

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

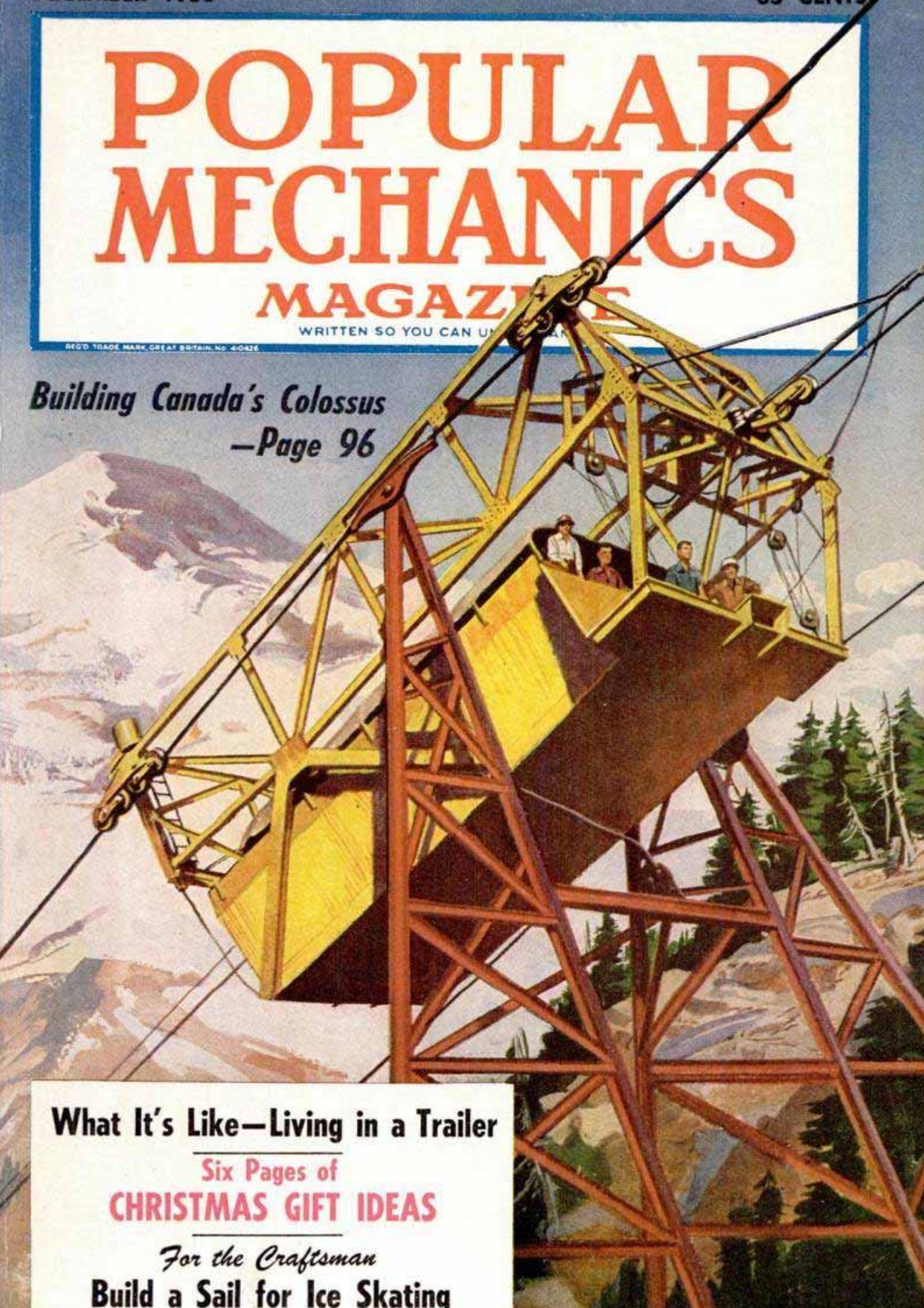
REGD. TRADE MARK, GREAT BRITAIN, No. 4-0426

Building Canada's Colossus
—Page 96

What It's Like—Living in a Trailer

Six Pages of
CHRISTMAS GIFT IDEAS

For the Craftsman
Build a Sail for Ice Skating



GET A SMOOTHER, QUIETER ENGINE... MORE PUNCH ON THE PICK-UP...with the **MARVEL INVERSE OILER**



Install it and see! Your car takes a new lease on life, when vital upper cylinder areas are lubricated automatically by the Marvel Inverse Oiler.

Operating off the intake manifold, this completely automatic oiler feeds to the upper cylinder areas in exact proportion to engine load and speed.

Install it. Fill it. Adjust it. And forget it! There's no maintenance worry with the Marvel Inverse Oiler. Fully automatic operation and full quart capacity give you 1000 miles of carefree motoring on each filling.

Here's how Fully Automatic Operation Improves your car's performance!

Notice how the Marvel Inverse Oiler feeds oil just exactly as your engine needs it. Throttle open, under load or speed...more oil. Throttle closed, less oil.



EMEROL

MANUFACTURING CO., INC.

Dept. 122

242 West 69th Street
New York 22, N. Y.

Use only **MARVEL Mystery Oil** in the Marvel Inverse Oiler

Time-tested secret formula gives you everything you want in an upper cylinder oil. Especially blended and refined to keep sludge-forming components in emulsion, and prevent oil rupture.

Marvel Mystery Oil reduces cylinder wall and piston wear. It keeps piston rings at their proper wall tension. Prevents excessive wear on intake valves, and keeps exhaust valves from sticking.

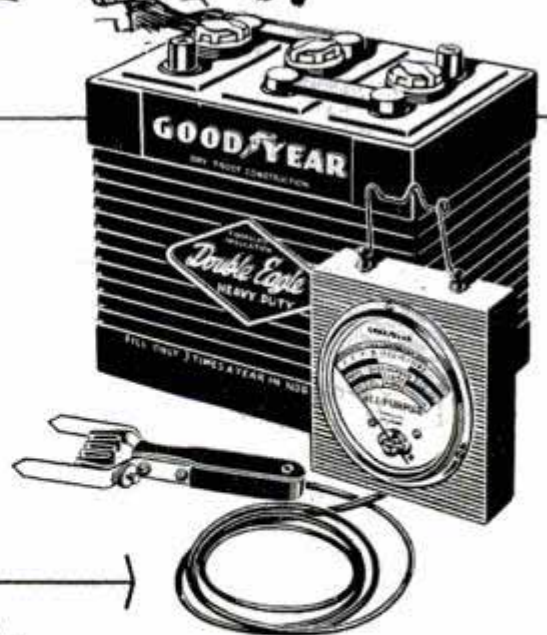


Don't let your battery let you down



When winter winds come whirling in, a good battery is something to be thankful for. So don't ever be caught alive with a dead battery. How do you make sure? First chance you get, stop in at your Goodyear dealer's. Have your battery checked free with the portable, accurate, Goodyear All-Purpose Tester. That's the way to catch battery troubles before they start. And don't forget to ask about the Goodyear Dry Proof Double Eagle Batteries, too.

Goodyear, Battery Dept., Akron 16, Ohio



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

GOODYEAR

DRY PROOF • DOUBLE

This One



Don't be satisfied with an ordinary radio...

get a hallicrafters



and Hear it All!

Now, at prices no higher than you'd expect to pay for ordinary radio, you can have all the thrills of short-wave reception, plus tops in regular broadcasts, too. You hear London, Paris, Rio, Moscow—hear ships at sea and planes in the air—police and military broadcasts—and you hear them *direct* with a Hallicrafters.

Hear amateur broadcasts from all over the world, and get in on the fun of the world's greatest hobby. And you'll hear them on the sets that these critical experts choose for themselves . . . Hallicrafters. For many years Hallicrafters has been first choice with amateurs, just as governments all over the world, including our own, have chosen Hallicrafters for critical communications.

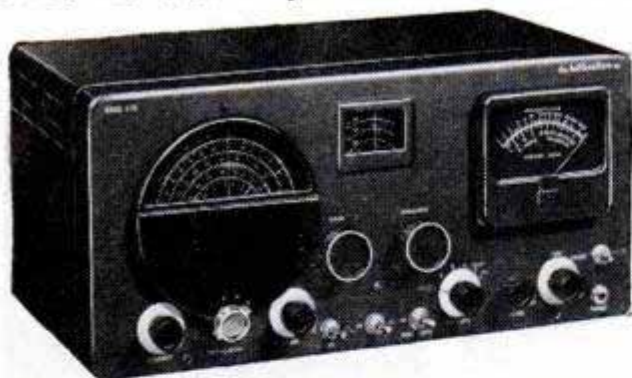
Hallicrafters prices start at \$59.95

Write today for full information.

Model S-53A. The finest small communications receiver built and ideal where maximum performance is required in small space. Covers Broadcast Band 540-1630 kc plus four short-wave bands covering 2.5-31 and 48-54.5 Mc.

Electrical bandsread for easy tuning. Two i-f stage. Switches for automatic noise limiter, code reception and high-low tone. Phono jack for records. Headfones tip jacks on rear and built-in PM speaker. Temp. compensated to reduce fading due to frequency shift.

Satin black steel cabinet with brushed chrome trim. 12 $\frac{7}{8}$ " x 7" x 7 $\frac{3}{4}$ " deep. Ship. wt. 19 lbs. Piano hinge top. Seven tubes plus rectifier. For 105/125 V. 50/60 cycle AC..... **\$99⁹⁵**



Model S-76. Double conversion receiver. Value packed communications receiver with Broadcast Band 538-1580 kc plus three short-wave bands covering 1720 kc-34 Mc.

Electrical bandsread tuning control with calibrated dial to separate stations on crowded bands. Double superhet with 50 kc second i-f and giant 4-inch "S" meter. Five position selectivity, one r-f, two conversion, two i-f stages, temperature compensated. Phono input jack. 3.2 or 500 ohm outputs. Socket for external power or remote control.

Satin black steel cabinet with chrome plastic trim rings. 18 $\frac{1}{2}$ " x 8 $\frac{7}{8}$ " x 9 $\frac{1}{2}$ " deep. Ship. wt. 41 lbs. Piano hinge top. Nine tubes plus voltage regulator and rectifier.

For 105/125 V. 50/60 cycle AC..... **\$199⁹⁵**
Use R-46 speaker.

hallicrafters

4401 West Fifth Avenue, Chicago 24, Illinois
Hallicrafters Ltd., 51 Camden Street, Toronto, Canada

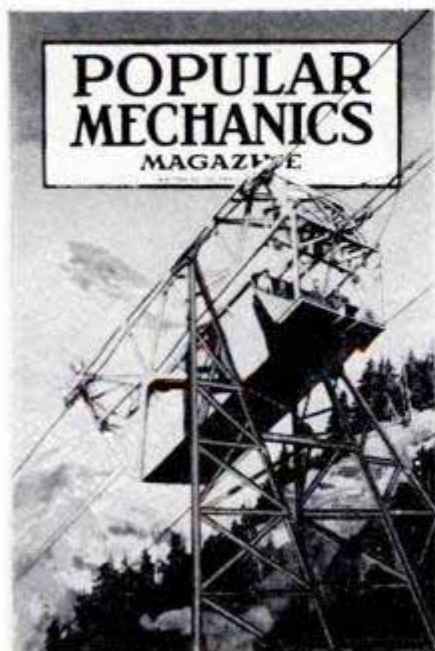
World's Leading Exclusive Manufacturer
of High Fidelity and Communications Equipment,
Radio and Television

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, *Founder*

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



this month's cover

LIKE TO RIDE one of the most thrilling "skylifts" ever built? You won't find this one at Coney Island, but in the Canadian Rockies 400 miles north of Vancouver, B. C., where a huge power plant is being carved deep in the base of a mountain. The turbines will spin up 1,650,000 horsepower which will crackle into the largest aluminum smelting plant on earth. The skylift carries men and machines 2600 feet up the side of a mountain. On its first journey the cable car ran smack into a jutting crag of rock. The passengers calmly blasted away a piece of mountain and proceeded on their way. To harness the water power, engineers have had to reverse the flow of a 125-mile chain of lakes, forcing the water back through a 10-mile tunnel to a mountain peak. From here the water will plunge down a half-mile manmade hole in the mountain to the powerhouse below. You'll find the fascinating story on page 96

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Address all communications to:
200 East Ontario Street, Chicago 11, Illinois

Managing Editor.....	Roderick M. Grant
Assistant Managing Editor.....	Wayne Whittaker
Shop Notes and Crafts Editor.....	James R. Ward
Radio-Television, Electronics Editor.....	Frank L. Brittin
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Assistant Editors	
Leonard F. Hilts	Elsie L. Domin Elliott H. McCleary Jay W. Hedden
Eastern Editor.....	Richard F. Dempewolf Empire State Bldg., Room 2906, New York City 1
Western Editor.....	Thomas E. Stimson, Jr.
London Manager.....	Douglas W. Wedderspoon Eagle House, Jermyn St., London S. W. 1, England
Director, Bureau of Information.....	Allan Carpenter 200 E. Ontario St., Chicago 11

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NEW! ALUMINUM STORM WINDOWS EASIER TO MAKE THAN WOODEN ONES!

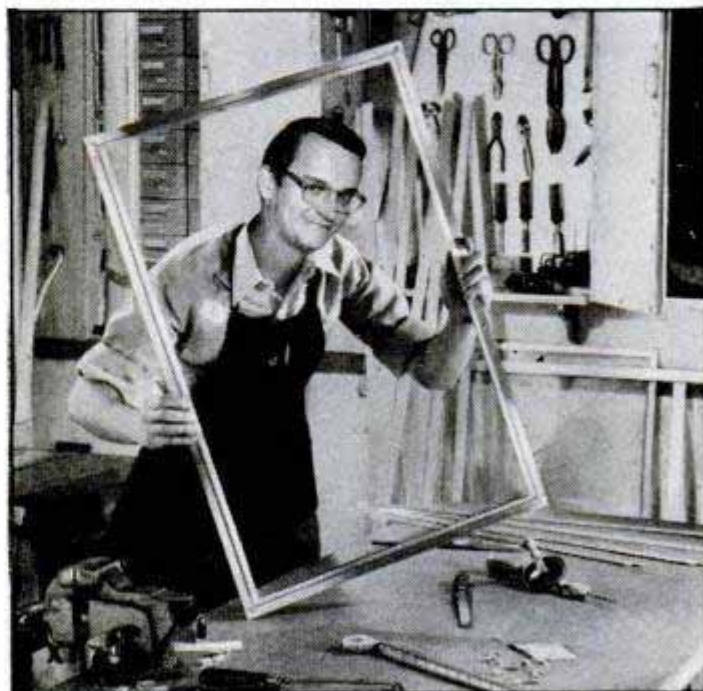
Make and repair countless other things
around your home with amazing new

REYNOLDS Do-It-Yourself ALUMINUM



No Special Tools . . .
No Special Skills Required!

This amazing new kind of material opens up a brand new field for the home owner and hobbyist. It has the beauty and strength of regular aluminum. But Reynolds *Do-It-Yourself* Aluminum, made by the makers of Reynolds Wrap, is specially engineered for amazing workability. You can cut it with scissors, drill it, bend it, shape it and plane it, using ordinary hand or power tools. And it's so easy to use that even an amateur can become an expert overnight!



Wally Cox, TV's Mister Peepers (Sunday nights, NBC-TV) shows one of the aluminum storm windows you can make with Reynolds *Do-It-Yourself* Aluminum. These storm windows . . . so much easier to make than wooden ones . . . are permanent, rustproof, attractive, can be made with either glass or plastic panes.



END TABLES like this, made easily and quickly with new Reynolds *Do-It-Yourself* Aluminum, are smart, modern . . . cost very little.



WALL PROTECTOR made in an hour using Reynolds *Do-It-Yourself* Embossed Aluminum Sheets is just as handsome as it is practical.



FISHING NET and light, strong fishing rod cases are simple projects with Reynolds *Do-It-Yourself* Aluminum, make fine Xmas gifts.



HOUSE NUMBERS add an expert decorator's touch to any house, are easy to make with Reynolds *Do-It-Yourself* Aluminum.

ORDINARY HAND OR POWER TOOLS WORK FINE
ON THIS FABULOUS NEW MATERIAL



SAW IT PLANE IT DRILL IT BEND IT CUT IT

CAUTION: Regular aluminum may harm tools . . . use only Reynolds *Do-It-Yourself* Aluminum. Each piece has Seal attached.

Look for this Self-Service
rack containing
REYNOLDS
Do-It-Yourself
ALUMINUM
at hardware and lumber
supply dealers everywhere

Tubes • rods • bars • plain
sheets • embossed sheets
angles • fasteners • screen
and storm window sections
window hardware • plastic
sheet • trim moulding

APPROVED BY:

Atlas • Delta • Disston • DeWalt
Black & Decker • Stanley
Skil Corporation and other
Leading Tool Makers



FREE BOOKLET is available with instructions and projects for Reynolds *Do-It-Yourself* Aluminum. See your dealer or write Reynolds *Do-It-Yourself* Aluminum at address below.



REYNOLDS DO-IT-YOURSELF ALUMINUM • 2502 South Third Street, Louisville 1, Kentucky



Texaco Tips

on car care

How to help keep front wheel bearings in top shape

Front wheel bearings may burn out if they're not lubricated every 10,000 miles. See your Texaco Dealer for a front wheel bearing check-up. If necessary, he will remove the old grease, clean the grime out of the bearings and apply heavy duty Marfak lubricant. It's care like this that helps keep your motoring trouble-free—and safer.



How to get that "cushiony" ride

Get Marfak lubrication for your car's chassis — and you'll get cushiony driving ease for 1,000 miles or more! This "stretch test" shows why. Given this treatment, an ordinary grease would fall apart. Not Marfak! It's extra-tough and stretchy. This means Marfak clings to chassis points of friction and wear far longer — resists jar-out, squeeze-out and wash-out, too. Start enjoying that cushiony feeling today. Get Marfak lubrication from your Texaco Dealer, the best friend your car has ever had.

THAT "CUSHIONY" FEELING
LASTS LONGER WITH



THE TEXAS COMPANY
TEXACO DEALERS
in all 48 states

Texaco Products are also distributed in Canada and in Latin America

TUNE IN: METROPOLITAN OPERA radio broadcasts every Saturday afternoon. See newspaper for time and station.



Sealing Savvy

YOU CAN SEAL ABOUT EVERYTHING WITH

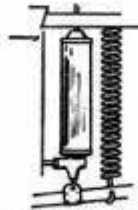
PERMATEX FORM-A-GASKET®

Leakproof against water, oil, gasoline, most chemicals, heat and cold.



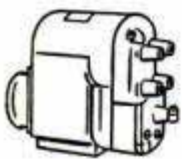
SAVE CORRODED CYLINDER HEADS!

Clean out corrosion. Build up with Form-A-Gasket #1. When set, reassemble with Form-A-Gasket #3.



SEALS CAR WINDOW CLOSERS!

Seal automatic window closer cylinders with Form-A-Gasket #2; it allows later removal of cap.



KEEPS MAGNETO DUST FREE!

On farms and other dusty areas, seal magneto caps and covers with Aviation Form-A-Gasket #3.



SEALS ELECTRIC MOTORS!

Keep motors dry by coating the motor windings and sealing the cover flanges with Form-A-Gasket #2.



RESCUE DROPPED PARTS!

Use Form-A-Gasket #2 on a long shank screwdriver with a thin strip of cloth around it. Makes it easy to pick up small parts you can't reach.



**MEND CAR
WEATHER STRIPPING!**
Aviation Form-A-Gasket #3 holds stripping in place. Also good for car floor mats.

3 TYPES

- No. 1** Sets quickly, dries hard
- No. 2** Sets slowly, remains pliable
- No. 3 (Aviation)** Brushable liquid (brush in can), sets to a paste; remains tacky.

All three belong in your shop!



PERMATEX COMPANY, INC., Brooklyn 35, N.Y.

Over 50 Chemical Products for Better Automotive Maintenance

in this corner.....

THE EDITORS



This month the world salutes again the Wright brothers on the fiftieth anniversary of their first powered flight at Kitty Hawk, N. C. To show in a graphic way how far we have come since Kitty Hawk, we present on pages 92 to 95 in this issue two drawings by the noted artist, Leydenfrost, one pin-pointing the 54 giant passenger planes en route across the Atlantic at one moment of this year, the other a map showing the major historical events and records in these first 50 years of flight.



For years one of our frequent overseas contributors has been Hans F. Kutschbach of Bad Grund/Harz, in the British zone of Germany. Reminiscing on this fiftieth anniversary of the Wright brothers' first flight, Mr. Kutschbach tells us he was a fellow student of the famous Anthony



Fokker and learned to fly in the same biplane in which the now noted German aircraft builder first flew in 1911. The photograph shows Kutschbach at the stick of the plane at Doitzheim near Wiesbaden.

Next Month, the Rear-Engines

What do American owners of European-made rear-engine automobiles think of their cars? To find out, we have polled drivers of the Porsche, Volkswagen and Renault. A report based on these questionnaires, along with Floyd Clymer's study of the three automobiles, will appear in the January issue. Don't miss it!

To the Editor:

I enjoy Floyd Clymer's write ups on cars, and consider he gives a fair opinion on each make, but I cannot see myself ever getting

(Continued to page 8)

This **FREE SAMPLE LESSON** will prove you can become an expert **BOOKKEEPER... ACCOUNTANT** OR **C.P.A.**



This well-paid
LaSalle-trained
Accountant's
success could
be yours.

FREE SAMPLE LESSON

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You will see exactly how LaSalle's famous "Problem Method" works... how you are led step-by-step through actual accounting work—*learning by doing* and not by study of theory alone. First you tackle easy problems, then more difficult ones—until soon you master them all. And at every step you have the close personal guidance of LaSalle's large staff of C.P.A. instructors.

HIGHER ACCOUNTANCY

By the LaSalle Problem Method..

• Practical Accounting

Assignment 1

THE BALANCE SHEET



QUOTING from the "Journal of Accountancy," the authoritative organ of the professional accountants of the United States:
"...the accounting profession is probably the best paid in the world. If there be a profession in which the average compensation is higher, it is not known to us."
"There is need for accountants. There is ample compensation for accountants. There is no prospect that the supply will overtake the demand within the lifetime of even the youngest of us."

LaSalle Extension University
A Correspondence Institution
CHICAGO

THIS SAME LESSON HAS STARTED HUNDREDS OF THOUSANDS toward well-paid accounting careers—in business, government, and as C.P.A.'s. Even without previous knowledge, progress is rapid—earning power climbs fast. This sample lesson shows why.

If you have been envying the high incomes and good jobs enjoyed by thousands of men and women Accountants today... incomes ranging from \$4,000 to \$10,000 and more per year... why not launch such a career for yourself?

Do you doubt that you can?

Then let us send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand

men and women toward successful accounting careers. We want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain... how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree of Certified Public Accountant if you so aspire.

It doesn't matter whether you've had previous bookkeeping experience, or whether you don't know a debit from a credit. Whether you wish to qualify as an expert bookkeeper, advanced accountant, cost accountant, auditor, government accountant, income tax specialist, or public accountant... you'll find in LaSalle's Problem Method the exact plan to prepare you rapidly and inexpensively—in spare hours at home—without losing a day from your present job.

So right now, today... if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions... send your name and address on the coupon below. We'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

**Nearly 10%
of all C.P.A.'s
in the U.S. have
been trained by the
LaSalle Problem
Method**

GOOD-PAY JOBS IN 5 BIG FIELDS

If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Surveys show that accountants earn more than those in other major professions.

There are five big fields of opportunity open to Accountancy-trained men and women... opportunities that are wide open and highly inviting, offering maximum income and job security in good times or bad. And under LaSalle's "Problem Method" you can start earning while still learning—either in spare-time or full-time employment... or in business for yourself with no capital required.

Get the latest information by sending for our 48-page book, "Accountancy, the Profession That Pays"... plus free sample lesson. The coupon at right will bring both to you without cost or obligation. LaSalle Extension, 417 S. Dearborn St., Chicago 5, Ill.

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

Street Address.....

City, Zone & State.....

Present Position.....



NEWS FROM SCIENCE ABOUT YOUR HAIR



V-7

—new
grooming discovery
outdates messy oils

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

PROOF

you don't need
grease to
correct dryness



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

KEEPS YOUR HAIR NEAT ALL DAY —GREASELESSLY

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



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

(Continued from page 6)

one of them. . . . It might interest you to know that a Ford V8 costs about \$5,700 in your money and I am afraid that in this country they are no longer the family car for the workingman as they were before the war. . . . I look forward each month to the new copy [of *Popular Mechanics*] because I know that for the next week or so all my spare time will be a pleasure.

G. R. Pullan,
Auckland, New Zealand.

Mile-a-Minute Delta:

John B. Vella of Sliema, Malta, sends us this photograph of a model delta plane built by himself and designed, with Vella's help, by his brother Wilfrid. Construction



took two weeks, and Vella writes: "The trial test went as follows: Speed, first test over 60 miles per hour. Most effective elevator response over 35 miles per hour. Performance, excellent stability at all speeds flown on 50-foot lines. Powered by a 3.5-cubic-centimeter diesel engine."

☆☆☆

K.L.M. Royal Dutch Airlines has turned down a permit to land airplanes at Mala-Mala Airport in South Africa. Reason: Several lions and a lioness with newborn cubs are at home on the runway, and any aircraft landing there must wait until guards shoo the animals out of the way.

To the Editor:

You provided a very one-sided picture of the passing of the steam locomotive: "What Comes After the Iron Horse" (Sept. 1953).

(Continued to page 10)

ARE THESE MISTAKES HOLDING YOU BACK?

If you're not getting ahead as fast as you'd like, check these possible reasons. Find out why you're not a success and what you can do about it.

YES NO

- Do you put things off? To get anywhere you have to make a start.
- Do you really want to succeed? Isn't there something you want enough to work for it? Marriage, a new home, money for your family—all depend on your advancement.
- Are you unwilling to give up temporary pleasures? Some people think more of a good time now than of promotion and higher pay later on.
- Are you too lazy to plan ahead? You've got to manage your life, plan for success and stick to it.
- Are you afraid of responsibility? In a bigger job you'll have to make decisions, act, be somebody.
- Are you short on courage? It takes grit and determination to set a course and stick to it.
- Is your education limited? The good jobs go to men who know—men with sound training in their field. I. C. S. offers you that training.
- Do you think you can't afford specialized training? College may be too expensive, but home study lets you earn while you learn, at 1/10 the cost.
- Do you hesitate to find out where to get training? If you shy off from taking the first step, you'll never achieve success.

One out of three who read this page and check their shortcomings will do something about it. Two will stay in the rut. One will plan for self-improvement and stay with it till he gets there. Are you the one?

I. C. S. has helped train nearly 6 million men and women for better jobs. Among its 391 courses there's one that can help you succeed. I. C. S. lessons are clear, direct, authoritative. They give you bedrock facts and theory with practical application. Studying at home you can progress at your own speed, have the advantage of individual instruction. Choose the course you need from the list below, and *mail the coupon today!* We'll send you full information plus free book, "How to Succeed."

I.C.S.—the lifetime Christmas gift

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

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ICS

BOX 5604-L, SCRANTON 9, PENNA.

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

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Drafting <input type="checkbox"/> Building Contractor <input type="checkbox"/> Estimating <input type="checkbox"/> Carpenter and Mill Work <input type="checkbox"/> Carpenter Foreman <input type="checkbox"/> Reading Blueprints <input type="checkbox"/> House Planning <input type="checkbox"/> Plumbing | <ul style="list-style-type: none"> <input type="checkbox"/> Heating <input type="checkbox"/> Painting Contractor <input type="checkbox"/> Air Conditioning <input type="checkbox"/> Electrician <p>BUSINESS</p> <ul style="list-style-type: none"> <input type="checkbox"/> Business Administration <input type="checkbox"/> Certified Public Accountant <input type="checkbox"/> Bookkeeping and Accounting <input type="checkbox"/> Office Management <input type="checkbox"/> Stenography and Typing <input type="checkbox"/> Secretarial <input type="checkbox"/> Federal Tax <input type="checkbox"/> Business Correspondence <input type="checkbox"/> Letter-writing Improvement <input type="checkbox"/> Personnel and Labor Relations <input type="checkbox"/> Advertising <input type="checkbox"/> Retail Business Management <input type="checkbox"/> Managing Small Business <input type="checkbox"/> Ocean Navigation <input type="checkbox"/> Sales Management <input type="checkbox"/> Short Story Writing <input type="checkbox"/> Creative Salesmanship <input type="checkbox"/> Traffic Management <p>CHEMISTRY</p> <ul style="list-style-type: none"> <input type="checkbox"/> Chemical Engineering <input type="checkbox"/> Chemistry <input type="checkbox"/> Analytical Chemistry | <ul style="list-style-type: none"> <input type="checkbox"/> Petroleum—Nat'l Gas <input type="checkbox"/> Pulp and Paper Making <input type="checkbox"/> Plastics <p>CIVIL, STRUCTURAL ENGINEERING</p> <ul style="list-style-type: none"> <input type="checkbox"/> Civil Engineering <input type="checkbox"/> Structural Engineering <input type="checkbox"/> Surveying and Mapping <input type="checkbox"/> Structural Drafting <input type="checkbox"/> Highway Engineering <input type="checkbox"/> Reading Blueprints <input type="checkbox"/> Construction Engineering <input type="checkbox"/> Sanitary Engineering <p>DRAFTING</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aircraft Drafting <input type="checkbox"/> Architectural Drafting <input type="checkbox"/> Electrical Drafting <input type="checkbox"/> Mechanical Drafting <input type="checkbox"/> Structural Drafting <input type="checkbox"/> Sheet Metal Drafting <input type="checkbox"/> Ship Drafting <input type="checkbox"/> Mine Surveying and Drafting <p>ELECTRICAL</p> <ul style="list-style-type: none"> <input type="checkbox"/> Electrical Engineering <input type="checkbox"/> Electrician <input type="checkbox"/> Electrical Maintenance | <ul style="list-style-type: none"> <input type="checkbox"/> Electrical Drafting <input type="checkbox"/> Electric Power and Light <input type="checkbox"/> Lineman <p>HIGH SCHOOL</p> <ul style="list-style-type: none"> <input 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Cotton, Rayon, Woolen Mfg. <input type="checkbox"/> Carding and Spinning <input type="checkbox"/> Warping and Weaving <input type="checkbox"/> Loom Fixing <input type="checkbox"/> Throwing <input type="checkbox"/> Finishing and Dyeing <input type="checkbox"/> Textile Designing |
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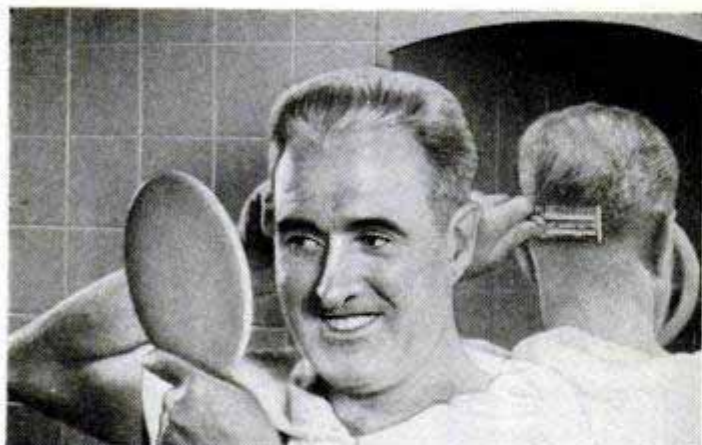
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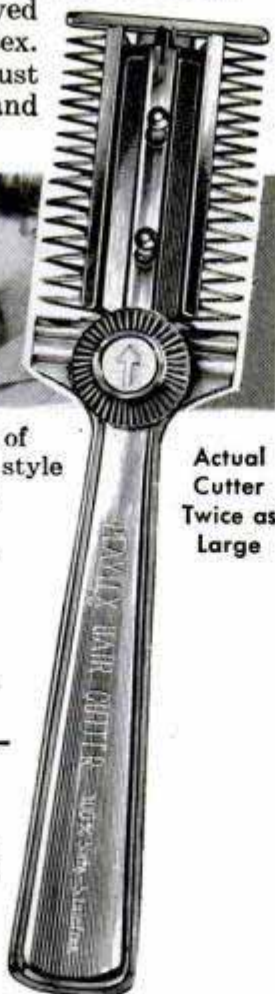
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(Continued from page 8)

Why didn't you include in your panel of experts someone who is engaged in the actual manufacture of steam locomotives? Asking a manufacturer of diesels or electric locomotives about the future of the steam locomotive was like asking Vishinsky if he thinks there is any future for capitalism. . . .

Wm. A. Novak,
Maywood, Calif.

EDITOR'S NOTE:—There is no locomotive manufacturer currently building the conventional steam locomotive. The only railroad adding steam locomotives in the last year was Norfolk & Western, which built the engines in its own shops. In the last 12 years 16,226 new diesels were put into service while the number of steam locomotives operating dropped from 39,624 to 21,747; in 1952 only 17 new steam locomotives were installed, while 2,227 diesel and electric locomotives were added. Diesels today handle 65 percent of all freight, over 70 percent of all passenger traffic and over 75 percent of yard and switching operations. There are at least 24 major railroads which do not own a steam locomotive. We felt that the steam locomotive's interests were represented by the two railroads participating in the panel, which utilize steam, electric, diesel and turbine locomotives.

To the Editor:

I read with interest sometime back, an article in *Popular Mechanics* [Aug. 1953] about the gas turbine-driven truck that is being road tested at the present time, in the western part of our country.

The article stated that noise and fuel consumption are two of the problems yet to be solved. There is no doubt in anyone's mind, I believe, but what the engineers will one day solve these problems. But at the same time, I can't help but wonder what our engineers could do with steam to power these huge trucks if they were to put their brains to work on this type of power plant. I believe that they could make today's methods of using steam look primitive in a very short time and at the same time take away some of the terrible noise which the present-type power plants make.

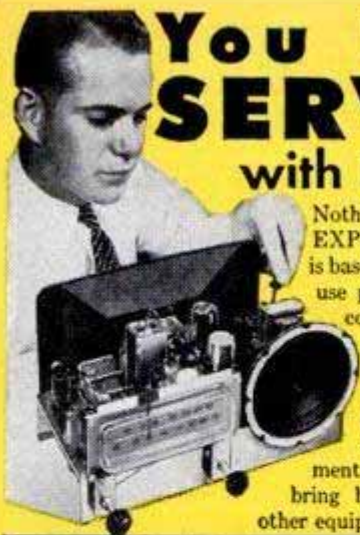
I wish we could get them (engineers) interested. I think we all would be grateful if they would.

Kenneth L. Orris,
Maumee, Ohio.

ⓄTires cushioning the landings of the Douglas-built Navy rocket plane that has broken speed and altitude records are no larger than those on a Crosley automobile.

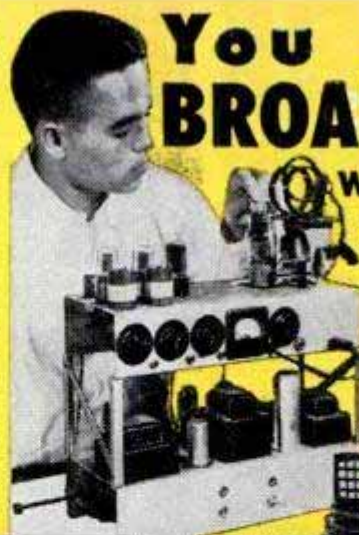
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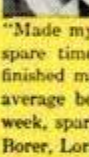
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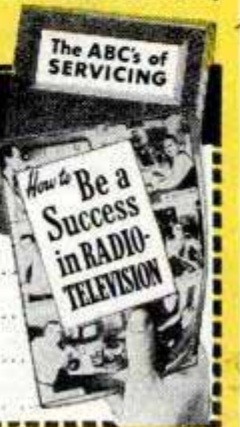
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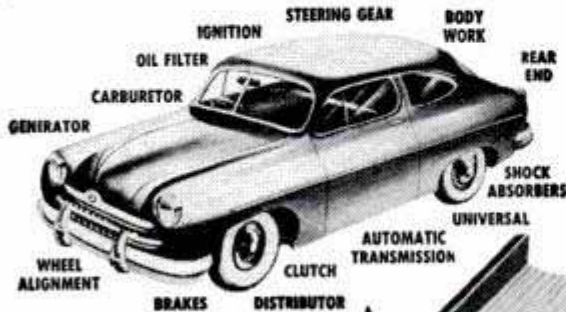
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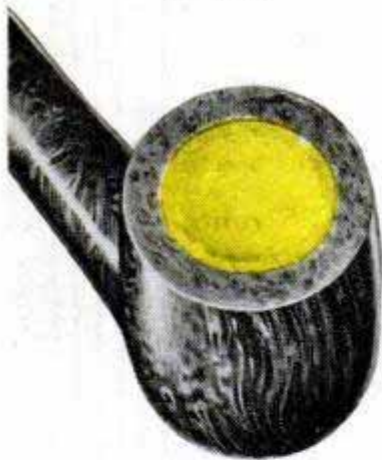
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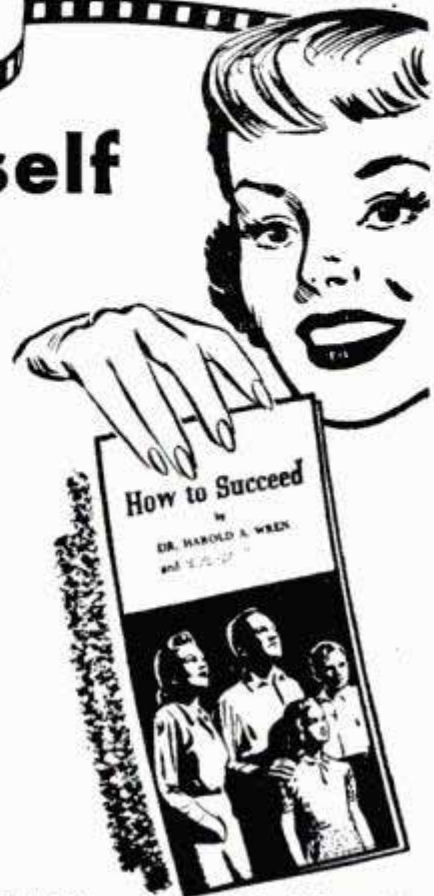
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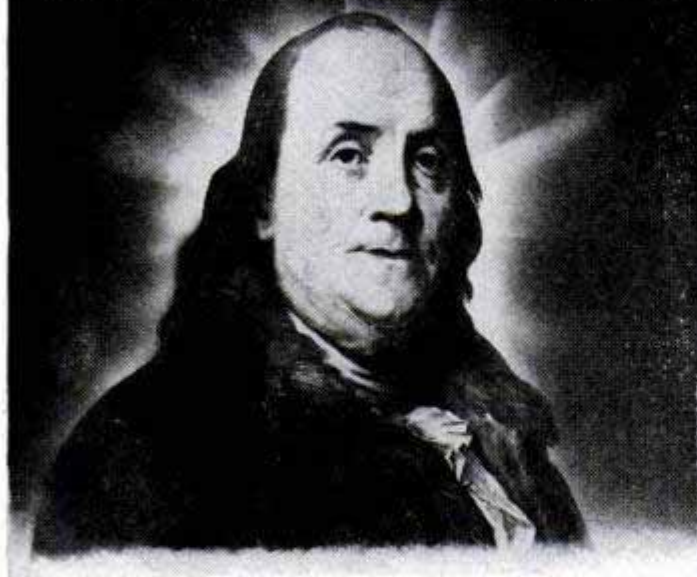
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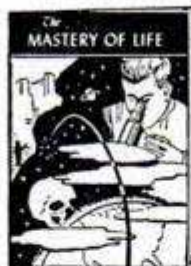
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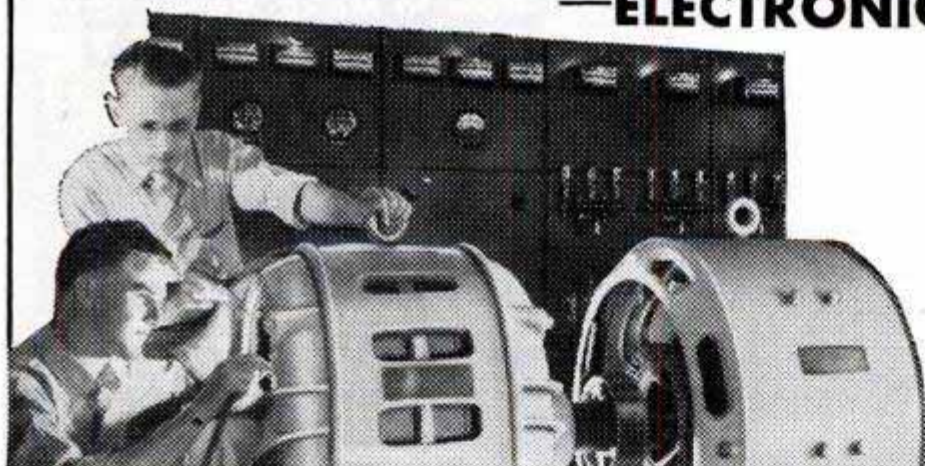


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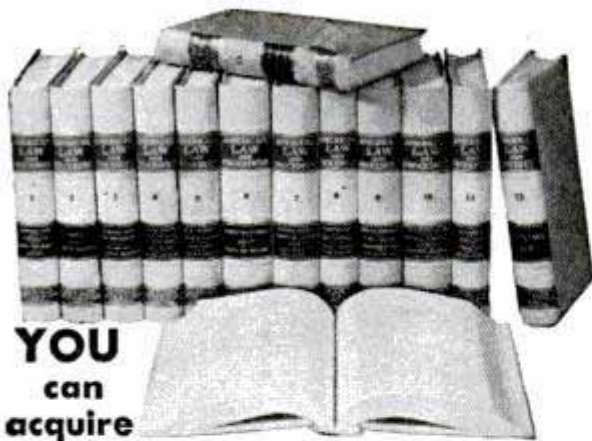
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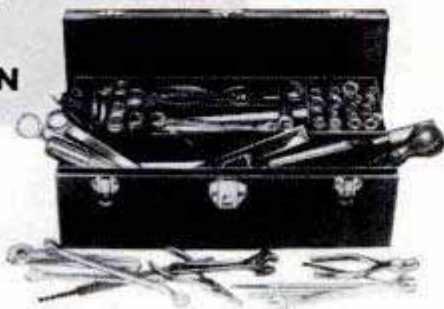
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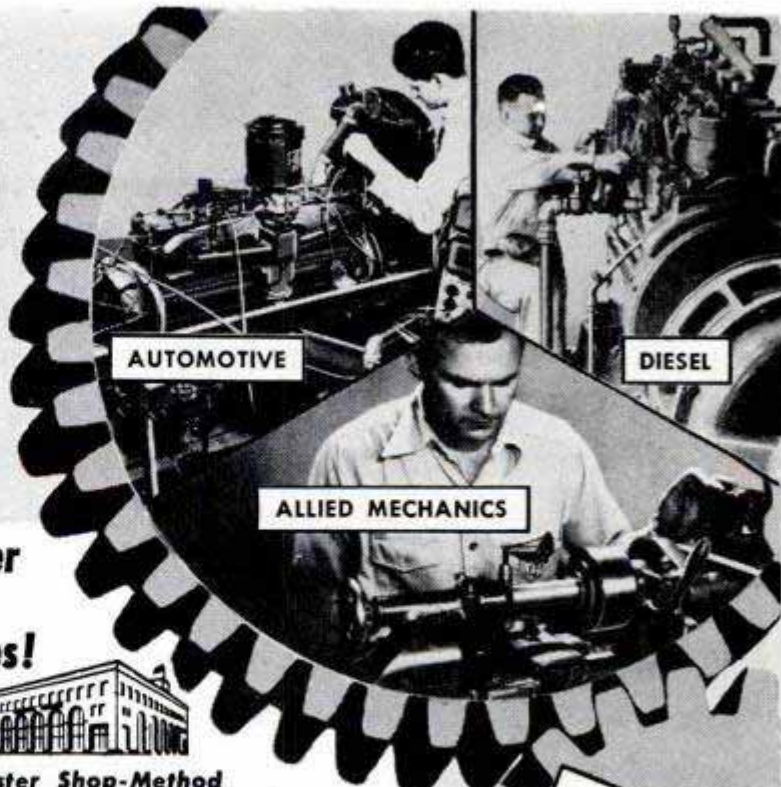
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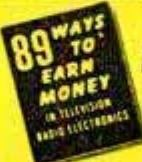
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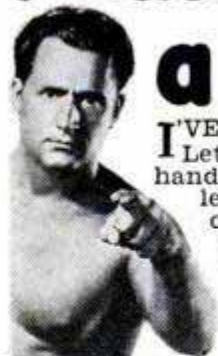
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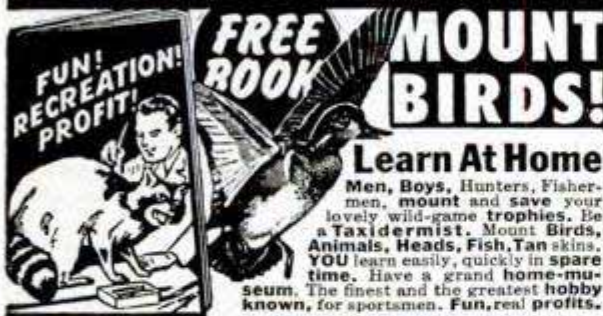
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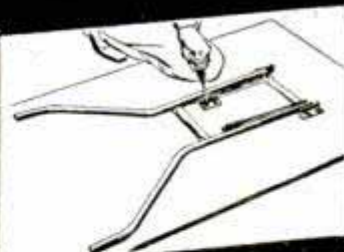
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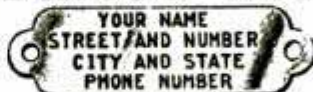
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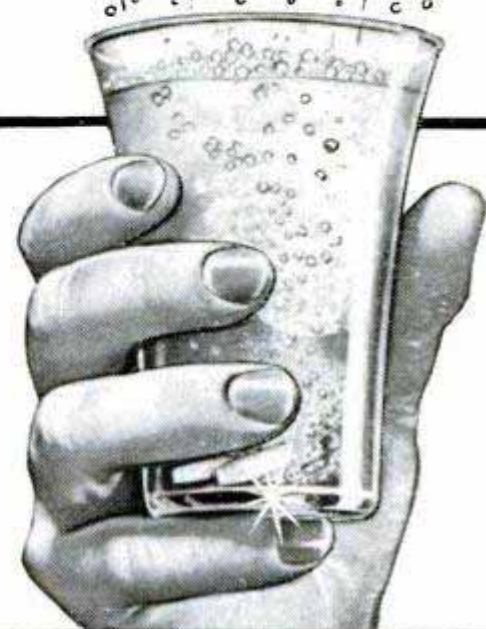
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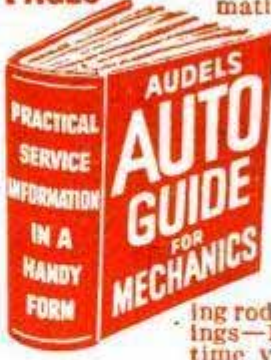
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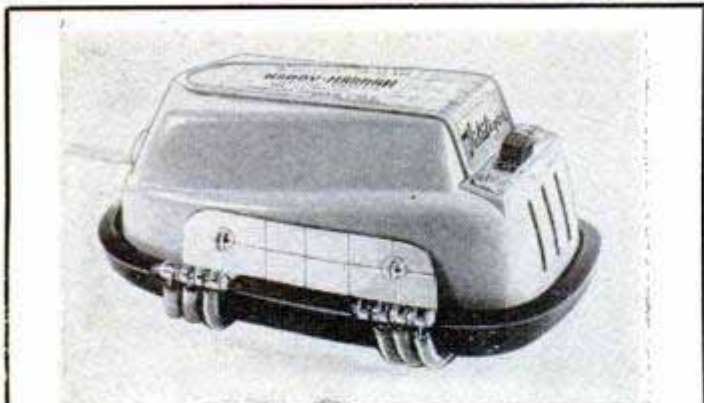
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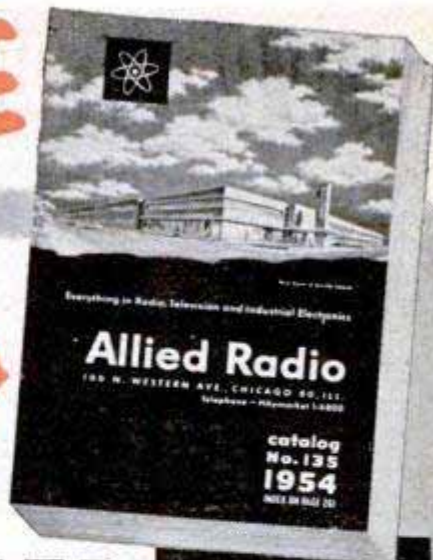
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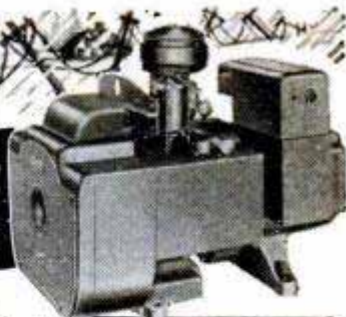
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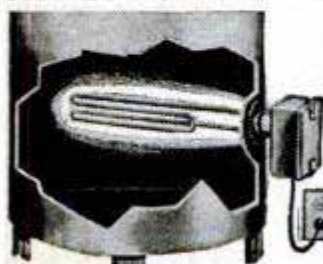
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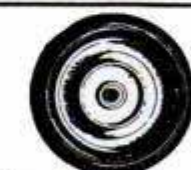
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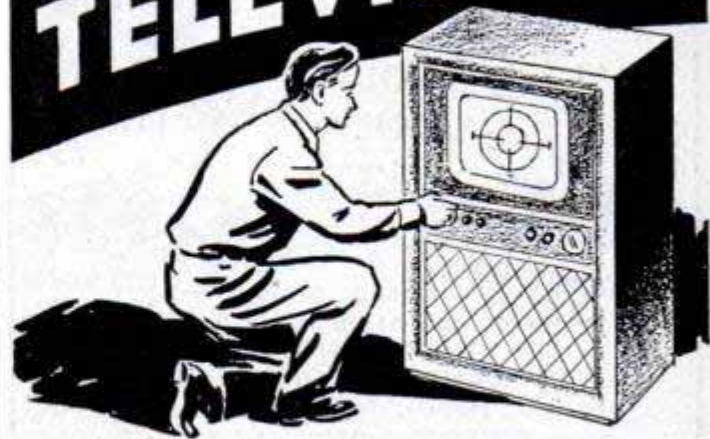
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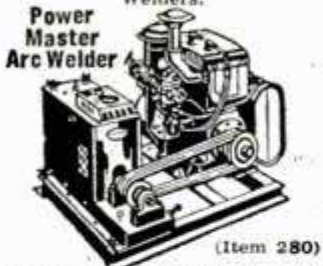
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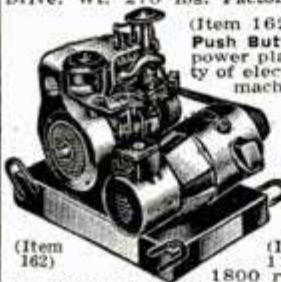
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Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois

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RECONDITIONED Motorcycles and motors. Chromium accessories. Complete stock Indian parts. Expert rebuilding. Fast service. Indian Motorcycle Sales, Kansas City 27, Mo.

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SNOW Sleigh, air boat, propellers, lowest prices, literature. Universal, Box 3123, Ft. Worth.

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ELECTRIC Pencil: Engraves all metals \$1.50. Beyer Mfg., 10511-H Springfield, Chicago 43.

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WELDERS, Instant start, 110v. \$29.50. Morris, 1070 Inner Drive, Schenectady, N. Y.

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SMALL Motors 110 a.c. and 32 d.c. for driving sewing machine, small power and hobbycraft tools, grinders, polishers, number of home and shop uses. \$7.95 postpaid anywhere. No c.o.d. Humen Sewing Machine Co., 12405—87 Street, Edmonton, Alberta, Canada.

REBUILT Gasoline engines \$17.00 to \$37.00. Cauffiel Motor Industries, Temperance, Michigan.

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ALTERNATING Current generators. 750 watt, \$38.50; 5000, \$185. Motors 1/2 horse, \$15; 3/4, \$22; 1, \$35. Butler, 1885 Milwaukee, Chicago 47.

WINDING Data, listing 225 motors, single and three phase, \$1.00. Motor Data Co., Box 7631, Kansas City 28, Mo.

BOATS, OUTBOARD MOTORS

CRACKER Box boat plans, \$7.50 set. Marine hardware at discounts. Literature free. Glen Designs, Box 568, Compton, California.

MARINE Conversions—Willys to Cadillac. Catalogue and conversion hints free. Barr Marine Products, 2706 Castor Avenue, Philadelphia 34, Penna.

BOAT Kits: Sail, power. Fittings. Catalog 15c, refundable. Boatbuilders Marine, 55-M Sorrento, Allston, Mass.

PLYWOOD Boat plans 21 for \$1.00. Catalog boat building plans and copy boating magazine, special price for both, 50c. The Rudder, 15 Murray Street, New York 7.

CURE That leaking boat with Fiberglass-plastic covering. Ends caulking and painting. Nationally approved process. Complete instructions. New low prices. Industrial Plastics, 3807 Harrison, Oakland 11, California.

BUY Wholesale nationally advertised outboards, thousands other products at big discount. Free "wholesale plan." American Buyers, 628-DD Linden, Buffalo 16, N. Y.

FIBERGLAS Permanent boat coating. Gem-O-Lite's own "how" book \$2.50. Complete catalog 10c. Airmailed 35c. Gem-O-Lite, Box 6867B, North Hollywood, California.

MARINE Conversions for Ford and Jeep engines. Catalog 10c. Lehman Manufacturing Company, 972D Broad Street, Newark 2, New Jersey.

CONVERT Fords and Jeeps to 100% marine engines with Osco's world famous Convo-Kits. Deluxe catalogue 25c (coin). Oscomotors, 3627B Lawrence, Philadelphia 40, Penna.

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 24, Coldwater, Michigan.

PLANS: Inboard-outboard runabouts, cruisers, sail, Wood, plywood, welded steel. Advise requirements. John B. Clark, N.A., 329 Kenmore, Bay Village, Ohio.

BUILD Marine engines with Federal conversion kits. Federal Marine Motors, 9011 Cottage Grove Ave., Chicago 19, Illinois.

JOHNSON Outboard specialists. Used parts for all models at substantial savings. Prompt quotations. Specify model serial. Crandall-Hicks, 910 Commonwealth, Boston, Mass.

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BOAT Kits, plans and patterns for America's fastest and finest outboard racers and runabouts, fishing boats, hunting skiffs, dinghies, canoes. Illustrated literature 25c. Schneider Boat Co., Dept. PM, 1913 W. Vliet, Milwaukee 5, Wis.

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BUILD Beautiful fiberglass-plastic boats without using molds. New patented method. Write Speedcraft, 2450 Emerson, off Square Lake Road, Pontiac, Michigan.

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120 PROFUSELY illustrated pages antique pistols, swords, daggers, armor, etc. 50c. Robert Abels, M860 Lexington Ave., New York 21.

CAST Iron molds—For casting fishermen's sinkers. Free illustrated booklet. Reading Instrument Co., Box 78, Reading, Penna.

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MODERN Taxidermist Magazine, Greenfield Center 2, N. Y. Devoted entirely to taxidermy, photos, articles, methods. Trial year's subscription, \$1.00.

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AMAZING Prices, binoculars, telescopes, microscopes. Free trial. Folder, "Binocular Selecting," optical catalog free. Prentiss Importers, Mercury Bldg., West Los Angeles 25, Calif.

REFLECTING Telescopes, 60X, completely assembled \$29.75. Guaranteed observatory clearness. Free information. Skyscope, 475 Fifth Avenue, New York 17.

MAKE Your 6" telescope reflector. Glass, abrasives, instructions—\$9.50. F. Cameron, Box 65, Inwood 96, N. Y.

BINOCULARS. Lowest prices. 8x30. \$32.00 guaranteed telescopes, microscopes. Free catalog: All sizes. Joe's Binocular Sales, 4827 Second Blvd., Detroit 1, Mich.

SAVE Money—Get interesting facts! Free 52 page three color catalog. 80 different models. United Binoculars, 9043 S. Western, A-5608, Chicago 20.

REFLECTOR Telescope kits from \$6.25. All parts designed and built at our Hoboken factory. Mirror cells, diagonals, focusing mounts, tripods, tubing, oculars. Fully guaranteed. Send for free illustrated catalog. Our only sales showroom, Esco Products, 134 West 32 St., Rm. 204-A, New York 1.

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GOLDEN Hamsters, \$2.75 pair. Write for folder. Engle's, 1228 So. 17th, Terre Haute, Ind.

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WANTED: To buy registered Airedale dog. Large male or female. B. B. Carlton, Gadsden, Alabama, R. 1.

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HAMSTERS—Golden and Albino. Fine Christmas gifts. Free information. Anderson's Hamstery, 35 Oneida, Pontiac, Michigan.

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BEAUTIFUL Pure white police puppies. Ansonia Kennels, Mose, N. Dak.

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CHINCHILLAS, Mink raising list. Robert Lasky, 12,217 Memorial, Detroit, Mich.

CHINCHILLAS Rented, offspring bought. R. Rau, Route 2, Jeannette, Pennsylvania.

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MAKE Big money! Raise Chinchilla rabbits. Cash markets supplied. Write today! Rockhill Ranch, Sellersville 15, Penna.

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CHINCHILLAS (No rabbit.) Easily raised anywhere. Profitable. Big future. Terms. Hibner Chinchillas, Ithaca, Mich.

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TREES And shrubs—Raise your own from seed for shade, windbreak, snow fence, ornament, erosion control. Free planting guide—price list. Write Woodlot Seed Company, Norway 4, Michigan.

MULTIFLORA Rose, the living self-repairing fence, ornament, erosion control, windbreak, snow fence, etc. Rapid grower. Raise from seed. Free planting guide, write Woodlot Seed Company, Norway 4, Michigan.

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WE Sell on the installment plan. Best varieties peach and apple trees, low as 12c; grapevines 5c; shrubs 13c; evergreens 15c. Berries and plants. Catalog free. Benton County Nursery, Box 542, Rogers, Arkansas.

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WHAT Is Ekeradio? Subminiature battery radio, broadcast and shortwave. Story carried by the Associated Press, national magazines. This powerful Ekeradio, headset, batteries, antenna, ready to play is only \$29.95. Dealers needed in every state. Send your order now. Ekeradio, Box 247M, Pasadena, California.

CONDENSER Checker kit \$5.95. Plans \$1. Bullocks, 1910 Montgomery, St. Louis, Mo.

TVeto Silences annoying television, radio commercials! Operates from your viewing chair. Attach it yourself to any set; it's easy, harmless! Money back guarantee. \$2.95 postpaid. TVeto, Box 444A, Arcadia, California.

CRYSTAL Radio kit, \$1.50; phone, \$1.75; fixed crystal, 60c; guaranteed. Clearco Crystal Co., Dept. 9, Des Moines 11, Iowa.

BUILD 15 Radios—Only \$19.95 complete. Free radio tester, tools, soldering iron. No experience required. Money-back guarantee. Order direct or send for descriptive literature. Free valuable radio and TV repair guide on request. Progressive Electronics, 497 Union Ave., Dept. PM12, Brooklyn 11, N. Y.

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

24 PAGE Plans "18 long distance crystal sets" 25c, including "Radiobuilder," catalog. Laboratories, 328-C Fuller, Redwood City, California.

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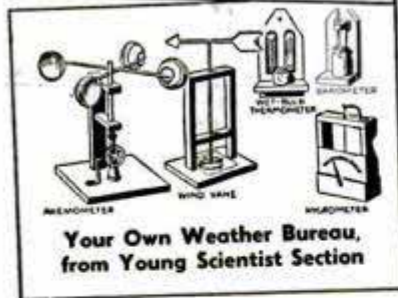
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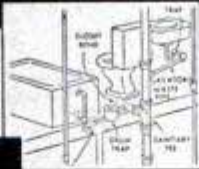
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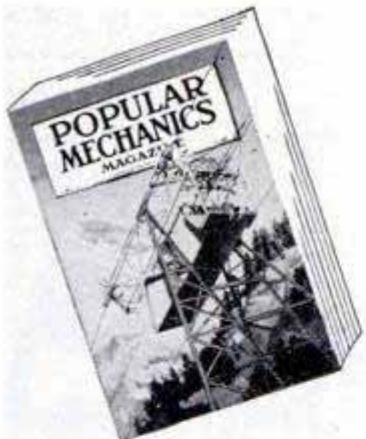
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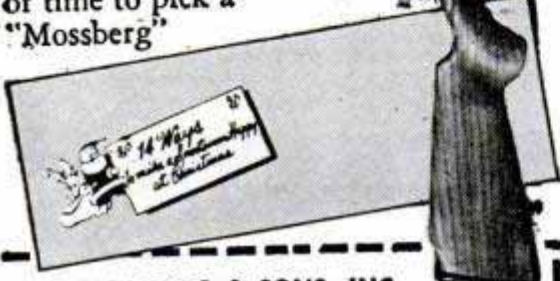


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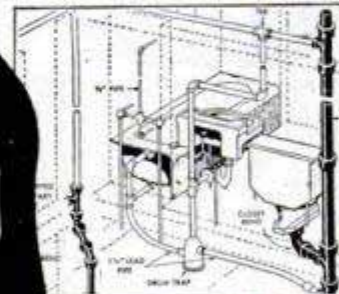
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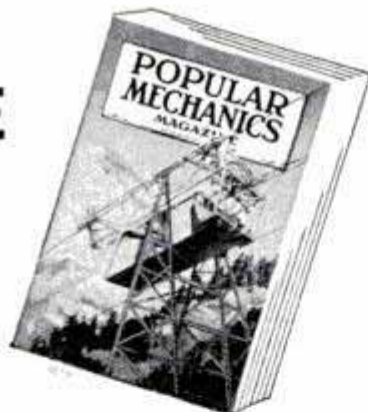
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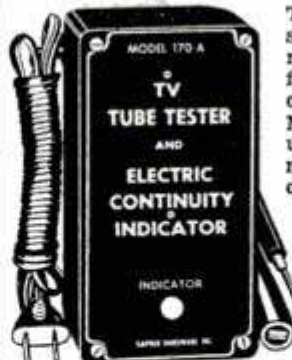
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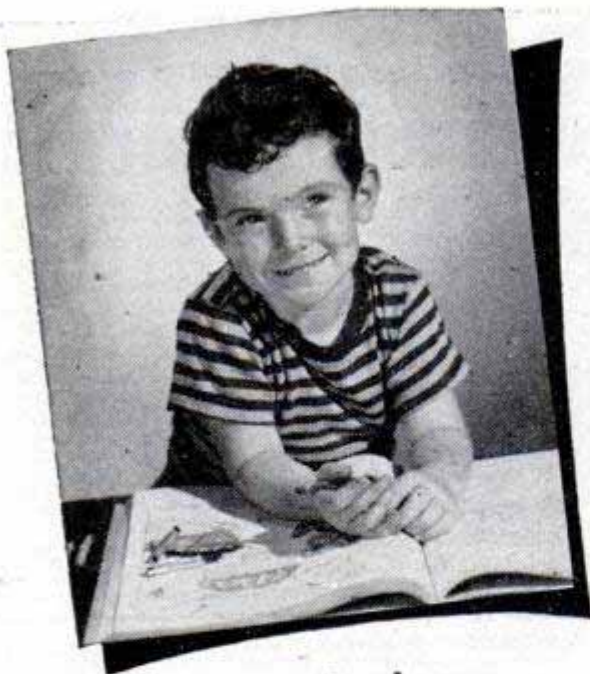
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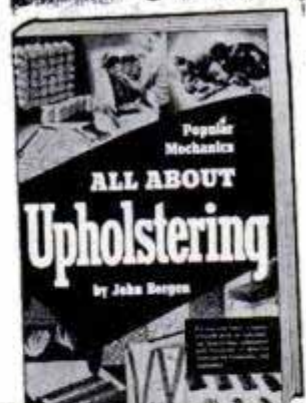
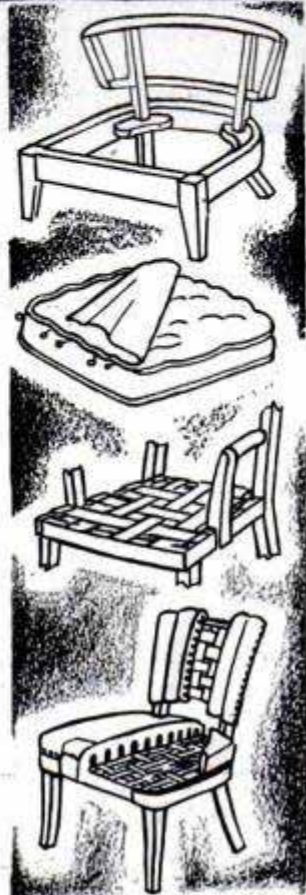
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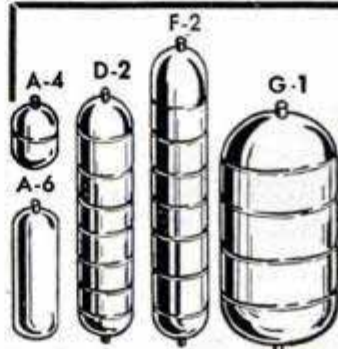
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To prove our confidence, we even joined forces with some of the "enemy" as we continued to produce worthwhile books in these fields. For instance, we got the feeling that it was just too bad that the excellent science programs of Mr. Wizard (Don Herbert) had to vanish from the record at the conclusion of his weekly half-hour television program. We got Don Herbert to put down on paper some of his best tricks and experiments. The result was *Mr. Wizard's Science Secrets*, a book that started walking off the shelves literally as fast as we could get it to the stores. A first printing was exhausted within a few weeks . . . now we're out with the third printing (a total of 75,000 copies).

The book is an excellent gift for any bright youngster. He'll be able to mystify his friends (and learn a lot about science, too) after he reads how he can turn "wine" into water, pop popcorn with radiant energy, blow up a balloon inside a bottle, make his own telephone and telegraph systems, cause water from a faucet to bend mysteriously, make mothballs dance, etc., etc. Mr. Wizard tells not only *how* to do these tricks, but *why*. It was this that led Wilbur L. Beauchamp, professor of education at the University of Chicago, to pronounce his judgment: "It's a good book."



We think we have another best-seller in *Dorsey Connors' Book: Gadgets Galore!* Miss Connors has written an excellent book, hard to label except by the blanket term, "Ideas." Some of them represent the best that she has presented on her television show over WNBO-NBC (Channel 5). Others are brand new. Altogether they make up a collection of intriguing ideas for household short cuts, homemade gifts, etc. In an ordinary wire coat hanger, Miss Connors sees: a mail caddy . . . an earring bar . . . a rack for cups . . . a beverage holder for garden parties . . . an extra shelf . . . a newspaper or book rack . . . an outdoor grill fork . . . an omelet stirrer . . . a muffin toaster. In her capable hands an aspirin tin, a stone from discarded jewelry and a little gilt paint become a Marie Antoinette pill box; while four handkerchiefs and a length of bright ribbon work into a fancy party apron. *Gadgets Galore!* is an excellent gift for any woman, whether bachelor girl or homemaker. And the handy man of the house will find much to interest him, too, in this fascinating book.

Another television star who's doing a book for us is Walt Durbahn, genial proprietor of "Walt's Workshop," a program which has a large following among home-workshop craftsmen. Walt's book, *Carpentry for the Home Craftsman*, is eagerly awaited by this group.

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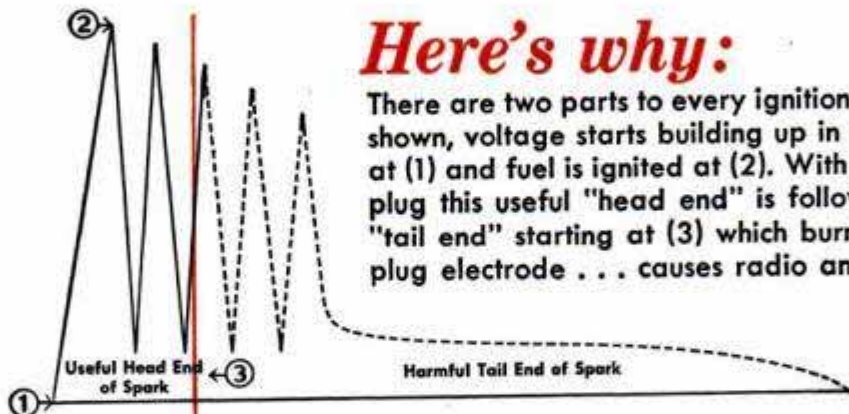
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By Richard W. Emery

IT COULDN'T HAPPEN to you. That is, it probably won't. But it could happen to someone else, when you were the one they yelled to for a little help. And rescuing someone who has trapped himself may turn out to be a major project.

In most cities, rescue jobs go to the firemen. Fire stations keep a batch of special tools for tough rescues and firemen train in their use. A rescue may be fairly simple, like salvaging Junior when he has stuck his foot in a drainpipe. Or it may be complex, like unpinning a man from a tangle of gasoline-splashed wreckage.

Mostly, the rescue jobs where an amateur might do some good are of the type which look, at first glance, like a very fine joke on the victim. They are the home-front booby-trap type. But such accidents can be painful and dangerous. They can happen

POPULAR DECEMBER 1953 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 100 NO. 6

at times or places where firemen can't be quickly reached. On camping trips, on lonely highways, on pleasure boats hours from port, pinning-type accidents can be deadly.

Almost always, there is some common-sense solution to a rescue problem. If a study of successful rescues indicates only one rule of thumb, it is this: before you act, take time to think. There may be more than one solution to the rescue problem and one may be better than the other!

Fireman Save my Child!

Firemen were called to free the foot of this 12-year-old movie-goer who stuck it between seats





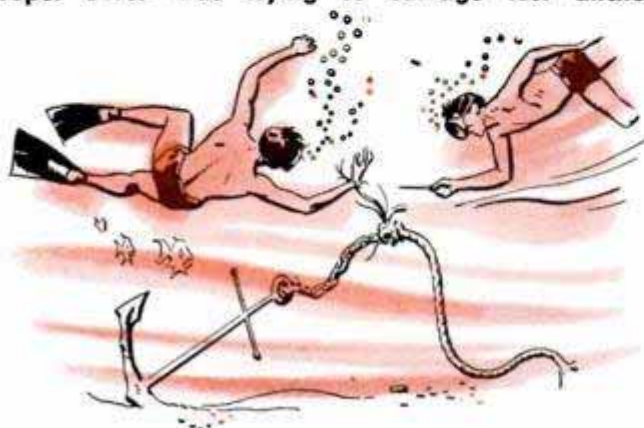
Firemen use pry bar to raise iron manhole cover in which frightened boy has finger stuck in small hole

A simple example is the procedure, well known among fishermen, of removing a fishhook which has snagged in someone's skin. At first thought, it would seem that the hook must be pulled back out—a rough and painful remedy because of the barb.

Usually the hook can be pushed farther, so that its point and barb emerge through the skin. There the barb can be nipped off with wire-cutters or pliers. Then the hook is retracted easily.

"Discuss methods freely with others—if there are any at the scene," suggests a fire captain with years of rescue experience. "Try to attack it from the best side. Look at all sides. Try to think of some second way to free the person; there may be some quick, sure method just waiting to be thought of."

A swimmer with knife rescues a skin-diver whose identification bracelet got caught in strands of rope. Diver was trying to salvage lost anchor



The manhole cover is lifted over the boy's head to drain blood from his hand and reduce the swelling

Youngsters frequently trap themselves by poking their feet into narrow places—water-meter pipes, for example. Frantic parents have struggled to extract Junior's foot, and despaired, only to see firemen release Junior in a few minutes by pulling the foot out of the shoe which is wedged in the pipe.

An old man fell in front of a heavy bus and the front tire of the bus came to rest, pinning the man's foot. No jack powerful enough to raise the front of the bus could be brought quickly to the scene. Firemen blocked up the front axle and released the air from the bus tire. The man's foot was moved without further injury.

Fright can blind a whole household of adults to the most obvious, immediate solution to a rescue problem. Recently firemen raced to a home to free a woman's hand from a washing-machine wringer. Arriving, they found the woman screaming beside the machine, her hand still being mangled by the machine. Three other housewives ran back and forth, also screaming.

"Not one of them had thought to pull the electric cord and shut off the machine, or to strike the machine's tripping lever," the firemen reported. "Even ordinarily level-headed people can go panicky like that, especially if someone in their own family gets trapped."

Many rescues involve youngsters who have stuck a finger into a steel pipe, or



The boy asks: "Do you have to cut off my finger?" Firemen are using soapsuds and detergent on finger

bottle neck, or some other trap—and discovered the finger wouldn't come back out. Steel washers pushed past the second knuckle, and worn briefly there by small-fry, have a way of staying put because the finger swells. Salt-and-pepper shakers are favorite traps for small fingers.

Elevating the trapped hand reduces or prevents swelling. Ice or cold cloths may do the same. Soapsuds or oil then may speed rescue of the imprisoned finger. If the finger is trapped in a bottleneck, as a means of breaking the air-seal you may have to break the bottle. First wrap it with adhesive tape to prevent shattering.

Hospitals use slick little rotary saws to remove rings and similar metal objects from fingers. The blade is hand-turned against the ring while a thin metal guard protects the finger.

Some of the oddest "pinning" accidents are what firemen call repeaters. The same thing happens over and over, as the years roll by. One of these is the "splinter test" trap.

It happens when an amateur carpenter bores a hole through one wall of a partition, using a dull bit against grainy, tough wood. He jabs the bit through the last part of the cut, pulls the bit out, and runs a finger into the hole to see if he has removed all the wood from the cut.

On the far side of the hole, ratchet-like splinters prevent him from pulling his finger out. The rescue on this one usually calls



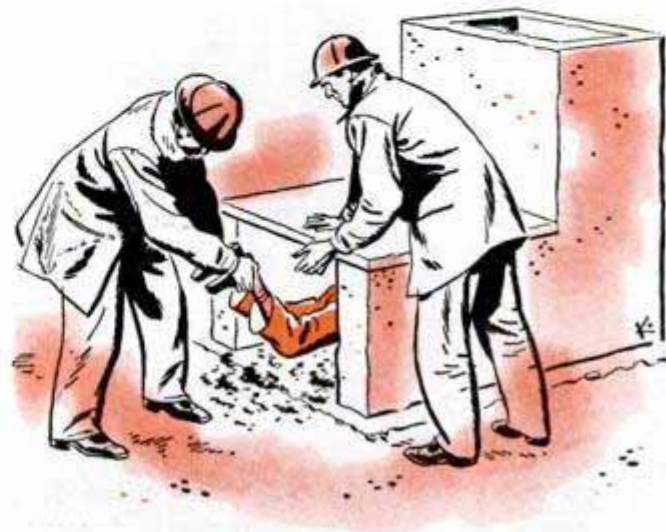
The soapsuds worked and the finger slipped out of the hole. It is Exhibit A to all near-by small fry

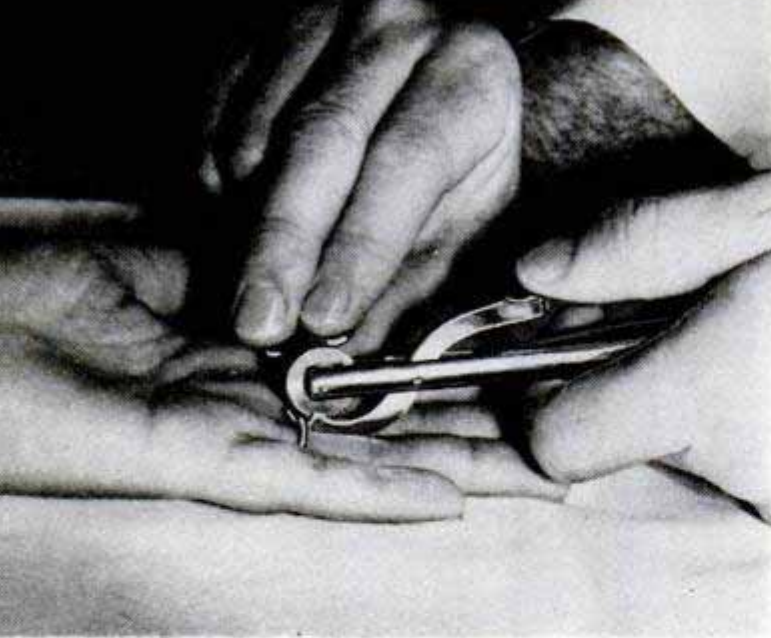
for sawing out a portion of the opposite side of the partition, or a disk around the pinned finger.

Small boys get themselves caught in such unlikely things as empty oil drums, brick chimneys, sections of sewer pipe, concrete storm drains and old-fashioned flour bins. Experts proceed on the idea that by reversing the movements which got him into his fix, the boy can get out. Gravity is a complication. If the boy's cramped position has made his legs go to sleep, for instance, that may complicate the rescue.

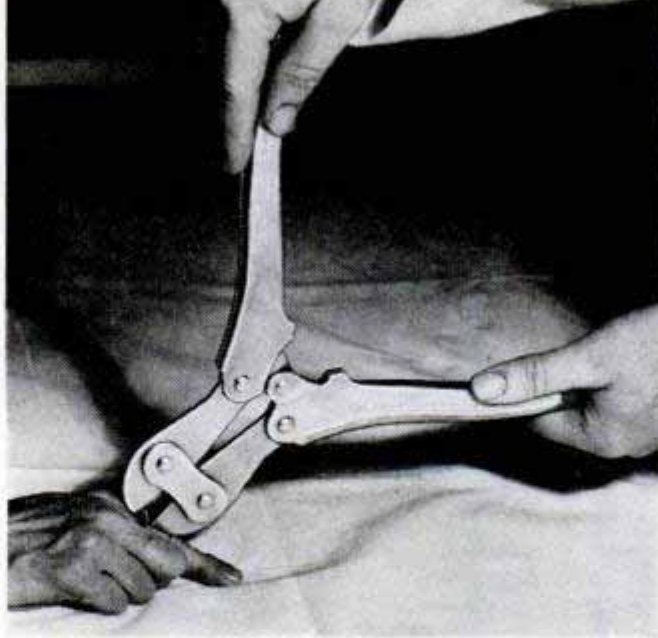
Often the first thing to do is to quiet down the relatives, so that you can talk quietly

A mother's screams brought riot call for boy stuck in incinerator chimney. Firemen scooped out ashes, had boy flex knees and they pulled him out of firebox

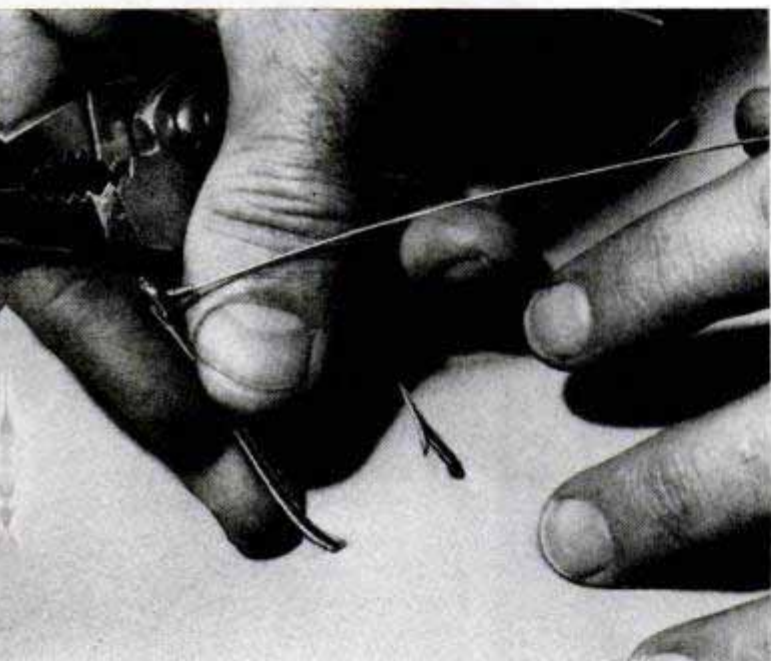




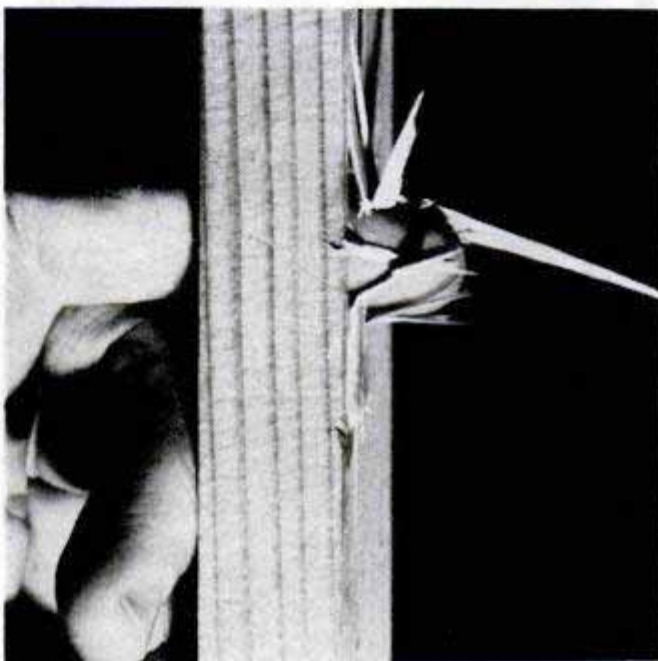
This hospital tool is used to remove a ring from finger. The right hand turns small rotary hacksaw while pressure of thumb at right presses the cutter against ring. Finger is protected by a metal shield



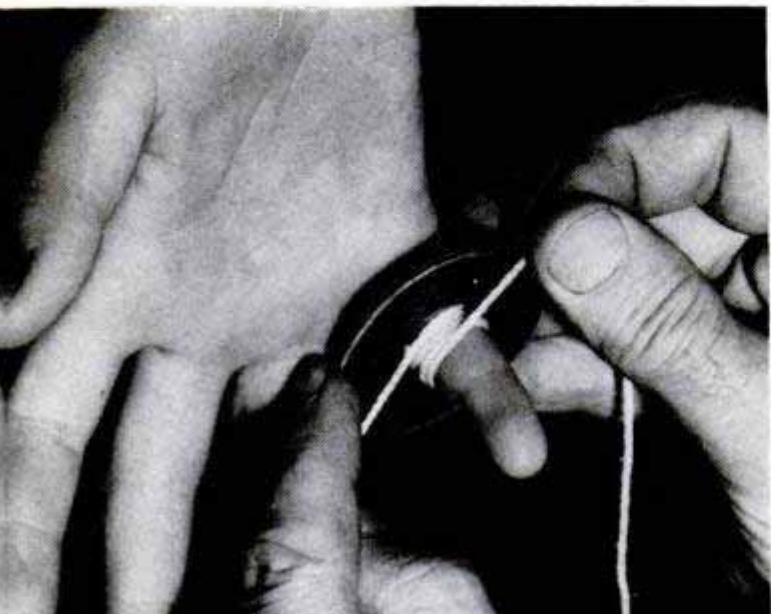
Rings, barbed wire and fish-hook barbs are also removed with powerful bolt cutters such as the pair shown above. Such tools are standard equipment in hospitals and must be handled with considerable care

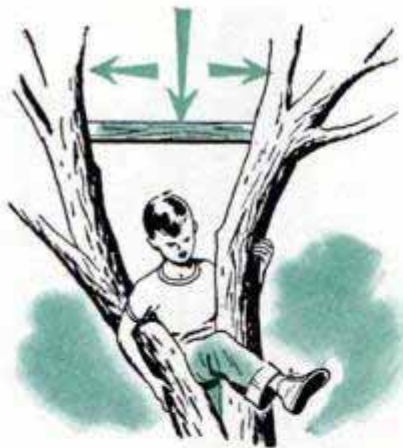


Here's a quick way to remove a fish hook embedded in a finger: turn hook through the skin and clip off the barb. Below, winding string on finger is help in removing stuck washer, one turn at a time



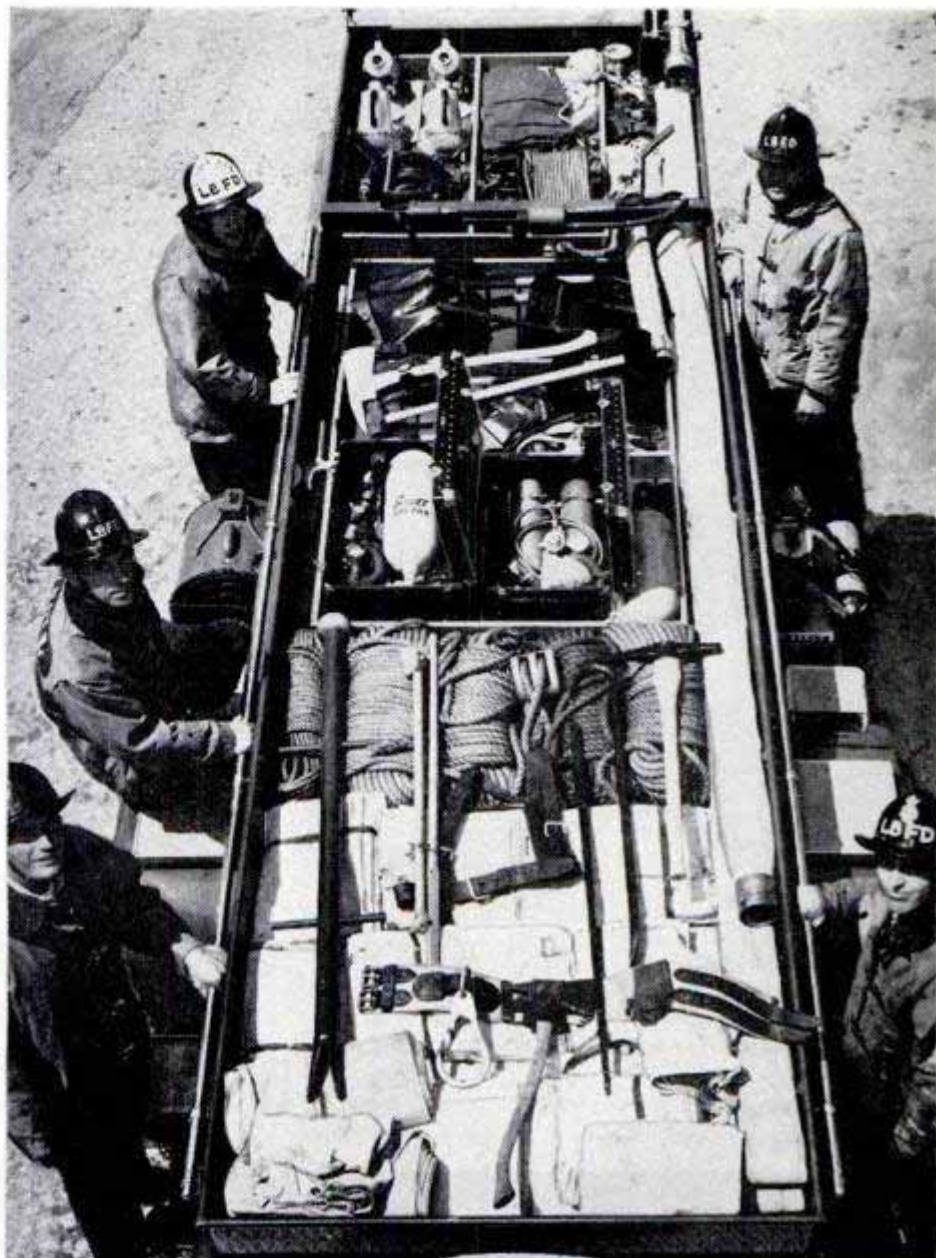
Many a carpenter has tested newly drilled hole and caught his finger in splinter trap. Finger can be removed by sawing disk around hole. Below, a metal cylinder can be ejected by filling with cold suds





Junior's leg, trapped in tree crotch, is best freed by wedging block of wood between limbs and pressing it down as breeze flexes and widens crotch

Below, as last resort in this finger-stuck-in-bottle rescue the bottle is wrapped with adhesive tape to minimize the shattering, and hit with hammer



Special tools displayed by firemen for rescue work at Long Beach, Calif.

to the boy and get his confidence. If he relaxes, it may be possible simply to lift him out. He may be so terrified that he can't try to help. Give him hope and encouragement—and you may be able to rescue him without hacksaw, tin snips or pry bar!

The mechanical principle of leverage can be used to free victims of some types of mishaps. Even a small person can bring tremendous power to bear against an object by using a plank or pipe or bar as a lever. An automobile jack can be used to raise heavy objects, or to pry heavy things apart.

In all rescue operations, fright is an opposing factor. The victim is frightened; everyone around him is frightened. The rescuers must try to look confident, because that look is contagious. Here's our fire captain on that point:

"I've seen firemen, even nurses, go to pieces in an emergency. You've got to keep control. We teach our men to stop a moment and take several deep breaths if

they get in a 'blind' on a rescue job. The appearance of confidence is catchy—just the sight of the ambulance man's white coat helps to restore calm at an accident scene.

"If people have no relation to the incident, they'll have greater panic. Give them a job to do. Encourage the person you're trying to help. Talk to him. Remember that a person learning to swim can be 'talked' stroke by stroke along the surface; but turn your back on him, and he'll drown!"

Thinking things out, despite a tough situation, has saved the life of many a man trapped alone without hope of outside aid.

A fisherman set sail alone in a sailboat from a West Coast port, bound for Tahiti. His boat was caught in a hurricane off the coast of Mexico. At midnight, a huge wave shook him loose from his place at the stern and threw him feet first and barefooted along slippery planks of the cabin deck. One prong of a big fish spear was driven through his foot, emerging above the instep.



Lever action gives this door opener plenty of the necessary squeeze, far exceeding strength of a man

At a teen-age party, prankster clamped a pair of old handcuffs on girl; police had to find a key



Tin-roof opener works on the same principle as the familiar can opener; just jab it in and rock along

In the darkness, with his boat threshing in heavy seas, the fisherman found that he could not reach forward far enough to unlash the spear handle. Neither could he pull his foot loose from the barbed steel. All night long he notched at the hardwood handle of the spear with a short knife. When the knife finally cut through, he dragged his speared foot forward to a tool locker, filed the barbs from the spear and pulled the steel out of his foot. He managed then to ride out the storm and reached shore for necessary medical attention. ★ ★ ★

These firemen are rushing a handy rescue tool to scene of disaster—an all-purpose battering ram



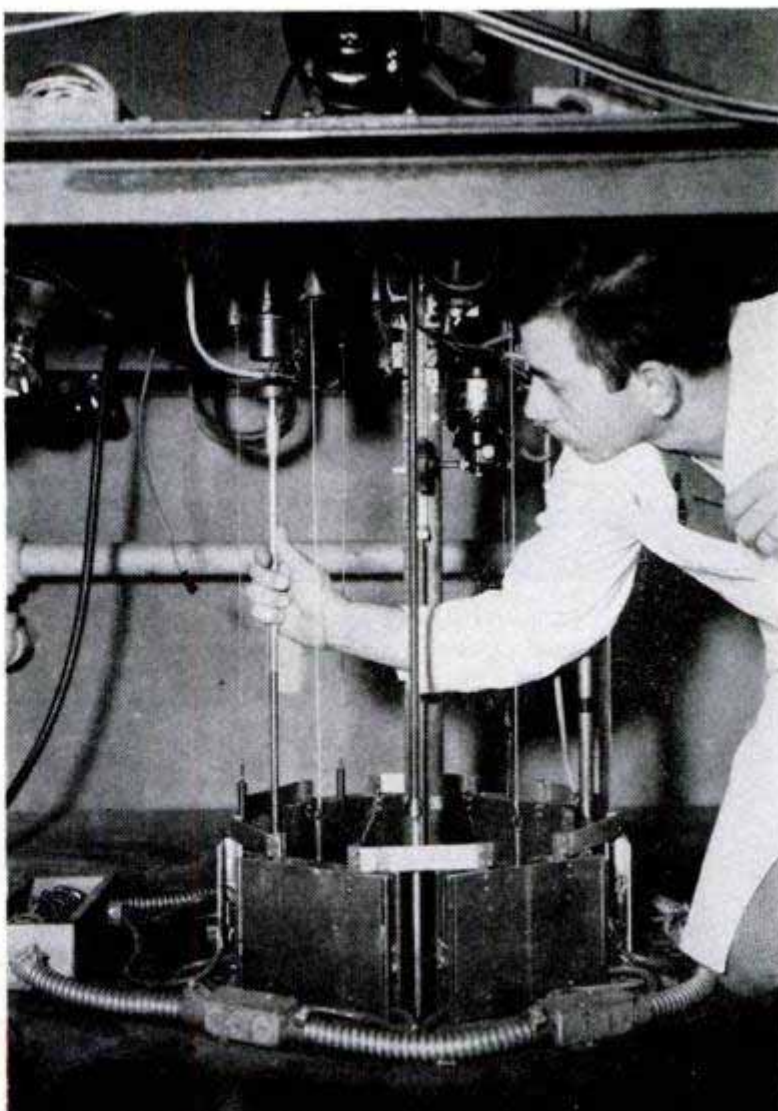
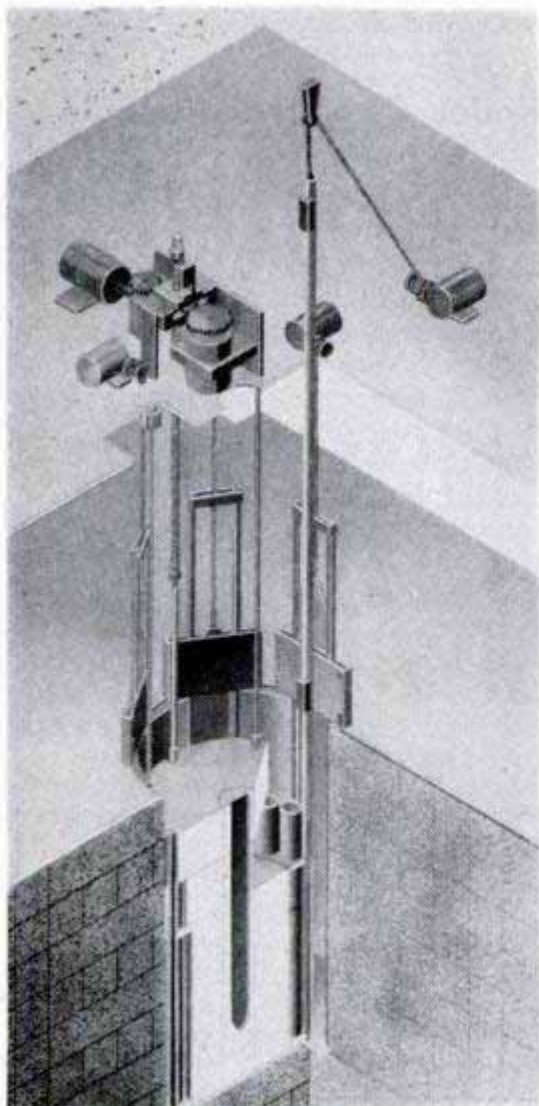
Five-by-Five Atomic Pile Aids Research Workers

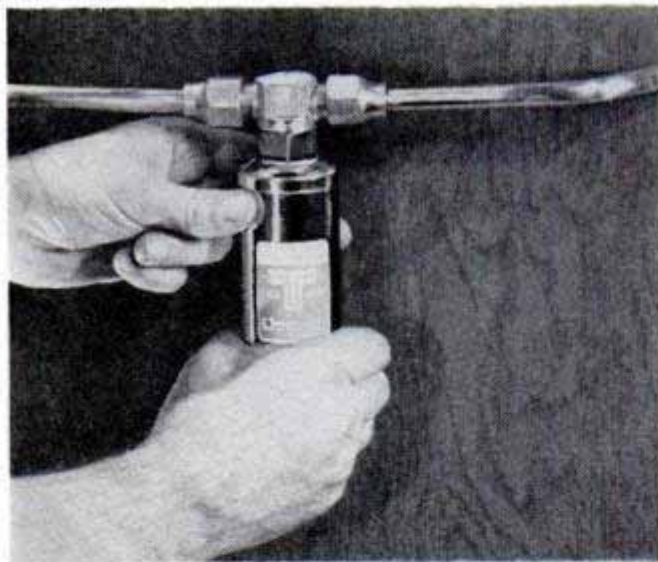
A MINIATURE atomic pile used by researchers at an atomic-power laboratory operated by General Electric is housed in a cube of graphite measuring five feet on each side. A handy source of the atomic particles called neutrons, it can be used in many fields of fundamental research. The reactor can also be utilized to analyze minute amounts of chemicals, and to make radioactive isotopes. Test samples are lowered into a narrow shaft surrounded by a cylindrical graphite block. Encircling the blocks are 20 rods on which are "strung" small disks of an alloy of uranium and aluminum. Control of the reaction is accomplished with rods and sheets of cadmium which can be lowered into the fuel assembly. The pile is in a cell surrounded by a thick concrete wall. The operator controls the lifting and lowering mechanism from a panel.



Technician at control board can increase or decrease activity of pile by movement of shields. Test samples are analyzed by recording activity of pile before and after samples are lowered

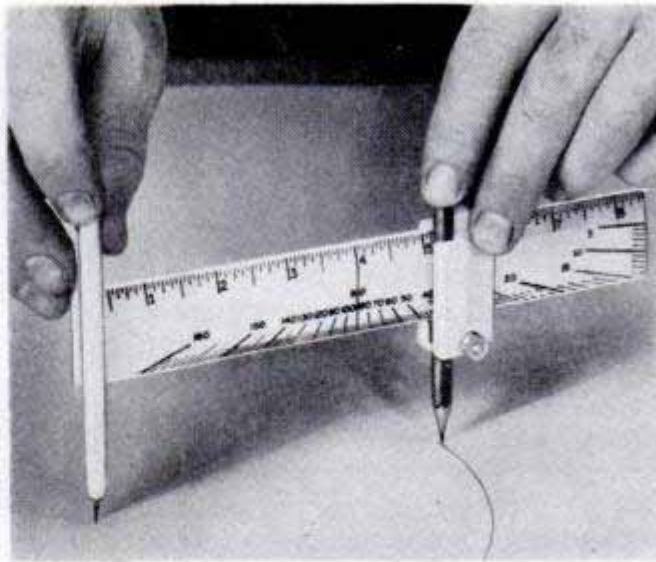
Safety rods, below, are held by electromagnets which drop them into place in case of emergency. Cutaway, left, shows part of control mechanism and test cylinder encased by graphite blocks





Quick-Change Drying Cartridge Removes Moisture From Gas

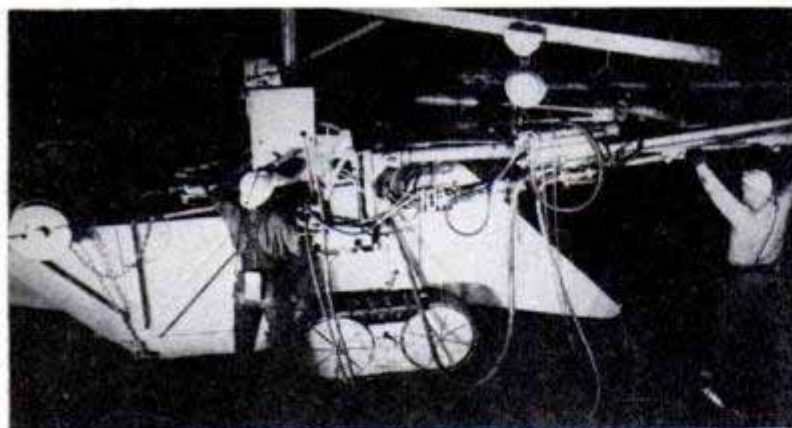
Moisture in refrigerant gas is removed efficiently by a T-shaped appliance that is quickly installed at any point on the gas-carrying line. Tiny spheres of moisture-absorbing material absorb the moisture as the gas percolates around them. The canister containing the drying agent can be replaced when saturated without removing any pipe fittings. It is simply unscrewed from the T-fitting and a fresh canister installed. The device is designed for use in commercial refrigeration systems.



Five Instruments Combined By Plastic Draftsman's Tool

Craftsmen, draftsmen, artists and students find wide uses for a compact five-way tool. Made of plastic, it consists of a straightedge with ruler and protractor markings, a pencil holder which slides the length of the ruler but can be fixed at any point and a post at one end with a steel needle on the bottom. As a compass, it makes circles up to 17 inches in diameter. When the instrument is turned upside down, it becomes a T square, and can also be used as a marking gauge.

Mining Machine With Many Functions Multiplies Ore Production



Boom containing rock-drilling equipment is mounted in minutes. [With boom removed, machine scoops up rock, hauls it away



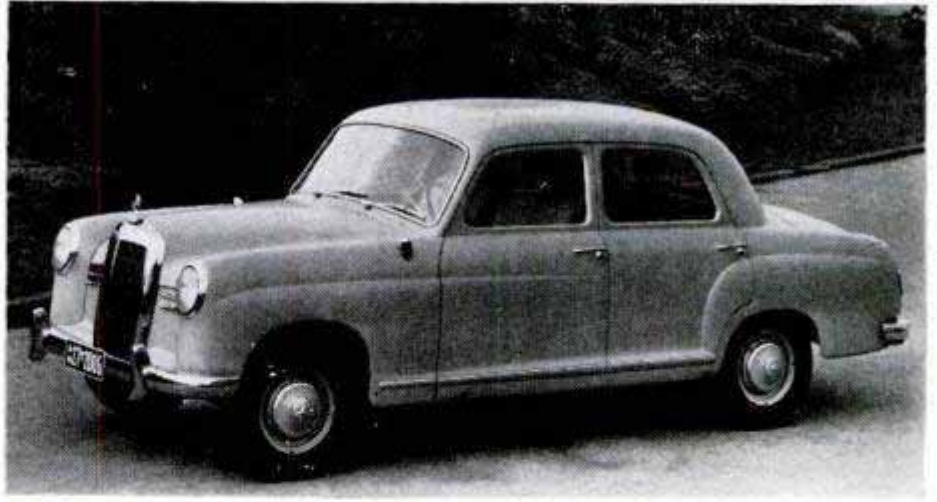
Ore production at a Washington mine has been boosted from 15 to 100 tons per man a day with a machine which drills blast holes, scoops up the broken ore and hauls it away. Rock drills and jibs are mounted on a special assembly that is removable in one piece by a portable crane applied to the machine for this purpose. Pick and shovel work is eliminated by a loading scoop on the front, which fills the large ore compartment. The machine then backs away, hauls the ore to an unloading area, and dumps it by releasing a door in the bottom. Built at a cost of \$13,000, the unit replaces equipment valued at \$100,000.

Human Moles

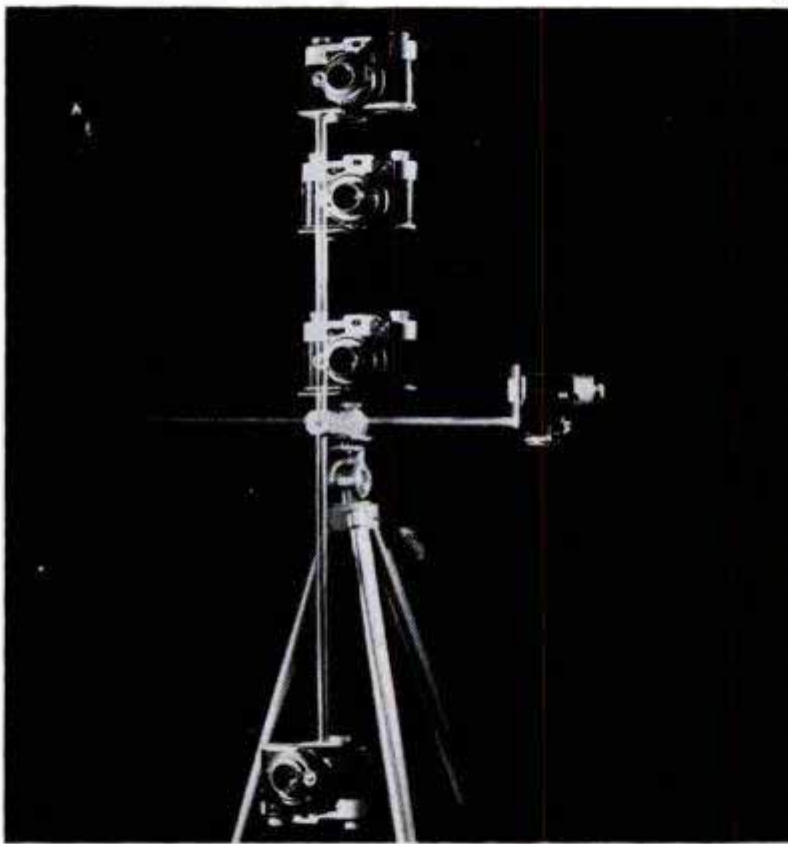
They work deep under the city, crawling and squirming through pipes narrower than their shoulders. Their job is to clean out the miles of pipe that serve a city. A feature next month tells of these amazing men and their weird machines

Mercedes-Benz Is Roomier With Better Vision Than Former Model

Considerably more space for passengers is offered in the new Mercedes-Benz. The model, Type 180, has 22 percent more available space than its predecessor in the same price class. Window area has been increased about 40 percent, and the lines of the car show a marked similarity to some American cars. The four-cylinder engine yields about 27 miles per gallon.



Tripod Attachment Permits Wide Variety of Positions



Photographers can vary the position of their cameras almost endlessly with a swinging tripod attachment. The device increases the height of the tripod and permits taking pictures from a vertical or horizontal position, or from any point in between. A lock screw keeps the camera steady in all positions.

Chemicals Check Oak Wilt

Shade and forest trees are saved from destruction by eight different chemicals designed to check oak wilt. In tests, up to 75 percent of afflicted saplings and seedlings recovered and resumed apparently normal growth. The chemicals seem to change the growth processes of the trees and allow them to live despite the presence of the fungus. The disease is now spreading in many parts of the nation.

Parking-Lot Guard Operated by Coin Eliminates Need for Attendants

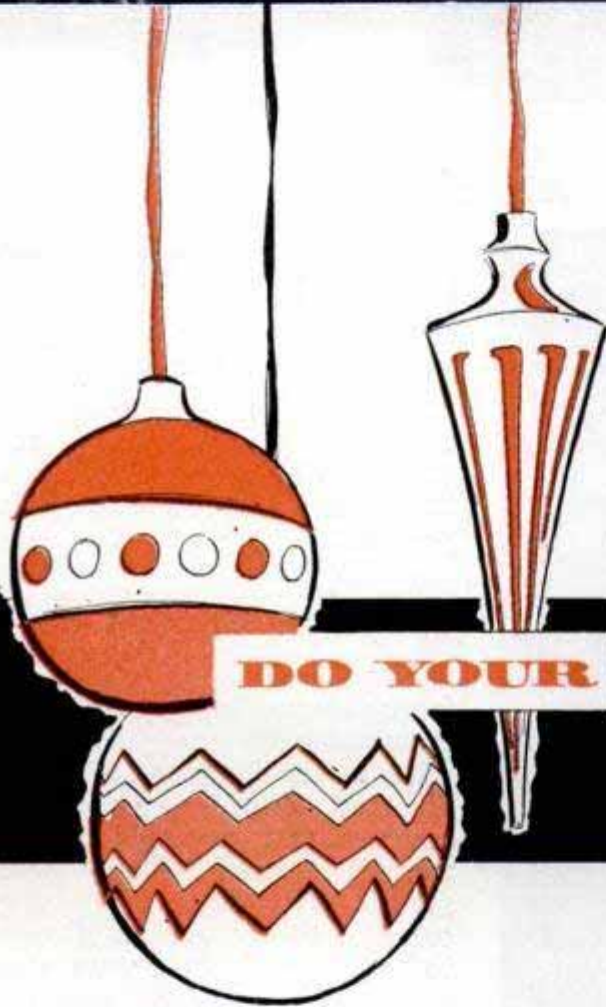
Combining the action of a midget railroad-crossing barrier and a modified parking meter, a parking-lot device ends the need for attendants. The motorist simply drops a coin in a slot and the barrier rises. The car drives over an air hose which causes the barrier to lower again. A similar machine is placed at the exit. Machines for private lots are opened by use of a magnetized card.





PROJECTOR for silent home movies is quiet, casts a sharp image and never needs to be oiled. Lifetime lubrication is sealed around bearings and nylon gears. Lamp is 750 watts, cannot be turned on unless fan is operating. The weight of 16 mm. projector is 19 pounds

BELT WATCH for men or women has a snakeskin snap cover and can be worn on a belt, placed upright on a night table or carried in a pocket or purse. One of the new designs presented by Swiss watchmakers, the timepiece is not easily damaged when worn at the waist



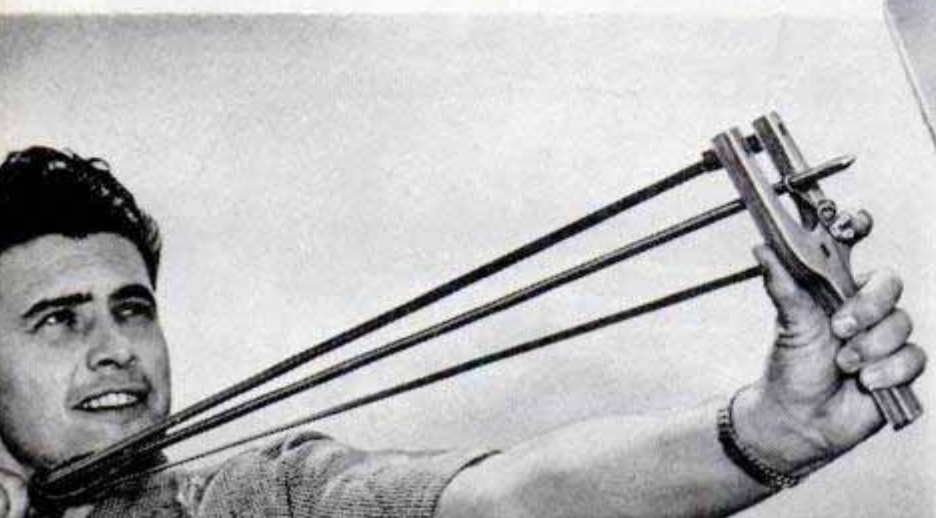
DO YOUR

Christmas



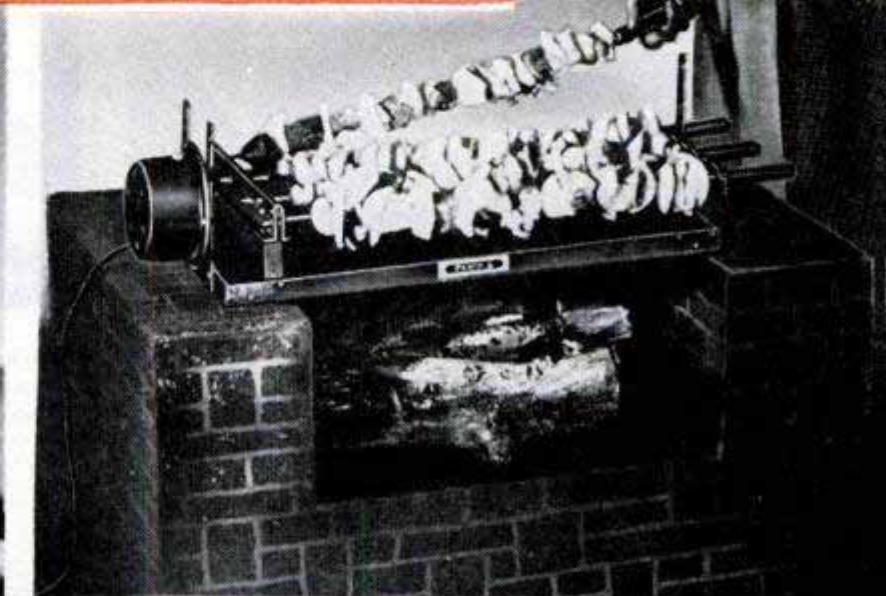
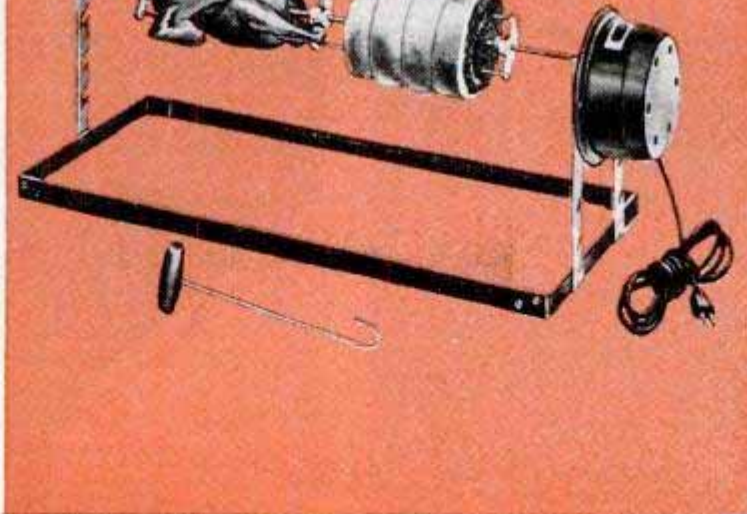
FOUNTAIN-PEN SET for car enthusiasts features accurate metal replica of a famous automobile mounted between pen holders

POWERFUL SLINGSHOT with three rubber bands instead of two shoots arrows, stones or pellets, can kill small game and is accurate enough to be used for target practice



SPIT driven by electric motor frees the outdoor chef from the tedious job of turning and basting. Horizontal adapter allows a set of four skewers to turn independently

ELECTRIC REEL for surf and boat fishermen has a small electromagnet that applies tension to spool when line slackens. Tiny flashlight battery in reel furnishes power



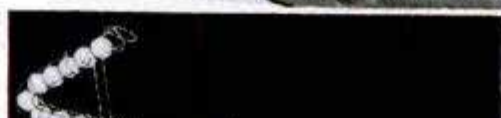
Shopping Here

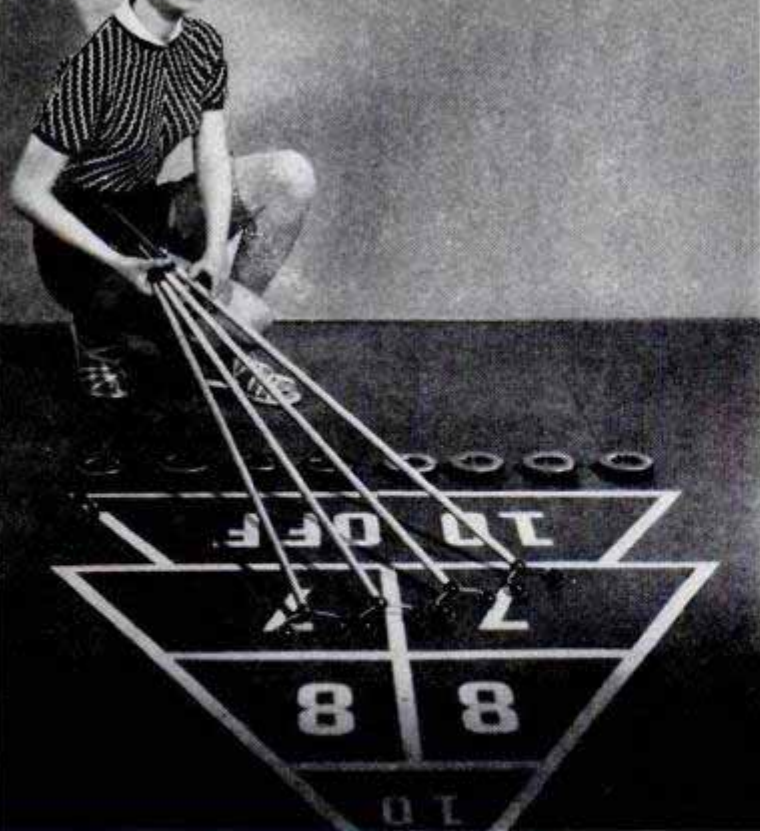
For the man— and
the outdoorsman—
in the family

Six pages of timely new Christmas gift ideas for the home, the youngsters, and the man of the family

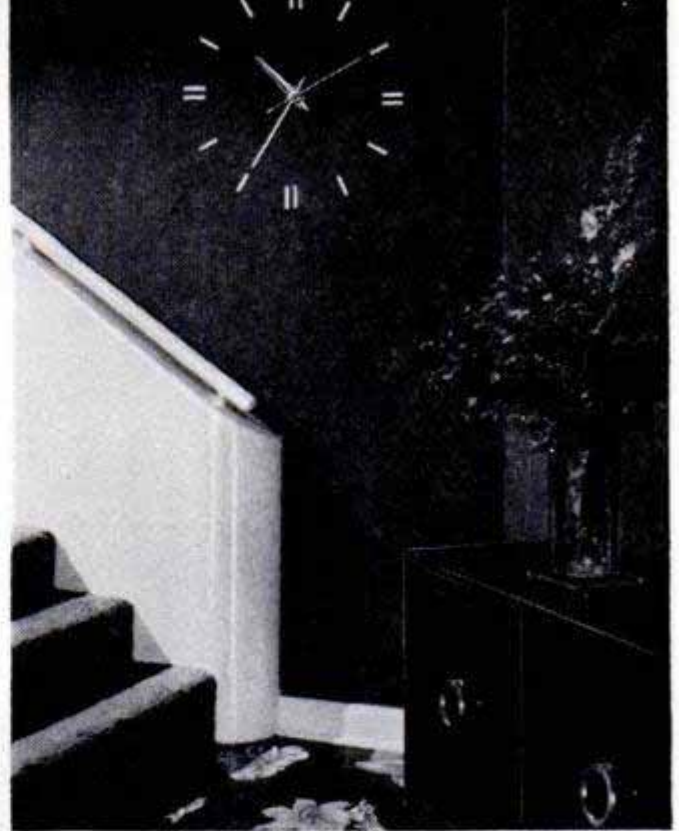
COFFEE KIT assures the traveler of a perfect brew even when he is far from home. A plastic carrying case contains the pot, four cups and spoons, a small vacuum bottle for cream and canisters for coffee and sugar. The fast-percolating electric coffeemaker has a six cup capacity

GOLFBALL FEEDER contains 15 balls for practice shooting in the house or on the lawn. Each time the golfer depresses the delivery tube with his club a ball rolls out and seats itself on the rubber tee. Baseboard won't skid on floor, anchors to turf by means of wooden pegs





SHUFFLEBOARD SET two-thirds regulation size is just right for recreation rooms and driveways. Four aluminum cues and eight disks comprise the set



WALL CLOCK driven by hidden works is assembled from kit which includes template and full directions. Works are covered by a disk or installed behind wall



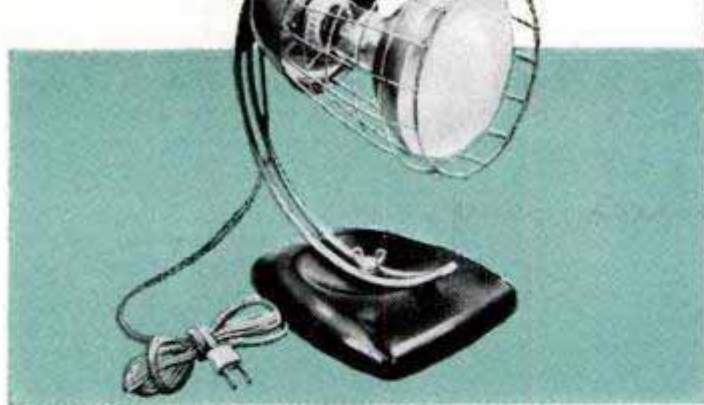
DO YOUR

Christmas

DISHWASHING SPRAYER mixes detergent with water from faucet to clean dishes in one third the usual time. Thumb lever opens detergent reservoir or closes it when only rinse water is needed. Device won't rust



PHOTO LAMPSHADE is illustrated with enlargements of favorite pictures, black and white or hand-colored. Printed on extra-heavy photographic paper made translucent and durable by a plastic treatment, pictures appear to have depth and reality when lamp is turned on. Snapshots, large glossy prints or transparencies may be reproduced on shade



MULTIPURPOSE LAMP gives you a sun tan, a heat treatment or enough light for indoor picture-taking by using ultraviolet, infrared or photoflood bulbs



HOME-FREEZING KIT supplies everything for the beginner, including cartons, plastic bags and boxes, aluminum foil and instruction book



ELECTRIC TRIVET keeps food hot after it has reached the table. The decorative hot plate won't harm table finish. Handle remains cool

Shopping Here

For the **HOME—**
and the woman
who runs it

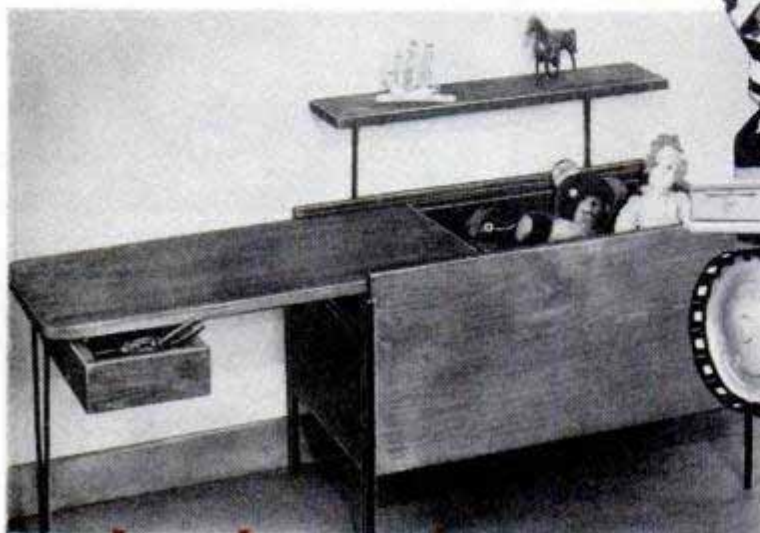
PHOTO PLAYING CARDS contain black-and-white reproductions of personal caricature or snapshot. Caricatures are drawn by company artists from enclosed photographs. The service is handled entirely by mail



WATER-POWERED MIXER connected to faucet blends fruit juices and mixes beverages, topping and batter. Stainless-steel blades in base revolve at high speed to mix liquid efficiently. Container is of plastic



COALING STATION for model trains is operated by remote control. Contents of dump car are emptied into an elevator and carried to overhead bin which then releases its load



TOY CHEST has a sliding top that can be pulled out to form a work table or play table. Attached to sliding top is an extra leg and a small tool drawer

BULLDOZER is a scale model of the real thing, one of the largest playthings that is available to mechanically minded boys



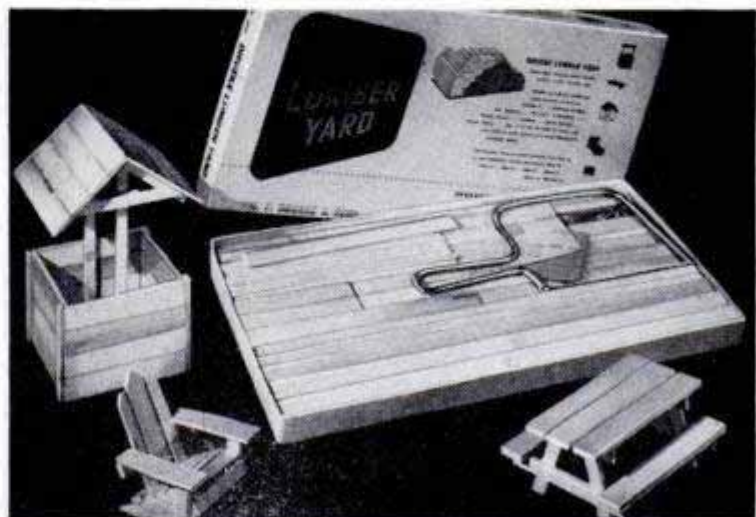
DO YOUR

Christmas



ELECTRIC TRACTOR directed from control box turns in its tracks, crawls over obstacles, shifts into two forward or reverse speeds at touch of button

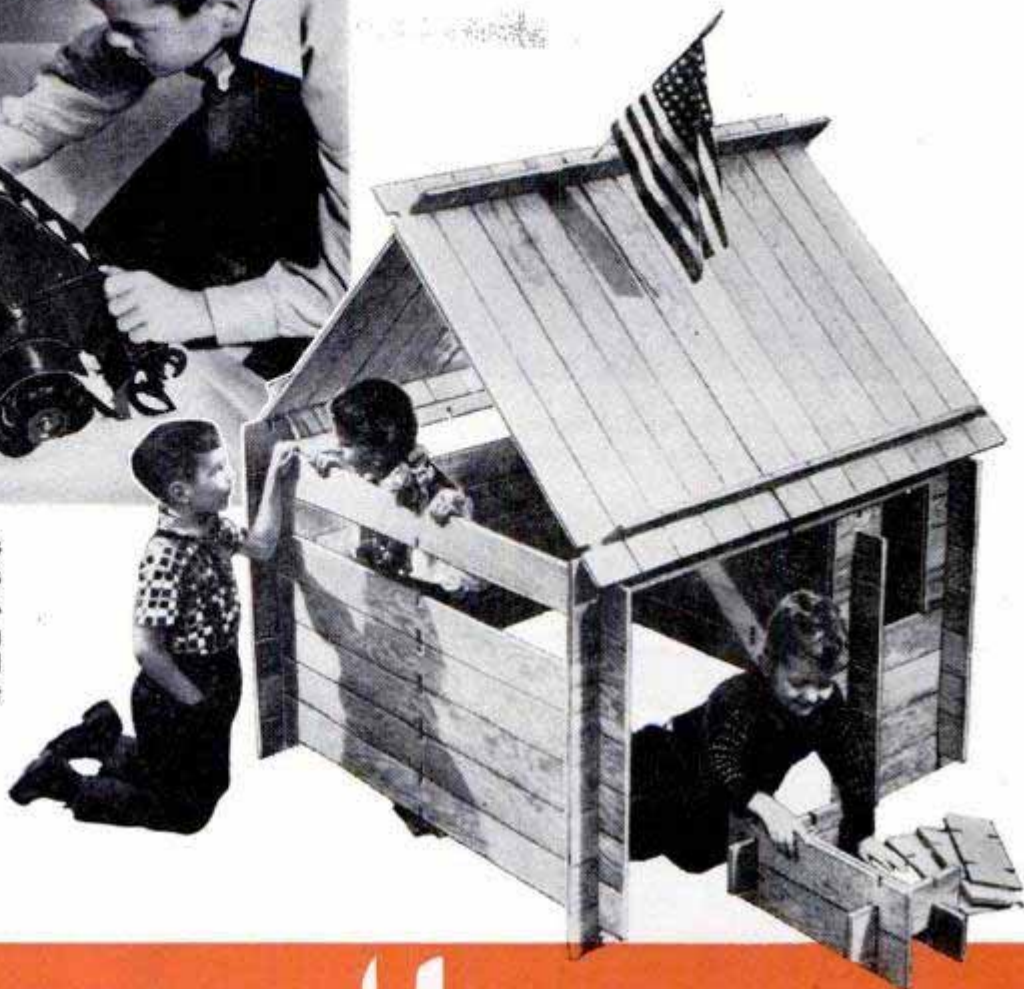
LUMBER KIT contains everything needed to build toys or authentic models of furniture and buildings. Miniature boards, beams and dowels, glue, sandpaper and a saw are provided for the young modelmaker





BUCKET LOADER scoops up sand or gravel and puts it in an earth hauler. A crank operates the loading screw, sand buckets, and the rubber conveyor belt

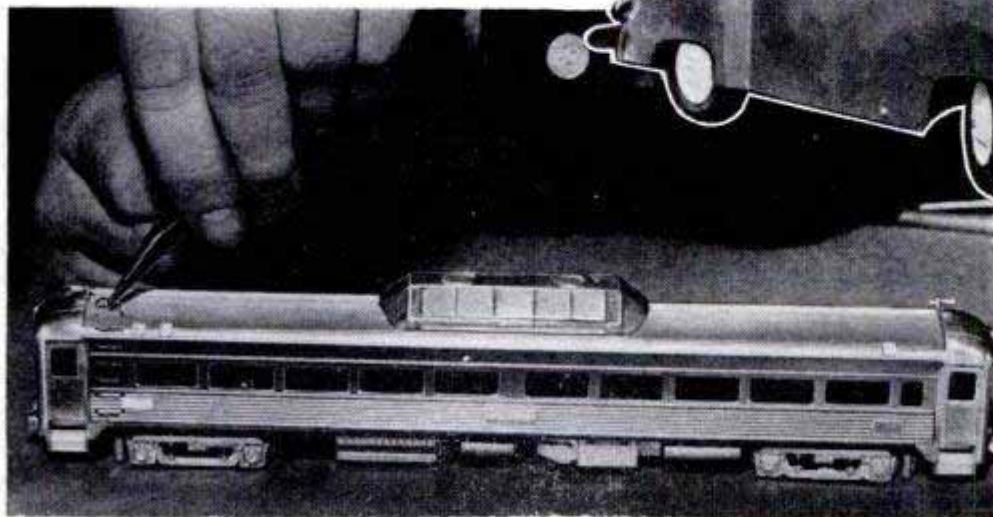
BUILDING SET enables children to build fort or playhouse big enough to walk into. Building planks are $\frac{3}{4}$ -inch plywood notched at the ends so that boards can fit into each other



Shopping Here

For the youngsters

ELECTRIC AUTO powered by battery needs charging only once a day, attains a speed of five m.p.h. Gearshift for forward and reverse speeds, lights, brake and horn add reality



HO MODEL of self-propelled diesel car now in service on major railroads includes pre-painted parts, electric motor

1954 Nash Line

For 1954 Nash continues to expand its Rambler line by introducing a four-door sedan. It has a 108-inch wheelbase, eight inches longer than other Ramblers. Its L-head engine produces 90 horsepower. Standard for the smaller Ramblers is 85 horsepower; with Hydramatic, 90 horsepower. Seats in the sedan recline and fold to make a bed. The only styling change is the addition of chrome teeth in the air intake below the windshield. Statesman 1954 models have 110-horsepower engines featuring dual carburetors, aluminum head and 8.5:1 compression. Ambassador models have 130 horsepower and 7.6:1 compression. The Le Mans 140-horsepower engine is optional on the Ambassador. Continental spare-tire mounts are standard on the Rambler, optional on others.



Above, a four-door, slightly longer sedan joins the Rambler line for 1954. Below, the only exterior change in the Ambassador is a concave front grille



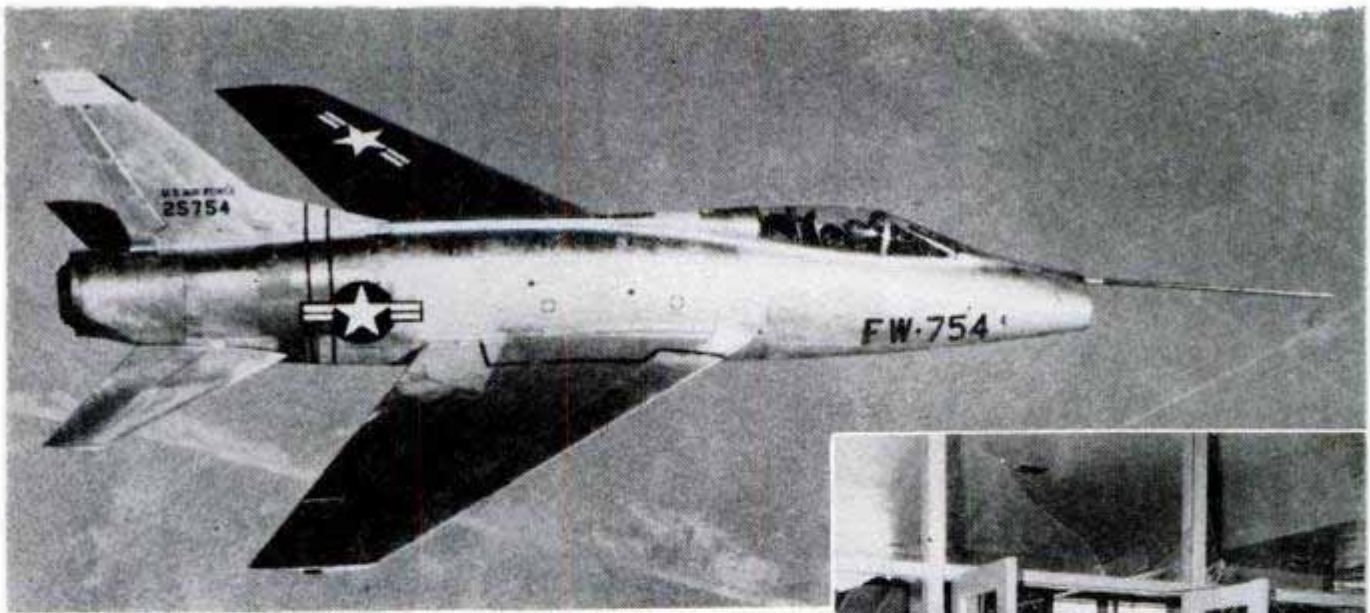
DeSoto V8 Offers Added Horsepower and New Transmission

DeSoto for 1954 features a fully automatic transmission, increased horsepower and all-new interiors. Exteriors are only slightly changed, with a new grille, bumpers and taillight clusters. PowerFlite, the new transmission, combines a torque con-

verter and a two-speed planetary unit. There is only one automatic shift from starting gear to direct drive. Over-all torque-multiplication is 4.47 to 1, highest in the industry. The Fire Dome V8 engine develops 170 horsepower, up 10 from 1953.

DeSoto has given its 1954 models a longer look by redesigning its chrome trim. Interiors have added luxury

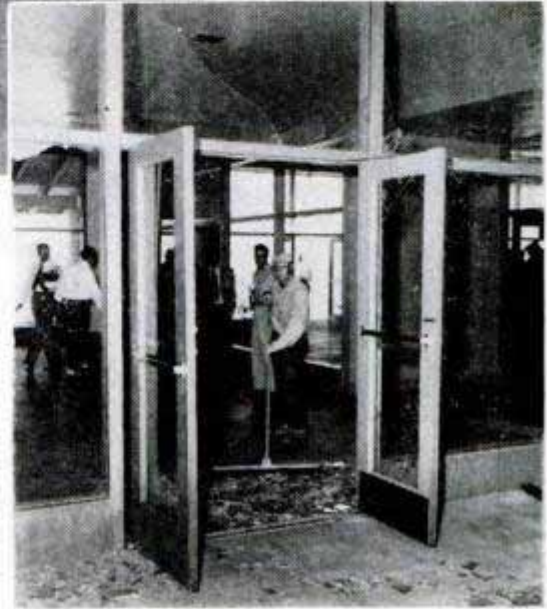




North American Aviation photo

Production Fighter Tops Speed of Sound

Introduced by its manufacturer as the world's fastest jet fighter, the Air Force's F-100 Super Sabre roared through three speed runs averaging about 760 miles per hour. Quarter-inch plate glass in an airport building (shown at right) was shattered by the terrific shock wave created by one supersonic run. The F-100 is in production as successor to the F-86 Sabre. Both its wing and tail are swept back 45 degrees. Titanium, the new metal that resists heat and corrosion, is used throughout the F-100's construction.



Studebaker Offers Station Wagon in 1954

The 1954 Studebaker line includes the company's first station wagon—the Conestoga. Style changes from 1953 are slight: new front grille, larger bumper guards and hood ornament. Sedans (not the sports line) have a chrome rub rail running along the body. Both V8 and 6-cylinder engines have 7.5:1 compression ratios and larger brakes. Overload springs on the Conestoga give passenger-car comfort with small loads, ample support on larger loads.

Below, the new Studebaker Conestoga retains the sleek look. Right, center armrest in back seat is removable on 1954 coupes





Around the high-speed curve at Milford come nine plastic Corvettes, each doing about 100 miles per hour

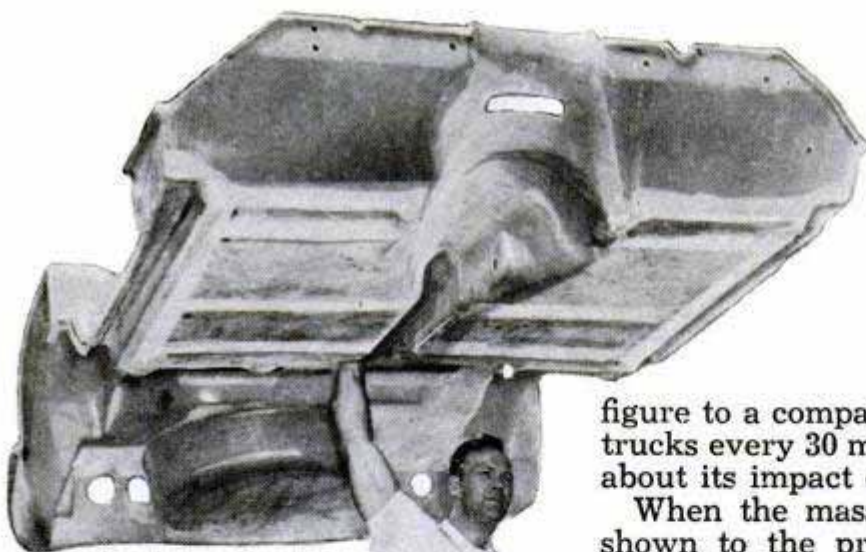
HERE COME THE CORVETTES!

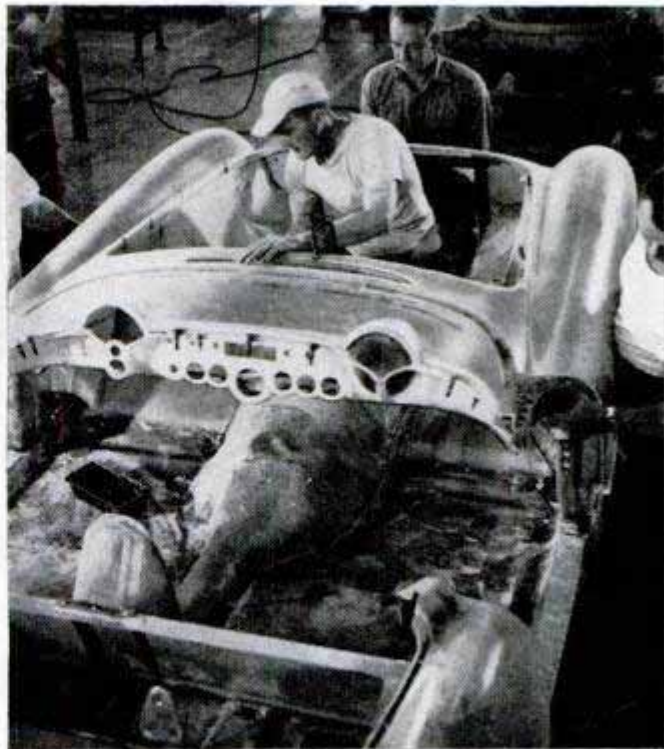
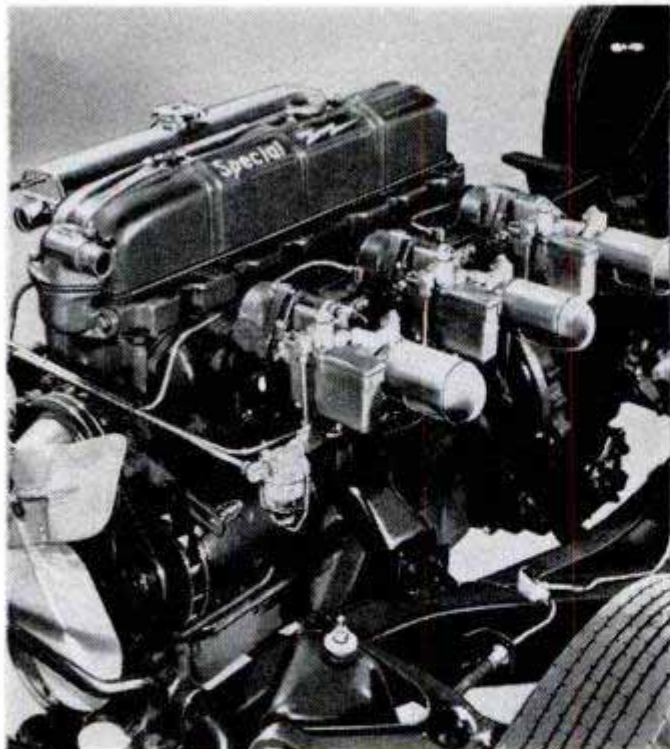
CCHEVROLET has come up with a pair of firsts: It is the first modern United States manufacturer to mass-produce a sports car; second, it is the first to mass-produce a plastic car.

By the end of January 1954, plastic Corvettes will be coming off the line at a rate of 1000 each month. Small potatoes, indeed, is such a production figure to a company that builds 250 steel cars and trucks every 30 minutes, but there's nothing small about its impact on the industry.

When the mass-produced Corvettes were first shown to the press there were some surprised skeptics. Confirmed sports-car enthusiasts were frank to praise the car after a few spins around the Milford proving ground. Although not billed as a

Corvette floor is this huge plastic underbody. Weight: only 75 pounds. Entire body weighs 411 pounds, 300 less than it would if of steel





Engine has three carburetors. Top right, front section is fitted to underbody. Plastic parts are bonded together. Right, plastic body is so strong no separate bumper is required either front or back

competition car, the Corvette handles, accelerates and corners like one. Of course, it will not please the purists among the sports-car clan. Biggest complaint: it will be sold only with Powerglide, the automatic transmission—anathema to the sports-car enthusiast.

By using plastic, Chevrolet got into production years sooner and with a tooling cost of only \$500,000, compared with \$4,500,000 for steel. The plastic is thicker than steel and much sturdier. A hammer blow that would dent steel bounces harmlessly off the plastic. If it does break through, the damage is localized, can be repaired in an hour.

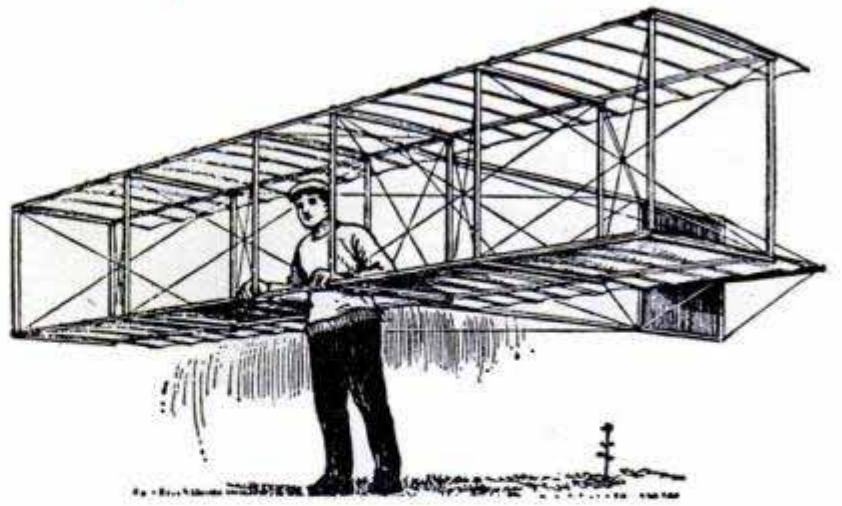
The engine is a souped-up Chevrolet six, developing 150 horsepower. Compression ratio is 8:1. Powerglide has been modified to provide full-throttle upshift at 55 miles per hour. High-lift cams and dual exhaust boost performance. Wheelbase is 102 inches. Frame, springs and shocks were specially designed for the Corvette. Steering ratio is a fast 16 to 1. Acceleration: from 0 to 60 in 11.4 seconds. Top speed: over 100. Price: \$3490.



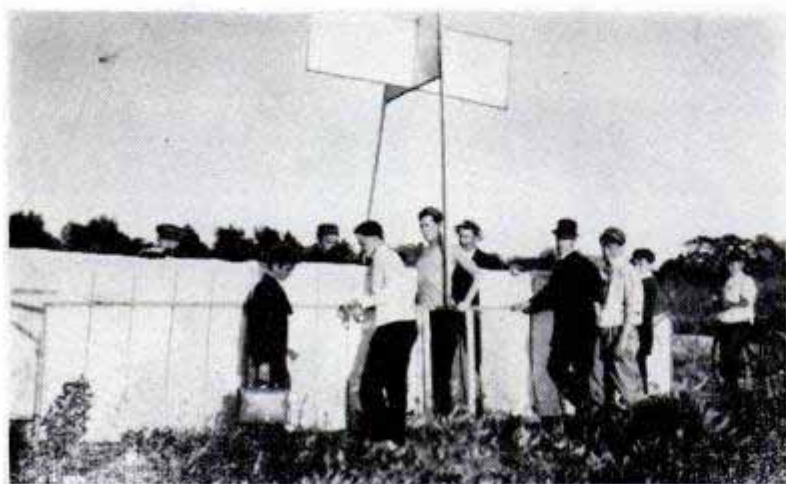
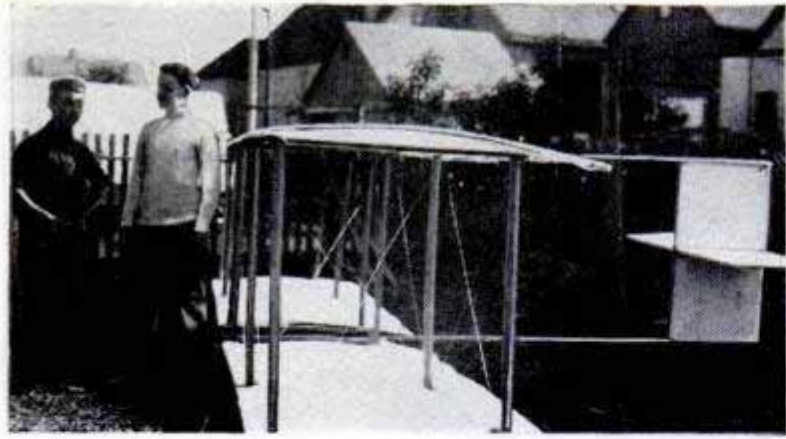
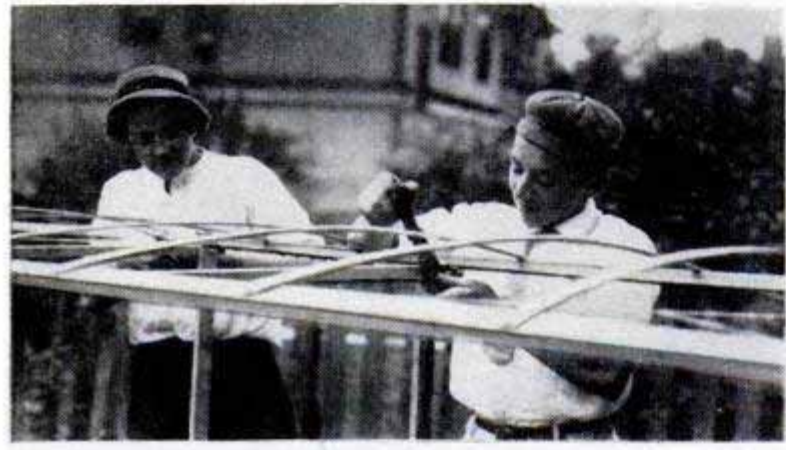
Right, major plastic parts of Corvette. Only metal body part is gas-tank flap

April 1909 p. 386

Way back in 1907 Popular Mechanics was telling its readers how to build their own glider. This drawing, revived from the old "build-it-yourself" story, was reprinted in our September 1953 issue to advertise the new PM Album of Aviation. Its republication brought pangs of nostalgia to Ralph H. Hall of Seattle, who wrote us the following letter accompanied by these photographs of his "early American" PM glider.



PM Glider, 1909 Model



To the Editor:

While thumbing through the September 1953 issue of Popular Mechanics I encountered an advertisement that had a vaguely familiar appearance. I answered the original advertisement sometime in 1909. And from the plans my pal and I constructed the poor man's glider. As proof thereof, enclosed are snapshots of the two amateur builders and flyers working on their "bird."

I recall that both of us leaped from a tremendous and precipitous cliff just outside of Milwaukee, Wisconsin. Strangely enough, I cannot recall that we returned the "scraps" to the family backyard on conclusion of the experiment. I should like to see that "cliff" again. I wonder just how high it was. Since then I have been a passenger in military planes in Europe during World Wars I and II, across the Pacific and all over Japan and Korea during the recent fracas. None of these flights provided the thrill or anticipation of that leap in the Pop Mechanics contraption.

The taller chap [center photo] is Edward V. Oehler, now a vice president of the Briggs & Stratton Corporation in Milwaukee. I am the short boy in the cap, now a retired Army lieutenant-colonel living in Seattle.

Hope you get as much kick out of these pictures as I did. You should, since their reprinting was inspired by your article on aviation.

Ralph H. Hall
Seattle 2, Wash.

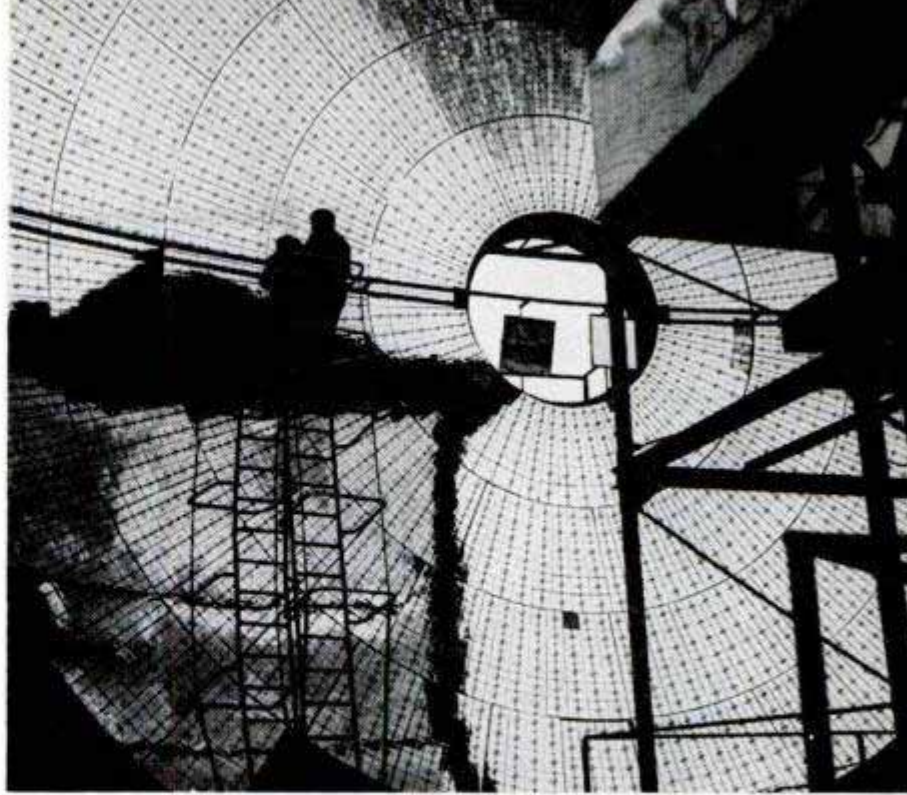
Mammoth Solar Furnace 'Burns' at 3000 Degrees

TRAPPED SUNSHINE melts glass and liquefies steel at a research station in the eastern French Pyrenees mountains. A 10-ton flat mirror is moved about to catch the rays of the sun and bounces the beams to a fixed parabolic mirror made up of 3500 individual concave plates. The huge 12-ton "burning glass" causes the rays to converge in a solar oven placed between the two mirrors. The resulting heat reaches a temperature of 3000 degrees Centigrade. The individual plates in the curved mirror are adjusted by a simple hand control to vary the concentration of the burning rays.

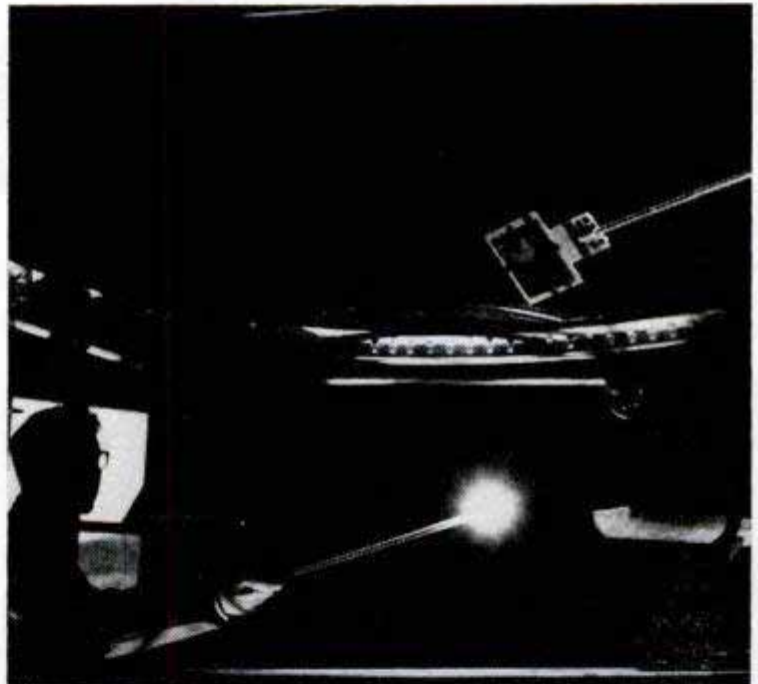
According to the French National Center of Scientific Research, the apparatus is the largest solar furnace in the world. Designed by scientist Felix Trombe, who became interested in the idea while conducting research in rare metals, the furnace was built during a period of three years in an old fort at Mont Louis. The installation is located 5200 feet above sea level.

Experiments conducted at the research station indicate excellent possibilities of the solar furnace as a source of power. The scientists look forward to a day when electric generating plants fueled by sunshine will furnish heat, light and power for home and industry.

Glowing end of glass rod, right, marks point in oven where sun's rays converge. Huge flat mirror, below, catches sunshine, bounces it to curved mirror which beams it into oven



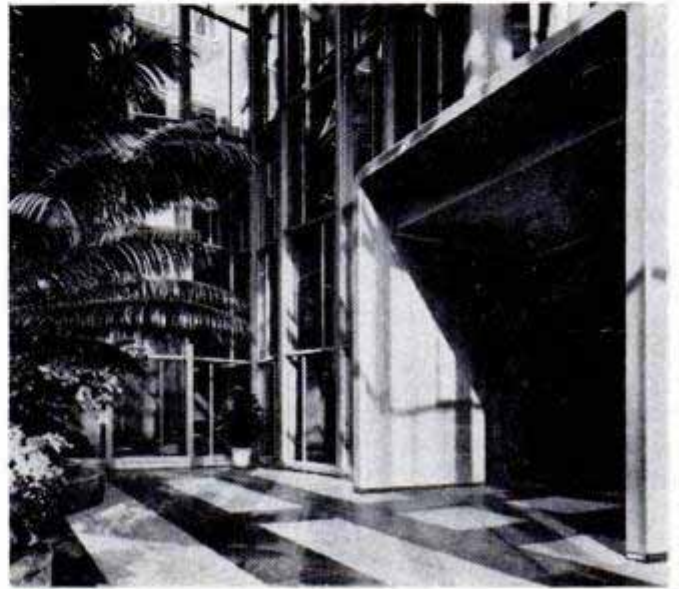
Polishing the 3500 individual concave mirrors is a daily task



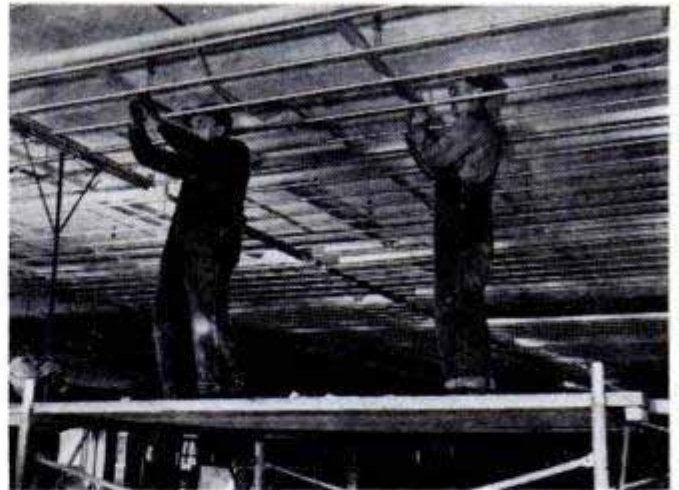
ALUMINUM SKYSCRAPER



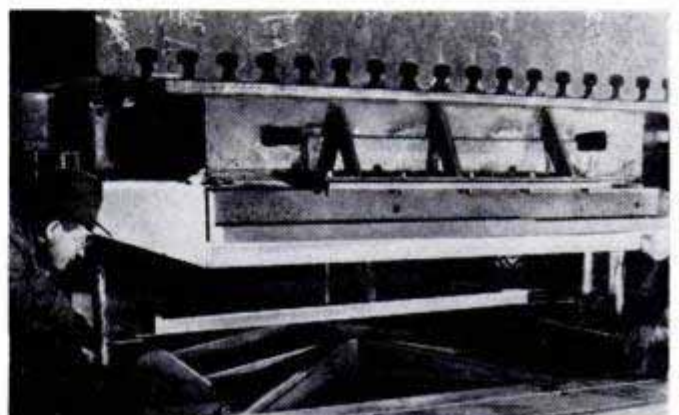
Six-by-twelve-foot exterior panels already fitted with windows are bolted to metal brackets by crew inside the building. Workmen on floor above position the panels. No taping or caulking of joints is needed



Glass-walled main entrance rises $4\frac{1}{2}$ stories alongside the main tower. Two huge cantilever beams which jut out from the fifth floor of the tower support the weight of the structure from the top. Floor is marble



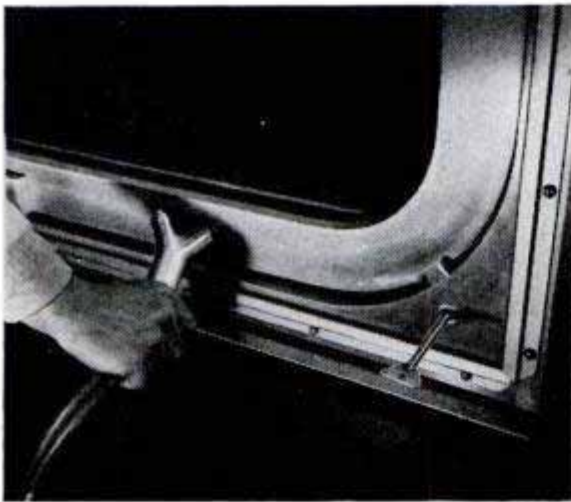
Grids of aluminum pipe suspended from true ceiling provide all heating, half the cooling. Below, thin panels are stamped out like cookies by hydraulic press



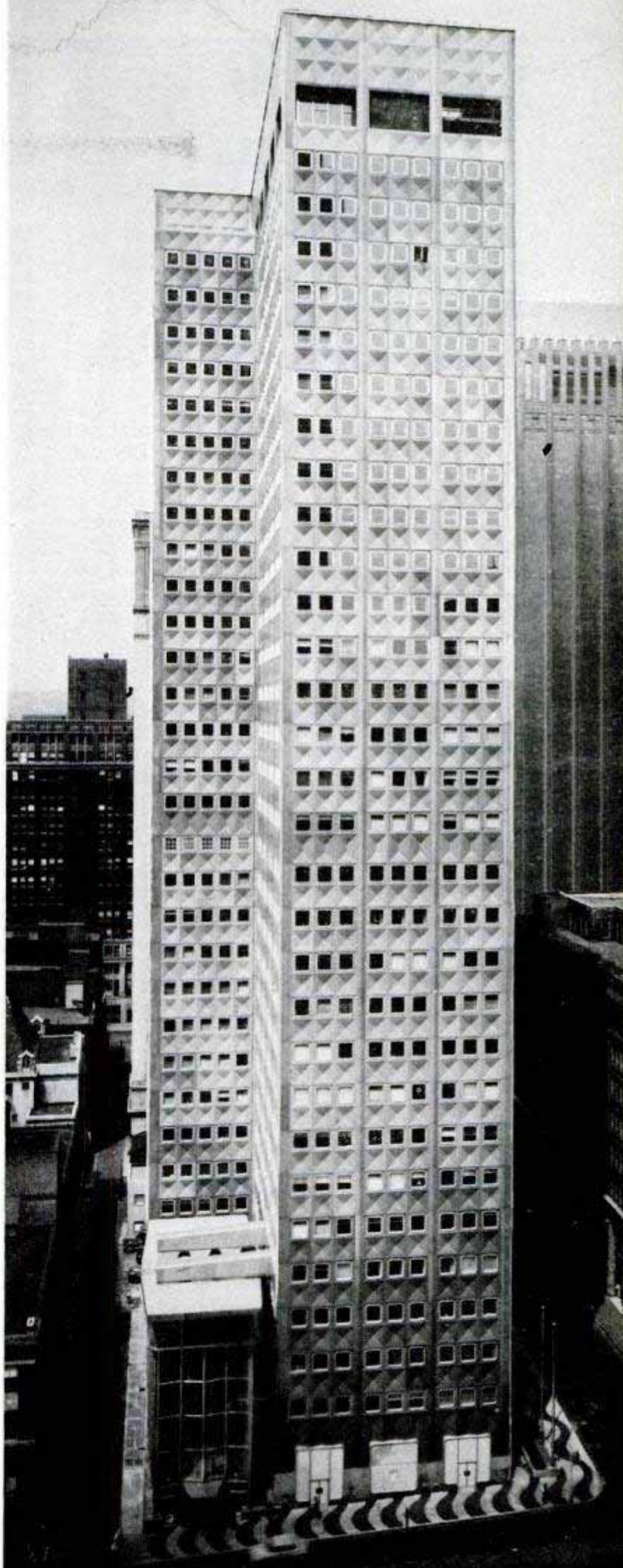
AMERICA'S FIRST aluminum skyscraper, the 410-foot, 30-story Alcoa building in downtown Pittsburgh, is also said to be the lightest building of its size in the world. Use of aluminum saved space and cut the need for structural steel by 30 to 50 percent.

Perforated aluminum panels in the ceilings, topped by a glass-fiber blanket, deaden sound and mask grids of aluminum pipes which heat and cool the offices. Lights are hooked to aluminum conduits. Circulated air travels through aluminum ducts.

A skinlike outer wall is made up of stamped aluminum panels only an eighth of an inch thick. After metal holding clips were bolted to the horizontal beams the one-story-high panels were easily hoisted and bolted into place by a small crew working inside the building. The inner wall consists of four separate layers of perlite concrete sprayed from a pneumatic nozzle onto slotted aluminum lath and metal reinforcing bars. Such methods resulted in a strong, modern, low-cost structure. ★ ★ ★



Y-shape tool deflates and inflates a rubber gasket before and after cleaning. Key at right locks window. Below, window is reversed for washing. Compressor on cart supplies air hose



Detroit Listening Post

By Leo Donovan



LOW-SLUNG and high-powered, a snug little sedan is definitely being planned by at least one of the Big Three in Detroit. The car is referred to as an "executive coupe" because it is to be built for the executive who drives to the office every day.

So much criticism has been made of the extravagance of the breadwinner driving downtown in a car with five empty seats, that the plan is to approach a "two car" economy through what amounts to a "one and one-half car" doorway.

Production of the two or three-seater is at least two years away, but it is no mid-winter night's dream—it's on the way.

The "explosion" of our cities into the suburbs has made cars more essential than ever. Transportation to these outlying areas offers a market of the future, especially for cars designed not to carry whole families but only two or three persons.

The new, smaller car will not be a cheap car. Its power plant will have a higher compression ratio than most present models. It will be on a 102-inch wheelbase and will be highly maneuverable, sensitive to the throttle and well-balanced for high speeds on better, wider thoroughways of the future.

It definitely will be a closed model, not a convertible. You can take this on the word of an executive who said he felt too conspicuous in the wide-open Corvette.

Before the 1954 models are very old, probably before press previews of the 1955 cars roll around, buyers will begin to get some long-awaited price cuts as a result of technological progress. Several spokesmen for producers foresee a combination automatic-transmission-and-power-steering package next year at the current price of the transmission alone.

Chevrolet is moving steadily forward with its plans for a V8 engine, persistent gossip says. Forged camshafts may be replaced by shell-molded camshafts so accurately cast that millions of dollars in machining costs eventually may be saved.

The 1954 models have, in the main, made little more than "identification" changes in their exterior body lines over 1953. But there is a definite newness about the interiors. Women shoppers especially notice a much wider variety of color combinations and fabrics this year. Undoubtedly, the tricks Kaiser Motors first introduced in color styling of interiors are being adopted by other manufacturers.

Natural wool, mohair from Texas goats and easily-soiled cotton fabrics are being replaced by nonstaining and longer-wearing synthetics. Not only are nylon and Orlon fabrics appearing in greater varieties of colors, but also Dacron, Saran, Kuralon, Perlon and other less familiar test-tube fibers are making an appearance in combinations that harmonize with exteriors.

General Motors' experiments with plastic-body production in its Corvette line have failed to indicate any future possibility of impregnating the plastic with color to eliminate the need for exterior paint. The plastic can be colored—there is no trick to that. But the problem is that the color does not have the deep, brilliant shine the public demands. All colors come out rather muddy, engineers say. So the Corvette has a conventional paint job over its plastic body and the problem of chipping paint still persists.

While body engineers generally agree that it will be a long time before plastic replaces sheet steel in body panels, they now predict a much earlier adoption of the glass-fiber material than originally estimated—and in many more uses.

The use of plastic in the Corvette reduces its weight by about 300 pounds from a similar vehicle with a steel body. That is worthwhile, but the really big saving is in tooling. E. N. Cole, Chevrolet engineer largely responsible for the quick appearance of the Corvette, estimates tooling for the Corvette body in steel would have cost about \$4,500,000 compared with only \$500,000 for the tools, dies, jigs and fixtures in plastic production.

Chevrolet's pioneering in the plastic-body field (which Kaiser announced last June it also would enter) will be followed by a third major producer. The nameless (for the present) manufacturer plans to market a limited number of plastic-bodied sedans in 1954.

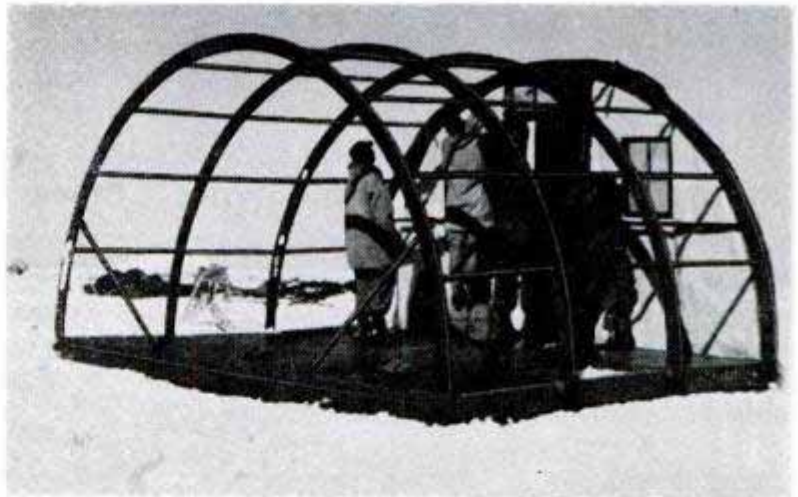
Auto-sales executives are convinced that the super-de luxe models will be the big sellers in 1954. The day of the standard, stripped-down model apparently is now over. The trend applies to trucks as well. GMC Truck and Coach Division has invested \$500,000 in new tooling to provide extra chrome moldings and trim panels in the new commercial-vehicle line.



Scientist melts snow to obtain drinking water. In the future, men may use steam from volcano to heat camp

Mountain-Top Lab for Cosmic-Ray Research

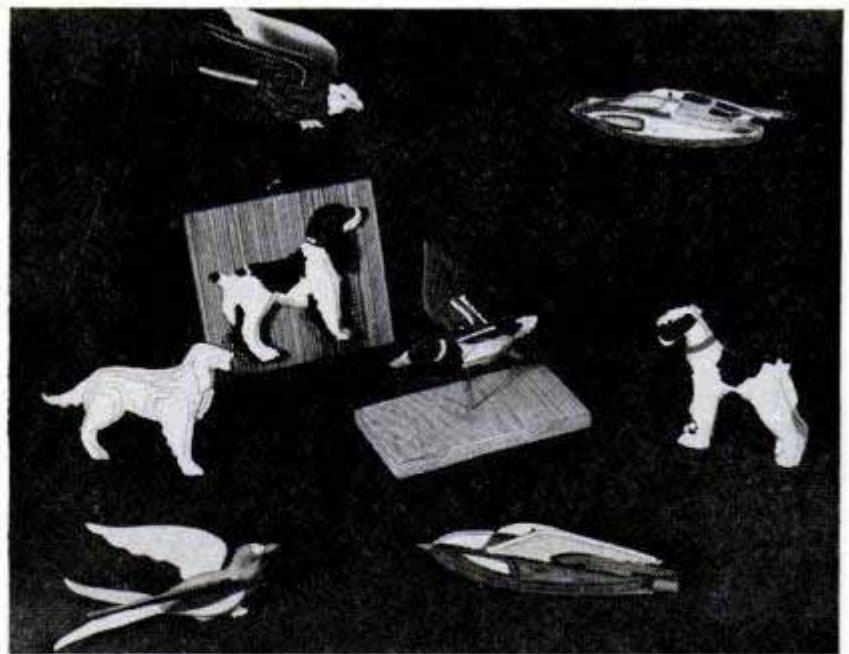
ON THE 14,006-foot summit of Mt. Wrangell, a dormant volcano in Alaska, a scientific expedition has established an observatory for cosmic-ray research. The mountain-top station, a venture of New York University and the University of Alaska, consists of two Jamesway huts, shelters made by covering a wooden framework with an insulated fabric. Supplies are flown to the station in a plane equipped with a ski-wheel combination landing gear. The scientists are attempting to find the connection, if any, between cosmic rays and other radiations.



Research party erects framework of one of the two Jamesway huts. Over this prefabricated wooden frame goes insulating fabric

Top-of-the-world station consists of a couple of huts on the bleak mountain. One serves as a laboratory





Kit Produces "3-D" Figures From Series of Flat Parts

With a new craft kit, youngsters can build full, rounded figurines from pre-cut flat parts. In the kit are three rectangular boards stamped with die-cut patterns. The child punches out the middle part of a dog, for example, and then cements succeeding parts on each side until the dog is complete. The figure then is sanded lightly, coated with a special liquid and painted with oil paint or water colors. Kits are available to make dogs, birds and rocket ships. The figures measure about 4½ inches high and can be mounted on plaques.

Pigment Tubes Give Homeowner Choice of 1322 Paint Colors

Any of 1322 colors of paint, in addition to several hundred "deep tones," can be secured at paint stores which supply the customer with base paint and separate tubes of pigment. Preparing to paint, the customer empties the tubes of colorant into

the white or gray-base paint, stirs it thoroughly, and the desired color results. Enamel, flat, semigloss, floor enamel and outside house paint can be supplied in this manner. Precise color matching is assured the customer.

Folding Box Solves Christmas Train-Storage Problem the Year 'Round



Young engineers can keep their Christmas trains readily available, yet neatly stored away inside a new plywood box. The box measures four feet wide, six feet long and six inches deep. It is hinged in the center so it folds into a covered box measuring four by three feet. The train accessories are permanently mounted within the box and are folded into it when the box is stored away. Coasters on the bottom permit the box to be pushed underneath a bed or into a closet storage area.

Wheeled Frame Helps Wounded Soldiers Regain Use of Legs

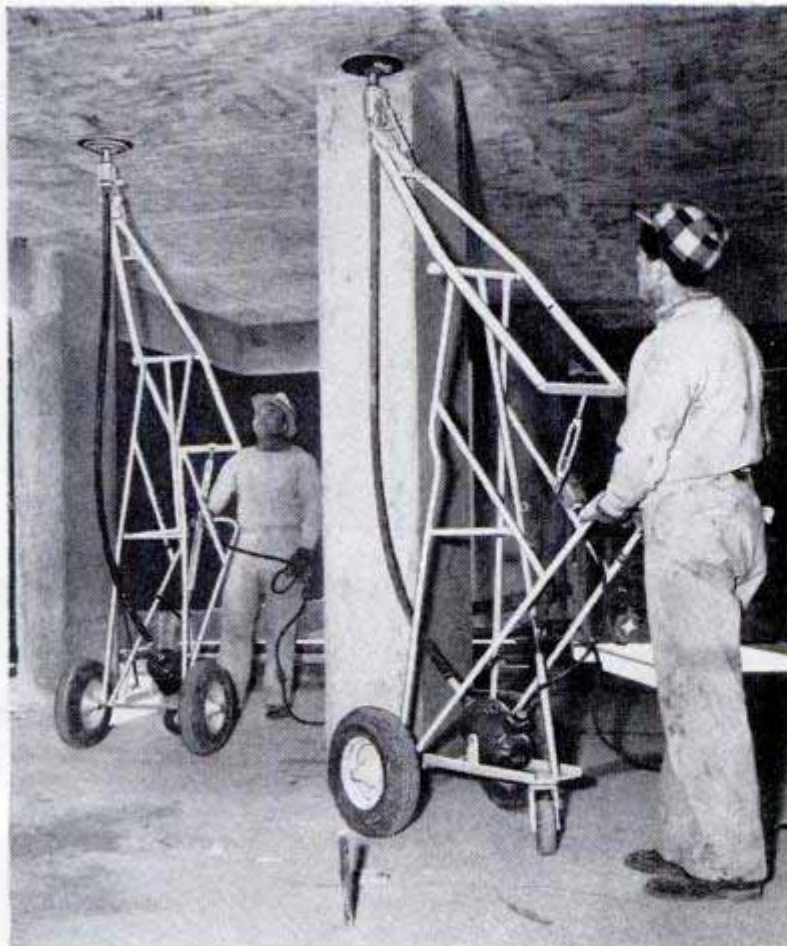
Patients at the Veterans Administration Hospital in Long Beach, Calif., learn to walk again with a "self-reliant walker" designed by Nathan Hack. It helps a wounded or polio-afflicted vet regain the use of his legs by providing a wheeled support. The frame is indented to fit snugly over the side of a bed, where the patient can get right into it.



Quiet Outboard Motor Has Noise Cushions

Power without the proverbial "putt-putt" noise is achieved by Evinrude's new 7.5-horsepower outboard motor, the Aquasonic Fleetwin. It weighs only 49 pounds, 17 pounds more than the company's three-horsepower motor, yet it delivers more than twice as much power. Twin resilient mountings soak up the engine pulsations before they reach the hull and the propeller thrust is absorbed against companion cushions in the lower housing. Silencers "tune out" annoying sounds.

Grinding "Giraffe" Polishes Concrete Ceilings Without Scaffolding

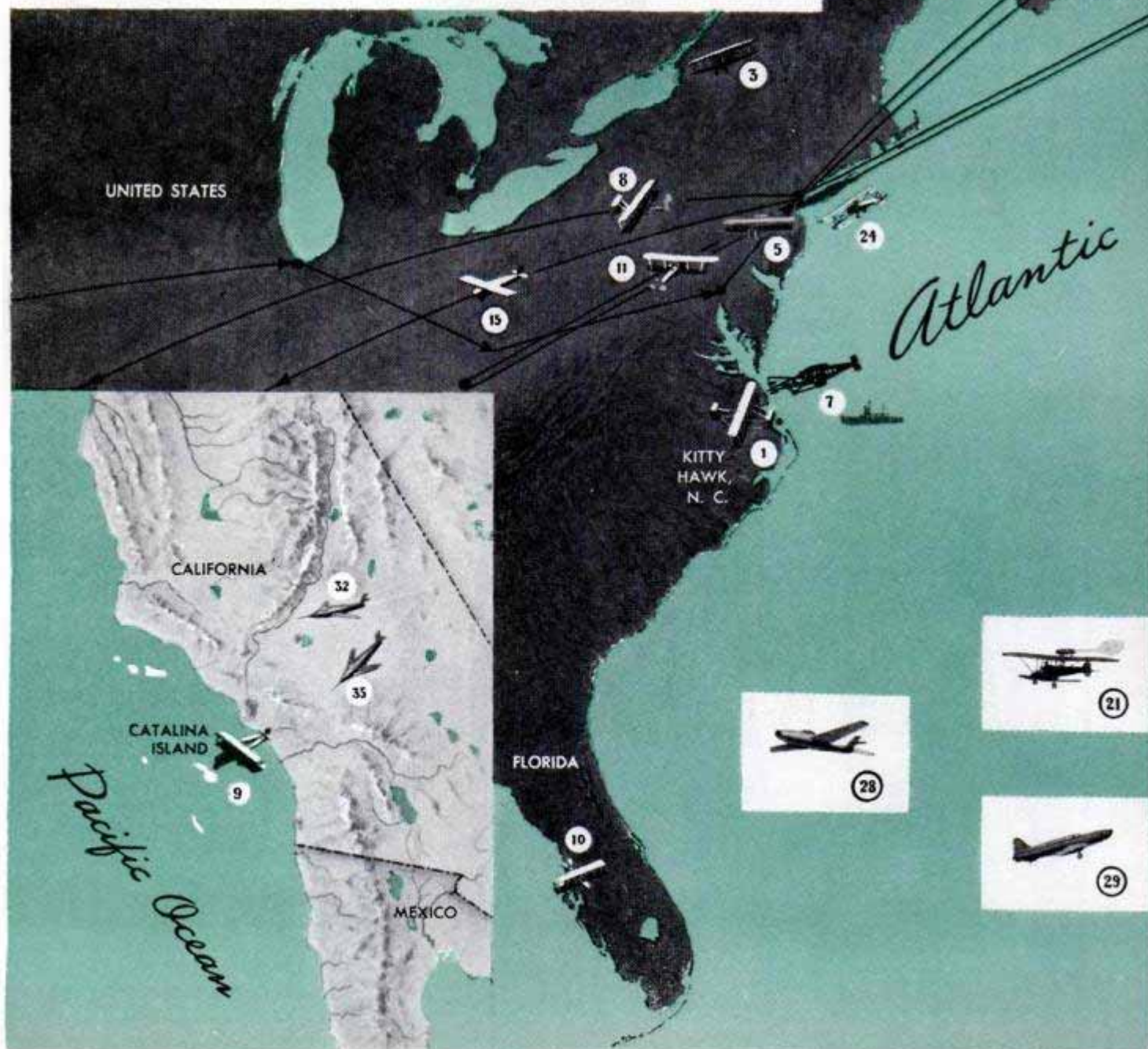


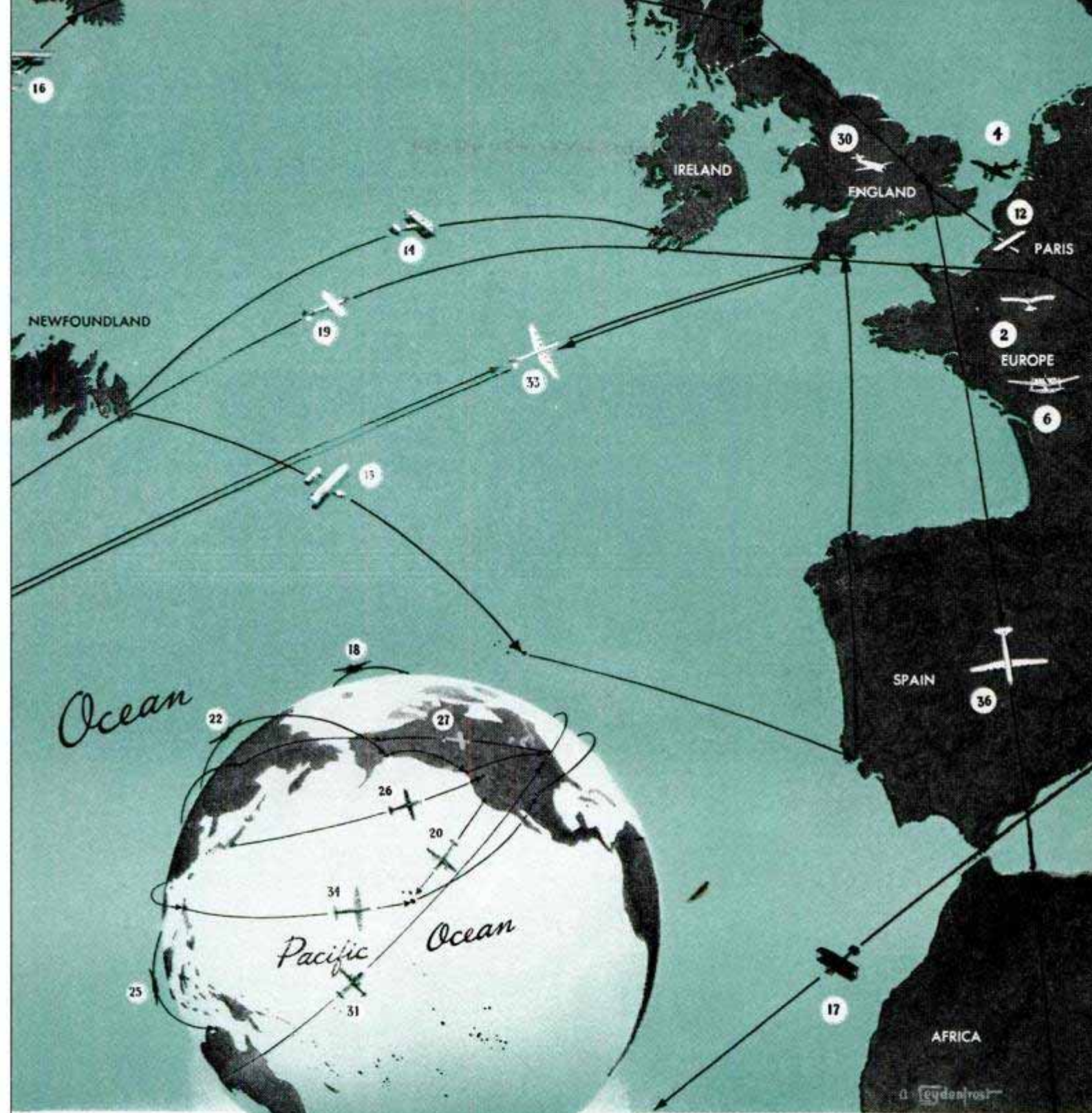
Dubbed the "giraffe," a grinding tool polishes concrete ceilings up to 11 feet high, whisking away any ribs, fins, board marks or nails that may be left when forms are removed. An electric motor mounted at the base of the wheeled unit drives a flexible shaft which turns the grinder disk. Since no scaffolding is needed, the tool speeds grinding operations and lessens the need for masks and goggles because the operator is not directly beneath the grinder. The unit weighs 148 pounds, is only 28 inches wide and is powered by a $\frac{3}{4}$ -horsepower motor run by standard current.

Sources of supply for available products described in this issue are listed in the monthly index starting on page 12. Sources of further information on other articles shown in the magazine will be found in the WHERE-TO-FIND-IT LIST, which is available to you without charge from the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario St., Chicago 11. Write for your free copy

Milestones of Aviation

THIS MONTH the world is observing the Fiftieth Anniversary of Powered Flight and paying tribute to the men—from the Wright brothers on—most responsible for its remarkable progress. In a half century the airplane has helped to shrink the size of the globe, in travel time, until now no place on earth is more than two flying days from any other place. Thousands of big transports and airliners daily ply the sky lanes, moving goods and people safely and swiftly over routes tens of thousands of miles long. Along with these great benefits to commerce and industry, the airplane's ever-increasing speed, range, carrying capacity and mobility have forced drastic changes in the strategy of war. As part of the magazine's salute to aviation's fiftieth birthday, the editors of *Popular Mechanics* have mapped the 37 flights they believe have contributed most significantly to flying's development. The exploits of the airmen of many nations are represented. Artist Alexander Leydenfrost on this specially drawn map has indicated the sites or routes of their famous flights, with small drawings of the planes they flew. At the bottom of the opposite page is a key to the map with brief identifications of the flights. The full details of these accomplishments are familiar to air-minded people all over the world. ★ ★ ★





1. First sustained, controllable flight of a heavier-than-air machine, Orville and Wilbur Wright, Kitty Hawk, N. C., Dec. 17, 1903.
2. First flight in Europe, by Alberto Santos-Dumont, Paris, 1906.
3. First U. S. aeronautical trophy won by Glenn H. Curtiss for a flight exceeding one kilometer (3280 ft.), Hammondsport, N. Y., 1908.
4. First flight across English Channel, Les Baraques to Dover, by Louis Bleriot, 1909.
5. First flight higher than one mile, Richard Brookins (6176 ft.), Atlantic City, N. J., 1910.
6. First seaplane flight, Henri Fabre, Port de la Mede, France, 1910.
7. First ship-to-shore flight, from USS Birmingham, at Hampton Roads, Va., by Eugene Ely, 1910.
8. First transcontinental flight, New York to Long Beach, Calif., by Calbraith Rodgers, 1911 (49 days).
9. Over-ocean round-trip flight from California mainland to Catalina Island and return by Glenn L. Martin, 1912.
10. First scheduled airline, St. Petersburg-Tampa, Fla., Tony Janus pilot, 1914.
11. Army pilots start scheduled U.S. mail route, New York-Washington, 1918.
12. First London-Paris airline service, 1919.
13. First trans-Atlantic crossing by air, U.S. Navy NC-4, New York to Southampton, England, 1919.
14. First nonstop trans-Atlantic air crossing, Newfoundland to Ireland, Capt. John Alcock, Lt. A. W. Brown (England), 1919.
15. First nonstop flight across U.S., New York-San Diego, Lts. Oakley Kelley and John Macready, 1923.
16. Around-the-world flight by two U.S. Army planes, starting from Seattle, Wash., 1924 (175 days).
17. Flight from Spain to Argentina, by Ramon Franco, 1926.

18. First airplane flight over North Pole, Lt. Cmdr. Richard Byrd, Floyd Bennett, 1926.
19. First nonstop solo trans-Atlantic flight, New York-Paris, by Charles A. Lindbergh, 1927.
20. California to Hawaii flight, by Lts. Lester Maitland and Albert Hegenberger, 1927.
21. Rocket-propelled plane flown by Fritz von Opel, at Frankfurt, Germany, 1929.
22. Soviet flight from Moscow to New York, via Siberia, Alaska and Seattle, Wash., 1929 (12,500 miles).
23. First flight over South Pole, Cmdr. Richard Byrd, Bernt Balchen, from Bay of Whales, 1928.
24. First demonstration of "blind" flying, by Lt. James H. Doolittle, Long Island, N. Y., 1929.
25. Flight from London to Port Darwin, Australia, by Sir Charles Kingsford-Smith, 1930.
26. Nonstop flight Japan-U.S. (Wenatchee, Wash.), by Clyde Pangborn and Hugh Herndon, 1931.
27. Around-the-world solo flight, starting from New York, by Wiley Post, 1933 (seven days, 18 hours).
28. Jet-propelled aircraft flies in Germany, 1939.
29. Aircraft with both jet and piston-engine power flies in Italy, 1940.
30. Jet-powered fighter flies in England, 1941.
31. Record nonstop flight of 11,235 miles (without refueling) by U.S. Navy crew in Lockheed Neptune, Perth, Australia to Columbus, Ohio, 1946.
32. First flight faster than sound (761 miles per hour at sea level), by U.S. Air Force Bell X-1, Capt. Charles Yeager, pilot, Muroc, Calif., 1948.
33. Automatic robot airplane (C-54) flies round trip from Wilmington, Ohio, to England, and return, 1948.
34. Nonstop around-the-world flight (four mid-air refuelings) by U.S. Air Force crew in Boeing B-50, starting from Ft. Worth, Texas, 1949 (94 hours).
35. Speed of 1238 miles per hour (1051) and altitude of 83,235 feet (1953) attained by U.S. Navy Douglas Skyrocket at Muroc, Calif.
36. Jet-powered airline service begins, London-Johannesburg, South Africa, 1952.

Air Traffic Fills Atlantic Skies

IN CONTRAST to the lonely sky through which Lindbergh winged his way to Paris 26 years ago, at a single instant during 1953's peak-travel period there were nearly 3000 passengers en route across the Atlantic in 54 luxurious airliners. As part of its observance of the 50th year of powered flight, *Popular Mechanics* had illustrator Alexander Leydenfrost "freeze" Atlantic air traffic at that moment for this drawing. The 10 lettered vessels, operating at fixed points, are maintained by six nations as weather observation and transmittal

stations and for rescue work. The broken lines are the boundaries of ocean air traffic control areas. For this drawing the International Air Transportation Association pin-pointed the location and gave the identity of every airliner plying the ocean air lanes at that specific second. This year, according to IATA, an estimated 525,000 passengers will have flown the Atlantic, marking the first time in history that the air-traffic total has exceeded the estimated combined first and second-class surface travel across the ocean.



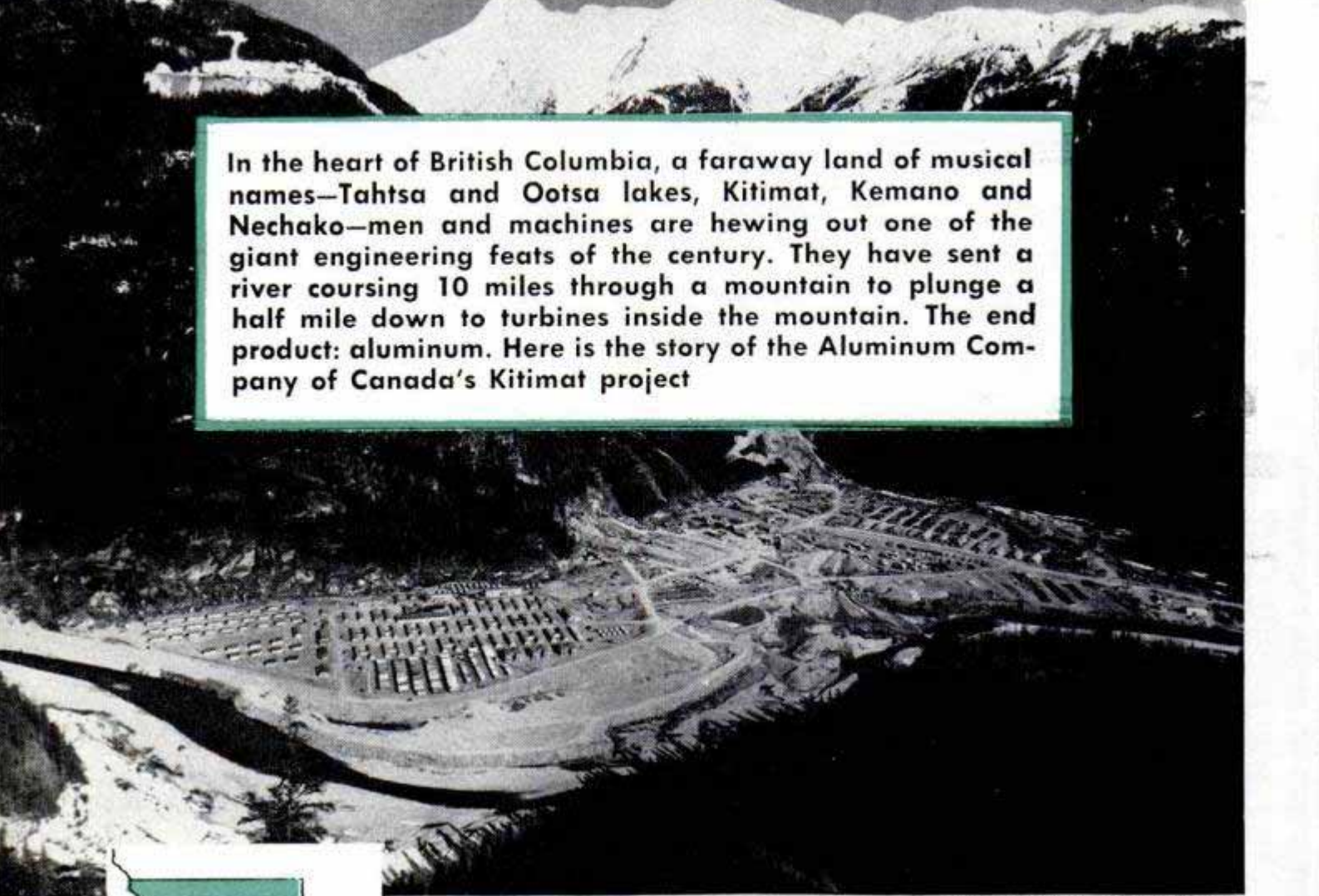
MAIN AIRPORTS AND ALTERNATES

LORAN STATION

CONSOL STATION

M. M. O.





In the heart of British Columbia, a faraway land of musical names—Tahtsa and Ootsa lakes, Kitimat, Kemano and Nechako—men and machines are hewing out one of the giant engineering feats of the century. They have sent a river coursing 10 miles through a mountain to plunge a half mile down to turbines inside the mountain. The end product: aluminum. Here is the story of the Aluminum Company of Canada's Kitimat project

Aluminum Company of Canada photo

Headquarters for the project is Kemano, at the foot of "powerhouse mountain"

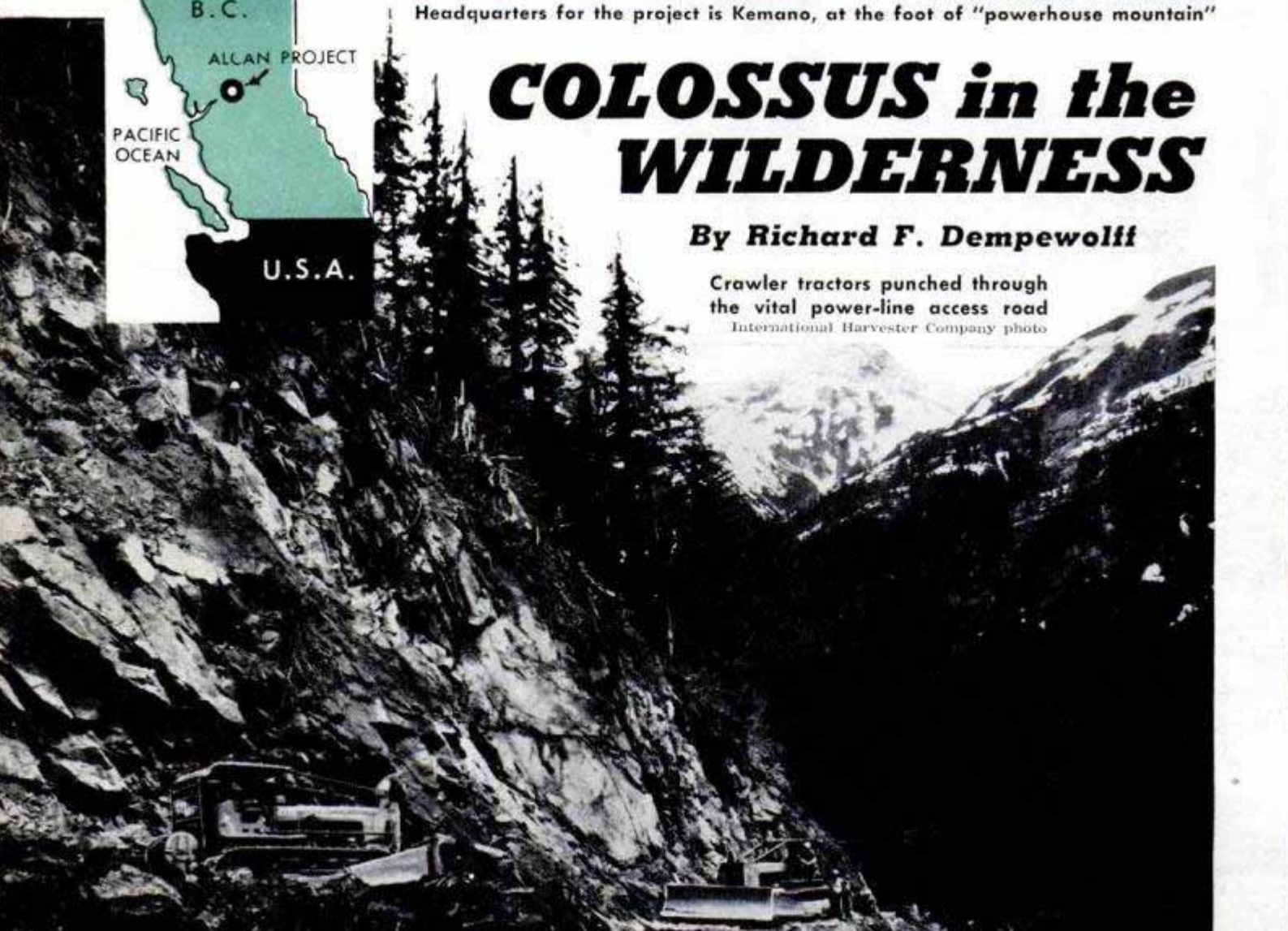


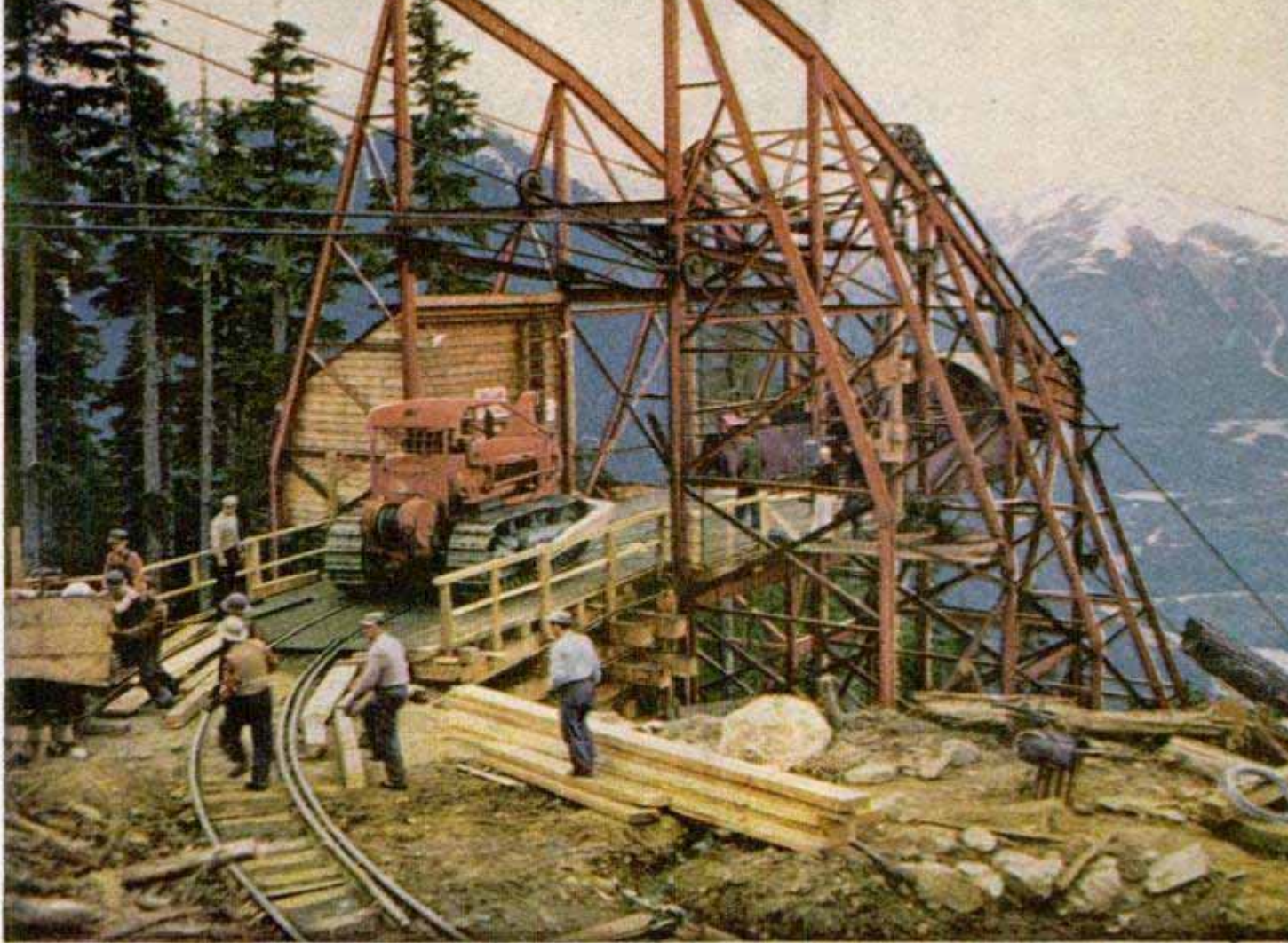
COLOSSUS in the WILDERNESS

By Richard F. Dempewolff

Crawler tractors punched through the vital power-line access road

International Harvester Company photo





International Harvester Company photo

Arriving at the 2600-foot level on the aerial tramway, a powerful TD-24 backs off to the tunnel entrance

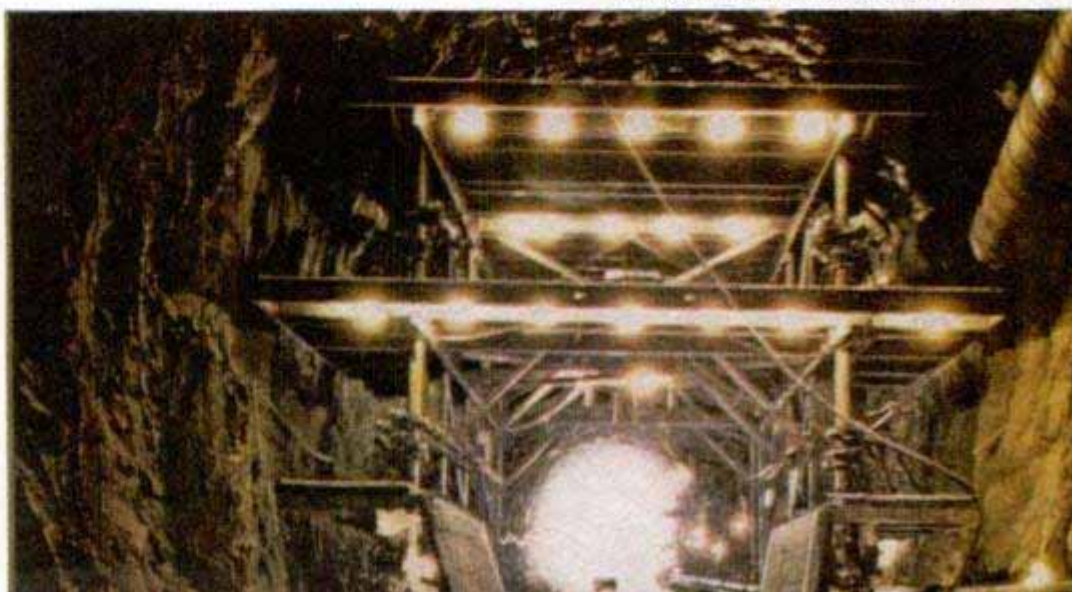
IN THE BLACK BELLY of the mountain at Kemano, 400 miles north of Vancouver, B. C., an underground army of shouting, sweaty men, in aluminum "tin hats," works under glaring floodlights. In caverns and tunnels of jagged rock, they're splashing through underground brooks and mud, scrambling over chunks of broken rock as big as an average garage, and clambering from level to level on rough wooden ladders. Some jolt around on roaring machines or on cars that heave precariously along rough-laid track as they haul away the rock debris.

Deep in the Canadian Rockies, these men are somersaulting the flow of a 125-mile chain of mountain lakes, forcing it backward through a 10-mile tunnel to the core of a mighty peak. Here it will cascade down a half-mile man-made hole to a subterranean powerhouse they are carving inside the mountain's base.

The turbines it spins will turn up a potential 1,650,000 horsepower—equal to the combined top output of Shasta, Bonneville and Wilson dams. And all that power will leap across a mile-high range of peaks on a line of steel and aluminum towers, jutting from "postage stamp" crags, to the largest aluminum-smelting plant on earth. Its ingots—550,000 tons of them a year—will one day sail down the fjord and into homes and industry everywhere, in the form of useful products.

Floodlights bathe work crew inside the 25-foot-diameter rock tunnel that will carry water 10 miles to the huge subterranean powerhouse at Kemano

Aluminum Company of Canada photo





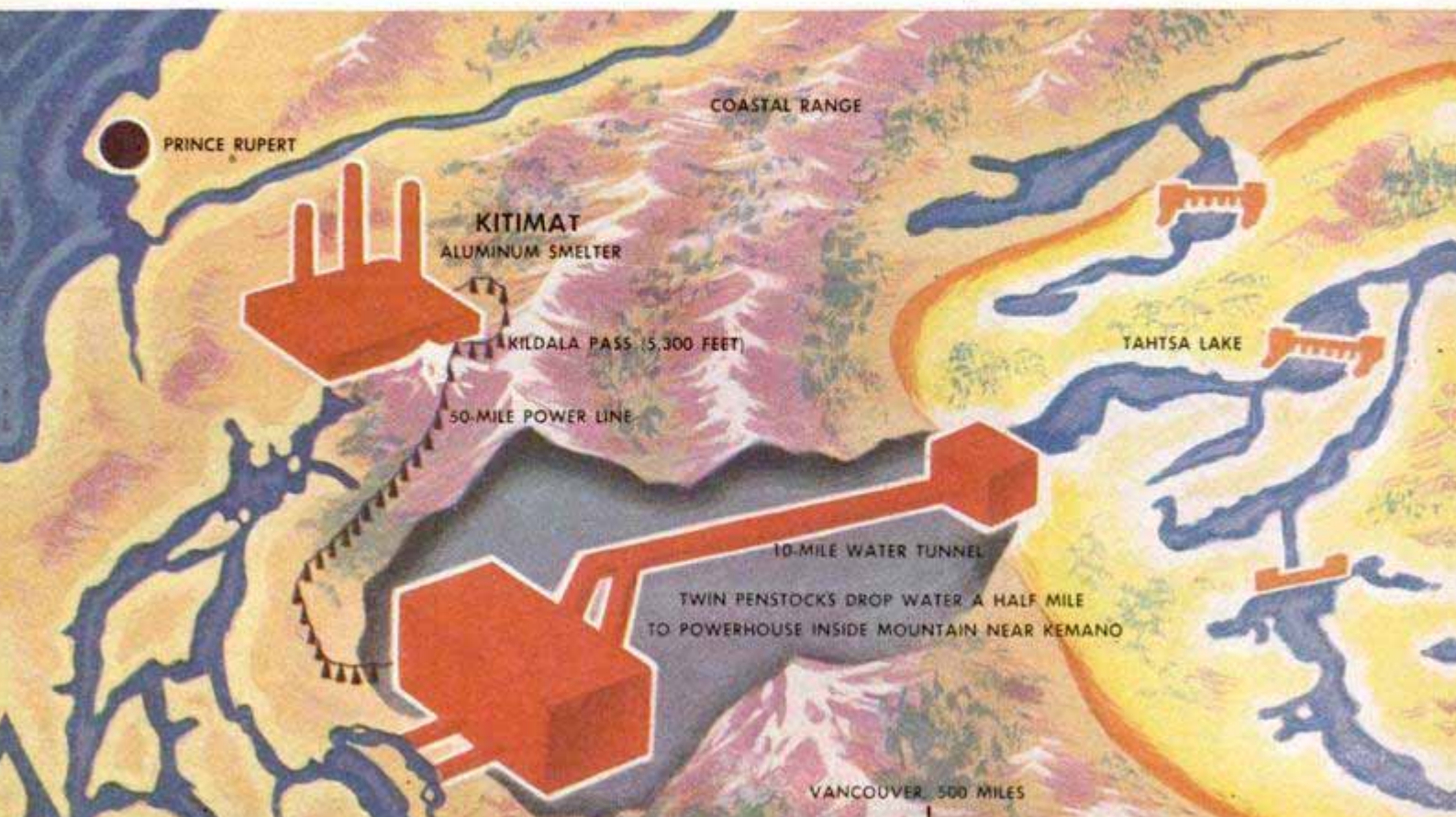
Aluminum Company of Canada photo

Over 300 feet high, the ramparts of the rock-filled Kenney Dam hold back a 900,000,000-cubic-foot inland sea

Why go to all that fuss to locate a huge aluminum factory in a rugged, inaccessible wilderness when space is available in civilization? Aluminum smelting takes huge amounts of cheap power. So much that ingots are often called "packaged electricity." The juice required to make a ton of aluminum from bauxite ore would run your house for eight years. Hence, when the

Aluminum Company of Canada decided to expand their production a few years ago, they didn't look for more ore—they hunted for fast water, boiling down from great heights. Their search brought them to a tiny Indian village called Kitimat (for which the project is named) at the head of a long, navigable fjord winding inland from the Pacific Ocean, 70 miles southeast of

Diagram of the vast Kitimat development whose giant turbines will turn up a potential 1,650,000 horsepower

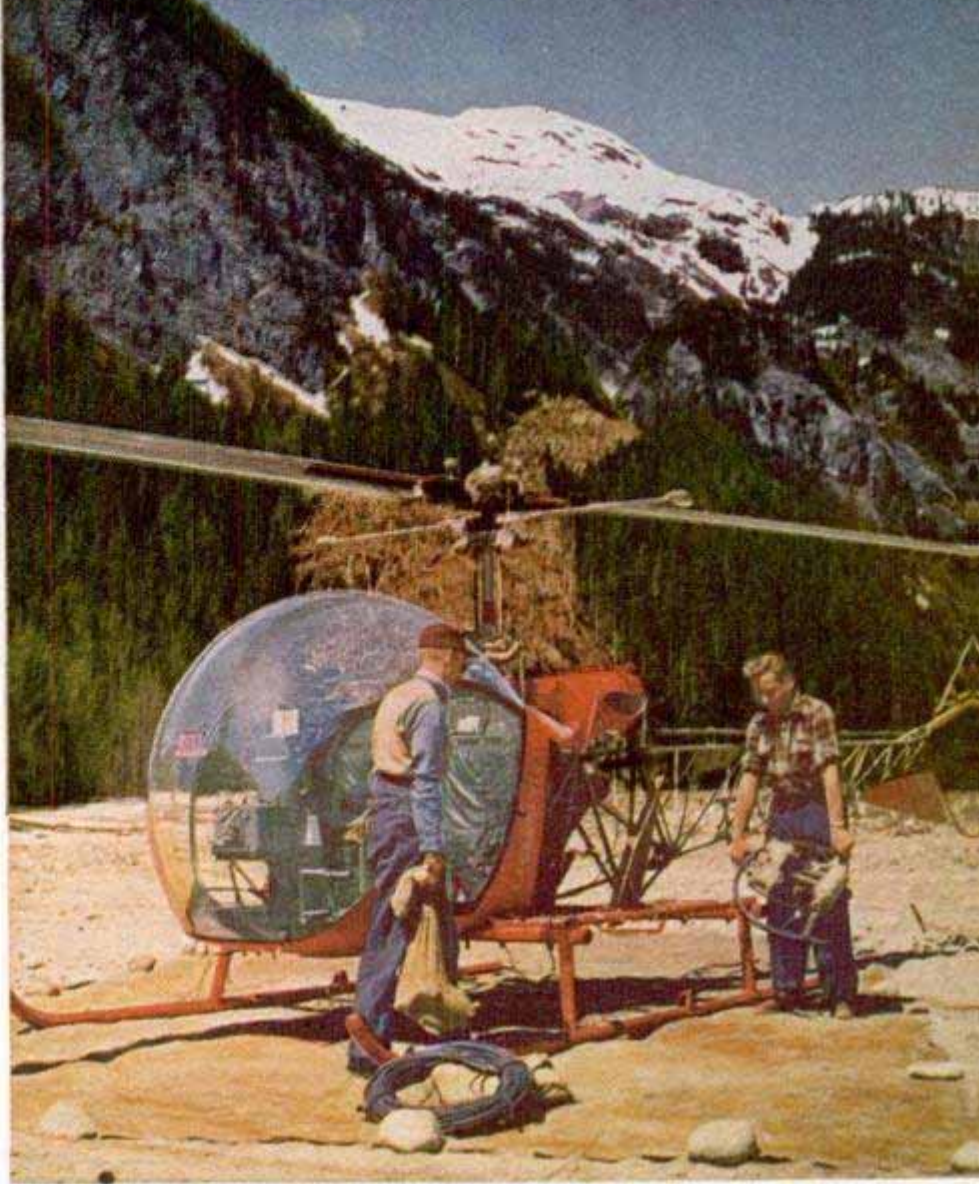


Prince Rupert. Beyond the mountains east of Kitimat, a chain of 12 lakes nestle in a 5,000-square-mile bowl-shaped plateau nearly 3,000 feet high on wooded uplands. The lakes drain off in gently flowing rivers toward the northeast—away from Kitimat and the sea. It was hardly a sight to stir a cataract hunter. But in those lakes, engineers saw a mighty slumbering giant that could be put to work by reshaping geography on a monstrous scale.

First job was to reverse the flow of those vast lakes (Tahtsa and Ootsa, the two largest, stretch for 125 miles) so their waters would plunge 2800 feet to sea level on the precipitous west side of the big basin—instead of dribbling eastward. To do it, a giant plug was needed to stop up the gorge of the Nechako River where it split the peaks in the northeast rim of the mountains.

The ramparts of the rock-filled Kenney Dam that today holds back a 900,000,000-cubic-foot inland sea, was completed by 1,000 men in less than six months. It is 1,550 feet long and 317 feet up to the 40-foot-wide crown atop its sloping sides.

Mammoth Euclid trucks, husky bulldozers and other heavy machines were flown,

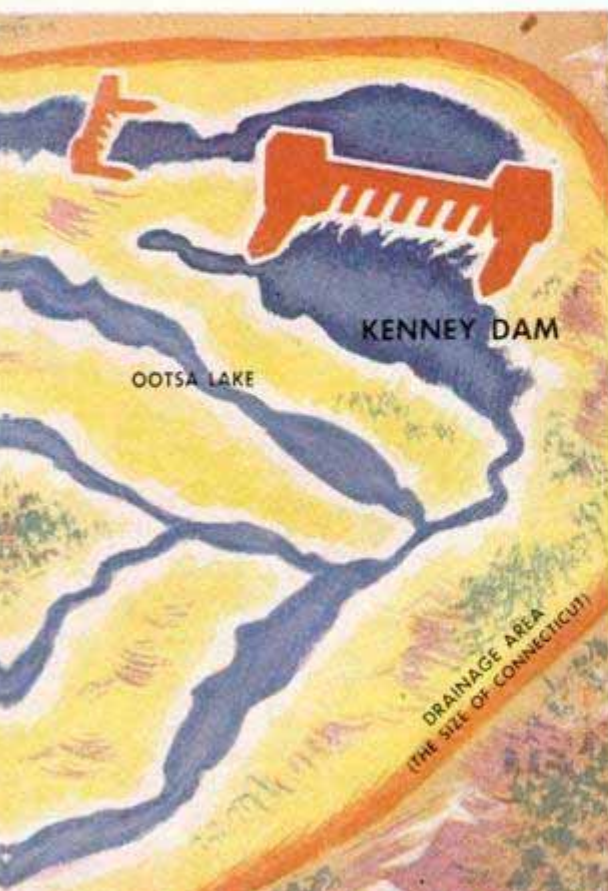


Aluminum Company of Canada photo

Loading a helicopter with equipment for erecting power-line towers

Clearing snow around a test-tower location on top of Glacier Creek Pass. The helicopter about to land is carrying inspectors to the site

International Harvester Company photo





Bulky pieces of construction equipment were moved up the slope, at a 30-degree angle, in this nine-ton cable car

Fuel had to be flown by helicopter to tractors and other machines working far into the rugged mountains

Aluminum Company of Canada photo



hauled or driven up those crags over a hair-raising 60-mile access road carved from the cliffs in record time. With the precision of a trained army, men and machines flipped the forces of nature head over tail. Clattering drills echoed through the chasms as a yawning 32-foot tunnel was bored through the mountain rim to divert the Nechako from its bed at the dam site. Two hundred tons of dynamite was tamped into 300-foot holes in a near-by granite peak. Under the greatest explosion in Canada's history, the entire face of the mountain crumbled. Chunks of rock up to 20 tons cascaded earthward, where giant shovels scooped them up at one bite and dumped them into a stream of 40 trucks that scooted from dam site to quarry in 12-minute round trips. Every 45 seconds, another 20 tons of rock cascaded down the hill. As each load tumbled, huge hydraulic guns sluiced the tumbling rock to clean and wet it for the clay that would bind it.

Some 40 mammoth scrapers scurried back and forth over the mounting pile of rock and clay at 10-minute intervals. A yellow mechanical demon, resembling an overgrown saber-toothed cultivator, ploughed the sticky gumbo ahead of the compactors. From the tip of each curved-steel tusk gouging the soil, a jet of water shot into the clay, making it more plastic for the rollers.



Forty dump trucks shuttled back and forth on 12-minute round trips with rock loads blasted from the slope

Engineers like to tell how they were warned by an old trapper not to use the first clay deposit they found. "The beavers don't use it for the winter houses," he explained. "It's no good."

Samples shipped to Toronto laboratories, according to the tale, proved extremely poor and porous. A new deposit up the river yielded impervious clay—which, the old timer allowed, the beavers used, too.

Following a year of preparation, work on Kenney Dam began in May, 1952. In November, the 114-ton gates of the diversion tunnel slammed shut with a resounding clang. A concrete plug was poured in the temporary hole. A river's flow was turned end over end, and the lakes fattened and rose in their mountain-rimmed saucer.

With the lakes locked up, the next job was to back the overflow off the other side of the plateau and let it plunge down to the bottom of that abyss 2,800 feet below. But the water, in its fall, would never spatter the landscape and be lost in countless cataracts.

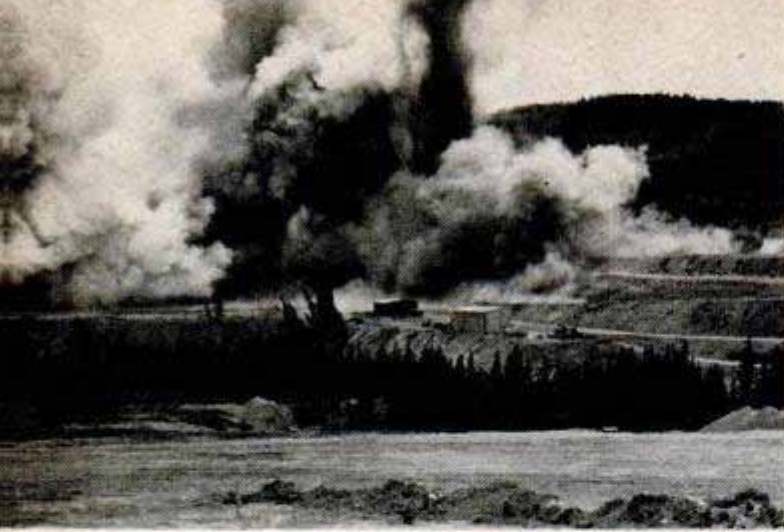
Instead, it would be guided 10 miles through the mountain in a tunnel big enough to handle a two-lane highway. A quarter mile from the outer slope of the mountain, the water would suddenly plunge down two penstocks, jabbing through the rocks at a 48° angle for a drop

Big hydraulic guns sluiced each rock load during the dumping to wet it for the clay that would bind it



Once a Sacramento river boat, the Delta King was grounded to become a hotel for 400 Kitimat workers





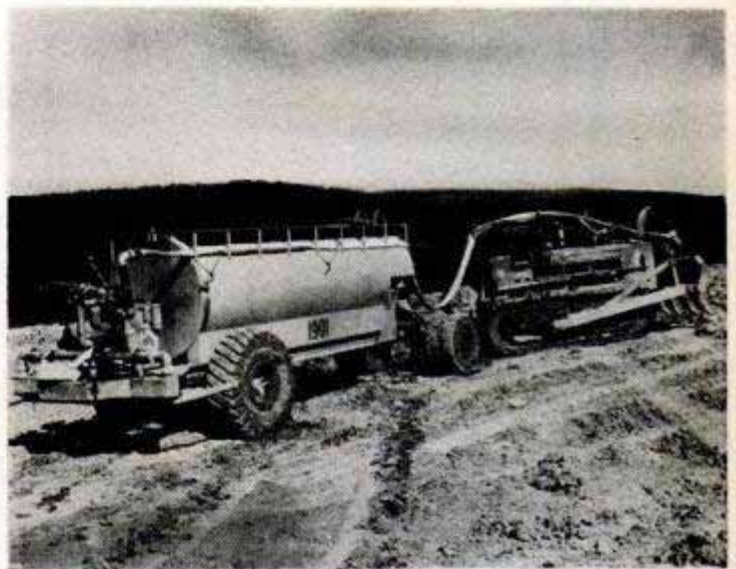
Tamped into 300-foot holes, more than 200 tons of dynamite, the largest amount ever shot in Canada, blasted out the hillside in the Kenney Dam area



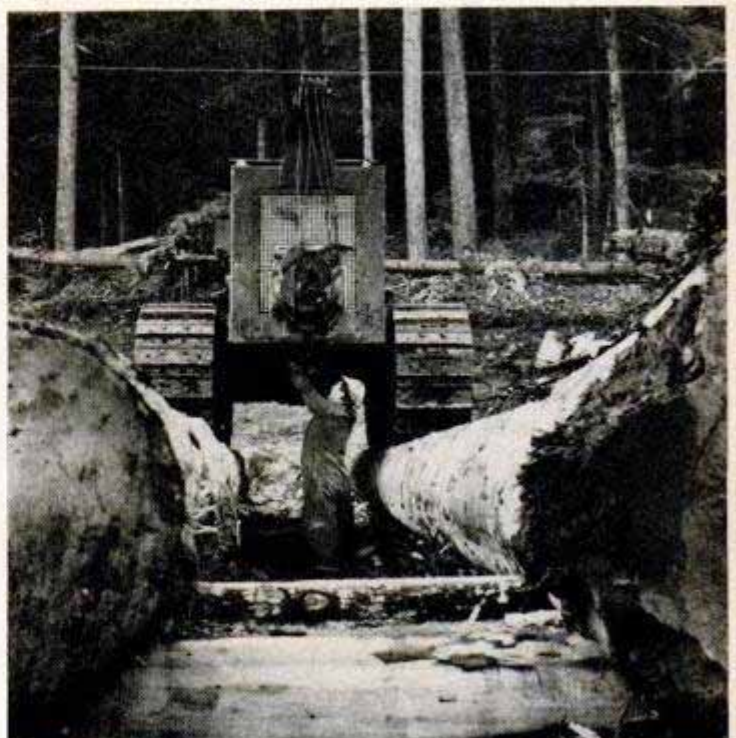
After being positioned for the shovels by TD-24s, the huge rocks were dumped into big Euclid trucks like the one in the background and scooted away to the quarry



Fast, close teamwork between shovel and truck crews made it possible to construct the giant Kenney Dam in less than six months. One thousand men worked on the project. Below, improvisation a daily need; here crawler and earthmover become a ferry



Water from tank towed by TD-24 is pumped through ducts in rippers attached to bulldozer blades and into the mealy clay, making it more plastic for the compacters. Below, this doesn't look much like the greasing pit in your local garage, but big logs serve the same purpose





Tractors were the workhorses of the projects. Here one drags ski-mounted machinery to a 5300-foot summit

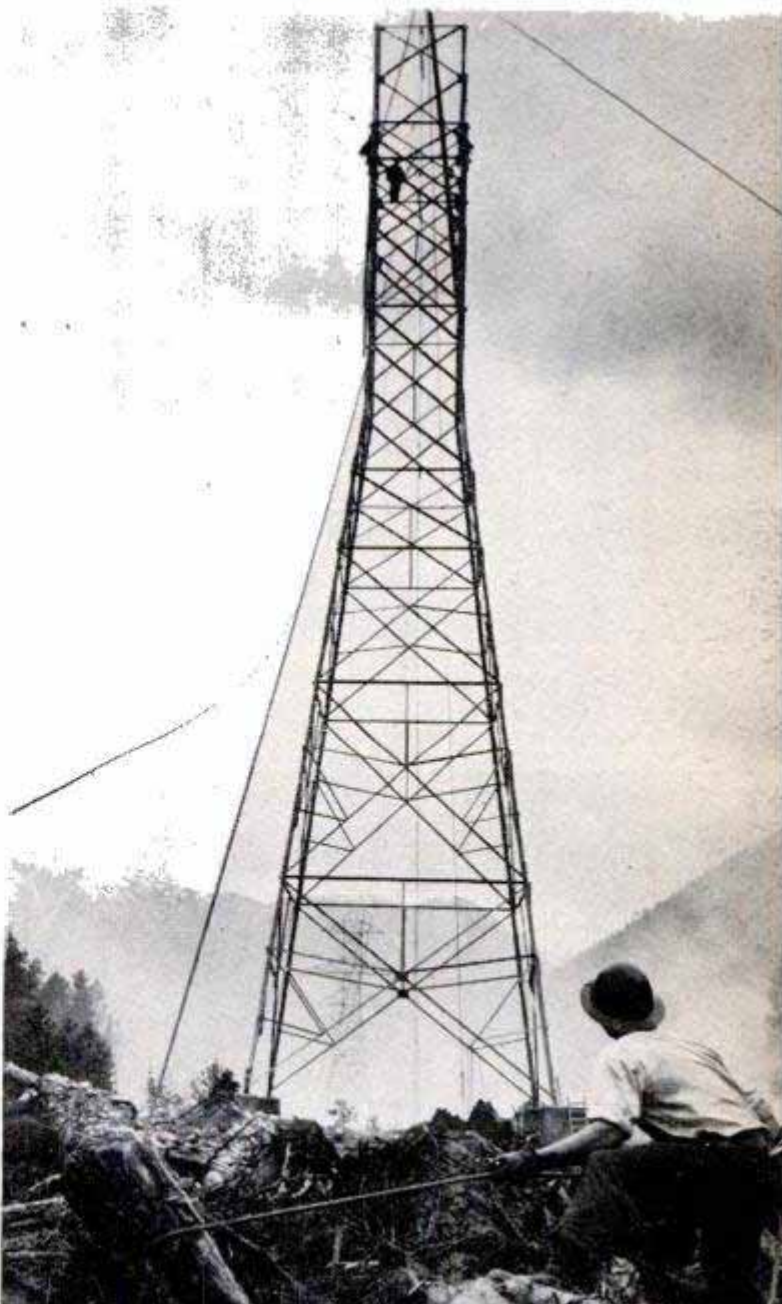
16 times the height of Niagara. Two Empire State Buildings, from footings to TV antenna tip, would not reach the distance of that mighty plunge. The water will hit the bottom with a force of 1000 pounds per square inch. That is the power that will drive the turbines in the cavernous powerhouse 100 feet high, 80 feet wide and 5 blocks long, carved out of granite a quarter mile inside the mountain.

Putting the powerhouse inside the mountain protects it from the rock or snow slides that tumble down the precipitous slopes, prevents it from trembling under the impact of the fantastic cataract dropping on it from the sky, and makes it invulnerable to air attack in case of war.

Five thousand men of the Morrison-Knudsen Construction Company marched in to storm the mountain and riddle its innards. One group attacked the granite wall at the eastern shore of Tahtsa Lake. Eleven miles away, on the west side of the mountain, another crew camped precariously half a mile up the slope on a tiny level plateau, where they began to bore a tunnel in to drive the penstock holes downward. Far down the valley, 1300 men ground their way into the mountain's base to blast out the powerhouse. Working with dynamite, bulldozers and trucks, they started at roof level and gouged their way down. For months, the clatter of jackhammers bounced off the surrounding peaks. Tortuous roads curled dizzily up the ridges to every level that could possibly be reached in a wild country where caribou and bear could be shot from the seat of a giant "cat" as the vehicle lumbered along on the job.

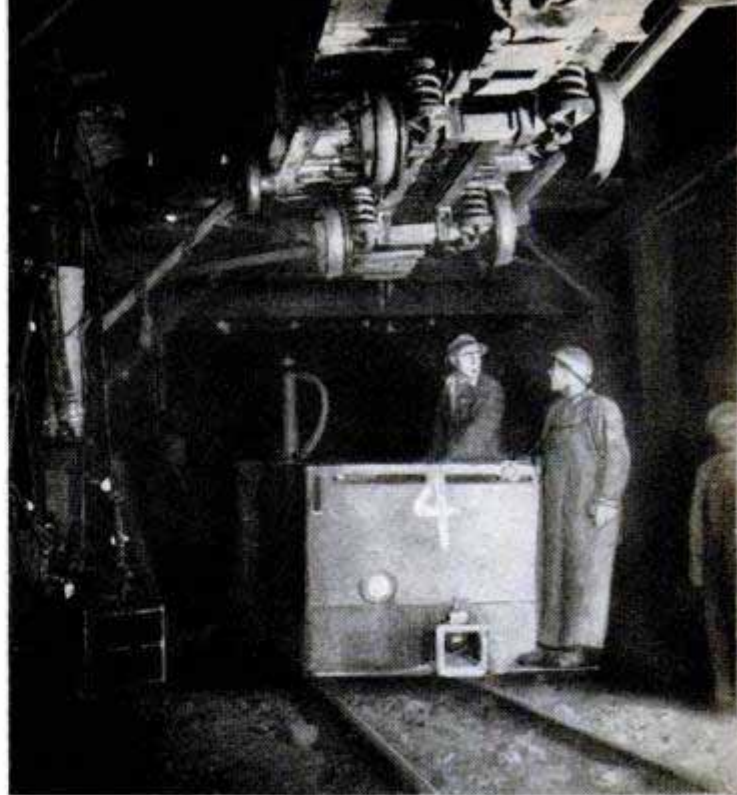
To carry massive rock-breaking monsters, bulldozers and other ponderous machines to the crew working 2600 feet up on the

Power-line towers like this, carrying 300,000 volts of electricity, link Kemano and Kitimat, 50 miles apart





Working in damp tunnels and caverns of jagged rock, drilling crews pushed along at a rate of nearly 300 feet per week in some places. About 260,000 cubic yards of rock were blasted for the underground powerhouse



Called the "cherry picker," the gadget above solves the problem of moving waste quickly during tunnel boring. As each car is loaded, it is plucked from the track and set down at the rear end of the train



Mucker working its way through the tunnel. Below, dozing rocks inside powerhouse cavern. The exhaust "scrubber" unit shown eliminates most harmful gases



western slope, the men rigged a 5500-foot cable tramway, capable of lifting a TD-24 dozer to the tunnel mouth with the ease of a pulley clothesline handling wash. Climbing at 30 degrees, it will carry 20 tons or 60 men and its schedule calls for 16 hours a day of duty.

The "skylift" has caused moments of palpitation. On its first journey with a big TD-24 cat, the tractor's weight put such a sag in the cables that the car came hard against a jutting crag half way up the mountain. A passenger solved the problem by drilling a hole in the crag, packing it with dynamite and touching off the "shot."

To date, the rock chewers have been driving their bits and chippers through the mountain at a rate of 30 feet per day. At the main tunnel, driving in at Tahtsa, work moves a little faster and a record of 282 feet was hung up in a week. Huge chunks of granite waste are hauled from the heading by a train of little cars that roll in and out on rough-laid tracks. At the heading, a steel monster loads the first car. When it's full, the giant steel claw of an overhead traveling crane reaches down, plucks the car from the track and sets it down at the rear of the train as the empties move forward. The men call this gadget the "cherry picker." When the train is loaded, it's pulled from the hole to a raised track outside. Here, arms on each car ride a rail that lifts the arm, dumps the car sideways and the muck rumbles down the dump.

(Continued to page 232)



Rail-Riding Plymouth

EX-RAILROADER Truman Crowell of Torrington, Conn., has found a way to put his 1941 Plymouth on rails. 'Most any Sunday, "Old 386" can be seen scooting along a little-used, 29-mile stretch of the Suncook Valley Railroad, with Truman at the controls and brother Russell conducting. Attached to the front and back of the auto are section cars, loaded with ballast, which keep the auto tires on the rails. Tires are deflated to 15 pounds pressure, and fold down around the inside of the rail, acting as flanges. Originally, the front wheels fitted exactly on top of the rails, but each of the rear-wheel rims had to be machined back to bring the rear wheels into line. The perfected "railmobile" can clip along at 20 to 30 miles per hour.

Above, section cars fasten to front and rear bumpers by special drawbars. Signal flags classify the vehicle as a "light extra"



Derailment, above, results from a broken drawbar on the lead section car. Note iron ballast. Below, Conductor Russell Crowell flags auto traffic to a stop as "Old 386" moves through crossing. "Railmobile" runs on extra set of wheels not used on highway





Saucer roof of theater rests on ring of steel posts around its edge. Workshops and offices are housed in wings

Ring Around the Stage

ON THE SPRAWLING lawns of the University of Miami's campus, a circular building squats like a gigantic mushroom cap, kicked off its stem by a clumsy giant. It looks as though it had skittered across the green and wedged itself between two curved wings that jut from it on each side.

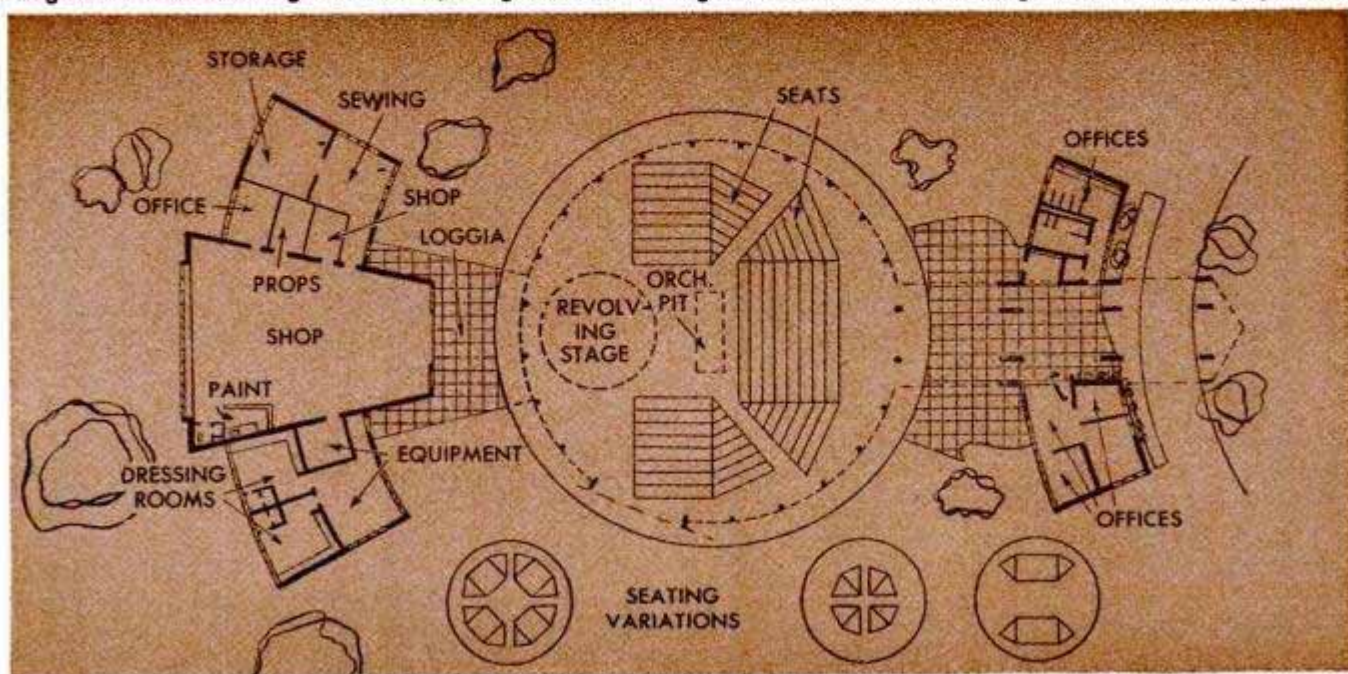
The building is a unique auditorium, measuring 100 feet across its inverted saucer-shaped roof. You won't see a single post inside the structure. The 283-ton dome of reinforced concrete is held in place by a three-inch steel band circling its edge like the rim of a wagon wheel. As the wheelwrights used to shrink-fit iron rims on wood spoked wheels, so the builders of the university's Ring Theater pulled up on the iron band around the dome by heating it, then taking up on 28 turnbuckles spaced around the circle. As long as there is proper tension on the steel band, the 8000-

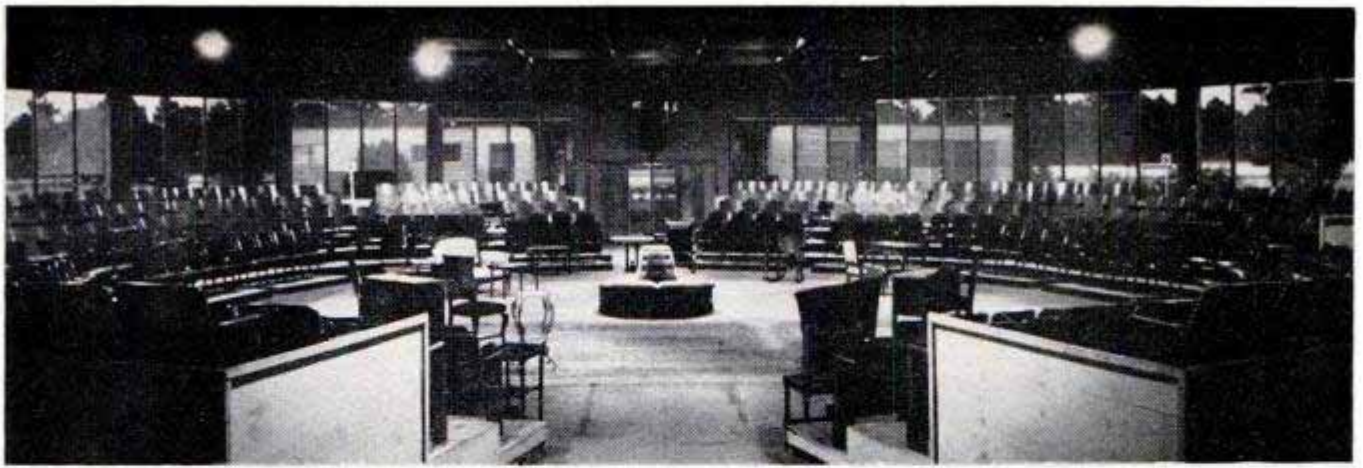
square-foot dome of five-inch concrete can't sag or collapse. It sits on the exterior wall like a lid on a sugar bowl. The outside wall of the theater is really no wall at all, but a circle of steel columns. Between them are hung big double doors made up of horizontal steel slats that open or close like Venetian blinds to let Miami breezes through—or keep Miami hurricanes out.

The Ring Theater is no architectural whimsey. Designed by Robert M. Little and Marion I. Manley, it was carefully planned, first, to weather a 250-mile-per-hour hurricane. Second, its unique style makes it one of the most versatile theaters in the world. Inside its great circle, audiences can watch theater-in-the-round, a fast-growing form of show in which the audience completely surrounds the stage.

But supposing the producers want to stage a conventional show on a standard stage? Or a horseshoe-type production?

Diagram shows seating variations, Ring Theater sitting between its curved wings and connecting galleries





Audience completely enfolds stage for theater-in-the-round. Stage lights are directly above stage in grid

Nothing to it at the Ring. The bleacher-type seats, accommodating nearly 1000 people, are built in pie-shape sections on retractable aircraft-wheel carriages. To shift seating arrangements, men trot from section to section, jacking down the caster wheels. The double-doored jalousie walls of the theater are opened and the seating sections are dollied in and out of the building on their own rollers until any desired pattern is achieved. Then they're jacked down again. On a curved track across the dome, a standard stage arch can be drawn in front of the audience like a curtain and the actors can perform in the regular Broadway manner.

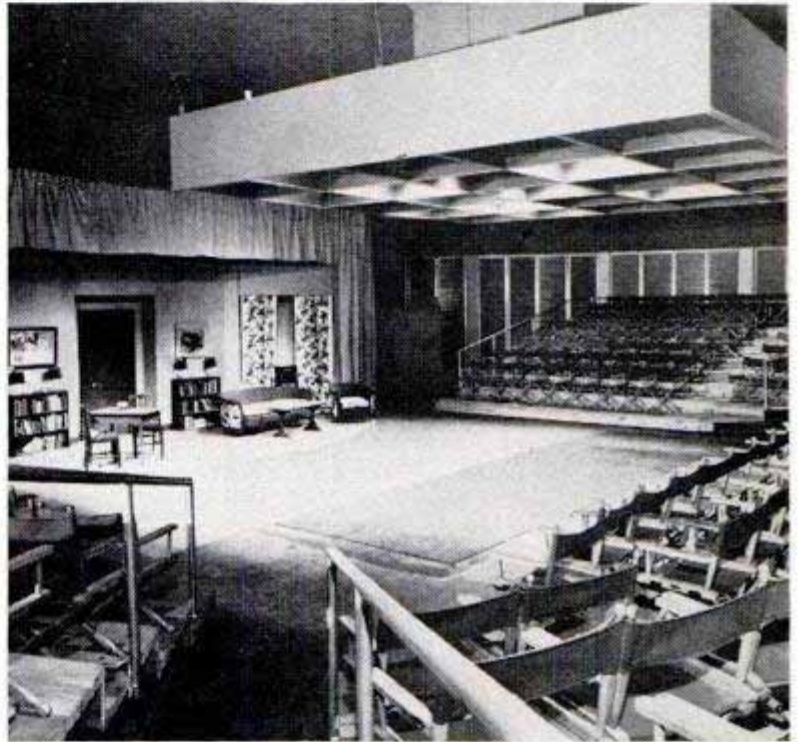
The circular form of the building, however, lends itself especially to theater-in-the-round, which has advantages for enthusiasts.

(Continued to page 218)

Hydraulic jacks on casters lift frame of seat section off floor so it can be moved



DECEMBER 1953

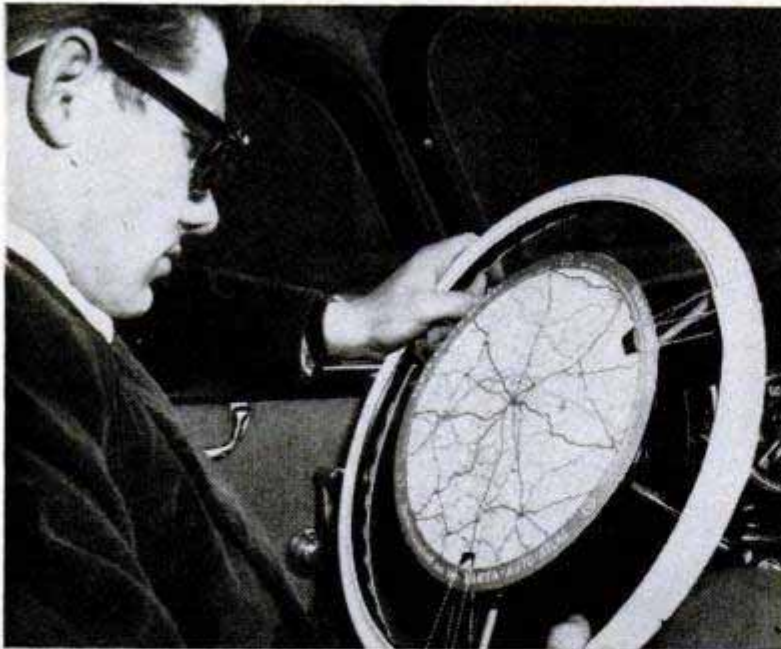


Revolving stage mounted on surplus Army gun turret is built into one side of theater for conventional staging of plays

Vast dome of reinforced concrete five inches thick was poured in a plywood mold. A steel rim holds unsupported dome in place



Circular Road Map Fits on Steering Wheel for Ready Reference



Drivers follow their routes easily with a circular road map, developed in Germany, that slips on the steering wheel. Three rubber bands hold it in place and it is quickly removed when a new map is needed. All Germany is being mapped in this form for the convenience of motorists.

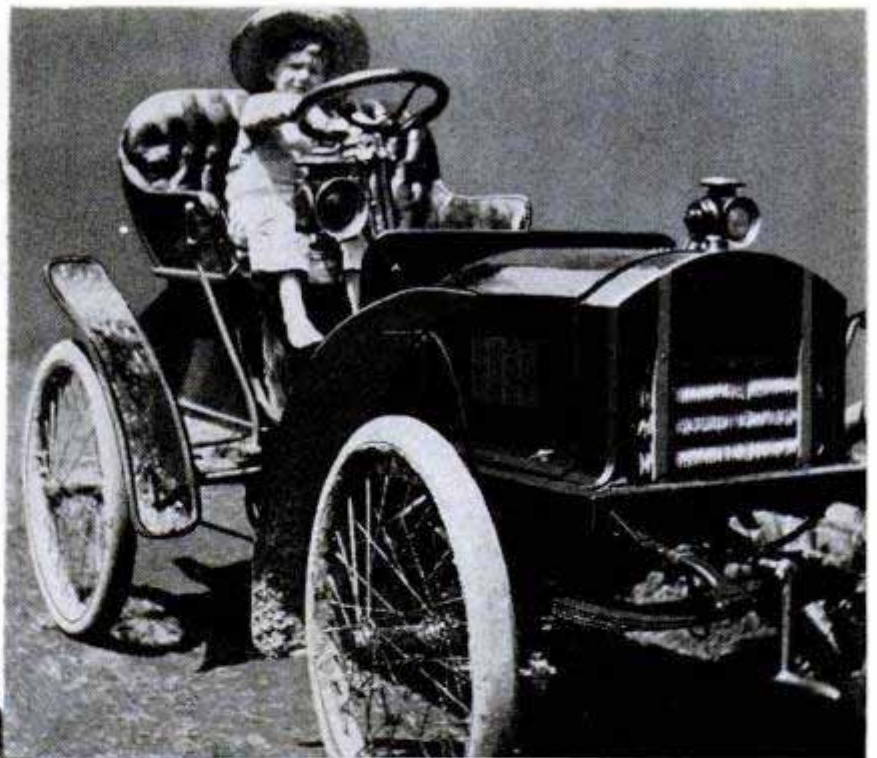
Wall Coating Resists Fire

Acoustical tile and wallboard are made fire-resistant by a new plastic coating. When flame strikes a treated wall or ceiling, the coating swells up and covers the surface with a protective layer of char which insulates the board itself from the flame.

Homemade Horseless Carriage Built in 1900 Rattles Again

How long will a good automobile last? William Braley of Clifton, Ohio, has found that the car he built over 50 years ago still has plenty of spunk. Reclaimed by Springfield garage owner T. J. Goss, it is once again putt-putting down the highway. When Braley built the car in 1900, with the aid of a local blacksmith, many of the parts were forged by hand. The car weighed between 1000 and 1200 pounds, and in one run averaged 50 miles per hour over 7½ miles of gravel road. For the initial run the car was powered by a one-cylinder water-cooled French De Dion engine, but the four-cylinder air-cooled Braley handmade motor was installed in 1903. Braley sold the car in 1909, saw it once in 1915, but lost track of it. Finally abandoned, it remained for years in an old garage with its engine in a

bushel basket. When Goss bought the car he replaced damaged gears and fabricated new parts. Minor improvements included the installation of cylinder sleeves. After putting it in running condition, he exhibited it at an antique-car show. There William Braley rediscovered the durable automobile he had built half a century before.



Fifty years ago Braley's young son posed at the wheel of his father's homemade car. A different grille, spoke wheels, running boards, big headlamps and Braley's handmade engine have since been added. Left, Braley and present owner T. J. Goss take the car for a spin



Two-Piece German Ski Comes Apart for Carrying Convenience

Broken into two sections for carrying, a German ski is easy to pack or transport. A ball-spring locking device prevents it from coming apart when in use, yet permits assembling or disassembling in a few seconds.

Fully tested, the ski is said to have the correct amount of spring required by good skiers. Each pair comes complete with steel edges, leather carrying case, bindings and metal ski poles.

Miniature Trailer With Fold-Down Ramp Hauls Tractors

Tractors can be hauled to the shop for repairs or moved from a field to a far distant one on a simple, two-wheeled trailer. The tractor simply is driven up a small ramp until the front wheels rest securely in a cradle on the trailer. The ramp then is swung upward to lock the wheels in place. The trailer, made of tubular steel, has a 36-inch tread and accommodates all row-crop tractors.



Garbage Becomes Humus

Municipal garbage and other organic refuse can be converted into humus, valuable in increasing soil fertility, according to research workers at the University of California. The composting method—called aerobic or oxygen-requiring—creates no bad odors and requires no decomposition agents or chemicals. The microorganisms which cause decomposition already are present in the refuse. Heaps of refuse must be turned to aerate them. From 12 to 21 days are required to convert municipal refuse into humus.





Mechanical harvester crawls through an orchard. Steel fingers snatch up prunes or nuts in a seven-foot swath

This year a good many farmers are field-testing strange new implements. They're so enthusiastic

They Call It **AUTOMATIC FARMING**

By Thomas E. Stimson, Jr.

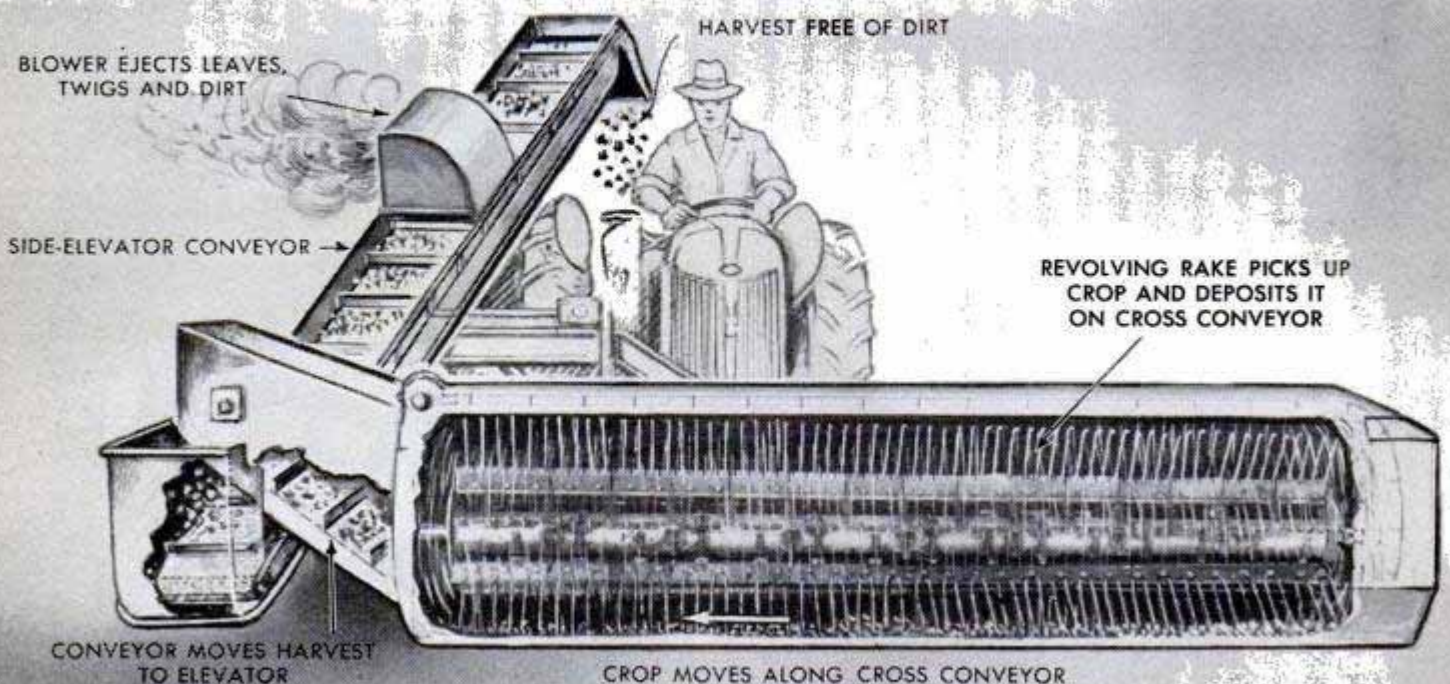
ON HIS WAY to town recently, a startled farmer slammed on his brakes, pulled off the road and gazed popeyed at a man apparently soaring 12 feet off the ground through an orchard. What the farmer couldn't see because of the trees was the self-propelled "steel squirrel" on which the man was riding.

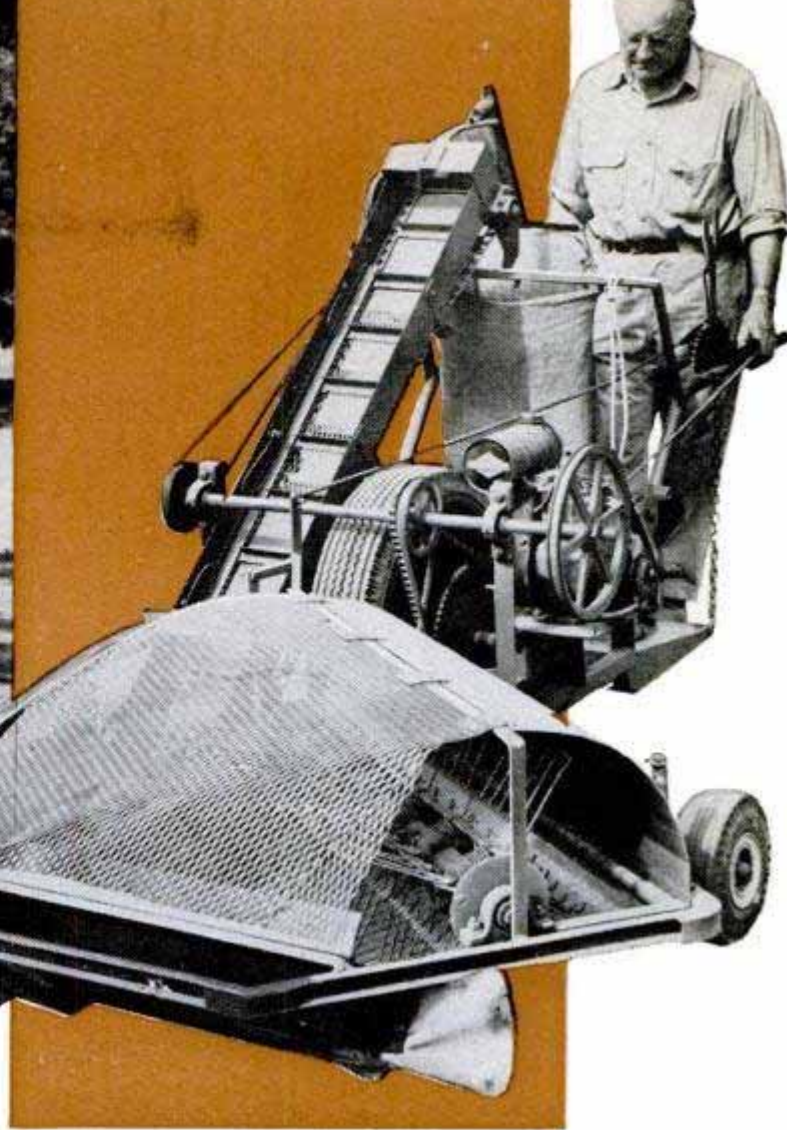
The steel squirrel is just one example of

some mighty strange new machines rambling through American fields and orchards. Other examples: A flame cultivator that burns away the weeds and leaves the cotton crop untouched, a new harvester with mechanical fingers which pick up every nut or prune lying on the ground and a mechanical hoe directed by an electronic brain.

After crop is picked up it moves along a cross conveyor and up an elevator where blower ejects foreign matter

A. D. Goodwin & Son drawing





Smaller version of the mechanical harvester is powered by a gasoline engine, picks up the crop along a three-foot swath and deposits it in sacks

Some of these odd implements have been invented by farmers themselves; others have been developed by special engineering groups. But regardless of who invented them, the men who are testing the machines are enthusiastic about the results. One farmer, after putting a new implement through its paces, said flatly "I'd call it automatic farming."

The steel squirrel is a little self-propelled

Spring-loaded fingers, mounted in groups, revolve to rake up crop and whirl it onto moving belt in machine



vehicle with a tiny tower on which the operator rides. By manipulating hand and foot controls he can flit from tree to tree, turn in a 30-inch circle and raise or lower the tower. At his elbow are compressed-air outlets to which he attaches pneumatic shears and other air-driven tools. One man, according to tests, can do the work of two men on ladders. When not roaming through an orchard, the vehicle can be used as a mobile air compressor for spray painting and other odd jobs.

The flame cultivator is a harrow attachment for a tractor, equipped with a butane tank and pairs of butane burners. It cultivates the soil and sears and kills all the young weeds while leaving the sturdier cotton plants unharmed. It's fast and efficient in the field.

The nut harvester uses spring-loaded wire fingers to sweep up the crop from the ground. It picks up every nut in a seven-foot swath, sifts out the dirt and lumps of soil, blows away any leaves and twigs and delivers the cleaned crop to a bin. The harvester can be pushed by any farm tractor. It's suitable for gathering walnuts, almonds, pecans, filberts, tung nuts and prunes. Eleven of the machines do all the



"Steel squirrel" is a self-propelled perch for orchard workers. Below, it's small enough to move easily between trees. Operator guides it by foot and hand controls, has compressed air at hand for pneumatic tools



picking on a 5000-acre pecan orchard in New Mexico, replacing almost 100 laborers. A smaller hand-operated model is powered by a small gas engine and snatches up the crop along a three-foot path.

Undergoing field trials this year is the mechanical hoe, equipped with electric eyes and activated by an electronic brain. It thins a row crop to the desired number of plants per foot, and later in the season does much of the weeding. The electric eyes "see" the difference between plants and weeds, and the hoe chops away all the weeds between the rows and even between the plants. Several of the units can be mounted on one tractor. The electronic hoe is especially suitable for weeding young sugar beets and cotton.

Such mechanical farm hands are steadily reducing the amount of "stoop labor" drudgery associated with some kinds of planting, cultivating and harvesting. The ultimate aim is to put almost all of agriculture on a production-line basis that will eliminate most hand labor. That goal isn't as far off as it might seem.

Roy Bainer, head of the agricultural engineering department on the Davis campus of the University of California, says that no big problems remain today as far as the mechanization of field and row crops. There are lots of odd jobs that still are done by hand, to be sure, but in most cases it's only a question of sitting down and devising a machine for any particular task.

Bainer cites rice as one crop in which hand labor no longer is used at all, in California at least. In Japan it takes 900 man-hours of hand labor per acre to bring rice to maturity and harvest it. In California, the rice crop costs only 15 man-hours of labor per acre. The rice is planted, fertil-

Strange cotton topper moves along on three wheels





Crew tosses heads of lettuce on a wheel-mounted endless belt which carries them quickly to waiting trucks

ized and weeded by aircraft, then harvested with combines. One man, with machines, does the work of 60 Japanese.

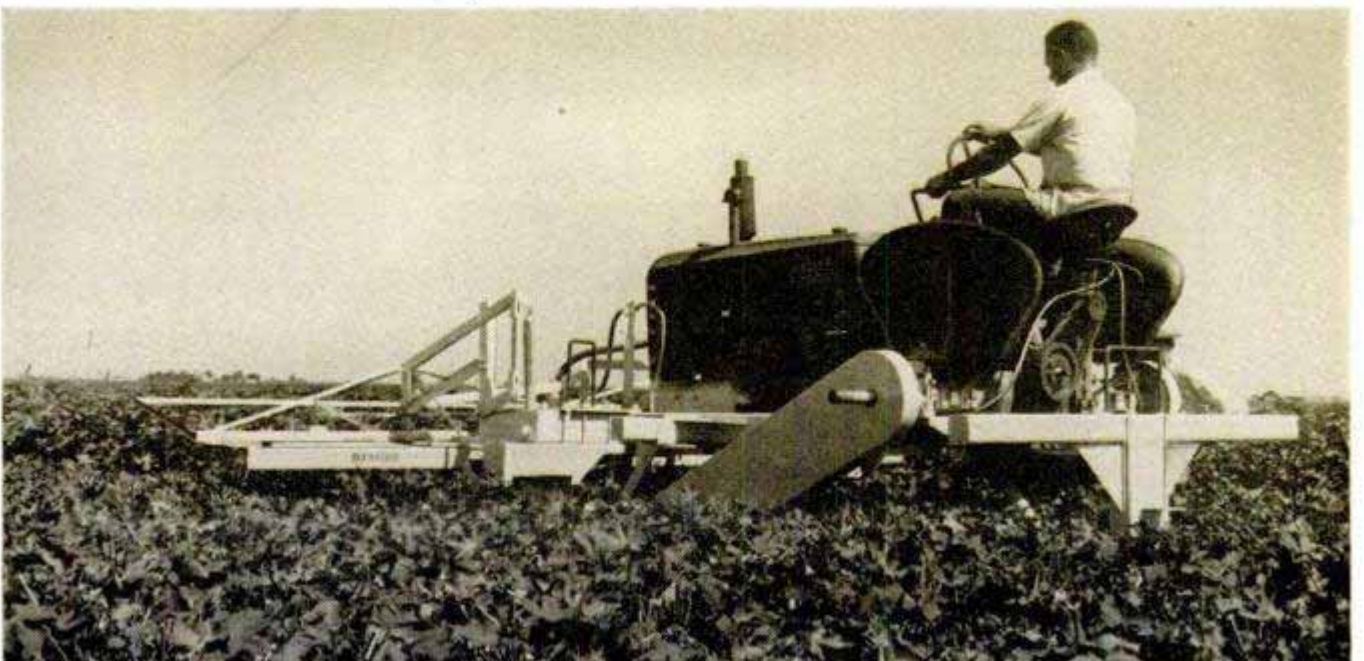
In cotton it's becoming a similar story. Close to 80 percent of the 1953 California cotton crop was machine-picked. All of it was sown by machine, much of it cultivated by tractor-drawn equipment, most of it fertilized automatically by nutrient solutions in the irrigation water, and all of it dusted with insecticides by tractor equipment or aircraft. It was defoliated by chemicals dropped from aircraft to make machine harvesting easier. In some areas where

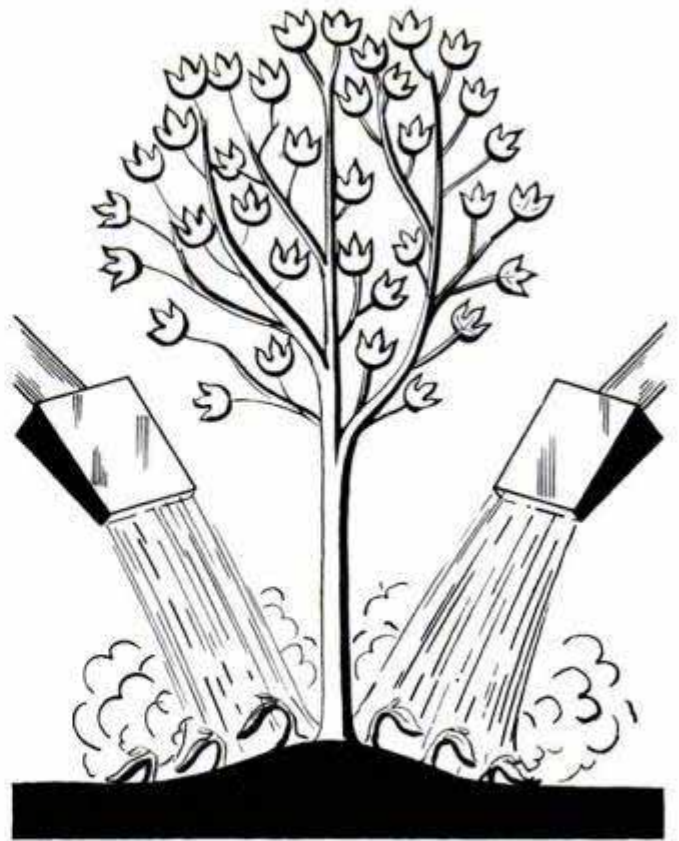
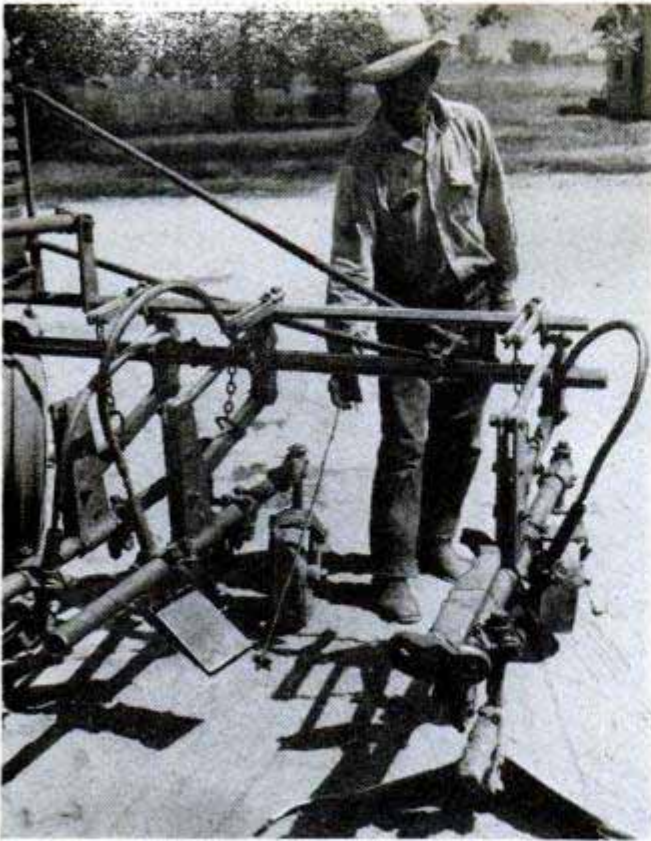
cotton grows as tall as a man it was topped by mechanical rotating knives, to force growth into the lateral branches.

Ten years ago the Western sugar-beet crop required 120 man-hours of labor per acre to plant, cultivate and harvest. Today the same operations are performed at a labor cost of only 25 man-hours per acre. In this short period of time the whole sugar-beet operation has been almost completely mechanized.

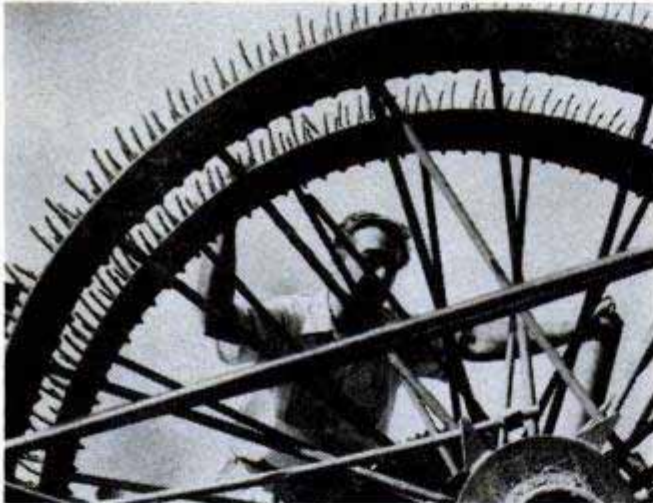
The big surge toward mechanization has been spurred by the fact that farm labor is vanishing rapidly. Seventy-five percent

Topper has four rotating knives which chop off the tops of tall plants, forcing growth into lower branches





Operator ignites flame cultivator. Diagram shows how it sears weeds without damaging stronger cotton plants



of the total population lived and worked on the farm when this country was young; less than one fourth of the population is engaged in agriculture today and the percentage still is going down. Fewer persons are producing more and more food, working with machines instead of with hands.

Research and instruction groups such as the Davis engineering department are playing an important part in this trend toward automatic farming. Bainer and his staff of 30 men sometimes take a new machine invented by an enterprising farmer and test it exhaustively; sometimes they

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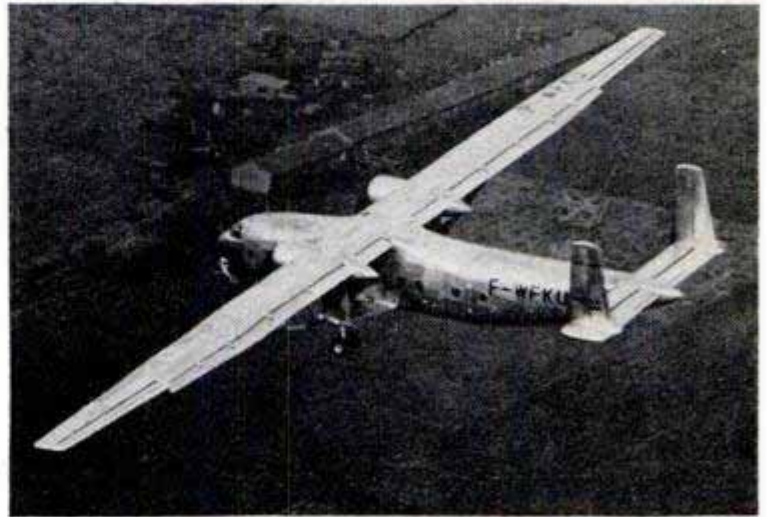
↑Huge spiked wheels are forced into ground to pick up sugar beets and deposit them in a bin. Below, from high perch of this strange machine, operator spots and flame-kills patches of dodder in alfalfa fields





French Air Oddities

THREE UNUSUAL planes distinguish new French aircraft design. In one built for close support of ground troops and antitank roles, the Potez 75, the pilot sits in an open cockpit and the observer rides in an enclosed cabin in the nose. A twin-boom pusher, it cruises at about 150 miles per hour. The prototype of a new transport, the Hurel-Dubois 31, features a very narrow wing with an exceptional span—nearly 148 feet—for the over-all size of the airplane. Specially shaped lifting struts and very-high-lift flaps add to its unusual appearance. It is the forerunner of a medium-size transport, carrying 36, that will operate out of small fields. The designer claims the HD-31's operating expenses will be 40 percent lower than those of existing transports. France enters the convertible aircraft field with the SO-1310 Farfadet, with jet units turning the rotor and the propeller. The Farfadet is fitted with a newly developed three-blade rotor 36 feet 8 inches in diameter. Compressed air is fed from the jet engine through the blades, ejecting at the tips, thus driving the rotor. For horizontal flight, the rotors are placed in autorotation and the main lift effort is transferred to the wings, which have a 20-foot span.



Cruising speed of the HD-31, above, will be about 170 miles per hour. High lift struts support its very-wide-span wing



Designed for low flying in support of troops, the Potez 75 above is heavily armored against small-arms fire. Built by Sud-Ouest, convertiplane below will help speed development of a 20-30-passenger commercial model already in design stage

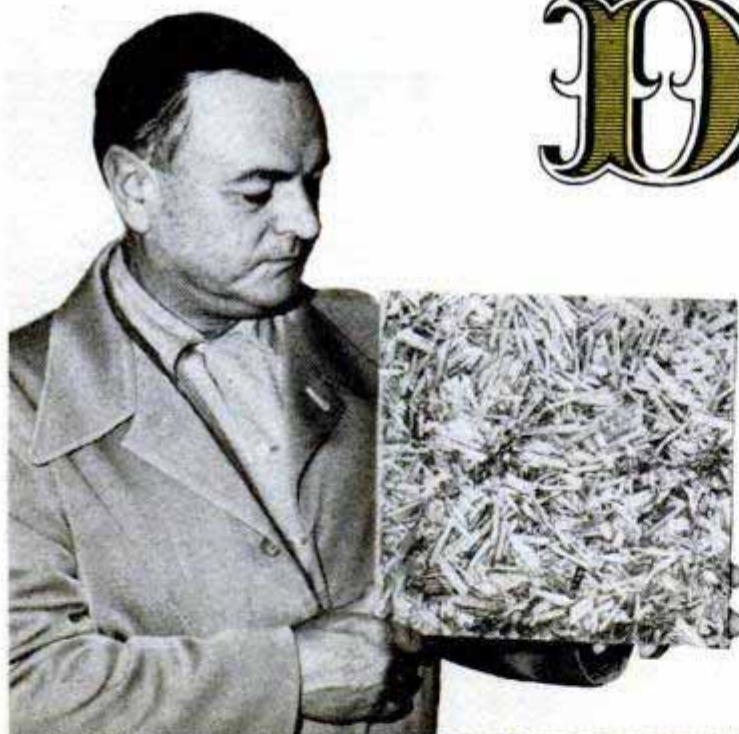




Pressed cedar chips form panels and doors behind Hughes. Desk and lamp stand are treated with white putty

DECORATIVE

By Ewart Thomas



WASTE WOOD that formerly was burned is being converted into unique decorative panels that are in big demand for homes and stores on the West Coast.

In a Sacramento restaurant, in North Hollywood homes and in other places you'll find walls with a textured appearance unlike anything you've ever seen.

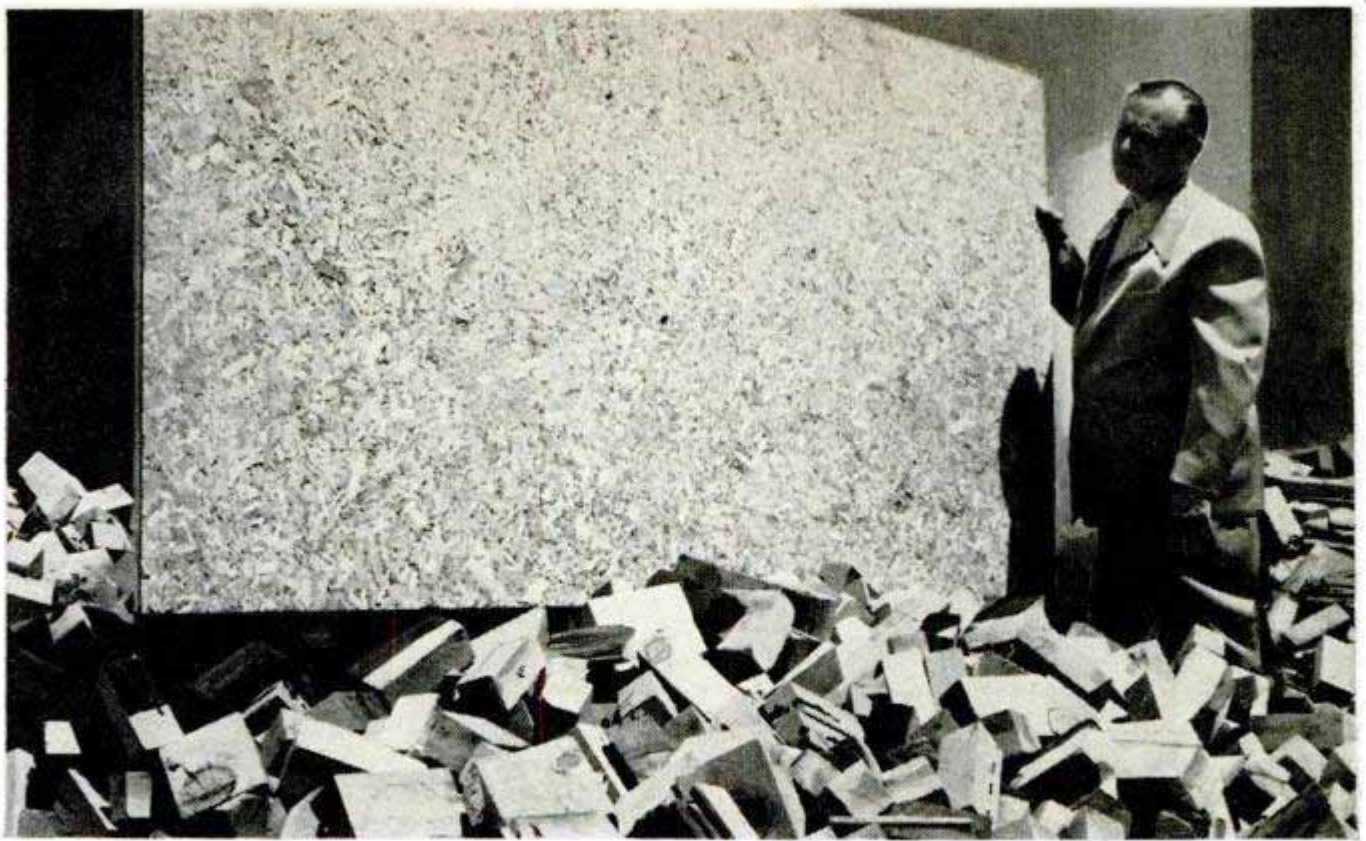
The material looks like a lot of wood chips that have been pressed together, and that is precisely what it is.

Used mainly for decorative effects, the panels have roughly the same properties as has ordinary lumber. The material can be nailed, sawed, turned in a lathe and cut up into furniture. It sells for around 40 cents per square foot, from half to a third the cost of some decorative plywoods and veneers.

The panels come from a factory in North Sacramento, Calif., where the process for manufacturing them was



Samples, left, contain cotton stalks (top) and bolts, cedar chips with white and colored putty



Attractive, durable pressed-chip panel was made from imperfect cedar blocks like those in foreground

PANELS from WOOD CHIPS

developed over a 10-year period by Fred Hughes, research chemist and engineer. Waste wood culled from woodworking operations is shoveled into one end of the factory; finished panels of Hu-wood go onto trucks at the other end of the plant a half hour later.

To manufacture panels from cedar chips, Hughes uses the imperfect cedar blocks discarded by a local pencil factory. For panels of pine, fir or other woods he takes the odds and ends that unavoidably are wasted by near-by factories in making boxes, furniture and other items. Wood with knots, wormholes and other imperfections can be used.

The manufacturing process is simplicity itself. The waste wood goes first into a "hogging" machine that reduces it to splinters and chips from a quarter of an inch to two inches long. These wood particles then are treated with a plastic binder and are fed to a depth of several inches into a metal tray that is slightly larger than four feet wide by eight feet long.

The tray then goes into a big press where the chips are compacted under heat and pressure for several minutes. The layer of chips is compressed into a panel three quarters of an inch thick. Meanwhile, the plastic binder solidifies the panel. Three trays at a time go into the press, each producing a panel.

When removed, each panel slides on rollers to saws that trim it to the dimensions of 4 by 8 feet. Next the panels are fed through a sanding machine that grinds a smooth, finished surface on one side. A sealing lacquer is sprayed on and the panels are stacked for shipment. That's all there is to the operation.

But it isn't as simple as it sounds. One of Hughes'

Pressure pipe made from sawdust can be tapped and threaded, is designed to convey corrosive chemicals





Samples are sections cut from slab doors made by sandwiching wood chips between plywood veneers. Center sample is pressed rice-hull insulation

achievements was to provide a way for the chips to slide into position when placed in the press, providing an interlocking effect and relieving all dimensional stresses. Otherwise the panels would have weak spots and lumpy surfaces. Controlled slippage permits turning out panel after panel having the same characteristics of appearance and strength.

Hu-wood floats as do other woods and it picks up some moisture unless sealed. It does not swell up and come apart, as do some plywoods. It can be manufactured in various thicknesses and in various densities. It is somewhat fire-retardant and can be given additional fire-resisting qualities by adding chemicals in manufacture.

Smooth-finish panel results when surface is impregnated with water putty and sanded down. Tinted putty gives desired color—here, a light pink



Other chemicals can be used to make it fungus-proof. DDT has been added to the mix, experimentally, to create panels that are lethal to flies and some other insects.

As an offshoot of his decorative panels, Hughes has manufactured wood blocks $\frac{3}{16}$ to $\frac{5}{16}$ inch thick for use as flooring. Somewhat similar in appearance to the chip boards and containing a percentage of rubber for resilience, the blocks measure nine inches on a side.

So far the Hu-wood factory has been operated only on a research and pilot-plant basis. To date about 500,000 square feet

of product has been produced. Production is at the rate of about 5000 square feet per day. Hughes points out that his operation requires a minimum of labor, none of which needs to be skilled, and that one of his plants can be placed wherever quantities of waste wood are available.

As an example, he cites one woodworking factory that is forced to reject or waste one third of the wood that it buys, using this waste as fuel for its boilers. The amount of wood that is burned per day, Hughes figures, could be converted into 450 panels of Hu-wood having a retail value of \$5760. Its value as fuel is only \$90.

Not only can manufacturing waste be used by the process, but much of the debris that is discarded in rough lumbering also could be converted into panels by compression molding. Limbs that are slashed off in the forest, stumps, and even bark have been tested successfully.

Hughes turns out panels having a different appearance by using chopped stalks of cotton plants as a surface material. He gets still another effect with cotton bolls and ginning debris used as the surface layer.

His standard wood-chip panels have a slightly rustic appearance because of the small surface voids and spaces between the chips. To create an entirely different surface he

wipes water putty, white or tinted to a desired color, into the surface of a panel and then sands the panel to a smooth finish. After a coat of lacquer the panel has a smooth, hard surface for table tops.

Odd attractive inlays not otherwise practical can be obtained with his process. One type has palm leaves on the surface with a background of the usual wood chips. Treated palm leaves are simply laid on the bottom of a tray in the factory and the tray is filled with wood chips in the usual way. When taken from the press the finished panel contains the palm leaves permanently embedded in its surface. Flat inlays of rare woods, cut to any desired pattern, similarly can be pressed into the surface of a panel. This technique is particularly effective in making doors.

Hughes is also experimenting with slab doors that are made by laying a sheet of plywood on the bottom of a tray, adding wood edges and a filler of wood waste, bark, or even rice hulls, then placing another sheet of plywood on top. This "sandwich" becomes a single, permanent slab in the press.

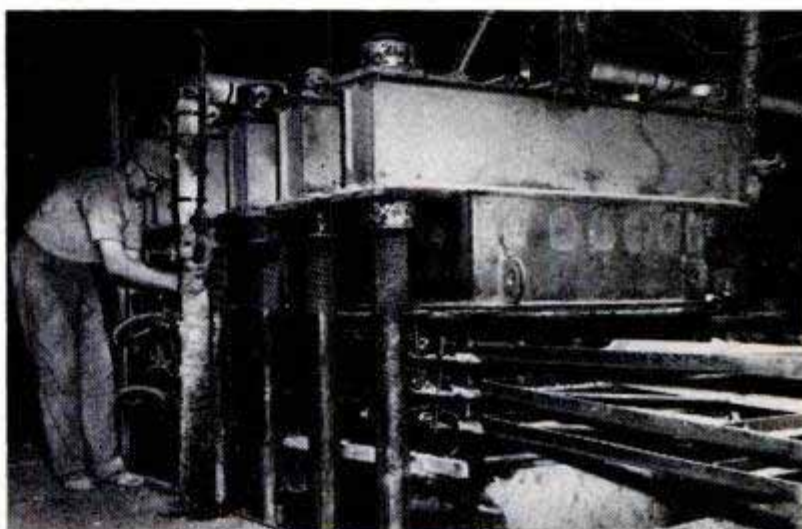
Similarly, shaped components for furniture can be made in a single operation, using expensive veneers for the surfaces and a filler consisting of various waste products.

Hughes is even manufacturing pipe from sawdust and disintegrated wood particles. Pressed to a high density and lined with a protective coating, the pipe can withstand internal pressures of up to 150 pounds per square inch and is suitable for carrying various acid or caustic solutions. It costs about half the price of other pipes used for these purposes and can be manufactured in sizes ranging from two to eight inches inside diameter. By means of a different technique the same products can be used in pipe as large as 20 inches. The material can be tapped and threaded. Lengths can be joined with standard drive-collar fittings when used as conveyance pipe, or with synthetic-rubber rings when used in pressure systems.

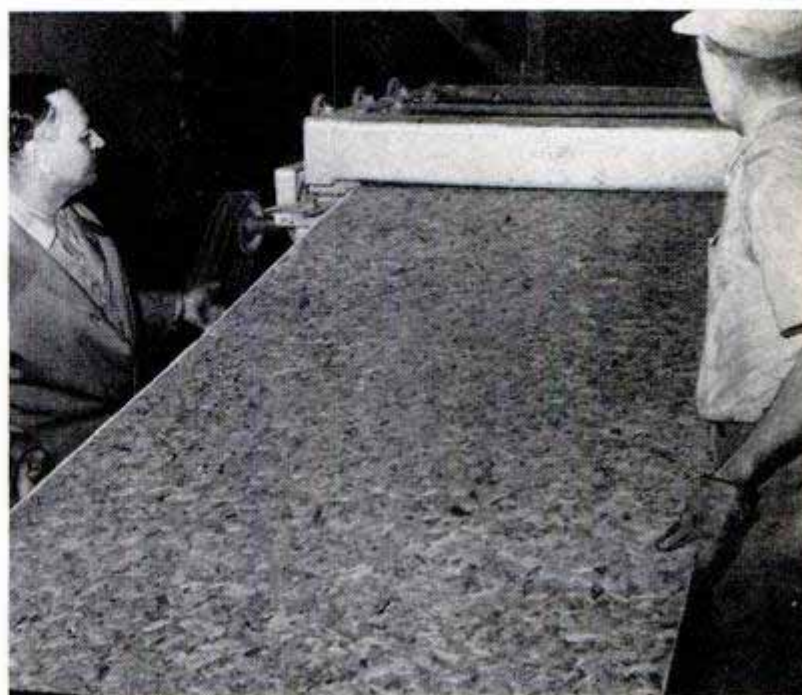
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Machine at left feeds cedar chips treated with plastic into moving tray. In the press, tray serves as form for finished panel



Three trays of chips are fed into press at a time. Within a few minutes they are transformed into panels complete except for trimming and sanding. Below, trimmed panel is fed through sanding machine that puts a smooth surface on one side of the panel



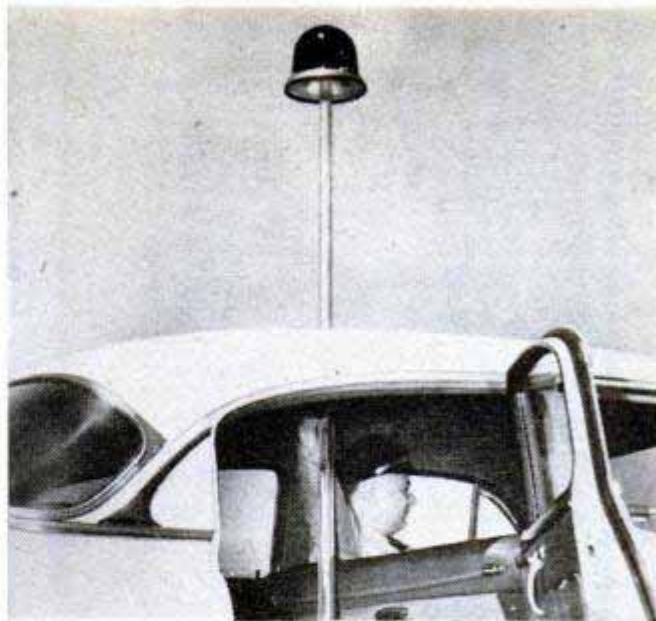
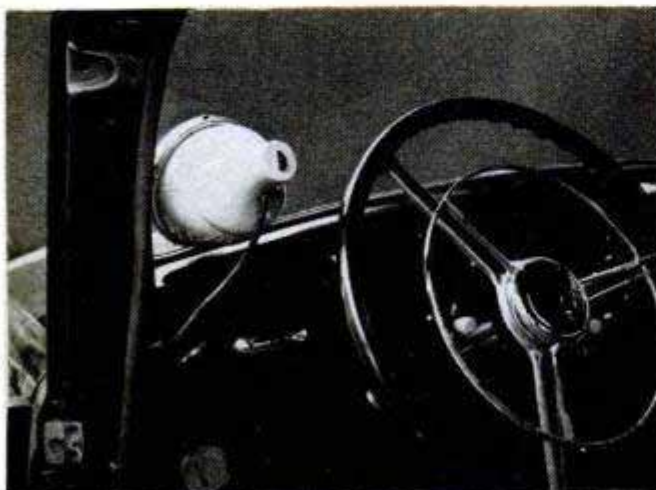


Battery Tester-Analyzer Can Forecast Failures

At a glance, a new battery tester-analyzer tells you the condition of your car battery and charging unit. Equipped with two contact prongs and a grounding clamp, the unit can be used to test individual cells; under load conditions the device can indicate internal damage and foretell failure. It can also be used to indicate need of charge, the rate of charge and to take a voltage reading.

Quickly Installed Spotlight Grips Automobile Windshield

There's little effort involved in mounting a German auto spotlight that is held to the windshield by suction. The direction of its off-center beam is changed by rotating the lamp on its suction-plate base. If desired, it can be removed from the fixture and used as a hand lamp. Vacuum is created between the suction plate and the windshield by tightening screws around the edge of the rubber-ringed disk.

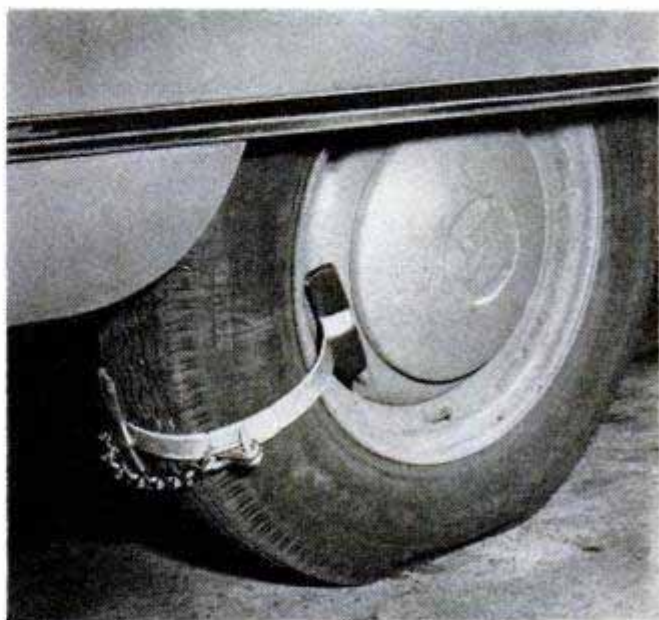


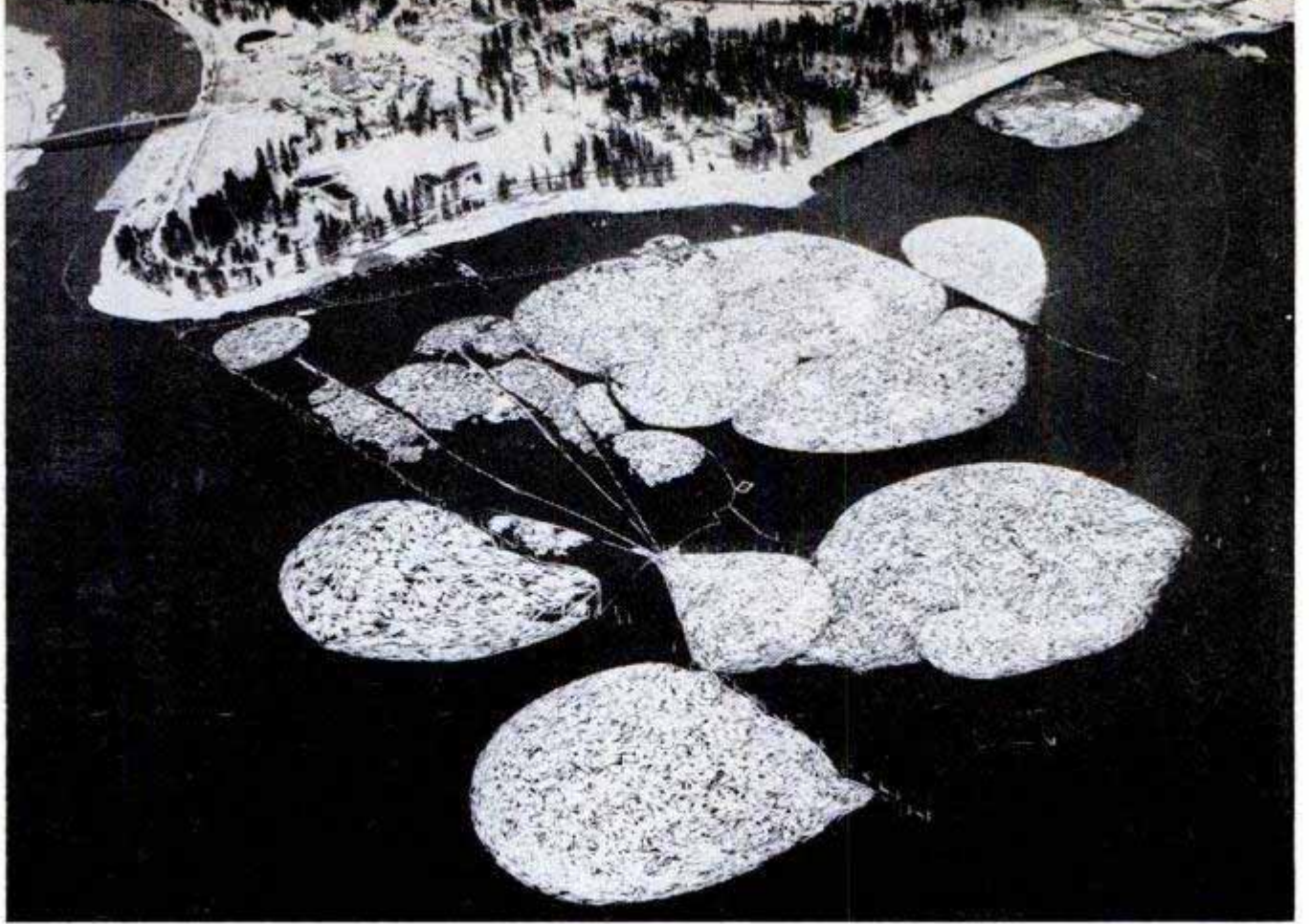
Emergency Telescopic Flasher Elevates for Visibility

Controlled from inside the car, a telescopic flasher light provides police and other emergency vehicles with a high-level warning that can be seen from a great distance. Four bulbs inside the glass housing flash alternately, providing warning in all directions. The light is normally kept in the down position on the car roof. In an emergency, it can be elevated several feet while the car is operating at high speed. A quick locking device holds the extended shaft in any position.

Clamp-On Spring Steel Band Serves as Non-Skid Chain

Easy to put on, a spring-steel band with a single chain attached serves as an emergency nonskid chain. It is expandable and the ends touching the wheel are rubberized to prevent scratching. The band fits all types of wheels.





Aerial Photos Aid Log Counters

Aerial photographs of a manmade log jam on Lake Coeur d'Alene, Idaho, enabled loggers to take a January inventory while seated around a hot stove. Ordinarily, each log would have to be measured by men walking about on the wet, icy, bobbing timber. Instead, a photographer was sent aloft to take aerial

shots of each boom. Ten percent of the logs were measured by hand to get an average. Scalers then huddled around enlarged photographs, counted the logs and multiplied the total by the board-foot average. Above is shown the captive timber, encircled by nooses of cable. Below is a close-up of 6005 logs





Keller cocks the lever and Sureshot fires the ball at the basket. Inset, he follows up for the rebound, too!

WHO SAYS ANIMALS ARE DUMB?

By Clifford B. Hicks

THE AVERAGE VISITOR to the little farm near Hot Springs, Ark., comes away with his head spinning and the feeling he's walked out of another world. After watching chickens play baseball and rabbits shoot baskets, he's ready to swear that psychologists Keller and Marian Breland could very easily teach a cow to jump over the moon.

The Breland system of animal training through scientific reinforcement is deceptively simple and surprisingly effective. The two psychologists use no punishment in any form. They simply "reinforce" the

animal or bird by rewarding it with food for any random movement that even suggests the goal of the training. All their "students" are well fed—the feed simply is rationed out over the training period.

Two hilarious examples of this type of training are Casey-at-the-Bat and Sureshot.

Casey (there are about 125 Casey chickens across the country now belting home runs) is conditioned to peck at a rubber-covered wire loop. To begin the training, Keller reinforces the chicken with a few grains of feed whenever she even wanders close to the loop. Soon she associates the

loop with the feed, and he waits until she pecks at the ring before giving her any more reinforcement. As soon as she absorbs this basic idea, he puts her on the floor next to the "diamond"—a slanted board much like a pinball game, with humorous baseball figures spotted strategically about the playing field. Attached to the lower end of the board is a child's baseball bat, actuated by a solenoid.

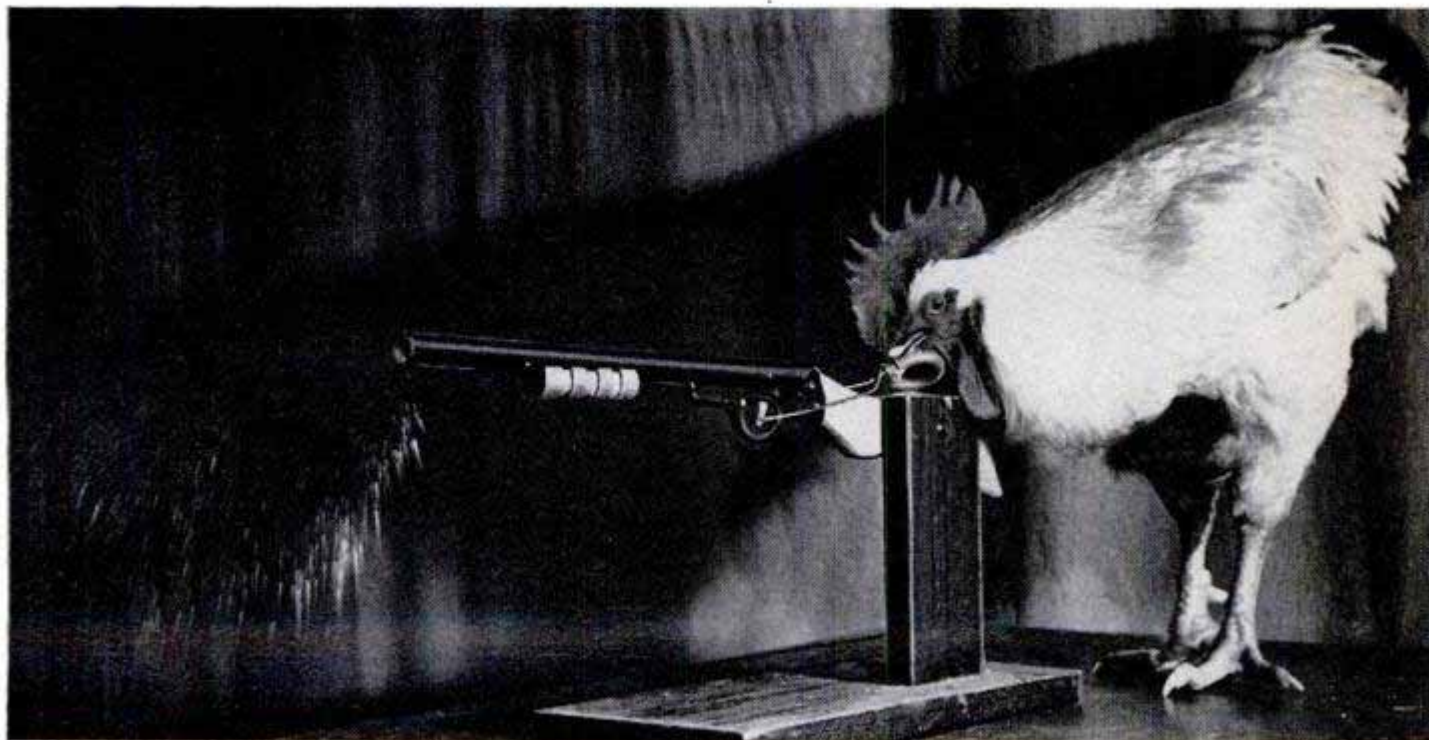
When Casey is placed near the diamond, she struts over to the batter's box, braces her feet and jerks on the rubber-covered ring. This touches off the solenoid, which swings the bat against a rubber baseball. If it's a poor hit, or a "fowl," the ball strikes one of the figures, then rolls back down to the batting position. If it's a well-hit liner, it zips right past all the players and strikes a tripping bar on the outfield fence. Bzzzt, grain drops, Casey scrambles for her reinforcement, then struts back to bat again.

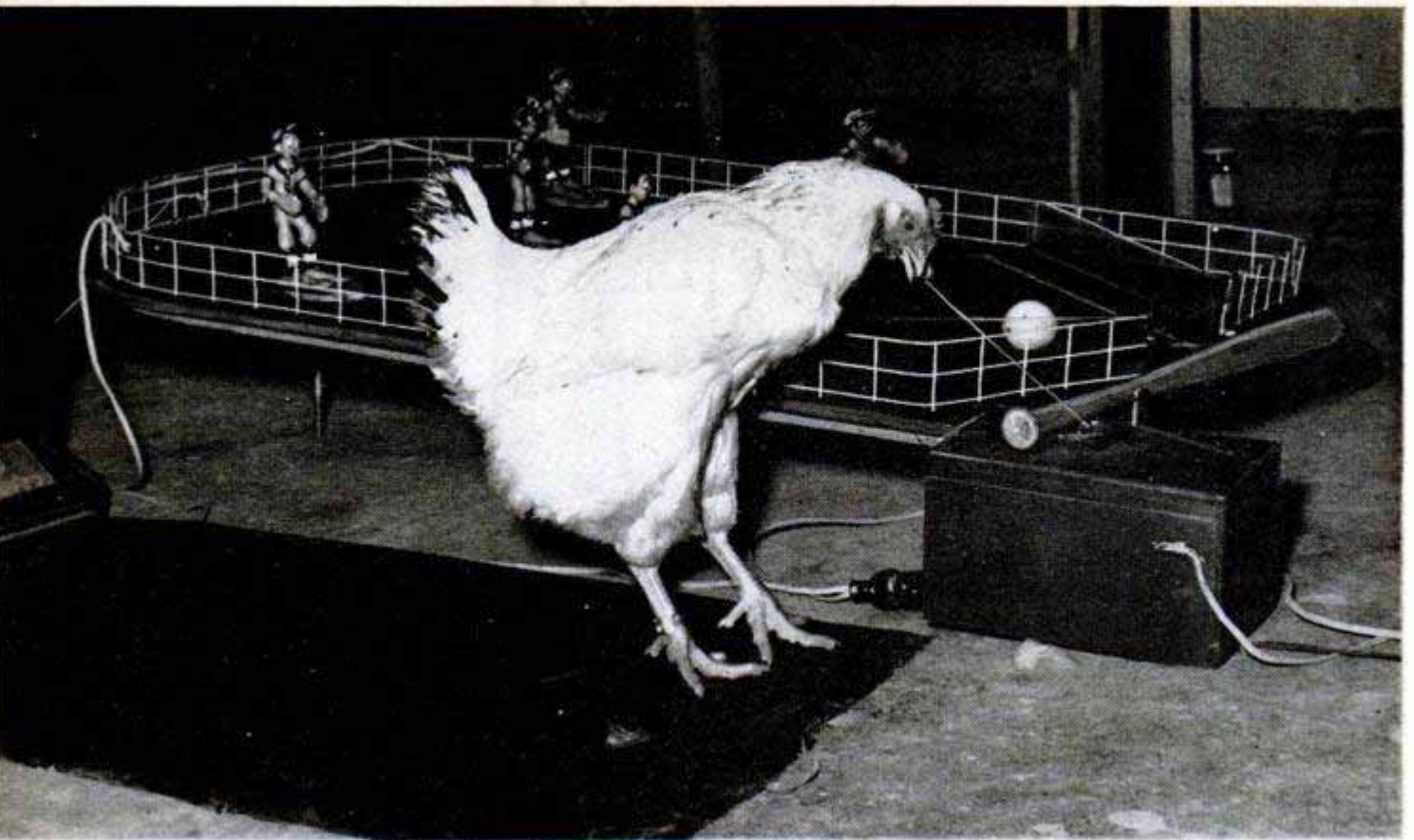
The training itself is simple: all the Brelands have to do is condition Casey to pull the ring and the mechanism does the rest. But the behavior patterns which develop in the chicken are fascinating. Casey gradually begins to throw "body English" into her line drives. The moment she swings the bat she runs alongside the board, peering anxiously at the ball as it moves between the players, leaning this way and that to "help" it around them. When one of the players stops the ball, she dashes desperately back to bat. One of the Caseys, while I was watching, rapped out a solid liner that shot past all the players but one. The center fielder made a spectacular stop. It made Casey so mad she leaped to the top of the board and pecked the ball on up to the outfield fence!



Assistant teaches cat to high-jump. Bit of liver is placed on platform, which is raised each time Tabby reaches it. Another method is to tie a bit of liver on a string, hang it from ceiling, and swing it like a pendulum. When cat gets liver, string is raised

Favorite stunt of this rooster is to pull the trigger of a popgun, spraying powder over the audience





There'll be joy in Mudville tonight, for the mighty Casey slams out another homer, then claims "his" reward

"Putty" poses on teetering chair. He'll perch here without flicking a muscle for minutes until released
Jack and Jill Studio photo

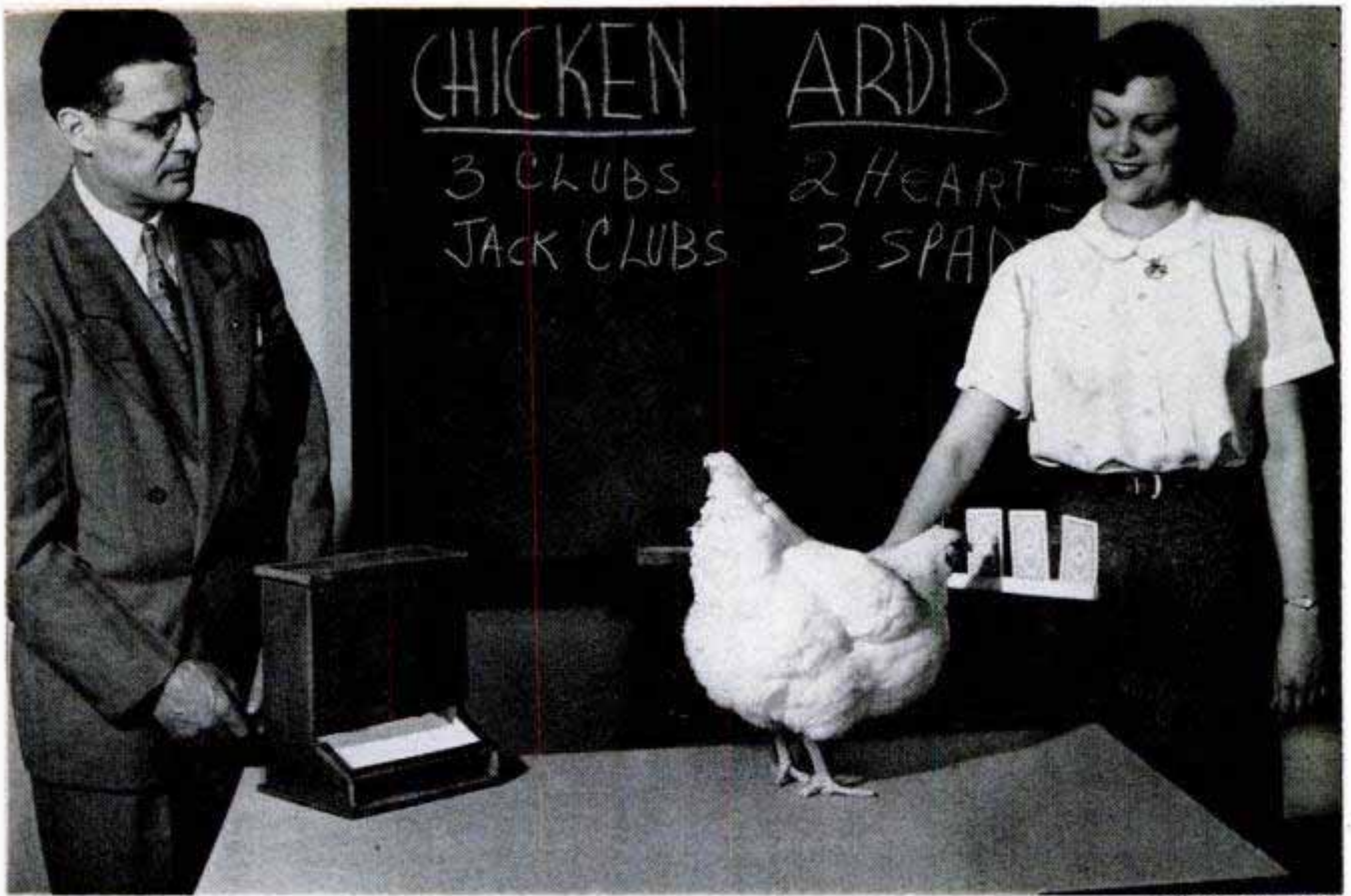


It's an amazing sight to see half a dozen Caseys lined up on the floor, all training feverishly for the big leagues. If you walk out of the room and return a few minutes later, you'll find them all as intent on their batting techniques as they were when you left.

Casey is an automatic act—the audience merely watches the spectacle. On the other hand, Sureshot, the basketball-playing rabbit, is touched off by the spectator, who places a little ball in a socket and pushes back a lever. When Sureshot hears the click of the cocked lever he hops happily over, grabs the tip with his teeth and gives a strong tug. A spring snaps and the ball arches high into the air with Sureshot watching anxiously. If the ball strikes the backboard and drops through the basket, a buzzer sounds and he gets his reinforcement. If the ball misses the basket, he waits impatiently for someone to recock the lever so he can try again.

One of the most remarkable of all the birds is the chicken that plays the old-time pea-and-shell game. The exhibitor places three walnut shells, a pea and the hen on a table. He shuffles the pea and the walnuts about, his hands moving so fast that every spectator is utterly confused as to the location of the pea. When he stops, the hen walks regally over, looks at the three shells for a moment, then decisively pecks one of them. Invariably the pea is under the shell.

The trick? Through a period of intensive



General Mills photo

Clucking cardsharp carefully selects one card from three held by opponent, who takes her choice of the remaining two. Each player ends up with a poker hand, and hen invariably wins. The trick? Brelands won't tell

reinforcement and "localization" the Brelands actually have taught the chicken to distinguish the wrinkle pattern on one of the shells. All the handler must do is make sure the pea comes to rest under the key shell, regardless of the position of that shell in the line.

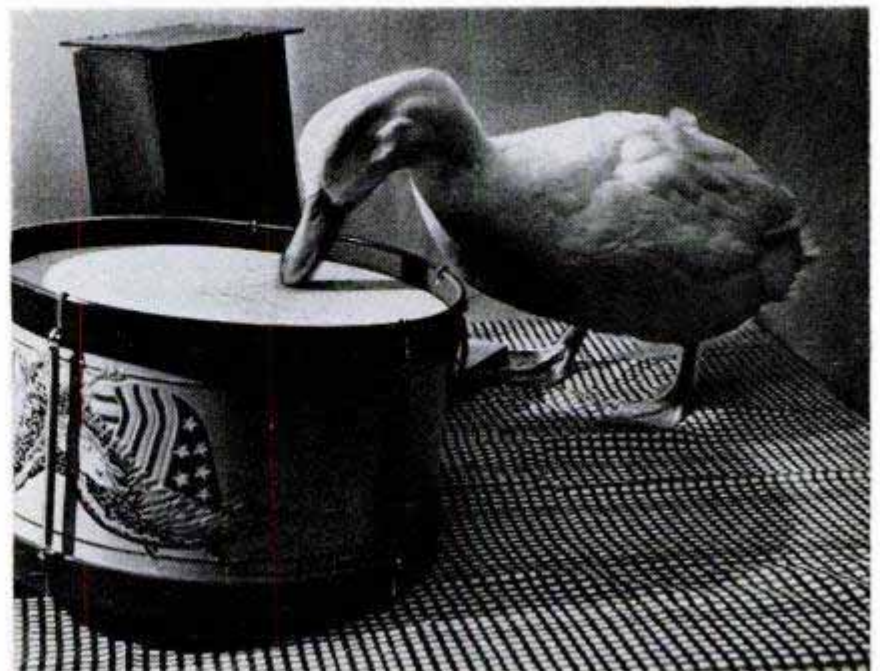
A somewhat similar and even more mystifying trick is the poker-playing hen. This remarkable fowl is placed on a table and a volunteer from the audience is escorted to the stage. Three cards then are placed in a wooden rack, which is held so the volunteer can see the faces of the cards but the hen can see only the backs. Because of this "unfair advantage" the chicken is given first choice, and pecks at one of the cards. This is removed and the volunteer selects his card. The procedure is repeated until both hen and volunteer have full poker hands. Invariably the chicken wins.

The mysterious part of this trick is that no signals pass between the handler and the hen, and no one can detect any marks on the cards, which can be inserted at random in the holder by the volunteer himself. It's such an effective trick that the Bre-

lands, usually very open about their training methods, refuse to divulge the secret. Meanwhile, humans are losing a lot of poker hands to fowls when you consider that there are 50 of these clucking card sharps roaming the countryside with feed salesmen.

Although training by reinforcement—immediate and positive—is the major method the Brelands use, they may occasionally employ what they call "inhibition of

Patriotic duck beats drum incessantly until rewarded. Brelands have trained several fowls to put on complete half-hour shows by themselves





Brelands' daughter conditions chicks to tiny rubber rings. Chicks then will be given away to children who "fish" them out of bowl

Mathematical wizard solves problems chalked on blackboard by pecking arrow to correct answer. Breland helps a little, of course!



response" to train an animal to do a particular trick. "Putty," their own mongrel farm dog, is a ludicrous example of this technique. You can mold Putty into any weird position—both front feet over his neck, one eye closed, hind legs shooting out at wild angles and tail arched over his back—and he'll stay motionless for as long as you like. One favorite trick is to prop him on his nose in the corner with his tail pointing straight as a gun barrel toward the ceiling, and leave him there for a couple of minutes.

"Anyone can teach a dog to be a Putty, and it's quite easy if the dog is one of the hunting breeds," states Keller. "Hunting dogs have an innate tendency to 'freeze.'"

He makes the training sound simple. "Just before starting each training period, show affection for the dog. Otherwise he may not like the training period and eventually may refuse to come when you call. After fondling the dog for a few minutes, order him to 'stay' and hold him forcibly in a sitting position for one or two seconds. Soon he'll hold the position even when you remove your hands. After he's learned to stay, insist that he

(Continued to page 222)



Douglas Aircraft Company photo

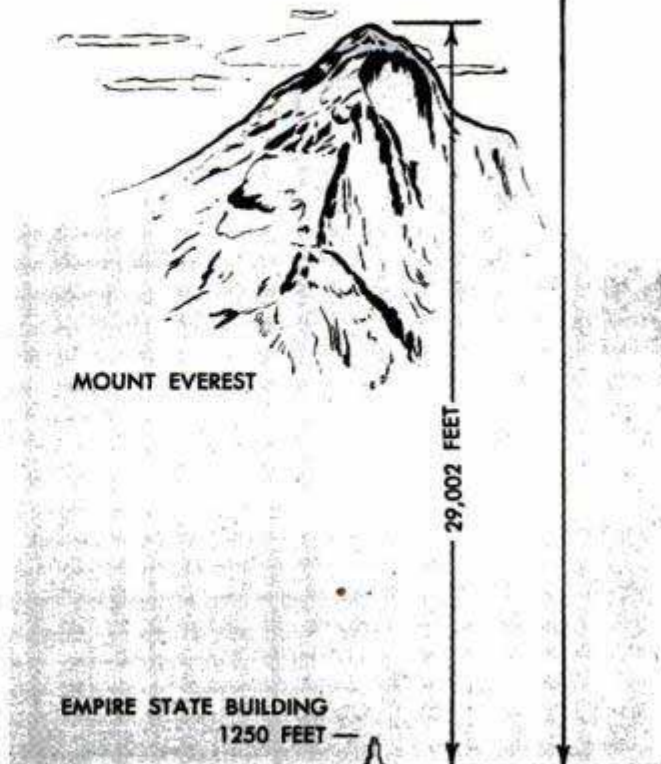
During its climb, the Skyrocket used about a ton of fuel per minute. It has a 25-foot wingspan, is just over 40 feet long

Marine Flies Rocket Plane to Altitude of Nearly 16 Miles

ASCENDING higher than man had ever been before—nearly 16 miles above the earth—Marine Lt. Col. Marion E. Carl flew a rocket-powered research plane to 83,235 feet above the California desert. It bettered the previous mark by more than a mile. The record will not be recognized as official by the Federation Aeronautique Internationale, since present rules require the aircraft to take off under its own power. Col. Carl's plane, the Douglas Skyrocket, was released from the belly of a Superfort at 35,000 feet in order to economize on fuel. Carl climbed at an ever-increasing angle that reached 40 degrees when his fuel supply was exhausted at 75,000 feet. The craft's momentum carried it on up to 83,235 feet in about five seconds. Col. Carl took about 10 minutes to glide down, landing dead-stick at about 150 miles per hour. The pressurized Skyrocket also holds the unofficial speed record of 1238 miles per hour.

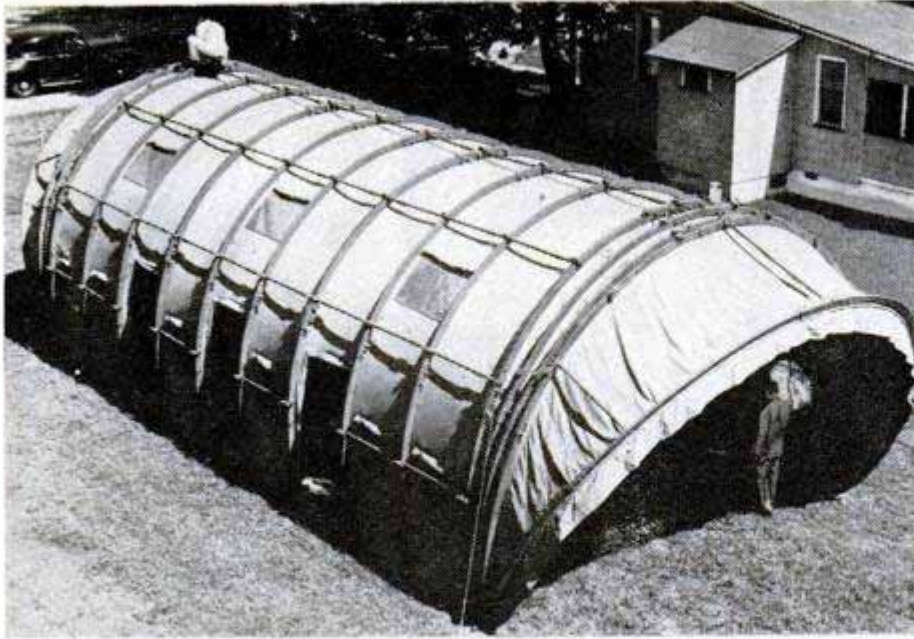
Pressure suit worn by Col. Carl inflates automatically if the cockpit pressure system fails

Department of Defense photo



83,235 FEET

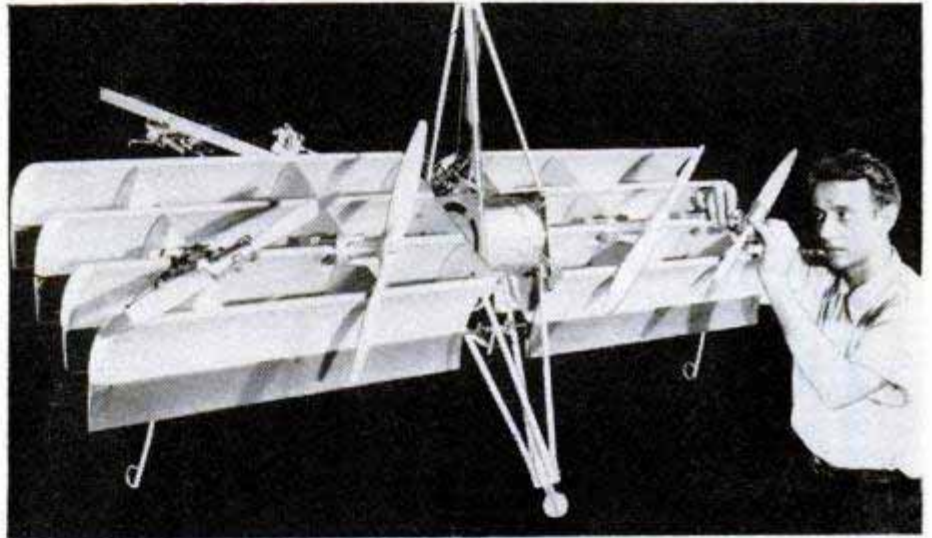
Portable Garage With "Buggy Top" Doors Shelters Army Vehicles



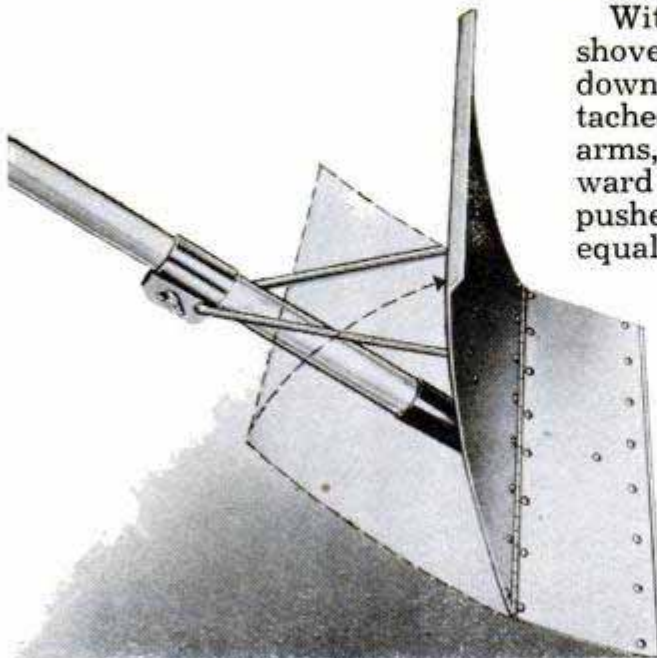
Big enough to accommodate the largest tank or truck, a portable garage developed for the Army protects vehicles and crews in the field during repair work. The shelter, resembling a Quonset hut, is 66 feet long, 21 feet wide and 15 feet high at the center. Arches made of magnesium alloy form the framework to which a canvas cover is fastened. The covering has plastic skylights, portholes and zippered doors. At each end is a unique "buggy top" door.

Model Airliner's "Venetian Blind" Wings Permit Vertical Take-Off

With wings resembling Venetian blinds, tomorrow's airliner may take off straight up and yet not be a helicopter. A model being studied by the National Advisory Committee for Aeronautics has multiple wings that can be tilted to the rear for take-off, then straightened for forward flight. The engines and propellers, mounted at the leading edge of one of the wings, will not tilt with the wing.



Hinged Blade of Snow Shovel Adapts to Shoveling or Pushing



With a simple, quick adjustment, a versatile snow shovel is converted into a snow pusher. By moving down a wing-nut collar on the handle, which is attached to the back of the blade by two supporting arms, the upper two-thirds of the blade moves forward on a piano hinge to become an efficient snow pusher. Converting the pusher back to a shovel is equally simple.

Chemical Toughens Cotton Fibers

Cotton fibers are fortified against mildew and bacteria by a new chemical treatment that also gives them greater strength after exposure to wet and dry heat. The basic chemical, acrylonitrile, is also an important ingredient in fibers such as Orlon, Dynel, Acrilan and X-51. Additional treatments have given yarns and fibers extra "stretch" and greater resistance to scuffing.



Los Angeles Times photo

Sections of pipe 12 feet high await their addition to Los Angeles' storm-drain system—the world's largest

SUBWAYS for a CITY'S FLOODS

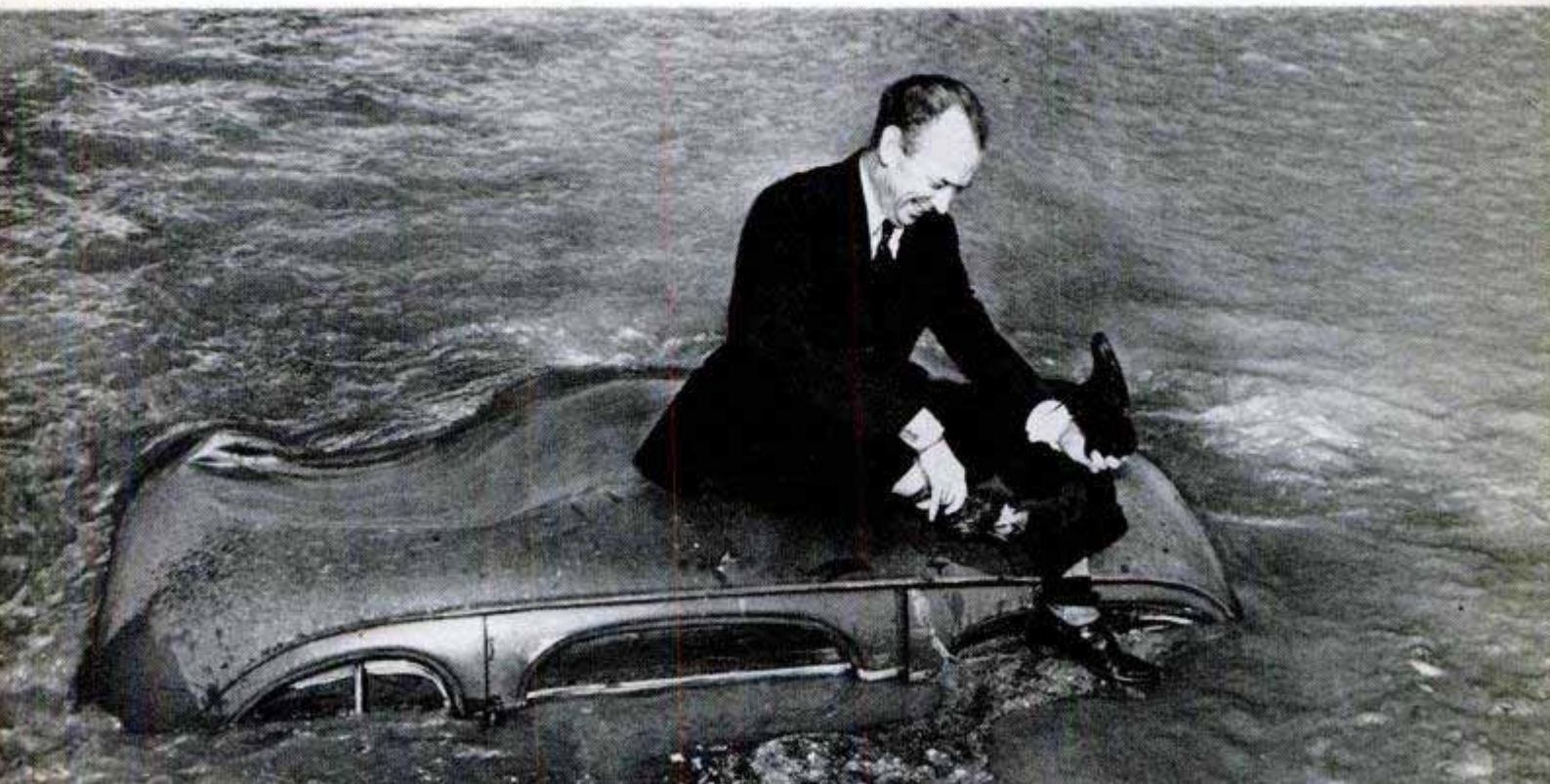
By Robert H. Forbes

AT THE GENERAL election that swept Ike into the White House, citizens of metropolitan Los Angeles put themselves in hock to float \$179,000,000 worth of bonds, final results of which hardly any of them will ever see! The whopping bond issue was required for additions to their area's network of modern underground "cata-

combs"—some as large as subway tunnels. Already the underground river system is the largest in the world.

What is more, the catacombs will be badly needed only at two or three-year intervals, for they are buried storm sewers designed to carry away infrequent but torrential rains.

During the big 1938 flood many motorists were trapped. Some took it less gracefully than this newspaper man





Villain of motion picture *He Walked by Night* sought refuge after his movie crimes in Los Angeles sewers

Record-breaking rainfalls have washed the mountains overlooking the city. One world's record was established at Opid's Camp, just behind famed Mount Wilson, where 1.02 inches of rain fell in one minute.

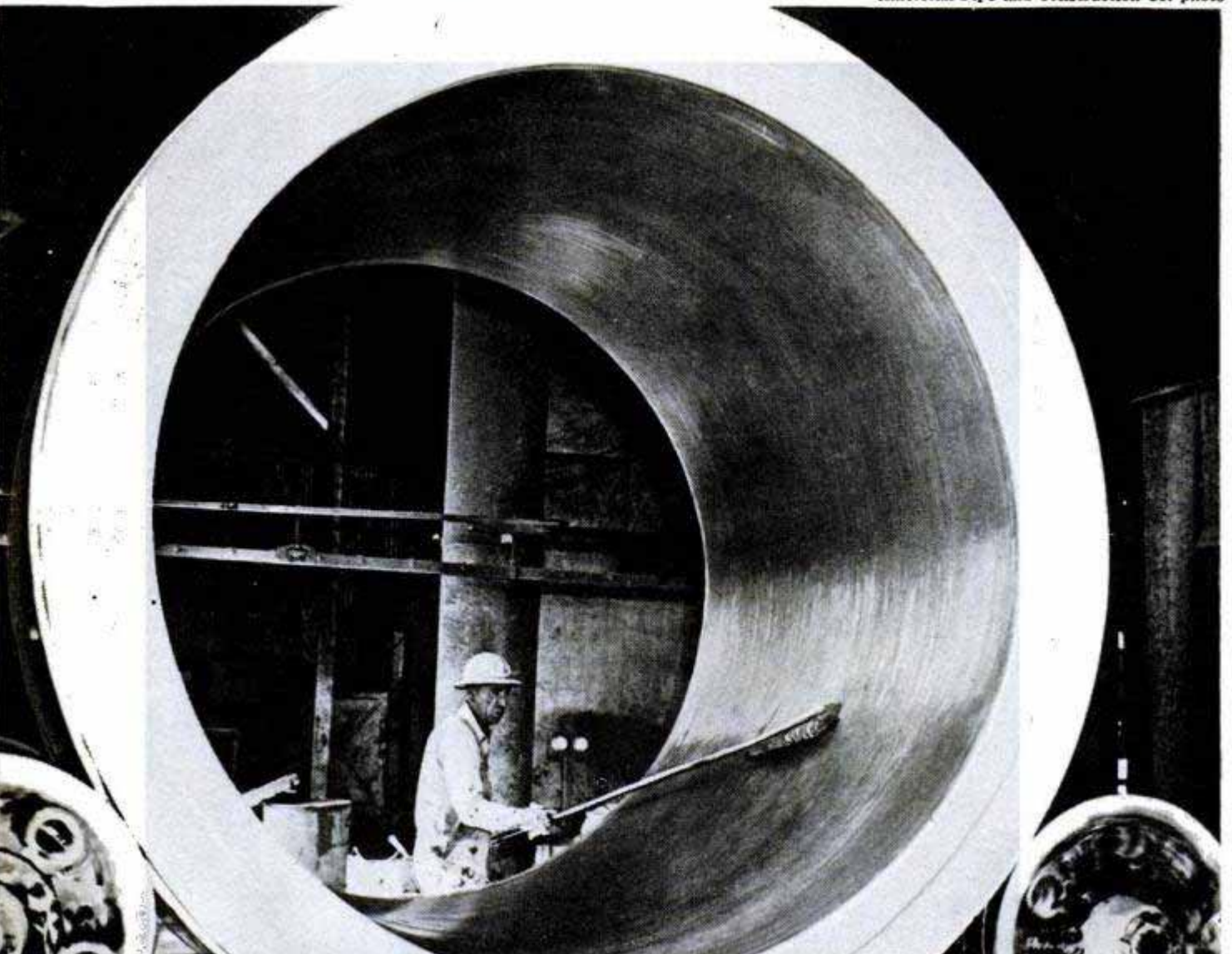
Camp LeRoy, in the Santa Anita Canyon, holds a United States' record for 24-hour precipitation; over 26 inches of water pelted down there in one day of January 1942. During the record-breaking downpour in the canyon, a total of more than 37 inches of water fell on the camp in three days.

Rain from such record showers spills over into the city, too. Streets become awash with water curb-deep. People who build homes in the picture-postcard Los Angeles highlands may find their residences washed downhill or covered with water-borne debris.

The skies over Los Angeles opened up to unload a few years of rain all at once in March 1938. The torrent taxed the partially completed system of drains in one section with a discharge rate of 99,000 cubic feet per second at the Pacific Coast Highway and Los Angeles River. The cascade of water at this point was equal to 6480 gasoline tank cars per minute spilled in the usually dry river.

Imagine the drenching for the whole city!

Workman removes slurry from densely compacted concrete pipe resulting from centrifugal spinning process
American Pipe and Construction Co. photo



Storm sewers, although not everywhere in sufficient numbers, are under every part of Los Angeles and most of its county's 44 other mainland communities. Drains total thousands of miles in length, according to George Hartley, engineer of the county storm-drain division.

Huge Los Angeles, although nineteenth in the world population, is second only to London in area. The British metropolis spreads over 693 square miles and greater Los Angeles is next with 451 square miles. New York City and environs cover only 319 square miles.

Los Angeles' storm-drain network might appear to be ideal for bomb shelters, since reinforced concrete has proved to be good protection against atomic explosions. But an investigating commission's report to city engineer Lloyd Aldrich pointed out major drawbacks. The drains are not deep enough to offer much protection. They might also be brimming with water at a critical time, the biggest objection. If reservoir dams around the city are broken by bombs, the storm drains would quickly flood and, if the drains were full of refugees, a calamity would result.

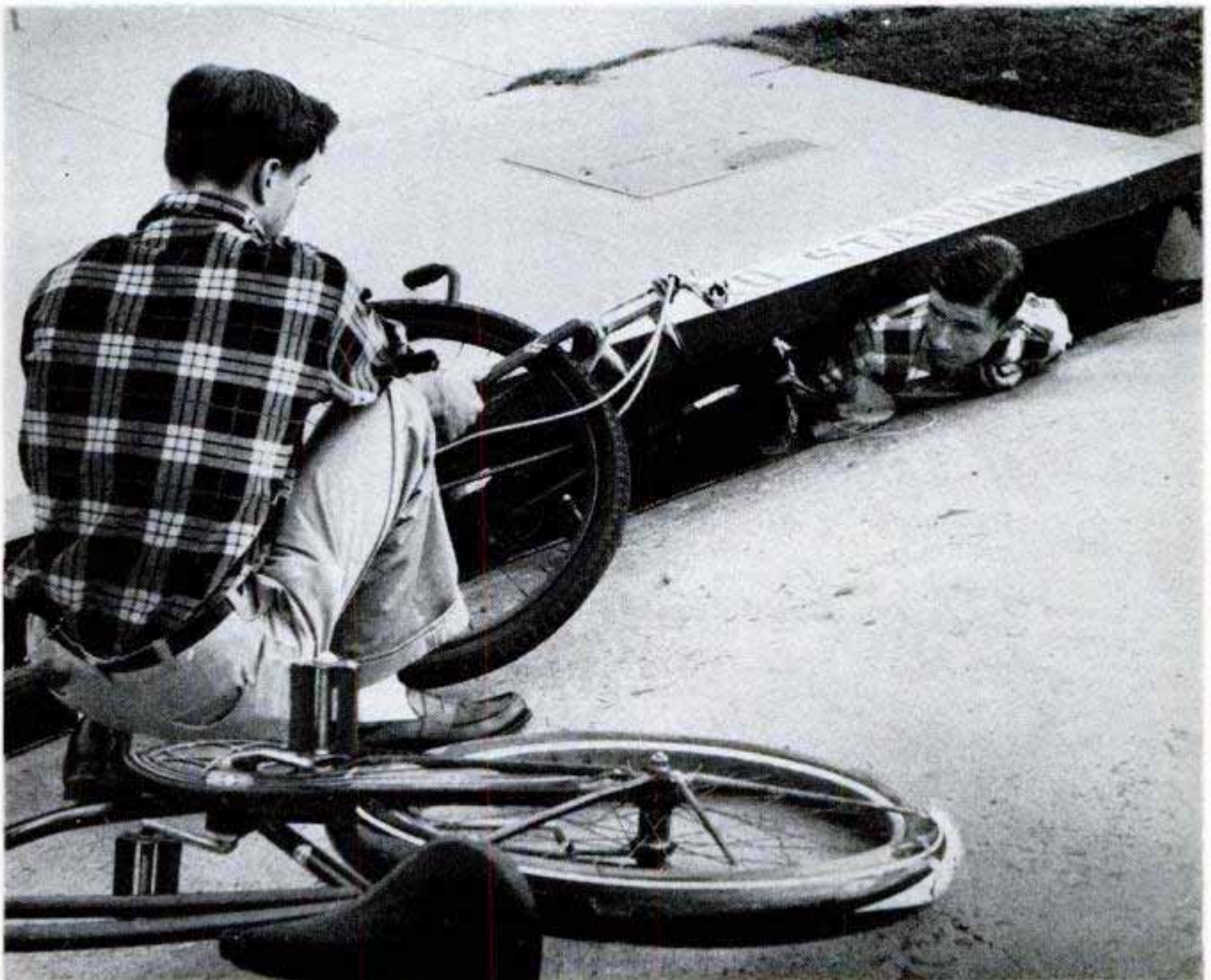
Larger sewers are not such bad places

for human habitation, however. Hoboes have a summer resort in the Los Angeles River ends of many drains. But knights of the road usually have to find "jungles" elsewhere in the winter months when southern California might suffer a cloudburst.

When a Hollywood movie producer discovered the catacombs beneath his feet, he filmed a cops-and-robbers epic under a street near his studio. *He Walked By Night*, starring Richard Baseheart, was about a policeman-killing thief who fled to a storm drain after his crimes, only to reappear in a totally different part of the city and baffle detectives.

Young boys of suburban Los Angeles like to tell their less-venturesome elders about subterranean-exploration trips taken on their bikes in big storm drains. By removing the handlebars of the bicycles, the boys can lower them into the long gutter-level openings of excess-water sewers and then ride for miles under the heaviest traffic. When it's time to come out, they somehow take the correct turns and head their wheels toward the river, where the tunnels end. The idea is not recommended. The authorities say their catacombs are no place for play. ★ ★ ★

Los Angeles boys prepare to embark on a bike trip through the city's sewers—not a recommended sport





Merry-Go-Round Spins Cake for Decorator

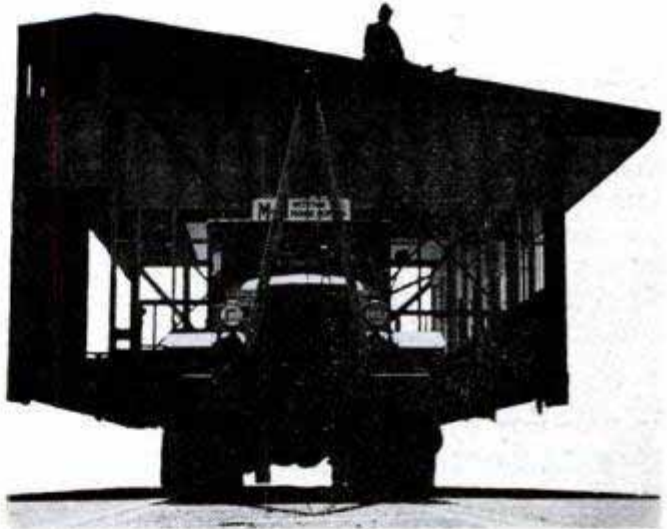
Pastry artists now have a new tool—a motor-driven cake turntable which permits them to circle a wedding cake with loops and flowers in one continuous operation. The turntable is connected to a variable-speed motor controlled by a foot pedal. The

platform can be raised or lowered gently by using a hand-operated hydraulic lift. Seat and arm rest are adjustable, and wheels give the rig mobility. With the old method, the baker placed the cake on a Lazy Susan which was revolved by hand.

Rare Metal Germanium Harvested From Vegetables

Germanium, the rare, \$350-a-pound metal, may be harvested profitably from vegetation, according to Dr. Hans Brauchli of Johns Hopkins University. The chemist has been working on the theory that vegetation growing in certain areas where the underground water has a high germanium

content would absorb some of the metal. He has reduced such vegetation to ash and found that the germanium content is as high as five percent. This corresponds to the .001 percent found in the most promising "bonanzas" of certain coal mines today. The rare metal is used in transistors.

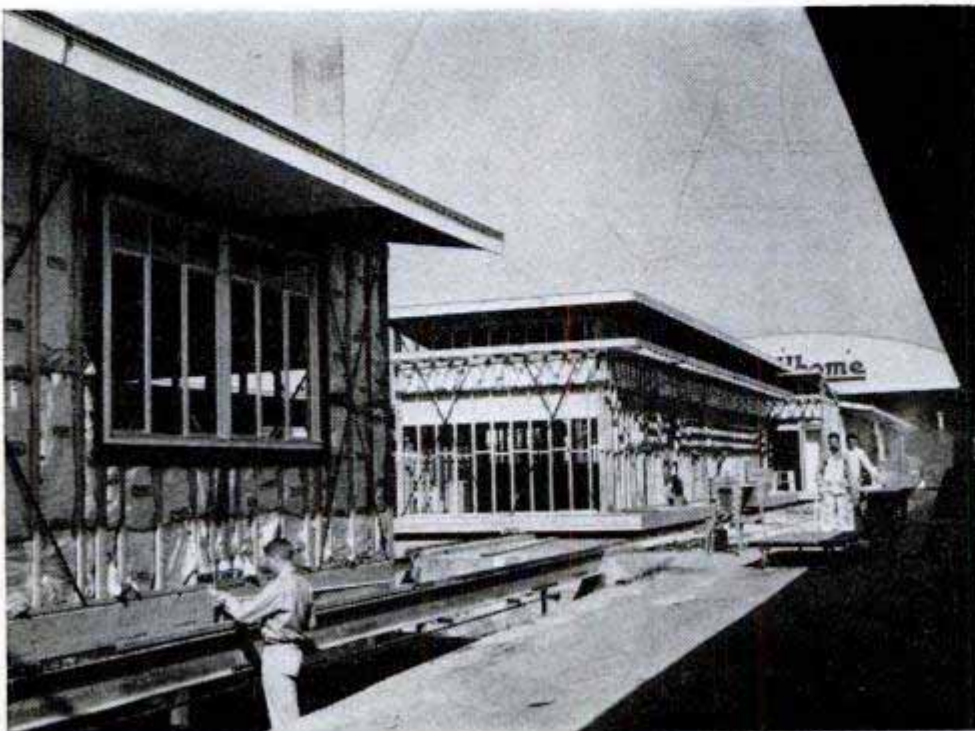


Room-a-Day Is the Story Of 59-Room Prefab Building

WHEN A California oil company wanted a 59-room office building in a hurry, it asked a maker of prefabricated homes to do the job.

Designed to be built in 38 separate sections on an assembly line, the 34,000-square-foot building was finished in 57 working days—faster than a room a day. Three sections rolled off the line every two days, completely assembled, plastered and painted—ready to be moved to the site.

As the sections were completed, they were loaded on derrick-equipped trucks and hauled to the site outside Bakersfield, Calif. None of them cracked en route from the factory in Bakersfield to the building site. Lowered in place by the derricks on the trucks, the sections were bolted together to form a building with a front 291 feet long and three arms extending 157 feet to the rear. The building provides complete facilities for drafting, filing, record storage and a paleontology laboratory.



Top, 90 days after the lot was cleared, this expansive office building was ready to use. It is 291 feet long. Air photo shows over-all size and shape of the tremendous prefab building

Above, loaded on a truck, one of the 38 sections is hauled to the building site. Derricks on the truck lift the sections into position

Left, sections move along the assembly line like new cars. Three sections were finished every second day. Exterior walls are stuccoed



Vest Holds 117 Batteries To Power Walkie Talkie

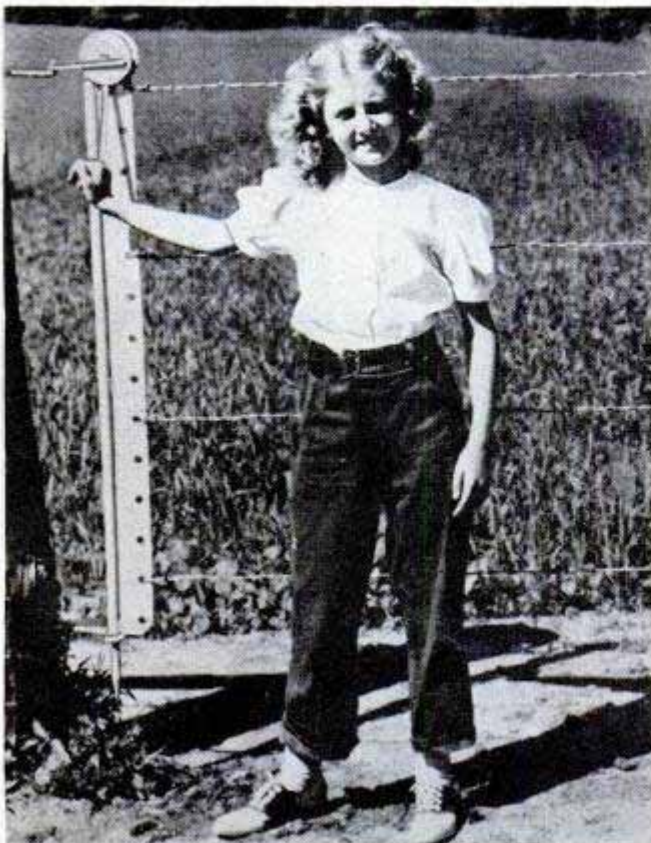
Batteries operate more efficiently when warm, so the Army has developed a method of keeping their temperatures up even in subzero weather. A flexible rubber vest contains 117 pockets with a tiny dry cell in each one and when worn under a heavy overcoat it uses body heat to keep battery temperatures at a point that assures efficient operation. The batteries are the power supply for a compact portable radio designed to provide short-range, two-way communication in combat areas.



Portable Emergency Light

When Louisville, Ky., police failed to find an emergency light suited to their needs, they designed and made their own. Raised to a height of 5½ feet, the battery-powered blinker can be seen clearly by approaching drivers. The emergency lights formerly used were frequently bowled over by motorists.

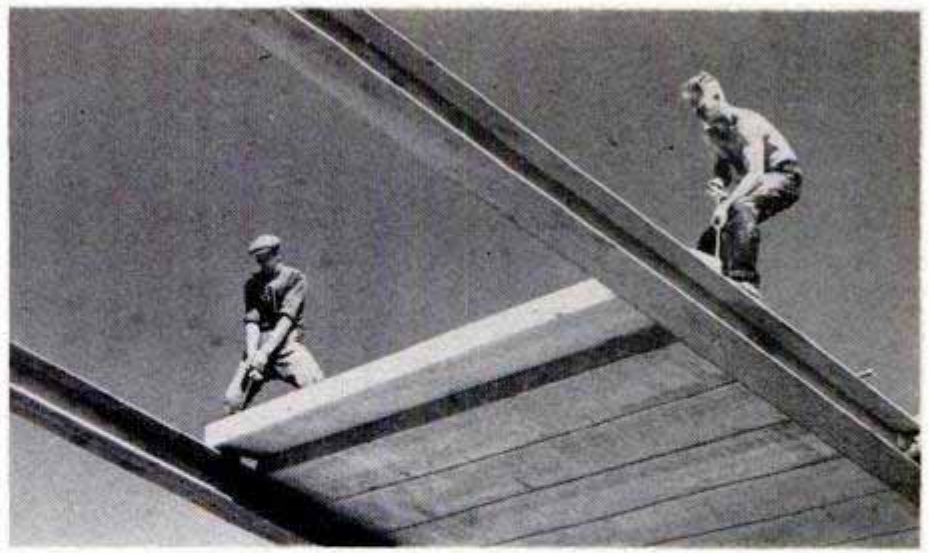
Handle on Post Tightens Barbed-Wire Gate



Gates made of barbed wire are kept taut, yet are opened or closed easily with a steel gatepost equipped with a tightener. Welded onto a steel stake, which is stuck into the ground to keep the gate upright when open, is a flat metal plate perforated along the edge to hold a number of wires in any position. At the top of the gatepost is a circular tightener equipped with a handle. A U-bolt pivoting off-center on the tightener wheel hooks to the anchor post and tightens the gate as the handle is pulled downward and locked in position.

Airplane Distance Finder

Pilots can pin-point their flying position within a tenth of a mile by using a new radio distance finder. A transmitter in the plane sends out impulses which are picked up by a receiver on the ground and retransmitted to the plane. A measuring circuit in the plane receiver translates the time required for the impulses to return into miles and tenths of miles. The device is effective up to 100 miles.



Lightweight Cooked Concrete Handles Like Wood

Cooked concrete, one-fifth as heavy as ordinary concrete, can be worked like wood. Slabs, available in 20-in widths in lengths up to 18 feet and in thicknesses from 2 to 10 inches can be cut with an axe or hatchet, sawed, drilled or nailed. Structurally strong, the slabs are self-supporting and require no insulation as they have 10 times the insulating value of concrete. Although the material is light in weight—it

floats in water—it barely warms up when exposed to flame for more than an hour. Developed in Sweden, it is used in 50 percent of all the new buildings erected there. The manufacturing process involves placing a mixture of sand, cement, aluminum powder and certain chemicals in a mold where the ingredients react chemically and rise like bread before they are placed in an oven and baked.

*Patent held by:
INTERNATIONELLA
SIPORTEX AB,*

Dry-Land Destroyer-Escort Teaches Recruits Drill Procedures

U. S. Navy photo

One of the most useful ships in the U. S. Navy has never even been afloat. It's the USS *Recruit*, a mockup destroyer-escort at the Naval Training Center in San Diego, Calif. The dry-land craft is used to teach recruits the fundamentals of mooring and the procedures to follow during drills. Measuring 221 feet long and 24 feet through the beam, the mockup has classrooms below deck.

Joshua Tree Veneer

Window-shade panels, Venetian blinds and lamp shades are now made from the translucent veneer of the Joshua tree. The veneers are produced by a special process, since the wood cannot be removed in the ordinary manner. Stained to any desired color, the veneer makes a novel covering for walls and furniture.

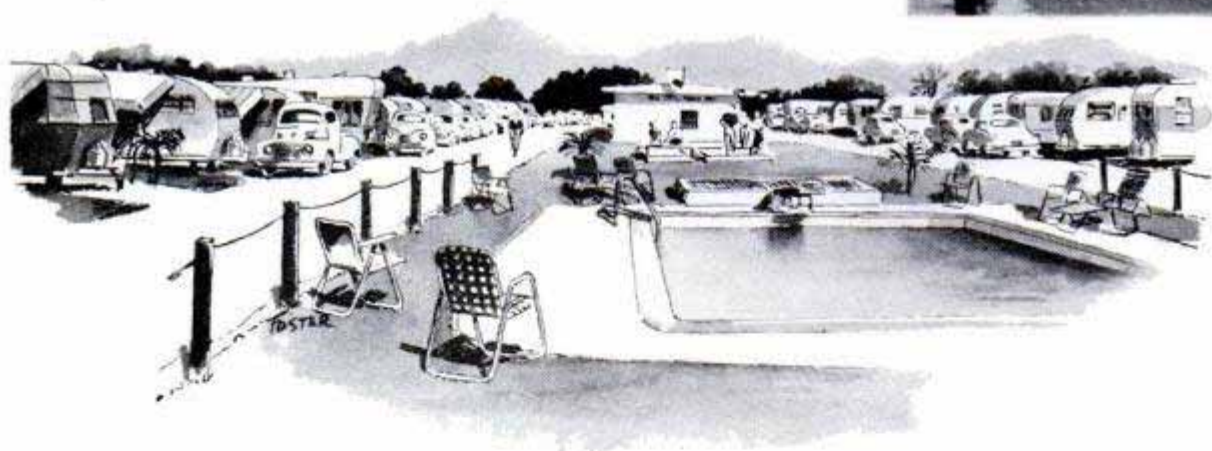
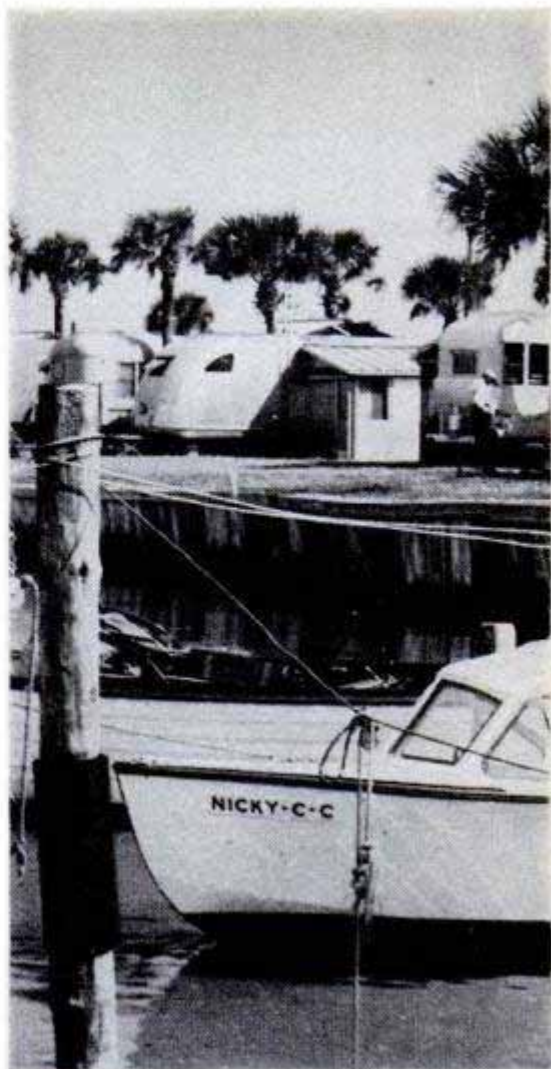


*ACRRLAN
GATE
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When we tell you some 2,000,000 Americans are living in trailers, don't assume we've become a nation of nomads. For these fancy homes may be equipped with wheels, but

Trailers are Stay-at-Homes Now

By Arthur R. Railton



Trailer parks like beautiful Squaw Peak at Phoenix, Ariz., provide such luxuries as private swimming pools

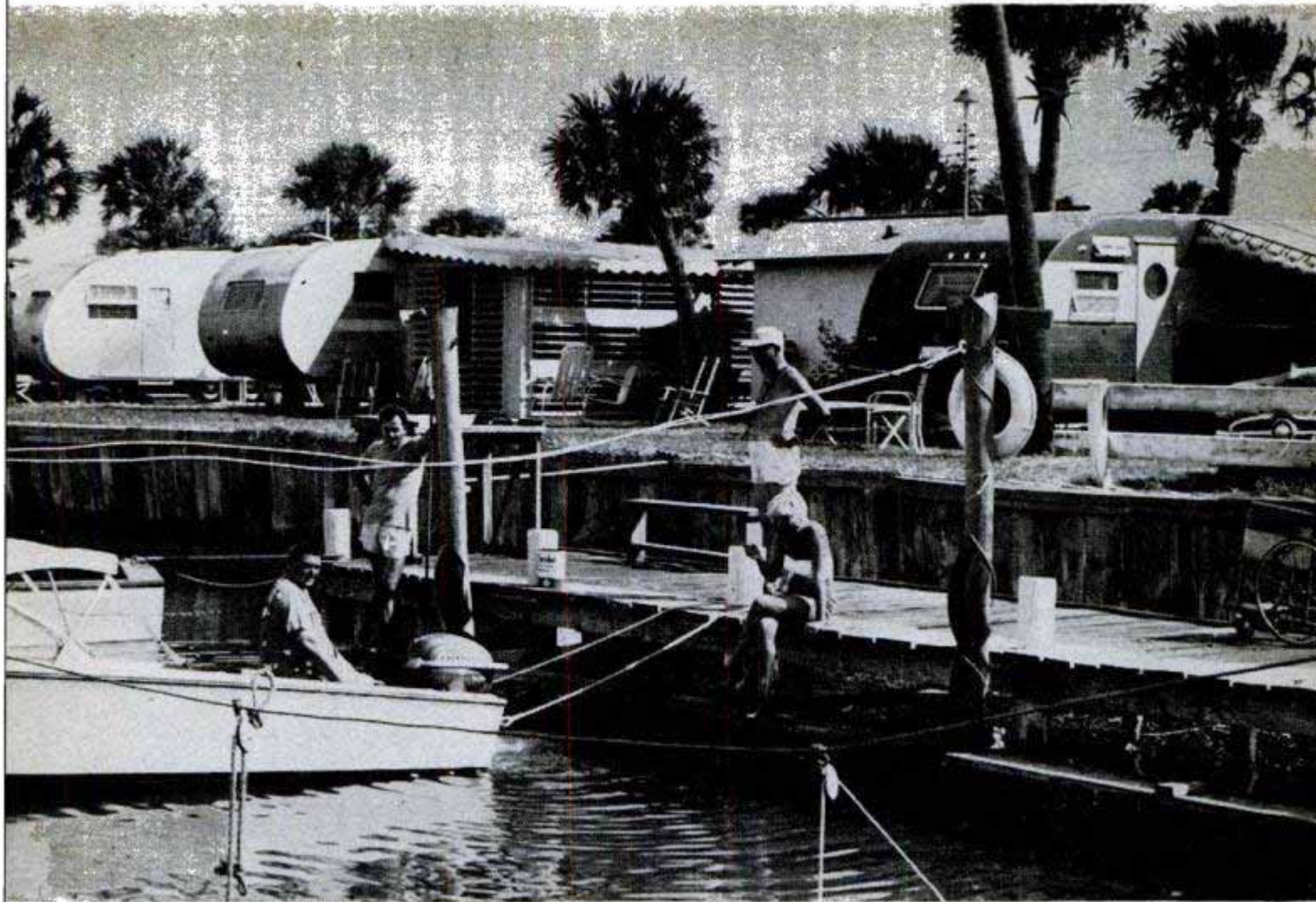
TRAILERS DON'T TRAIL so often these days. Diluted is the gypsy blood once so much a part of trailer living. Trailerites stay put most of the time, moving only once or twice a year, if at all.

While trailers have lost some agility, they have taken on comforts. They have become more like homes, less like caravans. In fact, recent years have brought so many changes that about the only item an old "tin-can tourist" would recognize is the hitch—and even that is different.

They even have a new name. Now they are mobile homes—homes on wheels with everything the anchored-to-the-ground house has except open space.

To find out about trailer life, *Popular Mechanics* assigned the writer, his wife and two small sons to live in one for a couple of weeks. It was our first taste of trailer life.

We moved into a huge, handsome Liberty 41-footer with two bedrooms. It was in one of Florida's best known parks: the Parsley Trailer Park on the Gulf north of St. Petersburg. The combination of a fine trailer and a wonderful park made trailer life most inviting. We learned some things about trailer living that we had not known before. We learned enough to know that it's an utter waste of effort to feel sorry for families who live in trailers. In most cases they should be envied!



Florida has 1100 trailer parks. Parsley's, on the Gulf near St. Petersburg, is a sportsman's paradise

There are two popular misconceptions about trailer folks. The first is that they live in trailers because they can't afford to live elsewhere. The second is that they were forced into trailers by a housing shortage.

Trailerites are, on the average, a prosperous group. Their annual income is \$1100 above the national average. (We noticed plenty of Cadillacs in our trailer park!)

During and just after the war, many

families did move into trailers because of the housing shortage. But today that is not the reason for the trend toward trailer living. By the end of 1953 more than 2,000,000 persons will be living in 700,000 mobile homes in the United States. In 1952, 83,000 trailer coaches were sold at a total cost of \$320,000,000—the biggest year in the short but phenomenal life of an industry only 22 years old.

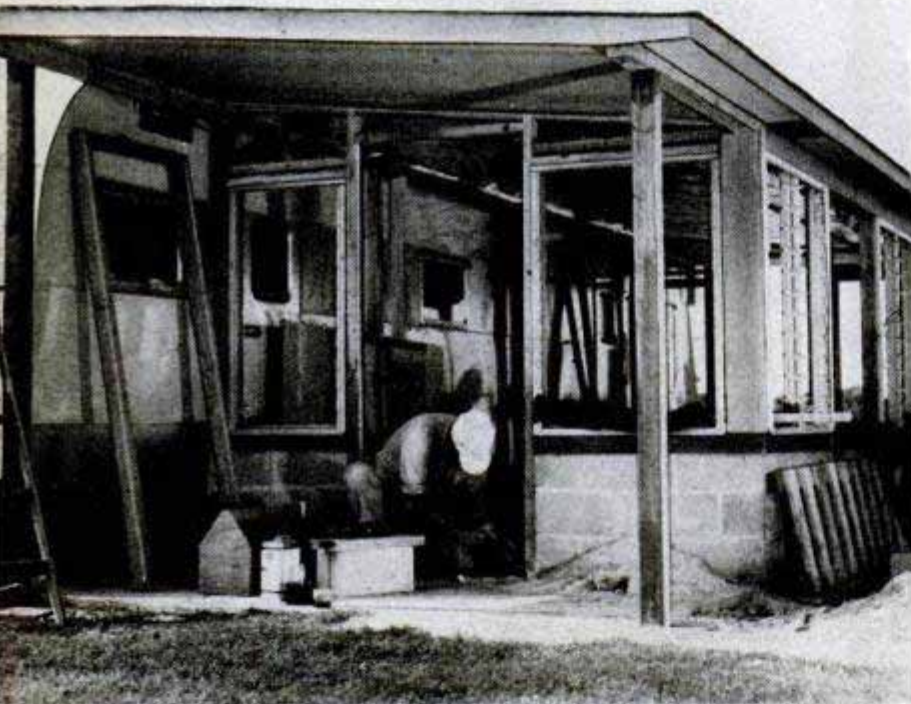
Left, a 1953 trailer has a front porch! Right, retired couples say trailer life is economical and relaxing





CABANAS

Cabanas are becoming more popular each year. Trailer can be seen at right. Below, cabana construction is usually permanent



Today's trailer has one or more separate bedrooms. Although small, they are handsomely furnished as the sketch below shows

Why would anyone buy a trailer, you ask, especially when they cost up to \$6000? The principal reason is mobility, of course. This is true even though the average trailer moves rarely. The trailer owner knows that if he wants to move, it's no problem. If he wants to change jobs, he's not dissuaded by the complications of selling and buying a house, of packing and unpacking. He just hitches up his trailer and moves.

Another big reason for owning a trailer is that it involves less work for both the man and woman. Housework is a breeze. In an hour, the whole house can be cleaned. Women love trailer living for that reason. Most trailers have aluminum siding and that means no rust or paint problem. If painting is necessary, its a week-end job at most. There is no interior painting or wallpapering. Dust-collecting ledges are virtually nonexistent. All woodwork is smooth and streamlined for quick cleaning.

Economy is a big factor in trailer buying, of course. Space in the better trailer parks costs only about \$25 a month. The lush resort parks charge only \$40 or less. Utilities amount to another dollar or two. Fuel bills are small because the cubic space is small and well insulated.

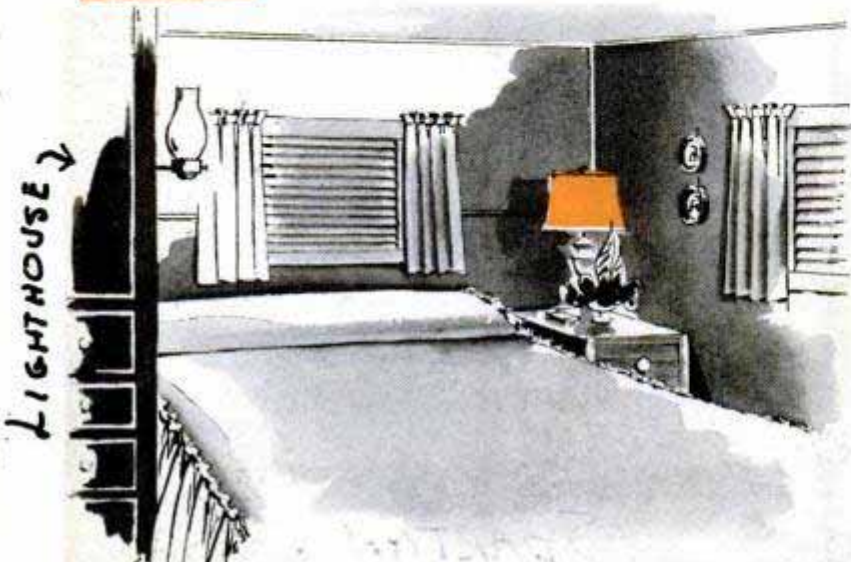
Economy, too, is the big reason why retired couples are becoming trailerites in large numbers. Pensions, caught in the squeeze of inflation, go farther in a trailer. Surveys show that the annual cost of heat and upkeep is about a quarter

Children's bedrooms often have bunk beds in keeping with the ranch-house tradition

INDIAN TRAILER CORP.
122 E 63RD ST
CHICAGO

INDIAN

BEDROOMS



LIGHTHOUSE



of that in the usual frame house.

Yet there is more than economy responsible for the movement of retired couples into trailers. Sociability is another big factor. There is no place less lonesome than a trailer park. Everybody talks to everybody else. Everybody shares the other fellow's problems. As one man remarked: "If you don't know how to do a job, don't let that stop you. Just start it and you'll get all the advice you need."

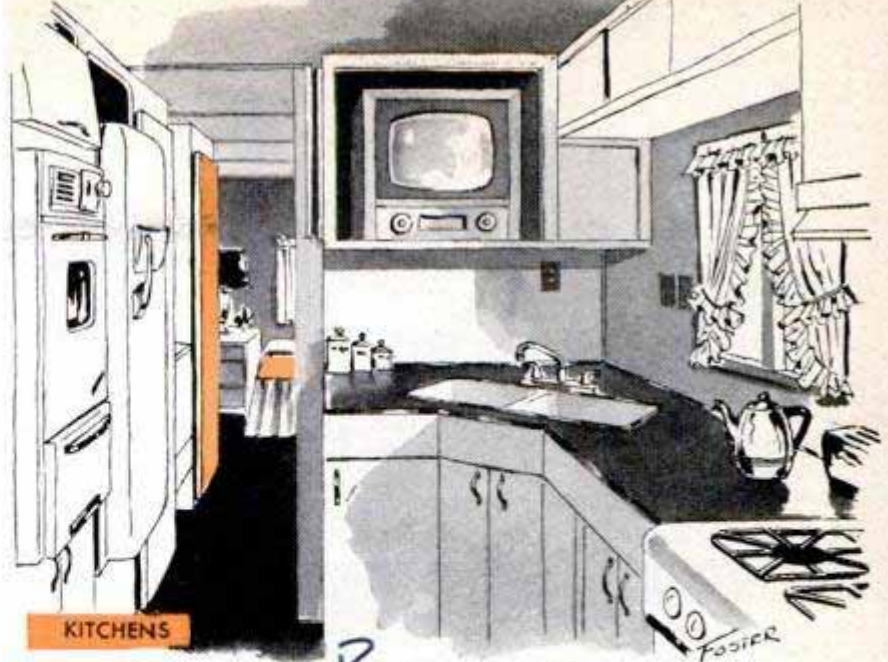
However, some retired couples do have trouble adjusting to trailer life. There are a few difficult months while they realize that they have given up the old familiar furniture they lived with for so long. Women especially complain about this. But once they get over that hurdle, they're usually trail-erites for life. "We wouldn't go back to that big house if you gave it to us," one woman told me.

Trailer parks run organized recreational programs. There are hobby groups, movies, bingo games and dancing. Shuffleboard is the traditional trailer-park sport and the courts are busy from early morning until late at night.

Why have trailers become so popular? Why haven't they disappeared as more housing became available? The reason is obvious: They are no longer stripped-down, primitive shelters on wheels. You don't give up a thing except space when you move into a trailer.

Obviously, they are smaller than a house (although a 48-footer has almost as much room as a small home). But the space that is sacrificed is not living space—the sacrifices involve the extra room which you kept for storage, for odds-and-ends you no longer use or for getting-away-from-the-family. These spatial luxuries you have to give up in trailer living. That means, for most families, that you are forced to get rid of piles of junk you never used anyway!

If you think trailer life is primitive, answer this: Does your home have a garbage-disposal unit, an air conditioner, wall-to-wall carpeting, a completely automatic range, continuous hot water, thermostatic heating? If it does, it is not primitive. You can have all those conveniences in a trailer at a price that is lower than that of



Kitchens are streamlined and some even have TV. Oven, broiler and refrigerator are built into the wall at left in this model



Above is one example of the corridor style of kitchen design, while below is a U-shaped style with work space on both sides

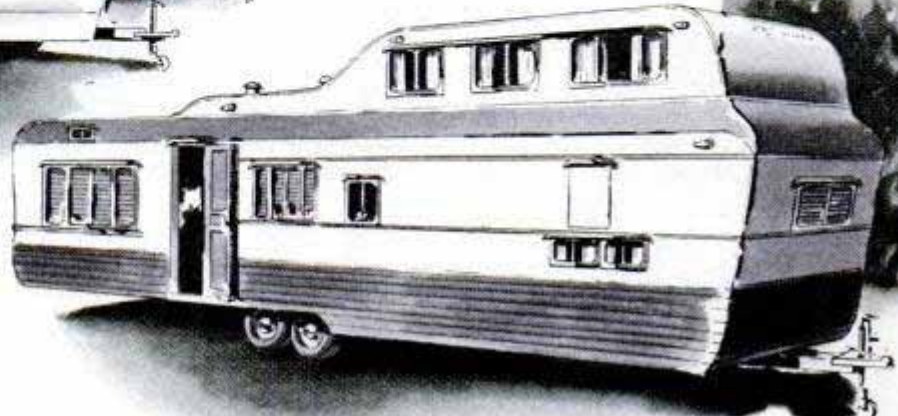




National's 44-footer features functional, modern Raymond Loewy design. It is all metal. Left, the 28-foot Lighthouse Duplex has an upstairs bedroom



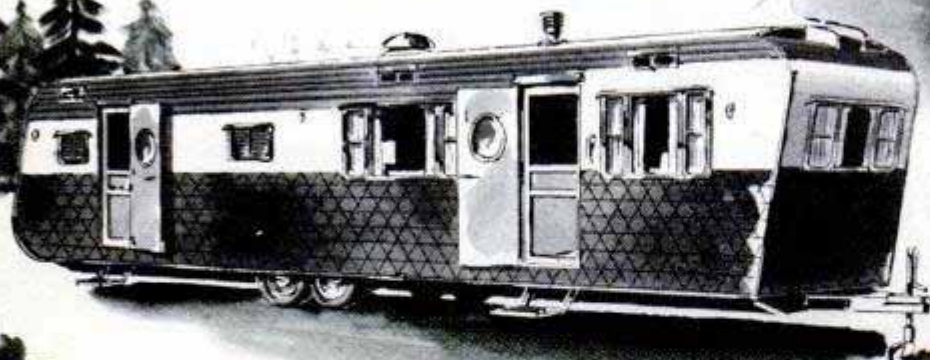
Ventoura's two-story coach, right, is 41 feet long, 12 feet high. It has two upstairs bedrooms, one downstairs



Below, Trotwood's 22-footer is easy to haul—an ideal trailer for the wanderer



Above, Spartan uses airplane methods to build a strong, streamlined trailer with large picture windows front and rear. The sides are riveted aluminum



Left, a 41-foot Liberty like the one used by the author and family. It has a vented attic for better insulation. Below, the Overland Twin Liner—a 50-foot trailer that splits into two small units



FOSTER'S

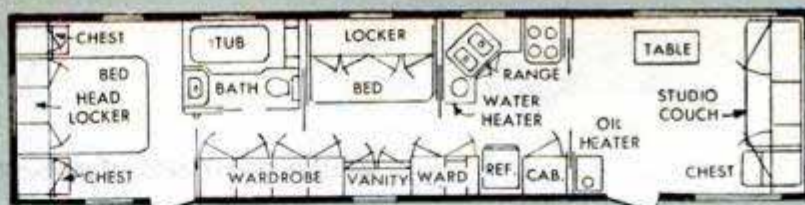
many small homes today. And what is more, you get furniture as well. All you have to buy are dishes and linens and you can move right in.

Of course, you want a modern bathroom and kitchen. You get them in a trailer. The bathroom of today's trailer has a normal-size bathtub, a wash basin, a flush toilet (which may have a garbage-disposal unit incorporated in it) and a standard medicine cabinet. The kitchen has more cabinet space than the average house kitchen. It has an automatic range, a refrigerator, exhaust fans, electric water heater and streamlined sink. Some even have freezers, automatic laundries and other extras.

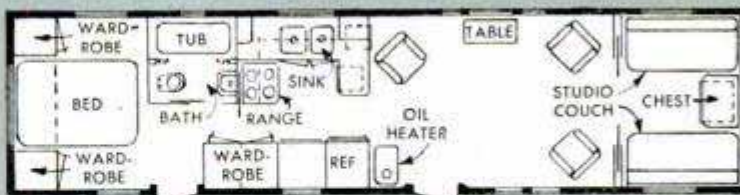
Trailer heating is another field where improvements have been made. Forced hot-air heat is standard. Fresh air is brought into the trailer from the outside and heated before being discharged into the rooms. The air inside is always fresh even if the windows are kept shut. Heating ducts run under the floor, warming it so that it is comfortable to your bare feet in winter and also adding a radiant-heating effect.

In summer, the insulated roof and sidewalls keep the trailer as cool as the average house. There is

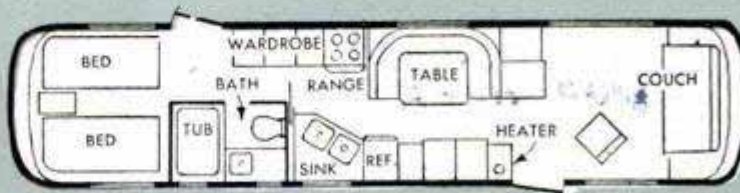
Column at right shows a representative group of floor plans. Below, cutaway of double-deck, three-bedroom Ventura trailer



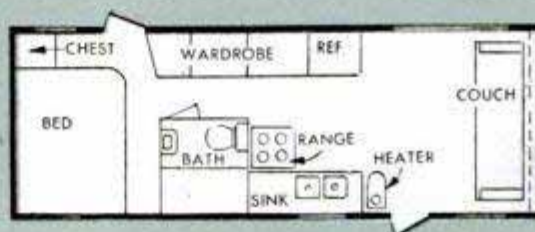
Liberty's 41-footer uses the conventional two-bedroom layout



Prairie Schooner builds a 37-footer with a bedroom at each end



Spartan's twin-bedroom 37-footer has a big dinette, roomy bath



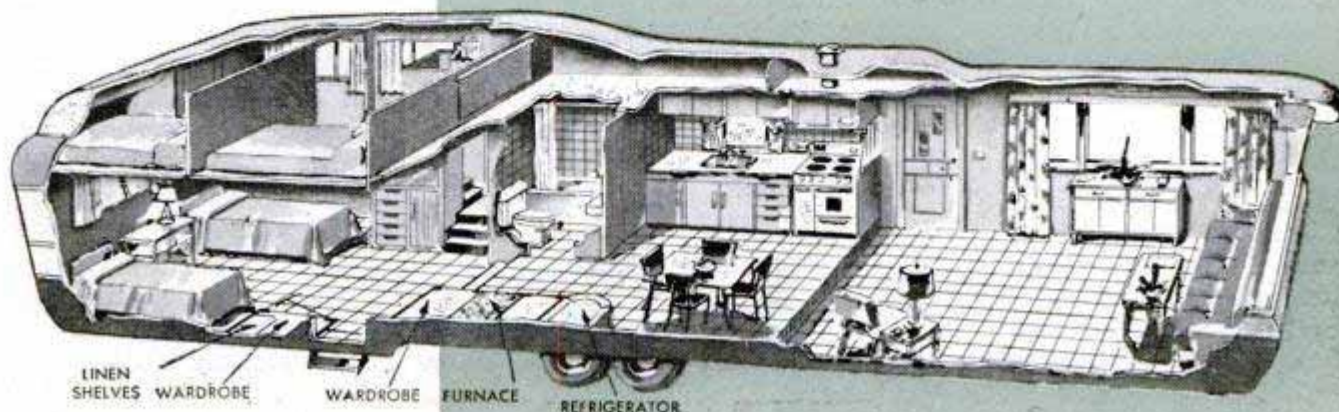
Stewart's compact 27-footer trailer has a full bath, one bedroom



Boles-Aero 22-foot travel trailer uses shower stall as bathroom



Tour-It's 15-foot model is compact, designed for vacation trips





DINETTES

Duo 43-2

Dinettes are getting increased attention in mobile homes these days. Eating in the living room is on the way out. These four examples show how manufacturers are providing adequate dining space in and near the kitchen

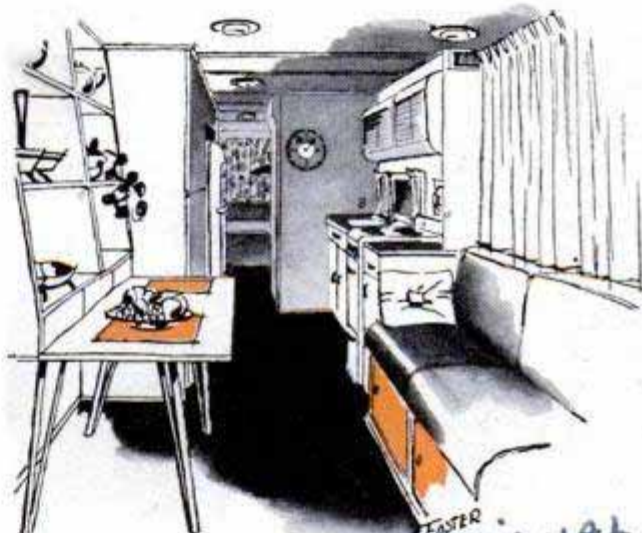


SEYMOUR PLATT

cross ventilation in every room and the slightest breeze keeps you comfortable. If you park your trailer where it is extremely hot, you can air condition it at a fraction of the cost of air conditioning a standard house. In some models, the air conditioners are built into the furniture. In others, the units are mounted on the roof or window.

Living rooms are as handsome as those in the newest homes. The only way they differ is in width. All are a standard eight feet wide. Some run up to almost 20 feet long. Wall-to-wall carpeting is common. Built-in television sets are also popular this year. Picture windows are standard and in parks like Parsley Park in Florida there is good reason for having such a window.

There once was a time in trailer history when the living room doubled as a bedroom and dining room. You opened a studio couch and went to bed. In the morning you pulled a table out of the wall and ate breakfast, all in the same room. It's different to-



NATIONAL

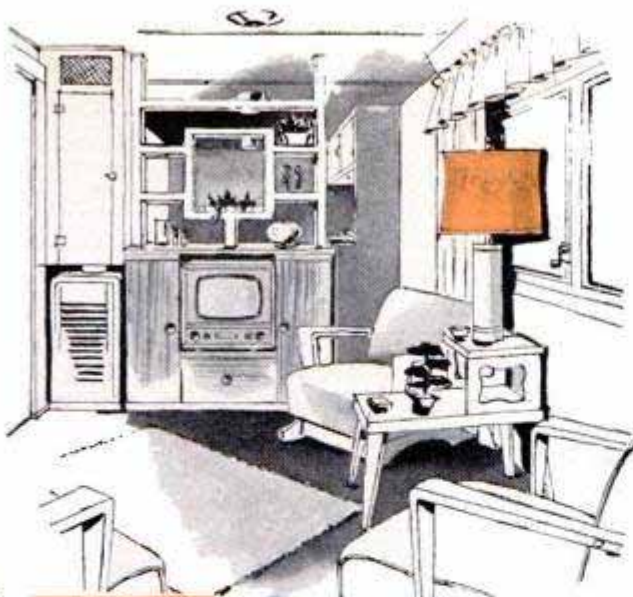
day. Trailers still have sofa beds, but they are usually reserved for guests. Normal today is a large master bedroom with a full-size double bed. Many trailers have second bedrooms, some even have a third.

Dining alcoves, rooms or built-in breakfast nooks are standard in most models now.

Just about essential for the permanent trailer dweller is a nonmobile room called a cabana. This can be lush or modest. It is a large, enclosed room built adjacent to the trailer. When you leave, you sell it to the trailer-park operator who rents or sells it to the next customer. Some of them are put together with bolts and can be taken down when you move and set up at the next stop.

The cabana is the social room of the trailer. Cooking, eating, bathing and sleeping are done inside, but entertaining and relaxing are done in the cabana.

What about pulling a trailer over the



LIVING ROOMS

PLATT-?



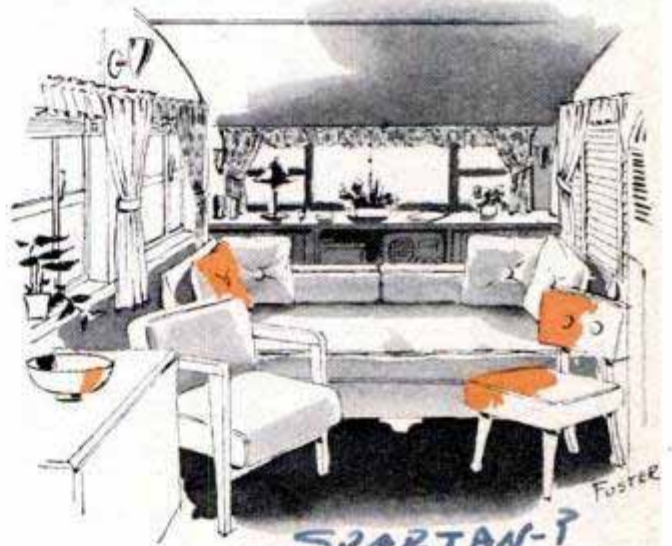
1607 WOOD CHALET 21 FT.

Living-room designs are fairly standard. The eight-foot width limits furniture arrangement. The sofa is usually placed across the front end. Built-in television is common. Accordion walls are an innovation

SCHULTZ CORP.
1830 SO. MAIN, BURLINGTON, VT.



SCHULTZ



SPARTAN-?

Below, trailers became real homes when the bathroom was added. Here, the bath is alongside the bedroom

highway? Aren't these 40-foot "monsters" as hard to handle as a freight car? Owners say not. After you have been towing one for a few hours, you almost forget it is behind you. Or, if you wish, you can forget it completely and hire a hauling company to pick up the trailer, pull it to your next stop and set it up ready for you to arrive at your leisure. You don't even have to own a car to be a trailerite today!

If you intend to spend a lot of time on the highway with your trailer, you'll do well to consider a small, vacation model. These come in sizes from 12-footers up to 22-footers. They are not mobile homes—they are camps on wheels. Usually they have no bathrooms, but all the other conveniences are there.

One trailer manufacturer has found a novel solution to the problem of the vacation trailer. He builds a trailer in two sections. At your home location you couple

(Continued to page 230)



BATHROOM

PEERLESS MFG. CO.
4300 BLUFFSON RD.
- WATKINS -

Oversize Camera Produces Large Photograph in One Minute



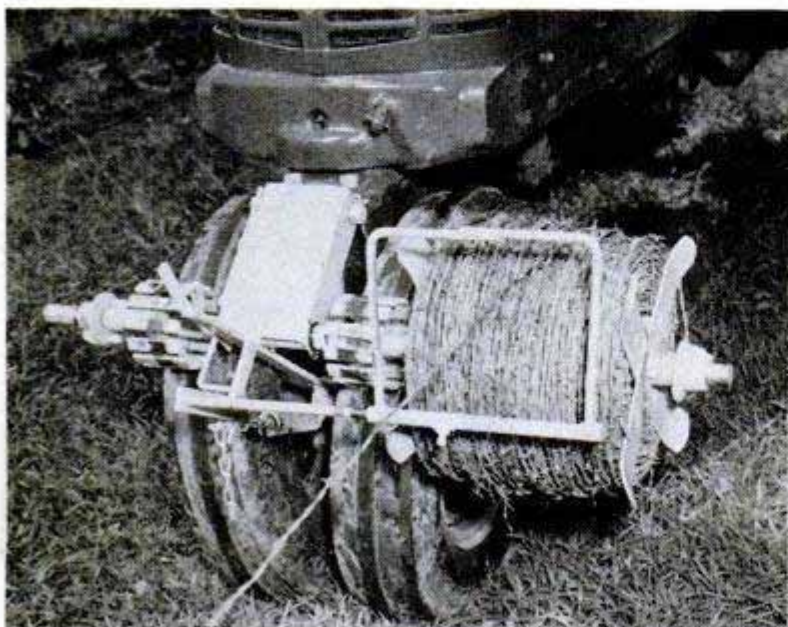
Weighing 40 pounds, a huge working model of the Polaroid Land camera makes a 9 by 8-inch photograph in one minute. Built to use the 20-exposure roll film developed for Air Force aerial photography, the oversize camera is for exhibition purposes only. The same type of film and developing system is used as on the smaller model after which it was patterned. Carefully scaled up from its smaller counterpart, the camera measures 20½ inches high and 11½ inches wide. The film develops within the camera as it advances through the self-contained chemicals to emerge as a positive print.

V-Shape "Boat" Puts Concrete Lining Into Irrigation Trenches

Irrigation ditches are lined with concrete by a V-shape "boat" which lays and packs a uniform coating of concrete as it is pulled through the trench. The ditch is presized with a V ditcher, the boat's hopper filled with concrete from a truck mixer, and the lining process begins. As the boat moves along, it packs the concrete tightly against the earthen banks to form an efficient and easily cleaned waterway. By raising or lowering the guides along the sides of the boat, different-size ditches are lined. The resulting trenches reduce seepage which builds up the surface water table.



Wire Winder Operates Off Tractor Tires



With a tractor attachment, a farmer can roll up or unroll fence wire. Handling either barbed or smooth wire, the winder has drive spools which are held by a spring against the tractor tires to maintain tension on the wire at all times. The farmer always drives the tractor forward, regardless of whether he is picking up or unwinding the wire. Available in styles to fit most tractors, the winder can be mounted on either the right or left side of the wheel. It will lay out or pick up as much as 80 rods of wire in three minutes. An antibacklash brake prevents the wire from snarling or kinking as it is handled.

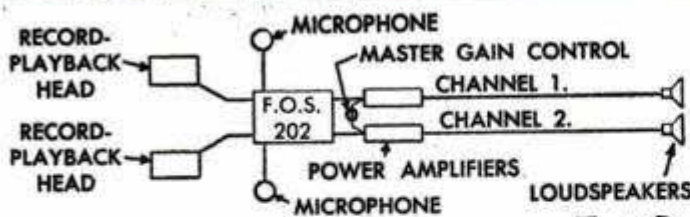
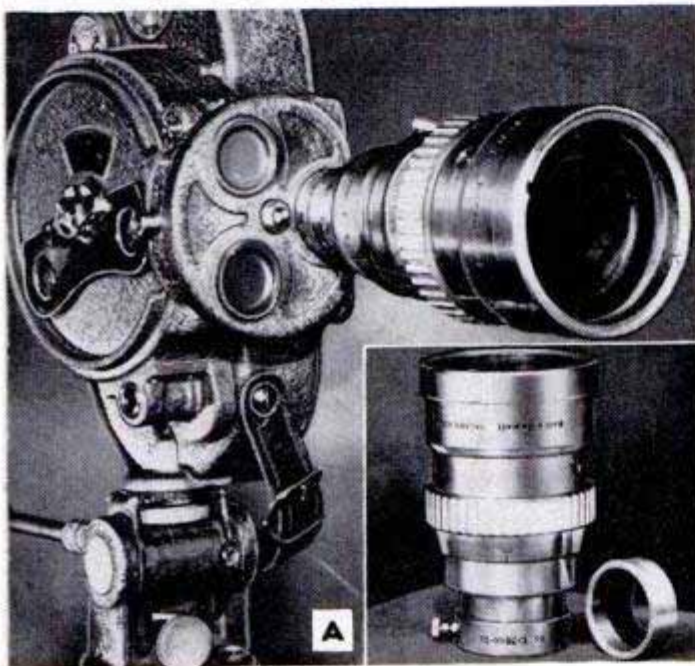
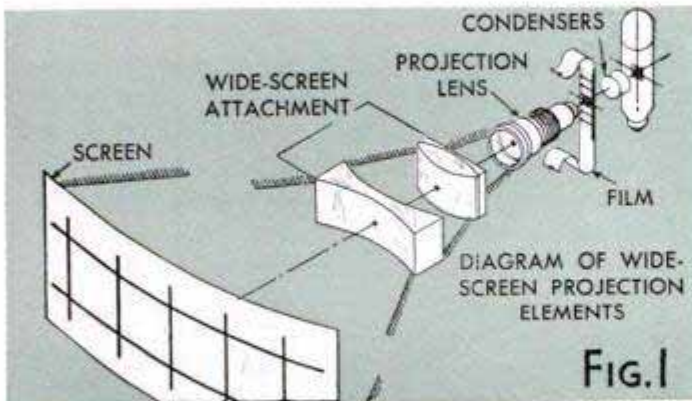
Wide-Screen 16-mm Movies

NOW YOU CAN HAVE wide-screen 16-MM movies with stereophonic sound in your living room, rumpus room, schoolroom or church. A single anamorphic or "squeeze" lens attachment, photo A, is used for both shooting and projecting the movies.

The projected picture, photo B, is of normal brilliance picture and fills a curved screen 2.5 times as wide as it is high. This expanse covers more nearly the normal field of vision of the human eye. The peripheral, or side, as well as the "straight ahead" vision of the viewer is brought into play, and a strong sense of depth and participation in the scene is created without the use of special glasses. The illusion is further heightened by three dimensional, or stereophonic sound, which emanates from the part of the screen where the action takes place.

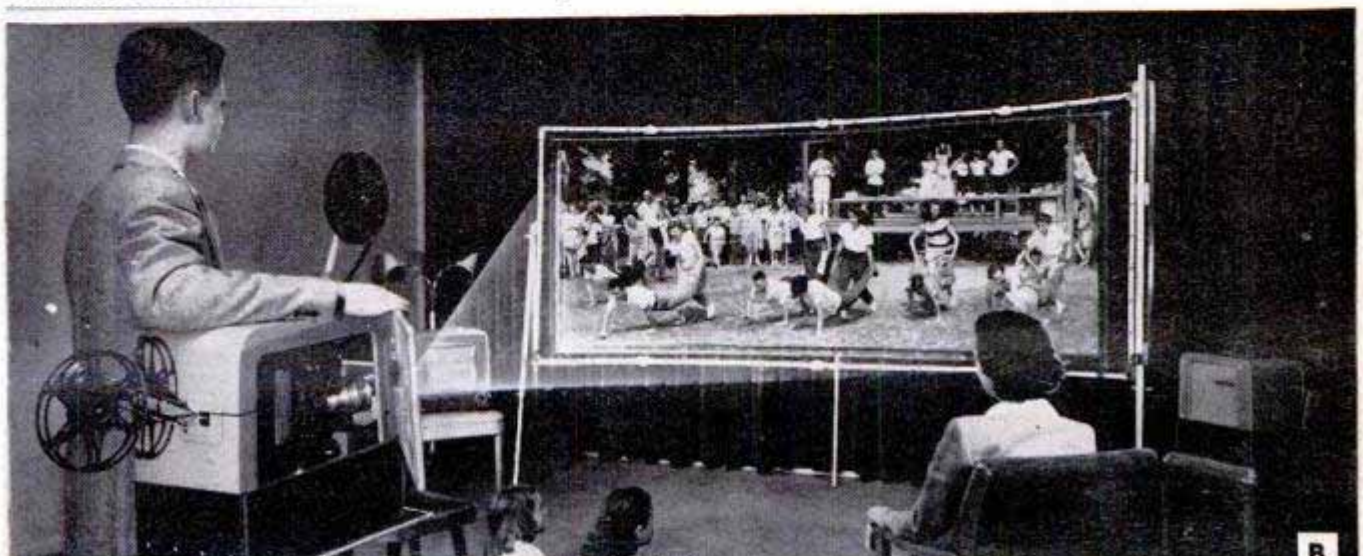
This Bell & Howell 16-mm. system is also intended for use in making industrial films. Diagram Fig. 1, illustrates how the "squeezed" picture spreads out during projection as it passes through the lens attachment, photo A.

To produce stereophonic sound, Fig. 2, a modified version of this firm's model 202 magnetic recording projector is used to record the magnetic sound tracks and project the film. Two different sound tracks are recorded side by side on a single strip of magnetic material bonded to the edge of the film. The sound is then played back through separate amplifier-speaker systems located at opposite ends of the curved screen.



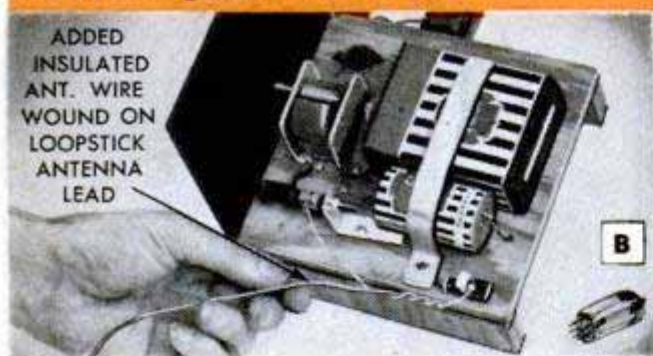
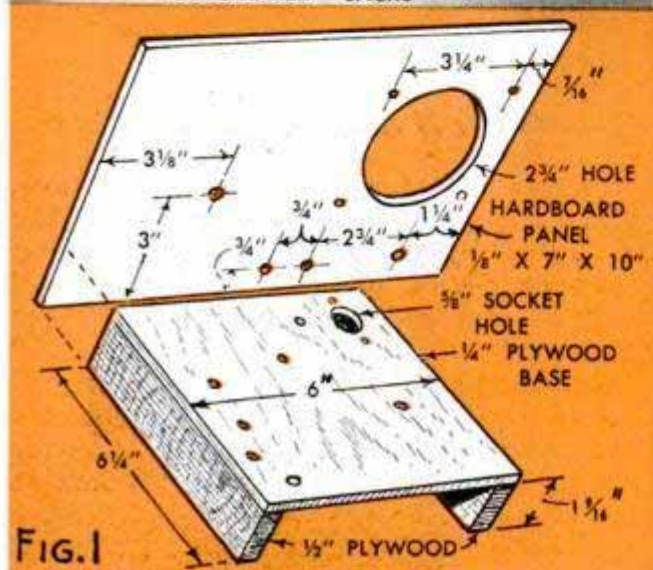
BLOCK DIAGRAM—PROPOSED STEREOPHONIC SOUND SYSTEM

FIG. 2



ONE-TUBE LOUDSPEAKER SET

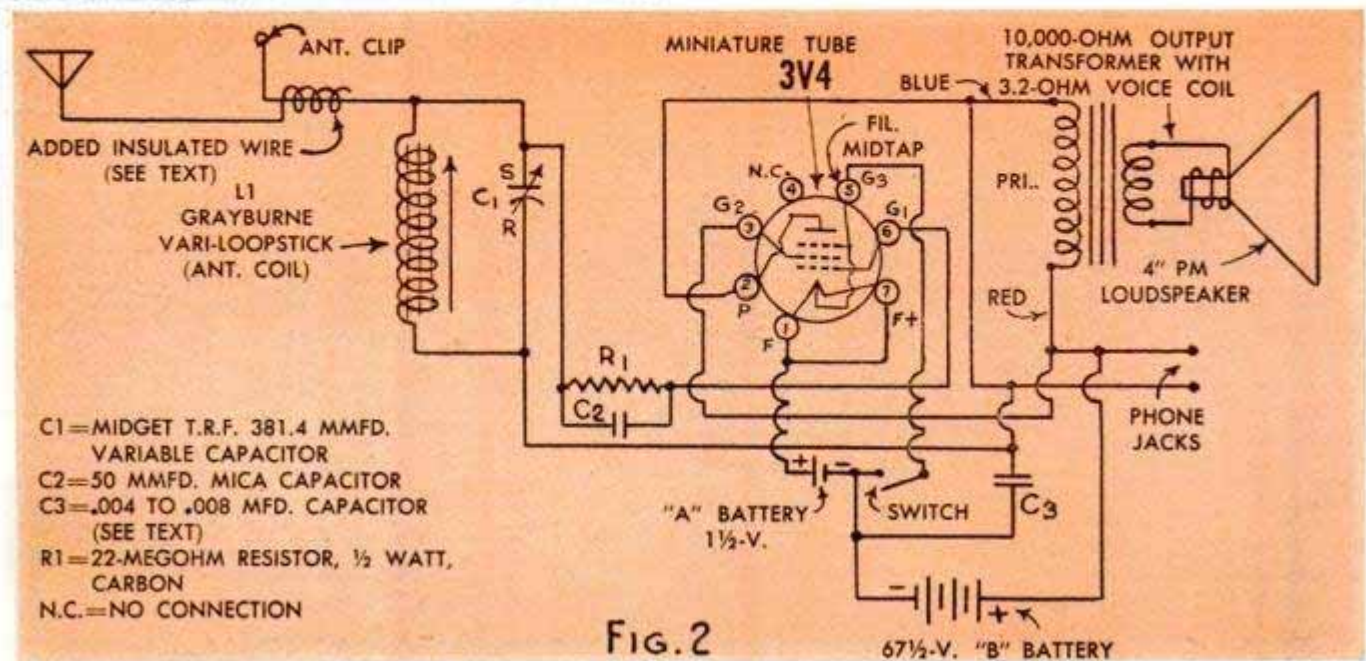
By Lothar Stern



SAFE, SIMPLE AND SENSITIVE are the words which best describe this one-tube receiver designed especially for junior radio experimenters. It provides sufficient volume to drive a loudspeaker, and it employs only a few simple parts that are available from all radio-parts houses. Safety is insured by the use of dry-cell batteries; simplicity is achieved by the use of a wooden chassis and a hardboard panel. Sensitivity is the result of a simple but efficient circuit which provides maximum amplification from the radio signal present at the antenna.

This little one-tuber makes an excellent project for beginners, who can build it in one evening during the holidays. Only a few tools and a small soldering iron are necessary. A battery-operated broadcast receiver of this type can also be used as a stand-by receiver in the event of a power failure, or other emergency, which would make line-operated receivers useless.

All base and panel details are clearly shown in Fig. 1. If headphone reception alone is desired, the loudspeaker and the output transformer may be omitted, thus cutting the number of parts and cost to an absolute minimum if you happen to have a good pair of 2000-ohm headphones on hand. The plywood for the chassis base should not be thicker than 1/4-in. in order to permit the tube socket terminal lugs to protrude from the bottom for easy access when soldering circuit leads to them. Two small angle brackets are used to mount the variable-tuning capacitor (C1) on the chas-



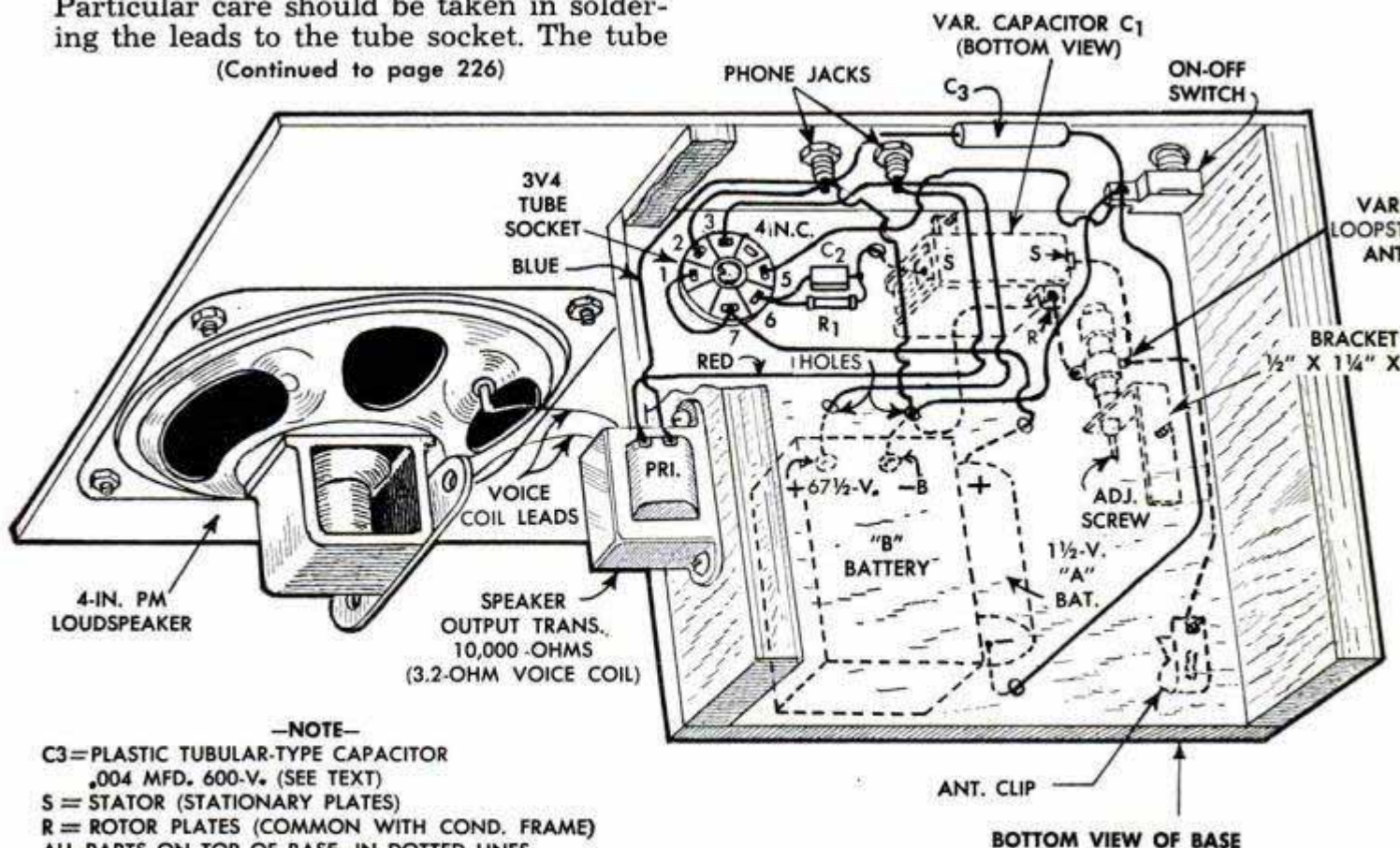
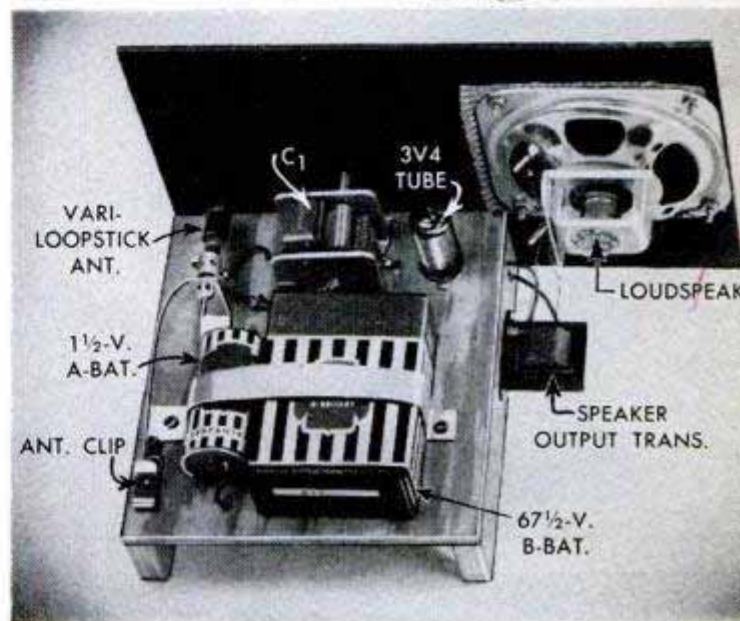
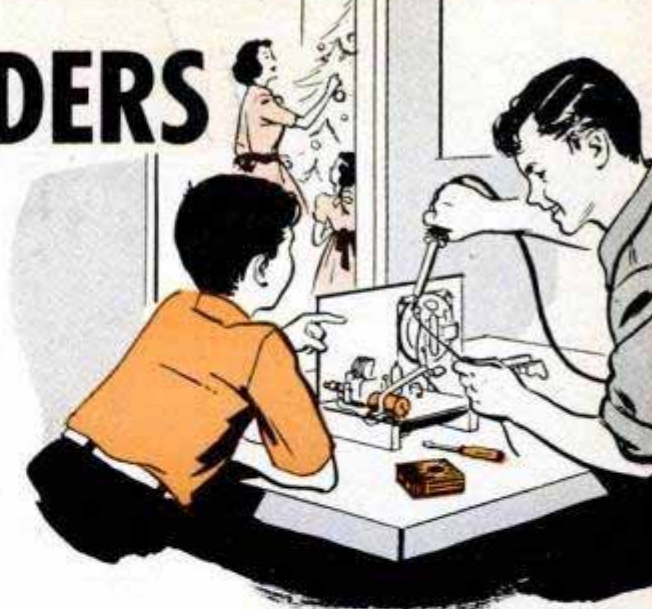
for JUNIOR BUILDERS

sis base. A soldering lug is placed underneath one of the capacitor-mounting screws as a common tie point. Brads or screws fasten panel to base.

Small holes drilled in the base permit passing the hookup wires from the components mounted on top of the chassis to those on the bottom. The schematic-circuit diagram is given in Fig. 2; the pictorial wiring diagram, Fig. 3, shows all parts in their relative positions and every connecting lead. Photos A, B, C, D and E should be studied carefully as they are close-up views of the completed set. Check each connecting lead with the pictorial wiring diagram and you will soon learn to double check your wiring with the schematic diagram as they both agree in every detail. Please note that there is a stator (S) lug on each side of variable capacitor C1. These lugs make the connection to the stator (stationary) plates. The rotor plates are common with the condenser frame. No external ground wire is required.

The bracket holding the dry-cell batteries was made from a strip of thin aluminum; any similar metal strip will do. The B-battery connectors are standard pressure-clip types; the connections to the 1½-V. A-battery are soldered directly to the negative and positive end terminals, the bottom of the battery case being the negative side. All wiring should be done with rosin-core wire solder, and No. 20 solid copper wire with push-back insulation. Particular care should be taken in soldering the leads to the tube socket. The tube

(Continued to page 226)



—NOTE—

- C3=PLASTIC TUBULAR-TYPE CAPACITOR .004 MFD. 600-V. (SEE TEXT)
- S = STATOR (STATIONARY PLATES)
- R = ROTOR PLATES (COMMON WITH COND. FRAME)
- ALL PARTS ON TOP OF BASE—IN DOTTED LINES
- N.C.=NO CONNECTION

BOTTOM VIEW OF BASE

Fig.3



A

TELEVISION TODAY

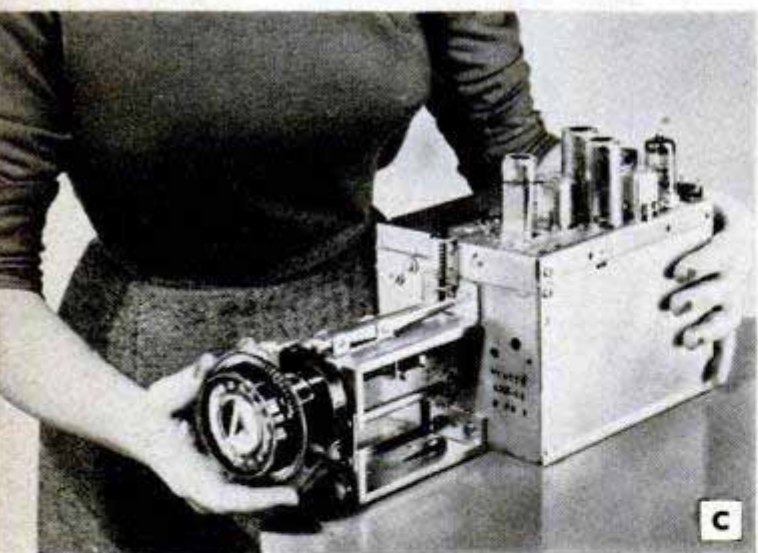
REMOTE CONTROL gives the young lady in photo A complete supervision over this advanced combination all-channel TV set, AM-FM radio and a three-speed record player from a single chairside-control signal unit. The picture console is at the right, the chairside cabinet at left is the remote-control signal unit and the cabinet at center provides generous record storage.

A device that has been employed extensively to protect pianos from dampness, is now available for the same purpose to television-set owners. It is claimed to cut down TV failures and service expense commonly encountered in damp locations. The method of installation is illustrated in photo B. It is claimed to give continuous protection without attention.



B

The TV-tuner unit shown in photo C is one of the latest to emerge from television's electronic laboratories. It is claimed to automatically bring in 16 TV stations, reaching into the ultra-high-frequency (UHF) channels. The new tuner is designed to meet the need created by the TV-station expansion program. The new tuner instantly "clicks" the receiver into proper alignment automatically for the best possible reception on all channels.



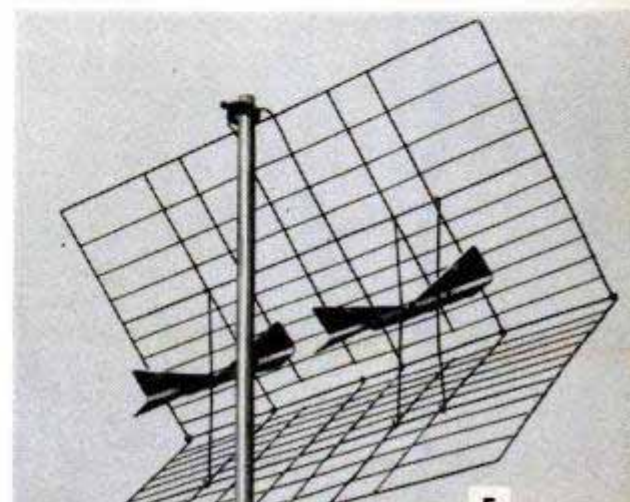
C

An idea for a demountable music wall is illustrated in photo D. A single speaker serves the TV set, built-in record player and receiver. There is also plenty of space for all three sizes of record albums. It may be made of fir plywood and finished in a neutral blend to harmonize with other modern room furnishings.

Now that UHF stations are beginning to join the established VHF television group in many localities, one of the uppermost problems is selecting the proper type of UHF antenna. In certain locations where receiving conditions present problems a high-gain UHF-antenna system will be necessary. The twin corner reflector antenna system shown in photo E is claimed to be an all-channel UHF array that provides up to 16 DB gain, owing to its stacked design.



D

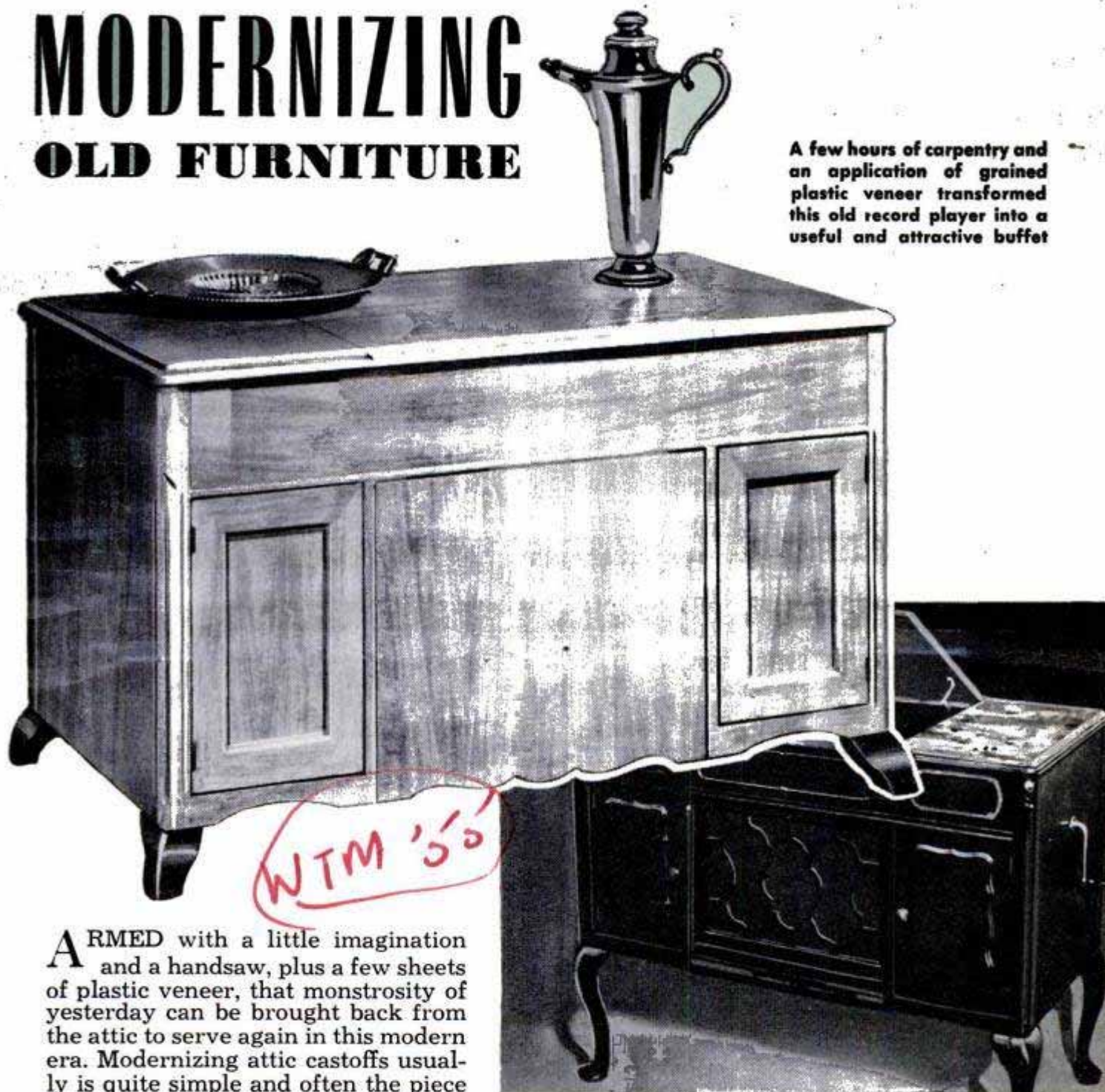


E

*Modern
Furniture*

MODERNIZING OLD FURNITURE

A few hours of carpentry and an application of grained plastic veneer transformed this old record player into a useful and attractive buffet



ARMED with a little imagination and a handsaw, plus a few sheets of plastic veneer, that monstrosity of yesterday can be brought back from the attic to serve again in this modern era. Modernizing attic castoffs usually is quite simple and often the piece can be made to serve an entirely different purpose than that for which it was originally designed. The old record player pictured above is a good example of the transformation that can be brought about in a few hour's time. It took only a minimum of careful carpentry and a facelifting with plastic veneer to produce the attractive serving buffet you see in the upper photo.

What happened? First, the player

"works" were removed and the cabriole legs sawed off at approximately the center of the upper curve, or knee. Then the open grille was covered with a piece of $\frac{1}{8}$ -in. plywood, the lower edge being scroll-cut in the pattern indicated. To continue the scroll across the full width of the lower rail, a shallow cut was made in the original rail below each door. Finally, the doors were reversed on the hinges in order to

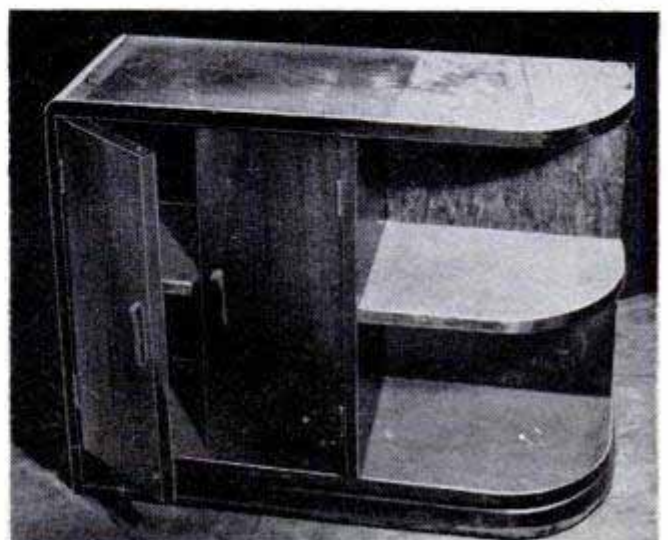
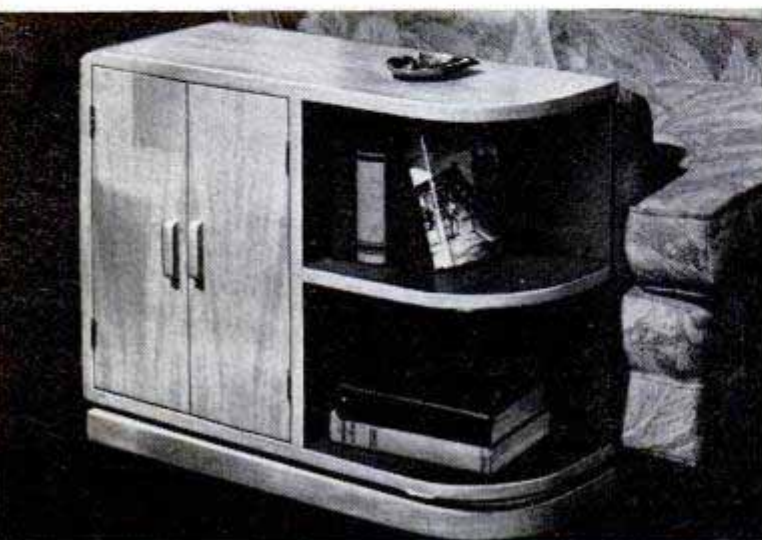


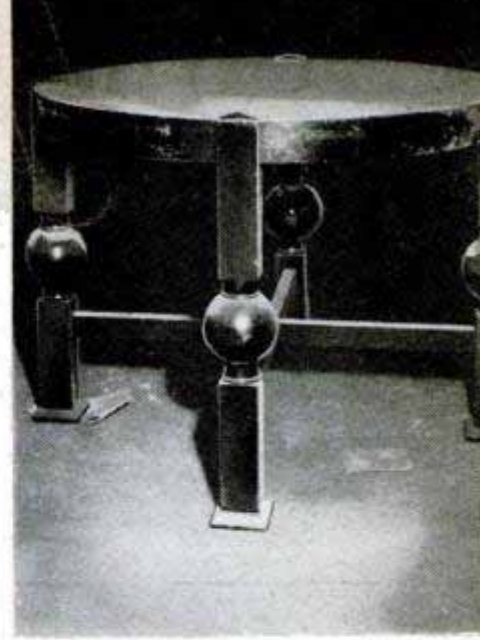
locate the panel overlays on the inside. Then all surfaces were sanded smooth in preparation for the application of the plastic veneer. Application of the veneer should be done carefully in accordance with the manufacturer's instructions. As a last step, the altered legs are coated with a semigloss black enamel.

Another similar project is pictured above in before-and-after views. In this case only

the backboard and the carved overlays were removed. A portion of the carved knee of each cabriole leg was cut away to provide for the application of a straight front rail, which is simply a narrow strip of plywood glued and nailed to the original rail. The top and legs were enameled in semigloss black. Only the doors, front rail and end panels are plastic-veneered. In this case the wood-grain veneer is applied so that the grain runs vertically on all surfaces. Select a light-colored veneer with a pronounced grain for this project.

Any design, new or old, can be restored to usefulness with plastic veneers. This end table is typical





Sawing off the legs and covering circular top with rose-colored marble veneer salvaged this old table

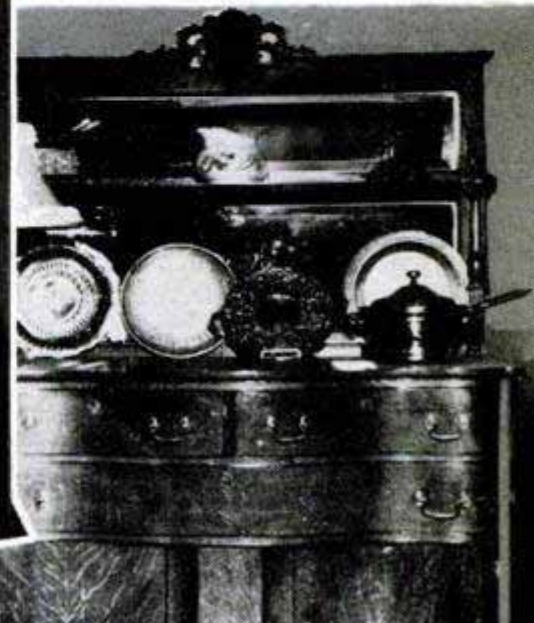
The modern end table pictured below required no structural changes, only a thorough cleaning and sanding to remove dirt and grime and smooth the old finish. In this case both the back and front are veneered as both are exposed when the piece is in normal use. This piece, although of modern design, is typical of many older pieces that will require very little change in design detail. Many older types of tables will lend themselves to modernization with veneer alone. Others require only minor changes in structural details which is easily done with household hand tools. In many instances, a leather or marble top combined with a careful use of enamels can transform an old table into one that is attractively modern and useful. A good example is the marble-topped coffee table

pictured above. The photo at the right shows what it was made from. The plastic veneer also comes in a beautiful Breche Rose Marble and this was used on the top and curved rail of the restoration you see at the left. The legs were sawed off and the short sections were coated with semigloss black enamel.

The old oak sideboard, or dresser, pictured below gets about the same treatment as the player cabinet on page 149 except that to accent the overhanging serpentine drawer section the veneer was applied with the grain running horizontally. The backboard, along with its mirror, was removed and the short cabriole legs were cut off just above the knees. All hardware was removed before applying the veneer. Then new pulls were attached and the rails, edges of the top and the corner posts were finished with a black enamel. The finished credenza is shown in the lower left-hand photo. ★ ★ ★

Photos and information courtesy Transvener Sales Co.

Minor alterations plus plastic veneer transform sideboard



Plastic Shoe Bag in Car Trunk Eliminates Packing Problem



A plastic shoe bag fastened inside the trunk of your car will eliminate the headache of finding room for shoes in suitcases when packing for a motoring trip. A length of curtain rod, or other rod stock, is bent to a U-shape. The top crossbar is just high enough to be held in place by two S-hooks fastened to the back support of the car seat. The flange ends of the rods are secured to the deck of the trunk. The plastic shoe bag is then hung onto the rods.

R. E. Hensley, Chico, Calif.

Lacquer Thinner Has Many Uses

Besides its intended purpose of reducing lacquer to desired brushing or spraying consistency, lacquer thinner also serves as a solvent of many uses. For example, paintbrushes, except those used with water-soluble paints, can be softened and cleaned by soaking them for a day or two in a closed container partially filled with lacquer thinner. Then the loosened paint is worked out with a wire brush or by stroking the brush against any rough surface. After this, the brush is rinsed in clean thinner. To re-use the solvent, store it in a tightly sealed container and, when the paint has settled to the bottom of the container, drain off the clear solvent. In addition, lacquer thinner used together with fine sandpaper or steel wool, is an effective rust remover. The solvent also is helpful

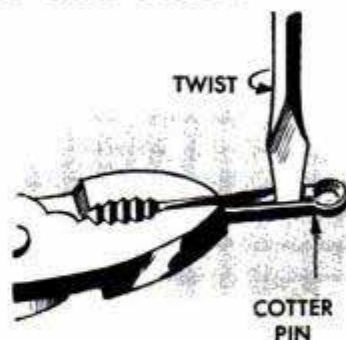
in loosening "frozen" machine screws or bolts. To do this, place a few drops of thinner on the threads and allow to soak for a few minutes, repeating if necessary.

Ralph E. Moore, Wenatchee, Wash.

Distorted Cotter Pin Reshaped With Screwdriver and Pliers

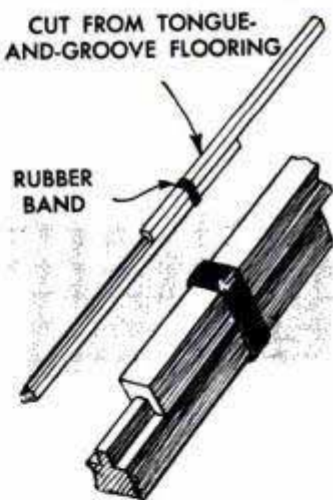
A cotter pin that has been distorted in removal, can be straightened again with a pliers and screwdriver. Firmly grasp the open end of the cotter pin with the pliers, insert the screwdriver blade between the arms and open them with a twisting motion. The ends of the arms are now close together and the pin easily can be replaced in the hole.

Andy Vena, Philadelphia, Pa.



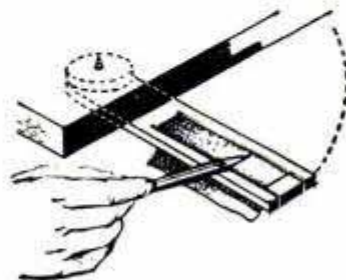
Long Extension Rule Improved From Tongue-And-Groove Boards

A length of discarded tongue-and-groove flooring will provide an emergency adjustable-extension rule for making long comparative measurements such as on masonry or excavation work. The piece of flooring is ripped down the center into two lengths which are fitted together, tongue in groove, and held with a rubber band cut from an old inner tube.



Pivoted Paddle Holds Sandpaper For Sharpening Pencils

Sandpaper for sharpening artist's and draftsman's pencils is kept at hand on a slotted panel that pivots out of the way under the drawing board. The paddle is made of plywood and slotted to hold the ends of the sandpaper. The latter may be replaced easily by slipping out the old piece and inserting a new one.



PLAYROOM

WTM '53

PHONOGRAPH

By Mrs. Henry Clark

SAVING wear and tear on the regular living-room radio-phono combination is only one feature of this playroom phonograph. What's even more important, it makes a wonderful Christmas present that will be used daily throughout the year. The playroom unit is simply an old-fashioned phonograph which is modified somewhat and installed in a new upright cabinet.

First, the phonograph mechanism is removed from the old cabinet. Player head, arm, pivot, throat and speaker are reused without change except for shortening the

The little girls, listening to their windup phonograph, below, find plenty of storage space in the modern cabinet for their favorite records and albums



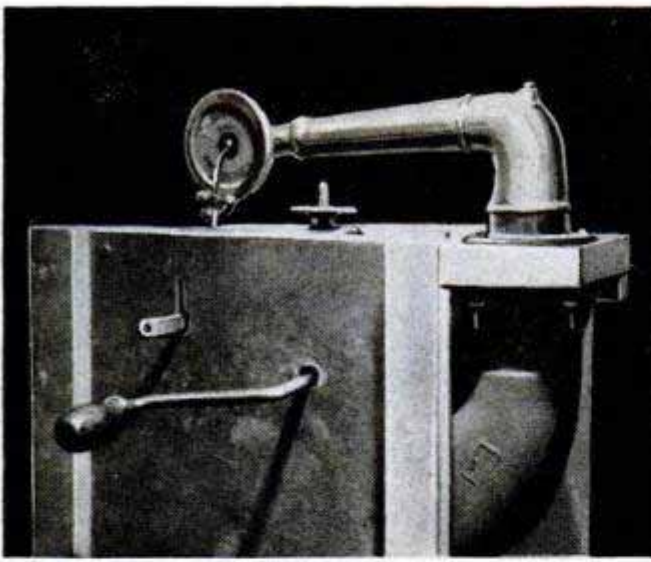
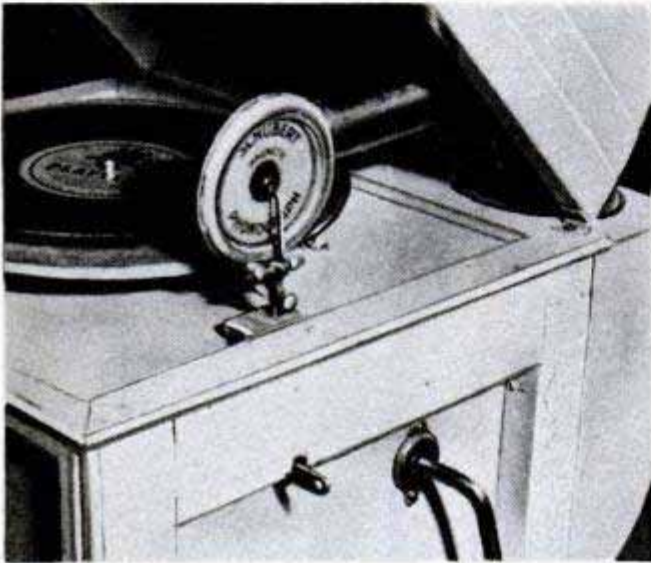
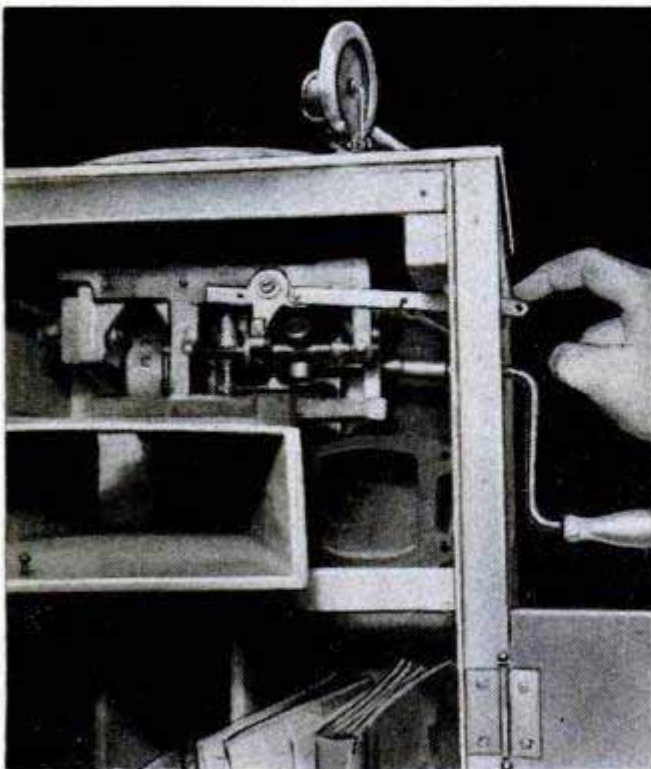


Photo above clearly shows speaker extension on back of cabinet. Player head, below, rests on rubber pad



When the lever arm is pressed into "stop" position, below, friction pad is forced against brass disk. Small block engages lever to hold it in place



speaker to suit the new cabinet. The original turntable, however, is discarded and replaced with a 1/4-in.-plywood disk.

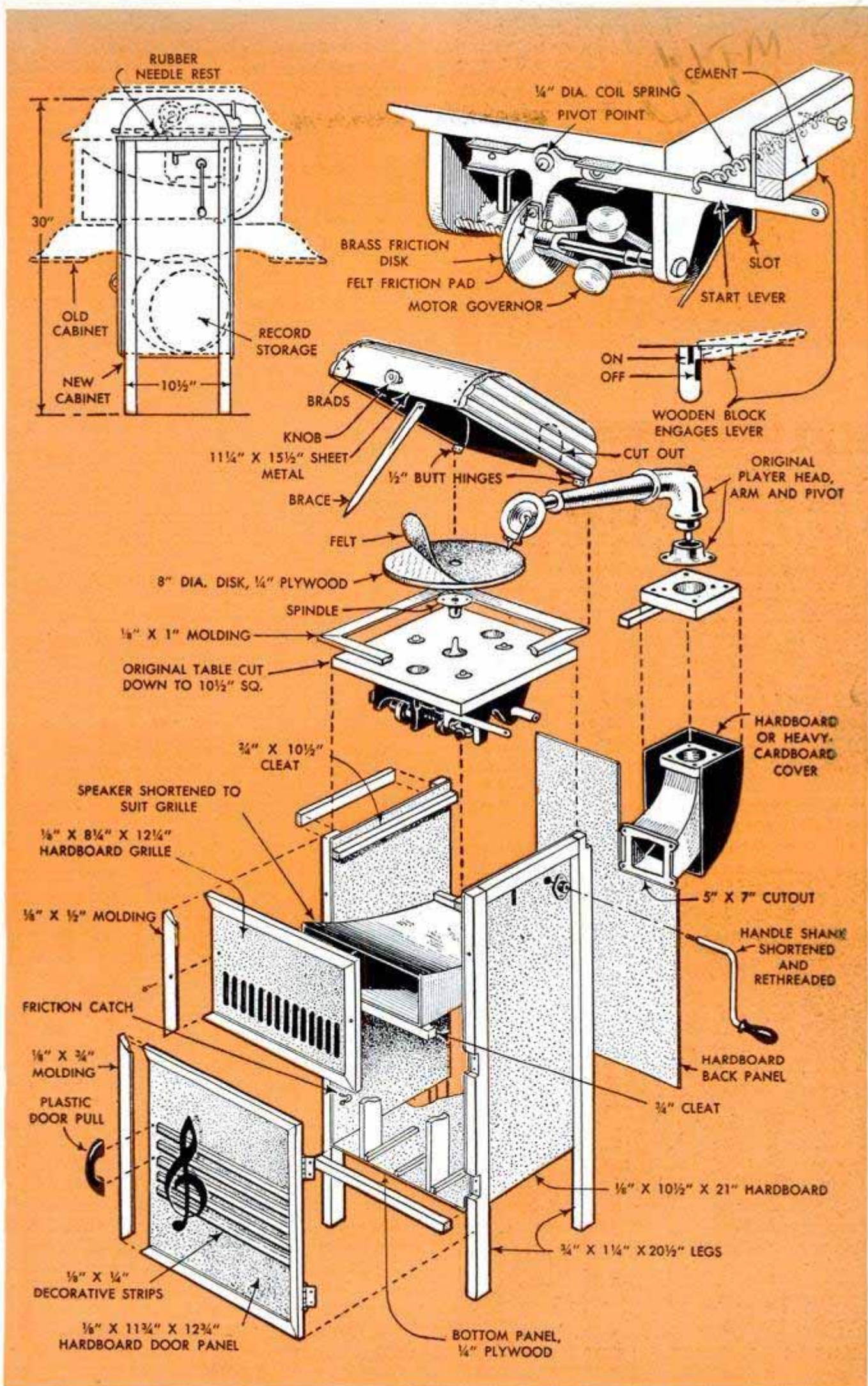
The spring motor, shown in the upper right-hand detail on the opposite page, is altered to make the original speed-control lever serve as a start-stop lever. The felt friction pad is adjusted to jam the brass friction disk when the lever is in the down, or off, position, thus stopping the motor. When the lever is moved to the up position, the friction pad is released from the disk to start the motor. Note in the details that a coil spring provides tension for the lever and that the end of the lever extends through a slot cut in the side of the cabinet. A small block extends beyond the edge of the slot to engage the lever and keep it in the down position.

The cabinet is built of hardwood applied to a wooden framework. The particular phonograph mechanism used may require varying the cabinet dimensions to a certain extent, but this can be done without difficulty. Begin construction by fastening the hardboard side panels to the legs, mounting the panels on the inside surface. The panel on the right-hand side of the cabinet is slotted for the stop-start lever and drilled to receive the motor-winding handle.

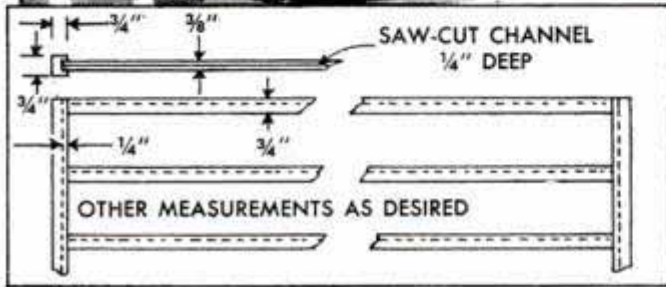
The sides of the cabinet are joined together with cleats which form the rests for the bottom panel and supports for the speaker. After the bottom panel and speaker have been installed, a slotted hardboard grille is mounted in front of the speaker and the record-cabinet door is hung. Both the grille and the door are finished with mitered molding, either 1/8-in. stock being used as an overlay or heavier stock being rabbeted for the edges of the hardboard.

The back panel is cut out for the speaker extension and the latter is hung from a wooden block which supports the player arm. This block is butted against the rear edge of the phonograph table and reinforced with cleats screwed to the underside of the table and the block. Additional support may be gained by notching both the rear edge of the table and the right-hand rear leg to take the inner edge of the block. The speaker extension is concealed with a hardboard or cardboard cover.

The phonograph table and motor are supported by two cleats fastened to the sides of the cabinet. A lid is made by nailing sheet metal over two wooden sidepieces as indicated and notched at the rear to clear the player arm. The hinged lid is supported in the open position by a wooden or flat-steel brace which is pivoted to the inside of the lid with a roundheaded screw. The cabinet door may be decorated with overlay strips, a jigsawed C-clef or other design and the cabinet painted. ★ ★ ★



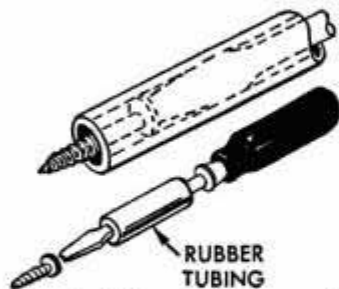
Christmas-Card Display Rack Adds Festive Touch



The cards you receive this Christmas can be displayed very attractively in the rack shown in the illustration. And the rack, festooned with holly and loaded with gay cards will add a festive, holiday touch to the room in which it is placed. The rack is made of $\frac{3}{4}$ x $\frac{3}{4}$ -in. stock, and is an easy one-evening project. A $\frac{1}{4}$ -in. deep saw cut is made in each of the crossbars and the cards are inserted in this cut. All the necessary dimensions are given in the detail.

E. E. Gearhart, Bucyrus, Ohio.

Rubber Tubing Holds Screw For Easy Starting



A small piece of rubber tubing slipped over the shank of a screwdriver will save time when it is necessary to drive screws in places that are difficult to reach. The tubing will grip the screw for starting, holding it securely against the screwdriver blade until it is driven in.

John Comstock, Wellsboro, Pa.

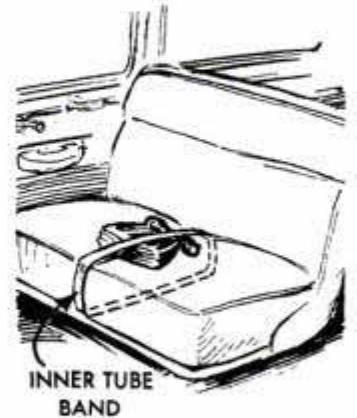
Repairing Toaster Elements

When the wire or ribbon element of a toaster or similar electrical appliance breaks, place the broken ends together,

sprinkle a little borax on them and turn on the current. The resulting electrical spark will fuse the two broken ends and the element will be restored to operation.

Inner-Tube Strap Holds Articles On Automobile Front Seat

Purses, gloves and other articles a driver habitually places on the front seat of the car can be kept on the seat and within reach if tucked under a rubber strap. The strap is made by cutting around the circumference of an inner tube



which is placed around the seat cushions. When not in use, the band may be left in position since it does not interfere with the use of the seat.

Proper Mixing of Paint Important to Good Job

The mixing of your paint before starting on a job can well make the difference between a poor paint job and a good one. If this step is hurried, and the heavy pigments at the bottom of the can are not thoroughly mixed with the surface liquid, it is possible that unsatisfactory coverage and



slow drying will result. To be sure of getting full value from your paint, follow these simple mixing steps: 1. Pour surface oil into an empty, clean container. 2. Stir up pigment thoroughly from the bottom. 3. Pour oil back gradually, stirring as you do. 4. Stir and pour from can to can.

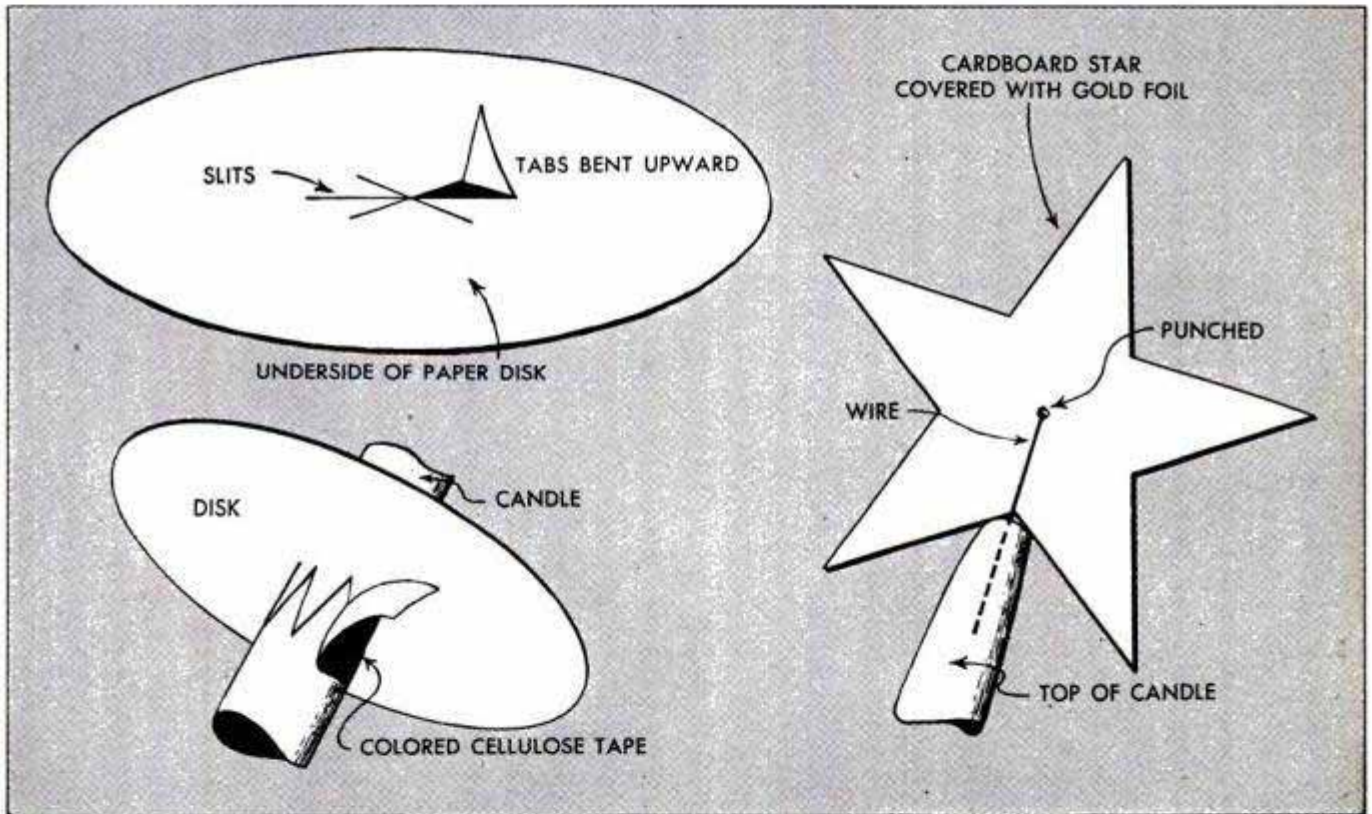
Clean Soiled Playing Cards

Soiled linen playing cards can be cleaned by wiping them with a cloth which has been dipped in soap suds and wrung almost dry. When the dirt has been removed, dry the cards carefully. Playing cards made of other materials may be cleaned by placing in a pie tin and sprinkling liberally with talcum. Then rub them with a soft dry cloth.—Blanche Campbell, Las Vegas, Nev.

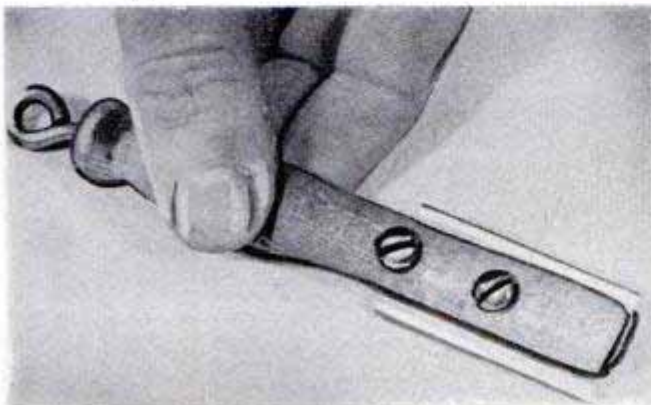
Candles to Christmas Trees With Paper and Foil

Shimmering Christmas-tree table decorations that reflect the holiday spirit are easily made from ordinary candles. The smallest of the three trees shown is shaped around a birthday-cake candle. Circles cut from paper doilies are pasted on five disks cut from colored-paper napkins, each disk being $\frac{1}{4}$ in. smaller than the one below it. The disks are slit as shown in the detail, slipped over the candle and fastened with cellulose tape. The star on top of the tree is cut from gold foil glued to cardboard and fastened to the candle with a short piece of stiff wire. The two larger trees are made in the same manner as the small one, the larger disks varying $\frac{1}{2}$ in. in size. Colors can be alternated for a more interesting effect and stiff paper used to support the disks and doilies.

Helen Lemberger, Chicago.



Clothespin Provides Handle for Razor Blade



Fitting an ordinary razor blade with a clothespin handle provides a handy cutting tool that is useful both in the home and in the shop. Two holes are drilled in the clothespin for small bolts. One passes through the center of the razor blade, and the other engages the notch at one end. The cutter is stored out of reach of inquisitive youngsters by driving a small screw eye into the end of the clothespin and hanging it from a nail.

John J. Rea, Urbana, Ill.



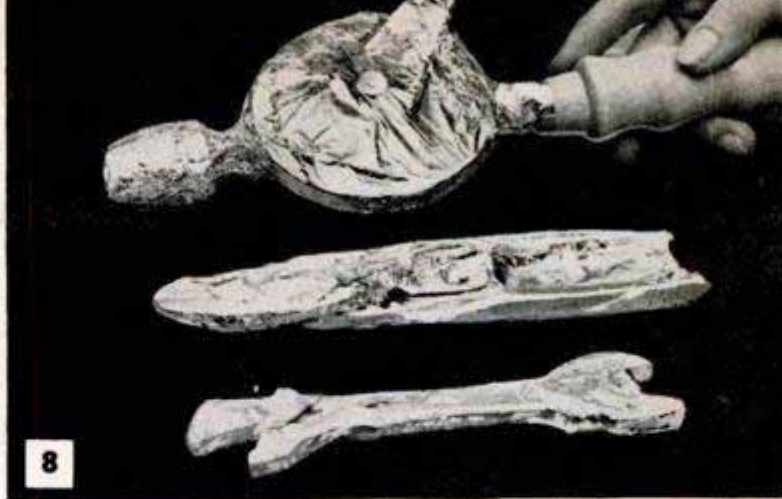
FOILING HOUSEHOLD CHORES

WITH a surprising number of new-found uses around the home, aluminum foil is fast becoming commonplace. Although you're no doubt familiar with this versatile product, here are some practical applications of aluminum foil that may not have come to mind. An old stand-by, 1, is wrapping yams, squash and other vegetables for baking. They can be served right in their foil wrappers. Lining pots, pans and oven racks with foil, 2, saves scouring after frying or broiling. In the bedroom, dresser tops can be protected from spilled perfume by slipping foil under doilies, 3. To keep odors of onions, cheese, fish, etc. from permeating the





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refrigerator, wrap the food in aluminum foil, 4. Damp washcloths and toothbrushes may be wrapped in the foil for packing, 5. Silverware can be brightened by boiling in a water-filled pan, the silverware touching a piece of foil placed in the bottom of the container, 6. Foil wrapped around medicine-bottle caps prevents dangerous mistakes, 7. It also can be used to keep small tools from rusting, 8, the tools being thoroughly oiled before wrapping. Left-over foods retain their moisture and flavor when wrapped in foil, 9. Foil also can be used to decorate coat hangers, 10, and make novelty candle holders, 11. Paper plates lined with foil form neat throwaway ash trays or coasters, 12. The foil provides novel gift wrappings, 13. ★ ★ ★



12



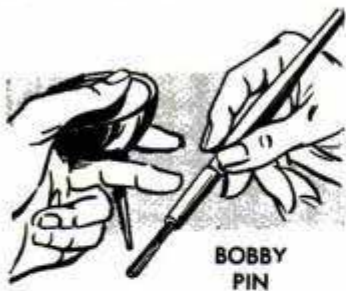
13

Saw Blade Hold-Down Aids Glass Cutting



The biggest problem when cutting glass is to keep the straightedge from slipping, so that a single pass can be made with the cutter to assure a uniform score. When the homeowner has a number of pieces of glass to be cut, this can be simplified by attaching a saw blade to the wall or backboard of his workbench, just high enough to allow placing the end of a yardstick under it. A blade from a bucksaw is suggested in the illustration, but a common handsaw held by cleats will serve as well. With the glass placed on the bench and the end of the yardstick held under the blade, pressure on the opposite end of the stick will force it against the teeth of the blade and keep it from slipping. This allows the workman to hold the stick with one hand, while making a single sweep with the glass cutter.

Oiler Made From Bobby Pin



it can be applied. The oil is then released by tapping the end of the penholder.

Rust Preventive for Tools

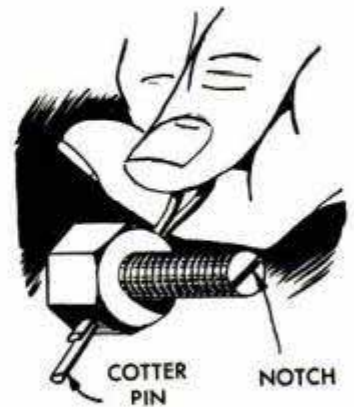
An effective rust preventive for tools to be stored, or tools that are seldom used, can be made by mixing paraffin, 2 oz., in carbon tetrachloride, 1 pt. The mixture is applied with a brush and, when dry, leaves a waxlike film on the tool that will not attract dust or grime as oil or some other

preventives do. Also, it is less messy to handle and easy to wipe off when the tool is to be used again.

Harvey Muller, Danboro, Pa.

Cotter-Pin Holes Aligned Quickly By Notch Filed on Bolt

A notch filed in the end of a bolt will considerably lessen the difficulty of aligning a cotter-pin hole in the nut. File the notch parallel to the cotter-pin hole in the bolt. When the nut is tight, place the cotter key in the hole and check its

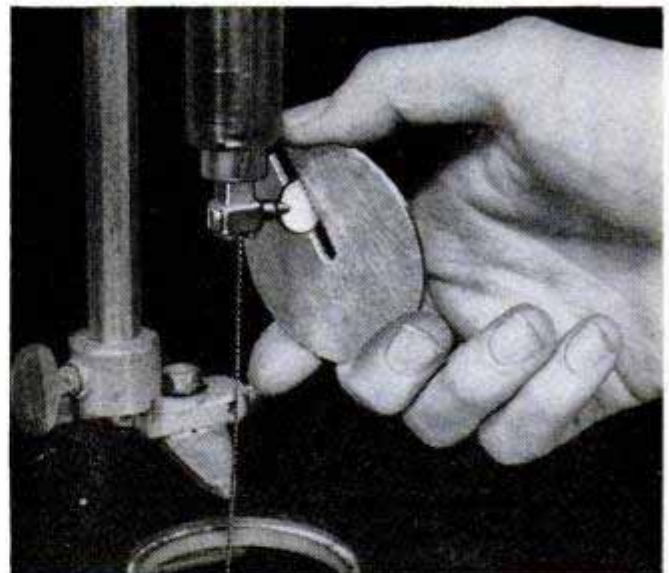


position against the notch. This will tell quickly how much the nut must be turned to bring the holes in alignment.

Table Insert Used as Wrench To Adjust Blade Chuck

The slotted insert on a jigsaw table provides a handy wrench for tightening the blade chuck screws. The insert is convenient, since in most cases, it must be removed when the saw blade is changed. A light twist is sufficient to tighten the screw.

Richard Hanscom, Elmhurst, Ill.



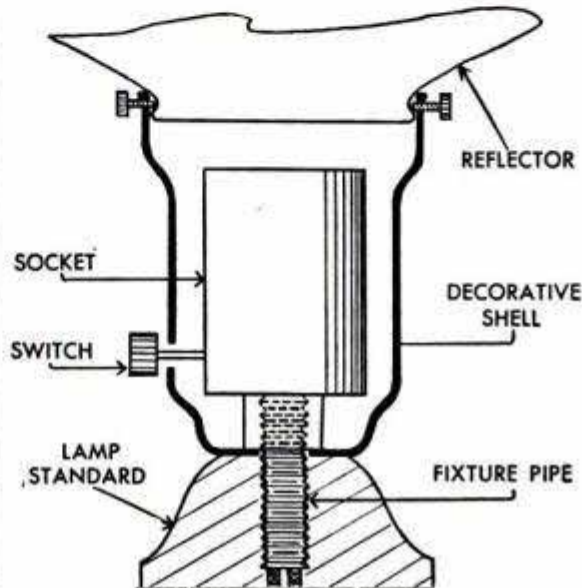
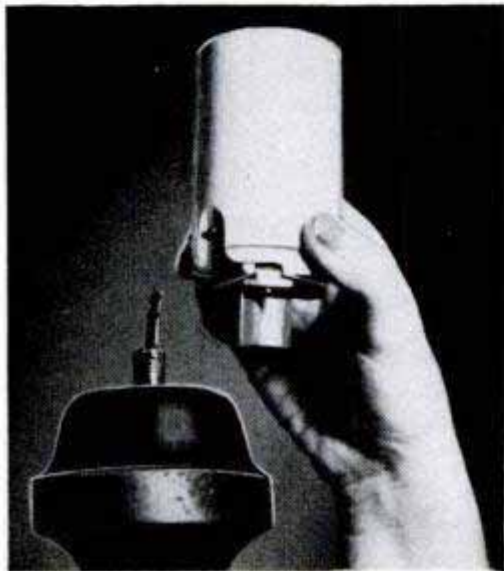
Sharpen Rasp with Grinding Wheel

When a coarse rasp becomes dull it can be sharpened with a hand grinder. Hold the grinder at an angle of 20 deg. to the file and sharpen one row of teeth at a time, being careful to grind very little from the top of each tooth. The wheel is held at an angle to provide clearance for the teeth.

Charles Homewood, Los Angeles, Calif.

FLOOR LAMP BECOMES MODERN TORCHERE

An old-fashioned floor lamp with its wide, fringed shade and poor lighting characteristics is easily converted to a modern indirect-lighting torchere with little cost and labor. The first step is to disassemble the old lamp, removing the shade and socket. Usually there will be a length of fixture pipe extending above the lamp standard. This must be cut and rethreaded or replaced with a shorter length cemented in place, leaving just enough threads exposed for screwing on the new socket. It is suggested that at this time the cord be replaced, using the old cord to pull the new one through. Then a 3-way socket and decorative shell are screwed on the pipe, their size depending on the size of the lamp standard. A translucent reflector bowl is fastened in place, a bulb installed and the lamp is complete. The lamp standard may be refinished in a lighter tone to match the modern motif by removing the old finish and bleaching the wood with a prepared bleach.—Max Alth, Yonkers, N. Y.



Self-Supporting Shelf Brackets Made of Welded Pipe

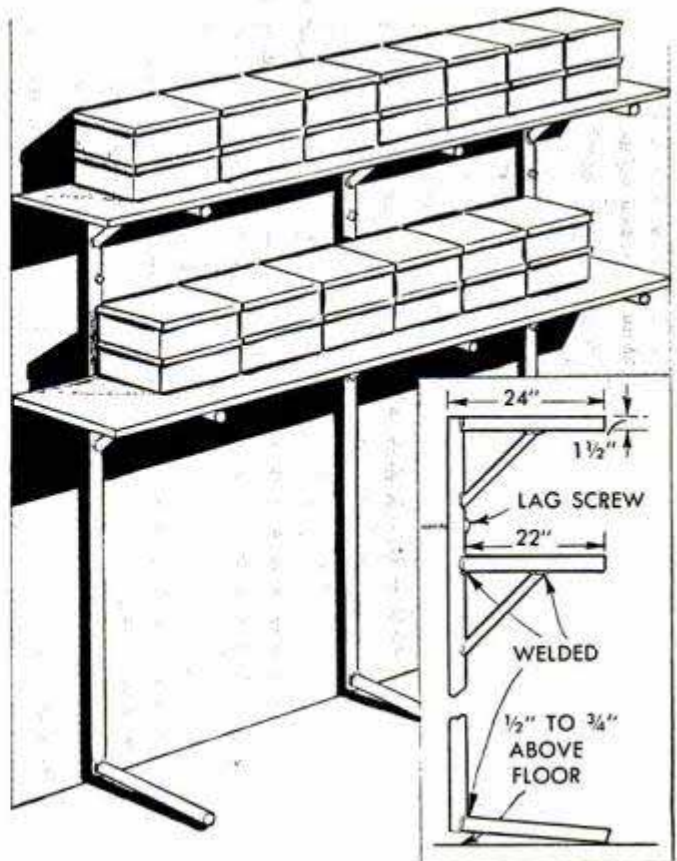
Self-supporting shelf brackets for use in storerooms and other places where the walls are not adaptable to ordinary shelves, or are not strong enough to support anything but a light load, can be made by welding 1½-in. pipe as shown in the detail. The original brackets were made for 1 x 12 shelf boards, but could be of any convenient size. The brackets are fastened to the wall at one point on each upright, just under the top-shelf brace, using a lag screw or a toggle bolt. This fastening serves only to keep the shelves from swaying, as the brackets are propped against the wall and held in position by the "toe."

G. R. Slaughter, Winnipeg, Man., Can.

Tape Holds Small Parts

Place small parts which are removed during a repair job on a strip of cellulose tape which has been attached to the workbench with the sticky side up. This will prevent them from being lost and also will indicate the order in which the parts were removed, thus facilitating reassembly.

Howard E. Moody, Upper Jay, N. Y.

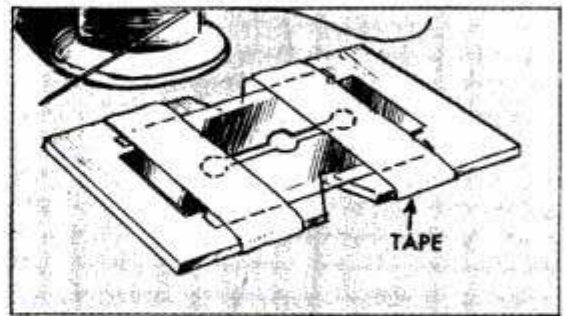
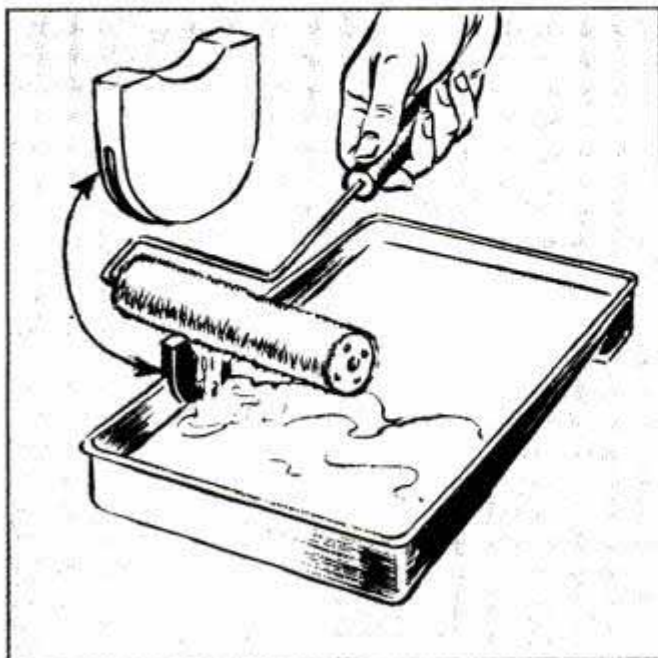


Solving HOME PROBLEMS



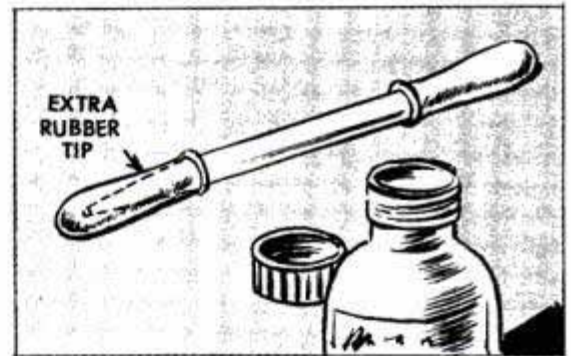
CHILDREN LEARN to operate slide fasteners at an earlier age if buttons are stitched to tabs of fasteners. Button gives youngster larger finger grip

WIPING EXCESS PAINT from roller is simplified by slotted wooden block slipped over side of pan. Edge of block is cut to conform to shape of roller

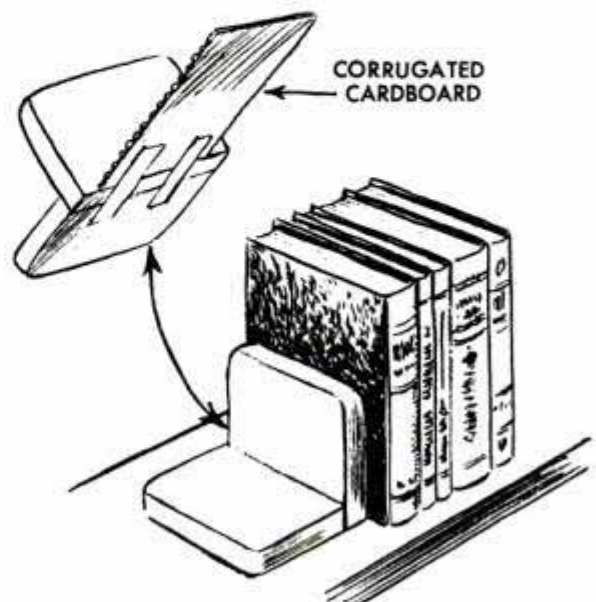


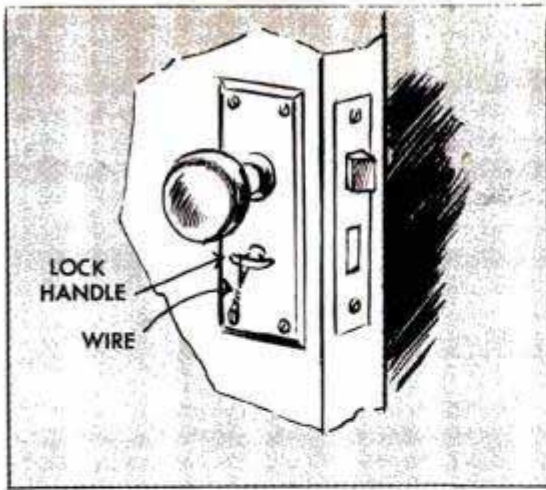
RAZOR BLADE used for cutting sewing thread is shielded by taping it to notched piece of cardboard. Notch on each side is deep enough to expose portion of blade edge

FRAGILE TIP of glass eye dropper is protected from breakage by slipping an extra rubber bulb, or tip, over it. The rubber shield also helps keep the eye dropper clean



WOODEN OR PLASTER BOOK ENDS can be prevented from sliding apart if a piece of corrugated cardboard is taped to the bottom of each book end. The cardboard extends under books and their weight holds it in place



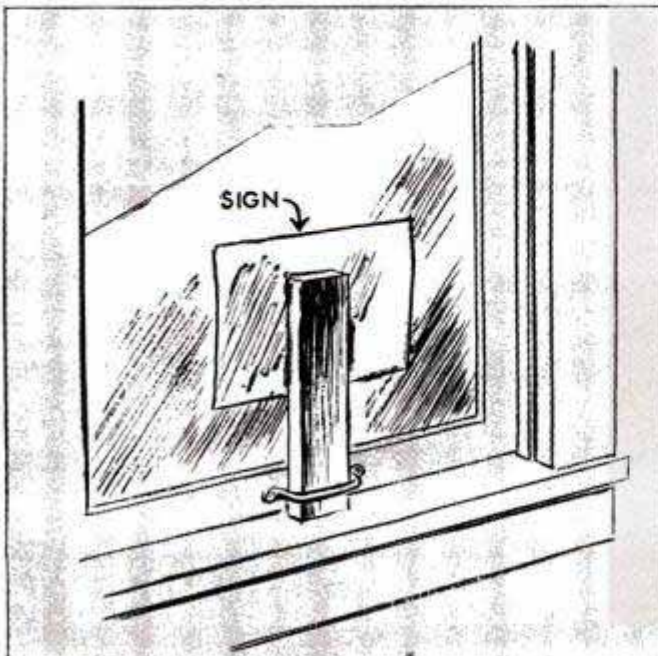


CHILDREN CAN'T LOCK themselves in the bathroom if lock handle is wired in open position. Anchor wire to escutcheon screw



COLLECTORS can remove choice stamps from envelopes neatly and with less danger of damaging the stamp by applying lighter fluid to inside of the envelope. If the envelope is of heavy paper, roughen surface with eraser before swabbing on lighter fluid

WHEN PLACING A SIGN in a window to rent a room or sell furniture, hold the sign snugly against the pane by slipping a piece of wood into the sash lift



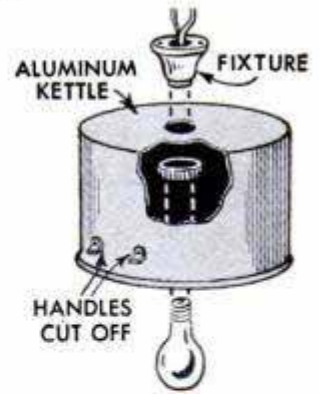
HANGING HEAVY FRAMED PICTURES is easier if an ordinary fork is placed over the picture hook as shown in the detail below. In this way, the fork handle guides the picture wire to engage the hook





Reflector for Shop Light Made From Kettle

A discarded aluminum or stainless-steel kettle can be converted into an excellent reflector for a shop light. A hole is cut in the bottom of the kettle as shown, to fit the light fixture, and the handles of the kettle are cut off with a hacksaw. The threaded ring on the fixture is used to hold the shade in place, as it would any other shade. Care should be taken to see that the shade is insulated from the fixture, so that there is no danger of shock when the shade is touched.

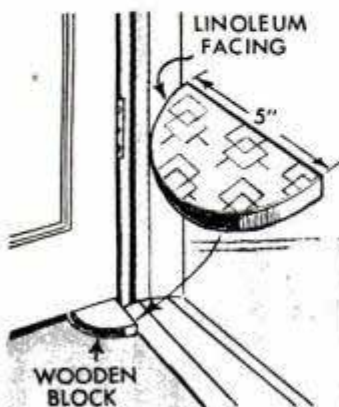


Victor H. Lamoy, Upper Jay, N. Y.

Wood Stained With Fabric Dye

Recent research has proven that it is practical to use dyes of the all-fabric type to stain unpainted woodwork and furniture. Since only a limited number of colors in oil stains are available for wood, this new method gives the advantage of an extensive color selection, and also has the advantage of extremely easy application. To stain wood, first prepare the dye as you would for fabric, following the manufacturer's directions. Then apply it to the piece to be stained with either a brush or a cloth. When the dye is thoroughly dry, brush on a coat of white shellac. After ample drying time has been allowed, rub the shellac down lightly with fine sandpaper, and apply a finishing coat of clear varnish. This finish then may be protected with the usual wax or furniture polish.—Tintex Home Economics Bureau, New York City.

Friction Block Holds Door Open



Taking advantage of the slight play in the hinges of the door itself, this friction doorstop relies on the weight of the door to hold it in place. The stop consists of a wooden block faced with linoleum, the combined thickness being slightly greater

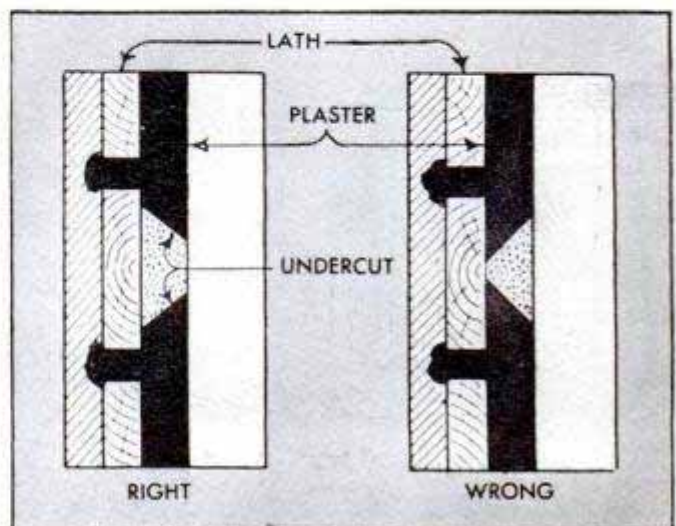
than the space between the bottom of the door and the floor. In use, the doorstop is wedged under the door at the hinged edge.

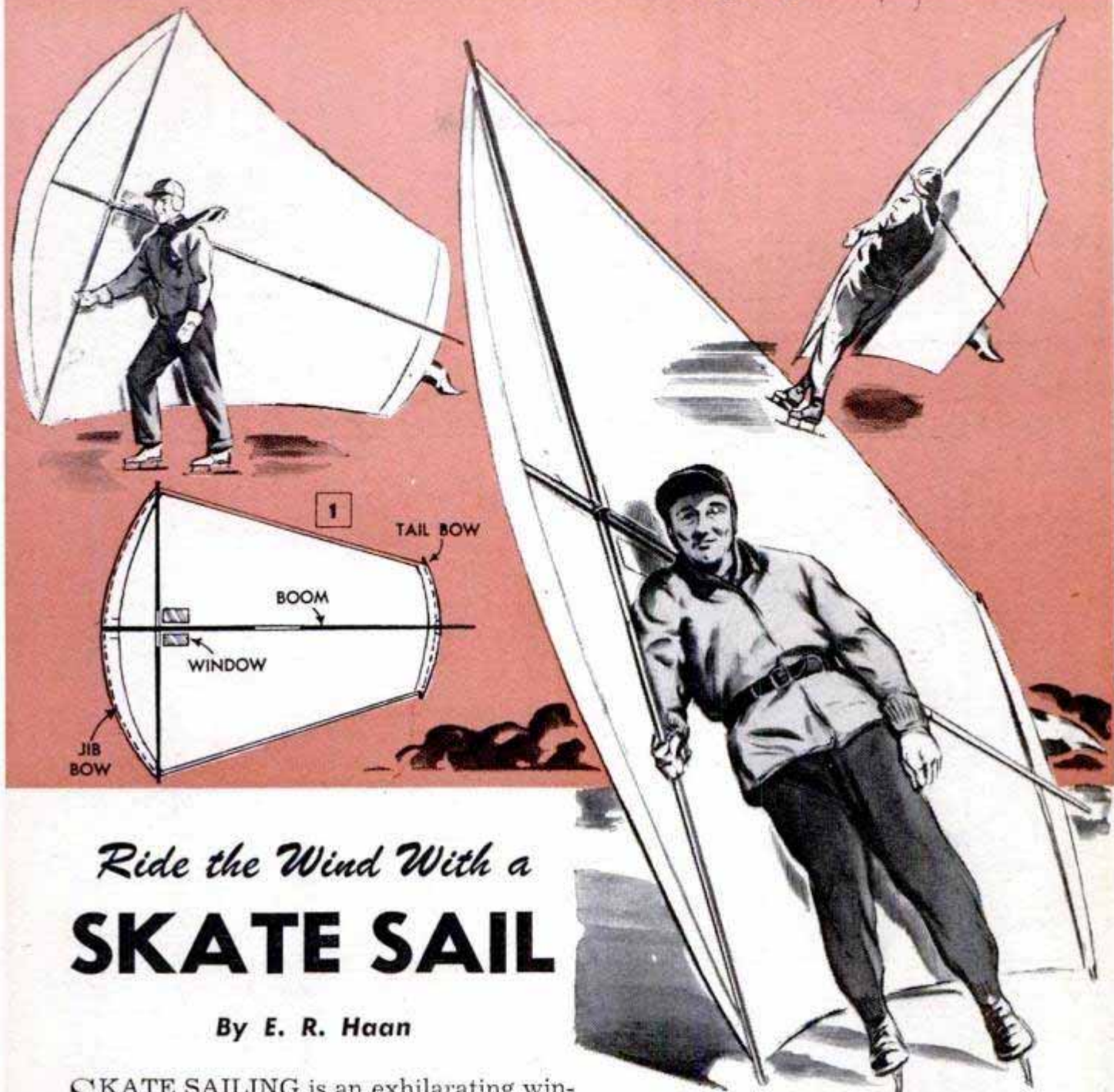
Ice Pick Aids Nailing of Stud

The job of holding 2 x 4 studding in place for toe nailing can be simplified considerably with the use of an ice pick. Simply force the pick into the floor plate at the base of the stud on the side opposite the one in which the nail is to be driven.

Repairing Cracks in Plaster

When repairing cracks in a plastered wall, the large cracks must be cleaned out and cut more deeply to key the patch. The wrong and right way to cut out the crack is shown in the sketch. The V-cut allows the patch to loosen and fall out, while the undercut, inverted-wedge type of cut will lock the patch permanently into the old plaster. Before applying the plaster, thoroughly wet the edge of the area to be patched with water, using a paintbrush or sponge. This keeps the plaster and laths from taking moisture out of the patch.





Ride the Wind With a **SKATE SAIL**

By E. R. Haan

SKATE SAILING is an exhilarating winter sport that is gaining in popularity every year because it is easy to learn and fun to do. You don't have to be an expert skater to learn to handle a sail, and it takes very little time to become proficient at steering a course both with and against the wind. All you need to begin having fun is a sharp pair of skates, a sail and an open expanse of ice, $\frac{1}{2}$ mile or more long.

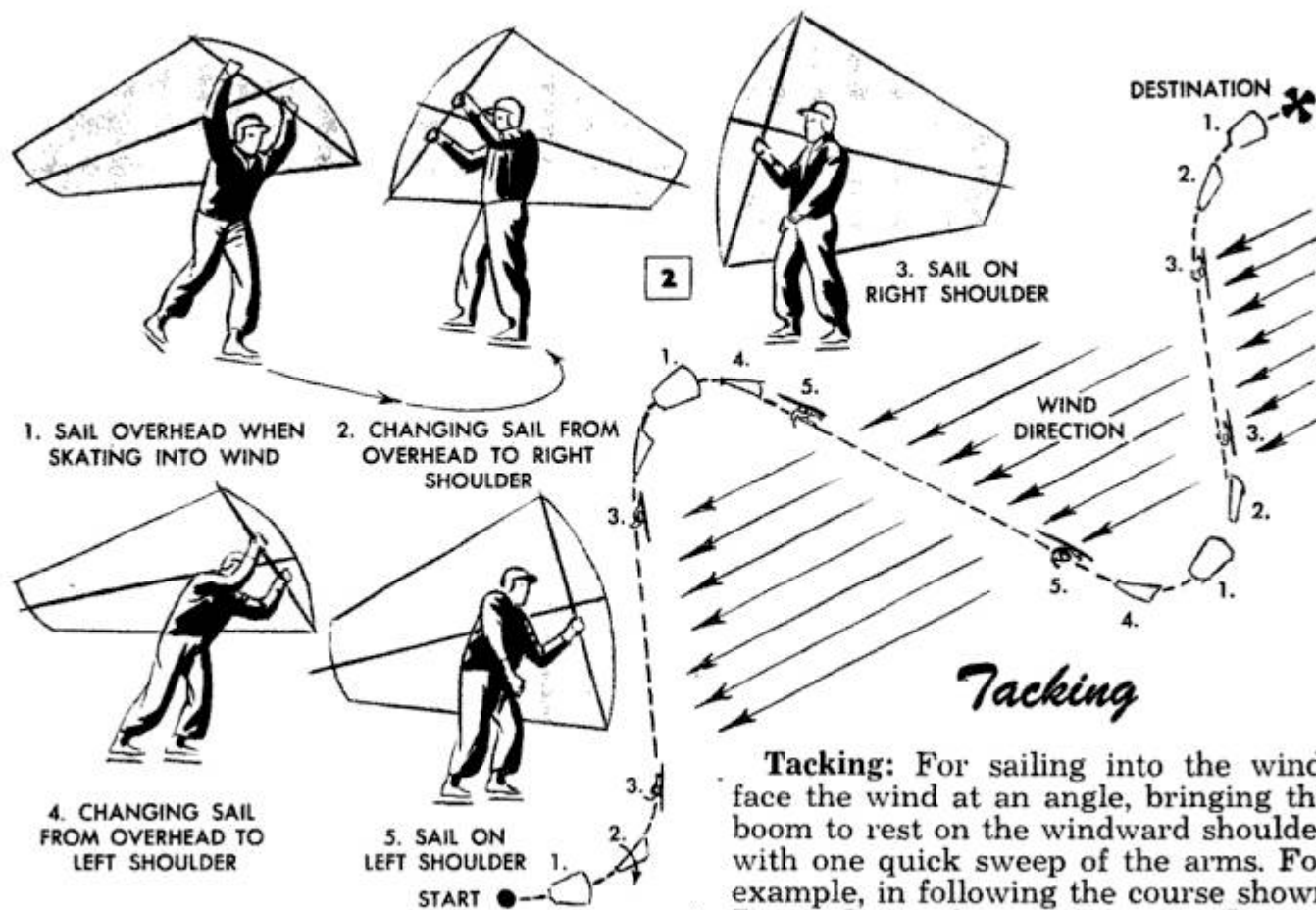
Basic points of skate sailing: In skate sailing, the boom rests on the skater's windward shoulder, as in Fig. 1, so that the sail is balanced. The boom should slope downward slightly from the shoulders toward the back. Both feet are kept on the ice about 5 in. apart, with the foot nearest the sail a little ahead of the other one. The body is kept straight and almost rigid, so that it can pivot with the skates. The wind keeps the boom snugly on the skater's shoulder, allowing him to lean against the

sail and giving a degree of stability not possible in regular skating. It enables him to ride over bumps and rough spots and over patches of soft snow up to $1\frac{1}{2}$ in. deep. The weight is kept on the heels, with an upward pull on the toes for best control.

Selecting a skate sail: A sail of the shape shown in Fig. 1 has been found best for maneuverability in varying wind conditions. Its size should be suited to the user's weight and height. Relation of sail area to a user's weight is given in Fig. 8. When a person's height is less than average for his weight, the next smaller size that provides sufficient clearance above the ice should be used. A sail that is too large becomes uncontrollable in winds over 20 m.p.h.

Skates to use: Beginners in skate sailing should use the skates to which they are

Illustrations courtesy Skate Sailing Ass'n of America

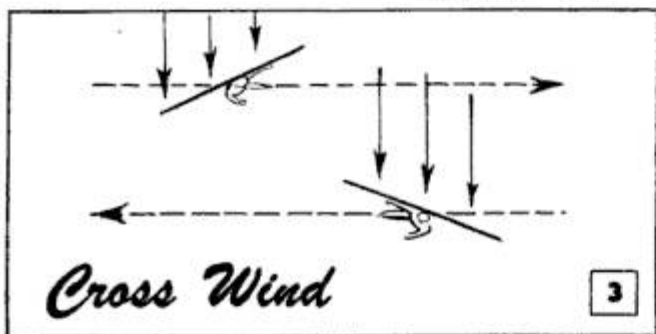


Tacking

Tacking: For sailing into the wind, face the wind at an angle, bringing the boom to rest on the windward shoulder with one quick sweep of the arms. For example, in following the course shown in Fig. 2, bring the sail from the floating position down toward your right side, continuing until the sail is vertical. As the sail catches the wind, lean firmly against it. Then the top of the sail will tilt slightly into the wind, and the bottom away from it. Since this deflects the wind downward, it tends to lift the sail and relieve its weight from the shoulder.

Retain the grasp on the mast with your right hand just below the boom. It doesn't take long to learn to hold the sail with one arm entirely free. The shoulder is the pivot point on which the sail is swung to keep it at the desired angle. Should you find yourself going too fast, bring the sail to the horizontal floating position and make a gliding turn into the wind. To change direction on tack toward the right, bring the sail over your head and down on the left side through the positions shown in Fig. 2. The skater has full visibility ahead and on the left, and the windows in the sail provide him with ample visibility to the right.

Across and downwind: To sail crosswind, hold the sail diagonally to the wind direction, as in Fig. 3. To go downwind, follow a zigzag course as in Fig. 4, holding the sail a little more toward your back, but never directly at right angles to the wind. Each time a turn is made, transfer the sail from one side to the other as already described, except for one important difference: don't hold the sail in the horizontal overhead position, but keep its tail down close to the ice behind you, so that the wind cannot whip it out of control. Holding the sail at

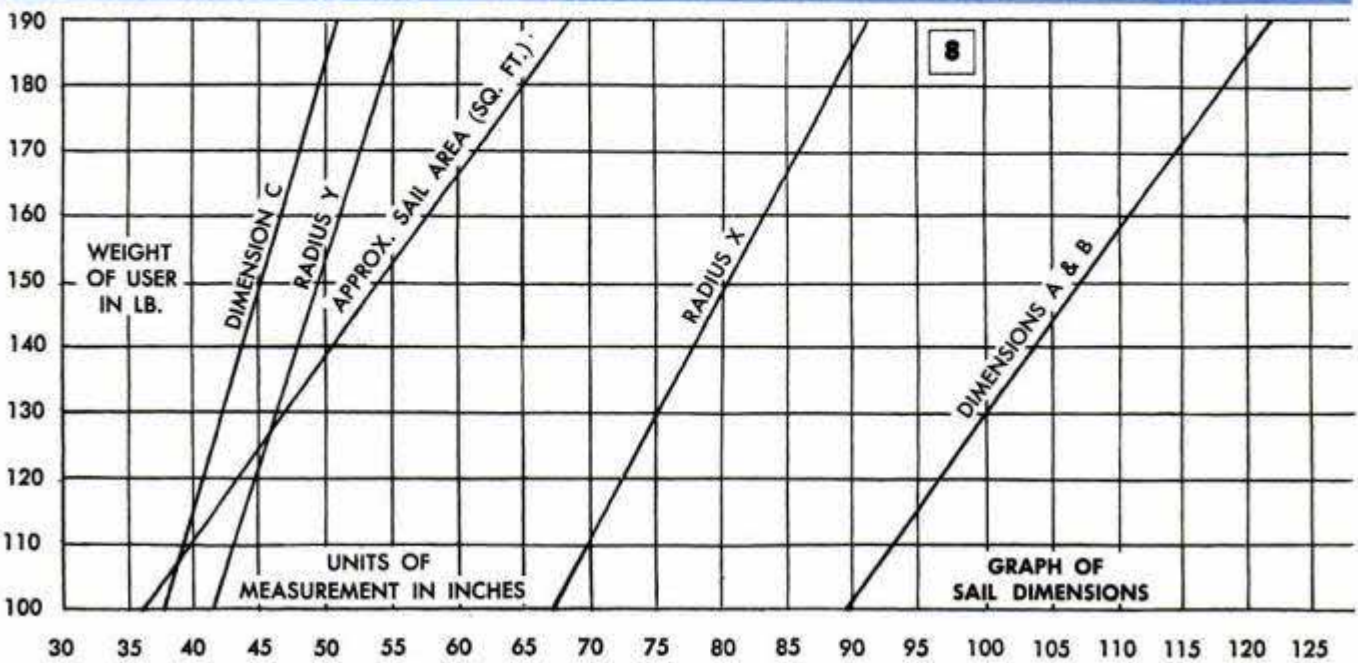
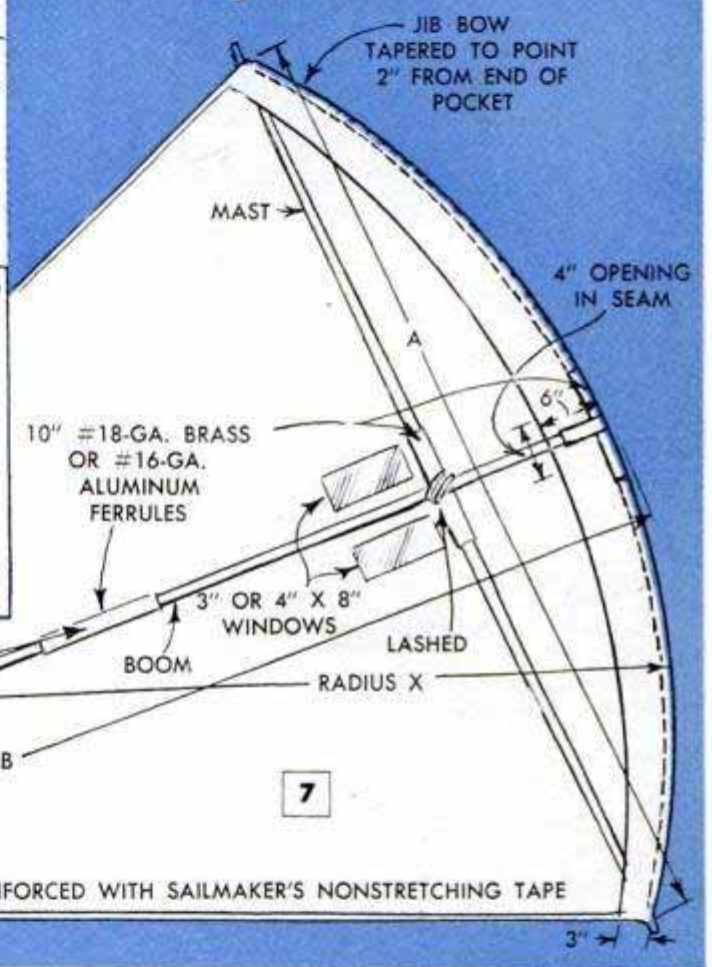
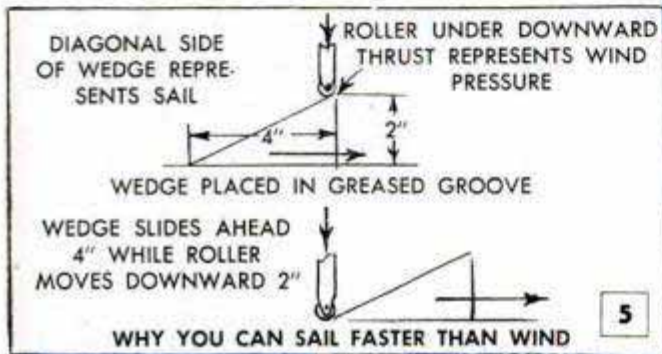
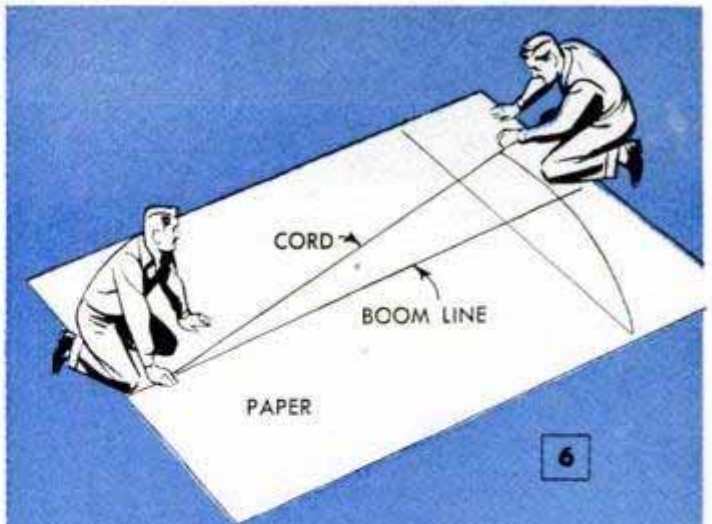
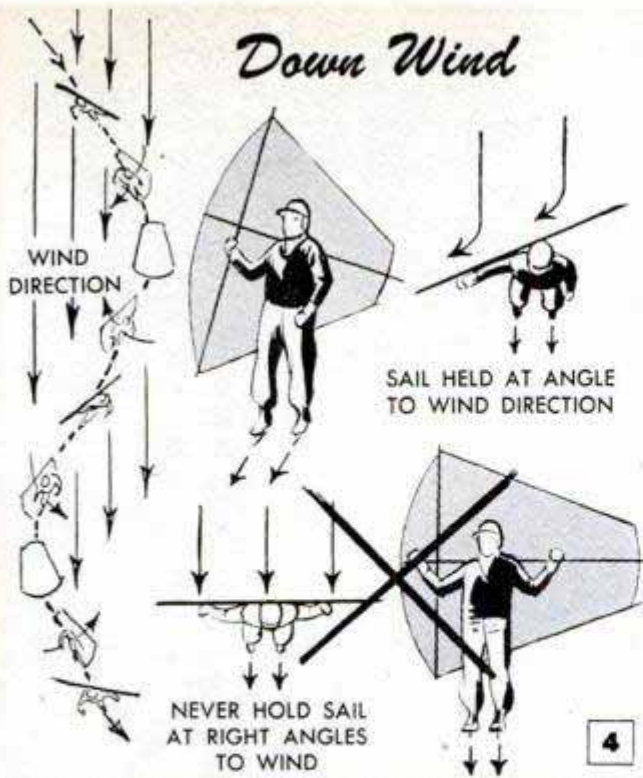


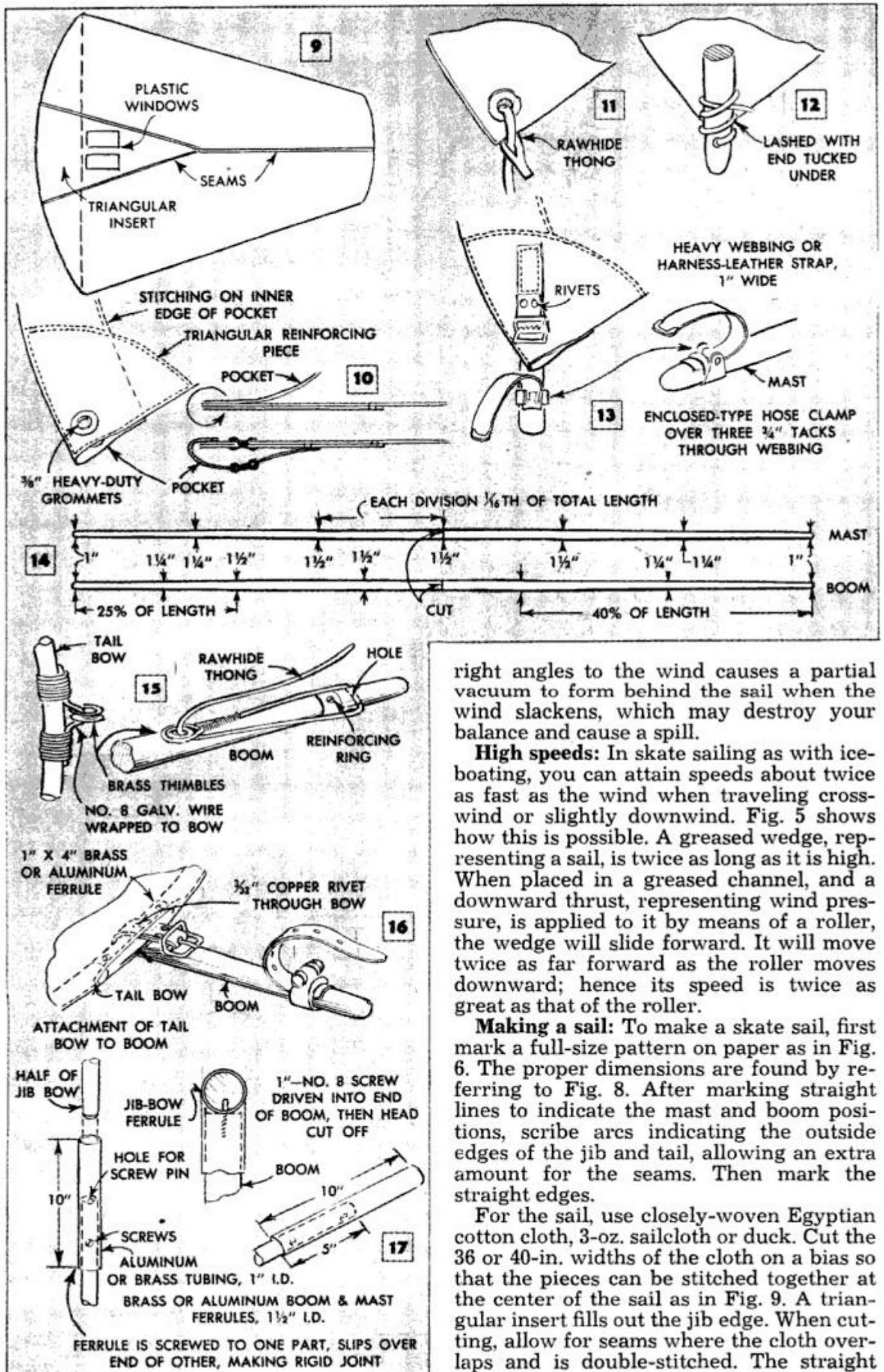
accustomed, and the skates kept very sharp. Then, after developing some sailing skill, you may prefer 18-in. racing skates, which provide better riding over rough ice and also enable the user to keep a straight course more readily.

Getting out on the ice: Try out a skate sail for the first time when there is a fair wind, and select a smooth expanse of ice on which to begin. Give other skaters a "wide berth" and skate out into the wind with the sail held horizontally over the head at arm's length. Grasp the mast with both hands as shown in Fig. 2, since the sail, when held in this fashion, does not catch the wind, but "floats" above you.

If the wind is behind you as you go out, keep the back of the sail down to deflect it. This will prevent the sail from blowing down in front of you. The sail is held in the horizontal floating position also when turning from one tack to another. If the sail becomes uncontrollable at any time, let it go. It is easier to retrieve it later than to attempt to fight the power of the wind.

Down Wind





right angles to the wind causes a partial vacuum to form behind the sail when the wind slackens, which may destroy your balance and cause a spill.

High speeds: In skate sailing as with ice-boating, you can attain speeds about twice as fast as the wind when traveling cross-wind or slightly downwind. Fig. 5 shows how this is possible. A greased wedge, representing a sail, is twice as long as it is high. When placed in a greased channel, and a downward thrust, representing wind pressure, is applied to it by means of a roller, the wedge will slide forward. It will move twice as far forward as the roller moves downward; hence its speed is twice as great as that of the roller.

Making a sail: To make a skate sail, first mark a full-size pattern on paper as in Fig. 6. The proper dimensions are found by referring to Fig. 8. After marking straight lines to indicate the mast and boom positions, scribe arcs indicating the outside edges of the jib and tail, allowing an extra amount for the seams. Then mark the straight edges.

For the sail, use closely-woven Egyptian cotton cloth, 3-oz. sailcloth or duck. Cut the 36 or 40-in. widths of the cloth on a bias so that the pieces can be stitched together at the center of the sail as in Fig. 9. A triangular insert fills out the jib edge. When cutting, allow for seams where the cloth overlaps and is double-stitched. The straight

edges of the sail are reinforced by sewing on sailmaker's nonstretching tape. Two 3 x 8 or 4 x 8-in. windows of transparent-plastic material are sewed into the sail at the points shown.

The bow pockets at the jib and tail should be faced with fairly heavy duck on the spar side for strength. They should be about 6 in. wide at the center and 3 in. wide at the ends, which are open. Both pockets have openings in the center of the seams as indicated in Fig. 7, so that the bows can be joined to the boom. Before sewing the inside edge of the jib pocket to the sail, sew on the corner-reinforcing pieces and grommets for rawhide thongs, Fig. 10. Figs. 11 and 12 show how the thongs are lashed to the ends of the mast. If you prefer, heavy webbing or harness-leather straps with buckles can be used to hold the sail to the mast ends, Fig. 13. However, sewing thick fabric and leather together is a job for a shoe repair shop.

Mast, boom and bows: After the cloth part of the sail has been completed, make and fit the mast, boom and jib bow. Each of these consist of two pieces joined together by means of brass or aluminum ferrules as in Figs. 7 and 17. The tail bow is one piece. The jib bow tapers to $\frac{3}{8}$ in., and the ends extend about 1 in. beyond the ends of the pocket. The mast and boom are made of spruce, $1\frac{1}{2}$ in. thick, tapered to 1 in. at the ends, as in Fig. 14. For tapering, use a block plane or a spokeshave. The boom extends 10 or 12 in. beyond the tail, and both ends of the mast project about 2 in. beyond the sail.

The tail bow, if lashed, is provided with a heavy wire yoke that carries a brass or aluminum thimble to which the thong is attached as in Fig. 15. If straps are used at the tail bow, they are attached as in Fig. 16. The tips of the bows should be rounded so they will slip easily into the pockets. The mast and boom are sanded smooth and then coated with spar varnish.

Assembling the sail: To assemble the sail, lay it out flat with the pocket side up. The two sections of the jib are first inserted, one from each end, and are joined at the center. Then the mast is laid in place, but is not attached to the sail. The forward end of the boom is slipped into place, so that it joins the jib bow. Then the top and bottom of the sail are joined to the mast ends at about half the required tautness. The tail bow is inserted and stretched tightly, and the fastenings at the mast ends also are drawn up snugly so that the sail will be "drum" tight. The mast is always located between and sail and the boom, and the two are bound together tightly where they cross by lashing with a rawhide thong or a web strap. ★ ★ ★

Rack for Rubbers and Galoshes

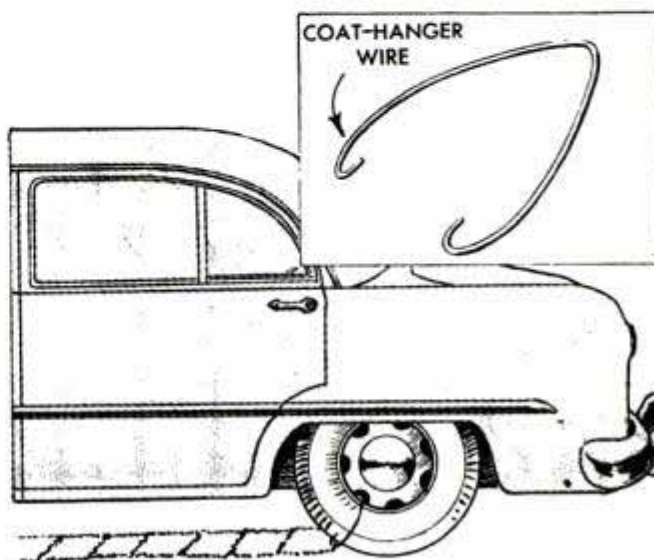


Wet galoshes and rubbers worn by all members of the family can be stored and dried on this handy rack which is placed just inside the back door of your home. A length of 2 x 6-in. lumber is used for the base, with two pieces of 1 or 2-in. stock nailed to the underside to serve as feet. Dowels cut from old broom or mop handles, are forced into holes drilled into the base. The dowels can be of various heights, to suit the size of footwear to be hung on them.—I. M. Fenn, Chicago.

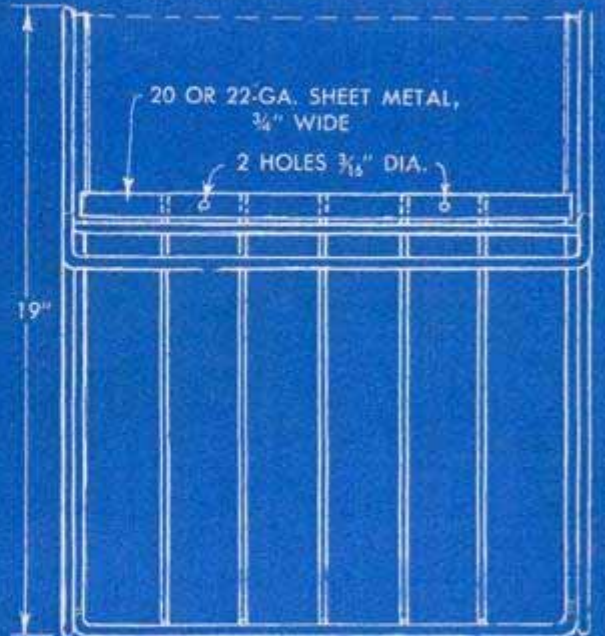
Skid Chains Put on Easily

A device to simplify attaching snow chains to your car can be made from a wire coat hanger. The straight bar of the coat hanger is snipped out and bent into a V, and the ends twisted to form hooks. To put the chains on, slip the puller through a spoke opening in the wheel. Stretch out the chain in front of the wheel, hook the puller to the chain, and drive the car forward until the wheel makes one complete revolution. Then fasten the chains.

Stanley J. Meyer, Hamilton, Ohio.

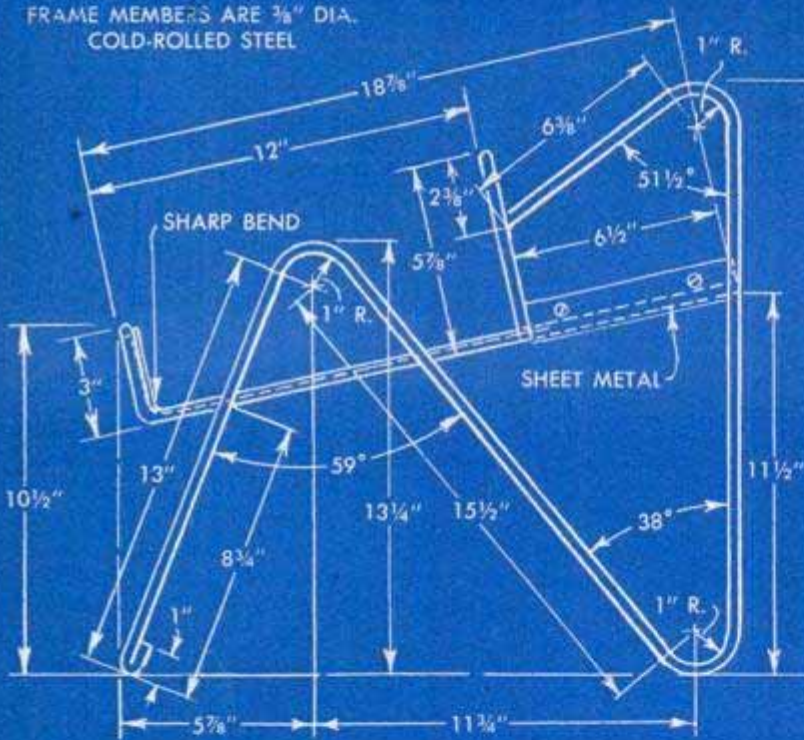


PLAN of the MONTH...

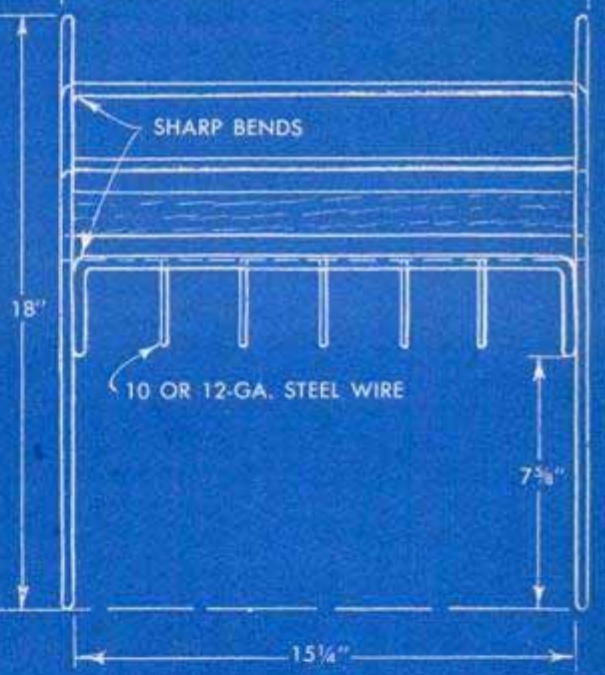


PLAN

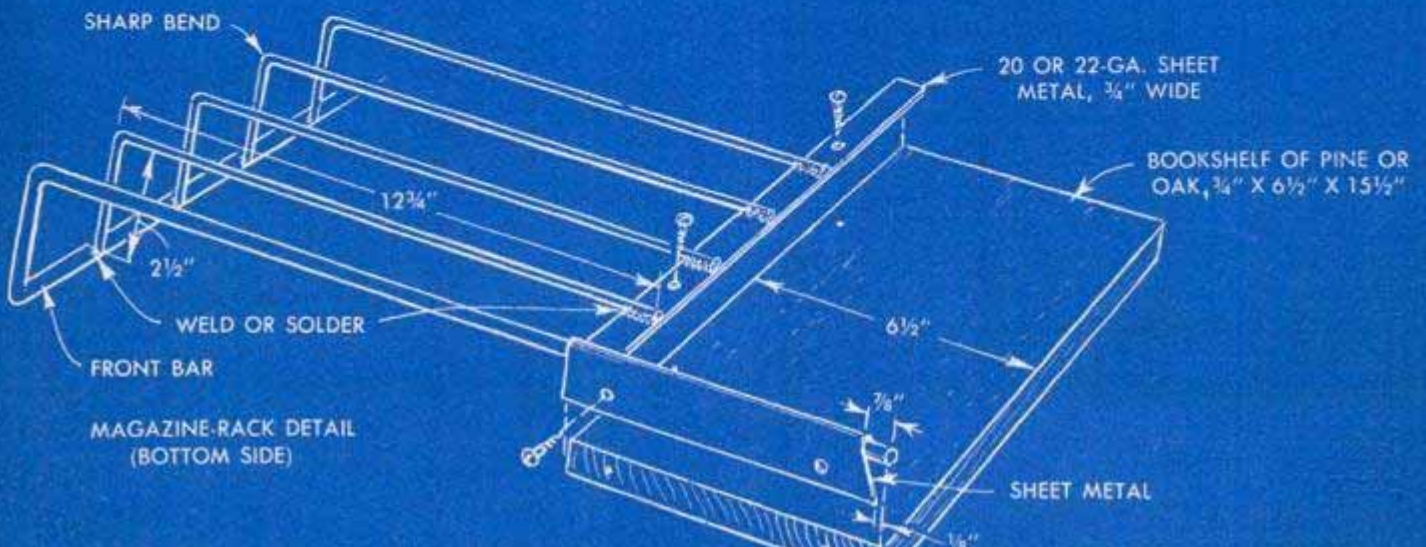
FRAME MEMBERS ARE $\frac{3}{8}$ " DIA. COLD-ROLLED STEEL



SIDE VIEW



FRONT



Wrought-Iron Furniture

MATERIAL LIST

WALL BOOKRACK

Pine or Oak Lumber

3 pcs.— $\frac{1}{2}$ " x $6\frac{1}{2}$ " x 15"—Shelves

Sheet Metal, 20 or 22 ga.

16 pcs.— $\frac{1}{2}$ " x $1\frac{1}{4}$ "—Shelf supports

Cold-Rolled Steel Rod

2 pcs.— $\frac{1}{4}$ " dia. x $50\frac{1}{4}$ "—Shelf supports

4 pcs.— $\frac{1}{4}$ " dia. x 13"—Side brackets

2 pcs.— $\frac{1}{4}$ " dia. x 6"—Shelf brackets

4 pcs.— $\frac{1}{4}$ " dia. x $13\frac{1}{8}$ "—Top and bottom

4 pcs.— $\frac{1}{4}$ " dia. x $15\frac{7}{8}$ "—Side

18 pcs.—16-ga. steel wire, $3\frac{3}{4}$ "—Gallery

MAGAZINE AND BOOKRACK

Pine or Oak Lumber

1 pc.— $\frac{3}{4}$ " x $6\frac{1}{2}$ " x $15\frac{1}{4}$ "—Book shelf

Sheet Metal, 20 or 22 ga.

2 pcs.— $1\frac{3}{4}$ " x $6\frac{3}{8}$ "—Shelf brackets

1 pc.— $\frac{3}{4}$ " x $14\frac{7}{8}$ "—Rack bracket

Cold-Rolled Steel Rod

2 pcs.— $\frac{3}{8}$ " dia. x $62\frac{7}{8}$ "—Legs

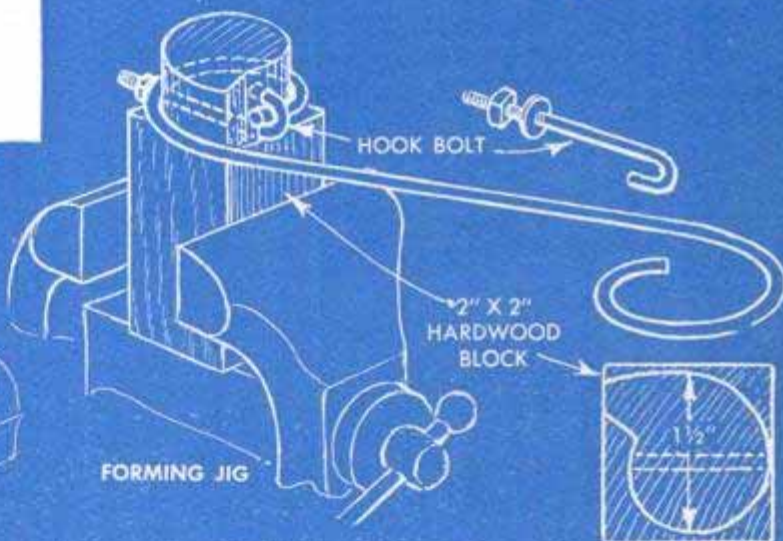
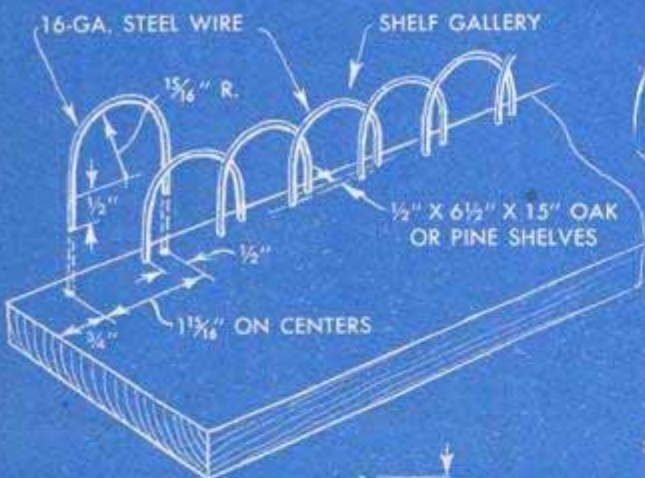
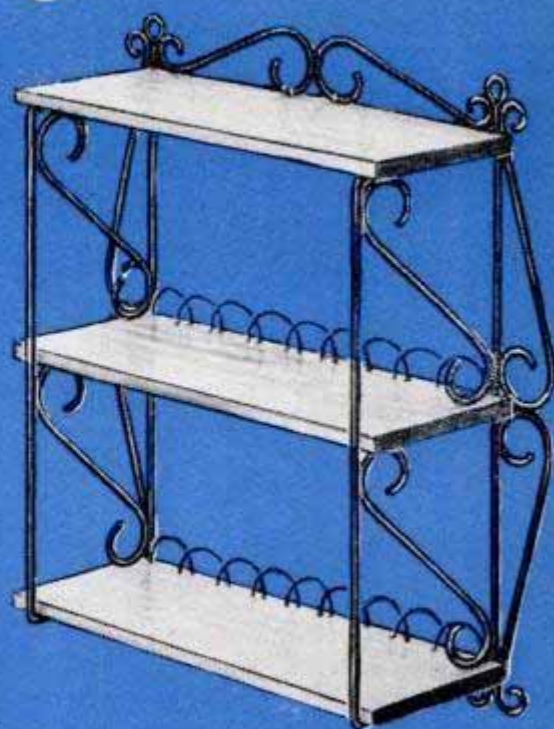
1 pc.— $\frac{3}{8}$ " dia. x 59"—Rack frame

1 pc.— $\frac{3}{8}$ " dia. x $27\frac{3}{4}$ "—Bookrack rail

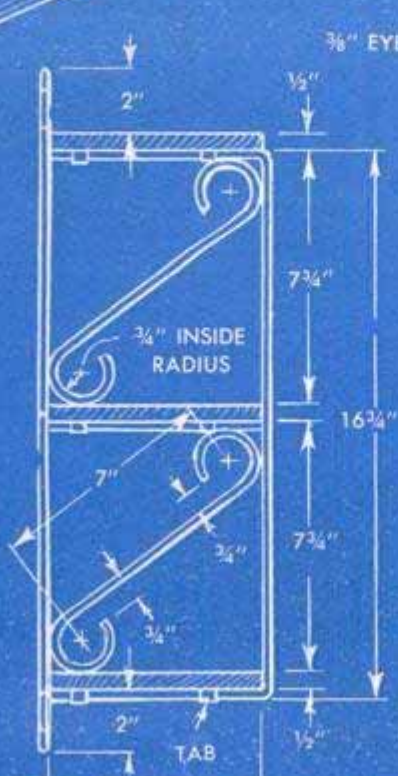
1 pc.— $\frac{3}{8}$ " dia. x 16"—Bookrack rail

WTM
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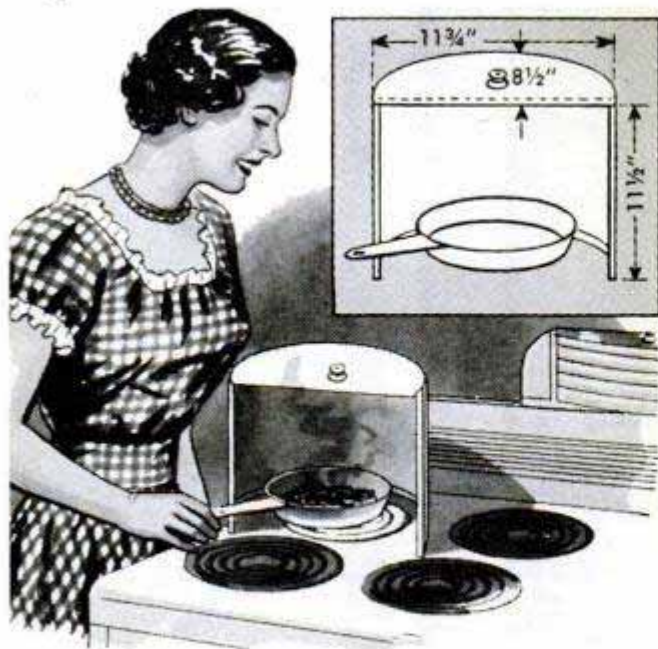
Modern
Furniture



TAB FOR FASTENING
WROUGHT IRON TO
SHELVES

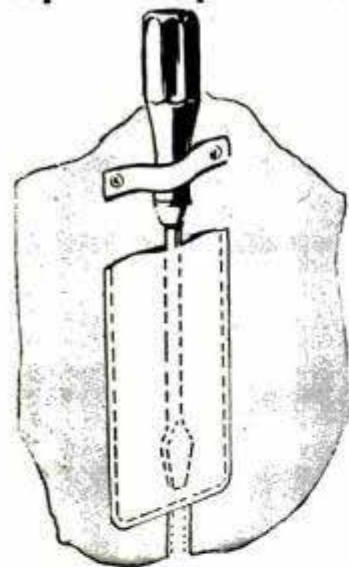


Spatter Shield on Stove Burner Improvised From Metal Container



When frying food, there is always a spattering of grease on the stove top, and very often on the walls around the stove. A spatter shield that will keep your walls clean can be made from a large metal container such as a lard or shortening can. Cut it in half and bend back the metal edges to eliminate the sharp edges. A glass, plastic or wooden knob is fastened to the top of the shield.—Martin Mantell, Hazleton, Pa.

Open Loop Holds Tools



When you carry a long screwdriver or other tool in your rule pocket, sew or rivet a loop an inch or two above the pocket. This will prevent the tool from flopping back and forth or from falling out, and will not interfere when the pocket is used for the rule.—G. E. Hendrickson, Argyle, Wis.

Patching Plaster Applied With Small Brush

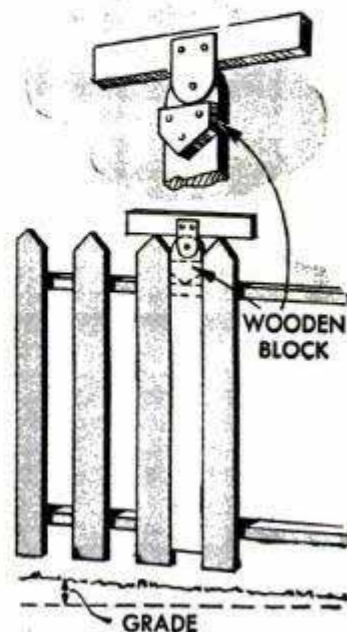
You can do a neat job of filling fine cracks in rough plastered walls before painting by using a small stiff paintbrush to apply the patching plaster. A 2-in. brush will be found satisfactory for this purpose. If a water-base paint is to be used, mix a little of it with the plaster. With this meth-

od it often is possible to conceal the cracks with one coat of paint. When patching smooth-finished walls, allow the plaster to dry and then sand smooth before painting.

Arthur A. Stevens, Canby, Ore.

Jig for Building Picket Fence

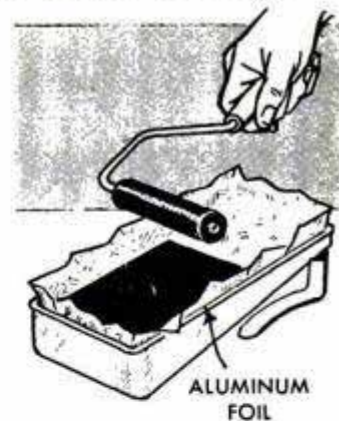
A jig that will automatically space the pickets the proper distance apart and maintain the proper slope is a real timesaver when building a fence. A board equal to the width of the opening between the pickets is selected, and a V-shaped wooden block, designed to rest on the top rail of the fence, is nailed to one face. A movable head is pivoted to the top of this board to align the tops of the pickets. Use a level to true up the first picket.



N. C. Darling, Orleans, Mass.

Foil Speeds Paint Color Change

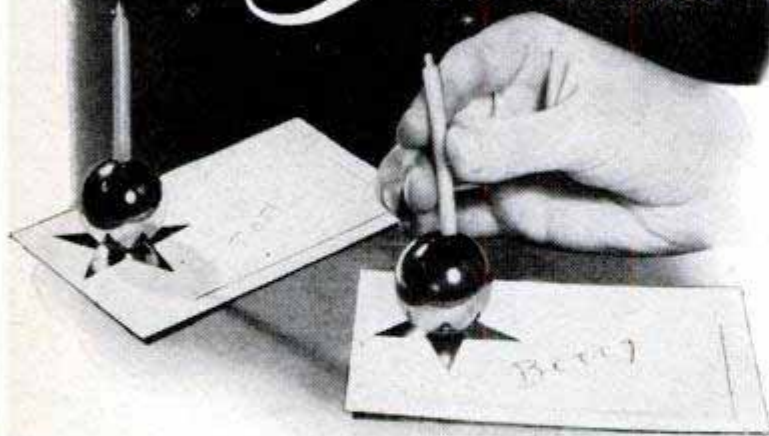
When using a roller and roller pan to apply a number of different colors of paint, several sheets of aluminum foil speed the job of changing colors by eliminating the need for cleaning the pan. Press a sheet of aluminum foil into the pan and smooth it over the edges. When ready to change colors, pour out the paint and remove the foil.



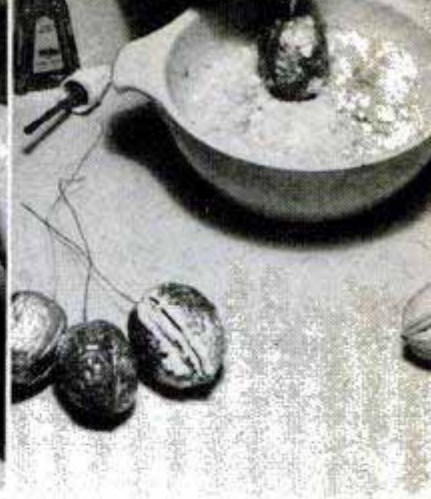
Dry Cells Stored in Refrigerator

Since heat and low humidity tend to deteriorate dry-cell batteries, they will last longer if stored in the refrigerator. When removed from the refrigerator for use, the batteries should be allowed to stand and "thaw out," in order to deliver maximum power. Flashlights, with the dry cells in them, should not be put into the refrigerator because of the danger of corrosion. They should be kept in a cool place.

CHRISTMAS *Ideas*



Christmastime is party time and there's nothing quite like decorative place cards to dress up the festive table. To make the cards pictured above, paste a large metallic star—gold, silver, red or green—to the upper left-hand corner of a plain card. Then remove the cap from a small tree ornament and "cement" the ornament to the star with melted wax. Insert red or green birthday candle in neck opening of the ornament and print guest's name on the card

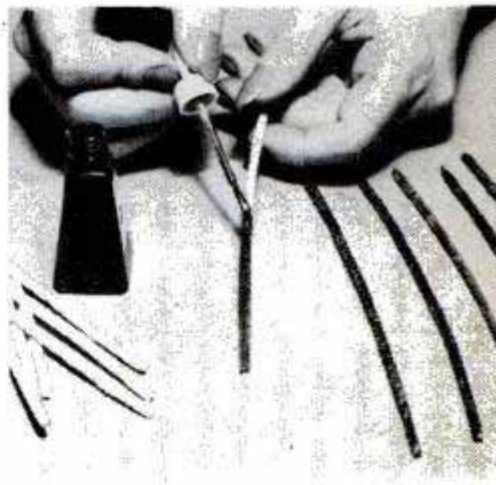
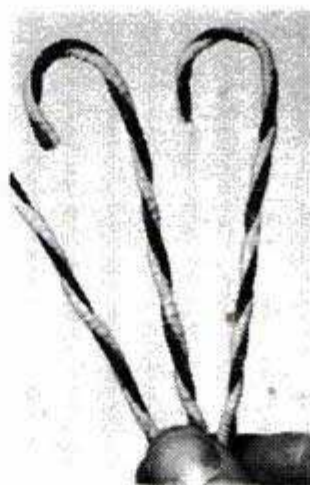


Empty walnut shells covered with artificial snow provide novel tree ornaments. Wrap a length of fine wire around a scrap of paper and place the wrapped end inside one half of the walnut shell, as in the upper left-hand photo. Then cement other half of shell to first half. Finally, coat shell with quick-drying paint or fingernail polish and dip in artificial snow

Neat little "candy" canes for your tree can be fashioned quickly from pipe cleaners, as below. Divide package of cleaners in half, leaving half of them their natural white color and coating others with red fingernail polish. When colored cleaners dry, twist a red cleaner with each white one to form spiral. Then bend to shape of a cane handle



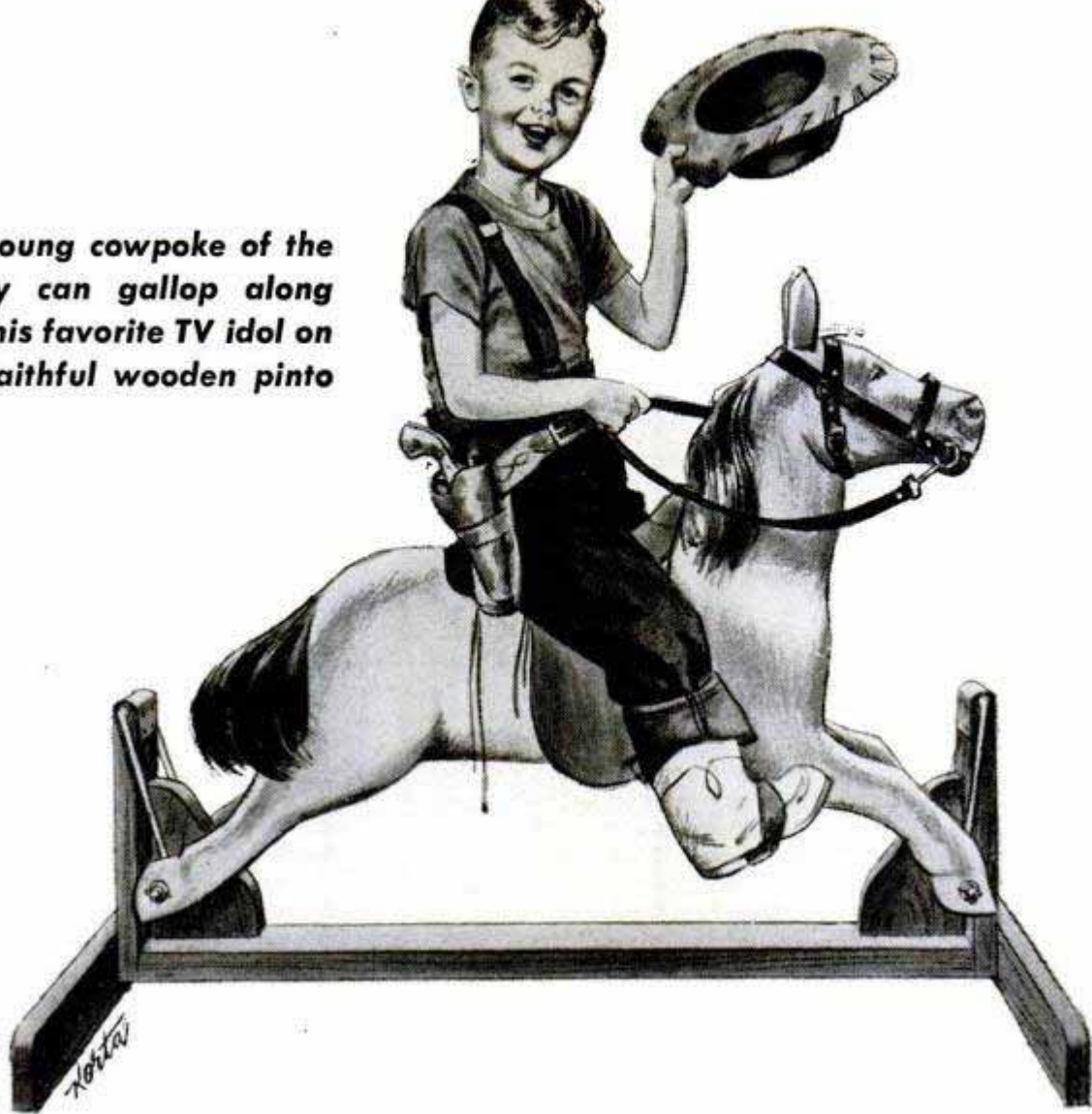
You can use ordinary soap flakes, above, to simulate snow on the branches of your Christmas tree. Mix 1 cupful of flakes with $\frac{1}{2}$ cupful of water and whip to a creamy consistency with an egg beater. Then apply mixture to tree branches with paintbrush. Before coating entire tree, experiment on a small sprig to be sure the effect will be satisfactory



Decorative Christmas bells are made from scraps of colored candles as shown below. Melt the candles and pour wax into bell-shaped molds—several small glasses are excellent. Then remove hardened "bells" from the molds and pierce each one with a hatpin. String colored beads on fine wire, fasten ends of wire to hatpins and bind wires around ribbon bow



The young cowpoke of the family can gallop along with his favorite TV idol on this faithful wooden pinto



RIDE 'EM COWBOY

By
Dick Hutchinson

LONG A FAVORITE toy, the rocking horse has grown in popularity through TV westerns. To live the exciting action of stagecoach days, the modern cowhand of the family generally saddles up astride the piano bench or the arm of an easy chair. Imagine the thrill of being able to mount this fine stallion to help round up cattle rustlers, train robbers and other badmen of the western plains. You've still got time to tether this fine mount to the tree on Christmas morning, and can make it even more complete by placing a full cowboy regalia near by.

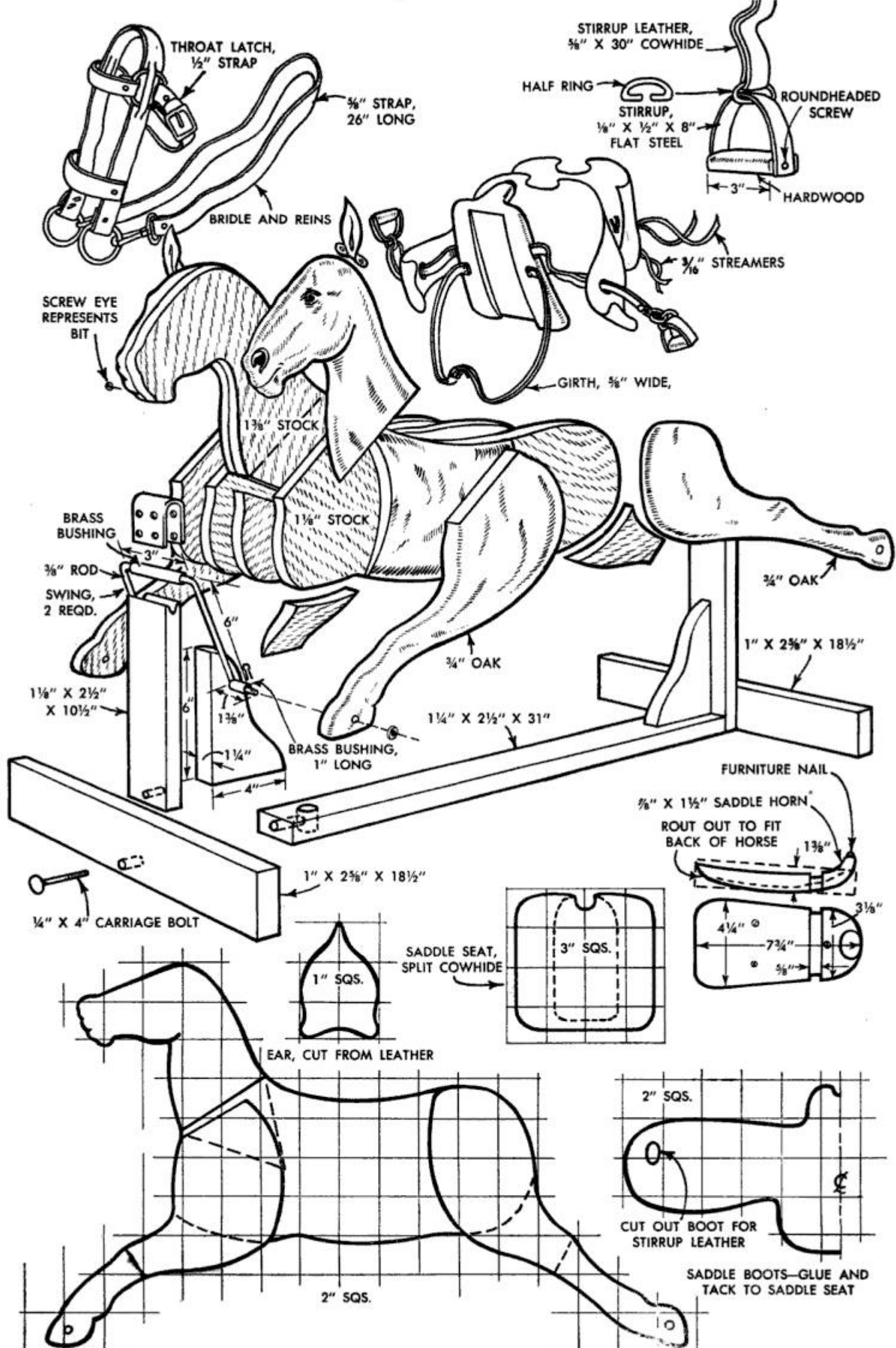
The "3D" body of the horse is built up of several layers of white pine, the outer ones being carved to the proper contour. Following the plans on the next page, the body and head pieces are cut out on a bandsaw. The head is assembled with glue and finishing nails, and then sanded roughly to shape on a sander. Next the body is put together, also with glue and finishing nails, and then the legs, made from 1-in. oak for sturdiness, are cut out and sanded to rough shape.

The swings which support the horse are

made of $\frac{3}{8}$ -in. rod that is heated and bent to shape in a vise. Set the bushings in the horse's feet and place the hangers in position in the bushings. Now the legs are glued and nailed to the body, with the feet fitted over the swings at the same time.

The whole body is brought to shape with a rasp. Fill and sand until the entire surface is smooth. The completed horse is given a coat of shellac, and then either painted or finished in felt flocking. The latter method produces a very realistic coat. First mix an enamel about the color of the flock you are going to use, and apply it to the horse with either a spray gun or a brush. When the enamel is tacky, the flock is sifted on and then pressed down with the fingers. Brush off lightly with a bench brush, let dry, and then brush again.

Hemp rope may be combed out for the hair of the mane and tail. A $\frac{1}{4}$ -in. slot is cut along the top of the neck, and clumps of the hair glued into it for the mane. For the tail, scrape away the flock at the point at which it is to be attached, coat the surface with glue and then staple the tail in place. The stand is made of oak. ★ ★ ★



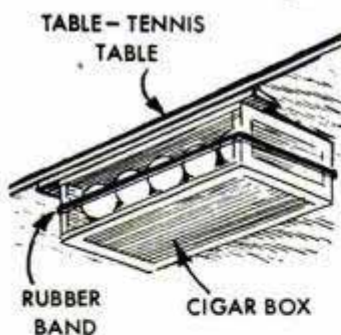
Plastic Egg-Storage Tray Used In Mixing Artist's Colors



Artists will find that a plastic egg tray of the type used to store eggs in a refrigerator is excellent for mixing small amounts of paint. Such trays are available at most ten-cent stores. The wells in the trays provide small individual mixing bowls and have the advantage of being easy to clean.

Hugh Lineback, Stillwater, Okla.

Rack for Table-Tennis Balls Made From Cigar Box



A generous supply of table-tennis balls is kept ready for action when stored in this cigar-box rack, which is fastened to the underside of the table top or a near-by shelf. The front of the box is

removed and the top is tacked shut. A large rubber band is drawn around the box to keep the balls from rolling out. Note in the detail that a thin strip of wood is inserted above the front edge of the rack. This tilts

Build the Midway!

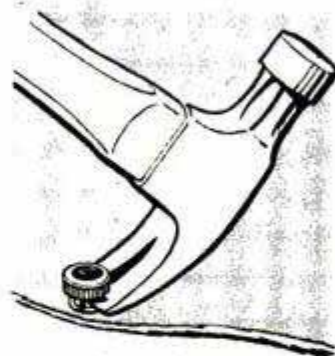
Only the magic of modelmaking could transform your workbench into a shipyard for building one of the world's most powerful warships. All of her imposing 968-ft. length is concentrated in a finely detailed 2-ft. model, the story of which will start next month. You'll enjoy working out the rakish lines, unusual armament and streamlined superstructure of this famous fighting ship

the box forward just enough to keep the balls at the front where they are within easy reach of the players.

Tacks Through Terminal Nuts Prevent Damage to Carpet

When stair carpeting is moved, as it must be occasionally to prevent uneven wear, the edges frequently are damaged and torn during the removal of the tacks.

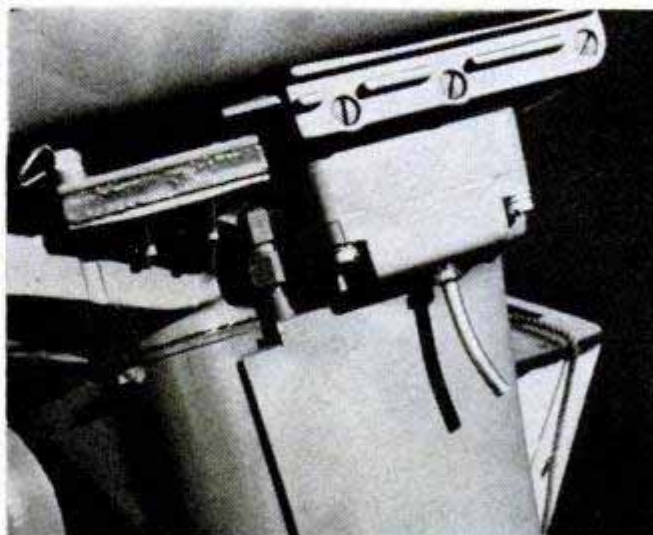
To prevent this damage, one building owner used longer tacks when laying the carpet and drove them through terminal nuts taken from dry cells. Then, when relocating the carpeting on the stairs, withdrawing the tacks was simple, since the claw of the hammer fitted under the head of the terminal nut. The terminal nuts should be used only where there is no danger of tripping over them.



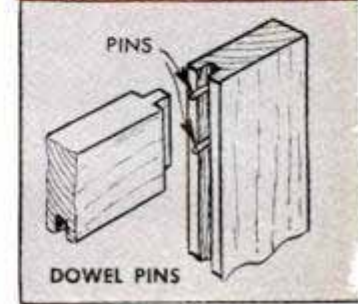
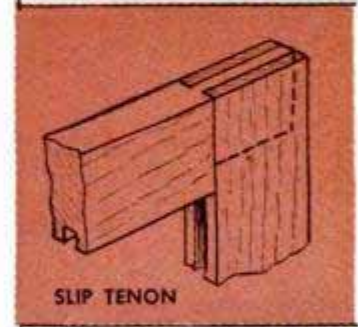
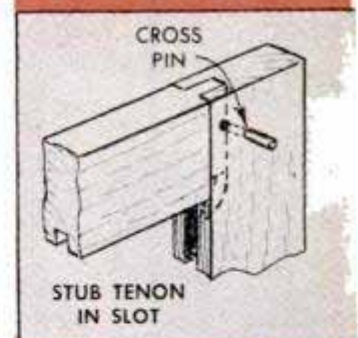
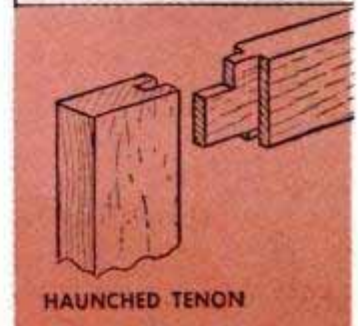
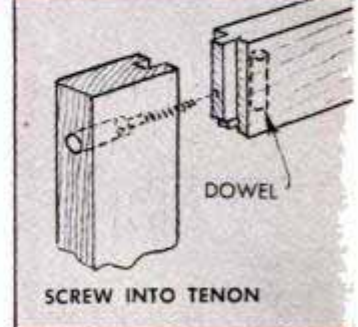
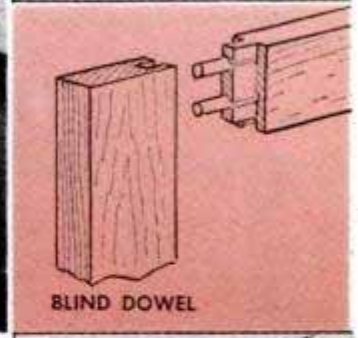
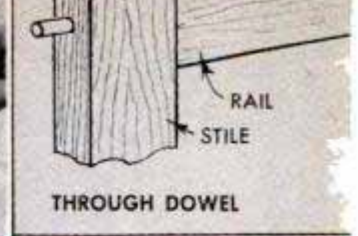
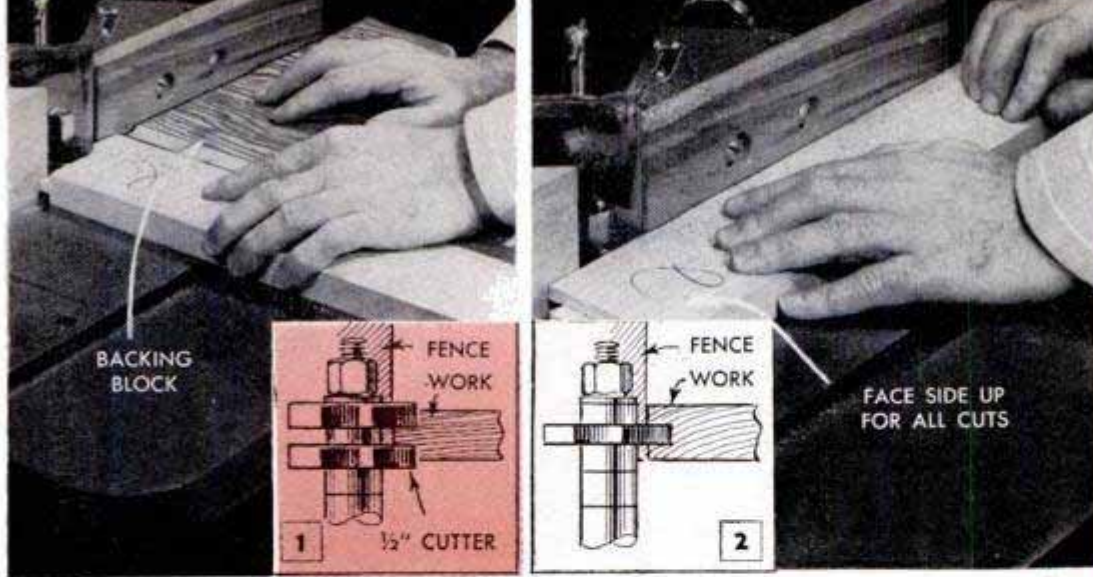
Outboard-Motor Drain Deflector Protects Against Corrosion

On some older type outboard motors the cooling water drains directly onto the exhaust housing, causing a constant corrosion, especially in water containing salt or of a high mineral content. To prevent this, drill a $\frac{5}{16}$ -in. hole into the present drain and tap it with a $\frac{1}{8}$ -in. pipe thread. Install a 2-in. length of copper tubing which has a male fitting with a $\frac{1}{8}$ -in. pipe thread. Then bend the tubing so the water drains away from the motor, as in the photo.

Clinton R. Hull, Costa Mesa, Calif.



One way of thawing a frozen lock on a car door is to hold a hot-water bottle containing boiling water against it.



HOW TO MAKE PANEL DOORS

WTM
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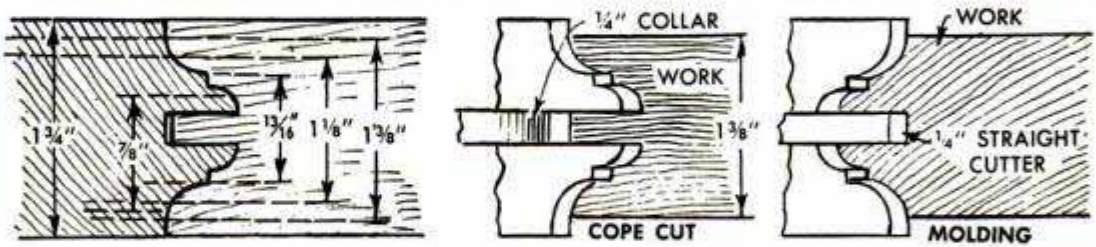
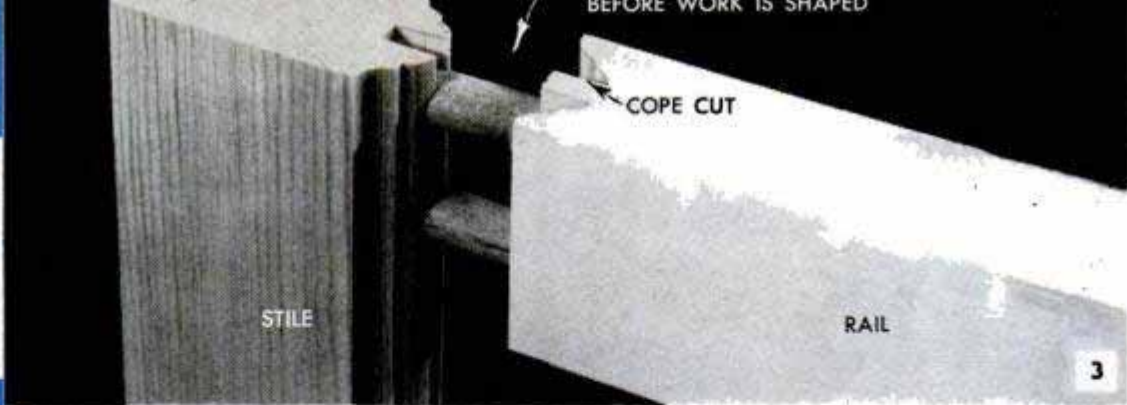
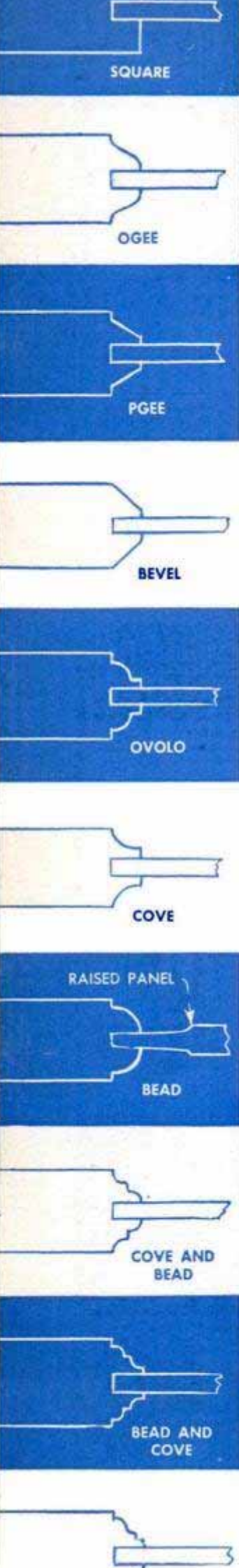
By Sam Brown

WITH A wide variety of applications from the kitchen cabinets to full-size entryways, recessed-panel doors present a finished professional-looking appearance. This is especially true when the stiles and rails are molded and coped to fit together neatly. If your shop is equipped with a single-spindle shaper, you'll be surprised how easily this can be done. In most cases, special shaper cutters are required for any specified type of molding. A full set consists of four cutters, two of which run the molding on the edges of the stiles and rails and a second pair which shape the matching cope cut in the rails. This is illustrated clearly in the series of details directly below Fig. 3. Half of a full set of cutters; that is, one molding cutter and one cope cutter, can be used for both molding and coping as in Fig. 4, and a few shapes can be cut with but a single cutter.

Square molding: Because this type of molding retains the original square shape of the stock, no special cutters are needed, the regular straight knives supplied in any stock assortment of cutters being used. The stub tenon on the rails is made with two cutters separated by a 1/4-in. spacer, Fig. 1, while the molding is formed automatically when the panel groove is cut, as in Fig. 2. Although a cut 1/4 in. deep usually is sufficient for the panel groove, many craftsmen prefer to make this groove 3/8 in. deep to permit using a longer stub tenon and thus achieving greater strength. It is also recommended to make the groove slightly deeper than the length of the tenon to allow room for excess glue. The tenon-cutting setup shown in Fig. 1, which consists of two 1/2-in. cutters and a 1/4-in. spacing collar, can be conveniently changed for making the cope cut. To do this, a 1/2-in. collar is substituted for the lower 1/2-in. cutter, automatically positioning the single 1/4-in. cutter used for the panel groove at the proper height, Fig. 2.

When the complete set of cutters is used, the work is shaped with either the face side up or down during the entire operation. The depth of cut, which is governed by the fence setting, is the same for both the molding and cope cuts. An efficient and safe method for feeding the work into the cutters, especially when

Although stub tenon and groove formed by making cope and molding shaper cuts frequently are sufficient, stronger joints can be made in a number of ways. Note the seven popular methods given in the details at the right



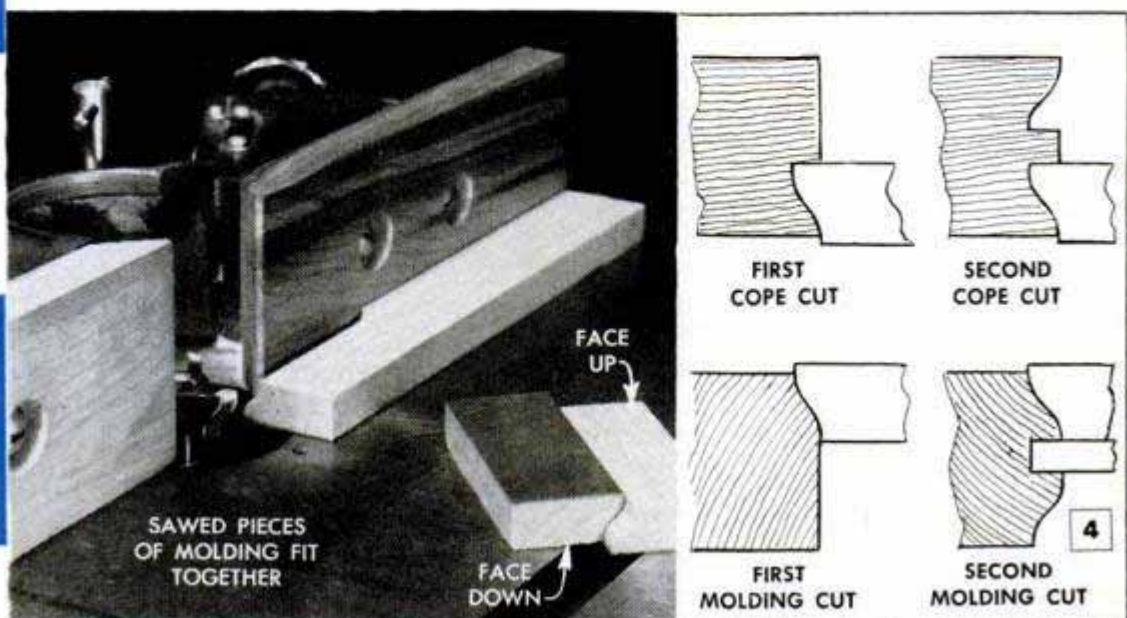
Details at left show various types of molding. Complete set of shaper cutters for making both cope and molding cuts is shown above. Note dimensions for 1 3/4-in. stock

making cope cuts, is to use a wooden backing block, as pictured in Figs. 1 and 5. The block may be a piece of 3/4-in. plywood about 12 in. sq. with the front edge faced with a wooden strip held in place with brads. The strip provides a backing for the cut and also a gripping edge for the operator's thumb when the work is fed into the cutters as in Fig. 5. It is necessary, of course, that the faced edge of the plywood be at right angles to the edge guided along the fence.

Door joints: Lightweight doors usually are satisfactory if assembled only with the 3/8-in. stub tenon formed in the shaping operation. However, additional reinforcing can be obtained by using any of the various joints pictured in the series of drawings along the right-hand side of page 177. The stub-tenon-in-slot joint is one of the more popular because it requires only straight shaper work, differing from the square molding only in that special long shaper knives are used to cut 3/4 in. deep. Blind doweling, also shown in Fig. 3, is a practical method of joinery for the average worker, while the haunched-tenon joint has a reputation for providing maximum strength.

Cove and bead molding: Fig. 5 shows a typical coped-and-molded doorframe with cove and bead molding. The cope cut always is made first, as in Fig. 5; then, when the molding is cut, Fig. 6, the slight splintering at the ends of the cope cut is removed. A good routine is to run

Forming ogee molding with one cutter, as below, is simple inexpensive setup. The same cutter can be used to cope the rails as well as cut the molding

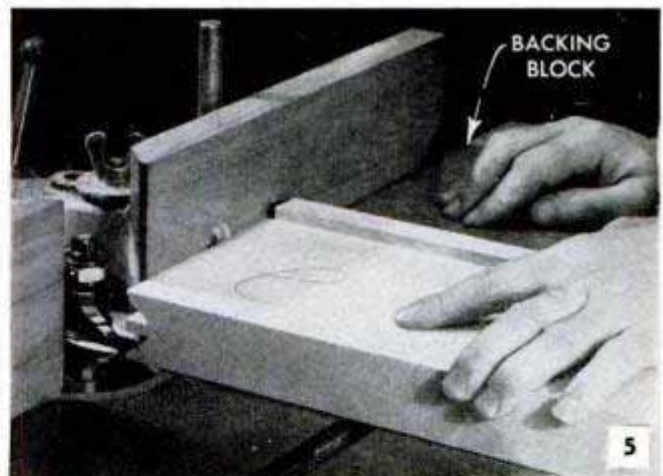


test cuts for both the molding and cope. Assemble the test joint, and if the fit is satisfactory, as in Figs. 9 and 10, proceed by making the cope cuts on the actual work. In any setup of this type, the fence setting remains the same for both the cope and molding cuts and, in many instances, the cutters are matched so that the spindle height setting remains the same throughout.

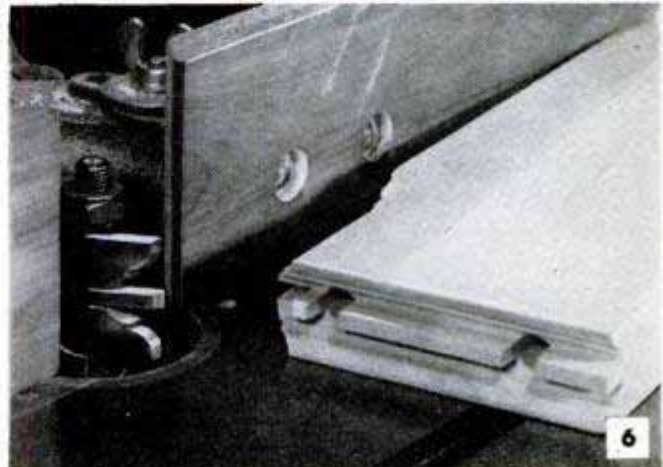
Long tenons: When assembly is to be made with long tenons, the tenons are marked and rough-cut on the bandsaw or circular saw, the idea simply being to get rid of some of the excess wood. The tenon is then cut to net thickness and coped by using a single cope cutter, Fig. 8. It is necessary to turn the work over to cope the opposite side. A single pass will form a tenon up to 2 in. long provided that some of the excess wood has been cut away. As the cope cutter runs completely under the work, it is necessary to mount the cutter so the end of the shaper spindle does not extend beyond the top of the cutter. There are various methods of accomplishing this; two of the most common methods being the use of either the stub spindle or the threaded cutter, as in Fig. 7. Note that the cope cut can be made with one cutter simply by turning over the work. The molding cut can be made similarly, enabling you to do a good job with only half a cutter set. Before making the molding cuts in the stile, it is necessary to use the dado head on the circular saw to cut the deep full-length groove for the rail tenons and the door panel. Special care must be taken to center this groove along the length of the stile.

Reversible moldings: Certain moldings, such as those detailed at the bottom of the page, have a reversible shape and fit together perfectly when one section of the molding is turned over and placed against the other part, as in Fig. 4. This means that a doorframe can be molded and coped with just one special cutter as shown in the setups for the ogee molding, Fig. 4, and the detail below Fig. 10. The fence setting remains the same for all cuts but the spindle height must be varied when changing from the molding to the cope cut. The straight cutter for the panel groove can be combined with the molding cutter, as in Fig. 11, or the groove can be run as a separate cut. Other examples of the single-cutter setup are shown in Fig. 11. These include the ogee, 45-deg. bevel and reverse ogee on 3/4-in. stock. In all cases, the cutter can be

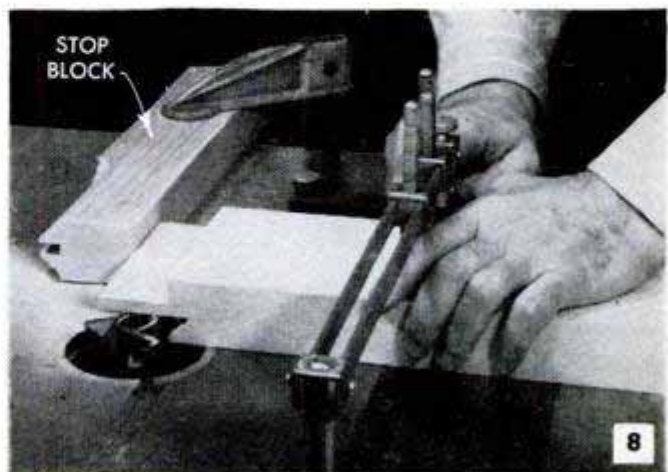
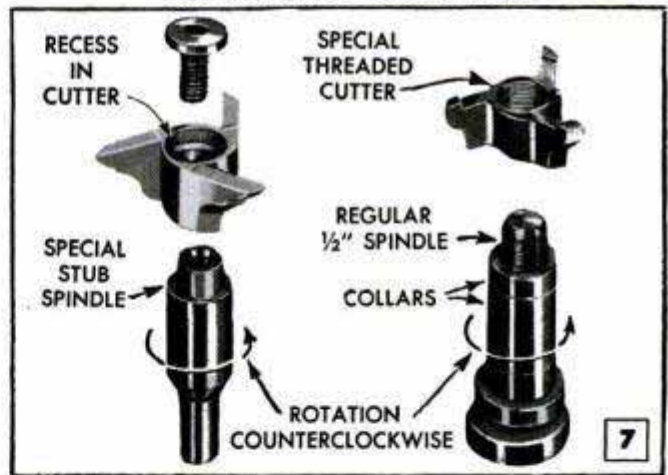
Long tenons are rough-cut with a handsaw or circular saw and then shaped as pictured at the right. Work must be turned over to cope the opposite side



COPE CUT IS ALWAYS MADE FIRST



MOLDING IS RUN ON ALL PIECES

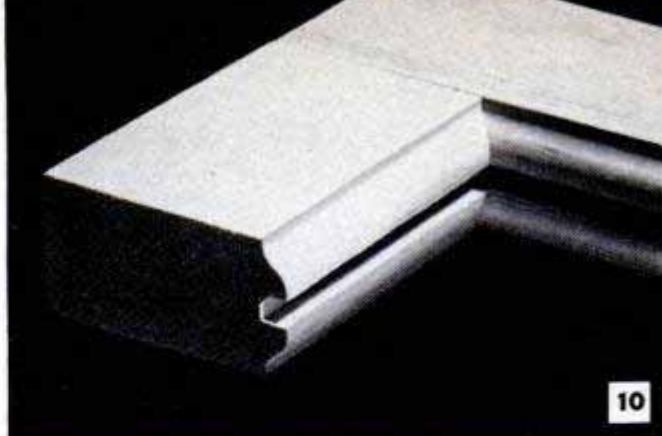


COPING A LONG TENON





1 3/8" STOCK WITH
OGEE MOLDING



10

Ogee molding on 1 3/8-in. stock is typical of door work where ends of the rails are coped to fit the molding on the stiles. Note joint in right-hand photo

reversed, if desired, instead of turning over the work. This is shown in the upper series of details which pictures the ogee molding cut. Note in the three right-hand details in Fig. 11, that a set of two cutters would be required as normal equipment for working 1 1/16 or 1 3/8-in. stock.

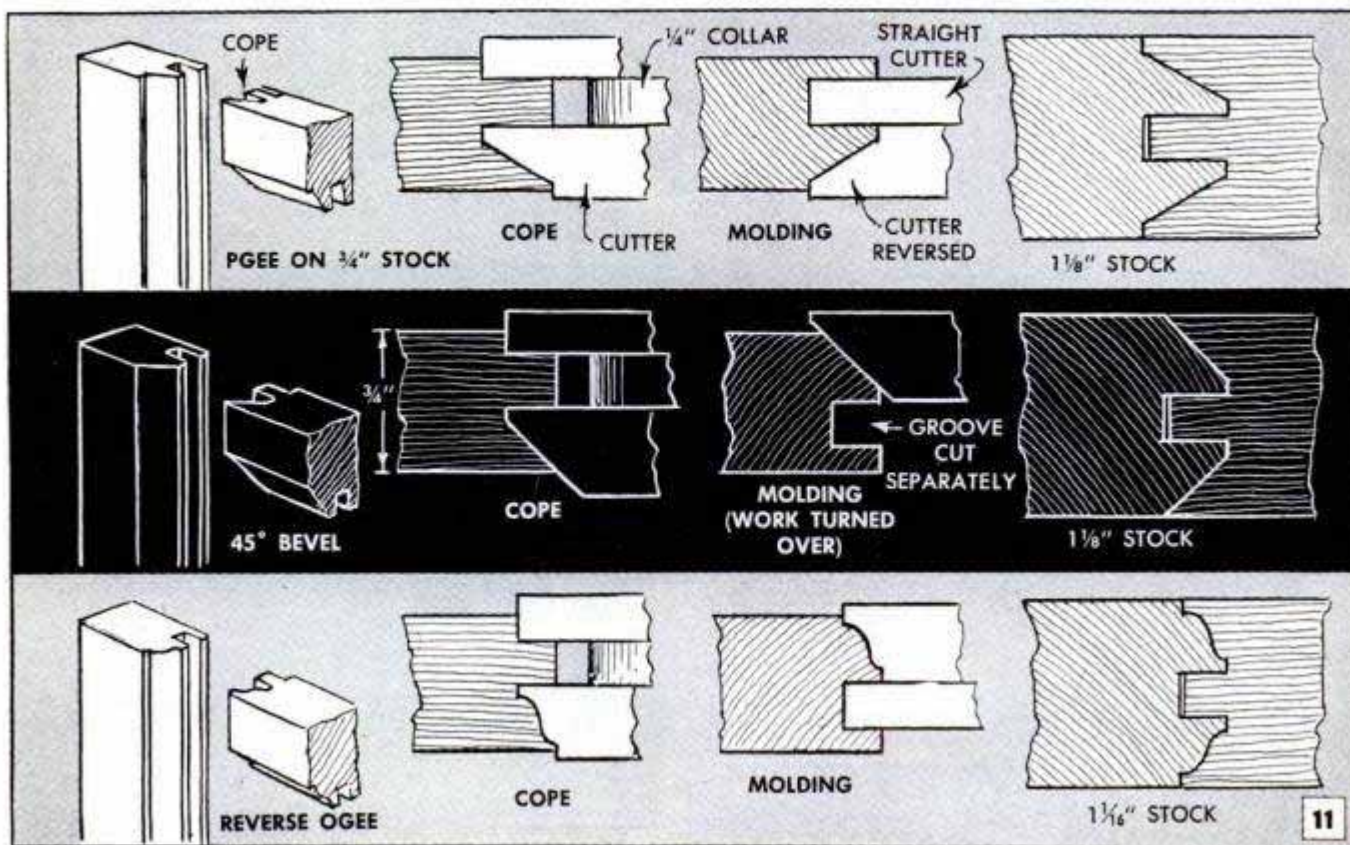
Raised panels: Most doors are assembled with 1/4-in.-plywood panels. If raised panels are desired, they can be cut by using a special shaper cutter, Figs. 12 and 13, or by sawing with a hollow-ground blade tilted 4 or 5 degrees. Whether the shaper or the circular saw is used to shape the edges of the panels, it is best to use a high fence to help support the work. The spring hold-in pictured in Fig. 12 and shown in use in Fig. 13, is made by slotting one end of the length of hardwood. The hold-in is clamped to the shaper table so the slotted edge bears against the flat surface of the work. Height of the fence may be increased by clamping

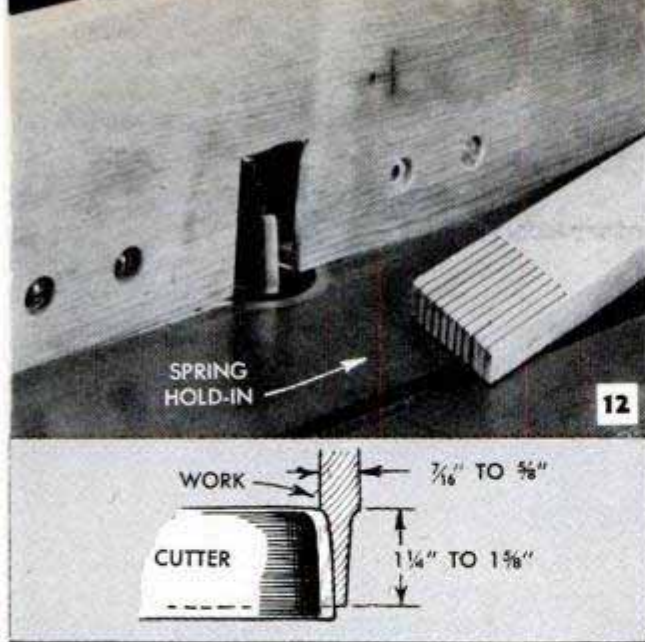


OGEE ON 3/4" STOCK

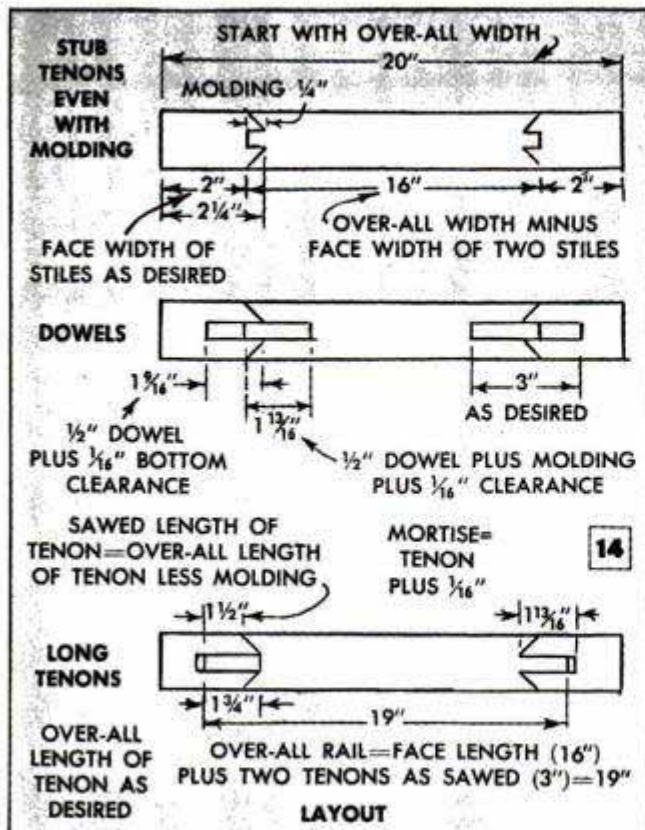
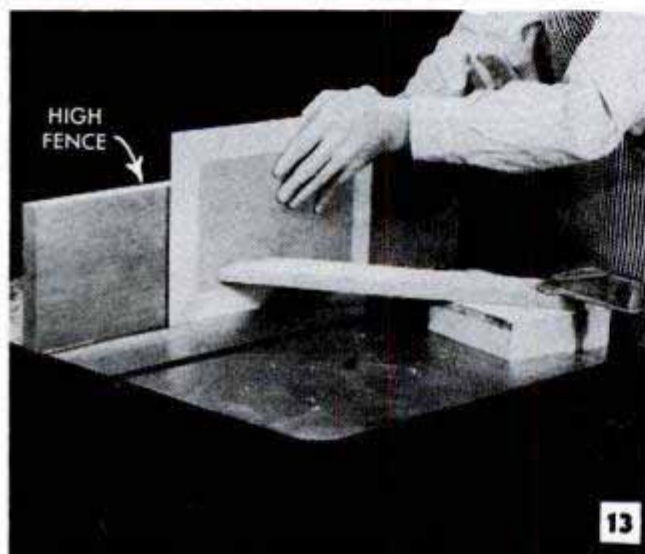
a board to the original fence or bolting it in place, Figs. 12 and 13, countersinking the bolt heads. The auxiliary fence, of course, must be cut out to clear the shaper cutter.

Door layout: Probably the most troublesome problem to the beginner in sash-and-door work is layout; that is, how long to saw the rails to compensate for molding and joints. This becomes easy, however, if a rough drawing is made as in the upper detail of Fig. 14. Then, starting with the required width and applying the various simple additions and subtractions indicated, all the necessary dimensions can be calculated quickly. When determining the width of the molding, always measure an actual sample, as the width varies from cutter to cutter, and also when part instead of the full cutter shape is used. ★ ★ ★





Raised panels are made by shaping edges on circular saw or with special shaper cutter as detailed above



Miniature License Holder Used As Luggage Identification Tag

The miniature license-plate holders many people carry with their automobile keys make excellent identification tags for use on brief cases and other types of luggage. Instead of throwing away last year's tag, pry open the metal tabs, remove the license numbers and insert a small card with your name and address on it. An inexpensive key chain may be used to secure the tag through the handle-grip posts on the piece of luggage.



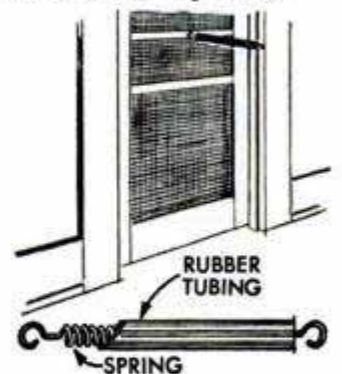
H. G. Frommer, Milwaukee, Wis.

Modeling-Clay Substitute Cooked in Kitchen

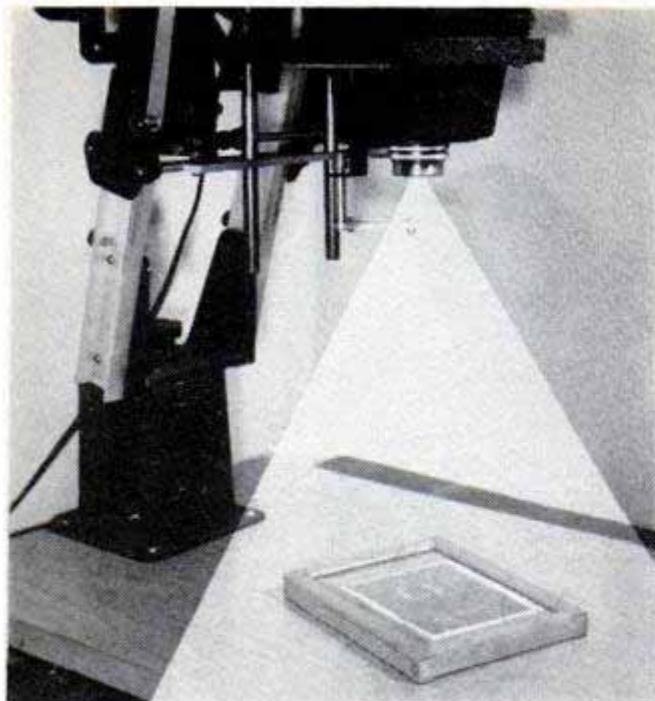
An inexpensive modeling material, allowing both children and adults a chance for artistic expression, is made easily from water, cornstarch and ice-cream salt. Two cups of salt are boiled in one cup of water, into which is stirred one cup of cornstarch that has been thinned to the consistency of thin gravy. When the mixture cooks to a semisolid condition, roll it out on waxed paper to cool. For variety, work in a small amount of vegetable coloring to a portion of it. In its moist condition the "clay" can be kept for weeks by wrapping in waxed paper and storing in a crisper bag in the refrigerator. This material will get quite hard after air-drying for several days. During the drying, pinch shut and smooth over any cracks which appear.—Mrs. Gertrude Springer, Cloverdale, Mich.

Rubber Hose Snubs Door Spring

A piece of small-dia. rubber hose or tubing slipped over a screen-door spring will prevent possible injury if the spring should break or become unhooked. Cut the hose long enough to cover the spring and hooks, loosen the spring and slide it into the hose. Then hook it back into place. In this way, the hose or tubing forms a rubber sheath to dampen and absorb the backlash of the spring if it should break.



Louis Booker, Louisville, Ky.



Enlarger Doubles as Printer

When you run short of contact paper, contact prints can be made by switching over to your enlarger and using enlarging paper. The negative and enlarging paper are held in the printing frame as before and placed on the bed of the enlarger. As enlarger paper is slower than contact, a trial exposure of 10 seconds at f:16 should be made.

Virginia Hanson, Los Angeles, Calif.

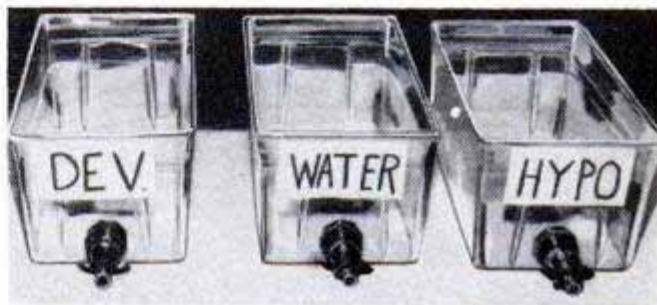
Blue Filter on Enlarger Gives Softer Contrast

Photographic prints made on enlarging paper with a cold-light enlarger have a softer contrast because of the greater amount of blue light in the fluorescent bulb. A blue filter used on a condenser-type enlarger will, for the same reason, give a softer contrast to prints.

Robert C. Florian, Chicago.

Refrigerator Water Coolers Used as Developing Trays

Furnished with identifying labels, several glass or plastic water trays of the type used in home refrigerators will provide a set of photo-developing trays. Each tray holds more than a gallon of liquid and can accommodate 18 film hangers up to and including the 4 x 5-in. size. Each tray has a push-button faucet.—S/Sgt. Eugene H. Lechler, M.C.A.S., Cherry Point, N. C.



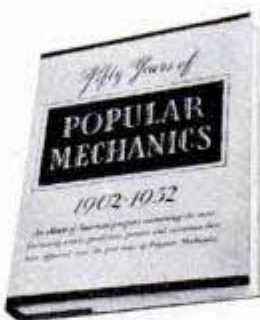
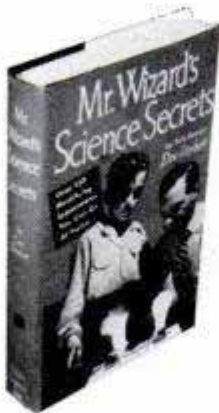
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For Adults

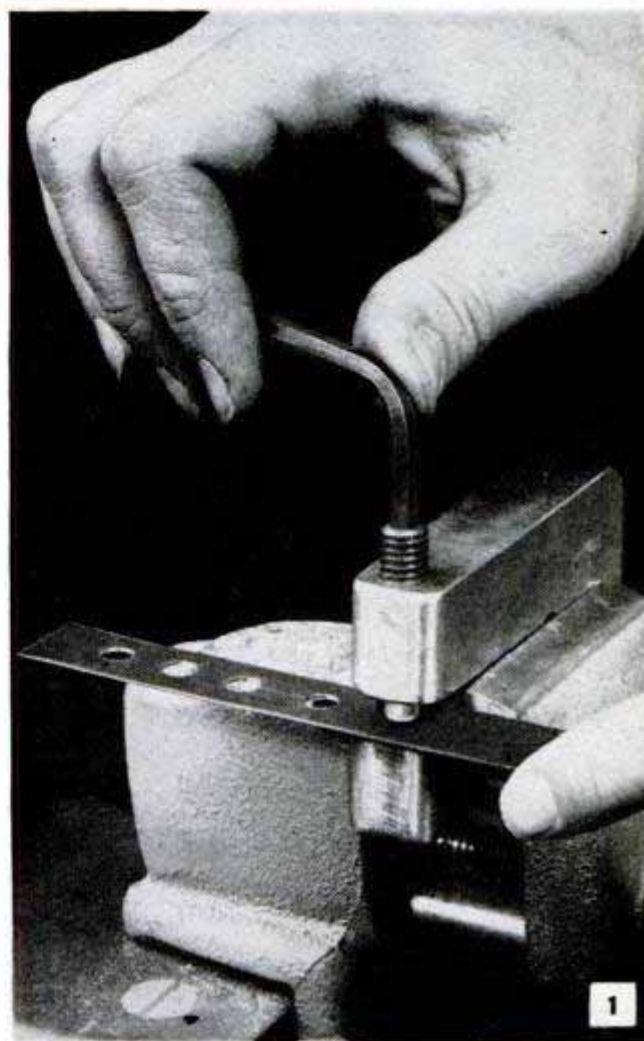
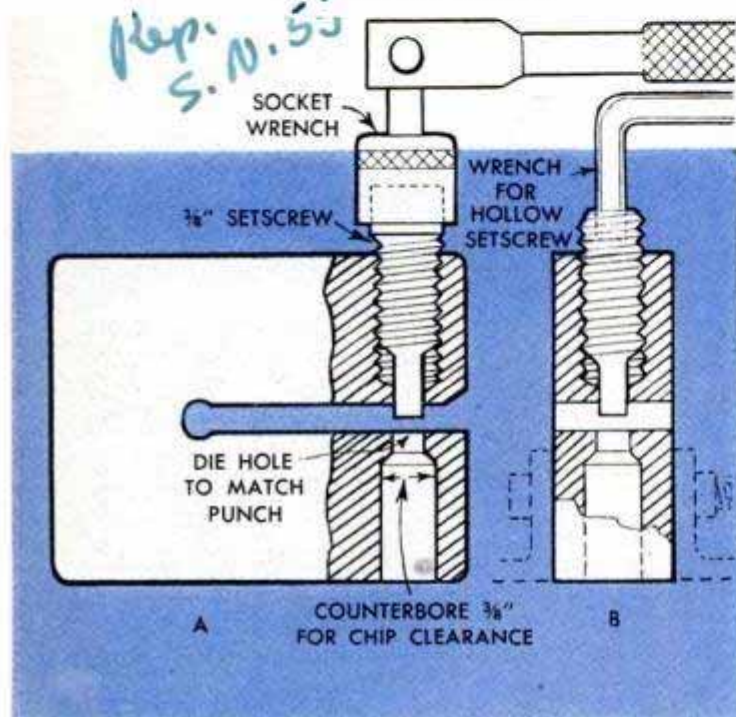
AND HERE'S a solution to a perennial problem: what to give the person who "has everything." Within the pages of this book anyone can find a good many smiles, and memories of "the good old days" when the most important thing on earth was Barney Oldfield's latest race or that amazing phenomenon, pictures that actually moved! Here's a 50-year record of the way we've lived, worked and played, illustrated with a fine collection of photos from every decade. Whether you thumb through the book for one minute or three hours, you'll thrill again to the thrills of yesterday. \$5.00

Both books available from Popular Mechanics Book Department, 208 E. Ontario St., Chicago 11

PUNCHES

for sheet metal and cardboard

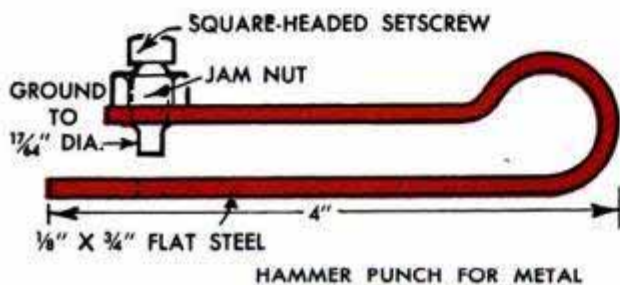
By Carl S. Bates



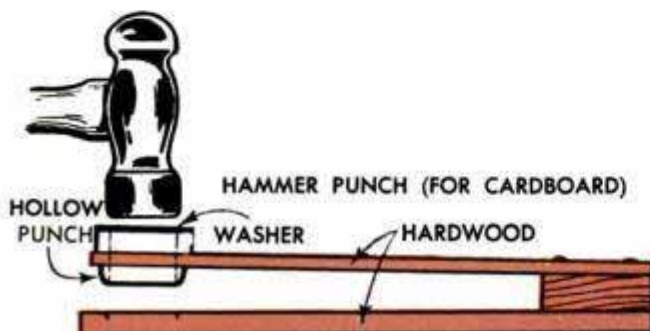
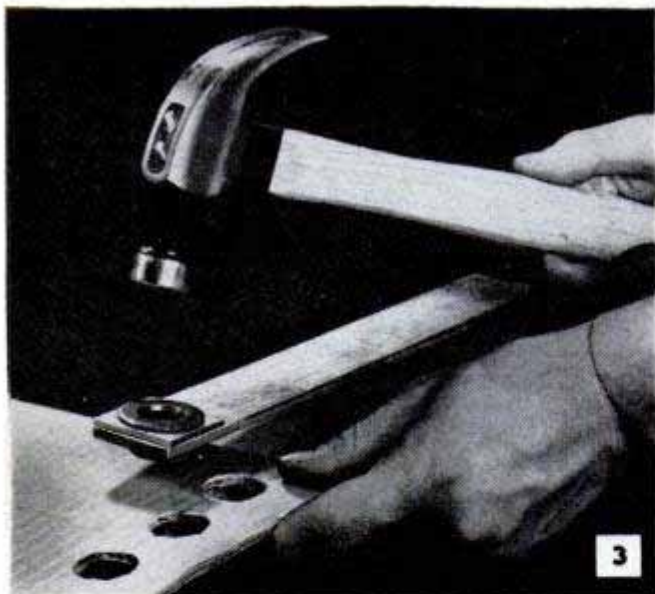
FOR ACCURACY, holes in sheet metal should be punched rather than drilled. Drilling the holes by sandwiching the metal between two pieces of hardwood and drilling through all three thicknesses is never quite satisfactory, especially where a layout is involved. It is difficult to locate the drill bit on the layout centers and unless the bit has been precision-ground the hole is almost sure to be slightly oversize.

When the work requires clean, round holes with sharp edges, simple hand punches that operate on the screw-press principle give the best results on sheet metals of varying thicknesses. The detail above shows the construction of the simplest type, and the photo, Fig. 1, pictures it in use. As detailed, the punch gives only one hole size, but of course, screw punches and insert dies of varying sizes could be used in the same frame. However, as a rule it is easier to make a number of individual units of one-hole size than it is to make insert dies and separate punches of several sizes for use in the same frame. As will be seen from details A and B, suitable punches can be made from ordinary setscrews of the hol-

low and square-headed types. Forming the cutting punch on the end of the setscrew is done by first rough-grinding by hand to remove the threads for a distance of about 1/2 in. from the end of the setscrew. Then drill and tap a block of 1/2 x 1-in. steel for the setscrew. Clamp the block to the grinder tool rest with one face as close to the side of the wheel as possible. Then raise the tool rest until the tapped hole is on the center line of the wheel, or slightly below it. Turn the screw into the tapped hole and adjust the block so that the wheel will take a very light cut as the setscrew is turned in slowly. The advance of the threads carries the rounded end of the setscrew across the face of the wheel, grinding the end concentric. Turn the screw in the required distance and then back it out to clear the wheel. Check the diameter at the end and if it is slightly over the required dimension, tap the holder lightly with a hammer to shift it slightly inward on the tool rest. Then repeat the grinding procedure. Several passes may be necessary to bring the punch to the required diameter. When grinding in this manner be careful not to



HAMMER PUNCH FOR METAL



overheat the setscrew and draw the temper, making it useless as a punch.

When a $\frac{3}{8}$ -in. setscrew is used as the punch, the frame can be made from a piece of $\frac{3}{4}$ -in. tool steel about 2 in. wide and $3\frac{1}{2}$ in. long. Note in the details A and B that the piece is slotted to a clearance hole. The exact width of the slot is not important. If a milling machine is not available, two hacksaw blades placed side by side on the saw frame will do the trick. In either case the clearance hole must be drilled before slotting. If the slot is cut by hand, true the cut with a file so that both faces are smooth.

The next step is to drill the die hole through both arms of the frame. Follow with a tap hole for the $\frac{3}{8}$ -in. thread in the upper frame, and a $\frac{3}{8}$ -in. chip-clearance hole drilled in the bottom arm. Note that both the tap hole and the chip-clearance hole do not break through into the slot. Next, tap the hole in the upper arm for the setscrew, using a bottom tap. It will be noted that these separate drilling operations produce what is in effect a double counterbore with the smaller-diameter hole serving as a guide for the punch in the upper arm, and as the actual die in the lower arm.

For thin sheet metal a hammer actuated punch, Fig. 2, is practical and somewhat faster in operation. The punch itself is made from a square-headed setscrew in the same manner as described. The frame is a length of flat steel bent back on itself as in the detail, Fig. 2. An eye is formed in the bend to accentuate the normal spring action in returning the upper arm to a position parallel with the lower arm after each hammer blow. The punch is held rigidly in the upper arm by means of a jam nut and the hole forming the die is drilled in the lower arm, the hole centering under the punch.

The cardboard punch, Fig. 3, operates in the same manner as the hammer punch for metal, except that the frame is made from three pieces of hardwood and the hollow punch is made from a short length of steel tubing. An inside bevel is ground on one end of the punch to form a cutting edge and a washer welded to the opposite end provides a striking surface. In the assembly the punch is simply forced into a hole drilled through the upper arm. ★ ★ ★

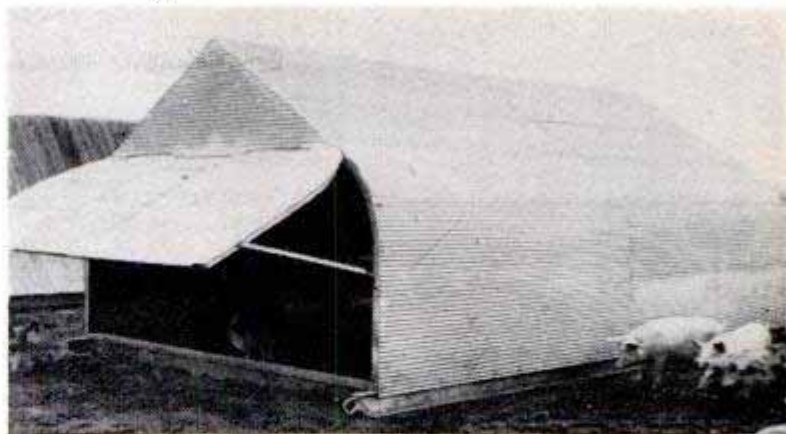
Reducing Tap Breakage

Tap breakage can be kept to a minimum in hard metal by using drills larger than those listed on a tap-drill chart. For holes less than $\frac{1}{2}$ in. use a drill $\frac{1}{64}$ in. larger than listed. For holes larger than $\frac{1}{2}$ in. use a drill $\frac{1}{32}$ in. oversize.

C. Wayne Close, Sycamore, Ohio.

Here's a portable, large-capacity hog shelter which is towed by means of eyes welded on the ends of the skids. The two skids and the crossbeams joining them are 6-in. steel I-beams. The frame is of welded construction, utilizing angle iron from an old windmill tower. The angles were heated and bent to form a radius where roof and walls join. The building is 12 x 20 ft. and 8 ft. high at the ridge. Five rib sections were used to support the roof. The 2 x 10-ft. sheets of corrugated aluminum forming the skin were bolted to the ribs. One sheet was folded over the ridge, extending a foot on each side. The aluminum sheeting, plus the rib-type welded construction, results in a lightweight

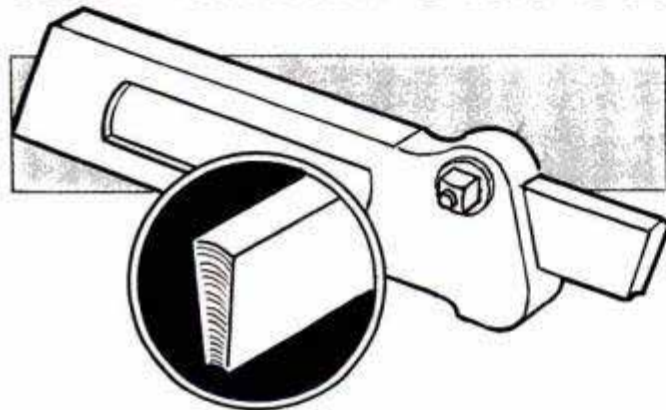
Portable General-Purpose Shelter Is Easily Towed on Skids



building that can be readily towed to any desired location.

Arthur Trauffer, Mt. Pleasant, Iowa.

Cut-Off Tool Hollow Ground to Form Curved Chip

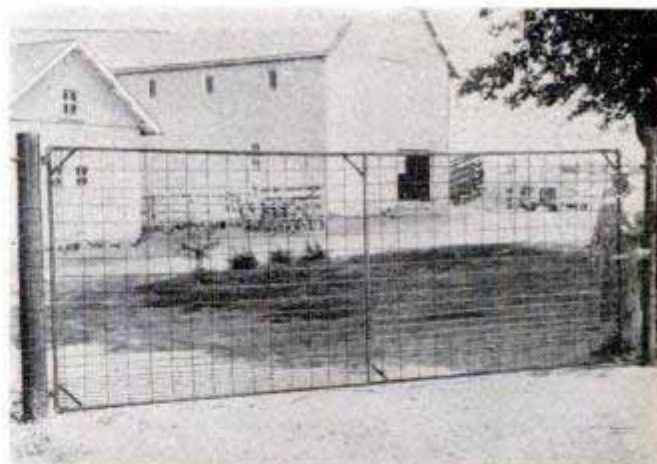


When cutting off large-diameter work in the metal-turning lathe, the straight chips have a tendency to curl tightly and wedge in the groove, causing the tool to bind as the cut deepens. This often results in tool breakage and damage to the work. The trouble generally can be avoided if the cutting edge of the tool is hollow ground as indicated. The new cutting edge forms a chip that is slightly curved across its width and lifts readily without wedging.

C. W. Woodson, Chicago.

Extra-Wide Farm-Implement Gate Easily Handled

Although measuring 16 ft. long and 6 ft. high to allow passage of large implements, this farm gate actually is lightweight and easy to handle. The steel-pipe framework is reinforced by welding lengths of flat bar stock across the corners. The tightly stretched, welded-wire fabric is wrapped around each end and tack welded to the frame. The fabric is wired to the frame at the top and bottom. Short lengths of pipe welded to the end of the frame serve as sockets to rest on the pintle hinge pins screwed into the fence posts. The hinge pins illustrated, are the type that are threaded.

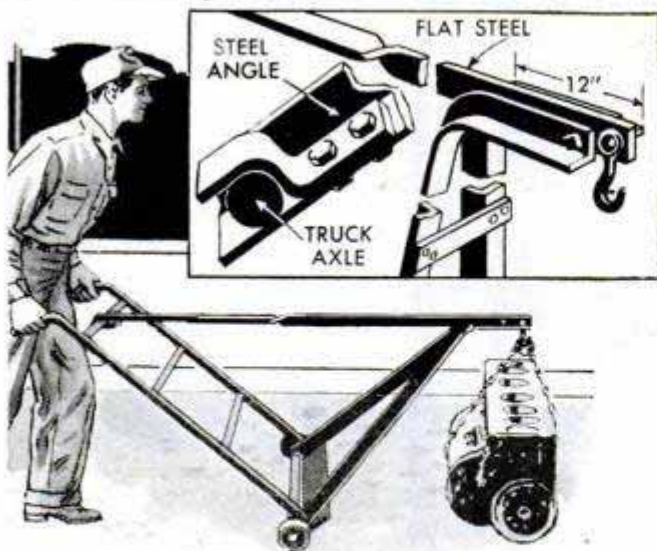


Corroded Carburetor Cleaned by Mild Acid Solution

Deposits of corrosion in the float chamber of a carburetor built up through the action of water on the casting can be removed in all except the very worse cases. First, scrape and blow out as much of the corrosion as possible. Then plug all holes and fill the carburetor to the height of the corrosion with a mild solution of sulphuric acid, such as battery acid. A stronger solu-

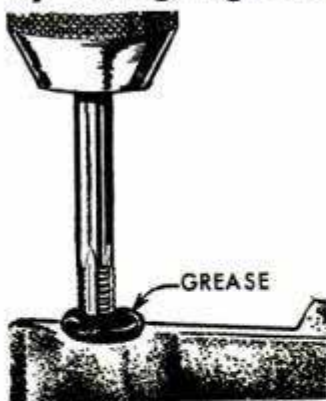
tion of the acid will eat away the corrosion more rapidly, but it must be watched closely to prevent damage to the casting. An ideal solution is one which will not quite float the bulb of the hydrometer. Such a solution will clean the average float chamber in 20 min. After cleaning, rinse the carburetor thoroughly with clear running water and reassemble.

Hand Truck Equipped With Crane Lifts Heavy Loads



The moving of heavy and awkward objects can be simplified by the use of this crane which is attached to a handtruck, and can be removed when the truck is used for normal operations. The length of flat steel used as the crane arm is bent at one end to hook over the top crosspiece of the truck while a hook is attached to the other end. The crane arm is supported by two lengths of angle steel which are bent and bolted to the arm just in back of the hook. These support arms are fitted with brackets which slip over the axle of the truck. A short length of chain for wrapping around some items makes a convenient accessory for this tool.

Chips "Floated" From Tapped Hole By Using Light Grease



When running threads into blind holes, chips often jam the tap, causing it to break. To prevent tap breakage and produce a cleaner thread, one mechanic fills the hole to be tapped with light grease. Then, as the tap enters, pressure is

built up, forcing the grease out between the flutes of the tap and the chips with it.

Walter E. Burton, Akron, Ohio.

Overhead Plumbing in Barn Simplifies Floor Cleaning

Instead of running a water pipe over his barn floor, or up through it, making the floor difficult to clean, one farmer ran the pipe in along the ceiling and down the wall

to shoulder height. A sill cock installed at this point made it possible to use a length of garden hose to direct the water wherever needed.

Drop Cord Kept on Empty Spool

An effective way of handling and storing your drop cord is to use an empty metal lamp-cord spool, obtainable from an electrical appliance or hardware store. Drill a $\frac{1}{4}$ -in. hole in one side of the spool, insert the end of the cord through it and attach a male plug. Any length of cord may then be unreeled from the spool.

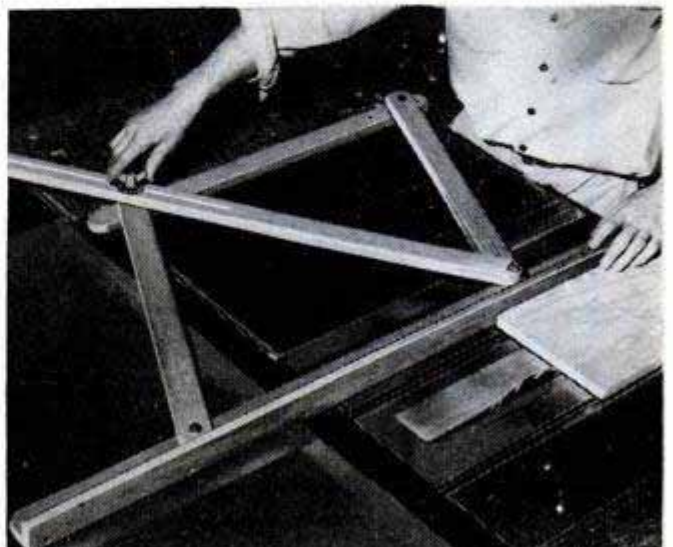
John W. Byrd Jr., Jacksonville, N. C.

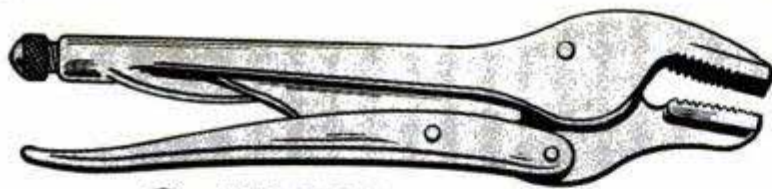


Adjustable Ripping Fence Extends Saw Capacity

This adjustable ripping fence, in conjunction with a plywood table extension, greatly increases the capacity of any small table saw, allowing it to rip wide pieces, such as plywood sheets. For the rough adjustment, the bolts through the outside parallel bar are set into a series of holes drilled in the front and back edges of the extension table. These holes are on a line at right angles to the saw blade, and spaced exactly the same distance apart on both edges. The fence was made of oak scraps, two pieces being screwed together L-shape to form the actual fence. The four pieces were clamped and drilled together to assure keeping the sides parallel. In use the fence is adjusted to any measurement by the quick-adjusting thumb nut.

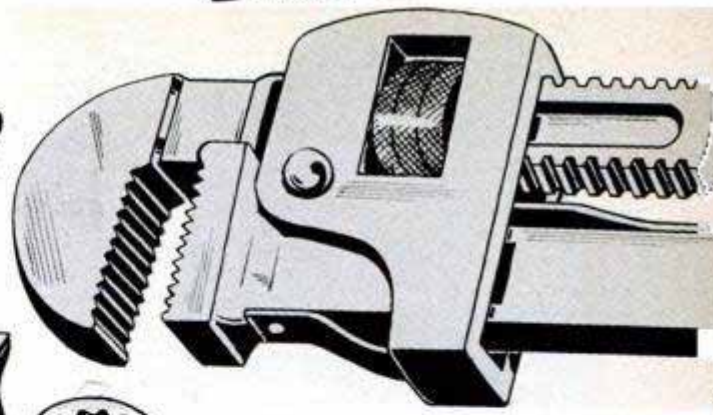
Val F. Rebhahn, San Francisco, Calif.



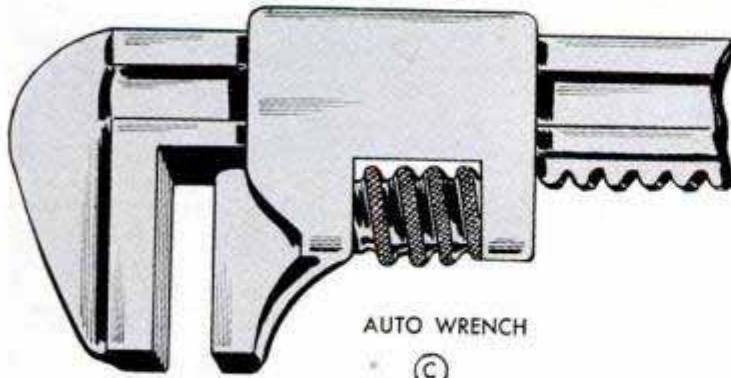


(A) LEVER-ACTION WRENCH

1

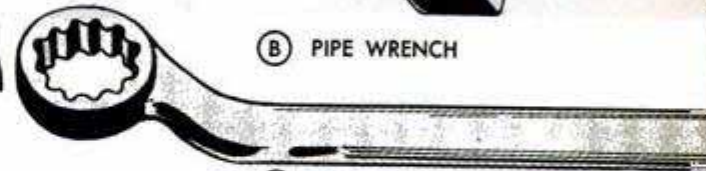


(B) PIPE WRENCH



AUTO WRENCH

(C)



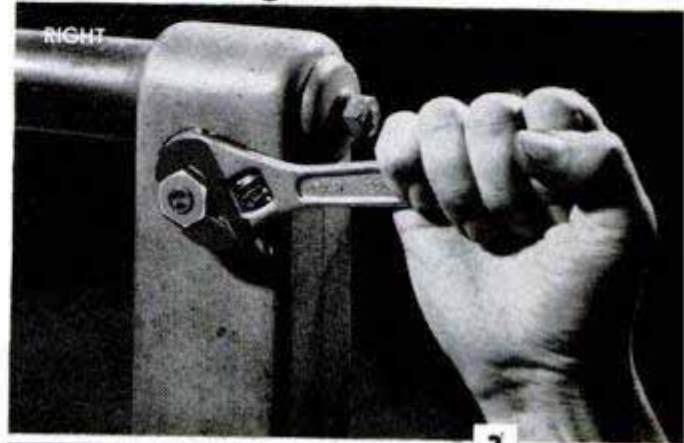
(D) BOX WRENCH

USING WRENCHES *The Right Way*

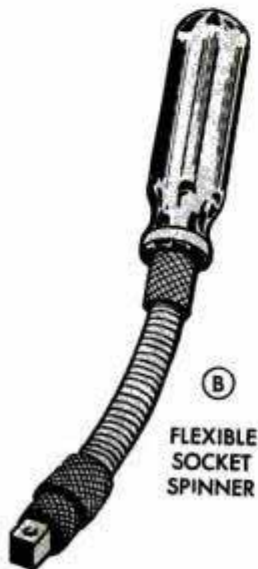
By E. R. Haan

BY PUTTING INTO USE a few simple tricks that experienced mechanics practice regularly you can get more work out of wrenches with less effort and without damaging the tools. Wrenches are either adjustable or have fixed jaws, and each type has many variations. Some are for all-around use; others are designed for specific jobs. Figs. 1 and 3 show a number of commonly used wrenches.

Adjustable flat-jaw wrenches: Every homeowner frequently has use for an adjustable flat-jaw wrench. Auto wrenches, detail C, Fig. 1, have certain advantages but are in much less use than adjustable wrenches, detail A, Fig. 3. These

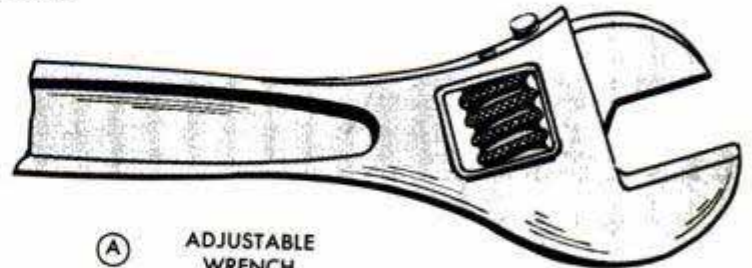


There's a right way to put pressure on the handle of an adjustable wrench. In emergency you can use light pressure as in lower photo

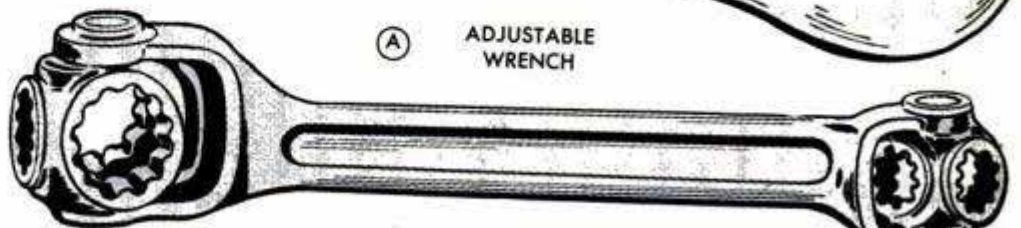


(B) FLEXIBLE SOCKET SPINNER

3



(A) ADJUSTABLE WRENCH



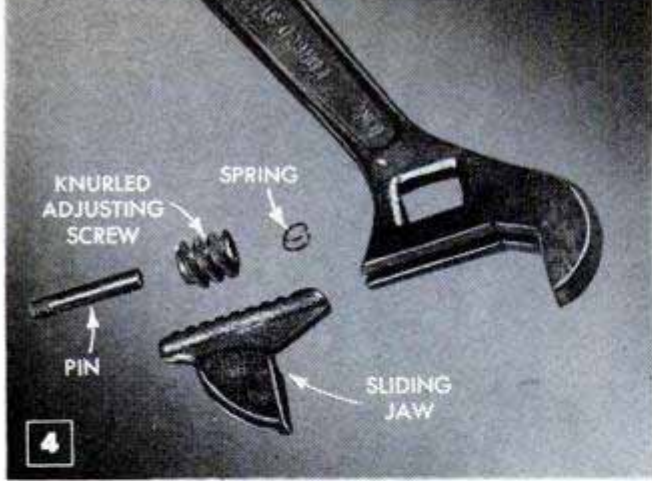
(C) MULTISOCKET WRENCH



(D) NUT DRIVER (INTEGRAL SOCKET)



(E) RATCHET BOX WRENCH



Disassembled, an adjustable wrench looks like this. A short coil spring maintains tension on the movable jaw. When the jaw becomes loose, stretch the spring

Wrenches with badly damaged jaw faces can be made serviceable again by grinding the jaws so that the spacing between them is equal to the next nut size

SOCKET DRIVERS

SOCKET TYPES

USUAL ANGLE 15°

SIZES OF OPEN-END WRENCHES (DIMENSIONS IN INCHES)					
OPENING	$\frac{1}{4} \times \frac{3}{16}$	$\frac{3}{8} \times \frac{7}{16}$	$\frac{1}{2} \times \frac{9}{16}$	$\frac{5}{8} \times \frac{11}{16}$	
LENGTH	4 $\frac{3}{8}$	5	5 $\frac{3}{4}$	6 $\frac{1}{2}$	
OPENING	$\frac{3}{8} \times \frac{3}{4}$	$\frac{1}{2} \times \frac{13}{16}$	$\frac{3}{4} \times \frac{7}{8}$	$\frac{15}{16} \times 1$	$1 \frac{1}{16} \times 1 \frac{1}{8}$
LENGTH	7 $\frac{3}{4}$	8 $\frac{1}{4}$	8 $\frac{3}{4}$	10	11 $\frac{1}{4}$

are much more efficient and also are far easier to handle on most work. They vary from 4 to 16 in. in length, the smallest one opening to $\frac{1}{2}$ in., and the largest one to approximately 2 in. The 6, 8 and 10-in. sizes, which open to about $\frac{3}{4}$, $\frac{7}{8}$ and $1\frac{1}{8}$ in. respectively, are the most popular.

In using any type of adjustable wrench it should be placed on the work so that the stationary jaw takes the greatest strain. The right and wrong ways are shown in Fig. 2. Adjust the jaws so they just slide over parallel flats of the nut without excessive clearance. Too much clearance allows the jaws to ride over corners, which tends to round them, and may also cause the wrench to slip off the work, resulting in bruised fingers.

Excessive play in an adjustable wrench often can be minimized by first removing the threaded pin on which the "worm" or knurl turns. This loosens the other movable parts including the movable jaw, the worm and a small coil spring as in Fig. 4. Stretch the spring, reinsert it into the cupped end of the worm and then reassemble the wrench, tightening the pin and prick-punching its end to lock it in place.

Open-end wrenches: An open-end, fixed-jaw wrench, details A, B and C, Fig. 7, has two advantages over an adjustable wrench. First the jaws, being stationary, do not require constant readjustment. Second, as the jaws are usually inclined at a 15-deg. angle from the body center line, the wrench can be turned over to change the angle of the handle when tightening or loosening a nut in close quarters, detail D, Fig. 9.

Ordinary open-end wrenches come in sets but can also be obtained separately. Each wrench has jaws at both ends. The ends are referred to as heads and the jaw widths vary so that each individual wrench takes two nut sizes. Body lengths vary with jaw sizes as indicated in the table, Fig. 7. Lengths are standardized within certain

limits so that excessive leverage cannot be applied to the work. Most open-end wrenches have rather wide jaws as in detail A, Fig. 7. Better ones of tough alloy steel often have thin, pear-shaped heads, detail B. Some open-end wrenches have the head at one end set at an angle from 60 to 90 deg. as in detail C.

Open-end wrenches with battered, nicked or spread jaws often can be made serviceable again by filing or grinding the jaws, which then should be enlarged to the next standard-size opening. The jaw faces should be perfectly flat and parallel. If you do this by grinding as in Fig. 5, be sure to dip the wrench end into water constantly in order to avoid drawing the temper.

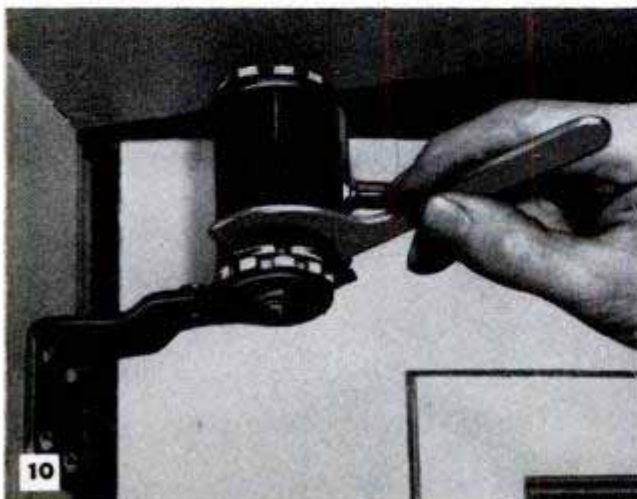
Box and combination wrenches: Box wrenches for hexagon nuts, detail D, Fig. 1, come in practically the same sizes as open-end wrenches. The heads are round and are usually offset from 10 to 45 deg. from the handle for greater handling convenience. On the inside of the heads there are twelve notches permitting a nonslip grip on all corners of a nut or bolt head. The earlier type of box wrenches, which are hexagon shaped inside, do not have the range of adjustment as do modern 12-point box wrenches, but still are being used for small assembly work.

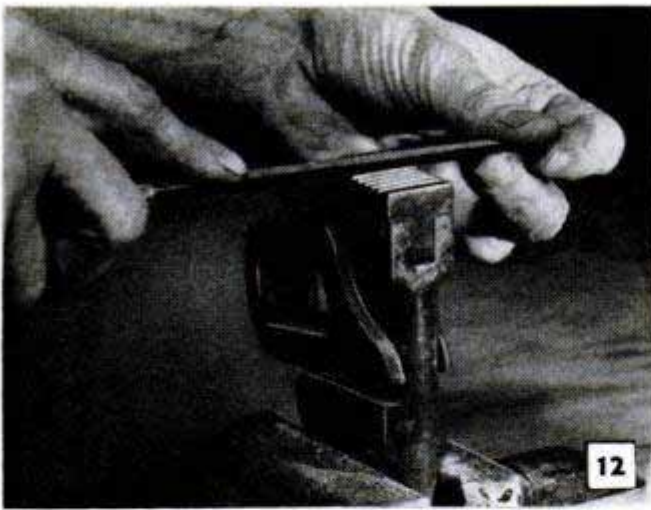
Combination wrenches have one open end and one box end. The reason for this arrangement is that the box end is safer for loosening nuts or for final tightening, while the open end is more convenient to slip on and off a nut while turning it.

Socket wrenches and nut drivers: Socket wrenches are similar to box wrenches but have a deeper reach in recessed places where other wrenches cannot be used. Nearly all socket wrenches consist of a driver to which the interchangeable sockets or drive heads are attached. Details A to F of Fig. 6 show various types of drivers. Detail G shows a regular-length socket and

Hook-type spanner wrench is being used to adjust door closer. Spanners are made in several types

Lever-action wrench is easily adjusted to the size of work. Compressing the handles locks the jaws





Serrated pipe-wrench jaws can be resharpened by filing or grinding. Teeth are filed to uniform length

also one that is extra deep. Sockets for both square and hexagon-shaped nuts and bolt heads are available. The work openings may be square or grooved like box wrenches. The 6 and 12-point heads, or sockets, are for hexagon nuts, and the 8-point heads for square nuts. Some drive heads are combined with universal joints as in detail H, permitting the drive tool to be held at various angles. The universal joint may be a separate adaptor unit be-

tween the drive tool and the head. Small socket wrenches and spinners that are used like screwdrivers, details B and D, Fig. 3, are called nut drivers. Multisocket wrenches, detail C, Fig. 3, also are available.

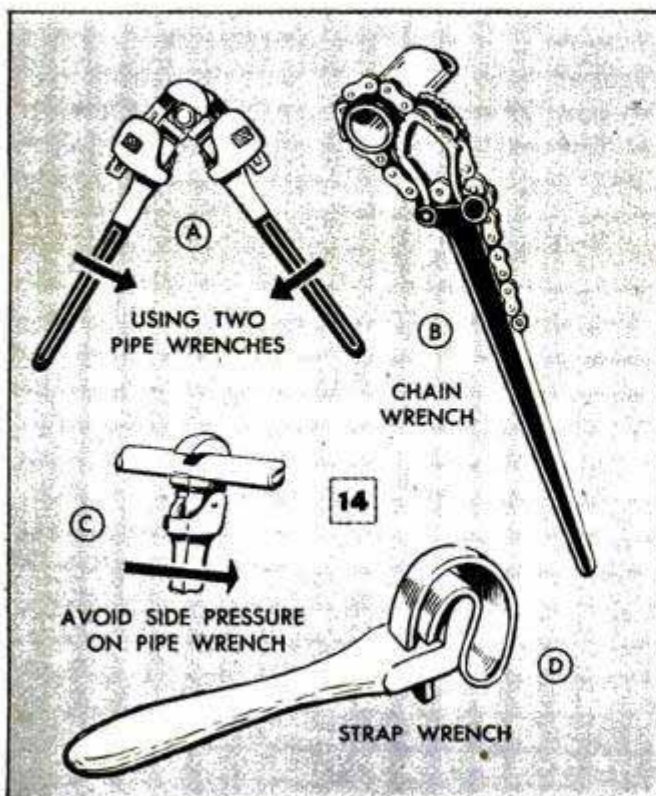
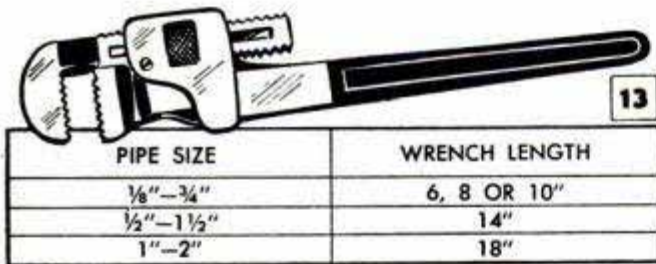
Ratchet wrenches: Box and socket wrenches may be of the ratchet type. A ratchet permits the handle to be moved back and forth while driving a nut in one direction only. This eliminates slipping a wrench off and on the nut for each stroke, and is especially handy where the stroke is limited. Ratchet box wrenches have heads integral with the body as in detail E, Fig. 3. These have to be turned over to turn a nut in the opposite direction. A reversible ratchet, detail F, Fig. 6, is used for drive sockets. It also will take an extension or universal joint. A pin or small lever reverses the ratchet.

Spanner wrenches: Threaded rings often have notches or holes near the edges to permit tightening or loosening them with hook-type spanner wrenches shown in Fig. 8. Such wrenches may have one hook or a round pin, an adjustable hook, or two hooks diametrically opposite each other. Sometimes the faces of threaded rings are drilled, in which case fixed or adjustable face-pin spanners, also shown in Fig. 8, are used. Important dimensions of spanners are the length and diameter of the pins and their spacing. Fig. 10 pictures a hook-type spanner in use.

Setscrew wrenches: Socket setscrews having hexagon-shaped holes in the body, rather than square or hex heads, often are used on motors and other machinery, especially to hold pulleys on shafts. L-shaped wrenches to fit standard setscrews of this type also are shown in Fig. 8.

Using wrenches properly: Before exerting any pressure on a wrench, make sure that it fits the nut, or other work, as snugly as possible. This will prevent rounding corners of the nut, and also keep the wrench from slipping off. If the work is gripped at the jaw tips, they may spread or break, and may also slip off the nut. Pull a wrench toward you as in detail E, Fig. 9, rather than pushing it, which may result in injury to the hand if the wrench should slip, or the work suddenly break loose. If you must push a wrench, apply pressure with the palm of the open hand as in detail F. Don't increase the leverage of a wrench by slipping a length of pipe over it as in detail A. This may break a bolt, strip the thread or even break the wrench. For the same reason don't hammer on a wrench as in detail B to jar a nut loose. If hammering is necessary, use a striking wrench, detail C. Don't use wrenches as hammers or pry bars.

Lever-jaw wrenches: Fig. 1, detail A, and



also Figs. 10 and 11 show a lever-action wrench. The jaws are adjusted on the work by turning the thumbscrew while the lever handle is held open just beyond the locking point. Then the handle is closed to lock the jaws on the work. Such a wrench can serve as a small pipe wrench. However, as its sharp teeth bite into metal, it should not be used where marks are objectionable.

Pipe wrenches: For pipe fitting, or wherever round work must be gripped to prevent it from turning, you need one or two pipe wrenches, detail B, Figs. 1 and 13. The table in Fig. 13 indicates the proper size wrench to use for various diameters. For average requirements a 10 and 18-in. pipe wrench will be found satisfactory. Two pipe wrenches often are needed, one to hold pipe while turning a fitting on or off with the other, as in detail A, Fig. 14. Pipe too large for a pipe wrench is gripped with a chain wrench, detail B.

When adjusting a pipe wrench on pipe, you adjust the movable jaw so that when pressure is applied on the handle, the teeth on the jaws will bite into the pipe but will not crush it. A pipe wrench should not be pushed sideways as in detail C. This may damage the wrench. Avoid using a pipe wrench on any surface that you do not wish to mar, as on chromium-plated pipe tubing, or nuts. Use a strap wrench, detail D, for such purposes. If a pipe wrench is the only tool available, then insert pieces of cardboard between the work and the wrench jaws.

When the sharp teeth of a pipe wrench become dull and the wrench loses its holding power, you can sharpen the teeth with a fine, 8-in. triangular file, Fig. 12. This may also be done with a grinding wheel, dressed to the same angle as the teeth. The level of the teeth should be maintained so that they will be parallel to each other through their length and also to those of the other jaw.

Special wrenches: There are numerous other types of wrenches designed for special purposes in various professional fields as well as for assembly work in industrial plants. In general, the basic methods of handling them are similar to the methods used on ordinary wrenches. ★ ★ ★

Exterminating Black Ants

To exterminate a hill of black ants, one farmer soaked a large sponge in gasoline, placed it on top of the hill and then inverted a dishpan over it. If the hill is too large to be covered by the pan, a washtub may be used in place of it. When trapped beneath the pan, the gas fumes were concentrated sufficiently to destroy most, if not all, of the ant colony within a 24-hr. period.



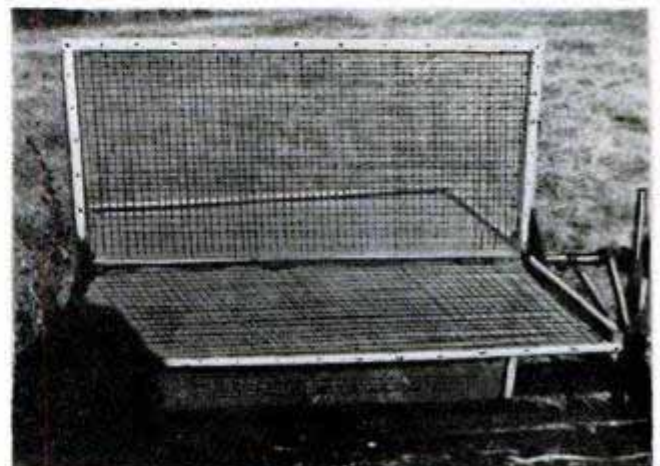
Raised Cash-Register Keys Are Timesaver in Store

When a heavy turnover of a single item in a store sale is anticipated, considerable time can be saved by fitting keys representing the price of the article with dowel caps as shown. This enables the clerk to locate the keys with a quick glance or, if far enough apart, by feel alone. The caps are made from short pieces of dowel that are drilled at one end to fit over the keys, after which they are taped in place. Numbers that correspond with the respective keys are then lettered on the caps.

Hardware Cloth on Combine Reel Prevents Fouling

To prevent his combine reels from becoming fouled in viney crops, or in crops infested with bindweed, one farmer modified his reel as illustrated. He removed the wooden cross blades and attached hardware cloth to the arms of the spider. Each piece was fastened to the axle of the reel with a length of baling wire and secured to the arms of the reel with tacks.

J. R. Kennedy, McCool, Miss.



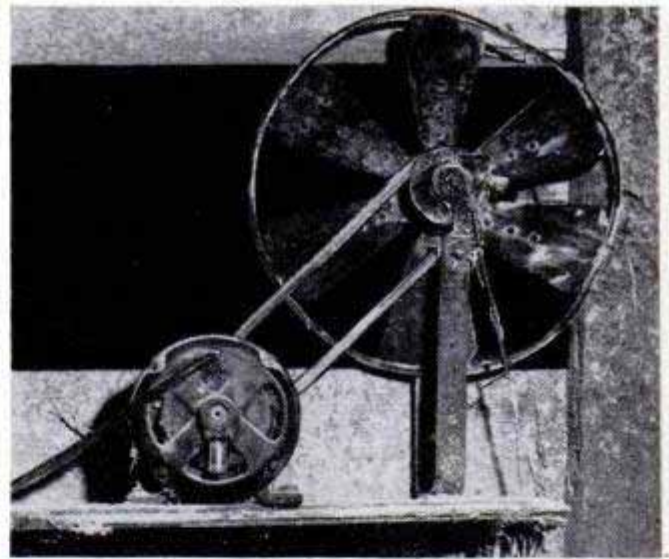
Tractor-Lift Arms Used to Load Corn Shocks



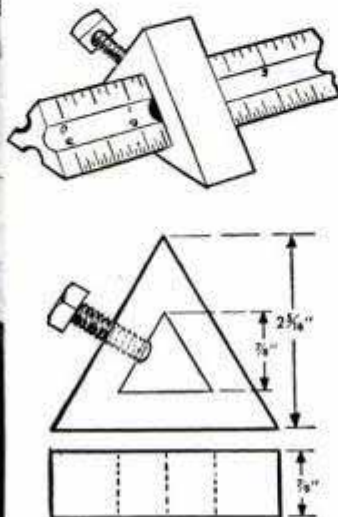
When feeding corn fodder in the shock to cattle, one farmer simplifies the job of loading the shocks by utilizing a tractor scoop to lift the whole shock onto a wagon as shown. This was made possible by removing the scoop part and bolting an A-shaped extension to the ends of the lift arms. The extension, held vertically by lightweight cable, is made from 2 x 4s that are joined at the top by a long bolt. A swivel hung from this bolt holds a six-tined grapple fork having a trip rope.—Ed Mercer, Madison, Wis.

Truck-Radiator Fan Cools Dairy Barn at Milking Time

To remove heated stagnant air from a small dairy barn at the end of a sultry day, one farmer improvised a highly efficient fan by utilizing the six-bladed unit from a dismantled truck engine. The fan, V-pulley and bracket assembly are welded or bolted to a heavy U-shaped bracket of flat steel. This bracket is bolted to a shelf attached to the inside of the barn wall in a position to center the fan over an opening cut in the wall at a point just below the ceiling. The motor, driving the fan through a V-belt as pictured, also is bolted to the shelf. Located in this position the fan quickly removes warm air from the first floor of the building and displaces it with cooler air from the outside.

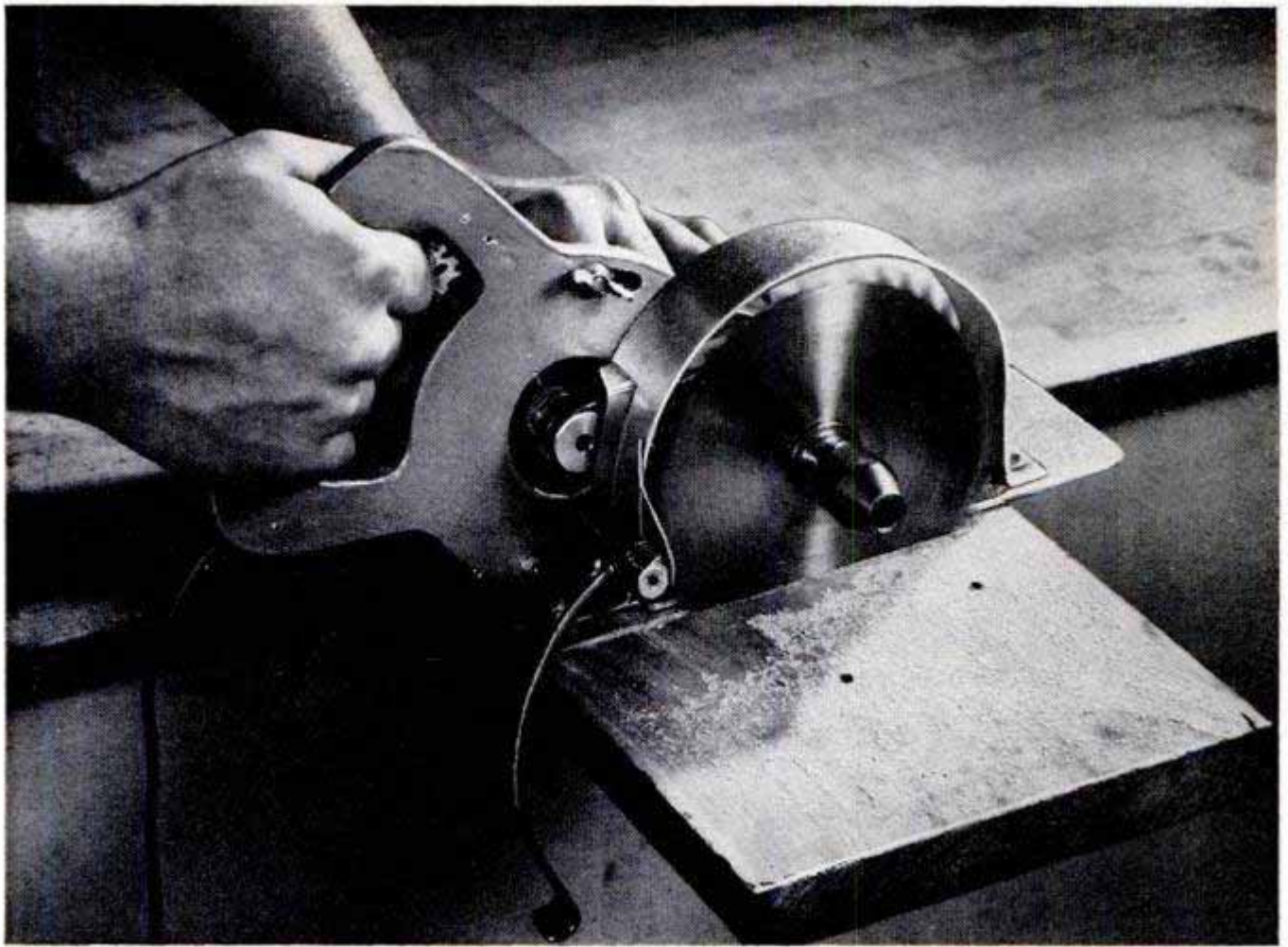


Gauge Gives Scale Reductions Directly on the Layout



An aluminum stop fitted on a draftsman's triangular scale permits the user to lay off and score stock to scale measurements without the necessity of transferring the measurements in the usual manner. Hardened metal scoring points are fitted at both ends of the scale so that it can be used to mark gauge lines on both metal and wood. The 1-in. graduation on the triangular scale also permits the unit to be used as a regular marking gauge. The sliding stop is made from aluminum to the dimensions given and is drilled and tapped for a small set-screw, the threaded end of which should be ground to a radius slightly less than that of the flutes in the sides of the scale.

Richard Dickover, Chicago.



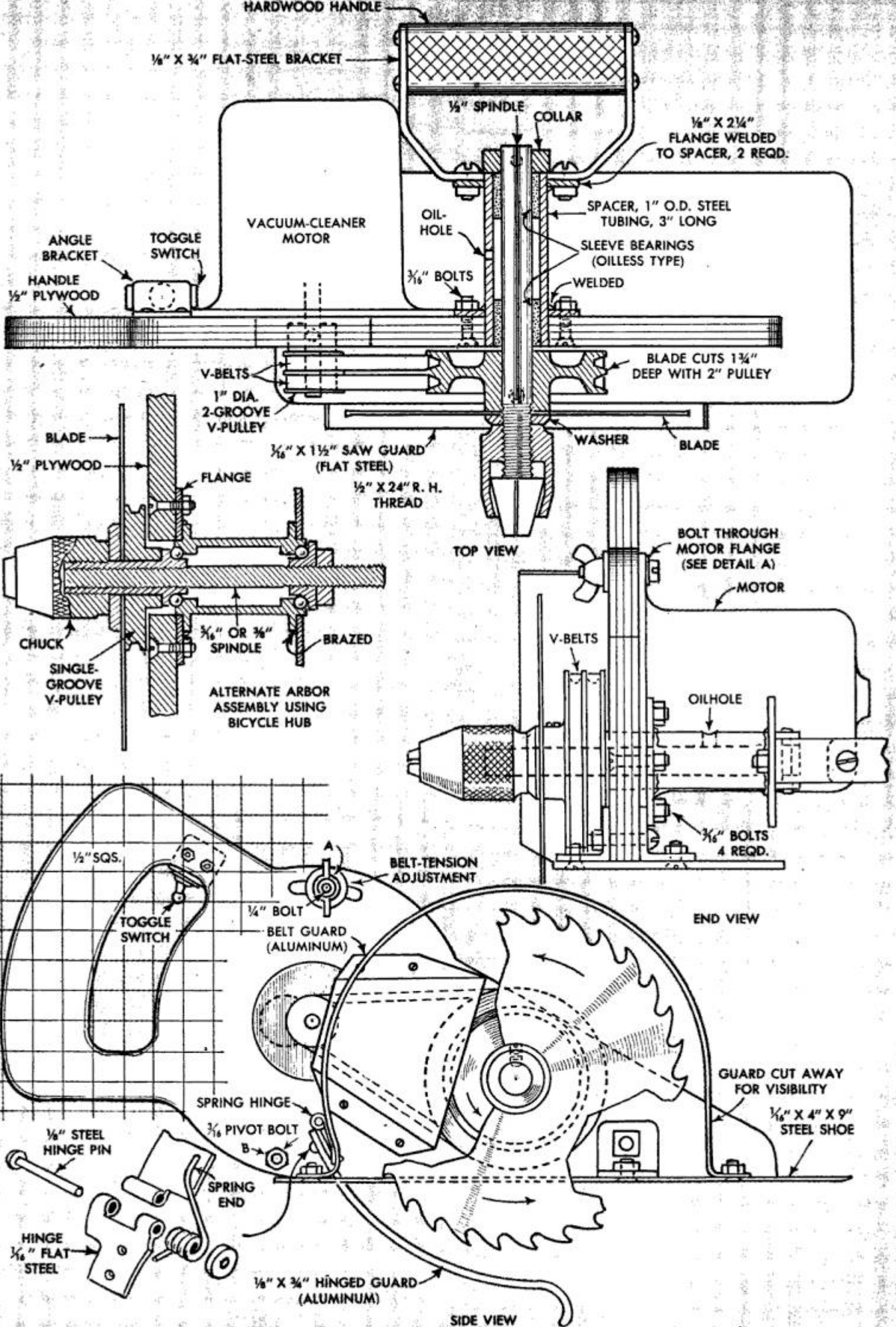
PORTABLE POWER SAW

FROM VACUUM-CLEANER MOTOR

THIS PORTABLE SAW doubles as a drill that will bore holes as large as $\frac{5}{16}$ in. in metal and 1 in. in hardwood. A vacuum-cleaner motor of the flange-mounted type provides power to drive a 6-in.-dia. saw blade through two $\frac{1}{4}$ -in. V-belts of the type used on sewing machines. A 6-in. blade cuts through a standard 2 x 4 easily. Before cutting or machining any stock according to the details on the following page, have the motor, belts, drill chuck of $\frac{3}{8}$ -in. capacity and the oilless sleeve bearings at hand. As shown in the center left-hand detail, a bicycle hub can be used as a spindle housing if desired. This will contain ball bearings which take both lateral and radial thrust. However, its length will permit the use of only a single-groove pulley rather than the more efficient two-groove pulleys as shown in the top detail. Note that the motor is flange-mounted on the plywood frame to the rear of the saw arbor and drives from a 1-in. pulley to a 2-in.-dia. pulley on the arbor. Recondition the motor by replacing worn sleeve bearings and brushes, and if necessary, true up the commutator. Check to see that the

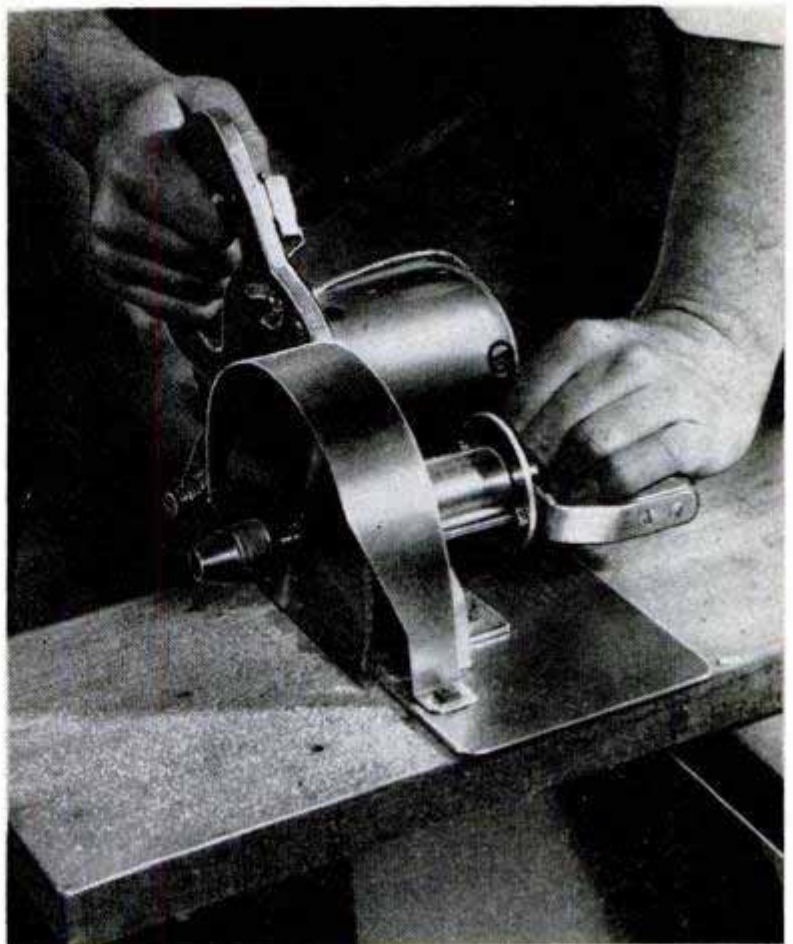
brush holders are in good condition and clean the motor thoroughly.

Note that the length of the $\frac{1}{2}$ -in. saw arbor is not given. This must be determined from the drill chuck at hand as the length of the thread required to close it may vary somewhat. As will be seen from the detail, the chuck also serves as the arbor nut to hold the saw blade in place. The bearing housing is assembled from a length of steel tubing and two steel washers, one being welded to each end of the tube to form a flange. Note that the flange at the inner end of the housing is welded to the tube at a point $\frac{1}{2}$ in. from the end of the tube which is inserted in a hole drilled in the plywood frame. Both flanges are drilled to take $\frac{3}{16}$ -in. bolts for attaching the outboard handle and also for attaching the housing to the frame. The oilless sleeve bearings, or bushings, should be a light drive fit inside the housing. Now cut a triangular piece of $\frac{1}{2}$ -in. plywood, laying it off from a base line with the short side measuring about 15 in. and with the long side at a 30-deg. angle from the base line. This will give you the rough blank for the frame. Lay out and saw



the handle to shape from the squared portion of the lower detail. Then locate and bore a 2-in. hole for insertion of the motor shaft in the position indicated in the detail. The size of the hole can vary somewhat but it is necessary that the motor flange pivot on the lower bolt, B, so the belt can be tightened by loosening the thumb screw, A, and shifting the bolt in the slot. After centering the shaft in the 2-in. hole, drill holes for bolts A and B, and elongate the upper hole to form a slot about 1½ in. long. Mark the outline of the motor flange on the frame, making sure that the flange clears the finger opening in the frame. Then cut the frame to a rounded contour at the point where the motor is fitted. The remainder of the waste is cut away later to give approximately the shape shown. No dimensions are given for the frame, as the sizes of motors and flanges will vary and the frame must be made to suit the motor at hand.

The center-to-center distance between the motor shaft and the saw arbor is determined by the length of the belt and this can be measured only with the belts on the pulleys. Turn a two-groove drive pulley from machining aluminum or mild steel to fit the motor shaft. Space the grooves so the belts run with about ⅜-³²-in. clearance between the edges. Then turn the arbor pulley to 2-in. outside diameter with a two-groove rim, the grooves corresponding in size to those in the motor pulley. Note that both pulleys have projecting hubs which are drilled and tapped for hollow setscrews. With these parts made you can then determine the length of the saw arbor. Before cutting the arbor, or spindle, to length, thread the end for the drill chuck and make a trial assembly with the pulley, saw blade and chuck in normal position. Then bolt the housing in place, slide the arbor through the bearings and slip a shaft collar on the outer end. Mark the arbor and cut off to length. This completes the assembly ready for the motor switch, saw guard and shoe. If the unit is to be used extensively for drilling holes, the outboard handle for the left hand is essential. It is pictured in the photo above and shown in the upper detail on the opposite page. The belt guard, lower detail, is made from light sheet aluminum and is attached to the frame in the position shown. Its purpose is to prevent sawdust from getting into the pulley grooves. The shoe is attached to the frame with two angle brackets, cut from ⅛ x 1-in.



Saw cuts through 1½-in. stock easily. Guard is cut away so gauge line on stock can be seen from above. Note drill chuck

steel angle, one bracket being placed on each side of the frame as shown in the end view. Note in the lower detail (side view), that the hinged guard is shown swinging in an open-ended slot in the shoe. However, if desired, the shoe can be notched and the guard attached so that it swings outside the shoe as in the photo on page 193. This simplifies the construction to some extent.

★ ★ ★

Prevent Engine Overheating After a Complete Overhaul

An automobile engine often will overheat after it has been overhauled because rust and scale, which has been in solution in the cooling system, hardens and sets in the empty radiator and block. The best method to avoid this is, of course, to have the engine and radiator thoroughly cleaned and flushed by a professional shop. But if this is not possible, keep the rust and scale to a minimum by flushing the engine beforehand with clear water, then if the radiator is removed, fill it at least half full of water. This can be done by leaving the bottom hose on and standing the radiator upright. If the petcocks in the block are not opened, the water will stay in the block up to the level of the water pump, while the engine is being overhauled.

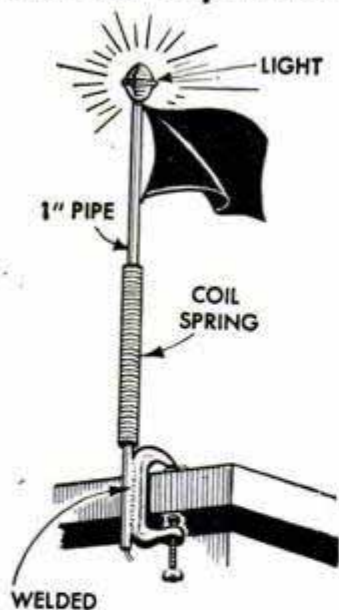
D. W. Brentlinger, Richmond, Calif.

Oil Ignited in Drain Tile Thaws Water Hydrant



To thaw a frozen outdoor hydrant, one farmer drops a large bell tile over the hydrant, pours crankcase drainings over the inner walls and ignites it. The oil will burn slowly for a time and as the walls of the tile prevent rapid dissipation of the heat, the hydrant is thawed quickly without damage. A common tile, which is porous and will absorb the oil, also can be used.

Combined Taillight and Flagstaff Guards Implements on Highway



Faced with the problem of transporting large and heavy farm implements on a busy highway, often at night, one farm operator devised this detachable taillight and flagstaff unit. Due to its novel construction it gives motorists ample warning of the presence of slow-moving equipment. Both the red daytime flag and the red

warning light are carried at the top of a flexible staff which consists of a length of $\frac{1}{2}$ -in. pipe, the lower end of which is welded to a heavy coil spring. The lower end of the spring is welded to a short length of $\frac{1}{2}$ -in.-i.d. tubing which in turn is welded to the back of a C-clamp as pictured. The

lamp cord is fed through the tubing, spring and pipe to the light at the top of the staff. When the unit is clamped to the rear of the implement, the motion of the latter imparts an erratic waving movement to the staff which is sure to attract attention.

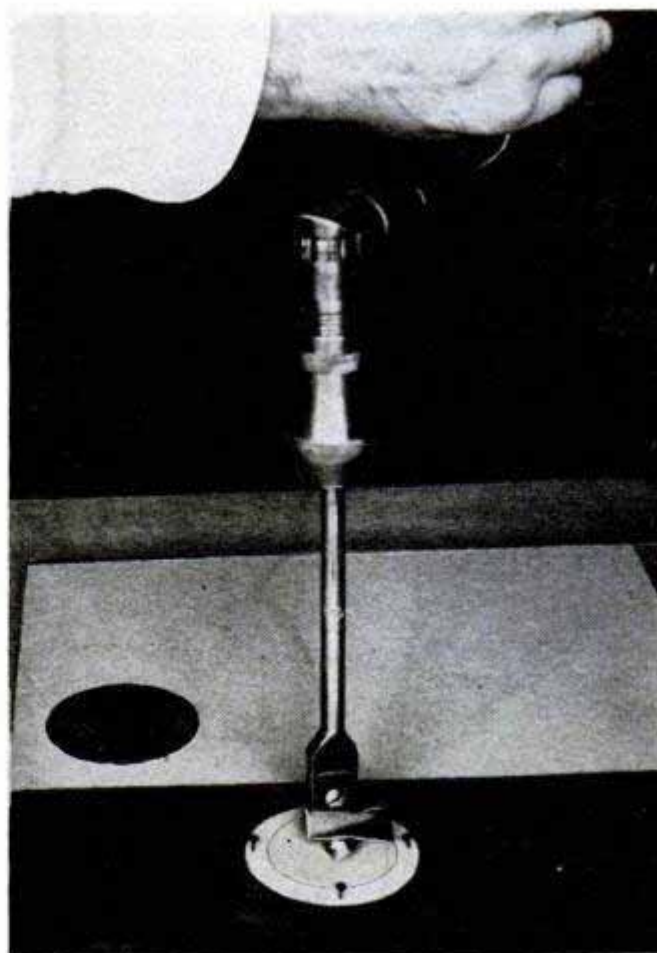
A. M. Wettach, Mt. Pleasant, Iowa.

Hard-Rubber Stoppers Frozen For Easy Machining

To overcome the difficulty of altering the size or shape as well as drilling holes in hard-rubber stoppers, technicians of one research laboratory immerse the stoppers in a freezing mixture of dry ice and acetone. This causes the stoppers to become so hard they can be machined like wood or metal when placed in a lathe or drill press.—Leroy J. Hebert, Arlington, Mass.

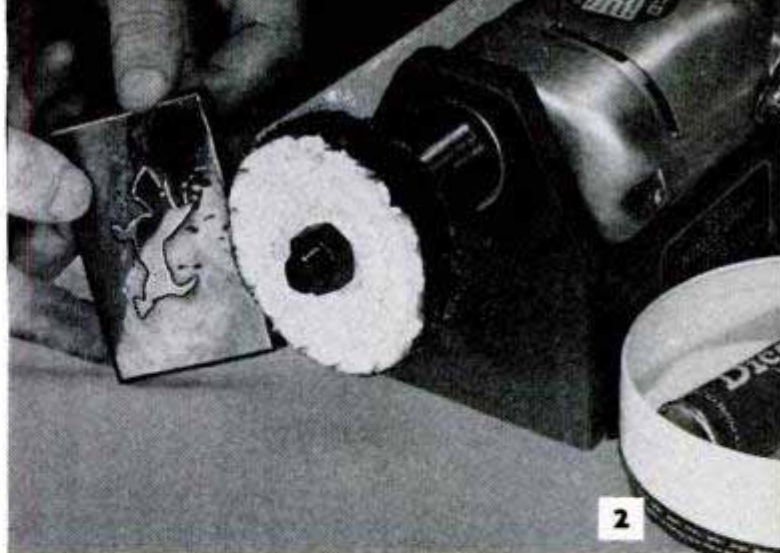
Cutting Circular Gaskets

When you need a small, round gasket quickly and there's no regular equipment at hand with which to cut it, use a hand brace and an expansive bit. If the gasket required is in the form of a flat ring, cut the outer diameter first. Then tack the disk to a flat surface and set the bit to cut the inner diameter. A few sweeps of the brace and you'll have the gasket you want, cut neatly to size. Any of the regular gasket materials can be cut in this manner in an emergency.—O. A. Nelson, Seattle, Wash.





1



2

FINISHES

for your

Metal Work

WHEN YOU SAND surfaces of wood in preparation for finishing, the finishing process is just beginning. But when you use abrasives on projects made from art metals the job is practically done. Top coatings, such as metal lacquer, are used only to protect the luster of the polished metal surfaces.

Polishing: Polishing in some form is a part of all metal craftwork. The degree of polish can range from soft satin to mirror-bright. Craft metals usually have a fairly good finish to begin with and it will save a lot of extra work if you handle the metal carefully and protect the surfaces from fingerprints. Probably the best and simplest way to do this is to cement heavy paper to both sides of the metal sheet. Then the layout can be made on the paper. If the job involves cutting on the jigsaw, sandwich the metal between pieces of thin stock taped tightly together at the edges. By protecting the original finish in this way, you can produce a fairly high polish with 3/0 steel wool used dry. A wet rub with 3/0 or 4/0 steel wool and soapy water, Fig. 1, produces a somewhat higher luster on most craft metals. On circular pieces rub with a circular motion. On square or rectangular pieces rub with a straight back-and-forth stroke.

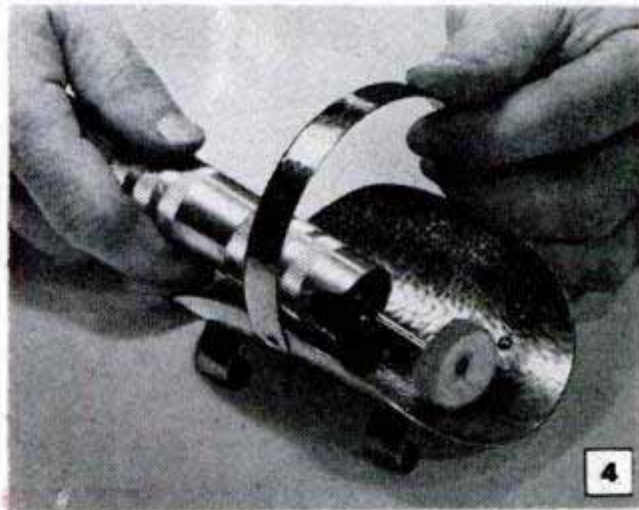
For higher lusters up to mirror-bright, the next step is "color" buffing, Fig. 2. This operation often is referred to as "coloring," as the high polish has the effect of changing the color of the metal. It is done with the fine abrasives such as rouge, rottenstone,

BUFFING SPECIFICATIONS

Metal	Cut	Color
Aluminum	Tripoli	Lime or stainless *
Copper and Brass	Tripoli	Red rouge
Magnesium	Tripoli	Dry lime
Pewter	Fine pumice	White rouge
Steel	Emery or stainless *	Stainless *

* Stainless is finest grade of aluminum oxide and silicon-carbide abrasives in a white composition

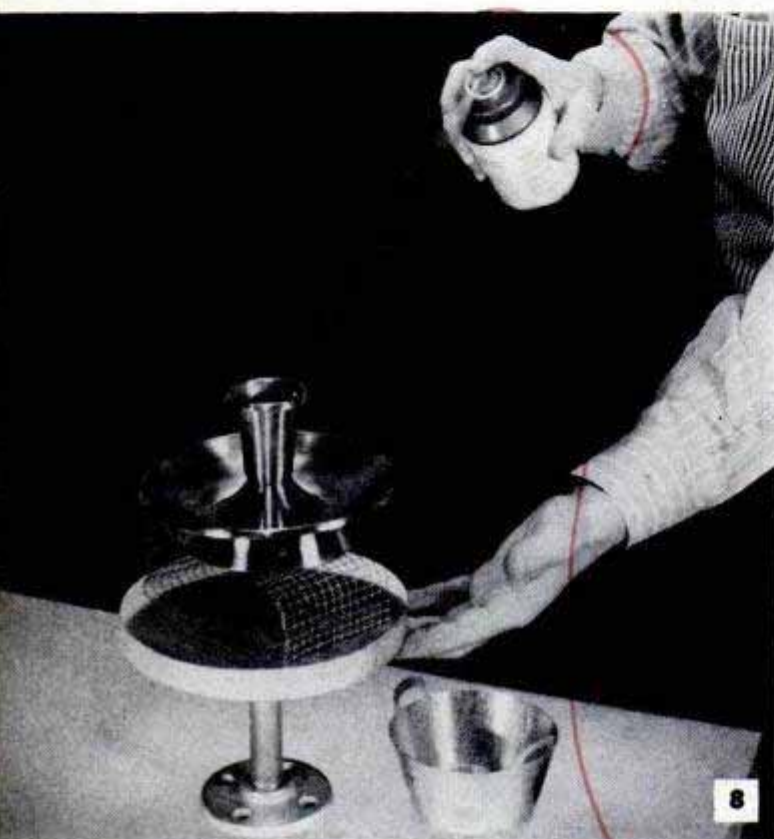
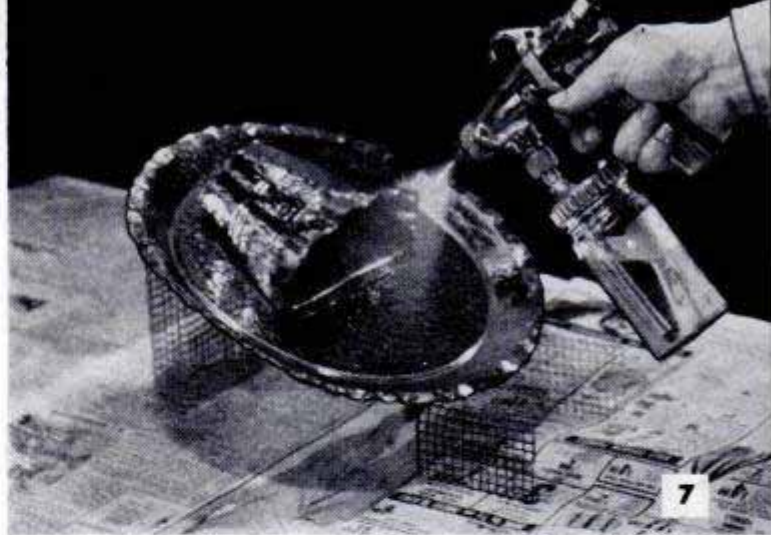
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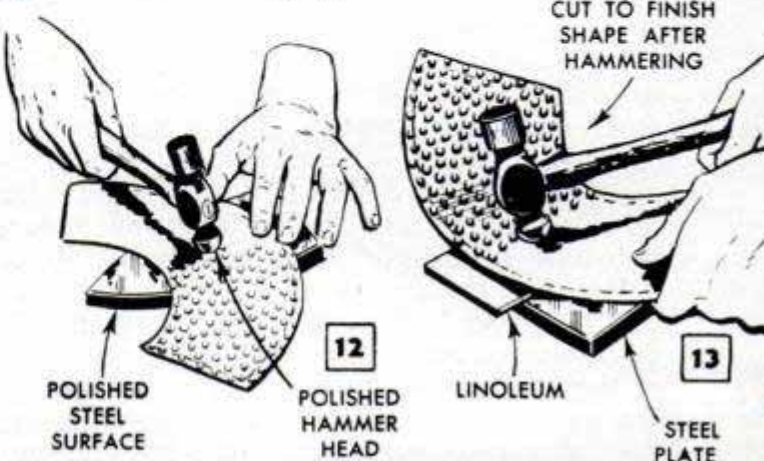


Top coating prevents tarnishing and discoloration. Wax, metal lacquer and plastic finishes are easy to apply as in the two photos above and at the left

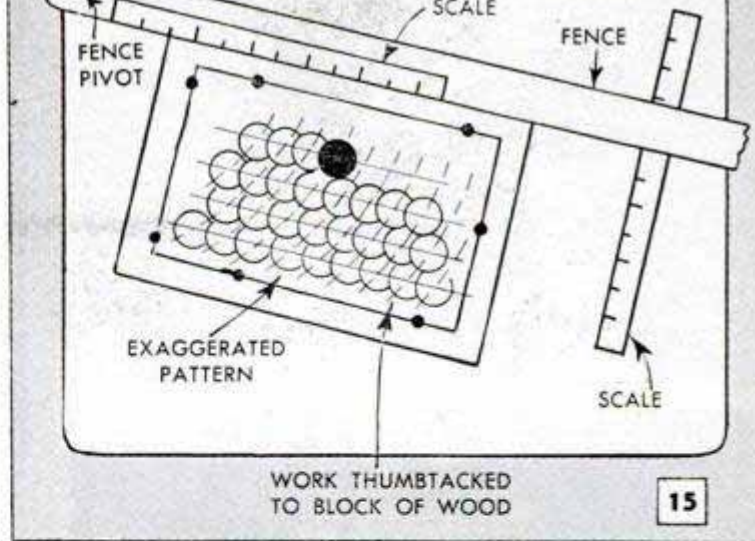
lime or crocus. The table of buffing specifications, Fig. 3, list the selections ordinarily used. A common procedure is to begin buffing with one of the coarser abrasives, such as tripoli, and finish with rouge or crocus. Abrasive compounds such as those listed are commonly used in stick form, making it easy to charge the buffing wheel simply by holding the end of the abrasive stick against the rim while the wheel is rotating. A separate wheel must be used for each grade of abrasive. Small buffing wheels of the type supplied for use with a flexible shaft, Fig. 4, are especially effective on curved work and on surfaces difficult or impossible to reach with a large wheel. Although buffing produces a high luster on most craft metals, many metalcrafters prefer the steel-wool finish as the extremely



KIRYDON, INC.
2601 N. Broad St.
Phila. 32, Pa.



RE-MARK AND CUT TO FINISH SHAPE AFTER HAMMERING



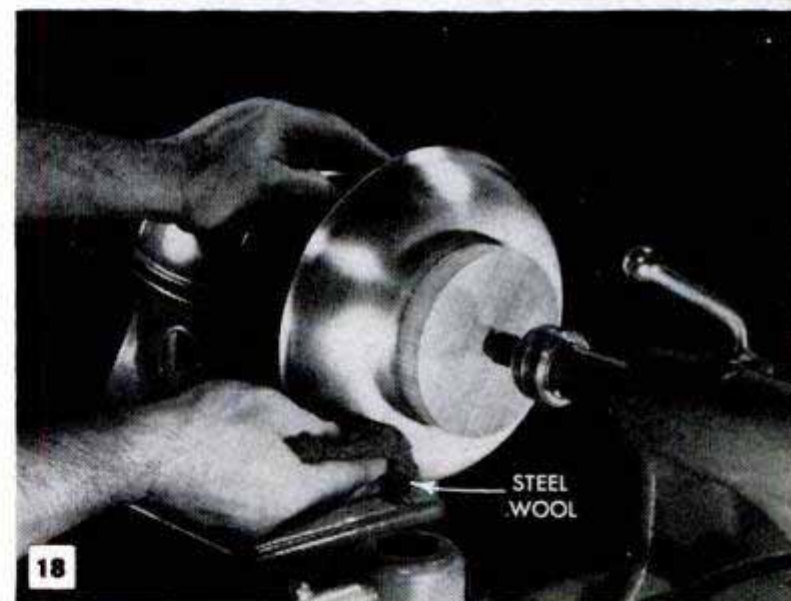
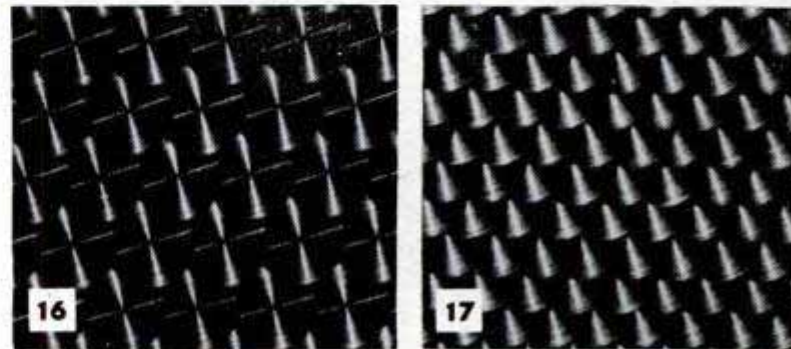
Spot finish is attractive on machine parts such as slides and worktables. Photo above and detail at right show how to set up job on drill press

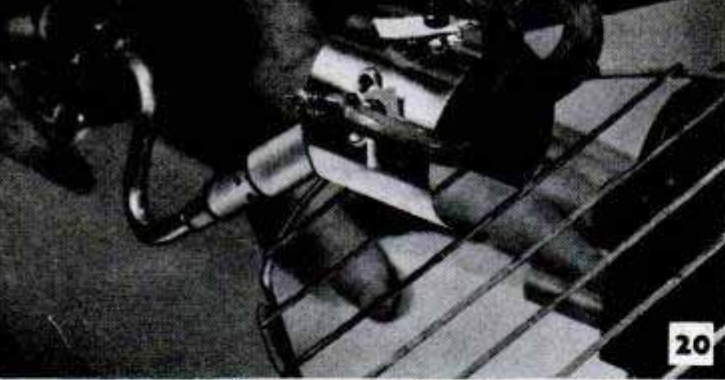
fine scratch pattern left on the surface makes it appear brightly polished, yet is sufficiently irregular to break up light reflection. A simple method of polishing trimmings is pictured in Fig. 5.

Top coatings: Polished metals will not remain bright unless the surface is protected against the moisture always present in the air. The simplest protective coating is ordinary furniture wax of the paste type. Apply with the fingers as in Fig. 6, permit it to set until it feels slightly tacky to the touch, then polish briskly with a soft cloth. The wax, properly applied, gives most polished metals a soft, burnished appearance that is very attractive.

Although water-white metal lacquer can be applied by brushing, use of a spray gun gives best results. Another excellent liquid top coating is acrylic plastic spray which comes in a handy pressurized can, Fig. 8. This material should be applied in the thinnest possible coating. Always use a heat-proof metal lacquer on ash trays and lamp shades, or on any work subjected to temperatures of 180 deg. or more. A ground coat of metal lacquer should be applied to all work which is to be decorated with low-bake enamels, Fig. 9. Work which has been buffed should always be thoroughly cleaned to remove all traces of wax before lacquering.

Mechanical Textures: Common mechanical textures are produced by hammering, spotting and spinning. The simplest and most popular is done by hammering, the patterns being worked on the metal before cutting to finish size. The head of the hammer, whether ball peen or any other shape, must be perfectly polished, as any scratches or other imperfections on the surface of the head will be impressed in the surface of the work. The close ball-peen pattern, Fig. 10 is easiest to do, as it is worked over a polished metal surface, Fig. 12. Here the





20



21



22



23



24



25

Ornamental iron usually gets a pigmented top coating which covers and protects the metal. Colors can range from flat-black lacquer to bright-colored enamels

hammer blows must overlap and form an irregular pattern of raised facets on the surface. Hammer blows should be light and uniform to avoid thinning and drawing the metal. The open ball-peen pattern is somewhat more difficult as the hammer blows must be carefully controlled to give a uniform pattern. Open peening is done on a soft, yielding surface such as that afforded by a piece of linoleum laid over a flat-steel backing plate, Fig. 13.

Spot finishing—or “engine” turning, as it is sometimes called—produces glittering circular facets on polished metal. It is often used as a decoration on machine parts, such as slides and worktables. Figs. 14 and 15 show the setup for spot finishing on a drill press, using a special table and a pivoted guide. Two sample patterns are pictured in Figs. 16 and 17. The size abrasive specified in Fig. 14 usually gives best results on steel, but on softer metals a somewhat finer abrasive may be used. Although not essential, the pivoted fence gives somewhat better results as its use gives a sweep to the pattern that is more attractive. A spun finish can be done either with steel wool as in Fig. 18, or with abrasive cloth as in Fig. 19.

Oxidized copper: One of the most popular



26

and attractive finishes on copper is produced by swabbing a liver-of-sulphur solution on the surface, Fig. 22, and then highlighting with steel wool as in Fig. 23. The finished work with the high-lighted pattern is shown in Fig. 24. If work to be finished by oxidizing has become discolored from annealing or soldering, Fig. 20, it should be dipped in an acid pickle, Fig. 21.

Finishing ornamental iron: The most popular and durable finish for ornamental iron is a pigmented lacquer or paint. Flat-black lacquer probably is best for plain black work and for a high-lighted hammer finish. In this latter case, the hammered surfaces are lacquered black and then sanded lightly, producing a finish similar to that in Fig. 11. If the work is to be in color, Figs. 25 and 26, then use a full-gloss enamel.

Chemical solutions: A liver-of-sulphur solution for an oxidized finish on copper or brass is made by dissolving a lump of liver of sulphur (potassium sulphide) approximately $\frac{1}{2}$ in. in dia. in a glass of pure water. Apply to the work by immersion or by swabbing with steel wool. The black-brown color appears in about 20 to 30 sec. After the desired color is obtained rinse the work in running water. Avoid touching the metal. Dry thoroughly and then high-light with 3/0 steel wool.

A mild acid solution for pickling (cleaning) copper, brass, nickel silver, silver and pewter is made as follows: To 15 parts water in an earthenware or glass container, add slowly 1 part of commercial sulphuric acid and 1 part commercial nitric acid. Immerse the work on a copper wire or apply with a cloth swab. A 10-sec. dip is usually sufficient.

A solution for frosting aluminum is made by dissolving 1 part household lye (sodium hydroxide) in 4 or 5 parts of cold water. Pour the water into a glass or earthenware container and add the lye. Immerse the work or apply with a cloth swab. The solution attacks aluminum violently and will etch the surface silvery white overlaid with a black smutlike coating in about 40 to 50 sec. The work is then rinsed in water and dipped in a 25-percent solution of nitric acid to remove the black coating. Rinse the work again, allow it to dry and protect with a coat of metal lacquer.

Caution: Solutions for pickling and frosting are both corrosive and toxic. Handle with extreme care. Wear rubber gloves and avoid inhaling the fumes. Always add acid to water; never water to acid. The liver-of-sulphur solution is harmless. ★ ★ ★

☐ If a nail is heated before driving it into plaster, there is less chance of it causing the plaster to crack.



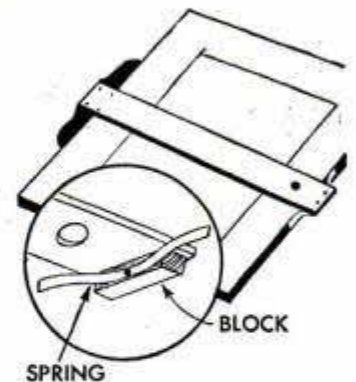
Wrecking Tool for Plasterboard From Discarded Car Spring

Especially useful when salvaging soft materials, such as plasterboard, this wrecking tool can be made from one of the short leaves of a discarded automobile spring. Heat a spot 2 or 3 in. from one end and bend it about 30 degrees. Grind a knife-edge notch in the end of the bent portion to be used for pulling nails. Because the spring is flat and wide, rather than narrow, as is the usual wrecking bar, there is less tendency to dig into plasterboard and other soft materials when removing nails.

M. J. Berg, Wausau, Wis.

Brake Stops T-Square Slipping On Large Inclined Boards

Draftsmen who work on large inclined drawing boards frequently have trouble keeping the larger types of T-squares from slipping down. One way to solve this problem, without damaging the face of the board,



is to install a simple brake on the end of the square. A small block is fastened to the underside of the square on the portion which extends over the end of the board. A piece of light spring steel, such as from an old clock spring, is screwed to the block, as shown. The spring holds the square firmly, yet allows it to be moved easily.—Frank M. Butrick, Jr., Alma, Mich.

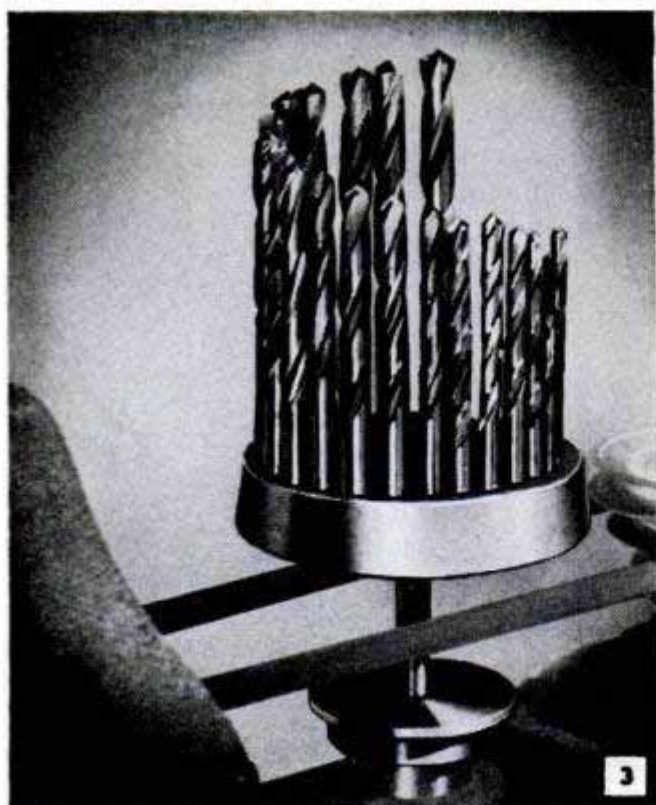
SHOPPING FOR TOOLS



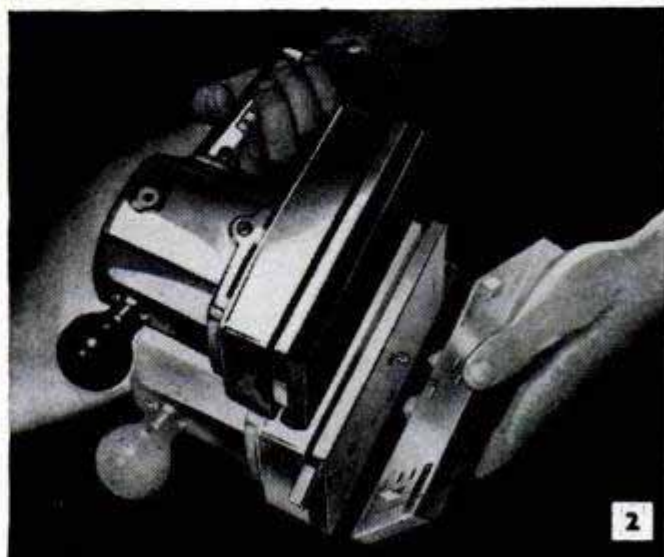
1

1. STORAGE CONTAINER for paint rollers solves the cleaning and storing problem. Comes complete ready for use with 1 qt. of a special cleaning solution. Roller is placed in the container, which holds it centered. Solution in container removes paint residues

3. ROTATING DRILL HOLDER fits in the top of the drill-press column. Does not interfere with adjustment or operation of the machine, yet keeps drills always at hand. Stepped adapter fits 1½ or 2¾-in. column. Made of aluminum. Holds set of 29 drills



3



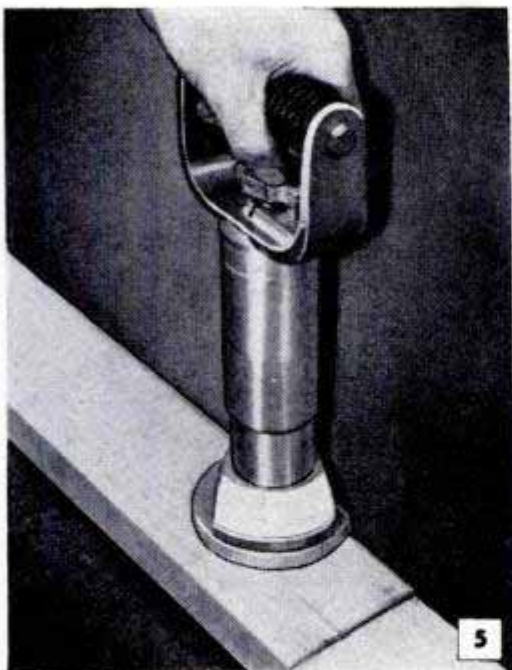
2

2. MOTOR-DRIVEN SANDER features a sanding pad which moves in a straight line. Action of pad eliminates laps, orbital swirls and other abrasive patterns on work. Sander is furnished with two abrasive holders so that change in grit size can be made quickly

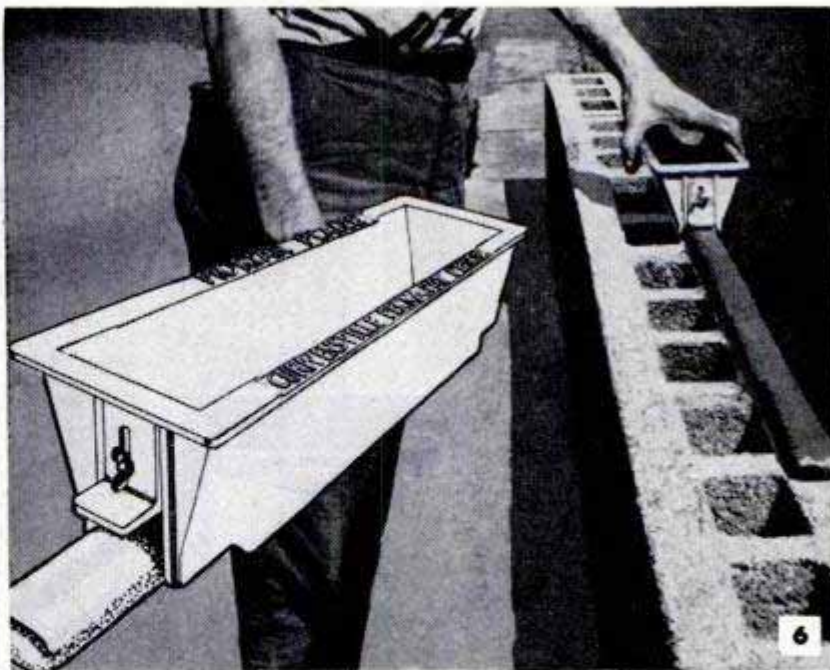
4. MASON'S TWO-WAY LEVEL straps to the back of the hand, enabling the user to level each brick or block as it is laid. Use of the device practically eliminates the necessity of constantly checking the work with a conventional level. Speeds up intricate work



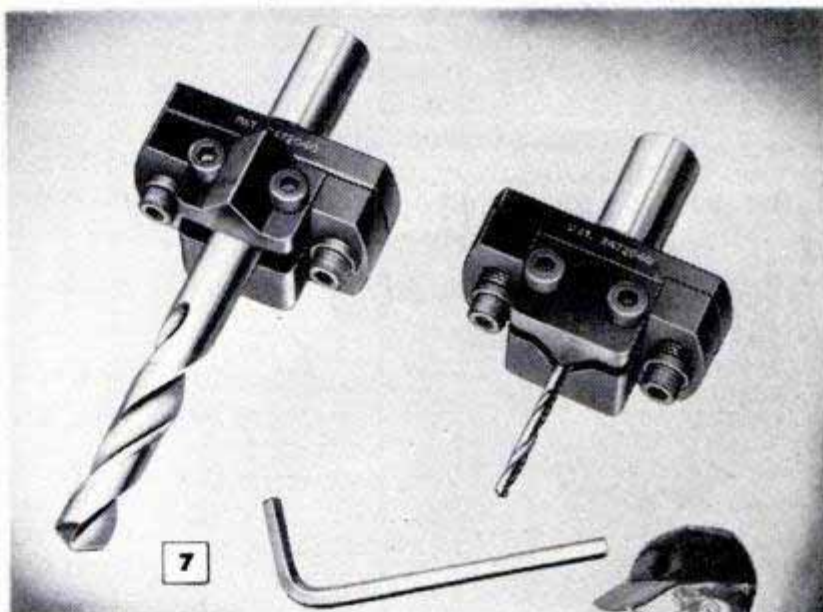
4



5. CARTRIDGE-ACTUATED POWER DRIVER for setting studs in concrete or steel has a permanently attached shield having a hinged section which can be lifted when working close to a wall. Interchangeable barrels permit driving either $\frac{1}{4}$ or $\frac{3}{8}$ -in. studs with same firing unit. Spring-loaded safety arm and center-fire cartridges avoid accidental discharge and assure correct load for job



6. SLIDING "TROWEL" lays mortar to a uniform depth in concrete-block wall construction. Even flow of mortar is controlled by gates which are adjustable to give varying thicknesses of the mortar strip. Consists of hopper with flaring sides the lower edges of which project and serve as guides. Can be used on both sides of blocks. One filling of hopper is sufficient for four to six blocks



7. TOOL HOLDER centers twist drills, counterbores, reamers and similar tools having shank diameters from $\frac{1}{64}$ to $\frac{1}{2}$ in. without the use of bushings. Precision grinding of parts assures accuracy within .0005. Movable and fixed jaws are designed to prevent creeping or shifting of tool when it is being tightened in the holder. Reduces setup time

8. PORTABLE BENDER handles pipe up to 2 in. in dia. and tubing to $1\frac{1}{2}$ in. in dia. Magnetic stop switches give positive forward and reverse control of bending mechanism. Bends to 190 deg. are made with standard bending dies and the push-button controls start and stop bending operation. Unit comes complete on trailer as pictured



Wet-Paint Signs Supported By Pin Card Holders



Pin card holders are ideal for supporting small signs on freshly painted surfaces. All that's necessary is to bend the pins at right angles and clip the loops over the edge of the sign as indicated. The pins then can be stuck in a newly painted surface without marring it visibly.

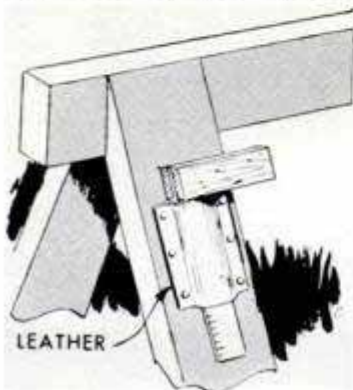
Milk-Can Lids Removed With Wringer Roller



Finding that his milk cans were being damaged by knocking open the lids with an ordinary hammer, one dairy owner fashioned efficient rubber hammers from discarded washing-machine wringer rollers. He modified them by cutting away all but a few inches of

the rubber near the end of the rollers. The steel cores of the rollers serve as handles and provide sufficient weight.

Square Held on Sawhorse Leg

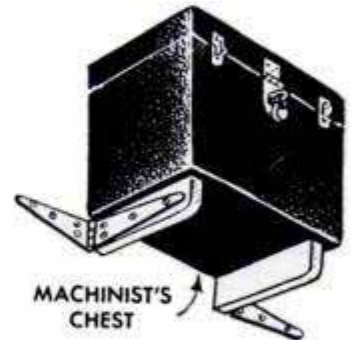


To hold a try-square within easy reach when using sawhorses, one carpenter tacked a piece of leather to one of the legs to provide a "holster" for the tool when not in use. Cut in a rectangular shape, the piece

is attached so the center arcs away from the side of the leg sufficiently to permit insertion of the square as shown. If the leather is not available, a piece of canvas, heavy cloth or even sheet metal may be used.

Brackets Hinged Above Bench Support Machinist's Chest

Cramped for working space on his bench top, one machinist attached a pair of swinging brackets to the wall above the bench to support his tool chest at a convenient height. Each bracket is

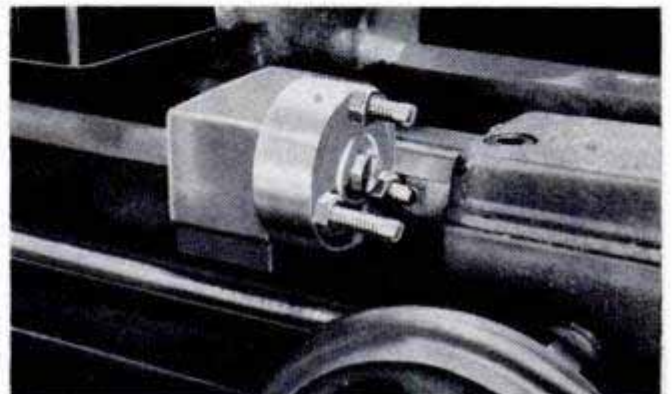


made by screwing one leaf of a strap hinge to a strip of hardwood, the length of each strip being approximately equal to the depth of the chest. The other hinge leaf is attached to the wall with screws, using lead screws anchors if the wall is of masonry. It's important to locate the brackets so the strips are level when swung outward. Brackets of this type fold flush with the wall when not in use.

Lathe-Carriage Stops Altered For Multiple Operations

To convert a lathe-carriage stop for multiple operations, one machinist attached three adjustable stops to a steel disk, which then was mounted as shown on the face of the bed clamp. The disk, which pivots on a bolt turned into the hole for the original stop, has a diameter large enough to allow any two of the stops to clear the carriage while the third is in use. Holes for the stops were spaced an equal distance apart, drilled and then tapped to take setscrews of three different lengths. The face of the bed clamp was marked to coincide with one of the stop holes and a registering hole drilled to house a spring-loaded ball catch. This engages the holes as the disk is rotated.

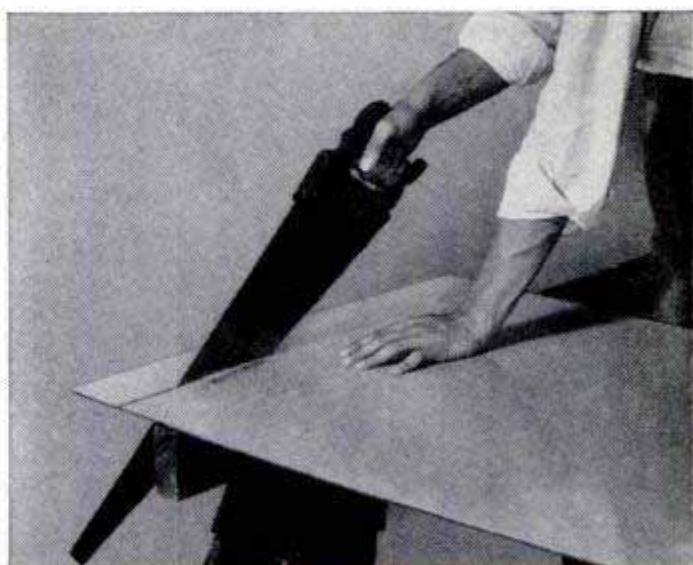
H. K. Chapman, Englewood, Calif.



How to fix up your bathroom with Armstrong's M-67 Monowall



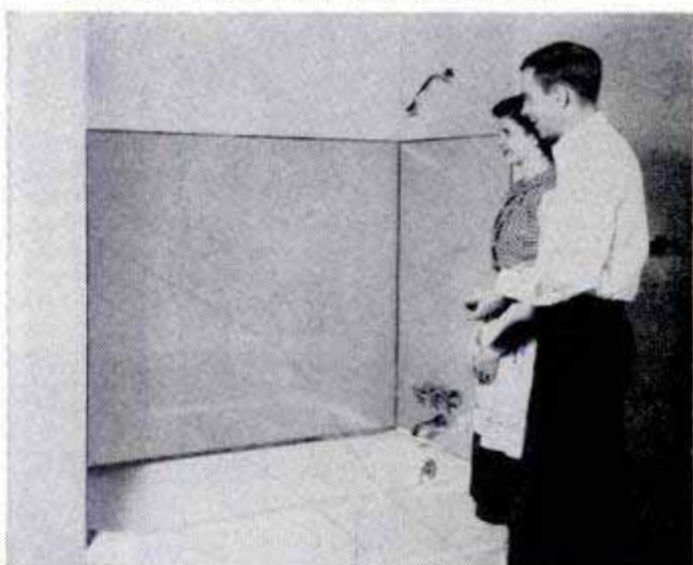
- 1.** Large, colorful panels of M-67 Monowall® can help turn an old-fashioned bathroom into a bright, easy-to-clean room in less than two days. Begin by marking a level guide line around the walls.



- 2.** Then you cut Monowall to fit all wall surfaces. Handy-sized sheets of Monowall cut like wood but will not crack, chip, or peel. Decorative metal channels are used for corners and joints.



- 3.** Spread Armstrong's Panelboard Cement on the back of the Monowall and apply a sealer coat to the walls. Then press Monowall into place, using metal channels to join panels.



- 4.** You'll be proud of the results. Monowall's M-67 plastic finish resists all kinds of stains and hard wear, is a cinch to wipe clean. Your wife will want Monowall in the kitchen next.

M-67 Monowall's ten beautiful colors and three smart styles will suggest plenty of handsome decorating schemes for your bathroom, kitchen, or laundry. For full details, see your local building materials dealer.

FOR FREE BOOKLET: "How to Install Armstrong's M-67 Monowall," write Armstrong Cork Company, 4112 Watch Avenue, Lancaster, Pennsylvania.



ARMSTRONG'S M-67 MONOWALL



Easy-to-use materials for printing pictures—ideally suited for beginners. **Kodacraft Printing Kit**, \$4.95.



Essentials for developing and printing pictures, including roll-film tank. **Kodacraft Photo-Lab Outfit**, \$9.75.



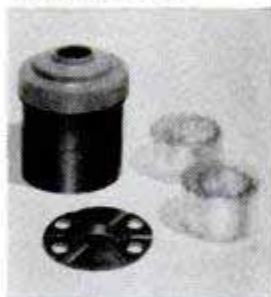
Complete developing, printing equipment incl. metal printer. **Kodacraft Advanced Photo-Lab**, \$14.95.



For efficient print drying. Stops tendency of prints to curl. Use it over and over. **Kodak Blotter Roll**, \$2.88.



Easy to use. Simple to load in dark. Takes 620-120 and 127 roll films. **Kodacraft Roll-Film Tank**, \$2.53.



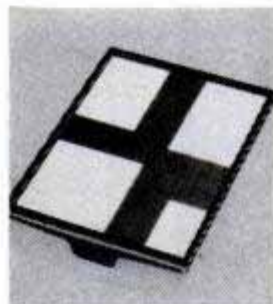
For simultaneous development of two rolls of 828 or 135 film. **Kodacraft Miniature Roll-Film Tank**, \$2.53.

Save time—Shop here for the photo fans on your Christmas list

These two pages give you some idea of the many useful and inexpensive gift ideas at your Kodak dealer's. Visit him soon. He'll be glad to help you choose just the right gift for every photo fan on your shopping list.



For accurate darkroom temperature control. You have choice of four **Kodak Thermometers**, from \$1.55.



New-type printing frame of steel construction. Includes a set of masks. **Kodacraft Printing Frame**, \$1.65.



Converts tray to efficient, trouble-free washer for prints or films. **Kodak Automatic Tray Siphon**, \$4.50.



Tilting base, minute and split-second hands, large dial. Intervals up to 60 minutes. **Kodak Timer**, \$7.95.



Chemical-resistant plastic housing protects all working parts. **Kodak Chemical Scales**, \$14.50.



Includes three cups for darkroom work with both papers and films. **Brownie Darkroom Lamp Kit**, \$1.75.



New darkroom safelight provides direct or indirect illumination—or both. **Kodak 2-Way Safelamp**, \$4.50.



Can be used either from a drop cord or in a wall plug. Includes safelight filter. **Kodak Darkroom Lamp**, \$5.75.



For wall, shelf, bench. Includes switch, cord, safelight filter. **Kodak Adjustable Safelight Lamp**, \$8.75.



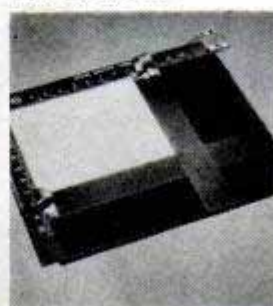
For determining correct printing time—saves both paper and time. **Kodak Projection Print Scale**, \$1.15.



Cool, circline fluorescent lamp, integrating-sphere lamphouse are prominent features in each enlarger. **Kodak Hobbyist Enlarger (left)**, \$57.50, complete with f/6.3 lens. **Kodak Fluorolite Enlarger (right)**, \$99.50 (lens extra).



Lenses for the Fluorolite Enlarger range from 50mm. f/4.5 "Ektanon" to 4-inch f/4.5 "Ektar." From \$15.00.



For accurate masking of enlargements with any vertical enlarger. **Kodak Masking Easel**, 11 x 14. \$15.00.



View-type camera—permits one-to-one close-ups. **Kodak Fluorolite Camera Combination**, \$69.50 (less lens).



Expertly made Kodak Field Cases make cameras easy to carry, offer sound protection together with smart appearance. Include fine-quality leather cases (left), and durable simulated leather (right). **Kodak Field Cases**, from \$2.65.

Automatically trips shutter, permits photographer to get into picture. **Kodak Auto-Release**, \$3.86.

Provides dependable "flash" for most internally synchronized cameras. **Kodak Standard Flashholder**, \$8.25.

B-C (battery-condenser) flash insures longer battery life, sure synchron. **Kodak B-C Flashholder**, \$10.40.



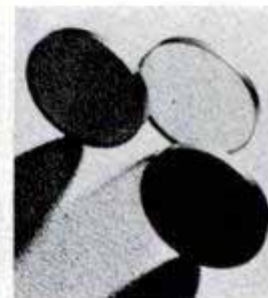
For quick, easy multiple lighting, with Lumac-lad reflector. **Kodak Flashholder Extension Unit, Model I**, \$11.00.

Condenser-type power for dependable "flash." **Kodak B-C Flashpack**, \$2.95 (without 22 1/2-volt battery).

Sensational new battery-condenser flash system. **Kodak Ektalux Flashholder (Standard Bracket)**, \$29.75.

Holds your camera and flash extension unit on most flat or tubular surfaces. **Kodak Flexi-clamp**, \$4.95.

For use with new Brownie Hawkeye Camera, Flash Model. Very easy to attach. **Kodalite Flashholder**, \$4.00.



Permits close-range picture taking with most fixed-focus cameras. **Kodak Close-up Attachment**, \$1.63.

Now, a filter designed for inexpensive box cameras — emphasizes clouds. **Kodak Cloud Filter**, \$1.85.

It's easy to get extreme close-ups with both still and movie cameras with **Kodak Portra Lenses**, from \$2.65.

Shades camera lens and reduces sky flare — attaches to adapter ring. **Kodak Lens Hood**, from \$1.75.

Popular yellow (K2), red (A), and green (X1) filters to fit most cameras. **Kodak Wratten Filters**. From \$1.75.

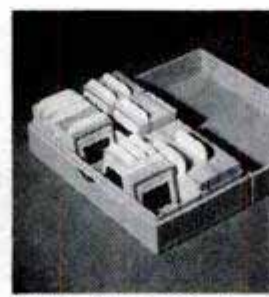


Two compartments hold 4 filters, adapter ring, lenshood. **Kodak Combination Filter Cases**, \$4.25, \$4.95.

New-type slide-feeding mechanism, cool operation, elevating device. **Kodaslide Merit Projector**, \$26.10.

Two superb new slide projectors. **Kodaslide Highlux III Projector (left)**, 300-watt; quiet fan; blower, carry case, \$56.50. **Highlux II (right)** gives brilliant 200-watt projection. Converts to Highlux III. \$36.50. Carry case, \$7.50.

2x2 projector and screen in a single unit. Usable in fully lighted room. **Kodaslide Table Viewer 4X**, \$37.50.



Projector, screen, changer in one unit. **Kodaslide Table Viewer, Model A**, \$97.50.

Compartments for 240 cardboard or 96 glass slides. **Kodaslide Compartment File**, \$3.94.

Holds 360 2x2-inch or 160 stereo slides. **Kodaslide Flexo File**, \$1.25.

Materials for mounting 50 color transparencies in glass. **Kodak Slide Kit**, \$3.63.

Prices include Federal Tax where applicable and are subject to change without notice.

Kodak



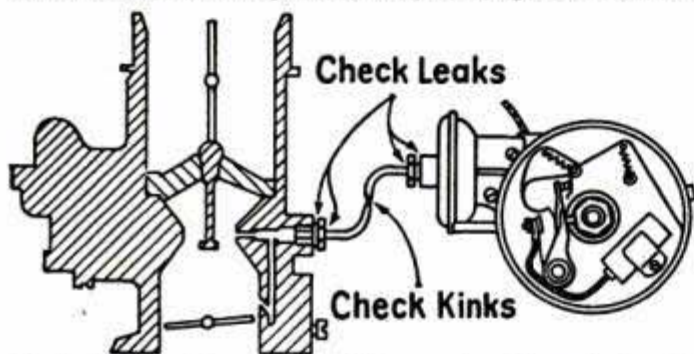
Care and Feeding of Engines

BY S. P. CORP

ENGINE EFFICIENCY

One of the prime causes of engine inefficiency is piston ring wear. Worn rings waste oil, waste gas, drag down power. At the first sign of blue smoke from the exhaust, consider reringing.

However, engine efficiency also suffers to a lesser degree from other conditions such as if tail pipe is bent or plugged with mud, so that the exhaust is obstructed. Likewise if you have a V-8 engine with a heat control valve between banks, see that it operates freely. Most engines have a heat control valve in the manifold system. This must operate freely for engine efficiency.



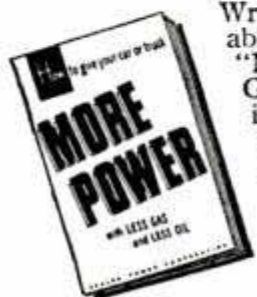
If timing is off, engine efficiency is affected. At 10 mph in high gear gradually push accelerator down until you reach 25 mph. Listen for a slight ping between 15 and 20. If not heard, advance timing.

COLD WEATHER HINTS

It is important to know engine temperature in cold weather. Check the accuracy of your temperature indicator by removing unit from engine and immersing bulb in a container of hot water. Use a thermometer to check water temperature. Now watch the gauge on the dash. Thermometer reading and gauge should agree.

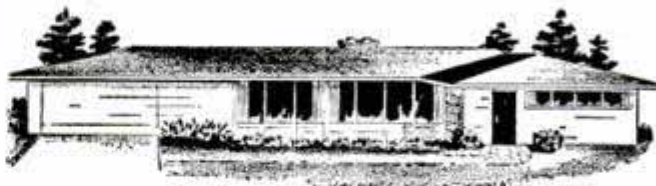
To check for proper cooling and water circulation, place a cover over the radiator and run engine at a fast idle until needle reaches top of gauge. Place a thermometer in top tank of radiator and see whether gauge and thermometer agree. They should.

GET THIS FREE MANUAL



Write for your free copy of the valuable illustrated manual of car care, "MORE POWER, Less Oil, Less Gas." It may help you save money in several ways. When you need new piston rings, insist on a Sealed Power KromeX Ring Set with the famous MD-50 Steel Oil Ring, the only ring with the Full-Flow Spring. Sealed Power Corporation, Dept. G-12, Muskegon, Michigan.

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.

Soundproofing



Q—I live in a first-floor apartment and we are greatly annoyed at times by footsteps, the piano and radio and other sounds from the apartment above. I understand that the ceilings in my apartment are of plasterboard. I'm thinking about soundproofing and have been told that it will be necessary to remove the plasterboard ceiling. Is this correct, or is there some other way?

—J. T., Mass.

A—Installing soundproofing between floors in the regular way is expensive, especially in older construction. We could not recommend it as we believe the cost will be out of proportion to the benefit derived. It would be necessary to remove the plasterboard from the ceilings, a considerable job in itself in addition to the waste of material and the inconvenience you would experience while the work is being done. Rather we would suggest that you consider the installation of acoustical tile, or tileboard. This material comes in 12-in. squares and in ½ and ¾-in. thicknesses and can be installed over the plasterboard with a special adhesive. The tiles have a fairly high noise-reduction coefficient, can be cleaned with a brush or damp cloth and can be painted without affecting their sound absorption qualities.

Wall Condensation

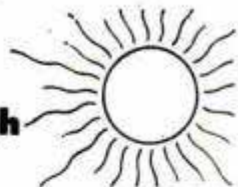
Q—What causes condensation in the walls of a building? How is it prevented? Why does it cause trouble in newer buildings, but not in older structures?—C. Y., Tenn.

A—So many of our readers encounter this problem that we are repeating our answer to a question published some time ago. Space does not permit an extended discussion, but perhaps the basic cause of wall condensation can be outlined briefly. Because of what is known as vapor pressure, air containing moisture escapes through walls and ceilings of the house when the outside temperature is lower than that inside the building. Heat loss through an uninsulated wall tends to prevent a lowering of the temperature within the wall to the condensation point, or dew point. For this reason such walls remain comparatively dry. When walls were first insulated with sawdust and other fine material, the insulating properties of these materials greatly retarded, but did not entirely

(Continued to page 210)



Willard Announces the only battery in the world with



Climate Control

...The All-New Willard Weathermaster

Just turn this Key...



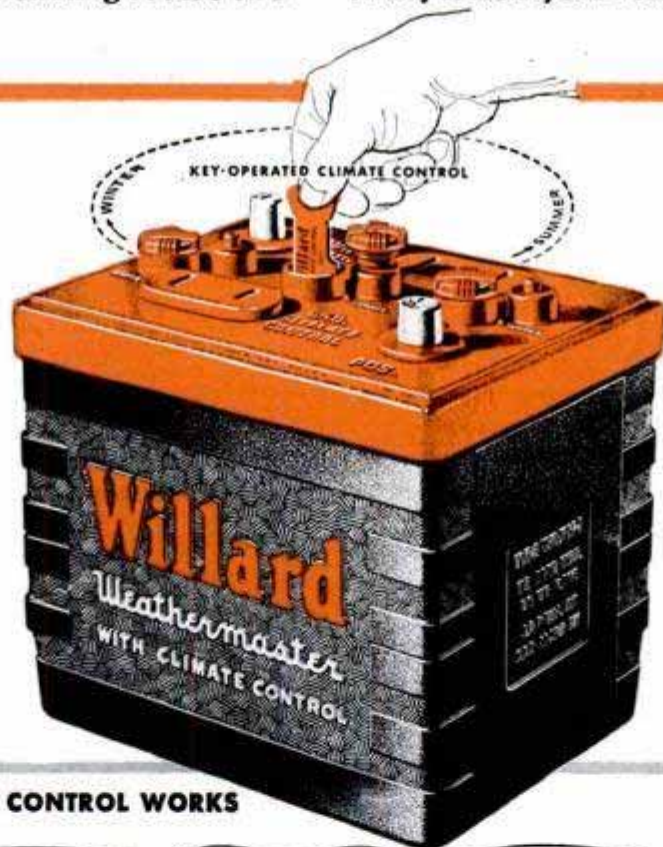
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Wherever you live—North, South, East or West—you'll want the revolutionary new Willard Weathermaster with Climate Control. Best for hot weather driving... best for cold weather starting... it's two

tremendous batteries in one. It's the first and only battery in the world that automatically adjusts its power-out-put to meet your climate—at the turn of a key. See it... try it... buy it from your nearby Willard Dealer.

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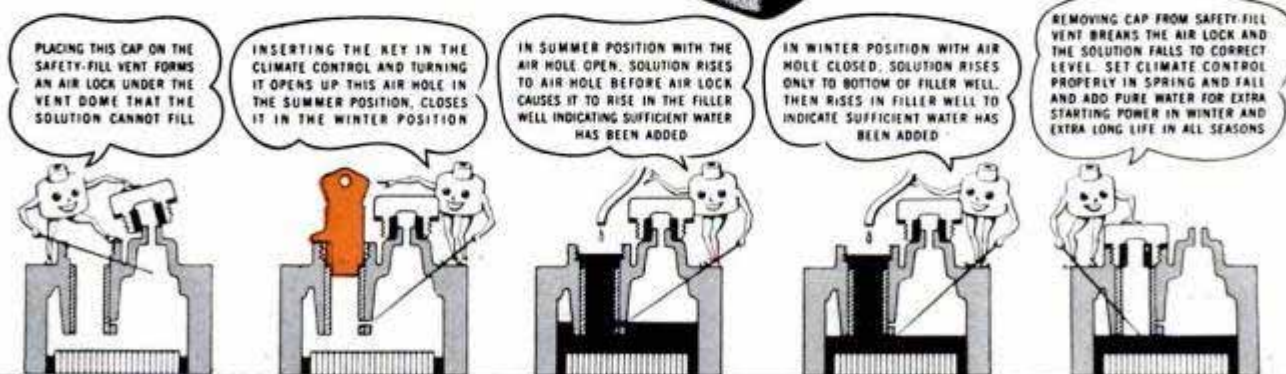


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(Continued from page 208)

prevent, the passage of heated, moisture-laden air through the walls and ceilings. This slowing up of the process of air and heat transfer usually resulted in a gradual lowering of the temperature within the walls to a point where the water vapor in the air condensed and formed beads of moisture, or frost, depending on the temperature. Manufacturers have developed various insulating materials having "built in" vapor barriers. Barriers also come in separate sheet forms for direct application to the studding under the plaster. These barriers are fully effective only if they are installed in accordance with the manufacturer's instructions. In homes without barriers, reducing the humidity in the rooms will lessen the possibility of trouble. Applying two coats of oil-base or rubber-base paint to the walls will help, as these paints are fairly effective barriers.

Raised Shingles

Q—We have a new home, less than two years old, and just recently we've noticed that the butts of the shingles have turned upward, some of them as much as 1/2 in. or more. Some courses of shingles appear to be affected nearly all the way across, while those above and below seem to be flat. In some cases the affected area, or strip, extends only part way across. What causes this, and is there a remedy?—O. F., Ind.



A—There are several causes but according to your description the most likely one is the use of roof boards that were not thoroughly seasoned. As soon as the boards are covered by the shingles they dry slowly and the wider ones will shrink appreciably across the width during this period. The course of shingles that happens to be nailed to a wide board with the row of nails entering near the upper and lower edges, will buckle when the board shrinks across the width. This buckling, even though it is slight, raises the butts of the next course of shingles and would give the effect you describe. Unfortunately there is no simple remedy but, of course, in time the shingles will flatten to some extent so that the defect will not be so noticeable.

Furring Siding

Q—I have just built a home for myself and am planning to build another, using the same plan. I used an insulating sheathing under cedar siding, but now I notice that paint is beginning to peel from the siding. I suppose this is due to condensation of moisture on the back of the siding boards. I'd thought of using furring strips under the siding, leaving openings at the top and bottom of the wall. Is this idea practical?—A. J., S. Dak.



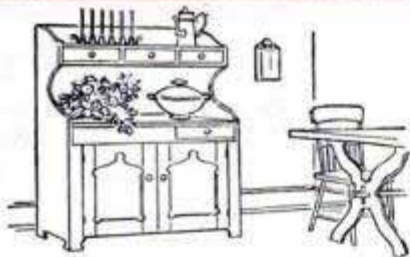
A—The idea you propose may have some merit so far as ventilating the area back of the siding is concerned, but we wonder if you have thought about the structural weakness that could result from this procedure. We'd rather recommend that you stick to conventional wall construction in the new home you plan to build. Install a vapor seal under the plaster or plasterboard on the room side of all exterior walls. In the house already built we suggest that you consider painting all exterior walls, on the room side, with either a rubber or oil-base paint. Two coats form a fairly effective vapor seal. Wallpapers can be applied over the painted surface if you prefer this type of wall decoration.



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What Dad's Gift Can Give!

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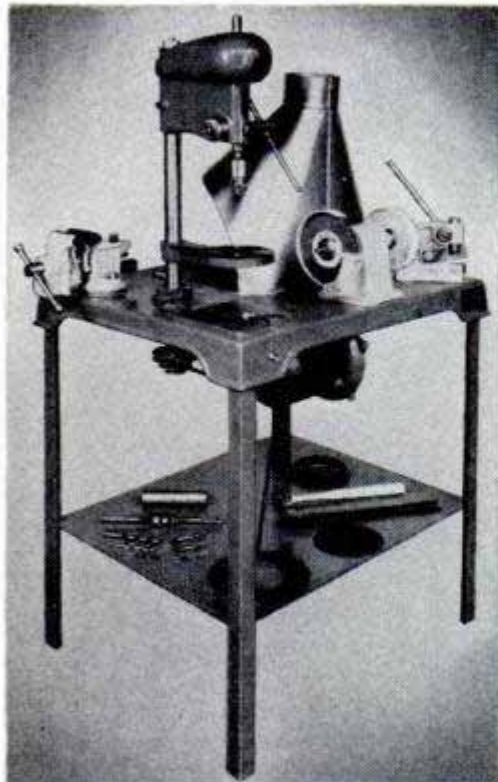
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They Call It Automatic Farming

(Continued from page 114)

start from scratch and pool ideas to develop equipment which can do a necessary job. When they've tried out a new machine in the field and worked out all the bugs, they make the implement available to any interested manufacturer. Their principal concern is to help the farmer solve his equipment problems.

Agriculture is such a broad field that a good many of the mechanical problems have absolutely nothing in common. Not long ago the Davis research group was called on to devise a smokeless heater to protect citrus groves against frost. The need was a new heater that could replace standard types which create enormous clouds of smoke and soot. The research group came up with a fine solution—a return-stack heater that produces so little smoke that all other types are now banned in many communities. Then the group jumped from heaters to a far different problem: how to eliminate the stray bits of wire and pieces of metal that sometimes find their way into baled hay. This problem was solved by devising a magnetic separator—a device on the baler that automatically ejects any hay in which a metal object is detected.

For asparagus growers, Bainer and his staff have developed a new mechanical harvester that may change the whole technique of growing the vegetable. One machine can do all the harvesting for 80 acres of asparagus. It's under test this year.

One recent problem at Davis was to find a better way of separating sticks and chaff from dry beans. Some machines now on the market do the job fairly well, but none efficiently removes the small lumps of clay that also are picked up with the crop. The new machine solves this problem. It uses a new approach—the differential in skin friction between beans and trash—to make 100-percent separation. It's now being manufactured commercially.

Another Davis innovation, demonstrated this year to apricot growers, is a mechanical cutter and stoner that washes the apricots, cuts the fruit in halves and removes the seeds preparatory to sun drying.

The poultry industry grades eggs according to weight by means of simple equipment. Why can't fruit be graded not only according to size but also color? Bainer says this question has already been pretty well answered. Now under final test is a lemon sorter perfected by Bainer and his staff that automatically grades the fruit according to its color. An electronic eye

(Continued to page 214)

What every Automobile man should know about

Power Steering

The fastest-growing innovation in automotive history is Power Steering—and the leader in Power Steering is SAGINAW, world's largest producer of steering gears. Saginaw Power Steering is now available on all General Motors cars and three other well-known makes. Nearly 600,000 new cars have been equipped with it—more than all other types combined. So naturally, many people wonder:



This assures the "feel of the road" SAFETY ZONE which distinguishes Saginaw Power Steering from ordinary types.

However, as soon as *more* than three pounds pull is needed, the resistance of the wheels causes the ball-nut and screw assembly to act as a jack. If the turn is to the *left*, this forces the whole steering shaft, including the valve spool, imperceptibly *toward* the driver, as shown in Diagram 2. This changes the course of the oil, so it now flows to the front of the power cylinder and forces the piston backward. Power assistance is thus applied to the pitman arm, to help turn the wheels to the left. At the same time, oil pressure on the valve plungers tends to move the steering shaft and spool back to neutral position, which cuts off the flow of oil to the power cylinder.

When the steering wheel is turned to the *right*, the spool moves slightly *away* from the driver. The oil flows to the opposite end of the power cylinder and forces the piston to assist in turning the front wheels to the right.

The whole system also acts in reverse to resist any force, such as a blowout, which tends to twist the wheel from the driver's hands. When a road shock is transmitted through the pitman arm, the resulting movement of the valve spool admits oil to the proper side of the power cylinder to counteract the shock. Note, too, that a by-pass valve is provided which opens in case of pump failure, so there is no resistance to manual steering.

IF YOU'D LIKE TO LEARN MORE—we'll be delighted to send you "THE FACTS ABOUT POWER STEERING."

6. HOW DOES SAGINAW POWER STEERING OPERATE?

Basically, it is simply a highly efficient recirculating Ball Nut Steering Gear with a built-in hydraulic assist. This consists of a pump which delivers oil at 750 pounds per square inch, a reservoir, a double-acting hydraulic cylinder, and an ingenious spool-type control valve, as shown in simplified Diagram 1.

The spool valve, part of the steering shaft, is a grooved cylinder machined to a sliding fit within the grooved valve housing. The spool revolves with the steering shaft, can slide forward or backward about .060" and still retain the high-pressure oil. Whenever *less* than three pounds pull on the steering wheel is needed, the valve remains in "neutral" position, as shown in Diagram 1, and the circulating oil by-passes the power cylinder. *No hydraulic force whatever is applied to the steering mechanism*, and the car remains completely under manual control.

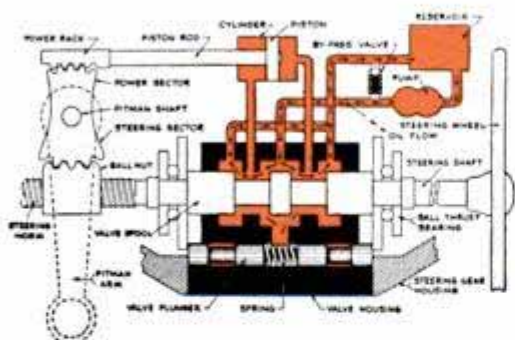


Diagram 1

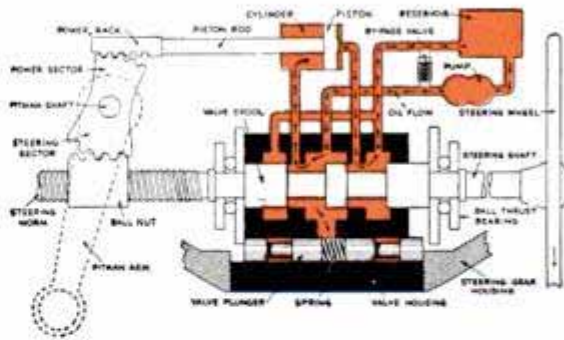


Diagram 2

Saginaw

POWER STEERING

Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Michigan (Dept. M)

Please send a free copy of "The Facts About Power Steering."



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Available in beautiful hardwood chests or colorful plastic rolls. Choice of 6, 10, or 13 bit assortments. Made of special heat-treated steel, accurately tempered, hardened full length to stay sharp longer. Brightly polished. Gift-package of 13 bits in solid walnut chest now available from most Irwin dealers. Price: \$15.50. Other sets as low as \$6.50.

IRWIN auger bit set in beautiful hardwood chest

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IRWIN ALL-PURPOSE EXPANSIVE BITS: America's most versatile wood-boring tools. Easily adjusted to desired size. Two types, small and large sizes. Boring range from $\frac{5}{8}$ " to 3". Ideal for the home handyman who wants a practical range of auger bit sizes combined in one efficient tool. As low as \$2.40.

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the original solid center auger bit

Screw drivers
Screw driver bits

IRWIN

inspects each fruit, compares it to an index color and automatically diverts ripe lemons to one bin for immediate marketing, green lemons to another bin for warehouse storage. Soon it will be tried on apples and olives.

Bainer foresees the day when all packing operations including sorting and packaging will be virtually automatic. In addition to the color-grading machine there'll be one that grades fruit according to size. The principle has been worked out already. An individual fruit can be graded as small, intermediate or large simply by the size of a shadow it casts, under a strong light, on a light-sensitive surface.

Not all research is completely successful. Once Bainer invented a novel way of shelling walnuts by actually exploding the shells away from the meats. Each nut passed under a saw that cut through the shell. Then it passed a nozzle from which a metered amount of illuminating gas was injected through the saw cut, and finally a spark gap threw a spark, igniting the gas and blowing up the walnut. The routine worked to perfection—but couldn't compete with more conventional shellers! One of the latest developments in this field is the splitting of shells with high-voltage electricity—in effect, striking them with lightning.

The major problems in farm mechanization that remain to be solved, Bainer says, are in tree and vine crops. Such crops involve far different operations than row crops. Some problems already have been solved, such as the steel squirrel that puts a man into any part of a tree he desires. Handling of picked fruit in boxes, in the field, has been speeded through pallets and fork-lift trucks, similar to conventional industrial equipment. These are steps forward but they don't represent the ultimate, which would be some kind of a machine that would quickly strip a tree of its ripe, soft fruit without harming the tree or bruising a single fruit. That sounds impossible right now, but don't bet against such a possibility! ★ ★ ★

Imported Grass Stays Green

Grass that will remain a brilliant green during conditions of drought and cold has been discovered by scientists at the University of California in Los Angeles. Imported from Queensland, Australia, it is known as "McCoy Grass." Grown in a test plot, it maintained its vivid color during the summer under irregular watering and during winter months when the temperature dipped to 25 degrees Fahrenheit.

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stapler beats
man with
hammer 4 to 1**



...and cuts fastening costs 60%.

This race between two carpenters took place in a wood products shop—the man at left fastening latticework with ordinary hammer-and-nails, the other working 4 times faster with a Bostitch H4 Stapling Hammer.

The shop foreman reports that one $\frac{3}{4}$ " staple is more rigid than two $\frac{3}{4}$ " nails. The staple won't loosen because its legs diverge inside the wood, bracing against each other when under strain.

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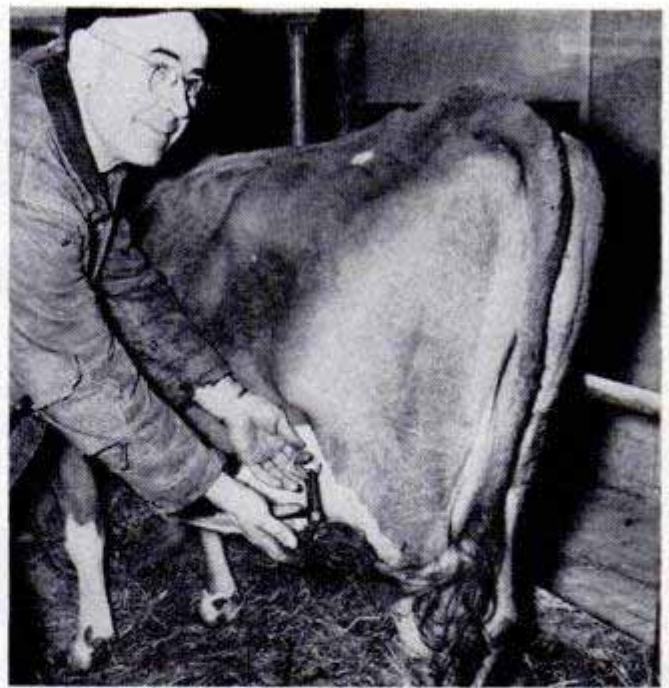
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Clamp on Cow
Prevents Tail-Swishing

Cows no longer will swish their tails in Frank M. Kaneski's face. Kaneski, a farmer near Duluth, Minn., has invented a "tail tie" which protects him from flicks of the tail while he's milking his cows. Secured to the flabby skin along the cow's flank is a metal ring, similar to a bull ring. When it's time to milk the cow, Kaneski slips one end of a clamp on the ring and uses the other end to hold the cow's tail.

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Daddy's been prompting *this* lad. Not a bad idea, either. A word to the right person *now* will pay off at Christmas.*

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Your Santa Claus can buy Bonney wrenches wherever fine tools are sold—in open stock or complete sets.

Bon-E-Con tools, also, carry the famous Bonney guarantee. They're tools any man would value—at prices anyone can afford.



* Confidentially, men, it would be smart to leave this page where the right person can't miss it!

Ring Around the Stage

(Continued from page 107)

"Here the audience no longer watches a play," explains Fred Koch, Jr., drama-department chairman. "It is enfolded by it."

When Miami's Ring Theater is producing this type of play, the last seats in the house are only 10 rows from the stage. "The close-up, born in Hollywood," says Koch, "now emerges into the world of flesh and blood. It flows into a third dimension."

This is fine, but it poses problems for designers and technicians on a limited budget. How do you light such a stage without blinding the audience? Where do you hide your stage-handling equipment? How do you arrange for a central stage and still operate like a conventional theater when you want? Ingenious stunts at Miami solve these enigmas. Men working house lights, for instance, prowl a circular catwalk, suspended from the dome 17 feet inside its outer perimeter and 14 feet above the floor. Stage lights, made from surplus Navy signal lamps, are installed directly above the stage in individual cubicles of a huge hanging grid that looks like an overgrown egg crate. Lenses are high up in the cubicles so the audience can't see the source of light, which is directed straight down on the stage. A booth above the entrance wing houses electrical controls for all theater lights. Stage manager and electrician yammer back and forth over an intercom system throughout a show. The orchestra is sunken from sight in a big pit shielded by a low canvas wall.

As for the conventional stage, it was Technical Director Gordon Bennett who came up with the answer for that. From Army surplus he bought a coast-artillery gun turret which he installed under the rear sector of the theater. On top of it, workmen mounted a 30-foot-diameter revolving platform. Divided into pie-shape sets, this stage supports three scenes at a time, which are rotated to face the audience as needed. It works as neatly as the million-dollar rig in Radio City, New York and, with the proscenium arch drawn across the front, looks like any conventional theater.

Total cost of the unique Ring Theater was only \$110,000—a cheap price to pay for the realization of a ten-year dream for the University of Miami's drama staff. It's a far cry from the circus tent on the student parking lot that first served as a playhouse and inspired the theater-in-the-round idea at the school. "We could seat 120 under that carnival hood," the men recall. "And if it hadn't been for a high wind and rot in the canvas, we might still be struggling along and turning away customers." ★ ★ ★



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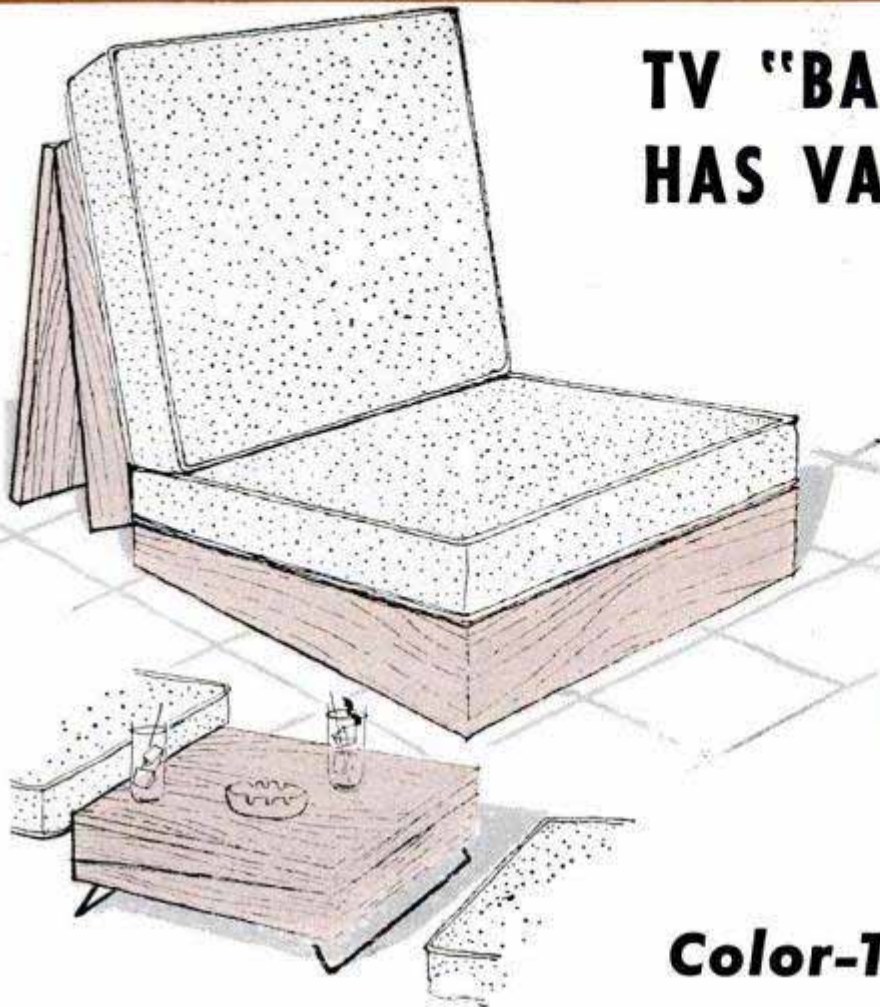
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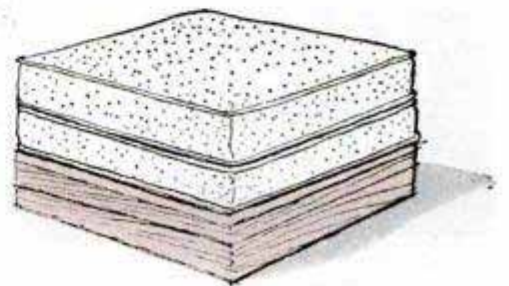
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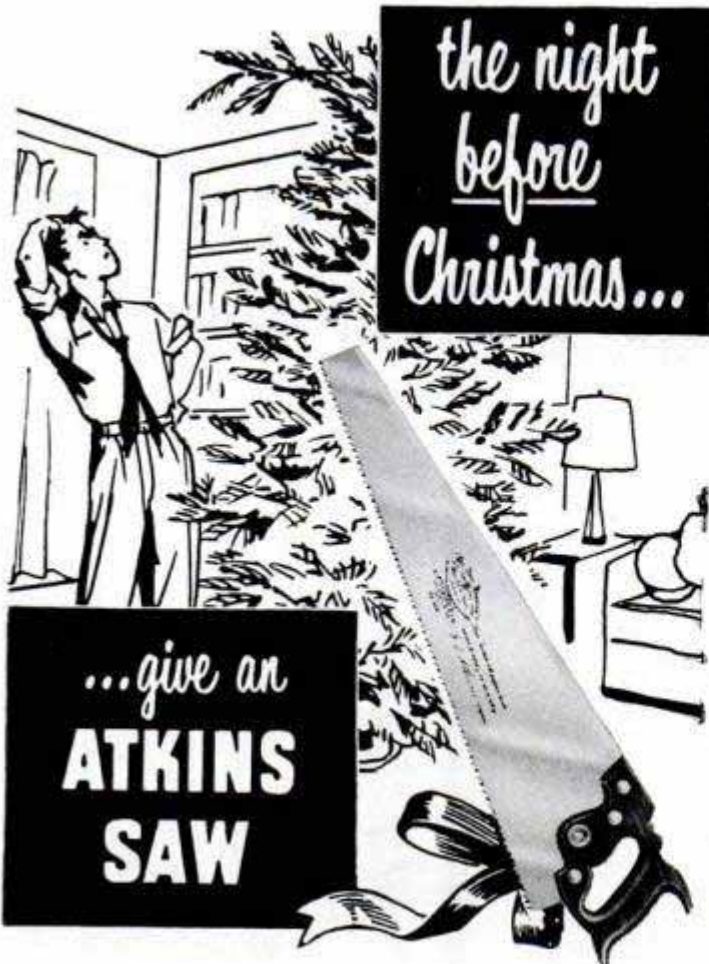
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For men who want the best, choose the Atkins *Silver Steel* "400." The blade is tempered, balanced, taper ground. The Perfection Handle relieves wrist strain—takes the work out of sawing. Costs more—but worth it!

... if your friend is handy around the house, give him an Atkins *Silver Steel* 65! It cuts fast and accurately—stays sharp! The cost is average—the value high!

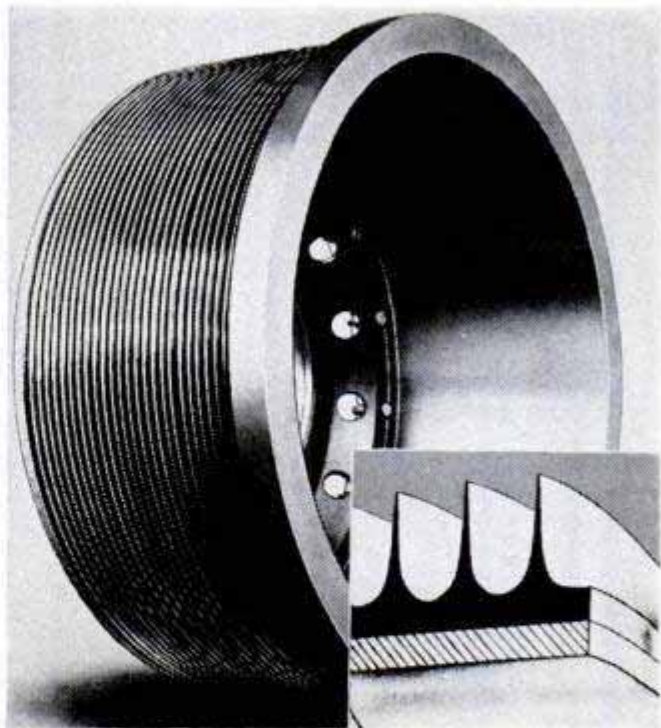
... if he is a once-in-a-while carpenter who wants a saw that cuts easily—pick the Atkins P-4! A low-cost saw of very good quality.

Ask for Atkins...at hardware stores
or building supply dealers

ATKINS



Atkins Saw Division • Borg-Warner Corp., Indianapolis 9, Indiana



Finned Brake Drum Adds Life to Linings

Welded to an alloy-steel brake drum, a band of copper grooved to form sharp fins disperses heat due to friction fast enough to make linings last about four times longer than normally. Designed for use on trucks, busses and other heavy road equipment, the brake drum itself outlasts the conventional cast-iron drum by a ratio of more than six to one.

Back Toaster for Chilly Drivers

Motorists can toast their backs on chilly days with a new heating pad that plugs into the car's cigarette lighter. The pad is equipped with a plastic harness so it can also be used on motorcycles, jeeps and speedboats. One side of the pad radiates medium heat, the other side higher heat. Outdoorsmen can use the pad by connecting it to a carton of six-volt batteries.



CHRYSLER CORPORATION'S "deep-breathing V8"

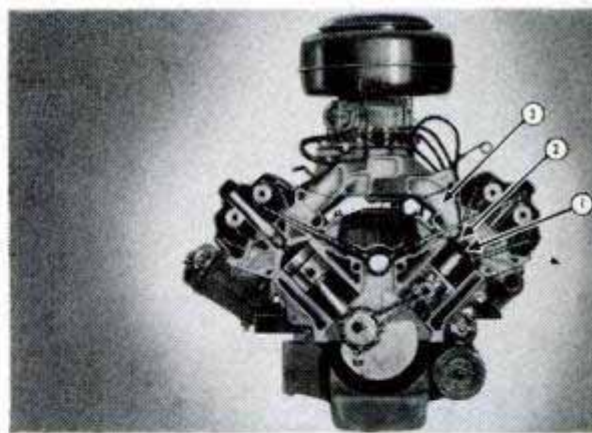
NEWEST, MOST ADVANCED CAR ENGINE

Compact, low-friction engine inhales and utilizes air and fuel more efficiently . . . gives you greater performance and safety, even on steepest mountain roads.

What's happened to automobile engine design?

At Chrysler Corporation, something spectacular! America's most advanced car engine, the V8 hemispherical combustion chamber design, is already turning gasoline into power more cleanly, more efficiently, than any other power plant for passenger cars.

This extraordinary engine, which is now being enjoyed by Chrysler, DeSoto and Dodge V8 owners, actually *breathes* deeper through the wider, straighter fuel passages. Valves are larger, open wider. Spark plugs fire directly above pistons. So efficient is performance that the engine doesn't "carbon-up" with resultant power loss.



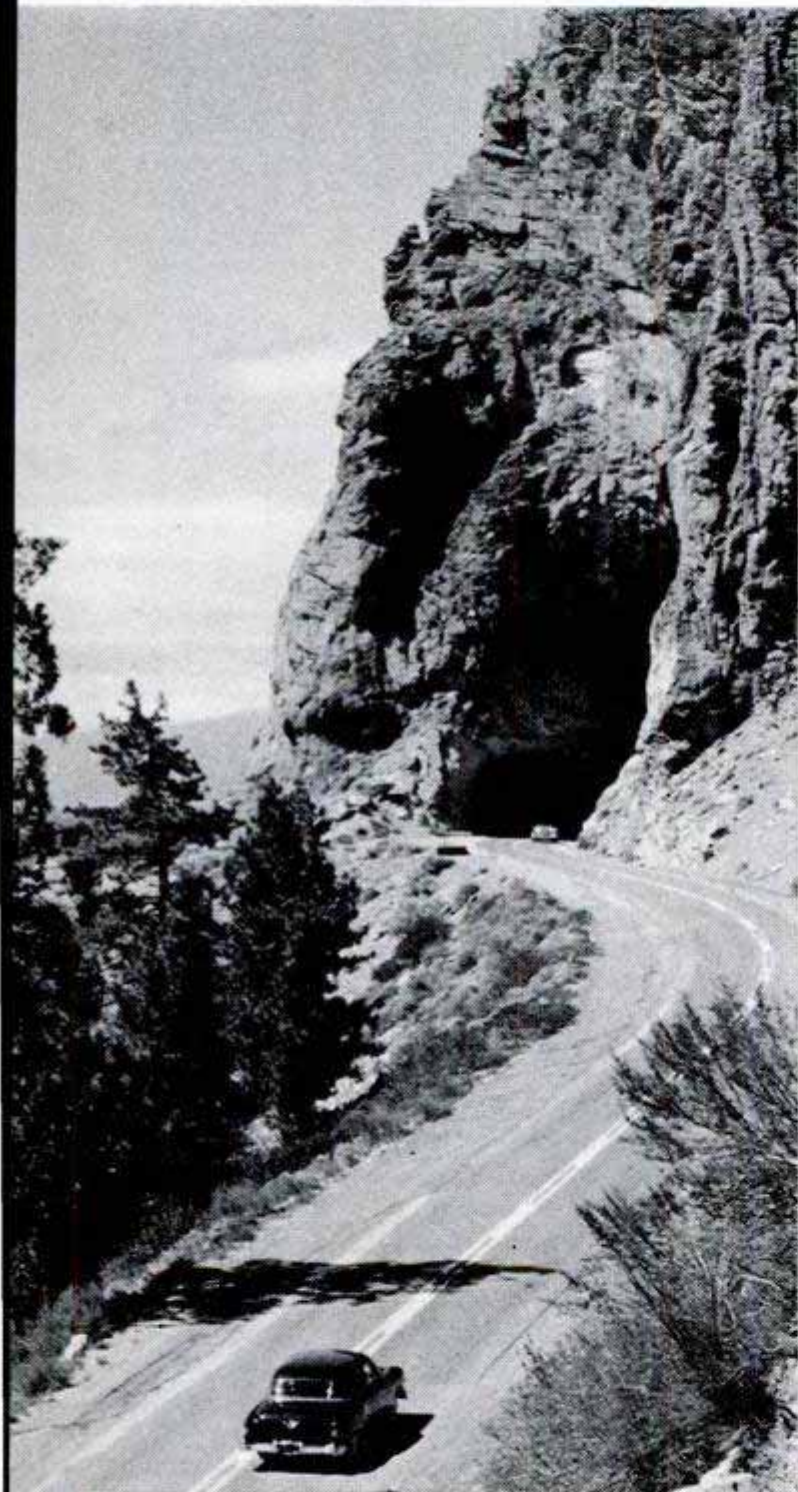
Cutaway view of Chrysler-built V8 engine showing (1) dome-shaped chamber, (2) bigger, high-lift valves, (3) wide fuel channel.

The new engine is another example of how practical imagination puts *more value and worth* into Chrysler Corporation cars. To get the "feel" of this Chrysler-built V8, call a Chrysler, De Soto or Dodge dealer for a demonstration . . . today!

Chrysler Corporation produces Plymouth, Dodge, De Soto, Chrysler & Imperial cars and Dodge Trucks, Chrysler Marine & Industrial Engines, Oilite Metal Powder Products, Mopar Parts and Accessories, Airtemp Heating, Air Conditioning, Refrigeration, and Cycleweld Cement Products.

You will enjoy Medallion Theatre—
dramatic entertainment for the whole family on CBS-TV.

Practical imagination that brings you the good things first. *This deep-breathing, high efficiency engine has enough reserve power to handle with ease rugged terrain like that found on Nevada's Route 50.*





YOUR LIFE MAY DEPEND ON USING THE RIGHT BRAKE FLUID

Just keeping enough fluid in the brake system is NOT the answer if you want good brakes . . . and SAFETY!

There are many brake fluids which can be dangerous . . . some, freezing point too high or boiling point too low . . . no water absorption . . . no rust protection . . . no lubricating qualities . . . ingredients which cause distortion of rubber parts and formation of sticky gums . . . and . . . some that won't properly mix with fluid presently in brake system.

Don't Take Chances . . . INSIST ON

BOWES BRAKE FLUID



Certified to meet or exceed
SAE Specifications

**IF YOU WANT TO STOP IN TIME . . .
SEE YOUR BOWES DEALER
FOR SAFE
BRAKE FLUID!**

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, IND.

Who Says Animals Are Dumb?

(Continued from page 126)

remain in any position by holding him there until you give the releasing command. Pretty soon you can tie him in knots and he'll make no effort to untie himself."

Since the dawn of history, Keller points out, man's two household pets have been the cat and dog. Dogs are taught quite complex tricks, but few people succeed in training a cat to perform more than an elementary stunt or two. Why? To the Brelands, any behavior question demands an answer, and they have recently undertaken a research program on cats. A graduate psychologist from the University of Arkansas has been doing some of this work at the Breland laboratory. The preliminary studies show that a cat won't accept "remote reinforcement" like a dog. You can train a dog to travel a mile or more and perform an involved routine (round up the sheep, bring in the cows) to earn a reward. A cat, on the other hand, apparently needs reinforcement right under its nose before it will respond.

The Brelands have discovered that cats can be trained to do a wide variety of tricks if the reinforcement is immediately at hand. For example, they have trained a run-of-the-farm Tabby to be a high-jumper. The cat, on signal, will leap six feet straight up in the air. Looks like a bouncing ball.

Wrestling pigs are among the funniest of animals the Brelands have trained. They grapple with huge enjoyment in a miniature ring. Keller first made each pig realize it would be reinforced if it pushed another out of the ring. From that point the porkers trained themselves. Although the pigs remain the best of friends outside the ring, they have developed their own specialties inside. They shove, push, attack from the flanks and teeter on the apron to an orchestration of grunts and squeals. One little porker, initially at a disadvantage, learned to run around the very lip of the ring, then give an extra-fast jump when an opponent charged from the flank. The poor opponent invariably plunged on through the ropes.

Keller designs many of the tricks to take advantage of an odd instinct or peculiar behavior pattern in the animal. Just for fun, the Brelands decided many months ago to "imprint" a goose (attach it psychologically) to their baby daughter. No training is involved in imprinting an animal or bird. You merely deceive it by rearing it in association with some creature other than its own species. A goose is just about the easiest animal or fowl to imprint. Each day the Brelands placed a gosling in a little pen

(Continued to page 224)

THRILLING POWER



PUTS YOU MILES AHEAD IN FUN

As powerful as it looks . . . more comfortable to ride than anything in its field. The "Golden Anniversary 74 OHV" is truly the undisputed ruler of highways and byways. No other two wheeler offers so much pleasure and safety. It's the one motorcycle every rider wants to own. See it! Thrill to a test ride at your dealer's today. Ask about his easy-payment plans. For your copy of the action-packed ENTHUSIAST Magazine and illustrated literature, send 10¢ to Harley-Davidson Motor Company, Department P, Milwaukee 1, Wisconsin.

GOLDEN ANNIVERSARY



HARLEY-DAVIDSON

HYDRA-GLIDE®

beside the baby's playpen. This continued for several months until the goose was full grown and the child had begun to walk. By then the goose was convinced beyond any doubt that it was a child, too, and imitated the little girl to perfection. It played with the baby's toys, tried to enter into the children's games. Today wherever the child goes, a tremendous goose chases after.

Although the Brelands have been training animals commercially since 1947, they consider that most of their past work has been research. Now they're ready to try new ideas.

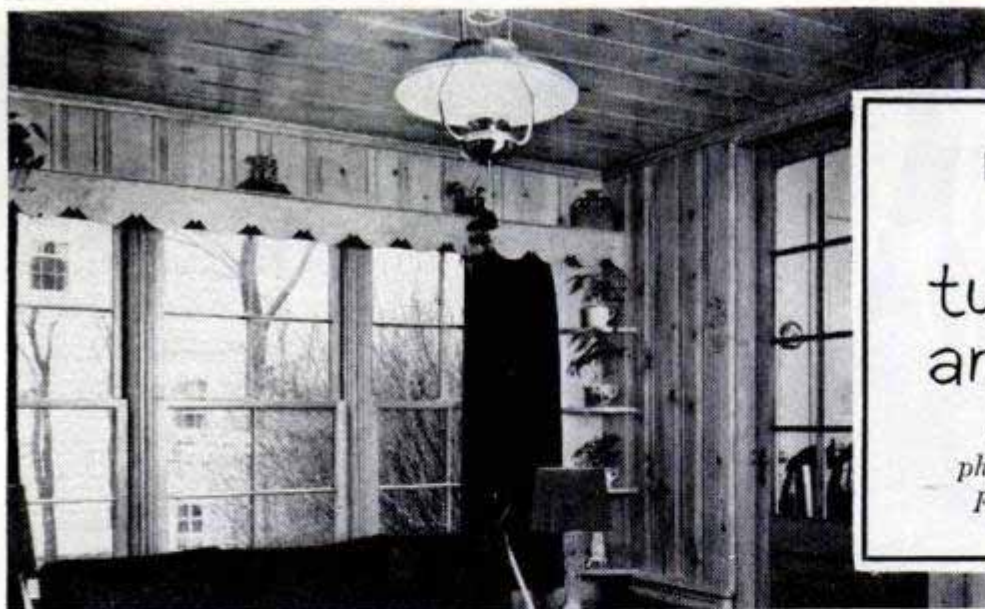
For example, they're branching into animated displays for store windows, using animals instead of mechanical figures. They state emphatically that the behavior of a highly conditioned animal is as predictable as the swing of a pendulum. Animals, they say, will repeat a routine far longer and with fewer failures than most mechanical displays. The Brelands also hope to branch out into television programs and the filming of famous animal stories.

Another idea, and one of their favorites, is to work out a coin-operated zoo. Zoos, it seems, are costly to maintain. This idea would bring in revenue while still permitting anyone to see the animals free. Here's the way a coin-operated zoo would work: You could walk up to the monkey cage or

the hippopotamus tank and watch the animals just as you do now. However, if you wanted to see two monkeys do a sprightly waltz while another played the piano, or watch the hippopotamus dive from a three-foot perch with a tremendous splash, you'd simply insert a penny, nickel or dime into a reinforcing mechanism.

Training turkeys to play with electric trains and pigs to jump from eight-foot towers is more or less routine with the Brelands now. What excites them most is their research is basic behavior patterns. There are several "schools" of psychology today, they point out, but all schools agree there is a definite correlation between animal and human behavior patterns.

When you acknowledge this fact, a good many questions suddenly pop into your head—some of them with deep philosophic overtones. If you can train an animal to do phenomenal tricks, what happens when you set about scientifically reinforcing a child? Can humans be so strongly conditioned that, like the Breland animals, certain of their actions are completely predictable, even inevitable? And if you go this far (as the Brelands do), can a teacher or statesman "reinforce" groups of people so strongly that they are almost certain to react favorably, thereby creating a real opportunity for human betterment? ★ ★ ★



**put your porch
to work**

turn it into
an extra room!

*complete detail drawings,
photographs and directions in
FREE IDEA PACKET 247*

The handsome woods of the Western Pines* changed an open porch into this cozy room!

Western Pine horizontal log siding forms the wainscot, vertical paneling with molded edge continues up to the paneled ceiling.

You'll find the Western Pines cut clean

and accurately with hand or machine tools. Their even texture and smooth surface take all finishes without grain-raising.

See these versatile woods at your local lumber dealer — he'll be happy to help you select them.

the Western Pines (***IDAHO WHITE PINE**
***PONDEROSA PINE**
***SUGAR PINE**

Send for FREE IDEA PACKET 247 — including the booklet, "Enchanting Homes of Western Pines" — to WESTERN PINE ASSOCIATION, Dept. 247-N, Yeon Building, Portland 4, Oregon.

NOW
a power tool that's

Really New!



JUST TURN TO RIP
No need to disassemble and reassemble when changing from cross-cutting to ripping. Just turn head 90° . . . you're all set to rip!

BUILT-IN
BLOWER

TABLE
TILTS
TO 45°

NEW SHOE
HOLD-DOWN
DESIGN

FULL-ROTATING
ARMATURE AC
MOTOR

MASTER-VIEW
CONTROLS

SHOPMASTER'S

Sensational **20" JIG SAW**
with **Self-Contained Motor**

Think of it—this rugged 20-inch jig saw has its own built-in motor! Not a solenoid or a vibrator, but a full-rotating armature, powerful AC motor.

A rugged, professional power tool that cuts up to 2½" stock with ease, this newest of all power tools makes precision woodworking actually easy. Shopmaster's EXCLUSIVE COMBINATION MITRE GAUGE AND RIP FENCE accessory sees to that!

Want to rip? Just turn saw head 90°. It's that simple. Truly the most outstanding QUALITY power tool value on the market today!



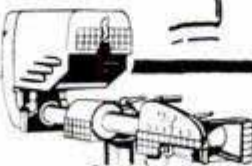
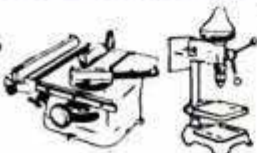
**Just plug
it in**

(Exclusive combination mitre gauge and rip fence available at slight extra cost.)

\$39⁹⁵ Motor included

Slightly higher in zone 2

**OTHER FAMOUS
SHOPMASTER
TOOLS**

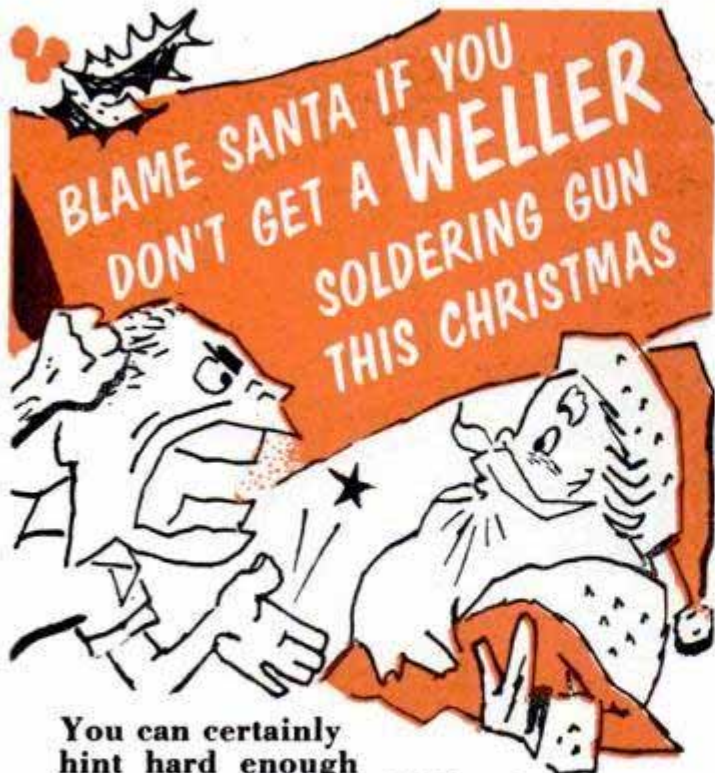


**FAMOUS UNIVERSAL
COMBINATION TOOL**

WRITE FOR FREE CATALOG
There's a Shopmaster power tool for every need. Write today for catalog of complete line.

SHOPMASTER, INC. Room 10F
1214 South 3rd St. • Minneapolis, Minn.





You can certainly hint hard enough telling everybody a Weller Soldering Gun tops your "want" list because it makes all kinds of homcraft and hobby jobs easier, faster and better. So if you don't get one, it's because the old guy kept it for sled repairs and his toy factory. Even at the North Pole, there are endless uses for the new Weller Soldering Guns!

While you're thinking about it... they're gift wrapped for Christmas and a sure-fire idea for giving, too!



INSTANT HEAT—saves time and current
2 SPOTLIGHTS—eliminate shadows
SPECIAL TIPS—for cutting, smoothing and soldering



Cuts plastic tile



Seals freezer packages

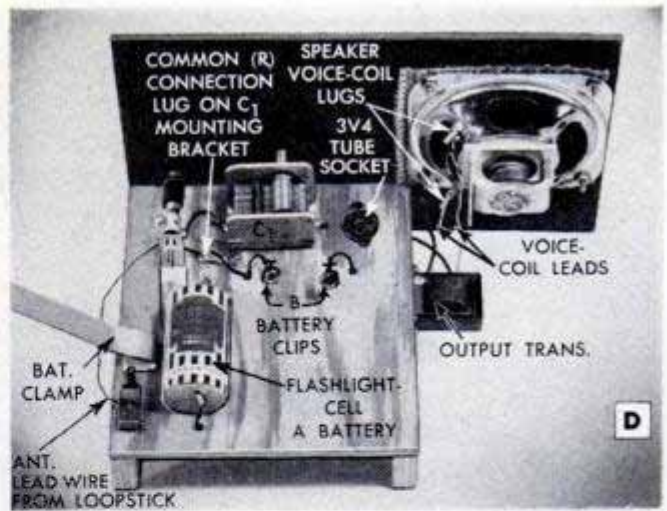


Removes hard putty



Solders and repairs

Weller SOLDERING GUNS
 816 Packer Street, Easton, Pa.
 AT BETTER HARDWARE STORES EVERYWHERE



One-Tube Loudspeaker Set for Junior Builders

(Continued from page 147)

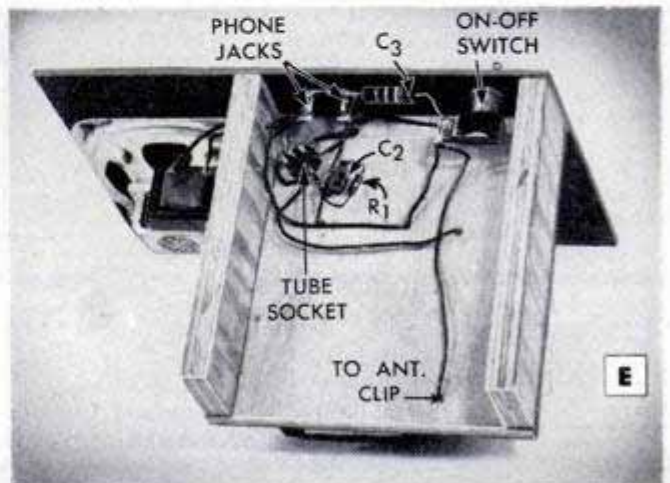
lugs are spaced very close together and the excessive use of solder could cause a short circuit between the terminals.

All components are standard and available to radio students and experimenters. The variable capacitor C1 is a single-gang unit with a capacity range from 11.2 to 381.4 mmfd. The exact capacity is not critical; any type of broadcast-band variable can be used as the loopstick antenna coil is variable. This antenna coil has a single winding and a variable iron core; it is known as a Vari-loopstick and it is especially suitable for a simple set of this type where maximum gain is essential. The mounting bracket comes with the coil.

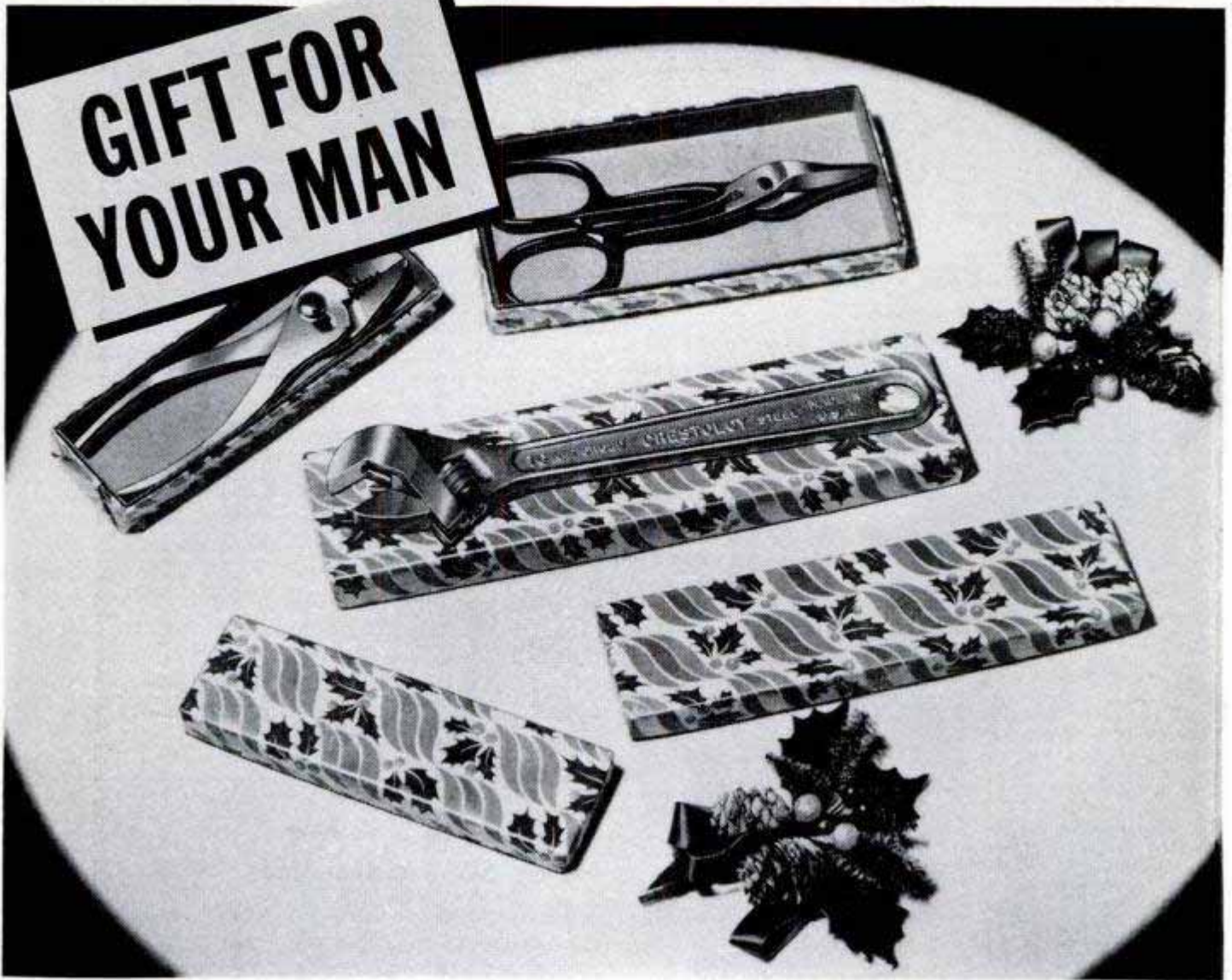
The value of fixed capacitor C3 is critical and it must be carefully chosen for best results. In the model, a .004 mfd. gave the best volume and sensitivity. If the capacity is too high the sensitivity and volume will be less than the maximum obtainable. If too low the set will oscillate (whistle) as you tune in stations.

Best results are obtained with a good long outdoor antenna; however for strong

(Continued to page 228)



**GIFT FOR
YOUR MAN**



★ No finer gift for the mechanic, home workshop fan or householder! You can't buy finer tools anywhere, and your local hardware dealer has these popular Crescent Tools *gift wrapped* in colorful, Christmas boxes. See him soon while his Crescent stock is complete.

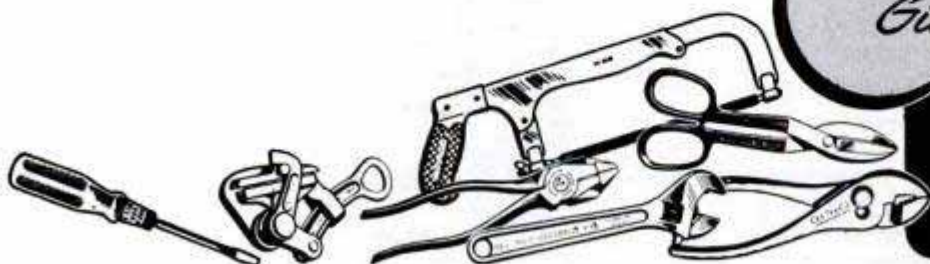
**CRESCENT TOOLS
available in Gift Boxes**

AC16	Six inch Crestoloy Wrench... Retail value.....	\$2.00
AC18	Eight inch Crestoloy Wrench... Retail value.....	\$2.30
AC110	Ten inch Crestoloy Wrench... Retail value.....	\$3.00
L26	Six inch slip joint, thin nose Plier... Retail value.....	\$1.20
T47	Seven inch combination Snip... Retail value	\$2.60

CRESCENT TOOLS

Give Wings to Work

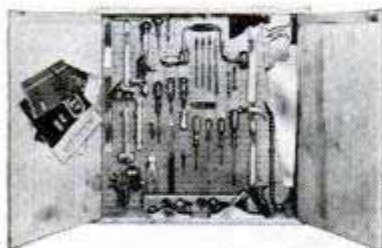
*Sign of the Artisan
Symbol of Excellence*



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by **CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK**



Tell them you want **STANLEY TOOLS** for Christmas



"Suburban" Set No. 981—
Knotty pine chest holds 34 tools—
for handyman or hobbyist.
\$99.50. Other chests and sets
from \$25.75

When your family or
friends ask what you
want for Christmas, tell
them Stanley Tools! You
know Stanley Tools are
practical and they'll give
years of service.

STANLEY TOOLS are de-
signed to please experts,
yet are priced for the
handyman. Only a few of
the wide selection are
shown here.

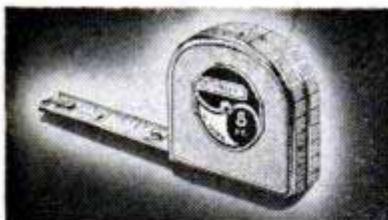
Bench Plane No. 4—Better
Plane for Better Work. Per-
fect balance—cutter fully ad-
justable. \$8.25.



Nail Hammer No. 51½—
Balanced for easy driving.
Beveled claws grip and pull
nails and brads easily. \$2.90
(Western price
slightly higher)



INDIVIDUAL
STANLEY TOOLS
AVAILABLE IN
GIFT BOXES



"Pull-Push" Rule No.
1208W—Large black num-
bers on 8 ft. white blade. Tops
for Christmas stocking. \$1.19

"Yankee" Push Drill No.
41—Push to drill holes in
wood or plastic. Chromium
plated. 8 drill points in
handle. \$5.65



"Yankee" Handyman Spi-
ral Screw Driver No.
233H—Drives and draws
screws easier, faster—also
drills small holes. Rugged
ratchet construction. \$4.75.



STANLEY TOOLS
New Britain, Connecticut

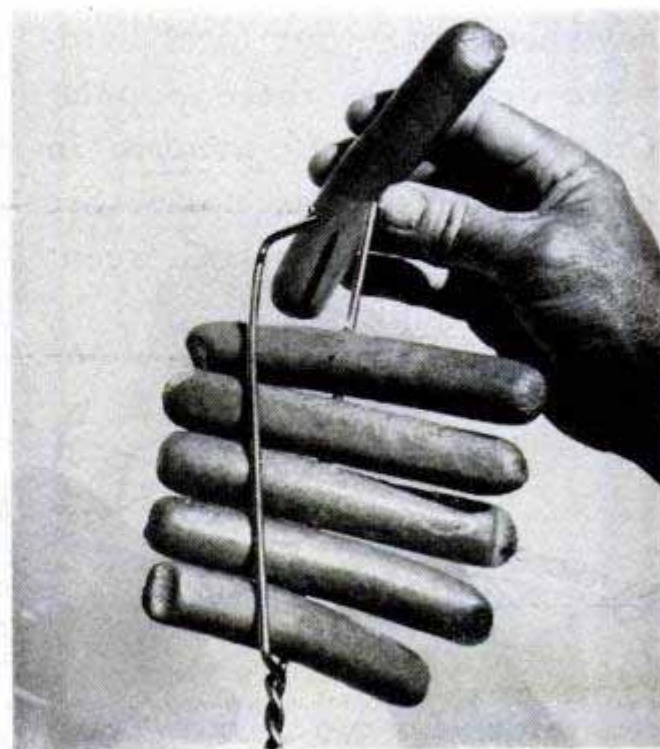
THE TOOL BOX OF THE WORLD

STANLEY **STANLEY**
TOOLS HARDWARE
ELECTRIC TOOLS
STEEL STRAPPING
STEEL

locals an indoor type can be used. You will note a short wire on the loopstick that is connected to the clip. If a 10 or 15-ft. indoor antenna is used, connect it to this clip. Scrape the enamel off the wire to insure good connection at the clip. When the outdoor antenna, which gives maximum results, is used it should be terminated in a length of flexible insulated lead-in wire which should be coupled to the loopstick-antenna lead by winding several turns of the insulated wire around the loopstick lead as indicated in photo B. This form of capacitive coupling improves selectivity. The exact number of turns for best results is found by experimenting, usually only a few turns are required. The tuning-dial plate is a standard 3½-in. 0-100 type cemented to the front panel. Heavy paper or cardboard can be substituted. The front panel can be decorated with colored decals if desired. Before plugging the tube in the socket, be sure that all wiring is correct and the A and B-batteries properly connected. Detailed student-material list R-423 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

"Safety-Pin" Skewer Holds Six Frankfurters

Back-yard chefs can roast up to six frankfurters at once over an open fire with a skewer that works like a safety pin. The pointed end of the skewer is punched through the frankfurters. The wire then is sprung over a hook, holding the franks under tension. The skewer is 34 inches long.



GET IT OR GIVE IT!

Build the One-Motor **DELTA'SHOP**

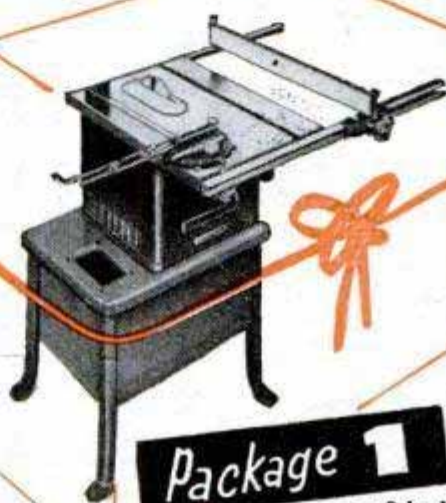
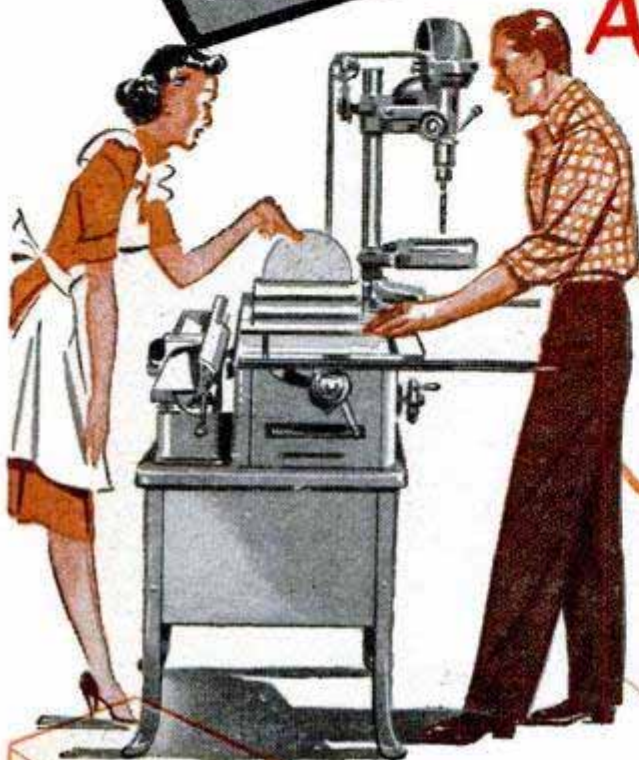
A TOOL AT A TIME

Now you can get the wonderful one-motor DELTASHOP on a year-around gift plan.

You can start with the saw this Christmas and add the other tools throughout the year. Ask your family to start you on the Deltashop "Add-a-Tool" gift plan this Christmas, or start yourself and let the family take it from there.

Here's how it works:

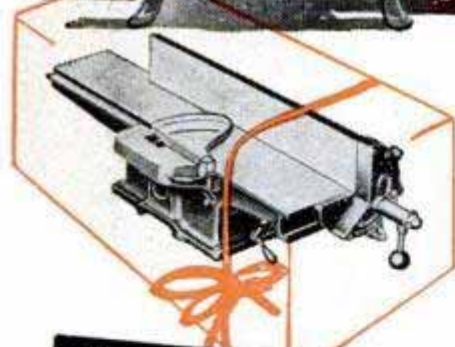
A GIFT FORMULA FOR YOUR COMPLETE WORKSHOP



Package 1

The circular saw and stand for Xmas. A Delta Home-craft quality saw—with an 8-inch tilting blade—handles every sawing job for your "do-it-yourself" home projects.

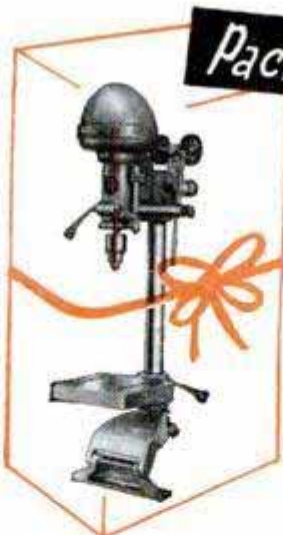
Saw and stand only . . . \$109.80



Package 2

The jointer is the next natural gift—a fine tool that puts a true "finish" edge on a board and planes stock 4 inches wide.

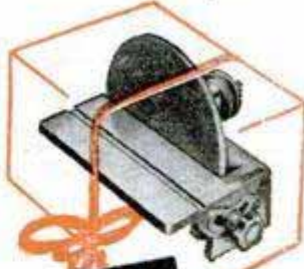
4' Jointer, only . . . \$49.15



Package 3

Comes the drill press for the birthday or Father's Day—a Home-craft 11" drill press, none finer. Does a multitude of jobs; no shop complete without one.

11" Drill Press, only...\$57.50



Package 4

Finally the sander, a most versatile tool—puts a professional finish on wood surfaces; also can be used to grind, buff, polish—a real handyman tool.

8½" Disc Sander, only . . . \$17.55

You get these packages for the same total price as the complete DELTA'SHOP

The DELTASHOP is a complete home-workshop that does 95% of home do-it-yourself projects, occupies only a 3-foot square, and pays for itself quickly by savings on home repairs and improvements. Keep it anywhere, move it anywhere, use it anywhere, indoors or out.

Make it a "must" to see this remarkable tool demonstrated—at your local Delta dealer, department store, or your nearby IRHA hardware store.

Also send for catalog of famous Delta "How to do it" books. Delta Power Tool Division, Rockwell Manufacturing Company, 502M North Lexington Avenue • Pittsburgh 8, Pennsylvania.



DELTA QUALITY MAKES THE DIFFERENCE

Prices slightly higher west of the Rockies

DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**



AMAZING TOOL for ELECTRICAL WIRING

Wherever there is an Electrical Connection there is a USE for this PRECISION ENGINEERED, PROFESSIONAL WONDER TOOL

CRIMPS
Solderless TERMINALS and CONNECTORS

In one simple, easy operation this wonder tool crimps terminals and connectors for safe connections. Supply of Terminals and Connectors included with Tool free.

SPLICES WIRE

Makes quick, firm splice in damaged wire, preparing it for connector and crimping. Completed splice with connector is firm, neat and safe.

CUTS WIRE

Makes a sharp, clean bite through wire and insulation, leaving no loose, scraggly conductor strands.

STRIPS WIRE

Cuts through insulation, and when loose fabric is pulled off, leaves wire strands clean and bright and of proper length.



**EXTRA FEATURE
SHEARS BOLTS**

Bolt snaps off clean, leaving no damage to threads — no burrs to file, Cuts steel or brass bolts.

Thousands in Use

Electricians, garage and service station mechanics, maintenance men by thousands depend on this wonder tool for all wiring work. It is made of high quality tool steel and is needed by every home craftsman. Satisfaction guaranteed or money back. Send check or money order for \$3.95. Post Paid.

American Pamcor, Inc.
1315-D American Bldg.
Cincinnati 2, Ohio



CRIMPS



SPLICES



CUTS

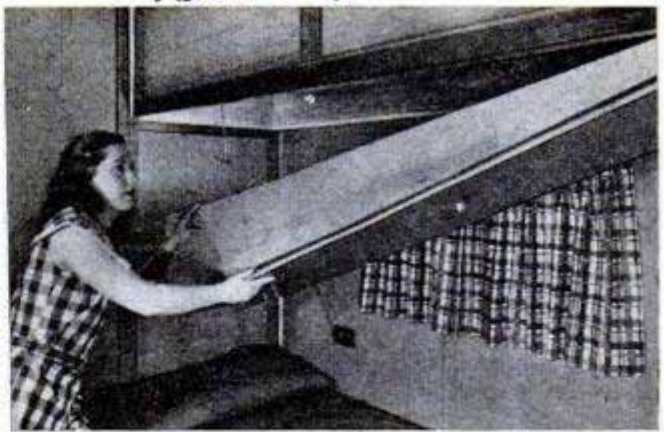


STRIPS

FREE
with Tool
Terminals and
Connectors
in assorted
sizes.

formerly
\$5.00
Reduced to
\$3.95
POST PAID

LIBERTY



Trailer designers are always coming up with clever uses for waste space like this overhead cedar chest

Trailers Are Stay-at-Homes Now

(Continued from page 143)

the two together to form a roomy, 50-foot home. At vacation time, you uncouple the 25-foot kitchen-bath-bedroom unit and take it with you, leaving the master bedroom and living room behind.

Latest innovation in trailers is a model with a folding front porch. It has a wrought-iron railing, a porch light and a canopy.

Trailers are so important in the American scene that when the University of Chicago set up a research project in retirement problems, the educators turned to the trailer. A brand-new trailer park at Melbourne, Fla., houses the retired couples as the Chicago sociologists study the adjustment problems that arise when active folks retire.

So what are you waiting for? Next time you pass a trailer park, stop in, step up on the front porch and ask if you can look around. You'll find trailerites love company. You'll be in for some surprises when you see what's happened to trailers lately.

★ ★ ★

Trailer air conditioning is new. Some companies are building units into corner tables or other furniture



ZIMMER

POPULAR MECHANICS

Tom McCahill says—

TOM McCAHILL, well known, free-lance automotive journalist whose test reports of American and European cars appear regularly in *Mechanix Illustrated* magazine.

“The finest automobile engine in the world
is no better
than its weakest
spark plug!”



“I’ve been around automobiles for a long time and have road-tested practically every make of hack put together on these shores or across the pond. You learn a lot about any engine when you start dishing out the punishment. But there’s one thing you discover quickly—the finest engine in the world is no better than its weakest spark plug.

“Spark plugs may look small and unimportant but, brother, if you want that mill of yours to unleash all its horses make sure you have the best spark plugs money can buy. That’s where Champions take the spotlight. I’ve had stock Champions go on delivering the mail in car tests that were downright brutal.

Furthermore, I’ve watched Champion-equipped cars cream everything in sight in the world’s great speed, endurance and reliability runs—from Indianapolis “500” to the LeMans 24-Hours.

“So take a tip from your Uncle Tom, and get set for winter driving by putting dependable Champion Spark Plugs in your car. They’re your best assurance of positive starting and worry-free motoring when, ‘the north wind doth blow and we shall have snow’.”



Stop in at the service station or garage displaying this poster!

AMERICA'S FAVORITE

CHAMPION

SPARK PLUGS



CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

Colossus in the Wilderness

(Continued from page 104)

If all goes well, the subterranean work for Kitimat will be completed by the time you read this.

Meanwhile, 50 miles westward at Kitimat, pile drivers are pounding poles into the waters of the fjord to complete a \$7,000,000 pier for the ships that bring the raw alumina in from foreign ports. A 70-acre site for the gigantic smelter is being cleared and filled. So is a townsite that someday may house 50,000 residents. Crews are living in the Delta King, an old stern wheeler that was towed up the fjord and beached. She sleeps 400 men in mahogany-trimmed comfort, provides her own utility services, and her saloon makes a recreation and movie hall.

Why couldn't the smelter and town have been put on the Kemano River at the foot of powerhouse mountain? There wasn't a piece of flat ground at Kemano big enough to house the plant, much less the people.

That's why a centipede of towers must crawl from Kemano to Kitimat across 50 miles of mile-high ragged peaks through Kildala Pass, carrying 300,000 volts of electricity on its back through stout 2½-inch aluminum cables strong enough to carry an ice casing weighing 40 pounds to the foot.

Of all the jobs in Project Kitimat, the transmission line has proven toughest. Never in history has anyone tried to send that much power over such staggering terrain. The steel and aluminum towers must cling to abutments, leap across gorges and step firmly across the top of a glacier. Tower sites are often no bigger than eagle aeries, clinging to sides of 5000 foot cliffs.

Test towers were first built on the eerie heights, to gather ice and be buffeted by gales—so that men could see how they'd withstand the rugged weather.

High on the crags, 12 by 12-foot platforms of wood were built. Helicopters, built on skids that could carry loads on each side, skylifted men and materials to their mountain perches, setting them down on the postage-stamp platforms. It's a hero's work for the whirlybird pilots. The canyons they fly are fraught with treacherous up and down drafts that buffet the craft mercilessly, threatening to bash them against jagged mountain walls. The roosts they light on are often encased in swirling clouds of mist, or whipped by winds so strong that tower crews stationed on them can't live in tents. Living quarters are tiny shacks, bolted to the rock of the mountainside on dynamited ledges.

(Continued to page 234)

IT SMELLS GRAND



HERE'S THE SEASON'S FRAGRANCE HIT!

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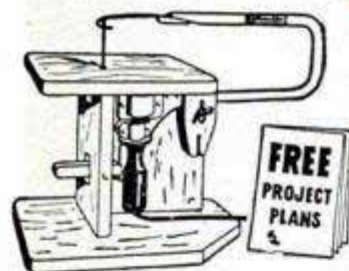
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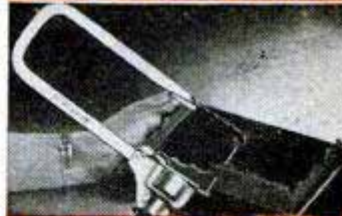
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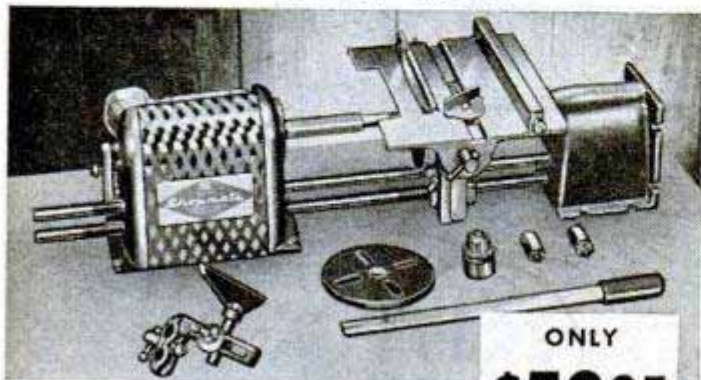
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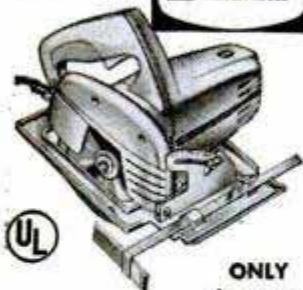


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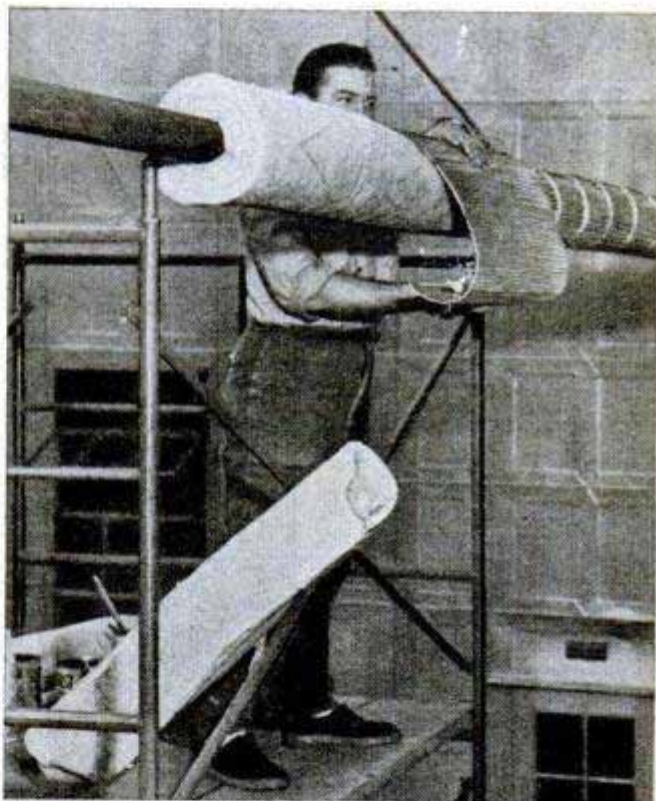
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Yet, with all the difficulties, the sturdy shoulders that will carry the power to Kitimat, will be ready for their burden by the time the first water plunges from the tailgates under the mountain at Kemano next year.

With that first flood of power, only one penstock will carry water through three big 150,000 horsepower turbines. The line of pots at the Kitimat smelter will produce 80,000 tons of ingots the first year. But if all goes as planned, another tunnel will start through the mountain at lake level. The underground powerhouse will expand to a total length of 1140 feet—big enough to engulf a 12-story office building sideways—and 16 massive turbines will wham up 2,240,000 horsepower to feed voltage across the mountains to the biggest aluminum smelter in the world. ★ ★ ★



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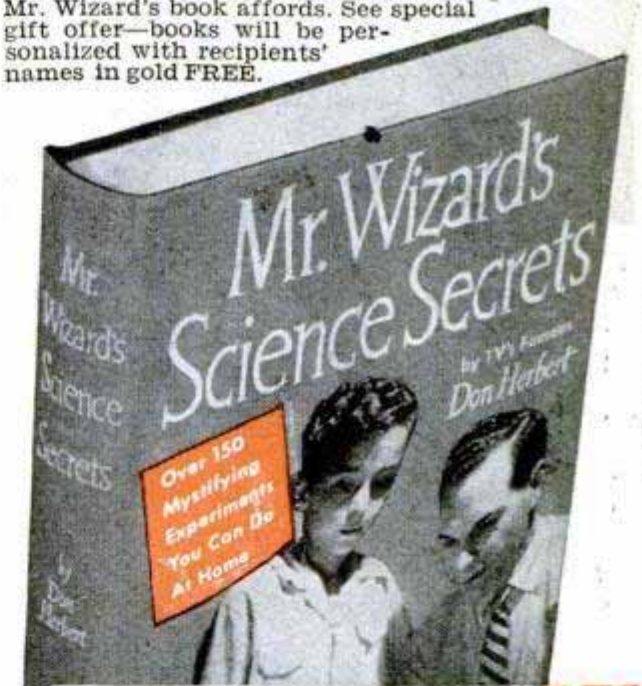
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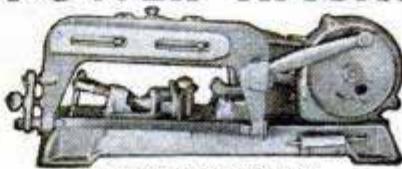


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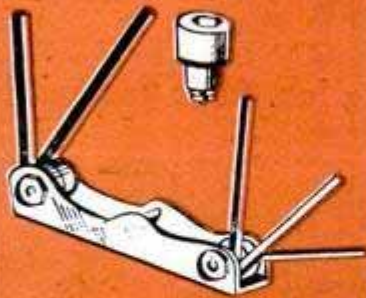
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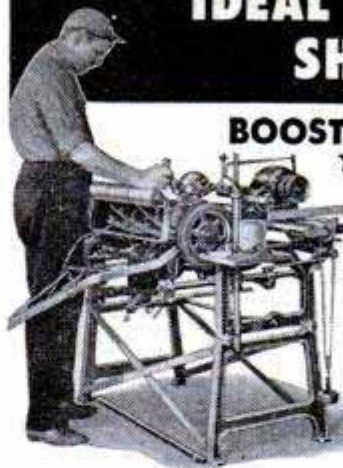
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The Gem Maker comes complete with all necessary equipment, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt, for only \$29.50, f.o.b., Burlington, Wisconsin. Write today for information and literature.
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Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost \$380.00.

Shpg. wt. 55 lbs. Dimensions 16" x 10" x 7". F.O.B. Chicago... **35.00**

ITEM #176—Type L-3. Rated 25 amps., 24 volts. Manufactured by Leece-Neville Co. Shpg. wt. 30 lbs. Dimensions 12" x 6 1/2" x 5 1/2". F. O. B. Chicago.

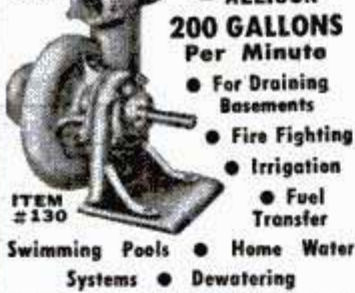


16.50

ITEM #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 55 lbs. Dimensions 15"x9"x6". F.O.B. Chicago.... **22.50**

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Brand New GENERAL MOTORS — ALLISON



200 GALLONS Per Minute

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Will deliver 200 gals. per min. against 65 ft. head using 5/2 H.P. at 3500 R.P.M.

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ITEM #355—2 1/2" bore and 7 1/2" stroke, 1 1/2" stainless steel piston rod. Lift capacity 5000 lbs., using 1000 lbs. pump pressure. Manufactured by Delco-Remy Division of General Motors Corporation. Clevis mounting on base and piston rod for 7/16" bolt. Overall length closed 21". Distance between centers 19". Supplied with fittings to 3/4" pipe thread. Brand new — in original carton. F.O.B. Chicago. **16.00**

ITEM #355A—Same unit, but supplied with built in spring to provide cushion effect on power stroke and rapid return. F.O.B. CHICAGO... **17.00**

GENERATORS MANY SIZES FROM 350 WATTS TO 25 KVA



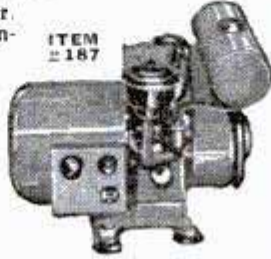
Item #183—3000 to 4000 Watt Generator Set —FEATURES—Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. SPECIFICATIONS—Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler. 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker. voltage regulator start button. Today's cost over \$1200.00. SALE PRICE, F.O.B. Chicago... **465.00**

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Compact Electric Plant suited for small homes, cabins, campers, hunting and fishing camps, trailers and small electrical home appliances.

Operating costs: About 5c per hour. Runs exceedingly quiet. Sturdily constructed for dependable service.

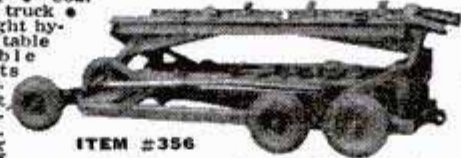
Net weight only 88 lbs. Can be carried from place to place, or transported in trunk of car. 350 Watt—110 Volt—60 Cycle—A.C. Model — M.S. 35-3, made by Midco Mfg. Co. 1 Cylinder, 4 Cycle Engine complete with muffler, starting rope and oil bath air cleaner, direct coupled to a 350 Watt Generator with voltage control rheostat and twin outlets. Engine speed 1800 R.P.M. Shipping weight 116 lbs. COMMERCIAL LIST PRICE \$250.00. NOW ONLY... **89.00** F.O.B. Chicago



ITEM #187

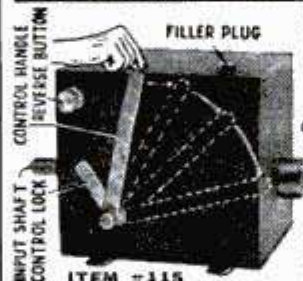
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Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam. include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions, 7 1/2" x 7 1/2" x 11 1/2". Gov't. acquisition cost \$428.00. Shpg. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago... **54.50**

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with built-in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded, neutral position for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive, easy operation. Can be used as single unit or mounted in series of any combinations desired. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports. Newly manufactured to our specifications. Ship. wt. 8 1/4 lbs. An outstanding buy! F.O.B. Chicago... **21.50**



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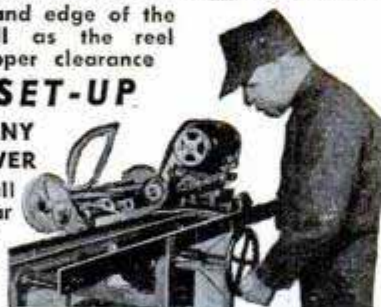
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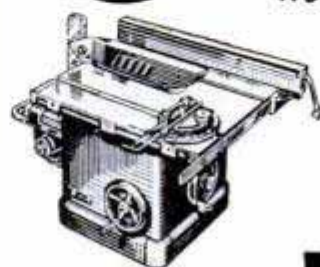
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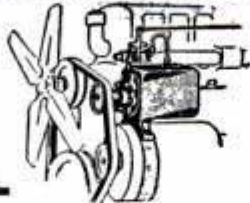


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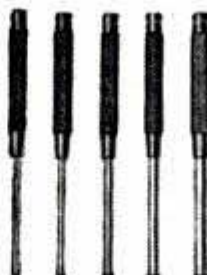
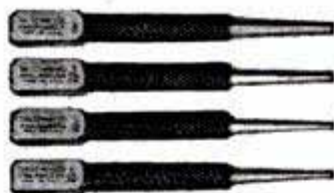


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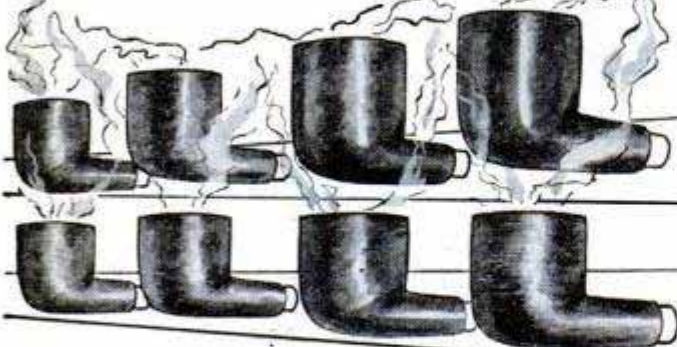
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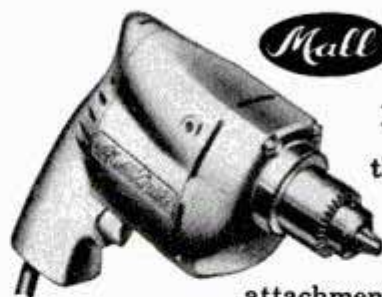
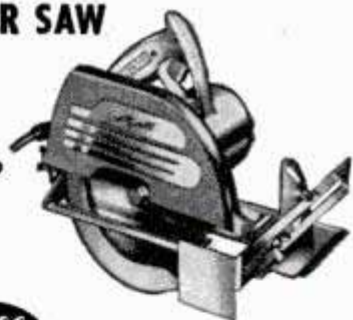
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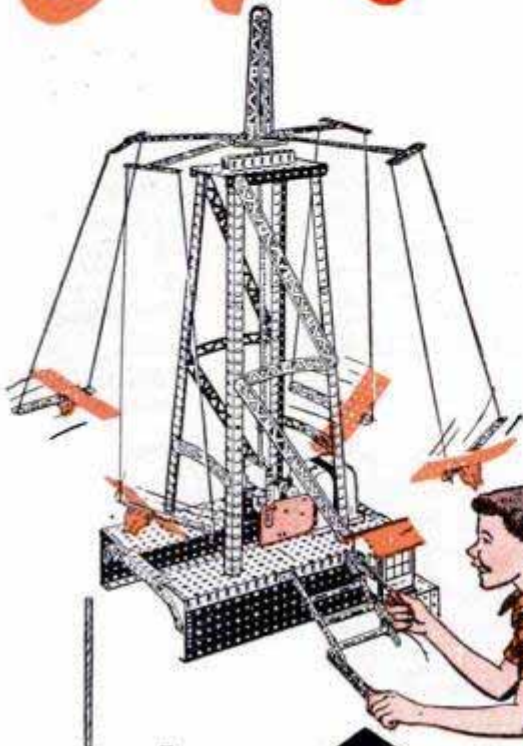
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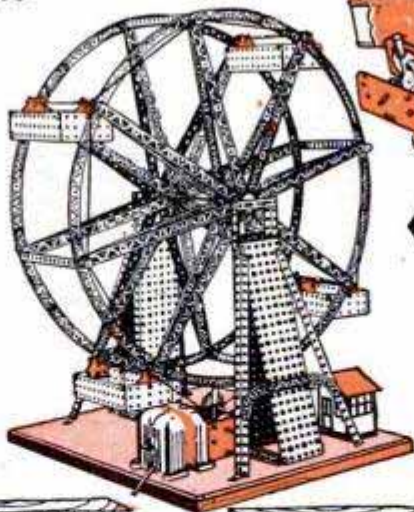
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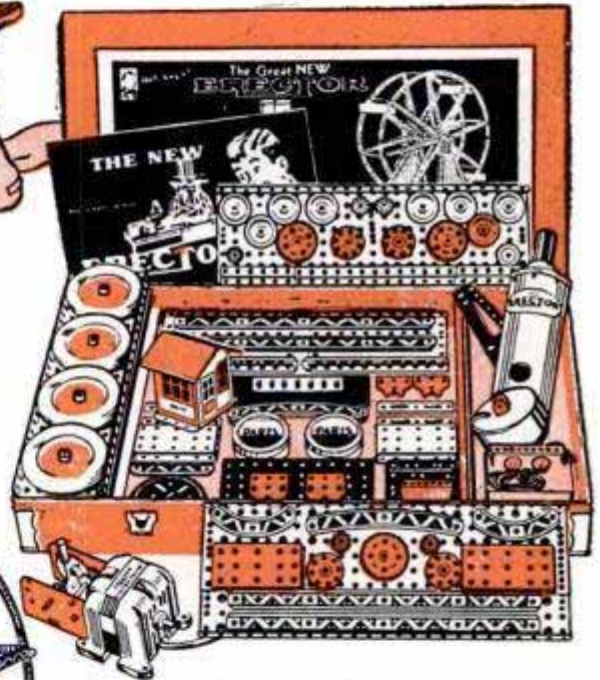


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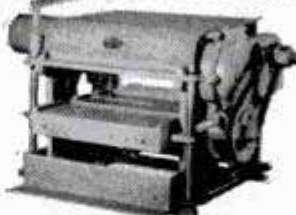
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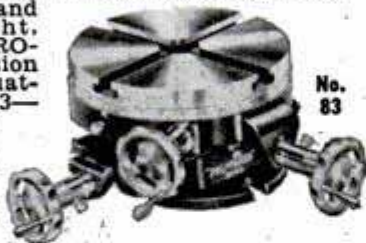
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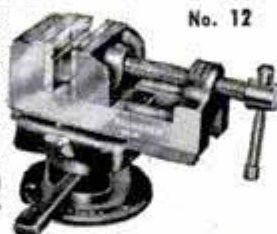


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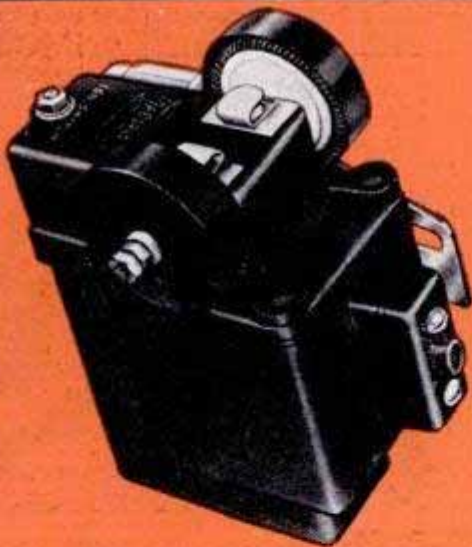


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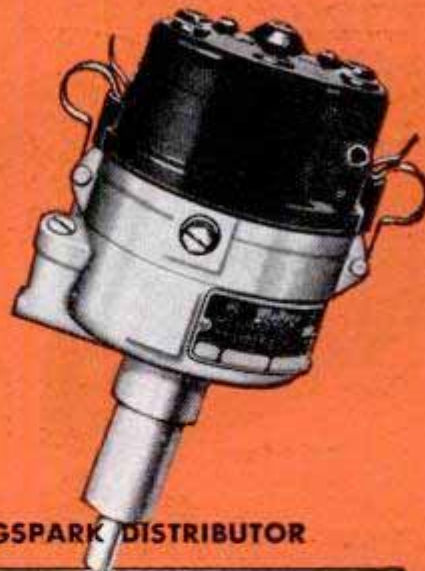
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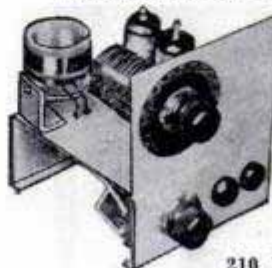


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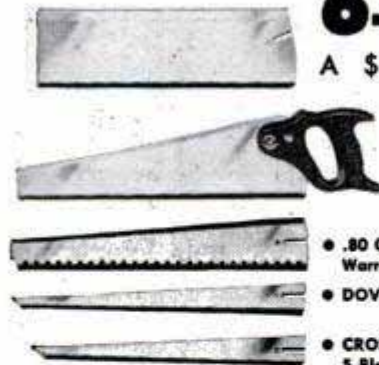
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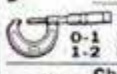
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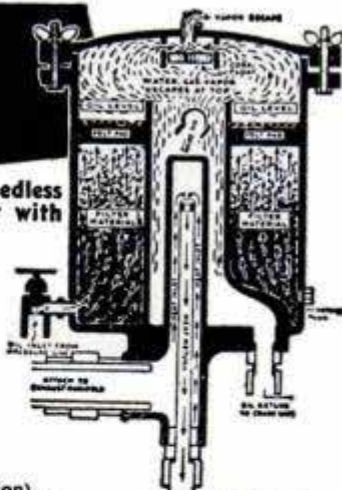
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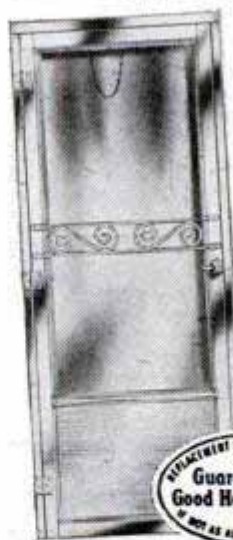
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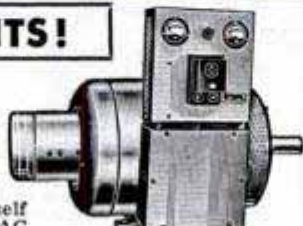
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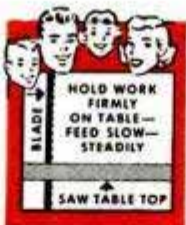
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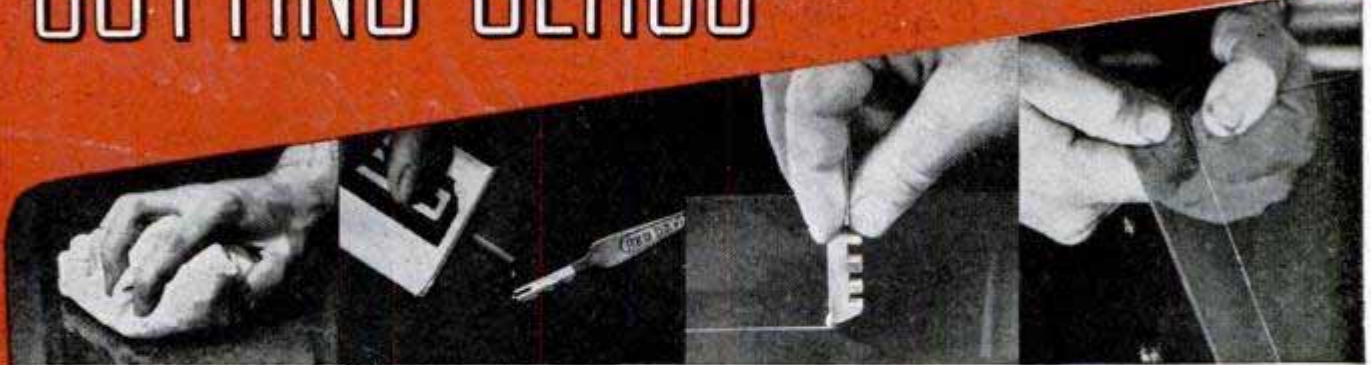
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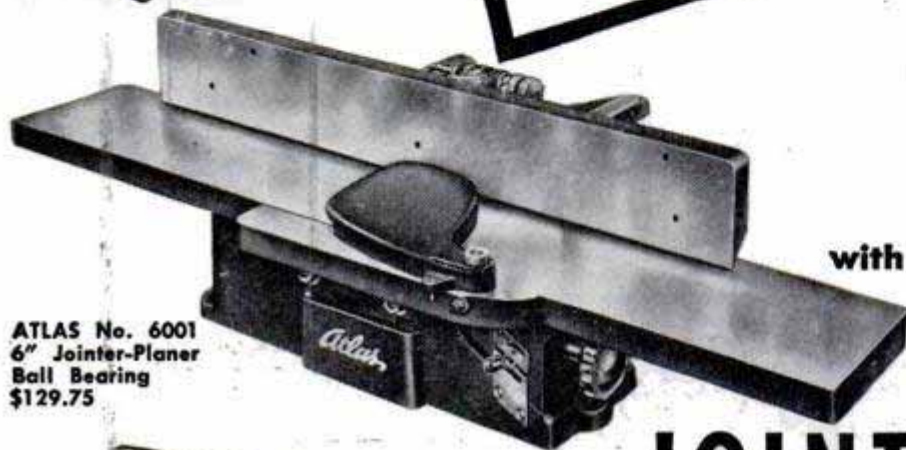
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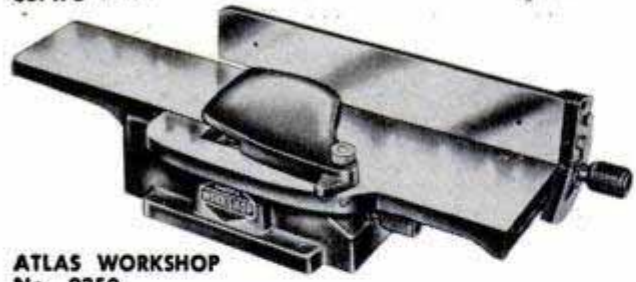
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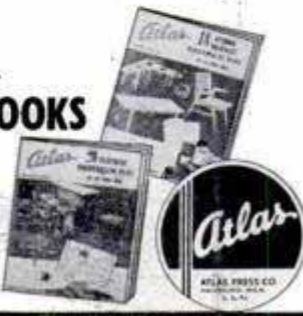
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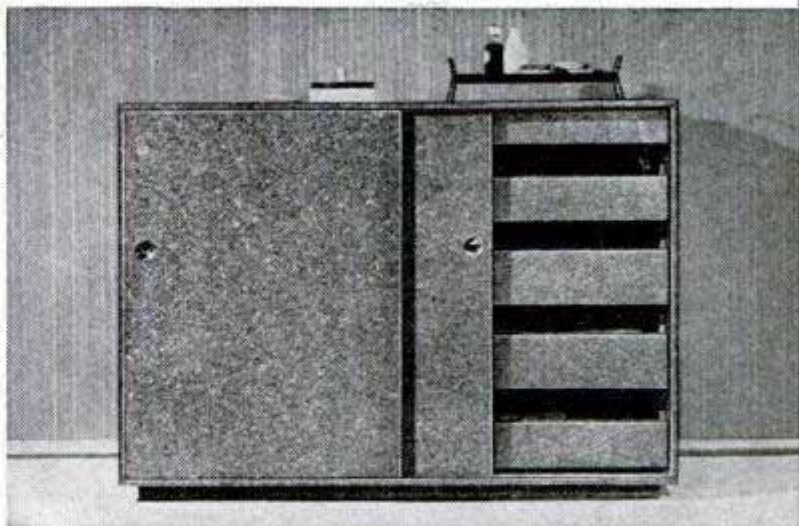
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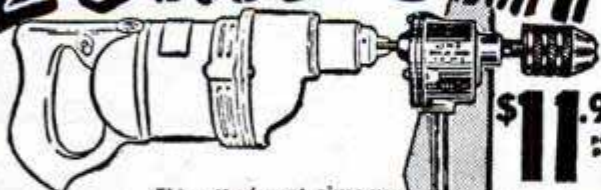
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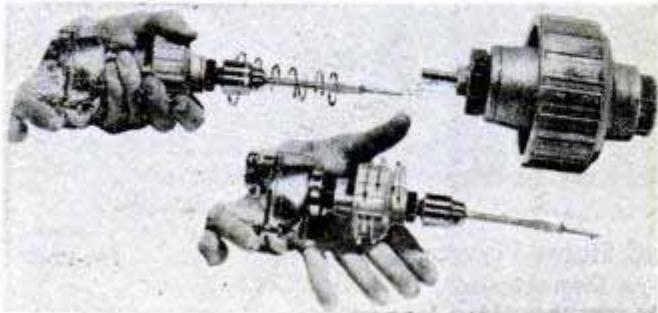
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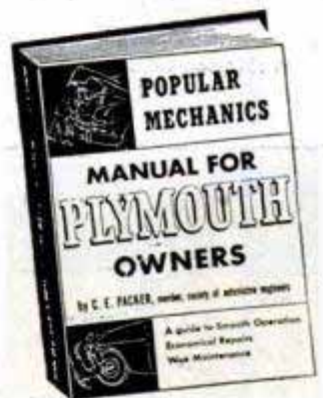
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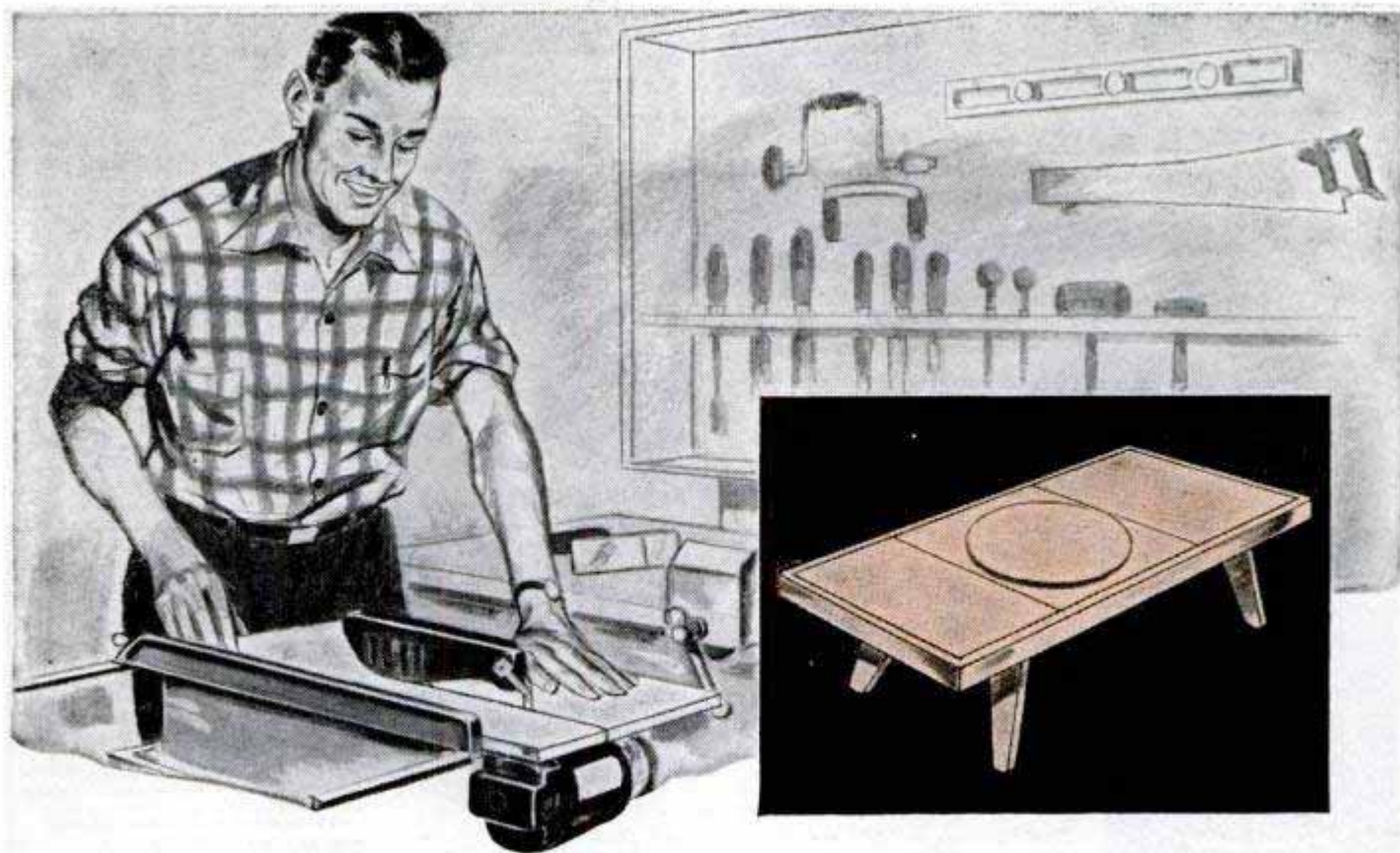
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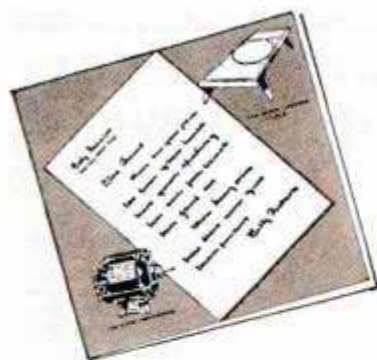
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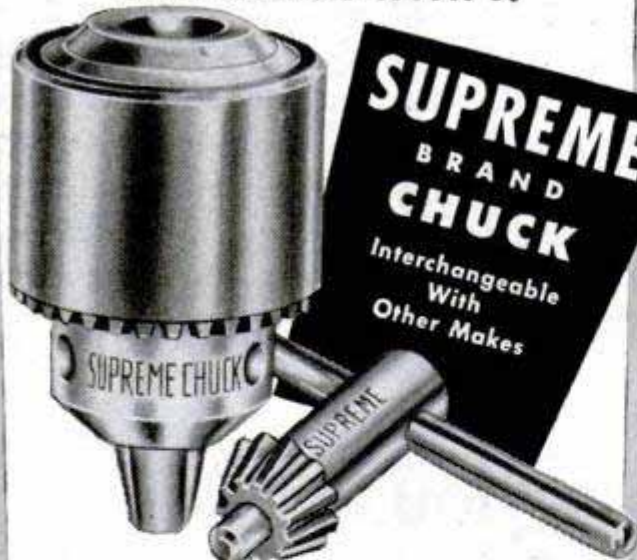
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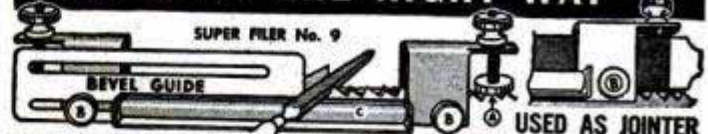
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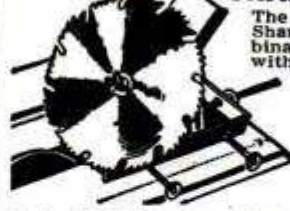
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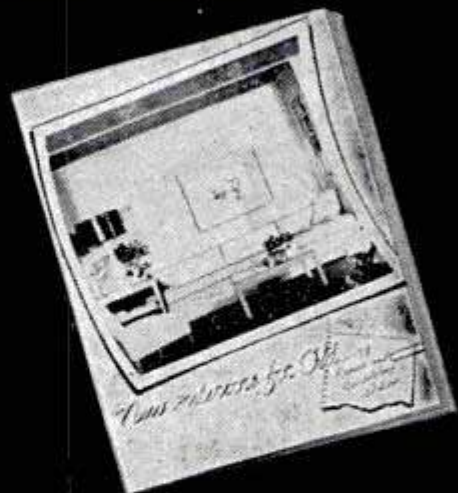
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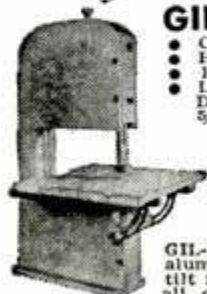


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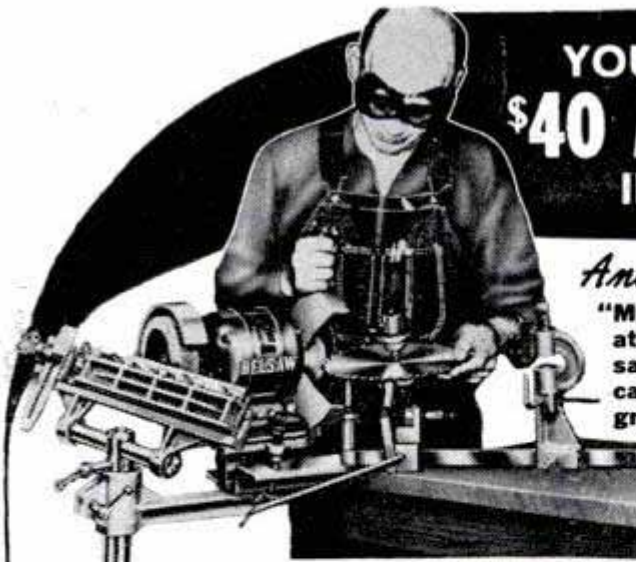
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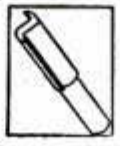


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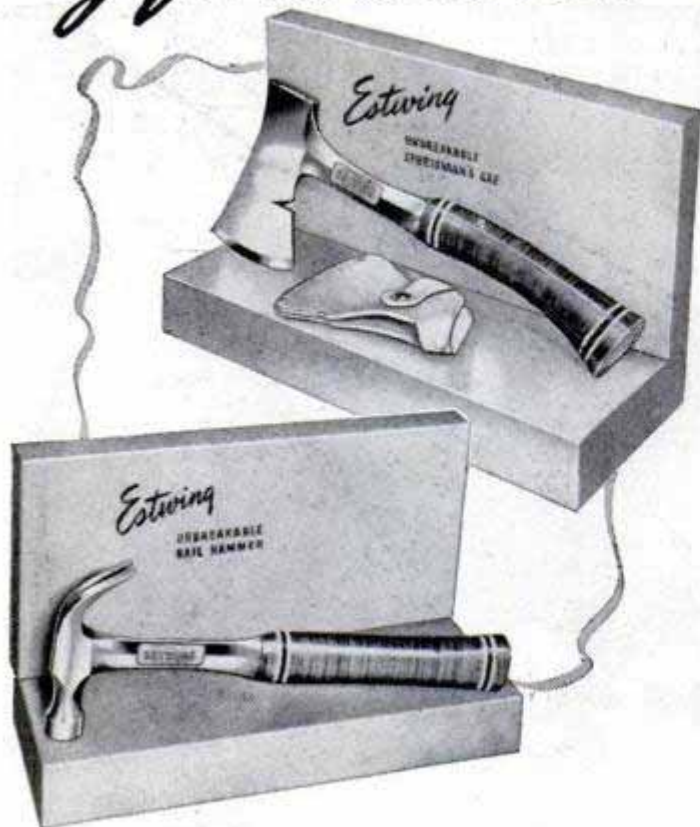
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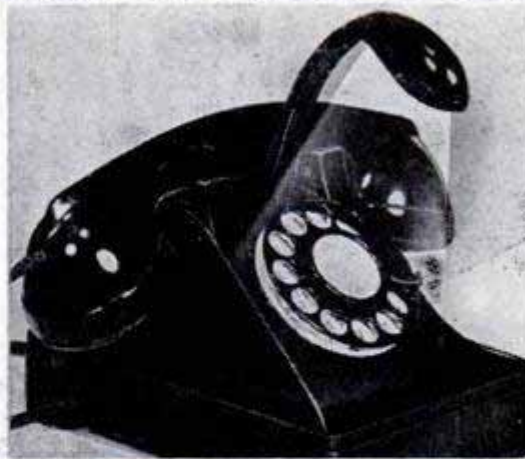
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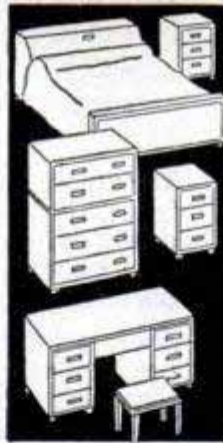
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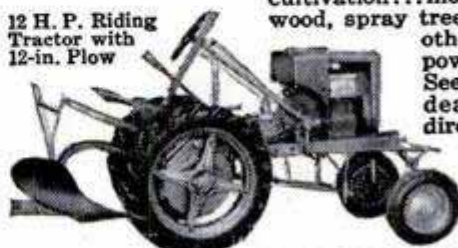


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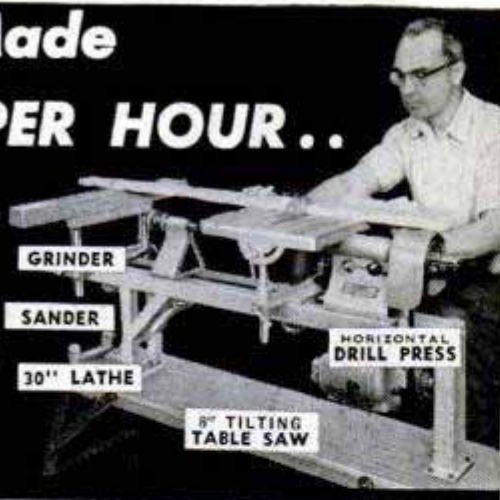
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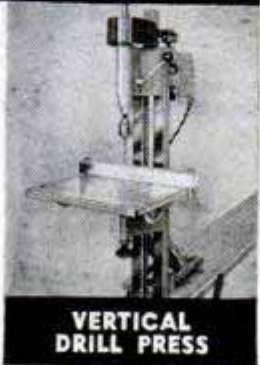
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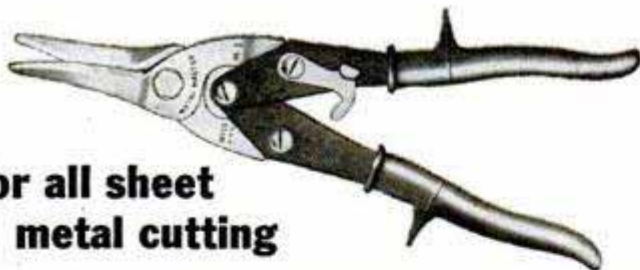
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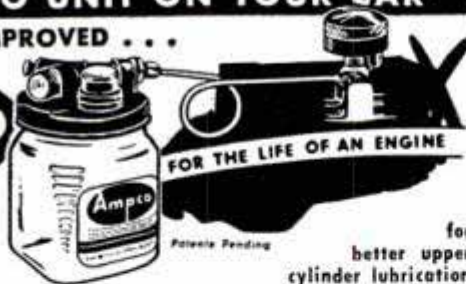
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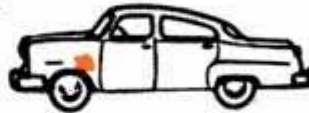
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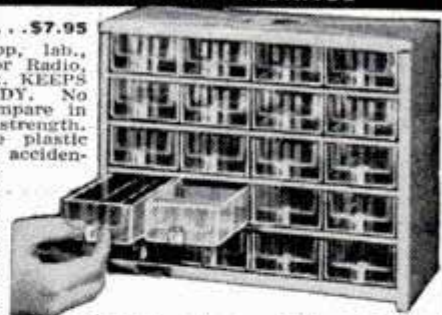
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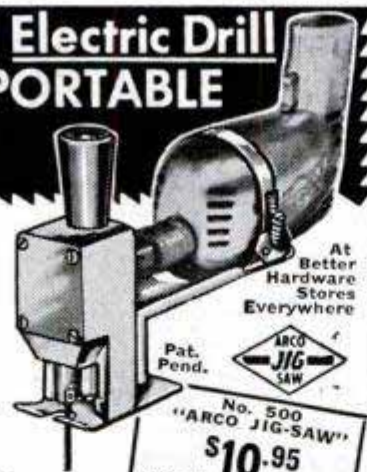
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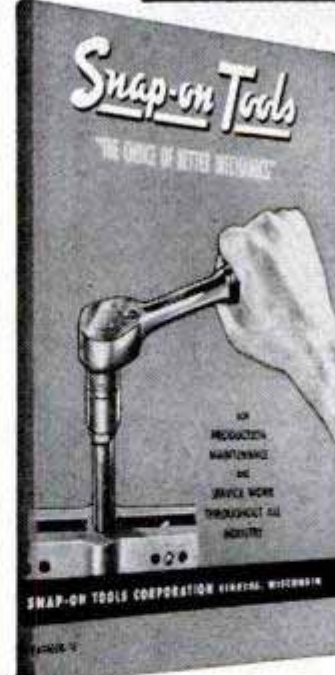
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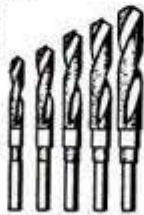
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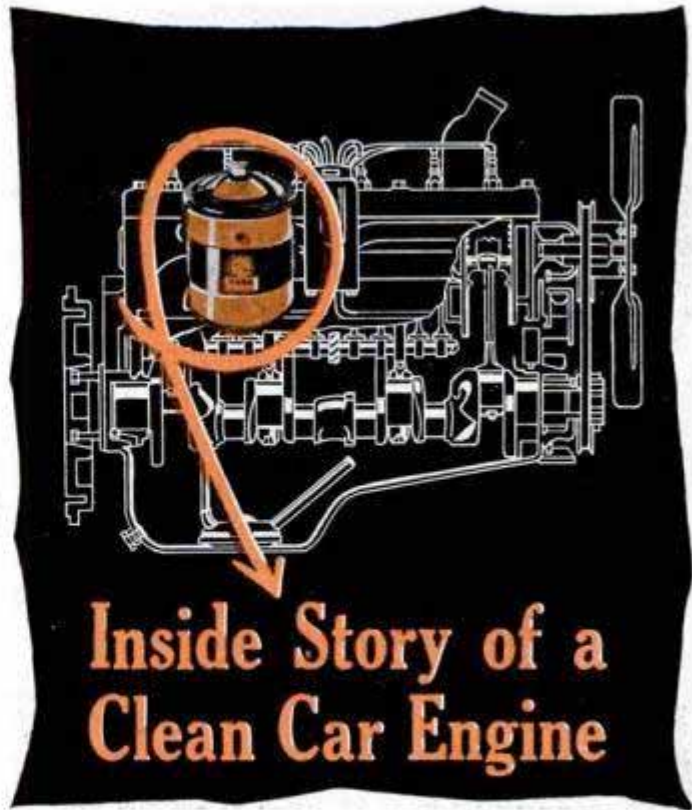
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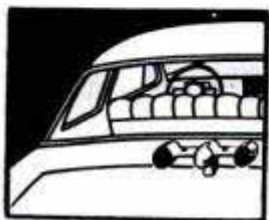
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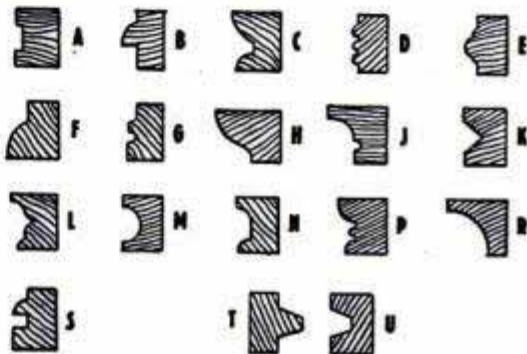
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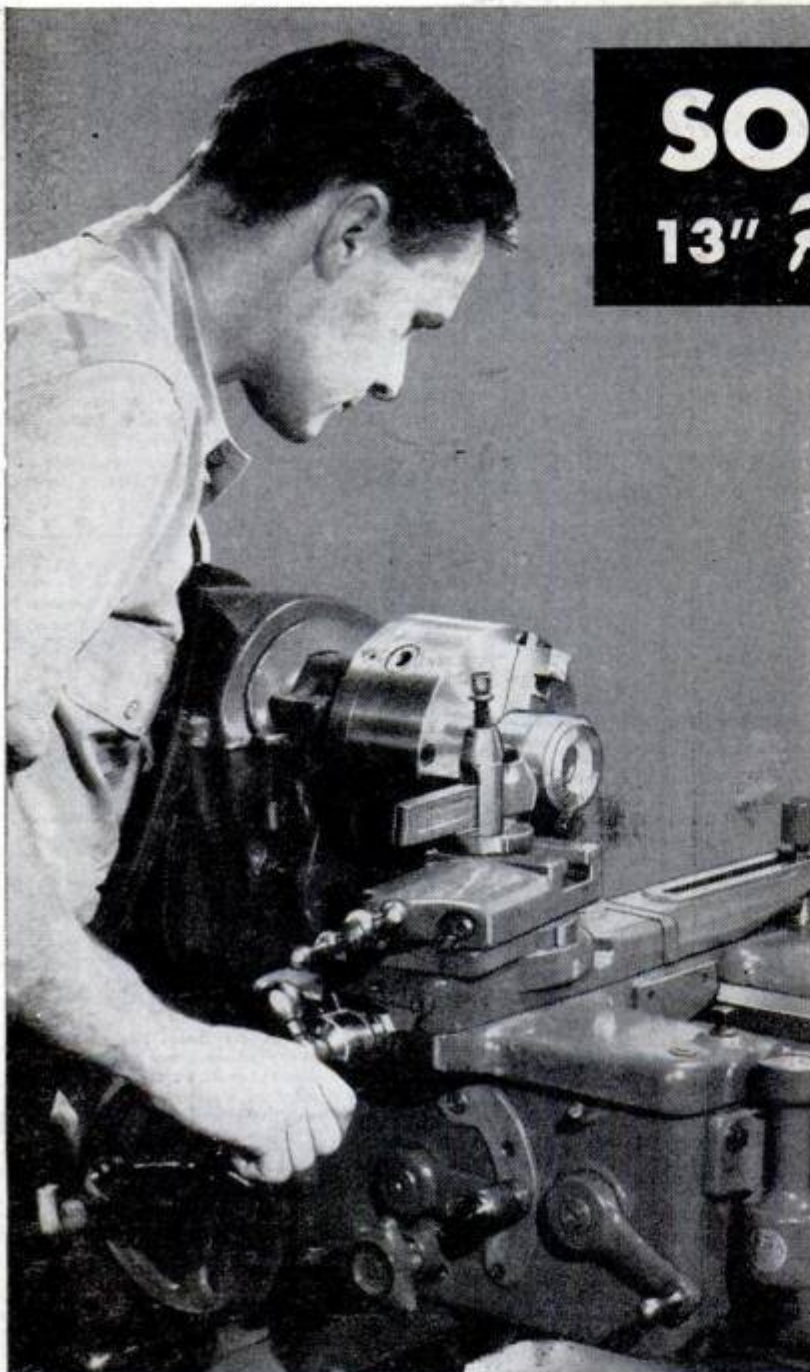
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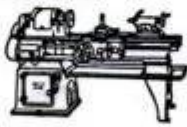
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