sensational PROTO torque-limiting wrench. In addition to foot-pound models, you can now buy *inch-pound* styles with all of the features that made the Torquer famous overnight. Thousands of jobs can now be handled with the various inch-pound and foot-pound capacities, different drive sizes and plain or ratchet head styles available. Whether used for repair, assembly, inspection or installation work, the super-fast Torquer pays for itself in time saved. Buy the model you prefer from your PROTO dealer today! Send 10¢ for 68-page catalog of entire line to

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Head of Plain Head Model

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## Fastest Torquer in the World!

- \* Automatic Torque-Limiting Release
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- \* Use in Dark, Noisy or "Blind" Locations
- \* Enclosed Precision Spring and Accurate Micrometer-Type Adjustment
- \* All-Steel Trouble-Free Construction

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Eastern Factory: Jamestown, N.Y.  
Canadian Factory: London, Ont.

(Continued from page 6)

### Oh! For the Life—

Of a human mole. In this instance, the mole is our New York editor, Dick Dempe-wolff. When our editors research and write



an article, we expect them to live the part. This Dick did, as he proves in this picture portraying himself, with a grin of simulated happiness, emerging from an underground pipe. For his story, turn to page 152.

### To the Editor

No doubt you have received many compliments on your October issue. However, I want to add mine from the technical press because I believe you are contributing a great deal to the general home-building picture by broadcasting this factual information to the public.

Your presentation is particularly impressive to me as to its importance, because you have, in the most part, presented your subject through the facts, rather than glamorizing the home-ownership and home-building pictures, as is being done by some of the consumer magazines.

Your editorial recipe is similar to that of PRACTICAL BUILDER, and we welcome this October issue because we believe it will help everyone in the home-building industry who has a legitimate stake in that business.

Sincerely yours,  
James M. Lange,  
Executive Editor,  
*Practical Builder*,  
5 South Wabash Ave.,  
Chicago 3

### Electronic Termite Detector

Ever hear a termite lurching? They're noisy eaters, according to an Oklahoma City man who detects them with a tiny microphone and an electronic amplifier. The sensitive "mike" picks up the sound

(Continued to page 14)



# INVENTORS

**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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# NEWS FROM SCIENCE ABOUT YOUR HAIR



**V-7**  
— new  
grooming discovery  
outdates messy oils

Not an animal, vegetable or mineral oil, V-7 in new Vitalis Hair Tonic is a completely new greaseless grooming agent.

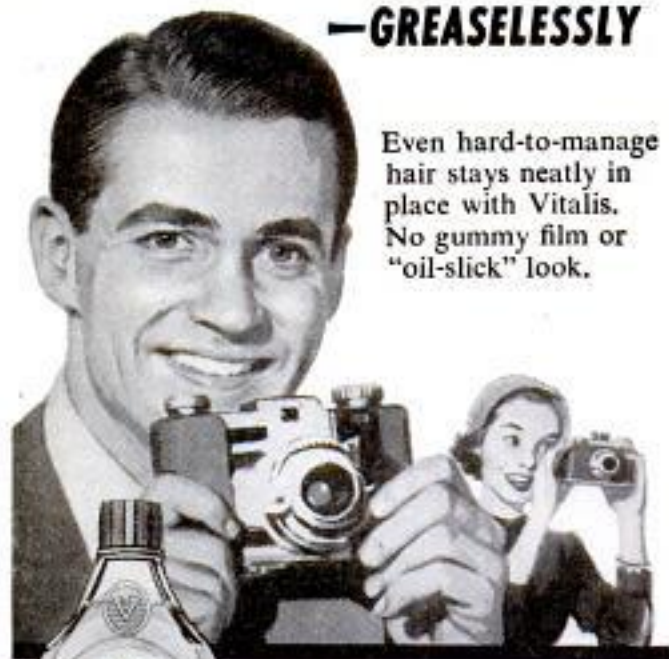
**PROOF**  
you don't need  
grease to  
correct dryness



New research on human hair shows that even very dry hair regains its normal moisture content faster with new Vitalis than with any leading cream or oil hair tonic.

**KEEPS YOUR HAIR NEAT ALL DAY  
—GREASELESSLY**

Even hard-to-manage hair stays neatly in place with Vitalis. No gummy film or "oil-slick" look.



New, finer  
**VITALIS®**  
Hair Tonic with V-7  
*Product of Bristol-Myers*

(Continued from page 12)

made by the insects as they rub against the wood and break the fiber with their heavy jaws. The sound is carried through a long wire connected to a powerful radio amplifier, boosted, and relayed to the operator, who listens with a set of dictaphone



ear tubes. A loudspeaker can be connected to make the sound audible to everyone in the room. Termite exterminator W. E. Fisk picked up the idea for the detector while reading about undersea recordings of noises made by fish. The instrument was made by Ed Cones, a local radio technician.

## Workshop Club

Arthur C. Miller of Evansville, Ind., tells us he has organized a home-workshop club "to help underprivileged children." In the picture, he writes, "we are finishing up our



first project of 36 lawn chairs for our local Children's Home. . . . Our next project is to buy those kids a set of woodworking power tools they can use this winter when they can't get outside."



# How I foxed the Navy

by Arthur Godfrey



The Navy almost scuttled me. I shudder to think of it. My crazy career could have ended right there. Who knows, I might still be bumming Chesterfields instead of selling them.

To be scuttled by the Navy you've either got to do something wrong or neglect to do something right. They've got you both ways. For my part, I neglected to finish high school.

Ordinarily, a man can get along without a high school diploma. Plenty of men have. But not in the Navy. At least not in the U. S. Navy Materiel School at Bellevue, D. C., back in 1929. In those days a bluejacket had to have a mind like Einstein's. And I didn't.

"Godfrey," said the lieutenant a few days after I'd checked in, "either you learn mathematics and learn it fast or out you go. I'll give you six weeks." This, I figured, was it. For a guy who had to take off his shoes to count

above ten, it was an impossible assignment.

I was ready to turn in my bell-bottoms. But an ad in a magazine stopped me. Here, it said, is your chance to get special training in almost any subject—mathematics included. I hopped on it. Within a week I was enrolled with the International Correspondence Schools studying algebra, geometry and trig for all I was worth.

Came week-end liberty, I studied. Came a holiday, I studied. Came the end of the six weeks, I was top man in the class. Within six weeks I had mastered two years of high school math, thanks to the training I'd gotten.

I.C.S. made the impossible—easy!

## GET EXPERT GUIDANCE 2 FREE BOOKS

Free, illustrated catalog on career that interests you. Also 36-page, pocket-size guide to advancement, "How to Succeed." Just mail the coupon!

I. C. S., Scranton 9, Penna.

### INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 5609-L, SCRANTON 9, PENNA.

Without cost or obligation, send me "HOW TO SUCCEED" and the booklet about the course BEFORE which I have marked X:

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## WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available

### AUTOMOTIVE

Seen at the Paris auto show.....	106
Chrysler stylists bring out two experimental models.....	113
More 1954 "Debutantes" — Pontiac, Chevrolet, Lincoln, Mercury.....	120
Detroit Listening Post.....	122
Porsche sports car gets boost in horsepower and speed.....	140
Detroit didn't build these "cars".....	146
Passengers enter tiny Italian automobile through door in nose.....	176

### AVIATION

2000 M.P.H. goal for "Stiletto" (Douglas Aircraft Co., Santa Monica, Calif.).....	102
Air Force flying lung and its user easily carried by two men.....	104
Biggest transport helicopter cruises 150 miles per hour (Piasecki Helicopter Corp., Morton, Pa.).....	119
Twin-boom helicopter to become ambulance for navy personnel (Kaman Aircraft Corp., Bloomfield, Conn.).....	140

### HOUSE AND HOME

Rubber strip on bottom of garage door keeps out rain and snow (United Products Co., 900 N. 43rd St., Milwaukee 8).....	103
Binding strip (Cyemba Sales Corp., 120 Wall St., New York City 5).....	142
Juice pipes (Biltwell Brush Co., 225 S. Church St., Rockford, Ill.).....	142
Phone kit (Leavitt Mfg. Co., 208 E. 25th St., New York City 10).....	142
Portable bed rail (Misco Products, Box 564, Rockford, Ill.).....	142
Adjusting towel bar (Gerity-Michigan Corp., 10 S. Superior St., Toledo 4, Ohio).....	143
Card rack (Maclean Associates, 722 Citizens Bldg., Cleveland 14, Ohio).....	143
Carpet needle (Albin Enterprises, 1401 W. 8th St., Los Angeles 17).....	143
Dual faucet pedals (Crane Co., 836 S. Michigan Ave., Chicago).....	143
Thermostat heater (Titan Mfg. Co., 701 Seneca St., Buffalo 10, N. Y.).....	143
Low-slung chair for television viewing folds into hassock (Parkko Mfg. Co., 4655 Park Blvd., San Diego, Calif.).....	158
Interlocking rubber tiles fit together like jigsaw puzzle (R. L. Mitchell Rubber Co., 2114 San Fernando Road, Los Angeles 63).....	161
Adjustable table permits typing, writing or sewing in bed (Arthur C. Hokanson, R. I., Box 259, Cassopolis, Mich.).....	116
Reel for extension cord has built-in electric outlet (House of Ideas, Racine, Wis.).....	167
Glareproof tilted blackboard mounts bulletin board on back (Claridge Equipment Co., 4608 W. 20th St., Chicago 50).....	168
Toddler's chair serves at home and in car (Malbee Enterprises, Box 111, Elmont, N. Y.).....	168
Mirror panels and grooved molding make quick wall covering (Creative Workshop, 7 Parker St., Watertown, 72, Mass.).....	173
"Electric Wallpaper" cemented to ceiling supplies heat for room (United States Rubber Co., Rockefeller Center, New York City 20).....	174
Double-glazed window without metal edge.....	175

### INDUSTRY

Plastic balloons save oil.....	104
Mechanical brain prints answers in easy-to-read numbers (Streeter-Ames Co., 4101 N. Ravenswood Ave., Chicago).....	119
Plastic truck tank carries 3460 gallons of liquid.....	151
Bombardment with electrons toughens plastic bottles (General Electric Research Laboratory, Schenectady, N. Y.).....	175

### MILITARY AND NAVAL

Inflated life raft in hold of sinking trawler saves ship.....	141
Mobile power-tool unit aids front-line troops.....	151
Single transmission line carries 30 TV channels.....	159
Flying radar stations to be "eyes" for U. S. defense forces.....	174

### SCIENCE

Tilting X-ray examination table suspends patient by heels.....	103
Scientist uses "mud pies" to explain changes in earth.....	133
Artificial atom chip.....	151
Atomic "preserver" kills food bacteria.....	159
Chemical shotgun shell absorbs moisture.....	160
Coating protects metals against 5000-degree temperature (B. F. Goodrich Co., Ind. Prod. Div., Akron, Ohio).....	160
Long-distance gauge checks faraway storage tanks (Shand and Jurs Co., 8th and Carlton, Berkeley, Calif.).....	161
Metal-powder process forms strong castings (Chrysler Corp., Amplex Div., Detroit 31, Mich.).....	168
Delayed-action nitrogen.....	260
Sound waves clean bearings.....	268

### TRANSPORTATION

Personalized markers identify freight cabooses.....	105
Semitrailers ride railroad flatcars in fast-freight system.....	112
Truck cab sliced in half to make lumber loading easier.....	154
Two-section German bus uses bellows-type connection.....	160
Change freight-car wheels to fit different gauges.....	176

### MISCELLANEOUS

Cigarette-making machine (Sears, Roebuck & Co., Chicago 7).....	102
Motor from paratrooper bike powers miniature motorcycle.....	103
Clamp fastened to automobile wheel gives needed traction.....	104
Paint dispenser mixes any color (Martin-Senour Co., 2620 S. Quarry, Chicago).....	141

(Continued to page 18)

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(Continued from page 16)

Single sportsman's gun has four sets of barrels (Simmons Gun Specialties Co., 504 E. 18th, Kansas City, Mo.).....141

Daredevils play donkey ball.....144

Cabinet converts leaves into compost in 30 days.....145

Easily operated lifeboat radio transmits on SOS frequencies (Mackay Radio & Telegraph Co., Marine Div., 60 Broadway, New York City).....145

Galvanic rod in radiator prevents scale deposits.....145

"Sweet" chemical fed to cows.....145

Small portable camera photographs fingerprints at scene of crime.....158

Breath-controlled television set entertains police victims (Lion Mfg. Corp., 2640 W. Belmont, Chicago).....159

English hearing aid mounts on spectacles.....160

"H bomb" vault has 18-ton door.....165

Flashlight batteries supply power for portable turntable.....166

Versatile drawing table quickly assembled from kit (Tectonic Services, Inc., 2074 E. 36th St., Cleveland 15, Ohio).....166

Drive-in movie theater features screen for each automobile.....167

Portable luggage carrier folds into small carrying case.....167

"Sea Cow" foghorn.....173

Midget fire extinguisher (Pyrene Mfg. Co., 540 Belmont Ave., Newark, N. J.).....173

Radiator warming shelf.....175

Tricycle built for fire.....175

Rice-bran oil.....176

Miniature pen (Parker Pen Co., Janesville, Wis.).....248

Texas butterfly branding.....248

White House weathermaker.....254

Padlock sealed with metal strip (Corbin Cabinet Lock Div., New Britain, Conn.).....286

## Craftsman and Shop Notes Index

**AUTOMOTIVE**

Driver and automobile brakes must team up for safety.....196

Rolled towel across back eases traveling fatigue.....204

Location of car in parking area revealed by flag on antenna.....211

Rear window of car kept clear by concealed defroster.....212

Warning buzzer prevents driving with emergency brake set.....223

**BOATS AND BOATING**

Plastic webbing replaces canvas as lift on jump-rail window.....187

Wax dressing helps preserve outboard starting rope.....211

Avoiding motor corrosion.....211

**FARM**

Auto pistons used as anchors for fence and gateposts.....201

Egg-crate fillers provide "pots" for seedlings started indoors.....211

Poultry-house feeders supplied by hopper on overhead track.....229

Four gates in fenced pasture permit field rotation.....236

**HOUSE AND HOME**

Breadboard has adjustable guide for cutting uniform slices.....190

Handy washing-machine switch.....190

Solving Home Problems.....194

Toaster bracket supports doors.....200

Bleach cleans stained vase.....201

Shower curtains hang better when weighted with sinkers.....204

Sawdust cleans chinaware.....204

Metal foil in picture window reflects light and heat.....212

New furnace adjustment assures even heating.....212

Magnet holds wooden pencils.....236

**OFFICE, SHOP AND STORE**

Pencil eraser spreads paste.....187

Anchoring rolls of screen wire.....190

Chalk line in bow aids lettering.....192

Flooring strip aids squaring.....196

Steaming stamps from envelopes.....211

Portable welding-rod holder.....229

**PAINT AND PAINTING**

Hardboard painted and finished the same as hardwood.....193

Hand rest on wire brush provided by half of ball.....199

Wall-paneling filler.....200

Modified spray-width valve allows quick adjustment.....229

**PHOTOGRAPHY**

Wet-cell floodlight.....205

Petroleum jelly deepens tones when copying matte prints.....217

Thermometer in darkroom hose indicates water temperature.....217

Light-tight darkroom heater uses Bunsen burner.....217

Repairing camera bellows and shutter curtains.....218

Wax for ferrotype plates.....218

**TOOLS**

Adjustable stock support for table saw utilizes ball-bearing casters.....223

Miniature brake for light-gauge sheet metal.....223

"Wrench" improvised in shop adjusts voltage regulator.....233

Folding screwdriver (Hunter Tool Co., Whittier, Calif.).....234

Wire-twisting mechanism (Ralph C. Robinson Co., Box 494, North Sacramento 15, Calif.).....234

(Continued to page 20)

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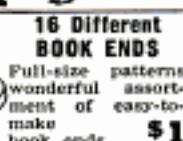
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(Continued from page 18)

- Four-corner miter clamp (Cincinnati Tool Co., Cincinnati 12, Ohio) . . . . . 234
- Block handling tool (Lay-Level, Inc., Box 99, Toledo 99, Ohio) . . . . . 234
- Precision hand grinder (Precise Products Co., 1328 Clark St., Racine, Wis.) . . . . . 235
- Pocket saw (Pixley Co., 5336 Glenwick Lane, Dallas, Tex.) . . . . . 235
- Carpenter's and mason's level (Creative Plastics Corp., Stony Brook, N. Y.) . . . . . 235
- Inspection instrument (Eder Instrument Co., 2293 Clybourne Ave., Chicago) . . . . . 235
- Magnetic locator (Dresden Mfg. Co., 2375 Walnut Ave., Long Beach, Calif.) . . . . . 235
- Machinist's vise holds thin work by use of auxiliary jaws. . . . . 236

## WOODWORKING

- Straightening warped doors . . . . . 193
- Plan of the month—dining table commode . . . . . 201
- Wooden drying rack folds into cabinet. . . . . 201

## WORKSHOP HINTS

- Free-cut saw blade improvised . . . . . 190
- Renew your scissors . . . . . 191
- Discarded oil can stores drills . . . . . 192
- Hot lead cuts hole in glass . . . . . 196
- Piece of hose speeds sawing in difficult places . . . . . 199
- Shaker-type seasoning can dispenses abrasives . . . . . 200
- Scrub-brush sanding block ideal on uneven surfaces . . . . . 200
- Plumb bob improvised from solder and cord . . . . . 200
- Band of inert tube on block makes bench brush . . . . . 204
- Improvised pipe wrench . . . . . 204
- Tighten electric motor bushings by knurling in lathe . . . . . 222
- Stop block for saw or shaper has clamp attached . . . . . 229
- Winding small coil springs between lathe centers . . . . . 232
- Handy workbench tool "pocket" . . . . . 232
- Machine vibration dampener . . . . . 232
- Broken drills removed with slotted tool . . . . . 236
- Rejuvenate steel brushes . . . . . 236

## MISCELLANEOUS

- Rod driven without bending when inserted in pipe . . . . . 190
- Rawhide lacing cut uniformly with hatchet and knife . . . . . 192
- Sand trap for water-pump line . . . . . 192
- Adhesive tape anchors badge to hunter's lapel . . . . . 196
- Envelope corner as bookmark . . . . . 199
- Foam-rubber pad on palette helps prevent cramped hand . . . . . 212
- Kite hauls line over chimney to simplify rigger's job . . . . . 223
- Mason's line held tight by slotted rubber hose . . . . . 232

## Radio-Television, Electronics

- TV programs recorded on tape . . . . . 177
- Portable radio "test bench" for convenient service . . . . . 178
- Radio frequency calibrator (Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, Ohio) . . . . . 180
- TV antenna coupling device (RCA Victor Div., Radio Corporation of America, Camden 2, N. J.) . . . . . 180
- Electronic leak detector (Fisher Research Laboratory, Inc., Palo Alto, Calif.) . . . . . 180
- Ultra-sensitive volt-ohm-microammeter (Simpson Electric Co., 5200 W. Kinzie St., Chicago 44) . . . . . 180

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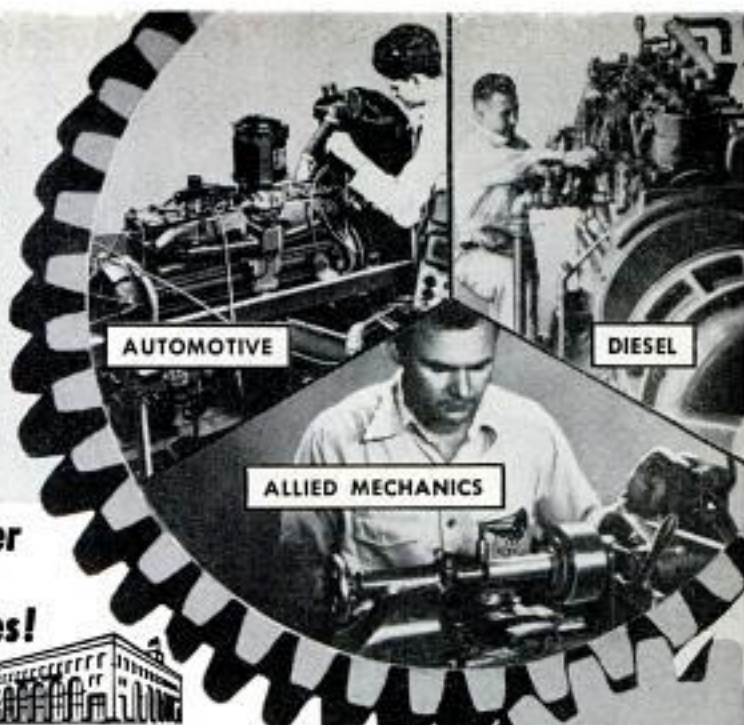
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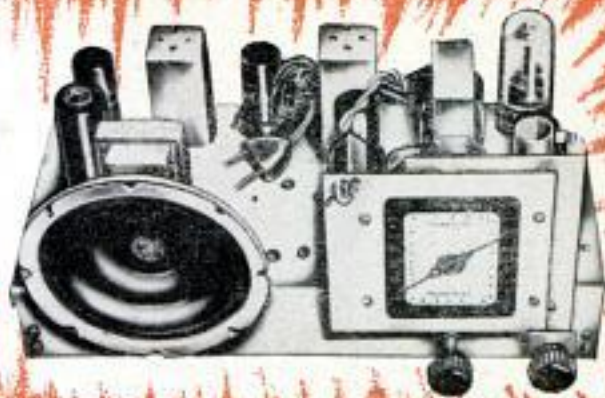
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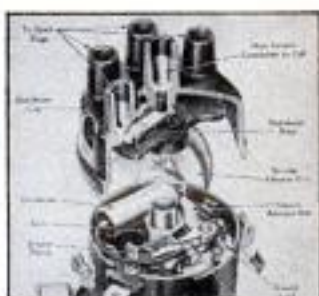


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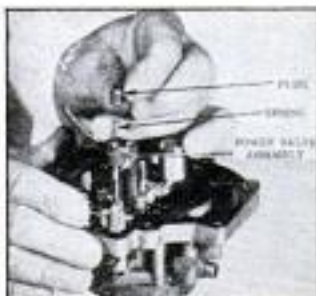
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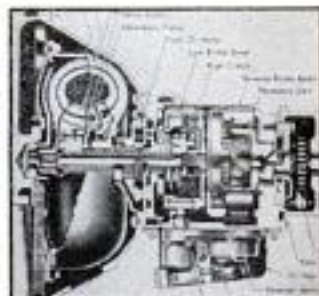
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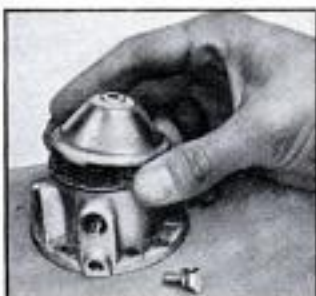
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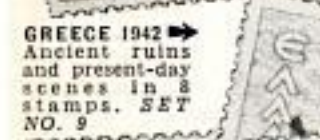


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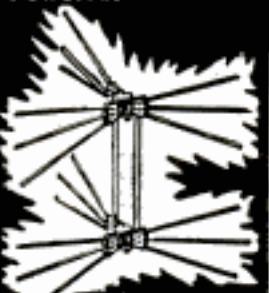
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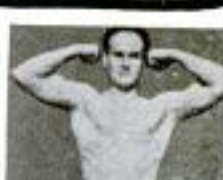
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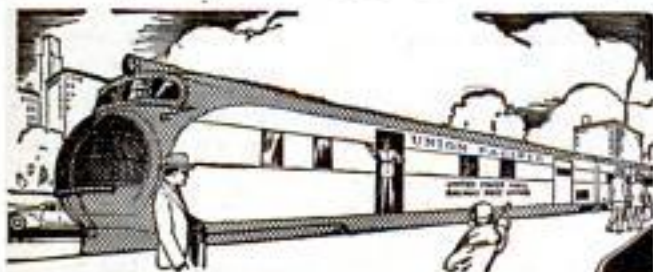
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**GAINES.** I personally guided his start when he invented an automatic parts presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

**VAN MARK.** I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start —ended up six years later with savings of \$50,000 and an income of \$5000.00 a year for life without further work.

**DUGGAN.** A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

**MRS. NIXON.** Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

**FOXMAN.** Foxman worked as a book writer at \$70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made \$18,000 the first year. He gives me credit for "showing the way."

**JORGENSEN.** Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of \$50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

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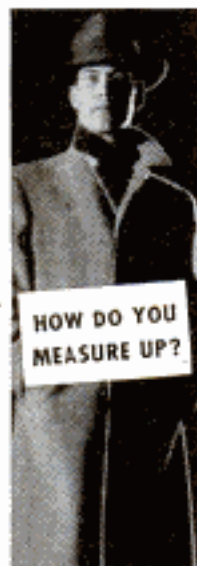
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Mr. Mellinger: Show me the big profits to be made through World Trade, especially in mail order from my own home.

- I enclose 25¢ in coin. Send me one Melson Cigarette Lighter and your plan that shows me how to learn the secrets of World Trade.
- Just send your **FREE** World Trade Plan.

PLEASE PRINT

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 Town \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

### New World Trade Boom Offers BIG PROFIT OPPORTUNITY

to ambitious Men and Women everywhere. I'll show you how you may import thousands of useful or unusual products at low foreign prices for Department Stores, Gift Shops, etc., in your locality who pay high U. S. prices. Also how you may operate a profitable world-wide mail-order Import-Export business from home, whether you live in a big city, or a small town.

*B. J. Mellinger*  
—Exporter-Importer

**MAKES \$2500.00 PROFIT ON FIRST ORDERS...** "Sales up to this time are \$10,000, leaving about 25% profit (India Brass artwares samples sent without charge). Only takes part time. I plan to expand."

A. E. PIXA, Ohio

"We operate a profitable **WORLD TRADE BUSINESS FROM OUR HOME**

... Thanks to Mellinger."  
Mr. and Mrs. H. F. Beke, N. Y.



**\$680 PROFIT ON ONE EXPORT ORDER.** "Two months after enrolling received first order for \$6,800 in Sound Projector equipment from Philippines. Made 10% commission."

Jay A. Welsh  
California



**START ON THE ROAD TO BIG PROFITS TODAY!**

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# Sell WORK UNIFORMS Make BIG MONEY

Need money? Here's a quick, easy, pleasant way to earn lots of it—spare time or full time. Just show the huge, unlimited selection of **TOPPS EMBROIDERED WORK UNIFORMS**—to garages, service stations, factories, institutions, stores, every business man in your community. Sales are easy—profits are big because you show more styles, more fabrics, more colors, more sizes, more of everything than any competition can match.

## TOPPS THEM ALL!

You can't miss making sales and money. And the profits are worth the time . . . and how! One man made \$800 profit on a single sale! You show the biggest, best, most-economical uniform line in America **MADE EVEN BETTER** by exclusive features like these.



### ORLON

Uniforms of DuPont ORLON that look and feel like wool, but wear like iron. Crease-resistant, acid-proof, wash them at home. A sure seller. Many other fabrics not available in stores **PLUS** all sizes, all colors, all styles — more than any competition can match.

### PANORAMIC LINE

—The TOPPS Line spreads out over 3 feet. Swatches are man size. Prospect can see everything at a glance. It's eye-stopping, sales-compelling.

### NEW EMBROIDERY IDEAS

—Biggest, finest selection of lettering styles, designs, trade marks in all the world. Or we'll custom make it to suit individual requirements.

**OUTFIT FREE!** Get in the great new TOPPS "Panoramic" Line now. See how fast the sales pour in . . . see how fast your profits mount up. Start spare time if you wish—you'll earn enough money to make TOPPS your career! Write today.

**TOPPS, Dept. 611, Rochester, Indiana**

I SHOW YOU HOW TO

# MAKE MONEY AT ONCE

START YOUR OWN BUSINESS IN 2 WEEKS—AT HOME IN SPARE TIME

## METALIZE BABY SHOES

IF YOU ACT NOW, I will show you how to start earning extra money immediately—in spare time or full time. **AND I SHOW YOU HOW** to start your own profitable business. With my complete course and easy-to-understand illustrated instructions containing trade secrets of ALL metalizing processes **PLUS** beautifully processed sample metalized baby shoe **AND** all my tested and proved methods of operating a successful metalizing business. I show you how to start **YOUR OWN** profitable, fascinating business right in **YOUR OWN HOME**. Absolutely no experience needed. For **PROOF** send coupon today for **FREE** details of my **MONEY MAKING PLAN** for you and be convinced.

# FREE!

**MONEY MAKING PLAN**

Full Details Without Obligation

MAIL COUPON TODAY!

**KIKTAVI CO., Dept. PM-541**  
7217 So. Broadway, Los Angeles 3, Calif.  
Send me **FREE** details of your **MONEY MAKING PLAN**, without obligation.

NAME \_\_\_\_\_  
STREET \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

### THIS WIRE HAS NOT BEEN OVERSEAS

This high quality two conductor communication wire offered in No. 18 and No. 22 gauge is ideal for intercoms, lead-ins, telephones, indoor and outdoor speaker extensions, doorbells, signal and burglar alarm systems, shot string, etc., etc. **SAMPLES ON REQUEST.**

## U.S. GOV'T CLOSEOUT



# Wire

U. S. Signal Corps  
Communication Wire

TWISTED TWO CONDUCTOR \$5.00  
No. 18 STRANDED per 1000 ft.  
\$7.50 per 1000 ft. TWISTED TWO CONDUCTOR No. 22 STRANDED

NEW WAR SURPLUS

**Won't Last Very Long at These Prices**

**Stock Up Now — Subject to Prior Sale — Order Today**

**W-110-B — TWO CONDUCTOR #18 STRANDED** (four 5 cc. and three copper strands) rubber covered plus weatherproof cotton braid and twisted, 5,280 feet per steel reel. Only \$3.50 per thousand feet on 5,280 foot reels or \$18.25 per reel.  
**W-110 — TWO CONDUCTOR #22 STRANDED** and twisted (one copper and six steel strands) in your choice of rubber or plastic insulation, 10,000 feet per steel reel. Only \$3.50 per thousand feet on 10,000 foot steel reel or \$35.00 per reel.  
(Note: Steel strands are incorporated for extra tensile strength and are tinned and treated for efficient conductivity.)  
Wt. per 100 ft. #18 wire, 25 lbs. Wt. per 100 ft. #22 wire, 11 lbs.  
All these wires below market prices, our stock will not last long! Take advantage of this exceptional closeout on **STOCK UP NOW!**

Prices F.O.B. Chicago. Include approx. postage on orders paid for in advance. C.O.D. orders enclose 25% balance with C.O.D.

**U. A. S. Corp.** Dept. PM-1, 5637 W. 63rd Pl. Chicago 38, Illinois

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Really Works—Small as a Pack of Cigarettes!



**FITS IN ANY POCKET OR PURSE—GETS LOCAL RADIO STATIONS WITH CLEAR BELL-LIKE TONE—NO STATIC OR INTERFERENCE! NEEDS NO TUBES, BATTERIES OR COMPLICATED HOOKUPS! NO AC PLUG INS! Nothing to wear out. Thousands of users—many report years of service. Uses new crystal diode and H-Q coil. SELF-CONTAINED SPEAKER PHONE. Just the tiny radio to take with you ANYWHERE YOU GO—ON TRIPS, VISITING, ETC.—for real fun and enjoyment—ANY TIME. **SEND ONLY \$1.00****

(bill, ck., mo.) and pay postage \$3.99 C.O.D. postage or send \$4.99 for p.p. delivery. COMPLETE READY TO LISTEN. MIDWAY CO., Dept. PPM-1, Kearney, Nebr.

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Beat the high cost of home upkeep. Save hundreds of dollars every year on carpentry, electrical, painting, plumbing and other jobs around the house with **Popular Mechanics GUIDE TO HOME REPAIRS**. Simplified how-to-do-it instruction and 646 pictures make all jobs, inside and out, easy. Covers construction, remodeling, modernizing, repairing that you can do yourself at small cost. 192 page cloth bound book only \$2.50 postpaid. Order today under our money back guarantee.

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**THE WORLD'S LARGEST STAMP FIRM**

## SAVE TIME & MONEY WITH NAME LABELS

YOUR NAME & ADDRESS  
Printed like this on Gunned Labels

(Twice This Size)

Stick them on books, packages, letters, envelopes, umbrellas, camera, luggage, etc. and get loaned and lost articles back!  
300 Labels • Gift-Boxed • \$1.00

**MAKE MONEY EASILY!** Sell for us. Big profits! Write for Sales Kit and full information.

**WRITEWELL CO. • Dept. SM-42 • BOSTON 15, MASS.**

POPULAR MECHANICS



**I have a good proposition for men or women who would like to make an extra \$125.00 a month for spare time**



These 15 Utensils and covers are all interchangeable. They fit into each other so as to make up 23 different cooking combinations for "Waterless Cooking." The four egg cups make a 19-piece set that covers 99% of all cooking needs.



**By Frank W. Strong**

**I won't make any fancy promises of \$50.00 a day. And I'm not after any of your money. What I can do is show you a simple plan by which you can pick up enough extra money every week to help make up for the money you're losing in higher taxes and higher costs of living. And I supply your working outfit free—no charge and no deposit. Just your name is all I need. Read my proposition. It is honest and down to earth. And it won't cost you anything to try it.**

TODAY almost everyone needs extra money. Increased taxes and increased living costs are making your dollar worth less and less, so you have to have more and more dollars just to keep even. There are lots of good ways to make extra money. I don't say my way is the best. I do say it's one of the easiest and most pleasant. It even leads to making new friends. It doesn't call for house-to-house canvassing, either. Let me explain:

I am Sales Manager for a very big manufacturing company. We make Stainless Steel Cooking Utensils. We do an enormous business with hotels, restaurants, hospitals, and institutions. We also make utensils for the Army, Navy and Air Force.

As a result, we have very low manufacturing costs. We can sell a set of Stainless Steel Cookware for home use for about what it costs some companies to make it! In fact, for years we did sell to one Sales Organization who resold our cookware house to house under their own name. They got \$120.00 for the same set that our people sell for approximately half of that.

You've probably heard of salesmen who give dinner parties in homes and then take orders from the ladies who attend. These salesmen have to get a high price because it costs money to give parties—he has to make his share—and his supervisor has to make his. The sales organization adds a profit and the manufacturer has to make his. So there are about four or five profits added to the actual manufacturing cost.

About two years ago I got to figuring. There are five good reasons why Stainless Steel is the kind of cookware that should be in every home. 1. It washes as easy as a drinking glass. No scouring, scraping or scrubbing. 2. It doesn't rust or corrode—and it doesn't stain. 3. It doesn't affect the taste of food. 4. Carlton Ware enables you to prepare food by the method called "waterless cooking" which keeps more of the natural minerals and vitamins in your food and makes the food taste better. 5. Buy it once and you're all through buying for life. You can't wear it out.

You see, Stainless Steel is not a coated or plated metal, like chromium plate on the bumper of your car. That chromium plate can chip or wear off and exposes the raw steel underneath. Then the steel rusts. But our kind of Stainless Steel is stainless all the way through. It can't chip, crack, peel, or wear off. You could use a set the rest of your lifetime and then give it to your children and it would still be good for their children.

Well, I figured that if the price was low enough every family could afford Stainless Steel Carlton Ware. So I worked out this plan! We would sell a complete set of 15 pieces at a figure that would include our profit. Then you add your profit and re-sell this set to your friends and neighbors for just about half of the usual price charged on the "party plan." They are glad to get such a bargain and they feel that you've done them a real favor.

The plan becomes like an endless chain. When a woman gets her first piece of Carlton Ware she gets so thrilled with its better cooking and easy cleaning that she talks and talks. She can't wait to demonstrate it to her friends and tell them all about it. She's so proud of its silvery sheen that she just "bubbles over." So just by letting your own friends in on a good thing, before you know it their friends call you up and ask

if you can get the same low prices for them. Then their friends call you and their friends' friends. It goes on and on!

To make an extra \$125.00 a month, you only have to deliver seven sets and that's easy. Mrs. Montell in Pennsylvania took orders for \$1400.00 worth in her first month. And Mrs. William Hanchow wrote, "Got my set Saturday—I already have 17 customers."

Now, I'll let you in on another part of my plan. If you take only ten set orders a month for six months my company pays your expenses for a winter vacation in Florida. We maintain a beautiful resort in the Florida Keys just so our sales representatives can enjoy a Florida vacation at company expense.

Get all the information right now. I'll not only be glad to send Free Information, I'll also send you a complete demonstrating outfit that you can show to your friends and neighbors. And I'll give you exact instructions by which you can write up orders without ever trying to "sell" and without making any house-to-house calls.

Everything I send you is free. When you qualify, I'll even furnish you with a complete 15-piece set of Carlton Ware to use in your own kitchen and show to your friends. It's an extra bonus I give to encourage good earnings on your part.

Send your name today in confidence. You'll be glad you wrote. This ad may not appear in this magazine again, so don't take any chances on losing out. Send the coupon or just send your name on a postcard. I won't send any salesmen to call on you and you won't be under the slightest obligation.

**Frank W. Strong**

*Carlton of Carrollton, 3341 High St., Carrollton, Ohio*

**Frank W. Strong, Carlton of Carrollton  
3341 High St., Carrollton, Ohio**

Dear Mr. Strong: Please send me free and without any obligation a complete selling and demonstrating outfit with exact instructions for making an extra \$125 a month. I don't want to do any house-to-house selling, but I will show your products to my friends and give them the advantage of the low prices.

Name .....

Address .....

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

I am already selling Cookware and am interested in getting a line that can be sold at a lower price. Please send me your Distributor's proposition.



# TURN SPARE HOURS INTO CASH



Few Hours Evenings and Week Ends Can Pay up to

**\$1650**

A DAY AND MORE!

## Every Car Owner Wants Sensational "Wipe-to-Clean" Plastic AUTO SEAT COVERS

Here's big money! Just show car owners America's most sensational Auto Seat Cover values. Newest materials; exciting variety of colors and styles. Superb tailoring means perfect fit for every model, old or new. Amazing low prices . . . bring you big profit orders. New line includes popular "wipe-to-clean" plastics (just a few strokes with a damp rag cleans like new) . . . BAMBOO, FIESTA, PLAIDS, many more. Get YOUR OWN \$50.00 SET OF SEAT COVERS AS BONUS!

### Big FREE OUTFIT — Send No Money

Rush name and address on coupon below. Send no money. We'll rush complete new FREE SALES OUTFIT including many actual samples. Start earning from first day. No experience needed. Just make a few pleasant calls a day on car owners in your town. Hurry . . . RUSH COUPON TODAY for FREE OUTFIT.

KEY PRODUCTS, Dept. 441, 800 N. Clark St., Chicago 10

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Rush MONEY MAKING auto seat cover sales outfit, including actual samples—all FREE.

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 Town \_\_\_\_\_ State \_\_\_\_\_

## I'll Send You This Handsome SAMPLE CASE—FREE!



Make up to **\$15.00** in a Day!

Your Own Tailored Suits Without 1¢ Cost

If you want to make more money, spare time or full time, rush the coupon below today for this big, valuable tailoring Sample Case packed with 150 beautiful, big-value suit and overcoat samples. Just show the samples and last-minute styles to friends, fellow-workers, others. Take their orders for fine made-to-measure clothes—and pocket BIG CASH PROFITS in advance. No experience, no tailoring knowledge needed—and no money needed, ever. WE SUPPLY EVERYTHING FREE . . . sample case, sample suitings, equipment, complete instructions. Start making money first day!

Use Spare Evenings . . . Weekends . . . Make Money . . . Get Suits!

It's easy to make money taking orders in just spare time—lunch-time, evenings, weekends. When men see the fine fit, quality and value of our suits—THEY ORDER! So we make it easy for you to get your own personal suits and overcoats without paying even one penny. Don't wait! Rush coupon with your name, address, and age for FREE Sample Case.

**STONE-FIELD CORP., Dept. F-816**  
 532 S. Throop Street, Chicago 7, Ill.

**STONE-FIELD CORP., Dept. F-816**  
 532 S. Throop St., Chicago 7, Ill.

Please rush ABSOLUTELY FREE the valuable Sample Case with suit fabrics and style display. Include instructions, money-making plans and details for getting my own suits without paying one cent.

Name \_\_\_\_\_ Age \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_



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**\$195,000**  
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Now I'm ready to pay out another Giant Jackpot of \$25,000 to some more lucky people. Will you sell me a few hours of spare time if I guarantee to pay you \$12,000 if you win First Prize in my New and excitingly different puzzle game just starting? No 25-word essays to write . . . no big dictionaries to toil over . . . no weird pictures to figure out! Without obligation or the risk of a penny, I'll send you ABSOLUTELY FREE complete contest instructions, entry puzzle charts and rules. I'll also put your name down to receive all my future Big Prize Money puzzle contest offers. Send postcard or letter TODAY with your name and address to:

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 ANY OBJECT IN HOME, SHOP, GARAGE OR STAY  
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NO TANKS USED  
 NEW SIMPLIFIED METHOD

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Start a Buying Service At Home, SPARE TIME, GET BIG NAME MERCHANDISE FOR SELF AND CLIENTS UP TO 40% LESS THAN REG. PRICE. SALES EASY AS YOU CAN SEE. Sizable Discounts, STILL MAKE FAT COMMISSIONS. Post Card Brings Free Copy

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Whether it's your business or your hobby, the Monal Kit's amazing assortment of handbag locks, turn locks, hook locks, lift locks, snap locks, strap handle holders and clips, has everything you need. \$4.95 prepaid. Send 10 cents (Refunded with Order) for graphic photo of every item in the kit.

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**Telephones**

**Desk Stand Style**  
 Slightly used and in excellent condition. Many Valuable Uses—  
 Inter-house phones **\$2.75**  
 Loud Speakers  
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 Come complete, ready to use, in U.S.A.  
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**TELEPHONE LAMP KITS**  
 Including Telephone, lamp, nipples, push switch, cord & plug together with illustrated instructions \$6.50 postpaid (shade not included).

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**BUILD A BIG PROFIT HOME BUSINESS...**

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with **NEW**

**Suede Paint!**



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the **NEW WONDER FINISH** that **COVERS EVERYTHING**

... Plastic, Fabric, Metal, Plaster, Wood, Rubber... any Surface!

**MAKE \$500 to \$1000 PER HOUR and more!**



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TOYS

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"Received the flok-kraft outfit and everyone that saw it is very enthused. I only had it about thirty minutes and got an order for a hundred dollar job." Mr. C. H. Maryland.

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"Got \$52.50 for those 7 trunk interiors for about 4 hours work. \$7.50 per trunk." J. O., Mo.

"... pleased with your course and I'm being swamped with work to do." W. F.,

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Examine in your own home — then decide. The complete instructions, the full starting kit of materials and equipment plus full details on how you may open your own business — spare or full time — EVERYTHING will be sent to EXAMINE AT OUR RISK.

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This amazing miracle finish is of inestimable value for use on hundreds of manufactured products. Flok-Kraft offers you a way to big, extra money, assisting manufacturers in many lines as well as filling a big demand among home owners.

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1004 S. Los Angeles St., Los Angeles 15, California  
Please rush me FREE details, sample, etc., I understand that everything you send is free and that I'll be under no obligation now or ever.

NAME \_\_\_\_\_  
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**Coast Industries** Dept. 21 1006 S. Los Angeles St. Los Angeles, California



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The demand is endless. Laundries, cleaners, tailors, department stores, homes — everybody needs professional reweaving service. And skilled craftsmen are scarce! You can learn to make cuts, moth holes, burns, tears DISAPPEAR from coats, suits, dresses, all fabrics almost like magic! . . . EARN UP TO \$10.00 IN AN HOUR AT HOME!

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Invisible Reweaving offers as much or more promise for profit to men . . . as it does to women. Over half our successful students have been men. Men can learn to do the work as well and as quickly as women. Actually, Invisible Reweaving is the perfect "team" business — for man and wife . . . or even the entire family! Write today.

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**100** BRITISH  
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Dept. XH-292, Milford, New Hampshire

Kenmore Stamp Co., Dept. XH-292, Milford, N. H.  
Rush me FREE 100 British Empire Stamps and Booklet "How to Recognize Rare Stamps". I enclose 10c to help pay postage and handling.

NAME \_\_\_\_\_  
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CITY \_\_\_\_\_ STATE \_\_\_\_\_

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... valuable illustrated booklet "How to Recognize Rare Stamps", tells where and how to seek, identify and sell rare stamps. May lead you to stamps worth many dollars!



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and Tiles

**PRESERVE Real FLOWERS  
in NEW CRYSTAL PLASTIC**



"Pours like water . . .  
Sets like glass"

**NEW BOOK Shows How:**

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**YOU CAN DO IT—AT HOME WITHOUT EXPERIENCE.** Illustrated step-by-step instructions show how to get started, what to make, to have fun, make money. Free with book, new manual "How to Make Jewelry" and proven "Home Success Plan." Send 25c to **CASTOLITE, Dept. A-1, Woodstock, Ill.**

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200 East Ontario St. Chicago 11, Ill.



# WILL YOU SMOKE MY NEW KIND OF PIPE 30 Days at My Risk?

By E. A. CAREY

All I want is your name so I can write and tell you why I'm willing to send you my pipe for 30 days smoking without a cent of risk on your part.

My new pipe is not a new model, not a new style, not a new gadget, not an improvement on old style pipes. It is the first pipe in the world to use an ENTIRELY NEW PRINCIPLE for giving unadulterated pleasure to pipe smokers.

I've been a pipe smoker for 30 years—always looking for the ideal pipe—buying all the disappointing gadgets — never finding a single, solitary pipe that would smoke hour after hour, day after day, without bitterness, bite, or sludge.

With considerable doubt, I decided to work out something for myself. After months of experimenting and scores of disappointments, suddenly, almost by accident, I discovered how to harness four great natural laws to give me everything I wanted in a pipe. It didn't require any "breaking in". From the first puff it smoked cool—it smoked mild. It smoked right down to the last bit of tobacco without bite. It never has to be "rested". AND it never has to be cleaned! Yet it is utterly impossible for goo or sludge to reach your tongue, because my invention dissipates the goo as it forms!

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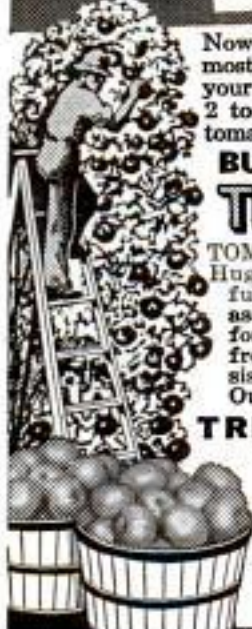
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**PACKETS**. World different 2,000, \$3.00; 3,000, \$5.00; 5,000, \$15.00; 10,000, \$47.00; 20,000, \$200.00; 30,000, \$610.00; 40,000, \$1,220.00; 50,000, \$2,180.00; 60,000, \$4,220.00; 70,000, \$8,040.00; 80,000, \$12,360.00. Russell Smoky Mountain, Box 2011D, Natural Bridge Station, St. Louis 15, Mo.

**327 DIFFERENT** Stamps 25c! Including early Canada, Newfoundland, British Colonies, Vatican, Red Russia, Hitler heads, Indian states, animals, airmails, French Colonies, rarities, unusuals. Every stamp different. Rare bargain with approvals. Money back guarantee. Niagara Stamp Co., Niagara-on-the-Lake 61, Canada.

**COLOSSAL** Stamp zoo 10c. Jungle beasts, wildlife, domestic animals—Fifteen different, including, rhinoceros, elephant, snake, tiger, zebu, kangaroo, koalabear, emu, kookabura, bull, horse. Extraordinary accompanying approvals. Niagara Stamp Company, Niagara-on-the-Lake 51, Can.

**NEW** Zealand triangles. Queen Elizabeth, 10c with approvals. Seminole Stamps, Box 1138-P, Coral Gables 34, Florida.

## COINS, TOKENS, CURRENCY

**GOLD** U.S. coins bought 50% above face value. Baevitz, 229-04 Hillside Ave., Bellerose, N. Y.

**105 DIFFERENT** Foreign bills—\$1.00. Free list. Dwight Musser, Dunbar, West Virginia.

**FREE!** Foreign coin, banknote and coin collectors illustrated catalog to approval service applicants. Send 3c postage. Tatham Coinco, Springfield 30, Mass.

**INDIAN** Cent with bargain lists 10c. Hutchinson, 3463 "I" Street, Philadelphia 34, Penna.

**WANTED—**1894-8 dime pay \$500.00. Certain 1913 nickel \$1,000.00. 1901-8 quarter \$20.00 to \$150.00. Hundreds of others. Know their true value. Complete illustrated catalogue 25c. Worthycoin Corporation, (D-325), Boston 8, Mass.

**\$10.00** FOR Certain Lincoln pennies, Indianheads \$30.00. Send dime for booklet listing prices paid. Lincoln Coins, D-29, Glendale, Arizona.

**GET** Profit and pleasure in collecting old coins. Send 10c for 56-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Building, Fort Worth, Texas. Largest rare coin establishment in U. S. Established 54 years.

**THIRTY** Liberty nickels \$3.00, fifteen different \$2.00. Sayers, 1000 East Unaka, Johnson City, Tennessee.

**OLD** Money wanted. Will pay fifty dollars for nickel of 1913 with liberty head (no buffalo). We pay cash premiums for all rare coins. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 20, Fort Worth, Texas.

**OLD** Stamps wanted. I will pay \$100.00 each for 1924 1c green Franklin stamps, rotary perforated eleven (up to \$1,000 each unused). Send 10c for large illustrated folders showing amazing prices paid for old stamps, coins. Vernon Baker, PM-41, Elyria, Ohio.

**35 DIFFERENT** Foreign coins. \$1.00. Claud Denney, 3633 Colonial, Dallas 15, Texas.

**40 DIFFERENT** Coins, \$1.00. 66 coins and bills \$1.00. Oddehon, Box 482, St. Louis, Mo.

**CONFEDERATE** And Southern bank notes, 3 different, \$2.00. 50 mixed Indian pennies, \$2.00. Ben's Coin Shop, 31 N. Clark, Chicago 2.

**JAPANESE** Invasion notes 1c to \$1000.00 set \$1.00. 100pp. illustrated catalogue, 25c. Shultz, Salt Lake City 10, Utah.

**UNITED** States coins! Bargains! Sullivan's, 127-F East Fourth, St. Paul 1, Minn.

**WORLD'S** Greatest magazine for coin collector's and wooden nickel 10c. Lawrence Brothers, Anamosa, Iowa.

**UNITED** States Rare Coin Value Guide. 48 pages 50c. Fortunes in rare coins. Ideal, 4464-P Geary, San Francisco 18, California.

**WHAT** Are your coins worth? Fell's amazing new International Coin Book, 1954 edition, tells you how to identify and learn exact value, history, and country of origin, of every coin you own, buy, sell, trade! Hundreds of detailed illustrations, thousands of fascinating facts, for amateur and professional collectors in 1 giant volume reference guide. Pay postman just \$2.50 plus postage for handsome cloth-bound edition, or enclose \$2.50—Save postage. Order now, satisfaction or money back. Fell Publishers, 386-B-1 Fourth Avenue, New York 16, New York.

**COIN** Collector's Magazine. Over 1000 pages per year. Sample copy 30c; \$3.00 per year. Hewitt, 7320-J Milwaukee, Chicago 31.

## ANTIQUES, RELICS, INDIAN GOODS, CURIOS

**1903** AUTOMOBILE With original county license. Make offer. Shelburne, 818 Broadway, Hannibal, Mo.

**ROYAL** English daggers \$12 dozen. Arkin, 4195-MP Third Ave., New York 57, New York.

**FREE!** Indian relic catalog. Nirscher's, 111 South 31st, Belleville, Illinois.

**ARROWHEADS.** Location given, four \$1.00, 24—\$5.00. Bird points, two \$1.00, dozen—\$5.00. Fine stone axe plus celt \$7.45, good \$4.95. Book-relic catalog 10c. Tilton Relics, Topeka 51, Kansas.



INTERESTING reproduction of old Oregon map used by early explorers. \$1.00. Moise Penning, Klamath, California.

**QUWITZSCHUERBELLERAIN**—Selling several hundred historical firearms, 30,000 Indian relics, collectors cartridges, coins, Confederate money, antiques. 400 bayonets, swords, Revolutionary, Civil War; flintlocks, muskets, blunderbusses, snaphaunces, matchlocks, revolvers, frontiers, Kentuckies, stagecoach carbines, Winchester, Ramrods, powderhorns, blunderbusses, bullet moulds, pepperboxes, steer-deer-buffalo horns, Arrowheads, spearheads, tomahawks, discoidal, gorgets. Violin wood, bo-wood, daguerrotypes, ambrotypes, gun parts. Agates, lapidary supplies, minerals, fossils, gold dollars. Send 35c for profusely illustrated catalog. Heike, (Abbotstown) Wenona, Illinois.

**SPECIAL**—10 Indianhead cents 87c; 6 prehistoric arrowheads \$1.46; scalper \$2.88; hammerstone \$2.65; pestle \$8.88; bayonet \$1.98; canteen \$1.95; geode, pyrite, galena, molybdenite, ricolite, hematite, muscovite, turquoise, fossils, gastropod, 48c each. Heike, (Abbotstown) Wenona, Illinois.

6 EXTRA Fine bird arrowheads \$2.00. 4 fine Indian arrowheads. \$1.00. Good grooved tomahawk \$2.00. List free. Lear's, Glenwood, Arkansas.

**ANTIQU** Firearms, pistols, percussion flintlock, list 25c. Westbrook, 738 Royal St., New Orleans, La.

4 PERFECT Arrowheads \$1.00. Flint knife 50c. Hide scraper 50c. Stone axe \$3.00. Perfect pipe \$3.00. Flint hoe \$1.00. List 10c. H. Daniel, Lamar, Arkansas.

4 SELECTED Arrowheads \$1.00. List 5c. H. Talburt, Calico Rock, Ark.

#### PRECIOUS STONES, MINERALS

**URANINITE**, The rock that lives. Principal source of uranium. Curio extraordinary! Certified specimen, beautifully mounted, \$2.00. Schools, homes, prospectors. Uraninite-carnotite \$3.50. Join Future Chemists of America. Membership participation, education, profit, fun. Particulars free. Parkway Laboratory, 1004 d, Second Ave., Pittsburgh 19, Penna.

**GEMOLOGY** Books! Catalog 10c. Atlantic Books, Cedar Street, Charlestown 29, Massachusetts.

**INDUSTRIAL** Mineral prospecting pays big when you hit! Free instructions. Stratex Instruments, 1861E Hillhurst, Los Angeles 27.

**FUN** With rocks! Rockhound's own monthly magazine featuring mapped trips, gem cutting, silverwork, minerals. 9,000 already enjoy it, so will you. Only \$3.00 year. Gems and Minerals, Box 716P, Palm-dale, Calif.

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

**JADE**, Agates, gems, gem cutting machines, supplies. Free list. North West Gems, 2819 North Warner, Tacoma 7, Washington.

**SAPPHIRE**, Topaz, tourmaline, garnet, peridot. 5 uncut gem specimens, \$1.00. O'Brien's, 1116M Wilcox, Hollywood 38, Calif.

**GEMSTONES**. Mineral specimens. Every variety. Lowest prices. Postcard brings free booklet. Plummer's, 4730 Point Loma Ave., San Diego 7, Calif.

**TEN** New Mexico minerals \$1.50, six fluorescents \$1.00, fool's gold 25c. Free literature. Minerals, Winston, New Mexico.

#### HOBBIES AND COLLECTIONS

**EXCITING** Hobby: collect authentic military patches, insignias, campaign ribbons, navy rates, etc. 57 assorted \$1.00. Free gift. Pruitt, Dept. M-1, 12 West 27th, New York City.

**MATCHBOOK** Collectors—Latest set and lists 25c. Yeingst, Parkway Road, Harrisburg, Penna.

**UNUSED** Match book covers from famous hotels and gambling casinos in Las Vegas. 15 colorful covers, all different, only \$1.00. Supply is limited. Pasadena Novelty Co., 468 Cypress, Pasadena 3, Calif.

**WANTED** Cigarette, tobacco, cards. Write Charles Bray, East Banker, Penna.

**NAZI**, Soviet, medals, campaign ribbons. Big packet. Lists. \$1.00. Medcrafts, 1923 34th St. S.W., Calgary 2, Canada.

**WEATHER** Instruments. Amateur and weather bureau types. Free catalog. Science Associates-Weather, Philadelphia 8, Penna.

**BOOKBINDING** As a hobby. Large 28 page materials and tools catalog will be sent upon receipt of 25c to cover cost of handling and mailing. House of Gane, Box PM, 1335 W. Lake St., Chicago 7, Ill.

**HOBBIES** Catalog and cyclopedia of model railroads, boats, ships, historical vehicles, handicrafts and model tools, 187 pages, 300 manufacturers, illustrated. \$2.00 purchase price refunded with twenty dollar order pro rata. Aircraft Sales Co., Box 235, Quincy 69, Mass.

**UNUSED** Matchbook covers—100 different \$1.00. 36-page catalog 25c. Charles Edelman, 1311C East 84, Cleveland 3, Ohio.

**INVENTING** Can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 40-E 631-E St. N.W., Washington 4, D. C.

**CLEARANCE** Sale—Army patches 3c up; catalogue 10c; 32 different emblems \$1. Hobbyguild, 550-A Fifth Ave., New York City.

#### CAMERAS, PHOTO SUPPLIES

**OWN** A new camera. With carrying case and films only \$2. Alts, 6106 University Ave., Chicago 37, Illinois.

**BUY** Wholesale nationally advertised cameras, photo supplies, thousands other products at big discount. Free "Wholesale Plan." American Buyers', 629PP Linden, Buffalo 16, N. Y.

**PHOTOGRAPHY** For pleasure or profit. Learn at home. Practical basic training. Long established school. Free booklet. American School of Photography, 835 Diversey Parkway, Dept. 3432, Chicago 14, Illinois.

**OIL** Coloring photographs—A fascinating hobby or profitable sideline for those with artistic talent. Learn at home. Easy simplified method. Free booklet. National Photo Coloring School, 835 Diversey Parkway, Dept. 3442, Chicago 14.

**AMATEUR** Photographers. Big profits with your camera. Lee, 4011-C, Tulsa 9, Oklahoma.

**WILD** Life films. Exciting, dramatic action in the natural habitat of animals of forest and plain. 8mm. or 16mm. in beautiful color or B & W. Also 2" x 2" color slides. Write for free illustrated literature. Wild Life Films, 5151AM Strohm Ave., North Hollywood, California.

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

**BASS** Says: Trading since 1910. Used but good as new buys: 8mm. B.&H. Sportster \$52.50; 16mm. Keystone A-7, F:2.5 lens \$37.50; Voigt. 35mm. Vito II, flash shutter, Skopar F:3.5, like new \$38.50; Kodak Reflex F:3.5 lens, like new \$38.50; Contax 1, F:2 Sonnar \$37.50; 3 1/2 x 4 1/4 Speed Graphic, Skopar F:4.5 Ibsor shutter, \$52.50. Satisfaction guaranteed. Bass Camera Co., Dept. AG, 179 W. Madison St., Chicago 2.

#### PHOTO FINISHING

**35MM** Specialists—Fine grain developing. 20 exposures 95c, 36 exposures \$1.40. Individual handling. Free prices and mailers. Tops Photo Service, Lyons, New York.

**CUSTOM** Jumbo album prints! 8 exposure 35c; 12, 36c. Special! 35mm 36 exp. \$1.00. Free mailer. Flash Photo, Box 36M, Brooklyn 4, N. Y.

**TOP** Quality with Magni size prints in albums, 8 exposure roll, 35c; 12 exposure roll, 50c; reprints 3c. Lee's Film Service, P.O. Box 1021, Battle Creek, Mich.

6 OR 8 Picture roll 35c. 12 or 16 picture roll 55c. Each roll developed and printed in handy album pack. Send coin with roll. No c.o.d.'s. Mailing containers sent free. Deluxe Film Service, Box 1268-A, Shreveport, Louisiana.

**SPECIAL**—8 Jumbos 25c; 12, 45c with this ad. Western, PM14, Box 298, San Francisco 1, Calif.

**ENLARGEMENTS**, 8x10 Oil colored \$2.00. Miniatures. Free price lists. George Brewer, 5864-D Hollywood Blvd., Hollywood 28, California.

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

**TWO** Prints each good negative, 8 exp. 35c; 12 exp. 50c; 16 exp. 65c. Reprints 4c. Mayfair Photo Service, Box 617-K, Toledo, Ohio.

**ENLARGEMENTS**! Eight 5 x 7's or five 8 x 10's, \$1.00. Wilart Enlargers, Box 967, Little Rock, Ark.

**TOP** Quality. Fast service. 8 jumbos 35c in beautiful Super Pak Album. 16 contacts 40c. Reprints—Jumbos 4c; contacts 3c. Satisfaction guaranteed. Write for free mailers and circulars. Fast-X-Photo, Box A, Jersey City, N. J.

12 JUMBOS 35c, 8 Jumbos 25c, 16 jumbos 50c from roll or negatives with this ad. S. Skrudland, Lake Geneva, Wis.

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

**BEAUTIFUL** Enlargement in album from each good picture on roll. 8 exposure, 40c; 12 exposure, 50c; 16 exposure, 65c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

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

#### MOTION PICTURES AND SOUND EQUIPMENT

**BARGAINS** 16MM. sound features and shorts. Bedner, 5300 So. Talman, Chicago.

**16MM.** Movie subjects. New 300' 16mm. sound releases, \$11.95. Bargain prices on hundreds used 16mm. sound, silent prints. Dime brings 32-page, 1954 catalog. Blackhawk Films, 1231 Eastin Bldg., Davenport, Iowa.

**8MM.** Movie subjects. New 150' films, \$2.98. Dime brings 32-page, 1954 catalog. 50' 8mm. Prevue film and catalog, 50c. Blackhawk Films, 1230 Eastin Bldg., Davenport, Iowa.

**EARN** Up to \$15.00 daily with your movie projector! Details free! Metcalf, 16806 Glenroy, Chicago 43.

**16MM.** Sound projectors—Excellent used units, all makes, \$119.95 up; some \$39.95. Dime brings 32-page catalog equipment, films. Blackhawk Films, 1229 Eastin Bldg., Davenport, Iowa.

**WOW!** We've got everything! Collector's items, new releases. Free catalog. Vanity Productions, Dept. 10, 93 Seneca Street, Seattle 1, Washington.

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

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

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

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

**MOVIE** Camera film: 8mm. roll \$1.50, 16mm. 100' \$3.00. Free processing. Better Films, 742 New Lots, Brooklyn, N. Y.

**TAPE** Recorders, tapes, accessories. Unusual values. Dressner, 624-M East 20th Street, New York City 9.

**GUARANTEED** Fresh 8mm. roll, magazine; 16mm. roll, magazine movie films. Color, b&w. Free catalog. ESO-R, 47th Holly, Kansas City 2, Missouri.

**8MM., 16MM.** U. S. National parks in color. Free list. Ideal Service Supply, 4644 Geary Blvd., San Francisco 18, California.

**BELL & Howell** 16mm. sound projectors. Castle sound films, splicers, reels, other supplies. Free catalog. Ideal Service Supply, 4644 Geary Blvd., San Francisco 18, Calif.

#### MUSIC AND MUSICAL INSTRUMENTS

**LEARN** Piano, singing, songwriting. Valuable catalogue 20 other self-taught instruments 10c. Write: Music Teachers' Associates, 26 Potters Lane, Great Neck, N. Y.

**NEW** Songwriters can sell their songs for cash! Get free facts. No obligation. Meadowlark Music School, 203 Summer Road, Colorado Springs, Colo.

**SWISS** Musical movements, assorted tunes, \$1.70. Helax, 218 West 72nd Street, New York City.



**LEARNING** Violin or viola? Here's a little pamphlet which can make a big difference in your playing thru emphasis on tone quality. Just send one dollar to M. L. Stayner, P.O. Box 1393, Salt Lake City 10, Utah. Thirty day refund period.

**GROW** Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 175, 2954 Admiral Way, Seattle, Washington.

**FREE** Songwriters kit. Write your melodies without music knowledge. Name band singer records. Postcard brings details and kit. Harmony Unlimited, 3409-B Grand Ave., Oakland, Calif.

**MAGNUS** Push button harmonica. Accordion effects. 7 1/2 in. Postpaid \$2.00. Moeller's, 3209 Crystal, Chicago.

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**GUITAR** Playing a new way. Ten times the music for one tenth the effort. Different tuning, easy fingering. Simplified music. Instruction \$1.00. Will Hughes, Box E2, Depoe Bay, Ore.

**SUCCESS** Assured through simple device. Valuable information free. Publisher, Box 6346, Philadelphia 39.

**\$5.00 SERVICE** Lead, copies, records. Al Music, 245 W. 51st, New York.

**PIANO** Technic simplified, \$1.00. Kazaks, 234 East 56th Street, New York 22.

**MUSIC** Printed. Specializing in small quantities for song writers. Skoumal Music Service, 319 E. State, Rockford, Ill.

**MUSIC** Arranged. Songs printed. Frank Wildt, Music Publisher, Lancaster, Penna.

**SONGWRITERS:** Your song expertly arranged for piano. Send lead and \$8.00 to Zarlengo Music, 1454 Welton Street, Denver, Colorado.

**UKULELE.** Play by ear, easily. Instructions 50c. Details free. Pete Eby, Box 81, Perry, Oklahoma.

**FREE** Record of your song. Your words, my melody. Free information. Johnny Mack's Melody Mart, 1094 West 39th Street, Dept. A, Los Angeles 37.

**YOUR** Voice made loud, clear and powerful with my diaphragm exerciser. Inexpensive. Write, Inventor Co., 34V, Box 663, St. Louis, Mo.

**ACCORDIONS** And other musical instruments wholesale. Music Center, Plymouth, Ind.

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

**SONGWRITERS!** Outstanding, ethical offer. Hibbeler, C-5, 2157 N. Avers, Chicago 47.

**SONGWRITERS!** Let me help you. Stamp for booklet. Mark Rubens, 146-D West 79 St., New York 24, N. Y.

**COLLABORATION** Offer. Newark Publications, GPO Box 1226, Syracuse, N. Y.

**SONGWRITERS!** Protect your ideas! Hold all songs, poems! Write for safe correct procedure first! Song Service, Dept. P, 323 W. 56th St., New York 19, N. Y.

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

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

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

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

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

**1953 ACCORDIONS** Wholesale. Free catalog. American Accordion Center, 5329 Belmont, Chicago.

**POEMS** Wanted for musical setting. Send poem for immediate consideration and free rhyming dictionary. Richard Brothers, 24 Woods Building, Chicago 1.

**WANTED:** Songpoems, lyrics. To be set to music. Work done by Hollywood professional artists. Recordings made. Quarterly magazine. Write for free sample. Inside Music, 3653 1/2 Hollywood Blvd., Dept. K-6, Hollywood 28, Calif.

**SONGPOEMS** Wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

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**BUILD** A transistor radio yourself! Kit contains all necessary parts including the new junction-type transistor. Complete with instructions and headphone. \$11.95 cash, check, money order. Morley-Turner, 23 Capen Street, Medford, Mass.

**MAKE** Simple, tubeless, batteryless distance-getting crystal radio. Crystal and illustrated instructions 25c postpaid. Allen, 427-P, Clinton, Missouri.

**F.C.C.** Commercial operator license quickly. Grantham, 6064 Hollywood Blvd., Hollywood 28, California.

**BUILD** 15 Radios—Only \$19.95 complete. Free radio tester, tools, soldering iron. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Free valuable radio and TV repair guide on request. Progressive Electronics, 497 Union Ave., Dept. PM13, Brooklyn 11, N. Y.

**INSTRUCTION** Booklet for new twin crystal set and crystal set with signal strength meter 30c. Potential Radio Company, 446 Crown Street, Brooklyn, N. Y.

**INSTRUCTIONS,** Simplified radio repairing, only \$1.00. Slate's Radio Service, Corsicana, Texas.

**LOUD** Crystal, catwhisker, radio plans, catalog: 25c. Amoroses, Route Four, Richmond, Virginia.

**LOUDER** Crystal radio. Complete kit \$1.00. Malloy, Box 1031-M, Tacoma 1, Wash.

**BUILD** Your own top quality TV set. We supply complete equipment, tools, instructions as part of America's finest home-study TV course. Be a high-paid TV technician. Install, repair, service all makes of sets. Many excellent jobs now open. Or start your own business. Get full facts free. Write: Commercial Trades Institute, Dept. CT2-1, 1400 Greenleaf Ave., Chicago 26, Ill.

**PICTORIAL** Construction plans. Free list. Alena, Box 24, Astoria 6, New York.

**SENSATIONAL** Television development! Instantly eliminates annoying commercials. Sample \$2.95. Franklin, 2156-A, Los Angeles 54.

**COMPLETE** Schematic, illustrated instructions for simplest one tube 110VAC capacity relay, 50c postpaid. Draws no idling power. Ideal for trick locks, scare-em gadgets, burglar alarms, operating window displays. Printed, not mimeographed. Technix Labs, 568V Riley, Buffalo 8, New York.

**YAKITY-Yak** eliminates television commercials. Operates from your favorite chair. \$2.98 postpaid. Electronic Tube-Mart, 8709 114th Street, Richmond Hill, N. Y.

**FREE.** Get on our radio and electronics mailing list. A.R.I., Box 1438, Denver, Colorado.

**SH-H-HUSH** Annoying television commercials from easy chair. Flick switch, sound stops; flick again, sound resumes. Easy installation directions enclosed. Guaranteed. \$2.50 postpaid. Agents wanted. Sh-h-hush, Box 89, Cincinnati 31, Ohio.

**AMAZING** Newly developed, permanently fixed crystal detector with warranty guarantee and complete plans for building crystal radios only \$1.00 postpaid. Allen, 427-PM10, Clinton, Missouri.

**STOP** Radio television noise immediately. Patented filter plug eliminates interference from household appliances, fluorescent lights, motors, oil-burners. Clear reception. No c.o.d.'s. Try 7 days. Moneyback guarantee. \$1.00. Electronic Tube-Mart, 87-09 114th Street, Richmond Hill, N. Y. Dept. PK-12.

**CLEARCO** Crystal radio kit \$1.50; pre-assembled \$1.75. Free catalogue. Clearco Crystal Co., Box 1857, Milwaukee, Wis.

**CRYSTAL** Radio experimenters. Write Leslie Hulet, R4, Lakewood, New Jersey.

**LIMITED** Quantity surplus double headphones. High quality, slightly used, \$7.95 value. Special now \$2.95 postpaid. Guaranteed. Allen, Dept. PMH, Clinton, Mo.

**COLOR** Television! Enjoy multi-color filter screen now. Easily attached. Send \$2 for your screen size. Satisfaction guaranteed. Dealers opportunity. Zingo Products, Johnstown 7, New York.

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**BIG** Money. Amazing new home business. Pearl finish baby shoes. Free plan. Pearl Art, 7218 Bear, Bell 1, Calif.

**LIST** Your name in "big mails." Get opportunities, catalogs, samples. One issue 10c, three issues 25c. Walter Rix, P.O. Box 6521, Cleveland 1, Ohio.

**GROW** Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 175, 2954 Admiral Way, Seattle, Washington.

**LUCRATIVE** Fascinating business, learn china repairing at home. Make invisible, strong repairs. Service antique shops, private customers. Course \$5.00. Gussack, 12310 Magnolia Blvd., North Hollywood, California.

**200 TESTED** Plans for home business, details free. Paul Greene, 115 Hyde Park Ave., Tampa, Fla.

**LET** Others sell for you. Earn steady from home. Full setup service from idea to success. Free information. Hermes Company, 152-H West 42, New York.

**EARTHWORM** Breeding! Bait, soil! Easy, profitable! Get unusual story. "An Earthworm Turned His Life." Free. Write Earthmaster System, Dept. 14 A, El Monte, California.

**MONEYMAKING** Home mailorder business. Free details. Service Bureau, Box 596, Toronto, Canada.

**COLOR** Concrete with chemicals. Marble-glass cement benches, pottery, garden ornaments. Home — shop. 10c yards sample, pictures. Hollywood Cementcraft, 8527-R Wonderland, Hollywood 46, Calif.

**MAKE** Them! Eat them! Sell them! Pralines, the good Southern pecan candy. Details free! A. Dadson, 4815 Belinole Drive, Houston, Texas.

**MAKE** Tough durable plastic of waste—easily. Makes attractive, resilient floors, walls, built-ins. Stucco. Build good home for half. Bays Laboratory, Oklahoma City 9.

**\$100.00 MONTHLY** Sparetime sharpening lawnmowers at home. Get business through hardware. No experience necessary. Send for free instruction book and business plan. Vernon Foley Company, Columbia Heights, Minn.

**RAISE** Orchids—At home. Big profits. Fascinating. Year 'round any climate. No greenhouse. Instructions, including blooming-size orchid plant, sent for no-risk examination. Free details. Flowerland, 4622-DT, Wilshire, Los Angeles 5.

**IMPORT-Export!** Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger 701, Los Angeles 24.

**ADVERTISING** Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-154, 7330 Greenwood, Chicago.

**NEWEST** Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautify auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-HZ So. Los Angeles St., Los Angeles 15.

**"10 WAYS** To Travel and Make Money." Copyrighted instructions \$1. Willmack, 14838 Winchester, Harvey, Illinois.

**GIFT** Shops: Make money selling leather bags, skirts, other typical Guatemalan products. Free catalog. Write airmail. Mapilon, Box 268, Guatemala, C.A.

**OWN**, Operate, route—"Wishing Wells." Place these new \$8.50 skill games on counters in cafes, luncheonettes, clubs, etc., collect coins weekly. Write, Legalsbaro, Box 929, Long Beach 1, California.

**LIQUID** Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

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



**START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-P Linden, Buffalo, N. Y.**

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**137 PLANS** For starting home business. Details: Elite Co., 220 Grand St., New York 13.

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**START A** buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-P Linden, Buffalo, N. Y.

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**FREE** Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

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**BUY** Wholesale thousands nationally advertised products. Save money! Make money! Postcard brings details. Kemah Company, 5017-L Washington, Houston 7, Texas.

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**GENUINE** Manufacturing formulas. Latest. Literature free. Nelko, 3462-P Merchandise Mart, Chicago 54.

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**ANY** Formula \$3.00. Chemical Instruction Sheet—catalog 10c. J. Belfort, 216 W. Jackson, Chicago 6.

**FREE** Formula catalog. Anything analyzed \$35. Western Chemical, Salem, Ore.

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**PLEXIGLAS** Sheets—Cut to size. Clear. All thicknesses. Standard outdoor translucent colors. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

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**LEARN** Plastics at home. Complete kit—\$5.98 postpaid. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

**PLEXIGLAS** Closeout—Masked, square foot— $\frac{1}{8}$ —\$1.20,  $\frac{1}{4}$ —\$1.90,  $\frac{1}{2}$  tubing 15c ft. List 10c. Plastics, Box 602A1, Janesville, Wis.

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

**PLEXIGLAS,** Lucite. Any size sheets. Square foot (12 x 12) cost, 1/16", \$1.18; 1/8", \$1.55; 3/16", \$1.90; 1/4", \$2.25. Add 15% for postage. Minimum order \$3.00. Almac Plastics, 600 Broadway, New York City.

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**ILLUSTRATED** Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

**CHEMICAL** Set makes water, snow, glow in darkness. Blue, green, orchid colors. Resembles glow of fireflies, deep sea fish. Harmless. Free literature. Varniton Company, 416 N. Varney Street, Burbank, Calif.

**COMPLETE** Catalog, bargain lists, 20c. Laboratory Sales, Box 161-A, Brighton, Mass.

**SECOND** Improved printing, "Spectacular Chemical Experiments" manual. Not mimeographed. Contains complete formulas, set-ups, instructions, special data, on thermites, fulminates, explosive powders, etc. Still \$1.00 postpaid. Chemi-Technix Laboratories, 568CM Riley, Buffalo 8, New York.

**AMAZING** New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. 16, 2204 W. North Ave., Chicago 47, Illinois.

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**CHEMICALS** And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

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**BUY** Wholesale. 25,000 items. Catalogue 25c. Matthews, 1472-B4 Broadway, New York City 36.

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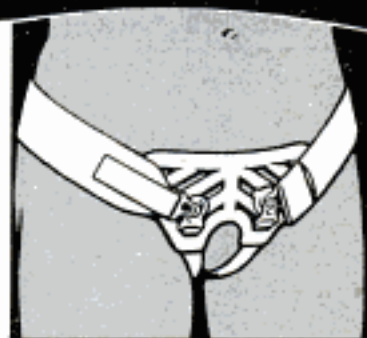
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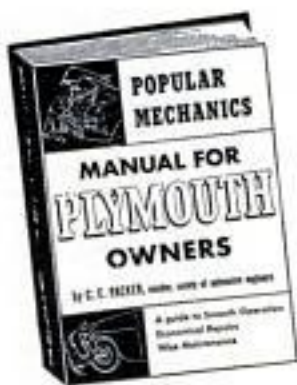
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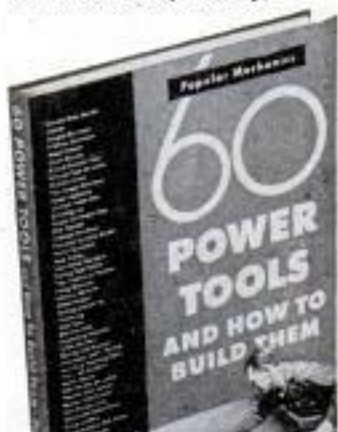
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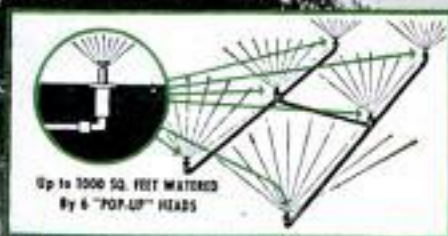
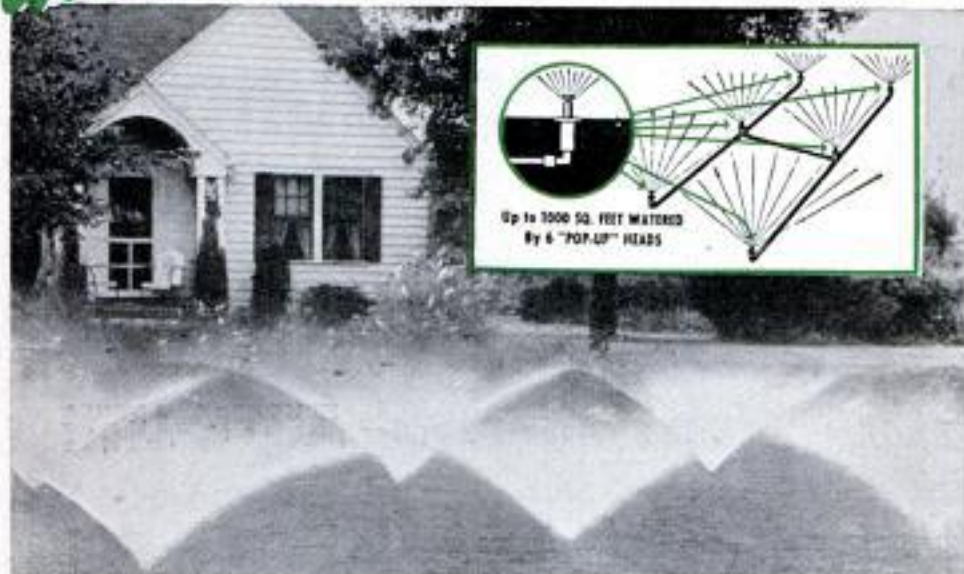
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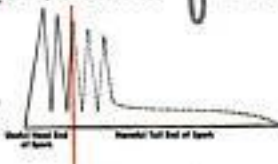





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# POPULAR JANUARY 1954 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 101 NO. 1

**By Sea Jug and Camel,  
Dog Sled and Helicopter . . .**

## LOOK HOW YOUR MAIL GETS THERE!

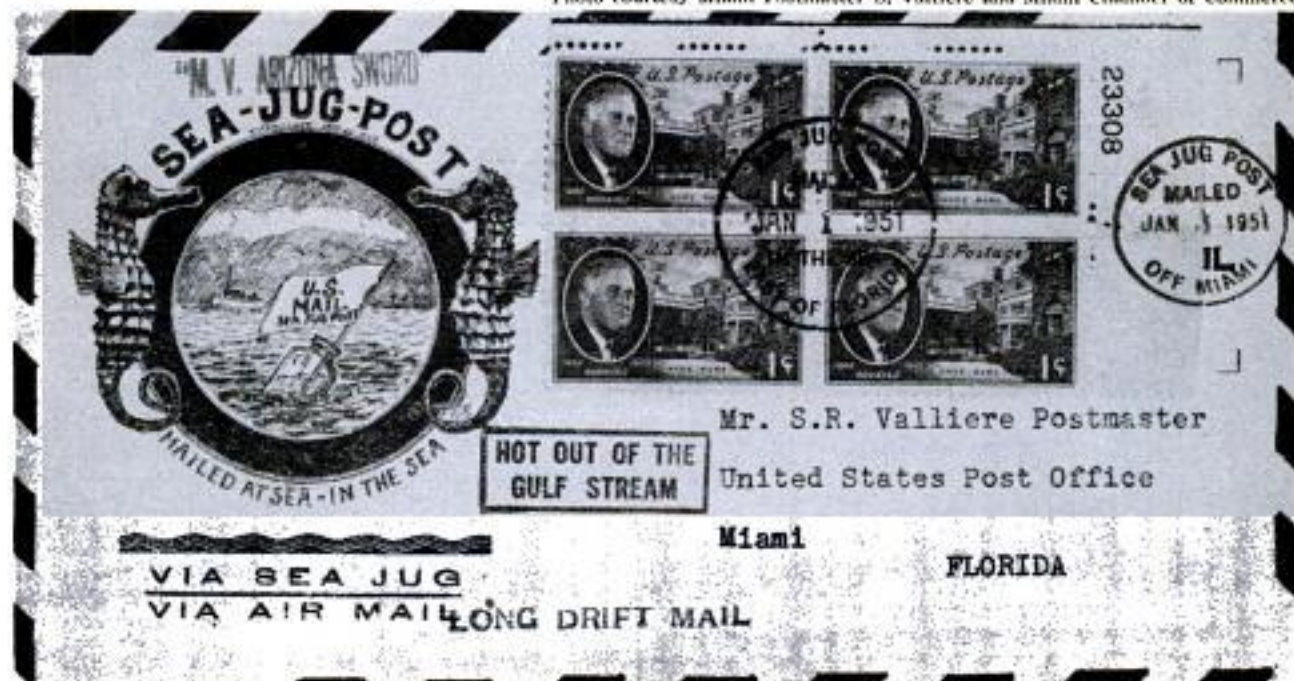
SHELL HUNTERS prowling Miami's palm-fringed beach recently picked up a pickle bottle washed ashore by strong east winds. Inside, they discovered a packet of letters with a note asking the finder to drop them in a letter box. Underneath was a pack of cigarettes and a silver dollar for the favor.

This new twist on the old message-in-a-bottle technique became a legitimate part of the United States postal system a few years ago. It was invented by two merchant marine captains in order to get crew and passenger mail ashore without slowing

down. Letters from Captain C. E. Milbury's ship, *Arizona Sword*, bear the printed cachet "Sea-Jug-Post, mailed at sea—in the sea, via sea jug." Letters from the *SS Mexico*, skippered by "postmaster" Captain O. H. Martinson, carry a "Via Pickle Bottle" cancellation.

The system was simple. When his ship was due east of Miami, each skipper collected mail from those on board and put it in an empty gallon jar ballasted with sand or cement so it could stand up in the water. The jug was fitted with a sealed top from which poked a tiny flag saying: "U. S. Mail

Letter mailed via official "Sea-Jug-Post" floated to Florida shore in a bottle. Note cachet and cancellation  
Photo courtesy Miami Postmaster S. Valliere and Miami Chamber of Commerce







Standard Oil Co. of New Jersey photo  
Clerk inside a new Highway Post Office sorts mail while the two-unit vehicle moves down a country road

—Sea Jug Post.” The jar was tossed overboard and drifted away to be picked up by fishermen, cruisers or swimmers on the near-by beaches.

“Letters mailed by jug seem to reach their destination far sooner than those saved for mailboxes in foreign countries,” one of the skippers explains. The unique mail became an established service operating in conformity with postal regulations for as long as the skippers plied that run.

Tricky as it is, Sea Jug Post is only one of many queer ways in which the mail you post today may be delivered. If your letter is bound overseas, anything that moves is a suitable carrier for it. Near the town of Sodankyla, Finland, under the Arctic Circle, the post goes on small sleds hauled by reindeer.

In the Philippines, your letter rides an oxcart; in Ceylon it goes via elephant. Fancy, two-wheeled horse-drawn carts carry the post in Pakistan; so do camel carts, built like flatbed trucks. In northern Scandinavia your letter may be shoved around the route in chair sleds with baby-carriage handles.

If these contraptions seem weird, you should see some of the streamlined carts the Post Office Department is testing right now. In half a dozen big cities, letter carriers, the foot soldiers of the department, are moving down the streets in or behind some 25 two, three and four-wheeled experimental go-buggies.

In several suburbs, letters ride on three-wheeled “Thrif-Ts,” tiny motor cars. The postman sits in the one-passenger front seat, which he shares with a center steering

Drawings based on CARE photos show how CARE packages are delivered by mail around the world. From top to bottom: By elephant in India, oxcart in the Philippines, reindeer and sled in Finland, horse-drawn cart in Pakistan and by camel-drawn truck in Ceylon





Standard Oil Co. of New Jersey photo

**Highway Post Office, pivoted in middle, swings onto the road. Over 100 of these vehicles now roam highways**

wheel. In one version, his bag of mail rides in the trunk above the two wheels in front of him. Just as odd is the three-wheel Autoette, with tiller instead of steering wheel, making experimental deliveries in Washington, D. C. In other suburbs "mounted" postmen are testing a four-cylindrical "putt-putt" with a square-cut body and a right-hand drive so the carrier can get out the door beside the wheel and step onto the curb.

Where go-buggies are impractical, plans call for other tricks. In Washington, Houston, Milwaukee, Miami and some smaller cities, mail is rolling in a wide variety of pushcarts—some like two-wheeled caddy carts for toting golf clubs; others resembling basket carriers in supermarkets.

A post office spokesman reports some curious reactions to all this. In downtown areas, where heavy volume calls for a four-wheeled, rubber-tired affair with a big boxlike compartment capable of holding 90 pounds of mail, the postman finds himself the victim of jibes such as: "Well, well, can we warm you a bottle?" and "Whose little darling are you airing?"

In spite of the ribbing, carriers are slashing up to two hours from their route time with some of the new vehicles. Older men with foot and leg injuries that would be aggravated by ever-increasing loads find them valuable. Since 1945 the number of pieces of annual mail has risen 31 percent to a total of 50,000,000,000. The weight has jumped 72 percent to a staggering 12,000,000,000 pounds annually, requiring 500,000 men to handle it and vast ingenuity to speed it on its rounds.

Oddly, one of the most streamlined means of scooting urban mail between main office and substation today is one of the oldest. Underneath New York City, 27 miles of eight-inch pneumatic tubes circle Manhattan Island to zip the mail along at

30 miles per hour in big 21-pound steel cylinders carrying 400 letters each. The system was laid down in 1897 and still moves 5,000,000 letters a day. Air pressure shoots the cylinders through the underground tubes, servicing 21 stations on the east and west sides of the city. Despite the speed of the cylinders, they shoot out at destinations unharmed into nets. Nerve center of the system is in the city's big General Post Office, where some 95,000 projectiles are loaded and sent out every day. Occasionally a projectile jams in the line. Then the men step up air pressure to pop it loose.

When postal officials bucked the first postwar traffic jams they figured the best answer was to jump over the whole mess. So, since 1946, in Chicago, New York and Los Angeles, helicopters have been skylifting your letters from airports and from the lawns behind outlying stations to platforms on the roofs of main post offices in town. More and more privately contracted whirly birds will be hovering over cities and suburbs to drop bundles of mail or make pickups via special hook-type devices as time goes on.

One of the trickiest uses of the postal eggbeater, though, is made by the Navy to deliver mail to men aboard picket submarines at sea. The helicopter hovers low above the sub and from the hatch a cylindrical object plummets into the sea. Made from a disposable container, it is attached by rope to a flotation buoy. Inside are papers, magazines and letters. A good "drop" will see the container plop into the sea 20 feet in front of the sub's bow, where it is retrieved with boat hooks.

Most people think of air mail as something just more speedy and efficient than regular post. But there are isolated places where, if it weren't for planes, people wouldn't get letters at all. Big PBY planes shuttle mail, fruit, meat, cigarettes and





U.S. Coast Guard photo

At a lonely loran station in the Pacific, a sack of mail is unloaded from the gun blister of a PBY. Right, mail from suburbs is unloaded from helicopter at heliport, a painted square on roof of Chicago's post office

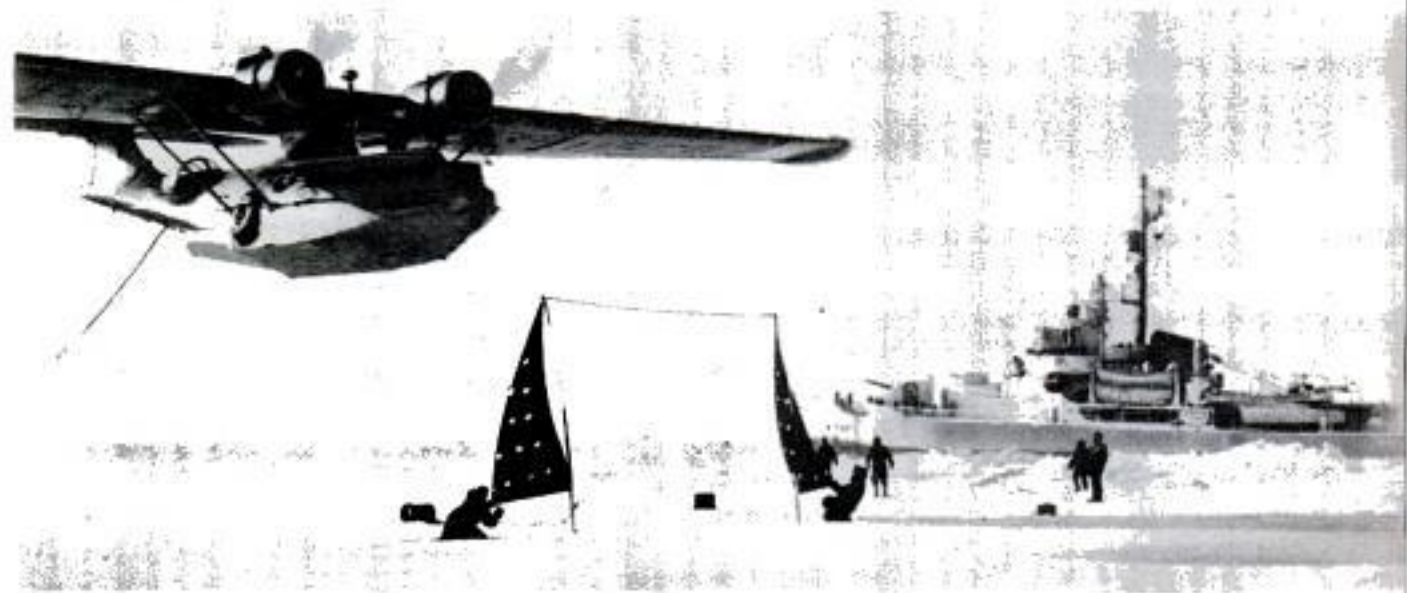
candy to some 200 isolated officers and men of the Coast Guard who run our chains of loran stations in South Pacific islands. Another such air-mail route is Bud Branham's, out of Rainy Pass, Alaska. On the first Monday of each month, Bud takes off on the 125-mile jaunt to Anchorage. Along the way he "sits down" on lakes and waterways at fishing or trapping villages on the Cooke inlet. At each stop, mail and freight is toted on Bud's back. He wears hip boots to wade his cargoes back and forth. Besides incoming mail, on the return trip, he may bring in drugs for a sick trapper in Tyonek, rugs for the schoolma'am in Skwentna, clothes for the cleaner, gossip and messages from "outside" for everyone.

A tremendous amount of America's mail must find its way into remote hinterlands and the newest mass method for handling it is the unique \$17,000 Highway Post Office, a double-jointed superbus. Actually,

it is a bus and trailer. The front end contains an "office" patterned after railroad mail cars, with sorting bins, counters and pouch racks. The rear half is for storing bulk mail. More than 100 of these roving monsters already carry mail into isolated hill towns, and plans call for a fleet of 5000.

Unfortunately, some of our back roads are too rough, narrow and remote even for these rugged carriers. In such places, carrying mail is purely a matter of American ingenuity and determination. During winter, a tractor-drawn sled bulldozes the mail through snowdrifts in northern Wyoming. Across the Idaho highlands in winter, a propeller-driven snowmobile whisks sacks of letters across frozen plateaus at 85 miles per hour. But where mail routes tunnel into deep, roadless canyons and climb tiny trails into spiring mountains, a postman has to be a combination of tough outdoorsman, mechanical wizard and good Samaritan.

Plane with a carrier-type cable snatches mail from Bering Sea ice field during expedition by Coast Guard. Nylon cable with the "give" of rubber but without the rebound was used to pick up the 75-pound mail parcels







Boat on Snake River mail run plows through 93 miles of rapids. Canyon dwellers meet mailman along river

In the wilds of Idaho, for instance, from December through March, Lloyd Van Sickle runs a frigid, sky-bound mail route between Drummond and Squirrel, on a trail below the white crests of the Grand Teton Mountains to serve some 60 snowed-in farmers and cattlemen. The trail is often buried in 10 and 12-foot snowdrifts. So Van Sickle uses a team of 15 sled dogs and the mail rides on an Eskimo-type sled that is usually loaded down with a supercargo of necessary supplies for the isolated families on the run. Like Bud Branham, this north-country courier also brings in news from outside and, thus, is one of the most looked-for mailmen in the country.

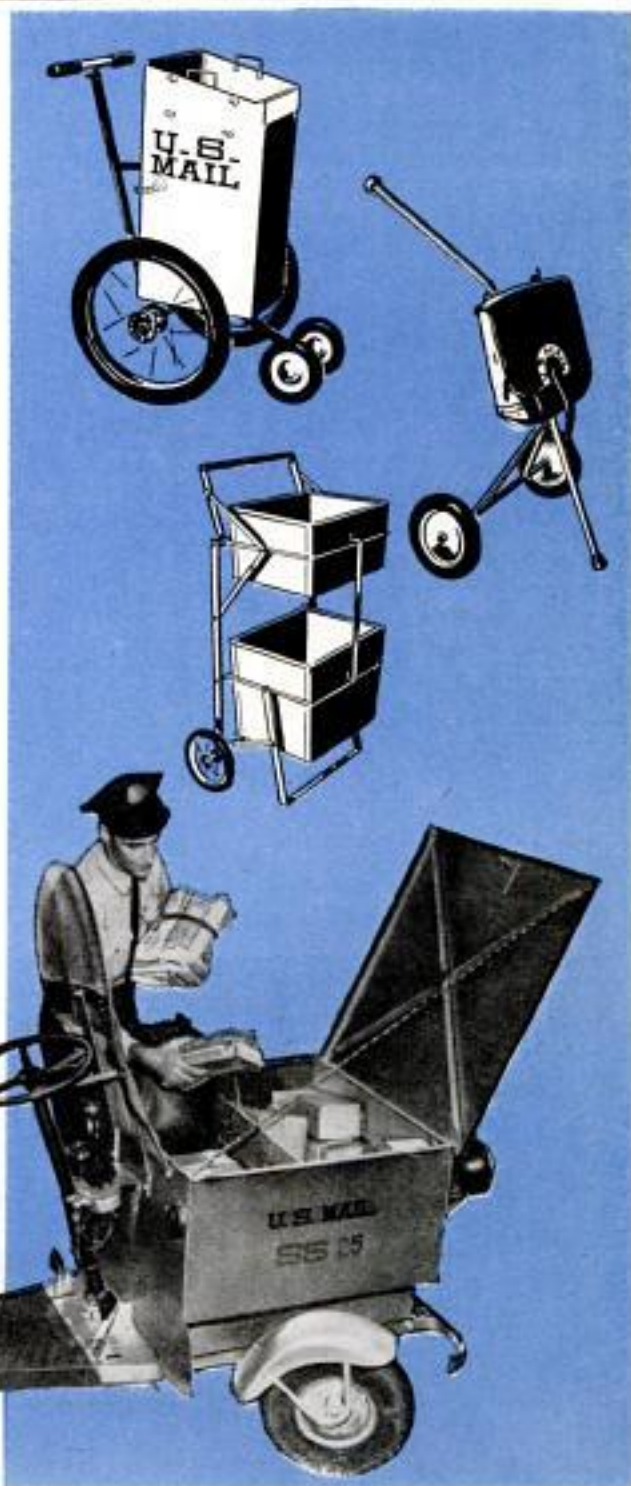
Plenty of United States mail travels between Garden Valley and Lowman, Idaho, in the back packs of mountaineers equipped with snowshoes or skis. Many rural routes in Alaska get snowshoe service.

In a world of jet planes and guided missiles, mail by snowshoe and dog team seems incongruous. Unfortunately, there still are plenty of places where foot power, mules and horses are more practical than anything with wheels or propellers.

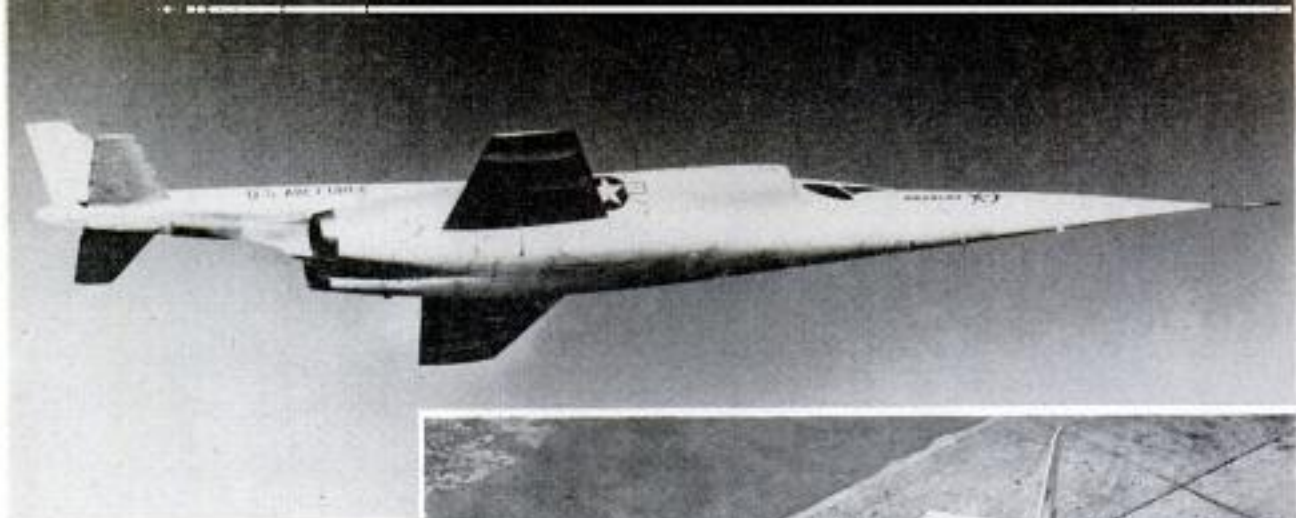
For more than 16 years Alex Worrells, route carrier between Rice Station and Noland, Ky., has run his 27-mile stint over incredible roads through the back hills in a horse-drawn buggy fitted out with

(Continued to page 284)

Shown at right are some of the experimental carts for Uncle Sam's carriers







## 2000 M.P.H. Goal For "Stiletto"

Stiletto-shaped, a 66-foot-long Air Force research plane is expected to fly at speeds of 2000 miles per hour at very high altitude. The jet-powered Douglas craft has an extremely long, tapered nose and straight, stubby wings spanning a little more than 22 feet. Instead of armament, the X-3 carries 1200 pounds of research instruments. More than 850 pin-hole orifices dot the fuselage, wings and other air foils of the plane, part of the system for measuring pressures at virtually every point on the aircraft. Temperature recordings are made at 150 points. Strain gauges are spotted at 185 points to measure loads on the frame, most of which is titanium.



Douglas Aircraft Co. photos

## Cigarette-Maker Rolls Regular or King Size Five at a Time



Five cigarettes at a time are produced by a cigarette-making machine that comes in two models. The de luxe edition has built-in cutting blades, the other a manual cutting blade. It turns out both regular and king-size cigarettes, and the diameter of the cigarette can be adjusted to preference. With the machine you can "roll your own" at a cost of about nine cents a pack.

Information not listed on articles in the index, starting on page 16, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy of this list may be obtained simply by sending a postcard or letter to the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11



## Tilting X-Ray Examination Table Suspends Patient by Heels

Patients fastened to an X-ray table that tilts in a 180-degree arc can be fluoroscoped as they are changed from a head-up to a horizontal to a feet-up position. Uninterrupted observation is possible as the patient is turned. Unneeded are cumbersome shrouds and compression-band attachments, which interfere with fluoroscopy. The feet-up position is especially useful when inspecting the spinal column and digestive tract. The unit mounts an X-ray camera so that the examining doctor can record on film what he has just seen in the fluoroscope. Incorporated in the camera is a novel photo-timing device which automatically terminates an X-ray exposure when a proper film density has been reached, eliminating guesswork and retakes. The new diagnostic unit was developed by General Electric.



## Motor From Paratrooper Bike Powers Miniature Motorcycle

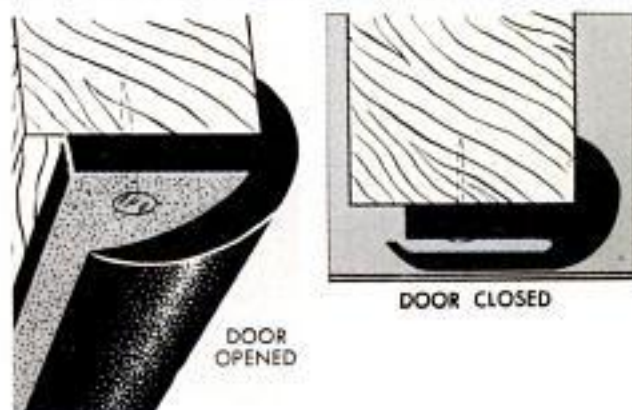


Five-year-old Randie Lou Reynolds of Albuquerque, N. M., scoots around the neighborhood on a miniature replica of her father's motorcycle. Reynolds secured the 97-c.c. one-cylinder motor from an English paratrooper bike. Other parts came from a child's bicycle and a tricycle, a piece of copper tubing and a shower rod, auto wrist pins and a sun-visor bar. A governor holds Randie Lou's speed to 15 miles per hour, but a top speed of 35 m.p.h. is possible.

## Rubber Strip on Bottom of Garage Door Keeps Out Rain and Snow

Overhead garage doors fitted with a flexible rubber weatherstrip are sealed against the elements when closed. Nailed to the bottom of the door, the strip keeps out rain, snow, sleet and drafts. Uneven surfaces under the door are sealed by the strip, which eliminates the bang when the door is closed and prevents the door from freezing to the floor.

☐ Almost half of California's cotton crop is now sprayed with chemicals which remove the leaves before harvest.





## Air Force Flying Lung and Its User Easily Carried by Two Men



Movement of lung-disease victims by air or ambulance is simplified with the use of a new lightweight "flying lung." Developed at the U.S. Air Force School of Aviation Medicine, the portable respirator operates off either a plane's electrical system or a 24-volt battery. It is six feet long, less than two feet deep and with a patient inside is easily carried by two men.

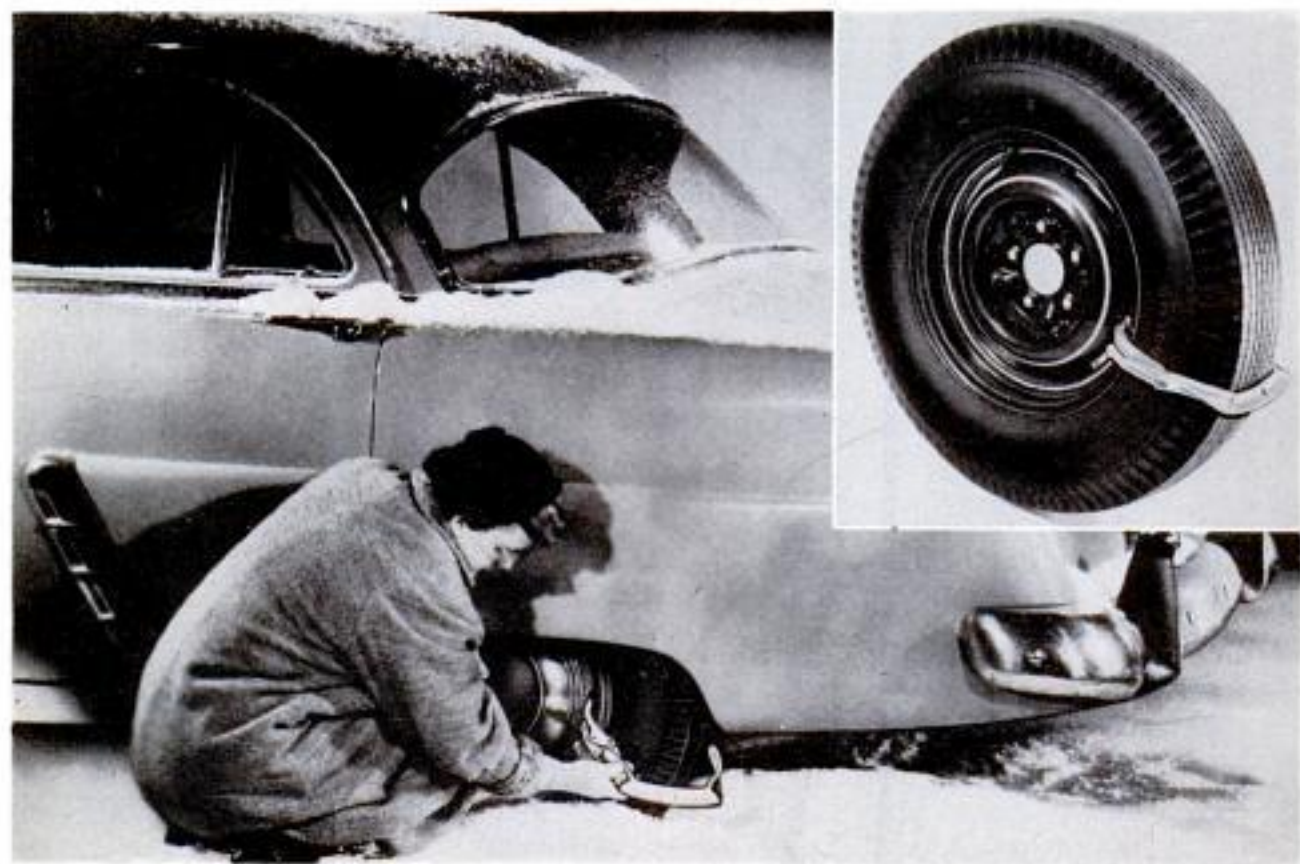
## Plastic Balloons Save Oil

Microscopic plastic balloons floating on top of crude oil may solve the evaporation problem in large storage tanks. Filled with nitrogen gas, the resin balloons nudge each other into a tight, floating pack one inch thick. This layer is said to cut evaporation as much as 90 percent. Each year an estimated \$60,000,000 worth of stored oil is lost by evaporation.

## Clamp Fastened to Automobile Wheel Gives Needed Traction

Cars are freed from snow and mud by a pair of clamps which fit around the rear tires and clamp to the wheel rims. The new devices can be installed or removed in seconds without the use of tools and without

soiling gloves or hands. A simple lock fastens them to the rear wheels of Fords, Chevrolets, Plymouths and several other automobile models using size 670 tires. Pressing a release unfastens each clamp.







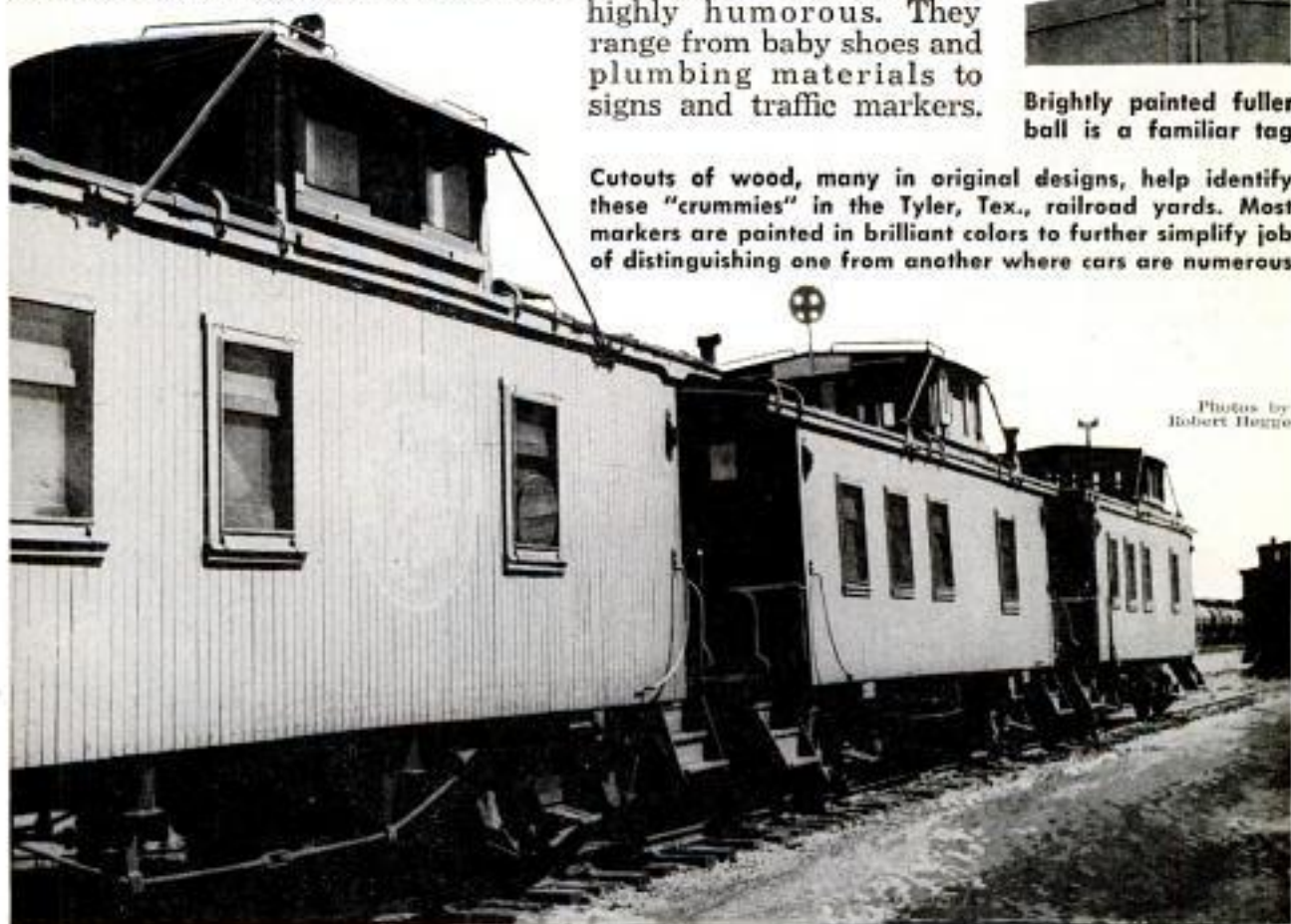
Wooden cross, studded with coffee can tops, and yellow and black auto license plates label these cabooses

## *Personalized Markers Identify Freight Cabooses*

YEARS AGO the freight crews on the St. Louis Southwestern Railway had a problem. When night fell and crews returned from town, even with flashlights it was difficult to locate the proper caboose—their headquarters on wheels. Lined up on the caboose track, all the “crummies,” as they’re called by railroaders, look alike, even to the crews. Checking the car serial numbers took a great deal of time. Finally someone came up with the idea of identifying each by a distinctive marker or sign, perched prominently on the roof. Ingenious crews took up the challenge and competed in designing unusual, personalized markers for their cabooses. Now the railroad’s yards at Tyler, Tex., and Pine Bluff, Ark., are liberally sprinkled with cars bearing individualistic standards, some highly humorous. They range from baby shoes and plumbing materials to signs and traffic markers.



Brightly painted fuller ball is a familiar tag



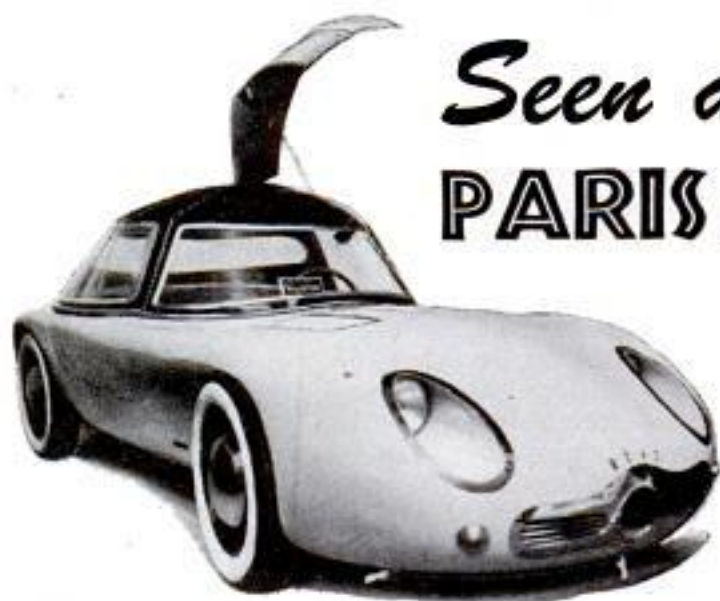
Cutouts of wood, many in original designs, help identify these “crummies” in the Tyler, Tex., railroad yards. Most markers are painted in brilliant colors to further simplify job of distinguishing one from another where cars are numerous

Photos by Robert Hogue





France's Renault Fregate convertible was a top attraction. It has an overhead-valve, four-cylinder engine



With a body of lightweight plastic, the Morocco-built Reac has won several North African races. Roof and windows can be detached from the body to convert it into a roadster

## *Seen at the* **PARIS AUTO SHOW**



Among the British cars was the Austin-Healey 100, a four-cylinder speedster that set a record of 142 m.p.h. on the Bonneville Salt Flats



Among the numerous American cars exhibited at the Paris show was the Henry J, which is closer in size than most U.S. cars to Europe's average

Left, the Marathon two-seater is another car with a plastic body. It was made in France and is extremely lightweight with very sleek lines



Below, Chrysler showed a special Ghia-bodied car at the exhibition, as well as its regular line of cars. This model has the 185-horsepower Chrysler engine



Above, an example of the sleek Italian styling, the Nardi sports car has two cylinders and a top speed of over 100 m.p.h.



Below, Spain's Pegaso 102 boasts a body by Saoutchik. Designed as a high-speed sports car, it has a big 250-horsepower V8 engine

Below, the Bristol 403 has a rather unconventional front end, but one based on careful wind-tunnel tests for high-speed efficiency. It exceeds 100 miles per hour with a minimum of effort. Engine produces 100 hp.



Right, weighing only 1430 pounds, the French Panhard 54 is made mostly of aluminum. Its two-cylinder, air-cooled engine gives it a top speed of over 80 m.p.h. The body panels, engine and chassis castings are of aluminum



Above and right, another French car at the show was the Salmson sport coupe. It has a four-cylinder, double-camshaft engine. The rear window extends up into the roof. Its overhanging hood makes it look like a shark



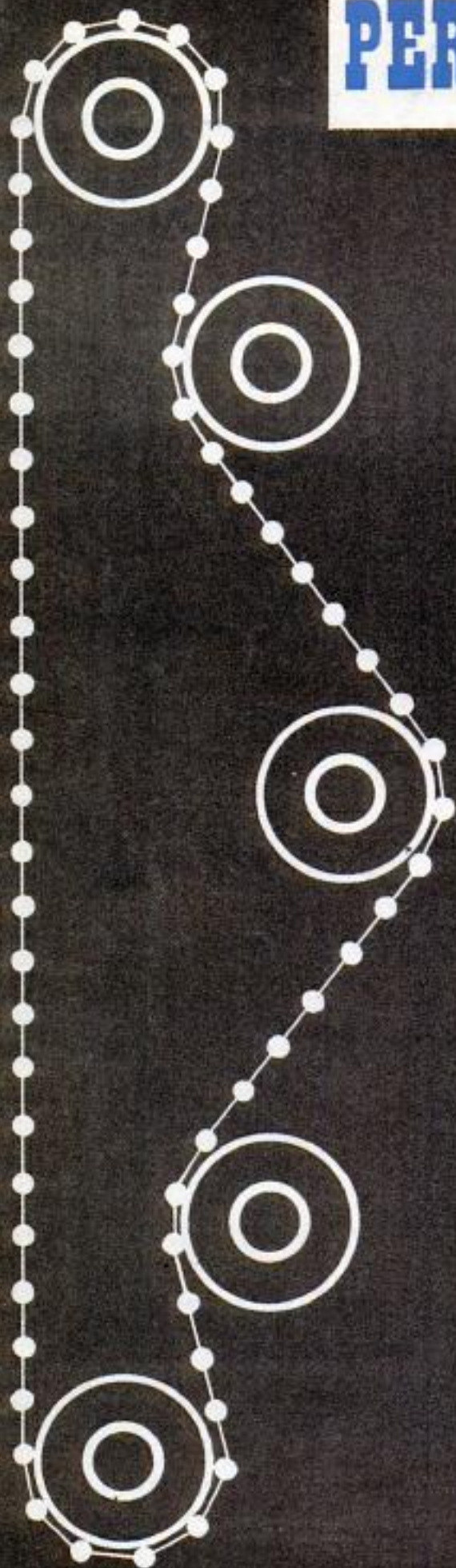


# PERPETUAL MOTION

By Robert E. Paquin

**THE CHAIN THAT RUNS FOREVER.** Here's just one of several similar inventions. It's an endless chain mounted on pulleys. Free-rolling idler wheels on one side of this marvelous machine make that side of the chain longer than the other side. Since the chain is obviously off balance, says the inventor, it therefore follows that this added weight on the right will pull the chain around and—presto, we have perpetual motion. Why doesn't it work? Figure it out yourself before reading further. Explanation: part of the weight of the right side of the chain is supported by the idling wheels at the points where the chain curves round them. This offsets the extra weight of the right side of chain

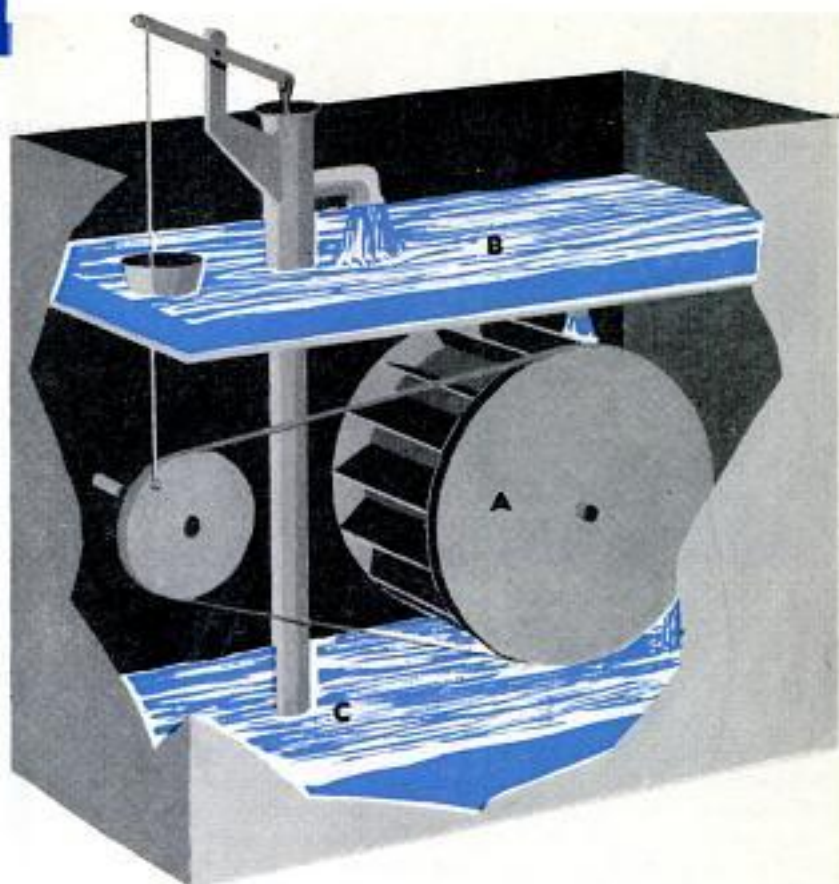
**THE SPINNING RING.** One of the simplest ideas of all, and it's bound to work, says the inventor. A metal ring is held in position by two idler wheels which have free-rolling bearings. The ring is supported at such an angle that it has a continual tendency to roll downward, causing it to spin merrily on forever. You can try it if you wish, but it just won't work. Why? Explanation: the force exerted by the two idler wheels to hold the ring in this position cancels out the gravitational force which tends to turn the ring, and the ring doesn't spin





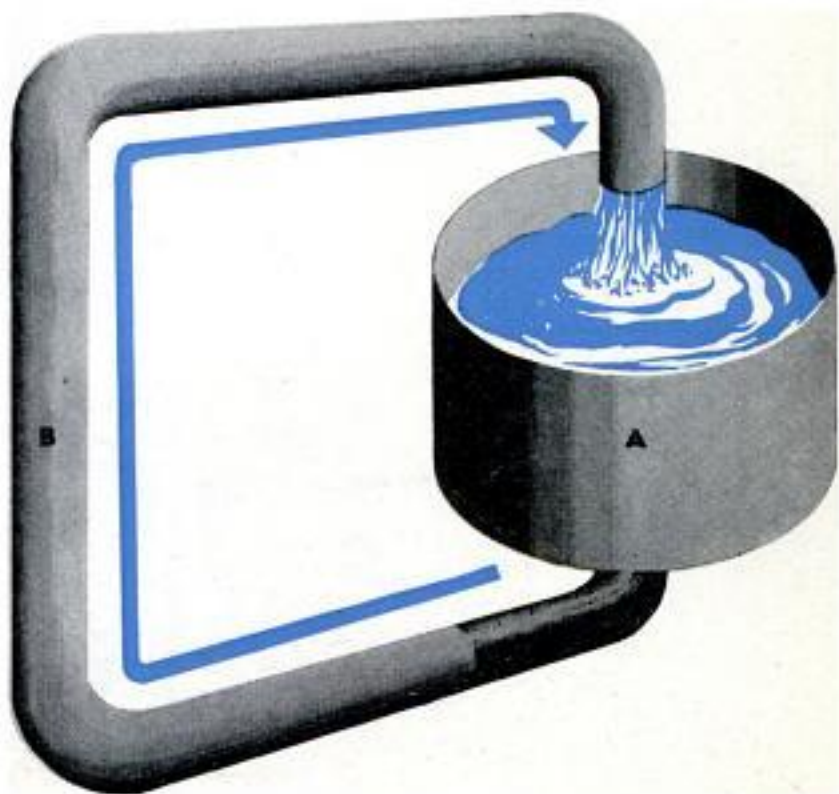
# JUST ISN'T

**T**HE HISTORY of perpetual-motion machines is replete with motors that won't "mote" and engines that won't "eng." Fortunes have been spent to make possible the impossible. We present here some of the more common types of perpetual-motion devices. In many cases, the inventor's explanation of why the machine will work seems quite plausible, but always he overlooks some principle of physics that stops his machine dead in its tracks. Can you tell why the device won't work before reading the explanation? ★ ★ ★

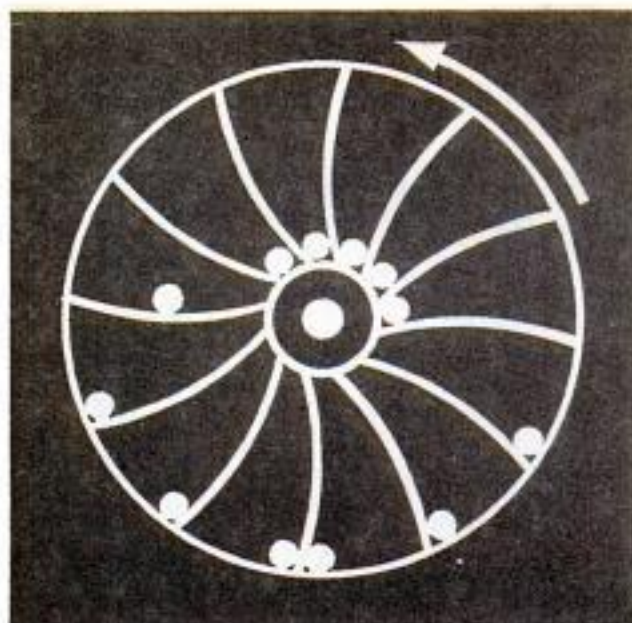


**THE PUMPING WATER WHEEL.** There have been a good many variations of this idea. A water wheel "A" is operated by water dropping through a hole in the top reservoir "B." The wheel drives a pump to lift water from the bottom reservoir "C." The water is lifted up to the top reservoir, finds its way through the opening and turns the water wheel. Works fine according to the inventor. Now you figure out why it won't. Explanation: Friction won't permit the apparatus to lift as much water as falls, so all the water eventually ends up in reservoir "C"

**THE WATER CYCLE.** You may laugh at this one but a good many inventors have tried it. The apparatus consists of a large vessel of water "A" with a tube extending from the bottom, back up at "B" and around until the end is over the vessel. Now when you put water in the vessel, says the inventor, it will push its way up tube "B," and since the weight of the water in the large vessel greatly exceeds the water in the tube, the water will flow right on up and eventually fall back into the vessel. This will continue forever (or at least until someone explains why it won't work). Explanation: Best summed up in the old phrase, "Water seeks its own level." The water will rise in the tube only to a point equal to the level of the water in the large reservoir

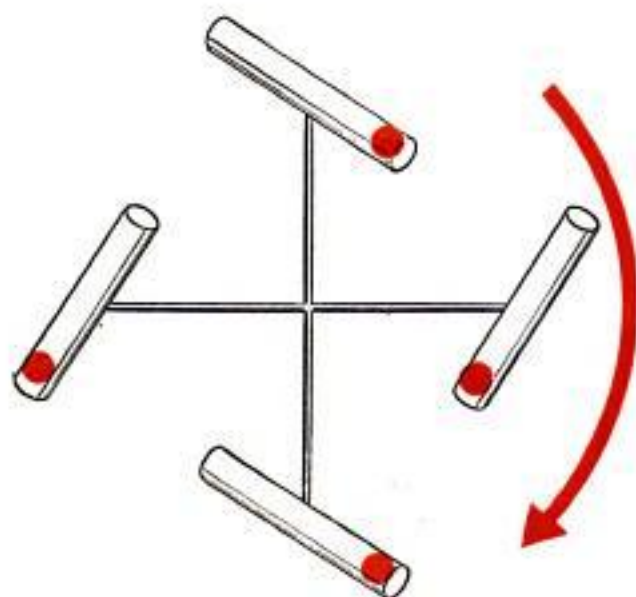
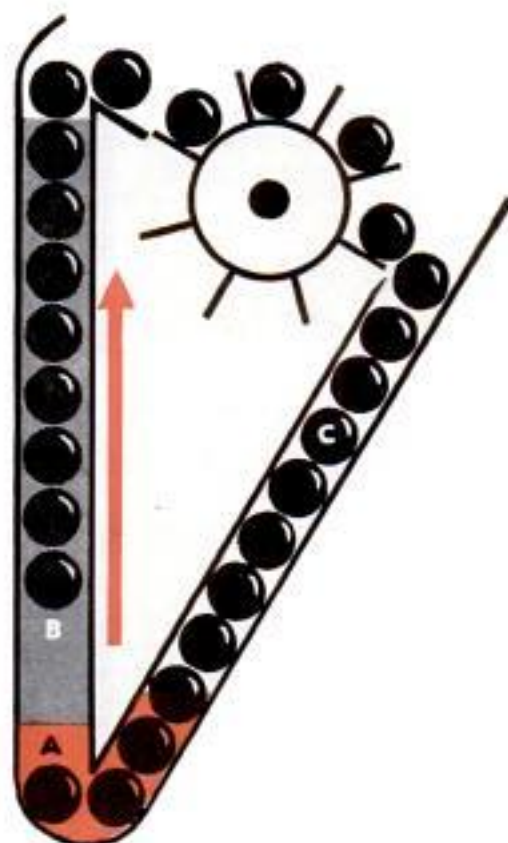






**THE CAGE AND BALLS.** This is a leverage problem. The invention consists of a cage divided into pockets, each of which contains a heavy ball. The drawing shows the apparatus in cross section. Because the balls at the left are farther from the hub than those at the right, the wheel should turn in a counter-clockwise direction. As it turns, more balls roll toward the rim to keep it spinning. Well, why won't it work? Explanation: This one has to be disproved mathematically, but the idea is that despite the illusion of greater leverage on the left, the total force exerted downward on each side is exactly the same and the wheel will reach a state of equilibrium

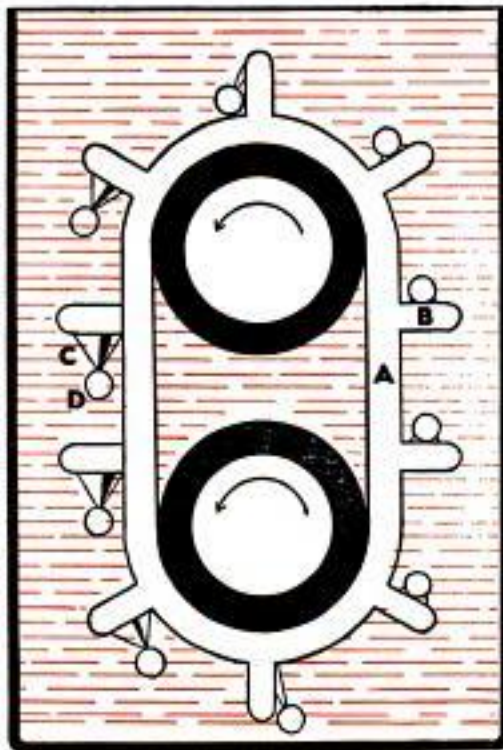
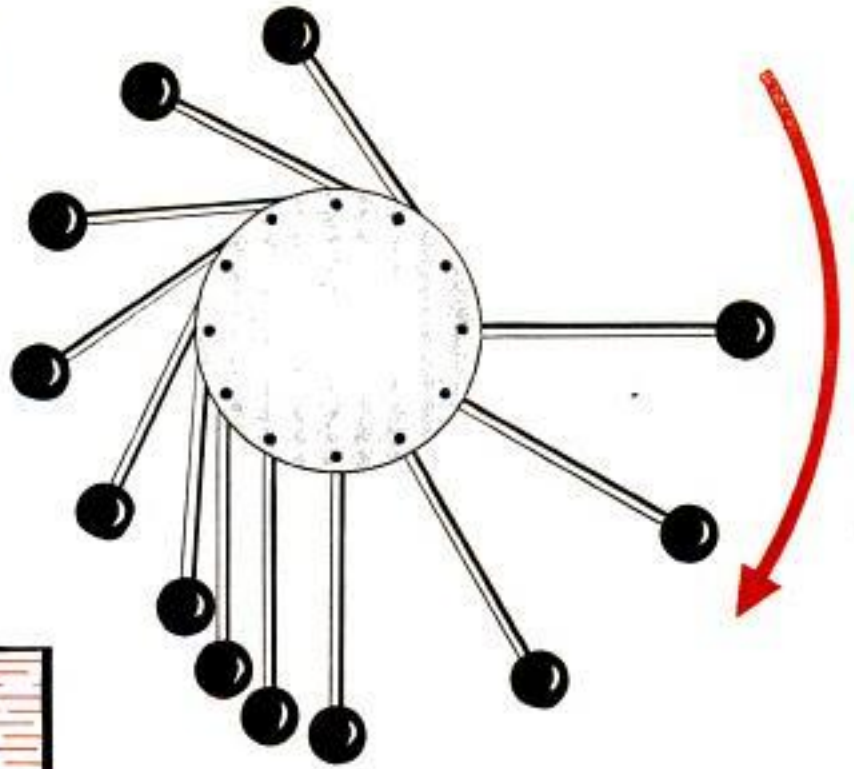
**THE BUOYANT SPHERES.** Here's a good one. In this rig, the left column, "B," is filled with water. At the bottom is a puddle of mercury, "A." The mercury, being heavier than the water, stays at the bottom of the apparatus. In the slanting column at the right are hollow iron spheres. The total weight of the spheres pushes the bottom one through the puddle of mercury and into the upright column. The hollow sphere floats up through the column of water, strikes the line of spheres and pushes the top one over to the ramp, and eventually it reaches the slanting column again. On the way over, it partially rotates a paddle wheel to perform useful work. Sounds rather logical, doesn't it? Explanation: As the bottom ball is forced up into the column of water, it raises the weight of the water-plus-balls, forcing the mercury back up the other column. This prevents another ball from entering the column. Another failure



**MORE ROLLING BALLS.** In this one, hollow cylinders, capped at both ends, are fastened at an angle to the crossbars. Inside each of the cylinders is a steel ball. Since there are three balls on the right side of the center and only one on the left, the wheel should turn in the direction of the arrow. As the cylinder on the left reaches the top, the ball will roll to the other end to keep the wheel turning. Sounds reasonable. Why won't it work? The explanation: Imagine the vertical arm completely removed. The remaining arm will swing in a counterclockwise direction. Now imagine the horizontal arm removed. The vertical one will swing in a clockwise direction. At one point in the revolution, these two forces will balance and the blame thing just won't turn

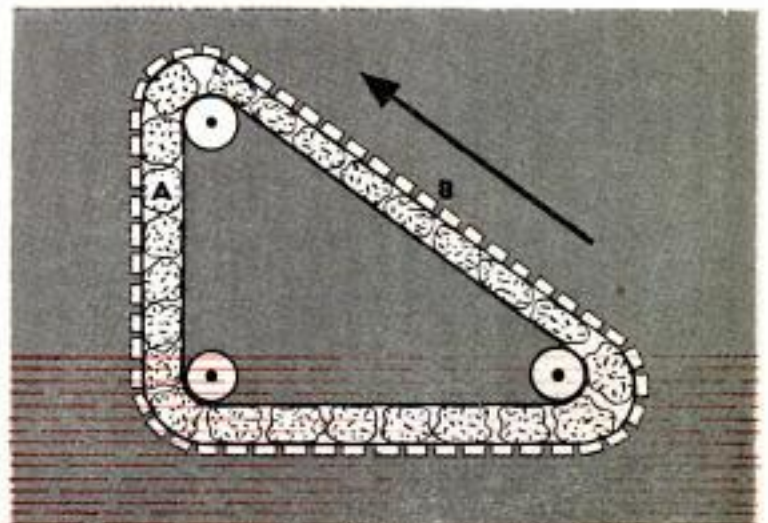


**PIVOTING BALLS.** There are variations on this one by the hundreds. You can get the idea at a glance. As the wheel revolves, the weights are thrown out to the right, where they have greater leverage and therefore keep the wheel spinning. Each successive weight adds its thrust. Try building one, and you'll soon find out that the apparatus grinds to a halt. Explanation: there are more weights on the left side, balancing the increased leverage of the weights on the right. The wheel soon reaches a state of equilibrium

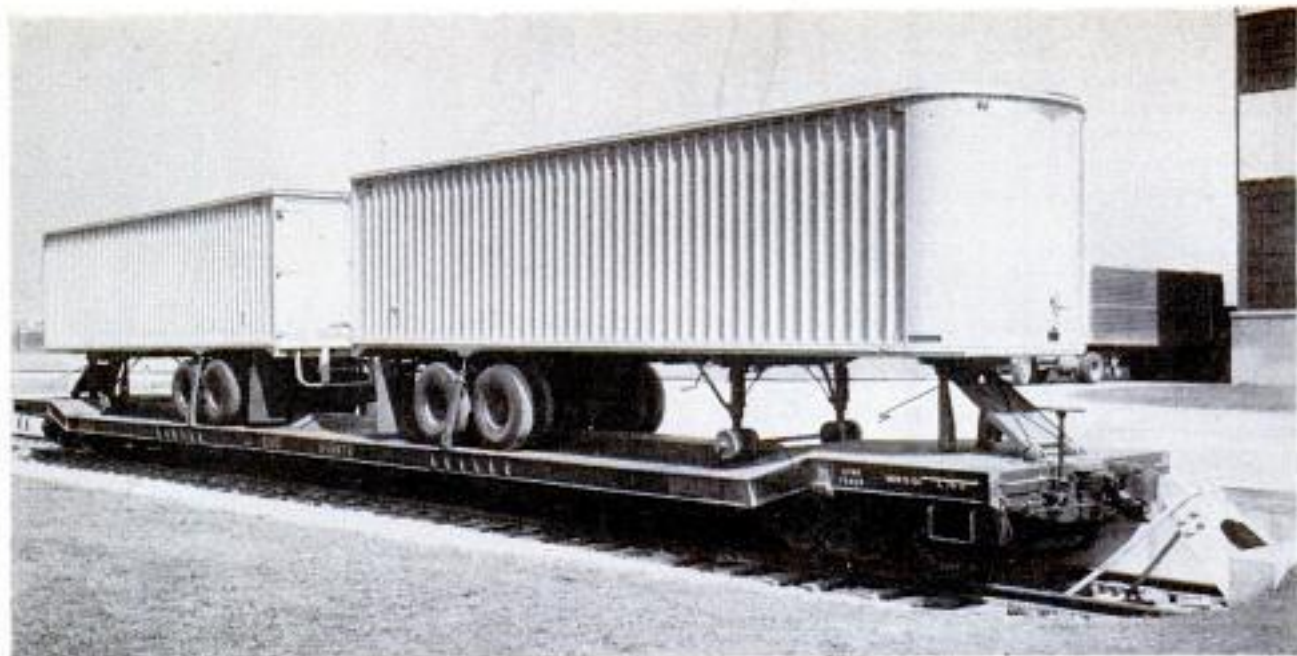


**THE WEIGHT OF AIR.** This one is highly theoretical. A hollow ring of rubber "A" has hollow projections "B" which extend outward like shelves. Fastened to each shelf is a thin rubber membrane "C" to which is fastened a metal ball "D." At the right side of the assembly, the metal balls lie on the projections after having deflated the air from the thin membranes. At the left side, the air has been drawn into these membranes, and the wheels should turn. We've put the apparatus in a vacuum to make it a little easier to understand. Why won't this one work? Explanation: The weight of the trapped air is so negligible that it cannot overcome the impeding force of friction, no matter how fine the bearings. It poses well for a time exposure

**THE CREEPING SPONGES.** There's a lot of ingenuity wasted on this idea. A continuous band of sponges "A" is confined between conveyor belts. To the outside belt is fastened a band of weights, "B." The inventor says that capillary action will draw water up the vertical band of sponges, causing the band to move in the direction of the arrow. Weights pressing down on the slanted column of sponges will squeeze out the water and the whole apparatus will continue to revolve. This idea is all wet. Why? Explanation: Water in the sponges on the right is not instantly removed as each sponge emerges from the water. Thus these sponges are also partially hydrated and there are more of them. It's a standoff

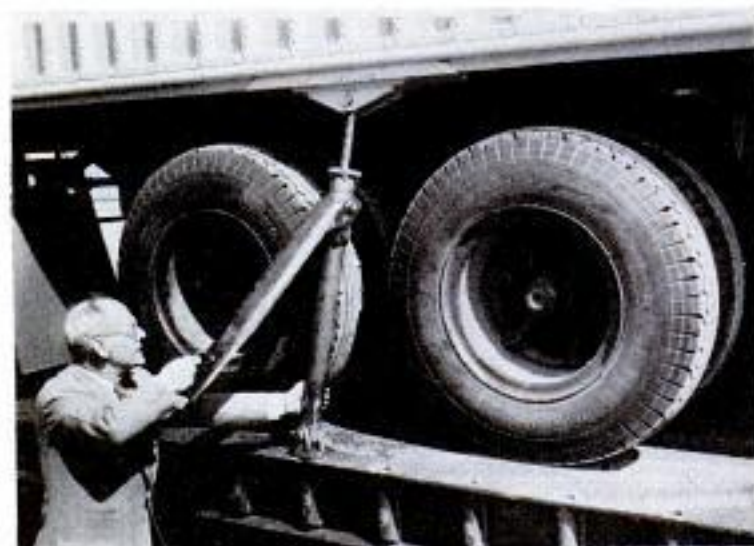






Long flatcar totes two trailers. Shock absorbers permit stanchions to move  $4\frac{1}{2}$  inches, reducing shock to cargo

## Semitrailers Ride Railroad Flatcars in Fast-Freight System



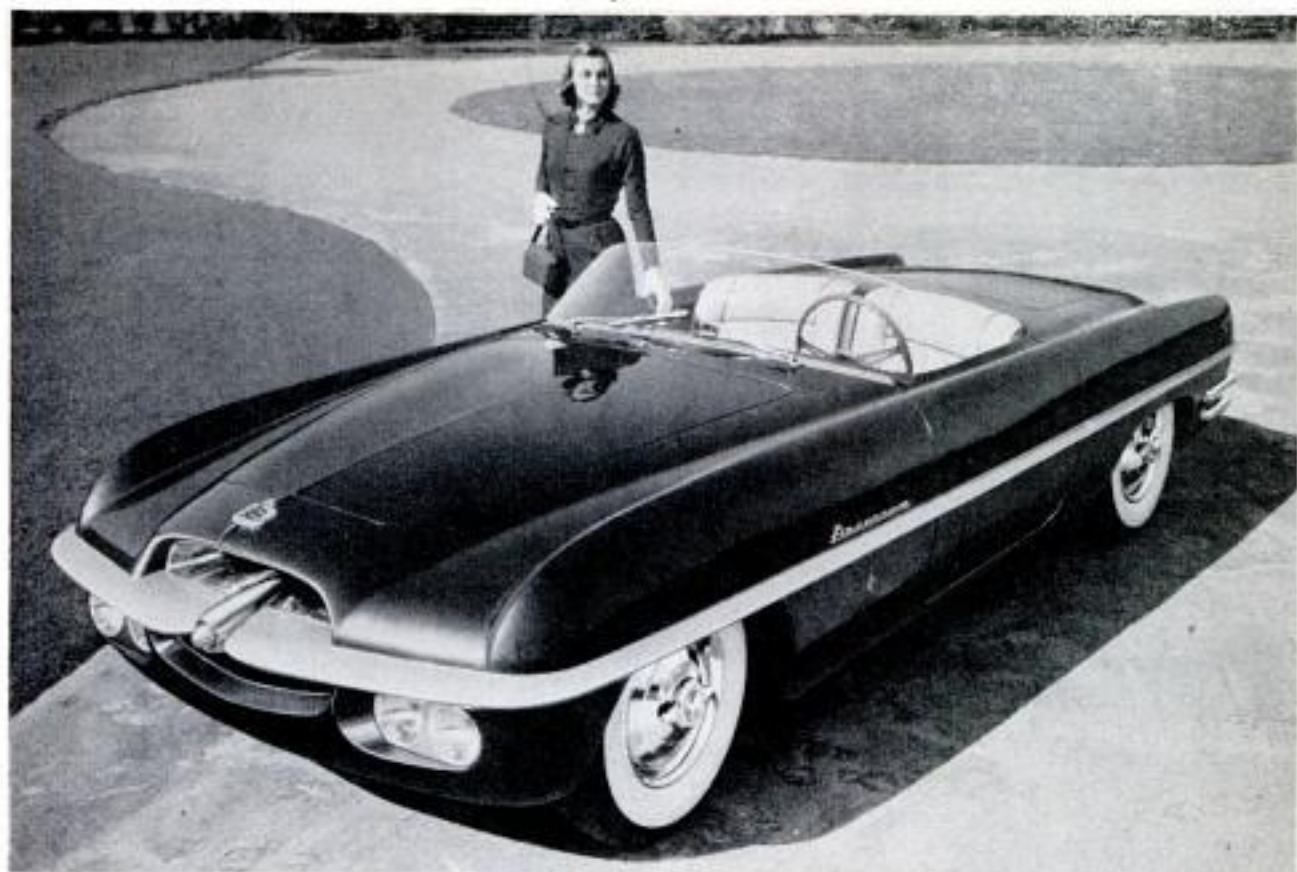
Adjustable struts anchor the trailer to the special flatcar

IN THE NEAR FUTURE, many semitrailers may ride on railroad flatcars instead of rolling down the highways. General Motors has worked out a system which may take thousands of semitrailers off the highways and speed freight deliveries. In the new system, the trucker picks up his load at a shipper's dock and delivers the loaded trailer to the railroad. A big lift truck maneuvers it aboard a special 75-foot-long flatcar designed to carry two trailers. The flatcar moves the trailer to its destination, where another truck picks it up and delivers the cargo. The plan is considered applicable over 300-mile intercity routes.

Big hydraulic lift trucks maneuver the semitrailers on and off the cars at the railroad loading docks







Only 34 inches high, the Dodge Firearrow has four low-mounted headlights, one large radiator air intake

## Chrysler Stylists Bring Out Two Experimental Models

TWO CHRYSLER divisions, Dodge and De Soto, are showing special models or "dream cars" that may herald things to come in tomorrow's styling. Both bodies were made in Italy by Ghia; the Adventurer is Chrysler-designed, Firearrow Italian-designed.

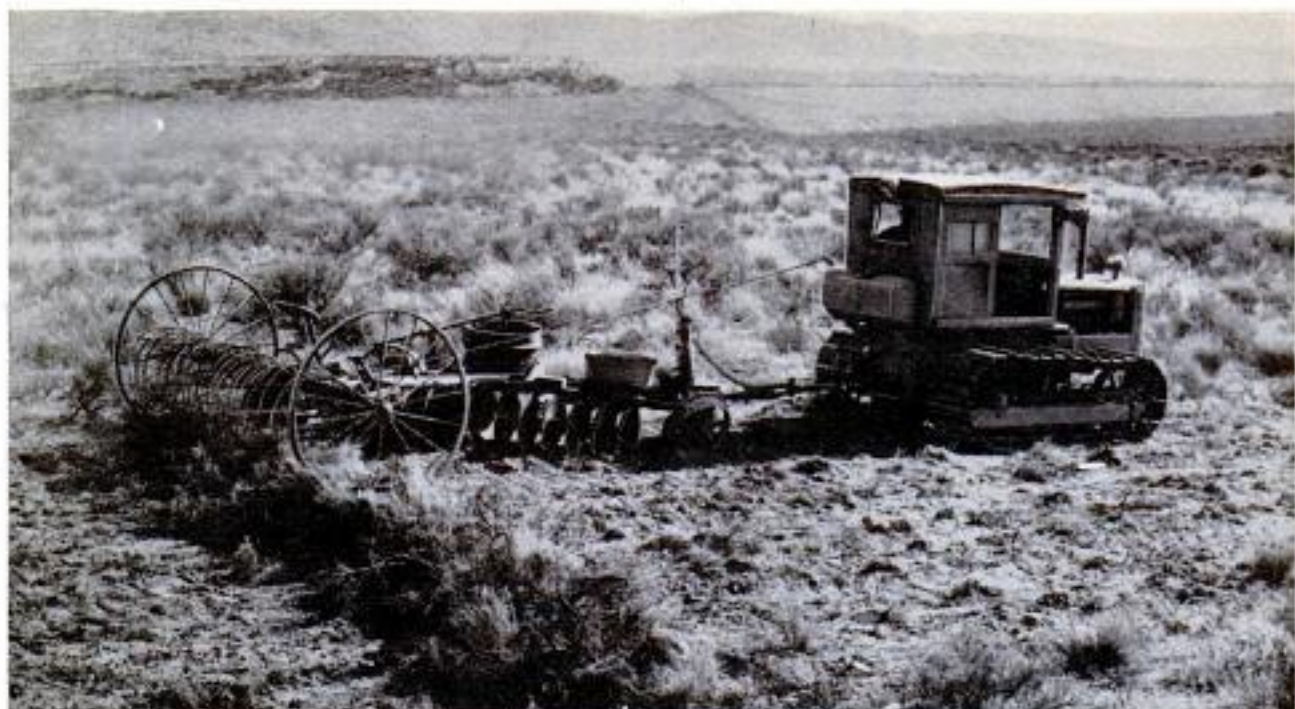
The Dodge prototype, called the Firear-

row, is a low, two-seat roadster. The De Soto Adventurer is a closed coupe that seats four. Both are examples of the uncluttered Italian styling so often imitated these days. The Dodge has a V-shaped rub rail running around it. The De Soto is virtually without ornamentation.

De Soto's Adventurer has a recessed rear floor. Below the door one of two polished exhaust pipes is visible



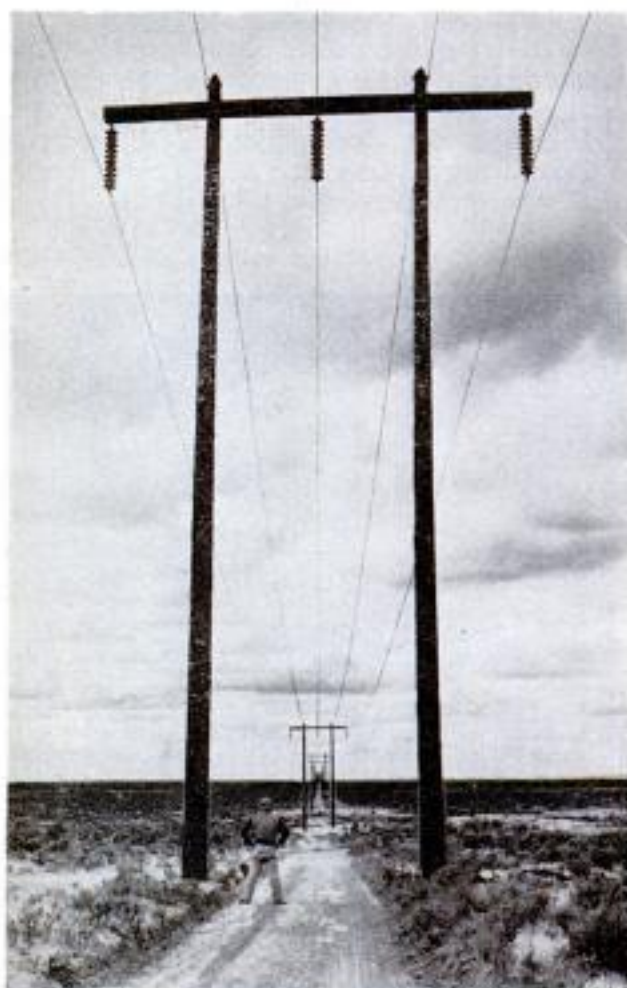




U.S. Bureau of Reclamation photo

Ingenious farmer in Yakima Valley combined a disk and rake to grub out and pile sagebrush in one operation

# The Battle of the Sagebrush



**M**ARK TWAIN once summed up the West's sagebrush situation: "As a vegetable, sagebrush is a distinguished failure. Nothing can abide the taste of it but the jackass and . . . the mule." Twain would be pleased if he could see what is happening today.

Westerners are currently gunning for sagebrush with the same vigor they showed years ago in warring on horse thieves. In fact, the situation is such that it recently inspired one Western columnist to lament that "the sagebrush is going the way of the buffalo, the trumpeter swan and the passenger pigeon." This is a slight exaggeration. There are still more than 90,000,000 acres of sagebrush in the West!

For the most part, sagebrush is just about as worthless as Twain said it was. Not only worthless, but it makes growth tough for worth-while forage.

During a four-month summer-grazing season, 100 acres of average sagebrush land will feed only one cow. But rid that same land of sagebrush and reseed it to crested wheatgrass and it will take care of 10 cows.

Through overgrazing, some range lands that were once hip-deep in grass have been almost completely taken over by sage-

**Power lines now cross the purple sage. Power means dams, dams mean water, water means less sagebrush**





First harvest: The year before, this land was covered with worthless sagebrush. Now it's good farm land

# Busters

By Rafe Gibbs

brush. In fact, there is more sagebrush in the West today than when Twain sounded off about it.

That's what bothered members of the Rotary Club at Lakeview, Ore., one Wednesday noon in 1948. Their county—Lake—sprawls over 5,000,000 acres. Half of this acreage is in sagebrush. What could be done about it?

The Rotarians staged for ranchers demonstrations of brush clearing with specially adapted plows and flame throwers, then

With the oldtime mattoxe a man was lucky to clear half an acre from sunup to sundown







"Stump jumper" for "brush bustin'" has disks mounted in pairs. Each pair can ride right over a big rock

offered annual prizes of grain drills for the ranchers making the best showing in rehabilitating their ranges. So far, about 20,000 acres of land in Lake County have been cleared of sagebrush and reseeded to grass. That's not a very big dent in 2,500,000 acres but it's a start and, as one Rotarian put it, "We're now able to feed 1800 more cows. Add that up in T-bones."

Biggest pay-off, however, has been the fact that other organizations in the West have been inspired to adopt the campaigning tactics of the Lakeview Rotary Club.

Cutting a big swath through sagebrush in

national forests the last few years has been the U.S. Forest Service. Land cleared and reseeded to date—506,843 acres. Now scheduled for sage-to-grass transformation—3,289,599 acres.

But the Forest Service, like the Lakeview Rotarians, is also interested in inspiring individual ranchers to clear their ranges of sagebrush. It has been highly effective with its Dixie National Forest project in southern Utah.

Some ranchers had been contending that the Forest Service picked only selected, small and lush spots for its demonstration

In areas where sagebrush is fairly dense it can be burned out, then the soil seeded with hardy grasses

U.S. Forest Service photo





plots. That was a challenge to the men in green and they came back in 1947 with plans to reseed a single, 23,000-acre area known as the Pines, on Paunsaugunt Plateau. "Paunsaugunt" is Ute for "home of the beaver," but the beaver had long since left. Pickings had become too slim.

"Sure, the natural grass was grade-A," said one old-timer, "but getting a stand with reseeding is something else. Rainfall most years isn't much over 12 inches. And rocky—you can walk for miles some places without stepping on dirt. The Forest Service is going to look awful silly trying to grow grass here."

And for a while the Forest Service men thought so, too. They started tearing into the sagebrush and rocks with one-way wheatland plows. Three plows broke the first day.

Then the Service imported from Australia a plow called the "stump jumper" and redesigned it for sage-busting. "Cookies" (Australian farmers) apparently got the idea for the plow from watching kangaroos travel across rugged terrain. When a kangaroo comes to a difficult obstacle, he jumps it. The plow works the same way. Disks are mounted in pairs on independent arms controlled by springs. When a rock or stump is encountered, the disks in its path rise up and ride over it. But the obstacle has to be a pretty tough one before the plow will let it pass.

On some of the rockier ridges, however, even the stump-jumper was stumped. Forest Service mechanics then came up with the Dixie harrow or drag. Large, loose pipes with spikes twist and roll through the brush, tearing it down and at the same time smoothing the earth.

"The job was as tough a one as I ever got involved in," says Forest Ranger Bert Tucker, "but we've got the grass before us now and the ranchers back of us."

Typical of the Pines-area ranchers is Konroy Henri, a Navy veteran who returned to ranching on 830 acres of sage-studded land.

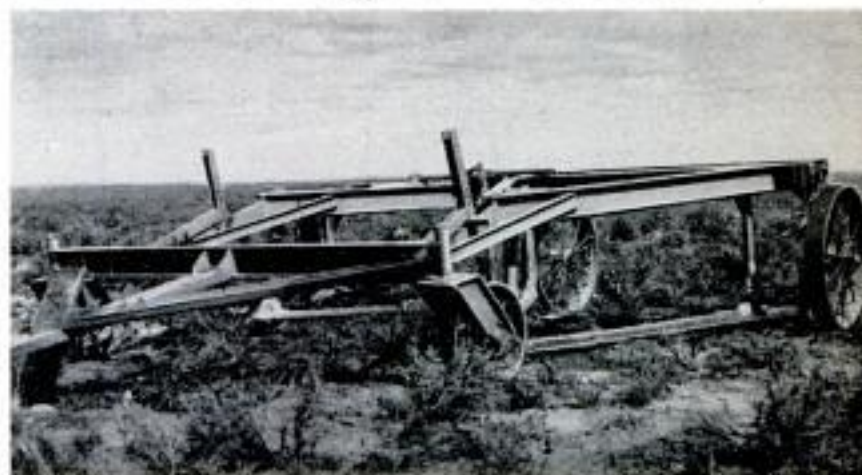
"The Forest Service spread looks mighty good," he says. "On one choice, 690-acre patch the stock carrying capacity has been increased 15 times by reseeding.



Farmer uses a homemade rake to windrow the sagebrush. Then he comes along with an improvised flame thrower and burns it



Homesteading veteran in Idaho has his own system for "busting out" sagebrush. He uses a rail weighted down with a heavy log. Here's another homemade rig. This one has sharp blades that slice off the brush below the ground. It will cut 40 acres a day







**This farmer is literally "in clover" now that he's cleared the sagebrush and water has come to his land**

I'm starting to reseed my range, and don't plan to stop until I've got 600 acres of new grass."

What has happened in the area has interested all Utah—particularly its women. The Utah Federation of Women's Clubs is now promoting trips to the scene of the Forest Service's triumph. And it has long been said out in the range country that "when the women get behind the wheel the men will start turning it."

Giving the men further inspiration is the Production and Marketing Administration, which has been paying part of the costs of clearing sagebrush and reseeding the land, and the Soil Conservation Service. Ranchers in SCS districts can rent heavy sage-removing equipment from the SCS at maintenance and operation costs.

Another organization due credit in the clearing of much sagebrush from Western

acres is the Bureau of Reclamation. Last year the Bureau celebrated its 50th anniversary and figured it had brought irrigation to 2,190,000 acres. Most of those acres were in sagebrush before the water came and most of them had to be cleared by individuals who moved onto the land.

Even today it is difficult to find commercial equipment suitable for removing sagebrush. The Forest Service's stump-jumper or "brushland plow," for instance, is not on the commercial market. Comments O. L. Kime, Bureau of Reclamation engineer at Burley, Idaho:

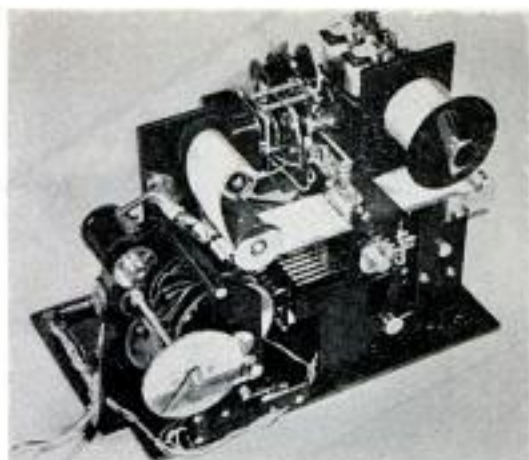
"Perhaps the reason why the farm-machinery industry has neglected to develop a machine for clearing sagebrush is that it is not a continuous seasonal operation. Once the brush is removed and crops are started, the brush never reappears."

(Continued to page 258)

**Huge wheatland plow is among the most effective weapons against sage. It cuts a swath of brush 30 feet wide**  
U.S. Bureau of Reclamation photo







## Mechanical Brain Prints Answers in Easy-to-Read Numbers

There are no graphs or punched strips of tape to be interpreted with a new mechanical brain that prints the numerical answers for anybody to read. The machine, called an Analog Data recorder, can record temperature, take weight, measure the length of an object, give the light intensity, voltage, pressure, stress strain and revolutions per minute. It measures and records almost any physical quantity that can be converted into a corresponding voltage. This multiple recorder can be operated re-

motely, printing its data on tape, cards or tickets. Controls can be set for automatic operation, such as the taking of temperature or pressure at specified intervals; or it can be manually operated. The electronic engineers who developed the compact recorder in the laboratories of the Streeter-Amet Company in Chicago report the versatility of the machine is virtually unlimited. It will even do addition, subtraction, multiplication and division by utilizing various components.

## Biggest Transport Helicopter Cruises 150 Miles Per Hour

Weighing 15 tons and believed to be the world's largest transport helicopter, the new Piasecki YH-16 will carry 40 fully equipped troops, 32 litter patients or three

Jeeps. It has a 78-foot fuselage and cruises at nearly 150 miles per hour. Supplies, including guns and ammunition, can be carried in a sling beneath the fuselage.

Dwarfing two other multiplace helicopters, the YH-16's over-all length is 134 feet and its height is 25 feet



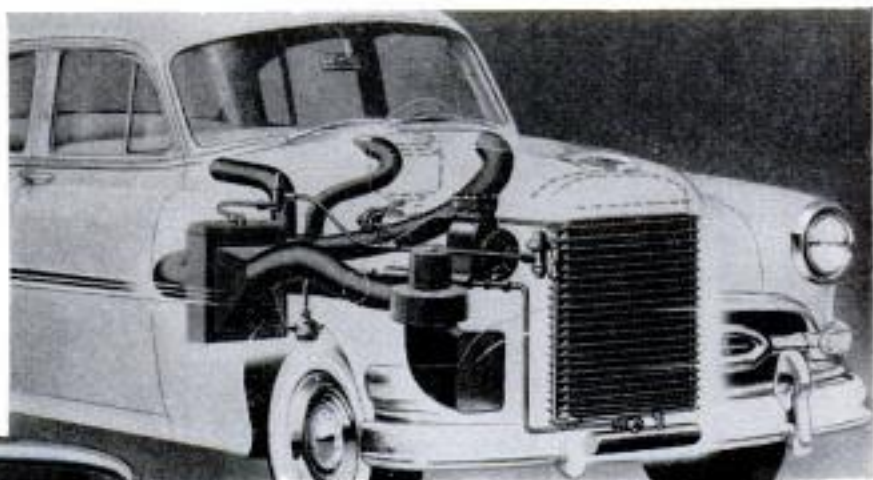




Pontiac introduces a new line in 1954—it's the Star Chief series, shown at left. The Star Chief models are bigger and more de luxe. Wheelbase is 124 inches, 2 inches longer than on other Pontiacs; overall, Star Chief is 213 inches long, 11 inches longer than others of the line. You can spot it by the stars on the rear fenders. Other style changes include a new grille and chrome striping

## Pontiac

Right, Pontiac also has a new air-conditioning system that is entirely front-mounted as shown here. The normally trunk-installed evaporator is placed inside the right front fender. Another idea is a mechanical seat adjustment that permits you to move the front seat up or down as well as horizontally



## More 1954

Chevrolet has a new front grille, but only few other exterior changes. The wider grille gives the car a lower look. Mechanically, there are more obvious changes. The 115-horsepower Blue Flame engine is now in the gearshift models; a 125-horsepower engine is used with Powerglide. Mufflers are almost twice as long for improved silencing

## Chevrolet

New this year with Chevrolet is the option of an electric front-seat adjustment and electric front-window lifts. There are 13 body models available in three series, with 13 two-tone color combinations. Powerglide is now optional on all models and interiors are emphasizing two-tone color treatments





Lincoln, after its win in Mexico for the second year in a row is making no important changes in its 205-horsepower V8 engine. Improvements this year include a better spark control, new vacuum-controlled four-barrel carburetor and redesigned hydraulic tappets. The bumper-guard air scoop and the three vertical bars in grille are new



## *Lincoln*



From the side, several decorative changes are apparent on the 1954 Lincoln. The forward-jutting bumper guards and wrap-around bumpers combine with new side moldings to make the car look longer. The gravel-shield design is new as are the taillights

## **“Debutantes”**

Mercury is unveiling a surprise model in its Sun Valley hardtop, shown at the right. It has a portion of its roof made of transparent plastic. A great car for sightseeing in the mountains or in big cities! Front grille is new



## *Mercury*



Mercury's biggest news is the overhead-valve V8 engine with 161 horsepower. High compression, with a short stroke, it is said to have economy plus performance. A four-barrel carburetor is also new as is ball-joint front suspension. Side view of hardtop, left, shows how rear fender now extends over taillight



# Detroit Listening Post



By Leo Donovan

**C**ARS GET BETTER every year and that's as it should be. Customers insist on such progress, although a few precious sentimentalists would still buy Model T Fords, Marmons, Bugattis, Hupmobiles and even Tucker Torpedoes, given the chance.

Constant improvement certainly contributes to sales. Some of these improvements, of course, are "corrections of last year's mistakes," as C. F. "Boss" Kettering has so aptly observed.

**But today we hear criticism directed at engineers for having given cars too much performance, too much convenience and comfort.**

Engineers are having to defend such developments as faster acceleration, greater horsepower, power steering and braking. They point out that while it is important to build cars to minimize crash injuries, it is even more important to build cars that make it easier for the driver to stay out of accidents. Charles A. Chayne, vice president of General Motors, said the driver has better control of his car today because of increased acceleration, visibility, power steering and braking.

On the other side of the argument, Paul H. Plaisdell, national safety expert, said he thought the one-arm driver soon may be eclipsed by the one-finger driver as a highway menace. Power steering makes such a menace possible, he said.

Another viewpoint was submitted to the National Safety Council by safety leaders in Michigan. They state that faster speeds make essential 100-percent driver attention, yet such physical aids as power steering tend to give the driver a sense of security that might lead to inattention.

The general manager of Studebaker Corp. of Canada has also suggested that the auto industry take another look at itself. In 10 years, he said, these high-horsepower cars will still be able to go as fast, yet their tires, brakes and other parts will be dangerously worn. What happens then?

**Buick has pulled a fast one on the smart boys around Detroit. It was expected that**

**only the Roadmaster would be completely new, with wrap-around windshield. Now it turns out that the whole line will be all-new bodywise. And, of course, the V8 goes into the Special this year.**

Don't look for the long-rumored Lincoln Continental until 1956. And unless you're very rich and influential, don't expect to own one! Hints have it that it will gleam in splendor with production limited to fewer than 3000 copies a year. That will put it in a very restricted class indeed. How much it will cost is unknown, but a conservative guess is upwards of \$7000. With such restricted output, the competition to buy should put it in a far more exclusive category than any of the present "prestige" cars.

Speaking of performance and speed, the 1954 Dodge V8 averaged more than 101 miles per hour (including time out for pit stops) for 48 consecutive hours on the Bonneville Salt Flats to set a new stock-car record. It also travelled 108.36 miles per hour on the straightaway to become the fastest standard American car ever clocked by AAA officials.

You can expect Ford to come forward with a sleek sportster to rival the Chevrolet Corvette before the end of 1954. By then, the market for such cars will have been tested by the plastic Corvette and if it shows promise there will be others in it, too, you can bet on that.

**Suburbanites are expected to be the target for the dealers' sales drives in 1954. They hope to make more and more two-car families among the 30,000,000 persons now classified as suburbanites, most of whose breadwinners commute or drive to the city daily.**

That's the reasoning behind the contemplated "executive coupe" which will provide the man with a small car to drive to the station or office while the wife has the family car for the kids and shopping.

Nash is getting ready to announce its new offering in this field—although it refuses to label it a "second" car. That is the NKI—the small vehicle built to Nash design and specifications in England and brought over here for sale at a price said to be the "lowest in the industry." It has a wide, three-person seat in front and a "convenience" or jump seat in the back for packages or, on short trips, for the youngsters. It is expected to be announced early in 1954.

It looks as though you can cross the V6 engine off the list as far as Plymouth is concerned, at least. One very high Chrysler official was heard to say that you couldn't compete "uphill" with a V6 against a V8 and that when competition required it, Plymouth would have its V8 power plant.



READ ABOUT  
THE '54 CARS

IN

BUBBLES

*Cadillac*

CHEVROLET

*Chrysler*

DODGE

*DeSoto*

FORD

HUDSON

KAISER

*Lincoln*

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*On the newsstands January 29th*

JANUARY 1954

123

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Net tender drops buoys and nets into water while another vessel prepares to tow completed sections away

## *Deep-Sea Sentinels* **GUARD OUR HARBORS**

By Dick Frederic

**I**N SUBTERRANEAN ROOMS beneath the coastal hills around certain vital United States harbors, a new surge of activity is in progress. Week-end warriors of the Naval Reserve, standing side by side with "regulars" in the somber gloom, watch patterns of green light dance across oscilloscope screens. Each wiggle tells about some object that is moving through the water out beyond: A submarine is preparing to dive, a depth charge has exploded, a ferry is plowing its regular course. Each writes its distinctive pattern across the scopes.

In other underground rooms, men with earphones listen to an eerie bedlam of noises from all over the ghostly depths of the harbor entrance—the grunting and croaking of fish, crackling shrimps, the

whoosh of big and little propellers, the thrum of ship engines. The sharp "ping—clunk" of the signals echoes back from moving hulls and monitors track the course and speed of every vessel in the harbor. Harbor radar scopes flicker, radios crackle, galvanometers silently scrawl jagged lines on reels of paper.

At a semicircular table resembling a huge protractor, men determine an instantaneous fix for any suspicious vessel out there, simply by swinging a pair of swivel cross-arms to known positions on the table. And out in a big central control room, earphone plotters at a vast Lucite harbor map sketch the course and progress of every ship in the area through information fed to them by each electronic watchdog in a modern harbor-defense web so complex that a fish



would have a tough time sneaking through it undetected. Anything that did get through would run head-on into a nightmare of mine groups, harbor nets and patrol gunboats back-stopping the whole business.

Russia's marine strength today lies in a powerful fleet of more than 300 submarines. If war came, we could be pretty sure these silent marauders would try to nose into our harbors, torpedo our shipping and atom-bomb our coastal cities if they had the bombs to do it. That's why, in laboratories and in secretly designated harbors here and there, the Navy's "bad-dream department" is perfecting three-dimensional harbor defense capable of pin-pointing



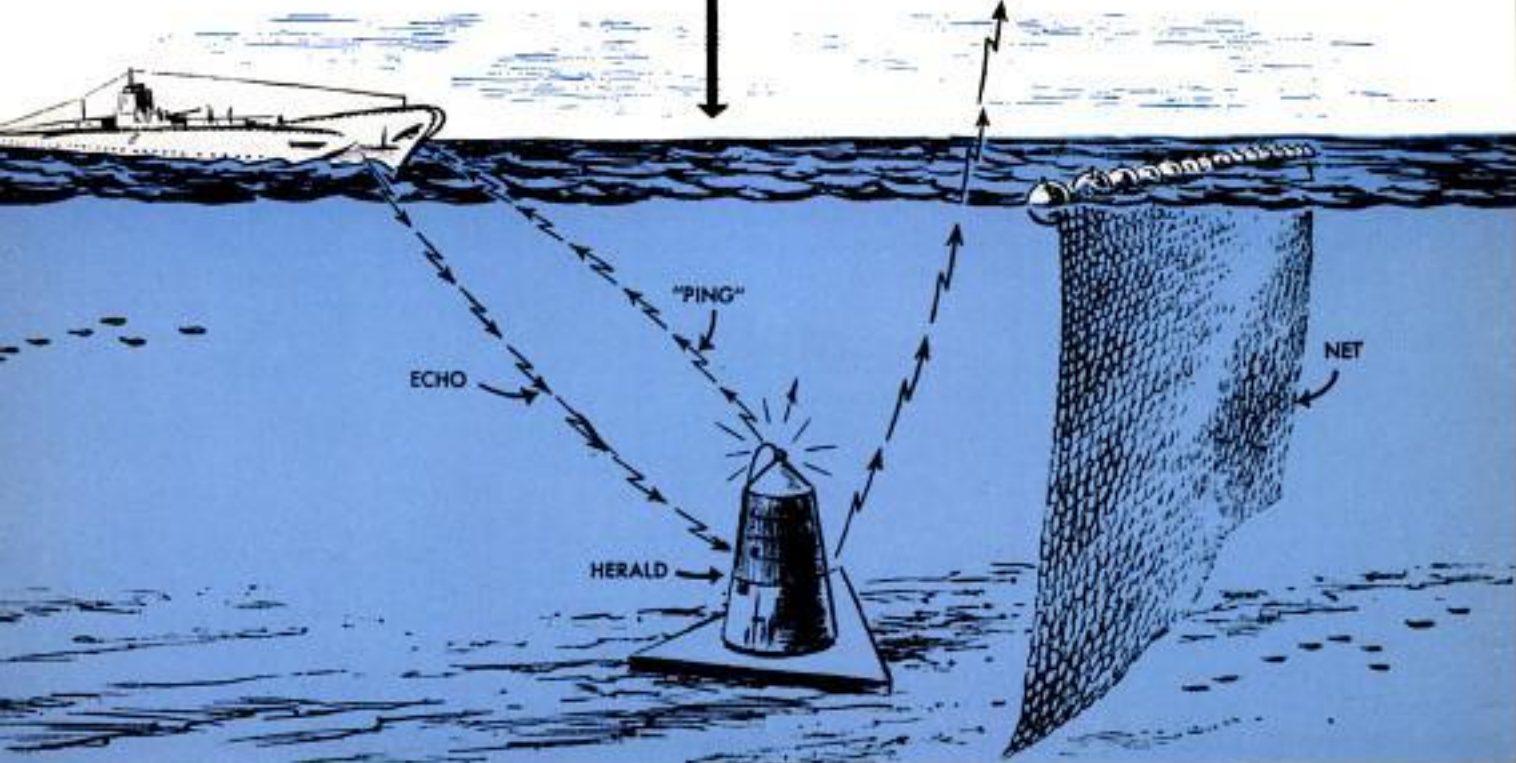
"Heralds," like this one, are placed in row at bottom of harbor entrance and are actually sonar instruments. Their "pings" are monitored at control post



MONITOR CAN DISTINGUISH WHAT'S COMING BY INTERPRETING PICTURE ON HIS SCREEN. SAMPLES ABOVE SHOW A FEW OF DOZENS OF PICTURES MADE BY UNDERWATER SOUNDS TRANSMITTED BY HERALDS

MONITOR AT H.E.P.C. CAN HEAR "PING" AND ECHO TRANSMITTED TO HIM BY HERALD; ALSO WATCHES PICTURE OF SOUNDS ON OSCILLOSCOPE SCREEN

HERALD ON BOTTOM OF HARBOR ENTRANCE SENDS OUT HIGH-FREQUENCY SOUND WAVES, PICKS UP ECHO WHEN "PING" BOUNCES OFF OBJECTS, AND TRANSMITS BOTH SOUNDS TO HARBOR ENTRANCE CONTROL POST





potential surface or subsurface intruders, determining what and who they are and blasting them before they even reach the harbor entrance.

Electronic brain of the system is the harbor-entrance control post (HECP)—that underground maze of chambers. Here all the signals from the vast array of robot eyes and ears lurking out on the bottom of the harbor entrance filter through monitoring equipment in flickers of light or sound that men can translate into vital intelligence. In effect, it's like human eyes, ears and fingers sending impulses through the nerves to the brain, where they are interpreted into mental images.

"An ideal HECP," explains one harbor-defense skipper, "might be laid out in semi-circular form—like half a pie. The big room in the hub houses the harbor plot where all information is assembled. Chambers encircling it contain the control or monitoring equipment for each set of robot guardians that are watching, listening or waiting out there on the sea bottom."

To see how it works, imagine that a submerged enemy sub is sliding silently through black water towards the entrance of a vital harbor. It is night. Not a ripple betrays his presence to the 24-hour watch in the lookout signal towers atop the bluffs overlooking this harbor.

The sub may still be miles from the entrance when the first watchdog detects him. Far out beyond the harbor, lying on the bottom, are long, overlapping strands of armored copper cable over which he must pass. These are "magnetic loops," so sensitive they detect the slightest change in the earth's magnetic field. A steel hull moving through the water sets up its own magnetic field and, back in a room in HECP, this variation is instantly recorded by a stylus, in a series of jagged lines on graph paper. Since the sub passed over only one particular loop in the long chain of five or six that span the harbor entrance in a long arc, the monitor knows: First, there's a ship coming; second, its general position.

Radio and communication lines buzz as the alert goes out. Sharp-eyed lookouts find no sign of surface craft in the reported area. Hence, the crew already suspects a sub.

Out there in the black depths, the unsuspecting sub skipper has only begun to snare himself. His craft now skims the top of a metal box—one of many jutting from the ocean bottom on weighted tripods like a long row of fence posts. They are hydrophones, or underwater "mikes."

No sound escapes these eavesdroppers of the deep. Back at HECP, where monitors listen in shifts 24 hours a day, every whisper in the sea comes through their earphones in a cataract of sound. "A school of

shrimp swimming by a hydrophone comes across like an amphitheater full of people cracking peanut shells," one man explains.

The whoosh of the enemy sub's propellers comes clearly over the line from the hydrophone nearest to it. Now, HECP knows it has a sub and, since the men know the exact location of the phone that picked up the noise loudest, they have narrowed the sub's position.

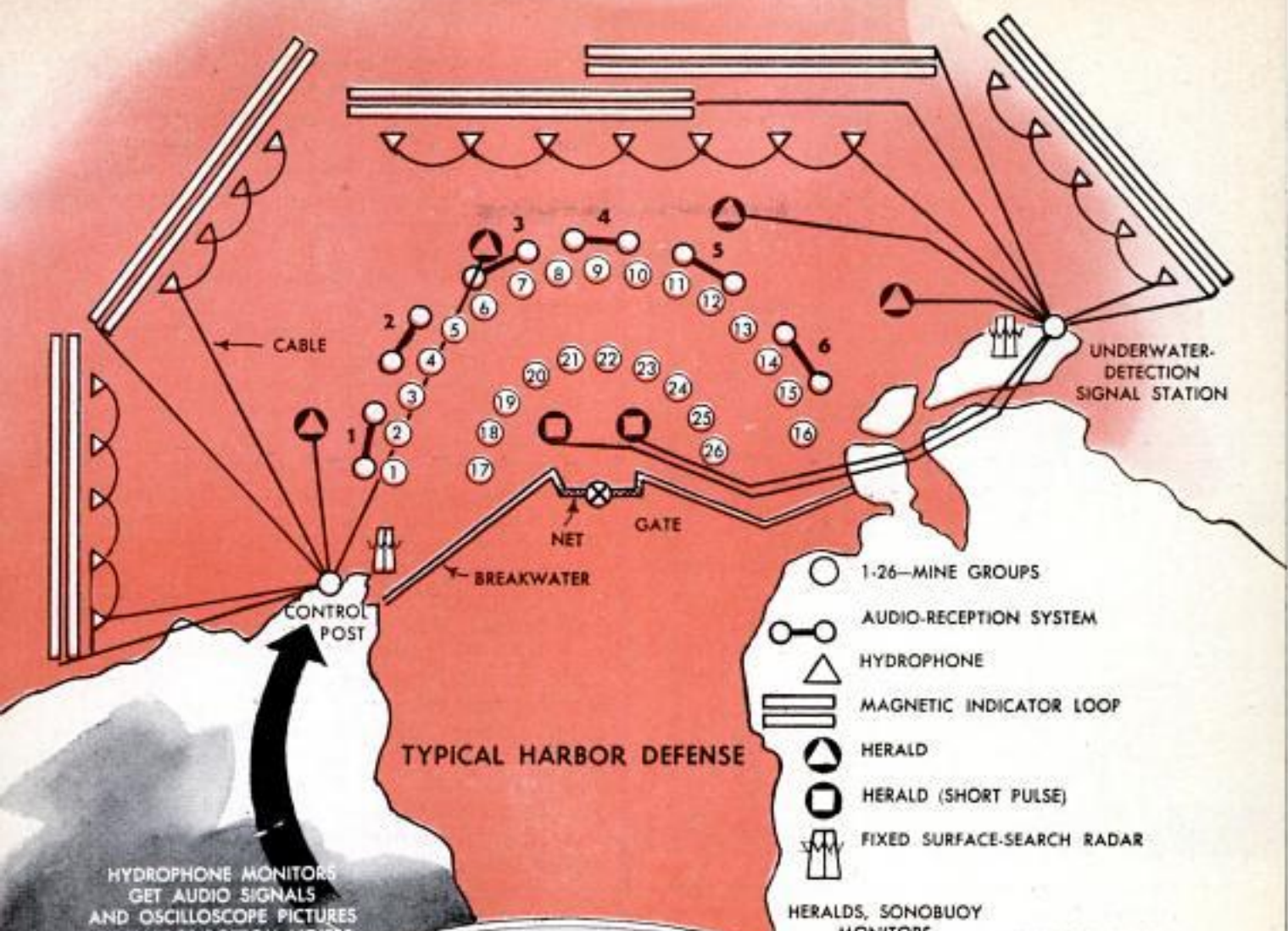
Ahead of him, in the depths, another guardian has gone into operation—the "heralds" (Harbor Echo Ranging and Listening Device.) These massive affairs look like small lighthouses on heavy triangular bases. They're spotted around the ocean floor inshore from the hydrophones. They house special harbor sonar—the radar of the deep—and, like most of these detection instruments, are lowered in place by harbor-defense crews from net tenders, harbor workboats or lighters.

Using high-frequency sound waves instead of radio waves, and linking electronics and magnetism, this "Davey Jones Radar" combines listening gear and ranging equipment. It sends out a sharp "ping" that spears through the ocean until it fades out in the distance or bumps into something, like the hull of a ship or submarine. When that happens, an echo bounces back to the herald, is picked up and transmitted to the monitor listening in at HECP. The monitor hears both the "ping" and the echoing "clunk." The time interval between them tells the distance of the approaching object. And, since the direction of the sound beam is known, a bearing can be taken on the sub. His progress across the harbor entrance can now be plotted with deadly accuracy on the big Lucite board in central control.

By now, HECP will have dispatched harbor-patrol craft to depth charge the enemy sub. But what if they miss? He's not likely to slip away undetected. Behind the heralds, an audio-reception system, similar to the hydrophone ring, is picking up his noises. If he comes up for air, the big rotating "fans" of harbor radar will pick him up and he'll be a blip on the scopes in HECP. If he gets past the heralds, he's really in trouble. Beyond them are the mine fields.

Modern mines are a far cry from the old spherical monsters that exploded when a ship bumped their horns, though this "Model T" of the mine department is still in business. More subtle and deadly are the controlled mines, triggered from ashore, and the ground mines that can be exploded by a fantastic combination of impulses. The magnetic field of a ship will "pull the cord" on a magnetic mine. The acoustic mine is a fiend with an ear—a sim-





HYDROPHONE MONITORS GET AUDIO SIGNALS AND OSCILLOSCOPE PICTURES OF HARBOR-BOTTOM NOISES

TRANSMITTER ROOM

HERALDS, SONOBUOY MONITORS

HARBOR RADAR SWEEP MONITORS

MINE CONTROL

CENTRAL CONTROL

OFFICES

GALVANOMETERS RECORD ON STYLUS SIGNALS FROM MAGNETIC LOOPS ON OCEAN FLOOR

PLOTTING TABLE FOR FIX

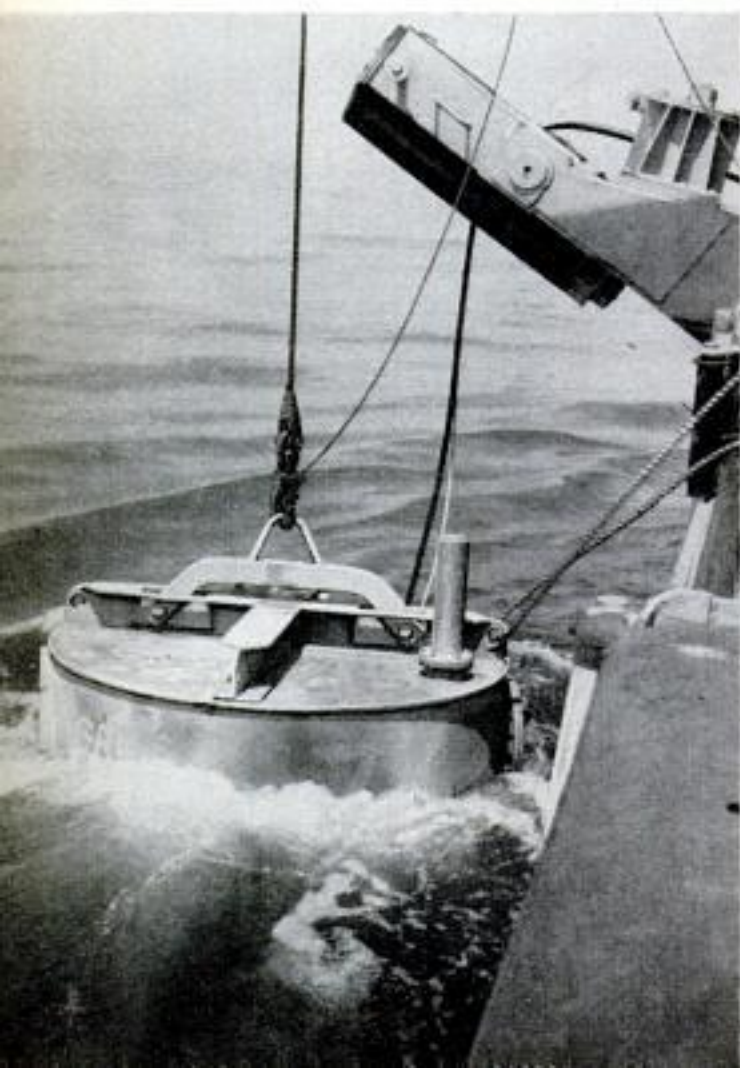
HARBOR-ENTRANCE CONTROL POST





Mass of steel rings is a harbor net strong enough to stop a torpedo. It's made of  $\frac{1}{4}$ -inch steel wire

Minelayer lowers a controlled mine toward bottom of harbor. This type is exploded by remote control



ple hydrophone that can be cocked for a special ship noise, like the turning of a screw or the beat of a particular type engine. Let the noise get loud enough—and wham!—On a pressure mine, a tiny diaphragm is faintly depressed by a hull pressing into the water overhead. But it's enough to throw the switch.

Working in combination, these triggering systems can be scrambled into a fantastic number of actions, one backstopping or booby-trapping another. And they may all lie harmless in the bottom of a harbor until someone ashore pulls the switch that cocks their triggers.

Chances are 10 to 1 that our enemy sub would end his voyage here, if he got this far. By now, Navy planes would have been alerted and would be circling his position waiting for a periscope to show.

But suppose he crept through that minefield hazard. Another set of heralds will be watching his movement through the field—and beyond them, the sub skipper will find himself up against a tough net capable of stopping both him and his torpedoes.

Establishing and maintaining such an elaborate harbor defense is a whopping job. To do it, the Navy has established several Naval Reserve Harbor Defense Units, where week-end warriors go out with veterans on the unique workboats that lower the massive equipment to the sea bottom, patrol the nets and keep the robot sentinels operating.

The men who do this work are a race apart. Big, rugged and ingenious, they follow the first assault waves, locking up waterways as they are taken. "Harbors, safe for fleet anchorage and repair, must be provided in forward areas," Commander S. E. Taylor points out. Typical of the men he leads, Taylor is a ruddy-faced, salt-bitten mariner heading operations at one of our harbors. Behind him lies a lifetime of rugged experience in defending harbors all over the world, under all conditions.

"The logistics of the job," he says, "is staggering. The tremendous bulk and weight of nets, buoys and electronic gear means that often there's no room for everything in the initial convoys. If ships carrying our gear are sunk, we improvise with what we've got."

A simple "boom" might do a perfect job blocking a river, for instance. This is just a barrier made up of baulks, or wooden floats, with timbers bolted between them. It can be enough to stop a small ship long enough to give it the works with shore batteries. Sometimes "star cutters"—big 18-inch steel spikes—are attached to the timbers. Purpose: to tear the bottom out of any small craft that tries to cross the boom.

(Continued to page 270)



Here's the control room during a color telecast. Screen at left is a black-and-white reproduction of flower scene in center, which is on the air. Engineer can switch either of the other two scenes on the air



# COLOR



## TELEVISION IS HERE

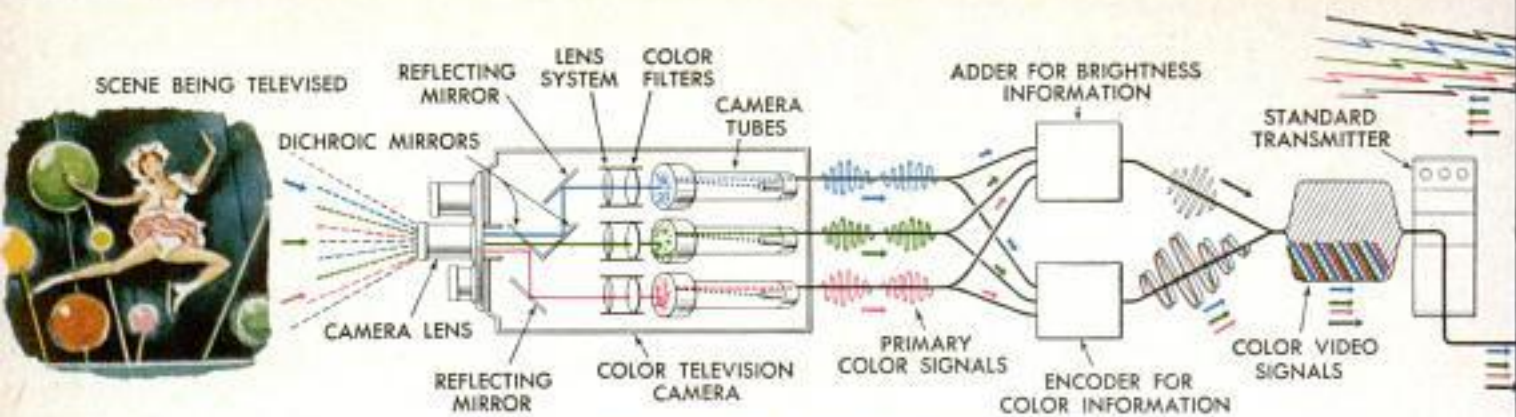
**By Michael Day**

**S**TEP THROUGH the door marked "restricted" on the 18th floor of the CBS Madison Avenue (New York) studios, or through a hidden portal in the soundproof glass partition of NBC's specially designed "Colonial Theater" on Broadway, and you'll find yourself in a flickering world of color. The only light comes from rows of TV-monitor screens. Some are alive with scenes in full color, playing across the glowing phosphors like miniature movies

in Technicolor. Others duplicate the same pictures in black and white.

Green graph patterns tremble on oscilloscope screens as technicians manipulate scores of dials and switches on the panels before them. Hushed voices of earphoned producers, technical directors and video-control men drone back and forth in weird, technical lingo as they issue orders over an intercom system to cameramen, actors and stagehands outside on the set:





## RCA COLOR TELEVISION

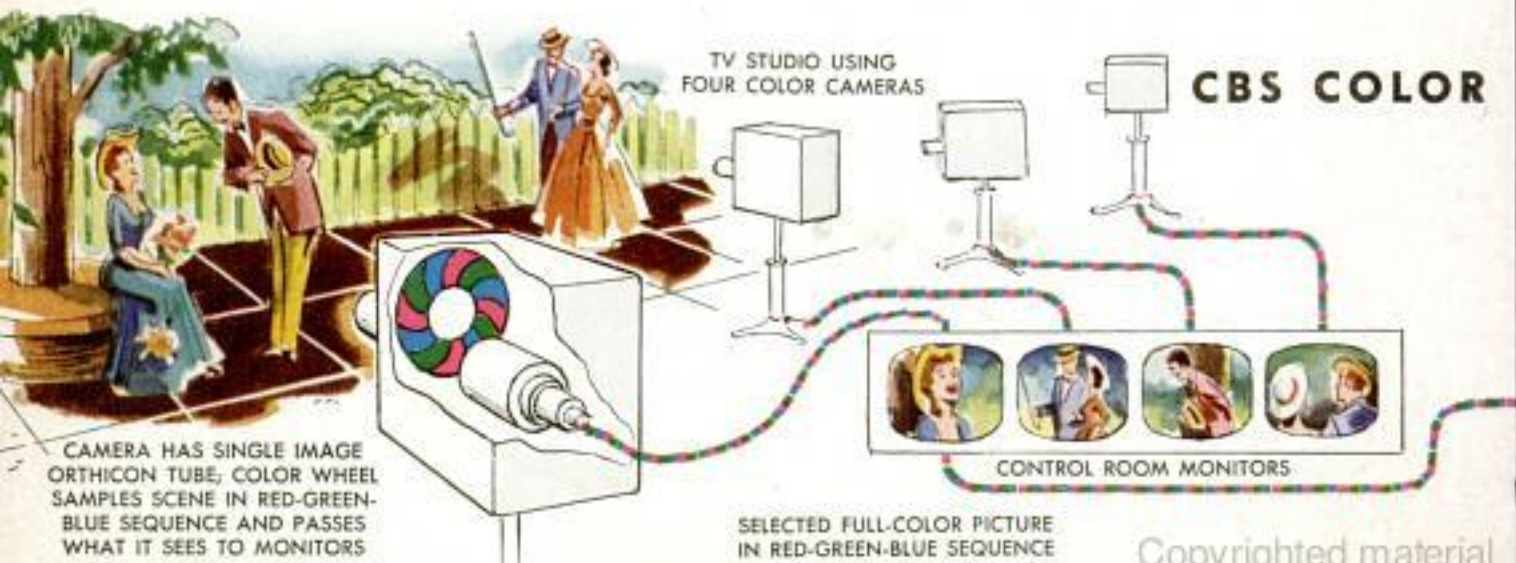
In RCA system, full-color image is focused on special mirrors which reflect one color, allow other two colors to pass. Color images then are focused on three camera tubes, which produce three color signals. Samples of signals are combined to add black-and-white signal. Process is reversed during reception



Before a telecast, each camera must be "tuned in" for delicate shadings of flesh tones. Here a cameraman focuses on a girl beside a color wheel to adjust camera for perfect color pickup

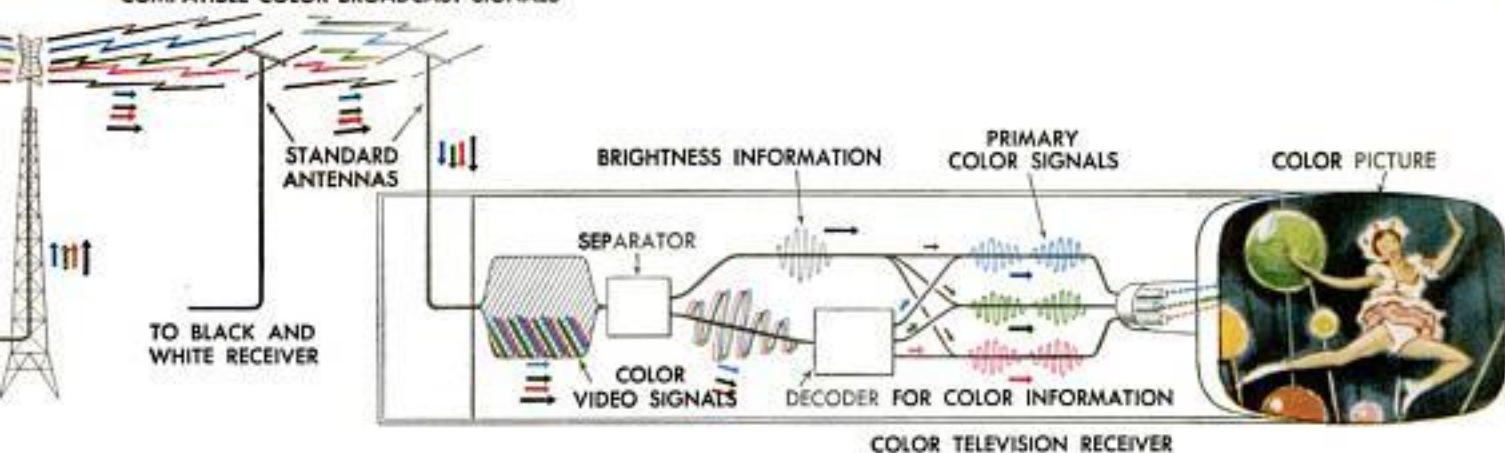
"Too much red on number three . . . there's a 'kick' in that vase lip on number two preview; move it back . . . we pick up convergence on number two; how's your registration? . . . gamma check on number four, please . . ."

These are the control rooms for the new coast-to-coast color telecasts. Both NBC and CBS have been telecasting color shows around the East Coast—and NBC has even microwaved color shows to the West Coast—for many months. Starting with the Rose Bowl game on New Year's Day, NBC expects to send out several network shows weekly in color. Most of their 70-odd primary stations have already agreed to put in the \$22,000 color-conversion equipment, and more are expected to follow. If the shows look just as black and white as usual on your set, that's because you happen to have a black-and-white set. If you'd been watching the same channel on one of the handful of existing color sets owned largely by TV and advertising executives, you'd have seen the show in a dazzling array of brilliant hues.





## COMPATIBLE COLOR BROADCAST SIGNALS



COLOR TELEVISION RECEIVER

Actually, those same color signals were streaming down your own antenna the whole time. And, while your set can't translate the signals into color on its black-and-white screen, it still can produce a perfect black-and-white picture from the same telecast—no matter whose network is beaming the show.

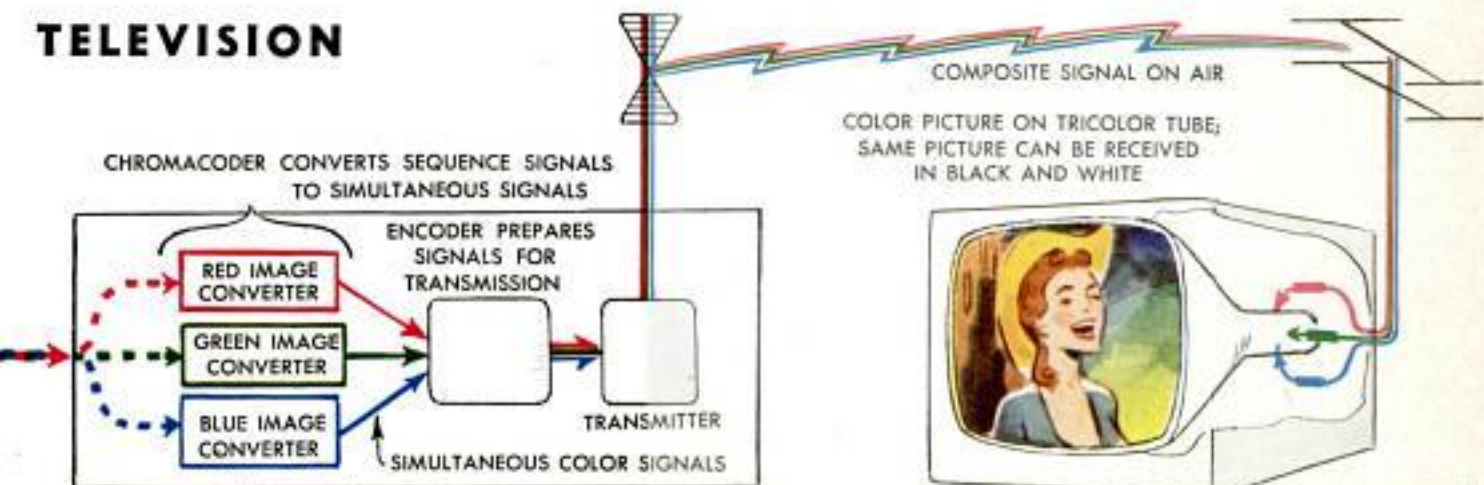
According to the big networks, color TV is here to stay. By the end of this year, 50,000 color sets will be operating. But don't get too excited unless, as one set manufacturer puts it, "you're in the mink-coat-and-foreign-car category." The first sets will cost about \$1000, and most will go to potential advertisers and engineers. As mass production and simplification sets in, the price tag is expected to move down, but it may be several more winters before the price levels off at what manufacturers guess will be about 100 percent higher than black and white today. For awhile, replacing a picture tube will cost as much as a whole black-and-white set (about \$250). Since color circuits are more complicated, repairs will cost proportionately more. You'll be able to convert your old set, if

Dr. Frank Stanton, president of CBS, shows heart of CBS system, the Chromacoder. This electronic panel converts sequence signals, representing colors, into simultaneous signals for the air

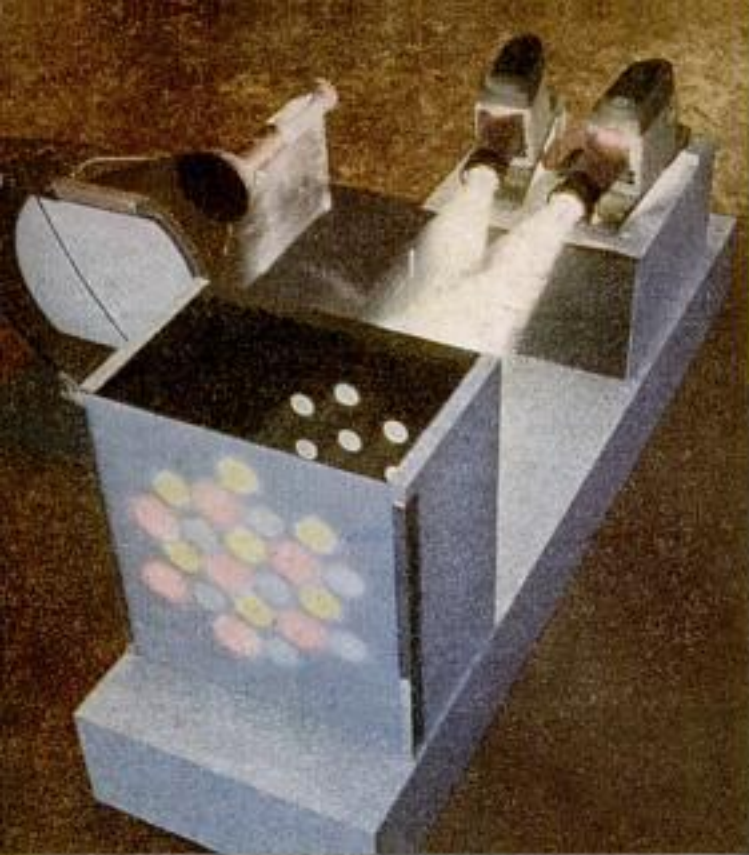


In CBS system, camera sees through a rapidly rotating color wheel. Signals from the camera are in a red-green-blue sequence. After passing through control room, signals go to Chromacoder which converts them into three simultaneous signals for transmission. On the air, signals of CBS and RCA systems are identical

## TELEVISION







RCA demonstrator shows in large scale how beams pass through mask to affect phosphors on the screen

you want, but even that will cost between \$500 and \$800. About the only part of your present equipment that works equally well for color reception is the antenna—if it's well designed. In spite of all this, color is definitely in your very near future. The first big handicap has been hurdled.

Until recently, color had bogged down in a battle of "systems" (see *Popular Mechanics*, January 1950). One big stickler was



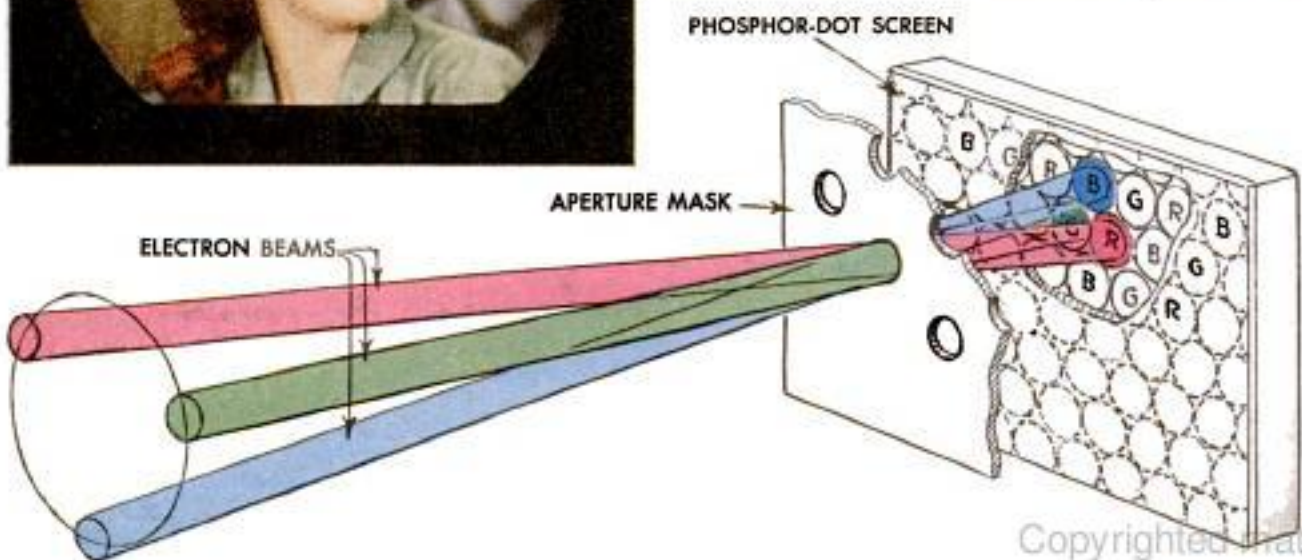
Engineer checks light prior to telecast. Poor lighting can turn blues to reds, give flesh a green tone

that not all the systems could be picked up in black and white on the 25,000,000 standard sets now in American homes, unless people bought special adapters. To protect billions of public dollars, the industry refused to commercialize color TV until all its members could come up with "compatible" standards. This meant that a program must be seen in color on color sets, but must also be seen in black and white on present sets, without adapters, and regardless of the type of equipment used to telecast the show.

For two years, the NTSC (National Television Systems Committee), made up of representatives from each network, has

(Continued to page 274)

Diagram shows how each of the 250,000 microscopic holes in aperture mask permit each of the electron beams to affect only the proper phosphor. When eye sees these glowing phosphors it combines them into full-color scene, such as unretouched photo at left





## Scientist Uses "Mud Pies" To Explain Changes in Earth

"MUD PIES" are helping explain changes in the earth's crust to geology students at The Johns Hopkins University. Maker of the mud pies is Dr. Ernst Cloos, who uses this method to illustrate in half an hour the changes which took place in the surface of the earth over millions of years. In effect, the mud pies are flexible models of the earth's surface. On a table with a hole in the center are two rectangular pieces of tin which overlap slightly. The outer ends of the tin sheets are fastened to the table. Over the tin Dr. Cloos spreads a "pie," about two inches thick, of moist clay. A rod under the table, when operated by a ratchet, moves up through the hole and begins lifting the two sheets of tin. As the center of the pie rises, something of course has to give. Minute fractures occur on the surface, just as fracture zones have appeared in the earth's crust over millions of years. Eventually the entire surface gives way to form a crevasse. Why is the pattern of such fractures important? When a vein of ore or oil is interrupted by a fracture, the geologist can determine where the stratum is likely to be found on the far side of the fracture. In another demonstration, Dr. Cloos forces a mud pie against a metal rod which represents an immovable barrier. In this way, he demonstrates what happens when softer sections of the earth's crust move against harder ones. Overlapings occur, such as the "folds" which can be found in the Appalachian area.



Sequence above shows how a "mud pie" is lifted in the center until fractures occur. Below, Dr. Cloos sprays clay with atomizer in demonstration of the earth's folds





# The OWNERS REPORT on

**LIKES:** 5. I add 0 quarts of oil in 1000 miles. I change oil every 1000 miles.  
6. Here is what I like about my rear-engined car: *Maneuverable and easy to park. Less tiresome to drive & more comfortable on a trip (I am over 6 feet tall) than the "big" cars! Easy to service. Rugged in operation. Cheap to run.*

LORAIN, OHIO,  
PHYSICIAN

**DISLIKES:** 7. Here are my specific complaints: *Utter lack of quick acceleration above 40 m.p.h. No power on steep grades at high speeds. As a four-passenger car, it is cramped, but adequate for our two children.*  
8. I hate its roadability.

EVANSVILLE, IND.,  
WELDER

CAMBRIDGE, MASS.,  
RESEARCHER

**LIKES:** 6. Here is what I like about my rear-engined car: *Easiest car to drive (including 11 U.S. cars) I have owned. Can take any car on speed and acceleration, especially on winding roads. No leaning on corners.*

**DISLIKES:** 7. Here are my specific complaints: *It is very noisy and this cannot be gotten around. The result is that long trips are more tiring than they need be. Luggage space restricted, car difficult to enter and leave.*

ITHACA, N.Y.,  
STUDENT

NORRISTOWN, PA.,  
AUTOMOTIVE ENGINEER

**LIKES:** 5. I add  $\frac{1}{2}$  quarts of oil in 1000 miles. I change oil every 2000 miles.  
6. Here is what I like about my rear-engined car: *It can go anywhere. It holds the road well, One feels in this small car as though one were personally motorized and not riding.*

**DISLIKES:** 7. Here are my specific complaints: *Complete lack of body insulation. Muffling could be improved. Standard heater is useless. Side mirror necessary for rear visions.*

DARIEN, CONN.,  
CIVIL ENGINEER



# THREE REAR-ENGINE CARS

The true test of a car begins when the owner takes the wheel. Popular Mechanics sent questionnaires to 1000 owners of rear-engine cars. Here is what they say

By Floyd Clymer

**WHAT IS BETTER:** engine in front or engine in the rear? It's an endless argument!

We're all familiar with the front-engine car. To find out about the less familiar rear-engine design, *Popular Mechanics* asked 1000 American owners of Volkswagens, Porsches and Renaults to tell you about their cars.

How do they feel about the rear engine after thousands of miles of driving? Only a scant one percent say they won't buy another rear-engine model! The majority are most enthusiastic. Let's see what they have to say.

"No heat from engine being in front. No antifreeze or radiator worries with air-cooled engine."—Binghamton, N. Y., Volkswagen owner.

"Weight in rear aid to traction."—Islip, N. Y., Volkswagen owner.

"No drive-shaft troubles. Better traction. I have taken roads that only a Jeep could negotiate."—Spring Valley, N. Y., Volkswagen owner.

"Logical to have engine in rear and eliminate long drive shaft which wastes power."—Los Gatos, Calif., Porsche owner.

"If any American manufacturer ever produced a rear-engine car it would sell like hotcakes."—Edmonds, Wash., Renault owner.

## Volkswagen Comments

What do the owners have to say about their particular make of car? Like most foreign-car owners, they are enthusiastic.

"Economy above all! Good forward visibility, nice ride, no road shock felt in steering, terrific gearbox," writes a Volkswagen owner from Bloomfield, N. J.

Other owners agree with him. Economy of operation is the best-liked feature (see *Percentage Poll*, page 138). That is understandable



## VOLKSWAGEN

With its hood swooping abruptly downward, the VW is affectionately called "Beetle" by some of the responding owners



## PORSCHE

Lively, sleek and expensive, the Porsche is acclaimed by a large number of owners as "the finest automobile ever built"

## RENAULT

France's most popular car, the Renault is water cooled, unlike the air-cooled German cars above. This is a 1954 model



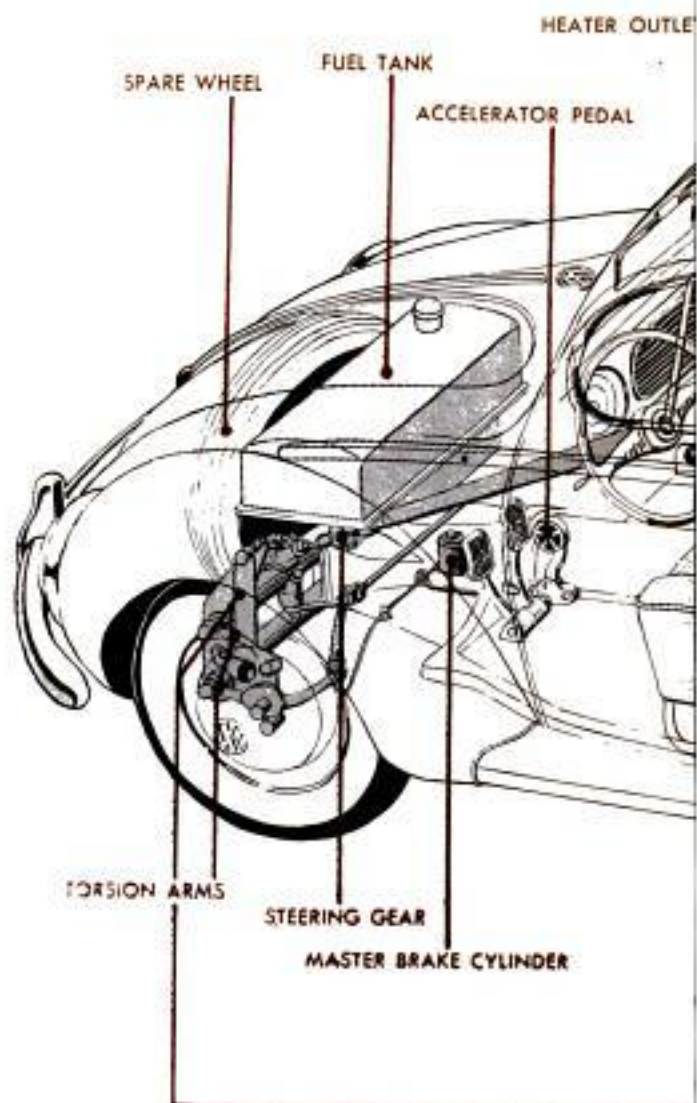




Clymer points to the belt that drives the cooling fan of the rear-engine, air-cooled Volkswagen he tested



Spare tire, gas tank and some luggage space is under the hood of the VW. Below, the rear engine gives fine traction, Clymer reports, even on rough, sandy roads



Phantom sketch shows major parts of the Volkswagen

since Volkswagen owners average 37 miles per gallon in country driving, 32 miles per gallon in the city.

But there are other good features, say the VW owners. Safety is one of them.

"I like freedom from sideway due to torsion-bar spring. Also the comfort, economy, sure traction on slippery roads. Easy parking."—West Cornwall, Conn., purchasing agent.

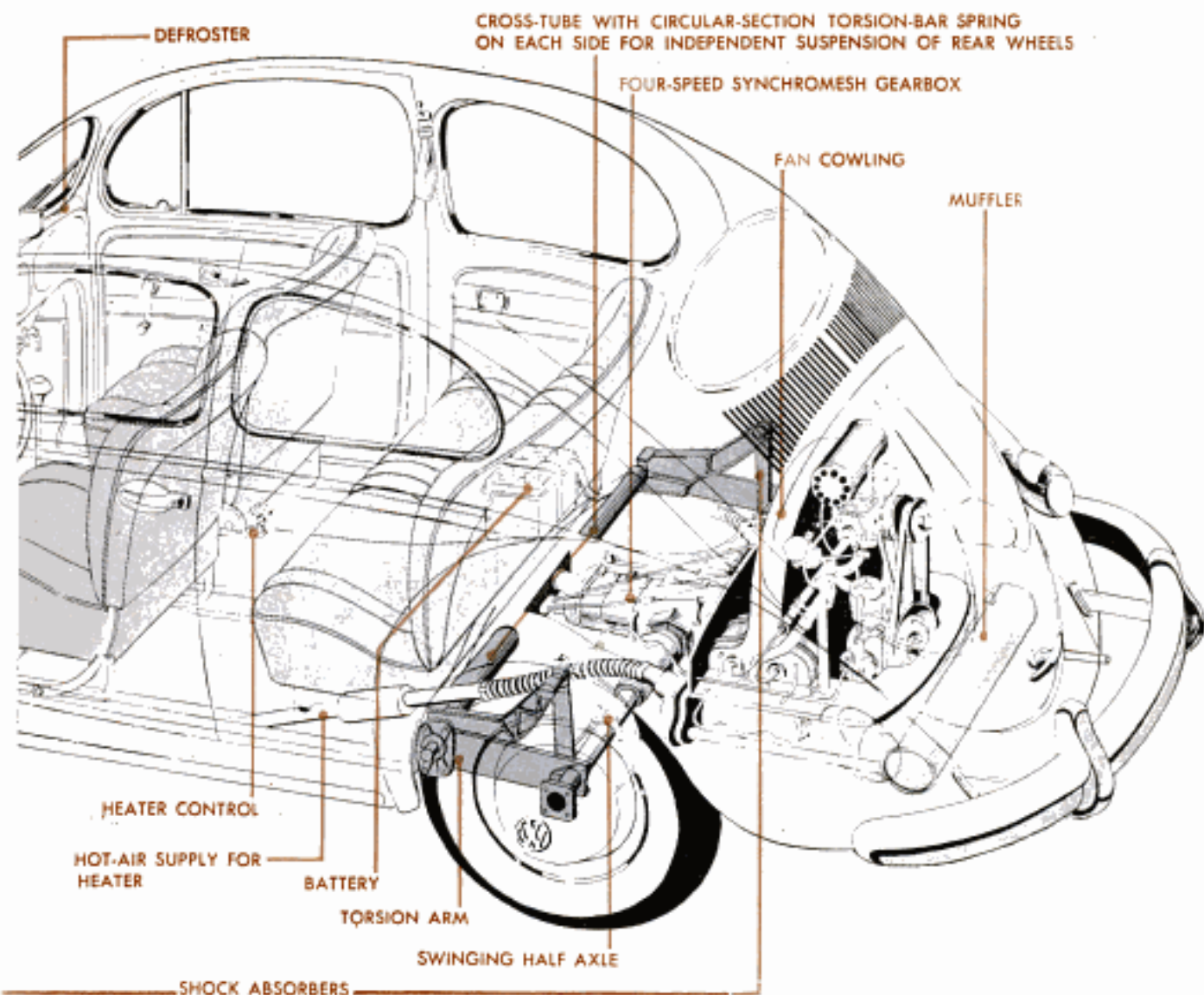
"Excellent traction on wet pavement. Structurally rigid. Sensitive steering. Four-wheel independent suspension."—Lansing, Mich., draftsman.

"Had an accident with my first VW. Its special safety glass is excellent. In accident, two heads went through the windshield. The glass broke up into harmless small pieces. No damage to heads!"—South Ozone Park, N. Y., foreman.

"Quiet, smooth engine at cruising speed (65 m.p.h.). Excellent cornering, easy maintenance."—Detroit, Mich., telephone worker.

"Exceptional engineering, functional design and low upkeep. Riding comfort excellent."—Jersey City, N. J., instructor.





"Rear engine gives a far cooler ride over a long distance in hot weather. Lower horsepower is no disadvantage since I can maintain a higher constant speed than with my larger U.S. car, which has six times the horsepower."—Paterson, N. J., auditor.

"I wanted an economical second car. Now I prefer driving it instead of my large U.S. car."—Lorain, Ohio, physician.

"The air-cooled engine has really freed me from summer and winter radiator worries."—New York City photographer.

"Four hours at 65 m.p.h. with temperature over 100 degrees and motor could still be touched."—Jamaica, N. Y., student.

A great many owners wrote that they have rediscovered the "fun of driving" with their Volkswagen.

"The joy of driving has certainly come back to me since I bought my VW."—Buffalo, N. Y., owner.

#### Volkswagen Complaints

Biggest complaint of the VW owners was the poor rear visibility. Next came the lack of high-speed acceleration.

"Poor vision over shoulder to either side. Do not like divided rear window."—Chi-

cago, Ill., clerk. (The 1954 VW has one-piece window.)

"Over 40 m.p.h. acceleration is painfully slow."—Evansville, Ind., welder.

"I believe a danger exists in the lack of acceleration on today's highways."—Manhasset, N. Y., salesman.

"Horsepower output is good in the lower ranges, but long hills leave a lot to be desired."—Racine, Wis., sales engineer.

"No reserve power for passing."—Highland Park, N. J., salesman.

"A little underpowered, but easy to remedy with twin carburetor kit."—Lexington, Mass., photographer.

Other complaints were less frequent:

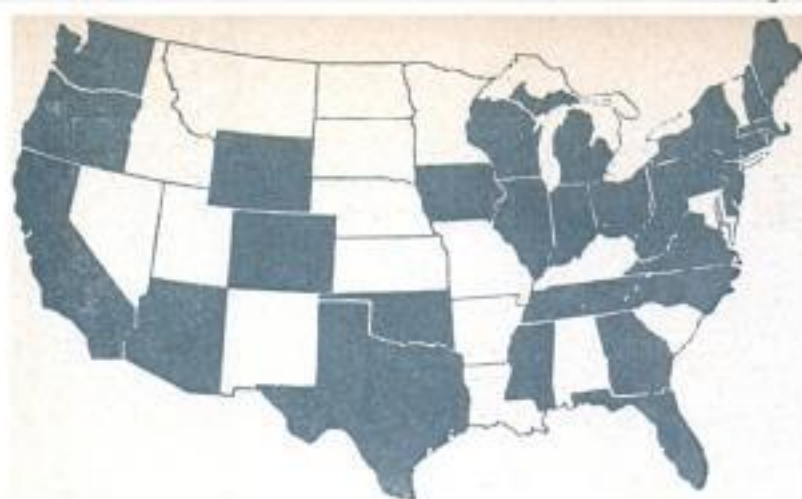
"Engine noisy when one rides in back seat."—Lakeville, Conn., housewife.

"Inadequate protection against front and rear body damage from bumpers of larger cars."—Uniondale, N. Y., engineer.

"Lack of fuel and oil gauge. Low sloping front deck easily pock-marked by flying stones."—Huntington, N. Y., engineer.

"I would rather have gearshift on steering post. Luggage space should be larger."—Port Washington, N. Y., locksmith.





Owners from the 30 shaded states took part in the survey on rear-engine cars

## Percentage from PM Poll of Owners of Rear-Engine Cars

### PERFORMANCE RATINGS

	Porsche	Volkswagen	Renault
<b>Average miles per gallon</b>			
city .....	26.4	32.1	37.1
country .....	32.2	37.4	43.9
<b>Roadability</b>			
excellent .....	95%	91%	76%
good .....	5%	9%	22%
unsatisfactory .....	0%	0%	2%
<b>Handling</b>			
excellent .....	95%	97%	89%
good .....	4%	3%	11%
unsatisfactory .....	1%	0%	0%
<b>Structural rigidity</b>			
excellent .....	94%	95%	55%
good .....	4%	5%	41%
unsatisfactory .....	2%	0%	4%
<b>Acceleration from standstill</b>			
excellent .....	87%	40%	28%
good .....	13%	54%	64%
unsatisfactory .....	0%	5%	8%
<b>Acceleration from 40 m.p.h.</b>			
excellent .....	78%	21%	23%
good .....	21%	66%	62%
unsatisfactory .....	1%	13%	15%
<b>Traction on wet or icy pavement</b>			
excellent .....	65%	75%	73%
good .....	22%	20%	23%
fair .....	8%	4%	4%
poor .....	5%	1%	0%

### BEST-LIKED FEATURES OF THE PORSCHE

(in order of popularity)

1. Roadability and handling qualities
2. Engine and sports-car performance
3. Economy of operation
4. Engineering quality and workmanship
5. Exterior and interior styling

### COMPLAINTS ABOUT THE PORSCHE

(in order of frequency)

1. Engine noisy
2. Bumpers too low and too weak
3. Valve trouble
4. Tendency to "spin out" in fast cornering
5. Difficulty of getting in and out of body
6. Inadequate luggage space

### BEST-LIKED FEATURES OF THE VOLKSWAGEN

(in order of popularity)

1. Economy of operation
2. Roadability and handling characteristics
3. Engine location
4. Engineering and workmanship
5. Air-cooled engine

### COMPLAINTS ABOUT THE VOLKSWAGEN

(in order of frequency)

1. Poor rear visibility
2. Insufficient horsepower, acceleration above 40
3. Bumpers too low and too weak
4. Rear seat too small
5. Engine noisy

### BEST-LIKED FEATURES OF THE RENAULT

(in order of popularity)

1. Roadability and handling characteristics
2. Economy of operation
3. Engine location
4. Convenient maintenance

### COMPLAINTS ABOUT THE RENAULT

(in order of frequency)

1. Too small
2. Engine noisy
3. Bumpers too low and too weak
4. Inadequate horsepower

### MISCELLANEOUS

	Porsche	Volkswagen	Renault
Owners with no complaints at all.....	29%	33%	20%
Would buy another of this make?			
yes .....	88%	88%	63%
possibly .....	11%	10%	16%
no .....	1%	2%	21%
Also own a U.S. car?			
yes .....	60%	43%	63%
Have trouble getting parts and service?			
yes .....	17%	10%	21%
occasionally .....	39%	16%	13%
no .....	44%	74%	66%

### WOULD BUY ANOTHER REAR-ENGINE CAR

(responses of all owners)

Would buy another.....	90%
Might buy another.....	9%
Would not buy another.....	1%

### OVER-ALL RATING BY OWNERS

	Porsche	Volkswagen	Renault
Excellent .....	95%	88%	59%
Good .....	3%	11%	33%
Average .....	1%	0%	6%
Poor .....	1%	1%	2%

### Porsche Comments

Economy is not so important to owners of the Porsche, it being an expensive, carefully assembled sports car that costs well over \$3000 (the Volkswagen, its "bargain basement" brother, lists for about \$1600). Most Porsche owners list roadability and performance as the points they like the most about the car. Economy of operation rates third. The average gasoline mileage

was very high: 32.2 miles per gallon in the country; 26.4 in the city.

"Fantastic performance, economy, road holding, ease of handling and comfort. No service expense. It just runs and runs."—Bremerton, Wash., photographer.

"Will outrun most any United States car, regardless of horsepower. On winding roads it handles far better."—Los Angeles attorney.





Dashboard of the VW is simple. Owners complained of no gas gauge. Hole near shift lever is heat outlet



Designed for the mechanical minded, the Porsche has a more complicated dash, but no fuel-gauge either

"Effortless at 75 and 80 m.p.h. Absolutely no roll on curves. Excellent aerodynamic body."—Detroit, Mich., engineer.

"Unbelievably short braking distance at any speed."—Crestwood, N. Y., food broker.

"Since owning the Porsche, other cars seem obsolete."—Berkeley, Calif., naval officer.

"Air-cooled engine is built like a fine watch—as is the complete car."—Writes a Dallas, Tex., furniture manufacturer.

"The car provides a feeling of being in complete control. Absence of leaning on corners gives a safe feeling I don't find in Detroit products."—Cambridge, Mass., researcher.

"I would like to shake hands with the old-fashioned craftsman who did such a wonderful job on this car."—Iowa City, Iowa, engineer.

"Most fun to drive."—Fitchburg, Mass., sales executive.

"The only 'car of the future' made today."—Marion, Iowa, salesman.

"Amazing economy at speeds above 60."—Decatur, Ill., student.

#### Porsche Complaints

Generally the owners of the Porsche had little to complain about. Most frequent gripe was the engine noise. Other complaints included low, weak bumpers, tendency to spin in fast cornering, small luggage space, difficulty of getting in and out and valve trouble.

"Noisy. Needs acoustical insulation between rear seat and engine. Bumpers should be heavier."—Claremont, N. H., engineer.

"Car was noisy. I corrected it by insulating the belly pan and motor

(Continued to page 262)



Four-cylinder, air-cooled Porsche engine fits neatly into the "trunk." It has two carburetors, gets expert factory tune up. In front is spare tire, gas tank and little luggage space







## Twin-Boom Helicopter to Become Ambulance for Navy Personnel



Convertible to use as an aerial ambulance, the Navy's new Kaman HOK-1 is believed to be the world's first twin-boom helicopter. It normally will serve as a four-place utility craft. To save space aboard aircraft carriers and other ships, HOK-1's rotor blades can be aligned parallel to each other and to the longitudinal axis. Its Continental engine delivers 500 horsepower on take-off and 450 horsepower during cruising. Another Kaman helicopter being built for the Navy, the smaller HTK-1, has been equipped with floats so that it can take off and land on land, water, marshland, snow or ice. Seating three, it has a 240-horsepower Lycoming engine.

## Porsche Sports Car Gets Boost in Horsepower and Speed

Power and speed are increased in the latest Porsche sports-car racer. Horsepower has been boosted to 80 and maximum

speed from about 110 to 125 miles per hour. The body is a few inches lower than the previous model of the same type.







Shotgun and the sets of over-under barrels fit into a handy gun bag for easy carrying by the sportsman



Hunter selects the set of barrels which will give him the desired combination of gauges and chokes

### Single Sportsman's Gun Has Four Sets of Barrels

Trap and skeet shooters have virtually any choice of gauge and choke they want in a single gun equipped with four matching sets of barrels. The over-under barrels are available in 12, 20, 28 and 410 gauges

and in various lengths and chokes. Each set of barrels has a ventilated rib sight. If the sportsman desires, he can buy the gun complete with one set of barrels and add other sets later.

### Inflated Life Rafts in Hold of Sinking Trawler Save Ship

To the Coast Guard rescuers, the plight of the trawler *Dixie B* seemed hopeless. The 64-foot vessel had gone hard aground off the North Carolina coast and was sinking. If pulled off the sandbar she would sink beyond hope of salvage—if left on, she would be ripped apart by the waves. And there was more water pouring into the

hold than could be removed by portable pumps. Finally one coastguardsman thought up a scheme which saved the ship. Two 7 by 13-foot inflatable life rafts were placed in the hold and inflated, raising the level of the vessel 18 inches. Pumped out at low tide, the *Dixie B* was towed back to port without further incident.

### Paint Dispenser Mixes Any Color

Select any color out of a choice of thousands, fix the indicated setting on an automatic paint-mixing machine and within seconds the desired paint is produced. With the mechanical mixer, a paint dealer need stock only 12 colors and finishes to produce custom-color paint in flat enamel, satin-gloss and high gloss. With older systems, a formula was obtained from the color chart and the operator measured out the indicated quantities.







# WHAT'S NEW FOR Your Home

**1. JUICE PIPES** inserted in pie crust prevent fruit juices from boiling through. Made of heat-resistant glass, the sanitary stacks insure a crisp pie crust with all the juice retained inside the pie—where it belongs. The little glass pipes are no trouble to use and can be easily cleaned for repeated use



**2. PORTABLE BED RAIL** protects sleeping child from rolling off bed or davenport, ends bruising falls. Folding prongs slip under mattress or sofa cushions. Designed especially for travel and visits, the compact guard changes a standard bed or sofa into a safe crib, keeps awake, bouncing babies from tumbling to floor



**3. PHONE KIT** attaches to back of telephone or rests on desk top. An automatic index includes phone numbers and addresses, and a push-button tally counts the number of calls made in a month. Two perpetual calendars, one monthly and one yearly, an attached pencil and a convenient memo pad complete the set

**4. BINDING STRIP** allows you to bind your own rugs, using only a hammer and metal shears. The edge of the rug is pressed down upon a row of spikes protruding from the base of the metal strip. The side of the strip is then bent over the edge of the carpet to produce a firm binding. Fabric covering of strip matches rug







**5. CARPET NEEDLE** for making deep-pile rugs at home is automatic and driven by a hand crank. The compact needle permits speedy outlining with yarn of patterns traced on canvas, and can be adjusted to provide piles of three heights. You can sew backward or forward by simply reversing the crank rotation

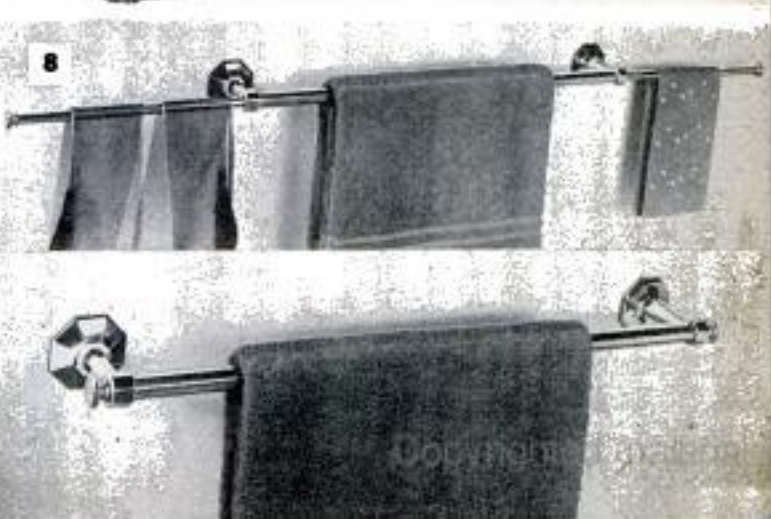


**6. DUAL FAUCET PEDALS** at base of lavatory control hot and cold water flow. Both hands are free for washing, excessive use of water is reduced and water flow is more easily adjusted. The supply valve can be mounted on the wall underneath the lavatory on new or existing installations of bathroom equipment



**7. THERMOSTAT HEATER** turns itself on and off as temperature varies. Thermostat is suspended in air for instant response to small temperature changes. Warning light prevents you from forgetting that the heater is plugged in even when fan and coils are not operating. Handle on top makes unit easily portable

**8. ADJUSTING TOWEL BAR** doubles as a drying rack for stockings and other light clothing. An extension bar pulls out of each end of the hollow rod to extend the total length from 24 inches to 46 inches. The telescoping fixture helps to keep the bathroom neat-appearing even after nightly laundry



**9. CARD RACK** with a capacity of over 60 playing cards keeps canasta, samba or rummy hand in full view of the player. Three slots in the transparent plastic holder keeps cards on graduated levels, making every card visible and easy to reach. Handicapped players find the new holder useful for any card game



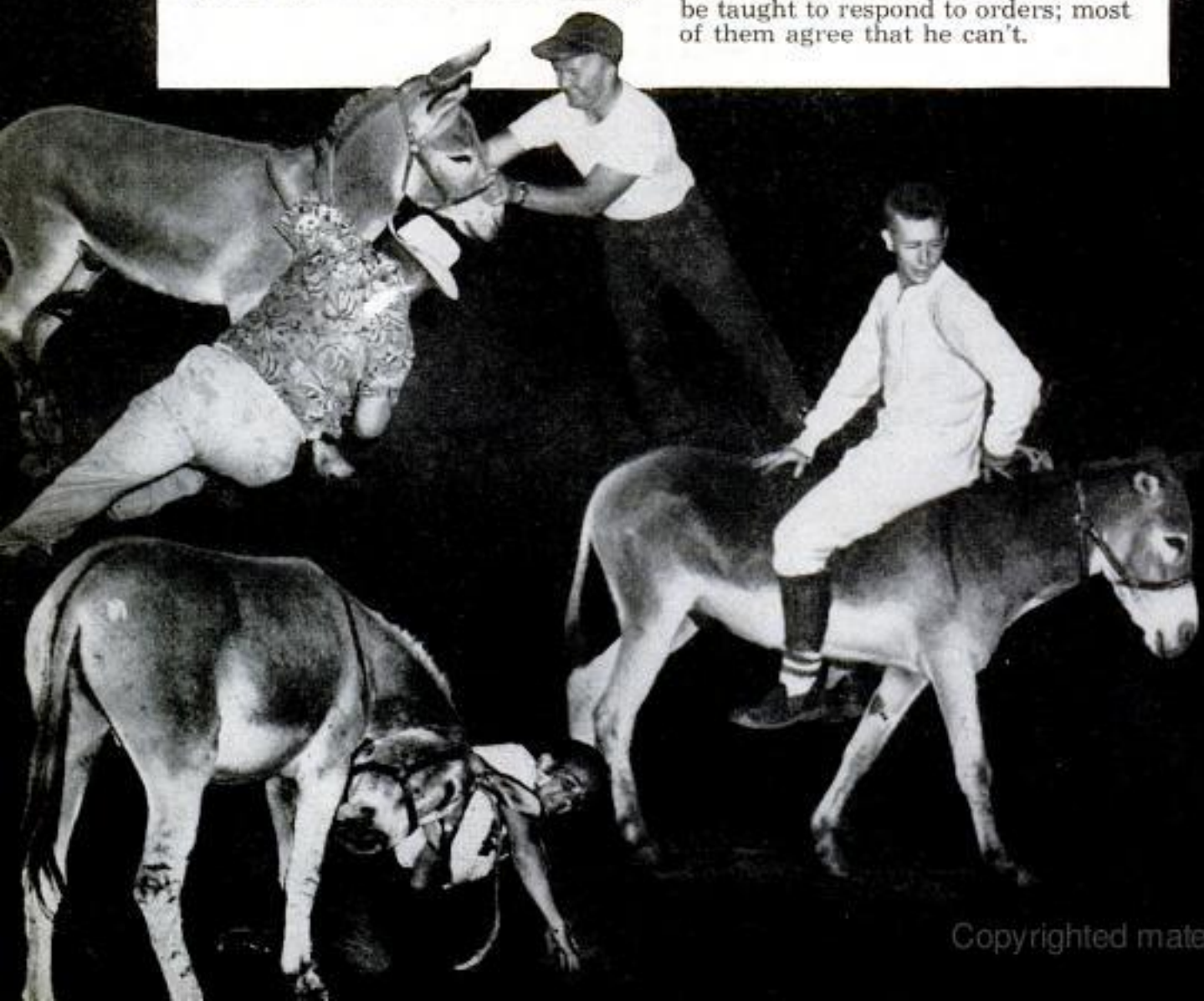




## ***Daredevils Play Donkey Ball***

THERE IS a thrill per second in the familiar games of basketball and baseball when the players use such frisky and uncooperative means of transportation as the donkeys pictured on this page. The light-colored burro at the top of the page is appropriately named Atom Bomb. Donkey ball originated in mining camps years ago when the hard-working

miners "relaxed" on Sunday afternoons by playing baseball on the backs of their faithful burros. Traveling donkey-ball troupes were popular in the 1930s, but today there are less than a dozen troupes left. They travel from town to town and recruit local daredevils to play the game, usually for charity benefits. Old-timers argue whether a donkey can be taught to respond to orders; most of them agree that he can't.







### Galvanic Rod in Radiator Prevents Scale Deposits

Scale deposits that choke a car's cooling system are prevented by inserting a galvanic-type protection rod in the radiator reservoir. The rod consists of copper and zinc plates assembled like the plates in a battery. The hot water in the radiator activates a galvanic field that makes the scale-forming salts inert.



### Easily Operated Lifeboat Radio Transmits on SOS Frequencies

Anyone can operate a portable lifeboat radio that receives and transmits on international distress frequencies. The portable unit, complete with collapsible mast and antenna wire, weighs only 56 pounds. If dropped in the water, it will float for an indefinite time.

### Cabinet Converts Leaves Into Compost in 30 Days

Gardeners can now convert old leaves, grass, kitchen garbage and other waste into soil-building fertilizer in 30 days with an automatic composter. No working or spading is required. You simply place the raw materials in the cabinet, add an activating chemical compound and the resultant humus falls through a grating into a drawer at the bottom. Entirely odorless, the cabinet is screened to bar flies and insects and has a double-wall construction.

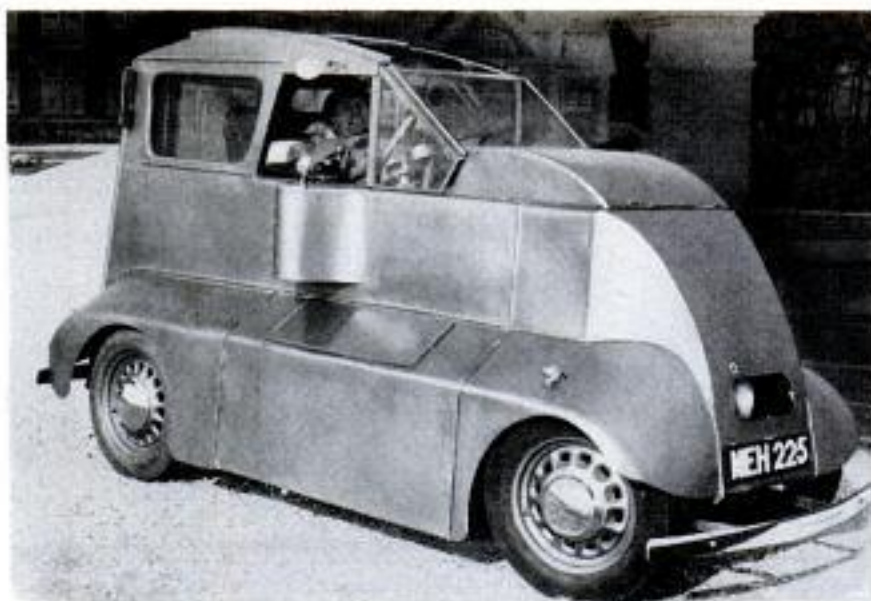
### "Sweet" Chemical Fed to Cows

Milk can be kept sweet by feeding cows menadione, a harmless chemical that slows the action of bacteria. Tests at Florida State University showed that raw milk from treated cows remained sweet for 96 hours at 68 degrees Fahrenheit. Ordinary milk soured after 24 hours. Pasteurized milk from menadione-fed cows remained sweet 20 percent longer than pasteurized milk from untreated cows. One pound of menadione, from which vitamin K is formed, supplies 50 cows for one year.





**INVALID'S CAR** is driven by Englishman Sidney Jones who is unable to sit up because of a spinal injury. He drives while lying on his back. Powered by batteries, the electric car will do 12 miles per hour and go 30 miles on a charge of batteries



**ELECTRIC CAR**, built by Gaver Powers, Florida engineer, contains parts of an old electric auto, an X-ray outfit and a pin-ball machine. One charge of its 14 batteries takes it 60 miles at a speed of 30 miles per hour

# Detroit



**HORSE CAR** is also electric, powered by storage batteries. The robot horse actually walks, trots, runs or gallops and it pulls the wagon behind it on a level road. When the hill gets steep, a belt drive on the rear wheels helps. It was built by a Cleveland war-surplus dealer





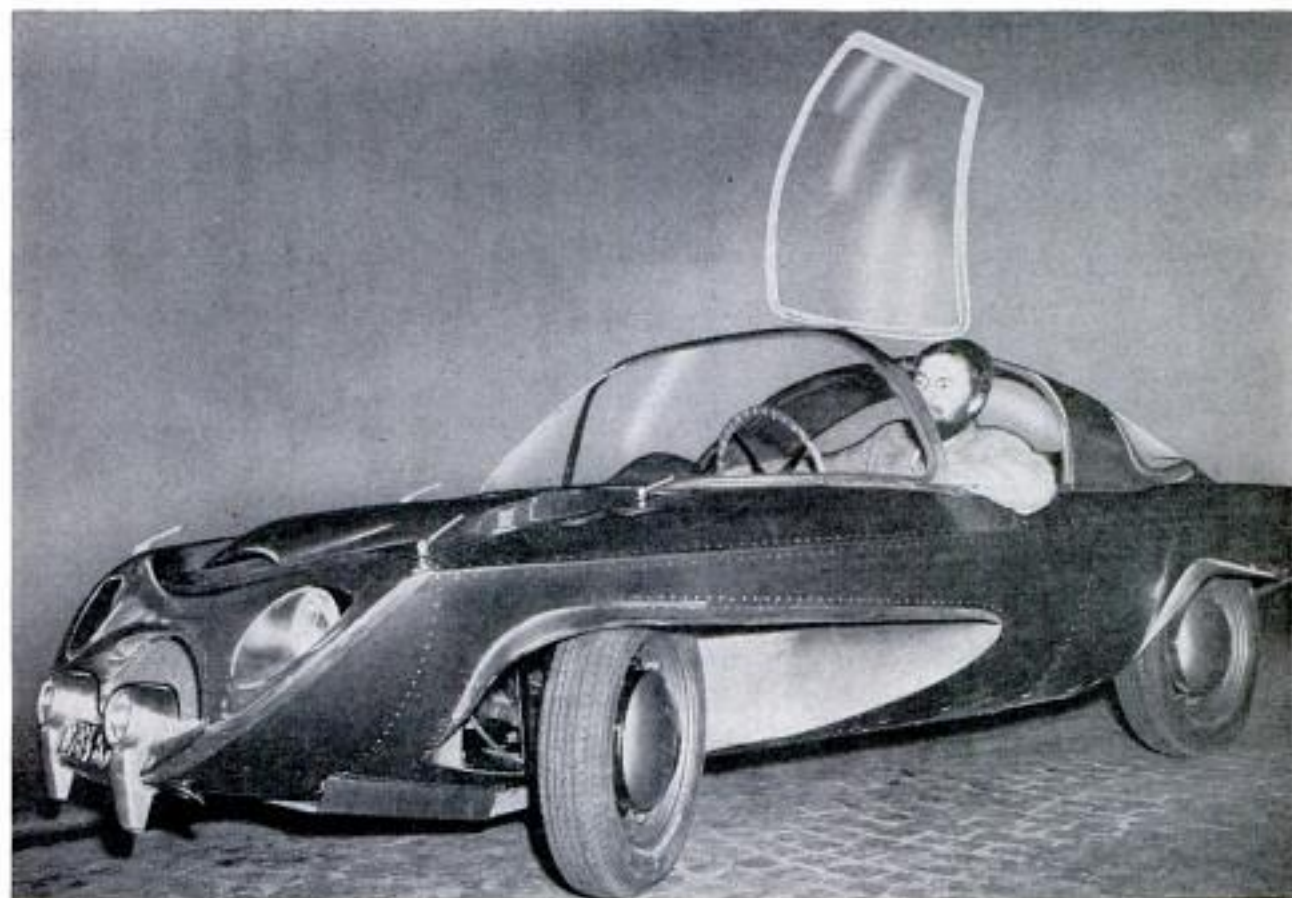
➤ **SLEIGH CAR** needs no snow or ice. A Delaware auto-parts dealer uses it for city deliveries. He mounted the antique sleigh on the chassis of a motor scooter

**PROPELLER "CAR"** is almost an airplane without wings. The engine is mounted on the rider's back. It drives the propeller, pushing man and bike forward

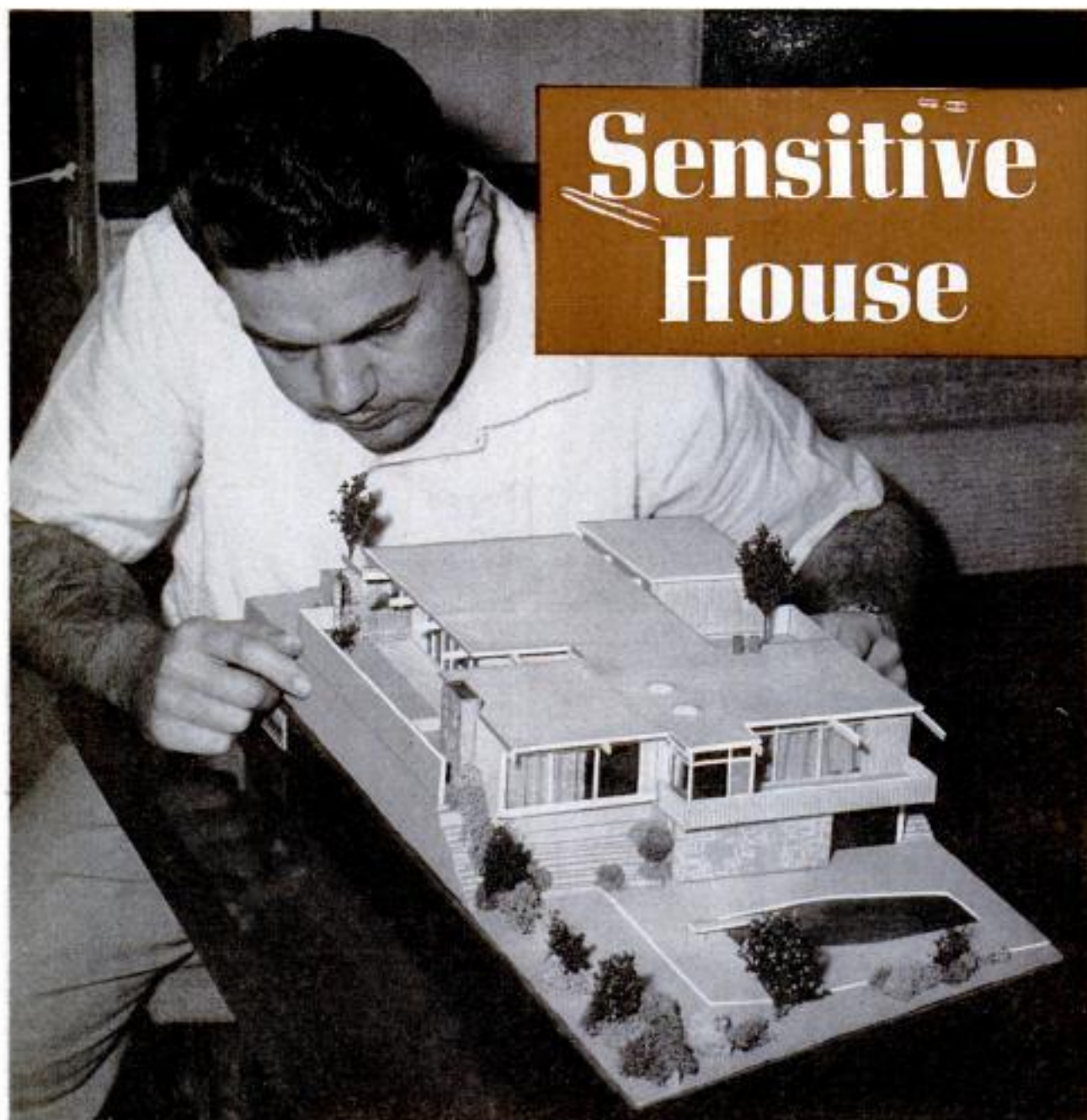


## Didn't Build These "Cars"

**ARTIST'S CAR**, designed and built by a Paris decorator, is also unlike any Detroit product. It has strangely angular lines, a transparent dome and no seats. The driver has to sit on a thick carpet on the floor



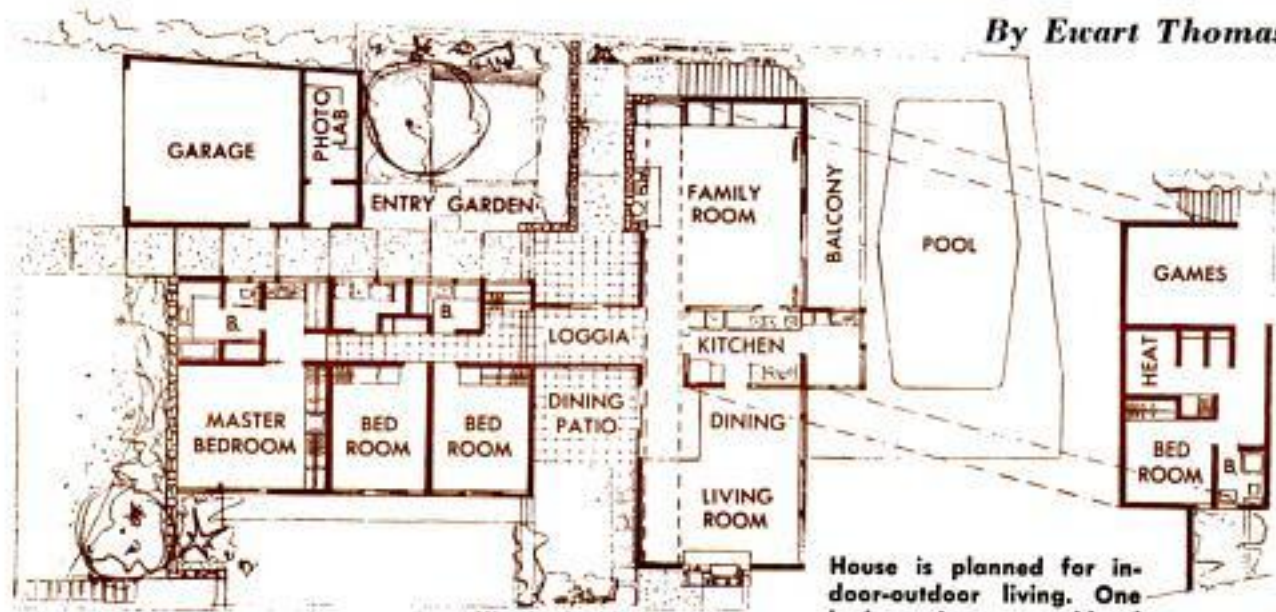




# Sensitive House

Jerry Tamkin displays model of his home with swimming pool at rear. Plastic skylights are for the kitchen

*By Ewart Thomas*



House is planned for indoor-outdoor living. One bedroom is on ground level





Tamkin tests efficiency of fire-detecting unit at alarm "station" in garage. Each room has one unit



Radio-operated mechanism in garage opens or closes doors when signal is received from approaching car

A "RADAR" burglar screen, a sliding front door that has neither hinges nor handle, and a master control panel at the head of his bed are features of a home built by Jerry Tamkin in Los Angeles.

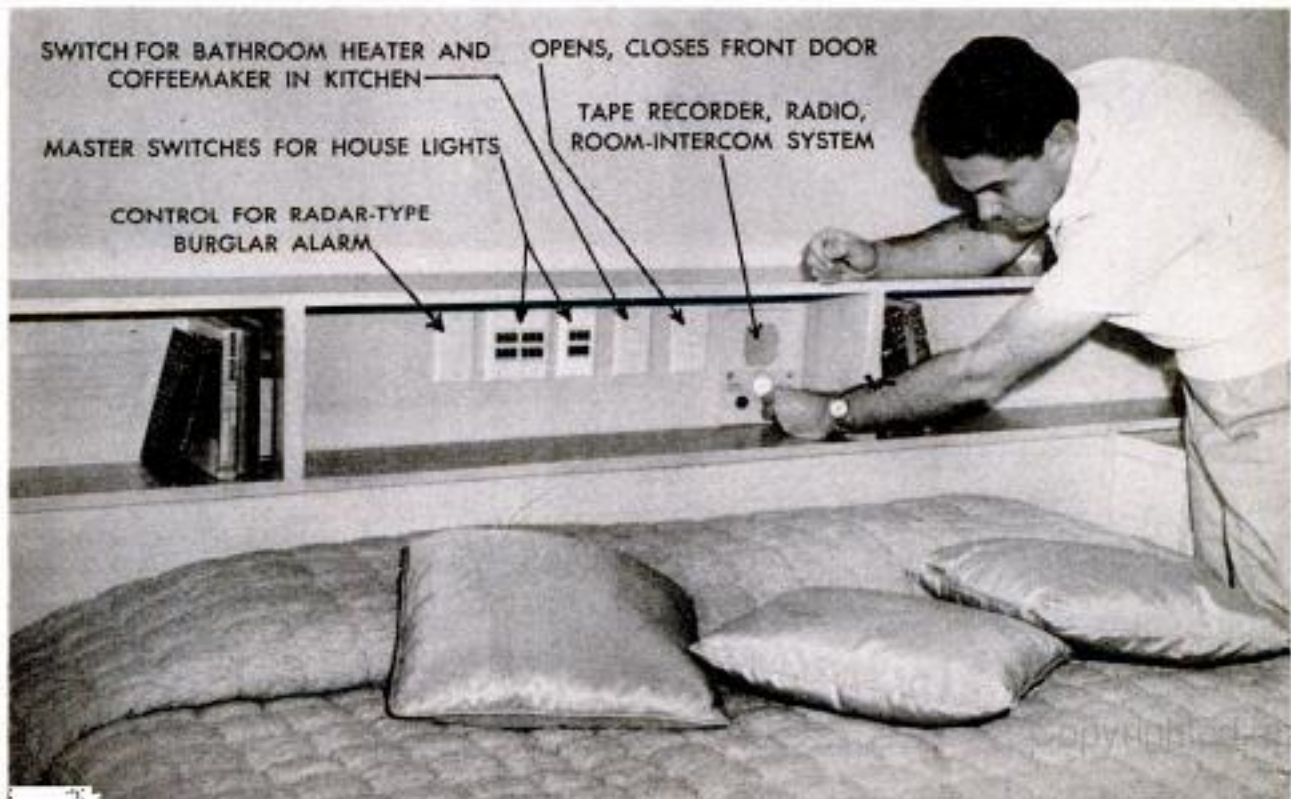
The burglar screen consists of a wire that extends around the outside of the house and that actuates alarm buzzers if an intruder approaches the wire.

Tamkin's motor-driven front door slides to one side when the door key is placed in the lock on an adjoining wall. A button inside the entrance as well as one on the bedroom control panel likewise opens or closes the door.

Tamkin calls his residence the "Home of



Below, remote-control panel in master bedroom. Above, sliding front door opens when key is placed in lock







Entry garden leads to front door. Clay pipes are chimneys from fireplace and adjoining barbecue in den



Above, storage wall in den. Below, built-in range and broiler

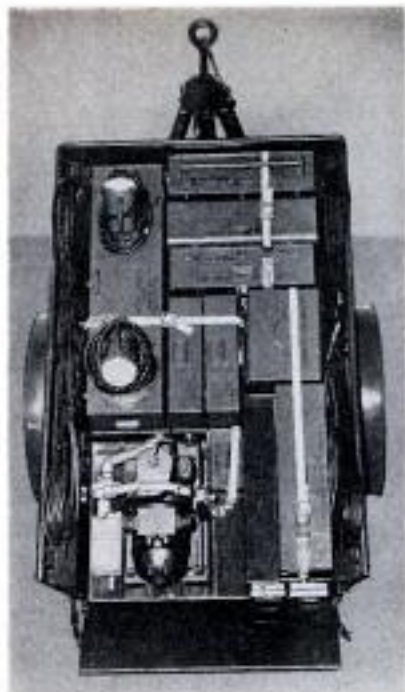


Imagination" because he built into it all the newest devices on the market plus many of his own ideas. From the bedside control panel he can switch on or off the principal outside and inside lights, turn on the burglar alarm, start the electric percolator in the kitchen, turn on the bathroom heater and operate the front door. The panel also has switches for a tape recorder, radio, and a room-intercom system by which he can talk to people in any room or at the front entrance.

A storage wall in his large den provides space for a television receiver, tape recorder and a combination phonograph and radio whose music is piped to outlets in the principal rooms of the house. The storage wall also contains a movie projector and aquarium and has folding doors that conceal a built-in desk complete with interphone, telephone and lighting controls. Traverse window draperies in the den are pulled open or closed by means of a small electric motor.

The house is equipped with an automatic fire-alarm system that has sensitive detectors concealed in the ceiling of each room. The garage door is operated by means of a special radio mounted in Tamkin's car. In the kitchen is a dumbwaiter that is used for lowering snacks to the recreation area and pool on a lower level. ★ ★ ★





## Mobile Power-Tool Unit Aids Front-Line Troops

Already tested in Korea by Army Engineers, a portable electric-tool unit housed in a Jeep trailer is light enough to be dropped from a plane to troops near the front. A standard Army gasoline engine powers the 220-volt, 2½-kilowatt generator. Included are chain saws, circular saws, one ¼-inch drill, one 1¼-inch drill, two

impact wrenches, a grinder, an electric hammer and floodlights. Total weight with trailer is 1370 pounds; the electric generator and any two of its tools can be carried easily by two men if the trailer is stopped by rough terrain or enemy fire. Army engineers used the set in Korea to construct bunkers and assemble steel fuel tanks.

## Plastic Truck Tank Carries 3400 Gallons of Liquid Chemicals

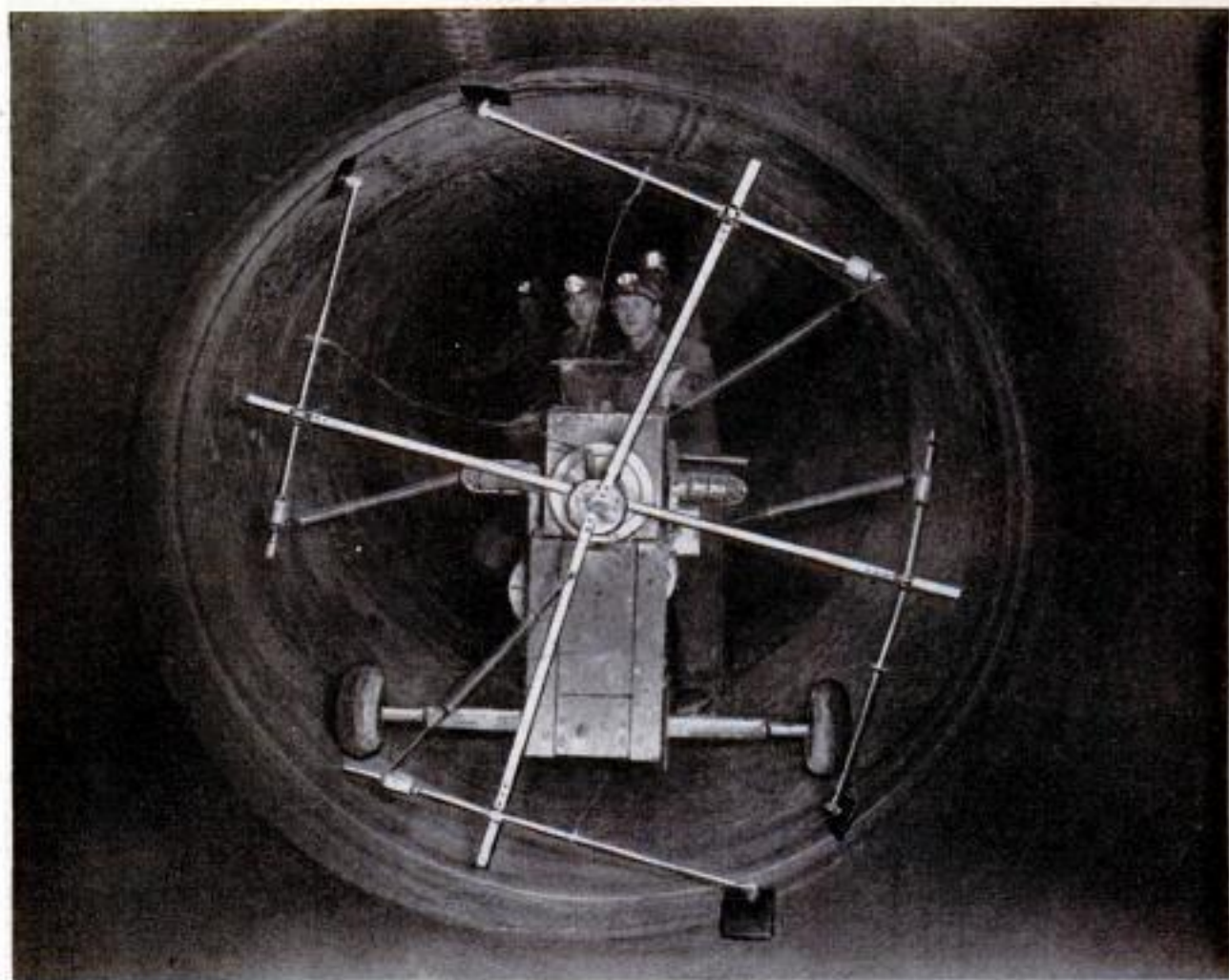
One of the largest one-piece molded structures ever made, a 3400-gallon plastic transport tank is now being used in commercial trucking. It weighs only 7025 pounds, 3600 pounds less than the steel tank it replaces. The P. B. Mutrie Motor Transportation, Inc., Waltham, Mass., is using it to haul formaldehyde and similar liquid chemicals. The oval tank is nearly 22 feet long, over six feet wide.



## Artificial Atom Chip

For the first time the neutral V particle, a bit of the atom's nucleus, has been produced artificially. At Brookhaven National Laboratory, the giant cosmotron atomic accelerator, operating at 2,200,000,000 volts, yielded two examples of these V particles, so called because of the shape of their vapor trails. Only two examples were found on about 4000 photographs taken. Similar particles have been noted in cosmic rays.





Trowel arms of pipe liner rotate like windmill arms while cement is sprayed from whirling multijet nozzle

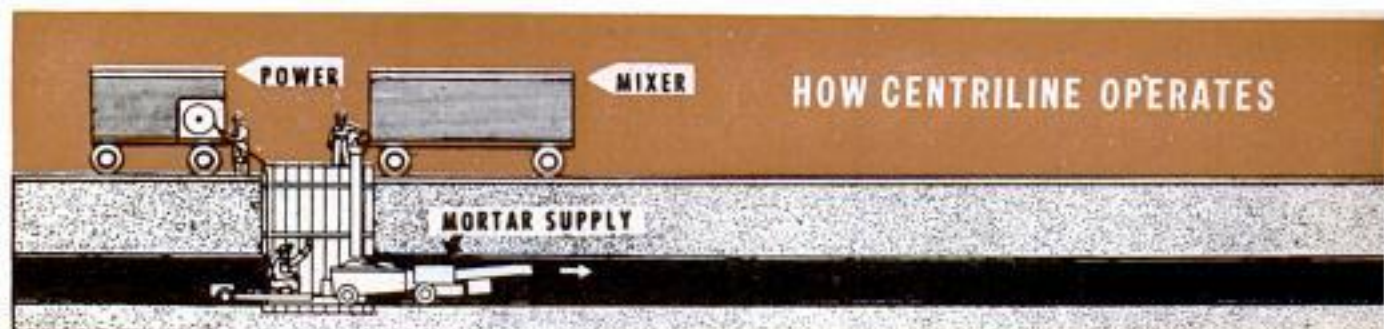
## ***Oh, for the Life of a Human Mole!***

**By Richard F. Dempewolff**

**D**EEP UNDER the ground, crews of rugged men are worming their way through thousands of miles of dank pipe lines beneath city and countryside. Depending on the size of the pipe, they wriggle, squirm or lope along on their feet and knuckles like chimpanzees. Through the tight squeeze of a 16-inch water main, they

ride belly-flop on miniature "go buggies" propelled by outstretched fingertips working against the sides or bottom of the pipe. And some men, lying prone, buzz through the narrow underground labyrinths aboard tiny, rubber-tired trains of electric cars.

Their job, one of the most unique professions, has carried these human ferrets





100 feet deep in the bowels of London, through a pipe so big that a six-footer standing on another six-footer's shoulders wouldn't bump his head. They have squeezed under rivers through pipe narrower than their own shoulders. Their odd little trains have carried them scuttling head-on into some spine-tingling surprises.

The object of all this burrowing usually has to do with the precious water that most of us take for granted. Turn on the tap and down comes your shower. But, supposing some morning it oozed out in a thin trickle? And what if the fireplug out front produced a rusty dribble when you needed a flood? That's what would happen if the thousands of miles of 4 to 148-inch mains carrying water from mountain reservoirs to your kitchen sink were left to shift along for themselves.

If you could peer into the black gloom of a big iron or steel pipe that had been in service for 30 years, you'd soon see why. Lumpy, barnacle-shaped corrosion deposits, called tubercles, crowd in around the inside wall of the pipe and gradually choke off the flow of liquid, killing pressure and often eating tiny holes through the pipe wall. In a 30-inch pipe of such vintage, even though population growth has increased water needs, an original gushing torrent of 140,000,000 gallons per day would have trickled out to 65,000,000, requiring pumps to force up enough pressure to service the same territory.

For years, men have forced scraping machines through such pipes to clean out tuberculation. But with each cleaning, the blobs of corrosion form faster, and in some cases, big pipes finally must be scraped every few months to do their job at full capacity.

Actually, men have known for a long time how to protect pipe insides from coming apart. Back in 1836 a French scientist



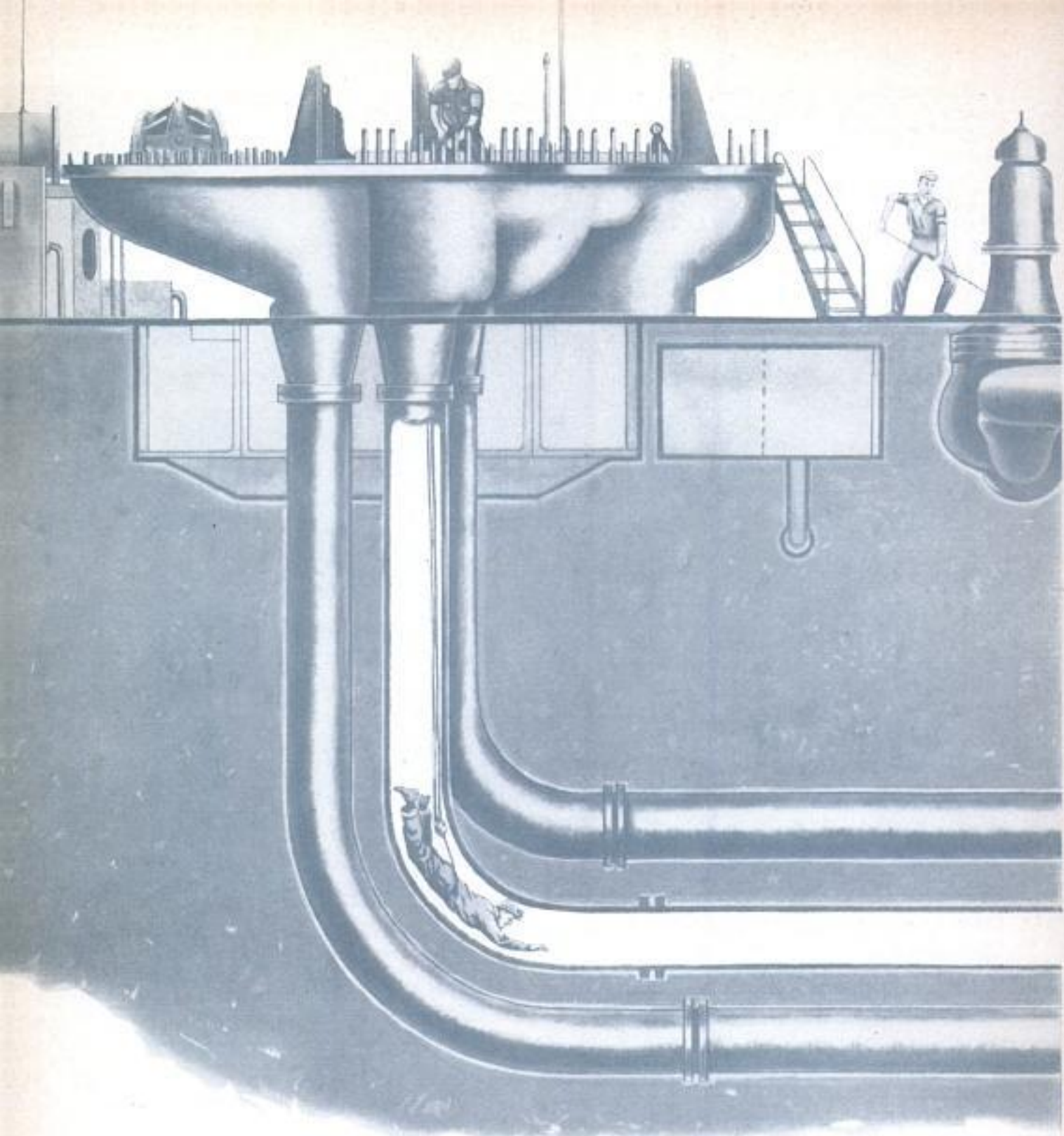
Pipe worker riding contoured "buggy" worms his way into a 16-inch pipe with automatic liner. He will come out feet first

discovered that by lining metal pipes with a thin layer of hydraulic cement, tubercles stopped forming, corrosion halted, and the line would carry full capacity indefinitely. Such a cement-lined water main was buried in New Jersey in 1845. Someone dug it up for new construction a few years ago and found to his amazement that, after a century of use, it was still in excellent shape.

It's easy to line new pipe in short sections before it's buried. Some of it comes that







way today. But what about the miles of pipe already in the ground, which grows tubercles because it didn't have a cement lining when it went in?

Recently, engineers have come up with some clever answers. One of the cleverest is a system developed and put into operation by the Centrline Corporation. Mechanical star of the show is a fantastic little electric mole that comes in varying sizes to fit pipe of varying diameters. It crawls through underground tubes spraying cement from a whirling multijet nozzle in its tail that "revs up" to 1000 revolutions per minute. Behind the nozzle, long, skinny arms slowly rotate delicately sprung

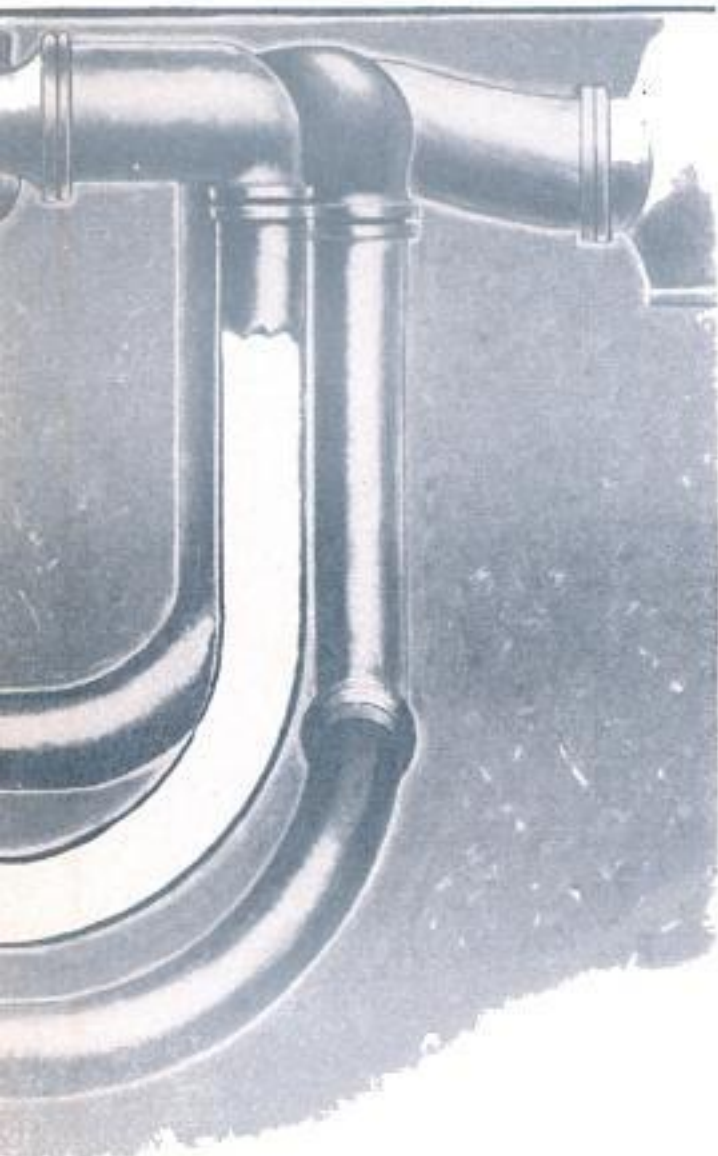
trowels that put a precise finish on the new lining. Cement is flipped out with such force that it will even stick to wet pipe walls. Thickness of the lining is determined by the speed of the machine's whirring drive motors.

Some of these liners carry men on their backs. Others burrow alone, completely remote-controlled, pushing a lining through pipes at some 800 feet per day. Already they have ferreted their way through some 3,000,000 lineal feet of buried pipe here and abroad, spewing new and virtually permanent life into them at costs that are a small fraction of the price of new pipe. A remarkable thing about the lining is that it



Cutaway diagram shows how human moles were used to retrieve 50 steel turbine blades that had broken and fallen into the pipe line of a turbogenerator. Photo at right shows only the feet of Earl Parker as he is lowered by block and tackle into the 19-inch vertical steam line. He and co-worker Ken Powell had to creep through two vertical right-angle turns 20 feet down in the pipe line. Both men are six footers. They found all of the broken turbine blades and a grateful company made a movie of job

Courtesy of Consolidated Edison Company of New York



will cover leaks and holes as big as your hand. In tests, lining covering a six-inch hole in a steel pipe held up under more than 300 pounds of water pressure.

It takes more than one machine to line an old pipe, of course. The line must be opened and cleaned. Men go through to see that all obstructions are cleared. Water must be cleaned out. Once the grotesque lining machine goes in, it has to be fed a constant supply of cement. Then, afterward, special crews tunnel through to make sure the lining is perfect before the pipe is sealed and fluid gushes through it. All this requires a wide assortment of tricky contraptions and a crew of human moles to run



them. Each of the pipe-lining units at Centrline is packaged neatly in a semitrailer, self-contained and ready to move in on any pipe that needs new innards. A built-in mixer in the rear of the trailer turns out cement to supply the hungry liner via hose, electric car or hand-propelled carts. A generator up front whirls up the 50,000 watts needed to run the mixer, the winches and the heavy little electric trains and cars that buzz along deep down in the pipe below the street. The center section carries all the mechanical gear to and from location and holds a day's supply of cement and sand on the job.

To show *Popular Mechanics* how it works, Centrline invited us to crawl and coast around with them inside dark tubes that twisted tortuously beneath the streets of Cleveland, Ohio, and Norfolk, Va. In Cleveland, Charlie Smiley's team of veterans was working its way toward a river through a 36-inch water main—big enough for men to move around in with cement carts. The Norfolk job was 16-inch watermain that Earl Parker's boys could barely squeeze into when they belly-whopped on little underslung carts with curved bottoms that fitted the contour of the pipe with a clearance of about one inch.

Before an old pipe can be lined, it must be cleaned. In Norfolk, Joe Fielder, colorful old veteran with the National Watermain Cleaning Company, was busy "shooting" the line ahead of the Centrline crew. In Cleveland, Joe Quigley was doing the same thing.

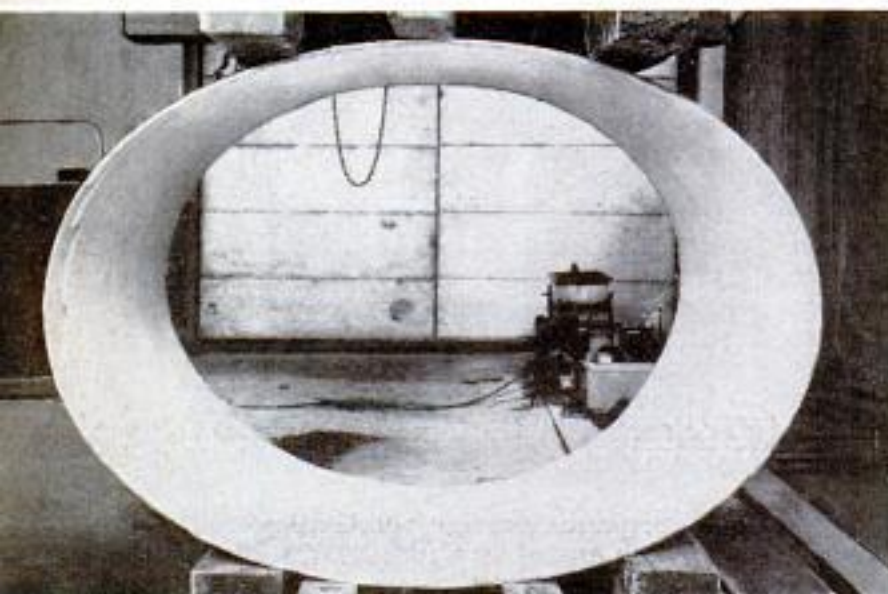




Pipes are cleaned with a "go devil" which has hoelike blades and is flushed through pipe (below) to scrape interior clean



Below, to prove cement will bend without cracking, Centriline engineers depressed 72-inch mortar-lined steel pipe 13 inches



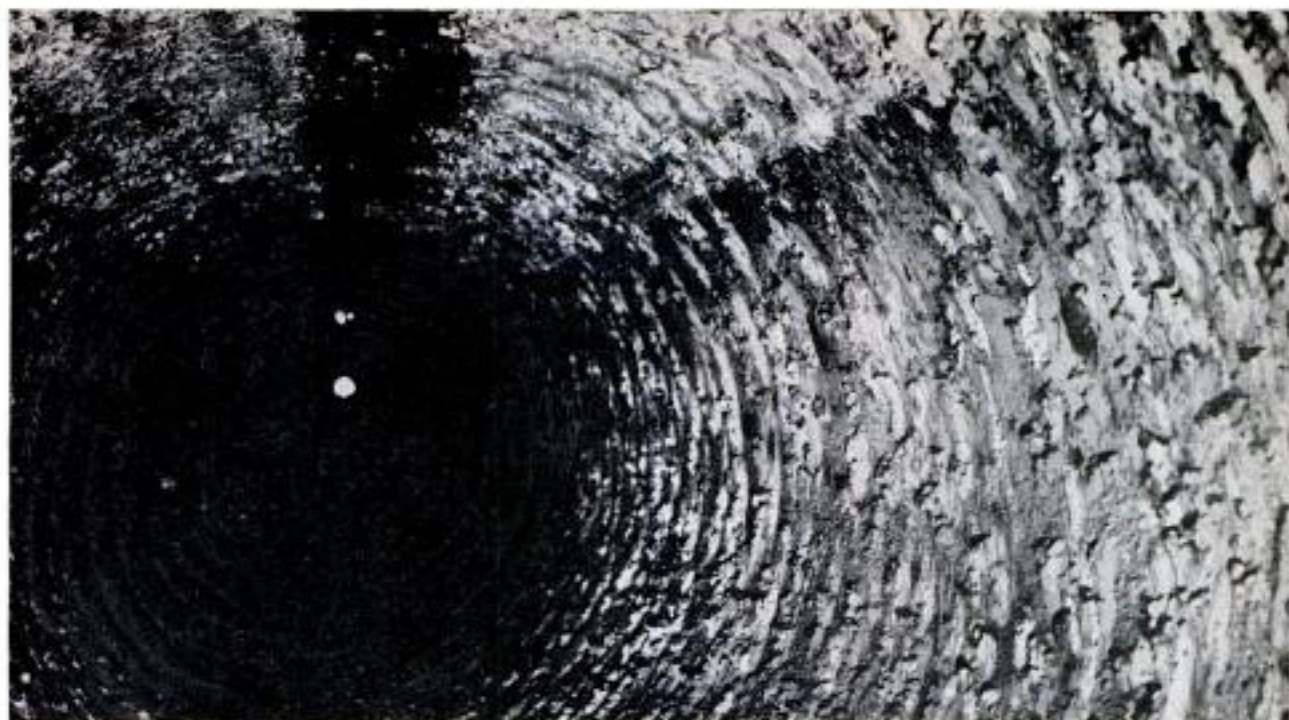
At intervals varying from 500 to 1000 feet along the line, men dug excavations, bolted huge rotating pipe cutters on the main and removed 10-foot sections called "nipples." Things the men call "go devils" do the cleaning job. These machines look like a string of steel bushel baskets, dangling one above the other on a cable like nested Christmas bells. Each "cleaning head" bristles with scrapers, resembling little steel hoes, which are bolted to big discs. Into the opening goes the machine, its spring-steel hoe edges pointed outward against the pipe wall. Nipples are winched back into place, fastened with Dresser couplings and full city-water pressure pours into the pipe behind the big go-devil. Perforated pistons on its front end catch water pressure from behind, and off it goes down the pipe, grinding and scraping the walls down to their skin. Huge tubercles and chunks of rust pile up in front of the monster as they break loose and are washed ahead through the perforations in the go-devil's pistons. An incredible quantity of stuff will gush in a roaring cascade from the yawning excavation that is left open at the end of the line.

"In a 2½-mile stretch of pipe in Louisville," reminisces Joe Fielder, "we cleaned out 76 tons of junk from a line in one shot."

If everything goes well, the cleaner, with 1200 gallons of water a minute pushing it, rumbles along beneath the ground at 60 to 80 feet a minute—about the speed of a slow walk. But everything doesn't always go well. "She'll take almost any degree of turn in a pipe," Joe reveals. "But obstructions can trip her up. Lead for instance, piled up in the line from a sloppy joint, will roll her up like a candy ball." When this happens, the spring steel of the go-devil can get wedged in the pipe so thoroughly that it must be cut out.

To keep track of their underground monsters, Fielder and Quigley follow them above ground by sound as they grind through the pipe. When the men lose the rumbling machine in deeper pipe, a broomstick sounding rod—one end pressed to the ground and the other to an ear—helps them keep track of its progress. It's not al-





Before cleaning—interior of 48-inch steel pipe heavily encrusted with deposits that slow flow of water

ways a snap to stroll along above a galloping go-devil. Fielder tells about the time he shot 25 miles of pipe at one crack in Texas, running and stumbling across the prairies all day long as a crew of men cut a swath through the tangled mesquite ahead of him with machetes.

Once a line is cleaned, Centriline's crews move in. Men crowd the excavations, removing nipples again. In smaller pipe, like the 16-inch in Norfolk, a self-propelled machine called a "ferret" whisks down the long tube, trailing the cable that feeds power to it from the generator on the trail-

er, plus a steel cable that will be used to winch the squeegee through from the other end. The latter contraption looks like two disc wheels with rubber tires. As it drags down the pipe, it scrapes up water in low spots, pushing it out to the opening. Then the lining machine goes in. The long-nosed affair is hitched to a tiny electric engine that moves it slowly through the pipe. A hose line feeds the mortar to it from the mixer unit up on the street. Between engine and liner, a man lies prone on a tiny buggy, making a train about 21 feet long.

(Continued to page 250)

After cleaning with a go devil and lining with mortar, the pipe shown at top of page looks like this





## Truck Cab Is Sliced in Half to Facilitate Loading of Lumber



One-man delivery of small orders of building materials is speeded by an island-type truck designed by an Oregon lumber-yard owner. The cab of the 1-ton Dodge truck was sliced just off center and the truck bed extended to the front bumper. The bed is only 32 inches from the ground, making loading less strenuous. Extending full length, the bed is 20 feet long on the right.

## Small Portable Camera Photographs Fingerprints at Scene of Crime

Fingerprints are gathered in record time by a portable camera with built-in lighting. Its narrow nose fits on small ledges, on undersurfaces and other usually inaccessible spots. Flashlight batteries power four tiny bulbs around the lens hood. Pressure on a guide-block cover first turns on the light and then trips the shutter to make an exposure on  $2\frac{1}{4}$  by  $3\frac{1}{4}$ -inch film. Coins, stamps and portions of printed material can be photographed.



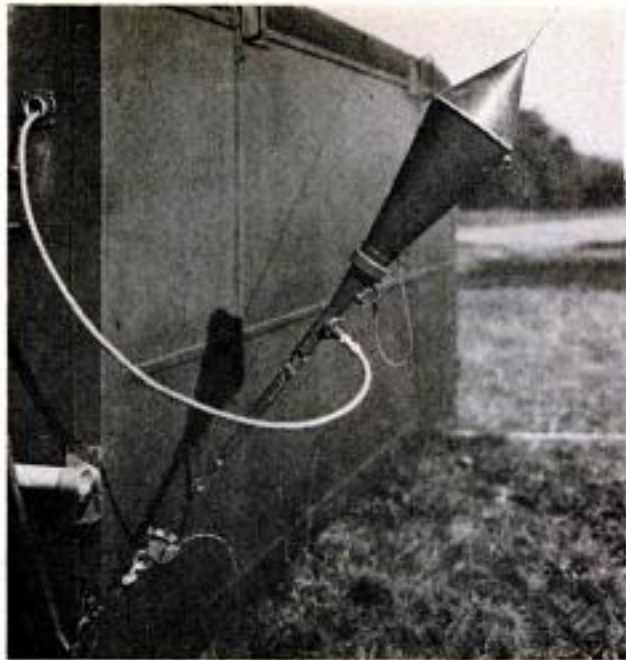
## Low-Slung Chair for Television Viewing Folds Into Hassock



Contoured for comfortable sitting, a low, plastic-covered chair designed for television watchers can also be folded into a hassock. It doesn't interfere with the vision of those seated behind on ordinary-sized chairs and couches. The adult size has a headrest that can be folded out of sight. A beach-lounging model of the chair has a Zipper-covered hollow bottom for towels and suits.

☐ Just the fuel carried by a jet bomber weighs more than a World War II bomber did when fully loaded for combat.





### Single Transmission Line Carries 30 TV Channels

Wide uses are forecast for a transmission line developed by the Army Signal Corps that consists of a single wire, special insulation and funnel-shaped terminals. Up to 30 separate television programs can be carried on the surface of the simple, inexpensive line. A new radar method uses the wire in eliminating costly, bulky wave guides and simplifying the problem of feeding power to rotating antennas. Microwave-relay techniques are improved by the wire's efficient transmission of energy from sender to antenna.



### Atomic "Preserver" Kills Food Bacteria

Scientists at the University of Chicago are testing radioactivity as a means of preserving foods. The "preserver" is a cobalt tube placed in an atomic reactor and made radioactive. It is installed in a lead chamber and sealed with lead plugs which are lifted by a rope and pulley. The fresh foods are sealed in the tube for periods ranging from a minute to several hours. Then they are tested to determine the effect of radiation.

### Breath-Controlled Television Set Entertains Polio Victim

Being encased in an iron lung doesn't stop an Illinois polio victim from tuning in her favorite television shows, for she controls the set with her breath. A small unit beside her head contains two telephone mouthpieces which funnel air

against delicately counterbalanced vanes, which actuate switches. A gentle puff into one mouthpiece changes the channel; the other mouthpiece controls the sound, consecutively turning it on and off. A mirror above her head reflects the TV image.







### English Hearing Aid Mounts on Spectacles

Attached behind the ear to a spectacle frame, the earpiece for an English hearing aid is held securely and inconspicuously. A gimbal mounting with swiveling support holds the bone-conductor earpiece firmly against the bone. A short, tiny cable leading to the amplifier passes inside the wearer's shirt collar.



### Chemical Shotgun Shell Absorbs Moisture

Atmospheric moisture which condenses inside a shotgun barrel is absorbed by a new shell which is filled with a chemical. The shell is slipped into the chamber of the gun between hunting periods to keep the barrel free from rust and corrosion. Machined from aluminum, it is a duplicate of a real shell.

### Coating Protects Metals Against 5000-Degree Temperature

Metals treated with a new spray-on material developed by the B. F. Goodrich Company can withstand temperatures up to 5000 degrees Fahrenheit. A  $\frac{1}{16}$ -inch coating of the new insulation, called Pyrolock,

protects metal for as long as 10 seconds against flame temperatures hotter than the melting point of the metals. It was developed for the Defense Department for use in the rocket and guided-missile field.

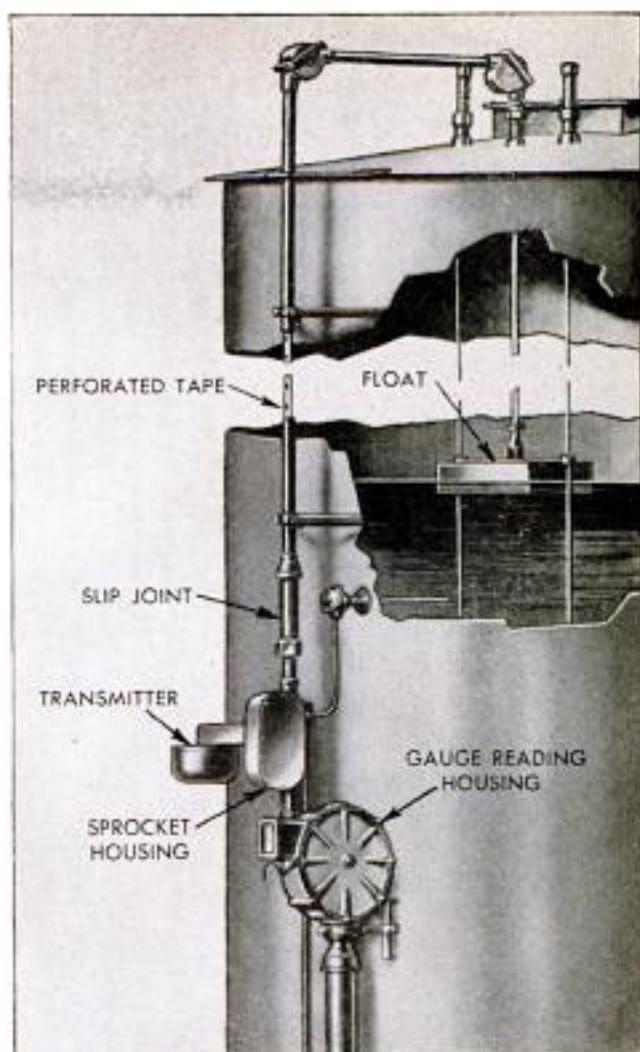
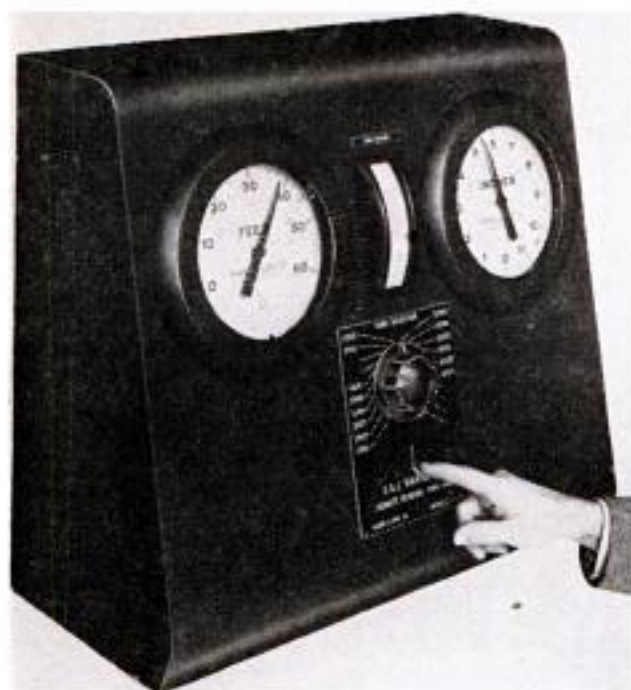
### Two-Section German Bus Uses Bellows-Type Connection

Consisting of two sections coupled with a bellows-type joint, a large German bus carries 120 persons. When used as a metropolitan bus, it has a two-man crew with the conductor riding at the rear. All pas-

sengers board the bus through the rear door and exit through either of the forward doors. When built for longer runs, the bus has adjustable sleeping seats, radio, tape-recorded music and refreshments.





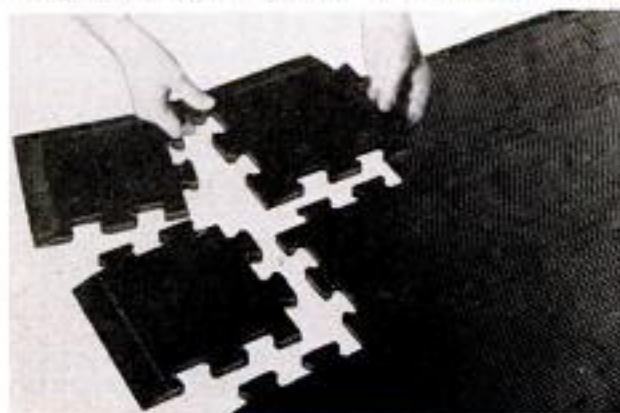


## Long-Distance Gauge Checks Levels in Faraway Storage Tanks

Seated in a New York skyscraper, an engineer now can measure the contents of storage tanks located in Houston, Tex., or Los Angeles, Calif. He dials the number of any storage tank, then reads instruments which report the height of the liquid to the fraction of an inch. The new remote-gauging system operates on any telegraph, teletype, telephone, radio or microwave circuit. First developed for the remote reading of tanks in the petroleum industry, the system can be used in other industries

and for measuring the water level of lakes and reservoirs as an aid in flood control, irrigation and power production. The basis of the system is a perforated steel tape connected to a float that rests on top of the liquid in the tank. A ratchet mechanism keeps track of the movement of the tape. It operates an electronic device that furnishes impulses to the transmitter, thereby sending out a report of the liquid level inside the tank. The transmitter can be adapted to radio or telephone circuits.

## Interlocking Rubber Tiles Fit Together Like Jigsaw Puzzle



No mastic is required in laying rubber floor tiles that have interlocking edges. The tiles fit together like pieces of a jigsaw puzzle. They are available in two sizes—eight inches square and 24 inches square, and in thicknesses of  $\frac{1}{4}$  and  $\frac{1}{2}$  inch. The flooring can be laid from wall to wall or assembled with a beveled border. Suitable for installation below grade and on cement floors, the material requires no adhesive. One advantage of the flooring is that it can be picked up and relaid in another location if desired.



# RELAX!

By Dr. Donald A. Laird

**A**S THE IRISH laborer exclaimed, "'tis hard work doing nothing, that it is."

The artist's model has nothing to do—just strike a pose and keep muscles tensed to hold it. Keeping in a more-or-less fixed position is hard work because of static tenseness. It is called static, not because sparks are given off but because there is a lack of motion.

The small boy who has to sit through a ponderous sermon gets the wiggles because of static tenseness. Activity is needed to restore the dynamic equilibrium. People who attend long meetings, such as conventions, get bothersome temporary attacks of static tenseness. At a ball game, a seventh-inning stretch really should be taken about every other inning.

A person driving an automobile any length of time is likely to notice static tenseness in the leg and foot on the gas pedal. Painful cramps in the calf of the leg are not rare.

Persons in many occupations can arrange materials and equipment so they can shift position or move around occasionally. Being able either to sit or stand at work is a simple example. Another example was given in a patent issued in 1887 when women were wearing flowing skirts with bustles underneath. The invention was a combined bustle and stool—fine for watching a parade from the front row!

How can an individual detense from static tenseness in connection with so-called mental work?

Eye muscles provide a good example of the usefulness of intentionally shifting the tenseness as a relaxing aid. There are three pairs of muscles which control the eyeball's movements. As with most voluntary muscles, the muscles of each pair are ar-

Buckingham Palace sentry learns to "pump" calf muscles to relieve tenseness while standing at attention

POPULAR MECHANICS

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ranged in opposition. When the lower muscle pulls the eye down to look at the desk top, the upper muscle has to stretch. It is pull-and-give in that fashion with all three pairs all the while we are awake.

There are four or five jumps of these pulling-and-giving eye muscles as you read one line of print. There can be a considerable total of these darting shifts during the course of a day.

These muscles are in balanced equilibrium when the eyes are looking slightly above a horizontal line. Nature wants the eyes to look up slightly. If you watch the movements of the eyeball as a person slowly closes his eyelids, you will see the eyeball automatically turn upward.

Yet most occupations require a downward look. This causes continuous tenseness because it keeps half the muscles shortened and the other half elongated. This occurs even while reading a magazine or watching the traffic while driving an automobile.

Eye muscle tenseness can be balanced several times a day by turning the eyes upward. Raise the eyes and look at the right corner of the ceiling, and hold them in that position for a few seconds. Lower them.

Now raise them to look at the left corner

of the ceiling. Repeat this four or five times, alternating right and left. The eyes can be either open or closed during this detensing. They should always be closed, however, if there is a bright light on the ceiling.

When close eye work is being done, tenseness is increased in a small muscle inside the eye which automatically focuses the lens. If this tenseness is continued long enough, it may cause this focusing muscle to become trembly (a spasm), blurring the vision momentarily.

If your work requires reading or equivalent use of the eyes for any length of time, pause a couple times each hour to look out the window at the most distant object you can locate. Spend two or three minutes looking into the distance.

Such detensing from close eye work can also be combined with detensing the muscles that move the eyeball—look to the far right in the distance, then to the far left and far up.

All other muscles can be relaxed at the same time. Just let your jaw and back and stomach relax, and slump as you look into the distance.

Mental work provides another example of static muscular tenseness. Very little energy is used for the brain work itself—

**Good news for office workers! Author says they should move about occasionally or put their feet on the desk**







Closing the eyes or looking far into distance relaxes focusing muscles of eyes, preventing blurred vision

only about four calories an hour. But brain work tires the person physically because of static tenseness, as if the thinking were being done by all the muscles.

Experiments by Dr. G. L. Freeman have shown that when a person starts some mental work there is a sharp increase in static muscular tenseness. And if the person is interrupted while doing the mental work, his muscle tenseness is raised again.

Artists' models, soldiers standing at attention, brain workers and others who are

Another eye exercise: Arrows show path of vision as eyes look up to left, then down, then up to right



required to hold a position (even continuous sitting), should follow two rules to minimize static tenseness.

1. Shift the position slightly every 10 or 15 minutes. The movement is relaxing because it offsets static tenseness.

The soldier at attention, for instance, is taught to shift his weight to his left leg for a time, then back to his right. A shift of this sort can be made without the reviewing notables observing any change.

The mental worker or industrial worker can make greater shifts. The typist can put one foot on top of the other, or lean slightly backwards for a few minutes, or stretch out her legs, or run an errand.

The mental worker can put his feet on the desk. Three out of four executives do!

2. "Pump" or flex the calves of the legs to speed up the return of blood to the heart.

All sedentary workers, whether they sit or stand at their work, should pump the calves of their legs several times a day or put their feet on the desk (or even stand on their heads!) to relieve the congested circulation in their lower legs. Dental students are taught to pump this way:

Just tense the calf of the right leg and hold it squeezed for a few seconds, then let it relax as fully as possible. Then do the same with the other leg while the right remains relaxed.

Remember, big tensions are just an accumulation of little ones. Relax away the little ones to avoid the big ones. ★ ★ ★



## "H BOMB" VAULT HAS 18-TON DOOR

NOT EVEN the blast of a hydrogen bomb, it is said, could destroy the new vault in the Ohio State House. Its rock, concrete and steel construction make it indestructible by any known force. Four time locks and two separate combination locks are encased in the massive 18-ton door, behind which are stored over \$1,000,000,000 in bonds. If anyone is accidentally locked inside the vault a fresh-air vent prevents him from suffocating and an emergency hatch allows him to leave the huge safe.

Right, vault door. Bottom of page, massive escape hatch. Below, inlet for fresh air





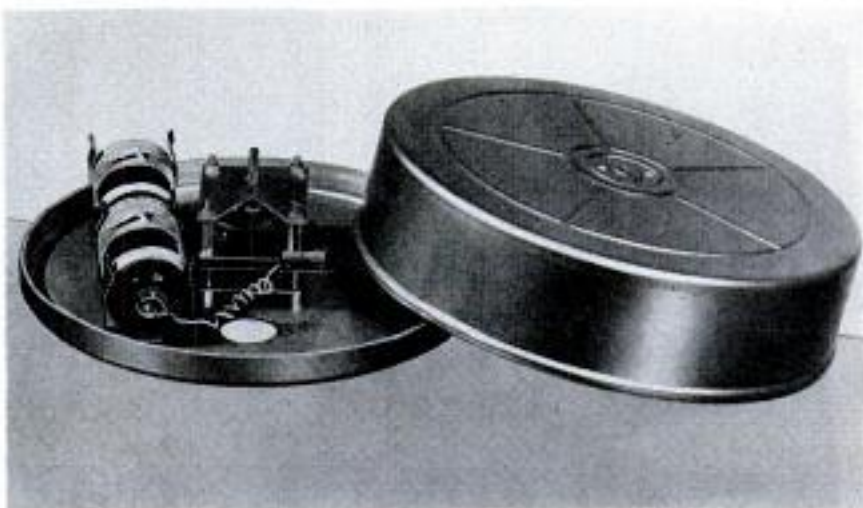
## Adjustable Table Permits Typing, Writing or Sewing in Bed



Permitting a bedridden person to type, manage correspondence or operate a portable electric sewing machine while sitting upright or lying on his back, an adjustable bed table makes for efficiency and comfort. The table top may be moved up or down the steel-tube frame and set at one of three different angles by the adjusting knob at the side. The lightweight frame rests solidly on each side of the bed to maintain a stable surface.

## Flashlight Batteries Supply Power for Portable Turntable

Powered by two ordinary flashlight batteries and a clock-type motor, a portable turntable is said to revolve continuously for five to six weeks. Outwardly, the self-contained unit resembles a circular metal candy box; the cover revolves on a central spindle-motor mechanism mounted on the bottom section. Useful for window displays and in photography, it will carry a 6½-pound load.



## Versatile Drawing Table Quickly Assembled From Kit

Shipped disassembled, a pine-plywood drawing table can be put together by anyone with a hammer and a screwdriver. The edge of the

table top closest to the draftsman is only 30 inches from the floor, permitting the use of an ordinary chair, though the top can be raised to standard height, fixed at a

sloping or level position anywhere within the range of adjustment, or tilted toward either side. A large reference shelf, open at the front, can also be reached through a slot in front of the draftsman. Hinged on the right side of the table is a palette table with two sliding shelves for supply storage. The disassembled table can be stored in a carton three inches thick by three by six feet.



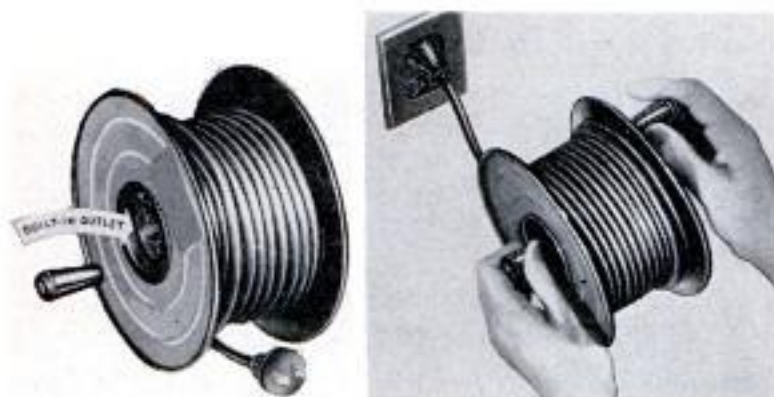


## Drive-In Movie Theater Features Screen for Each Automobile

Every car has an individual screen in a drive-in movie theater devised by Tom Smith, of Urbana, Mo. Screens are arranged in a circle with the projection booth in the center, the image being flashed on the rear of the screens. Smith won't tell how the projector directs separate beams to the individual screens, but says the system will eventually have screens for 150 to 200 cars. Clearer, unobstructed images are its chief advantages.



## Reel for Extension Cord Has Built-In Electric Outlet



Wound on a small reel, an electrical extension cord is virtually tangleproof. Built into one side of the reel is an electric outlet, permitting the user to unwind only as much wire as he requires and still have access to a plug. Twenty-five feet of wire are wound on the reel, which is 6 $\frac{3}{4}$  inches in diameter.

Far left, "portable plug" is in side of reel. Left, cord rolls neatly on drum

## Portable Luggage Carrier Folds Into Small Carrying Case

Luggage weighing more than 150 pounds has been carried by a "portable porter" invented by Albert Roubeck of New York City. A traveling wholesaler, Mr. Roubeck devised the adjustable, folding dolly to move his luggage without dependence on porters at hotels and terminals. The four-wheeled dolly, made of Duralumin, is 18 inches long and 3 inches wide when closed, adjusting to 13 inches in width when fully opened. It has straps and four suction cups

that screw into the corners of the dolly to hold luggage in place. The carrier and its leather traveling case together weigh less than three pounds.







## Toddler's Chair Serves at Home and in Car

Energetic toddlers can be anchored to "home base" in a collapsible chair that does four-way duty as a car seat, nursery chair, TV seat or sanitary training unit. Made of hardwood, the chair folds up at the squeeze

of a spring-held bar. Rubber-covered hooks hold it to the back of the car seat and a strap keeps the youngster from slipping out while traveling. The seat is hinged, with a plastic well beneath.

## Glareproof Tilted Blackboard Mounts Bulletin Board on Back

Glare from natural or artificial light is eliminated by a reversible blackboard that is mounted at an angle. The blackboard can be lifted out of its frame easily and flipped over to bring a cork-faced bulletin board to the front. Space behind the board can be used for the storage of papers, art materials, chalk, books and other school supplies. The height of the blackboard can be adjusted to accommodate school children of any age.

## Metal-Powder Process Forms Strong Castings

Able to withstand high stresses, a new metal is so ductile that it can be twisted two full turns without cracking. Gears, cams, and other finished machine parts of high strength can be formed from the metal. A mixture of iron powder is fed into a briquetting press and formed into the exact shape and size of the part. Then the briquette is heat-treated to fuse the metal particles and finished-sized again in a press, eliminating costly machining.







Hundreds of fishing boats dot the mouth of the Columbia River night after night during the salmon run

## ***SALMON FISHING on the Night Shift***

**By Tom Riley**

Pulling in a floater gill net. It rains most nights

**S**CIENTISTS are predicting that the heavily populated world of the future will depend more and more on ocean foods for sustenance. Doing quite well already are the night fishermen of the Columbia River.

The mouth of the Columbia, separating Oregon and Washington on the Pacific Coast, is a rainy, storm-ridden spot, treacherous for the largest ocean-going ship. It is also the hub of United States salmon fishing, where most of the King Chinook, Silverside, Blueback, Chum and Steelhead—each a variety of salmon—are prepared in the canneries lining the shores.

The fishermen work mainly at night for the simple reason the wily salmon can see and dodge their nets in the daytime. During a heavy salmon run, these men dot the black, windswept waters with such a multitude of lights from boats and net buoys that visitors driving by on the shore highways wonder what city it can be.

Even in the seven-mile width of the Columbia's mouth, the traffic problems are enough to make a policeman shudder. Literally hundreds of boats are there during the salmon runs, roaring through the darkness, stormy or calm, to take their turns in floating the 1500-foot-long nets down a

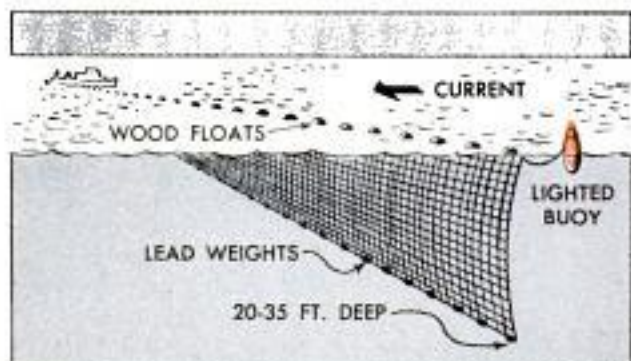




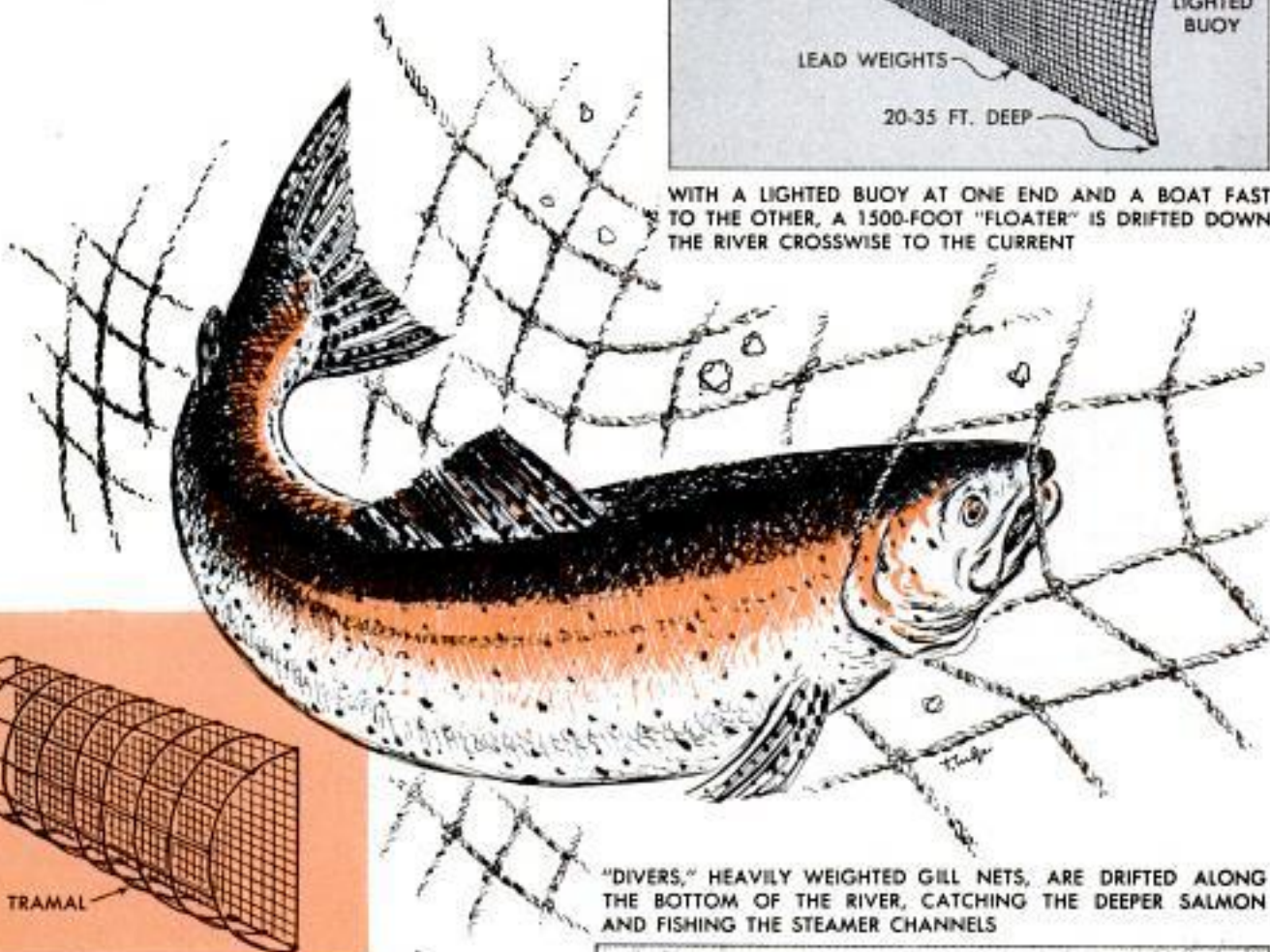


So what do the night netters do during their day off? They go fishing in the annual Astoria Salmon Derby

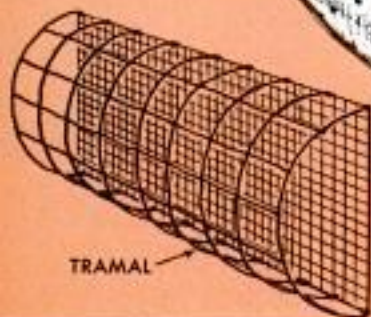
THICK PART OF SALMON'S BODY PREVENTS IT FROM PUSHING THROUGH NET AND GILLS CATCH IN NET TO PREVENT IT FROM BACKING OUT. OTHER FISH AND SMALL SALMON PASS THROUGH



WITH A LIGHTED BUOY AT ONE END AND A BOAT FAST TO THE OTHER, A 1500-FOOT "FLOATER" IS DRIFTED DOWN THE RIVER CROSSWISE TO THE CURRENT

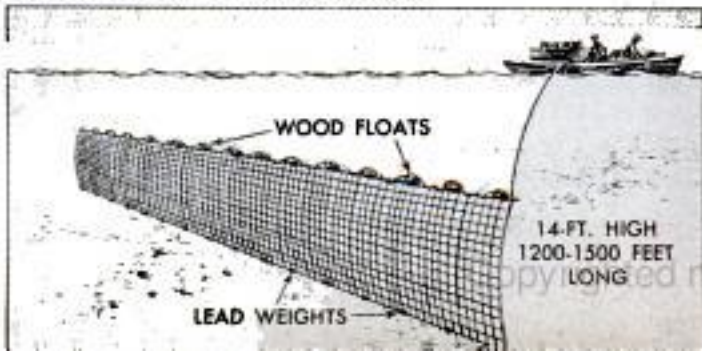


"DIVERS," HEAVILY WEIGHTED GILL NETS, ARE DRIFTED ALONG THE BOTTOM OF THE RIVER, CATCHING THE DEEPER SALMON AND FISHING THE STEAMER CHANNELS



TRAMAL

A TRAMAL NET IS SOMETIMES ADDED. BILLOWING BEHIND GILL NET, ITS LOOSE, LARGE 34-INCH MESH ENTANGLES SALMON TOO LARGE TO BE CAUGHT IN GILL NET





10-mile "drift." One close behind another, they slip their bulky nets past miles of dangerous sandbars and jetties and under busy steamers puffing up the river channels to Portland.

Scientists call the salmon the romantic fish of the sea, because he leaves the ocean to spend his last days at the exact spot where he was born. After four years of wandering through the Pacific Ocean, feeding on shrimp and smelt and growing to between 20 and 80 pounds, he returns in huge schools or runs to the mouth of the Columbia. The salmon then swims up the river to leave the school at one of the tributaries, to return to the very gravel bar where his life began. There he mates, the eggs are spawned and his life is over.

How each salmon can find the mountain stream of his birth is still a mystery. That he does is known, and the practical fishermen gather their bountiful harvest at the river's mouth. They close down their net fishing a part of each run to allow enough salmon to race by to spawn.

Back at the turn of the century, the then-untouched salmon fishing of the Columbia attracted fishermen from all over the world. These hardy men from Norway, Sweden and Finland and from the Mediterranean—Greece, Italy and Portugal—brought with them seven or eight proven designs of rough-weather boats. The result has been that the best features of all have been blended together into one of the most seaworthy small craft ever built—the Columbia River salmon boat. Usually a 26-footer, it has a round-bottomed hull, because the river's mouth is far too rough for fishing from a V-bottom craft. It is a "bow picker" (the nets are handled from a bow cockpit), and the roomy bow is claimed to have developed from an ancient Scandinavian design. Most of the fishermen have favored the boat as a double-ender, the pointed stern from a Mediterranean design. Some are using a square-sterned version today, thus having a modern transom that gives more speed with a large motor but less seaworthiness in bad weather.

Speedy motors are a great help to the night netters. In the past, their boats were powered with one and two-cylinder in-board engines—because those heavy-duty gas engines were the most reliable on a wet night and reliability is an all-important feature at the mouth of the Columbia, where an engine failure in the darkness would mean being carried to clutching sandbars and breakers that tear up the largest of ships.

But those "one lungers" were slow and meant 12 to 16 cold hours a night on the river, half the time on the trips to the start of the drifts. The powerful 4 and 6-cylinder



To halt rot, nets are "bluestoned"—soaked in a copper sulphate solution—in large wooden tubs at the right

gasoline marine engines of the last 10 years have fully proved their reliability to these fishermen, especially since the war-developed ignition waterproofing. Their 26-footers are now roaring through the black water to the start of a drift in a half hour.

A single floater or diver net, the two types used on the Columbia, costs from \$800 to \$1100. Both are gill nets, made of the strongest linen line available; and both catch the salmon when the fish pushes his head through the seemingly flimsy netting. His thick body prevents his passing on through and his gills prevent his backing out. The floaters are 1200 to 1500 feet long and up to 35 feet deep, with wood floats supporting the upper edge at the river's surface and with lead weights on the lower edge to hold the net vertical. A buoy containing a waterproof battery and light is attached to one end, and the net is spread out its full width at right angles to the current. The boat is kept fast to the far end and drifting alongside as the net bobs down the river. The diver nets are similar, except that they have additional lead weights on the lower edge, a carefully balanced number of weights to sink the net





Part of the mouth of the Columbia River, showing how it is congested with boats and nets during the run

Crowded deck of a salmon boat. Fish are stored in hold below the hatch to keep them out of the way



just enough to drift it along the bottom of the river. Many of them know their Columbia so well they can drift a net down the bottom of the main channels while steamers ply back and forth above it.

The Columbia has an all-sand bottom, but tree stumps and other snags are continually lodging in the sand to hook and rip the expensive nets. Whenever this happens, the next morning a heavy snag scow moves out to the spot. Owned by the fishermen's association at Astoria, Ore., it contains a powerful winch and diving equipment. The diver goes to the bottom to attach a cable to the snag, which is then jerked out by the scow.

The boats are not as spotless on hull and deck as a yacht, but they are kept in better operating condition. The nets are "bluestoned"—soaked in a 1:3 solution of copper sulphate and water—once a week during fishing weather to prevent their rotting from the salty waters. When not in use, the nets are carefully dried and any tears in the linen mesh repaired. These nets will withstand only four months of use, so it doesn't pay to use them when the salmon are not running strong.

The salmon are unpredictable. The fall run of huge Chinooks will often mill in the ocean off the mouth of the Columbia for weeks, seemingly in no hurry at all. Then, for some obscure reason, all will move with a rush over the bar and disappear up the river, the peak of the run lasting only one frenzied night for the fishermen. Actually, these night netters make the most of their year's income on just a few, rain-ridden nights—but they work on those nights.

★ ★ ★



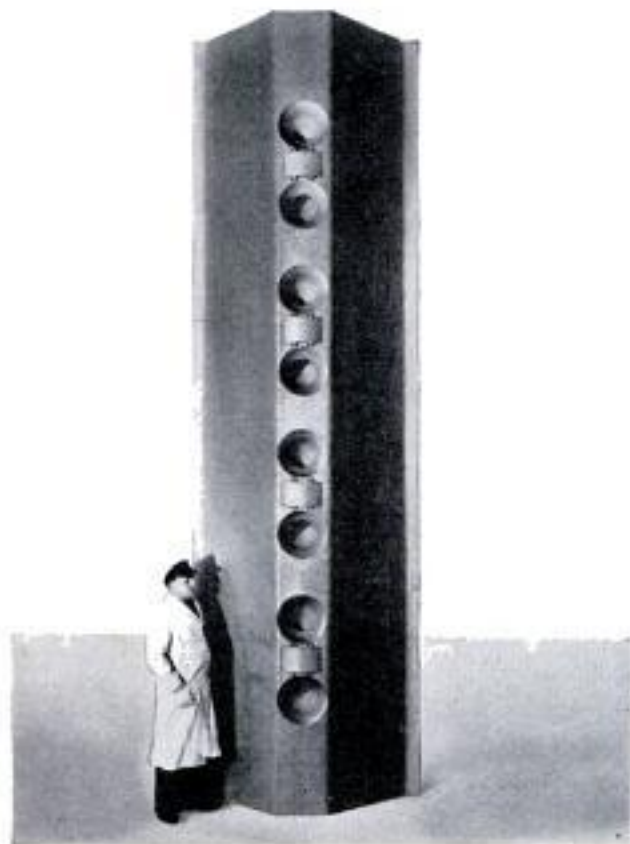
## Mirror Panels and Grooved Molding Make Quick Wall Covering



With easy-to-handle panels and molding strips, one person can completely cover a wall with mirrors in an afternoon. The full-wall mirror makes the average room seem much larger. The grooved molding strips measuring  $1\frac{1}{2}$  inches wide and either 16 or 18 inches long, are attached to the wall first, then the mirror panels are simply slipped in from the front. The grooves are cut so they do not require sliding the panels in from the side. The panels measure 16 by 18 inches. They also can be attached to the wall with a special cement, eliminating the moldings to produce a solid wall of mirrors.

## "Sea Cow" Foghorn

When fog blankets the Isle of Helgoland in the North Sea, a powerful noisemaker goes into action to warn ships. Called the "sea cow" because its signal is like the lowing of cattle, the device produces sound by electrical means. Twenty feet high and made of steel, it contains eight apertures from which sound emerges.



## Midget Fire Extinguisher

Fires can be extinguished from a distance of 25 feet with a push-button extinguisher powered by compressed air. The container is recharged by filling the shell with fluid and adding air from the hose of any filling station. Suitable for home workshops and automobiles, the small, stainless-steel extinguisher contains a fluid which smothers flames of all types, including those originating from flammable liquids.







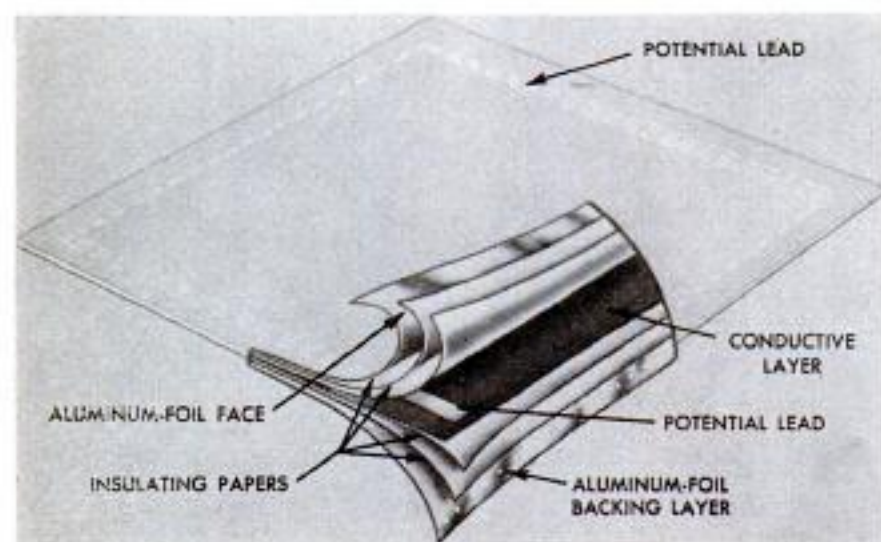
Lockheed Aircraft Co. photo

## Flying Radar Stations To Be "Eyes" for U.S. Defense Forces

Like magic spyglasses, new flying radar stations will carry the military services' most powerful "search" radar to high altitudes for maximum effectiveness in spotting surface and air targets. Radar beams scan on a straight line and cannot bend over the horizon. The aircraft are special versions of Super Constellation transports. Housed in an eight-foot-high hump on top

of the fuselage is a height-finder radar antenna and mushrooming from the bottom is a bowl-shaped radome. Each plane has facilities for a crew of 31 and carries a complete electronic maintenance shop to permit in-flight repairs during long patrol flights. They will be used to give early warning of approaching air targets and by the Navy to screen United States fleets.

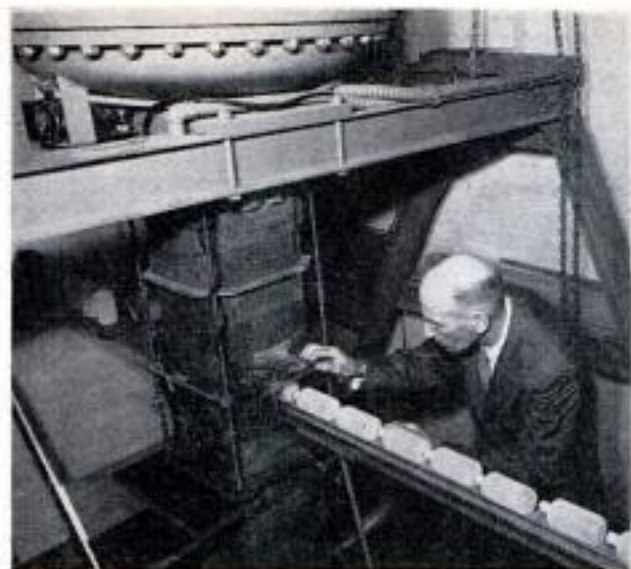
## "Electric Wallpaper" Cemented to Ceiling Supplies Heat for Room



Electric heating panels which cement to the ceiling like wallpaper are designed for partial or complete home heating. Only  $\frac{1}{10}$ -inch thick, the panels consist of a sheet of electrically conductive rubber sandwiched between layers of electrical insulating paper, plastic and aluminum foil. Since the rubber itself is conductive, there are no wires in the panels. A potential lead connects the rubber sheet to the source of the current. Surface temperature of the panel is a uniform 100 degrees, warm enough so that the entire ceiling does not need to be covered. Where the cost of electricity is 1½ cents per kilowatt or below, cost of operation is said to compare favorably with other methods.

Research men have found evidence that antibiotics in feed speed animal growth by stimulating bone development.





### Bombardment With Electrons Toughens Plastic Bottles

Brief bombardment with electrons can toughen plastic bottles enough to withstand steam sterilization, General Electric scientists have found. Otherwise the polyethylene containers, used for packaging pharmaceuticals and fluids such as blood plasma, melt into a shapeless mass when subjected to extreme heat or steam. Only a few seconds bombardment from a million-volt X-ray machine is needed for the complete toughening process. The electrons can also "cure" plastic dishes so they will keep their shape in hot water.

### Tricycle Built for Five

Baby-sitting can be pleasant, believes one Italian miss. With four young charges and a small dog seated before her in a wrong-way rumble seat, she's off to see the sights of Rome. At other times the "rubberneck buggy" serves as a pedaled pushcart for packages and produce.



JANUARY 1954



### Double-Glazed Window Without Metal Edge

Insulating windows are now being made without the customary metal edging and separating strips. The two panes of glass are electrically fused on all edges, forming a permanent, airtight seal. It is primarily designed for homes, apartments and other buildings requiring relatively small size panes. The two layers of glass are separated by a  $\frac{3}{16}$ -inch air space. All air between the panes is removed and replaced with specially dried air.

### Radiator Warming Shelf

Restaurants in Florence, Italy, don't allow food to cool once it's taken from the oven. Instead, it's placed on a warming shelf built into a radiator beside the diner. As a result, no matter how long the customer dawdles over his meal, food remains piping hot.





## Passengers Enter Tiny Italian Automobile Through Door in Nose

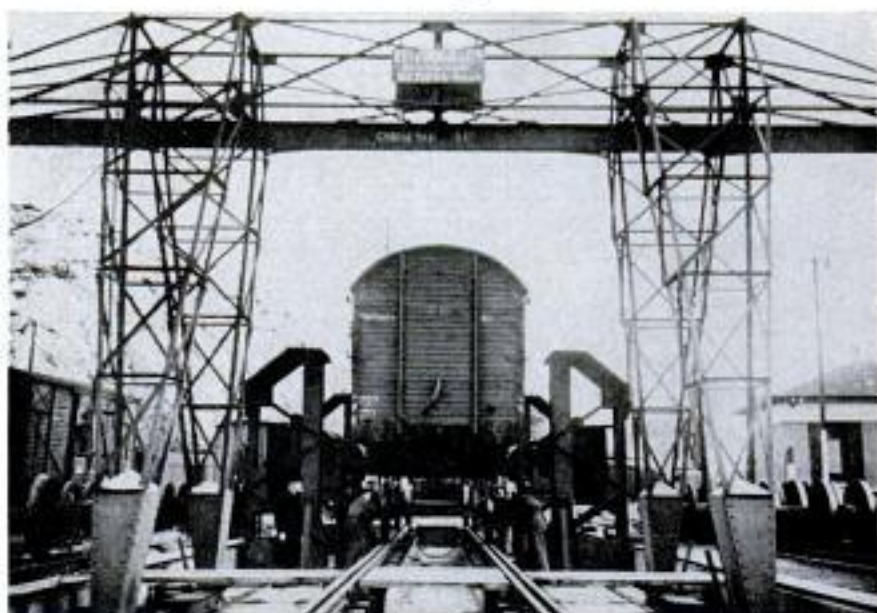
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Two passengers fill a tiny Italian car to capacity. The car, called the Iso, has a door in its nose and a steering column that swivels forward as the door opens to permit easy access. The tiny engine burns only a gallon of gasoline every 120 miles yet will drive the car at speeds up to 55 miles per hour. Another unusual feature of the car is the extremely narrow tread of the rear wheels. The hand-shift gearbox has four forward speeds and one reverse.

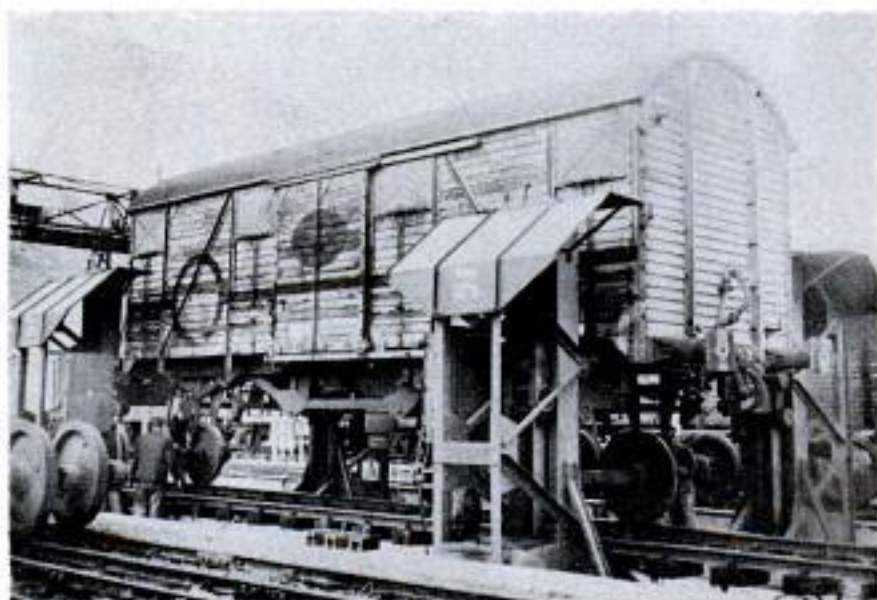
## Change Freight-Car Wheels to Fit Different Gauges

Moving freight from one European country to another has long presented a problem because railroads are built on a variety of gauges. Today, on the Franco-Spanish border, wheels are switched on the freight cars instead of reloading the freight. Each freight car simply is raised on electric jacks, the wheels removed, another set of wheels of the proper gauge installed and the freight car is ready to roll to its destination with little delay.



## Rice-Bran Oil

Oil extracted from rice bran by a new process can be used for cooking, lubrication, and as an ingredient of candles and varnish. As a cooking oil, the clear, bland extract is resistant to becoming rancid and does not pick up food flavors and odors. Foods fried in rice oil contain less fat than when they are fried in other oils. The oil is a good industrial lubricant because of its high penetration ability, and may also find use in cosmetics, soap and antirust compounds.





# Radio Television Electronics

## TV PROGRAMS RECORDED ON TAPE

By Thomas E. Stimson, Jr.

COMPLETE television programs are now being recorded on tape. Half-inch tape takes the place of film in a new video recorder perfected for the industry by the Bing Crosby Enterprises in Hollywood.

Electric impulses from an iconoscope camera or from a TV circuit are registered magnetically on nine channels of a tape at the same time the accompanying sound is recorded on an additional channel. The program thus recorded may be viewed at once, or stored for later use.

The system is claimed to replace the Kinescope camera now used for recording TV programs for later broadcasting. The video tape recorder eliminates film development process required with camera film, and provides a motion picture claimed to have no flair, very little loss of definition, and almost complete gray scale. Recordings will be available to TV-transmitting stations in 1954.

Techniques radically new to the recording field are employed. Instead of recording a single track down the length of tape as is done in sound work, all tracks are employed simultaneously. These are recorded by a multiple head in a solid-block assembly; the stack of heads having their gaps precisely in line. The half-inch tape is standard acetate-base type coated with magnetic iron oxide. The sound channel is recorded by a wide-deviation FM system and playback is through a frequency-counter type of discriminator. This sound system is claimed to be one of the finest ever assembled.

The operator in photo A is making a magnetic record on half-inch tape of the video (picture) and sound channels of a TV program. When completed, it can be played back immediately, or held for future rebroadcast. Photo B shows the video recording, video playback, and sound circuits of this new video tape recorder. In commercial installations all of these circuits will be contained in the stand assembly on which the tape recorder itself is mounted. A test pattern, photo C, that was recorded on the tape, is being played back on the regular TV-receiving tube for checking purposes.

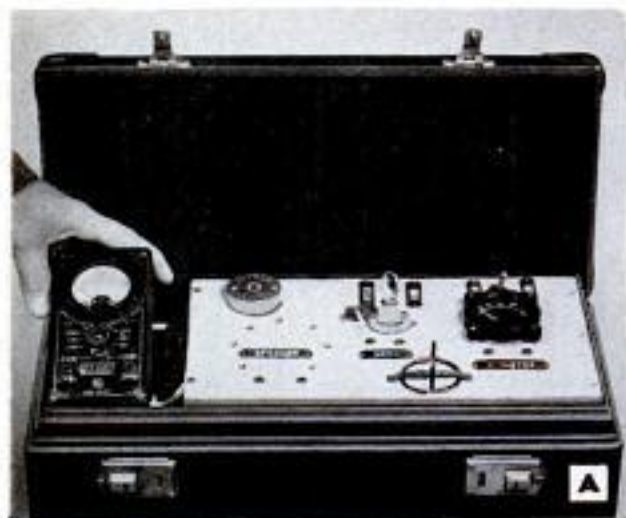






# PORTABLE RADIO "TEST BENCH"

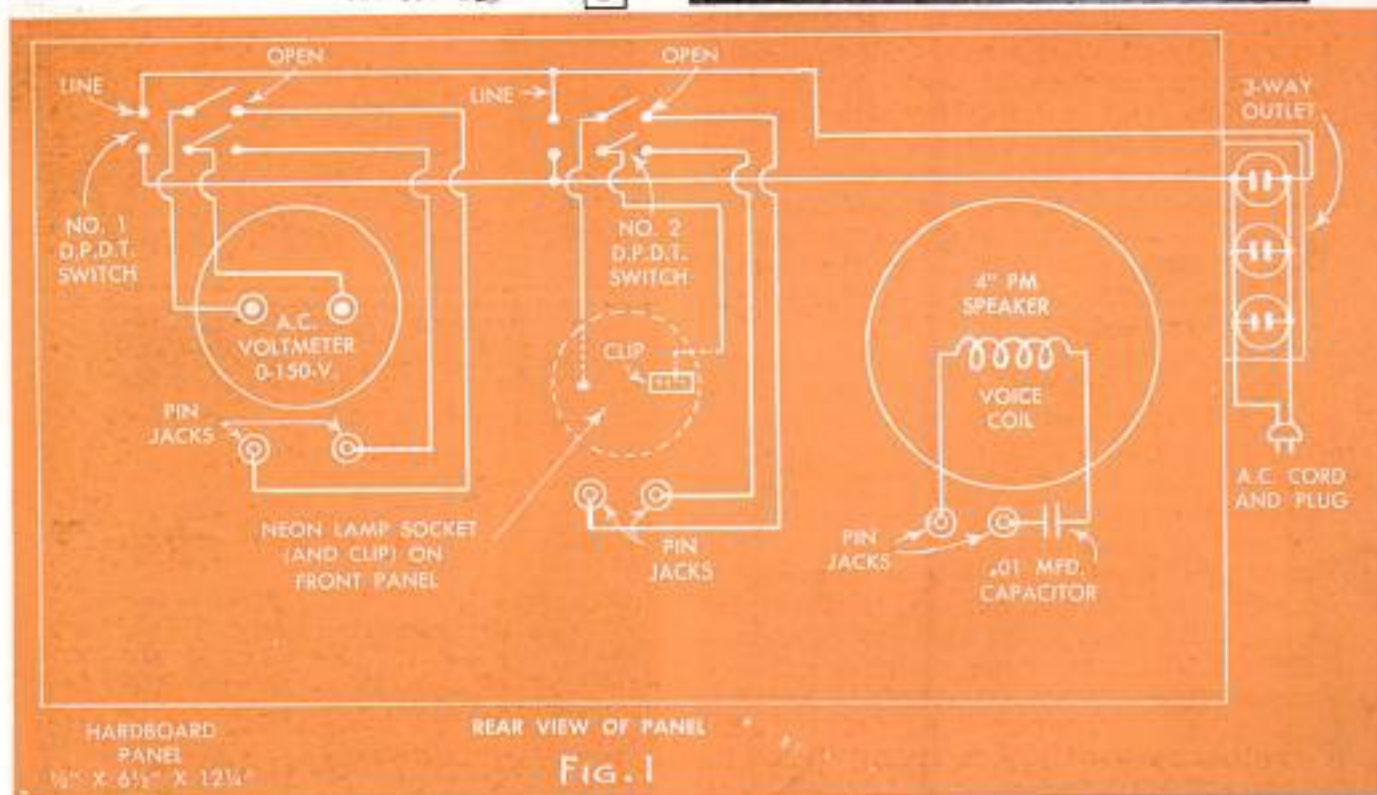
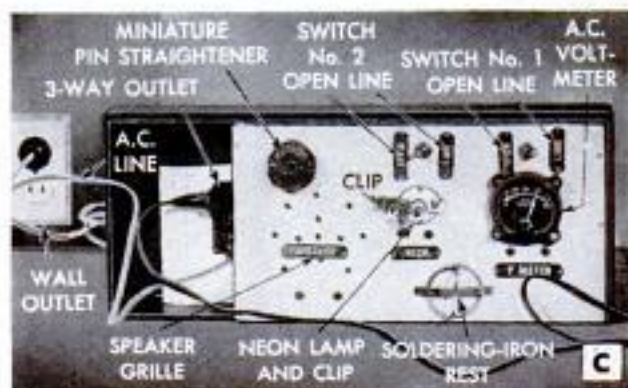
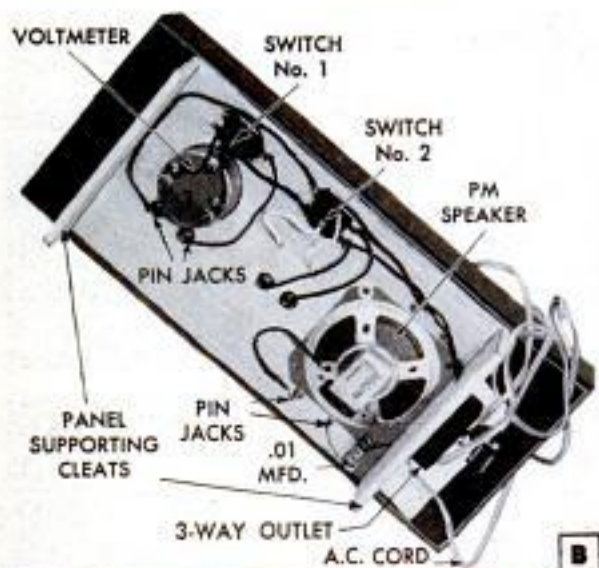
By Harry F. Leeper



INSTEAD OF having various pieces of small testing and service equipment scattered over the test bench, why not mount such units in a portable kit? Such a kit becomes a portable "test bench" that will save the student or experimenter many unnecessary steps. Many servicemen can arrange their small testing units in the same compact form for use on outside jobs.

The units illustrated were arranged to mount in the top tray of a standard fiber tool kit having outside dimensions as follows: 18-in. long, 11½-in. high and 8-in. wide. These dimensions are not too critical.

Several services are available from this assembly; there is a triplex outlet for soldering iron, testers and radio or TV set. The a.c. voltmeter keeps line voltage in sight while operating the set under test. The neon lamp tester is for continuity or





# FOR CONVENIENT SERVICE



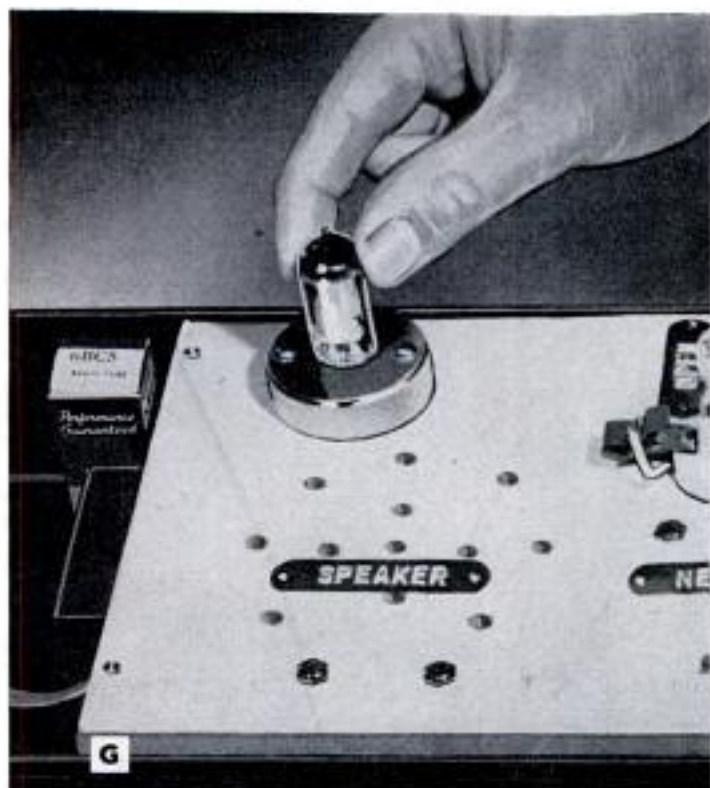
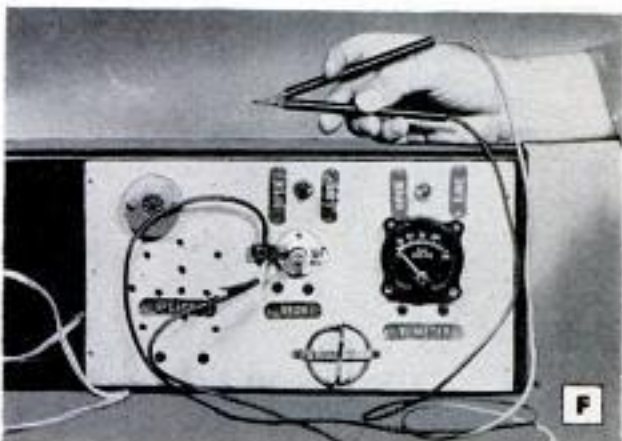
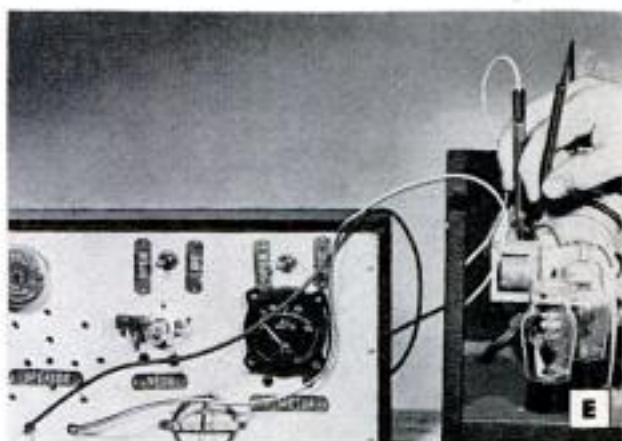
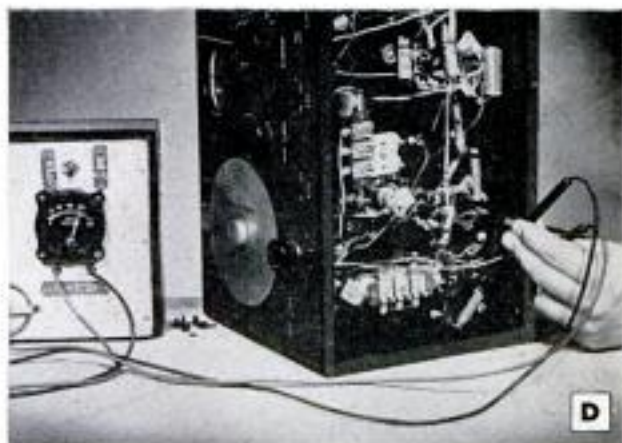
voltage tests. A spare speaker of the small 4-in. PM type, is mounted so as to be easily available by means of pin jacks. A miniature-tube pin straightener, and a rest for the soldering iron, complete the assembly.

Photos A and B show the various units mounted in the kit tray, and wired as indicated in diagram Fig. 1. The  $\frac{1}{4}$ -in. plywood panel is  $12\frac{1}{4}$ -in. long and  $6\frac{1}{2}$ -in. wide, with supporting cleats to fit into the kit tray. The voltmeter is an 0-150-volt a.c. type; switches Nos. 1 and 2 are double-pole, double-throw, bat-handle types. A  $\frac{1}{4}$ -watt neon lamp and candelabra-type socket, and a .01 mfd. 600-volt fixed capacitor, together with 6 pin jacks and the 3-way outlet with line cord and plug, complete the list of parts. Ordinary No. 20 insulated hookup wire is used for wiring. As the instrument panel is only  $12\frac{1}{4}$ -in. long, sufficient space is left for a standard pocket-size volt-ohmmeter, as shown in photo A.

Photo C shows the line cord plugged into a wall outlet with the meter switch No. 1, thrown to line. When the meter switch is thrown to "open," as in photo I, the meter is disconnected without disturbing the line plug in the wall outlet. The meter may then be used with test leads for other purposes, such as for testing a radio off-on switch as indicated in photo D.

Photo E shows how the spare speaker may be substituted for the set speaker where an open circuit in either a radio or

(Continued to page 256)







A



B



C

## Radio and Electronics Today

WRIST RADIO is now made possible through the use of tiny transistors and other miniature components. The one shown on the wrist of Lt. John H. Willis, Signal Corps officer at Fort Monmouth, N. J., in photos A and B, owes its small size to printed circuits and transistors, with their low-power battery requirements. This tiny receiver has been picking up broadcasts from New York City. Fort Monmouth is approximately 40 airline miles from mid-town Manhattan.

One of the most important accessories in every amateur radio station is a frequency calibrator. It provides a simple, accurate means of checking transmitter operating frequencies to avoid out-of-band operation. The Bud FCC-90 unit, photo B, consists of a stable 100-kc. crystal oscillator.

Quick, inexpensive installation of secondary TV sets in the home is made possible by the small RCA coupling device shown in photo C. It permits operation of two TV sets on the same antenna. The coupler is attached to the antenna line, and a separate transmission line is run from the top of the coupler to the No. 2 set.

Photo D illustrates the use of a tiny electronic device for detecting leaks in pipes or valves. The operator merely touches the pipe or valve with the protruding pickup on this midget M-Scope detector and the leak, unmistakable in sound, is heard.

An ultra-sensitive 100,000-ohms per volt, volt-ohm microammeter is shown in photo E. This Simpson model 269, a.c.-d.c. test instrument is ideal for voltage measurements in high-resistance circuits in TV receivers and other electronic equipment. It is claimed to replace vacuum-tube voltmeters for many such tests in TV and other service work.

Very few radio sets have been built into cowboy saddles. The one shown in photo F was designed for a rodeo by Motorola.



D



E



F





## Room Divider Features Writing Desk

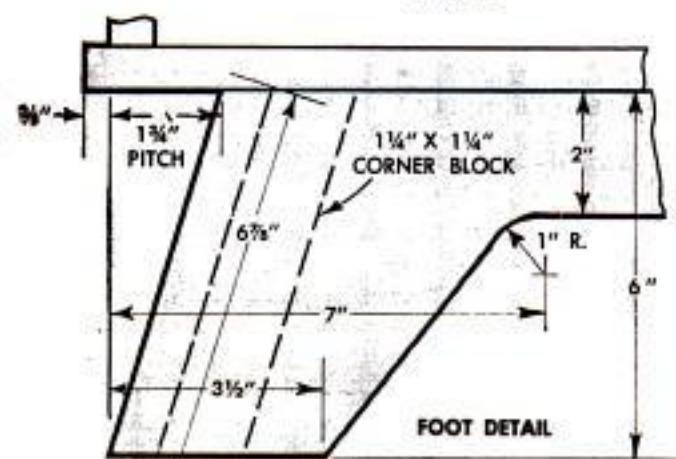
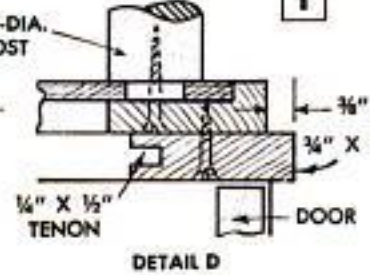
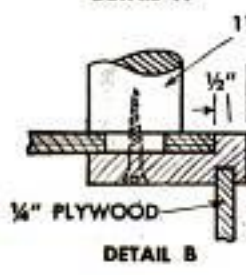
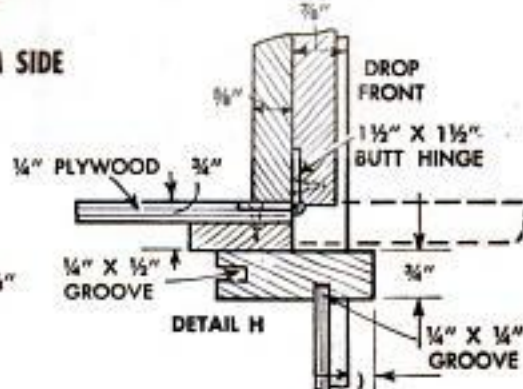
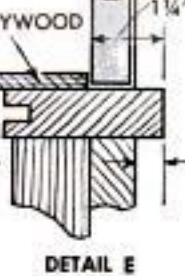
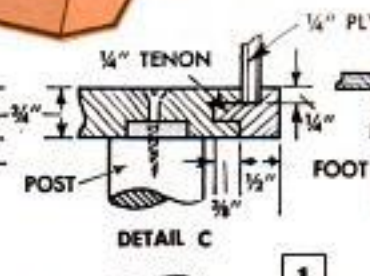
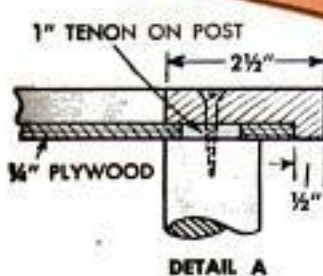
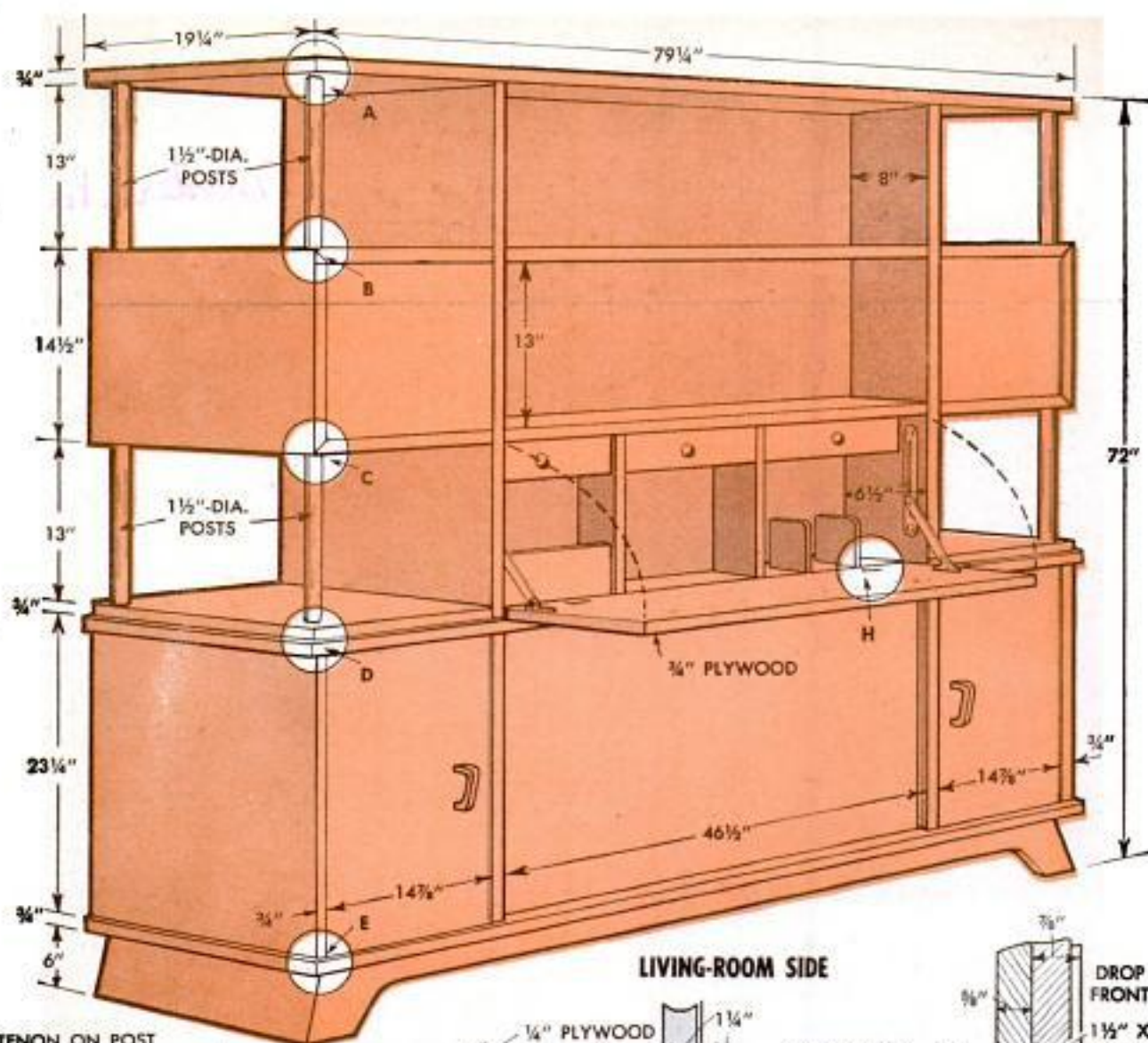
By John Bergen

WANT TO GET that separate-room feeling from your dining-living room area and still make the most out of available floor space? Then here's the piece of furniture you've been looking for. It's a modern, movable room divider that serves as a partition wall to separate the dining area from the living room. In addition, it has two otherwise space-stealing pieces built right in—a convenient writing desk and a generous-sized china cabinet. The china cabinet, which faces the dining room, incorporates three shelves covered with

sliding glass doors, four spacious drawers and four cabinets. On the living-room side of the unit, there is a low storage cabinet on each side of the writing desk and two bookshelves above. Both ends of the room divider are finished so it can be used in the center of the room or against either wall.

Figs. 1 and 2 clearly show the difference between the two sides of the divider. Overall construction is detailed in the sectional views, Fig. 3, and the pull-apart perspective, Fig. 6. The upper and lower sections of the divider are built as individual pieces



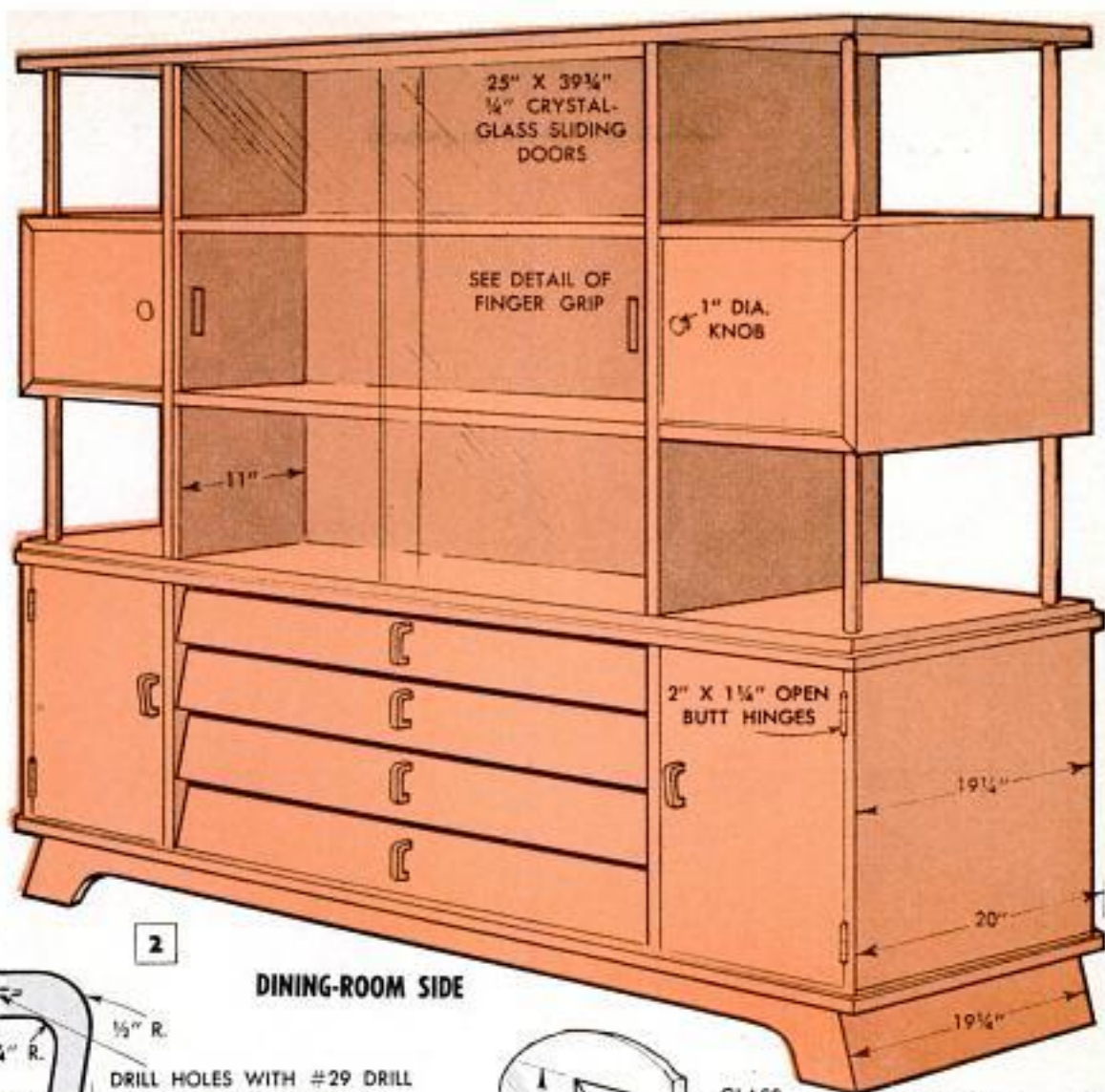


LIVING-ROOM SIDE

and then fastened together with wood screws driven upward through the top frame of the lower unit and into the bottom-frame rails of the upper unit.

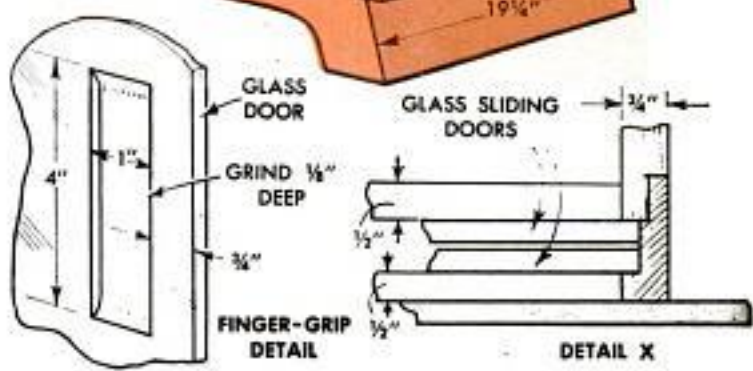
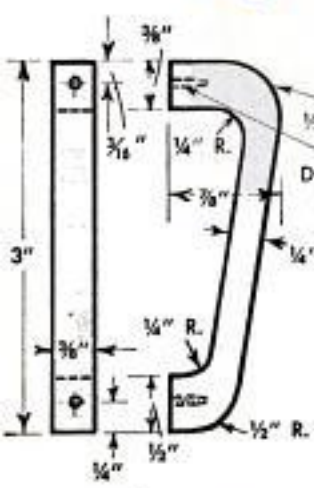
The base of the lower unit is made of 3/4-in. hardwood. The legs, or feet, are cut as in the lower left-hand detail, Fig. 1, and assembled with corner blocks as in Fig. 6. The bottom frame, which rests directly on the base, is of 3/4 x 2 1/2-in. stock mitered at the corners. The front and rear rails are grooved along the inside edges to take tenons cut on the ends of the center cross members, and the rear rail of the frame is grooved to take the bottom edge of the 1/4-in.-plywood back panel. The top frame is made in the same way as the bottom frame except that it is grooved on the underside to receive the top edge of the back panel.





2

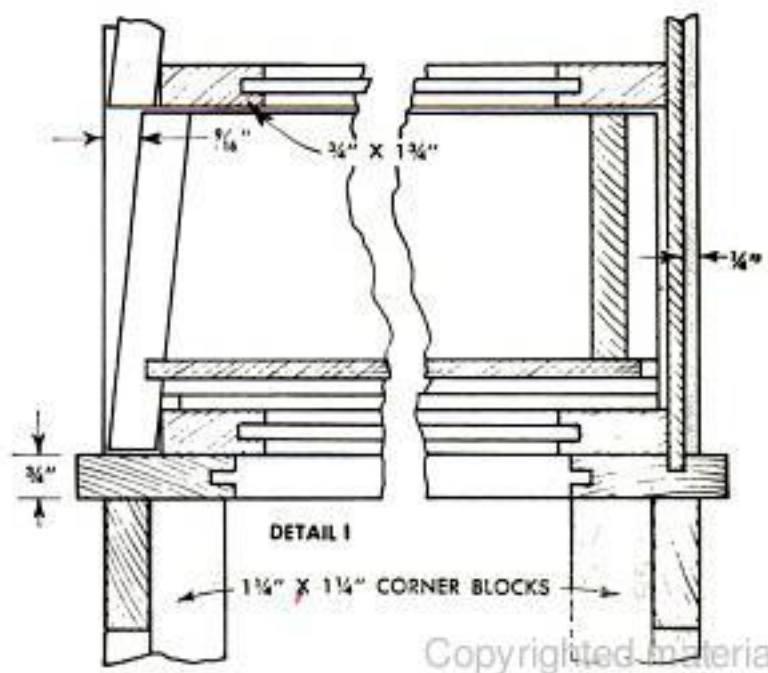
DINING-ROOM SIDE



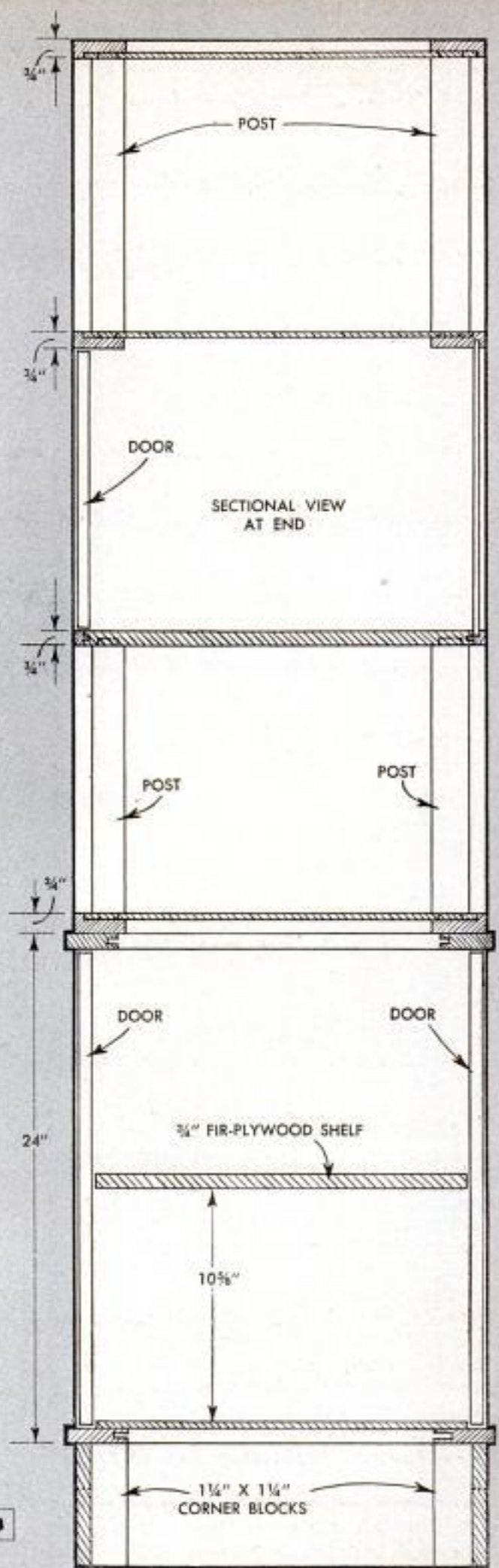
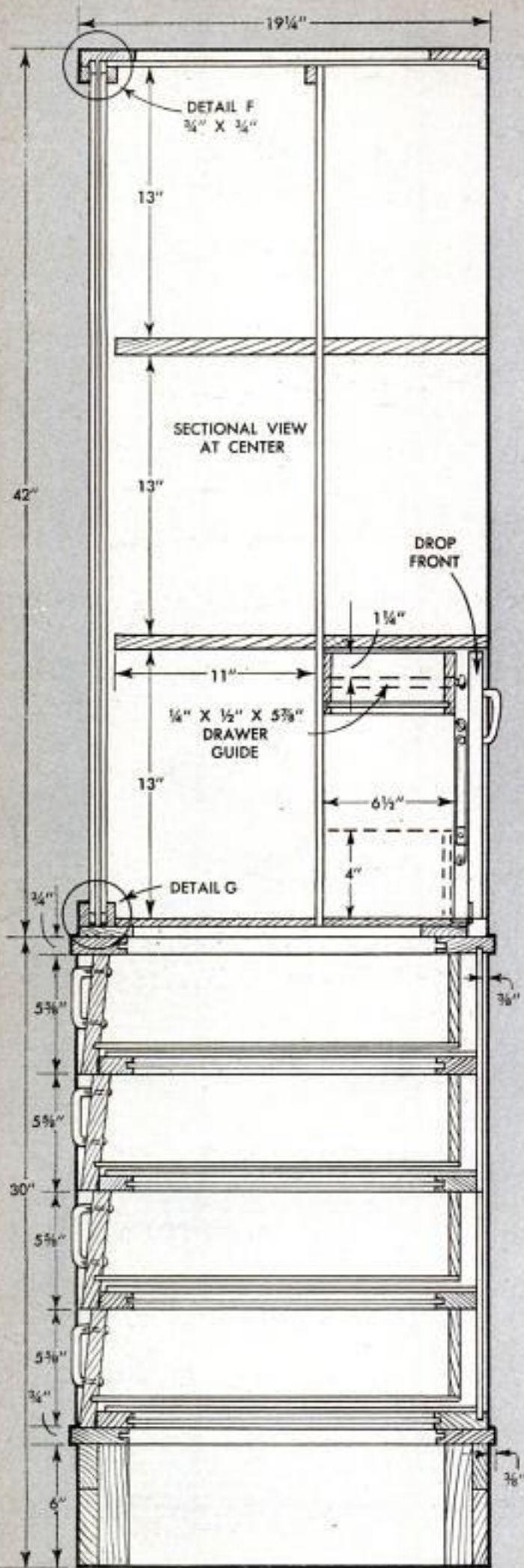
Both grooves are located 3/8 in. from the outer edge of the rear frame rails.

The cabinet portion of the lower unit consists of two end panels and two partitions framed as in Fig. 5. The drawer frames are installed between the partitions, the ends of the rails being fitted in the notched uprights of the partition frames. Figs. 5 and 6 clearly show the construction and installation of the drawer frames and the plywood or hardboard dust panels. The drawers are made as in Fig. 2, detail I, and Fig. 5.

The side cabinets contain a 1/4-in.-plywood bottom shelf and a 3/4-in.-plywood center shelf. Each cabinet is fitted with two doors to permit access from either the dining-room or living-room side of the unit. All the doors and drawers of







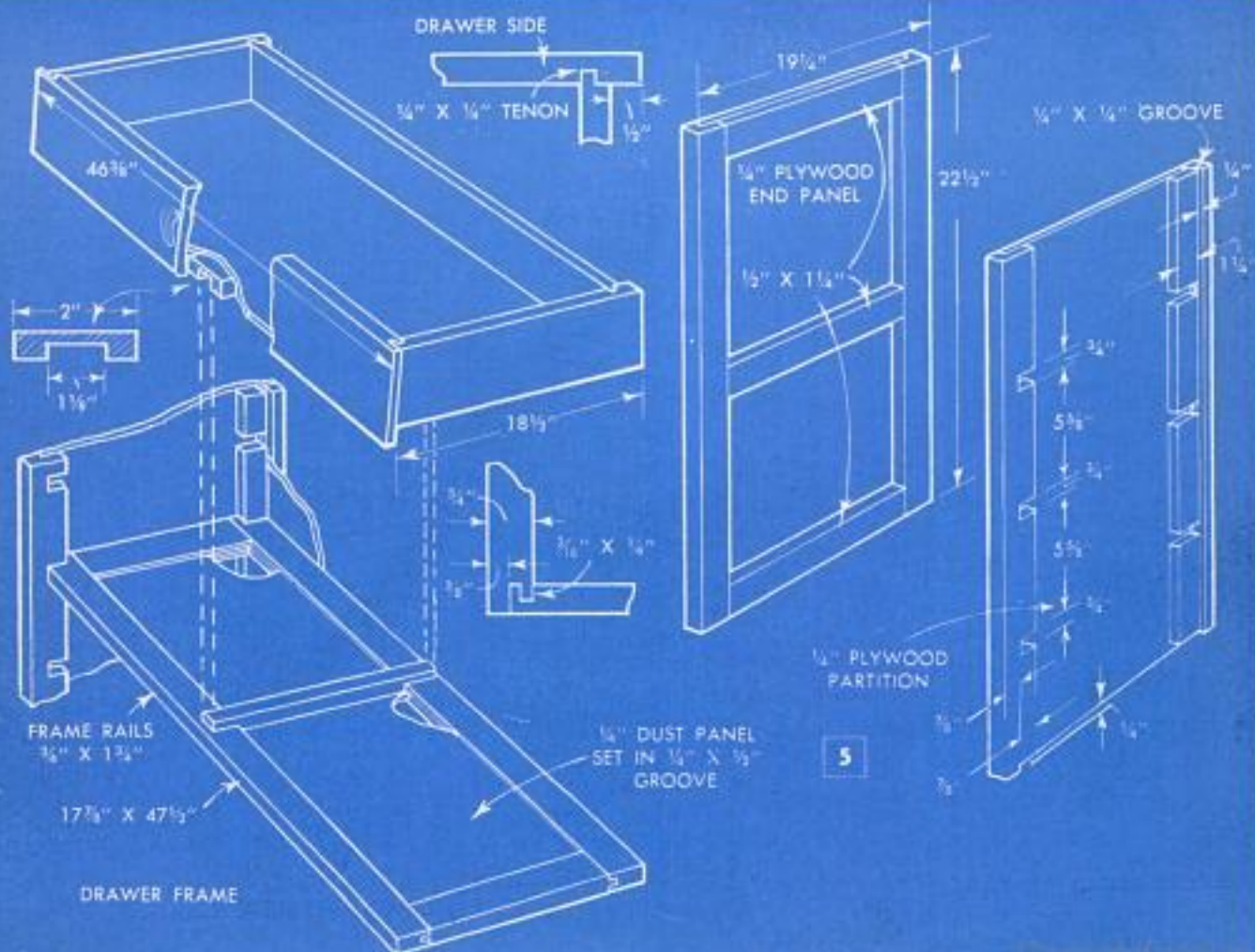
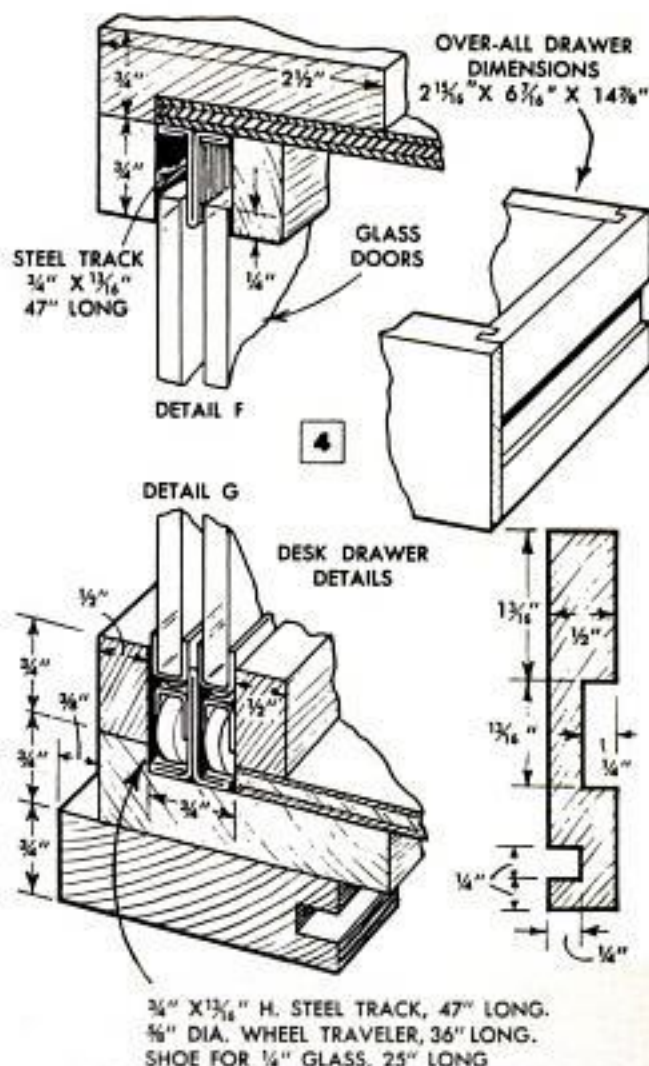
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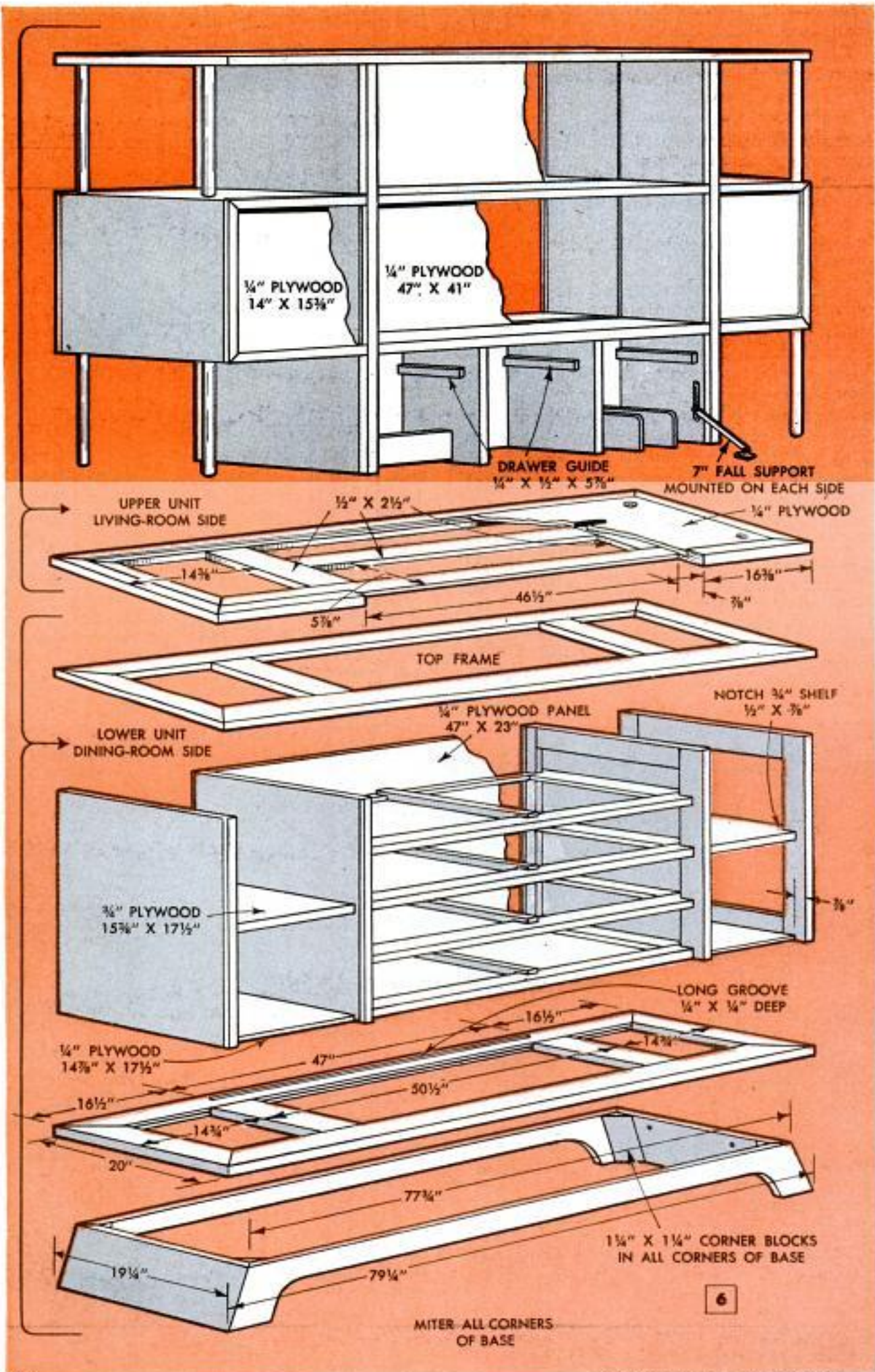
the lower unit are fitted with pulls cut from brass as in Fig. 2.

Construction of the upper unit can be seen from the two finished views, Figs. 1 and 2, and the pull-apart perspective, Fig. 6. Note also the various details in Fig. 1 and the sectional views, Fig. 3. The bottom frame for the upper unit, Fig. 6, is made similarly to the lower-unit frames except that the rails and end members are faced with a  $\frac{3}{4}$  x  $\frac{7}{8}$ -in. molding which is rabbeted, as shown, to take a  $\frac{1}{4}$ -in. plywood panel.

The center section of the upper unit, which contains the china cabinet on one side and the writing desk and bookshelves on the other, is assembled between two  $\frac{3}{4}$ -in.-plywood end panels. The panels are grooved on the inside surface for the two bookshelves and two china shelves. These are of  $\frac{3}{4}$ -in. plywood and are separated by a vertical panel of  $\frac{1}{4}$ -in. plywood, the edges of which are set in  $\frac{1}{4}$ -in. vertical grooves in the end panels and a  $\frac{1}{4}$ -in. groove in the bottom-frame panel. As shown in Fig. 1, the vertical grooves are located 8 in. from the edge on the bookshelf side of the unit. On this side, the end panels are faced with  $\frac{3}{4}$ -in. molding, while on the china-cabinet side they are faced with molding cut as in Fig. 2, detail X, to receive the ends of the sliding glass doors.









The pair of whatnot shelves and cabinet at each end of the upper unit are assembled as in Fig. 1, details A, B, C and D, 1½-in.-dia. posts being used to support the cabinets and the top frame of the unit. Although the bottoms of both cabinets are of ¾-in. plywood, the tops, sides and back panels are of ¼-in. plywood. The center-section end panels are grooved on the outside exactly opposite the inside grooves, the two grooves in each panel being ¾ in. wide. The lower groove takes the ¾-in.-plywood cabinet bottom while the upper one receives the ¼-in.-plywood cabinet top along with a ½-in. cleat. The corner joint of the top with the side panel also is reinforced with a ½-in. cleat. The molding used to face the plywood parts of the cabinet is mitered at the corners. The top frame is made in the same way as the other frames except that it is rabbeted on the underside for a ¼-in.-plywood panel, Fig. 1, detail A, and Fig. 3.

The three drawers of the writing desk are fitted between two ¾-in.-plywood separators and the center-section end panels. The drawers are made of ½-in. stock as in Fig. 4, the drawer sides being grooved for the side-mounted guides. Front and side pieces of the drawers are grooved for a ¼-in.-plywood bottom panel, the grooves being run ¼ in. from the lower edges of the pieces. The separators mounted on the bottom of the desk between the partitions are of ¼-in. plywood.

The drop front of the desk is of ¾-in. plywood hinged to the desk bottom with mortised butt hinges. Fig. 1, detail H, shows how the drop front clears the top of the lower unit to provide a writing surface flush with the bottom of the desk. A 7-in. fall support is mounted on each side.

To keep the china dust-free and add beauty to the dining-room side of the divider, the front of the china cabinet is fitted with crystal-glass doors. Details F and G in Fig. 4 show how the ¼-in. sliding doors are installed. At the tops of the doors, a steel track is mounted between two ¾-in. cleats, detail F. At the bottoms of the doors, the lower track, wheel traveler and shoe also are installed between ¾-in. cleats. However, an extra ¼-in. depth is gained by utilizing the groove which is formed by stopping the bottom-frame panel ¾-in. from the shoulder on the bottom rail. The ½-in. clearance at the tops of the glass doors is necessary so they can be lifted in place on the track after assembly.

Each door is fitted with a finger grip ground ⅛ in. deep in the surface of the glass. As grinding the finger grips is difficult to do without breakage, it is by far the best procedure to have them ground by the glass dealer. ★ ★ ★

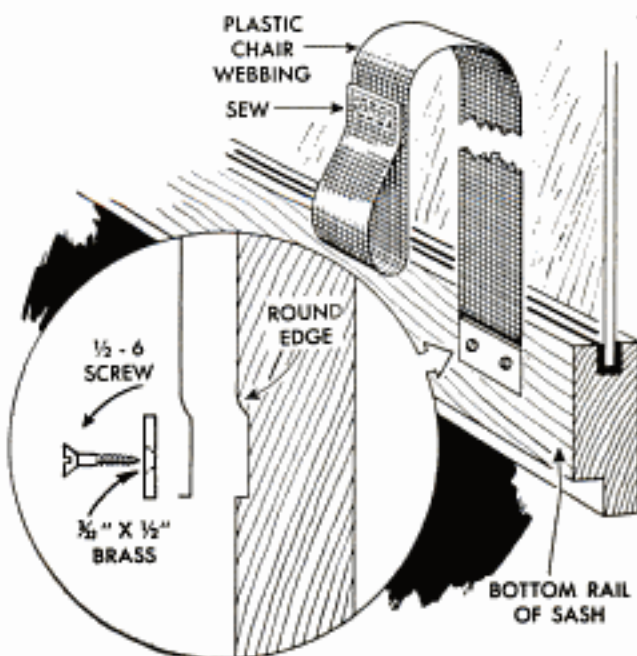


### Pencil Eraser Spreads Paste

When a regular paste brush is not at hand, library paste may be applied and spread with a pencil having a slip-on eraser of the type shown. The flat, flexible surfaces of the wedge-shaped eraser spread the paste uniformly and the "brush" is easily washed clean for regular use.

### Plastic Webbing Replaces Canvas As Lift on Jump-Rail Window

Leather and canvas are used generally to make the lifts for jump-rail boat windows, but both materials are subject to mold and mildew because they absorb moisture. To avoid this, replace the lifts in the windows aboard your small boat with the new plastic chair webbing, sold in many hardware stores. It is available in a wide range of colors to match the boat's interior, and is mildew resistant.—George Brook Taylor, Daytona Beach, Fla.





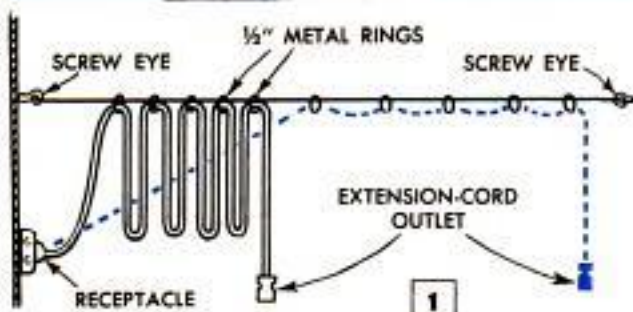
# EXTENSION



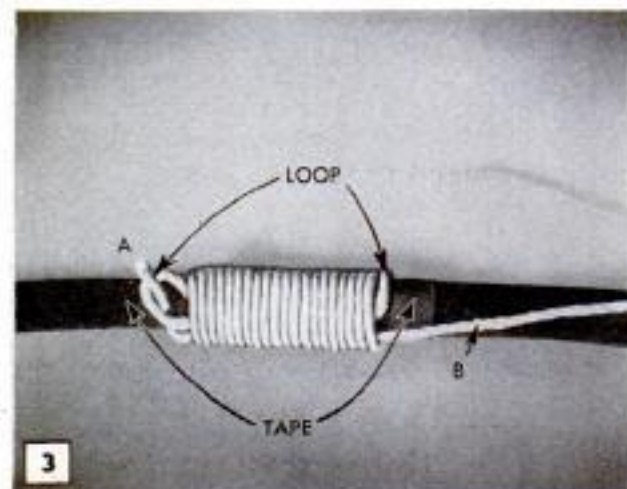
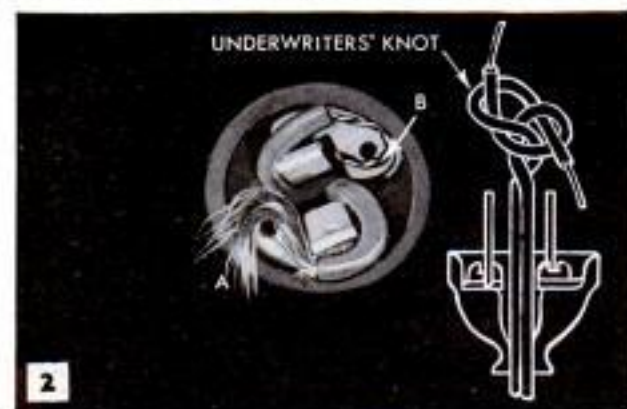
**A**ROUND YOUR HOME and workshop, the extension cords are as useful and valuable as any of the tools you own. Because so much depends on them, they deserve the same care as do your tools. Furthermore, if neglected, the extension cords can be numbered among the most dangerous items in the shop.

Extension wires trailing over the floor have caused more accidents than can be counted. The detail in Fig. 1 shows one good method of avoiding such a condition. The extension cord is strung through metal rings on a wire runner overhead. With this device, the cord can be pulled safely across the shop and yet be out of the way at all times.

Your extension cords should be checked occasionally for bad connections and broken wires. One way to do this is to turn on the radio at a spot between stations. Then, with the extension cord carrying current, roll it between your hands, and push and pull the cord at the points where it joins the plug and socket as well as at any suspected trouble spot. If the radio sputters during the test, the spot being checked needs repair. A typical source of trouble is indicated at A in Fig. 2, where the unsoldered strands of wire have frayed



Above, the extension cord is wired or taped to metal rings about 3 ft. apart when extended. This method keeps cord out of the way no matter where it is used





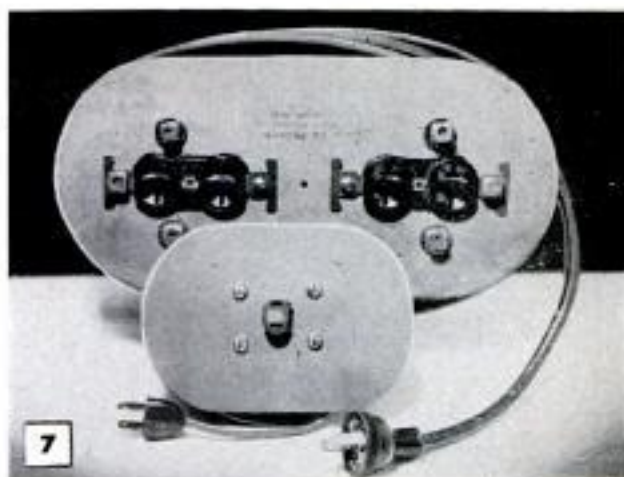
# CORDS By Ed Packer

so the connection is poor. The proper condition of the wire is shown at B, where the strands of wire have been soldered before being wrapped around the terminal screw. Note the underwriter's knot in the same figure. When installing plugs, use such a knot inside of the plug to keep the wires from being pulled loose.

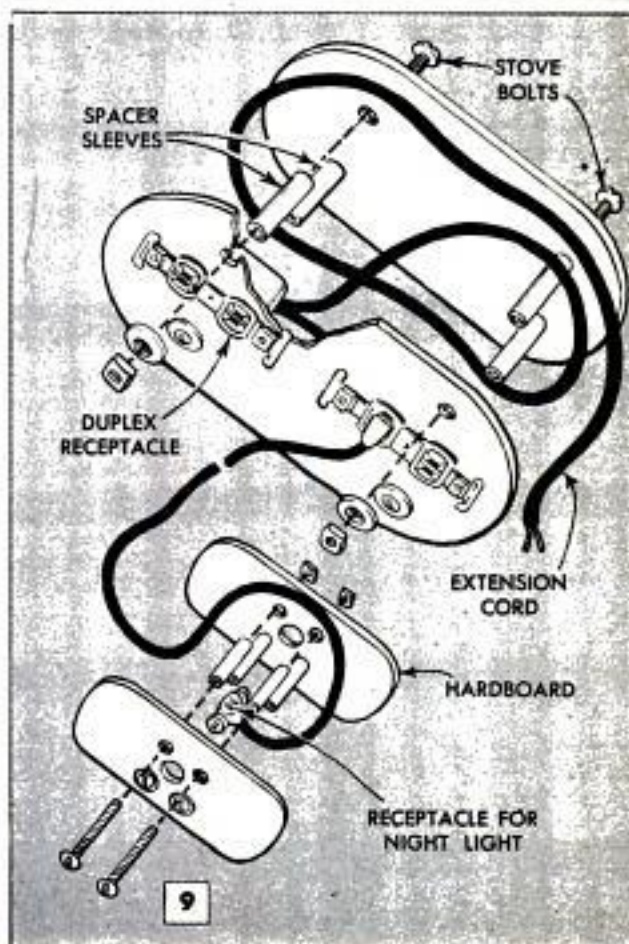
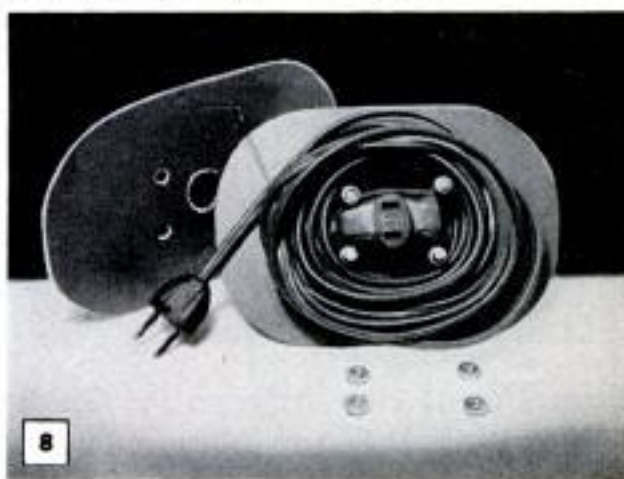
A neglected break in the insulation can cause a serious shock or a short circuit, and should be repaired immediately. A cord used in the shop is not easy to keep taped because of oil and grease, so the repair shown in Fig. 3 is useful. The broken area is taped, and the tape is held in place by a cord wrapping. A loop of cord is laid lengthwise on the wire and then the loop wrapped with cord. The end of the wrapping is brought through the loop at A. Then a pull on B, will tuck the end at A securely under the wrapping.

There are several ways of improving an extension cord's contact in the outlet. As in Fig. 4, the prongs can be notched with side cutters, which roughens the surface. Another method, Fig. 5, is to twist the prongs slightly, since bent contacts will wedge more tightly into the receptacle. The contact surfaces of a receptacle should be kept clean for best results. Fig. 6 shows how to clean them by sandpaper rolled over a large nail.

Finally, for convenient storage and handling, every extension cord should have a winding reel. Figs. 7 to 9 show two such reels that are made easily from hardboard. The dimensions of the sides of the smaller one are  $3\frac{1}{2} \times 5$  in., and the large one is  $6 \times 12$  in. The small reel accommodates 20 ft. of light cord, and has a night light which tells when power is coming through the line. The capacity of the large reel is 50 ft. of heavy cord, and it is made doubly handy by the receptacles mounted on it. ★ ★ ★



Reels are assembled from hardboard sides using copper tubing as spacer sleeves. 3-way outlet on small reel takes night light which acts as "on" indicator







### Breadboard Has Adjustable Guide For Cutting Uniform Slices

For the woman who bakes bread at home, or buys unsliced bread, this adjustable bread-slicing guide will permit cutting uniform slices. A piece of light sheet metal, 2 x 14 in., is bent into a U-shape and fastened with wood screws to the edge of a 1 x 4 about 14 in. long. A T-shaped piece of 1/4-in. plywood is slotted and held to the board with a wing nut. This piece is kept in line by two 1/4-in.-plywood strips. The bread is placed on the board, under the metal band and the guide is adjusted for the desired thickness of slice. The knife is held against the sheet-metal band for accurate slicing.—O. A. Nelson, Seattle, Wash.

### Rod Driven Without Bending When Inserted in Pipe

You will find that a long electrical ground rod frequently will bend while being driven into hard or stony terrain unless you have a helper at hand to hold it. When one man is obliged to handle the job alone, such bending can be prevented if a suitable length of small pipe is forced a few inches into the ground first, and then the ground rod inserted in it. After the rod has been driven to a depth of several feet, the pipe can be removed and the task completed without further difficulty.

### Free-Cut Saw Blade Improvised

A hollow-ground circular-saw blade can be modified for use as a free-cut type, by grinding off the crosscut teeth in each section of the blade, leaving only the raker tooth. A combination blade also readily adapts itself to this modification, but it is necessary to alternately set the raker teeth to allow them to cut freely. This modification will work well, but has definite limitations. The saw should not be run at too high a speed, nor should the work be forced into it.



Robert Micals, Freehold, N. J.

### Anchoring Rolls of Screen Wire

One hardware dealer, faced with the problem of tying up rolls of screen wire for storage at the end of the season, saved himself time by anchoring the loose end of the roll with hog rings, as shown. These rings, which come



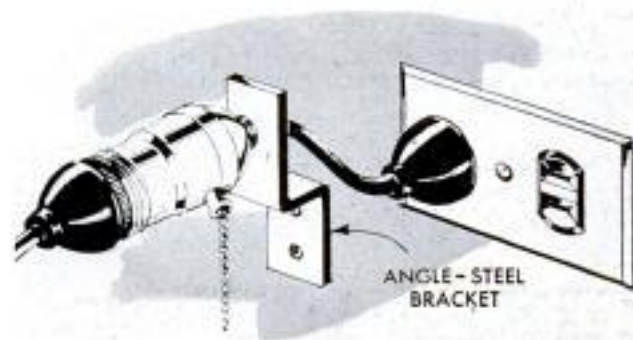
bent as pictured in the inset, can be pushed into the mesh with little difficulty, and can be withdrawn just as easily when the screen wire must be unrolled.

G. E. Hendrickson, Argyle, Wis.

### Handy Washing-Machine Switch

To save my wife the bother of disconnecting the washing machine five or six times during a washday, I fastened an improvised switch to the wall near the machine, as shown in the illustration. The switch consists of an ordinary pull-chain socket mounted on an angle-steel bracket and connected to the wall outlet by means of a short cord. The plug of the washing machine is then inserted in a female receptacle which is screwed into the socket.

Martin Mantell, Hazleton, Pa.







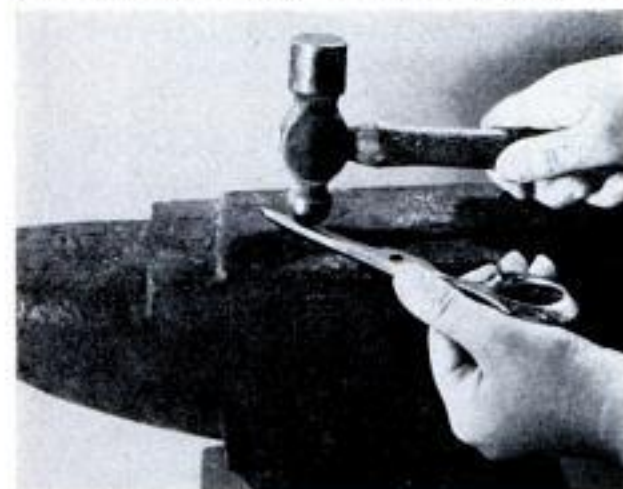
# RENEW YOUR SCISSORS



Dull, bent scissors that you've been intending to throw away can be put back into service with a few simple repairs. Start by cutting off original rivet



Clean rust from scissors with dampened steel wool and polish blades with fine sandpaper or emery cloth. Adding drop of oil helps to obtain a "satin" finish



Polish one surface of bent blade until bright, heat gently until yellow tinge appears and place on anvil, concave side down. Straighten by hammering lightly



Temporarily assemble scissors. If tips are uneven when closed, file rivet holes either toward or away from cutting edge and redrill holes for larger rivet

New rivet can be made from head and shank of round-headed screw. Assemble scissor blades with rivet, spring and washer and peen over end of screw shank

Scissors may be sharpened by filing or grinding on fine-grit wheel. Draw blade across wheel so bevel is same as original, one pass usually being sufficient



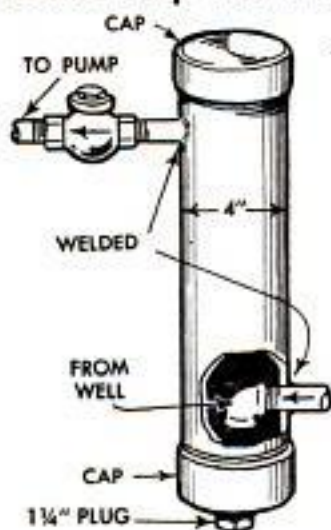


## Rawhide Lacing Cut Uniformly With Hatchet and Knife



If a sharp knife and a hatchet or ax are available, you have the tools for cutting leather shoelaces. Start the lace by cutting a strip 2 or 3 in. long parallel to the edge. Then strike the hatchet, ax or even another knife blade into a flat surface. Holding the started lace tightly against the side of the hatchet, force a knife into the surface against the lace, with the cutting edge of the knife blade slanted toward the piece of leather. Hold the piece flat to the surface and pull steadily to make an even lace. The knife should be sharp, or the leather will have a tendency to bunch up against the blade.—N. C. Darling, Orleans, Mass.

## Sand Trap for Water-Pump Line



A length of 4-in. pipe, 15 in. long, will make an excellent sand trap for a water line fed by a well pump. The pipe is threaded at both ends and capped, with the bottom cap drilled and tapped for a 1/4-in. pipe plug. One hole is cut near the top end of the pipe and another is cut near the bottom on the opposite side, both

being large enough to insert pipe nipples of the size used for the line from the pump. The lower pipe nipple is fitted with an elbow turned so the opening faces the bottom of the trap. Both nipples are welded in

place. The trap is connected in the line between the well and the pump with a check valve on the pump side of the trap, as shown. When the water is pumped through the trap, sand will fall to the bottom as the water is forced down by the elbow. Several times a year, or as often as required, the pipe plug in the bottom is removed and the sand drained out.

G. W. White, Severn Park, Ont., Can.

## Chalk Line in Bow Aids Lettering

When laying out signs on windows and doors, the difficulty of holding a short chalk line can be eliminated by using the whip-bow chalk line shown in the diagram. The line is attached permanently to one end of a flexible dowel. The other end of the dowel is slotted to receive the line when the bow is bent. A knot in the free end of the line holds it in the slot.



The line is attached permanently to one end of a flexible dowel. The other end of the dowel is slotted to receive the line when the bow is bent. A knot in the free end of the line holds it in the slot.

## Discarded Oil Can Stores Drills

When a battered spout renders an oil can useless, save the bottom to use as an oiltight container for short drills, punches and other small tools. Partially filled with oil, the can will protect the tools from rust. When set near the job it is handy for dipping drills to lubricate them when drilling. The wide base of most oil cans makes them ideal for this use, because they are not tipped over easily even when empty.

H. Leeper, Canton, Ohio.



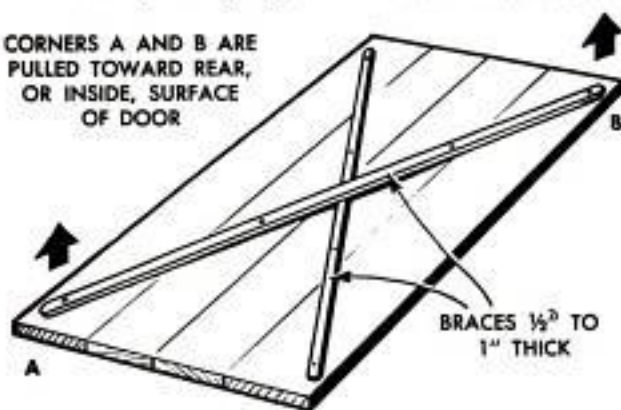
POPULAR MECHANICS



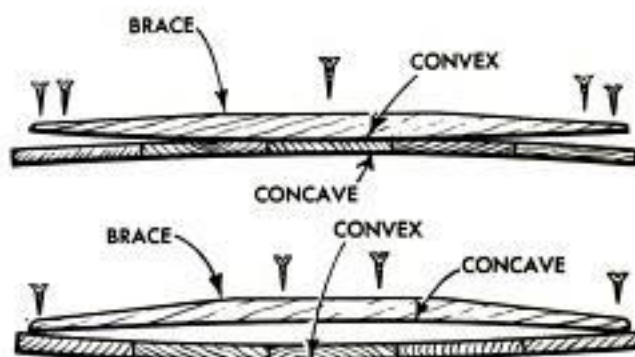
# Straightening WARPED DOORS

Wooden doors, especially those made from tongue-and-groove lumber, often warp diagonally so that opposite corners are too far "in" or "out." Such warping can be neutralized by means of simple diagonal braces installed on the inside of the door, where they are visible only when the door is open. One form of brace consists of a 2-in. board,  $\frac{3}{4}$  to 1 in. thick, tapered to 1 in. at the ends. The taper is formed by planing the outer edge of the brace. The underside is planed either concave or convex, depending on the warp of the door, as shown in the right-hand detail. When the X-brace shown in the left-hand detail is used, one arm of the X is flat against the door, and the other bridges it. The bridging piece exerts an upward pull on the warped corners of the doors, bringing them back into line.

CORNERS A AND B ARE PULLED TOWARD REAR, OR INSIDE, SURFACE OF DOOR



Above, crossed braces are applied to the inside of a warped closet door. Outermost brace exerts pull on top outer corner and bottom inner corner of door



DIAGONAL DOOR SECTIONS

## Hardboard Painted and Finished the Same as Hardwood

Hardboard is painted or finished in the same manner as any hardwood, following the instructions of the manufacturer of the particular finish to be applied. As with wood, the surface must be cleaned of dirt, grease and other foreign matter before finishing. Dirt is removed with a mild soap-and-water solution, and grease with carbon tetrachloride or naphtha. After cleaning, wait until the surface is completely dry before applying the finish. Any rough spots caused by cutting, handling or fastening should be smoothed with fine sandpaper. Next, a sealer or primer that is intended for use with the particular finish is applied. The primer, used as a base for the finish coats, is pigmented so as to have opacity as well as sealing qualities. Sealers, on the other hand, are sometimes used as the only finish. Penetrating sealers, which are an excellent means of finishing hardboard

work surfaces, are of this type. They are easily applied, fast-drying and require only occasional washings to keep them in condition. Hardboard also can be stained with good results. The best stain to use is the nongrain-raising type, which may be applied by brush, spray, dipping or wiping. The stain should be covered with a protective coating of varnish, clear lacquer or clear sealer. Another method of staining is to use colored penetrating sealer or to mix a small quantity of dry pigment or color-in-oil in clear penetrating sealer. The mixture is applied heavily, then the excess is wiped off.—Masonite Corporation.

☞ When sewing snap fasteners on clothes, attach the stud first. Rub chalk on its tip and press against the other side of the garment. The resulting mark will show where the socket of the snap should be sewn.

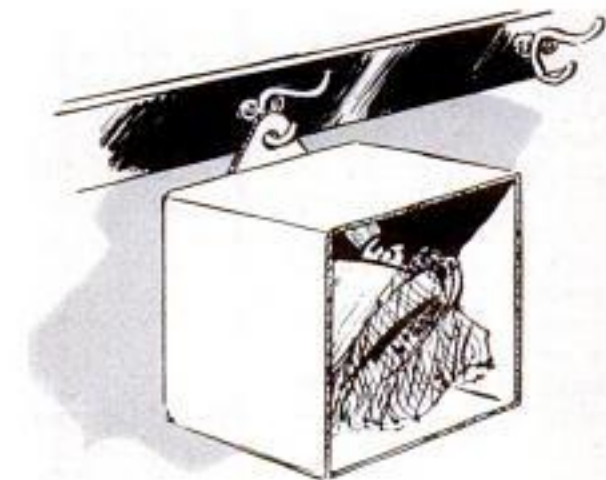


# Solving Home Problems



**HANDY SPICE CABINET** recessed in kitchen wall is closed with neat door hinged to open downward. Cabinet is simple box,  $3\frac{1}{2}$  in. deep by  $5\frac{1}{2}$  in. high, which is inserted and fastened between wall studs

**THE HANGING HAT BOX** shown below, is a real closet-space saver that can be made in a few minutes from a small cardboard box. Top flaps are cut off and V-cut made in bottom is bent to form tab



**DUPLEX RECEPTACLE** fastened to back of bed headboard, left, is ideal for plugging-in an electric clock, radio or electric blanket. Cord from surface-mounted receptacle is run to the baseboard outlet





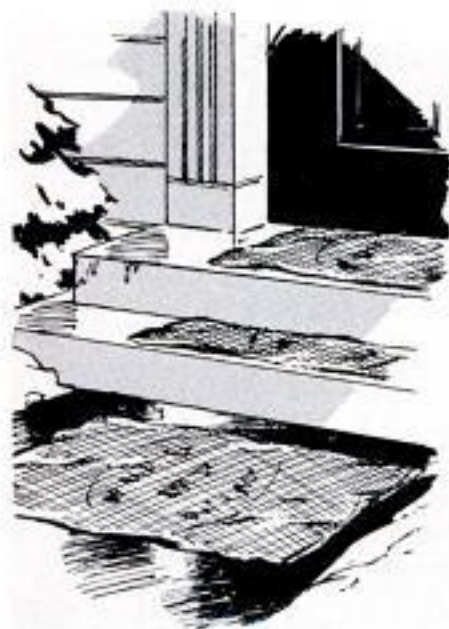
**IF SEWING THIMBLE** is misplaced, a suitable substitute can be improvised by taping a coin to tip of finger. Although not as efficient as thimble, coin allows you to push needle through the fabric



**WHEN RING DROPS** part way down sink drain, easiest way to retrieve it is with tweezers. If latter are not available, wrap piece of paper toweling in tight spiral and use to pick up the ring as shown above



**PAINT SPOTS** on linoleum floor that are too dry to be removed with turpentine, often can be "sanded" off with fine steel wool. Work carefully to protect linoleum, then wax and polish

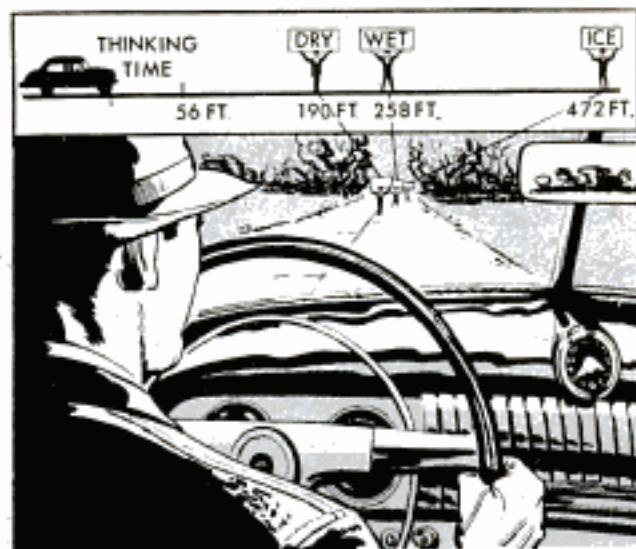


**BURLAP SACKS** spread over icy steps and walks, above, provide nonslip surface and eliminate nuisance of ashes or sand being tracked into house. Dampen sacks first so they will freeze in place on icy surface

**RIGHT, OILSTONE MOUNTED** in kitchen-cabinet knife drawer permits quick whetting of blades as knives are removed. Cement oilstone to wooden block and mount flush with edge of drawer which is notched for blade







## Driver and Automobile Brakes Must Team Up for Safety

"Look at my tire marks! The wheels were locked! What more could I do?" How often have you heard these statements at the scene of an automobile accident? Such a driver has no knowledge of the limitations of his brakes, nor of the tremendous force of momentum. A modern passenger car traveling at 60 m.p.h. covers ground at the rate of 88 ft. per second. At the conservative open-highway speed of 50 m.p.h. on dry pavement your car will travel 190 ft. before you can bring it to a full stop, even when the brakes are in good condition. This distance increases to 258 ft. on wet pavement, and stretches to 472 ft. on icy pavement. With most automatic transmissions and overdrives, the car can be slowed or stopped only by the brakes, because there is no braking compression from the engine that is transferred to the driving wheels. A good safety habit to acquire is to allow a car length between you and the car ahead, for every ten miles an hour of speed on dry pavement, a length and a half on wet surfaces and three lengths when driving on ice. Close to 30% of the cars tested in one safety checkup had faulty brakes. Do not buy cheap linings or questionable brake fluid. Many of the cheaper linings will not stand one "panic" stop from 70 m.p.h. At present there is no accepted quality standard on brake lining set up by any independent source, such as the S.A.E., as there is for brake fluids. And one in three brands of brake fluid does not meet the S.A.E. specifications for the heavy-duty fluid required in modern automobiles. A serious misconception is held by many drivers that power brakes will stop a car more quickly. The power brake makes it easier to apply pedal pressure, but does not stop the car in a shorter distance. Too much pressure may cause trouble.

## Hot Lead Cuts Hole in Glass

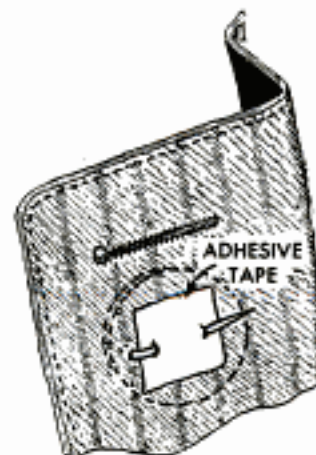
When faced with the need to bore a hole in a pane of glass, one craftsman used a dam of putty and molten lead to do the job. He shaped a pocket in the putty with the point of a pencil and poured the molten lead into the pocket. The lead cut a hole through the glass approximately the same diameter as the hole in the putty. *Caution:* No moisture should be present on either the glass or putty.



John A. Comstock, Wellsboro, Pa.

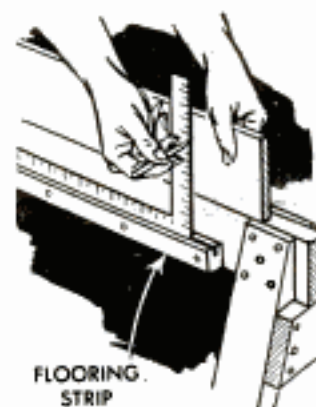
## Adhesive Tape Anchors Badge To Hunter's Lapel

To avoid the possible loss of an identification badge, one hunter inserts the pin of the badge through his coat lapel and also through a small square of adhesive tape stuck on the back of the lapel, as shown. The tape anchors the badge securely and yet may be removed easily when the badge is taken off. This same idea is practical also for those attending conventions and other gatherings where identification badges are worn.



## Flooring Strip Aids Squaring

Should it be necessary to square off a large number of pieces of lumber, one way of doing it quickly and accurately is to screw a strip of tongue-and-groove flooring to the side of a sawhorse. The strip of flooring is fastened groove up and parallel to the top edge of the sawhorse. In use, a carpenter's square is set in the groove and held against the work by the hand that holds the pencil, while the other hand steadies the work.





SN 56

# ALUMINUM

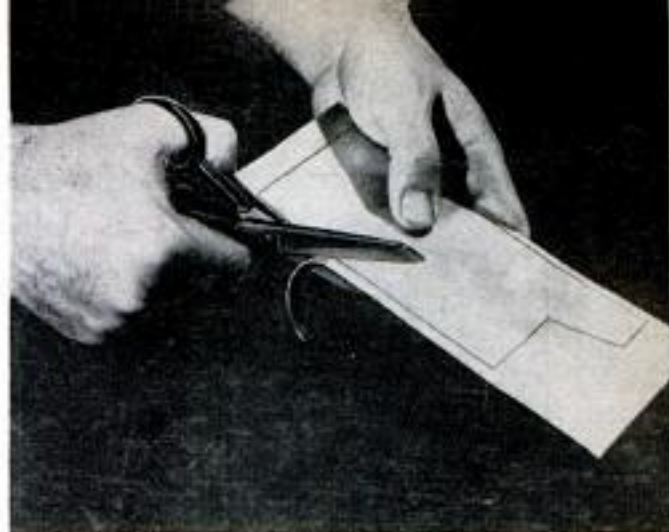
## Makes Its Debut

### As a New Craft Material

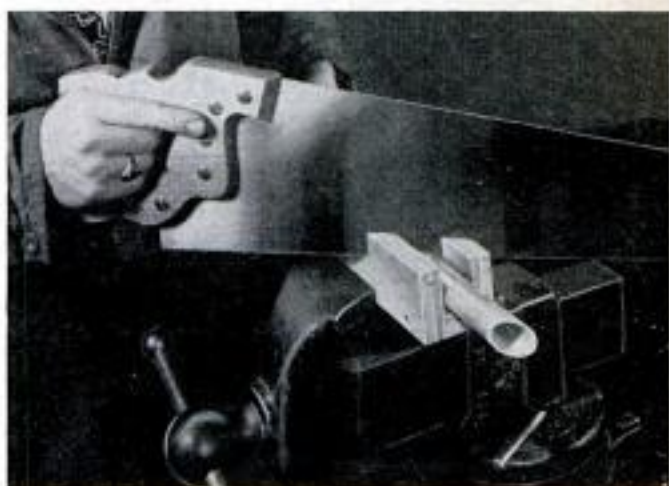
**T** IRED OF WORKING solely with wood? A fascinating new experience awaits you in working with do-it-yourself aluminum—a new, easily worked craft material that offers the home craftsman unlimited possibilities in creating attractive, smart-looking pieces of modern furniture. The many advantages of aluminum are familiar to most craftsmen, but up to now, this material has been fairly difficult to work. Now, thanks to the Reynolds Metals Company, a special homecrafter's aluminum is available which can be worked with ordinary hand and power woodworking tools.

Do-it-yourself aluminum is available in standard sizes and shapes, including rod and bar stock, various sizes of angle, tubing, embossed or mill-finished sheet and the popular aluminum foil. In addition, there are a variety of aluminum fasteners such as sheet-metal screws, machine screws, wood screws, rivets and nails. As you can see from the right-hand photos on this page, the sheet may be cut with ordinary scissors or tin snips, the tubing, rod or bar stock with a handsaw or coping saw, burrs removed with a pocketknife and holes drilled with wood bits. The home-shop circular saw, jigsaw, jointer, drill press and other power tools also can be used. Because of the thinness of the sheet and the tubing walls, it is recommended that a fine-tooth blade be used to

This handsome barbecue cart is a striking combination of aluminum angle, tubing and sheet. Shelves of  $\frac{1}{4}$ -in. hardboard and a pair of semi-pneumatic wheels complete unit



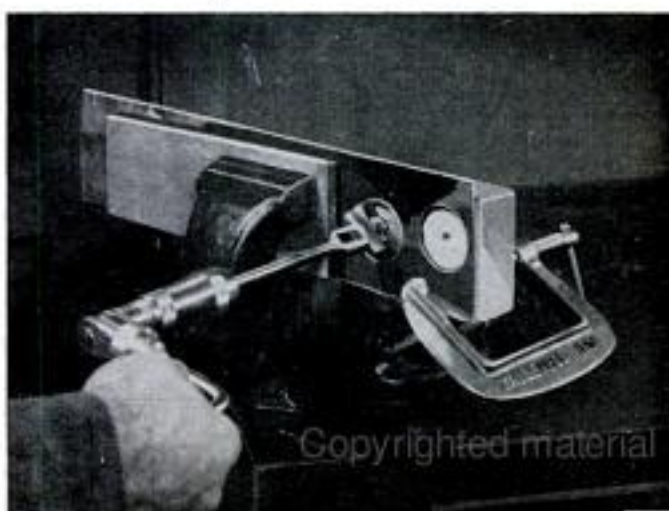
Plain or embossed aluminum sheet is cut readily with pair of ordinary household scissors



Above, a length of tubing is clamped in vise between wooden blocks and cut with handsaw

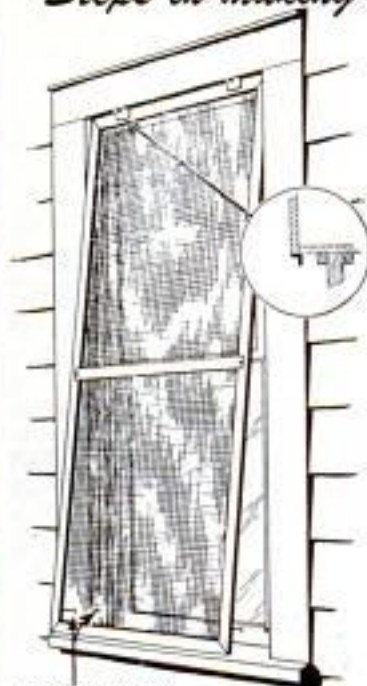


Burrs can be removed from edges of tubing with pocketknife, above. Aluminum sheet is bored with expansive wood bit, as below





## Steps in making aluminum screens



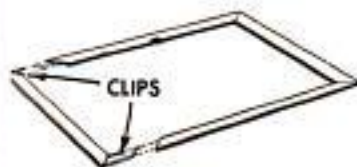
SCREEN HOOK AND EYE



FRAME MEMBERS MITERED WITH HACKSAW

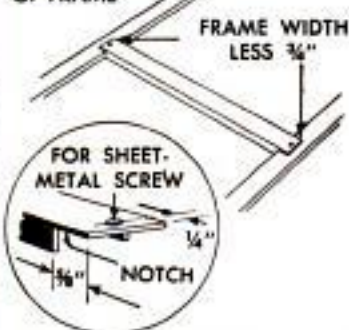


METAL CLIPS LOCK MITERED CORNERS



HOW METAL CLIPS LOCK CORNERS

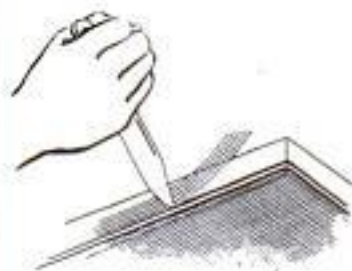
BRACE ADDED AT CENTER OF FRAME



ALUMINUM FRAME SECTION



SPLINE DRIVEN IN GROOVE ANCHORS SCREEN WIRE



EXCESS TRIMMED OFF WITH KNIFE

saw the material. These pages picture some of the countless attractive things that can be made from this new material, and plans and instruction booklets giving you further information are available from the dealer who handles this product.

One of the real moneysaving features of this material, is newly designed extruded moldings which allow you to make your own screen and storm sash. The series of drawings above show how screens can be made. The frame members are mitered at the corners and assembled with clips, the screen wire is stretched across the frame and the wire is driven into the frame grooves all the way around. Then a wire spline is driven into the groove over the screen wire to hold it in place. Plastic storm windows are made in much the same way using the same molding. ★ ★ ★

Modern magazine rack, left, combines embossed aluminum sheet with black-painted tubing. For some really eye-catching furniture, note sketches at the right. Here, aluminum is used with hardboard or plywood

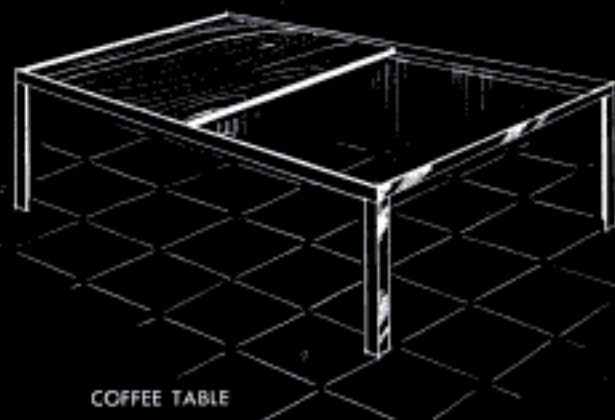




DESK



ARM CHAIR



COFFEE TABLE



MODULAR CABINET

## Envelope Corner as Bookmark

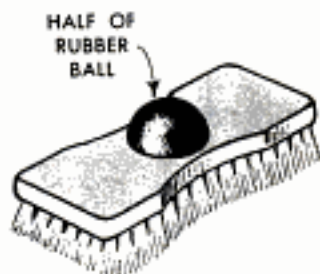
The corner of an old envelope often makes a more satisfactory bookmark than the usual card or paper stuck between the pages. Cut off a lower corner from the envelope and slip it over the upper corner of the page to be marked. This marker will not project above the corners of the book and, therefore, does not interfere when placing the book on a shelf that provides little or no clearance over the top of the book.

Henry A. Miller, Kent, England.



## Hand Rest on Wire Brush Provided by Half of Ball

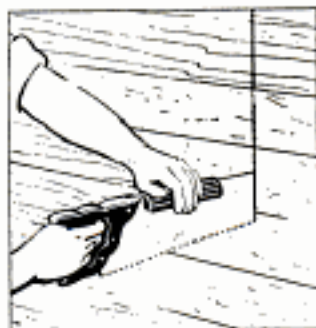
Much of the strain on wrist and finger muscles that results when painters use a wire brush to remove old paint, can be avoided if the back of the brush is equipped with a hand rest. One method is to cement one half of a sponge-rubber ball to the back of the brush. The ball will fit up into the palm of the hand, providing a resilient rest.



## Piece of Hose Speeds Sawing In Difficult Places

Making cuts with a handsaw that require short strokes and guiding of the blade with both hands can be facilitated by an extra handhold improvised from a piece of garden hose. Slit a 5-in. section of the hose lengthwise and slip it over the edge of the blade to form a grip for the left hand. This will enable you to apply more pressure to the saw and also to obtain better control of the blade.

Victor Lamoy, Upper Jay, N. J.



☐ The annoyance of searching through your purse or handbag for the house key can be avoided if the key is placed in an empty spectacle case, which is easy to find.





### Plumb Bob Improvised From Solder and Cord

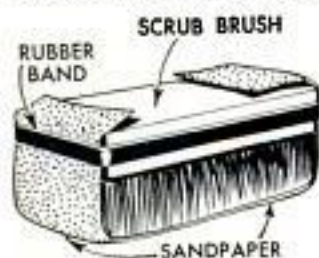
A plumb bob suitable for use around the house is made easily from a length of wire solder. Flatten one end of the solder, band the flat end around a fine cord and, pinch it tight with pliers. This makes a bob that can be used against a wall when hanging wallpaper or large pictures. A number of these plumb bobs can be made to use for individual drops from a cord stretched between two points, as in the case of spacing fence posts.

Watt Baker, Charlotte, N. C.

### Wall-Paneling Filler

After wall paneling has been installed, the nail holes can be filled with a mixture of fine, sifted sawdust and shellac. Since the shellac dries quickly, it is best to work with small amounts of the mixture. After the filled spots have dried, sand them.

### Scrub-Brush Sanding Block Ideal on Uneven Surfaces

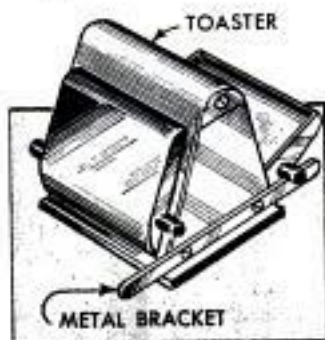


The sanding of irregular surfaces will be no problem if you wrap the sandpaper around a scrub brush and use it as you would a sanding block.

The bristles of the brush permit just enough "give" to allow the sandpaper to follow any curvatures in the surface. A rubber band secures the sandpaper.

### Toaster Bracket Supports Doors

A metal bracket fastened to some of the older, non-automatic toasters will prevent damage to table and cloth caused by the hot door dropping open. The length of the bracket and its location will depend on the individual toaster. The bracket is mounted so that the handles of the doors rest on it when the doors are open. The bracket is also useful for winding up the cord when the toaster is stored away.



Arthur Trauffer, Council Bluffs, Iowa.

### Shaker-Type Seasoning Can Dispenses Abrasives

Rottenstone, pumice and other abrasive powders used around the home workshop for polishing are kept ready for instant use if stored in the small shaker-type cans in which seasonings such as paprika are packed. The "sprinkler" top makes it easy to dispense just the right amount of abrasive required. And since shaker cans are usually provided with separate covers, the abrasive can be kept free of moisture and foreign substances.

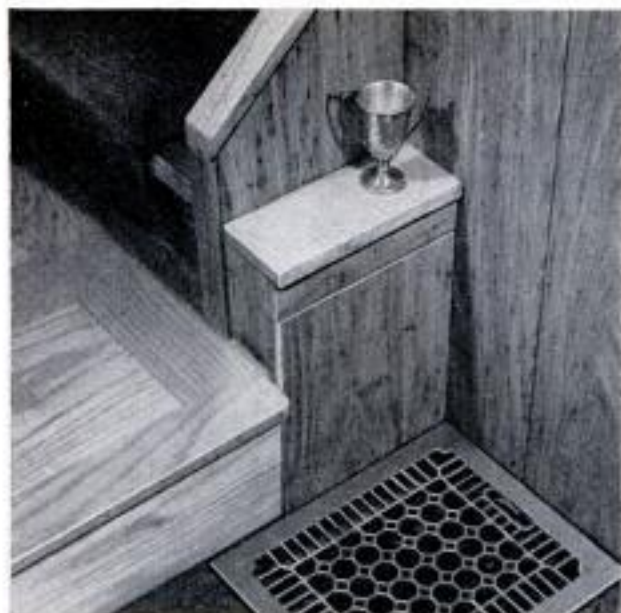
R. F. Donovan, Guttenberg, N. J.



Opening a partially used can of paint will be easier if a little petroleum jelly is applied to the cover rim each time the can is sealed. For best results, remove any paint drippings left in the rim of the can before applying the petroleum jelly.



WIM '55



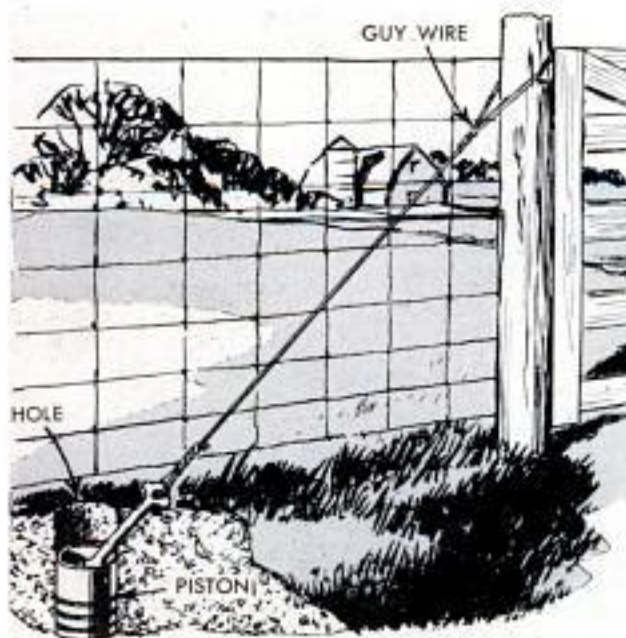
## Wooden Drying Rack Folds Into Cabinet

When not in use, this wooden drying rack is slipped out of sight into its own neat-looking cabinet which becomes an attractive whatnot shelf. Situated next to a radiator or hot-air register, it utilizes the heat to dry gloves, stockings and other small articles of clothing. The rack is formed of  $\frac{3}{8}$ -in. dowels, which are glued at one end in blind holes drilled in a piece of 1-in. stock. The other ends of the dowels are glued in holes in the underside of a second piece of 1-in. stock that becomes the top of the cabinet when the rack is closed. Another length of stock is screwed at right angles to the top piece, thus forming the top section of the cabinet front. A  $\frac{1}{8}$ -in. strip is attached to the inside of the

latter, forming a lip to hold the top in place when the cabinet is closed. A cleat is fastened to the back of the cabinet so the lower end of the rack will engage the cleat to hold the rack in a horizontal position. A  $\frac{1}{2}$ -in. strip is fastened across the fronts of the dowels. This is located to bear against the inside of the cabinet front and prevents the rack from sliding out when in the open position. The top of the cabinet projects  $\frac{1}{4}$  in. at the front to provide a finger grip for lifting the rack from its cabinet. The latter is of simple box construction made to suit the particular installation, which also determines to some extent the dimensions of the rack itself.

Walter E. Burton, Akron, Ohio.

## Auto Pistons Used as Anchors for Fence and Gateposts



Set in a hole dug by a posthole digger, an automobile piston can be used as an effective anchor for corner and gate fence posts. The piston is inserted in the hole several inches below ground, and then a channel is cut on the side of the hole toward the post to be supported. The connecting rod of the piston is laid in this channel and the guy wire from the top of the post is attached to it and tightened. Dirt is tamped over the piston to complete the job.

## Bleach Cleans Stained Vase

Stain that accumulates in a narrow-necked flower vase where it is difficult to get at with a cloth or brush can be removed with a mild solution of ordinary laundry bleach. After such a cleaning, the vase should be rinsed thoroughly in hot water to remove all traces of the bleach.

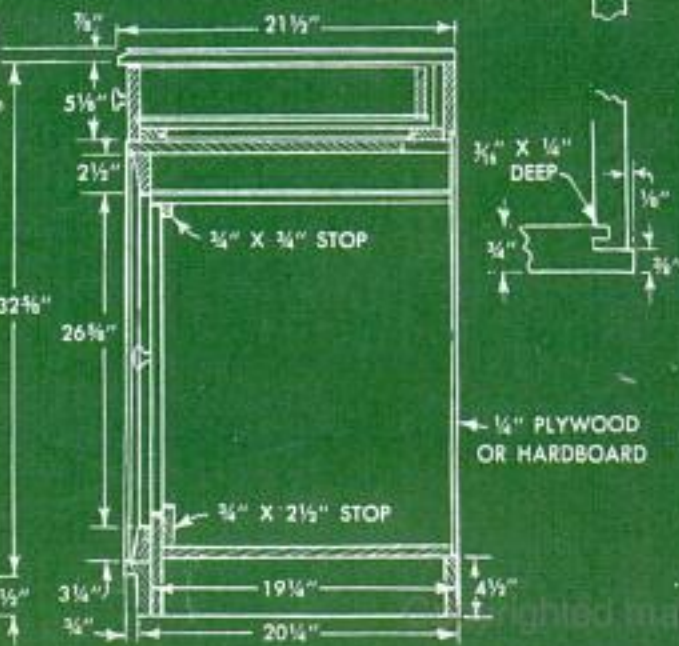
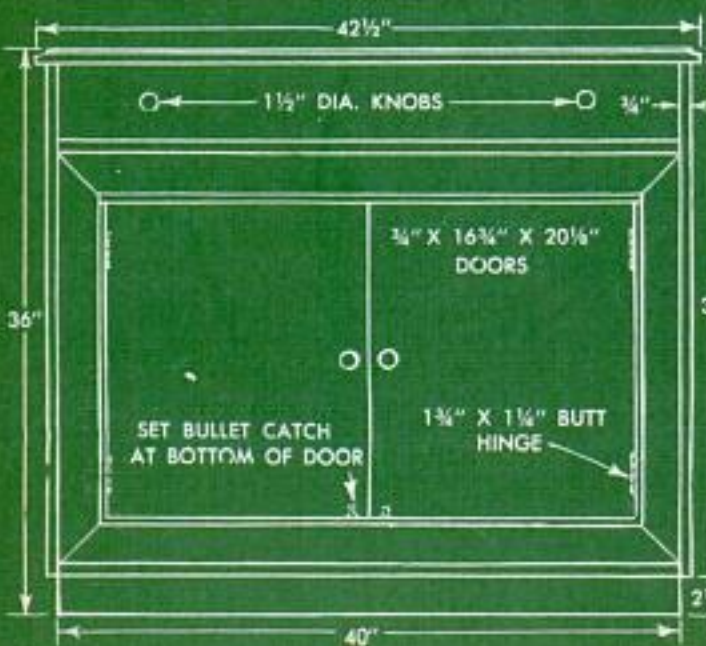
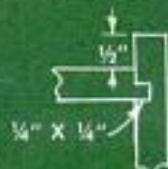
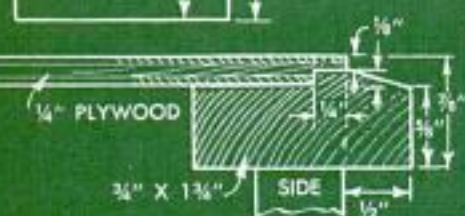
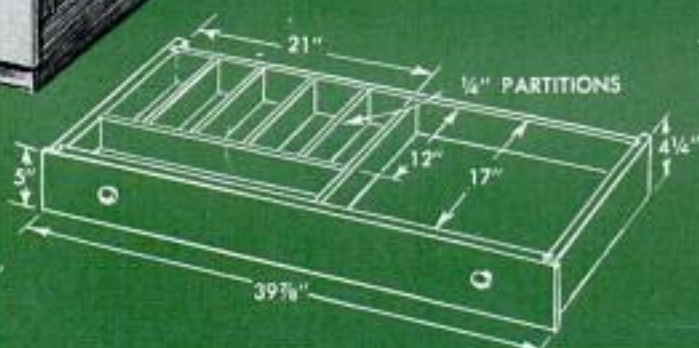
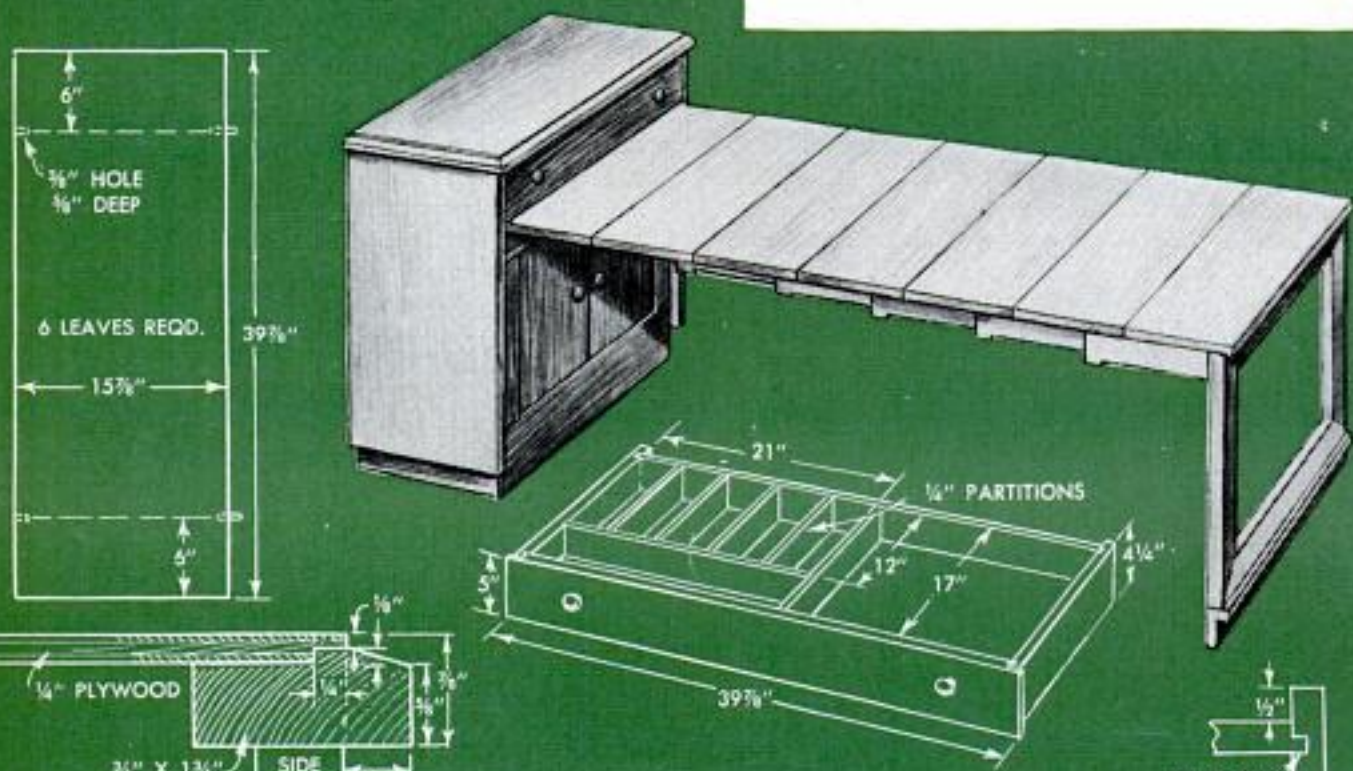


# PLAN of the MONTH...



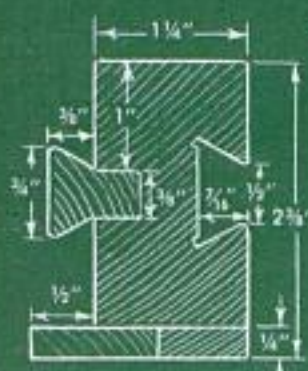
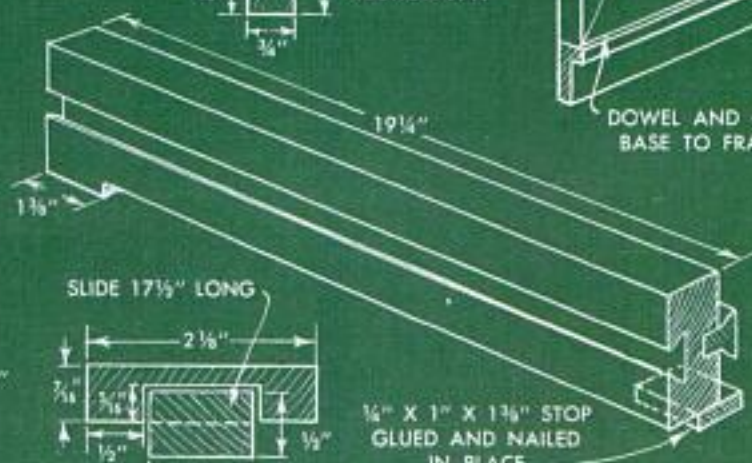
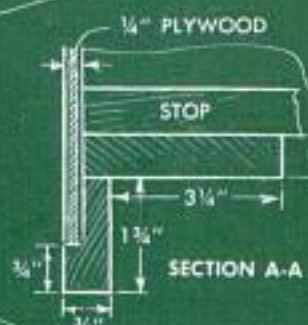
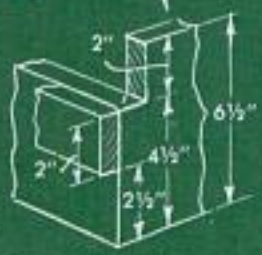
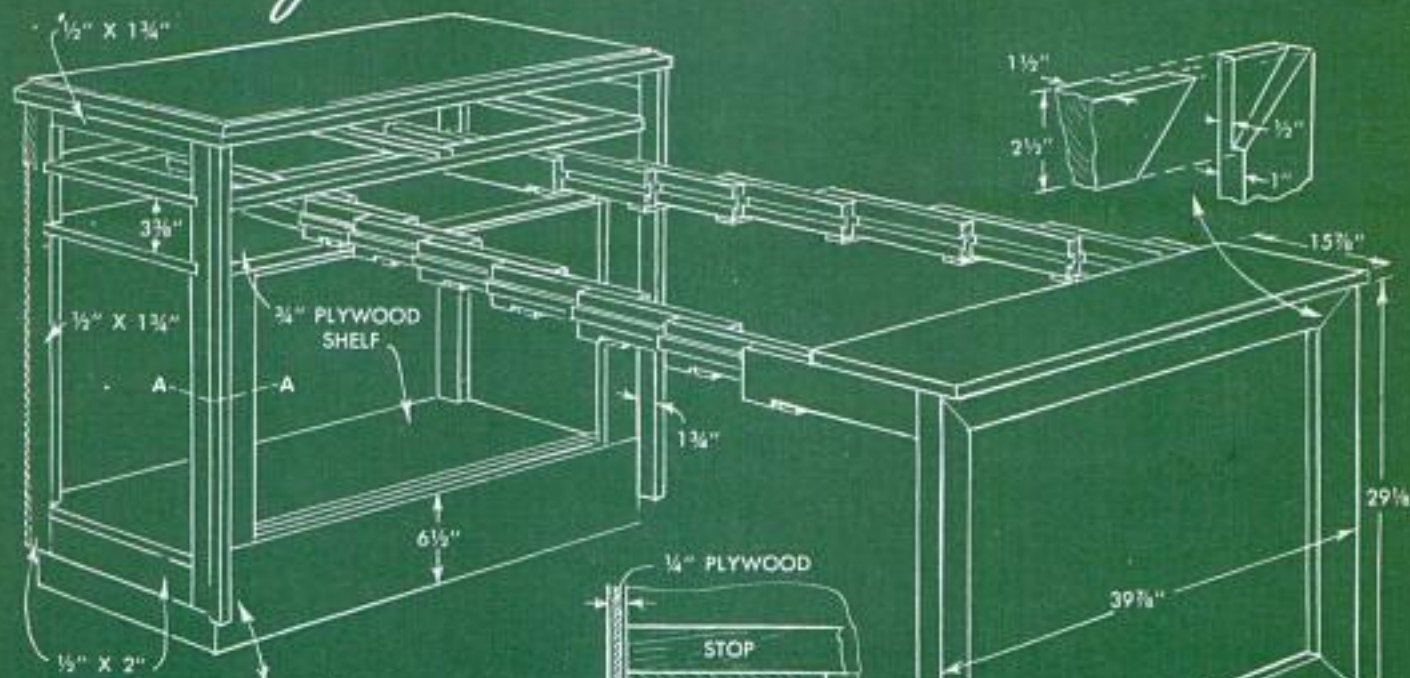
W T M '55

Combining the advantages of minimum storage space with a maximum seating capacity, the table featured in this month's plan by John Bergen is large enough to seat 10 people, yet folds into a cabinet only 21½ in. deep. The secret of the table's flexibility lies in the leaf supports, which telescope by means of dovetail slots and keys. A dovetail bit of the proper size, chucked in a drill press, can be used to rout the dovetail slot, as well as shape the key. However, both slot and key can be cut with a circular saw, using a sharp chisel to clean out the bottom of the slot. The key can be made an integral part of the slide by cutting each member from one piece. Note that the table top, which is the same size as each leaf, is permanently attached to the outboard "leg" of the table by wood screws. A drawer in the cabinet provides a convenient storage space for table linens and silverware





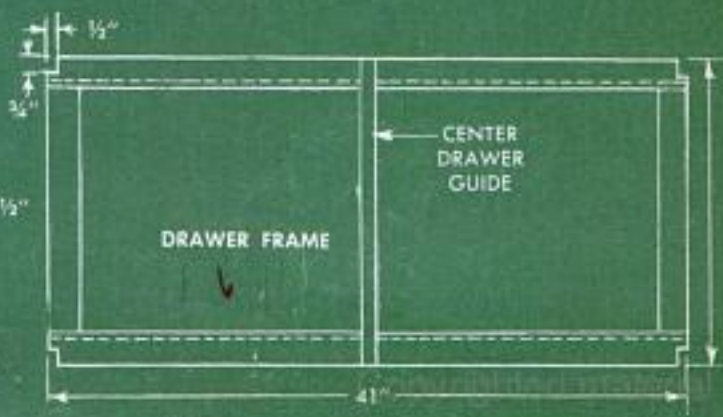
# Dining Table Commode



$\frac{1}{4}$ " X  $1\frac{1}{2}$ " X  $1\frac{3}{4}$ " STOP GLUED AND NAILED IN PLACE

CAN BE MADE IN ONE PIECE

WAX SLIDE MEMBERS THOROUGHLY WITH PARAFFIN AFTER ASSEMBLY USE HARD MAPLE FOR SLIDES







### Rolled Towel Across Back Eases Traveling Fatigue

To avoid backache caused by sitting for long periods of time, as on a train, bus or car ride, one traveler uses an ordinary bath towel. A large-size towel is folded in half, across the short way, then wrapped into a tight roll. The rolled towel is placed across the small of the back, and by occasionally moving it up or down, changes the muscle tension enough so that back fatigue is kept to a minimum. The towel is carried easily in a suitcase and is inconspicuous as compared to a pillow.

S. S. Rubira, Jr., Phoenix, Ariz.

### Sawdust Cleans Chinaware

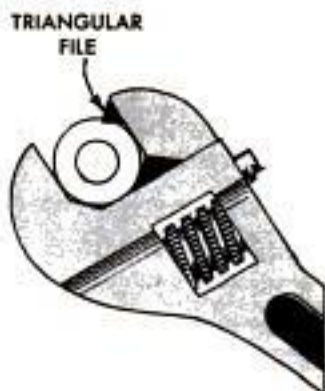
Irregular corners inside china and glassware can be cleaned with a mixture made by mixing a pinch or two of fairly fine sawdust with the scouring powder or other cleaning agent used for this job. Drop the mixture inside the item to be cleaned, and swab it around with a bit of cloth wrapped on the end of a stick. The sawdust particles will conform to the shape of the object and carry the cleaner into the smallest crevices to remove the dirt.



### Improved Pipe Wrench

In an emergency, a wrench for turning pipe or tubing can be improvised by using an ordinary adjustable wrench and a three-cornered file. With a sharp cold chisel, notch the pipe deeply enough to take the edge of the file and tighten the wrench snugly over the file and pipe. Use a firm even pull.

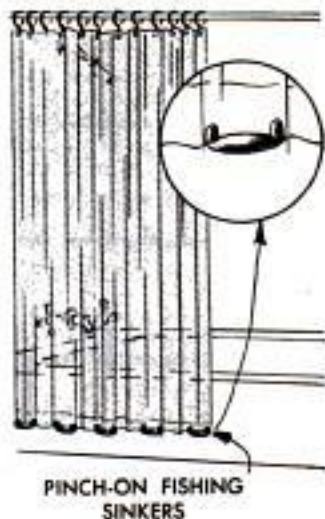
Frank Butrick, Jr., Alma, Mich.



### Shower Curtains Hang Better When Weighted With Sinkers

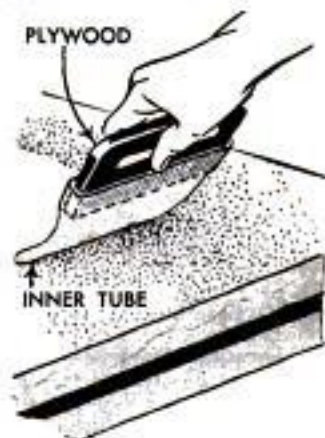
Fishing sinkers on the bottom edge of a plastic shower curtain will prevent the lightweight material from billowing and blowing around the person using the shower. The sinkers on the curtain shown in the sketch are 1½ in. long and of the pinch-on type. Space them about 1 ft. apart and pinch with pliers. Be careful not to cut the plastic by pinching too hard.

Theo. Kleinrock, Brooklyn, N. Y.

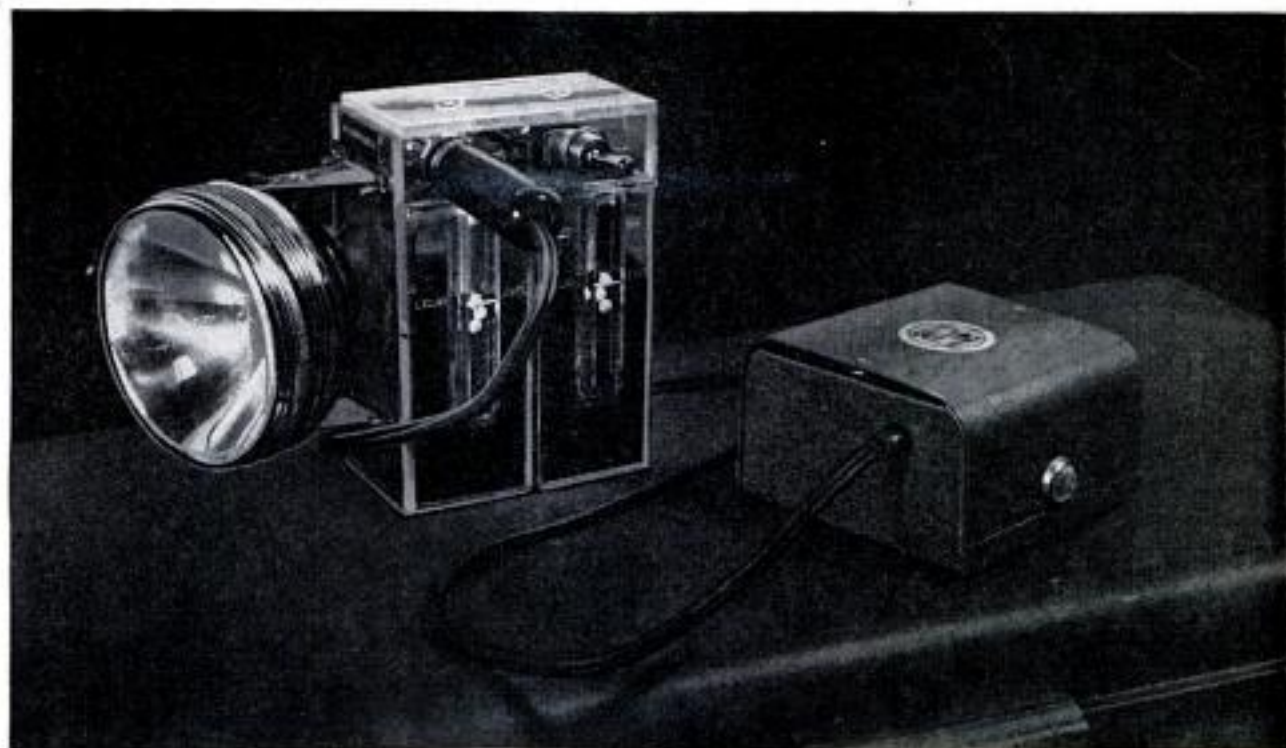


### Band of Inner Tube on Block Makes Bench Brush

For dusting the sawdust and shavings from your workbench, a "rubber bristle" brush can be made by stretching a section of inner tube over a plywood handle. Because it is wide and flexible, the brush will clean the bench in a few strokes. Such a brush would be useful also around the house for sweeping up broken glass, plaster dust and other materials which are difficult to sweep with an ordinary broom.



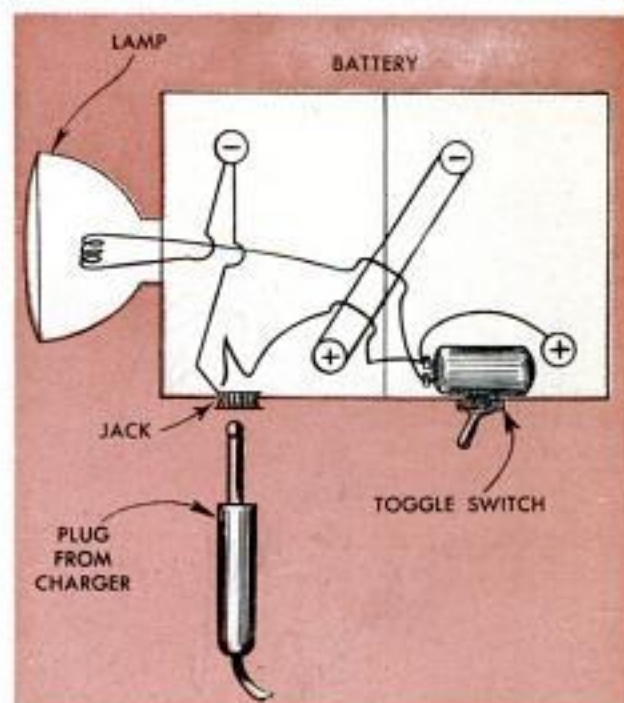




## Wet-Cell Floodlight

UTILIZING a wet-cell storage battery as a source of power, this portable floodlight eliminates the need for the supply of dry-cell batteries required by conventional flashlights. The battery has a plastic case and is the type used for photo-strobe lights. The bulb and reflector unit for the floodlight are salvaged from a swivel-head flashlight, the bracket of the swivel head being fastened to a sheet of  $\frac{1}{8}$ -in. plastic. The latter is cut to fit over one end of the battery case, projecting 1 in. above the top. The flat-headed machine screws used to hold the bracket are countersunk so the sheet of plastic can be cemented flush against the battery case. Two holes are drilled in the projection of the plastic sheet to allow the wires from the light to be connected to the battery and toggle switch. Then strips of the  $\frac{1}{8}$ -in. plastic are cut to provide a 1-in. extension around the top of the battery case. One side strip is drilled to receive the switch and a phone jack which is used to plug in a battery charger. Extension tubes of  $\frac{1}{8}$ -in.-i.d. plastic are fitted into the battery openings and cemented directly beneath holes drilled in a plastic plate, to allow refilling the cells with distilled water. It is suggested that a  $3\frac{1}{2}$ -volt bulb be used, as this type of battery supplies 4 volts. The sheet plastic and cement are obtainable at most hobby stores. The phone jack and plug, toggle switch and wiring are available at a radio-supply house, while the battery and charger may be purchased in a photographic store.

John L. Hoke, Washington, D. C.



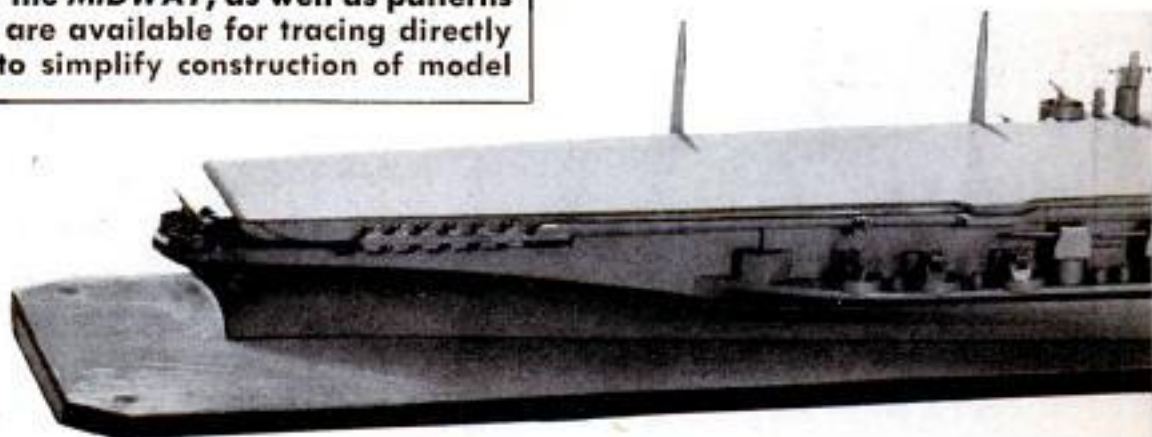


Rep: WTM '55

# Try Your Hand at

## FULL-SIZE PATTERNS

Actual-size patterns of the various lifts that comprise the hull of the *MIDWAY*, as well as patterns for the fittings, are available for tracing directly on your wood to simplify construction of model



## PART I

By Paul Strayer

Below, aerial view shows how actual ship dwarfs tugs. Symbol of power and strength, the mighty *Midway* knifes along at a speed of 34 knots, to provide a formidable striking force in defense of our shores  
Official United States Navy photograph



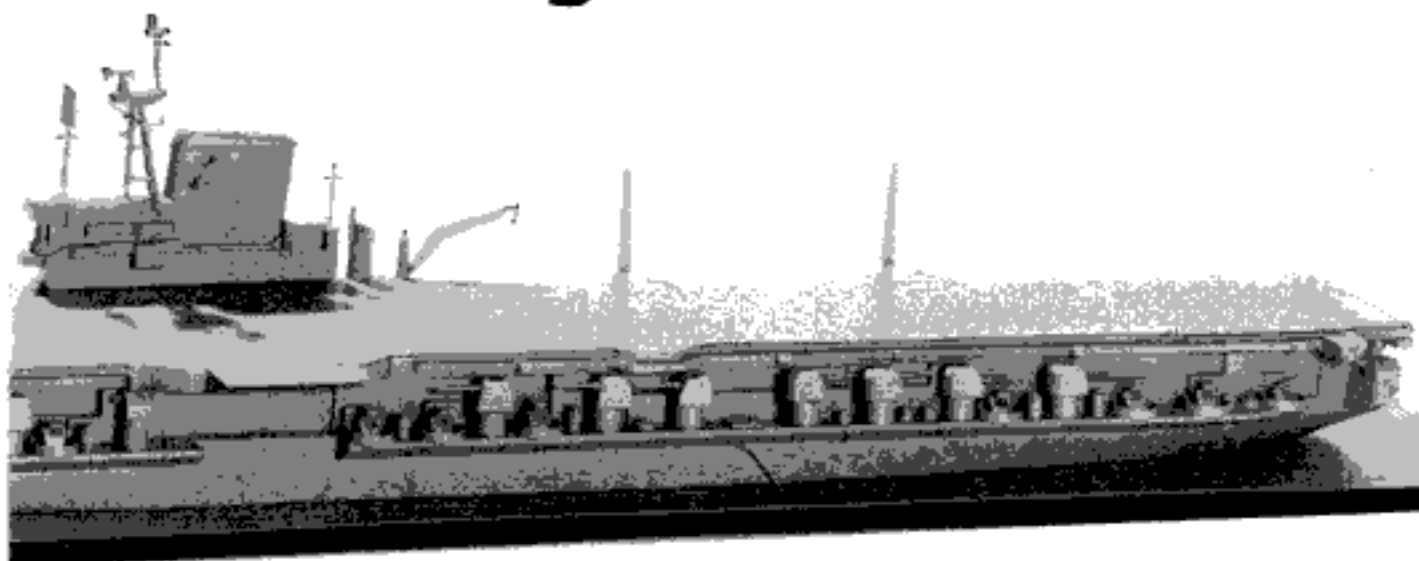
FROM HER BATTLE-READY flight deck down to the vigorous speed lines of her immense hull, this water-line scale model of the mighty 55,000-ton USS *Midway* faithfully reproduces one of the most powerful warships afloat. The modelmaker who thrills to the sight of sleek naval craft will be proud to add this beautiful model to his collection of fighting ships.

**The hull proper:** The hull of the USS *Midway* is divided into four basic parts: the hull proper, the sponson piece, the notched piece and the cover board for the notched piece. If possible, select a piece of white (sugar) pine for the hull proper, measuring 24 in. long, 3½ in. wide and 15/16 in. thick. Usually a local pattern shop will sell you enough sugar pine for your model. Basswood can be used as a substitute as well as mahogany. Pass up balsa wood, ponderosa pine and fir as they are unsuitable for carving. If working with ready-drawn hull patterns which save making your own, you are all set to trace them right on the work. If not, the first step is to enlarge to full size the patterns given on page 210. Note in the case of the hull and sheer patterns, that only half patterns are necessary, as both port and starboard lines of the ship are of the same contour. A pattern also is needed for tracing the hull outline at the water line.

Before the deck and water-line



# Modeling the *MIDWAY*



patterns can be traced on the hull block, you must draw centerlines all around the block—top, bottom, sides and ends. These lines are used to position the patterns for tracing. In tracing, place each respective pattern on the centerline and trace around one side, then flip the pattern over to draw the opposite side, keeping it registered exactly with the centerline. Trace the deck pattern on top of the block and the waterline pattern on the bottom, taking care that the latter is positioned to coincide at the bow with the cutwater as it curves backward at this point.

Mark off the over-all length of the hull by drawing around the four faces of the block, fore and aft. Place the sheer pattern in position and trace around it on opposite sides of the block, keeping the pattern registered with the crosslines at the bow and stern. We are now ready to draw transverse lines all around the block. These establish the points at which the contour templates are held during the carving of the hull. In cutting the sheer profile of my

model, I set the circular saw to the various depths required and made a series of cuts  $\frac{1}{8}$  in. or so apart. Then, with a chisel, I cut away the waste and finished up with a wood rasp and sandpaper, taking care to keep the surfaces level.

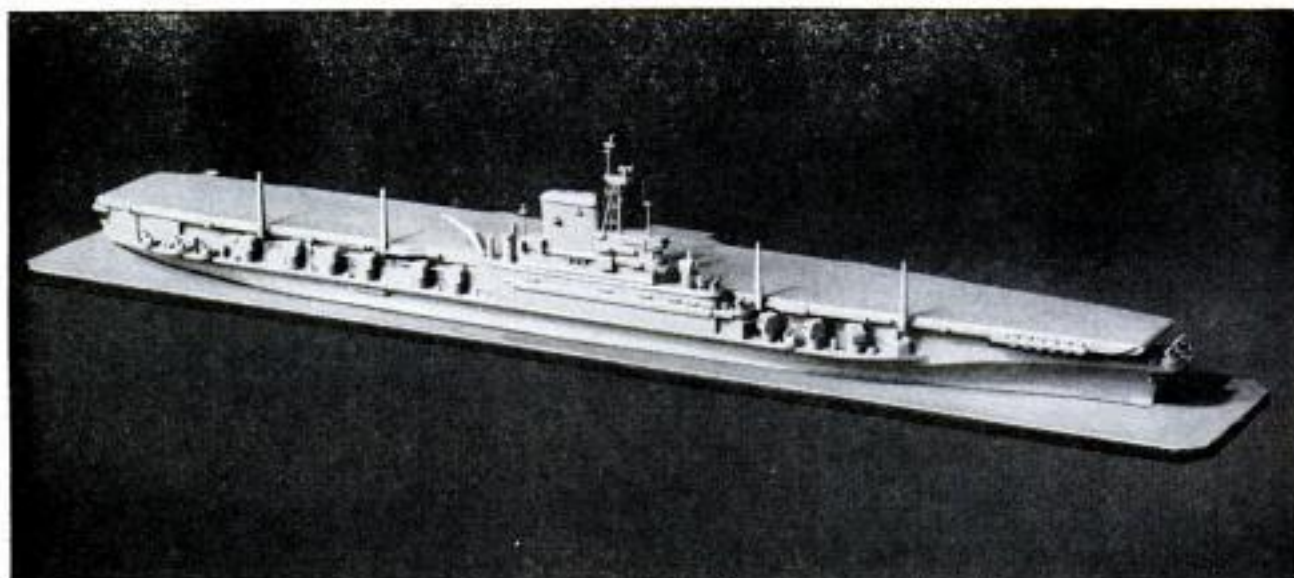
Now you can concentrate on the bow and stern profiles. The stem shape or cutwater of any ship is as characteristic as the profile of a person's face and, therefore, it must be shaped with utmost care. You will note there is a subtle convex curve above a concave curve. This reverse curve is most pleasing and harmonizes perfectly with the semicircular plan of the bow. In sawing the stem and stern profiles, avoid sawing too closely to the actual lines. Final finishing is done after the hull is shaped. The deck outline may be cut with a coping saw, bandsaw or jigsaw. It also may be shaped with a drawknife. Again remember not to saw too closely to line, reserve some wood for final finishing.

The hull is ready for shaping. First, however, you must re-establish the template

## The Mighty Midway

*Commissioned too late to participate in the history-making naval actions of World War II, the mighty Midway and her sister ships, the Coral Sea and the Franklin D. Roosevelt, represent the most powerful carrier units of the United States Navy. Immense ships, they measure 968 ft. in over-all length by 136 ft. maximum beam. Their armament, unlike that of conventional carriers of the Essex class, is carried, for the most part, on sponsons which extend from the sides of the ship. Most of the measurements for Mr. Strayer's 24-in. water-line model were taken from the government model on display at the Museum of Science and Industry in Chicago*





Above, starboard view of completed water-line model



How hull looks when carved according to templates



Stern view showing sponson piece in place on hull



Above, underside view (looking aft) showing overhanging sponson. Below, starboard view shows sponson topped with notched piece. Cover board fits on top



station lines on the hull proper. As these lines are still intact on the bottom, they can be carried easily up the sides of the rough-sawed hull. These lines should be numbered 1 to 12 from the bow aft and from 1S to 8S from a point just aft of midships to the stern. The carving templates are presented actual size on page 209, ready for tracing directly on cardboard. Number each template to correspond with the station numbers. Inasmuch as the center section of the hull is flat, the hull can be held conveniently for carving in a bench vise. In carving the hull, begin at the center and work fore and aft, both sides, using a chisel and gouge. Work carefully, taking only shallow cuts and checking frequently each particular station point with its respective contour template. Watch to see that each template is held vertically in checking the progress of the carving. Pay particular attention and use great care in shaping the region beneath the bow, where the curves are deep, and use utmost care in shaping the area in the vicinity of the bow quarter. As you view the stern from aft, you'll note that it appears to have a triangular shape. After carving the hull down to general but accurate form, bring it down to final lines with various grades of sandpaper.

**The sponson piece:** The sponson piece is the member which distinguishes the carriers of the *Midway* class from those of the *Essex* class which formed the major striking force of the carrier fleets of World War II. The sponson piece is cut from the same kind of wood as the hull, and measures 18 in. long, 4 in. wide and  $\frac{1}{4}$  in. thick. As before, draw a centerline along the top, down the ends and on the bottom of the piece. Then trace around the sponson pattern and cut the wood to shape, taking care that the ends are cut squarely and cleanly. Now with the sponson piece centered on the hull, place the fore end of the sponson in



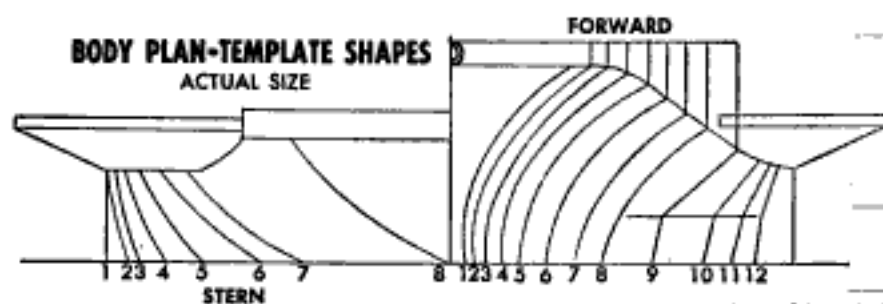
the recess marked X. Tack the sponson lightly in place, leaving the brads projecting a bit so the piece can be removed for shaping. Turn the model upside down and carefully draw a line on the underside of the sponson, following the shape of the hull. When this is done, withdraw the brads and remove the piece. Now take the paper pattern for the sponson and trace around it on the top surface of the board. Thus we have an outline on both the top and bottom of the sponson. Next a guide line is drawn along opposite edges of the sponson at a point  $\frac{1}{32}$  in. down from the top surface. This serves as a point from which the angle or flare of the edge is maintained in shaping the sponson. The shaping is brought from the guide line down to the hull outline drawn on the underside of the sponson piece. Work carefully to see that these lines are closely maintained. The ends of the sponson should be faired smoothly into the hull. Filler, such as wood putty, will enable you to shape the subtle, difficult joints with a riffle file.

**The notched piece:** This piece measures 20 in. long, 3 in. wide and  $\frac{1}{2}$  in. thick. It is somewhat complex in shape with its recesses, projections and half-heights. After the notched piece is cut to shape, it is fastened in place with small brads. A second member, called a small forecastle, butts flush against the fore end of the notched piece. This piece may be added later, and is located as indicated in the plan drawing to be shown in Part II.

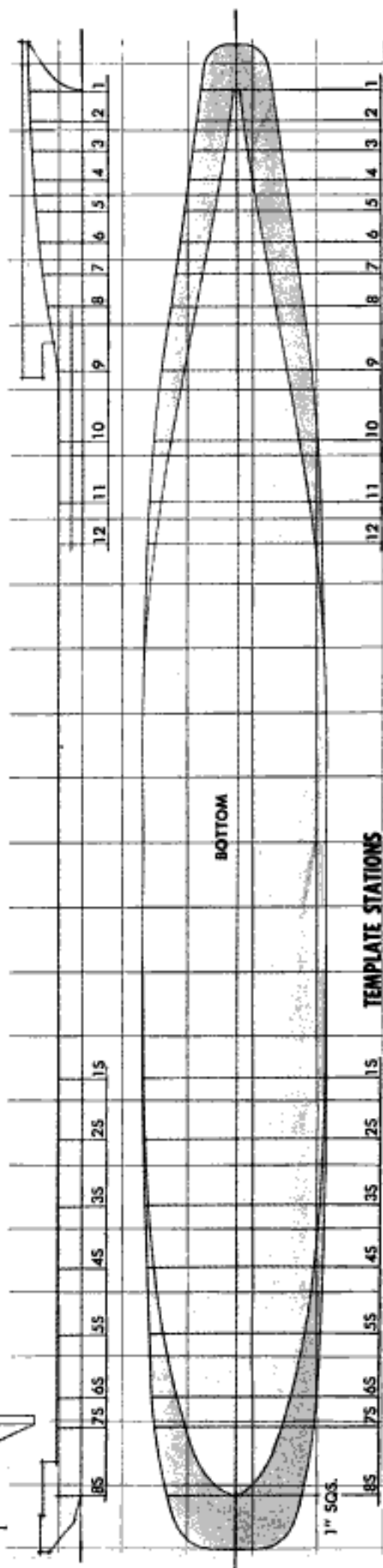
**The cover-board piece:** The cover board forms the top or ceiling of the notched piece. It is cut from  $\frac{1}{16}$ -in. material and forms a part of the flight deck. Two small dowels are used to hold the cover board in place on top of the notched piece. Here, the cover board is temporarily bradded to the notched piece and dowel holes are drilled through both pieces at one time. The dowels are driven part way into the notched piece and sanded off flush with the top surface of the cover board. The dowels register the cover board perfectly so that it may be removed and replaced accurately when necessary.

To be continued next month

The 20 individual templates required to check the contour of the hull when carving are made by tracing the outlines given below directly on cardboard. Each numbered line represents the contour of the hull at the corresponding station line as indicated at the right. Make each template about 3 in. long to provide a sufficient base to keep the template at right angles to the hull when checking the carving. Proper depth of carving at each station is reached when template contacts the hull at the sheer line.

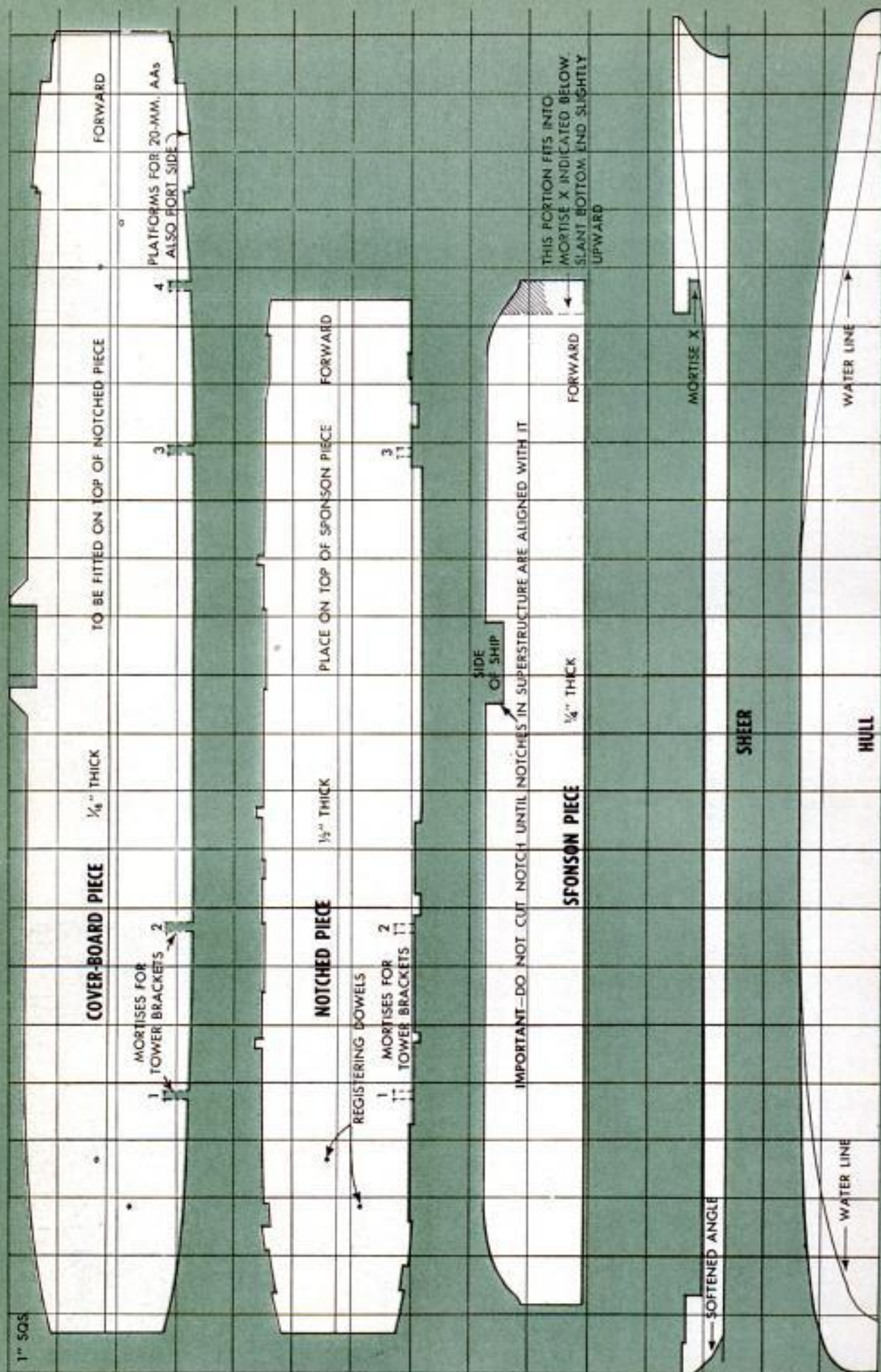


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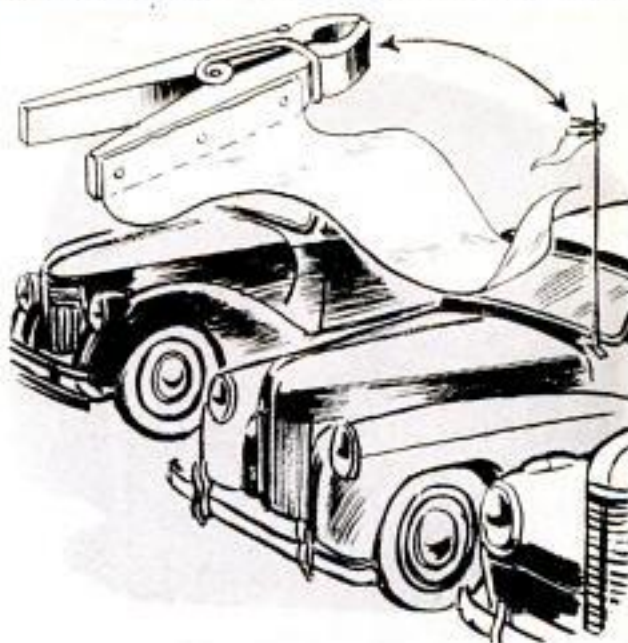
## Location of Car in Parking Area Revealed by Flag on Antenna

Made from brightly colored material, a small pennant which can be fastened to the top of the radio antenna of your car will enable you to spot it more easily when parked in a large, unattended parking area. Cut the pennant 8 to 12 in. long and about 3 in. wide, and tack it to a spring-type clothespin. Rolled and stored in the glove compartment, the pennant will take up negligible space and yet always will be available when needed.

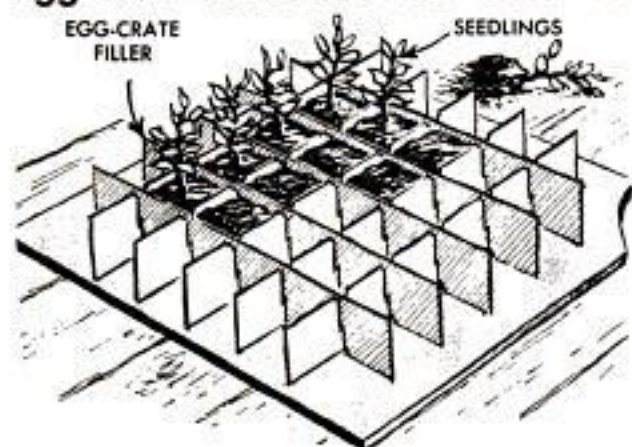
Harold Cripe, Racine, Wis.

## Steaming Stamps From Envelopes

Collectors who wish to remove stamps from old envelopes can do the job quickly by steaming them in a wire strainer set in the top of a teakettle. To keep the stamps from curling after removal, place them between weighted blotters to dry.



## Egg-Crate Fillers Provide "Pots" for Seedlings Started Indoors



Egg-crate fillers make ideal "pots" for starting seeds indoors early in the spring. Set the filler on a base of sheet metal, hardboard or in a shallow pan. The latter is desirable, as it permits moisture to be added from underneath the soil and packing of surface soil is thus avoided. In the latter case, give the filler two coats of spar varnish to prevent disintegration of the cardboard. When seedlings reach transplanting size, the filler is easily peeled away leaving each plant in its own block of earth which can be readily transferred to the garden. Marguerite McLees, Moose Jaw, Sask., Can.

## Wax Dressing Helps Preserve Outboard Starting Rope

The useful life of an outboard-motor starting rope can be doubled by frequently dressing it with beeswax, which greatly decreases normal chafing and wear. It is best done during the warm part of the day when the wax will be softer and more readily applied.

## Avoiding Motor Corrosion

To prevent the formation of rust and corrosion which gathers on power heads and exposed bolts of outboard motors that are used in salt water, spray the motor with a solution consisting of the greaselike rust preventive sold by most oil companies, 1 part, and carbon tetrachloride, 3 parts. After dissolving the compound thoroughly, apply with a common fly sprayer. When set, the coating will withstand considerable contact with water, and even with gasoline, before losing its protective qualities.





## Foam-Rubber Pad on Palette Helps Prevent Cramped Hand



To avoid a cramped thumb and hand caused by gripping a palette for a long period of time while holding a handful of brushes, one artist uses a piece of sponge rubber fastened to the underside of the palette. The foam rubber is cut to the shape shown in the sketch, and glued with rubber cement to the bottom of the palette.

Lance Werner, Cleveland, Ohio.

## New Furnace Adjustment Assures Even Heating

A new method of adjusting the controls of a forced warm-air furnace provides greater comfort and economy during the winter months, and prevents the extreme fluctuations that sometimes occur during the fall and spring. The new method entails running the blower most of the time, but at a reduced speed. This allows an almost constant circulation of air, and in changeable weather when the outside temperature suddenly rises, permits the air to dissipate the extra heat more rapidly. Thus a

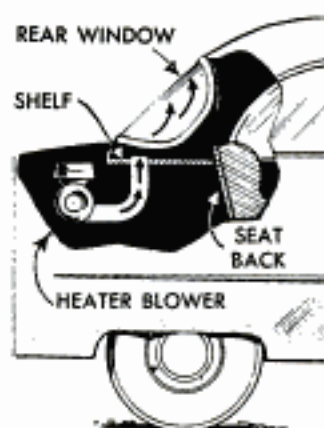
### Free How-To-Make-It Index

Write the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, for your free copy of the latest index to all the how-to-do-it sections of *Popular Mechanics*

more constant temperature is maintained inside the house.—National Warm Air Heating and Air Conditioning Association.

## 145 Public Square - Cleveland 14, Ohio Rear Window of Car Kept Clear By Concealed Defroster

A blower unit of the type sold for replacement in car heaters can be installed under the package shelf of your automobile to serve as a defroster for the rear window. A round hole for the air outlet is cut in the package shelf and covered with wire screening, thus leaving the shelf unobstructed. The blower unit is fastened to the inside of the trunk, and a flexible air hose is led to the opening on the package shelf. A switch should be mounted on the instrument panel to give the driver control of the unit.—Ed Packer, Chicago.



## Metal Foil in Picture Window Reflects Light and Heat

Aluminum foil, widely used for a variety of purposes, was utilized by one homeowner to reflect the blinding hot rays of the afternoon sun that shone through a large picture window on the west side of the house. Besides keeping the temperature down an appreciable amount, the foil prevents the sun from fading the drapes, rugs and furniture. The foil may be purchased in different widths and in both heavy and light-gauge thickness. Because it is metal, careful handling will allow it to be removed and stored for use the following year.

John L. Hoke, Washington, D. C.





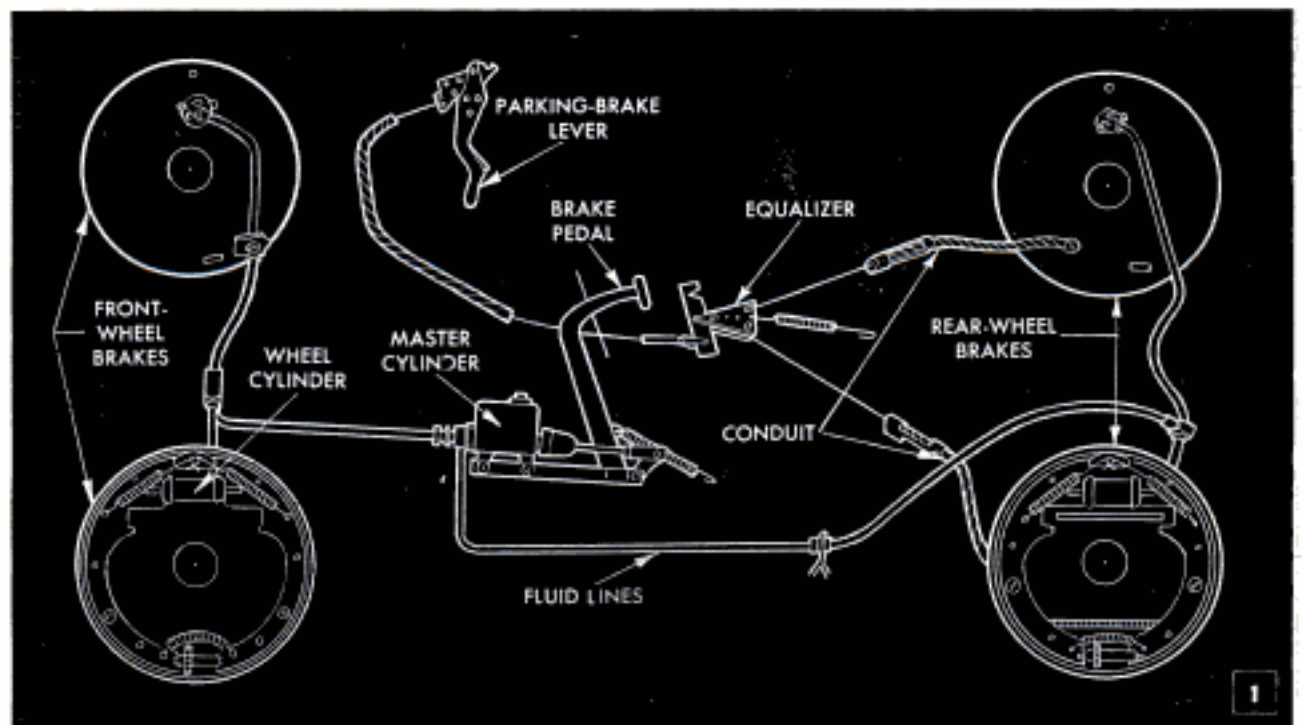


## HOW YOUR BRAKES WORK

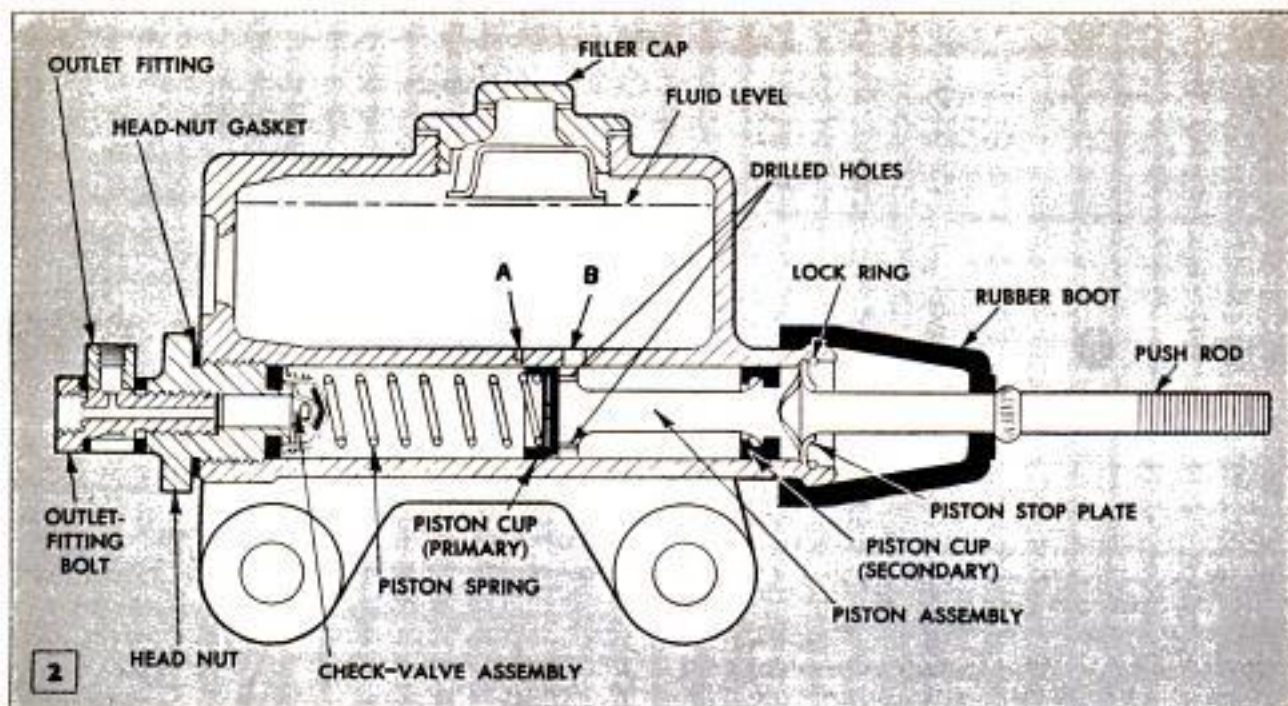
**N**O PART OF a modern passenger car is called on more frequently to absorb sudden high stress and frictional heat than the brake system. A mechanically minded motorist can do much to make sure his brakes will give maximum trouble-free service once he understands the principles on which the brake system operates. The majority of passenger cars are equipped with hydraulic brakes, which operate on the principle that pressure applied to a closed column of an incompressible fluid will be transmitted to all surfaces with equal force. The principle is utilized in automobile brakes by employing a master cylinder to develop the pressure, and four wheel cylinders which transmit this pressure to brake shoes bearing against the drums. In a typical brake system, Fig. 1, the master cylinder is mounted beneath the floor of the car, and is connected to brake pedal by means of mechanical linkage.

**Master cylinder:** The master cylinder consists of a pressure chamber, a fluid reservoir located above the pressure chamber and a combination filler cap and breather

plug on the reservoir which permits atmospheric pressure to act on the brake fluid in the reservoir. A piston in the pressure chamber compresses the fluid ahead of it when force is applied through the brake pedal. As the pedal is depressed, the piston and cup assemblies move forward in the master cylinder, closing off the compensating port, Fig. 2, A, and forcing the fluid through the check valve into the brake lines. Actual braking pressure is not built up until all the shoes are in contact with the drums. Additional pressure then increases the braking action. When pressure on the pedal is released, a spring returns it independently of the master cylinder. Meanwhile, the piston spring forces the piston to follow the push rod back until stopped by the stop plate. The spring also holds the primary cup firmly against the piston and keeps the check valve in place. In each wheel, Figs. 3 and 4, the retracting springs on the shoes pull them away from the drum and force the pistons and cups in the wheel cylinders back to the release position. This, in turn, forces the fluid back





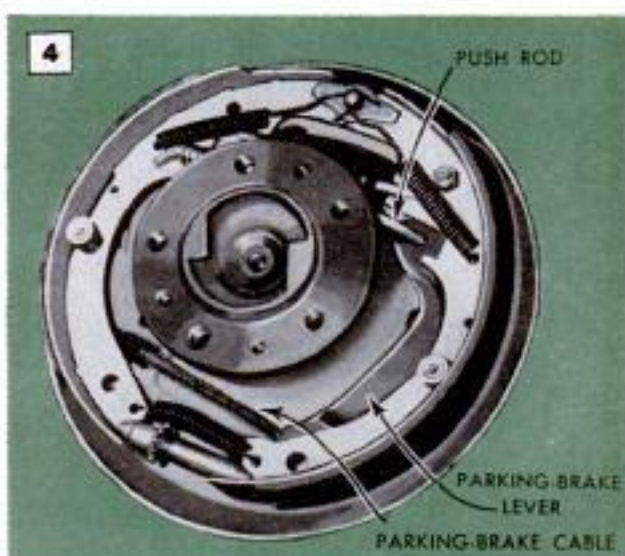
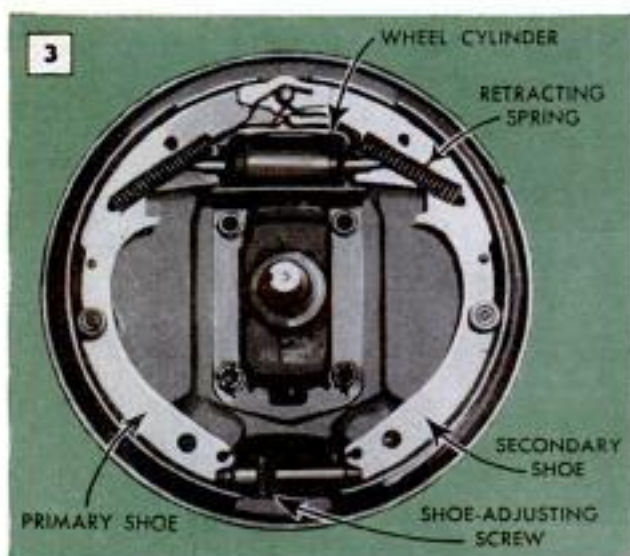


through the lines to the master cylinder. When the line pressure equalizes with the piston-spring pressure, the check valve closes. Depending on the model of the car, this action maintains a fluid pressure of from 8 to 16 lb. in the lines and wheel cylinders. This constant pressure prevents air from leaking into the system. As shown in Fig. 2, a secondary cup is fitted over the rear of the piston. This secondary cup acts as a seal to prevent the fluid from leaking out the back when fluid from the reservoir passes through vent B into the recessed area of the piston behind the primary cup. When the brake is released, the piston and cups in the master cylinder move back so rapidly that a partial vacuum is created in the pressure chamber. This vacuum is relieved by drawing fluid into the pressure chamber through small holes drilled in the face of the piston and over the lip of the primary cup. The primary cup must clear

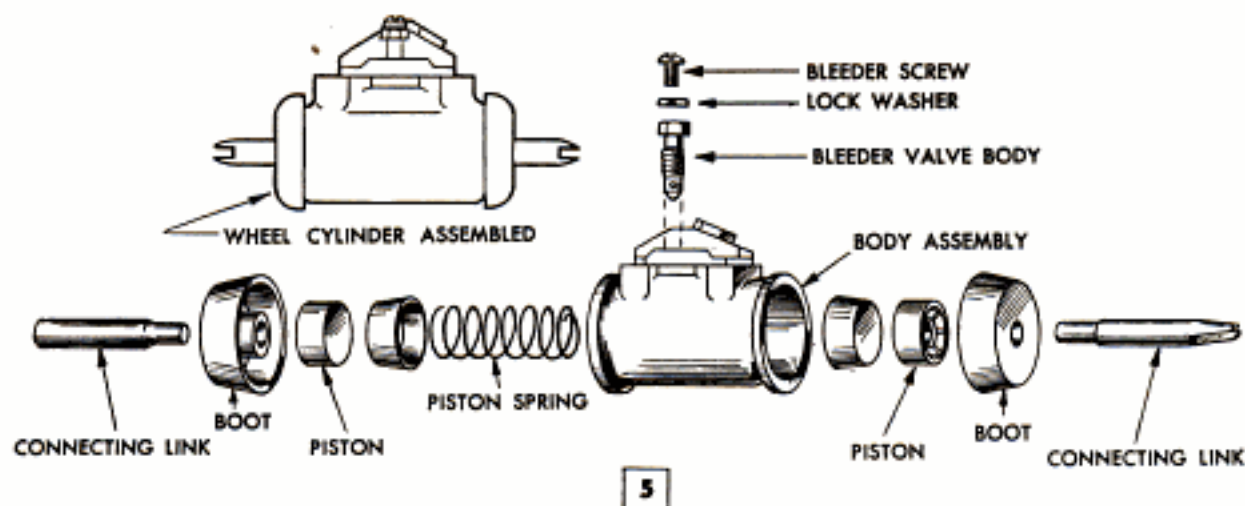
port A when the brakes are released, or the compensating action will not take place and the brakes will drag. Correct adjustment of the brake pedal positions the primary cup.

**Wheel cylinder:** When the brake fluid, under pressure, enters the wheel cylinder, Fig. 5, it forces the cups out against the pistons which in turn transmit the force through connecting links to the shoes causing them to bear against the brake drum. Only after all shoes on all wheels are in contact with the drums will pressure be built up in the system. This assures simultaneous action of all brakes.

**Parking brakes:** Depending on the make and model of car, parking brakes, Fig. 1, are operated either by a hand or foot-operated lever, located just below the instrument panel. In most cars this lever is connected by conduit cables to the brake shoes on the rear wheels only. A single cable runs





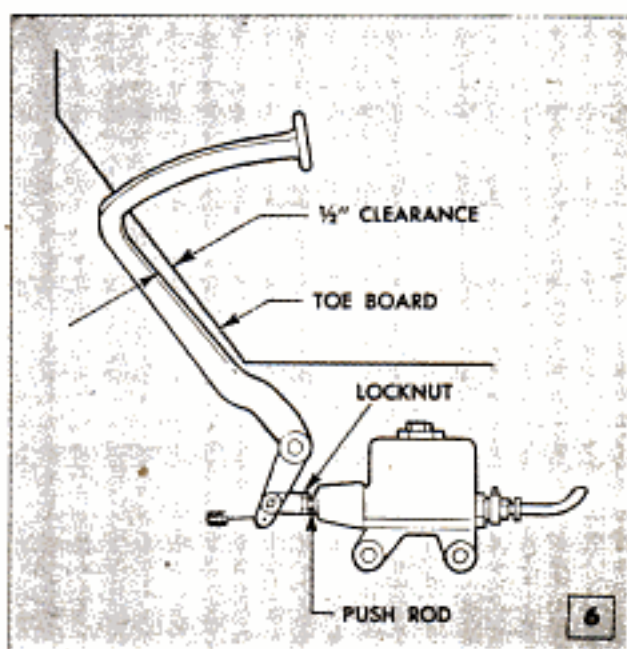


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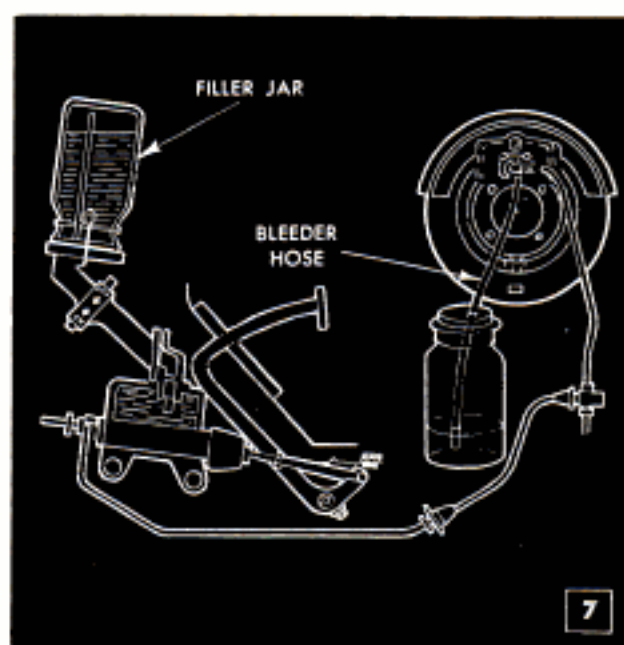
from the parking-brake lever to an equalizer. Other cables lead from the equalizer to each of the rear-wheel brakes. Each cable fastens to the free end of the parking-brake lever which pivots at its top end on the secondary brake shoe, Fig. 4. A push rod, joining the secondary and primary brake shoes, is mounted horizontally just below the wheel cylinder. When the parking-brake lever is operated, the cables apply an equalized pull to each of the push-rod levers, which actuate the push rods and force the brake shoes against the drums.

**Bleeding hydraulic system:** Air in the hydraulic system will cause a "spongy" pedal and inefficient brakes. Air will enter if the fluid level in the master-cylinder reservoir is too low. Worn parts in the system may result in leakage, and air frequently enters the system when some part of the brake mechanism is removed for repair. Air should be removed from the hydraulic system by bleeding and refilling. Fig. 7 illustrates the filler-jar method of bleeding. All parts of the brake system must be assembled when bleeding the lines. To bleed the system, remove the filler cap from the master cylinder, first making sure the top of the cylinder is perfectly clean. Then insert the neck of a standard filler-jar full of clean brake fluid into the cylinder opening. Next, remove the bleeder screw from the wheel-cylinder bleeder valve, Fig. 5. Attach a bleeder hose to the bleeder valve. Place the other end of the hose in a container partially filled with brake fluid, making sure the end of the hose is below the surface of the liquid. Open the bleeder valve about  $\frac{3}{4}$  of a turn and have someone press the brake pedal down slowly and then release it slowly. When air bubbles cease to show in the fluid in the container, you can be reasonably sure that air has been bled out of the cylinder and line. Tighten the bleeder valve, remove the bleeder hose and replace the screw. Repeat this procedure at each wheel. When the bleeding

On cars having two cylinders per wheel, each cylinder has one spring and half the parts shown above

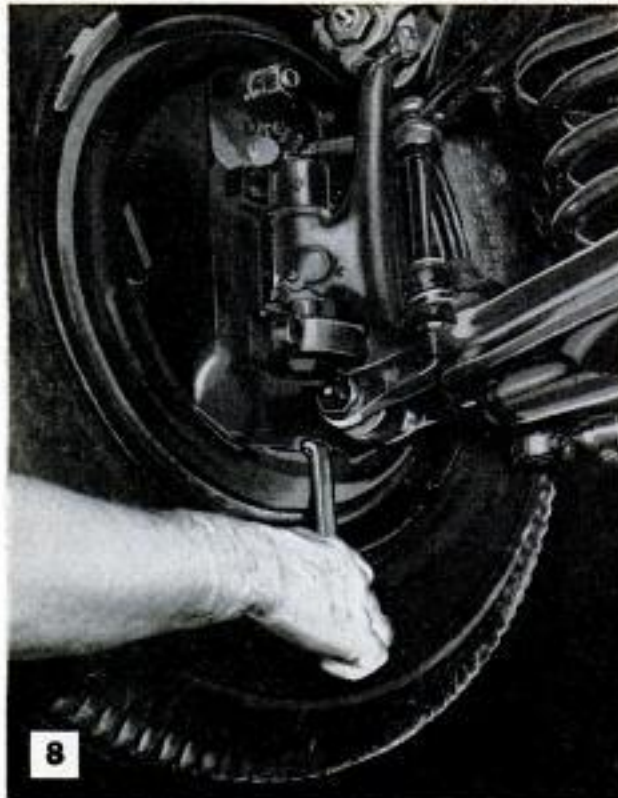


The clearance between brake-pedal arm and toe board is shown above. In filler-jar method of bleeding brakes, below, jar is attached to master cylinder



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operation is completed, make sure the master-cylinder reservoir is filled to the proper level.

**Maintainance:** Some cars have a pedal stop incorporated in the master-cylinder casting, others have an adjustable stop in the linkage. These stops hold the brake-pedal arm about  $\frac{1}{2}$  in. below the toe board, Fig. 6. In addition, there must be  $\frac{1}{2}$  to  $\frac{3}{4}$  in. of free pedal movement, that is, the pedal can be pushed down freely  $\frac{1}{2}$  in. or more with no resistance except that of the pull-back spring. This will assure that the piston in the master cylinder can move back to clear the compensation port.

**Adjusting brakes:** First, check the brake pedal for proper master-cylinder clearance, and look on the inside surface of each wheel for traces of leaking brake fluid. If the emergency brake does not release completely, disconnect the emergency brake-cable conduits from the backing plates and slide the conduits along the cable. Clean

the cables with emery cloth, wipe clean and lubricate sparingly. Replace the conduits. Next, jack up each wheel in turn. If there is an eccentric on the rear shoe (this pertains to the Bendix-type brake), adjust it until the wheel starts to drag, then back off until the wheel turns freely. Repeat this procedure by expanding the adjusting screw with a brake wrench or screwdriver, Fig. 7. Lockheed-type brakes usually have an adjustment on each shoe, and these are adjusted in the same way. Check all nuts and bolts on the backing plate to make sure they are tight, Fig. 8. On the Lockheed-type brake, if the anchor bolts are loose, tighten the locknuts while holding the anchor bolts with another wrench. If these anchor bolts turn, it is usually necessary for a mechanic to reset them, using a dummy drum or special gauges. After adjusting the brakes, road-test the car to make sure all wheels brake evenly. ★ ★ ★

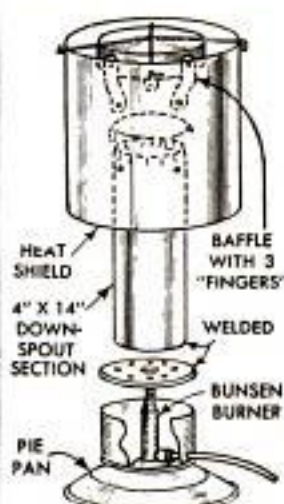
### TROUBLE-SHOOTING HINTS

EFFECT	Pedal Goes to Floor	Car Pulls to One Side	Spongy Pedal	Brakes Fade
<b>POSSIBLE CAUSES</b>	Worn linings Loss of fluid Air in system Brakes need adjusting Worn master cylinder Clevis pin missing from pedal linkage	Grease or brake fluid on linings Bad linings Primary and secondary shoes reversed Clogged hydraulic line Wheel cylinder sticking Loose backing plate	Air in system Wrong brake fluid Worn lining Drums worn too thin Anchor pin adjustment incorrect Wrong lining thickness Master cylinder filler-cap vent clogged Brake drum distorted	Worn lining Poor lining contact Wrong lining Drums worn too thin Expansion of drums from heavy braking



## Light-Tight Darkroom Heater Uses Bunsen Burner

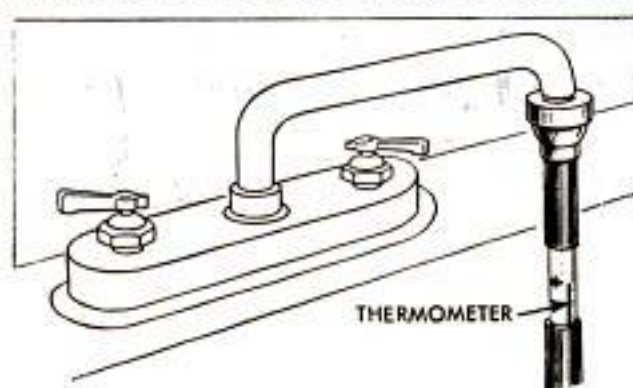
For chilly nights in the darkroom, here's an odorless, safe and light-tight heater that doubles as a stove for warming chemicals. The heating unit is an old Bunsen burner, although the jet from a hot-water heater will do as well. The burner is placed inside a 1-lb. coffee can fastened to an inverted piepan, which serves as a nontip base. Six  $\frac{1}{2}$ -in. ventholes are cut in the lower edge of the can and made light-tight by metal strips soldered behind them. Several large holes are cut in the lid of the coffee can, one being directly over the flame from the burner. This lid is then welded to the end of a length of downspout. Slits are cut into the edge of the other end of the downspout, and the tabs thus formed are bent inward. Cut a metal baffle, with a diameter 1 in. less than the downspout, with three ears equally spaced. Install the baffle inside the upper end of the downspout by bending the ears over the edge, making sure there



is  $\frac{1}{2}$ -in. clearance all around. Remove the lid and metal sealing strip from another coffee can. Fasten the strip to the inside edge of the rim of the lid. This will be the stove cover, which is fastened to the downspout body by three metal strips, or fingers, 1 in. x  $2\frac{1}{2}$  in., using sheet-metal screws. A length of 8 or 10-in. stovepipe with a crossed-wire support near the upper edge makes an efficient heat shield to prevent accidentally touching the hot stove body.

Clinton R. Hull, Costa Mesa, Calif.

## Thermometer in Darkroom Hose Indicates Water Temperature



To keep a close temperature check on the water used in washing negatives and prints, install a thermometer in the hose leading from the darkroom mixing faucet to the print washer or developing tank. Cement the glass tube from an ordinary outdoor thermometer inside a short length of plastic tubing, using a strong waterproof cement. Then cut the hose near the faucet and insert the tubing into the hose as shown. When the thermometer is in place, turn on the water and, with a second thermometer, carefully adjust the water to washing temperature. After the water has run for a few minutes, use red fingernail polish to mark the plastic tube at the mercury level of the thermometer cemented

inside. Then, whenever you wish to bring the water to washing temperature, simply adjust the faucets until the mercury level is aligned with the mark on the tubing.

John J. Rea, Urbana, Ill.

## Petroleum Jelly Deepens Tones When Copying Matte Prints

Since matte photographic prints are dull in finish and lack any really deep black, they have less range of tone than glossy prints. For this reason they make poor copies and photoengravings. This can be remedied to some extent by rubbing a film of transparent petroleum jelly on the surface of the print. This will deepen the black tones by eliminating some of the surface reflections, and give the print a more brilliant appearance, producing better copies and engravings.

Virginia Hanson, Los Angeles, Calif.

## What About Used Cars!

You take no chances in buying a used car if you know where and what to check. Read the factual article in next month's issue and learn how to purchase a used car with confidence





## Repairing Camera Bellows and Shutter Curtains

Tiny holes and other defects that develop in camera bellows and shutter curtains can be repaired effectively by coating them with a mixture in which rubber cement provides a base for an opaque color pigment. While there are a number of flexible adhesives and pigments which, with a little experimentation, may be used successfully for this purpose, the combination of dry lampblack mixed with a synthetic rubber-resin cement will be easy to prepare and provide very satisfactory results. The pigment and the rubber cement should be mixed thoroughly, using lacquer thinner to thin the cement if necessary, as shown above left. A thin coating is then applied uniformly over the defective areas with a small brush. If the finish on the inside of the shutter curtain has flaked off, it's a good idea to recoat both the inside and out-

side surfaces, as shown in the center photo. The mixture is easily brushed on practically any type of camera bellows, shown above right, and provides a smooth, nontacky surface once the solvent in the cement has evaporated. In covering large holes, a piece of black cloth that has been saturated with the cement may be used as a patch. On the other hand, a new flexible paint on the market will be found ideal for renewing the finish and sealing leaks on leather bellows. It will not crack or peel from repeated bending and can be applied over patches.

### Wax for Ferrotypes Plates

Paraffin dissolved in lighter fluid makes an excellent solution for waxing ferrotypes plates. A lighter-fluid can provides a handy dispenser for applying the solution.

## Popular Mechanics Bookshop



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Every railroader—the real one, the armchair Casey Jones or the model enthusiast—will welcome this book. It's a picture history of the iron horse from the Tom Thumb of 1830 to the streamlined train of tomorrow, with a commentary that changes history into lively entertainment. Price, \$3.00



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### What to Make

The latest edition of Popular Mechanics' famous collection of top-notch projects—more than 500 things to make. Here is a book for the beginner as well as the experienced craftsman. Included are such projects as glassware, lamps, furniture and a big model of the SS United States. \$2.00

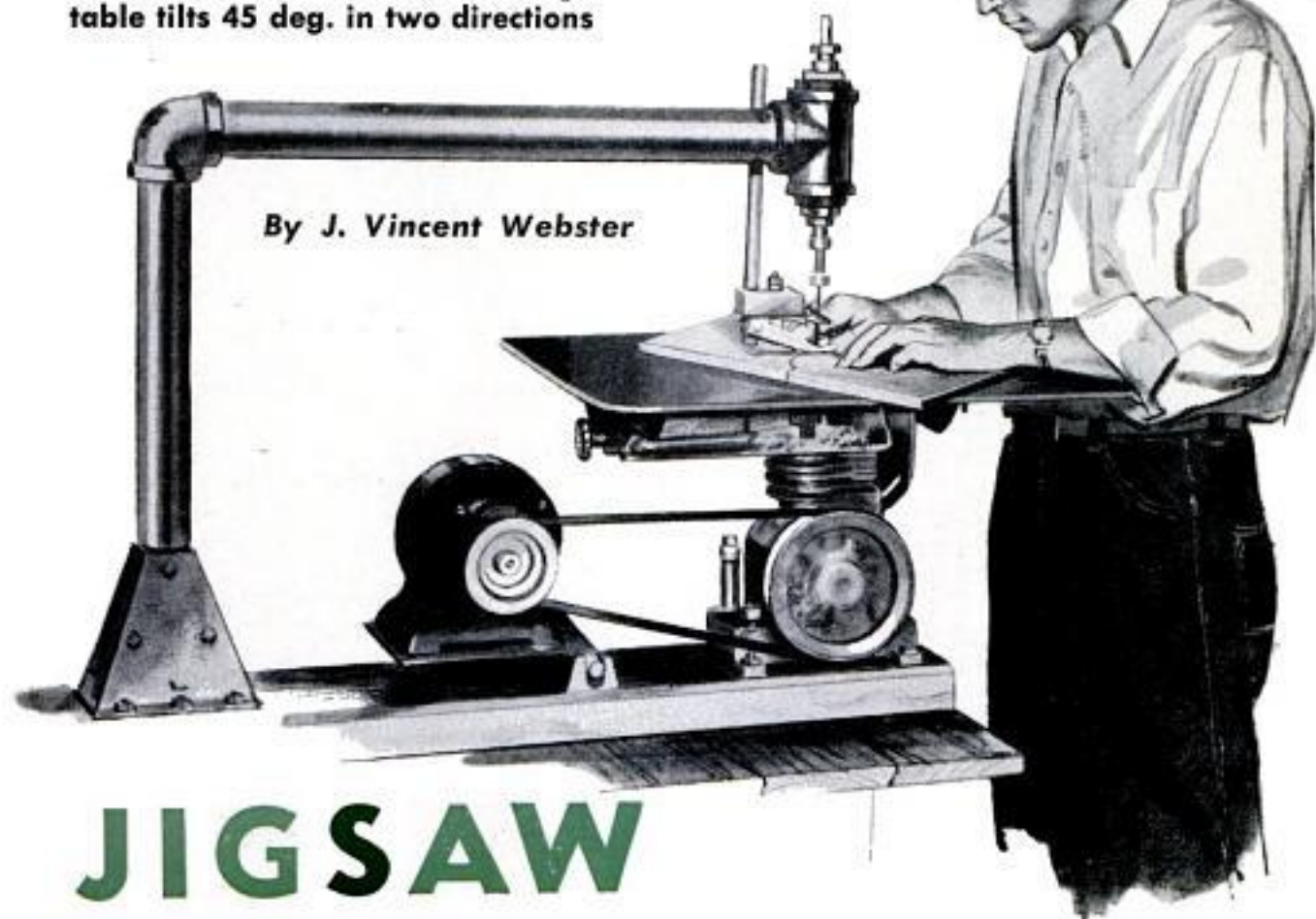
All books available from Popular Mechanics Book Department, 208 E. Ontario St., Chicago 11



This jigsaw is standard size and has a 1½-in. stroke. It uses regular straight-end blades in the common sizes from fine to coarse. Large table tilts 45 deg. in two directions

SN 55

By J. Vincent Webster



## JIGSAW

### FROM SMALL ENGINE BLOCK

A SMALL GASOLINE engine stripped down to the block and crankshaft assembly becomes the sturdy driving mechanism of this 24-in. jigsaw. Any engine of the vertical air-cooled type having a 1½-in. stroke can be utilized. Also it is possible to use an old single-cylinder refrigerator or air compressor of the vertical type. All other parts are made from stock materials. The overarm is assembled from 2-in. pipe and fittings, the pipe tee at the outer end of the arm serving as a housing for the spring-tension mechanism and upper blade guide.

Strip the engine or compressor of all parts except the crankshaft, connecting rod and piston. Replace the engine flywheel with a 5-in. V-pulley. Drill a ½-in. hole through the top of the piston for insertion

of the ½-in. rod on which the lower blade chuck is mounted. Both upper and lower blade chucks can be purchased ready-made as repair parts for commercial jigsaws. The lower end of the ready-made chuck is drilled so that it can be slipped over the end of the rod, or plunger, and locked in place with a setscrew. In some cases it may be necessary to shoulder the upper end of the ½-in. rod so the chuck can be fitted. It also is possible to make a suitable blade chuck by simply slotting the end of the ½-in. rod with a fine hacksaw blade to a depth of about ½ in. Then sweat-solder or weld a ½-in. shaft collar to the upper end of the rod. Drill and tap straight through the shaft and collar at right angles to the slot for ¼-in. setscrews. Hollow setscrews turned into the holes will hold the blade

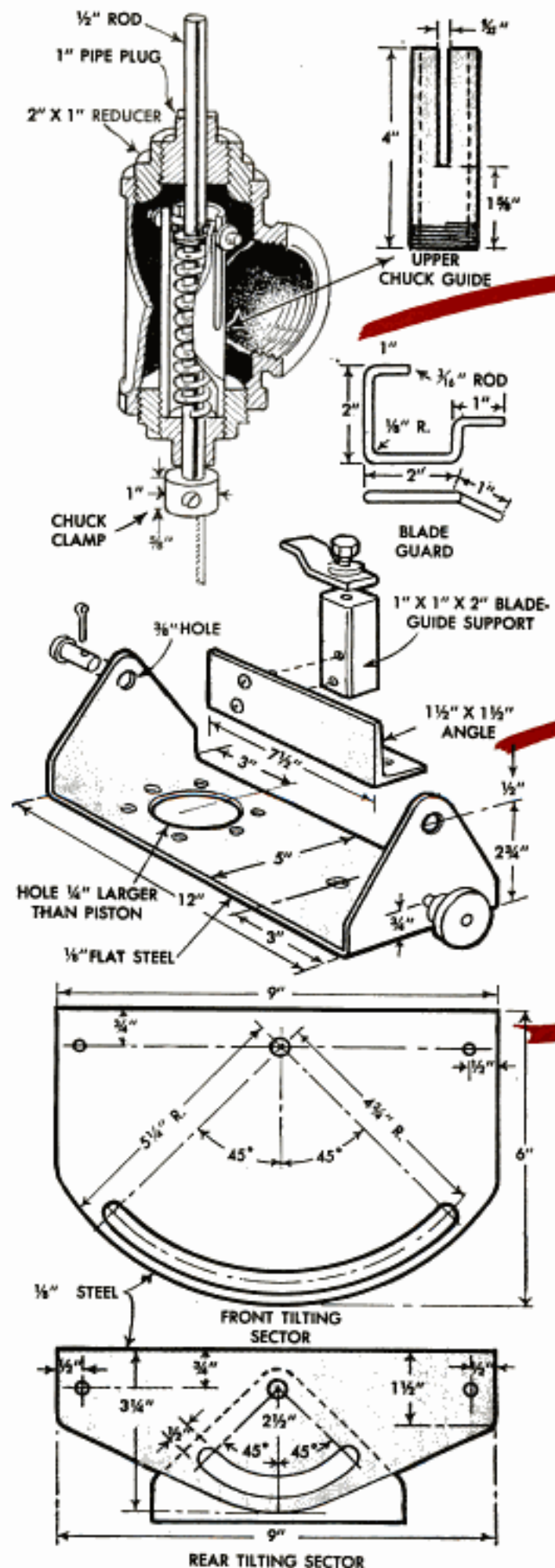


securely in position. The upper blade chuck also can be made in this manner if desired. On some engines and compressors the top end of the piston will not permit a nut to be used on the end of the plunger, as in the lower left-hand detail on page 221. In this case it will be necessary to drill and tap the top end of the piston, and then turn the threaded end of the rod into the hole. Tightening the upper nut will hold the rod in place. In either case, thread the end of the rod  $\frac{1}{2}$ -13 N.C. (National Coarse).

Now, measure the height of the engine or compressor block from the bottom of the base to the top. The height of the engine used in the original jigsaw is about  $9\frac{1}{8}$  in. and dimensions of all other related parts are based on this height. If the height of the compressor or engine you have at hand varies from this height, then it will be necessary to alter dimensions of other parts accordingly. An example of this is the arm upright, the length of which is given in the details as  $17\frac{1}{4}$  in. If the engine or compressor you have varies from the height of the original, the length of the upright will have to be changed to assure that the table and arm are at the correct height when the units are assembled. Be sure to check before you cut parts to size.

When assembling the upper chuck guide, upper left-hand detail on this page, it's a good idea to use brass pipe plugs for the upper and lower bushings carrying the  $\frac{1}{2}$ -in. plunger. Drill the holes through the plugs  $\frac{7}{16}$  in. in dia. and ream to  $\frac{1}{2}$  in. Use polished steel shafting for the plunger. Also, it's best to use 1-in. brass pipe for the upper chuck guide. This is slotted  $\frac{9}{32}$  in. wide to clear the  $\frac{1}{4}$ -in. steel crosspin which rides in the slot and prevents the plunger from turning. By using brass plugs for bushings and brass pipe for the chuck guide, compatible wear surfaces will be provided for both the plunger and pin.

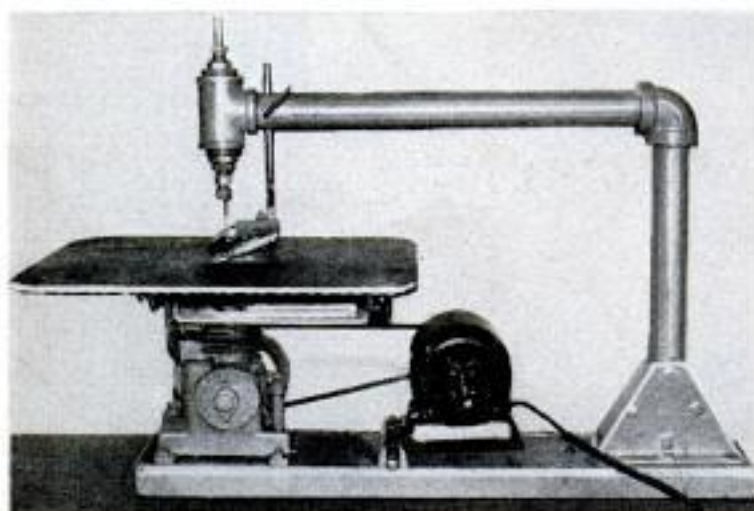
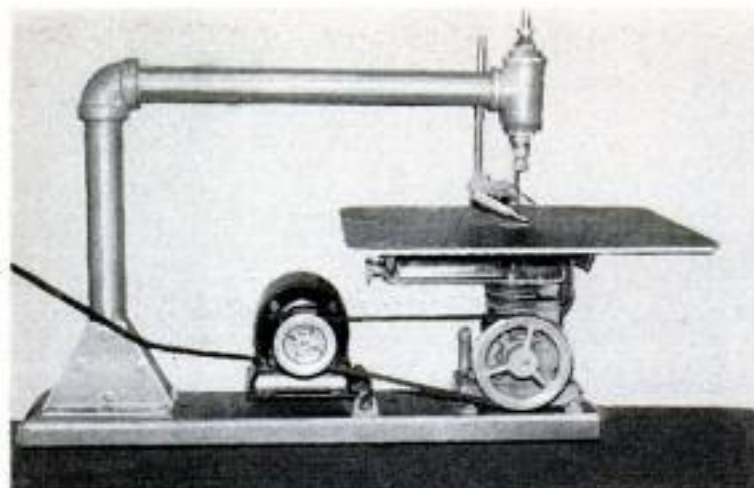
The sector, or trunnion yoke, center detail at the right, is made by cold-bending  $\frac{1}{8}$ -in. flat steel. Note the assembly of these parts in the cutaway view on the opposite page. The complete assembly consists of the front and rear sectors, or segments, the yoke, the lower blade guide and its angle-steel support, and two angle-steel brackets to which the segments are bolted. As will be noted, the table is bolted to the brackets when the assembly is complete. Again it is necessary to carefully check the dimensions before cutting parts. Bolt holes in the yoke should be located from the cylinder head of the engine or compressor. The clearance hole, which must be at least  $\frac{1}{4}$  in. larger in dia. than the piston, should be located likewise. The latter can be cut through with a plumber's hole saw if no circle cutter is available. The blade-guide











Right and left-hand views of the completed jigsaw. Although the swing, or blade-to-frame capacity of the saw is given as 24 in., this may vary slightly due to irregularities in the length of the pipe threads. Capacity can be increased to 30 inches

support is a 2-in. length of 1-in.-square steel with tapped holes for  $\frac{1}{4}$ -in. machine screws. This part is mounted on a steel angle, the latter being bolted to the yoke where it serves the dual purpose of a support for the lower blade guide and also as a stiffener for the overhanging portion of the yoke.

On the original jigsaw the manifold pad of the stripped engine permitted the use of a front sector, or segment, of the size given. In some cases, due to the design of the engine block, both segments will have to be made the same size. In either case the table should pivot on keyed pins, rather than bolts. Note the  $\frac{3}{8}$ -in. pivot pin in the center detail on page 220. Cut the curved slots in the segments  $\frac{1}{2}$  in. wide and use  $\frac{3}{8}$ -in. locking bolts fitted with wing nuts, or use a small handwheel, or palm wheel, as in the lower center detail on page 221.

Bolt the flat-steel brackets to the vertical member of the overarm and then bolt the assembly to the hardwood base. Tie a small weight to a cord and grip the free end of the cord in the upper blade chuck. Then

use this improvised "plumb bob" to locate the position of the engine or compressor. First, place the assembly on a table and level it. Then locate the engine with the lower blade chuck centering directly under the suspended weight. Mark the location of the bolt holes on the wooden base; drill the holes and bolt the engine in place.

If a counterbore for cutting the shouldered blade opening in the table is not available, cut the hole through with a 2-in. hole saw. Then cut a hole through a small piece of  $\frac{1}{8}$ -in. flat steel with a  $1\frac{1}{2}$ -in. hole saw, and screw this piece to the bottom of the table with the holes concentric to form the shoulder which supports the insert. The latter can be made from  $\frac{1}{4}$ -in. hardboard or fiber. It also is possible to make the table from  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. plywood.

The pressure-foot assembly, which includes the upper blade guide, is dimensioned in the upper details on page 221 and shown fully assembled in a separate detail on the same page. It is carried on a  $\frac{1}{2}$ -in. rod which slides in a hole drilled through the overarm. The guide is held in any position by means of an L-shaped locking screw turned into a tapped hole in the overarm. When assembling, be sure that the bottom of the open slot in the pressure foot does not

touch the back of the blade when the foot is raised to its highest position. Engagement of the parts will cause breakage of the blade. Use a  $\frac{1}{4}$ -hp. 1750 r.p.m. motor for the drive. The motor should be mounted on a floating rail as indicated in the details and also in the photos above. Use a  $2\frac{1}{2}$ -in. V-pulley on the motor. ★ ★ ★

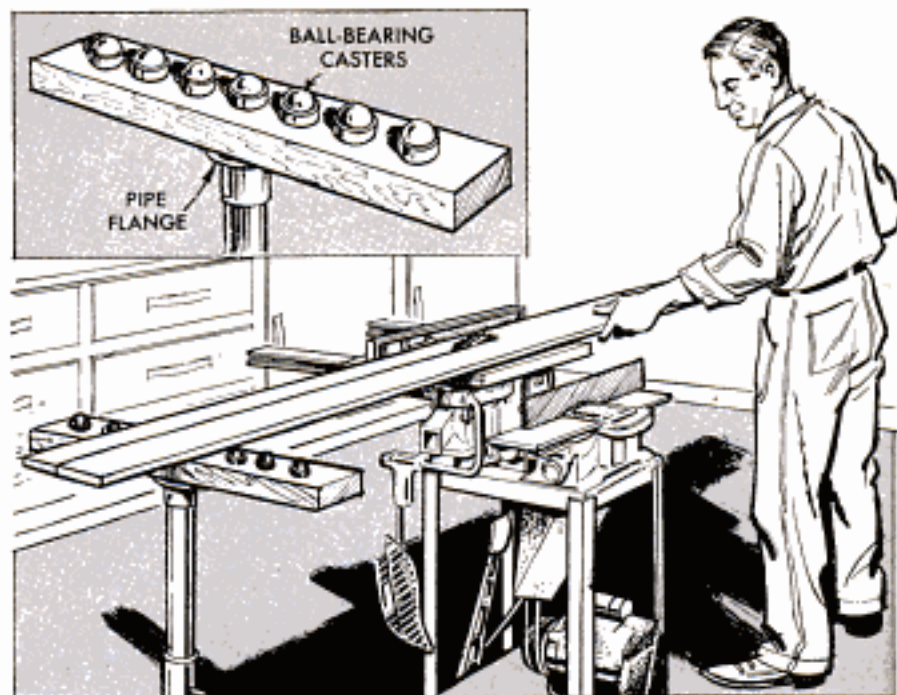
### Tighten Electric Motor Bushings By Knurling in Lathe

When new parts are not readily available, worn bearings on electric motors of fractional hp. sizes can be tightened by knurling them in the lathe. These motors have a sleeve bushing that can be pressed or driven out of the end housing. With the bushing held lightly on a mandrel, the outside surface is knurled, leaving  $\frac{1}{16}$ -in. clearance at each end to allow easy reinsertion. The knurling raises the surface a few thousandths of an inch and when the bushing is forced back into the housing the inside diameter will shrink enough to cause a tighter fit on the shaft.—E. J. Gilkerson, Columbus, Ohio.



Because the roller on a conventional stock support tended to pull the length of lumber to one side when the support was not exactly in line with the saw table, one carpenter built his own, utilizing ball-bearing casters. The casters roll easily in any direction, allowing complete control of the stock being sawed. The pedestal of the support is a 12 x 18-in. base to which is fastened a 2-in. pipe flange to hold a 24-in. length of 2-in. pipe. A 24-in. length of 2 x 4, fitted with a 1½-in. pipe flange, holds a number of ball-bearing casters. An 18-in. length of 1½-in. pipe is screwed into the flange, and the unit is then slipped into the 2-in. pipe column. Near the upper end of the 2-in. pipe a hole is drilled and tapped to receive a ⅜-in. steel rod, which is threaded and bent L-shape. This serves

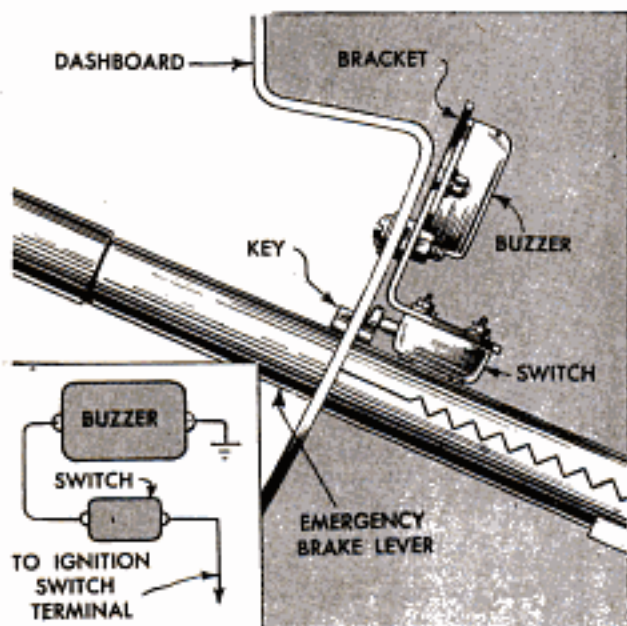
## Adjustable Stock Support for Table Saw Utilizes Ball-Bearing Casters



as a lock for the adjustable column of the support.

Fred J. Lingham, Lockport, N. Y.

## Warning Buzzer Prevents Driving With Emergency Brake Set



If you have the habit of setting your emergency brake when you park, this warning device will tip you off immediately if you start to drive away without releasing it. Hooked in series with the ignition switch, a warning buzzer sounds when the key is turned on and the brake is engaged. A small doorbell buzzer is secured to the fire wall or dashboard and hooked up with a spring-loaded, off-on switch of the type that is normally on. The arrangement in the sketch uses a "key," made from a piece of ⅜-in. aluminum rod, which floats in a hole in the dash and depresses the switch when the brake handle is in a released position. Depending on the model of car and the type of brake, the key can be a longer screw or a piece of metal fastened to the brake handle.

Sidney V. Worth, Brooklyn, N. Y.

## Kite Hauls Line Over Chimney to Simplify Rigger's Job

When one rigger had the job of replacing the control wires on the damper of a spark arrester near the top of a 120-ft. chimney, he simplified the job by flying a kite over the chimney. When the kite string was above the stem of the T-bar control of the damper, a light line attached to the tail of the kite was used to draw the flying line down over the T-bar stem. Progressively

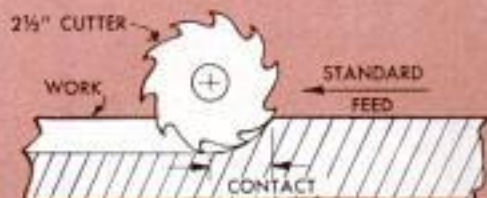
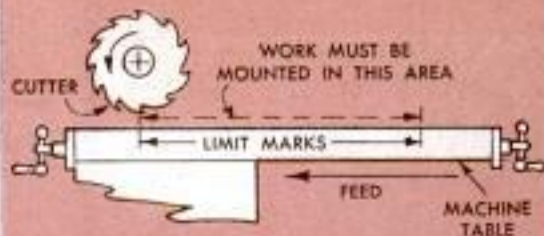
heavier lines were then tied to the string and drawn up and over the T-bar until a block and tackle was in place. The rigger was then hoisted up in a boatswains chair, carrying the control lines with him. Several men hung their combined weight on the final line to make sure the damper stem would support the man and chair.

Preston Taylor, Detroit, Mich.





Outboard support gives maximum rigidity and must be used for all heavy cuts in iron or steel. The overarm is always used for spindle-mounted cutters



# MILLING-MACHINE SETUPS

## *with plain and side mills*

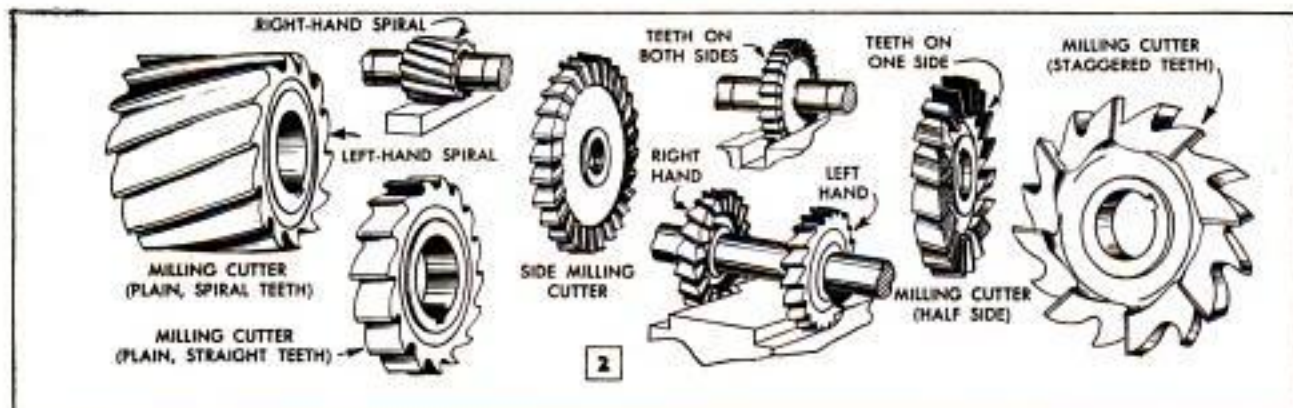
By Sam Brown

THE COMMON RUN of work on a small milling machine usually is done with two types of cutters—the plain mill and the side mill. A plain mill has cutting teeth only on the periphery, or rim, while the side cutter has both rim teeth and side teeth. These two cutters form a hard-working team with which it is possible to do a wide variety of milling operations.

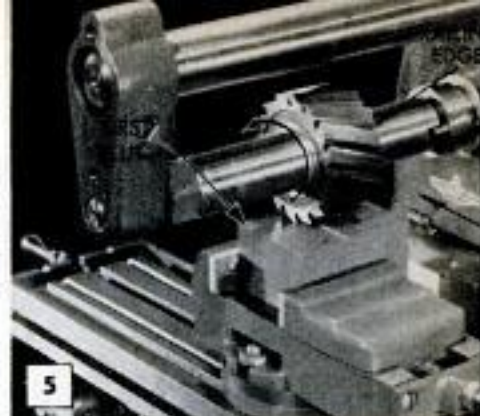
**General setup:** A common setup for milling with the cutter mounted on the milling-machine spindle is pictured in Fig. 1. Here the work is supported in a milling vise bolted to the machine table, and the outboard support is attached to prevent any tendency of the overarm to vibrate when

a heavy cut is being made. The overarm is not used when making light cuts in steel, or in nonferrous metals and plastics. When the outboard support is used, the milling vise must be placed the long way of the machine table so that it will clear the support. Standard feed is used, with the work moving against the rotation of the cutter. This means that the direction of work travel is from right to left.

**Cutters:** Plain milling cutters less than  $\frac{3}{4}$  in. wide generally have straight teeth. Wider cutters have spiral teeth, Fig. 2, and are furnished both right and left hand. The shearing cut of the spiral mill leaves a smooth surface and eliminates the "ham-

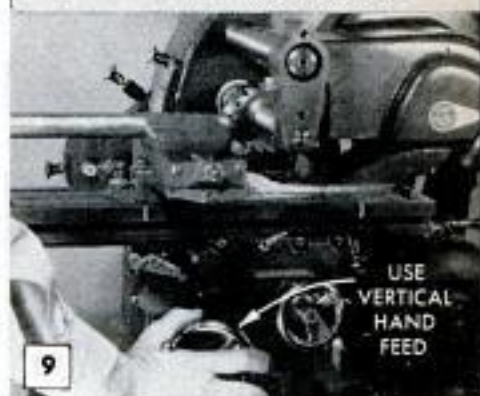
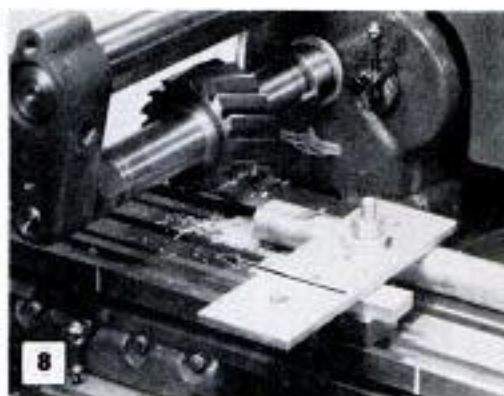
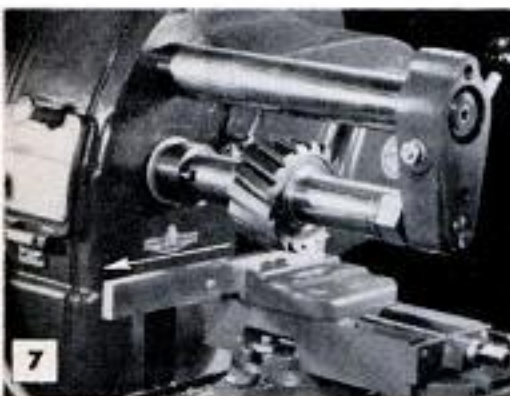
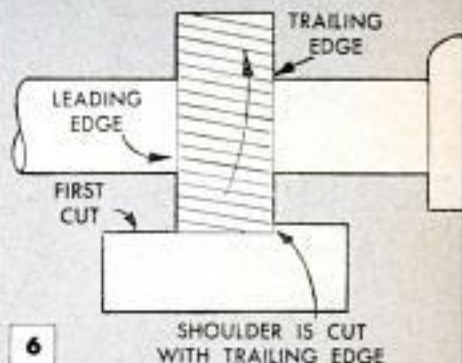






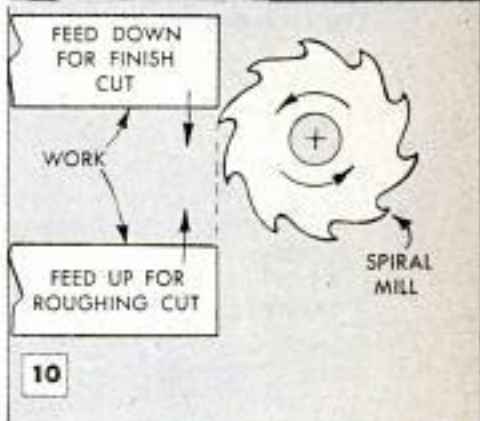
**SURFACING, OR SLABBING**, as it is called in the shops, is main job of the plain milling cutter. Whenever possible, select a cutter that is wider than the stock so that the cut can be made in one pass. However, if a narrow cutter must be used, the shoulder should be formed with the trailing edge as in Fig. 6. Otherwise the cutter may dig in and jam

**MILLING AN EDGE** is done with a spiral mill as in Fig. 7. Work is held in vise and if longer than space between limit marks, it must be moved to continue cut. A spiral cutter can be stopped at any point without leaving mark on work. However, it is necessary to make sure that the work is relocated at precisely the same height in the milling vise



**MILLING FLAT ON A SHAFT** with the cutter running in from the end is a simple operation. Work can be mounted in the vise or clamped directly to the machine table with a clamping fixture as in Fig. 8. Care must be taken to clamp the work securely in one of the V-grooves in the table, as otherwise it may shift even under a light cut. Successive cuts are made, using automatic stop to stop feed of the machine table

**SQUARING AN END** is one of the few milling operations where the work must be mounted at the left of the cutter. Use the vertical hand feed as shown in Fig. 9. Work can be any length that the vise will support. Squaring usually is done with successive cuts to avoid undue strain on the vise, especially if the end of the work has been cut at an angle. Feed up for the roughing cut and down for the finish cut, Fig. 10

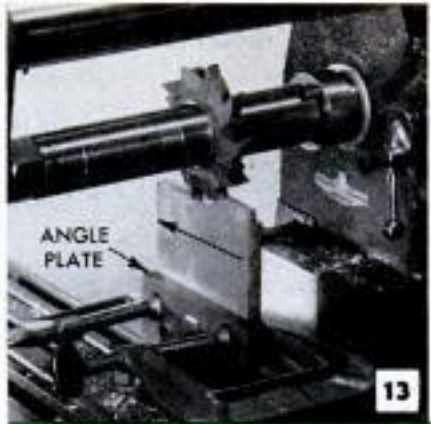


mering" action of the straight-toothed cutter in certain materials. Side mills of conventional pattern have straight teeth. A variation is the side cutter with staggered teeth, Fig. 2, which gives a shearing cut due to the angle of the cutting edge on each individual tooth. Both side and plain mills can run right or left. Nearly all bench milling machines are designed for counter-clockwise rotation as viewed from the operator's position. Because of the direction of rotation, the right-hand spiral cutter is favored by most machinists, as it leads into the work. Average diameter of cutters for use on small machines is 2½ to 3 in.

**Plain milling:** This operation usually is

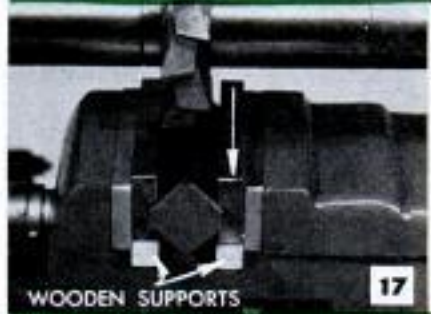
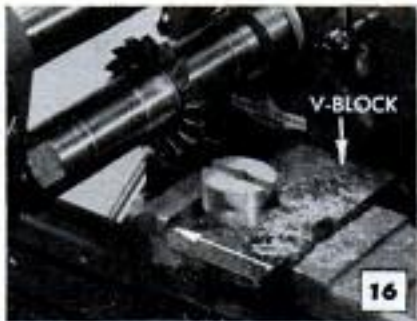
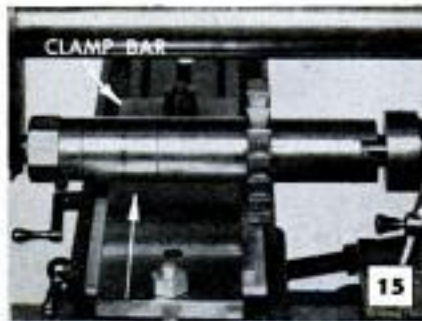
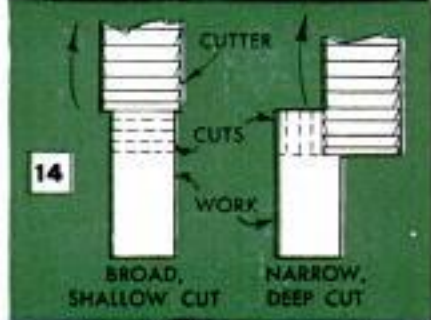
referred to in the shops as slabbing, or surfacing. Plain milling, or surfacing operations with a spiral milling cutter are shown in Figs. 3 to 10 inclusive. In surfacing operations, as in other work, it is best to determine the length of the cut beforehand and then mount the work within the limits of the machine-table travel. Note the limit marks in the photo, Fig. 1, and also in the upper detail of Fig. 1. Cutters of small diameter usually give a smooth cut in surfacing due to the greater number of teeth in contact. Note the variation in the center and lower detail in Fig. 1. When the work is wider than the cutter, Fig. 5, successive cuts must be used. Using right hand





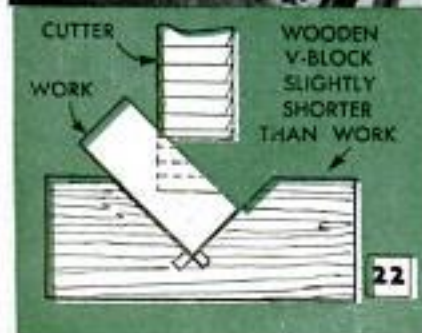
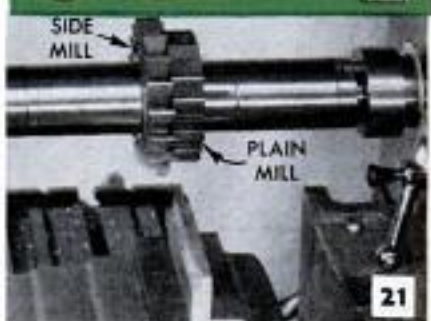
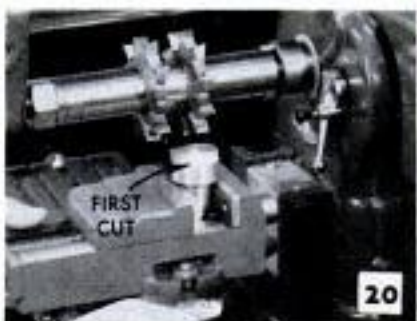
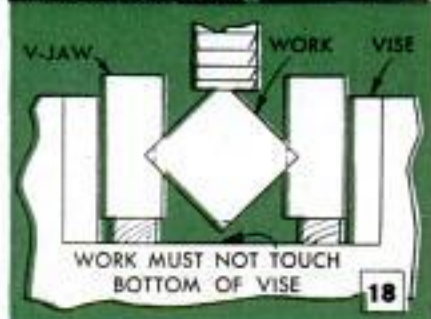
**FLAT ON SHAFT** has square shoulder when worked with a side mill. Fig. 11 shows cut on square stock, while Fig. 12 shows same cut on round stock. Successive cuts are made at full depth until required length of flat is obtained. Use outboard support whenever possible

**MILLING AN EDGE** can be done either with broad, shallow cuts or with successive narrow side cuts as in Fig. 14. As a rule it is best to clamp stock to an angle plate as in Fig. 13, rather than rely on the vise, especially where the work projects more than 1 in. above jaws



**STEP MILLING**, Fig. 15, is the common term for shouldering or rabbeting operations. Step is run with a side cutter, either in a single cut to depth or with successive, narrow cuts to the required depth. Clamp bar over the work requires a 3-in. cutter for clearance

**SLOTING** usually is done with saws or straight-toothed side mills, Fig. 16, provided the latter are the correct width. Mounting the work sometimes poses a problem. Frequently it is possible to slot long stock by setting up as in Figs. 9 and 10 and using same feeds



**SETUPS FOR GANG MILLING AND STRADDLE MILLING** are pictured in Figs. 20 and 21. In gang milling the side and plain mills are placed side by side on the spindle to make a combination surfacing and step cut. In straddle milling cutters are placed on the spindle with a collar

**VEE-CUT** is made with the work clamped lengthwise in vise and supported by a hardwood V-block as in Figs. 19 and 22. It's important to note that the V-block supports the work at the correct height, while the vise jaws hold it in position for making successive cuts



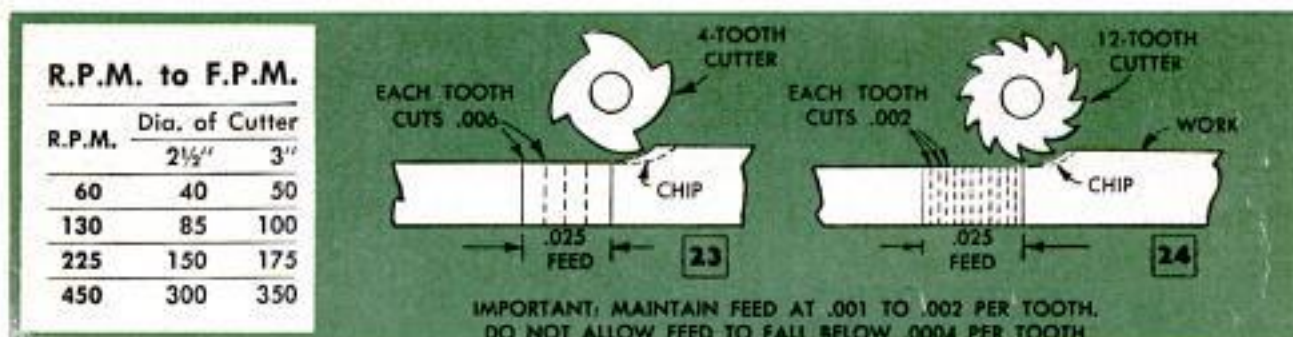
# Speed, Feed and Cut

## FOR 2½" and 3" DIAMETER CUTTERS

BASED ON 4 SPINDLE SPEEDS  
AND 4 TABLE FEEDS

60	} REVS. PER MIN.	.003	} INCHES PER REV.
130		.006	
228		.012	
450		.025	

MATERIAL	SPEED (R.P.M.)	WORK FEED PER REV. = I.P.M.		DEPTH OF CUT — REMARKS
ALUMINUM MAGNESIUM	450	.012	5½	Step cuts or grooving to ½" wide by ¼" deep with stagger tooth mill. Surfacing cuts up to ¼" deep.
SET PLASTICS	450	.012	5½	Cuts readily at 450 r.p.m. or higher speeds. .025 feed can be used if desired. Cuts up to 1½" wide by ¼" deep.
THERMO PLASTICS	225	.025	5½	Coarse cutters (not over 16 teeth) needed to avoid softening of work. Stagger tooth side mill is excellent.
	450	.025	11	
YELLOW BRASS	130	.025	3¼	Side mill, ¼" x ¼"; surfacing, 1/16". Coarse teeth and spiral work best and prevent hogging and chatter.
	225	.012	2¾	
CAST IRON (SOFT)	60	.025	1½	Always use .025 feed. Side mill cuts to ½" wide by ⅛" deep; surfacing to 1/16 x 1¼. 60 r.p.m. best for 3" mills.
	130	.025	3¼	
SOFT STEEL	60	.025	1½	Harder to mill than cast iron but .025 feed can be used with slotting cuts to ⅜" deep. Surfacing, about 1/32".
	130	.012	1¾	
MACHINE AND LOW CARBON STEEL	60	.012	¾	Resists penetration of broad cutters. Surfacing, 1/32". Often faster to walk across work with narrow deep cuts.
		.025	1½	
MALLEABLE IRON	60	.025	1½	Requires low speed but permits big chip. Spiral and stagger tooth cutters work smoother than straight teeth.
HARD STEEL	60	.006	¾	Reduced feeds often necessary but should be avoided if a narrower or shallower cut can be made with faster feed.
		.012	¾	



rotation and a right-hand spiral cutter, the first cut is made on the outside. In this way the shoulder is cut with the trailing edge, reducing friction to the minimum.

The operation of squaring an end, Figs. 9 and 10, is one of the few instances where the cut is made with the work mounted at the left of the cutter. Use the vertical hand feed and feed up (climb feed) for the roughing cut and down for the finish cut.

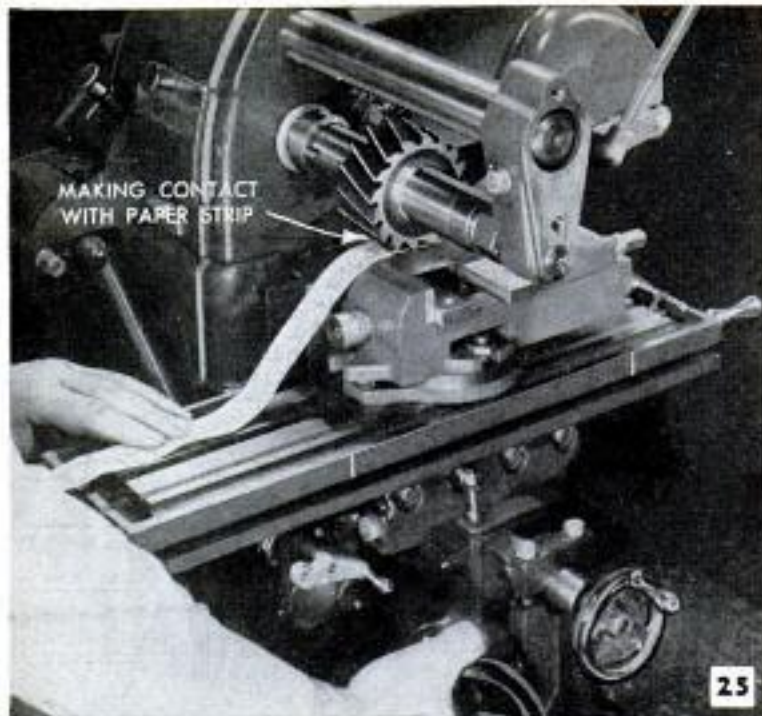
**Use of side mill:** Various operations with side mills are shown in Figs. 11 to 22 inclusive. These illustrations are more or less self-explanatory. Note in Figs. 17, 18, 19 and 22, the use of hardwood supporting blocks and shims. If care is used in cutting the blocks to exact size, extremely accurate work can be done by these simple methods. For side milling, the stagger-toothed side mill generally is superior to the side mill with straight teeth. When making straight cuts it's a good idea to tighten the gib lock just sufficiently to cause a slight drag. This steadies the machine table and generally

eliminates any tendency to chatter. Another step that's important when setting up the work is to make sure that it is in full contact either with the vise or the surface of the machine table, depending on how it is set up. Generally this can be accomplished by tapping the work lightly with a soft hammer as in Fig. 4.

**Speeds and feeds:** When milling soft metals and plastics, the cutters usually can be operated by direct drive at comparatively high speeds. The back gears and intermediate speeds generally give satisfactory results on cast iron, but steel always takes the lowest back gear, especially when 2½ or 3-in cutters are used. Due to the comparatively large diameter of the spindle-mounted cutters considerable power is required, even in light cuts. With a 2½-in. cutter, cast iron usually can be worked at a surface speed of 85 f.p.m. (feet per minute) which means that the cutter speed will be about 130 r.p.m.

Most materials should be worked with





ORIGINAL THICKNESS	.658
WANTED	.625
STOCK TO BE REMOVED	.033

MIKED AT	.634
WANTED	.625
UPFEED FOR FINISH CUT	.009



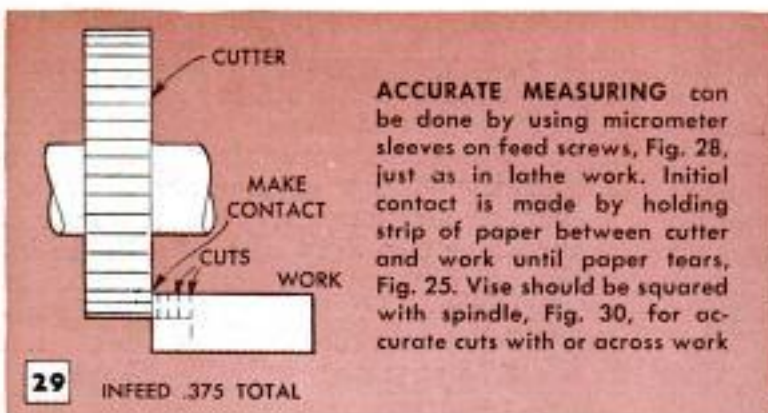
ROUGHING CUT ABOUT .025



ZERO THE VERTICAL FEED

the coarsest feed, which is about .025 per revolution. However, using a 4-tooth mill, Fig. 23, the .025 feed results in a .006 chip, while the same feed with a 12-tooth cutter gives a .002 chip, Fig. 24, which is more within the capacity of the bench machine. As most plain side mills have 14, 16 or 18 teeth, the .025 feed is a good value for nearly all materials. Extremely fine feeds must be avoided, as a fine feed-per-tooth powders the metal and dulls the cutter quickly due to the abrasive action.

**Measuring:** A good example of preliminary measuring requirements for a precision job are shown in Figs. 25 to 28 inclusive. This is the initial surfacing cut on the V-block shown in Fig. 19. In the rough the stock measured slightly over  $\frac{5}{8}$  in. or about .658. The requirement for thickness is assumed to be .625, or  $\frac{5}{8}$  in. The first roughing cut of about .025 reduces the thickness to .634 on the mike, Fig. 27. The vertical micrometer collar is then zeroed, Fig. 28, after which an upfeed of .009 sets the work for the finish cut. Note the calculations set down at the right of Fig. 26. Where the surface of the work is smooth, the initial contact between cutter and work usually is made by the paper-strip method, Fig. 25. This is easy to carry out. When the paper is gripped to the point where it tears, the contact usually is considered sufficiently close for average calculations. Precision work generally requires square mounting and for this reason it's advisable to check the index marks on the vise by squaring from the spindle as shown in Figs. 29 and 30. Special care in this phase of the setup will assure accurate cuts whether with or across the work. ★ ★ ★



INFEEED .375 TOTAL

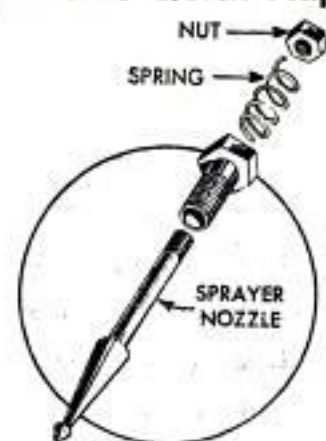
**ACCURATE MEASURING** can be done by using micrometer sleeves on feed screws, Fig. 28, just as in lathe work. Initial contact is made by holding strip of paper between cutter and work until paper tears, Fig. 25. Vise should be squared with spindle, Fig. 30, for accurate cuts with or across work



30



## Modified Spray-Width Valve Allows Quick Adjustment



The spray-width adjustment valve on a paint spray gun may be modified to a quick-acting one that is controlled by thumb pressure. In this way, the spray pattern may be changed momentarily by pressing on the valve, which will return to its original setting

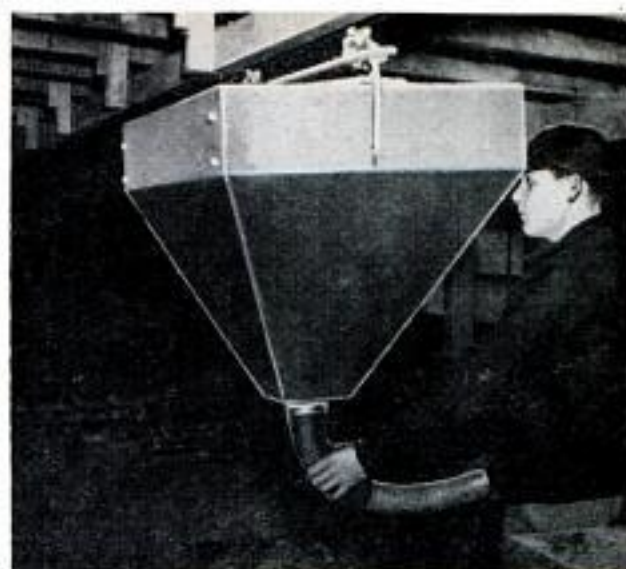
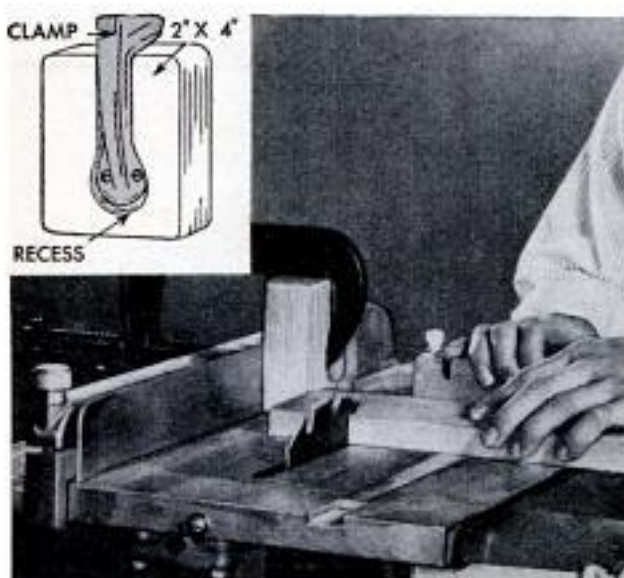
when pressure is released. To alter the valve, unscrew the packing gland, remove the valve and have the valve reshaped like the one illustrated. Install this new fitting in the gun, using the old packing gland. Depending on the type of gun, some valves may be modified by turning the sprayer nozzle, while other guns will require machining a completely new fitting.

John E. Walden, Delaware, Ohio.

## Stop Block for Saw or Shaper Has Clamp Attached

The advantage of this one-piece, cut-off stop block lies in the fact that the clamp and block need not be handled separately. The stop block is made by recessing a short length of 2 x 4 to receive the fixed pad of a C-clamp. Two holes are drilled in the pad and it is fastened to the block with wood screws. Because it is one piece, the stop block can be quickly and easily removed from the fence of one machine and moved to another, thus requiring only one clamp for several machines.

Milt Evans, Palmdale, Calif.



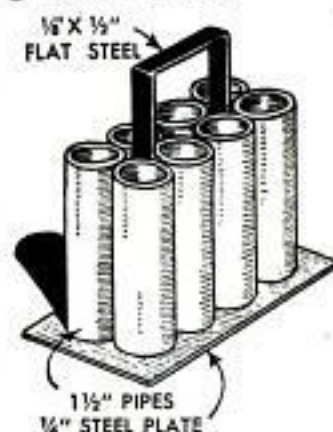
## Poultry-House Feeders Supplied By Hopper on Overhead Track

Suspended from an overhead track running the full length of the poultry house, this traveling hopper holds 200 lb. of feed for supplying half of the 80 feeders used in the building. Two loadings of the hopper, which supplies the feeders through a flexible tube attached to the bottom, makes possible completing in 10 minutes an operation that formerly required eight trips carrying 50-lb. buckets of feed. Constructed of sheet steel, the hopper is suspended on short lengths of chain beneath trolley-type door hangers that run in tubular track of the kind used for heavy barn and garage doors. The track is attached to 2 x 4 supports that are nailed to rafters or joists overhead. Flow of feed from the hopper is shut off by hooking the flexible spout to one side of the hopper.—S. R. Winters, Orlando, Fla.

## Portable Welding-Rod Holder

Easily welded together from short lengths of 1½-in. pipe and pieces of scrap steel, this portable holder will carry a generous supply of welding rods of various sizes. The base of the holder is cut from a piece of ¼-in. steel plate and the handle is a length of ½ x ½-in. flat steel. The pipes are cut to 8-in. lengths and welded to the base. The number of pipes will depend on the variety of sizes required by the individual welder. Pipe other than 1½ in. may be used.

C. Wayne Close, Sycamore, Ohio.







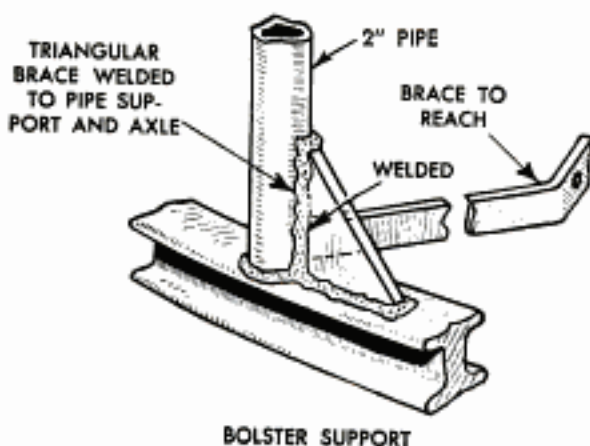
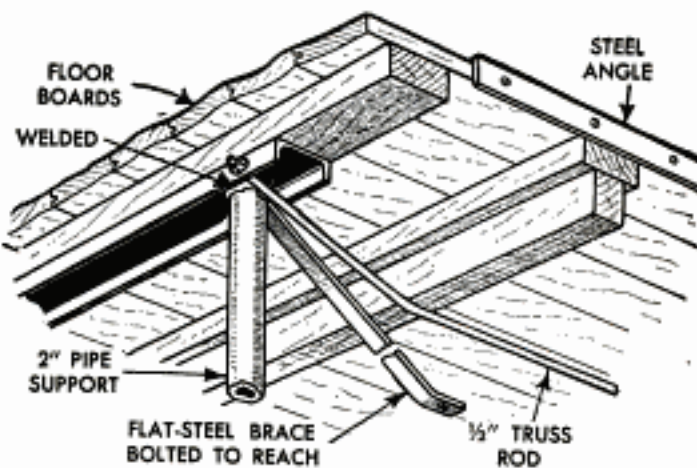
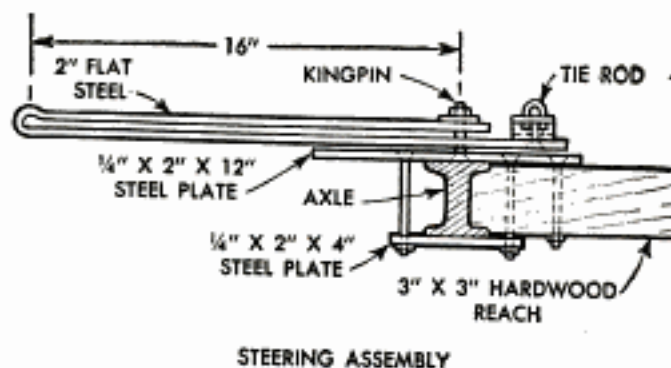
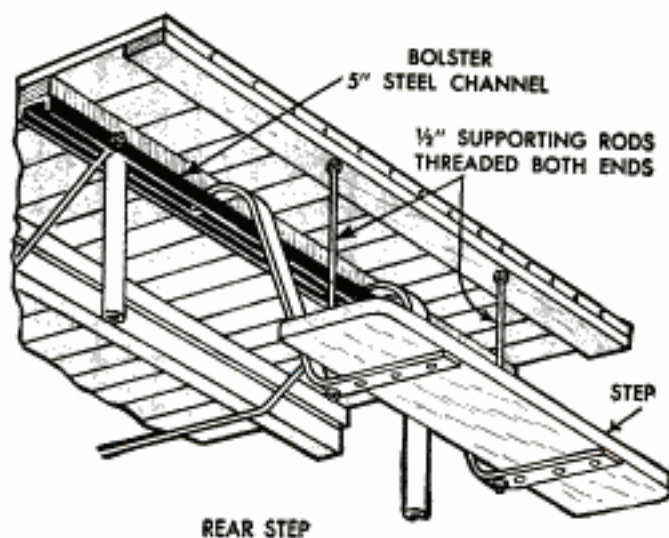
# FARM TRAILER

## *made from auto chassis*

By David F. Costello

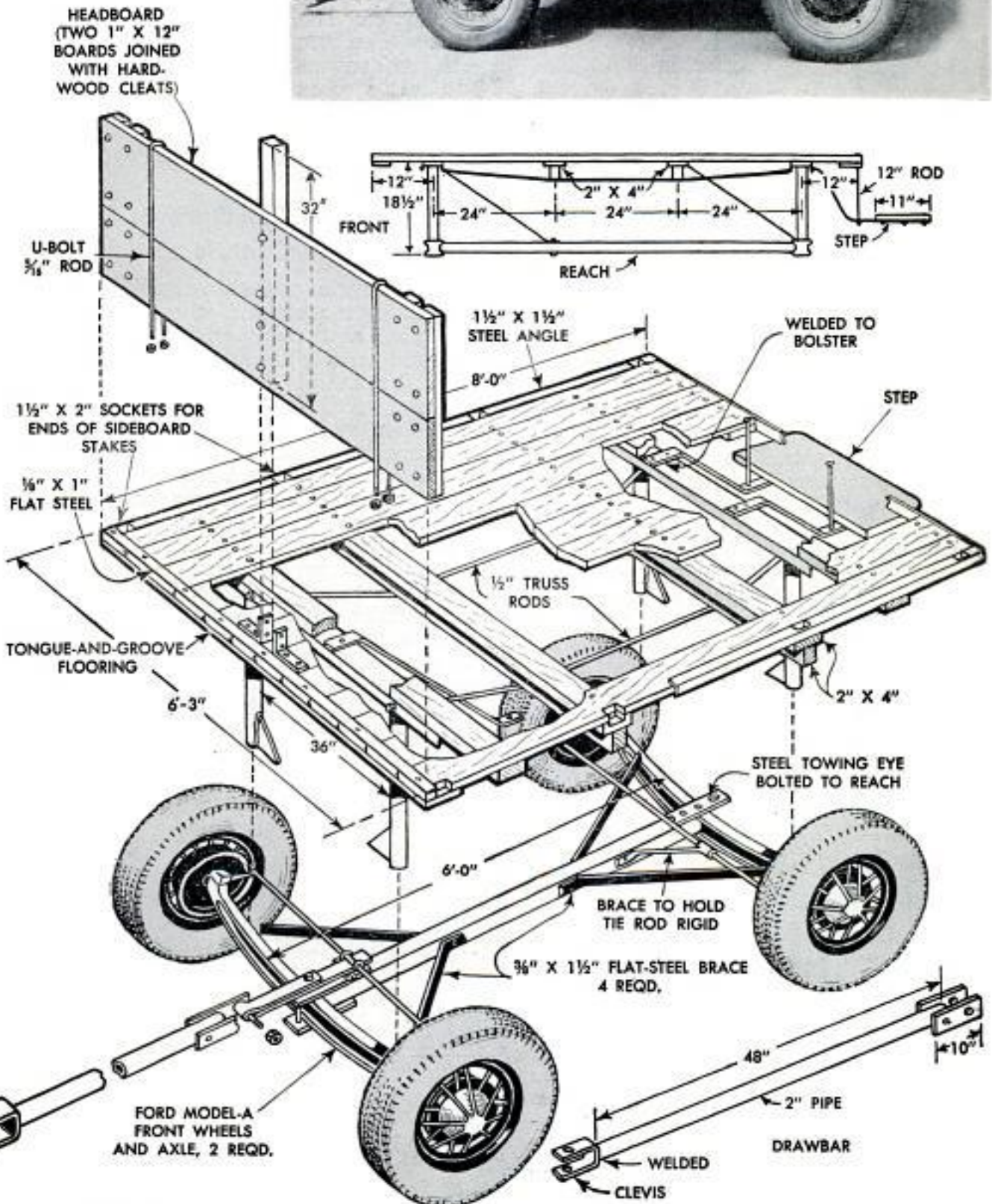
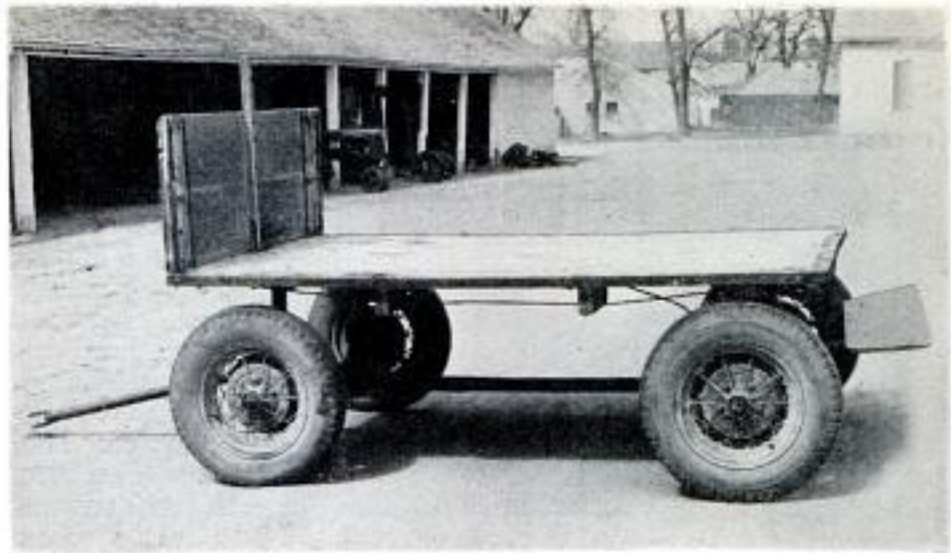
FARMERS LIKE the easy maneuverability and handy loading height of short-coupled tractor trailers, such as this one which is built on a wheelbase of only 6 ft. The front and rear channel-steel bolsters are elevated on pipe uprights to clear the wheels. This construction permits a short turning radius and a bed width of 6 ft. 3 in. on standard-tread front axles salvaged from Ford Model-A cars. In the assembly of the chassis, the tie rod of the rear axle is braced to the reach to hold the wheels in the straight-ahead position. Note that a 3 x 3-in. wooden reach is used for greater flexibility. Select straight-grained hardwood, preferably oak or hickory, for this member. The construction and assembly of the steering gear is shown in the detail at the right and also on the opposite page. Although not indicated, the clamping plates can be welded to the I-beam axle if desired. Some adjustment of both tie rods may be necessary to assure that the wheels track properly. The bolsters consist of 5-in. steel channels supported on 18-in. lengths of 2-in. pipe, the lower ends of which are welded and braced to the front and rear axles. Cross members, spaced between the bolsters, are made by bolting one 2 x 4 flatwise to the edge of another. Truss rods bolted to the channels pass under these members and support the center of the bed. Hardwood 2 x 6s are bolted to the top of the channel-steel bolsters as in the cutaway view of the bed. Construction of the bed offers considerable latitude. You can build the type shown, or make it longer and wider to suit a specific purpose. Use oversize tires as pictured. Sideboards are cleated and held in place by stakes which fit in sockets cut in the bed. The rear step is supported by steel rods and braces.

★ ★ ★

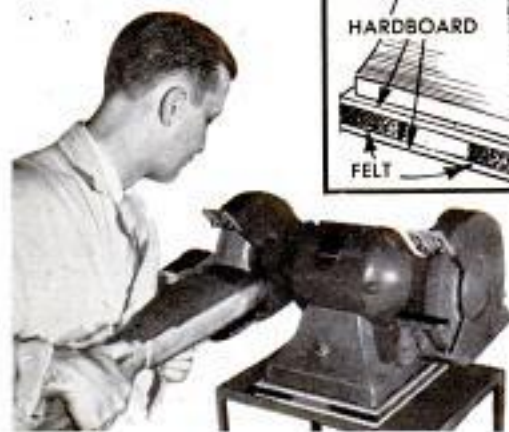




Although only a flat bed is pictured and detailed, provision is made for mounting sideboards and a rear endgate. Use two 1 x 12s for each sideboard and the endgate, joining the boards edge-to-edge with hardwood cleats. Use paint or creosote on wooden parts



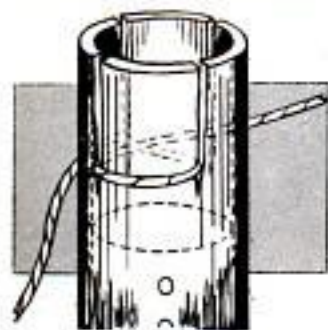




### Machine Vibration Dampener

When operated at high speeds, bench-type power tools often set up high-frequency vibrations, and also a resonance that may be objectionable in some locations. In many cases, vibration may be so pronounced that it is difficult to do accurate work. This is especially true where the work can be only partially supported by a table or rest and must be held and guided by hand. To remedy the condition one craftsman mounts his drill press, lathe and bench grinder on a simple sandwich-type vibration dampener, consisting of two pieces of  $\frac{3}{16}$ -in. hardboard with strips of  $\frac{1}{2}$ -in. felt between. Parts of the dampener are cut slightly larger than the base of the machine. Flathead machine bolts are used to attach the assembled dampener to the machine base. Countersink the bolt holes so that the heads of the bolts will not touch the bench top. When necessary to attach the tool to a bench or stand, separate bolts are used, each one passing through the lower piece of hardboard and through a hole drilled in the bench top.

### Mason's Line Held Tight By Slotted Rubber Hose



Bricklayers, masons and others who use a tightly stretched line for aligning and leveling, can eliminate tying and untying the cord by using a length of rubber hose slipped over a round stake. The hose is allowed to project about two inches above the top of the stake and is cross-sawed to make four notches. The line is pulled tight, slipped into the slots and wound around as shown.

### Handy Workbench Tool "Pocket"

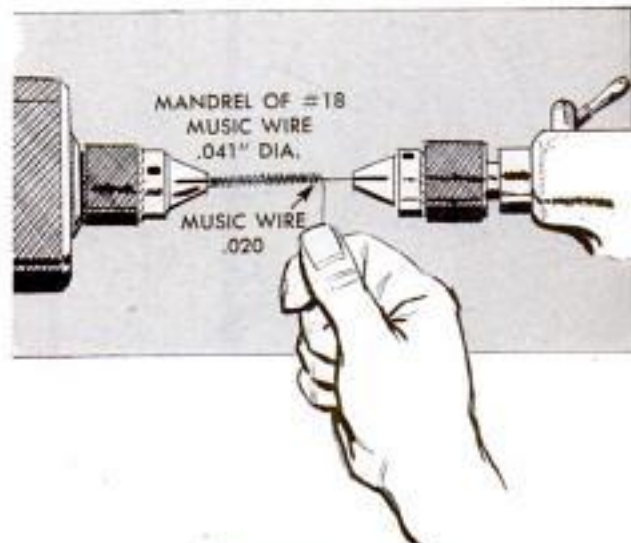
If you like your tools hung or mounted at the back of your workbench, a "pocket" of plywood scraps will make a handy holder. Folding rules, putty knives and other hard-to-hang items can be stored within quick reach. The pocket can be made any convenient size, but



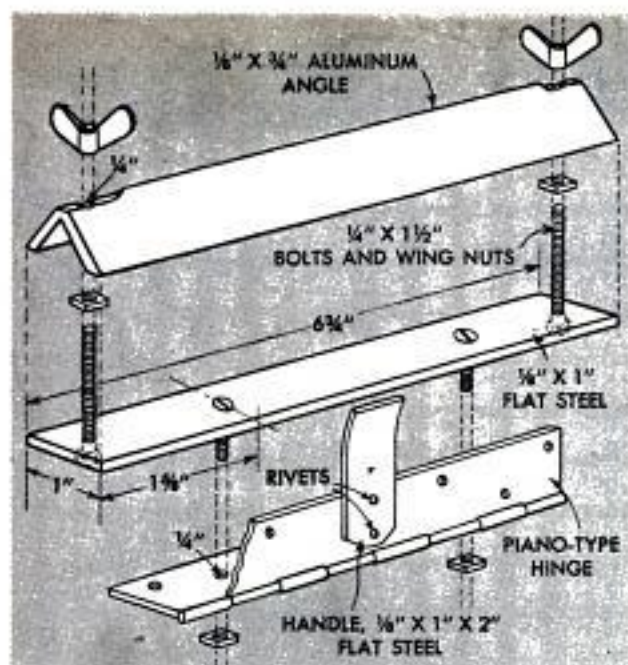
should not be made too large, because smaller tools will drop down inside out of sight.—Robert C. Barnes, Joplin, Missouri.

### Winding Small Coil Springs Between Lathe Centers

Tiny coil springs, used in cigarette lighters, working models and other fine mechanisms, are not readily available, but can be wound on a lathe by using two small chucks. A mandrel 6 in. long is made of No. 18 music wire, about 1 in. of which is chucked in the headstock chuck. The tailstock chuck is tightened just enough to allow the mandrel to turn freely. Bend the end of a piece of No. 8 music wire so that it catches in one of the spaces between the jaws of the headstock chuck. Turn the lathe by hand until several turns of wire are made on the mandrel. Then, using power, run the lathe at slow speed and wind the spring to the desired length. Use a fairly long piece of No. 8 wire, so there is enough to allow you to keep it at an even tension, then cut it off after the spring is wound. The spring should be tempered to a blue color.—E. J. Gilkerson, Columbus, Ohio.





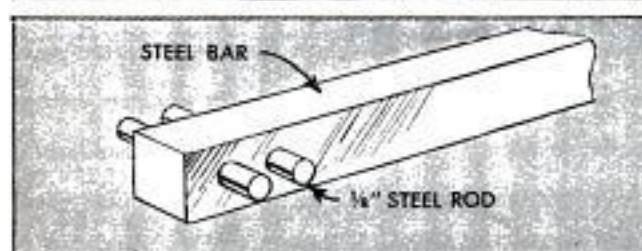
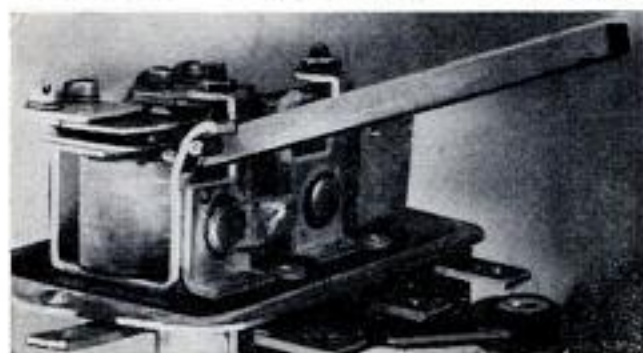


## Miniature Brake for Light-Gauge Sheet Metal

ANY MODELMAKER, hobbyist or craftsman who has occasion to work with the lighter gauges of metal, will find dozens of uses for this miniature sheet-metal brake. The base of the brake is a piece of flat steel drilled for four  $\frac{1}{4}$ -in. screws, as shown in the detail. The two inside holes are countersunk for flat-headed machine screws which hold a piano-type hinge to the base. The two outside holes are fitted with  $\frac{1}{4}$  x  $1\frac{1}{2}$ -in.-roundheaded machine screws, held to the base with nuts. The  $\frac{1}{8}$  x  $\frac{3}{4}$ -in. angle used in the original was aluminum. However, steel can be used, but will be somewhat more difficult to work. A flat is filed across the heel of the angle at each end, and

two  $\frac{1}{4}$ -in. holes are drilled to align with the end holes in the base. The legs of the angle are filed so their edges are parallel to the face of the base. Wing nuts are turned on the  $\frac{1}{4}$ -in. bolts that hold this angle to the base, facilitating quick adjustment. The handle for the brake is a 2-in. length of  $\frac{1}{8}$  x 1-in. flat steel, riveted to the middle of the hinge. Two holes may be drilled in the handle for attaching an extension arm. In use, the piece of sheet metal to be bent is placed on the base, the wing nuts are tightened to clamp the angle on the sheet and the hinge is swung up by means of the handle to give the desired angle of bend.—Carl S. Bates, Chicago.

## "Wrench" Improved in Shop Adjusts Voltage Regulator



Although special tools may be purchased for the job, some machinists prefer to make their own tools for bending the spring support of a voltage regulator in order to raise or lower amperage. One such tool devised for this purpose was made from a length of  $\frac{1}{4}$ -in.-sq. steel bar, 5 in. long, and a scrap piece of  $\frac{1}{8}$ -in. steel rod. Two  $\frac{1}{8}$ -in. holes were drilled in the bar, one being about  $\frac{1}{8}$  in., the other about  $\frac{7}{16}$  in. from the end, after which pins cut from the rod were inserted. They were cut so they extended approximately  $\frac{1}{16}$  in. from each side of the bar. The pins are held in place by upsetting the metal around the edges of the holes with a centerpunch.

☞ To patch holes in roof gutters, coat the damaged area with roofing cement and apply a patch cut from building paper.

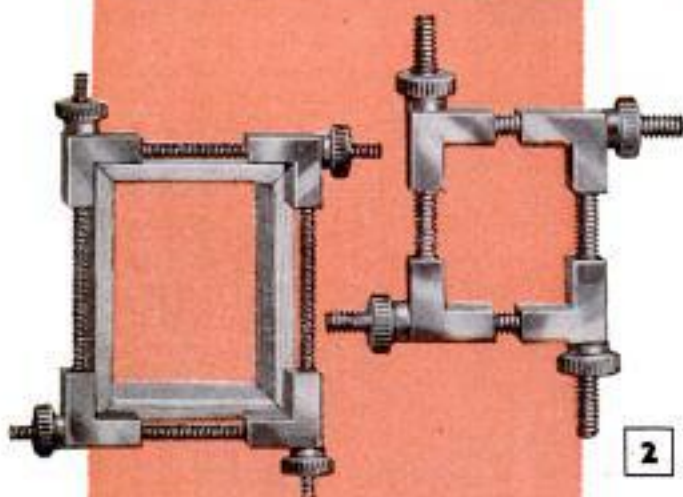


# SHOPPING FOR TOOLS



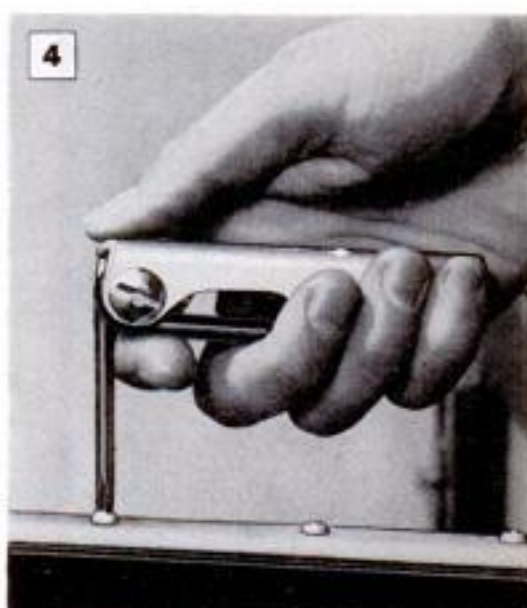
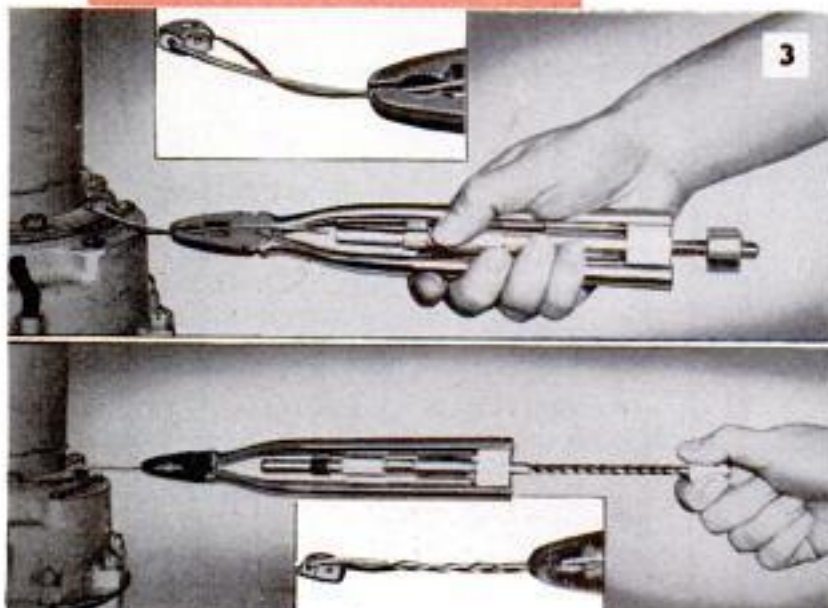
**1. BLOCK HANDLING TOOL** provides that extra hand so often needed by masons when laying cinder and concrete blocks. Tool is designed to slide easily into the block openings and has case-hardened jaws that grip the block securely, enabling the user to carry it from a distance and place it in position on the wall. Has two spirit levels

**2. FOUR-CORNER MITER CLAMP** is designed to put equal pressure on the four corners of a mitered frame simultaneously. Angle corner blocks are of aluminum alloy and are drilled and tapped for  $\frac{1}{4}$ -in. threaded rods. Large adjusting nuts have knurled rims so that they can be spun into position quickly. Comes in 8, 12, 18 and 24-in. sizes



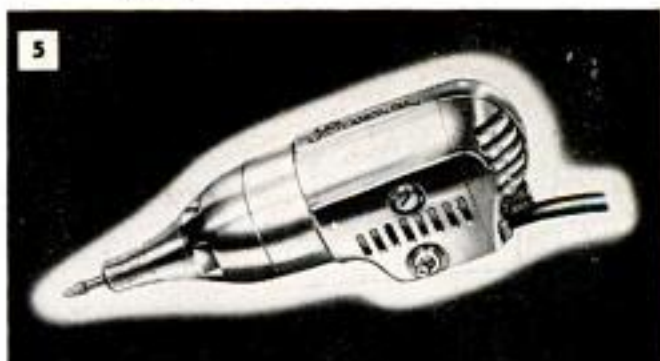
**3. A WIRE-TWISTING MECHANISM** built into pliers of a special design makes it easy to spin two wires into a neat twist in a matter of seconds. Wire ends are gripped in plier in usual manner and a sleeve is pushed forward with thumb to lock jaws. Then the pliers are released and a pull on the knob spins them as in lower photo

**4. FOLDING SCREWDRIVER** has three separate bits that close into a sturdy handle like the blades of a pocketknife. Can be used as an offset screwdriver as pictured, or a regular screwdriver simply by opening the blade straight out to an overall length of 8 in. As an offset driver it works anywhere there is a clearance of  $2\frac{3}{4}$  in.





**5. PRECISION HAND GRINDER** has speed and power to operate carbide midget milling cutters and other rotary tools for grinding, finishing and polishing metals. Can be used freehand or mounted on lathe or drill press in a special holder for internal or external grinding. Specially designed motor operates at 45,000 r.p.m. and has built-in overload protection. Features sealed ball bearings



**6. MAGNETIC LOCATOR** finds nails in tires, locates lost parts in the shop and enables the user to spot position of studs in a plastered wall. A small disk pivoted in a clear-plastic tube supports a permanent magnet which reacts to presence of ferrous metals within  $\frac{3}{8}$  in. of pointed end. Nails used to attach lath or plasterboard to studs make it easy and simple to spot the studs

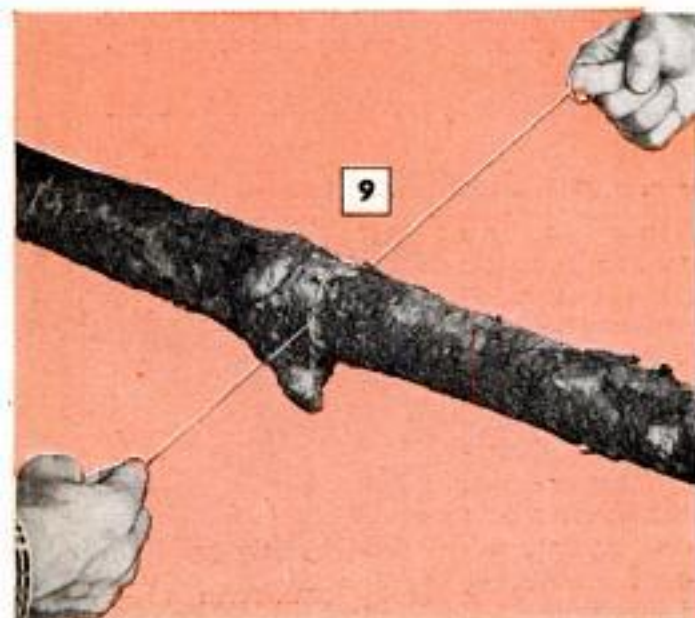


**7. INSPECTION INSTRUMENT** contains a special optical system mounted in a flexible tube which can be inserted in any opening  $\frac{1}{2}$  in. or larger. Reflecting lens system forms an image at eyepiece. Dark areas, such as those in cored castings, are illuminated by built-in light. Tube may be curved and maneuvered into desired position by means of a handwheel on handle of instrument

**8. CARPENTER'S AND MASON'S LEVEL** has a frame made from plastic having accurate working surfaces and exceptional lightness and strength. Openings at ends give a comfortable handhold for placement of the level either vertically or horizontally. Solid webs in the center sections support the level glasses and at the same time afford protection against breakage. Comes in 24-in. length



**9. POCKET SAW** consists of a wire-type blade with spiral cutting teeth. A steel ring attached to each end of the 20-in. blade serves as a handle. Handles many emergency needs of campers, fishermen, woodsmen and hobbyists. Cuts in any direction in any kind of wood, hard or soft. Can be operated as pictured, or can be made into a bow saw by fitting a bow fashioned from a tree limb







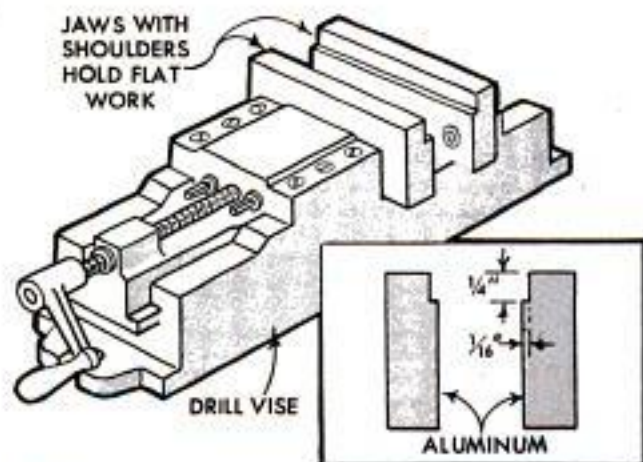
### Magnet Holds Wooden Pencils

A convenient and novel pencil holder for the kitchen can be made from a small horseshoe magnet. The magnet is fastened to the wall or to the side of a kitchen cabinet at a handy location with a strip of wood and four screws. Steel screws or thumbtacks provide metal ends for the pencils. Thumbtacks can be pressed into the rubber erasers, whereas the use of screws requires cutting off the brass eraser ferrule and drilling out a portion of the pencil lead.

H. G. Frommer, Milwaukee, Wis.

### Machinist's Vise Holds Thin Work By Use of Auxiliary Jaws

When milling, drilling or planing thin work held in a drill vise, shouldered auxiliary jaws of soft metal will save considerable set-up time. The jaws are machined from aluminum blocks and a shallow shoulder is milled in the face of each one. When milling the shoulders, clamp the blocks together in the vise and true-up the whole assembly on the milling machine bed, to make sure of the accuracy of set-ups when using these jaws.



### Broken Drills Removed With Slotted Tool

To solve the problem of removing center drills broken off in the work, one machinist devised a tool by modifying a larger-size drill. He ground a slot, slightly wider than the diameter of the broken drill, in the shank, or body, of the larger drill. In use the larger drill fits around the broken piece and cuts away enough metal to clear the end of the broken section. It is then fairly simple to grasp the end of the broken drill to pull it out.

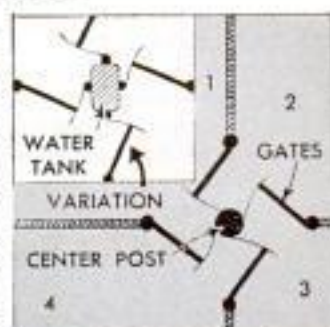
Thomas J. Kilb, Springfield, Mass.



### Four Gates in Fenced Pasture Permit Field Rotation

Fencing a pasture into four fields, that can be combined in a variety of ways, is done by installing four gates at the intersection of the fences. A large center post is installed at the intersection, to which all four gates are latched. An alternate method, using a water tank common to all four fields, requires four center posts. With either method, three fields can be combined to form one large pasture, plus one small field, or adjacent fields can be used to divide the pasture into two fields. The many variations allow frequent pasture rotation by merely opening and closing gates.

R. A. Meeks, Mannville, Alberta, Can.



### Rejuvenate Steel Brushes

Steel-wire brushes become dull after prolonged use because the ends of the bristles become rounded. To restore the sharpness of the bristles, brush them a few times across the side of a rotating grinding wheel.





## DE LUXE DRESSING TABLE YOU CAN BUILD AT HOME



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Rez is used in finishing the wood portions of the unit. Rez

—which primes, seals and gives you the natural wood finish decorators recommend.

Rez Color Tones bring you these ultra-modern *natural* shades: *Redwood, Cedar, Sage, Driftwood* and *Mahogany*. *White Rez* can be used for 1-coat blond finish. Just put it on and wipe with a cloth. *Clear Rez* beautifies grain in the original wood color.

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**Times your work.** Kodak Timer covers all intervals up to 60 minutes. Spring-wound; has both minute and second hands. Can be stopped and restarted without re-setting hands. Special feature: handy tilting base. \$7.95.



**Washes film or prints automatically.** Kodak Automatic Tray Siphon converts an ordinary tray into effective washer. Attaches to water tap. Water is siphoned out at same speed it enters. Wonderful for kitchen or bathroom. \$4.50.



**Protect light-sensitive materials.** Kodak 2-Way Safelight (left) swivels on socket for direct or indirect lighting. Second filter (extra) allows 2-way light. \$4.50. Kodak Adjustable Safelight Lamp (right) attaches almost anywhere. \$8.75.

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**Accurate weight scale.** Kodak Chemical Scale weighs up to  $3\frac{3}{4}$  ounces or 175 grains (avoirdupois), or 130 grams (metric). Chemical-resistant housing. Hair-lined window makes easy reading. \$14.50.



**Dries prints without curling.** Kodak Blotter Roll with corrugated backing allows free circulation of air for rapid drying. Capacity, 80 prints of average size. 6 feet long,  $11\frac{1}{4}$  inches wide. \$2.88.



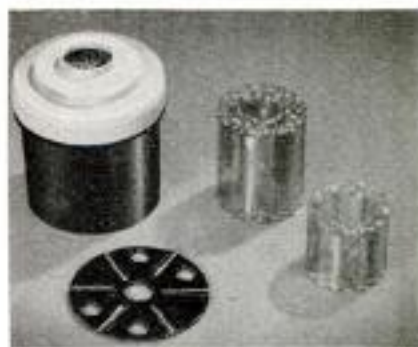
**For contact printing.** Kodacraft Printing Frame includes glass plate, mask for 9 popular negative sizes. Accepts paper up to  $4\frac{1}{4} \times 5\frac{1}{2}$  inches. Corner loading assures accurate positioning. \$1.65.



**Zips off the water.** Kodak Rubber Squeegee quickly removes superfluous water from flat surfaces. Ideal for quality ferrotyping, or Kodak Dye Transfer Process. 10-inch blade. \$3.75.



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**Easy roll-film developing.** Kodacraft Roll-Film Tank can be used in lighted rooms (after loading). Faster drying "apron" method allows immediate development of successive rolls. \$2.53.

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## Care and Feeding of Engines

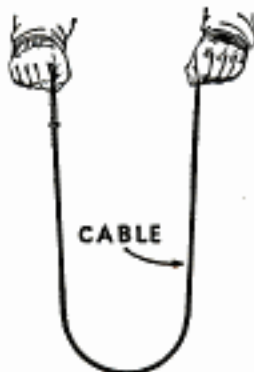
BY S. P. CORP

### FLIRTATIOUS SPEEDOMETER

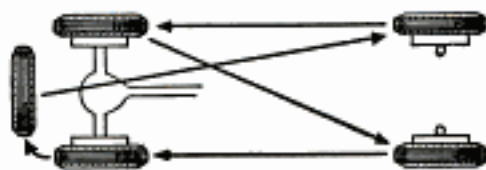
When your speedometer becomes noisy and waves at you, it's time to inspect the head and the cable. To test for tightness in the head, disconnect the cable casing up under the instrument panel and pull cable out of casing. Then insert upper end of cable back into the speedometer head and spin it between your thumb and finger. If cable turns hard, the head should be removed for internal repairs.

Next, inspect cable for breaks, worn spots, or kinks. Hold both ends of cable as shown and turn it slowly. A kinked cable will "flop" and you need a new one. Check casing carefully and replace it if distorted or broken. Remove any sharp bends. Before putting cable back in casing, spread a thin layer of high-temperature grease over the lower two-thirds of the cable. As cable is installed, entire cable will be lubricated.

Make sure that cable enters the socket in the worm gear by turning cable until connection is made. Be sure upper end of cable is seated in speedometer socket before connecting upper end of casing to speedometer head.



### CROSS TIRES EVERY 5000 MILES



Your tires will last longer if you cross them every 5000 miles, as shown above, to counteract the uneven wear which occurs when a tire is left on the same wheel continuously. As tires are rotated, remove any metal or foreign material imbedded in the treads. If treads are worn smooth, replace them for winter driving and thus reduce the danger of skidding. Be sure to have any cuts repaired, as water or dirt penetrating to the cords can cause rapid deterioration of the tire.

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## Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

### Crackle Finish

Q—How does one apply the so-called crackle finish? I've always understood that it is a finishing process requiring special materials and is done in several steps. I'd like to try it. What comes first? Can the finish be applied to both wood and metal? Is spray equipment required? Does the process require heat?

J. B., Colo.



A—At one time the crackle finish was quite extensively used on table tops, radio cabinets, instrument panels and the like. However, changes in design and materials made its use impractical and for this reason it is seldom recommended at the present time. It is still possible to produce a fairly suitable crackle finish by using ordinary slow-drying (brushing) lacquers in two colors. For best results the two coats should be sprayed on. The base color, such as Chinese red, is applied first and allowed to set partially. Then the darker-colored top, or crackle coat is sprayed on. In drying, the top coat breaks, or crackles, into an irregular pattern exposing the base color. Another method effective on metal, is the use of what is known as "crystal" lacquer, a special slow-drying material which on drying produces an all-over crystal pattern very similar to frost patterns on a window pane. It is available in colors and also in clear. For best results it should be applied by spraying rather than brushing. No heat is required as the materials dry at room temperatures.

### Refinishing Meat Block

Q—I have a heavy meat block, or cutting block, which is now covered with knife marks due to prolonged use. The block is about 10 x 12 in. and consists of several hardwood strips glued together, or joined in some manner, and supported on four short legs. How does one remove the knife marks and refinish the block? I tried planing with a hand plane, but this does not work satisfactorily as the grain in adjacent strips seems to run in opposite directions.—B. Y., Ore.

A—If the plane iron is very sharp and set to lift a paper-thin shaving you can remove the knife marks quite easily even though cutting against the grain. However, you may be able to do a better job by using a cabinet scraper and working with the grain in two directions. Rarely are the knife marks more than  $\frac{1}{16}$  in. deep but of course, cleaver marks may cut in as much as  $\frac{1}{8}$  in. In either case

(Continued to page 242)



Announcing **TYNEX** ... a new  
trade-mark for Du Pont nylon bristles



GET FULL  
PAINT  
PICK-UP



SMOOTH  
EVEN  
FLOW



choose brushes  
with bristles of Du Pont

**TYNEX**

nylon

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"Tynex" nylon bristles help make painting easier and faster. Brushes with long, tapered, well-tipped "Tynex" bristles pick up a full load of paint ... flow it on smoothly and evenly. Home painters know from experience that "Tynex" bristles are easy to clean with any commercial cleaner ... won't break off ... last three to five times as long as other types of bristles.

"Tynex" has been granted the Good Housekeeping Guarantee Seal. Leading brush manufacturers are now using the trade-mark "Tynex" to identify genuine Du Pont nylon bristles in all types of paintbrushes. So next time you buy brushes, look for the word "Tynex" on tags and brush handles. It's your guarantee of work-saving, long-lasting bristles of Du Pont nylon!



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... THROUGH CHEMISTRY



"Handy" SANDY says:



Use these  
**GOOD  
SHORT-CUTS**  
to save work!

**Drawer sticking slightly?** Fix it quickly: rubber cement a piece of Fine Flint Paper by CARBORUNDUM, sand side out, to the shiny spot where it's binding. Work drawer in and out 'til it's free — then peel off the Flint Paper. The sanded spot is concealed . . . no "touch up" needed, so it's better than sanding the drawer itself. Look for CARBORUNDUM® Brand Flint Paper at your hardware store or lumber dealer. Five useful grades: Extra Fine, Fine, Medium, Coarse, Extra Coarse.

**What? Shaving cream in your tool kit?** Sure — it's a smart way to "lubricate" wood screws. Just stick the threads in the end of the tube before driving them into your wood.

**Paper or plastic garment bags** will last longer if you reinforce the upper edges with sturdy FLEXBAC® Masking Tape by CARBORUNDUM. Use it on the corners and around the edge, overlapping the top and sides. If you seal the seams with FLEXBAC Masking Tape, too, you'll make them really air-tight — keep the vapors in, moths out. Ask for FLEXBAC Masking Tape by the brand name. It's flexible, tough, goes on easily and stays put.

**Save work** next time you glue a mitered joint. Before gluing, wrap strips of FLEXBAC Masking Tape around the outer edges of the joint. The excess glue that squeezes out will then be on the tape . . . and tape and glue will peel off quickly, cleanly after the job is done. Saves extra sanding and cleaning.

**Use your power drill** to polish inside surfaces of holes — with a simple attachment you can make in a few minutes. Take a ¼" rod and slit one end to a depth of 1". Insert a strip of Abrasive Paper or Emery Cloth (CARBORUNDUM® Brand, of course) in the slot and wind it around the rod spirally — in a clockwise direction. Lock t'other end in your drill chuck and you're ready for business.

**Safety tip:** Don't cut yourself with dull knives and tools. Keep 'em sharp and smooth with handy CARBORUNDUM® Brand Sharpening Stones and avoid dangerous slipping. Your favorite hardware or lumber dealer has a complete assortment you can choose from. One for the kitchen and one for your workshop is a mighty good safety rule.

**"HOW TO SAND"**, useful pamphlet by CARBORUNDUM, is yours free for the asking. Gives you all the info you need to refinish furniture, plus tips on many other sanding jobs. Write for your copy—a postcard addressed to me will put it in your hands promptly.



**"Handy" SANDY**  
**CARBORUNDUM**

REGISTERED TRADE MARK

Niagara Falls, New York

(Continued from page 240)

It will be necessary to remove stock to a point slightly below the depth of the marks in order to eliminate them entirely. This done, sand the surface until it is smooth to the touch, then dampen it slightly to raise the grain and after it is dry, sand again. Although linseed oil is sometimes used to finish cutting blocks, this is not recommended unless you can be certain that the oil is absolutely pure. It is better to use pure olive oil, making several applications and allowing time for absorption between coats.



#### Ink Stain

**Q**—Recently I sanded the hardwood floor in one room but before a finish could be applied I had the misfortune to spill ink, which of course spattered over a considerable area. I have tried several ways of removing the ink stain without success. A strong solution of washing powder helped some but the stain still shows. Most of it seems to be embedded in the grain of the wood. Can it be removed entirely?—O. B., Miss.

**A**—Use of any of the common ink eradicators should remove most of the stain, but if the floor is of oak you may have some trouble getting the ink entirely out of the grain. Rather we think it would be better to rely on a mild solution of oxalic acid. Prepare the solution in an earthen jar or bowl by dropping several oxalic-acid crystals, or granules, into ½ gal. of clean water which has been poured into the bowl. Never pour water onto the acid crystals. Apply the solution to the affected area with a cloth swab. Let it dry and note results. If discoloration still shows, strengthen the solution and apply again. In some cases a third application may be necessary to remove the stain entirely. Then wash with clean water and when dry, sand the surface lightly to remove the raised grain caused by wetting the wood. **Caution:** Avoid handling the acid crystals, or granules, with the bare hands. Wear rubber gloves and avoid inhaling the fumes from the acid solution both when preparing and applying it. Destroy any unused portion of the solution.

#### Patching Cracks in Wall



**Q**—There are a number of narrow cracks in my basement wall. These run diagonally from the top of the wall to the lower course of blocks. The wall has been plastered. The cracks are only about ¼ in. wide but some loose material has fallen out in places. Should I fill with a cement mortar?—T. E., Mass.

**A**—You can probably make a satisfactory repair with cement mortar. However, it cannot be considered wholly permanent because of the possibility that the blocks may shift slightly later on. Should this occur, the newly repaired cracks may open again. Clean all loose material from the cracks and undercut the edges with a cold chisel so that the new mortar will "key" securely in the opening. Then mix prepared cement mortar fairly stiff and press into the cracks with a small trowel. Use considerable pressure to assure that the mortar is forced into all irregularities of the opening throughout its length. Strike the mortar off flush with the surface and smooth lightly with the trowel. After the mortar has partially set, trim the bristles of a whisk broom square across, and use the broom to "stipple" a pattern on the troweled surface of the mortared joint to match the surrounding surface. Touch the fresh mortar only lightly with the ends of the bristles and shift the broom so that the imprints overlap irregularly.



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can buy!



YOU'LL find a complete selection of pliers in the Channellock line — a plier for every job . . . at work and in the home. Don't take a substitute when you shop for pliers — Only Champion DeArment make Channellock . . . patented features assure you of the finest line of tools you can buy.



THE PLIER DESIGN THAT OBSOLETEES ALL OTHERS

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MEADVILLE, PENNSYLVANIA



**No. 407 GRIPPING  
PLIER**



Length 7". Capacity  $\frac{1}{8}$ " to  $\frac{5}{8}$ ". Two adjustments. Knurled grips.

This No. 407 plier is primarily intended for battery work. The self-gripping feature insures a positive grip on acid corroded and mutilated terminal nuts. Its adjustable feature also makes it indispensable for many other kinds of work. Polished steel finish.

**No. 410 GRIPPING  
PLIER**



Length  $9\frac{1}{2}$ ". Capacity  $\frac{3}{16}$ " to  $1\frac{1}{8}$ ". Four adjustments.

Our No. 410 is a heavy-duty self-gripping plier which will hold work of any shape with a positive pipe wrench grip. Will exceed a pipe wrench in usefulness because of its light weight and streamlined design. Polished steel finish.

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UTILITY PLIER**



Length 7". Capacity  $\frac{7}{8}$ ". Three adjustments. Knurled grips.

The No. 417 is a heavy-duty plier with a gripping power many times greater than the ordinary slip-joint plier. Polished steel finish. Its superiority can only be appreciated by actual use.

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**The NEW No. 420 PUMP  
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Length  $9\frac{1}{2}$ ". Capacity  $1\frac{3}{4}$ ". Five adjustments.

The wide range of adjustments of the No. 420 Pump Plier makes it adaptable to a multitude of uses. New strength has been added by the patented design of the tension edge. Interlocking channels and lugs prevent slipping. Wide base lugs provide maximum cross section strength.

**SELECT THE PLIER YOU NEED**

**No. 424 IGNITION  
PLIER**



Length  $4\frac{1}{2}$ ". Capacity  $\frac{1}{2}$ ". Four adjustments.

This No. 424 ignition plier incorporates the Channellock adjustment feature in order to eliminate wear on the joint bolt and lengthen the life of the tool. A midget plier. Polished steel finish.

**No. 307 BATTERY PLIER  
LAP JOINT**



Length 7". Capacity  $\frac{1}{4}$ " to  $\frac{5}{8}$ ". Blue finish.

**No. 317 $\frac{1}{2}$  LONG  
NOSE PLIER  
with Side-Cutter**



Length  $7\frac{1}{2}$ ". Polished steel finish. Knurled grips. No. 3017 $\frac{1}{2}$  same model without side cutter. Point,  $\frac{3}{32}$ " round.

**No. 326 LONG NOSE  
PLIER  
with Side-Cutter**



Length 8". Polished steel finish. Knurled grips. No. 3026, same model without side-cutter. Point  $\frac{3}{32}$ " round.

**No. 337 DIAGONAL  
CUTTING PLIER  
Lap Joint**



Length 7". Weight 6 lbs. per doz. Polished steel finish. Knurled grips.

**No. 348 $\frac{1}{2}$  LINEMEN'S  
PLIER  
Rounded Nose**



Polished steel finish. Knurled grips. Side-cutter.

No.	Size
346	6"
347	7"
348 $\frac{1}{2}$	8 $\frac{1}{2}$ "

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**No. 3048 1/2 LINEMEN'S  
Bevel Nose**

Polished steel finish.  
Knurled grips. Side-  
cutter.

No.	Size
3046	6"
3047	7"
3048 1/2	8 1/2"



**No. 356 END CUTTER**

Length 6". Polished  
steel finish.



**No. 366 FLAT-NOSE  
PLIER**

**with Side-Cutter**

Length 6". Polished  
steel finish. Knurled  
grips. No. 3066, same  
model without side-  
cutter.



**No. 378 LONG REACH  
DUCK-BILL  
PLIER**

Length 8". Polished  
steel finish.



**No. 3078 LONG REACH  
NEEDLE-NOSE  
PLIER**

Length 8". Polished  
steel finish.



**No. 436 DIAGONAL  
CUTTING PLIER  
Box Joint**

Length 6". Polished  
steel finish. Knurled  
grips. No. 435, same  
model 5" long.



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**No. 437 DIAGONAL  
CUTTING PLIER  
Box Joint**

Length 7". Polished  
steel finish. Knurled  
grips. A popular plier  
with automobile and  
airplane mechanics.



**No. 447 CURVED  
DIAGONAL  
CUTTING PLIER  
Lap Joint**

Length 7". Polished  
steel finish.



**No. 516 SLIP-JOINT  
PLIER  
Thin Nose**

Length 6". Polished  
steel finish. Knurled  
grips.



**No. 537 SLIP-JOINT  
PLIER  
with Side-Cutter**

Length 7". Polished  
steel finish. Knurled  
grips.



**No. 568 ANGLE-NOSE  
PLIER  
Slip-Joint**

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steel finish. Knurled  
grips.



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Made of tough, durable plastic  
material. Easy to install, full  
instructions with each pair.  
Plier loss reduced as light blue  
color makes pliers easy to locate  
Gives maximum handle-grip  
comfort.





**No. 27 1/2  
BRICK HAMMER**



Drop Forged — Black Enamel Finish  
Adze Eye

Hickory Handle

No.	Size
27 1/2	#2/0—10 oz.
27 1/2	#0—18 oz.
27 1/2	#1—24 oz.
28 1/2	#1—24 oz.

**No. 88 LONG NECK  
ELECTRICIAN'S  
HAMMER**



Designed specially for working over conduit and nailing junction boxes. Full Polished, Black Neck. Weight, 16 oz.

**No. 451 1/2  
"Our Pride"  
NAIL HAMMER**



Special Analysis Steel. Properly heat-treated to insure maximum durability for claws, face and body. Square face provides wider striking surface at edge of face and enables easier driving of nails close to abutting surface and in corners. Claws are clean-cut and sharp for easy gripping of nails of all sizes. Lacquered handle is moisture proof, full octagon, nonslipping, and easy on the hands. Weight, 16 oz.

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HAMMERS**



**No. 20**  
Full Polished Finish  
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Black Enamel Finish  
Dropped Forged  
Hickory Handle  
This hammer available from 2 oz. to 3lb.

**BRICK CHISELS  
AND SETS**



Drop Forged — Black Enamel Finish

No.	Size
52 Single Bevel	3"
	3 1/2"
	4"
53 Double Bevel	3"
	3 1/2"
	4"

**No. 140  
WRECKING BAR**



Forged from High-grade Hexagon Tool Steel... Heat Treated for Maximum Strength... Tips Hardened to Resist Wear... Pry End Carefully Ground... Claw End Separately Forged and Ground Just Like a Nail Hammer Claw... Clean... Sharp... "Nipper-Grip" Claw for Easy Gripping of Nails of All Sizes. Distinctively Painted Red and Black Lacquer. 18, 24 and 30 inch lengths.

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HEAVY DUTY NIPPERS**



This "Heavy Duty" Nipper is specially designed for Concrete Form Builders, Carpenters, Mechanics, Farmers and for Miscellaneous work. It will easily cut large nails, small spikes, form tie wires, reinforcement wire, etc. Drop forged from special analysis steel, and designed to give greatest leverage and strength. The stops prevent dulling of cutting edges and provide adjustment when edges have worn. Polished head. Painted "T" handles. Cutting edges hand filed. Available in 8, 10 & 14 inch lengths.



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- NEW** MODERN STRUCTURAL DESIGN . . . for accurate work.
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**NEW Coleman Folding Picnic Table and Carrying Case** sets up in a jiffy on strong legs. All steel. Big 28-in. square top. 26½-in. high. Folds into carrying case with legs and stools inside, plus extra space for other equipment.

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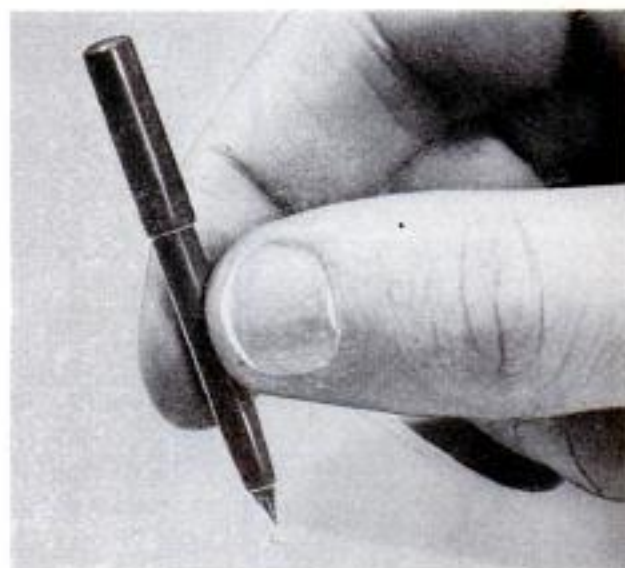
Dallas Morning News

### Texas Butterfly Branding

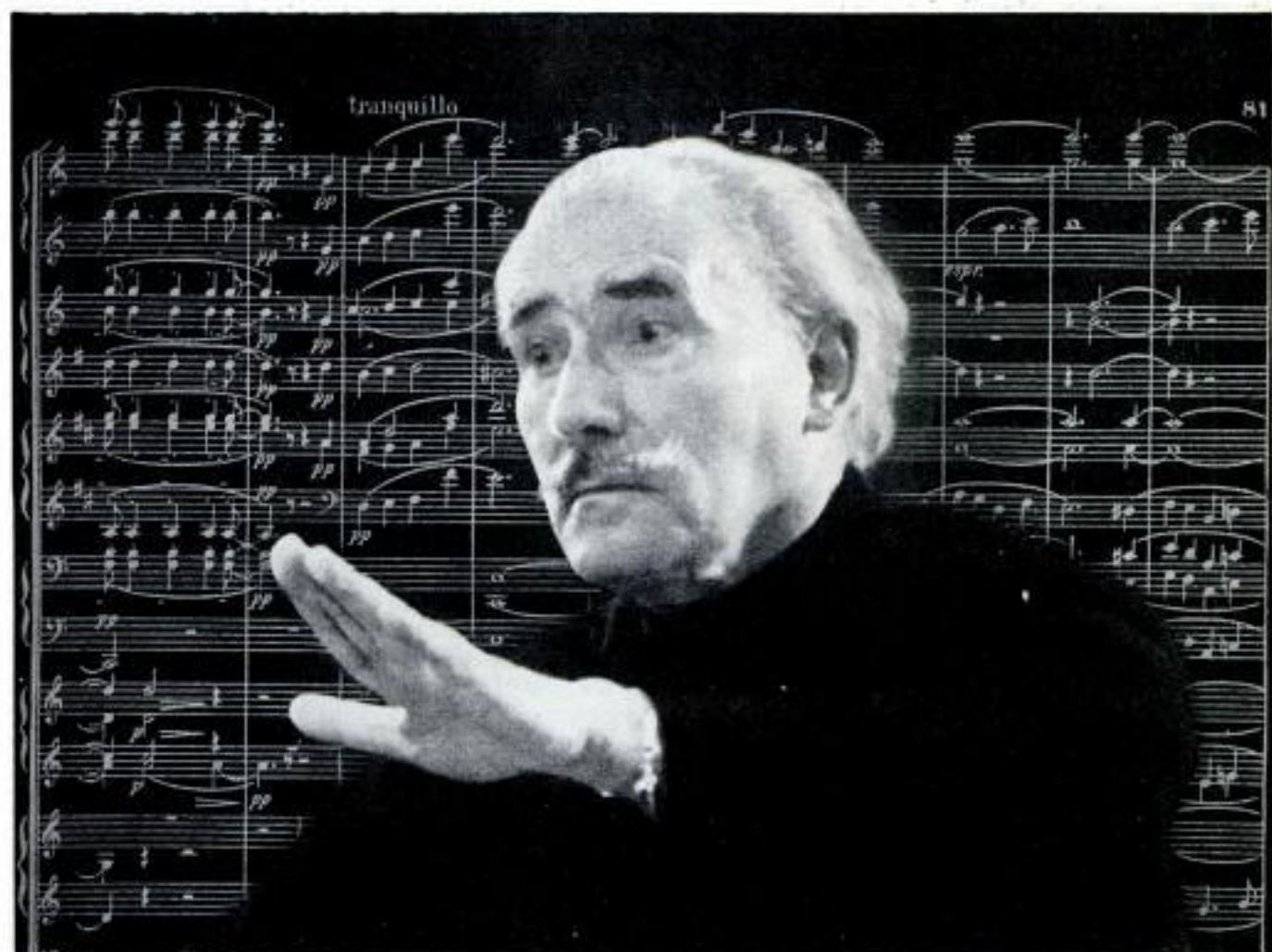
Butterfly breeder Carl Anderson of Dallas, Tex., keeps track of his insects with a traditional Western method — branding. Anderson, who raises monarch butterflies as a hobby, paints a number on the butterflies with check-protector ink and then turns them loose. Postcards are sent to interested people throughout the country, who are asked to report any branded butterflies. Most of the reports come from the Dallas region.

### Miniature Pen

So small it must be filled with an eye dropper, a new fountain pen weighs only an eighth of an ounce. Half as long as a king-size cigarette when closed for carrying, it actually writes and carries its own ink supply.







Arturo Toscanini conducting "Death and Transfiguration," Opus 24, by Richard Strauss

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A genuine high fidelity instrument re-creates the full range of tones and overtones of the original composition—exactly as the composer intended.

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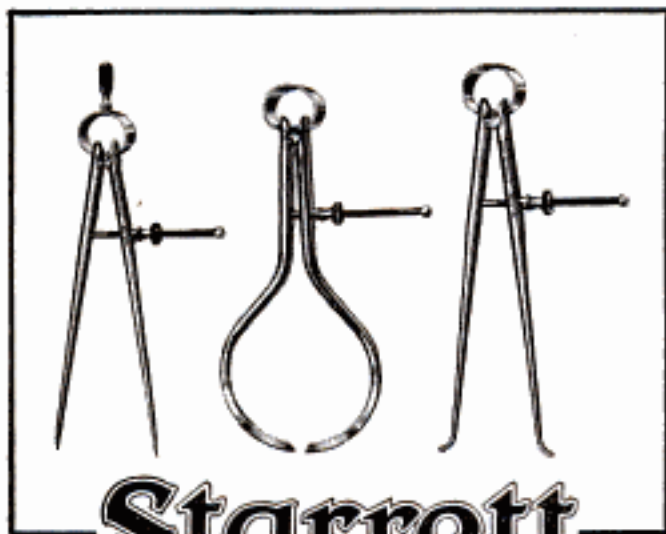


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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS  
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK  
HACKSAWS, BAND SAWS and BAND KNIVES

### Oh, for the Life of a Human Mole!

(Continued from page 157)

To look at the pipe opening you'd never suspect that a man could fit in, but actually these fellows, with arms stretched out in front of them, have squeezed into 14-inch lines.

In his rigid position, the rider can't do much but observe the operation. His buggy is remote-controlled from a panel up on the street. And when he comes to the pipe opening, feet first, he must be pulled out by teammates. A woman watching this operation from the sidewalk one day let out a horrible scream, the men report. "She thought we'd found a corpse in the line."

To really see what happens, larger pipe like the 36-inch main that Charlie Smiley's crew was lining provides a better view. Creep 500 to 1000 feet back in one of these overgrown mole holes and you find yourself in another world. Up ahead, the headlight on the humming lining machine flickers across rotating trowel arms, and silhouettes the line of men spaced some 50 feet apart. You see them like shadows relaying the tiny mortar buggies from the pipe opening, where they pick up cement, back to the liner where they are discharged into the hungry hopper. Empties are passed back over the top of the full ones coming in. In cramped quarters, the job takes plenty of energy. "It separates the men from the boys," is how Smiley puts it. "Ordinarily," he explains, "in this and larger pipe, we now use a little electric mortar buggy that a man drives back and forth at four or five miles per hour. At the lining machine, he discharges his load into a charging machine behind the liner. This reservoir keeps the liner supplied while the mortar-buggy man scuttles back for another load."

Down in the eerie regions of a long pipe there's no communications problem. Sound carries along like it would on a telephone wire, since it has no place else to go. A whisper carries 1000 feet. At that distance voices echo back and forth as though men were side by side. Miner's lamps on the men's caps flicker far up in the black hole. Sounds of trucks on the surface thunder sullenly, as their big tires thump over pavement seams. Some of the odd pipe noises can give even a veteran the willies.

Joe Quigley tells about the time he was followed by one of his men when he went down to inspect a big pipe. "I didn't know he was there," says Joe. "Suddenly, 1000 feet back in the pipe, he fell in some water with a tremendous splash. I was sure someone had opened a valve and I was due for drowning. I set a running record that day."

(Continued to page 252)





*Sparking*  
Every  
**CHEVROLET**  
Since 1916



**ABOVE**—This restored 1916 Chevrolet Baby Grand was quite a car in its day. Its 4-cylinder AC-equipped engine developed 24 hp.

**BELOW**—The thrilling Chevrolet Corvette, with AC-sparked 150-hp. engine, has been named "The First All-American Sports Car."



**And Original Equipment on Nearly as  
Many New Cars as All Other Makes Combined**

From the Baby Grand right down to the brand-new Corvette, AC Spark Plugs have been Chevrolet's constant companions.

Today's ACs have insulators of patented *CORALOX*, the greatest spark plug advancement in the past forty years. *CORALOX* resists the formation of oxide and carbon deposits much more effectively than any previous insulator. Elimination of these common causes of plug "shorting" and misfiring can—

- INCREASE ENGINE POWER BY AS MUCH AS 10%
- SAVE UP TO ONE GALLON OF GASOLINE IN TEN

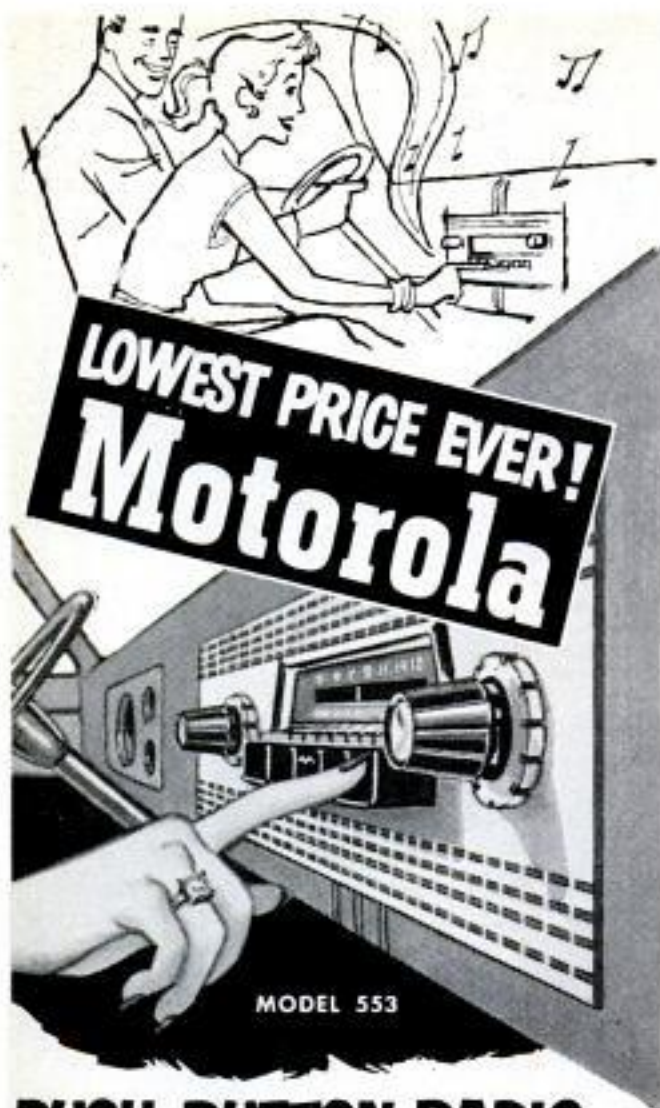
You, too, can enjoy the gas-saving, power-boosting advantages of AC Spark Plugs—no matter what make or model car you drive.



AC SPARK PLUG DIVISION

GENERAL MOTORS CORPORATION





## PUSH BUTTON RADIO

ONLY \$54<sup>95</sup>

Now—you can have real driving pleasure with a Motorola push-button radio at a sensationally low price—only \$54.95! It's easy to install in your car. New larger speaker gives new depth of tone never believed possible in a set so compact!

Five station push-to-lock control locks in the station; razor-sharp selectivity; full automatic volume control reduces fading. Low battery drain! So easy to install, it can be put in your car while you wait.



Water is one hazard the men respect, with reason. "We were lining two parallel 36-inch mains in an eastern city recently," Smiley recalls, "One was finished and we were 500 feet up the other. Some official opened the gate valve on what he thought was the finished line. Instead he released a flood into the one we were in. We knew it instantly. A rush of air came past. There was noise like a waterfall. Yelling men crawled over each other in a mad dash for the exit. The last man made the nipple opening with the roaring water close at his heels.

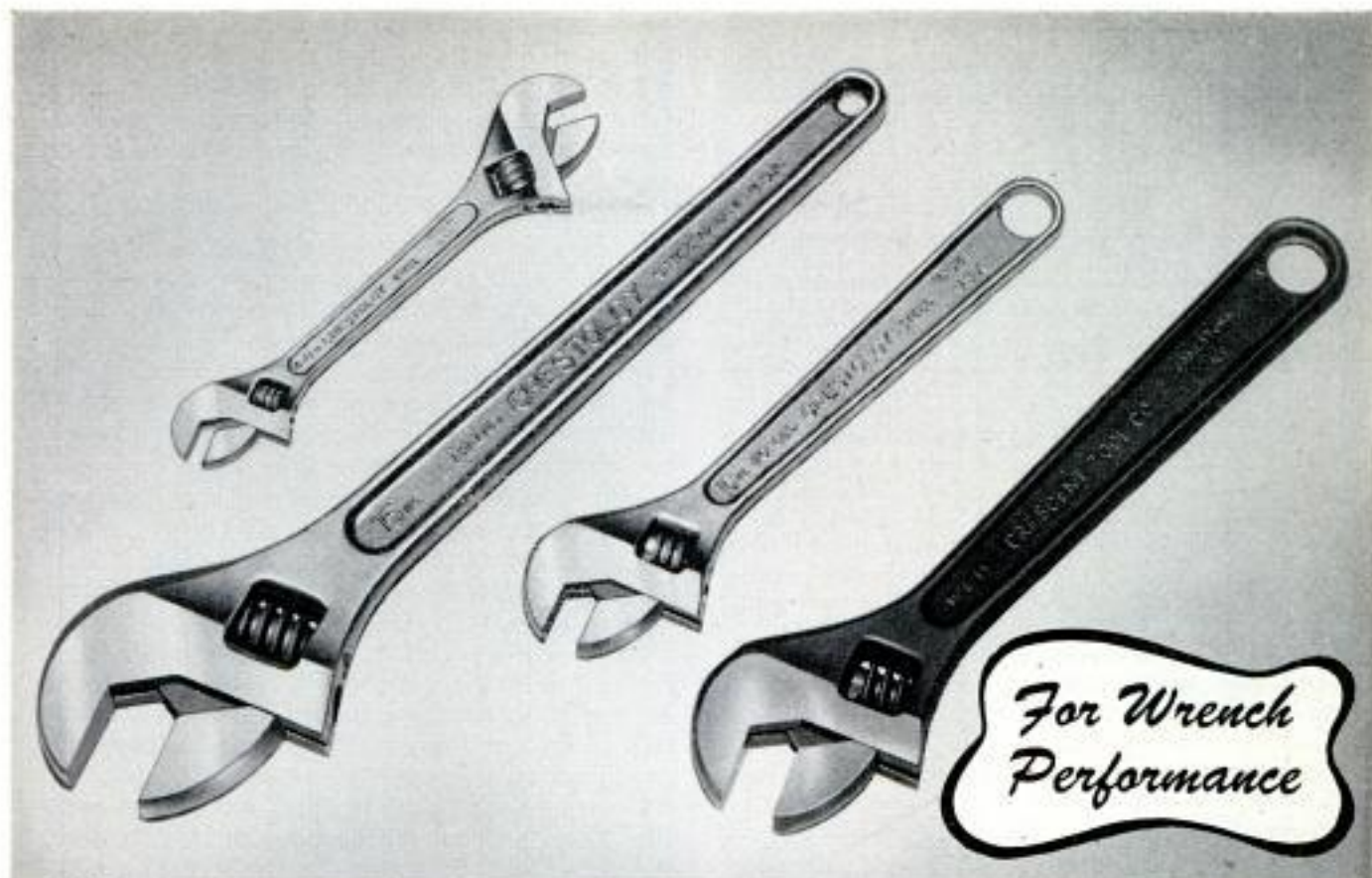
Like steel riggers, some men actually freeze, or get "pipe happy" in the gloomy recesses now and then. The men describe it as a kind of momentary panic. It happened once to Ray Briere, a rugged young man on Earl Parker's gang. Briere was working his way through a long stretch of 16-inch pipe, hand cleaning the line as he inched his buggy along with his fingertips. Far inside the pipe his strength gave out. Men yelled encouragement to him, but he wasn't having any. "Just leave me alone. I can't move. I'm staying here," he said. They finally went in and hauled him out, struggling and protesting.

In spite of his experience, Briere is one of the toughest and best pipe men in the business today. On one job, he was belly-whopping through a small pipe on a winch-hauled buggy and went head-on into a long dip filled with water. For almost two minutes, men at the opening yelled to him and got no reply. Finally the buggy broke through on the other side of the trap. Briere came out wet and sputtering and mad. Without knowing how long he would be submerged when he saw that water coming at him, he held his breath and went under with the buggy.

Tricky jobs at Centrline are standard. Not the least tricky was the mile of 22-inch pipe in a western canyon that climbed at a fantastic angle up the canyon wall. On such a grade, the electric buggies couldn't haul the liner, so winches at the top pulled it along. High-speed winches hauled the mortar buggies back and forth. The operator, lying between the 1800-pound liner and the equally heavy charger, was 4000 feet from the canyon bottom when suddenly the cable holding his train snapped. For almost a mile, he rocketed downward inside that black tube, until the entire train whammed to a stop against a closed gate valve at the bottom. The machinery crumpled and wedged so fast inside the pipe that the entire section had to be cut out. Miraculously, the operator sustained a few broken bones and nothing more. That was

(Continued to page 254)





## Choose **CRESCENT** or **CRESTOLOY**

● Since more Crescent and Crestoloy Adjustable Wrenches are sold today than any other brand, an explanation of the differences in these two famous Crescent tools may be appropriate.

**CRESTOLOY** Wrenches are forged from a special alloy steel permitting thinner, trimmer design with greater strength and less weight than conventional types. They are available in Single End patterns, 4" to 24" size. Double-end in four models combining 4-6; 6-8; 8-10; 10-12 inch sizes.

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NOW BETTER THAN EVER—GREAT NEW 1954

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Saw Wood..Make Many Other Hard Jobs Easy

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Best for all around garden and lawn work. Variable speeds, adjustable wheel widths, individual gang tool controls. 3 speed and reverse automotive gears on 3 and 5 H.P.

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### Powerful 8 & 12 H.P. Riding Tractor

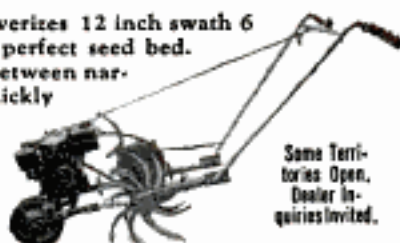


Low cost power for truck gardens, small farms. Handles 10, 12, 14 in. plows. Works astride or between 42 inch rows. Automotive transmission, 3

speeds and reverse. All wanted tools and power take off attachments.

### Inexpensive New Garden Tiller-Lawn Mower

Nine inch rotor pulverizes 12 inch swath 6 inches deep, makes perfect seed bed. does all cultivating between narrow rows. Rotor quickly replaced with single wheel for lawn mowing, hauling, power take off work.



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probably the most serious accident in Centriline's 14 years of operating history. And it's rare that even minor accidents occur. "People take care of themselves down there," says Smiley. "It's not worth taking chances."

No one at Centriline needs to go into pipe less than 16 inches in diameter. These smaller jobs are performed by the "Tate process." Cement is pumped into the pipe and a bullet-shaped cylinder is dragged through the line, spreading and pressing the mortar to the pipe wall. Spring steel arms on the front end of the cylinder keep it centered in the pipe.

But there are pipes other than water mains that carry these men down into pretty predicaments. Not long ago, Joe Reidlinger, a Centriline pipe man, was working on a team with veteran superintendent Charlie Erskine in a 30-inch-tile drain beneath a Florida airport. Way up the drain he suddenly came face to face with a five-foot alligator. It didn't faze Joe. He backed away quietly, got a rope and went back in. After a two minute tussle, he had roped the 'gator's jaws, trussed it up, and hauled the thing out to fresh air for everyone to see. Before the men were through, they had also flushed a family of foxes from under that airport.

Probably one of the trickiest Centriline jobs materialized when the Consolidated Edison Company of New York yelled for help. Turbine blades from one of their big generators had broken off and fallen into a 19-inch steam line that fed the monster. They had heard (erroneously) that Centriline used midgets to crawl up pipes, and their eyes popped when Earl Parker and Ken Powell—two lanky six footers—showed up. One was lowered feet first by a rope into the deep chasm under the generator. The other went in head-first to check the job. They had to make two vertical right-angle turns that meant practically doubling up 20 feet down in the narrow hole. But they found all the turbine blades, and "Con Ed" officials were so impressed they made a movie of the whole job.

Whether it's water main, steam-turbine lines, oil line or gas line there isn't much in the way of gloomy pipes that these men can't handle. ★ ★ ★

## White House Weathermaker

Comfort of the President and his household will be assured by a new electronic control panel which regulates temperature and humidity in the White House. The complex board monitors 106 thermostats in the modernized executive mansion.



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Build your one-motor  
**DELTA SHOP** this ideal way—  
**A TOOL AT A TIME!**



FIRST I BOUGHT THE  
BASIC SAW AND STAND



... and that gave me the tool to do the sawing operations that are needed on every job. The DELTASHOP'S big tilting blade saw does many other important operations, too—such as cutting grooves, decorative moldings, etc.—and its accuracy helps me do work like a professional.

Saw and stand, less motor \$109<sup>80</sup>

LATER, MY WIFE GAVE ME  
THE COMPANION JOINTER-PLANER



To do any finished-looking job you must plane the edge of a board right after you rip it. The Delta jointer planes boards up to 4" wide . . . does operations such as tapering and rabbeting, too.

Jointer, complete \$49<sup>15</sup>

THE DRILL PRESS WAS A  
GIFT FROM MY FOLKS



In addition to doing accurate drilling, the Delta drill press made it possible to make mortises, do routing, carving, sanding, polishing, make beautiful shaped edges . . . actually it's a "master of all trades."

Drill Press . . . \$57<sup>50</sup>

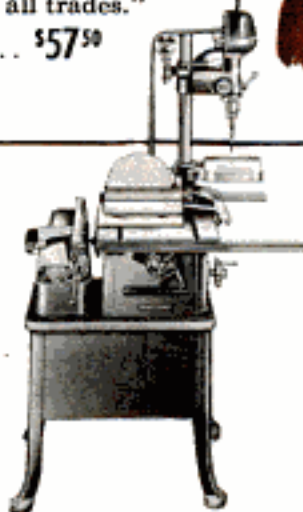
MY KIDS JOINED FORCES TO  
GIVE ME THE SANDER



This handy, low cost tool is perfect for finish-sanding jobs—has many other uses, too.

Sander . . . \$17<sup>55</sup>

Ask about the DELTASHOP "tool-at-a-time" plan today—at your Delta dealer, department store or nearby hardware store. Then start building your complete workshop this easy, low-cost way. Delta Power Tool Division, Rockwell Manufacturing Company, 502A N. Lexington Avenue, Pittsburgh 8, Penna.



Prices slightly higher west of the Rockies

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## Portable Radio "Test Bench" For Convenient Service

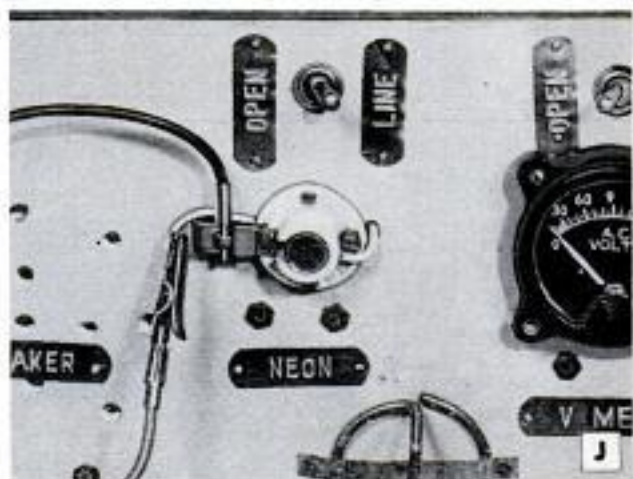
(Continued from page 179)



TV speaker is suspected. The 7-prong miniature-tube pin straightener is shown in photo G; there is also room for a 9-pin straightener at the right if desired. Photo H shows the convenient soldering-iron rest.

Photos F and J illustrate the use of the 1/4-watt neon lamp in the candelabra socket. The clip is a Fahnestock type arranged for one of the test leads. It is connected to one terminal of the lamp socket by means of a flexible wire brought through the panel from d.p.d.t. switch No. 2 as indicated in Fig. 1. This wire may be detached to permit a pair of test leads to be inserted as shown in photos F and J. The lamp may then be used in series with the line voltage for continuity testing. With the flexible wire replaced and switch No. 2 in the open position, test leads may be plugged into the pin jacks below the lamp socket and the lamp used to detect voltage, or the absence of same.

\*\*\*





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Ranch - type home,  
64 feet wide, with  
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"We have moved into our 'Liberty' home and are more pleased with it every day. I think I would be safe in saying we are ahead \$2,000 to \$3,000 by buying your Liberty Home and doing the work ourselves."

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"Compared to a local contractor's price to build a home equal to my 'Liberty,' I will be saving \$4,000 to \$6,000; so you can see why I have such enthusiasm for Liberty Homes."

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Don't pay several hundred dollars more than necessary when you build a home! Buy direct from our mill at our low, factory, freight-paid price. We ship you the lumber cut-to-fit, ready to erect. Paint, glass, hardware, nails, etc., all included in the price. Plans furnished—also complete building instructions. No wonder our customers write us that we saved them 30% to 40%. Architecturally approved construction. (Not prefabricated.)

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Many thousands of Liberty Homes have been built in all parts of the country. If you would like to visit and inspect the model that suits you best, write us and we will give you its location.

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**Springfield** GARDEN TRACTOR



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You can earn extra cash with the Model 300 Ideal Lawnmower Sharpener. Used and recommended by leading manufacturers and service shops, the Ideal has everything you need, nothing else to buy. Grinds reel and bed knife, also reconditions. Get started now in this highly profitable business. Write for catalog today.



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Dept. PM-1, Plymouth, Ohio



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OF YOUR OWN?**

**A HIGH PAY  
SPARE-TIME  
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Here is your chance to be your own boss, secure financial independence, build a future for yourself and your family in a profitable business in your own garage or basement. J. S. of Michigan writes, "I figure my profits (last season) at over \$1,000.00." Mr. C. H. R. of Ohio says, "This season I have taken in \$3,688.20." J. P. of Pennsylvania writes "I spent only 40c for a newspaper ad and have done nearly \$500.00 worth of business." Another owner writes, "I have had 4 mowers a day brought to me since last May . . . and do the grinding evenings at an average of \$2.50 each." Think of it! That's \$10.00 an evening in spare time. If you want to get ahead, make big money, be your own boss. Act Now. Write today for full details of our proved success plan.



**ONLY ON THE UNIVERSAL LAWN MOWER GRINDER**

can the inside face and edge of the stationary blade, and all reel blades, be ground to proper clearance

**ALL IN ONE SET-UP**

**WITHOUT REMOVING ANY BLADE FROM THE MOWER**

. . . that's why this business is simple, easy, and interesting. No experience or long hours of study are necessary. A leading National Magazine says, even an inexperienced worker can do a good job. We furnish complete instructions, everything you need to get started . . . But you must take the first step. Just fill in and mail the coupon below. Do it right now.

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**The Battle of the Sagebrush Busters**

*(Continued from page 118)*

For many years, the removal of sagebrush required a grub hoe or mattox—a sort of cross between a pick and hoe—a strong back and gallons of liniment.

Then one day a team of horses, dragging an iron rail into place for the Union Pacific's new line, became frightened by a rattlesnake and raced across the sagebrush. The rail knocked down brush in its path and that gave a settler who has long gone unnamed an idea.

That night he "borrowed" a rail from the Union Pacific, hitched a couple of spans of mules to it and began clearing his land. For many years thereafter, many other rails were borrowed from railroads throughout the West. Railroad officials never complained seriously, because the sooner the land got into crops the sooner the railroads had freight to haul.

The "railers" did complain, though. To get the land cleared, they had to go over and over it. Said one early settler: "Trouble was the brush was sometimes tougher'n the mules."

About 12 years ago, Westerners began to use extensively big Wheatland-type plows, which cut a 30-foot swath through the land. The plows run into trouble, however, in rocky land.

One of the most ingenious recent developments is the handmade outfit of Ray Sherwood at Twin Falls, Idaho. His machine is designed like a cultivator, with thin, sharp blades for cutting the sagebrush off two to four inches below the earth. Tractor drawn, the device will cut sagebrush off 40 acres a day—providing the land isn't rocky. Sherwood has also developed an improved rake which windrows the brush.

Sherwood moves along the rows of brush in a truck with an improvised flame thrower. For a complete job, he's been charging neighbors \$9 an acre—and the neighbors have been happy to pay the price.

Burning of brush as it stands has been done in some areas for as little as 35 cents an acre. If the burn is good, no other seedbed treatment prior to drilling is required. But the brush must be unusually dense if this type of clearing is to be successful.

And now comes the airplane spewing chemicals. Reports the Forest Service: "Studies in the Beaver Rim area near Lander, Wyo., reveal that 75 percent and higher kills of big sagebrush can be obtained with as little as one pound of 2,4,5-T ester per acre, or 2 pounds of 2,4-D ester per acre. These herbicides were most effective

*(Continued to page 260)*



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**MIDWEST Series 16 RADIOS**  
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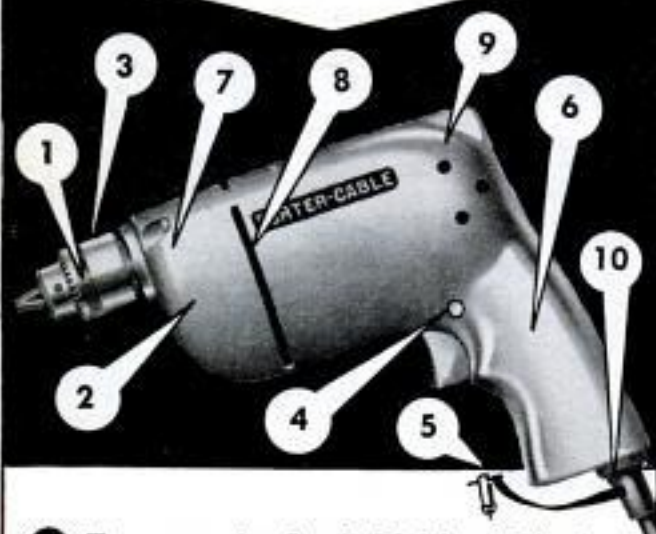
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Before you buy, make sure you get  
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- 2 Compound reduction gears assure smooth operation, longer life.
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PLUS speed and power to drill 1" bar stock  
in 2 min.—1" hardwood board in  $1\frac{1}{4}$  min.

Everything you want in this  
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in this area when applied in three to five gallons of diesel-oil carrier about the time the native bluegrasses started blooming. Herbicide treatments, which gave the best control of big sagebrush, did not result in severe damage to other shrubby species or to perennial grasses."

Over in the Columbia Basin of Washington recently, airplane operators were given the job of spraying 20,000 acres of sagebrush. In one day alone, two planes sprayed approximately 5000 acres. With the grub hoe or mattox, two men did well to clear an acre a day.

In reseeding of rangeland after the brush is gone, the big question in the West for many years has been the type of grass to plant. Sixteen years ago, A. Perry Plummer, range ecologist in charge of Utah reseeding studies for the Intermountain Forest and Range Experiment station at Ogden, Utah, was given the job of finding the answer.

Plummer experimented with more than 700 grass and shrub species hailing from Siberia to Africa. More than 60 were found to have some place in artificial revegetation of the intermountain area. In areas with more than 14 inches of rain, intermediate wheatgrass and tall wheatgrass, both from Siberia, were found to be highly productive. But in areas with less than 14 inches of rain, crested wheatgrass soon proved a favorite.

"Successful plantings have been made in areas with rainfall as low as five inches," said Plummer. "Major difficulty is getting the grass started, but once established it will persist."

His main experiments were conducted on a patch of land near Ephraim, Utah, that was entirely bald except for thistles and sagebrush. Many ranchers in the area scoffed at his first grass-growing efforts. One rancher leaned from his saddle to snort:

"I'll give you a dollar for every blade of grass you grow on that land."

Plummer's lament: "I should have taken him up. I'd be a billionaire today—or at least have a billion or so owed to me." ★ ★ ★

### Delayed-Action Nitrogen

Nitrogen in granular form makes it possible to apply a full year's supply at one time without danger to a garden. The same materials which make Bakelite are put together in a slightly different way to make the fertilizer, called "uramite." Urea and formaldehyde combine to give a granular material that, in moist garden soil, slowly makes nitrogenous food available to plants.



## D. C. GENERATORS

ITEM #91



Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz, Gov't. Acq. Cost \$380.00.

Shpg. wt. 55 lbs. Dimensions 16" x 10" x 7". F.O.B. Chicago. . . . **35.00**

ITEM #90—Type P-1, rated 300 Amps.—28 Volts. 2500 R.P.M. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 55 lbs. Dimensions 15" x 9" x 6". F.O.B. Chicago. . . . **22.50**

ITEM #176—Type L-3. Rated 25 amps., 24 volts. Manufactured by Leece-Neville Co. Shpg. wt. 30 lbs. Dimensions 12" x 6 1/2" x 5 1/4". F. O. B. Chicago. **16.50**



## FOUR-WAY, OPEN CENTER CONTROL VALVE

ITEM #126 with built-in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation. Can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet. 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Ship. wt. 8 1/4 lbs. An outstanding buy! F.O.B. Chicago. . . . **21.50**



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GENERAL MOTORS

—ALLISON

200 GALLONS

Per Minute

- For Draining Basements • Fire Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home water Systems • Dewatering

ITEM #130

For high volume commercial, home and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/4" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago. . . . **39.50**

Will deliver 200 gals. per min. against 65 ft. head using 3.2 H.P. at 3500 R.P.M.

## EXTRA HEAVY DUTY Double Action HYDRAULIC CYLINDER



ITEM #224. 3 1/4" bore, 24" stroke, will lift 3250 lbs. with 1000 P.S.I. line pressure. 1/2" pipe thread ports —1 3/8" stress-proof ground, polished & plated solid steel shaft. Overall length closed 36". 3/4" steel wall cylinder barrel clevis mounting at base and shaft. Features—Tie rod construction. Honed barrel. Ship. wt. 50 lbs. F.O.B. Chicago. . . . **39.60**

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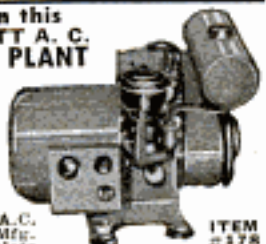
ITEM #193—Ideal for radio equipment, grounding cables, power tools, battery chargers, electric generator sets, searchlights flexible jumpers and general power supply. Individually export packed, net weight 120 lbs. gross 190 lbs.

Neoprene covered flexible—2 conductor, 1/0 wire size. Each cable is 75 feet long, and equipped with 1-male and 1-female Hubbell plug. Conforms to requirements of Federal Bureau of Mines and I.P.C.E.A.

Specifications. Regular price \$135.00 Per 75 feet. **47.50** F.O.B. Chicago

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## A. C. ELECTRIC GENERATORS

Power these electric generators with your own gasoline engine, power take-off, or electric motor, and save the difference.

ITEM #G-3—3000 Watts, 120 Volt, 60 Cycle, 1200 R.P.M. single and three phase, for two or three wire circuits. Excellent source of electricity for portable or stand-by use for homes, farms, hatcheries, radio stations, factories. Built by Hobart Mfg. Co. to exacting specifications of the U. S. Army. Ball-bearing, generator, fan cooled. Equipped with standard 1 1/2" shaft with keyway for direct or pulley drive. Built-in Self-Exciter Foot Mounted. Gov't. Acquisition Cost: \$325.00. Dim. 21"x13" Dia. Ship. wt. 290 lbs. **155.00** F.O.B. Chicago

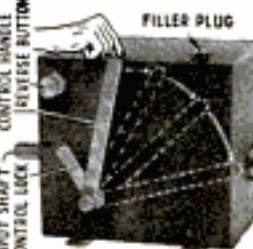
ITEM #G-75—7500 Watts, 120 Volt, 60 Cycle, 1800 R.P.M. single and three phase current, for 2 or 3 wire circuits electric generator, double ball-bearing construction, standard 1 1/2" shaft with keyway, and included at no extra price, 2-groove six inch pulley for belt drive. Direct connected Self-Exciter Foot Mounted. Gov't. Acquisition Cost: \$545.00. Dim. 34"x11 1/2". Ship. wt. 420 lbs. Price Slashed To: **269.00** F.O.B. Chicago



## HYDRAULIC SPEED REDUCER with FINGER TIP CONTROL

USE FOR: Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/2 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 lph pounds of torque may be reset up to 180 lph pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2" x 7 1/2" x 11 1/2". Gov't. acquisition cost \$428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago. **54.50**



## PESCO GEAR TYPE HYDRAULIC PUMP

COMPACT—POWERFUL—RELIABLE Especially designed for belt drive from fan belt, power take-off, drive pulley, electric motor or small gas engine. Equally suitable for direct coupling. Pedestal type mounting with two bolt holes for 3/4" hold-down bolts. Standard 1/2" pipe thread inlet and outlet ports. Delivers 4.5 GPM at 1000 Psi at 2800 R.P.M. with 3 HP. Will actuate one item #G, 3" bore, 24" stroke cylinder in 10 seconds. Hardened steel wears turn in dense oilite bronze bearings. Rotation—clockwise facing shaft. Guaranteed trouble-free service. Ship. wt. 6 lbs. F.O.B. Chicago. . . . **22.50**



## D. C. ARC WELDER

NEW MODEL 353

ITEM #65 For Stationary or Portable Use. HEAVY DUTY RANGE to 250 AMPS.

- Ideal for
- Farm
  - Garage
  - Factory
  - Workshop



Welds Anything From Auto Frames To Tractor Frames

- Dial Type Rheostat Control
- Use 1/16" to 1/4" Rod
- Generator-type Welder
- Reactor Coil for Smooth Even Arc
- Use 7 1/2 H.P. Electric Motor or 10 H.P. Gasoline Engine
- Run at 2500 R.P.M.
- Available with Either Flat Belt or Double V Pulley
- Complete Operating Instructions

Shipping wt. 107 lbs. \$350.00 value. **99.50** F.O.B. Chicago. . . . Deluxe Model—with "Magic Terminal" for low amperage range welding. (Between 30-100 amps.) **119.50** F.O.B. Chicago. . . .

## CONTINENTAL "RED SEAL" 1 1/2 H.P. ENGINE

ITEM #97—Power for lawn mowers, garden tractors, pumps, generators, compressors, tillers, rakes, plows, feed mills, milking machines and motor scooters.

Brand new Continental "Red Seal" 1 1/2 H.P. gasoline engine, Model AA-7, single cylinder, 4 cycle, with 8:1 gear reducer. Shipping weight 60 lbs. A \$74.00 value. Order now. Limited quantities. **47.50** F.O.B. Chicago. . . .



## Brand New! Just Released! BLACKHAWK HAND-HYDRAULIC PUMP

ITEM #82. Perfect for Hydraulic Presses, Snow Blows, Farm Wagons, Jacks, and Farm Plows. A few easy strokes of the 20" handle and you can lift 5000 lbs., using Item 355 — Hydraulic Cylinder. Blackhawk Model P-151—complete with built-in oil tank and release valve. Rated 1200 lbs. per square inch. Dim. 9"x7"x6". Ship. wt. 35 lbs. Worth much more. F.O.B. Chicago. **22.50**



## Brand New—DOUBLE ACTION HYDRAULIC CYLINDER

ITEM #355 — 2 1/2" bore and 7 1/2" stroke, 1 1/2" stainless steel piston rod. Lift capacity 5000 lbs., using 1000 lbs. pump pressure. Manufactured by Delco-Remy Division of General Motors Corporation. Clevis mounting on base and piston rod for 7/16" bolt. Overall length closed 21". Distance between centers 19". Supplied with fittings to 3/4" pipe thread. Brand new—in original carton. F.O.B. Chicago. **16.00**

ITEM #355A— Same unit, but supplied with built-in spring to provide cushion effect on power stroke and rapid return. **17.00** F.O.B. CHICAGO.



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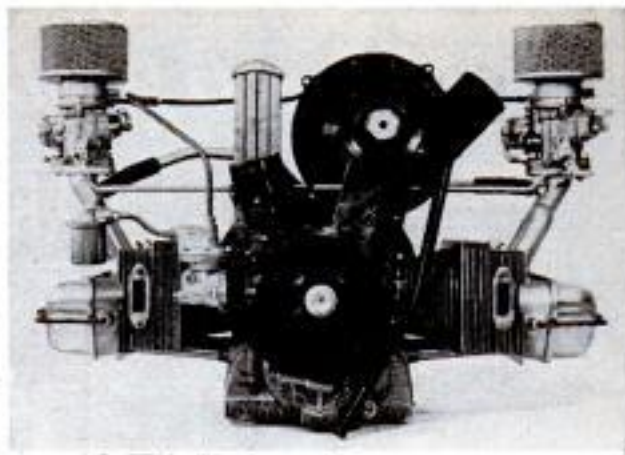
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Out of the car, the Porsche engine looks tiny. Two carburetors, circular fan and oil cooler are visible

**The Owners Report on Three  
Rear-Engine Cars**

(Continued from page 139)

compartment with glass fiber."—Milwaukee, Wis., executive.

"Have had some valve trouble. The front end gets out of line easily."—Boston, Mass., internal-revenue agent.

"Road clearance in front is too low."—Car bottoms on medium-grade driveway."—Detroit, Mich., owner.

"Can't park this car just anywhere. No protection as its bumpers are too light and too low."—Los Angeles, Calif., executive.

Many Porsche owners stated that they had to learn to drive the rear-engine car. This is primarily due to difference in weight distribution over a front-engine design.

"Not a car for the beginner driver. Peculiar cornering characteristics."—Libertyville, Ill., executive.

"Dangerous for inexperienced driver."—Fitchburg, Mass., sales executive.

"On wet pavement the car is a little skittish."—Los Gatos, Calif., realtor.

"Marked breakaway of rear wheels on wet roads."—Los Angeles, Calif., physician.

"No gasoline gauge. Car hard to get in and out of. Rear seat useless. Definitely a two-passenger car."—Portland, Ore., timberman.

"Weaves or follows a wavy path. This is reported inherent in the car. They do not know how to fix it."—Centralia, Ill., engineer.

"Car can be 'whipped' by inept handling—meaning rear will skid and slide."—Scarsdale, N. Y., teacher.

"Rear seats are called 'occasional,' but 'emergency' is a better term."—Kirkland, Wash., aircraft-design engineer.

"Surface coat of paint chips too easily. Primer coat is tough as copper plating.

(Continued to page 264)





# Powerful **New** Jig Saw with Built-in Rotary Motor **Only \$23<sup>50</sup>**

**Compare it! Try it!**

**Dollar-for-Dollar,  
DREMEL MOTO-JIG SAW  
Out-performs Them All!**

- Cuts 1½" wood, ¾" plywood, metal, plastic, etc.—will even cut a 2x4!
- New **ROCKER ACTION PRINCIPLE** prevents blade whipping or buckling, eliminates breakage! This revolutionary improvement obsoletes old-style blade tension springs, permits use of finest, fastest-cutting blades in jig saw history!
- **Safe for children!** Blade is completely guarded against finger injuries!
- 4-way blade holder saws any direction, takes any length stock! Table raises and lowers so you can use every tooth in the blade!—Tilts 45°.



Pat. Pend.



Here's jig saw magic to amaze you! Here's a powerful tool driven by a real rotary motor (not a vibrator) that cuts through wood as fast as you can feed it! Sturdy, compact, and agile, it takes 90° turns at top speed, cuts the most intricate scrolls yet is rugged enough for major household repair jobs! Use it to make lawn furniture, valances, knickknacks, toys. It's ideal for adults, safe for children—an all-family tool! The new Dremel Moto-Jig Saw is so superior to others anywhere near its price class that we challenge you to match it against others costing many dollars more. You'll agree it's the greatest value in jig saw history!



**Hobby Project or Household Repair . . . Do it with Dremel—and Save!**



**CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS**

**BLADE  
FACES  
4 WAYS**

**SAFE!  
AS A  
HANDSAW**

**JUST  
GUIDE IT!**

**Only  
\$6<sup>85</sup>**  
with 3 new blades

**ANOTHER LONG-TIME FAVORITE WITH CRAFTSMEN!**

## DREMEL *Electric* MOTO COPING SAW

A genuine craftsman's tool with dozens of household and workshop uses. Lightweight . . . easy to operate . . . perfect for knickknacks, corner shelves, intricate scroll work. Cuts through ¾" wood, plastics, rubber and asphalt tile, etc. Perfectly safe for children—women love to use it too! Has only two moving parts, never needs oiling. Unique 4-way blade holder permits cutting any direction—no limit to length of stock it can handle.



Jig saw plans and 6 project patterns **FREE**.

SEE YOUR FAVORITE DEALER. Dremel Tools are sold at better dealers everywhere. If yours can't supply you, order direct on a five-day trial, money-back guarantee. Remit in full and we ship postpaid. Or, send only \$2, now, pay postman balance plus postage and C.O.D. fee.

**DREMEL MANUFACTURING CO.**

**Dept. 114-A**

**RACINE, WIS.**



Valve guides too long, must be end-milled to cure hanging."—Claremont, N. H., engineer.

### Renault Comments

Best-liked features of the Renault were its roadability and handling, with economy of operation next. The Renault is bought more often as a second car, than the two other rear-engine cars surveyed. Sixty-three percent also owned American cars (percentages for the others were: Volkswagen 42 percent; Porsche 59 percent).

"Inexpensive to buy and to operate—a good 'second' car."—Shelburne, N. H., lawyer.

"Traction unequalled. Economy unbelievable (40 miles per gallon). Good braking and cornering."—Manhattan Beach, Calif., owner.

"Weight over rear axle has proved its value. Have never been stuck in the 25 months since I bought it, even in snow and ice, although I drive it daily."—Seattle, Wash., aircraft worker.

"I have never driven a car that had such an uncanny ability to hold the road on the sharpest curves."—Seattle, Wash., radio man.

"Balance and road-holding ability is far greater than any of over 40 cars I have owned."—St. Petersburg, Fla., owner.

"Easy to park."—Wayne, Mich., airways worker.

### Renault Complaints

But, since nothing is perfect, there were complaints. Some of the more typical:

"Too small. Other cars back into me. Heater inadequate. Had to put in a gasoline heater."—Babylon, N. Y., bus driver. (Incidentally, this same owner listed smallness and the ability to get into tight places as what he liked best about his Renault!)

"Needs a little more room in rear. Would like to see a Renault the size of the Volkswagen. Needs larger rear window. Better plugs."—Johnston, R. I., teacher.

"Little too small for comfort. Damp or rainy weather makes hard starting. Local mechanics not fond of working on car."—Harriman, Tenn., banker.

"Poor ignition system, somewhat erratic at low speed and heavy pull. I have had the Renault completely undercoated and its acoustic characteristics entirely changed."—Long Branch, N. J., engineer.

"Gas inlet too near engine block. Dangerous when engine is hot."—Washington, D. C., student.

"Quite a bit of road noise." Lakebay, Wash., electronics technician.

"Rear-engine hood is so made that a hard

(Continued to page 266)

### IT SMELLS GRAND



WANT AROMA WITH "LIFT"? MAN, HERE'S HOW

### IT PACKS RIGHT



AND IT PACKS SO NEAT IT RATES A BOW

### IT SMOKES SWEET



IT'S THE PIPE-BLEND CHAMP YOU MUST ALLOW

### IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE. AND SIR WALTER RALEIGH NEVER LEAVES A SOGGY HEEL IN YOUR PIPE. STAYS LIT TO THE LAST PUFF.



*It costs no more to smoke the best!*



- CEILINGS CRACKED?
- NEED MORE ROOM?
- BUILDING A GARAGE?

# Use UPSON PANELS

*do it yourself, save money, get better finished job!*



## Recover cracked ceilings in a day

**Upson Kuver-Krak Ceilings.** Apply Upson Ceilings on furring strips right over your old cracked plaster ceilings. They stay anchored from the back with ingenious Upson Floating Fasteners. (See insert). There are no visible nailholes. In just a matter of hours the job is finished. No dirt, no mess. And you have a beautiful, *permanent* and crackproof ceiling. See your lumber dealer. Insist on Upson.



## Add beauty to extra room with Striated Panels

**Upson Striated Panels.** Panel-finish your attic or basement with Upson Panels. And, to add a beautiful modern touch, finish one wall with smart Upson Striated Panels. A contrasting wall adds a professional decorator touch to your room. There's nothing tricky about Upson Striated Panels, either. They're easy to apply, won't crack, shatter, splinter. Take paint beautifully, withstand extra hard jolts. See your lumber dealer.



## It's easy to build your own garage

**New Upson All Weather Sheathing.** Costs surprisingly little. And the superior weather resistant qualities of this super-strong 6-ply Sheathing make it perfect for siding. Cover a garage, utility shed, in no time. Easy to apply, nail direct to studs. No paint required or one coat covers beautifully. Offers good insulation value. See your lumber dealer. Insist on Upson All Weather Sheathing.

*Mail coupon for FREE details*

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Make \$20 to  
\$30 a Week  
**EXTRA  
MONEY**



## MACHINE SAW FILING PAYS UP to \$3 or \$4 an HOUR

• Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$3 or \$4 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

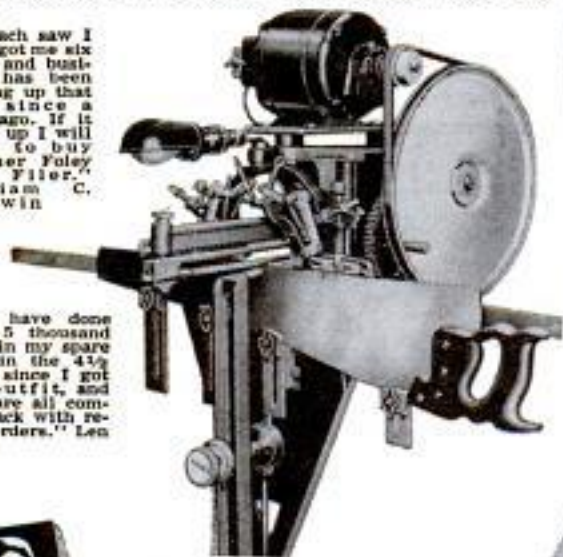
You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

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Shows how you can get business from home owners, farmers, carpenters, schools, factories, etc. With a small investment, no overhead, no stock of goods to carry, you can get right into a cash business,—and possibly later on develop into a full-time repair shop. Send coupon today for Free Book. No salesman will call.

"Each saw I filed got me six more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer."  
William C. Baldwin

"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back with repeat orders." Len Crego



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rain can drown it out." — Miami, Fla., musician.

"Have to watch greasing in service stations as Renault has many fittings not common to U.S. cars."—Bothell, Wash., investigator.

"Finish is poor, protection against rusting virtually nonexistent."—Wellesley, Mass., mechanical engineer.

"Engine should be mounted with more cushioning to eliminate so much vibration now transmitted through body."—Culver City, Calif., retailer.

**And now for my own tests:**—I've driven all three of the rear-engine cars in this survey.

**Volkswagen**—In addition to several hundred miles in Europe, I recently drove a Volkswagen from New York City to Springfield, Mass., and return. While around Springfield, I put the car through its paces on some back roads that were rough and sandy. The car has amazing performance and in sand it has excellent traction, due to the engine weight in the rear of the car.

The car is well balanced and handles exceptionally well on curves and over rough roads. The steering is rather quick compared to American cars, but I rate this as a good feature.

I've long been an advocate of air-cooling and I can see no reason for millions of automobiles on our highways lugging around a radiator, water pump and a lot of extra weight that is unnecessary. I've found it impossible to overheat a Volkswagen engine under any condition. It remained cool with no loss of power during all of the tests I made.

In the days of U.S. air-cooled cars, Franklin dealers made many demonstrations in hot weather and on the desert, driving the cars in low and second gears to prove that air-cooling is advantageous. Air-cooling is a boon to owners residing in cold climates.

Outstanding features that I liked about the Volkswagen are the economy, the reserve gasoline tank, the excellent paint and workmanship on the body and the fact that the engine mounted in the rear practically eliminates gasoline fumes. The VW has an oil cooler as standard equipment, which is highly desirable, and only 45 minutes are necessary for removal of the complete power plant.

There is a noticeable engine noise, which is common in an air-cooled engine because it has no water jacket around the cylinders to help reduce engine noise, as in a liquid-cooled engine. Insulation, and possibly undercoating, would reduce the noise.

**Porsche**—I've driven several different

(Continued to page 268)





### 20" JIG SAW

With completely built-in motor. Table tilts to 45°. Built in blower. Blade turns to rip. Available with mitre gauge and rip fence.....

**\$41<sup>50</sup>**



### 10" TILTING TABLE BAND SAW

All cast tool of rugged aluminum alloy. 10 by 10 table top. Has excellent locking mechanism.....

**\$49<sup>95</sup>**



### 6" JOINTER-PLANER

Professional model with latest cutting head. Cuts 1/2 inch deep and 6 inches wide. Removable guard..

**\$86<sup>50</sup>**



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**Shopmaster**  
The Most Complete Line of Power Tools in America!



### 12" DRILL PRESS BENCH MODEL

Equipped with Jacobs Chucks, three-spoke feed wheel. Shaper attachments available.....

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### 8" TILTING ARBOR SAW

Heavy duty construction. Sealed-for-life ball bearings. Table size 13 by 16. Complete with mitre gauge and rip fence.....

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### 9 IN 1 UNIVERSAL TOOL

Has sturdy workbench stand. Adapts quickly to Circle Saw, Drill Press, Sander, Shaper, Router, Lathe, Jointer, Grinder, or Buffer. All in one tool.....

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### DUAL CIRCLE SAW-JOINTER

New combination dual purpose tool, complete with motor that switches easily from one tool to other. Complete with motor.....

**\$154<sup>60</sup>**



### COMBINATION BELT AND DISC SANDER

Ruggedly constructed. Table tilts to 45°. Entire sander tilts to vertical position. Has belt tension knob and lock.....

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do-it-yourself  
**IDEAS**  
to give you  
more room



**CORNER CLOSET**

Build across corner of room. Attractive Ra-Tox Folding Door gives complete closure for handy storage of household items, hobby materials, tools or toys.

**PROJECTED CLOSET**

If there's no corner to spare, build out from wall. Ra-Tox Folding Door forms sides and front... travels on curved overhead track for 100% accessibility.



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To have everything in easy reach and view... build an "open wide" wardrobe. It's economical and easy to enclose one end of room or alcove with a Ra-Tox Door.

Ra-Tox Folding Doors are woven of beautiful Northern Basswood, in colors or natural finish. They are quickly installed, sturdy and long lasting.

Send 10c for folder and plans for four space-saving closets. See Ra-Tox Doors at your lumber or building materials dealer.

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easy to build with



Porsche models in many and varied tests. The Porsche, being a sports car, is in demand by a select group that appreciates its handling characteristics and unbelievable power and speed from such a small engine.

It definitely has outstanding advantages for mountain driving and on winding roads or highways, as well as for top speed. The acceleration is terrific and even though the displacement of the engine is small, it will actually outrun many of our large cars having two or three times more engine capacities. The obvious reason for such performance is the unusually low over-all weight per horsepower of the car.

**Renault**—I was pleased with the tests I made of the Renault 750 (mostly in Europe.) The ride is unbelievably smooth, when you consider that it is an ultrasmall car. While driving through the Swiss and French Alps, I saw hundreds of these little rear-engined jobs—slowly but surely climbing the high mountain passes, and many of them with luggage piled high in a carrier mounted on top of the roof.

Renault economy is outstanding and they are preferred by many owners of larger cars as second cars. While top speed is not exceptional, the car apparently has a definite place in various automotive markets throughout the world. It is held in high esteem in Europe and holds first place in sales of cars made in France. ★ ★ ★

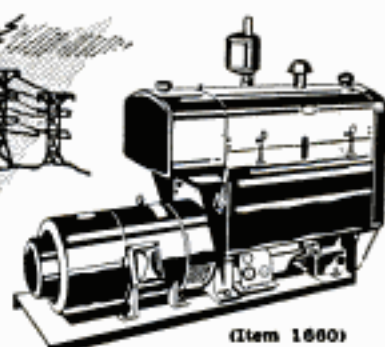
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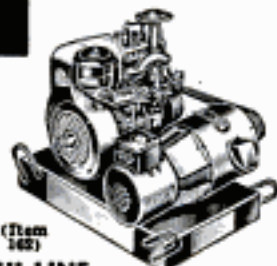
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**STANDBY or CONTINUOUS DUTY**  
by **MASTER MECHANIC** at lowest factory-to-you prices



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**HI-LINE**  
**6000 WATT PLANT**  
(Item 162) Push Button Start 115-230 v. 60 cyc. AC. A brute of a power plant with a rugged 14 HP Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 390 lbs. Easily worth \$985.50 With self-starter. **\$645.00** Factory price. Same plant but with Crank Start (Item 166) **\$585.00** Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lb. (Item 163) **\$345.00** Factory price.

**GIANT 2000-2500 WATT PLANT**



(Item 31)

(Item 31) 110/120 volt, 60 cyc. AC. A favorite plant among farmers and contractors. Skid mounting has advantage of easy portability. Double V belt drive permits engine to be easily disconnected for other uses. Exclusive dynamically balanced armature—heavy windings develop up to 5000 watts overload for motor starting. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories. Big outlet box and voltmeter—no wiring necessary. Provides ample current for operating lights, refrigerator, freezer, pumps, fuel systems, power tools. **\$299.50** Wt. 230 lbs. Same plant with elec. self-starter (Item 179) **\$359.50** **GENERATOR ONLY** and control box. Drive it with engine, jeep or tractor. **\$169.50** (Item 31A). **POWER-FLO 3000-3500 Watt Plant** (Item 198) 110-220 v. 60 cyc. AC. Triple V-belt drive. 8 HP Wis. engine. Electric self-starter. Wt. 310 lbs. **\$399.50**

**MASTER SHOP COMPRESSOR**



Big and rugged. This stationary compressor provides 8 c.f.m.—plenty of air for industrial uses, powered by heavy duty repulsion induction 34 HP, 115/230 v. motor. Factory type twin cylinder compressor designed for continuous operation. Mounted on heavy 22 gal. steel tank. Complete with unloader type automatic switch, pressure relief valve, check valve gauge, shut-off valve, and 20 ft. heavy duty air hose. (Item 200H) Reg. retail \$319.50 **\$179.95** Factory price.



**Be prepared to operate essential equipment!**  
In your home, farm or business—it's vital that many different modern devices continue to run—even when power lines are down. A freezer without power lets high cost meats and foods spoil, an oil burner lets the house become freezing cold, electric farm equipment, milking machines, separators, etc. go dead—everywhere the lights go out. And without regular power in new locations, the builder contractor cannot use his time saving power tools, chain saws, compressors or pumps. You can be prepared to meet any of these emergencies or regular power needs at amazingly low cost with a **MASTER MECHANIC Light Plant**. Low direct factory prices from the world's largest direct selling light plant factory on a wide range of models from 350 to 25,000 watts, assures you a high quality, durable plant—whatever your power needs—at tremendous savings!

## MASTER PORTABLE LIGHT PLANTS



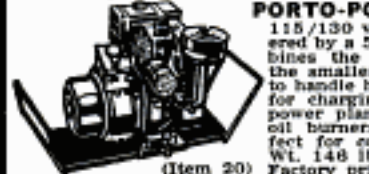
**LITTLE GIANT 350 WATT PLANT**  
Imagine—35 compact pounds of portable power that goes with you anywhere—easier to carry than an outboard motor. Provides plenty of current for lights, portable radios, 1/4" drills, small power saws, electric shavers, etc. Perfect for hunters, campers, contractors' service trucks, wreckers, etc. 350 Watts, 115 v. Dc. Ruggedly constructed with 1 1/2 HP price \$224.75. (Item 273) **\$99.75** Special at the terrific factory price of only...



**ELECTRA-LITE 600-700 WATT**  
Push Button Start 115 v. 60 cyc. AC. Powered by a rugged 2 HP, easy starting Briggs gas 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 w. Complete with voltmeter and built-in winding to charge 8 v. auto batteries. Item 24. Wt. 55 lbs. Reg. \$275.00 value. **\$143.50** Factory price.



**1000-1200 Watt Plant (Item 45)** same as Item 24 but larger generator & engine. **\$199.50**

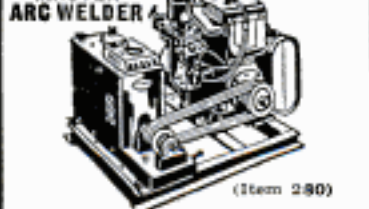


**PORTO-POWER 1500-1750 WATT PLANT**  
115/130 v. 60 cyc. AC. Push Button Start. Powered by a 5.10 HP Briggs engine. This plant combines the compactness and easy portability of the smaller plants above, but has a high output to handle heavier starting loads. Built-in winding for charging 12 v. batteries. An ideal standby power plant for operating lights, sump pumps, oil burners and communications systems. Perfect for contractors and line crews. (Item 20) Wt. 148 lbs. **\$279.50** Factory price.



**700-800 Watt Plant (Item 44)** same as Item 24 but larger engine. **\$169.95**

We make fully automatic controls for all light plants. Write for details **WE MAKE ALL SIZES UP TO 25,000 WATTS.**



**POWER MASTER ARC WELDER**  
(Item 280)  
Now! a portable, rugged, self-powered industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. High capacity DC welding unit enables you to tackle any job with confidence—easily handles anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and dual control simplifies any welding job from 30 to 250 amps. Welder is powered by 14HP 2 cylinder air cooled Wisconsin industrial engine with triple V-belt drive. Mounted on a welded steel chassis—easily transported on trailer or pick-up truck. Ideal for shop, factory or farm welding. Complete with instructions and guarantee. Wt. 480 lbs. Compares with welder costing \$1200. (Item 280) Factory Special **\$449.50**

## HEAVY DUTY D-C ARC WELDER



Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free continuous service. Will handle light or heavy jobs. Easily welds up to 3/4" plate using 1/4" rods. Built-in air cooling system. Arc is easy to strike and hold because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Runs welder at 3500 rpm with tractor, jeep or 14 HP gas engine or 7 HP elec. motor. Complete with instructions, guar. and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder. (Item 38). Wt. 110 lbs. **\$99.75** \$400 value at. **DUAL CONTROL MODEL** same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Special. **\$119.50** **WELDING KIT**. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at. **\$10.50** See our other ad on Page 271

**11-12 KW Diesel Light Plant**  
Item 1600. Diesel Master illustrated above. 115/230 v. AC single or 3 phase. 1800 rpm. direct connected. Electric self-starting. Engineered for permanent power where continuous low cost, heavy duty service is important. Wt. 1350 lbs. Reg. list \$3650.00 **\$1895.00** Factory Price. **10-11 kw. GAS DRIVEN PLANT**  
115-230 v. 60 cyc. AC. single or 3 phase, powered by a 4 cylinder Wisconsin air cooled engine. Belt driven. Constructed similarly to Hi-line 6 KW shown above at left, but much larger. (Item 217) with crank start. Wt. 900 lb. **\$1075.00** Factory price. Same plant with **\$1145.00** elec. self-starter.

## DYNA-POWER 3500 WATT PLANT



(Item 23)  
115 volt 60 cyc. AC. Built-in battery charger. Powered by a sturdy 8 HP air-cooled Wisconsin engine. A powerful plant built for continuous duty, yet compact and portable. Integral positive drive—an exclusive Master Mechanic engineering feature. Ideal for farms, ranches, country estates, resorts, etc. High output makes it an excellent unit for larger contractors, fire departments, communication systems, Civil Defense, etc. (Item 23) Wt. 279 lbs. **\$379.50** Factory price. **MASTER-LITE 2500 WATT PLANT** 110-220 v. 60 cyc. AC. Similar to above. Powered by 5.10 HP Briggs engine. **\$329.50**

## MASTER AIR COMPRESSOR



Tank Tested up to 500 lbs. per sq. in.  
(Item 200) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing and the hundreds of other jobs done by compressed air. Piston type 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Lifetime, stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lb. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE**. Low factory prices. With 1/2 hp., 110 v. AC motor. (Reg. \$175) **\$109.50** (Item 200p) With 1/2 hp motor. Reg. \$199.50. (Item 200Ap) **\$129.50**

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **BIG 1954 Catalog**  
**MASTER MECHANIC MFG. CO., DEPT. EE Burlington, Wis.**



# Personalize

## YOUR CAR

DAY or

NIGHT



FENDER OR DOOR



(4/5 actual size)

(Pat. applied for)

## MONO-LAMP

- EASILY INSTALLED IN MINUTES
- COMPLETE INSTRUCTIONS

This attractive chrome-nickel plated die-cast day and night insignia will add that touch to your car as identifying as your own finger print. In shining red and blue squares alternating with black as the background, your own initials in gold plate have that rich embossed look under the interchangeable molded plexiglass blocks. At night your initials illuminate whenever your car lights are on, as the Mono-Lamp becomes a part of your lighting system. All necessary parts including bulb, wiring, screws and instructions come with the Mono-Lamp and are guaranteed, except bulb, for one full year. Just \$3.95 each, prepaid. \$4.95 Gold Plated.

*The Mono-Lamp makes a fine gift. Fill out order blank and mail today. Be sure to print initials desired in squares at bottom of coupon.*

**G. & S. MACHINE CO., MONO-LAMP DIV.**

10725 Briggs Avenue • Cleveland 11, Ohio

Please send me  Mono-Lamps at \$3.95 each

I enclose

(check)

(Money Order)

Send C.O.D. (Postage & handling charges extra.)

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Initials desired:

Ohio residents add 12c per unit for Sales Tax

## Deep-Sea Sentinels Guard Our Harbors

(Continued from page 128)

To protect an island airstrip, it would be foolish to ring the whole island with nets, mines and tricky expensive gear. So harbor defenders may just protect the thing that's most vital—the gasoline supplies, which are generally in barges offshore. Torpedo nets hung on buoys around a couple of barges are relatively cheap and effective.

Even doing this much in an action-packed forward area can present problems and develop into amusing fiascos. Taylor recalls one barren Pacific airstrip so small there was no room to store his gear. "We scouted the shoals," he says, "and found a coral plateau covered with about four feet of water at high tide. Apparently a satisfactory place to keep our stuff. We put a cable fence around it, dropped all our gear inside and called it Warehouse Number One. The big round net buoys, floating in the coral, were all you could see. It was fine until a big storm broke the cables and the buoys "kited" off across the ocean in all directions. The whole crew went out in boats, rafts and lifejackets, chasing them. We retrieved some, but the rest got away. For months afterward we kept getting reports of 'floating mines' from our ships in the area—my buoys."

Handy tools in harbor defense are the big steel nets, draped from buoys like huge curtains from shore to shore and from surface to bottom at river and harbor entrances. Today, these huge circlets of steel mesh come in all kinds of tricky variations—indicator nets, submarine nets and torpedo nets. Ingenious variations are forever being tried by harbor defense men.

"During World War II," Taylor reveals, "someone got an idea that a net might be made, not to stop ships, but to set off an alarm when a ship broke through it. Among the trickiest was the XLI (extra light indicator). It was a mesh of stuff like coat-hanger wire. Fine wire across the top supported it on plastic floats. It came collapsed in one thick strand bound by blocks of salt. Work ships simply payed it out like cable. The salt melted, and the mesh unfolded to the bottom like a window shade."

Most familiar, though, are the heavy submarine and torpedo nets, made of heavy wire wrapped around itself and formed into circular grommets that are interlaced to form a mesh. These rugged affairs will stand the tremendous impact of torpedoes. In the last war, they protected not only harbors, but also kept drydock locks from

(Continued to page 272)



## EXTENSION CORD



(Item 16) Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire enclosed in a treated braided jacket. So tough that you can drive over it. Use indoors or out. Resists oil, grease or water. Extends electrically up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. (Item 16) 40 ft. (wt. 2 1/2 lbs.) Usually \$4.50

**\$1.99**  
Special. . . . . 2-40 ft. & 1-20 ft. (total 100 ft.) (Item 16c) **\$4.95**  
100 ft. length (1 piece)

(Item 18p) **\$4.95**  
**RUBBER EXTENSION CORD** #16, 2 conductor stranded wire, extremely flexible, ideal for hedge trimmers, lawn mowers, power tools, etc. Tough and rugged, withstands any abuse. Complete with rubber plug and outlet. 40 ft. (Item 17a) wt. 2 1/2 lbs. Regularly \$4.95 **SPECIAL \$2.49**  
Combination 2-40 ft. & 1-20 ft. (total 100 ft.) (Item 17b) **\$5.95**  
100 ft. length (1 piece)  
(Item 17c) **\$5.95**  
Wire only. No fittings. 100 ft.  
(Item 17d) **\$5.00**  
**NEOPRENE CABLE** #14-2 (Item 18b) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**  
**NO. 12-2 POWER CABLE.** Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 19b) wt. 8 lbs. **\$6.95**  
100 ft. (Item 200) **\$12.95**

## AUTOMATIC HOT WATER HEATER



(Item 76) Modern electric hot water heater. Its air tank with threaded openings 1" or 1 1/2". Works just like heater costing \$100 or more. Goes on and off automatically to heat water to desired temperature—using electricity only when needed. Takes only 1/4 to 1/2 cent of electricity per gallon of steaming hot water. Heater element and thermostat. **\$14.95**  
Wt. 8 lb. Reg. \$49.50  
Heater only for manual temperature control. **\$7.95**  
Wt. 3 lbs. . . . .

## Variable Speed Selector



Heavy duty, made by **8-F GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midge auto. Exp. to a reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: 1/2-1 hp. wt. 36 lbs.; 1-2 hp. wt. 58 lbs.; 3-5 hp. wt. 105 lbs. Reg. list \$288, \$352 and \$352. Our prices . . . **\$79.50, \$89.50 and \$114.50.**

## FIRE EXTINGUISHER



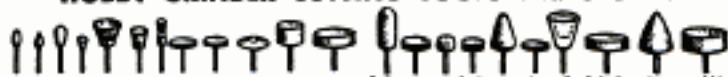
(Item 39) Fully charged (at 1000 lb. P.S.I. or more) with CO2 (carbon dioxide), the proven miracle fire-fighting chemical that smotheres oil, gasoline and electrical fires. Place it in your garage and home. Heavy ICC approved steel cylinder, valve, and 3000 lb. gauge that shows available remaining pressure. **REFILLABLE** at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lb. **\$19.50 Value. Special. \$6.95**

## BUY DIRECT FROM FACTORY



## SAVE MIDDLEMAN'S PROFITS

### HOBBY GRINDER CUTTING TOOLS and STONES



The perfect accessory kit to increase the scope of your hobby grinder. Has a dozen different burrs, cutters, flutes, reamers, routers, etc. Cutters are of finest, hardened tool steel on 3/32" shafts. Holds a keen edge for a long time. Packed in a handy index base. Item 342. Wt. 1 lb. Factory price **\$1.95**

### MASTER SAFTI-FUSE

Flip-on fuses that restore electrical service by merely pressing a button. This amazing permanent safety fuse protects all your electrical circuits against dangerous overloads (the cause of most fires). Just screw them in—in place of your old fuses—and forget all future worries. Automatically interrupts any dangerously overloaded circuits. To restore service—just flip the button. Uncond. guaranteed **SAFE**. U. L. approved. Eliminate danger of shock from old-fashioned fuses and enjoy automatic, permanent protection. Available in 15, 20 and 30 amp. sizes—please specify. All sizes 4 for **\$5.25—\$1.35 ea.**

### RIGHT ANGLE DRIVE and SPEED REDUCER

for 1/4" Electric Drills  
A precision built drive which converts right angle drilling in confined spaces as between joists or shelves. 2 to 1 reduction gear will drill with ease up to 1" holes in wood using 1/4" shank bits. Makes impossible drilling jobs easy and accurate. Also ideal for power buffing and sanding. Can be used in either direction—to increase or decrease speed. Twice speed of drill for sanding metal—half speed of drill for sanding wood or polishing. Eliminates danger of damaging finishes caused by too high a speed. Fits practically all 1/4" electric drills—simply transfer drill chuck to right angle drive. Item 243. Wt. 1 lb. **\$4.95**  
Factory Special. . . . .

**HEAVY DUTY RT. ANGLE DRIVE** for 1/2" DRILLS. Has 2 to 1 speed ratio. Easily handles large auger bits and will drill up to 3" in wood. Ideal for plumbers—drilling for pipe installations in confined places—or electricians drilling between joists. Attaches easily to most electric drills with 1/2-20 threaded spindle. Precision cut gears; main and rear bearings on each spindle to assure perfect alignment. Item 308. Wt. 2 lbs. **\$19.95**

### COMBINATION TAPER DRILL AND COUNTERSINK

The first real improvement in drills for the wood working industry in over a century. This 3 in 1 drill bores a tapered hole which corresponds to the contour of a wood screw. This enables every thread on the screw to hold tightly right down to the tip. Ordinary drills bore straight holes which allow only part of the threads to come in contact with the wood. Get increased holding power out of your screws; make better, longer-lasting joints. In addition you can countersink the hole, if desired, thus saving an extra operation. Merely send the drill hole right down to the collar and you will get a perfectly countersunk hole without extra effort. Set of 5 most commonly used sizes in handy kit; accommodates 7, 8, 10 and 12 screws; Item 246. Wt. 2 lbs. **\$3.75**

### JET FLOW BLOWER

Tremendous air movement (1700 CFM) and quiet operation make this double inlet 10" turbine blower unbestable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any 1/4, 1/2 or 1/2 HP motor. Oversized, long-life bearings. Includes variable speed motor pulley and belt. Dimensions: 19" h.l.x 8"x16 1/2". Outlet opening 13"x 11 1/4". Wt. 45 lbs. Item 245. Regularly \$54.50. **\$27.50**  
Factory Spec. . . . .  
**HEAVY DUTY 1/4 HP motor** for above blower. **\$16.95**  
See our other ad on page 269

A complete set of highest quality abrasive wheels and stones permanently bonded to hardened steel 1/4" & 1/16" shafts. One dozen different stones—of every conceivable shape made to match any grinding job. Packed in a handy index base. Item 341. Wt. 1 lb. **\$2.95**  
Factory price. . . . .

### 6 FT. FLEXIBLE SHAFT

A sensational all-around power tool kit that includes a precision-built heavy duty 6 ft. flexible shaft complete with all the necessary accessories for doing a hundred different jobs. Fits any 1/4, 1/2 or 3/4" shaft on any 1/4, 1/2 or 3/4 HP electric motor. Also works fine with gas engine, or with shaft chucked in drill press or lathe. Shaft unit has heavy duty 3/4" piano wire core encased in tough rubber housing. Handle and arbor have rugged industrial type precision type ball bearings for years of service. Accessories included are: rubber backer plate, lamb's wool bonnet, 6 sanding discs, 8 drill bits, wire brush and drill chuck. Ideal for all grinding, metal polishing, drilling, finishing, repairing, etc. Does countless jobs impossible with ordinary tools. Complete kit (Item 240a) Wt. 13 lbs. **\$19.95**

6 Ft. Flexible Shaft only (Item 240. Wt. 10 lb.) **\$15.95**

### POTTER'S WHEEL

Power Driven—Foot pedal speed control  
New compact modern design. Precision built to meet exacting requirements of professional artists—the finest wheel ever built. Heavy and sturdy for quiet accurate operation. Mechanism fully enclosed for safety and to exclude clay and moisture. Foot controlled variable speed drive provides instant, smooth speed range of 30 to 150 rpm. Equipped with adjustable arm rests. Easy to operate—even for handicapped persons. Reversible 10" throwing head—back side recessed for casting plaster bats. Larger 18" dia. throwing table; wedging wire attached, removable water cup inside. Heavy prelubricated bronze bearings. Use any 1/4 HP motor (not incl.). Shipped fully assembled—just mount wheel and motor on table or sheet of 1/2 plywood. Self storing—tip up on edge. Wt. 45 lbs. List price \$125.00 (Item 47) **Factory price. . . \$64.95**  
1/2 HP 115 v. AC motor for Potter's Wheel, Wt. 27 lbs. **\$16.95**  
Item 258. . . . .

### 29 PC. SPEED DRILL SET

Superb, high quality, imported drills of chrome vanadium speed steel designed for superior performance. Normally you'd expect to pay much more for these precision made, drill bits. Perfect for all drilling in steel, cast iron and other metals. Also excellent for wood or plastics. Set of 29 drills from 1/16" to 1/2" by 1/64s in an indexed steel box. Wt. 4 lbs. (Item 311d) **Special. . . \$11.95**  
Same set with 1/2" shanks **\$12.95** for 1/4" drills. (Item 311e)

### 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" Fan, wt. 5 lb. . . . . **\$6.85**  
9" Fan, wt. 6 lb. . . . . **\$7.85**  
10" Fan, wt. 7 lb. . . . . **\$8.85**  
12" Fan, wt. 8 lb. . . . . **\$9.85**  
**HEAVY DUTY FAN.** Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc.  
10" Fan, wt. 8 lb. (Item 10E) **\$11.95**  
12" Fan, wt. 10 lb. (Item 10D) **\$12.95**

## MASTER SNO-BLOW



**NO PUSHING**  
Tractor shown with Snow Blow Attachment (Item 206)  
**SELF-PROPELLED**  
It's a snow-blower  
It's a power sickle  
It's a cultivator  
It's a rotary tiller  
It's a plow  
It's a rotary mower  
Where can you get a power tool that does so many jobs? Works for you the year round. Does terrific job of cleaning snow from walks, drives, etc. without backbreaking work. Also prepares deep mellow seed beds, cuts weeds, lawns, etc. The Master Gardener performs better—does more than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic, self-propelled 2 hp. tractor, Briggs **\$119.50**  
Snow Blow. . . . . **\$39.50**  
Cultivator. . . . . **\$8.75**  
Rotary Tiller. . . . . **\$42.50**  
Disc Harrow. . . . . **\$15.50**  
Furrowing Tool. . . . . **\$8.75**  
Plow. . . . . **\$15.00**  
Rotary Lawn Mower. . . . . **\$42.50**  
Sickle Bar Mower. . . . . **\$42.50**  
Lawn Mower Hitch. . . . . **\$4.50**  
Freight prepaid to most areas. Easy payment plan available.

## AUTOMATIC 6 VOLT COMPRESSOR



The ideal compressor for operating load blast air horns on cars or boats, and for use as tire inflating equipment on service trucks or jeeps. Inflates tires in seconds. Compact! Can be installed in small space under hood, in trunk, etc. High air output, (4 CFM). Operates on standard 6 or 12 volt storage battery current. Built-in 1/2 HP electric motor, Solenoid switch, 6"x24" air tank, pressure gauge, safety valve, shut-off valve, automatic on and off switch. (Runs only when air is needed.) Wt. 39 lbs. Item 355 Reg. \$129.50  
Our Special. . . . . **\$54.50**

## 37 pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome alloy. Absolutely the best. Complete range of 17 sockets from 1/4" thru 1 1/2" (1/4" drive) and 7/16" thru 1-1/16" (1/2" drive), 1 extension, reversible ratchets, ratchet bit, sliding "T" handle, "L" handle, 1/2" speeder, 5 pc. alloy combination wrench set, 8 pc. Allen wrench set, and a doghouse tool box. We challenge anyone to match this value. Easily worth \$41.95, Wt. 14 lb. (Item 59) **\$16.95**

## 44 PC. SOCKET SET

(Item 59E) Same unconditionally guaranteed, non-breakable sockets as above—but with added sizes. Complete range of 21 sockets from 1/4" thru 7/16" (1/4" drive) & 7/16" thru 1-1/16" (1/2" drive). Two extensions, reversible ratchets, ratchet bit, sliding "T" handle, all angle coupling, 1/2" speeder, 1/2" breaker, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool box with ample room for other tools. Reg. \$49.50 **\$21.95**  
Wt. 16 lb. . . . .

## 52 PC. SOCKET SET

(Item 205) Contains a complete set of sockets in 1/2" drive, 3/4" drive and 1 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautifully matched chrome thin wall alloy sockets in a sturdy hand-some steel box. Wt. 17 lbs. List price \$62.00  
Factory Special. . . . . **\$27.95**

Send check or M.O. Prices L.o.b. Factory. 10 day Money back guarantee. SEND 10c for . . . **BIG 1954 Catalog**  
**MASTER MECHANIC MFG. CO., DEPT. 4E Burlington, Wis.**





### This oil-pumper needs Tough-but-oh-so-Gentle Piston Rings

Oil pumping is just the start of expense and trouble—the first danger signal from worn-out piston rings. The longer you let those rings stay in, the more oil you use, the more power you lose, and the bigger your repair bill.

As your engine gets older, it runs hotter because of accumulations in the cooling system. Cylinders wear tapered and out-of-round—need more oil on the walls.

It requires a special type of piston rings—replacement rings—to deliver this extra oil, under full control, without waste. Hastings makes replacement rings exclusively, devotes all its research on the highways and in the laboratory, to the particular replacement problems of each make and type of engine.

That's why Hastings Rings stop oil-pumping, check cylinder wear, restore engine performance—in re-ring, re-bore and re-sleeve installations.

So go to your motor specialist at the first sign of oil-pumping or performance drop-off. If rings are the trouble, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car! Hastings Manufacturing Company, Hastings, Michigan; Hastings Ltd., Toronto; Piston Rings, Spark Plugs, Oil Filters, Casite, Drout.

#### TOUGH-but-oh-so-GENTLE

TOUGH on oil-pumping  
GENTLE on cylinder walls



**HASTINGS** STEEL-VENT PISTON RINGS  
*Regular or Chrome Faced*

being rammed by attacking enemy ships. "It's always a race to keep one jump ahead of the enemy," says Taylor. "You build a net, and they find a way around it. Then you fix that, and they look for another way."

Shining example was the explosion boat (E Boat) developed by the Italians in World War II. These explosive-laden outboards hydroplaned right over the net buoys. The motor flipped up on a hinge as they went, then snapped back in place on the other side. The pilot dove out, after aiming his craft at the nearest ship inside the harbor. Later the Nazis made similar craft that were radio-controlled. Star-cutter booms helped stop them, but the men went even further.

"We tried to develop a tricky affair called a 'sausage' or 'table cloth' net," says Taylor. "This was a sort of snare that spread out flat on the water, supported by kapok-filled hose and 18-inch balls for flotation."

"Our new electronic wizards will help," he says. "There are too many ways to breach nets. Some of our enemies can think up slick tricks—like the Italians did in Alexandria Harbor. One night this sub skipper came up to the submerged net. Four men with aqua lungs crawled out through the tubes and, with compressed air jacks, hoisted the net high enough off the bottom to let the sub through. The sub sank several ships in the harbor that night—even though it never got back out.

"But," points out the commander, "it was a different story in Sidney Harbor, when the Japs released midget subs. There, we had some magnetic loops that warned us what was up. We dropped depth charges and got them."

The secret of success in harbor defense is to get there first with the most. Hence the latest and trickiest developments are on the top secret list and we won't hear about them until after they've done a job and the enemy has found a way to breach them.

"You can bet they'll go to incredible ends," says Captain A. C. Burrows, head of Harbor Defense for the Navy's Undersea Warfare Division. "The Japs were fantastic in their efforts during the last war. They didn't plan on going home like we did. In Ulithi Harbor, they swam under cartons and orange crates—right through our defenses, carrying explosives with them. They were human torpedoes. There were swarms of them and some got through. They slapped their homemade mines against the sides of ships with considerable effectiveness. It's tough work, but challenging. Our new schools start from the ground up, so applicants no longer need previous training for Harbor Defense." ★ ★ ★



**DO IT YOURSELF**

Anything you do, this glue does better!

**NEW! WELDWOOD PRESTO-SET GLUE**

**USE IT EVERYWHERE, FOR EVERYTHING!**

BONDS WOOD TO WOOD	REPAIRING ART OBJECTS
BONDS WOOD TO COMPO BOARD	SPORTING GOODS UPKEEP
BONDS CLOTH TO WOOD	SHOP WORK
BONDS PAPER TO CLOTH	ALBUM COLLECTIONS
BONDS PAPER TO PAPER	HOBBY WORK

Perfected at last! A ready-to-use *white glue* worthy of the famous Weldwood name! Sets fast, bonds like magic! The perfect all-around glue for home, hobby, shop. Doesn't spoil or stain! Ask for Presto-Set glue with the blue and white label at your lumber, paint or hardware dealer's. If he is not yet stocked, send us 25¢ for a full size tube.



In 25¢ and 45¢ tubes, pint and quart bottles.



**FREE!** Leaflet of many uses. Write **UNITED STATES PLYWOOD CORP.** Dept. 33, P.O. Box 205, N. Y. 46, N. Y.

**ANOTHER WIZARD WITH WOOD: WELDWOOD Plastic Resin GLUE**  
The water resistant powder glue—America's largest selling wood glue.



Trade where you see this sign

**DRAINS Cellars, Laundry Tubs; CIRCULATES Oil; IRRIGATES Gardens**

Original "Type P" Pump has 2400 GPH capacity. 360 GPH 75' high, or 1500 GPH from 25' well. Use any 1/8 to 1/2 HP motor. DOES NOT CLOG. 1" Intake; 3/4" outlet.  
Postpaid if cash with order. (West of Miss. add 50c.) Motor coupling included. **MONEY BACK GUARANTEE**  
Also Gear Pumps in all sizes.  
**LABAWCO PUMPS, BELLE MEAD 7, N. J.**



**\$6.95**

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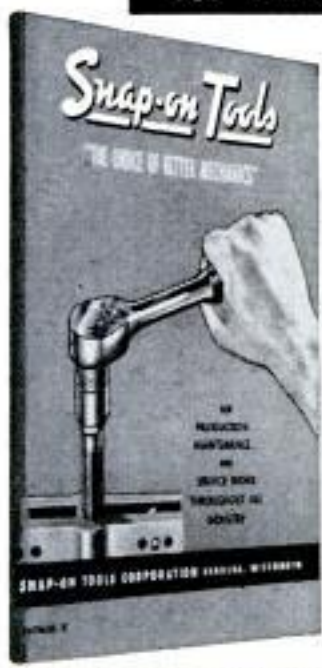
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CBS color camera at right is about the same size and  
shape as conventional black-and-white camera at left

## Color Television Is Here

(Continued from page 132)

worked to set up specifications that would  
make the big dream come true. Finally last  
October FCC members saw the results.

On color receivers produced by 13 differ-  
ent manufacturers, NBC's Nanette Fabray  
sang before a multihued background;  
dancers in colorful costumes whirled across  
vivid color sets. Pretty girls flipped swirl-  
ing red skirts to show brilliant green slips  
beneath. Then, CBS took its show outdoors  
to prove how well its color cameras worked  
on remote pickup. In a program called  
"Autumn in New York," the lenses panned  
garden colors, climbed to dizzying sky-  
scrapers in midtown, browsed through a  
sidewalk cafe to zoom in on dishes of pink  
lobster, bright, delicious-looking salads  
and plates of sweet red berries. The Allen  
B. Du Mont Laboratories flashed close-up  
and distant shots of brilliantly colored  
scenes across the phosphors. And all the  
while, regular black-and-white sets beside  
the color screens faithfully reproduced  
everything coming in on all the channels.

As for those 13 different color sets, they  
looked exactly like black-and-white re-  
ceivers, but the cabinets were larger by  
half. For the present, color screens are 14  
inches (producing a 12½-inch-wide pic-  
ture), but 21-inchers are in the works.

In many recent color demonstrations,  
technicians have hovered over sets, tinkering  
and making adjustments, leading ob-  
servers to wonder if every color set would  
come equipped with a built-in electronics  
engineer. Last November 1, when NBC  
microwaved Bizet's opera "Carmen" in  
superb, delicately shaded colors, news and  
magazine reporters were loaned color sets  
and permitted to tune them in unassisted.

How do they work? Remarkably well. A  
typical set has five or six knobs. Four are

(Continued to page 276)



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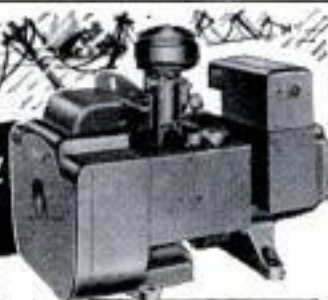
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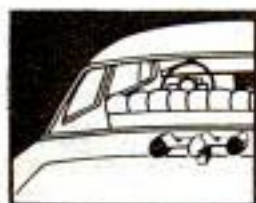
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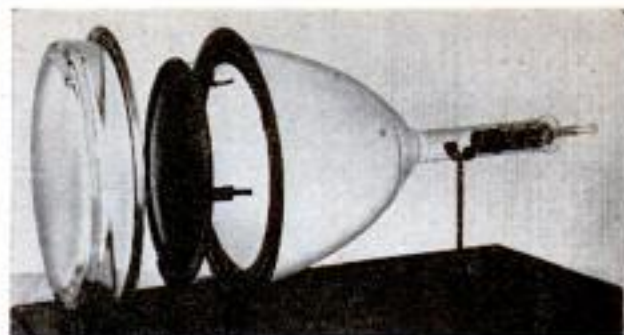
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Newest CBS tube is shown at top. It is simpler and less expensive than the former color tube at bottom

the familiar ones on your standard black-and-white (monochrome) set: channel selector, brightness, contrast and focus control. One new one is the "chrome control." Turn it all the way left, and color fades to a bland, washed-out mess resembling a badly over-exposed color transparency. At far right, color jumps out in a dense intensity and brilliance, startling but hardly "true" color. In between lie the subtle shadings to suit your taste.

There's also a "convergence control," a delicate adjustment for aligning the three color signals coming into the tube so that they strike the tube face in perfect register. If this adjustment is off, people on the screen may suddenly develop green or red ears or grow purple halos.

Actually, TV color signals are identical to black and white. But instead of a single signal carrying a single picture there are three signals riding together, carrying three separate images. One shows all the red values in the scene being shot, another all the green, a third all the blue.

Each network has its own special cameras and gear for breaking down the scene into these three colors. What the NTSC has set up is not a new "system" but a set of standards. "It's like standardizing railroad tracks," explains NBC chief engineer O. B. Hanson. "Any railroad can streamline its cars and engines. But all must fit the same gauge track. Like railroad cars, each network can run its own equipment, as long as it fits the same standards."

When the signal leaves the transmitter,

(Continued to page 278)





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it is the same for all networks—three color signals riding in close frequency to black-and-white and sound signals.

All this electronic information is picked up by your home color receiver. The black-and-white signal tells the set how much brightness is in the picture. Impulses for each of the three color images are separated and zipped to three electron guns (one for green information, one for red and one for blue) at the base of the big tri-color tube. The inner face of this tube, pioneered by RCA and recently modified by CBS, is coated with up to 750,000 dots of red, green and blue phosphor, mechanically arranged in 250,000 tiny triads. Behind this surface a perforated screen or "shadow mask" with 250,000 microscopic holes is so perfectly registered over the triads that the three electron beams angling through them hit only the right phosphors. The green beam, piercing a tiny hole in the mask, hits the green phosphor of a triad and makes it glow. The red beam, angling in from another direction through the same perforation, is masked from the blue and green dots but "tickles" the red one.

Thus, each beam lays down its own image in its own color. Since the dots are so tiny and closely packed, your eye melts them together into one picture in true-to-life color.

In the host of vital circuits between scene and screen, startling things occasionally happen to the colors. If the three guns are out of alignment, you get a cascade of color flecks instead of the picture. One or more colors have been known to drop out until emergency equipment could be brought into play.

Though controls on present sets are simple, you may find yourself diddling with dials a lot more to get the picture you want. Color signals are more sensitive to interference than monochrome and an accurate shade may stubbornly elude capture.

Vance Hallack, producer in charge of color for NBC, wryly recalls that during the 1950 FCC demonstrations, transmission engineers fought bitterly all day with the receiver engineers, each blaming the other for the poor color coming through. "Finally, during a break," he says, "I sent out for green bananas and substituted them for yellow ones in a fruit bowl on the set. Soon as we started up again, a receiver man called up, screaming:

"'What's with the green bananas?'

"'Don't know what you're talking about,' I told him. 'They're yellow on *our* monitors.' That kept him quiet for half an hour. Then he called again and said: 'Got your

(Continued to page 280)



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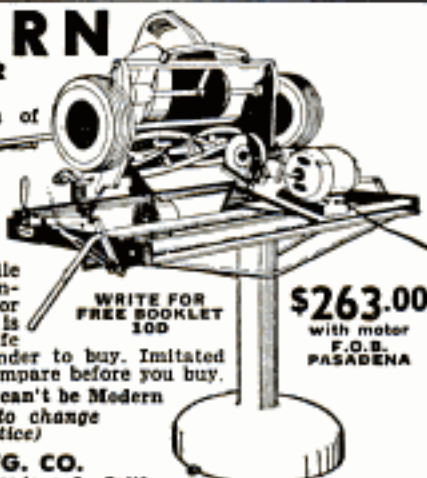
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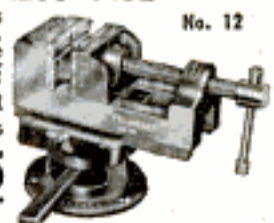
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yellow bananas—but your apples are blue.’”

Hallack, and his counterpart at CBS, Jerry Danzig, still shudder over some of the whimsies of the new medium. The minute anyone steps into a shadow his face may turn a hideous green, purple or other unlikely shade on receiver screens. A blue dress may go dirty red.

The shade problem makes “remotes” a tough job, too. Last year when NBC ran a sneak preview of the Penn-Columbia football game, everything was fine until the last quarter. “Then,” says Vance, “the sun went below the stadium rim and the final quarter came through in a greenish black and white.”

Indoors or out, color TV requires more light than monochrome. RCA, NBC's parent company, says three times more; CBS says six times. Art-museum guards, in charge of a Picasso painting in one scene, were sure the oils would melt and run on the priceless picture. They didn't, but everyone trembled.

Hurdles still confronting color are technical and economical. Most TV executives are confident they'll all be solved in a relatively short time with the brains and effort being applied today.

Already, with all its whimsies, color is cutting dollar corners in a few areas. “We can paint our scenery with light instead of paint,” Hallack points out. “We built a gray cyclorama for the studio. By playing lights through varicolored gels, we can give an audience 500 different backgrounds per hour if we want. That way a set can be varied all night at no cost. We can paint objects and costumes with colored spots, too—everything but flesh tones.”

Flesh is the key to all color TV and it's giving technicians some headaches right now. At NBC, cameramen “tune in” on what they call Gamma Chips—three bars of shading, one black, one white and one a flesh tone—providing full color range. When these are right on the monitors, everything comes out right, they claim. To make sure, they run further tests on color bars.

Finally, they tune in on Marie MacNamara—a pleasant chore. Marie is a natural auburn-haired beauty who has been tuned in on by RCA color cameras daily for 2½ years. “Her natural skin tones are perfect and her hair, one of the hardest colors to telecast correctly, is among the toughest tests we have,” Hallack explains.

Radical simplifications in technique and equipment are being announced every month. CBS claims that its new Colortron tube is a simplification of the shadow-mask

(Continued to page 282)



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## Slide Rule

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If you can use a pencil you can use a slide rule. For bookkeepers, accountants, salesmen (figuring commissions, cost, etc.), farmers, housewives, etc. For Armed Forces highly important. Men's most useful tool. Easy to calculate instantly. Multiplying, proportions, division, roots, etc. "High Vision" Clear View Slide. Full 10" Rule. A, B, C, D, C1 and K scales. **FREE** 28-page instruction book on how to get correct answers instantly without pencil or paper.

Gene Loewy, 545 5th Ave., Dept. 43-H, N.Y. 17

Limit three rules to each coupon

type that suddenly makes possible mass production of one item that posed manufacturing sticklers six months ago. The tube will be in pilot production next month. By next September 15,000 are expected to roll out each month.

RCA's big three-tube color camera that does everything in one operation, but is a cumbersome \$65,000 affair, already is obsolete. At RCA's Princeton labs, technicians are shooting successful color with a camera the size of a standard black-and-white job. Three miniature Vidicon tubes no bigger than two-cell flashlights do the work. The same men are also dollying a brand new single-tube camera that works like a tricolor receiver tube in reverse.

One of the hottest color developments, quietly being perfected in Paramount's laboratories, is a receiving tube known as the "Chromatron." Owned by Dr. E. O. Lawrence (who invented it) and Paramount pictures (who financed its development), this tube may speed the arrival of lower-cost color sets.

Instead of using three electron beams, perforated masks and thousands of phosphor dots, the Lawrence-type tube has a single gun—like a black-and-white tube. Across its screen are 900 vertical lines of red, green and blue phosphor. The gun fires red, green and blue signals at the screen in an ultrarapid sequence through a grid of vertical wires. As each tiny color impulse flies between a pair of wires, it passes through a magnetic field that bends it toward the right phosphor.

Other startling things are in the works. A big headache for advertising men has been the fact that color films don't work well on color TV. Now they won't need film. Brig. Gen. David Sarnoff just announced that RCA's Princeton scientists have perfected a method for storing color signals on half-inch magnetic tape. It does away with all chemical processing. A color "show" can be stored indefinitely and played back anytime—or the tape can be "wiped" and reused.

"Magnetic tape recording of video signals," says the General, "should make possible a simple means by which a TV-set owner can make recordings of television pictures in the home. And they can then be 'performed' over and over."

Nobody believes that color will completely replace black and white. There wouldn't be much point in seeing wrestling bouts or horse races in color. Dr. DuMont has pointed out that Technicolor didn't replace black-and-white movies. "Neither," he says, "can it happen in TV. There will always be plenty of monochrome shows to watch." ★ ★ ★



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JANUARY 1954

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## Howard MANSION COACH

HOWARD INDUSTRIES INC., SAGINAW, MICHIGAN

## Look How Your Mail Gets There!

(Continued from page 101)

a canopy like a miniature covered wagon to keep off the intense sun.

Worrells' is lucky to have roads. One of the toughest routes in the country is a 38-mile trail from the Big Creek, Idaho post office, on an air strip, to the Middle Fork of the Salmon River. The trail follows the rocky stream bed through a deep canyon. Tin mailboxes of mountain folk along the creek are serviced twice a week by L. E. Curtis and his two pack horses who take two days picking their way up trail to deliver a week's inbound "air mail." The first night is spent in a cabin along the creek, the second at a ranch on the Fork.

Few people think of a postman as the pilot of a boat. Yet several mail routes are famous waterways demanding mailmen who are far more than just letter carriers. Perhaps the most exciting mail route in the country is the Snake River run—93 miles of treacherous rapids curling through Hell's Canyon—deepest and narrowest cut on the continent—from Johnson's Bar to Lewiston, Idaho. Up in the Canyon live some 350 cattlemen, sheep ranchers and prospectors with no established means for getting in or out except via the torrential river. And that's the way their mail goes.

Until 1938, mail delivery up the canyon was spasmodic and unpredictable. Only a few pilots would run it when the river was "right." That year, a rugged mechanic named Kyle McGrady quit work in a Lewiston garage, bought himself a tough-bottomed freight boat and began to ply the Snake on a regular weekly schedule—feeling his way around rocks and sandbars as he crept up and plummeted down the rapids. McGrady would ride the river when it was "right" or "wrong," servicing the 50-odd mailboxes along the shores. He smashed as many as three propellers per trip. His first boat crashed on the rocks and blew up under him before one year of duty. But grateful canyon dwellers helped him buy another and for 12 years McGrady bucked the Snake, carrying not only mail but cattle, medicine, boots, canaries and everything up to a year's supply of groceries for his clientele. He ferried sick people out (one appendicitis case and scores of mothers-to-be) and brought them back. In one 18-month period, he never missed a single weekly mail trip.

Knowing the hazards of the run, McGrady's wife worried in bad weather. To ease her mind, the river mailman kept a cage of homing pigeons aboard his craft. When the last rapids had been navigated

(Continued to page 286)





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It has Infinite Speeds 0 to 550. Reverse, Automatic Overload Protection; Adjustable Torque up to 180 inch pounds. 3/8" Input and Output Shafts. It will handle 1/2" to 1 1/2" H.P. Motor. Case measures 7 1/2" long, 7" high, 6 1/2" wide. **VALUE OVER \$300.** Shipping Wt. 25#. On C.O.D. Orders we require a 10% only deposit. **\$54.50** Fab. Chicago

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VACUUM BOTTLES  
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10 OUNCE  
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ONLY  
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MOTOR

on the return trip, he'd write a note estimating his arrival time in Lewiston, slip it in a leg capsule on one of the birds and release it with the news.

Today the run McGrady established is covered by a big 52-foot boat powered by twin diesels. Her shallow-draft hull, drawing only 22 inches, is specially designed for riding the Snake's shifty bottom. For the past three years this boat, the *Wenaha*, has been the official Snake River mailboat, piloted by Capt. Oliver McNabb of the Inland Navigation Company. Mail leaves the Lewiston dock each Wednesday morning at dawn and reaches the end of the route 10 hours later. McNabb and the *Wenaha* are generally back for supper next day.

Perhaps the most catch-as-catch-can mail "routes" in the United States are the speed runs made on the Great Lakes by several boats operating out of Soo and along the Detroit River. These high-powered craft, rigged up as floating post offices, chase after big lake steamers and transfer mail back and forth while both craft move along at 10 miles per hour. A mail bucket comes slithering down the high sides of the big steamer to the pitching mailboat. Outgoing mail from the ship is removed and letters for the crew put in the bucket which is then hauled up.

One of these blunt-prowed, square-sterned boats, the *G. F. Becker*, plies a 13-mile run up and down the Detroit. Her interior is lined with pigeonholes, each marked with the name of a lake ship. More than 2,000,000 letters and packages a year are delivered to the big steamers on the run, and only heavy fog or impossible weather sees her miss a connection.

In spite of jet planes and a streamlined century, the mailman is still doing a yeoman service to live up to the Post Office creed: "Neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds." ★★★

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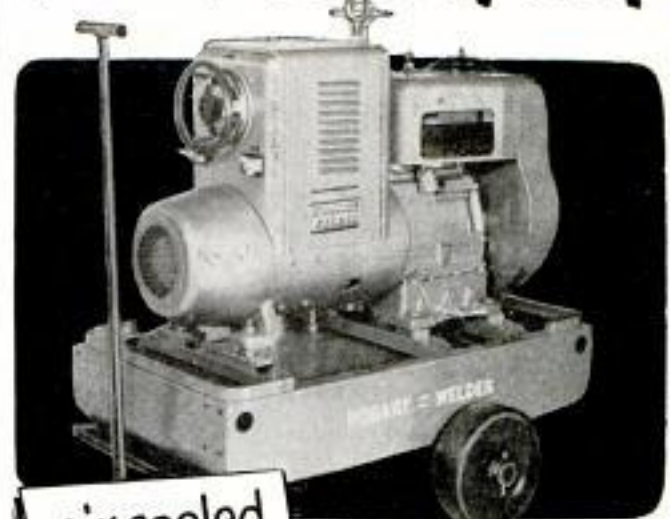
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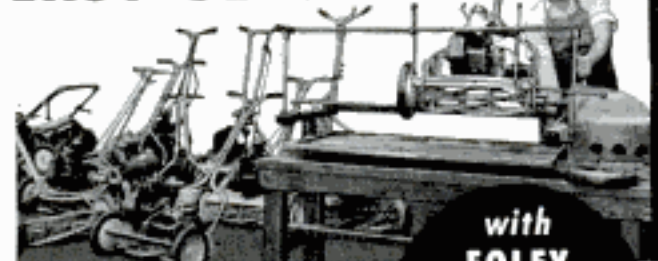
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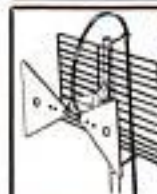


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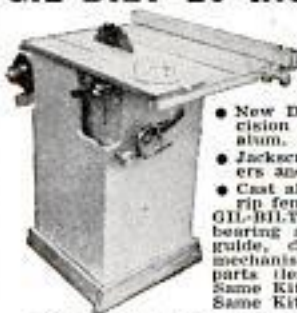
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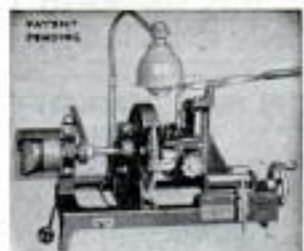


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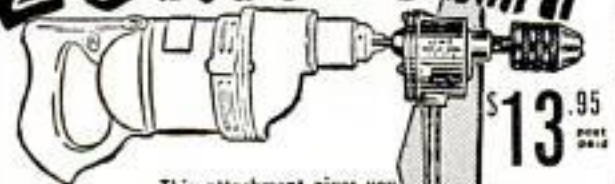
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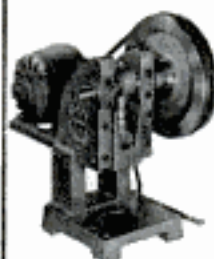


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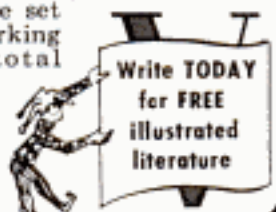
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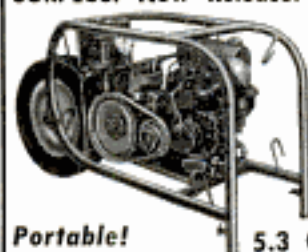
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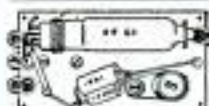
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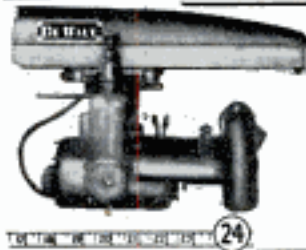
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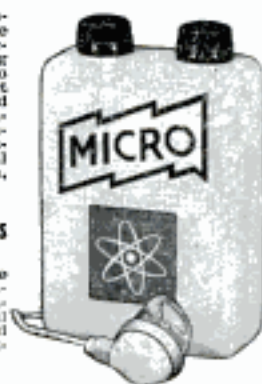
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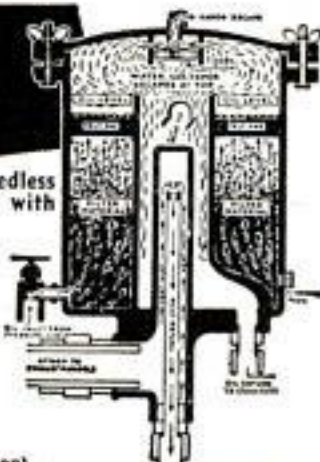
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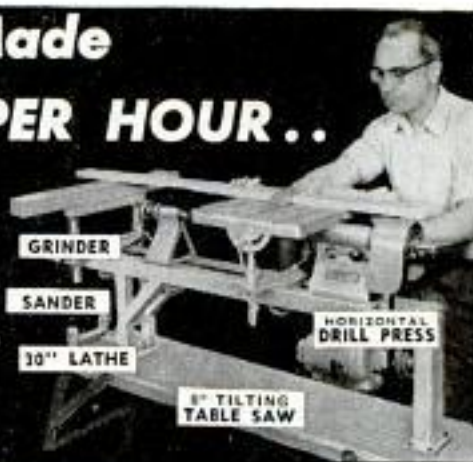
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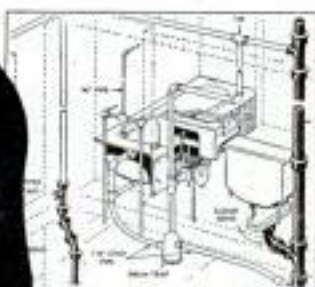
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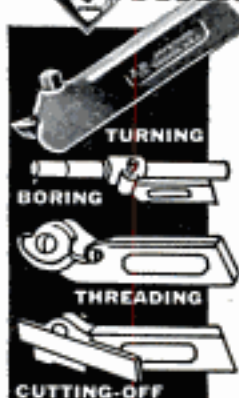
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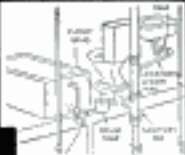
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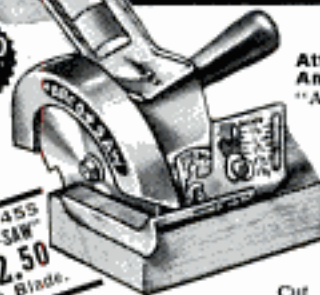


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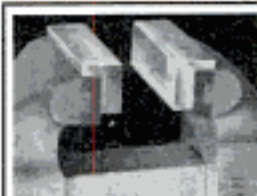
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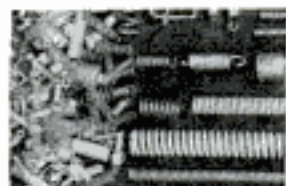
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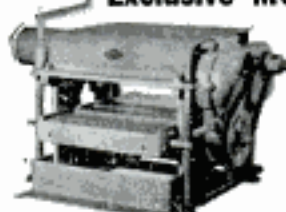
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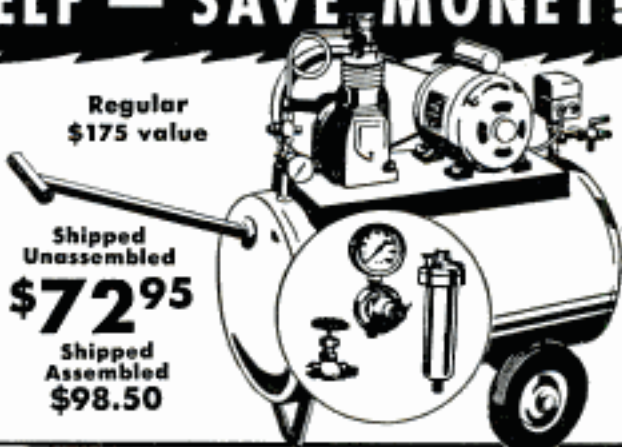
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**Motor-Weld Model 1A**  
—Recommended for Hobby and Home work. Comes as illustrated above. Plugs into any 110 Volt AC or DC Line. Amperage Output is 50 to 70 Amps. Size: 11" deep, 4 1/2" high, 13" wide. Shipping Weight 45 lbs. Price F.O.B. Chicago, Ill. Less Accessories \$49.95. Complete with Accessories \$54.75. Fast Battery Charger Attachment \$5.00 Extra.



**Porto-Weld Model 2A**  
—Amperage Output: 50 to 140 Amps. Input: 110-220V AC or DC. Line Draw: 24 Amps. on Each of Two 110V Circuits or 24 Amps. on a 220V Single or 3 Phase Line. Straight or Reverse Polarity. 5 Welding Heats. Size: 12 1/2" x 18 1/2" x 15". Shipping Weight 56 lbs. Price F.O.B. Chicago, Ill. Less Accessories... \$85.00. Complete with Accessories \$98.00. Fast Battery Charger Attachment \$5.00 Extra. \*Accessories include—300 Amp. Electrode Holder, Helmet, Ground Clamp, Sander, Buffer, Sample Electrodes, V-Pulley, 8" Welding & Ground Cables, and Instruction Booklet.

**9 TOOLS IN 1**

- ✓ WELDS
- ✓ BRAZES
- ✓ GRINDS
- ✓ SANDS
- ✓ POLISHES
- ✓ BUFFS
- ✓ BRUSHES
- ✓ POWER UNIT
- ✓ CHARGES BATTERIES

**HAS SELF-CONTAINED MOTOR GENERATOR JUST LIKE BIG PLANT UNITS**

MOTOR WELD is the only known motor-generator type unit that has its Large Amperage Output, is self-contained, yet has light-weight "Pickup" Portability and sold at transformer price levels. Low cost, economical operation. No special wiring—just plug into any 110 volt AC or DC line (any cycle) and it's ready to use! Its portable POWER UNIT can be used to operate saws, grinders, etc. Other models (100-225 amp.—Cart Models, etc.) available.

Send for FREE Literature  
**10-DAY FREE TRIAL**  
**90-Day Warranty**  
**On All Machines**

Send remittance with order: will ship C.O.D. (\$15 deposit)

**GENERATOR SALES CO. • 1627 N. Damen Ave. • Dept. L • Chicago 47, Ill.**



# Schupack's Amazing Tool Bargains! All Brand New! Save up to 100%!

**FLEXIBLE SHAFT — ONLY \$4.95** Post-Paid



Fits all electric drills & hand power tools. 35 1/2" long. Oilite bearings. Core of specially wound, high carbon steel wire in flexible steel casing. Will accept modular tool shafts up to 1/2" dia. For lathes, electric drills, etc.

**SURPRISE VALUE 100 PIECES FOR \$1.00** Post-Paid

**FOR ELECTRIC GRINDERS**



Grinding Wheels, Cut-off Wheels, Sanding Discs, Mounted Stones, Sharpening and Honing Stones, Rotary Cutting Burs, Abrasive Cartridges, Mandrels, and many other items.

**75 MOUNTED WHEELS & MINIATURE CUTTERS \$4.50** Post-Paid



Regular \$11.00 value. For cutting and grinding on wood, metal or plastic. Includes 26 mtd. wheels and points on 3/32" shanks; 24 miniature cutters on 3/32" shanks; 25 short shank min. cutters. Will fit all electric drills and hand grinders.

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For less than the price of one, 50 yds. per roll. 1 1/2" wide—3.20 grit; 3/4" wide—2.40 grit; 5/8" wide—50 grit.

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**ALL AT ONE LOW PRICE**



1" diameter saws on 1/2" Mandrels. For cutting wood, plastic, or soft metals. Order as usual. Send Check or Money Order.

**20 ABRASIVE ROLLS, \$1.00** Post-Paid



cloth, and 1/2" mandrel for grinding, sanding, deburring metal, plastic, wood or rubber. ONLY.

**4 GRINDING WHEELS WITH ARBOR \$1.75** Post-Paid



3 grits—fine, med., coarse. 2—4" gr. wheels; 1—3" gr. wheel; 1—1 1/2" gr. wheel, 1 arbor for above to fit 1/4" drill and all chucks. A \$4.50 value.

**HIGH SPEED DRILLS**

**7 High Speed Drills \$1.00** P.P.

15 Drills \$2.00 P.P.

7 Popular sizes—up to 1/4" Brand new. Set #10. Drills from 1/4" to 5/8" Dia. . . . \$1.95

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**10 Twist Drills** Brand New. From 1/4" to 1-1/64". High speed, and carbon steel. Set #18. Ppd. **\$10.95** Only . . . . .

**5 All New Drills** From 1/2" to 1-1/64". High speed, and carbon. Set #19. Ppd. **\$7.50** Only . . . . .

**12 Assorted Drills** High speed & carbon steel, from 1/8" to 1/2". Set #21. **\$3.60** Ppd.

**8 Assorted Drills** High speed & carbon steel, from 1/4" to 1-9/64". Set #22. Ppd. **\$9.50**

**Woodworkers' Drills \$2.00** P.P. U.S.A.



4 drills, from 5/16" to 1/2" with 1/4" shanks. Brand new, popular sizes. Set #14.

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For grinding on plastic, wood, soft and hard metals. Regular list value \$8.40.

**12 MTD. WHEELS ON 1/4" SHANK. . . . . \$3.60**

**18 MOUNTED POINTS ON 3/32" SHANK. . . . . \$2.50**

**ADAPTER CHUCK** With 2 interchangeable collets, opening from 3/32" to 0, on 1/2" mandrel. Price each only. **\$1.50** Post-Paid



**4 HIGH SPEED SLITTING SAWS ONLY \$2.95** Post-Paid



From 1 1/2" to 3" dia. 3/8" to 1" arbor hole. For cutting hard and soft metals, wood, or plastic. Any thickness. A regular \$8.00 value.

**112 PIECE ASSORTMENT FOR ELECTRIC GRINDER \$3.95** Post-Paid

\$10.00 VALUE — ONLY



Here's what you get! Mounted Stones on 1/2" mandrel, Drum Sander, Sanding Discs for sander, Rotary Cutters, Wire Scraper, Electric Brushes, Circular Saw Buffing Wheel, Grinding Wheel, Rubber Polishing Wheel, Cut-off Wheel, Rubber Cylinder-Mandrel to fit above tool, and! Sanding Discs, Sharpening Stone, etc.

**18 ROTARY CUTTERS \$5.85** Post-Paid

Value \$13.50



Assorted sizes cutter on 1/4" or 3/32" shank. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Guard new.

**12 MINIATURE CUTTERS \$1.00** Post-Paid



FOR CUTTING WOOD, PLASTIC, or METAL. Actual size. Aust. shape on 3/32" shank. For the makers, some workmen, etc.

**36 SHORT SHANK MINIATURE CUTTERS. . . . . \$1.00**

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LOWEST COST — HANDIEST STORAGE



**MODEL J-20 . . . . . \$7.95**

Useful in every shop, lab., home, office, etc. For Radio, T.V. or ignition work. KEEPS SMALL ITEMS HANDY. No other cabinet can compare in price, construction strength. "SEE-THRU" durable plastic drawers can't spill accidentally. Strong welded steel cabinet. Drawers 5 3/4" L x 2 3/4" W x 1-7/16" D divide into 2 or 3 LENGTHWISE or CROSSWISE compartments. Sent complete, postpaid. Money back if not satisfied within 10 days. Free catalog on other sizes.

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Now your car can sound off those exciting, dynamic tones — easily controlled mechanically from your dashboard. Channel your exhaust through special pipes or muffler without removing your original muffler. Easily installed. **MONEY BACK GUARANTEE.**

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F.O.B. Benton Harbor



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Send for full details and name of nearest dealer.

Dept. PM-14  
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**AUTOMATIC AIR COMPRESSOR**



1/2 H.P. heavy duty capacitor motor, 115-V, 60 Cy. AC. . . . . \$23.80  
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Furnas automatic adjustable pressure switch . . . . . \$6.50  
Tank #26, rubber tired wheels and handle . . . . . \$17.00  
Adjustable pressure regulator and gauge . . . . . \$6.00  
Moisture filter — \$3.25 V-belt drive \$2.75  
Hose and tire chuck \$2.50 • Safety valve . . . . . \$1.50  
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Small parts shipped parcel post prepaid at above prices.

Complete 1/2 HP unit assembled, ready to use—Plus Special FREE \$12.00 value Quart External Atomizing Spray Gun with every unit . . . . . \$33.00 **\$79.00 FOR CHICAGO**

Save \$10.00 — 1/2 HP outfit knocked down, you assemble, free spray gun, \$12.00 value. **\$69.00 FOR CHICAGO**

Same as above with larger 1/2 HP motor—free spray gun, knocked down unit **\$79.00**

1/2 H.P. **\$69.00** FREE \$12.00 QUART GUN

• SK-75 — 3/4 HP Motor 12x24 Stainless Steel Tank, wheels, all accessories, large 4 CFM compressor, free gun. . . . . \$123.50 FOR  
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**VOLUME BLOWERS FOR HEATING, VENTILATING, EXHAUSTING**

Blowers for forced drafts, heating boosters, exhausters, coolers, dryers and dust collectors, 110 volt A.C., 50/60 cycle motors.

\*75 CFM Blower, 3 inch wheel. . . . . \$10.75  
\*125 CFM Blower, 4 inch wheel. . . . . \$14.75  
\*200 CFM Blower, 4 1/2 inch wheel. . . . . \$19.50  
400 CFM Blower, 5 inch wheel. . . . . \$32.50  
600 CFM Blower, 6 inch wheel. . . . . \$38.50  
1000 CFM Blower, 8 inch wheel. . . . . \$52.00  
1500 CFM Blower, 9 inch wheel. . . . . \$72.00

\*These blowers with motors shipped Post Paid. Larger sizes are FOB.

Write for CIRCULAR: Listing Motors; ALL SIZES: Fans and Air Compressors — ALL SIZES.

**16 TO 1 SPEED REDUCERS**

For Dia. 1/2" Table — Barbecue Spits — Toy Auto Gear Box — Experimental Uses, Etc. Gears Enclosed in Aluminum Housing. Bronze Gear, Hardened Worm, Input Shaft 1/4 in. Output Shaft 3/8 in. Speed Reducer **\$5.95** Post Paid

#R 161. . . . .





**NEW SURPLUS WINCH HOIST**

Ideal for use in garages, machine shops, boat yards, farms, trucks, etc. Has 2500 lb. lift capacity through a 24 to 1 gear ratio. Has bronze worm gear drive. 18 feet of 7/16" high tensile strength steel cable. Originally made for use as Navy Bomb Hoist. **3250**

**SURPLUS 5 TON HOIST**

A real heavy duty hoist. Mfd. by the Seattle Chain & Rig. Co. Hand operated. Has 2 speeds - one for rapid lifting and one for heavy duty. Drum size is 8-3/8" wide x 5" dia. at center. Complete with hand brake and crank type handle. A \$100 Value **7350**



**CONTROL QUADRANT**

Kids love it to play "Space Man". Ideal for remote controls on boats, machinery, etc. Has four levers mounted in precision frame. One lever fitted with a ratchet type position lock. Another with a 7/16" curved gear rack with a pinion gear and knob for precise control. Originally used on aircraft. **195**

**4-WAY LAMP**

A handy lamp for desk, work bench, chart table, engine room, etc. May be used on 6 - 12 - 24 or 110 volt current by simply changing the bulb. Has 3 foot shaft with four movable joints to adjust light. **395**

**PROP PITCH MOTOR**

One of the best all-around heavy duty motors. Does the job of bigger, bulkier more expensive motors and you can operate it on as little as 15 Volts DC. Will handle rotation of heavy beam antenna, farm equipment, etc. Cold weather will not FREEZE it up. Rated at 2 HP but will develop tremendous power through a 10,000 to 1 gear reduction. Easily adapted to AC current by using any standard current converter. **1975**



**SAVE UP TO 85% ON WAR SURPLUS FROM WORLD FAMOUS 'GADGETEER'S' HEAVEN**

**SMISS PATTERNED NEEDLE FILES**  
Ideal for model makers, technicians, repairmen, etc. Here is a set of finest quality needle files. Made of the toughest file steel, specially hardened and accurately machined for precision filing. **349**

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Here at Palley's we carry the WORLD'S LARGEST supply of special Hydraulic Equipment. Our huge stocks of Hydraulic Cylinders alone feature over 20,000 units in 61 sizes and types. We also stock thousands of accessories such as Hydraulic Pumps, Transmissions, Valves, Tanks, Filings, Hose, etc.

**HYDRAULIC CYLINDERS**  
No. 29 - Double Action Cylinder Gives 20,000 lbs. lift with a 1500 PSI line pressure, or will give 40,000 lbs. thrust on an intermittent 3000 lb. line pressure. Has a 4" bore, 3-1/2" diameter piston shaft, 18 inch stroke, 30-1/2" length. Ideal for presses, road, farm and shop equip. Cost Gov't \$390. **2995**

No. 3 - Double Action Cylinder - Bore is 1", Shaft 1/2". Stroke adjustable from 2-1/2" to 4" with internal sleeve stops. Length overall 8-1/2". Will raise 1500 lbs. continuous - 3000 lbs. intermittent. Will lift or push up to 1500 pounds. **575**

No. 66 - Double Action Cylinder. Bore 2-1/4", Shaft 1", Stroke 4-1/2". Length 13-1/4". L.Hrs 4000 lbs. with 1500 lbs. pressure. **1150**

No. 53 - Double Action Cylinder. Bore is 2-3/8", shaft 1 1/2", stroke 1 1/2", length 26". Gives 6643 lbs. lift with 1500 lbs. line pressure. **2050**

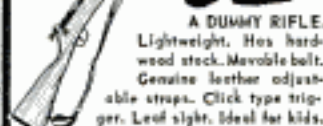
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Has operating pressure of 2000 PSI. Capacity of 3.5 cu. inches per complete cycle. Our special price ONLY. **1275**

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A DUMMY RIFLE. Lightweight. Has hardwood stock. Movable bolt. Genuine leather adjustable straps. Click type trigger. Leaf sight. Ideal for kids.



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Capacity, 11GPM at 1500 RPM or 1500 PSI. Pressure limit is 1500 PSI continuous, with intermittent maximum of 1875 PSI for 15 seconds. Normal operating speed is 3750 RPM with an intermittent maximum speed of 4500 RPM. Rotates right-hand only. **Now 895**



**NEW! PUMP FOOT MOUNT**  
Contains 2 first-line, high speed bearings. Mount plate has 4 holes - 2" from the center to center. Has spline shaft one side, key slotted 1/2" shaft on other side. **1050**

**Large Base FOOT MOUNT** - For a pump up to 10 HP. Four mount holes are 3-1/2", center to center. Shaft is 3/4" dia., slotted. **1495**

**VICKERS HYDRAULIC TRANSMISSION**  
Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies piston hydraulic motor. Has 2 H.P. Automatic pressure dash pot for smooth control. Power output RPM - 0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Dupli-licator setup on Mills, Conveyors, Small Cars, Drives, etc. **4250**

**4" SPLINE SHAFTS** for input and power take-off on above. Pair \$2.50

**INPUT & TAKE-OFF PLATE ASSEM.** To adapt Trans. to pulley drive. Has 1/2" keyway shaft. 2 first-line, shielded high speed bearings in each unit. Per Set - **\$20.00**

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A Jumbo Surprise Package containing control, coils, switches, wire and a variety of other valuable radio and electronic devices. A BARGAIN BUY! **225**

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For tuning beam antenna. Powered by 1/8 HP, 24V, GE motor, engaged to gear reduction only when electrical contact is made. Operated in either direction. Ideal for auxiliary power take-off. 150 RPM at take-off. Used for opening & closing doors, etc. A tremendous value. **NEW 875**

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Genuine USAF type T-30. Gives distinct voice reproduction for aircraft or amateur radio broadcasting. Consists of two microphones, mounted on rubber neoprene elastic neck band. Operates between 100 & 300 ohms. **139**

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The new model J5A with ball type, flame-proof metal key. perfectly balanced to permit positive contact with minimum effort. An ideal adjustment for "ham" or professional use. A BUY at... **NEW 189**

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Used by the Navy for flight deck and gunnery control. An ideal emergency communication system because they require no power supply. Perfect for office-to-shop house-to-garage or barn, or any point-to-point within 1/2 mile radius. These sets are fully sound powered. A set includes 2 phones on chest plate, two headsets, button switches, 35' of cable. **995**

**DC METERS VOLTMETERS**  
0-30 0-240 30-0-30  
0-60 0-480 50-0-50  
0-120 0-300 40-0-60  
120-0-120  
**495 EACH**

All Voltmeters & Ammeters are NEW and have 2" face (except 0-300 which is Used and has 3" face) Manufactured by Westinghouse, G.E., & Weston.

NOTE: External SHUNTS are required on DC AMMETERS.  
SHUNTS - with meter . . . \$1.35  
SHUNTS - without meter . . . \$1.65

**NEW AMMETER 0-30 ONLY 495 EA.**

**UNIVERSAL JOINT**  
Rotates with full flexibility from 90 to 180 degree angle. Body is solid bronze. Drive shaft is 29/32" dia. steel. Joint is Ball and Socket type. Ideal for use on boats and heavy machinery. **595**

**RIGHT ANGLE DRIVE**  
Has direct 1 to 1 ratio through 90° level gears. Drive & take-off shafts are 3/8" diameter. Gears are self-lubricating hi-speed steel. Ideal for use on power tools, flex drives, etc. Size 3/16" x 25/16" 1/4". Many other types Gear Boxes and flexible Drive Shafts in stock. See Catalog! **225**

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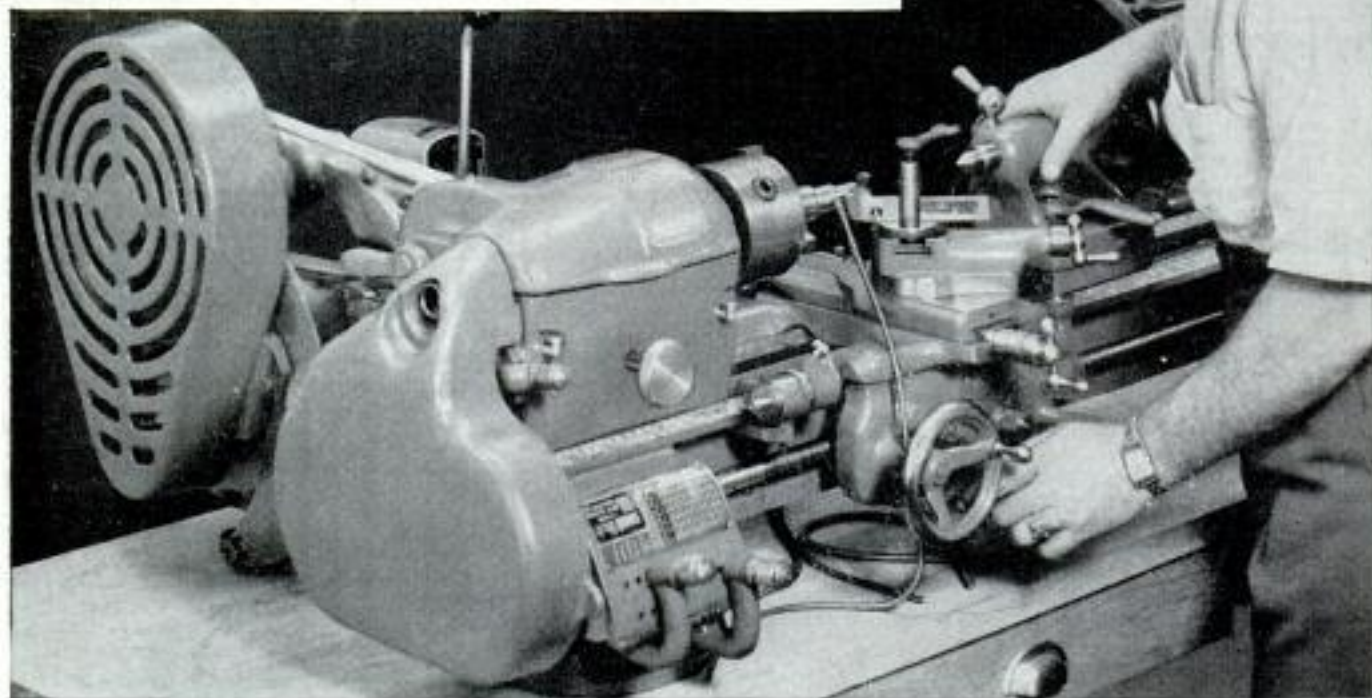
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When? How?

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

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BENCH LATHES

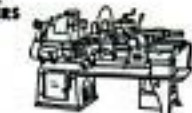


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TURRET LATHES



7"  
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Street \_\_\_\_\_ City & State \_\_\_\_\_



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# We'll **train** & establish you in Your Own Business ... even if now employed

We are enlarging this 24-year-old world-wide chain of Duraclean dealerships. Many excellent locations are still available in the U.S.A., Canada, and other countries. If you are reliable and diligent, this is an opportunity to increase your income... and have the freedom, financial independence, and prestige of YOUR OWN business.

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No shop needed

Machine becomes carrying case

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24 Years of Proven Success

**DURACLEAN** cleans by absorption. It eliminates scrubbing... soaking... shrinkage. Aerated foam, created by electric Foamovator, restores the natural lubrication of wool and other animal fibers in rugs and upholstery. Dirt, grease and many unsightly spots vanish. Fabrics and floor coverings are cleaned with a new consideration for their life and beauty.

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**DURAPROOF** is another year-round service rendered in the home, office or institution — without removing furnishings. It protects upholstery, rugs, furs, clothing and auto interiors against damage by moths and carpet beetles. U. S. Government says "Moths are present in practically every household... No section of country seems free from such infestations." **DURAPROOF** kills moths and carpet beetles... it makes materials non-eatable to both. **DURAPROOF** is the ONLY moth-proof service backed by an International Money Back, 4-Year Warranty.



## Easy to Learn • No Overhead Expense

### Permanent, Growing Market

Service is rendered IN homes, offices, hotels, theaters, institutions and to revive used-car upholstery for auto dealers. There is need for these services in almost every building. Duraclean dealers operate from their home, an office or shop, as they prefer. It's easy to learn... we quickly train you. Rendering service yourself, at first, prepares you to train and supervise service men.

### Repeat and Voluntary Orders

Demonstrations win new customers. **DURACLEAN** Dealers find REPEAT and VOLUNTARY orders a major source of income. Customers, enthused with results, tell friends and neighbors. Furniture and department stores and others turn over rug and upholstery cleaning and mothproofing to **DURACLEAN** Dealers. We show you 27 ways to get new customers.

### Two-Way Profit

You enjoy big profits on BOTH materials and labor — after paying service men and salesmen. This is a year-round large-profit business. You have the cooperation of a 24 YEAR OLD organization interested in your success. If you want to become the owner of a **DURACLEAN** Service business, you should inquire now. TODAY, while territory is still available.

### What Dealers Say

- W. Looklebill: We've had 20 years of pleasant dealings. I'm 65 but am setting my sights for 20 more years.  
Gerald Merriman: \$700 cleaning... only 13 working days.  
P. D. Freidinger: 70% of our business is repeat.  
A. Ullman: Every demonstration has been a sale.  
Ellsworth: Your advertising certainly has paid dividends.  
M. Lassanske: My original investment was returned in about two months. I am not sorry in any way that I started my business 'on a shoe string.'  
R. Kimbrough: Finished First White House of Confederacy and am to Duraclean the Governor's Mansion.  
Margaret Turner: Took in \$106 in 15 or 18 hours.  
L. Johnson: Each customer leads to 3 or 4 more.  
T. Komori: We have 1,000,000 yen contract Duracleaning for U. S. Army in Japan.

### EASY TERMS

A moderate payment establishes your own business—pay balance from sales. We furnish electric machines, folders, store cards, introduction slips, sales book, demonstrators and enough material to return your TOTAL investment. Your business can be operating in a few days. Mail coupon today! No obligation.

**Duraclean Co.** 4-161 Duraclean Bldg., DEERFIELD, ILLINOIS

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Your services are Nationally Advertised in Life, McCall's, Better Homes & Gardens, Ladies Home Journal, House & Garden, Maclean's (Canada's largest magazine), etc. See full-column ad in Jan. McCall's on newsstands Dec. 23.

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Our first letter and illustrated booklet will explain everything—the two modern, urgently needed services, waiting market, how business grows, your large profit, easy terms and PROTECTED territory. Send Coupon TODAY!

## "OWN a Business" Coupon

**DURACLEAN CO., 4-161 Duraclean Bldg., Deerfield, Illinois**

With no obligation to me, send booklet and letter giving full details. Tell me how I may OWN a growing business of my own built upon satisfied customers.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



Bed bumpy?



Oatmeal lumpy?



Wife grumpy?



Nerves Jumpy?



Climb into your

**REO**

and relax!

Step in through that almost yard-wide door (a full 30"), spread yourself on that comfortably cushioned seat (foam rubber in all tractor models)...for steering without peering, check that new-angle steering wheel, the new positive-power 103° arc electric windshield wiper...and not only that—lend an ear to the potent purr of that perfect power plant...that GO upgrade...run your rig through traffic like a swivel-hipped halfback on the loose...And all the while you're relaxing in that comfortable REO cab, cozy as a caliph after curfew.

**REO MOTORS, INC.,** Lansing 20, Michigan

Manufacturer of Commercial & Military Trucks • Buses • Power Lawn Mowers  
Children's Wheel Goods & Play Ground Equipment • Inboard Engine Kits  
for Small Boats • Replacement Engines for Trucks • Industrial Engines



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