

NOVEMBER 1955

35 CENTS

# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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*Felix Polm*

**The New Continental—Page 81**

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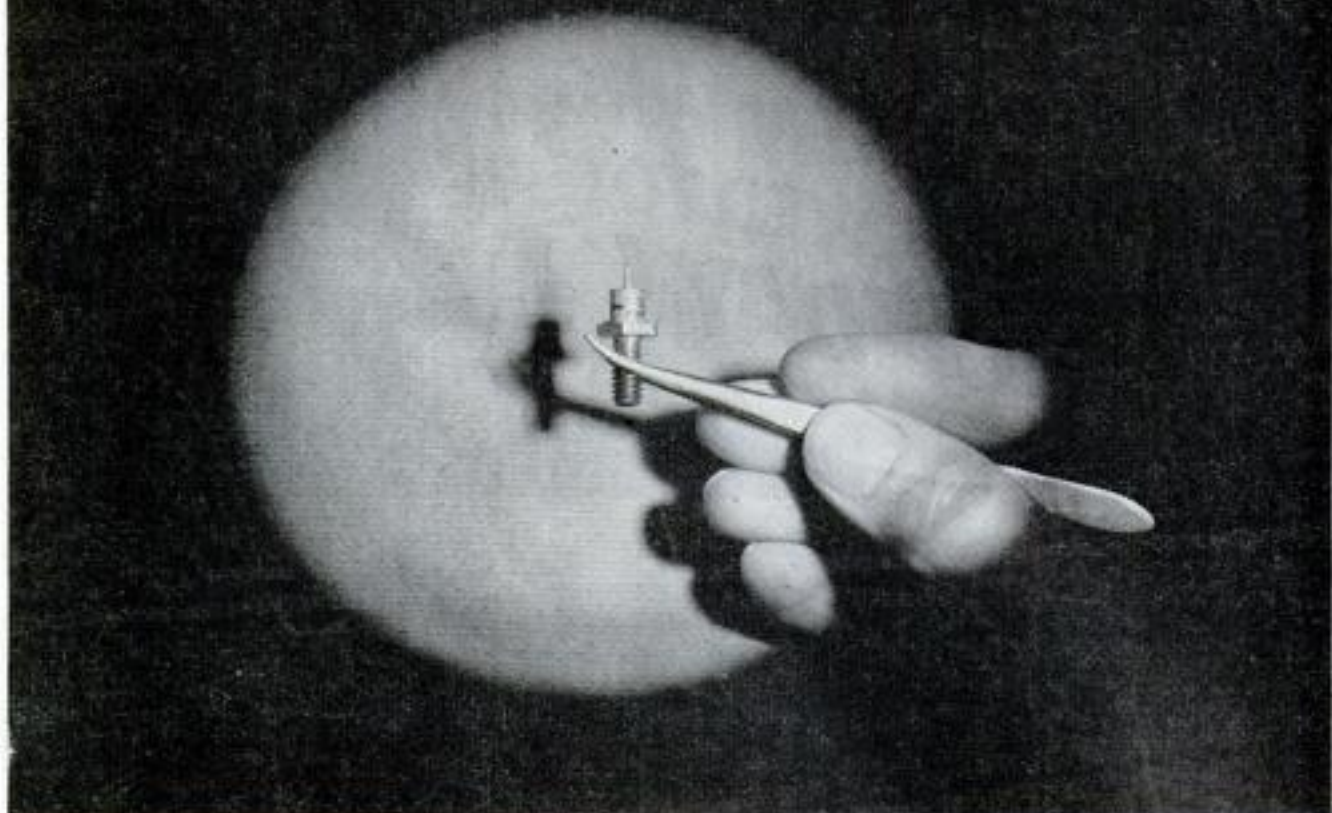
PM-11

**This One**



XXLL-F92-96Z8

# A GIANT FOR ITS SIZE!



## Telephone science produces an important new rectifier

At Bell Laboratories one line of research is often fruitful in many fields. Latest example is the silicon power rectifier shown above.

Product of original work with semi-conductors—which earlier created the transistor and the Bell Solar Battery—the new rectifier greatly reduces the size of equipment needed to produce large direct currents. It is much smaller than a tube rectifier of equal performance and it does not require the bulky cooling equipment of other metallic rectifiers.

In the Bell System the new rectifier will supply direct current more economically for telephone calls. It can also be adapted to important uses in television, computers, industrial machines, and military equipment. Thus, Bell Telephone Laboratories research continues to improve telephony—while it helps other fields vital to the nation.

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Above, new rectifier (held in pliers) is contrasted with comparable tube rectifier and its filament transformer, rear. Mounted on a cooling plate, lower center, the new rectifier can easily supply 10 amperes of direct current at 100 volts, that is, 1000 watts—enough to power 350 telephones.

# Popular Mechanics Magazine

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H. H. WINDSOR, Founder

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



## Next Month

Full of adventure, Jacques Cornet and Henri Lochon sat in Paris and dreamed of driving down the Pan American Highway, from the United States to Tierra del Fuego, at the tip of South America. The dream progressed into a plan, and soon, in a tiny two-cylinder Citroën, they chugged out of Quebec. Then ugly rumors began to reach them. There was a Pan American Highway, but it came to an abrupt halt at the border of Guatemala. Beyond that there were jungles, swamps, trails and trouble. Since they had come this far, they didn't want to turn around and so the trip continued. It turned out to be one of the most daring and exciting automobile trips in history. They eventually reached the bottom of South America, and then began the return trip to Paris, through more fabulous and difficult lands such as the Sahara desert. Their trip, illustrated with color photographs, is in the December issue

Information not listed on articles in the index, starting on page 74, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; Wm. Harrison Petridge, exec. vice-pres.; D. F. Windsor, vice-president and secretary-treasurer; H. H. Windsor III, vice-president; W. T. Windsor, vice-president; Clover L. Perkins, advertising manager; Alan M. Devoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in the United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year \$3.00; 2 years, \$4.00; 3 years, \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both your old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Registered by Second Class Matter at the Post Office at Mexico, D. F., Mexico, June 20, 1950. Copyright 1955 by Popular Mechanics Company. Copyright under International Copyright Union. Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

Volume 104 NOVEMBER 1955 Number 5

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for other items and manufacturers of available products

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## ACROSS THE DESK



### "Crusette," Brazilian Style

I am sending you two photos of my recently completed version of "Crusette," described in your May 1954 edition. No difficulty was experienced in construction and the performance is all that can be desired.

I had great difficulty in obtaining a suitable plywood out here in Brazil, and am not too happy about the quality finally used, so made a small modification which may be of interest to your readers, as it can apply to any plywood-sheeted boat. After fitting



the plywood sheeting as shown in the drawings, I fitted a closing strip of thin aluminum sheeting well painted with red-lead paint, before fixing the half rounds. The aluminum is secured with small brass brads spaced about every half inch. This aluminum sheet definitely seals the edge of the plywood sheet and eliminates water getting between the plies, and also any tendency for splitting of the top ply is avoided.

As you can see from the photo, I have made a trailer to pull the boat behind my Model-A Ford.

Anthony R. Gill,  
c/o Dunlop do Brasil, S.A.,  
Caixa Postale 490,  
Campinas, Brasil.

(Continued to page 8)



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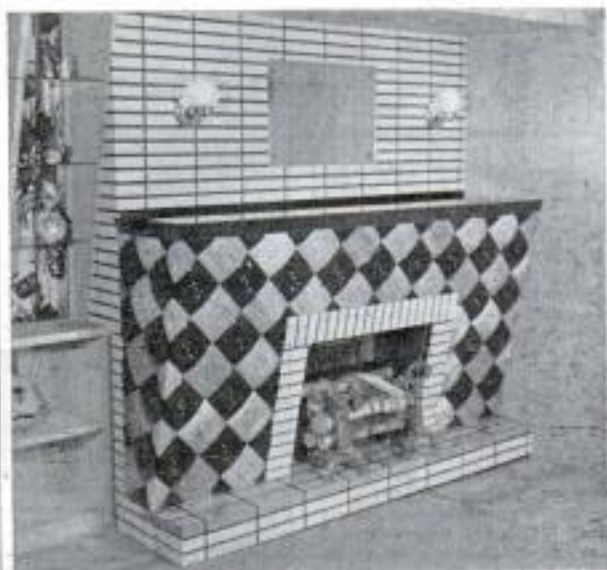
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(Continued from page 6)

### To the Editor:

Enclosed is a snapshot of a fireplace I have constructed in a rumpus room. It is made of 104 mahogany and maple squares six inches by six inches which I have spun



on a lathe. The fireplace was six feet by four feet. Roman brick above is also artificial, made of scraps of wood toned yellow. The fireplace took me about four months to build, spare time.

Jim Jackson,  
Edmonton, Alta., Can.

### To the Editor:

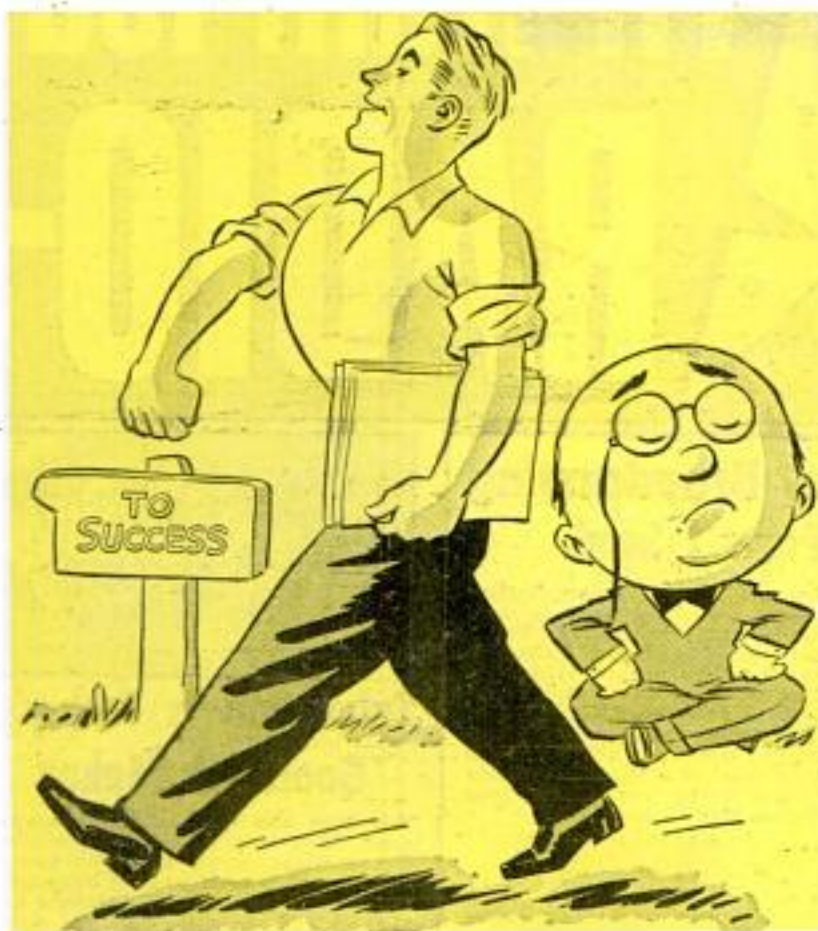
Due to many letters I have received from the article "Art of Carpentry Taught by Kits" having a bearing on my work in the



January 1955 issue of *Popular Mechanics*, I would like to explain just what my Minimalistic Construction (Beginner Carpentry) Kit embraces and how these kits may be obtained.

Any school having an industrial-arts  
(Continued to page 14)

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Technician</li> <li><input type="checkbox"/> Auto-Engine Tune Up</li> <li><input type="checkbox"/> Automobile</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 &amp; Engine Mechanic</li> </ul> <p><b>BUSINESS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Advertising</li> <li><input type="checkbox"/> Bookkeeping and Accounting</li> <li><input type="checkbox"/> Business Administration</li> <li><input type="checkbox"/> Business Correspondence</li> <li><input type="checkbox"/> Public Accounting</li> <li><input type="checkbox"/> Creative Salesmanship</li> <li><input type="checkbox"/> Federal Tax</li> <li><input type="checkbox"/> Letter-writing Improvement</li> <li><input type="checkbox"/> Office Management</li> <li><input type="checkbox"/> Professional Secretary</li> <li><input type="checkbox"/> Retail Business Management</li> <li><input type="checkbox"/> Sales Management</li> <li><input type="checkbox"/> Stenographic-Secretarial</li> <li><input type="checkbox"/> Traffic Management</li> </ul> <p><b>CHEMISTRY</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Analytical Chemistry</li> <li><input type="checkbox"/> Chemical Engineering</li> <li><input type="checkbox"/> Chem. Lab. Technician</li> <li><input type="checkbox"/> General Chemistry</li> <li><input type="checkbox"/> Natural Gas Prod. &amp; Trans.</li> <li><input type="checkbox"/> Petroleum Engineering</li> <li><input type="checkbox"/> Plastics</li> <li><input type="checkbox"/> Pulp and Paper Making</li> </ul> | <p><b>CIVIL, STRUCTURAL ENGINEERING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Civil Engineering</li> <li><input type="checkbox"/> Construction Engineering</li> <li><input type="checkbox"/> Highway Engineering</li> <li><input type="checkbox"/> Reading Struct. Blueprints</li> <li><input type="checkbox"/> Sanitary Engineering</li> <li><input type="checkbox"/> Structural Engineering</li> <li><input type="checkbox"/> Surveying and Mapping</li> </ul> <p><b>DRAFTING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aircraft Drafting</li> <li><input type="checkbox"/> Architectural Drafting</li> <li><input type="checkbox"/> Electrical Drafting</li> <li><input type="checkbox"/> Mechanical Drafting</li> <li><input type="checkbox"/> Mine Surveying and Mapping</li> <li><input type="checkbox"/> Plumbing Drawing and Estimating</li> <li><input type="checkbox"/> Structural Drafting</li> </ul> <p><b>ELECTRICAL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Electrical Engineering</li> <li><input type="checkbox"/> Electrical Maintenance</li> <li><input type="checkbox"/> Electrician</li> <li><input type="checkbox"/> Contracting</li> <li><input type="checkbox"/> Lineman</li> </ul> <p><b>HIGH SCHOOL</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Commercial</li> <li><input type="checkbox"/> Good English</li> <li><input type="checkbox"/> High School Subjects</li> <li><input type="checkbox"/> Mathematics</li> </ul> | <p><b>LEADERSHIP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Foremanship</li> <li><input type="checkbox"/> Industrial Supervision</li> <li><input type="checkbox"/> Leadership and Organization</li> <li><input type="checkbox"/> Personnel-Labor Relations</li> </ul> <p><b>MECHANICAL AND SHOP</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Gas—Electric Welding</li> <li><input type="checkbox"/> Heat Treatment</li> <li><input type="checkbox"/> Metallurgy</li> <li><input type="checkbox"/> Industrial Engineering</li> <li><input type="checkbox"/> Industrial Instrumentation</li> <li><input type="checkbox"/> Industrial Supervision</li> <li><input type="checkbox"/> Internal Combustion Engines</li> <li><input type="checkbox"/> Machine Design-Drafting</li> <li><input type="checkbox"/> Machine Shop Inspection</li> <li><input type="checkbox"/> Machine Shop Practice</li> <li><input type="checkbox"/> Mechanical Engineering</li> <li><input type="checkbox"/> Quality Control</li> <li><input type="checkbox"/> Reading Shop Blueprints</li> <li><input type="checkbox"/> Refrigeration</li> <li><input type="checkbox"/> Sheet Metal Worker</li> <li><input type="checkbox"/> Tool Design</li> <li><input type="checkbox"/> Toolmaking</li> </ul> <p><b>RADIO, TELEVISION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Industrial Electronics</li> <li><input type="checkbox"/> Practical Radio TV Eng'g</li> <li><input type="checkbox"/> Radio and TV Servicing</li> <li><input type="checkbox"/> Radio Operating</li> </ul> | <ul style="list-style-type: none"> <li><input type="checkbox"/> Television Technician</li> </ul> <p><b>RAILROAD</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Air Brakes</li> <li><input type="checkbox"/> Car Inspector</li> <li><input type="checkbox"/> Diesel Locomotive</li> <li><input type="checkbox"/> Locomotive Engineer</li> <li><input type="checkbox"/> Section Foreman</li> </ul> <p><b>STEAM AND DIESEL POWER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Combustion Engineering</li> <li><input type="checkbox"/> Diesel—Elec.</li> <li><input type="checkbox"/> Diesel Eng's</li> <li><input type="checkbox"/> Electric Light and Power</li> <li><input type="checkbox"/> Stationary Fireman</li> <li><input type="checkbox"/> Stationary Steam Engineering</li> </ul> <p><b>TEXTILE</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Carding and Spinning</li> <li><input type="checkbox"/> Cotton, Rayon, Woolen Mfg.</li> <li><input type="checkbox"/> Finishing and Dyeing</li> <li><input type="checkbox"/> Loom Fix'g</li> <li><input type="checkbox"/> Textile Des'ing</li> <li><input type="checkbox"/> Textile Eng'g</li> <li><input type="checkbox"/> Throwing</li> <li><input type="checkbox"/> Warping and Weaving</li> </ul> <p><b>MISCELLANEOUS</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Domestic Refrigeration</li> <li><input type="checkbox"/> Marine Engineering</li> <li><input type="checkbox"/> Ocean Navigation</li> <li><input type="checkbox"/> Professional Engineering</li> <li><input type="checkbox"/> Short Story Writing</li> <li><input type="checkbox"/> Telephony</li> </ul> |
|--|---|--|--|--|

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.

## 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.

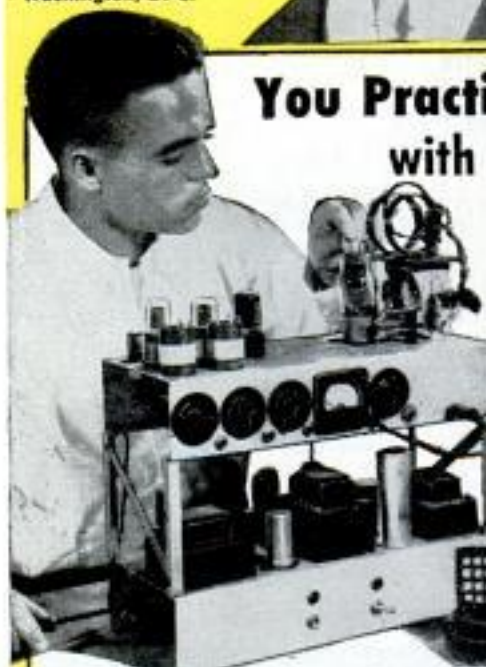
*J. E. Smith*

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



Thanks  
NRI for  
Wonderful  
Start

"Right now I am doing spare-time repairs on radios and television. In the near future I intend to go into full-time servicing."—C. Higgins, Waltham, Mass.



Switched  
from Studio  
Work to  
Service

"I 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  
Before  
Graduation

"By the time I graduated I had paid for my course, a car and testing equipment. Can service toughest jobs."—E. J. Streitberger, 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. 5MA, National Radio Institute, Washington 9, D. C. Our 40th Year.

## Actual Lesson and 64-page Book

**BOTH FREE**

The ABC's of SERVICING

How to Be a Success in RADIO-TELEVISION



Chief Engineer with Station

"I received my License and worked on ships. Am Chief Engineer at WARA, Alliboro, Mass. I am grateful to NRI for preparing me for this position."—R. D. Arnold, Rumford, R. I.

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MR. J. E. SMITH, President, Dept. 5MA  
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.....

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# 49½c STORM WINDOW

## protects your family all winter!

### New Trans-Kleer Storm Window Goes on In 5 Minutes Without Tools, Hooks, Screws or Nails

10.8 Sq. Ft. Window Costs only 49½c

NOW... Storm Windows need not cost you up to \$14.00 apiece. American industry has developed a lightweight flexible product that enables you to seal out wintry blasts for only 49½c a window! Imagine it! For pennies per window you can insulate EVERY ROOM in your home! This new material was developed by the Gary plant of a billion-dollar American manufacturing firm—for use by the U. S. Government during the last war. It looks like glass, yet can't peel off, never chips, shatters or rattles. Actually flexible like rubber. Has a tensile strength of over one ton per square inch. Crystal clear, not milky or yellowish like some plastic materials. Weighs less than 1/10th of the lightest glass windows ever developed. Even a large window comes to less than 8 oz. Not affected by snow, sleet, rain or dampness—because it's 100% waterproof. Won't crack even at 53 degrees BELOW FREEZING! Use and re-use it YEAR AFTER YEAR for winter comfort and protection.

### Sensational Discovery Used By Army To Fight Cold

One of the big problems of the last war was how to defend our troops and protect equipment against the ravages of Arctic winters. One of the world's greatest manufacturing companies was ordered to build a special plant and soon millions of yards of this new material was moving out to Alaska, the Aleutians, Iceland and Greenland. Finally, it was released to the public and ever since the demand has been greater than the supply! The Gary plant of famous REYNOLDS METALS COMPANY is working round-the-clock trying to supply it!

### Use Year After Year — No Upkeep Cost!

At winter's end just fold away your Trans-Kleer like cloth for use next year. You can air the room anytime, too—lift the Adheso border to let in fresh air, then press back and it's sealed tight again! Cleans easily with a damp rag. It's no wonder so many home owners, hospitals, churches and public buildings use this tried and tested REYNOLDS product! TRANS-KLEER comes in kits 36 inches by 432 inches and costs you only \$4.95 complete with Adheso border! That is enough for 10 windows—each measuring 10.8 sq. ft.—just 49½c each! In all you receive 108 SQUARE FEET for only \$4.95! Good GLASS storm windows cost from \$7.95 to \$16.00—for ten you'd have to pay \$79 to \$160.00. With this remarkable REYNOLDS product you not only save a terrific amount in the purchase price, you also cut down enormously on your fuel bills!

### Install Trans-Kleer Windows in 5 Minutes

Trans-Kleer storm windows require no nails, hooks, screws or tools. No back-breaking toil or broken glass to contend with. Cut off required amount, trim to fit the inside of your window, large or small, square, round, rectangular—it makes no difference! Then press on the special Adheso border supplied and your storm window is firmly in place. Simple, easy—a child can install them!

### Test in Your Home AT OUR RISK!

Here's your chance to get Trans-Kleer on a HOME TRIAL BASIS. You can't lose a single penny. Mail the coupon below and a 36 by 432-inch kit—108 SQUARE FEET—will be shipped you immediately, complete with Adheso border. Deposit only \$4.95 plus postage with the mailman. Try TWO windows inside any room. Test them—see for yourself how they seal out drafts. Compare the temperature—any 25c thermometer will do—compare with any other room in your home. See the difference—feel the difference! Then if you're not convinced they're every bit as effective as any storm window—why, just keep the TWO windows and return the balance and get your \$4.95 back at once!



### Just Lift Up For Airing

Trans-Kleer goes on quickly inside the window. To ventilate just lift the Adheso border. You may then open the storm window as much as you wish. Press back and you have perfect sealed-in insulation again. (See picture.) The special Adheso borders supplied with the Trans-Kleer windows will not lose their adhesiveness even if you air the



### STRETCHES WITHOUT BREAKING!

rooms daily. They seal the Trans-Kleer to the frame snugly, tightly.

### Avoid Disappointment — Order Now!

Millions of folks in the U. S. and Canada are reading this same ad in hundreds of magazines and newspapers. Despite enormous production facilities, the REYNOLDS ALUMINUM people can turn out so much and so more! Don't wait until it's too late! Play safe! Rush the coupon NOW! If you wish to save postage cost, send check, cash or m.o. for \$4.95 and the windows will be shipped postage free.

### THORESEN'S, Dept. 6-M-47

352 Fourth Ave. New York 10, N. Y.

CANADIANS: Same price! Same guarantee! Order from our Canadian Subsidiary: THORESEN LTD., 45 St. James St., West, Dept. US-47, Montreal 1, Que.

### RUSH FOR FREE HOME TRIAL!

THORESEN'S, Dept. 6-M-47  
352 Fourth Ave., New York 10, N. Y.

RUSH \_\_\_\_\_ kits of Trans-Kleer measuring 108 sq. ft. each, enough for 10 windows averaging 10.8 sq. ft. each. Include improved Adheso Sealing Border and easy picture instructions at no extra cost. I will try 2 windows and if I'm not satisfied for any reason, I'll return the remainder within one week for FULL REFUND of my money. I will keep the 2 windows free.

Payment enclosed. Send Prepaid.

Send C.O.D. plus postage.

#### CHECK AMOUNT DESIRED

1 KIT (108 sq. ft.) for 10 windows—4.95  2 KITS (216 sq. ft.) for 20 windows—8.95

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

# INVENTORS

Learn 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.

---

## CLARENCE A. O'BRIEN & HARVEY JACOBSON

*Registered Patent Attorneys*

51-L DISTRICT NATIONAL BUILDING

WASHINGTON 5, D. C.

(Continued from page 8)

shop or equal, an instructor competent to teach carpentry and a class of 8th, 9th and junior high or beginners in advanced carpentry, the purchase order of such school will be honored up to one complete Minimal Construction (Beginner Carpentry) Kit for each such student so enrolled.

This is with the understanding that these kits must not be constructed by others than such students.

O. G. Hughson,  
State Building Congress,  
515 Henry Building,  
Portland 4, Ore.

#### To the Editor:

An ardent reader of your splendid magazine and a registered Illinois barber, I am enclosing a picture of a scale-model steam-type locomotive, which I have made for my little grandson. This locomotive took two years of spare-time work to construct.

The track is  $6\frac{1}{2}$  inches between the rails for this model is  $1\frac{1}{2}$  inches to the foot. It stands three feet high and with its tender is about five feet in length. It is made of steel and is ball-bearing. With its  $\frac{1}{3}$ -horsepower motor run by a covered third rail it weighs 100 pounds. 110 a.c. supplies the



motive power on a 150-foot track of scale-size iron rail.

Thought you might be interested in one of your reader's handicraft work.

Wm. V. Harmeling,  
Chicago, Ill.

☆ ☆ ☆

EDITOR'S NOTE: Since the story of the whooping crane (page 142) went to press we have word from Mr. Dickie that 17 cranes—6 young and 11 adults—have been sighted this year in their Canadian nesting grounds. The discovery aroused fresh hope that the big bird, once believed nearing extinction, is now making a comeback.

## New greaseless way to keep your hair neat all day



Prevents dry, unruly  
"musk-ox hair"

New Vitalis keeps hair in place and prevents dryness with V-7, the greaseless grooming discovery.

You never have an overslick, plastered-down look. Try it. You'll like it.



ANOTHER FINE PRODUCT  
OF BRISTOL-MYERS

## New VITALIS® Hair Tonic with V-7®



Train in Big  
**COYNE**  
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Instructor helping students check the wiring and trace the circuits of television receivers.



Instructor explaining operation and testing of a large Motor Generator.

This big fire-proof building is occupied entirely by Coyne.

## YOUNG MEN AND OLDER MEN — PREPARE FOR A CAREER WITH A FUTURE!

Conditions are changing. Many "one operation" jobs will not last. Don't be satisfied with a "no future" job. Whether 17 or up to 45 years of age, train the Coyne way for a better job and a real future in **ELECTRICITY** or **TELEVISION-RADIO**, fields that offer a world of opportunities.

## TELEVISION-RADIO      ELECTRICITY

Here at Coyne you're trained for Television, Testing, Trouble-Shooting on Radio, Public Address, F. M., Sound Units, etc. Many Coyne trained men in good jobs or own well paying Television-Radio businesses of their own.

Big future in Power Plant Work, Motors, Industrial Electronics, Armature Winding, Home and Factory Wiring, Appliances, Refrigeration, Maintenance, Illumination, etc. Lifetime job service to Coyne graduates.

### WE TRAIN YOU IN CHICAGO

Our famous Practical-Technical method gives you practical experience on a massive outlay of equipment. Actual shop work plus necessary technical training. You are trained right here in the great Coyne shops. Send for **BIG FREE BOOK**.

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FOR  
VETERANS**

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Enroll now, pay most of tuition after graduation. Special plan for men of draft age. We'll help you get part-time work, if you need it to help pay living costs while at Coyne.

B. W. COOKE, President

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500 S. PAULINA STREET, CHICAGO, Dept. 85-72H  
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B. W. Cooke, President  
COYNE ELECTRICAL SCHOOL 500 S. Paulina  
Dept. 85-72H, Chicago 12, Ill.

Send me your Big Free book. I am interested in field checked below. This does not obligate me.

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NAME.....

ADDRESS.....

CITY.....STATE.....



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# Learn Electric Appliance Repair

**AT HOME IN SPARE TIME**

**B**uild a better future. Get into a field where there is important work and the security that comes from knowing a good trade. The electrical appliance repair business offers OPPORTUNITY FOR YOU. Every wired home today has an average of 8 electrical appliances. Up to 10 million new appliances are sold every year. Owners pay well to keep them in repair and enjoy the convenience they provide. That means there's a fast growing need for trained men.

## Opportunities Increasing For Men Who Know This Profitable Trade

You may want to be your own boss so you can enjoy the profits of your business. Or you may want to qualify for the better job of Service Manager or Supervisor in an Appliance Servicer. Or perhaps you want to supplement your income doing electrical appliance repairs in your spare time. Opportunity in this growing field is great. Send for free book and see what the Electrical Appliance field offers you!

## Pick up \$3, \$4, \$5 an Hour in Spare Time Starting Soon

Start soon to fix electric toasters, clocks, fans, vacuum cleaners, etc. for neighbors and friends. Spare time work done in your basement, garage, or spare room can earn you \$3 to \$5 an hour. See how easy it is to increase your earning power—how you can pay for this training many times over with spare time earnings.

## Learn and Earn With This Appliance Tester You Get

This course includes the parts to build this sturdy portable appliance tester that helps you find electrical defects quickly and easily. You use it to learn and do actual electrical and appliance repair jobs. This multi-use tester helps you start making money soon after your training starts.



## ACT NOW! Get Free Book And Sample Lesson

Actual lesson proves our method is clear, practical. Book gives facts about Electric Appliance opportunities and details of our training. Act now to make your future more secure.

## Train Now for Greater Security Low Price—Easy Terms

Today's automatic electrical appliances need expert servicing. The man who knows a good trade like appliance repair has a secure future. Put your spare time to good use. Invest \$2.50 down and \$5.00 a month in a better future. Write Electrical Appliance Training, National Radio Institute, Dept. AM5, Washington 9, D. C.

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Please send me Electrical Appliance Training Lesson and Book Free. (No salesman will call.)

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Address \_\_\_\_\_

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APPROVED MEMBER NATIONAL HOME STUDY COUNCIL

# INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

*Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.*

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*Registered Patent Attorneys*

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135-M VICTOR BUILDING, WASHINGTON 1, D. C.

## WHAT SECRET POWER DID THIS MAN POSSESS?



**BENJAMIN FRANKLIN**  
(A Rosicrucian)

**WHY** was this man great? How does anyone—man or woman—achieve greatness? Is it not by mastery of the powers within ourselves? Know the mysterious world within you! Attune yourself to the wisdom of the ages! Grasp the inner power of your mind! Learn the secrets of a full and peaceful life!

Benjamin Franklin—like many other learned and great men and women—was a Rosicrucian. The Rosicrucians (NOT a religious organization) first came to America in 1694. Today, headquarters of the Rosicrucians send over seven million pieces of mail annually to all parts of the world. Write for YOUR **FREE COPY** of "The Mastery of Life"—TODAY. No obligation. No salesmen. A non-profit organization. Address: Scribe P.C.G.

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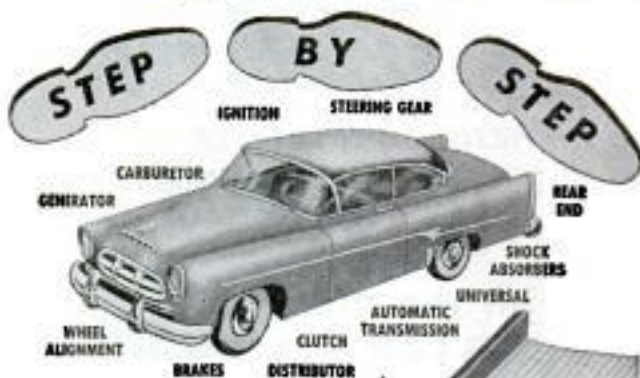
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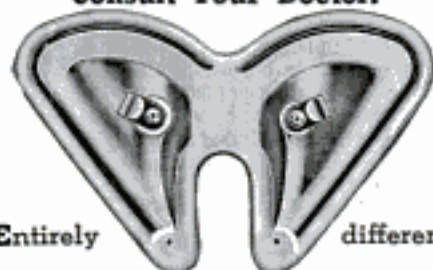
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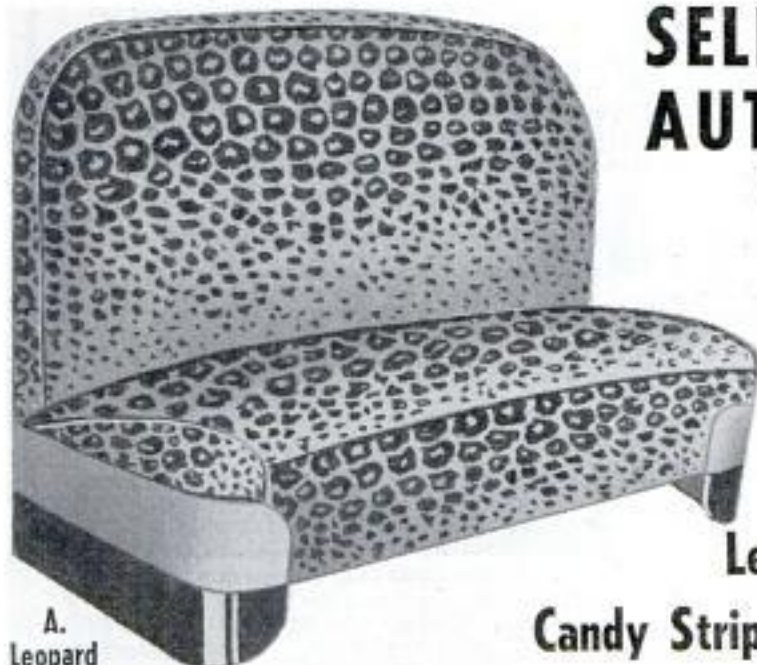
Values to \$5

YOUR CHOICE \$

Tough Vinyls, Nylons,  
Denims, Scotch Plaids,

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Candy Stripes, Crystal Tones, etc.



A.  
Leopard

We've been serving the public for years with choice, well-made auto seat covers—the kind any motorist would be proud to have in his car. We put our heart and soul into this business. We put out the best possible seat covers at the lowest possible price and sold hundreds of thousands. Then trouble set in. Material and labor costs mounted higher and higher. Competition set in too, from big, multi-million dollar outfits who sold on credit. Our profits vanished and so did our capital. So this is "Goodbye" to the business. It's our last seat cover ad to appear in this publication.

### TAKE YOUR CHOICE OF MANY ATTRACTIVE DESIGNS! YOUR CHOICE ONLY \$1

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Many thousands of people will be seeing this ad. Our stock will be sold very fast, we hope! So please make your choice at once and rush coupon TODAY. Also make a SECOND choice to protect yourself if we run out of any one design. It's a case of first come, first served. Send only \$1 plus 10c postage for each seat cover chosen. For front and rear, send only \$2.00 plus 20c postage. All sales final. No C.O.D.'s. None sold to dealers. To be fair to all, we cannot accept orders for more than a set of two for front and rear. All orders shipped promptly. NOTE: When these are gone, no more will be available. However, if your order arrives after our stocks are finished, we will return your money AT ONCE! To avoid disappointment, rush your orders today!



B.  
Candy  
Stripe

C.  
Solid

D.  
Zebra

E.  
Scotch  
Plaid

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A.  Leopard

B.  Candy Striped \*

C.  Solid (State color) \*

D.  Zebra

E.  Scotch Plaid

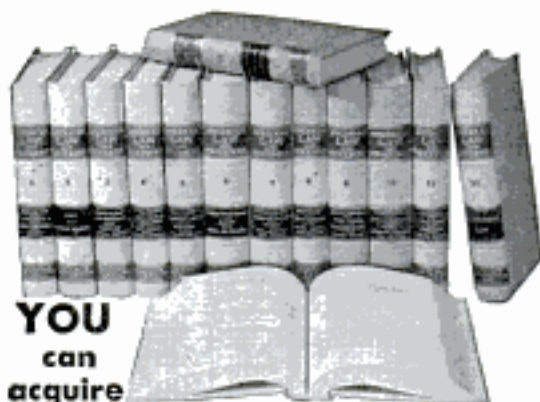
NAME \_\_\_\_\_

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\*Please state SECOND color choice.



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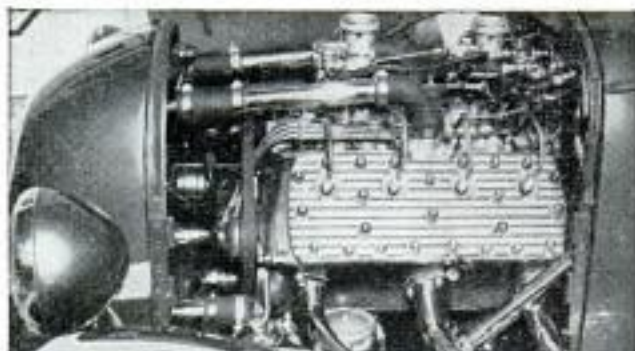
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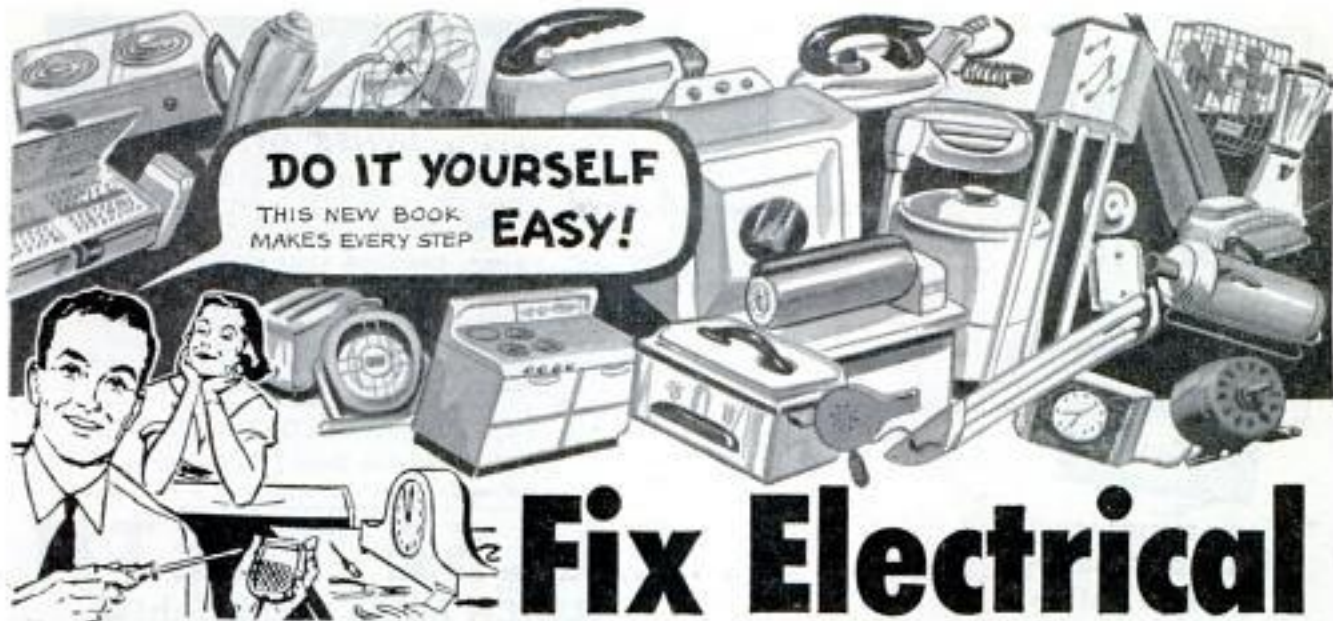
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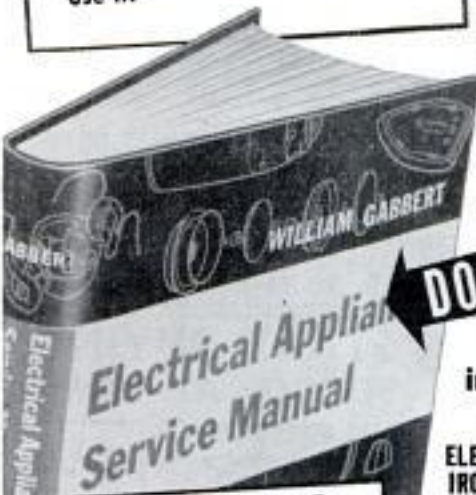
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1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill.; Editor, H. H. Windsor, Jr., 200 E. Ontario St., Chicago 11, Ill.; Managing editor, R. M. Grant, 200 E. Ontario St., Chicago 11, Ill.; Business manager, W. H. Peiridge, 200 E. Ontario St., Chicago 11, Ill. 2. The owner is: (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill.; R. H. Windsor, Jr., 200 E. Ontario St., Chicago 11, Ill.; H. H. Windsor, Jr., Trustee for H. H. Windsor III and Wm. T. Windsor, 200 E. Ontario St., Chicago 11, Ill. 3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (if there are none, so state.) None. 4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs above the affiant's full knowledge and belief as to the circumstances and conditions under which such stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner. 5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semi-weekly, and tri-weekly newspapers only.) Not daily publication. H. H. Windsor, Jr., Editor. Sworn to and subscribed before me this 16th day of September, 1955, Vera L. Frechill, Notary Public. (My commission expires July 17, 1958.)

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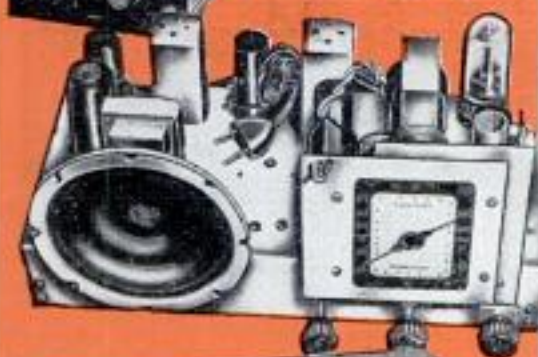
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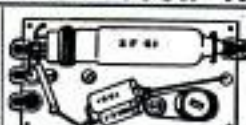
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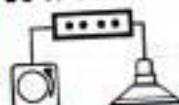


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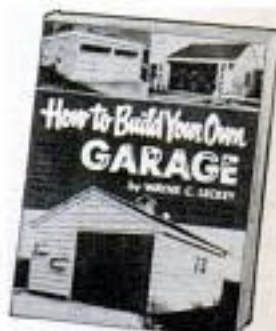
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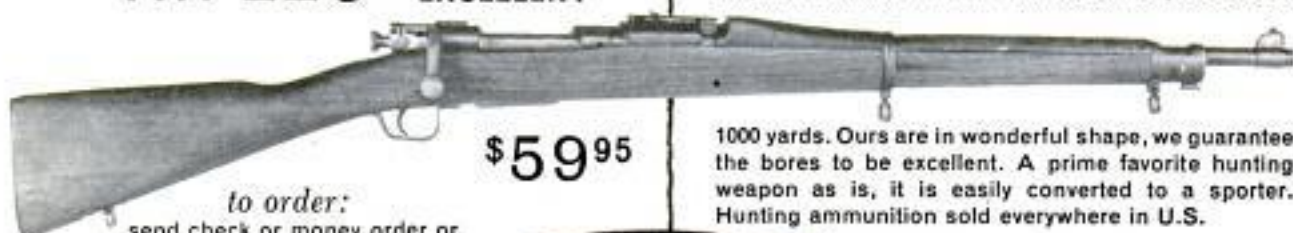
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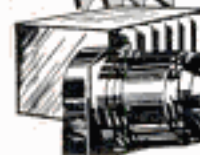
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**BUILD Your business on building plastics.** Easily made at home. Enormous profits. Bays Laboratory, Oklahoma City 8.

**SPECIAL—One million articles wholesale.** Catalog-directory 50c. Johnson's, 1262-T Medina, Fort Worth.

**SELL Direct and through dealers best concrete sealer and decorator.** Extra profit on contract jobs. Aquadry, 906 W. North Ave., Chicago, Ill.

**BE A landscape contractor.** Make \$20 to \$60 a day. Start with smaller projects and work into larger jobs. We show you how. Easy-to-follow home study course. Write for free book. National Landscape Institute, Dept. M-115-C, 310 S. Robertson Blvd., Los Angeles 48.

**\$100.00 WEEKLY with your telephone!** Guaranteed. Details free. Johnson, Dell Rapids, South Dakota.

**WHOLESALE Catalog! 30-80% discounts!** Appliances, musical instruments, typewriters, phonographs, watches, jewelry, recorders, housewares, etc. Consolidated Distributors, 21-11 Lafayette, Paterson 15, New Jersey.

**OPERATE Cafe, diner.** Start with minor investment. Guides reveal every step. Write for free booklet "Cafe Business." School of Restaurant Arts, BUIII, Fremont, Ohio.

**BE First.** Get the latest. Best low cost starting mail order offers. Everything furnished. Orders filled. Rush name. A. M. F. Service, Gallipolis, Ohio.

**BOOKKEEPERS.** Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 466, Youngstown 1, Ohio.

**JUST Like** having an oil well, have money flowing in for years. Operate steady, profitable business from home. No selling. No mailing. No telephone canvassing. No appointments to keep. Practically works itself. Business increases in value for future sale and retirement. Everything supplied. Can be started even on a budget. Send now for proven method. All information free. Write, Creators International, Box 2350, Edmonds, Wash.

**COIN Radios** and television. Buy direct from manufacturer and save: steel cabinet, modern design, coin rejector, write for prices and full story. Coin Radio & Television Corp., 190A Duane Street, New York, N. Y.

**LADIES.** Earn money at home spare time. Details free. Evans, 10431 Bonnie Drive, Garden Grove, California.

**TO \$50.00 Weekly.** Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

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

**BUY Wholesale,** 800,000 items. Write Info-Center, 216 West Jackson Blvd., Chicago, Ill.

**EXPORT Business** made easy! Expect something different. Complete setup, everything furnished. Hermes, 152 West 42, New York City 36.

**FINEST Formulas** for making world's fastest sellers. Literature free! Miller, Chemist, 1517-R, Tampa, Florida.

**ADVERTISING Business—City, country.** Low overhead, substantial income. Experienced advertising company offers complete setup. Harold, 69-S Bennett, New York City 33.

**MINIATURE Trees.** Why pay \$1.00-\$10.00 for growing secrets? Free details. Tiny Trees, Box 3684-P, Chicago 54.

**BUY Wholesale!** 100,000 name brand products! Save 66%!! Big profits selling others spare time! Free catalogs! National Buyers Service, Box 426EE, Oakland, Calif.

**GET Merchandise** orders by mail! Everything furnished—Orders filled, Big profits. Long, McKays Beach, Leonardtown 3, Md.

**\$1.75 HOURLY** Minimum, evenings. Preparing tax returns—Simplified! Auditax, 34757AT, Los Angeles 34.

**WHOLESALE!** 16-80% Discounts! Appliances, tools, etc. Catalog 25c. Levesque Supply, Atlanta, New York.

**WHAT'S New** in mailorder? Let "Mail-order World," published monthly, keep you informed. Sample, 25c. Wayne, 1233 Elden, Los Angeles 6, Calif.

**DOLLARS:** Baby record books, Kitty Kat shoes. My Baby albums, eleven thousand new prospects daily. Sold by mail, use our literature. No-Co-Ro, Oakland 6, Calif.

**WANT** Up to \$100.00 weekly deposited in your mail box? Details free! Smith, 2708-P Ladera, San Bernardino, Calif.

**BUY It** wholesale! Manufacturers, distributors offer 850,000 items. Literature free. Olsen, 1231-A East Third, Duluth 5, Minnesota.

**ELECTROPLATE** Auto parts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 1321-MM, Houston 19, Texas.

**LEARN** Sewing machine repair. How to make big money at home sparetime. New machines. Everything supplied. Write Taylor Service, Box 2126, San Bernardino, California.

**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 E701, Los Angeles 24.

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

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

**HOW** And where to obtain capital. Particulars free. Star Service, Wapakoneta, Ohio.

**FREE** Folio "Up to \$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

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

**RESILVERING** Mirrors, formula 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c. All \$1.00. Nelko-Mir Box 3462-J, Chicago 54.

**POPCORN** And potato chip equipment. Eakins, Box 933-AB, Springfield, Ohio.

**MEN—Income** from local information. No selling. Netherco, LaVerne, California.

**RUBBER Molds** for casting plaques, figurines, novelties. Catalog illustrating over 100 fast sellers, 10c. Cascraft Studios, 508-PM Marion Street, Brooklyn 33, N. Y.

**COPUBLISH** Mail Sale Advertiser, leading mail order paper. Details, latest copy, dime. Vanroy Shirk, Lebanon, Penna.

**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. 172, 2834 Admiral Way, Seattle, Washington.

**\$23 WEEKLY** Working two hours daily at home. Lycke, Box 3471-A, Cleveland 12, Ohio.

**OPERATE** Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

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

**MINK** Raising information free. Complete. Lake Superior Mink Farm, Superior, EEL, Wisconsin.

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

**BRONZE** Baby shoes. Instructions, equipment and mountings for genuine electroplated process. Free catalog. Holly-wood Bronze Supply, Dept. B-3, 1624 East First Street, Los Angeles 23, Calif.

**YOUR Own** name brand business. No investment; no inventory. Part time or full time. Sell famous brands of appliances, housewares, silverware, radios, vacuum cleaners, lamps, tools, clocks, watches, jewelry, etc., etc., over 1000 items. Join thousands of successful independent dealers. Send for free catalog and dealer price list. H. B. Davis Corp., Dept. W. 145 W. 15 St., New York City.

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

**GOOD** Paying business silvering mirrors, plating articles in the shop and home by late method. No tanks or shop required. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

**GROW** Orchids at home—Profitable, fascinating. Year 'round, Maine to California. No greenhouse. Gorgeous cattleyas, cymbidiums, etc. Successful home grower shows you how. Full details free. Flowerland, 4622 Wilshire, Los Angeles 5.

**FIX** Typewriters. Inexpensive home course teaches factory secrets. Free booklet. Write, Typewriter, Tarentum 1, Penna.

**WANT** To make big money at home? \$5 profit in an hour possible with invisible re-weaving. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 8334-S Prairie, Chicago 19, Ill.

**BIG** Profits raising fishworms and crickets. Free literature. Carter Farms, Plains, Georgia.

**BECOME** A game warden, professional hunter! Join forestry, park, fishery services. Good pay! Opportunities open! Free revealing "Select-Job Chart," details, job-getting secrets, Write Home Study Institute R10, Los Angeles 19, California.

**FLEXIBLE** Rubber molds for plaster and Marble figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 205, Southampton, Mass.

**\$25 DAILY** Profits sharpening farm discs without dismantling or moving. No experience necessary. Free plan explains. B. T. Foley Company, Columbia Heights, Minn.

**UNTOUCHED** Mailorder opportunity. Establish industrial supplies mailorder business. High income, more repeats, lower overhead. Complete setup offered. Stewart Advertising, 1625 S.W. 19th St., Miami, Florida.

**METALIZE** Baby shoes, jewelry, gifts. Free catalog. Publisher, Box 73136, Los Angeles 3.

**BIG Money!** Operating home mailorder business. Sparetime, small capital. Jackson, Newfoundland, Kentucky.

**\$5 TO \$10** An hour. I've did it, I'm disabled now. Real genuine offer. Complete information \$1.00. Lucas, 2210 Carson St., Pittsburgh 3, Penna.

**WHOLESALE** Catalogue! Appliances, cameras, watches! Cam Company, 6806PM 20th Ave., Brooklyn 4, N. Y.

**GROW** Expensive herbs for us! Big profits home-business of your own. Year around profitability! We supply everything necessary! Send for free rare seeds and revealing plan. National Herb Exchange, Dept. A, Gardens, Calif.

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

**BE** in your own business. Buy wholesale. Big profits. Get free nationally famous name brand mdse. Catalog. Dept. PM, Normandy Distributing Corp., 133 Fifth Ave., New York City, N. Y.

**SAWDUST**, Turn it into cash. Forty-nine methods. Instructions \$1.00. Sawdust Laboratories, Box 155, Islington, Ontario, Canada.

**NEWEST** Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautiful auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, Los Angeles 61.

**IMPORT-Export** mailorder opportunities! Details. Warner, Box 6, Fort Scott, Kansas.

**MONEY** In sheer sharpening. Repeat business. Details free. W. Zell, Summitville PM-2, Indiana.

**WE'VE** Got a highly unusual deal for you on a new line of fire extinguishers. This is a new company, but you'll recognize the men behind it, who have had more than 20 years' experience in this field, when you write us, and it might pay you well to airmail us today. The Fire King Company, Inc., Dept. 13, Littleton, Colo.

**A Monthly** repeat business which you can operate in your own community. For free details write Orsak, Dept. A-101, P. O. Box 494, McKeesport, Penna.

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

**\$46 FROM** Square foot plywood;igsaw necessary. Details free. Woodarts, X-16, Bridgewater, Mass.

**SELL** Quilt pieces by mail! Woods Remnant Co., Bedford, Penna.

**FREE** Spawns. Free instructions. Join National Association Mushroom Growers. \$1.00. Mushrooms, 32 Kendrick, Lawrence, Mass.

**WORK** At home. Free details. Ajax Products, 734 East 236th Street, Cleveland 23, Ohio.

## MONEYMAKING OPPORTUNITIES

**MONEY** In saw and lawn mower sharpening sparetime at home. Repeat cash business. Experience unnecessary. No selling. Free booklet explains. V. Foley Company, Columbia Heights, Minnesota.

**HOME** Money making opportunity. Quentin Trent Publishing Company, 16216 Kercheval, Detroit 14, Michigan.

**WORK** From home in spare time. Start profitable magazine renewal service. We show you how; furnish everything free. No experience needed. Write McGregor Magazine Agency, Dept. 500-C, Mt. Morris, Illinois.

**GET Rich!** Make gewgaws at home. We furnish materials. Hancock, Box 97K, Lombard, Ill.

**EARN** Big money. Manufacture better mousetrap. Disposability assures reorders. \$1.00 brings complete plans. Dispos-O-Mouser, Box 2693, Dept. PM115, Sacramento, California.



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

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

**PRINTING** And office supplies wholesale. 20,000 items. Literature free. Royal, Box 368-A, Cleveland 27, Ohio.

**MAKE** Money, be popular, glamorous, entertainer show business, television, stage. Write for talent questionnaire. Show Talent Enterprises, Box 5417, Tampa, Florida.

**\$170,000.00 INCOME** Possible. Unbelievable, fantastic money-maker. Informative literature \$1.00. Huebl Minkery, LeSueur, Minn.

**\$10,800 PROFITS!** Your own mailorder business! No risk! Success plan free! Treasury, 709 Webster, New Rochelle, PM-27, N. Y.

**AMATEUR** Artists, cartoonists! Turn your art ability into money. Hamilton, Box 4-PMK, Astoria 5, N. Y.

**RAISE** Sell earthworms. Instructions free. Johnny K's Hatcheries, #45 Selby, St. Paul 4, Minn.

**METAL** Castings, art, machine parts. Write Box 124, Lynwood, California.

**FOR** Profitable full, part time outdoor, indoor enterprises, write Cottage Industries, Omaha 12, Nebr.

**\$9.00 RETURNS** \$160.00. Repeats. 25c coin for sample. Ezee, Bayport 7, Mich.

**\$1,000 MONTHLY** Possible raising earthworms! Backyard, garage, basement. Complete illustrated booklet explains raising, feeding, packing, marketing. 25c postpaid! Ozark Worm Farm-J, Willow Springs, Mo.

**TYPISTS!** Make money at home! Mailers. 2 Madison, Greencastle, Indiana.

**FACTORY** Workers, earn extra money easily; no selling. Details free. Ferguson, Box 227, Harvey, Ill.

**NEW** Comedy, religious, general "T-x11" signs. To retail 50c. 15 samples, \$1.00. Lowy, 812 Broadway, Dept. 903, New York 3.

**CLOSEOUT** 50,000 GE subzero automobile engine heaters. Listed \$8.95, sample \$3.95. Terrific quantity discounts. Illustrated literature and mailorder plans \$1.00 (refundable first order). Wisniewski, Milwaukee 7, Wisconsin.

**OPERATE** "Escalator" mailorder system, selling our products or any products. Most revolutionary mailorder system known. Postcard. Selbyco, Decatur 163, Illinois.

**FREE** Descriptive literature. Make money, save money, 1000 valuable tips, all needs wholesale. Nelson Sales, Elkhorn 9, Nebraska.

**BUY** Wholesale! Fifty-seven free catalogs. Thousands items. Econ-O-Mart, 8 Perry, Whippany 2, New Jersey.

**MAKE** Money with your typewriter! Write Barnett Company, Cleveland, Ohio.

**SPLENDID** Home money making plans. Magazine 25c. William Stanton, 3762 3rd Ave., Los Angeles 18, Calif.

**CONFIDENTIAL** Instructions, guidance "How to become manufacturer, sell products rightaway." Free booklet. Jary, 268-BU, New York City 5.

**\$200 WEEKLY** Cleaning Venetian blinds. Free book. Burt's, 2434A, Wichita 13, Kans.

**EARN** Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

**SELL** Titania gems; far more brilliant than diamonds. Catalog free. Diamonite, 2420 77th, Oakland 5, California.

**HUGE** Profits selling mail order plans! Guaranteed. Details free. Johnson, Dell Rapids, South Dakota.

**BIG** Profits selling ties (\$2.00 value) \$6.50 dozen. Free catalog. Empire Cravats, 611-PM Broadway, New York 12.

**BRAND** New opportunity. Free details. Bellant Sales Company, Box 53, Bangor, Penna.

**SELL** Helbrus watches-jewelry. 70% discount. Wholesale catalog 25c. Dorinda, Box 77, Huntington Station, New York City.

**MAKE** Spare time money preparing and mailing sales literature. Adams Survers, 3513-AT Sunset Blvd., Los Angeles 20, Calif.

**SCHEMER** Magazine. Canfield 1, Ohio. Mailorder and business plans. Year \$2.00, sample 25c.

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

**MAKE** Money with cameras. Professional secrets \$1.00. Brewer-Photographer, 5880 Hollywood, Hollywood 28, Calif.

**"MONEY** Getter's Bulletin." Prints helpful money-making ideas, plans, tips. Sample 25c; details free. Distributors, Box 831-D, Monessen, Penna.

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

**BUILD** Sales by recruiting productive distributors selling direct or to retail outlets. Secure most concentrated circulation through classified columns of Salesman's Opportunity. Write for facts. Gilbert, Salesman's Opportunity, Room 1700, 850 N. Dearborn, Chicago 40.

**FREE** Folio "Up to \$45,000; Unlimited Vacations." No merchandise, equipment. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

**SPARETIME** Profits taking subscriptions all magazines. Wholesale catalog free. Cassell Publishers, Westfield, New Jersey.

**GENERAL** Contest Bulletin. Issued monthly. Sample, 25c. 1609 1/2 East 5th, Duluth, Minn.

**GROW** Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$3.50 lb. We paid Babbitt \$4,165.09 in few weeks. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Washington.

**50,000 ARTICLES** Wholesale. Source directory, dime. Nelko, Box 3462-DH, Chicago 54.

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

**READ** Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

**ATTENTION:** Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 8, Nebraska.

**START** A profitable subscription business in spare time! We need men and women (young or old) as representatives for all leading national magazines. Liberal commissions paid for new and renewal subscriptions. Start earning money in this pleasant work at once! Clip this ad and send with your name and address to: Agency Bureau, Dept. PM, Hearst Magazines, 250 West 55th St., New York 19, N. Y.

**SCHOOL** Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection. Highest commission. Outsell all others. Free sample kit. Printcraft, Dept. M, 1509 Maple Street, Scranton 5, Penna.

**BUY** Wholesale! Save 66%! Appliances, furniture, jewelry, toys, sporting goods, tools. Free catalogs. National Buyers Service, Box 428EB, Oakland, California.

**HAVE** Home business—Get \$10 orders in every mail. Keep \$8.00. Everything supplied. National, Box 88-W, Dorchester 23, Massachusetts.

**PRESERVE** Living flowers to last indefinitely. Swell for gifts. Interesting hobby. Make money too. Free details. Old Town Gifts, 405 S. Clark Blvd., Clarksville, Indiana.

**BIG** Profits servicing new and renewal subscriptions for firms, clubs, churches, friends, neighbors. No experience. No investment. Free catalog and supplies. Hanson-Bennett Magazine Agency, Desk P-2, 180 N. Wabash Avenue, Chicago 1, Illinois.

**TO \$50.00** Weekly. Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

**\$5 TO \$10** An hour. I've did it. I'm disabled now. Real genuine offer. Complete information \$1.00. Lucas, 2210 Carson St., Pittsburgh 3, Penna.

**BIG** Money. Mail order. Details 25c. Desert Mail Sales, Box 858-PM, Mojave, California.

**VENDING** Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 15, 715 Ensor St., Baltimore 2, Md.

**OVER \$200,000.00** in cash prizes offered this month. They are yours for the taking. Free details. Robert Spence, Dept. P, 7352 Central Ave., St. Petersburg 7, Fla.

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**FORMULAS:** All kinds, latest, best. Literature free. Kemical, Park Ridge, Ill.

**REAL** Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

**PRODUCT** Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

**MODERN** Formulas for today's fastest selling big-profit products. Literature free! Miller, Chemist, 1517-N, Tampa, Florida.

**FREE** Formula catalog. Anything analyzed \$35.00. Western Chemical, Salem, Oregon.

## PLASTICS

**PLASTICS** Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3-M, Portland 13, Oregon.

**ACRYLIC** Plastic, water clear solution for coating brass lamps, silverware, chrome, fishing rods, tools, lampshades. 8 ounces \$2.50. A. B. Dunn, Department A, Box 537, Chicago 80, Illinois.

**CASTING** Plastic, new liquid resin for casting and embedding. Sample casting and complete information for only 10c. Virginia Research Laboratory, Dept. D-511, Marion, Virginia.

**PLEXIGLAS**, Fiberglass, polyester, acetate. Unique wholesale-retail catalog. 15c. Gem-O'-Lite, Box 686M, North Hollywood, California.

**NEW** Liquid casting plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25c for handbook. "How to Cast with Liquid Plastic." and proved success plan showing how to make money at home. Castolite, Dept. M101, Woodstock, Ill.

**PLEXIGLAS**, Lucite. Square foot cost 1/16"—\$1.15, 1/8"—\$1.52, 3/16"—\$1.86, 1/4"—\$2.21, 3/8"—\$3.28, 1/2"—\$4.38. Colors add 10%. Send 15c for postage. Aristocrat Plastics, 23-25 Sussex Avenue, Newark, N. J.

**PLEXIGLAS** Sheets for less, 1/4" 12 x 12" \$1.75. Plus 15% postage. Catalog 25c. Plastic's, Box 1812, Salt Lake City 10, Utah.

**SPECIAL** Offer—Home repair kit with powerful adhesive plastic and fiberglass. Prize contest. Complete information brochure 10c. Adhese Sales Co., Box 282, Nixon 1, N. J.

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

**PLEXIGLAS**. Cut to size. Clear. Any thickness. Colors. Rods. Tubing. McClarin Plastics, P.O. Box 168H, Hanover, Penna.

## CHEMISTRY

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

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

**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.

**CHEMISTRY** For beginners. All ages. Systematic. Fascinating. First lesson 25c. Also formulas, trade secrets, expert advice on all plastics. Parkway Laboratory, R. #1, McKees Rocks, Penna.

**CHEMICALS**, Glassware. Large catalog. 25c. Laboratory Sales, Box 161-A, Brighton, Mass.

**"BEGINNERS** Chemistry." 56 page booklet, 10c. Franks, 3121 So. Racine, Chicago 8.

**AMAZING** New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. PM-11, 2204 W. North Ave., Chicago 47, Illinois.

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**BIBLE** Stories paint book for children. New painting process, harmless, not available in stores. Free sample. Retail \$1.00 per set. Religious Craftsmen, 1106 Broad Street, Providence, Rhode Island.

**WE** Put you into big mail order business, drop shipping orders, no investment. No minimum. Catalogues supplied. Terrific new sellers, tremendous profits. Turner Company, 1170 Broadway, New York 1, N. Y.

**BEAUTIFUL** Feather pictures, 200% profit! Free sample. Apartado 9036, Mexico 1, D. F.

**MEN!** Make \$1000 a month with 3-second demonstration of powerful, midjet Presto fire extinguisher to homes, offices, factories, car owners, garages, farms, etc. New chemical beats expensive extinguishers. Merlite, 114 E. 32nd, Dept. 50-B, New York City 16.

**CALENDARS.** Advertising novelties, matches. All styles, including religious, varnished, 12 sheet, girls. Hundreds of advertising novelties, book matches, etc. Fleming Calendar Co., Sales Division, 6539 Cottage Grove, Chicago 37, Ill.

**BE** Your own boss! No investment—No inventory. Big real profit-making wholesale catalog free! Dept. PM, Jay Norris, 487 Broadway, New York City, N. Y.

**YOU** Can make a fortune with miracle discovery liquid cloth. Mends everything from coats to finest hosiery. Dries soft, durable elastic texture. Sells so fast production increased 34 times already. It's sensational! Bard's Products, Dept. Q, Evanston, Illinois.

**BUY** Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-A, N. Y.

**AGENTS-Salesmen:** Sell beautiful hand-colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline. Better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

**START** Your own business on credit. Your own boss. 1135 of our dealers sold \$5000 to \$30,000 in 1954. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by worldwide industry. Write Rawleigh's, Dept. K-U-PPM, Freeport, Ill.

**WHOLESALE** Catalogue! Appliances, cameras, watches! Anelag Industries, Rochester 1, Wisconsin.

**NEW** Plastic mending tape. Just press on! Repairs clothing immediately. Lightning seller. Samples sent on trial. Kristee 77, Akron, Ohio.

**FREE** Wholesale catalogue! Famous brand appliance, cameras, watches, etc. M. B. Serv., P.O. Box 232, So. Chicago 17, Illinois.

**BUY** Wholesale, 25,000 items, catalog 25c. Matthews, 1472-B2 Broadway, New York City 36.

**GUARANTEED!** Sensational sales profits selling sensational new shavers. Demonstrator \$7.98. Free information. Write now! Paradine, 1 DeMott Place, Rockville Centre, New York.

**PRINTING!** Highest quality. Big profits. Free wholesale price list, supplies, details. Napco, 2337-A Bath Avenue, Brooklyn 14.

**AGENTS** Make big profits on stainless steel tableware. Bargain deals. Low wholesale prices. Rush name for catalog and amazing details. House of Cards, 208 S. Lamar, Amarillo, Texas.

**STARTLING** Discovery. Cleans white-wall tires like magic. Spray on. Sponge off. Whirlwind seller. Profits galore. Write for free sample offer. Chemade Products Company, 777 Bayside, Detroit 17, Mich.

**"FUN** And Profit in Selling." Booklet by retired sales manager. Inspires confidence. Helps remove mystery from selling. \$1.00. R. Hyland, P.O. Box 2216, Cleveland 9, Ohio.

**100% PROFIT** Selling imported gifts. Free catalog. Martin Importing Company, Healdsburg, Calif.

**GOOD** Profits selling Mexican feather cards. Free sample. Apartado 7118, Mexico City 1.

**SELL** Dif hand cleaners. For 35 years, the fastest selling, highest profit items in handcleaning world. Markets everywhere. Sure repeats, 100% profit, sales guaranteed or money back. Write Dif, c/o Hyb, Garwood, N. J., for information, samples, other good news.

**MAKE** \$100 Up weekly — Demonstrate, take orders. Sensational new product. Prospects everywhere, part-full time. Campbell Company, Rochelle 53, Illinois.

**\$10.00** IN Soap scraps used by nylon brush! \$1 demonstrator puts you in business! SoapMiser, 2511-B Euclid Street, Santa Monica, California.

**BIG** Profit repeater. Low cost chamois. Babrok, 11D Tannery Distributors, Hudson Falls, N. Y.

**REAL** Diamond rings. Sell direct. Make big middleman's profit. No investment. Experience unnecessary. Free catalog, details. Gleamlight, 111-R No. Columbus, Mount Vernon, N. Y.

**BUY** Wholesale 550,000 products. Literature free. Carter, Box 6911-H, Chicago.

**MANUFACTURING—**Opportunities unlimited. Start small, grow big manufacturer. Complete instructions. Jarry Associates, 266-BH, New York City 5.

**SCHOOL** Seniors—Be popular with classmates. Have spending money galore. Details free. Craftcards, Box 235-L, Pittsburgh 19, Pennsylvania.

**\$200** WEEKLY Cleaning Venetian blinds. Free book. Burt, 2434A, Wichita 13, Kans.

**AMAZING** \$1.00 Retailer! Used by men, women, children! Tremendous market! Free details. Edmunds, 3009 Weaver, Baltimore 14, Md.

**WOMEN.** Men, make money spare time plus new car as bonus for encouragement. Amazing hosiery guaranteed to wear without holes, snags, and runs, or replaced free. For example, lovely 60 gauge nylons guaranteed for as long as 1½ years, or replaced free. Write Wilkint, 17511 Wash., Greenfield, Ohio.

**MAKE** Products. Sell mailorder. Catalogue free. Imoco, 6347 Farnell, Chicago 21, Illinois.

**ZODIAC** Lucky coins — Wagon jobbers, agents. New sensational zodiac merchandise, \$1.00, \$2.00 sellers. Lucky coins, money clips, key chains. Tells lucky numbers, lucky days, person's natural abilities. Fast selling items. Profits up to 100%. Three samples, 1 each, \$3.00 postpaid. Zodiac Manufacturing Co., 1603 Lawrence, Chicago.

**YOUR** Own business—Used suits \$1.50, overcoats 85c, mackinaws 35c, shoes 12½c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Nathan Portnoy Associates, 605 West 12th Place, Chicago 7.

**"SEE-KLEER."** Amazing new eye-glass cleaner. Prevents steam, frost. Application lasts days. Purse size plastic spray bottle. Minute demonstration makes fast sales. Wonderful profits. Free details. Staples Sales, 805 East Vine, Knoxville, Tenn.

**MAKE** Money at home as headquarters for all magazines. Earn big Christmas profits. Liberal commissions. No experience—No capital needed. Supplies furnished. Write McGregor Magazine Agency, Dept. 500-A, Mount Morris, Ill.

**NEW** Line portable electric power tools. National manufacturer sponsoring Perry Como's fall program. Send for free catalogue. Glasser Products, 389 Kingston Avenue, Brooklyn, N. Y.

**NEW** Silicone car polish. Shines without rubbing. Fast seller. Details free. Bonluth Products Company, Box 1078, Bristow, Oklahoma.

**150% PROFIT** Selling 500 name and address labels. Retail \$1.00. You keep 60c profit. Free selling kit. Bruce, Box 71-Y, Boston, 1, Mass.

**IMPORTING** Without capital. Become successful U.S.A. resident agent for leading overseas manufacturers. High income, home operated, no risk. Complete arrangements furnished including U.S.A. distribution assistance. Impex, 1974-A Comstock, Los Angeles 25.

**PROFIT** With your own wholesale, name brand catalog. Appliances, watches, jewelry, gifts, tools. Imprint your name on cover. Full or part-time sales. Details free. Robel Sales, Dept. P.M., 487 Broadway, New York 13, N. Y.

**GOLD** Or silver letters, numbers. Windows, doors, trucks, 1" to 6". 500% profits. Free samples. Atlas-T, 544 West 79th, Chicago 20.

**WANTED:** Men interested in making up to \$15,000 a year. Exclusive line of personalized articles. No investment. Free information and sales kit. Write Hook-Fast, Box 480 (PM), Roanoke, Virginia.

**TREMENDOUS** Profits! Every man, woman and child a customer. Suits \$1.50, pants 35c, dresses 20c, shoes 20c. Operate from store, home, car. Free catalog. Superior, 1250-A Jefferson, Chicago 7.

**FREE** Color catalog of religious jewelry. 100% profit. Virgin Mary heart necklace, sample \$1.00 (value \$2.50). Money back guarantee. Stephen-New York Inc., 1947 Broadway, New York 23.

**EARN** \$200 A week and up! Amazing profits are yours selling Seal-Tite, miracle puncture-proofing discovery! \$1.98 tube stops flats forever. Sure-fire appeal to America's 50,000,000 motorists! Complete sales kit free on request. M & M, Dept. M-2, 842 Third Ave., New York City 23.

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

**MAKE** Extra money. Sell front door name plates to friends, neighbors. Retail \$1.98; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 194, Boston 14, Mass.

**\$1.00 PROFIT** Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

**AGENTS—** 300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

**YOUR** Ad in this space will get some good agents for you. Yes, I'll prove it. Write for Folder "A," right now. F. W. Johnson, Classified Advertising Manager, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

**CALIFORNIA** Sweet smelling beads. Sensational sellers. Particulars free. Mission, 2328 PR, W. Pico, Los Angeles 6, Calif.

**EARN** \$30 A day! Sell Dab-It, amazing pocket-size, stick-form, "no rime" spot remover. Works like magic! Guaranteed! M & M, Dept. M-1, 842 Third Ave., New York City 23.

**EASY** Money selling the new Pro Candid 35 mm. cameras. Your area is open for anyone to cash in on these fast-selling cameras. Selling kits furnished, cash commissions guaranteed. For complete information write Beaurline Industries Inc., 509 N. Robert Street, St. Paul 1, Minn.

**USED** And new watches. \$2.00 up. Free list. Southern Watches, Gray, Georgia.

**FOG-STOP** Windshield cloth. Instantly removes blurry mist, frost, sleet, snow. Stops windshield fogging. Samples sent on trial. Kristee, 79, Akron, Ohio.

**EASY** Handwork makes fast-selling articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

**500% PROFIT.** Retailers can't resist colorful, large "sale" signs. Big selection. Dynamic samples \$1.00. Soik, 132 West 23, New York City.

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**BUY** Wholesale! 30-80% discount! Nationally advertised merchandise. Send \$1.00 for catalog. (Refunded on first order.) John E. Sexton Company, Garland Street, Winston-Salem, N. C.

**THOUSANDS** Nationally advertised brand name products. Discounts to 80%. Meder, 550-PM Fifth Avenue, New York City 36.

**WHOLESALE!** Double head electric shaver, case. Fully guaranteed. Retail \$27.95, wholesale \$9.95. North American Distributors, Box 1044, Lansing 4, Mich.

**THOUSANDS** Articles wholesale! Catalog \$1.00 (refundable). Evanich, Stamford (Catskills), N. Y.

**ELECTRIC** Guitars, amplifiers, parts. Wholesale. Free catalog. Carvin, PM287, Covina, Calif.

**WHOLESALE** Catalog! Housewares, appliances, watches. Postcard. Selbyco, Decatur 262, Illinois.

**BUY** Wholesale! 30-50% discount! Name brand television, refrigerators, water heaters, radios, electric housewares, power tools, etc. Catalog 25c. Marpat Distributors, Box 1485, Milwaukee, Wis.

**FREE Gift!** Plus free "Wholesale Purchasing Secrets"! Save 50%-80% nationally advertised appliances, watches, tools, gifts. Everything for home, office, workshop. Write! Panatron, 7721 J. Melrose, Hollywood 46, Calif.

**EVERYTHING!** For home, office, gifts, sports, jewelry, etc. Standard brands. Catalogs \$1.00-\$5.00, refundable. Agents deal also. Consumers-Cooperative, 2153 Lemoine, Chicago 23, Ill.

**WHOLESALE Catalog!** 30-60% discounts! Appliances, musical instruments, typewriters, phonographs, watches, jewelry, recorders, housewares, etc. Consolidated Distributors, 21-20 Lafayette, Paterson, New Jersey.

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**BARGAINS, Joblots, close-outs, 2000 items.** Save to 50%. Clothing, hosiery, toys, toiletries, gifts, jewelry, television, etc. Get acquainted. 25c brings wholesale catalog plus free \$1.00 merchandise certificate. Reliable Jobbing, 311-B North Desplains, Chicago.

**BUY Wholesale!** Save 60%! Appliances, furniture, jewelry, toys, sporting goods, tools. Free catalogs. National Buyers Service, Box 424EB, Oakland, California.

**POGO Sticks.** Will carry 150 lbs. guaranteed! \$4.50 postpaid. U. S. Industries, 803-A Macy Street, Los Angeles 12, Calif.

**INDIVIDUALS, Nationally advertised merchandise, wholesale.** Tremendous discounts. Kingsley, Chepachet, Rhode Island.

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**SPARE** Or full time top earnings selling America's largest low-priced line business printing and advertising specialties to every retail store and business. Big advance commissions. Complete order-winning sales kit free. National Press, North Chicago 1, Illinois.

**AD Matches!** Sell amazing designs—10, 20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices for high quality. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-71, Chicago 32, Illinois.

**SELL** Calendars. You make big money daily. Giant line. Every business buys. Also business printing, book matches, advertising specialties. Big sales outfit free. Write, Arrow Press, 515-T Fourth Ave. So., Minneapolis, Minn.

**GET** New shirt outfit free! Make \$90.00 weekly on 5 average orders a day. Famous quality made-to-measure dress and sport shirts at \$3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 135, Terre Haute, Ind.

**MEN!** Make \$1000 a month with 3-second demonstration of powerful, midjet Presto fire extinguisher to homes, offices, factories, car owners, garages, farms, etc. New chemical beats expensive extinguishers. Merlite, 114 E. 32nd, Dept. 50-B, New York City 16.

**NO** Trick to selling ties at 69c each! Free plan shows how easily you pocket \$3.33 hourly profit. Loren Specialties, 2849-A11 Birchwood, Chicago 45.

**BIG** Money-making opportunity. Exclusive line work uniforms, jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit free. Master Div., 572 Water, Ligonier, Ind.

**SEND** \$5. For fine collection manicure sets, leather cases, kitchen knives, steak knives, post paid. Cabiri Works, Solingen-Germany.

**WHY** Work for peanuts? \$16.95 profit per unit possible with amazing new Alarm-O-Safe. Sells itself. No experience needed. Free sales kit. Merlite-Alarm, Dept. A-5011, 114 East 32nd St., New York City 16.

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**DELAYED** Action light switch for automobile headlights. Send for free information. \$2.00 for sample. Delayed Light Division, 3100 Fenton Road, Flint 7, Mich.

**BUY** Wholesale thousands nationally advertised products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-J, N. Y.

**SALESMEN** Calling on any trade using grinding wheels can make money selling our patented dresser. Write for proposition. Thompson Manufacturing Co., Erie, Penna.

**BIG** Money! Buy wholesale, sell retail. Dresses, children's wear, family apparel. Lowest factory prices. No stock to carry. No samples to buy. Big sales kit with actual fabrics free. C. E. Israel, Dept. P-6793, Cincinnati 25, Ohio.

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**SIX** Ways to sell alphabet checkers. Krume, 240 W. Eight, Dallas 8, Texas.

**MONEY**-Making opportunity! Take big profit orders for world famous patented varieties fruit trees. Also flowering shrubs, roses, vines. Big sales outfit free. Stark Bro's, Desk 30156, Louisiana, Missouri.

**WILL** You wear new suits and topcoats without one penny cost and agree to show them to friends? You can make up to \$30.00 in a day even in spare time, without canvassing. Pioneer Tailoring Co., Congress and Throop Sts., Dept. K-1226, Chicago 7, Illinois.

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**100% PROFIT, 100% Repeat.** Kograt Distributors make fortunes. Write today! Nassau Laboratories, Hackensack, N. J.

**NEW** Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide. Listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 850 N. Dearborn, Dept. 17, Chicago 40, Ill.

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**BLUEPRINT** Reading for machine and building trades. Train at home. Learn to read blueprints with confidence in 10 easy lessons. Earn more pay. Literature free. Belton School, 1039-2 North Lawn-dale, Chicago 51, Illinois.

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**WANT** A diesel job? New opportunities to increase income. Higher pay. More money. We can help you qualify. Tools. Shop method home training. Write today! Diesel, Tractor, Heavy Equipment Division, Interstate Training Service, Dept. B-3, Portland 13, Oregon.

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**PINEST** Quality printing at bargain prices. Free catalog. Hampton Printing, 601 1/2 N. Main, Wichita, Kans.

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**FREE** Catalog. Letterpress, offset printing. D & M Press, Sebastopol, Calif.

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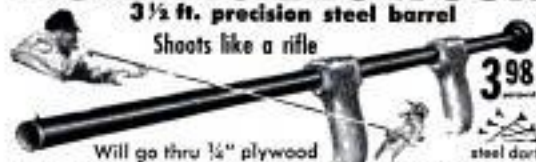
Electrical batteries of the future may be powered by atomic radiation converted directly into electricity. Even today, some atomic batteries giving small but constant amounts of power are ready for practical use. Radioactive wastes from reactors are cheap enough to be used in such batteries. They also have a long enough life. But like other radioactive substances they require shielding to prevent radiation danger to people and damage to materials.



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Illustrated: *Mighty American Flyer 4-6-4 "Hudson"*

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THE STANDARD OF COMPARISON



## Bill Ford Revives a Classic:

# THE CONTINENTAL

**W**HAT SHOULD YOU GET when you plunk down \$10,000 for an automobile? After all, it can have only four wheels and one engine just like any other car!

But the new Continental, designated the Mark II in a somewhat British accent, is unlike other cars, say its builders. For \$10,000, the Continental buyer is said to get finer quality than has ever been built into an assembly-line product before, plus an outward appearance so striking that there can be no doubt he is driving an automobile that costs \$10,000.

Let's look at these two claims for the Continental. Do they stand up?

First, what about striking appearance? Judge for yourself. The car is certainly

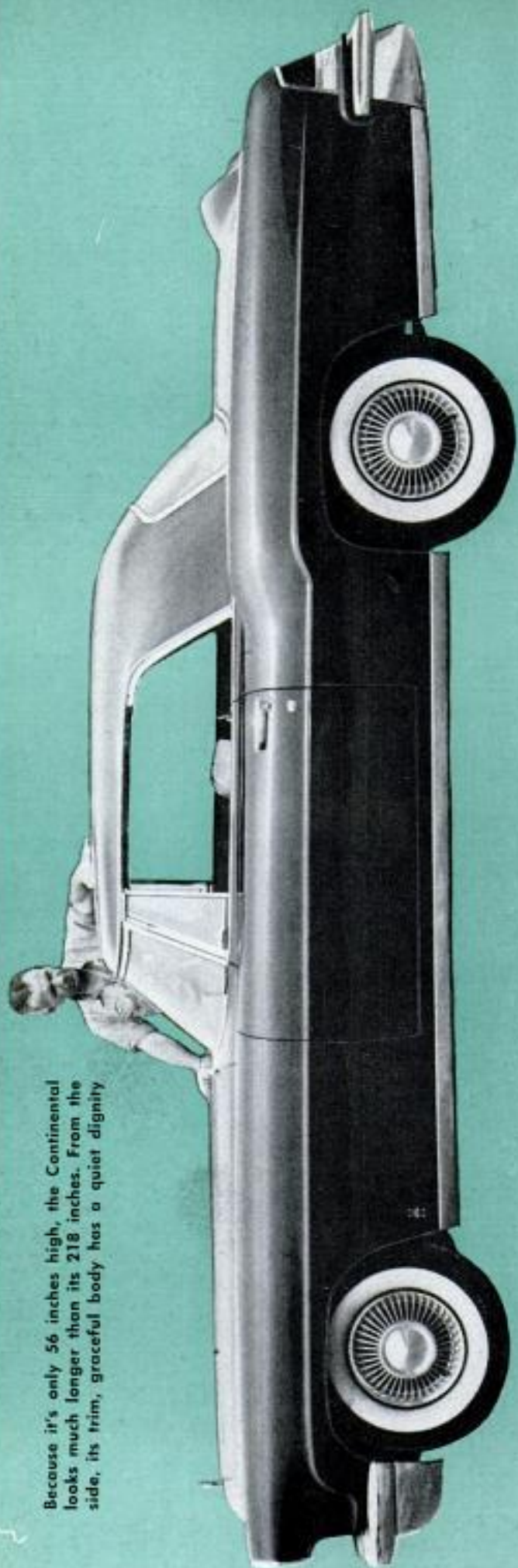
By Arthur R. Railton



There's just enough of the original Continental (photo top of page) in the new to continue the breed. Spare tire of new model is inside trunk, not outside as before



Because it's only 56 inches high, the Continental looks much longer than its 218 inches. From the side, its trim, graceful body has a quiet dignity



different without being freakish. There can be no doubt that it is a descendant of the original Continental. Its proportions emphasize what many persons still believe is the epitome of automotive design—the long, long hood that signifies power and the small, compact passenger compartment that denotes elegant intimacy.

It has, for this writer at least, a flashy dignity. If that sounds like a contradiction, it is! But, strangely enough, it is true. There's enough dignity to satisfy the most retiring of retired millionaires, yet with it there's enough flash to elicit wolf-calls from street urchins. Driving the new Continental, you look impressive, but you certainly won't be called a grandstander!

What about the claim of fine quality? Can any assembly-line operation live up to that promise?

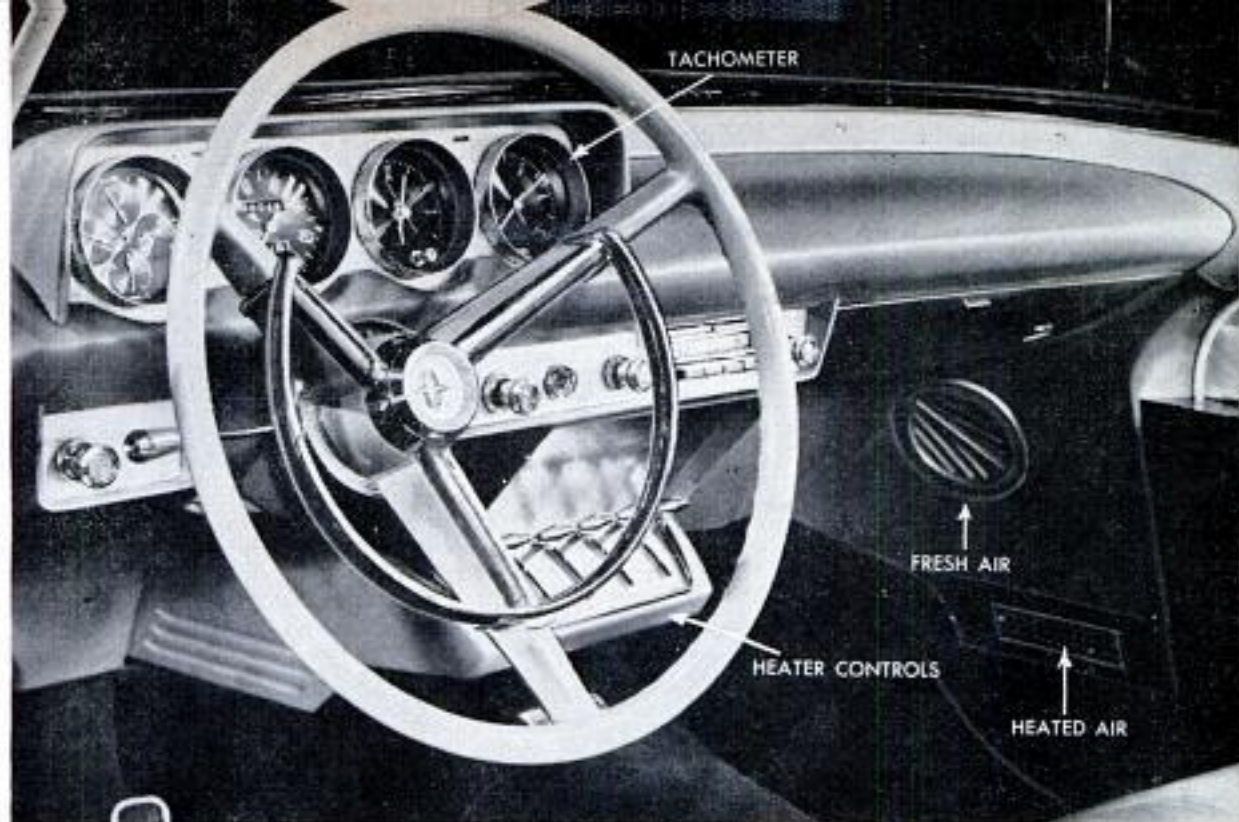
Months ago when production of the new Continental was just getting under way, an inspector spotted burrs on an incoming shipment of washers. The burrs were small; the washers not of major importance. The fault would not affect by as much as a whit the operation or looks of the car.

Yet the whole shipment of washers went back. Not because the faults were critical, but because they violated the basic concept of the car—it must be as perfect as possible.

And it should be. After all, it does have a price tag that reads \$10,000 or so and when a man spends that kind of money he should get perfection.

That is Bill Ford's philosophy and the Continental Mark II is Bill Ford's baby. He has been the driving force behind the car since its conception. Months back, when the division was just starting to produce cars, this writer was startled to spot Bill Ford test-driving cars on the plant's own track. He wanted to satisfy himself that each car was right. He no longer can do that, production being what it is today, but he still spot checks Continentals as they come off the line.

To make certain each car is right, Continental established a new job classification in the



Inside or outside, the Continental is in good taste without cheesecake. The panel is simply four round dials

assembly operation — the road-test mechanic. Each Continental gets two test drives around the small but adequate test track by one of these experts. This mechanic takes the car over the railroad-tie "rattle course" and brings it in for corrections. He must do the correcting himself. There is no passing the buck. If the car has a rattle, he's got to get rid of it. If it skips a beat on acceleration, he must make it right.

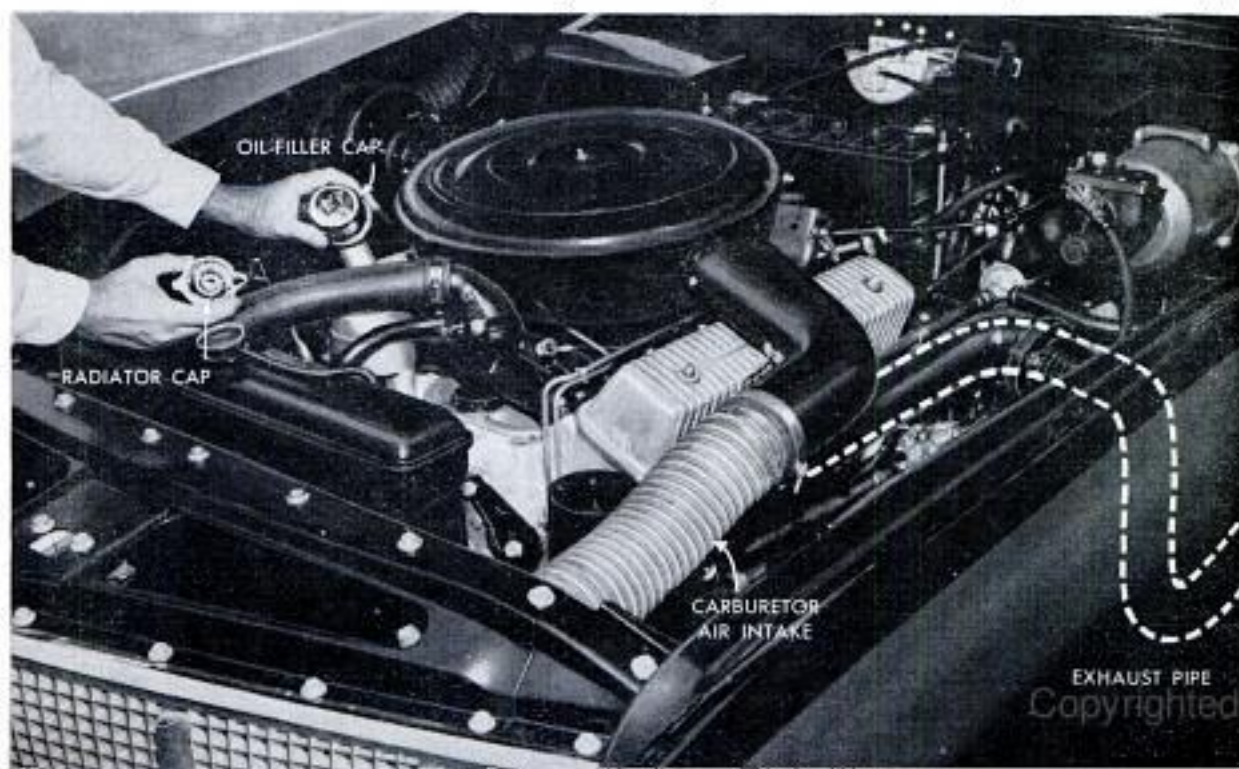
Two examples will illustrate the careful planning that went into details. When the time came to select a horn, Ford and others sat for hours listening to the sounds of various horns as the car was driven past,

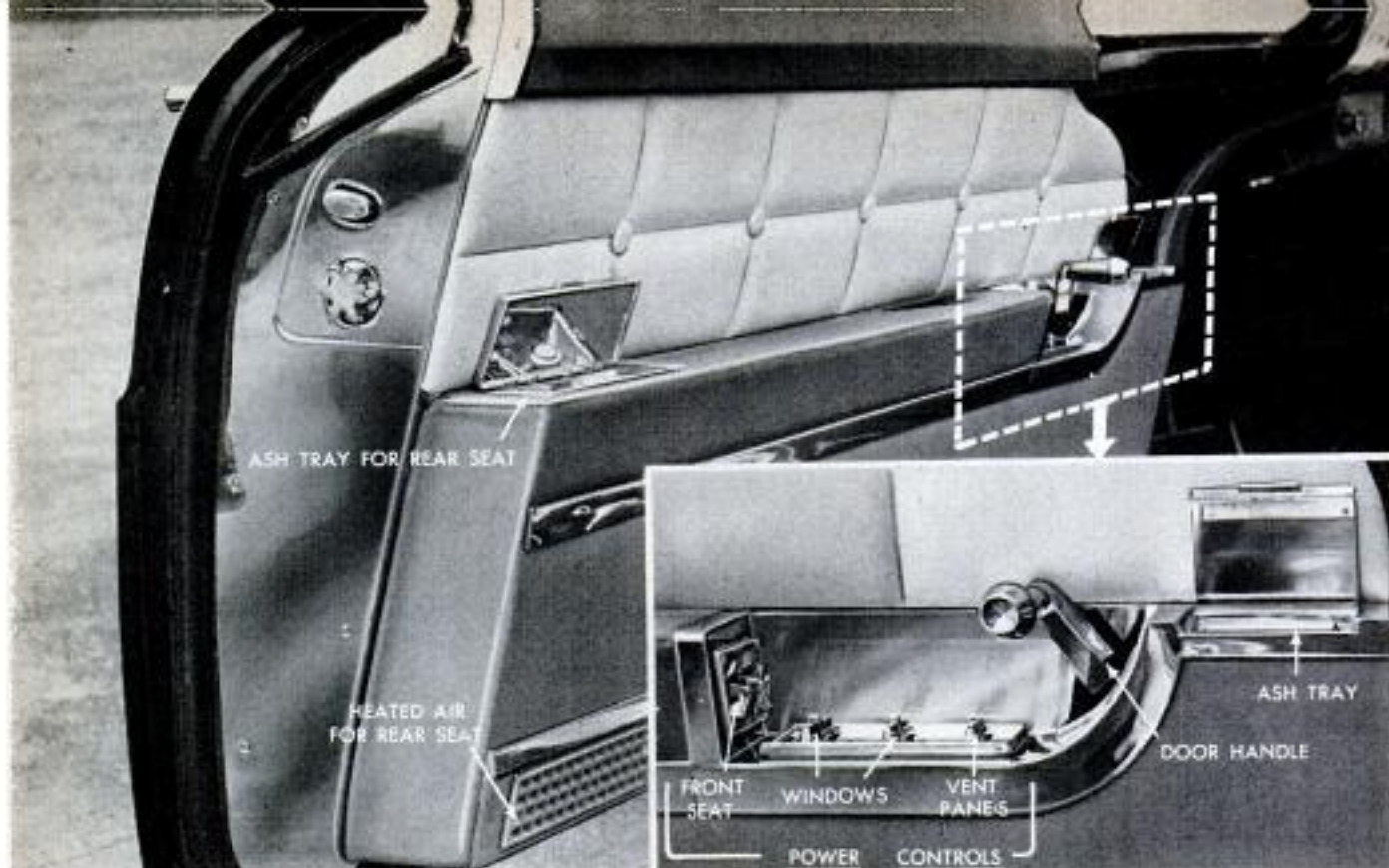
driven into a driveway, under the window. After hundreds of samplings, a horn was selected with just a touch of "sass" blended into its authoritative tone.

A similar amount of care was taken in the exhaust-pipe design. First, there were simply two straightback pipes, but that sounded like two four-cylinder engines, hardly impressive enough for a Continental. Finally, a rear crossover pipe was added just above the differential so the engine would sound right. There are still the two separate exhaust systems, but the crossover pipe blends the two sounds into one.

Here are some added reasons why the new Continental is a \$10,000 automobile:

Under the hood is a modified Lincoln V8 of unspecified horsepower. Dotted lines show path of exhaust pipe



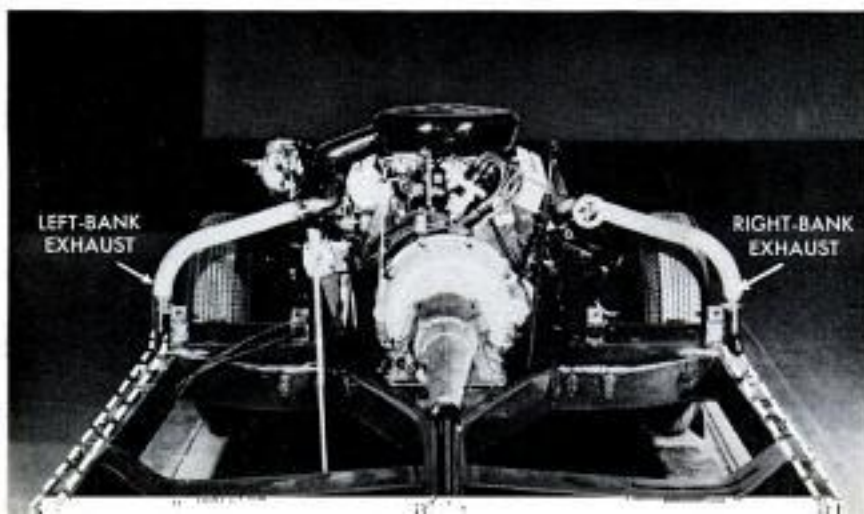


Edges of the big doors are chrome plated. Inset is the control panel. Even the vent panes are power operated



Spare-tire bulge in trunk lid is in keeping with the former Continental tradition. However, the tire location makes loading trunk very awkward

Chassis shot on the Continental assembly line. Between the tail pipes at rear is a crossover pipe (not visible here) to improve sound of exhaust



- Painting a Continental is said to take longer than the entire assembly operation of other cars. There are eight double coats altogether: 1. Two double coats of primer followed by a water-and-sand rubdown; 2. two double coats of surfacer followed by water-and-sand rubdown; 3. two double coats of color followed by oil-and-sand rubdown; 4. two added coats of color and another oil-and-sand rubdown; 5. final polishing. There are 14 single colors and five conservative two-tone combinations available.

- Chrome parts get successive layers of copper, nickel and chromium. They pass salt-spray resistance tests three times as severe as the usual S.A.E. standard. Chrome, used sparingly outside, appears in unexpected places: the radiator cap, oil-filler cap, dipstick, door edges.

(Continued to page 252)

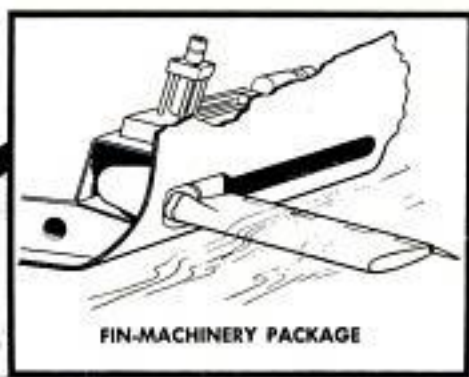
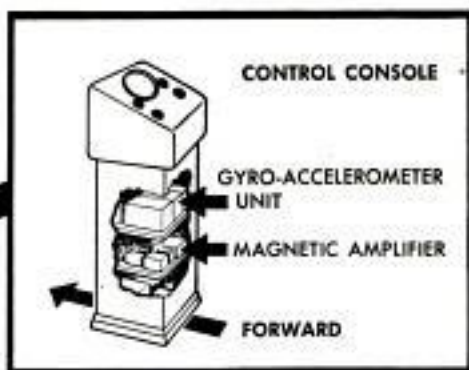
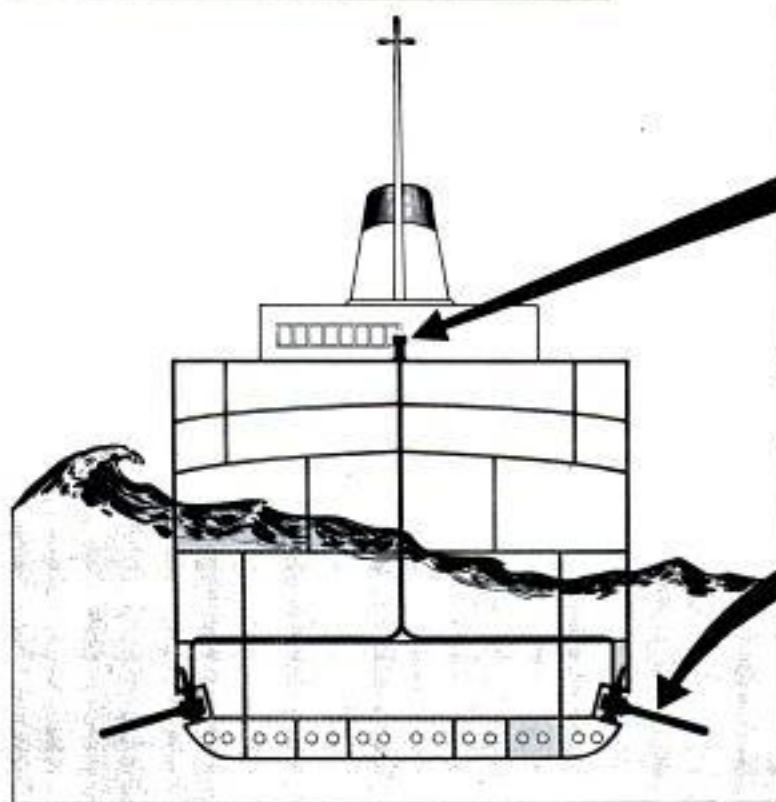
## Waterproof Duck Blind Shelters Two Hunters

There's plenty of room for two hunters in a portable duck blind that offers shelter as well as concealment. The blind weighs only 18 pounds and can easily be carried by one man. At the hunting site the parts of the metal frame are clamped together. A canvas bag is slipped over the frame and held in place with a drawstring. A turret-type hood fastens to the base and accords back from either side to give 360-degree vision. The blind comes in a choice of colors.



## Ship's Stabilizing Fins Cut Roll in Rough Seas

Roll of a vessel, even in heavy seas, is reduced as much as 90 percent by stabilizing fins recently developed. The fins, placed midway between bow and stern and about 20 feet below the water line, feather back into the hull when not in use. They are automatically controlled from the bridge by instruments that measure the ship's impending roll. The compact sensors then transmit, through magnetic amplifiers, anti-roll signals to the hydraulic actuators of each fin shaft. The fins on a typical merchant ship are each 14 feet by 7 feet.





*Make Way*

## FOR THE MICRO-MIDGETS

**T**HERE'S A GROUP of youngsters in Phoenix, Ariz., who talk, sleep and eat racing. These boys, ranging in age from 12 to 16 years, build their own racing cars and put them to the checkered-flag test on their own race track every Saturday.

No one seems to know how the racing club started. The members do recall that a 16-year-old boy came on the scene one day with a  $\frac{3}{4}$ -horsepower racing job rolling on soapbox wheels. From then on, the club grew until now, about two years later, there are 25 boys piloting odd-looking homemade contraptions around the dusty oval. These racing cars, called micro-midgets, are powered by three-horsepower engines. The track is a  $\frac{1}{2}$ -mile oval.

No race drivers are more earnest than these youngsters, all of whom aspire to the big time. One of them, Loren Barnes, uses the same number on his micro that his brother, Don, uses when racing professionally in Phoenix.

The track is complete with racing flags, official timers and track stewards. With their three-horsepower engines buzzing

like excited bees and their tiny wheels churning clouds of dust, the little cars speed around the oval at up to 15 miles per hour.

The early micros used discarded washing-machine engines to drive the rear wheel of a soapbox body. Since then, the box has been junked and a bare angle-iron frame substituted. Added refinements are handmade tie rods for the front wheels, oversize drive wheel at the rear and a two-inch slab of foam rubber on the seat.

Before modifications got out of hand, the youngsters drew up a set of specifications. Over-all length is limited to 60 inches. Wheels cannot be more than 12 inches in diameter. Three-horsepower engines are the maximum that can be used.

The underslung micros are virtually nontippable, but nevertheless each racer wears a safety belt and most cars have sturdy roll bars behind the driver's seat.

With gas tank full (it holds about five quarts—enough to race for several weeks), a micro weighs about 230 pounds. No rules have been formulated on brakes, but either manual or automatic clutch is permitted.





Above, the starting lineup. Some cars have foot throttles, others use a hand control

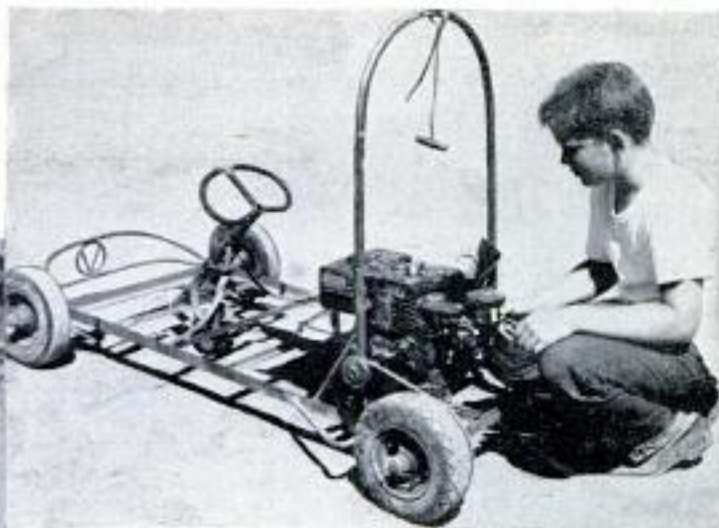
Top speed is about 17 miles per hour. The lap record of 11.4 seconds is held by Reese Verner, 12 years old and the youngest member of the club.

Usually the youngsters build their own cars, although they do get some help from parents and older brothers. Many of the parts come from auto junk yards.

Engines are usually taken from old power lawn mowers. Each week the boys work over these noisy engines before the big 15-lap race on Saturday.

Heat trials are held prior to the event. The car with the fastest time gets the last position. Points are given to the first five finishers in the race. Occasionally, when a trophy is available, a sprint race is held with the two fastest cars competing for three laps.

Headed by 15-year-old Ed Yue, the club, so far as the boys know, is the only one of its kind. ★ ★ ★



Youngest driver and lap-record holder is Reese Verner, 12



Considerable dust flies when the micros swing around the turn and into the straightaway. Each racer should have a roll bar

Post positions are determined by means of trial heats. With an official flag, the starter signals these two to get going



## Flying Aircraft Carrier Launches Jet Fighter From Bomb Bay



Convair's RB-36 bomber has become a flying aircraft carrier, capable of launching and retrieving a Republic RF-84F reconnaissance jet fighter while in flight. The fighter rides in the bomb bay and is launched and taken aboard by a boom lowered through the bay. The combination enables the Air Force to conduct long-range, high-speed reconnaissance missions. The first squadron to operate from the bomber has been activated.



## Brush-Cutting Saw Slung From Strap

Brush clearing is speeded as much as 300 percent with a powered cutter slung from a shoulder strap. A lightweight gasoline motor at the rear of a five-foot arm powers a 10-inch circular saw mounted on its tip. Handlebars mounted on the arm permit the operator to swing the brush cutter from side to side, to reach under overhanging branches or to reach high for overhead cutting and limbing. The brush cutter, an attachment for a chain-saw motor, is constructed of lightweight magnesium and aluminum alloys.



**PLYMOUTH**



Plymouth's four-door hardtop comes in the Belvedere series. Two-toning is slightly different from 1955

## **Chrysler Family Makes 1956 Debut**

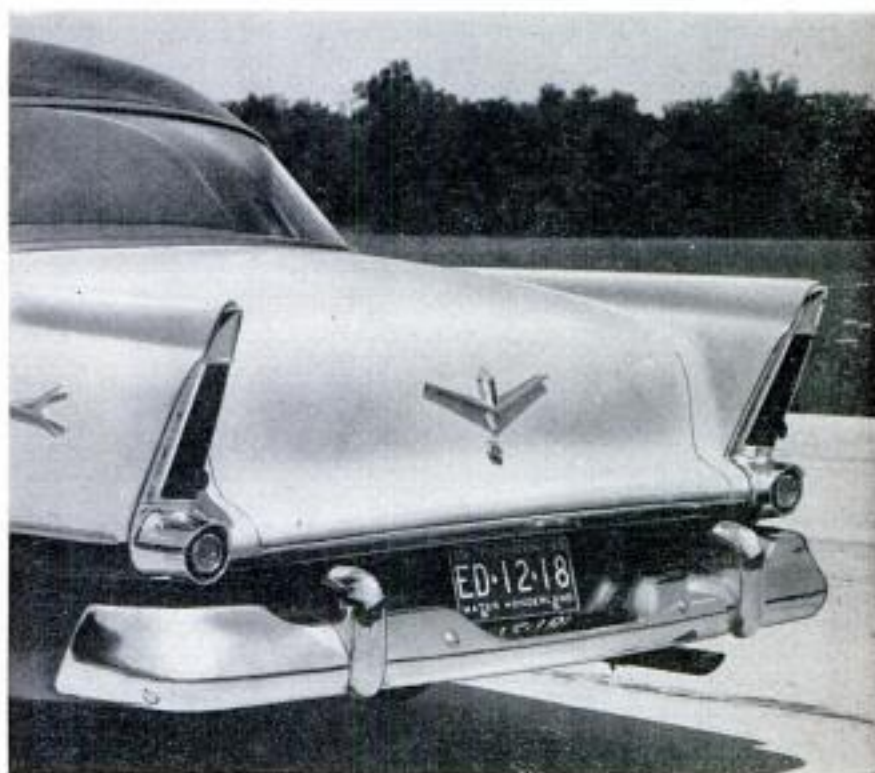
**C**HRYSLER CORPORATION spent a whopping \$175,000,000 on retooling for its 1956 models—and 1956 was supposed to be an “off year” involving only facelifts.

Chrysler spent that much money, right on the heels of the big change of 1955, because it is determined never again to be “engineering-rich, styling-poor.”

Everything from the rear window back is new for 1956. Fenders flare back with what is called the Flight-Sweep motif—a step in the direction of jet-plane styling. Bigger and more emphatic than ever before, the rear fenders are eye catchers, making the roof line look lower by optical illusion. Each of the five cars in the Chrysler family has these big tail fins and easily recognized taillight designs.

But Chrysler is not ignoring engineering. There are important changes here, too. Most talked of are push-button transmission and the long-playing phonograph.

All PowerFlite-equipped cars are controlled by push buttons. A control panel, not unlike the keyboard of an adding machine, is mounted on the dashboard just to the left of the steering wheel, out of reach of children. Only four buttons are needed: One for Neutral, one for Drive, one for Low and one for Reverse. There is no Park position with PowerFlite as Chrysler still provides the separate propeller-shaft parking-brake system. Instead of moving a shift lever, the driver merely presses a button. Safety devices prevent the engagement of more than one at once or going into Reverse while traveling forward faster than 10 miles per hour.



Above, cleanly sculptured are the airfoil tailfins of the '56 Plymouth. Tall, vertical taillights quickly identify the car. Below, center section of the front grille has been restyled



**DODGE**



Dodge Custom Royal Lancer two-door hardtop. Also available in this series is the four-door hardtop

### Long-Playing Phonograph

Also available through the entire corporation line is a long-playing phonograph that is mounted just below the radio on the dashboard. It plays through the radio and consists only of a turntable and pickup arm, designed so it is virtually impossible to make it jump a groove even on the roughest roads. Records are seven inches in diameter and spin at about 16 revolutions per minute. One record will play for about 45 minutes. Because of the ultra-long-playing design, no automatic changer is needed. Once every 45 minutes or so, you flip the record over or change it for a new one, an operation that Chrysler says can be accomplished without taking your eyes off the road.

Four-door hardtops are available through the whole line with Plymouth, Dodge, De Soto, Chrysler and Imperial all offering them.

The entire line now has the 12-volt electrical system and new safety door latches. Seat belts are available as dealer-installed options, as they were last year.

Here, in summary, are additional high-points of each division's 1956 cars:

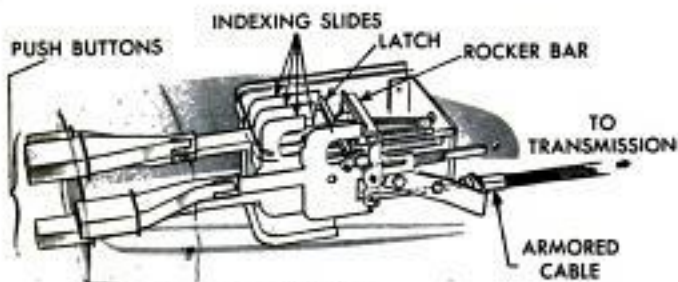
### Plymouth

Large, cleanly chiseled rear fenders are definitely of airfoil shape. Grille and other front-end chrome have been simplified, although basic styling is unchanged.

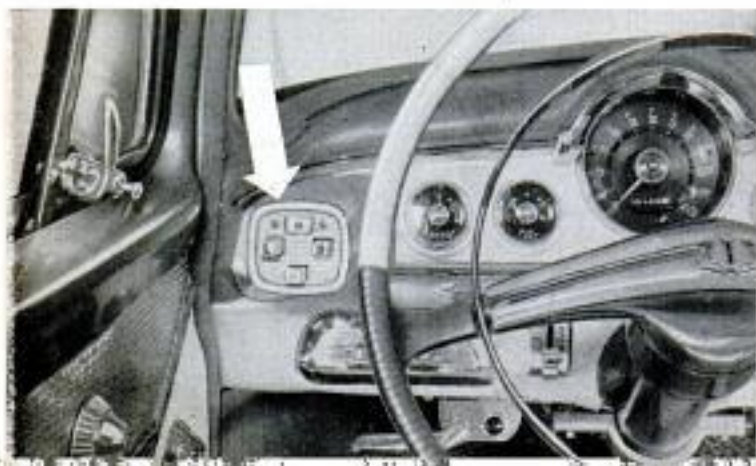
Plymouth's new V8 engine is bigger,

From the rear, you'll recognize the Dodge by the bold diagonal lines. Note the dual radio antennas

Above, you can get a long-playing phonograph on any Chrysler Corporation car. It mounts under dash



Below, arrow points to push buttons for transmission. Sketch, above, shows how it operates with one cable





DE SOTO

For the first time in years, the De Soto grille has no vertical bars or teeth. Instead, it uses this mesh. Parking lights are inside the bumper guards

having a 277-cubic-inch displacement and an 8.0:1 compression ratio. Dual-throat carburetor is standard. The bore is 3.75 inches (up from last year's 3.56) and the stroke is 3.13 (down from last year's 3.25) to make the engine well over-square.

Optional is a power pack with a four-barrel carburetor and dual exhausts. Horsepowers are not available at this writing, although on power-pack engines it is expected to be around 200.

The six-cylinder is unchanged except for a slight increase in compression ratio (7.6:1).

Combustion chambers in the V8 have been reshaped. Valves are larger and intake ports improved for better breathing. Turbulence caused by valve action has been reduced. Fuel mixture burns more evenly and gasoline economy is said to be improved noticeably. New mechanical valve tappets improve the lightweight valve train. As previously, the Plymouth V8 uses regular gasoline.

The four-door hardtop is available only in the Belvedere series. All station wagons for 1956 are in a separate series, known as the Suburban. There are three basic



De Soto taillight assembly is three separate lights. Below, profile of two-door hardtop



**CHRYSLER**



**New Yorker uses two-toning to emphasize its finlike rear fenders. Exhaust pipes are invisible in rear view**

models: the two-door with two bench seats; the four-door with two bench seats; and the four-door with three bench seats. The most luxurious of the wagons, the Sport Suburban, has a permanent luggage rack built into the roof.

Dashboard layout has been changed. The oil and ammeter dials have been replaced with flashing lights. All engine instruments are now directly in front of the driver.

Plymouth has gone back to the pull-type door handles, dropping the push-button type used in 1955.

**Longer this year by 5½ inches, the Imperial has bigger rear fenders, larger and jauntier gunsight taillights**

### **Dodge**

Two-toning on the Dodge Lancer series has been changed to put the emphasis on the finlike rear fenders. The sharp dip of the chrome strip comes just a few inches forward of the taillights. The four-door hardtop is in the Lancer series.

The new Super-Powered Super Red Ram V8, as it is called, develops 230 horsepower with its optional power pack, consisting of a four-barrel carburetor, dual exhausts,

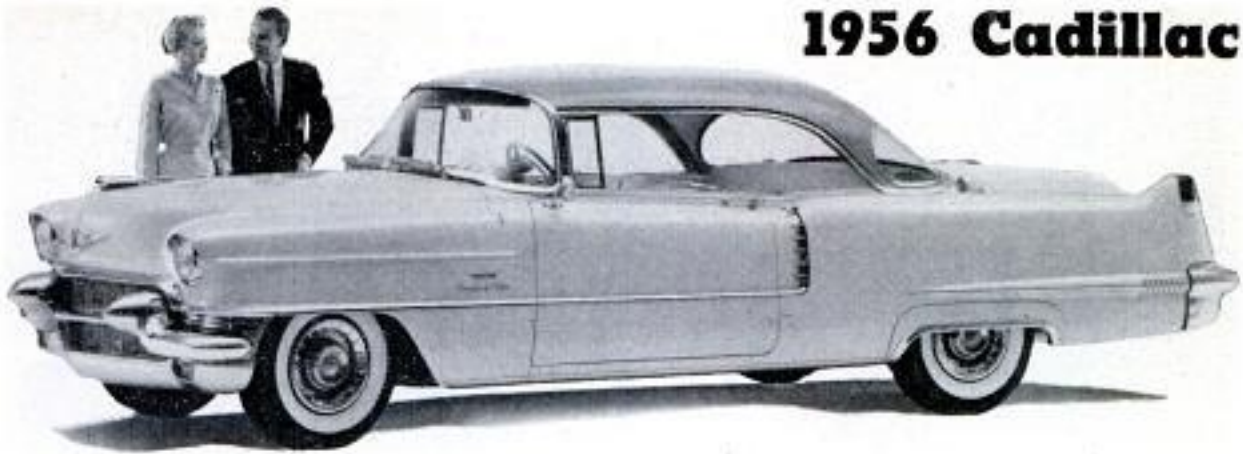
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**IMPERIAL**



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# 1956 Cadillac

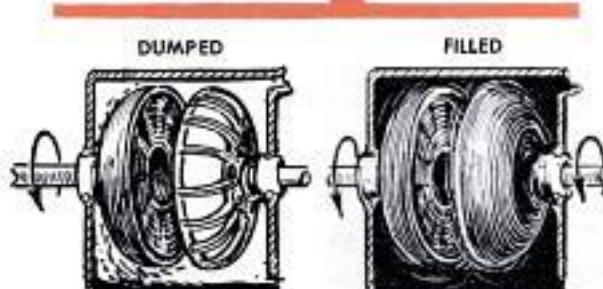
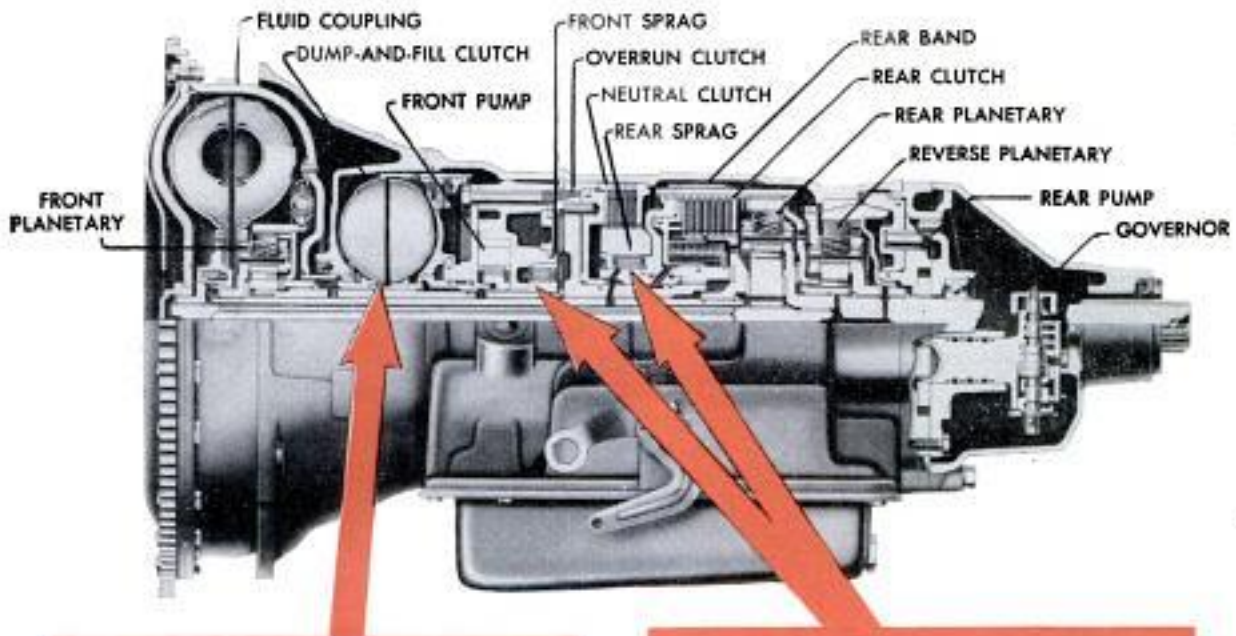


**BIG NEWS** at Cadillac is mechanical: A new engine and a Hydra-Matic that uses a dump-and-fill clutch and two sprag clutches to shift gears without jerking (see below). The new V8 engine has a 365-cubic-inch displacement (last year: 331). Horsepower is 285 on the Cadillac, 305 on the Eldorado. Both develop 400 pound feet of torque. Over-all ratio of power steering is 19.5:1, faster than last year's 21.3:1.

Styling maintains the Cadillac look. New are wider headlight hoods, parking lights in bumpers, an aluminum grille which you

can get in yellow-gold color if you wish. Rear bumper is restyled to make the rear end appear lower. More chrome trim is apparent. There is even a delicate chrome line running along upper portion of the rear fender, right up to the famed fishtail.

Also new: Center-mounted glove compartment; two ash trays and lighters on dash; antenna drops completely out of sight into small well in front fender; power seat tilts as well as moves back and forth, up and down; hump in front floor is lower; air conditioning available on convertibles.



Dump-and-fill clutch is a fluid coupling that transmits torque when full of oil (right), disengages without jerk when oil is dumped



Sprag clutch turns freely one way (left) but as planetary reaction tries to go the other way, the tiny pawls jam so it cannot rotate



*Packard Patrician*

## **1956 Packard, Clipper**



*Clipper Custom*



*Caribbean Convertible*





**1** With temperatures in the 90s, workman "ices" a 35-percent hill by spreading liquid soap over it



**2** Car equipped with regular rear end tries the hill. Right wheel spins on soap. Smoke is from tire



**3** Car can climb no higher than point of arrow even though its left wheel is on clear pavement

## **Packard "Ices" a Hill in September To Prove Its New Differential Works**

### **and Caribbean**

ONCE AGAIN, Packard has come up with something new. In 1955, it was the self-levelizing torsion-bar suspension. This year, there are two innovations (both optional at extra cost): 1. A new rear end that makes winter driving less hazardous, and, 2. A push-button transmission.

New in the rear end is the differential. The function of any differential is to let one rear wheel go faster than the other so the car can turn corners without scuffing tires. Packard's new differential tends to keep both wheels going at the same speed if there is a difference in traction so you won't get stuck when the going is tough. It is, as Packard engineers like to say, "reluctant to differentiate."

It distributes torque to both wheels so a Packard can pull away from other cars on ice-covered hills. It channels power to the rear wheel with more traction instead of to the wheel with less as does a standard differential (see photos on this page for a visual demonstration).

You can imagine what this differential will do on ice or snow. And it helps in the rain or even in dry weather when cornering fast because it transfers torque to the outside wheel to which centrifugal force has moved most of the weight.

#### **Push-Button Transmission**

Packard has push-button controls for its Ultramatic transmission. The control panel is right under the steering wheel in the same place the shift lever used to be. Controls are electrical and the buttons depress as easily as adding-machine keys. You can't accidentally depress two at once, nor can you activate Reverse or Park when the car is moving faster than five miles per hour.

Here's another safety factor: The transmission can't be taken out of Park unless the ignition key is turned

(Continued to page 268)



**4** Strip is "re-iced" to duplicate original conditions. Soap is so slick, workman can't walk on it



**5** Car with new differential goes up hill without any hesitation. Closeup, below, of tire tracks is proof wheel did not slip on soap





## 1956 Pontiac

Four-door hardtops are available in all three Pontiac lines. Shown here is the top-price Star Chief version

FIRST OF THE General Motors cars to offer 1956 models, Pontiac features a four-door hardtop and the new Hydra-Matic.

The hardtop or pillarless four-door sedan (shown above) is 1½ inches lower than a standard four-door sedan. Yet rear-seat legroom is 40.7 inches (standard four-door's is 42.0 inches). Rear-seat hiproom is 62.8 inches (standard's is 63.1 inches).

The redesigned Hydra-Matic retains its previous high-performance, high-economy four-speeds-forward advantages, but eliminates jerky shifts by eliminating the bands that caused them. These bands, which formerly put the planetary units in

and out of reduction, required frequent adjustment to prevent jerkiness. This year, bands are not used (except for one that functions only during down-hill braking in Low). A second, smaller fluid coupling acts as a dump-and-fill clutch to smooth out gear changes. For an explanation of the sprag clutch and the dump-and-fill clutch which provide jerk-free shifts, see page 93.

Displacement of the V8 engine has been increased to 316.6 cubic inches by boring out the cylinders to 3.94 inches. Stroke remains unchanged at 3.25 inches. Horsepower is 227 on Star Chief models, 205 and 192 on the others.

Some of the styling changes you will note are new grille, bumper, two-toning, chrome bands recessed in hood



## Electronic Juggling Machine Balances Three-Foot Rod

Science has come up with an electronic "trained seal" that keeps a three-foot rod in perfect balance (right). The machine, designed by Reeves Instrument Corporation, was used to entertain visitors at the German Industries Fair in Hanover. A light on top of the swaying rod shines on two photoelectric cells above. The cells transmit information on the rod's movement to an electronic "brain" that actuates mechanical arms which reposition the bottom tip of the rod. The brain, previously used to predetermine performance of unbuilt guided missiles, may be used in the future to guide industrial processes.

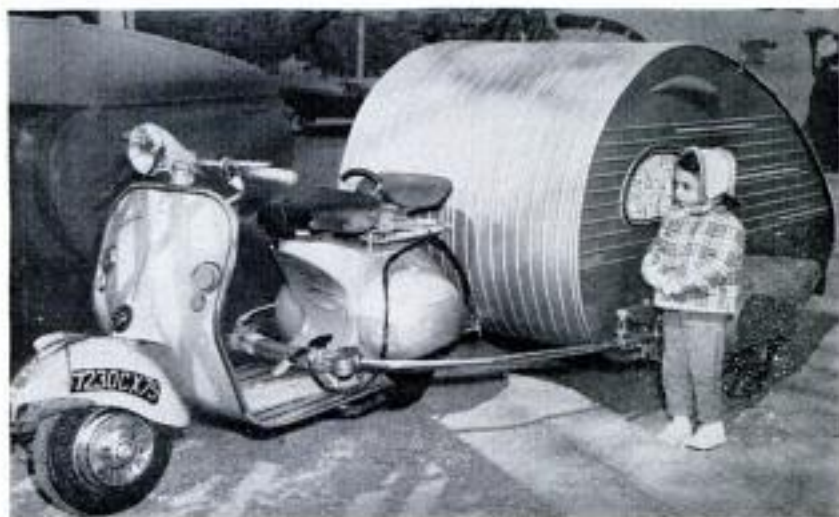


## Amplifier Spots Termites

You can track down termites with an electronic listener that amplifies the characteristic sounds of the wood-boring insects. It is designed to tune in on dry-wood termites, which obtain water from the natural humidity of the air. The five-pound unit (left) consists of earphones, a battery-operated amplifier with volume control and filter selector, a pick-up unit with an on-off switch and a vibration-sensing needle. A record of termite sounds familiarizes the operator with characteristic noises. A carrying case completes the kit. At work, the operator taps a suspected area. This causes any termites below to relay alarm signals—sharp signal raps—which are picked up by the detecting unit. The method eliminates probe-and-drill techniques which sometimes do more damage than the insects.

## Small Camp Trailer Hooks on Scooter

Vacationers in Europe don't have to own a car to pull their camping trailer—they can use a regular motor scooter. The small, two-wheeled trailer, scaled down to match a scooter's size, still has enough sleeping room for two persons. An unusual trailer hitch encircles the entire rear end of the scooter. The trailer contains two air mattresses.





Boat suspended from crane swings off launching platform. Hole was cut in side of house to get boat out

## Crane "Launches" Attic-Built Cabin Cruiser

"LAUNCHING" a 19-foot cabin cruiser recently built on the second floor of a Kansas home meant: 1. Tearing out a wall, 2. Building a scaffold and 3. Hiring a huge construction crane to lower the craft safely to the ground. Charles E. Boeppler of

Leavenworth, Kans., working at night and on weeks ends, built the *Bobbe-B* in the unfinished upstairs of his home. He spent more than 600 spare-time hours in constructing the solid mahogany boat, which he says is in the \$3000 to \$4000 class.

**T**HERE'S SOMETHING wrong somewhere! As the 1956 cars come out, they're all bigger and more powerful. Even with the current safety emphasis, power boosts are spectacular. Every car but one will have at least one model with 200 or more horsepower.

Yet, while all this is happening, an unbelievable event takes place in the background. A car, small and underpowered by 1956 standards, can't keep its dealers supplied, so spectacular are its sales. And all this without free trips to Paris, free TV sets, free groceries or discounts. And with no advertising worth mentioning.

**What is this unbelievable car? It is the tiny, buglike Volkswagen. Its dealers even have waiting lists for second-hand models.**

Volkswagen sold over 10,000 cars in the first half of 1955, will probably sell 30,000 for the year. For October delivery, the factory had orders for 8600 cars from its American dealers. In 1954, they sold only 6300 Volkswagens here. That means almost 500-percent increase and still going up. No American car even comes close to that record—and yet the VW is no longer than last year's, has no additional power.

How is this possible? Some observers say it is simply that American makers have deserted the entire area of the small car. There just is no place for the small-car buyer to go except to go foreign. And, if sales prove anything, he's beginning to go there. There just aren't any small American cars any more. There are big cars and bigger cars.

Volkswagen bought a former Studebaker plant in New Jersey and is installing machine tools in it. The sedan bodies will be stamped and assembled there (convertibles and commercial bodies will be made in Germany). Engine and power-train parts will come from Germany. Within three years, one high VW source claims, Americans will buy 250,000 Volkswagens a year. Unbelievable? Perhaps, but who would have said we would buy 30,000 this year?

What will Detroit do if this VW claim comes true? Will it build a small car? It's a good bet, it will.

#### 1956 Tooling Costs

Most of the 1956 cars are face lifts, with no sheet-metal changes. Yet the estimated bill for these changes (plus costs of expanded facilities) is \$750,000,000. For 1957, the change-over bill is expected to hit \$1,000,000,000 (that, my friend, is a billion dollars!). So you can see there are big changes coming.

Studebaker is hot for 1956—much hotter than expected. You won't recognize the sedans, so extensive are the changes, de-

## Detroit Listening Post



By Leo Donovan

spite the use of the same body shell. The squared-up front end has a handsome mesh grille. Rear fenders are higher, rear deck is raised. Concave side panels are gone. The car has been Americanized again.

**But Studebaker's smash hit is its sports line—the Hawks. These have fresh styling: New hood, rear deck, flashy tailfins! One of them, the Golden Hawk, is a bomb! Horsepower is secret, but the engine can't be disguised—it's a Packard V8 with four-barrel carburetor. Horsepower is probably 270. That power in a 3375-pound coupe makes it sizzle. It has a better power-weight ratio than any U. S. car.**

In a test run in the rain, the Hawk averaged 114 miles per hour for 2½ miles with two hefty men aboard. The day before, the same car averaged 121 miles per hour on a dry track. Acceleration is terrific.

The Rambler, all new for 1956, will be out in December. Those who have seen it say it's controversial. Some like it enthusiastically. Others say it's been ruined! All seem to think it is different. It's not a copy of any other car. It does not have the by-now - almost - universal forward - slanting headlights and backward - slanting taillights. It is only a little longer, but quite a bit wider, inside at least. And as one insider describes it, "It's been jazzed up like a Christmas tree!"

It will offer a four-door hardtop. The engine will be a new overhead-valve six. The V8 may come later in the year.

#### Hardtops Take Over

A Mercury spokesman, discussing the company's forthcoming four-door hardtop, said he expects 30 percent of Mercury sales to be of that model. Add in the two-door hardtop and the total is about 70 percent.

Ivan Wiles, Buick general manager, says he expects about 90 percent of the Buicks sold in 1955 to be hardtops. By 1957, Wiles predicts there may be no Buicks built with conventional doors.

**Tidbits for 1957:** Most cars will have 14-inch wheels. Heights will be down three inches. Suspensions will make news.



**TWINKLER UNIT** operates three to six strings of lights on your Christmas tree. It turns each string on and off at different rate for twinkling effect  
 Shopping Ranch, Dept. 17, Box 368, Scottsdale, Ariz.

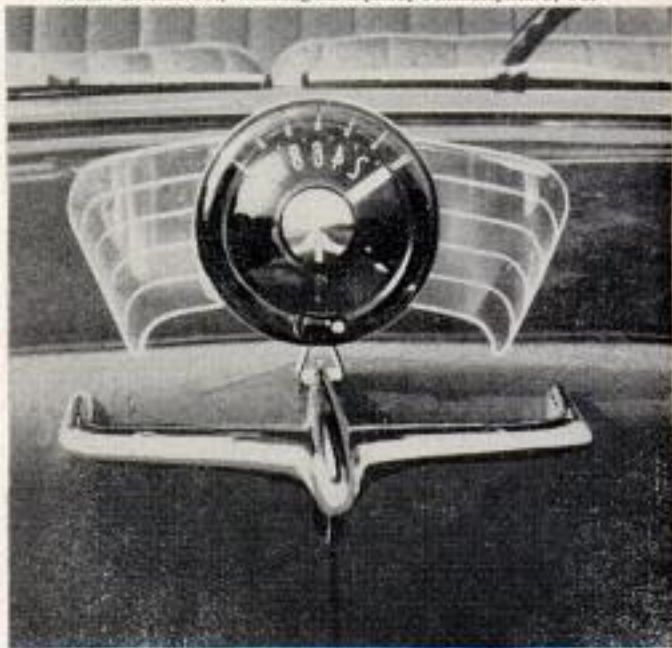
**SPOTLIGHT** (left) plugs into cigarette lighter on instrument panel of car and has 12-foot cord. It was designed for TV-radio servicemen making night calls  
 General Electric Co., Schenectady, N. Y.

# Christmas

**BOW PISTOL** for sportsmen hurls arrows at high speed and has range of 150 yards. Arrows will penetrate a coyote at 30 yards. The bow is made of aluminum alloy. Outfit includes six arrows and target  
 Malibu Archery Co., 1036 S. La Brea Ave., Los Angeles 19, Calif.



**AIR-SPEED INDICATOR** is mounted on hood of car and permits driver to check speed without taking eyes from road. It is combined with an insect deflector. Dial is transparent green-tint Plexiglas  
 Bohm & Haas Co., Washington Square, Philadelphia 5, Pa.





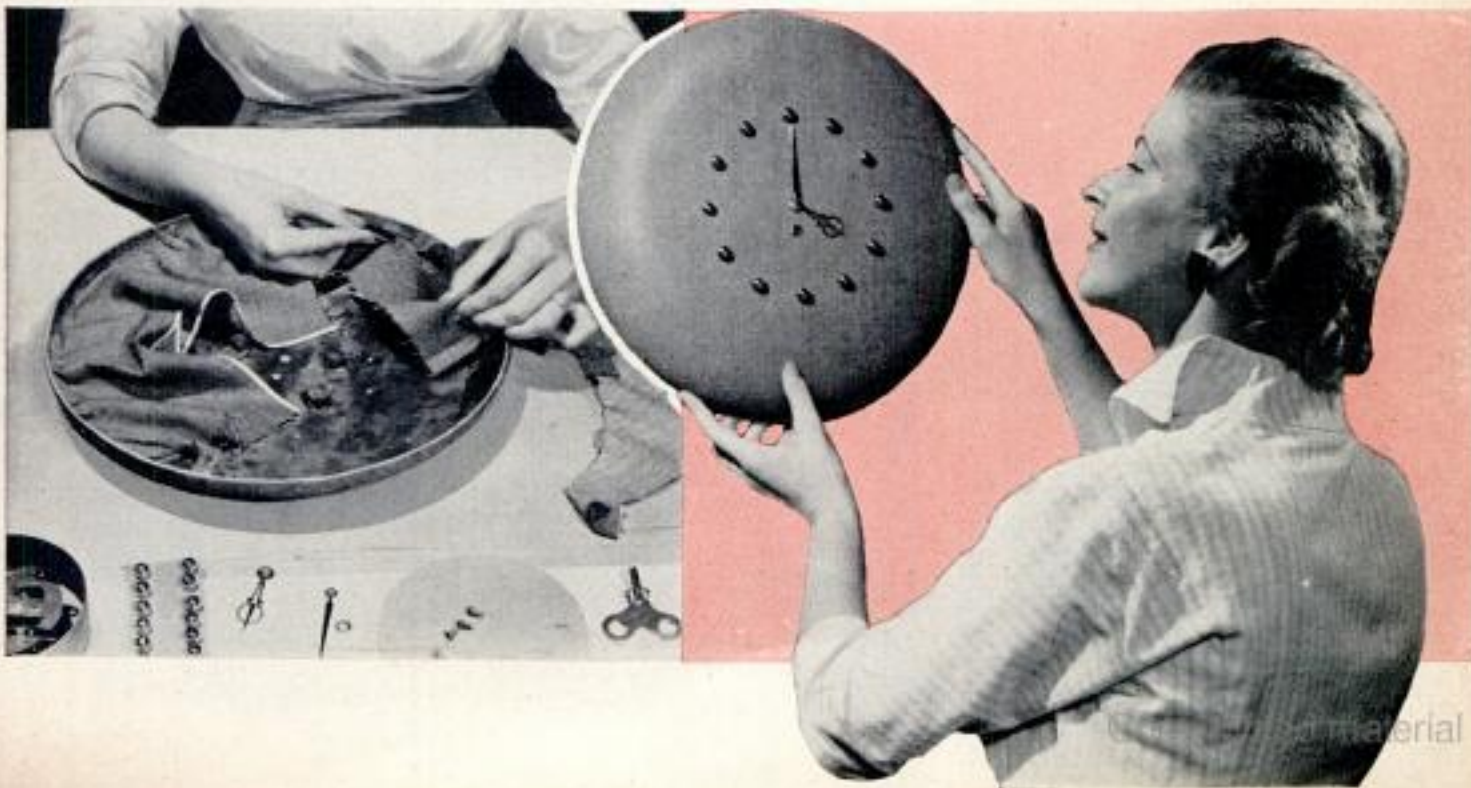
**HOLDER** for live Christmas trees is made of steel with green enamel rust-resistant finish. Tip-proof holder is 10 inches deep, 20 inches in diameter  
 Mutio Manufacturing Co., 1800 20th St. N.E., Canton, Ohio

**SCALE-KNIFE** for weighing and cleaning fish opens to become a notched yardarm scale. It gives accurate weights from 10 ounces up to 12 pounds  
 Thorsen's, Dept. F5FK, 352 Fourth Ave., New York City



# Shopping Center

**CLOTH-FACED CLOCK** comes in a kit for home assembly using any fabric you choose to match or harmonize with draperies, upholstery or wall coverings. The kit includes the assembled works, hands, numeral indicators and adhesive for applying fabric. Photo at left shows fabric being trimmed with razor blade after it is in place. When new face is desired the special adhesive makes it possible for fabric to be peeled off with ease  
 Herschelle Hall Clock Co., McMillan St. and Essex Place, Cincinnati 6, Ohio





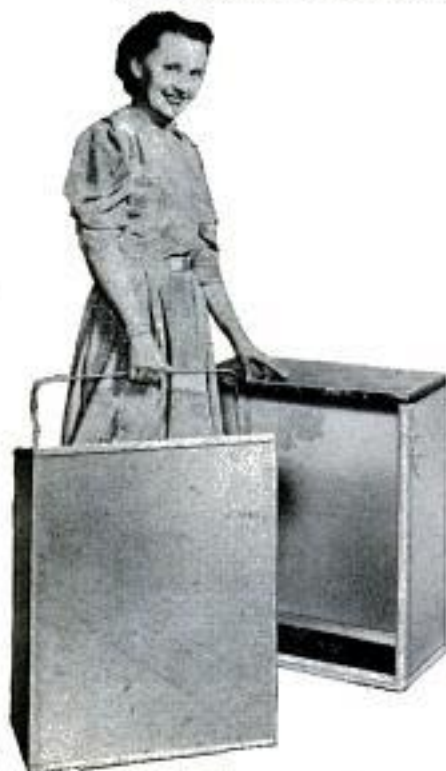
**DO-IT-YOURSELF ENCYCLOPEDIA** consists of 12 volumes of directions for making and repairing almost everything in the field of home craft: Furniture making, remodeling, plumbing, wiring, heating, also car repairs  
 Book Dept., Popular Mechanics Magazine, 200 E. Ontario, Chicago 11



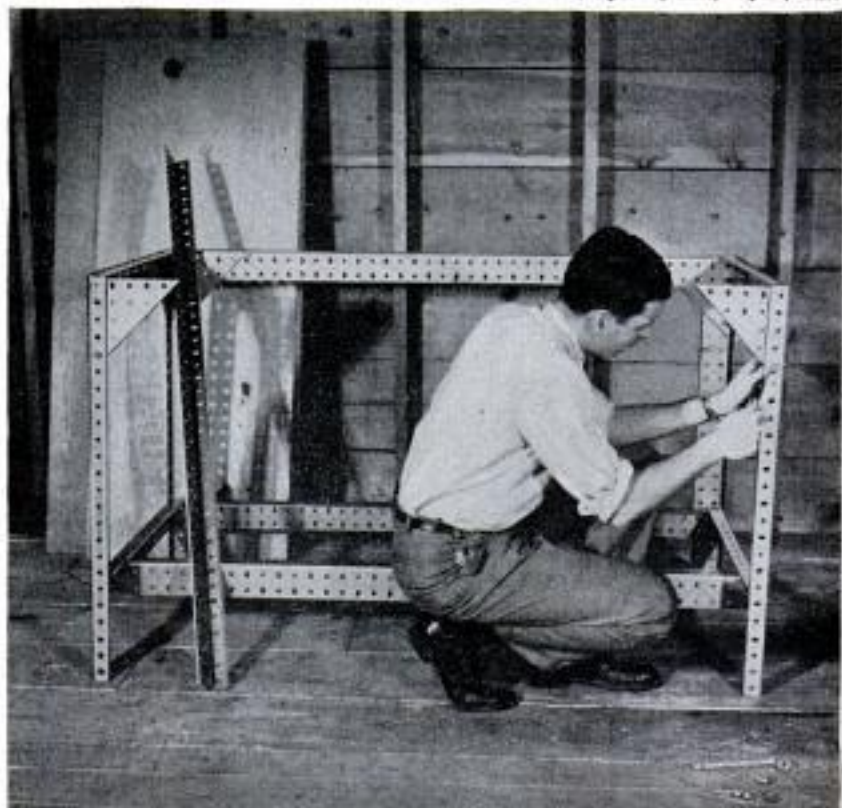
**AUTO COMPASS** has its own interior dial illumination and is available in all of the new pastel shades of the '55 cars  
 Hull Manufacturing Co., Warren, Ohio

# Christmas Shopping

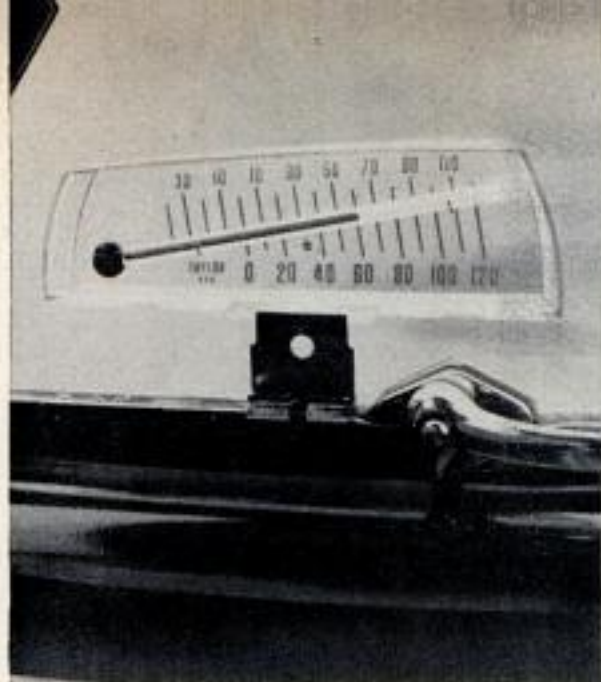
**TOTE BIN** for laundry has section that lifts out. Metal bar serves as a towel rack and handle for carrying the bin  
 Hall Products Inc., Carterville, Ill.



**HOME WORKBENCH** has precut metal frame and comes in a kit. It can be set up in 30 minutes. Plywood panels (not included) can be bolted to the frame to serve as bench top and shelf. Workbench is five feet long  
 Structo System, Inc., Elyria, Ohio





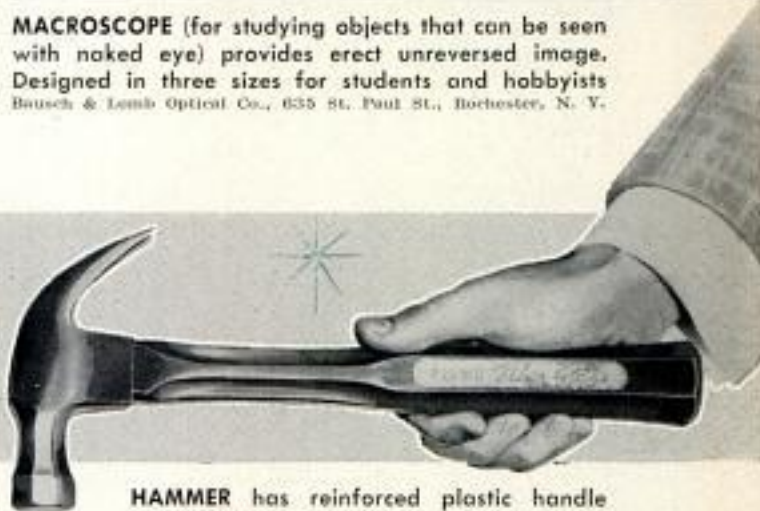


**AUTO-WINDOW THERMOMETER** clips onto right-hand vent window and gives outside temperature. When window is closed and locked it cannot be removed.  
Taylor Instrument Companies, 95 Amos St., Rochester 1, N. Y.



**MACROSCOPE** (for studying objects that can be seen with naked eye) provides erect unreversed image. Designed in three sizes for students and hobbyists.  
Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.

# Center

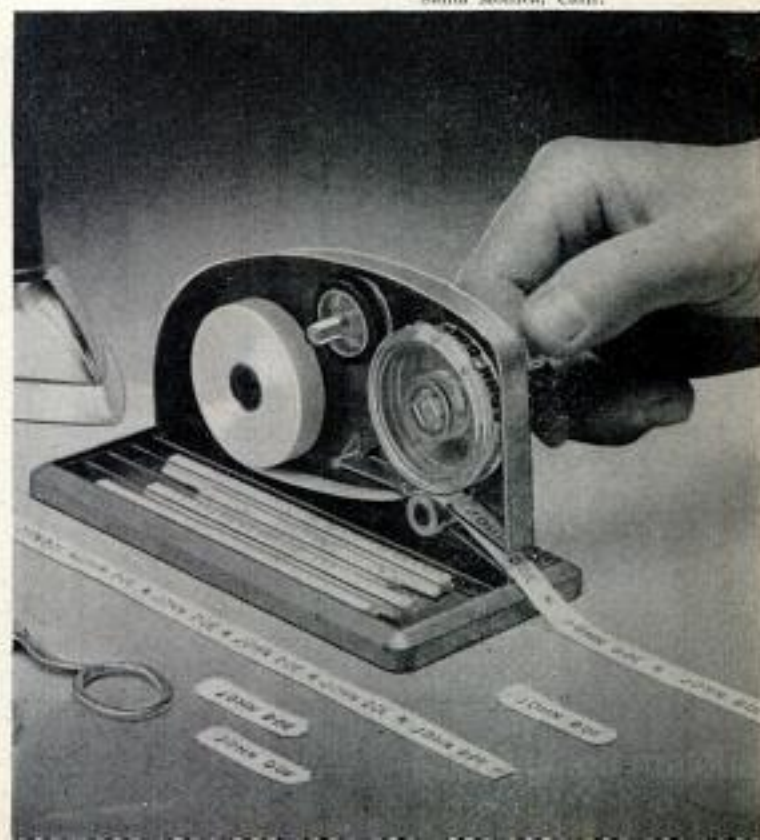


**HAMMER** has reinforced plastic handle  
Fayette R. Plumb, Inc., Philadelphia, Pa.

**PINLESS CLOTHESLINE** is made of twin strands of plastic-coated steel wire with a special twist. Wheel-like spreader runs along line to attach wash.  
Demman Manufacturing Co., 1 Washington Ave., Providence 5, R. I.



**NAME-TAPE PRINTER** comes with plastic type and enough iron-on tape to print 300 to 400 labels. The compact printer is operated by turning a crank.  
Reynolds Industries, Inc., 2100 Colorado Ave., Santa Monica, Calif.



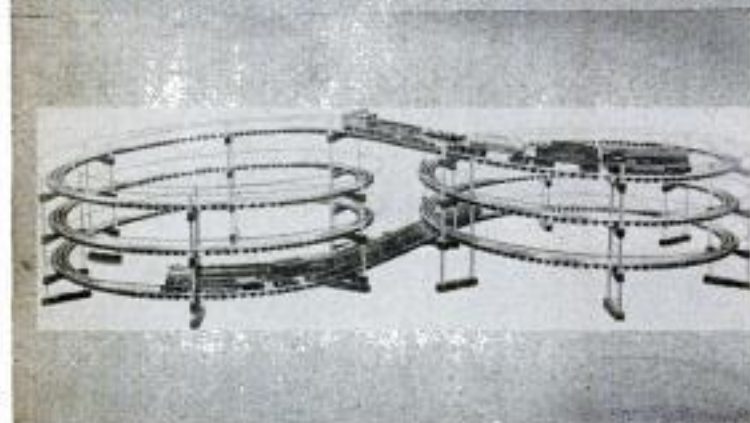


**ROCKET TOY** with launching platform and sound effects will delight the youngsters. The toy is released by spring action. Siren is operated by crank  
 Ideal Toy Corp., 200 Fifth Ave., New York City



**RADIO BIKE** has a radio built into the body. It is powered by a battery over the rear wheel. The radio is shockproof and has 100-mile station range  
 Huffman Manufacturing Co., 117 Gilbert Ave., Dayton, Ohio

# Christmas Shopping



**SPIRAL TRAIN TRACK** comes in a kit with the upright brackets assembled. It's for electric sets  
 Jack Built Toy Co., 1401 W. 8th St., Los Angeles 17



**AERIAL SAND LOADER** complete with crane and truck scoops the sand and conveys it to the hopper  
 Mound Metalcraft Co., Mound, Minn.

**SPACE-SHIP TOY** zooms to 300 feet with jet stream of water when the pressure tank is opened up  
 Park Plastics Co., 940 Park Ave., Linden, N. J.



**RIDING TRACTOR** with a 2½-horsepower gasoline engine can easily pull leaf sweeper or lawn mower  
 Strunk Equipment Co., Coatesville, Pa.





**WIRE-ART KIT** can be used to make a variety of figures or knickknacks. It can be combined with pipe cleaners and other materials for odd effects  
*X-Acto, Inc., 48-41 Van Dam St., Long Island City 1, N. Y.*



**OPTICAL HOBBY KIT** includes lenses, prisms, mirrors, color filters, optical bench, periscope housing, lens frames, various stands and the necessary holders  
*American Optical Co., Southbridge, Mass.*

# for Juniors

**PRECUT HOUSE** in miniature is put together like the real thing. Kit contains over 550 pieces including glue, chimney, floor plan and the directions  
*Toy Construction Kits, Inc., P.O. Box 145, Niagara Falls, N. Y.*



NOVEMBER 1955

**MINIATURE SEWING MACHINE** is precision designed and will do various types of sewing like a regular model. Guard protects fingers from needle  
*Singer Sewing Machine Co., C/O Young & Rubicam, Inc., 285 Madison Ave., New York City 17*



105



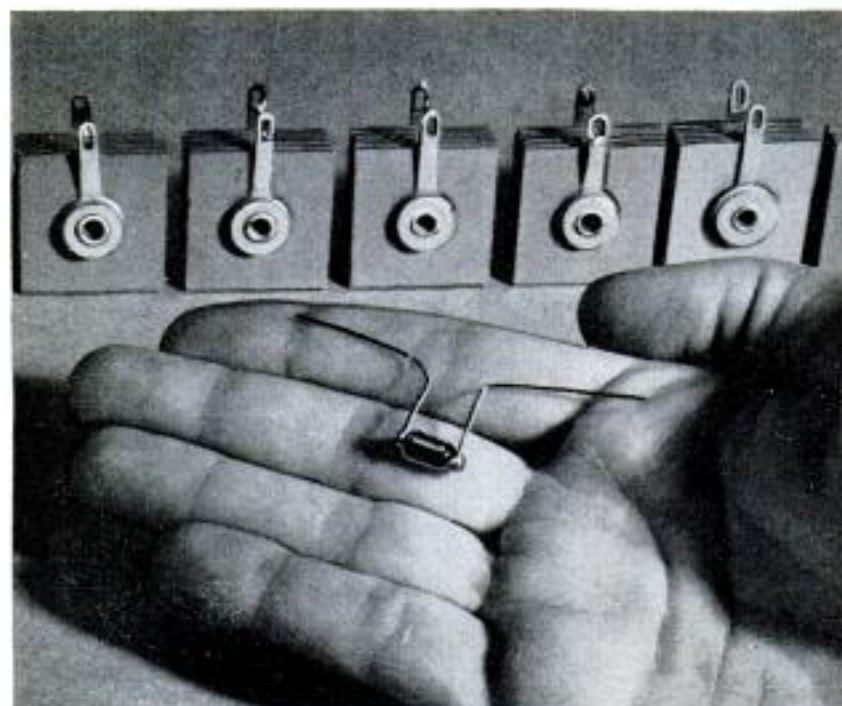
## Bicycle Trailer Carries Mowers

Full equipment for lawn-mowing jobs is carried around in a bicycle trailer by a Tacoma, Wash., boy. The 30 by 48-inch trailer, made of  $\frac{1}{2}$ -inch plywood, is braced with strap iron and rides on a  $\frac{5}{8}$ -inch axle. It holds a power and hand mower, two grass catchers, an edger, broom and trimming shears, and is easily pulled by a geared bicycle.

Everything needed for a professional lawn-mowing job is carried in trailer

## Bent-Rod Clothes Rack Fits Between Car Seats

All the suits and dresses needed on a long trip can be carried in an unwrinkled condition with a clothes rack that fits between the seats of an automobile. The base of the metal rack rests on the floor of the car, leaving enough room for two to ride in the rear seat. The rack can also be used in the home as an extra rack for children's clothes. It is short enough to be used by a preschool child.



Tiny silicon power rectifier in man's hand does job of seven selenium rectifiers like the ones in background, used in TV sets, switchboards

## Pea-Size Rectifier Turns A.C. to D.C.

Alternating current is changed into direct current by a tiny rectifier the size of a pea. Heart of the transistorlike device is a silicon wafer smaller than the head of a pin. Developed by Bell Telephone Laboratories, the rectifier could be used in charging storage batteries used in automobiles and telephone central offices, to operate electric motors and could take the place of conventional rectifiers in TV sets. It is said to last indefinitely, to resist heat, and would replace large, low-efficiency rectifiers that need bulky cooling equipment in order to prevent overheating.



General Mills photo

Plastic balloons will carry instruments to heights never reached by man

Come July 1, 1957—the start of the International Geophysical Year—scientists will begin a 'round-the-world and 'round-the-clock



# MASS ATTACK ON THE EARTH'S MYSTERIES

By Dr. Sydney Chapman

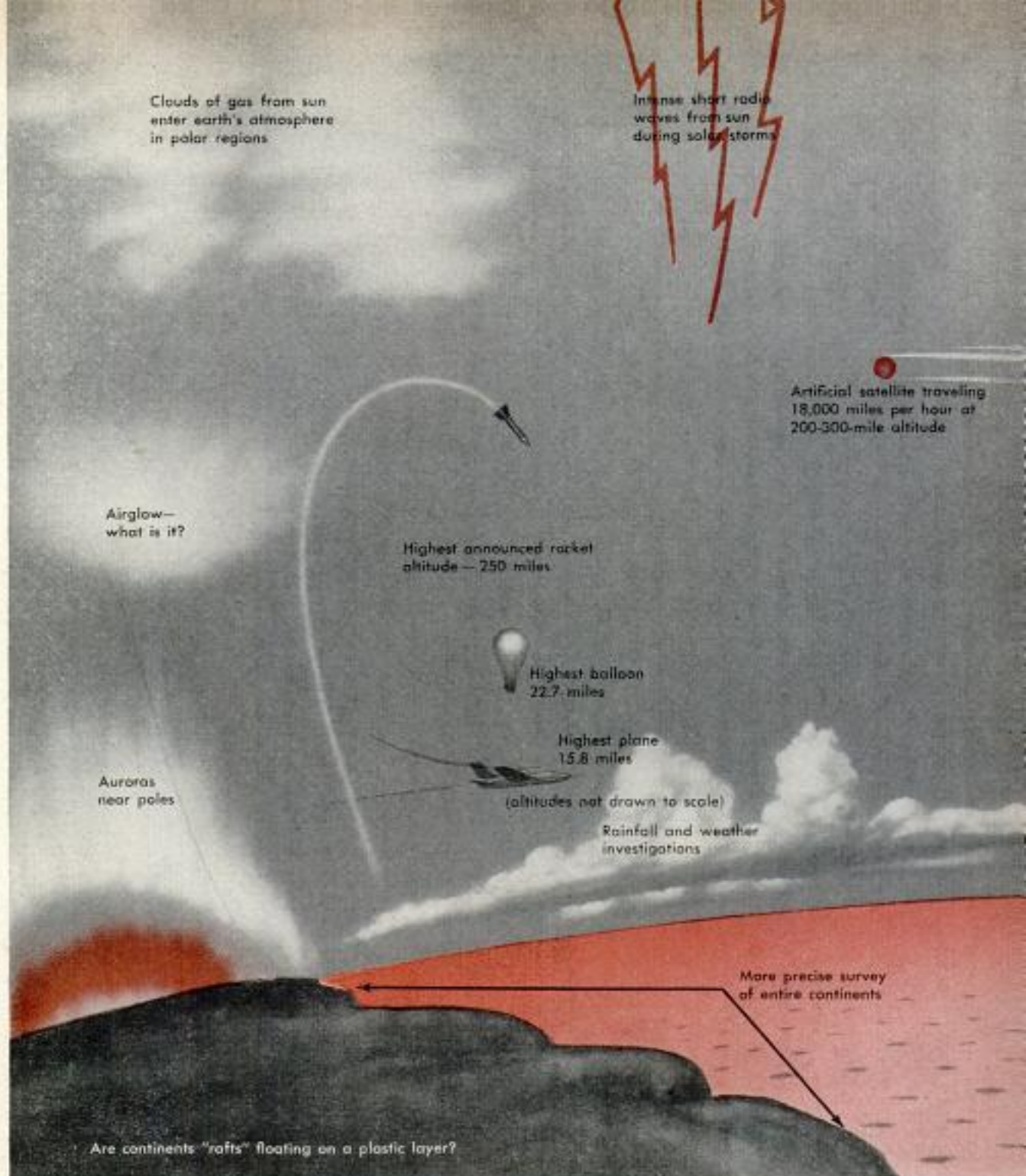
*Chairman, International Committee for the International Geophysical Year*

**I**N 1957 A GREAT research enterprise shared by 41 nations will begin. The aim of the research is to increase our knowledge of the planet we all inhabit, the earth. It will be a period of special effort to be concentrated in what is called the International Geophysical Year (IGY), but it will actually be a year and a half extending from July 1, 1957, to the end of 1958. It is called *geophysical* because it will concern mainly the earth's physical aspects—the land, seas and atmosphere.

The atmosphere, because it "makes" our weather and climate, affects our daily life and food supply. Though long studied, the

causes and mechanisms of its changes are still shrouded in mysteries. Not so long ago its pressure, temperature, humidity, winds and rainfall were measured only near the ground. Now it is explored in height by instruments borne aloft by aircraft, balloons or rockets. Among the latest of the many surprising features thus revealed are

Doctor Chapman, one of the world's outstanding scientists, was born and educated in England. He has left his mark on many fields of science including astronomy, mathematics and natural philosophy. At the present time he is visiting professor of geophysics at the University of Alaska and is associated with the High Altitude Observatory, University of Colorado.



Drawing (not to scale) shows some mysteries of the earth and its atmosphere that will be probed during IGY

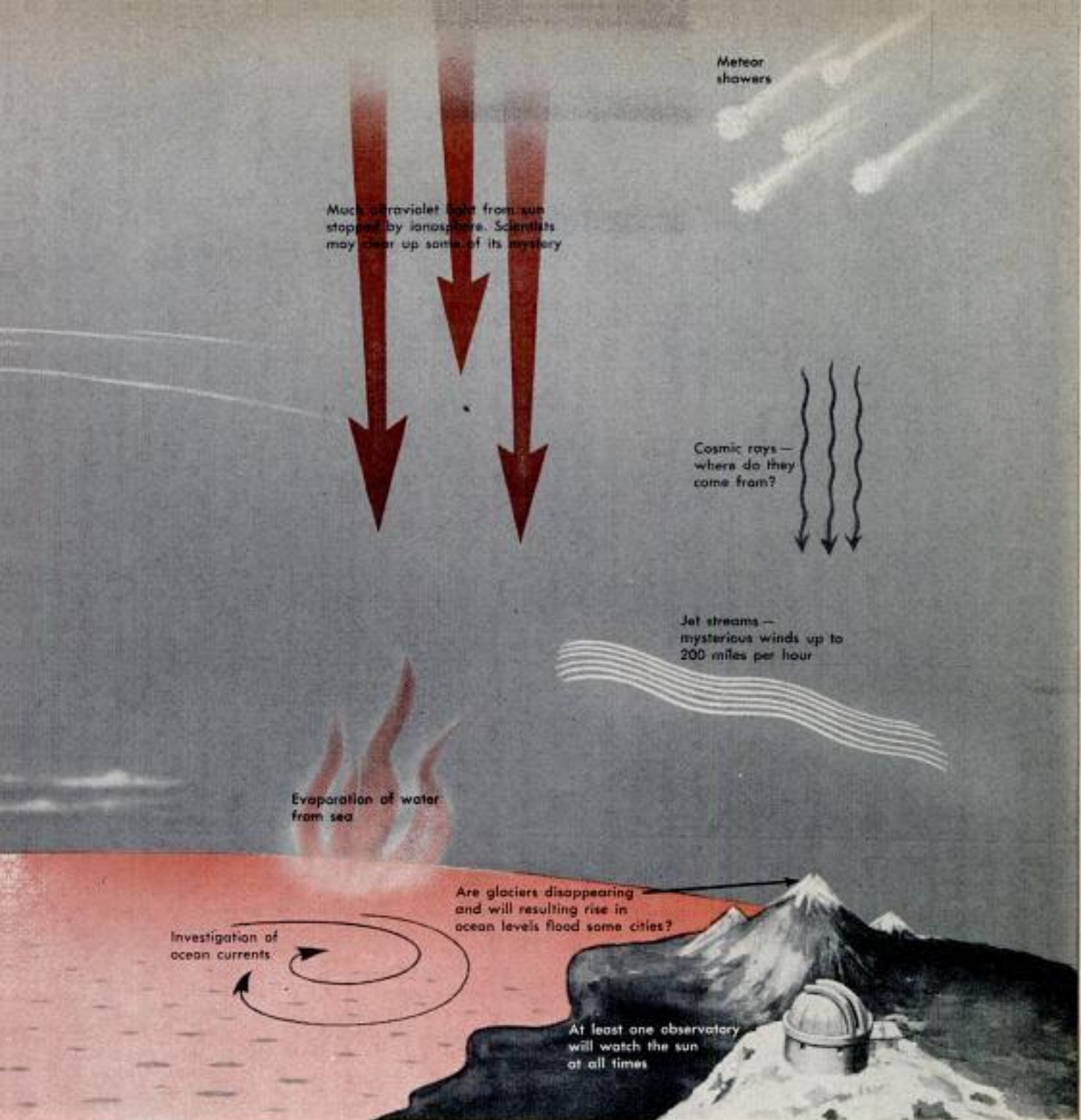
the jet streams—swift, meandering rivers of air somewhat comparable with that oceanic river, the Gulf Stream. It is essential to explore the air upward if we are to understand and predict the atmospheric changes, and it is important also for air transport, ever moving to higher levels.

**Greatest Heights Ever Reached**

The IGY observations of the atmosphere will be more widespread and will reach to a greater average height than ever before. Their simultaneous continuance for more than a year will give them much greater

value than similar observations, equally long continued, but made at different times and at different places.

The water of the oceans is an element more sluggish than the fast-wandering air, but its changes of temperature and its slow but far-traveling currents greatly affect the atmosphere. Ocean currents are generated by sunlight heating the water unequally in different places. These currents transport warmth and cold to the sea, the land and the air in other regions. The evaporation from the seas starts the grand cycle of rainfall and snowfall upon which agriculture



depends. The heating and evaporation also alter the salt content and density of the sea water and influence its teeming population, from which we draw so much of our food. To properly understand either the oceans or the atmosphere we must gain a greater knowledge of both, again by widespread simultaneous observations. Hence the International Geophysical Year will include an extensive program of oceanographic research.

A high region of the atmosphere, above 60 miles, will engage attention, although it is above the level of weather changes and air transport. In this region, called the ionosphere, an important part of the air

consists of electrically charged particles, positive and negative, ions and electrons. In the lower atmosphere, except in thunderstorms, these electric particles are few and insignificant. The ionosphere is of interest to mankind especially because it affects radio communication, which it can both help and hinder. It is ionized, or rendered electrical, mainly by ultraviolet light from the sun, which it absorbs, thereby shielding the ground from these rays. The sun also adds to the ionization by streams or clouds of gas which it sends forth; much of the gas is guided by the earth's magnetism so it enters the atmosphere at high speed, especially in the polar regions, where it



Aerobee-Hi rocket is designed specifically for research. United States will fire over 200 rockets for IGY



Air Force photos

Technicians make final adjustments to rocket. It carries parachute for lowering delicate instruments



produces polar light or aurora. At times when such solar particles are pouring thickly upon the outer atmosphere, these lights are especially brilliant and widespread. The ionosphere is highly disturbed, so much so that we speak of the event as an *ionospheric storm*. These storms occur most often when there are many and frequent spots on the sun and when brilliant eruptions of light occur among the sunspots; they are called solar flares, and are part of what may be called *solar storms*. When these solar storms take place near the edge of the sun's disk, great prominences or visible outpourings of solar gas can be seen. Much of this gas falls back onto the sun, but also much escapes and, when it passes over the earth, an ionospheric storm is produced, with brilliant northern (and southern) lights. During the progress of these solar storms the sun also sends out intense radio waves of short length.

Pole-to-pole chain of stations along one meridian will give meteorologists clearer understanding of weather





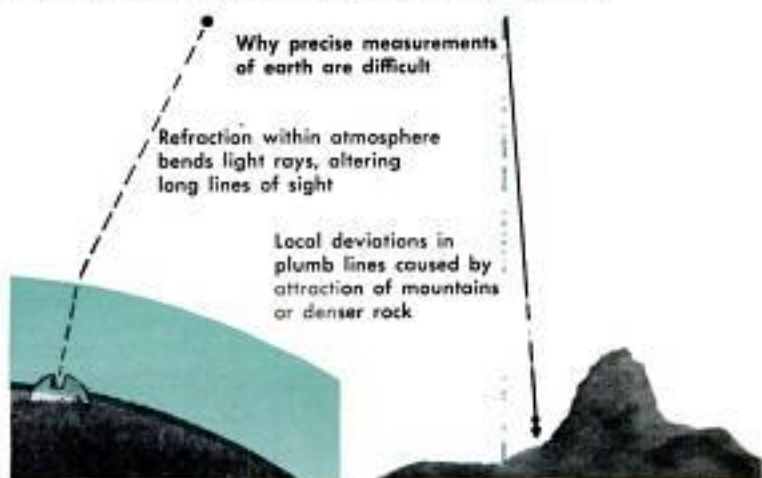
High Altitude Observatory photos

Top photo of sun, made by coronagraph above, shows disturbance that disrupts radio communication on earth

### One Observatory Always on Watch

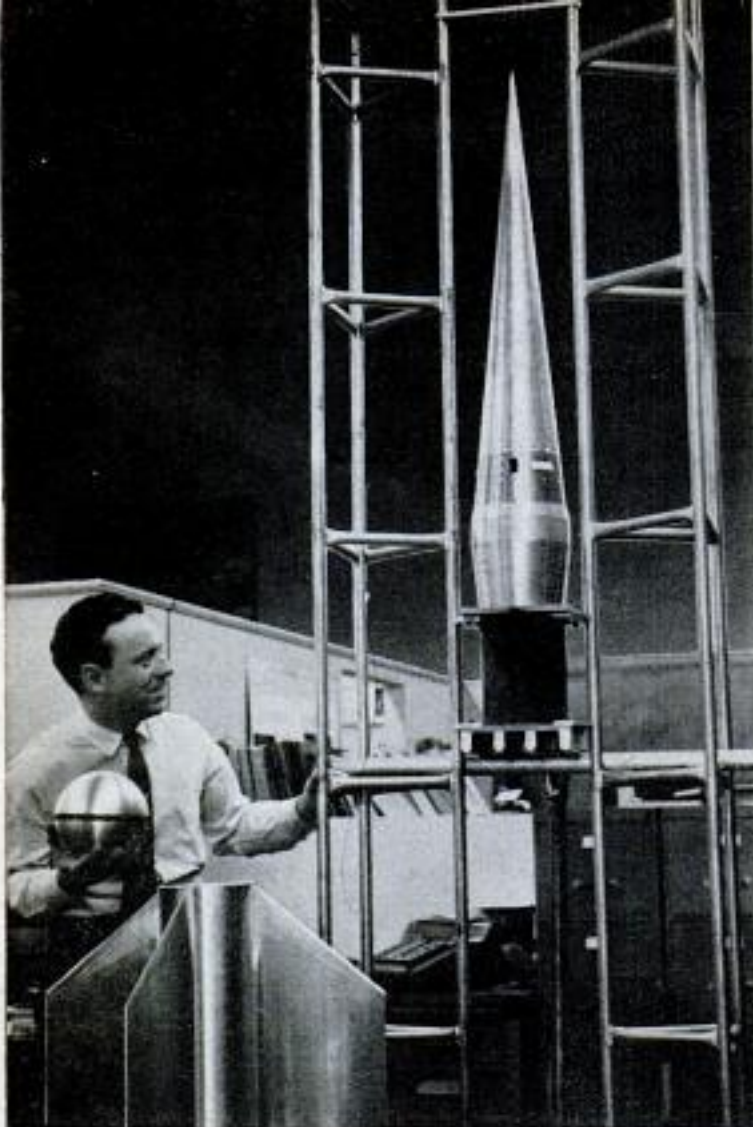
Because of the great influence of solar storms upon the ionosphere and thereby on radio communication, solar observation will be stepped up to new levels of intensity during the International Geophysical Year. The aim will be that at least one solar observatory will be watching the sun; as the rotation of the earth carries each observatory in turn away from the sun, from day to darkness, one or more other observatories will take up the watch. Clouds may obscure the sun from view at some observatories at a particular time, but it is hoped that enough solar observatories will take part in the watch to insure continuous observation. Thus the astronomers as well as the earth scientists will play an important part in the International Geophysical Year.

The solar storms affect communications by cable as well as by radio. The interference with cable telegraphy has been known for nearly a century, and was found to be linked with disturbances of the earth's magnetic field, called *magnetic storms*



Drawing above shows two reasons why precise surveys of continents are difficult. Below, centrifugal force acting on satellite will cancel pull of gravity





Needle nose of a new rocket will carry an aluminum sphere, crammed with gear, into upper atmosphere

when intense. Magnetic storms are closely linked with great auroral displays, and like them are especially strong in high latitudes, but they affect the whole earth simultaneously. They sometimes develop very suddenly, all places becoming affected within a single minute. The close connections between magnetic, ionospheric, solar and auroral storms make it important to observe them simultaneously, continuously and as fully as possible. This will be one of the



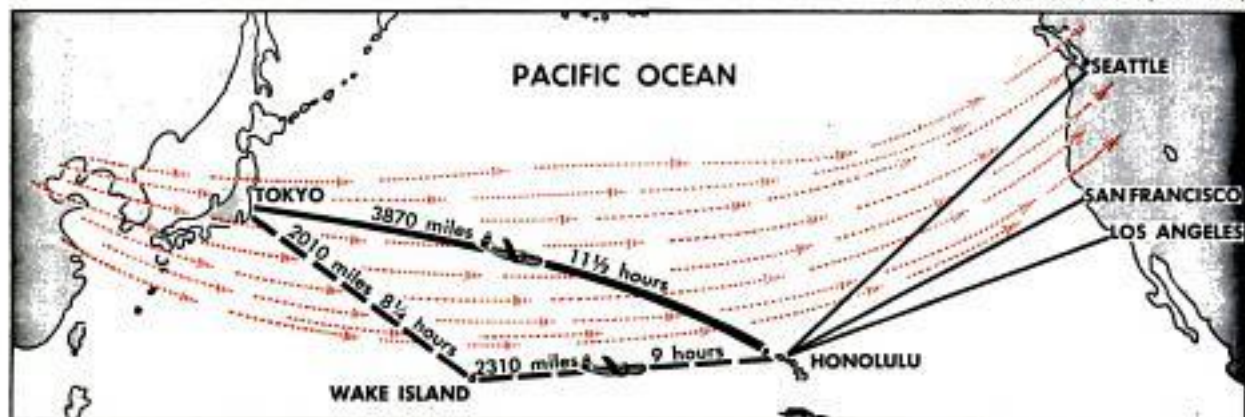
University of Michigan photos  
Ball, dropped from rocket, will measure its own rate of descent and radio this information back to earth

chief goals of the scientists during the IGY. In this great detective attack, it is well to neglect no clue that may help unravel the physical mysteries of our planet. One such clue is given by the usually very faint light constantly emitted by the air in the ionosphere; it is called the airglow. It is worldwide, and quite different from the often far brighter auroral light. Other clues are afforded by the cosmic rays that perpetually

(Continued to page 260)

Planes using jet stream save time. One of the goals of IGY is more information on these mysterious winds

Pan American World Airways drawing



# KEEPING UP WITH THE ATOM

**I**T MAY BE a few years before you can buy a compact little atomic furnace to heat your home, but the time will come, scientists assure us. Robert E. Ferry, general manager of the Institute of Boiler and Radiator Manufacturers, has disclosed a tentative plan for a home-size nuclear power plant that would cost about \$1500 and provide heat, summer air conditioning and hot water at an annual operating cost of \$50. The fuel would be nuclear "ash," by-product of an atomic-energy process, and the heat developed in the household atomic pile would be transferred probably by liquid sodium to a hot-water system. Many problems remain to be solved, one of them the safe shielding of the radioactive elements.

☆☆☆

Typewriters have been turned into deluxe thermometers in the Hanford atomic plant at Richland, Wash. (below, right). To get efficient production, a constant check on heat conditions within atomic piles is a "must," for excessive heat is damaging. That is why the temperatures inside the reactors are measured by thousands of thermocouples which develop voltages in proportion to nearby temperatures. The thermocouples are connected one by one to the typewriter before complex equipment goes into action to turn the temperature data by means of a code signal into a temperature chart; each signal is a different centigrade degree and operates a typewriter key. The printing of temperatures on a chart can now be done at once, whereas it used to take hours and the data was far outdated before a chart could be finished. But the new charts will show which reactor areas are too hot for safety and which are too cool for maximum plutonium production.

☆☆☆

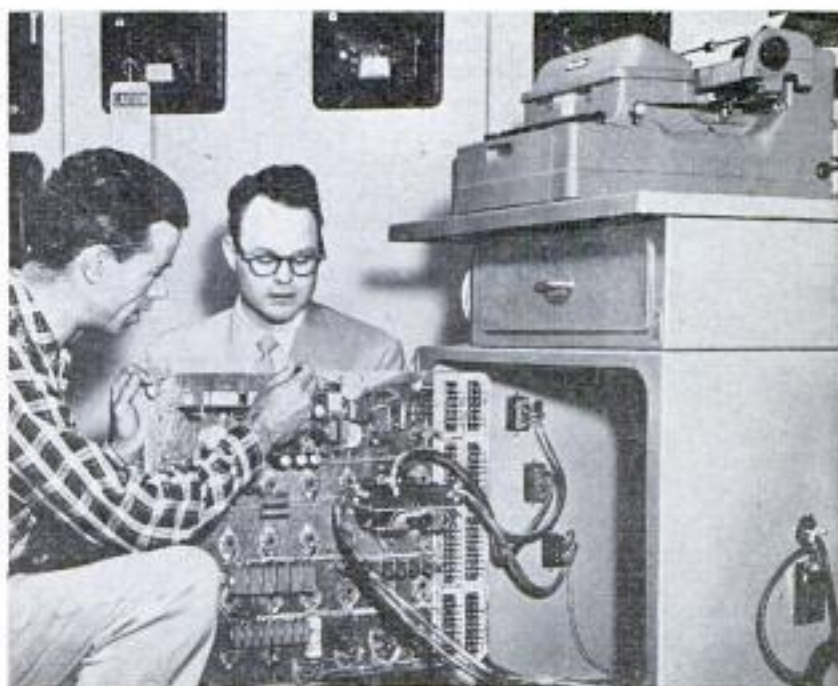
More food for a hungry world, perhaps better food and more efficient crops are a possibility through the mutation of species by atomic radiation. Entirely

new species have already been produced by irradiating plants and causing changes in their hereditary characteristics. Experimental work in Sweden has proved that subjecting barley and other test plants to atomic rays could produce new varieties with larger yield per acre, or leave the yield unchanged while effecting other improvements in the plant. At the present stage of experiments there is no way of predicting what kind of mutation may result when seed is exposed to radiation, but studies are being made along this line and the scientists hope to learn how to control the mutations by varying the kind and dosage of radiation. Agricultural scientists have been developing and altering plant species for many years through breeding experiments based on natural mutations, but the mutation rate can be speeded up thousands of times by the radiation method.

☆☆☆

Hazards to the public have been reduced to the minimum in the atomic tests on the Nevada desert. In five major test programs no one has incurred any dangerous radiation exposure off the site, and no injuries to eyes have been reported. The test area comprises 600 square miles, surrounded by a 4000-square-mile Air Force gunnery range and more miles of sparsely settled land. Aircraft are warned to stay clear of

(Continued to page 248)





### Experimental Turboprop Fighter Uses Jet for Extra Power

Undergoing initial tests in California, the Air Force's experimental turboprop fighter, the Republic XF-84F, is the first of its type to use an afterburner for jet thrust to augment propeller propulsion. It is designed to provide test data on supersonic

propellers, turboprop engines and the feasibility of turboprop fighter aircraft. The engine converts jet thrust into propeller power through a gearbox and shaft. At the same time, additional jet power is provided through the tail pipe or afterburner.

### Gate for Swinging

Modern children without front gates to swing on get an old-fashioned thrill from two gates set up on a playground in West Allis, Wis. Each gate is mounted on a bearing so that it turns in a full circle. The gates are the most popular pieces of equipment on the playground, authorities report.

This latest piece of playground equipment has West Allis children going in circles. It is well braced



### "Sea Dart" Planes On Single Ski

Newest version of the Convair XF2Y-1 "Sea Dart" has been equipped with a single water ski, in place of twin skis used on other models, as a part of the Convair-Navy hydrodynamic-research program. The Sea Dart is the first jet seaplane ever built and cruises at subsonic speeds in level flight.

## Machine Reads Traveler's Checks

Banks now have a machine that can read checks. The machine, developed by Burroughs Corporation, reads traveler's checks at a rate of 7200 per hour and automatically punches the information on cards. The equipment consists of a reader and a punch. Through electronics and a special photoelectric process, the reader scans the printed numbers on every traveler's check, and punches a card to correspond. The card is used to operate other equipment which carries out the accounting operation. The machine's ability to recognize characters may make it applicable to the processing of bonds and securities, income-tax statements and personal loans.



## Subminiature Battery

About as small as half a penny, a tiny battery delivers a constant voltage for as long as two years. The semicircular battery delivers 1.15 volts. The use of the metal, indium, eliminates leakage permitting the case to be very thin. An Elgin National Watch Company development, the battery can be made in any shape and may power a future electric wrist watch.



## Self-Contained Burglar Alarm

No electrical wiring is needed to install a self-contained burglar alarm powered by battery. The simple unit rings a bell when it is moved, and stops sounding only when it is switched off by a key. It is placed on the floor by any door or window, and protection is extended by using nylon trip cords. The alarm is made in England.



## Cross-Wind Landing Gear Latest Feature of Long-Range Bombers

The Strategic Air Command's B-52 Stratofortress bombers are rolling off the assembly lines equipped with cross-wind landing gear. The gear, prepositioned from the control cabin, permits the airplane to

take off or land in a "crabbing" attitude that cancels out the effect of the wind across the runway. All four of the dual-wheel main-gear units swivel to either side to maintain a correct heading.





Tiny screen of weather-mapping radar is installed in center of instrument panel, while radar controls are mounted above the windshield



### Plastic Water Scooter Has Small Engine

You can skim over the water at eight miles per hour on a little circular boat invented by a West Berlin engineer. The pressed-plastic craft weighs about 44 pounds, has a small motorcycle-type engine and is steered with handle bars. One gallon of gasoline is used in seven hours of running time. If you happen to fall off, the boat starts turning in circles to give you a chance of boarding it.



### Weather Radar For Airliners

Weather-mapping radar is being installed in all planes of the United Air Lines fleet, making United the first airline in the world to adopt this device as standard equipment. Focused on apparently solid storm clouds, it shows corridors for smooth flight around turbulent areas, and can spot the weather for the pilot as far as 150 miles ahead.

### Dirt and Ashes Make Sturdy Brick

Rice-hull ashes, ordinary dirt and asphalt make up a lightweight, low-cost building brick developed at Louisiana State University. The brick could be used for farm buildings and may be used in shelters for protection against atomic fallout. Not only does it have good insulation qualities, but it is said to absorb radiation well. It becomes increasingly hard with age until it finally reaches the consistency of soft sandstone. Rice-hull ashes, according to the university, are almost 95 percent silica.

# Testing . . . Testing . . . ATOMS AT WORK



At a once desolate spot in Idaho the AEC's materials-testing reactor is doing vital service for industry

THREE BOTTLES hang on a wall. Through their polyethylene sides can be seen fascinating future possibilities for industry.

The bottles are in an office of the Atomic Energy Commission at Idaho Falls, Idaho. One bottle is . . . well, just a bottle. Nothing special has happened to it. The second bottle is shrunken and twisted like an old fishing hat tossed in a closet corner. It has been heated at 126 degrees C. for 30 minutes. Except for being slightly more transparent, the third bottle looks exactly like the first. It, too, has been given a 30-minute blast of heat, but first it was gamma-irradiated at the materials-testing-reactor installation of the National Reactor Testing Station near Arco, Idaho.

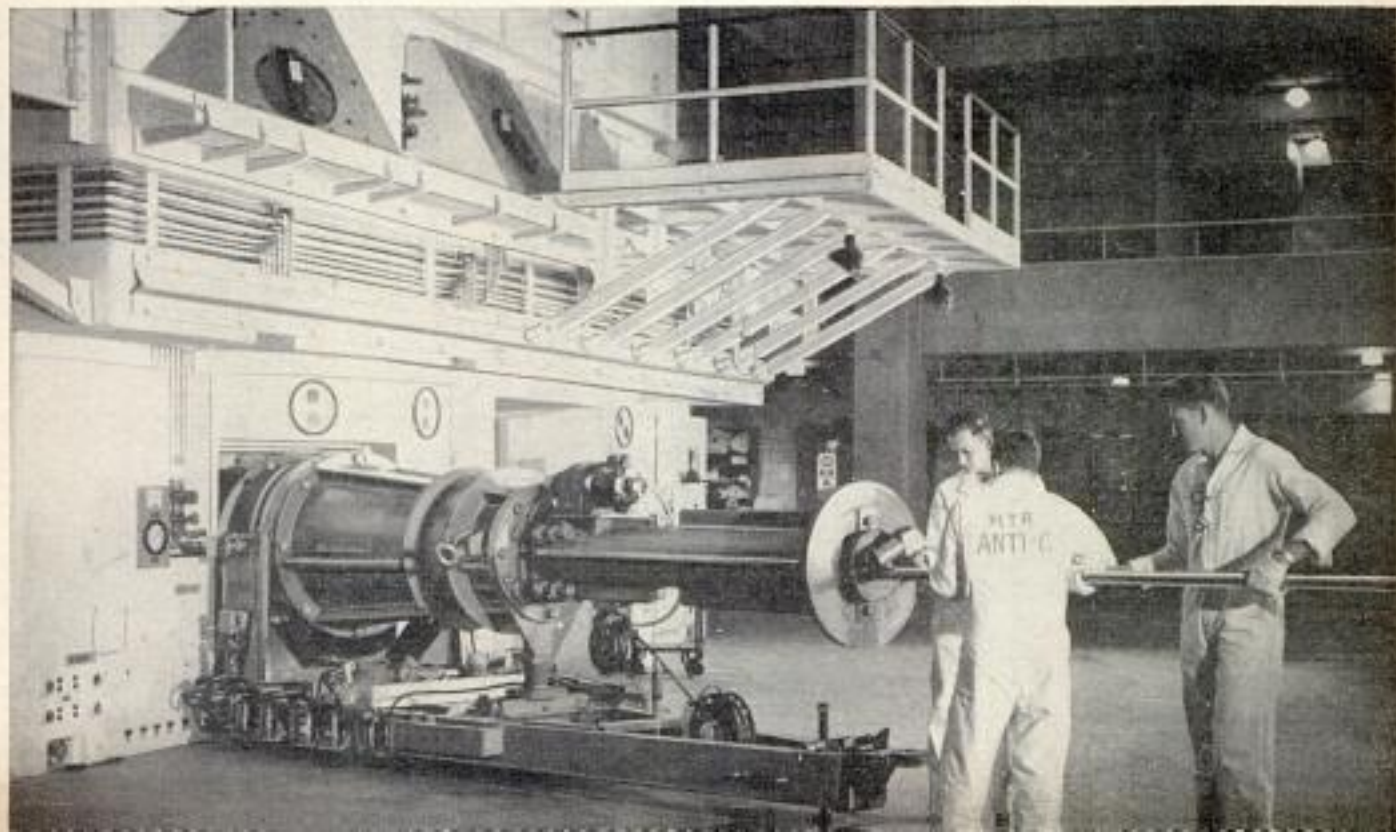
Possibilities uncorked by this bottle

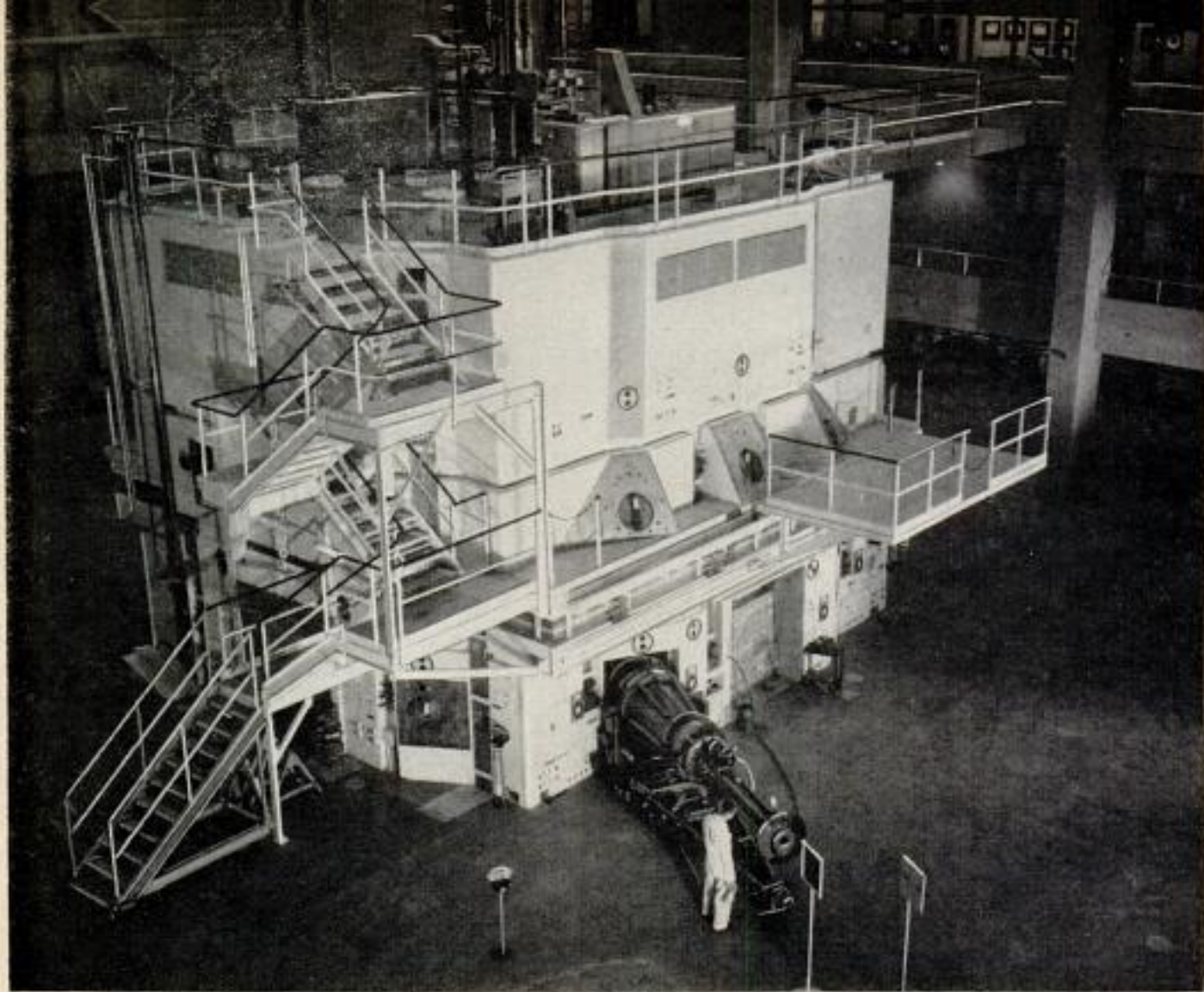
By Rafe Gibbs



Rising out of the big beyond in southern Idaho is the world's most powerful atomic reactor

"Universal coffin" is the name given this cannonlike instrument which is used to shield experimental materials





There's a cleared area 40 feet wide all around the huge reactor, giving plenty of room to maneuver "coffin"

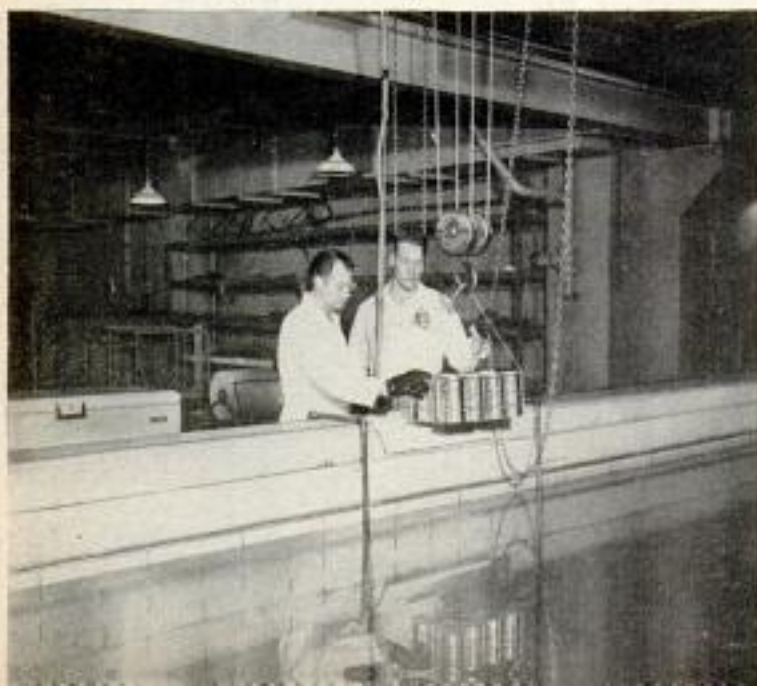
research are many and far-reaching. If, for instance, plastics can be treated by irradiation to withstand extreme heat and cold—and detailed studies are now being conducted in this field—a parade of new uses will be started. Many plastics failed in certain applications because they do

not stand up under temperature extremes.

But of special significance at this time is the fact that the industrial-type research was carried out as a sort of by-product use of the world's "hottest" reactor, a reactor which produces 30,000 kilowatts within its "furnace" space which, without its shield-

Cans of food are irradiated under 18 feet of water in experiments on preservation of various foods

Control room of reactor is jammed with instrument panels and moving graphs under constant surveillance





ing, is only the size of a foot locker.

This superreactor, costing about \$18,000,000, was originally set up primarily to test the effects of intense neutron radiation on materials and fuel elements to be used in future reactors. It can be used simultaneously, however, for a variety of other testing purposes and for the production of radioisotopes. Ever since it went into operation in 1952 the eyes of industry have looked with envy on the potentialities of the reactor, but it is only within the last year that space has been made available for some irradiations for industry.

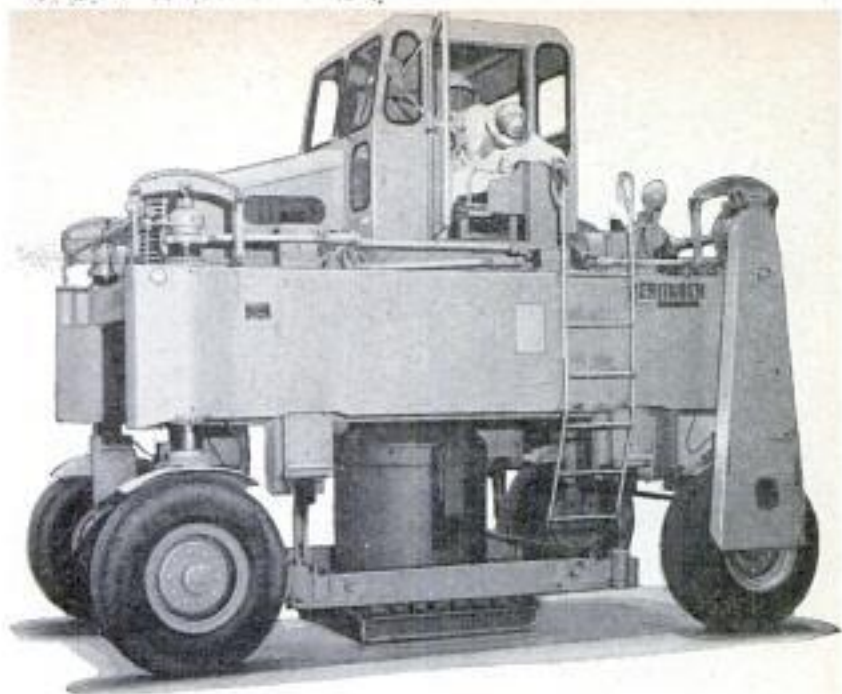
Joseph Campbell, commissioner of the U. S. Atomic Energy Commission, recently commented:

"The present savings (to industry), and I emphasize present savings, through the use of radioisotopes alone are in the order of \$100,000,000 a year. My guess is that within the next 10 years American industry will increase the savings to 10 times the present value, or in the neighborhood of \$1,000,000,000 a year."

What makes the giant materials-testing reactor in Idaho especially significant in view of this statement is simply that the reactor can turn out radioisotopes much faster than any other reactor in existence, can produce radioisotopes of greater intensity than is possible with any other reactor, and can produce to a marked degree effects barely discernible in lesser neutron fields. So industry today has a phenomenal new tool for its advancement.

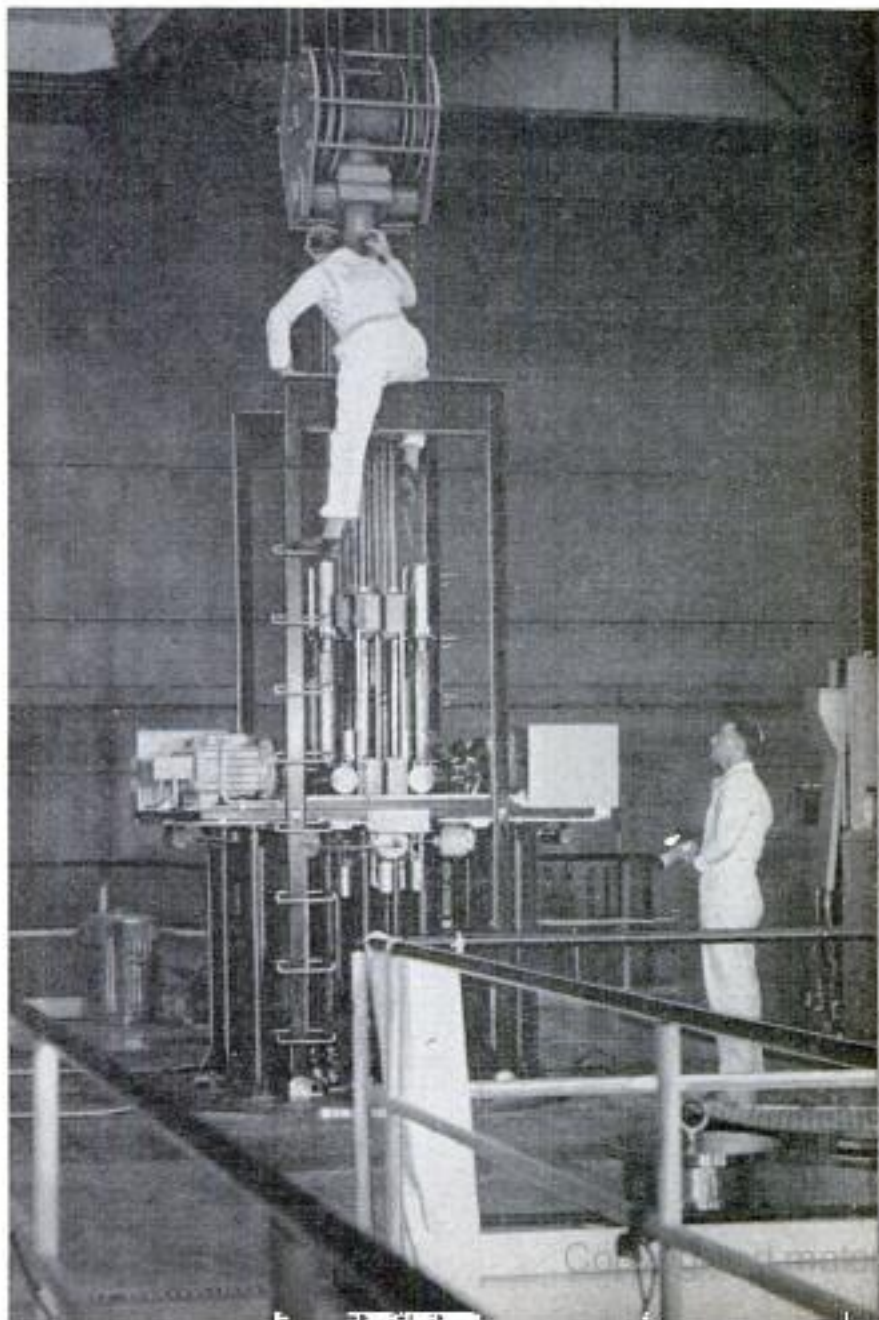
Just five years ago the site of this powerful atomic device in the shadow of the Lost River Mountains would have been one of the last places on earth considered of industrial significance. The 400,000 acres now utilized by the National Reactor Testing Station were sagebrush-covered desert land, largely populated with jack rabbits. What energy existed was found mostly in the rabbits, which had to do a lot of scrambling for food. Some cattle and sheep grazed on the land.

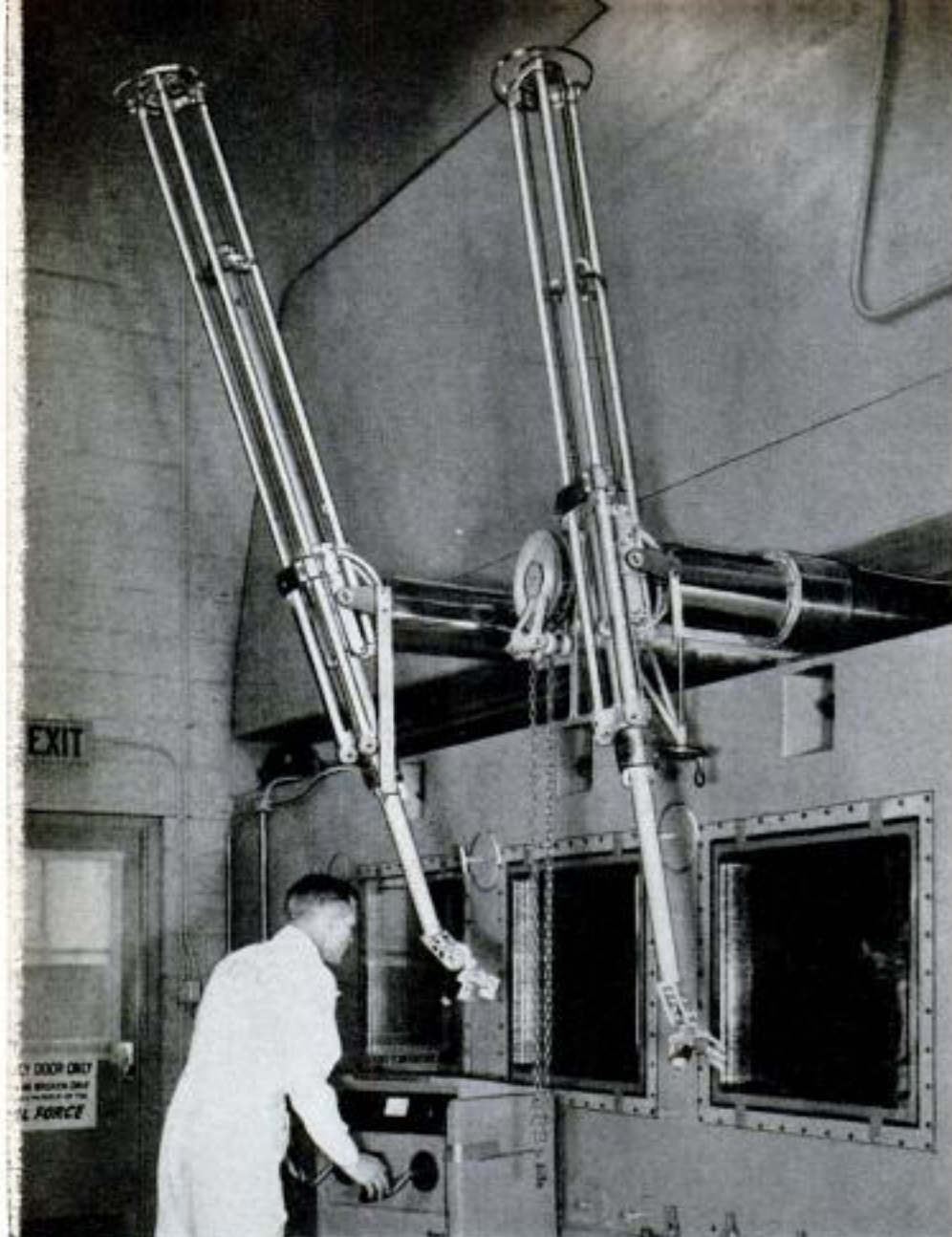
It was here, however, that engineers found exactly the right combination of physical characteristics, including such things as isolation, in which to carry out



Small boy could carry the radioactive material, but its heavy lead container requires the lifting strength of a big machine

Top plug of the reactor is so heavy it takes a huge crane to lift it. One man stands by to check radiation level





Scientist can only move experimental materials inside reactor with remote-control manipulators, which serve as extensions of his arms and hands.

advanced work without public hazard, water, suitable building conditions and adequate supplies of labor.

So in 1950, big trucks loaded with men and equipment churned across the dusty plains. A shepherd, pulling out with his wagon, commented to a trucker who had stopped to ask directions:

"I hope you fellows put up more than a couple of shanties out here, because it will be mighty lonesome for the folks if you don't."

Some contractors' shanties were erected, but from them has grown a \$100,000,000 plant. The once desolate area is now dotted with modern, streamlined buildings with smokestacks reaching 250 feet into the sky.

And there is no reason for lonesomeness. Even the scientists brought to the station have plenty of colleagues for talking shop—and highly technical shop it is. At the station are about 400 scientists and technicians, and the percentage of doctorate

degrees runs about the same as that on an average university campus.

It was here that the "powerhouse" was spawned for the *Nautilus*, the world's first atomic submarine. Currently the sensation of the seas, the *Nautilus* has led to a prediction by a member of the congressional atomic committee that an atom-powered airplane, capable of flying around the world several times without stopping, would be in operation in this country in five years. And what the Idaho station has done for the armed forces, it may now, through the materials-testing reactor, do in an equally spectacular way for industry.

The reactor with its unique high intensity of flux—10 to 100 times that available elsewhere—did not suddenly spring into existence. In fact, work was started on it long before anybody thought about planting it out in Idaho.

Planning began at the Oak Ridge National Laboratory in Tennessee in December 1945. By August 1946, a design had taken shape on the drawing board that was

essentially that of the reactor as it is today. Final design and development were a joint enterprise of the Oak Ridge Laboratory and the Argonne National Laboratory at Chicago.

At the station, the scientists can still tell you the exact minute when the reactor became critical or chain reacting. Said one with all the preciseness of a railroad conductor:

"It was at 11:19 p.m.—Mountain Standard Time—on March 31, 1952."

The minute was both tense and historical because the operators were generating a flood of neutron radiation of an intensity never before released by man in a machine. And they went at it gradually, for the reactor did not attain full design power until May 1952. Operation has been smooth ever since with no loss of time due to shutdowns except for those constituting a regular part of the operating program.

The materials-testing reactor is one of

three now operating at the Idaho station, but it is in a class and a building by itself. The building is small—about 130 feet square by 80 feet high—but entering it you get the idea of vast space because of the 40 feet of clear area on all sides of the reactor. The reactor itself is a giant, intricate piece of equipment, standing 24 feet high.

Here you have speed that is speed.

One of the reactor's instruments, known as a "fast chopper neutron spectrometer," measures neutron speeds up to 3,000,000 miles per hour.

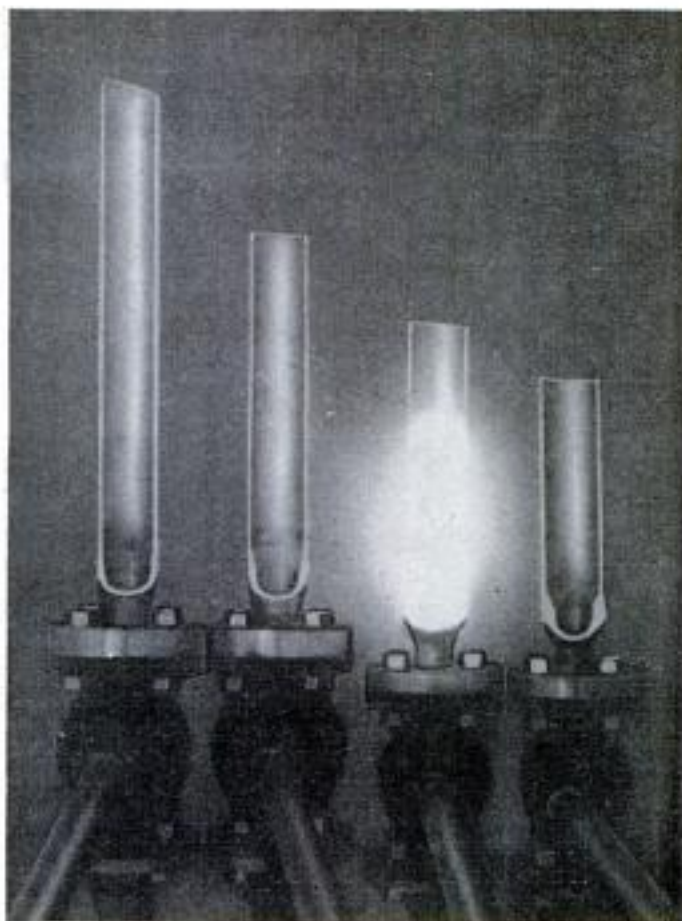
The tremendous output of neutrons from the materials-testing reactor tops everything previously reported—500 trillion per square centimeter per second—compared with 50 trillion produced by the Canadian heavy-water reactor at Chalk River, Ont.

Bombardment of the neutrons against atoms of various chemical elements produces radioisotopes. The ordinary atoms are made unstable or radioactive in the process, and they then give off unseen rays that can be detected by a geiger counter. The materials-testing reactor has more than 100 ports in which specimens can be exposed to neutron bombardment for irradiating—virtually mass production of radioisotopes. Almost daily someone comes up with a new use for these isotopes.

Recently, for instance, the owner of a moderate-sized ranch-type house got a \$400 heating bill for one month. The house was warmed by a radiant-heating system with copper tubes buried in the concrete floors. There just had to be a serious leak in the pipes. But how could it be found without tearing up the whole floor?

A commercial laboratory added the radioisotope Iodine-131 to the water in the heating system. A technician with a geiger counter then explored the floor with all the intentness of a prospector looking for uranium. When the counter started to click frantically, the technician knew he was over the leak because of the great increase of gamma radiation in the large amount of water surrounding the spot. Already this principle for detection of hidden leaks has been expanded and is being widely applied in industry.

(Continued to page 234)



Hydraulic shuttles above are called "rabbits." Here one glowing rabbit returns after carrying sample into reactor



At left is a standard bottle made of polyethylene. Below left is a bottle of the same type which has been heated at 126 degrees C. for 30 minutes. Below is a gamma-irradiated bottle which has been exposed to the same heat. Irradiation has produced heat resistance





# Handy ITEMS for

**E**VERY CAR that comes off a Detroit assembly line is complete—it can be driven without adding anything but gas, oil and water. But millions of car owners are not satisfied with assembly-line equipment. As a result the automotive-accessory business sells \$1,000,000,000 worth of goods



**BUMPER MOUNT** provides convenient method of transporting your outboard motor. Attached to front or rear bumper, the 22-pound mount holds outboard motors of any size without interfering with normal use of car. It tilts back to give access to trunk

Lawncraft Sales Company, Salem, Ill.



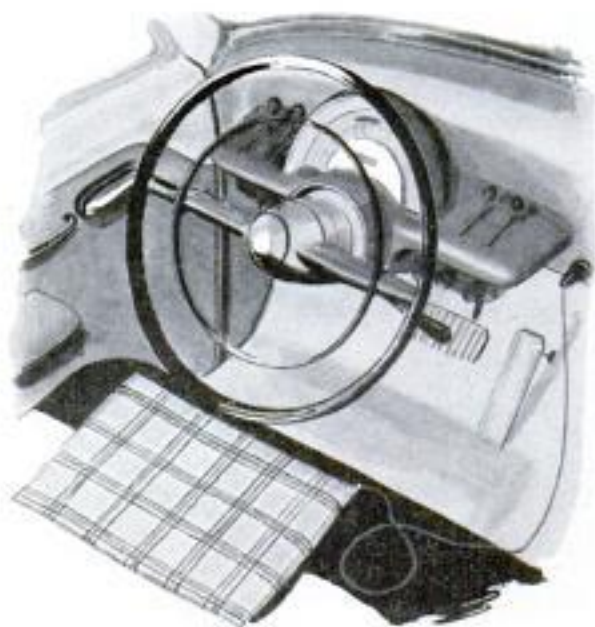
**WASTEBASKET** that holds disposable bags helps keep car interior neat. The wax-paper liners can be used to hold peach pits, apple cores and other moist trash. The detachable plastic container fastens to the dash, door panels, seat backs or cowl kick pads

Advance Enterprises, Inc., 423 Norway St., York, Pa.

**WARMING PAD** makes winter driving comfortable. Developed and manufactured in Germany, the electric pad is plugged into the cigar-lighter socket. If you prefer, you can use it to keep your feet warm. The pad is made for use with 6, 12 or 24-volt systems

**HOOKED SHAFT** that rests on rear-window shelf will hang several suits and coats, permitting you to retain well-pressed look while traveling. Top of shaft is flattened to fit between window frame and glass. Nut at base is rotated to adjust shaft height

Wallace Intra National, 1036 N. Dearborn St., Chicago 10, Ill.



# YOUR CAR

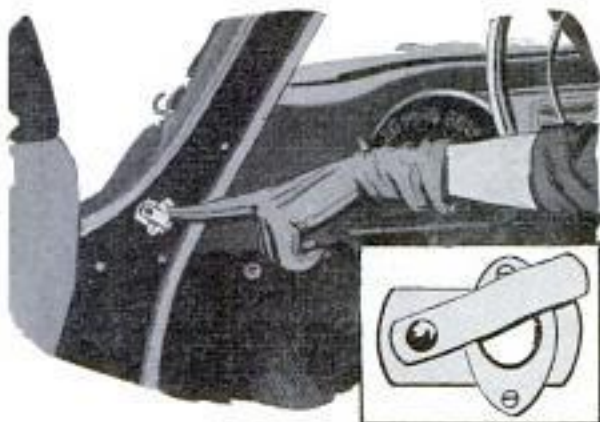
a year. More than 1000 manufacturers keep 50,000 retail outlets supplied with items ranging from bug deflectors (complete with propellers) to continental tire kits (which, incidentally, are big sellers at the moment). On these two pages are other items you'll see in your auto store. ★ ★ ★

**SEALING COMPOUND** ends water and dust leaks around windshields and rear windows. Nonhardening, the compound does become firm to the touch. It won't damage upholstery, says the manufacturer. Although not gummy, it sticks to metal, glass and rubber  
Super Seal Products Co., 1235 35th Ave., Oakland 1, Calif.

**POCKET COMPUTER** speeds checking of gasoline mileage. When slide is moved to number of miles run, miles-per-gallon figure shows in slide opening opposite number of gallons used. Gas and oil purchases can be recorded on a ruled section of the metal unit  
MIRMO, 800 S. Ada St., Chicago 7, Ill.



**DOME-LIGHT CUTOFF** enables you to deactivate the dome-light switch so the light does not go on when the car door is opened. It prevents drain on the battery during repairs to the interior. With it, you can open the door while at a drive-in theater  
DeActivator Inc., P.O. Box 232, Anderson, S. C.



**BOAT CARRIER** turns so one person can load boat on car from either side. Hardwood rollers ease the boat on and off. Made in two sizes, unit adjusts to fit boats up to 53 and 61 inches wide. It is designed to fit all cars with rain gutters

Tomloe Carrier Company,  
Oconto, Wis.





## Small Autopilot For Light Planes

Weighing only 12 pounds, a small, single-axis autopilot has been designed to keep light planes in straight flight without constant pilot attention. The autopilot is built by the Javelin Aircraft Co., Wichita, Kans., and uses a gyro to maintain direction. The gyro, spinning at 15,000 revolutions per minute, can be manually overpowered by the pilot at any time. Tilting of the plane reacts against the gyro's tendency to remain on its spinning axis and controls automatically turn the rudder.

Single-axis autopilot stabilizes light plane in flight by rudder control

## \$6000 Worth of Flies Freed in Sugar Cane to Control Borer

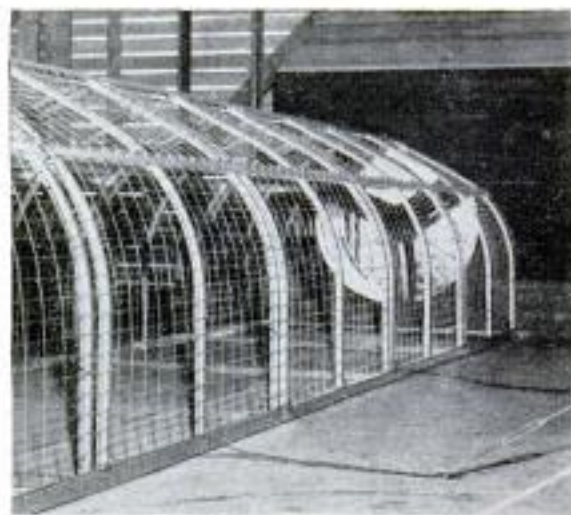
Sugar-cane growers of Louisiana have imported \$6000 worth of parasitic flies (price: five for a dollar) in the hope that they will help to control the sugar-cane borer. These flies deposit eggs at the entrance to holes the borers make in sugar-

cane stalks. When the eggs hatch, the fly larvae move into the holes where they feed on the larvae of the borer. Tests in Trinidad indicated a 75-percent kill of borers on one plantation by the end of the second year after release of the flies.

## Corn Covers Crop Drier to Increase Capacity of Crib

Up to 50 percent more corn can be stored in a crib which is equipped with a new crop drier. The drier can be installed in the driveway of an existing crib or built into a new one. A metal frame runs the length of the crib to provide a duct. The corn

then is placed in both cribs and above the duct. The fan, installed at one end of the duct, is portable and can also be used to dry hay. Through use of the drier, corn can be picked at 30 percent moisture and is available to sell 30 to 40 days earlier.




# Model Railroad Disappears Into Closet

WHEN REX KOURY of Hollywood, Calif., is through working on his model-railroad layout, he simply folds it up into a closet. Koury, Hollywood music director for the ABC radio network, has a room in his home which he devotes to model railroading. The HO-gauge track is the equivalent of two miles, full scale. The layout depicts the business district of a small town and contains more than 25 houses, stores and railroad structures. It is mounted on a panel measuring  $6\frac{1}{2}$  by 10 feet, with the operating controls in a separate cabinet. The back of the panel is hinged to a closet-like structure, and when Koury wants to convert the room into a guest room he removes the rolling stock and pivots the panel up and into the closet.


Top, folded up, there's no sign of the layout.  
Right, controls in a cabinet operate trains





Hine tests light intensity on piece of equipment he is photographing with a huge camera. The camera has a motor-driven mount to permit easy maneuvering

## FINE NUT AND BOLT



**D**OING THE IMPOSSIBLE is taken for granted at the photo studio of Sheldon Hine, technical photographer in Fort Wayne, Ind.

Specializing in photos for industrial and scientific use, Hine has earned a reputation for solving photographic problems which stumped research departments of the photographic "big guns."

Much of his specialized work for local industrial firms deals with highly technical devices, but Hine simply refers to it as "fine nut and bolt photography."

Through close attention to detail and using a vast technical knowledge he picked up in spare-time research, he has put his cameras and related specialized equipment to work solving intricate problems for industries.

One local electronics firm was turning out an extremely delicate electrical meter which had a hard-to-locate "bug." Sample meters shipped across the country lost their accuracy, apparently because of a change in the weight of the tiny needle.

Through a special photographic setup employing high-quality lenses, plus meticulous care in developing, Hine made huge enlargements showing that vibration was causing the meter needle to deposit a metal coating on the "pin" at the end of the scale. Though this coated spot was much smaller than a pinhead, Hine identified it and its source by means of his photographs. From then on, the meters were shipped with a battery wired on to keep the needle from bouncing on the pin during transportation.

Another electronics manufacturer was having trouble with special military-quality radio tubes in armed-forces applications, so Hine was assigned the job of photographing the interiors of these tiny "peanut" electronic tubes and making extreme



**Sheldon Hine of Fort Wayne, Ind., is a technical photographer who specializes in doing the impossible. He calls it**

# PHOTOGRAPHY

By Marshall Lincoln

enlargements of them so that almost microscopic defects could be seen easily.

Using these photos as guides, it was possible for the engineers to design better tubes for armed-forces electronics gear.

It was while he was with the Navy during World War II that he developed a photographic training device which others had given up as an impossible task.

While in the Special Devices Center of the Office of Naval Research, he found a way to coat a relief model of a ground area with a light-sensitive emulsion, giving the relief model a much more accurate presentation than the hand-painted models previously used.

While rising from lieutenant (jg) to lieutenant commander from 1942 to 1946, he developed various projectors and other optical systems used in training naval aviators. He also designed and supervised installation of the topographic laboratory on the command ship *USS Mount Olympus* and trained the crew for its operation.

After the war, a whole new system of lighting was developed by Hine as a result of the needs of his industrial clients.

Called "shadow-free photography," or

"photography with high revealing power," the system of lights makes possible photos of tiny parts of deep cavities with no shadows to hide details.

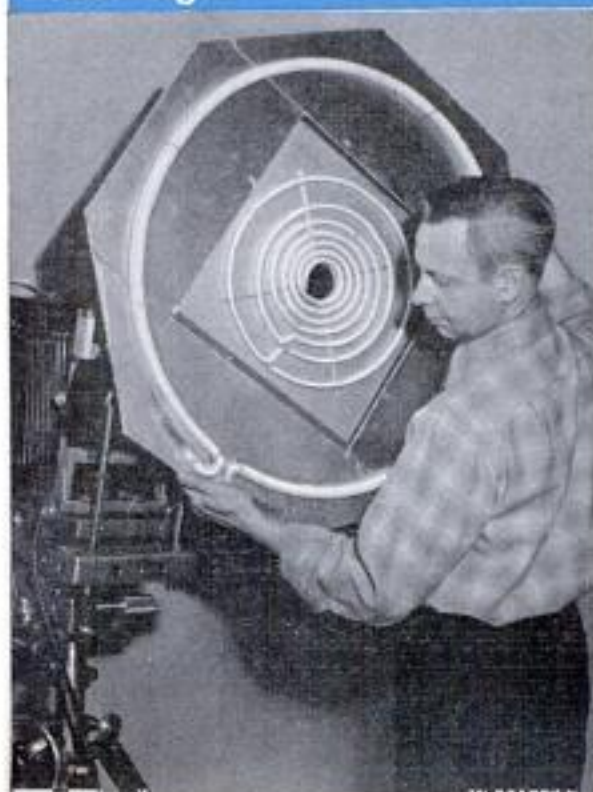
Two kinds of light are involved; each one may be mounted on the front of a camera to provide all the illumination needed for making photographs.

Heart of the "Class A Hinelight" is a "beam splitter," or partly silvered mirror, which is mounted at a 45-degree angle to the camera lens. A high-powered projector bulb with a set of condenser lenses is mounted at one side of the lens so that light from the bulb will strike the mirror and be reflected forward onto the object being photographed. The camera lens "shoots through" the mirror without "seeing" the projector bulb.

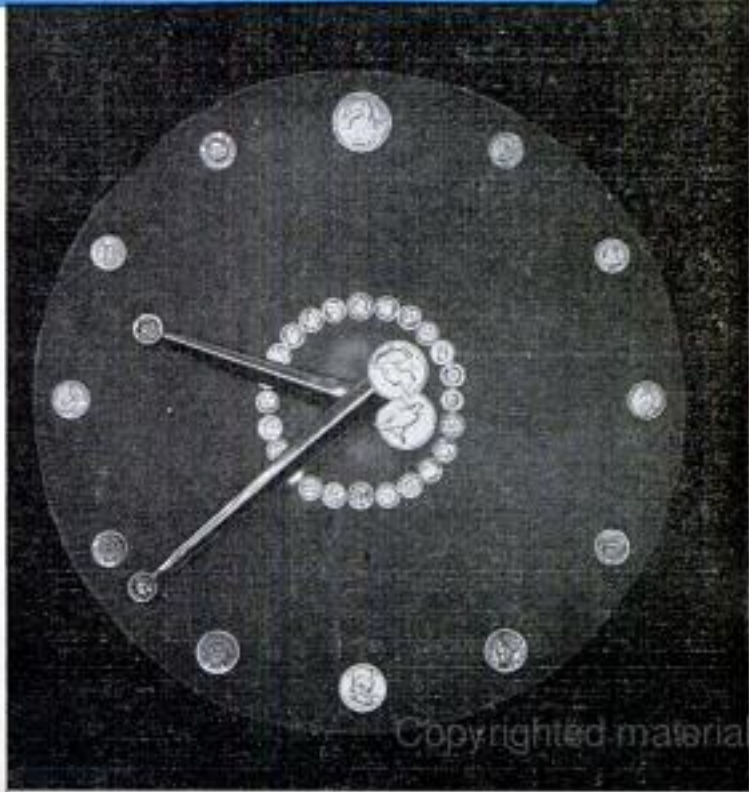
This arrangement makes the light strike the subject as if the light came from the center of the camera lens; consequently the object being photographed throws no shadows visible from the camera position.

Used on most of Hine's industrial photography is the "Class B Hinelight." An elaboration of the common ring light, this outfit consists of eight rings mounted with

**This Light**



**Flashed This Picture**



Copyrighted material



A 35-millimeter camera and focusing device are fitted on the back of a 4-by-5 Linhof for telephotos and close-ups

Light in special reflector is used as a "shadow killer" when shooting room interiors. Regular room lights provide the primary illumination



Hine shoots 4-by-5 stereo photos with standard press camera by using two lenses on board with rear divider

a common center. All eight rings are mounted on a flat reflector, which is attached to the front of his camera so that the camera lens peeps through the center of the rings.

To convince the Patent Office that his Class B light was better than the conventional one-ring lights commonly found today, Hine made a series of photographs of the same object, a white star on a white background, to show how many shadows are cast by a single ring and how the number and intensity of shadows decrease as one, two, three, five and seven larger rings are added to the original ring.

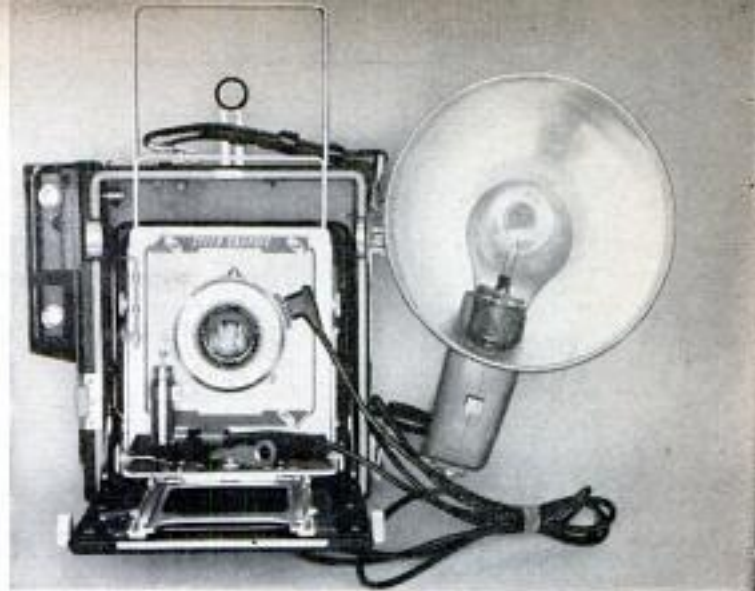
The Class A Hinelight is used mainly on close-up photography or photos of deep cavities, while he uses the Class B Hinelight for other general photos such as radio equipment and machinery.

Although these special lights enable Hine to turn out top-quality photos in a short time, he doesn't mind spending several days making a single photo, even designing special equipment for the job.

When he was called on to photograph an unusual and intricate clock for a Fort Wayne bank, he found it necessary to build a special light just for this one photo.

Rare coins used as numerals and pointers on the clock face presented a problem: Ordinary flood or flash lights produced glaring reflections on some of the coins.

Hine solved the problem by building a special ring light for the photo. This light was about four feet in diameter and was mounted on the front of the camera along with a Class B Hinelight. Size of the huge ring was calculated to provide uniform reflections from the circle of coins representing numerals on the clock face, while a



All tones from blackest black to whitest white are recorded in this photo made with Class B Hinelight

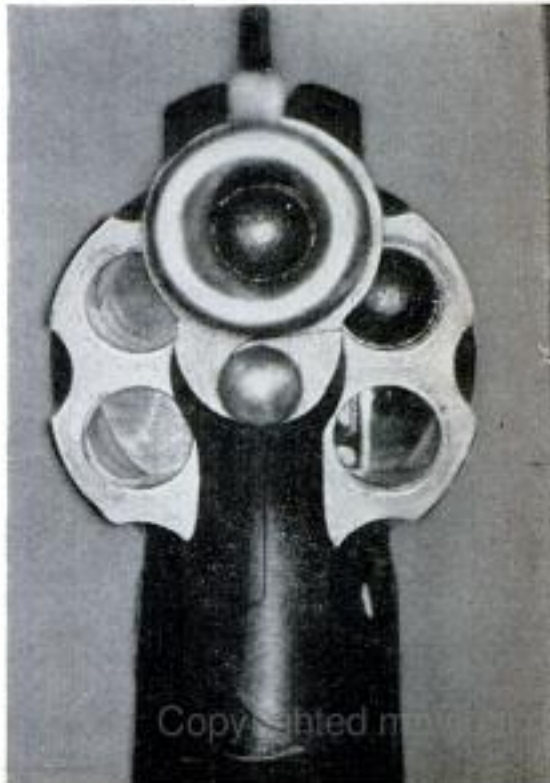
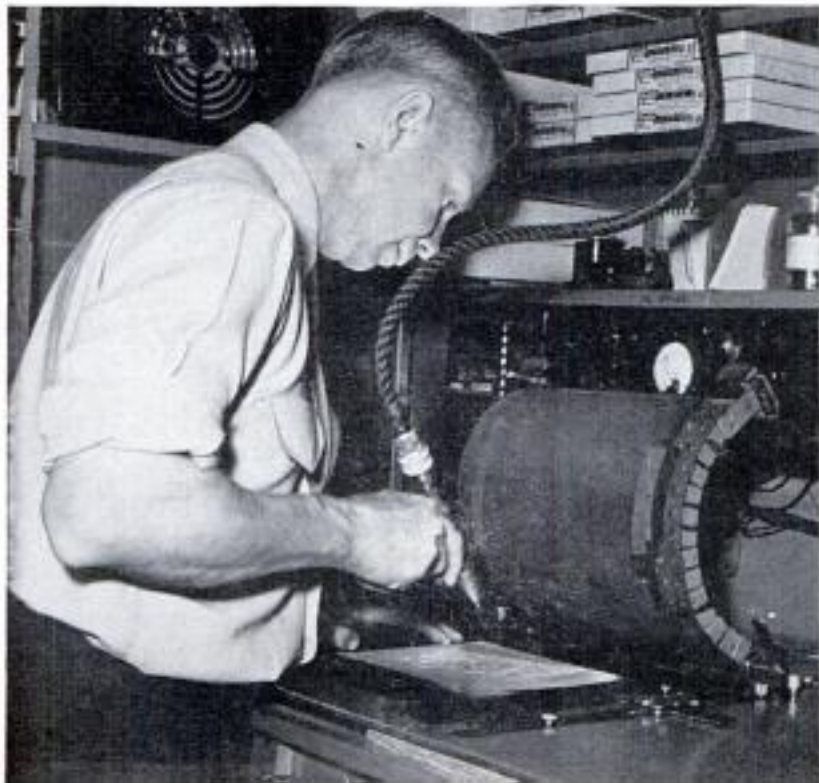
Class B Hinelight illuminated the hands and a smaller decorative circle of coins without bothersome glare.

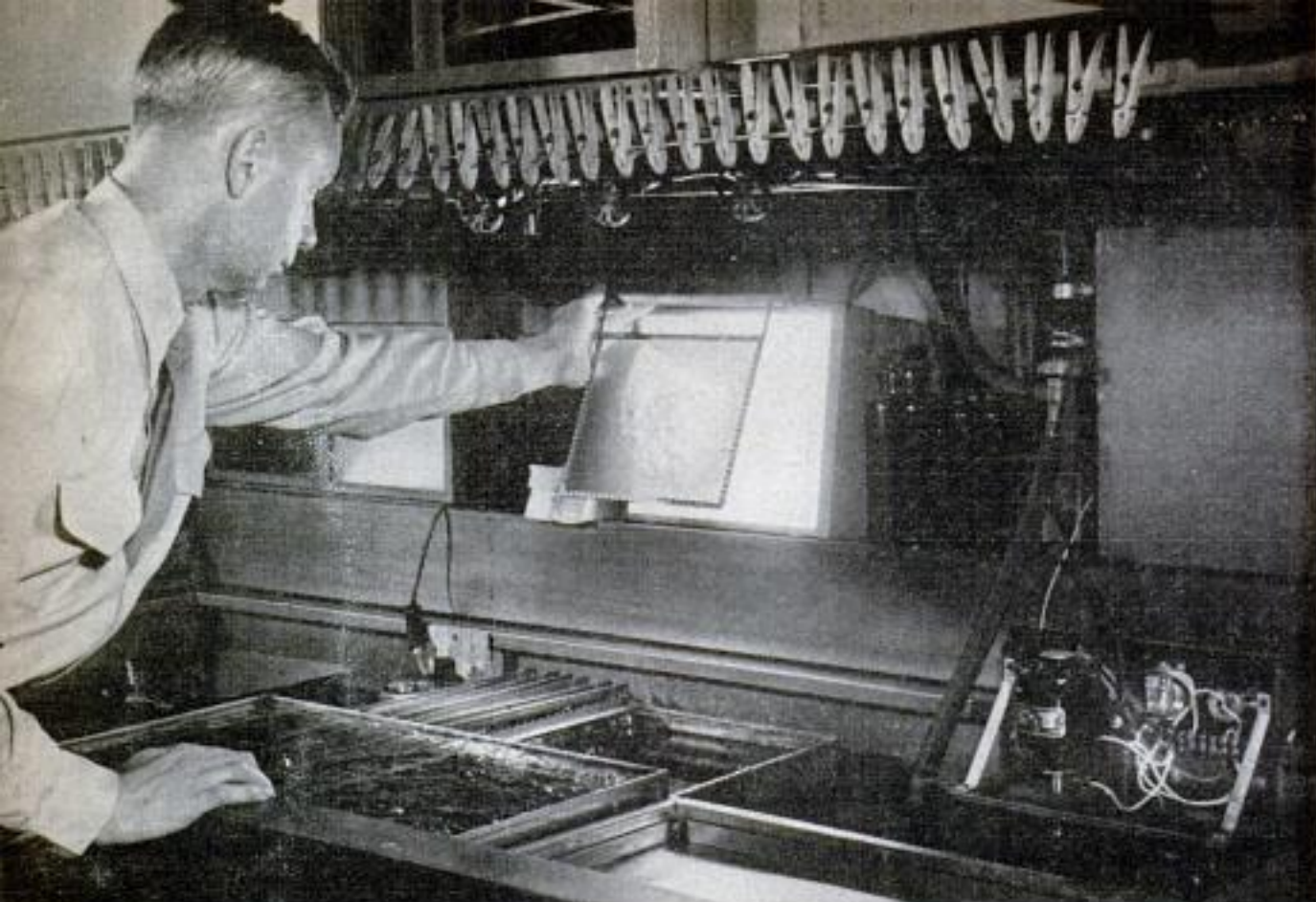
Hine regularly "does the impossible" for the Farnsworth Electronics Co. in Fort Wayne when he copies an extremely delicate line made by an electronic recording device which traces on graph paper the results of electrical measurements.

Expert copying firms tried this job and gave it up, saying the line was too faint to be copied successfully.

Again special lights built by Hine came to the rescue. He decided that high-contrast copying film would do the job if illumination on the graph paper was carefully controlled. He built two sets of fluorescent lights, one below and one above the copy board. Carefully designed flat reflectors made the light level across the board nearly uniform, and a few patches of tape spotted on the light bulbs gave necessary critical

Hine uses compressed air to clean negatives. Photo made down a gun barrel shows nose of bullet at other end





Thermostats control temperature of film developers. Aspirator bubbles water to agitate negatives being washed

Hine puts one of his shadowless lights to work photographing a piece of machinery. Reflectors cover lamp when not in use



adjustment so that meter readings were constant over the entire copying surface.

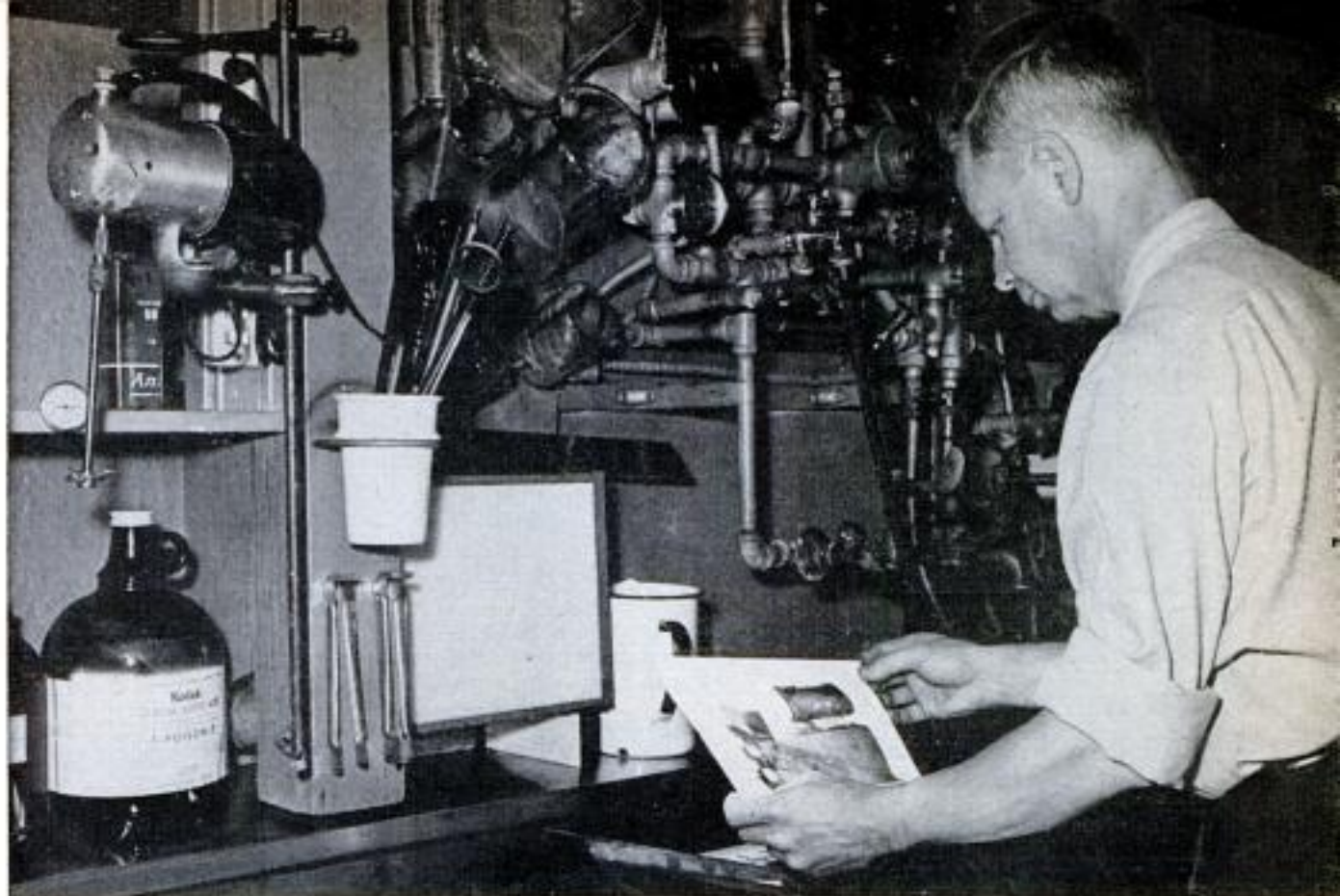
Careful control of film exposure is all that is necessary now to produce top-notch copies of the delicate graph lines.

To turn out high-quality photographs for industrial purposes and to live up to his own high standards, Hine has built much of his own equipment and has installed in his darkroom facilities for controlling time and temperature "down to a gnat's hair."

His "dream darkroom" looks like a combination power station and plumbing shop, with lights, cables, pipes, valves, thermostats and relays scattered about in profusion, each one a vital part in Hine's setup for producing photos of top quality.

Much of the work of building the darkroom facilities and most of the cabinet work in his office-studio were done by his father, H. S. Hine, a man equally at home with a saw or developing tray. In addition to doing carpentry and machine work, he helps out with the processing, doing all the film developing and helping do the printing when a big rush order demands "all hands on deck."

Critical control of time and temperature, plus careful use of high-



Maze of plumbing mixes hot and cold water to produce desired 72 degrees. Power mixer, left, stirs chemicals

quality lenses are the watchwords in Hine's darkroom.

After many experiments, he chose 72 degrees Fahrenheit as the ideal processing temperature, rather than the conventional 68 degrees.

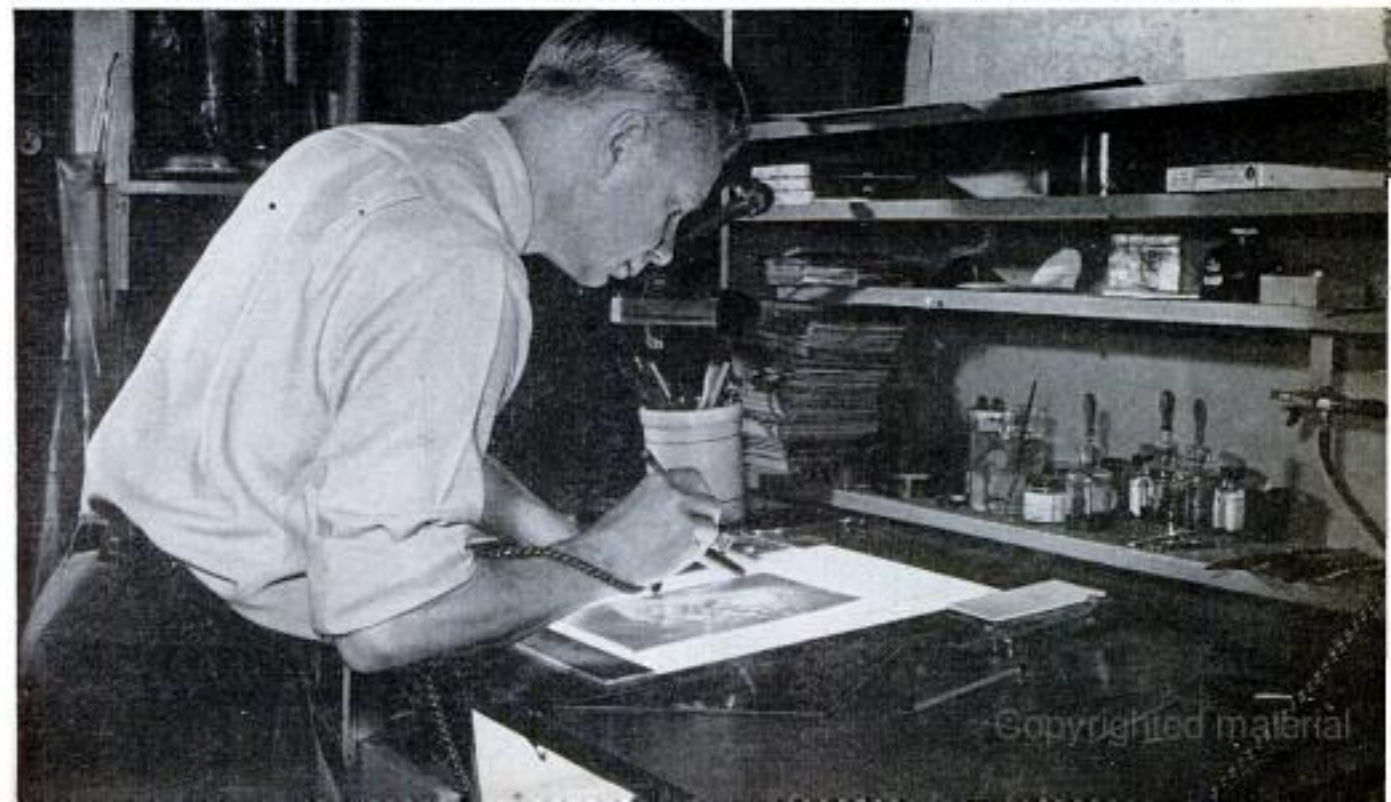
Automatic controls keep all his processing solutions at this temperature, and even his film drier is designed to keep his negatives at this temperature while drying, thus keeping grain size negligible. All tanks

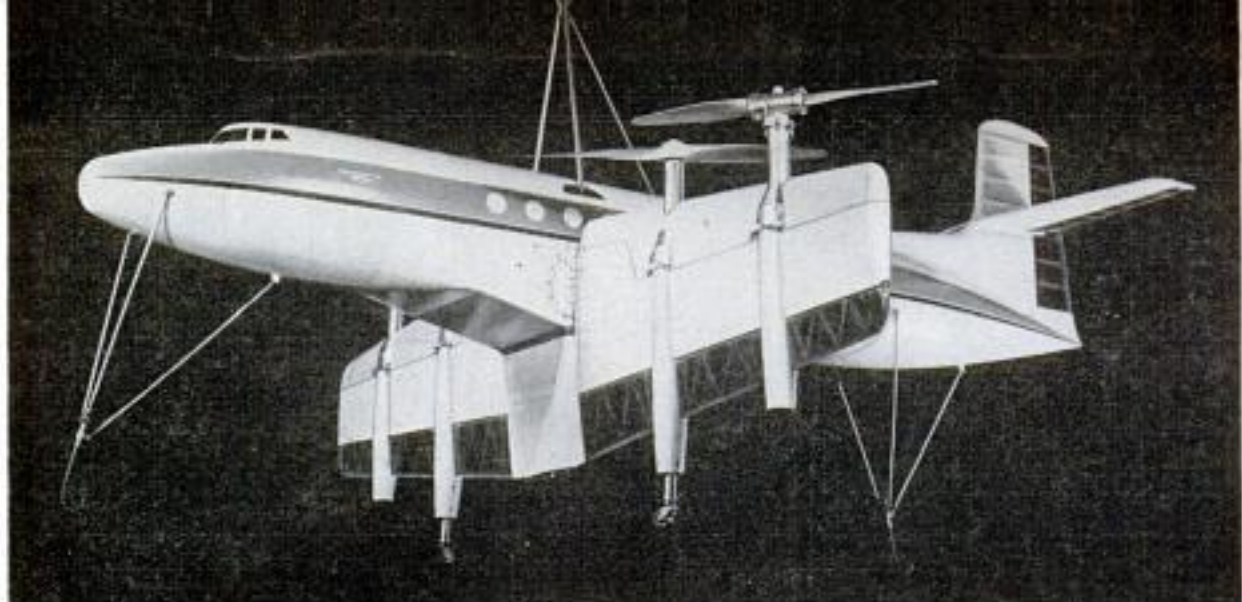
used in film developing are immersed in a water bath which is kept at 72 degrees by thermostatic controls.

Water circulating in the print-processing sink is kept at this temperature by an elaborate "plumber's nightmare" over the sink. Through use of this maze of pipes, thermometers, special valves and other gadgets, Hine's water supply is automatically adjusted to proper temperature.

(Continued to page 228)

Instead of dodging, Hine air-brushes thin areas of negative with red dye when enlarging or contact printing

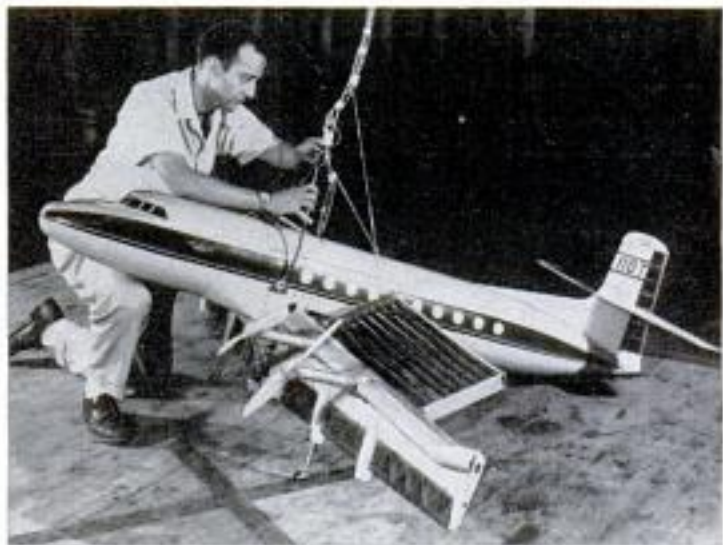




## Vertical Take-off For Airliners

Vertical take-off and landing is one of the ideas under investigation by NACA as a possible solution to the nation's costly airport-construction problem. Two of the methods tested on model airliners at the Ames Aeronautical Laboratory of the NACA are shown in the photos. In one, the wings and propellers are turned to the vertical. In the other, the slip stream is redirected through sets of extra wings and flaps that look like Venetian blinds. This latter system permitted hovering, take-off and landing while the fuselage of the model was nosed upward 15 degrees from the horizontal.

Experiments in planes capable of vertical take-offs are being pushed as larger planes, requiring long expensive runways, go into service. Here are just two of many recent VTO designs



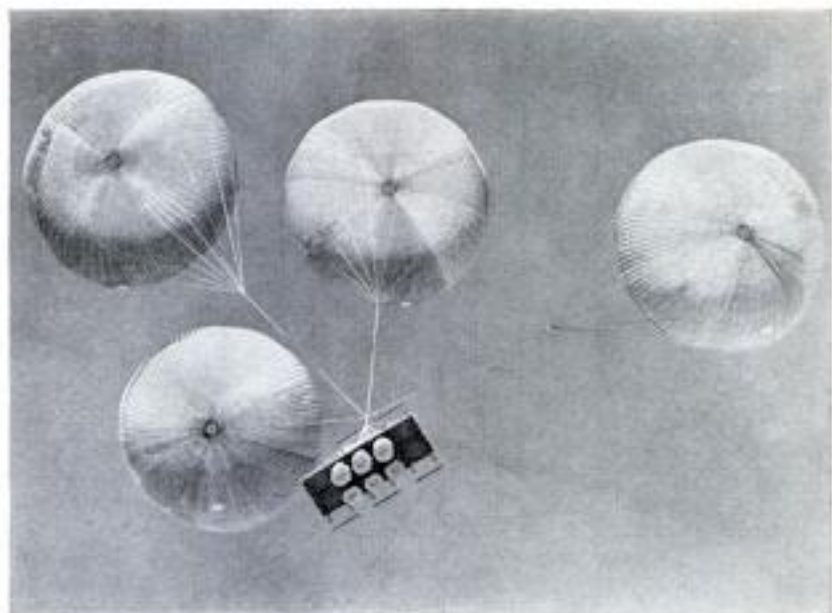
## Muscle-Powered Duck Boat Retrieves Downed Birds

Duck hunters are a hardy and ingenious lot, and Earl Blevins, of Rices Landing, Pa., a member of the tribe, proves it by

coming up with a paddle-wheeled boat to be used for shooting and for retrieving the downed birds. The boat is small enough to be carried in the trunk of a car. Basic machinery of the paddle wheels is a pair of bicycle sprockets mounted in the sides of the boat and fitted with hand cranks and paddles. As a safety measure, he has equipped the boat with floats similar in principle to those used on outrigger canoes. The floats were made by sealing the ends of lengths of downspouting, and are attached to the sides and the stern with metal braces.



Craft is made seaworthy by outrigger-type floats



## Flying Freight Platform Cushions Delivery of Heavy Equipment

Platforms made of magnesium and provided with collapsible rubber bags resembling barrels on the underside to absorb landing shocks are the Air Force's newest approach to the problem of heavy-equipment delivery to ground troops by means of parachute drops. Four to 10 air cushions are fixed to each platform and carry loads up to 25,000 pounds. When such a load is dropped from a cargo plane, a rush of air

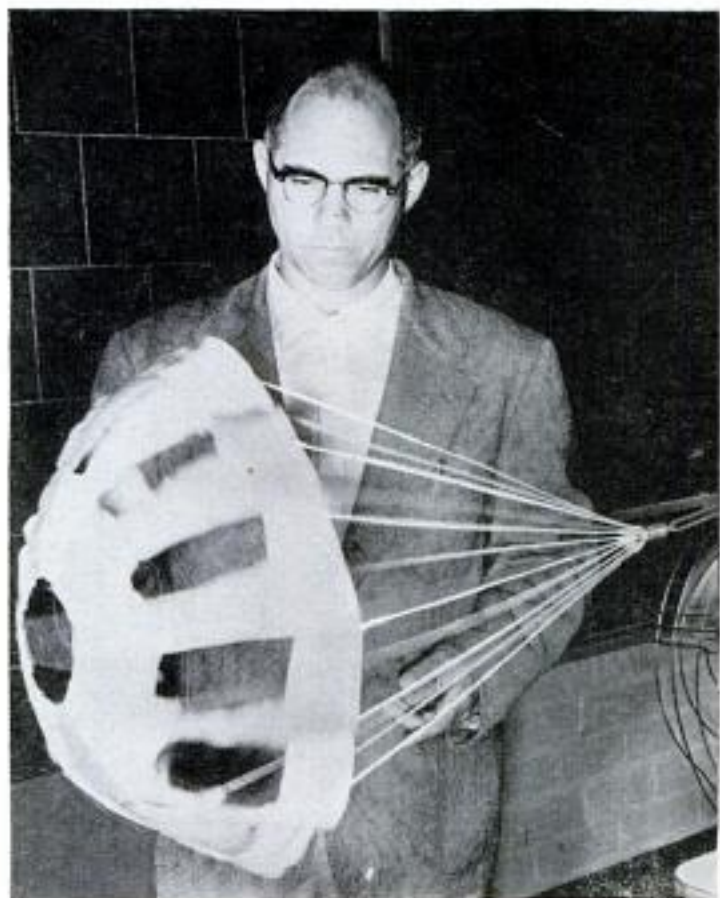
fills the cushions and a diaphragm closes automatically to keep them inflated. When the load hits the ground, the compressed air in each cushion takes up the shock, then forces out a rubber plug, permitting the air to escape. Then as the cushion deflates, the load is lowered to the ground. Tests show that the cushions cut ground impact so that a 1000-pound load hits with a force of 12,000 pounds instead of 35,000.

## Rotating Parachute Slows Flight

Spinning at the rate of 1500 to 3000 revolutions per minute, a new type of perforated parachute called Rotafoil is intended to slow and to stabilize flight and descent. Studies by the manufacturer indicate that one of these chutes weighing only four pounds can stabilize and prevent tumbling of a falling object weighing as much as 6000 pounds. It is not intended for humans.

## Motor "Canned" in Pump

Civilian industry has put into use a "canned motor" pump like the one developed for atomic submarines. Both the stationary outer coils and the rotating portion, or "rotor," are canned in metal and the circulated water flows through the space between them. A unit is being used to circulate boiler feed water in a closed-loop system in the Possum Point, Va., electric generating station. The pump is said to be leakproof.





Astronomer steps from elevator into booth at upper end of telescope. Below, outside view of observatory



Seventy-ton fork of the instrument dwarfs man standing beside it



## A New Eye Scans the Stars

**A**STRONOMERS who are studying the distant reaches of the universe will have the aid of a new tool this winter. A giant 120-inch telescope is scheduled to go into operation in early 1956 at the University of California's Lick Observatory on Mount Hamilton near San Jose.

The instrument is the second largest in the world, ranking next to the 200-inch telescope on Mount Palomar near San Diego. Its range is approximately 900 light-years. It will be used in studies of distant galaxies in a cooperative program with other observatories.

The tube of the telescope is actually an open framework of large-diameter steel pipe. The 16-inch-thick 4-ton Pyrex



mirror is supported at the lower end of the tube. At the top of the tube, at the prime focus where the light gathered by the big mirror comes to a point, is located a small booth in which an astronomer will ride the telescope for some types of celestial observations.

The telescope rests in a huge, hollow, 70-ton steel fork, the first mount of its kind for a large instrument, one that will permit observations in virtually any part of the visible sky. A motor inside the hollow fork drives the 35-ton tube and mirror while another motor rotates the fork. Other motors rotate the 96-foot dome inside which the telescope is located. An elevator inside the dome permits an astronomer to ride to the prime focus no matter at what attitude the telescope is placed.

The new Lick instrument was built at a cost of \$2,500,000. Grinding and polishing of the big mirror consumed two years of painstaking work, and work is being completed on 10 secondary mirrors that will be used in various ways to focus the light gathered by the 120-inch disk. In addition, photoelectric recording apparatus for measuring the brightness of stars is being installed.

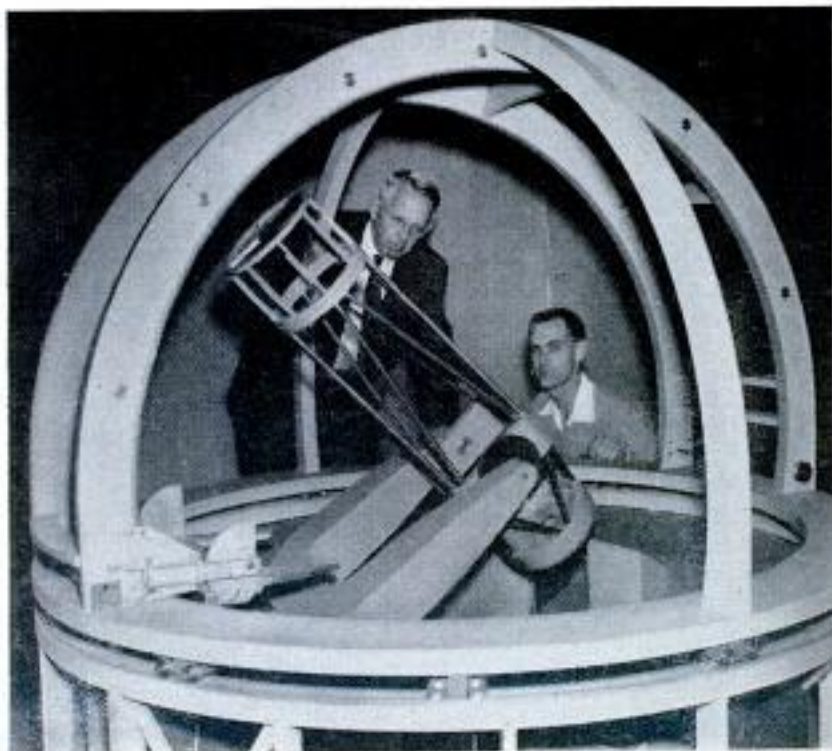
Pending installation of the mirror, steel slabs and a concrete disk were placed in the bottom of the telescope during orientation and testing of the drive mechanisms.

With the new telescope, Lick becomes the possessor of the world's newest as well as one of the world's oldest large astronomical telescopes. Still in use is the big 36-inch refracting telescope that was installed on Mount Hamilton in 1888.

★ ★ ★



Open-framework section of the telescope is 53 feet long. Below, Dr. C. D. Shane, director of Lick Observatory, and a technician inspect a working model of the new instrument. The 120-inch telescope will be the second largest in the world and will have a range of 900 light-years





U. S. A. F  
TEST PILOT SCHOOL

# Where They Learn to Test Jets

**T**HE NEW experimental fighter was making a tower fly-by at top speed, 30 feet off the ground. There was a crash of sound from its afterburner as it hurtled past and seconds later it was almost out of sight. By now its pilot was calling the tower to report the readings that his air speed and Mach indicators had shown during the fly-by.

"Okay, okay," the tower replied. "Come around again, Ed. Take it slow this time, for altimeter calibration. And watch your altitude. You were stirring up dust on your last pass!"

High-speed and slow-speed runs only a

*By Glenn Infield* few feet off the deck aren't

recommended for ordinary pilots, but the flier who was making the instrument checks in this new fighter was far from ordinary. He was one of the experimental test pilots attached to the Flight Test Center at Edwards Air Force Base in the California desert. More than that, he is a graduate of the Experimental Flight Test Pilot School that the Air Force operates at Edwards.

This is the only test-pilot school in the Air Force and there are only two like it in the world. One is that of the Navy at Patuxent, Md. The British have the other.

The job of the test-pilot school is to produce men who are a match for the planes they will fly. These planes are the newest experimental designs that may be adopted later as standard bombers or fighters if performance and safety come up to Air Force requirements. To test such aircraft a pilot must be an expert in engineering evaluation as well as in flight technique. He must have the boldness of a buccaneer, the mental precision of a slide rule and the insight of a top-notch reporter.

Only 15 men at a time are selected from Air Force personnel for the special schooling. Each student is an accomplished flier even before he enters the school, for a basic requirement is that he have a minimum of 1500 hours of diversified flying time. He must be a lieutenant, captain, or major, between the ages of 23 and 33, with a knowledge of college mathematics and aeronautics and preferably at least two years of engineering training.

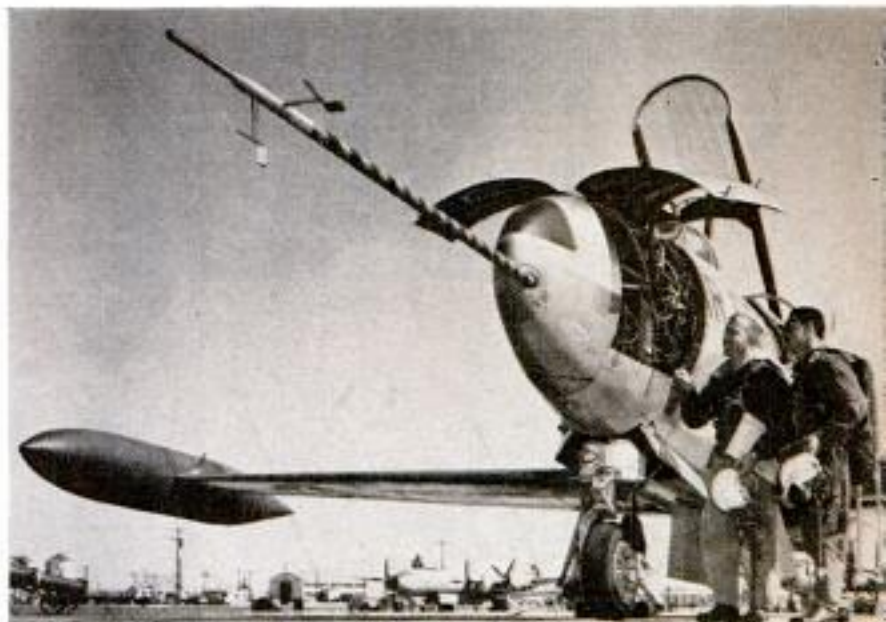
However, certain requirements may be waived if a pilot has an exceptional record. A few graduates of the test school, including Maj. Charles E. Yeager and Douglas test pilot Bill Bridgeman, had very little formal training in engineering.

The course is a grueling six months of concentrated classroom work, home study and flying. It keeps the student busy nearly every day of the week from early morning until as late as midnight. Sundays and holidays theoretically are free but often a student finds that he must fly on those days to complete projects in the tightly jammed schedule. The first four weeks of the course take the student from the use of the slide rule up through algebra, trigonometry and physics to integral and differential calculus.

Graduates are qualified to accomplish both Phase II and Phase IV flight testing performed by the Air Force; that is, they are trained to evaluate the performance and stability and control characteristics of an aircraft. In the classrooms the students are taught the routine for testing and evaluating the level flight and climb performance of a plane, then they are taught the methods by which the



Trained jet pilot starts over with T-28 at test-pilot school



Next step is to Lockheed T-33, fitted with instrument boom



Hottest aircraft operated by school is the F-86 jet fighter

Delta-wing fighter YF-102A undergoing typical flight tests





Six of USAF's top test pilots and some of the planes they have tested. Left to right, Maj. Charles Yeager, Maj. H. G. Russell, Col. F. J. Ascani, Brig. Gen. J. S. Holtner, Lt. Col. Jack Ridley, and Maj. Arthur Murray

safety and ease of control of the plane can be determined.

Classroom studies are balanced by about 70 hours of flight time in the trainers, fighters and bombers attached to the school. During all flights except in the single place F-84 and F-86 an instructor accompanies the student pilot.

Just as in the case of an actual experimental plane, a special instrument panel is mounted on each trainer, with a motion-picture camera automatically recording every detail of the flight.

Typical flights include maximum per-

formance take-offs, a check climb for altitude and maximum performance landings in which the plane is stalled a foot off the ground. One test is to take a plane aloft and make several dives to check for possible unusual reactions. An unusual reaction might be the need for more pressure on the control stick. The student writes this on a clipboard attached to his knee, regains altitude, and dives again. He may note on his new dive that he had to hold left rudder and that he had felt rudder pulsations.

The student learns that when he is instructed to do a 5G pull-out, he doesn't just



Special instrument panel is installed in plane being flight tested. Camera records instrument readings

stick the nose of the plane down and close his eyes. He has to check and double-check the instruments, watching the Gs pile up as he starts his pull-out and all the time a camera is clicking away at its instrument panel, recording the filmed truth of what he did or didn't do on the dive.

As one of the stability tests he makes aileron rolls as rapidly as he can, at various speeds. This was a mild and pleasant maneuver in older, slower aircraft; in a fast jet it can be a queasy experience if the pilot isn't in top physical shape.

He makes side slips at various speeds, all at high altitude because some of the controls blank out in a side slip and he can anticipate a spin. He will need plenty of altitude if that happens when testing a new plane in the future.

He learns how best to control a plane that has an after center of gravity, causing it to handle very poorly. This is part of a series of tests for handling a plane under various loading conditions. As part of the stability tests, too, he studies the compressibility effects that are encountered at very high speeds.

A test pilot not only flies a plane to



Film is projected after flight. Student pilot prepares his flight report after reading instruments

learn how to operate it best, he checks out every part of it. He notes the way the drag chute operates when landing (does it produce enough deceleration?) and he fires all the guns or rocket armament (any malfunctions?) with which the plane is equipped.

The student may spend six or eight hours writing a report of all that happened on a flight. He must provide the engineers with a professional report of the plane's behavior. There is no purpose in a test flight if the pilot's report is not clear and concise so that the engineers can iron out the "bugs" in a new plane.

Operations at the test-pilot school begin in the very early morning, before sunrise. The pilots have learned that the air in this desert area is still during this time, making it the best part of the day for student testing. Most of the morning is spent on various types of flights or in studying the film taken of the instruments on the day before. Ground school takes up the afternoon.

There are other activities for the test-pilot trainees. During the six months they visit the aircraft industries in the Los Angeles area and confer with aeronautical and design engineers. They tour NACA's Ames Laboratory at Moffett Field near San Francisco; check out in the ejection seat

Republic F-84 Thunderjet launched from truck-mounted platform uses a booster bottle to provide necessary extra kick





Project engineer records instrument readings during testing of C-124C Globemaster as test pilot watches

on the specially constructed stand at Williams Air Force Base, Ariz., and in the high-altitude chamber, also at Williams.

Physical endurance during these check-outs is closely observed. When a test pilot hurtles through the air so fast that the paint peels off his "aerial hot-rod," he has to be in tiptop shape. If a student fails to withstand the check-outs at Williams he is automatically relieved from the school.

Mostly, washouts are for academic deficiencies. Failure to keep up with class in calculus, aerodynamics or physics has sent a number of students back to their squadrons, though otherwise they were excellent test-pilot material.

"There is a good reason for this," explains Lt. Col. John R. Amann, school commander. "An experimental test pilot associates with the top engineering brains of the aircraft factories. He must be able to understand what they are talking about and he should be able to make intelligent contributions in a discussion about a new aircraft. Mathematics and many of the physical sciences have become important tools of his trade."

A graduate of the school, if accepted as

an experimental test pilot, first spends six months in routine test flying at Edwards. After that he may be assigned to a major project. This could consist of taking complete charge of the Air Force flight testing of a brand-new plane.

But not all graduates are retained at Edwards. Possibly only the two top men in every class of 15 are assigned as experimental test pilots at the Flight Test Center. Still, there are many interesting jobs for the others.

Some may be assigned to other centers of the Air Research and Development Command, others go back to their original commands where they check-out their fellow pilots. Still others are needed as acceptance pilots at the factories that are delivering production aircraft to the Air Force, others go overseas to test-fly aircraft that have been shipped abroad. They are needed, wherever they go.

Men like Major "Chuck" Yeager do this experimental work day in and day out, flying that isn't covered in a textbook, piloting that pits a man against the strangest and most dangerous forces of the universe. And they do it for the regular pay of their rank—nothing extra. A comparative civilian job would pay \$15,000 to \$30,000 a year. Why do they do it?

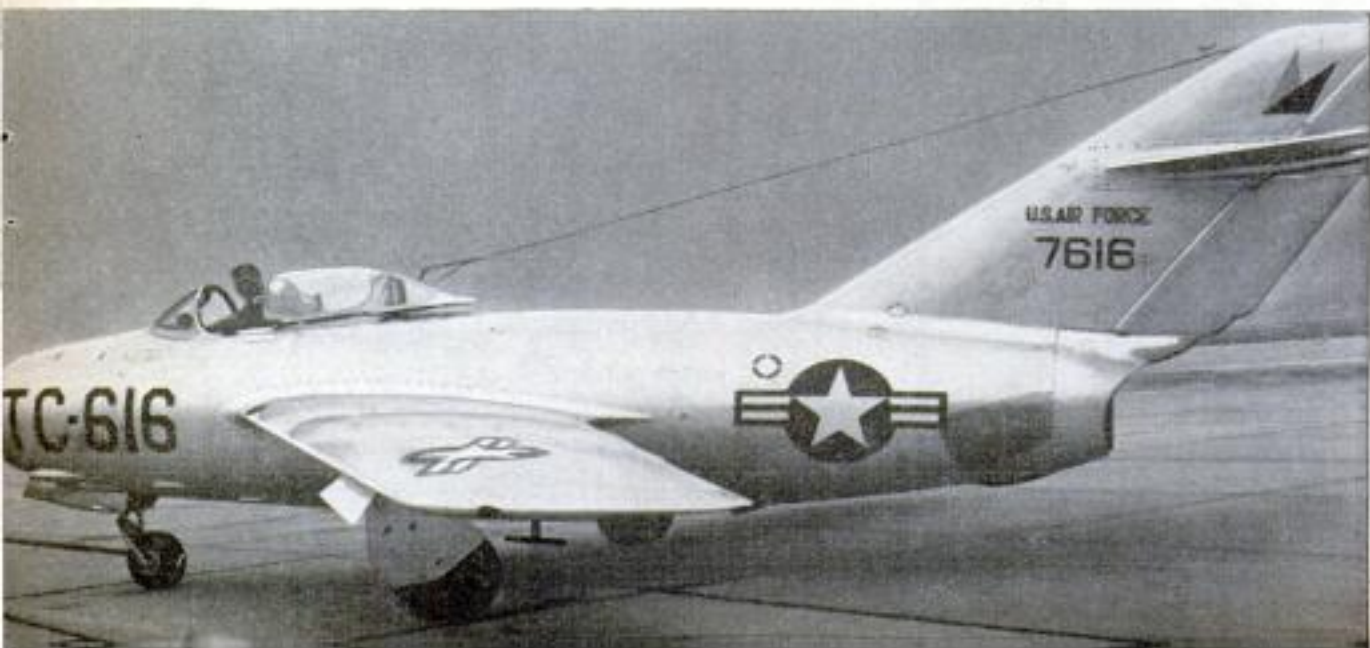
Most of them just shrug their shoulders and say, "It's a fascinating challenge to your ability. Sort of keeps you on your toes, stops you from falling asleep on the job."

There is no doubt about test pilots staying awake on the job. These "you build 'em, we'll fly 'em" pilots don't dare sleep.

Bill Bridgeman called the shot when he said "Stop thinking and boom!—before you can collect yourself, you're fresh out of space."

But despite the rigors and dangers involved, pilots clamor for assignment to the world's toughest flying school. ★ ★ ★

How good is the Russian MIG-15? Here one is taxied out for tests at Wright-Patterson Air Force Base



## Versatile Easy Chair With Fold-Out Back Converts Into Combined Chair and Table



Both chair and table are combined in a piece of furniture built by upholsterer Roland Provencher. A section of the chair back swings forward and down at a slight

push to become a Formica-covered table. The arms of the chair double as legs of the table, which is suitable for study or for games. It is now in production.

## System Like Wirephoto Transmits Pages of Books or Magazines

Excerpts from scientific books and journals go by wire from the Library of Congress in Washington, D. C., to the National Institutes of Health at Bethesda, Md., 13 miles away. A system similar to Wirephoto

transmits the information, which is reconverted to print at the rate of 15 inches per minute. The method permits much wider service without having the books and magazines leave the library.



# On the Trail of the Whooping Crane



By Francis Dickie

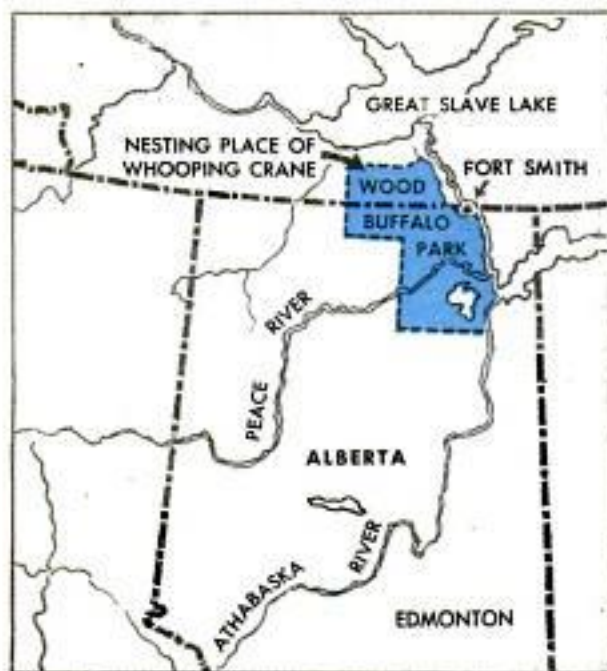
Photo by Fred W. Lahrman

Famous photograph by Fred W. Lahrman of three whooping cranes in flight was model for Canadian stamp

**A** BUSH FIRE raged in Wood Buffalo Park, in the wild country of northwest Canada. Pilot Don Landells, in a Bell helicopter, was rushing forest engineer G. Wilson and extra fire-fighting equipment to the scene from headquarters at Fort Smith. As they churned along, Wilson suddenly tapped Landells on the shoulder and pointed down.

Visible below them were two large white

Wild, inaccessible region of Northwest Territory of Canada where whooper's nesting area was found



birds. Since birds of this size were rare in this region, Landells took a few moments from his emergency flight to circle back low for a better look. In addition to the two white birds, he could also see a smaller one of reddish color. Almost immediately he identified them as rare whooping cranes—two parents and a young bird at a nesting site. He carefully noted the location and then went on with his mission.

Later, when he arrived back at Fort Smith, Landells related his discovery to W. A. Fuller, mammalogist for the Northwest Territories Administration, who immediately recognized Landells' discovery as one of tremendous importance to ornithologists. For the whooping crane, North America's largest rare bird, has nearly reached the point of extinction.

During the past 32 years, ornithologists have been searching desperately for the nesting place of this bird, in the hope that once it was found, efforts could be put forth to save the crane from the fate of the great auk and the passenger pigeon. These latter are now no more than myths, having passed from the face of the earth. In the past 10 years, efforts to locate the whooping crane's nesting place were increased tremendously, but to no avail.

The whooping crane, scientifically named *Grus Americana*, is a beautiful, dignified bird, standing four feet three inches, with a six-foot wingspread. One cause of its decreasing number is the fact that it sometimes lays only one egg a year; sometimes





Aerial view of section in which whooping cranes nest. Area is difficult to enter except by helicopter

two; three are exceptional. Another cause is the fact that, in spite of widespread appeals, hunters shoot down the migrating flocks at their resting stops.

In 1935, the United States Fish and Wildlife Service set aside 47,261 acres near Austwell, Tex., as the Aransas Whooping Crane Refuge. This area was selected because the birds always returned to it for the winter. And in the refuge an exact count of the number of cranes in existence each year was possible.

Figures show that in 1950 there were 33 whoopers in the wild state on the refuge. By 1954, only 21 birds were returning from the northern Canada nesting grounds. This decrease in the population was mute evidence that the unlawful shooting of the crane by hunters continued. It should be noted that the decrease leaves out any count of young birds which must have been hatched during these years.

In 1945, the endeavor to save the crane was boosted by the formation of the Cooperative Whooping Crane Project. In this, the National Audubon Society joined the Wildlife Service, giving large additional funds. In

(Continued to page 230)



Above, two whoopers flying low over their nest, and below, one of the majestic birds about to take off. These are the only photographs ever taken of the whooping crane in its nesting grounds, and were shot by pilot Don Landells from a helicopter

Photos by Don Landells





### Floating Trailer For Road or River

One English family is at home on a road or on a river. A trailer-boat built for his family by boat designer Alan Eckford is quickly convertible. Two men can easily slide it off its undercarriage into the water. Built of laminated marine wood, the craft was constructed at a cost of \$1350. It is powered in the water by an outboard motor.

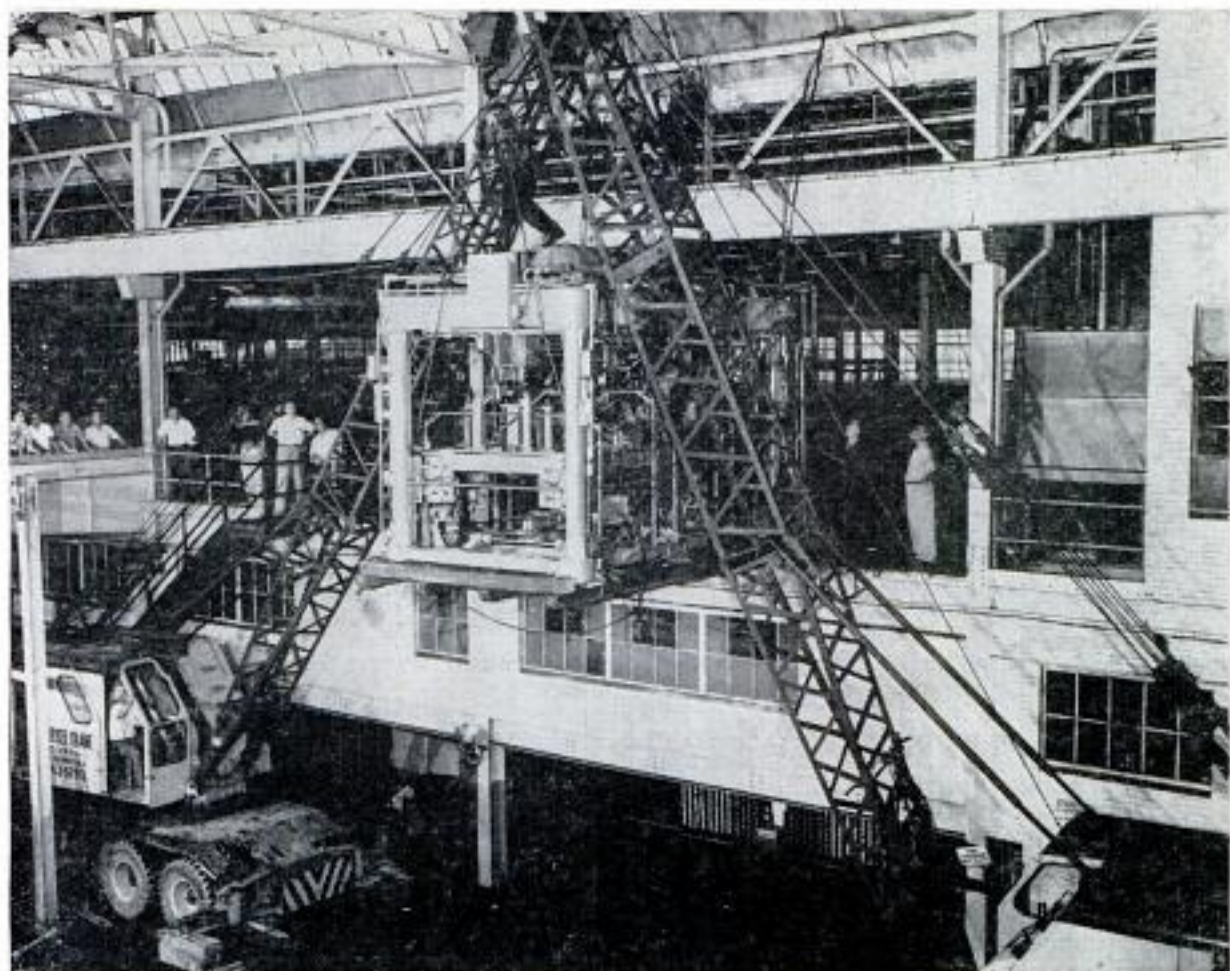
Backed up to the shore, trailer easily slides off its undercarriage and slips into water

### Harmonica With Keys

You play a new German harmonica by pressing the keys on an accordion-type keyboard. With the instrument you can play harmonic chords with as many different tones as desired and in any desired key. The instrument produces tones when air is inhaled or exhaled, and requires no more air than standard harmonicas.

☐ An estimated 1,055,000 brick houses were built in the United States last year—29 percent of all homes constructed.





## Cranes Join to Load 20-Ton Welder

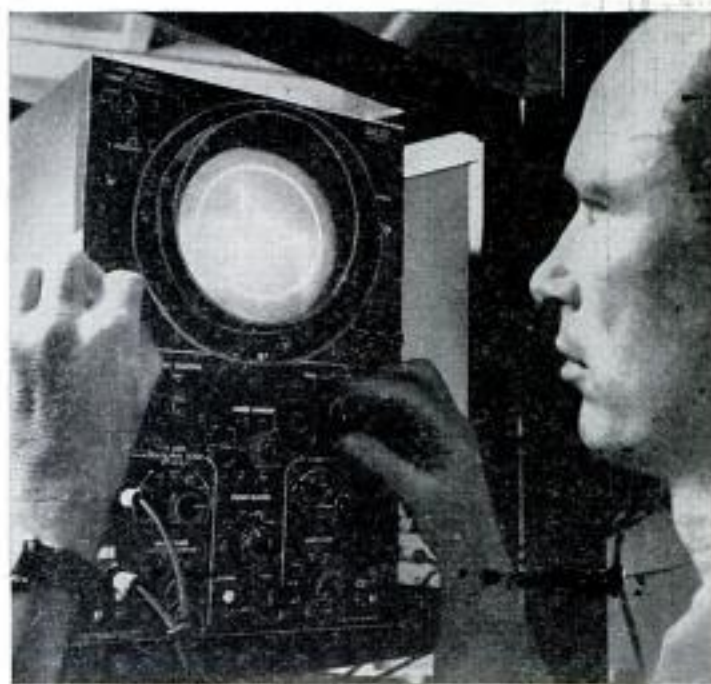
Cables strain as 20-ton welding machine is lowered by two cranes in the old plant

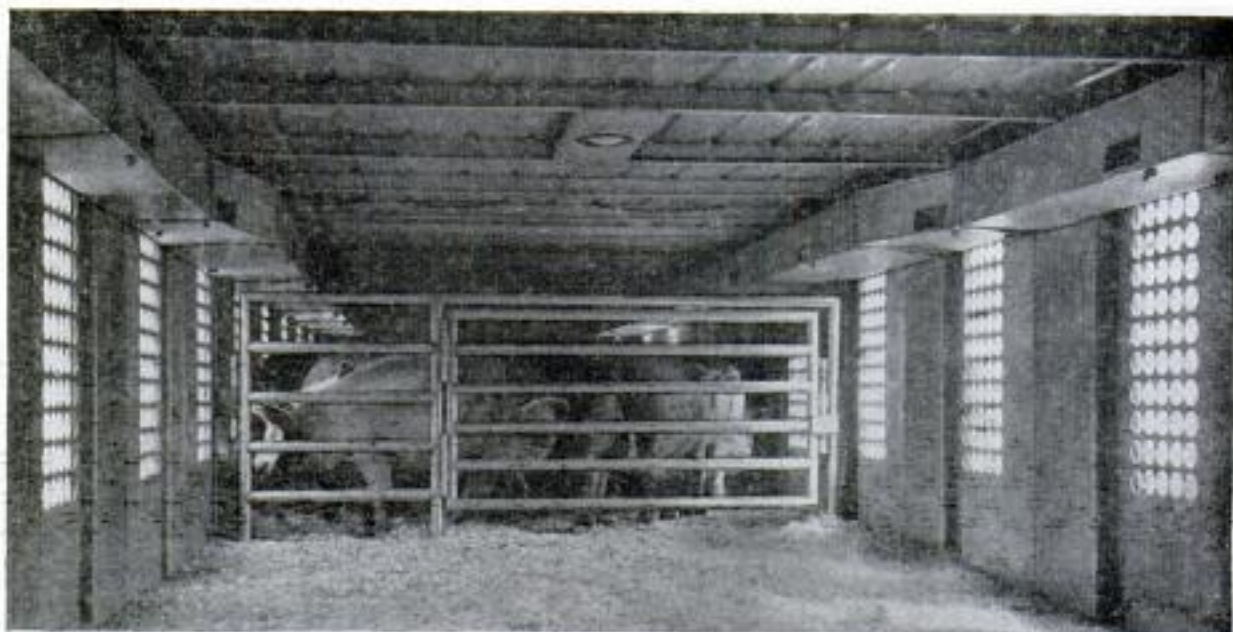
Heavy-duty cranes had all they could handle in a 20-ton welding machine that was taken from the second floor of Ford's Edgewater, N. J., assembly plant. The machine was loaded on a railroad flatcar for

the 26-mile trip to Ford's new plant at Mahwah, N. J. More than 100 moving vans and between 200 and 300 railroad cars were used to move equipment from the old plant. Biggest item was the welding machine.

## Electronic "Brain" For Supersonic Planes

Air Force planes operating at supersonic speeds may be equipped with a new electronic "brain" capable of doing 60,000 additions or subtractions in a second. The computer, known as Tradic, was developed at Bell Telephone Laboratories. In its final form it will probably occupy less than three cubic feet of space. The computer contains nearly 800 tiny transistors. Less than 100 watts of power will operate Tradic, which can run through 250 different steps of computation and come up with an answer in about  $\frac{1}{1000}$  second. The machine provides answers to problems of trigonometry by drawing dots on an oscilloscope in geometric patterns.





Double-decked, air-conditioned luxury liner transports hogs across western half of country in comfort

## Ham-on-the-Hoof Trailer

By B. F. Sylvester

**N**O MATTER what you've heard on the matter, a hog prefers to be clean. Furthermore, he has sensitive feelings that are easily hurt, can't stand cold, can't stand heat and is finicky about comfort. Edwin B. Hutton, a long-distance hauler from Boise, Idaho, heard about the hog's prima-donna temperament and decided that pampering him might be good business.

Hutton is now completing the first year's operation of a fancy, air-conditioned van liner for pigs, designed for pampering, which makes weekly trips from Omaha to the Pacific Coast. The van takes 152 slaughter hogs, averaging 215 pounds each, to San Francisco in 48 to 54 hours, as against rail time of 76 to 80 hours. Omaha sends 15,000 hogs a week to the West Coast, still mostly by rail. The truckers began to move in two years ago, and an increasing number of pigs are going that way.

Though summer temperatures run from 100 to 120 degrees for almost half the distance, no hog has died from heat in the van. The total death loss was three of undetermined cause in one shipment last fall. Don Diez, who buys for West Coast packers on the Omaha market, says a death loss of one hog in a freight car of 150 can be expected, as well as two or three cripples due to jamming around in the switchyards. Cripples are only occasional in the Hutton van.

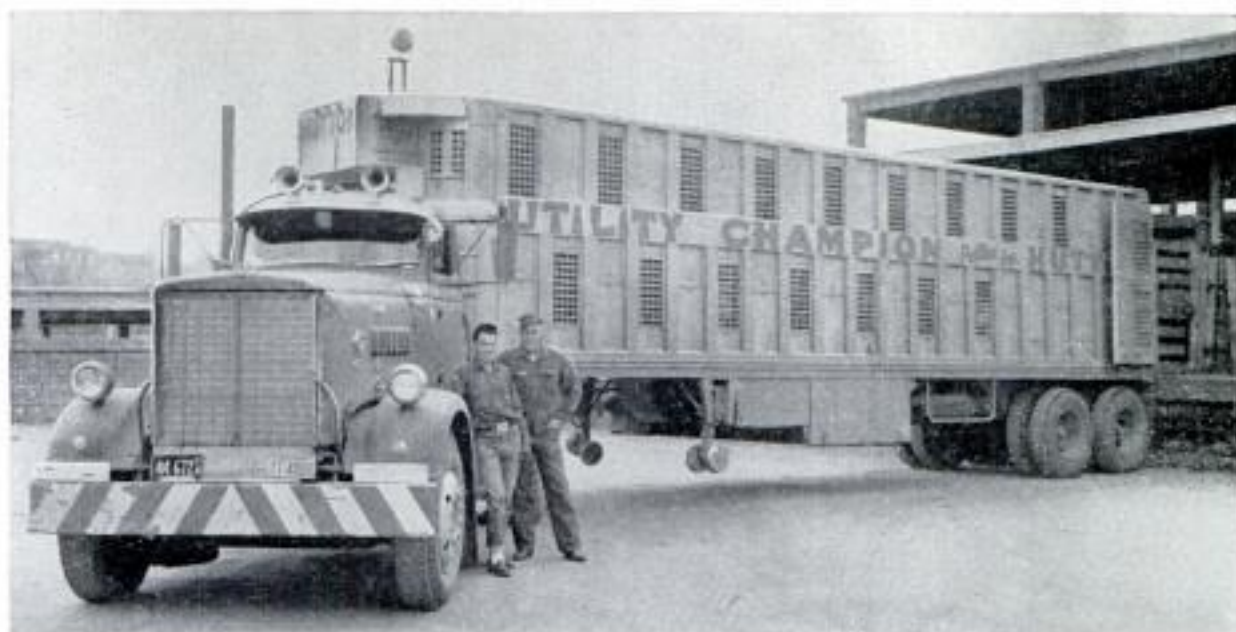
Further, Diez asserts the weight shrinkage is about 6 percent as against 8 by rail; and the packer gets a 1½ to 2-percent

increase in marketable pork. Trucking effects a saving on feed-and-water stops at \$25 each, making the trip with one stop while the railroads take two.

Hutton's trailer, with an all-aluminum body, saves two tons in weight which is replaced profitably with hogs. The trailer is 36 feet long, more than 7 feet wide and stands 12 feet high—virtually a freight car on rubber. It has two decks, with a removable aluminum floor for the upper deck. There are 18 windows on each side and four on each end, each with 24 portholes.

Jack Sherwood, Denver electrical contractor worked out an air-conditioning system for the trailer. A 2500-watt power plant, a 30-gallon tank and pump are carried underneath the body to keep inside temperatures 15 degrees cooler than outside summer heat. An example of its usefulness is in Wyoming, where a through shipment of hogs cannot be unloaded without clearance from the governor. The problem of what to do with the load until repairs can be made would present a tough situation for a conventional truck. The driver of this truck has only to turn on the air conditioning until the truck is able to proceed.

The ham-on-the-hoof van liner is a \$34,000 job. The responsibility for getting it and \$6000 worth of butcher hogs halfway across the continent in summer heat or winter ice, every week in the year, falls on the shoulders of 220-pound Sewell Simmons and 140-pound Ronnie Hansen.



Van liner cost \$34,000 to build, and can haul \$6000 load of butcher hogs to West Coast markets per week

Simmons was not a trucker but a farmer when he joined up with Hutton. Hansen had only a bacon-and-pork-chop acquaintance with pigs. Hansen has the tough, diplomatic job of persuading the pigs to enter the trailer. He loads 152 hogs in 20 minutes.

Let us say Simmons and Hansen are taking a shipment to the Armour plant in San Francisco the last week of July. They spend three hours getting the van ready, bedding the floors with four inches of sawdust before backing it against a loading chute. Simmons takes the hogs from their pen and delivers them to Hansen who coaxes the animals into four compartments.

At one time, yard loaders and unloaders used prod poles and loud voices. A live-stock-conservation board has put a stop to that. Yelling gets them excited and off their feed. Punching with a pole produces blemishes and bruises which cut down the cash value. A man who made a study of the subject once figured it costs \$3.75 to kick a hog.

Simmons aims to leave at 4 p.m. to provide two cool nights and a half day of Nevada desert. He takes the first shift while Hansen enters a sleeper berth behind the driver's seat.

There is a halt near Columbus, Neb., for a required 75-mile stop, where Simmons looks at the hogs and checks the 18 tires.

The van reaches Grand Island, Neb., in four hours for a 15-minute fuel stop and to pick up sandwiches to eat on the way.

The hogs lie down in the sawdust and sleep all the way to Salt Lake City where they have a four-hour feed and water stop. The speed is 45-50 miles an hour in Nebraska and Wyoming and gets up to 55

beyond Salt Lake City where the drivers make time to beat the desert heat. They leave Salt Lake City about 10 o'clock at night and cover as much ground as possible before daylight. Arriving in Winnemucca, Nev., at six o'clock they are done with the desert in four hours on a wide, straight highway, reaching Reno at 10.

There are slowdowns, such as Sherman Hill in Wyoming, Echo Canyon in Utah and Donner Pass in California. The long ascent of Sherman Hill reduces speed to 35 miles per hour. The descent, about eight miles, into Laramie is a tricky business calling for speed of 10-15 miles per hour. Many a truck has been lost on the deceptively steep grade of Telephone Gulch. First thing a careless driver knows, he is rolling too fast and can't do anything about it. He tries the brakes, they heat up and burn out. Then he loses his gears and winds up in a ditch or against the mountain.

The toughest section is Donner Pass which rises sharply cutting speed to seven miles per hour and has all the weather from Alaska, Canada and the Northwest. This is concentrated trouble on 130 miles of mountain driving from Reno, Nev., to Auburn, Calif., which takes five hours.

Except for 40 miles of stoplights all the way in from Vallejo, the rest of the trip is a breeze. The van crosses the Oakland Bay bridge and skirts lower San Francisco to the Armour plant. After unloading the hogs, Simmons and Hansen spend time with hose, rags, soap and water in cleaning the trailer. They leave the truck to be serviced, except the brakes, which no one touches but Hansen. They seek out a truckers' hotel for a few hours' sleep before starting a return load to the Midwest. ★ ★ ★



Purdue expert erected this plastic greenhouse on his farm. Structure half this size can be built for \$75

## Plastic Replaces Glass in Low-Cost Greenhouse

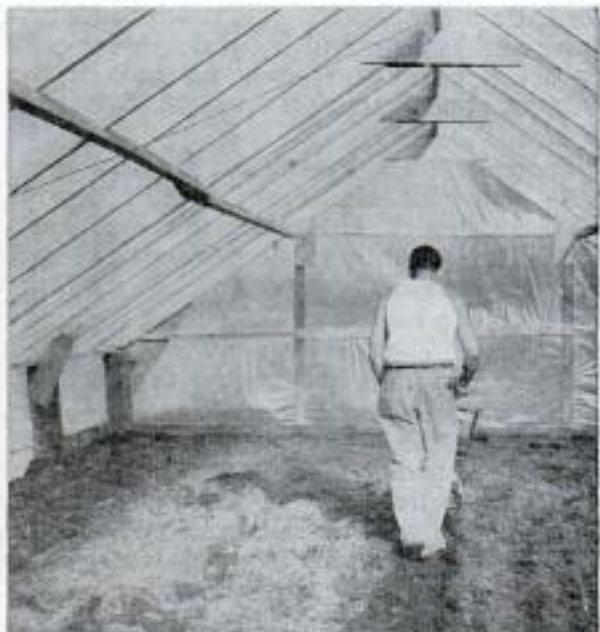
YOU CAN GROW your own vegetables and even flowers this winter in a plastic-covered greenhouse that covers 400 square feet and costs only \$75 to build. Heating will add to the cost, but you may decide it's worth the expense to have blooms and fresh vegetables in midwinter. Designed at Purdue University, the back-yard greenhouse consists of a plastic cover stretched over a wooden framework of two-by-twos and two-by-fours. The framework is rigid, yet there are no shadow-casting cross braces. It is of truss design, with glued-and-

Plastic-covered swing-out windows provide ventilation for experimental greenhouse at Purdue University

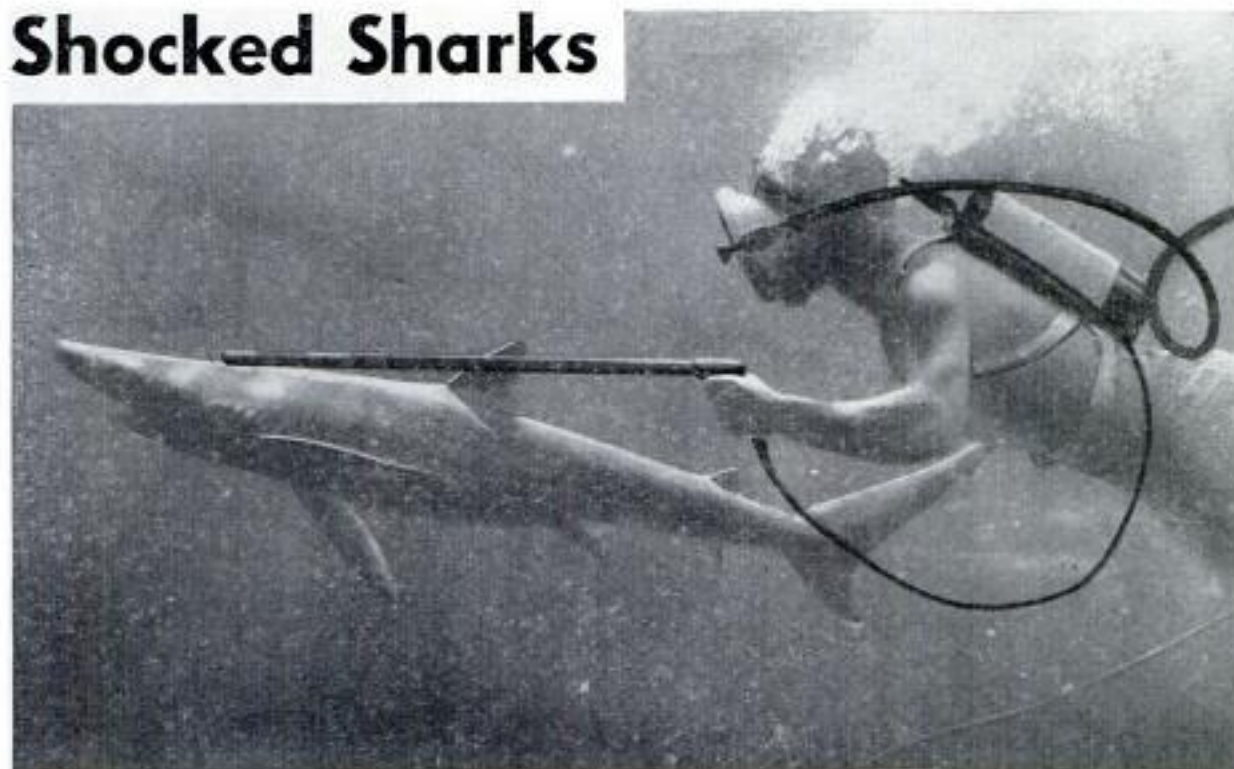


nailed gusset plates at all joints in the trusses. The cover, which is replaced every year for about \$10, withstands heavy winds, hail, rain and snow. It is easily patched. The plastic retains moisture exceedingly well, which makes for less watering. Because the covering is slightly opaque, heat from the sun does not build up in the plastic greenhouse as much as it does in the conventional hothouse. Swingout windows made of plastic-covered wooden frames are opened for short periods every day or so to ventilate the building.

Two-by-fours and two-by-twos make up simple framework of greenhouse. Braces at joints give strength



# Shocked Sharks



Shocking news for sharks, barracudas, sting rays and other undersea creatures that frighten skin divers is the development of an electronic shark repeller, a wand which generates an electrical beam to send the fish scurrying for less-populated waters. The wand consists of a watertight unit housing an electrode which releases

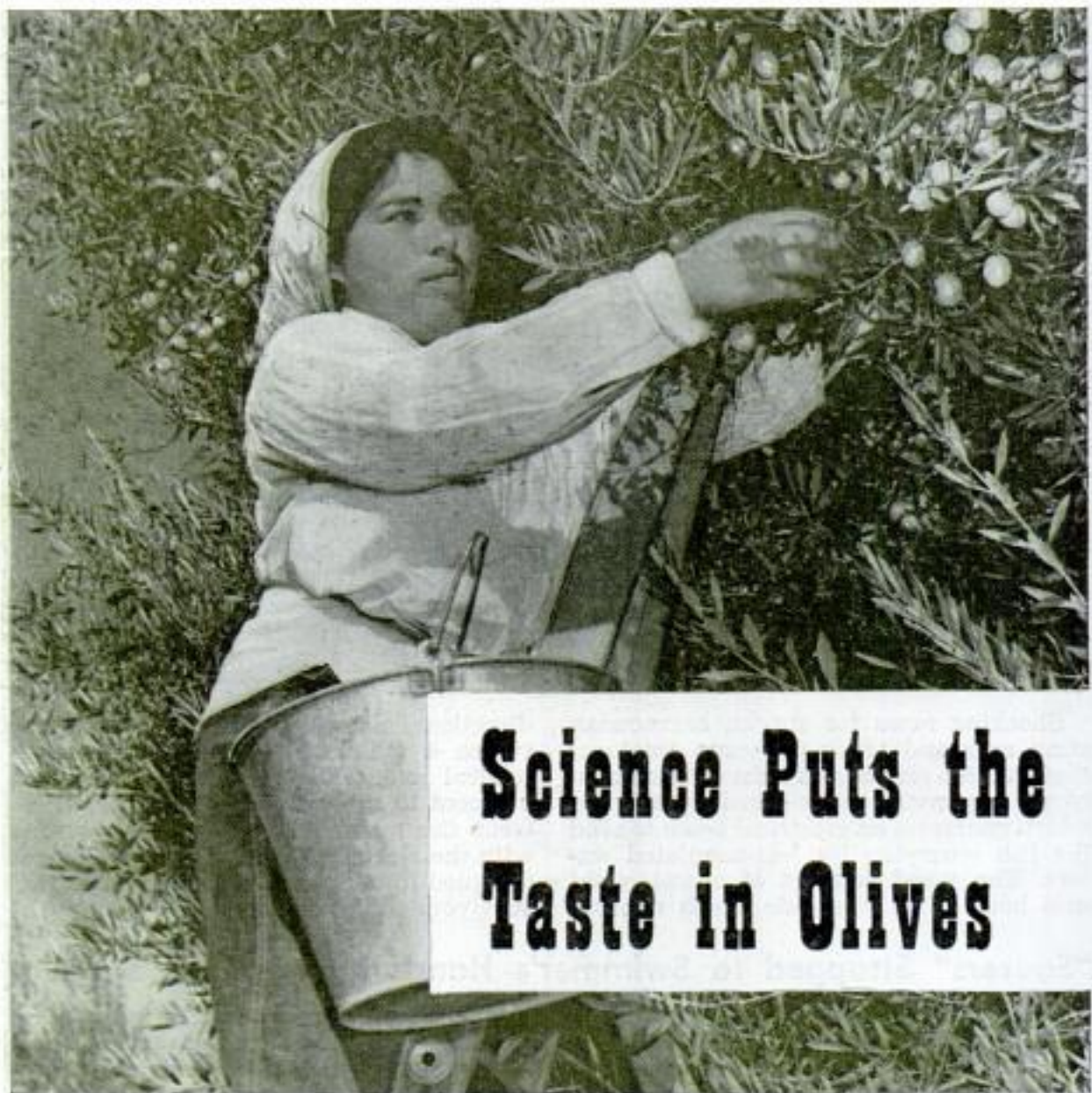
directional electrical waves when a trigger switch is pulled. The diver remains in a neutral zone while the electrified zone is adjacent to the end of the wand. Fish retreat the moment they come in contact with the electrified zone. The repeller was designed for skin divers, frogmen, life-raft survivors and scientists.

## "Saucers" Strapped to Swimmer's Hands Increase His Speed

Swimmers can now boost their speed by wearing paddles on their hands as well as fins on their feet. The saucer-shaped paddles are strapped on the backs of the hands,

leaving the fingers free for grasping. According to the inventor, the saucers boost a swimmer's speed 25 percent by increasing the amount of water he can push.





## Science Puts the Taste in Olives

By Jack B. Kemmerer

**T**HOUGH OLIVES ARE KNOWN and eaten throughout the civilized world, few persons, aside from those living in olive-producing countries, know that olives undergo extensive treatments before they are ready for the table. In fact, when picked they are bitter as gall, and California olive growers delight in offering the unwary tourist a handful of the luscious-appearing fruit fresh off the tree.

Olives contain an extremely bitter substance that must be removed before the fruit is edible. Contrary to the condition existing in most fruits, the bitterness remains in all stages of development in the olive.

However, even people of ancient times knew how to remove this extreme bitterness, and the olive has played an important role in the lives of many people. Its daily

use in the eastern part of the world is so widespread that in Spain olive oil is known as the "poor man's butter." A Spanish peasant often makes his lunch of a small loaf of bread which has been liberally soaked with olive oil.

The olive, oldest fruit known to mankind, dates back to and even before the beginning of recorded history. It is known to have existed for more than 4000 years and received frequent mention in the Bible.

Olives made their appearance in the New World through groves planted by Spanish missionaries in Mexico and South America. The Franciscan missionaries introduced the fruit to California when they established their first mission at San Diego in 1769.

As the missions were extended up the length of California the Franciscans took



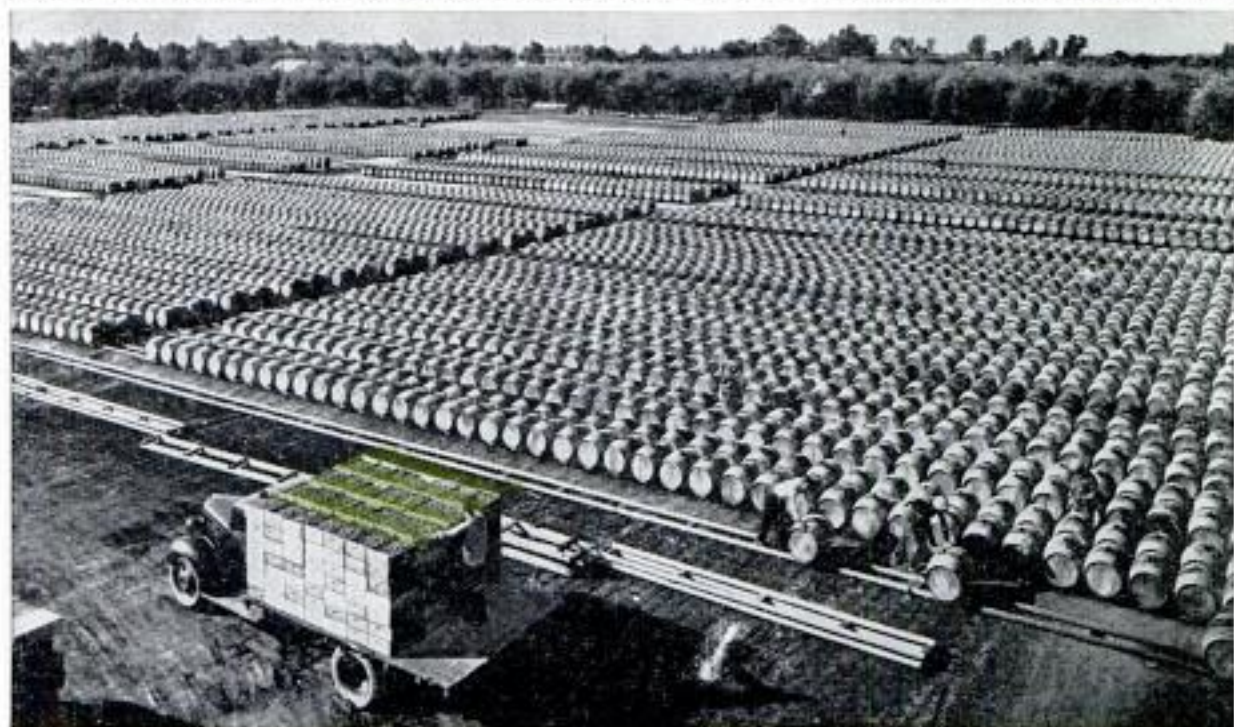


**Avalanche of green olives pours from mobile bin into big tank where bitterness is removed before pickling**

the olive along and planted orchards at each new site. The padres and others who planted olives in the early days had but one thought in mind—olive oil. The ripe, canned olive, which forms the basis of the California industry today, was not then known.

Most of the Franciscan fathers were from Spain and Italy and familiar with the pickled Spanish olive of their homelands. Numerous attempts were made to duplicate this prized delicacy in California but their efforts were not highly successful at that time.

**Acres of barrels of Spanish-type green olives are left to ferment in the warm sun for about six months**





Green olives are pumped from washing vats into 50-gallon barrels and covered with a weak brine solution

These ripe olives are being moved by air pump from one vat to another. Pump protects fruit from damage



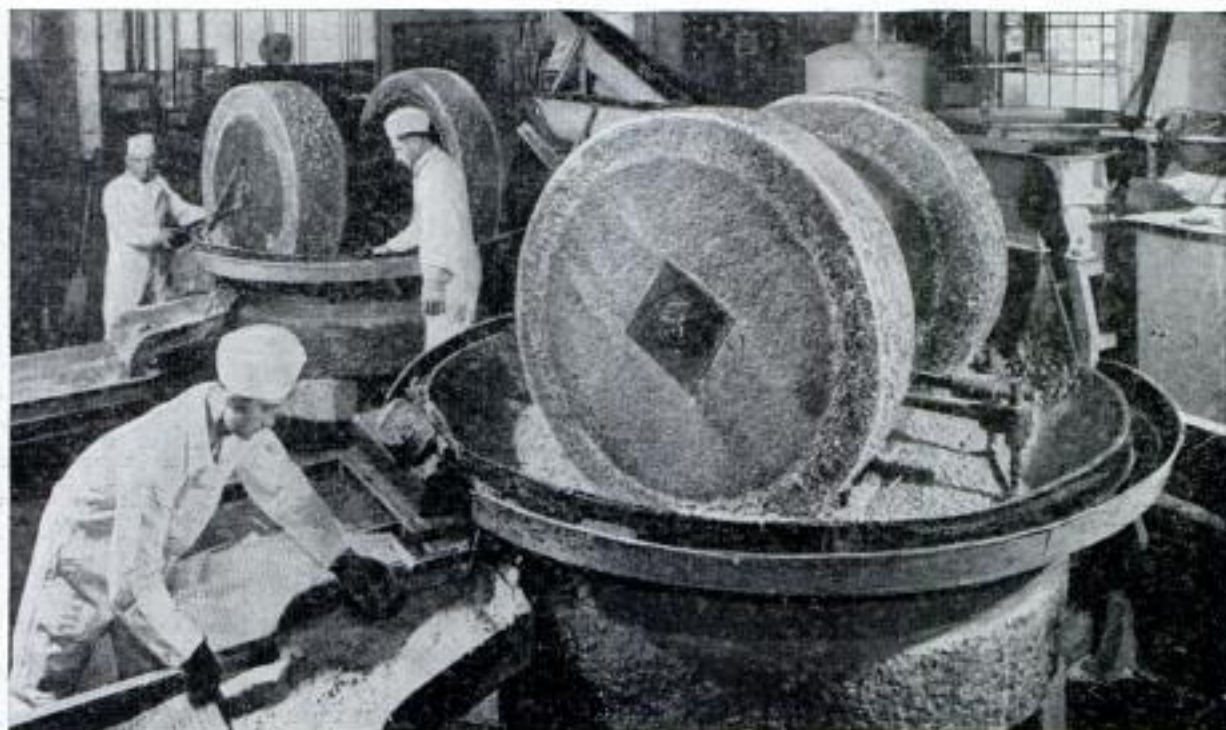
Eventually, someone found the fruit of the olive tree could be permitted to ripen fully before picking and curing. This was never attempted in the old countries because of a fruit pest that destroyed olives if they were allowed to remain on the tree until ripe. A simple method of treating the olives to completely remove the bitterness laid the foundation for the ripe-olive industry which flourishes in California today.

This new product was unique; there was no other olive like it in all the world. It was not cured in salt and it had no bitterness whatever; on the contrary, the ripe olive possessed a smooth, oily and nutlike flavor. By 1910 the open cask of ripe olives was a familiar seasonal item in all general stores.

Many people took part in the discovery that gradually changed the olive tree from an oil well to a food factory. Frederic T. Bioletti, a scientist at the University of California, contributed greatly to the field of olive culture and curing through extensive investigations into olive spoilage.

Shortly thereafter, Mrs. Freda Ehamnn, pioneer olive grower, discovered a method of sealing olives in cans and then steaming the cans at high temperature. About the same time, a retired San Diego sea captain, C. M. Gifford, also found that he could pack ripe olives in cans and the olive industry was off to a new start.

Ripe-olive processing and canning is a simple and yet complex operation. Let's take a trip through the plant of the Lindsay Ripe Olive Company, Lindsay, Calif.,



Stone wheels weighing 2500 pounds each grind olives (pits and all) into mash from which oil is pressed

world's largest olive packer. Lindsay's chief chemist, J. R. Webster, is a well-known expert in the field with many years of olive experience.

The olive-harvesting season begins in September and runs through October with as much as 270 tons of fresh fruit received at the plant in a single day. Unlike other fruits, however, olives can be stored and kept fresh in a light-brine solution for as long as a year without damage to the fruit.

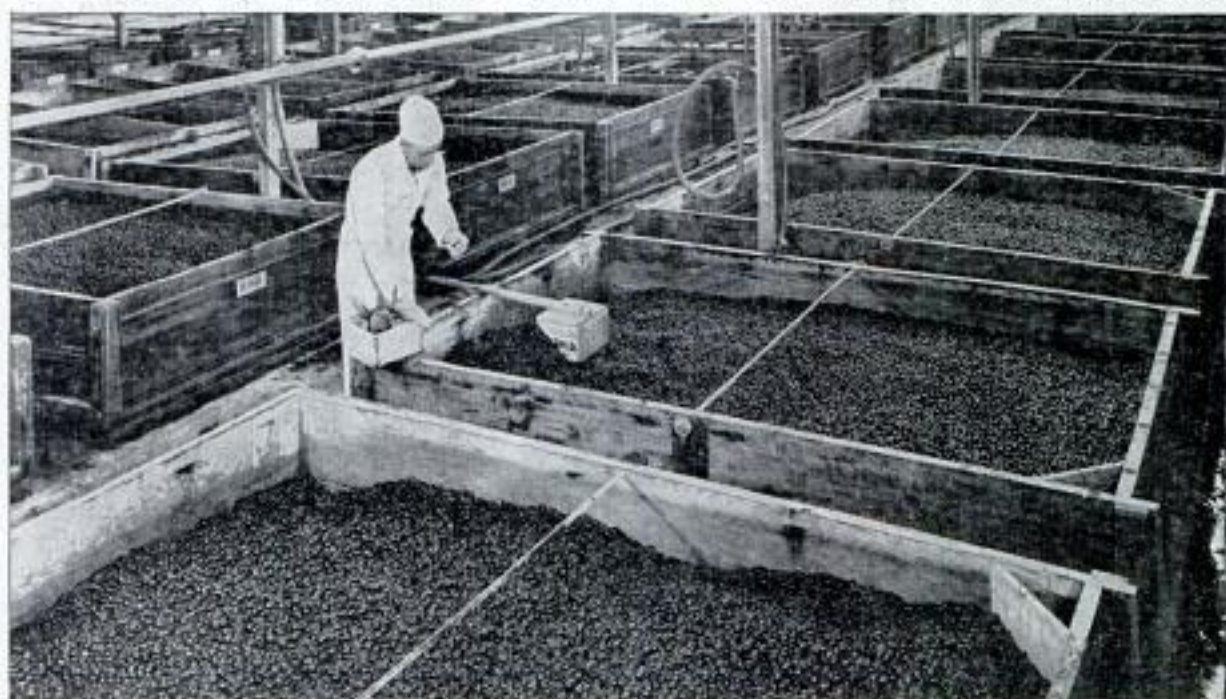
Olives arrive at the plant in lugs holding

35 to 40 pounds which are placed on a conveyor which automatically dumps the fruit into a deleafer. The olives roll onto the sorting belt where clusters are broken up and twigs and leaves removed.

Leaving the sorting table the olives pass through an automatic grader which separates them according to size. The smallest olives drop into mobile bins for transfer to the Spanish green-olive process. The remaining fruit moves through flumes to

(Continued to page 240)

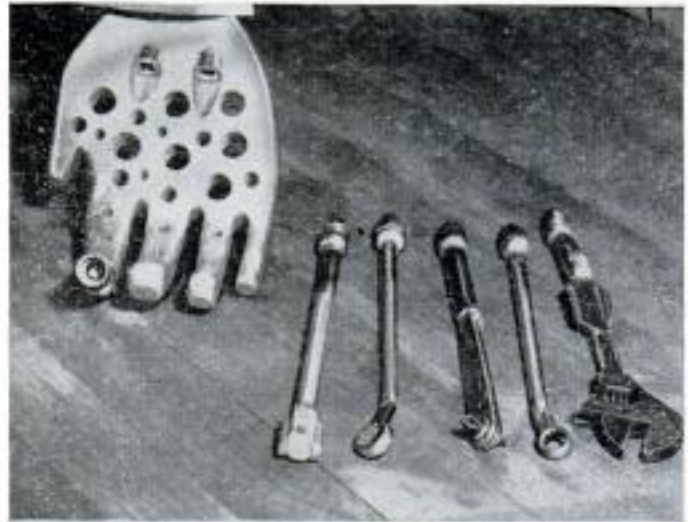
Ripe-olive processing vats expose fruit to air which oxidizes olives and turns them black in 24 hours



## Metal Hand for Holding Tools Restores Proficiency of Amputee



Inventor Roberts, right, looks on as Travis operates mechanical hand to tighten bolts



Perforations in the lightweight metal hand hold variety of tools adapted for the purpose. "Fingers" hold tools steady

S/Sgt. Herman Roberts, a machinist at Altus Air Force Base, Okla., is not the man to leave a fellow worker without proper tools. Learning about the handicap under which James H. Travis, a one-armed mechanic at the same base, worked, Roberts set out to ease the problem. He designed and turned out a metal hand with built-in sockets and fingers so

arranged that hand tools, such as wrenches and screwdrivers, could be grasped firmly. He then redesigned and built tools that best fit the artificial hand. Travis says that Roberts' invention aids him materially in his work. Now he can tighten nuts and bolts, a task that was formerly impossible for him. Roberts is working on a new hand lighter than the original 1½-pound model.



### Plate-Glass Lifter Relies on Suction

Workers installing a new plate-glass window on a Paris shop don't have to worry about dropping and breaking the huge sheet. An octopuslike tool takes over the job. Four big suction cups attached to metal arms hold the glass while a crane lifts it into place.

### Puffed-Wheat Wallboard

Puffed wheat compressed to about a quarter of its volume under heat and bonded with plastics forms a panel that rivals plywood and wallboard. Inventor of the new construction material is Washington, D. C., research scientist Stanley F. Reed, who says that it is light, strong, weatherproof and insulating, and could sell for 30 to 40 percent less than competing products. It contains chemicals which make it proof against rodents and termites and can be faced with metal, wood or plastics. Reed developed the panel to answer the wheat-surplus problem.



Movie criminal's photo pulled from files closely matches composite made under direction of witness



Witness tells operator which facial segments match those of criminal. This is a scene from new movie

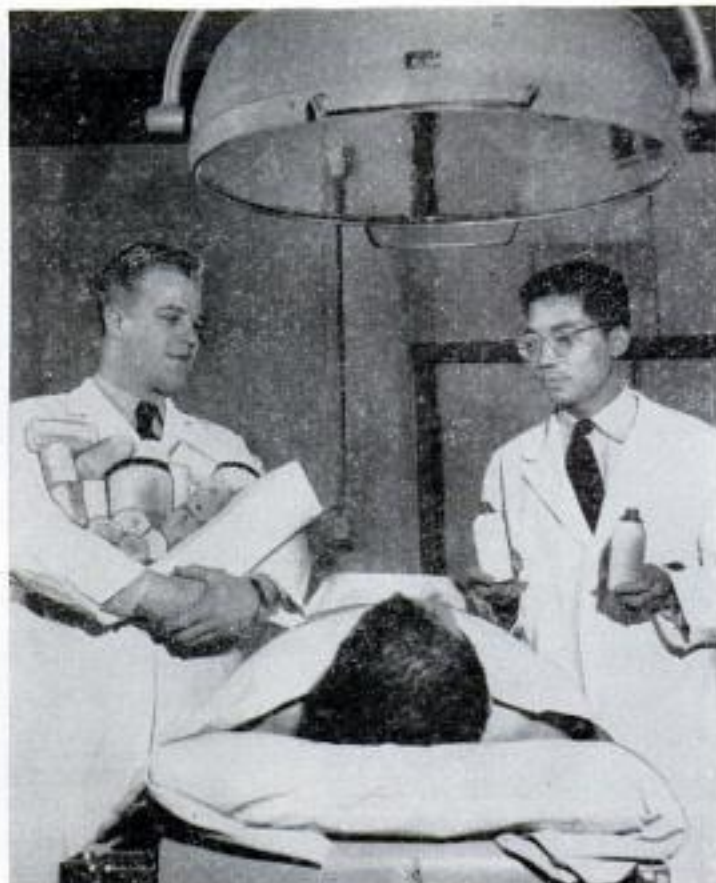
## Projector 'Draws' Face

WITNESSES OF A CRIME can describe the appearance of the criminal while a police detective makes up a picture of him with a new projecting instrument. The unit holds various slides with different-shaped noses, lips and other facial segments. A composite of different facial segments projected on the screen becomes a picture of the criminal. The police then check through their "mug" files to obtain photos of criminals that closely match the composite on the screen. Used by Los Angeles police, the unit has also caught the fancy of Hollywood script writers. It will be shown in use in a new movie, *The Steel Jungle*.





Bandage is sprayed on affected area. Right, old method of covering burns requires doctor and armload of bandages. For the same area, new method requires only two Aerosol bombs



## Spray-on Plastic Bandage Provides "Window" for Inspection

Aerosol bombs now have invaded the field of medical bandaging. A new type of bandage is sprayed on the wound. The bandaging material is a polyvinyl plastic which quickly solidifies to form a coating over the damaged tissue. The new dressing, particularly useful in bandaging burns, can be applied much faster than ordinary bandages, can be used by untrained personnel and is applicable to parts of the body where pressure bandages can't be used. It is transparent and therefore allows inspec-

tion of the damaged tissue without removal of the dressing, is flexible so it can be applied to joints, seals out bacteria and seals in body fluids. The dressing is of special interest to civil-defense authorities, as it requires little storage room and can be applied quickly by anyone. To bandage a 50-percent body burn by conventional methods requires a doctor, 2½ pounds of ointment and 120 yards of bandage. The same area can be bandaged by two medical corpsmen with four of the new bombs.



### Auto Burglar Alarm Set Off By Pressure on Front Seat

Would-be auto thieves are frightened away by a burglar alarm that is attached to the springs of a car's front seat. Any pressure on the seat turns on the auto horn, which continues to blast until the intruder has left. The device then resets itself for the next time. A control switch, clamped to the car dash, connects the detector to the horn. When the owner leaves his car, he sets the control switch to operate the alarm. The alarm fits all models and can be removed easily for quick installation in another car.

### Elevator "Phantom" Announces Floors

"Phantom" voices in push-button elevators designed for department-store use will announce the floors and the wares to be obtained there, ask shoppers to step to the rear and admonish those who block the doors. Hidden loudspeakers in each car will be connected to a tape play-back machine. The unit is recorded and synchronized with car movement.

## Roof-Mounted Auto Radio Has Many Features

IF YOU OWN a convertible, this is definitely not the radio for you. But, if you've been wanting to install a radio in a truck, for example, and don't have enough room on your dashboard, here's the answer to your problem. The radio isn't restricted to trucks, however, since its many features make it ideally suited for installation in most station wagons, passenger cars and cabin cruisers.

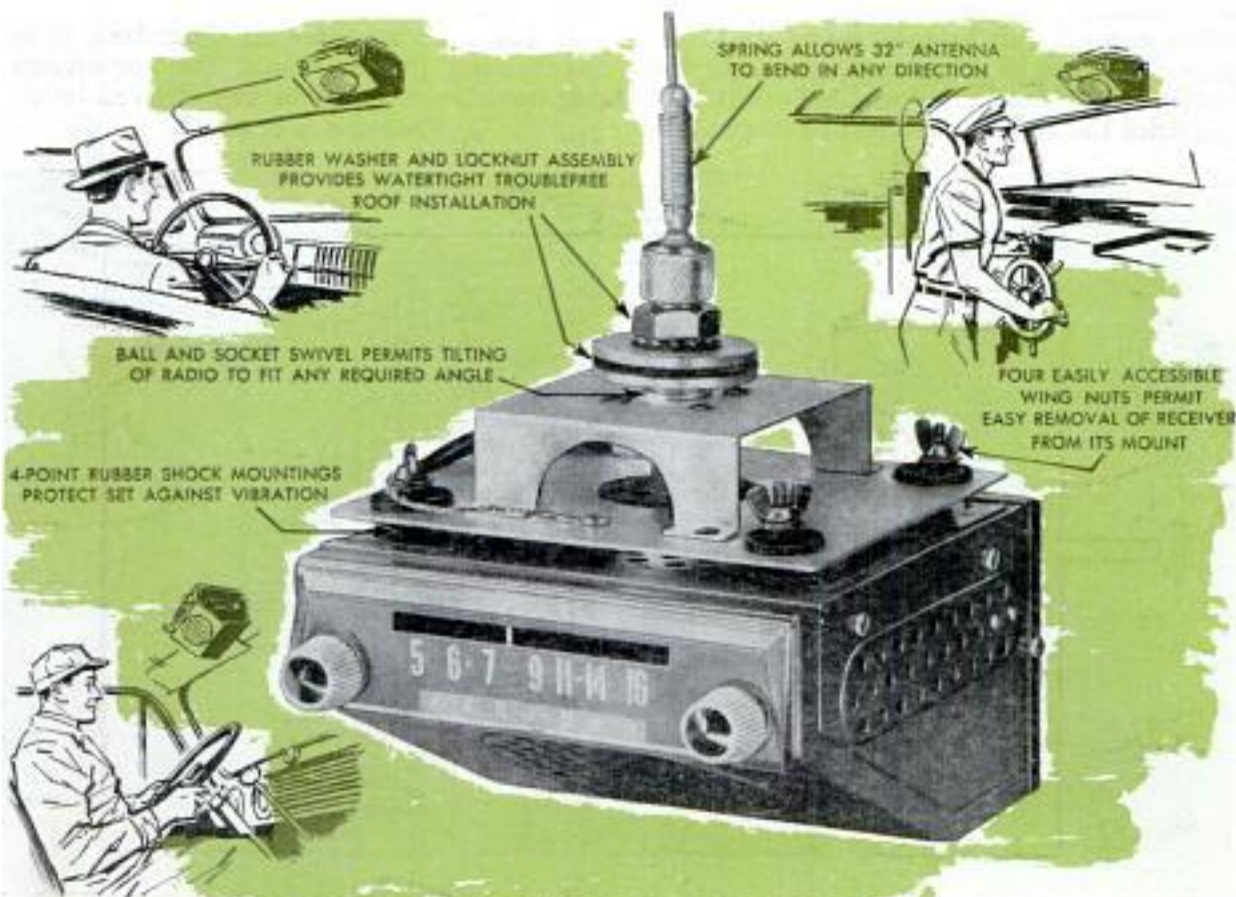
Anyone planning an automobile-radio installation is primarily interested in three things: Initial cost, performance and upkeep. In all three fields, this setup is claimed to be superior to conventional, dash-mounted jobs. Weighing less than 7 pounds, including antenna, the radio is available for both 6 and 12-volt operation for about \$55. It is easily installed by drilling a  $\frac{5}{8}$ -inch hole through the roof and connecting a single wire from the radio to the ignition switch.

Performancewise, the overhead, air-

plane-style mounting of this six-tube, slug-tuned radio is said to provide remarkable freedom from static, engine and road noises. The in-line position of the speaker permits more sound to reach the listener, so that the volume need not be turned up to the point of distortion, even when driving at a good clip. A fixed-length antenna, connected to the receiver by a 5-in. lead, permits proper matching of the antenna to the receiver under all conditions, thus increasing the set's sensitivity.

As to the upkeep, it is quite conceivable that the vibrationproof rubber shock mountings and the excellent ventilation will considerably increase the life of the various parts.

When service is required, you don't have to be a contortionist to get at the radio. Nor do you have to pay a serviceman to remove and reinstall it. Merely take off four easily accessible wing nuts, and the radio is ready for the service bench.



# ELECTRONIC SERVANT

## Works for Pennies a Week

By John R. Satter

**T**HIS VERSATILE electronic unit has numerous applications around the home, shop or office. It is a light-operated photoelectric switch which can automatically activate any electric device, such as lights, bells, chimes or motors with the coming of darkness or by interrupting a light beam.

This particular model, which was built by the author in one evening, has been turning the hall lights of a four-family house on and off much more efficiently than the owner possibly could—as proven by the reduced electric bills.

The parts for building the unit should cost about \$10.00, including any BX wiring to the fuse box if that type of installation is desired. They are available from stock at any large radio distributor or mail-order house.

The simplicity of the construction can be seen from the schematic diagram below, and from the simplified wiring diagram on the opposite page. Since the layout of parts is not at all critical, the unit can be built on any type of chassis. Even a wooden box is satisfactory. If desired, the entire unit, tubes and all, can be completely enclosed, provided some holes are drilled into the enclosure for ventilation and to permit light to strike the light-sensitive phototube.

The model is so designed that an external device is activated when the light striking the phototube is removed or dimmed. In the event of tube or parts failure within the switch, the controlled device will be activated until it is shut off manually.

The sensitivity of the unit is adjusted by means of the potentiometer R4. The setting of this control determines at what level of illumination the controlled device will be turned on. To test the operation of the photoelectric switch, after the wiring has been completed, the following procedure can be used.

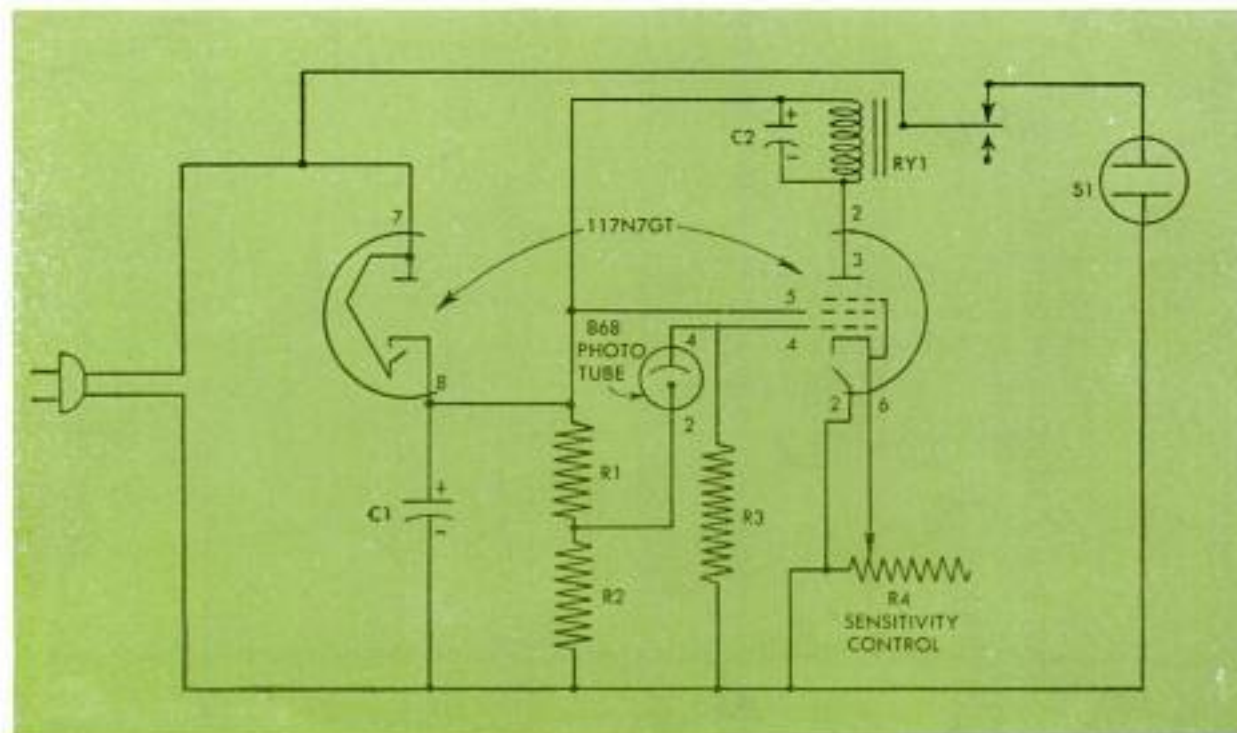
1. Rotate the sensitivity control to the approximate mid-point position and plug the line cord of a lamp into socket S1. Turn the lamp on and apply power to the photoelectric switch.

2. As soon as power is applied, the lamp should light and remain lit for about 30 seconds (long enough for the tube in the unit to warm up). Then it will go out.

3. Make the room as dark as possible and rotate the sensitivity control until the lamp is again lit.

If the unit operates as described, it is functioning properly and the sensitivity can now be adjusted to any desired level.

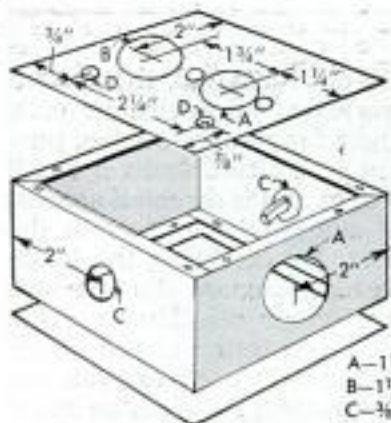
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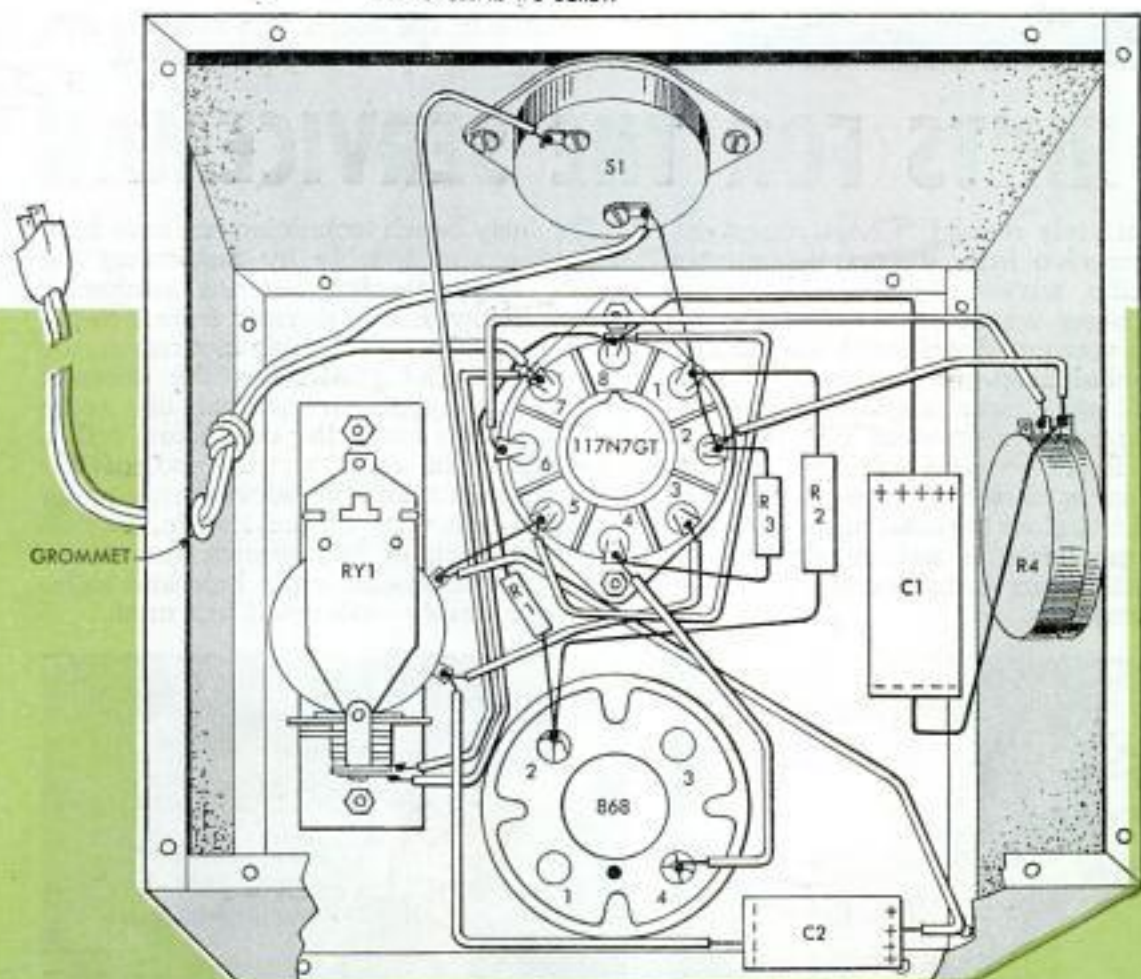
## LIST OF MATERIALS

R1, R2—1 megohm, 1 watt resistors  
 R3—4.7 megohm, 1 watt resistor  
 R4—5000-ohm control, Ohmite CU5021 or equivalent  
 C1—40 mfd. 150 v. elec.  
 C2—10 mfd. 50 v. elec.  
 RY1—5000-ohm plate-circuit relay, Potter Brumfield type LS5  
 S1—A.c. receptacle, Amphenol 61-F1  
 117N7GT Tube  
 868 Phototube  
 Metal case, 4 x 4 x 2 in., Bud CU-883  
 4-prong tube socket, Amphenol 78S4  
 Octal tube socket, Amphenol 88-8  
 Line cord and plug  
 Rubber grommet to fit  $\frac{3}{8}$ " hole  
 Assorted screws, nuts, hookup wire, solder (rosin core)



A—1 1/4" HOLE  
 B—1 1/4" HOLE  
 C—3/8" HOLE  
 D—TO CLEAR #6 SCREW

Above: Photo showing tubes, socket S1 and control R4. Left: Chassis layout with dimensions and hole sizes. Below: Diagram showing location of parts



# REMOTE CONTROL FOR TELEVISION



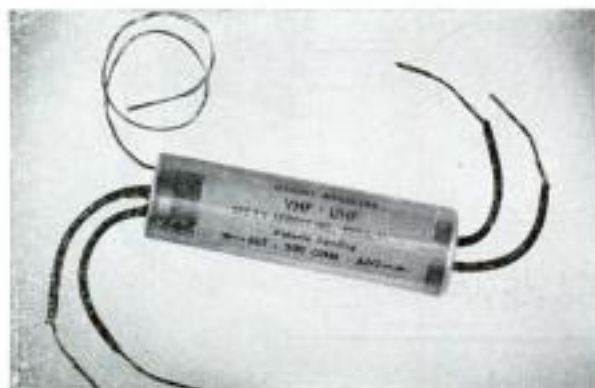
Provisions for remote control receive special emphasis in many new television receivers. At left, a control called Tun-O-Magic is used to turn the receiver on and off, and switch channels from a remote location. The device consists of a cylindrical control attached to a 20-foot cable. Channel switching is accomplished by pushing a button on top of the control. A switch on the side permits the receiver to be turned on or off. The device operates a rotary solenoid attached to the tuner of the set.



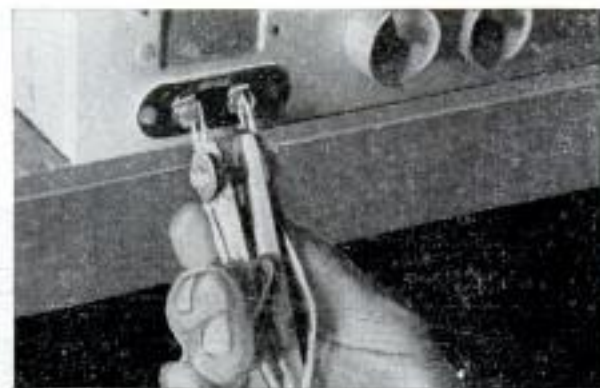
Somewhat less conventional, the system at left uses a series of photoelectric cells and a beam of light for remote-control purposes. The beam is emitted from a small pistol-shaped gadget and is directed against one of the four sensitive windows in the corners of the set. By directing the beam to the lower left hand corner, the operator can turn the set on or off. The two top windows control the rotation of the tuner, while the lower right is used to tune out commercials. The system requires no interconnecting wires and can be used from anywhere in the room. The receiver may also be manually operated, if desired.

# TV HINTS FOR THE SERVICEMAN

Appropriately named "Ghost Arrester," the inexpensive little gadget below may provide the answer to those annoying double images which are troubling many television viewers. Specifically designed to correct unbalanced-line conditions, the arrester will not eliminate ghosts due to improper antenna alignment or reflected signals. However, it is effective against double images caused by running the television lead-in close to metal pipes and steel building materials, as well as other conditions causing an unbalanced line. It is easily installed.



The busy bench technician can save himself time and trouble by fashioning the handy spring-tension antenna connector shown below. Easily devised from two paper clips and a spring-type clothespin, the connector quickly attaches the antenna lead-in to the antenna terminals of a radio or TV set. To make the connector, drill a small hole in each handle end of the clothespin. Attach a metal washer, a paper clip and one wire of the lead-in, in that order, to each of two screws. Insert one screw into each clothespin hole and tighten the assembly with small hex nuts.



the

POPULAR  
MECHANICS

## CRAFTSMAN

By Anthony Tubacki

A TYPEWRITER DESK →

A SEWING CABINET ↓



## Save Space With This FAMILY DESK

**O**PEN THE DOOR on one side of this attractive kneehole writing desk and out comes a sewing machine. Open the opposite door and out comes a typewriter. What could be more ideal for family use in a small home, especially an apartment, where every foot of space counts? There are the usual number of drawers for storage and the center kneehole drawer is fitted with dividers for thread, buttons and other sewing needs.

The original desk was made of birch and oak, the oak being used for parts which are not exposed. Veneer-faced hardwood plywood is used for the wide side and back pieces. The dimensions given on the two following pages are such as to accommodate any standard portable typewriter and electric sewing machine. If an upright-style typewriter is to be used, the length of the desk can be altered to suit. Basically, the

desk consists of two pedestals which, except for the sliding mechanisms, are made alike. The square members that form the posts are grooved as indicated, keeping in mind that right and left-hand members must be cut. Panels of 1/4-in. plywood fit the grooves in the posts. These need not be the full length of the posts, only long enough to assure that the mitered base members will overlap the lower edges. The side assemblies of each pedestal are joined together with three drawer frames which are installed before the mitered base members are added.

Each drawer frame is fitted with a plywood dust panel, and the two lower frames in each pedestal are fitted with a drawer runner to slide in a guide fastened to the underside of each drawer. The special hinges which are used to bring the inner face of the doors nearly flush with the







Both portable typewriter and sewing machine hang inside their respective compartments and to raise them to a working position, you first pull them out to engage the track on the door and then swing them up

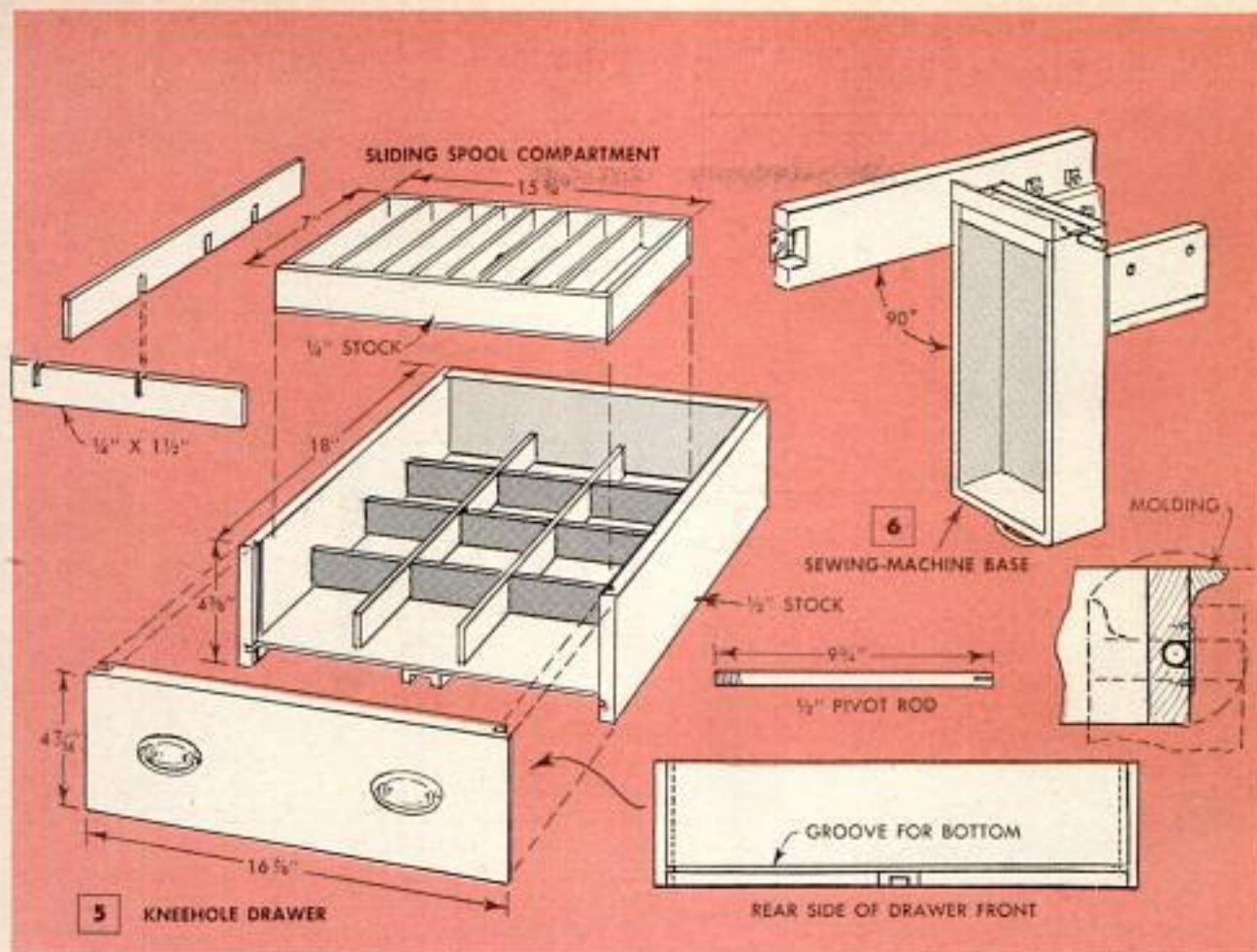
inner faces of the posts when the doors are open, are set in notches  $\frac{3}{16}$  in. wide and 1 in. deep. The detail to the right of Fig. 1 shows how the hinges are installed in the posts. The hinge notches can be formed by drilling a series of adjacent holes and cleaning out the waste with a sharp chisel. The hinges are simply surface-mounted on the doors. The base members, by the way, are added to the four sides of each pedestal and scroll-cut only across the front. The squared drawing will permit a full-size pattern to be made for the scroll.

The pedestals are joined together with two rails plus a drawer frame. The rails are shown below Fig. 4, rail B differing from rail A in that it is wider at the center to accommodate a  $\frac{1}{4}$ -in. groove for the back panel. The rails are notched as indicated to fit around the posts and are doweled and screwed to them, the rails being spaced 3 in. apart. The drawer frame is made like the others and is doweled to the posts at the front corners and further braced by two scroll-cut brackets. At the rear, the frame rests on the lower rail. Adding the plywood panel to the back of the center-drawer compartment and doweled the desk top to the posts completes the desk proper. The top, incidentally, is made of solid stock, edge-glued to the required width, and shaped around the four edges. An alternate method of forming the top is

to glue and nail a suitable stock molding to the edges of a panel of  $\frac{3}{4}$ -in. plywood, mitering the molding at the corners. The desk top is attached with short  $\frac{1}{4}$ -in. dowels, a dowel being placed in the top of each post.

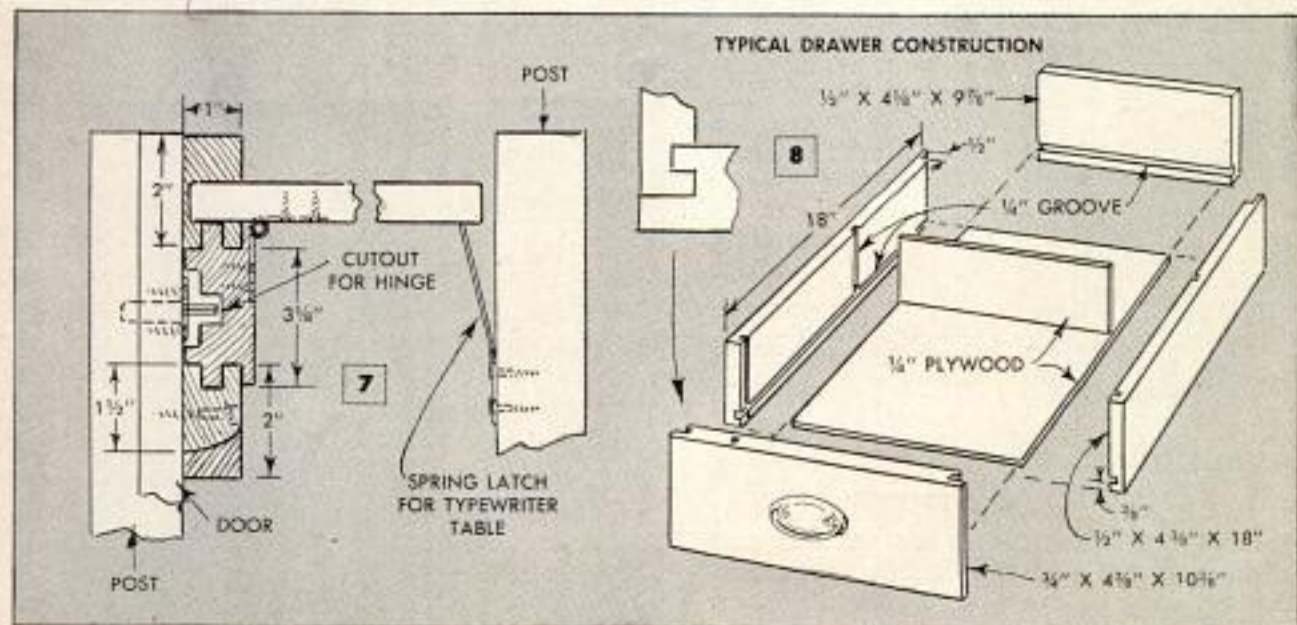
Figs. 2 and 7 detail the sliding mechanism for the typewriter shelf. As shown, two grooved pieces which are fastened permanently to the front and rear posts, provide a track for a third sliding member that carries the hinged typewriter shelf. The latter assembly slides forward on another grooved member which is mounted in line and screwed to the door. Note in Fig. 7 that the sliding member is grooved on the back side as shown to clear the hinge leaf. A short pin inserted in the groove of the track attached to the door will provide a stop for the slide. A spring latch attached to the facing post supports the typewriter shelf in a raised position. The typewriter is bolted securely to the shelf.

Figs. 3, 4 and 6 detail the sliding and pivoting mechanism for the sewing machine. In some respects it is similar to the slide for the typewriter in that it, too, slides out on a track attached to the door. The original wooden base of the machine is used and pivoted on a  $\frac{1}{2}$ -in. rod in such a way as to bring the top of it flush with the desk top when the machine is swung up. It is held in this position by a hinged support. Note the section of molding which is

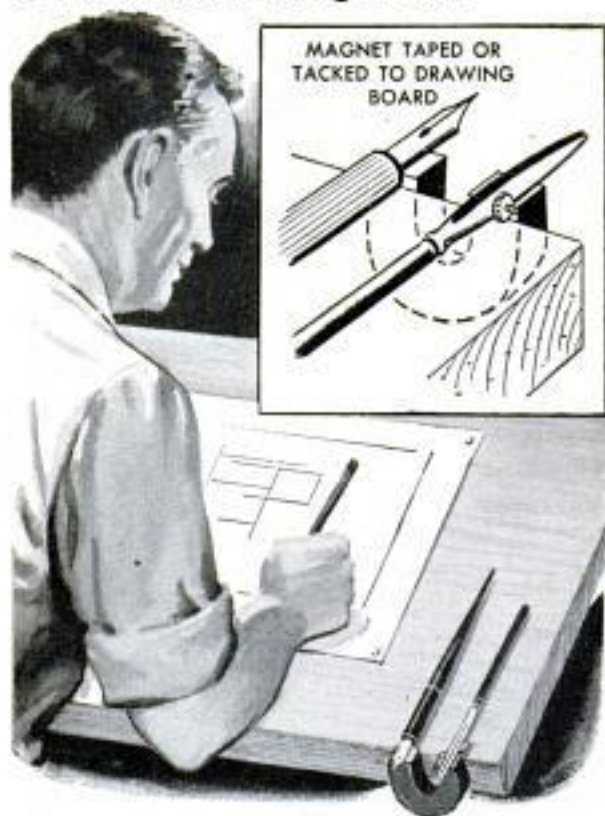


attached to the edge of the machine base and which is shaped to conform to the shaped edge of the desk top. A sliding-bolt gate latch attached to the free end of the support engages a hole in the post. A hole is provided in the bottom of the sewing-machine base for the cord which is run to a duplex receptacle mounted in the back of the desk. This in turn is wired to an

extension cord. This makes it handy to plug in a desk lamp, radio or other appliance. Fig. 8 shows how a drawer is put together. Two drawers are used in each pedestal. The doors are made to look like drawers by running saw cuts across the front to represent drawer rails and each dummy drawer is fitted with the same type pull as used on the other drawers. ★ ★ ★



## Magnet Holds Ruling Pens On Slanted Drawing Board



Ruling and lettering pens may be held on a slanted drawing board by using a small permanent magnet taped or tacked to the edge of the board. The magnet is located on the top or bottom edge of the board, depending on personal preference, so the steel penpoints contact it. Even wet pens can be placed on the board with no worry about them rolling off onto the floor.

Leonard W. Mitchell, Marion, Ky.

## Clear Chips From Blind Holes With Battery-Water Syringe



Instead of risking eye injury by blowing into a blind hole to clear it of drill chips, use a battery-water syringe. The long tube of the syringe will reach into awkward locations and to the bottoms of deep holes.

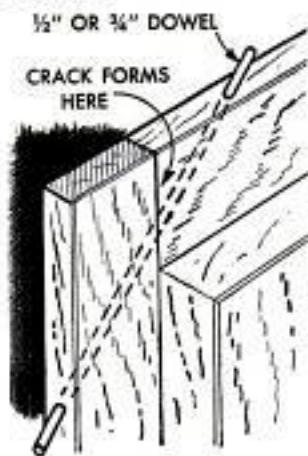
## Faucets and Drain at Opposite Ends Keep Bathtub Cleaner

When the bathtub was installed in our new home, we had the faucets placed at one end and the drain placed at the other. We find that the tub is now much easier

to clean, for when the clean water is let into the tub it forces the dirty water down the sloping tub bottom to the drain, instead of back into the tub, as is the case with the standard installation.—Stanley Clark, East Bradenton, Fla.

## Dowels Used in Door Corners Hold Stiles to Crossrails

When moisture causes the stiles and crossrails of a door to spread apart, a repair can be made by installing dowels diagonally through the door corners. Remove the door from its hinges, wipe the opened joints with glue and pull the stiles against the crossrails with bar clamps. Drill  $\frac{1}{2}$  or  $\frac{3}{4}$ -in. holes diagonally through the door corners and drive in dowels as shown. Wipe the dowels and inside of holes with glue before assembly. Cut the projecting ends of the dowels flush with the door edges and sand smooth. When the glue has set, rehang the door.



## Clip-Type Screwdriver Improvised

Next time you need to turn a screw in an awkward location, tie two paper clips to the end of a screwdriver blade with a rubber band as shown. The screwhead is slipped between the projecting loops of the clips and is held by tension of the rubber band. When the screw is turned tightly into the work, the screwdriver is pulled away from the screwhead.—Glen F. Stillwell, Manhattan Beach, Calif.





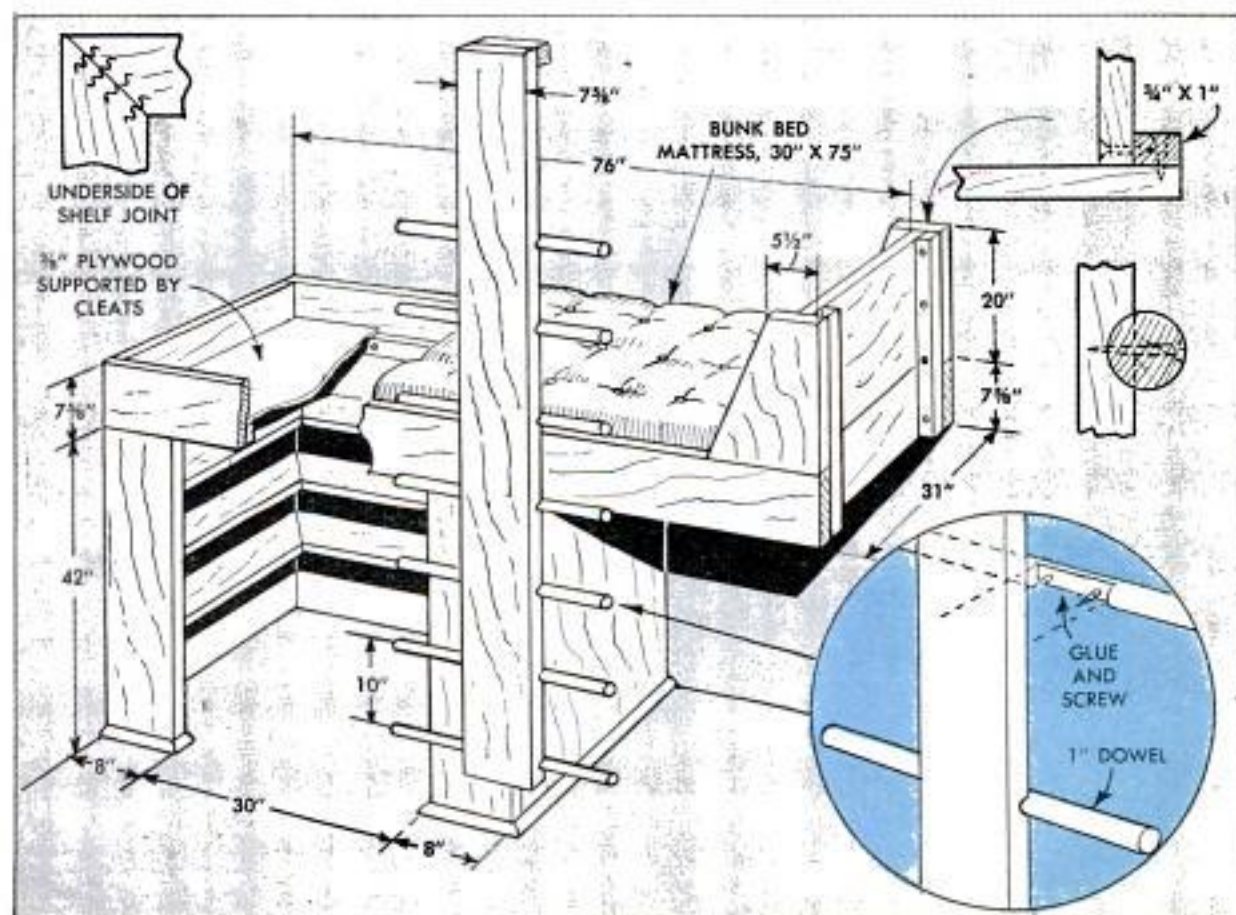
# MONKEY BUNK

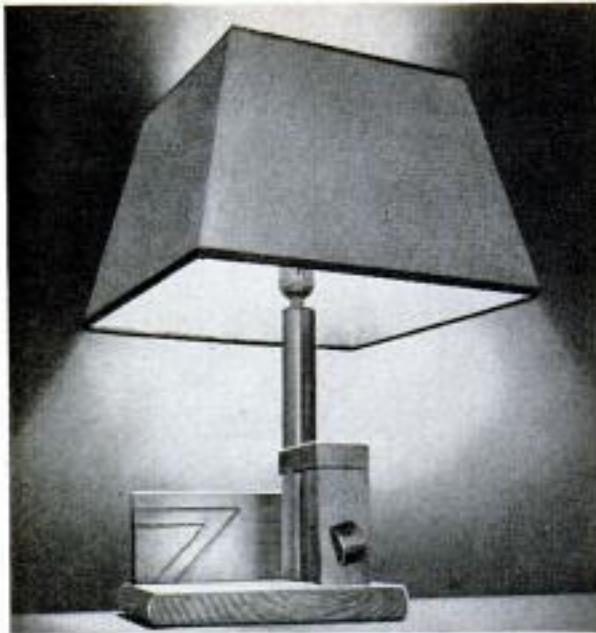
DIFFERENT and yet practical, this monkey bunk makes bedtime an adventure for your youngster. The bunk itself is built over a small toy closet that offers plenty of shelf space along its three walls. As dimensioned, the bunk will take a standard bunk-bed mattress, or it may be built larger for a twin-bed mattress. The uprights, shelves and bed rails are of 1-in. lumber with  $\frac{3}{8}$ -in. plywood being used to support the mattress and cover the outside wall of the closet. The ladder consists of a length of 1 x 8 with rungs of 1-in. dowel. Note how the dowels are notched to fit across the back of the 1 x 8 upright which is screwed to the bunk side and the ceiling.

Hi Sibley, Nuevo, Calif.



Dowel-rung ladder serves double duty in providing guard rail for bed. Note the bookcase that is built in at foot of bed





Unique lamp has a column formed by a single dowel. Modernistic base consists of several pieces of scrap wood sanded, stained as desired and then varnished

# DOWEL CRAFT

BY LUCIEN R. GREIF

*Although frequently overlooked or forgotten, the dowel is one of the most versatile pieces of preshaped hardwood available—ideal for home-shop projects*

**WOODEN DOWELS**, which generally are thought of as a means of strengthening a joint in woodworking, actually have hundreds of other applications. Shown on these two pages are a few of the many ways that dowels can be used as the main components of useful home-workshop projects.

The unusual lamp pictured at the top of the page requires only a single length of fairly large diameter dowel, plus a few pieces of scrap wood. A length of  $\frac{1}{4}$ -in. electrical pipe is fitted in a hole drilled through the dowel. The pipe is allowed to project at both ends. A lamp harp is screwed to the upper end, a locknut to the lower end.

Shown at the bottom of the page are two projects, a tie rack and a shoe rack, which consist simply of lengths of dowels and pieces of plywood.

In the illustration on the opposite page, dowels fitted in a bookcase are used to file phonograph records, five records fitting between each pair of vertical dowels. Another dowel screwed to the shelf prevents the records from rolling out.

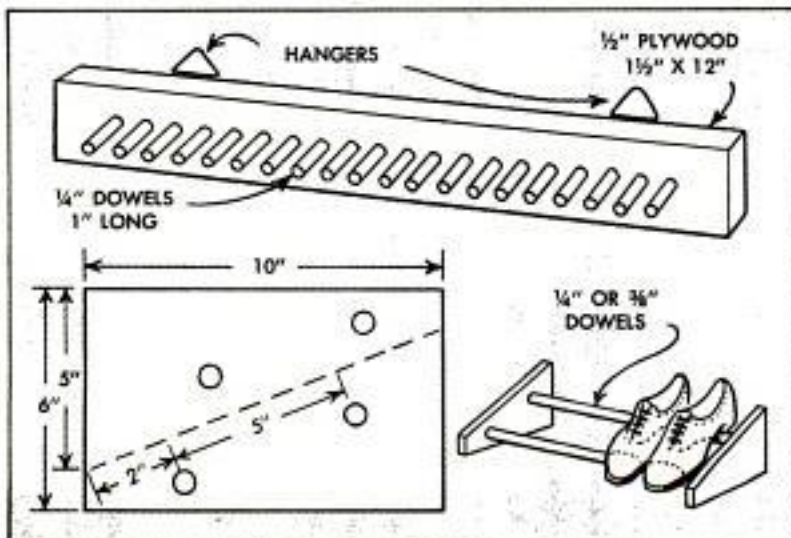
Fig. A at the bottom of the page shows a toy-storage wagon, in which dowels are utilized to cage-in large toys. The box at the end of the wagon is used for smaller toys.

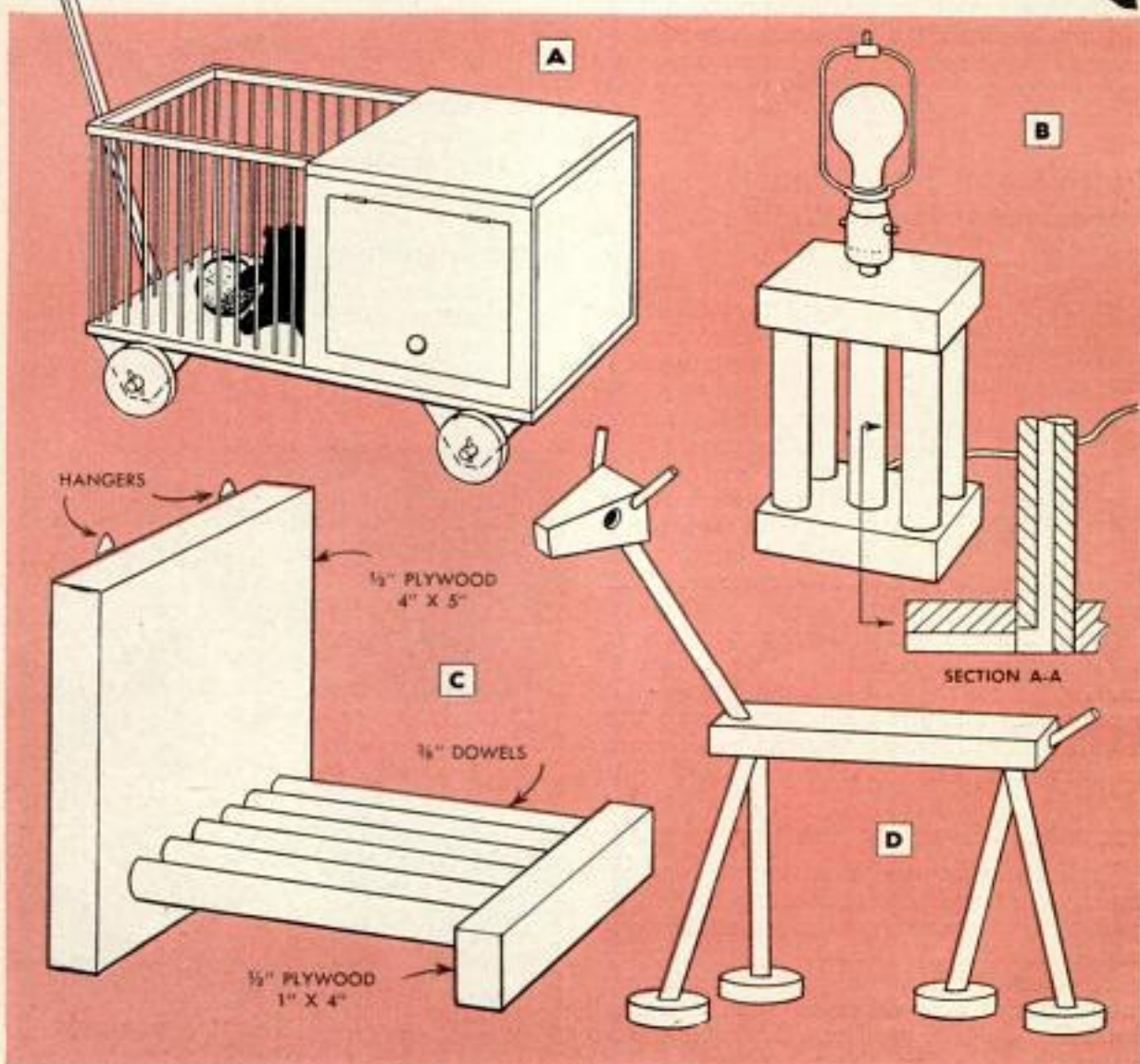
Another lamp made of dowels is detailed in Fig. B. Five dowels are set in blind holes in two squares of plywood, the center dowel being drilled to receive a length of electrical pipe. Section A-A shows how the lamp base is grooved to permit leading the lamp cord out the side.

The flowerpot or bric-a-brac shelf pictured in Fig. C is made by gluing the ends of six dowels in blind holes in a 4 x 5-in. piece of plywood and a 1 x 4-in. strip of plywood.

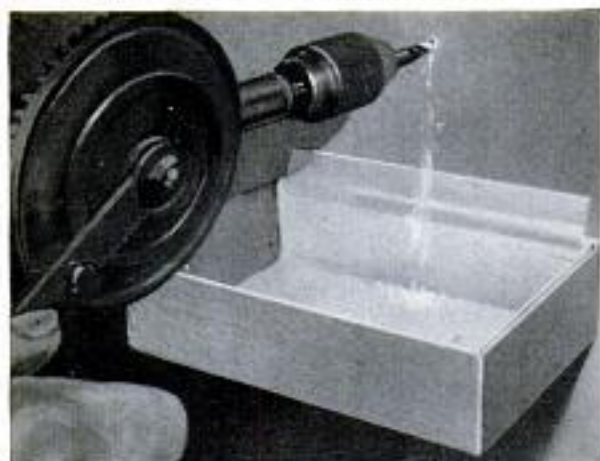
The "clothes horse" in Fig. D has a length of 2 x 4 for a body, a block of wood for a head and dowels for legs, ears and tail. The horse provides a convenient place for children to hang clothes when they are too busy to open a closet door. If made sturdy, the horse also might carry a young TV cowboy. ★ ★ ★

Tie rack can be designed to hold any number of ties by lengthening and adding more dowels. Dimensions of shoe rack also may be changed to accommodate additional pairs



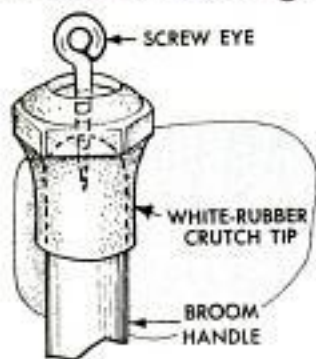


## Box Lid Provides Dust Catcher When Drilling Plastered Wall



There will be no need to clean up a floor and baseboard after drilling a hole in a plastered wall if a cardboard-box cover is taped to the wall beneath the work area to catch the plaster dust. Use masking tape to attach the cover. If the wall is papered, test a small spot to make sure the paper will not be damaged when the tape is removed. Use two or three thumbtacks in place of the tape, should the latter tear the wallpaper.

## Crutch Tip on Broom Handle Prevents Marring of Walls



Leaning a painted broom handle against a wall carelessly often leaves marks that are difficult to remove, especially from wallpaper. To avoid this, push a white-rubber crutch tip onto the end of the handle.

The crutch tip will not leave marks even though the broom may fall against the wall with some force. If a screw eye at the end of the handle is used for hanging the broom, remove it temporarily and drill a hole through the crutch tip so the screw eye can be inserted through it.

## Household Uses for Shellac

Shellac can be used in a number of ways around the home as an aid to easier house-cleaning and simpler maintenance. For example, coating the cover of a cookbook with clear shellac will permit removing finger marks and smudges with a damp cloth. Easy cleaning of paint or wallpaper around a light switch is assured if the

area adjacent to the switch is protected with clear shellac; the color of paint or wallpaper is not affected. If you want to apply new wallpaper over old, and there are any grease spots, coat them with shellac to prevent the grease "bleeding" through the new paper. Worn spots on a varnished floor can be matched to the rest of the floor by first applying one or two coats of orange shellac. After the shellac is dry, revarnish the entire floor. When the index tabs on a dictionary, Bible or other book become curled from use, straighten them out and coat with two coats of clear shellac to keep them flat and resistant to wear.

Blanche Campbell, Los Angeles, Calif.

## Pocket Sewed to Folding Cot Keeps Pillow in Place

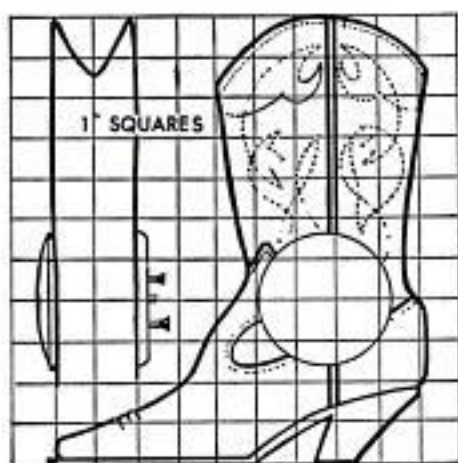
The problem of having a pillow slide off a folding cot can be eliminated by sewing a strip of cloth across the head of the cot as shown. Slipped into the pocket thus formed, the pillow will stay in place and remain clean.



## Syrup Dispenser Saves Solvent

When adding solvent to paint, use a glass syrup pitcher of the type shown. The glass lets you see exactly how much is in the container and the snap top lets you measure it to the drop.





## Carved Boot Is Case for Mantel Clock

An inexpensive electric clock is easily turned into a novel timepiece that will complement the rustic decor of a ranch-styled living room. Simply carve a "Western" boot from a wooden block 2 x 8½ x 11 in. and fit the clockworks into it.

The first step is to remove the clockworks from the case, keeping the face and crystal intact as a unit to retain the dust seal and permit easy transfer. Next outline the boot shape on the block of wood and cut it out on a bandsaw or jigsaw. Hardwoods are best and will take a finish to resemble polished leather. Then cut the opening in the block to take the works, using the diameter of the collar on the works

side of the clock's face flange as a guide.

Outline the sole by making a cut parallel with the bottom of the boot and carve out enough wood to make the sole project about ¼ in. Shape the heel with a wood rasp and the top of the boot with a drawknife.

"Stitching" can be applied with a clock gear run over the wood to leave impressions of the gear teeth.

When the boot case is finished, insert the clockworks and fasten the back plate. If the clock is to be used on a table, either attach a wooden base or weight it with lead. For a hanging position use three small wooden pins to keep the control knobs away from the wall.

## Metal "Spine" Guards Razor Blade Used as Hobby Knife

Although a single-edge razor blade is safer than a double-edge blade to use as a hobby knife, the cutting edge still presents a hazard when the blade is stored or carried. To eliminate this hazard, cover the edge with the "spine" taken from the back of another single-edge blade. Heat the

spine, which is a small metal channel, to a dull red so it expands and can be pulled off the blade. The spine will slip snugly over the cutting edge of a single-edge blade, yet can readily be removed when the blade is used. This will be found easier to use than the usual method of wrapping with tape.

# SHEATH SET for Knife and Hatchet

By Lee Woods

**H**ANDSOME IN APPEARANCE, yet rugged enough to be appreciated by an outdoorsman, the knife and hatchet sheaths shown on these pages have several advantages over the usual homemade types.

First, they can be worn separately, Figs. 3 and 6, or worn together as a set, Fig. 9. Worn as a set, either tool can be removed from its own sheath without removing or releasing the other one.

Second, rivets, which are used on the knife-edge side of many sheaths, are avoided because they dull the cutting edge of a tool when it is drawn past them.

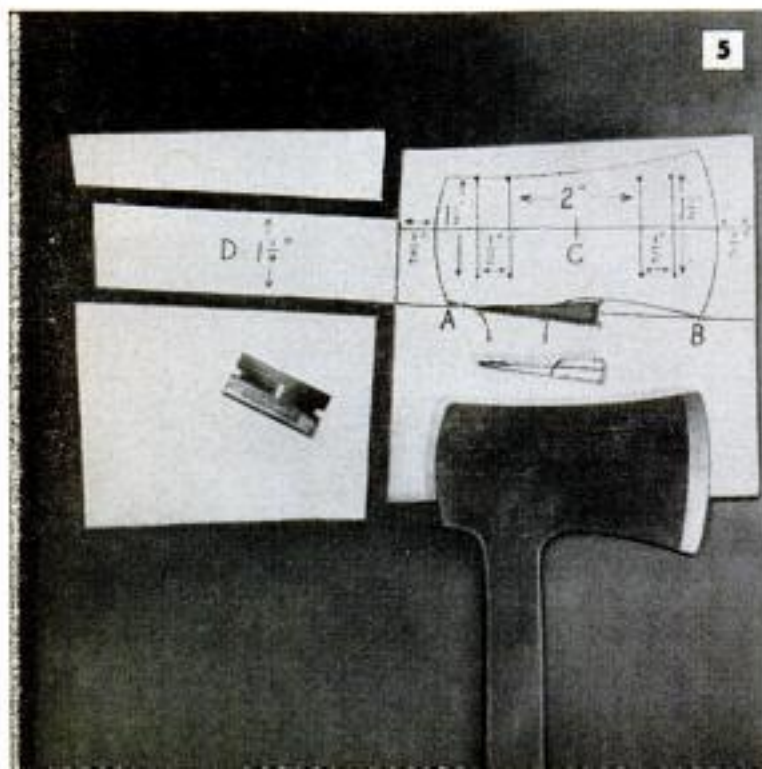
Third, because the sheaths are designed primarily for the outdoorsman, D-rings are used on the keeper straps instead of snap fasteners. The latter, although acceptable for general use, are too easily opened by heavy brush when the wearer is walking in a thickly wooded area. Once the keeper strap is released, the knife also can be pulled from its sheath by undergrowth.

Fig. 4 indicates another advantage of the design of the knife sheath. The keeper strap

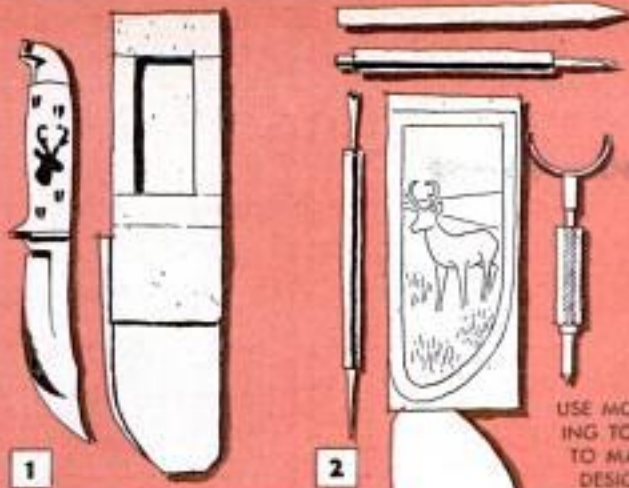


is located so that it "locks" the sheath on a belt loop. The sheath then cannot slide around to the front of the wearer's belt where it would be possible to force the point of the knife through the sheath and into the wearer's leg should he kneel suddenly.

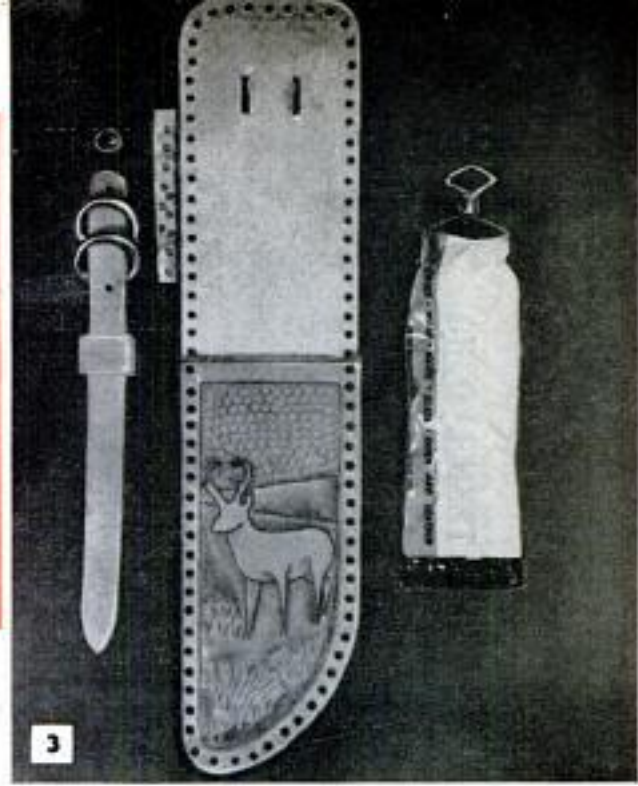
The sheaths are cut to fit individual knives or hatchets. Fig. 5 indicates the general method used in laying out the hatchet sheath. Tab D, which is almost the length of the sheath, is cut as part of the



MAKE SHEATH TO FIT INDIVIDUAL KNIFE



USE MODELING TOOLS TO MAKE DESIGN

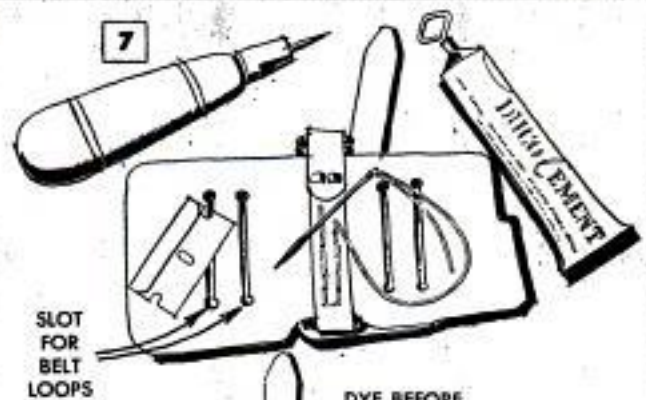
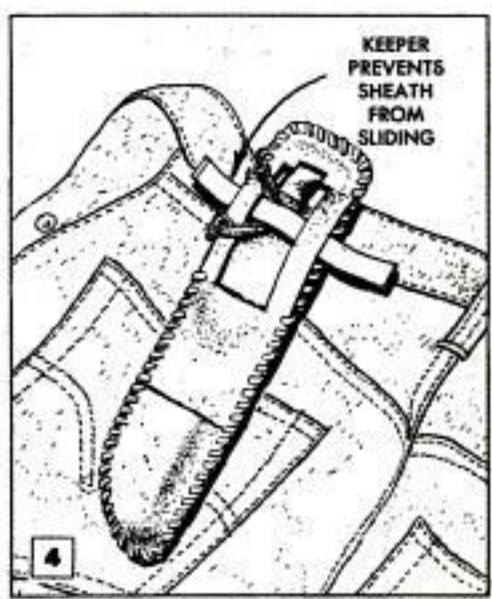


sheath. The finished product is shown in Fig. 6. Fig. 9 indicates how the tab is used to hold the knife sheath, the hatchet-sheath keeper strap being passed through the holes in the end of the tab to hold the knife sheath to the hatchet sheath.

The knife sheath is cut from a long strip of leather which then is folded and fitted with a reinforcing piece on the lower end as indicated in Fig. 1. Fig. 2 shows how a paper pattern is used to transfer a design to the leather when it is to be tooled. If the sheaths are not to be tooled, the only tools required to make them are a razor blade for cutting and trimming the leather, an awl—which can be a cut-down ice pick—and a heavy needle and thread. The cord used to lace the edges of the sheaths is a plastic type available at hobby shops that carry leathercraft supplies. Before sewing or lacing the sheaths, cement the parts together, Fig. 7, so they cannot become misaligned.

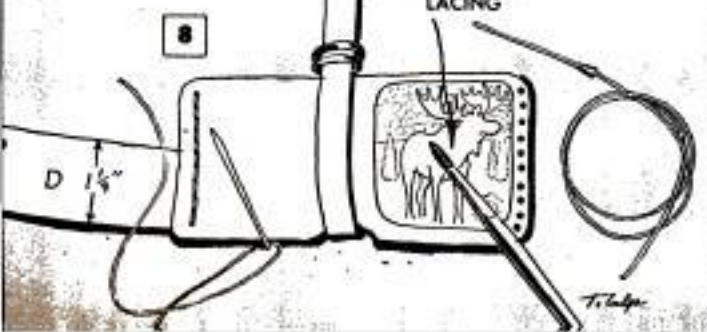
If a design is to be worked into the leather, modeling tools also would be required. Any painting or dyeing should be done before lacing the sheaths, Fig. 8. In the examples shown, the sheaths were decorated to complement the plastic handles of the knife and hatchet. ★ ★ ★

KEEPER PREVENTS SHEATH FROM SLIDING



SLOT FOR BELT LOOPS

DYE BEFORE LACING

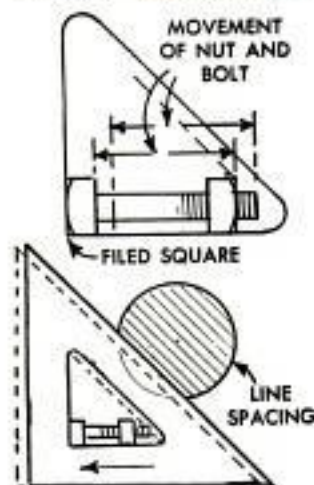


## Card-Table Movie Screen



An ordinary folding card table can be set up quickly to provide a movie screen when a regular screen is not at hand. Open two of the legs and set the table top in a vertical position on another table so the legs act as horizontal braces. If the card-table top is dark colored, cover it with a bed sheet or a piece of white paper.

## Nut and Bolt in Triangle Cutout Locate Equidistant Lines



A small nut and bolt inside a drawing-triangle cutout will permit accurate spacing of parallel lines. First, the rounded corner of the cutout, adjacent to the right angle of the triangle, is filed square. The nut then is adjusted on the bolt to determine the line spacing. Triangle and bolt are now moved alternately in one direction. Lines ruled at the triangle edge will be equidistant. Although a hex-head nut and bolt can be used, a square-headed bolt and nut can be handled more easily.

## Wren Houses Require No Perches

Disappointed when wrens refused to occupy houses he had built for them, one homeowner investigated and learned that his mistake was installing perches at the entrance of each house. Wrens land directly in the entrances of their homes and re-

quire no perches. However, sparrows and other birds use the perches to attack and harass the wrens. The smaller birds thus have learned to avoid houses fitted with perches.

## Soldering Iron Heated Quickly With Insulation Around Tip

An electric soldering iron can be brought to working temperature more quickly if it is insulated during the warm-up period. Simply force the tip into a can filled with loose insulation. After the iron is at operating temperature, remove it from the insulation.



## Purse-Sized Mucilage Container Is Empty Nail-Polish Bottle

If you have need for a small, leakproof container of mucilage for emergency re-sealing of envelopes and packages, utilize an empty nail-polish bottle. Clean the bottle and its brush with nail-polish remover or lacquer thinner and fill with mucilage. The brush in the bottle cap can be used as an applicator.

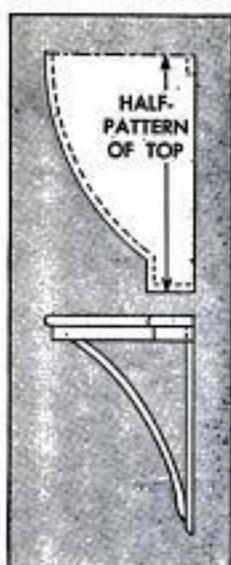


Keep a pair of cotton gloves near the freezer, to wear when handling and rearranging the frozen-food packages so that your hands won't become chilled.



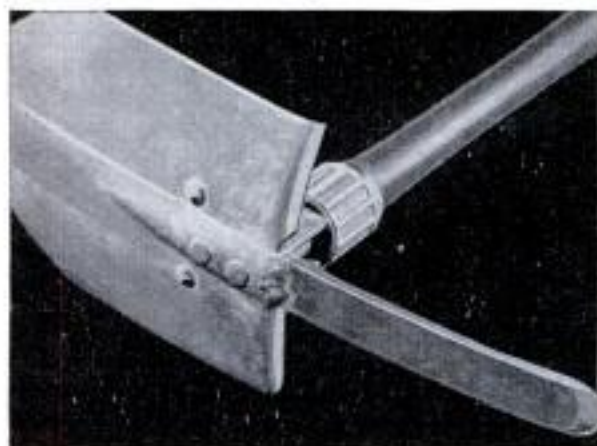
## Shelf Built With Hand Tools Appears to Have Machined Edge

Only hand tools are required to make this attractive entrance-hall shelf that appears to have a machine-molded edge. Dimensions of the shelf can be varied to suit a particular location; the original shelf measured 8 in. long and 5 in. wide. The top of the shelf is made from two pieces glued together, the lower piece being about  $\frac{3}{8}$  in. smaller than the top. Round the edge of the top piece and leave the edge of the lower piece square to provide a molded-edge effect on the finished shelf. The shelf brace consists of two pieces, a straight length that fits flat against a wall and a curved piece that supports the shelf. The



latter is jigsawed from a single piece of wood. — Bertram Brownold, Cedarhurst, N. Y.

## Modified War-Surplus Entrenching Tool Provides Pick and Shovel



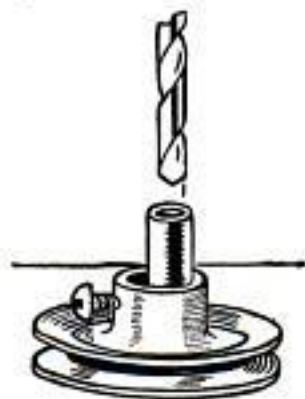
A war-surplus entrenching tool of the type shown can be modified for use as a handy camping tool or to carry in the trunk of an automobile for digging out of snow or mud. For use in hard-packed soil, a pick is added to the entrenching tool by welding and riveting a length of auto-spring leaf to project from the heel of the shovel as shown in the upper photo. When the tool is used as a shovel, the pick is folded flat

alongside the handle. Replacing the pivot pin of the tool with a nut and bolt permits quick removal of the pick-shovel so the handle can be fitted on a hatchet head as shown in the lower photo. The hatchet head is drilled to receive the bolt.

J. A. Anderson, Norfolk, Va.

## Steel Pulley Used as Holder For Drilling Bushings

When a drill-press vise is not available and small bushings must be drilled or reamed accurately, a steel pulley can be used to hold them vertically on a drill-press table. The bushing is slipped into the pulley hub and prevented from turning or twisting by tightening the setscrew against it. The pulley is large enough to permit the operator to hold it firmly during the drilling.



Worn or faded spots on automobile bodies and fenders can be touched up without leaving ridges if the paint is applied with a small brush and then the outer edge feathered by means of a circular motion with the thumb.



**1. RUBBER FORCE CUP** of the type ordinarily used in cleaning sink drains usually will open a stuck drawer when everything else fails, especially narrow drawers with only one pull. If latter has loosened or is damaged, then force cup is the only safe means of opening drawer without damage

**2. SNAP FASTENERS** often pull loose in light fabrics after only a short period of use. This tendency can be prevented by coating the area around the fastener with fingernail polish which is a clear lacquer that will not discolor light fabrics. Apply sufficient polish to saturate the fabric

**3. OLIVE OIL** is safest and most durable finish for salad bowls, breadboards and cutting boards used in the kitchen when preparing foods. Apply oil with a soft cloth and allow utensil to stand over night. Wipe off the excess oil and polish with a dry cloth. Renew finish periodically

**4. CELLULOSE TAPE** placed across a plug base or a cube tap as illustrated prevents the base or tap from turning out of socket when bulb is unscrewed. Only one strip of tape is pictured but it may be advisable to use two or more strips should the bulb be unusually difficult to remove

**5. SHELLAC** can be used effectively to stainproof nailheads used in fastening various types of wallboards over which wallpaper is applied. Shellac prevents rusting of the nailheads, which is the cause of the discoloration. Apply not only to the nailhead but also to the adjacent area



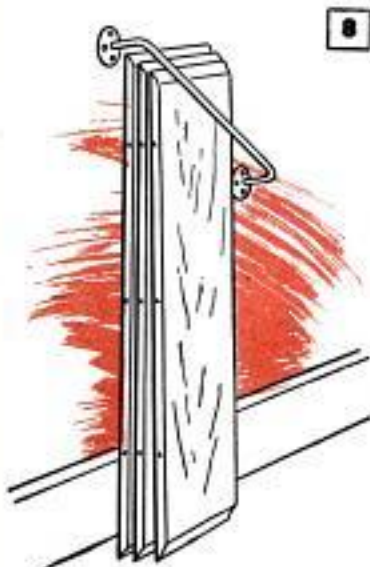
**6. LAMPS** on small occasional tables cannot be easily upset by children if the lamp cord is attached to the table rail in the manner pictured. Turn a screw eye into back face of rail, or into table top, then tie the cord to it with a shoelace. Knot should be fairly tight so cord cannot slip



**7. ALARM CLOCKS** of the spring-driven type often tick annoyingly loud when placed on a dresser or night stand. Silence the tick by placing the clock on a sound-dampening pad cut from  $\frac{3}{8}$  or  $\frac{1}{2}$ -in.-thick sponge rubber. Pad should be cut slightly larger than over-all size of clock base to prevent tipping

**8. TOWEL BAR** makes a good, safe rack for storing those extra table leaves in a closet or other out-of-the-way location. Stand one leaf on end against the wall and mark its height. Then screw the towel bar to the wall at an angle, the high end just above the mark. This permits the leaves to be placed under the bar from the side

**9. LOCK WASHER** holds knob of a pot cover securely in place simply by preventing the screw from loosening, which nearly always happens sooner or later due to handling. Place washer under knob rather than under head of screw. Then turn knob down tightly. Use lock washer of a size that fits screw



## Box of Baking Soda Under Car Hood Provides Fire Extinguisher



A box of household baking soda kept in a holder under the hood of your car will provide a fire extinguisher that is effective against gasoline and oil fires. Make a sheet-metal holder for the box and fasten it to the side of the engine compartment with sheet-metal screws. Wrap the box with aluminum foil to prevent moisture from caking the soda. To fight a fire, the soda is sprinkled on the flames. The soda generates carbon-dioxide gas which smothers the fire.

## Plastic Bottle Used as Bellows



An empty plastic "squeeze" bottle can be used as a handy bellows for blowing dust and chips out of blind holes and other awkward locations. To remove any residue of the original contents, rinse the bottle with water or solvent. Permit it to dry thoroughly so that the air ejected will be free of moisture. When using a bellows of any type, make sure the eyes are protected against flying particles.

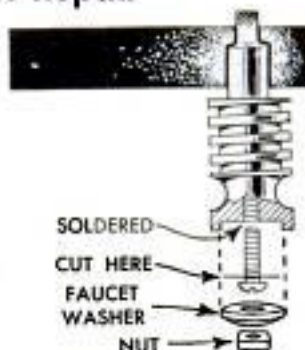
## Spark From Discarded Lighter Ignites Propane Equipment

Cigarette lighters that do not work well enough to perform their original function, but still produce a strong spark, can be used in a number of ways to eliminate the

need for matches. Propane torches, lamps and stoves can be ignited by holding the lighter at the edge of the gas stream and striking a spark into the stream. Use no fluid in the lighter. The best lighter for this kind of use is the windproof type.

## Emergency Faucet Repair

When the screw that holds a faucet washer was found to be completely corroded away, the faucet was repaired in the following manner: The screw hole had corroded over-size so it could not be tapped for a

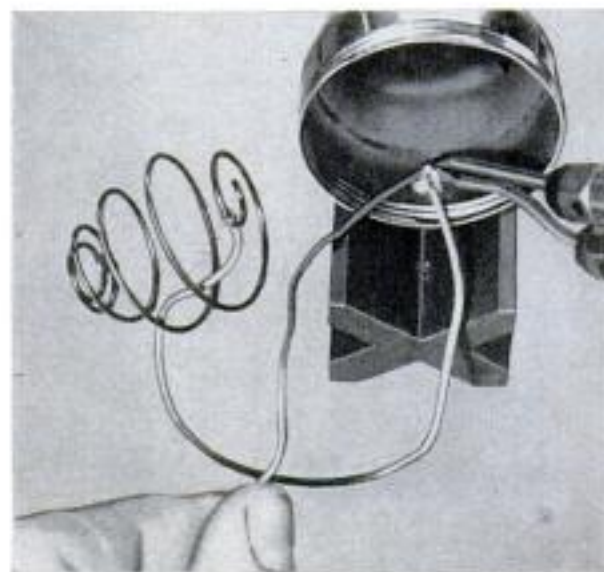


larger-size screw. Instead, a brass machine screw was soft-soldered in the hole, cut off and fitted with a brass nut to hold the faucet washer. It might be necessary to cut off the corners of the nut to provide clearance for the washer seat.

C. L. Sample, N. Augusta, S. C.

## Curing Flashlight Flicker

If a flashlight flickers because of a poor ground connection between the case spring and the case, the problem can be corrected easily. Pull the spring out of the case and solder a length of light, flexible wire to it. Cut the wire slightly longer than the length of the flashlight case and solder the free end of the wire to a point just below the threads on the inside of the flashlight case. Keep it clear of the switch. Push the spring back down inside the case and a direct ground connection between dry cells and flashlight case is assured.—Elbert Robberston, Port Washington, N. Y.



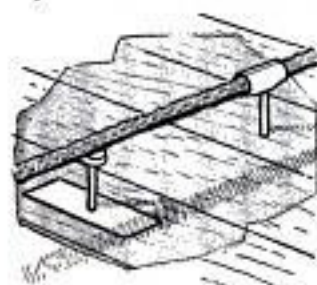
## Spring-Loaded Turn Button Needs No Tightening



A compression spring fitted on a screw that holds a turn button will eliminate the need for loosening and tightening the screw when removing or installing storm windows and screens that

might vary in fit and thickness. The spring permits the turn button to be rotated, but keeps it under constant pressure. When the spring and two washers are installed as shown, a longer screw is required than with the turn button alone.

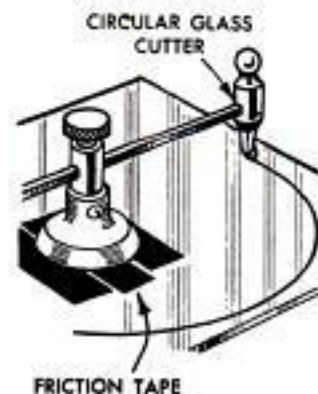
## Concrete-Reinforcing Rods Held By Sheet-Metal Strips on Nails



An easy way of supporting concrete-reinforcing rods at the right height above horizontal wooden forms is to use nails and sheet metal strips about 3 in. long. The nails are driven through

the strips and into the form to project the desired height. Then the rods are placed on the heads of the nails and the metal strips lifted up and wrapped around them. To keep the rods at a uniform height above the form, use a block of wood as a gauge when driving the nails.

## Friction Tape Secures Circular Glass Cutter



When scoring glass with a circular glass cutter that is not provided with a nonslip centerpiece, a slight movement of the latter may ruin the work. Such movement can be avoided by simply sticking two or three short lengths of friction

tape to the glass. Space the strips apart to provide a flat surface. Adhesive tape, while not as good for the purpose as friction tape, will help in keeping the centerpiece from slipping.



## Offset in Plaster-Base Panels Reduces Chances of Cracking

Eliminating the unbroken line between rows of Rocklath will considerably reduce the chances of plaster cracking in the middle of a long-span ceiling. An offset is cut in the ends of a number of panels, as shown in the illustration, to produce a staggered line lengthwise of the panels. The panel ends are offset in the usual manner, adjacent rows being nailed to alternate joists.

Michael Ligocki, Gary, Indiana.

## Plastic Spray Bottle Applies Water to Plaster Patch

An ideal method of applying water when patching plaster is to use a plastic squeeze bottle fitted with a spray nozzle. The spray will thoroughly saturate the edges of the old plaster so it will not absorb water from the patch. The latter condition results in the patch not bonding satisfactorily with old plaster surrounding it.



# PATTERNCRAFT



# CHRISTMAS LAWN CUTOUTS

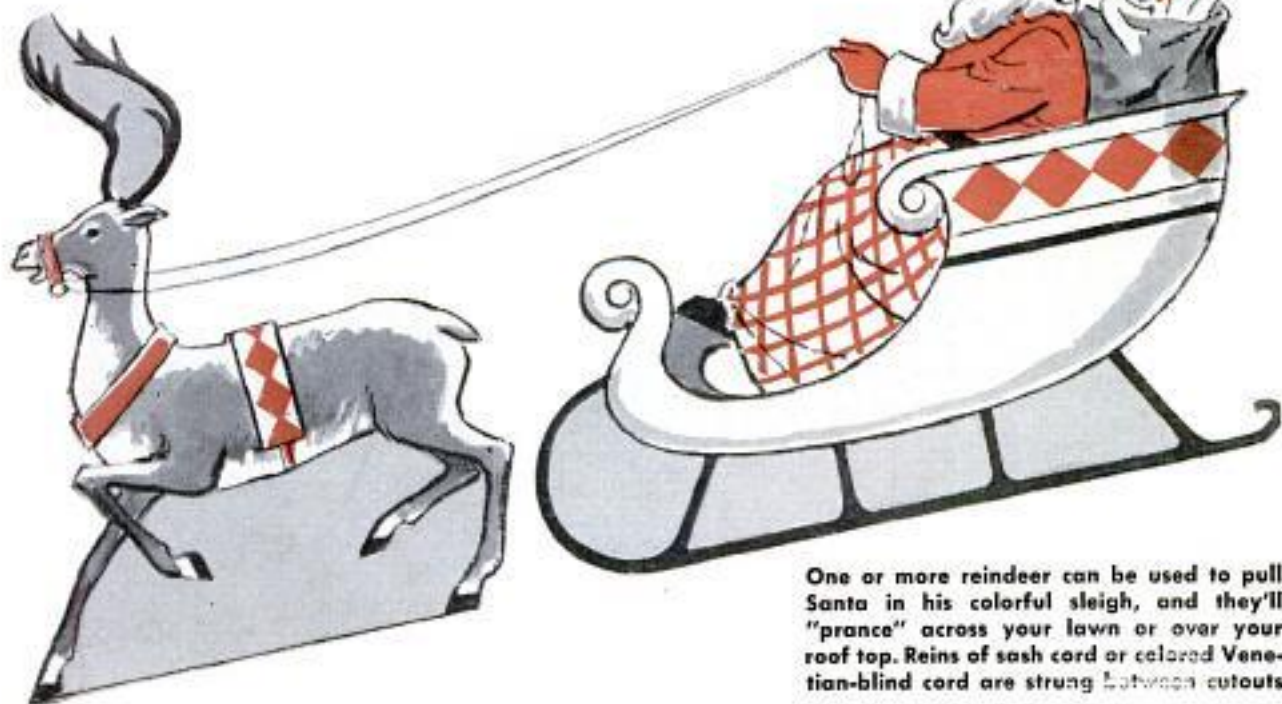
Outdoor Christmas decorations are many and varied, but there is nothing like a jolly old Santa to give a cheerful greeting to passersby. It's easy to cut this smiling fellow from 1/4-in. plywood or hardboard by following the squared pattern on the opposite page. If you use plywood, be sure that it is exterior grade. After the pattern has been cut out, give front, back and edges a priming coat of paint. Then, again using the pattern, draw in the features and clothing details. Finish by applying flat paint or enamel in the desired colors. A simple wooden prop fastened to the back of the cut-out is all that is needed to keep Santa standing in the front lawn



## FULL-SIZE PATTERNS

You will save time and do a better job if you trace the Santa, or the sleigh and reindeer shown below, from a full-size pattern. Either or both of these attractive patterns can be obtained from Patterncraft, Popular Mechanics Press, 200 E. Ontario St., Chicago 11. For the Santa, Plan No. 121, send 50 cents. The price of the sleigh and reindeer patterns, Plan No. 122, is \$1.00. Be sure to mention the plan number when placing your order

Santa's bright colors stand out during day, can be lighted at night



One or more reindeer can be used to pull Santa in his colorful sleigh, and they'll "prance" across your lawn or over your roof top. Reins of sash cord or colored Venetian-blind cord are strung between cutouts



### Metal Typewriter-Eraser Shield Catches Particles in Trough

A typewriter will stay in good condition longer if eraser particles are caught in a trough bent on the edge of an eraser shield as indicated, instead of being allowed to fall into the typewriter. The shield is cut from thin, rustproof metal. Before the trough is bent on the shield, holes are drilled in the latter and filed square or rectangular as required. The sides of the holes then are filed to a taper so erasures can be made to the very edges of the holes.

### Small-Parts Tray Bandsawed From Wooden Block



A tray for brads, nails, screws and other small parts can be bandsawed from a length of 2 x 4 as shown in the detail. This provides round-bottom compartments for easy removal of the contents. Nailing two strips of plywood across the open ends of the compartments completes the job. For a more finished look, strips can be nailed to all four sides.

### Cutting and Polishing Marble With Home-Workshop Tools

Having an old marble table top to be reduced in size for use on a small table, one home craftsman did the job with a 7-in.

abrasive cutoff wheel on a table saw. In order to maneuver the marble, which was  $\frac{7}{8}$  x 21 x 52 in., an auxiliary table of  $\frac{3}{4}$ -in. plywood was placed over the saw table. Short pieces of  $\frac{1}{4}$ -in. dowel served as rollers to facilitate feeding the marble into the cutoff wheel. A tin can having a small nail hole near the lower end lubricated the wheel when placed on the slab to direct water at the point of contact between the wheel and the marble. Polishing the marble was done with a disk sander, starting with No. 24 grit abrasive, then using No. 60 and finally No. 100. Final polishing was done with jeweler's rouge and water applied with a piece of felt. The marble finish was protected with a coat of white shellac, cut with equal parts of alcohol. A final high luster was given to the dry shellac by cleaning it with fine steel wool and applying a coat of paste wax.

E. M. Hawes, Marietta, Ohio.

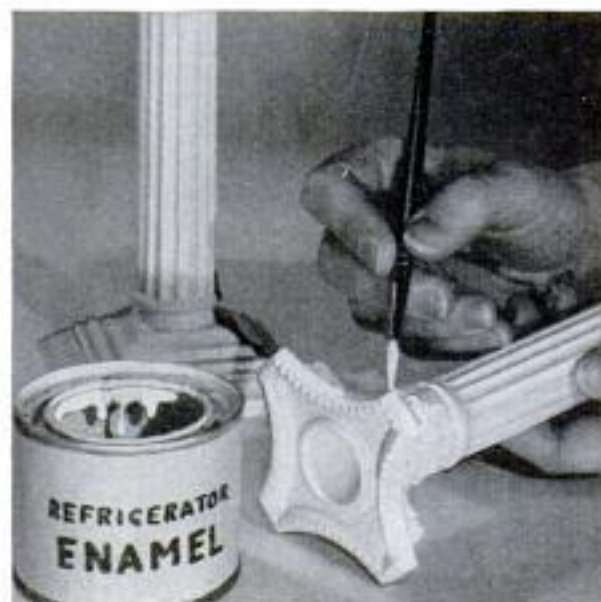
### Solder Carried on Film Spool

Carrying a full roll of wire solder in a toolbox often is inconvenient and unnecessary. Simply unroll enough for a job and wind it on an empty film spool.



### Enamel Refinishes Old Silver Plate

If you have some old candlesticks, or other silver-plated objects that are too badly worn to be polished again, give them a new and attractive appearance by painting them with refrigerator enamel. The hard bright gloss looks much like a porcelain finish and is easy to keep clean.







Refrigerator door will be easier to close if the latch is rubbed lightly with a grease stick. Other latches and sash locks in house respond equally well

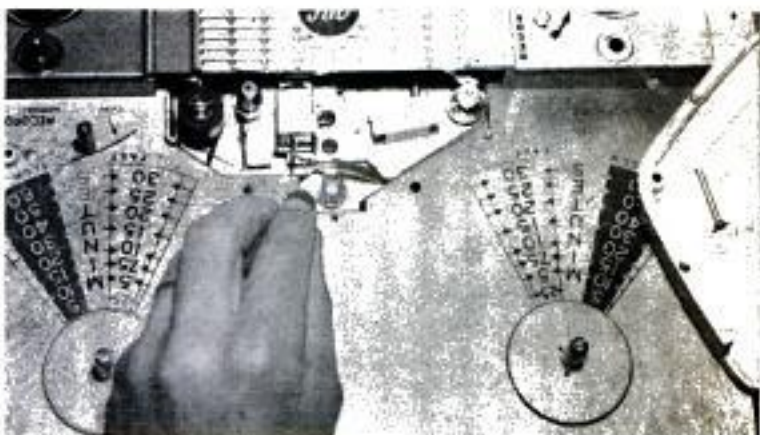


For smooth operation of firearm bolts and slides, lubricate with grease stick. However, stick provides no substitute for oiling of precision mechanisms

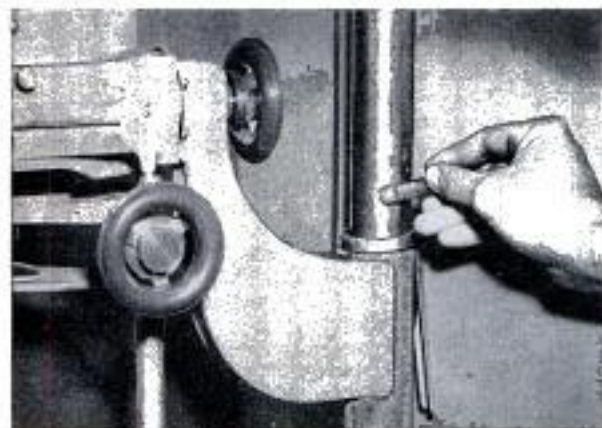
## "OIL" IT WITH A GREASE STICK

By J. W. Rocke, Jr.

You will find the grease stick a welcome addition to your lubricating supplies. The heavy-bodied coating of grease applied by the stick stays put and often does the trick where other lubricants prove unsatisfactory. It's clean, nonstaining and easy to use on everything from hinge pins to rotary can openers



Whether it's for the head of a tape recorder or mechanism of a record changer, grease stick provides effective lubricant that won't work into delicate parts



The grease stick has its place in the darkroom, too. It provides a clean lubricant for enlarger columns and slides, tripods, pan heads and many other items

A light film from the grease stick lubricates the breaker cam on a small-engine magneto. It also serves as a substitute lubricant for car distributor



Right at home around the car, the grease stick will smooth operation of the ash tray, glove-compartment latch, etc., in addition to the usual lubricating jobs

By applying a few strokes of the grease stick to both sides of your handsaw blade you can reduce binding considerably. Even helps when using dull saw





### "Clothespole" in Basement Room Utilizes Chain and Hooks

A removable "clothespole" for hanging coats in a basement game room can be made from a length of chain and several clothesline hooks. If the basement ceiling is low enough, the hooks can be driven into floor joists on a line parallel with a wall. The chain is hooked from one to another. Where the ceiling is high, turn the hooks into screw anchors set in the basement wall. When it is not needed, the chain is lifted from the hooks and stored.

W. P. Nelson, Lombard, Ill.

### Worn Overshoes "Skidproofed"



To assure firmer footing on ice-covered sidewalks "skidproof" the smooth bottoms of worn overshoes or rubbers with strips of waterproof adhesive tape. Clean the bottoms thoroughly and allow to dry.

Apply the strips across the soles and heels at right angles to the length as shown.

### Fungicide Prevents Lawn Mold

Snow mold, a condition that causes areas of a lawn to be withered and yellow in the spring after a winter of heavy snowfall, can be alleviated by using a number of preventive measures. The mold is caused by fungi that are active at low temperatures. Apply fungicide in early winter just before the first heavy snowfall. Since nitrogen seems to encourage snow-mold fungi, do not apply nitrogen-rich fertilizer after

August. Because the mold remains active longer under cover of snow, avoid piling snow alongside driveways and sidewalks. Instead spread out the snow so it all melts at about the same time. Fescue and bentgrass lawns are highly susceptible to snow mold, while Kentucky bluegrass is resistant to the disease.

### Stronger Wire Splice Assured By Using Two Pairs of Pliers

When splicing electrical wires, use two pairs of pliers to assure a strong joint and positive connection. Grip the wires at the base of the splice with one pair of pliers and use the second pair to twist the wires together. When taping the splice, start below the stripped portion of the wire to provide complete insulation of the splice.



### Handles for Closing Car Doors Made From Range-Door Pulls

Chrome-plated handles of the type used on the oven doors of a kitchen range can be used to provide rigid grips for the insides of car doors not equipped with door pulls. The handles not only allow the doors to be closed without pulling on the latch handles or window cranks, but also serve as emergency handholds. Locate the handles beneath the car-door windows with sheet-metal screws.

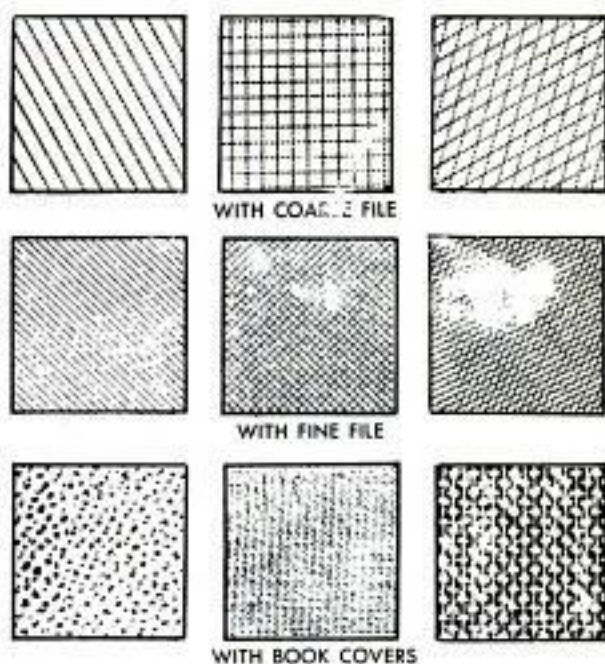
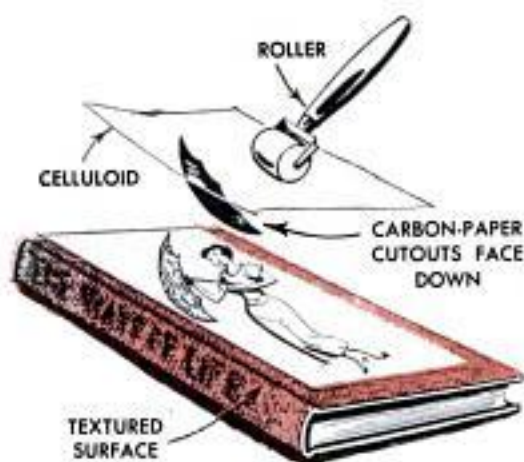


☞ To measure a half glass of liquid, when a glass has straight sides, pour out the liquid until its surface reaches from the mouth to the opposite side of the bottom.

# BETTER TEXTURE SHADING

By Enno R. Haan

Here's an improvement on the method of using rough surfaces, such as book covers, sandpaper and files, to obtain textured shading effects on drawings. Instead of rubbing a pencil over the drawing after it has been placed on the textured surface, cut out a piece of carbon paper to fit the area to be shaded. Then place a piece of celluloid over the carbon and use a small wooden roller to produce the impression, as shown below. This method of shading gives sharper results in blacks and whites than those possible by the pencil-rubbing process, permitting clear line engravings to be made from pen-and-ink drawings thus shaded. However, care must be taken not to rub the shaded portions, as the carbon will smudge. To prevent smudging, spray the drawing with a fixing solution. It's best to use paper having a smooth surface.



## Fuel Tank Set in Carton to Protect Inside Finish of Boat

The cardboard carton in which a portable fuel tank for an outboard motor is packed is used by one boatowner to protect the inside finish of his boat. The tank is removed

from the carton, a piece of heavy cardboard is fitted in the bottom and the tank replaced. With care, the carton lasts two seasons. When it wears out, another can be obtained from an outboard dealer.

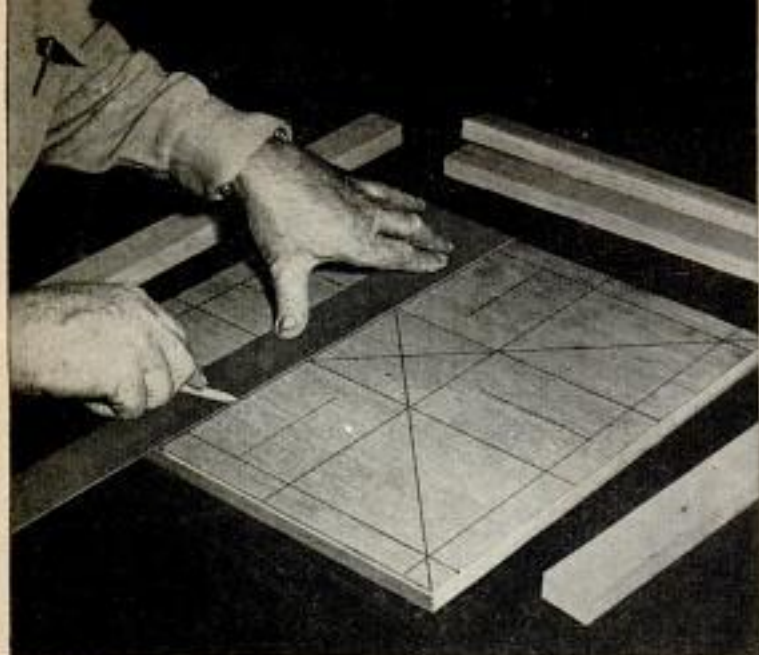
Clinton R. Hull, Santa Ana, Calif.



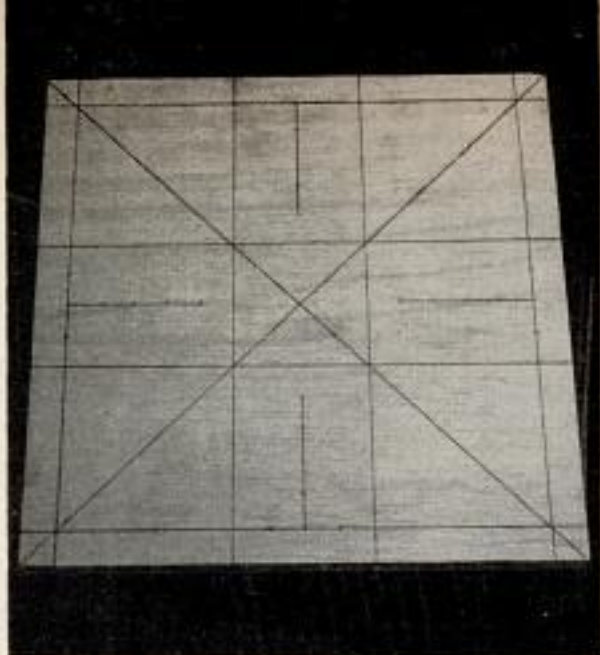
## Bills Kept Separate in Wallet

Fitted in your wallet, a piece of thin plastic the length of a dollar bill and 1 in. wider, does a twofold job. It serves as a divider between one-dollar bills and those of larger denominations, with the extra 1 in. of plastic folded down over the latter. The folded portion prevents a larger bill being removed by mistake when reaching for a single, and also prevents anyone seeing how much money is in the wallet.

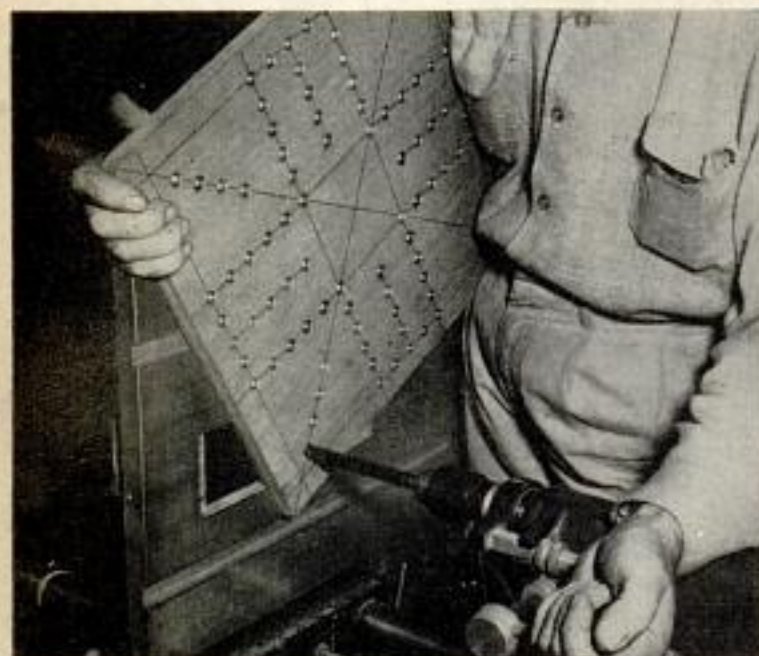
Mrs. Michael Fey, New York City.



Layout of game board is begun by drawing lines directly on  $\frac{3}{8}$ -in. plywood, using straightedge as above



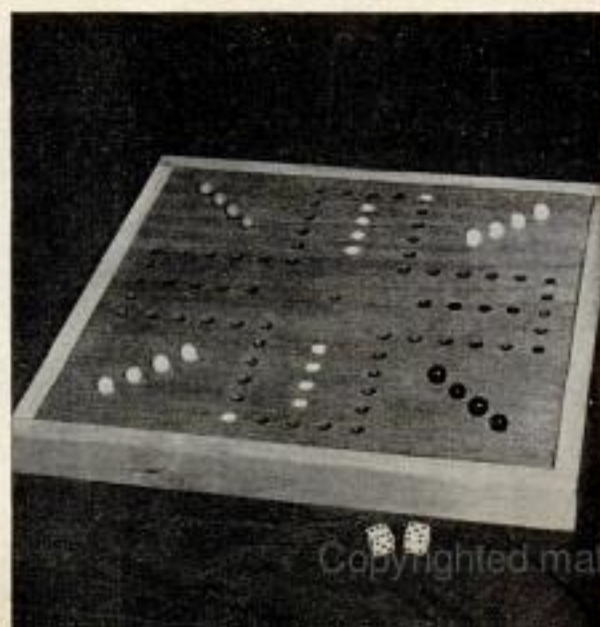
The layout consists of basic 5-in. squares at corners, with diagonals and short home lines drawn in



Above, holes are spotted 1 in. apart and drilled with  $\frac{1}{2}$  or  $\frac{3}{8}$ -in. bit just deep enough to retain marble. Board is sanded to remove pencil lines after drilling and again after painting holes, as below



Note above that base, starting-point and home holes are painted color to match each set of four marbles. Photo below shows finished board which has been coated with clear lacquer. Molding is optional



# FOUR TO GO—A NEW FAMILY GAME

**T**HIS NEW GAME furnishes hours of fun for two, three or four players. Object of the game, which is played on a board made as shown below, is to try to be the first player to move four marbles from the "base" through the center of the cross pattern to "home." Rolling a pair of dice determines the moves. When one player's marble lands on a space occupied by another player, the first player must return his marble to base. The play moves clockwise around the board.

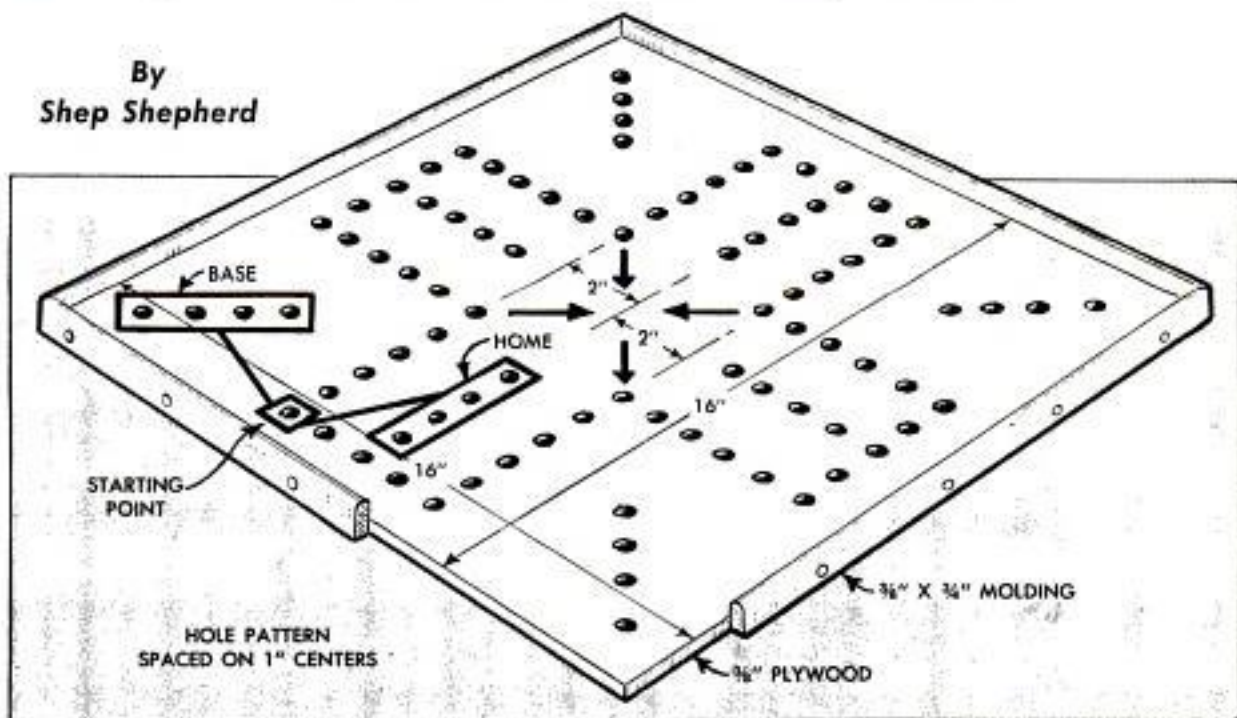
The player rolling the highest number on the dice begins the play. He has four marbles, as do the other players, of a color corresponding to the color of his base. The marbles are placed in the four base spaces which are to the left of the player. He gets one roll and must roll either a "6" or a "1" to bring a marble to the starting point. Once at the starting point, the marble is moved ahead on the player's next throw of the dice. Since only one marble may be moved for each of the dice, a player must have two marbles in play to utilize the numbers on both dice. Players must move when possible, but may move any of their marbles in play according to either die.

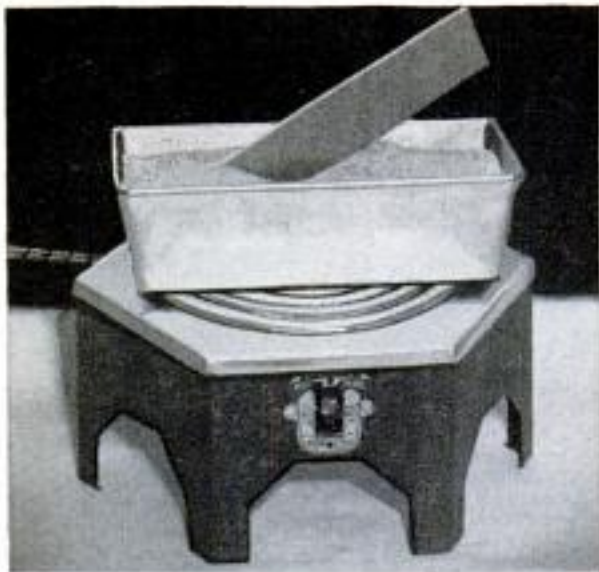
The player gets a free throw of the dice for each 6 that he rolls, and in moving around the board he may pass another player's marble but not one of his own. A marble may be moved into the center space at any time the final count ends on the center, provided that the center can be



entered from one of the first three corner holes clockwise from the player. Note arrows. To leave the center, the player must throw a 1. He then moves his marble to the corner just to the right of home. The marbles must be played through the starting point and then to home, arriving at the final count of the roll. A partial count of either die may not be used. ★ ★ ★

By  
Shep Shepherd



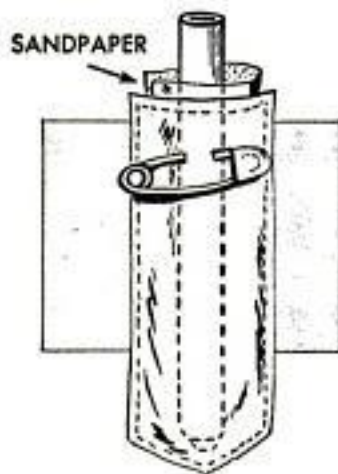


### Heat Bath for Thermoplastics Consists of Salt or Sand

Preparing thermoplastic material for bending and forming can be accomplished without elaborate handling. Fill a metal baking pan with fine sand or table salt and heat it over a thermostatically controlled hot plate. The plastic piece is pushed into the sand or salt and left until it is soft enough to work. Because the temperature inside the sand or salt is higher than at the surface, remove the plastic before it seems to be quite ready and test it for working.

Simon S. Palestrant, Bronx, N. Y.

### Pocket Lined With Sandpaper Prevents Pencil Loss



Frequent loss of pencils from his overall pocket prompted one carpenter to line the pocket with sandpaper. A strip of the paper is folded double and cut so it projects slightly above the pocket. To assure that the paper does not fall out, a safety pin is used.

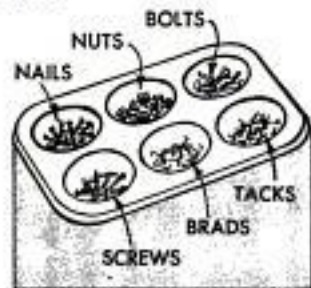
### Spray Head Cools Auto Radiator

Spraying water over the front of the radiator eliminated the problem of overheating in an older-model car that was used to pull a heavy trailer. A length of copper tubing is fastened across the top of the radiator and drilled with pinholes provides a "spray head." The tubing extends back to

a truck-type electric fuel pump in the trunk of the car which pumps water from a junked automobile gasoline tank also in the trunk. When the car engine shows signs of overheating, as when pulling up a long grade, flipping a switch on the instrument panel actuates the electric fuel pump and water is pumped to the radiator spray head to bring down the temperature.

### Muffin Tin Used as Tray To Store Small Parts

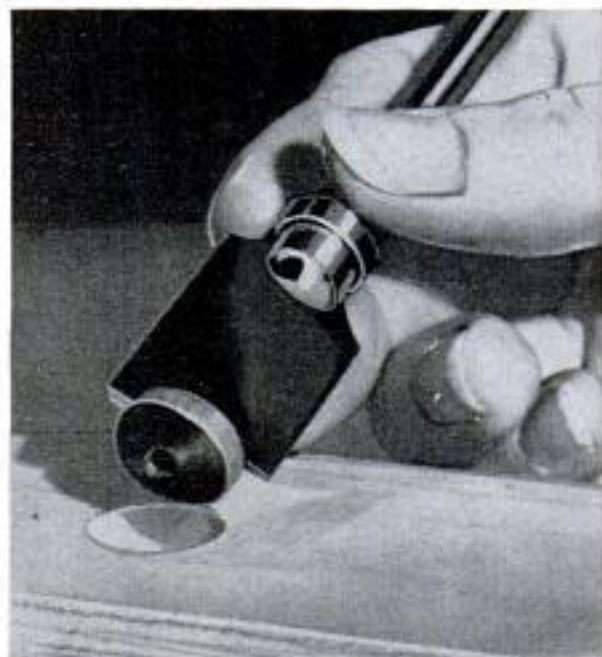
A muffin tin can be utilized as a tray for storing small parts. For further convenience, the tray can be made into a drawer to slide under a work-bench or table top by



nailing cleats to the underside of the top on which the rolled edges of the tray can slide. A small tab should be attached to the end to facilitate pulling the drawer out when it is to be used. If there is frequent need for a number of small parts, it would be worthwhile to build a cabinet to hold several of the muffin tins.

### Faucet Washer Centers Auger Bit When Boring Hole Oversize

When enlarging a hole in wood with an auger bit, use a faucet washer of the same diameter as the hole to assure that the bit is centered. The hole in the washer will center the lead screw and, being soft, the washer will not damage the cutting edge of the bit.



# "BABY PRINTS" IN PLASTER ARE LIFETIME KEPSAKES

By Ralph T. Moore

IF YOU, like many parents, want to keep lasting mementos of your youngster's babyhood, preserve your baby's hand and foot prints on these unique wall plaques. Common puttylike products, such as calking compound, ordinary putty or child's modeling clay, may be used to obtain the prints. Most any product that will retain an impression and also permit plaster of paris to set will do the job.

You will need about 1 lb. of putty. Roll this out on a piece of board or plywood to roughly 6 in. square. The surface of the putty should be smooth and flat. Then moisten the baby's hand or foot with water and press it gently but firmly into the putty. Don't rush this part of the procedure, but use a slow, steady pressure without trying to press too deeply into the putty. Remove the hand or foot slowly from the mold so the putty does not adhere to the skin. If the resulting print is not satisfactory, roll the putty smooth and make another impression.

For the next step, make a square frame from four pieces of  $\frac{1}{4}$  x  $1\frac{1}{2}$  x 6-in. plywood. Force this down over the putty to form a dam around the print. Cut a piece of  $\frac{1}{4}$ -in.-mesh hardware cloth 5 in. square and twist a loop of thin copper wire into the mesh about 1 in. from one corner. This becomes a sturdy loop with which the finished plaque may be hung.

Next mix plaster of paris with water, stirring until smooth, grease the surface of the mold so the casting will not stick to it and pour the plaster of paris into the mold. Press the hardware cloth completely into the plaster with the wire loop at the upper corner of the plaque. Then smooth out the plaster and allow it to set overnight.

After the plaster has set, pull the frame apart and remove the casting from the mold. Permit it to cure for several days and sand and bevel all sharp edges. Seal the plaster with a coat of shellac which, when dry, may be followed with a colored-enamel or metallic finish. If you like, glue felt to the back of the plaque.



Hand or foot impression is made in putty which has been rolled smooth on a piece of plywood



Plywood dam is set up around impression and plaster of paris is poured into mold, above. Hardware cloth, photo below, reinforces plaque



WTM '57

# TWIN-BRUSH FLOOR POLISHER

By David W. Murphy



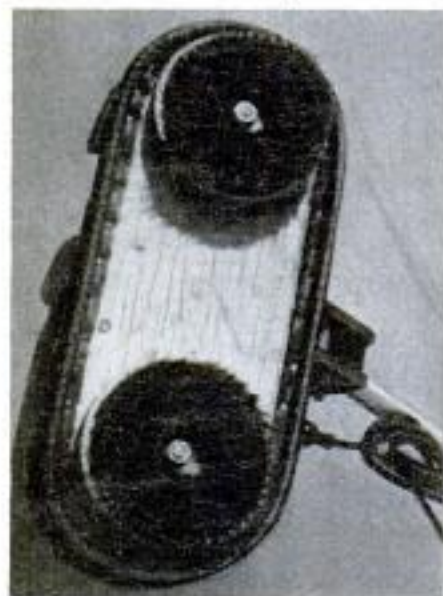
**B**ESIDES SAVING PLENTY of elbow grease in keeping your floors beautifully waxed, this homemade twin-brush floor polisher will save the usual rental fees, plus the inconvenience of carting the machine back and forth, and actually will do a better job of polishing than the common single-brush type. If you already have a 1/4 or 1/2-hp. electric motor, the polisher can be made for less than \$10.00.

The pullapart drawing on the opposite page shows the main parts that must be purchased, namely, the motor, four V-pulleys, two V-belts, four bronze bushings and two 6-in. circular floor brushes. The bronze bushings used in the original can be purchased for about 60 cents each from a dealer of Boston Gear products. The pulleys are sandwiched between plywood plates which are held 2 in. apart by two spacer blocks screw-fastened to small mounting blocks attached to the plates. Except for the 3-in. hole for the motor shaft, both plates are drilled alike and may be clamped together for boring to assure perfect alignment. The brush spindles are lengths of steel tubing which turn in bronze



bushings press-fitted in 3-in. plywood disks. These disks also are slotted for lateral adjustment and are centered over the 1-in. brush-shaft holes. Regular 1/2-in. machine bolts are used inside the tubing to mount the brushes. The sectional drawing shows how several washers are used to provide clearance between the brushes and the mounting bolts that

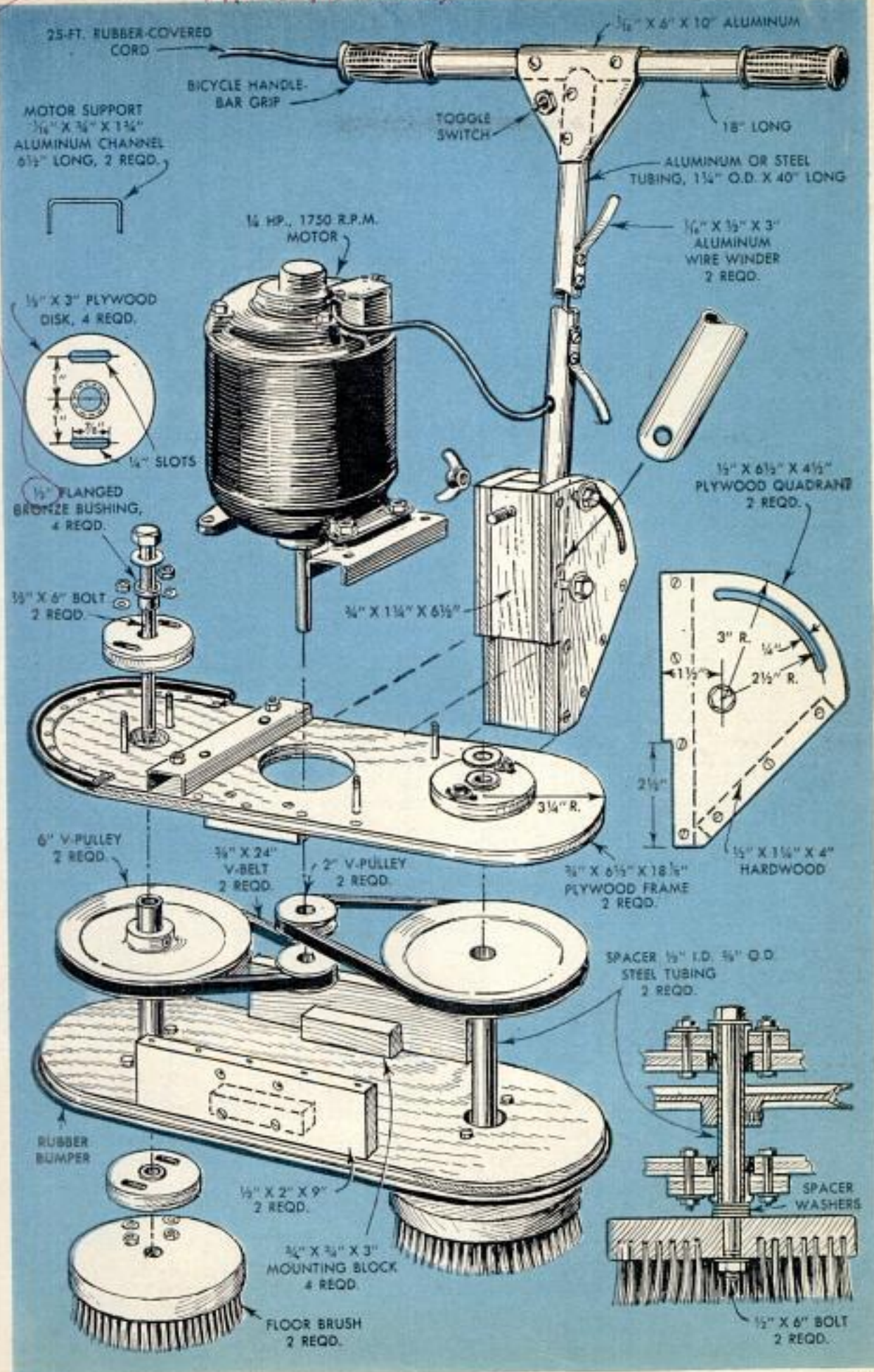
Underside view of polisher. Note rubber bumper tacked to rim to prevent marring



hold the bushing disks. The motor is mounted in a vertical position on two aluminum rails bolted to the top plate. If your motor has a mounting bracket like that shown in the drawing, it may be bolted directly to the top plate. If your motor is of the conventional type that has the mounting bracket on the side, it still can be mounted on end by using the threaded bolt holes that hold the end housing on the motor. Drill the mounting holes in the rails to align with the holes in the end housing and replace the original bolts with longer ones. If direction of rotation causes the brushes to loosen, simply reverse the position of the leads in the motor to reverse the direction. A sheet-metal guard is tacked to the edges of the plates to enclose the belts and pulleys, and the handle is made as detailed. Note that the top of the handle bracket is held to the motor with a bolt which is turned into a tapped hole in the side of the motor. Sponge-rubber upholstery welting is tacked around the edges of the plates to protect furniture from marring. The motor can be wired to a toggle switch located in the handle. ★ ★ ★



*5" (BOSTON GEAR WORKS  
BRONZE FB-1013-6)*



## Oversized Plywood Palette Has Greater Color Choice



Desiring a more extensive color selection than could be fitted on a small palette, one artist designed this oversize plywood palette which holds 36 different colors. Holes are drilled in the plywood to accommodate flanged, screw-type bottle caps. Tube colors can be squeezed into the caps, or water-color cakes may be used. In the latter case, it is necessary to wrap paper strips around the pans which hold the paints, so they fit snugly in the bottle caps. The top three rows as shown hold 18 hues evenly graded around the color cycle, from green-yellow, yellow, orange-yellow, yellow-orange, orange, red-orange, etc., back to lemon yellow. The diagonal arrows connect complementary hues. The other 18 hues in the palette are neutralized or grayed colors.

Walter L. White, Indianapolis, Ind.

## Plate Scraper Protects Wood When Pulling Nails

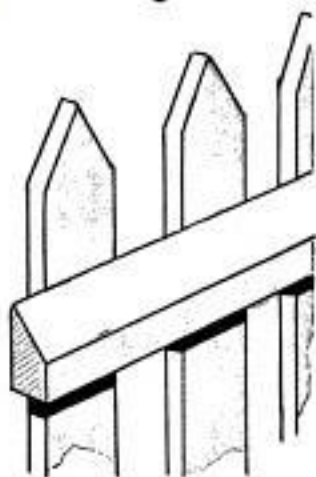


Slotted as indicated, a rubber plate scraper provides an ideal shield to protect finished wood surfaces when driving or pulling nails. When a nail is pulled, the hammer head is rested on the scraper blade as shown. If

a shield larger than that provided by the scraper is desired, one can be cut from an old rubber sink pad or car floor mat.

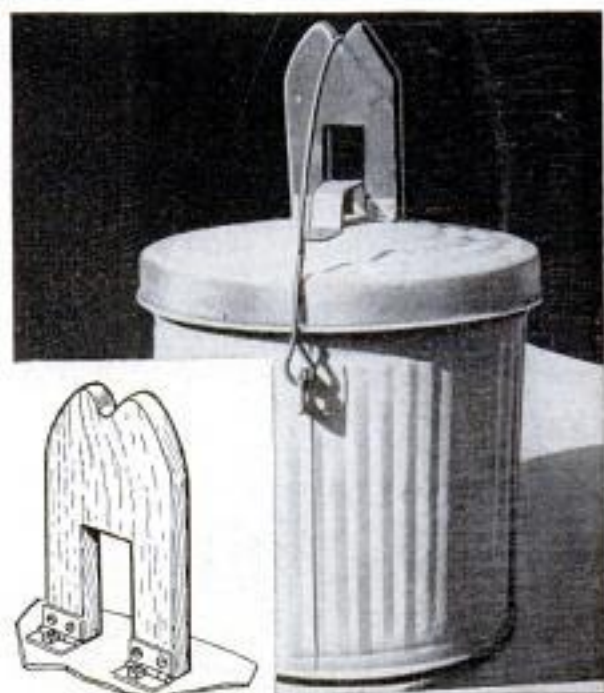
## Beveled Top Rail of Picket Fence Prevents Children Walking on It

As a safety measure, one contractor who builds picket fences bevels the top rail as shown. The slanting surface eliminates the temptation to children who might try dangerous stunt-walking and balancing acts on the fence. Fence strength is not affected and the bevel prevents many accidents which might occur if the rail were flat. The bevel also acts as a watershed, preventing water from standing on the rail.—G. E. Hendrickson, Argyle, Wis.

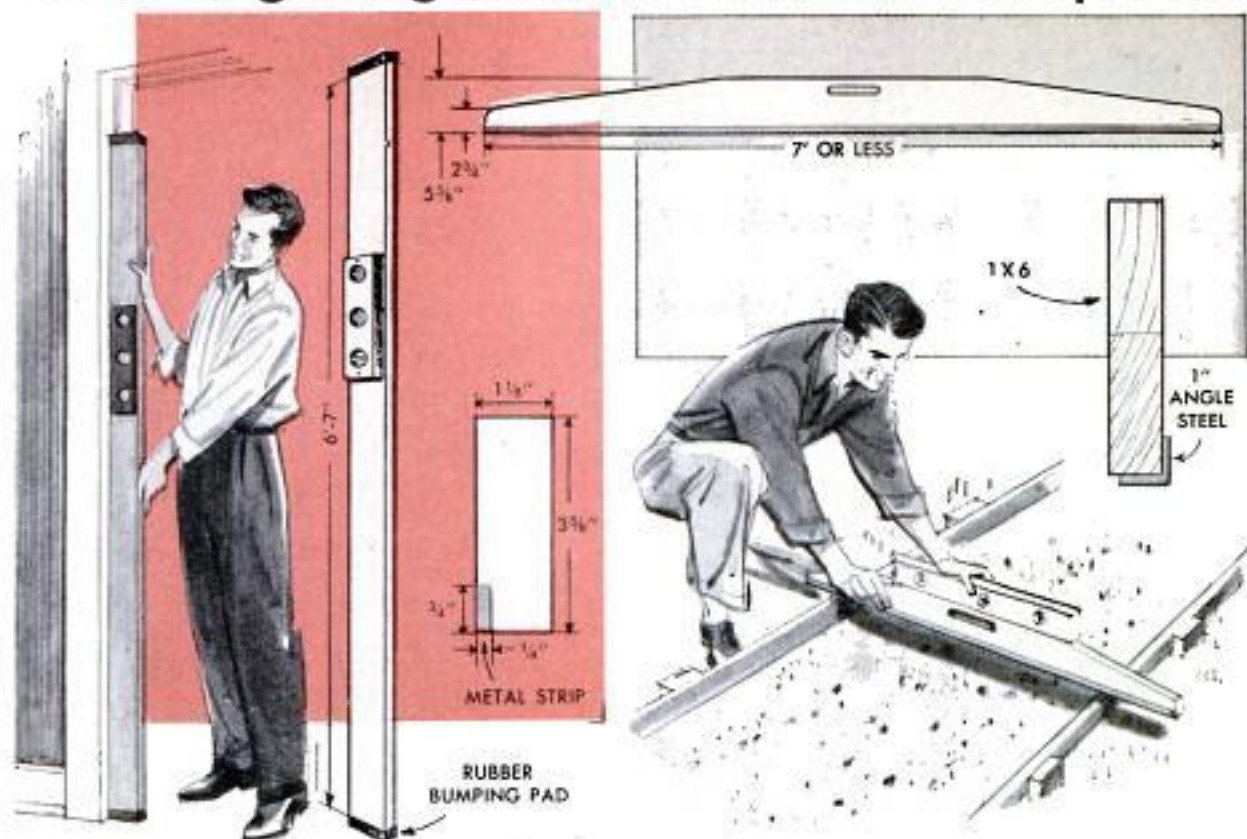


## Block Locks Refuse-Can Lid

Even though a refuse can is knocked over by roaming dogs, the lid will stay on tightly if this hinged block is used under the bail. The block is cut as indicated to straddle the handle and is hinged to the lid with two 1-in. butt hinges. If the lid handle is small, it may be necessary to replace it with one that will project far enough above the folded block to permit gripping it.—R. S. Howard, Milton, Wis.



## Two Straightedges for the Week-End Carpenter



Homeowners who are tackling do-it-yourself jobs that range from framing a doorway to laying a new sidewalk will have need for these two simple-to-make straightedges. The one pictured in the illustration at the left can be used to plumb a doorjamb, level floor joists and to mark wallboard or plywood for cutting. The straightedge shown in the illustration at the right is useful for grading purposes, setting sidewalk forms and other leveling jobs. Both straightedges are used in conjunction with a level. In one, a leveling device, which can be purchased for the purpose, is fastened permanently to the face of the straightedge to save holding it. Although this frees one hand, a regular level may be held against the straightedge

instead. Fitting metal strips along the edges saves wear. Angle steel is used in the case of one, while flat bar stock is set flush in a rabbet cut in the edge of the other. The latter provides a durable cutting edge along which a knife can be used in scoring various materials. Rubber pads can be fitted to the ends as shown to prevent marring the floor or head jamb when the straightedge is used to check a door opening. Although not shown, a small wooden block about  $\frac{1}{2}$  in. thick nailed to the edge of the straightedge at each end will allow the straightedge to span any bow that might be in the doorjamb and which otherwise might interfere with plumbing the jamb. Once jambs are plumb bow can be corrected with wedges.—J. G. Jensen, Chicago.

### Discarded Flash-Gun Dry Cells Still Usable in Flashlight



In most cases, dry cells no longer strong enough for use in photoflash units are still strong enough for use in a flashlight. Wrapping the dry cells with light cardboard will increase the diameter to fit the flashlight case. Usually the spring in the bottom cap of the case can be stretched to make contact with the shorter dry cells.

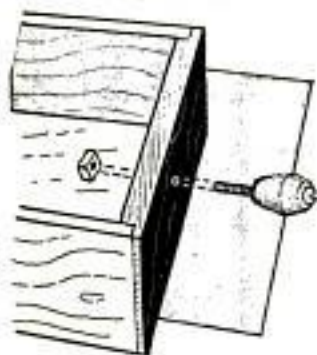
☐ When mailing stamps for return postage or in payment for merchandise, dust a little talcum over the mucilage to keep them from sticking together.

## How to Use Corrugated Fasteners To Prevent Splitting Work



When corrugated fasteners are used at mitered joints, crossing the wood grain at 45 deg. as shown in the upper detail, portions of the wood may be weakened and chip off so the joint has little strength. To avoid this, bend the fasteners at right angles as in the center detail, so they will be in line with the wood grain. Generally it is better to use corrugated fasteners having widths less than half the thickness of the stock to be joined. Drive the fasteners from the opposite sides, locating them so they are not opposite each other. The fasteners also can be used to join two pieces of stock together when a split turning is made. The fasteners are driven into the end of the stock beyond the limits of the turning.

## Fuller Balls Double as Knobs On Shop-Cabinet Doors



Knobs for shop-cabinet drawers can be made by using rubber fuller balls. Attach them to the drawers with small-diameter stove bolts. The rubber knobs are easy to grasp and are virtually breakproof.

## Luminous Paint for Home Safety

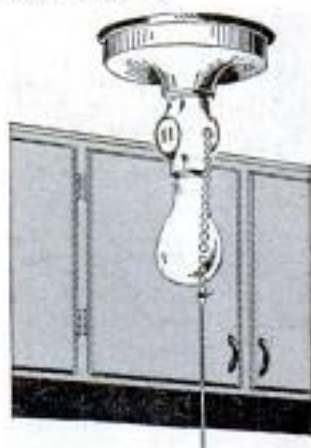
Spots of luminous paint located at strategic points in and around the house will help prevent accidents and save tempers.

Try putting a spot on the corner of the house next to a service walk, another on an elusive light switch, and perhaps one on the edge of an opened door that presents a nighttime hazard.

Ted Otsu, Vancouver, B.C., Canada.

## Socket In Overhead Receptacle Simplifies Changing Switch

When the pull-chain-type switch in an overhead receptacle required frequent replacement because of heavy use, one homeowner installed a "screw-in switch." The receptacle switch was pulled to the "on" position and the chain removed. A combination socket and double plug of the type shown, which has its own pull-chain switch, was screwed into the receptacle. Replacing the switch now is merely a matter of changing the socket plug.



## Novel Bathroom Wastebasket

An unusual bathroom wastebasket that matches the wall tile of the room can be assembled easily. The sides of the basket are of 1/4-in. plywood, each large enough to take two standard 8 1/4-in. plastic tiles. The bottom is made of 3/4-in. stock. After the wooden parts are assembled, the tile is applied, with beaded outside-corner molding of aluminum used for the corners, bottom and top edges. A 6-ft. strip of this material is needed to complete the basket. For extra convenience, chromium cabinet handles can be attached to two sides.



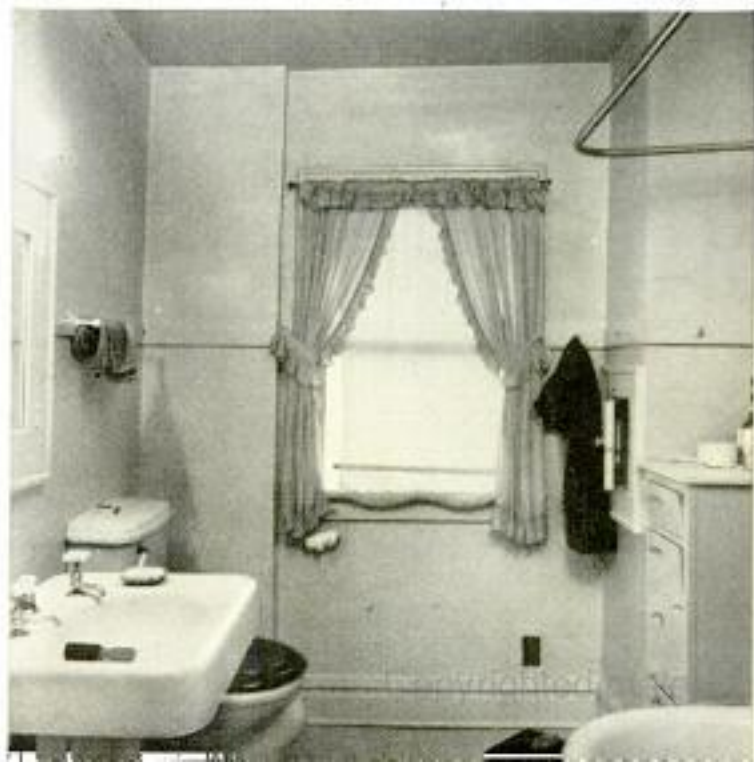


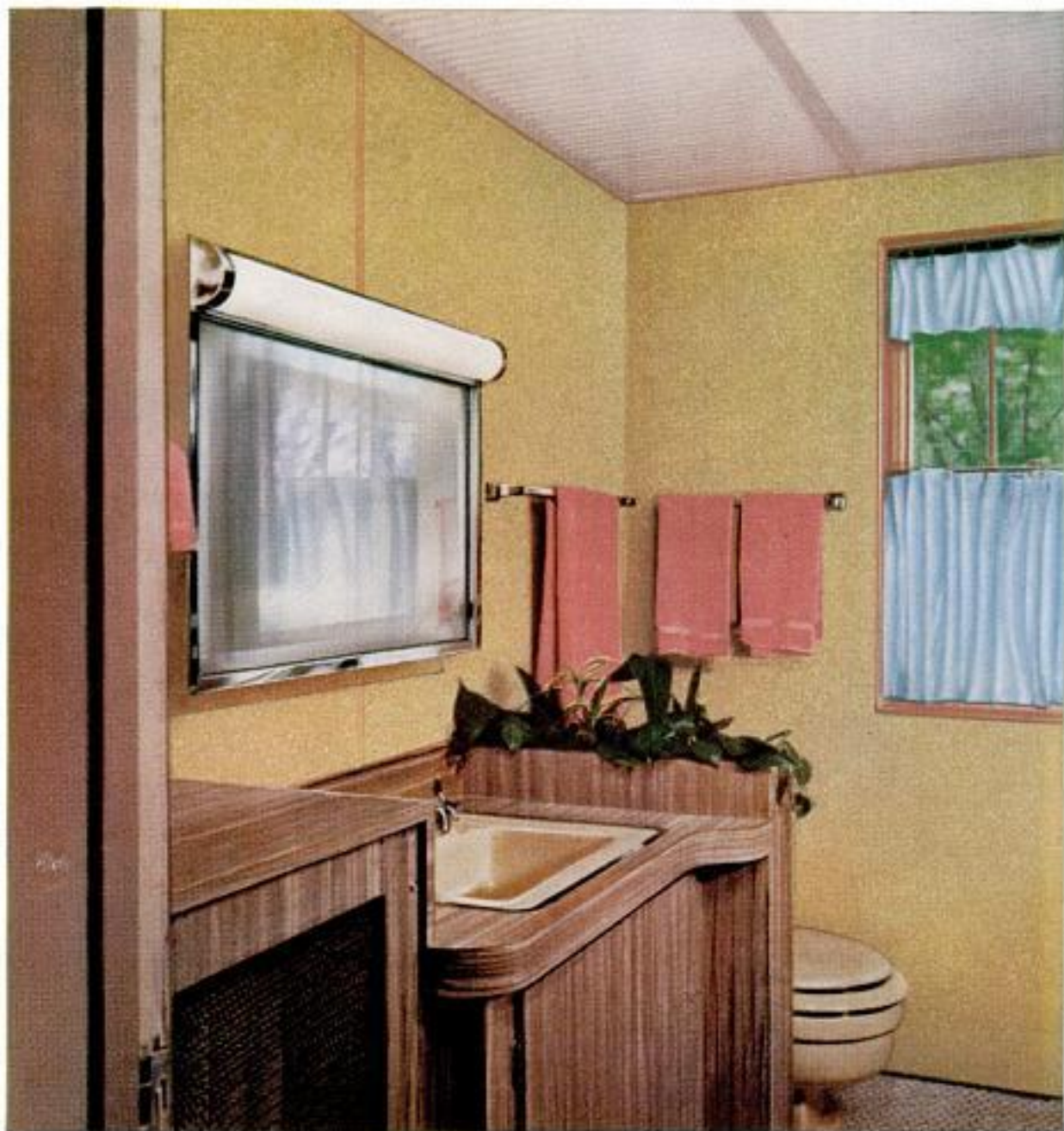
## DO YOUR BATHROOM IN LAMINATE

**R**IGHT NOW there are probably counter tops and table tops in your house that are covered with decorative laminate. A damp cloth will wipe them clean and they won't chip, scratch or corrode. They are just about as troublefree and convenient as a covering material can be.

All of these advantages combine to make the same decorative laminate the ideal covering for your bathroom walls. Just think—those hard-to-clean walls and cabinets can be covered with a completely water-repellent material that never needs painting or polishing. Once your bathroom is done in decorative laminate, you can forget about redecorating.

The photo above and the one at the right are similar views of the same bathroom. Decorative Textolite by General Electric was used on walls and cabinets





Lavatory finished in laminate of a wood-grain pattern contrasts nicely with linen pattern on walls

The photographs on these pages show you how a typical old-fashioned bathroom was completely remodeled and redecorated with plastic laminate called Textolite. Compare the hard-to-maintain painted walls in the "before" picture with the striking transformation in the two full-color photos.

The decorative laminate, which is  $\frac{1}{16}$ -in. thick, can be applied over existing plaster or dry walls that are in relatively good condition. If the plaster is loose, the walls should be covered with  $\frac{1}{8}$ -in. hardboard or  $\frac{1}{4}$ -in. plywood which is nailed to the studs. If the laminate is to be applied directly to the existing wall, all paint runs or torn seam tapes should be removed. Raised portions of the plaster should be sanded flush with the rest of the wall sur-

face and any large breaks or holes patched beforehand.

Installation of the laminate is easiest if as much wood trim as possible is removed from the room. As it is difficult to remove the window stool it is best to cut a  $\frac{1}{16}$ -in. space for the laminate between the stool and the wall with a handsaw. Window and door trim that cannot be removed without considerable trouble usually can be pried up sufficiently to permit sliding the laminate behind it. Notice in the bathroom that window trim was not replaced. Instead a matching end-cap molding was used around the window and door.

It is important that all sheets of laminate be laid out and cut to size and shape before applying any adhesive. The first step



Lavatory framing, cutout for medicine cabinet and part of hardboard underlayment are shown above

is to divide the wall into equal sections, each being approximately the same width as the sheet of laminate. The finished installation is better looking if all the pieces of laminate are about the same width. Draw vertical lines on the wall surface at points where the edges of the sheets will be set. Use a plumb bob to be sure that the lines are vertical.

Since the ceiling line is the most conspicuous all the sheets of laminate should be scribed and filed to match along the ceiling line. All openings, of course, should be measured from the ceiling. Lay out the holes to be cut in the sheet and drill a

Hardboard or 1/4-in. plywood panels nailed to studs provide smooth surface for application of laminate



NOVEMBER 1955



Plywood top for lavatory is assembled and checked for fit before the plastic laminate is applied to it

starting hole with a 1/2-in. twist drill in two opposite corners of the cutout. Then cut out the hole with a keyhole saw. Temporarily install the laminate without cementing it, to be sure that the cutout sheet fits properly. The sheet should slip behind trim and cabinets without binding.

The laminate is simple to cut. The lines are scored on the face of the sheet with a sharp ice pick or awl, the cut being made deep enough so that the core material of the laminate is apparent. Then hold a straightedge against the scored line and pull upward on the sheet until it breaks off. Edges that will not be covered

Divider molding is added to edge of laminate already in place. Molding is cut short to clear medicine cabinet



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Molding is tapped in place by using wooden block to cushion hammer blows. Adhesive anchors molding



After next piece of laminate has been cut to size, adhesive is spread on wall surface and on laminate

After adhesive loses tacky feeling, panel is slipped in place. Tap corners with block for good adhesion



with molding should be filed smooth. If available, a portable router can be used to trim the sheet to size and also for the cutouts. The laminate should be supported almost to the point of cut.

The adhesive used for plastic laminates is available in two types. One is designed for industrial application and is too quick-acting for practical use by the home craftsman. The second type does not set as rapidly and permits sliding the sheets into place and making minor adjustments in position. This is the type to use. In this installation, G. E. Pressure Contact Adhesive, Type B, was used.

Begin the cementing operation with the section of laminate that is most difficult to handle. Using a spatula, place gobs of the adhesive on the wall and spread it out with the notched spreader which is supplied with the adhesive. Again using the spatula, butter the back of the laminate with a thin coat of the adhesive. Wait until the adhesive on both wall and panel is no longer tacky to touch, then place the laminate against the wall and slide it into place. When the sheet is in position, it should be rolled firmly with a rolling pin.

The divider molding should be precut to the proper length before starting the installation. As soon as the laminate panel is in place, select a piece of molding of the proper length, spread some adhesive on the back of the molding and force the flange along one side behind the edge of the laminate. The exposed flange of this molding may be nailed to the wall, if desired. However, in most cases, the adhesive will anchor the molding securely.

After the molding is in place and the adjoining piece or pieces have been cut to size, spread adhesive on the wall and on the back of the next piece of laminate. Then apply it in the same way as before.

In order to get satisfactory bonding pressure in the corners, a block of wood is placed on the surface of the laminate and tapped with a hammer. When fitting the last panel into a corner, cement a strip of inside-corner molding to the laminate before applying the latter to the wall surface. Simply put the molding in place along the edge of the sheet before applying the adhesive to the back of the sheet, and then coat both the sheet and the molding with the thin layer of adhesive.

When the wall installation is complete, clean off all excessive adhesive with a special adhesive cleaner and replace any trim and electrical cover plates. Original baseboards may be used again, if you like, or rubber or asphalt base shoe can be purchased and applied over the laminate.

You will notice in the photographs that a built-in lavatory was installed in this





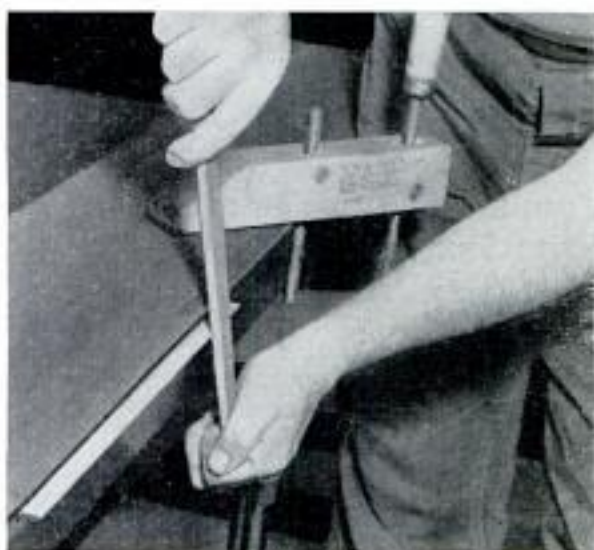
To cut laminate, score face through to core with ice pick or awl, using a straightedge as a guide



After scoring, hold the straightedge firmly against the scored line and bend the panel upward to break

bathroom. The lavatory, which incorporates a radiator cover and a planter, was completely finished with decorative laminate in a wood-grain pattern. The top piece of the lavatory is of  $\frac{3}{4}$ -in. plywood cut and assembled to fit and then covered with laminate. The doors of the linen cabinet at the far corner of the room also are covered with laminate to match the vanity. The decorative laminate is applied to these pieces in much the same way as it is to the walls, except that no molding is used to conceal the corner joints. To obtain neat-appearing joints apply the laminate to the front first. File it carefully flush with the plywood top. Then add the top piece, filing it flush with the front laminate, using downward strokes of the file. Hold the latter at 10-deg. angle to avoid scratching the material. ★ ★ ★

Adhesive is applied to wall surface with notched spreader and to back of laminate panel with spatula



Laminate edges not covered with molding are smoothed with single-cut file, as above. After panel is in place it should be rolled with rolling pin or tile roller to assure a firm bond to the wall surface





### Furniture Stains Removed With Salt and Shortening

White rings and stains on furniture tops, resulting when glasses or dishes are left on a varnished finish, often can be removed by using vegetable shortening and salt. Sprinkle the stains with salt, then rub gently with a clean cloth dipped in shortening. When the stain is removed, wash the surface immediately and re wax. In cases where the stain is extremely stubborn, the only solution is to sand and refinish the surface.

### Estimating Paint Needed For House Exterior

If you have wondered how to figure the number of gallons required to paint the outside of your house, use the following method: First, determine the number of square feet to be covered by multiplying the distance around the house by the average height. Increase the average height by 2 ft. before multiplying, to allow for gables.

### Build Your Own Reed Organ

No Rube Goldberg contraptions but fine reed musical instruments, these Tom Thumb organs in beautiful little cabinets are ideal for the home, small church or service club. One is made from a used accordion, the other from a kit which can be amplified "electronically." Be sure to read "Homemade Organs," beginning next month.

Now find out how many square feet a gallon of paint will cover (it usually is printed on the paint-can label) and divide the square feet of the house by that number. The type of surface to be painted also must be considered. A surface that is rough, dry and porous will take up to 20 percent more paint. Concrete block will require up to 50 percent more paint for the first coat. A corrugated-metal surface needs one-third more paint than a flat metal one, and narrow-lap siding takes 10 percent more than wide-lap siding.

### Key Groups Separated on Chain By Strip of Cellulose Tape

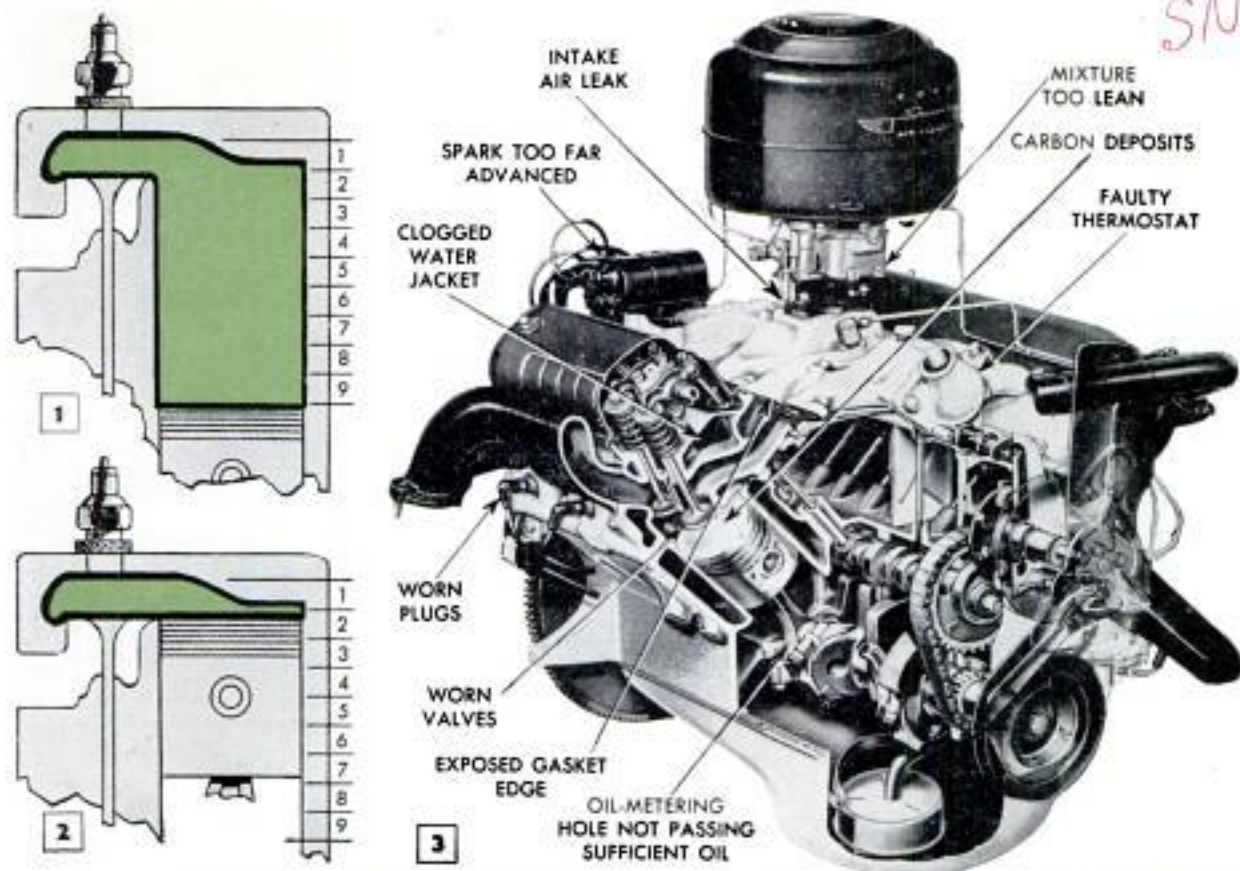
When convenience requires that two groups of keys be separated on a key chain, use a strip of cellulose tape. Slide the two groups to opposite ends of the chain and wrap the tape around the chain to form two loops. It takes only a moment to unwrap the tape when keys are to be added or removed.



### Masonry Joints Flame-Dried Before Being Calked

When joints in concrete or masonry are sealed with calking compound or asphalt cement, the surfaces of the joint must be absolutely dry to assure adherence of the calking materials. Joints in contact with the ground, such as those between basement floors and walls, tend to remain damp and must be dried artificially. This can be done with a torch as shown. *Caution:* Wear safety glasses or a face shield, and do not concentrate the heat in one spot in the joint. Steam resulting from heating trapped moisture in concrete may cause a minor explosion that will hurl fragments.





## CONTROLLING ENGINE PING

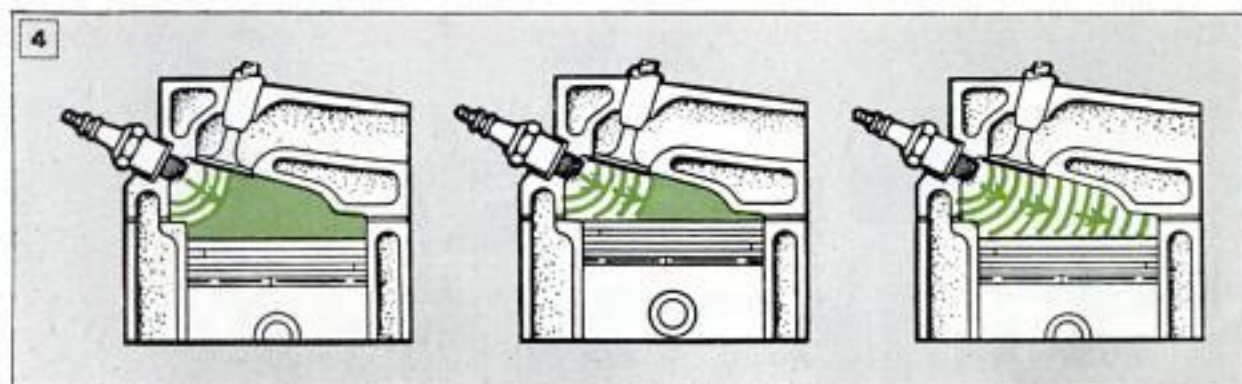
By Ed Packer

**M**ECHANICS AND MOTORISTS generally call it engine ping, but fuel ping or fuel knock is perhaps a more descriptive term. Common causes are continued use of fuel of too low an octane rating, engine wear, carbon deposits, pre-ignition, incorrect carburetor setting and spark timing. There also are other contributing causes, Fig. 3.

Engine compression and power increase with each new car model. Figs. 1 and 2 show graphically how the fuel charge is compressed in late-model engines. The details are for the purpose of illustration and do not apply to any one model. The details

in Fig. 4 show the progress of normal spark ignition of the compressed fuel charge. Ignition is progressive from the plug electrodes to the opposite side of the combustion chamber, with heat and pressures building up steadily against the piston head. In right-hand detail, Fig. 4, the piston is beginning the power stroke. Uniform burning of the fuel charge and the resulting expansion of the gases are what drive the piston downward on the power stroke.

Detonation, or ping, occurs when secondary ignition takes place in the combustion chamber as in the upper details in



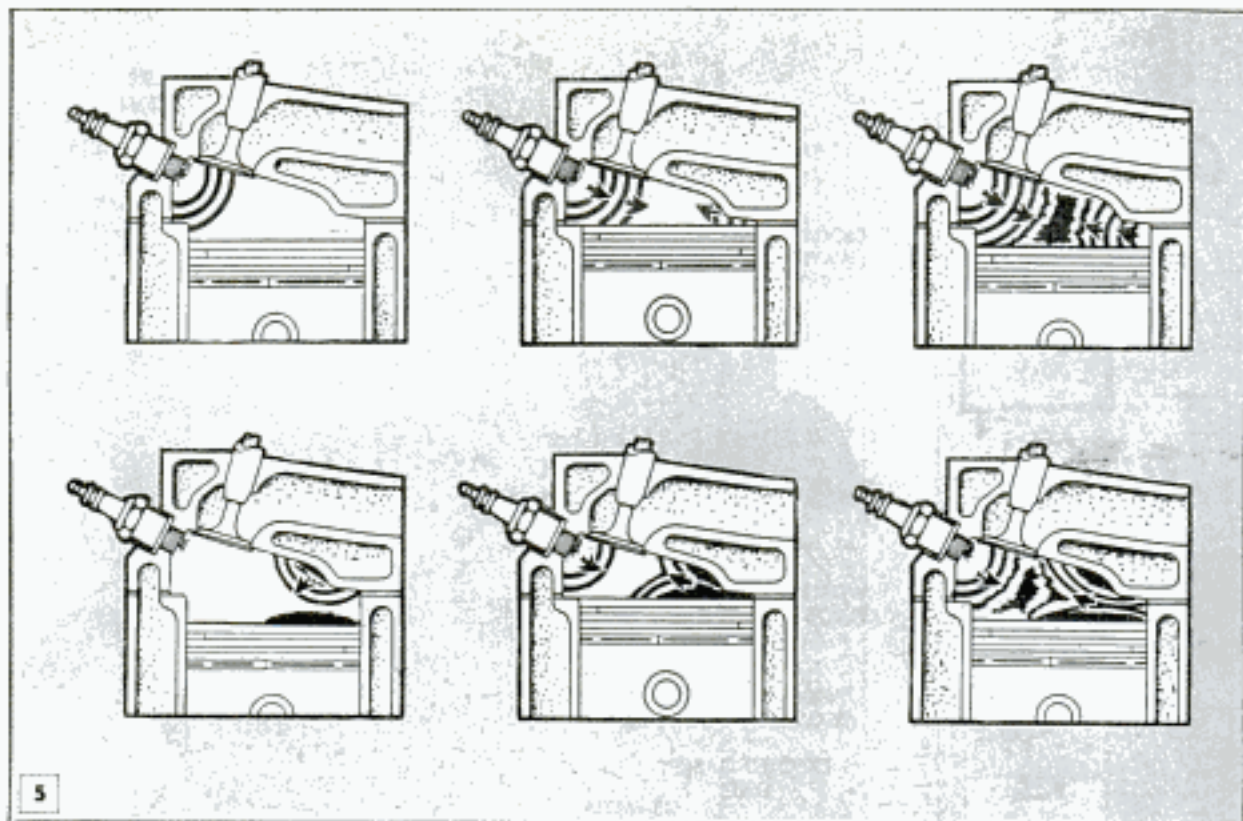
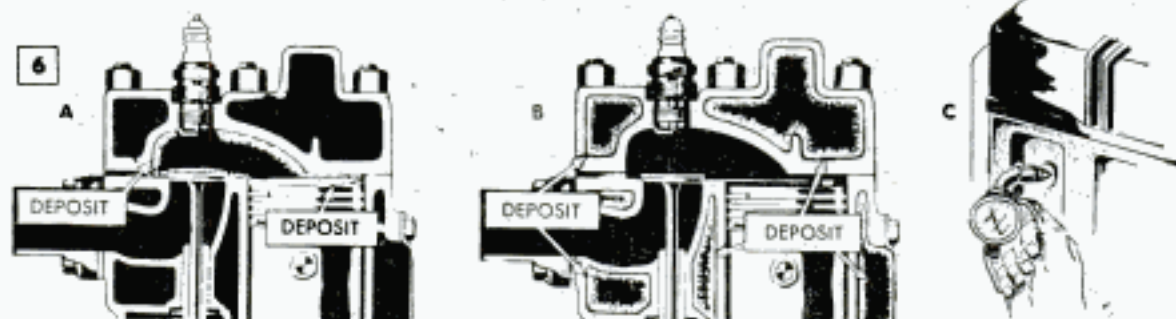


Fig. 5. Ignition begins at the plug electrode in the normal manner but excessive heat and pressure, due usually to some abnormality, raise the temperature of that portion of the fuel charge opposite the plug to the ignition point. The greatly increased pressure resulting from the "dual" explosion causes the audible ping. This can seriously damage pistons, rings, wrist pins and connecting-rod bearings if not corrected.

The lower details in Fig. 5 show the progress of preignition of the fuel charge. Note in the view at the left, Fig. 5, that the fuel charge is already partially ignited before spark ignition takes place as in the center detail. The end result is a dual explosion of the fuel charge, right-hand detail, which is not only wasteful of fuel but also is destructive of engine parts if permitted to continue over a period of time. Preignition usually is caused by carbon deposits which become incandescent due to abnormal conditions within the cylinder.

The higher the compression of the engine

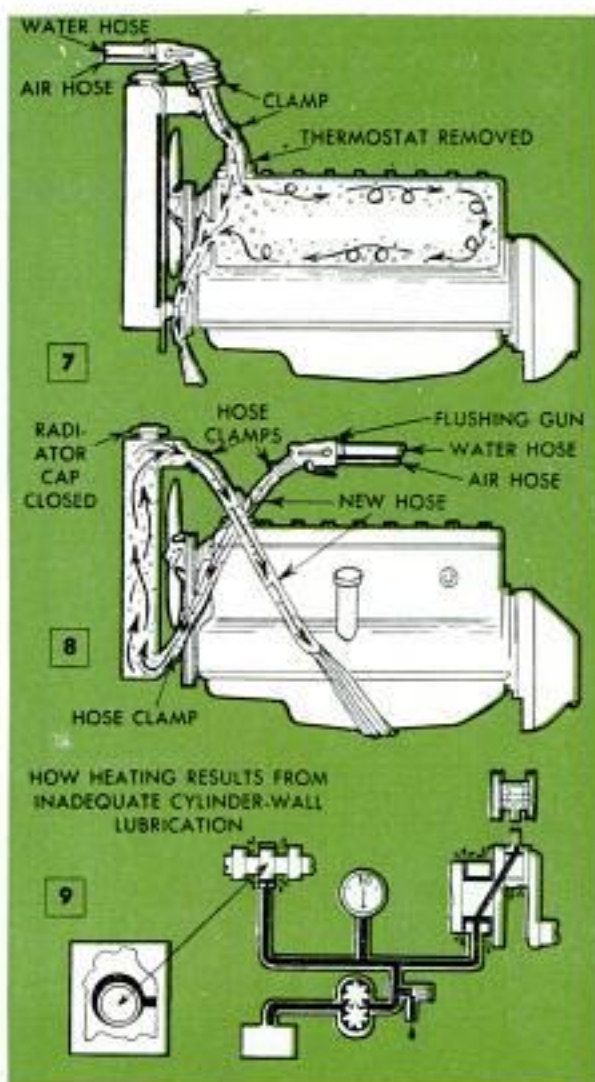
the more sensitive it is to changed conditions that tend to increase the compression or raise internal temperatures. If the normal area of the combustion chamber is reduced, even slightly, by a layer, or deposit, of carbon the effect is to increase compression pressure. In addition to raising the pressure, carbon deposit raises the engine temperature. High-performance, high-compression engines have been developed to a point of perfection which does not permit appreciable carbon deposit in the cylinders or any undue amount of foreign matter in the cooling system, Fig. 6, details A and B. Because of this, it's always good insurance against trouble to pressure-flush or reverse flush the cooling system periodically, Figs. 7 and 8, check or change the thermostat, Fig. 3, and also check compression in the cylinders as in Fig. 6, detail C, using a compression gauge made for the purpose. To make a compression test, bring the engine to operating temperature, then stop it and remove all the plugs. Place the compression gauge



in the spark-plug hole and turn the engine over with the starter. Repeat this procedure for each cylinder, recording the readings for each one. A comparison of the readings of two or more periodic checks will show up any variation. If, for example, the compression readings show an increase, it's a fairly reliable indication that carbon is building up in the combustion chamber of the cylinder or cylinders having the higher readings. On the other hand, should the readings show a decrease of pressure, it's time to think about worn piston rings or valve defects, Fig. 3.

The oiling system of the engine works closely with the cooling system in the dissipation of heat. Oil is thrown from the crankshaft to all internal parts of the engine. The hottest of the larger moving parts are the pistons, especially the undersides of the heads. These surfaces are constantly cooled by the oil spray thrown from the crankshaft. As the oil drains back into the engine pan it carries with it heat from all the surfaces which it contacts. The pan, being in the air stream passing under the car, dissipates the heat at a fairly rapid rate. As the oil thickens in service, its ability to transfer heat lessens proportionally. Continued service at high temperatures drives off the lighter parts of the oil; the oil remaining circulates less freely and the temperature of the engine gradually increases. Because of this tendency it is important to change the oil at regular intervals. Badly worn engine bearings, Fig. 9, also partially clogged metering holes, Fig. 3, can greatly reduce the amount of oil thrown onto the pistons and other parts. This will cause the engine to operate at a higher temperature.

When the spark plugs are removed for cleaning, or for any other reason, always reinstall them with new gaskets. Be sure to remove the old gasket from each plug. Double gaskets may change the heat range of a plug sufficiently to cause severe ping in the cylinder affected. Also, be sure that plugs are of the correct heat range for the engine model and the driving conditions



imposed, Fig. 10. Badly worn plugs with knife-edged electrodes, Fig. 11, should be replaced, as the fuel savings alone will likely return the cost of the replacements within a short time.

In some cases a lean fuel mixture is a cause of ping. Often the mixture is leaned out because of a slight air leak, either at the carburetor mounting pad, the intake manifold or the windshield wiper. Spark too far advanced for the load conditions is another cause. Retard the spark a little at a time, Fig. 12, driving the car after each setting, until no pinging is heard. ★ ★ ★



## Corner Shelves Permanently Installed by Using Metal Channels



A neat method of permanently installing corner shelves, such as those between wall and cabinet above a sink, is to use metal channels into which the edges of the shelves fit snugly. The channels are notched at 90 deg., as indicated, so they can be bent to fit in the corner. Rounded tabs formed on

the ends of the channels are bent down to hold the shelves in place. If shelves of 1/4-in. glass are installed, chrome-plated auto-window channels may be used.

## Metal Baffle in Fireplace Eliminates Smoky Condition

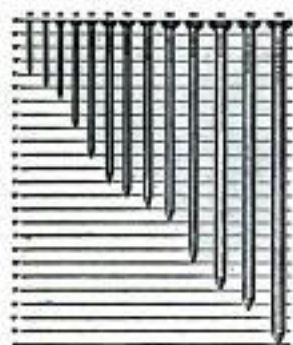
If not resulting from downdrafts, a smoky condition in a fireplace can be eliminated by reducing the area opening into the room. The area should not exceed 10 times the flue area for chimneys less than 22 ft. high. For chimneys over 22 ft. high, the opening should not exceed 12 times the flue area. The size of the opening can be reduced by installing a piece of 1/8-in. sheet steel across the inside of the opening at the top.



## Do-It-Yourself MATERIALS GUIDE for the Homeowner and Handyman

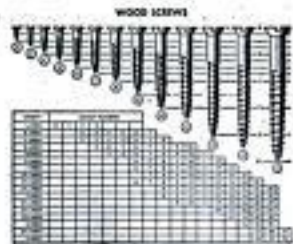
### Cross Indexed for Easy Use

If you've ever walked into a hardware store without knowing exactly what you need (and walked out without being sure of what you'd bought), you'll want a copy of this new guide that lists all the specifications for all Do-It-Yourself materials. With this book, you'll know exactly what to look for, and how to save money when you buy.



Need to know how long a 50d (penny) nail is? In the Do-It-Yourself Materials Guide, charts like the one at the left (4 1/2 times larger in the book) will show you it's 5 3/8 inches.

The chart at the right, of common wood-screw sizes and gauges, is typical of the dozens of illustrations (all much larger) in the book. Now you'll know how to choose and where to use building and hobby materials.

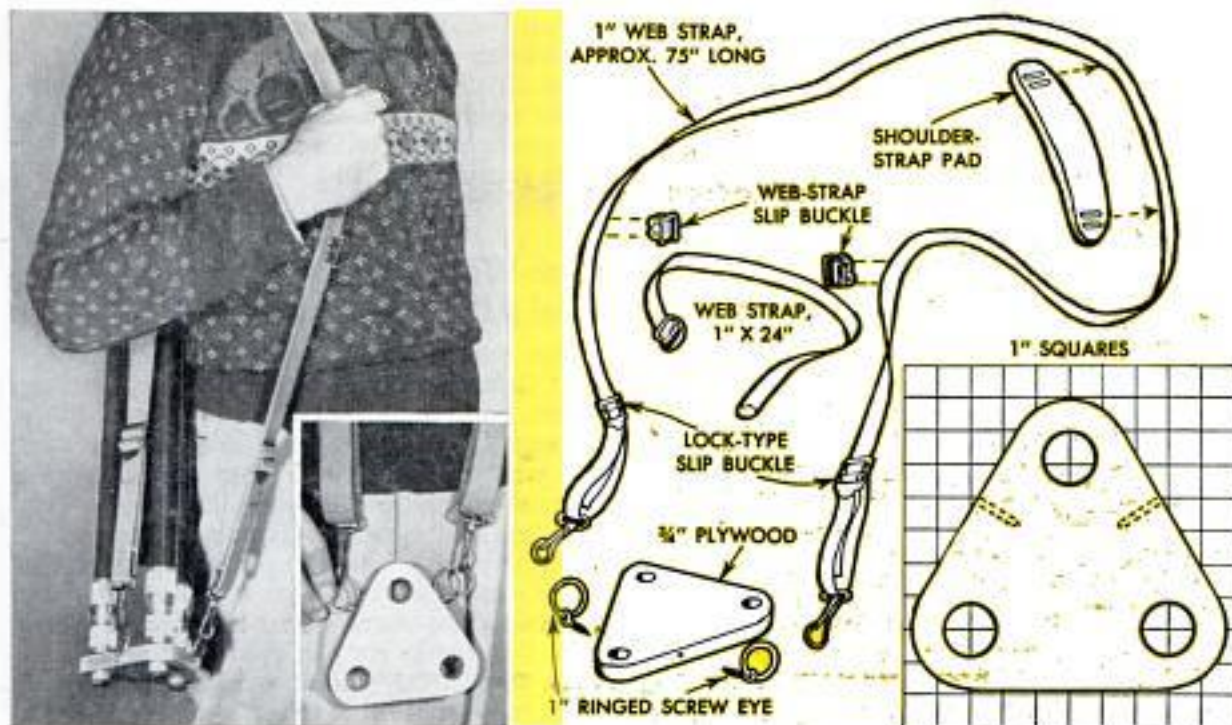


### A Key to Buying and Using:

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# Shoulder-Strap TRIPOD CARRIER

By M. G. Winterton

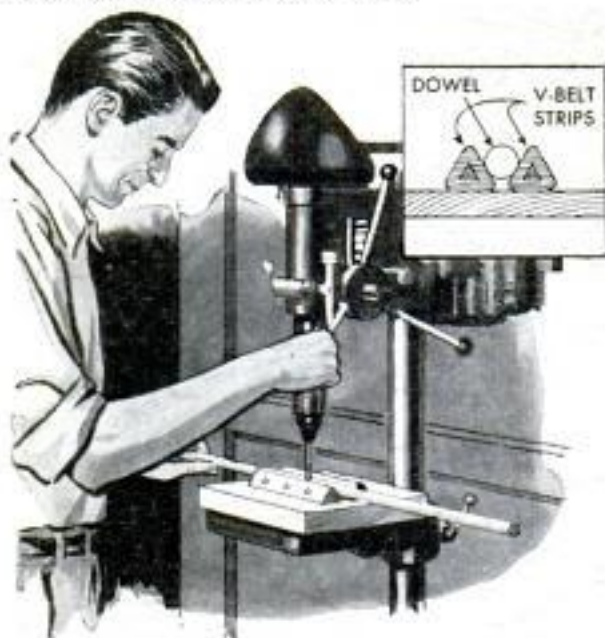
BESIDES PROVIDING a most convenient way of carrying a tripod and camera when out on a movie-making jaunt, this shoulder-strap carrier permits me to use my tripod as a unipod in a jiffy for on-the-spot shots of sporting events which demand steady camera support. In addition, I can quickly change over from a unipod to an extended tripod by merely lifting the tripod out of the carrier.

The triangular-shaped carrier is cut from a scrap of  $\frac{3}{4}$ -in. plywood. While a pattern is given, actual over-all size must be determined by the tripod at hand. Since mine has tubular legs I drilled holes for the legs, but if you happen to have a wooden tripod with square legs, square openings can be jigsawed in the carrier. In either case, the spacing of the holes should be such as to permit a slight spread to the tripod for better stability. The web strap material and fittings can be purchased at most sporting-goods stores. The drawing shows what the complete strap assembly looks like, two slip buckles being attached to the main strap for a short safety strap which is used to prevent the camera from tipping forward when used as a unipod. To tote the tripod from the shoulder the safety strap is removed from its unipod position and used to lash the carrying strap to the tripod head, thereby forming a shoulder sling as shown in the photo above. The inset photo shows how the carrier lies flat against the body when the tripod is removed.



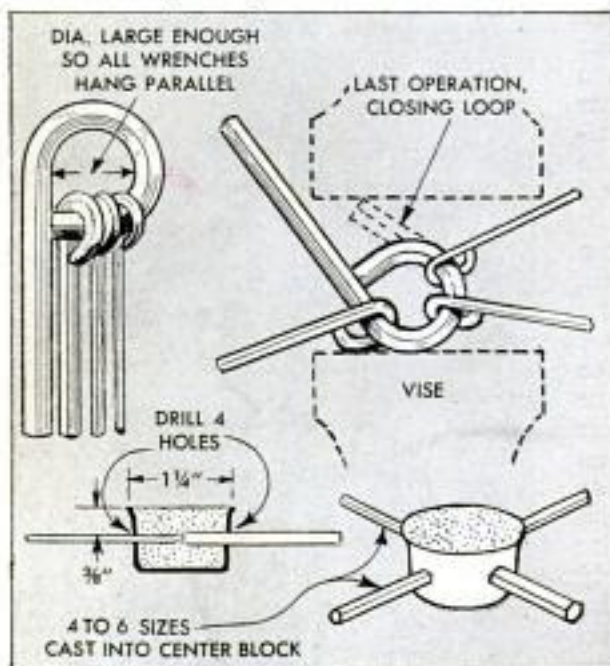
Suspended from the neck, the carrier provides stable support for the tripod when used as a unipod. The use of the tripod head for both upward and downward angles is retained by merely reversing the direction of tripod head

## Holder for Drilling Dowels Made of V-Belt Sections



An ideal method of holding dowels while drilling them on a drill press is to use a "V-block" made by tacking sections of V-belt to a wooden block. The material of the belt provides sufficient friction to prevent the dowels from rotating.

## Coupled Socket-Head Wrenches Not Easily Misplaced

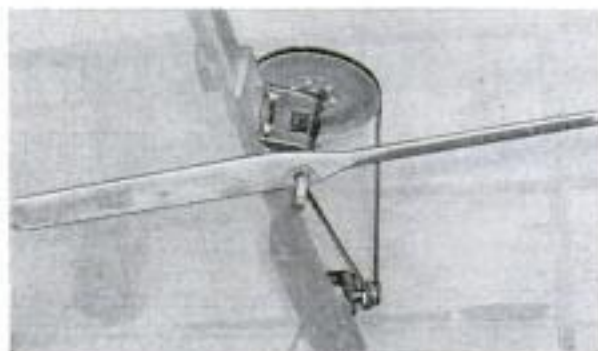


Simplify picking the right size socket-head wrench and prevent losing them by keeping the wrenches together with one of two methods. The first method is to anneal the end of each wrench, except the largest size, and bend a loop in the end. Finally,

anneal the largest wrench, slip the loops of the others over it, then bend a loop to enclose all the wrenches as indicated in the upper details. A second method of keeping the wrenches together is to insert them into holes punched in the side of a deep bottle cap and fill the cap with molten lead.

## Farm-Workshop Overhead Fan Used All Year Around

The overhead fan in this farm shop is used in all seasons to carry away welding fumes, and in summer circulates the air to keep the building cool. The blade of the fan, which was carved from a 6-ft. length of straight-grained lumber, is mounted on an arbor bolted vertically to a ceiling beam. A large pulley on the opposite end of the arbor combines with a small pulley on the fractional-horsepower electric motor to turn the blade at fairly slow speed. The large size of the blade permits it to move a considerable volume of air at slower speed.



## Tape Keeps Spark Plugs in Order When Removed From Engine

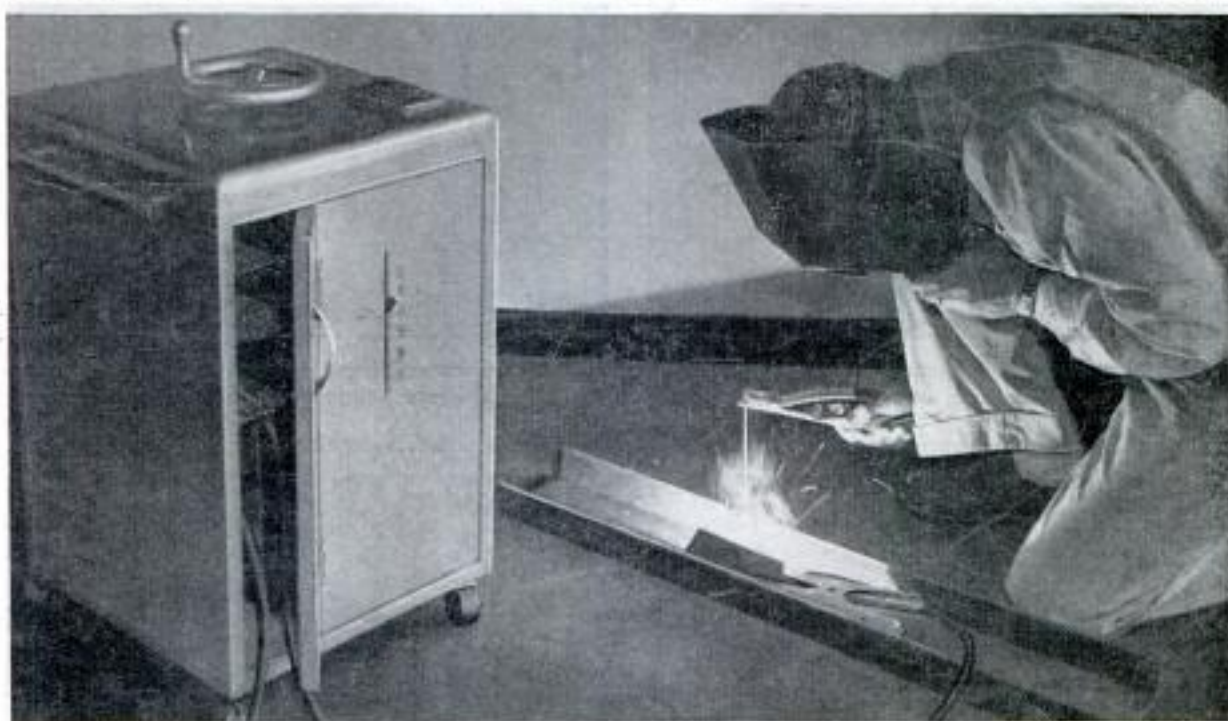
One mechanic uses a wide strip of masking tape to hold spark plugs taken from an engine being checked. As they are removed, the plugs are laid on the strip in correct order. The free end of the tape strip then is placed across the plugs and pressed around them so they are held securely. Held in the tape "package" each plug is readily checked to determine the condition of its particular cylinder. As an example, an oil-fouled plug might indicate a cracked piston or broken ring land.





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# Shop Notes



1. Shop-built welder constructed entirely with hand tools works as well as many manufactured products

## ARC WELDER FOR HOME SHOP

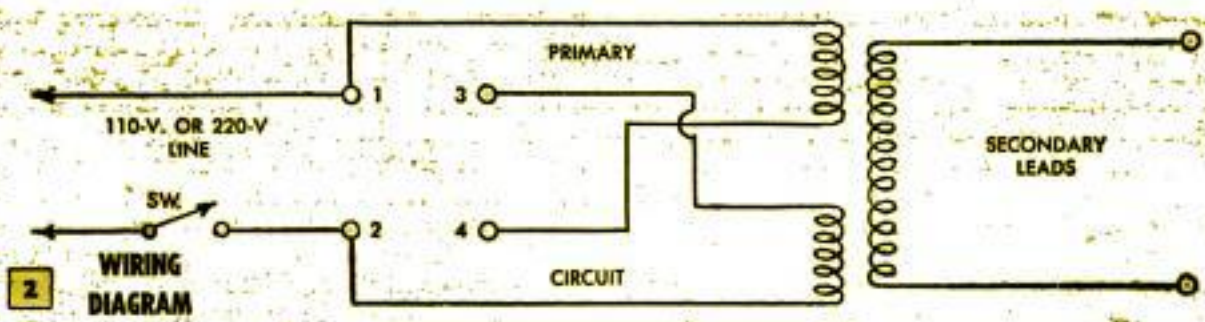
By J. W. Wilson and M. C. Anderson

THERE IS NOTHING like an arc welder for assembling metalworking projects quickly and permanently. Besides saving many tedious hours of drilling and bolting, welding produces a more rigid assembly than other methods of construction. Also, when equipped with a carbon-arc tip, an electric welder will supply local heating for bending metals, brazing and soldering.

The electric-arc welder described in this article is especially designed for home-workshop construction, being made of materials available in most localities, and requiring only hand tools to make it. Welding, which is required in the later stages of

assembly, can be done by using the semi-finished welder itself.

The primary source of material for the welder is a discarded tank-type, utility-pole transformer. The one used in the original welder is shown in Figs. 3 and 4, after being removed from its oil-filled tank. This transformer is a General Electric 5 kva. Get a transformer of this type, if you can, since the wire sizes on both primary and secondary windings are usable for the welder. Such transformers usually are not difficult to find, because they are considered obsolete by most power companies and are being replaced by newer types.



2 WIRING DIAGRAM



3. Pole transformer is removed from its oil-filled tank and distribution ring and wire leads discarded



4. Remove outer "legs" of transformer. Use knife blade to separate L-shaped laminations as indicated

5. Unwind wire from transformer coil onto reel made from scrap wood. Turntables simplify this operation



When selecting a transformer, pull the lid off the tank and check the wire size and type of core. Later-model transformers are built with spiral-wound cores, or with cores other than the L-shaped sections used in the 5 kva. Assembly of the welder transformer is much simpler with the L-shaped sections, although, with some modifications, other types can be used. Wire size is important, because the 20-ga. wire wound on the primary coils of some transformers is too small to be used in the welder coils.

Begin construction of the welder by removing the transformer from its tank and discarding the lead distribution ring and core clamps. Next, remove the outer legs of the transformer, as shown in Fig. 4, prying apart with a knife to aid disassembly. Now unwind the coil wire onto a reel, Fig. 5. If there are two sizes of wire in the transformer, use a separate reel for each size. The reels can be assembled from scrap wood, since they will be used only once. Also, two improvised turntables will help in the unwinding and unreeling operation.

The first step in making the coils for the welder is to make a coil form as shown in Fig. 20. A form with the dimensions given

will accept the correct amount of 10-ga. wire. Note that the core of the form is cut diagonally so the form can be disassembled for removal of the finished coil, Figs. 8 and 20.

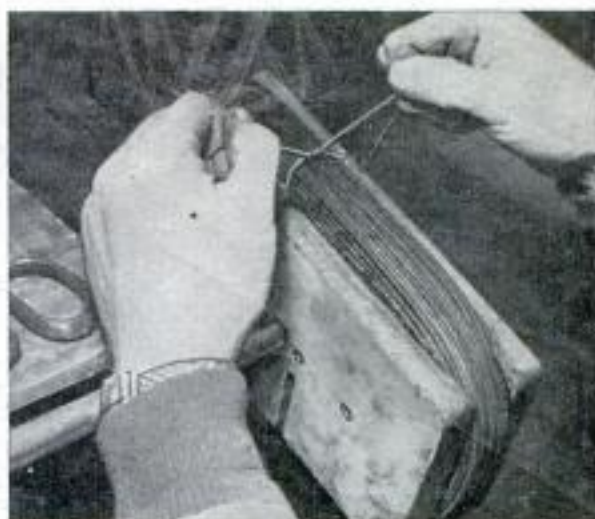
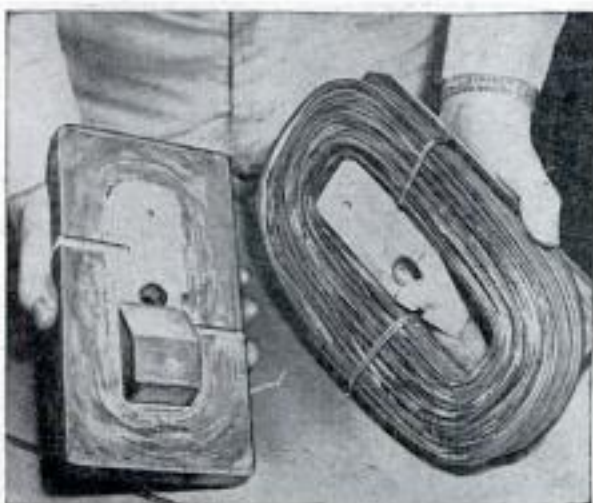
Wind the two primary coils, using two strands of 10-ga. wire. The two 10-ga. wires provide the equivalent of one 8-ga. wire. If you are using a size of wire other than 10 ga., check the chart on page 211 to determine the number of strands required to equal 8-ga. wire. The single secondary coil is wound with five strands of 10-ga. wire, or any equivalent of 3-ga. wire.

Figs. 6, 7, 8 and 9 show the steps in winding the coils. Cut strips of heavy paper just wide enough to fit between the sides of the coil form and wrap three layers of the paper on the core of the form before beginning to wrap the coil, Fig. 6. Pull about 6 in. of wire through the hole in the coil form to provide a lead wire, and wrap it heavily with tape or fit it with an insulating sleeve. Begin winding the coil, keeping the wire turns as close together as possible. Tape any cracks that appear in the wire insulation. When the first layer of turns is complete, cover it with a strip



**6.** Wrap a strip of heavy paper around each layer of turns, shellac the paper, then wind another layer

**8.** One bolt holds halves of coil form together, so it can be disassembled to permit removing finished coil



**7.** When coil winding is completed, tie coil as shown, slipping string through slots sawed in coil form

**9.** Finished coils are saturated with shellac or insulation varnish, then wrapped with plastic tape



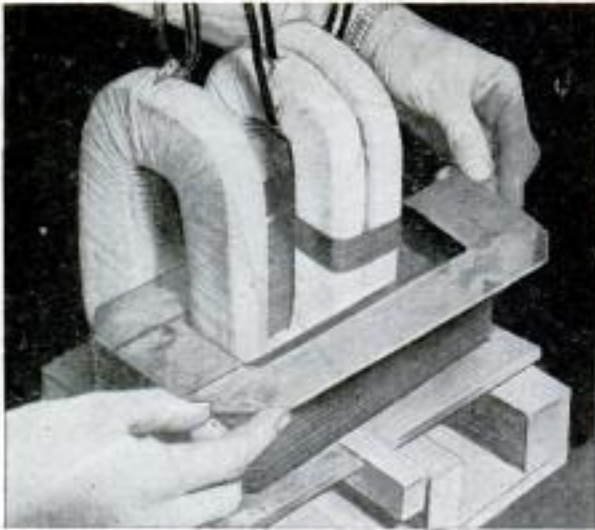
of paper, shellac the paper, then continue on to the next layer. Repeat the operation until 64 turns of wire are in the coil. Tie the coil through the slots in the coil form, Fig. 7, cut off the wire, leaving a 6-in. lead, and remove the coil from the form, Fig. 8. Both primary coils have 64 turns of wire equivalent to 8-ga. wire; the single secondary coil has 28 turns of wire equivalent to 3-ga. The finished coils should be saturated with shellac or insulating varnish and, when dry, wrapped with plastic electrical tape, Fig. 9.

With the coils finished you are ready to build the transformer by stacking the core. Make a jig to support the three coils while doing it. The jig, Fig. 10, is simply three blocks nailed to a piece of plywood. Light crosspieces support the core as it is stacked. In most transformers of the type used to build the welder, the core is made of laminations having legs of different widths. Use only the wide laminations for the welder. Begin stacking the core, alternating the

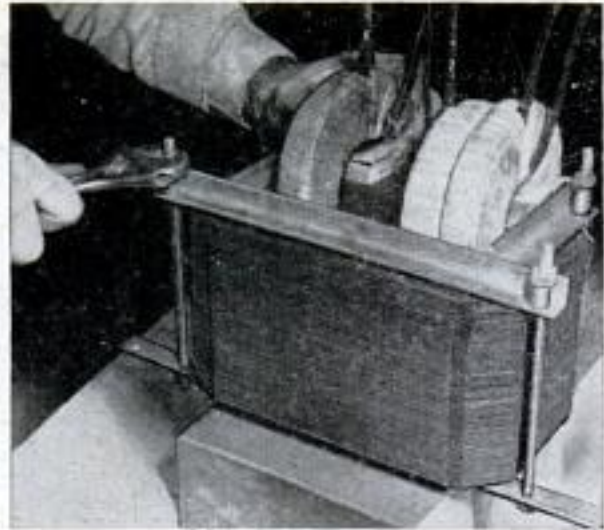
L-shaped laminations to produce a rectangular core, Figs. 10 and 18. The height of the finished core is 6 in., which requires that the loose stack be slightly higher. Angle-steel frames are used to clamp the core, Fig. 11. Four welded joints are required in the frames. They can be welded by wiring the welding transformer as indicated in Fig. 2, and using the control slug manually to control the welding current, Fig. 13.

The control slug is made by stacking transformer laminations to a thickness of 1 in. The slug then is wound with plastic and cotton tape and shellacked. The two outside laminations are cut longer than the others to permit pinning the slug to the adjusting mechanism, Fig. 15. Be sure the slug is small enough to slide freely down inside the welding transformer, Fig. 21.

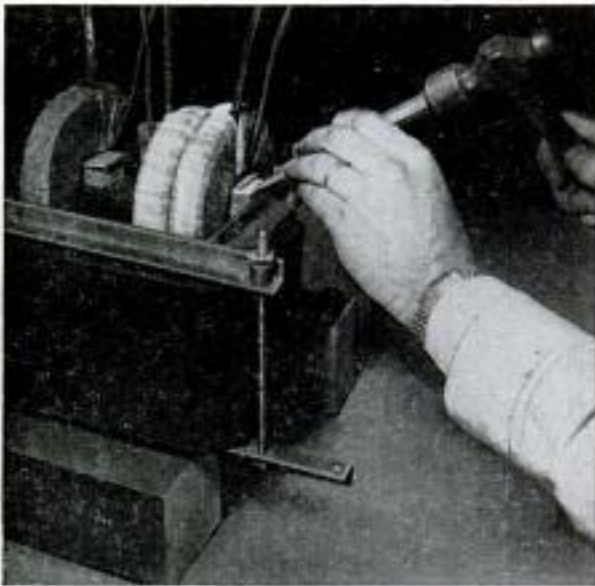
If the welder is to be used on 110 volts, connect terminals 1 and 3 together, and 2 and 4 together by copper bars. If 220 volts are used, connect the three coils in series



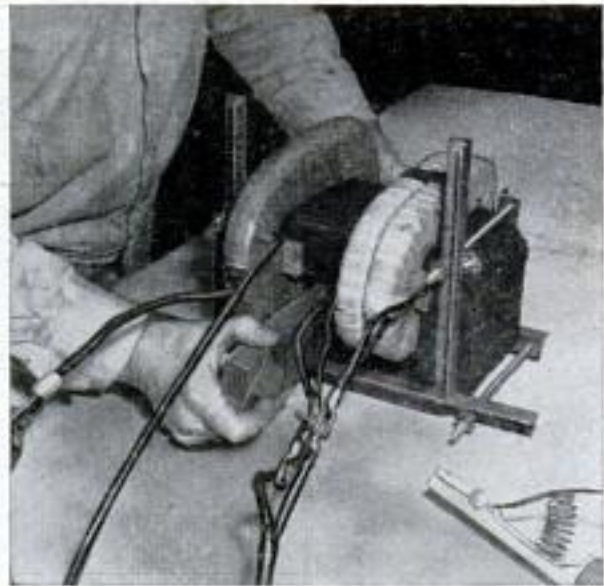
**10.** Three coils are held upright and in position by jig, while core laminations are stacked around them



**11.** Core clamps are tightened snugly, then laminations are tapped flush and clamps pulled down tight



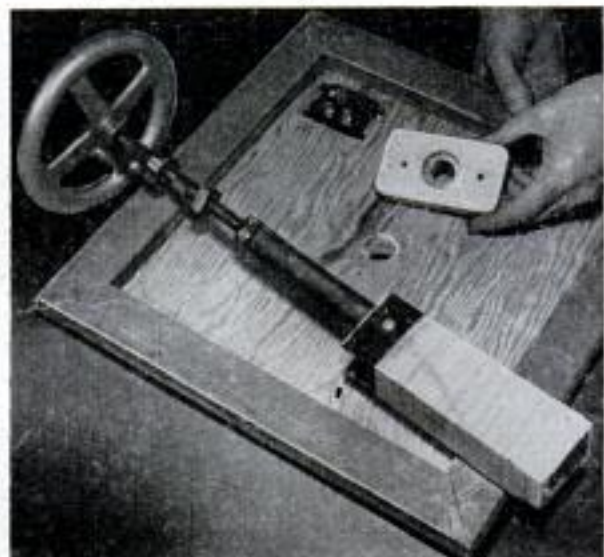
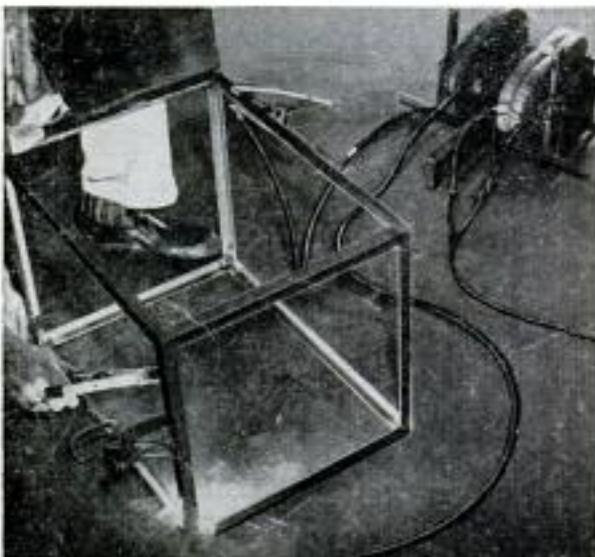
**12.** Hardwood wedges are driven between coils and core, paper or fiber strips protect insulation on coils

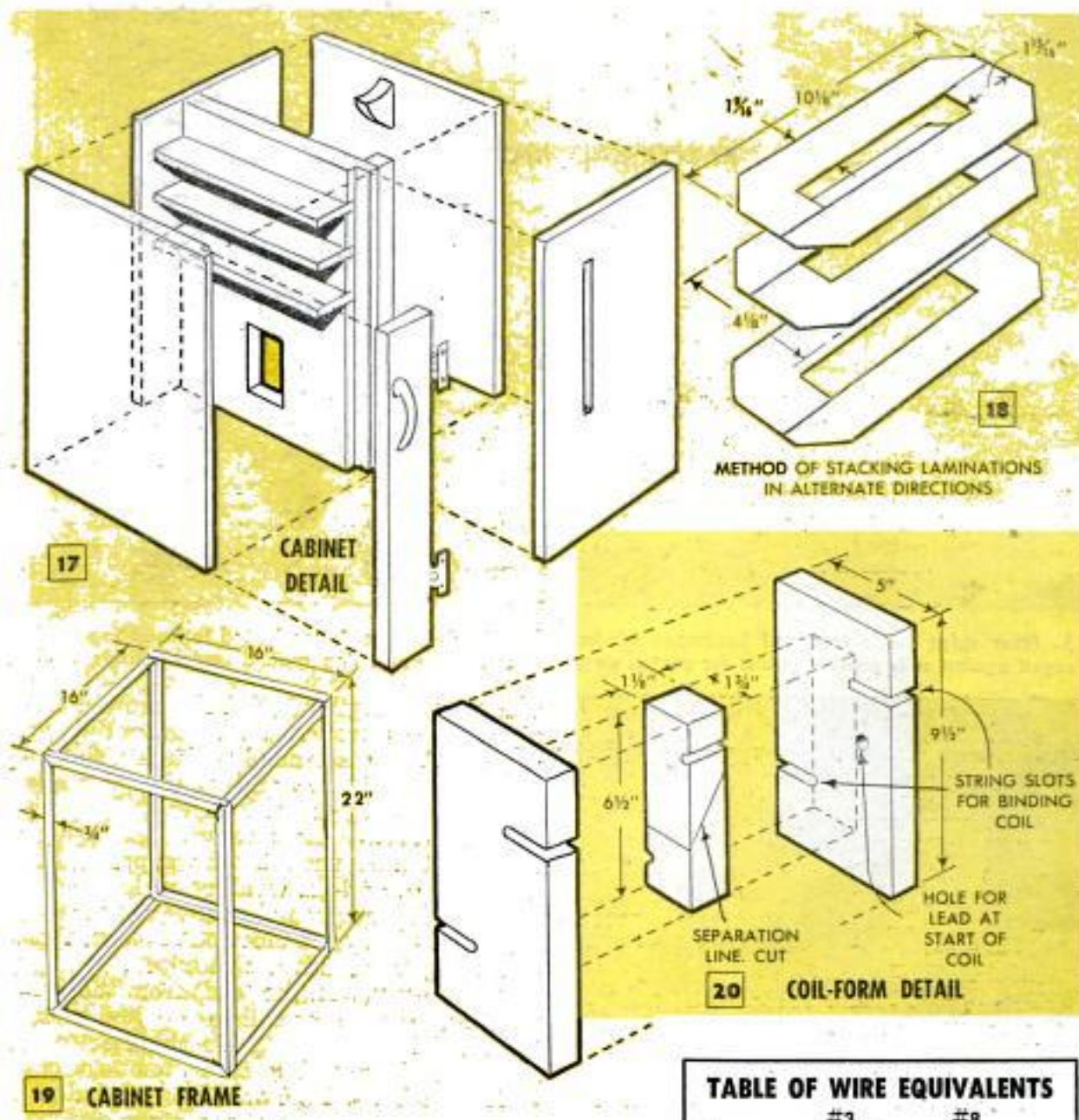


**13.** Semifinished welder can be used for welding by inserting control slug and operating it manually

**14.** "Building its own house," the welder is used to weld the joints of the angle-steel cabinet frame

**15.** Counterbored block screwed to underside of cabinet top supports bearing for control mechanism





by connecting only terminals 3 and 4 together.

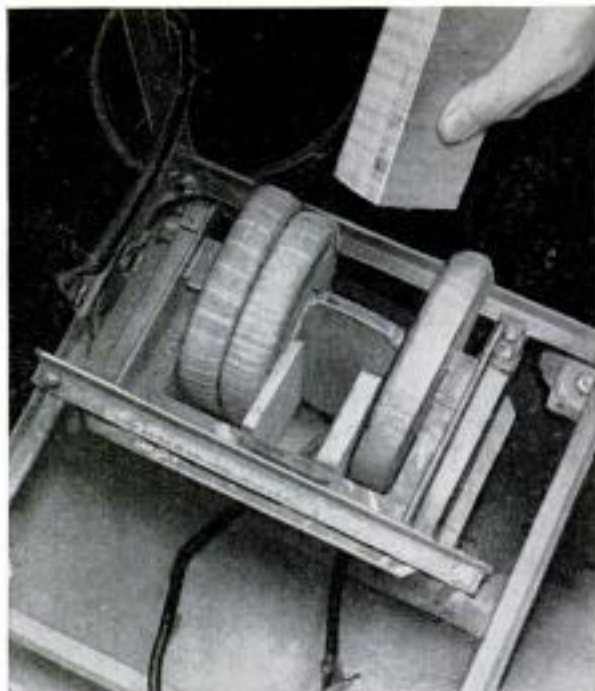
After the clamping frames are welded together, fit threaded rods at the corners, Fig. 11, and draw the frames together snugly. Gently tap all the laminations of the core until they are flush, then tighten the holding rods firmly. After the core is clamped, wedge the coils in place with hardwood wedges, Fig. 12. Use cardboard or fiber spacers between the wedges and coils to prevent damaging insulation.

Fiber spacers also are cemented to the long sides of the inside of the transformer core, Fig. 21, and wedged in place with hardwood blocks. The blocks and spacers act as guides for the control slug. The adjusting mechanism for the control slug is shown in Fig. 24. A length of threaded rod turns in a nut welded to the end of a length of pipe which is pinned to the control slug. As the rod turns into the nut it raises or lowers the slug. A ball bearing recessed into the welder-cabinet top supports the mechanism.

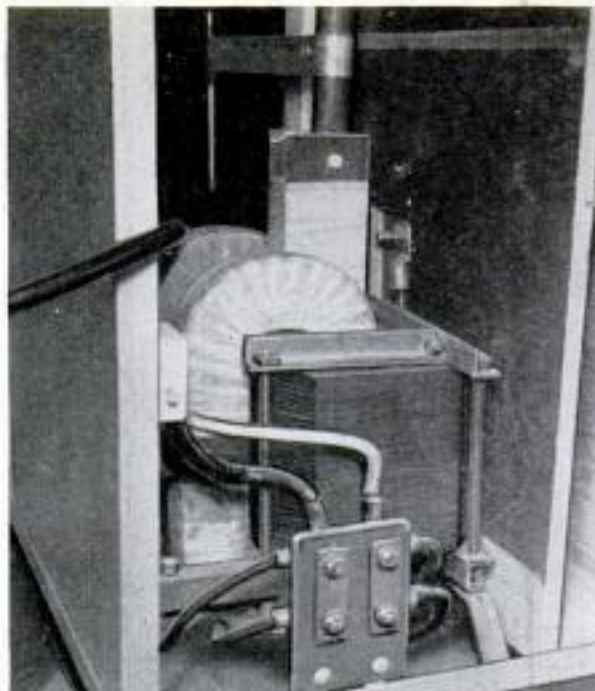
The welder cabinet is built around an angle-steel frame, Figs. 14 and 19. Fig. 17 shows the general

TABLE OF WIRE EQUIVALENTS		
	#3	#8
# 6	2 strands	—
# 7	3 strands	—
# 8	4 strands	1 strand
# 9	4 strands	2 strands
#10	5 strands	2 strands
#11	7 strands	2 strands
#12	8 strands	3 strands
#13	10 strands	3 strands
#14	13 strands	4 strands
#15	16 strands	5 strands
#16	20 strands	7 strands

arrangement of the cabinet. The 3/4-in.-plywood cabinet top is fitted with an apron of 2 x 2s. The welding transformer is mounted inside the cabinet on two steel flats welded to the angle-steel frame. Holes are drilled in the flats to receive the ends of the core-clamping rods. An indicator for the welder can be made by



**21.** Fiber strips inside core and hardwood blocks wedged against coils provide guides for control slug



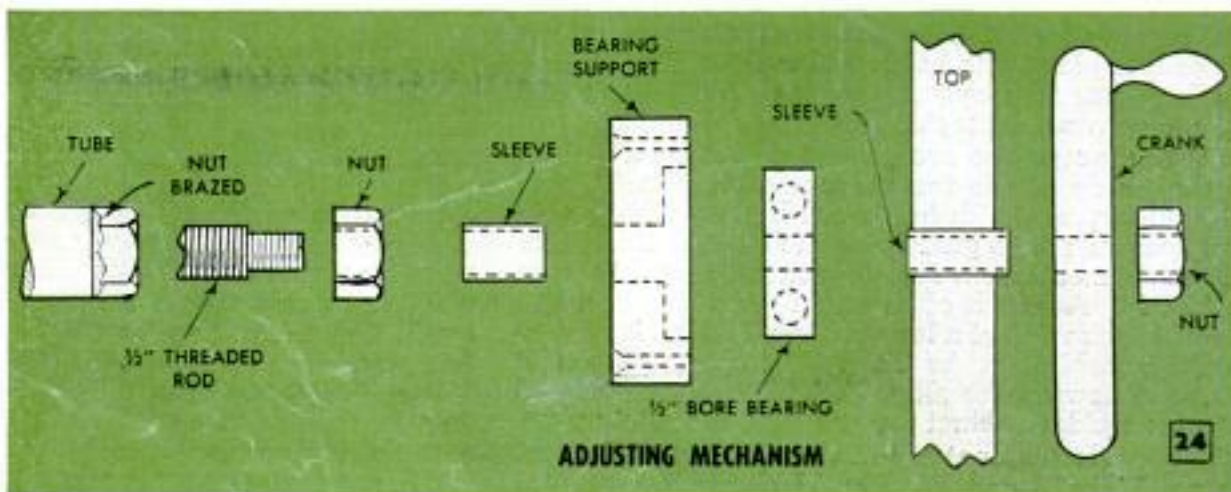
**22.** Leads from coils are bolted to insulating block to simplify connecting ground and electrode leads



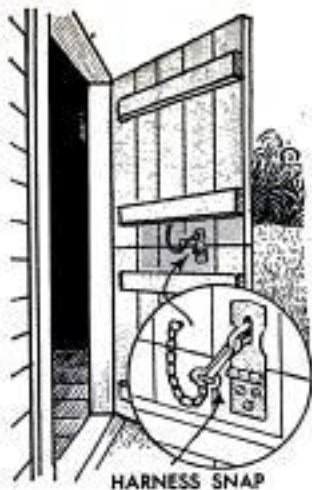
**23.** Decal numbers equally spaced along indicator slot permit judging relative heat at any setting

clamping a length of steel flat around the pipe of the control slug. The end of the flat is pointed, and extended through a slot in the cabinet, Figs. 22 and 23. Decal numbers are equally spaced along the slot to indicate relative heat ranges. A heavy-duty switch is used in the supply line. About 30 ft. of 4-ga. welding cable will be required for the ground and welding leads. A ground clamp and electrode holder, plus a welding mask also are required.

For convenience, the leads from the primary and secondary coils are bolted to an insulated block, Fig. 22, so the electrode and ground wires can be bolted to them with brass bolts. Pipe or tubing is used for cabinet handles, and the casters can be welded or bolted to the cabinet frame. The material used to cover the welder-cabinet frame can be either hardboard or sheet metal as desired. ★★★



## Snap Locks Hasp and Staple To Hold Door Halves Together



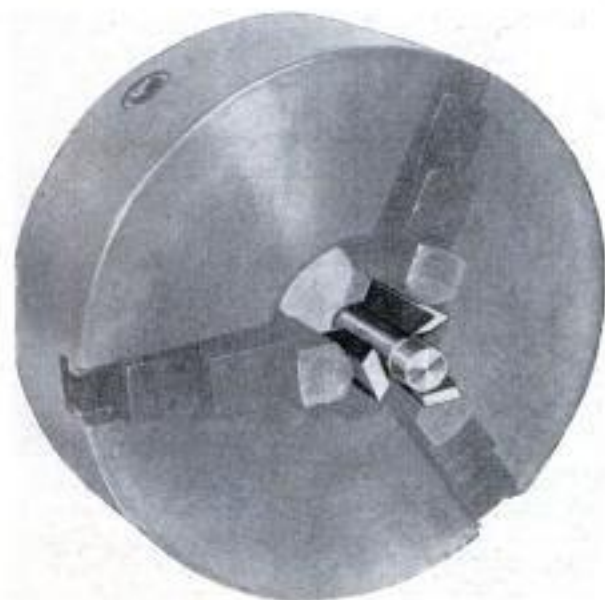
HARNES SNAP

Because a one-piece door sometimes is more convenient to use, one farmer locks the upper and lower halves of a two-piece barn door together with a hasp and staple. The hasp is screwed to the lower half of the door so it drops out of the way when not in use. A harness snap used

to lock the hasp to the staple is hung on a length of chain screwed to the upper half of the door as indicated in the detail.

## Chamfering Edges of Tubing With Special Lathe Setup

Chamfering the outer edge of the ends of several hundred lengths of tubing was done at the rate of several a minute by using a lathe setup consisting of three tool bits and a pilot chucked in a three-jaw chuck. The pilot is a length of steel round shouldered to fit snugly inside the tubing. Each of the tool bits is ground to a 45-deg. angle with considerable clearance to assure that the cutting edges of the bits contact the work piece. Chamfering different sizes of tubing requires only changing pilot sizes. The same tool bits are used for all diameters. To use the setup, the operator holds a length of tubing in his hand, slips it over the pilot and forces it lightly against the rotating tool bits.



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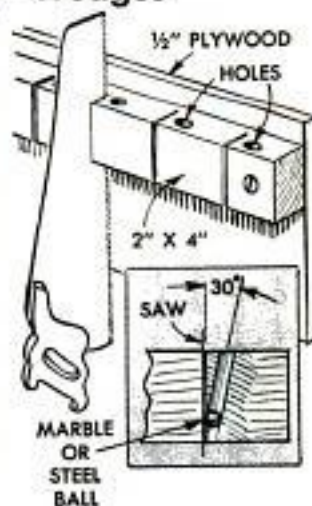


## Automatic Feeder for Turkeys Reduces Time and Labor

A minimum of time and labor is required to supply mash to growing turkeys when this automatic mash feeder is used. Controlled by a timer, the feeder discharges mash onto a conveyor system that runs in a narrow metal trough the length of the turkey house. The long trough provides more eating space for the birds, yet requires less floor space than a hand-filled trough. Depending on the number of birds in the house, the automatic feeder can be set to discharge more or less feed each hour.

## Handsaws Held in Slotted Rack By "Self Locking" Wedges

Handsaws are locked in this rack simply by slipping the blades into the slots and pulling downward. The rack is a 2 x 4 in which slots are sawed 1 in. deep. Holes then are drilled through to intersect the slots. Marbles or steel balls dropped into each hole act as wedges.



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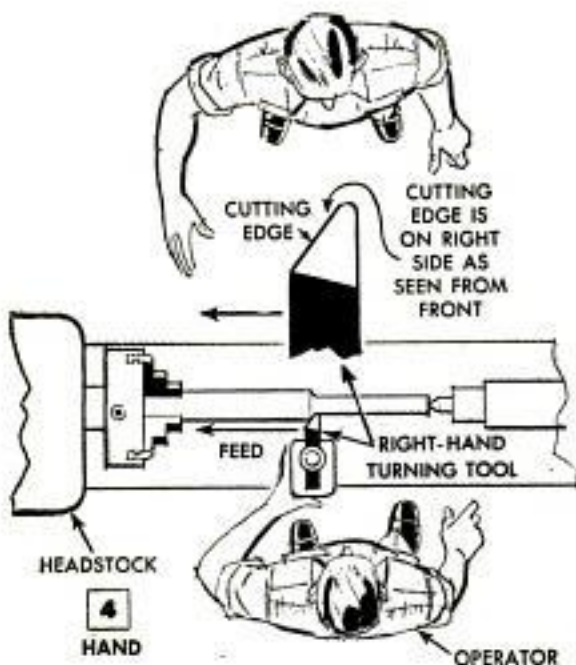
SN 57

X385



# GRINDING LATHE TOOLS

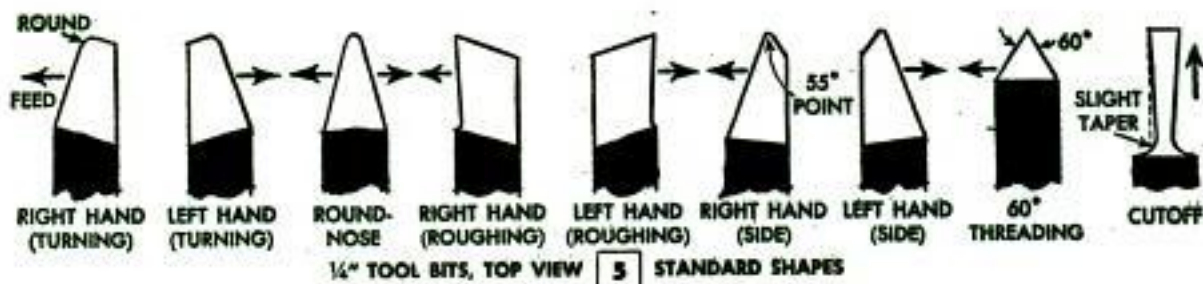
By Sam Brown



ALTHOUGH grinding lathe tools looks complicated to the beginner, they are perhaps the easiest of all cutting tools to sharpen. You can shape them freehand and, as long as enough clearance is allowed to prevent rubbing, almost any kind of shape will cut and do satisfactory work.

One of the first things learned about lathe tools is that all cutters are mounted "on center," as in Fig. 6. It is easy to locate any tool bit at the right height by using a height gauge made from a scrap of metal, Fig. 1. Some operators like special tool-post rings, Figs. 2 and 3, to automatically locate often-used tools at the right height. Still another way to set the tool height is by reference to a line scribed on the tailstock ram, Fig. 8.

Lathe tools are named according to their application and profile shape. Some standard shapes are shown in Fig. 5. The "hand" is called from a front view of the cutter, Fig. 4.

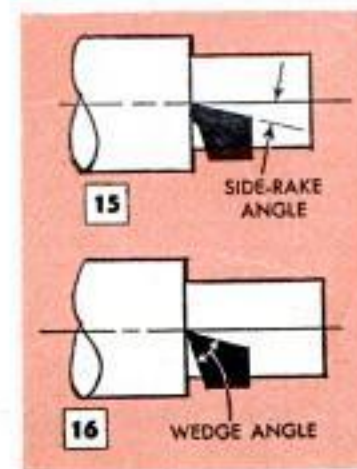
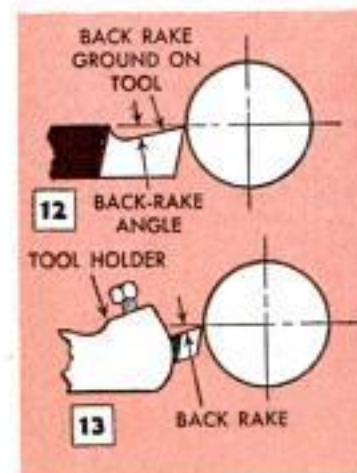
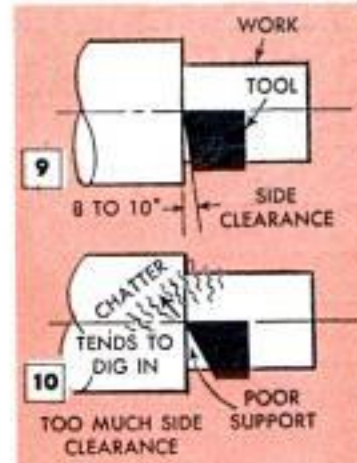
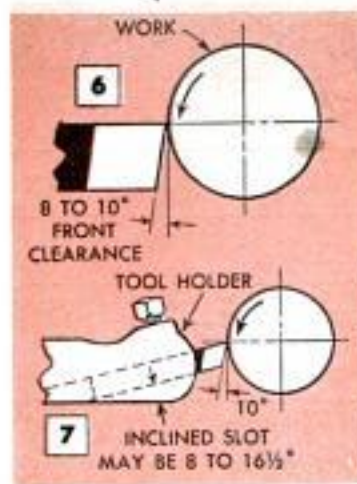




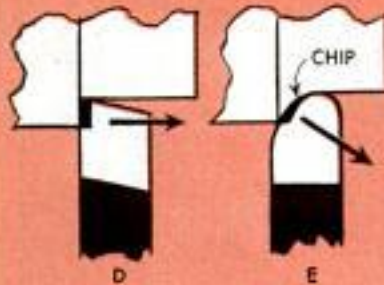
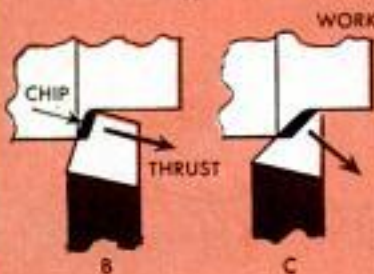
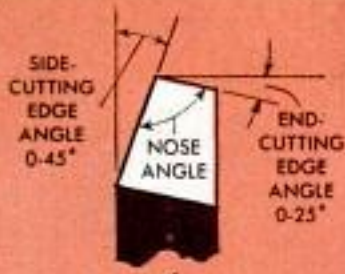
The front and side clearances of a lathe tool are satisfactory if both are 10 deg. although variations are sometimes useful. The front clearance is measured from a tangent line at the point of contact, Fig. 6. Side clearance, Figs. 9 and 10, is easy to understand. Back rake and side rake, Figs. 12 to 17, give the tool a certain wedge angle, which should be blunt enough to cut without dulling, yet not require excessive pressure. A back rake of about 15 deg. is a good value for turning steel. If you use a toolholder with a 15-deg. inclined slot, Fig. 13, the back rake is obtained without grinding the cutter. Large cutters mounted in an angle-type milling attachment can be given any desired amount of back rake by tilting the attachment, Fig. 14.

Exact adherence to any specified rake angle is not necessary since tools function quite well over a wide range of angles. An angle gauge can be made or purchased, Figs. 11 and 20, and is a useful aid for the beginner. Some manufactured gauges of this type have one side at 20 deg. to be used for front clearance, as shown by dotted line in Fig. 20. This large front clearance angle is for use in connection with a tool setting 5 deg. above center as in Figs. 21 and 22.

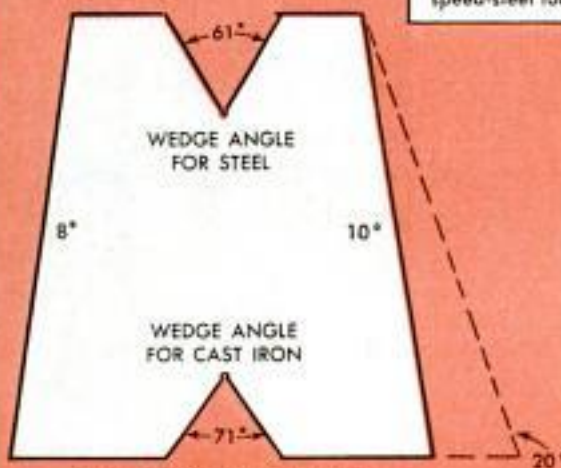
Edge and end-cutting angles, Fig. 19, are not too important but are of interest in that they reflect the favored shapes used by different turners. Some operators make extensive use of the plain square shape with zero side-edge angle, D. However, this is a rough cutter and should be confined to roughing operations. The conventional shape of a turning tool is shown in A, with side-edge angle about 20 deg. and end-edge about 15 deg. This cutter puts most of the thrust lengthwise with the work, B, with just enough back thrust to hold the slack



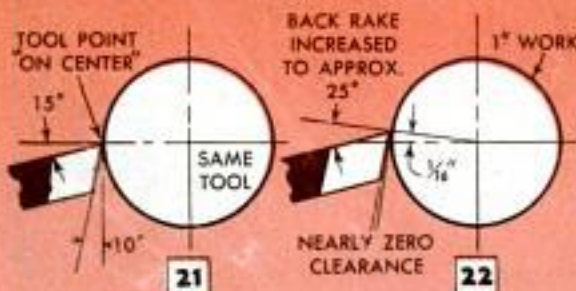
## 18 TOOL ANGLES AND WORK SPEEDS



19 EDGE AND END-CUTTING ANGLES



20 TOOL-ANGLE GAUGE (APPROX. FULL SIZE)



21 22 EFFECT OF HEIGHT ON RAKE AND CLEARANCE

MATERIAL	FRONT CLEARANCE	SIDE CLEARANCE	BACK RAKE	SIDE RAKE	F.P.M. SPEED
STEEL (MILD COLD ROLLED)	8-10°	8-10°	15°	20°	80-120
STEEL (MEDIUM HARD)	8-10°	8°	12°	14°	60-100
STEEL (HARD AND TOUGH)	8-10°	8°	10°	12°	40-60
CAST IRON	8°	8°	5°	12-15°	50-80
MAGNESIUM	10°	10°	10°	5°	150 AND UP
ALUMINUM	8-10°	8-10°	30-40°	10-20°	200 AND UP
COPPER (FREE MACHINING)	8-10°	5-10°	0°	5-10°	100-200
COPPER (TOUGH)	8-15°	10°	10°	20°	75-150
BRASS (FREE CUTTING)	8°	2-8°	0°	0-5°	120 AND UP
BRONZE (PHOSPHOR)	10°	10°	15°	20°	60-120
FIBER	15°	12°	0°	0°	80
PLASTICS (THERMO-SETTING)	10°	10°	0°	0°	100 AND UP
PLASTICS (THERMO-PLASTIC)	10°	10°	10°	15°	150 OR LESS

Angles are measured from true horizontal and vertical planes of work and are for tools set "on center." Work speeds in feet per minute (F.P.M.) are for high-speed-steel tools.

in the cross-feed screw. Excessive drag angles, C, are favored by many turners. A cutter like this cuts smoothly but leaves a large amount of uncut metal when working to a shoulder. The round edge tool, E, does excellent finishing.

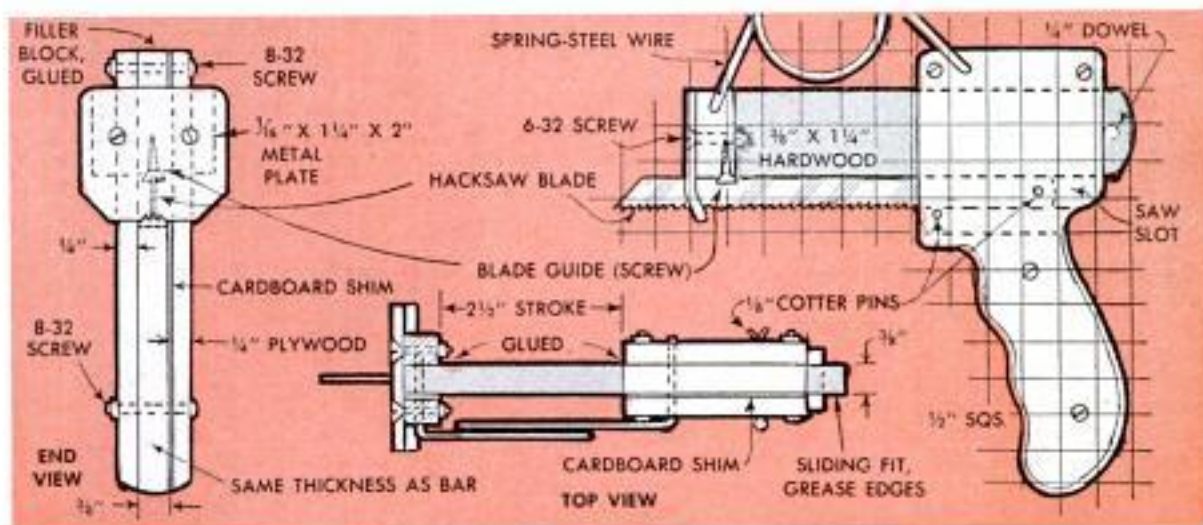
The actual grinding of a lathe tool is simple. It should be held in the toolholder for convenient handling and can be ground on either the side or rim of the wheel as desired. High-speed steel can be ground either wet or dry, the best home-shop practice being dry grinding, avoiding overheating and letting the tool cool in air, not water. The life of a tool is greatly prolonged if the cutting edge and top surface are honed. Although the table, Fig. 18, gives specific angles, remember that 10 deg. front and side clearance with a modest amount of back and side rake will produce a satisfactory tool. However, back rake and side rake vary considerably, as shown by the varying degrees of angle given in the chart. Lathe speed also is a definite factor in proper cutting. A tool will quickly become dulled and, in some cases, damaged, if lathe speed is too high. At the opposite extreme, a very slow speed used on some materials rapidly dulls the tool. ★ ★ ★

SN 57

# HAND-POWERED SABER SAW

Better and faster than a keyhole saw on straight or curved cuts, the hand-powered saber saw's wide metal foot holds the blade perpendicular to the surface during the cut. The blade is driven on downstroke by pressure on the handle and the spring returns the handle to the up position when pressure is released. Close-fitting parts are necessary to smooth operation and to prevent kinking of the saw blade on the cutting stroke. Make the slide, filler blocks and handle from hardwood or plywood.

Carl S. Bates, Chicago.



## Toothpaste Tubes Reused for Storage of Special Lubricants

Special distributor lubricants, Prussian blue and other similar materials that are used infrequently and in small quantities can be stored in empty toothpaste or shaving-cream tubes. The tubes are unrolled and the bottoms cut off. Compressed air can

be used to "pop" them open. The inside of the tube then is washed clean and thoroughly dried. Material which is to be stored in the tube now is ladled in through the cutoff bottom. The bottom then is flanged over and the screw cap turned on tightly.



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## Brush-Holding Solvent Container

A few cuts with tin snips on an empty tin can will permit converting it to a brush-holding container for paint thinner or brush cleaner. Bend the cut portions of the can as indicated, so they grip the brush by the handle or ferrule. — Ken Murray, Colon, Mich.

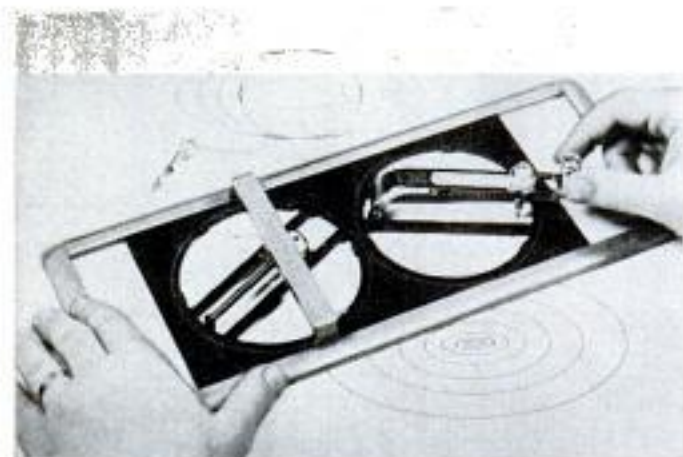


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# SHOPPING FOR TOOLS

**MASONRY HOLE-CUTTING MACHINE** is fitted with a self-sharpening diamond drill bit for cutting holes through hard aggregate from  $\frac{1}{2}$  to 10 in. in dia. and up to 18 in. deep. Deeper holes are possible by fitting an extension shaft on the drill bit. Average drilling time for a 6-in. hole to a depth of 1 ft. is less than two minutes. Available in two models with 1 and 2-hp. motors

Metro Drilling Machines, Inc., 110 20th St., N.W., Washington 6, D.C.

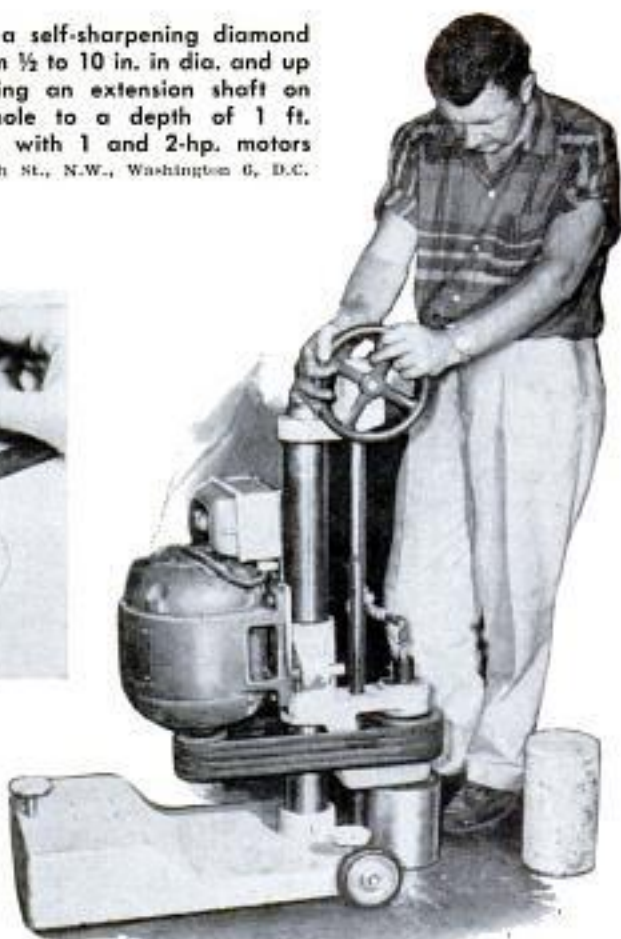
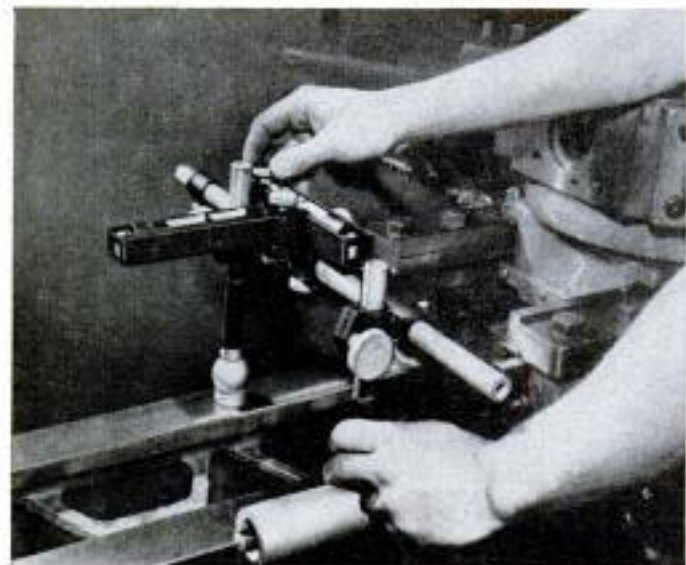


**DRAFTSMAN'S ELLIPSOGRAPH** makes quick work of drawing ellipses of any desired size and degree. Eliminates use of templates and saves hours of time on jobs where it is necessary to transpose orthographic flat plans to pictorial presentations. No mathematical calculations are necessary as self-calculating charts are included for all average ellipse requirements. Comes complete with stylus

Fowler Engineering, 1109 Maple Street, Whittier 2, Calif.

**TOOL ALIGNER** is designed to measure parallel, horizontal and vertical alignment in one setting. Comes complete with shafts which provide mountings for dial indicators of standard types. Enables machinist to make a quick check of machine before setup in the toolroom and also out in the shop where critical accuracy is essential to production of the job according to specification. Also comes in handy and saves a lot of time when setting up new machines

King Instrument Co., 804 Northwest Bank Bldg., Minneapolis 2, Minn.



**SELF-HONING SAW BLADE** made especially for use in portable electric handsaws. Blade cuts in either direction, one set of teeth doing the cutting while the second set is honed to a new sharpness by contact with wood as blade passes through cut. Made from a special alloy steel and has rust-resistant, glare-free black finish. Available in sizes of 5 $\frac{3}{4}$ , 7 $\frac{1}{4}$  and 8 $\frac{1}{4}$  in. dia. Lasts four times as long as regular blades and saves the time usually spent sharpening

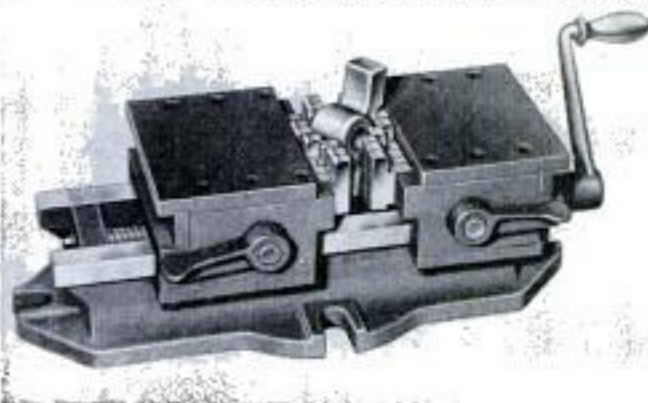
Skil Corp., 5035 Elston Ave., Chicago 30



**SIMPLIFIED SLIDE RULE** has been designed especially for beginners. Rule comes in two colors with magnifier for easy reading and the price includes carrying case and instruction book that covers details of its use  
C. V. Oro, 14906 Center Ave., Harvey, Ill.



**HAND SANDING BLOCK**, or "file," for shaping and finishing wood, plastics and metal comes with the abrasive triple-coated on chip-board tubes, both round and square. Tubes are 10 in. long and 1 in. in dia., or 1 in. square  
Diamilite Mfg. Co., 2301 Main St., Santa Monica, Calif.



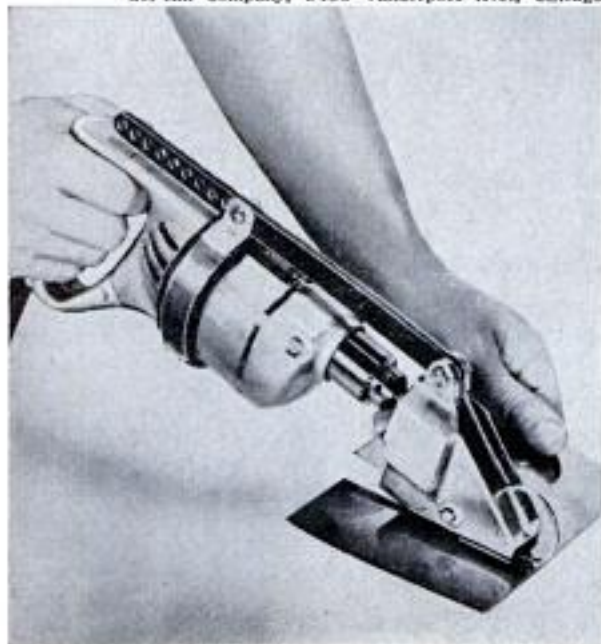
**VARIABLE-GRIP MACHINE VISE** eliminates jigs and fixtures normally used to hold work of irregular shape for drilling and machining operations. Base is designed with mounting pads to fit nearly all types of machine-tool tables  
American Positive Grip Vise Corp., Olive St., Williamansett, Mass.

**NAILING MACHINE** doubles the nailing speed of one man on such jobs as shingling and applying siding and flooring. Unit feeds and positions nails automatically, the mechanism being actuated by a light blow on plunger with soft hammer. Used in any position without undue fatigue on part of operator. Weighs 2 lb.  
Vera Products, 4041 Ridge Ave., Philadelphia 29, Pa.



**METAL SHEAR** comes as attachment for portable electric drill. Adjustable clamping device grips body of drill as pictured, aligning drill chuck with spindle which drives shear. Makes straight, curved cuts  
Ger-Am Company, 9450 Vanderpool Ave., Chicago

**SOLDERING MACHINE** operates in a manner similar to a spot welder, except that carbon tips contact work. Tips are clamped onto work by means of special hand-piece supplied. Specially designed for soldering tubing  
Wassco Electric Products Co., 126 W. Cass St., Joliet, Ill.

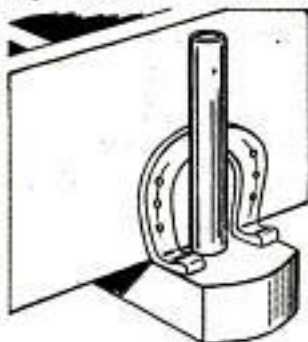




### Electrified Post Drill Has Idler "Clutch"

A post drill in one farm workshop was electrified by replacing the hand crank with a large V-belt pulley and driving it from a motor mounted above the drill. The V-belt is kept taut by an idler pulley mounted on a pivoted arm that is kept under tension by a screen-door spring. To stop the drill while the motor continues running, an extension on the idler shaft is used as a handle to pull the idler away and slacken the belt.

### Wagon Box Held in Place By Bent Horseshoes



Wooden bolster cleats under a wagon box are not always effective in preventing the box from sliding back and forth on the bolsters when the wagon is driven over rough ground. In such cases, rivet bent horseshoes to the sides of the wagon box as indicated so they will bear against the bolster stakes. The horseshoes will not interfere with removal of the box.

### Threading a Short Pipe Nipple

Threading a pipe nipple that is too short to be held in a vise is done easily by using a coupling and a length of pipe on which

an extra-long thread has been cut. The long thread permits turning about two thirds of the length of the coupling onto the pipe. When the short nipple, which has been threaded on one end before being cut, is turned into the coupling, it butts against the end of the pipe before the threads seat. After the short nipple has been threaded it can be removed with firm hand twist or a slight assist with an internal wrench.

R. S. Hart, Seattle, Wash.

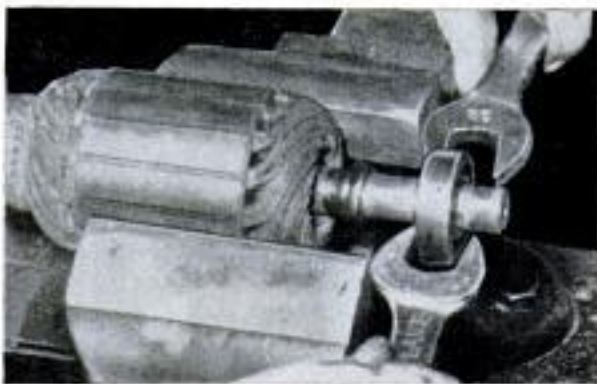
### Full-Length Coating on Matches Assures Moistureproofing

Dipping match heads in melted paraffin does not provide full protection against moisture, since water still can soak into the wood or paper stem, then travel up to the head. For thorough waterproofing, dip the matches so the stems are entirely coated. Paper matches so treated are not affected by perspiration when carried in a workman's pocket and similarly treated wooden matches are ideal for the outdoorsman.



### Improvised Ball-Bearing Puller

An emergency method of pulling a ball bearing from a shaft when a bearing puller is not available, is to use two open-end wrenches. The wrench jaws should be wide enough to straddle the bearing. The shaft—in this case an armature shaft from a generator—is gripped in a vise. As pictured, the ends of the jaws act as fulcrums for the wrenches, which then are used simultaneously as pry bars to move the bearing. If the bearing binds after being moved, the shaft may be relocated in the vise to permit taking another "bite" with the wrenches.



POPULAR MECHANICS

# Texaco Tips On Car Care



## Safety check your heater hose connections

If the rubber tubing between your heater and motor block is weak, it may break and splash your engine with the coolant and anti-freeze. Carefully inspect these hose connections. Interior linings on hoses three or four years old may have separated and the entire connection should be replaced. You'll find your heater will work better, too. Your nearby Texaco Dealer has a stock of new tubing on hand.

## Safeguard your chassis with proper lubrication

Marfak chassis lubrication protects your car against winter weather. It's tough and stretchy . . . clings tightly to points of wear and friction . . . won't squeeze out, jar out or wash out. So you get smooth, cushiony motoring for 1,000 miles or more. And remember — your car is lubricated by chart, not by chance. Today, drive in for longer lasting Marfak chassis lubrication. See your Texaco Dealer, the best friend your car has ever had.



**TEXACO DEALERS IN ALL 48 STATES**

*Texaco Products are also distributed in Canada and in Latin America*

THE  
TEXAS  
COMPANY

TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE, on TV Saturday nights, NBC.

## NEW DO-IT-YOURSELF KITS

➤ **Develop your own negatives . . .**

➤ **Print your own snapshots . . .**



### **. . . and do it the easy way with a Kodak Photo-Hobby Outfit**

It's a thrill to watch a blank sheet of paper change into a familiar snapshot scene right before your eyes. And with a Kodak Photo-Hobby Outfit that thrill can be *yours*.

If you're a beginner—you'll like the simple, compact, "no-fuss" versatility of the new do-it-yourself Photo-Hobby Outfits. With Velite Printing Paper, for instance, you don't even turn off the room lights in order to print sparkling snapshots. Just subdue the brightest lights, add water to three chemicals, and start printing. To develop

negatives you darken a room long enough to place a roll of exposed film in the developing tank, then switch on the lights. The chemicals do the rest.

If you're an experienced amateur—a Photo-Hobby Outfit can be a handy time-saver for making your "proofs." As for the extra pictures other members of the family want, here's a thought: With a Photo-Hobby Outfit, they can print their own snapshots and photo-greeting cards. Best of all, they'll enjoy doing it!

Now—read the details below.

### **New Kodak De Luxe Photo-Hobby Outfit**

**\$16.95**

**Similar Outfit with Printing  
Frame instead of Photo-  
Hobby Printer**

**\$9.95**



Here's what you get in this outfit—1. A Kodak Photo-Hobby Printer, Model A, with a built-in lamp socket (takes a 60-watt lamp for Velite Paper, or 15-watt lamps for other Kodak contact-printing papers); a hinged platen, red safety light, switch for controlling exposure time. 2. Kodacraft Printing Mask Set with openings to fit all popular-sized negatives. 3. Kodacraft Roll-Film Tank with two aprons for 127 and 620-120 film

sizes. 4. 16 ozs. liquid Kodak Versatol Developer. 5. 16 ozs. Kodafix Solution. 6. Six 8-oz. packets of Kodak Universal Stop Bath. 7. 100-sheet package of 2½" x 3½" Kodak Velite Paper. 8. 4-oz. plastic measuring cup. 9. Three 5" x 7" Tenite Rocker Trays. 10. Kodak Glass Stirring Rod. 11. Kodak Darkroom Thermometer. 12. 2 Plastic Film Clips. 13. Blotter Book for drying prints. 14. Viscose Sponge. Also, Simplified Instruction Card.



## New Photo-Hobby Outfits feature "Do-It-Yourself" Instruction Cards

Packed with each of the two outfits described on the previous page is a big 11 x 14-inch card. On one side are simple 1-2-3 instructions for *developing* negatives . . . the other side for *printing*. You can't miss. It's the easiest-to-follow guide you've ever seen.

**P. S. for Christmas**—Either one of the new Kodak Outfits makes a wonderful gift for snapshot fans of any age. Want one for yourself? Drop a hint in the right place—now! Want one for someone else? You'll be making someone very happy!



## When you need more Photo-Hobby Outfit materials . . .

Next time you visit your photo dealer, ask him to show you the Kodak chemicals that have been prepared for do-it-yourself hobbyists. Some of them come in ready-mixed liquid form. Others are in handy foil packets—you simply mix the powder with water and it's ready for use. Here are several chemicals particularly suitable for home use. (The first two are Photo-Hobby Outfit liquid chemicals you'll want to replace, along with Velite Printing Paper, before your original supply runs out.)

**Kodak Versatol Developer**—An economical "all-purpose" developer. Dilute 1:7 (1 part developer to 7 parts water) for developing negatives in a tank. For clear, sparkling prints, dilute 1:3. 8-oz. bottle, \$.35. Quart, \$1.



**Kodafix Solution**—A concentrated hardening-fixing bath which makes the images permanent on film and paper. Requires only the addition of water to prepare it for use. Quart bottle (to make 1 gallon), \$1.



**Kodak Microdol Liquid Developer**—For even finer-grain negatives (hence finer-grained prints) than an all-purpose developer can provide, use Microdol for developing your *negatives*, and Versatol (see above) for developing your snapshot *prints*. Microdol comes ready for use without dilution. 1 quart, \$1.



**Kodak Rapid Selenium Toner**—Usable at various dilutions to give your snapshot images permanent cold-brown tones. 8-oz. bottle, \$1.05



**Kodak Brown Toner**—Dilutes 1:32 to give snapshot images warm-brown tones. 8-oz. bottle, \$.90.



**Kodak Photo-Flo Solution**—Highly concentrated wetting agent that lets water run off film and paper surfaces without leaving water marks and streaks. Note to 35mm users: As you may know, 35mm film differs from paper-backed roll film in that it has gelatin on one side and a plastic base on the reverse (instead of gelatin on both sides). Kodak Photo-Flo does a remarkable job in wetting *both* the plastic base and gelatin surface to let the water run off without leaving streaks or spots. No need to even sponge the film. 4-oz. bottle (to make 6 gallons), \$.45; 16-oz. bottle (to make 24 gallons), \$.90.



Ask to see the handy foil packets of Kodak chemicals, too.

Prices are list, include Federal Tax where applicable, and are subject to change without notice.

**Eastman Kodak Company**  
Rochester 4, N. Y.

NOVEMBER 1955

**Kodak**  
TRADE-MARK

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# Care and Feeding of Engines



BY  
S. P. CORP

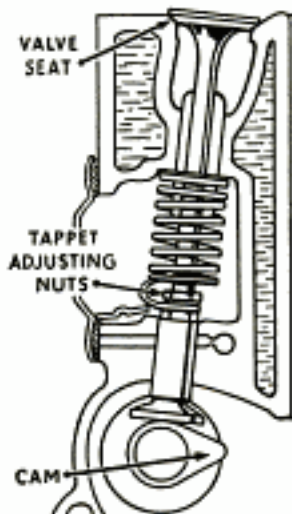
## VALVE ADJUSTMENT

Before you start to adjust valves, consult manufacturer's specifications and know the answers to these questions: 1. Should your valves be set hot or cold? 2. What are the intake valve tappet clearances? 3. What are the exhaust valve tappet clearances?

Tappet clearances *below* specifications will make camshaft open valves too early and close them late, which can cause exhaust valve burning. **NEVER REDUCE VALVE TAPPET CLEARANCE TO ELIMINATE NOISE.** Instead, look for worn tappets or misalignment of valves in the guides.

Tappet clearances *above* specifications cause camshaft to open intake valve late and close too early, reducing amount of fuel entering cylinder, and losing power. The same condition in exhaust valves imposes an extra load on connecting rod bearings. Always follow specifications!

**NOTE:** These facts do not apply to valves with hydraulic valve lifters.



## LOCATING A MYSTERIOUS MISS

If a cylinder misses, look for corrosion in the distributor cap. Pull each wire out of the cap and clean sockets with a wire brush. If corrosion has eaten away the metal, or terminals are eroded, get a new cap. Also check to see that carbon brush is not chipped or broken. Inspect rotor for cracks or oxidation at the tip. If tip is burned, the resulting gap could cause that mysterious miss. In such a case, you need a new cap and a new rotor.

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# Sealed Power

## PISTON RINGS

# 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.

## Ladders Not Painted

**Q**—I'm curious to know why it is that one never sees a new ladder painted or otherwise finished. I'm referring to ladders that one purchases at a local hardware store or from a building-materials dealer. I once saw a man at an auction sale refuse to bid on a ladder that had been painted. Later I asked him why. He said that it would be easy to hide flaws in a ladder with paint. Is that the reason?—*J. L., Pa.*



**A**—Correct. It's an old custom, or perhaps we should say sales policy, at one time adopted by manufacturers of ladders and continued more or less regularly down to the present time. The prospective purchaser at the auction you refer to was possibly a little more than ordinarily cautious, but his reason for not bidding on the used ladder—we suppose it was freshly painted—was quite logical whether or not he had any reason to believe that the ladder in question was faulty. However, if you purchase a new ladder it's always a good idea to finish it, either with white shellac or with a good clear finish of the outdoor type.

## Complete Fertilizer

**Q**—What is a complete fertilizer for use on lawns and gardens? I have been told by a neighbor that I should have the soil tested and then apply a complete fertilizer before attempting to rebuild an old lawn that has become fouled with weeds. Grass grows only in scattered areas. Should I proceed as advised, or what do you suggest?—*U. L., Ky.*



**A**—Your neighbor is right so far as he went in advising you. But if we can judge correctly from your description of the condition of your lawn, he did not go far enough. We think it would be well to have the soil tested, but unless this is done correctly the test will be of little value. First, you should plot the lawn, that is divide it into areas of 4 to 8 sq. ft. and take a soil sample from each plot. Place the samples in small glass vials (usually

(Continued to page 226)

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forget  
your  
change!**



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NOVEMBER 1955

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# TIME SAVING TIPS

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Put loose umbrella handles back on to stay with tight-gripping "Duco" Cement.



Stiffen wobbly picture frames fast—just put tough "Duco" Cement in mitered corners and on backing.



### CLEAR

Give broken fingernails first aid with clear "Duco" Cement—can't be seen, stops further damage!



Patch torn wire screening. Transparent "Duco" Cement lets light in, keeps bugs out.



### FLEXIBLE

Put name tags in your over-shoes with "Duco" Cement—it's flexible, won't come loose when you walk.



Repair leather wallets, compacts, coin purses like new with strong, flexible "Duco" Cement.



NEW CAP HAS HANDY APPLICATOR TIP



BETTER THINGS FOR BETTER LIVING  
... THROUGH CHEMISTRY

(Continued from page 224)

you can obtain these from your druggist) and then make a drawing showing the location of each plot. Number the plot and the soil sample taken from it. Then when you get the results of the test, you will know exactly what different areas of the lawn need to build fertility to the required levels. Send the samples to your State Experiment Station, usually a department of the state university. Generally, the tests are made free of charge for residents of the state. In the meantime apply a herbicide (weed killer) to those areas infested with weeds. Old lawns are greatly benefited by spiking, by hand on small areas, or with a power tool if available. This loosens and aerates the soil and permits fertilizer and moisture to penetrate to greater depths. When the results of the soil test are at hand they will show both deficiencies and excesses, if any, of plant nutrients. Deficiencies are easily corrected by applying a complete fertilizer of the recommended formula. This you can determine by running a check of all soil plots which were originally measured and recorded by number on the chart you prepared. However, it should be remembered that use of the correct fertilizer alone will not make up for a lack of other good practices in growing a lawn. These also should be carried out on a regular schedule.

### Refinishing Piano

Q—I have an upright piano I wish to refinish. It is, I would guess, about 25 years old and either the wood or the finish, or both, have darkened so much that the grain shows only in the lighter areas. The finish is quite badly checked, so much so that it is rough to the touch. I tried smoothing it with sandpaper. Although there was some improvement, the final result was not very satisfactory. I think the wood is mahogany. How should I proceed?

—Y. S., Colo.



A—If the piano was built as recently as you say, then there is a good chance that at least the larger panels are of plywood faced with mahogany veneer. Smaller parts are probably cut from some other wood and are of solid stock stained and finished to match the panels. If this assumption is correct, then the first step is to remove the top panel and run a test before attempting work on any other exposed part. The top panel usually is hinged and it will be necessary to remove all the screws in the continuous hinge before the top panel can be lifted off. Coat the finished surface with a varnish remover, allow it to "work" at least 15 minutes, then scrape off the softened finish. Then try scraping the surface, either with a hook-sharpened cabinet scraper or a small piece of glass cut with a true edge. Work carefully to avoid cutting through the thin veneer. When the wood has been scraped back to the "white," sand with fine-grit sandpaper to remove the raised fibers. In this process you will remove a part of the filler which was originally used. In refinishing we would suggest that you use a brown-mahogany filler and stain. Apply the stain first and wipe off to get the shade you want. After the stain is dry, follow with the filler tinted to a slightly darker shade than the stain. Apply with a soft cloth, allow it to partially set, then wipe off the excess across the grain. When dry, sand lightly with the grain and apply a sealer. Allow the sealer to dry overnight. Then follow with a high-quality pale varnish or a water-white lacquer of the brushing type. If you can rent a sprayer, it is recommended that you apply the final coats by spraying rather than brushing. After the first coat is thoroughly dry go over it lightly with fine steel wool, 000 or finer, and then apply the second coat. When this is dry, rub to a mirror surface with rubbing compound (available through your paint dealer).

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**Fine Nut and Bolt Photography***(Continued from page 131)*

The input voltage to his two horizontal enlargers and contact printer is kept constantly at 110 volts by means of a transformer which automatically compensates for variations in line voltage. Variable resistors are in the wiring circuit of his enlargers and printer so that the voltage may be cut down if necessary, as when printing on film rather than paper.

Horizontal enlargers are preferred by Hine for their versatility and freedom from vibration. Specially built timers on enlargers and printer keep printing time regulated down to 0.1 second so that in producing large numbers of prints, he can keep all prints uniform. On his contact printer is a highly accurate electronic timer custom built for him. It contains precision components and will time print exposures down to 0.1 second with 99.9-percent accuracy.

"Save time," is Hine's motto in the dark-room, a motto made necessary by his industrial clients who sometimes demand quick service to prevent holding up production in their plants.

One way he cuts down developing time is through use of a special print developer composed of one part Dektol, one part Ardol and two parts water. He finds this gives good tones in both dark and light areas, with a 30-second normal developing time.

If the job requires it, though, he doesn't mind spending a lot of time. One picture took the better part of two days to print and process. It was a photo of a horse. The owner wanted the print toned to match the horse's color.

After two days of experimenting, the right toner-paper-developer combination was found to achieve the result.

To make such jobs easier, he keeps a huge notebook filled with sample prints showing the results of hundreds of such combinations.

Having the patience required for such experimenting and the insatiable appetite for knowledge about everything photographic have helped Hine win recognition among industries and among other professional shutter bugs as a "photographer's photographer," a fact proven a couple of years ago when his technical achievements won him an Associateship in the Photographic Society of America. ★ ★ ★

☞ A new passenger-carrying record for land-based planes was set recently when the Air Force's XC-99 double-deck transport, an experimental version of the B-36 bomber, landed at Fort Worth, Tex., with 212 persons aboard.

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## On the Trail of the Whooping Crane

(Continued from page 143)

1946, the most far-reaching and costly field research in connection with any bird was begun. It was carried on by famous ornithologist Robert P. Allen and pilot-biologist Robert H. Smith.

In 3½ years they journeyed 20,000 miles by small plane, and 6000 miles by Jeep. Covering parts of Nebraska, Louisiana, Texas, Mexico and a million square miles of northern Canada, they sought all available information about the birds.

In the spring of 1951, Smith and Allen trailed a dozen whooping cranes by plane from the Texas refuge, hoping to follow them to their nesting site, for unless the nesting place was found there was no hope of renewing the species. For 2500 miles from southern Texas to the 60th parallel, they managed to keep the rare birds in sight—the most unusual job of air-detective shadowing ever recorded. When they reached the 60th parallel, they felt sure they were nearing their goal and their hopes were high.

Then suddenly a white, widespread and impenetrable fog blanketed the area. The two scientists lost sight of their quarry and their pursuit ended in failure.

In 1922, the last previous sightings of whooping-crane nesting grounds had been made in Saskatchewan, at points 300 miles apart. But these sightings were of no value to present-day ornithologists because the cranes had long since moved on to new homes.

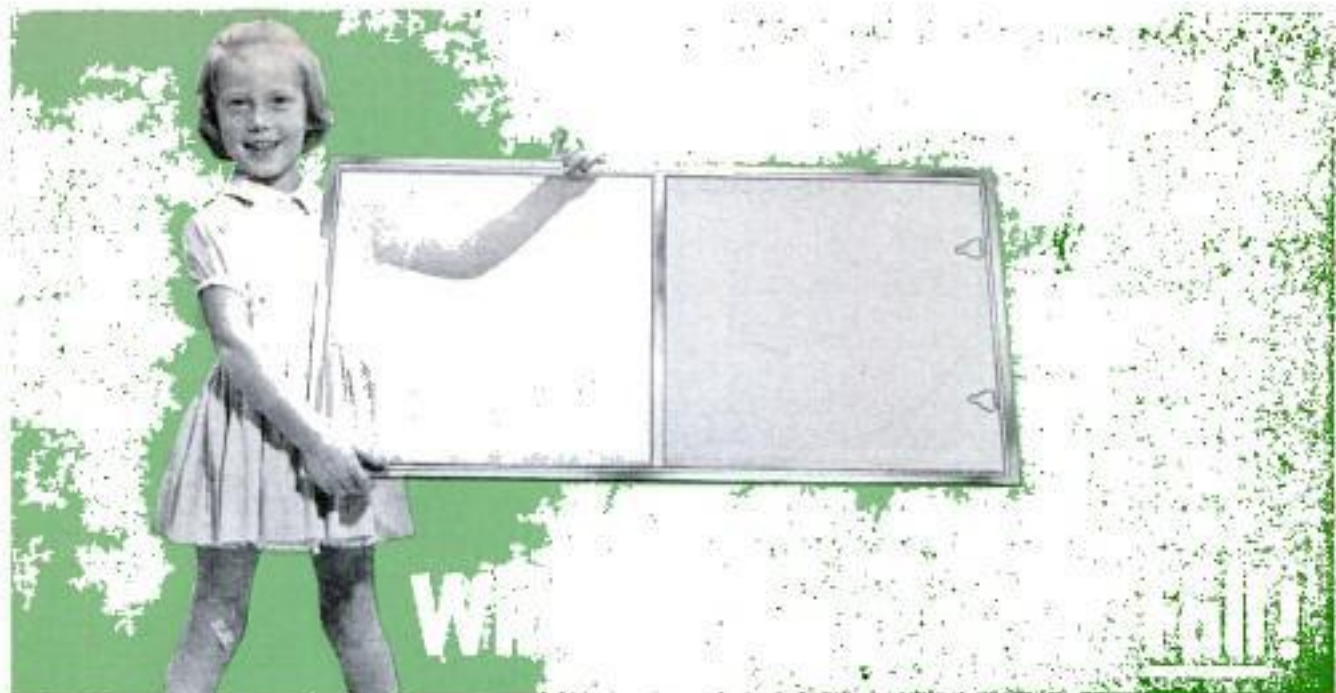
It was the knowledge of this long struggle on the part of scientists to find the nesting place of the crane that caused Fuller to become excited when pilot Landells indicated that he had seen whooping cranes tending a nest. It meant that the long search might be over. Fuller immediately wanted to see the site, and Landells, armed with a camera, took him over the area.

The pictures on page 143 were taken by Landells from the open door of his helicopter. They are the first and only pictures of whooping cranes in their new nesting grounds, and they are the most unusual close-up air photos of the bird ever taken.

Wood Buffalo Park, where the discovery was made is a 17,300-square-mile area, laid out by the Canadian government in 1926 as a wildlife sanctuary. It lies in the Slave River region of the Northwest Territories. The purpose of the park was to protect the buffalo, who was fast disappearing at the time. Now 15,000 of the big beasts roam

(Continued to page 232)





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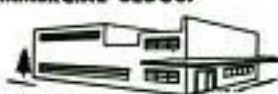
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Enclosed please find \$..... for the following Easi-Bild patterns:

- No. 29 Bathroom Valet—35c  
 No. 52 Serving Tray and Table—25c  
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the preserve and the threat of extinction has been removed.

Landells continued to watch the area and says that he never saw the young bird again. He discovered another pair of mature birds about 15 miles from the first nest, and later saw a single bird about the same distance from the first pair in another direction. Five birds in this small area have proved to scientists that this is truly the long-sought nesting grounds. Furthermore, Landells noted that on later trips, whenever he passed over the first nest sighted, he found the two birds still there.

As a result of this discovery, wildlife specialists traveled into Wood Buffalo Park to study the giant birds. It was a difficult journey, requiring three tries by canoe, plane and helicopter before completion. And reports from these observers indicate that, in addition to the 21 adult birds, there are now four nestlings who may grow to migrate with the flock this winter. If all goes well, 25 birds will fly into Texas, and this slight increase in the whooper's population may mean the beginning of their comeback as a game bird.

The United States and Canadian governments are cooperating to protect the birds, and to stop the slaughter of the cranes on their migratory trips. A great deal of publicity is being given the crane to help in this fight. For example, the Canadian Government has issued a five-cent stamp showing two of the whoopers in full flight.

Perhaps this concentrated effort will soon make the buglelike voice of the whooper a common sound over the central United States and Canada during migration seasons. ★ ★ ★

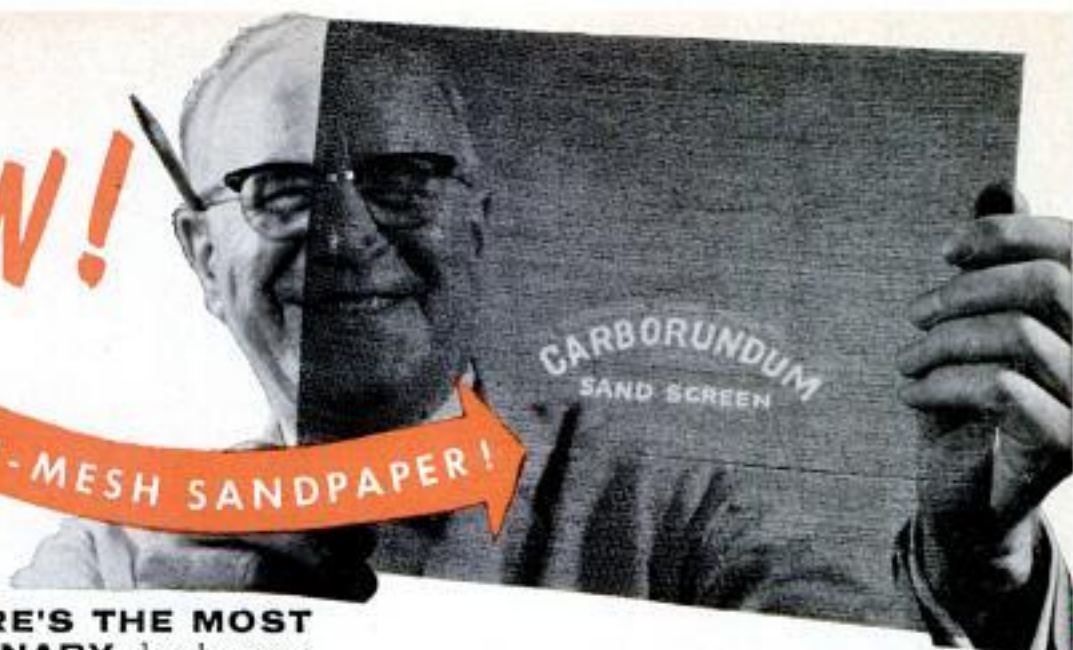
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## Testing . . . Testing . . . Atoms at Work

(Continued from page 121)

Operators of oil pipelines running across the nation long had a peculiar and expensive problem. Different kinds of oil are run through the pipes at different times, and there are switch points just as there are on railroad lines. Now, suppose a switch is to be made from one grade of petroleum to another. How does the operator know just when to turn the valve?

In the past he was not too certain, so on the average, he wasted about 50 barrels or \$500 worth of oil in the operation. But now the radioisotope Antimony-124 has been added to a new type of oil coming along the pipeline. When a geiger counter attached to the outside of the pipe starts to click, an operator turns the valve. Estimated saving to the oil industry: \$500,000 a year.

The radio-detection industry, born nine years ago, has already grown into a \$20,000,000-a-year business. In 1946, the AEC's Oak Ridge atomic pile was almost the only source of radioisotopes for industry, and still is the biggest producer, having sent about 40,000 shipments to more than 1700 purchasers. Meanwhile, Brookhaven National Laboratory in New York and the Argonne National Laboratory have come

into the picture. And now there is the materials-testing reactor in Idaho. Adding materials-testing reactor to the list should give industry the same glow of satisfaction that comes to a football coach who has just signed up a 220-pound fullback, fast and smart.

Industry, for instance, is now looking to the materials-testing reactor and its fellow radioisotope producers for aid in measuring the thickness of metal. Friction tests at the Massachusetts Institute of Technology show that by making a metal radioactive it is possible to detect the transfer of only  $\frac{1}{100,000,000,000}$  ounce from one surface to another. But first the metal must be made radioactive—usually by insertion in a reactor—and that is where the materials-testing reactor comes significantly into the picture because it can do the job with neutron intensities not available elsewhere.

Then there is radiography, a method for detecting hidden cracks and irregularities in such things as metal castings by directing rays through a sensitive emulsion. The materials-testing reactor is specially adapted to provide radiation sources such as cobalt for this equipment, and has been extensively used for this work.

Medicine and agriculture are also concerned. Among the newest aids to medicine,

(Continued to page 236)

### IT SMELLS GRAND



WANT AROMA WITH "LIFT"? MAN, HERE'S HOW

### IT PACKS RIGHT



AND IT PACKS SO NEAT IT RATES A BOW

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Cummins Drills run quieter, smoother, longer. They're made better, with shock-proof gears, double-coil motors, dynamically balanced armatures—to give better job results. Cummins Model 304, shown, \$24.95 Others from \$19.95 to \$34.95

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*Regular or Chrome-Faced*

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for example, are small, relatively inexpensive and portable thulium X-ray units such as the one developed by the Argonne National Laboratory. These produce X rays of remarkable efficiency, although models are as small as three inches in diameter, six inches long and weigh approximately 10 pounds. When produced in quantity, the Argonne type is expected to cost under \$200, but will do many jobs now requiring large machines worth tens of thousands of dollars. The materials-testing reactor, as one of its new assignments, irradiates the thulium for the portable devices.

The University of Michigan, under contract to the AEC, has completed a design of a facility capable of irradiating 20 tons of potatoes in an hour and giving them a shelf life of two years. The potatoes are not made radioactive, however, and will definitely not cause one's stomach to glow in the dark.

Perhaps the newest agriculture possibility for materials-testing reactor mass-production radiation comes with the discovery that insect pests in grains can be destroyed or made sterile with radiation. Insects cause an average annual grain-storage loss of approximately 150,000,000 bushels, valued at \$250,000,000.

Handy on the spot, the Idaho Potato Growers, Inc., cooperative of Idaho Falls, is considering using radiation sources of the materials-testing reactor for studies on some of its dehydrated products. A lot of persons in Idaho, in fact, are now talking about the possibility of new industries springing up around the reactor. But such businesses need not necessarily be located near the reactor.

Lewis L. Strauss, chairman of AEC, addressing the New England Council in Boston, explained:

"Availability of the materials-testing reactor for public use means that you in New England, for instance, could use the reactor to test products to see if new and desirable qualities could be developed in them. The reactor can prepare tracers for use in following the products of a distillation column; it can make a machinery item, like a gear, radioactive for wear tests, and it can perform many other services, limited only by the ingenuity of engineers."

But whether the industry is in Massachusetts or Idaho, it must have its experiments performed by the contractor operating the reactor—Phillips Petroleum Company. No private concern can send its scientists to do their own experimenting at the reactor. Reason: security.

Also, all requirements of the atomic-energy program take precedence over the

(Continued to page 238)

# Bench Saw Owners SAVE \$10



on a  
**CRAFTSMAN**  
REG. TRADE MARK  
**Molding  
Cutter Set**  
Separate Prices  
Total \$19.95 **\$9.95**



You get Molding Cutter Head and  
6 Cutter Bits Sets shown. 17 cutter  
bit sets available at Sears stores



## Convert your Bench Saw to a Jointer-Planer and Shaper

We want you to share with us the tremendous savings offered in this Molding Cutter Set. By special arrangement with our manufacturer we can again offer this amazing Molding Cutter Set at our **LOW SALE PRICE** during the months of November and December. We know of no comparable set selling at anywhere near this low price. Go to your nearest Sears Retail Store and see it for yourself. It saves lumber costs, and it saves time. Sale priced until December 31, 1955 . . . only \$9.95.

Number of designs are actually limited only by your own imagination. Cutter bits are made from special heat-treated tool steel; 1 inch wide. Vertical slot in back of blade assures alignment in molding head. Six different cutter bit sets included as shown above: (A) 3 Bead ( $\frac{1}{4}$  in.) cutter; (B) 1-in. Planer and Jointer; (C) Glue Joint Cutter; (D)  $\frac{3}{4}$  and  $\frac{1}{2}$  in. Quarter Round Cutter; (E) Cabinet Door Lip Cutter; (F) Base Mold Cutter. In plastic box, with wrench, spacer washer and bushings.

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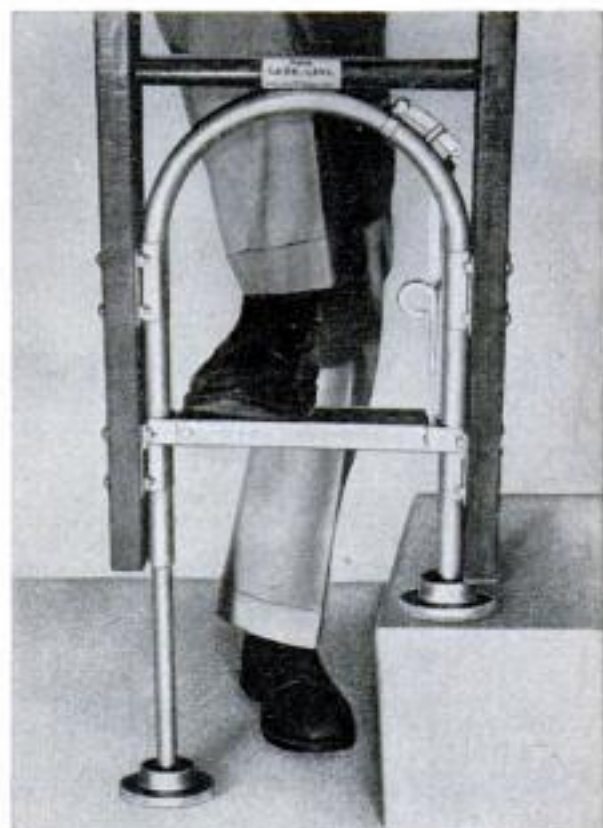
nongovernment experiments in areas of the reactor. There is a charge, based on all costs involved including depreciation, overhead and operating expenses, but still considered low enough to bring the service within the means of qualified research organizations.

"To date the National Reactor Testing Station has had six major design contracts plus countless small jobs," says Allan C. Johnson, manager of the AEC's Idaho operations office. "Our average design and construction load has been at the annual rate of \$12,000,000 to \$15,000,000. And the year ahead will be a busy one."

Meanwhile, this question is asked of industry: What are your problems? "Idaho" in Indian means "Light on the Mountains," and some atomic rays from the western state may bring many brilliant industrial developments. ★ ★ ★

## Self-Adjusting Ladder Legs Adapt to Any Terrain

Self-adjusting legs attached to the rails of a ladder make it possible to use it on steps and uneven terrain. With the device bolted in place, the user puts his weight on the first rung of the ladder to lock the legs in place automatically. They can be unlocked only by hand. Equipped with non-slip feet and weighing only five pounds, the device can be transferred easily from ladder to ladder.



POPULAR MECHANICS



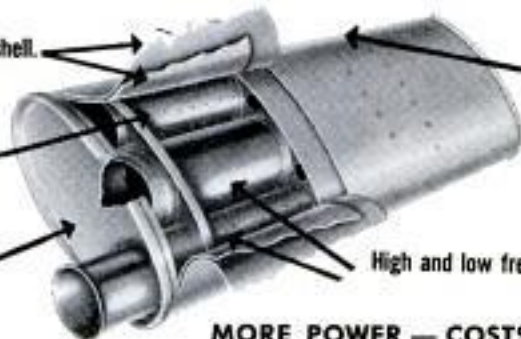
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Specially built for smaller shops requiring lighter weight and lower investment, the "Bantam Champ" gives full 200 amp.

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You can save even more by "Building Your Own" with this Hobart generator. Just connect the "Build-Your-Own" to your own used auto engine . . . it's perfect for small operations which do not justify a complete, factory built outfit.

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**Science Puts the Taste in Olives**

(Continued from page 153)

6000-gallon, redwood storage tanks and is stored in a light-brine solution. The olives are held in these tanks until needed for curing and canning.

As they are needed for curing, the olives are pumped from the storage tanks to numerous sorting belts for removal of over-ripe or damaged fruit. From here they move into the ripe-olive processing tanks.

In the processing or curing vats the olives receive alternate applications of caustic solution, water and air, over a period of nine days. Between the applications of caustic solution and washing with water the olives are exposed to air for periods of 24 to 48 hours. This oxidizes the fruit and gives it the familiar black color of the ripe olive.

Upon completion of these processes, the caustic and bitter factors are leached from the fruit by immersing in fresh water. The water is changed every four hours and the olives receive nine complete washings.

After being freed of caustic and their bitterness, the olives are put in brine and the solution raised to 185 degrees. The fruit is treated twice with brine, each treatment lasting for 24 hours.

Olives are now ready for canning and flumed to the second size-grader. This grader makes a final separation, insuring uniform canning sizes. From the size-grader

(Continued to page 242)

Inspector crosses stile over heaping conveyor that carries olives from receiving area into the plant



# New G-E *All-Weather* Headlamps protect you from 3 night driving hazards!

Replace your present headlamps now! A pair costs so little

## 1. THEY HELP YOU SEE THROUGH FOG, RAIN, SNOW

The top photo at right was taken with ordinary headlamps. A man changing a tire a short distance ahead is practically invisible in the fog. The bottom picture shows the identical scene, this time with General Electric *All-Weather* Headlamps. Now the man changing a tire is clearly seen through the fog—and in time to stop.

G-E *All-Weather* Headlamps help you see through fog, rain and snow far better than ordinary headlamps. The uncontrolled upward light from ordinary headlamps reflects off the fog and back into the driver's eyes, as blinding "kick-back" glare. But G-E *All-Weather* Headlamps have a specially designed shield over the lower beam filament. It blocks out the uncontrolled upward light making it easier to see in fog, rain and snow, with little or no interference from kick-back glare.



## 2. THEY MAKE IT EASIER TO SEE THE ROAD AGAINST ONCOMING HEADLAMPS

Photo at left below shows how you see against oncoming headlamps when your car has ordinary headlamps. 50 feet beyond the oncoming car, a pedestrian can barely be seen. In photo at right, your car now has G-E *All-Weather* Headlamps. The pedestrian is now clearly visible. Your seeing distance along the right-hand curb is increased by as much as 80 feet.



OLD HEADLAMP



NEW G-E *All-Weather* HEADLAMP

## 3. THEY PUT LIGHT FAR DOWN THE ROAD TO LET YOU SEE CURVES, DIPS AND OBSTACLES

General Electric *All-Weather* Headlamps are more powerful than ordinary headlamps. The 6-volt size, for instance, gives 25% more light! Since the fog shield does not cover the upper-beam filament, you get maximum light for distant seeing in clear weather. The extra light is spread over a wide area, including the shoulders of the road, to show curves and obstacles while they're still far away.



## REPLACE PRESENT HEADLAMPS NOW—G-E *All-Weather* HEADLAMPS FIT YOUR CAR

Don't wait until your present headlamps burn out. Put General Electric *All-Weather* Headlamps on your car today! Miniature Lamp Dept., General Electric, Nela Park, Cleveland 12, Ohio.



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New 1/4" gear-chuck drill with powerful motor; ZP-1 Drill Saw turns drill into portable saw. Welded steel tote case; complete accessories for drilling, sawing, sanding, polishing. Big-value price, only **\$34.88**.



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- ✓ Powerful New 2-amp. AC-DC Motor
- ✓ Accurate Geared Chuck
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- ✓ Complete Accessory Set, including 12 sanding discs, polishing bonnet, grinding wheel, muslin pad, 7 drill bits.

### No. 620 Shopmate Clutch Saw

Features exclusive Pet-O-Matic Slip Clutch. Powerful motor; guide, guard. Cuts dressed 2 x 4s at 45°. Biggest Saw value today.

Only **\$48.88**.



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- ✓ Powerful 4800 RPM Motor
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- ✓ Exclusive Pet-O-Matic Clutch eliminates kick-backs and motor burn-outs
- ✓ Depth of Cut at 90°, 0 to 2 1/8"
- ✓ Telescoping Safety Guard
- ✓ Graduated Adjustable Rip Guide



When you buy, take this ad with you as your buying guide to Shopmate values! Compare, and be sure!

Made by Portable Electric Tools, Inc.  
320 West 83rd St., Dept. PM, Chicago 20

the olives are conveyed to a final sorting belt, where workers again inspect them, removing any poor-quality fruit. The olives then proceed to the filling and canning lines.

Following canning the olives are put into large cookers where the temperature is raised to 242 degrees and held for 62 minutes for complete sterilization of the completed product. They are now cooled, labeled, cased and ready for shipment to the tables of the United States and the world.

Meanwhile, the small olives that were taken out in the first size-grader are being prepared for the Spanish green-olive process. They are placed in a caustic soda to remove bitter factors, then carefully washed and pumped into 50-gallon barrels. The wash water is replaced with 10 to 15 percent brine, barrel heads go on, and the barrels are rolled into the fermenting yards to let nature take its course.

When fermentation is complete, usually about six months, the barrels are rolled into the plant, and the olives size-graded, inspected and returned to the barrels of brine for shipment to other packers.

Over-ripe fruit is unsuited for canning, yet it is good material from which to make rich olive oil. The olives intended for the oil press are washed in warm water and taken to a disintegrator for grinding of the flesh and pits. This material moves to bull wheels for further grinding and then is put into strong, flat bags and placed in the primary hydraulic press, where a pressure

(Continued to page 244)

Olive cans are hand-filled, but most operations on the fast-moving canning lines are done by machines





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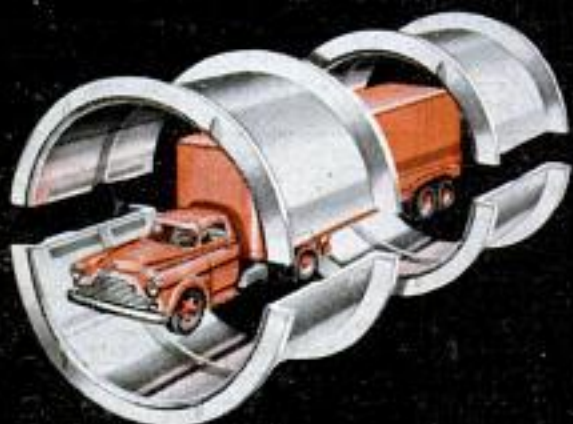


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for New Power . . .

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Oil-Control Bearings



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of five tons per square foot is applied. Bags are then moved to secondary presses where a pressure of 30 tons per square foot is applied. Oil and juice from the presses are separated by centrifuging. The oil is then washed, filtered and stored for two months to permit settling of impurities before packaging.

The tree that bears the olive has long been one of nature's wonders. It is the longest lived and producing of any fruit tree and it has been claimed that trees more than 1000 years old are still bearing olives in commercial quantities.

The olive tree thrives and produces best in a dry, warm climate where there is plenty of water but no summer rains, fog or extreme cold. The industry now centers in the old countries, along the borders of the Mediterranean Sea and in California.

The war gave domestic olives a big boost and olive growing has developed into a major California industry. It looks as if the olive, both green and ripe, is here to stay. ★ ★ ★

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Write a message on the pad of a new electronic instrument and a duplicate appears instantly on a receiver many miles away. Handwriting can be transmitted over cables, telephone wires or via radio. A ball-point pen is used to inscribe messages and maps, figures and formulas. Carbon copies can be made on both the transmitter and receiver. The units operate on ordinary alternating current.





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AGAINST BURN-OUT DURING  
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FAMILY  
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Basic power tool for Dad! Safest for children! Model 208 has full 15" throat, 10" x 10" table. For projects, recreation.



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TILTING ARM JIG SAW**

On Model 2500 work stays flat while making angled cuts—arm, blade and motor tilt together 0° to 45° to either side. 20". Heavy duty. 65 lbs. cast semi-steel.



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Model 900 sander in 900-D Kit (with metal case, 48 asstd. papers, polish pad) outsands other portables. Easy to handle. Features exclusive "Multi-Motion" sanding pad action.



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**Tunnel 23 Miles Long**

One of the longest tunnels ever built may be bored beneath the sea to link two Japanese islands. Japan's National Railway Corporation is making plans for a 23-mile tunnel between the main island of Honshu and the northernmost island of Hokkaido. It will take an estimated 10 years to build the long tunnel and the cost is expected to be about \$140,000,000.



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6, 8, 10 and 12 ft. lengths.  
Snow white line, jet black figures,  
extra strong featherweight  
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THE LUFKIN RULE CO. • SAGINAW, MICH.

## Keeping Up With the Atom

(Continued from page 113)

the area during atomic tests, and road blocks halt motorists. After the blast, planes track the atomic clouds and take samples of the contaminated air, and 90 United States Weather Bureau stations and 10 Atomic Energy Commission posts around the country make tests of any radioactive fall-out. Shock waves have caused some property damage in nearby communities but no personal injuries have been recorded from the waves.

☆☆☆

The Geneva atomic conference was told that the world will need eight times as much useful energy by the year 2000 as it uses now, and only atomic energy will be able to supply the demand as our coal, oil and gas reserves dwindle.

☆☆☆

They're even tracing the flow of mud and silt in river channels with radioactive elements. The British have tried it on the Thames River, using radioactive ground glass to test the movement of mud.

☆☆☆

To learn how effective a synthetic drug is in the treatment of leprosy, the drug is being tagged with radioactive sulphur and administered to patients experimentally in India.

☆☆☆

Liquid metals and other materials, instead of water, may cool nuclear reactors, generate steam and transfer heat. Dr. S. G. Bauer of Rolls-Royce, Ltd., Derby, England, has listed 20 different materials which could, because of the range of their melting and boiling points, be substituted for water in power reactors. These include organic compounds of carbon and silicon, inorganic salts, caustic soda, sulphuric acid and certain chemical elements and metallic alloys. Water has been found to be an excellent material for absorbing heat at one point of the power cycle and releasing it at another, where it can be made to do useful work. However, it has the disadvantage in a power reactor of slowing neutrons. This has led to the search for liquid metals and other materials which might be pumped through the pipes of a heat exchanger. Dr. Bauer points out that not all the materials he lists may be suitable as heat-transfer fluids. A suitable material must not only have the proper range of boiling points, but must resist corrosion and fire.

☆☆☆



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Routo-Jig gives you truly *professional* results every time—in fine cabinet work, furniture-making, home improvements, shop work of every kind. And you can own it *complete* at a big \$7.00 saving—if you act now!

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**33**

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**7 plans for BUILT-INS**

- |                             |                            |
|-----------------------------|----------------------------|
| 2. Living Room Storage Wall | 6. Hi-Fi Music and TV Wall |
| 3. Sectional Storage Wall   | 7. Odds and Ends Cabinet   |
| 4. Attic Storage Wall       | 8. Shelf Door Wardrobe     |
| 5. Child's Storage Wall     |                            |



**10 plans for  
KITCHEN FEATURES**

- |                                    |                          |
|------------------------------------|--------------------------|
| 9. Breakfast Snack Bar             | 14. Canned Goods Closet  |
| 10. Snack Bar Overhead Cabinet     | 15. Kitchen Desk         |
| 11. Movable Cleaning Cart          | 16. Sink Cabinet         |
| 12. Drawer Unit for Built-in Range | 17. Sliding Spice Rack   |
| 13. Movable Laundry Cart           | 18. Oven Utensil Cabinet |



**5 plans for FURNITURE**

- |                           |                        |
|---------------------------|------------------------|
| 19. Buffet Chest          | 22. Toy Storage Blocks |
| 20. Stacking Cabinets     | 23. Workshop Bench     |
| 21. Storage Bed Headboard |                        |



**4 plans for  
OUTDOOR STORAGE**

- |                         |                          |
|-------------------------|--------------------------|
| 24. Patio Furniture Set | 26. Garden Work Center   |
| 25. Child's Playhouse   | 27. Outdoor Storage Wall |



**6 plans for BOATS**

- |                          |                              |
|--------------------------|------------------------------|
| 28. 8' Pram Dinghy       | 31. 13 1/2' Outboard         |
| 29. 9' Flat Bottom Skiff | 32. 15' Knockabout Sailboat  |
| 30. 11 1/2' Skiff        | 33. 20' Marconi-Rigged Sloop |

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Order by plan number from Douglas Fir Plywood Assn.  
Dept. 911, Tacoma, Washington. (Good in U.S.A. Only)

**Electronic Servant Works for Pennies**

(Continued from page 158)

If the switch is used to turn on a light at a predetermined level of darkness, care must be taken in the placement of the unit so that the controlled light does not strike the phototube. Unless this precaution is observed, the relay in the circuit will open and close very rapidly, and the controlled light will flicker on and off continuously.

Any current required to activate the controlled device must flow through the contacts of the relay within the switch. These contacts can handle loads up to 600 watts, approximately 5 amperes at 117 volts. While this is sufficient for most applications, it is suggested that the current requirements of the controlled device be carefully checked in order to prevent damage to the relay contacts.

In the event that the load current exceeds the relay ratings, an auxiliary relay can be employed. A.c. relays are available with current ratings of 8, 10, 15 and 20 amperes and it is a relatively simple matter to select the one best suited to your particular requirements.

When an auxiliary relay is used, its coil must be connected directly across socket S1, and the controlled device is attached to its contacts. As a result, any control current will flow through the heavy-duty relay, while only a small amount of current actually flows through the contacts of the switch relay.

In addition to turning lights on and off, the photoelectric switch can be used as an automatic announcer to ring a bell or chime when someone enters a shop or office. For such applications, the switch should be used in conjunction with an external light source, such as a prefocused electric lamp which can be purchased at any hardware store. In such cases, the phototube should be completely shielded so that only the light from the desired source strikes its cathode. When this light is interrupted by the opening of a door, an electric bell or buzzer connected to socket S1 will announce the visitor.

When the switch is used in conjunction with a prefocused light and an electric counter, it can be used to count objects moving down an assembly line, or the number of persons passing a given point. These, and innumerable other applications, make the construction of the photoelectric switch a highly worthwhile project.

A list of mail-order houses where the materials for this project can be obtained is available from the Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

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Power-Mount is the exclusive SHOPSMITH® feature that lets you take advantage of SHOPSMITH'S ¾-hp. motor and Speed-Dial to operate other tools.

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**2** Power-Mount saves you space — simply store tools "on-the-wall" when not in use on SHOPSMITH.

**3** Power-Mount lets you add the rugged 4" MAGNA Jointer for use with SHOPSMITH for simultaneous saw-jointing.

**4** Power-Mount lets you add the big 18" MAGNA Jigsaw for use alone ... or with SHOPSMITH for jigsaw-disc (or drum) sanding operations.

**5** Power-Mount lets you add the versatile new MAGNA Paint Sprayer for painting or staining projects that you build on your SHOPSMITH.



There are many more reasons why you'll want SHOPSMITH in your workshop. See and try this versatile power workshop at your leading hardware or department store or any Montgomery Ward store. It's yours for as little as \$3 a week.

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1. "Project Digest." 36 pages of modern woodworking projects.

2. The valuable home-shop guide: "What to Look for When You Buy Power Tools."

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FREE patterns show how!**

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**Bill Ford Revives a Classic:  
The Continental**

(Continued from page 84)

- The leather in the Continental's upholstery (and 23 of 49 interior-trim schemes are all leather) comes from Bridge of Weir, Scotland, where barbed-wire enclosures are never used because the cattles' hides might be damaged by the barbs. This leather is tediously hand-worked in Scotland to make it supple.

- Each engine is tested on a dynamometer alone, then with its transmission attached, and finally in the car.

- Each transmission is tested individually in a test vehicle before being shipped to the Continental assembly plant.

- Glove compartment and trunk are lined with the same fine carpeting used on the floor.

- Vent panes as well as windows are motorized with the driver's control on a shelf in the door.

- It takes 90 man-hours to assemble the Continental—a figure believed to be two or three times higher than for other American cars. Daily production is a mere 10 to 16 cars.

- About 300 persons work in the assembly plant and 47 of them are inspectors. That is an inspector for every six workers, a very high ratio.

- Bodies are checked on a gauge and must come within a tolerance of  $\frac{25}{1000}$  inch.

Don't make the error of calling this car the 1956 Continental. It isn't. It is the Continental Mark II, meaning the second of a series. There are no plans for yearly changes. When a change does come, the new model will be the Mark III. That might be one, two or five years from now.

Have you noticed there is no talk about horsepower and torque? This was no oversight. While the rest of the industry shouts about its added power, the Continental people are mum.

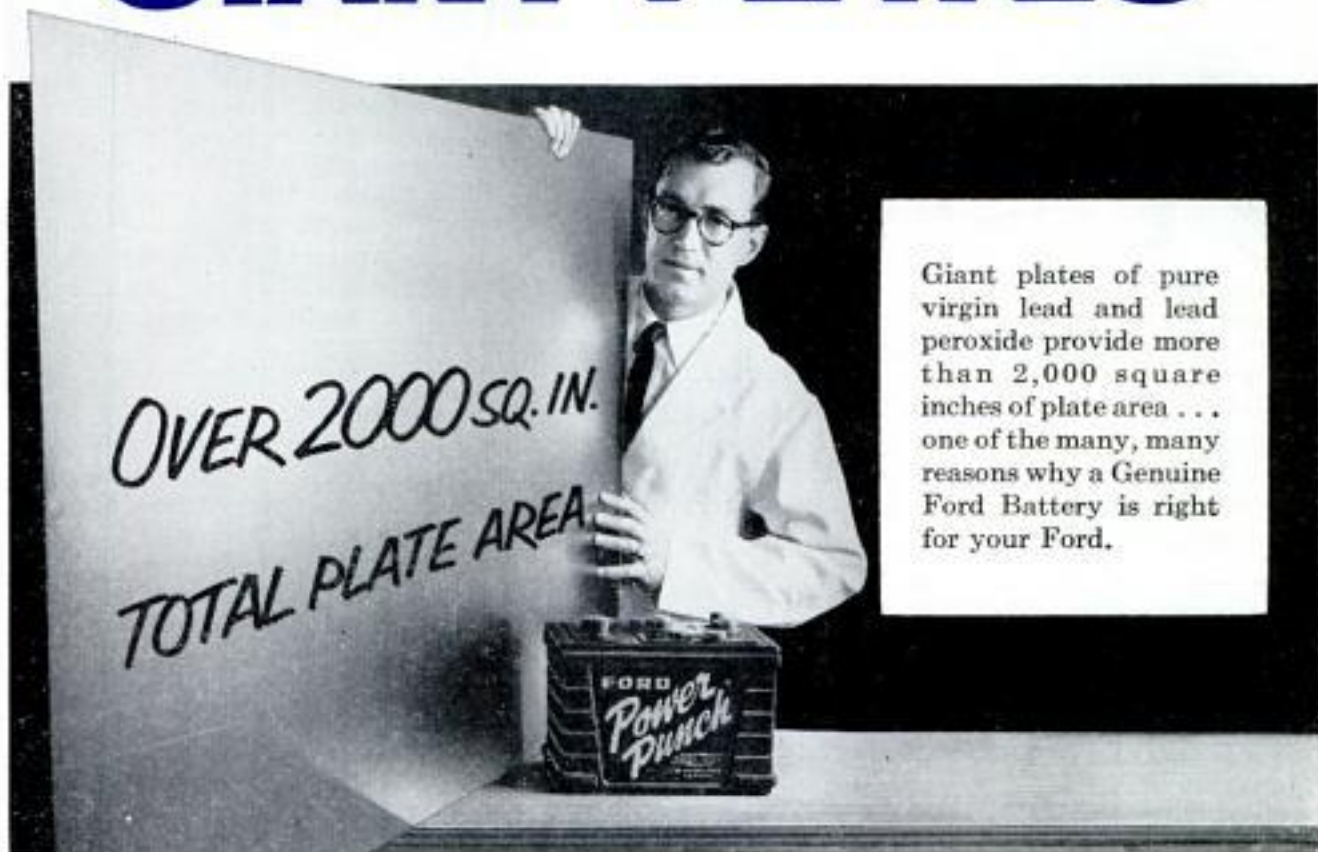
The engine is a modified Lincoln V8 and it obviously puts out as much (probably more) power as Lincoln's 285 horsepower and 401 pound feet of torque. But all you'll get from Continental sources is a smile when you ask how much. Their answer is simple: "Horsepower is adequate."

And, on the theory that when you buy a \$10,000 automobile you don't have to rely on such incidentals as horsepower to impress your friends, Continental says it will continue to stay aloof in the horsepower claiming race.

Having driven the Continental, I can say quite honestly that they are right—the horsepower is adequate! ★ ★ ★

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by the men who originally built your Ford before being approved for manufacture.

Remember, whenever replacements will add to your Ford's "go," always insist on Genuine Ford Parts—they're made right, to fit right, to last longer.



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Automatically  
figures for you in  
feet and inches or  
total inches.  
Also in 6, 8, 10, 12-ft. King-Size Tapes.



## Chrysler Family Makes Its 1956 Debut

(Continued from page 92)

special manifolding and other high-power extras. Horsepower on the standard Super Red Ram V8 is 218 on the 315-cubic-inch engine. All Dodge V8 engines this year have a single rocker-arm shaft. The hemispheric-head double-shaft design has been dropped. Stroke is increased to 3.80 inches. Compression ratio is now 8.0:1. The smaller Coronet V8 has a 270-cubic-inch displacement, 8.0:1 compression ratio.

The Dodge Six is available in certain models of the Coronet and Suburban lines (as with Plymouth, station wagons are a separate series this year).

### De Soto

From the front, the De Soto has an entirely different look for 1956. The familiar toothed grille has been replaced by a simple mesh design on which a broad "V" is mounted. Bumpers, front and rear, are new and the front parking lights are mounted inside the two bumper guards.

Horsepower is now 255 on the Fireflite and 230 on the Firedome. Both have 330.4-cubic-inch displacement, the difference being carburetion. The Fireflite has four barrels; the Firedome only two.

Stroke is increased by almost one half inch to 3.80 inches. Compression ratio is now 8.5:1, up from last year's 7.5:1. Valves have been made larger and ports redesigned for better breathing.

Taillights are distinctive, consisting of a three-turret assembly. The top turret is combination taillight and stop light. The center turret is a white back-up light. The bottom turret is an extra taillight, giving the De Soto four taillights!

The horn has been given a third tone to lend a more authoritative triad sound, says De Soto. Door handles are now of the easy-to-grab pull type, the flush design of last year being dropped.

### Chrysler and Imperial

Definite steps have been taken to separate the Windsor and New Yorker for 1956. Front grilles are different, although maintaining the same theme. Windsor grilles have only three horizontal bars while on the New Yorker there are about a dozen slender chrome strips. Chrome trim on such spots as the rear fenders also provides separate identifications.

Among the engineering changes is the new center-plane brake said to increase brake-lining life by as much as 20,000

(Continued to page 256)

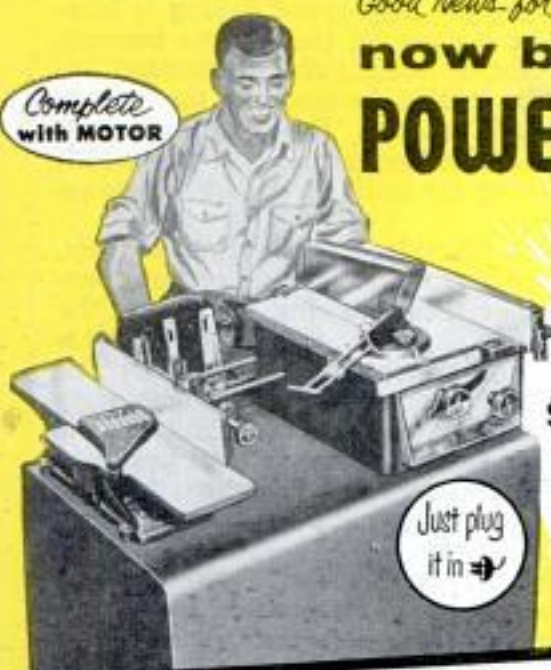


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miles. Twenty-five percent less pedal effort is required, yet high-speed fading is lessened. The brakes get their name because they consist of floating shoes mounted between two plates located on the center plane of the linings. Braking forces are thus transmitted equally across the width of the lining for uniform pressure against the drum.

On both Chrysler and De Soto models, the heater burns gasoline for instant operation rather than drawing heat from the engine's slow-to-warm cooling system. Air heated to 100 degrees is obtained from the heater in 15 seconds. With outside temperatures near zero, the car interior is brought up to 60 degrees in about five minutes. The heater will decrease gasoline economy only about one-half mile per gallon while in use.

Horsepower on the New Yorker V8 and the Imperial has been boosted to 280, up considerably from last year's 250 horsepower. Displacement is now 354 cubic inches, compression is 9.0:1 and four-barrel carburetors and dual exhausts are standard. Incidentally, Chrysler has taken a bold step in removing all evidence of exhaust pipes from the rear end at a time when other stylists are emphasizing them with chrome embellishments. Chrysler tail pipes curve downward out of sight, invisible from the rear.

The Windsor Spitfire V8 now has 331-cubic-inch displacement and a compression ratio of 8.5:1. Horsepower is 225, with 250 horsepower being available as an option involving four-barrel carburetor and dual exhausts.

Imperial styling changes are principally in the rear fender. The fenders are longer and sweep upward. Even more jaunty than last year are the gunsight taillights that have been moved farther back on the fender crown and enlarged.

Wheelbase of the 1956 Imperial is increased by three inches and over-all length by 5½ inches. The rear bumper is unmarred by exhaust ports or tail-pipe extensions of any type.

The electric clock on the Imperial has an automatic adjusting mechanism. If the clock is running slow, the operation of setting the hands ahead to the correct time also advances the speed control so the clock runs a little faster. After one or more settings, the clock will be adjusted correctly.

Improved handling with less sway and roll at the rear has resulted from a modification of the Imperial's Hotchkiss drive. The modification consists of two pieces of rugged spring steel attached to the frame

(Continued to page 258)

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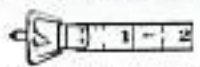
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# "ARCO JIG-SAW" WITH EXCLUSIVE NEW CIRCLE- CUTTER & RIP GAGE!

Another "ARCO" FIRST! "Arco Jig-Saw" (guaranteed to fit any 1/4" drill) with Adjustable Circle-Cutter & Rip Gage saves hours of work—assures professional-looking results everytime—whether cutting circles, curved patterns, or straight cutting. Cuts perfect circles any size up to 20" diameter; rips accurate widths any size up to 10" wide. Has same capacity and cutting speed as \$55 jig saws. Does work of Jig, Keyhole, Coping, Rip, Crosscut, Band & Hook-saw! Built-in "Air-Jet" blows away sawdust. Cuts intricate patterns—however large—in plywood, plastics, metals—even cuts 2x4's! Starts inside holes. Includes blade. Converts to Table Model with either



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**CUTS ANY  
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Not even a \$100 Portable Saw has a dado cutter! "Arco-Saw" (guaranteed to fit any 1/4" electric drill) with sensational new "Dado-Arbor" adjusts easily to cut any size groove up to 1/2" wide x 1" deep in ONE CUT! Graduated Depth-Bevel-Rip Gages adjust for depth of cut up to 1 3/4", angle cuts to 45°. Amazing swivel action of "Dado-Arbor" (see sketch above) cuts large grooves cleanly and accurately with little power. "Dado-Arbor" is easily removed to use the saw for straight ripping, crosscutting or angle cuts. Right angle steel gear drive and safety-yoke permit ONE HAND operation. Includes quick-cutting 5" Safecut Blade.



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## Mass Attack on the Earth's Mysteries

(Continued from page 112)

pour with great speed into the atmosphere from outside. Some of them can traverse it completely and even embed themselves many yards deep in the land or oceans. They represent a weak flow of energy compared with what we receive daily from the sun; but for such very minute particles, some of them have remarkably great individual energy, far exceeding what man has so far been able to impart to charged atoms by his most powerful cyclotrons and other devices. It is still uncertain whether the cosmic rays are generated within the solar system or in the far depths of space, but it is known that during some solar and magnetic storms their flow is altered by as much as 10 percent, though other storms, equally intense, do not affect the flow. Cosmic rays and the airglow will be studied the world over during the IGY.

### Surveying the Continents

Besides these phenomena of the sun, the atmosphere and the oceans, problems of the solid body of our globe will receive attention during the IGY. The greatest of these concern the size and shape of the earth. The different continents can be surveyed, though this is not easy for land masses so large that their surfaces are substantially curved. The measurements involve long lines of sight, along which the rays of light are bent by refraction, depending on the moisture and varying density of the air. Also, a plumb line has different directions in different places and is subject to local deviations by the attraction of mountains or denser rocks. It is still more difficult to extend the survey across the oceans between the continents, whose mutual distances are known less accurately than if the earth's surface were all land.

Some scientists think that the continents have changed their positions relative to one another and to the bulk of the earth, as if they were great rafts of rocks and plains and mountains, floating and slowly drifting on a denser layer, partly plastic. Such speculations may be checked by measurements of our globe at different epochs; only the highest accuracy will suffice for a reliable comparison, and then only over a long period, perhaps a century or centuries. The IGY may, for the first time in history, provide sufficiently accurate data for such a future comparison.

Other long-term comparisons of our globe may be of value. One of these concerns the glaciers. If these diminish by increased melting or reduced snowfall, there

(Continued to page 262)

POPULAR MECHANICS

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Loose, worn or damaged threads are costly — cause scrap, downtime, and poor performance. Now for the first time, it's as easy as A-B-C to replace these threads quickly and economically. Use Lynx\* Thread Kit! All you do is (A) drill out the hole; (B) tap new threads with tap provided; and (C) wind in Lynx stainless steel inserts, using inserting tool provided. You get a permanent, back-to-original size, stronger-than-ever repair made in minutes! Wonderful for screen doors, storm doors, furniture, lawn mowers, engines, door hardware, wood joints, boats — hundreds of uses!

Each Lynx Thread Kit contains two drills, two taps, two inserting tools and supply of stainless steel wire thread inserts for most household uses — and complete instructions!

Send check or money order — no C.O.D.'s. Money back if not completely satisfied. \*Reg. U. S. Pat. Off.



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will be more water in the sea and the sea level will rise. Too much melting of the snow and glaciers might submerge some of the greatest cities of the globe. During the International Geophysical Year glaciers and snow cover will be measured in many parts of the world, both on the ground and from the air.

Observers in the antarctic and in remote islands and other places seldom visited by scientists, will make other kinds of observations: Earthquake records and measurements of the earth's attraction, or gravity, are examples.

### International Polar Years

The IGY is not the first large-scale international geophysical study of the earth. Indeed, it was first proposed in a more limited form as the third International Polar Year (IPY). The pioneer enterprise of this kind was the first IPY, which occupied 13 months of 1882-1883; its object was to improve arctic knowledge of meteorology, magnetism and the aurora. It greatly enhanced scientific knowledge of the arctic. Fifty years later, in 1932-1933, a second IPY was organized, again mainly for arctic studies but with an increased program of related observations in lower latitudes also.

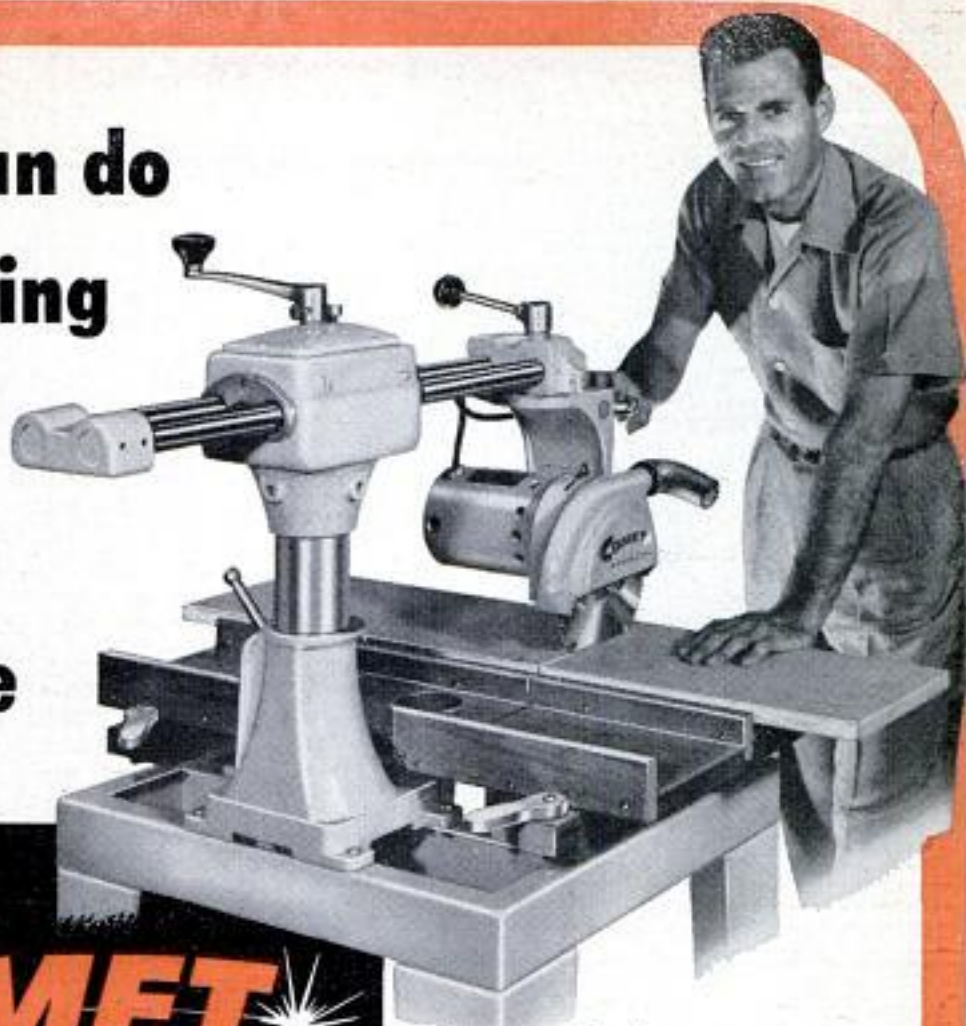
In April 1950, on my first postwar visit to the United States, I was privileged to be the guest, with a small group of American geophysicists, of Prof. J. A. Van Allen (now of Iowa State University) at his home in Silver Spring, Md. After dinner, the organization of a third IPY after 25 instead of 50 years was proposed by my friend Dr. Lloyd Berkner, one of the pioneers in ionospheric studies. A main reason for his proposal was the great advance in many techniques of measurement since 1933, partly through the stimulus given by World War II and the development of radar and rockets.

The proposal was warmly received by the group and later in 1950 Doctor Berkner and I brought it formally before international scientific bodies with which we were connected. Their support was forthcoming, and this led in 1951 to the adoption of the proposal by the International Council of Scientific Unions (ICSU). This body in 1952 appointed the nucleus of an international committee to organize the third IPY and also invited the nations to set up national committees to formulate plans, along suggested lines, for their shares in the enterprise. In 1952 the plan was widened to include the study of the whole earth, and the proposed third IPY thus gave place to the first IGY.

(Continued to page 264)



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A LATHE	SANDER-GRINDER
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JIG SAW	

**W**ould you like to make things like a professional cabinet maker? Then don't get a flimsy power saw you'll want to sell later. Get a *professional* machine you'll enjoy for years. Get a Comet! You *glide the blade through the wood* . . . *above* the wood where you can see the blade go right down your pencil mark. You *don't* shove wood (and fingers) over a blade that's *under* the wood. The Comet is safe, accurate, powerful, easy to use. You can build anything from a piece of furniture to an entire house . . . on one machine only 28 x 30 inches! Builders and cabinet shops use Comets, and recommend them for home workshops.

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**Nations to Share Costs**

The international committee was enlarged in 1953 and 1954. Doctor Berkner is vice-chairman of the committee, of which I was elected chairman; the secretariat is at Brussels, under Dr. M. Nicolet. The relatively small funds needed for the central planning of the IGY are provided by ICSU and UNESCO. The actual programs of observation will be paid for by the nations that execute them; the cost of the whole enterprise, which is one of voluntary cooperation between many nations, has been estimated to exceed \$100,000,000.

Russia, which took a valuable part in the first and second international polar years, in 1954 announced its intention to share in the IGY. Communist China also has joined the effort. In this country in 1953 Congress voted over \$2,000,000 for the preparatory work of the United States and this year placed a considerably larger sum in charge of the National Science Foundation for the main United States effort; much more will be contributed in auxiliary aid, naval and air transport and logistics. A United States Navy icebreaker, the *Atka*, already has made a south-polar journey to survey possible United States sites for coastal antarctic IGY stations. Other sites will be inland, one United States site being at the South Pole itself. Thirteen nations are expected to set up antarctic stations, probably about 20 stations in all.

The IGY is a period of concentrated widespread effort, but there will be special periods within it. Among these special periods will be three Regular World Days each month, fixed beforehand; they will include some predictable events like eclipses and meteor showers. For weather observers there will be longer special periods of 10 days, one in each of the six quarter-years of the IGY.

**World Alerts**

But the onset of solar, ionospheric, magnetic and auroral storms cannot be predicted long ahead. Several are expected to occur during the International Geophysical Year, which will be near the peak of the next sunspot maximum. The close watch to be kept on the sun will indicate, some days ahead, when there is a special chance (though not a certainty) of such storms; notices of World Alerts will then be issued from a central predicting agency—probably located at Boulder, Colo. They will be distributed within each participating nation to its own stations concerned with the geophysical observations. By this means it is hoped that all stations will be fully ready

(Continued to page 266)



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When you build your home be sure you're getting the added protection of insulation and building board that's *fully* protected against rot, mold, mildew and termites. Leading manufacturers ensure longer board life by treating with \*PENTACHLOROPHENOL preservative. Clean, odorless PENTA keeps board sturdy longer, helps it in such applications as sheathing, siding, roof decking, lath. Make sure the board you buy is PENTA-treated; ask your building supply dealer. You'll be glad you insisted.



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to observe the storms if they do occur. When the continuing developments on the sun render it suitable, a Special World Interval will be declared about 12 hours in advance, to continue until terminated by the predicting agencies. During such Special World Intervals the most intensive ionospheric, magnetic and auroral observations will be made. This should make it possible for any of those auroras which on occasions become visible from the tropics to be properly observed for the first time.

### Greatest Effort

The IGY is unquestionably the greatest international effort yet made in the study of the earth and sun. One of the most striking advances in the techniques to be used, as compared with the second IPY, is in the exploration of the upper atmosphere by rockets, launched from the ground or from balloons, and perhaps also from aircraft. And of course the United States government has announced its intention of launching artificial earth satellites for observations during IGY. In the IGY rocket program, the United States will play the major part, but France, England, Australia and perhaps other countries hope also to contribute. Plans of the United States include the firing of over 200 rockets from land, ship and balloon, from United States continental stations, Churchill in Canada, in the antarctic, and from ships in the Pacific and the Arctic and Antarctic Oceans.

### Commended by President

The IGY has been commended by President Eisenhower as an enterprise of great prospective material benefit to mankind, and as likely to contribute to more peaceful and cooperative international relations. The sails seem spread in a favorable breeze. May clear skies in one or another part of the globe permit a continuous watch on the sun; but it is hoped that the sun will not be too peaceful throughout the IGY. May it give us at least a few stormy periods, not indeed in the weather region near the ground, but aloft in the ionosphere whence the aurora shines down upon us. ★ ★ ★

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Caribbean cushions are reversible. One side is fabric (back cushion), other side is leather (seat cushion)

## 1956 Packard, Clipper and Caribbean

(Continued from page 95)

on. That means children cannot release the transmission and let your parked car roll down a hill.

### Top Horsepower So Far

Packard's V8 engine develops 290 horsepower. The Caribbean V8 puts out 310 horsepower, the highest in the industry so far this year. Torque of both engines (and Packard emphasizes that torque is more important than horsepower) is 405 pound feet (also tops in the industry) at 2800 revolutions per minute.

The Clipper has 270 horsepower in the Custom series and 240 horsepower in the Super and Deluxe series. Torque is 380 on the Custom, 350 on the others.

Packard claims to have increased fuel economy considerably despite the increased displacement by raising the compression ratio to 10:1.

(Continued to page 270)

Control box for Packard's push-button shift is just below steering wheel where shift lever used to be



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The Ultramatic transmission now has an aluminum casing to reduce its weight by about 95 pounds, making it the lightest in America, according to Packard. This weight reduction improves weight distribution. It is now 52 percent on the front wheels and 48 percent on the rear.

The torsion-bar suspension and levelizer have been extended through the Clipper line.

**Styling Changes**

A neat trick in upholstery is the reversible Caribbean seat cushion. One side of the upholstery is fabric, the other side is leather. The cushion itself is all foam rubber. You can use the leather by day and the fabric by night. Or you can take the cushions with you for comfortable seating at a picnic or ball game.

Stylewise, the cars have had a major facelift. Both have distinctive front bumpers with a grille built into them below the main horizontal member. Front fenders have been made longer and headlights repositioned slightly. Rear fenders on the Clippers are also longer, taillights are enlarged and dual exhausts are worked neatly into the underside of the rear bumper.

The Packard is now available in more than 60 paint colors or combinations. In fact, on a special-order basis, you can have a Packard painted in any color or combination of colors you want—you can even have it painted to match your mother-in-law's complexion, if you wish. ★ ★ ★

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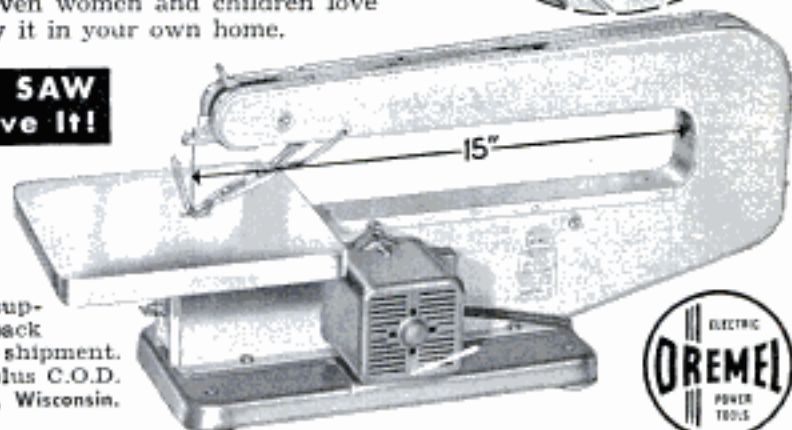
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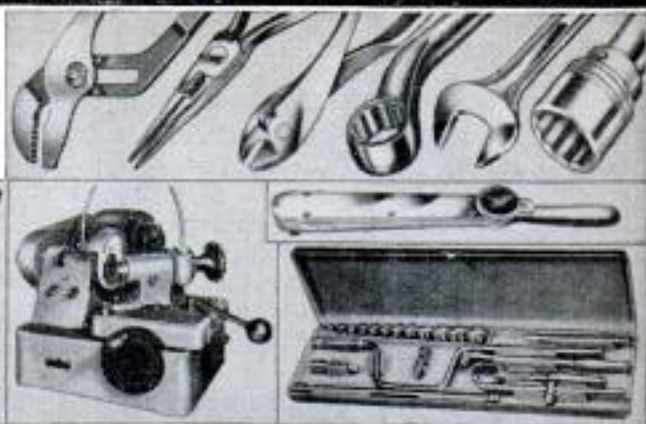
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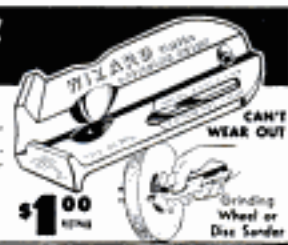
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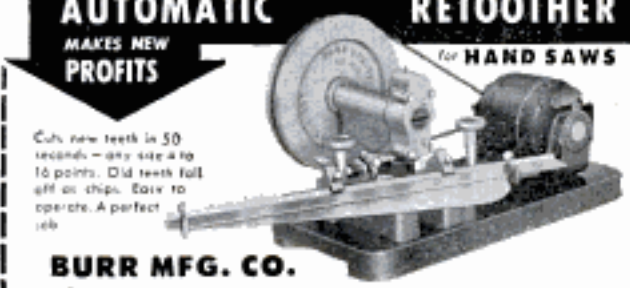
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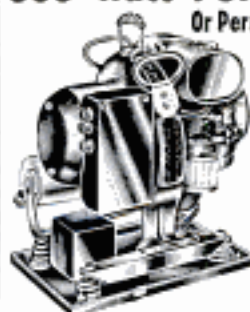
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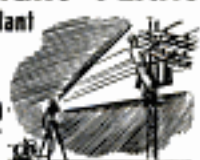
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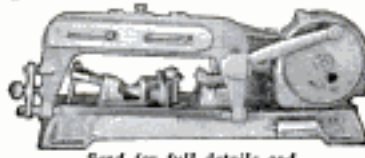
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Send for full details and name of nearest dealer.

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**AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC**

Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweepings. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.

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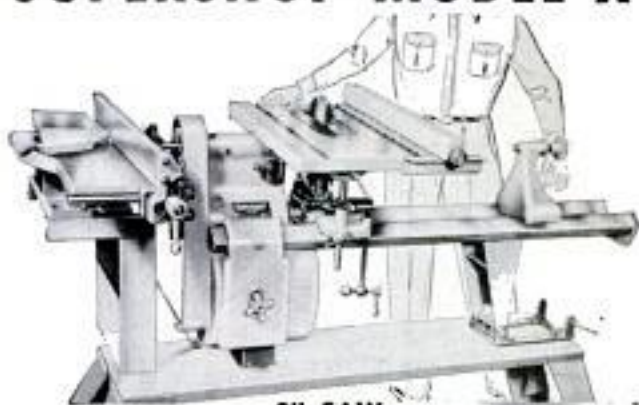
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8" SAW

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**SAWS ANY MATERIAL IN ANY DIRECTION**  
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World's safest saw blade.

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Does what no other Blade can Do  
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Makes hundreds of useful items so easy - just moisten gummed patterns and apply to wood supplied in Kit, then saw. Safe - can't cut the hand! Kit consists of magic saw frame, 3 Spyrals blades, 12 gummed patterns, screws, brads and cutting material. Only \$1.98 plus 35c postage. Order direct from factory. No C.O.D.'s.

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Cost the Air Force nearly \$200  
Can you use one at this pennies-on-the-dollar price?



**\$5.88**  
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Here's a partial list of  
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- Silver Surface Optical Mirrors
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**3400 RPM 1/2 HP POWER SAW**  
 COMPARES TO SAWS  
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 WITH A 5 1/2" BLADE **Only 19.98**  
**RIPS - CROSSCUTS**  
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A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable 0 to 7° rip fence. Safety-trigger switch on handle. Full 1/2 HP Universal AC-DC, 110-120 Volt, 50 cycle motor. Weighs only 8 1/2 lbs.

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### WITH THIS AMAZING RADIO RECEIVER

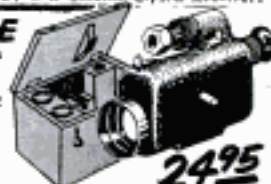
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**24.95**

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Beautifully turned, fully seasoned hardwood legs. Smoothly sanded and complete with brushed Brass tip and sturdy steel mounting plate. Available Finished or Unfinished - Finished units come in Blonde, Silver Fox, Mahogany or Charcoal Black. Please Specify type. Price per set of 4 with Brass tip.

SIZE	FINISHED	UNFINISHED	SIZE	FINISHED	UNFINISHED
4"	\$2.65	\$2.15	14"	\$4.40	\$3.95
6"	3.00	2.65	16"	4.75	4.40
8"	3.55	3.00	18"	5.35	4.75
12"	3.95	3.55	28"	6.25	5.35

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G1 Type Stainless Steel. Shatterproof and rustless. Has reinforcing ribs and its pressure tested up to 400 PSI. Has a high safety factor. Both ends have 1/4" pipe ports. It's ideal for use as a buoy, for drinking water supply, air supply for underwater fishing, diving, painting, spraying, cooking, etc.

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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, Dupliator setup on Mills, Conveyors, Small Cars, Drives, etc. **44.50**

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INPUT & TAKE-OFF PLATE ASSEM. To adapt Trans. to pulley drive. Has 1/2" keyway shaft. High speed bearings. **20.00 SET**

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Finest Quality, Lustrous White. Has tremendous tensile strength.

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1/4" Nylon	1300 lbs.	8¢ run. ft.
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1/2" Nylon	5000 lbs.	27¢ run. ft.
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LIFTS 1500 POUNDS - Made originally as a Bomb Hoist. Has 21 to 1 gear ratio. A 40" tubular arm extension with a 3" pulley. Drum has 12 ft. of 3/16" steel cable. Operating handle has ratchet brake. For "awing about" loading. \$125 VAL. **22.50**

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Our prices are LESS THAN DOMESTIC PLYWOOD at WHOLESALE. This selected LUAN MAHOGANY meets the most rigid specifications. It is WEATHER and WATER RESISTANT. You'll be amazed at the beauty of this fine wood. Its rich golden elegance will thrill you. Rotary cut for beauty of grain. Both sides sanded and ready to use. Bonded with finest resin adhesive. Face side unpeined.

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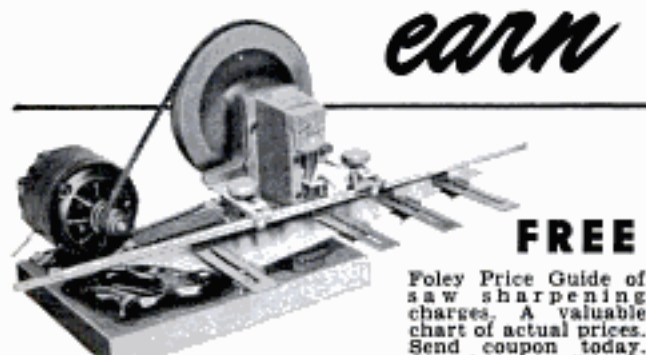
3mm (1/8") x 3 ft. x 8 ft. \$5.00 VALUE <b>1.79 PER SHEET</b> Minimum order 8 sheets	4mm x 4 ft. x 8 ft. \$7.50 VALUE <b>3.89 PER SHEET</b> Min. order 6 sheets	1/4" x 4 ft. x 8 ft. \$9.50 VALUE <b>4.99 PER SHEET</b> Min. order 4 sheets
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GUARANTEED  
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Make your own castings of aluminum, copper, bronze, silver. Foundry sets are available in three sizes including 2400 Deg. F. blast Furnaces. \$22.50; \$29.50; and \$42.00. f.o.b. Marysville, Kans. Free Circular.

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**& THE ART OF HAND SCRAPING**  
—USEFUL FOR DESIGN, SHOP & INSPECTION WORK—  
SEND FOR FOLDER DESCRIBING ILLUSTRATED BOOK  
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**The Modern PLASTIC  
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PERMANENTLY mends cracks or holes in wood, tile, stone or plaster. Sticks and stays put—Does not chip, shrink or fall out. Easy to use. Economical. Mold it, chisel it, polish or paint it. The big 4-lb. can is obtainable from your lumber, paint or hardware dealer at \$1.25; or will be shipped direct postpaid (in U. S.) for \$1.50. Complete satisfaction guaranteed or your money refunded.

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### 1300-1500 WATT PLANT

115v, 60 cyc. AC. Push Button Start. Powered by a 3 1/2 HP. Clinton engine. Combines best output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22). Wt. 110 lbs. Reg. \$475 value, Factory price... **\$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine starting & battery charging built-in. Factory price... **\$279.50**

### MASTER-LITE 2500 Watt Plant

110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5-1/2 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 220 lbs. Reg. \$945.00 (Item 23) Factory Price... **\$329.50**

3500 Watt Plant Push Button Start (Item 23)

115 v. 60 cyc. AC. Similar to above, but larger and 3 1/2 hp. capacity. Wt. 270 lbs. Reg. \$760. Factory Price... **\$379.50**

DUAL VOLTAGE 110/220 for any of above plants—\$10 additional

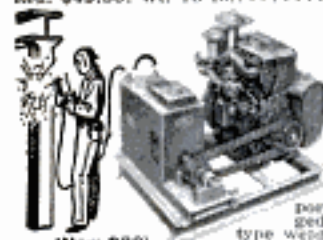
## 52 pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 52 sockets in 1/2" drive, 3/4" drive and 1/2" drive, plus all necessary extensions, handles, spacers, reversible ratchets, etc.; all uncoated, guaranteed against breakage. A beautiful set of tools that will handle any job in a big doghouse steel box. Wt. 17 lbs. (Item 24) List price \$62.00. Factory Special... **\$27.95**

## 44 Pc. SOCKET SET

(Item 506) Same unconditionally guaranteed, non-breakable sockets as above. Complete range of 21 sockets from 1/4" thru 1 1/2" drive; 6 7/16" drive, 1-1/16" drive and 1/2" drive, plus all necessary extensions, handles, spacers, reversible ratchets, sliding "T" head, all angle coupling, 1/2" speeder, 1/4" breaker, 3 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. Wt. 16 lb. .... **\$21.95**



## MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model meets for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easy welds anything up to 2" plate using from 1/16" to 3/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY—DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 14 HP. or more. (Item 25a). Wt. 110 lbs. \$450 value. .... **\$119.50**

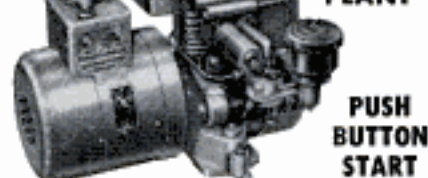
WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 28). Wt. 110 lbs. \$400 value. Special... **\$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 450 lbs. (Item 250) Compares with welder costing \$1200. Factory Special... **\$449.50**

WELDING KIT Two 10 lb. leads, welding helmet, electrode holder, ground clamp. Sells only with welder at... **\$10.50**

## get MASTER MECHANIC'S BEDROCK FACTORY PRICES

## 600-700 WATT PLANT

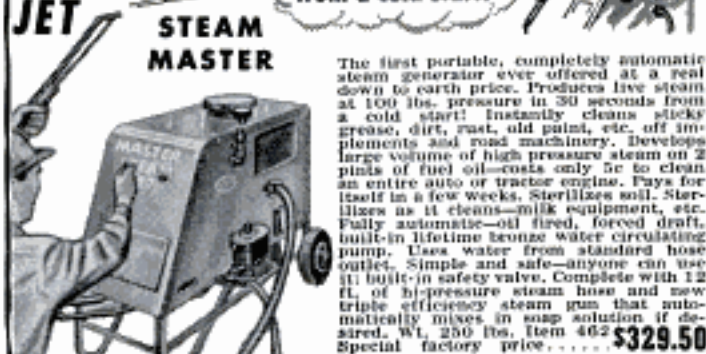


110 v. 60 cyc. AC. Powered by a rugged 2 HP. easy starting Briggs engine. No wiring necessary: just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Regular \$275.00 value... **\$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine... **\$199.50**

## MASTER MECHANIC'S LIVE STEAM

in 30 seconds from a cold start!



## JET STEAM MASTER

The first portable, completely automatic steam generator ever offered at a real down to earth price. Produces live steam at 100 lbs. pressure in 30 seconds from a cold start! Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Develops large volume of high pressure steam on 2 pints of fuel oil—costs only 5c to clean an entire auto or tractor engine. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired, forced draft, built-in lifetime bronze water circulating pump. Uses water from standard hose outlet. Simple and safe—anyone can use it built-in safety valve. Complete with 12 ft. of high pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 462... **\$329.50**

## EXTENSION CORD

heavy duty and very flexible. Neoprene 14-2 cable. 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**

No. 10-2 POWER CABLE. Heavy duty. Very flexible, rubber covered. 50 ft. with male and female fittings. Wt. 9 lbs. (Item 502a) **\$10.45**

No. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) Wt. 8 lbs. **\$4.95**. 100 ft. (Item 200) **\$12.95**

## HI-FLO Centrifugal PUMP

completely self-priming! No foot valve required! Tremendous capacity—100 gal. per min. Special impeller enables pump to handle mud, or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy low-cost service. Wt. 70 lbs. (Item 502) **\$134.50**

## 9 TON HYDRAULIC PRESS

A tremendous power hydraulic press, capable of exerting 18,000 lbs. pressure. Fits for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars—or pushing out frozen bearings and bushings. Developed pressure under perfect control and visible at all times on accurate gauge. Complete with both large and small anvils and dies to straighten any kind of curve or bend. (Item 404) Wt. 110 lbs. Actual list price \$300. Our special close-out price... **\$69.50**

## LESS THAN WHOLESALE

### GIANT 2000-2500 WATT PLANT

110-120 v. 60 cyc. AC. absolutely the best made—exclusive dynamicaly balanced armature heavy windings developed up to 5000 watt overload for motor starting. Skid mounted—portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price \$585. Special at... **\$299.50**

Same plant with electric self starter (Item 31a)... **\$359.50**

Generator only and control box... **\$169.50**

DUAL VOLTAGE 110-220 available on any of above models for \$28.00 additional.

### DIESEL LIGHT PLANT

(Item 1660) Diesel Master—11-12 kw. 110/220 v. AC single or 3 phase. 1800 rpm direct connected. Electric Self-starter. Engineered for permanent power where continuous low-cost, heavy duty service is important. Wt. 1350 lb. (Item 1660)

Reg. list \$3650.00 **\$1895.00**

### GAS DRIVEN PLANT. 10-11 kw

115-230 v. 60 cyc. AC. single or 3 phase, powered by 4 cylinder Wisconsin air cooled engine. Belt driven. Simple, reliable. 5 V-belt drive mounted on rugged steel skid. (Item 217) with crank start! Wt. 900 lb. Factory price... **\$1075.00**

Same plant with self-starter... **\$1145.00**

We make every type and size of light plants—Write, giving us your requirements!

## HEATING & VENTILATING FAN

(Item 10) Easily installed in furnaces, pipes, forces even heat to all rooms. Overrange removes kitchen smoke and odors. Powerful continuous duty motor. 110-120 v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM)

8" Pipe, wt. 5 lb. .... **\$6.85**

9" Pipe, wt. 6 lb. .... **\$7.85**

10" Pipe, wt. 7 lb. .... **\$8.85**

12" Pipe, wt. 8 lb. .... **\$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 100) **\$11.95**

12" Fan, wt. 10 lbs. (Item 100b) **\$12.95**

## CONDITIONAIRE VENTILATING FANS

Save big money installing your own exhaust fan. Efficient propeller type blade moves huge volume of air quickly and effortlessly. Heavy welded frame pre-drilled for easy installation. Just cut opening and bolt in place. Continuous duty motor. Ideal for auto, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade Opening CFM Wt. Item

16" 1814" 2925 19 lb. 305a **\$27.95**

18" 1914" 3600 27 lb. 305b **\$31.95**

20" 2114" 4100 30 lb. 305c **\$39.95**

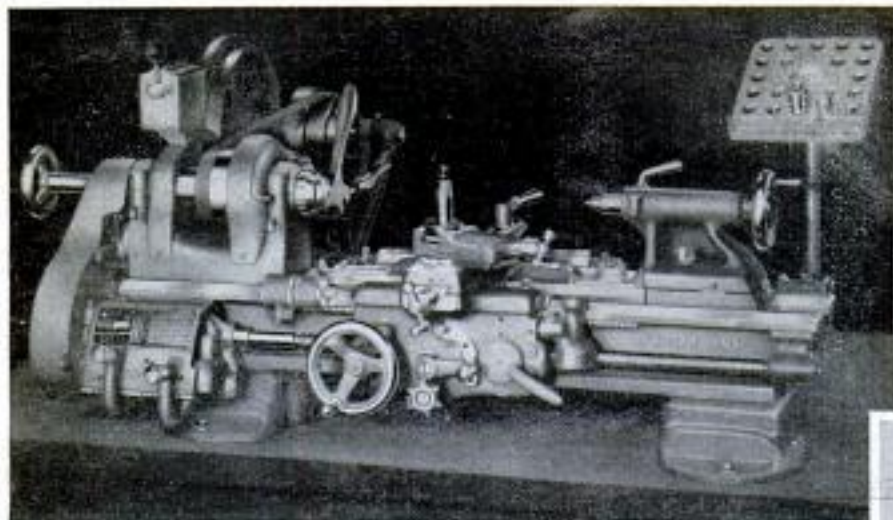
## JET FLOW BLOWER

Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unobtainable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any 1/4, 1/2 or 3/4 HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hi x 18" x 10 1/2". Outlet opening 13" x 11 3/4". Wt. 45 lbs. Item 245. Reg. \$54.00. Factory Special... **\$27.50**

HEAVY DUTY 3/4 HP motor for above **\$16.95**

12" TURBINE BLOWER Similar to above, but larger with 2400 CFM capacity. Wt. 65 lbs. (Item 245a) Reg. \$70.00. Factory Special... **\$34.50**

Send check or M.O. Prices F.o.b. Factory. 10 day Money back guarantee. SEND 10c for... **BIG 1956 Catalog** Burlington, Wis. DEPT. 60-L



9" x 3" Toolroom Bench Lathe with toolroom attachments, less electrical equipment, f.o.b. factory, **\$608**

# South Bend

**Built Better**  
TO GIVE YOU A  
**Better Buy**



10" Pedestal Grinder with wheels and lights, but less motor, f.o.b. factory, **\$248**



7" Bench Shaper with light, vise and pressure lubrication but less metal bench and motor, f.o.b. factory, **\$551**

South Bend Machine Tools contribute to the skill and ability of the most expert technician because they are a match for the most exacting tolerances required. Versatile and easy to operate they enable you to do more and better work. Quality built throughout, they represent maximum value at minimum cost. Regardless of the kind of machine work you do, it will be to your advantage to learn more about South Bend. Mail coupon for complete information without obligation.

### TIME PAYMENTS

only **3¼%**

annual interest on original unpaid balance. Low down payment and monthly installments.

Compared with our costs  
**OUR PRICES ARE LOWER**  
than they were back in 1941

WAGES UP <b>155%</b>	MATERIALS UP <b>131%</b>	PRICES UP ONLY <b>49%</b>
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Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

**SEND INFORMATION CHECKED:**

**9" and 10" BENCH LATHES**     **10" to 16-24" FLOOR LATHES**     **DRILL PRESSES**     **TOOL GRINDERS**     **½" & 1" Collet TURRET LATHES**     **7" BENCH SHAPERS**

Name \_\_\_\_\_ Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana





**17 pt. Plug**  
**shows 11% fuel**  
**saving in**  
**stock American**  
**automobile!**

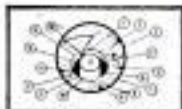


New electrode system still fires clean, hot and steady past 50,000 car miles! You may now order a set of these remarkable LIFE-TIME spark plugs from this advertisement . . .

**50,000 CAR MILES!** Before LIFE-TIME development, the spark plug was the most often replaced part of your car. Engineers agreed that "creeping paralysis," gradual electrode disintegration, carbon buildup, widening gap, burning, blistering, insulator failure could waste one gallon in ten. The LIFE-TIME plug goes far beyond the life of the average set of tires, the average battery, firing clean, hot and steady at 50,000 car miles! Most spectacular spark plug research breakthrough in 50 years allows unprecedented warranty. WE GUARANTEE GREATER GAS MILEAGE—GREATER ACCELERATION—A MAJOR POWER INCREASE—OR YOUR MONEY BACK.

**HOW 17 PT. FIRING WORKS**

Note electrodes closely. A circular arcing area (four concave segments). Gap being the same from all points. Electricity has property of arcing from coldest point. Current also arcs more readily from apex of two planes than from face of a flat, metallic surface. Note that there are 16 apexes (where two planes meet) — all the same distance from the center electrode.



**SPARK ROTATES AROUND CIRCLE.** Normal heat and spark erosion are spread around the entire 360 degrees and around the whole circumference of the center electrode.

**PLATONIUM-NICKEL ALLOY ELECTRODES**— Metallurgists' first major step beyond platinum aircraft plug electrodes. Arcing points of this material have continued to function after the equivalent of 120,000 car-miles.

**SPECIAL SINTERED CORUNDUM INSULATOR**— Made of gem-like mineral which conducts heat 20 times better than ordinary porcelain. Special shape (seen beneath electrodes) is designed to vaporize and exhaust wet carbon and oil.

**INDIVIDUAL INSPECTION**— Each LIFE-TIME Spark Plug is tested for firing in oil and for resistance to 30,000 volts/CM.

**PERMANENT GAP**— After months of use, LIFE-TIME Spark Plugs mike at exact factory pre-gap.

**SELF-CLEANING FOR LIFE**— Confined gases exploding in chamber formed by multiple electrodes reclean arcing surfaces with each firing stroke.

**"THANKS FOR YOUR WONDERFUL LETTERS"**



The real test of a spark plug is "What will it do in my own car?" Take the above dynamometer test on a 1951 Buick Super. It shows an 8 horsepower gain with Life-Time 17-point plugs. That was a 12 1/2% hp gain at 2000 RPM. You don't need a dynamometer with Life-Time Plugs. You can feel the difference both in your ride and your pocketbook. Try a set and let me hear from you about them. Many Thanks.

*Frank Williams*

Inventor of the LIFE-TIME Spark Plug

CONTINENTAL MFG. CORP., CULVER CITY, CALIF.



**NOW ORDER REGISTERED SET FOR YOUR CAR AT POPULAR PRICE!**

this registered set of LIFE-TIME Spark Plugs in proper series (heat range and gap) for the car you indicate in coupon. NOW AVAILABLE FOR AMERICAN & EUROPEAN PASSENGER CARS, TRUCKS, BOATS, FARM EQUIPMENT, INDUSTRIAL ENGINES.

**DEALERS AND DISTRIBUTORS**— The LIFE-TIME Spark Plug is now in full production. Write for full details. Distributors: Please inquire as to status of your territory.

• LIFE-TIME Spark Plug Division  
 • CONTINENTAL MANUFACTURING CORP.  
 • Washington Blvd. at Motor Ave., Culver City 106, California

Gentlemen: Please mail postpaid \_\_\_\_\_ set(s) (registered) of LIFE-TIME Spark Plugs in proper heat range and gap for my car at \$1.19 per plug (set of six, \$7.14, set of eight, \$9.52). (Or send \$1 per set, balance C.O.D.) California residents add 3% tax.

• Make of my car is \_\_\_\_\_ year \_\_\_\_\_  
 • Model \_\_\_\_\_ No. cyl. \_\_\_\_\_  
 • I enclose \$ \_\_\_\_\_ (check, cash or money order)  
 • Name \_\_\_\_\_  
 • Address \_\_\_\_\_  
 • City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

*"PRESTONE" BRAND anti-freeze protects  
your car from freeze-ups all winter long!*

## Guarantee

"National Carbon Company, A Division of Union Carbide and Carbon Corporation, specifically guarantees that 'Prestone' brand anti-freeze, if used according to printed directions\* in normal water cooling systems, will protect the cooling system of your car against freezing and clogging from rust formation for a full winter; also that it will not boil away, will not cause damage to car finish, or to the metal or rubber parts of the cooling system, and that it will not leak out of a cooling system tight enough to hold water."

*\*Ask your dealer for copy.*

You're SET, You're SAFE, You're SURE,  
when you find the **GREEN TAG** attached by your dealer



# PRESTONE

## ANTI-FREEZE

LIST PRICE **\$3<sup>25</sup>** A GALLON, 85¢ PER QUART

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