APRIL 1954 35 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

WHAT'S NEW IN BOATS

The Owners Report on the HUDSON

For the Craftsman

Build a Tool Shed for Your Garden

Introducing

AMERICA'S SMALLEST CAR

—Page 88

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I hadn't really intended to do it.

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But today was a rainy day, and I was cleaning up the wood shavings when I came across the Goodyear *ALL*-Vinyl Flooring carton and the How-To-Install booklet he had gotten from the dealer's. Then I saw the installation kit provided all the necessary tools. Well, I decided to surprise him and do the job myself!

It looked so easy—*and it was!*

Little Danny and I had the room finished well before supper time, and even if I do say so myself—we did a very professional job.

Of course I'm delighted to have another room with Goodyear *ALL*-Vinyl Flooring. It never needs waxing —is so easy to keep clean.

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P. S. Goodyear *ALL*-Vinyl Flooring comes in tiles and 45"-wide rolls—flexes easily, is ideal for counter tops and contour coving. SEND FOR FREE VINYL FLOORING "SELF INSTALLATION" BOOKLET—address a postcard to: Goodyear, Flooring Dept. P-8318, Akron 16, Ohio.

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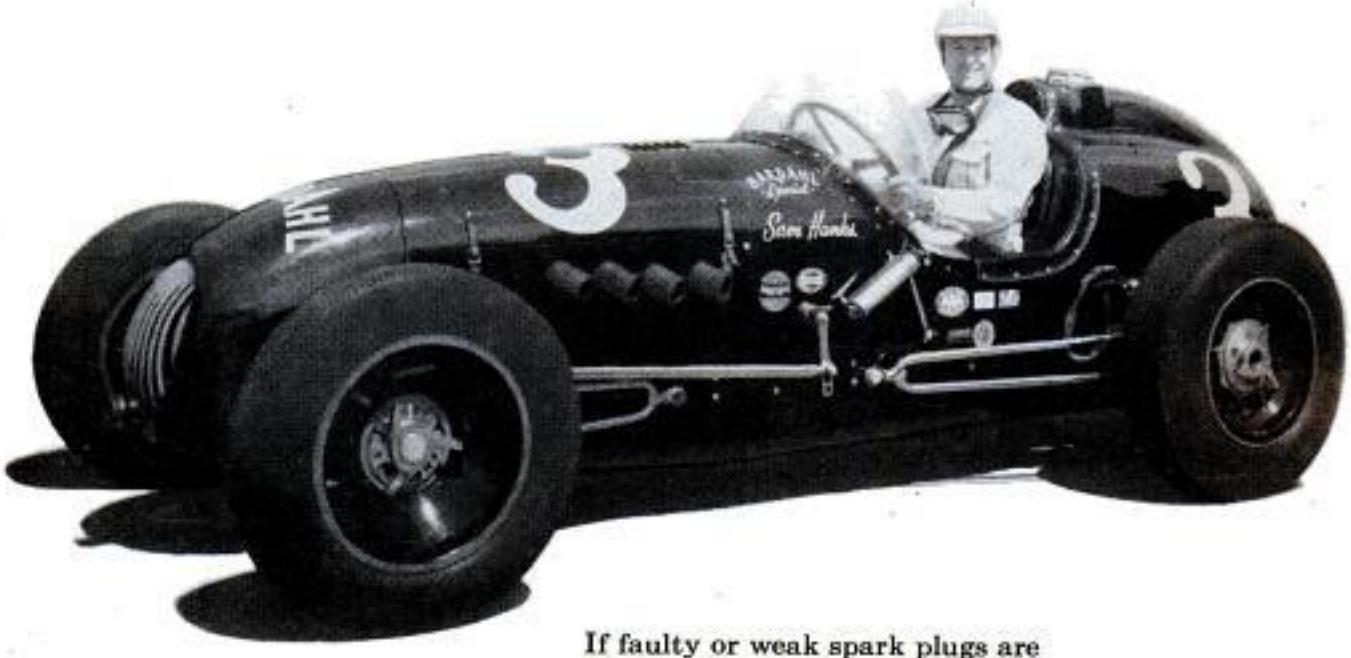

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this month's cover

IT'S PLAIN TO SEE that America's smallest car is not much higher than the tires on that truck trailer. The baby auto is the Metropolitan, Nash's long-awaited two-seater. It doesn't quite stretch up to 55 inches tall, it's pretty well limited to two passengers and it will scoot up to 40 miles per gallon of gas. In an effort to keep up with the changes in car models, Automotive Editor Art Railton frequently checks out a new car. Art's neighbors have become so inured to the sight of a snappy sports car or an expensive sedan in his driveway that they seldom even drift around for a look anymore. Not so when he drove home the Metropolitan, reports Art, for neighbors popped out from blocks around to give the little car the once-over. "Cute as a bug" was the universal opinion in this impromptu neighborhood poll, a reaction which we pass on to Detroit free of charge. You'll find Art's story on page 88

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IN THIS ISSUE

Fourth of July the Year Around - - - - 81
America's Smallest Car—the Metropolitan - 88
The Owners Report on the '54 Hudson - - 92
I Flew With the Atom Bombers - - - - - 98
All-Out War on Polio - - - - - - - - 106
That Versatile Stuff, Paperboard - - - - 116
Conference by Telecon - - - - - - - - 122
Where to Find Fish in a Lake - - - - - 128
Boat Show for '54 - - - - - - - - - 133
Bring Back That Vacation Alive - - - - 149
Radio, TV and Electronics - - - - - - 157

For the Craftsman

Tool Sheds for Your Garden - - - - - 161
Modeling the Midway (*Conclusion*) - - - 166
Solving Home Problems - - - - - - - - 172
Color-Size Your Home - - - - - - - - 177
Plan of the Month—Wall Case - - - - - 186
Check 'Em on Shore - - - - - - - - - 190
What Makes a Good Plastering Job - - - 197
Buffing in the Home Shop - - - - - - 203
Running Curves on a Shaper - - - - - 208
Shopping for Tools - - - - - - - - - 218

Other items, and manufacturers of available products described, are listed on pages 12, 14 and 16

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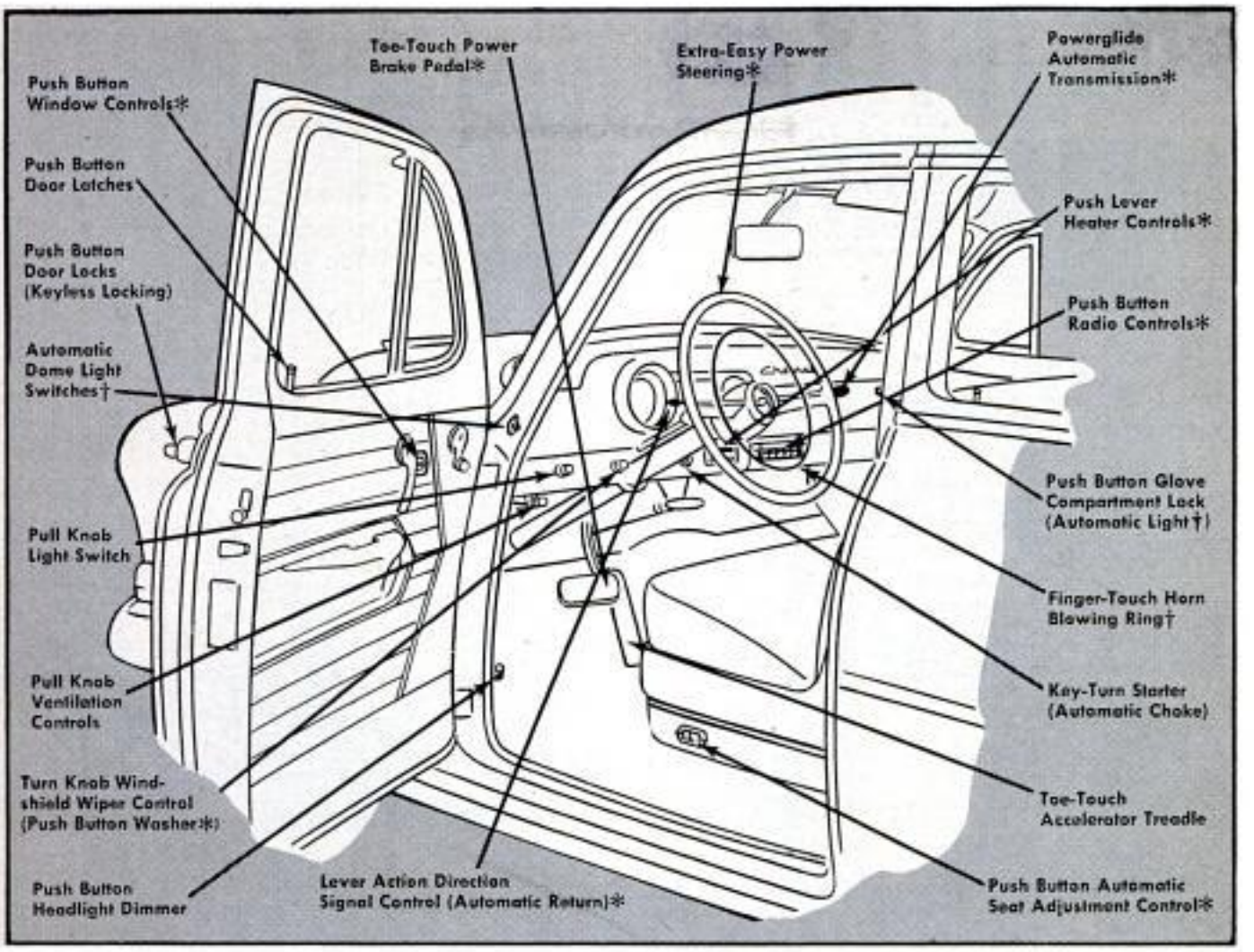

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in this corner..... THE EDITORS

Award to the Editor

For significant achievement in the field of science education, the Bausch & Lomb Optical Company recently made a special award to H. H. Windsor, Jr., editor and publisher of *Popular Mechanics Magazine.*

The award, in the form of a personally inscribed binocular, was presented to Mr. Windsor in Chicago by Carl S. Hallauer (shown at left in photo), executive vice-president of the optical company. Bausch & Lomb has been fostering the study of science in high schools through a program of awards of science medals and college scholarships, and the award to Mr. Windsor in 1954 is a part of this project.

To the Editor:

About 45 years ago as a young English settler in western Canada I became a regular purchaser of *Popular Mechanics.* I was everlastingly impressed by the meticulous care taken in the description of articles and clarity of drawings which has been continued down the years. The study of these and the making of articles has helped me in many ways. One result was that I became a senior examiner of aircraft during the last war which called for a rather keen perception in noticing mechanical faults, errors in reading drawings and specifications, and making certain that these faults were remedied before passing any aircraft for service. I have never been a mechanic, however, as a means of livelihood, being an accountant and auditor by profession, but still a very keen amateur . . . During the war I managed to get a friend in the

(Continued to page 8)

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5 *reasons why* ACCOUNTANCY

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(Continued from page 6)

States to send me a batch of *PM* books (including) Donald McKay's "Flying Cloud," a collection of articles from *PM* published in book form. I took my courage

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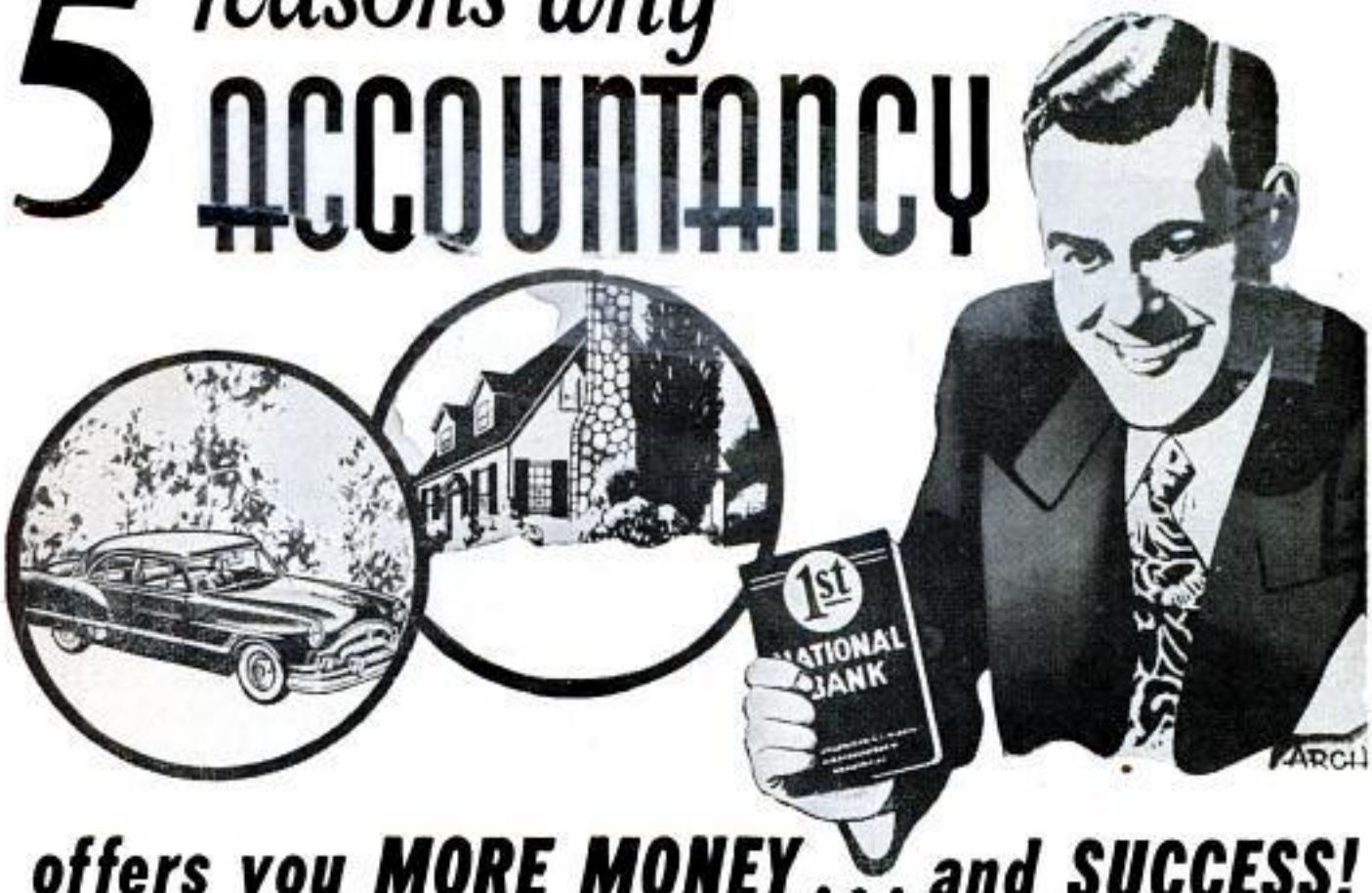

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in both hands and plunged right in. This was a little over three years ago and today I am the proud owner of the finished model. I could write a book about the difficulties encountered in making "bricks without

straw" and how I got over them by experimenting with anything I could think of. I even steeped tomato seeds in shellac and drilled them for blocks and deadeyes. I had to do this kind of thing for parts which could not be purchased. . . . For a man who went through the South African war 1899-1902, the Great War 1914-1918 and the last

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(Continued from page 8)

war, including the London Blitz, and still working for a living at 74 years of age and traveling 30 miles every day to do it, I think I have made a really beautiful exhibition job of it, true to scale in every particular.

George Hornsey
Stoneleigh, Surrey, England

Editor's Note:

So many comments have been received on our February automobile section and particularly the color feature on the American Classic Cars that we print here a few representative letters:

☆ ☆ ☆

I noticed in your February issue the very interesting collection of American Classics. I was particularly interested in seeing that the No. 1 car in your sequence was a Duesenberg Murphy 1931 Series J.

Enclosed you will find photograph of a completely restored 1935 Series J Murphy convertible with the top down.

Even though 18 years old, this car performs beautifully and receives almost daily use eight months of the year.

W. A. Burns, Jr., President
Trailmobile, Inc.
Cincinnati, Ohio

☆ ☆ ☆

I want to thank you on the part of the entire Classic Car Club for featuring these cars. It is a wonderful hobby and it is fun to have others recognize it.

S. Prestley Blake
Longmeadow, Mass.

☆ ☆ ☆

Congratulations on the splendid section on classic cars in your February issue! It's the most attractive feature ever to appear in your fine magazine. I can't tell you how much I enjoyed those beautiful pictures.

David P. Welp
Toledo, Ore.

☆ ☆ ☆

We read with great interest your Classic Auto Section. But, boy, did you slip up in your selection of Packards. Did you ever

(Continued to page 244)

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WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available

AUTOMOTIVE

American sports car has European origin..... 86
Powered evaporation cooler keeps car comfortable in hot weather (G & S Mfg. Co., 2824 E. Washington St., Phoenix, Ariz.) 91
Gasoline-saving midget tractor handles many jobs on farm...112
German garagemen use hydraulic lift truck to raise car for greasing 115
$10,000 "toy" car will go 70 m.p.h.....144
Safety steering gear protects driver.....226

HOUSE AND HOME

Paint roller prints translucent design on newly painted walls (Sherwin-Williams Co., 101 Prospect Ave. N.W., Cleveland 1, Ohio) 87
Collapsible hand truck eases lifting and moving of furniture.112
Bus serves as home for family of nine.....114
Circular dinette table "blossoms out" to double its size.....126
Circulating water warms bed in winter, cools it in summer (Howard Hollander, 115 Central Park West, New York, N. Y.) 126
Ice crusher (Mrs. Dorothy Damar, Damar Bldg., 233 Frelinghuysen Ave., Newark 5, N. J.).....142
Shirt marker (John Dritz and Sons, 1115 Broadway, New York 10, N. Y.).....142
Slicing aid (Sunset Sales Corp., 1660 N. Hobart Blvd., Hollywood, Calif.) 142
Spatterproof lid (Nu-Fry Lid, 917 W. 70th St., Los Angeles 44, Calif.) 142
Booster chair (The Wallace, Davis Co., Hampton 14, Conn.)..143
Door holder (Ultra Chemical Products, 700 Fort Washington Ave., New York 33, N. Y.).....143
Food chopper (Swisshouse Products Inc., 401 Broadway, New York 13) 143
Jar rack (George C. Knight Co., 19720 W. 8 Mile Rd., Detroit 35, Mich.) 143
Shower doors (Standard Steel Cabinet Co., 3701 Milwaukee Ave., Chicago 41, Ill.).....143
Folding downspout extension tips up out of way when rain stops (Crawford Company, Rock Island, Ill.).....153
Folding sewing-machine table holds portable in recessed top (G. D. Martin Co., P. O. Box 579, Olympia, Wash.).....154
Paint-your-own tiles presketched at factory.....236
Lightweight two-way pruner adapts to light or heavy work (H. R. Basford Co., 235 15th St., San Francisco).....268
Self-propelled garden tractor (Don Kemper Co., Inc., 505 Keith Bldg., Dayton 2, Ohio).....274

MISCELLANEOUS

Miniature traffic light on bicycle signals in three colors (Darwin Products, Inc., 1000 W. 50th St., Chicago 9)..... 87
Canada's First Rapid-Transit subway trains give "colorful" ride 91
Tumbler may try for world high-jump record.....103
The weird birdmen of Mexico.....104
Padded tongs for fishermen handle bait without damage (P. & K. Inc., 122 N. Dixie Highway, Momence, Ill.).....113
Shoulder camera holder aids photographer's aim (Momu Inventions Corp., 1966 Park Ave., Denver, Colo.).....113
Slingshot with sighting ring shoots arrows on pellets (Waldrop Enterprises, 801½ Houston St., Arlington, Tex.).....113
Wire-frame wall bracket parks and protects bike (Manufacturers' Distributing Co., 409 Allen Pl., Albion, Mich.).....113
Wireless piano exhibited in Germany contains metal sounding bars 115
Air drives power saws.....115
Caterpillar introduces highly mobile two-yard tractor shovel (Caterpillar Tractor Co., Peoria 8, Ill.).....115
Drawing aid shows objects in three-dimension views (The Wilkinson Co., Box 638, Arnold, Md.).....120
Hydraulic auger takes soil samples (Carl's Machine Shop, Woodward, Okla.) 120
Adjustable outboard motors power Belgian Congo river boat (Outboard, Marine and Mfg. Co., Waukegan, Ill.).....120
Chinese nuts resist blight (U. S. Dept. of Agriculture, Washington, D. C.).....121
"Trolley wire" carries long extension cord over large area (J. T. Templeton, Inc., 6432 Casse Ave., Detroit 2, Mich.)..121
Push-button parking machine doubles available space (Simmons Industries, Inc., N. Broadway, Albany 1, N. Y.).....121
Bite of hydraulic earth leveler controlled from tractor seat (Paramount Sales Corp., 860 Richards St., Salt Lake City, Utah) 125
Gardener's drill sows and tamps.....127
Mobile plant prints 12,000 London newspapers per hour.....127
BBC turret van relays telecasts.....132
Danish ship model is self-powered.....132

(Continued to page 14)

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(Continued from page 12)

Huge tank developed by British may be most powerful ever..132
American-style daredevil drivers thrill Germans.....141
Talking dictionary not only spells words—it speaks them!....141
Radioactive isotopes flown in wing-tip compartments.....144
Archery golf 145
Barrel weights raise and lower doorless fumigation building (Hemet Wholesale Nursery Co., Hemet, Calif.).....146
Slotted support for tiles (U. S. Gypsum Co., 300 W. Adams St., Chicago 6, Ill.).....146
Belt on wheels loads air cargo.....147
Aluminum net draped from ceiling of auditorium stops echoes (Reynolds Metals Co., 2500 S. 3rd St., Louisville, Ky.).....148
Elevator-truck speeds servicing by hoisting meals to airliners (Lambert Field, St. Louis, Mo.).....148
Baby climbs mountains in papoose fashion.....153
Farmers live dangerously.....153
Beam of hollow ceramic tile supports heavy load in tests.....154
Plastic patching kit (Woodhill Chemical Co., 1391 E. 33rd St., Cleveland 14, Ohio).....154
Giant ice box keeps metals soft between steps of fabrication..155
Hand-drill attachment defeathers game birds in short order (Scott W. McKendree, 1893 Del Moro, Klamath Falls, Ore.).155
Optical hygrometer gives instant readings.....226
Shoes stored on hangers.....232
Safety device steers aircraft away from hazards.....242
All-rubber bottle stopper seals bottle mouth with ball.....268

SCIENCE

Atomic locomotive may produce 7000 horsepower..... 86
"Atomic battery" converts radioactivity directly into electricity 91
Current stops rust on stored ships.....112
Airplane-control cable used to repair tendon in kneecap surgery 125
Refrigerator keeps trees healthy until they are planted.....125
Mexican sisal-plant juice rich source of cortisone.....126
Barium-iron magnets (Ferroxcube Corp of America, 97 Marshall St., North Adams, Mass.).....153
X rays taken without machine.....154
Does earth have tiny moons?.....155
Jet pulverizer 156
Produce new elements by altering uranium.....262

Craftsman and Shop Notes Index

AUTOMOTIVE

Minnow-bucket aerator 175
Depression in generator brush keeps spring in place.....213
Constant care of chromium-plated automobile parts important.214
Eliminate hard-starting in car with simple preventive measures 215
Floor creeper used as dolly when repacking wheels.....220

BOATS

Loop straps in boat hold oars to drain back into water.....169
Brass strip on bottom edge protects boat keel.....170
Small craft's water line marked with aid of light and cord....170
Hose section shields boat lines.....176
Bedspring coils do double duty as oar holders and fenders...196
Relocation of eye on small boat eliminates veering when towed.196

FARM

Multilamp method of chick brooding.....185
Butchering kettle raised on legs for building hotter fire.....213
Farm fuel-storage shelter.....214
Portable back scratcher for cattle utilizes worn tractor tire....214
Concrete strip through hog lot has many muddy-weather uses.216
Coil-spring "hinges" make nonsagging wire gate.....217

FISHING

Box pivoted under boat seat keeps tackle dry.....165
Film spools provide reels for spare fishing line.....165
Wooden clamp grips catfish while hook is removed.....181
Line on fisherman's jackknife aids removal from pocket.....184
Safety pin keeps bait on hook.....188

HOUSE AND HOME

Plastic hose filled with water acts as painter's level.....169
Shelf "rack" holds razor blades.....170
Frame your entrance.....171
Nighttime decoration in room made with luminous paint.....176
Cleaning toilet tank.....181
Rural mailboxes don't have to be ugly.....182
Remedying leaky flush tank.....184

(Continued to page 16)

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(Continued from page 14)

Removing egg stains from fabrics....188
Redwood flower box....189
Portable circular shaving mirror has "built in" light....196
Toothpicks locate holes after wallpapering....196
Solving home problems....172
Glass push pins support extension cord....172
Tangles and kinks in clothesline....172
Hanging out-of-reach pictures....172
Your note for the milkman....172
Copper screens given coat of shellac....173
Put outgoing mail in handy spot....173
Matching odd socks in the wash....173
To protect the seat cushions from children or pets....173

LAWN AND GARDEN

Cans fastened to stakes shade young plants....181
Steel wool provides strainer in sprinkling-can spout....184
Holder for garden-seed packets....188

PHOTOGRAPHY

Fluorescent darkroom safelight utilizes filter paper....202
Photographic-chemical cans provide labels for jugs....202

TOOLS

Prevent bar clamp from slipping....188
Hand-grinder setup on lathe cuts threads in plastic....207
Carbon "milled" from valves with drill press....207
Efficient portable blower has hardware cloth shield....207
Machining stainless steels....213
Plywood table for portable electric handsaw....215
"Sawmeter" assures accurate depth adjustments....217
Workbench made portable....220
Shopping for tools....218
Pressure gauge....218
Masking guide....218
Belt sander....218
Rethreading tool....218
Pocket slide rule....218
Lever-operated chain hoist....219
Caulking clamp....219
Electric pencil pointer....219
Angle jig....219
Pad sander....219

WORKSHOP HINTS

Auxiliary jaws on vise provided by clothespin....165
Opened drawing-instrument case becomes convenient stand..165
Extra handle for drill polisher taken from old coffeemaker....170
Lawn mower stored on wall conserves floor space....174
Thin strips of emery board sand hard-to-reach places....176
Adjustable flashlight support from long strap hinge....184
Garden-hose sandpaper "block" ideal for curved surfaces....184
Wooden plug used to determine diameter of internal threads.207
Slotted end of sawhorse holds try square handy....213
Sturdy sawbuck folds easily for storing in small space....213
Foot saver on drill press....215
How to remove rusted screws....216
Plywood chain-saw carrying case prevents staining car floor..216
Valve modifies hand sprayer for compressed air....216
Tire sections over sawhorse provide non-marring surface....220

MISCELLANEOUS

Ice skates protected from rust when stored in plastic bag....165
Padlock keeps tent flap open....170
Glued splinter held in place by cellulose tape....174
Bird dog taught to retrieve using screen-wound block....174
Candles given holiday air with metallic powder....174
Twine loops hold swing board out of small child's reach....174
Nail polish waterproofs matches....176
Record player used as carrier for phonograph records....176
Cardboard signs protected by pieces of hardware cloth....181
Patterned and textured articles provide leatherwork designs.184
Concrete anchors for steel posts precast in farm shop....185
Standard croquet-court pattern assured with knotted line....188
Moistening sponge improvised from blackboard eraser....196
Price cards on can displays supported by tape tabs....216
Sawhorse rack aids handling rolled building paper....216
Barrel on rocker platform tipped for easy access....220
Wire clip attached to drawing board holds sign artist's copy..220

Radio-Television, Electronics

Color TV on tape....157
Radio hams stage hidden-station hunts....158
How to check your car radio....160

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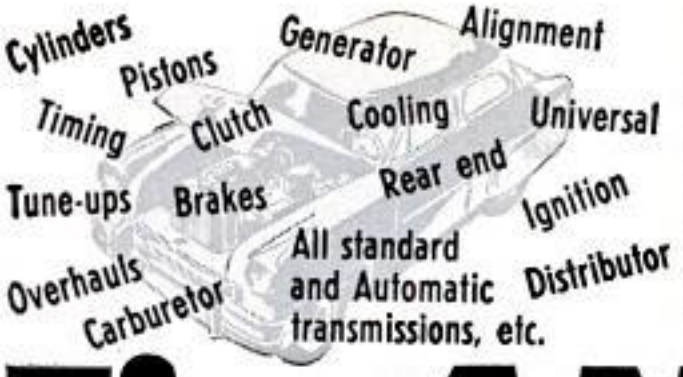

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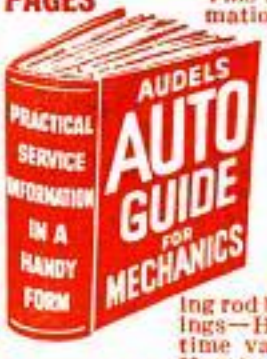

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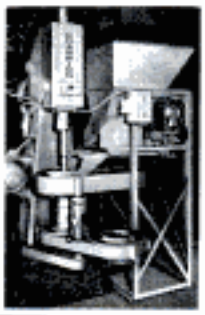

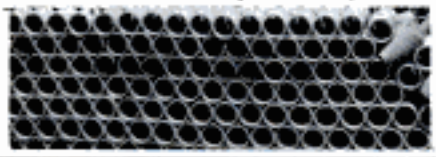

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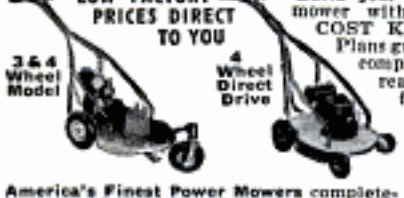

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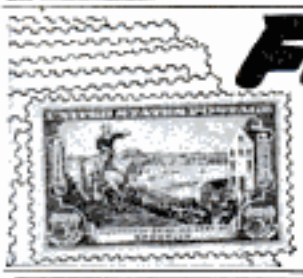

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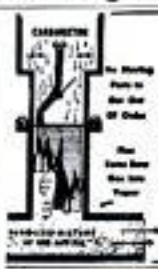

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IT ALL STARTED the day I got the bill: $214.36 for an engine overhaul—and I had only 28,000 miles on the car!

I told my troubles to a neighbor—a lubrication engineer—told him how I'd always changed oil every 1500 miles, changed filters every 5,000 miles. His answer floored me.

"You've been wasting your money," he said. "We've spent millions developing oil additives that keep carbon, gum and abrasives from damaging your engine. Your oil costs about 15¢ more a quart because of those additives. Yet oil filters on the market today are made of rag or paper—they soak up additives like a blotter. The more often you change oil filters the more money you waste!"

"But don't I need a filter to take the impurities out of the oil?" I asked.

He took a deep breath. "This will really shock you. Engine damage is done by abrasives 10 to 40 microns in size (a micron is .000039"). Your oil filter can't take them out because rags or paper can't be packed tight enough without stopping oil flow when the fibers soak up oil and expand."

"Isn't there any kind of filter that does the job it's supposed to do?"

"No, except for the porous bronze filters they're making for supersonic aircraft. And you can't buy a filter like that for your car."

I asked myself: "Why not?" Next day, I tracked down the outfit that was making the filters for aircraft, and got the answer. These porous bronze filters were made by fusing together millions of tiny bronze balls. Non-absorbent, they didn't remove additives, yet they removed abrasives in the 10-to-40 micron danger zone. Could they be made for automobiles? Again, the answer floored me.

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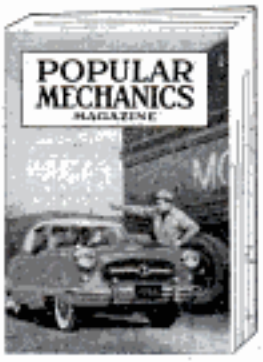

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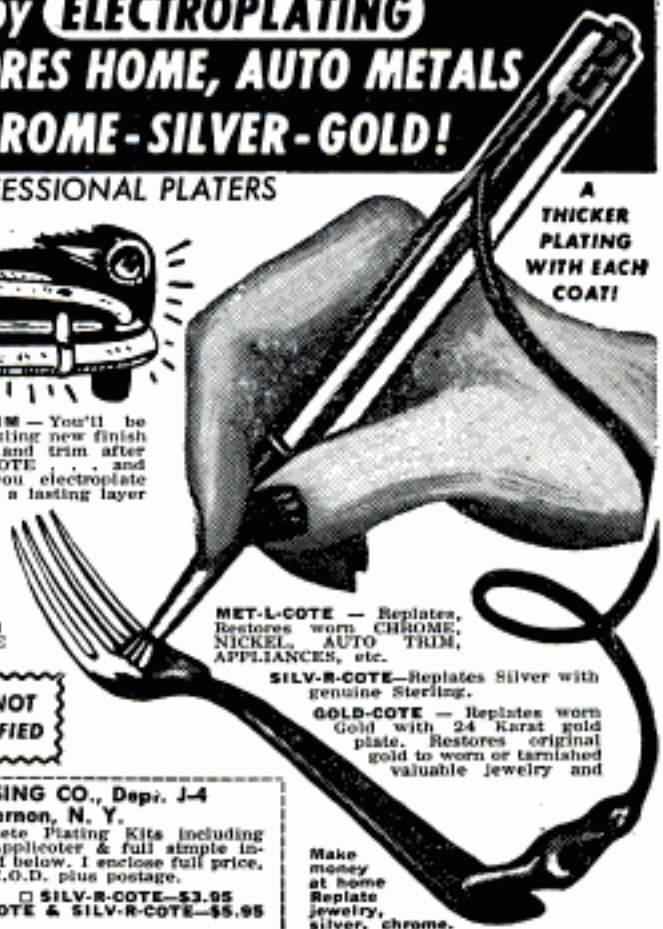

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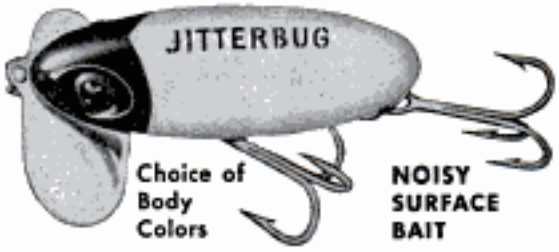

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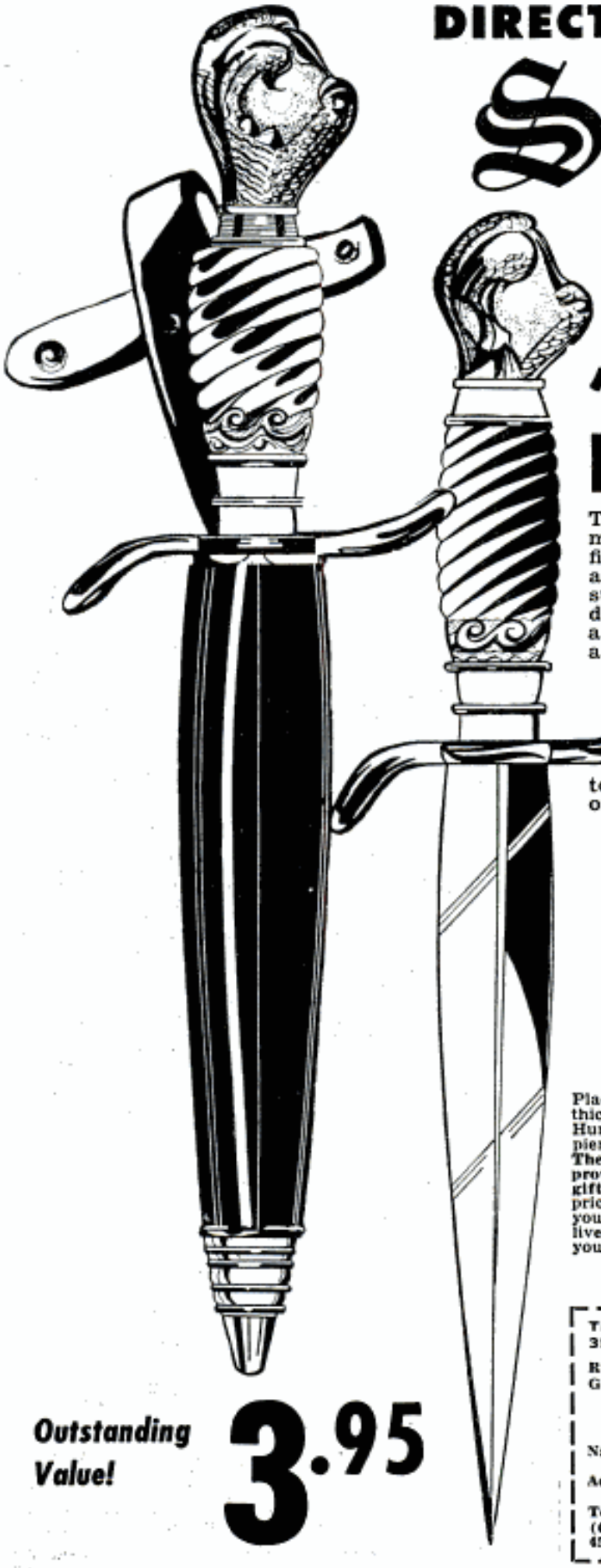
"BLACK FOREST" Hunting Knife



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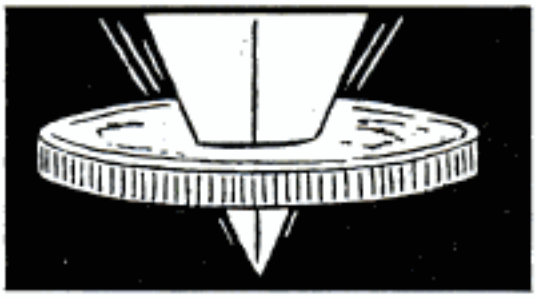

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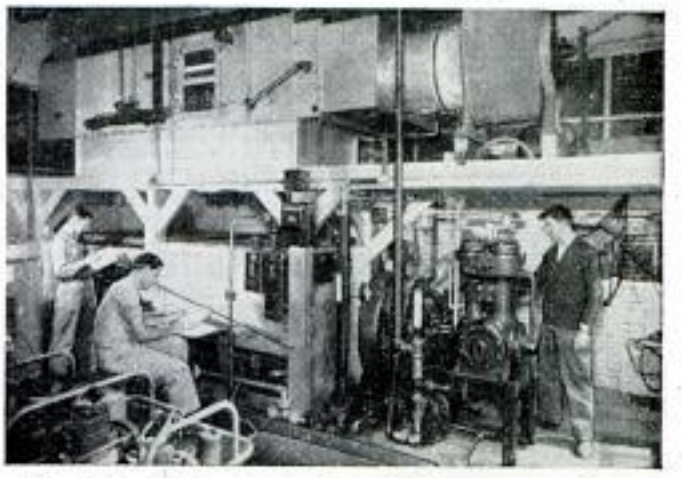

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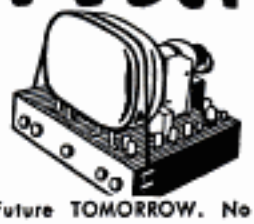

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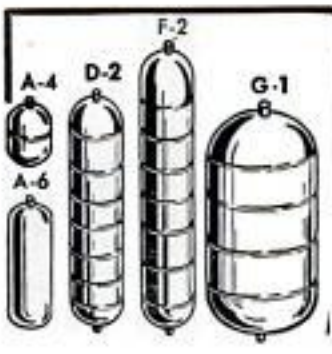

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750-17	11.84	1000:20	16.84
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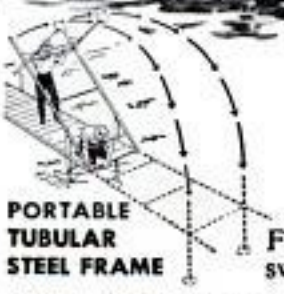

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(Item 24)

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700-800 Watt Plant (Item 44) same as Item 24 but larger engine.... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output..... **$199.50**

1500-1700 Watt Plant (Item 20) similar to Item 24, but has three times more capacity. Wt. 173 lbs. Factory price... **$279.50**

LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1½ hp. Briggs engine. Perfect for lights, radios, small power tools. Wt. 65 lbs. Factory price..... **$99.75**

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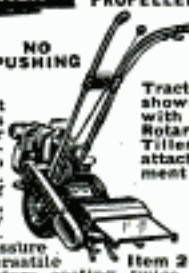
SELF-PROPELLED

It's a rotary tiller
It's a lawn mower
It's a power sickle
It's a bulldozer
It's a plow
It's a cultivator

NO PUSHING



Tractor shown with Rotary Tiller attachment

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Item 206

Rotary Tiller	$42.50	Snow Blow	$29.50
Cultivator	$8.75	Bulldozer	$11.25
Furrowing Tool	$8.75	Plow	$15.00
Rotary Lawn Mower			$42.50
Sickle Bar Mower			$42.50
Lawn Mower Hitch			$4.50

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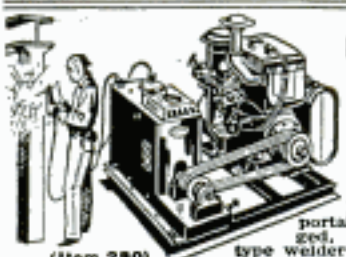
Variable Speed Selector

(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs.; Reg. list $228, $252 and $352. Our prices . . . **$79.50, $89.50** and **$114.50**



(Item 280)

MASTER DC ARC WELDERS

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

WELDER ONLY, standard model (with single rheostat), operate with tractor, jeep or any gas engine, 14 hp or up. Item 38, Wt. 110 lbs. **$400 value**..... **$99.75**

DUAL CONTROL MODEL, same as above but with built-in dual control rheostat for work on all types of metal. **$450 value**..... **$119.50**

COMPLETE POWER MASTER (Illustrated above) powered by a 14 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory price..... **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at.. **$10.50**

(Item 21)

MASTER-LITE 2500 Watt Plant 110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00 (Item 21) Factory Price..... **$329.50**

DYNA-POWER 3500 WATT PLANT

(Item 23)

Push Button Start 115 v. 60 cyc. AC. Built-in battery charging. Powered by a sturdy 8 hp. air-cooled Wisconsin engine. A powerful plant built for continuous duty, yet compact and portable. Integral positive drive — an exclusive Master Mechanic engineering feature. Includes control box, plug-in power receptacle and voltmeter. Wt. 270 lbs. Factory special..... **$379.50**

(Item 302)

6000 WATT PLANT PUSH BUTTON START. 115-230 v. 60 cyc. AC. A big, heavy duty plant powered by an air cooled V-type 4-cyl. Wisconsin engine direct drive connected. Plenty of current for ranges, water heaters, oil burners, stokers, pumps, refrigerators, freezers, lights, machinery, etc. Affords both 115 and 230 v. current simultaneously, 1800 rpm generator. Ideal for continuous duty where heavy current is needed. Extra heavy winding assures years of trouble-free service. Quiet and smooth running. Complete with duplex power receptacle, power distribution box and voltmeter. Wt. 735 lb. Reg. $1395. Factory price... **$899.50**

Model MM50. 5000 Watts, similar plant powered by 2 cyl. Wisconsin engine..... **$795.00**

We make fully automatic controls to operate any of the above light plants. Write for details. **We make all sizes up to 25,000 Watts.**

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Heavy welded frame, pre-drilled for easy mounting—just cut opening and bolt in place. Efficient propeller type blades move huge volume of air quietly and effortlessly. **Continuous duty,** slow speed motors. Ideal for barns, attics, chicken houses, restaurants, garages, etc. Can be operated manually or with thermostat. Compare our unbeatable factory prices!

Blade	HP	CFM	Wt.	Item	
16"	1/12	2925	19 lb.	365a	$24.95
18"	1/10	3600	27 lb.	365b	$29.95
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SHUTTERS—open automatically, 16", wt. 10 lb. $9.00; 18", wt. 12 lb., $10.25; 20" wt. 14 lb. $11.25. **THERMOSTATS:** BAIRN type (range 40°-80°) Wt. 2 lb. $6.95; ATTIC type (50°-90°) Wt. 2 lb..... **$11.95**

52 pc. SOCKET SET

Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all unconditionally guaranteed against breakage. A beautiful set of tools that will handle any job; in a big doghouse steel box, Wt. 17 lbs. (Item 205) List price $62.90. Factory special.. **$27.50**

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GIANT 2000-2500 WATT PLANT

(Item 31)

110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting **Briggs or 6 HP** Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**

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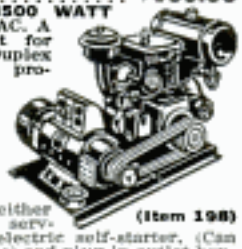
Generator only and control box..... **$169.50**

POWER-FLO 3000-3500 WATT



(Item 198)

115-230 v. 60 cyc. AC. A rugged power plant for heavy duty use. Duplex power distribution provides both 115 v. and 230 v. output at the same time if desired. Powered by a big 8 HP Wisconsin engine with triple V belt drive. Has built-in overload protection. A dependable plant for either standby or regular service. Equipped with electric self-starter. (Can also be started by rope) and plug-in outlet box. (Item 198) Wt. 310 lbs. Factory price..... **$399.50**

GENERATOR ONLY belt driven.... **$239.50**

MASTER AIR COMPRESSOR

Tank Tested up to 500 lbs. per sq. in.

COMPARE! This is the only compressor built with a **NO RUST** stainless steel tank. **Safe up to 500 lbs.** (Item 209) High pressure type for large volume of air for **heavy** duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. Low factory prices. With ½ HP., 110 v. AC motor. Reg. $175. (Item 209p)..... **$109.50**

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Pressure Gauge, range 0-160 lbs. ¼" pipe thread connection **2" face**.. **$1.50**

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SPECIAL . . . All four above..... **$8.95**

Pressure Switch for pumps and compressors, 0-85 lbs., **$5.95;** 0-150 lbs. with unloader (3 HP), **$10.95;** 0-200 lbs. (5 HP), **$12.95**

COMBINATION TYPE SPRAY GUN (Item 223) Precision made, converts in seconds from **internal mix** (for spraying heavy house or barn paints) to external **mix** (for spraying fast drying lacquers and synthetic enamels.) Conversion is made simple by changing nozzles and inserting an adaptor plug. Complete with 4 nozzles, including angle nozzles for spraying floors and ceilings. Wt. 4 lbs..... **$12.95**

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3 Gal. Tank with 10' air & paint hoses **$22.50**

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(Item 16a) Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire encased in a treated braid jacket. So tough that you can drive over it. Use indoors or out. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. Comb. 2-40 ft. & 1-20 ft. (Total 100 ft.) (Item 16a)..... **$4.95**

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ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-454, 7530 Greenwood, Chicago.

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OPERATE Profitable mail order business. Write Bryant, 5237 N.E. 22, Portland, Oregon.

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MAKE Perfumed stationery. Profitable local, mailorder business. Sample free. Rienzi Press, 24-R North 7th, Newark 7, New Jersey.

UNCLE Sam tells how to establish your business. 35¢. A-B Enterprises, Dept. P4, 9814 McMillan Ave., Silver Spring, Maryland.

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WANTED! Home producers, by manufacturers in our clearing house service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates, Dept. 4-PM, East Boston 28, Mass.

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EARN $2.00 Hour! I do—Making sandals. Young's, 1308-PM, South First, Arcadia, California.

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IMPROVED Second printing, "Spectacular Chemical Experiments" manual. Not mimeographs. Contains complete formulas, set-ups, instructions on thermits, fulminates, acetylides, explosive powders, etc. Interesting and thorough. Only $1.00 postpaid. Chemi-Technix Laboratories, 568C3 Riley, Buffalo 8, New York.

DO Your own analysis and chemical apparations. Laboratory analytical ion exchange column. Apparatus complete with cation, anion resins, instructions, $4. Rainaway Chemical Company, 800 Delaware, Berkeley, California.

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

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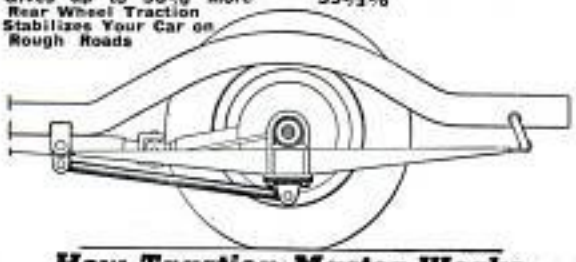

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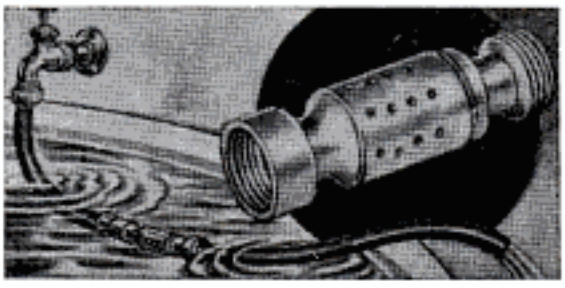

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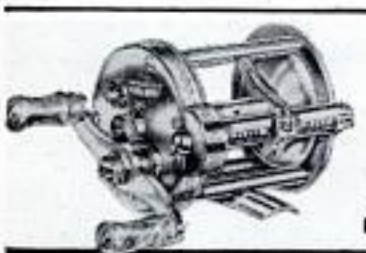

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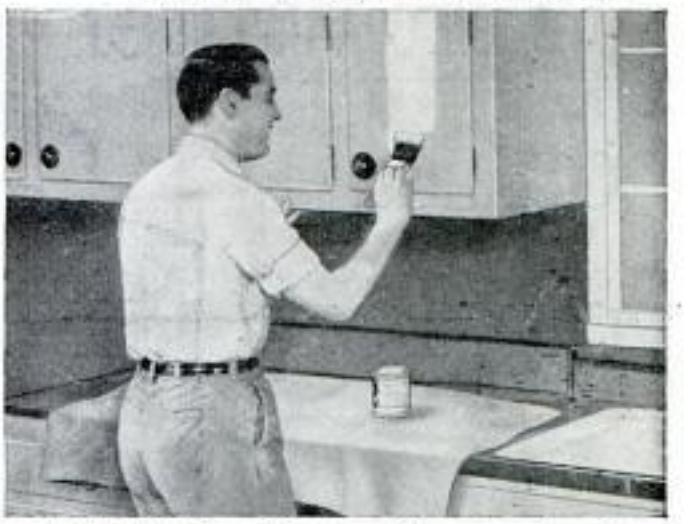

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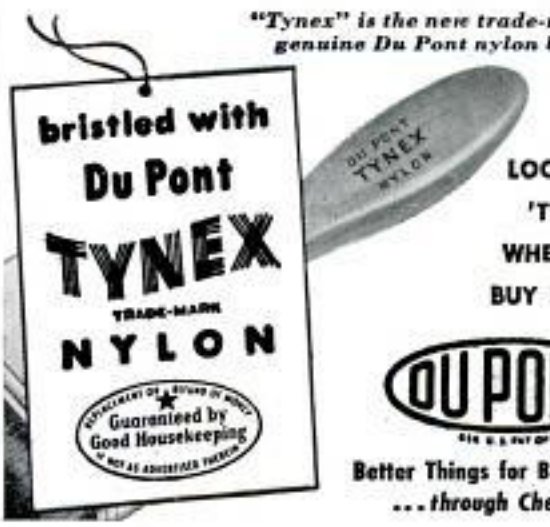

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POPULAR MECHANICS
APRIL 1954
WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 101 NO. 4

With the amateur—but serious—rocketeers out on the Mojave Desert, it's

FOURTH OF JULY THE YEAR AROUND

By Shep Shepherd

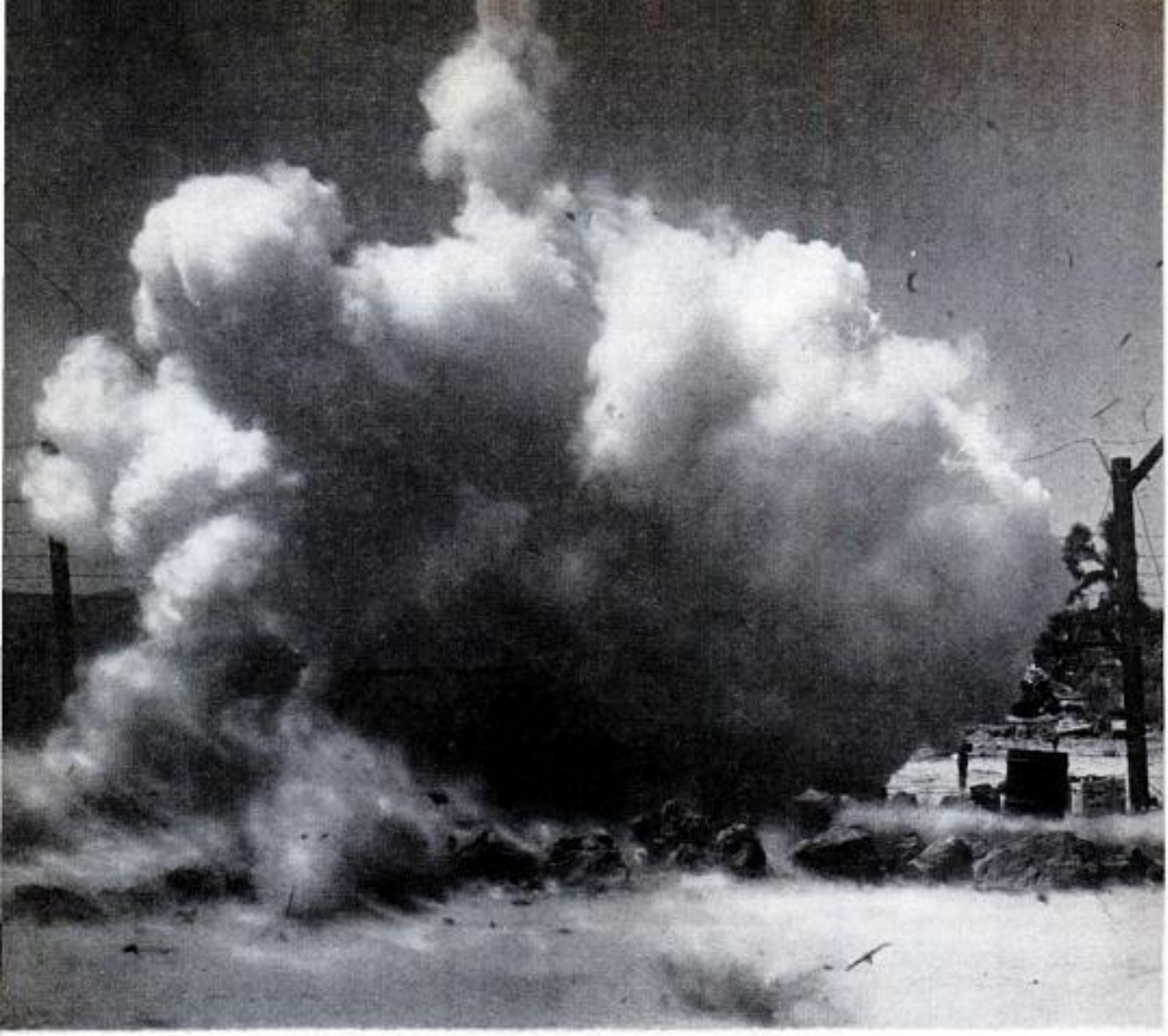
WHEN MAN finally ventures into actual space travel his first step will be "Space Station No. 1." The building of that space station isn't as far in the future as many of us believe. What's more, many of the problems of working and living in space have already been solved!

To most of us the idea of man venturing into space is something for distant generations to cope with. However, there are groups in Southern California that are keeping pace with the scientific minds of today who probe beyond the stratosphere.

The Pacific Rocket Society, with headquarters at 428 South Verdugo Road, Glendale, Calif., is made up of people from the ordinary walks of life: Doctors, merchants, mechanics, housewives, stenographers and the like. There is a goodly smattering among them of technicians in the field of aeronautics, people employed by the aircraft and instrument companies.

The PRS builds small, functional rockets, but they are not model-building hobbyists. The rockets they build may not travel as high as the Vikings, but they will travel as fast and as accurately. The purpose of the society is to "promote study and active research and to disseminate information in the fields of rocketry

Members of Reaction Research Society fired this 12-foot, two-stage rocket over the Mojave Desert



Not all tests are successful. Here a rocket is exploding because "throat" in a vital valve was too small

and space travel." They design and build rockets, fly them and study the results, to see if they performed as expected and if not, why not. And then they build another rocket that will outperform the previous one, solve new problems and test new theories.

The men and women who are the PRS know what's going on in the field of aeronautics every minute. Monthly meetings are usually addressed by such leading authorities as Dr. Walter Riedel, well-known German scientist now with North American Aviation, Gerald Heard, author of the book *Are Other Worlds Watching?*, Dr. Heinz Haber, author of *Man in Space,* and many other leaders in the field.

When the first flight to the moon becomes a reality there will have been no mystery in its accomplishment for members of the PRS. Man has the knowledge, ability and materials today to build a space ship capable of reaching the moon and returning. There are but two obstacles in the path of such a flight. The first is the tremendous amount of money needed to build the ship. The second is man's inability to withstand the rigors of space travel. We can build ships that will go through space but we haven't yet found how to keep the crews alive. Considerable attention and effort are being devoted to this particular problem by every agency concerned with space travel, including such layman groups as PRS.

Though they keep abreast of developments in all the kindred branches such as space medicine and the human body in space, the chief interest of PRS is building and firing rockets.

Out in the Mojave Desert, a hundred miles from Los Angeles and near the town of Mojave, there is a fenced-in area of an acre or so containing a Quonset hut, two barrackslike buildings, a blockhouse and several launching towers. This is the Mojave Test Area of the PRS. Here they go to test new fuels, telemetering equipment, altitude-recording devices, radar-tracking systems and new ignition systems. They also make static tests and conduct actual firings.

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Long before the firing takes place, the project has been born in panel discussion. The rocket is first designed, then its construction planned. Various members are assigned portions of the work which is carried out in scores of private garages, basements and workrooms. The building may require several months as was the case with the latest PRS project, the XDF-23 rocket.

This rocket is a liquid-solid type, using liquid oxygen and rubber as fuel. The XDF identification puzzles many who come in contact with PRS, including some of their newer members. It comes from their first rocket which used wood in conjunction with liquid oxygen as fuel. The X indicates experimental and the DF stands for Douglas Fir, which was the wood used. The number 23 following the initials indicates the present rocket's place in evolution of the PRS series.

Following the first liquid-oxygen-wood engines, the society experimented with other solids combined with liquid oxygen. Among them were cotton and paraffin. The present solid component is a commercial rubber known as Thiokol. Some younger members of the group are testing a new fuel using liquid oxygen and commercially sold fireplace logs.

The XDF-23 is four inches in diameter and six feet long. The rubber is cast in a hollow cylinder in the rocket's aluminum combustion chamber. The liquid oxygen is injected at 300 pounds p.s.i. pressure in the form of a spray entering through a center hole at one end of the chamber. Rubber burned under such conditions behaves something like high-powered smokeless-type gun powder, according to designer Jim Nuding, and produces great thrust and safe, stable performance. Fully loaded, the XDF-23 carries a small radio transmitter in the nose section, altitude recording and timing devices and a parachute recovery system with two chutes. The weight of the rocket is 18 pounds empty and 29 pounds loaded. It has a thrust of approximately 6000 pounds at take-off.

XDF-23 is a two-stage rocket, consisting of a primary stage and a booster. Proponents of space

Rigid safety rules are enforced at the trials. Spectators are shielded by stout barricades when the firing button is pressed

Doctors, mechanics and salesmen are among amateur rocketeers. A gun camera, above, records instrument readings during firings

Rockets are tracked by both radar and visual methods. If the atmosphere is clear their flight can be followed by telescope

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Weighing 29 pounds loaded, the Pacific society's XDF-23 uses a commercial rubber combined with liquid oxygen as its fuel. In a static test of this new fuel, below, the rocket is bolted down and the thrust of its fuel measured by a strain gauge

travel agree that the first rocket to reach outer space will be a multi-stage type, with only the final or primary stage reaching its objective, the other stages falling away in flight. The second stage, or booster, of the XDF-23 is 4½ feet long by 2½ inches in diameter, weighs 10 pounds empty, 20 pounds full and uses a micrograin fuel as a propellant. The micrograin fuel is a type developed for use in military rockets.

The booster develops approximately 500 pounds of thrust for $^{9}/_{10}$ second. Its function is to get the primary stage out of the launching tower and up to flying speed quickly enough that it will continue on its way in straight, vertical flight under its own power. The booster has its own parachute which is pulled from its socket by the primary stage as the booster falls away.

Out at the test area an actual firing is carried out under the supervision of several members, working as a team. Each official is identified by the color of his safety helmet and arm band. There is a test-area coordinator, test director, six members of a firing crew, safety police and an information officer. The firings are open to the public, the latest one drawing 125 spectators without a word of publicity or advertising.

The booster is placed in position first in the launching stand. The rocket is then lowered into position, resting on the booster. The ignition system is hooked up and tested. At this point the green flag flying over the blockhouse is pulled down and a yellow flag is hoisted, indicating that the testing of the circuits has been completed and loading the rocket with liquid oxygen is about to begin. Everyone but the firing crew and official photographers retires to places of safety behind the blockhouse or other solid objects.

The tank of liquid oxygen is raised to a platform alongside the launching tower, connected to the rocket, the valve is opened and liquid oxygen flows into the chamber. The loading requires about 10 minutes, after which a red flag replaces the yellow one, indicating that pressure is starting to build up. The nose section is bolted on and the igniter wires connected.

Inside blockhouse, a cameraman waits for man at right to press firing button after a 10-second count-down

The crew now retires to the blockhouse where the pressure gauge on the rocket is observed through a telescope. When the pressure reaches 300 pounds p.s.i., a 30-second warning is sounded. At 10 seconds a red flare is fired and the 10-second count-down begins. At the word "Fire," a button is pressed and the rocket and its booster take off in a burst of white smoke.

If every preparation has been carried out with the minutest precision the rocket will rise with a roar, the booster will fall away and float to earth on its parachute and the primary stage will continue on its way out of sight. It will reach an altitude of several miles and travel at supersonic speeds. A radar-tracking system will follow its flight. At its maximum altitude, the slender aluminum cylinder will turn nose down and start back to earth. At 5000 feet a barometric switch will explode a small charge of black powder to separate the nose section from the main body and release the two recovery chutes. A recovery crew in a Jeep will recover the rocket if possible.

The society plans to hold at least three public firings per year in the future. There are numerous problems aside from those concerned with actual firing. An example is determining and allowing for the effect of expansion and contraction when a vehicle is in a launching tower at ground level in 100-degree temperature one minute and perhaps 40,000 feet high, in a 40-degree-below atmosphere, the next.

There are other problems more mundane in nature but equally important to the over-all success of the project. Persons with any of the more ordinary talents are invited to join the society.

Between the drawing board and the launching tower, the building of a rocket will have need of the talents of people proficient in photography, engineering, radio, astronomy, chemistry, writing, painting, carpentry and many more of the mechanical crafts.

There are many men now living capable of building a space ship that could fly to the moon or Mars. When the human weaknesses have been overcome and the first space ship stands ready for the greatest of all adventures—the first flight into space—there will be no lack of volunteers for the voyage. They will come from knowledge-seeking groups like the PRS who have had a hand in the countless failures that will lead to the final success. ★ ★ ★

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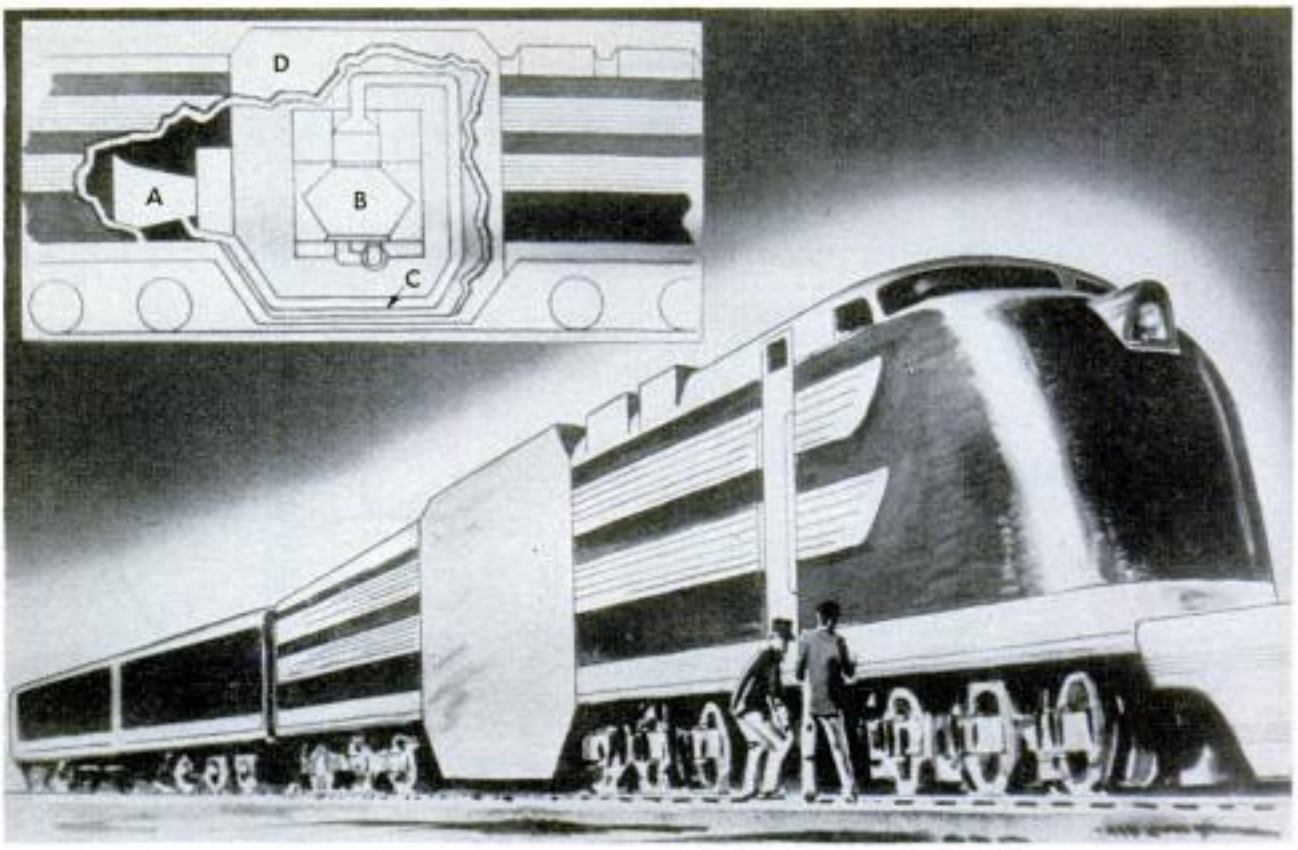

Atomic Locomotive May Produce 7000 Horsepower

Atomic locomotives can be built, and if the cost of their uranium fuel is not too high they can compete successfully with diesel power. These are the conclusions of Dr. Lyle B. Borst, nuclear scientist of the University of Utah, who has been supervising a study of atomic power for locomotives, sponsored by five railroads and nine manufacturing corporations. According to Borst, the uranium fuel would produce heat, which would produce steam, which in turn would produce electricity to provide the power. About a pound of uranium fuel would be added every few months. The locomotive would consist of two sections. The first would support a reactor only three feet long. The reactor would be housed in a steel block four feet thick and weighing 200 tons, which would protect the crew from radiation. The second section would carry huge radiators to get rid of the heat produced by the reactor. Borst estimates the locomotive would cost about $1,200,000 and would produce 7000 horsepower.

American Sports Car Has European Origin

American sports-car enthusiasts can now buy a "domestic" sports car that is European in everything except name. The car is the Arnolt-Bristol, being sold by the S. H. Arnolt Company of Warsaw, Ind. The Car Division of the Bristol Aeroplane Company builds the car in England. The body was designed by the Italian, Bertone of Turin. Weighing under 2000 pounds, the Arnolt-Bristol has a 96-inch wheelbase. Its engine develops 130 horsepower. The four-speed transmission has a free-wheeling first gear for ease of engagement. A one-shot lubrication system is built into the chassis. By pressing a foot pedal, the driver gives the entire chassis a grease job.

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"Atomic Battery" Converts Radioactivity Directly Into Electricity

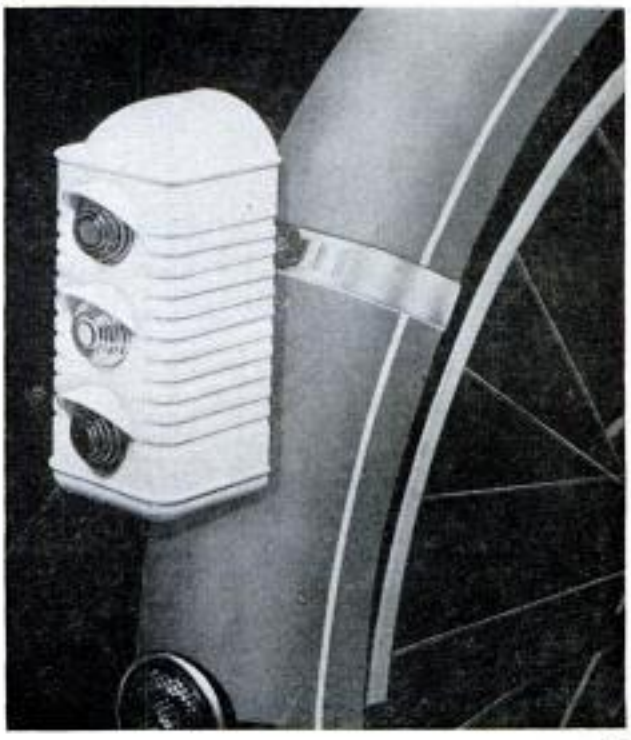
For the first time in history, atomic energy has been directly converted into small but usable quantities of electrical energy. An "atomic battery" developed by RCA makes the conversion. The battery contains a minute quantity of a radioactive isotope. This radioactive source is coupled to a tiny transistorlike wafer. The wafer releases about 200,000 electrons for each electron it receives from the radioactive source. Though the battery releases only a small amount of energy, it may be the forerunner of thimble-size atomic batteries which could power radio receivers and hearing aids for 20 years without further attention.

Paint Roller Prints Translucent Design on Newly Painted Walls

You can apply a textured pattern to a newly painted wall with a double roller that works like a simplified printing press. A fabric roller, of the type used for roller painting, is soaked with special paint. As it rolls, it "inks" a molded-plastic roller that imprints the design on the wall. The sparkling translucent paint unites with the base paint to produce an attractive, adhesive and washable surface. A quart of the paint and an hour's time are enough to decorate the average-size room, says the manufacturer. The design can be applied as soon as the base paint dries. Mistakes can be washed off with water in 15 minutes. A variety of patterns, colors and base paints make the number of possible designs practically unlimited.

Miniature Traffic Light on Bicycle Signals in Three Colors

Red, amber and green signals from a miniature traffic light mounted on the rear of a bicycle tell motorists behind what to expect. The green light flashes "go" while the bike is being pedaled. As soon as the cyclist begins coasting, the amber light signals "slow." Application of the brakes activates the red "stop" light. The battery-powered signal is quickly clamped to the rear fender, and is controlled by a switch on the rear-wheel sprocket. A battery case attaches to the bicycle frame.



"It Can't Happen to Me"

That's the universal philosophy regarding home fires. Yet an average of 1100 fires break out in homes in this country every day of the year. Without spending a penny you can do a good many things to safeguard your home, and other precautions cost only a few dollars. A feature next month surveys home fire-fighting equipment, including items you now have around the house

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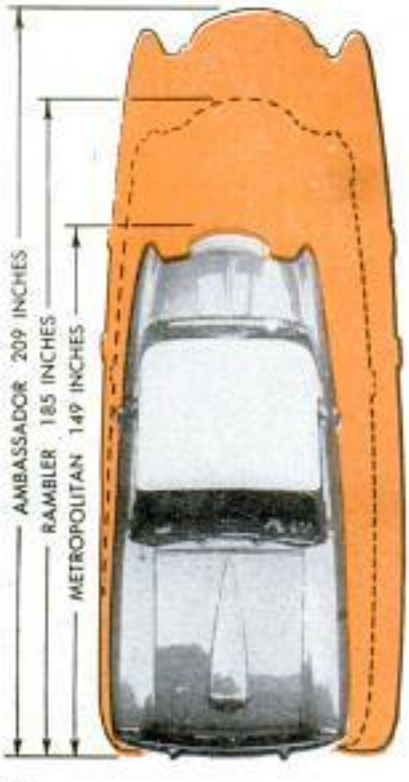
It's no trick—the small car fits neatly under outstretched arms. Below, comparative sizes of Nash cars



America's Smallest Car—the METROPOLITAN

By Arthur Railton

THERE'S A NEW BABY on Automobile Row. It weighs about 1800 pounds. The biggest thing about it is its name—the Metropolitan.

It is Nash's long-awaited two seater, the car that goes up to 40 miles on a gallon. You can put three in front but, as the saying goes, three's a crowd. A rear utility seat, fine for two youngsters, accommodates one adult for short rides only.

But then nobody is billing the Metropolitan as the family car of tomorrow—not even Nash. It is, at least for this country where cars seem to keep getting bigger and bigger ad infinitum, a new approach to the personal transportation problem.

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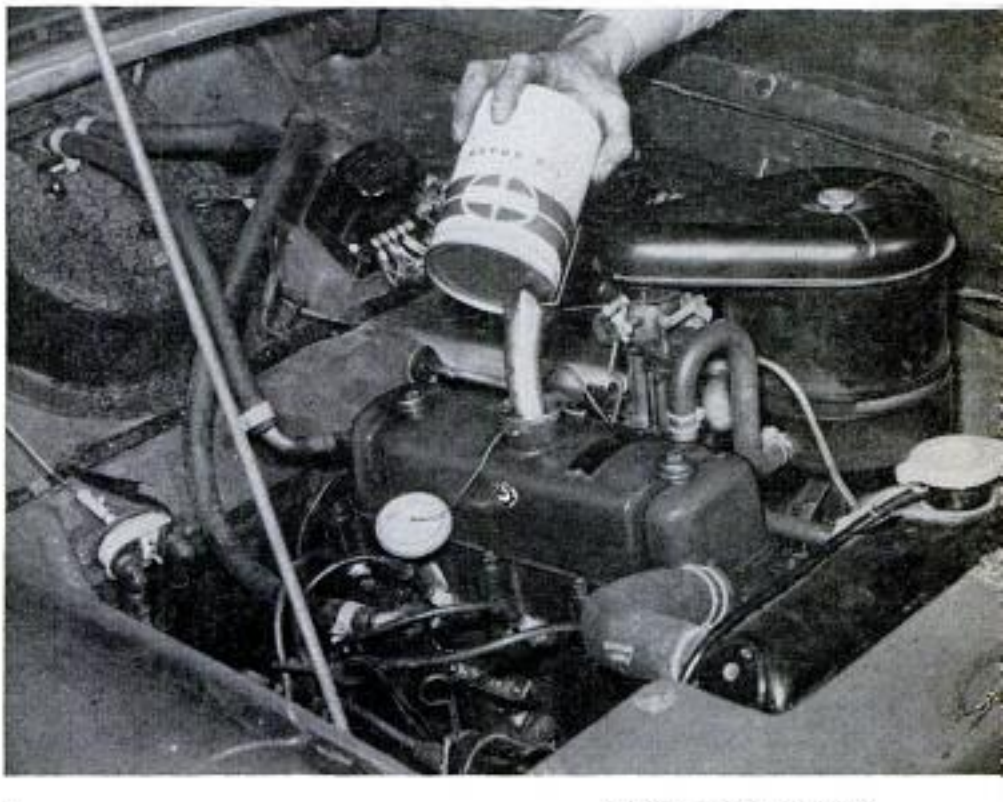
In a two-car family, it is perfect as the second car. It will suit the commuter who drives to the station daily; the housewife who uses the car to shop in or to take the kids to school; the businessman who drives a few miles to the office each day. Retired couples or those whose children now have children of their own will find such a car less tiring to drive, to park and to keep up. You can wash it without stretching an arm!

But Nash (even after a careful survey) hesitates to define the market for its new baby. They are, Nash says, just "feeling it out."

How small is the Metropolitan? It is just under 150 inches long from bumper to bumper. That makes it about four feet shorter than a Chevrolet, Ford or Plymouth; almost six feet shorter than such long cars as Chrysler and Cadillac. It is less than 55 inches high—three inches lower than the very, very low Studebaker hardtop. It is 62 inches wide, a foot narrower than most cars.

It is tiny, all right, tiny but not ridiculous. In fact, the universal comment seems to be that "it's as cute as a bug." The Farina

Hardtop Metropolitan is easily recognized as a Nash. Air scoop on hood is decorative only. Although it looks like one, it is not a sports car



Above, the four-cylinder engine is not much bigger than a quart can of oil! It's the overhead-valve Austin A40 engine

To change a tire, you slip the jack into a socket in frame, tilt the car so both wheels are off the ground. It can't roll

You won't believe it, but the boards standing upright fit inside the car with doors and windows all closed! Rear seat is hinged for access to the trunk. There is no outside lid. Boards are just under eight feet long

Above, the convertible model. Below, roomy for two, the front seat will take three with some squeezing

styling gives it proportions that belie its size.

Before you get the idea that the Metropolitan is too tiny to stand up in today's traffic, look at these records. One of them made a 24-hour endurance run (stopping only to refuel and change drivers) on the Raleigh (N. C.) Speedway and averaged 61 miles per hour. Another, on the same track, ran for 24 hours at 34.8 miles per hour, averaging 41 miles to the gallon. Neither of the cars had to have any oil added to their tiny engines (crankcase capacity: 4 quarts).

Two months prior to the Metropolitan's introduction, the writer drove one of the hardtop models for several weeks. During that period, hundreds of curious persons asked questions about the car (all identification markings had been removed or masked). You are probably asking similar ones now. Here are the most frequent questions, with answers based on present information and driving experience.

Who makes the car?

Initially, at least, the Metropolitan is being built in England to save Nash a $20,000,000 tooling cost that would boost the car's price beyond reason. The Austin Company assembles the car (the body is made by another British company). Nash designed the car and it is built to Nash specifications. Nash dealers sell and service it.

(Continued to page 260)

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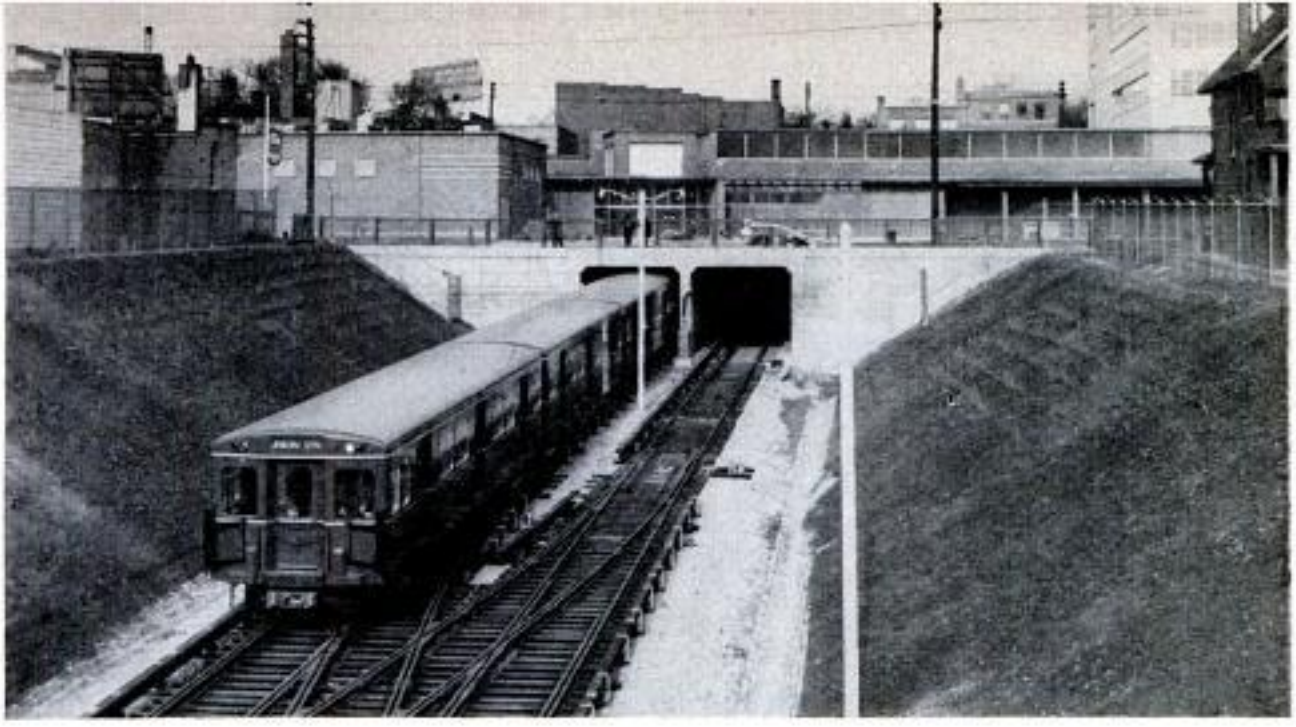
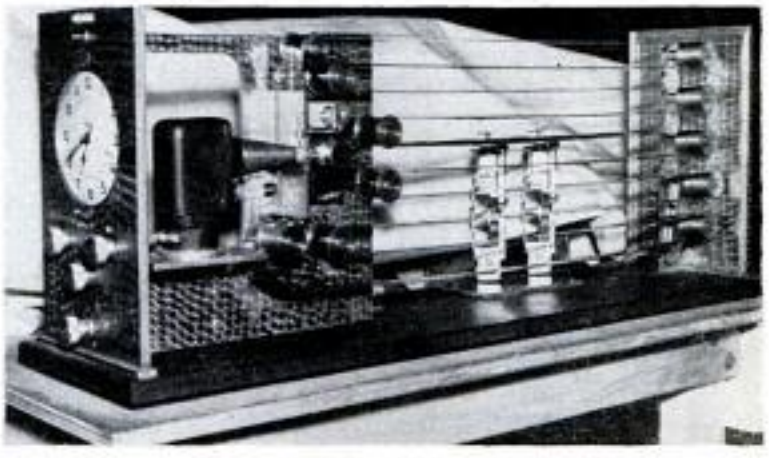


Canada's First Rapid-Transit Subway Trains give "Colorful" Ride



Rapid-transit trains now are running on Canada's first subway system, located in Toronto. About 1,000,000 people use the 4½-mile subway system daily. Each of the 12 stations has glass walls of a different color, so the rider can tell by color when he is approaching his destination. The subway trains are dispatched by a special clock which operates on a punched-tape system scanned by a photoelectric cell. The machine carries four tapes, each with a different punched timetable, allowing for rush-hour, normal daytime and nighttime operation. The subway was built by a new cut-and-cover method that minimized the disruption of above-surface traffic. One street block at a time was ripped up to a depth of six feet. A temporary bridge then was built across this area while the tunnel was constructed. Eventually the temporary structure was removed and the street rebuilt.

Powered Evaporation Cooler Keeps Car Comfortable in Hot Weather

Mounted on the hump in the front compartment, an automobile air cooler is installed in less than an hour. Water is recirculated through the cooler and is evaporated as it passes over a series of pads. This evaporation absorbs heat, cooling the air inside the car. A blower and pump are the only moving parts inside the cooler. A shaft, driven by the fan belt, comes through the fire wall of the car to drive them. Fresh air can be introduced into the car through the standard air vents. Speed of the blower is controlled by a variable switch on the dashboard. Adjustable legs enable the unit to straddle the front-floor hump.

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The OWNERS

Owners Say This About the '54 Hudson . . .

COMFORT

"It is easy to handle. You're at ease at all times at the wheel. Just like sitting in an overstuffed chair while riding in it."

Portland, Ore., tailor

STYLING

"Has good appearance. Could have the side-window area increased. I would like a lower silhouette."

Eggertsville, N.Y., manufacturer

ENGINE

"Motor noisy when idling or until it is warmed up."

Morristown, N.J. salesman

TRADE IN

"Trade-in value, while not as low as most seem to think, is definitely not as high as that of the Big Three."

Glenville, N.J. insurance man

SAFETY

"Step-down design gives extremely low center of gravity for road-hugging safety at all speeds. The car is beautifully streamlined too."

El Cajon, Calif., contractor

DEPENDABILITY

"I can drive it hard and fast and still get like-new performance when it has 70,000 to 80,000 miles on it."

Reno City, Nev., instructor

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REPORT on the '54 HUDSON

The true test of a car begins when the owner takes the wheel. *Popular Mechanics* asked 1000 Hudson owners from coast to coast about their cars. Here's what they say

By Floyd Clymer

SHOULD YOU BUY one of the "independent" makes of automobiles? Last year, the five independents (Hudson, Nash, Studebaker, Packard and Kaiser-Willys) lost ground. The Big Three (General Motors, Ford and Chrysler) increased their percentage of the total sales over 1952. A smaller percentage of buyers chose an independent make. Why?

To find out how owners feel about independents, *PM* asked 1000 Hudson owners to comment on their purchase of an independent as part of the Owners Report questionnaire. Most of them (96 percent, to be exact) previously owned one or more independent makes. Only 4 percent were buying independent for the first time.

"Independent dealers and manufacturers seem more interested in keeping you and your car happy."—Parma, Ohio, store owner.

"An independent has to build a superior product to compete." — Newcastle, Wyo., branch manager.

"This Hudson is my first independent. I got tired of being passed by Hudsons on my trips out West." — Hutchinson, Kans., broker.

"I can afford to drive any American make of car, but the big companies are not giving us the suspension they should. Power in a poorly designed chassis is unsafe. All cars need better brakes to go with these power increases." — Des Moines, Iowa, salesman.

The most frequent complaint about the independent car is its trade-in value.

"Trade-in value, while not as low as most seem to think, is definitely not as high as that of the Big Three."—Denville, N. J., insurance man.

"Poor trade in on other makes although good for another Hudson."—Louisville, Ky., minister.

"The main kick I have against a Hudson is they have no trade-in value on any kind of car except a Hudson and even they do not offer much more than anyone else. The parts (which you rarely have to buy) are very high."—Farmington, N. M., materials man.

All Hudson owners don't agree.

"I like the good trade in that I have received. On my last trade a Big Three dealer offered me more than Hudson."—DeWitt, Iowa, funeral director.

"People say they don't like Hudson because of their poor trade-in value, but I like them because they are less apt to have big breakdowns or serious trouble."—Garfield, N. J., grocer.

HUDSON RESTYLES . . . FRONT . . . AND REAR

Some owners say the broad, functional air scoop in the hood keeps engine from warming up in the winter

Rear fenders run straight back to large taillights. Slanted window gives poor rear vision, owners report

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Hudson owners in 29 states (in blue) told *PM* what they think about their new cars. A summary of their replies is printed on this page

Percentages from PM Poll of Hudson Owners

Handling

excellent	84%	92%
good	16%	8%
unsatisfactory	0%	0%

Structural rigidity

excellent	85%	92%
good	14%	7%
unsatisfactory	1%	1%

Acceleration from zero

excellent	45%	78%
good	51%	21%
unsatisfactory	4%	1%

Acceleration from 50 m.p.h.

excellent	56%	80%
good	37%	20%
unsatisfactory	7%	0%

OVER-ALL RATING OF THE HUDSON BY THE OWNERS

excellent	72%	80%
good	20%	17%
average	7%	2%
poor	1%	1%

ALL HUDSON OWNERS REPORTING

Previous Hudson owners 88%
Owners of 5 or more Hudsons previously 20%

Owners' rating of dealer service

excellent ..... 43% — average 19%
good ..... 25% — poor 13%

Would buy another Hudson?

yes 85%
might 12%
no 3%

Ratings on particular features

	Like	*Acceptable*	*Dislike*
Riding comfort	96%	4%	0%
Interior styling	85%	14%	1%
Visibility, forward	84%	14%	2%
Exterior styling	81%	17%	2%
Visibility, rear	69%	25%	6%

Owners' opinion of step-down design

excellent 66%
good 30%
poor 4%

Owners' opinion of flashing-light dash indicators

good 81%
fair 14%
poor 5%

Have owned an "independent" make before?

yes 94%
no 6%

HUDSON OWNERS BY MODELS

	Wasp, Super Wasp	*Hornet*
Average miles per gallon		
city	14.4	13.5
country	17.2	16.6
Oil consumption per 1000 miles		
No quarts	88%	92%
1 quart	10%	8%
More than 1 quart	2%	0%
Roadability		
excellent	90%	97%
good	9%	3%
unsatisfactory	1%	0%

BEST-LIKED FEATURES

Wasp and Super Wasp owners

Comfortable ride 51%
Handling ease 35%
Durability, dependability 25%
Roadability 23%

Hornet owners

Comfortable ride 40% — Performance 31%
Handling ease ... 40% — Safety 28%

MOST FREQUENT COMPLAINTS

Wasp and Super Wasp owners

Poor visibility (front and rear) 18%
Noisy engine 13%
Careless assembly 13%
Low trade-in value 12%
Poor gas economy 10%

Hornet owners

Poor visibility (front and rear) 11%
Paint and chrome failure 8%
Noisy engine 8%
Poor gas economy 7%
Body leaks (dust, air, water) 5%

Owners with no complaints at all

Wasp and Super Wasp owners 37%
Hornet owners 30%

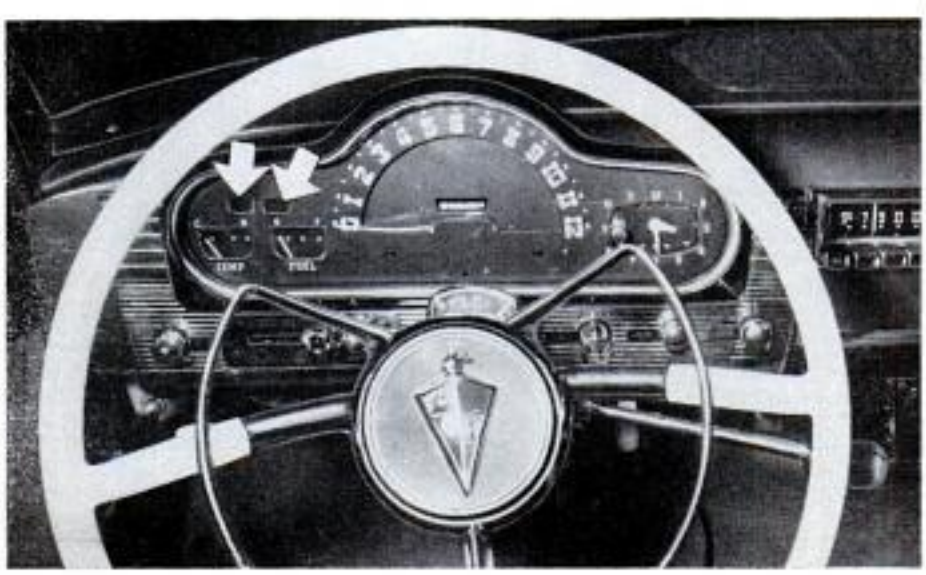
REASON THEY BOUGHT HUDSON

Wasp and Super Wasp owners

Previous owners 56%
Best trade-in 18%
Durability 9%
Styling 9%

Hornet owners

Previous owners 36%
Best trade-in 9%
Performance 8%
Safety 7%



Hudson was one of the first makes to replace the usual oil-pressure gauge and ammeter with flashing-light warnings. Most owners prefer the lights as they give an eye-catching warning of any trouble. Left arrow points to ammeter light, right to oil light. Entire instrument panel is redesigned for 1954

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"It costs me $300 a year to own my 1950 Hudson. Other cars in same price class have $700 depreciation first year."—Defiance, Ohio, farmer.

"If people who buy cars from habit would compare and drive a Hudson, there would be a lot more Hudsons sold." — Detroit, Mich., businessman.

Owners Like Hudson's Safety

Rarely in these polls do owners boast about safety. Usually, they mention styling, performance and comfort. But Hudson owners obviously believe they are driving the country's safest car.

"Hudson offers more safety features than any other car: Step-down design; Monobilt body and frame; lower center of gravity; all give you road-hugging safety."—El Paso, Texas, salesman.

"Triple-safe brakes should be compulsory on all cars. They can prevent an accident."—St. Petersburg, Fla., realtor.

(Hudson brakes are hydraulic, but there is a mechanical linkage under the hydraulic system so that you still have brakes even if your hydraulic-brake system fails.)

"I never drove a car that hugs the road like the Hudson. I cannot say enough for the way it handles on slick and icy roads." —Andover, Kans., aircraft worker.

"During a recent snowstorm when the roads were icy my car held the road beautifully."—Chicago, Ill., salesman.

"I like the step-down design. It makes me feel more safe."—Fairport, N. Y., realtor.

"I like the secure feeling of safety at all driving speeds." — Alexandria, Va., warehouse manager.

"The safety of the extra brakes. The step-down design whereby you sit within the frame."—Tampa, Fla., wholesaler.

"I have had two blowouts at these speeds (70-90 miles per hour) and the car holds the road."—Lansing, Ill., hammersmith.

"I never slow down for curves. No sway on curves."—Kenmore, N. Y., mechanic.

"I like the step-down idea. It gives a better ride because of the lower center of gravity, but it is a little awkward for passengers to get in and out."—Harper Woods, Mich., businessman.

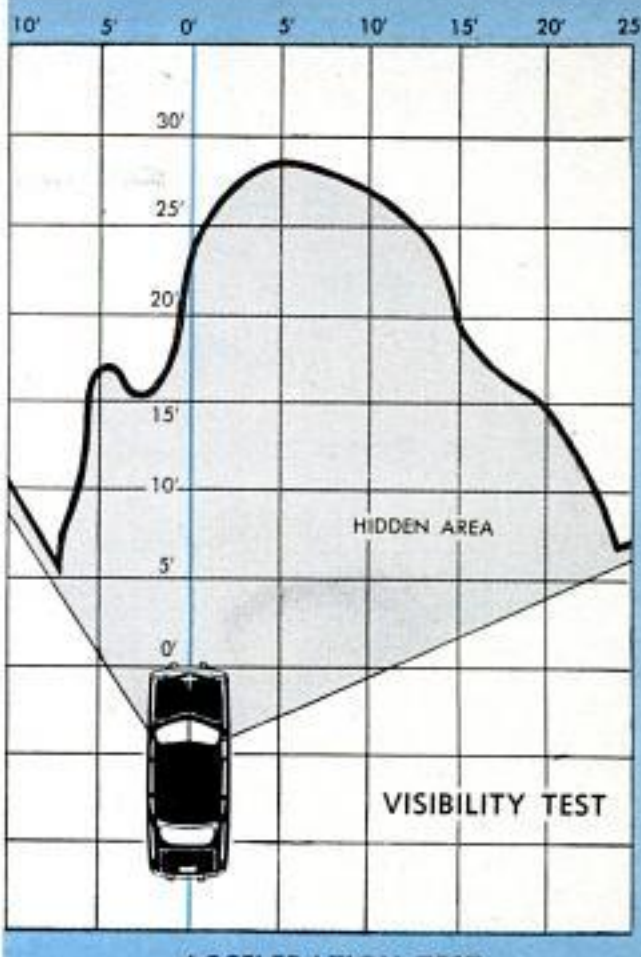
"Step-down design gives my friends trouble getting out — especially old people." — Westville, Ind., machinist.

"With step down it is too hard to clean the car."—New Orleans, La., electrician.

"A way should be figured out so that the front could be swept out."—Tacoma, Wash., Army officer.

Altogether only 4 percent of the owners rated the step-down design poor, while 66 percent said it was excellent. The remaining 30 percent described it as good.

(Continued to page 250)



ACCELERATION TEST

1954 HUDSON HORNET TWIN-H POWER with Borg Warner Automatic Transmission

¼ mile from zero	19.2 sec.	Drive range only
	18.3 sec.	Low and Drive
½ mile from zero	31.5 sec.	Drive range only
	30.8 sec.	Low and Drive
0 to 30 m.p.h.	4.2 sec.	Low only
0 to 60 m.p.h.	14.1 sec.	Drive range only
	13.6 sec.	Low and Drive

Top speed by speedometer.....110 - 112 m.p.h.
Actual top speed about 8% less (speedometer error)

ECONOMY TEST

MILES PER GALLON

Constant-Speed Mileage

At constant 30 m.p.h.	20.6 m.p.g.
At constant 50 m.p.h.	17.5 m.p.g.
At constant 60 m.p.h.	15.2 m.p.g.
At constant 75 m.p.h.	12.6 m.p.g.

Cross-Country Mileage

*Los Angeles to Phoenix	16.3 m.p.g.
*Phoenix to Las Vegas	16.2 m.p.g.
†Las Vegas to Los Angeles	17.1 m.p.g.

* Regular gasoline used
† Premium gasoline used

*

Frequently readers ask if they can participate in an Owners Report. Regretfully, we turn them down. The owners names we use are chosen at random by an independent organization. PM has no control over the selection. Such a survey, involving over a million miles of owner driving is, we think, the ideal test of a new car.

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Detroit Listening Post

By Leo Donovan

YOU STILL GET a porthole view through the widely heralded panoramic windshield when it snows or rains—and particularly in muddy weather.

What is advertised as the clear, wide view through the wrap-around windshield turns out to be an even wider blind spot when a passing car showers it with dirty water. Windshield wipers just haven't been designed or built yet that will overcome this hazard. Actually, under such conditions you see less than with the straight-glass windshield.

It's seemingly minor problems like that —or the rear-view mirror—that get the engineer down. He can, and does, turn out a complex job like an automobile transmission, but he's stymied by a corner post!

For years, engineers have sought the answer to the 180-degree rear-view mirror. Ed Cole, chief engineer for Chevrolet, says they are generally agreed that the best rear-view mirror will have to be outside the car. Perhaps a rear-view periscope?

Incidentally, there are whispers that the wrap-around windshields crack when the front end is jacked up. A similar rumor was current when curved windshields first came out. Strangely enough, nobody admits having seen one of them crack! Insurance companies deny that claims are any more frequent on wrap-around models. One reporter, trying to track down the truth, borrowed a Buick and jacked it up and down until he got tired, but no crack appeared.

Cheaper Power Steering?

Power steering has been coming down in price lately on many models, but a former car manufacturer in Detroit reportedly has a real simple, low-price unit it will try to sell to the major manufacturers. The hope is to market it before the carmakers combine power steering and automatic transmissions in a single package.

Auto executives, who used scrappage figures to predict a large new-car market this spring, were shocked to learn how wrong they were. They had predicted that the number of cars going off the road (failing to be re-registered) in 1953 would outnumber the 3,711,000 scrapped in 1951.

Instead, only 2,465,936 cars were scrapped!

Why the slump in junking cars? One answer comes from industry sources who say cars are more sturdily built and last longer.

But some of the dealers—particularly used-car dealers—claim it is a protest against high used-car prices. Many owners whose cars would normally be scrapped just had them repaired instead.

What's Coming in 1955?

At this early date, you get little firm information on the 1955 models, but there are the usual feed-bag predictions. Ford sources are saying that Chevrolet is going to make more changes than ever before. The changes include a new frame, similar in many construction features to Ford's frame, the River Rouge informants say. In case you think it strange to get information about Chevrolet via Ford, you're right, it is strange—but that's the way of the Motor Capital.

Both Plymouth and Chevrolet are expected to have new V8 engines and new bodies plus other styling and engineering advances. Ford, of course, has for several years had 1955 as the target year for a major body revision. Tool-and-die shop informants say schedules for change-overs will be earlier than ever.

Carmakers are relieved to learn that there will soon be a standardized size for license plates. The irritating problem of designing a recess or a bracket for as many as 20 different-size plates is one that should have been solved years ago.

A composite 1954 model car is 65 pounds heavier than the 1953 models and has a 16.7 higher horsepower to carry the over-all load.

Daytona Speed Records

Not exactly Detroit news, but of interest here are the results at NASCAR's Speed Week at Daytona Beach. Here are the winners of the strictly-stockcar flying mile with their average speeds:

Under 200-cubic-inch displacement
Nash Rambler—86.895 m.p.h.
200 to 249-cubic-inch displacement
Dodge V8—105.882 m.p.h.
250 to 299-cubic-inch displacement
Mercury—96.665 m.p.h.
Unlimited-displacement class
Chrysler New Yorker—117.065 m.p.h.

Also running through the traps at record speed was Packard's Panther Daytona, the plastic experimental convertible. It hit 131.1 miles per hour on one run, making it an unofficial record. The strictly-stock speeds are averages of two runs (one north and one south on the beach).

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Virtually free of trim, the Thunderbird has a high, straight fenderline. There is a large air scoop on the hood

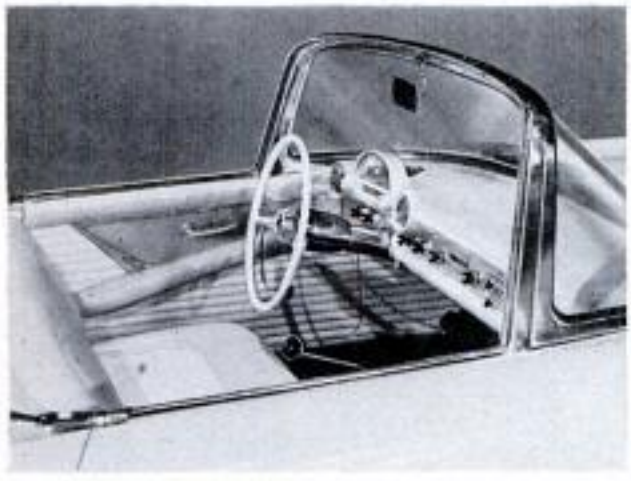
Ford's Sportster

THERE'S NOTHING NEW about the fact that Ford and Chevrolet are rivals —they've been fighting the good fight for years on two battlefields: passenger cars and trucks. But now the battle has spread to a new field—sports cars.

Late last year Chevrolet brought out its two-seater, the plastic-bodied Corvette (see *PM*, December 1953). Now Ford announces that it will begin production this fall of its own two-seater, the steel-bodied Thunderbird.

Ford powers its sports car with a modified overhead-valve Mercury V8 that develops 160 horsepower (Corvette's OHV 6: 150 hp.). The Ford sportster weighs 2837 pounds (Corvette: 2900 lb.). The Ford is 175½ inches over-all (Corvette: 167 in.). Wheelbases on both are the same: 102 inches. Both are 33 inches high at the doors.

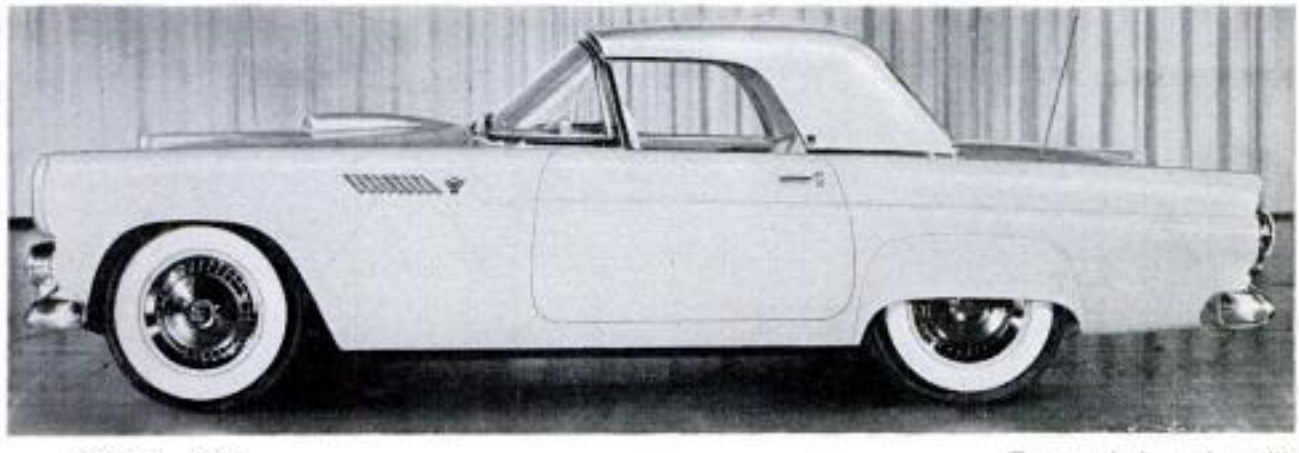
Price has not been released on the new Thunderbird. However, in light of the above, it is expected to be competitive with the Corvette which sells for about $3500.



It has wrap-around windshield. Steering post adjusts in and out to fit driver. The dash has a tachometer

Folding canvas top is provided. Extra-cost item is this snap-on plastic hardtop to "winterize" the car

Below, with hardtop in place. Diagonal strips on fender are decorative. Taillights are 8 inches in diameter



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I Flew with the Atom Bombers

By
Thomas E. Stimson, Jr.

Aircraft commander Lt. Col. Art Prichard, below, explains the preparation of the nose guns for combat to author Stimson

U.S. Air Force photo

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Stimson, left, is told the engines have enough power to run the transit system of a city the size of Fort Worth

WHAT IS IT LIKE to drop an H-bomb from the stratosphere?

A crack Air Force crew will find out soon, for a B-36 was scheduled to drop one of the bombs at Eniwetok this spring—perhaps while this article is still on the press.

Some people doubt that even a fast, high flying B-36 can escape the awful power of the thermonuclear explosion. They point out that the 1952 hydrogen bomb produced a blast equal to twice the tonnage of all the high explosives dropped by all Allied planes during the last war. They think an aircraft that releases a hydrogen bomb will be smashed in mid-air.

The Air Force is sure the plane can escape even though it takes a bad pounding when the shock wave overtakes it. Aside from that, there will be little difference between dropping the big one and one of the less powerful atom bombs. Our bomber crews have been rehearsing atomic warfare for years.

To show readers of *Popular Mechanics* what it's like to drop any of our nuclear weapons, the Air Force recently allowed me to fly an atomic-training mission on one of Strategic Air Command's giant B-36 intercontinental bombers.

We were to travel more than half way

If a bail-out is ordered, Stimson learns because of plane's speed he is to count to 30 before pulling ripcord

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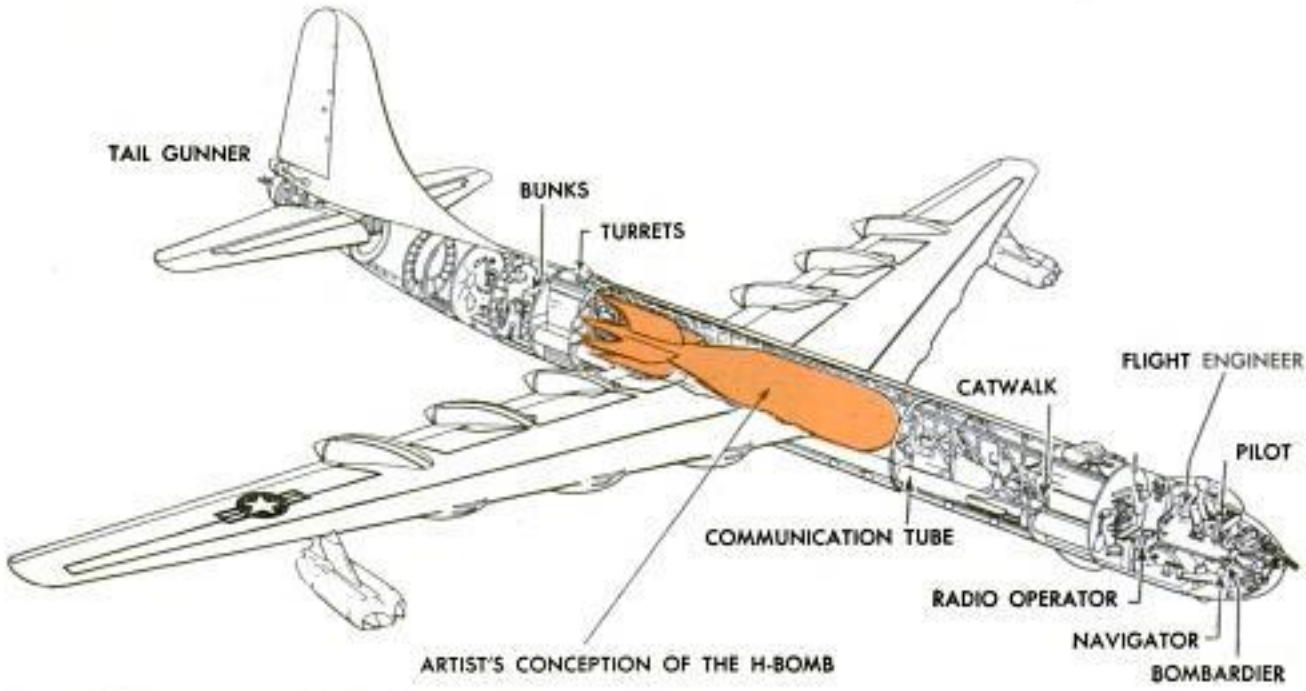

"Home" for 15-man crew during long missions, some lasting more than 36 hours. B-36s are 162 feet long and have a 230-foot span. They fly higher than 45,000 feet and well over 435 miles per hour. Below, loading 20-mm. shells for cannon in lower aft turret, under the fuselage. Operating in pairs, some cannon are in retractable turrets. Each of four bomb bays has capacity of a freight car

across the United States, drop a practice A-bomb from extreme high altitude, and return to base nonstop. The missile we were to drop has the size, shape and weight of one of our atomic weapons. When released from a plane it falls in the same trajectory as does a live bomb.

On the mission we would use all the new techniques that have been developed for high-altitude atomic bombing. We would observe radiological precautions exactly as if we were dropping a live weapon. Dense goggles would be worn by crew members during the drop to save their eyes from the intense flash that would occur if our practice bomb had a plutonium load.

At Biggs Air Force Base, El Paso, Tex., home of the Strategic Air Command's 95th Bomb Wing, I shook hands with Lt. Col. Art Prichard, aircraft commander, and the other 14 crew members of the B-36 that would carry the bomb. And I had my first close-up look at the huge 10-engine aircraft that had been designed especially as a nuclear-weapon carrier.

You could call the Convair B-36 an aerial battleship for that's just about what it is. Its engines develop enough power to run the transit system of a city the size of Fort Worth. The fuel tanks in its 230-foot wing hold enough gasoline to drive a car 16 or more times around the

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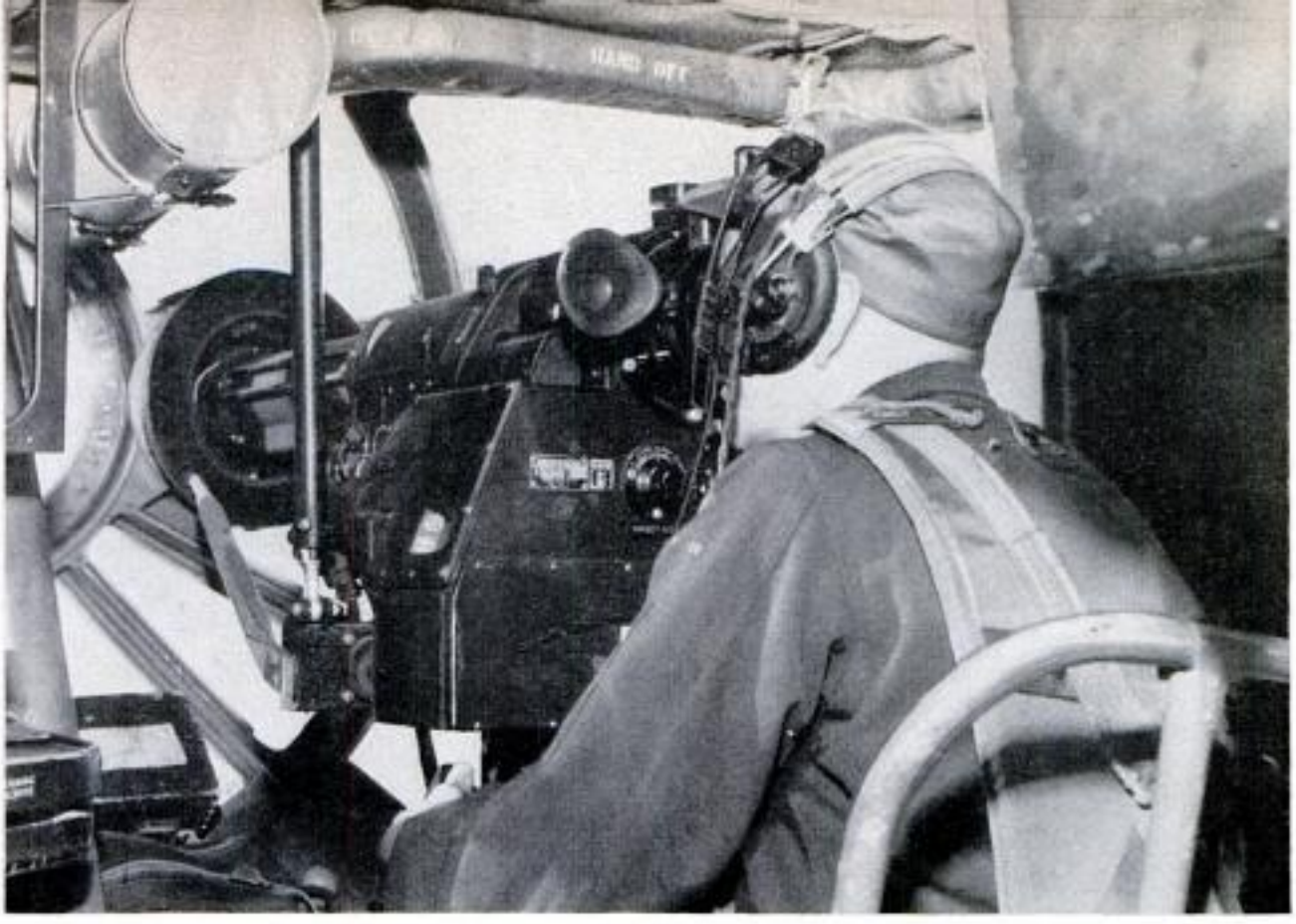

Second navigator operating a nose gun. Atom-bomb crew members have to be versatile, doubling in several jobs

world. Each of its four bomb bays has the capacity of a freight car and for defense it is armed with pairs of 20-mm. machine cannon, some of them mounted in retractable turrets.

I got an idea of what the mission would be like at the briefing on the day before. ". . . Take-off time will be 0200 hours (The military uses a 24-hour clock. This would be 2:00 a.m., civilian time) . . . Cruising altitude will be 25,000 feet . . . At 0800 hours you will encounter jet fighters that will simulate combat . . . climb to maximum altitude on approach to bombing range . . . Weather in target area will be an undercast at 5,000 feet, with thunderheads rising to 30,000 feet . . . Upon releasing bomb, proceed to gunnery range and fire live ammunition . . . Make simulated radar bomb drops on certain cities . . . ETA back at Biggs is 1930 hours."

This sounded like a special show, but Colonel Prichard assured me it was routine. SAC tries to make every training mission a complete rehearsal of what might be encountered in combat. Only thing unique about this flight, the aircraft commander said, was its short duration. Less than 20 hours in the air.

"On a mission last year," one of the gunners remarked, "we listened to the world-series opener one day on the radio and tuned in again the next day for the second game. And we didn't land until shortly before the start of the third game."

One of the reasons a B-36 can fly for thousands and thousands of miles and then return nonstop to its base is the "cruise control" techniques that its flight engineers use. They have engine analyzers that measure the richness of each carburetor and indicate the efficiency of each of the 336 spark plugs in the engines. Torque meters show the actual horsepower being delivered to each propeller shaft. The engineers use these and other instruments and slide rules and power charts to obtain the "most nautical miles per pound of fuel."

While the crew was lining up for inspection shortly after midnight Sgt. Glenn Morrow showed me how to hook the chute pack to my harness, connect my oxygen mask to the bail-out bottle, and the details of operating the Mae West and life raft I'd wear on the overwater portions of the flight.

"One thing," Morrow cautioned, "if we have to jump, don't count the usual 'one-two-three' before pulling the parachute release. Count to a full 30 instead. You'll be traveling better than 400 miles per hour when you leave the plane and you need half a minute to slow down to a safe opening speed.

"Don't worry about the ground. It will be miles below."

You don't just hop into the cockpit of a B-36, start the engines and taxi out for take-off. Careful preparation precedes every training flight of one of these monsters. There had been a two-hour preflight inspection by the whole crew the day before and now there was a final half-hour safety check before the six reciprocating engines were started.

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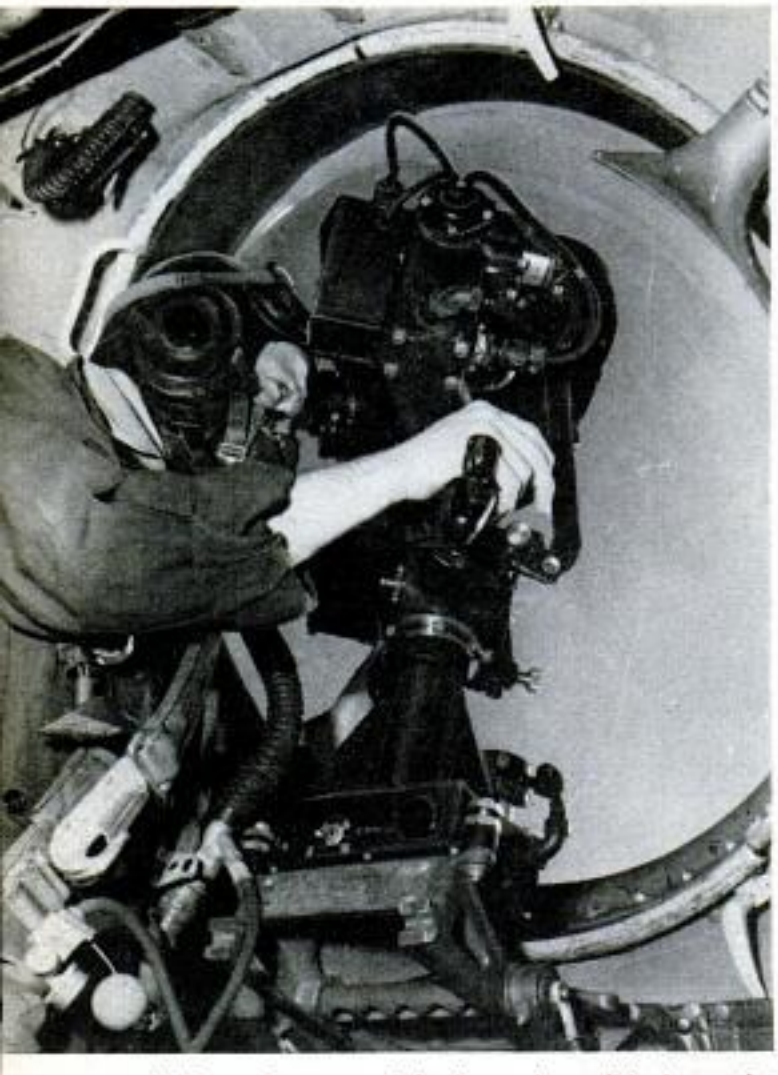

Wide nozzle, upper right, is an air-conditioning outlet that keeps window moisture-free. Below, amid control and dials, the engineer works with his slide rule

Getting these power plants going is quite an operation in itself, for the engineers can't see them from their post inside the plane. One of the ground crew plugs a phone cord into the fuselage and coaches the engineers.

"Number one engine is turning," he reports, "turning . . . turning . . . turning wet . . . running, running, running, running. It's yours. Number two engine . . ."

Two of the propellers were put in reverse, otherwise all that power would make us taxi across the ground too fast. Just before take-off they were restored to normal and the aircraft commander ignited the four jets that would give us extra boost during the climb away from the field.

After daylight the gunners pushed film packs into their gun cameras and began swinging the hemispherical sights that control the gun turrets. The jet fighters were due any minute and it was going to be a real "battle," using cameras instead of bullets.

"Two fighters coming in low at nine o'clock!"

That was on my side of the plane and I turned just fast enough to see the two jets hurtle past, right under the fuselage. The gunners tracked them until they were out of range.

"One coming in at six o'clock, high!"

"Fighter coming in at two o'clock, level!"

They were coming in all right, much too close for my peace of mind. And our own forward speed made each fighter appear to be sliding sideways as it approached. If one of those planes is out of control, I thought, it could take off a wing or smash our tail. I decided I'd feel a lot better if I couldn't see what was going on and I pulled off my headset and crawled down into the radio room. Radio Sergeant Wade and I were both celebrating our birthdays (he is a lot younger than I) and it was a lot more pleasant to talk to him than to watch those oncoming jets. I stayed right there until the fighters had made their last pass.

Climbing up past 40,000 feet for the approach to the bombing range, the gunners strapped themselves down to prevent being blown out of the aircraft in case a blister window let go, and the whole crew went on oxygen. The cabin pressure lets you move around without oxygen masks at lower altitudes but the system lags behind by the time the plane climbs eight or ten miles above sea level.

In theory, now, we were over enemy territory and the radio operator switched on the circuits that are intended to black out any ground radar-search apparatus that might be tracking us. The same apparatus

(Continued to page 264)

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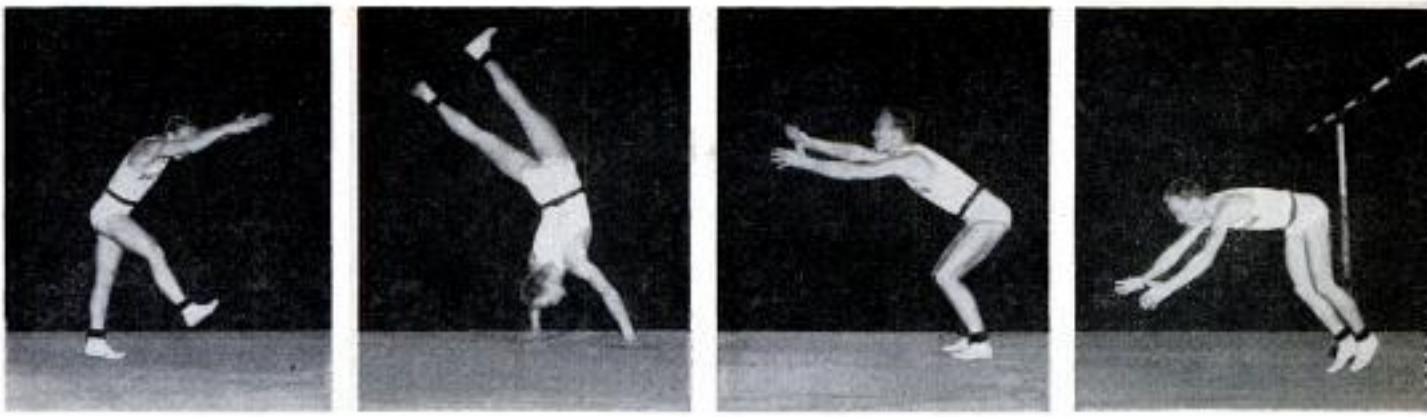
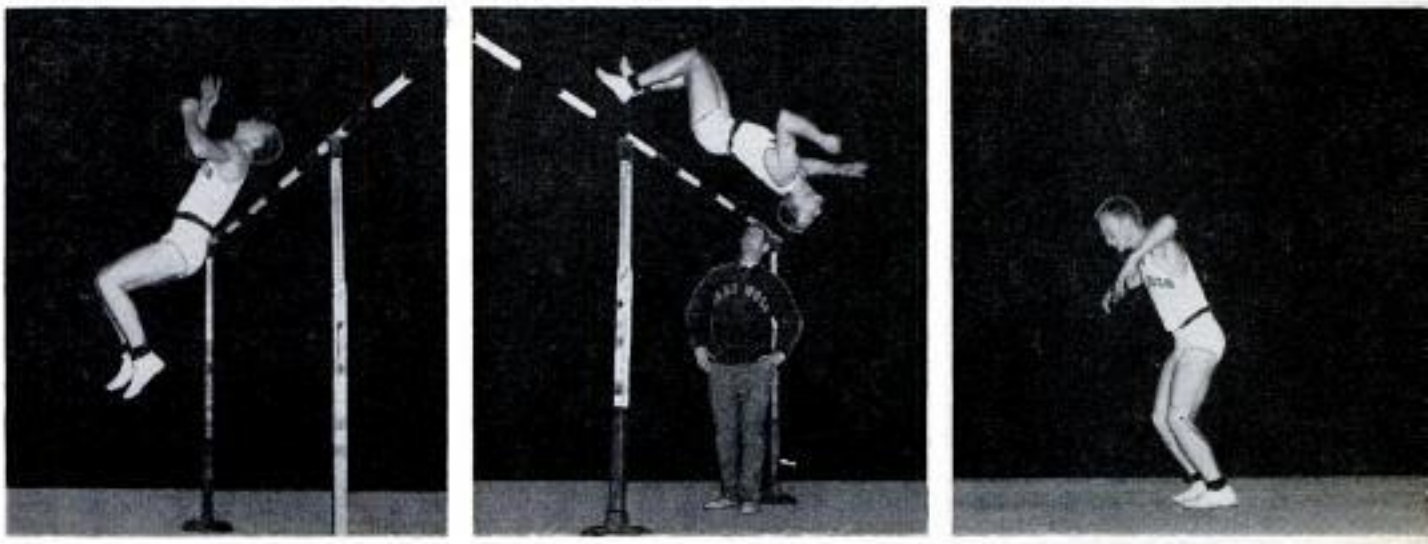


Starting with a running forward handspring, Browning does a round-off and then a fast double somersault



At climax of second somersault, he clears bar over head of Pond, who is teaching him a one-foot take-off

Tumbler May Try for World High-Jump Record

Tumbling to new heights may sound paradoxical, but that is exactly what Dickie Browning of the University of Illinois hopes to do. Browning, a gymnast, has been a national tumbling champion for three years and his coach, Charlie Pond, believes he can be trained to somersault to a new world's high-jump record. The present mark is 6 feet 11½ inches. Browning is only 5 feet 9 inches tall, but Pond says he has reached a height of eight feet many times at the top of his unique tumbling specialty. It starts with a running forward handspring, a round-off and finally, with terrific momentum built up, a backward double somersault. Browning is practicing taking off for the final phase on one foot, instead of two, so that he will conform with the international high-jumping rules. There is also some doubt as to a tumbling rather than a running approach.

Plymouth Boosts Power and Gets Fully Automatic Transmission

You can now buy a 1954 Plymouth with a fully automatic transmission and a larger, more powerful engine. In an unexpected mid-season change, the company adopted the Dodge 110-horsepower six to power cars equipped with PowerFlite, Chrysler Corporation's automatic transmission that is being offered for the first time by Plymouth. Hy-Drive, the "economy" semiautomatic transmission which requires limited use of the clutch, is still available. The PowerFlite unit has no clutch pedal. The cost of PowerFlite (an optional extra) is $175 plus tax, but there is no extra charge for the larger engine, it being standard with the new transmission. The new engine, long used by Dodge, is an in-line, L-head six with a horsepower rating of 110 at 3600 (regular Plymouth engine: 100 at 3600). Displacement is 230.2 cubic inches; compression ratio 7.25:1; and maximum torque 190, an increase of 13 pound feet.

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The WEIRD BIRDMEN of MEXICO

AN ANCIENT INDIAN RITE still performed in remote Mexican villages is the "dance of the flying pole." Six acrobatic Indians, dressed as birds, climb to the top of a tall pole where they perform individual dances and then tie ropes around their waists. In unison, they drop off into space with blood-curdling shrieks and glide in widening circles until they reach the ground. As they come down, they play birdlike tunes on fifes and accompany their glide with drum beats. The ceremony is believed to be connected with the Indian calendar. The performers are called *voladores* (flyers) and they are as popular as bullfighters in Mexico City or baseball players in the United States. ★ ★ ★

Whirling birdmen held by ropes tied around their waists have just leaped from the top of pole and are beginning descent as they play fifes. Below, craftsman puts finishing touch to top of pole which fits into hollowed "platform" (left) which turns

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Above, a moment after the leap birdmen are shown at ends of taut ropes. Right, crouched in framework around tiny platform atop pole, the performers wait for man to finish his dance. The coiled rope unwinds as top piece turns to lower the birdmen to the ground. They must all leap at same time as act depends on perfect balance. Below, closeup of performers dressed to ascend pole. Below right, the pole is circled with rope to facilitate climb which is made to special music that is part of the ancient Indian ceremony. The bird dance is banned in some villages due to injuries

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THIS SUMMER BEGINS OUR ALL-OUT WAR ON POLIO

By Richard F. Dempewolff

Magnified 77,000 times, the white bits are one of the three kinds of polio virus known to cause the disease

BEFORE JUNE FIRST, nearly 500,000 second-grade school children in 200 counties will troop through special, temporary clinics set up in elementary schools across the nation. Doctors, armed with hypodermic needles in disposable syringes will squirt a tiny "shot" of fluid in each passing arm. Every youngster gets three injections, the first two a week apart; the third, or "booster" shot, at least four weeks later.

If all goes as planned, those small fry, their parents, and eventually everyone may be able to quit worrying about man's most dreaded juvenile disease forever. For, if the brand-new vaccine works, that body-twisting, nerve-destroying paralyzer—polio—will have become another curiosity, like smallpox, in medicine's trophy room of whipped ills.

Last summer, as far as most people knew, something called gamma globulin was the big new gun in the war on polio. But scientists knew GG was only a stopgap. The unique blood protein is scarce, expensive and hard to extract ("Look What's Happening to Your Blood," *PM*, Feb. 1953). Its protection against the crippling virus lasts only about five weeks, and it must be given before the peak of an epidemic is reached to do the most good. So, at best, gamma globulin's antibodies could be used only as "shock troops" in epidemic regions where polio bugs were doing the most damage.

The real answer, medical men knew, would have to be vaccine—a solution containing dead viruses of the three types that cause the disease. Dead virus can't cause disease. But, when injected into a person, the blood doesn't know it from the real thing and is, in effect, frightened into building up armies of antibodies to fight the intruder. Once antibodies are made, they often stand by to protect their owner against any live virus that may drop around in the future.

Oddly enough, for all the years that lab wizards had been growing cultures of polio virus, no one had seen the "beast" or isolated it in anything like pure form. Then, last fall, everything happened at once.

Two separate scientific teams not only isolated different types of the culprit, but got a good, long look at it through electron microscopes. Magnified 77,000 times, the sinister white particles, about a millionth of an inch across, looked like fuzzy cotton balls on a black-top driveway. Virologist Alton Taylor of Parke, Davis & Company's Detroit labs, grew his "Brunhilde" strain (one of the three types of polio virus) on animal tissues in test tubes. He wouldn't tell how he isolated it. Drs. Howard Bachrach and Carleton Schwerdt, grew their particular "Lansing" strain in the nerve tissues of rats at the University of California. In a culture about 10 percent pure, they found two sizes of virus. To learn

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which was the villain, researchers separated the particles in an ultracentrifuge and injected the two products into different groups of rats. Those injected with the millionth-of-an-inch virus caught polio; the others didn't. Thus the exact culprit was identified.

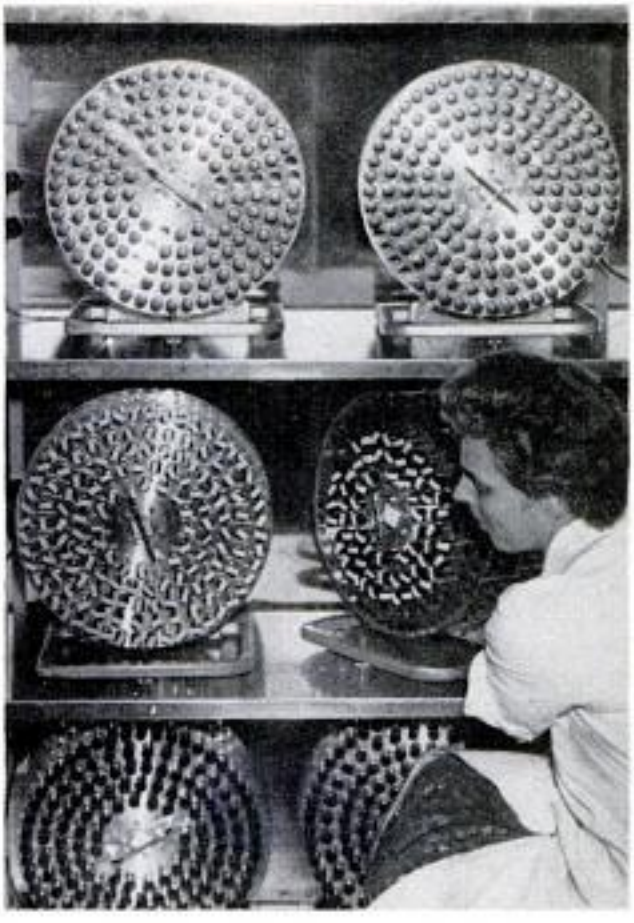
Meantime, in medical laboratories around the country, white-frocked technicians clustered over glass dishes and test tubes containing potent samples of three virus types known to cause polio in humans. From these cultures, researchers already have produced vaccines and tested them on rats, monkeys—and human volunteers. Killing the virus—vitally important, since any active specimens in the vaccine could produce the disease—is handled in different ways by different labs. Each considers its own system best.

In Chicago's Michael Reese Hospital, Dr. Albert Milzer kills his "critters" with ultraviolet rays which, he claims, does a thorough job "proven by critical safety tests, which included both repeated monkey and tissue inoculation." The Chicago team reports that its new vaccine produced antibodies against the three types of polio in most of 30 human volunteers, but that it "still has only a minimal ability to stimulate [these] antibodies."

The vaccine produced by Dr. Jonas Salk and his team at the University of Pittsburgh also consists of three known types of polio virus. The "bugs" are killed with formalin under special conditions, then prepared in a solution for inoculation. At first, the Pittsburgh team cautiously tested its potent brew on monkeys and rats, watching for the faintest signs of infectious activity. In the past year, a total of 700 human volunteers have offered themselves as guinea pigs, received the series of shots and submitted to tests. Result: New polio-fighting antibodies appeared in every bloodstream that got the vaccine—and there were no bad reactions.

Now, the National Foundation for Infantile Paralysis has decided to test Dr. Salk's product on a national scale, and thus remove any shadow of doubt. Starting this month or next, some 500,000 youngsters, with parents' consent, begin the series of shots, that will cost $7,500,000 from March of Dimes funds. It will be 1955 before full results of the big test are known. "It may be four or five years," one observer warns, "before polio inoculation is in the same class with smallpox shots—available for all youngsters."

Until then, polio will continue to paralyze breathing muscles and distort arms, legs and bodies. Early this year there were 66,000 patients from previous years still needing care. Of these, more than 1500 lie



Tubes containing both virus-inoculated tissue and watery solution are put in slowly revolving drums at body heat as preliminary step in making vaccine

clamped in iron lungs and similar breathing devices. Most are holdovers from 1953 and previous years. In 1954, as summer epidemics creep insidiously through communities, the Foundation knows that thousands more will be stricken. Only a few can be spared the pitiful ravages through the new vaccine, even if it proves effective.

What about the rest? Fewer than ever will be imprisoned in mechanical lungs for more than a year. Most will be out in a matter of days or weeks. At the big March-of-Dimes supported respiratory centers in Wellesley Hills, Mass., Buffalo, Houston, Ann Arbor, Omaha, Hondo, Calif., Chicago and New York, Foundation experts are working with a fantastic array of ingenious devices and techniques aimed at making victims able to live at home normally.

"One of our big jobs," explains a Foundation spokesman, "is to wean patients out of mechanical lungs. Many can breathe but don't know it. We call them 'iron-lung addicts.' I've seen attendants gradually cut power without saying anything, until a patient was breathing by himself, unaware. As soon as he was informed that he'd been doing his own breathing for ten minutes, he promptly began gasping and turned blue."

Many tricky machines are designed to coax patients back to their own breathing

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Overhead support for his arm allows a polio convalescent to do his own telephone dialing on a special rig on bed table

muscles sooner. At the Jefferson Davis center in Houston, a woman patient who had full use of both legs was confined to bed because she couldn't breathe alone. To solve the problem, one doctor and a technician built a "stand-up bed" that could be raised slowly to an upright position. The woman, wearing a chest respirator, could then walk off the bed and stroll around—toning her bed-weary muscles, jogging her circulation and boosting her confidence and morale. Today, stand-up beds geared to take up to a full hour to reach vertical position for extreme cases, are doing a yeoman job at several polio centers.

The Houston-center experts evolved an even trickier bed, which is proving a tremendous boon in weaning and transporting patients. The entire bed is slung on rockers —like an old-fashioned platform rocking chair—and teeters back and forth rhythmically. A bellows under the bed connects by air tubes to a compact chest respirator. As the bed rocks, it activates the respirator and "breathes" the patient. Eventually the patient learns that the teeter-totter principle alone will force air in and out of his lungs without the respirator attachment. Thus by practicing, he learns to breathe again. Besides all that, the constant motion of the bed relieves pressure and tension in the patient's body, stimulates circulation and gives therapeutic value.

To make things more pleasant, a North Carolina doctor is reported to be building a rocking chair that will work on the same principle, and will actually get the acute polio victim out of his bed for increasing lengths of time.

All these new gadgets are a far cry from the square, 1½-ton coffinlike box into which a 21-year-old Harvard student named Barret Hoyt was popped on Friday the 13th of September, 1929. Hoyt, in a pathetic state of polio paralysis, was given 30 minutes to live when his doctor remembered reading about a "breathing device" built by Dr. Philip Drinker of Harvard. In minutes, Drinker was contacted, the primitive "iron lung" was hauled out of a warehouse and the life of the first "respirator" patient known to the Foundation was saved. In a few hours Hoyt was sleeping peacefully. In four weeks he was breathing by himself, and he was home for Christmas.

Oddly enough, one of the most ingenious of the new polio machines—a sit-up respirator—was made by cutting down and rebuilding an obsolete "coffin-type" tank similar to the one that saved Hoyt's life. The device was conceived by Dr. James L. Whittenberger at Harvard's School of Public Health. In it, a patient looks as though he's in a steam bath with just his head sticking out. Instead of lying flat and staring at an upside-down world in a mirror he sits upright, surrounded by sloping tank walls, on a chair adjustable to his size. The

In this experimental iron lung, the patient can sit up in an adjustable chair and see things normally instead of upside-down in an overhead mirror

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machine functions like a standard iron lung. Pumps create a rhythmic partial vacuum in the tank, which expands the patient's chest and so pulls air into his lungs. If successful, the experimental sit-up "breather" may become standard at all polio centers.

Bathing iron-lung patients was always a tough problem for, in order to get at them, attendants had to open the tank and stop the breathing apparatus. Doctors at the Baltimore respirator center solved this one with a plastic dome that clamps to the end of the big lung and surrounds the head of the patient. When the big lung stops, the patient can be slid out with the tank end. Gusts of air are blown into the dome under pressure and forced into the patient's lungs. It's called a "positive-pressure dome," in contrast to the "negative," or vacuum-type action of other breathers. Even the new, small chest respirators, which permit patients to escape their iron prisons for extended periods, surround the rib cage and work on a vacuum principle.

Until recently, ordinary vacuum-cleaner units functioned as "coughers" or "sighers." Hitched to a respirator, they could create a sudden suction to exercise and increase expansion of paralyzed chests. At Wellesley Hills, Dr. B. G. Ferris now has a timing mechanism hitched to the big tank which automatically produces a "sigh" at stated intervals in a built-in "sigher."

In every polio center new stunts and ideas for speeding recovery are being tried. Patients at Hondo are learning to breathe like frogs. Since they can't depress their paralyzed diaphragm muscles, they are taught to push air into their lungs by swallowing it. The tongue acts as a sort of pump to shove rapid mouthfuls of air along. The stunt was invented by a couple of ingenious patients themselves. One became so good at it that he could stay out of his lung 14 hours at a clip. "Frog breathers" must, of course, go back in their iron tanks to sleep, but the new technique helps them through the weaning process and is being taught to polio victims in other centers by means of movies and slides.

Small gadgets and devices to

Recovery is speeded by slings and pulleys that hold feeble arms in position and help develop muscles to take over job

By turning her head against a cheek switch, this patient can "flip pages" of magazine rigged in scroll form in reading box

Using new stand-up bed plus a chest respirator, the patient can be hoisted to walk right off the bed

Slight seepage from portable "lung" makes it vital for convalescent to help breathe, speeding recovery

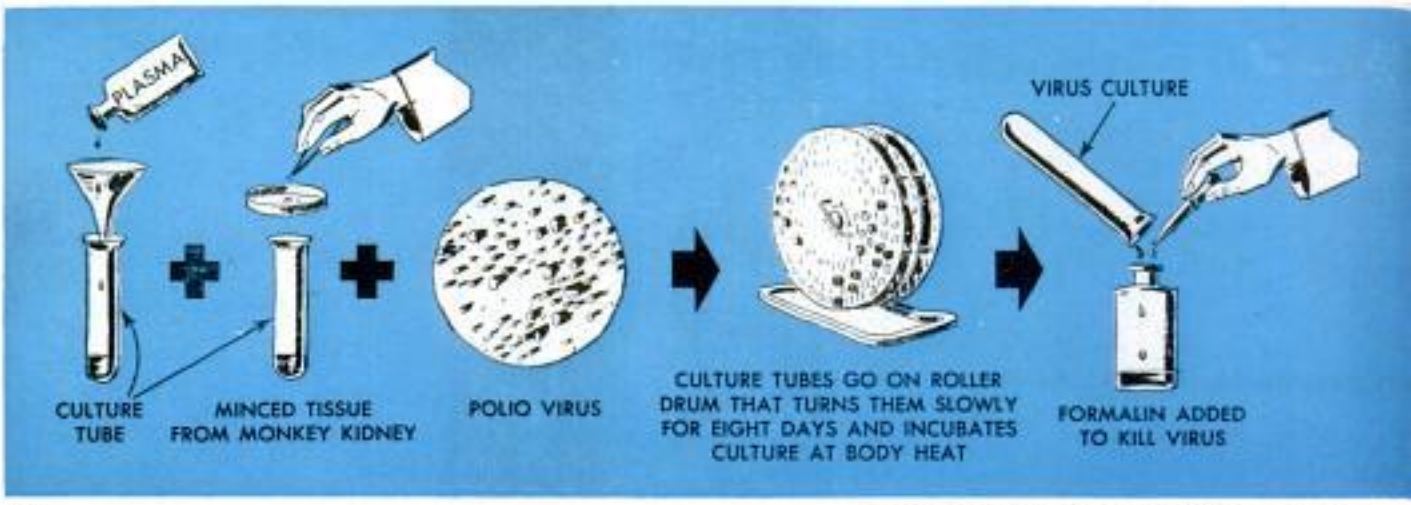
Tricky table exerciser has a crossbar footrest the patient tries to push on, strengthening leg muscles

help polio patients return to self-sufficiency and a useful life come in a bewildering profusion of new ideas and adaptations of old ones. At the Central Carolina Hospital in Greensboro, a young lady in a rocking bed has learned to write letters on an electric typewriter slung on a steel rack over her chest. Paralyzed from the neck down, she whacks the keys with a special rod held between her teeth, controlling the length of the rod by pushing a button in the mouthpiece with her tongue. Similar rods, ending in paintbrushes, charcoal, pastels or other pencils, are teaching many polio victims to paint, draw and write script with their teeth. Some show remarkable talent.

Other mouth-held gadgets permit patients a whole new range of activity. At New York State's Rehabilitation Hospital, youngsters can play cards with mouth-held pincers that close on a card when teeth are pressed, release the card when pressure is relaxed. With the help of arm slings and plastic turntables that look like transparent Lazy Susans, these children learn to wash and feed themselves and indulge in a growing list of play activities.

At Hondo, respirator patients read scroll-type versions of current magazines which they turn from "page" to "page" by tapping a cheek switch rigged beside the headrest. A new bed positioner developed in California permits a convalescent patient to sit himself up, lie down, raise his legs or head at the touch of a control dial.

Most respiratory centers gently prod patients to shift for themselves. At the University of Michigan Respiratory Center in Ann Arbor, men with paralyzed arms are dressed up, as soon as they're able, in a wild contraption of pulleys, ropes and slings. By manipulating controls on a motor, they can feed themselves, handle telephones and other everyday devices quite admirably. Similar slings allow the ladies to powder their faces and apply their own lipstick. Of 38 patients sent home from the Ann Arbor Center in the last two years, 36 have total-



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ly discarded their iron lungs. Most are able to fend for themselves in many ways.

In many cases, patients themselves show fantastic ingenuity in creating aids to help them live a nearly normal life. One of the Foundation's proudest examples is Kenneth Keyes, a 32-year-old Miami investment man. When polio hit him in 1946, he lost the use of both hands and an arm. By rigging special controls, he has since relearned to fly his own airplane. In his hopped-up speedboat, he built a special wheel studded with knobs so he can swing it around in the crook of his good left elbow. Last year he placed second in the 167-mile Gold Coast powerboat marathon.

Keyes has invented a motorized wheelchair that moves forward, backward or sideways under simple controls. He has also invented an electric bed which, at the touch of a button, can turn him on his stomach, put him in sitting or reclining position, prevent him from falling out, cool or warm him, provide light and any utility he may need. An adaptation of it which he calls the "turn-over bed" is patented and ready for marketing, to help other afflicted people.

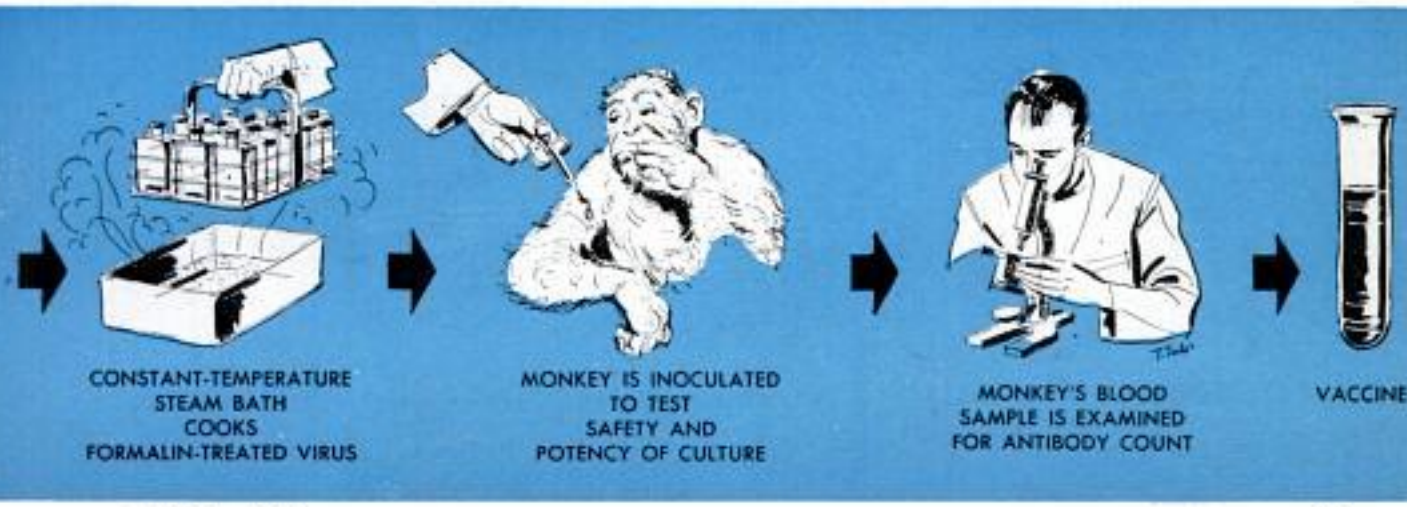
Until the day when vaccine actually does make polio a medical curiosity, the National Foundation plans all-out war in several directions. In a program that will pour some $75,000,000 into the fray next year, about $26,000,000 is for prevention work. The rest will help alleviate suffering, explore better and more effective treatments and equipment, aimed at getting the polio patient home and on his feet and lungs sooner.

Whether people one day will be made immune to polio, or be subjected to treatment that will prevent the disease from taking such dreadful toll, no one knows. But one thing is certain: relentless researchers are pushing their aggressive war against polio with new vigor on both fronts. And right now, the smart money is not on the "bugs." ★ ★ ★

During bath or massage, patient breathes from gusts of air pumped into plastic dome placed over his head

Slings, a telephone arm and a switching system on his dictaphone permit this polio sufferer to work

By pitching body weight fore and aft rhythmically, the rocking bed simulates artificial respiration



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Gasoline-Saving Midget Tractor Handles Many Jobs on Farm

Steep grades and small areas don't bother a compact German tractor which proves useful at almost any task. Light and easy to handle, it consumes little gasoline and is adapted to the needs of the small European farm. A mowing head which attaches to its front end cuts a broad swath of hay, grass, or small grain. Incorporating a pulley, it can be used to drive sprayers, circular saws and other agricultural machinery, and also serves as a plow or cultivator.

Current Stops Rust On Stored Ships

"Impressed current" is being used to prevent rust on ships in the "mothball fleet." The system turns the hull of a ship into a cathode plate. Graphite bars surround the ship below the water line and serve as anodes. Salt water around the vessel acts as an electrolyte to carry rust from the hull to the graphite bars.

Collapsible Hand Truck Eases Lifting and Moving of Furniture

Heavy furniture can be lifted and moved easily with a two-wheel collapsible hand truck which uses the leverage principle. The truck is pushed under the piece of furniture to the approximate midpoint. Then, when the handle is pushed down, the two wooden uprights rise and engage the underside of the article. Thirty pounds of pressure on the handle lifts 100 pounds. Further depression of the handle causes the article to be raised off the floor so it can be moved.

¶An estimated 173,000 miles of petroleum pipe lines are in operation in the United States.

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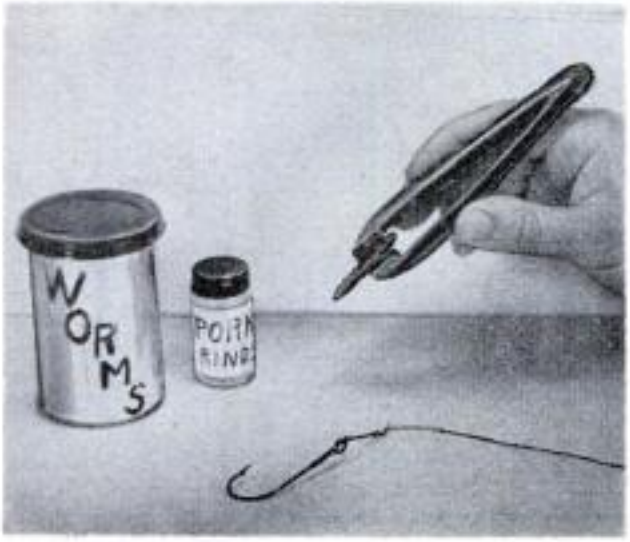
Slingshot With Sighting Ring Shoots Arrows or Pellets

Arrows or steel balls are shot from a metal slingshot designed for hunting and target practice. Steady aim is assured by a sighting ring and a balanced pistol grip. Powerful and accurate, it will kill foxes, coyotes and deer.

Padded Tongs for Fishermen Handle Bait Without Damage

Anglers can bait a fishhook in cold weather without removing their gloves, with a new pair of tongs. Built like huge tweezers, the tongs also permit fishermen's wives to bait their own hooks without handling the worms, minnows or pork rinds. The tongs have soft sponge-rubber pads which hold live bait securely without damaging it. The plastic tongs also can be used in the kitchen for handling food.

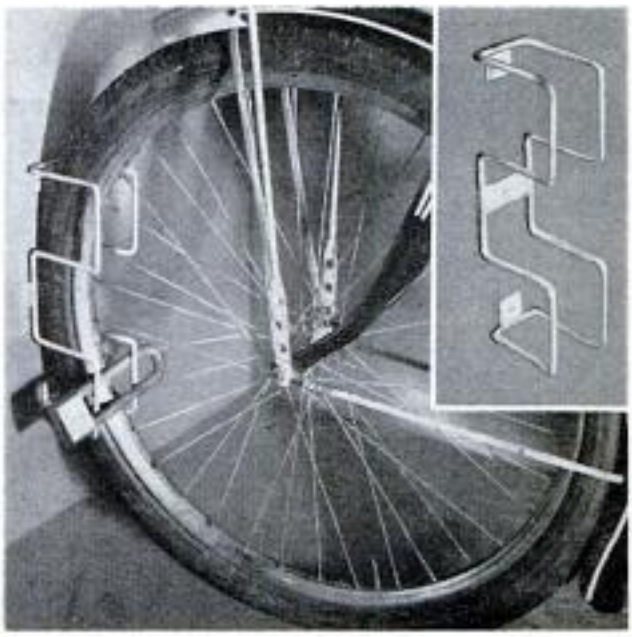


Shoulder Camera Holder Aids Photographer's Aim

Steady aim results from a camera holder that is braced against your shoulder. For still or motion pictures, large or small cameras, it permits you to shoot clear photographs of sports or scenery. A pistol grip on the bracket assures firm support.

Wire-Frame Wall Bracket Parks and Protects Bike

Bolted to the wall with three screws, a simple holder keeps a bicycle parked upright. It consists of a continuous length of heavy-gauge wire bent to shape and welded to rust-resistant metal plates. A padlock joining a pair of the clamps protects the bicycle against theft.



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Because of family's names—Loyola, Princeton, Harvard, Cornell—the bus was christened "collegiate caravan"

Bus Serves as Home For Family of Nine

WHAT WAS A 56-passenger school bus is now a year-round mobile home for the nine members of the Stanford Bardwell family. Within the 32-foot body, Bardwell built a galley compactly fitted with a butane stove and a refrigerator. Bunk seats and beds are combined with shelves to do double duty as tables. Fans circulate air and a one-kilowatt, gasoline-driven generator supplies electricity for heaters, wall outlets and an indirect-lighting system. In addition to the conventional folding door at the front, the Bardwell bus has a wide rear entrance reached by portable steps.

"Home was never like this!" Now, at the drop of a clutch, the Baton Rouge, La., family satisfies a constant yen for travel

It takes a lot of bedding to sleep the Bardwells. Children range in age from 9 months to 13 years

Water for shower baths, drinking, cooking and lavatory comes from a 100-gal. tank atop the mobile home

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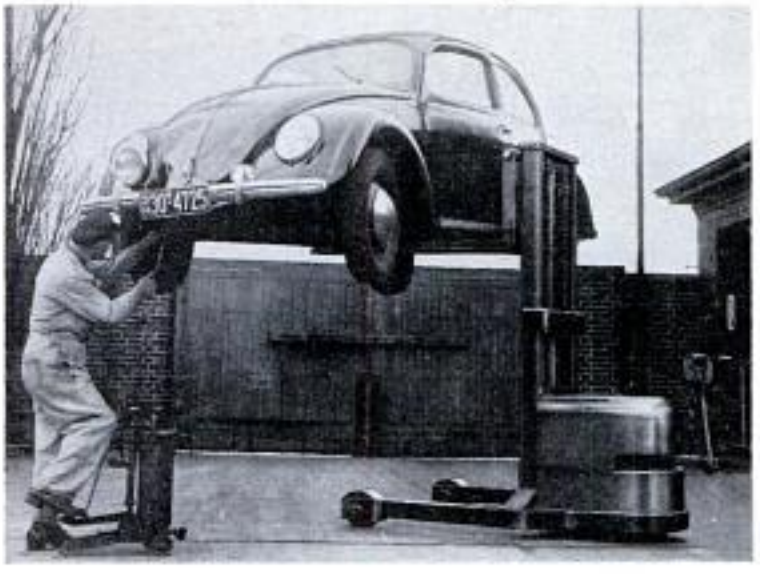
Caterpillar Introduces Highly Mobile Two-Yard Tractor Shovel

Two yards of material are scooped by each motion of a new Caterpillar shovel, the first highly mobile track-type equipment of its kind. The machine's dumping height is 10 feet 9 inches, with a reach of 3 feet 5 inches, insuring dumping of materials in the center of all standard hauling units. A bell crank striking the stop on the lift arm shakes out sticky contents. Control levers for both the lift arms and the bucket may be operated with one hand.

German Garagemen Use Hydraulic Lift Truck to Raise Car for Greasing



In Germany, mechanics wheel a car lift around, slide it under the vehicle and raise the car for repairs or lubrication anywhere, inside or outside. The lift device is simply an adaptation of the hydraulic lift truck. It will handle more than 4000 pounds.

Air Drives Power Saws

Power saws that run on compressed air have been developed in Germany for work in places forbidden to gasoline or electric motors. The one-man saws can be used safely in areas where engine sparks could trigger an explosion.

Wireless Piano Exhibited in Germany Contains Metal Sounding Bars

Metal bars replace wires in a piano displayed at the International Spring Fair in Frankfurt, Germany. The keyboard instrument has small hammers which strike metal bars made of a special alloy. Played the same as a standard piano, it sells for about $238.

Bananas are now being shipped from South America "canned on the stem" in a transparent-plastic film, arriving less dehydrated than those which are unprotected.

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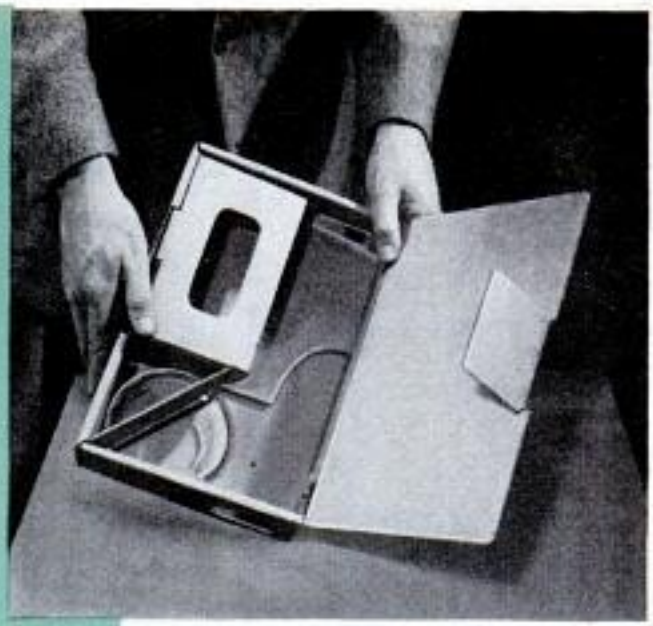
Folded flat, you can tote this music stand around under your arm. Fold out the sides and it's ready for use. Children can use it as a strong little desk



Rat trap, with hole only big enough for rodent, holds poison. Water in the bowl makes the poison act faster

Dallas Smith Corp.
3835 E. 21st St.
Indianapolis, Ind

Paperboard sofa and chair are fully upholstered, light in weight and strong enough to hold anyone

Handy disposable box has "ice bags" packed with cubes to cool a picnic lunch and beverages for four

Most of parts of this inexpensive seed sower and fertilizer spreader are made of paperboard

Copyrighted material

"Zipper" box opens as easily as a pack of cigarettes. Pull on a tab and the box is ripped neatly apart

Container for anything has a plastic liner. It will hold iced fish, live minnows, drinking water, diapers

It may turn up as a lounge chair or minnow bucket, an ice-box or building block. Anything can happen these days to

THAT VERSATILE STUFF

PAPERBOARD

By Clifford B. Hicks

TODAY YOU can buy everything from goldfish to refrigerators in that commonplace, disposable — and wonderful — stuff called paperboard.

For years you've been toting home the week's victuals in corrugated paperboard boxes. Now you'll find the stuff popping up in some startling new applications. It's used as the basic construction material in such oddly assorted products as desks, building blocks, fertilizer spreaders and fully upholstered sofas and easy chairs!

A product which turned up just recently is a fine example of paperboard's versatility. The product is simply a fibre box which will hold anything. Just anything. You buy it flat, in a 16 by 22-inch Manila envelope, and set it up at home. You then apply tape to the seams, slip a waterproof plastic liner into the box and you're ready for business —any kind of business. You can use it as a garbage can, store your antifreeze in it during the summer or fill it with ice and use it as a portable beverage cooler. When Pop goes on a fishing trip, he can slip it flat into the compartment of the car and eventually use it as a drinking-water container or a minnow bucket and then bring home his catch in it. Mom can use it as a laundry hamper and it serves Junior as a diaper container.

The rather amazing corrugated furniture also is marketed flat. You unfold the parts of the sofa, slip them together by means of interlocking slots, and cover the arms with foam-rubber pads. Then you drop a slip cover over the finished sofa, place the seat and back cushions in position and flop down for a nap.

The furniture is relatively inexpensive, extremely strong and durable, and can be disassembled whenever you move. It's ideal for summer cottages and seems tailor-made for military personnel or others who have to move frequently. Newlyweds can use it to bridge the gap until they can afford the kind of furniture they want for life.

Planning to move? The movers may dump half a dozen new superstrong barrels made of corrugated paperboard on your doorstep. Pack your finest china in them and it's safer than in the old wooden barrels. A good many bulky items, such as peat moss for your garden, are packed in big boxes with built-in handles. You tote away the stuff as though you were carrying

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Santa Fe Railroad photo

Lettuce is packed directly into paperboard boxes, which are set up and stapled on a truck roving the field

a suitcase. When you buy a new seed planter and fertilizer spreader, made mostly of paperboard, you assemble the parts, slip on wooden wheels and away you go.

Archers now are practicing on life-size animal targets made of the versatile board. The targets are printed cutouts of bears, mountain goats, deer, rabbits and other wild game. Arrows zip right through the realistic paperboard animals when they're spotted strategically around a field archery course.

What is paperboard? It's nothing but pulp, or pulp and wastepaper. Industry spokesmen hit the roof when you call their product cardboard or pasteboard. The word paperboard itself wraps up a big field, which can be slashed into two parts; solid fibre, used for everything from cereal packages to huge shipping drums; and corrugated, the familiar stuff in which you tote home the groceries. And while we're about it, the industry insists that a *carton* is an individual container, such as a cereal package. A *box* is a shipping container which frequently holds a good many cartons.

Today, only 60 years after the first corrugated box was pasted into shape, the manufacture of these containers is a billion-dollar industry—and that's only part of the paperboard field as a whole.

It's hard to believe the figures. As an example, take the production of corrugated paperboard. Production isn't measured in pounds or tons, but in square feet. Production figures recently have grown so unmanageable that square miles might make a better standard of measurement. In 1953 the nation's mills, by conservative estimate, rolled out the astounding total of 80,000,000,000 square feet (2870 square miles) of corrugated—enough to blanket the entire state of Rhode Island twice, with 374 square miles of trimmings left over to smother all of Manhattan under 17 layers of the disposable stuff.

Anyone who has tried to open a well-sealed corrugated box has been fought to a standstill by the bloomin' thing and can testify to the strength of corrugated board. The secret of its strength is also the secret of the arch, one of the oldest and strongest of building shapes. Corrugated board is nothing more than a series of tiny arches, made even stronger by sandwiching them between layers of tough paper.

A new tomato box is fantastically strong. Four men totaling almost 800 pounds can stand on it without so much as a bruise to the tomatoes inside. And for pure strength, very few boxes can beat a new one made by sandwiching a layer of Douglas fir veneer between twin layers of paperboard. In corner drop tests, the box proved twice as rugged as a nailed wooden box.

So strong are some of the new boxes that, from the consumer's standpoint, they're too strong. The U.S. Department of Commerce

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Lettuce-filled boxes are loaded into vacuum cooler which reduces temperature to 34 degrees. No ice is needed

recently made a survey of retailers on packaging methods. One complaint popped up consistently: the boxes are so strong they're almost impossible to open without damage either to the hands or to the merchandise inside. One druggist reported quite seriously that he frequently had to stand on top of a corrugated box and dissect it piece by piece in order to get at the merchandise.

Even that problem has been solved by a new "zipper" box. The sealed box has a pull-tab protruding from one corner. The store clerk simply pulls on the tab and a built-in tape rips the box neatly in half. It's no more difficult than opening a package of chewing gum or cigarettes.

Probably the biggest and strongest corrugated box ever built has recently made its appearance. It answers the special problems of the flour miller. For many years millers have turned out flour in immense quantities but have packaged it in small containers—usually 100-pound bags. It takes a substantial amount of time and labor to fill and seal each bag, then load it on the freight car. At the destination it takes an equal amount of time and labor to unload it, open the bag and empty by hand before the baker can go to work on your loaf of bread.

(Continued to page 238)

They're standing on paper! Men weighing almost 800 pounds stand on box without damaging the tomatoes

National Container Corp. photo

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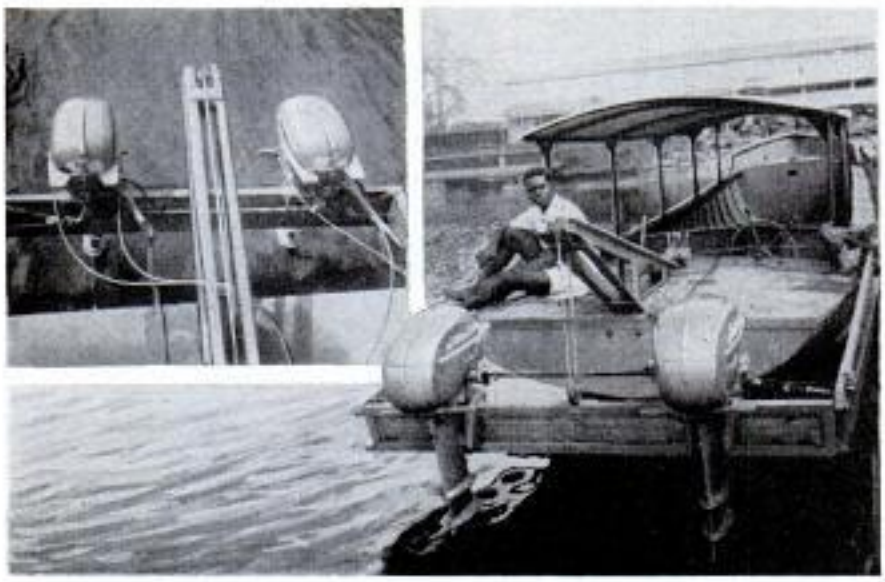
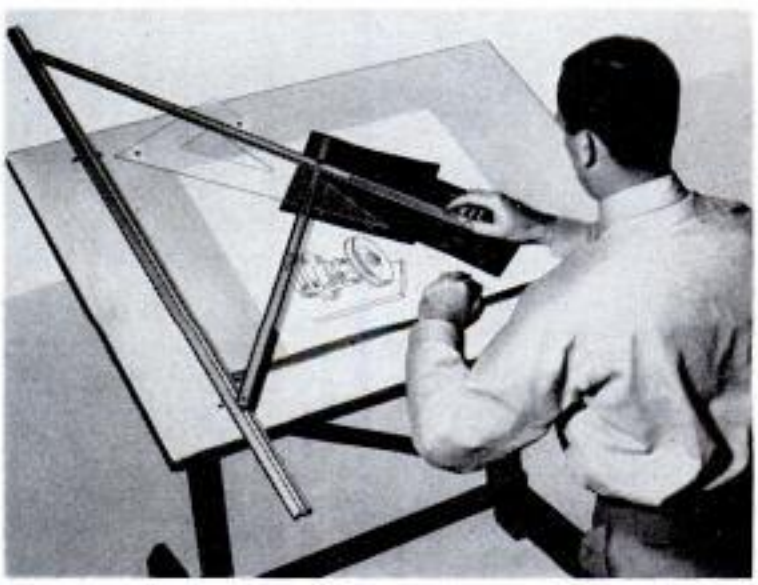
Adjustable Outboard Motors Power Belgian Congo River Boat



Coupled American outboard motors propel a heavy-cargo boat on a river in the Belgian Congo. The 25-horsepower Johnson motors are mounted on a frame which is raised or lowered by crane to proper water level, depending upon the weight of the cargo. The crane itself is mounted on a steel section attached to the stern. The motors are remotely controlled from the front of the section; steering wheel is at the rear of the boat.

Drawing Aid Shows Objects In Three-Dimension Views

With a new instrument the draftsman can make pictorial drawings from the normal "blueprint" views of an object. The completed drawing shows the object as it would appear in three dimensions and can be drawn from any of various points of view. In the language of the draftsman, the instrument converts orthographic views into isometric, dimetric and trimetric drawings. The drafting aid has three arms, one fastened to the board. The second is used to trace the normal drawings and the third produces the new view.



Hydraulic Auger Takes Soil Samples

Augers operating from the power take-off systems of trucks or tractors are now used to obtain samples of soil for conservation work. The hydraulic augers replace slow hand augers, bringing up a sample of soil from a depth of six feet in 15 to 20 seconds. One man with one of the augers can survey up to 400 acres per day. The samples help determine the proper crop and irrigation systems.

Sources of available products described in this issue are listed on pages 16, 20 and 22. Sources of further information on other articles are given in the WHERE-TO-FIND-IT LIST, available from Bureau of Information, *Popular Mechanics*, 200 East Ontario Street, Chicago 11, Illinois

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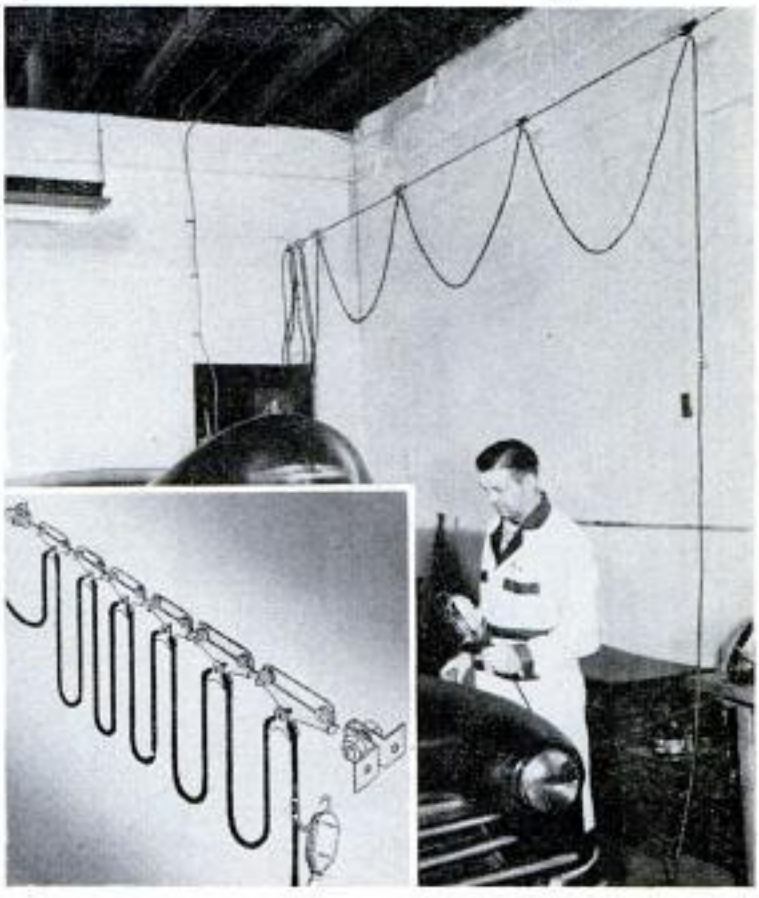
"Trolley Wire" Carries Long Extension Cord Over Large Area

Long extension cords are kept off the floor, yet are readily available over a wide area, when they are carried on miniature "cars" that roll along an overhead "trolley wire." The steel wire is fastened to the wall and drawn taut across the area. Six little two-wheel cars then are installed on the wire, and the extension cord is draped from car to car. A tug on the cord pulls out the cars one at a time to carry the line to the desired point. When the line is not in use, the cars are rolled close to each other and the line is stored in big overhead loops.

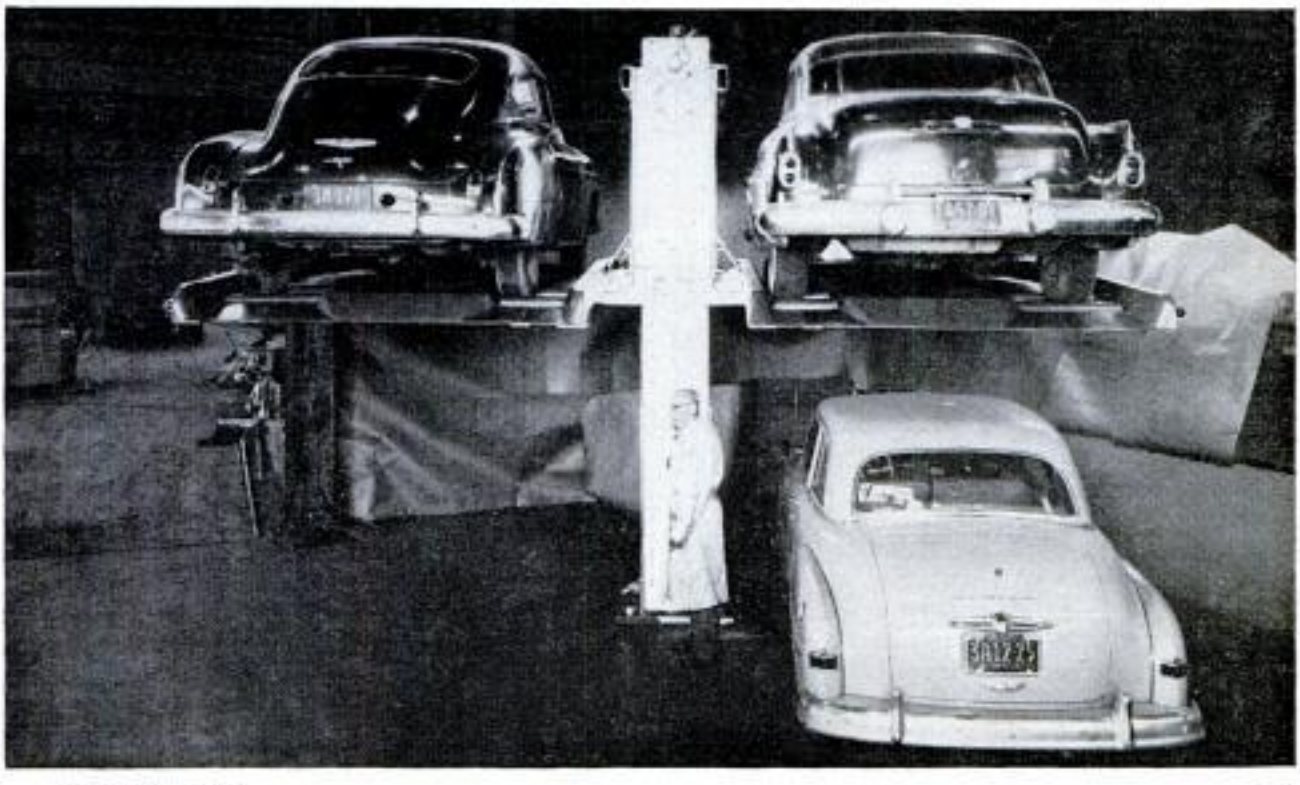


Chinese Nuts Resist Blight

Chinese chestnuts are being grown today in America in place of the native variety, which has been virtually destroyed by a fungus blight. The Chinese nuts, larger than American chestnuts, compare favorably with imported European nuts for size and quality.

Push-Button Parking Machine Doubles Available Space

Two cars are parked where one parked before with a push-button parking machine. Two movable platforms are attached to a rigid central column. A car driven onto one of the platforms is lifted out of the way by hydraulic or mechanical action, leaving room for another automobile beneath. A revolving model, suitable for street parking, suspends car above the lawn bordering a roadway. In new garage construction, the rigid columns of the parking units can be the supporting columns of the building.



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U.S. Air Force photo

Supply experts in California read an urgent telecon request from conferences in Japan, half a world away

Over in Japan the Air Force is having trouble with radar mountings on fighter planes. Experts gather around lighted screens on both sides of the Pacific for a

CONFERENCE BY TELECON

By Ewart Thomas

FEARLOGFOR in Japan and SMAMA in California were ready for their biweekly conference.

SMAMA's telecon screen was glowing brightly at McClellan Air Force Base, then on it appeared the names of the men who were sitting in front of a similar screen at Tachikawa.

Simultaneously the names of the SMAMA (Sacramento Air Materiel Area) representatives flashed on the screen at the headquarters of the Far East Air Logistical Force in Japan.

It was seven o'clock on Friday morning in Japan and it was three o'clock in the afternoon of the day before at Sacramento. The two groups of supply experts, half a world apart, were in direct contact with each other in spite of difference in time.

At McClellan the screen went blank, then the first message appeared.

"PACKARD TO WEIHE. RADAR MOUNTINGS ON F-94 STARFIRES MALFUNCTION DUE TO ROUGH RUNWAYS. REQUEST ADVICE AND CORRECTIVE REPLACEMENTS."

Ralph Weihe, Lockheed representative at SMAMA, didn't need to phone his factory for the answer. He'd been keeping track of some new replacements the factory was building. He scribbled a message for the telecon clerk: "New design mounts being air lifted from Travis tomorrow."

Almost immediately another message appeared, this time a request for aircraft parts that were needed in a rush for Indo-China and the Philippines. The files showed that the parts were available in Utah, and one of the men picked up the phone to arrange for their shipment by long distance. Before the two-hour conference ended he would be able to tell FEARLOGFOR when the parts would be shipped.

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OVERSEAS MONITORING OFFICE

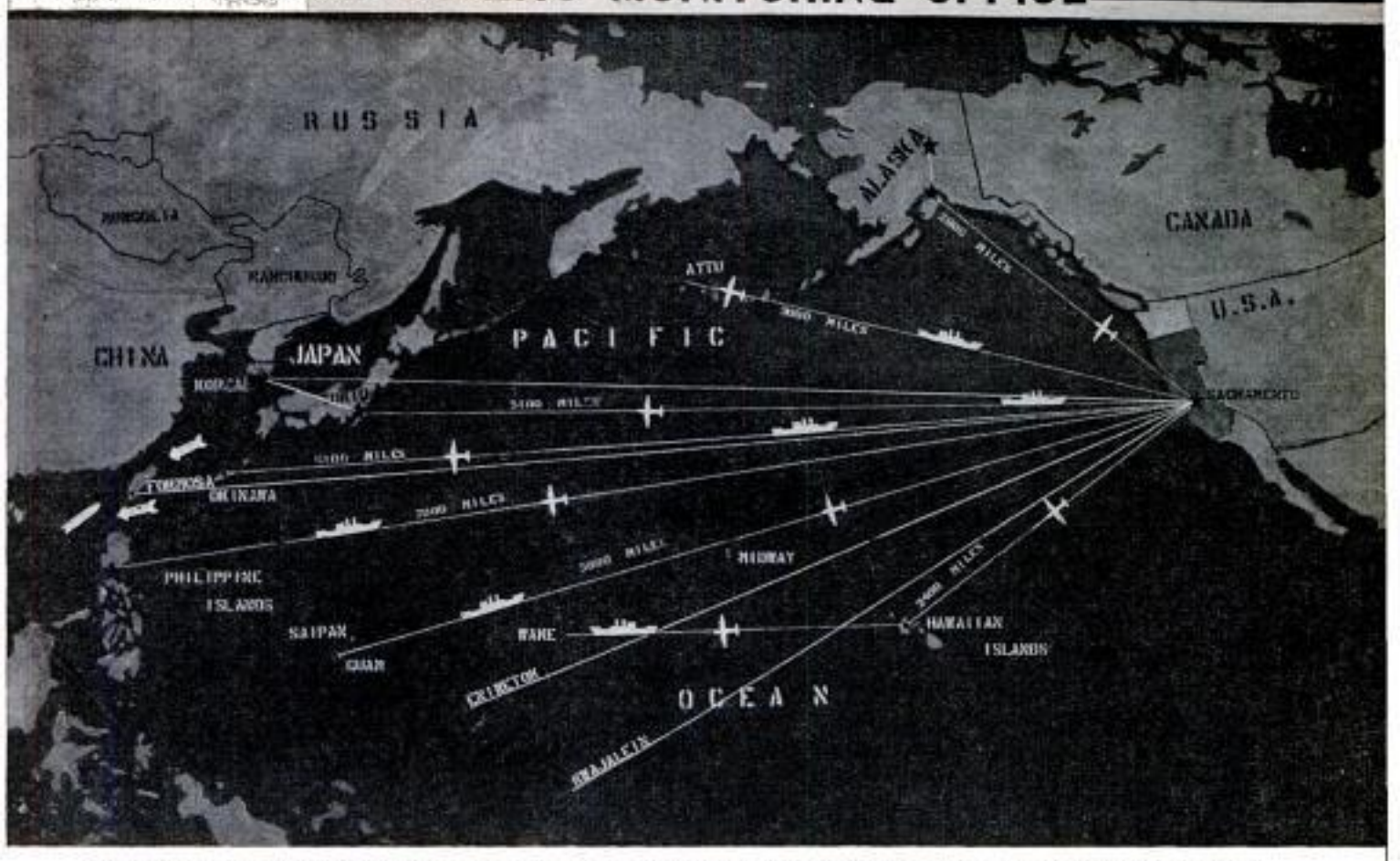

Chart shows some of the air and water routes over which supplies flow from U.S. to Alaska and Far East

Maintaining a steady flow of supplies to our around-the-world chains of air bases, and also supplying aircraft and parts to friendly foreign powers under the mutual-assistance program, are tasks of the Air Materiel Command. It's an enormous and complex job. You need gasoline trucks and typewriter desks and bulldozers at an air base, just as you need spare tail pipes for jet engines. The variety of necessary supplies and equipment continues to grow.

Most of this equipment moves by surface ship; priority and emergency items are carried by fleets of transport aircraft that are in the air 24 hours a day. At any one time, a half million Air Force items are en route to overseas destinations.

Air mail is good enough for routine orders but not even radio is fast enough for some of the requests that are needed on an urgency or emergency basis. Counting all the delays at relay points, it takes upwards of eight hours to get a radio message from Japan into the right hands at Sacramento. But through the use of telecon (teletypewriter conference), the transmission is practically instantaneous.

The telecon circuit is patched together by using land wires from Sacramento to San Francisco, underwater cable to Honolulu and radio to Japan. Teletype machines are connected to the ends of the circuit and each machine projects its messages through

Needed abroad at once, an Air Force gasoline truck is lifted from a flatcar for movement by airplane

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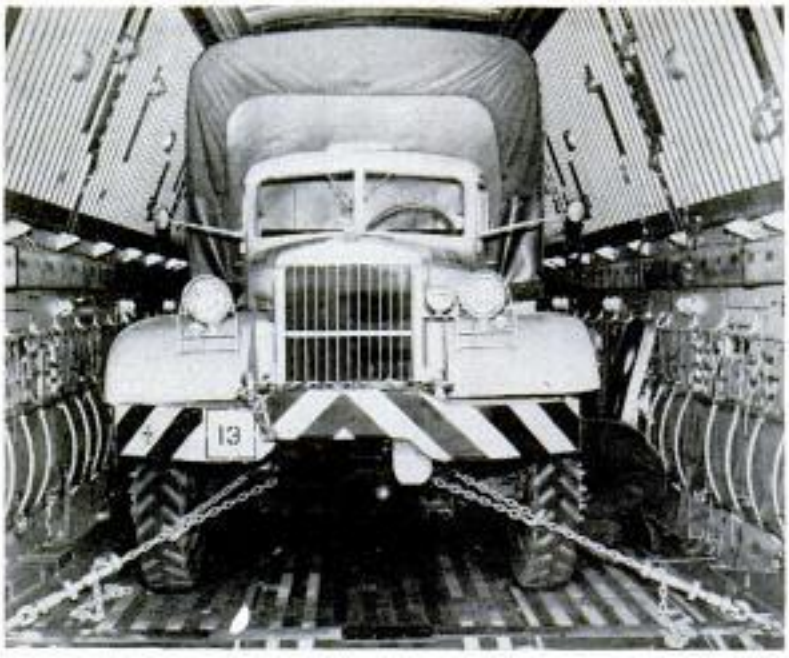


Big cargo trucks and bulldozers, as well as tiny parts for jet aircraft engines, get speedy flights across the Pacific when necessary

Boxes that move into SMAMA warehouse over endless belts coming in from right are diverted to their proper locations by photocell setup actuated by switch pedestal in front of the operator

an optical system onto its telecon screen.

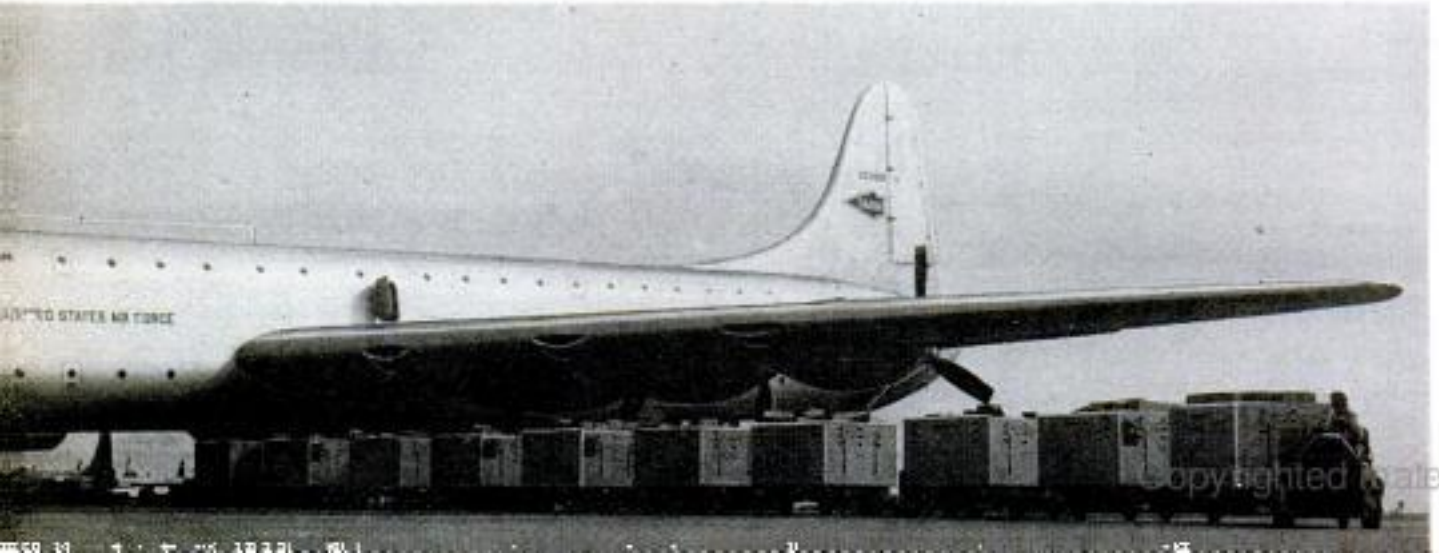
As many as 90 imperative topics have been discussed by telecon in a two-hour conference. A telecon circuit can be set up to connect SMAMA with any point in its jurisdiction whenever fast answers are required to many problems. During the Korean peace talks, telecon helped locate parts for grounded helicopters needed to transport our delegates. They arrived within 72 hours.

The Air Materiel Command has seven major supply depots east of the Mississippi and eight west of that line. Overseas-shipment control depots at Sacramento, Newark and New Orleans are the principal storage and transshipment points for supplies needed abroad.

At each of the three control depots there is an "overseas-requisition control branch" that maintains a complete record of stocks on hand and in transit. The huge job is handled by means of coded cards that are fed into tabulating machines. At Sacramento, Ralph J. Greiner, chief of the control branch, explains that a record is kept of each item in each case of each shipment so that if a transport aircraft is wrecked, or if a steamer is delayed in making a delivery, a duplicate shipment can be made up at once.

Incoming requisitions from abroad are processed in 12 hours. Priority items are processed in four hours. Emergency items that are discussed by telecon often can be processed within minutes. ★ ★ ★

Capable of carrying loads of more than 100,000 pounds, the Convair C-99 flies on domestic supply routes



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Refrigeration Keeps Trees Healthy Until They Are Planted

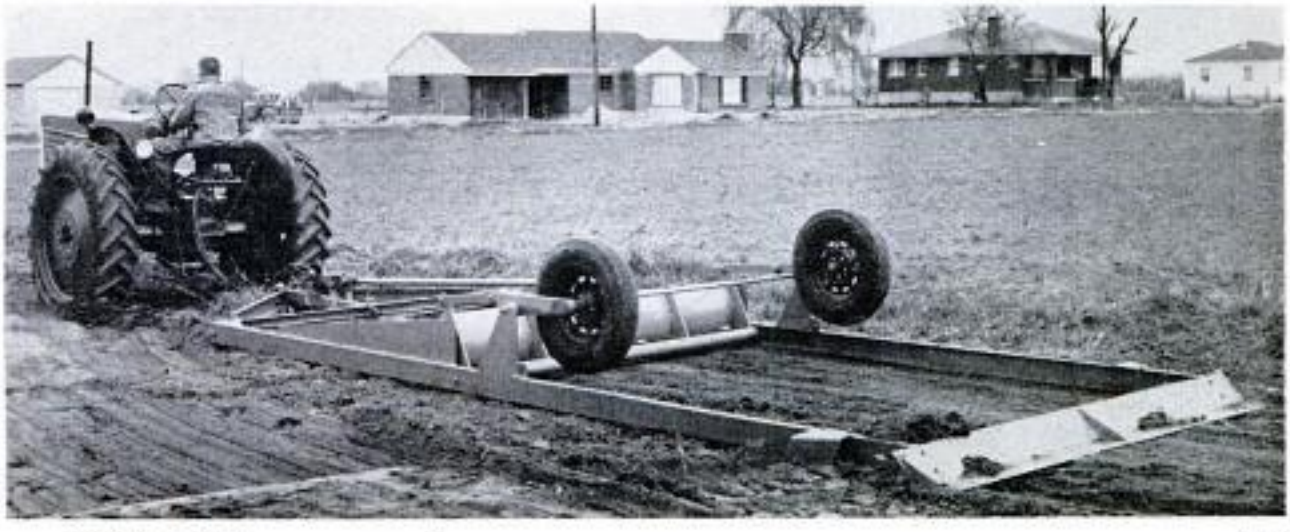
Millions of trees are refrigerated each year at a big nursery in Moscow, Idaho. The reason? To keep the trees healthy until they can be planted. In past years, the nursery has been swamped by orders for trees each spring. Often the orders arrived in such volume that they could not be filled until too late in the season. Now the nursery stock is dug out of the ground months ahead of time, bundled and stored in huge refrigerated rooms. In the constant 33-degree temperature and 90 percent humidity the trees are kept in good condition as long as nine months, then delivered for planting.

Airplane-Control Cable Used to Repair Tendon in Kneecap Surgery

Stainless-steel airplane-control cable has been used successfully to repair a ruptured tendon in the kneecap of a 24-year-old Chicago woman. The cable was tried after a single strand of stainless-steel wire crystallized and broke. The cable has seven strands, each of which consists of seven wires of very fine stainless steel. When thoroughly cleansed, it is tolerated by both bone and soft tissue.

Bite of Hydraulic Earth Leveler Controlled From Tractor Seat

Cutting down high spots and filling in the holes of uneven ground, an earth leveler mounts a scraper which is raised or lowered by hydraulic action. In the field, the heavy metal frame of the leveler rests on the ground as it is pulled behind a tractor. A flick of the hydraulic-control lever beside the driver's seat adjusts the bite of the scraper or raises it entirely, causing the frame to be lifted free of the ground, supported by two automobile wheels. The implement is suited for grading, scraping, dirt removal or snow removal. It can be towed at high speeds on the highway.



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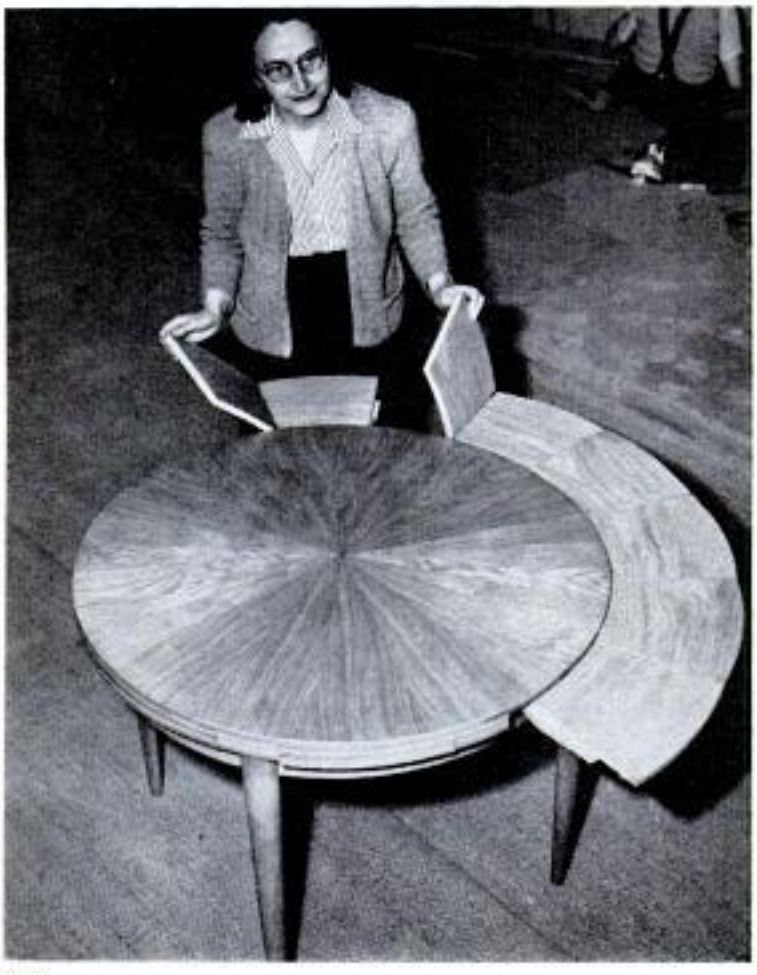
Circulating Water Warms Bed in Winter, Cools It in Summer

You can cool your pillow on hot nights or warm your feet on chilly ones with a plastic pad that contains a water-circulating system. The 14 by 20-inch pad is made of a series of tubes, connected with a small plastic container that holds a reservoir and pump. The container is placed on a table or on the floor beside the bed. The system is a miniature heat exchanger. In summer, cold water moves through the system, carries body heat away and returns cool again. In winter, a small heater in the pump warms the water. The pad can be tucked under the pillow slip or sheet.

Circular Dinette Table "Blossoms Out" to Double Its Size



When extra leaves are unfolded from a new circular dining table, the top "blossoms" out to twice its former area. The odd-shaped leaves slip out of pockets under the table top. The table was invented in France.

Mexican Sisal Plant Juice Rich Source of Cortisone

Cortisone, used in treating rheumatoid arthritis and a host of other ailments, can now be obtained quickly and cheaply from the Mexican sisal plant. Georgetown University chemists have found the juice of the plant to be a rich source of chemicals which can be converted into cortisone and synthetic versions of other hormones. Synthetic production of hydrocortisone and other hormones found naturally in the adrenal glands as well as sex hormones and the heart drug digitalis may be possible. The result of large-scale extraction from the sisal plant would be a marked drop in the cost of the drugs, the chemists say.

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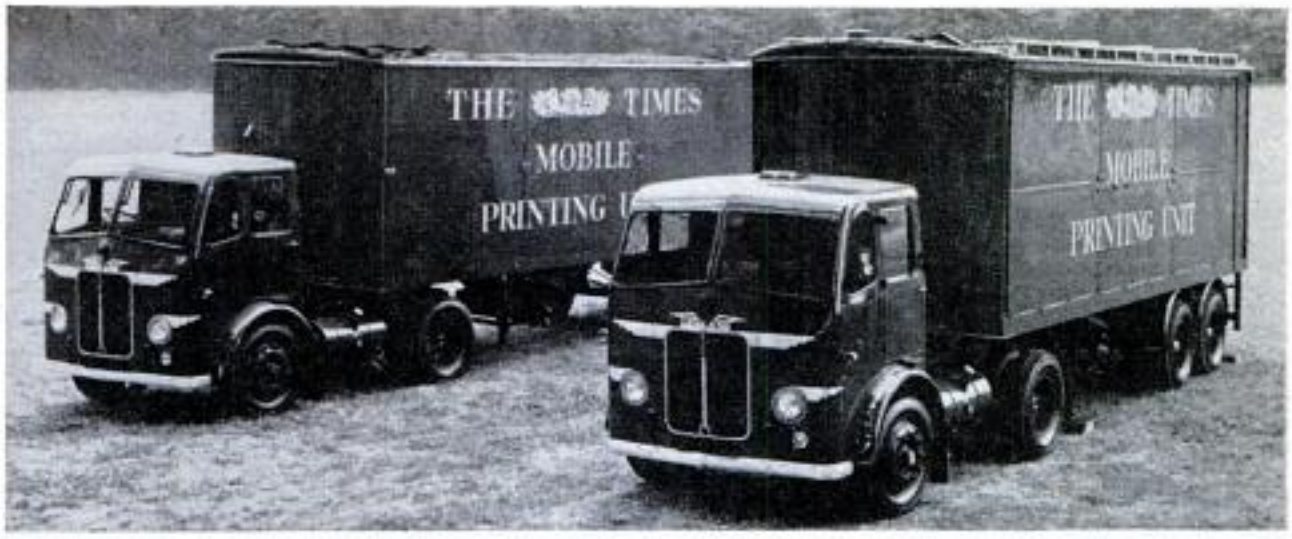
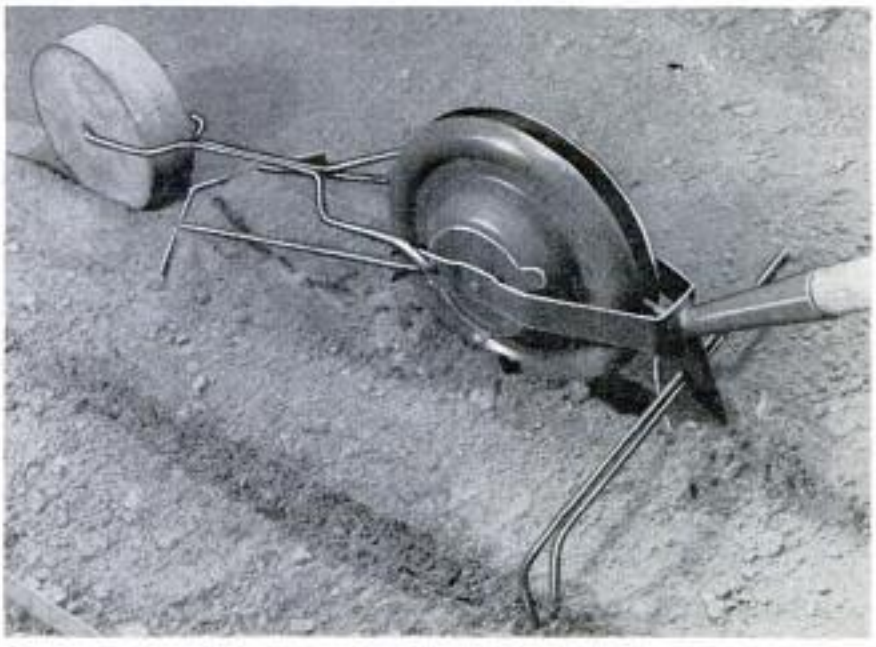


Mobile Plant Prints 12,000 London Newspapers Per Hour

No matter what happens to the main printing plant of the *London Times*, the English newspaper will continue to be published. Mobile vans and trailers owned by the paper contain a complete printing plant that can turn out more than 12,000 copies per hour. The six-man crew can set up the unit and start printing a reduced-size eight-page edition on its rotary presses in two hours.

Gardener's Drill Sows and Tamps

Gardeners can speed planting with a hand drill that will sow 400 peas separately or 800 peas two at a time, after one filling. As the tool is pulled over the ground, it makes a furrow in which it drops the seeds. A scraper covers the furrow and a roller tamps the loose soil. A wire marker extending to the side grooves the next row, eliminating the need for strings and markers. The device is manufactured in Germany.



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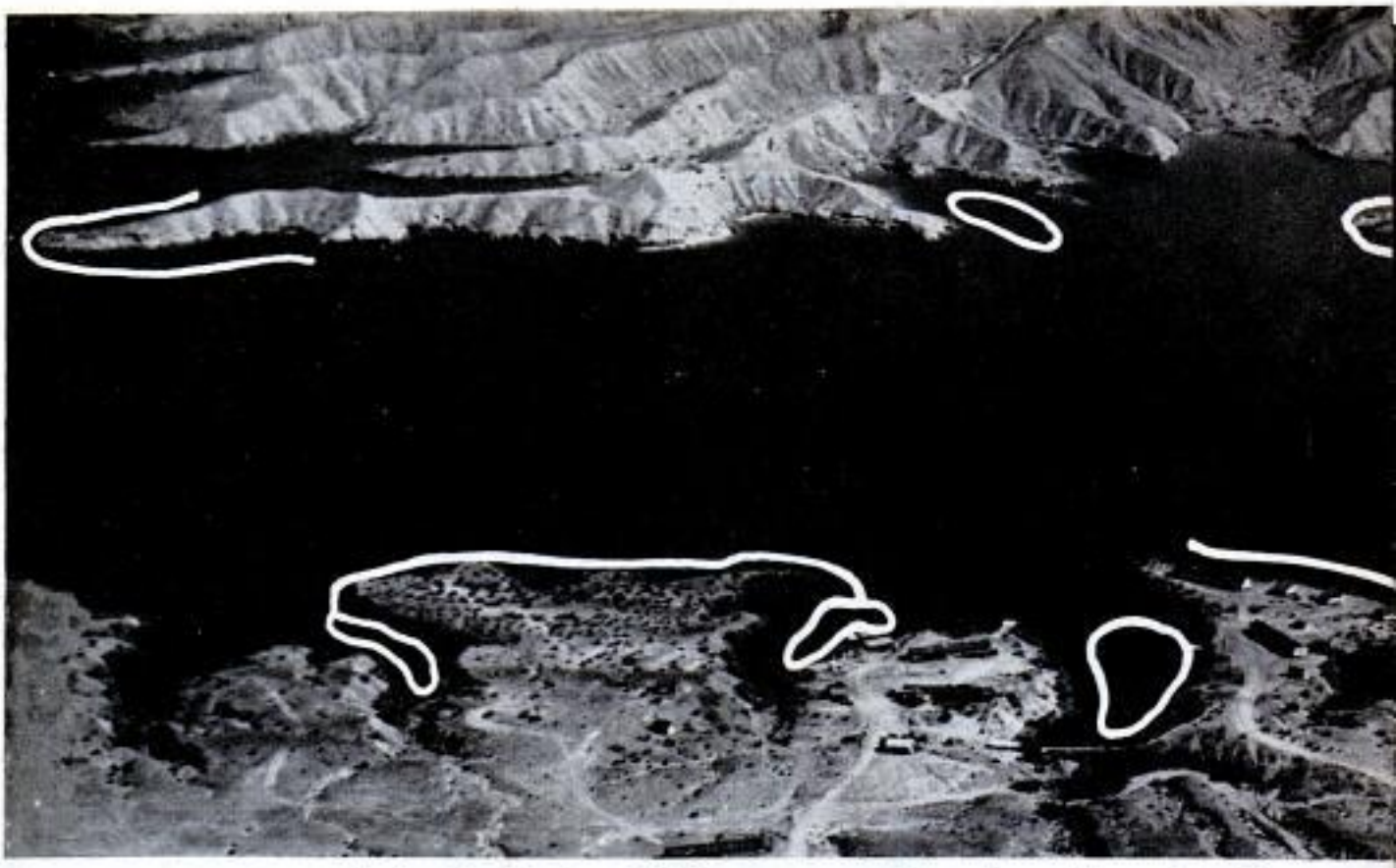

Don't waste time in the middle of a big lake. From inside coves, cast to shore, then troll around points

Where to

By Shep Shepherd

IF YOU WERE to visit several of our better-known lakes, particularly the well-fished ones, and spent some time around the boat landings you would notice one odd fact. Each lake seems to give up its gift of fishes to about every tenth angler.

Lakes, however, are impartial, and that tenth angler with his full string isn't riding a lucky streak. He is the one fisherman out of 10 who knows how to find fish in a lake. He makes his own luck with a systematic approach. His knowledge has been acquired over many years and he may have the advantage of familiarity with the lake he is fishing. But even on strange waters there are ways of eliminating much waste motion and lost time in finding and catching fish.

Whenever you visit a strange lake, devote the first evening to silent watching. Find a vantage point that gives a view of the entire surface, then just sit and watch from shortly before sundown until after dark. Watch for feeding fish. Pay little attention to the occasional lone fish that jumps clear of the water out near the middle of the lake. Watch for those boils on the surface that reveal the location of several feeding fish. If they occur repeatedly, that spot is sure to be a good place to fish. Mark it for the next day's fishing.

The signs you see will depend on the kind of fish and the type of food they are taking. Boils at the surface mean the fish are taking insects of some kind. Long V-shaped ripples indicate fish chasing minnows and shorter ones mean frogs are the bait.

Note the time the feeding begins and be there ready for action the following evening. Usually a few minutes' inspection of the surface will reveal the type of food the fish are taking. Match it as nearly as possible with an artificial lure, or the real thing if you can, and you should begin taking fish.

It is not always possible to make this inspection of a lake's surface. Sometimes the presence of late fishermen in boats may make the plan infeasible. Moving boats are

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For big ones like this brown trout, fish deeper waters

Find Fish in a Lake

Fine spot for bass and crappie: you'll find them in shade near the shore. At midday, try deeper holes by sheer banks

apt to put the fish down in even the best feeding spots and thus cause you to misread the surface signs. Also, fish feeding on hellgrammites, crawfish or bottom bugs would not be detected by a watcher. Or you might select an evening when something about the weather has made the fish nervous and put them off their feed. When the surface signs fail or when for any reason you can't spend an evening watching for them, you will have to go out and hunt for fish.

First thing to do is make an inspection of the shoreline. I like to do this from a boat driven by an outboard motor, cruising slowly close to shore all the way around the lake. Look for stumps, logs, weed patches, overhanging bushes or trees, overhanging grassy banks, mouths of streams entering the lake, clear channels through weed beds and open pockets in the weeds. Watch for underwater reefs and ledges and for sandy bars that drop off into deeper water. Small islands in the lake are always good.

Probably the best spot in a lake to catch fish is where a stream enters

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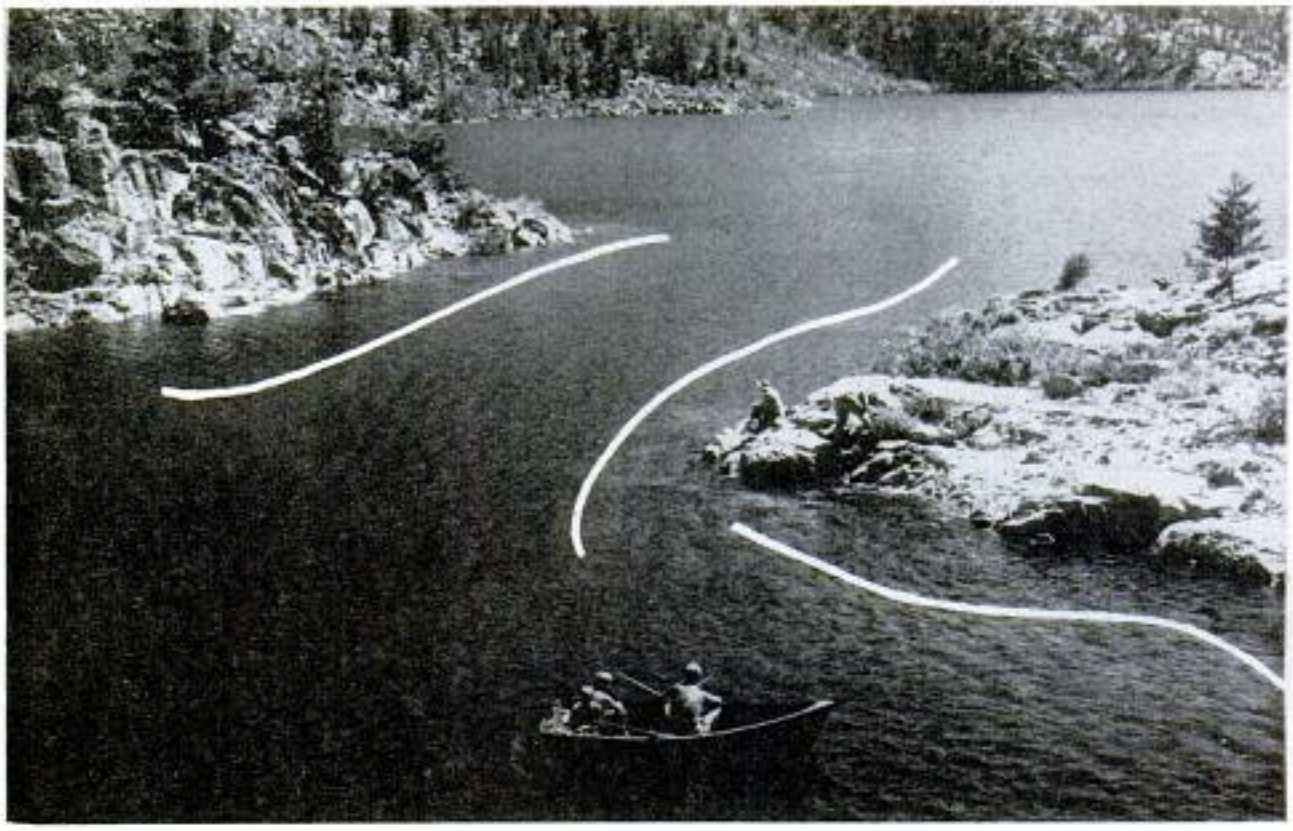

Anglers in this boat can cover the shore line while the fisherman on the point covers the entire channel

This is topnotch water for bass. From his boat the angler can cast into the shadows all along the shore line. The lure should strike the water as far beneath the overhanging bushes as possible. Hungry fish like to feed in the shade, particularly at midday

through a heavy growth of reeds or weeds. There are always fish moving around the edges of weed beds, feeding on bugs, hellgrammites, frogs or minnows. Where a stream carries additional food into the lake near the weeds, the attractions to the hungry fish are even greater.

Much will depend on the type of fish you are after. Largemouth bass usually like shallow water when feeding. They subsist mainly on minnows, crawfish, hellgrammites, bugs, frogs and mice, all of which are found in shallow water and usually around weed beds. Bass feed in the early morning and late evening hours. During midday they rest in the holes in the weeds, in the shade of overhanging bushes, under logs or in deep holes near boulders and rocky shores.

When they are feeding, the best fishing method is to cast from a boat to the shore or weeds where the fish are, then retrieve toward the boat. Try to hit the very edge of the shore or weeds and let the lure lie quietly for a few seconds, then move it a few inches and let it lie again. Do this several times

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One of the best fishing spots is where a stream empties into a lake, for here fish can find natural food

before retrieving for the next cast. Cover the area thoroughly, spacing each cast a few inches to the right or left of the previous one.

During midday when the fish are resting you will work a little harder to get results. Cast into open pockets in the weeds, to logs, deep holes near rocks or under bushes. Sometimes it requires several casts to arouse a resting bass to the striking point. Don't give up too easily. Make repeated casts to the same spot before moving on.

Smallmouth bass have somewhat different tastes. They prefer colder water and they like rocky shores. At times they will be found in the moving water where a stream enters. Excellent spots for bass, crappie and sunfish are those small coves where logs and driftwood have backed up into a sort of loose raft. Fish under the jam with natural baits such as worms and small

(Continued to page 230)

From shore, cast at stumps and fallen trees. Keep "plugging" away, as fish may not rise at the first cast

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Huge Tank Developed by British May Be Most Powerful Ever

Described by the British War Minister as "probably the most powerful tank in the world," the Caernarvon now is undergoing tests. Little information has been released on the huge vehicle. Authorities say, however, that it has better armor and a more powerful engine than the Centurion, which won high praise from the Allies in Korea. The tank is now facing many exhaustive tests by the British Army both at home and abroad.

Danish Ship Model Is Self-Powered

Two years of spare time and $470 went into the building of a powered boat model constructed by Claus von Drahten of Hamburg, Germany. The model is of the 4000-ton Danish ship, the Crown Prince Olaf. It weighs 150 pounds, is powered by four batteries, and mounts automatic pumps, electric switches and a screw propeller. Virtually every detail of the superstructure is complete and in scale. Usually the boat cruises in the waters of the Von Drahten swimming pool.

BBC Turret Van Relays Telecasts

Radio commentators covering outdoor events can broadcast in comfort from a British Broadcasting Company van mounting a windowed turret which gives them an unobstructed view. Windshield wipers and an extra heater take care of weather problems. A very-high-frequency transmitter inside the van broadcasts the commentary to a distant relay point whether the turreted vehicle is stationary or moving.

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1. Lone Star's Cruise Master is a sleek 21-foot outboard made of aluminum. It can carry seven passengers and sleeps three. It will float in one foot of water

BOAT SHOW FOR '54

BIGGEST NEWS in boating is the startling increase in the number of new sailors. No complete figures are available, but outboard-motor sales jumped 53 percent in the past year and more boats are bobbing up.

2. Harwill's Aero-Craft JCC Cruiser has 18½-foot aluminum hull, uses any motor from 7½ to 50 hp.

3. Culver's "22" for 1954 features a cabin with folding bunks for three, 62 inches of headroom

OUTBOARD CRUISERS

Newest and one of the most popular types of craft is the outboard cruiser, a boat that generally is less expensive than an inboard job, yet offers most of the same features. Outboard cruisers are primarily family boats, but they'll move along at a lively clip when powered by a suitable motor. Most of them have built-in bunks.

4. Experimental cruiser by Switzercraft likely will be put in production. Motor goes on a projecting bracket which is rubber-mounted to cut down noise

5. Motor yacht by Chris-Craft is a 63-foot home afloat. It has four baths and two showers, sleeping accommodations for 13. With twin or triple engine options it will go up to 21 m.p.h.

6. Here's a special for fishermen by the same company. Rakish flying bridge gives skipper a good view of fishing waters. It has twin engines, with 150-hp. diesel units available if desired

INBOARD CRUISERS

THE WEEK-END sailor can find almost anything he wants in the way of a home afloat when he goes into the inboard-cruiser class. New models range from little two-bunk jobs to the finest and most powerful yachts. One new model has a flying fishing bridge for a crow's-nest view of fishing waters. Another, shown at the top of this page, will sleep 13 amateur sailors and has four baths and two showers. The fittings of these cruisers are the finest. Many dinettes convert into bunks during extended cruising.

7. Semienclosed cruiser by Chris-Craft is a pleasure boat 29 feet long which will sleep two. With twin engines from 130 to 310 total horsepower it will go up to 32 miles per hour

8. There's a floating "living room" on the Owens Flagship Sedan, which features walk-around floor space and a cabin in mahogany. With flaring bow, it will go 17 m.p.h. on 118 hp.

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9. Dinette of 36-foot cruiser seats four and can be converted to double bed. Total sleeping capacity is six

10. Beneath the twin berths of this forward cabin there's space for a sink, stove, toilet and storage

11. Unique feature of Colonial's Flying Bridge Cruiser is the aft cabin with accommodations for six. It is designed for extended cruising

12. Something different: SaftiCraft's Flagliner has an all-steel welded hull with three watertight bulkheads

13. Richardson yacht has a double cabin, twin power plants with reduction gear and hydraulic clutch controls

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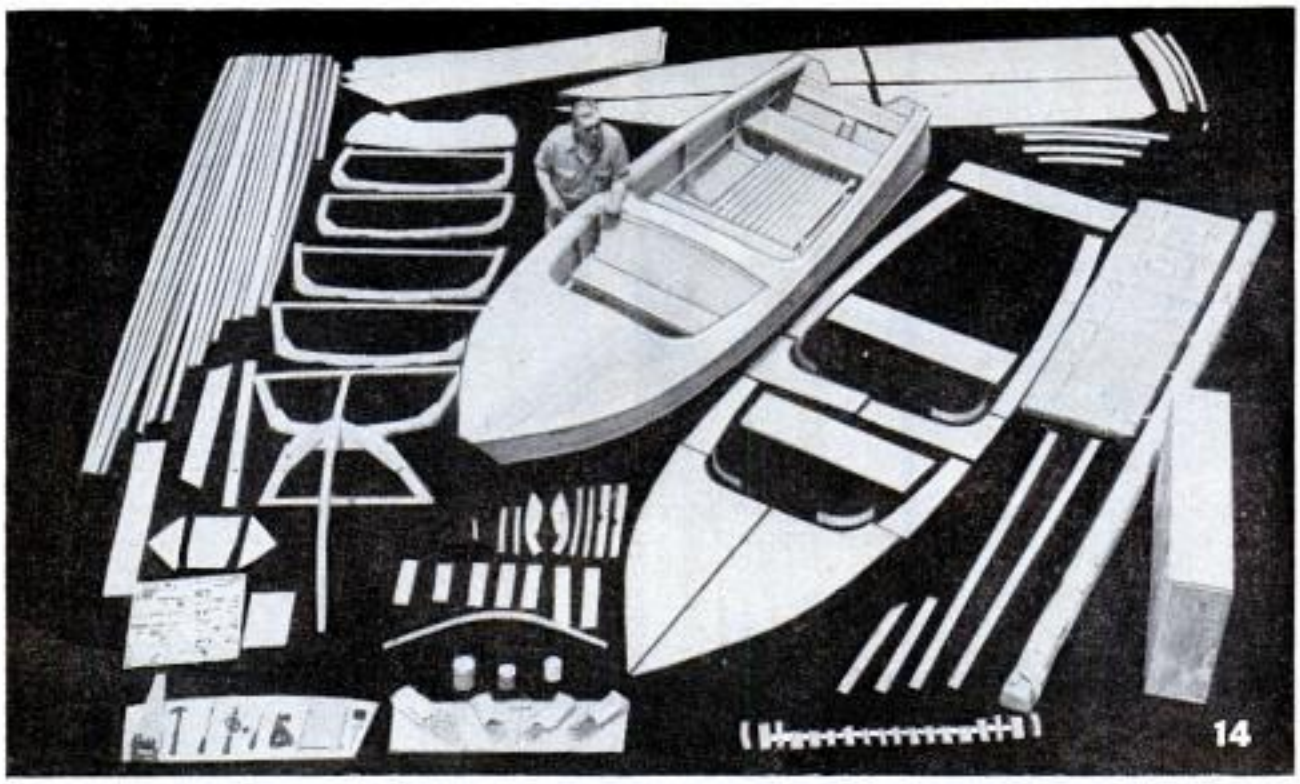


14. Here are all the parts for a runabout, by U-Mak-It. Other kits make everything from duckboats up to yachts

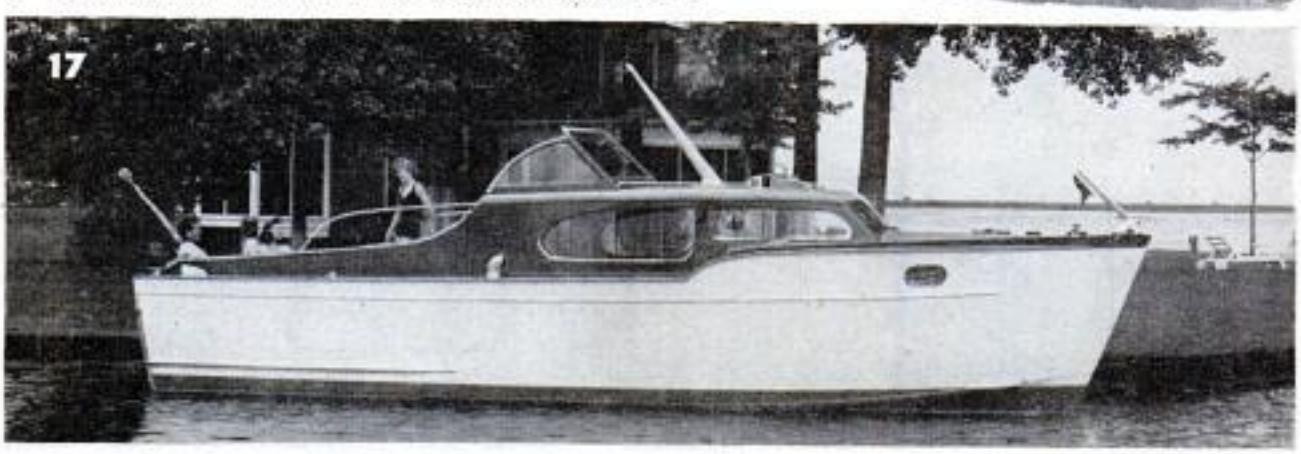
15. Skimming across the surface is a 10-foot pram that can be used for high-speed water sport. Boat was built from Chris-Craft kit

BUILD-IT-YOURSELF BOATS

BIGGEST SPURT in the boating field is in the production of kits. This year you can buy all the parts necessary to build anything from a tiny rowboat to the 31-foot home afloat shown at the bottom of this page. The parts are precision cut from the best of materials. Some of these can be assembled ready for the water in a week end.

16. Great fun for kids is this little eight-foot pram that weighs only 62 pounds. Kit's structural parts are mahogany

17. Yacht in a kit! Chris-Craft 31-foot cruiser is said to be the largest boat which is available in kit form



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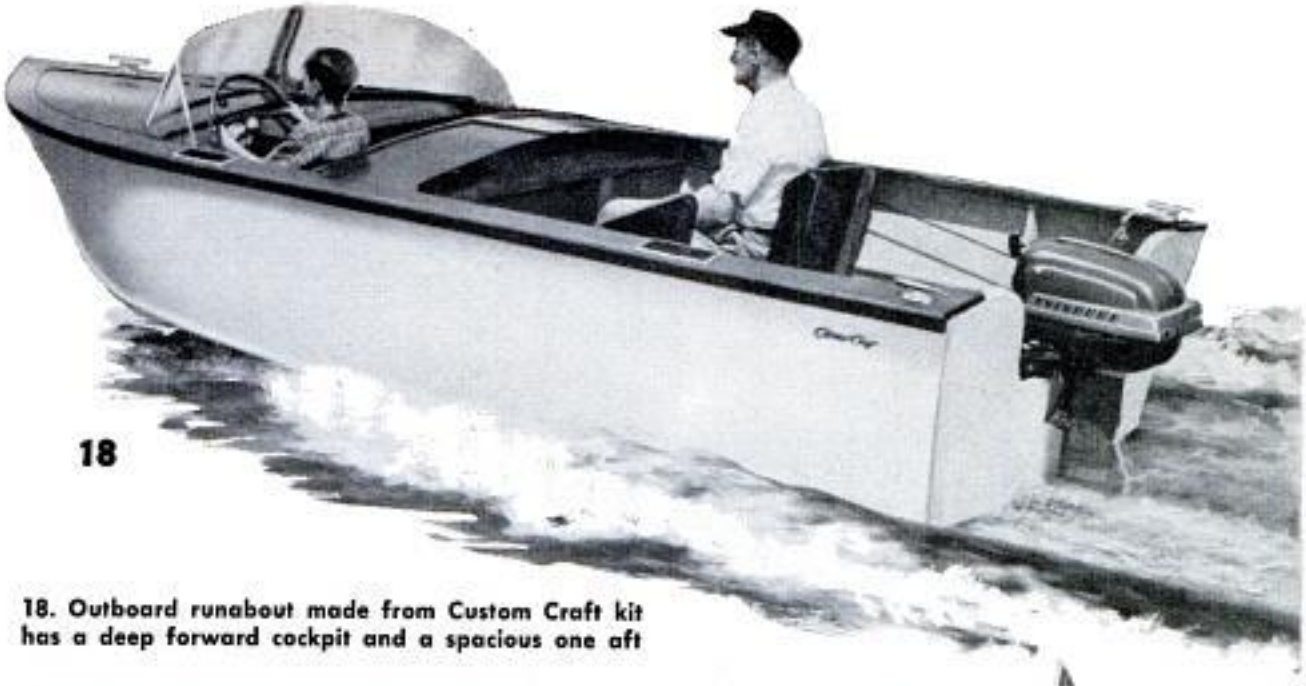

18. Outboard runabout made from Custom Craft kit has a deep forward cockpit and a spacious one aft

19. Precut parts of Chris-Craft 14-foot duckboat include a special transom so the duck hunter can power his boat with outboard motor

Kit for eight-foot sailing pram has mast, boom, rudder, centerboard, trunk, sail and all the hardware needed for assembly

21. Ozarka's cabin cruiser consists of two kits, one for the hull and the other for the cabin. Cabin has room for two bunks and galley. Boat is an 18-footer

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RUNABOUTS

RUNABOUTS are the "sports cars" of the boating field. Most are sleek, fast little craft designed purely for pleasure. This year more models, both inboard and outboard, are available than before.

22. Thompson runabout zips along on 15-hp. motor
23. Penn Yan features two comfortable cockpits
24. Wagemaker's Seafarer has plastic upholstery
25. Jafco makes this inboard model 20 feet long
26. Chris-Craft has engine options, 95 to 131 hp.
27. Chetek is available in 12 to 16-foot lengths

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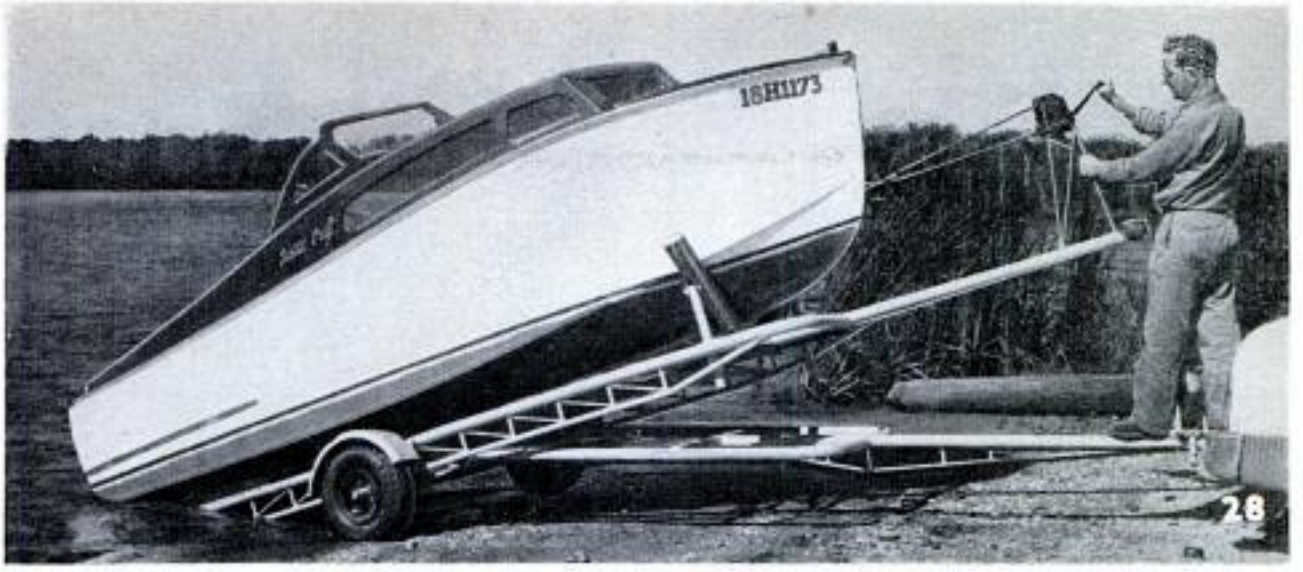


28. Trailer for outboard cruisers 18 to 21 feet long has 10 adjustable rollers. One man can load and unload it

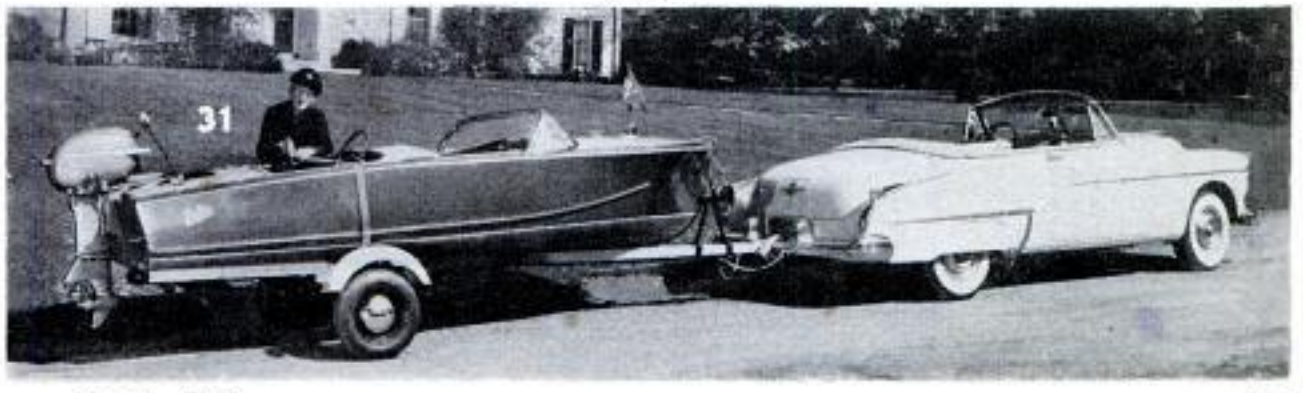
29. Here's a trailer for the sportsman. It carries boats up to 16 feet long, has only a 30-inch tread to ride the crest of back trails

TRAILERS AND CAR-TOP BOATS

ONE REASON for the big boost in pleasure boating is the new emphasis on mobility. Any boat up through the smaller cruisers can be kept at home and transported to the water anytime. New trailers make it easy for one man to launch or load boats over 20 feet long, and many smaller craft are designed to be carried on top of the car.

30. Arkansas Traveler aluminum boat is specifically designed for car-top portage. Hull is made from a single sheet of aluminum, entire boat weighs 100 lb.

31. Lone boatman can launch his boat from this neat trailer, which balances weight of the craft over the trailer wheels



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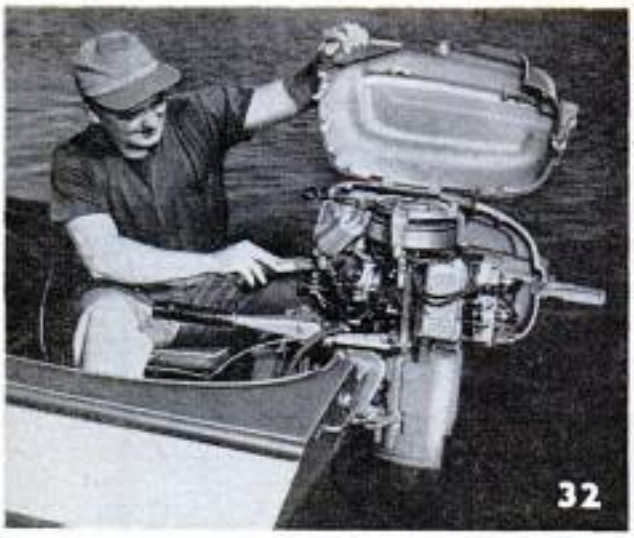
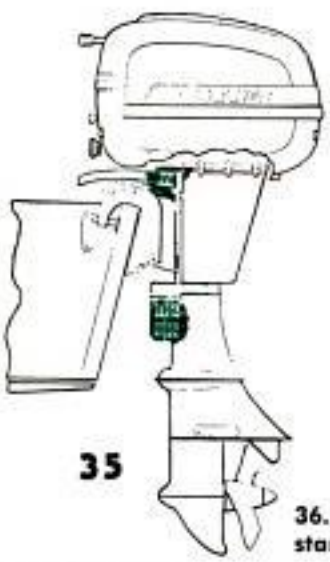


32. Hood of Evinrude motor swings up as easily as hood of a car, making the entire portside accessible

33. Motor mount has a crank which raises or lowers motor up to seven inches to suit water conditions

MOTORS

FOR A good many years motor manufacturers have been wrestling with the problem of noise. At last they've discovered it isn't the motor that produces the loud noise, but the boat itself. The vibration of the motor is transmitted to the boat which amplifies the vibration to produce the loud sound. The quiet motors which came out this year have vibration dampeners which isolate the motor from the boat. Other improvements include electric-starting systems and automatic bailers. ★ ★ ★



This year's quiet motors are a result of isolating the motor from the boat, rather than actually quieting the motor. Diagram of the Evinrude shows location of the two pairs of vibration-dampening springs

Biggest outboard motor in years is this Mercury four-cylinder model that is rated at more than 40 horsepower

36. The Johnson push-button starter operates off battery

37. Scott-Atwater motor has automatic bailer that operates continuously while the motor is running

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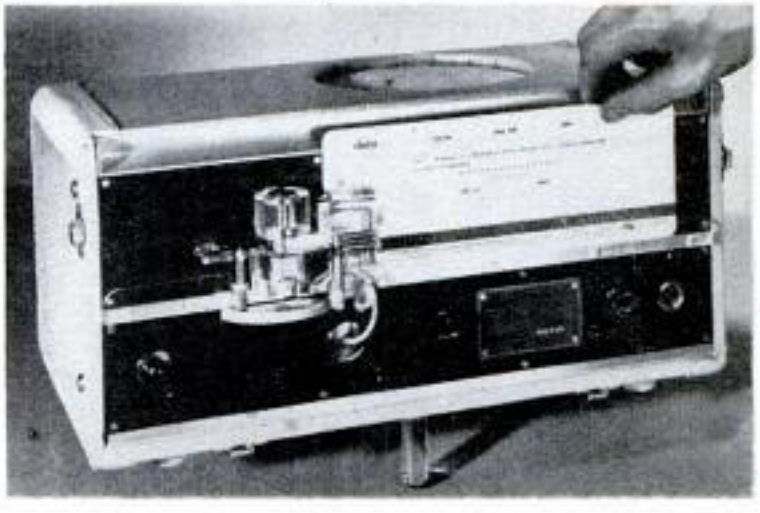
American-Style Daredevil Drivers Thrill Germans

Germans in the British sector are thrilled as stunt drivers put their cars through death-defying routines. With one member of the team lying prone on the hood, a car is crashed through a burning wooden wall. In other stunts, the Bruce Campbell drivers speed up an inclined ramp and take off like wingless aircraft before crashing.

Talking Dictionary Not Only Spells Words—It Speaks Them!

If you want to know the exact pronunciation of a word as well as its definition, you'll like a new "talking dictionary." Each word has its own card, with printed dictionary definition and a magnetic sound tape on which is recorded the spoken word. When the card is placed in the machine—a modified tape recorder—it moves along a track guide and the word is pronounced several times as the card moves by. Useful to lecturers, teachers and speech therapists, it also transmits to headphones or loudspeakers.



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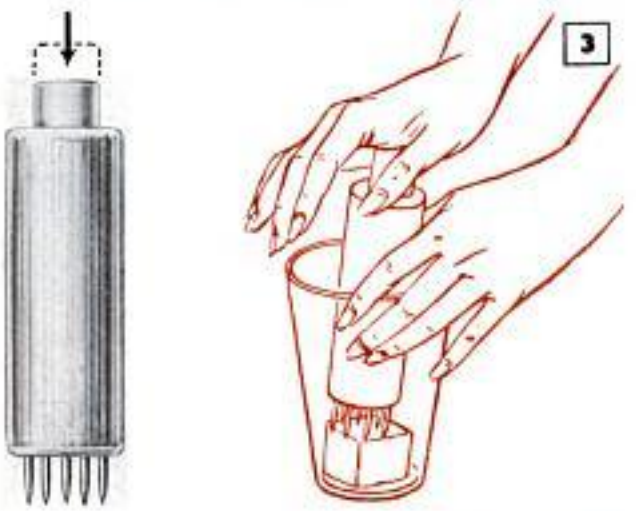
WHAT'S NEW FOR Your Home

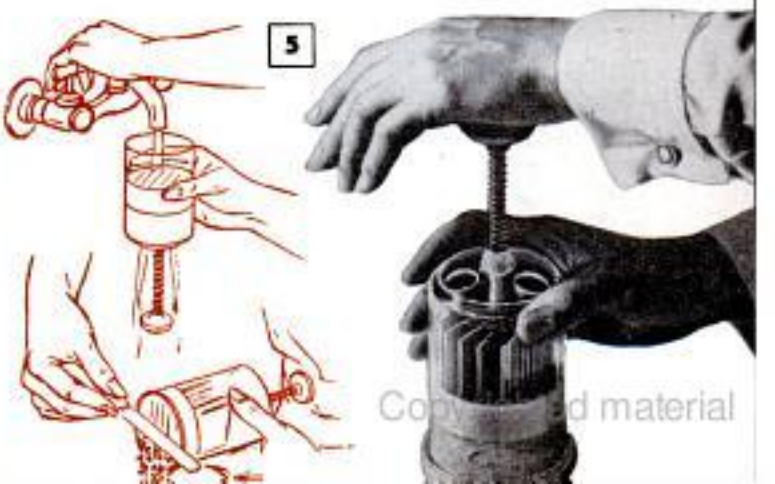


1. SKIRT MARKER lets a woman chalk her own hemline by pressing a bulb that moves a chalking arm fastened to a sturdy base. A second person can also mark skirt using pin grooves or the chalk guide

2. SPATTERPROOF LID will fit on griddles or skillets, keep grease from frying chicken, steaks, chops or eggs from escaping onto stove top. Made of aluminum, the cover is light in weight and easy to clean

3. ICE CRUSHER pulverizes ice cubes right in the drinking glass. You just hold the ice crusher over the cube with the left hand, jab handle with other. Sharp teeth on bottom of cylinder split the ice

4. SLICING AID lets you hold tomatoes, onions, meats and fruit for even slicing clear to the end portion, without damage to fingers. All slices are held firmly. The plastic device comes in several colors



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5. FOOD CHOPPER mounts plunger which is pushed down to slice vegetables or fruit contained in a bottom section. Five stainless-steel blades chop on a single stroke and clear automatically. Food is ejected without handling. Device is easily rinsed

6. SHOWER DOORS which take the place of curtain are designed to enclose tub-shower facilities. The sliding panels are made of glass, have aluminum frames and roll on ball bearings. A set comes in kit form ready to be assembled by the homeowner

7. JAR RACK holds six-ounce jars with metal clips that allow you to remove or replace the containers with one hand. For kitchen, workshop or laboratory, the set can be used to hold foods, liquids, and small parts. The racks are made in three different sizes

8. BOOSTER CHAIR for small children rests on seat of standard chair but has vinyl-covered nonskid legs. It folds flat for carrying, has an all-aluminum frame with pressed-wood seat and back, and a colorful enamel finish. Though sturdy, it weighs two pounds

9. DOOR HOLDER made of rubber mounts a long flap that is pressed down against a shorter flap by the door. The combined squeezing action keeps the door in place until it is pulled shut again. The holder screws to the floor, also acts as door stop

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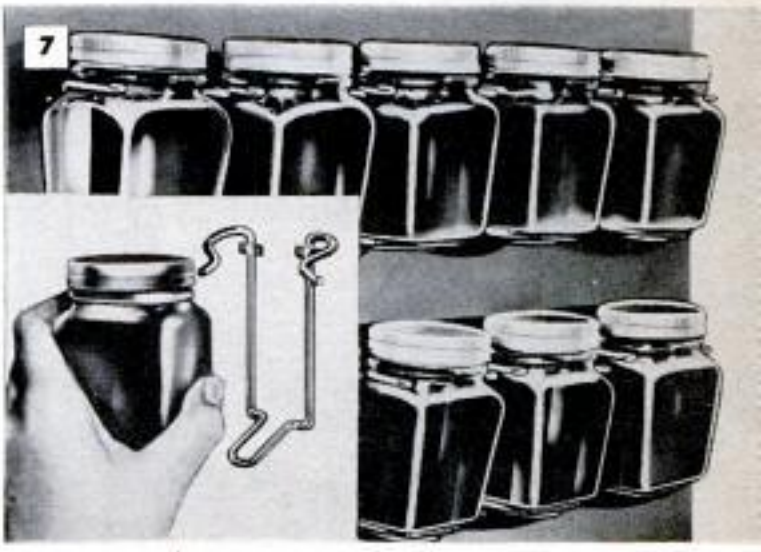
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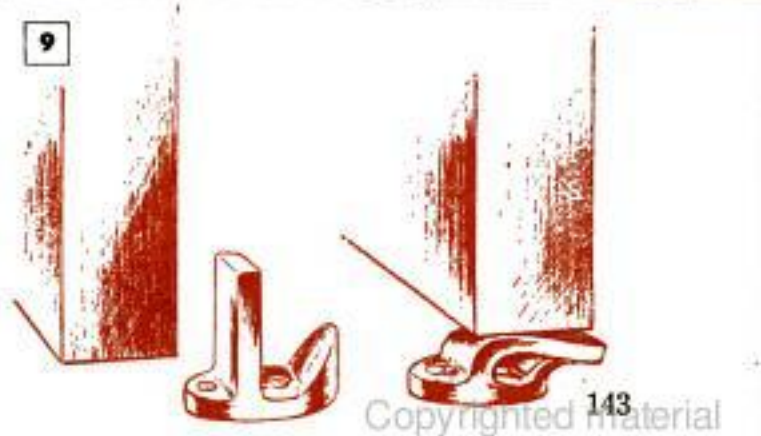
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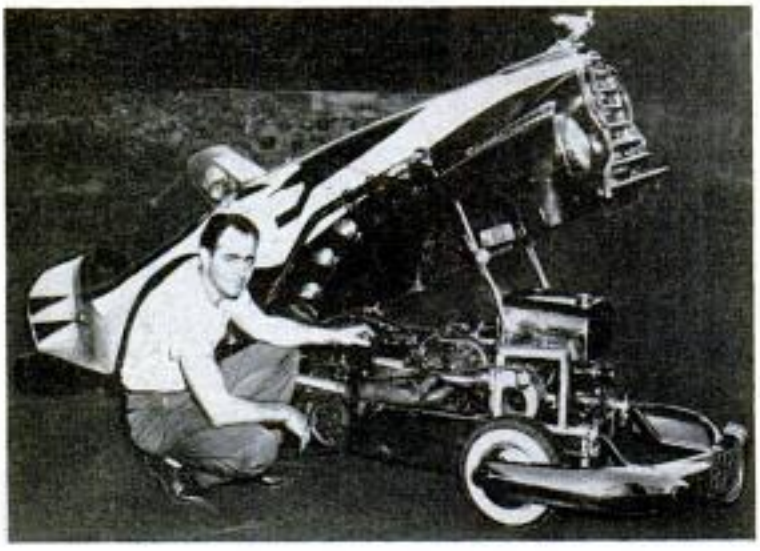
Fully equipped, the car can travel on the public highways, but its small wheels make fast driving dangerous



$10,000 "Toy" Car Will Go 70 M.P.H.

Nine years of spare-time work resulted in a "toy" automobile that Alfred De Franceschi of Torrington, Conn., values at $10,000. The tiny car is powered by a four-cylinder motorcycle engine and transmission. The tread is a scant 24 inches and there is no room for anyone except the driver. The car has a top speed of 70 miles per hour. To get at the engine, De Franceschi, a garage owner and mechanic, simply lifts the body.

Radioactive Isotopes Flown in Wing-Tip Compartments

British Overseas Airways Corp. photo

Radioactive isotopes of sodium are being shipped at savings of as much as 98 percent by loading them in wing-tip compartments instead of within the fuselage of aircraft. Stowed approximately 50 feet from the fuselage, the isotopes don't require the shielding of heavy lead containers and large boxes, reducing the weight of a single parcel from about 30 pounds to several ounces. Air transport is required because radioactive sodium's strength decreases by half in 14 hours. Most of it is being flown from the atomic piles at Harwell, England, to hospitals and laboratories in South America and South Africa. The isotope parcels are handled with three-foot "tongs."

Information not listed on articles in the index frequently is listed in the WHERE-TO-FIND-IT LIST, free to readers from Bureau of Information, *Popular Mechanics*, 200 East Ontario St., Chicago 11

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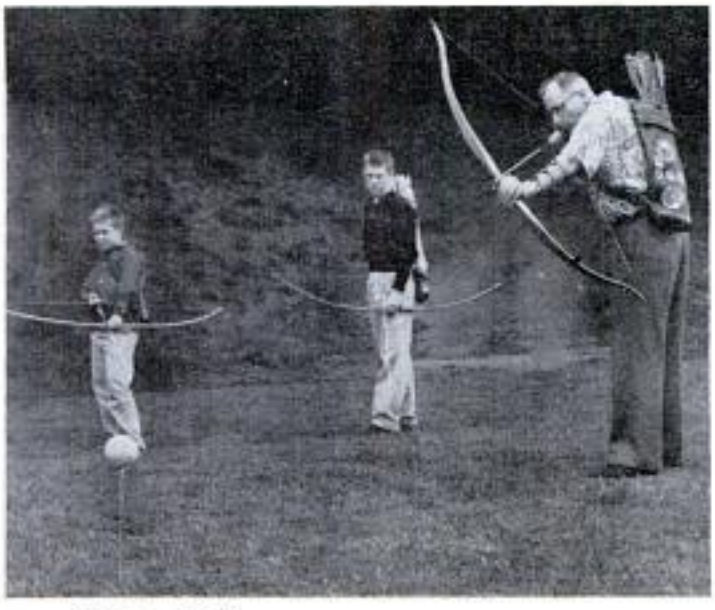
Archer prepares to "drive," using a fast, lightweight arrow which will go about as far as golf ball

Archery Golf

WHISTLING ARROWS take the place of golf balls in archery golf—a popular sport at Albany, Ore. Instead of driving a ball across the fairway, you shoot an arrow from hole to hole. Once it has landed on the green, you "sink the shot" by shooting a rubber ball off a near-by pedestal. A flight arrow is used for drives and a slow, heavily feathered arrow for approaches. "Putting" arrows have points which dig into the turf if a shot is missed. Archers take a 10-point handicap in games with standard golfers.

Arrows above are used for putting, driving, approach shots and putting, respectively. A powerful putt shot, below, sometimes pierces ball, but just dislodging it completes putt

After arrow lands on green, archer "putts" by attempting to knock a hollow rubber ball off a 12-inch wire pedestal



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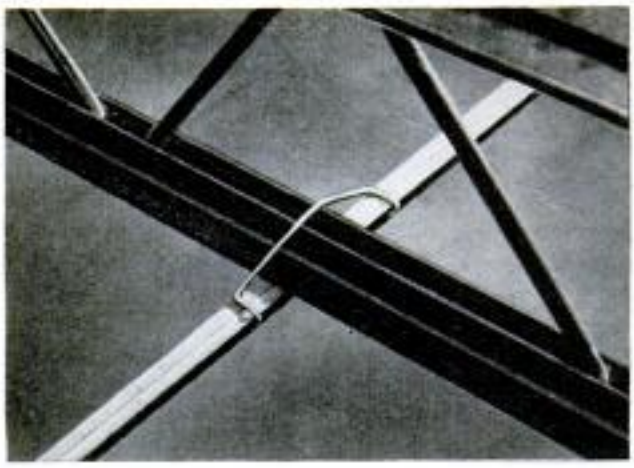


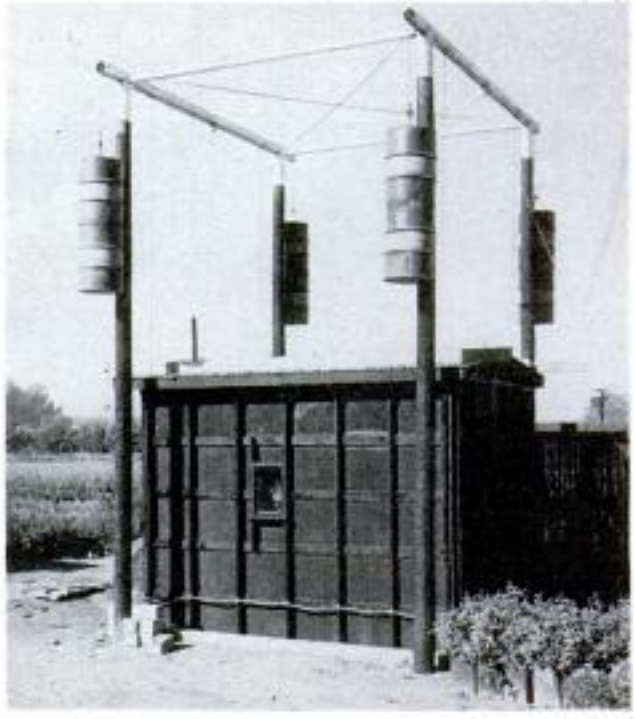
Splines can be attached with wire clips, above, to carrying channels or directly to bar joists. Tile is installed easily, right, without nails or adhesives

Slotted Support for Tiles

Slotted metal strips now available provide a fast, easy method for mounting acoustical ceiling tiles. The tiles lift out for quick access to any point above the ceiling for repair or alteration to plumbing, wiring or air-conditioning ducts. The metal strips or splines can be attached with wire clips to 1½-inch carrying channels in a suspended ceiling or directly to bar joists. The new method also simplifies lowering ceilings in existing buildings.

Barrel Weights Raise and Lower Doorless Fumigation Building

Rose bushes are fumigated at a California nursery in a doorless hut that is raised and lowered by weighted cables. When the house is lowered over a group of plants it sinks into a shallow pool of water beneath the roses, effectively sealing them off from outside air. Fine jets of water raise the humidity inside the hut, a poisonous fumigant is introduced and four electric fans circulate the spray. The black surface of the hut absorbs enough sunlight during normal weather to heat the interior to the required 80 degrees. At other times, the water beneath the plants is steam heated. The fumigant, methyl bromide, kills the organisms which cause red scale.



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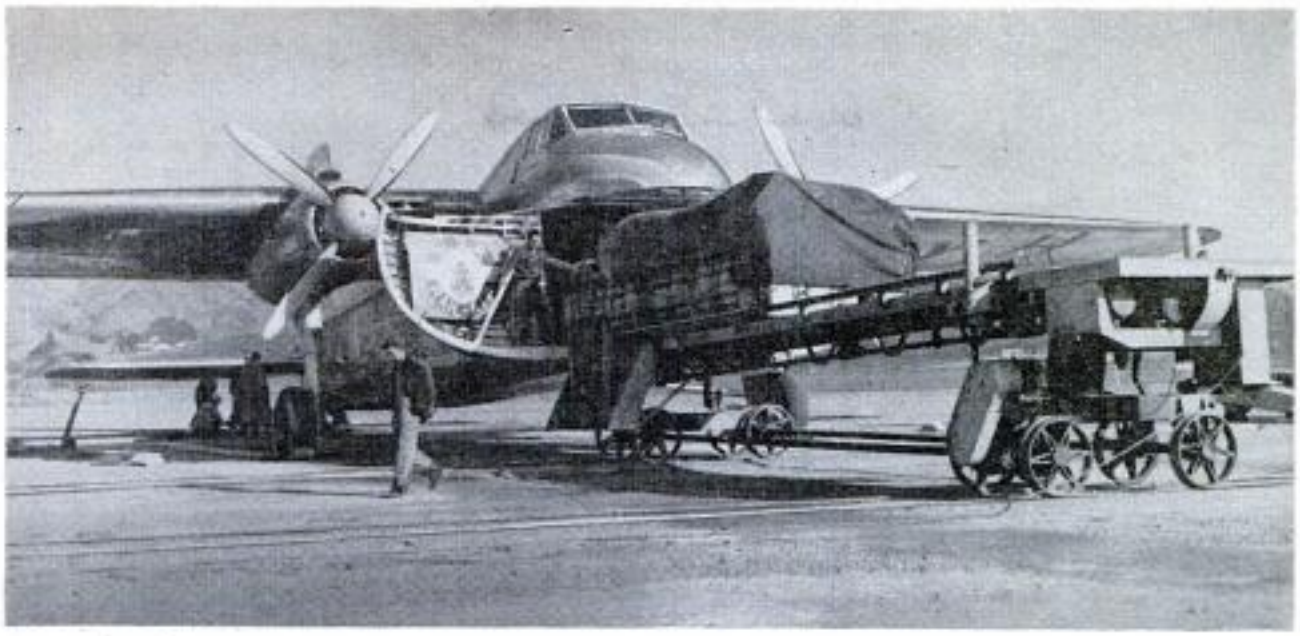
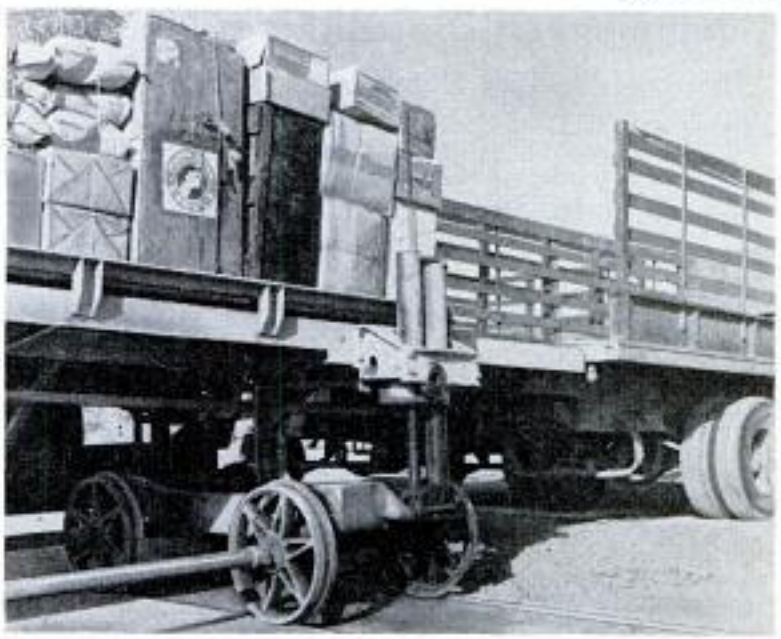


No manhandling is required as a cargo is winched from the traverser into the Bristol Freighter's hold

Belt on Wheels Loads Air Cargo

TWO AIRCRAFT comprise one of the world's busiest air-freight lines. Lifting some 18,000 tons of mixed cargo yearly over a 72-mile route across turbulent Cook Strait, the sea corridor dividing the North and South islands of New Zealand, Straits Air Freight Express (SAFE) can claim this distinction. Key to its efficient operation, with a turn-around time of just 10 minutes from touch-down to take-off, is the "cargon," a large tray with wheels on which loads to be lifted can be secured at any freight yard. The loaded cargon is carried by truck to the nearest SAFE air terminal. There it is winched on to a "traverser," a mobile conveyor belt which runs under its own power down twin sets of rails to where the aircraft stands with its nose doors open. The cargo is winched into the hold and the traverser stands by for the next load. Other refinements will soon be introduced into the handling technique, which was devised by T. M. O'Connell, operator of SAFE. Freight shippers are being urged to use trucks without trays, so that the cargon itself provides a combined tray and load that can be replaced by one withdrawn from an incoming aircraft. In the future, winches inside the plane will pull in the cargon.



Load and traylike "cargon," above, are handled as a unit. Tail of plane is lifted to get floor on level with incoming cargon

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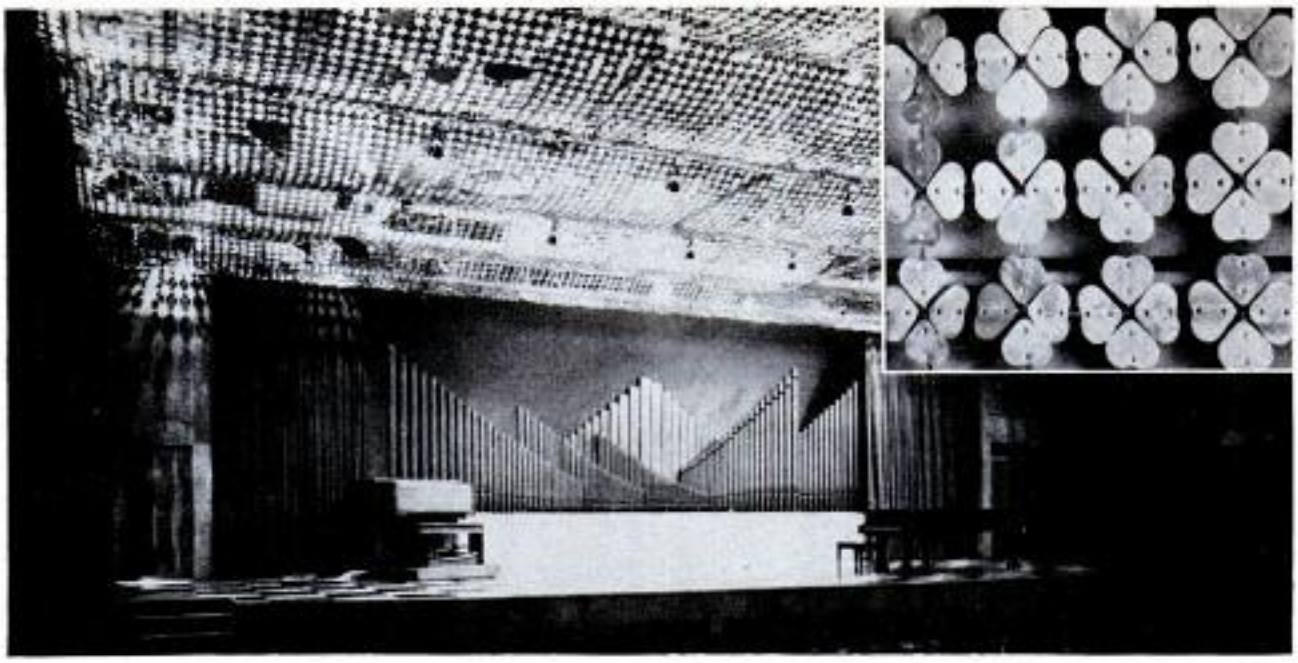

Aluminum Net Draped From Ceiling of Auditorium Stops Echoes

Thousands of tiny aluminum stampings form a sound-deadening net which is draped from the rafters of the new Fine Arts concert hall at the University of Arkansas. Mounted at a wide range of angles, they break up the sound waves into small waves which are scattered in many directions. Echoes are eliminated. Sprinklers and air-conditioning units above the net are partially hidden, but light streams through to illuminate the auditorium and cast strange shadows on the room below.

Elevator-Truck Speeds Servicing by Hoisting Meals to Airliners

Hot and refrigerated foods are lifted by a truck-borne elevator to big airliners flying in and out of the St. Louis terminal. It was specially built to replace the ladders, winches and small cranes formerly used to hoist food into fuselages as high as 15 feet above the ground. An elevating tower, six feet wide and seven feet high, rises 88 inches from a well at the rear of the food-truck van. Operated by two men, the new unit halves the time required to service 80 aircraft daily with meals.

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DON'T waste a shot on an angler just holding a string of fish. DO tell a story as is done in this photo

Let Your Camera

Bring Back That Vacation Alive

By Shep Shepherd

A TOURIST," some unknown wit once remarked, "is a person who drives thousands of miles to have a picture taken of himself standing by his car."

There is as much truth as humor in the jibe. A surprising number of vacationists return with photographs which they display to the tune of remarks like: "Here's one of Joe in front of the Washington Monument" or "Here I am in front of the White House." The big fault with such pictures is exactly that: someone is in front of the point of interest. And that someone is usually staring straight at the camera.

The first thing to settle about vacation photographs is whether you want pictures of the places you visit or of yourself. If the latter is true then the simplest thing to do is to go out in the back yard and take them. If you want to bring back vacation pictures

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DON'T make these mistakes: The tree "grows" out of the girl's head, her face is in shadow and the pose is not at all graceful. DO find a better angle and pose, fill in shadow with flash

DON'T forget that the sky can make or break some pictures. DO use a yellow filter to bring out the clouds. Be careful of overexposure when shooting pictures like this boat scene

that will be interesting to the people who see them and which you will enjoy later, there are some things to remember.

In the first place the interest is in the subject, not in the fact that you are standing by it or in front of it. This doesn't mean you or your companions shouldn't be in the picture. It does mean you should not be planted smack in the middle, grinning, waving or just plain staring at the camera. There is a legitimate reason, in fact, for having some person included in each picture and that is to direct the attention of the viewer.

The person in the picture should be looking at the point of interest, not at the camera. People viewing such a photograph instantly follow the subject's gaze to the point of interest.

I once illustrated this by placing a stuffed squirrel on the lower limb of one of a pair of trees and then photographed a friend who stood between the two trees and gazed into the branches of the one without the squirrel. Though the squirrel was in plain view, not one person who saw the picture noticed it. Everyone studied the tree at which my friend was looking, trying to discover his point of interest. Put this to use in your pictures. Don't photograph an interesting scene behind someone's back. Pose him at one side of the picture facing the point of interest. Almost any photograph is improved by the addition of a human figure, provided the viewer's attention is not distracted.

Vacations are often damaging to a camera, so take care. Obviously it must be protected from the rain or at least wiped dry immediately after being wet by the rain. Don't hesitate to use the camera in rainy weather, however, for some interesting pictures can be taken then.

Especially guard against salt-water spray and fine sand which can ruin delicate shutter mechanisms. Carry some lens tissue to wipe the lens occasionally. Keep it free of dust and fog. Never wipe it with a harsh cloth or paper. In cold weather check the lens when the camera is brought indoors. Sudden temperature changes cause condensation to fog the lens.

Never leave a camera, especially when it contains film, on a car seat

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or rear-window ledge where the sun can reach it. The sun's rays can ruin the film. The emulsion can't stand extreme heat. Don't put a camera in the glove compartment in hot weather. Again the heat may spoil the film. Keep it in a case on the floor of the car or cover it if it is left on the seat.

There is one worth-while extra that can be added to every camera for outdoor shots. It is a sunshade containing a yellow filter. No other one accessory will do so much for your pictures. The sunshade enables you to shoot almost directly into the sun. The yellow filter darkens the blue sky and emphasizes any clouds that are present. Without a filter the sky portion of a scene may be greatly overexposed and the result is an expanse of blank, white paper where the sky details should be. The yellow holds back the blue light rays, preventing overexposure in that portion of the negative.

The best time for outdoor vacation pictures is before ten o'clock in the morning and after two o'clock in the afternoon. During these hours the sun's rays are striking from an angle that gives better lighting. At high noon, with the sun directly overhead, dark shadows destroy contours and features, especially under hat brims and around the eyes.

If your vacation includes a visit to relatives or friends you will want to take pictures of them. In this case the person is the main point of interest or at least of equal interest if his home and surroundings are shown too. The rules about looking at the camera still apply. Have Aunt Mary or Uncle Ben posed in some natural manner, preferably doing something with their hands. Picture Aunt Mary cutting some flowers or feeding the kitten. Uncle Ben could be watering the lawn or lighting his pipe. Any ordinary, simple act which they do lends interest and does away with meaningless, staring-at-the-camera poses.

If Aunt Mary and Uncle Ben have children don't, for heaven's sake, let her dress them up in their Sunday clothes, wash their faces and slick down their hair. Take them as they are 99 percent of the time for pictures you will treasure later.

DON'T act as though monuments are made for you to use as backgrounds for portraits. **DO** look at the statue, pick an angle that eliminates distracting background and use filter for sky

DON'T forget some candid shots of atmosphere. **DO** remember that here each detail is unimportant, it is the total impression of trees, unposed campers and their equipment that counts

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DON'T take a picture without looking around for the most interesting viewpoint. DO include some activity in scenic shots. Without the boat, this would be a dud

DON'T shoot with the sun behind your back all the time. DO use a lens shade and shoot into the sun for dramatic backlighting, especially on the surf

Give attention to the surroundings and especially to backgrounds when you photograph someone. If you are using black-and-white film, remember that it doesn't see what your eyes see. Greens, blues, reds, grays, tans and several other shades may all photograph the same, depending on the type of film used. A yellow dress, for instance, will appear white and if taken against a white building, will lack definition and form. In general, use a dark background with light-colored subjects and a light background for dark subjects.

In color photography avoid matching colors in subject and background whenever possible, though it is less important here since even a slight variation in shades will give separation.

A common fault of many snapshots is improper posing and you end up with a tree, pole or vine growing out of someone's head. When you pose Aunt Mary by a rosebush she appears happy and pleasant to you, just the picture you want. The camera sees that too, but it also sees the telephone pole just beyond and the old newspaper that has blown up on the lawn. Study the background and surrounding area through the view finder before snapping the shutter. Remove any distracting objects or change your angle to eliminate them.

A vacation trip usually follows a full schedule, especially when much travel is involved. This means that you will want to shoot many subjects when the light is wrong because you haven't time to wait hours for it to change. Flash is the only answer to this problem and it serves a multitude of other purposes, too. With it you can shoot in the shade, take out shadows in the sun, take pictures inside buildings and outdoors at night.

The flash bulbs commonly called "peanuts" are surprisingly powerful. A dozen of them can be carried in a coat pocket.

(Continued to page 228)

DON'T ignore sunsets because you have a low-cost camera. DO rest it on a bench, hold shutter open five seconds

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Baby Climbs Mountains in Papoose Fashion

Assisted by the ingenuity and strong back of his father, one-year-old Quentin Smith has scaled many of New England's most rugged peaks. His father, Howard P. Smith of Bennington, Vt., mountain-climbing enthusiast, bent the supporting arms of a car seat for babies to a closer fit to his shoulders and added two pads from an old haversack. He looped a rope around his chest and the seat for added safety.

Barium-Iron Magnets

Permanent magnets that appear to be made of black pottery are now going into some magnetic-deflection TV tubes. Made by baking a mixture of powdered barium and iron oxide, the fused substance resists demagnetization in high-frequency fields to insure sharp and uniform focusing in television tubes. No critical materials such as nickel, cobalt, chromium or tungsten are involved in its manufacture.

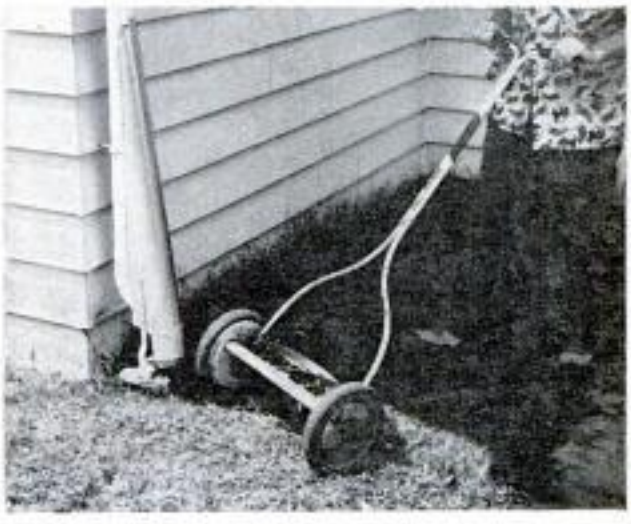
Farmers Live Dangerously

see Letter

Farming is one of the most hazardous of all occupations, according to an American Medical Association report. Farming has the third highest death rate among the major industries, surpassed only by mining and construction. In 1952, 62 out of every 100,000 farm residents lost their lives in accidents. The association points out that most farm accidents are preventable, usually by the person who is killed or injured.

Folding Downspout Extension Tips Up Out of Way When Rain Stops

Rain water rushing out of the downspout lowers a folding downspout extension which tips up again once the rain has stopped. Counterweights make action automatic. The folding extension does the same job as an ordinary trough but won't trip anyone or obstruct mowing. Made of aluminum, it is durable and rustproof.



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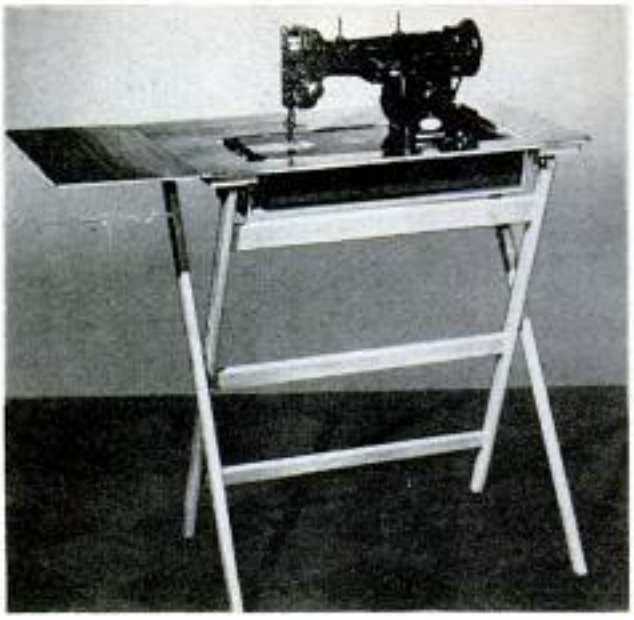

Folding Sewing-Machine Table Holds Portable in Recessed Top

In a well recessed in its top, a folding utility table holds almost any portable sewing machine. When the machine is removed, a panel fits over the well to leave the table top free, or can be attached to end of the top for extra space. The legs, sturdy enough to support a load of 150 pounds, open automatically when the top is raised from the folded position. Height of the table is a convenient 29 inches.

Plastic Patching Kit

Plastic patching that seals, mends, waterproofs and insulates in one operation now comes in kit form for home use. The fabric will stick to any surface. Rusted downspouts, damaged auto fenders, ripped awnings, cracked wood paneling and leaky boats can be repaired with it. A patch cut from the roll is dipped in solvent and pressed on with the hand. Drying hard in little more than an hour, it can be sandpapered to a feather edge and painted. It is not affected by gasoline, oil or water.

Beam of Hollow Ceramic Tile Supports Heavy Load in Tests

Lightweight beams of hollow ceramic tile can support enormous loads and might replace expensive steel in some types of construction, research at the University of California at Los Angeles indicates. The low-cost building blocks are held together by a cable or rod running through their centers, with pressure exerted by tightening bolts at the ends. This prestressing clamps the ceramic units together and asbestos gaskets are used between the tile to help distribute pressure. A tile beam 48 inches long, prestressed in this way, has supported loads up to 1800 pounds without failure. The research group points out that the ceramic materials are resistant to corrosion and require no painting because the tile can be glazed in any color desired.

X Rays Taken Without Machine

Dentists in the future may take X-ray pictures without X-ray machines, according to a report from Ohio State University. A wooden stick with radioactive material rounded on the end of it like a match head will be held against the tooth. This will produce a picture on an X-ray film packet held in the appropriate position.

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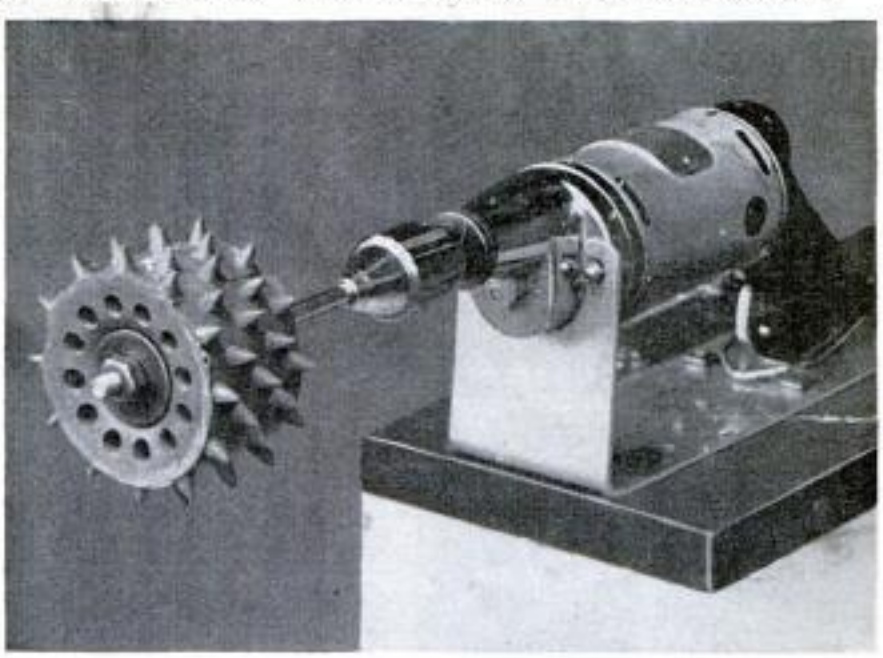
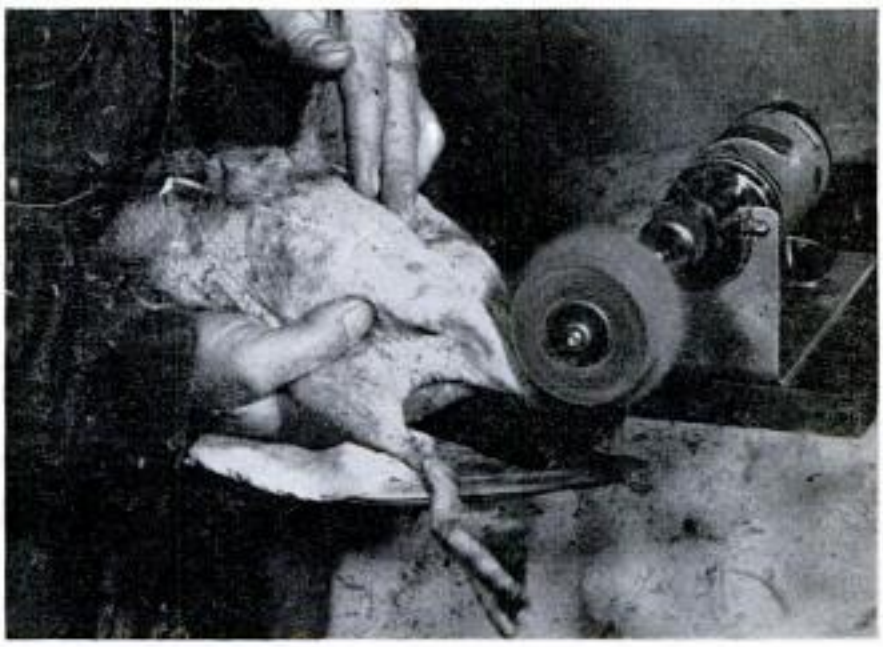
Hand-Drill Attachment Defeathers Game Birds in Short Order

Eighty whirling fingers on a mechanical game-bird plucker enable a hunter to defeather a duck in four minutes. The two-inch rubber wheel can be used with any electric hand drill. The rubber fingers remove large feathers as well as the down without breaking the skin. Plucked feathers fall at the base of operation rather than flying in all directions.

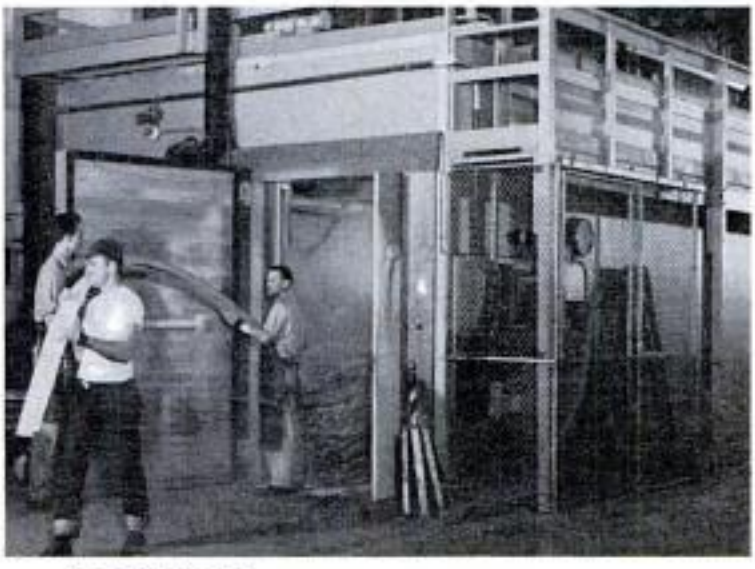


Does Earth Have Tiny Moons?

Tiny moons ranging from one foot to more than 100 feet in diameter are believed by some scientists to be circling the earth at distances of 10,000 to 240,000 miles. Astronomer Clyde Tombaugh, discoverer of the planet Pluto, has started a systematic search for these objects with a camera and a special eight-inch telescope. Sponsored by the Army Ordnance Corps at Lowell Observatory, Flagstaff, Ariz., the project may supply new data regarding the origin of the solar system and help furnish the probable cost of establishing stations in space.



Giant Ice Box Keeps Metals Soft Between Steps of Fabrication



Larger than two box cars, a refrigerator at the Lockheed aircraft plant freezes metal plane parts to keep them soft—holding their molecules in suspended animation—between two steps in fabrication. It makes shaping easier and also reduces breakage. The 5000-cubic-foot icebox can cool 2500 pounds of aluminum from room temperature to minus-20 degrees Fahrenheit within two hours.

¶Two and a half billion pounds of plastics are used each year in the United States; by 1975 the annual demand is expected to reach 9,000,000,000 pounds.

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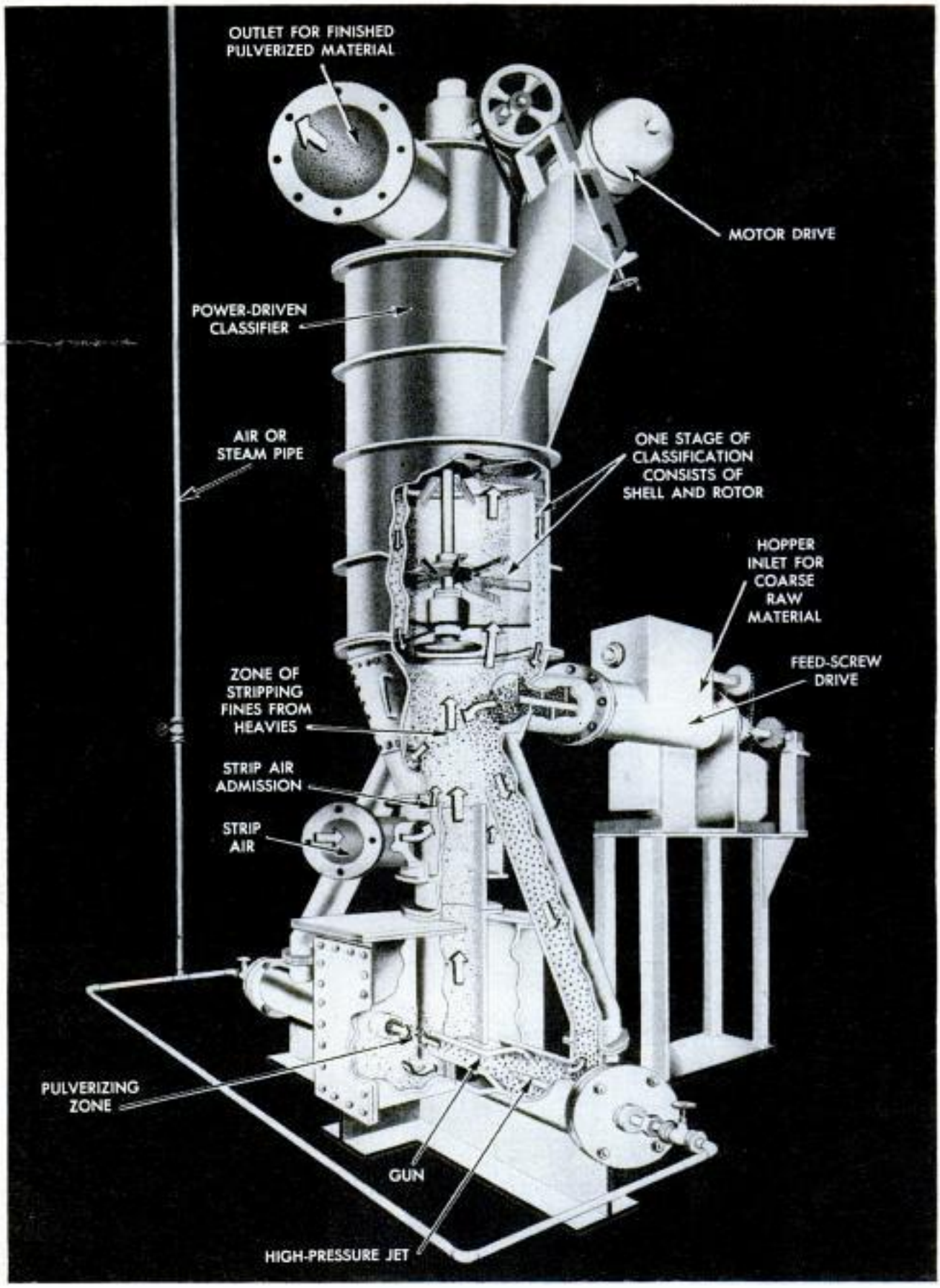

Jet Pulverizer Materials — from talc to coal — fed into a new jet pulverizer are thrown against each other with such force that they become powder. As the material feeds into the machine it is dried and its dust blown upward. The coarse material descends to two guns, where it is mixed with compressed air, steam or gas and jet-propelled from opposing nozzles. The resulting powder is blown upward to the classifier where coarse particles are sorted out for return to the guns, while the finished materials exit through an outlet in the top.

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Radio TELEVISION Electronics

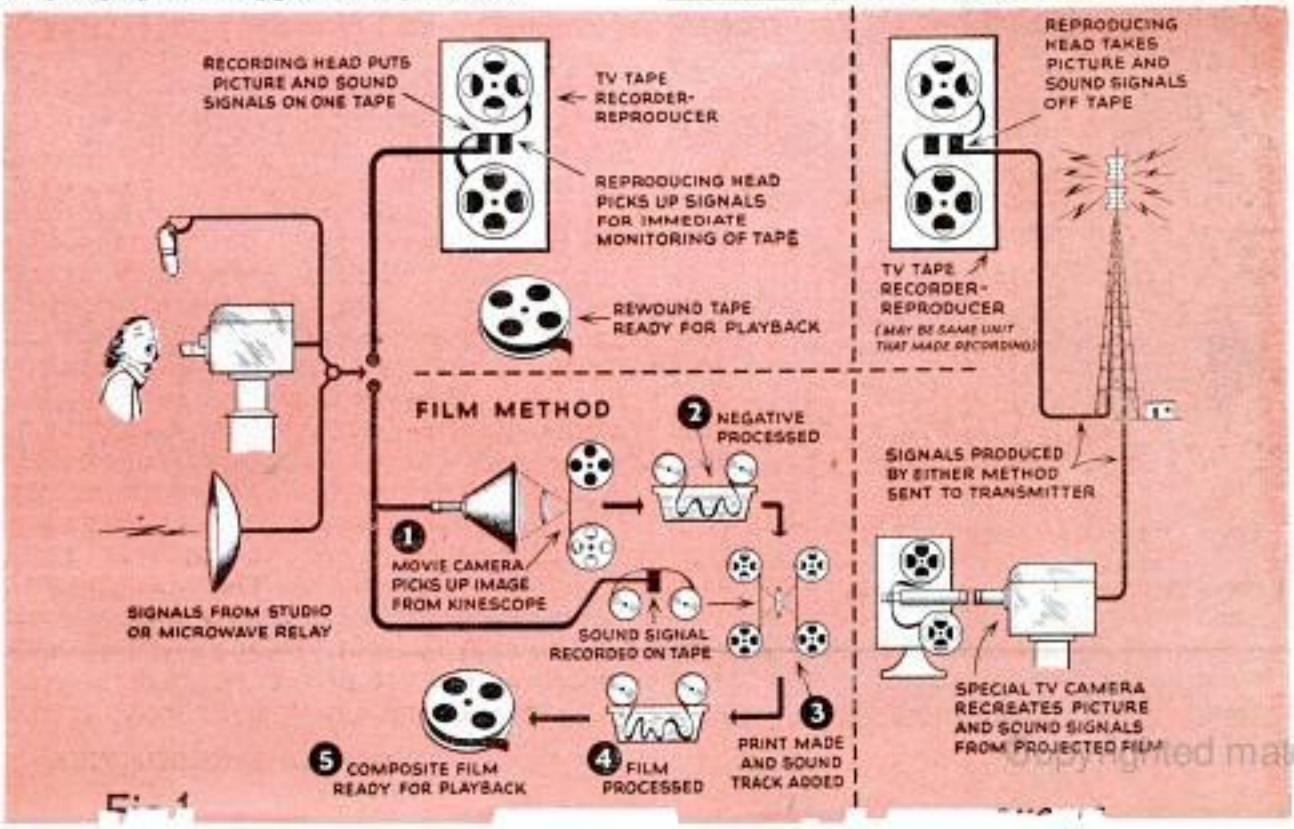
COLOR TV ON TAPE

RECORDING of television pictures on magnetic tape in color, as well as in black-and-white, was demonstrated recently for the first time by the Radio Corporation of America at Princeton, N. J., laboratories.

This new method of recording sight is similar in basic respects to tape recording of sound. It is claimed that motion pictures in color and black-and-white will be produced quickly and economically without photographic development or processing. Although the electronic video tape equipment is still in the development stage, the basic principle elements of the system have been tested and confirmed.

It is estimated that the cost of recording a color-television program on magnetic tape would be only five percent of what it would cost to put it on color film since the tape can be reused. The pictures can be viewed the instant they are taken, and an unlimited number of copies can be made.

Diagram Fig. 1 illustrates steps in recording and reproducing a television program by the RCA video tape method as compared to the typical film methods used in broadcasting station today. Photo A shows engineer Joseph Zenel displaying an experimental tape-recording head unit, the heart of video tape equipment. The laboratory equipment appears in photo B.



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✱ ✱ RADIO HAMS STAGE

HIDDEN TRANSMITTER HUNTS as conducted by certain groups of radio amateurs operating with mobile equipment, is something like "riding to the hounds" except that autos are employed instead of horses; mobile and portable receivers play the part of dogs, and the "fox" is a well-hidden ham transmitter.

The idea of hunting with radios is said to have started in Owensboro, Kentucky, in the late twenties with a hunt sponsored by the Kenrad Lamp and Tube Company, a manufacturer of radio vacuum tubes. The idea has since spread to various areas in this country and several foreign countries.

Donald F. Hayworth W9FYT, an employee of Western Electric is the voluntary historian and secretary of the Chicago Midwest Direction-Finding Club. He keeps records of all the hunts; the number of teams, the hunt committee and the names of the winners. The club does not have officers or dues, the members make their own equipment and have prevailed on local radio-parts manufacturers to give special prizes to the winners.

Standard equipment for a team is a short-wave receiving set installed temporarily in a car. The set is equipped with a "loop" or directional antenna mounted on the side of the car as illustrated in photo D. This loop is operated through one of the windows and as the loop is turned the code signals from the hidden transmitter gets stronger, or weaker, depending on the direction of the transmitter. The operator has a compass scale attached to the loop turning-rod from which he gets the exact bearing of the signal. Thus he can direct the driver of the car as to what roads to take. The receiver installation inside the car, appears in photo C.

Once a team set up a transmitter in a rowboat and anchored it out in the middle of Fox Lake, in Lake County, Ill. A typical hideout for the transmitter in a woods or forest preserve is shown in photo F. Branches of trees were added to camouflage the equipment. For each hunt, the admission fee of from one to two dollars, per person, makes up the prize money after expenses have been deducted. For long treks away from the car, the members have small loop receivers called "snifters" powered with flashlight batteries. Earphones are plugged in, and the operators can pick up the signals from the hidden station up to half a mile away.

Many of the men have their wives or girl

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HIDDEN-STATION HUNTS

friends pack lunches and come along on the hunts. The women seem to enjoy the sport as much as the men, and are frequently seen running through the woods with snifters. Photo A shows the latest thing in a snifter hair do. By pivoting her body the young lady rotates the built-in directional loop; this headdress is complete with a headlight for night hunts. Photo B shows Don Hayworth W9FYT, trying to figure the best way out of some dense foliage and, in photo E, one of the hunters pulls up his trousers legs and starts wading towards the hidden transmitter evidently located on the opposite bank of the stream. They wade through creeks and swamps, swim streams or slide down snow-encrusted banks, always watching for an antenna wire hanging from a tree. They have run into electrified fences in the dark, been chased by bulls on farms and have withstood the strain of driving in heavy Sunday traffic to achieve their goal. It may seem crazy, but it is really a lot of fun.

A recent article by R. B. Kuehn WØHKF, in the radio amateur's magazine *CQ*, described the 10-meter equipment used in "Hidden Transmitter Hunts" in and near St. Paul, Minn. He states that "while it takes at least two persons to play the game, the maximum number that can take part has never been determined." ★ ★ ★

D

E

F

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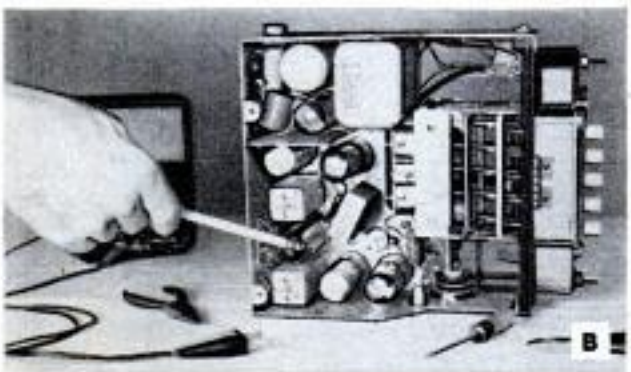
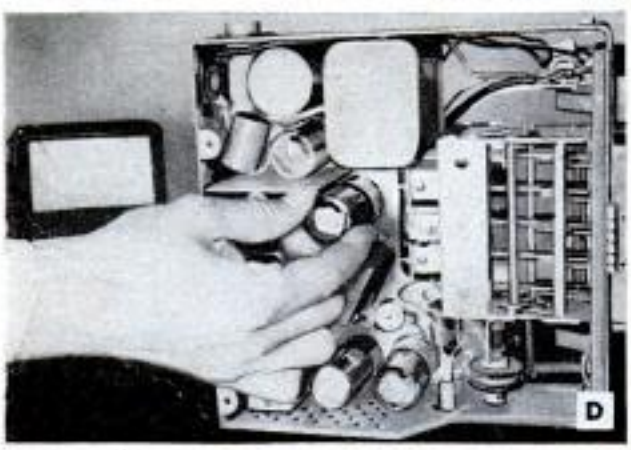
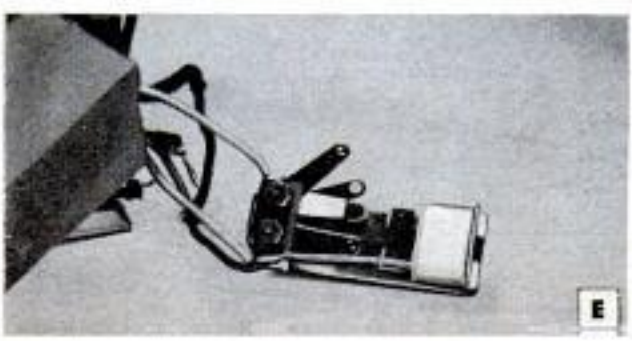
How to Check Your Car Radio

A


B

C


D


E

WELL-MADE auto-radio receivers give good service over long periods of time. However, like all electronic devices, they eventually require checking. Many emergency repairs can often be made without expensive test equipment.

Disconnect the battery lead, antenna and speaker plugs and place the set on the floor of the car as illustrated in photo A. Now reconnect the plugs and antenna lead, and turn the set on. If the set has been inoperative, and the pilot light is out, check the fuse, Fig. 1, for poor connection or burn out. Also check the battery connection at the ignition switch, especially if your set has been noisy and cuts in and out. If these points are clear, but the set is noisy, turn the chassis up on its side, as shown in photo B, and check for a defective tube. Tap each tube lightly with a pencil. A defective tube will create noise or operate intermittently.

If the tubes seem okay but the trouble is still present, remove the bottom cover and press gently against parts, wires and tube-socket connections with an insulated probe or pencil as indicated in photo C. This will often show up poor connections, badly soldered joints and defective parts. Resolder poor connections with rosin-core wire solder. Push down each tube in its socket and move it around gently as illustrated in photo D. Poor socket connections account for much trouble. If the set lights up but does not work, the vibrator may be stuck. Tap it lightly with a screwdriver to check. Remove the vibrator unit from its can, see photo E, and check for burned points. If they are badly burned or pitted the entire vibrator unit must be replaced. Before installing the new unit, have the buffer condensers in the set checked. Noise is often traced to improperly installed whip antennas. See Fig. 1. Raspy speaker operation is often caused by a loose speaker cone.

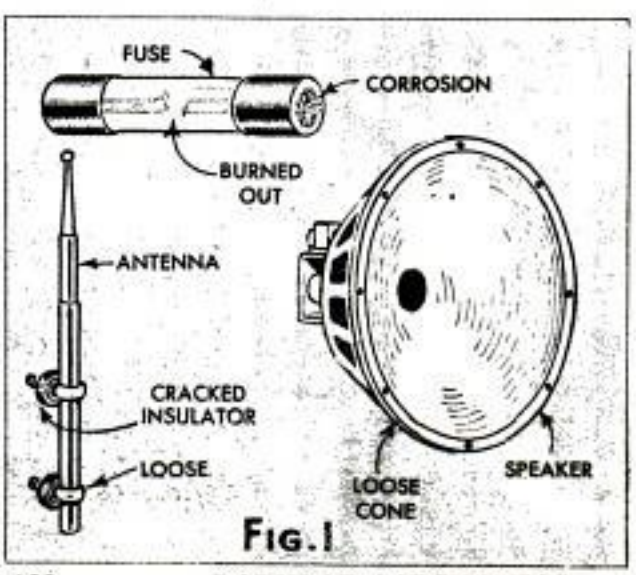


FIG. 1

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Rep: WTM-55

the POPULAR MECHANICS CRAFTSMAN

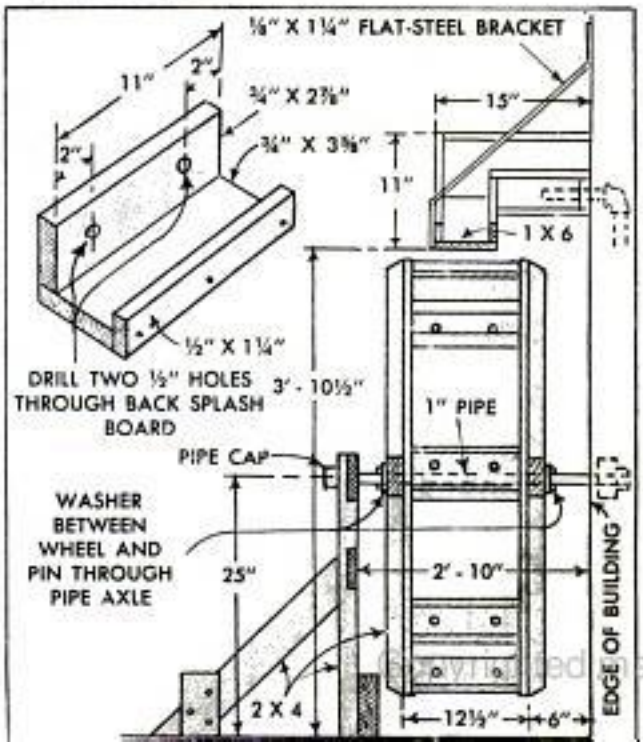
X716

TOOL SHEDS *for your GARDEN*

By John Bergen

FOR THE HOMEOWNER with a little backyard space to spare, the picturesque tool shed illustrated above serves both a useful and decorative purpose. It stores garden tools, lawn mower, hose and fertilizer right in the garden area and keeps the clutter out of the garage or basement. Besides that, with its water wheel, and possibly a small garden pool, the shed forms a pleasing rustic background for a variety of plantings. The lean-to shed shown on page 164 is built against the back or side of a garage. This type of structure may be preferred for reasons of space or economy and it, too, could be fitted with a water wheel if desired.

Construction of the tool shed is detailed on the following page. The concrete foundation and slab floor are poured at the



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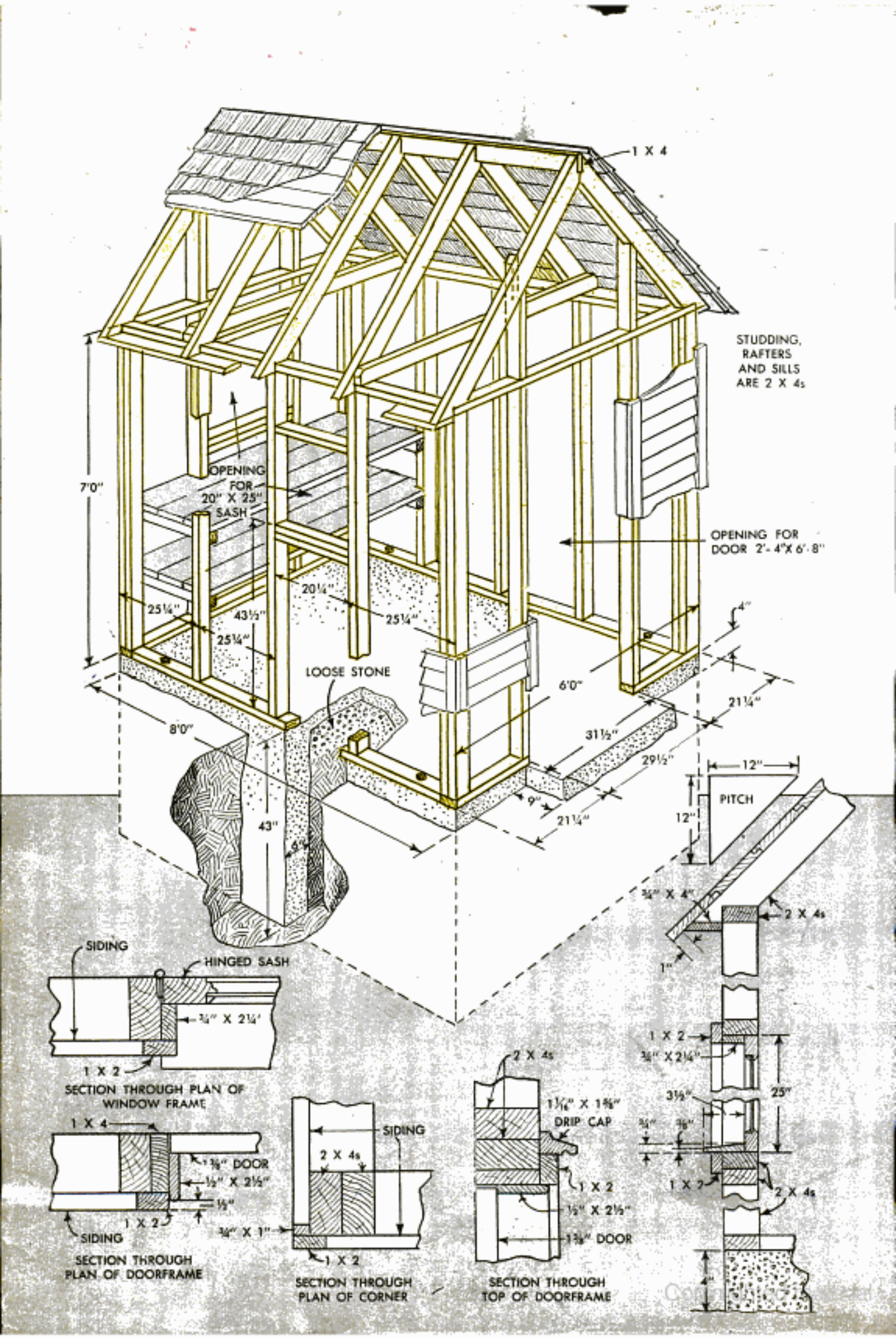
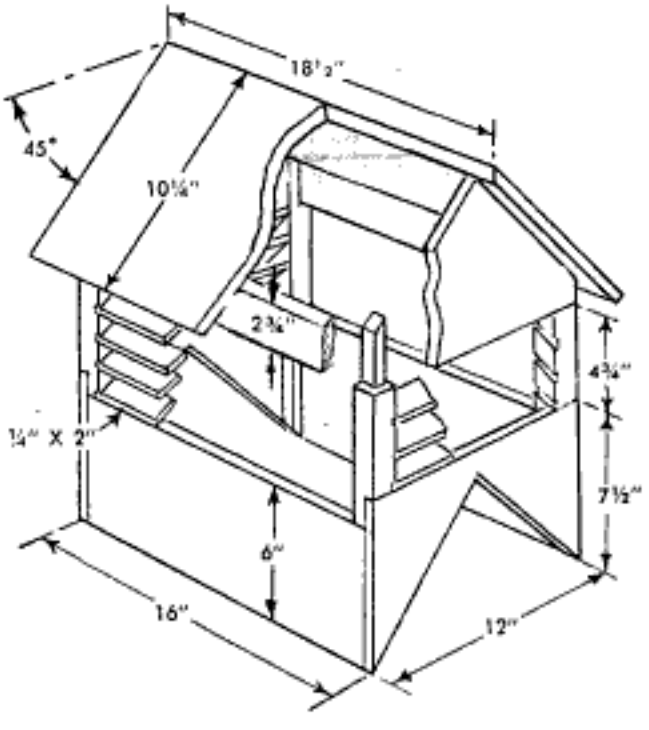
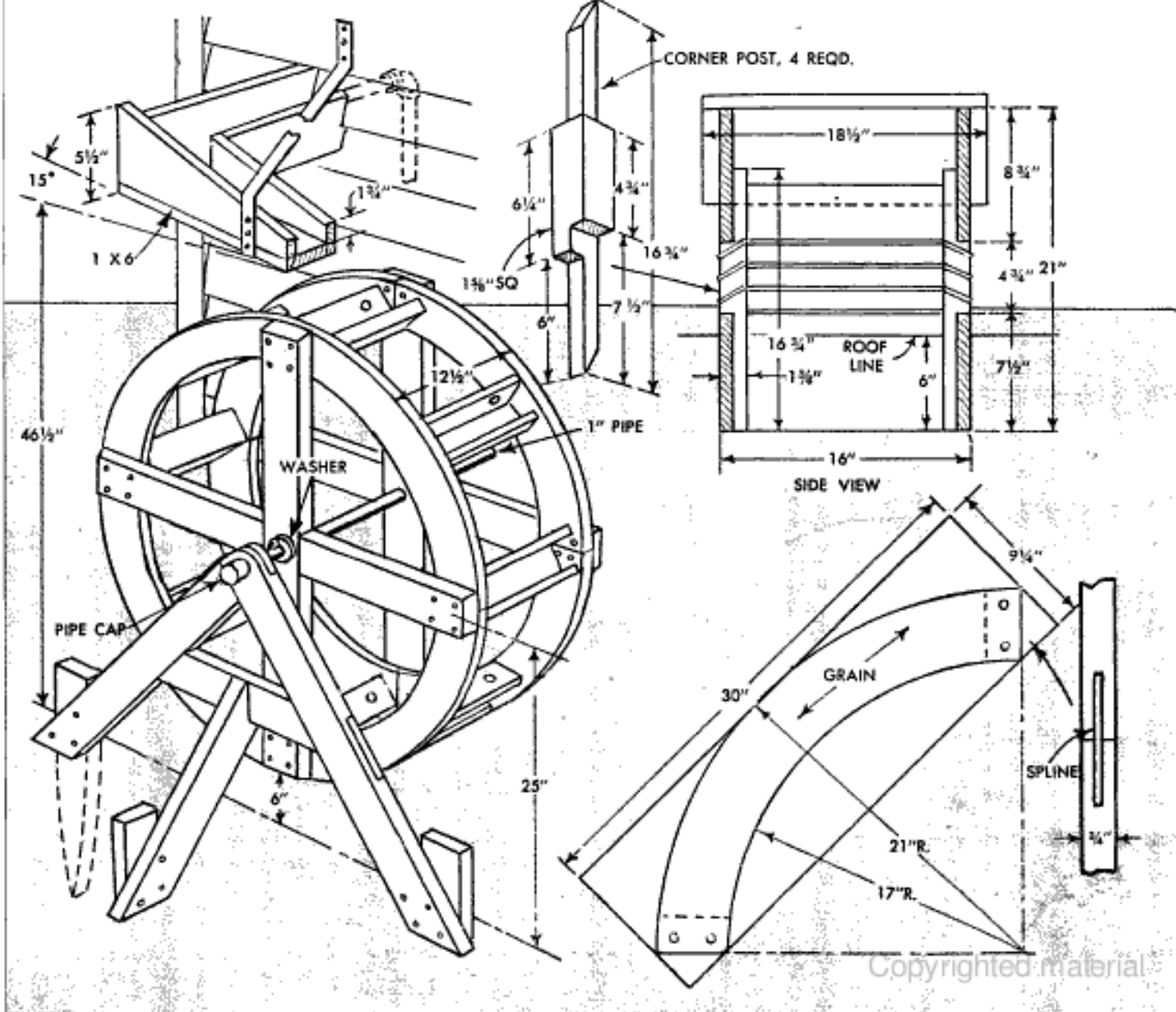

1 X 4
STUDDING, RAFTERS AND SILLS ARE 2 X 4s
7'0"
OPENING FOR 20" X 25" SASH
OPENING FOR DOOR 2'-4"X 6'-8"
20¼"
25¼"
43½"
25¼"
25¼"
LOOSE STONE
4"
6'0"
21¼"
31½"
29½"
8'0"
9"
21¼"
43"
4"
12"
PITCH
12"
¾" X 4"
2 X 4s
1"
SIDING
HINGED SASH
¾" X 2¼"
1 X 2
SECTION THROUGH PLAN OF WINDOW FRAME
1 X 2
¾" X 2¼"
3½"
25"
¾"
⅜"
1 X 2
2 X 4s
1 X 4
1⅜" DOOR
½" X 2½"
½"
1 X 2
SIDING
¾" X 1"
SECTION THROUGH PLAN OF DOORFRAME
SIDING
2 X 4s
1 X 2
SECTION THROUGH PLAN OF CORNER
2 X 4s
1¼6" X 1⅝" DRIP CAP
1 X 2
½" X 2½"
1⅜" DOOR
SECTION THROUGH TOP OF DOORFRAME
4"

same time, the foundation being deep enough to extend below the frost line. The studding, rafters and sills are 2 x 4s. Note that the studs are not spaced uniformly, but are located to provide the necessary openings for the two hinged sash and the door. The sectional details show the framing for the door and windows as well as construction of the walls and roof. A handy workbench and shelf along the rear wall of the shed is formed by nailing lengths of 2 x 8 or 2 x 10 between cleats fastened to the studs. Although narrow beveled siding is indicated in the detail, it is best to use a siding that will match the garage. The louvered cupola is especially neat if made with the tenoned corner posts as detailed. However, to simplify construction, it can be built with straight corner posts beveled at both ends and grooved for the louvers.

The water wheel requires eight segments bandsawed from 1-in. lumber as in the lower right-hand detail. The perspective detail below and the end view on page 161 give the dimensions and show the basic





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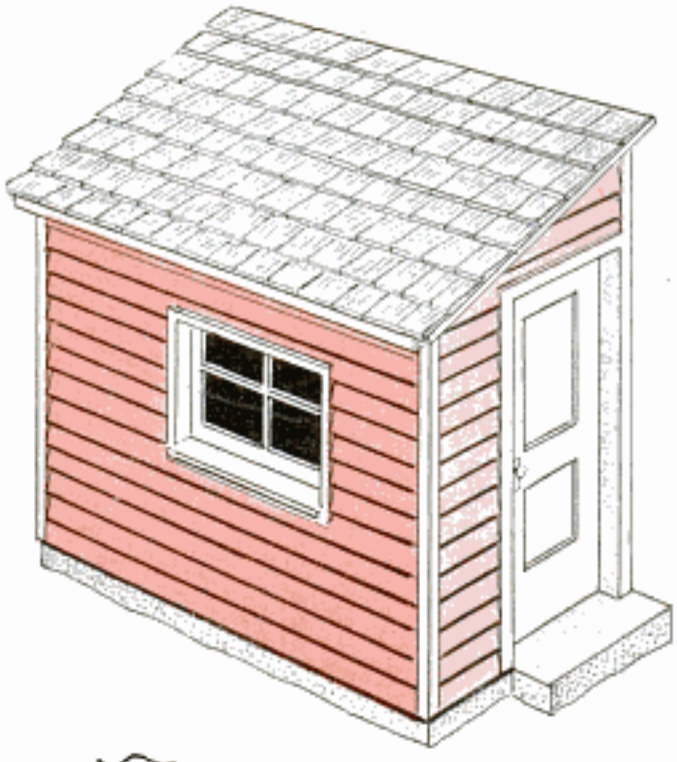
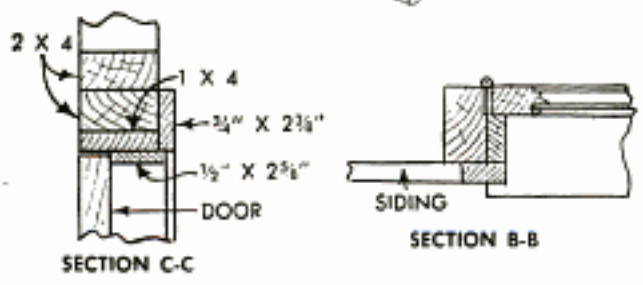
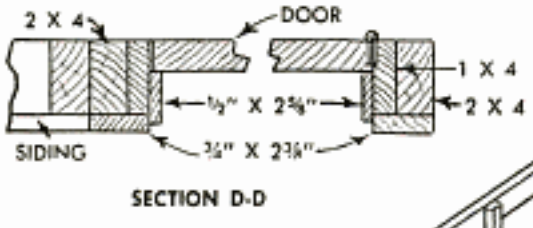


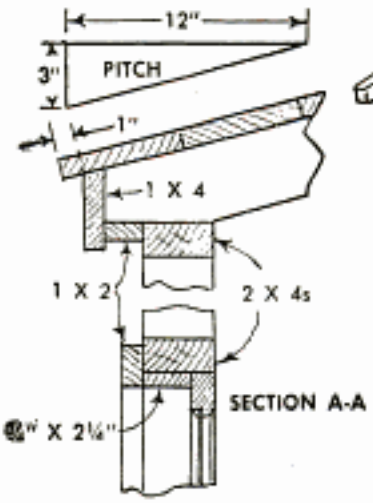
construction of the wheel. The ends of the bandsawed segments are butted together and joined with a spline and bolts. The latter also fasten the segments to a half-lapped X-brace of 2 x 4s to form each side of the wheel. A length of 1-in. pipe serves as the wheel axle, one end of the pipe passing through the side of the shed and the other end through a wooden bracket staked to the ground. Short sections cut from oversized pipe can be used to provide bushings for the axle. The eight buckets which are nailed between the sides of the wheel are simple wooden troughs. Two holes are drilled in the back of each trough to drain off excess water as the wheel revolves. Water is fed to the wheel by piping it to a wooden spout which is fastened to the side of the shed directly above the wheel. A spigot and garden-hose reel can be installed conveniently inside the shed.

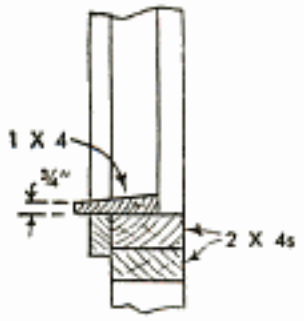
If you want the atmosphere of the water wheel without actually piping water to the shed, a dummy wheel can be built in the same way, using a length of dowel to simulate an axle and assembling the wheel to the side of the shed so that it is stationary. The impression of a pool can be achieved with a rock garden.

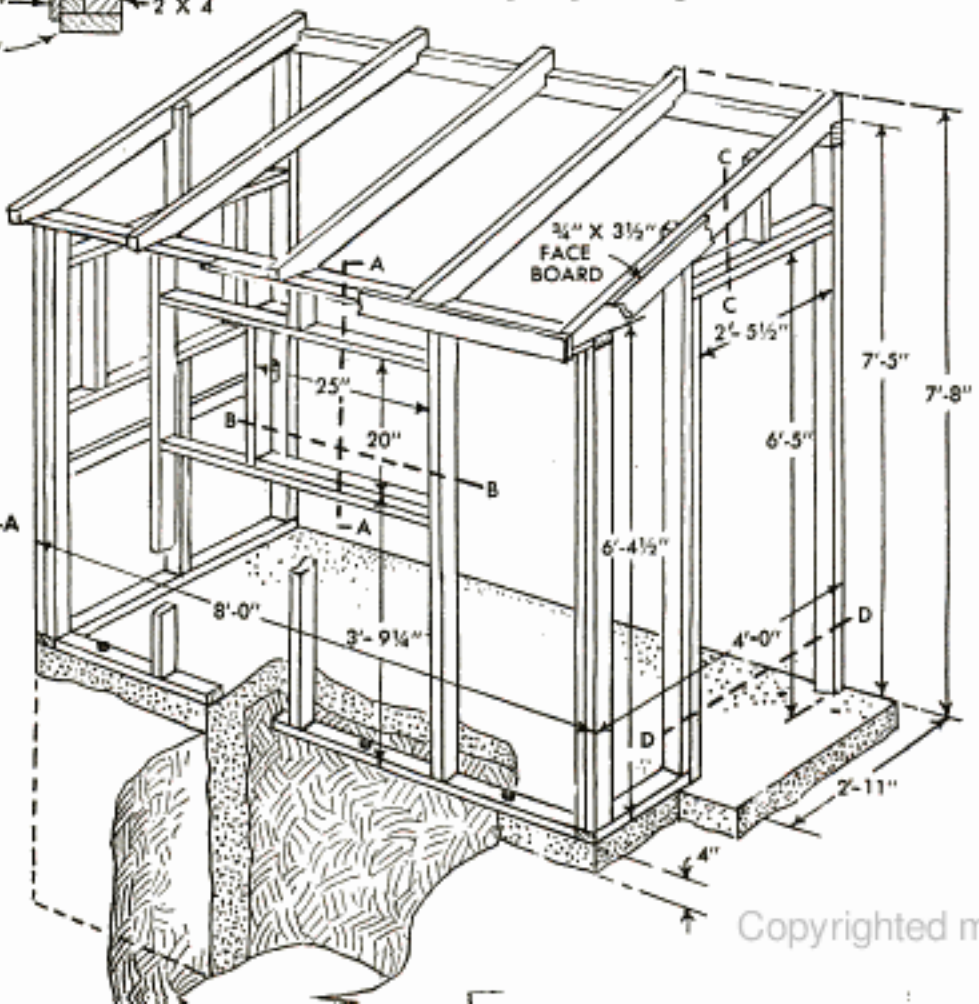
The construction of the lean-to shed is similar to that of the first shed. Obviously, it should be given an exterior that matches the garage against which it leans. For extra convenience, a door might be installed in the wall of the garage, giving entry to the shed from garage and garden. ★ ★ ★











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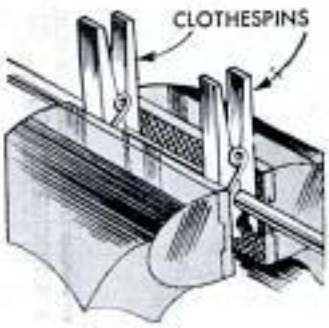
Opened Drawing-Instrument Case Becomes Convenient Stand

When using a mechanical drawing set the case can be supported at a convenient angle for selection of the instruments by folding the cover as shown in the photograph. Folded in this way, the edge of one flap rests against the snap fasteners on the other and, in this position, the weight of the case will hold the flaps in place.

Auxiliary Jaws on Vise Provided by Clothespins

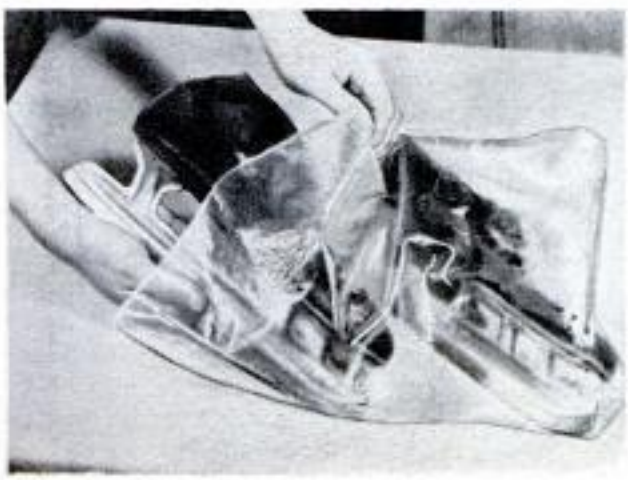


If you have occasion to grip small pieces of wood such as dowels in a machinist's vise, use a couple of spring-type clothespins as indicated. These will protect the work against the knurled faces of the vise jaws and will not fall every time the work is removed.

Hugh Lineback, Stillwater, Okla.

Ice Skates Protected From Rust When Stored in Plastic Bag

When storing ice skates for the summer, put them in a plastic bag of the type used for storing fresh fruits and vegetables in a home refrigerator. The bag will not only prevent rust from forming on the blades, but will prevent the shoe leather from drying out.—Benjamin Nielsen, Aurora, Neb.



Box Pivoted Under Boat Seat Keeps Tackle Dry

Especially handy during a fishing trip in an open boat, a box pivoted beneath one of the seats will provide a dry, convenient storage place for tackle, tools and even a light snack. When the box, which may be constructed as wide as the seat board itself, is positioned parallel with the seat, the latter serves as a cover for the box. The box simply is turned at right angles as indicated for removal of the contents. Separate compartments for tackle may be added if desired.—Hi Sibley, Nuevo, Calif.

Film Spools Provide Reels For Spare Fishing Line

Two or three empty film spools will serve ideally as reels for spare fishing line or for short pieces of line that are to be kept in a tackle box. Almost any camera shop will supply the spools, in most cases, simply for the asking. —H. Leeper, Canton, Ohio.

¶Soaking the mantles of gasoline lanterns in vinegar for a couple of hours and then allowing them to dry before using will cause them to burn brighter.

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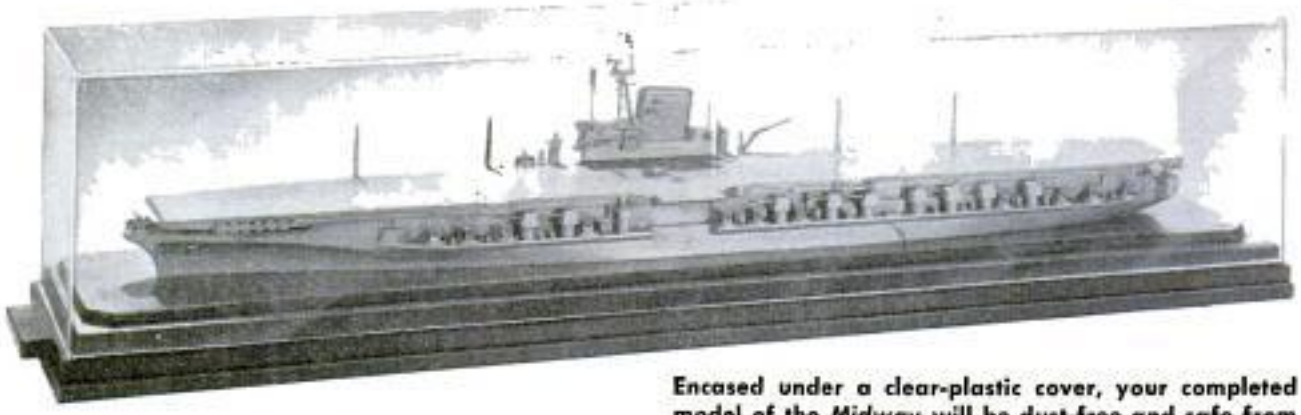
Try Your Hand at



Encased under a clear-plastic cover, your completed model of the *Midway* will be dust-free and safe from damage. Edges of wooden base are painted flat black

By Paul Strayer

Conclusion

IN THE THREE previous installments, construction details on modeling the carrier *Midway* have brought the modelmaker to the tedious job of fashioning the tiny guns and other minute deck fittings required. Among these are included the 40-mm. A.A. guns and carriages, the 5-in. guns, their turrets and barbettes and the range finders, most of which are installed on the port and starboard sponsons. Due to the particular scale and unusual type of fitting, all the parts must be handmade.

The 5-in. gun barrels, of which 18 are required, may be shaped of metal or wood. However, I found that they can be tapered perfectly in the following manner if made of metal. First, I cut 52-ga. drill rod into lengths ⅛ in. longer than the actual size. Next, I coated one end of each barrel by dipping it in paraffin for a distance of ⅛ in. Then I stuck the 18 lengths into a large cork, pressing them slightly deeper than the coated ends. Next, I filled two china cups, one with water and the other with a few ounces of nitric acid. Wearing rubber gloves, I dipped the gun barrels repeatedly in the two liquids, first in the water and then in the acid. The acid gradually etches the metal and the dipping process produces a perfect taper. *Caution*: Do not let the acid contact the skin and avoid breathing the fumes directly.

The 5-in. gun turrets, in which the gun barrels are held, are first made in strip form and then sliced off to the proper length. The turrets, as well as the gun barrels described above, are shown in actual size in the drawing on page 167. Boxwood is preferred for the turrets, although a strip of any close-grained hardwood will do. After ripping the strip to size on my circular saw, I tilted the saw blade to cut the two chamfered edges. Top, side and front views give the final shape of each turret.

PAINTING YOUR MODEL

Needless to say, it's important to see that all surfaces and fittings are glass smooth before finishing your model. All parts should be carefully sanded with fine sandpaper as any defects or flaws will be readily spotted after the finish is applied. Fill any irregularities with a prepared powdered crack filler.

Spraying with lacquer is preferred to brushing. Many times an expert job of modelmaking is spoiled by a messy paint job. Small fittings lose their fine detail and the whole model takes on an overpainted look. Spraying is especially desirable in the case of the *Midway* as the entire ship is done in one color—battleship gray—and masking is not required.

If you must paint your model with a brush, select a flat camelhair one about ⅜ in. wide. Use a semiluster, or eggshell enamel and thin it to a consistency which flows nicely and leaves no brush marks. Avoid a heavy application of paint. Where the paint gets too heavy on some of the small fittings or crevices, remove the excess with a "dry" brush. I have found that a wipe or two of the brush across a blotter works fine for drying the brush. Apply at least two coats when using a brush, and no less than five thin coats when spraying. The identifying numerals 41, given on page 168, are cut from the magazine page and pasted at each end of the flight deck.

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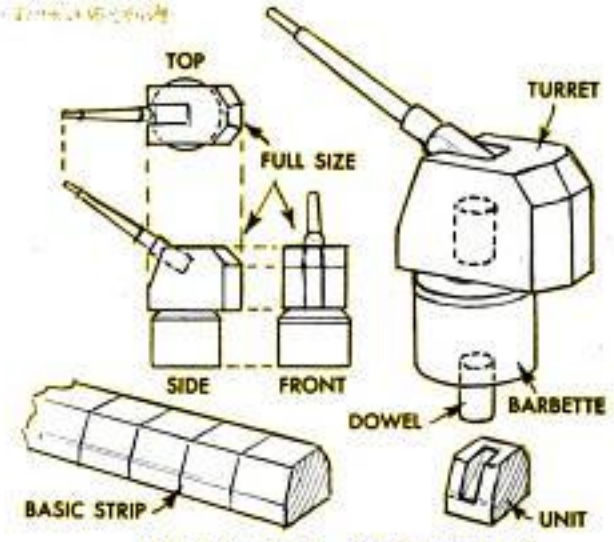
WTM 55

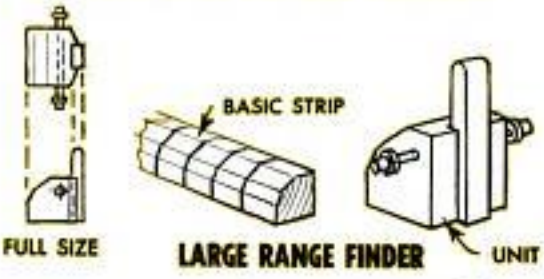
Modeling the *MIDWAY*

After carefully slicing them off from the basic strip, I worked each one to shape with jeweler's files, using the point of a penknife to carve out the small notch, or slot, for the gun barrel. A small jig can be improvised to assure all the turrets being sliced off the basic strip to exactly the same size.

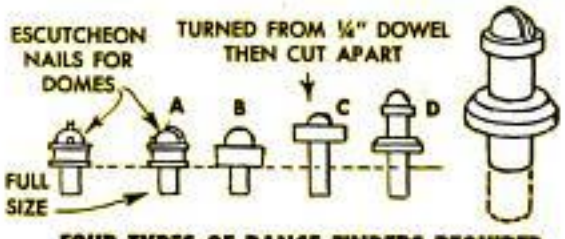
The turret barbettes are the circular bases on which the gun turrets rotate. These are made movable on your model. I made the barbettes of ¼-in. dowel and pressed them inside bands cut from brass tubing. This formed a smooth surface for painting, although a carefully turned and sanded barbette of wood alone will do. Note that I inserted a 1/16-in. dowel in the top and bottom of each barbette, letting the top one project 3/16 in. and the bottom one a scant ⅛ in. The turret fits over the top dowel, while the lower dowel fits a hole drilled in the sponson. In drilling the holes in the sponson, spot them so the barbettes come almost flush with the edge of the sponson. A study of the emplacement plan for sponson fittings, Part III, will show where the 5-in. guns are located. Glue them in place with a drop of quick-setting household cement. Note in the side-view drawing of the 5-in. gun that the turret overhangs the barbette at the rear when properly fitted on the upper dowel. The gun barrels are mounted level in their turrets in all cases except the three which are placed at the starboard bow. The turrets of these particular guns are rotated about 30 deg. outward and the muzzles are elevated. If desired, a spot of glue can be used to hold the guns and turrets in their final positions.



HOW 5" 54-CAL. GUNS ARE MADE

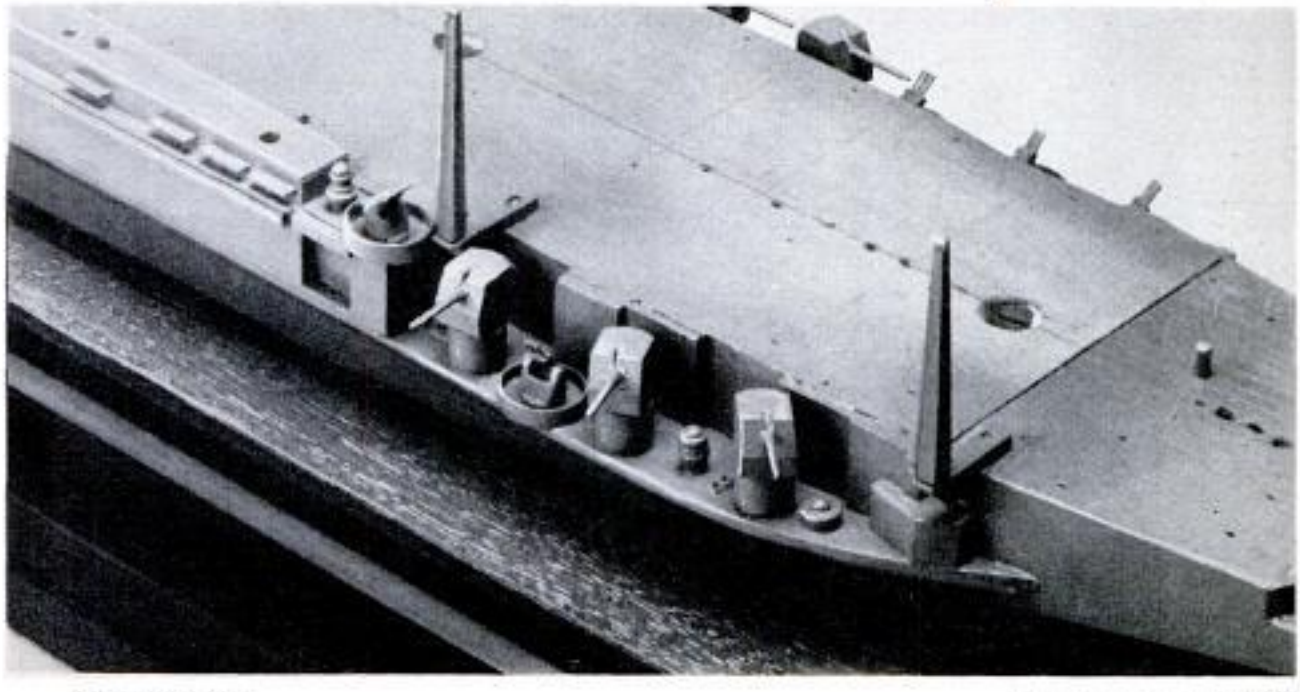


LARGE RANGE FINDER



FOUR TYPES OF RANGE FINDERS REQUIRED

Below, close-up starboard view shows towers, and gun emplacements mounted on forward end of sponson



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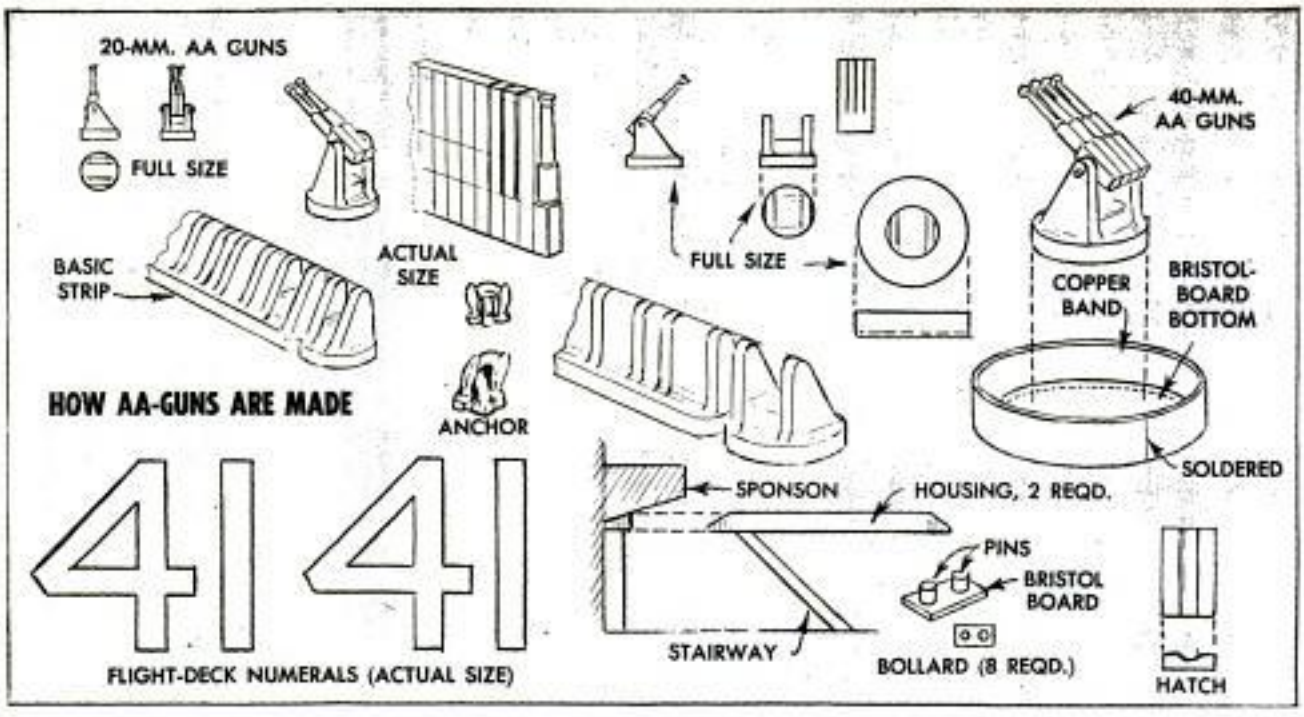
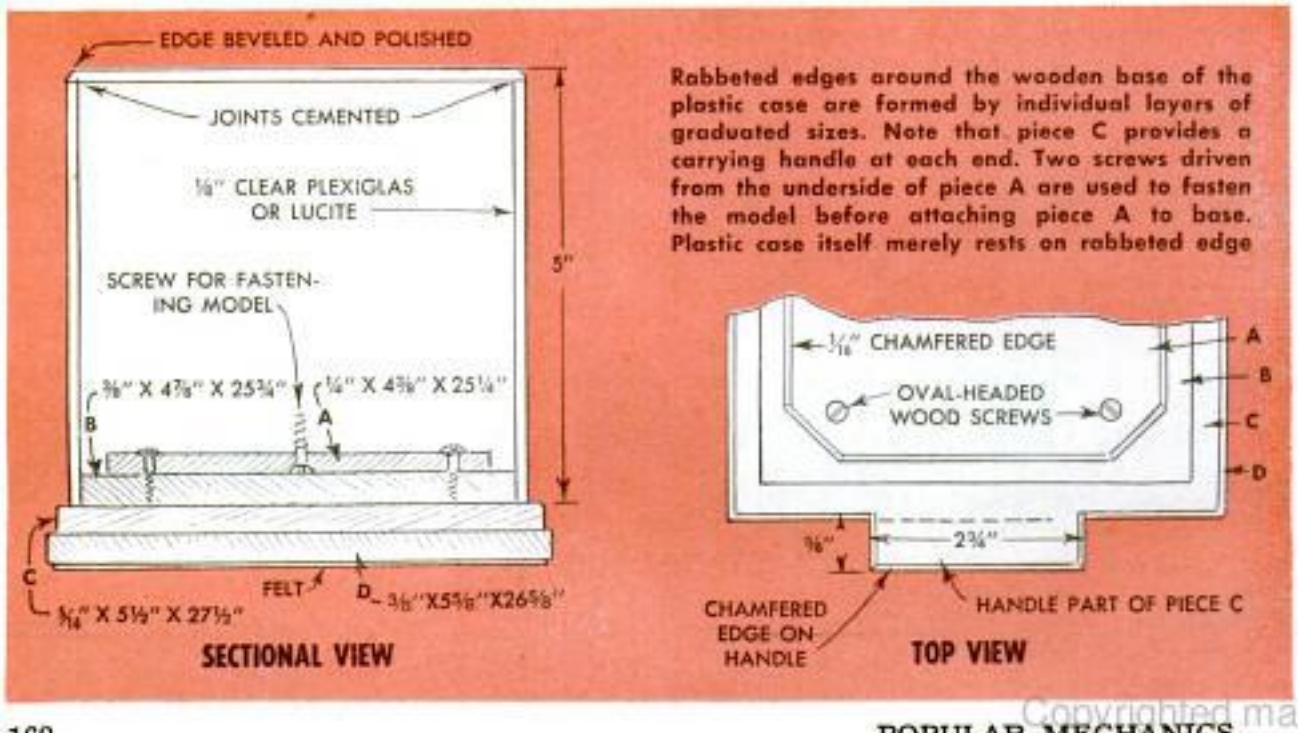


The large and small range finders are shown actual size on page 167. The large ones are made similar to the 5-in. gun turrets, each one being sliced off from a basic strip. Incidentally, a hollow-ground, planer-type saw blade is excellent for cutting the basic strip as it produces a cut equivalent to a planed surface. The slot for the vertical member in the large range finder is formed with a small file or sand stick. The projections from the sides of the range finders consist of small pins which have flat beads slipped over the ends and cemented. The ends of the pins may be filed square, although this is optional on such tiny parts. Of the four large range finders required, two are mounted on the island base, one at each end of the island. A third one is located on the sponson on the port side just forward of the elevator. A fourth one is mounted at the stern on a projecting bumpkin previously installed on the port side. The first three mentioned are supported on posts which are short sections of ¼-in. dowel, 5/16 in. high. The various types of small range finders required are pictured actual size on page 167. These are made from ¼-in. dowel in a series of turnings and then carefully cut apart.

The 20 and 40-mm. AA guns and turrets are detailed on page 168. Shaping the extremely tiny guns and carriages is a tedious, painstaking job and you can only hope at best to roughly represent the real



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FULL-SIZE PLANS

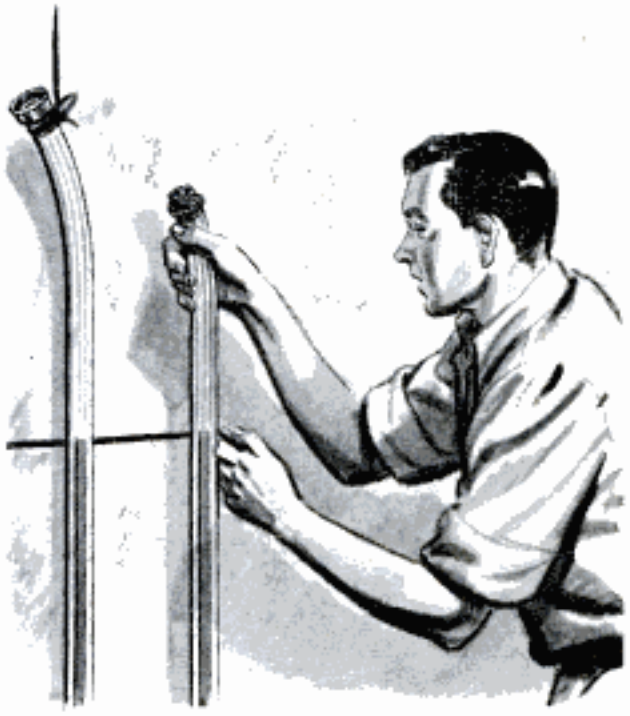
To save you the job of trying to accurately enlarge the small magazine patterns to full size, *Popular Mechanics* has prepared a set of five 22 x 34-in. plans which present all the construction details actual size. This permits you to simply trace off the various patterns directly on your wood with the assurance that all parts will be of uniform scale. These plans are priced at $2.50 postpaid and may be obtained by writing our blueprint department.

thing. Basically, the carriages are made in strip form as before. I made the turrets for the guns by winding a narrow strip of thin copper in a spiral around a suitable dowel, keeping the turns close together. Then I removed the coiled strip from the dowel and cut through the winding to form individual bands. To hold the ends of the bands together for soldering, I placed each one in a shallow hole bored in a scrap block. Each turret is completed by fitting a cardboard disk in the bottom of the band and cementing it with shellac. The gun carriages are cemented in the center of the turrets. A total of 21 turrets are required.

Two wooden broadside ladders, one on each side of the ship, are added last, along with the anchors. The port ladder is made to appear lowered while the starboard ladder is mounted in a raised position.

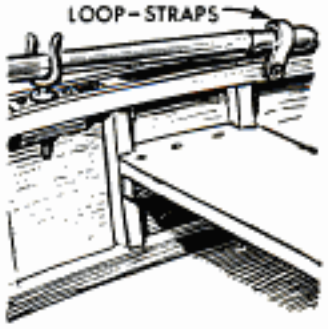
Mounting your model can be done in several ways. The Navy generally mounts its water-line models on a plain flat surface which is painted the same color as the model. I used a piece of walnut-faced plywood which I finished by applying a wash coat of shellac, rubbing it down with fine steel wool and filling the open pores of the wood with white filler. I wiped the filler off across the grain and gave the finish a coat of wax. A choppy "sea" can be simulated by applying a stiff mixture of spackle to the surface and modeling it to represent waves which are later painted blue. The texture of soft composition board, such as Celotex, also makes a realistic sea for your model. As the material is quite absorbent, it should be sealed with a coat of shellac before painting it a sea-blue color and adding white caps here and there. The details for making a plastic case for your model, which are given at the bottom of page 168, show how the "sea" is attached to the base of the case with a brass oval-headed screw at each corner. The case fits the built-up base loosely and merely rests on the rabbetted edge. If you wish, a strip of felt can be cemented to the bottom edges of the case to provide a dust seal. ★ ★ ★

Plastic Hose Filled With Water Acts as Painter's Level



A transparent garden hose can be used in place of a carpenter's level for scribing a line on a wall which is to be painted in two tones. One end of the hose is tied to hang above the level of the proposed line. The other end is held by hand above this line and the hose is filled with water. When the level of water in the hose reaches the height at which the wall is to be marked, the free end of the hose is carried along the length of the wall. During this time the water level, which can be seen through the transparent plastic hose, will remain at the desired height, and the wall can be marked at the necessary intervals.

Loop Straps in Boat Hold Oars To Drain Back Into Water



Leather loop straps fastened to the inside edge of the gunwale can be used to keep the oars from dripping and draining inside your rowboat. Bolt the loops at a point convenient to reach from the seat. When the oars are shipped, the loops are slipped over the handles and the wet ends of the blades placed outside the boat where they will drain back into the water.

¶Tin funnels can be made to last indefinitely by reinforcing the seams with solder when the funnel is new.

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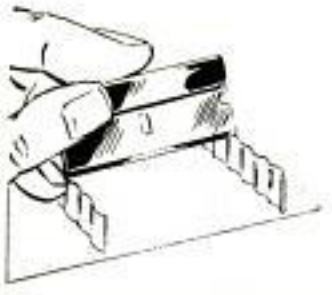
Small Craft's Water Line Marked With Aid of Light and Cord

One man can quickly and accurately mark the water line on a small boat by using a large, unfrosted light bulb, and a length of cord. Level the boat on horses or other supports. Fasten a short wooden strip to the bow and stern at the water line, and stretch the cord tightly between them, so it is 2 or 3 in. away from the hull at its widest point. A few feet away from this cord, and near the middle of the boat, either suspend the light bulb or mount it in a stand. Move this light up and down until the shadow of the cord falls on the water line at both bow and stern. Then, using the shadow line along the side of the boat as a gauge, mark the water line. Each side of the boat is done in the same way.

Donald Spiegel, Vancouver, B. C., Can.

Shelf "Rack" Holds Razor Blades

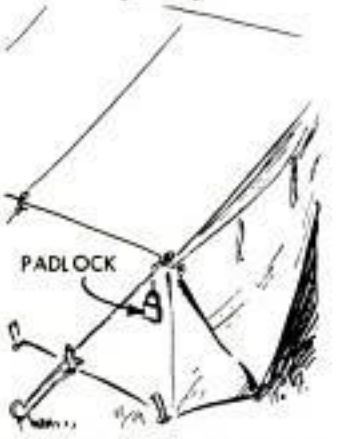


Single-edged razor blades used in the home or shop can be stored neatly and safely in a "rack" formed by two corrugated-metal fasteners driven into a shelf or other flat surface as indicated. Place the blades between the corrugations of the fasteners. Microscope slides and other small fragile items can be stored in the same manner.

Brass Strip on Bottom Edge Protects Boat Keel

Paint protecting the bottom edge of a boat keel frequently is damaged when the boat is beached or accidentally scraped on a sandbar, or when it is cradled on blocks for hauling on a dockside railway or elevator. One sure way of preventing this damage is to attach a ⅛-in. brass shoe to the bottom edge of the keel. The shoe is cut to the full length and width of the keel and attached with flathead, bronze wood screws. It is best to cut the entire shoe in one piece, to drive the screws every 6 or 8 in. and to counter sink each one.

Padlock Keeps Tent Flap Open



As a timesaver when camping, attach a padlock or other heavy weight to the bottom tie of your tent flap. Then, when you want the flap held open, simply throw the lock back over the front tent rope, as shown in the illustration. This will eliminate the nuisance of tying and untying the flap. When the tent flap is closed, the weight will keep it in place without tying.

Extra Handle for Drill Polisher Taken From Old Coffeemaker

If you plan to use a ¼-in. electric drill for polishing a car or furniture, attach the handle from a discarded coffeemaker so that the drill can be gripped in both hands. The original metal band attached to the handle is just the right size for a ¼-in. drill. For a larger drill, cut a band of suitable diameter from a piece of sheet metal, drill a pair of holes in each end to correspond with the original holes in the handle and screw in place.

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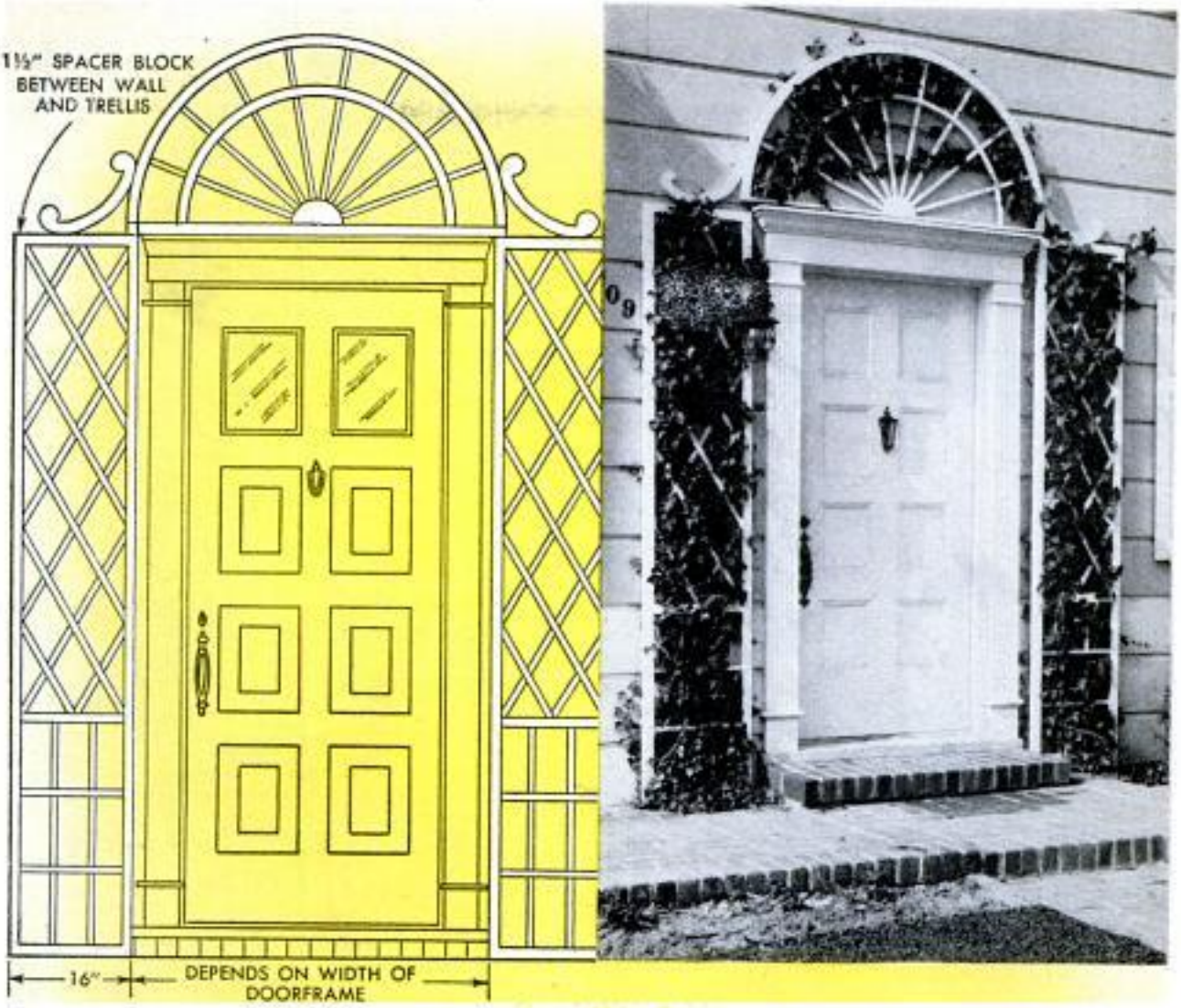
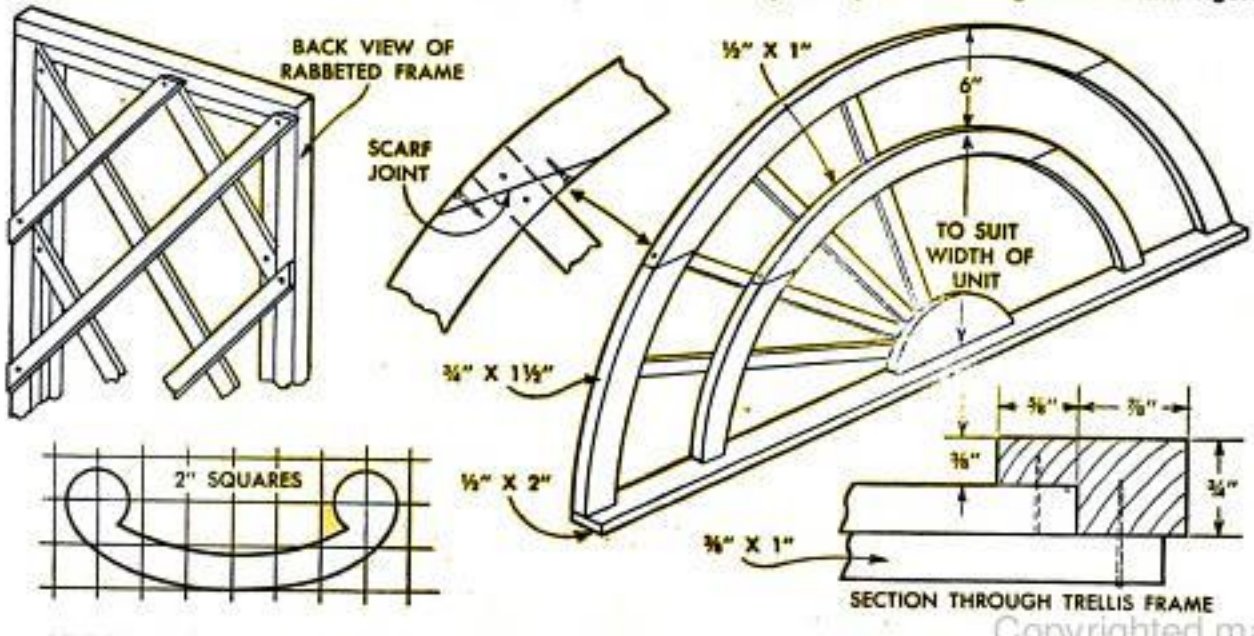


FRAME YOUR ENTRANCE

As a visitor approaches your home, one of the first impressions he receives is that given by the front entrance. A plain, unattractive front door makes a poor impression and affects his feelings toward the entire house. A complete remodeling job for the entrance can be expensive, but with the trellis frame shown here you can add a graceful colonial elegance to your doorway at a small cost and with only a few hours of work. The major dimensions depend, of course, on the measurements of your door, but the plan is laid out so that the frame is easy to build once you have put in your own height and width figures



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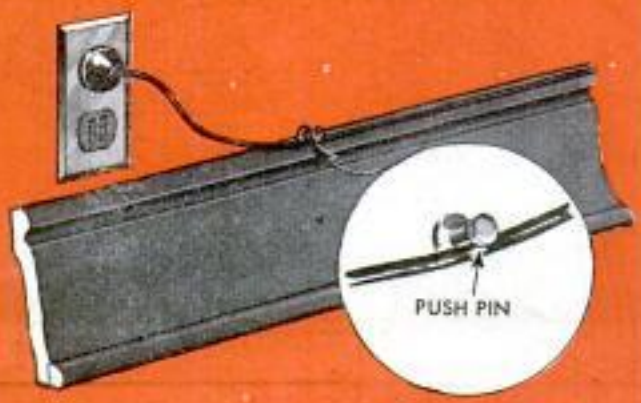
Solving Home Problems

TANGLES AND KINKS that pop up in the clothesline can be taken out easily while the line is being strung. Whenever kinks appear, use a clothespin to fasten the line to the ball or reel so it won't unwind. Then suspend line from a point above kinks and let it revolve until tangle-free

GLASS PUSH PINS will support an extension cord along the baseboard, keeping it off the floor and out of the way. Locate pins about 2 ft. apart and run the wire under the first pin, over the second and so on. The pins are inconspicuous and the wire will not slip from them too easily



YOUR NOTE for the milkman won't blow away if you write it on the bottom of a milk-bottle cap and replace the cap on the bottle. Insert the cap bottomside up, and use a soft pencil to write the message so rain won't blur it

YOU WON'T HAVE TO climb on a chair or ladder to hang or take down out-of-reach pictures if a yardstick notched as shown is used. Engage the picture cord in the notch and lift it on or off the nail. Yardstick should be strong enough to support the weight of the picture

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PUT OUTGOING MAIL in a handy spot for the letter carrier to pick up by attaching an ordinary spring-type clothespin as a letter clip to the side of your mailbox. The clip is also convenient for leaving messages for visitors and delivery men when you are not going to be home

TO PROTECT THE SEAT CUSHIONS of chairs and sofas, cut a piece of plastic sheeting large enough to cover the top of the cushion and tuck in securely around the sides. When children or pets climb over the furniture, the fabric will remain unsoiled. If company comes, extra cover is whisked off quickly

THE ODD SOCKS that usually turn up on washday can be saved for matching by dropping them into an empty jar kept near washing machine. A clear, wide-mouthed jar, such as a fruit jar, allows you to see socks and remove them easily when a matching sock is found in laundry

COPPER SCREENS, flashing and eaves trough should be given a coat of shellac every year. This will keep the side of the house from being stained as rain water carries away oxidation from the exposed copper. For the best looking and most effective job, clean the copper thoroughly before applying the coat of shellac

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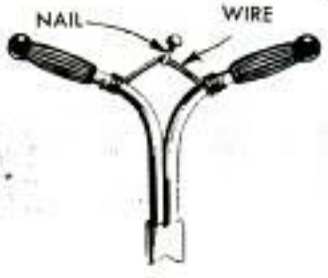
Bird Dog Taught to Retrieve Using Screen-Wound Block

When teaching a bird dog to retrieve without crushing or chewing the game, one trainer uses a block of wood wrapped with screen wire. When retrieving the block, whether in water or open fields, the metal screen discourages the dog from clamping down too strongly with his teeth. The habit thus acquired is remembered when the dog is sent out for real game. Well-trained retrievers can handle a bird without crushing or breaking a single feather.

Lawn Mower Stored on Wall Conserves Floor Space



To permit more clear floor space in his garage, one homeowner stores his lawn mower out of the way by suspending it from a large nail in one wall. This is made possible by forming a loop of heavy wire over the center of the handle as shown.

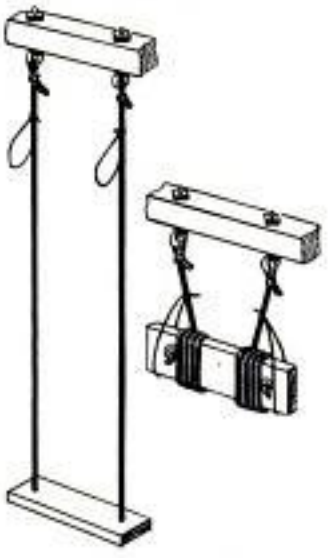
Walter M. Shutok, Uniontown, Pa.

Glued Splinter Held in Place By Cellulose Tape

To repair a splinter in woodwork or furniture, give it a coat of glue and apply one or more strips of cellulose tape to hold it in place until the glue sets. This is preferable to nailing the splinter, which possibly might cause it to split. To simplify removal of the tape, simply fold under the end of each piece used.

Clinton R. Hull, Costa Mesa, Calif.

Twine Loops Hold Swing Board Out of Small Child's Reach



Twine loops tied to the ropes of a heavy swing will hold it up out of the reach of a small child who might be injured playing with it. Form a loop of heavy twine around each swing rope, high enough to be out of the way. The heavy swing board can then be rolled up on the ropes and the twine loops slipped over the ends. To release the swing, the loops are merely slipped off and the swing board allowed to drop into place.

G. E. Hendrickson, Argyle, Wis.

Candles Given Holiday Air With Metallic Powder

Holiday sparkle and color may be given ordinary inexpensive candles by brushing them with a colored metallic dusting powder. These powders come in a variety of metallic and oxide hues and colors—gold, silver, and bronze being the most common. The powder is applied dry with a brush and the excess lightly wiped off. A novel effect is created by running the color only part way up the candle and using masking tape to make a neat division line.

Ken Murray, Colon, Mich.

A small bottle of clear fingernail polish is handy in the fisherman's tackle box for securing knots in the line, coating screws in reels to prevent loosening and to prevent unravelling of windings.

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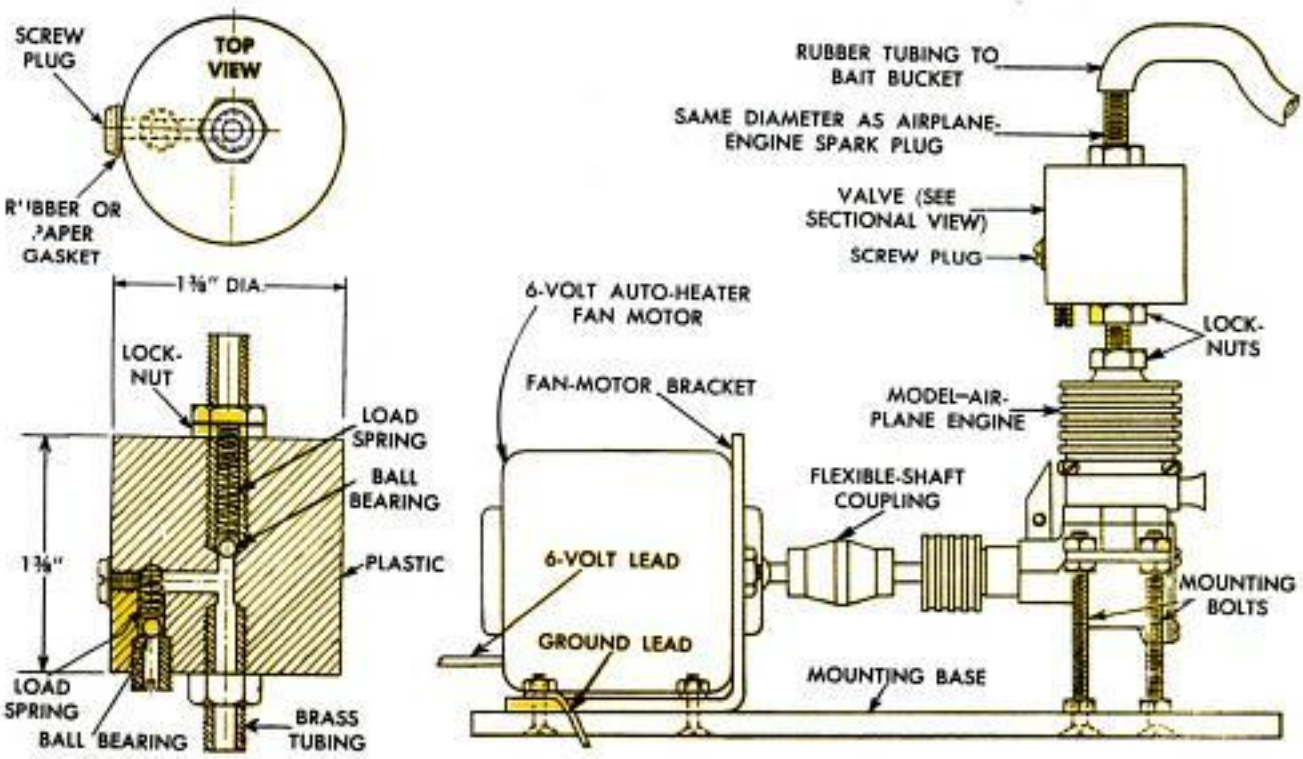
WTM '53

MINNOW-BUCKET AERATOR

By Walter Dugan

Minnows transported by automobile will be alive and fresh when they reach the fishing site if their water is aerated by a miniature air compressor powered by a six-volt motor from a car-heater fan. The compressor itself is simply a discarded model-airplane engine from which the spark plug has been removed. A snifter valve is made and screwed into the spark-plug hole, the valve body being a section cut from a cylinder of plastic, 1⅜ in. dia. x 1⅜ in. long. The cross-section of the valve body is shown in the detail. Brass tubing, ¼ in. in diameter, is used for the fittings. The wall thickness of the tubing must be sufficient to permit threading. The spark-plug hole in the particular engine used was tapped for a ¼-28 thread, although this may differ on various engines. The intake-valve hole is drilled and fitted with a ball bearing that is slightly smaller in diameter than the hole. Then the threaded brass tube is reamed on the upper end to provide a seat for the ball. The outer edges of the tube are notched to allow it to be turned with a screwdriver for adjustment of the spring tension. The two lengths of tubing that lead from the compressor and to the minnow bucket are screwed into holes that are drilled just deep enough to firmly hold the tubing. A steel pin inserted crosswise through the upper locknut keeps the bearing spring in place.



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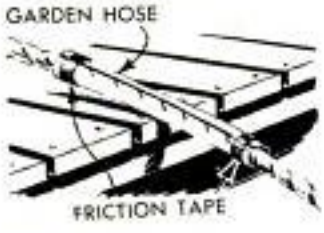
Nighttime Decoration in Room Made With Luminous Paint

An unusual nighttime decor for a game room, study or child's bedroom may be inexpensively done with hand-cut stencils and luminous paint. Barely noticeable during the day, figures stenciled with this paint will glow in the dark. The motif illustrated was used in a child's bedroom, the stencils depicting the moon and stars in a night sky. Other rooms, of course, would be decorated according to their use with many unusual effects being possible.

Mrs. Andrew Naby, Geneva, Ohio.

Hose Section Shields Boat Lines



A section of old garden hose may be slit lengthwise, as shown in the drawing, and fitted over the mooring line of a small boat to prevent the line from chafing against the dock. The hose is secured to the line by wrapping several turns of friction tape around each end. The tape should be wrapped tightly to prevent the hose from slipping.

Nail Polish Waterproofs Matches

Hunters and fishermen who need a supply of waterproof matches to take on trips can make them by dipping wooden kitchen matches in clear nail polish. In addition to waterproofing the matches, this treatment will cause them to burn better, and even stay lit in a strong wind. In dipping, the polish should be allowed to cover about half of the matchstick.

Record Player Used as Carrier For Phonograph Records

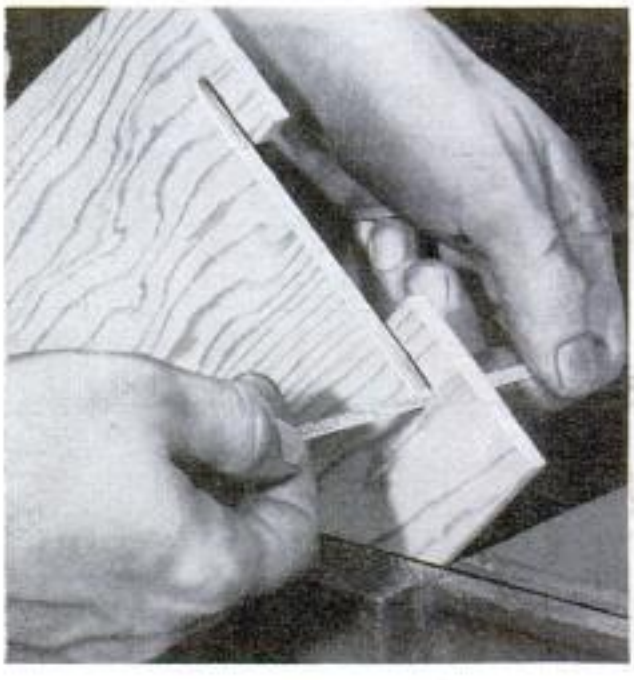
When transporting a 45-r.p.m. record player, as when moving or taking a trip, the player itself may be used to carry 20 or 25 records. Drop the records onto the machine, one at a time, and push the reject switch. When all the records are on the spindle, slip a rubber band, or wind tape, around the top of the spindle to hold the records in place. If the player does not have an arm lock, the arm should be fastened by the same means.

Bud Weisbrod, Corvallis, Ore.

Thin Strips of Emery Board Sand Hard-to-Reach Places

An emery board of the type used by women for manicuring is ideal for sanding small and hard-to-reach places in modeling and other fine work. The emery board is cut into thin strips, as shown, the width varying with the needs of each particular job. The boards are rigid enough to permit accurate work and are inexpensive.

Edward C. Johnson, La Jolla, Calif.



¶Steel wool will remain rust-free if it is submerged in a baking-soda-and-water solution when not in use.

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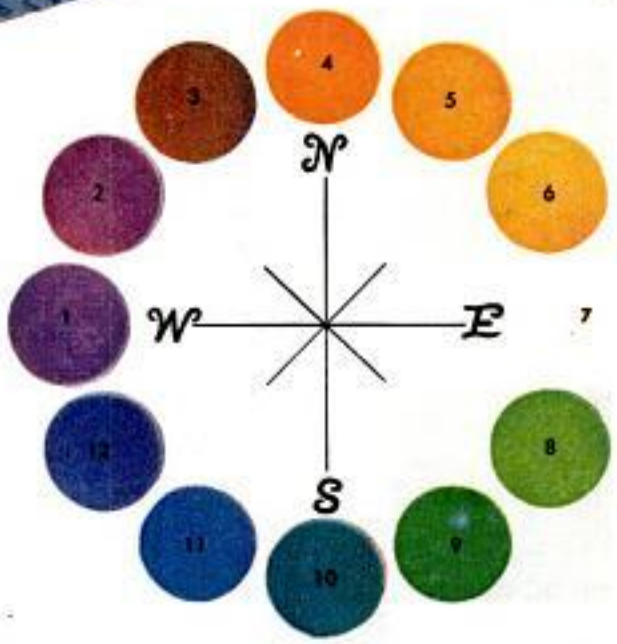
COLOR-SIZE YOUR HOME

With paint you can change the apparent size of a room, inject life and gaiety, produce quietness, dignity and often greatly camouflage objectionable details

FOR THE COST of a few gallons of paint you can change the size of rooms, raise or lower ceilings, subdue objectionable furniture and, in general, give your home a pleasing and inviting appearance. It is all done with the correct use of color.

For example, notice the two pictures on this page. In the lower one, the davenport is a dominant feature against the pink wall and red drapes. In the upper picture on this page, the use of harmonizing colors and a change of drapes blend the davenport into the wall, making the room seem larger and more pleasing.

A similar idea is illustrated in the two views on page 178. The fireplace at the left dominates the view and tends to pull the



Key: 1. Violet; 2. Red violet; 3. Red; 4. Red orange; 5. Orange; 6. Orange yellow; 7. Yellow; 8. Yellow green; 9. Gr.; 10. Blue gr.; 11. Blue; 12. Blue violet

Illustrations above and at the right show how color treatment of the walls affects apparent size of the sofa. Largest areas of rooms usually carry dominating color scheme with harmonizing colors as accents

When it's desirable to emphasize or subdue a room detail, such as a fireplace, color-treat it as in either of the two views above, depending on which effect is wanted. Note variation in room atmosphere

wall inward. In the right view, it blends into the wall, which then gives the illusion of receding and thus increasing the size of the room. In the lower picture the door and wardrobe are not only "eyesores," but also dominate the scene, thus making the room seem smaller. The right scene shows what was done with paint.

Treatment for long, narrow rooms that give a feeling of being in a hallway is shown on page 179. Here the room was "widened" by painting the ends a darker shade of the color on the side walls. The darker shades "pull" the end walls in.

High ceilings in narrow rooms that tend to make the room seem even narrower and give large rooms a barnlike appearance can be lowered by painting the ceilings a dark color that contrasts with the wall color. On page 180 notice how much lower the ceiling at the top of the page appears than the one in the center picture.

In the lower views on this page the hip ceiling of a room is "raised" and the room given a larger appearance by running the wall color up the sloping part of the ceiling and painting the remainder a light color.

While specific colors are unimportant in color-sizing of rooms, the color scheme usually being determined by unchangeable factors such as rugs or furniture, specific colors are important in the warmth or coolness of a room. Selection is made on the basis of sunlight exposure of rooms, cool colors, greens, blues, yellows, etc., for maximum sunlight and warm colors, reds, browns, etc., for minimum exposure. Intermediate color hues are used in rooms exposed to sunlight only part of the time. With warm colors in bright hues you can lighten dark rooms, or with cool colors add an illusion of refreshing coolness to rooms that are hot during summer months. In rooms where west light conflicts with east light use neutral tones, or warm and cool colors reduced in intensity.

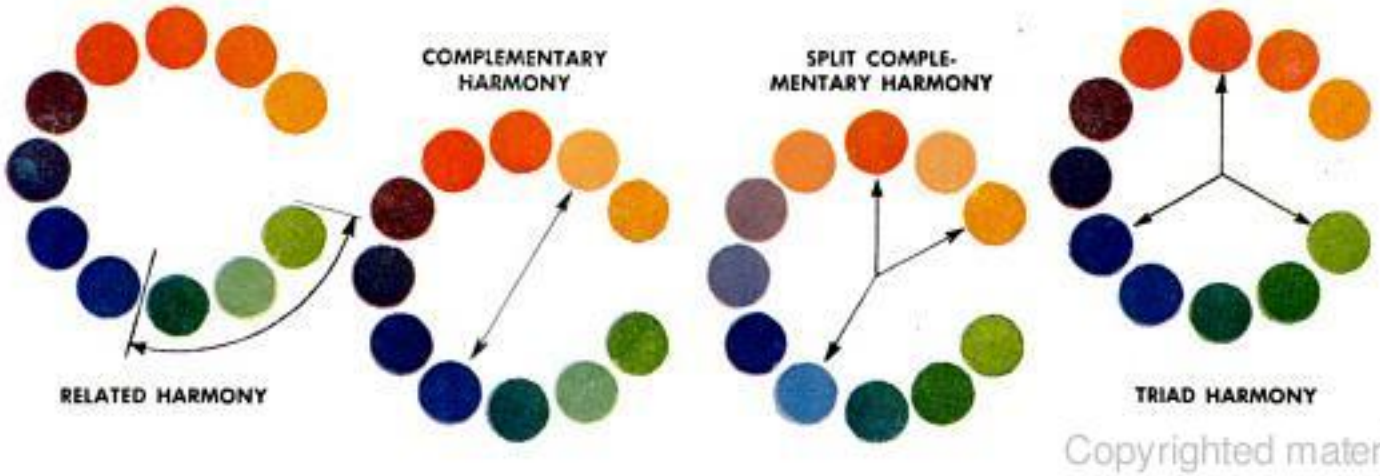
A color wheel like that pictured on page 177 shows how it is possible to create a color plan for the home by intermixing the primaries of yellow, red and blue and build-

Outdated woodwork and badly proportioned cabinets are made less conspicuous by covering with the wall color as in lower right-hand view. Compare with view below and note how woodwork detail is emphasized

Room interiors above and at the right show how careful use of color contrast can fool the eye. Ends of long, narrow room are in contrasting color. Lines in rug and blind give smaller room better proportion

ing up almost any hue desired. A secondary color is made by mixing two primary colors. As an example, red and yellow primaries give an orange secondary color. Red and blue result in a violet secondary and blue and yellow mix into an attractive green. There are three general types of color schemes, the monochromatic consisting of shades of one color; the related harmony, or analogous scheme, is worked out with adjacent colors, while contrasting schemes are developed from color hues that appear opposite each other on the wheel. Of course, the shades can be changed somewhat from those pictured, by varying the pure hues with black, gray or white.

Certain colors are suitable for use as dominant hues in rooms of varying exposure. As an example, yellow is generally



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selected as the dominant color in a room having an east or north exposure. The largest areas of the room—usually the walls and floor coverings—normally carry the dominating color scheme but it often is desirable to relieve this by combining two or more harmonizing colors to supplement the general plan.

As a rule the complementary colors should cover considerably less total area than the dominant color. Harmony also can be achieved in certain rooms by using two or more complementary colors. When windows of the room face southeast, south and southwest, bright sunlight enters both summer and winter. Such a room calls for the use of cool colors, blues and greens, to produce a restful effect. Of course, it still is possible to use complementary colors in such rooms. Your paint dealer will have more detailed color charts at hand from which you can make pleasing selections of

Color can raise or lower a ceiling in the manner shown in the two views above. A dark contrast on the ceiling tends to bring the ceiling down and move the walls out. Note opposite effect in lower view

Below, note the effect of the over-all gray tone on the ceiling in the right-hand view, then compare with the treatment at left where the wall color is carried up to the horizontal section of ceiling

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colors for rooms with varying exposures.

Changing room atmosphere and details: When the room is situated so as to necessitate a monochromatic color scheme, gaiety and sparkle can be added by selecting complementary colors to accent room details. Sometimes a color scheme can be worked out by using the color of the living-room sofa as a starting point. The entire decorating scheme is then built up with this unit as the nucleus.

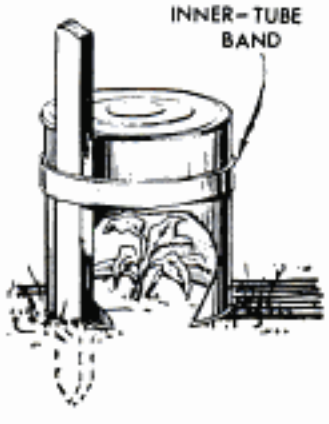
If it is desirable to emphasize interesting room details such as a fireplace, stairway or built-in, they can be "spotlighted" with a complementary color as in the upper left-hand view on page 178. Often the complementary color applied to the interior of a bookcase or built-in cabinet gives just the right degree of emphasis.

Color for adjoining rooms: When adjoining rooms are connected by a wide passageway, or archway, using the same color scheme in both rooms will produce an illusion of much greater spaciousness.

When variety is desirable, complementary colors often can be used to advantage. Where rooms are separated by single doors of standard sizes, it is rarely advisable to use the same color scheme in both rooms.

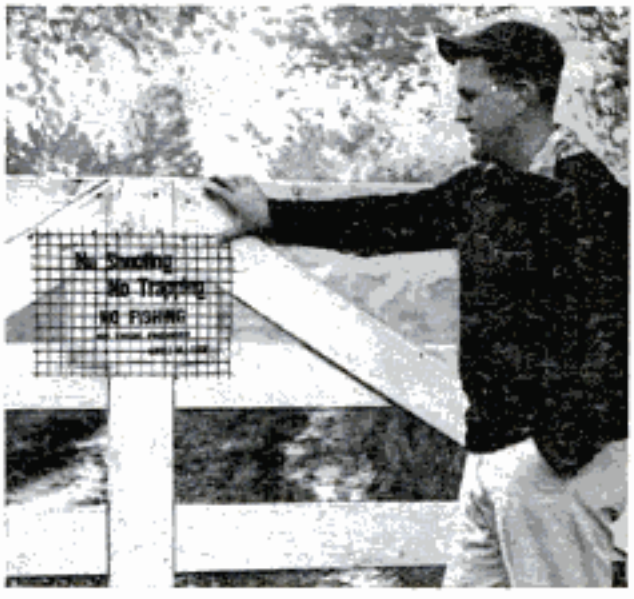
Light reflectivity: The amount of illumination in a room depends on the ability of walls and ceilings to reflect light. Pure white is a common selection for ceilings as it is a complementary to almost any color on walls. However, experienced decorators favor a tinted white, or off-white, for ceiling treatment in rooms which require the maximum reflectivity. The sources of light, both daylight and artificial, must be considered in planning the decorative scheme, especially in rooms having south and north exposures, to get the full benefit of the colors. ★ ★ ★

Cans Fastened to Stakes Shade Young Plants



Small seedlings that must be protected when first transplanted in the garden can be covered with a can of suitable size suspended over them. A stake is driven into the ground beside the plant and the can is attached to the stake with a rubber band cut from an inner tube. The can may be suspended at any desired height over the plant, and may be lifted easily whenever the gardener wishes to inspect the plant.

Cardboard Signs Protected By Pieces of Hardware Cloth



Cardboard signs posted outdoors are usually destroyed by wind, weather or vandals. To protect these signs, one farmer uses pieces of hardware cloth. A piece of the wire mesh is cut larger than the sign to be covered, then fastened over the cardboard with staples or bent-over nails.

Wooden Clamp Grips Catfish While Hook Is Removed

The possibility of being "horned" by a catfish while removing the hook can be avoided by gripping the fish with this clamp. It consists of two ½-in. plywood paddles hinged together at one end. Each paddle is 3 in. wide and 10 in. long and tapers to 1¾ in. at the handle. Brass or galvanized nails, projecting slightly from the inner paddle surfaces, improve the grip of the clamp.

Bo Burton, Alice, Tex.

Cleaning Toilet Tank

To keep the toilet tank in my home free of silt and any oil or grease that may accumulate, I simply use a little detergent in the water to clean it periodically. At least once a month, I add two tablespoons of detergent to the water and, after brushing the inside of the tank thoroughly, let it stand overnight. It then is simple to clean the tank by flushing several times.

Milton B. Hammond, Edgeworth. Pa.

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RURAL MAILBOXES
Don't Have to be Ugly

STAGGERING, LEANING and drooping rural mailboxes are gradually disappearing from the countryside as people discover that with some imagination, a little work and an even smaller amount of cash, the mailbox can become a decorative part of their property. Distinctive, individualized boxes are the rule, rather than the exception, in the newer communities where homeowners are especially conscious of the appearance of their homes. The pictures on these two pages are intended to stimulate your imagination by showing you what others have done with their mailboxes, and to give you some ideas for remodeling your own. As you can see, almost any material can be used and the design variations are infinite. Obviously, it is best to have the design of the box blend in with the style of the house or take advantage of the natural scenery around it. ★ ★ ★

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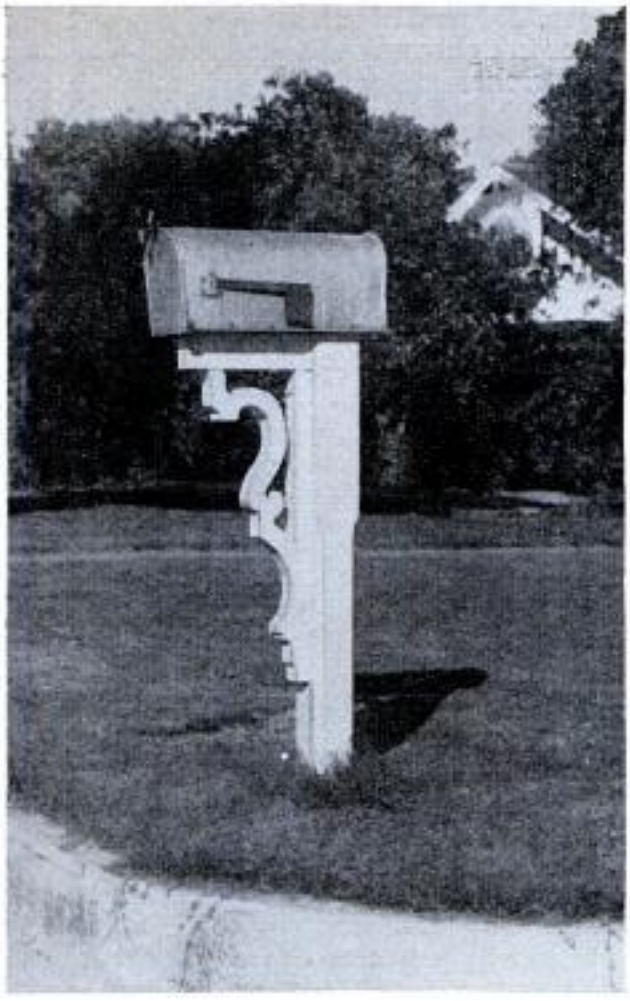

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Line on Fisherman's Jackknife Aids Removal From Pocket

When your fingers become wet and soiled from handling bait and fish, there's no need to soil trouser pockets in order to reach your jackknife. Simply close one blade of the knife on the end of a short piece of fishline and tie a lead sinker to the other end of the strand. When the knife is dropped into the trouser pocket, the sinker is left hanging outside where it is grasped easily without soiling the pocket.

Steel Wool Provides Strainer In Sprinkling-Can Spout

To prevent insect powders dissolved in water for use in a garden sprinkling can from clogging the perforations in the spout, insert a wad of copper or steel wool as indicated. The wool, which may be placed in the spout by unscrewing the cap, will act as a strainer to catch any undissolved particles in the water and prevent them from reaching the perforations.

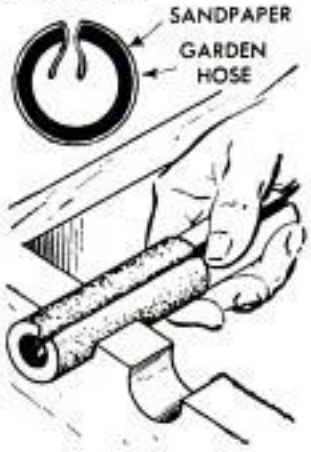
Patterned and Textured Articles Provide Leatherwork Designs

When searching for embossed designs with which to decorate leather, wood or metalwork, try copying the designs from bicycle tires, metal cellar doors and other objects which have a regular pattern. Hold a piece of paper firmly against the design you are copying and, using the side of a soft pencil, rub back and forth across the paper. This will transfer the design to the paper in light and dark shadows, making an ideal embossing pattern.

Fred Lettino, Astoria, N. Y.

Garden-Hose Sandpaper "Block" Ideal for Curved Surfaces

Sanding scrollwork and other curved surfaces will present no problem if you wrap the sandpaper around a short length of garden hose. To secure the edges of the sandpaper, slit the hose lengthwise and insert them as indicated at right.

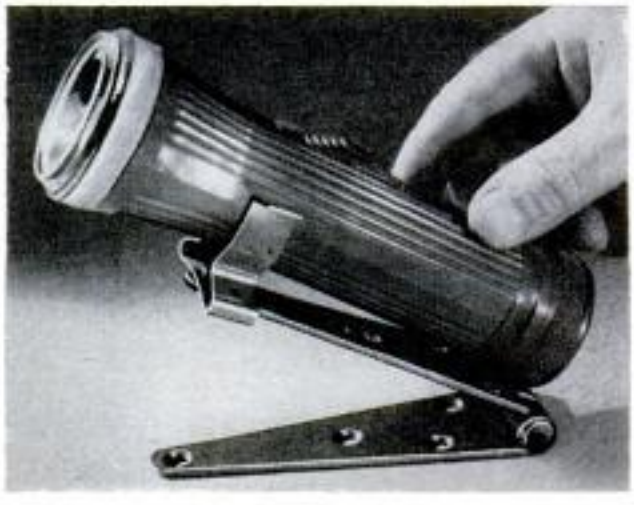


Remedying Leaky Flush Tank

The additional weight of a strip of wire solder coiled about the arm of a flush-tank ball often is sufficient to cause the ball to seat tightly, thus helping to eliminate any slight leakage into the bowl. Solder is wrapped several turns about the lower end of the arm and allowed to rest on top of the ball.—Joseph Amorose, Richmond, Va.

Adjustable Flashlight Support From Long Strap Hinge

Fitted with a metal broom holder, a long strap hinge will provide an adjustable flashlight holder that is carried easily in a toolbox or car. Because the light can be set at any angle, the holder is especially useful on jobs that require both hands being free. The hinge normally will work quite loosely, so it will be necessary to upset the hinge pin. A few hammer blows will swell it enough to give the hinge the required degree of stiffness.



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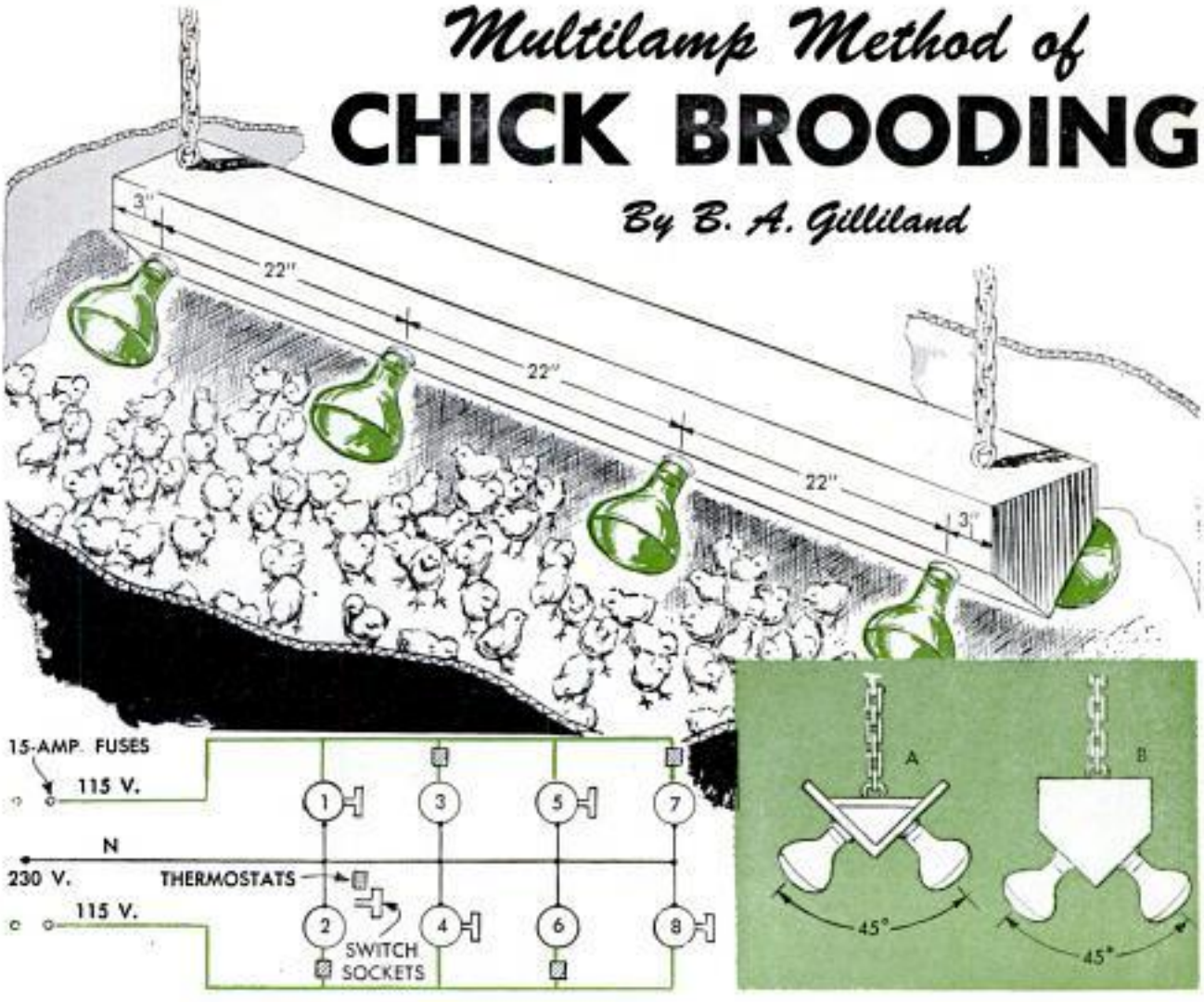
Multilamp Method of CHICK BROODING

By B. A. Gilliland



Using infrared lamps as a heat source for brooding baby chicks offers definite advantages of economy, flexibility and reduced labor over more conventional methods. Infrared lamps produce both visible energy as light and invisible energy which, when absorbed by a mass, becomes heat. Thus, baby chicks brooded under a battery of these lamps do not huddle together for warmth, but position themselves to absorb heat as required. An insulated shelter is not needed, but a barrier about 1 ft. high should be used around the brooder area to eliminate drafts. The lamps may be mounted in a line of pairs, a four-square pattern or a wagon-wheel arrangement. For year-round brooding, in most sections of the country, eight 250-watt lamps with a thermostat control on every other lamp will be adequate for 500 chicks in the winter and 600 in the spring and fall. A typical mounting for a line of pairs is shown in the sketch. The mounting can be made of wood or sheet metal. Porcelain sockets or swivel-type outdoor sockets should be used. The entire unit is hung by chains and snap hooks so it can be raised out of the way for easy cleaning of the brooder. Recommended practice is to start the chicks with the lamps 18 to 20 in. above the litter, and to raise the unit 3 in. each week to increase the heated area as the chicks grow larger. For midwinter brooding, usually all 8 lamps will be required the first week, but only 6 are needed in spring and fall. Thermostats are wired into individual lamp circuits as indicated, and are mounted on the unit so they measure air temperatures but are not affected by direct infrared energy. The thermostats used in the model shown are of the adjustable calibrated type, although a wafer type may be used.

Concrete Anchors for Steel Posts Precast in Farm Shop

In order for steel fenceposts to hold in marshy ground, holes ordinarily are dug for each post and concrete poured to anchor it firmly. However, instead of hauling mixed concrete to each post location, one farmer precasts the anchors in his farm shop. This he does by standing drain tile on end and filling them with concrete. Then, before the concrete sets, the lower ends of the posts are pushed in until the anchor plates rest on the top edges of the tiles. After the concrete has set, the posts are lowered into holes and the earth tamped firmly around the tile.

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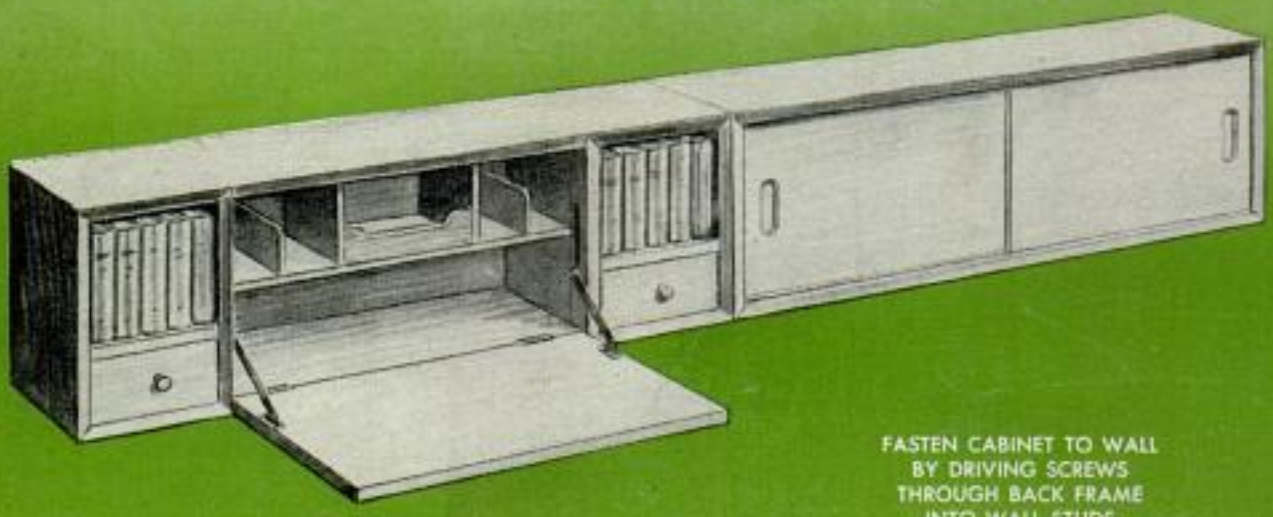
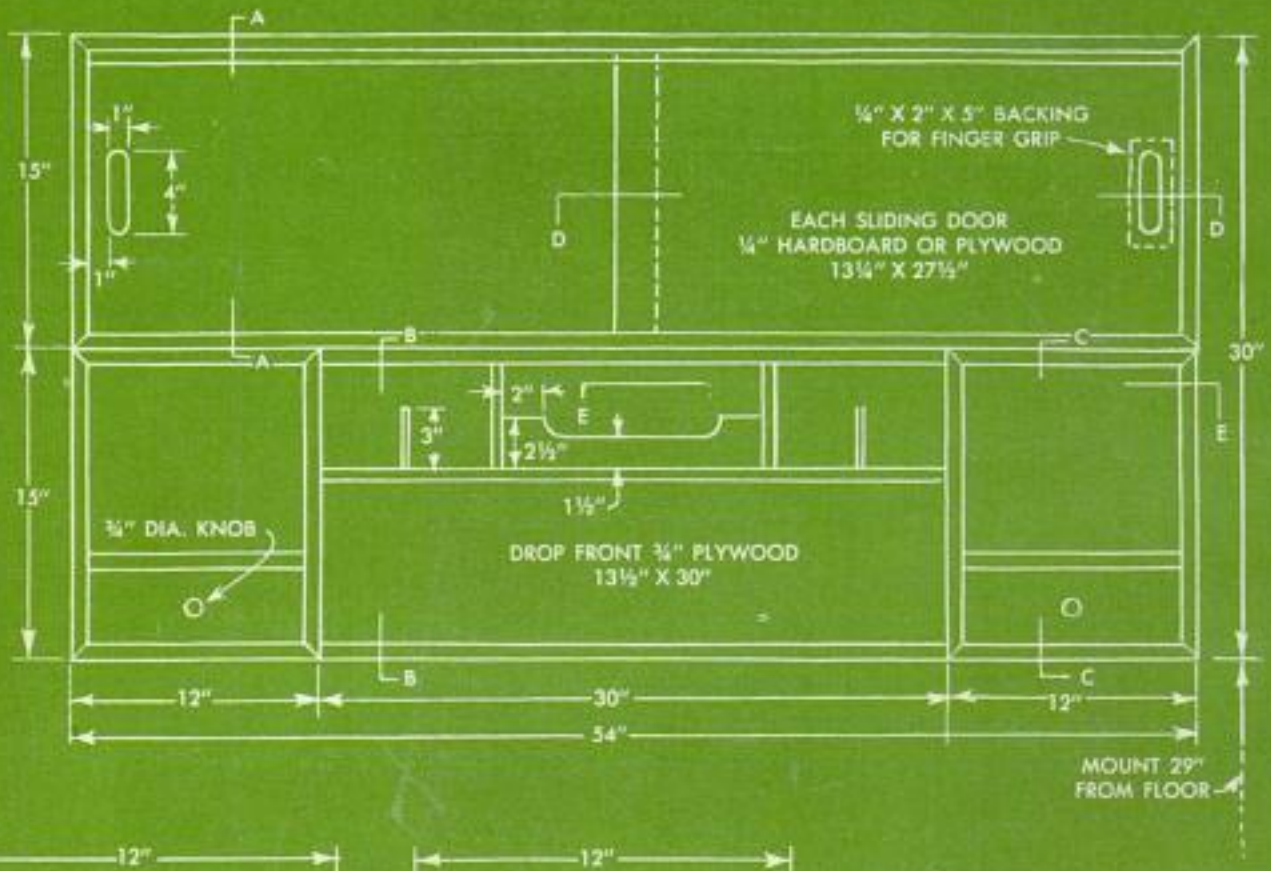
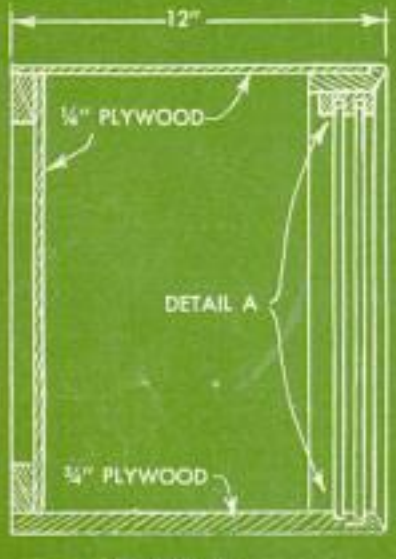
PLAN of the MONTH...

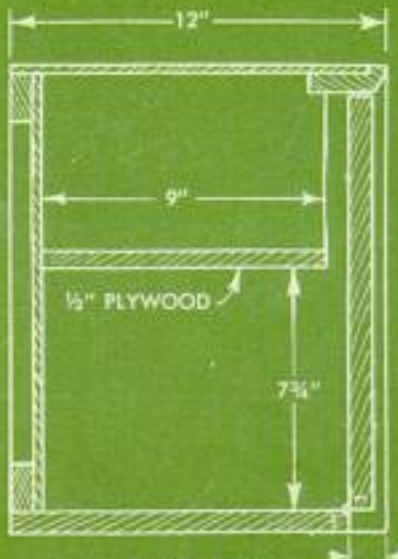


FASTEN CABINET TO WALL
BY DRIVING SCREWS
THROUGH BACK FRAME
INTO WALL STUDS

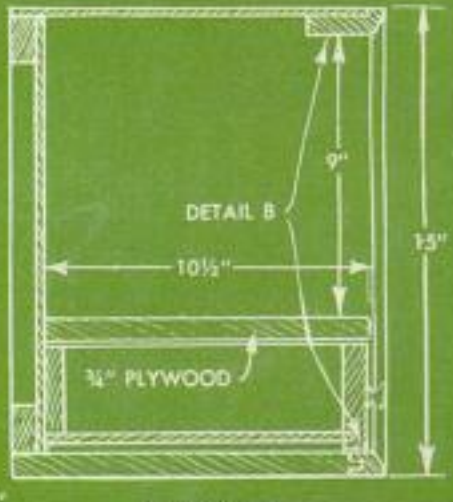




SECTION A-A



SECTION B-B



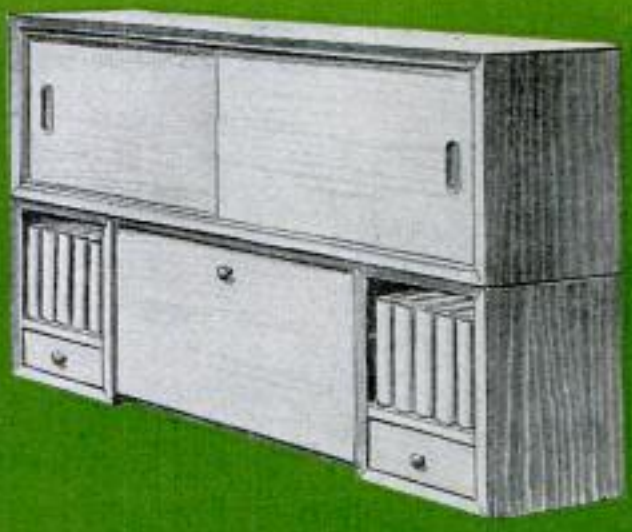
SECTION C-C

Wall Case

Modern Furniture

A wall case, consisting of a drop-front desk and a storage cabinet with sliding doors, is this month's design by John Bergen. The sections of the case may be placed one above the other or side by side, permitting the case to fit any available wall space in kitchen, utility room or other convenient location. The desk is ideal for the student's homework, Dad's account's and Mother's housekeeping records. And Mother always can utilize the storage space provided by the sliding-door cabinet

WTM '55



LIST OF MATERIALS

WALL DESK

Plywood

1 pc.—¼"x11½"x54⅛"—Top
2 pcs.—¼"x11½"x15"—Ends
1 pc.—¼"x14"x53½"—Back
2 pcs.—¼"x9⅝"x9⅞"—Drawer bottoms
2 pcs.—¼"x9"x31¼"—Partitions
1 pc.—¼"x2½"x13"—Partition
2 pcs.—½"x9"x5¾"—Partitions
1 pc.—½"x9"x30½"—Shelf
2 pcs.—¾"x10-1/16"x14¼"—Partitions
1 pc.—¾"x13½"x30"—Drop front
1 pc.—¾"x11-1/16"x53½"—Bottom
2 pcs.—¾"x10½"x11¼"—End shelves

Lumber

2 pcs.—¾"x2½"x15"—Facing strips
1 pc.—¾"x2½"x30"—Facing strip
2 pcs.—¾"x2½"x12"—Facing strips
2 pcs.—¾"x1-3/16"x15"—Facing strips
2 pcs.—¾"x1-3/16"x12"—Facing strips
2 pcs.—¾"x3¾"x10⅜"—Drawer fronts
2 pcs.—½"x3¾"x10"—Drawer sides
2 pcs.—½"x3-3/16"x9⅞"—Drawer back
2 pcs.—½"x1"x9⅝"—Drawer guides
4 pcs.—¼"x1"x9⅜"—Drawer slides
2 pcs.—¾"x1½"x53½"—Top and bottom back rails
2 pcs.—¾"x1½"x14"—End back strips

WALL BOOKCASE

Plywood

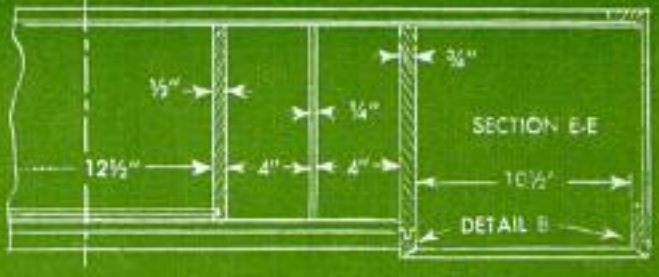
1 pc.—¼"x11½"x54⅛"—Top
2 pcs.—¼"x11½"x15"—Ends
1 pc.—¼"x14"x53½"—Back

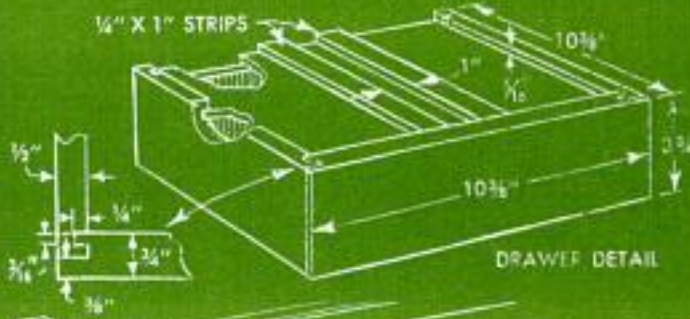
Plywood or hardboard

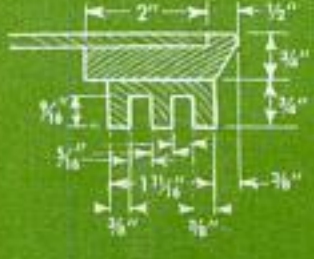
2 pcs.—¼"x13¼"x27½"—Sliding panels
1 pc.—¼"x2"x12½"—Sliding panel strip
2 pcs.—¼"x2"x5"—Finger-grip backs

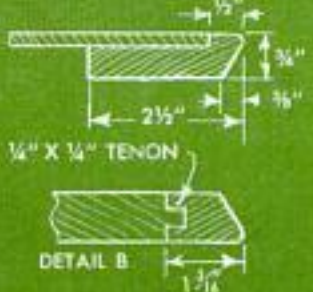
Lumber

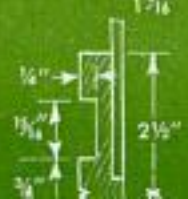
2 pcs.—¾"x2½"x15"—Facing strips
1 pc.—¾"x2½"x54"—Facing strip
1 pc.—¾"x1-3/16"x54"—Facing strip
1 pc.—¾"x1-11/16"x52½"—Channel
2 pcs.—¾"x1½"x53½"—Back rails
2 pcs.—¾"x1½"x14"—Back rails

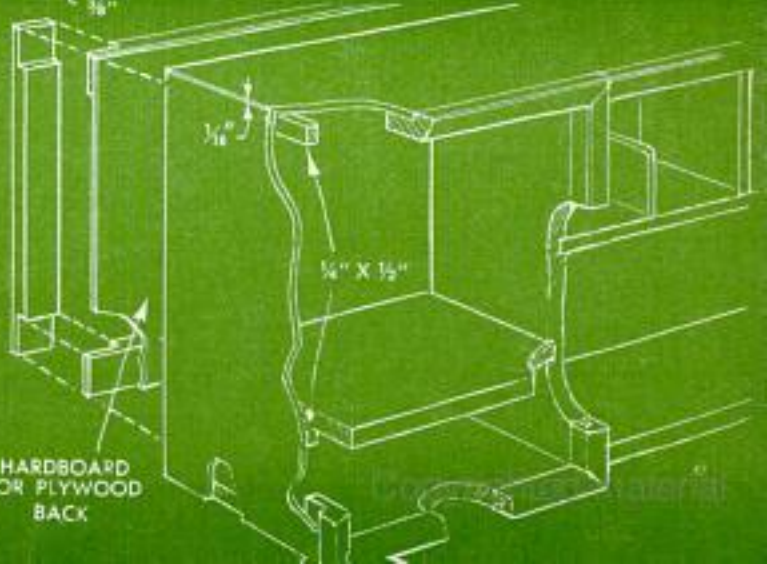




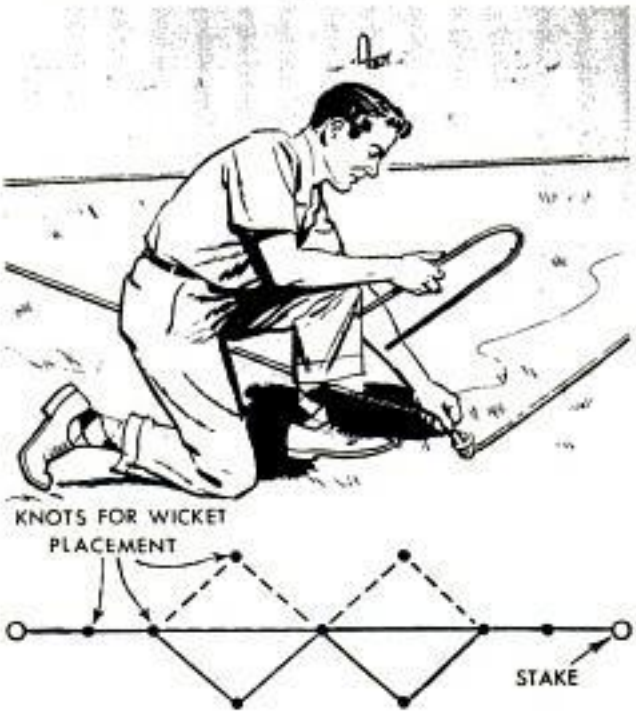






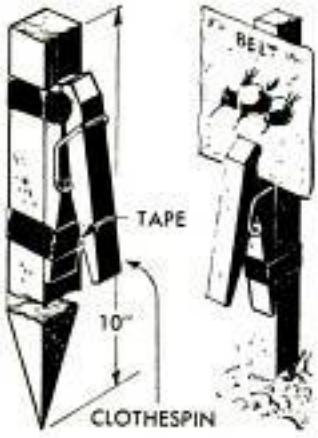


Standard Croquet-Court Pattern Assured With Knotted Line



Once you have this knotted-line "pattern" made up, laying out a regulation croquet court will take only a matter of minutes. The pattern is made by first laying out a court to the exact measurements given in the rule book. Then a length of heavy cord is strung between the end stakes and a knot is tied at the locations of the five wickets on the center line. Two additional lines are attached, as indicated in the detail, and stretched to form triangles. A knot at the apex of each triangle locates the side wickets. Swinging the triangles to the other side of the center line spots the location of the opposite outside wickets.

Holder for Garden-Seed Packets



A spring clothesline taped to a 10-in. pointed stake serves as a windproof holder for seed envelopes used to identify new garden plantings. Given a coat or two of spar varnish, these holders will serve you year after year. To make certain that the paper envelopes last as long as desired, coat them with a plastic spray or white shellac to make them water repellent.

Safety Pin Keeps Bait on Hook

A safety pin soldered to a fishhook having a long shank will make a hook from which live bait cannot escape. To use such a hook, open the pin and impale the bait on it. Then close it and you are ready to fish. Even the pull of trolling or casting won't pull the bait off of this hook. Fine wire instead of solder may be used to tie the pin to the hook.

Russ Jenkins, Chicago.

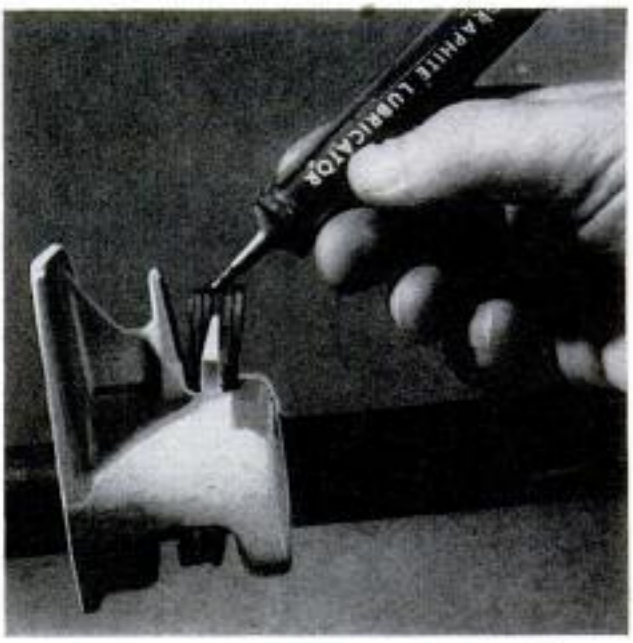
Removing Egg Stains From Fabric

Egg stains can be removed from fabric by first scraping off the residue with a dull knife and then sponging the stain with cold water. To remove more stubborn stains, rub in pepsin powder and allow it to remain for half an hour. Then rinse out the powder with cold water.

Ted Otsu, Vancouver, B. C., Can.

Prevent Slipping of Bar Clamp By Graphiting Spring Leaves

To eliminate the slippage in a bar clamp, which often causes trouble when setting up a job, lubricate the spring leaves with graphite. A wooden wedge should be used to hold each pair of leaves apart and thus insure a complete application. Commercial graphite available in applicators of the type shown, can be purchased in most hardware stores. As an emergency source, small amounts of graphite may be obtained by scraping the lead from a pencil.



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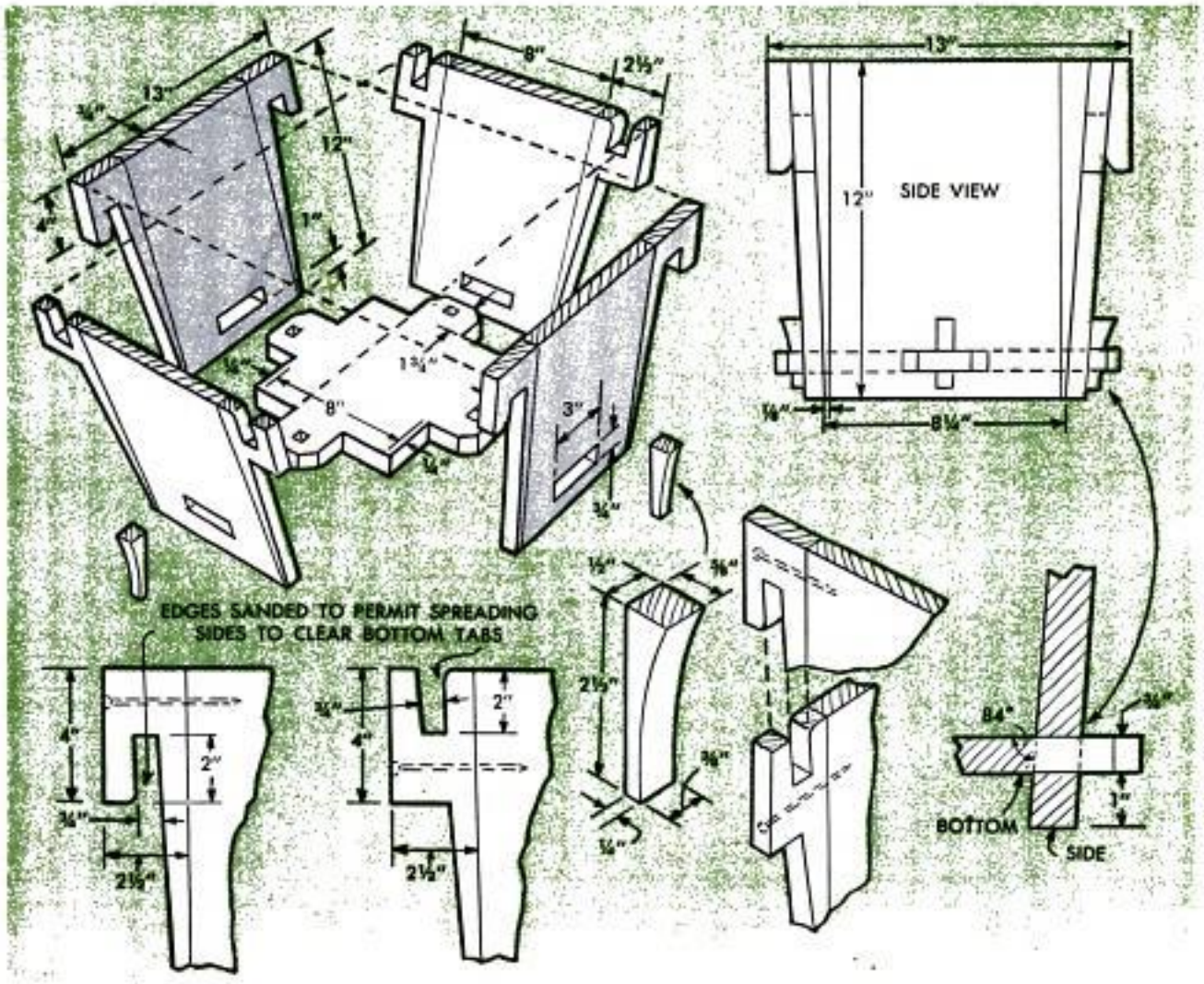
WIM 55

REDWOOD FLOWER BOX

By Dick Hutchinson

THE SIDES of this novel redwood flower box are held together with hooks and slots cut in the wood, and the bottom is locked in place with four wooden pegs. If wide stock is available, the sides of the box can be made in one piece, otherwise they can be built-up as indicated in the drawing. The mortises cut in the sides to receive the ears of the bottom should be sawed or filed at an angle of about 85 deg. The angle of taper for the sides is ⅛ in. from the vertical line at the bottom, as in the side view, to 1⅛ in. from the line at the top. Assemble the box by first locking the ears of the sides together, then set in the bottom and drive in the pegs. If redwood is not available, pine may be used. In this case, the wood should be treated against wood rot with a wood preservative solution of the type over which paint can be applied.

Eye-catching redwood flower box of novel interlocking construction is ideal for terrace or patio. Size and proportions can be varied, using similar assembly method to preserve the uniqueness of this design



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CHECK 'EM ON SHORE

The dejected soul at the wrong end of the tow rope knows that outboards don't quit if treated right. Now he remembers a few little details he didn't check when taking the motor out of storage

PART II

(HERE COME THE OUTBOARDS)

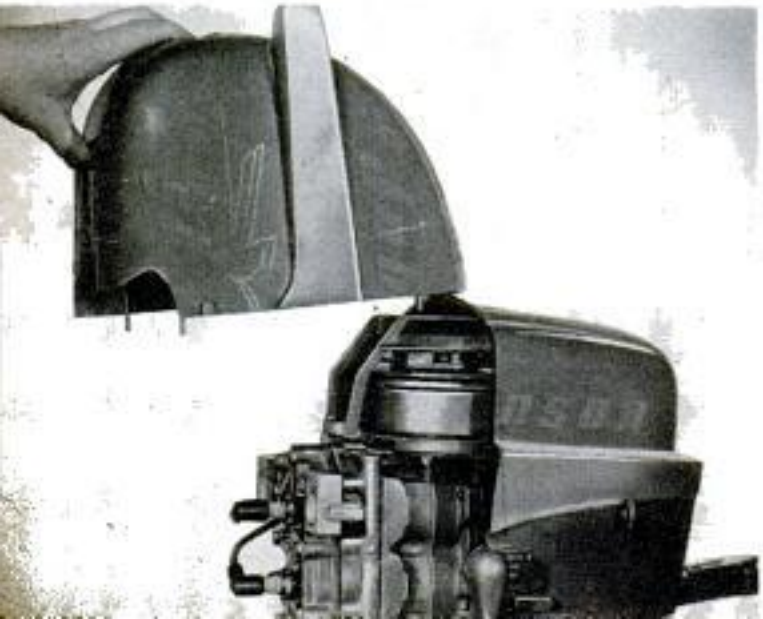
By Frank N. Stephany

THE OUTBOARD MOTOR is about as dependable and trouble-free a piece of machinery as can be made. It will give you service year after year and absorb a surprising amount of punishment. But, in spite of this, don't lose sight of the fact that it is a precision machine and requires a certain amount of care plus protection from any machine's worst enemy—rust.

The care of an outboard might be divided into four phases—break-in of a new motor, precautions and repairs while the motor is in use, maintenance and storage. Except for break-in, which is not necessary on some motors, all phases are of about equal importance in contributing to trouble-free motor performance.

While some manufacturers do not recommend breaking-in their motors, those who do will furnish specific instructions regarding treatment of the motor during this period. If you're in doubt, however, a safe break-in procedure to follow is to add 50 percent more oil to the gasoline than the proportions recommended for normal operation. In using this fuel mixture, do not run the motor with the throttle more than ¾ open, except for an occasional few minutes at full throttle when necessary to adjust the high-speed needle of the carburetor. The break-in period may last from a minimum of 5 hrs. to a maximum of 15 to 20 hrs. After break-in, check the lubricant in the gear housing, adding whatever amount may be necessary, and remove and clean the spark plugs. Chances are that the

Covers on the newer motors are hinged for convenient access to spark plugs and other working parts



Replacing propeller shear pin is easy and you will be able to make this repair while out on the water

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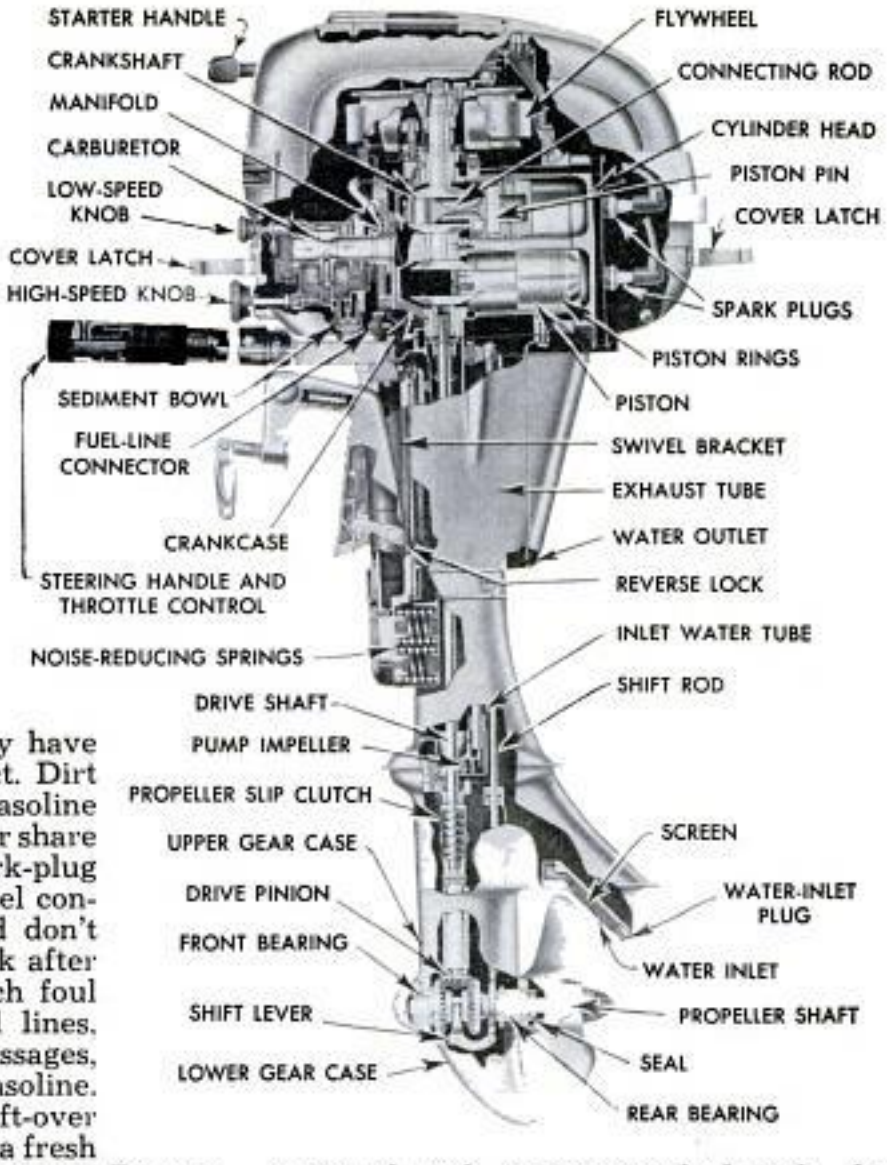
high-oil-content fuel mixture will tend to foul the spark plugs. Tighten any nuts and bolts that may have worked loose and adjust the carburetor idling jet for slower idling with the normal oil-gasoline mixture that will be used from now on.

Follow the motor manufacturer's directions regarding the proportion of oil to gasoline in the fuel mixture. Use a special outboard oil or a regular SAE-30 grade of automobile oil and a good-quality "regular" gasoline. Premium oils contain additives which are likely to shorten spark-plug life, while the high lead content of Ethyl gasolines may have the same undesirable effect. Dirt in the fuel mixture and gasoline gum are responsible for their share of fuel-system and spark-plug trouble. So, be sure that fuel containers are kept clean and don't leave fuel in the motor tank after a run. Gum deposits, which foul spark plugs and clog fuel lines, screens and carburetor passages, often are due to "old" gasoline. Thus, it's best to drain off left-over fuel and refill the tank with a fresh mixture before starting out again. Be sure to clean the sediment bowl or fuel strainer at frequent intervals.

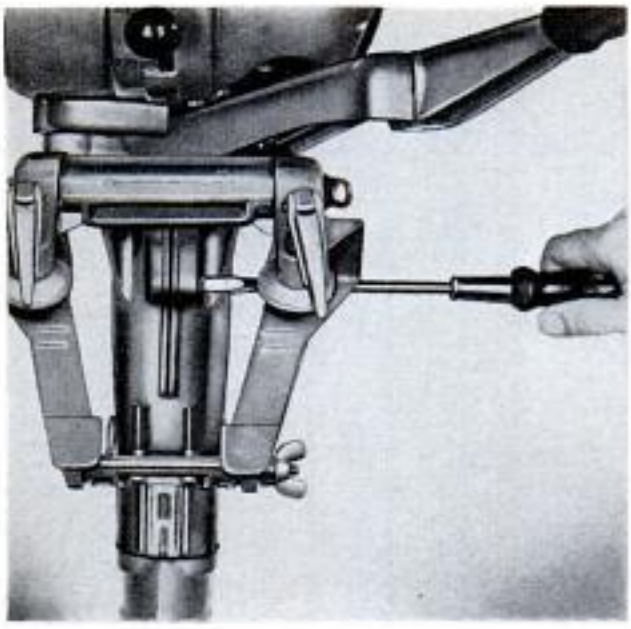


The motor fuel tank is designed to hold a little more fuel than its rated capacity to allow for the addition of oil. Don't attempt to mix the fuel in a tank built into the motor, but instead, mix the oil and gasoline in a separate container. If the motor is equipped with a separate fuel tank, the fuel, of course, can be mixed in it. To mix the fuel, first pour about half of the total amount of gasoline into the tank. Then add all the oil required and shake the tank until the oil and gasoline are thoroughly mixed. Finally, add the balance of the gasoline and again shake the tank vigorously.

You probably will find that your motor

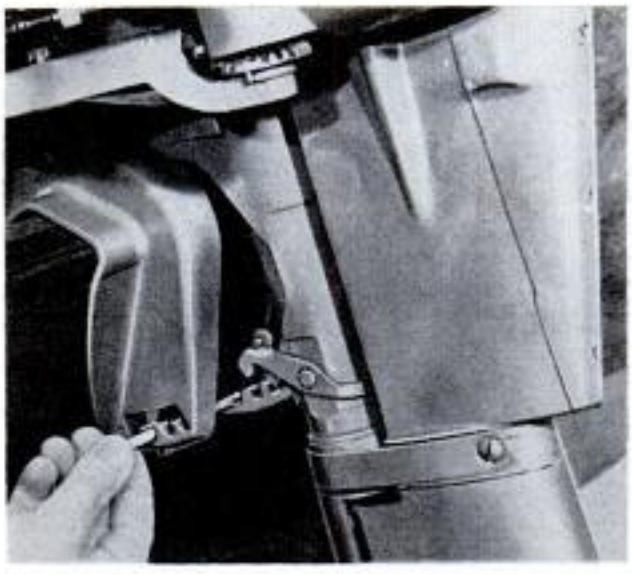
Note how simple it is to raise the motor cover and replace defective spark plugs while out in the boat

Boater in photo below demonstrates how shear pin is replaced. Here, he's removing bent pin with pliers

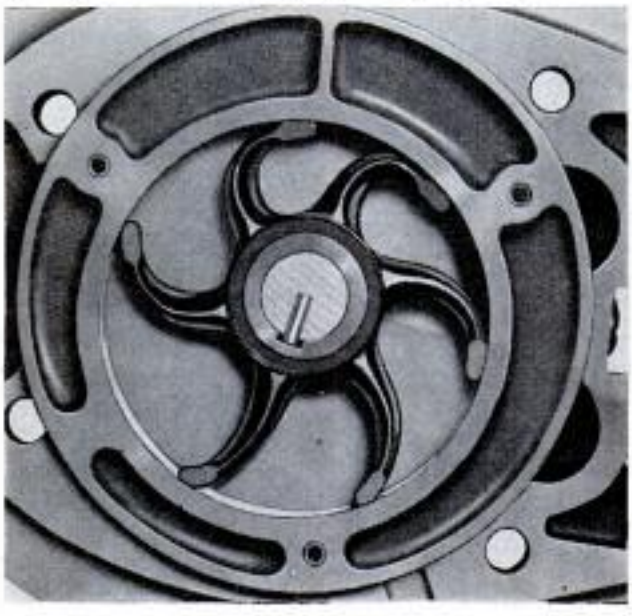


Above, steering friction can be adjusted to suit individual preference. Photo below shows one method of varying motor tilt so drive shaft is vertical

Lubricant is applied to gear housing with pump-type oil can, as above, using upper opening. If pressure gun is used, fill gear case through lower opening



Water pump used on many outboards, below, functions as a displacement-type pump at low motor speeds; as a centrifugal pump at high-speed operation



has two carburetor adjustments — high speed and low speed, or idling. Although these adjustments are made at the factory, there will be occasion to readjust them for smooth motor performance. Manufacturer's directions will vary somewhat as to exactly how these adjustments should be made on their particular product. However, basically, here is what you will do. Run the motor at high speed and adjust the high-speed carburetor needle to obtain just the right fuel-air mixture for smoothest operation. Then the motor is throttled down to low speed and the low-speed needle valve is adjusted similarly. Dial or lever controls are provided on the motor to permit making these adjustments easily. A mixture that is too rich (high percentage of fuel) will be indicated by "rough" operation, while a mixture that is too lean will be accompanied by spitting and coughing.

When using the motor, there are several things to keep in mind for top-notch performance and maximum protection of the motor. After mounting the motor on the boat transom, check the angle of the drive shaft to the surface of the water. To get the most in speed and handling qualities from your boat and motor, the shaft should be perpendicular to the water surface when the boat is being driven at its normal speed with a properly balanced load. Adjust the angle of the drive shaft to the transom bracket until this is attained.

If the motor is equipped with a gearshift, always reduce motor speed before shifting —the motor usually will have a shift position indicated on the throttle control. When running in reverse, be especially careful to avoid underwater obstructions. The propeller is unprotected and the motor cannot

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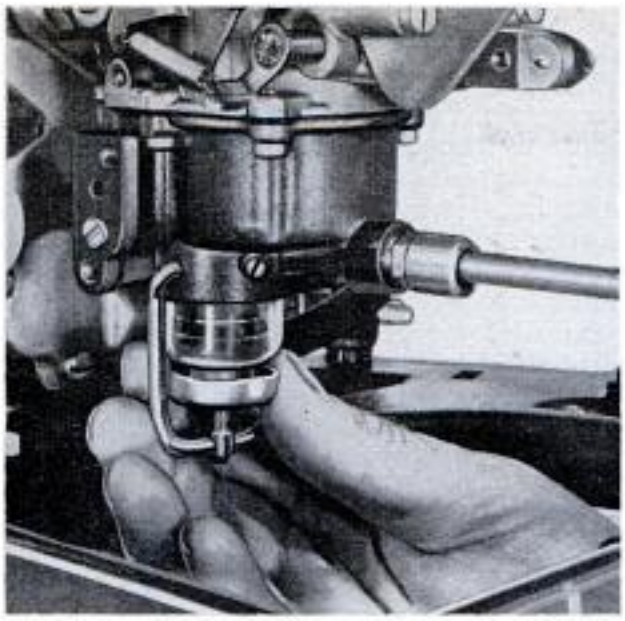


Sediment bowl should be removed from fuel filter and cleaned periodically. Access to sediment bowl is convenient. Fuel always should be kept clean

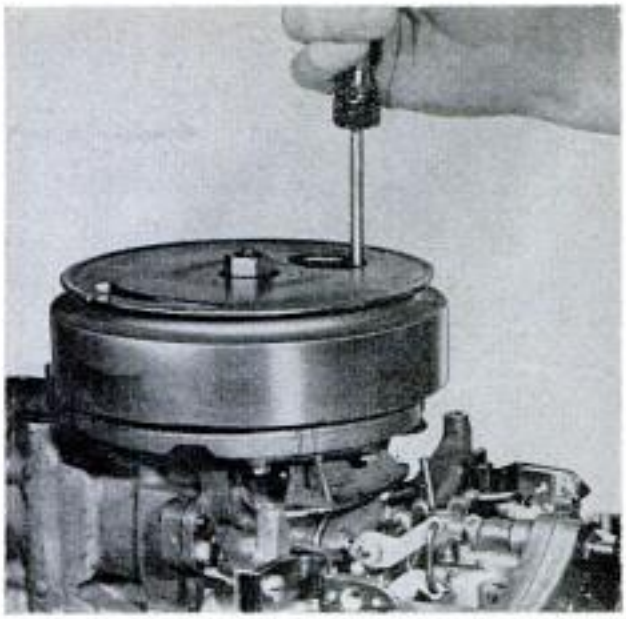


Photo above shows screw driver being inserted through flywheel port to adjust gap of breaker points. Note adjusting screw in detail, bottom of page

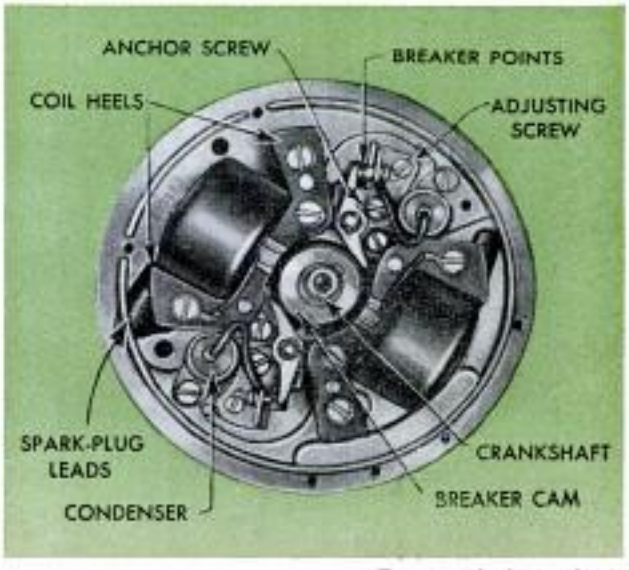
tilt away from the direction of travel if an obstruction is hit. Incidentally, when tilting the motor to bring the propeller out of the water, grasp the rear of the motor housing and the carrying handle usually provided at the front of the motor.

When going out on the water, carry along an extra set of spark plugs and an extra shear pin or two. Changing the spark plugs and replacing a broken shear pin are extremely simple jobs, as you will discover when checking the motor. It's a good idea to learn how to start your motor if the cord on the automatic-rewind starter should break. Carry a spare cord for this purpose. You can start the motor with the spare cord by removing the rewind assembly from the top of the motor. Then slip the knotted end of the cord in the notch in the flywheel pulley, wrap the cord clockwise around the pulley and pull the cord to start the motor in the same way as though it did not have a rewind starter. Replace a broken cord on the rewind mechanism as soon as possible. When removing the motor from the boat after docking, never carry or set it down with the lower unit higher than the power head. When this is done, water may run through the exhaust ports and into the power head, causing rust.

One of the most important points to check periodically is the gear-housing lubricant. Check the gear case after the first 5 hrs. of operation to be sure it is filled and, after this, check at least once every 50 hrs. To check for water in the gear case, remove the upper plug, sometimes marked either "fill" or "vent," and loosen the lower plug, marked "drain" or "grease," just enough to permit seepage. As water is heavier than the oil, it will drain off first. If water is

Magneto breaker points can be spread with a screw driver and cleaned by working a point dresser gently up and down between the point surfaces. Final cleaning is done similarly with small piece of paper

Construction of magneto is pictured below. Note that there are two sets of breaker points, each having an adjusting and an anchor screw. Turning flywheel brings either set of points under inspection port



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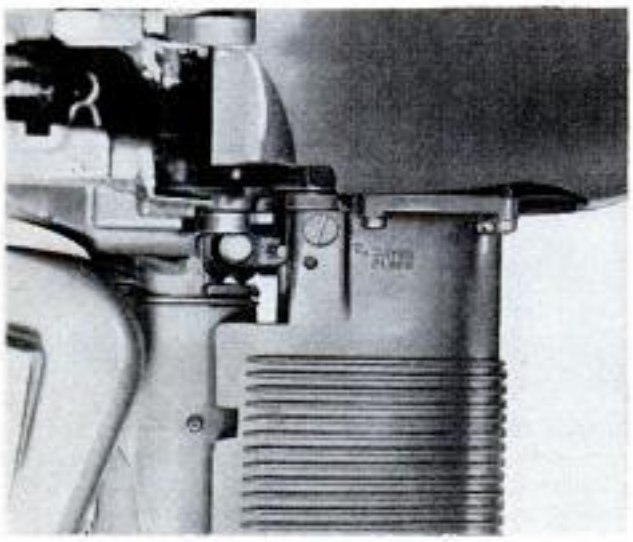
Cord of modern rewind starter is replaced as in photo above. This is done by removing complete starter assembly from motor and clamping in bench vise



Flush plug, photo above, is removed to flush out cooling system with fresh water after salt-water operation. Fuel is drained before storage, below

present, drain until lubricant begins to seep through and then refill the gear case.

The magneto, which supplies the electric power to the spark plugs, is housed in the motor flywheel. About the only attention it will require is occasional cleaning and adjusting of the breaker points. This can be accomplished through an inspection port provided in the top of the flywheel. The points are cleaned by spreading them with a small screw driver and sanding lightly by inserting a point dresser between them and working it gently up and down. Then a strip of clean paper is worked similarly between the points to remove any traces of abrasive material. The breaker-point gap should be set to the manufacturer's specifications, usually .020 to .025 in. This is done by loosening the anchor screw, turning the adjusting screw to the left or right to increase or decrease the gap, checking with a feeler gauge and then retightening the anchor screw. After checking with the gauge, run a second piece of paper between the points to be sure they are clean.

Spark plugs should be checked for carbon deposits and color, and the electrode gap should be set to the manufacturer's specifications. This can be done by unbending the side electrode and checking with a feeler gauge. A small carbon deposit around the electrodes is perfectly normal, and can be removed by scraping with a knife or a small wire brush. The porcelain around the center electrode of the plug should be a brown color and free from oil. If the porcelain is white or covered with a brittle carbon deposit, the plug is too "hot" and you should obtain a cooler-running plug. If it is oil-covered, a hotter-running plug is recommended for better service.

When getting motor ready for storage, remove plugs and add 1 or 2 tablespoonfuls of oil to cylinders. Revolve flywheel a few times with cylinders vertical

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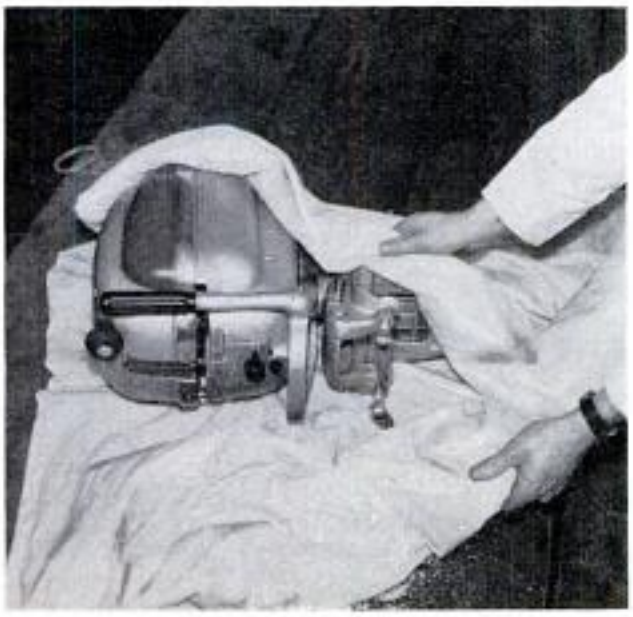
Carefully preparing your motor for winter storage will save you headaches in the spring and possibly a costly repair bill. First, run the motor on an extremely rich fuel mixture just before storing, thus flooding the interior with fuel to help reduce the effects of condensation. Then check for water in the gear case and refill with lubricant. If the motor has been operated in salt water, remove the flush plug and flush the cooling system with fresh water. Be sure that all water has been drained from the cooling system. Then remove the spark plugs and pour 1 or 2 tablespoonfuls of oil through each spark-plug opening and into the cylinder. To spread the oil on the cylinder walls, rotate the flywheel slowly by pulling on the starter cord. Then, replace the plugs. Drain all fuel from the gas tank, fuel line and carburetor and clean the filter. After wiping the exterior of the motor with an oil-saturated cloth, hang the motor on a rack in an upright position. Store the motor in a clean, dry place.

If you've been careful about storage preparation, putting the motor back into operation in the spring will be a simple matter. Remove the plugs for cleaning and, while they are removed, ground the high-tension terminals to the motor. Then crank the motor briskly to clear the cylinders of excess oil or fuel mixture. Clean the plugs with carbon tetrachloride and adjust the gap. Finally, test all nuts and bolts for tightness and check the condition of the propeller and shear pin. By keeping these suggestions in mind, following the manufacturer's instruction manual closely and checking with your motor dealer when in doubt, you'll get many years of pleasure from your outboard motor. ★ ★ ★

After motor is ready for storage, wipe exterior with oil-saturated cloth and then wrap in canvas, old blanket or paper. Clamp to rack so motor is vertical



What's Wrong

Possible outboard-motor troubles and common causes

MISSING OR HARD STARTING

No gas or fuel line closed
Gas-cap air vent closed
Cold motor not choked or warm motor flooded
Too much oil in fuel mixture
Water or foreign matter in fuel system
Spark plug shorting to motor cover
Loose or broken spark-plug lead
Spark plugs or breaker points need cleaning or gap setting
Outer spark-plug insulators cracked or dirty

ROUGH IDLING

Spark-plug type too cold
Carburetor idle adjustment needs resetting
Blown intake-valve gasket
Motor too deep in water

LOSS OF POWER

Spark-plug type too hot
Carburetor out of adjustment, either too rich or too lean
Incorrect fuel mixture
Fuel line clogged
Poor compression due to blown gaskets, scored cylinder walls or sticking piston rings

MOTOR FREEZES

No lubricant in gear housing
Rust on cylinder walls
Bent propeller or shaft
Propeller shaft fouled
Too little oil in fuel mixture

EXCESS VIBRATION

Transom-bracket clamps loose
Swivel bracket loose
Steering tension too loose
Carburetor adjusted too rich
Propeller bent or fouled

KNOCKS

Spark advanced too far
Propeller or flywheel nuts loose
Carbon in cylinders
Preignition due to overheating
Bearings, piston or cylinder worn; loose connecting rod

OVERHEATING

Pump inlet clogged or water line leaking
Exhaust gasket blown
Motor not deep enough in water to permit cooling
Pump clogged or defective

PROPELLER DOESN'T TURN

Broken shear pin
Propeller nut loose
Broken propeller, propeller shaft or drive shaft

MOTOR DOESN'T DRIVE BOAT

Propeller bent
Weeds causing cavitation or obstruction being dragged
Motor not deep enough in water (cavitation)

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Portable Circular Shaving Mirror Has "Built in" Light

A circular mirror of the type fitted with a wire stand may be modified for use as a self-illuminating shaving mirror by using a broom clamp and a small night light. A piece of sheet metal is cut just wide enough to slip through the base of the broom clamp and extend ½ in. on each side of the wire stand. The ends of the sheet metal are bent down over the wire stand. Two small sheet-metal screws can be used to hold the clamp more firmly. A small plastic-shaded night light snaps easily into the broom clamp. The inside of the light reflector should be lined with metal foil for more efficient lighting.

Toothpicks Locate Holes After Wallpapering

Before wallpapering, remove all picture hooks from the wall and insert toothpicks in their stead, allowing the toothpicks to extend ¼ in. or so from the wall. When the wallpaper is hung, these will project through it, indicating the spots at which the picture hooks are to be replaced.

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

A Motel on Wheels

Your vacation money will take you much farther in the folding trailer to be featured next month. Less than 9 ft. long, it unfolds to sleep four comfortably and is fully equipped for good living. Build it yourself from the detailed plans

Bedspring Coils Do Double Duty As Oar Holders and Fenders

Discarded bedspring coils fastened to the gunwales of a rowboat, as shown, will serve a double purpose. When the oars are shipped, the blades can be set in the spring coils, which prevent them from dripping in the boat. When the boat is brought up to a pier or dock, or alongside another boat, the coils will act as fenders, preventing damage to the side.—Lee H. Schrimpf, Tulsa, Okla.

Relocation of Eye on Small Boat Eliminates Veering When Towed

To keep a small boat from veering and yawing as it is being towed, try locating the towing eye well down on the stem as shown. This will cause the bow to rise higher out of the water thus eliminating the tendency of the boat to swing off course. Care should be taken in inserting the eye in the stem to avoid cracking the wood or causing a leak.

Moistening Sponge Improvised From Blackboard Eraser

A clean blackboard eraser provides an excellent sponge for moistening envelope flaps, stamps and paper tape. Saturate the eraser in water, then place it face up in a saucer or on a scrap of wood. Draw the adhesive surface slowly across it, applying light pressure with the fingertips.

M. E. Bowles, Magnolia, Ark.

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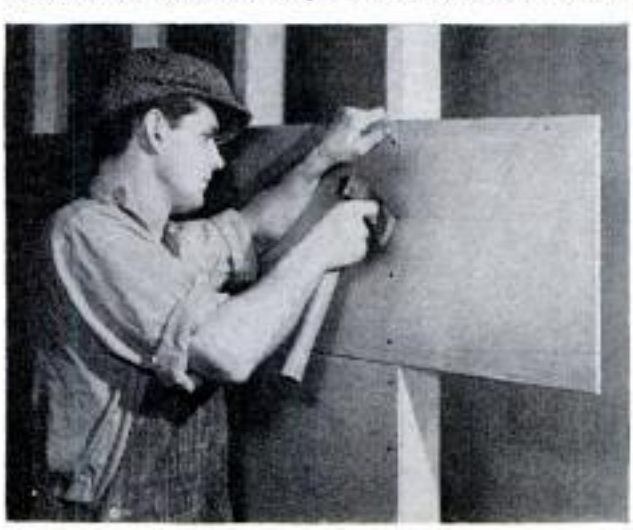
WHAT MAKES A GOOD PLASTERING JOB

PLASTERED WALLS are old stand-bys because of the flexibility of the material in application, its adaptability to almost any interior design and in large measure to its durability and fire-protective qualities. When you buy an old house, look carefully at the condition of the plaster. If you are building a new home you should know what procedures and materials result in a good, long-lasting plastering job.

In new construction, it's a common procedure to apply plaster over gypsum lath, a fireproof plaster base in standard sheet form which is faced on both sides with a special fibrous paper. Gypsum lath is low in first cost and is quickly and easily applied. It is available in three types, standard or plain, perforated and also an insulating type having an aluminum-foil facing on one side. All three types are ⅜ in. thick and the sheets are 16 x 48 in. so that they can be nailed to studs or joists placed on 16-in. centers. The perforated lath is identical with the other two except that perforations are made in each sheet in a regular pattern. The perforations provide a mechanical key for the plaster and also help to reduce plaster waste at the time of application. Aluminum-foil insulating lath is applied with the foil facing the studs or joists. It insulates, controls condensation and is highly fire resistant. Its insulating value is equal to ½-in. insulating fiberboard for side walls. For ceilings it provides the same amount of insulation in wintertime and summer resistance to heat is about three times as great as other ½-in. materials. The foil cemented to the back of the lath provides an effective vapor barrier, preventing moisture condensation within the walls by reducing vapor transmission

Plastered walls can be contoured to pleasing lines or curves of almost any degree or shape. Note graceful sweep of stair rail

Gypsum lath, or plaster base, is cut flush with studs at openings. Ordinarily, ends meet at stud centers. Note that lath is nailed; then scored and broken



Perforated lath allows plaster to anchor or key itself mechanically to lath for greater fire protection, and also help reduce plaster waste during application

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Gypsum lath with aluminum-foil backing is applied with foil facing studs. Insulates against heat and cold

by 90 percent or more, in most structures.

All three types of lath can be applied to wooden framing and wooden furring over masonry walls as well. The sheets can be nailed or fastened with special clips to metal furring. If desired, the clips also can be used for attachment to wooden furring. Nails used should be those specified by the manufacturer, generally 1⅛-in. blued nails made from 13-ga. wire and having a head 19/64 in. in diameter. Nails must be driven home so that the top of the head is flush with the surface of the paper but without breaking it. The lath should be applied to walls with the long dimension horizontal and the vertical joints staggered. After application of the lath, interior corners are reinforced with metal corners and exterior angles with metal beads. These should be set to provide for a ½-in. plaster thickness.

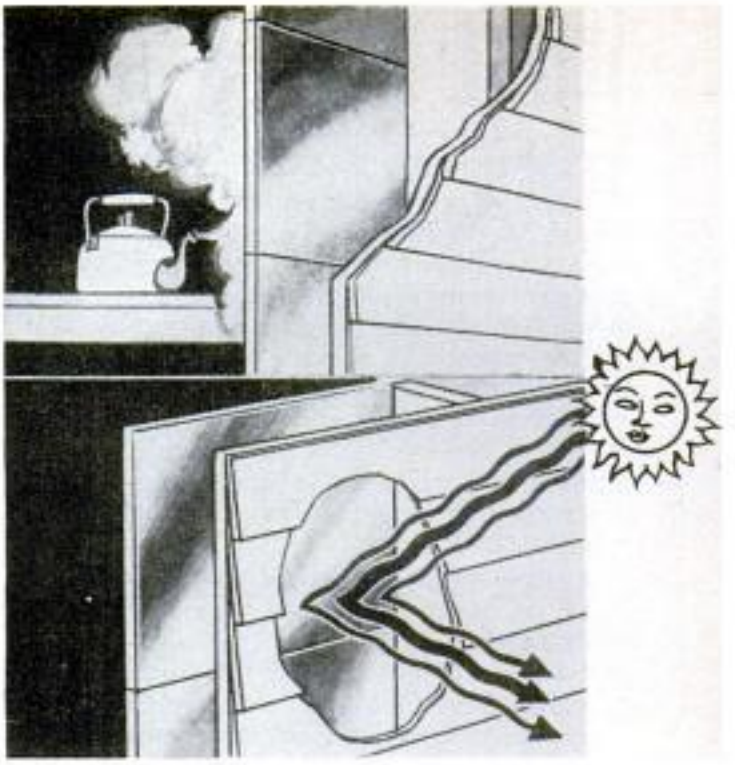
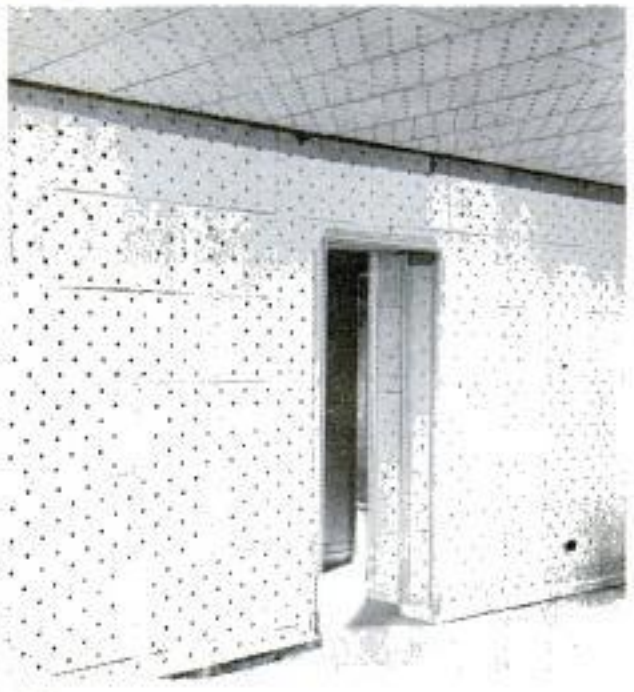


Diagram shows how foil-backed lath serves both as vapor barrier and reflective insulation in building

Metal-lath stripping should always be fastened to gypsum lath with staples, never with nails into framing members, as plaster cracks may result. Corner beads, which serve as grounds, generally are nailed to the framing members. Be sure the beads are straight as they form guides when plastering up to the corners.

Floating systems of lath attachment, employing various types of clips, are often used to reduce room-to-room sound transmission and also to reduce the possibility

Room finished with perforated lath ready for plastering. Note the use of cornerbeads and wire corners



Floating attachments may be used in place of nail-on construction to reduce sound transmission and cracking

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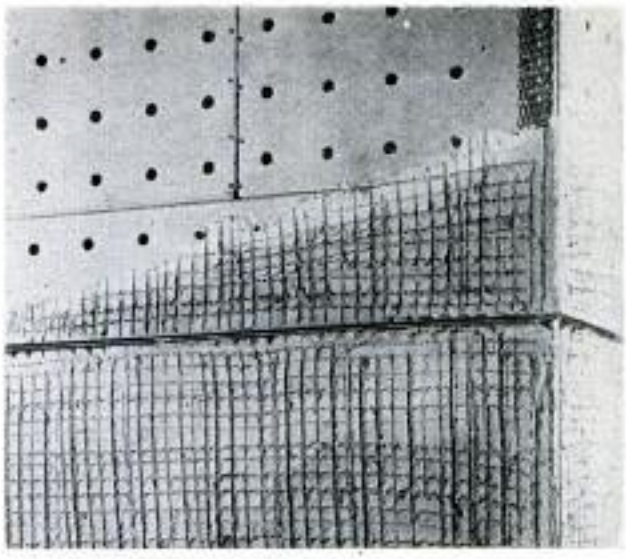
of the plaster cracking due to movement of the structural members of the building.

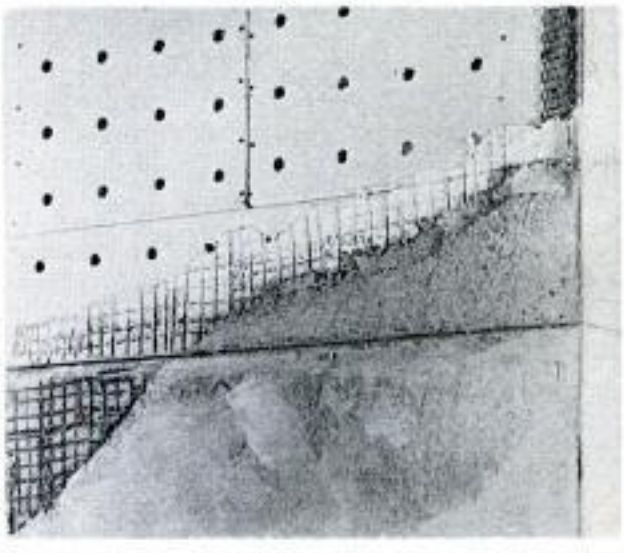
Proper thickness of the plaster base coat is an important step in a good plaster job. Usually the minimum thickness recommended is ½ in. Thickness of the plaster coat is controlled by grounds or screeds, or both. The grounds are metal or wooden strips applied at the perimeter of all openings. Screeds are continuous strips of plaster applied at spaced points across large wall and ceiling areas. To achieve a true plaster plane across the area, the plasterer uses a straightedge, or rod. While the proper plaster thickness over gypsum lath, fiber insulating lath and gypsum partition tile is only ½ in., a minimum thickness of ⅝ in. is required over brick, clay tile or over metal lath when measured over the face of the lath, providing a total minimum thickness of ¾ in. including the lath. When grounds and screeds are used an allowance of 1/16 in. is made for the finish coat.

In home construction, two types of basecoat plaster are commonly used: Gypsum neat plaster to which sand or other aggregate is added before application, and a ready-mixed gypsum plaster which requires only the addition of water at the job. Neat plaster is mixed with not more than 3 parts of sand and is available as fibered or unfibered. Fibered gypsum plaster is generally used for the scratch coat over metal and wood lath. Ready-mixed plaster contains sand, perlite or vermiculite in the correct proportions. Its use eliminates the hazard of improper sanding. The use of lightweight aggregates, vermiculite and others, greatly reduces the labor of handling and halves the load on the framing of the structure.

Plaster base coat usually is applied by



Scratch coat over gypsum lath for a three-coat job. This is applied directly to lath to thickness of ¼ in., then cross-raked to present roughened surface



Brown coat over scratch coat brings wall surface out to full ground thickness less 1/16-in. allowance for finish coat, which is third and final coat

Double-up basecoat in two-coat work showing brown coat being applied over unset scratch coat. Note that scratch coat is not cross-raked. Left, rodding a newly plastered wall with platerer's rod, or straightedge, to remove excess plaster and true surface

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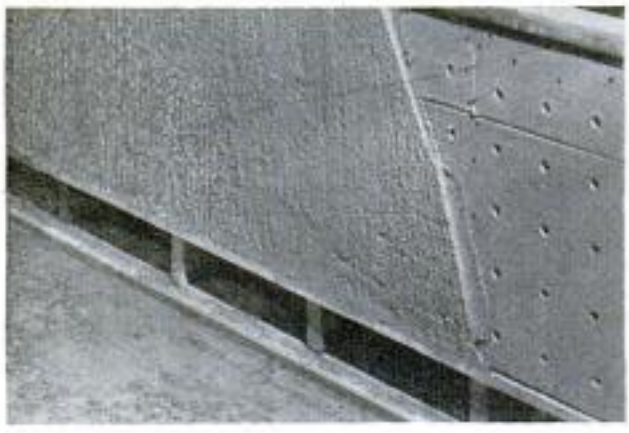
Simple test for strength of plaster is to scratch with nail. Deep scratches indicate too much aggregate

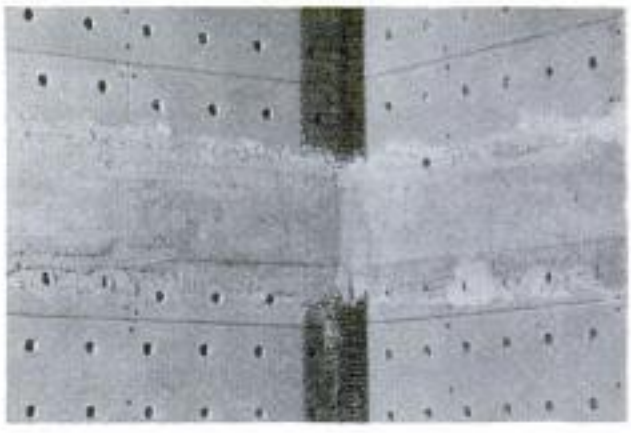
If nail can be made to scratch only lightly, plaster has correct sectional strength for average purpose

the two-coat, or double-back, method. The first coat is laid on to a thickness of about ¼ in. and followed immediately, before the first coat sets, with a second coat to bring the total thickness out to the grounds with allowance for the finish coat. This is rodded and uniformed with a darby to insure a true surface. In three-coat application, the first coat (¼ in. in thickness), commonly called the scratch coat, is cross-raked lightly to present a roughened surface and is then allowed to set before the final base coat (brown coat) is applied to build out to the final base-coat thickness. Over metal and wire lath, three-coat plastering usually is necessary as the open mesh will not support the full thickness of the wet base coat. For two-coat jobs, plaster is mixed in the proportion of 2½ cu. ft. of lightweight aggregate to 100 lb. of plaster for the base coat, or 250 lb. of sand to 100 lb. of plaster. In three-coat work the aggregate-to-plaster proportions for the scratch coat are 2 cu. ft. of lightweight aggregate to 100 lb. of plaster or 200 lb. of sand to 100 lb. of plaster. The aggregate-plaster mix proportions for the brown coat are 3 to 1.

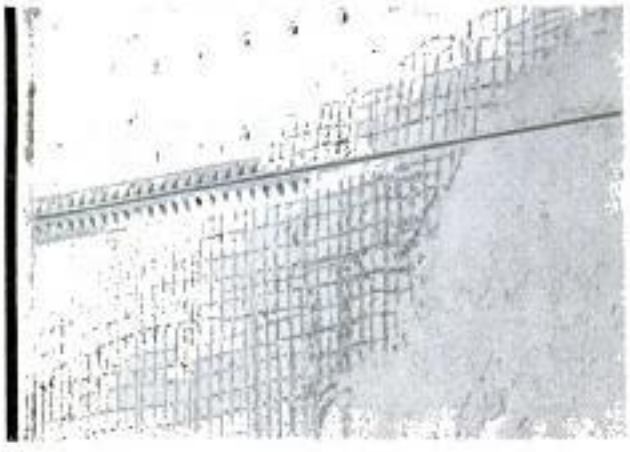
The mix for the finish coat usually consists of 3 parts of lime putty (lime soaked in water) to 1 part of gauging plaster or Keene's cement by volume. This is equivalent to 2 parts of dry lime to 1 part dry gauging plaster by weight. If a greater surface hardness is desired, the gauging plas-

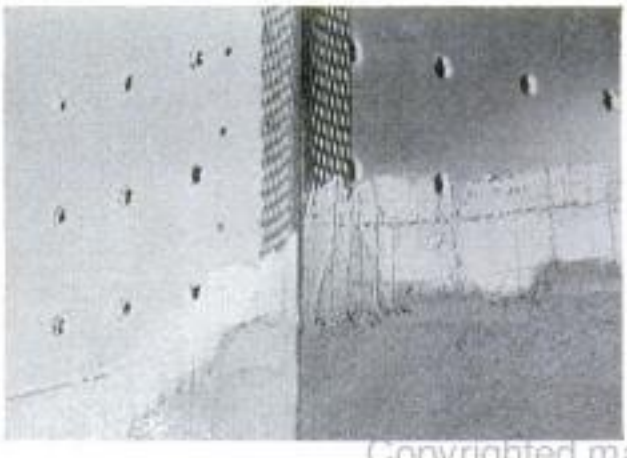


Above, it's important to maintain uniform base-coat thickness. Below, a corner bead used at a rod guide



Above, screeds aid in rodding to uniform thickness. Below, beads serve as guide to plaster thickness





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Cellular structure of acoustical plaster is secret of sound-absorption qualities

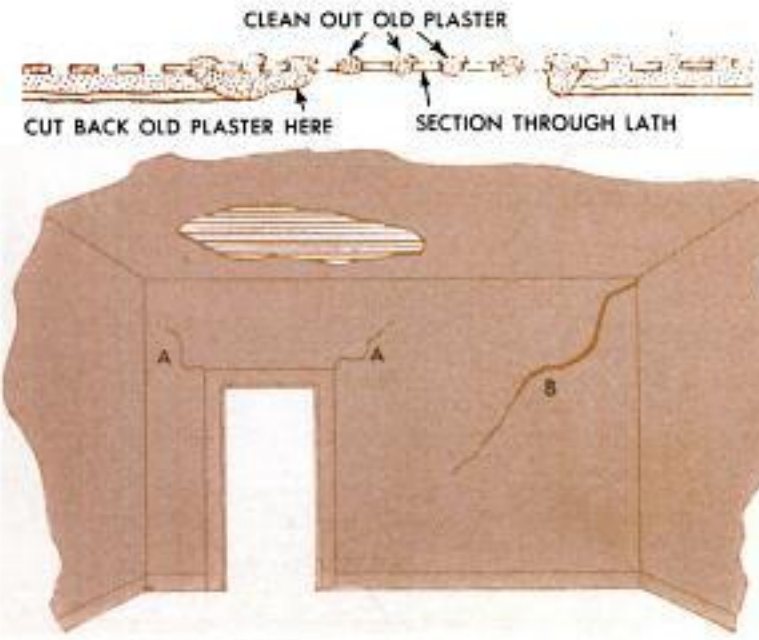
ter is increased to equal parts of lime putty and gauging by volume. After correctly proportioning, the ingredients must be mixed and kneaded thoroughly. A prepared gypsum trowel finish is available which contains all the ingredients ready-mixed in one package.

In repairing plaster defects such as those in details A and B below, the first step is to remove all loose plaster, then undercut the edges of the opening. Use the double-back method for building up the base coat in a large patch such as that shown at the right, detail B. Trowel on a finish coat after base coat is dry. Shield the patch from drafts until the plaster has set. Narrow cracks, ⅛ in. or less, should be filled with patching plaster and then sanded flush with the surrounding surface. It should be remembered that before paint is applied to the patch in redecorating, the surface should be sized or finished with an undercoater.

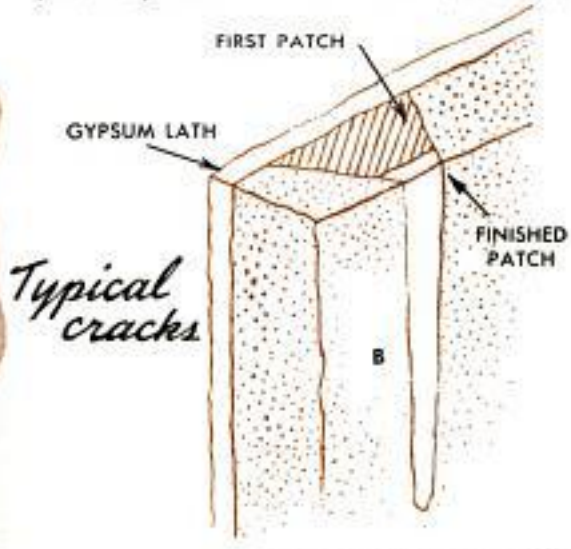
Acoustical plaster is applied to the brown coat on both ceilings and walls, two to three coats in place of regular finish

On the job, care must be taken to prevent exposure of newly applied plaster to drafts before it has fully set. In hot, dry weather special precautions must be taken to prevent water from leaving the wall before setting of the plaster, causing what is known as dryout. All openings in the building should be closed. In cold weather a minimum temperature of 55 to 70 degrees should be maintained in the building until the plaster is dry. To insure a strong, permanent job ample ventilation must be provided after the plaster has set. ★ ★ ★

Photos and information courtesy
The Gypsum Association



A and B in details below show typical plaster defects and how to patch them correctly. Note procedure in sectional view at left



Typical cracks

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Fluorescent Darkroom Safelight Utilizes Filter Paper

A photo-darkroom safelight, utilizing a gold-colored 40-watt fluorescent tube modified by filters, provides a light bright enough to permit reading a newspaper, yet is safe for printing all photo papers. The fluorescent tube, which must be gold-colored, is modified by first wrapping it with Varigam filter paper, as shown in the photo. Then ultraviolet filter paper is formed into a cylinder—shown to the right of the tube—and slipped over the fluorescent tube. The filters may be ordered through most photo-supply houses, the tube at an appliance dealer's. While the light is safe for printing paper, it should not be on, of course, when developing film.

Photographic-Chemical Cans Provide Labels for Jugs

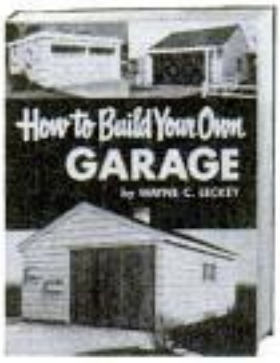
Permanent labels for jugs containing developer or other photographic liquids can be made by cutting them from the empty cans in which the chemicals are purchased. Outline the can label, leaving a tab at one end about 3 in. long, and cut it out with a pair of tin shears. The label is attached to the jug by bending the tab around the handle.

Newton H. Hartman, Glen Mills, Pa.

Popular Mechanics Bookshop

Fisherman's Guide

HERE ARE hundreds of tips on "tackling" a fish, from full-color photos of the finest lures to instructions on how to mount your catch. Veteran anglers share their secrets of fly fishing, bait casting and salt water fishing. The price is only $2.00



Need a Garage?

ANY MAN who can use a hammer and saw can build a garage. This book can cut your garage costs in half. Written for the amateur, it shows you how with more than 500 photos and drawings. Every style is covered, and every step of construction from foundation to the roof. Price is $3.50

Outdoor Kitchen

NOW IS the time to build that outdoor fireplace for pleasant summer meals, and here is the book to help you build it. Included are plans and detailed instructions for barbecue pits, grills, Chinese ovens and lawn furniture. The price is $2.00

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

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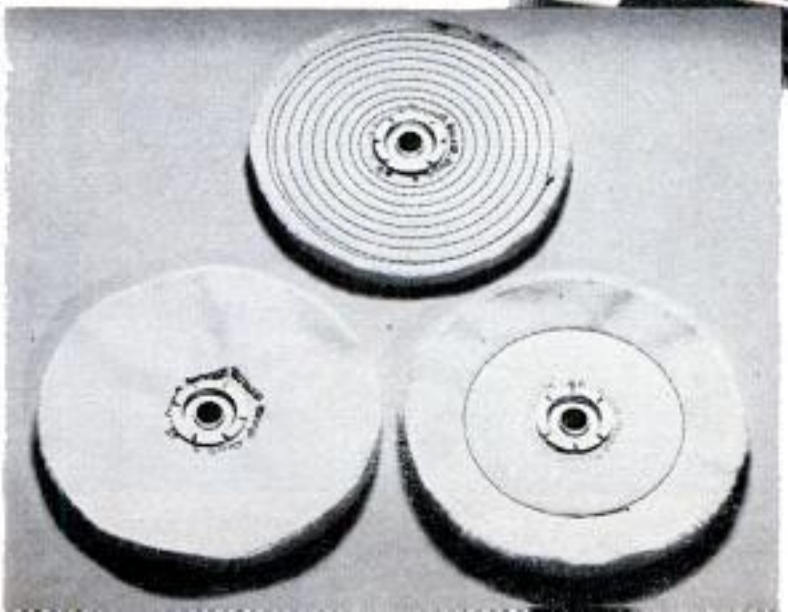
BUFFING in the Home Shop

THERE ARE FEW home-shop projects that give such obvious results as quickly as buffing. Besides providing hours of fun, the addition of a couple of buffing wheels and an arbor to your shop is almost guaranteed to brighten up the home, giving about every detachable metal object in the house a new lease on life. Once you've taken a worn door knob, a piece of aging copperware, the family silver, jewelry or even a plumbing fixture that's borne countless unmerciful scourings, and restored its finish to a beautiful luster, you'll find that buffing is hard to resist.

Polishing is done, where necessary, in preparation for buffing and amounts to fine grinding, using emery, aluminum oxide and silicon carbide as abrasives. Buffing, which is refined polishing, consists of two steps—cutting and coloring. Cutting, which is done with medium-fine abrasives such as tripoli or fine aluminum oxide, removes minute quantities of metal (left as ridges after polishing) or surface imperfections like the tarnish found on brass. Coloring, however, removes no appreciable amount of metal, but blends the fine lines left by polishing



By H. S. Rummell

Above, buffing can be done on a lathe in which the spindle has been chucked. Left, the three basic types of soft buffing wheels. The top one is spiral-stitched, the left-hand one is a loose buff and the right-hand one is the cushion-sewn buff. There is a specific use for each type that you should know about

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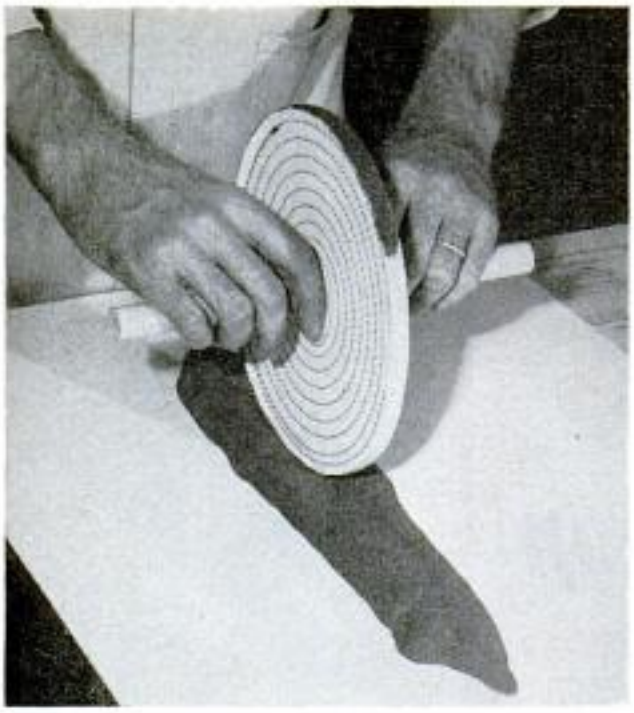


Above, rolling the face of a polishing wheel in glue before applying abrasive grains. Below, glue on face of wheel is cracked to provide flexibility

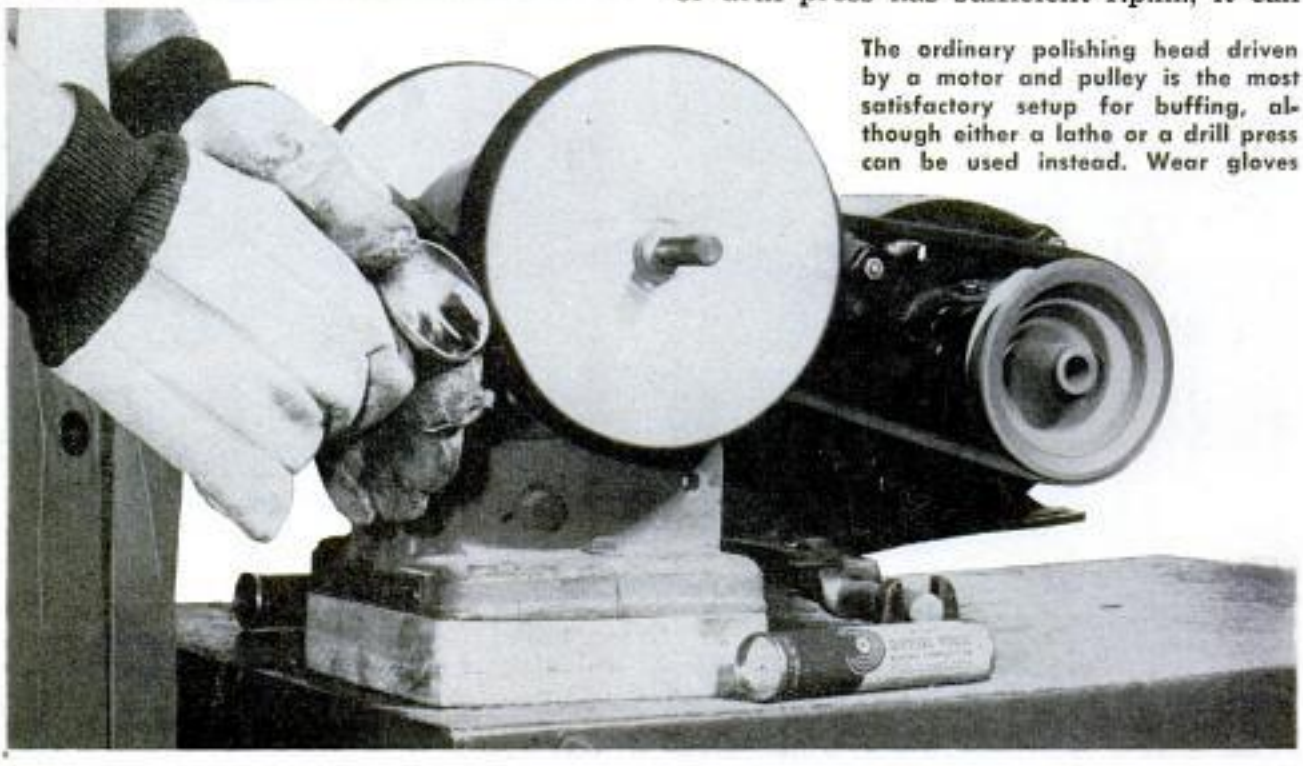
and cutting. Jeweler's rouge is used for coloring.

There are three basic styles of buffing wheels; the spiral-stitched buffs, loose buffs, which consist of cloth disks joined by a single circular stitch around the arbor hole, and the concentric-sewn, or cushion-sewn, buff. The latter is a loose buff with one or more additional circles of stitching between the arbor hole and the face.

The buffs can be mounted on a lathe, drill press, bench grinder or, better yet, an ordinary polishing head. For best results, the buffing wheel should revolve at comparatively high speed, between 5000 and 7500 s.f.m. You can estimate this speed by dividing the dia. of the buff (in inches) by 4 and multiplying the result by the r.p.m. of the buff. Be sure that the arbor holes of the buffs used are an exact fit for the shaft on which they are mounted. Unless the buff is fitted with a set of toothed flanges, a flange should be placed on each side of the buff when it is mounted. A metal washer with an outside dia. of at least 1 in. provides a suitable flange. When mounting a buff on the spindle, be careful not to distort the cloth piles, especially in the case of loose buffs.

A word of warning: don't treat a buff turning at 3000 r.p.m. lightly. A loose thread on the buff can give you a badly cut finger. Wear goggles or your regular glasses to protect your eyes and it's a good idea to wear gloves.

You can use any motor-driven bench grinder for buffing, but first remove the wheel guard and tool rest. The best tool is a regular polishing head driven by a 4-step V-belt pulley on the motor. If your lathe or drill press has sufficient r.p.m., it can



The ordinary polishing head driven by a motor and pulley is the most satisfactory setup for buffing, although either a lathe or a drill press can be used instead. Wear gloves

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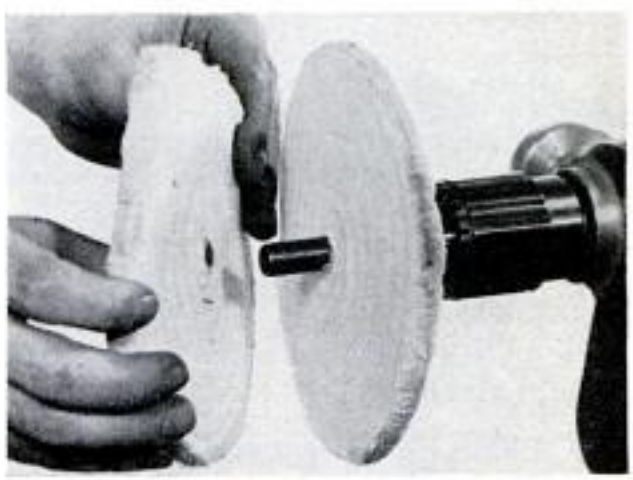
Polishing and buffing can be done on a drill press. Speed is sufficient for most home-shop jobs. Note that the operator wears his glasses to protect his eyes from flying particles

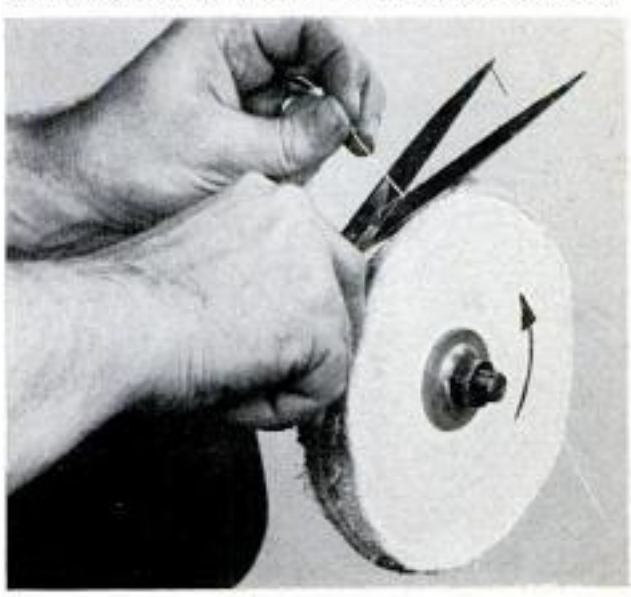
be used by mounting the buff on a headless bolt. Use nuts and washers to fasten the buff and chuck in the lathe or drill press. Light buffing may be done with a portable electric drill, but the work it will do is limited by its lack of speed and the difficulty of holding.

For the first project, find the sorriest-looking piece of brass you can—say a pitted and scaled door knocker. Scrape off any paint or thick verdigris with a knife. Mount a 6 or 8-in. spiral-stitched buff on the spindle and get it up to moderate speed—around 5000 s.f.m. If the knocker is badly pitted, you'll have to cut the entire surface down to the level of the deepest pit, using emery composition which comes in a tube or stick. To charge the buff, hold the tube to the face of the running buff and let the heat of friction melt the binder so that it will flow on the buff. The face of the buff will turn black when it is well charged. Hold a piece of scrap metal against it to smooth it out. Hold the knocker firmly in two hands and touch it lightly to the wheel slightly below the center, using smooth, downward, passing strokes. The wheel must be revolving with the top coming toward you, to keep the grit out of your face. Keep your eyes on the work at all times and don't bear down too hard. After the entire surface of the knocker is uniformly clean, charge a loose or cushion-sewed buff with tripoli and go over the brass very lightly, using the same downward strokes. The scratch lines left by the emery polishing will smooth out and blend into each other. Although the knocker will have a good finish now, it may be given a really fine finish by a final buffing, or coloring, with a soft felt wheel or flannel buff charged with jeweler's rouge. Final color buffing will show up imperfect work in the preliminary stages. If you find such spots, go back over them with tripoli. Protect the final finish with a coat of lacquer or plastic spray, after first cleaning the article with carbon tetrachloride.

Some jobs will require more metal removal than can be done by buffing. A solid grinding wheel will do this, of course, but it can't follow contours. A polishing wheel will accomplish the same thing while permitting flexible grinding. Here's how to make your own. Take a good, spiral-



Above, it is best to use as many buffs as your spindle will hold in order to polish greater surface with each pass. Usually two can be used most effectively



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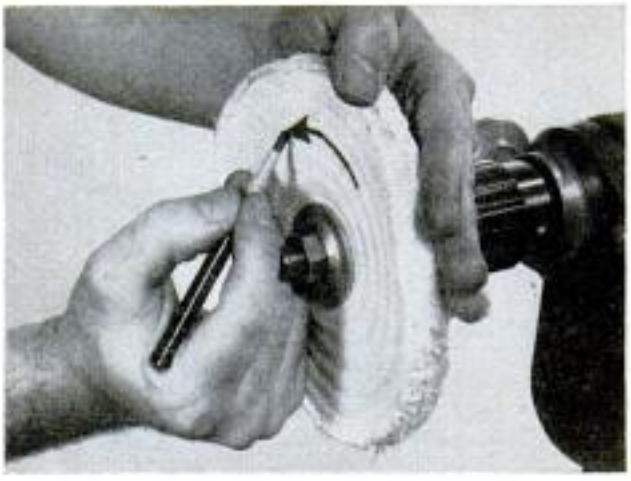
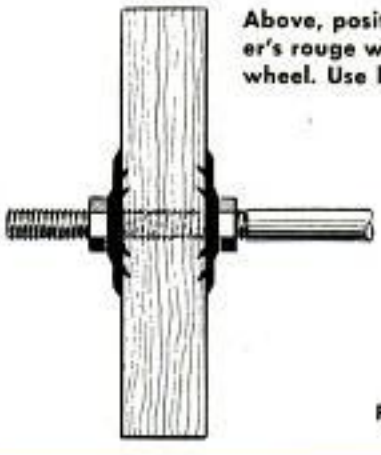


Mark the direction of buffing-wheel rotation with heavy pencil, above, and put wheel on spindle so that it rotates in the same direction each time it is used



Above, position of jeweler's rouge when charging wheel. Use light pressure

What to Use

BRASS: Cut with emery on spiral-stitched buff, followed by tripoli on loose or cushion-sewed buff. Finish with jeweler's rouge on flannel or felt
IRON, STEEL: Emery on firm, stitched buff, followed by finer but sharp-cutting composition
STAINLESS STEEL: Avoid compositions containing free iron, such as tripoli. They will cause stains
ALUMINUM, PEWTER, COPPER: Same as brass. They are softer and require somewhat less cutting
GOLD, SILVER: Usually not cut, but if needed, use tripoli. Buff with jeweler's rouge on flannel or soft felt. Go very lightly on plated articles
PLATED OBJECTS: Brass and copper plating are soft, so cut cautiously. Nickel and chrome can be buffed with compounds used for stainless steel

stitched buff having a clean face and roll it in good liquid glue which has been poured on wax paper. Coat the face uniformly with the glue and smooth the coating with your fingers or a stick. Then hang the buff on a nail, allowing it to dry for 24 hrs. After it has dried, place the wheel on the motor spindle and mark an arrow on the side of the wheel showing the direction of rotation —and always put it back on the spindle the same way. Run the wheel and sand its face lightly with No. 2 sandpaper to smooth the surface. Roll the wheel in glue once more and then roll it in a flat pile of abrasive which you have laid out on waxed paper. Let the wheel's weight provide the pressure. Allow 20 min. for drying. Repeat the treatment and then allow 24 hrs. for drying. The next day, scrape loose grains from the sides of the wheel and crack the face by flexing it with your thumb or pressing with a blunt tool. The face should now have hundreds of little cracks. Mount the wheel on the spindle and break it in by polishing a piece of scrap metal lightly. Be careful of this wheel, as it cuts very rapidly.

The home shop should have two or three wheels. Nos. 120, 220 and 320 will give you a selection for a variety of jobs. ★ ★ ★

POWER REQUIREMENTS FOR BUFFING
(AVERAGE CONDITIONS)

MOTOR RATING	WHEEL FACE—MAXIMUM			
	4" DIA.	6" DIA.	8" DIA.	10" DIA.
⅛-¼ H.P.	1"	½"	—	—
½ H.P.	1½"	1"	½"	—
¾ H.P.	2½"	2"	1½"	½"
1 H.P.	3"	2½"	2"	2"

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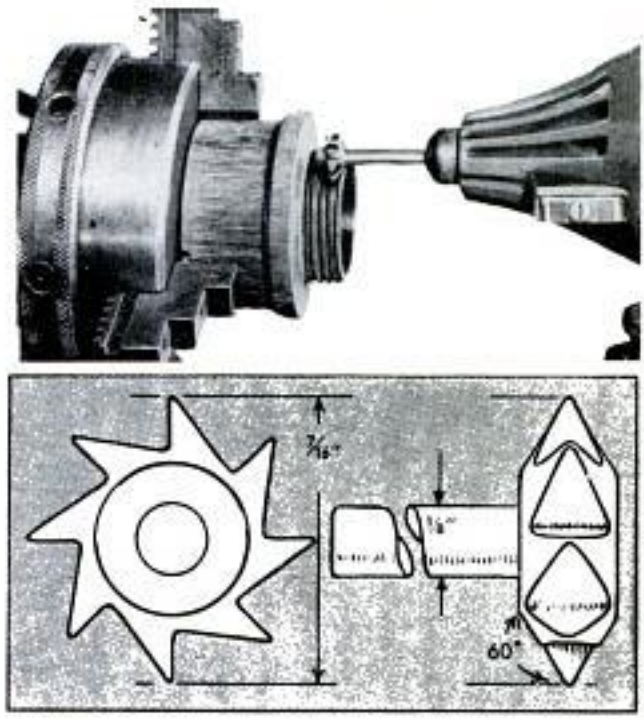
Hand-Grinder Setup on Lathe Cuts Threads in Plastic or Wood

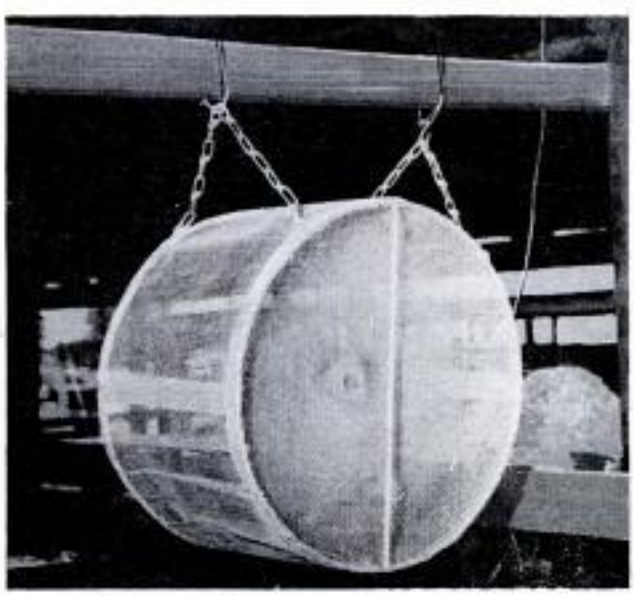
Clean, sharp threads can be cut in plastics or hardwoods by utilizing the high speed of a hand grinder mounted on the lathe tool post and driving a special rotary-type threading tool improvised from drill rod. A 2-in. length of ½-in. drill rod is shoulder-cut to ⅛ in. to form a shank and the stock remaining at the end is beveled to 60 deg. After beveling, eight cutting teeth are ground or filed, each tooth having a zero rake. The tips of the teeth are slightly rounded, bringing the cutter diameter to 7/16 in. Heat the cutter cherry red and plunge in cold water to harden. Hone the teeth to a sharp cutting edge. After assembling the hand grinder in a holder locked in the tool post, chuck the work as in the photo, set the cutter for depth and engage the lathe back gears to reduce the spindle speed. Set the leadscrew gears to cut eight threads per inch. Although finer threads can be cut, there is some tendency to chip at the crests. Start the lathe, run the rotating cutter up to the end of the work and drop the split nuts onto the leadscrew. The external thread can be cut with one pass, but the internal thread requires two.

T. K. Hastings, Los Angeles, Calif.

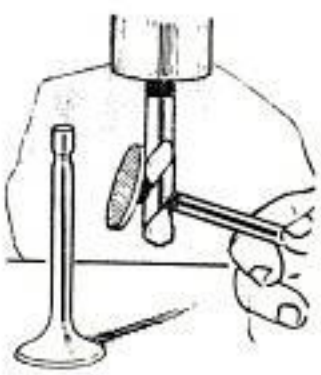


Wooden Plug Used to Determine Diameter of Internal Threads

One way of determining the diameter and pitch of internal threads is to turn a square softwood plug into the hole. In order to do this effectively, the diagonal measurement of the plug should be approximately equal to the outside diameter of the threads. When the plug is removed, you not only will be able to measure the diameter and pitch of the threads but also the number of threads per inch, the same as you would on a screw which fitted into the hole.



Carbon "Milled" From Valves With Drill Press



One home mechanic, who had no power wire brush, utilized his drill press to clean the hardened carbon from the valves of his automobile engine. A twist drill is chucked in the drill press and run at low speed. The valve is then held against the flutes of the drill and the carbon is cut away by the milling action of the drill. A discarded drill should be used, as the flutes will be damaged when the drill is used in this manner.

Efficient Portable Barn Cooler Has Hardware Cloth Shield

By enclosing a ¼-hp. motor-and-fan unit in a frame covered with ¼-in. wire mesh, one farmer constructed an efficient portable fan that can be used close to livestock without danger of injury from the whirling blades. The circular frame is of welded construction, using steel bars and angles. Four eyes were welded in place near the top of the frame to accommodate the two lengths of chain which are used to hang the unit in place. To move the blower, it is necessary only to unplug the motor, disconnect the chains from the overhead hooks and carry it to the new location.

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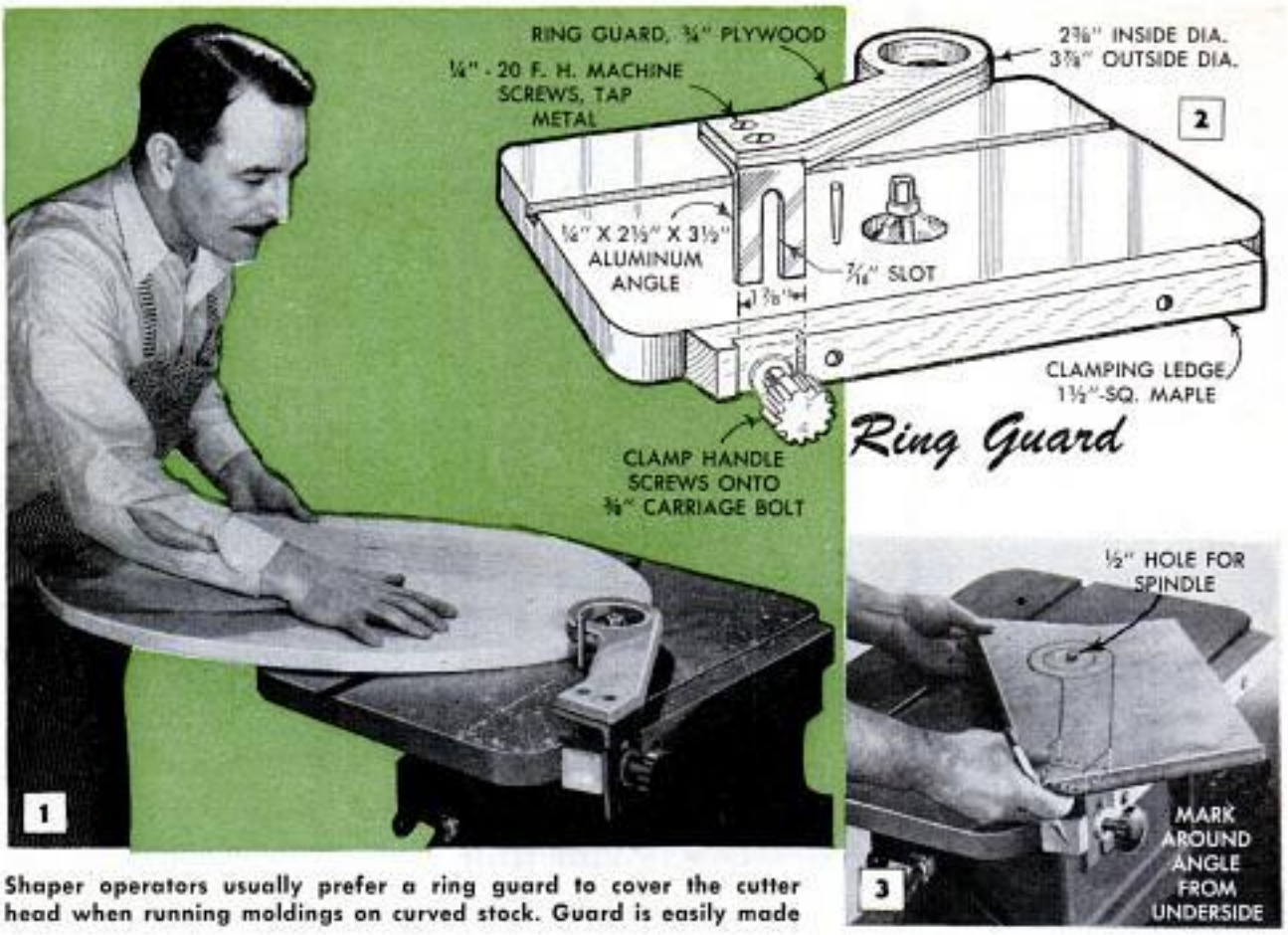


Shaper operators usually prefer a ring guard to cover the cutter head when running moldings on curved stock. Guard is easily made

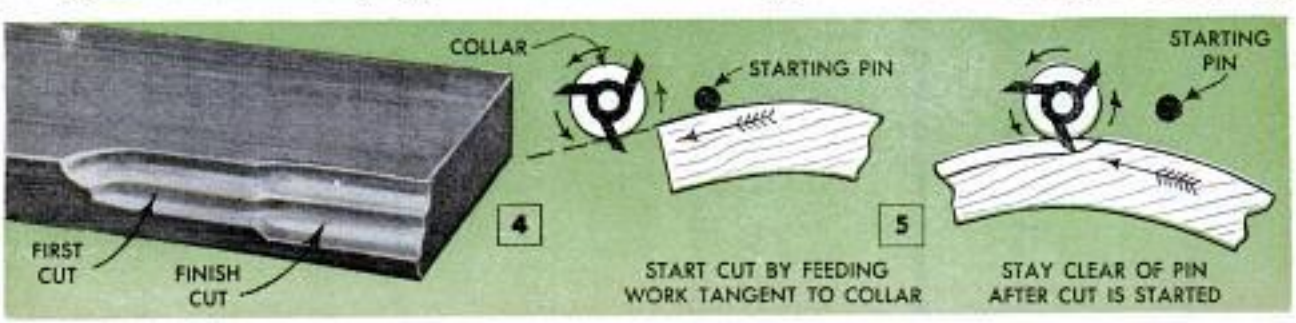
RUNNING CURVES ON A SHAPER

By Sam Brown

DUE TO THE extremely high speed of the cutter and its position in relation to the stock, edge planing and molding of curved work are easy jobs for the shaper. Both short-radius curves and long sweeps can be worked on machines having fairly large tables. A shaper produces smooth cuts with and against the grain as the high speed of the cutters breaks the chips clear without splintering.

Ring guard: All machines are supplied with guards and fences, but for curved work most operators prefer the wooden-ring guard pictured in Fig. 1 and detailed in Figs. 2 and 3. Although omitted in certain photos on the following pages for purposes of clarity, the ring guard should always be used when shaping curved work.

Making the cut: In ordinary work, depth collars on the machine spindle support the edge of the stock and govern the depth of cut. Figs. 4 and 5 show how a curved cut is started with the edge bearing against a starting pin. Note that as the cut is started the work must be fed to the cutter with its edge tangent to the depth collar. When the cut has progressed to the point where uncut portion of the edge is riding on the depth collar it is moved clear of the starting pin as in Fig. 5. Where the shape of the mold requires a deep cut to finish it, the cut usually is run in two passes as in Fig. 4. The shaper spindle is adjustable before running the second pass. It should be kept in mind that any irregularities in the edge will appear in the molding. Work is fed



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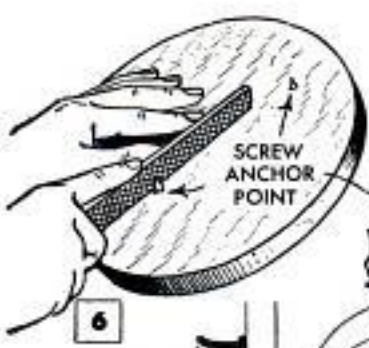

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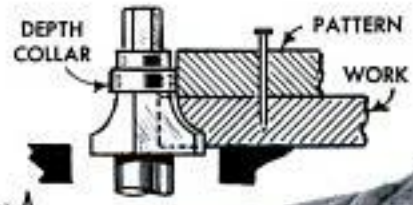

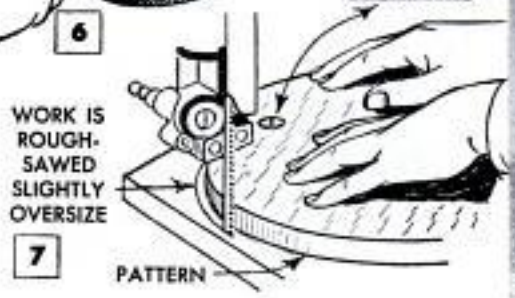

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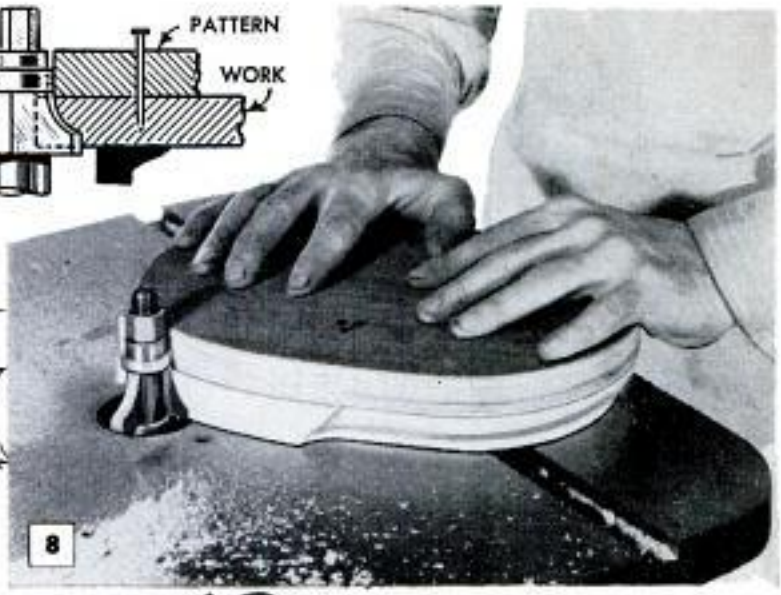


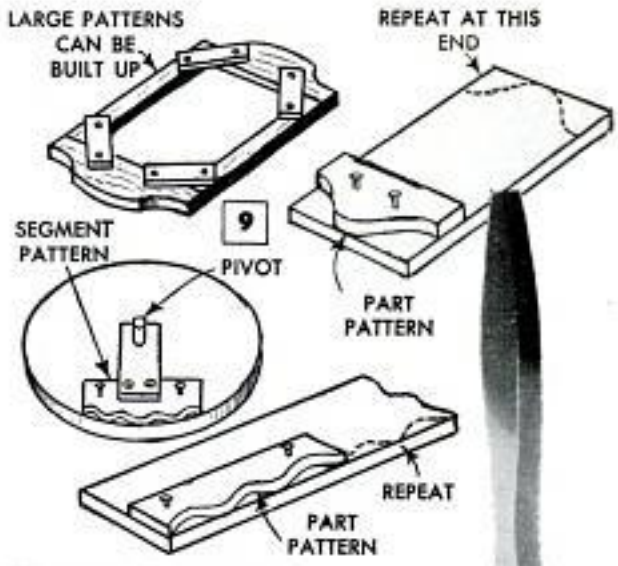
8

A Pattern

against cutter rotation, but may be fed from right or left on machines having reversing spindles. Feeding from the right is most convenient for most operators.

In regular practice, it is considered best to run curved moldings on the lower corner of the work with the depth collar on top of the cutter. This position not only is safer, but prevents any damage to the work should it tilt slightly when being moved over the table.

Shaping with pattern: When the edge of the work is to be molded the full thickness it is necessary to use a pattern as a guide. Figs. 7 to 12 inclusive show patterns and ordinary pattern-shaping methods. In most cases the pattern is a close duplicate of the shape of the work. The purpose of the pattern is to provide an edge against which



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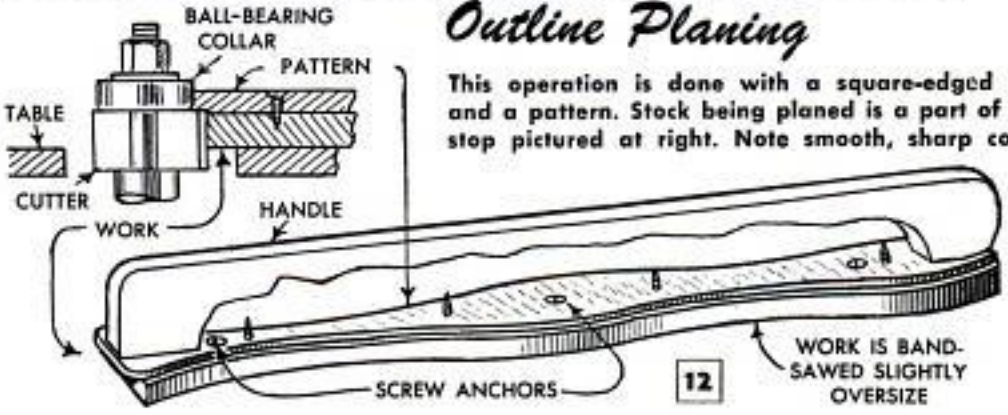
10

Outline Planing

This operation is done with a square-edged cutter and a pattern. Stock being planed is a part of door-stop pictured at right. Note smooth, sharp contour



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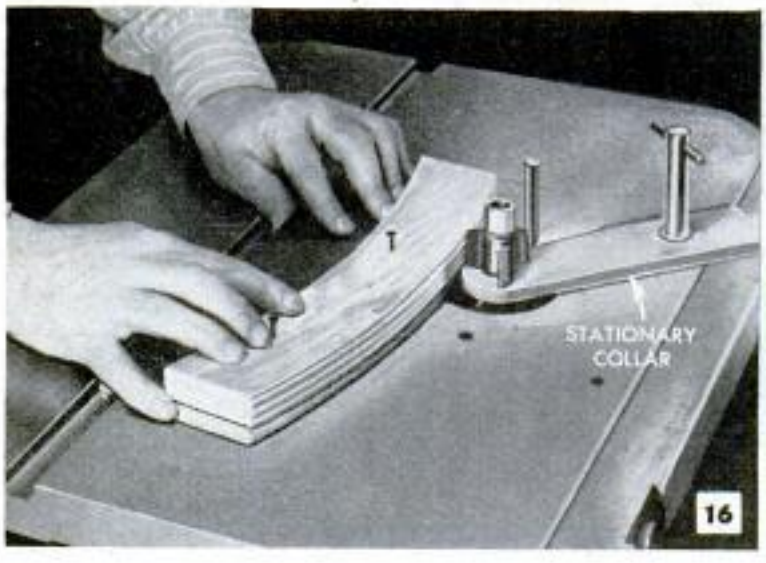
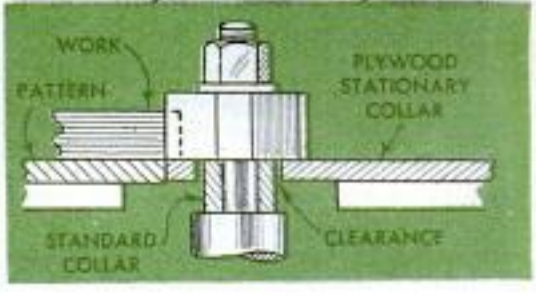
Antifriction Collars

Antifriction collars prevent scoring and "burning" of pattern or uncut stock. Can be improvised from ball bearings





the depth collars ride as in Fig. 8, also the right-hand detail in Fig. 6. When shaping individual pieces the pattern can be attached to the back (in the shaping operation this is the top) of the work with small nails. For production work with a pattern, screw anchors, Figs. 6 and 7, are best. In making the pattern it is important that the edges be sanded true, as any irregularity at the edge of the pattern will be reproduced in the molded edge. Patterns usually can be cut from solid stock when the parts are small. Large patterns often must be built up of several separate pieces as in Fig. 9. In some cases, part patterns will serve the purpose. A good example of segment pattern work is shown in Fig. 13.

Outline planing: Outline planing is one of the variations of pattern shaping. A typical job is shown in Fig. 10 with the planing work on the longest piece being carried out in Fig. 11. Fig. 12 details the pattern with the workpiece in place and the sectional view shows the setup, using a ball-bearing depth collar. When the ball-bearing collar is used the pattern can be made of any light stock, ¼-in. plywood being suitable for most patterns of average size.

Antifriction collars: Regular depth collars that turn at spindle speeds tend to score and "burn" certain woods. This not only may result in an irregular molding but also discolors the portion of the edge uncut by the shaper cutters. This problem is easily solved by the use of an antifriction collar that rolls on the edge of the stock or the pattern as in Fig. 15. Ordinary single-race ball bearings can be adapted to this purpose by fitting a bushing and a collar shell as in Fig. 14. The latter is machined with a flange so that when tightened onto the bearing with the spindle nut the collar contacts only the inner ball race, permitting the outer one to turn freely. Fig. 16

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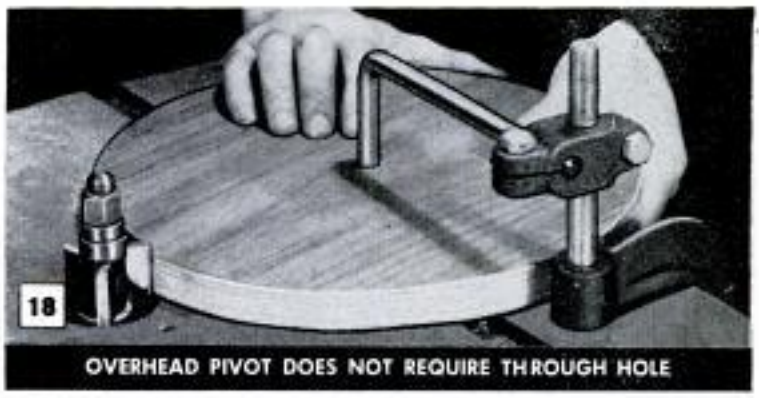
pictures an improvised stationary collar that is frequently used when shaping curved work with a pattern. This arrangement prevents scoring of the pattern which would occur when using a solid depth collar. The detail at the right of Fig. 16 shows the setup. The hole near the end of the plywood collar must be large enough to allow ample clearance around the shaper spindle. When using an improvised collar of this type be sure that it is fastened securely in place and also run a test cut on a piece of waste to make certain that the setup gives proper depth of cut.

Circular work: Nearly all circular work can be done with a pivot pin mounted in a manner suited to the work. Figs. 17 to 20 inclusive are examples. The subtable utilizing a nail as a pivot is the simplest, Fig. 17. When starting infeed, the subtable is eased inward with the palm of the hand, the C-clamp at the right in the photo being left slightly loose to permit movement of the subtable. Perhaps the best method wherever it can be used, is the overhead, or overarm pivot, Figs. 18 and 19. Its use does not require a through hole. An overarm pivot which has the advantage of screw-feeding the work into the cutter with the adjustable shaper fence is pictured in Fig. 20. The wooden arm in the foreground of the photo is fitted over the pin in the movable section of the shaper fence which normally carries the hold-down spring. By moving that section of the fence with the adjusting screw, the work is moved in or out in relation to the position

SUBTABLE WITH NAIL PIVOT IS POPULAR METHOD

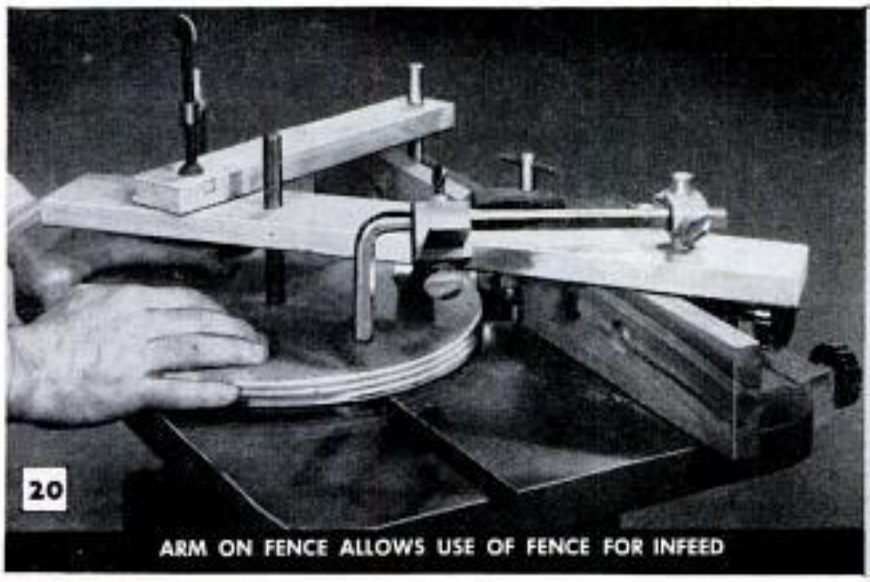
Circular Work

Circular stock ordinarily is worked with a pivot jig. Overhead pivot is best as surface of stock is not defaced by pivot hole

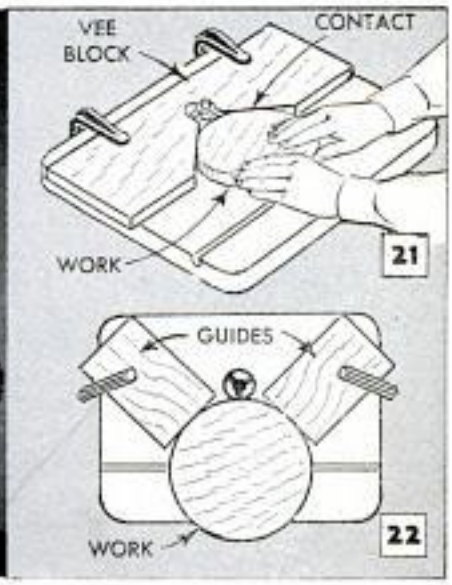


OVERHEAD PIVOT DOES NOT REQUIRE THROUGH HOLE

SIMPLE SET-UP OF OVERHEAD PIVOT



ARM ON FENCE ALLOWS USE OF FENCE FOR INFEED



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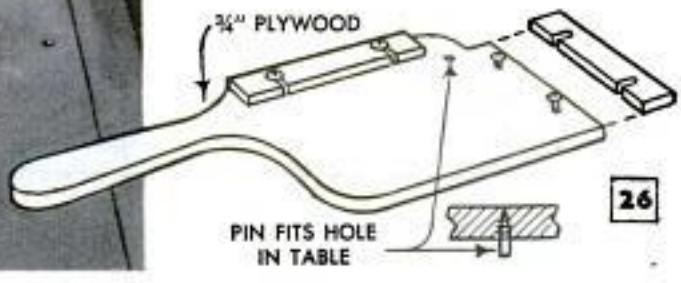
Column Work **can be shaped accurately by bandsawing the bottom of a simple jig to conform exactly to the required shape of work**

Corner-Rounding Jig **is useful for rounding corners. The jig pivots on pin in hole in shaper table**

of the cutter. This arrangement permits a controlled infeed. On circular work where the entire edge of the stock is not removed by the molding cut, the use of a Vee-block or separate guide blocks, Figs. 21 and 22, is practical.

Shaping columns: This job requires a boxlike jig, the bottom of which serves as a pattern, Figs. 23 and 24. Chair legs, table columns and pilasters can be shaped quickly with this setup. For multisided forms and also for reeding and fluting, an index disk will be necessary.

Corner-rounding jig: The shaper makes short work of rounding corners on square or rectangular pieces. Figs. 25 and 26 show how to do the trick with a simple jig which pivots on a pin. This arrangement assures that each corner will be cut to precisely the same radius. Note that the stops on the jig are slotted to provide adjustment. ★ ★ ★



Increased Spark Gap on Long Trip May Cause Engine Miss

There often is a simple explanation and cure for a miss that sometimes develops in an automobile engine after it has been driven at high speeds on a long trip. The trouble is in the spark-plug gap, which has been increased by removal of carbon from the ends of the electrodes. High temperatures during the sustained high speed burns off the carbon. The spark will jump the increased gap at low speeds because of the low compression of the fuel mixture. But when the throttle is suddenly opened and a dense fuel charge is dumped into the cylinders, the increased amount of gasoline will compress to a much more dense mixture. This increase in compression prevents the spark from jumping the wide gap. The simple cure is, of course, to properly gap the plugs.

¶When film clips are not available, roll film can be dried by safety-pinning one end to a window-shade pull and securing the other end to the sill with the point of an open pin. Then, by adjusting the shade, tension may be applied to hold the film taut.

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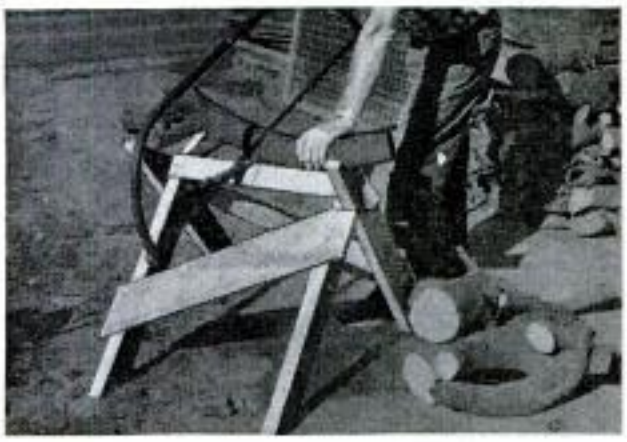
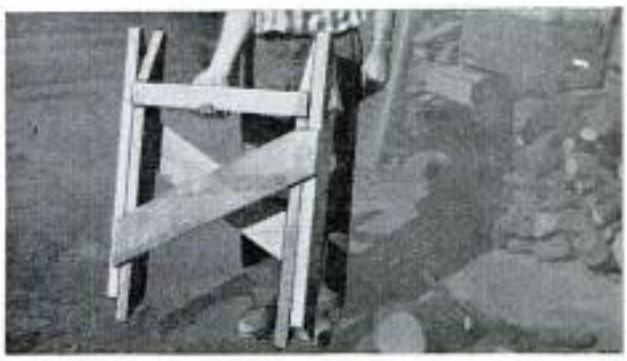
Sturdy Sawbuck Folds Compactly for Storing in Limited Space

Rather than clutter up a yard or wood lot with a conventional-type sawbuck, build this sturdy version that folds easily for storing in a small space. Legs of the unit are made from 2 x 4s and are pivoted on bolts near the upper ends. Jaws for holding a log or board to be cut are formed by sawing the upper ends of the legs as shown. The lower ends are sawed at an angle so they rest flat on the ground when the sawbuck is in use. A 1 x 3 crosspiece just below the jaws serves both as a brace and a handle. Lengths of 1 x 6 are used for diagonal bracing.





Machining Stainless Steels

Stainless steels should be machined at slow speeds, taking heavy cuts and with a 15-deg. side rake on the cutting tools. The angle of the top rake will depend on the type of finish desired, but it should be greater than that used for ordinary steel. Use a fine-pitch lead screw when cutting threads and keep the tools very sharp. The punch used for centering this steel should be ground triangular in shape so the drill will cut immediately. If the drill is allowed to "ride" it will cause hardening. A mixture of sulphur, 1 lb. and lard oil, 1 gal. is a good lubricant for any operation on this steel. Use fine grits when grinding, making sure that all pits and spots are removed to prevent electrolytic action at these points.

Butchering Kettle Raised on Legs For Building Hotter Fire

In order to build a hotter fire under a butchering kettle, one farmer increases the space under the kettle by setting it on lengths of pipe driven into the ground as shown. These are positioned so the feet on the kettle slip into them. The pipes should be long enough to extend into the ground at least a foot and project 8 or 10 in. above ground.—G. E. McVickar, Bethesda, Md.

Depression in Generator Brush Prevents Spring From Slipping

To eliminate generator and starter failure caused by the brush spring slipping sideways and catching on the brush holder, one mechanic countersinks a hole in the top of the brush. The hole is countersunk ⅛ in. deep and the end of the spring rests in this depression. Thus, it cannot move sideways and is held away from the brush holder.

Slotted Ends of Sawhorse Holds Try Square Handy

On siding jobs or other work where sawhorses are used, a try square may be kept handy by inserting it, as shown, in slots cut in the ends of the sawhorses. When stored in this manner, there is less likelihood of the square being damaged or lost and it is always available for immediate use.

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Portable Back Scratcher for Cattle Utilizes Worn Tractor Tire

It's good practice to provide cattle on pasture with a sturdy, durable back scratcher which contributes to the comfort of the animals during the hot summer months. One farmer solved the twin construction problems of durability and portability of such a unit by bolting an old tractor tire, or casing, to a heavy frame mounted on a platform provided with skids. Thus the unit can be moved to any desired location with the tractor. Note that the tire casing is bolted to the frame at three points and that a short length of link chain, or log chain, is wired securely to the inner rim of the casing. A section about 18 in. long is cut from the lower side of the casing to permit the animals to pass through. The platform is made from 2-in. planks spiked to the skids and the frame uprights are braced to the skids as pictured. The frame is assembled with bolts for maximum strength. The skids are tapered sharply upward at each end to allow easy towing.

A. M. Wettach, Mt. Pleasant, Iowa.

Constant Care of Chromium-Plated Automobile Parts Important

Extremely good care is required if the chromium-plated parts on your car are to retain their bright finish. The plating is thin, and on some of the late-model cars it does not have the subplating of copper and nickel which helps it to adhere. This latter type of chrome must not be cleaned with a harsh abrasive or permanent damage will result. Ordinarily, chrome needs to be cleaned only with a detergent or soap-and-water solution. A good metal polish usually will remove stubborn dullness. Rusty or pitted chrome may be cleaned with a mild abrasive such as typical kitchen scouring powder and water. Immediately after cleaning, apply several coats of automobile wax. Frequent washing and waxing of the plating usually will prevent serious rust and pitting. In the winter, when it is expected that salt from the roads will be splashed on the chrome, apply a commercial plastic coating for protection. Such coatings are available in both color and clear, in spray cans for easy application.

Farm Fuel-Storage Shelter

This fuel-storage shelter was built to house a 350-gal. gasoline tank and two oil drums, one on each side of the door. There is also a shelf for grease, grease guns and other equipment. A weighted rope running through a pulley at the top of the shelter is attached to the gasoline hose making it easy to raise or lower and keeping it out of the way when not in use. The shelter is supported by railroad ties. The framework of standard construction is covered with rough lumber which, in turn, is sheathed with sheet metal. Lightning protection is assured by running No. 9 wire "rods" from the roof into the ground. Concentrating all oil and gasoline in a fuel shelter well away from other farm buildings is a worth-while safety feature to consider. The shelter was built by two men in 1½ days, using $20 worth of lumber.

Kenneth R. Imig, Watseka, Ill.

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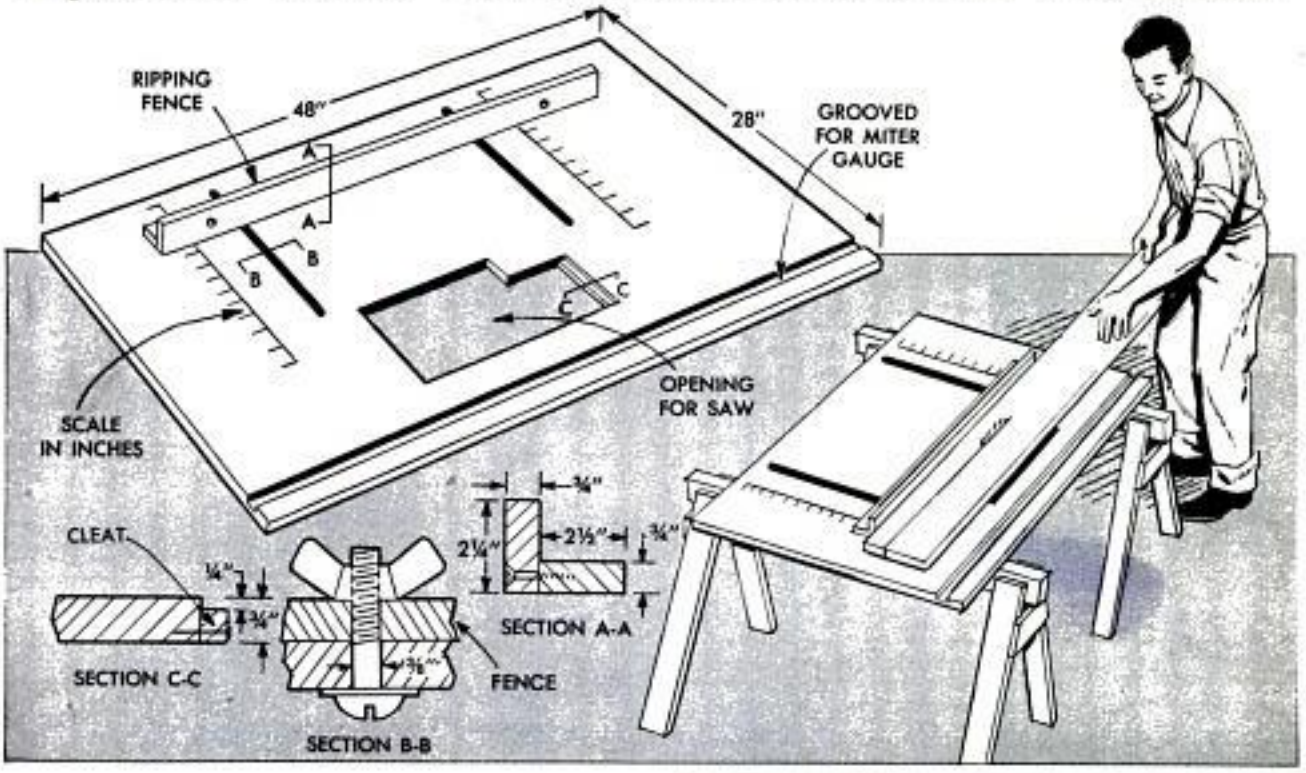
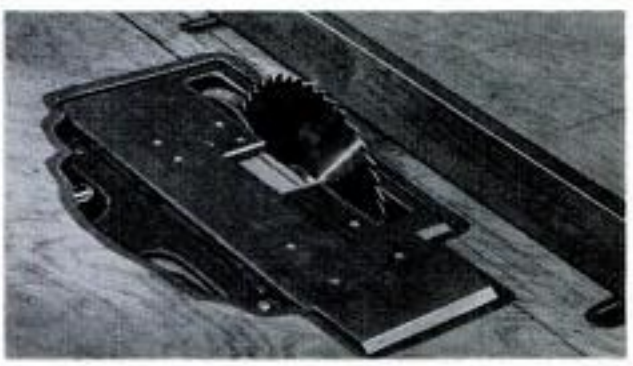
Plywood Table for Portable Electric Handsaw



Mounting your portable electric handsaw in a piece of ¾-in. plywood, 28 x 48 in., gives you a stationary table saw for more accurate on-the-job ripping and crosscutting. The opening for the saw will depend on the particular make and model used. Cleats nailed to the inside edges of the opening are set to hold the sole plate of the saw flush with the table top. The miter gauge, which should be the type used on a regular table saw, is fitted in a groove cut in the plywood. The ripping fence is made from two hardwood strips screwed together in an L-shape. The fence is held to the table with two machine screws fitted with thumbnuts on their top end. Two slots are cut in the table, at right angles to the saw blade, to permit the ripping fence to be adjusted. The suggested dimensions of the plywood table may be changed to suit any requirement as size is governed by the means of transporting. The method of fastening the saw in place will depend on each model.—Fred L. Anderson, Marquette, Neb.



Eliminate Hard-Starting in Car With Simple Preventive Measures

Not being able to start your car on a miserably cold, wet day is a disheartening experience that may be prevented by a few simple preventive measures. Dirt on spark-plug porcelains absorbs moisture which causes the plugs to short. Wash all the spark-plug porcelains with gasoline, then wipe dry. Scrub gasoline over the irregular shape of the distributor cap with a clean paintbrush, using enough gasoline to flush away the dirt. Leave the cap on the distributor so gasoline does not drain through the distributor into the crankcase oil. Brush gasoline inside the distributor cap, holding the cap away from the distributor. Wipe each spark-plug and ignition wire with a rag saturated with gasoline, then dry the wires with a cloth to remove loosened dirt. To insure ease of starting and economical performance, replace any wires on which the insulation is rotten, as it will absorb moisture and cause trouble.

Walter J. Swontek, Bedford, Ohio

Foot Saver on Drill Press

A ½-in. wooden dowel, 3 or 4 in. long, will prevent smashed toes caused by dropping the table of a floor-model drill press. Tape the dowel to the column of the drill press just above the floor plate.

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

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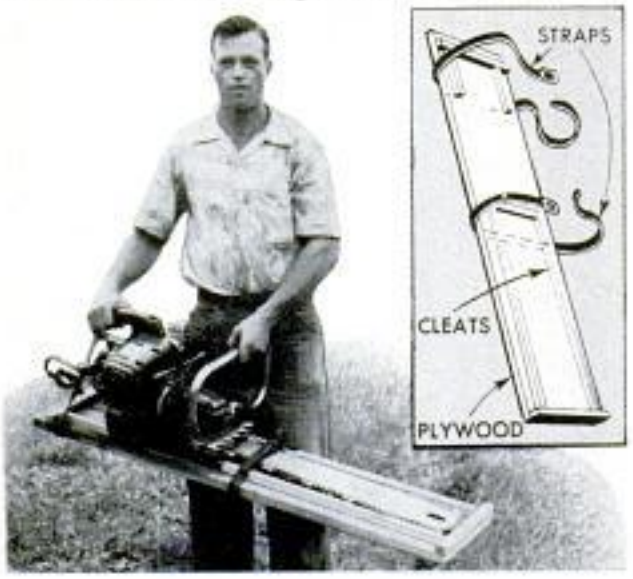
Plywood Chain-Saw Carrying Case Prevents Staining Car Floor



A simple plywood carrying case for a chain saw will prevent dirt and oil from staining the floor of a car when the saw is transported. Wooden cleats are screwed to the plywood base to keep the saw from shifting. Two heavy leather straps, which hold the saw to the case, are tacked to the bottom. The dimensions of the case will, of course, vary with the size of the saw.

Charles L. Stratton, Hollis, N. H.

Valve Modifies Hand Sprayer For Compressed Air

To take the work out of using a small, hand-pumped orchard sprayer, the tank can be modified to use a compressed-air charge. An air or water-type check valve is fitted into the shoulder of the tank as shown. Immediately before spraying, the tank is filled by an air compressor. One charge is sufficient to spray one tree. *Caution:* 50 lb.p.s.i. is the maximum safe-working pressure.

Arthur Trauffer, Mt. Pleasant, Iowa.

How to Remove Rusted Screws

When a screw is so badly rusted or corroded that a screwdriver will not turn it, try one of the following methods of loosening it. Use a solid-shank screwdriver and, while holding it firmly in the slot of the screw head, strike the screwdriver with a hammer. Repeated sharp blows will often loosen the rust or corrosion. If this does not work, then try a dull cold chisel by placing the point on the outer edge of the screw head and tapping it with a hammer. A sharp chisel will cut through the head rather than force it around.

Martin Mantell, Hazleton, Pa.

Sawhorse Rack Aids Handling Rolled Building Paper

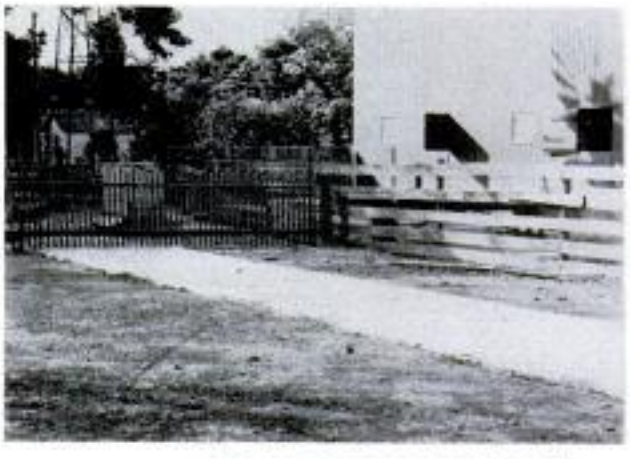
To overcome the difficulty of unrolling building paper when covering subflooring in a limited area, one carpenter mounts a roll between notched boards nailed to the legs of a sawhorse as shown. A broomstick is slipped through the roll and the ends rested in the notches. The paper unrolls readily.

Price Cards on Can Displays Supported by Tape Tabs

In order to support price cards so they will not fall off stacked canned-goods displays, one merchant forms tabs from paper tape on the backs of the cards as shown. Each tab is then inserted between tiers of cans where it is held in place by the weight of the can above. This idea also can be used on shelves.

Concrete Strip Through Hog Lot Has Many Muddy-Weather Uses

A concrete strip through the hog lot serves as a feeding strip or as a base for self-feeders during muddy weather. It also acts as a pen floor if the movable hog houses are brought up beside it and divided into pens for each sow.



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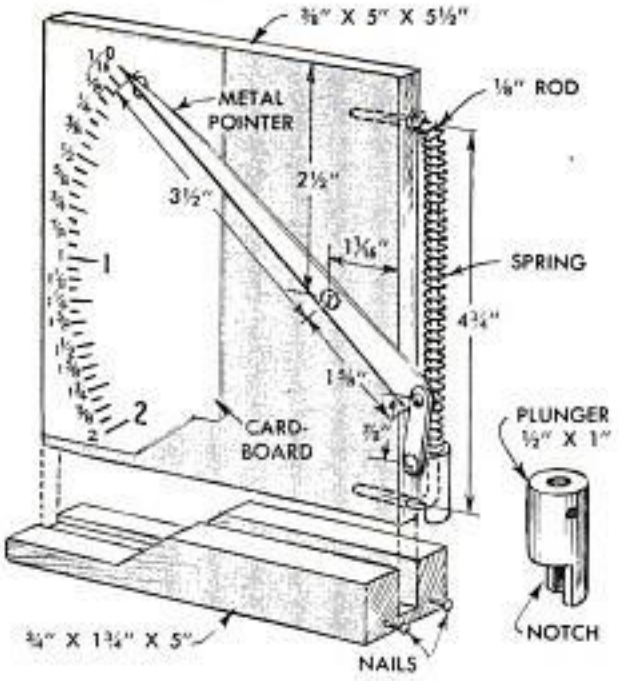
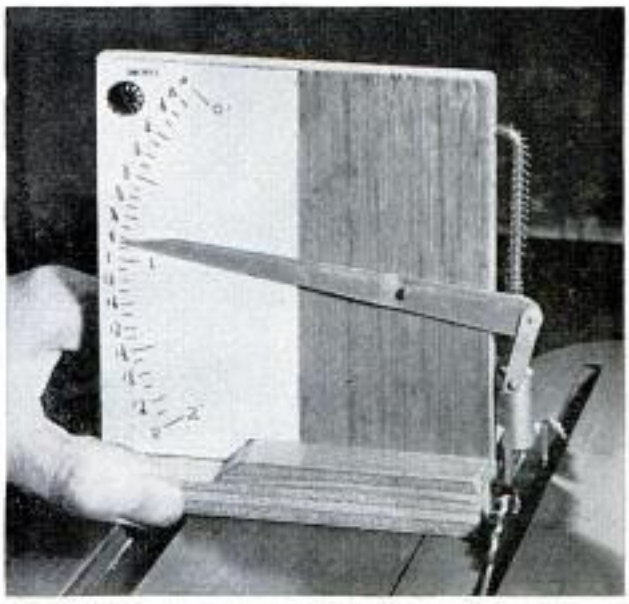
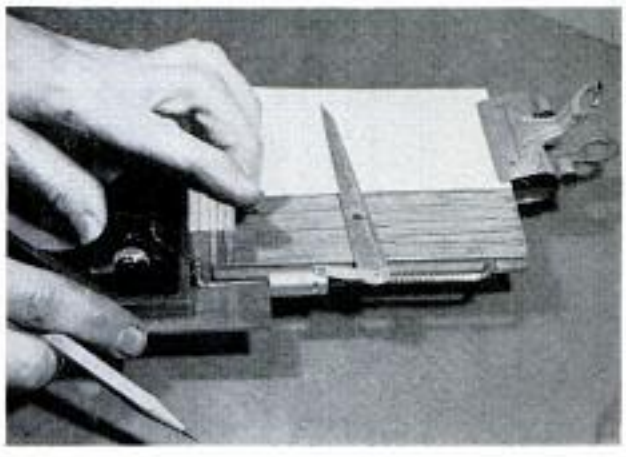
Sawmeter Assures Accurate Depth Adjustment



Setting a circular-saw blade to the exact depth of cut may be done quickly and accurately with this "sawmeter," the pointer of which multiplies the movement of the blade more than twice to permit easy reading on the scale. A light compression spring bears against the plunger to hold the pointer steady. After the sawmeter is assembled, use a combination square or other accurate measuring method to mark the scale in ⅛-in. steps. The two nails driven in the blade end of the gauge are set to allow the plunger to align with the saw blade. The saw, of course, should not be running.

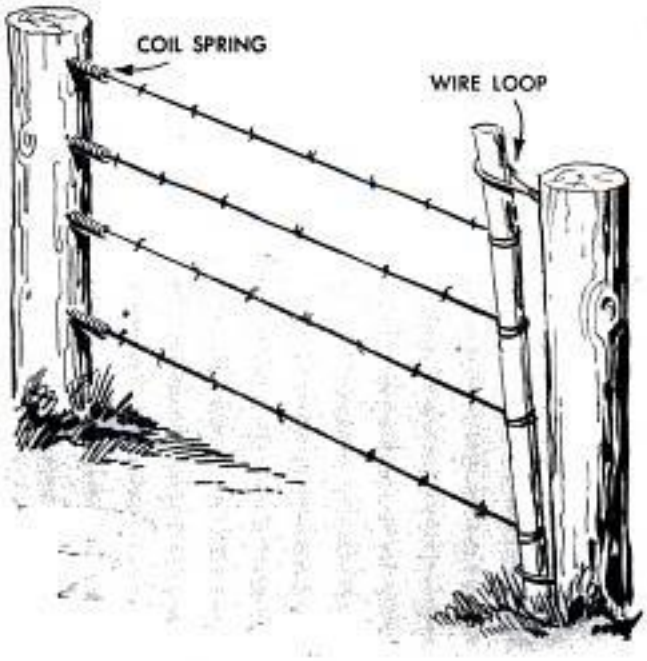
Walter E. Burton, Akron, Ohio





Above, how "sawmeter" is used to adjust depth of cut. Below, a combination square may be used to mark off the scale accurately. Use pencil, then trace with ink

Coil-Spring "Hinges" Prevent Wire Gate From Sagging and Twisting



Wire gates of the type illustrated often sag and become unreliable due to stretching and twisting of the wires when opening and closing the gate. To overcome this fault, one farmer attached a coil spring to one end of each of the wires. The other end of the spring is fastened to the gate post with a large staple. Installed in this manner, the springs serve as hinges and also as automatic tensioners when the gate is closed. The length of the wire loops that hold the gate pole in the closed position should be adjusted so that each spring is placed under tension when the ends of the pole are inserted in the loops.

Johnny Day, McLean, Tex.

¶When refinishing a spot on a maroon surface, a flat blue paint can be used as an undercoat. Lighten or darken the blue, if necessary, and then apply over the primer before spraying on the new maroon paint.

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SHOPPING FOR TOOLS

1. PRESSURE GAUGE reduces tap and drill breakage in production runs involving these operations on a drill press. To mount unit on drill press, handle of machine is removed and special split handle, furnished with dial gauge, is inserted in its place. Pressure on cutting tool is measured in lb. on a dial which gives an accuracy within 1 percent of the indicated reading

2. MASKING GUIDE makes fast work of cutting in sash with an ordinary small paintbrush. Masks come in sets consisting of blades of varying lengths and having a detachable suction cup which holds the blade firmly in position along the sash muntins, stiles and rails. Prevents paint from getting on the window pane. Guides are easily cleaned in paint solvent

3. BELT SANDER mounts directly on the frame of a small motor as pictured and takes abrasive belts from ¼ to 1 in. wide and 42 to 46 in. long. Fine for shaping and finishing small parts in either wood or metal. Machine is direct drive; lower pulley fits on motor shaft. Has tilting worktable and a self-adjusting device for tensioning the abrasive belts

4. RETHREADING TOOL restores damaged threads on bolts, studs and sleeves. Comes in 8 models, each designed for use within a certain thread-size range. Consists of a die stock specially built to accommodate an adjustable die having two sections with cutting teeth arranged at an angle so that die is easily adjusted in holder to fit threads of varying diameters

5. POCKET SLIDE RULE solves complex problems in measurement simply by turning a dial. Does multiplication, division, calculates circumferences of circles, proportion, decimal equivalents, figures standard pipe angles. Useful to steamfitters, draftsmen, architects, machinists and plumbers. Numbers and graduations are large enough for easy, accurate reading

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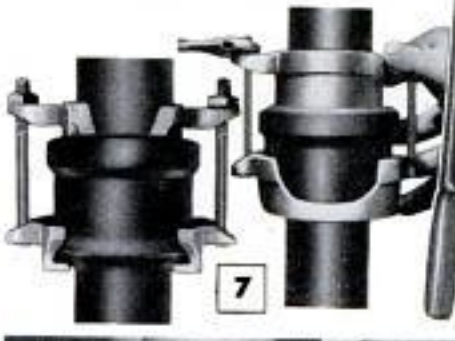
6. LEVER-OPERATED CHAIN HOIST lifts 1500 lb. easily. Can be arranged to pull or lift, making it suitable for use as woven-wire fence stretcher, log-load binder, car-engine hoist, loading hoist and any other job requiring lifting or pulling. Unit is furnished with grab hook for use on ordinary welded chain. Hoist simply "climbs" the chain when the lever is operated

5

6

7. CALKING CLAMP simplifies and speeds up the job of calking soil-pipe joints. Made in three sizes for 2, 3 and 4-in. soil pipe. Consists of two parts, a split gland, or ring, which is fitted over the pipe joint above the bell and a fixed jaw which engages the shoulder of the bell below the joint. Drawing up the bolts forces oakum tightly into the joint

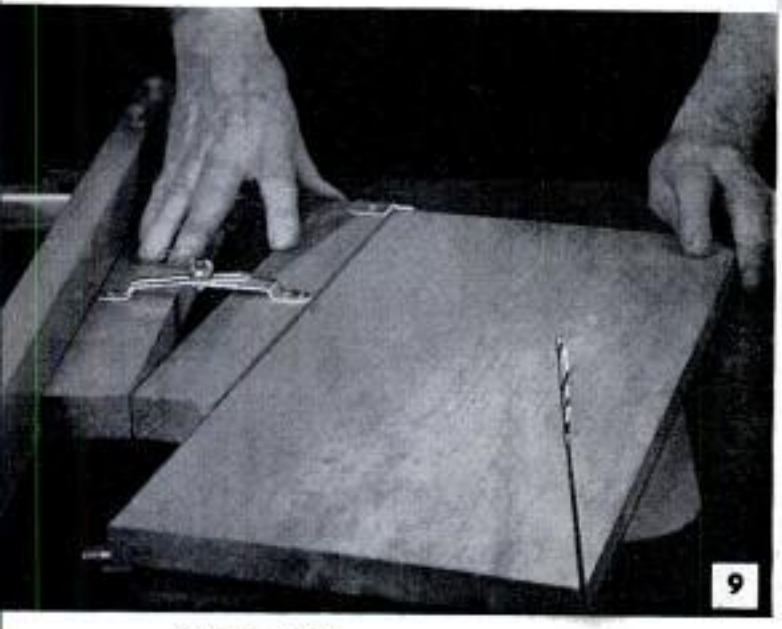

7

8. ELECTRIC PENCIL POINTER does just that—puts a really sharp point on a pencil. For detailers, draftsmen and architects who must have a pencil properly sharpened. Works automatically; pencil is inserted in a sleeve and pressed lightly. Movement of sleeve closes switch and starts motor. Pencil is turned one revolution for round point, 180 deg. for flat point

Eugene Dietzgen Co.
2425 N. Sheffield Ave.
Chgo — Ill.

8

9. ANGLE JIG for use on a circular saw is easily and quickly adjusted to make taper cuts. Speeds up the job of tapering legs to any degree desired. Can be set to make any type of wedge-shaped part in precise duplicate on production runs. Jig consists of two hinged members, one of which is guided by ripping fence. Other member supports stock at proper angle


9

10. PAD SANDER combines both orbital and straight-line motion by means of two types of platens, or pads, which are furnished with the machine. This gives the user an orbital motion on the pad for fast cutting and a straight-line motion for sanding with grain of the wood when finishing. Machine features a new method of changing sandpaper and has a bumper guard

10

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Wire Clip Attached to Drawing Board Holds Sign Artist's Copy

To hold copy for quick reference while working, one sign artist coiled a piece of wire in the center and inserted the ends in two small holes drilled near the top edge of his drawing board. The copy, when written, lettered or printed on stiff paper or cardboard, is inserted between the coils of the wire. However, copy contained on thin paper, or paper that has been folded, should be clipped to a cardboard backing to hold it upright in the coils.

Floor Creeper Used as Dolly When Repacking Wheels

Much of the heavy work involved in repacking the front-wheel bearings on a truck can be eliminated by using a mechanic's caster-mounted floor creeper as a dolly. Jack up the wheel until the creeper can be rolled under it, then lower the jack until the tire touches the creeper. Remove the wheel nut, brace the wheel in a vertical position and roll it out of the way. Reverse the procedure to replace the wheel. Use extreme caution when using the creeper as a dolly, to make sure that only the weight of the tire and wheel are supported.

Harry J. Miller, Philadelphia, Pa.

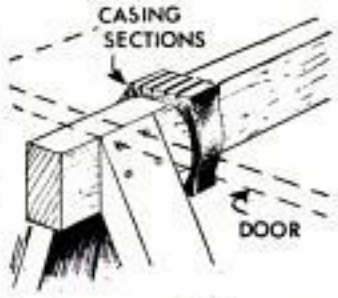
Barrel on Rocker Platform Tipped for Easy Access

To make it easy to reach the grain in the bottom half of a barrel, set the barrel on a wooden rocker platform, as shown. The rockers are cut from 2 x 6-in. stock and the platform of 1-in. lumber is nailed to them. Small blocks prevent the barrel from sliding off the platform when rocked.

Victor Lamoy, Upper Jay, N. Y.

¶To remove paint or varnish stains, soften with turpentine, oil or lard while still wet, then wash in warm soap and water.

Tire Sections Over Sawhorse Provide Non-Marring Surface



To protect doors or panels from scratches when rested on sawhorses for sawing or sanding, one carpenter uses sections cut from an auto casing to provide pads as indicated. These clamp easily over the horizontal members of the sawhorses and, when not in use, take up little room when stored in a tool chest.

Workbench Made Portable

Putting wheels on this workbench makes it possible to take both tools and work surface to the job. A vise is mounted at one end of the top, and tools are carried on the shelf below. The wheels were salvaged from discarded machinery. The welded frame is made from scraps of steel angle and flat bar. Two handles, cut from short lengths of pipe, were welded to the end opposite the wheels. Both the top surface and the shelf are made of wood.

L. H. Houck, Jefferson City, Mo.

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Here's the wonderful new Kodak CHEVRON Camera

Now, for the first time, Kodak's finest lens and fastest shutter in a precision 2¼x2¼ rangefinder camera

People kept asking: why doesn't Kodak combine the famous Ektar Lens, the Kodak Synchro-Rapid 800 Shutter, *plus* a coupled rangefinder, in a precision 2¼x2¼ roll-film camera? The Kodak Chevron Camera is it—a big camera, rugged, solidly balanced, designed for unsurpassed picture quality, trouble-free operation! And all at a sensible price—$215. See its many features in cutaway view below.

Viewfinder adjusts for 2¼x2¼-inch or 28x40mm. negatives and transparencies.

Automatic exposure counter.

Uses Kodak 620 Films, including Ektachrome and Kodacolor; also uses 828 film with adapter (extra).

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Precision, split-field rangefinder has Vee bearings for focusing accuracy.

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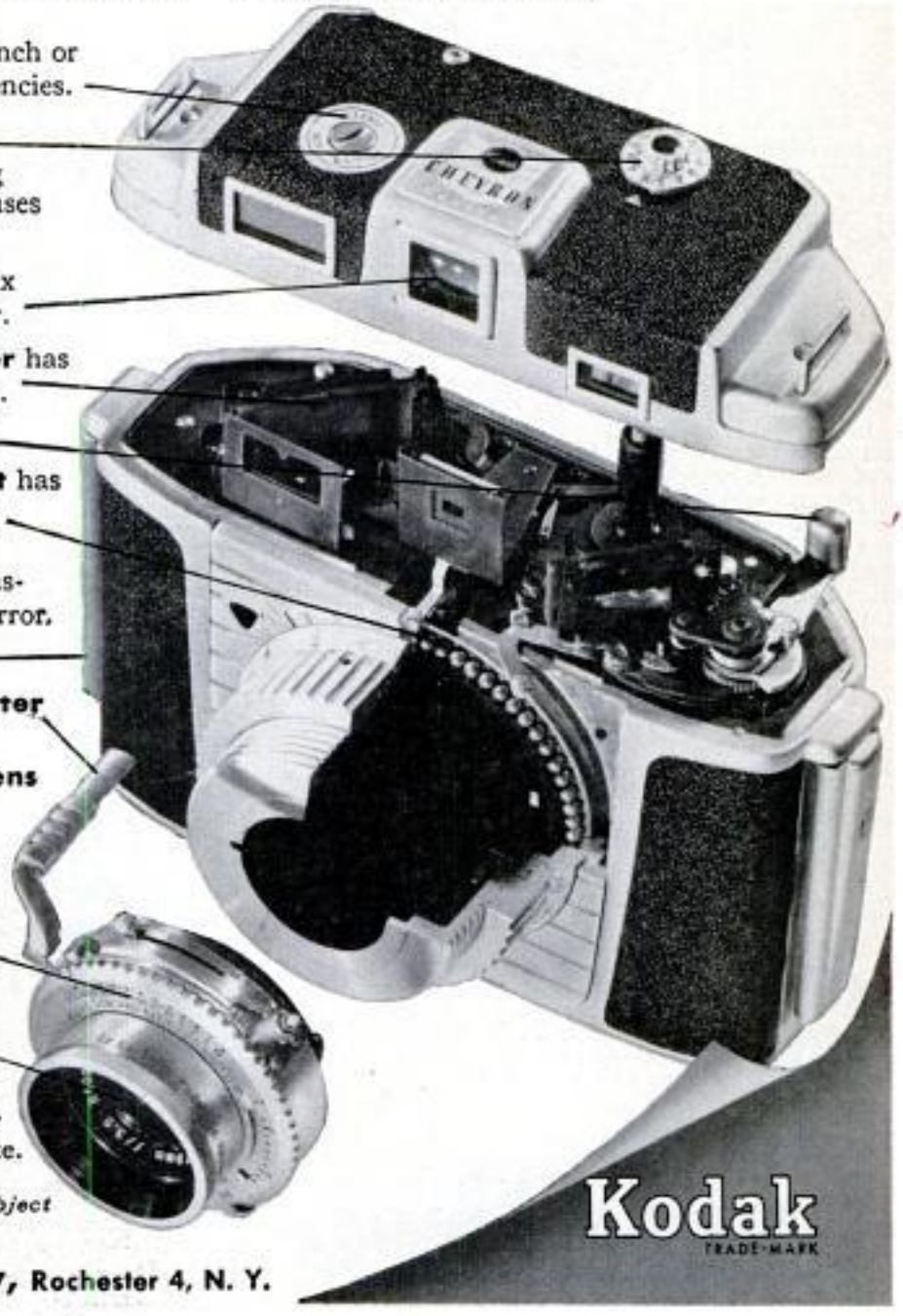

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Eastman Kodak Company, Rochester 4, N. Y.

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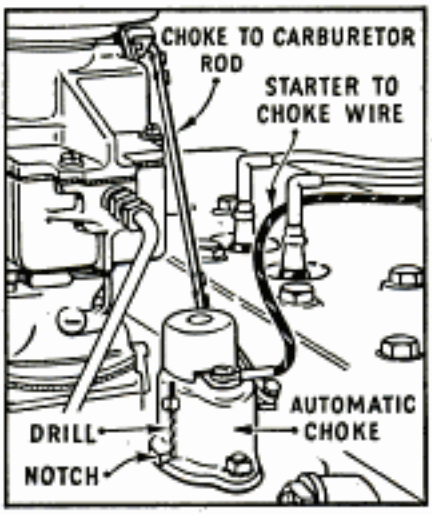
Care and Feeding of Engines

BY S. P. CORP

MAGNETIC AUTOMATIC CHOKE

If you have starting trouble, it may be wise to check the magnetic automatic choke which is probably used on your car if you do not have a hand choke.

With engine cold, remove air cleaner from carburetor and have someone step on starter as you observe action of choke valve in top of carburetor. As starter turns engine, valve should be closed. As engine warms up, valve should move gradually to wide open position. If choke operates but engine is still hard to start, do this:



Move choke-to-carburetor rod until hole in brass shaft aligns with a slot in the case and a notch in the base of the choke housing. Then push a No. 50 drill down through hole in shaft and engage notch in housing. NOW loosen clamp screw at choke lever and shaft, moving lever up until choke valve is closed. Open carburetor throttle one-third and tighten clamp screw. Recheck all adjustments and make sure there is no slack in the linkage. Do not oil any part of the linkage. Clean off any oil and dirt with a gum solvent. While holding throttle open, check linkage for free action. Check clips that hold rod in position, marked left and right.

Caution: Be careful not to over-tighten air cleaner when replacing it, as this will distort air horn on carburetor, causing choke valve to bind. Add extra gaskets if air cleaner is loose.

CHECK EXHAUST SYSTEM

After winter driving, check to see that gasket between muffler and exhaust pipe is tight, make sure that muffler is not bent, and that tail pipe is not bent in such a way as to restrict exhaust gases. High exhaust back pressure can cause a sluggish engine.

FREE CAR-HELP FOR YOU

This helpful manual of car care is yours for the asking. It may save you a lot of money. When you re-ring, use Sealed Power KromeX Ring Sets, factory seated for fast break-in and immediate oil control. Send a card, for "MORE POWER, Less Gas, Less Oil," to Sealed Power, Dept. G-4, Muskegon, Michigan.

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Clinic for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Loose Sash

Q—I have an old home and all the window sash seem to be loose in the frames. However, in several of the windows the top sashes will not lower. They are loose at the bottom but stuck fast at the top. Prying doesn't help, only damages the sash and frames. How does one loosen them at the top? Is it necessary to remove some of the frame parts? Can the sashes be tightened so that air does not leak through?—T. G., R.I.

A—Usually the upper sash stick due to the paint that works in between the frames and the stops before it dries. As a rule the sash can be loosened by running a thin-bladed putty knife all the way around the frame between it and the stops. This breaks the paint "seal" and frees the parts. Sash loose in the frames are tightened by resetting the inside stops, but care must be used in removing the stops to prevent damage to the frames. Generally the stops are nailed in place but on some frames they are attached with screws. In addition to moving the stops it is often recommended that weatherstripping be installed in older-type window units to prevent leakage around the sash. Weatherstripping is comparatively inexpensive and will save its cost in the reduction of heat loss alone.

Basement Excavation

Q—My home has no basement and I plan to excavate under a part of it and put in poured-concrete walls to give a basement height of 7 ft. from the floor to the bottom of the floor joists. My problem is how to support the building over the excavation and how to remove the earth, that is; how does one get it out from under the building? I want to do most of the work myself. Is it practical?—F. M., Ky.

A—You did not say how much time you have to devote to the job. Whether or not it would be advisable for you to undertake even a part of it alone would depend on this factor, at least to some extent. As a rule homeowners faced with this problem either borrow or build a conveyor or small elevator into which the earth can be shoveled for elevation to some point outside the building. This is quite

(Continued to page 224)

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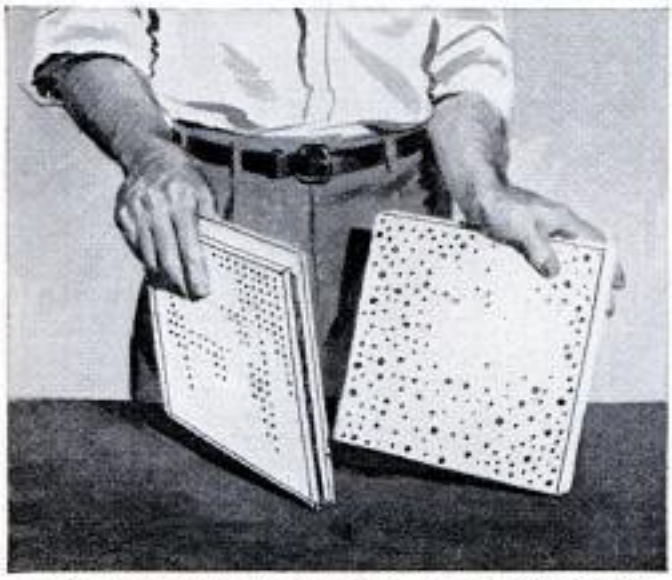
How to reduce workshop noise

It's easy to turn your workshop ceiling into an efficient sound-muffler by installing Armstrong's Cushiontone or Perforated Temlok Tile. These perforated wood fiber tiles absorb noise as it strikes the ceiling. You can install these noise-quieting tiles yourself.



1 **Your choice of two materials.** Armstrong's Cushiontone, which comes in the attractive Full Random design, absorbs noise most effectively. Perforated Temlok Tile—besides reducing noise—is the easiest and fastest to install.

2 **Furring strips provide a base** for installing tiles. Start by nailing seasoned wood furring strips at right angles to joists on 12" centers. Wood furring should be smooth, level, and solidly nailed. Shim where necessary to produce a level surface.

3 **Shallow-drilled holes** in each corner of Cushiontone take flathead or collar nails. Nailheads should be 1/8" to 5/32" in diameter. Wide nailing flange on Perforated Temlok Tile allows for nailing or stapling. Special joint hides nails or staples.

4 **In a few hours** you can install an attractive, noise-quieting ceiling of Cushiontone or Temlok Tile in your basement workshop. Both tiles are prepainted and washable. You'll want sound-conditioning ceilings in your playroom and kitchen, too.

For a free booklet on Armstrong's Cushiontone and Temlok, write Armstrong Cork Company, 3904 Watch Avenue, Lancaster, Pennsylvania.

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—to set plumbing.

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QUALITY BUILDING SPECIALTIES

(Continued from page 222)

easily done by purchasing bearings, shafting, sprockets, flat-link chain and elevator flights and building the run, or elevator flight, from ordinary lumber. The assembled elevator is driven by a small electric motor or gas engine. Such a unit not only greatly reduces the labor but speeds up the job as well. As the earth is removed the building must be supported on jackscrews or beams and underposts of sufficient size to carry the load without sagging. In some cases, depending on the size and architecture of the building, it is handier to excavate only a portion of the basement area, then install forms and pour a part of the wall at a time. However, this is not to be recommended unless unavoidable, as it is better to install complete forms and pour the whole job at one time, in a single day if possible.

Noisy Furnace

Q — My gas-fired, warm-air furnace has operated very quietly for the past two seasons and only lately has developed an annoying rattle I can't seem to locate. There seems to be nothing loose anywhere in the furnace yet the noise is like that made by metal-to-metal contact. It is heard only when the fan is running. The furnace is of the horizontal type. Can you suggest possible causes and a remedy?—P. B., Ill.

A—Have you cleaned the air filters lately? We're raising the question because clogged filters are a common source of objectionable noise in warm-air heating systems which use a fan to circulate the air. Also, have you checked the rubber motor mountings? While it is unlikely these would deteriorate sufficiently in two seasons to permit the metal-to-metal contact you mention, it is possible that they have loosened. Clean the filters, check motor mountings and when replacing the filters, be sure that the metal shield that fits over the top of the filters is in the proper position. If the noise still persists, then carefully withdraw the fan unit so that the air outlet clears the opening into the heat-exchanger chamber. This opening generally is lined with asbestos or other protective material. There is the possibility that this may have worn through at some point, permitting the metal discharge outlet from the fan to touch the edge of the opening in the metal divider, or partition. This defect could cause the noise you have described. When replacing the fan unit, be sure that it is properly located and that it rests firmly on the rubber feet.

Porcelain Repair

Q—I have an old wall-type apron sink on which the porcelain is chipped in several places, two fairly large spots on the bottom of the sink well and another on the apron. If possible I'd like to repair this sink and utilize it in a summer cottage. I understand there are porcelain-repair kits available. Are these satisfactory for this purpose and can you give me full instructions for applying?
A. G., Calif.

A—There are preparations available for the repair of chipped porcelain which are said to be very effective. However, these usually are liquids that harden on exposure to the air in a manner similar to paint or enamels and, of course, cannot be expected to have the durability of the original finish. You did not say how large the chipped areas are, but the size of these usually determines, to some extent at least, whether it is advisable to attempt repair. If these are large, 2 sq. in. or more, then we would suggest that you consider purchase of a new unit. However, smaller chipped areas can be repaired with fair success. When using any of the preparations available for the purpose, be sure to follow the manufacturer's instructions in all details. Usually these instructions stress the importance of making sure that the area is thoroughly clean and this is essential to success. Also, the instructions probably will direct that you apply the preparation in successive layers, permitting each application to dry before applying the next.

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Safety Steering Gear Protects Driver

When a collision thrusts the driver's body forward, a newly developed steering gear "gives" to protect him from rib fracture but prevents his being hurled through the windshield. A flexible joint in the steering column does the trick. A special switch cuts all electrical contacts to avoid post-accident explosions. The device was shown at the Paris Auto Salon.

Optical Hygrometer Gives Instant Readings

Developed by the U. S. Weather Bureau, a new instrument gives instantaneous measurements of humidity and isn't affected by freezing temperatures, two shortcomings of previous equipment. The optical hygrometer is based on the principle that some infrared light lets water vapor go through it, while other infrared light absorbs water vapor. The instrument directs alternating beams of infrared light at a piece of air—one beam is not affected by the water vapor in the air, the other is. The difference between the two beams is the measurement of the amount of humidity in the air. The improved instrument will mean more safety for aircraft flying in areas of ice fog and will be useful to food carriers who use refrigeration.

¶There are 1027 different species of trees in the United States and Alaska, according to the U. S. Forest Service.

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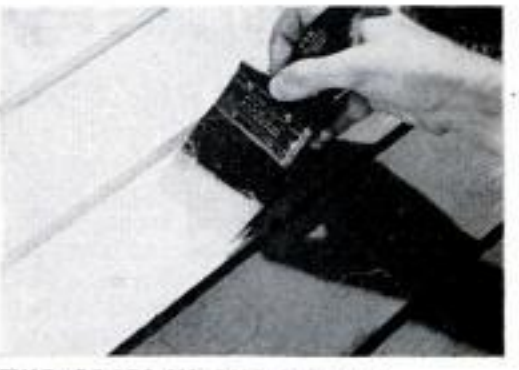

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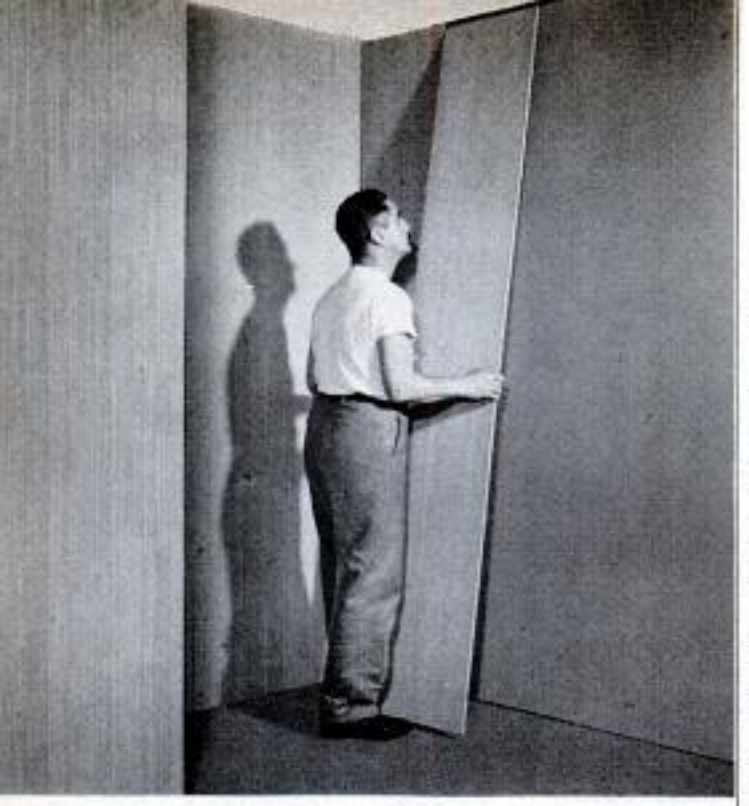

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Bring Back That Vacation Alive

(Continued from page 152)

Used in conjunction with sunlight they remove harsh shadows and bring out detail in shaded areas.

You may want to pose Aunt Mary in the shade of a tree while the rest of the area is bathed in bright sunlight. A peanut flash bulb will do the trick from as far away as 15 feet. Closer than six feet the power of a peanut bulb will override the sun. At six to eight feet it will equalize the sun. Beyond eight feet the balance decreases in favor of the sun until the effect of the flash is lost entirely at about 30 feet. Much depends on the type of reflector and film used but for ordinary purposes these figures will serve. The best indoor pictures will result when the flash is held 8 to 10 feet from the subject.

A pictorial story of a vacation should have a beginning and an end just the same as any other story. Start with a picture showing luggage being stowed into the car. If there is a sign at the edge of town that says "Leaving Hometown," picture the car outbound past it. Shoot the first state-line sign you see and others if your trip goes into several states. Signs are an excellent means of identification and explanation. Include them whenever you can. Use elevation signs, mileage signs, motel and cafe signs, park signs and various highway markers. By correctly arranging them in an album you can tell a story of your vacation that needs hardly a word of explanation from you.

Don't forget the ending. Every story has one. Yours might show the car entering the driveway at home with a final picture showing a two-week accumulation of newspapers around the front door. A little humor will gladden any story.

Remember the simple rules outlined here and it is a safe bet your next set of vacation pictures will interest, rather than bore, your friends. ★ ★ ★

Chemical Dates Birth of Earth

Scientists, using a chemical related to the tetra-ethyl lead in high-test gasoline, have estimated that the earth's crust was formed about 3,500,000,000 years ago. The University of Toronto scientists also found that the earliest time at which all the elements could have been formed was 5,500,000,000 years ago. By determining the amount of lead tetramethyl, an isotope, in samples from all over the world, the scientists were able to estimate the age of the earth's crust and the elements.

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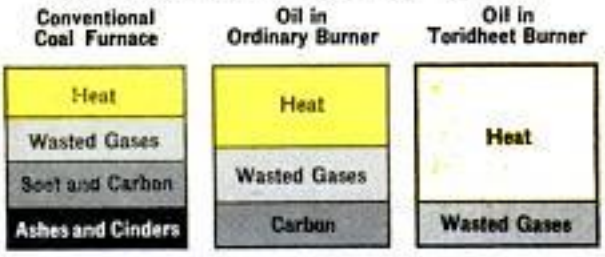

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Where to Find Fish in a Lake

(Continued from page 131)

frogs. Fish like to get under such jams and feed on the leeches and bugs that cling to the underside of the logs.

Under overhanging trees and bushes where insects are likely to drop into the water use artificial flies, spider or bug lures.

In general, crappie feed much the same as bass. They like the same types of food and the same kind of water. Except during the spawning season they are fond of company. Where you catch a crappie, keep fishing the same spot for a while and chances are you will get a few more. Though they will take the artificials readily enough at times, the best baits for crappies are the naturals such as worms, minnows and bugs.

For trout, go to the mouths of tributary streams, points of land extending into the water, submerged objects and overhanging banks, especially where there is any movement of the water. Streamers and bucktails are good for trolling and for casting for trout. Small bright spoon lures are excellent for trolling but the best rig of all is a spinner with flashing blades trolled a few inches in front of a baited hook.

A combination of casting and trolling is an effective method of taking trout. Here one or two lines are trolled behind the boat while another is cast to shore and allowed to swing out in an arc as the boat moves ahead. In this way the area is covered most effectively. Troll as slow as possible and far enough from shore to avoid very shallow water. Except in the early morning and late evening trout are apt to be down near the bottom.

In lakes, inhabited by northern pike, try the lily pads and along the edges of weeds and reeds. Pay particular attention to indentations in the weeds. In weedless lakes, try the deep water near the mouths of streams, channels between points of land and deep water near the mouths of narrow bays. Cast a big nickel spoon with the hook covered by a bucktail.

Muskellunge, too, like weed beds, and may also be found near sand bars or around sunken logs in medium to shallow water. But the biggest muskies taken by sport-fishing methods are found near the bottom in deep water and are taken by trolling.

The muskie has the reputation of being the toughest, meanest fresh-water fish that swims. His favorite food is the sucker and trolling a live one is an excellent way to take a muskie. Big spoons, plugs and bucktail spinners are the favorites of most muskie fishermen, however. Because he is so unlike any other lake fish and because

(Continued to page 234)

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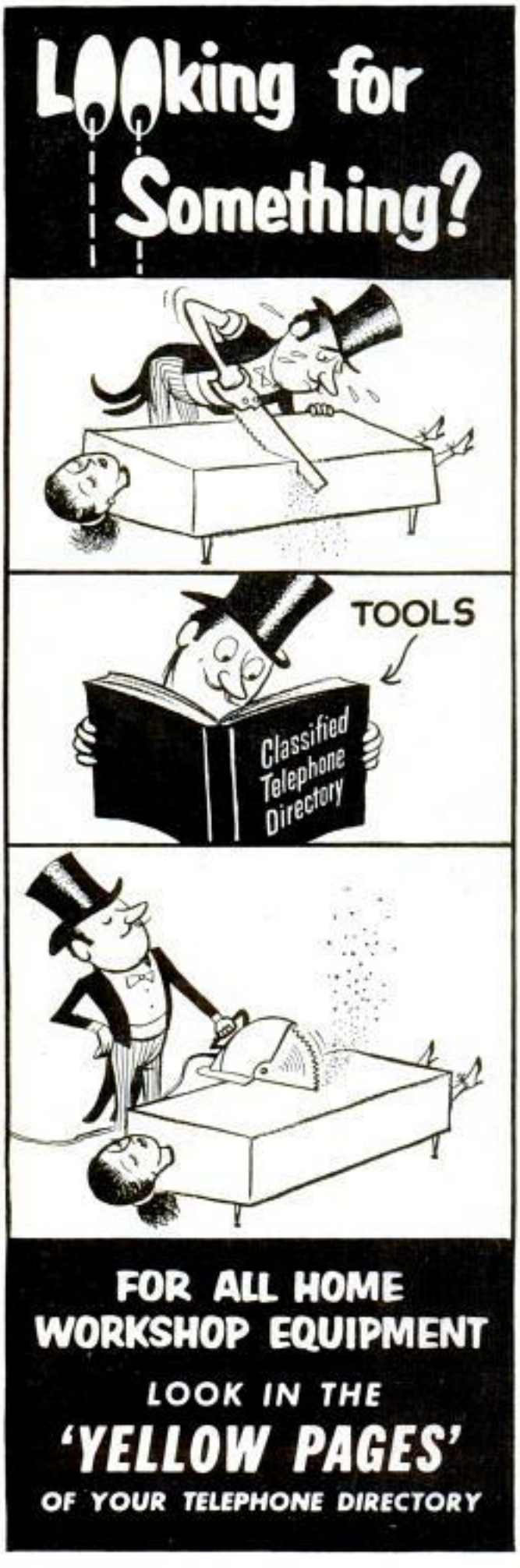
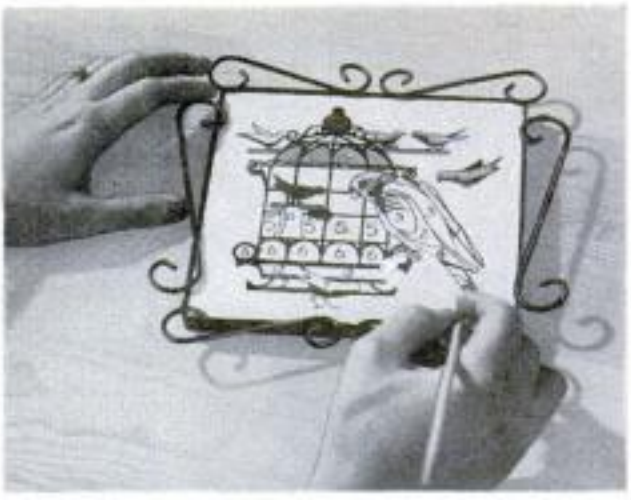


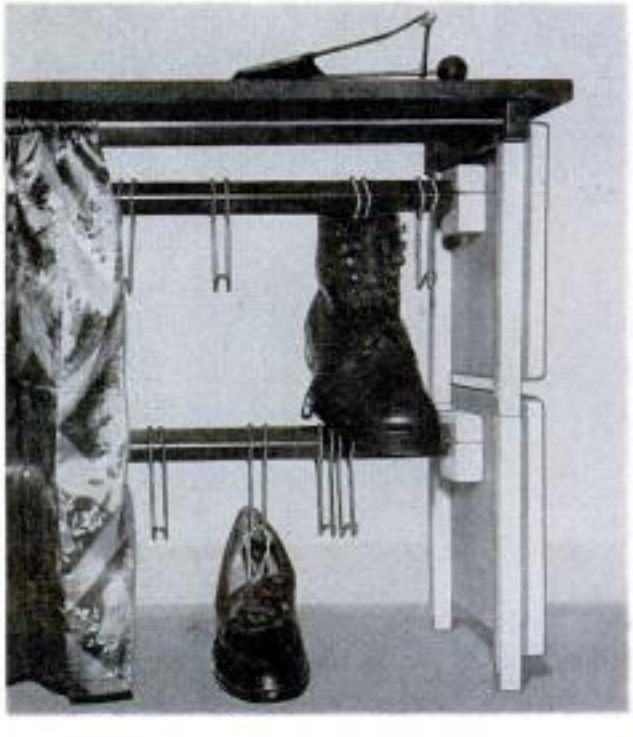


Paint-Your-Own Tiles Presketched at Factory

Now anyone can paint their own decorative tiles "by the numbers." Numbered oil paints are matched to numbered areas on the tiles until an oil painting in full color emerges. No skill is required. A kit for this purpose includes two matched, presketched tiles, wrought-iron frames, and necessary materials, including overglaze. The finished tiles can be hung on the wall or used as hot plates.

Shoes Stored on Hangers

Shoes are hung like clothes in a compact rack built in Germany. Adjustable wire shoe trees are slipped into the shoes and then suspended from the long hooks on the cabinet's bars. The rack serves also as a bench. A curtain pulled across the front conceals the stored footwear.



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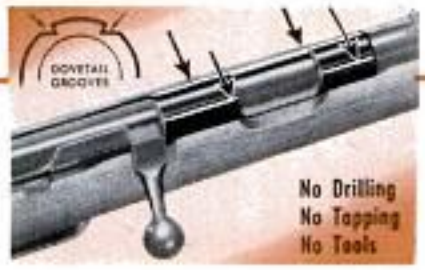
Big News for "22" shooters

STEVENS MODEL 87

SAVAGE MODEL 5



Grooved receivers on many popular Savage and Stevens .22 cal. rifles adapt them for instant use with the new, sensational Weaver Tip-off 'scope mount.

Mount "Tips-on" or "Tips-off" receiver in seconds. 'Scope is aligned for immediate use. The mounting is low, rigid, sturdy.

NOW SAVAGE offers you these "22" rifles ready for INSTANT 'scope use

SAVAGE and STEVENS AUTO-LOADING RIFLES

These *Three-in-One Rifles* are instantly adjustable as autoloaders, bolt action repeaters or single shots . . . an exclusive Savage "first in the field" feature. Their simple, dependable, rapid firing actions may be quickly disassembled without tools. Choice of either tubular or clip magazine models (as listed at right) at popular prices.

Savage Model 6 Tubular Magazine

Stevens Model 87 Tubular Magazine (shown far left)

Stevens Model 85 Clip Magazine

SAVAGE and STEVENS BOLT ACTION REPEATING RIFLES

Savage and Stevens bolt action repeating rifles—choice of either tubular or clip magazine models (listed at right) are recognized among small bore shooters for their fine performance, accuracy and outstanding value.

Savage Model 5 Tubular Magazine (shown at left)

Savage Model 4 Clip Magazine

Stevens Model 86 Tubular Magazine

Stevens Model 84 Clip Magazine

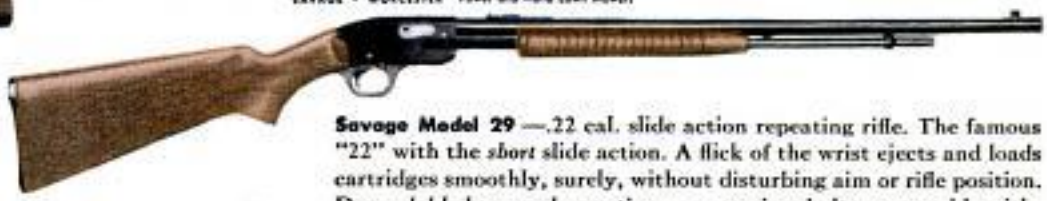
SAVAGE

SAVAGE • STEVENS • FOX Rifles and Shotguns

SAVAGE • WORCESTER Power and Hand Lawn Mowers

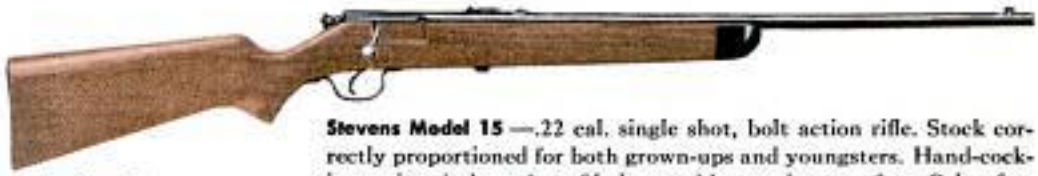
See them at your dealer's.

Write for free catalog of Savage, Stevens and Fox Rifles and Shotguns.



Short forearm stroke—slide travels only 1¾" in loading and ejecting.

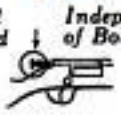
Savage Model 29 —.22 cal. slide action repeating rifle. The famous "22" with the *short* slide action. A flick of the wrist ejects and loads cartridges smoothly, surely, without disturbing aim or rifle position. Dependable hammerless action . . . one-piece bolt—removable without tools for cleaning . . . single takedown screw . . . walnut stock . . . extra long slide handle, grooved for firm grip . . . accurate sighting equipment.



Stevens Model 15 —.22 cal. single shot, bolt action rifle. Stock correctly proportioned for both grown-ups and youngsters. Hand-cocking action, *independent* of bolt, provides maximum safety. Other features include: Bolt handle directly over trigger for fast operation . . . new stock with handsome black-tipped fore-arm . . . 24" barrel . . . gold bead front sight and open rear sight with elevator.

Loaded NOT Cocked

Hand Cocked ↓ *Independent of Bolt*



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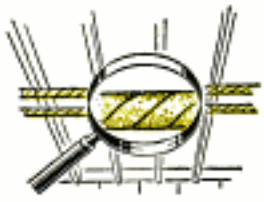
TIPS for the HANDYMAN

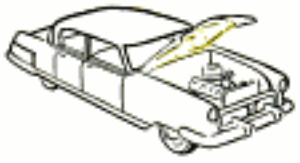
ON USING L·O·F SUPER·FINE FIBER·GLASS

Here's a new insulating product of "1001 uses." Wonderfully easy to handle and apply. And so versatile, so effective, you'll find uses for it in a dozen places 'round the house.

Save fuel by wrapping fire-resistant Super·Fine around your heating ducts! Highly efficient *heat* insulation. Flexible, lightweight, easy to install.



Reduce dripping from *cold* water pipes. Reduce heat loss from *hot* water pipes. Spiral wrap them with Super·Fine. Will not mildew or rot.



L·O·F Super·Fine installed under the hood of your car reduces airborne noise, tire whine and air-stream whistle.

Sound-insulate your home workshop! L·O·F Super·Fine provides excellent *sound* absorption. Cuts easily with scissors or knife.

Get L·O·F Super·Fine at your favorite hardware dealer's, where this rack is on display. If your dealer doesn't have it, write Libbey·Owens·Ford, Fiber-Glass Division, 4844 Wayne Building, Toledo 3, Ohio.

L·O·F GLASS Carnation FIBER GLASS

FIBER·GLASS

he is so cunning and tough to handle you'll get the best muskie fishing in the company of a competent guide. Trust his advice or that of local experts as to tackle, method and location.

Lakes in the northern states and Canada, including many of the muskie lakes, are the home of big, fighting lake trout. These lunkers are nearly aways taken by trolling with big, bright spoons and they are about the only fish found more often out in deep water near the middle of the lake. As with muskie it is best to rely on local advice as to tackle, time and method. Hook-and-line record for lake trout is something over 60 pounds but they have been taken in nets over 100 pounds.

Also in northern lakes another important fish is the walleye. Walleyes don't rate quite as high as the pikes and muskies as game fish but they are great favorites because of their excellent table qualities. In the spring they may be taken in shallow water much like the pikes but very soon they go to the deeper waters near the middle of the lake and away from shore. Some anglers who have fished walleyes for years are not aware of this trait and so miss many fish in the summer months. Trolling a spoon just off the bottom is the best method for taking walleye during the day in the summertime.

Walleyes are night feeders during the heat of summer. They hang near the bottom during the day but as soon as complete darkness has fallen they move up into the bars and reefs in shallow water. Moving in schools, they drive the minnows before them, herding them into the shallows.

Casting with a wobbling spoon or popping plug into the likely shallows during the two or three hours preceding midnight is almost certain to get fish. It will help considerably if the lure has been treated with luminous paint. Look the lake over during the day for the best-looking shallows containing reefs and bars. Walleyes, unlike bass and trout, make no noise when they feed so you will need to know ahead of time where you want to fish. Here's something to remember about walleyes if you want to fish for them during the day in summer: their favorite food is big, fat earthworms. Put the biggest worm you can find on a hook and let it down to the bottom in deep water. Every few minutes lift it a bit and move a few feet to a new location. If the worm lands near a walleye you should have fish for dinner.

It is not unusual to find a lake where there are few signs to read. The shores all look the same, there are no weed beds, islands or reefs. In such cases trolling is the best bet.

(Continued to page 236)

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Meet the one heating expert who can save you up to 25% on fuel oil

...AND GUARANTEE IT IN WRITING!

This man offers you money-saving magic! He is your Timken Silent Automatic Direct Factory Dealer. He can cut your fuel oil bills more than any other dealer in the heating business! He sells and installs the amazing Timken Silent Automatic Wall-Flame Oil Burner—which in test after test, home after home, has cut fuel oil bills up to 25% and more!

He offers you an exclusive written guarantee of fuel savings. As an authorized factory-trained heating expert, he will scientifically test your heating plant and tell you what you can expect to save on fuel oil by replacing your gun-type burner with a new Wall-Flame burner. If you buy, *he'll guarantee these oil savings in writing!*

If you heat with coal, this guarantee is important to you, too. For you are assured the same fuel economy, proved over other types of oil burners in home heating tests everywhere!

Let him show you this most advanced principle of oil heating. Completely quiet, clean, and with only one moving part, this amazing burner blankets your heating plant walls with a natural, unhurried, blue-hot flame. There is nothing to get out of order.

Phone your local dealer today for a free fuel-saving estimate! He is listed in the "yellow pages" of your phone book. Remember: *your home is like no other*. That is why it will pay you to get his expert advice. Hundreds of Timken Silent Automatic *Wall-Flame* Burners have already paid for themselves in fuel savings alone.

World's finest oil burner!
Scientific placement of flame, complete preparation of air-fuel mixture, gives unequalled efficiency and oil savings.

FREE! SEND COUPON FOR FACTS TODAY!

Timken Silent Automatic Products
Timken Silent Automatic Division
Dept. PM-44, Jackson, Michigan

Show me how homeowners in my community have saved money with Timken Silent Automatic.

Name .....

Street .....

City ..... State .....

Also facts on (type of equipment) .....

(Students, check for special data) ☐

A complete line of oil and gas furnaces, boilers, conversion burners and water heaters for every home heating need. No down payment. 36 months to pay!

TIMKEN
Silent Automatic
OIL HEAT
TIMKEN SILENT AUTOMATIC DIVISION
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Save Money... Install your own

REO TROLLABOUT

Inboard Marine Engine Kit

for Boats up to 18'

Only
$99.50
Complete

Model MKG-1 for fresh water only (Model MKG-11, for salt or fresh water, $124.50 complete)

• Now—for only $99.50—you can convert your row boat to an inboard engine troller! And you can install the Reo Trollabout *yourself* in from 4 to 6 hours, using only common hand tools! Full size template included with easy-to-follow directions.

• Gives you full speed range of ½ to 7 mph, exceptional handling ease (center of gravity located amidships). Ideal runabout for kids. Famed Reo engine develops thrust equal to outboards of twice the hp rating! Forward, neutral, reverse shifts. Skeg bar, flexible exhaust extension available.

• Kit comes complete, ready to install—nothing else to buy! Includes: Easy Starting Reo 1¾ hp engine with automatic rewind starter, automotive type down draft carburetion. Plus: propeller, propeller shaft, gear, rudder and controls.

Ask your marine equipment dealer to demonstrate, or write for free folder to:

REO MOTORS, INC., Lawn Mower Division
Dept. PM-4, Lansing 20, Michigan

Please send me more information on the Trollabout Inboard Marine Engine Kit, and the name of my nearest supplier.

Name.....

Address.....

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

Actually, trolling is always a surer method but it lacks the thrill of casting. Except for the comparatively short feeding periods of early morning and late evening, most daytime fishing is done when the fish are down. Especially with trout this means you should troll deep. Use a wobbling or darting lure that transmits its action through the line to the rod. You can tell by the feel when the lure has picked up weeds or otherwise become fouled. Use enough weight to put the lure down but place it far enough in front of the lure not to interfere with the action. Let out line until you feel the lure bump the bottom then pick up a little line. Repeat the bump every few feet to make sure you are still near the bottom. In this way you can soon learn the complexion of a lake's bottom, find the deep holes and get to know where the underwater reefs and bars are located. In a short time you will be able to keep the lure near the bottom but never hitting it.

When you want to "explore" the bottom in this way it is a good idea to attach the weight with a separate piece of line about 18 inches long. Tie this to the line about 18 inches in front of the lure.

Here are some things to remember about lake fishing:

In a boat, stay low, cast 40 feet or more and don't scrape feet on the bottom of the boat or bang it with an oar.

The most likely places are probably overfished. Seek those less apparent.

When casting into or retrieving through weeds use a weedless lure. It may cause you to lose a fish or two but it saves much time and temper in preventing snags. Keep the boat itself away from the weeds.

Weedy bays for largemouth bass, pickerel, pike, sunfish and perch. Rocky shores and mouths of streams for trout and smallmouth bass. Rock reefs, partially or completely submerged and best if partially weeded, for muskie and lake trout. Catch lake trout, too, out in deep water. Catch muskies around logs, sand bars and on the bottom in deeper water.

In strange lakes when you have little time use the natural baits—worms or minnows.

In trolling, use smaller lures for trout, medium sizes for bass, walleye and pickerel, big ones for muskie and lake trout. It's best to use spinners in front of a lure in trolling.

Close in around rocky islands you may find largemouth bass and muskie. Farther out will be walleye and yellow perch.

Every rule has its exception. Don't hesitate to experiment. You'll learn more that way than by reading—but it will take longer. ★ ★ ★

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IN PAN-AMERICAN ROAD RACE, "toughest 2,000 miles in the world," thirty leading contenders selected Life-time for their cars, had no trouble, although other cars dropped out due to battery failure. Small stock car winner C. D. Evans said: "most rugged battery I've ever seen."

SCIENCE AND CHEESE CAKE were combined in another test, where Life-time battery was run down completely, then lowered into tank of water and frozen solid. Six weeks later, still in cake of ice, battery was connected to heavy truck motor, started it immediately.

The Battery That Wouldn't Give Up

Run down, baked, frozen, it keeps bouncing back to life. Six-year bonded* guarantee rocks billion dollar industry.

Heralded as the "battery with 753 lives" a new American battery has defied the determined efforts of automotive editors and researchers to make it give up.

Run down, charged, run down and charged from 604 to 1142 times in S.A.E. tests, it keeps coming back for more.

In one test, the Life-time battery beat (by a narrow 24% margin) a famous German battery rumored to be postwar "super battery."

Over 58,000 foot-pounds of power—enough to lift an automobile 15 feet straight up—is developed by the Life-time battery. Tremendous power reserve accounts for battery's performance from 35 below to 160 in the shade.

For cars and trucks, the Life-time battery sells in all 6-volt sizes for $29.95, in 12-volt sizes for $34.95. Special sizes are made for marine and industrial use.

For name of nearest dealer or distributor, write Continental Manufacturing Corporation, Dept. PM-4 Washington Blvd. at Motor Ave., Culver City, Calif.

**Six-year guarantee backed by multi-million-dollar bonding company.*

WANTED: Life-time Battery Distributors, Dealers, Regional Managers

Frankly, we have a problem. Every day, letters and wires pour in asking for the name of the nearest Life-time battery dealer—so many, in fact, that we need more dealers to handle the demand. **These new customers** have seen our full-page advertisements in **Look, True, Argosy, Esquire** and about thirty other magazines. Or they have seen or heard our television and radio broadcasts of international sporting events like the Pan-American Road Race. Now, the same mail brings requests for Life-time battery dealerships.

The answer seems simple: appoint these dealers to take care of our new customers—but it isn't that easy. We need men with executive ability who can qualify as regional managers to help us decide which dealers should be appointed in the fastest-growing organization of its kind in the world. We also need distributors to handle warehousing and administration for our dealer network. If you have organizational ability and are financially responsible, we'd like to hear from you and discuss your opportunities with us.

Continental Manufacturing Corporation, Dept. PM-4 Washington Boulevard at Motor Avenue, Culver City, California

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INSTALL IT *Yourself* and SAVE!

YOU CAN GET
25 to 40%
BETTER
RECEPTION
on your present TV
Set... and you're
READY FOR
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ANTENNA KITS
FROM
Admiral
WORLD'S LARGEST TELEVISION MANUFACTURER

Priced from
$13.95 LIST
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UHF Kits
VHF Kits
All-Channel Kits

Kits contain everything needed...antenna, mast, mast mount, guy wires, insulators, lead-in...down to the last screw-eye. Step-by-step instructions are easy to follow. No experience or special tools needed. High-gain antennas get excellent reception. Finest quality, tested and guaranteed by Admiral. Buy from your Admiral dealer.

Same box that holds fisherman's catch will also store antifreeze for summer. User assembles the box himself

That Versatile Stuff, Paperboard

(Continued from page 119)

The huge new corrugated container is reinforced with slats of wood at strategic points. The miller dumps in a full ton of flour at once. It takes less than a minute to seal it and a fork truck delivers it to the freight car. Another truck unloads it at the baker's warehouse, and eventually special equipment dumps it into a bin. The big container then is snapped flat and returned to the miller for re-use. The paperboard box saves about 66 percent of the time and manpower formerly required to move flour from the miller to the baker.

And remember the ice-packed wooden crates in which lettuce is shipped to your grocery store? Before long they may be a thing of the past as a result of a new vacuum-cooling process made possible by the development of special corrugated boxes. A stapling machine on a truck assembles the boxes in the field. The assembler flips the boxes between the rows, and workers pick directly into them.

The vacuum cooler is a sealed tank. Lettuce-filled boxes are shoved into the tank, the door bangs shut and air and water vapor are pumped out of the tank. The vaporization, induced by lowering the boiling point of water by the vacuum, produces a cooling effect to reduce the temperature

(Continued to page 240)

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FAMOUS "FIRSTS" in American FIRE PUMPS

Colonial Pumper—One of the first practical fire pumpers of Colonial times was this interesting but rather crude device, hand-filled and pumped by volunteers.

America's First and Finest FUEL PUMP

Equipment on 9 out of 10 cars on the road

Fire pumps developed slowly through the years. Equally slow was the development of a reliable method for supplying fuel to automobile carburetors. AC engineers solved the problem with the fuel pump. A complete and amazing success from the beginning, it replaced earlier unreliable gravity, pressure and vacuum-type systems.

America's "*first*" Fuel Pump, steadily improved over the past quarter century, is still the "*finest.*" ACs now supply the carburetors of 90% of the nation's motor vehicles with exactly the amount of fuel needed, positively and automatically.

No other part of your car works harder than the fuel pump. It is literally the heart of your engine. After several years of operation it should be replaced with a new one, eliminating the possibility of an annoying and expensive roadside failure.

GM

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

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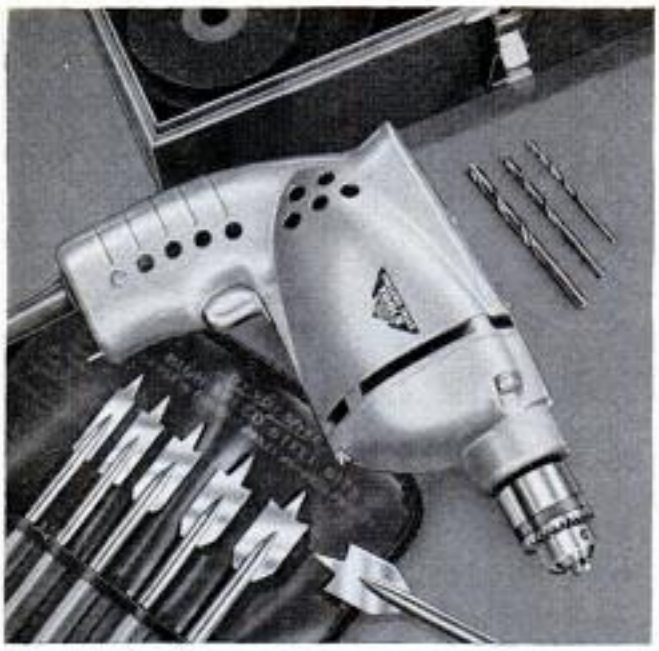

Millers Falls

Powerful New No. 1814
¼" Pistol-Grip Drill

Just try it once. Then you'll know why this new Millers Falls husky has won such instant popularity.

It's light, compact, easy-to-use — and it packs a wallop way beyond its size. More important still, it's built with all the craftsmanship and quality that have made Millers Falls tools world famous — electrically and mechanically, the last word in modern design and performance.

See and try it at your hardware dealer's — separately or in kits: No. 1814 Drill with Jacobs Geared Key Chuck, $22.35 . . . No. 814 Drill, same but with Millers Falls Precision Hand Chuck, $19.85 . . . No. 8142 Deluxe Kit, a complete power workshop, $42.25.

New Right-Angle Drive for any ¼" electric drill. Makes it easy to work in spots impossible to reach with drill direct. No. 2130 . . . . . $4.95

New "Dyno-Mite"® Bits. The only power wood bits with high-speed steel blades. Stay sharp 10 times longer. Even cut through wire nails. Fit ¼" drills. Sizes up to 1". Singly or in sets. No. 8006 shown . $5.50

FREE at your hardware store. Ask your dealer for this new Millers Falls Power Tool Catalog. If he cannot supply you, send 10¢ to cover mailing and handling.

MILLERS FALLS COMPANY • Dept. PM-1 • Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868
®
The Mark of Superiority

of the lettuce to 34 degrees within a very few minutes. When the door is opened, out roll the chilled, lettuce-filled boxes. There's less than one degree difference in temperature between the outside of the box and the heart of the innermost head of lettuce. Quicker and more uniform cooling does less damage to the lettuce.

The process is significantly cheaper than the old wooden-crate method because no ice is required for shipment. The grocer likes the new container because he receives his lettuce dry instead of soaking wet. The shipper likes it because the box costs about a third less than the wooden crate, the lettuce isn't bruised by ice particles, and the complete phase of repacking and icing lettuce is eliminated. The handler likes it because the new lettuce-filled box weighs only 37½ pounds, considerably less than the old. And the housewife should like it because there's no water in the lettuce-heads to cause rust and ruin the lettuce. Everybody's happy, so about 40 percent of the 1953 lettuce crop was shipped in corrugated boxes, compared to 20 percent the preceding year.

Paperboard boxes have invaded the citrus orchard, too. About 70 percent of California's 1953 lemon crop was moved in corrugated boxes, compared to only 20 percent the preceding year.

A good many oddities have been made of paperboard. Harry J. Bettendorf, president of Board Products Publishing Company and a top authority on paperboard, points out that in the 19th century laminated paper was used for everything from collars and cuffs to coffins. In 1869 the first set of freight-car wheels was built of paperboard. The laminated body of the wheel was made of paper disks, though the tire and the hub were of metal. By 1881, 10,000 of these "paper" wheels were rolling out every year, and one set eventually traveled more than 300,000 miles!

The paperboard industry grew with a bang. The famous Uneeda cracker carton revolutionized the packaging field. This sanitary method of handling food, as contrasted with the old open cracker barrel, proved so popular that cereal manufacturers soon were clamoring for cartons for their products.

But even as late as World War II, the industry had difficulty in persuading people that paperboard boxes were as strong or stronger than wooden boxes. "Paper boxes? Pshaw, they'd disintegrate in the first rain!" The armed services were specifying wooden boxes for everything from rations to ammunition containers when the war broke out. Necessity soon brought

(Continued to page 242)

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You Can Make Every Project on this page

FIRESIDE SET your friends will rave over is easy fun-project for you . . . with inexpensive Reynolds *Do-It-Yourself* Aluminum. Reynolds Plan #101. See Coupon.

ALUMINUM SCREENS that never rust or stain are much easier to make with Reynolds Do-It-Yourself Aluminum than wooden ones. Free instructions. See Coupon.

...quickly, inexpensively with REYNOLDS *DO-IT-YOURSELF** ALUMINUM

You start with a simple plan. You finish up with beautiful things for your home that would do credit to a professional craftsman. Yes, even if you're a beginner. Here's the secret. Reynolds *Do-It-Yourself* Aluminum is specially made for really astonishing workability. You can bend it, saw it, drill it, plane it, joint it and shape it, using standard woodworking hand or power tools.

Have fun . . . *and* save money!

With no previous skill you can now make hundreds of wonderful things for your home. And you'll save as much as 75% on one single project. You'll save money on *repairs*, too. Reynolds *Do-It-Yourself* Aluminum comes in plain and embossed sheets, tubing, bars, rods, angles, screen sections, handy fasteners.

*T. M. REYNOLDS METALS COMPANY

TEN PLANS IN ONE

Pictured below are three of ten useful fun-projects that you'll find in one 25c Reynolds Plan (#102). See Coupon.

WINDOW SILL COVER cut from Reynolds Aluminum Sheet. Protects the wood beneath, stays sparkling-clean.

TOWEL RACK made in a jiffy from Reynolds *Do-It-Yourself* Aluminum is handy, smart . . . and won't rust ever!

RUSTPROOF RAILINGS made from this wonder-metal look like a million dollars, cost amazingly little.

LOOK FOR THIS RACK *at your hardware or lumber supply dealer. Ask him about Reynolds Building Products and Liquid Aluminum, the wonder-coating that's made by leading paint manufacturers.*

NO SPECIAL TOOLS *are needed to work this new material. But be sure to use only Reynolds Do-It-Yourself Aluminum with the special Seal on every piece . . . other types of aluminum may harm tools.*

SEND FOR THESE REYNOLDS PLANS TODAY!

Reynolds Metals Company, 2494 South Third Street, Louisville 1, Kentucky

Please send me Reynolds Do-It-Yourself Plans, folders, booklets as checked below. I enclose 25c for each plan ordered.

- ☐ Reynolds Plan # 101 for FIRESIDE SET 25c
- ☐ Reynolds Plan # 102 for WINDOW SILL COVER, TOWEL RACK, HAND RAILING plus 7 other simple projects, all 10 plans for 25c
- ☐ Instruction folder for making ALUMINUM SCREENS (free)
- ☐ "How-to" booklet containing general instructions and many suggested projects (free)

Name.....

Address.....

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

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LONG QUART

SAVES OIL and ENGINE WEAR

This 100% Pennsylvania motor oil with THE Tough-Film® stands up under intense heat, resists formation of oil-wasting engine deposits. Your engine stays clean, smooth-running, *uses less oil.* And because Pennzoil *lasts* so long, it guards against costly wear caused by acids and friction. Switch to Pennzoil *now!*

As big a difference as ever!

Most motor oils now contain detergents. A detergent's job is not to lubricate, but to improve conditions under which oil lubricates. Pennzoil, too, contains detergents, but its basic lubricating quality, resulting from superbly refined Pennsylvania crude, still provides an *extra* margin of safety.

Sound your Z at this sign...

SOUND YOUR Z
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Safe Lubrication

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BETTER DEALERS IN EVERY STATE FEATURE PENNZOIL® MOTOR OILS & LUBRICANTS

about the development of weatherproof fibreboard, known as V-board, and acceptance was immediately followed by admiration. The material stands up under rain for weeks. Hundreds of millions of square feet of the stuff turned up all over the globe, enveloping literally everything from soup to nuts.

Shortly after the war, radio's famous "Answer Man" received this question from a listener: "How many paperboard containers are used daily in the United States?"

The Answer Man pitched the problem to Bettendorf. When he finished all his calculations, Bettendorf himself was somewhat jolted by the answer. More than 223,000,000 new containers are used in this country every day of the year, or 1½ containers for every man, woman and child!

Bettendorf points out that the figure is almost unbelievable until you realize that each time you squeeze out a ribbon of toothpaste, you are, in effect, using up part of the small paperboard carton in which it was purchased, and part of the corrugated box in which the carton was shipped, and part of every box of raw material shipped to the factory, and part of every nail-box used in building the factory, and so on.

Somehow, this thought is appropriately like the famous Quaker Oats label pasted for many years on a paperboard package. The label shows the Quaker holding a package, upon which is a label showing a Quaker holding a package, upon which is a label showing . . . Well, it's infinitely involved—but then so is the part played by paperboard in modern society! ★ ★ ★

Safety Device Steers Aircraft Away From Hazards

Airplanes may be automatically steered away from other aircraft, tall buildings, mountains and like hazards by a device newly patented by Glenn Muffly of Springfield, Ohio. It consists of a transmitter that broadcasts from an airplane on a standard frequency, and a receiver sensitive enough to pick up a reflected signal. The receiver, tuned to a slightly higher frequency than the one being broadcast, is linked to small motors which can move the aircraft's controls. If the plane nears another object at a dangerous rate of approach, the reflected signal is received at a higher frequency. This actuates the motors and turns the plane away from the potential collision. The aircraft will not be affected as long as it recedes or remains the same distance from an object, because the reflected waves will be at or lower than the frequency of the broadcast signal.

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OFFERS YOU MORE THAN ANY OTHER—REGARDLESS OF PRICE!

READY FOR ALL HOME JOBS and Industrial Applications

LIGHTS YOUR WORK AS YOU SAND...

The ONLY Portable with ALL these features:

1. MOTOR GUARANTEED AGAINST BURN-OUT DURING OWNERSHIP OR REPLACED FREE.
2. OVER 1000 HOURS OF CONTINUOUS SANDING WITHOUT BREAK-DOWN IN LABORATORY ENDURANCE TRIALS.
3. REMOVES MORE MATERIAL WITH LESS UP-KEEP THAN ANY SANDER AT ANY PRICE.
4. WORK-LIGHT IS STANDARD EQUIPMENT—A SYNCRO FIRST FOR PORTABLE SANDERS OF ITS TYPE.
5. VIBRATION-ABSORBING HANDLE FLOATS IN RUBBER (PAT. PEND.).
6. EASY TO USE, HAND OPERATED, POSITIVE PAPER HOLDING CLAMPS.
7. ONE HAND OPERATION—NO JUMPY, TWISTY TORQUE TO FIGHT.
8. MOST POWERFUL RECIPROCATING SANDER MOTOR (PATENTED).
9. NO OILING—POWER UNIT FLOATS IN RUBBER (PATENTED). NO CAMS, BUSHINGS, BELTS, PULLEYS OR GEARS TO WEAR OUT.

only **39.95**

OTHER SYNCRO SANDERS:

No. 504 **$19.95**

No. 504-D DELUXE SANDER IN STEEL CARRYING CASE: **$22.95**

SYNCRO NEW '900' SANDER

WITH BUILT-IN LIGHT — INDUSTRIALLY-RATED

Present, prospective sander owners! Here's the new husky '900' SYNCRO—best all around portable for home use ever—costing less than many others! Try this superior, powerful tool on "do-it-yourself" jobs—save what '900' costs (or more) depending on type of job. Because '900' is so new—and your dealer may be sold out—do this: Send $39.95 and your favorite dealer's name with coupon—and we will ship '900' direct to you—and see that your dealer profits from your purchase. Then—use your '900'—see how it sands better, quicker, easier, smoother one-handed than more costly "bucking" torque-knobbed heavier "two-handed" portables do! If not 100% satisfied—return '900' prepaid, undamaged, within 10 days from receipt—we'll refund $39.95 promptly! Or write for FREE facts today.

Dealers—See Your Jobber!

Now Send This Coupon

SYNCRO CORPORATION
DEPT. I-44
OXFORD, MICHIGAN

TRIAL ORDER or FREE '900' CIRCULAR

SYNCRO CORP., Dept. I-44, OXFORD, MICHIGAN

☐ *TRIAL ORDER:* I enclose $39.95. Send postpaid New No. '900' Sander with accessories . . . on 10 Days Money Back Trial Offer.

☐ *C.O.D. ORDER:* I enclose $5. Send '900' C.O.D. I will pay balance ($34.95) plus postage, C.O.D. fee, on arrival. Same 10 Day Money Back Trial.

☐ *FREE FACTS:* Send for new free Syncro Sanders Circular, Free "How to Sand" booklet.

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Dealer's Name, Address_____

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FLOOR SURFACING PROFESSION
as YOUR OWN BOSS at BIG PAY!

● Today—twenty million dwelling units thirty years old and more need remodeling and repairs including resurfacing of old and worn floors. Also, new construction continues to boom. This means—a lifetime opportunity to establish yourself in a fine business that pays you well . . . sanding floors with an easy-to-run American machine! Beautiful results . . . make old floors like new! Prospects everywhere want benefits of properly surfaced floors—easier to clean, extends life of floor, increases pride of ownership, makes house more valuable and easier to sell.

Be your own boss—*now!* Steady year 'round work where profits are limited only by the amount of time you are willing to spend. Unlimited full or part time opportunities. No schooling or special skills required. Only small investment in sander gets you started. Send coupon for "money-making booklet" entitled "Opportunities in Floor Surfacing"—enclose 25c in coin or stamps to cover handling.

AMERICAN
Performance-Proved Machines
. . . Nation-Wide Service

SEND!

The American Floor Surfacing Machine Co.
535 So. St. Clair St.
Toledo 3, Ohio.

Here is 25c in stamps or coin for booklet "Opportunities in Floor Surfacing," telling me how I can start my own floor sanding business.

Name .....

Street .....

City ..... State .....

(Continued from page 10)

see or hear of a Packard 12 LeBarron Speedster? Mr. Jepson's 30 Boat tail job is beautiful, but compared to the LeBarron it looks like a small truck.

Elmer's Auto Parts
Webster, N. Y.

Selection of the 12 foremost American Classic Cars was made by vote of the Classic Car Club members.—The Editor.

☆ ☆ ☆

Congratulations on the American Classics layout in your fine magazine for February! The color reproductions are beautiful, and the execution of the project is superb. I am very proud to have our 1933 Pierce Silver Arrow included.

Henry A. Clark, Jr.
Long Island Automotive Museum
Southampton, L. I.

☆ ☆ ☆

A limited number of reprints of the album of Classic Cars, printed in full color and on one side only to make them suitable for framing, is available. They will be mailed (as long as the supply lasts) upon receipt of 10 cents per set to cover handling. Address requests to Bureau of Information, Popular Mechanics, *200 E. Ontario St., Chicago 11, Ill.*

To the Editor:

Under date line of May 1, 1953 I received a letter from you informing me there was to be an illustrated feature on model-yacht racing in the summer. You stated that my name and address would be included in the article as a reference.

Up to the present time I have received nearly 550 letters prompted by the article in the August issue. Here is an idea of where the letters came from: The United States, Canada, Newfoundland, Nova Scotia, Guatemala, Panama, Honduras, Peru, Colombia, Brazil, Argentina, Cuba, Grenada, Puerto Rico, San Domingo, Saudi-Arabia, Holland, Sweden, Ireland, Canton Island (Phoenix Group); Thailand (Siam), Aden, Union of South Africa, Philippines, British Guiana, Honolulu and several other places I can't call to mind.

I think it has resulted in a shot in the arm for model yachting. I had no idea that your magazine had such a circulation. The article was extremely well done and accompanied by some very good colored photography. Thank you.

C. O. Davis, Secy.
Model Yacht Racing Assn.
of America
Everett, Wash.

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Beats anything on two wheels!

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50 YEARS Harley-Davidson AMERICAN MADE

Here's the one motorcycle every rider wants to own . . . truly the undisputed ruler of highways and byways. Yes, the Golden Anniversary 74 OHV beats anything on two wheels. It's powered to *lead* the way to thrilling sport . . . built to *last* for years to come . . . and designed to give you the *most comfortable ride* in its field. See it! Swing into the saddle on this proud beauty and test ride it at your dealer's today. And ask about his easy pay plans. For your copy of the action packed ENTHUSIAST Magazine and illustrated literature, send 10 cents to Harley-Davidson Motor Company, Dept. P, Milwaukee 1, Wisconsin.

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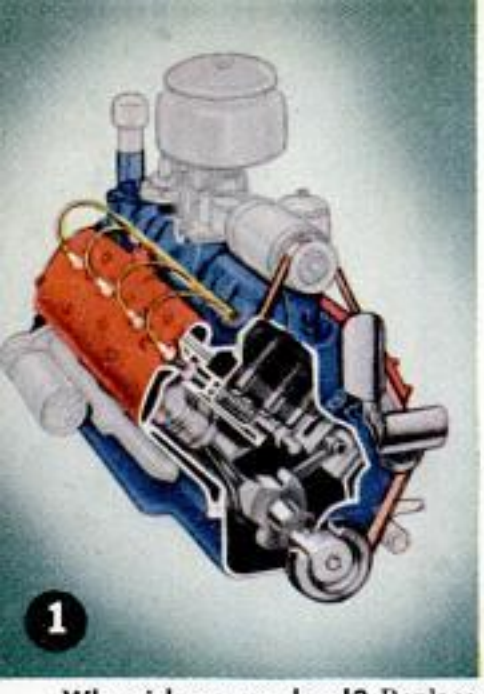
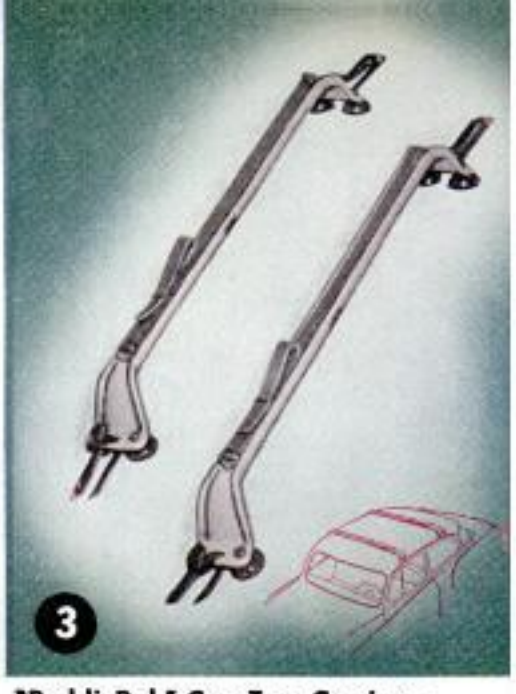


Why risk an overhaul? Replace your worn-out engine with a Wizard-ized Engine — get up to 3 times the miles! All moving parts brand new or fully remanufactured like new. New-car engine guarantee. Installation arranged. For Ford, Chev., Plym., and others. As low as (Exch.) **$149.50**

Guaranteed to fire in oil. Aldor spark plugs have bi-metallic thermostat control that keeps spark plug always at peak efficiency for smoother running, easier starting. Adjusts to any heat range requirement automatically. Special non-burning electrodes. Each, in sets **95c**

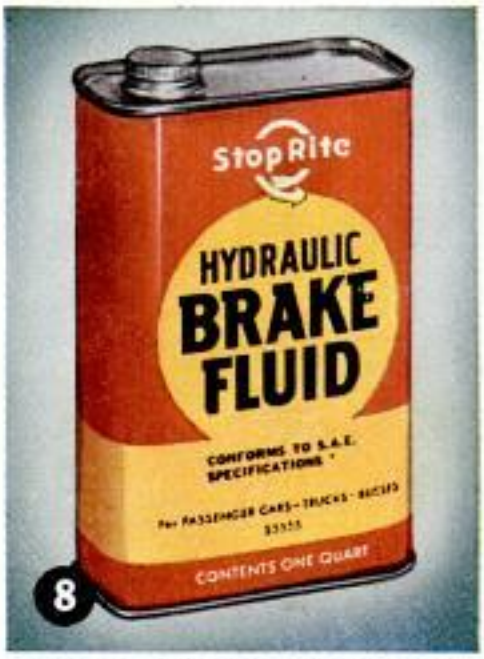


"Reddi-Rak" Car Top Carrier— new advanced design, complete, assembled, ready to install. Adjustable—mounts on any car top in a minute. Big 3¼" suction cups can't slip. Heavy web straps anchor to rain guard—hold big load safely. Heavy gauge steel. Pr. (C5222) **$7.95**

New Power...New Beauty...

Over 40 Years . . . Headquarters

Guaranteed Wizard transmission, rebuilt to same specifications as original equipment. All worn-out gears, shafts, bearings, etc. replaced with top quality new parts. Guaranteed against defects in materials and workmanship. Trade-in allowance. For Ford, Chev., Plym. from..... **$41.50** (exch.)

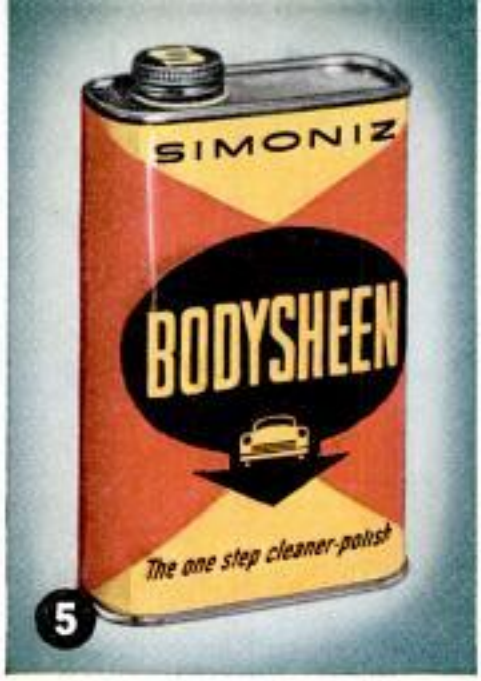


Quality brake fluid meets S.A.E. standards. Permanent-type, for all cars and trucks. Mixes with any fluid. Perfect all-weather performance—no loss at extremely hot temperatures or freezing at cold temperatures.
Quart (S5555) **$1.09**
4 ozs. (S5553) **20c**

Don't be stranded by a worn-out fan belt. Replace now with a Western Auto extra-quality fan belt. Inner core of endless cable cords. Tough rubber cushion reduces heat, assures long life, cooler-running performance. Can't warp, slip, or stretch. Guaranteed fit... **65c** to **$1.95**

FREE: Mail post card today for folder explaining how to get more horsepower

Gleaming chrome exhaust deflectors and extensions give long-lasting beauty to your car. Keeps exhaust off bumper. Easy to attach and styled to fit your car. Western's Exhaust Deflector. Simple, flared design. (CR2806) **49c**
Exhaust Extension. (8" x 2½") Straight-tube type. (CR2807) **$1.09**



The one-step cleaner-polish! New Simoniz Bodysheen cleans and polishes, in one easy simple step. Wipe Bodysheen on, then wipe it off and see your car gleam. Brings out natural brilliance, enriches colors. Gives your car a tough, long-lasting, weather-resistant finish. (3P7113) **98c**

Wizard Quality Chamois adds new sparkling luster to auto, furniture, windows, silverware, glassware. Highly absorbent. Strong and durable, yet soft and pliable. Will not scratch finest surface when used wet or dry. Can be washed over and over again. 21" x 27" (3PR8230) Ea. **$2.65**

New Safety For Your Car At Western Auto

STORES AND ASSOCIATE STORES

For Top Quality Auto Supplies.

NOTE: Western Auto Associate Dealers own their stores and set their own prices, terms and conditions. Prices may vary due to difference in local conditions. (PM44)

Add new beauty and style to your car's interior, and protect your floor mat from excessive wear with these handy rubber utility mats. Also has many uses around the house. Easy to clean. Black, blue, red, or green.
17" x 17" (2N1105-8) ..... Ea. **89c**
17" x 20" (2N1110-13) ..... Ea. **$1.19**

Bright, new arm rest covers snap on quickly, without removing the arm rests. Made of beautiful quilted Vinyl plastic. Choice of 5 popular colors — yellow, gray, blue, green or red—to harmonize with any seat cover or interior trim. Attractive pin-point Vinyl trim. Pr. (2N2899-2913) ... **$1.59**

Reduce driving hazards with this turn signal set. Automatically returns to neutral position when turn is completed. Blends with dash and steering wheel. Flashing red indicator light on switch. (2LR6176) **$6.45**
Wiring kit, with all installation material. (2LR6177) **$2.98**

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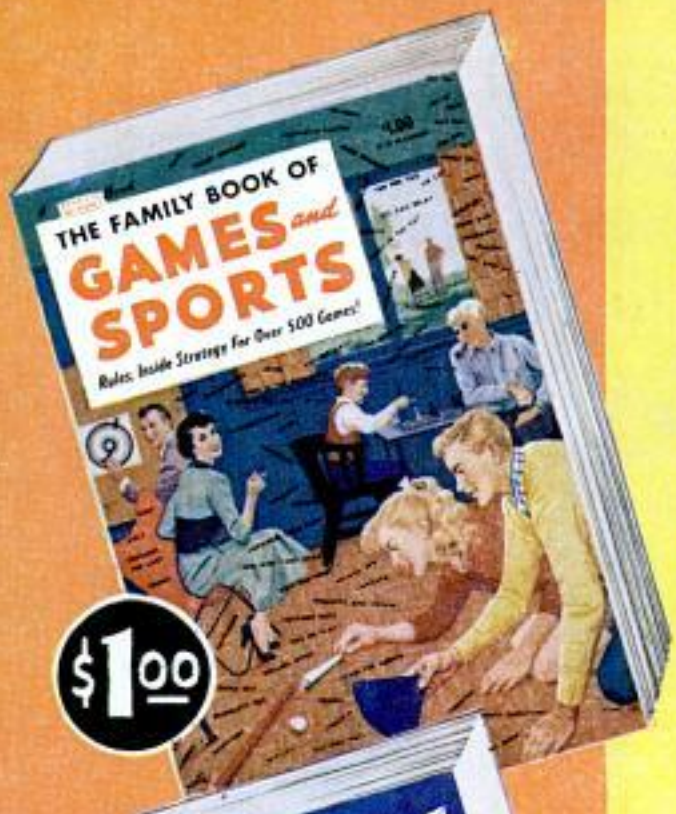
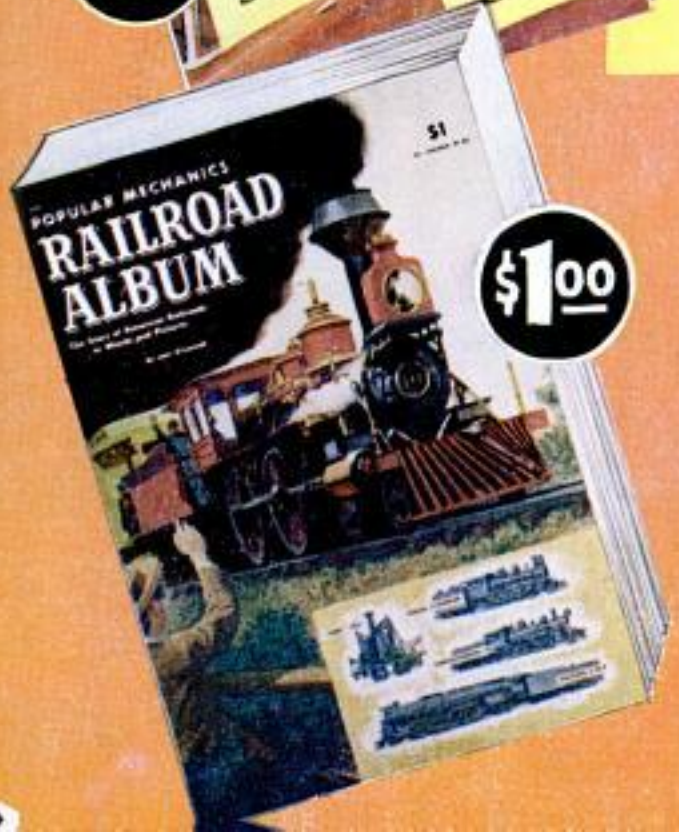
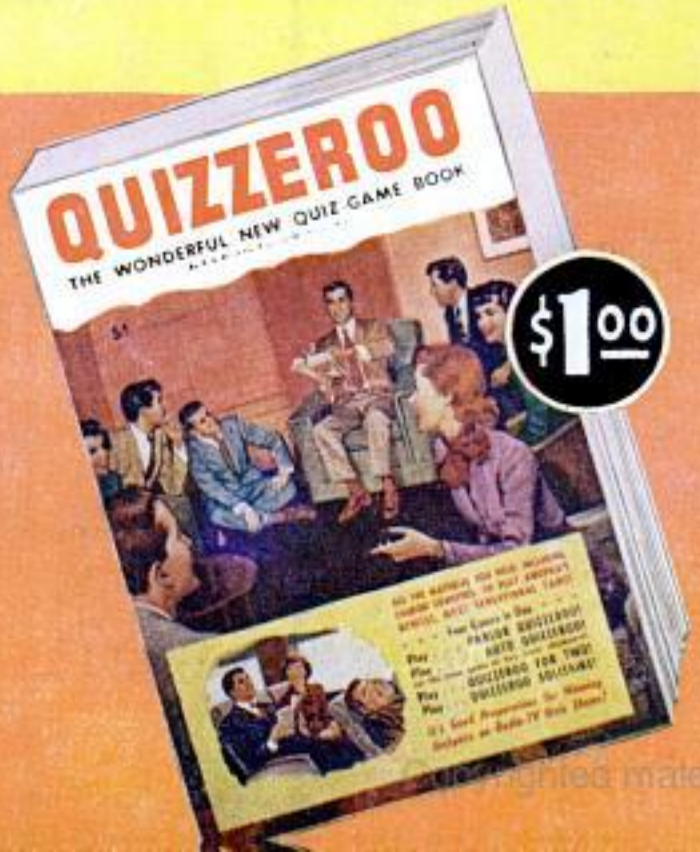
from your car. Write Western Auto, Dept. 2888, 2107 Grand, K.C., Mo.







BUY THESE NEW BOOKS AT YOUR NEWSSTAND

FAMILY BOOK OF GAMES AND SPORTS

Here are games, ideas and various types of home entertainment for every occasion. There are indoor and outdoor games for children, parlor games and stunts, outdoor sports and games and many novel ideas for parties. Written by Helen Joseph, the book also contains many 2-color illustrations showing how the games are played and includes quiz games, charades, stunts and projects for picnics and beach parties, as well. **$1.00**

HOW TO BUY A USED CAR

The first book of its kind that really tells you prices for all postwar models in the major U. S. areas, what to look for when checking a used car, how to road-test a used car, estimate future repairs, spot a cracked engine block and check the brakes without driving. Automotive authority and author, C. E. Packer, has also included a handy used car check sheet for buying or selling. **75c**

POPULAR MECHANICS' RAILROAD ALBUM

The complete story of the iron horse in words and pictures, this is the third in a series of Popular Mechanics' picture histories. Author John O'Connell starts with the birth of the American railroad in 1825 and covers everything through to the latest streamliner. He also tells the story of some of the railroad tycoons and his text is backed up by one of the finest collections of railroad pictures ever gathered together in one book. **$1.00**

QUIZZEROO

This is the wonderful new quiz game that the whole country is playing! All the material that you will need to play the game, even coupon counters, is included. It's also good preparation for winning jackpots on radio and TV shows. Play variations of the game—parlor Quizzeroo, auto Quizzeroo, Quizzeroo solitaire! **$1.00**

Popular Mechanics Press, 200 E. Ontario, Chicago 11, Ill.

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ON Atlas WORKSHOP POWER TOOLS DURING NATIONAL HARDWARE WEEK . . . APRIL 16-24

Atlas WORKSHOP TOOLS

At their regular low prices ATLAS WORKSHOP tools are America's most sensational values . . . rugged, accurate, versatile, quality machines at modest cost. But now, *for one week only*, you can equip your shop with these wonder tools at absolutely unheard of prices. You can't afford to wait . . . these spectacular values will be offered only during National Hardware Week. Write for FREE literature . . . we'll send the name of your nearest franchised ATLAS dealer . . . by AIR MAIL.

GRINDER-HONE

The only power tool that hones as well as grinds knives, chisels, bits, implements and utensils.

$31.50 value

SALE PRICE $26.50*

11¾" DRILL PRESS

Does hundreds of jobs with amazing efficiency. Has Jacobs Key-type chuck and other quality features.

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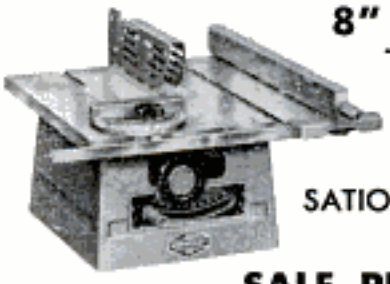

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Tilt/arbor, sealed-for-life ball bearings . . . America's MOST SENSATIONAL SAW VALUE.

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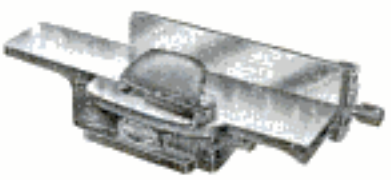
4" JOINTER-PLANER

Planes, tapers, bevels, rabbets and does dozens of other jobs.



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10" BAND SAW

Makes quick, easy work of curved and irregular sawing.

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13" JIG SAW

A tool the whole family will enjoy. Fast, easy-to-use, accurate.

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SALE PRICE $22.45*

* Prices slightly higher west of the Rockies.

SEE YOUR FRANCHISED ATLAS DEALER TODAY . . . he's the man who knows power tools . . . let him help you get the most out of your home shop.

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I don't want to miss the big ATLAS Workshop power tool sale . . . rush me a complete catalog and send the name of my nearest ATLAS dealer, by AIR MAIL.

☐ I would also like FREE literature on ATLAS heavy-duty woodworking tools.

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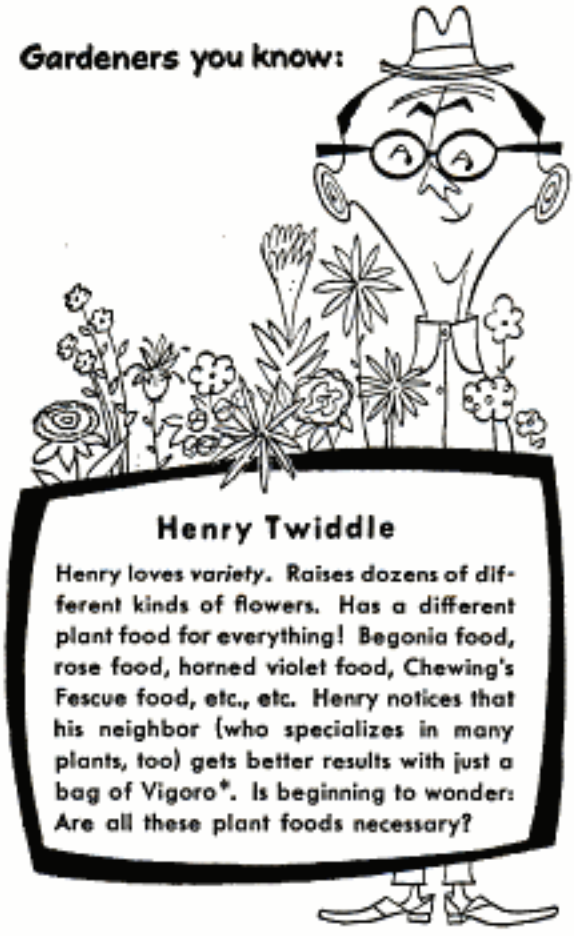
Gardeners you know:



Henry Twiddle

Henry loves *variety*. Raises dozens of different kinds of flowers. Has a different plant food for everything! Begonia food, rose food, horned violet food, Chewing's Fescue food, etc., etc. Henry notices that his neighbor (who specializes in many plants, too) gets better results with just a bag of Vigoro*. Is beginning to wonder: Are all these plant foods necessary?

We hardly blame you. It's fun to experiment. Fun to try this and that plant food to see what brings best results. We can save you a little trouble however.

Because a lot of folks who *have* experimented still find that you can't beat Vigoro for proved results. That's why so many professional gardeners—people who *must* get good results—use and recommend Vigoro for everything that grows.

Vigoro has actually been *proved* to contain all the food elements plants need from soil to grow and thrive best. That applies to every type of grass and flower.

When you want beautiful results *for sure*, depend on Vigoro. Now in 2 forms. Regular and new Instant Vigoro that's soluble in water.

*Vigoro is the trade-mark for Swift & Company's complete, balanced plant food.

Regular VIGORO • Instant VIGORO

The Owners Report on the '54 Hudson

(Continued from page 95)

Roadability and Handling

There is no doubt how Hudson owners feel about their cars' roadability. Of the Hornet owners reporting, 97 percent rated the car's roadability excellent; 3 percent rated it good; none called it unsatisfactory. Wasp and Super Wasp owners were almost as definite, the percentages being 90 percent, 9 percent and 1 percent in that order.

"Not tiring on a long drive. Takes turns without braking. Rides very smooth."—Stamford, Conn., engineer.

"At high speeds is easy to handle. Does not weave like most cars do."—Cincinnati, Ohio, electrician.

Handling was another point on which the owners agreed. None described it as unsatisfactory. Of the Hornet owners, 92 percent said it is excellent, the other 8 percent good. Wasp and Super Wasp owners: 84 percent said excellent; 16 percent good.

"After an entire day of driving I am not tired nor do I have a stiff neck or shoulders as with other cars."—Everett, Wash., teacher.

"Very easy to drive. They seem to have combined small-car handling with big-car roadability."—Romulus, Mich., inspector.

Visibility Not So Good

But there is one safety requirement in which Hudson does not rate so highly, according to the owners. That is visibility. Rear visibility, especially, is complained of by many.

"They should straighten up the rear window; vision is poor."—Inkster, Mich., office manager.

"Improve the visibility. It is better this year, but still not good enough."—Iowa City, Iowa, professor.

"Hard to see overhead traffic signals as you sit too far back of windshield."—Perth Amboy, N. J., executive.

"Blind spot in dip in roof line at right side of windshield. Need side mirror for distant rear view."—Bryan, Ohio, inspector.

"Rear seat is too low to allow good visibility of road to passengers."—Tucson, Ariz., retired owner.

"Could have side-window area increased."—Eggertsville, N. Y., manufacturer.

"Windows in the doors should be two inches lower."—Binghamton, N. Y., trucker.

"Rear window distorts actual view."—Waterloo, Iowa, salesman.

"Wider defroster is needed for the large windshield."—Quincy, Mass., police officer.

(Continued to page 252)

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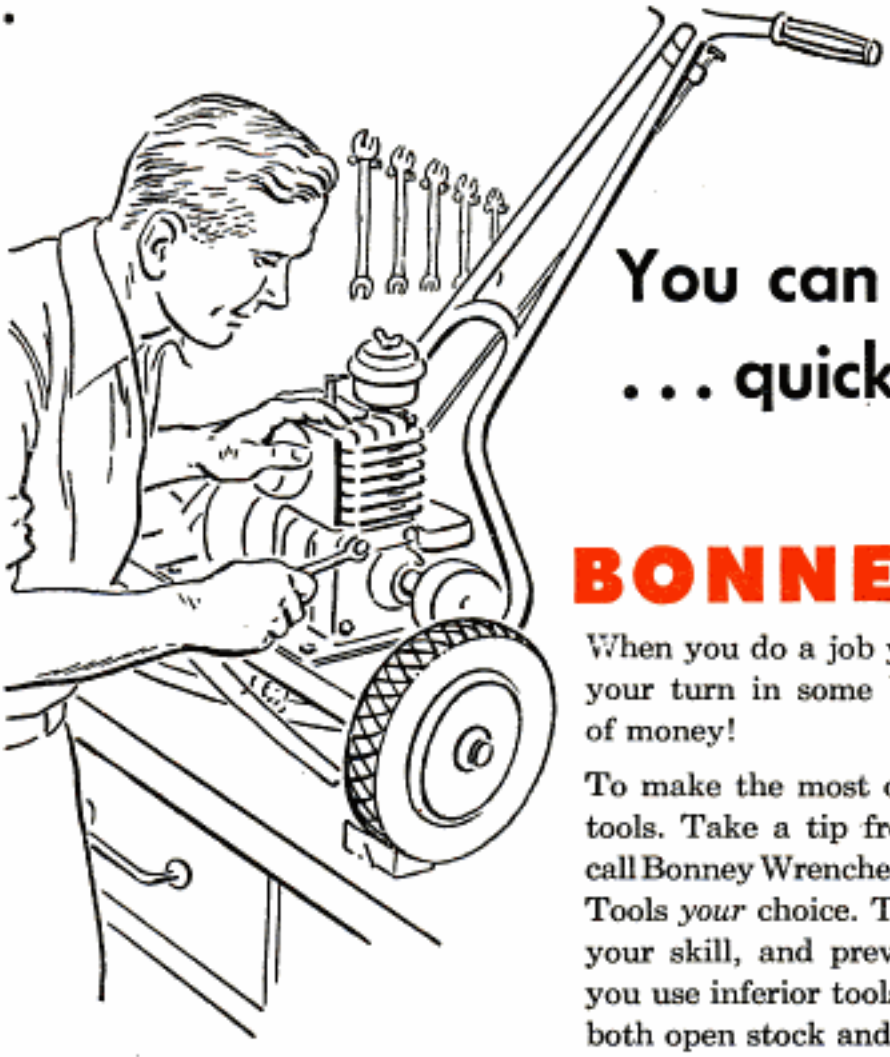

You can do it yourself ... quicker and better with BONNEY TOOLS!

When you do a job yourself, you don't have to wait your turn in some busy shop; *and* you save a lot of money!

To make the most of these advantages, use *quality* tools. Take a tip from professional mechanics who call Bonney Wrenches America's finest—make Bonney Tools *your* choice. They help you make the most of your skill, and prevent injuries that happen when you use inferior tools. Bonney Tools are available in both open stock and complete sets. Ask your dealer, or write us direct.

Start your collection of FINE TOOLS with this BONNEY AA8 SOCKET SET!

Here's the most practical basic socket set for home and shop. Contains twelve of the most useful ½" square-drive double-hex sockets, together with a 15" hinge handle and an 8" cross handle. Helps you make quick work of repairs on lawnmowers and garden tractors, automobiles, washing machines, and other household appliances.

BONNEY TOOLS

Note! **The economy-minded home mechanic or hobbyist will find Bon-E-Con Tools especially suited to *his* requirements. They are tools any man would value at prices anyone can afford. Bon-E-Con Tools carry the same guarantee as Bonney.**

BONNEY FORGE & TOOL WORKS, ALLENTOWN, PENNSYLVANIA

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Best-Liked Features

Almost half of the owners in the poll gave riding comfort as the feature they liked most in their Hudsons.

"Just like sitting in an overstuffed chair while riding in it."—Portland, Ore., tailor.

"Restful to ride in."—Rochester, N. Y., sales manager.

"Rides smoothly over rough roads."—Kansas City, Kans., priest.

"The 64-inch seats are wonderful. They give plenty of sleeping space and save motel expense."—Everett, Wash., teacher.

Handling ease is the next best-liked feature. We have already given owners' quotes on this subject.

Hudson owners are pleased with their cars' durability and dependability.

"Repair bills are nil, if you take care of a Hudson."—New Orleans, La., foreman.

"I do practically all of my own repair

(Continued to page 254)

1954 HUDSON SPECIFICATIONS

ENGINE

	Wasp Deluxe	*Wasp Super*	*Hornet*
Type	6-cyl., L-head	6-cyl., L-head	6-cyl., L-head
Bore and stroke	3-9/16 x 3⅞	3-9/16 x 4⅛	3-13/16 x 4½
Piston displacement	232.0 cu. in.	262.0 cu. in.	308.0 cu. in.
Brake horsepower	126 @ 4400 r.p.m.	140 @ 4000 r.p.m.	160 @ 3800 r.p.m.
Compression ratio	7.0:1	7.0:1	7.5:1
Transmissions	3-speed, overdrive optional.	Torque-converter automatic optional.	

GENERAL

Steering ratio (over-all)	20.2:1	20.2:1	25.6:1
Turning radius	20 ft. 9 in.	20 ft. 9 in.	21 ft. 11 in.
Tire size	7.10 x 15	7.10 x 15	7.10 x 15
Shipping weight	3440 lb.	3525 lb.	3629 lb.
Wheelbase	119⅞ in.	119⅞ in.	123⅞ in.
Tread, front	58½ in.	58½ in.	58½ in.
Tread, rear	55½ in.	55½ in.	55½ in.
Height, over-all	61.87 in.	61.87 in.	61.87 in.
Width, over-all	77.59 in.	77.62 in.	77.62 in.
Length, over-all	201.5 in.	202.93 in.	208.87 in.
Road clearance	6⅛ in.	6⅛ in.	6⅛ in.

CAPACITIES

Oil	7 qt. (8 qt. with filter)
Water (less heater)	18.5 qt.
Gasoline	20 gal.

INTERIOR DIMENSIONS

Front-seat width.....64 in.	Headroom, front.....36.5 in.	Legroom, front.....43.25 in.
Rear-seat width.....64 in.	Headroom, rear.....35.25 in.	Legroom, rear.....38 in.

ARE YOU MISSING THE BIGGEST THRILLS IN RADIO?

Get a hallicrafters Short-Wave and Hear it All!

You don't know how exciting radio can be until you've listened to today's short-wave. You hear stations from all over the world—broadcasting both in their own languages and English—mostly English. You hear ships at sea, planes in the air, police and military broadcasts that trigger tomorrow's headlines. You hear London, Paris, Rome, Rio—Moscow propaganda and our answers to it on the Voice of America. And plenty more!

Hallicrafters is by long odds the leader in the short-wave field. An unmatched record of dependability with amateurs, plus 20 years' experience in producing vital military radio communications equipment, stand back of every receiver sold under the Hallicrafters name. See your dealer today. Hear a Hallicrafters—and you'll choose a Hallicrafters!

FAMOUS HALLICRAFTERS S-38C—Most popular communications-type receiver in the world! Has electrical bandspread tuning to separate crowded stations. High gain circuit pulls in stations from all over the world. You hear five wave-bands. Regular broadcast plus 540 kc to 32 mc. Operates on regular 110 V AC/DC. **Only $49.95**

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Your Rockwell-built DELTA 14" Drill Press cuts mortises (square holes) quickly and simply with inexpensive Mortising Attachment.

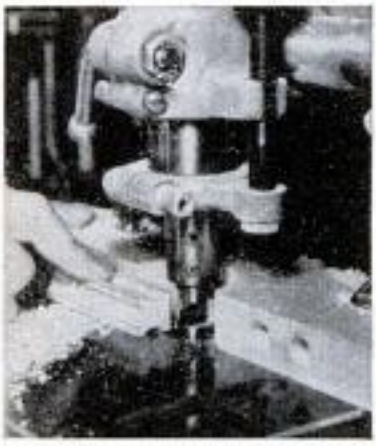
EVER COUNT ALL THE JOBS YOU CAN DO on a Rockwell-built DELTA Drill Press?

Fast, accurate drilling in wood and steel is only the beginning —there's almost no end to the jobs a Delta 14" Drill Press will handle in your shop!

For instance, you can cut perfect fitting plugs to make bolts and screws invisible. You can mortise square holes for tight, strong furniture joints. You can shape beautifully curved moulded edges. You can do large area routing or fine inlay work. In fact, the more you use a Delta 14" Drill Press, the more things you'll find you *can* do with it.

And the more you'll appreciate its full range of speeds, its easy operation, easy to get at controls, and its sensible safety devices.

This Delta 14" Drill Press is the same rugged, fine-quality tool you'll find speeding production and cutting costs in thousands of manufacturing plants—as well as in the finest home workshops. *There's nothing anywhere near its price to compare with it!* See it at your Delta Dealer's today; he's listed in your Classified phone book under "Tools" or "Machinery."



Mount a shaper fence and a shaper cutter bit to your DELTA Drill Press, and you're all set to quickly fashion beautiful mouldings.

Sanding inside and outside surfaces—even tightest corners—is easy with sanding drums and sleeves. Router bits also available.

DELTA

QUALITY POWER TOOLS

ANOTHER PRODUCT BY

Rockwell

Delta Power Tool Div., Rockwell Manufacturing Co.
502-D North Lexington Avenue, Pittsburgh 8, Pa.

- ☐ Please send B-53 Catalog, showing 14" Drill Press.
- ☐ Please send Homecraft Catalog.
- ☐ Please send 6 issues of Deltagram (mailed bi-monthly) $1.00 enclosed.

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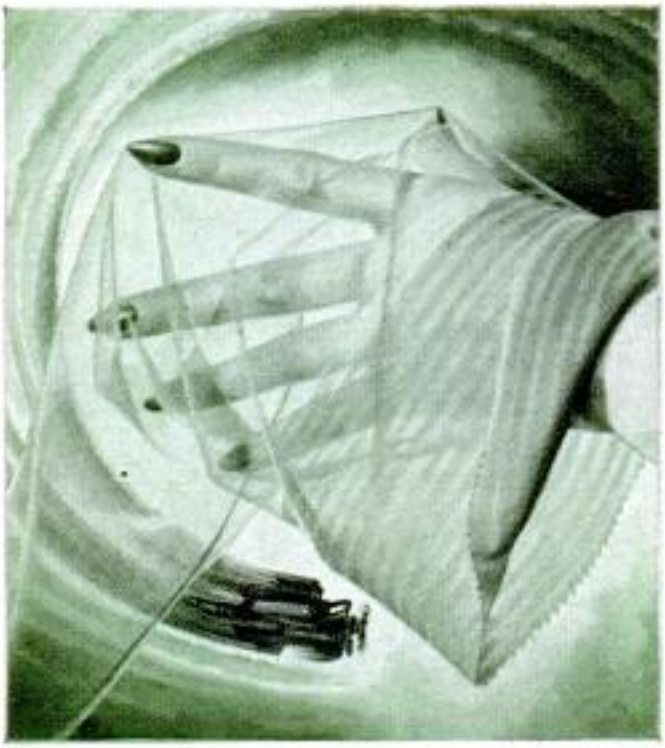
Your engine's life depends on a film of oil thinner than a nylon stocking!



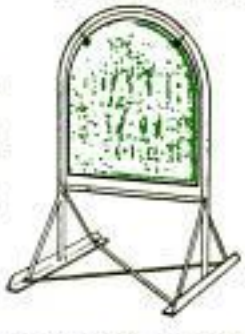
One thousandth of an inch! That's a typical clearance between fast-moving parts of your car's motor.

Use high-quality Quaker State for the super film that makes any motor run better

... FILM ... that does a super job both in lubricating and protecting your motor. Quaker State Motor Oil lubricates better and lasts longer. And it guards against rust, acid corrosion and other causes of wear. Quaker State is refined from 100% Pure Pennsylvania Grade Crude Oil, nature's best. It is the result of 50 years of continuous improvement and specialization in automotive lubrication. Specifically designed for today's modern motors.

ASK FOR ...

Quaker State Motor Oil is made to suit the requirements of all makes of cars and for every type of service. Ask your dealer.



QUAKER STATE OIL REFINING CORPORATION, OIL CITY, PA.

Member Pennsylvania Grade Crude Oil Association

work. Hudson is easy to work on and needs very little for the way it is used."—Eaton, Colo., aircraft mechanic.

"In my last three Hudsons I have not spent $10 for repairs outside of spark plugs and points. I drove each car at least 70,000 miles." — Seaside Heights, N. J., foreman.

"To the best of my knowledge, I do not recollect ever adding a quart of oil between changes in any of the three Hudsons I have owned." — Orchard Park, N. Y., retired owner.

"I drove my 1949 Hudson 80,000 miles and added not one drop of oil, changing it only every 3000 miles. Never spent a dime on the engine."—Hinsdale, Ill., contractor.

Oil consumption was almost zero, according to the owners. About 90 percent used no oil at all in 1000 miles.

See Percentage Chart for gasoline economy figures.

And There Are Complaints

The most frequent complaint of the owners was the poor visibility. Next most frequent complaint was the noisy engine.

"Engine is noisy from 50 up."—Haskell, N. J., welder.

"Motor noisy when idling or until it gets warmed up."—Morristown, N. J., salesman.

"New motor sounds worse than my 1950 Hudson did and that had 50,000 miles on it."—Cicero, Ill., superintendent.

Careless assembly and poor paint and chrome are also among the most frequent complaints.

"I think Hudson does the poorest paint job of any automobile that I have observed. The primer coat is hardly covered." — Tooele, Utah, supervisor.

Other frequent complaints included low trade-in allowances as well as poor gasoline economy.

Here is a selection of miscellaneous complaints from Hudson owners.

"There should be a better front-seat adjustment." — Cleveland, Ohio, technician.

"I live on 18 miles of country road and the dust gets in so bad I can hardly breathe."—Mammoth, Ariz., cattle rancher.

"Ash tray should be nearer the driver."—Chatham, N. J., housewife.

"Hand brake will not hold on hill."—Southern Pines, N. C., district manager.

"Get rid of useless and gaudy chrome and do something about the corner posts up front."—Bronx, N. Y., mechanic.

"I usually knock my hat off getting in or out."—Green Bay, Wis., engineer.

"Hudson should curve doors into roof to give more headroom when entering."—No. Attleboro, Mass., manufacturer.

"Borg-Warner automatic transmission

(Continued to page 256)

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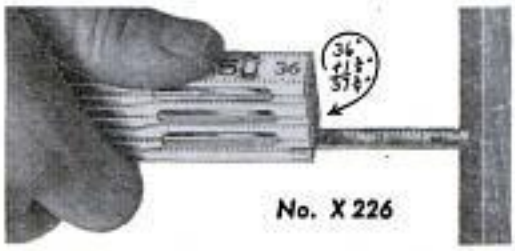
"I'll do the job well!"

"Because I have the tools to do it!" When you *know* you're using the finest, your tools and hands really work together. So give your hands all the help you can. *Tool up with Stanley!*

No. 11½

FINEST HAMMER! *Drive the nail in straighter* with the famous *Stanley "100 Plus"! Balanced power* puts more accuracy in every swing. Choice of curved or ripping claw. 16 oz., $3.65 — Western price slightly higher.



No. X 226

FINEST RULE! Take direct readings of inside measurements with the *Stanley "100 Plus"* Zig Zag Extension Rule. Slide and rule reading centered at one point. 6' rule, 8" slide. $2.75 wherever fine tools are sold.

"YANKEE"® PUSH DRILL

The drill you use with one hand

Just push — the tool does the work! Lead-holes in a jiffy! No need to use both hands — amazing, quick-return spring brings handle back automatically after each stroke. 8 drill points (1/16" to 11/64") in magazine handle for easy selection. A professional drill for only $5.65 wherever fine tools are sold.

No. 41

DO YOU KNOW WHEN TO STOP?

You do when you use the *Stanley No. 47 Bit Gauge* for boring. Will not mar surface — flexible spring bends if boring goes beyond desired depth. Fully adjustable clamp fits all auger bit sizes from 3/16" to 1". Only 85¢ wherever fine tools are sold.

No. 47

THE TOOL BOX OF THE WORLD

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HARDWARE • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

USE COUPON for copy of STANLEY TOOL GUIDE and free literature about Stanley and "Yankee" Tools.

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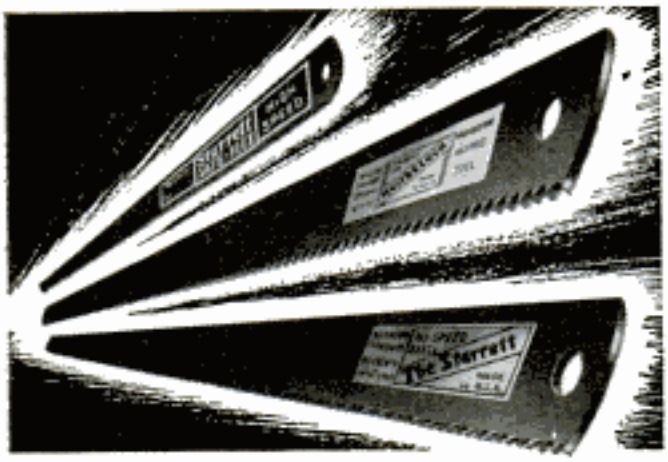

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HACKSAWS

Starrett Hacksaws are made with the same careful workmanship you always associate with Starrett Tools. Made in all sizes for cutting metals by hand or hacksaw machine including shatter-proof SAFE-FLEX® High Speed Welded Edge Power Hacksaws and unbreakable SAFE-FLEX® High Speed Steel Hand Hacksaw Blades.

NO. 249 SCREW SLOTTING BLADES

A real time-saver for hand slotting new or replacement screws. Set of four cuts .049", .065", .083" and .109" slots.

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THE L. S. STARRETT COMPANY
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Please send Catalog 26A containing *New Tools* section plus 300 page display of the complete line of Starrett precision tools, dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground flat stock.

Name.....Position.....

Address.....

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

has a flat spot after it makes its second change."—Williamsville, N. Y., foreman.

"Not enough room for legs in rear seat of hardtop or convertible."—Coral Gables, Fla., merchant.

"It is virtually impossible to look out a window (to back up) without knocking off your hat."—Totowa Boro, N. J., estimator.

"Why does Hudson in this age of eye appeal stick to the present body design?"—Rockville Centre, N. Y., magazine advertising manager.

"Hood is very flimsy. Rigidity was lost by adding air scoop."—San Jose, Ill., farmer.

"Something wrong with gas-tank vent. Can't hardly fill tank without spilling."—Houston, Tex., businessman.

"It takes 17 minutes to put in 14 gallons of gas."—Arlington, N. J., supervisor.

But there are many owners without a single complaint. Of the Hornet owners, 30 percent did not list a single item in the complaint section of the questionnaire; 37 percent of the Wasp and Super Wasp owners had no complaints.

Most of the owners bought their 1954 Hudsons because of experience with previous models. Another big factor in the selection of a 1954 Hudson was the trade-in allowance offered by the Hudson dealer. Durability, styling, safety and performance were also mentioned. Only a fraction of one percent of the owners was influenced by Hudson's impressive record in stock-car racing.

For these and other interesting statistics about the 1954 Hudson read the Percentage Chart on page 94.

And now for my own test. I drove the 1954 four-door Hudson Hornet test car from Los Angeles to Phoenix, Ariz., then to Las Vegas, Nev., and back to Los Angeles, a total of 1170 miles.

It was equipped with Borg-Warner automatic transmission. Hudson used Hydra-Matic before the disastrous General Motors fire after which they switched to Borg-Warner.

Except for the dual-range feature of Hydra-Matic, I prefer the Borg-Warner unit. It is a combination of torque converter and an automatic transmission and has three forward gear ratios and a reverse. The torque converter is bypassed in the third gear (direct drive) — an excellent feature. The shift to direct is automatic, taking place anywhere from 18 to 62 miles per hour, depending upon throttle position. In direct drive there is no slippage as a single-plate clutch is automatically set in operation between the engine and converter. The transmission is locked rigidly in a 1:1 ratio.

(Continued to page 258)

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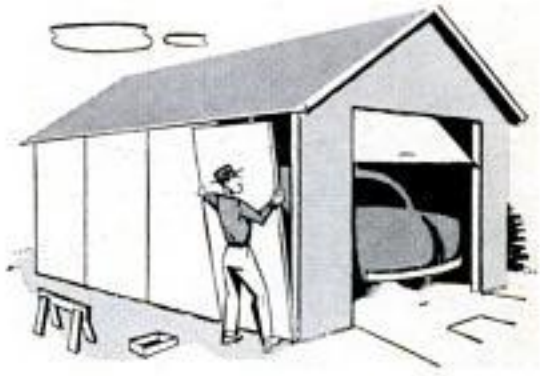
DO IT YOURSELF WITH...

Job-designed Upson Panels

There are many Upson Panel styles from which to choose. Each style is job-designed to do its work better, add greater beauty at less cost. Here are a few suggestions.

UPSON ALL WEATHER SHEATHING FOR GARAGE

Upson All Weather Sheathing is perfect for outside uses such as garage siding. Waterproofed through entire thickness by exclusive Upson *CuraSeal* process; stands up to rain, snow, heat, cold. Adds insulation value, too. See your lumber dealer, insist on Upson.



CARPORT

Use super-strong, 6-ply Upson All Weather Sheathing for walls and ceilings of a carport. Costs surprisingly little, yet offers highest quality. Easy to put up too. Nail direct to studs. Doesn't drink paint. Looks good for years.

UPSON PEG-IT PANELS FOR WORKSHOP . . . HANDY, SAVES SPACE

Upson Peg-it Panels are the newest wrinkle in space saving convenience. They change ordinary wall space into storage space like magic. And Upson Peg-it is extra sturdy, holds heavy objects with ease. Comes with lustrous lacquer finish, wipes clean with damp cloth. Strong cleaners won't mar surface. Use Upson Peg-it Panels in your workshop as illustrated or on closet doors, in the kitchen, for a tool rack in your garage. See your lumber dealer. Be sure to ask for Upson Peg-it Panels.

UPSON KUVER-KRAK PANELS FOR CRACKED CEILINGS

Apply crackproof Upson Kuver-Krak Panels on furring strips *right over* your old cracked plaster ceilings. Panels anchored from behind with Floating Fasteners. (See insert). No visible nailholes. Job finished in hours. No dirt. No mess. Permanent Upson Kuver-Krak Panels are a full ¼" thick, specially designed for ceilings. See lumber dealer, insist on Upson Kuver-Krak Panels. Accept no substitute.

OTHER UPSON PRODUCTS

Strong-Bilt Panels • Ceiling Tiles • Striated Panels
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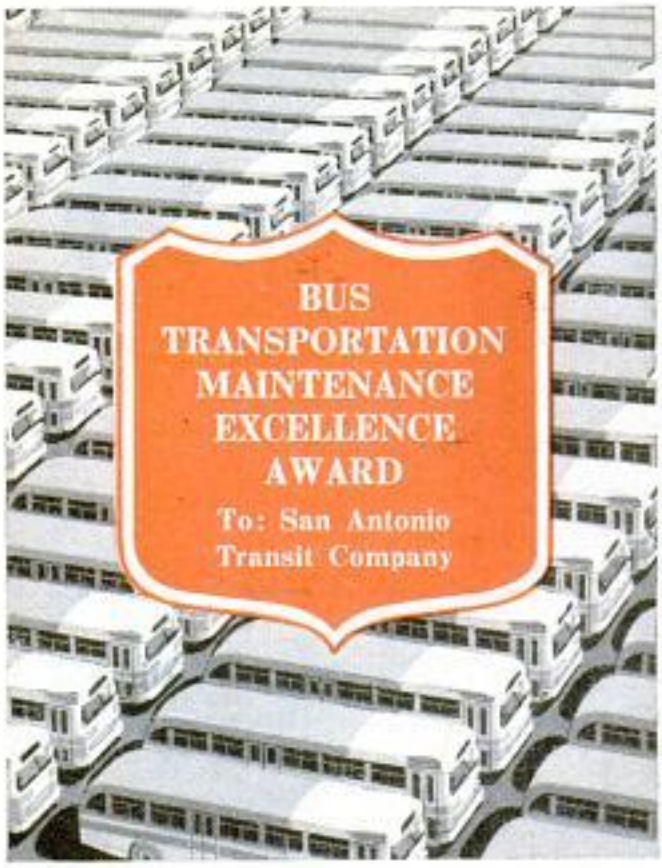

Their 100 Million Miles
Experience Pays off for You

TO RESTORE FINE PERFORMANCE IN YOUR CAR, REPLACE WITH FEDERAL-MOGUL ENGINE BEARINGS.

For 12 straight years, San Antonio Transit Company, operating nearly 300 buses, has won national awards for efficient maintenance practices. Only the finest quality is good enough when they buy replacement parts. That's why they use Federal-Mogul engine crankshaft and connecting rod bearings. That's why **you** should specify "Federal-Mogul engine bearings" when having your car engine reconditioned to restore clean power, pep and economy. Federal-Mogul engine bearings cost no more — yet they have led in the replacement field for 30 years — because of quality! Federal-Mogul Service, Division of Federal-Mogul Corporation, Detroit 13, Michigan.

for New Power . . .
FEDERAL-MOGUL
Oil Control Bearings

BEARING MANUFACTURERS TO THE AUTOMOTIVE INDUSTRY SINCE 1899

I rate the transmission first class except for a slight jerk when the lever is moved from neutral. There is some creep at stoplights also.

The big L-head Hornet six gives terrific acceleration and power. It has a top speedometer reading of between 110 and 112 miles per hour, although actual speed is about 8 percent less. The engine is an old, reliable L-head and gets its performance through a large displacement of 308 cubic inches. The long stroke (4½ inches) gives good "lugging" power on steep grades. There is a slight engine vibration at certain speeds but, generally speaking, the engine vibrates very little.

Hornet horsepower has been increased from 145 to 160 by a compression increase to 7.5:1. Hudson's excellent road-holding qualities are retained. It is, in my opinion, today's safest American automobile. The step-down feature gives a low center of gravity. Corners can be taken at higher speeds than in other cars. The car has great roadability, riding and handling ease at all speeds.

Body and chassis are a unit. If I knew I had to be involved in a collision or a rollover, I'd select Hudson as the car in which to do it.

Another reason for giving Hudson top rating in safety is that, should the hydraulic-brake system fail, there is a mechanical linkage in reserve that operates on the rear wheels. This emergency system takes over when the brake pedal nearly touches the floorboards.

Power braking is an optional feature. I am not sold on power braking for any car. Although pedal operation is easier, power braking does nothing to improve brake performance at the wheels. In certain types of driving, linings wear out faster in the power-braking system because of the easier application. Also there is no feel of the brake action, as in a conventional system. Brakes (they were not power brakes, incidentally) on the test car were excellent with little tendency to fade.

I do not like the flashing-light dash signals for oil pressure and generator output. I prefer the needle-type gauges. The rest of the instrument panel is good and the dials are easy to read, day or night.

The Hudson operates satisfactorily on regular gas, although premium gasoline may be necessary in some parts of the country, especially in the mountains and during hot weather. ★ ★ ★

¶Diseases and insects destroy more of America's timber resources each year than are consumed by fire, according to a spokesman for the Department of Agriculture.

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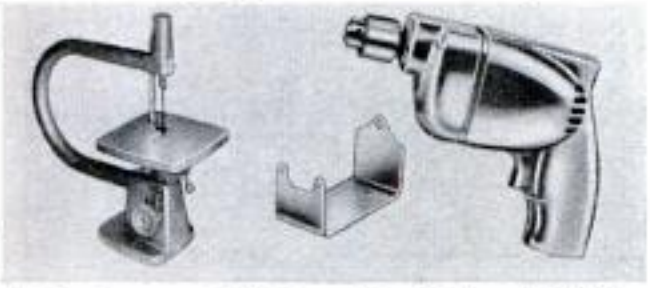
"We Really Make Hardware Week a Big Event for You at Cummins,"

says Paul Jones, president, Cummins-Chicago Corp.

Hardware Week, this year, is April 16 to 24—and it's a big event, with hardware stores everywhere offering you terrific special buys. At Cummins, we go all out to help our good friends, the hardware dealers, with Hardware Week bargains in power tools.

Again this year, good hardware stores everywhere will be featuring not one . . . but *three* Cummins Power Tools specials, all of them wonderful buys. Most outstanding buy of them all is Cummins NEW **do-it** Jig saw that you can operate with any good-quality drill, ¼" or larger, you now own. The **do-it** Jigsaw sells for only $24.95, complete, with no extra expensive motor to buy. Here are the Cummins Specials to look for at your Hardware store during Hardware Week:

Cummins Hardware Week Special No. 1



do-it Jigsaw, Drill Stand, Ball•Rite 44 Drill

Regular $56.15 Value—
Hardware Week Only **$49.88**

Save over $6 on this outstanding bargain offer! Ball•Rite 44 finest industrial quality ¼" drill, mounted in stand, runs the jigsaw. Or, can be used independently, of course, for drilling, buffing, sanding, polishing.

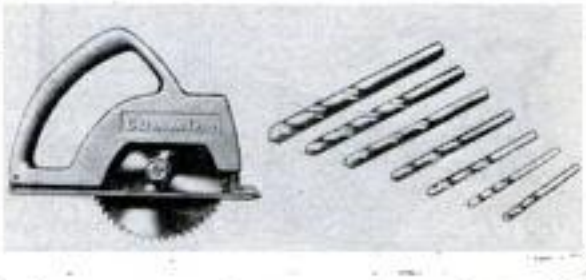
Cummins Hardware Week Special No. 2

do-it Jigsaw and Fixmaster Drill Kit

Hardware Week Only
Both for **$42.95**

Kit has 36 pieces, including Cummins Perm-Align Drill, which powers jigsaw. Complete outfit for drilling, sanding, grinding, buffing and jigsawing. Big value!

Cummins Hardware Week Special No. 3



Circular Saw Attachment and Set of 7 Drill Bits

Hardware Week Only
with Any Cummins ¼" Drill **$1.88**

Less than factory cost! You save almost $8. Buy any Cummins ¼" Drill at $17.95, $21.95 or $29.95 and for just $1.88 more you get this sensational 4" saw and drill bit combination.

About the New do-it Jigsaw

The NEW do-it Jigsaw featured in Offers No. 1 and 2 runs with any good drill, ¼" or larger, you now own—big capacity . . . cuts wood up to 2" thick to center of 28" circle. Blade turns 90° for unlimited length of cut without interference from overarm • Overarm quickly removes for unlimited saber sawing, sanding and filing sticks • Exclusive Recipro-Flo Drive gives smooth balanced power without blade vibration or "flutter". . . blade breakage is reduced to minimum • Driving mechanism (exclusive Recipro-Flo Drive) operates in self-lubricating bearings for long, trouble-free service • Multi-purpose chuck allows use of either pin-type or blank-end blades • Built-in blower keeps cutting line sawdust-free for greater accuracy • Large work table tilts to any angle up to 45° for precision angle cutting • Adjustable hold-down foot gives hairline cutting accuracy in any thickness of wood • Jigsaw comes complete with Pulley, V-Belt, 3 Assorted Saw Blades, Adjusting Wrench and Mounting Hardware. Ready to operate with your drill. $24.95

Go to your hardware dealer now and reserve one or more of these Cummins money-saving buys. Then, you'll not be disappointed! If you would like FREE illustrated material on any of these outstanding power tools, drop me a line.

Sincerely, Paul Jones
PRESIDENT

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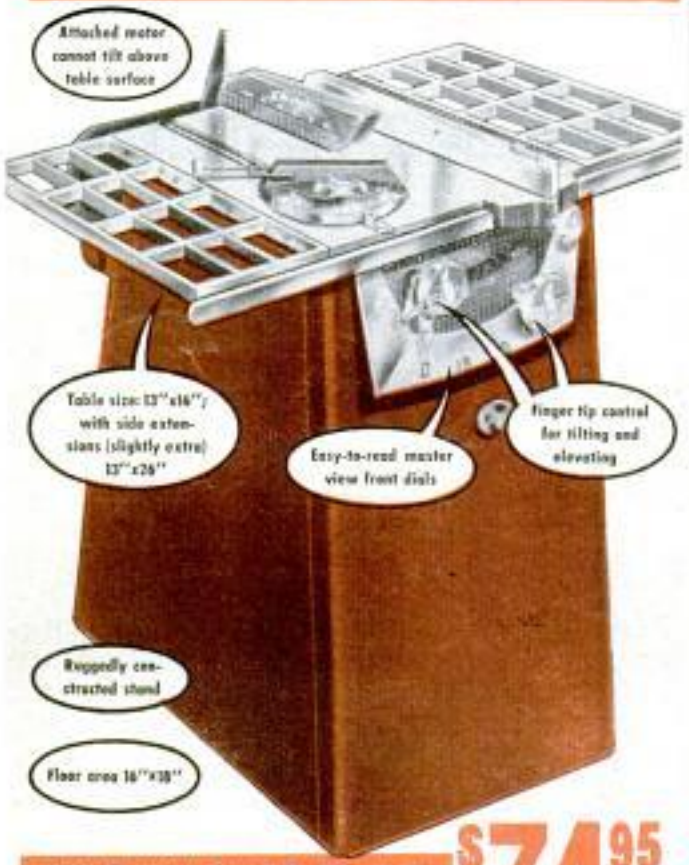
SPECIAL FOR HARDWARE WEEK
PLUG IN
Floor Model
TILTING ARBOR SAW
Including Attached 1/2 HORSEPOWER MOTOR



$99.95 Value Specially Priced at $74.95
A $25.00 Saving During Hardware Week, April 16-24

JUST PLUG IT IN!

SHOPMASTER scores again! First with a ready-to-use . . . ready to plug in Floor Model Tilting Arbor Saw. It's ideal for your home shop. Take it home . . . plug it in . . . and start sawing.

It's a precision tool, simple enough for even the beginner, yet accurate and efficient enough for the professional hobbyist.

Every feature of the new SHOPMASTER Floor Model Tilting Arbor Saw is designed for easier operation. Attractive, easy to read master view controls provide unusual accuracy, eliminates guesswork. Novel transparent plastic guard gives 100% visibility for precision cutting. Cuts up to 2½", tilts to 45° has ½" arbor. Sealed for life ball bearings. Special motor mounting provides easy rail adjustment even when motor is at 45°. ½ H. P. 1725 standard speed attached motor is included in price.

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Please send me a free catalog.
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America's Smallest Car—the Metropolitan

(Continued from page 90)

Present plans call for a production of about 10,000 units a year. If the Metropolitan catches on, says Nash, it will be made over here.

What does it cost?

As of this writing there is no price figure available, but by the time this magazine reaches you, Nash probably will have made the price public.

What kind of an engine does it have?

The engine is a modified Austin A40, an overhead-valve, four-cylinder engine that develops 42 horsepower with its 73.17-cubic-inch displacement (about one-third the displacement of a Plymouth).

1954 METROPOLITAN SPECIFICATIONS

ENGINE	
Type	4-cyl., OHV
Bore and stroke	2.58 x 3.50 in.
Displacement	73.17 cu. in.
Compression ratio	7.2:1
Brake horsepower	42 at 4500 r.p.m.
Torque	62 lb. ft. at 2400 r.p.m.
Transmission	Three-speed synchromesh
CAPACITIES	
Oil	4 qt.
Water (with heater)	7½ qt.
Gasoline	10½ gal.
GENERAL	
Steering ratio (over-all)	21:1
Brakes	Hydraulic
Tire size	5.20 x 13
Shipping weight	1785 (convertible) 1825 (hardtop)
Wheelbase	85 in.
Tread, front	45-5/16 in.
Tread, rear	44-13/16 in.
Length, over-all	149½ in.
Height, over-all	54½ in.
Width, over-all	61½ in.
Rear-axle ratio	4.625:1
INTERIOR DIMENSIONS	
Front-seat hiproom	49¾ in.
Front-seat headroom	35¾ in.
Front-seat legroom	43¼ in.

How does it ride?

It rides a little less comfortably than a conventional-size automobile. There is more road noise and engine noise at high-way speeds.

How fast will it go?

Nash insists that it is not a sports car although most persons assume it is. The writer does not know the top speed, although he did drive it 75 miles per hour (by speedometer) for a short stretch. It will go slightly faster.

Does it hold the road well?

The low center of gravity gives it good road-holding qualities at normal driving speeds. At very high speeds, it tends to become too light on the front end.

Is it easy to drive?

Yes and no. For normal traffic situations, it is very relaxing and responsive both to the throttle and steering wheel. It will go

(Continued to page 262)

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Whatever your hobby Model building, whittling, Indiancrafts, leather, plastics or any other creative handicraft

x-acto knives, tools & sets
designed by craftsmen and precision-made for fine craftsmanship

will help you do a better job
and get more fun and satisfaction from your hobby.

Build Model Planes?
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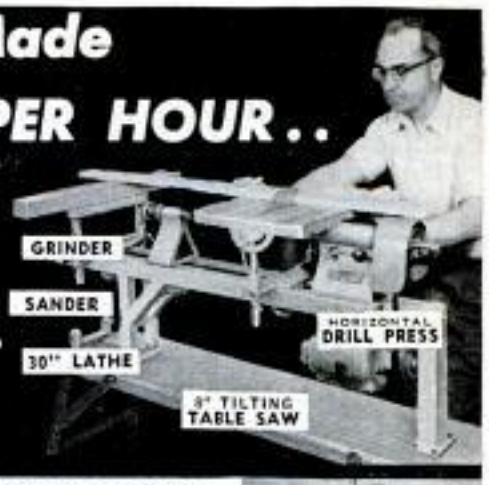
make your hands more creative with x-acto

I Made $15 PER HOUR.. with my SUPER-SHOP



Every hour spent with SUPER-SHOP has been worth $15 to me. Making it yourself is fun. SUPERSHOP is a complete, precision-built workshop. 100% ball bearing. Rugged tubular steel frame. Big capacity. 8 inch saw. Factory to you only $79.95. Free trial. Easy pay plan. FREE catalog.

Write for FREE Catalog on Money Saving SUPERSHOP

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Beautify your home —your flower gardens with the new colorful excitingly low cost

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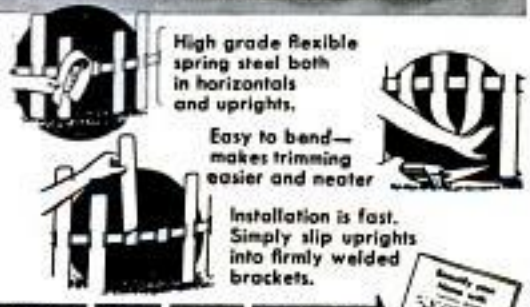

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Installation is fast. Simply slip uprights into firmly welded brackets.

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STREET.....

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

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down to five miles per hour in high without bucking and pick right up when you give it the gas. It has the Nash front-wheel skirts which limit its maneuverability drastically in tight places. You can't turn it around as sharply as you could if there were no limiting skirts over the front wheels.

Where is the trunk lid?

You pull down the back of the rear seat for access to the trunk compartment from inside the car. There is a lock on this "door."

Where is the glove-compartment lid?

As in most British cars, there is no lid for the glove compartment.

Where is the battery?

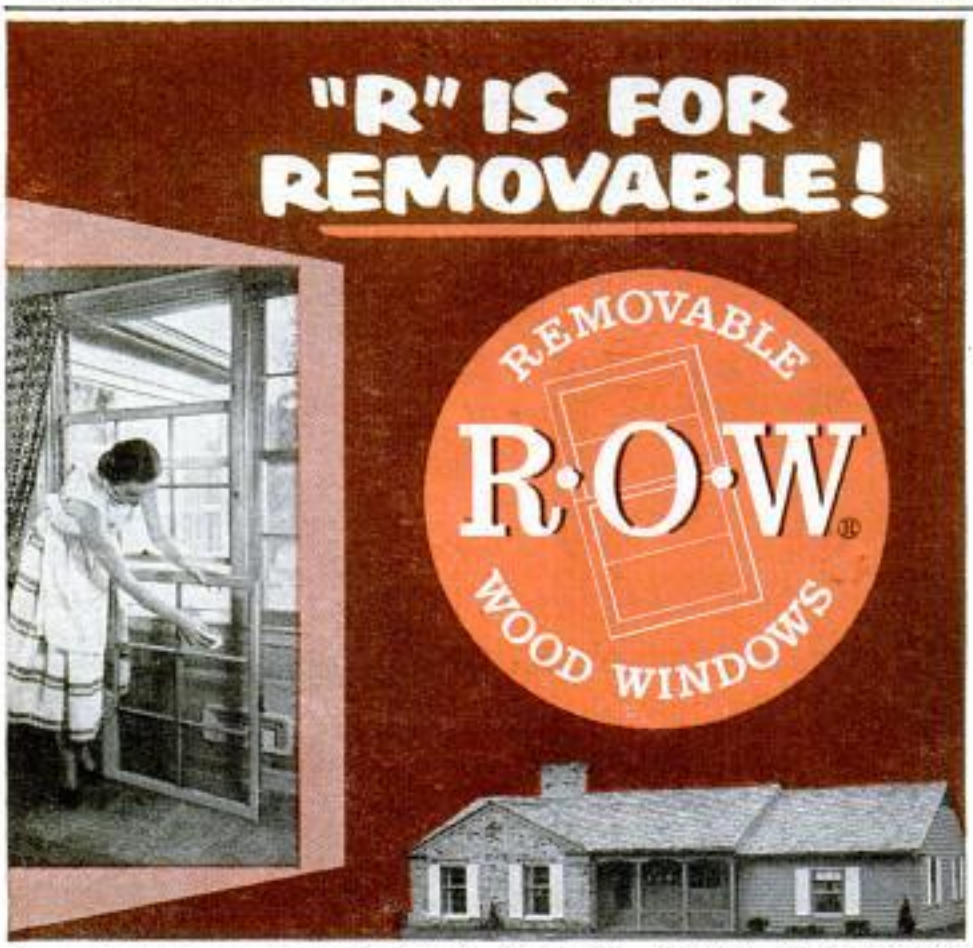
It is under the rear-seat cushion. Incidentally, a 12-volt system is used.

How do you like it?

Except for several faults, the car is highly satisfactory for its purpose. I doubt if it will ever be popular for long trips, but it is not expected to be. Driving in city traffic is remarkably easy. The car is narrow and agile. Even though a conventional hand-shift is used, you don't have to shift very often. The car operates through a wide range of speed in third gear. Here are the faults that I noticed: It should have overdrive or a fourth speed; the windshield wipers are too noisy and too slow; the dashboard light is too bright and cannot be dimmed or turned off; the dash light reflects in the windshield at a spot directly in line with the driver's vision; the heater motor is too noisy although it rarely has to be turned on full; the accelerator pedal is at an uncomfortable angle (Nash says it is correcting this); the very-low front seat makes it hard for a short person to see over the steering wheel; last and most trivial, the ignition and trunk keys look identical, and you invariably put the wrong key in the lock the first time. ★ ★ ★

Produce New Element By Altering Uranium

By bombarding uranium 238 with stripped nitrogen atoms, scientists at the University of California have produced a new man-made element. Seven protons added to the nucleus of uranium, number 92 in the series, produced the new atom, number 99. At the same time, enough elementary particles were added from the excited nitrogen to give the new element an atomic mass of 247, to date the heaviest on earth. The rate of decay of the new element is so high that one half of it changes to the lighter element berkelium every 7.3 minutes. Chemical properties are said to be similar to holmium, element number 67, a member of the rare earths series.



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The simple sensible Red-i-Kut way as thousands have — SAVE HALF. SHOP TESTED PLANS "SPIRIT OF THE CENTURY" Narrow waist 83" tall or stately straight side "SPIRIT OF AMERICA." EASY-to-FOLLOW photopacked PLANS tell all—plus BROCHURE of heavy brass weight Westminster, tube chime, movements, gorgeous dials, ¾" solid mahogany case kits. Send $1.00 today — Both plans $1.50 NOW.

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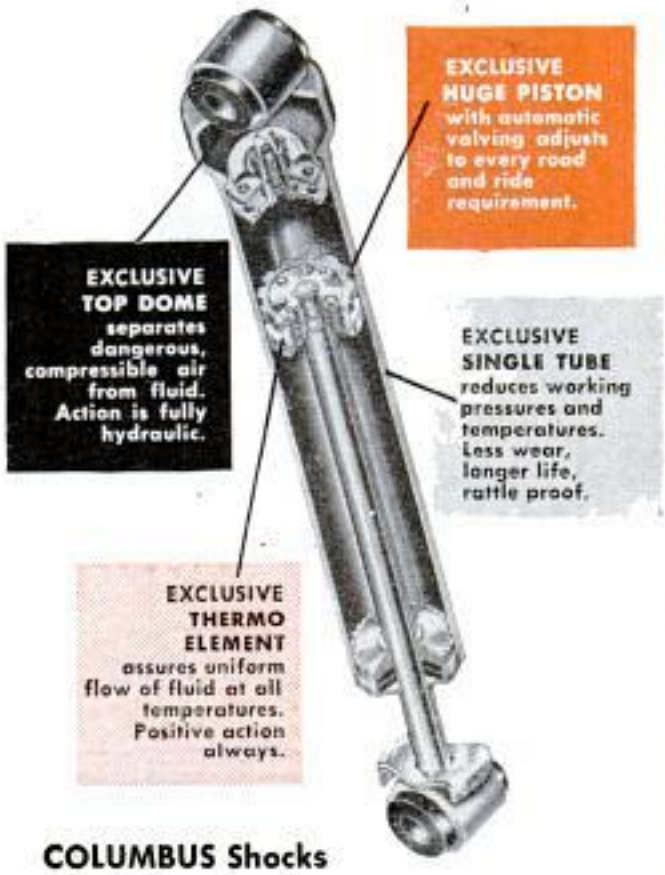

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COLUMBUS Luxury ride SHOCK ABSORBER
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I Flew With the Atom Bombers

(Continued from page 102)

is designed, too, to confuse the control systems of guided missiles that an enemy might send up against us, and to nullify any radar-directed antiaircraft guns.

Down on the lower deck the bombardier, Lt. Col. Earl Yaden, was checking our run into the target area on one of his radarscopes. From him I learned that the bombardier doesn't drop the bombs any more, he simply controls the electronic and mechanical equipment that can do the job much more accurately than any human. In an airplane that flies twice as high and twice as fast as earlier bombers, even a slight error at the release point can multiply itself into a wide miss on the ground. Accuracy is necessary even with an area-devastating atom bomb.

One of the adjustments that is fed into the automatic bombing brain is a "Q" factor that compensates for the various winds that the bomb encounters during its plunge to earth. Nothing so precise was considered vital in the past. But when you are in the stratosphere there may be half a dozen winds at various altitudes under the plane, some of them strong enough to deflect the heavy missile away from the target.

Colonel Yaden had within reach a visual bombsight that is far more accurate than the famous Norden bombsight used in the last war, but today's drop would be by radar. The whole target area was covered by clouds.

Yaden took charge of the plane after we passed the initial point and he passed his commands up to the flight deck by interphone. "Left a bit . . . left a bit . . . steady . . . steady . . . steady . . . bombs away!" The plane heaved upward the instant the heavy load was released and now Colonel Prichard and Maj. Joe Soic at the flight controls were bringing the bomber around in a tight turn and putting its nose down. We wanted all the distance we could get, in a hurry, to escape the blast that a real bomb would produce.

There were long seconds yet before the A-bomb would reach its theoretical detonation altitude and we were getting away as fast as we could. Black goggles were pulled down over every face until the explosion moment had passed.

A couple of minutes later the coded information on our score came up by radio from ground observers and Colonel Yaden translated the figures. "Not bad," he remarked over the phone, "not bad at all. One hundred and forty feet short of the target! We've done worse!"

(Continued to page 274)

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The way thousands of physicians and dentists recommend

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MAGNETS 225 lbs. PULL

GENUINE ALNICO—NEVER WEAKENS

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NOW—a radically new orbital sander that produces a fine piano finish—even better than hand sanding! And 10 times faster! Abrasive pad travels at high speed on ¼" orbit. Grits move in overlapping circles in all directions—with, against, across the grain. Therefore, no tendency to dig or burn...can't track. *Doesn't gouge.* Regardless of direction of grain—or variations in wood density—Porter-Cable 106 makes the surface smooth, even, uniform. *Won't ripple.*

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Can't be surpassed for blending spots where opposing grains or different woods meet.

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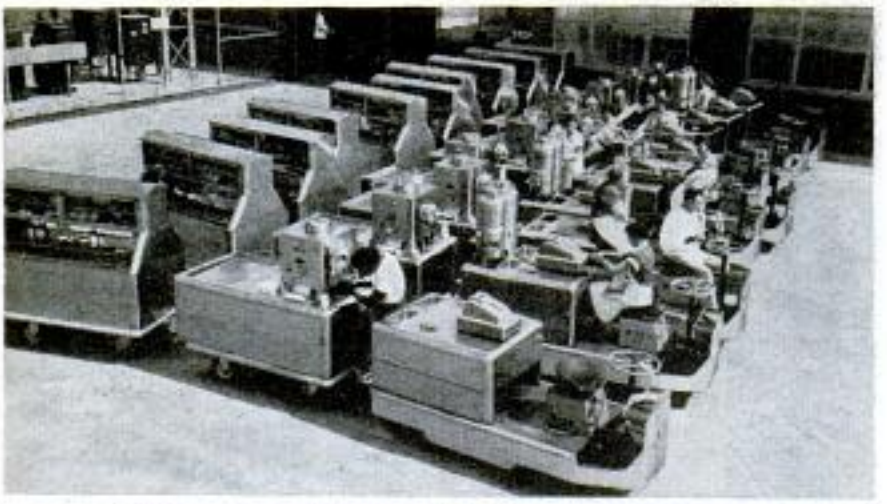

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Entire shifts of thousands of workers are fed at one time at Douglas Aircraft's El Segundo, Calif., plant by 12 mobile cafeterias that circulate in the work areas. Each three-section train has hot and cold storage compartments, bakery items, utensils, two 17-gallon coffee urns and two five-gallon cold drink dispensers. Employees serve themselves and pay the driver-cashier. The carts are loaded at a central commissary and they then stop briefly at entrances to dining rooms scattered throughout the plant. In addition to saving workers' time, the mobile units serve 10 patrons a minute compared to the six-a-minute average experienced by Douglas at its regular cafeterias.

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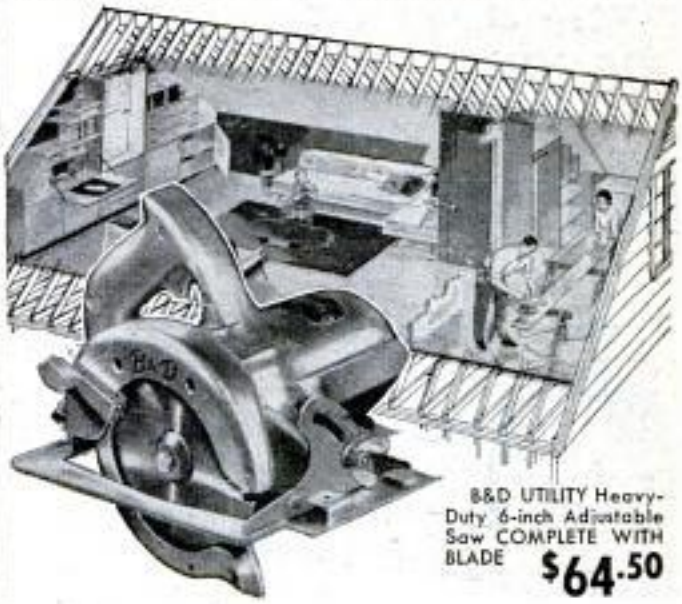

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PORTABLE ELECTRIC TOOLS

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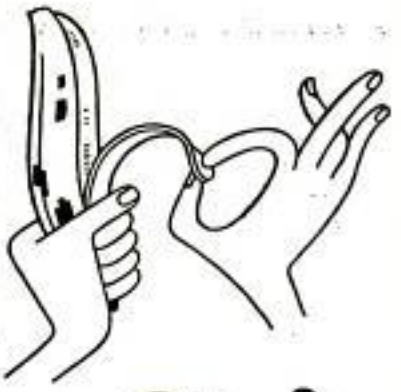

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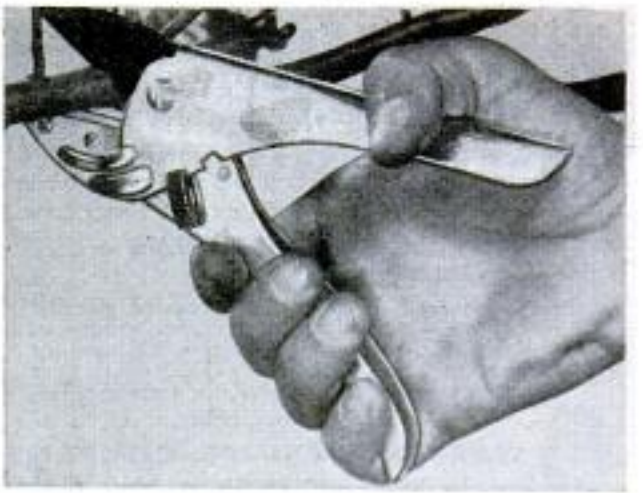

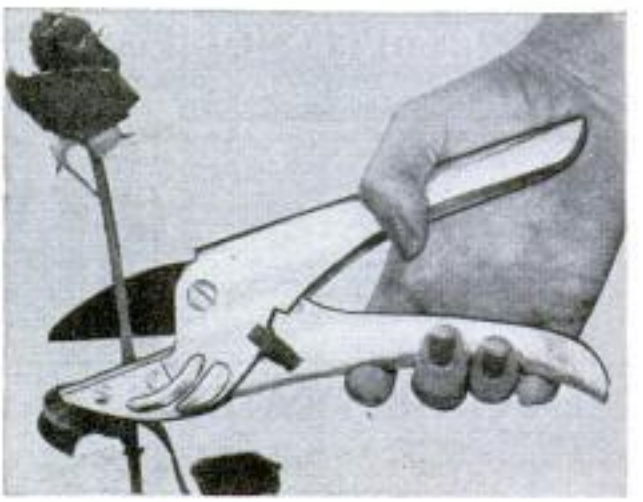

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Flowers or thick branches are cut with a pruner that is adjusted to two positions. A catch lock allows cutting at a half-open or full-open setting. The pruner has an aluminum handle and steel cutting blades that can be sharpened repeatedly. Lightweight and strong, it fits the hand comfortably. A self-adjusting replaceable anvil insures parallel reseating of the blades after each sharpening.

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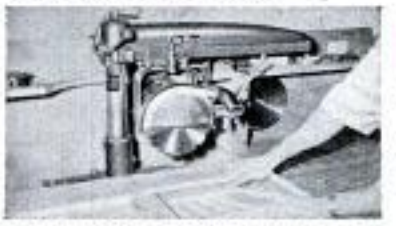

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Lazy-Susan turns wasted corners into handy storage space!

get complete detail drawings and directions in

FREE PATTERN KIT 307

—along with the picture-packed booklet, "Enchanting Homes of Western Pines." Write for it to Western Pine Association, Dept. 307-N, Yeon Bldg., Portland 4, Ore.

the Western Pines

- IDAHO WHITE PINE
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- SUGAR PINE

Salvage kitchen corner space with this convenient Lazy-Susan! Four shelves hold a surprising amount of supplies—put them all within easy reach.

You'll be happy to discover how little it costs to build this with the woods of the Western Pines*. Carefully selected and well-seasoned, they cut clean and accurately with hand or machine tools—take all finishes without grain-raising.

See the woods of the Western Pines at your local lumber dealer! Ask him for an estimate.

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It's easy to own the same "pay-off" tools used and endorsed by America's top-earning mechanics throughout the automotive, aviation and industrial fields! Snap-on tools help you handle every repair job faster, easier, better. And they LAST . . . pay for themselves over and over again! Start building your own tool set now with basic Snap-on units—add others any time. Genuine Snap-on tools are never sold in stores—direct to users only. Mail coupon for free catalog.

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THE CHOICE OF BETTER MECHANICS

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Geared hub. Sets in 5 seconds with Allen wrench. Cuts any groove 5/32"-7/8" wide, 2" max. depth. 12-gauge tempered steel blade; 8" dia. Available at SHOPSMITH dealers. Fits most saws. $14.95.

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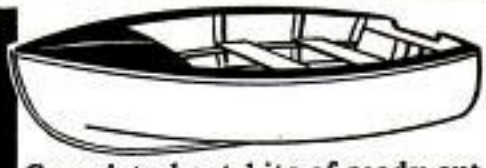

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NEW, IMPROVED CALCULATOR FOR WOODWORKERS only 25c

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make your own Gems 29.50 F.O.B.

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The black head with the red handle—exclusively PLUMB

Hit hard, heavy blows. Or tap a rivet lightly. The Plumb Ball Pein Hammer puts out just the right amount of force for the job.

Here's how this controlled power is engineered in. Weight is centered below the eye, behind the striking face. This adds force to the blow. Yet this off-center design lets you hit easy, accurate blows with the cone shaped pein. You'll spread rivets evenly, never mash them.

The shock absorbing second-growth, hickory handle and the special analysis steel head give it quality and longer life.

But it is the scientific distribution of the weight that lets the Plumb Ball Pein Hammer—and not your arm—do the hard part of the job.

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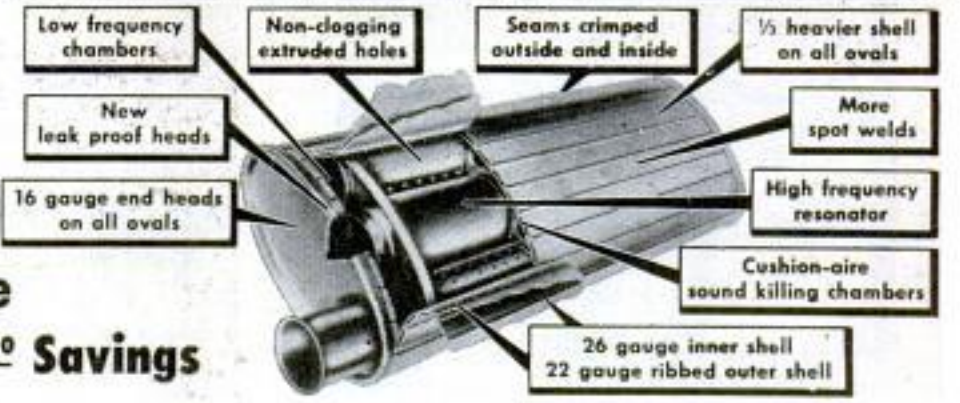

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Write Dept. 27-D for name of your nearest Silentone dealer

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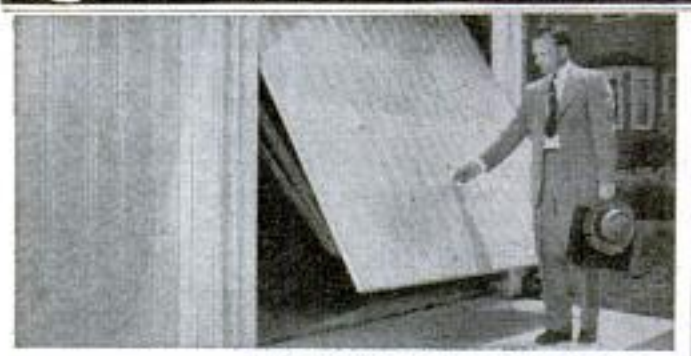

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Yes, you can have a swing-up garage door like the one shown here — complete with Stanley Swing-Up Hardware for *less than half* what you'd normally pay!

How? *Build it yourself* from Easi-Bild's* Pattern No. 86. It's easy! No special tools — no special skill! Just follow the clear, "can't-go-wrong" directions of the pattern. Tells you everything — including what materials to buy, where and when to use them. Stanley Garage Door Set is simplicity itself to install. You'll be amazed how quickly you can do the job — and mighty proud of your results.

Ask your dealer for Simplified Directions for Installing Stanley Garage Hardware and Easi-Bild Pattern. Or use coupon below. *Trade Mark Reg. U.S. Pat. Off. — Easi-Bild Pattern Co.

EASI-BILD PATTERN CO., Dept. S-4, Pleasantville, N.Y.
Enclosed is 50¢ in coin, money order, check for Garage Door Pattern No. 86
Please send Simplified Directions for installing
( ) Single ( ) Double Garage Door Hardware.
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Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send in your blueprints and inquiries.

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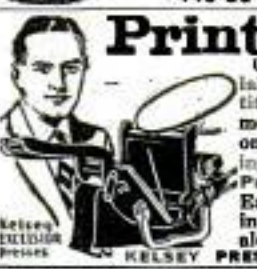
Print Your Own



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GEIGER COUNTERS (as shown) for Uranium Detection. **TREASURE DETECTORS** for gold, silver, etc. Lightweight, ultra sensitive. None finer. Also Mineralights for Tungsten.

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Delta **FLASHING POWERLITE ELECTRIC LANTERN**

LOW COST WOOD PANELS GUARANTEED FOR LIFE!

Beautiful Weldwood Plankweld®—easy to install—see it at your lumber dealer's now!

DO IT YOURSELF Plankweld is genuine wood wall paneling, factory prefinished to soft deep lustre. Ready for immediate installation; each package contains special metal clips which are nailed to wall to hold panels in place. Panels are edge grooved and overlap to conceal clips and nailheads. If you can hit a nail or saw a piece of wood you can install Plankweld easily. Can be installed on any nail-holding wall or directly to studs without furring. *Plankweld is guaranteed for the life of your home!*

CHOOSE THE WOOD YOU WANT. 16¼" x 8' Plankweld panels come prepackaged (108⅓ sq. ft. to package) and are available in birch, Philippine or Honduras mahogany, plain sliced oak, and walnut, ¼" thick. Now you can have a beautifully paneled wall for less than you think. See them all at your lumber dealer's or at any one of the 60 United States Plywood or U.S.-Mengel Plywoods showrooms located in principal cities, or write for complete information.

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CHAN NEL LOCK pliers

here's why

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line — you'll find a style and model to do any job better.

CHAN NEL LOCK

THE PLIER DESIGN THAT OBSOLETES ALL OTHERS

CHAMPION DeARMENT TOOL CO. • MEADVILLE, PA.

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Later that day we wiped out the city of Dallas, time after time—in theory. Not even practice bombs were used in this exercise.

We used a "radar bomb score" technique. Technicians with special equipment on the ground can determine exactly where a bomb would have landed if released by the bombardier of an approaching bomber at the instant that he sends a "bombs away" radio signal.

Our target was a single office building in downtown Dallas, hard to find even with field glasses from the air, let alone spotting it on the plane's radarscope. Yet few of our theoretical bombs landed as far as a block away.

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For the in-between gardener—the man with a plot too big for easy manual labor and yet too small to warrant a full-size garden tractor—there's a new self-propelled tiller. Driven by a two-horsepower gas engine, the little tractor is handled by steering it; no pushing is required. Throttle and clutch controls are mounted on the handles, which fold up to permit storage in a relatively small space.

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No brush to slow you down . . . no greasy cream to clog your razor. Just push valve . . . out comes lather! That's AERO SHAVE . . . the wonderful new "canned lather" that contains 3 beard-softeners to wilt toughest whiskers in a jiffy . . . *plus soothing lanolin to protect your skin against shaving irritation.*

Get AERO SHAVE Lather Bomb today . . . in the handy metal container with the turret top that won't leak when you travel.

Big Bargain! Aero Shave is the lowest priced "push-button" lather bomb on the market today!

USE "PUSH-BUTTON" LATHER

AERO SHAVE

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This basic design offers many possibilities . . . for an extra porch, a covered terrace, framing for another room — or, as designed, a carport with tool shed, potting bench and storage compartments. The plan adapts to meet your needs. *You build without blueprints!* Our simplified Easi-Bild* Pattern #273 specifies all materials required, shows you how to cut each piece to exact size, how to finish the job professionally.

The major material used is 15/32" Homasote — the oldest and strongest insulating-building board on the market. *Completely weatherproof, permanently crackproof,* Homasote saws and nails easier than wood, takes any paint or stain. Homasote is distributed by building materials dealers throughout the United States and in Canada. Send coupon today for pattern and Homasote literature.

*T. M. Reg. Easi-Bild Pattern Company

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I enclose $1.00 for which send me Pattern #273.
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CITY..... STATE.....
My lumber dealer is.....

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TEENUTS fasten anything that's bolted . . . provide flush mounting without counter-boring. Excellent for new work or repairs. Ideal for wood to metal applications and where old screw holes have become useless. Simply drill hole size of TEENUT barrel, hammer home TEENUT and its steel prongs provide rigid, permanent anchorage. Same size hole for bolt. Sizes to fit these standard bolts: 6-32, 8-32, 10-24, 10-32 (4 per card), ¼-20 (3 per card), 5/16-18, 3/8-16 (2 per card).

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15¢ per card

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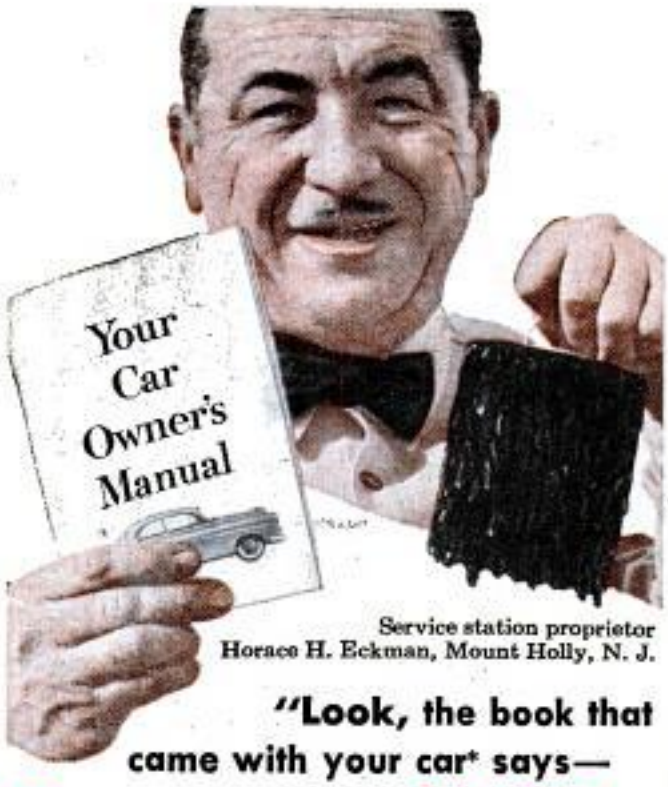

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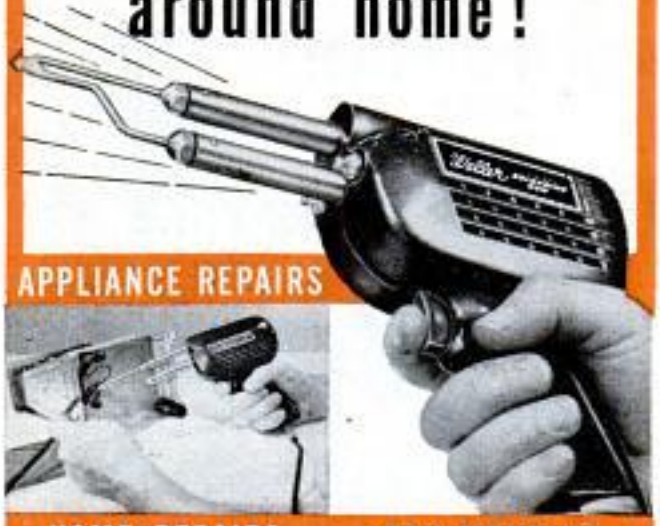

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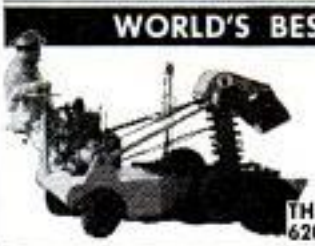

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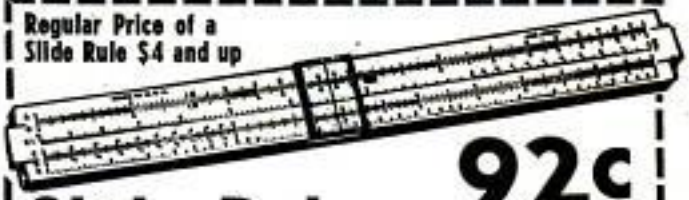

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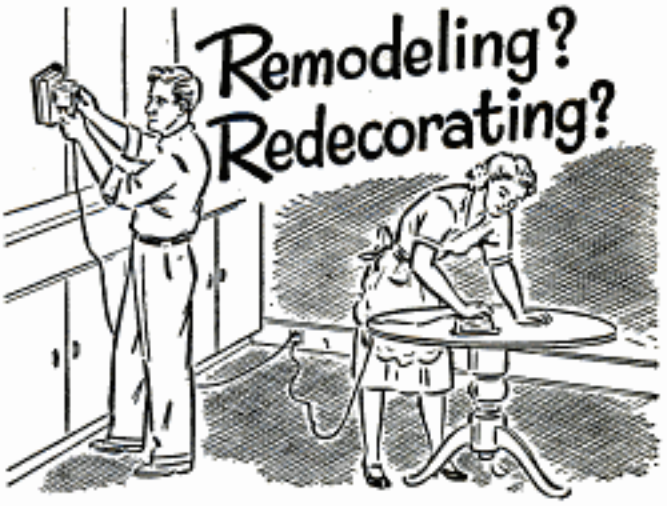

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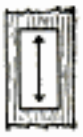
Dremel Straight-Line Action → 

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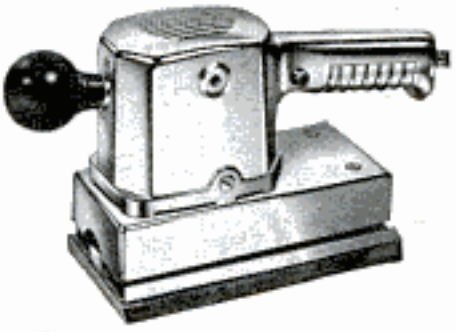

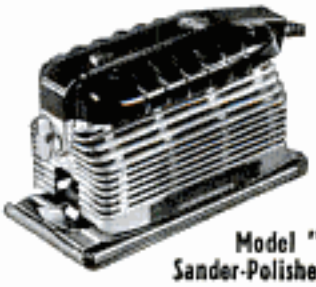

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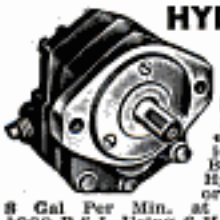

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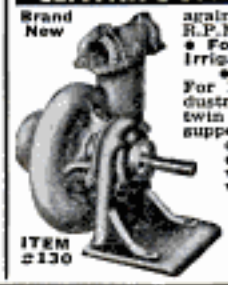

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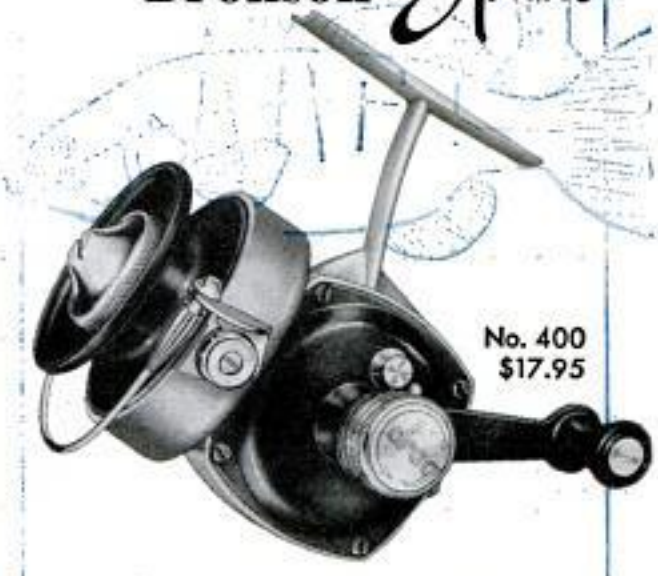

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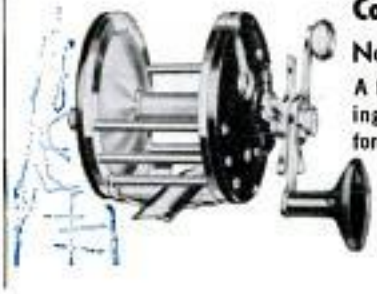

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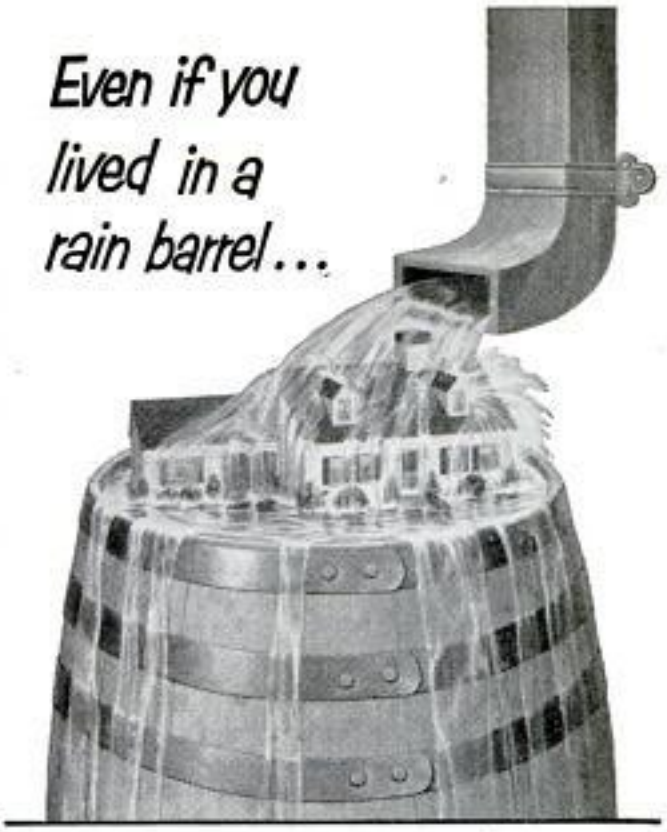

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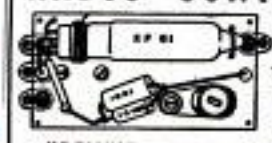

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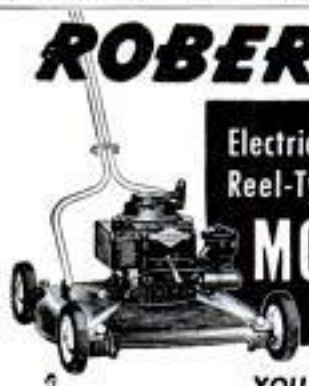

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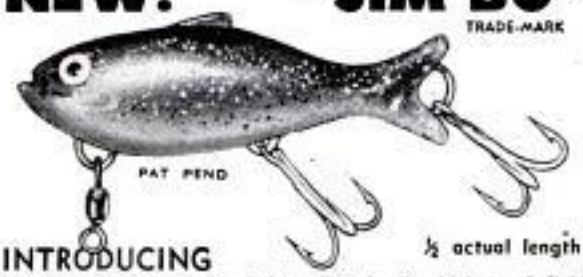

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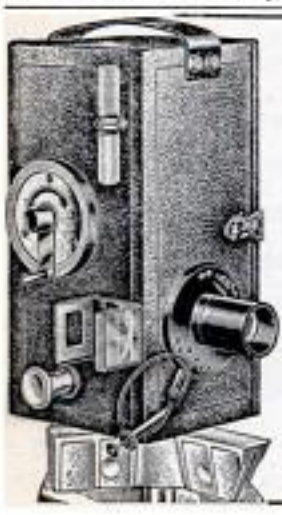

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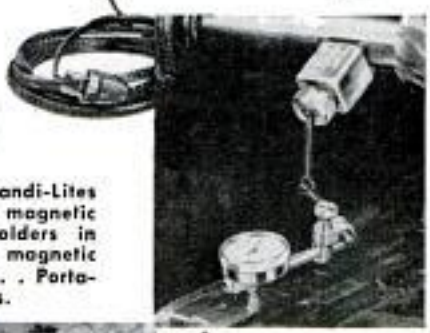

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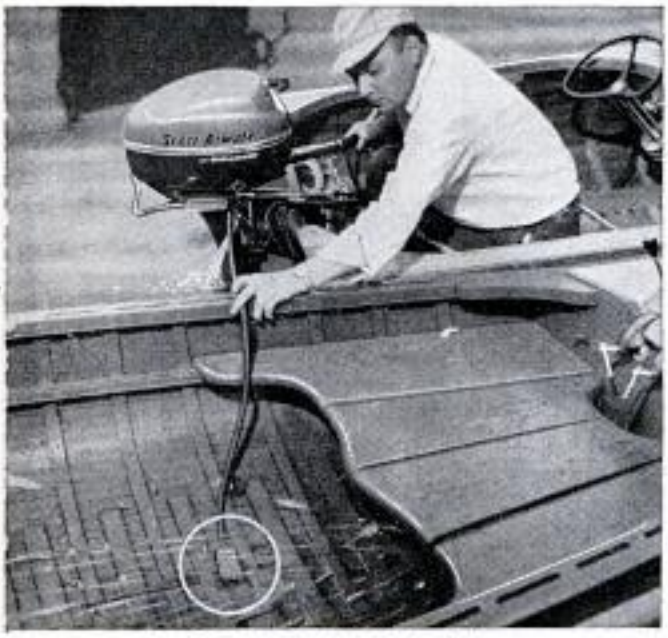

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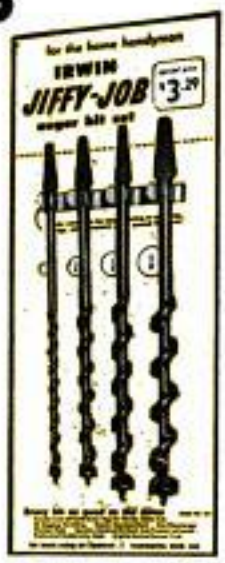

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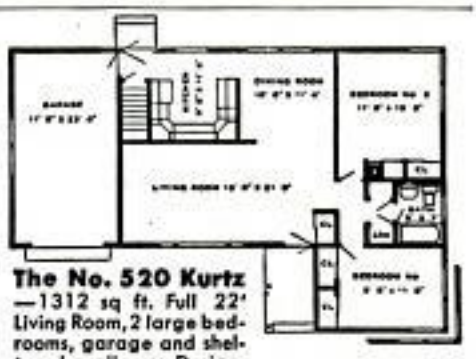

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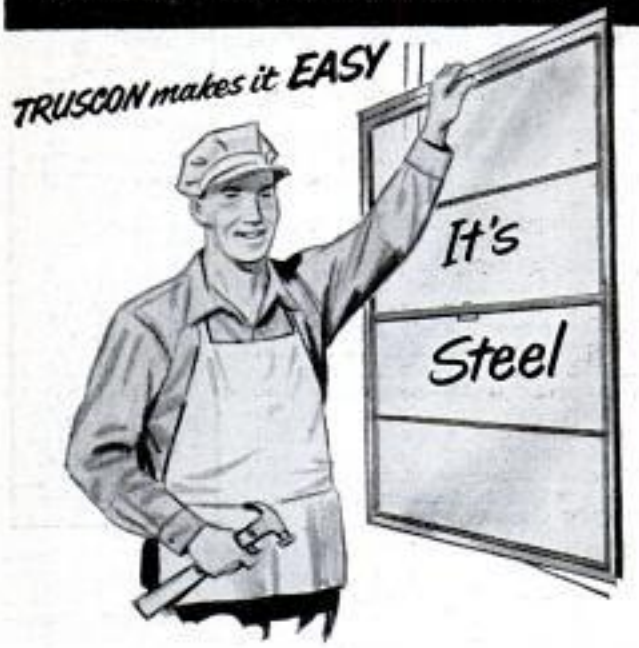

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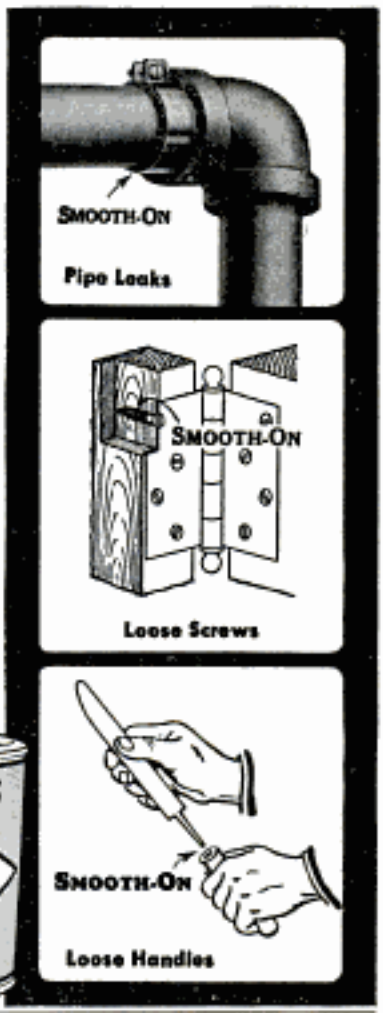

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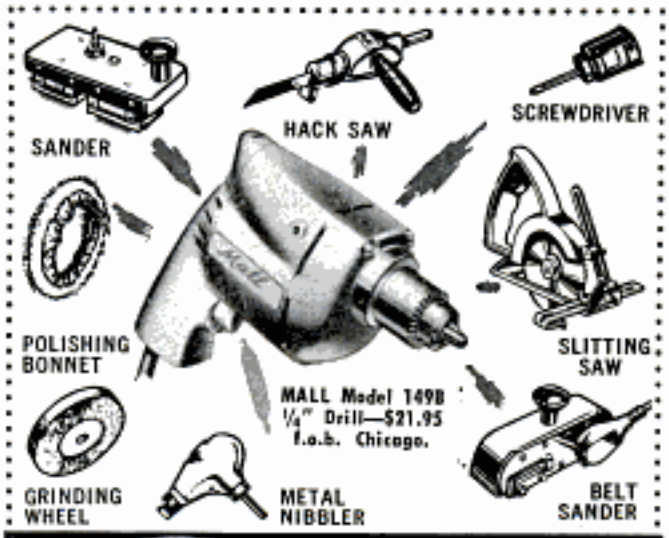

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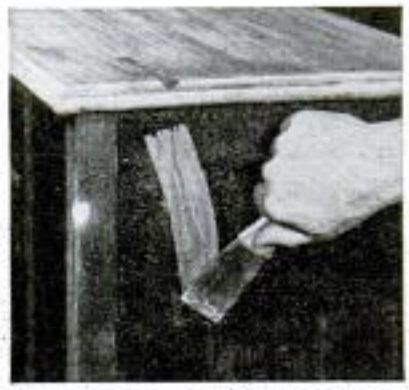

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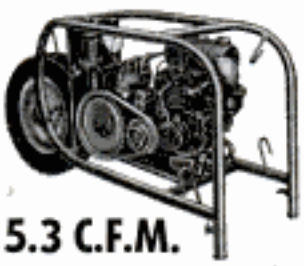

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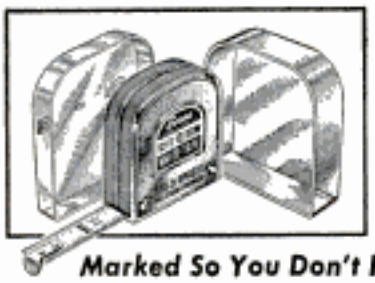

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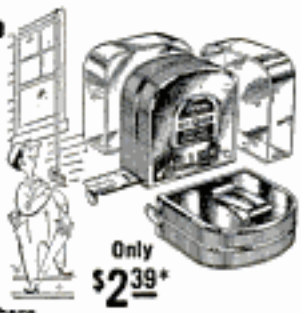

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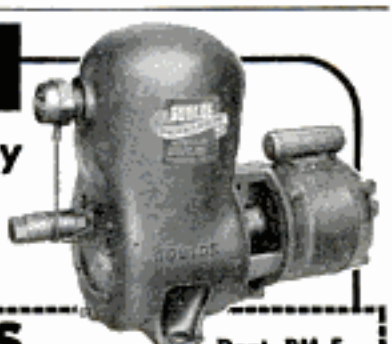

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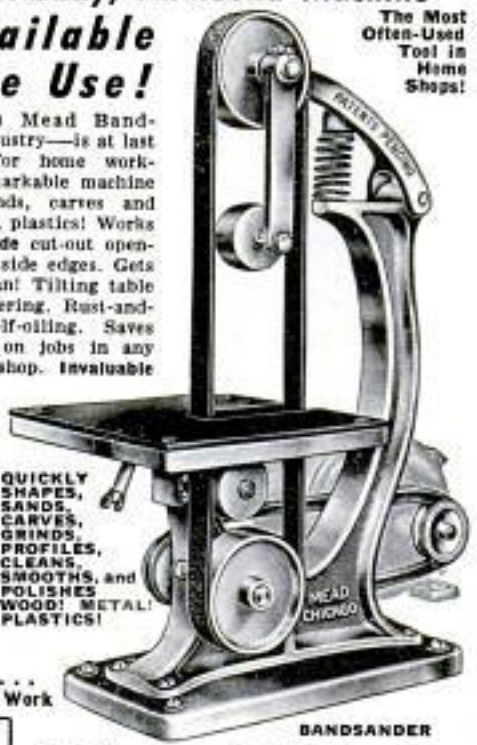

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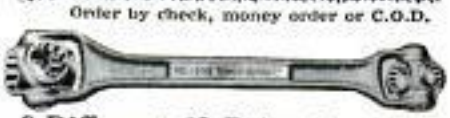

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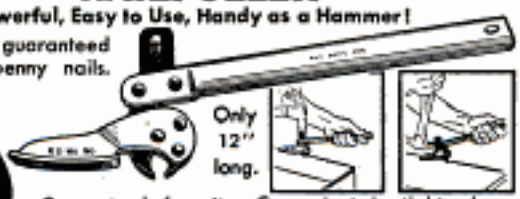

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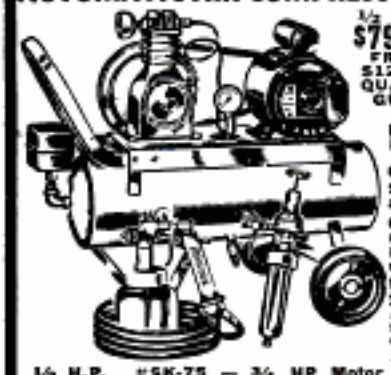

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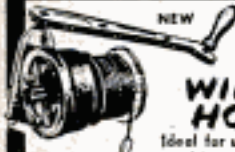

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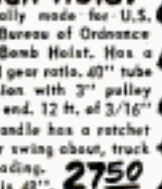

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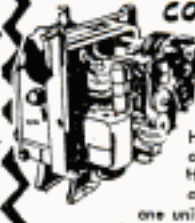

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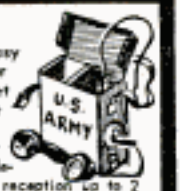

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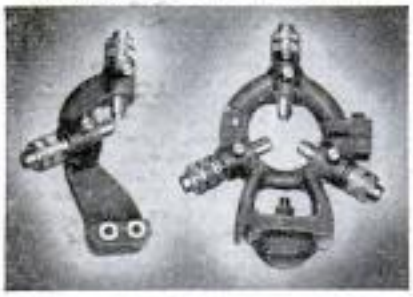

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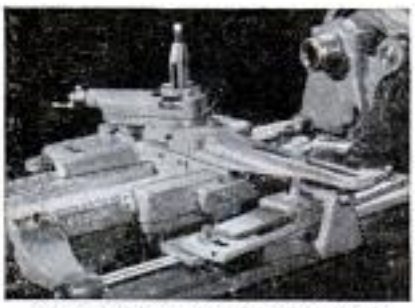

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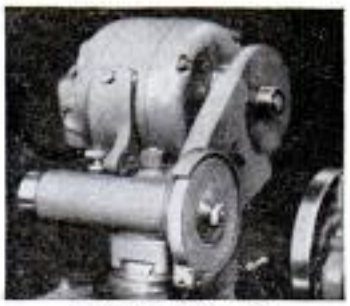

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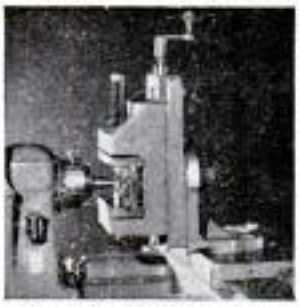

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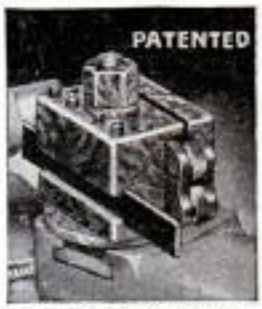

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