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MAGAZINE

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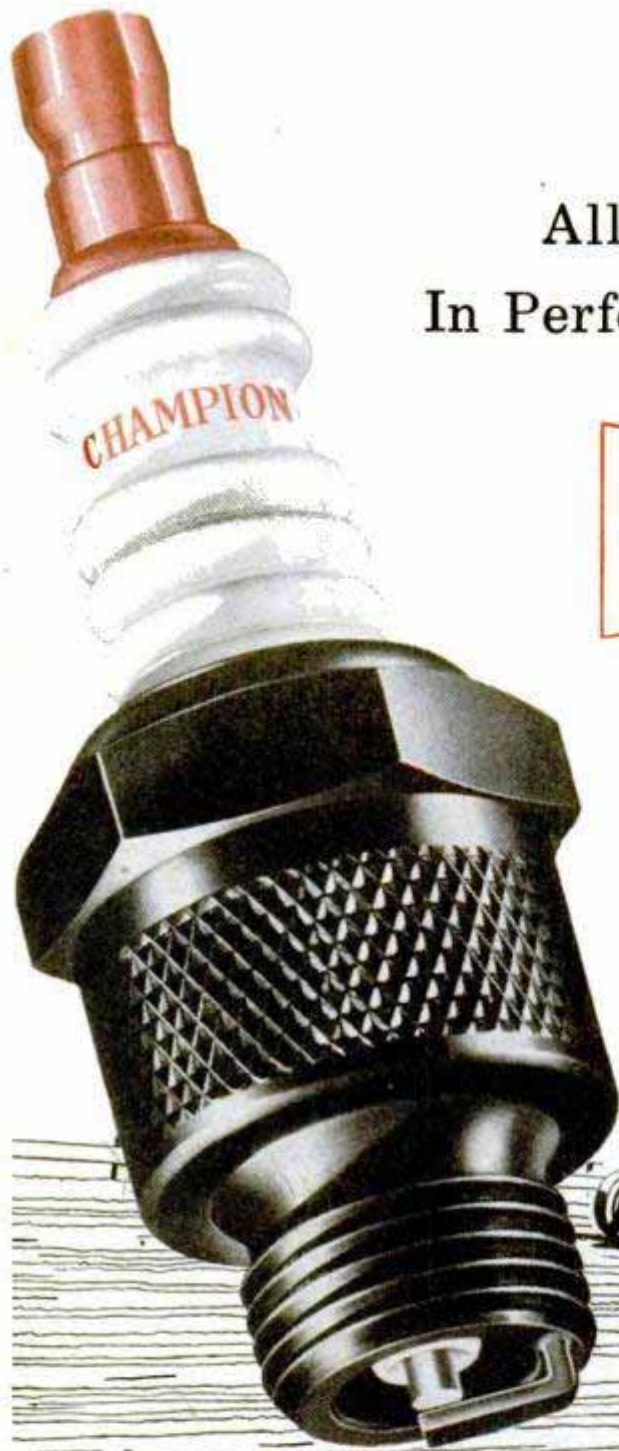
Timer for Champions
Page 88



Korta

**How Owners
Rate the
'51
CHEVROLET!**

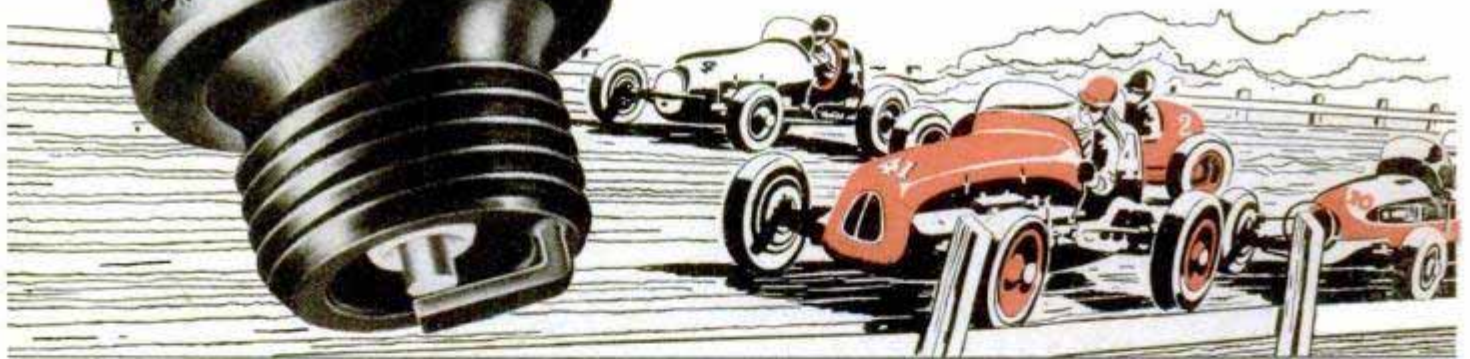
Read the report of
the real experts
page 94



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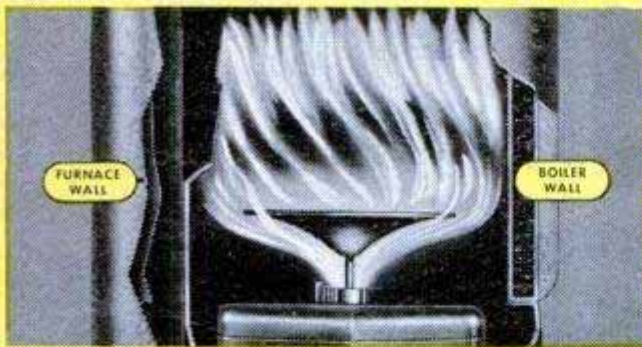


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Showing wall application of burner flame against furnace wall (left) and boiler wall (right).

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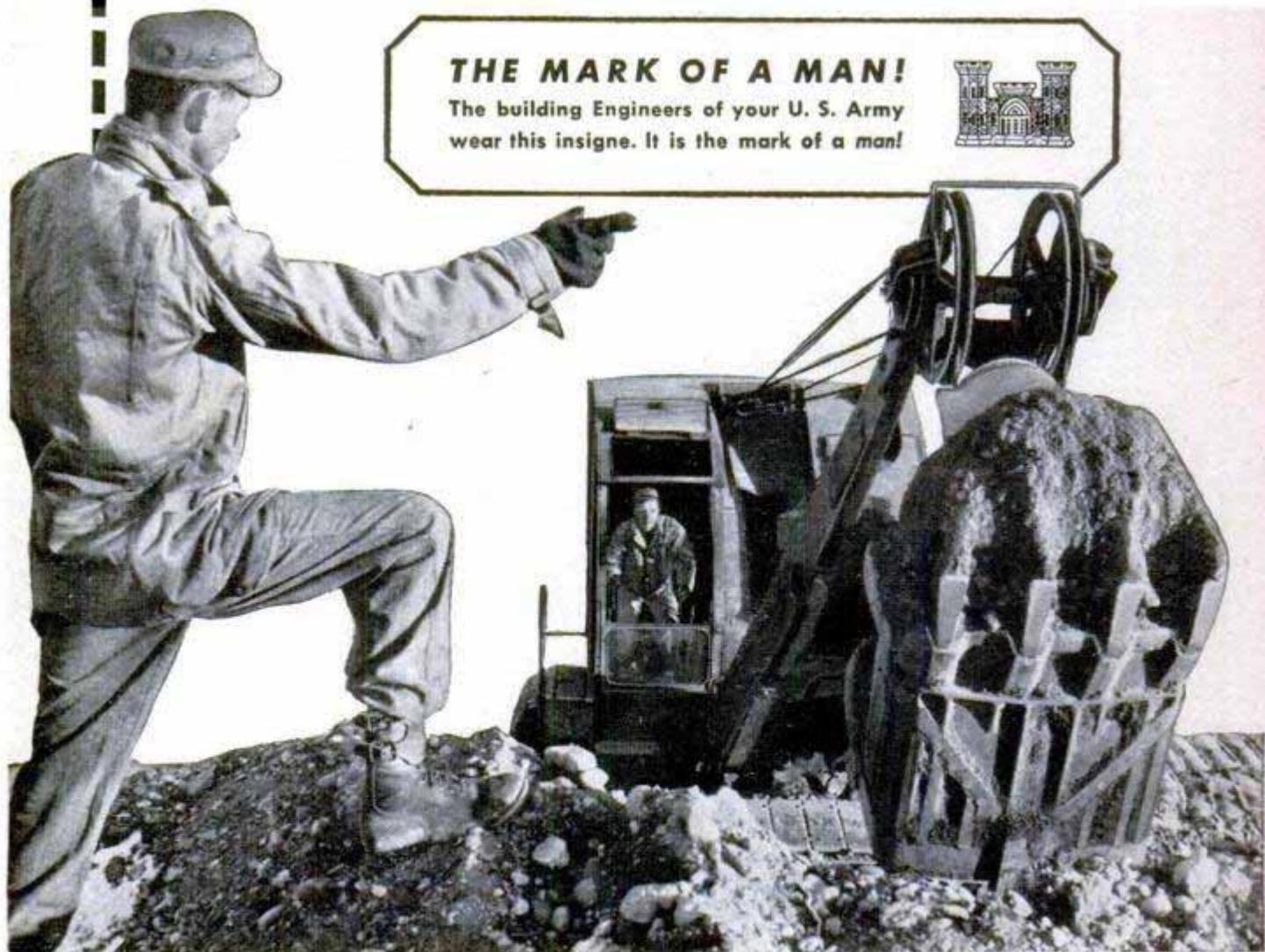
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this month's cover

THAT RACER streaking through the speed trap is just one of 38,000 high-speed vehicles clocked by a super-precise man named Otto Crocker. In his 10-year career as a timer, Crocker has officiated at the setting of 80 world records by speedboats, aircraft and autos. Mr. Split-Second, working in a world of high speed, has been forced to shred time to bits. The three-dial timer is his latest instrument, so precise it can clock objects along a course only 12 inches long or record a transcontinental speed dash. The instrument still has a slight error, Crocker admits—it gains 23/1000 second every 24 hours, or about the blink of an eye once a day. Crocker has witnessed a good many speed thrills in his career. There's the boat that spun crazily into a full barrel-roll, and the speed car that stood a driver on his head at 200 miles an hour. Crocker races through his own thrilling story beginning on page 88

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

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If you're interested in getting an average of 20 extra miles — yes, 20 extra miles — on every tankful of gasoline, you'll be interested in the following facts:

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You see, by reducing friction, you simply release *some* of the power that was being used to overcome it. So naturally your car goes faster or farther or climbs a steeper hill on the *same amount of gasoline*.

Let's examine the facts!

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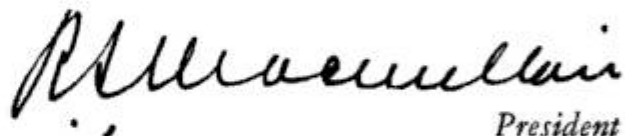
That's because Macmillan has not only

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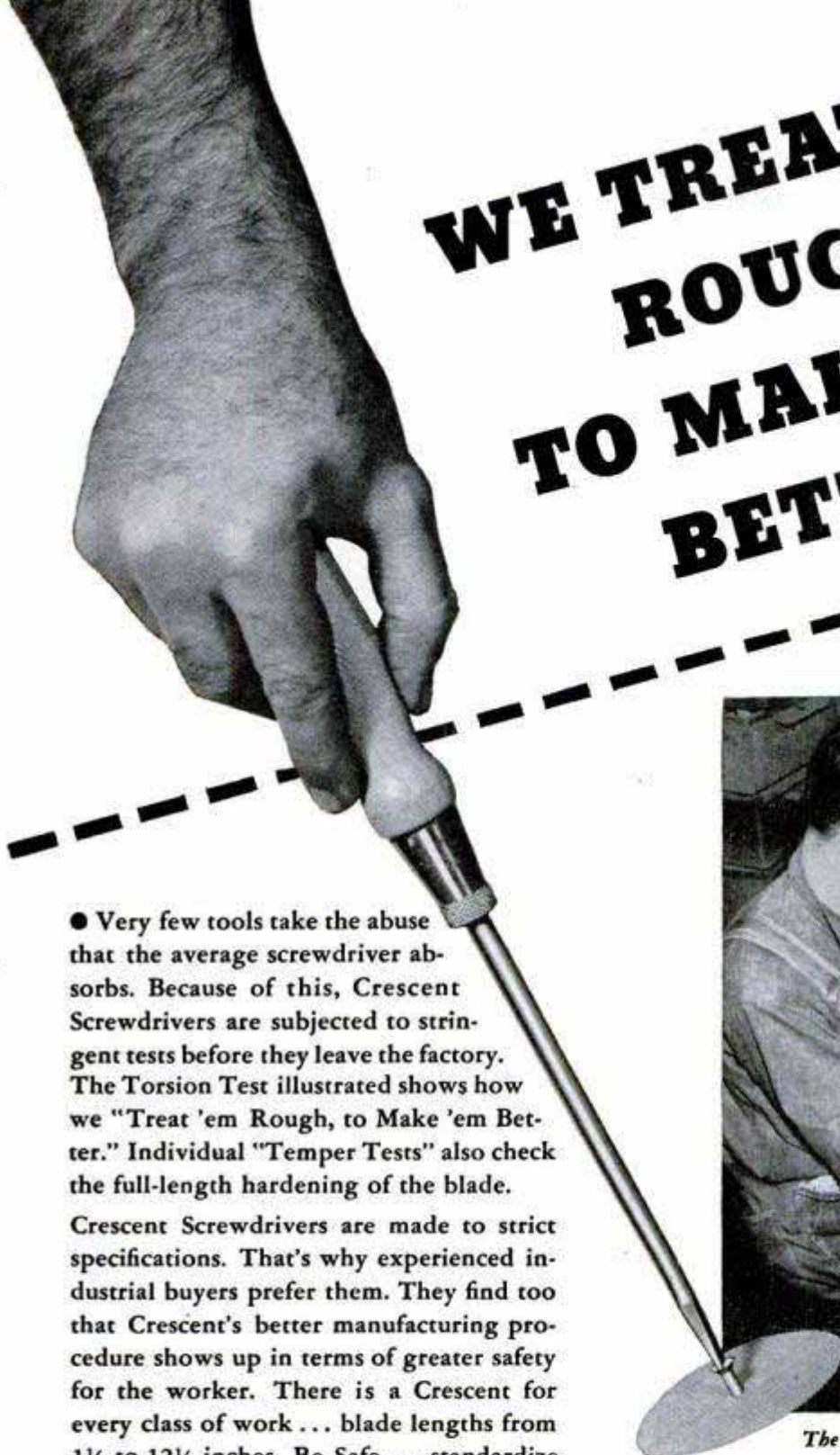


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THE EDITORS



THERE'S A NEW \$3000 pot o' gold awaiting photographers. *Popular Mechanics* announces its big Fiftieth Anniversary Photo Contest in this issue. A \$500 U. S. Defense Bond will go to the top entry in each of two divisions—black and white, and color. Entries will be judged on how well they illustrate the theme, "The Spirit of America." Even snapshots can win big money in this contest. You'll find the rules on page 111.



Smart Postmen!

Ask your postman where he'd deliver a letter addressed to "Written So You Can Understand It, U. S. A." and, if he's as smart as some postmen, he'll tell you: 200 East Ontario Street, Chicago 11, Ill.

Our mail bag the other day brought a letter from a Canadian reader in Beaupre, P. Q., with that simple and perfectly clear address. Naturally, it came through without delay.

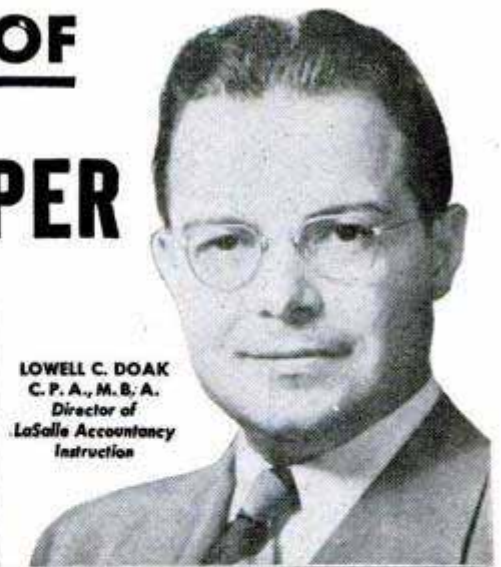
For the last 50 years, come next January, that famous slogan has appeared on the face of *Popular Mechanics*, but this is the first time, to our knowledge, that it has served as a street and city address. H. H. Windsor, Sr., founder of the magazine, devised the slogan to introduce the first magazine that brought science, mechanics and crafts "down to earth," clearly and concisely interpreted for every reader.

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News photographers and reporters in movies and life are always tearing back to the office with a story for the next edition. That's in the blood of journalists. At the University of Miami, student journalists have set a speed record that professional newsmen will envy. Combining the speed of the Polaroid Land camera and the speed

(Continued to page 8)

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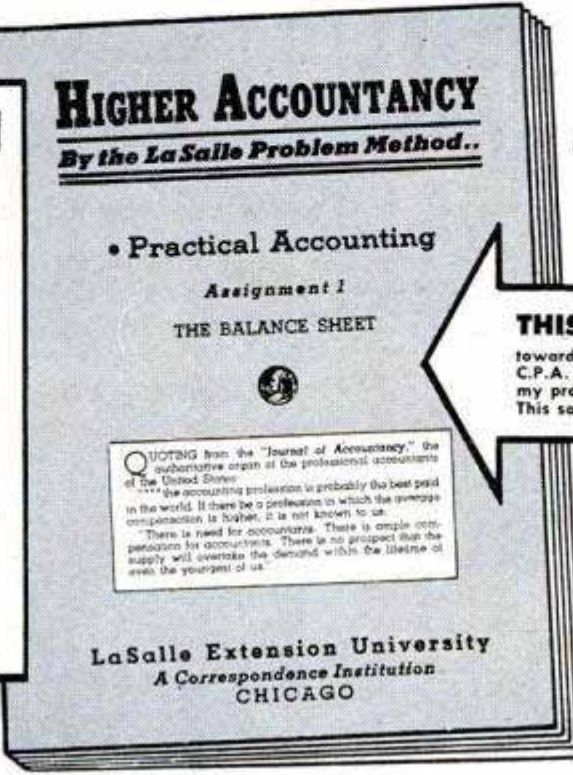


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(Continued from page 6)

of facsimile printing, the students published a photograph of a man making a speech while the speech was still being made! And it wasn't a long speech either. Total time from the moment the picture was taken until it was on the facsimile receivers was three minutes — 180 seconds. The photographer snapped the picture, developed it as he ran to the office, put it on the facsimile transmitter and it was instantly printed all over the campus. Metropolitan papers, please copy!

Letter to the Editor

... I read the article your two boys wrote in the October 1948 issue about their Alaska trip, drove up there last summer and found their information more valuable and correct than any other I had read ...

Leslie Faus,
206 W. 70th St.,
Chicago 21.

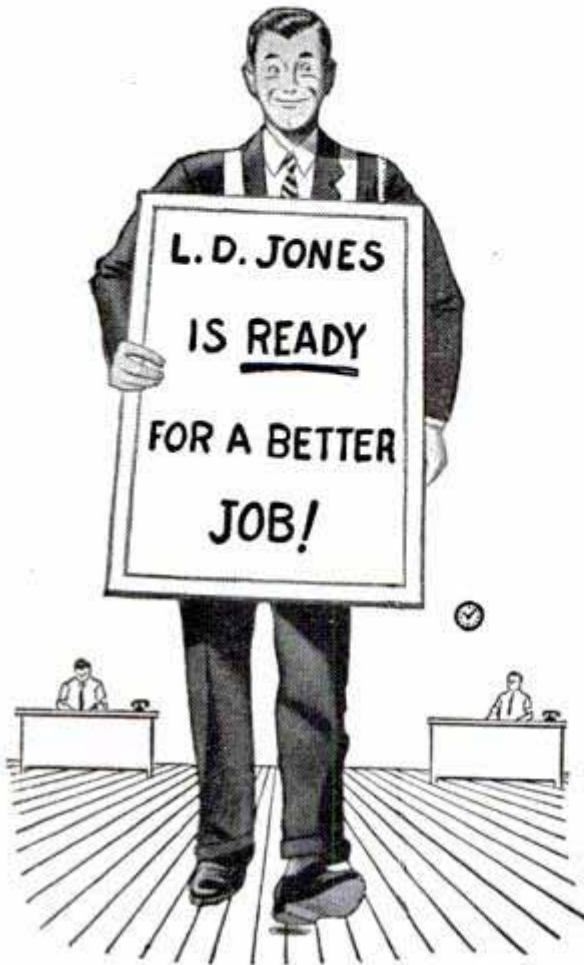


Letter to the Editor

I enjoyed reading the article "I Rode the Airlift to the Orient" by Richard F. Dempevolff very much, as I was a civilian employee with the Eighth Army in Tokyo and made the return trip from Tokyo General Hospital to Walter Reed General Hospital in October 1949 under similar conditions ... We changed crews at Kwajalein, and I noticed that it didn't take very long to gain

(Continued to page 10)

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(Continued from page 8)

altitude, so I asked the sergeant, "What's the rush?" He explained that the pilot had flown the Berlin airlift, was used to heavy loads and probably thought he had a load of supplies rather than a light load of 18 passengers . . .

Enclosed picture which I took while in Japan [shows] a Japanese Shinto clergyman at the summit of Mount Fujiyama. He wears white since Mount Fuji is sacred; it is also clean. In August 1948 he was around 70 years of age, had climbed Mount Fuji 67 times and his greatest ambition was to climb it 100 times before death.

Luther A. Middleton, Jr.,
V. A. Hospital,
Oteen, N. C.

Letter to the Editor

As an avid car enthusiast I would like to take this opportunity to commend both you and P.M. on your new feature by Floyd Clymer. I have been following Mr. Clymer's articles for many years and must say that you couldn't have made a better choice.

I heartily agree that one test driver cannot give as full an account of a car as can the compiled report of many owners. That is the real test. May I extend my best wishes and good luck to you, and P.M.

Hal Kolb,
The Travelers Broadcasting
Service Corp.,
Hartford 15, Conn.

Letter to the Editor

Your February 1951 issue of *Popular Mechanics* carries a very good story on Fritz Abplanalp, a woodcarver from these Islands.

I think it is unfortunate that his real connection here in the Islands was not mentioned in the article. He is working full time for The Kamehameha Schools, and has under his charge several classes of woodcarving students, old and young. He is at present on sabbatical leave from the schools and living in Carmel, Calif., but will return in September.

Col. Harold W. Kent,
President,
The Kamehameha Schools,
Honolulu, Hawaii.

☞ An ingenious barber at Kirkburton, Huddersfield, Yorks, England, has installed a traffic-light system for the convenience of his customers. The red light indicates "Shop Full," the amber "Won't Keep You Long," and the green "Come Inside."

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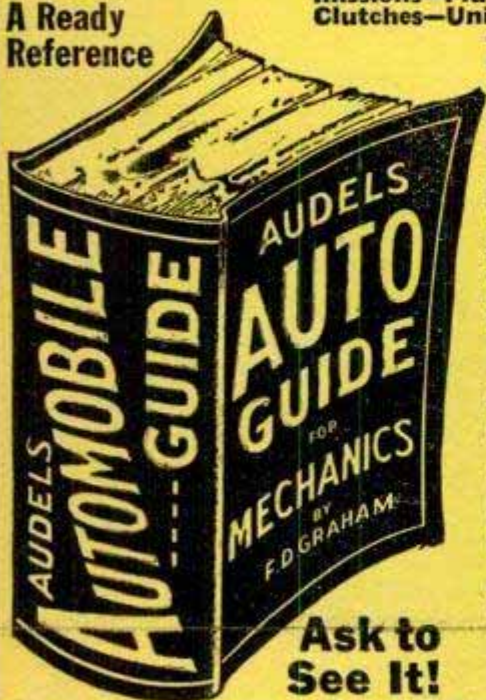
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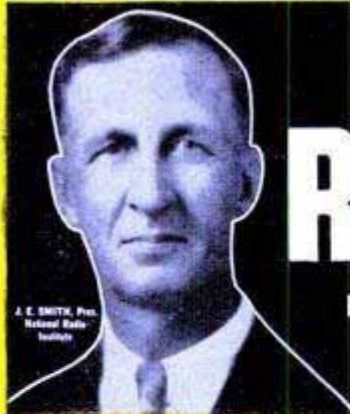
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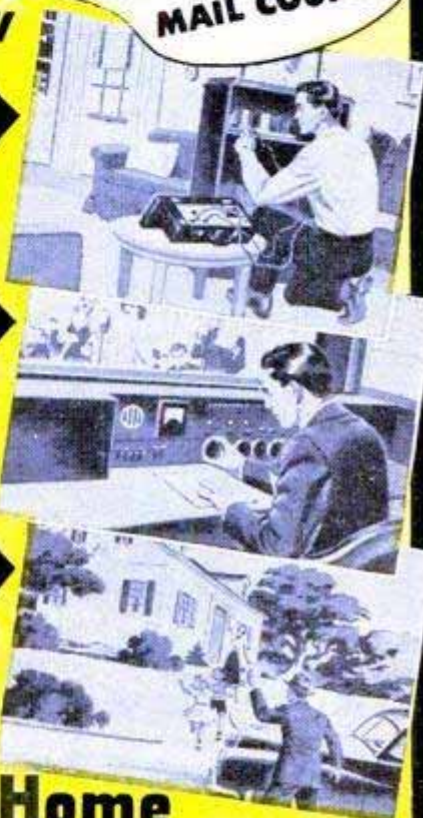
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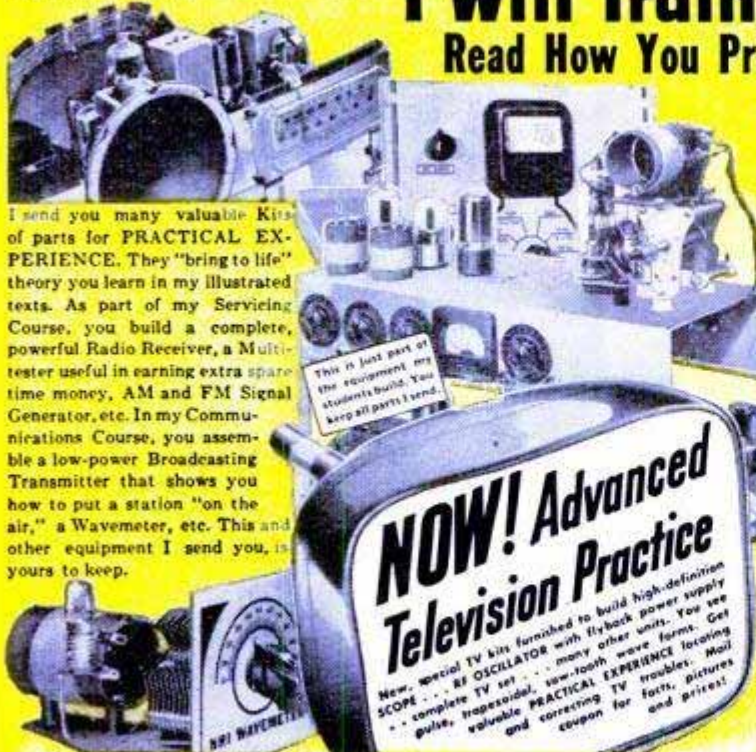
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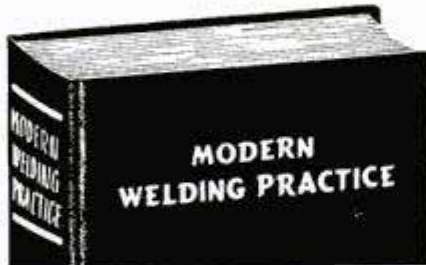
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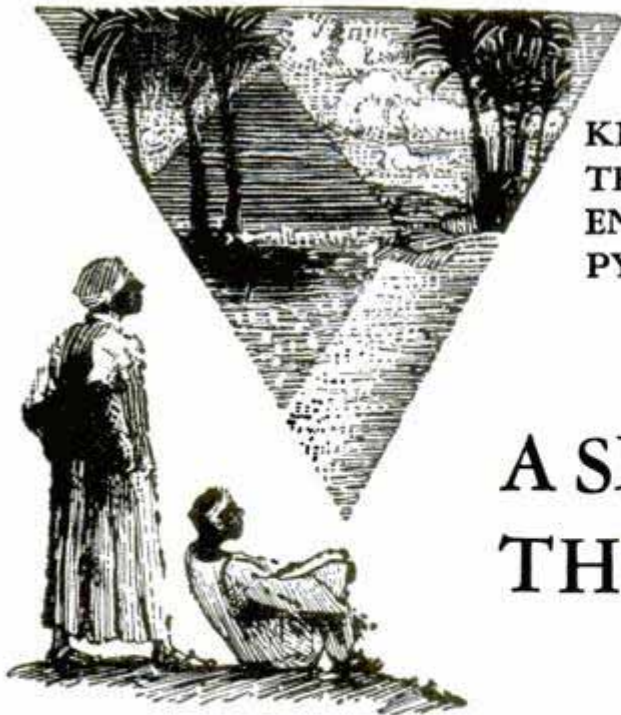
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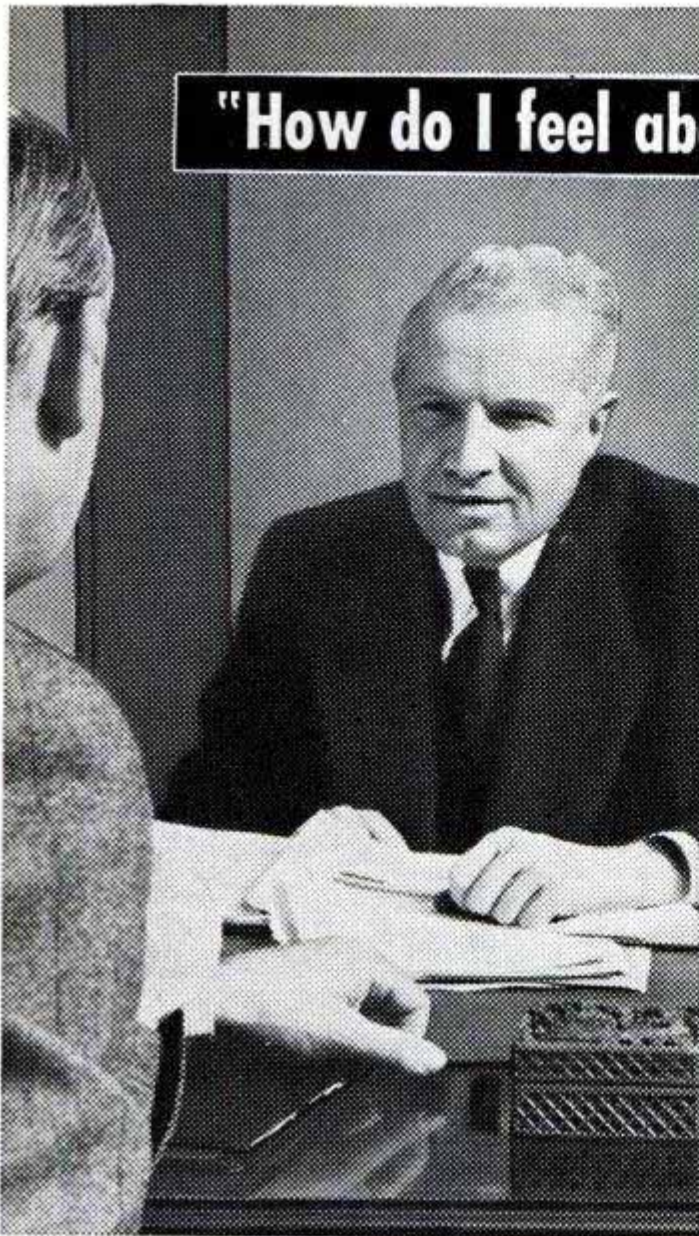
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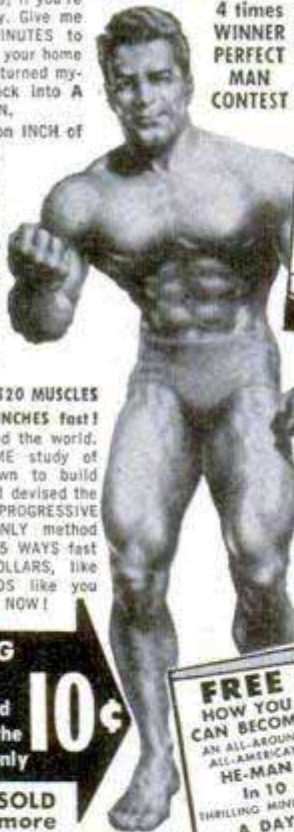
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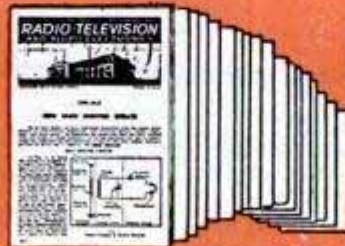
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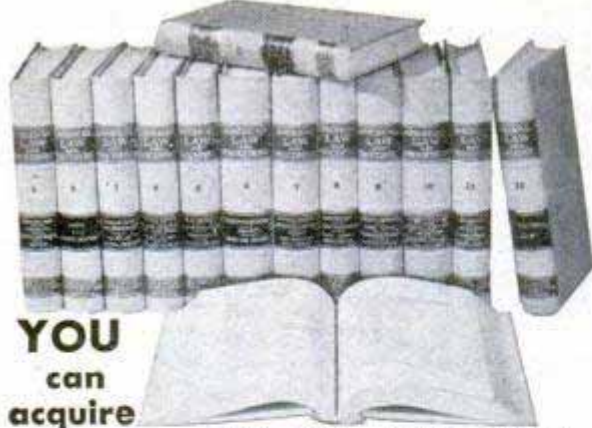
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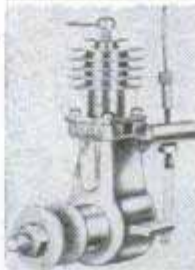
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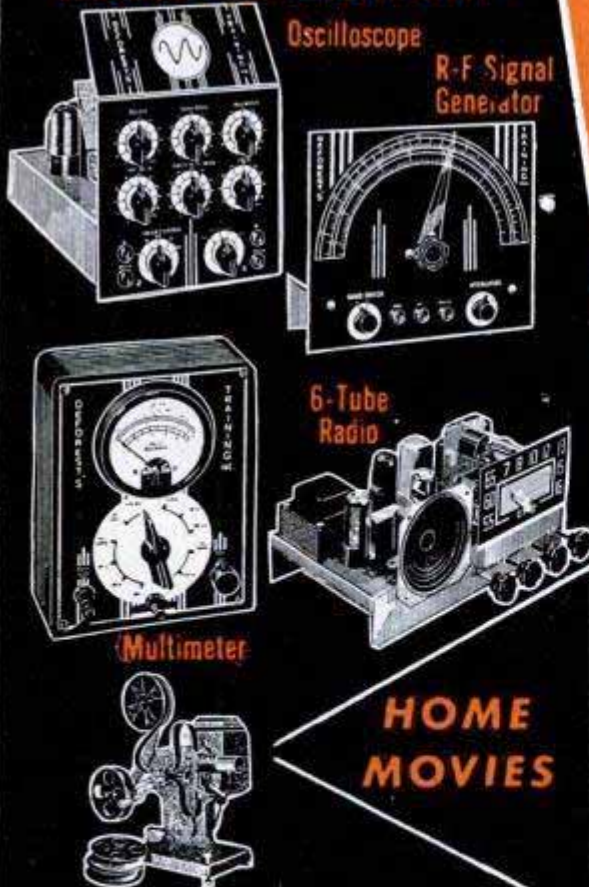
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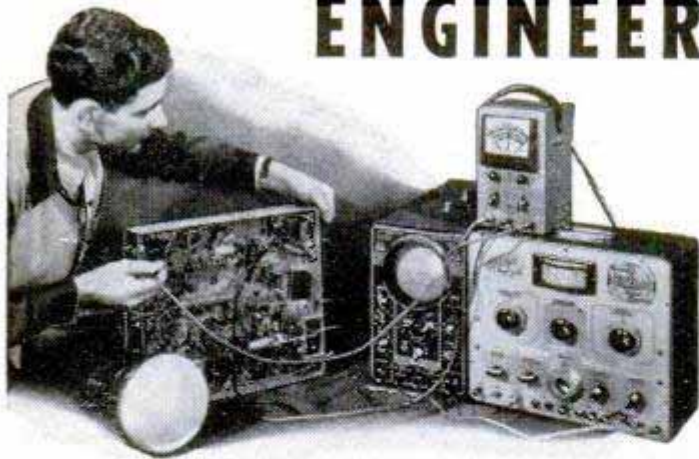
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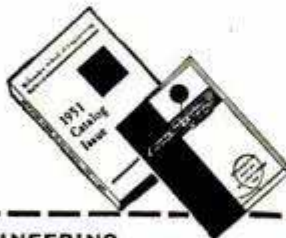
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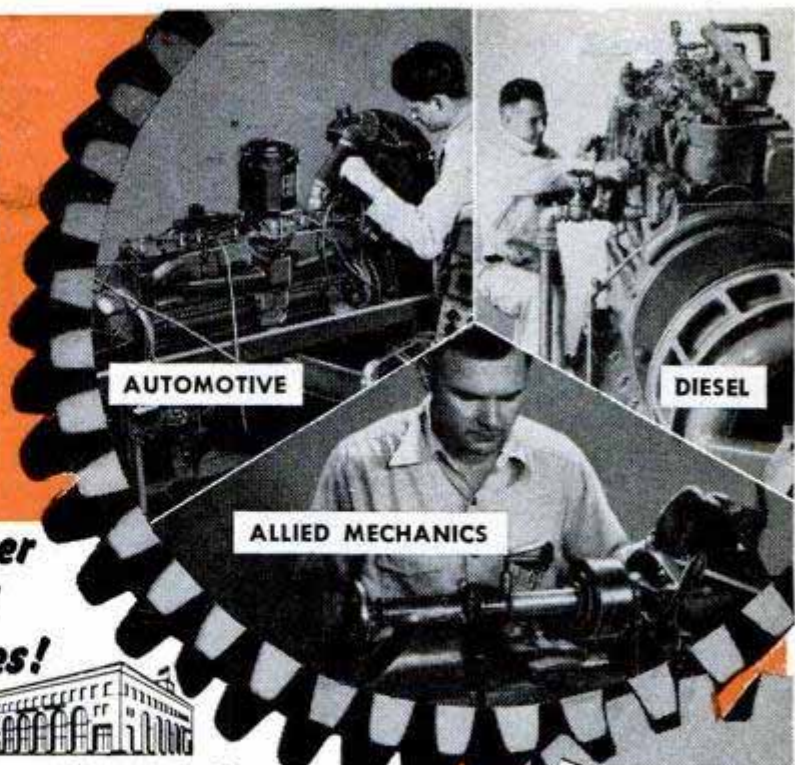
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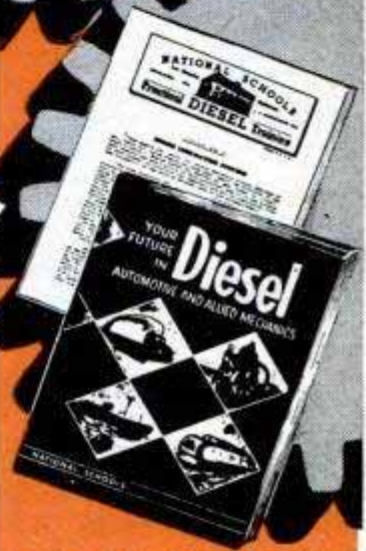
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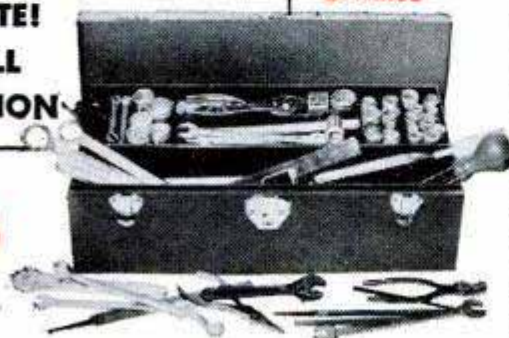
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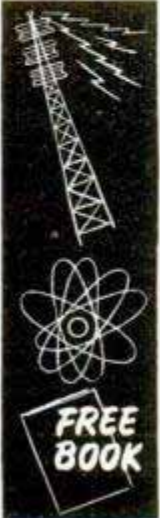
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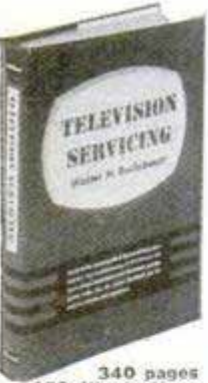
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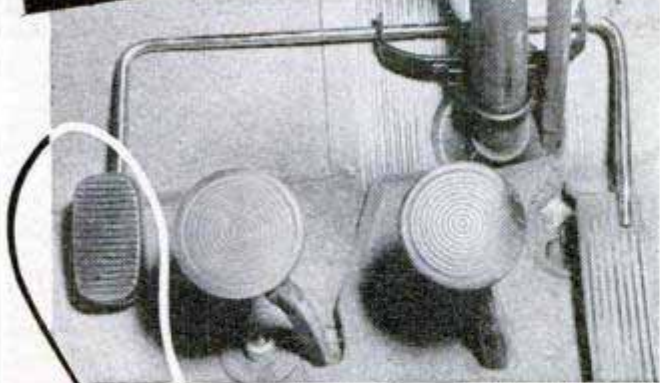
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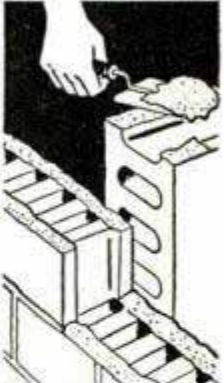
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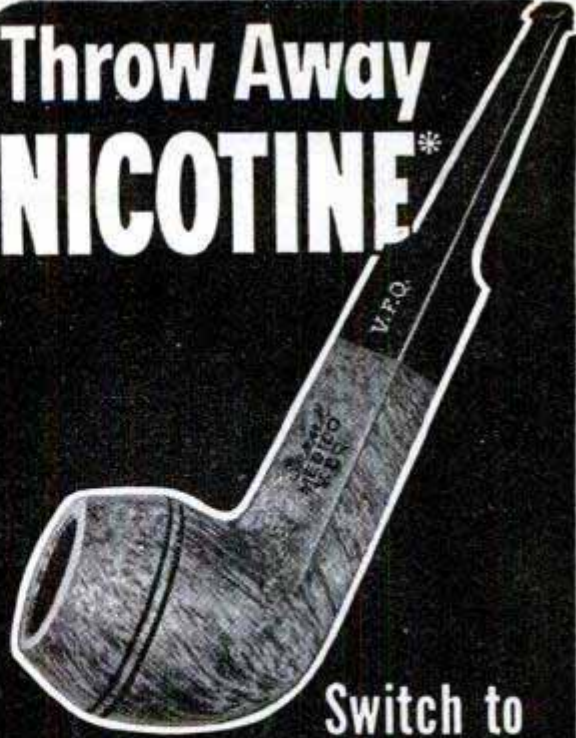
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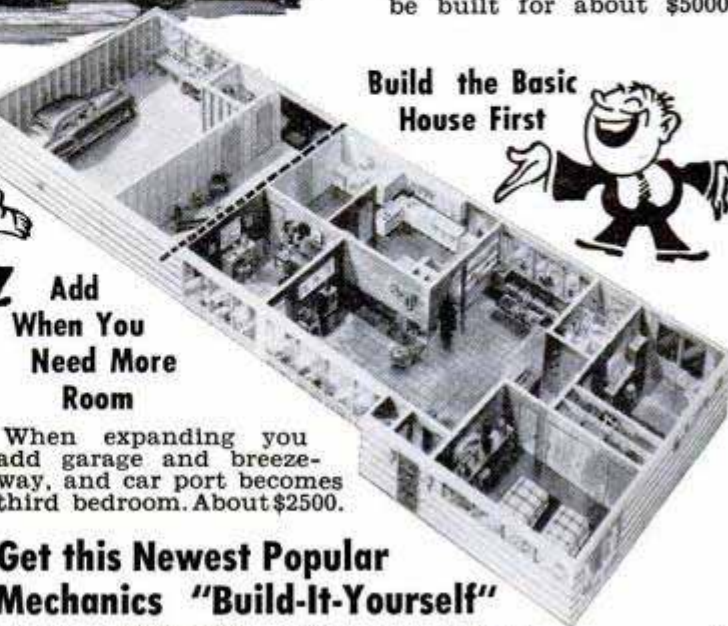
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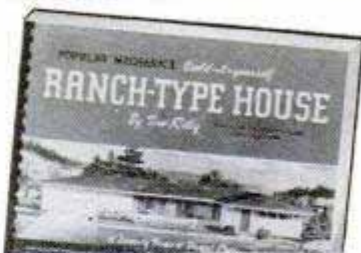
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MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience, no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

\$5 HOUR Easy! Sell name plates for houses. Free sample, order blanks. Write: National, 214 Summer, Boston, Mass.

SELL By mail, free details. Instructive booklet 25c. Manhattan House, Box 50-M, New York 28, N. Y.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

FIGURINE Molds and many others, liquid rubber, statuary plasters, flock finishes, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

SAWDUST, Scrap wood, over 150 cash uses 25c. Lee, Box 502, Chicago 90.

EARN Money at home with your typewriter! Spare time! Details free. Edwards, Publisher, 3915-PM, 12th, Des Moines 13, Iowa.

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NEED Money? Stop wishing! Do something! Free information. E. L. Godfelter, Box 23, Loganville, Penna.

UNPAINTED Figurines. Illustrated list. Free. Oman, 642 Broadway, St. Paul 1, Minnesota.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-R Chestnut, Hamilton, Ohio.

A Business in your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Western B Aircraft, Los Angeles 19.

BUY Wholesale—Million articles. Supply source directory, dime. Nelko, Box 3462-DR, Chicago 54, Ill.

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BOOKKEEPERS Boost income operating simplified bookkeeping service. Kern, 4942 Vineland Avenue, North Hollywood, Calif.

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

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READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

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MOLDING Rubber, \$2.95 qt.; \$9.95 gal. prepaidd. Plastercraft Supply Co., 3051 St. Clair Ave., Cleveland 14, Ohio.

HI-Profits, internally hand carved plastics, gifts, jewelry. Free catalog. Pilot Plastics, 67 C-Fulton St., New York City 7.

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AGENTS WANTED

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SELL Our waterproofings, floor mastic, cement hardener, etc. (30 items) to maintenance men, building owners, contractors. Can start part time. Commission. Territory. Write Haynes Products Co., Desk 6, Omaha 3, Nebr.

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\$5 HOUR Easy! Sell name plates for houses. Free sample, order blanks. Write: National, 214 Summer, Boston, Mass.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

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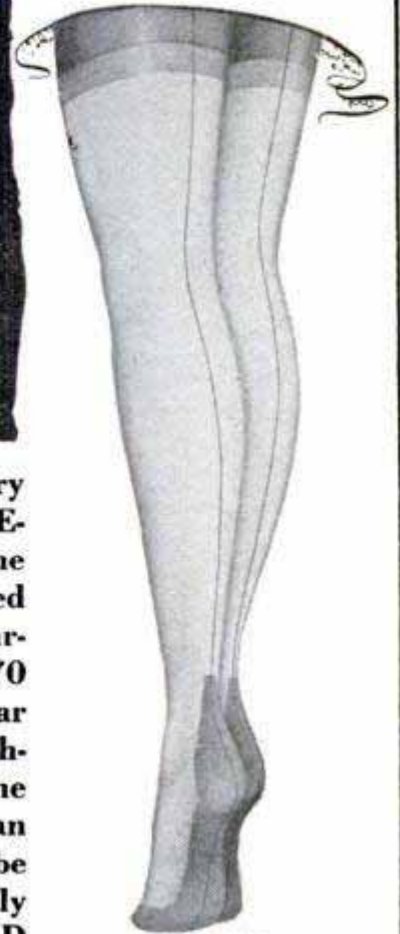
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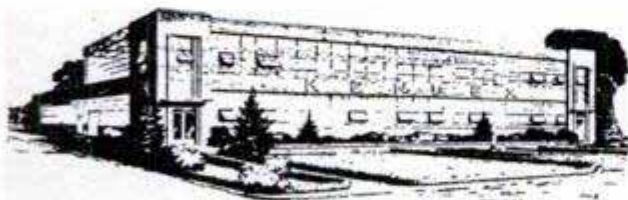
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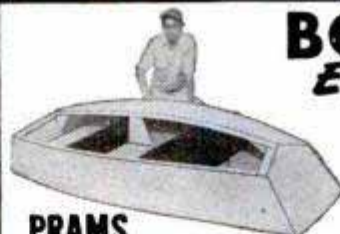
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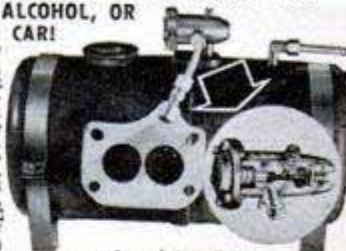
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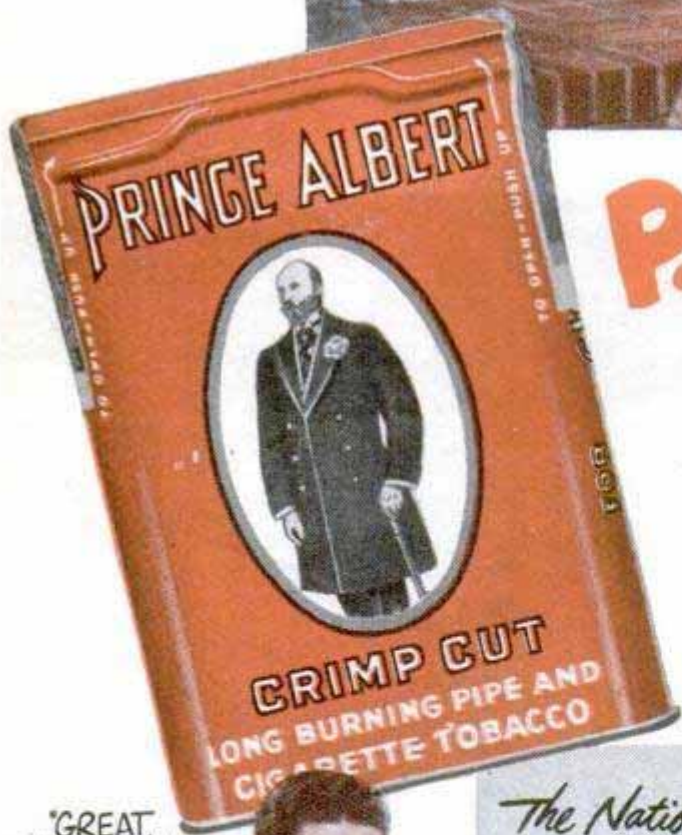
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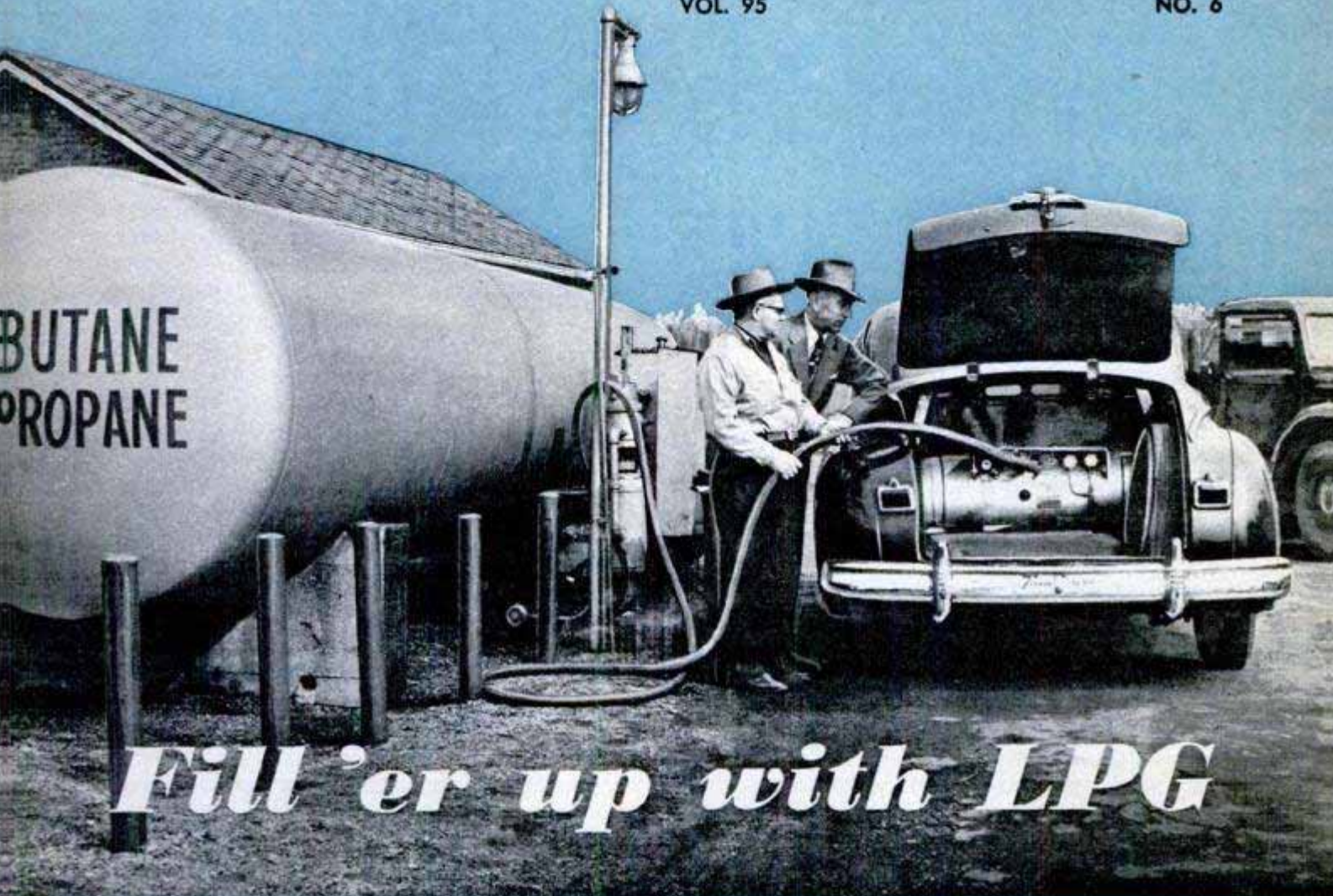
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Fill 'er up with LPG

The author, right, gets a tankful of LPG at a Chicago service station. Note the special tank in the trunk

By Jud Purvis

IT IS NO TRICK at all to run an automobile without gasoline **IF**—but thereby hangs quite a tale. It can be done and is being done every day by thousands of people in the United States. My car is one of the many now running on LPG.

LPG is the common term for liquefied petroleum gas which may be butane, propane or a mixture of both in varying proportions. Butane and propane are manufactured in the process of making gasoline and can also be obtained directly from natural gas. For this reason, there is an abundance of both and the price is low. These gases sell at the refinery in liquid form for as little as four cents per gallon and can be bought retail at considerably less cost per gallon than gasoline.

In current refinery practice, about half of each gallon of crude oil is turned into gasoline. During the process about two percent of the crude is converted into butane and another two percent into propane. A cubic foot of natural gas is over half methane, about six percent butane and about 12 percent is propane. Only about 20 percent of the amount of LPG available is sold at present, which accounts for its low cost as an automotive fuel.

LPG is now being used as fuel in airplanes, automobiles, trucks, tractors, buses, taxis and stationary engines. Last year 100,000 farm tractors were equipped with conversion units to burn LPG. There are nearly 600 LPG-burning busses in use in 18 U. S. cities today compared to very few



Operating on LPG, a Minneapolis-Moline tractor pulls a disk plow over a rice seed bed near Lake Charles, La.

only 18 months ago. One enthusiast predicts that in time 15 percent of the motor fuel burned in this country will be LPG. It also is used for heating, cooking and illumination, in blowtorches and cigarette lighters as well as many other applications where pressure containers can be utilized. It must be stored and handled under pressure to keep it in liquid form.

Butane boils at 31 degrees Fahrenheit and propane boils at minus 44 degrees Fahrenheit. As it is impractical to store and handle it at such a low temperature, it is kept in liquid form by storing it under pressure until it is used.

If LPG is to be used in an automobile or other internal-combustion engine, it must be reconverted into a vapor and mixed with air before it will burn in the engine. Space limitations in any automotive vehicle require that it be stored as a liquid and therefore under pressure. This requires a strong tank. Ordinarily, a tank tested to withstand 200 pounds per square inch is used.

As the fluid is under pressure, a sealed system must be used with positive closing valves in the circuit between the tank and

the engine. One of these valves is often of the electric-solenoid type and is connected with the ignition switch so that the valve is open only when the ignition is turned on.

When the ignition is turned on, the solenoid valve admits the liquefied gas at high pressure into a converter where it is allowed to expand into a dry gas. The gas is then piped to the mixing valve, or "carburetor," at low pressure from whence it is admitted to the engine and controlled by a throttle valve. A filter is placed in the fuel line near the converter to filter out any possible contaminants.

The converter has a water jacket around it which is connected to the engine water-circulation system. This heating of the converter prevents any frosting which might occur inside the converter due to the lowering of temperature as the pressure is reduced.

Excess heat is not wanted on the intake manifold either, so engines designed to run on LPG have "cold" manifolds. That is, they are not connected to the exhaust manifold as is the case with gasoline engines. When a gasoline engine is converted to

Right, W. D. Mitchell, engineer for Phillips Petroleum, tests the operation of LPG in a car designed for this purpose. He is trying to detect detonation with the help of a knock meter

Opposite page, left, hidden in the trunk of the Phillips test car are these two heavy tanks, each holding 18 gallons of LPG

Opposite page, right, beneath the hood of the test car there are several "extras" needed to modify the engine for burning LPG. Pressure regulator and vaporizer are in upper left and filter and valve are in center



LPG, it is customary to remove the manifold-heating equipment.

In addition to the fuel system and manifold changes made in conversion to LPG, it is desirable to increase the compression ratio of the engine in order to obtain full advantage of the antidetonating virtues of the gas. The average compression ratio has been increased in the past few years from about 5 to 1 until now it is nearer 7 to 1.

This has been made possible by improvements in design of the engine and improved fuels. The higher the compression ratio the more power is obtained from an engine of given size. The limiting factor is detonation or spark knock and, of course, ethyl fluid helps in this direction by slowing down the rate at which the fuel burns or "explodes" in the cylinder.

LPG burns exceedingly slowly and thus has a knock rating far above that of the best ethyl gasoline obtainable. For this reason, it is possible to operate an engine at a 10-to-1 compression ratio or even higher if desired. This means a tremendous increase in power. In addition to the increase in power, there are other advantages in the use of LPG—and there are some disadvantages.

Among the advantages is decreased engine maintenance. LPG is a clean-burning gas and leaves no deposit of carbon in the engine. As it is a dry gas it does not dilute the oil and form sludge in the crankcase. As it does not wash the oil from the piston rings and cylinder walls, wear is greatly reduced in the engine. With no carbon, no dilution and no sludge, it is not necessary to drain and replace the crankcase oil nearly so often.

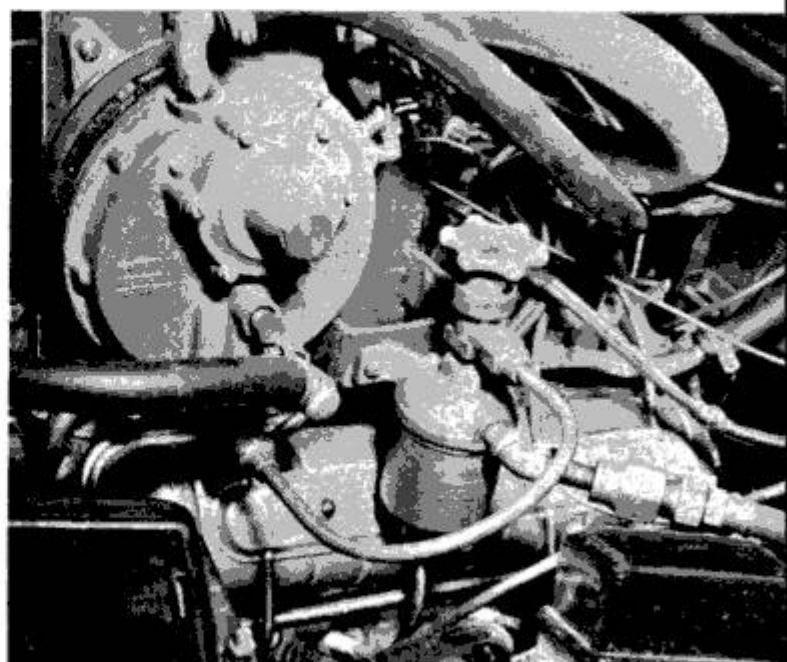
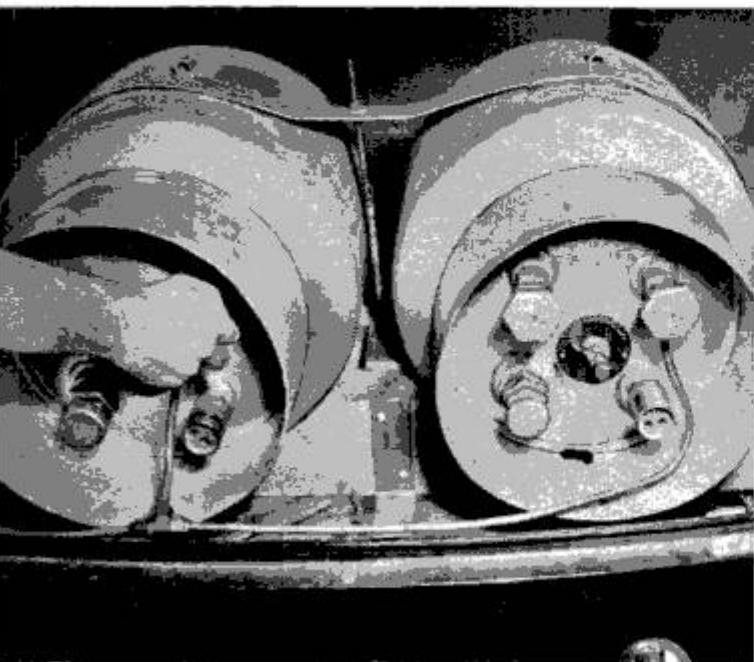
All of this results in less frequent replacement of piston rings, bearings and other engine parts as well as less frequent valve

grinding. Other advantages are an inoffensive exhaust and decreased fire hazard.

Among the disadvantages, the principal one is lack of wide distribution facilities in many cases. On the West Coast it is often readily obtainable. Another disadvantage in the case of converting to LPG is the cost of the new tank and other equipment such as converter and valves. It costs \$200 to \$400 for a conversion unit on a passenger car; on tractors built to burn gasoline the units range in cost from \$175 to \$300. Furthermore, the manufacturers of this equipment cannot keep up with the demand and it is difficult to obtain parts needed for the conversion.

The owner of a passenger car would need to run up considerable mileage to justify the cost of such a conversion. The operator of a truck or tractor, however, finds it pays off rather quickly on a dollars-and-cents basis. Many operators of fleets of trucks and most particularly fleets of busses are investing heavily in LPG-powered engines and conversion equipment. A bus company in Phoenix reports that since the company's vehicles have been converted to LPG they go 15,000 miles without an oil change. In Los Angeles, a milk company runs its trucks 8,000 to 16,000 miles without changing oil and estimates a saving of 25 percent on operating costs.

One disadvantage in passenger-car conversion is that the pressure tank is put in the trunk and considerable space is taken up by a 35-gallon tank. Some city authorities are concerned over the safety of LPG-burning vehicles. For example, New York City bars them from operating in tunnels. There should be no more danger from LPG than gasoline if the conversion unit is properly installed. As a matter of fact, an LPG tank will not explode if you have





an accident and, if the tank is ruptured, the gas will burn like a blowtorch. This elimination of explosion danger is a factor for the safety experts to consider.

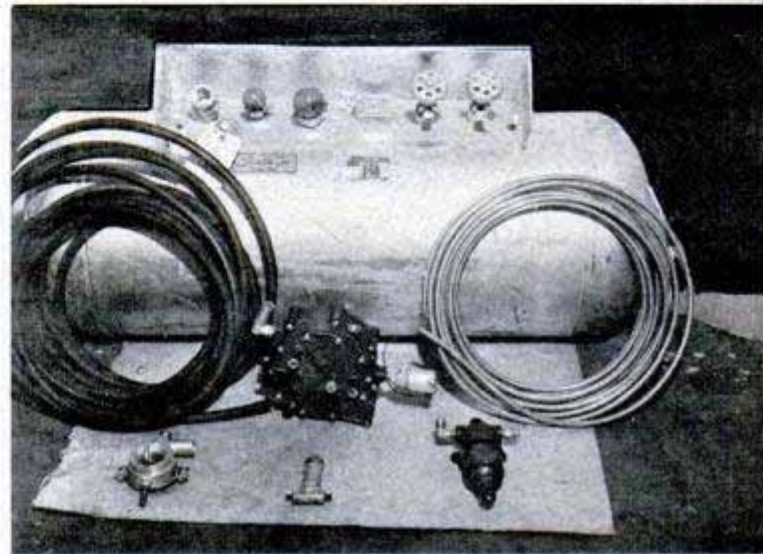
The type of equipment I have in my car is set up to function with the regular gasoline carburetor and, therefore, I can switch from gasoline to LPG and back again merely by flicking a switch on the instrument panel. The new tank was installed in the trunk space and the LPG carburetor on top of the gasoline carburetor.

In order to accomplish this it was necessary to use two electrically operated solenoid valves; one in the LPG line to the converter and another in the gasoline line to the carburetor. These solenoids are connected to a three-way switch on the instrument panel which is connected to the ignition switch. The valve-control switch does not operate until the ignition is turned on so therefore neither valve is open.

In one of the three switch positions, the valve opens for gasoline and closes for

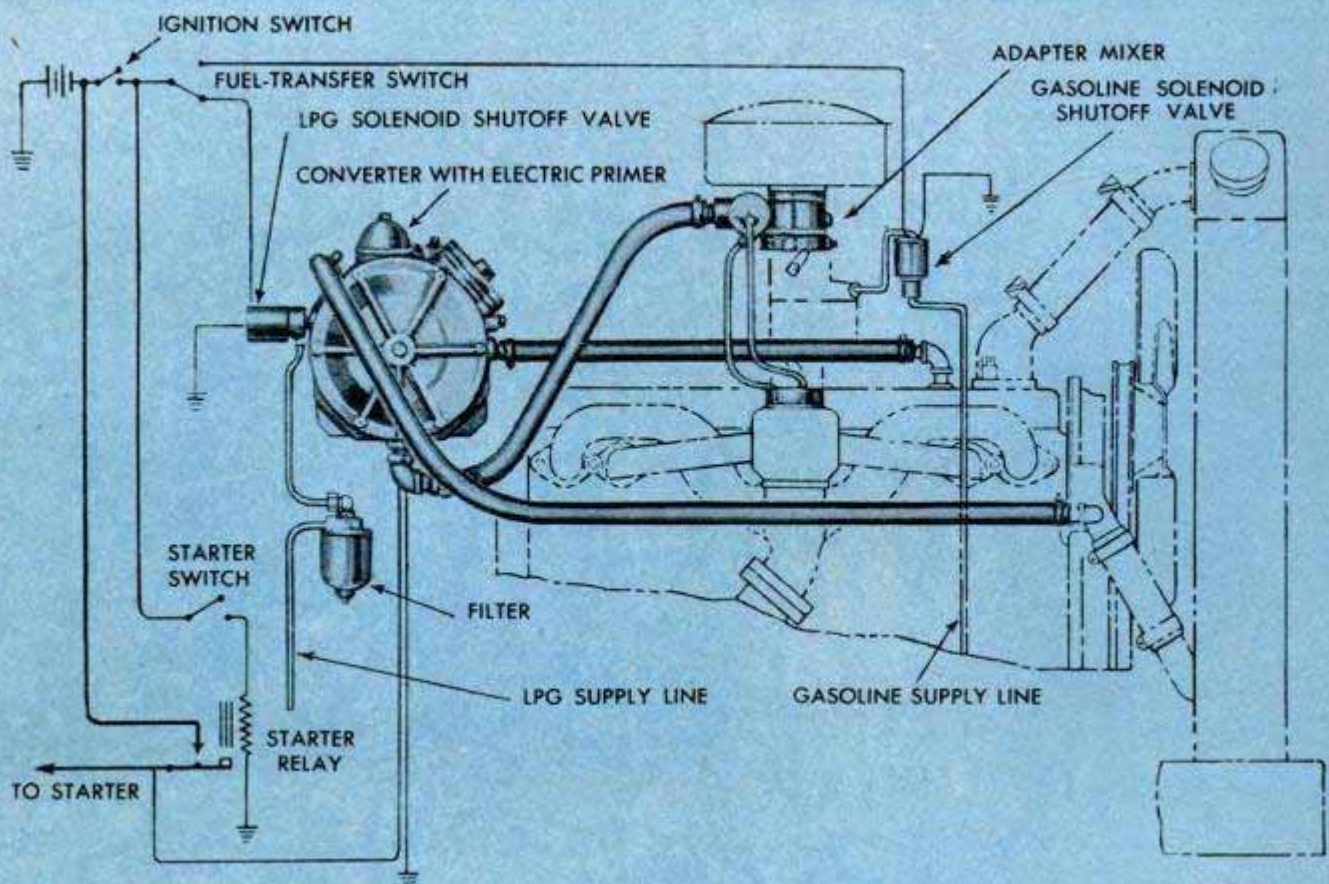
(Continued to page 238)

Even airplanes can use LPG. This Aeronca is being filled with the liquefied petroleum gas at Chicago. Below, the complete conversion kit. In it are the tank, converter, valves, carburetor and other parts



Below, diagram of a combination system that burns either LPG or gasoline. Solenoid valves provide the positive shutoff required for high-pressure liquid

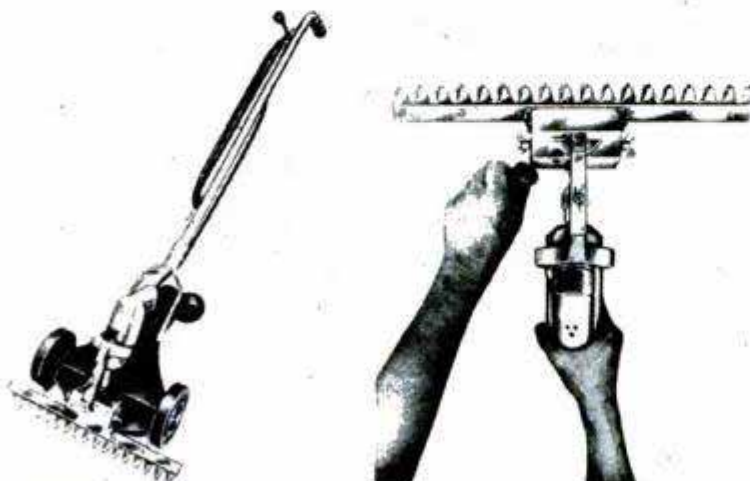
Diagram courtesy American Liquid Gas Co.





Hollow Log for Birling

Birling, or log rolling, traditional sport of the American lumberjack, may become a national recreational activity now that a hollow practice log has been developed. It was designed by George Glazier of Washburn, Wis., 71-year-old former birling champion. The log is a hollow pine cylinder with four metal tanks inside to add buoyancy. Any desired amount of water can be added to the tanks to make the log float deeper and slow its action. Tennis shoes are worn on the smooth surface instead of the conventional spikes. For beginners, a heavy canvas matting can be fastened around the log to increase traction on the surface. Glazier built the practice log to stimulate interest in the sport of the lumberjack.



Triple-Duty Garden Tool

Attached to any standard $\frac{1}{4}$ -inch electric drill, a new garden utility tool trims and edges lawns and cuts hedge. It cuts easily under trees, flower beds, shrubbery and fences, and along walks and gates. Operating at low speed, it can be used to trim hedges in any style or shape desired.

☐ In a normal year of driving the average automobile's spark plug fires 72,000,000 times.



Atomproof Camera

On-the-spot photographs are produced in two minutes by an Army Signal Corps camera with plates that are not affected by atomic radiation. These plates need no chemicals for processing. The plates are selenium-coated and sensitized by an electrical charge. When the shutter is open and light hits the charged plate, the electricity leaks off the sensitized material in proportion to the amount of light received and is

grounded on the plate. The electrical image remaining becomes apparent when finely ground charcoal or anthracite dust is blown across the plate. Wherever the electrical charge remains, the dust sticks, and the more electricity left on the plate, the more powder adheres. The powdered image is then transferred to ordinary paper or other material coated with an adhesive layer, such as rubber cement. Transparent plastic film is pressed against the picture to fix the print. Plates can be wiped off and reused.

Soluble Coffee Crystals Formed in High Vacuum

Evaporated in a high vacuum, a soluble coffee is sold in crystal form that dissolves instantly in hot or cold water. In the manufacturing process, the coffee beans are roasted and ground after which the coffee is extracted as a liquid concentrate. This

concentrate is sprayed on a stainless-steel belt that carries it into a high-vacuum chamber where the liquid is evaporated. The crystals which remain are scraped off and packaged by Holiday Brands, Inc., of Boston, Mass.

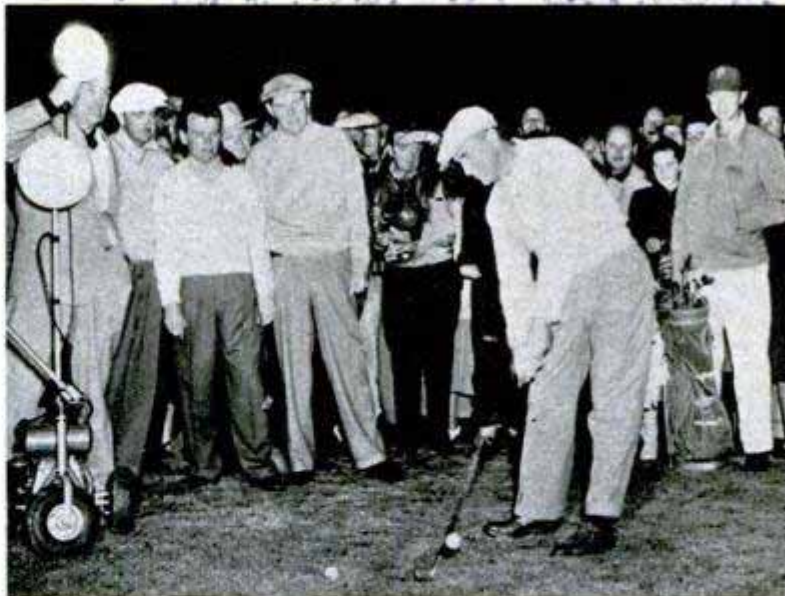


Balzer Mfg. Co., Mountain Lake, Minn.

Stubble Cleaner

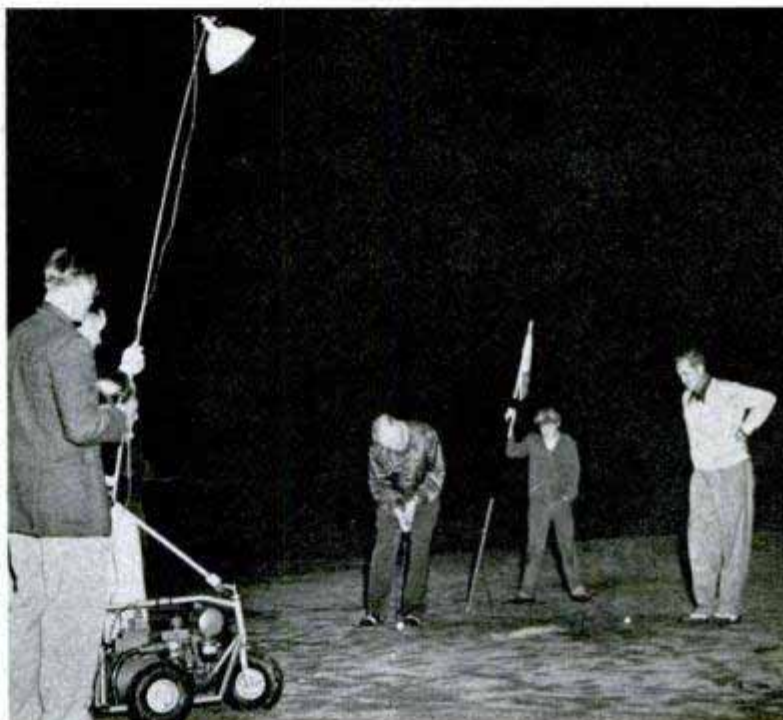
Straw in the path of a plow is gathered by the teeth of a new stubble cleaner and rolled into the furrow for use as humus. The cleaner, designed by Daniel F. Winter of Ceylon, Minn., has been field tested with small grain, flax and soybean straws, cornstalks and other loose-lying vegetation.

U. S. reserves of coal, oil, gas, oil shale and tar sand, all fuel sources, will last 1000 years, says C. F. Kettinger, General Motors director.



Mobile Spotlights For Night Golf

Use of a mobile "golf spotlight" may enable another daytime sport to follow the night-owl steps of baseball and football. In one test in a California tournament, the winning player shot a one-under-par score. The three elements of the lighting unit are a spotlight that follows the drive, another spotlight that illuminates the tee and driving area and a floodlight that shines over the greens area. Each light generates 600,000 beam-candlepower. A gallon of gasoline keeps the two-horsepower engine driving the electric generator in operation for about four hours of playing time.



Rubber Brush Cleans Typewriter Type Without Liquid



Requiring no liquids, a small cylindrical brush with raised dots scrubs the ink off typewriter type in a few seconds. The brush consists of three parts—a rubber handle, a sponge-rubber pad and a snap-on rubber cover. Rubbing the brush across the keys cleans off the ink. The cover can be replaced when it wears out.

Sources of supply for available products described in this issue are listed in the index starting on page 12. Sources of further information on other articles in the magazine are listed in the WHERE-TO-FIND-IT LIST, which is available without charge from Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11



Out of sight below decks of this 150-foot trawler, *Oceanlife*, is a factory for cleaning and freezing fillets

The Frozen-Fish Factory Goes to Sea

By Dick Frederick

OFF THE TEEMING fishing grounds of the Grand Banks, east of Newfoundland, a new kind of fishing ship is riding the North Atlantic swell. Except for her streamlined wheelhouse, where the captain stands amid an array of modern instruments, you can't tell her from a dozen other big trawlers.

But below decks, no other New England trawler ever looked like the *Oceanlife*. The ship is a complete seagoing fish factory. As fast as fish are caught, they are chuted into a compact processing room where experts immediately scale them, fillet them, weigh them out, package them, pop them into a freezer and pack them into cartons.

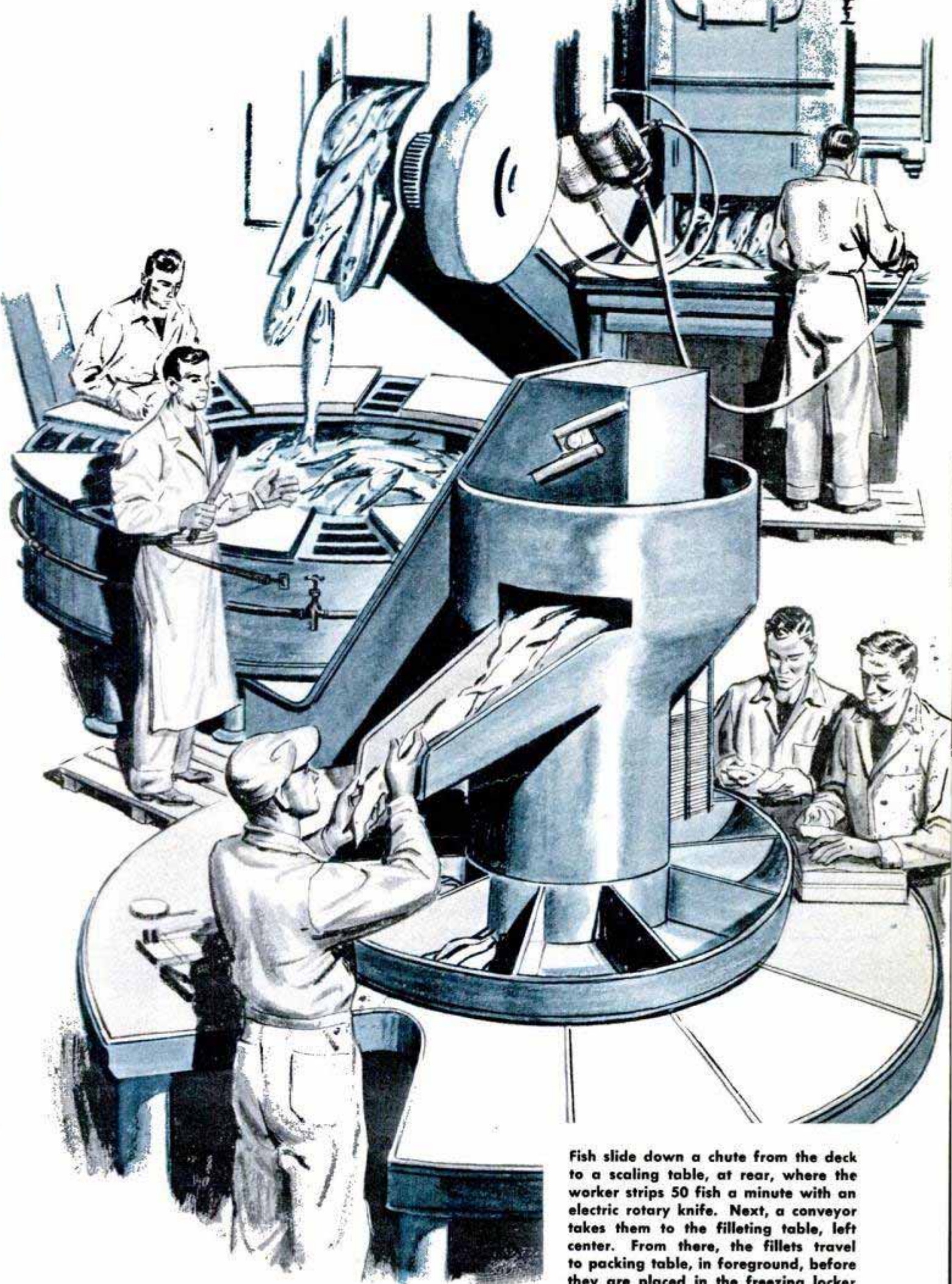
The cartons are stowed in a refrigerated hold, where they stay frozen solid until the ship reaches port and a refrigerated truck picks them up for delivery to your neighborhood store.

For more than two centuries, New England fishermen, plying out of Gloucester, Boston, Portland and New Bedford, have stored their fish whole in "pens" below decks, using chopped ice to keep them fresh

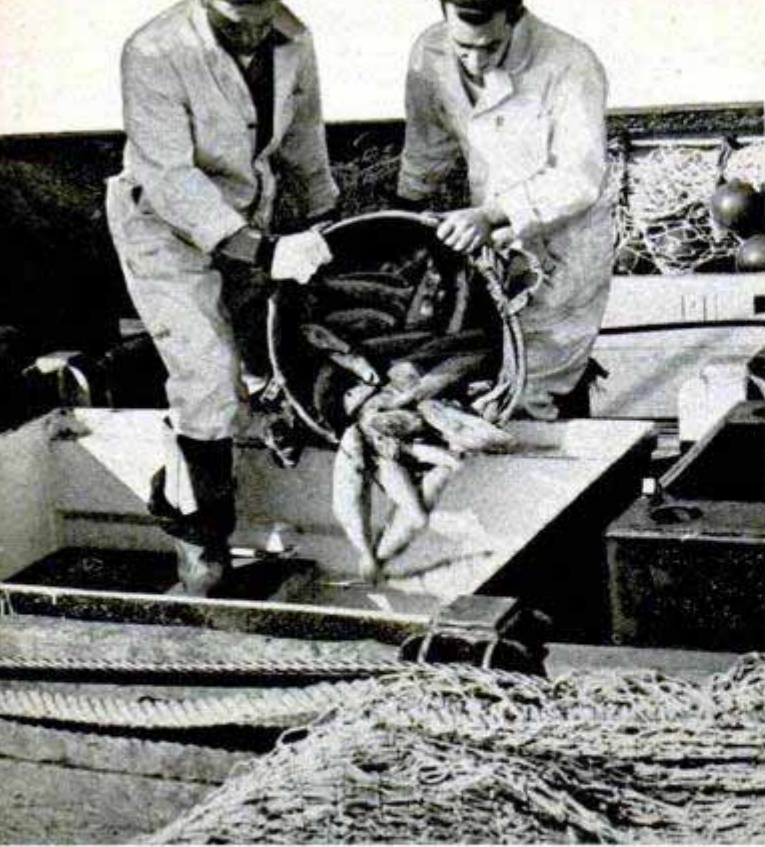
until they came back to port and the fish could be filleted and frozen in shore plants. There was little or no spoilage of the catch. Vast schools of haddock, cod, redfish and flounder abounded on the banks only a few hours out.

But modern trawling and dragging methods have devastated the area through many years of over-fishing. Nets have gone deeper, not only scooping up most of the fish, but scraping the bottom and destroying the feeding grounds on which the schools thrived. Lately, trawlers have had to stay out for days, chancing spoilage, in order to catch a payload on the depleted banks, or risk going farther north to the flourishing banks off Canada. With the time limitation necessary to prevent spoilage, that meant a three or four-day trip each way, with only a few days left for fishing. This is fine, any fisherman will tell you, if the fish happen to be where you drop your net. But often they're not and many a trawler has returned with pens half empty—or full of half-spoiled fish—a costly operation either way.





Fish slide down a chute from the deck to a scaling table, at rear, where the worker strips 50 fish a minute with an electric rotary knife. Next, a conveyor takes them to the filleting table, left center. From there, the fillets travel to packing table, in foreground, before they are placed in the freezing locker



These fishermen are dumping a basketful of fish into the chute that takes them down to the scaling table

This situation set a Boston marine manufacturer named Isadore Bromfield to thinking. "I dreamed of a ship," he says, "that could process the fish in some way to preserve them. For such a trawler, time and distance to fishing grounds would mean nothing. There would be no spoilage. Freezing was the logical answer. If you could freeze a catch in a small freezing plant ashore, I wondered, why couldn't I adapt the same equipment to a ship?"

Bromfield and his sons went to work at the drafting board. With the help of a Boston banker, he bought a 22-year-old trawler. She was 150 feet long, 25 feet

abeam. His men stripped her from stem to stern. Into her engine room went a 690-horsepower diesel, capable of pushing the ship through the waves at a solid 11 knots. Beside the big diesel went a 20-ton refrigeration plant, working on the ammonia-absorption principle.

In this system, ammonia circulates through condensers, heat exchangers and a vast system of pipes that snake back and forth across the overhead like a maze of spaghetti. They keep the entire hold and its capacity of 150,000 pounds of frozen fish at a zero arctic chill. In a glittering modern wheelhouse, with sloping front, went the best in radio and navigation instruments. The ship was altered to carry 30 days' supply of stores, food and fuel.

In the 'tween-decks section went the heart of Bromfield's dream—a stainless-steel factory space, about 25 feet square and a masterpiece of compactness. Circular tables permit 12 men to work in a small space. Revolving trays and conveyors move the fish from station to station and wash them as they go.

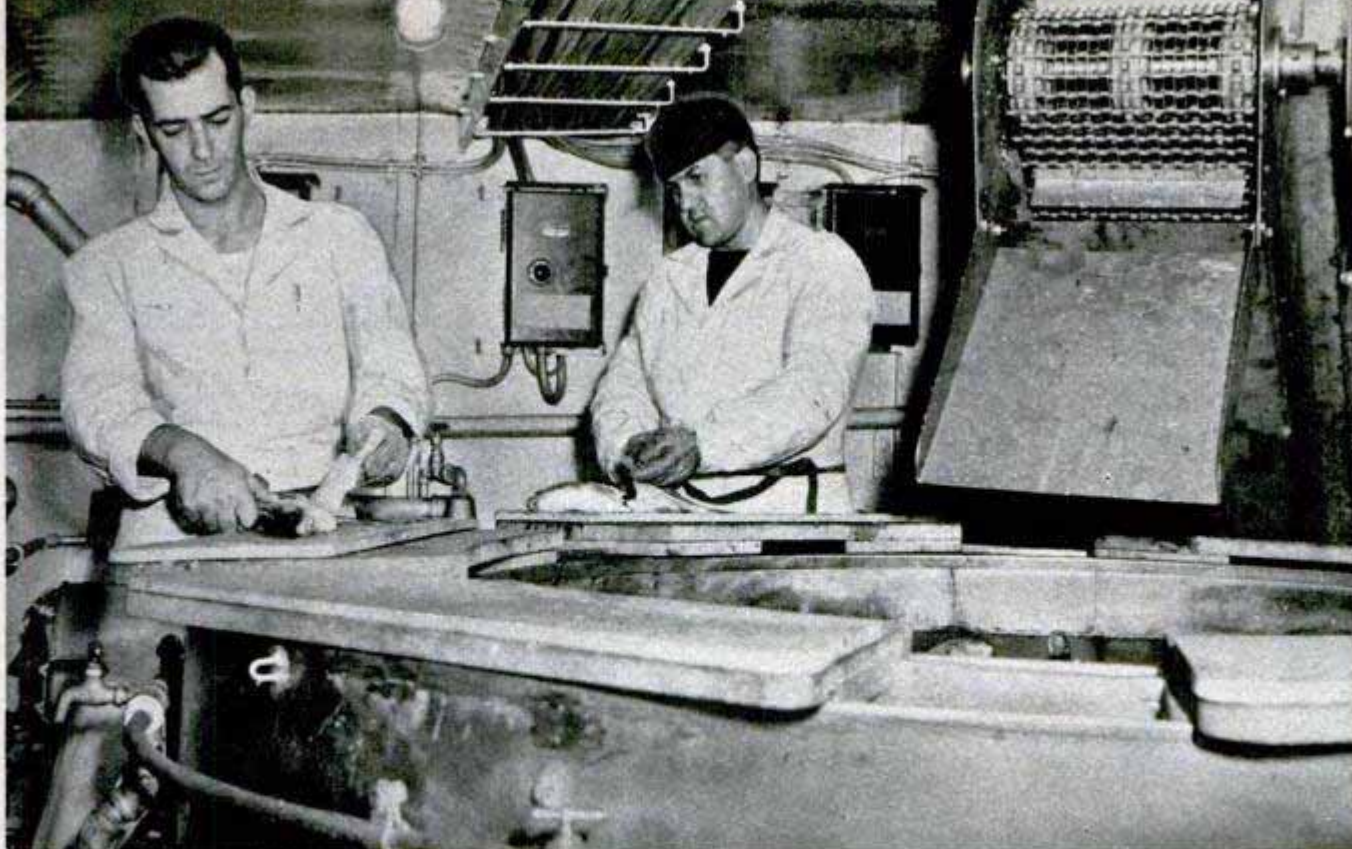
"Freezer experts ashore claimed that rough sea conditions were the main reason my floating fish factory wouldn't work," says Bromfield. "Too tippy. Well, they changed their minds. Today, the men who sneered most are the loudest in their praise. We invited them on our first five-hour test run, when we processed 8000 pounds of fish. Every one of those men went home with a package of frozen fish which he'd seen filleted that same day." On three subsequent voyages, the Oceanlife was out about a month each time. And each time she returned to port with her hold sagging under the weight of 150,000 pounds of fresh-frozen fillets.

It takes a crew of 25 men to run the ship. Twelve are factory workers—six cutters,

Water is pumped through rotary knife as workman scales fish with electrically driven tool shown at right



Bromfield, 1179. Co., Inc.
246 Border St.
East Boston, Mass.



Here are the filleters who swing razor-sharp knives, filleting each fish neatly in just two quick strokes

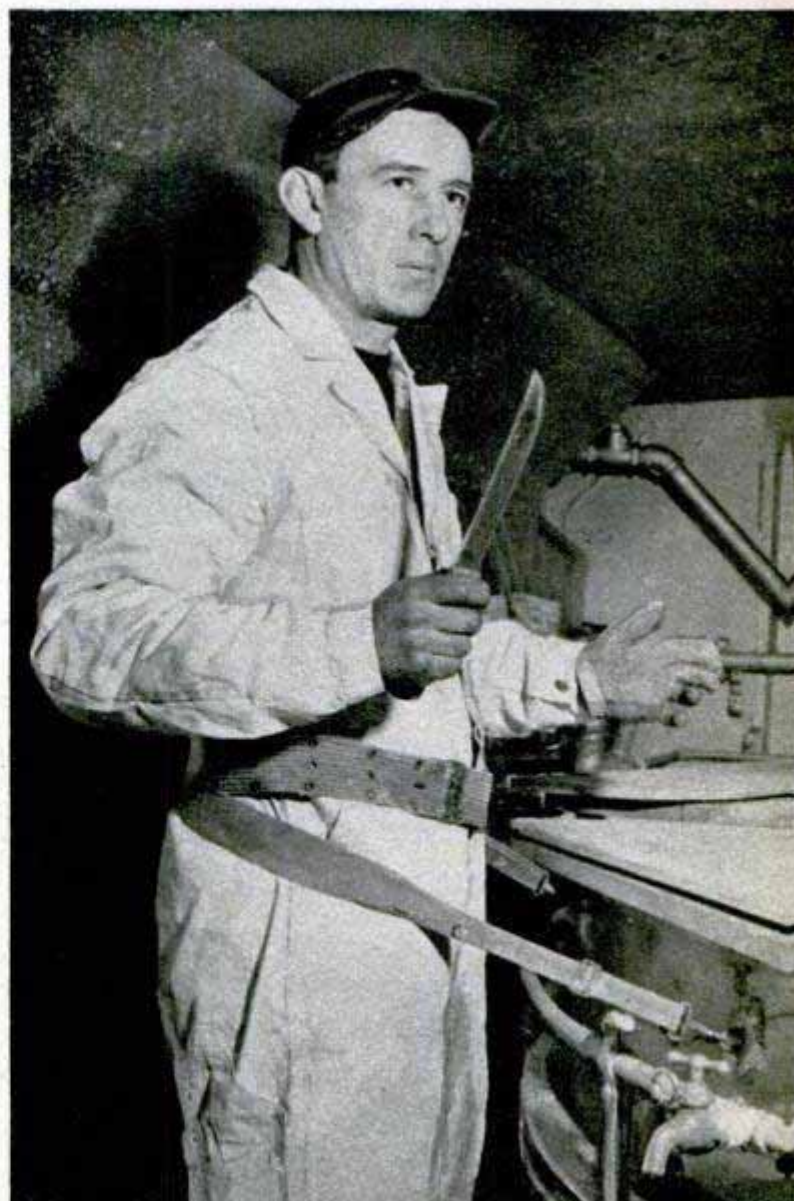
When the sea gets rough, the filleters wear safety belts around their waists and don steel-mesh gloves

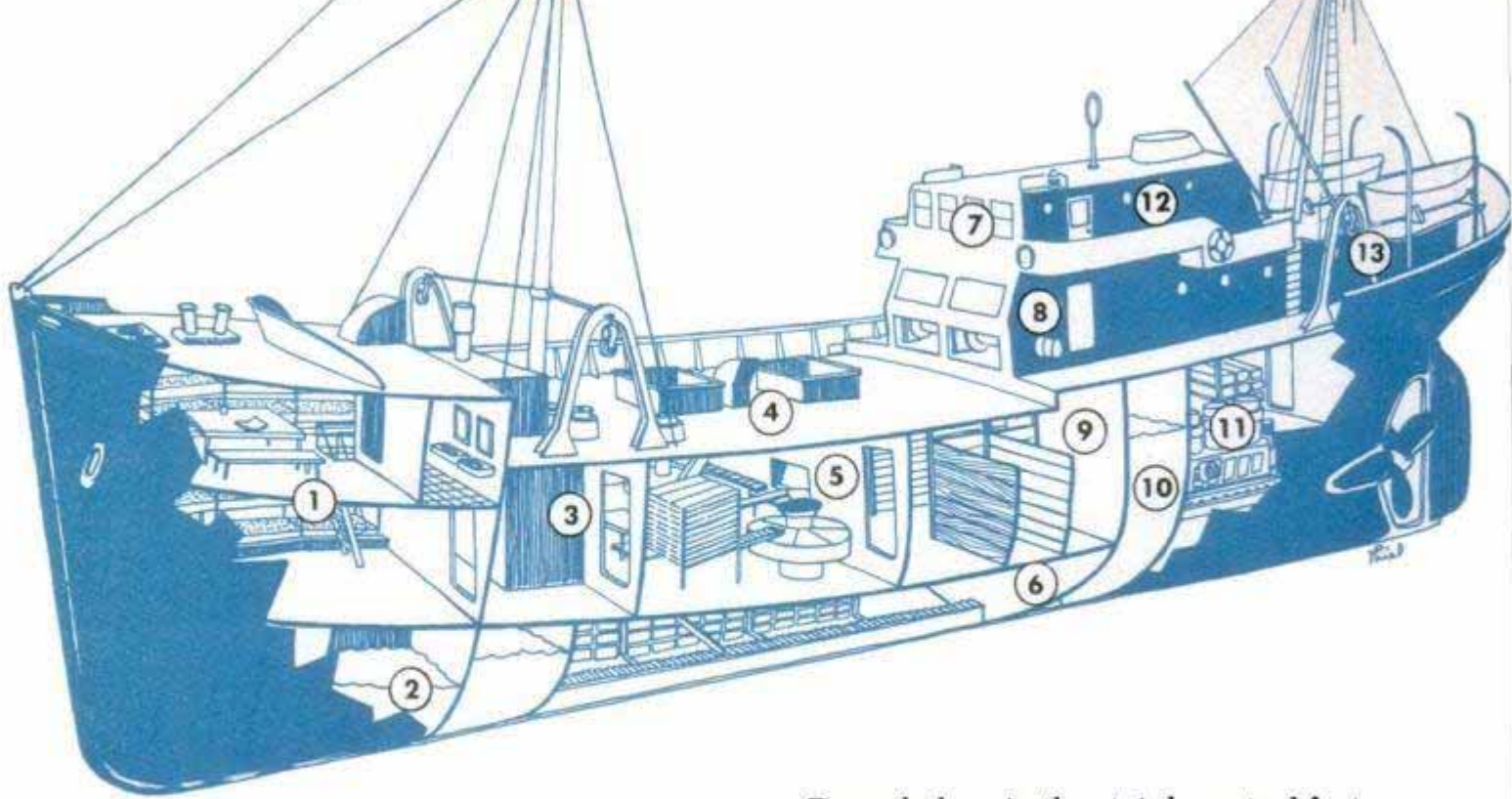
two scalers, two wrappers, one weigher and one general worker. The rest are fishermen and ship's crew.

The big nets on the Oceanlife are 180 feet long. Their mouths open in a 100-foot yawn from side to side, to scoop up the fish.

For one or two hours, the net is dragged astern. Then the winches go into reverse. Slowly the net comes back aboard. At last the cone, or "cod end," fat with a 15,000-pound harvest of silvery fish, is raised dripping from the sea into position above the "checkers," or topside sorting bins. Someone pulls the cord that holds the cod end closed at the bottom like the drawstring on a duffel bag. The bottom of the cone opens, spilling the skittering, flapping fish all over everything. Sorters swarm in to begin the job of separating the redfish from the haddock and the haddock from the sole. Bushel baskets of fish are emptied into a hopper on deck that chutes them straight down to the scaling table beneath. If the catches come in too fast for the workers, the fish are diverted into a refrigerated pen room aft of the factory. There they stay cool and fresh until the factory can handle them. The pens will hold 100,000 pounds of extra fish that can be processed as the ship heads back for port.

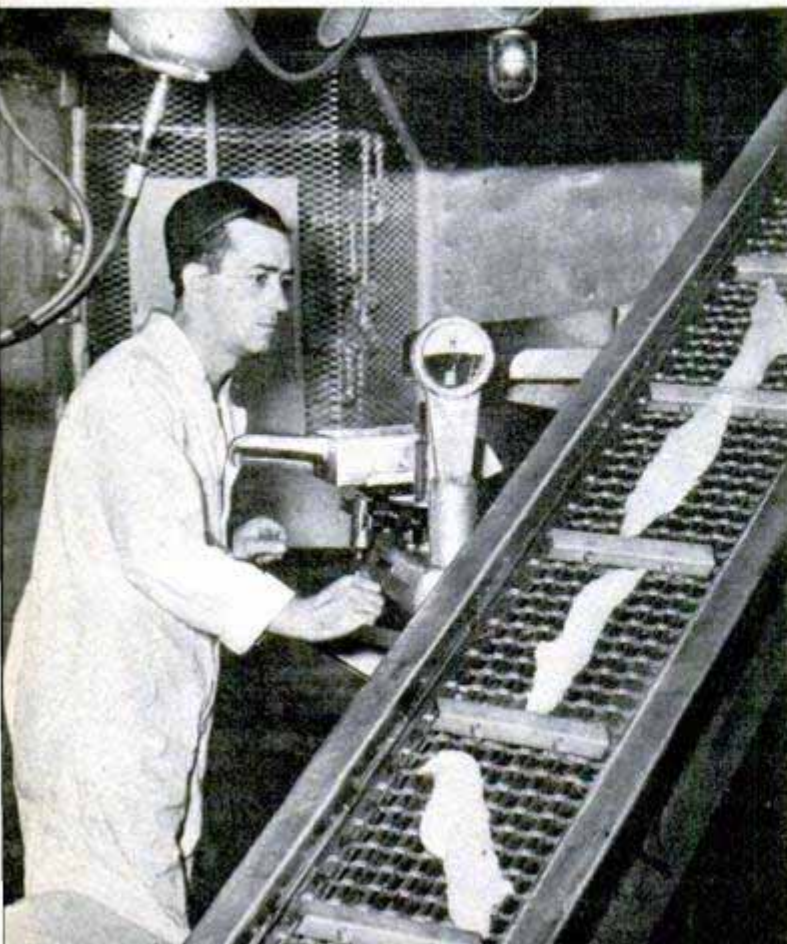
"All our sorting and handling are done by hand," Bromfield explains, "so the fish won't be damaged. On regular trawlers men use pitchforks and scarcely a fillet ever reaches the consumer without half a dozen gimlet holes bored through it. Besides, it ruins the fish skins, which can be sold for making pocketbooks, shoes and the like."





Cutaway drawing of the Oceanlife, showing important parts of vessel. 1. Crew's quarters. 2. Fresh-water tanks. 3. Quick-freeze room. 4. Fishing deck. 5. The processing room. 6. Frozen-fillet storage. 7. Wheel-house. 8. Trawl winch. 9. Fish hold. 10. Oil tanks. 11. Engine room. 12. Captain's quarters. 13. Galley

Close-up of a stainless-steel conveyor shows fillets being carried from cutters to weighers and packers

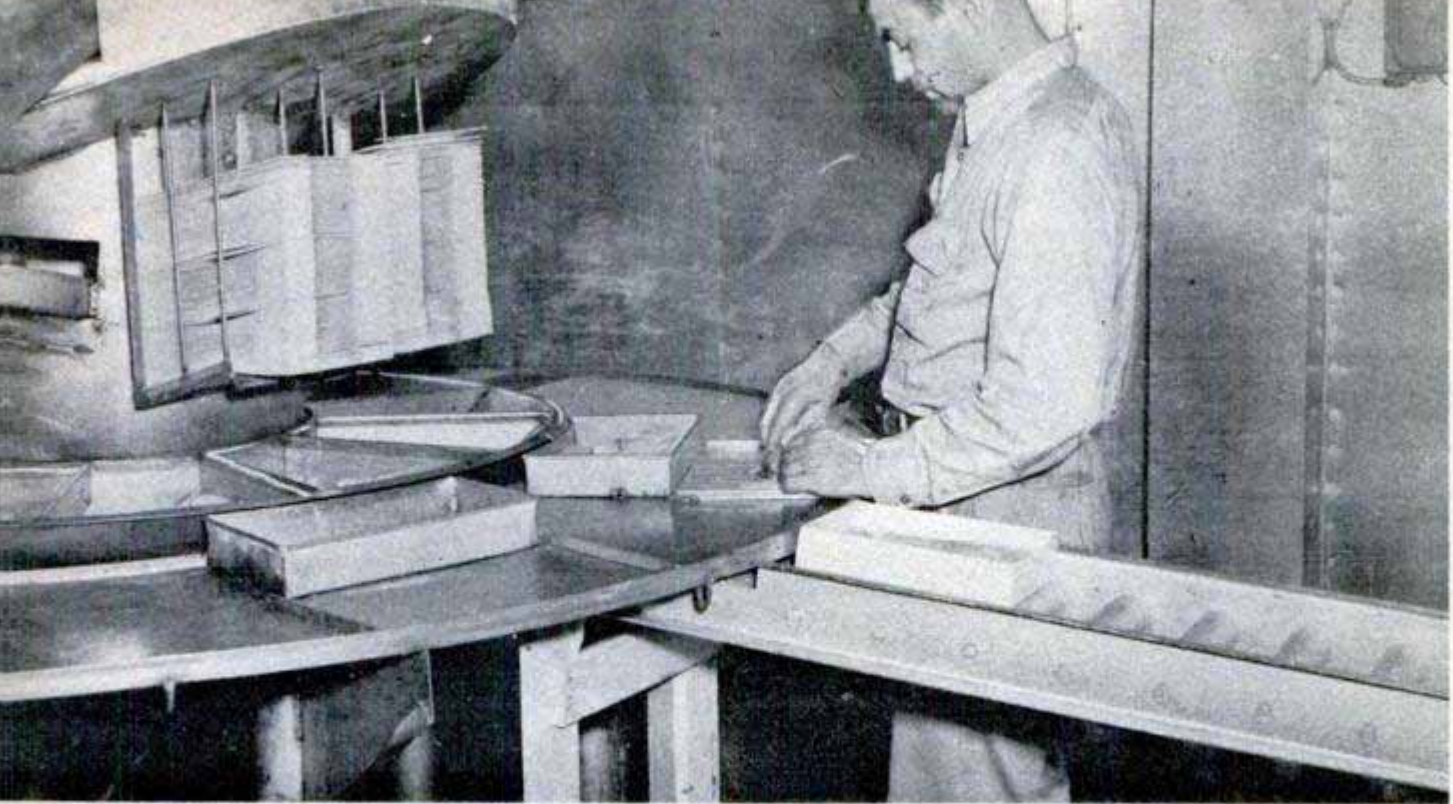


Down below, in the stainless-steel factory room, things are buzzing. At the scaling table, where the fish come chuting from the deck, two men hold electric scalers. These rotary knives, with four swoops up and down a fish, remove all scales. A good scaler can process 50 fish a minute. A stream of water lubricates the fish so the skin doesn't tear and also carries the scales away. Even so, when two scalers are going strong in the factory room, there is a continual snowstorm of wet scales that stick to everything.

Each scaled fish is plopped on a conveyor belt which carries it up, under several sprays to wash off remaining scales, and dumps it into a circular bin. Here the filleters, working with razor-sharp knives, fillet a fish in two motions—once down one side, once down the other.

It's one thing to handle a wicked filleting knife ashore, where the floor stays put, and quite another to wield it on a pitching, rolling craft at sea, where one slip might mean a severed finger. To protect his left hand, which holds the fish, the filleter wears a three-fingered stainless-steel mesh glove. No knife blade can penetrate its mesh. And when the going gets really rough, each filleter dons a safety belt that is lashed to the filleting table. By bracing his feet and leaning back against the belt like a window washer on a skyscraper, the filleter can stand as steady as the Rock of Gibraltar no matter how rough the sea.

As the filleter finishes, he drops the fillet into a deep trough circling the table. It goes to a brine tank, where it gets a thorough washing, and is then carried by conveyor belt to a weighing and packing table. What's left of the fish—head, skeleton and



After they have been weighed into five-pound lots, the fillets are packed in these cartons prior to freezing

innards (called gurry) — is brushed into another slot and is carried up to the deck and over the side.

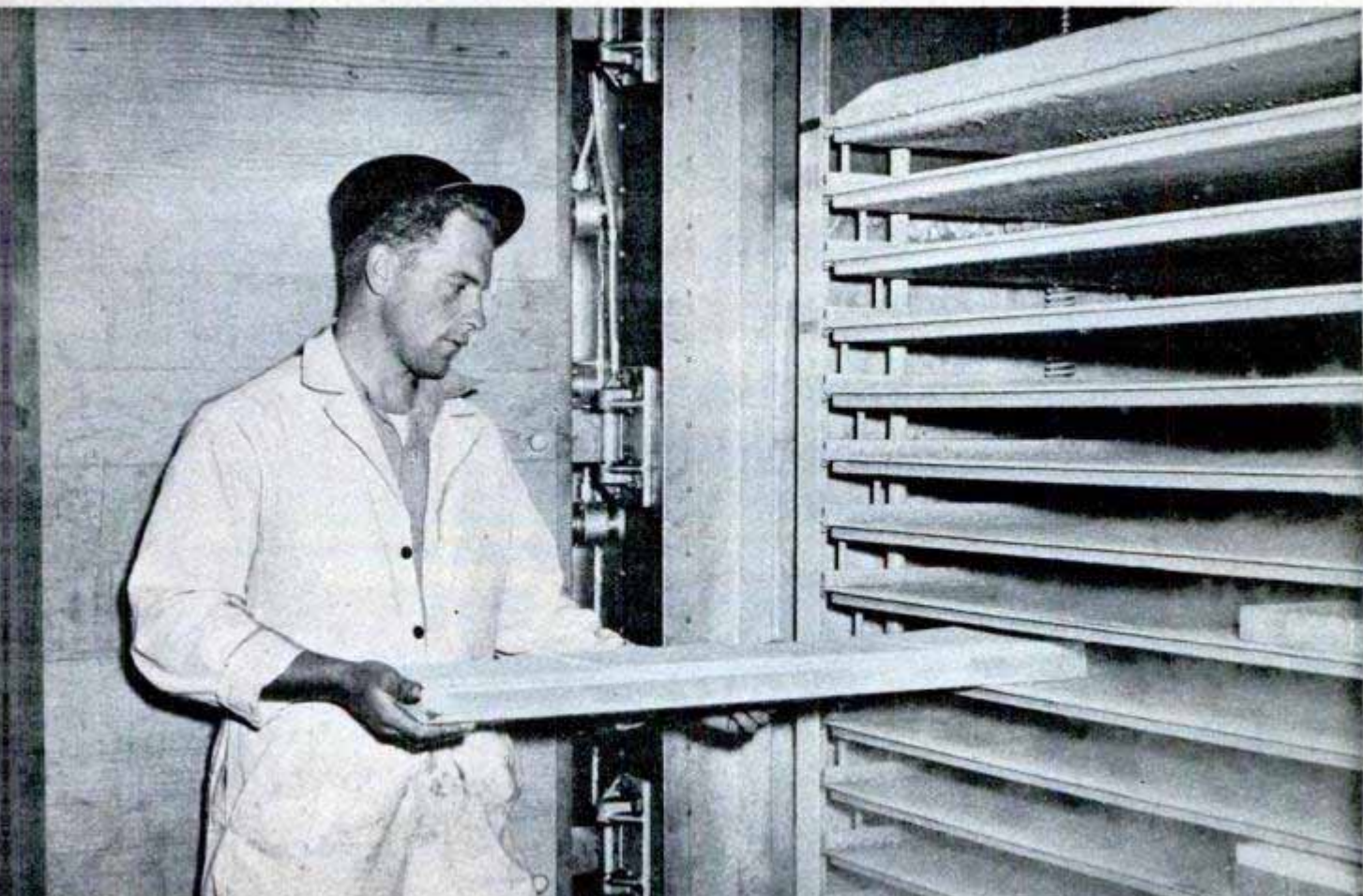
At the weighing table, one man takes the fresh fillets and weighs them into five-pound lots, drops them into trays that move around the table to the packers. These men inspect them for quality.

Packed in five-pound cartons, the fish shoot down a roller conveyor to the freeze

man. Here they are dropped into long trays and readied for the quick-freeze box, which chills them to about 40 degrees below zero. The freezer can handle 1500 pounds of fillet every two hours. The fish, frozen solid, are then packed in 50-pound cartons and stowed in the refrigerated hold where they stay solid in temperatures ranging around zero.

(Continued to page 236)

Loaded on a long tray, the cartons of fillets are placed in the quick-freezer where temperature is 40 below





Automatic bowling alley has a processed duralumin-sheeting floor that makes it suitable for outdoor play

Automatic Setter Pulls Bowled-Over Pins Through Alley Floor

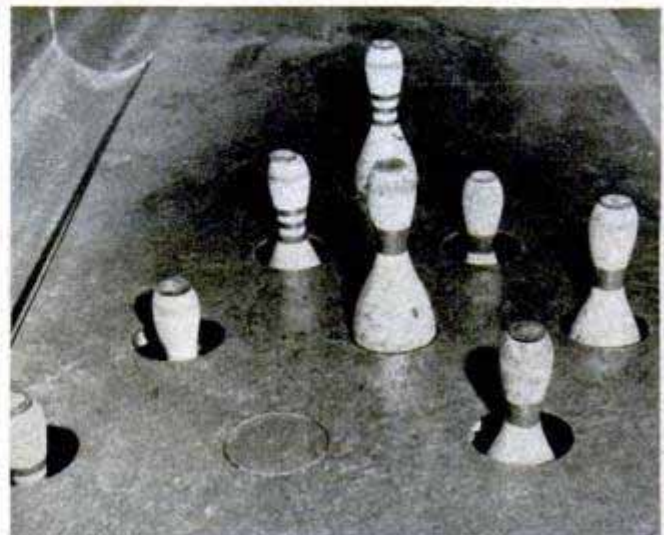
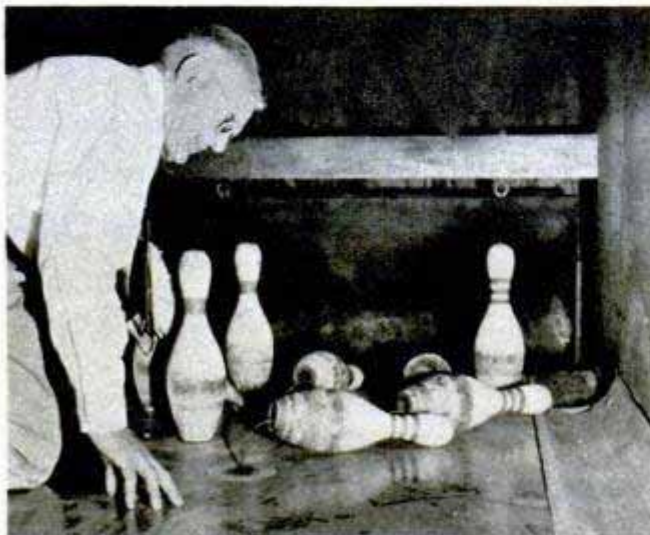
AFTER they have been bowled over, pins are removed from the alley by a new automatic pin setter and later reset for the next frame. Each pin rests on a small metal plate set flush with the floor of the bowling alley. When a pin is bowled over, the metal plate sinks down below the level of the floor and a thin wire cable attached to the pin pulls it down after the plate. Next, an auxiliary plate snaps up flush with the floor

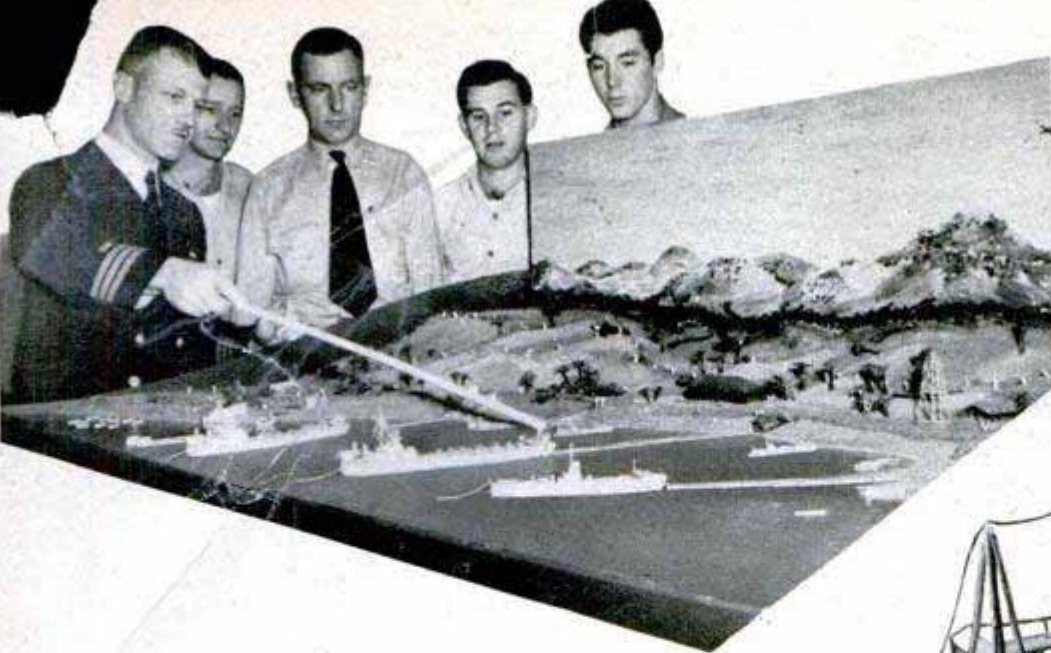
to provide a smooth surface over which the next ball can roll unimpeded. The auxiliary plate moves out of the way when the bowler presses a button at his end of the alley, and the bowling pins move up into position again, ready for play. Meanwhile the bowling ball rolls down an incline to an elevator and is moved up to the return track, rolling back to the bowler. The setter is operated by an air compressor.

Immediately after the pins have been knocked over, cables that draw them back through holes are visible

Control button pressed by bowler at his end of the alley automatically raises all 10 pins into place again

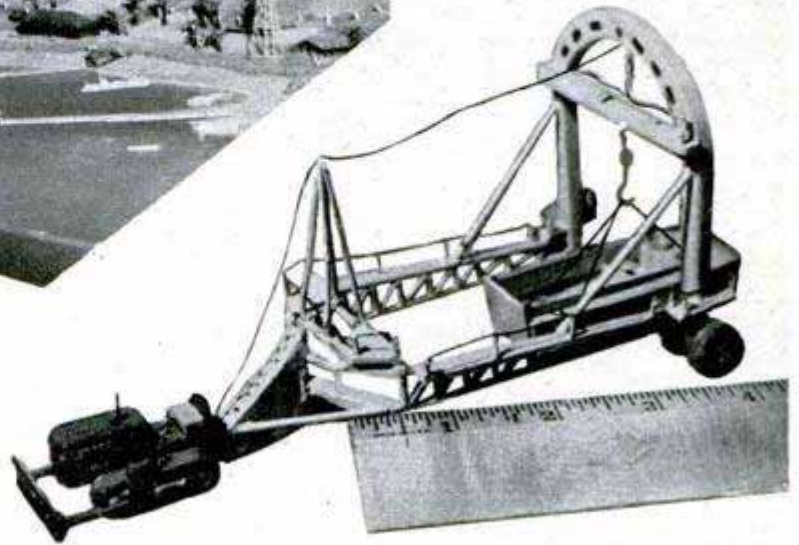
Automatic Bowling Enterprises, Inc., 5227 Sepulveda Blvd., Van Nuys, Calif.





Men of Navy Amphibious Construction Battalion Two have built a complete miniature beachhead to train recruits. Here a Navy instructor explains how an LST is secured to a causeway

Tom Thumb Beachhead



Miniature beachhead is mounted on a four by eight-foot table. There are 93 models which can be moved about during a demonstration landing. They range in size from bulky and realistic LSTs down to miniature cargo trucks. Above is a Gilhoist, an apparatus for rescuing beached landing craft. The real machine is 60 feet long. Left, one of the six-man volunteer team which built the exhibit puts finishing touches on a miniature landing ship. Below, men to be trained absorb the entire picture of a beachhead landing from the big exhibit. Every tactical mission of the battalion can be demonstrated on the board, including righting of landing craft, launching pontoons, clearing beach obstacles and preparing bivouac areas

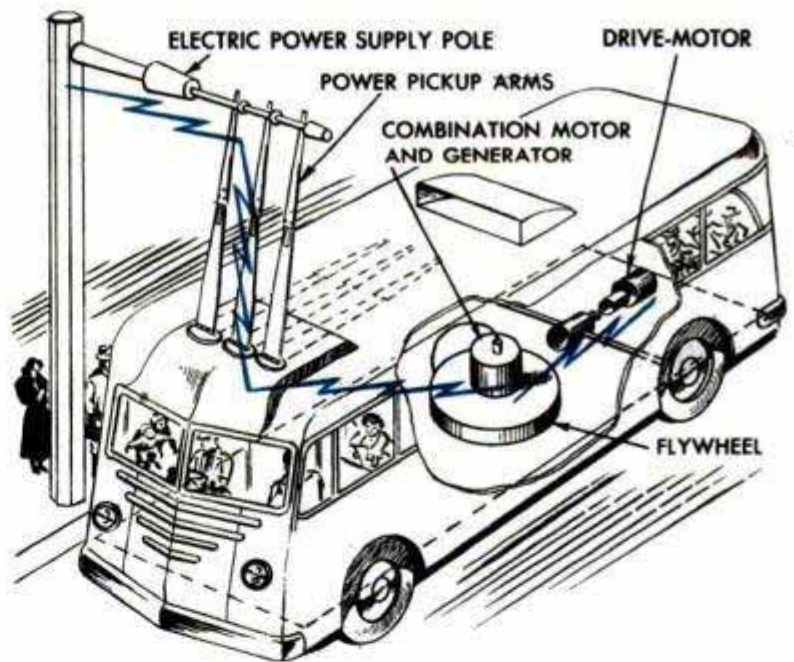




Flywheel Bus

Rolling the streets of Zurich, Switzerland, is a strange bus which apparently has no power plant. There's no liquid-fuel engine to emit noxious exhaust, and overhead there are no trolley wires. Power for the bus is provided by a six-foot flywheel built into the chassis beneath the floor. At a power station, three arms pivot up from the roof of the vehicle to touch an electric power-supply pole. Current flows to an electric motor on the bus, which spins the big flywheel at speeds up to 3000 revolutions per minute. As the bus pulls away, the motor becomes a generator, powered by the flywheel, and supplies electricity to run the bus. The vehicle will travel from four to six miles on one "charge" of the flywheel. The recharging time varies from 15 seconds to a minute depending on how far the bus has moved. In

At a power-pickup station, three arms reach up to make electric contact. Below, motor spins flywheel and bus rolls off



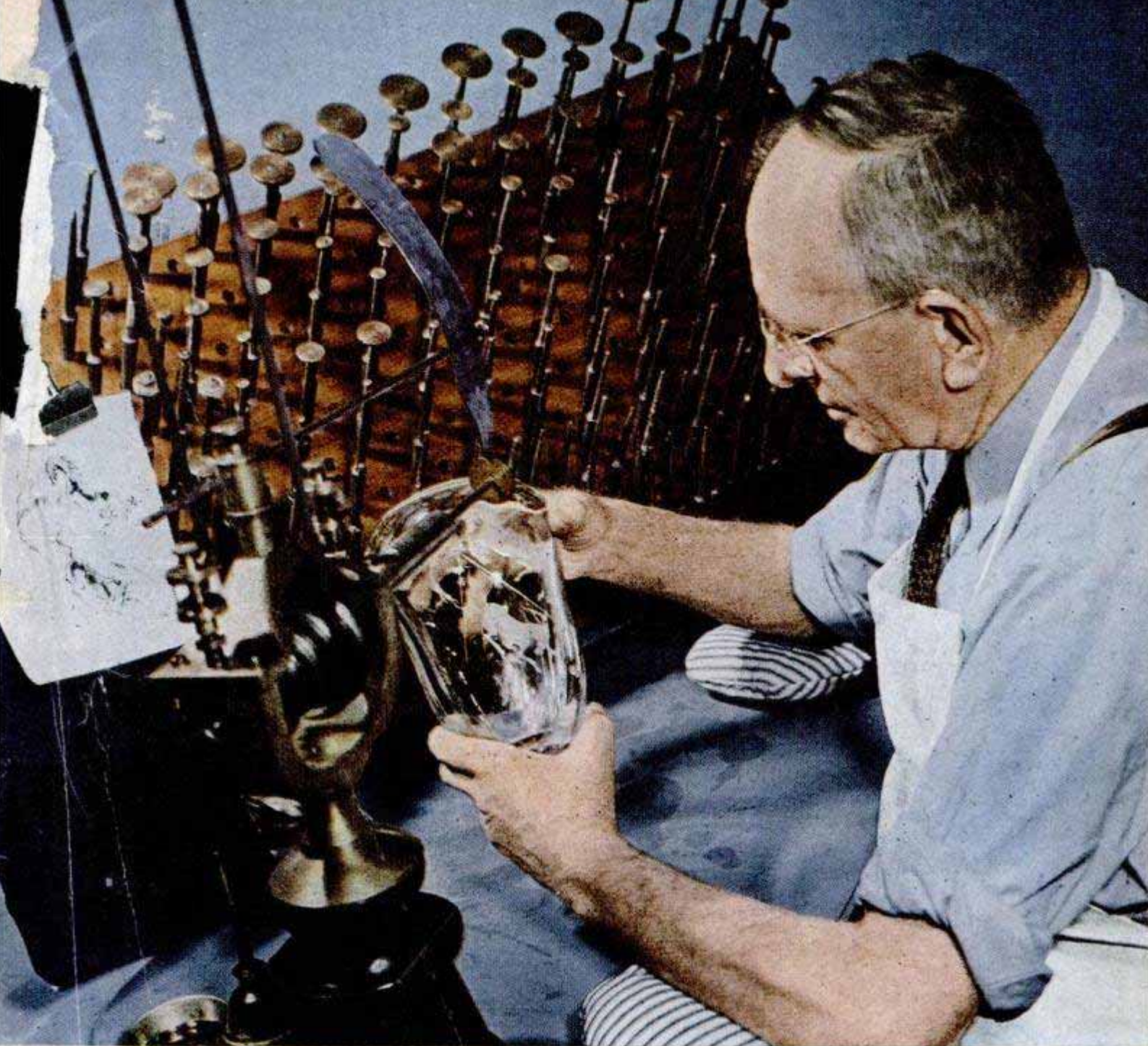
Zurich, the power supply poles are spaced from one-half mile to two miles apart along the bus route.

Concentrated Fresh Milk Reduces Container Cost

Milk in concentrated liquid form has been introduced in Boston and its suburbs, selling for two cents a quart less than the equivalent volume of ordinary milk. The new product, developed by Sealtest Research Laboratories, Oakdale, Long Island, is fresh whole milk from which most of the water is removed. It is homogenized, pasteurized and fortified with Vitamin D. By adding water, the housewife makes a full

quart of milk from a $\frac{1}{3}$ -quart container of the concentrate. The milk sells for less because the saving in containers and storage space can be passed on to consumers. It is said to taste exactly like whole milk.

☑ Splashing raindrops look harmless enough, but if a two-inch rainfall were delivered all at one time it would raise a seven-inch layer of soil a yard into the air.



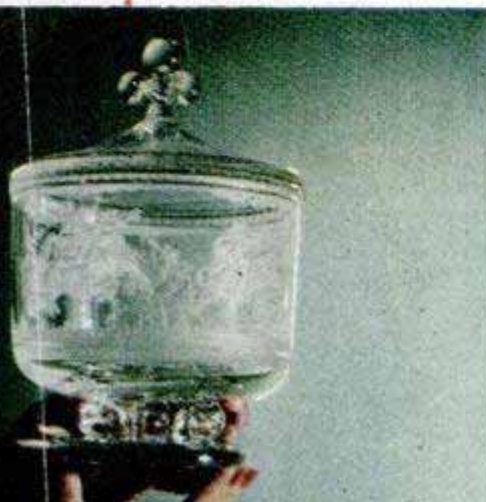
Steuben Glass photo by John Kalinich

Engraver transfers a horse design to a crystal vase. If his hand shakes, the copper wheel will ruin the piece

Masterpieces in Crystal

By Richard F. Dempewolf

YOU'D NEVER GUESS IT if you saw the place, but they're producing museum-piece jewels in the roaring, ruddy gloom of a huge plant, located on Chemung River below New York's Finger Lakes. The cavernous "blowing room" of Steuben Glass in Corning looks like a scene from Dante's *Inferno*. Arched brick openings on each side of the monstrous hexagonal furnaces spew an 1800-degree red glow over everything. Men in shirt sleeves move back and forth in endless procession, carrying gobs of white-hot crystal





To make a buried teardrop, the gaffer blows a bit of air into his iron, then holds his thumb over opening

on the end of their six-foot blowirons, twirling them as they go so the molten substance doesn't flow to the floor. Over all is the deafening roar of blowers which carry the heat outdoors.

But, gathered around a number of smaller furnaces, or "shops," craftsmen whose skill comes down through generations of forebears dating back to the Middle Ages shape the molten lumps through a series of intricate operations with a deftness that leaves you gawking. Here, in a blob of stuff the color of honey and about the consistency of cold molasses, a gaffer is trapping an air bubble that he shapes into a tiny teardrop. That lump, still yellow with heat, will become a crystal foot for a bud vase. Another man is twisting streamers of trapped air in a long "gather," which he pulls out like taffy to make a delicate air-twist stem for a crystal goblet. At another shop men are twining the hot glass into rope-twists for crystal candlestick stems. Elsewhere, master engravers hunched over lathes grind classic designs into priceless crystal.

There's nothing new about the "off hand" process of glass-making. In the 12th century Theophilus told how to make glass by

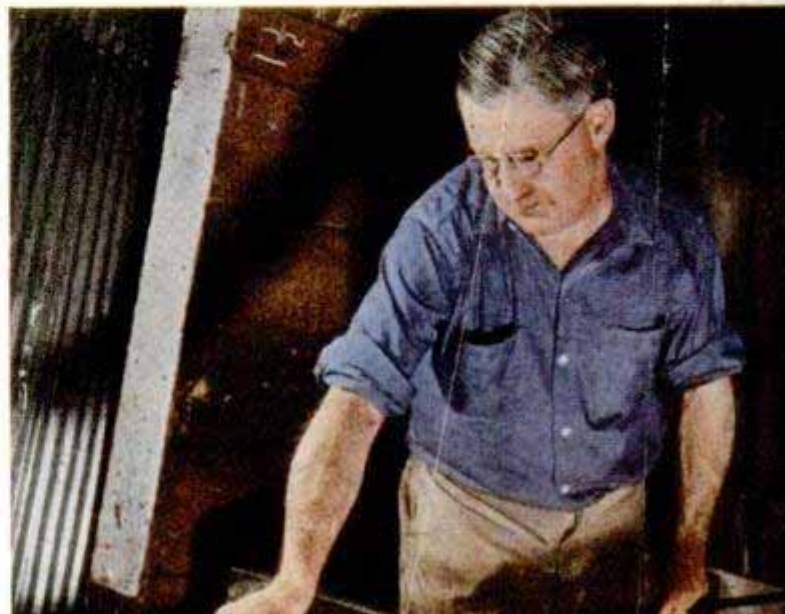
melting beechwood ashes and flint and how to form the shapes with a blowiron. But at Steuben today, though the basic steps are the same as those set down by old Theophilus, there's a brand new technique in the making of crystal pieces.

"Today," says Robert Leavy, who manages production, "the gentle curves of crystal from the blowirons follow the natural flow of molten glass." The trapped teardrops, bubbles and air swirls are buried in strategic places to give a gemlike sparkle and simplicity to everything from the thick little crystal mug that retails for \$8.50 to the flowing lines of a table fountain that costs \$1500. The result has brought Steuben some 20,000 customers a year, from just plain folks to President Truman and the Duchess of Windsor. And pieces from the

Here's the completed teardrop, buried in a candlestick. Heat has expanded air, forcing a bubble into the glass



Gaffer begins a rope-twist by pinching grooves into the glass. Photos at right show remainder of process



Corning shops are now displayed in some 17 museums throughout the world.

In spite of all this, the shops retain the medieval flavor of the ancient craft of glass blowing. In the red glow of the great furnaces sit the shops, each consisting of a smaller furnace, about 10 feet square. Into this the hot glass occasionally is thrust through a "glory hole" to keep it at workable consistency. Each shop consists of about six men, headed by the master blower, or "gaffer," who gets his name through an old English perversion of "grandfather." Under him are the "servitor," who blows the glass into its basic form; the "gatherer," who pokes his blowiron into the crucible of the big furnace, twirls it to gather on the end just enough of the molten "metal" to make whatever object is being produced,

Bubbles of air trapped inside the glass become long streamers when the glob is stretched and twisted

and blows the first basic bubble in it; the "bit gatherer" who, with a pontil (an iron rod without a hole), gathers tiny gobs of glass for handles, stems or decorative parts; the "stick-up boy," who holds the pieces while the gaffer sticks them together; and the "carry in" boy who, as one old Steuben gaffer likes to explain it, "carries out" the finished piece.

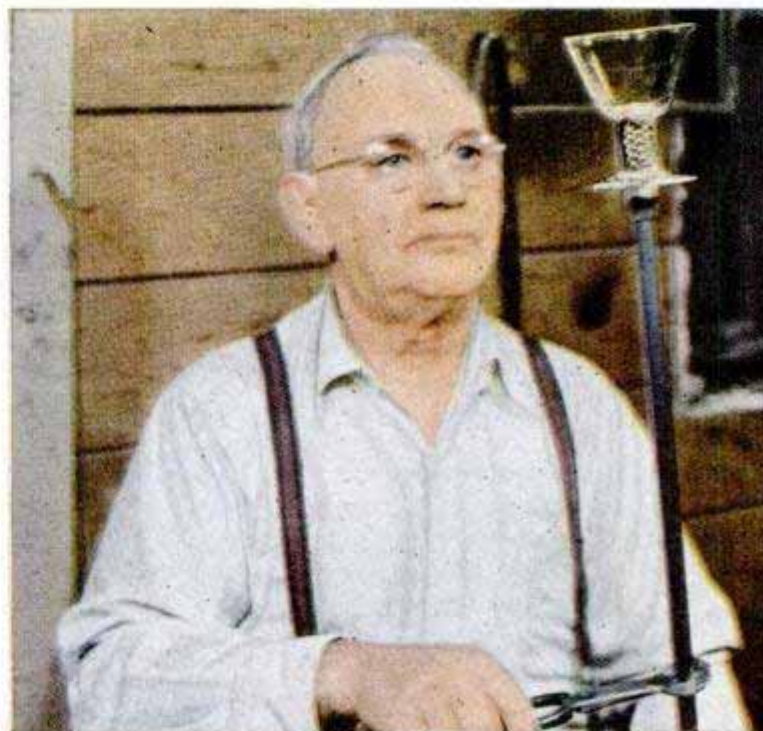
Watching this teamwork on a glass with a teardrop in the center gives you an idea of the judgment of master glass blowers.

At his bench the gaffer spins a balloon of honey-colored molten glass, which the gatherer has brought to him. It's always just the right amount to make the bowl of the glass to exact size. "If you weighed 100 gathers for this piece, they wouldn't vary more than an ounce or so," explains the

This is the result—a beautiful air-twist stem for a goblet which now will be broken off the iron



Grooved "gather" is pulled and twisted at the same time, producing long spirals in the molten glass



Finished rope-twist candlesticks have curved, gleaming lines. If there's one tiny flaw, piece is discarded





To make white spirals inside glass, milk-glass sticks are placed around mold and crystal dropped in center

gaffer. He twirls the bladder on the edge of his bench and opens the end with the sharp cherrywood tip of his woodjack (a wooden two-pronged fork that looks like a pair of oversized tweezers). Then he shapes it with a cherrywood paddle and clips the excess glass from the rim with steel shears. Though still molten, the snipped glass that falls to the floor startles you with a brittle clink as it shatters. "She always does that," says the gaffer. "Give her a jar and she'll shatter no matter how molten she is."

The gaffer continues to shape the bowl for the glass, twirling it and smoothing it with the wooden paddle. Now and then he shoves the piece in the glory hole to keep it soft, judging its consistency by color and workability.

Grooved gather is inserted into a crystal cup and the entire piece reheated to make bubbles in base



More molten glass is added, then the glob is twisted in an applewood mold, white spirals appearing inside

And here's the finished item, a gleaming crystal paperweight with milk-glass spirals embedded within the glass



Ballad Bowl, a sparkling piece of engraved crystal, cost about \$500. Note the ring of bubbles around base

By squeezing the molten glass, gaffer tools it into shape with bubbles inside. Bowl then is added to base





Master craftsman spent two weeks engraving just the tiger on this bowl. Each cut required different wheel

Meanwhile, the servitor is busy putting a teardrop in the crystal base. If all goes well, both men will finish simultaneously.

To make his teardrop, the servitor blows a tiny puff into the mouth of his blowiron, then clamps his thumb over the opening. "The heat at the end of the iron," he explains, "will expand that puff of air and force a tiny bubble in the glass. Watch . . ." Sure enough, a little air pocket forces its way into the glob of glass on the end of the blowiron. Instantly the servitor grabs his jacks, pinches the bubble off and presses it down into the center of the blob. Then he squeezes the twirling mass until the bubble is pinched at the top into a perfect teardrop. He smooths out the surface of the conical mass with his steaming paddle and the base is finished. The stick-up boy, with a dab of sticky glass on the serrated tip of his pontil, touches the rod to the bottom of the



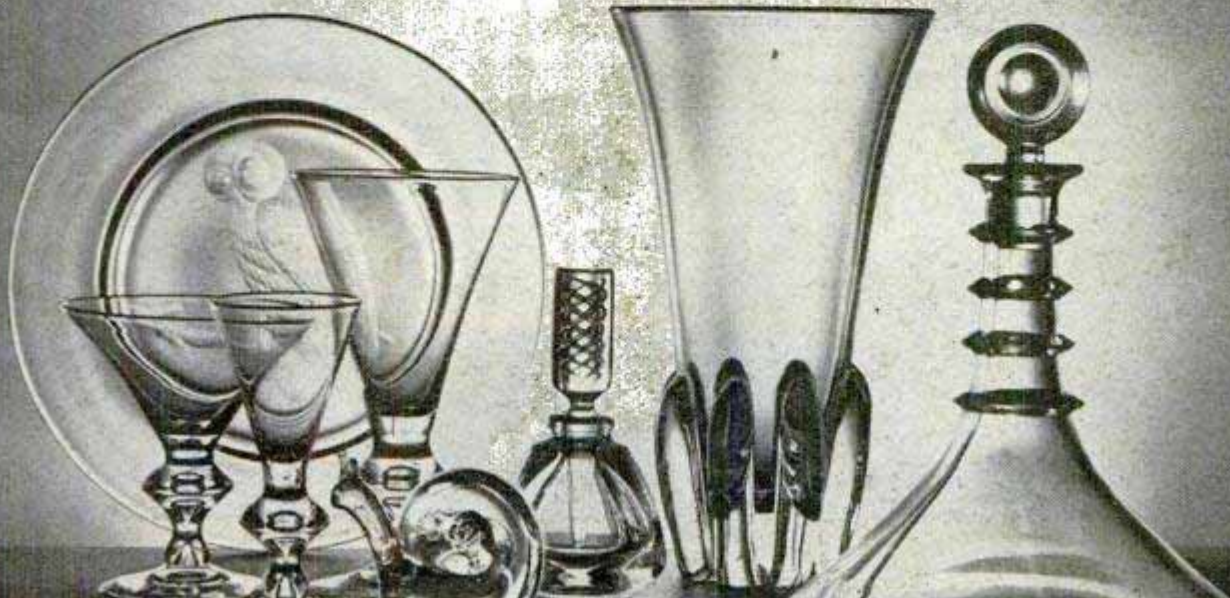
Valor Cup, given to Great Britain, is considered one of the finest pieces of crystal glass in existence

base. The glass fuses. The servitor gives his blowiron a whack and the blowiron breaks away from the piece, leaving the other end stuck to the pontil of the stick-up boy who carries it around to the gaffer. Now the two pieces are fused together. In a viscous state, one blob of glass will fuse to another permanently, leaving no line or mark at the joint. Quickly, the gaffer runs his calipers over several sections of the glass to see if he missed. It's a rare day when the caliper tips touch the glass.

The finished piece is broken from the pontil with another tap, leaving the rough depression in the base which is the hallmark of handmade glass. Then, the glittering object is carried away on an asbestos-covered stick to the lehr, or annealing oven, where, depending on its size, it will go through hours or days of slow cooling.

"There was a 10-pound crystal elephant,"

Here are examples of the gleaming Steuben crystal. Pieces are designed to follow natural flow of molten glass

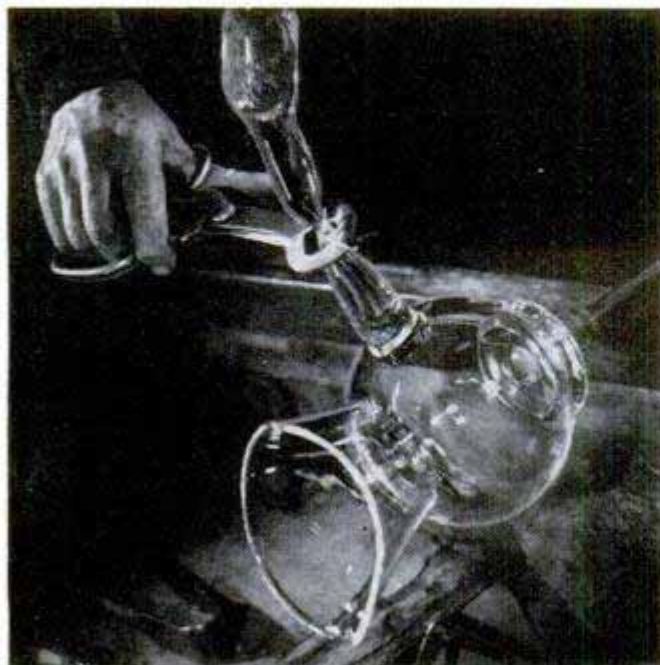




Small balls of glass, formed in a mold, are pinched off, then fused into place on the base of a bowl

one gaffer recalls, "that was in the ovens for five days. Even then, it split through the middle." Gaffers hate big, cumbersome pieces because they tend to break up. If crystal cools quickly and unevenly, tensions are set up inside the glass. To prove this point, Steuben gaffers like to make "St. Anthony's drops" for visitors. The gatherer takes a small wad of molten crystal, and flips it, and it trails a long gossamer tail as it plunges into a barrel of cold water. "Now hold the drop in your fist," instructs the grinning gaffer, "and break off the tail." When you finally snap the tail, there's a startling minor explosion inside your clenched fist. The entire drop has burst into thousands of grains. "Turned right back to sand," says the gaffer. The explanation is

Handle is the last bit of glass added to a pitcher. Gaffer snips off just enough, swings it into place



Finished bowl has decorative knobs which serve to steady it. This piece is much heavier than it appears

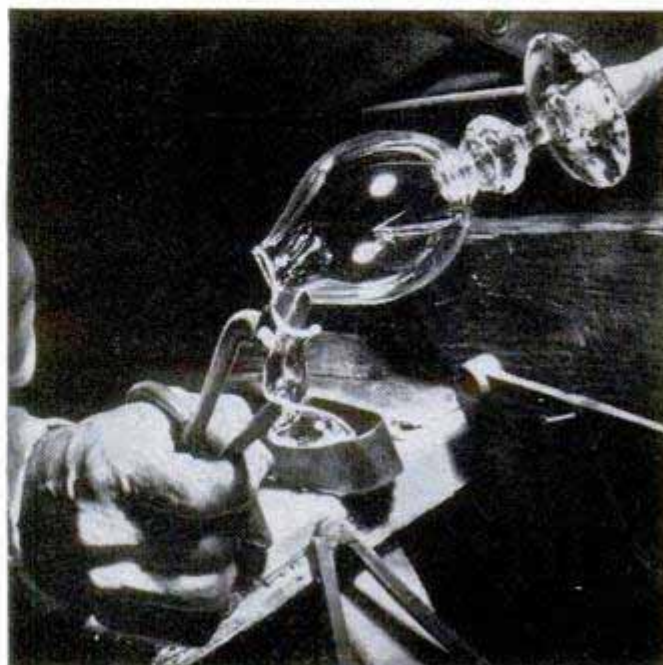
simple. Tensions set up in the drop from too fast cooling are so great that the jolt caused by snapping the tail is enough to upset molecular balance through the entire piece, and it disintegrates.

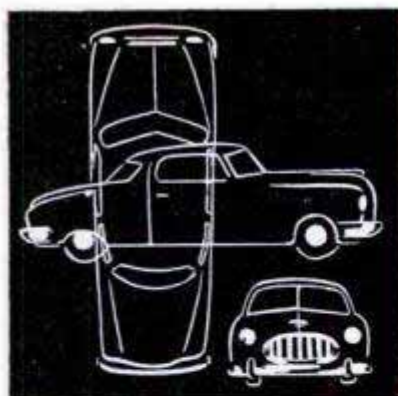
Lots of people think real crystal glassware is made from natural rock crystal. Steuben craftsmen are quick to point out the fallacy, though good crystal has the same rocklike purity. Basic ingredients are sand, potash and lead oxide. The mixture is melted in an enormous furnace at 2500 degrees Fahrenheit, cooled to 1800 degrees and becomes a thick, viscous fluid.

Gaffers dread a "spew," which occurs when their blowiron gets too hot. Bits of metal flake off when they blow, get into the

(Continued to page 218)

Shears snip excess glass from the end of a bubble just before it is opened to form the bowl of a goblet





Detroit Listening Post

By Siler Freeman

UNLESS Washington dictates a freeze on new auto models, most if not all of the auto manufacturers will have new 1952 designs on the market late this fall or before the end of the year. Ford will probably be the first with its new models, shooting for an October announcement of its line.

While outwardly the new Fords may not be startling, their engines will make up for what they lack in glamour. The division is pressing for its new overhead-valve engines, which have been finalized. They are being tooled for production. Lincoln too is getting its big engine, which has a displacement of 317 cubic inches and 155 horsepower. The Mercury is smaller, 247 cubic inches and 120 horsepower.

The Ford V-8 is a 221-cubic-inch job with 110 horsepower and the Ford 6 is 215-cubic-inch displacement and 102 horsepower. Lincoln is now scheduled to get its engine ahead of the two other divisions.

General Motors will bring out new designs for 1952, but outward changes will not be too radical. Chrysler will do likewise but will extend the use of its new V-8 engine to other lines, the first being DeSoto. The independents have some important changes to make, especially Studebaker, Hudson and Nash.

Willys-Overland, producing the Jeep line but otherwise without a passenger car as such, has been testing four prototypes of a light car. They are on a 108-inch wheelbase, thus coming between the Nash Rambler and the Henry J and the Big Three's triumvirate, Ford, Chevrolet and Plymouth.

It looks like no company can claim complete coverage of its market these days without a hardtop coupe. The popularity of this styling has been astounding. Buick was the first to invade the field and made it popular by keeping the price just above its regular coupe and sedan lines.

Pontiac, however, widened the price difference and stayed only in the coupe class. It accented the convertible theme by using real leather upholstery. This year, however, it offered its Catalina hardtop in nylon as well as leather.

Latest to enter the hardtop competition

is Ford with its smart Victoria. This caught hold so well that the company is setting up one assembly line which will make the Victoria only. With the Victoria production going good, the stop-gap model Crestliner has been dropped.

How booming it was is shown in figures on hardtop production last year. The industry as a whole turned out and sold 592,550 cars which come under that classification. This included coupes and the sedans which Buick and Oldsmobile pioneered. Cadillac's 60, 61, 62 and 75 sedans, which used the hardtop styling, were included.

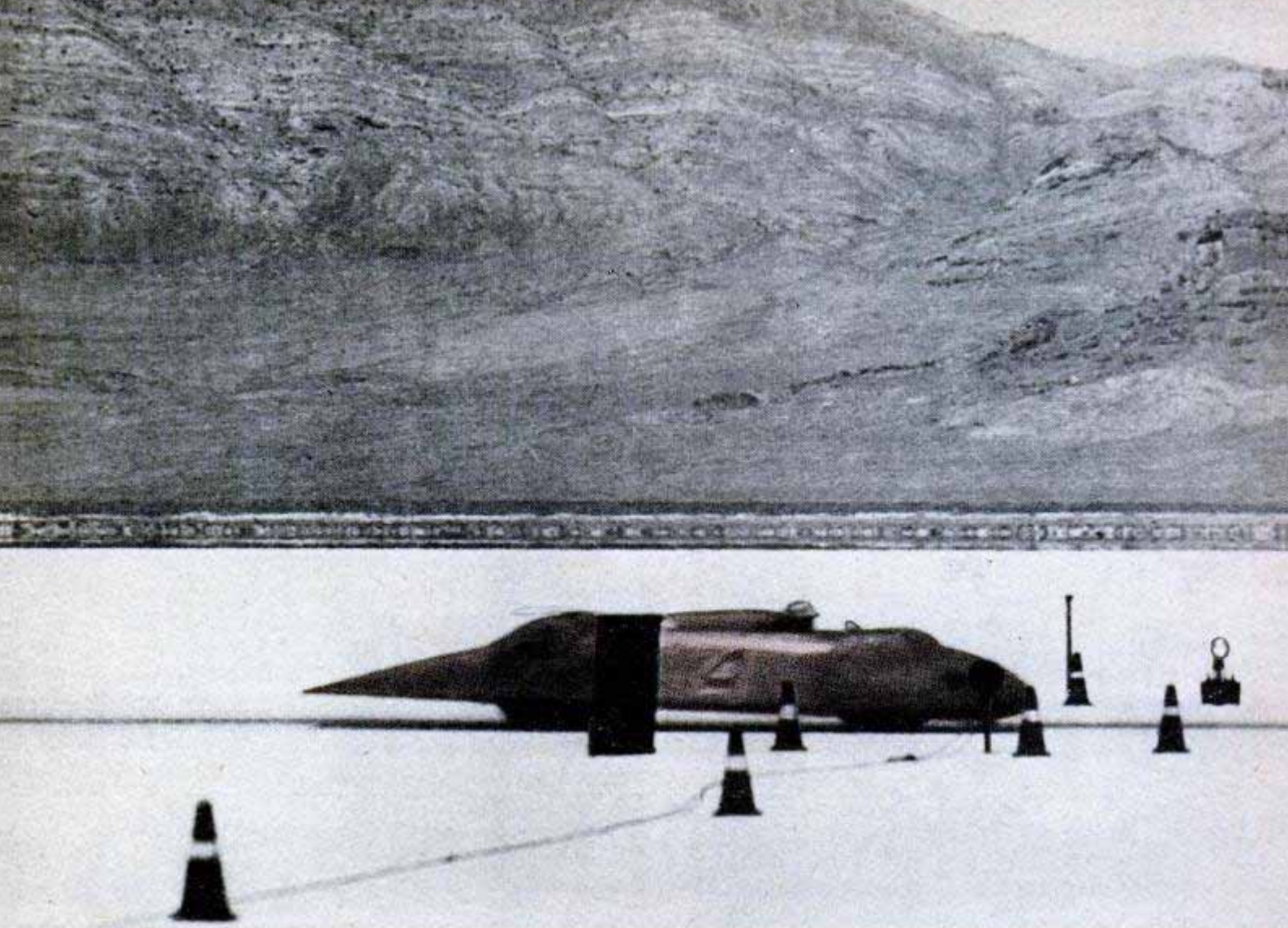
Hardtop coupes totaled 268,604, with Chevrolet's Bel Air taking the lead, Buick's Riviera second and Pontiac third. DeSoto, a late-comer, was low. Ford's Crestliner didn't appear until too late to be counted.

This year's hardtop market is expected to be even more extensive. Practically all of the passenger-car builders have at least one candidate or are about to bring one out. Nash has been delayed in announcing its hardtop but is expected to show it in July if it can get the materials to add to its line. Hudson too has one in the works. Chrysler's latest is the Plymouth, which is attracting a lot of attention.

Another change in styling tastes is seen in the gradual dropping of the "fast back" from General Motor's lines. Fisher Body, which has been stymied by the growing list of body styles that it must furnish all the divisions, has been urging elimination of some which have dropped in popularity.

So without any fanfare, the ultra-streamlined fast backs have been lopped off. Only Chevrolet is keeping its Fleetline models complete. Pontiac was the first to drop its Streamliner and Buick stopped making the Super two-door "jet back." Oldsmobile, which last year stopped making the 76, has added the Super 88, which is expected eventually to replace the 88. It has cut down its offerings to 13 body styles, lopping off the 98 club sedan.

But while cutting down its body styles, production emphasis is more and more on the de luxe rather than standard models. The passenger-car builders have accustomed their buyers to extra little frills.



Hod Rod Magazine photo

I Time the Champions

By Otto Crocker

IN THE LAST 10 years I've officiated as chief timer at the setting of 80 new world records by speedboats, aircraft and automobiles. I've seen approximately 180 national speed marks made. In all, I've clocked some 38,000 vehicles in races and time trials during the last couple of decades.

I've seen boats go crazy under the drive of too much power and rear up out of the water and throw their drivers. One boat was tossed 50 feet high when it rammed a swell at 92 miles per hour. The hull was smashed to bits when it crashed, but the driver escaped with no other injuries than a cut on his chin.

In one freak instance, a boat that was doing 50 miles per hour rolled completely over and continued on to an upright position again with the engine still running and the driver still hanging on to the wheel.

Crocker times a speedboat over the course at Salton Sea, Calif. That's his three-dial timer. He always uses his stop watch as well. "Just in case," he says

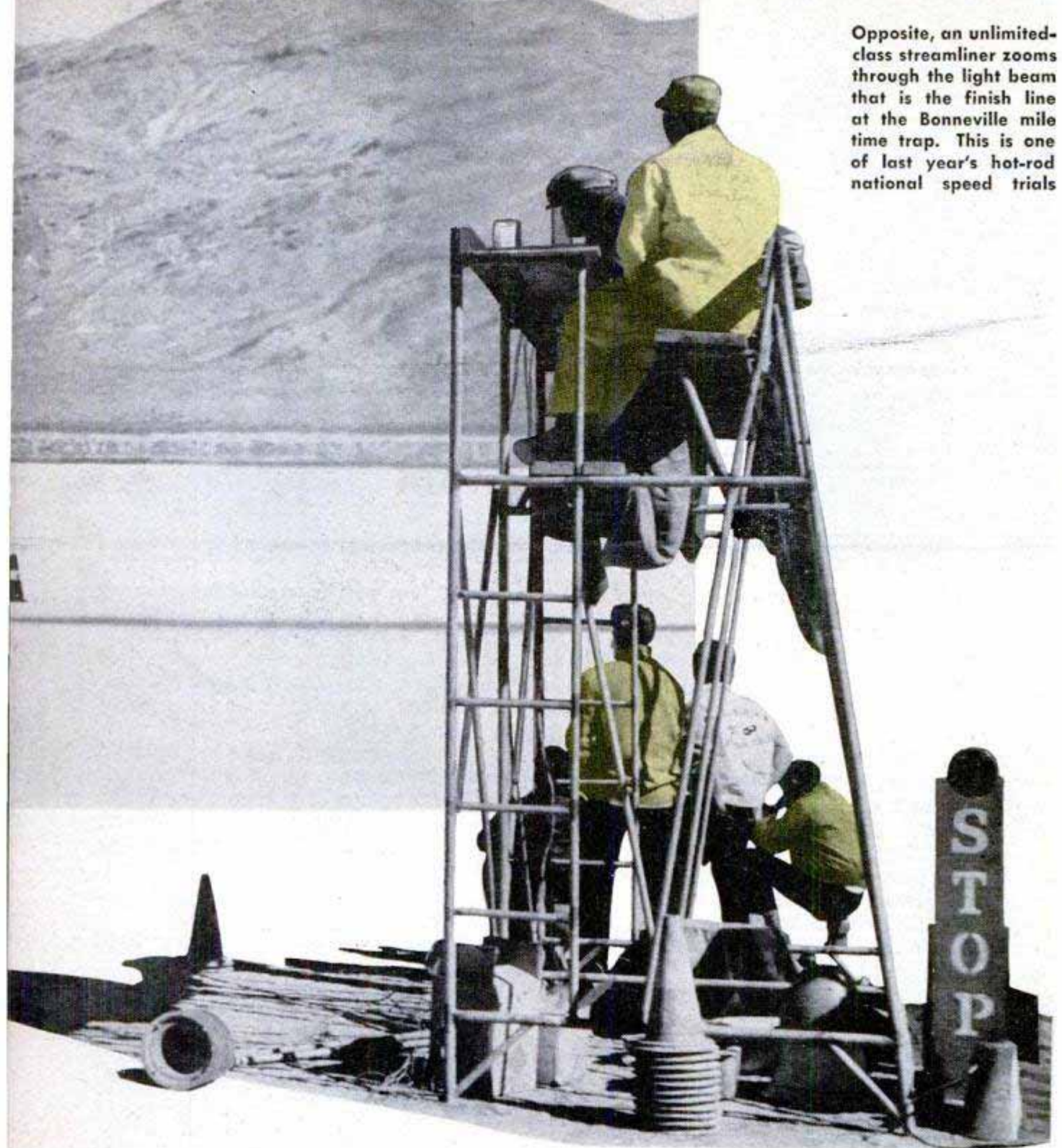
The driver hardly had time to realize what happened.

I think the best accident I've seen was at Bonneville national speed trials for ama-

Kent Hitchcock photo



Opposite, an unlimited-class streamliner zooms through the light beam that is the finish line at the Bonneville mile time trap. This is one of last year's hot-rod national speed trials



teur-built hot-rod cars last year. I say "best" because the driver didn't even get a scratch even though he was on his head for a while at 200 miles per hour. His safety belt, crash helmet and the good construction of the car saved his life.

Two cars had been clocked at better than 210 miles per hour at Bonneville and the accident happened when C. L. "Puffy" Puffer, driving City of Pasadena II, made an attempt to raise this mark to 220 or better. His engine was wide open when he went through the first beam of the time trap and then the car began to drift. It spun end for end, and rolled over in a series of gyrations across the salt flats. We didn't think Puffy

had a chance and yet he had climbed out of the car and was looking over the damage when the ambulance arrived.

The best way to watch a speeding vehicle, I find, is to hold your eyes motionless and to turn your head. That way, there are no interruptions to full vision and you can see every detail of the run.

Instead of a stop watch, I use a three-dial electronic timer that I designed and built myself, and that is accurate to within a thousandth of a second. With this instrument it's possible to measure a vehicle's speed for three different distances on the same run, or to time separately the first, second and third-place winners of a race.



Timing races like this is complicated even with Crocker's equipment. Time must be recorded for each racer

It can clock objects along a course that is only 12 inches long, if necessary, or it can record the elapsed time of a transcontinental speed dash.

My interest in dependable, split-second timing began 23 years ago when I was speedboat racing. Three official timers were required at each end of the course in those days. Not only was this expensive, there was a long delay after each run while the officials compared their watches and arrived at an average time. Usually, each official had a different reading on his watch. Their reaction times were different.

My first attempt at a better system was

to attach an electric solenoid to a stop watch, figuring that you can push a switch faster than you can punch a watch. That helped, but the possibility of human error was still there.

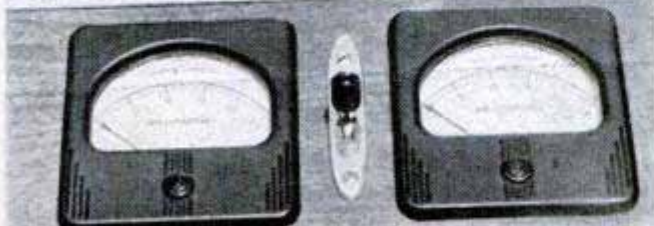
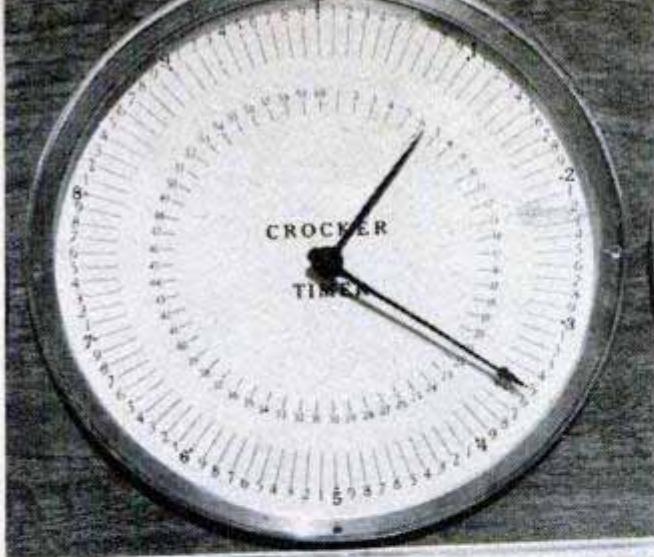
Next, I tried beams of light at the start and finish lines, focused on photoelectric cells at the far side of the course. When the hull of a boat interrupted the beam, the photocell current would operate the solenoid that in turn punched the watch. This would eliminate all human reaction time and error.

I was trying to do this in broad daylight and the beam of a lamp is pretty dim in

Rocket or speedboat? It's hard to tell here. Miraculously, the boat came down safely and continued in the race

Kent Hitchcock photo

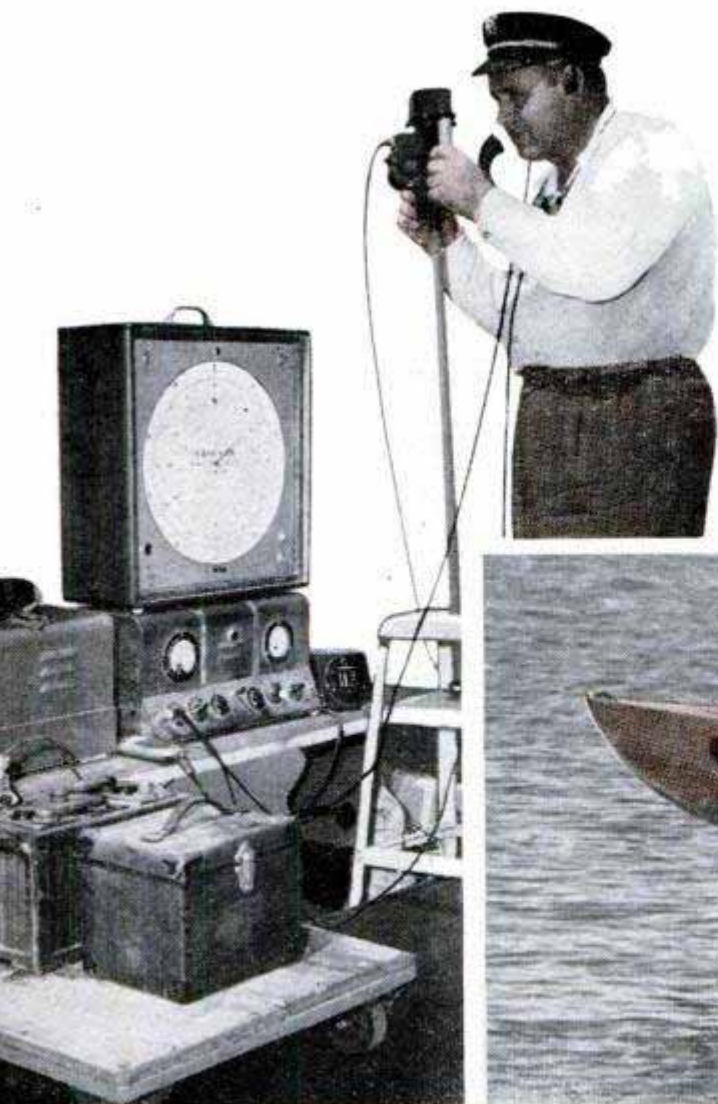




Hot Rod Magazine photo

Close-up of one dial shows small second hand and the long sweep hand that records hundredths of a second. Tip of the long hand breaks it down into thousandths

Crocker often uses his "one sided" timing trap for boat races when photoelectric cells can't be set up. The official tracks the racer. Timing is automatic



comparison with the sun, so I put a lens on the light and an 11-foot shielding hood in front of each cell to screen out sunlight and reflections from the water. The system worked.

Immediately, boats were clocked two or three miles per hour faster than before. The photocell timing trap almost always gave faster time than did a hand-held watch. The delay caused by human reaction time had been clocking boats at slower than their true speeds.

My next improvement was to get rid of the time delay that occurs inside a watch after it has been tripped. This can amount to $\frac{6}{100}$ second. I switched over to an electric clock that was connected to the solenoids operated by the photocells at the start and finish lines. One cell started the clock, the other stopped it.

There was still a chance for error because of the mechanical movement in a solenoid and so in my newest timer I replaced the relays with a vacuum-tube system that starts and stops the clock directly. The motor of the timer itself is reworked so that no time lag occurs in its mechanism.

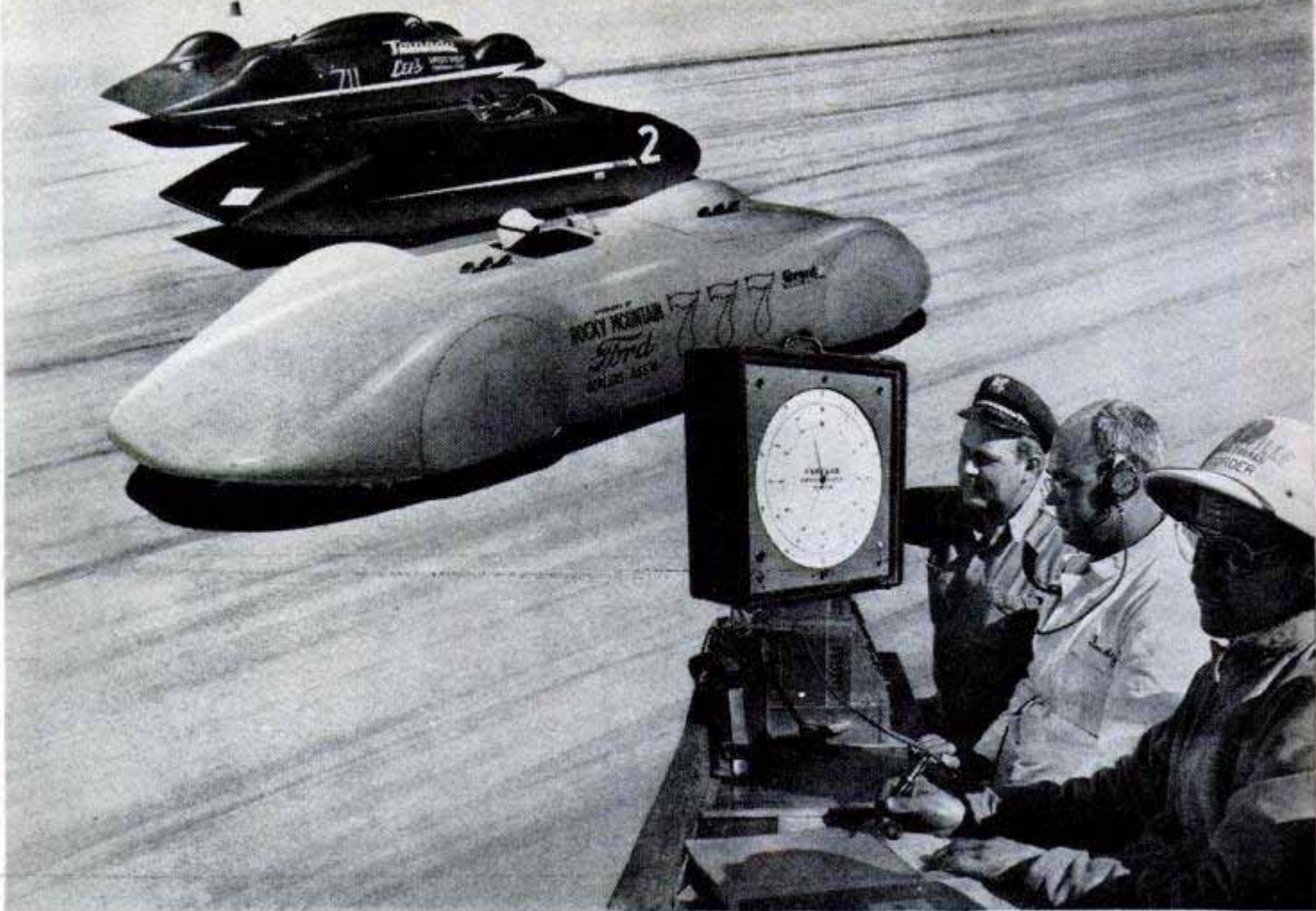
Next, I improved the photocell traps. The one I am using now employs a sealed-beam lamp of the automotive type as a light source and an improved photocell of the telephoto type that requires only a short shield. With 10,000-to-1 amplification, the cell can be as far as 1700 feet from the light source, permitting a race course of that width. The wires that connect the cells at each end of the course also serve for two-way phone communication. The whole system operates either from 110-volt alternating current or from storage batteries and a converter.

The instrument still has a slight error—its certificate of accuracy states that it gains $\frac{23}{100}$ second every 24 hours. That's the same

Crocker has timed a revolution in speedboat racing. Today, racers are airborne except for the propeller

Kent Hitchcock photo





Hot Rod Magazine photo

Three hot rods whiz past the timing stand at better than 200 miles an hour during the Bonneville trials

as one blink of your eye, once a day. I don't know of any other clocking system as accurate as that or that can be used to time vehicles one after the other in rapid succession. I've timed an even 1000 hot-rod cars in one day, each racing wide open through a speed trap in a dash against time.

As chief timer for the American Power Boat Association, I've seen speeds on the water climb to figures that we hardly dreamed were possible 20 years ago. Last

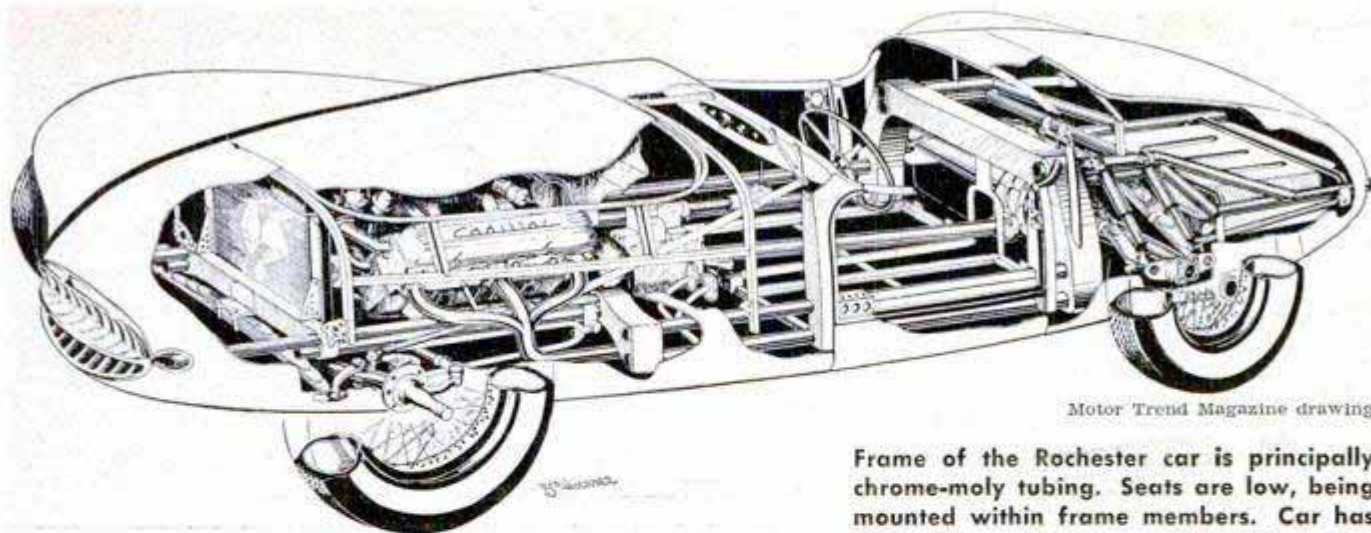
year a little hydroplane with a reworked Mercury automobile engine set a record in the 225-cubic-inch class of 115.045 miles per hour. That's less than 10 miles per hour under the world record for a boat with unlimited horsepower a number of years back.

Present boat speeds have been made possible by the development of the modern hydroplane design of hull. I recall that it was in 1941 at Salton Sea in California when we first saw a boat rise up out of the water and actually fly along the measured mile with only its propeller submerged. It was the first of the hydroplane "prop riders." It was an amazing sight at that time although it's commonplace today.

I missed one of the greatest spectacles of all, the record-breaking run of Stan Sayres' Slo-Mo-Shun at Seattle last year. The four-point hydroplane set a new world record in the unlimited class of 160 miles per hour. I couldn't make the trip and so Kent Hitchcock, A.P.B.A. official, took north with him a "one
(Continued to page 250)



Eliminating the reflex lag present in human timing, photocells at the start and finish make timing exact

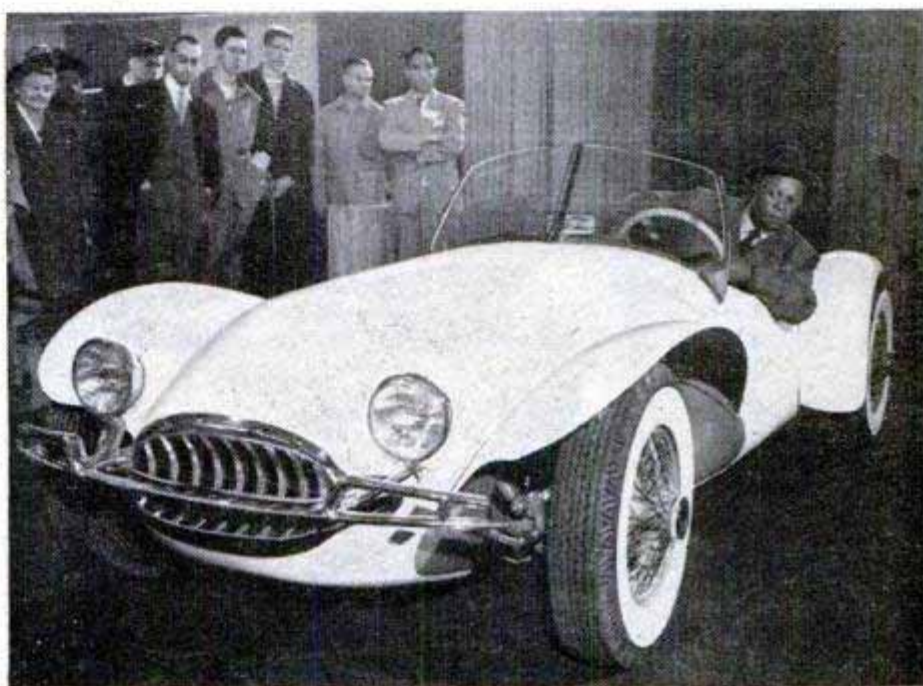


Motor Trend Magazine drawing

Frame of the Rochester car is principally chrome-moly tubing. Seats are low, being mounted within frame members. Car has 6½-inch ground clearance. Below, Rochester and his car. Note the "clamshell" fenders

Rochester Designs Own Speedster

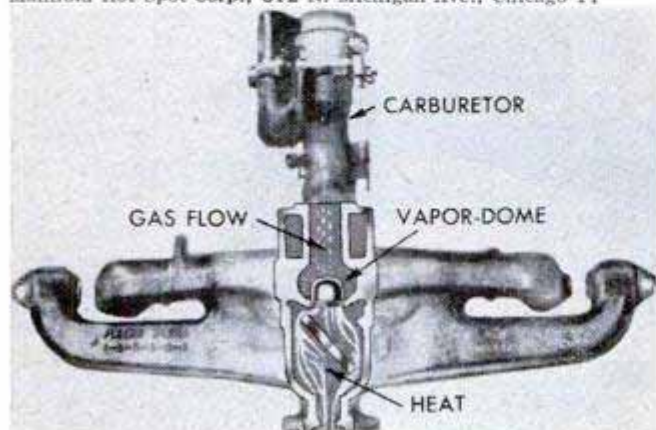
Tired of "driving" the boss' horse-and-buggy Maxwell, Eddie Anderson, famed Rochester of Jack Benny's show, designed himself a sleek sport car that will hit more than 100 miles an hour. Its power plant is a highly tuned Cadillac engine. Anderson proved himself to be no slouch as an engineer, coming up with such innovations as dual soft springs in the rear for a gentle, firm ride. Said to cost about \$20,000, the speedster was made by Emil Diedt, builder of the Blue Crown Special racers.



Heat Dome for Car's Manifold

Installed in the manifold of a car, a metal dome is said to give better vaporization of the fuel, thereby reducing carbon formation, improving combustion and saving gasoline. The steel insert transmits heat to the fuel. This assures more complete vaporization of the gasoline, resulting in greater combustion.

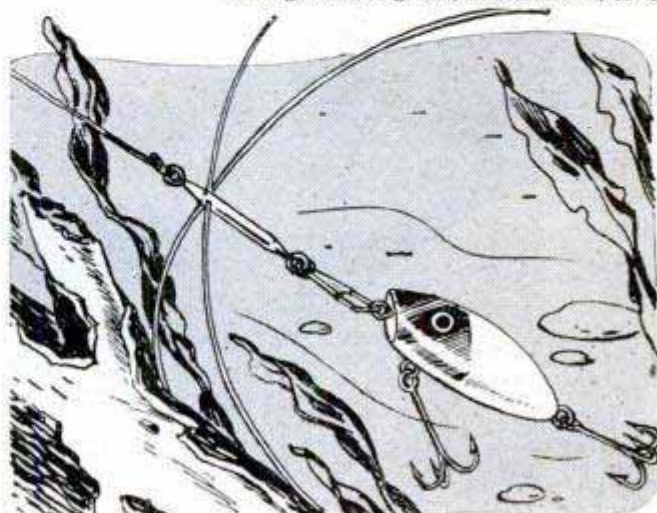
Manifold Hot Spot Corp., 612 N. Michigan Ave., Chicago 11



Plug Protector

Four spring-steel wires shaped like the ribs of an umbrella protect your plug or bait from becoming snarled in logs, rocks or weeds. The device can be used with any lure, without interfering with bait action.

Hollingsworth Mfg. Co., Marshalltown, Iowa



The OWNERS REPORT



The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1951 cars who answered questionnaires sent by Popular Mechanics to 1000 Chevrolet owners from coast to coast

THE POPULAR MECHANICS MOTOR SURVEY AS CONDUCTED BY FLOYD CLYMER

I am the owner of a 1951 Chevrolet. Fleetline Styleline
I have owned it about 2 months. Speedometer mileage is now 2500

I use only regular gasoline - I use premium (high test) gasoline

My approximate gas mileage in the city is 15 MPG; in country, 17-18 MPG.

I CHANGE OIL every 2000 miles; I ADD OIL - one quart every _____ mi.

My car has: Standard Transmission Powerglide Transmission

How does the car handle on the road? VERY GOOD FOR SMALL CAR

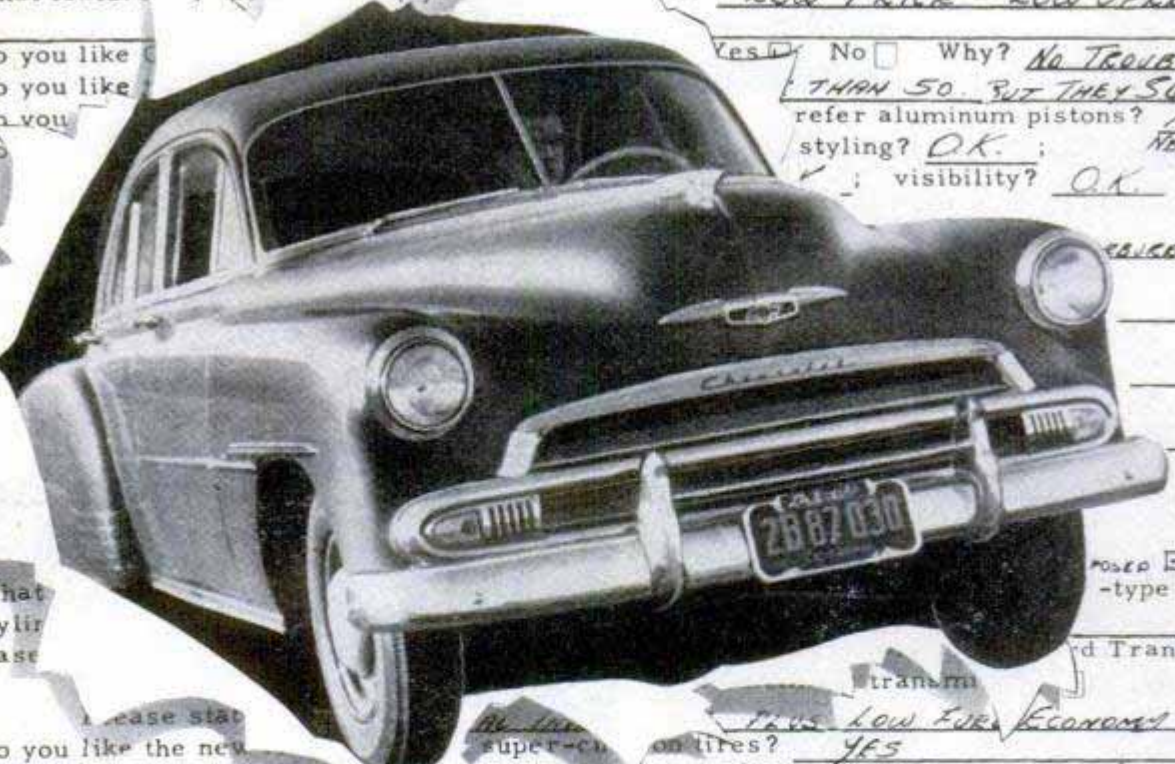
Maneuverability seems to be: Excellent Average Unsatisfactory

Acceleration is: Outstanding Very good Fair Poor

Curb and road clearance is: Satisfactory Too high Too low

Why did you buy a Chevrolet? CHEAPEST FULL-SIZE CAR
What feature do you like best? LOW PRICE - LOW UPKEEP

Do you like the styling? Yes No Why? NO TROUBLE MORE THAN 50. BUT THEY SQUEAK
Do you like the refer aluminum pistons? NOT NECESSARILY
Do you like the styling? O.K.
Do you like the visibility? O.K.



What type of tires? STANDARD
Cylinders? 6
Base? STANDARD

Please state the number of super-cam on tires? YES
Do you like the new? YES
Do you carry recommended load? Yes No How much more? A lbs.
28 PSI TOTAL

Please check the answer boxes (). Your reply will be held in strict confidence.

Please mail promptly to:

FLOYD CLYMER
1268 SO. ALVARADO ST.

My Name: [REDACTED]
Address: [REDACTED]
City & State: INDIANAPOLIS 8 INDIANA

on the '51 CHEVROLET

By Floyd Clymer

ASK THE OWNER what he likes about a '51 Chevrolet. He'll tell you—body styling, the new larger brakes and visibility.

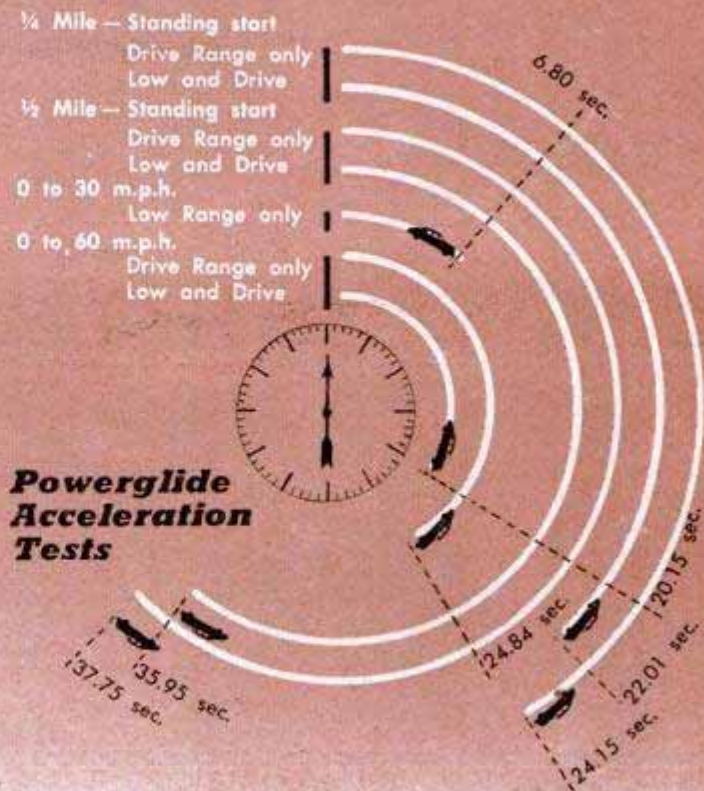
Ask him what he doesn't like. You'll get some squawks—but 90 percent of the owners rate the car as excellent or good.

This month's survey by *Popular Mechanics* of 1000 owners reveals that 26 percent of those who filled out the questionnaire have owned five or more Chevrolets. Opinions recorded in the survey are based on tens of thousands of miles of driving this car under every imaginable condition.

A man in Omaha, Neb., reports that he has owned 350 Chevrolets (a fleet owner, of course) and likes everything about the cars except the low-pressure super-cushion tires. A feature he especially likes is the resale value. This was noted by many other owners but under "best liked features," top rating goes to body styling which had an approving vote of 99 percent.

Odd figures crop up in any survey, probably to prove again that truth is stranger than fiction. The strangest figure in our percentage poll is that 38 percent report they prefer an eight-cylinder engine in their car of the future. As everybody knows, the Chevy is a six-cylinder car.

Eighty-eight percent give their approval to the car's overhead-valve system, but the other 12 percent registered their complaints about noisy tappets. There were more squawks about tappet noise than any other specific item. (I find this a little unjust because of the advantages of overhead valves, particularly accessibility for



easy maintenance.) The No. 2 complaint, which might more properly be classified as a "lament," is the fact that a Chevy does not have overdrive. Many owners would like a lock inside the car for the hood.

Twenty-eight percent report they bought cars equipped with the new Powerglide automatic transmission. Many others indicated they would have bought Powerglide but it was not available at the time they bought their cars. A great majority of owners like Powerglide and were high in its praise. A Chicago driver says, "It is the smoothest of automatic transmissions with no jerk or indication of gear changing."

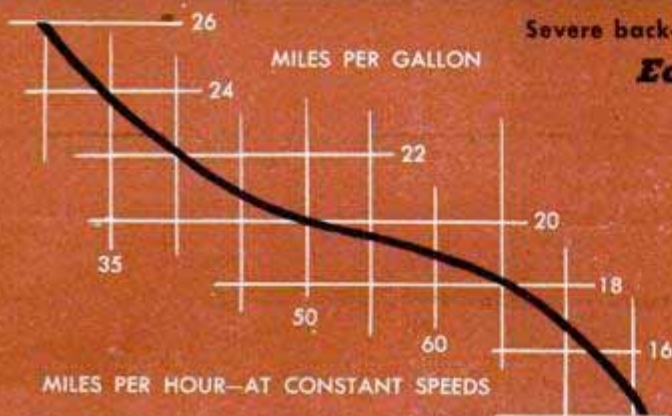
A high percentage of the owners commented on good maneuverability, demonstrated here by easy parking





Severe back-road test gave the Powerglide transmission a real workout

Economy Test of Powerglide Chevrolet



Miles Per Gallon

At constant 30 m.p.h.	26.02
At constant 50 m.p.h.	20.01
At constant 60 m.p.h.	18.95
At constant 75 m.p.h.	14.80

Mileage — (Car showed only 150 miles at start of test).

San Francisco to Bend, Ore.	18.40
Bend to Portland, Ore. (over Cascade Mts.), 200 miles of snow, ice	16.12
Portland to San Francisco	22.45

Oil economy of the '51 Chevy pleases owners. During strenuous 1700-mile test not a drop was added



There were a few complaints such as the one from Clarksburg, W. Va., about "slippage and lost power in accelerating." Several Chevy owners implied that General Motors must think they have cat's-eye vision at night when it comes to reading the initials for the automatic-transmission lever. (I agree with those who would like separate lighting for these initials.)

A Detroit owner writes: "I have owned Chevrolets in 1935, 1937, 1941, 1942 and 1949. My '51 model is the best of all. It never burns oil, and I like Powerglide because you don't have to divide attention between driving and shifting." A Maryland Powerglide owner writes that he has owned 10 Chevrolets in 16 years and doesn't think the '51 rides as easily as it should, and that gasoline mileage is only fair (See percentage chart for averages.) Sixty-eight percent report satisfactory use from regular gasoline.

A Lincoln, Neb., banker writes: "We always have driven larger cars, but recently our Chevrolet gets more hard driving than the larger car. We had heard that Chevrolet would take a great deal of hard driving

Percentages from P. M. Poll

Owners of Styleline models.....	79%
Owners of Fleetline models.....	21%
Bought standard transmission.....	72%
Bought Powerglide automatic transmission.....	28%
Average gasoline mileage (in country).....	20.1 m.p.g.
Average gasoline mileage (in city).....	16.9 m.p.g.
Use regular gas.....	68%
Use premium gas.....	32%
Change oil.....	99%
Average mileage for change of oil.....	1356
Add oil (and also change periodically).....	16%
Average mileage for adding oil.....	931
Maneuverability excellent.....	71%
average.....	28%
unsatisfactory.....	1%
Acceleration outstanding.....	13%
very good.....	61%
average.....	24%
poor.....	2%
Road clearance satisfactory.....	98%
too high.....	1%
too low.....	1%

BEST-LIKED FEATURES

Riding qualities.....	92%
Body styling.....	99%
Interior finish.....	89%
Instrument panel.....	87%
Visibility.....	95%
Prefer cast-iron pistons.....	77%
Overhead-valve system.....	88%
Larger brakes.....	96%

(These percentages are based on the fact that some owners mentioned more than one feature.)

with very little upkeep or operating expense, as well as commanding a satisfactory trade-in allowance. We found all these things to be true." An Omaha, Neb., owner writes that he likes the way his Chevrolet starts in cold weather; parts are cheap to buy, he gets good economy and has low oil consumption, but he doesn't like the door latches or the hand brake. A Norwich, Conn., owner says: "I am completely satisfied, and the fact that more Chevrolets are sold than any other make of car proves to me that it is the best for the money."

In answer to our question, "Why did you buy a Chevrolet?" one owner wrote: "My wife nagged me into getting a light car." In reply to our question, "What do you especially like?" he answered, "My wife has stopped nagging!"

A Nebraska owner writes: "I think Chevrolet has built a very fine car for 1951. The motor seems to be one of the best in Chevrolet history." A Wichita, Kans., owner writes: "It handles just as easily at 90 miles per hour as at 30. The roadability is wonderful; the seats fit you in a comfortable manner, pickup is very good, better on

RATING OF CAR

Excellent or good.....	90%
Average.....	9%
Poor.....	1%

GENERAL INFORMATION

Prefer in-line engine.....	64%
Prefer V-type engine.....	36%
Prefer six cylinders.....	62%
Prefer eight cylinders.....	38%
Prefer overhead-valve system.....	88%
Prefer side-valve arrangement.....	12%
Prefer automatic transmission.....	41%
standard transmission with overdrive.....	30%
standard transmission only.....	29%
Prefer Powerglide automatic transmission.....	74%
(The above figure means 74% of the 41% preferring automatic transmissions.)	
Prefer makes other than Powerglide.....	26%
Like low-pressure tires.....	82%
Previous Chevrolet owners.....	80%
Will or may buy another Chevrolet.....	98%
Will not buy another Chevrolet.....	2%
Dealer service good.....	68%
Dealer service average.....	21%
Dealer service poor.....	11%

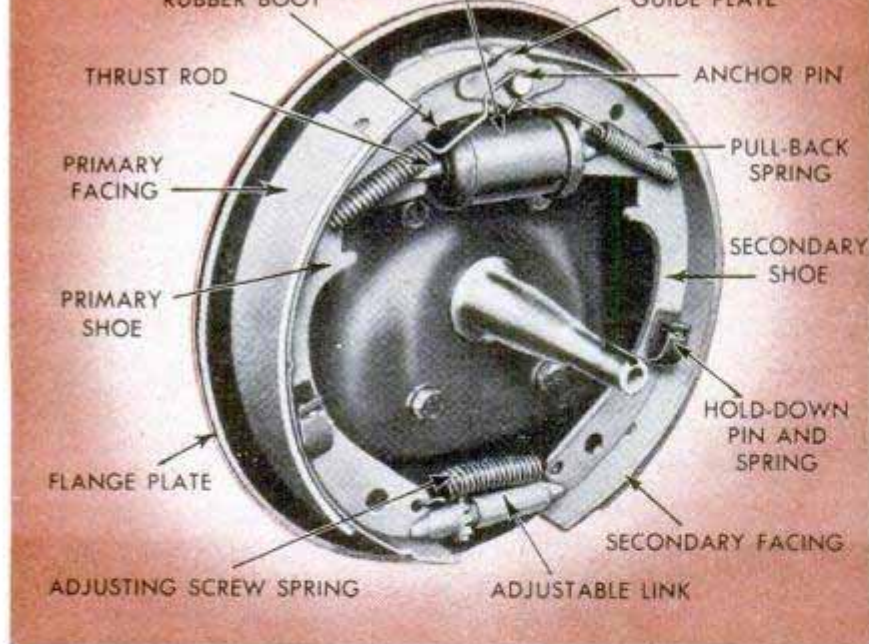
Most disliked feature:

Hood locks from outside, excess effort needed to close doors, no overdrive unit available, noisy tappets.

the highway than any other car in its price field." A Maryland owner was short and snappy in reply to our question "Why did you buy a Chevrolet?" He said, "Habit." A Ventnor City, N. J., owner says that he has used Chevrolets exclusively for 17 years and finds them best for local driving. A Cleveland, Ohio, owner complains that "the chrome rusts easily, should be undercoated at the factory. I think aluminum pistons would save gas and give greater pickup." A San Antonio, Tex., owner writes: "The Styleline body is nice; overhead-valve engine is easy to work on."

A Nebraska owner writes: "I like my standard-transmission Chevrolet because I enjoy driving a car, and with an automatic transmission and nothing to do, I might fall asleep. I think the emergency-brake handle is in a poor location." A Miami, Fla., owner wrote that his car was exceptionally easy to handle in traffic and has no side pull on a high-crown road. A Newport, Ky., housewife gave a good and sufficient reason as to why she is a Chevrolet owner: "A Christmas gift."

A Dorothy, N. J., housewife writes that



Owners gave Chevrolet's new brakes a 96-percent rating under "best liked features." Below, opinions varied on manually operated choke



she thinks the Chevrolet is the best all-around car in the low-priced field. A Hammond, Ind., owner made the complaint that the cigarette lighter is too far from the driver, and that the level of the floor is too high off the ground to be comfortable. A Columbia, S. C., owner was so well satisfied that he wrote, "I like the Chevrolet because it is a Chevrolet, I guess!" An Indiana owner complains that the clutch and shift are not smooth, ignition points foul up quickly and valve tappets are noisy. A Norwich, Conn., owner writes: "I like the ease of entrance and exit, plenty of passenger and leg room. I think the heating and ventilating features should be improved." A war-conscious Cambridge, Mass., owner came up with: "Interior finish looks mass-produced. (What would he expect from the world's largest producer—a hand-built custom job?) Chevrolet

should have reclining front seats to provide for sleeping as a feature for air defense!" A Waterford, Conn., owner likes the air and heating system, the hand choke and plenty of glass which allows fine vision, and he says the car is easy to park.

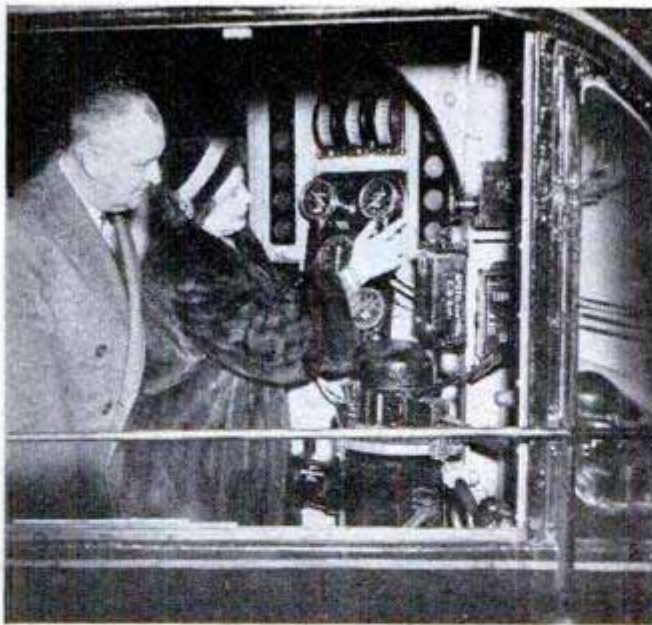
On the other hand, an Ohio owner doesn't like the hand choke, thinks the car is too big for a light car and should have more vision. However, he still thinks Chevrolet is the best buy on the market for the money. Another owner from Chicago also is war-conscious because he thinks that there might be gasoline rationing and that is why he bought a Chevrolet. An Overland Park, Kans., owner says the Chevrolet fits his pocketbook best, and that he has owned seven Chevrolet passenger cars and 10 trucks. A Salt Lake City, Utah, owner writes: "I like the new high rear fenders, curved windshield. Steering is exceptional this year and the car is very good on hills." However, he complains that the body metal seems too thin and the doors do not fit as well as in prewar days.

A Massachusetts owner says the only thing he doesn't like about the car is that the hood cannot be locked from the inside. There were numerous similar comments on this feature. A New Jersey owner likes the performance, price and economy, but says the lightweight rear end creates skidding on icy roads. (This is a common complain about modern cars, and it is true, but what can be done about it?)

Now for my own test of the car: Starting from San Francisco, I covered 1700 miles in a 1951 Powerglide Styleline four-door sedan. The route to Portland, Ore., and return also included a severe off-the-highway test into the Oregon backwoods over narrow trails, through mud, snow, slush and ice.

Highway conditions varied from the long straightaways where the car would cruise smoothly and easily from 80 to 85 miles per hour, through the rough, winding and mountainous highway. The car was nearly new, with only 150 miles on the speedometer when we started the test.

(Continued to page 252)



Speed Control for Locomotives Is Traffic Cop of the Rails

Automatically slowing down the train to the required speed if the engineer fails to do so, an electronic speed control is an ever-present policeman in the cab. If the block signals call for a speed reduction, the speed control blows a warning whistle in

the cab. If the engineer fails to reduce speed sufficiently, the electronic control automatically applies the brakes. If the signals indicate stop, and the engineer fails to take action, the train is stopped automatically by the control system.

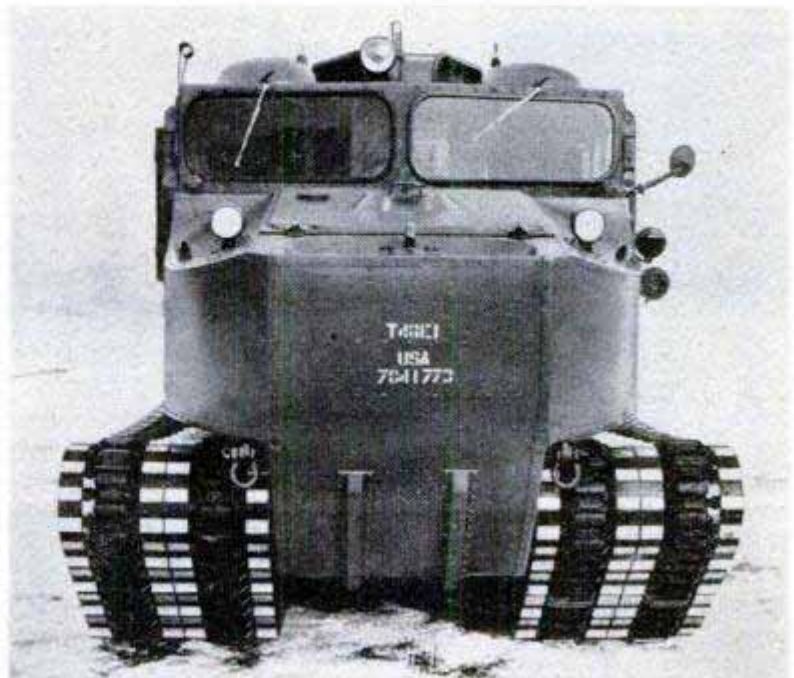
Mixing Ball Creates "Out-of-This-World" Colors

Completely new colors are being produced daily at the University of Illinois, simply because a researcher there noticed how light beams were focused by his spherical shaving mirror. Why not, thought Prof. Jozef Cohen, use this method to bring colors together from their purest source—a spectrum? He built a machine resembling a large bowling ball, into which a viewer peers through a binocular-like eyepiece. The strange colors appear inside on

a disk the size of a telephone dial. The disk can be split vertically so that different colors appear on each half. Actually, the Cohen machine works like this: A white light is focused upon a diffraction grating, which splits the light into a spectrum. With a mask, the user selects the color or colors wanted and lets them hit the spherical mirror which recombines them. A Lucite tube carries the resulting beam to the viewing spot.

"Otter" Goes Anywhere

Developed by the Ordnance Corps, the Army's new "Otter" can plow through water, mud, snow or sand, and travels 36 miles an hour over level land. The track-laying vehicle is as easy to steer as an automobile, and can turn on a dime. Operated by a crew of two, it can deliver a substantial number of fully equipped soldiers wherever they are wanted, regardless of the terrain. The Otter is a modern, bigger version of the wartime "Weasel."



☐ America's main-line railroads acquired 2372 diesel-electric locomotives in 1950, the largest number in history.



Trailside Mercantile Co., 532 Thatcher Rd., River Forest, Ill.

Fishing Rod Five Inches Long

Casts of 50 feet or more are possible with a new fishing rod only five inches long. The rod consists of a plastic handle topped by a disk and six prongs. The prongs form the reel around which the line is wound. Holding the device in one hand, the angler throws the weighted line underhand with the other. The line spins free of the reel as the weight arches through the air. The hand reel can be used with live bait or artificial lures. Following a cast, the line is retrieved simply by rewinding it around the prongs.

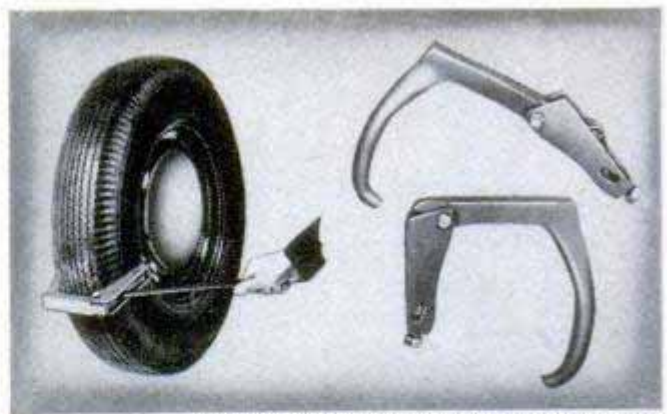
Sighting Tee

Golfers can accurately gauge distance to the green with the sighting slit in a new plastic tee. The player holds the tee at arm's length and sights the flagpole through the slit. He moves his thumb up or down until the flagpole appears to fill the height between the top of the slit and his thumb.



Gerrits Bros., Appleton, Wis.

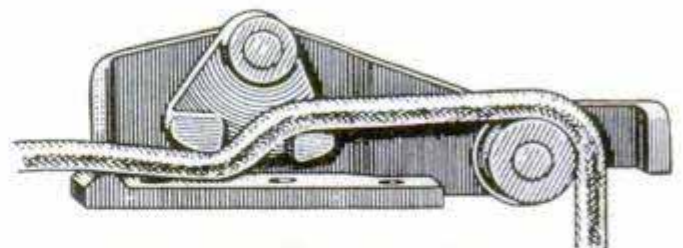
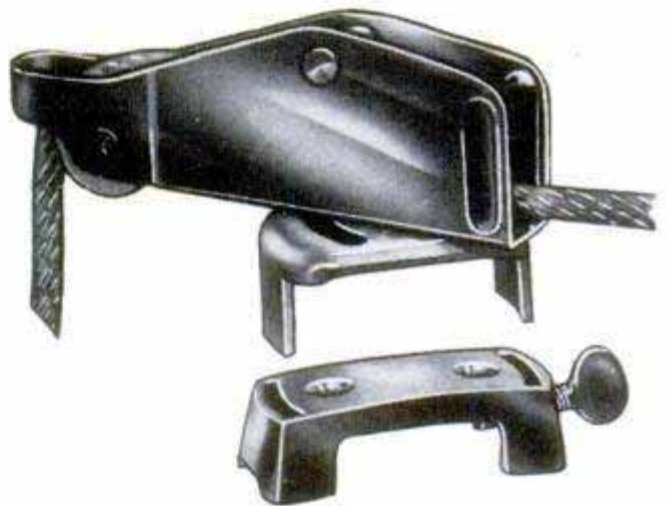
A yardage scale and numbers of the appropriate iron clubs to use from each distance are printed at the sides of the slit and the golfer selects the one appearing nearest the tip of his thumb. When used as a tee, the numbers and gradations act as indicators for players who always want the ball elevated the same height.



Lantz Manufacturing Co., Inc., Valparaiso, Ind.

Traction Clamp for Tires

One motion fastens a tire traction clamp for cars stuck in the snow, mud, a ditch or on a sheet of ice. The steel clamp fits any 5:90 to 7:00 tire and because of its thickness only one is required for each wheel. A single adjusting screw brings the linkage into position for clamping onto the tire with one stroke of a lever. It fits solid wheels which do not permit lug chains to pass through them.

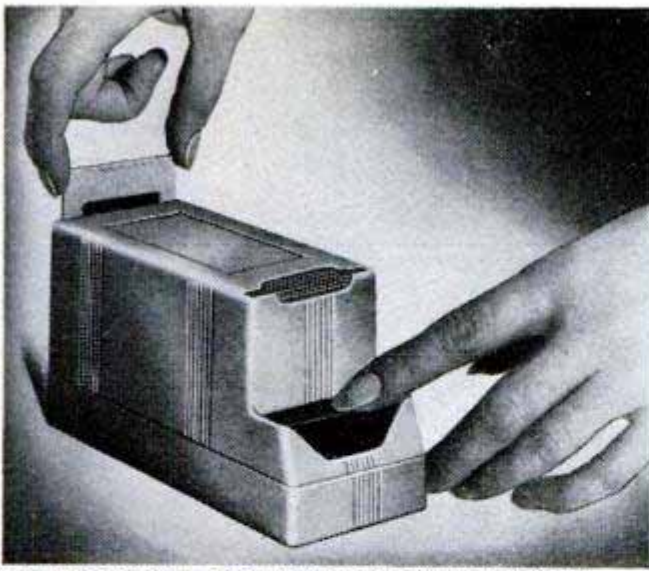


Thoss Mfg. Co., 206 West Third St., North Manchester, Ind.

Anchor Control for Small Boats

Nonslipping and self-locking, a foolproof anchor control can be used with ropes from 1/4 to 1/2 inch in diameter. The locking mechanism is completely automatic. Pulling on the rope unlocks it. Releasing the rope locks it. The rope can be operated from any position in the boat.

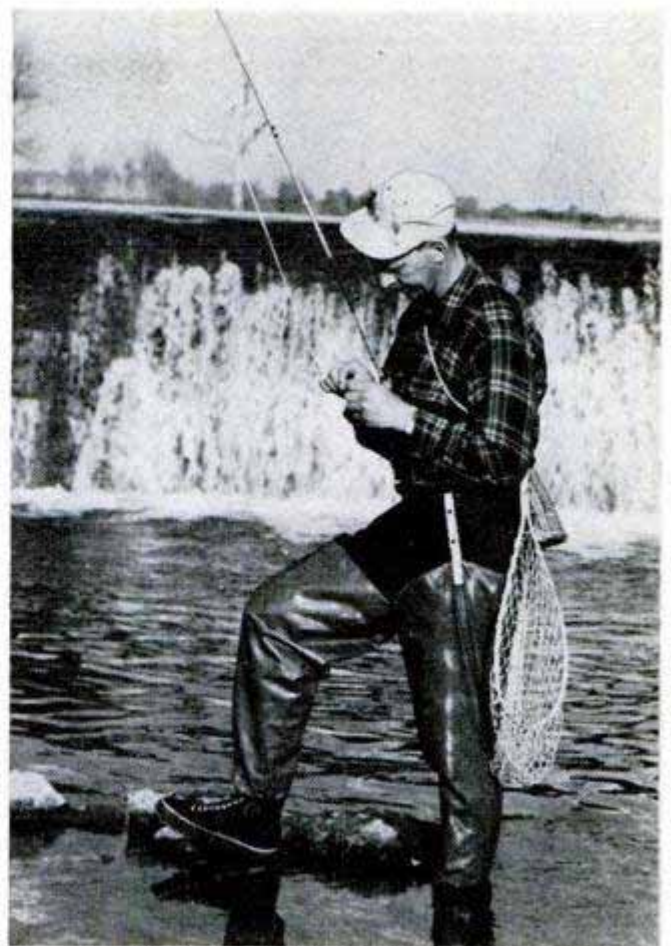
Ready-mixed pancake and waffle batter now are available in pressurized cans—the housewife just presses a valve and the batter pours out onto the hot skillet.



Westerlind Products, 1000 E. Walnut St., Pasadena 4, Calif.

Pop-Up File for Slides

Photo slides are kept in sequence and ready for instant use in a key-operated ejecting file. The operator simply presses a key at one end of the file and the slide pops through a slot at the other end. As many as 200 slides can be filed in the device.



Seal-Dri Sportswear Co., 2514 Kilburn Ave., Rockford, Ill.

Flying "Manure Spreader" Fertilizes Pasture Land

Down in New Zealand, the soil-conservation department is using airplanes to fertilize thousands of acres of pasture land. The largely mountainous terrain which presently supports only one sheep per acre can, when top dressed with phosphatic fertilizer, support twice that or two sheep an acre. The phosphate is distributed over the land as pellets about the size of peanuts. Flying between 400 and 500 feet above the ground, the plane spreads a 100-foot swath at a rate of 200 pounds per acre.

Plastic Hip "Boots"

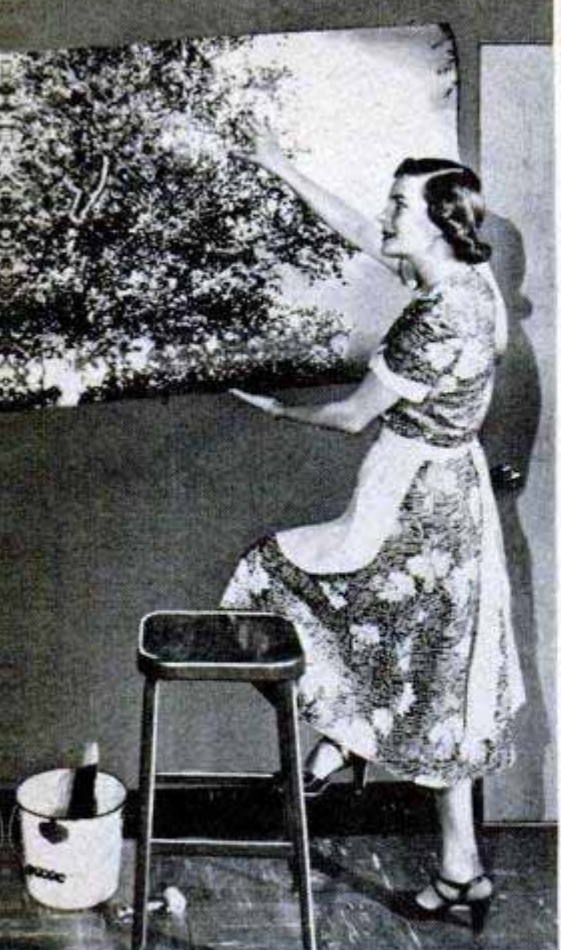
Worn inside any shoe like overgrown stockings, a pair of plastic hip "boots" keeps the fisherman dry without uncomfortable weight. The foot is shaped to fit into gym shoes and can be worn all day without discomfort. The legs are held up by straps that slip over the belt. When not being worn, the boots, which weigh less than two pounds, can be folded and carried in the pocket or tackle box.

Fielding-Practice Aid

As a practice aid, baseballs thrown at a slatted "cradle" are deflected at different angles to provide a variety of ground balls for infielders to catch. It was devised by Branch Rickey, general manager of the Pittsburgh Pirates.

☐ Though a light bulb could be designed which would burn continuously for a thousand years, Westinghouse engineers say it would be useless for lighting purposes as it would give less illumination than a firefly.





R-C-S Studios, 123 N. Wacker Dr., Chicago 6, Ill.

PHOTO MURALS by mail order enable the average homeowner to decorate his rooms with actual enlarged photographs of beautiful scenes. There are 90 different scenes available in a variety of sizes. All of them are sepia toned to give a rich, warm effect. Once mounted, the murals are washable and last indefinitely

What's New FOR YOUR HOME



Ogden Filter Co., 4214 Santa Monica Blvd., Los Angeles 27, Calif.

WATER FILTER removes many bad tastes and odors. Its replaceable element filters hundreds of gallons

VACUUM LID seals open jars or cans. Depressing membrane expels air, making vacuum that holds lid on

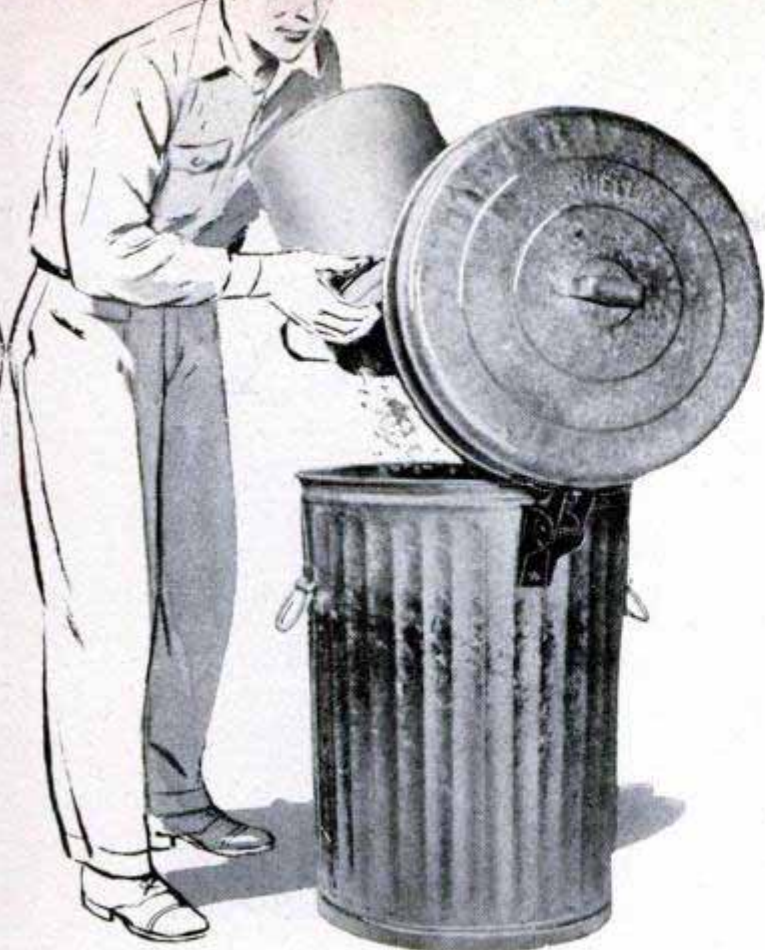
C & S Engineering Co., Woodside, Calif.



PLACE MATS of plastic look like fabric, yet require no washing or ironing. Just rinse under a faucet

Hedwin Corp., 1525 West 41st St., Baltimore 11, Md.





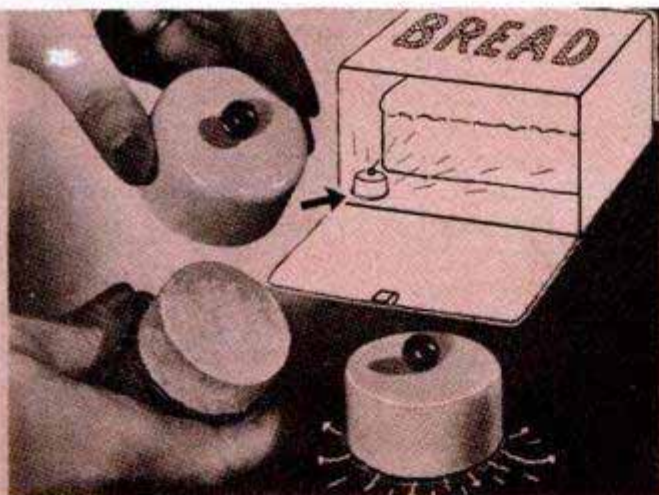
Sta-Kov Corp., 4536 Vernon Blvd., Long Island City 1, N. Y.

SPRING HINGE for garbage cans can be attached in a few minutes. It holds lid open in any of three positions. When lid is down, spring keeps it closed



The Meyerecord Co., 5323 W. Lake St., Chicago 44

DECALS FOR FABRICS decorate clothing, linens and other materials with full-color designs. Simply iron the design on. Laundering won't dim the colors



Moist-Sure Products, Box 3870, Merchandise Mart Sta., Chicago 54

HUMIDIFIER for breadbox or tobacco jar retains twice its weight in water and moistens air for days

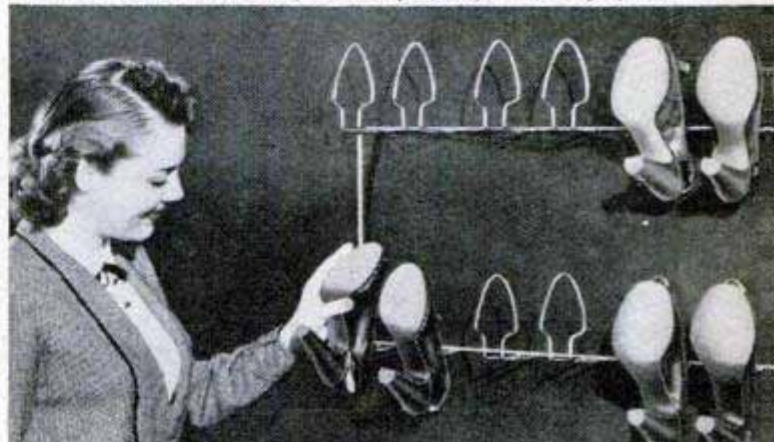
NEAT PLEATS are made easily with a jig consisting of two slotted forms that shape cloth properly
Hide-A-Brush Container Co., Brook, Ind.



Simplicity Tool Co., 2850 N. Mississippi, Portland, Ore.

NEWS RACK adjusts for books or magazines. It's fine for breakfast readers. It holds cookbooks, too

WALL TREE keeps shoes in shape and allows them to air out thoroughly. It will hold any kind of a shoe
Midwest Metal Products Inc., 315 Westport Rd., Kansas City 2, Mo.





Left, shaft enters water at angle to keep bow of light craft from riding skyward. Right, same engine, with pump and nozzle, sprays trees. Below, fouled propeller can be swung inboard
Atco Motor Mowers, 67 Broad St., New York City 4

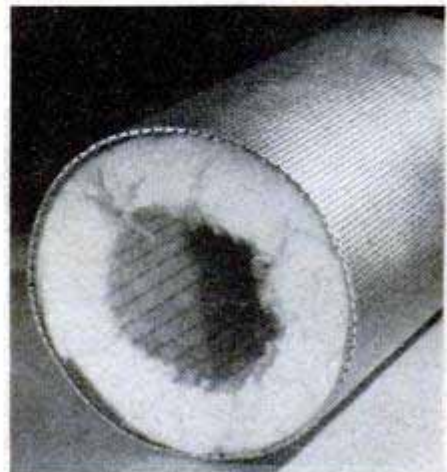
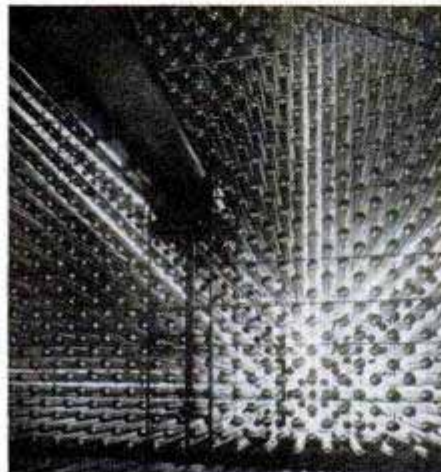
Outboard Motor Sprays Trees

With a versatile outboard motor developed in England you can power your boat or spray your trees. The motor weighs 44 pounds and comes in two sections about 30 inches long for easy storage in an automobile trunk. A single wing nut fastens it to the sternboard of a dinghy or rowboat. If weeds foul the propeller, the whole shaft can be swung aboard on its swivel-hinged mount. Inboard, the shaft can be fitted with a suction pump and used to bail the boat. The same pump and engine can be used with nozzles to spray fruit trees.



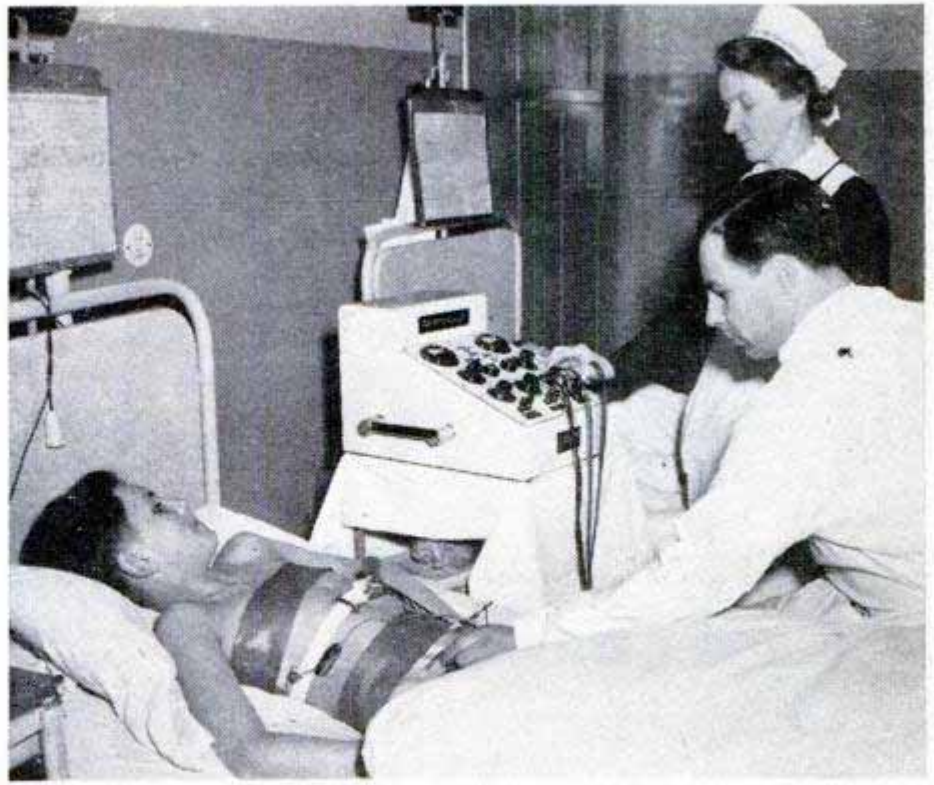
Fiberglas "Sound Blotters" Deaden Roar of Test Engines

Perforated aluminum cylinders, packed with Fiberglas insulating wool, are helping deaden the roar in aircraft-engine test cells. The cylinders, 7½ feet long and 9 inches thick, hang by cables at the intake and exhaust ends of the cells. The cylinders are suspended in staggered rows. The "sound blotters" aren't damaged by the high wind velocities in the cells.



Shock "Breather" Helps Polio Victims

Using electrical-shock impulses to control breathing, a 28-pound machine invented by two German doctors, regulates the involuntary respiration of polio patients. Costing about \$475, the machine may end the need for the cumbersome iron lung for many patients. Rubber straps around the patient transmit shock impulses which control breathing.



Cropland in Peril

Unless immediate steps are taken to save the nation's remaining cropland, the United States soon will reach a disastrous turning point where there will be insufficient nutrition available for the population, according to Dr. Wendell H. Camp of the Academy of Natural Sciences in Philadelphia. Already, he warns, misuse of the soil has robbed the nation of 100 million acres of cropland out of an original 560 million acres. Since nutritionists estimate that 2½ acres are re-

quired to provide a balanced diet for a single person, the United States seems destined to reach the point where it has just enough cropland within the next 15 to 20 years. Doctor Camp suggests plant breeding, reforestation and improved utilization of soil and fertilizer as methods to save the land, and the possible use of the yeast plant and seaweed as sources for basic foods.

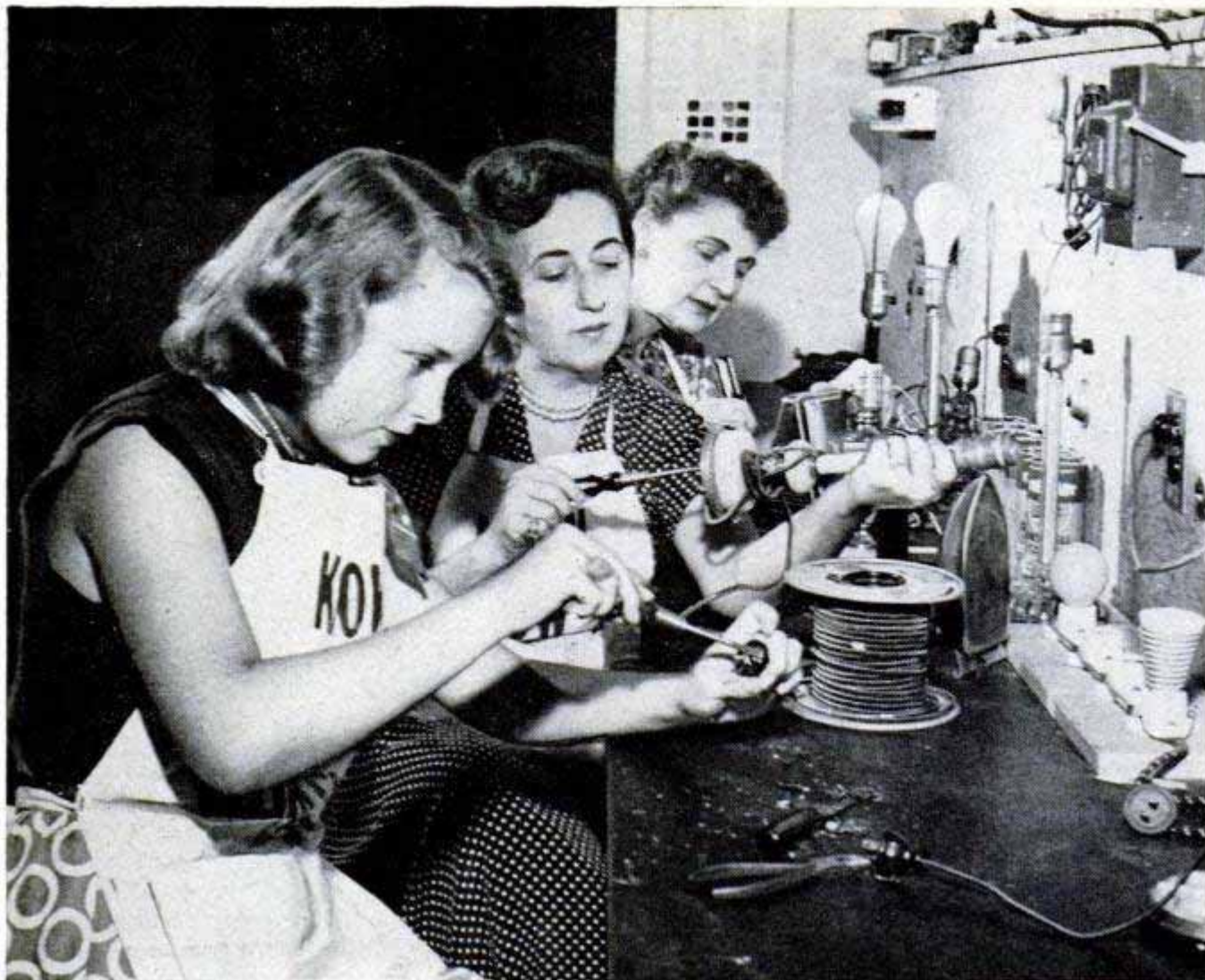


Glass Soldered to Metal

Glass is soldered to metal in a process that makes the bond stronger than the glass itself. Developed by General Electric engineers, the process uses titanium hydride. The glass and metal areas to be soldered are painted with a thin layer of titanium hydride and solder is placed on both areas. The parts are then put together and heated under a vacuum. At about 900 degrees Fahrenheit, the titanium decomposes, causing the molten solder to adhere to the painted areas.

Bureau Raps Battery Aids

Storage batteries can't be rejuvenated by adding various preparations promoted for that purpose, according to the National Bureau of Standards. The bureau has made tests of the preparations. The tests show little or no difference between dead batteries treated with mixtures and similar untreated batteries.



Students learn electrical work, then are handed worn-out appliances which they proceed to fix without help

Sit still, hubby. Your new bride can patch the hole in the plaster. Husbands heartily approve this school



SCHOOL for

MAKE WAY NOW for the woman who not only can do the housework, but also the home plumbing, upholstering, electrical repair work and even can pound a nail straight.

Most housewives, helpless before a burned-out toaster, a dripping faucet or a sofa with a broken spring, spend more time hounding hubby than they would spend in doing the repair work themselves—if they knew how.

Mrs. Lillian Baldwin decided not so long ago that she wanted to learn how to handle odd repair jobs continually cropping up in her home. She found that, at various schools, she could learn to become an upholsterer, an electrician or a plumber, but nowhere could she learn how to be a full-fledged handywoman.

Finally, she discussed the problem with a friend, and together they established a workshop where women could learn to cope with common home emergencies.

The result is a "college" in midtown New York where student-housewives become

proficient in handling such odd jobs as repairing broken crockery, fixing an electric iron or rewiring a lamp.

The housewives also are taught to mix paints, prepare a surface for finishing and how to stain or varnish furniture. Other subjects include the repair of window shades, replacing fuses, rewebbing upholstered chairs and even sharpening a knife or loosening a stuck bureau drawer.

Workbenches are fitted for electrical jobs, and sinks are available for practice on plumbing problems.

Students are charged \$30 for the nine-session course which is completed in 4½ weeks. "Graduates" are prepared to tackle with confidence odd jobs that would overwhelm most of their husbands.

By Joseph Kostin



Below, left, students who normally handle nothing heavier than a dust mop practice the plumber's trade on sinks in the school. Below, two young wives replace a broken cord in a fake window

Does Pop's easy chair have a sprung spring? Here a housewife learns to do an upholsterer's job herself



Handy Housewives





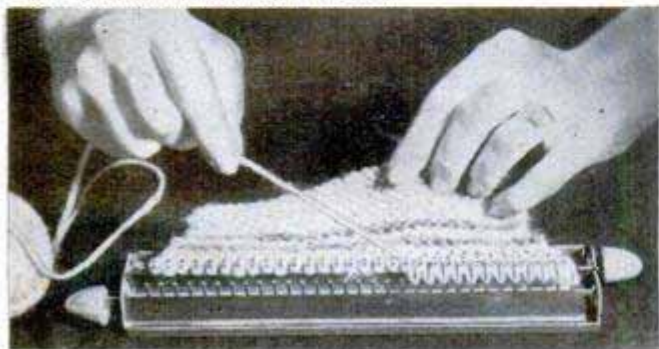
Shop-Made Space Heater

When mechanics of a Western truck line needed a space heater for their shop, they rigged one themselves from materials they found in the building. The gas-fired heater has a steel cylinder for a base. With a few lengths of old stovepipe they built a zigzag "radiator" five feet high, supported by lengths of steel rod. The result is a heater that warms a person from head to toe.

Hand Knitting Machine

With a new hand knitting machine the housewife can turn out fabric up to 30 stitches wide (about eight inches) and as long as desired. Scarves, hats and mittens can be made completely on the machine; larger articles such as afghans and sweaters are made in strips and sewed together. The yarn is first wound on the pins of the machine. Then in one movement the previous row of stitches is released. The final step for each row is casting over the stitches with a few sweeps of the hand.

Ainslie Knitting Machine Co., Inc.,
740-750 Grand St., Brooklyn 11, N. Y.



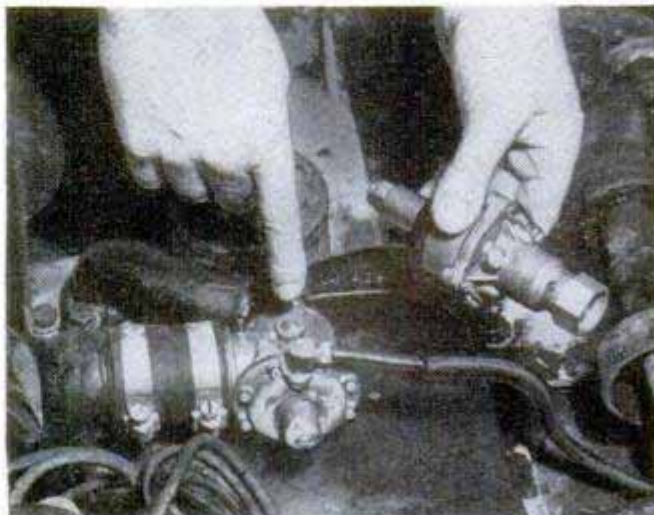
Scott-Atwater Manufacturing Co., Inc.,
2901 E. Hennepin Ave., Minneapolis 13, Minn.

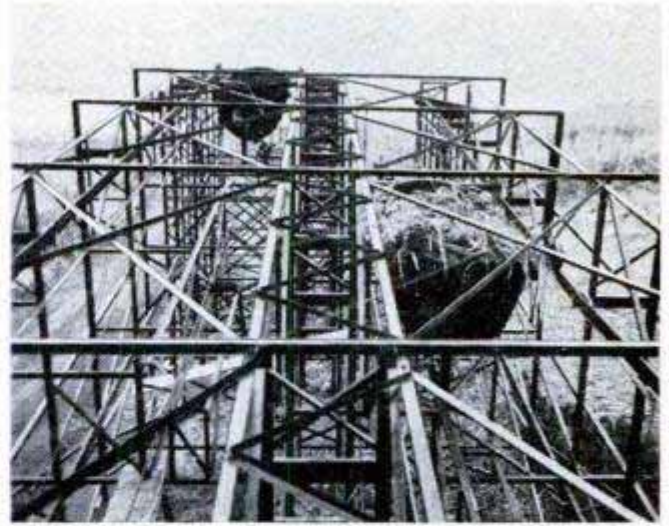
Remote Controls for Outboards

Manual operation is outmoded by remote controls that shift gears and regulate the speed of outboard motors. It permits a helmsman up front, operating two control levers at his side, to maneuver and dock an outboard motorboat just as he would an inboard-type craft.

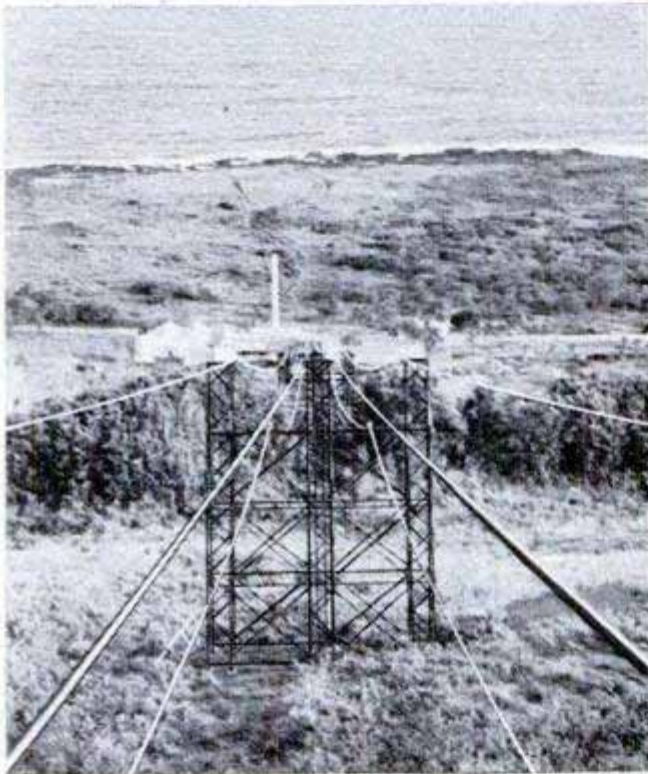
Degasser Valve Stops Bus Fumes

Pacific Electric busses in Los Angeles produce no dense clouds of eye-irritating fumes when coasting or slowing to a stop. Their gasoline engines are equipped with a degasser valve on the intake manifold that admits fresh air into the manifold when the engine is coasting. The added air creates a lean mixture that burns completely in the combustion chambers. Without the valve, the rich mixture of raw gasoline and air is exhausted in a partly burned state, creating fumes and smoke.





Above, left, buckets are loaded by a power grab atop the plateau, 1300 feet above sea level. Above, the filled buckets travel down the tramway to the mill by gravity. Empties are hauled up by a steel rope. Left, a downhill view from halfway point on tramway



High-Riding Sugar Cane

Tons of sugar cane flow downhill from the high plateau on which it grows to the mill on the Hawaiian seacoast via a mile-long aerial tramway. Despite its cost of \$240,000, the tramway is a dollar-saving investment because it eliminates trucking, an expensive and slow process due to the rugged terrain. There are 23 two-ton buckets in continuous operation delivering as much as 100 tons of cane an hour. Sixteen towers, each 30 feet high and spaced from 100 to 700 feet apart, support the cables. At the mill terminal, buckets filled with sugar cane are automatically tilted, dumping the cane into a chute that leads to the mill yard.

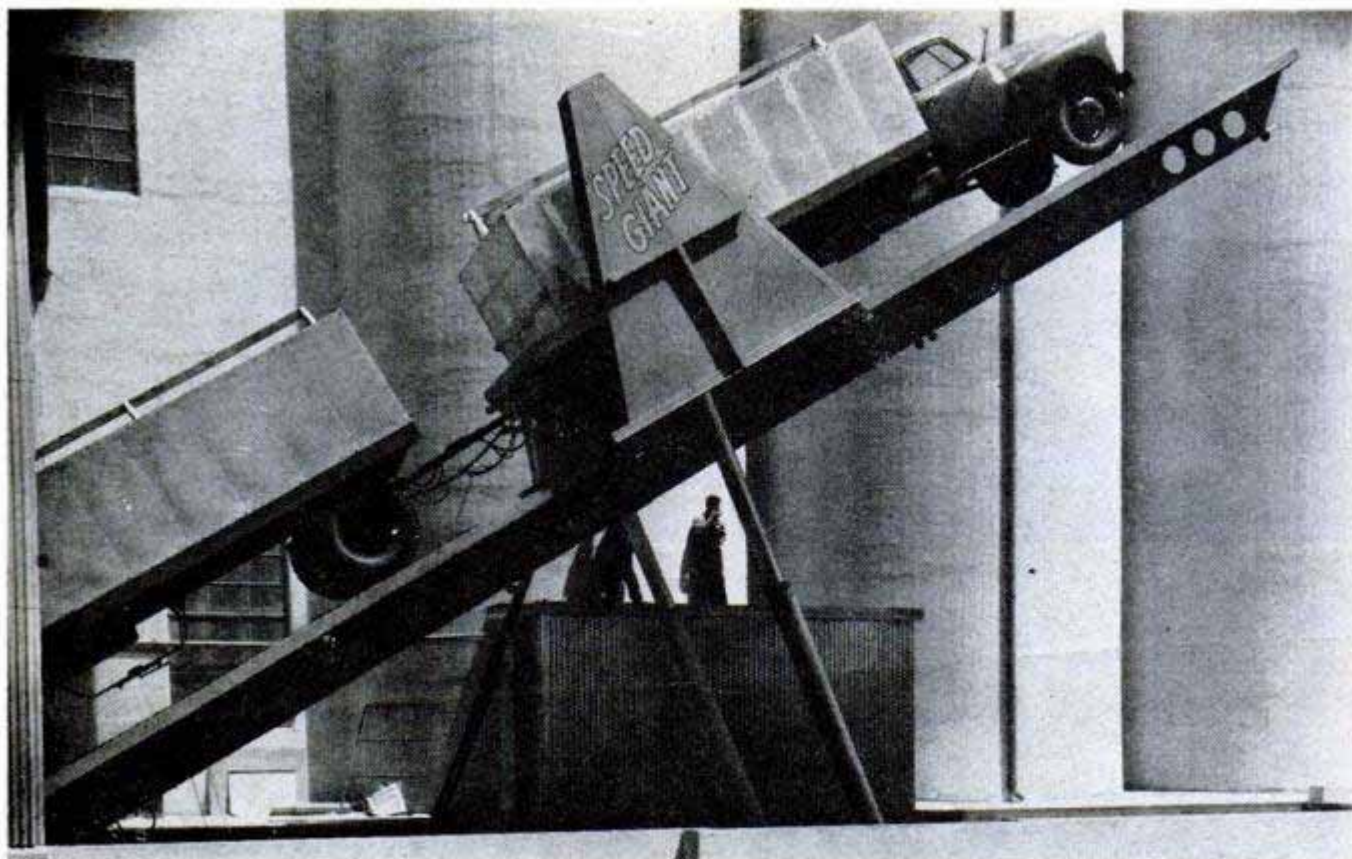
Robot Caddy

It is still thought advisable to have the golfer swing the clubs, although an ingenious Oregonian has simplified life on the links with a radio-controlled caddy cart and lawn mower. Jim Walker of Portland attached a conventional cart to a power lawn mower and added remote control and radio equipment to lessen human effort.

Vegetable "Blood" May Save Lives

Powdered okra, a vegetable widely grown in the South, can be used as a substitute for blood plasma, research at Marquette University has shown. Plasma is administered as a transfusion to victims of shock caused by injury, surgery or anything else causing reduced blood volume. Tests made on animals show that one ounce of okra powder, when mixed with sterile water, is the equivalent of a quart of plasma.





Truck Tilter

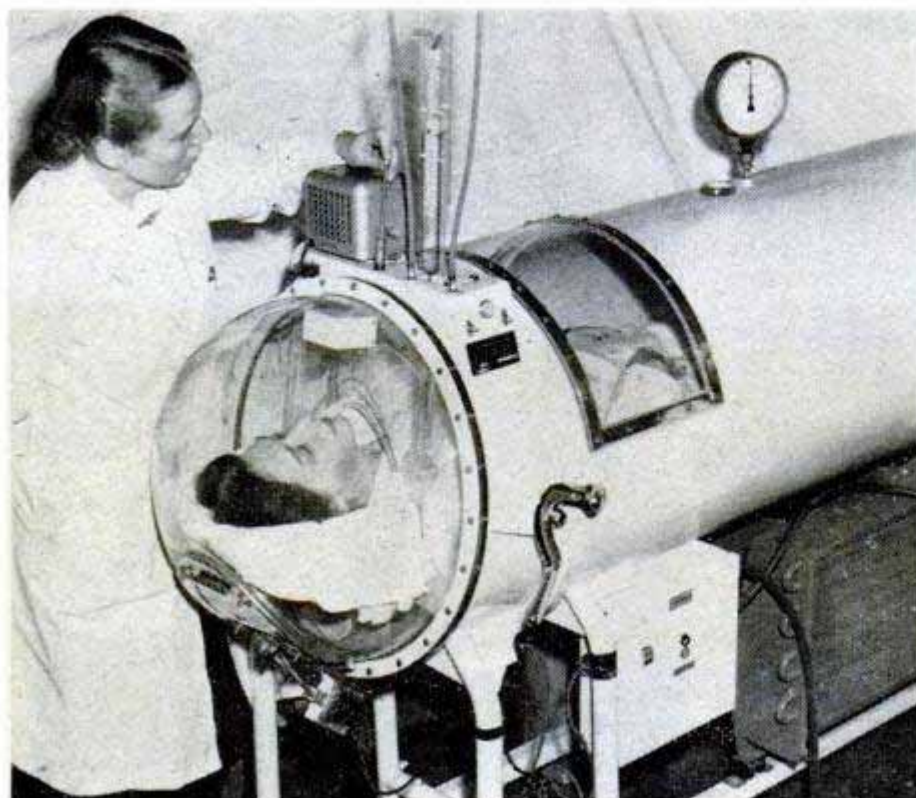
Truck loads are quickly emptied by a dumping platform that resembles a giant teeter-totter. After a truck or truck-trailer combination is driven onto the platform,

the operator presses a button that raises a chock behind the truck's rear wheels and then up-ends the platform to any angle up to 35 degrees. It can be lowered back to horizontal in 70 seconds or stopped at any angle desired.

Mechanical Cougher for Infantile-Paralysis Victims

Infantile-paralysis victims who have respiratory difficulties now can be forced to cough naturally inside a pressure chamber

similar to an iron lung. Previously, the patient's inability to cough could lead to serious and sometimes fatal consequences.



Inside the pressure chamber, a baffle is fitted closely around the patient's neck. An air valve timed to operate in $\frac{1}{1800}$ second permits a sudden and explosive compression of air on the patient's chest. The effect is similar to that of a natural cough by the patient. The pressure chamber was developed by Dr. Alvan L. Barach of Columbia University.

Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, available from the Bureau of Information, Popular Mechanics, 200 East Ontario St., Chicago 11, Ill.

American Way of Life

PHOTO CONTEST

What does America mean to you?

**Answer that question with a photograph
and win one of these big prizes!**

prizes

	Black and White	Color
1st Prize	\$1,000	\$1,000
2nd Prize	\$ 500	\$ 500
3rd Prize	\$ 300	\$ 300
4th Prize	\$ 100	\$ 100
5th Prize	\$ 100	\$ 100
6th Prize	\$ 100	\$ 100
7th Prize	\$ 100	\$ 100
8th Prize	\$ 100	\$ 100
16 Prizes—Black and White Only	\$ 25 each	

rules

1. The "American Way of Life" photo contest is open to all persons except employees of Popular Mechanics Company and their families.

2. There will be a Black-and-White Competition and a Color Competition with separate prizes in each. Hand-tinted prints are not eligible.

3. Photographs must illustrate your own conception of the "American Way of Life," but the subject you pick can be in any field — industry, agriculture, government or any other. You may see it in a country store, a view, a man at work, a city street or a thousand places. Winners will be selected on (a) how well the picture illustrates the "American Way of Life" and (b) its all-around photographic excellence.

4. All entries must be postmarked not later than midnight, September 1, 1951, and must have been taken between April 1, 1951, and September 1, 1951. No entry fee is required and there is no limitation on the number of entries you may submit. Data sheet, giving information listed at the bottom of this page, must be attached securely to the back of each entry. When submitting transparencies, attach data sheet to the top of the transparent sleeve.

5. All prints and transparencies will be held until after winners are announced in the 50th Anniversary Issue of Popular Mechanics, January 1952. Non-winning prints and transparencies will be returned as soon as possible thereafter, provided that a self-addressed and stamped envelope is enclosed with the entries.

6. Black-and-white prints must be no smaller than 8 by 10 inches and no larger than 11 by 14 inches and must be mailed flat and unmounted. Color prints submitted must be 5 by 7 inches or larger. Color transparencies must be 2¼ by 2¼ inches or larger.

7. All prize-winning photographs become the exclusive property of Popular Mechanics Company. Original negatives of prize-winning prints must be submitted upon request.

8. Judges will be selected by the editors of Popular Mechanics Magazine. Their decisions will be final. In case of ties, duplicate prizes will be awarded.

9. Mail all entries to PHOTO CONTEST, POPULAR MECHANICS, 210 East Ontario St., Chicago 11, Ill.

10. Popular Mechanics Company will use all reasonable care in handling entries, but it can assume no responsibility for loss or damage of any entry.

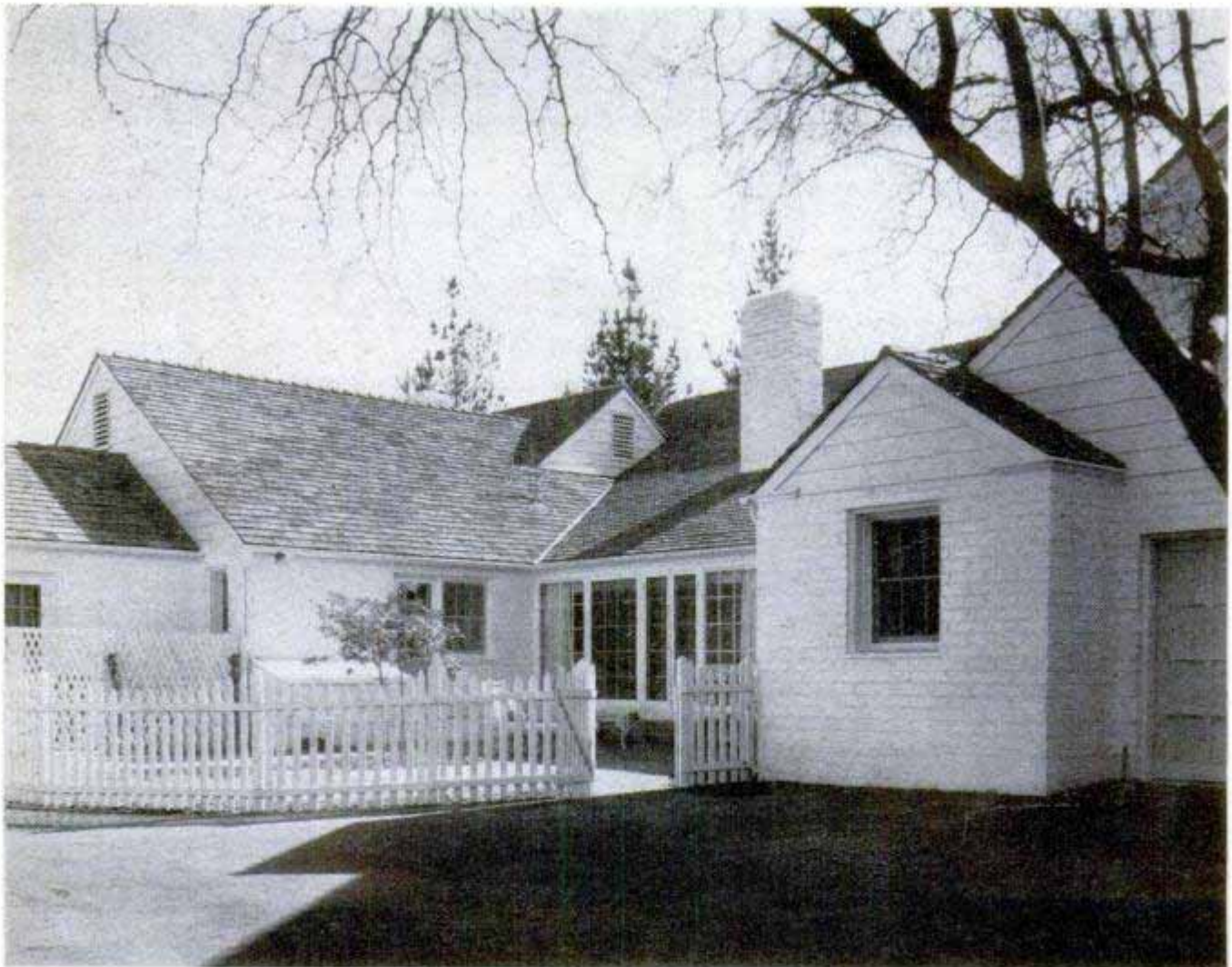
Attach to each photograph the following information:

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|-------------------|---------------|------------------|----------------|
| 1. Your name | 4. Subject | 7. Shutter speed | 10. Film |
| 2. Street | 5. When taken | 8. Lighting | 11. Lens stop |
| 3. Town and state | 6. Camera | 9. Where taken | 12. Other data |

Adobe...



Above, Mission San Gabriel, near Los Angeles, is an adobe structure that was built more than 150 years ago. Right, each adobe brick (weight: 30 pounds) is examined for cracks. These bricks are drying, a process that takes 10 days. Below, a modern relative of mission, above, is a present-day adobe-brick home



GOES MODERN

By
Jack B. Kemmerer

ADOBE as a building material antedates the discovery of fire. When man first emerged from his cave he constructed a rude framework of sticks and plastered it with mud. Mud or, as we know it, adobe has been used through the ages.

From mud-plastered walls man progressed to making bricks of mud. It was a crude, slow process, and all bricks were handmade in small quantities. These bricks, though not waterproof, for centuries withstood the ravages of both man and the elements. One of the oldest houses in the United States, built entirely of adobe, has stood for hundreds of years in Santa Fe, N. Mex.

Now, petroleum scientists have developed a stabilizing agent. It is guaranteed to make adobe permanently waterproof. The Standard Oil Company of California,

in conducting research to improve road-paving materials, discovered that emulsified asphalt—colloidal asphalt and water—would waterproof any material it was added to.

During these experiments the new stabilizer was mixed with adobe, and we now have stabilized adobe bricks that are waterproof, insectproof, soundproof and, of course, fireproof. This material will make one of the longest-lasting houses ever built.

To be popularly accepted, adobe bricks had to be made in quantity and be readily available. Stationary plants were set up for this purpose. However, once the usable soil in the immediate vicinity was exhausted, long hauls were necessary and this increased the price of the finished bricks.

To overcome this difficulty, Ben Pinsker

Here is the den of the colonial house, shown opposite. Even the interior walls were made of adobe brick



of the Certified Adobe Company, Los Angeles, designed and built a portable machine. It is constructed on the chassis of a one-ton truck and can be moved to any location where the earth has been determined satisfactory for making bricks.

This machine consists of a digging wheel, mill for grinding the earth, mixing mill and an extrusion die.

The adjustable digging wheel can be set to take a cut from three inches above ground level to 12 inches below ground level. Six cutting shovels dig into the earth as the wheel revolves. The earth is carried into the hammer mill by a screw conveyor. In the hammer mill are 60 swinging steel hammers which pulverize the earth until it is as fine as face powder.

Suction created by the engine exhaust removes the dust from the mill, thus preventing dust explosions. This exceedingly fine dust escapes from the bottom of the muffler through a rubber hose. It can be sacked and makes an excellent mortar for the adobe brick.

The pulverized earth then passes from the hammer mill to the forward end of the "pug" mill, which is a deep rectangular trough with two contrarotating shafts six feet long. Each shaft has 48 sets of mixing blades.

The earth is mixed with the stabilizer and water to the proper consistency. As the earth is mixed it moves down the trough until it reaches the last two sets of blades on the shaft. These force the earth into the compression chamber.

The brick is formed and shaped by an extrusion die and shaper cap. The pressure in this chamber is 500 pounds per square inch. The adobe bricks emerge four inches thick and can be made in any width from 2 to 12 inches.

Mounted on a truck, the brick-making machine can be moved to any area where soil is of proper type

The earth is extruded like toothpaste and is cut into bricks 16 inches in length. A length of piano wire serves as the cutting knife.

After the bricks are cut they are stacked on wooden platforms. In warm weather the bricks dry in about 10 days and do not require turning during the process. However, they must be stacked carefully to provide an air space around each brick for even drying.

"The first 30 minutes of a brick's life are the most important," explains Pinsker. "Any strains, stresses or cracks will start during this time."

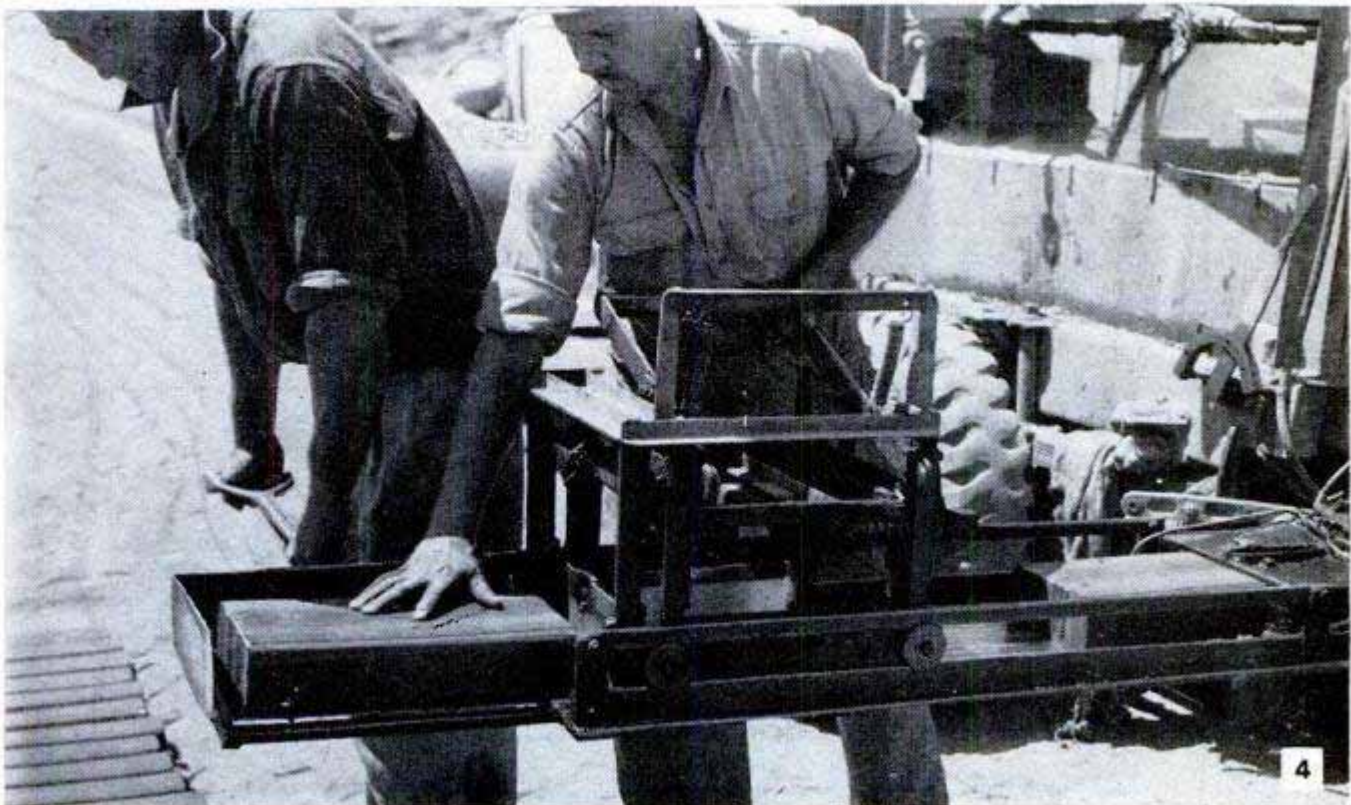
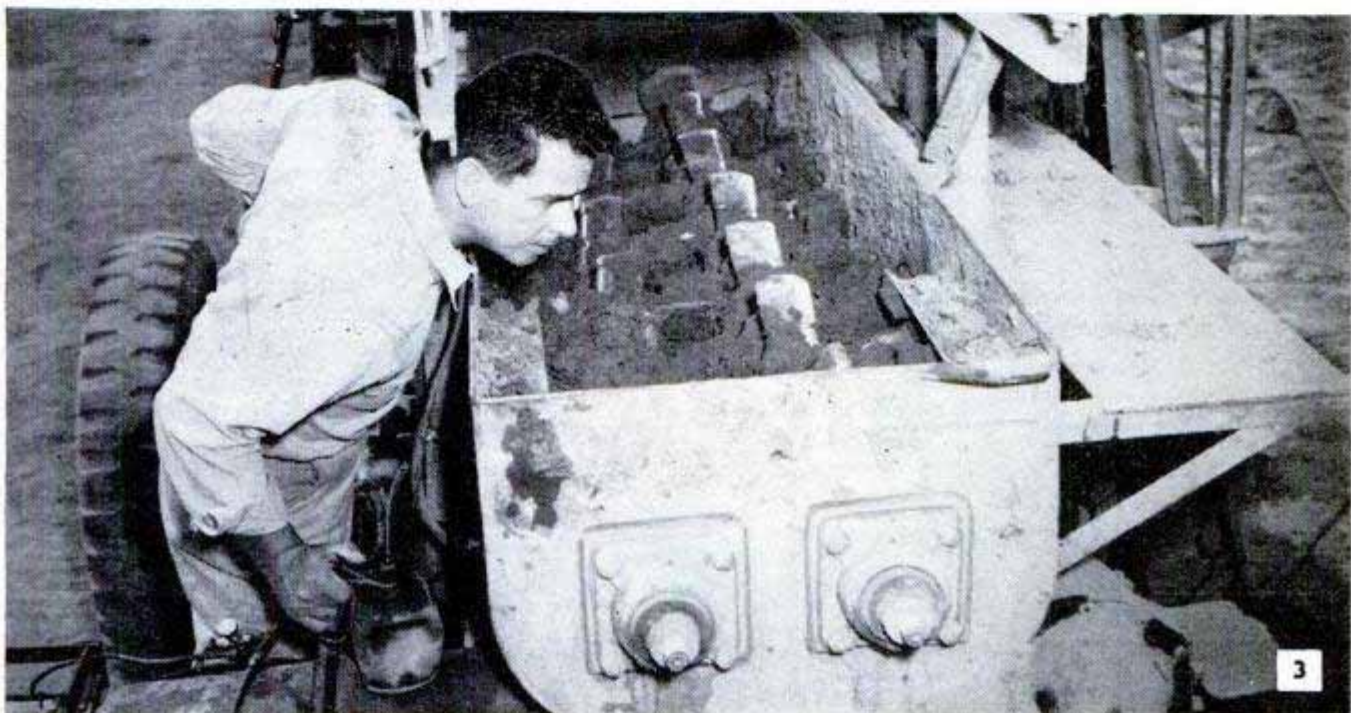
Before the machine is moved to a new location, Pinsker makes a careful study of the new area. The earth is laboratory tested. It should consist of 60 percent alluvial clay and 40 percent fine, sharp sand. One hundred thousand bricks can be made from one acre of land with an eight-inch cut.

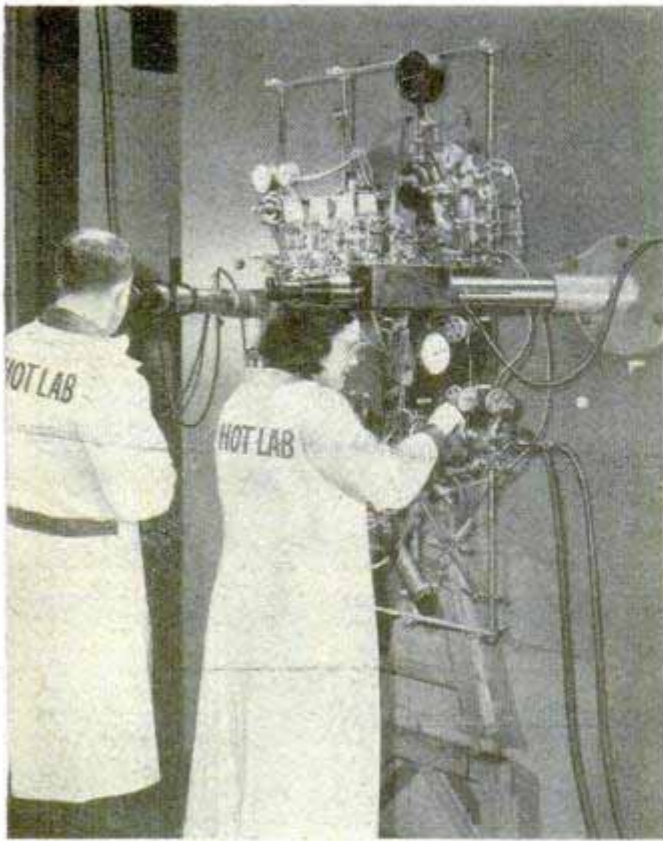
Adobe has superior insulation qualities. Four inches of adobe are equal to one inch of mineral-wool insulation. Adobe laid in good mortar withstands earthquakes, cyclones and tornadoes.

People who live in adobe houses are positive that it is the best material to use. When you build with adobe, you are building for eternity.

1. Adjustable digging wheel on the portable machine for making adobe bricks is set to any desired depth
2. Screw conveyor moves the earth from the digging wheel to the hammer mill that pounds it into powder
3. Emulsified asphalt, the stabilizer, is mixed into the powdered earth by the 96 blades of the "pug" mill
4. Extruded by the machine, the "ribbon" of adobe is cut into bricks and carried by shovel to drying yard







One scientist observes results of tests by periscope as colleague, right, operates the controls

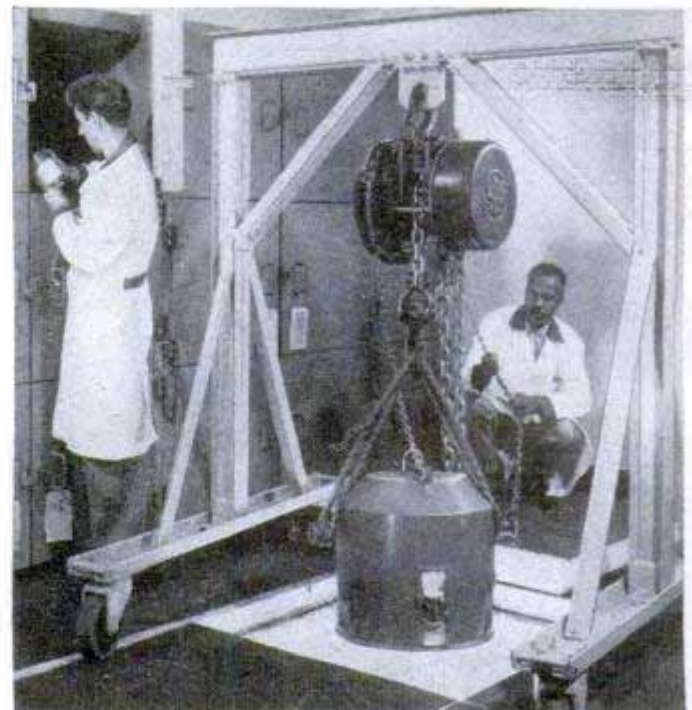
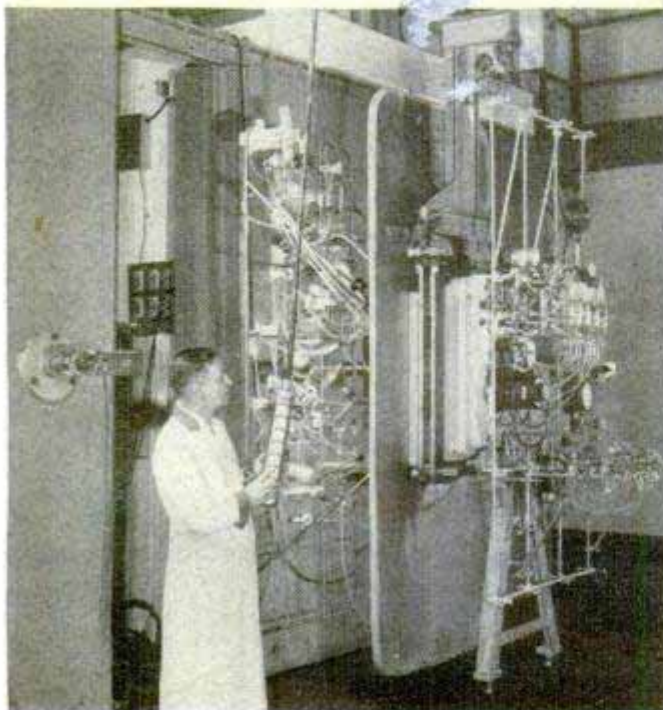
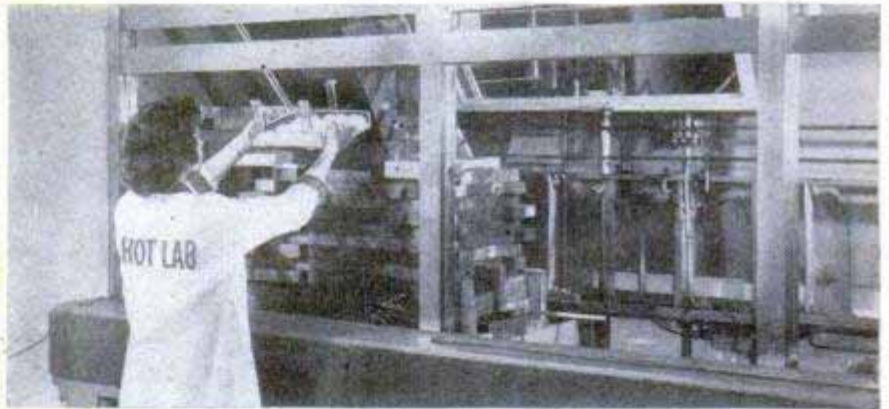
LOCKED TIGHTLY in "cells" with walls thick enough to stop their radiations, "hot" atoms perform for the scientists at Brookhaven National Laboratory's new Hot Lab. These cells are made of stainless steel backed by concrete walls three feet thick. Direct observations are made through periscopes while data observations are made by instruments outside the chamber.

There are three such cells at Brookhaven. These are used only with the hottest of hot materials, or radioisotopes. Eleven-ton steel doors, one foot thick, bar the only opening to each cell while experiments are in progress. These doors slide to open or close and each move takes only five seconds despite the tremendous weight.

Equipment for each experiment is pre-assembled on a panel which is then fitted into one of the doors. When the experiment is completed, the panel is removed for decontamination in special "clean up" rooms near by. This system reduces "dead" time for each cell to a minimum, as one experiment can be set up while another is in progress inside. Because of the stainless-steel lining, the entire cells can be scrubbed clean if contaminated during an experiment.

HOT LAB'S "Cell Block"

Right, these fertile eggs will be bombarded in the "semi-hot" cave, used in experiments where radiation is weaker. Below, a preset panel is moved into its place on the "hot cell" door just before test begins. Below, right, radioactive material is stored in a concrete well



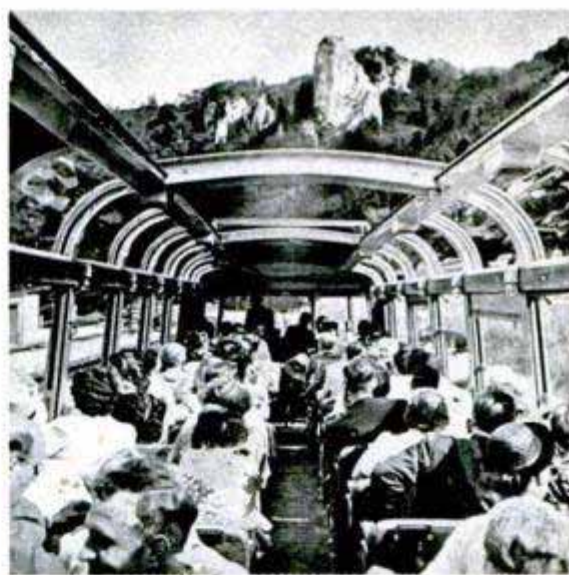


Keyco Mfg. Co., 1250 E. 12th St., Oakland 6, Calif.

Auto-Body Repair Jack has 3000-Pound Punch

Automobile-body mechanics do better work and do it faster with a lightweight body-jack kit that pushes or pulls with a 3000-pound force. The jack itself weighs less than six pounds and is completely me-

chanical in operation. Very compact, it can be used in the close quarters characteristic of body work. A variety of attachments for the jack permits the mechanic to do all straightening jobs with this one tool.



German Federal Railroads photos

Convertible Railroad Coach Has Rollaway Top

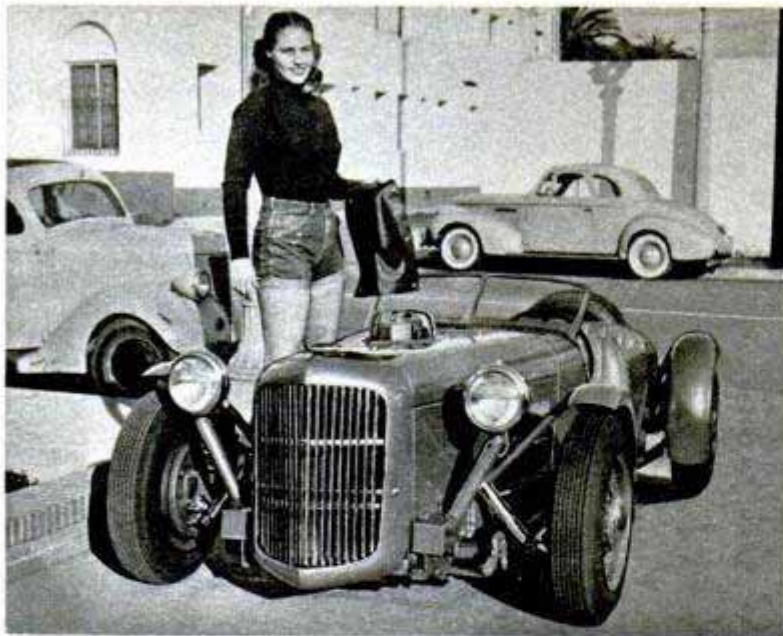
Sight-seers see all the sights when they tour the Bavarian Alps in a new open-top diesel train of the German Federal Railroads. Two 180-horsepower engines mounted under the floor are hydraulically coupled to the wheels and drive the single-

coach train up to 72 miles an hour in either direction. The sides and top are all windows except for a narrow strip in the center which has a rollaway canvas cover. In addition to an engineer and conductor, the car carries 60 passengers.

Arsenic—Just a "Pinch"—Makes Lead Alloys Stronger

Just a "pinch" of arsenic added to the lead alloys, which cover underground electric cables, will improve the life and strength of the metal. The University of Illinois, which conducted the research, interprets a pinch as one tenth of one percent of ar-

senic. Lead alloys are used to shield the cables because they are resistant to moisture and corrosion. However, the alloys sometimes crack due to expansion and contraction. The arsenic gives the alloy resistance to such cracks.



Handmade Sport Car Is Knee-High to Owner

Built so close to the ground that it barely clears its own shadow, a sleek, speedy sport car is the pride of Mrs. Linda Plannette, who is a spare-time Los Angeles mechanic. She and her husband put together the souped-up car, using a standard Mercury frame shortened by 18 inches and a stock 1949 Mercury engine. Weighing 2340 pounds, the custom-made car has a road clearance of only six inches and has hit 110 miles an hour in tests. The Plannettes devoted three years of their spare time to collecting parts and building the car.

Door-Level Truck For Cargo Planes

On-the-ground time can often be halved by a new cargo-loading unit for airplanes that acts as a door-level storage room. The load is made ready prior to the plane's arrival and then immediately placed on board. The platform, which can be built to the cargo-door level of the type of plane that is most frequently loaded, can be either of two sizes, 12 by 20 or 12 by 24 feet.



Crimseo Mfg. Div., Truog-Nichols Inc., 1730 Oak Street, Kansas City, Mo.



Cartridge Starter for Jets

Cordite cartridges are being used to start jet airplane engines. The jets require about 10 times the energy input needed for starting piston engines of comparable horsepower. Each starter unit, which weighs 60 pounds, has two cartridge barrels and a small turbine. A firing button ignites one of the cartridges and its gases start the small turbine, which in turn accelerates the main jet turbine to self-sustaining speed. The starter's normal peak is 40,000 revolutions per minute and a safety device holds it to 45,000 revolutions per minute.

Sources of available products described in this issue are listed on pages 12, 14 and 16. Sources of further information on other articles are given in the WHERE-TO-FIND-IT LIST, which is available without charge from the Bureau of Information, Popular Mechanics, 200 East Ontario Street, Chicago 11, Illinois



Electrified Curtains Warm Air Around Casement Windows

Giving a new twist to the electric-blanket idea, Jack Brightman of Erie, Pa., has installed electrified curtains in his home to warm the chilly air that comes in casement windows. Brightman arranged ordinary heating wire in loops on the lower part of each curtain, then had his wife sew the loops in place. He checked the wattage and voltage of the electrified curtains to make sure they wouldn't be a fire hazard. Now when winter winds blow against the house, the Brightmans "turn on the curtains" and the air near the windows is pleasantly warmed. Brightman, oddly enough, is a refrigeration expert for the General Electric Company.



Lenk Mfg. Company, 30-38 Cummington St., Boston, Mass.

Electric Calf Dehorner

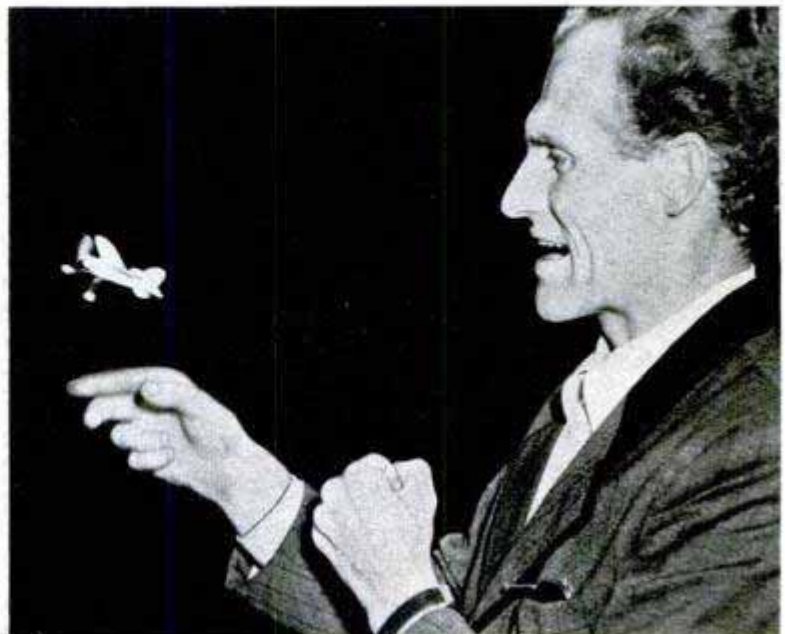
Calves are dehorned faster and with less pain and no bloodshed by a new electric heat unit resembling a soldering iron. The unit's tip, placed against the horn button, comes in contact with the horn growth cells and destroys them, preventing further growth.

TV Teaches Photography

More than 700 persons registered for a course in photography that was given over Station WWJ-TV in Detroit. The television camera showed the students how to focus, how to light a portrait and how to compose a photograph. The course, aimed at the beginner, lasted seven weeks.

German-Built Housefly Model Airplane

Powered by a rubber-band motor, a sub-miniature model airplane built by a German in West Berlin flies like the real thing despite its small size. The hobbyist calls his model the Housefly. Made of water reed, balsa wood, onion-skin paper and fine steel wire, the plane is so light it would take 50 of them to weigh an ounce.



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Fine Orlon filaments drop from spinnerette into hardening bath. Right, thousands of strands form a rope tow



By Michael Day

BRAND NEW MATERIALS that look and feel exactly like wool, silk or cotton now are being brewed in huge chemical plants. The "woolen" suit you wear tomorrow may be made of corn, spruce trees or peanuts. Your wife's fluffy "cashmere" sweater already may have as its basic ingredient the same stuff that's used to make antifreeze for your car. Milk, brine, crude oil, oxygen, nitrogen, natural gas, glass, chicken feathers—all are basic materials for an assortment of new man-made textile fibers, each one chemically tailored to contain special properties for special purposes.

Out of our modern brew pots are coming woolly blankets and clothes that won't shrink, satinlike overcoat linings as warm as wool, laboratory aprons that acid won't touch, cottonlike skirts that will hold a hundred pleats after being soaked in a jug of water for a month. There are fabrics for curtains that won't wrinkle, stretch or shrink. There are sunproof, mothproof, waterproof, fire-resistant and mildewproof fabrics. There's a fluorescent satin that

glows in dark or daylight. There's even an incredible cloth that looks, feels and acts like cotton—except for one thing. Drop it in a bowl of tap water and it disappears.

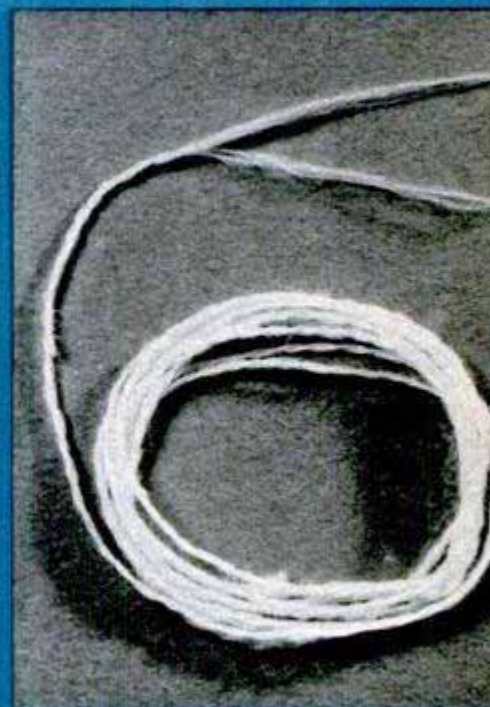
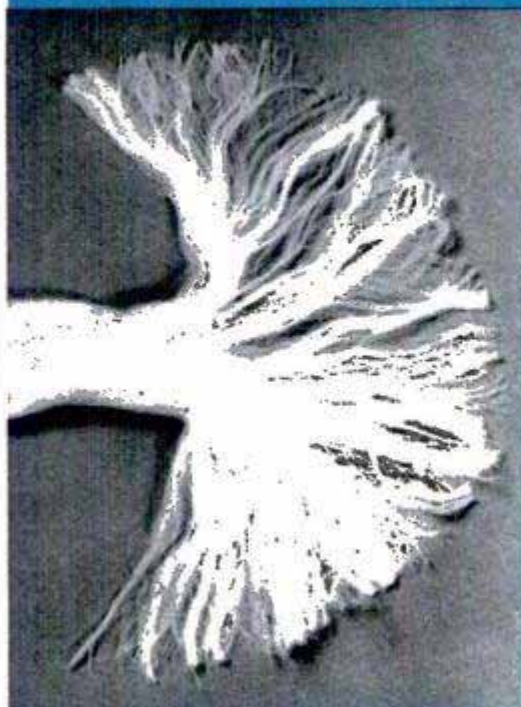
Nearly all of these new materials are made by extruding one of a number of basic chemicals through a spinnerette, where it is forced out through tiny holes in long, shimmering strands that instantly are run through chemical baths to solidify them. By using the filaments individually, by gathering them into tows, or hanks, and by crimping, cutting, brushing or combing them in different ways, different fibers are created. From them are produced materials that are fuzzy, like wool, sheer as silk, compact as cotton or linen.

One of the most-talked-about of the new fibers, already on the market, is Orlon, made by the DuPont Company of Wilmington, Del. Acrylonitrile, its chief ingredient, comes from limestone, petroleum, natural gas, coal, air and water. Orlon feels and looks silkier than silk, and silky textiles can be made from it by using the long strands. But by chopping it up into shorter—"staple" fiber and giving it a "permanent

Tow is crimped with heat to give it a springiness similar to wool. It then is cut to desired lengths and fluffed up

After fluffing, Orlon is a staple fiber handled much the same as wool or cotton staple. It can be spun into yarns which simulate almost any natural fabric

Finished material is Orlon yarn drawn from the staple. It can be made into fabrics which resist wrinkles, moths and mildew



There's a New World in TEXTILES

wave," it can be twisted into a yarn which, according to its developers, is the most woollike fiber yet made by man.

Hot sunrays that dry out and weaken most fibers, have almost no effect on Orlon. It sheds water and refuses to harbor mildew or fungus. It's highly acid-resistant and a lighted cigarette can't set it afire. Moths, carpet beetles and other insects hate the sight of it. In many ways, it's the most rugged fiber going. But despite this, and

unlike tough nylon, it has a warm, soft texture wet or dry. In all-weather tests sponsored by DuPont engineers, the new fiber lost less than a quarter of its strength, after control samples of nylon, silk, wool and rayon had fallen to shreds.

A five-year-old Orlon top on a convertible is still solid, though a control car is shedding its second ordinary canvas top now. An Orlon awning put over a Wilmington shoe store 4½ years ago still looks like new.

Orlon car top, installed in 1946, looks like new. It resists sun, can be flexed without any damage





Worker combs Caslan fibers which look like coarse hair. They will be cut, used as paintbrush bristles

But it isn't just coarse Orlon fabrics that are unique. The fibers can be woven into any finish from the softest cashmere to the toughest carpet pile.

Men's suits made of Orlon look just like wool, but can be cleaned in a washing machine. Wear them in the rain, if you like. The creases stay put, and the suit will dry almost as fast as a pair of nylon stockings.

Silky shirts and underwear of Orlon for men can be washed in a sink and hung over the towel rack to dry. They'll be ready to wear in a few hours, and need no ironing. When Orlon is woven into marquisette curtains, your wife can throw her stretcher away. The material won't shrink. Besides, due to its resistance to sun, heat, smoke and acids, it has a phenomenally long life.

An important use for Orlon at present is in the chimneys of industrial plants, filtering out tons of chemicals, soot and fumes you would otherwise inhale. Most filters today are made of cotton or wool bags, through which smoke is forced. When they're full, an automatic dumper empties them. But tremendous heat and corrosive acids rot out the fabrics in no time, and replacements are frequent and expensive. Here's where Orlon comes in. Filters of it, tested over the past few years, have outlasted any other known material 17 to 1.

When will you find all these wonderful things in your neighborhood store? Within the year, DuPont men say. Right now a

second plant is being built at Camden to produce Orlon staple at a rate of 15,000 tons a year. Industry is taking most of the present output of continuous-filament yarn, which will be used first in awnings, car tops, sails and outdoor-furniture covering. The finer fabrics for clothing and home materials will be along soon after.

A new chemical fiber you'll be seeing quickly, because it's been in production since July of last year is dynel—produced by the Union Carbide and Carbon Corporation. Dynel is made of vinyl chloride and acrylonitrile.

Dynel staple makes a fabric that is literally warmer and woollier than wool. It can be woven soft as mashed potatoes or as tough as mohair. Water has no effect on it. It has a high resistance to bleaches, corrosive chemicals and wrinkling. High heat will set a crease in it as permanent as the Rock of Gibraltar.

To prove these points, dynel men in the home office of the company will show you some startling exhibits. There's a pleated woollike dynel skirt hanging in a container of water. "I think it's been there two months—or is it three . . .?" says the man. Every pleat is as knife-sharp as the day it went in. In a container of pure Clorox there were placed two pieces of dynel and wool. Now there's just dynel. The wool is a hazy fuzz on the bottom of the jug, where it fell after being dissolved by the chemical.

Dynel is the only pure organic fiber that won't support fire in fine textiles, according

Chemical textiles are fuzzed into fluffy fabrics by special method. Here material passes over wavy roll





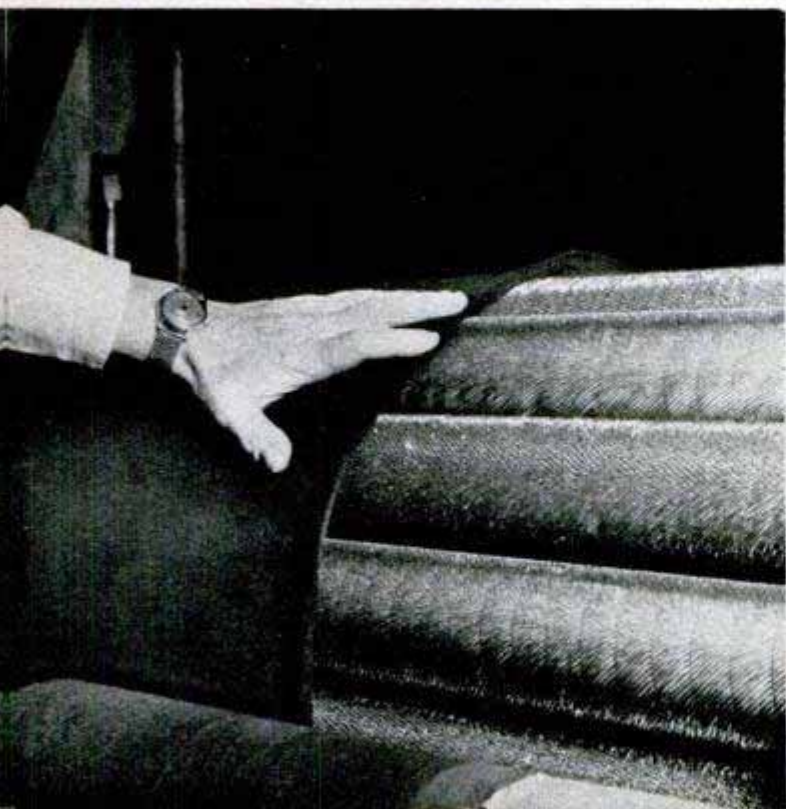
Every item in this picture is made of Orlon, from socks to umbrellas. Material is mildew and mothproof

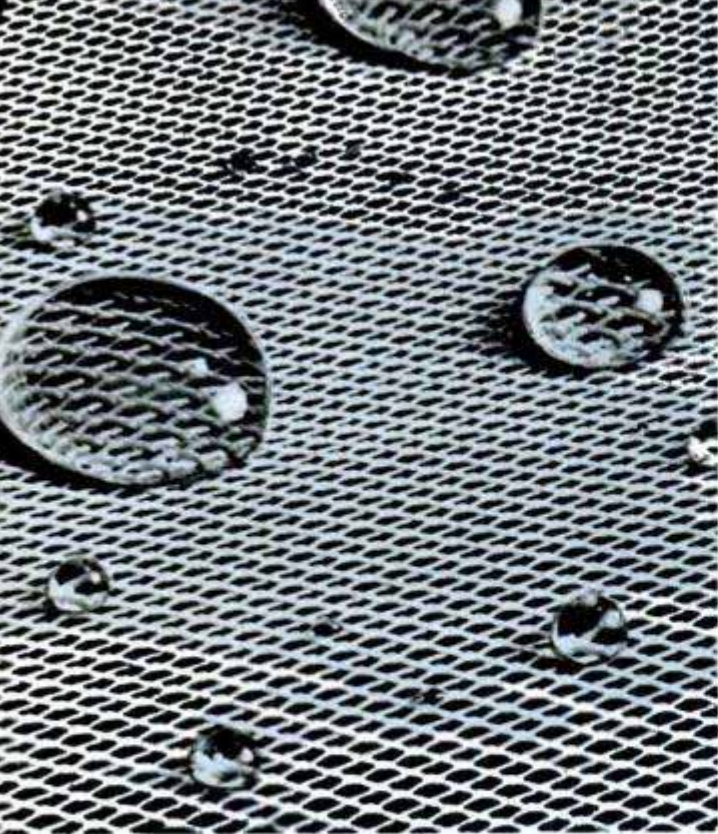
Fuzzing cylinders are covered with wire spikes of various lengths which tear open fabric's knitted loops



Lovely lass models a bathing suit made of—peanuts! Government scientists developed the new protein fiber

Result is a furry chemical fabric from which soft bed jackets and fluffy linings for coats are made





Water gathers in globules instead of penetrating a fiber treated with DeCetex 104, a silicone solution

to Union Carbide. To prove it, you can burn your fingers off lighting matches under a sample maintained for the purpose.

Already, warm, woolly dynel blankets are on the market. They're even making wigs for dolls out of the fiber because, for an odd chemical reason, the synthetic hair can be given a wave by any doll's young mother with a simple solution of sugar and water. There will be a rash of washable, quick-drying fuzzy blankets and socks of the fiber. By next fall, you'll see dynel non-shrinkable sweaters, draperies and women's dress goods. Men's work clothes that acid and chemicals can't burn are already being used in industry; the pleats are permanently creased. The clothing is warm and mothproof. There will be soft, deep, dynel pile for furry collars and coat linings.

What gives wool warmth is its springiness which, when the fibers are bunched up, creates a lot of dead air space that serves as insulation. To give chemical fibers the same effect you get in fuzzy blankets has been a real trick. By putting a heat kink in short-staple fibers, resilience has been added. Fuzzing it up is something else.

At Empire State Mills in New York, the company's president, Arthur Brook, has been fuzzing up heat-crimped, man-made fibers for 20 years. First the staple yarn is knitted into a long, wide bolt. The knitted bolt then goes over a series of wire-brush rollers, bristling with pinlike spikes. The thousands of wire spikes hook into the knitted loops, as the material passes over them, tear them open and spread the fila-



Young lady's suit, treated with the chemical, sheds water like an oilskin while rain soaks her companion

ments in all directions. Result: a soft, downy, thick, woollike blanket.

Still secret is Brook's system, developed more recently, for making long, furlike nap from nylon, rayon, Orlon and many other new fibers. Basically, the process is the same, but for years no one has been able to

Lawn and garden furniture covered with Orlon has been outdoors for two years, both winter and summer, and still retains bright color and appearance



get a consistently long fuzz. From Empire comes a material that looks for all the world like rabbit fur. But it's warmer, softer and more durable.

Most chemical fibers will not replace wool or cotton, but will be blended with them to provide the best qualities of each. One of the most recent synthetics for such blending comes from the farmers' cornfields. It is called Vicara and its basic ingredient is zein—a white powdery substance which is a protein of corn. Up to now it has been a waste product in the manufacture of starch and other corn products. The U. S. Department of Agriculture, a few years ago, did the basic research that has turned this waste into a staple fiber.

Vicara isn't quite as strong as wool, but is softer and just as warm. About 20 million pounds of it a year are already being made by Virginia-Carolina Chemical Corp., and you'll find it in popular bathing suits, sweaters and knitted socks. It gives a beautiful sheen to gabardine and a warm, soft feel to rayon.

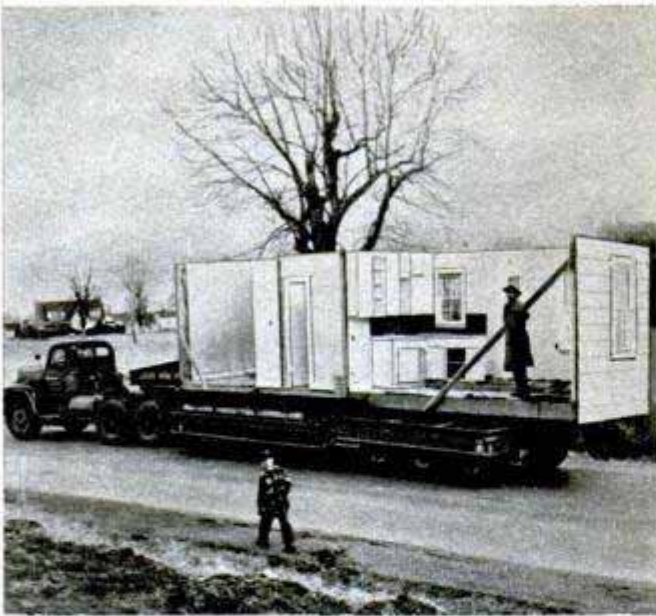
The Department of Agriculture has been experimenting with other protein fibers made from peanuts and milk. So far, the soft, downy staple from peanut protein has not proved practical commercially. One fiber from milk casein is, however, finding plenty of use. For fabrics it's not too good. It is so coarse and springy that one textile manufacturer claims "it must have come from discontented cows." However, milk fiber in long, continuous-filament form, as it comes from the spinnerettes, has proved itself in other fields. Great hanks of it were chopped up in a New

(Continued to page 228)

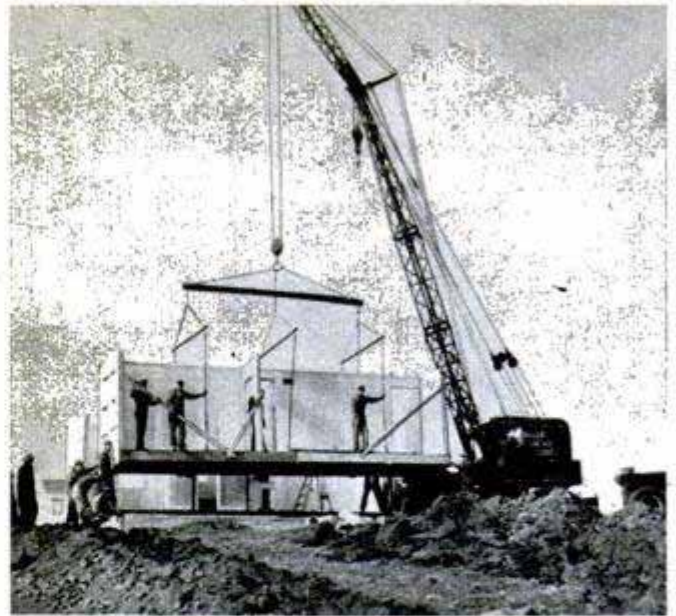


At about 9:30 washday morning, a housewife drops her Orlon curtains in her machine. Below, one hour later she is rehung the clean curtains. The fabric dries quickly and even the fancy ruffles need no ironing

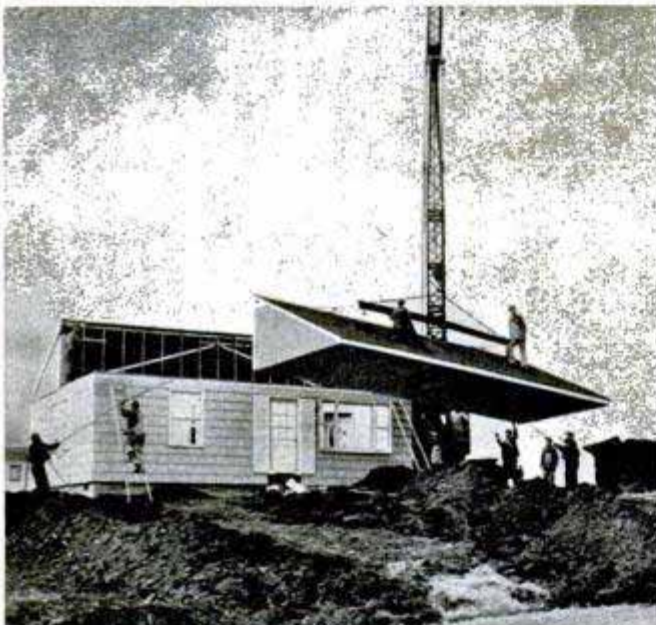




After being cut into five trailer-size sections, the factory-built house is trucked to the building site



Balanced by the workmen, the second section of the house is lifted onto the foundation by a big crane



Fifth and last is the front half of the roof which is quickly swung into place, complete with shingles



Workmen seal up the joints of the completed house. It was assembled on the site in less than two hours

B. D. Homes Co., Martin City, Mo.

Factory-Built Houses Cut Up for Delivery

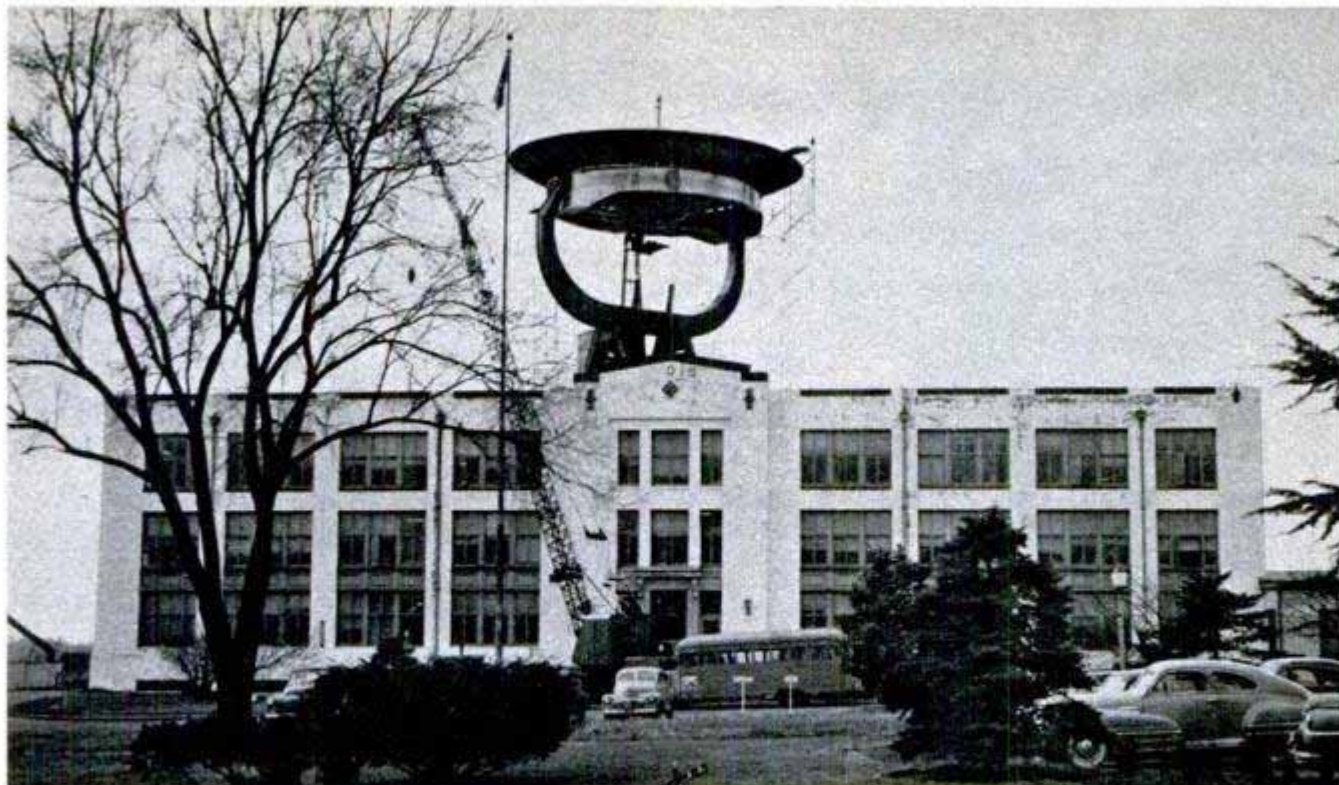
Put together on an assembly line, one-story frame houses are cut into five sections and hauled to the homesite by trailers. There, the five sections are bolted together to form a complete house again. The production line is capable of turning out three

houses a day. Without lot or landscaping, the two-bedroom prebuilt houses sell for about \$7000. The basic floor plan is 24 by 32 feet and includes two bedrooms, living room, dining area, kitchen and storage space plus utility room.

Scientist Seeks Solution to Mystery of Liquids

Scientists with all their progress have never been able to explain satisfactorily what a liquid really is. Gerald J. Holton, Harvard physicist, has developed evidence that water is actually a network of crystals. He learned this by subjecting water to pressures as high as 180,000 pounds per square inch and then shooting sound waves

through it. Normally, liquids absorb sound readily, but when water is compressed, the waves move faster and are less easily absorbed. This, Professor Holton believes, gives a definite clue that liquids have a crystalline structure. Compressing the liquid breaks down the crystals, reducing its ability to absorb sound.

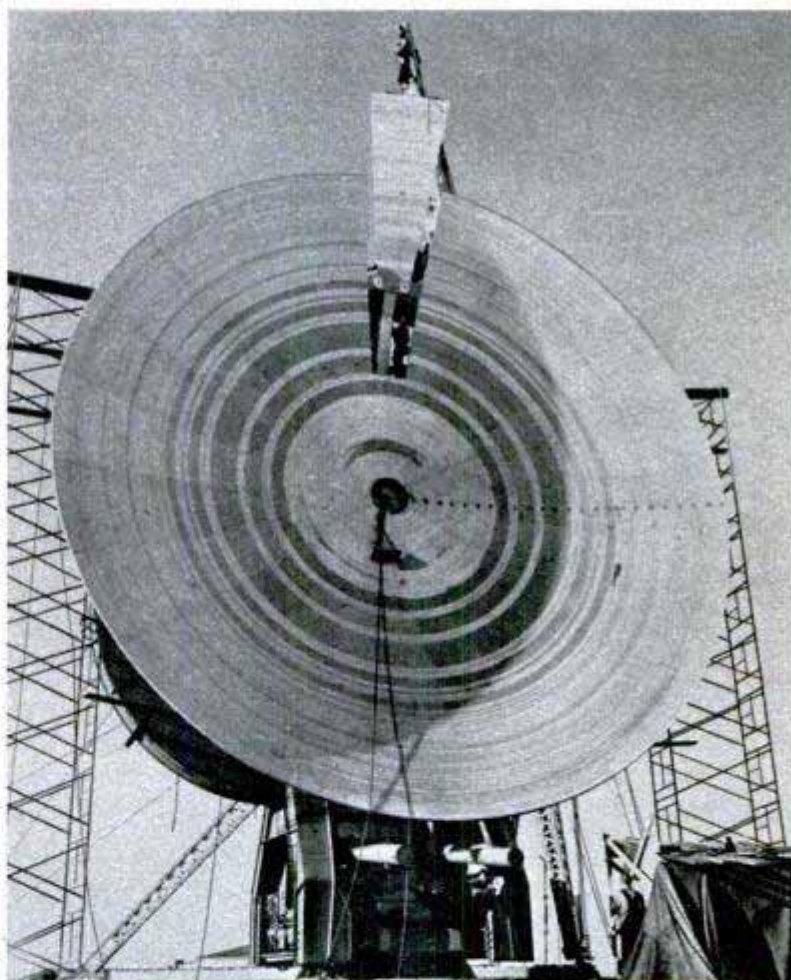


Radio Telescope

Astronomers will look at the universe with a 600-inch radio telescope at the Naval Research Laboratory in Washington, D. C. The 14-ton reflector has a diameter of 25 feet and will pick up the 3, 10 and 30-centimeter wavelengths. Radio astronomy is actually a second "window" into the universe. Classical astronomy, using the conventional telescope, is the first "window" and is limited to radiations in the visible portion of the electromagnetic spectrum. The second window, radio astronomy, is opened by the giant metal reflector and antenna, which concentrate and pick up radio waves from the galaxies.

Long-Distance Appraisal Of Snow's Water Content

Atomic-bomb by-products may soon simplify forecasting of water supplies for Western states. Estimating the volume of water to be expected from melting snows has been difficult in the past because many key mountain areas are virtually inaccessible in winter. In new experiments in California's Sierra Nevadas, small amounts of artificial radioactive isotopes of zinc or cobalt were put on the ground. A lead shield concentrated their gamma rays on a Geiger-Muller tube suspended 15 feet above-ground. The radiation registered at the



tube, indicating to within a few percent the water content of the snow, can be transmitted to a receiving station miles away.

¶ Ten gas-turbine electric locomotives—the newest form of rail power—have been ordered by the Union Pacific Railroad following tests of a 4500-horsepower unit on regular freight runs for 18 months.



Pretty girl zips along at 25 miles an hour aboard one of the bucking water broncos. Hand lines steer the little craft and operate the throttle control

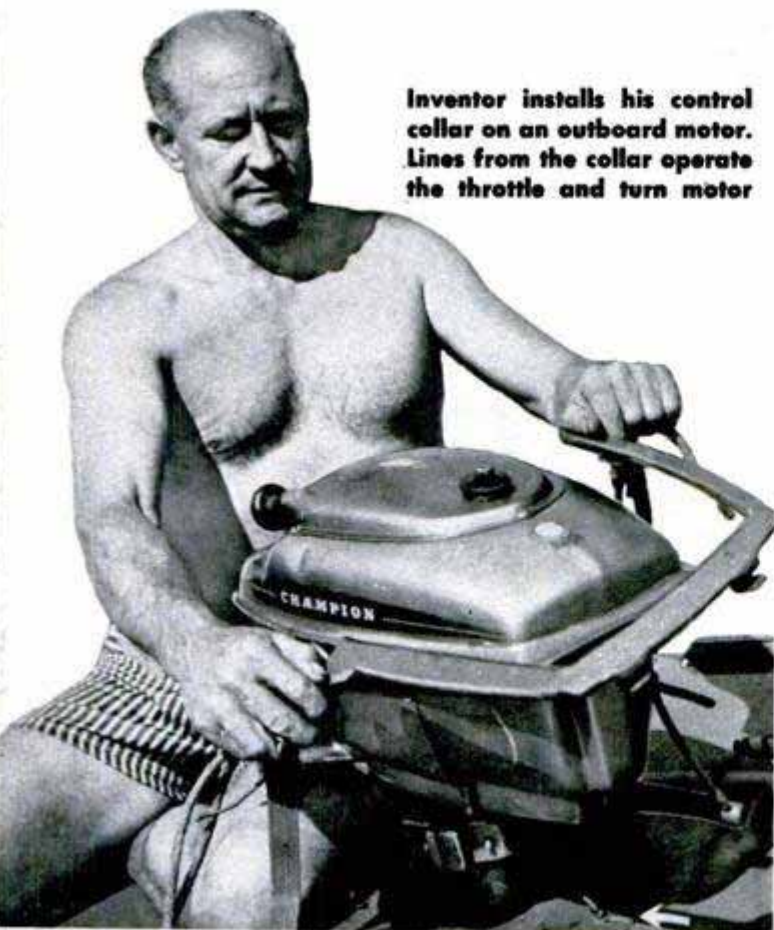
Daring rider throws his craft into a high-speed slide by turning sharply and gunning the motor suddenly





Aquatic sportsmen play follow-the-leader, maneuvering in close formation. Motor stops if rider is thrown

Water Bronco



Inventor installs his control collar on an outboard motor. Lines from the collar operate the throttle and turn motor

By Ed Lundburg

A SELF-POWERED water bronco, which skips along at speeds up to 25 miles an hour, currently is thrilling scores of aquatic sportsmen at Long Beach, Calif.

The unique craft, developed by Doty Steele of Hollywood, Calif., is easy to build and economical to operate. It is powered with an outboard motor which may be detached and used elsewhere. The board is 8 feet long, 40 inches wide and 6 inches thick. It weighs 65 pounds without the motor and can be transported to and from the water atop a car.

If the rider is thrown off the board during a speedy maneuver the motor automatically stops. A spring restores the throttle to "zero" position, breaking the circuit of the ignition system. Steele can teach an adult or child to ride the board in three minutes.

The outboard motor is clamped to a head-board located 27 inches back from the prow. The board has a well 10 inches by 30 inches to accommodate the motor, which is fitted

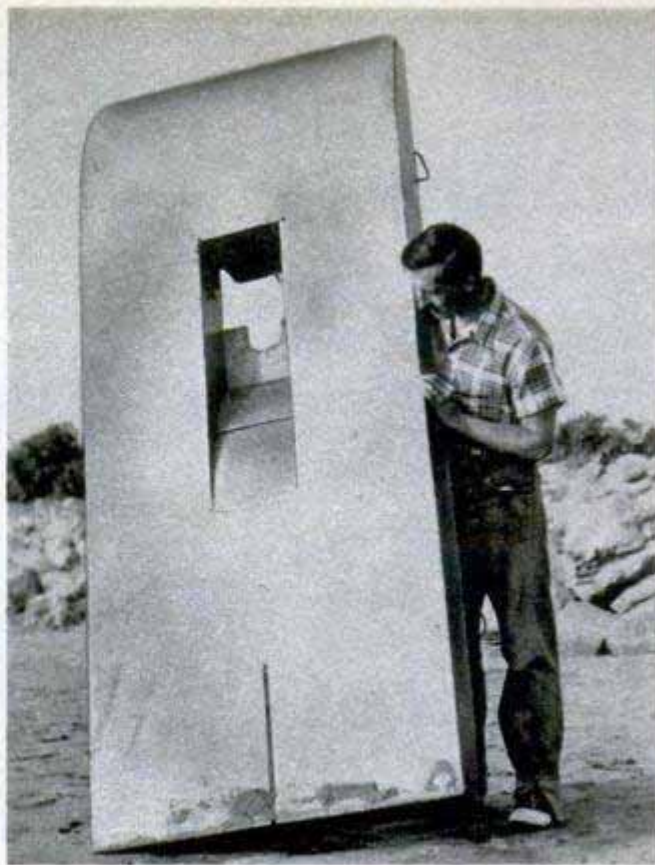


Emergency paddle is clamped to water bronco. Odd-shaped board prevents water from splashing rider

with a steel bracket held fast with a strap. The bracket supports the throttle and guide lines.

Steele says the board can be constructed with a hammer, saw, plane and nails. For lumber he uses waterproof plywood, sugar pine and spruce. The joints are glued.

Riders play follow-the-leader and vie with one another in speed dashes. Skill is exhibited in riding the board backwards, doing headstands and other tricks.

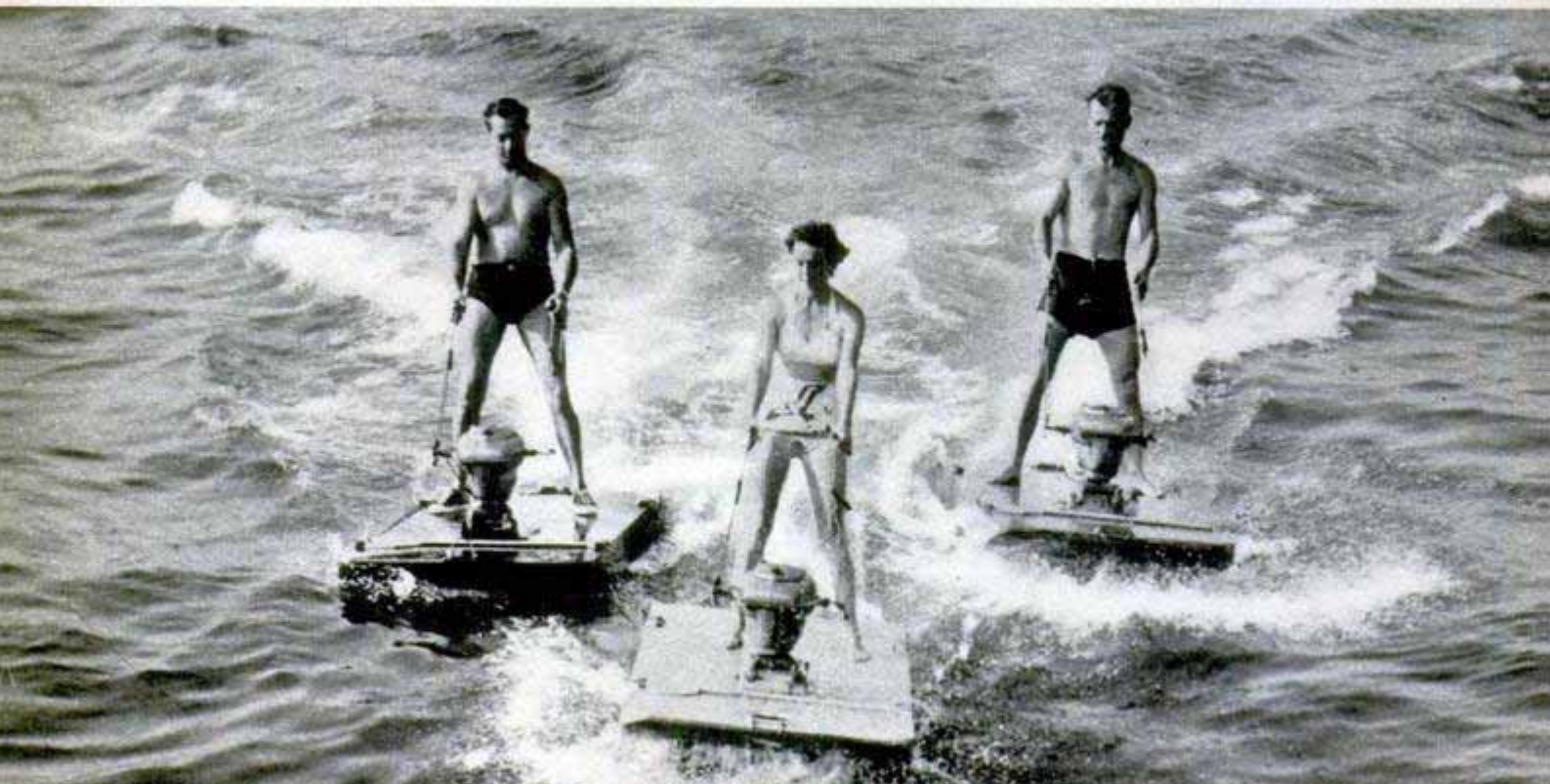


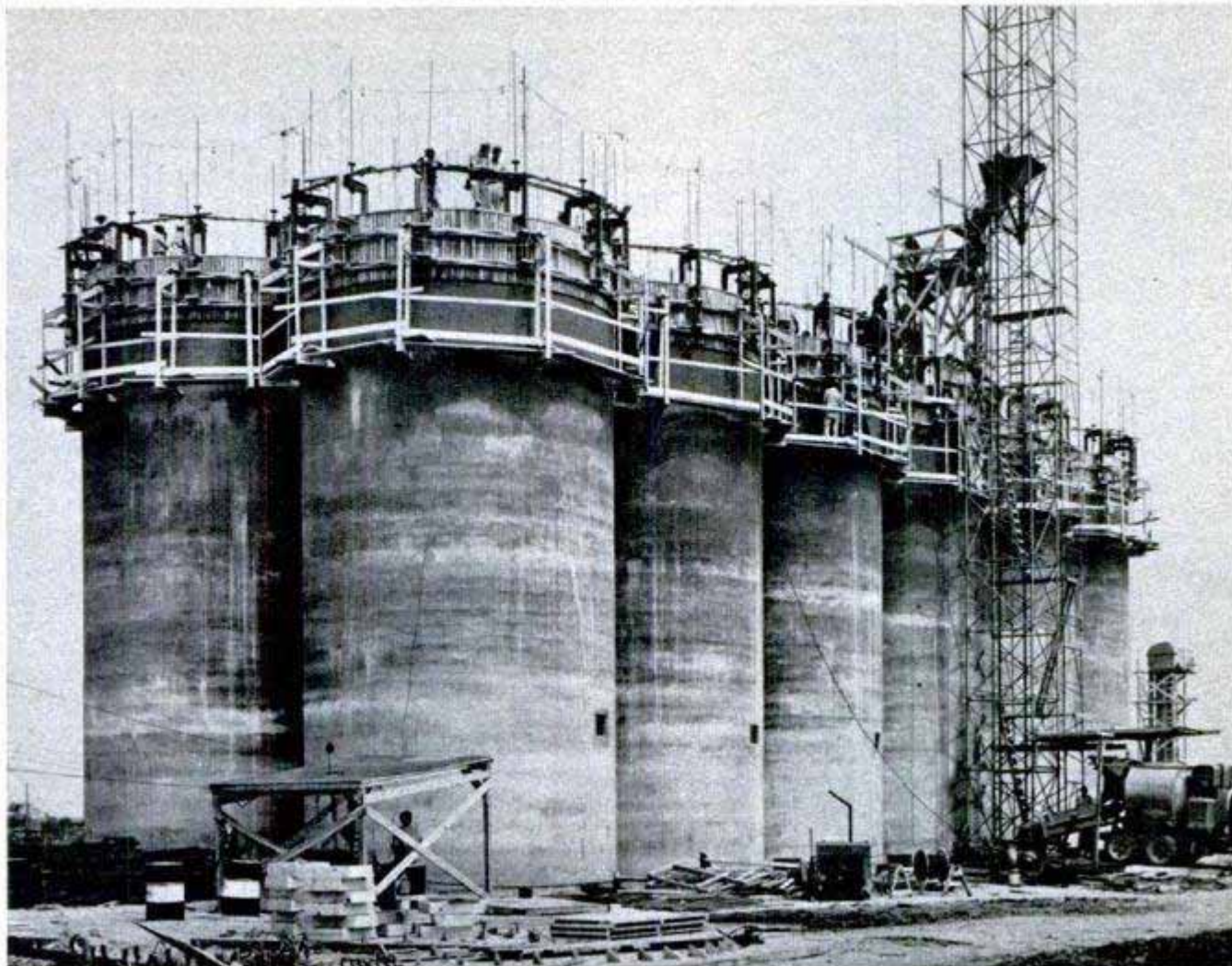
Board weighs only 65 pounds without motor. Bottom of hull has slot for motor and a retractable rudder

The rider can guide the board by shifting his weight from one foot to the other and by steering with the hand controls. He can slide the board across the surface by making a sharp turn and then, as the speeding board begins to slip laterally, quickly turn the motor in the direction of the slide.

Steele says he plans to ride one of the boards from Long Beach to Santa Catalina Island, which is a distance of approximately 30 miles.

Riding the bucking broncos is the latest aquatic craze on the West Coast. Riders scorn use of the rudder



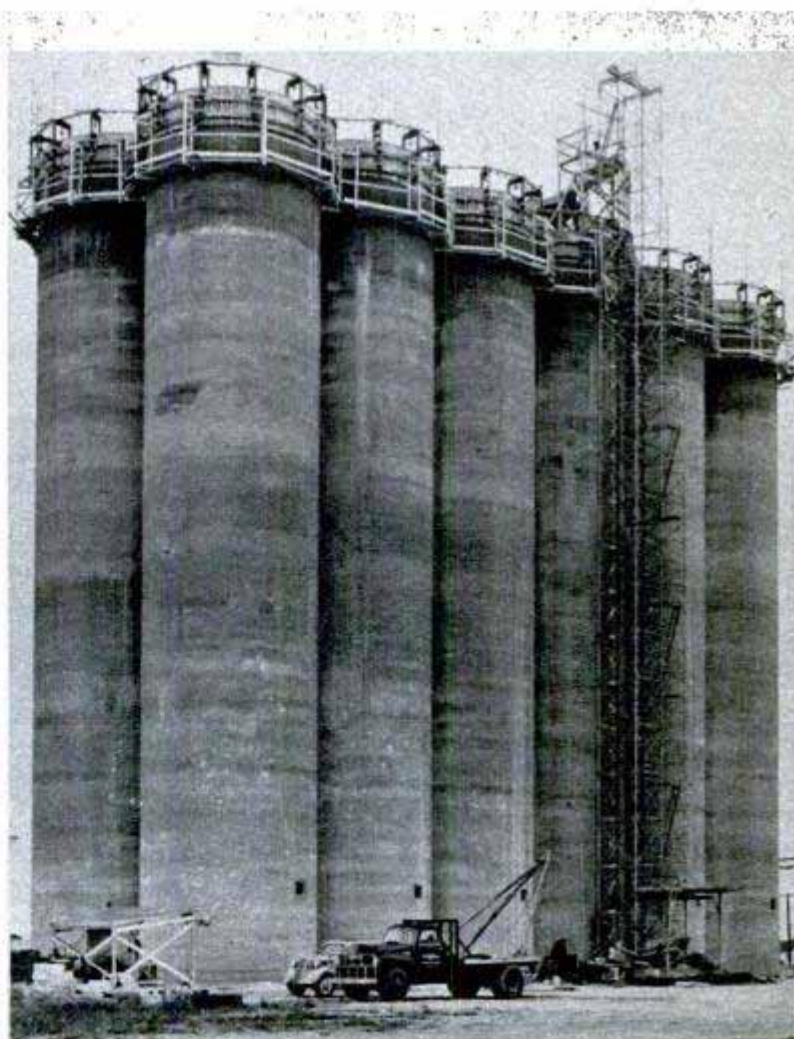


Top, Wednesday morning, after two days of pouring, the job was this far along. Scaffolding below forms is used by the finishers who smooth the walls. Right, early Saturday morning, the job's done

Concrete "Grows" Into Tall Elevators

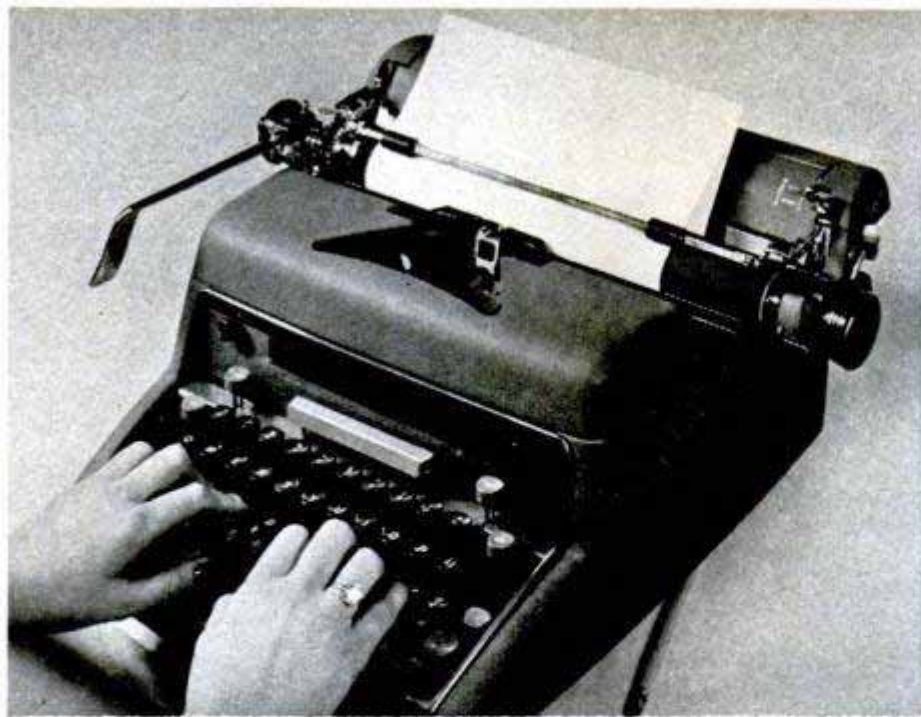
In only five days, 12 elevators, each 110 feet high, were poured with a sliding-form technique in which the same forms were used throughout, being jacked up as the work progressed. Every 75 seconds, the 180 screw jacks were given one full turn, raising the forms about $\frac{1}{4}$ inch. Thus the elevators "grew" at a rate of about a foot an hour. Since concrete must be poured continuously it was necessary to operate in three shifts, 24 hours a day. More than 2800 cubic yards of concrete were used. The elevators hold 428,640 bushels of grain and are located at Alice, Tex.

☐ There were 70,300,000 telephones in the world at the beginning of 1950, of which 40,709,398 were in the United States.

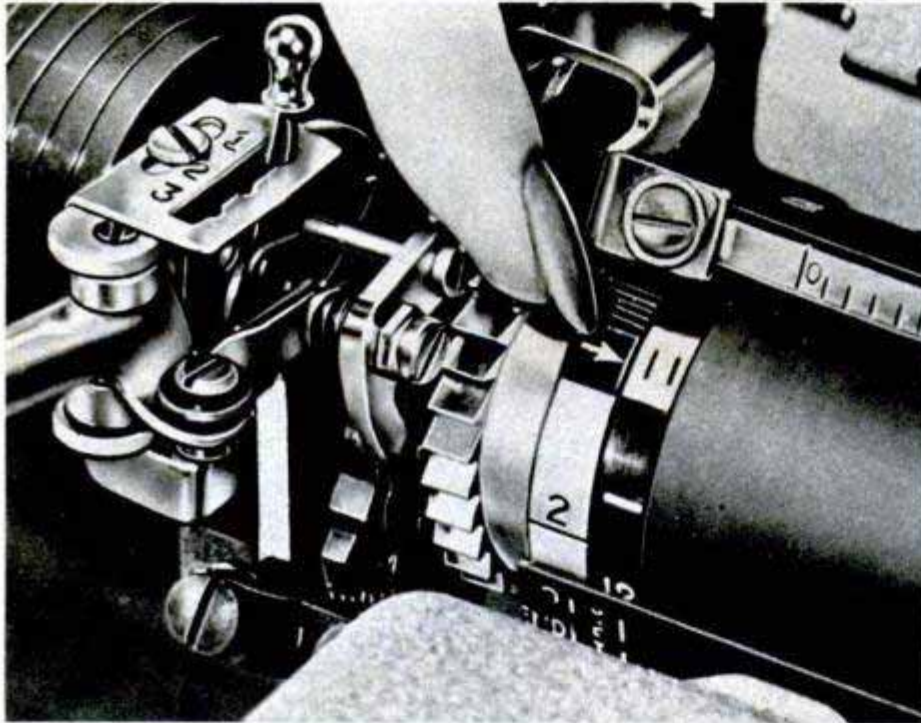


Typewriter Rings Show Page Length

By watching the page gauge on the latest Smith-Corona typewriter the operator knows exactly how close she is to the bottom of the page. The gauge consists of two graduated rings attached to the typewriter platen. The typist adjusts the rings to the size paper she is using. When she is $2\frac{1}{2}$ inches from the bottom of the page, a red signal appears on the outer scale. The scale continues to give her the paper position to within $\frac{1}{2}$ inch of the bottom of the page. Other innovations on the typewriter include an enlarged platen, easy disassembly and a small magnifying glass in front of the carriage scale, giving the typist a clear view of the numbers.



L. C. Smith & Corona Typewriters Inc., 3200 Smith Building, Syracuse 1, N.Y.

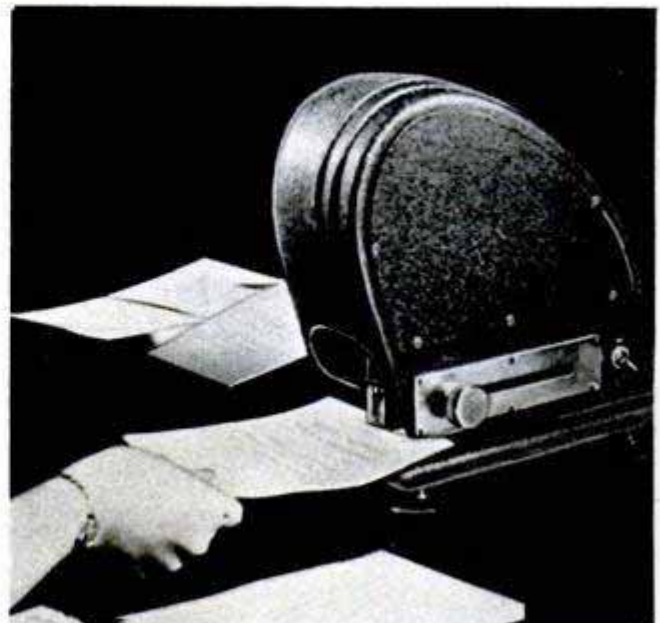


Top, new typewriter has magnifying glass over carriage scale. Left, typist sets rings to match length of paper. Gauge then shows her exactly how many inches to bottom of page

Paper Operates Electric Stapler

Easily portable, a stapler operated by electricity leaves both hands free to feed papers into the device. It requires no foot or hand controls. Insertion of papers in the jaws actuates the stapling mechanism, and the stapling position is always visible to the operator. Staples in strip form are inserted from the front without removing any parts. The device occupies only $4\frac{1}{2}$ by 10 inches of space.

¶ If you don't bind or store your back issues of *Popular Mechanics*, do you burn them? America's defense effort requires a vast number of paper products. Call your local Boy Scouts or veterans' organization to pick up your wastepaper.

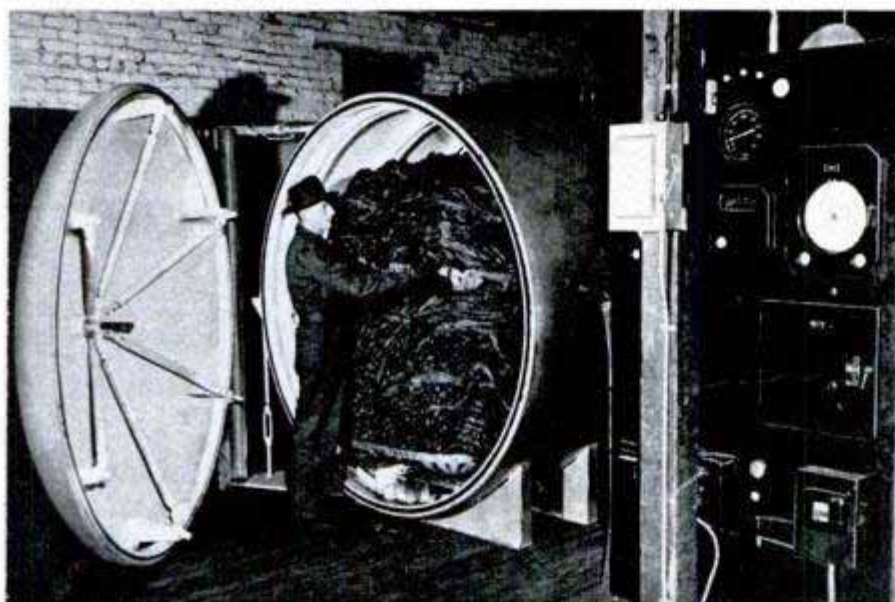


The Staplex Co., 30 Church St., New York City 7

POPULAR MECHANICS

Tight Belts on Trees May Increase Seeding

Narrow steel bands are wrapped tightly around trunks of fir trees by Weyerhaeuser timber men to "frighten" the trees into producing larger seed crops. As the trees grow, the steel bands bite into the trunks, restricting the flow of nutrients. This strangling process is believed to make the trees react as they would if they were dying—by a new burst of energy in cone and seed production. The bands are left in place for two years. Foresters believe, however, that the "scare" effect will linger up to seven years longer after the bands are removed, resulting in much more seeding per acre.



Tobacco Processor

Making the tobacco man independent of weather conditions, an airtight chamber brings 3500 pounds of tobacco to the proper moisture content in less than two hours. The machine will humidify or dry, whichever is necessary, and fumigate the tobacco, eliminating the labor-consuming operation of hanging the tobacco on drying racks. It is in operation at the Colonial Tobacco Company, Springfield, Tenn.

Worm Listener

You can listen to the chatter of tiny worms with a mechanical ear developed in Germany. The instrument is designed to detect worms in wood. It amplifies their gnawing sounds 10,000 times. Once located with the instrument, the destructive little pests are destroyed in the wood by chemical treatment.

❏Iceland is blessed with a natural and virtually unlimited source of power located 700 feet beneath the earth's surface where engineers have tapped a supply of volcanic steam, which promises to provide an estimated 5000-horsepower jet for driving turbines.





There's No Age Limit for Mountain Climbers

By Rafe Gibbs

While his mountain-climbing class watches, Glenn Exum illustrates how a fisherman's knot links two ropes

THE NEW YORK BANKER sucked in his breath—and paunch—as he awaited the verdict of Glenn Exum, operator of the Petzoldt-Exum School of American Mountaineering at Wyoming's Grand Teton National Park.

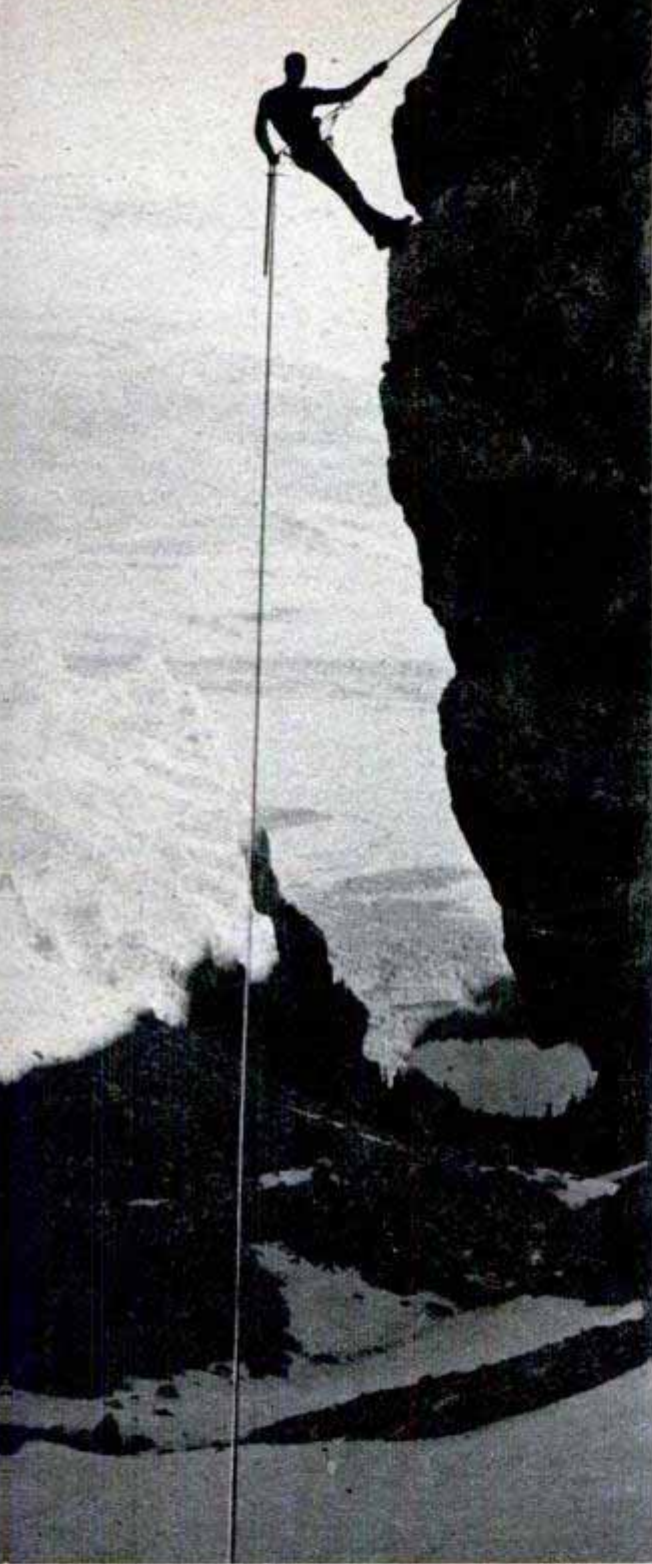
"Sure, you ought to be able to climb the Grand—all 13,766 feet of it," said Exum. "First, though, you should do a little scenery scanning . . . on foot. Three or four days. Toughen up those legs. Get used to the altitude. Then we'll give you a day in the mountaineering school. Show you how to handle yourself and the tools you'll need.

"After that—well, we'll start up the Grand. First day's trip is to base camp at 11,500 feet. Fairly easy going. If the first

day isn't too hard on you, the next day you can tackle the last couple of thousand feet. But, sure, I believe you can do it."

The banker got a look on his face—a look that doesn't come often in a man's life. Maybe in college when he scores the winning touchdown in the big game, when he becomes a father for the first time, when he is made a partner in the firm—or when Exum opines he is capable at 50 of climbing that magnificent hunk of granite which rises from the Wyoming plains like an arrow shot into the sky.

Actually, mountain climbing is not so much a matter of age or strength as it is of mental attitude and know-how. Older men than the banker have climbed America's



Rule No. 1 for the lead man is: Never fall. Another must, above, is to keep as much weight as possible on the feet

Experts use the speedy Carabiner sling, left, for rapelling

Only on rare occasions does the rope come into play as an aid in ascending. Its main use is as a protective life line




"Matterhorn" located in Wyoming.

Last summer John Hubbard of Nevada City, Calif., ascended the Grand with Exum. Age: 65. On the same ascent was the Exums' son, Eddie. Age: 9.

Mountain climbing, one of the world's oldest diversions, in the last 10 years has become a major American sport.

What should one know about mountain climbing? Well, Exum is a man to answer that question. Although only 39, he has been a Teton mountain guide and instructor for 23 years. In all those years he has never had a serious injury in any



"Wall Street" on the face of Wyoming's Grand Teton, left, key to a route discovered by Exum in 1931. The start of a free rapel, right, in which the mountaineer will drop 40 feet

of his parties. His wife and No. 1 assistant, Beth, a former nurse, told us with a touch of justified pride, "The most I've ever had to do for anyone in Glenn's parties is to treat blisters."

The most important thing for a man to remember in climbing mountains was put this way by Exum: "Only novices and record seekers run up mountains. A rhythmic, slow tempo is best for getting to the top."

Contrary to popular belief, the rope is not a tool for climbing. It is used as a tool in descending in some cases, but in climbing it is strictly a protective life line.

One summer five men connected with 250 yards of clothesline started to climb the Owen Route of the Grand. They passed Exum, and he noticed that they were using the rope to pull one another up bad spots. Exum advised them that they weren't good insurance risks handling the rope that way, but they flatly refused to cooperate with their insurance companies.

At the top of a jutting landmark known as Owen Chimney, it happened. The lead man got too much pressure from below, and started pinwheeling down the mountain. Fortunately, the last man on the rope, a former football player, tackled the



Open-air elevator system. This young lady shows how to come down a mountainside fast, easy and safely

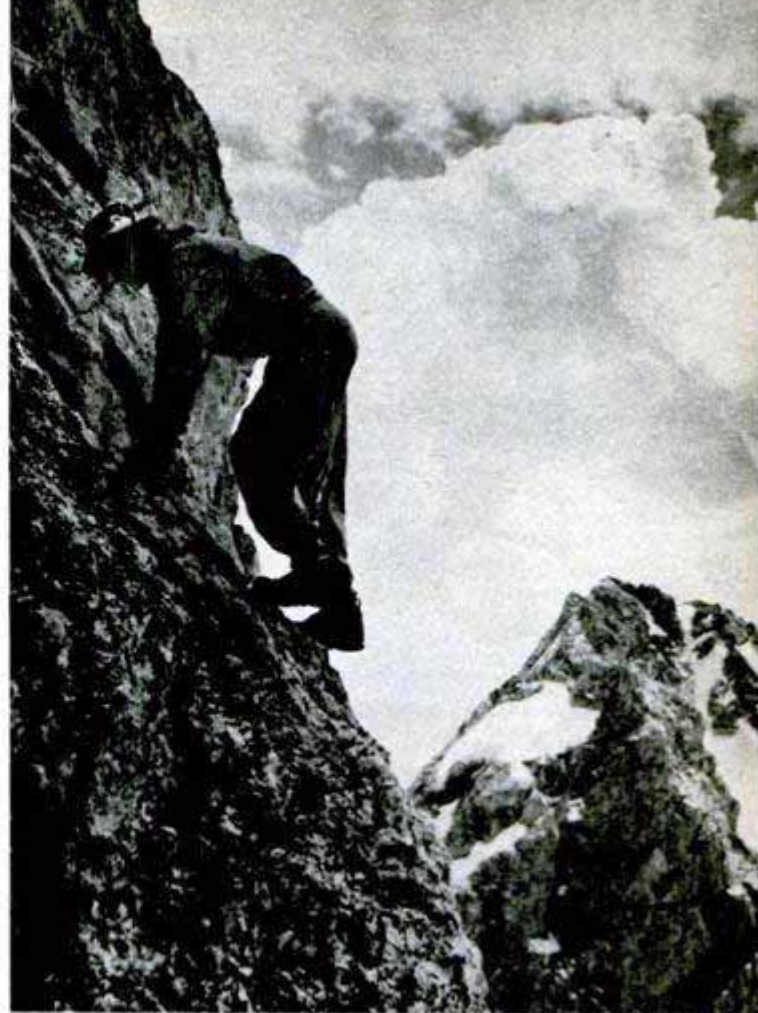
spinning one at the Chimney's base. The tackle prevented a drop—possibly for all five men—of 3500 feet.

"In a climbing party, the rope is everybody's business," said Exum. "Not only should it be kept free at all times, but it should never be permitted to drag. A dragging rope is liable to pull off rocks on those below."

When the climbing becomes dangerously difficult, the man ahead uses a technique called belaying—fixed or artificial. Fixed belaying is tying the rope around a rock or snag, so that if the man coming up should slip the fastened rope will hold him. If a suitable rock or snag is not handy, a piton, which might be classified as an iron spike with a hole through its head, is driven into the mountain with a piton hammer, and the rope tied to it. Artificial belaying is simply looping the rope around the body and bracing the feet firmly.

In descending, the procedure of letting yourself down a mountain with the rope is known as rapelling.

There are three occasions when a knowledge of rapelling comes in handy: When you want to descend an unclimbable pitch—an overhanging cliff, for instance. When storm clouds start pushing against the mountain, and it seems highly desirable to get down fast. When you just hanker for



Never fail, Exum warns, to keep at least two feet and a hand, or two hands and a foot, in contact with rock

the sheer sport of dropping off into space.

The basic rapelling method used in the Alps way back in Hannibal's day is simply looping the rope about the body in a way which will slow its release as the descent is made. One way is to run the rope between the legs from behind, crossing it in front of the left leg, and passing it up the front of the body, over the left shoulder and down the back to the right side.

An experienced rapeller can bounce as much as 50 feet at a time. Exum's eight-year-old daughter, Glenda, hasn't sturdy enough legs yet to climb to the top of the Grand, but she is an artist in rapelling. At an age when most girls use a rope for sidewalk skipping, Glenda leaps off a precipice with hers.

Virtually all mountain climbers now use a special nylon rope developed during World War II for American mountain troops. It is $\frac{7}{16}$ inch in diameter and has a tensile strength of 3700 pounds. Under stress, it may stretch more than 50 percent. In rapelling, the rope acts like a rubber band and takes the jerk out of the bounce.

Another new development has made for easier mountain climbing. This is the boot with the rubber-lug soles, replacing the hob-nailed boot. In difficult scaling, sneakers (tennis shoes), or felt or hemp-soled

(Continued to page 232)

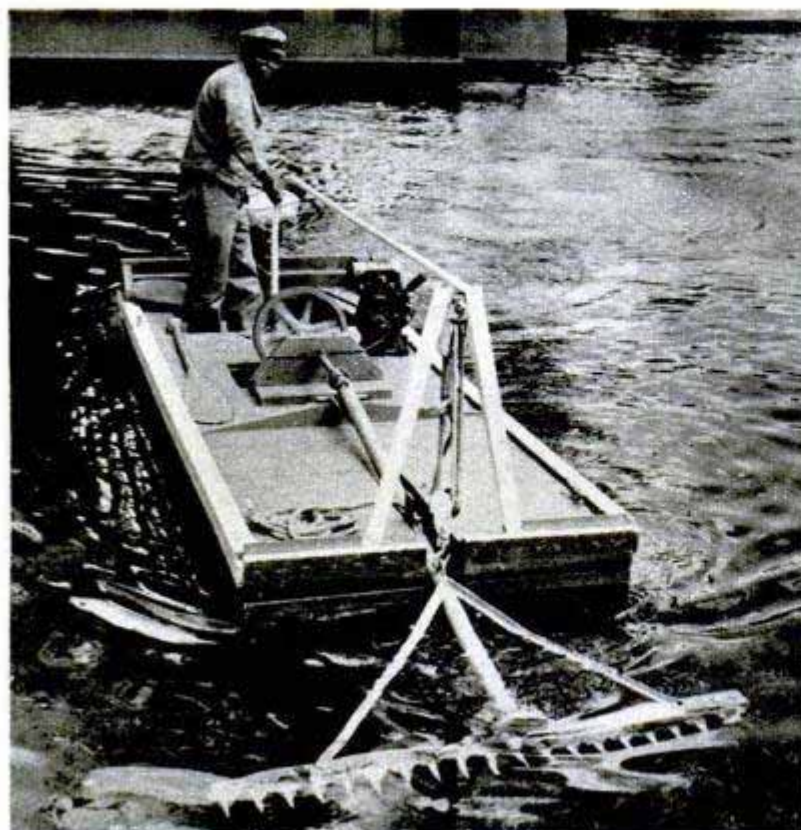
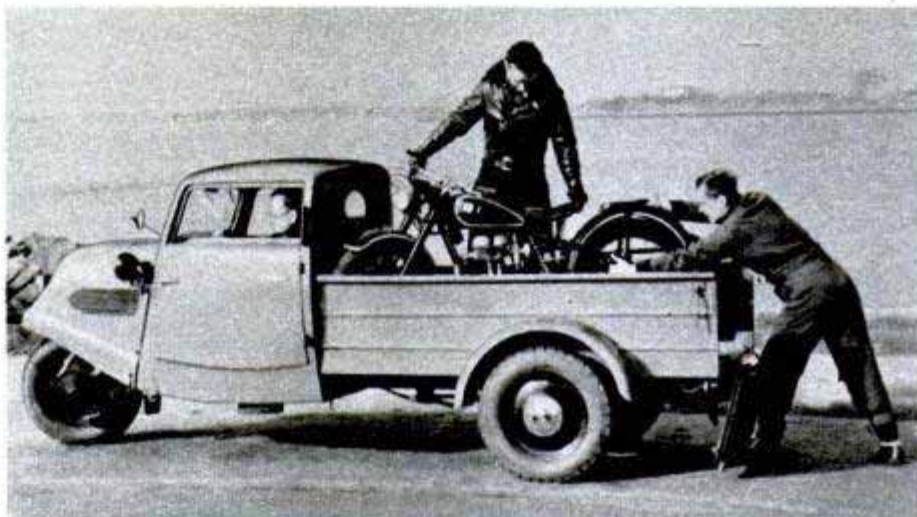


Ship's Telegraph System Records Orders

Recording each order given by the ship's bridge, a new engine-order telegraph system provides chronological evidence should the vessel be involved in an accident. The device records the second at which each order is given and also when it is acknowledged by the engine room. If the engine room fails to acknowledge or respond correctly, an alarm system warns the bridge and crew. Lights on the signal panel flash on to identify the order given and minimize errors. The system also records the precise time the ship's whistle is blown, an important legal point because by law the ship first blowing its whistle has the right of way.

Three-Wheel Truck

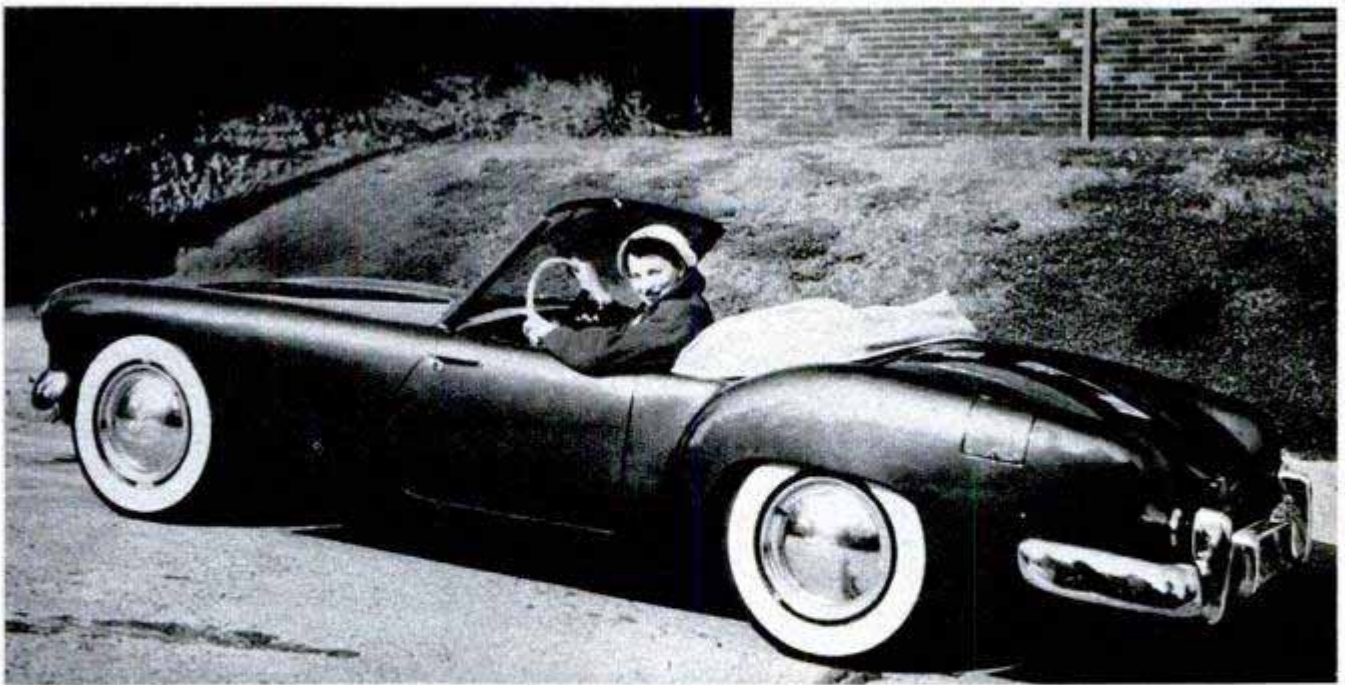
There's only one front wheel on a new German-built truck. The single wheel beneath the hood is the only one of the three wheels which is powered, yet the truck can haul a one-ton load. Power is transmitted to the wheel by chain drive. The truck travels 35 miles on a gallon of gasoline and has a top speed of about 45 miles an hour.



Underwater Power Mower

Mounted on a small barge, an underwater power mower keeps swimming areas free of weeds and does the work of more than 20 men. The cutter arm is powered by a $\frac{1}{2}$ -horsepower engine connected through a Model-T Ford universal joint. A block and tackle raises and lowers the cutting head in a slot in the bow of the barge. The mower was designed and built by Dave Edwards of Rainbow Springs, Fla.

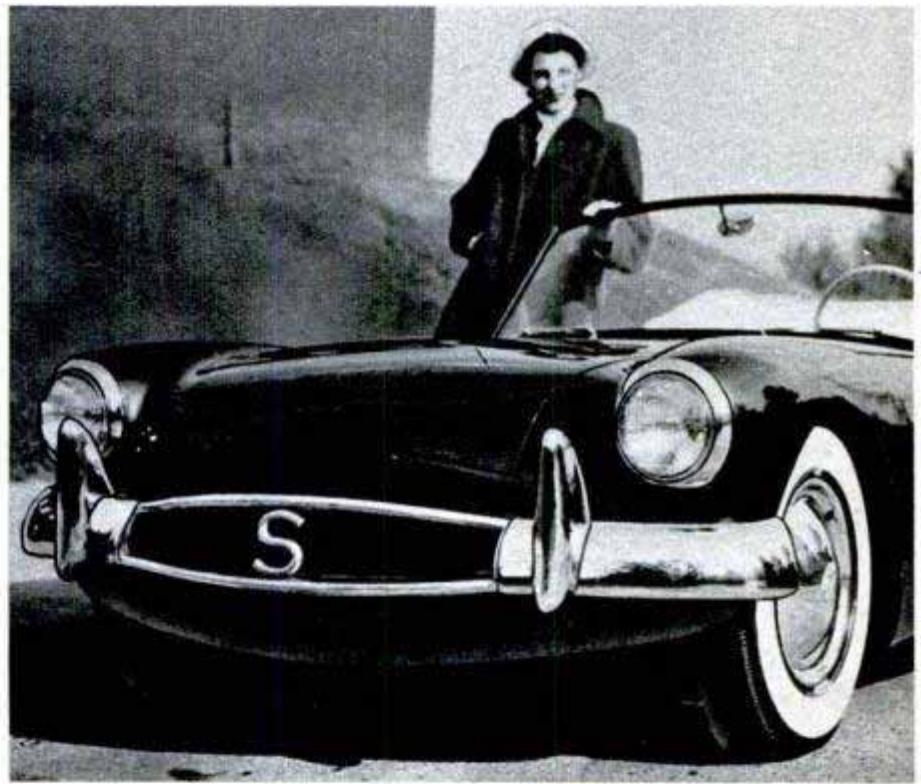
Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario Street, Chicago 11, Illinois



Racy Sports Car Made In U. S. A.

As slick as the raciest European sports car, a custom-made sportster made by Tom Story, body-shop foreman for a Portland, Ore., car dealer, is only 46 inches tall. Story used many stock parts such as Chevrolet and Pontiac fenders, Lincoln windshield and Ford engine, all with modifications. The car has a 97-inch wheelbase and a ground clearance of only five inches under the engine. The old Ford V-8 60-horsepower engine was "souped" up to put out 113 horsepower with a compression ratio of 10½

to 1. The two seats are so low that the drive-shaft tunnel serves as an armrest between them! With a top speed of 105 miles an hour, the car holds the road tightly be-



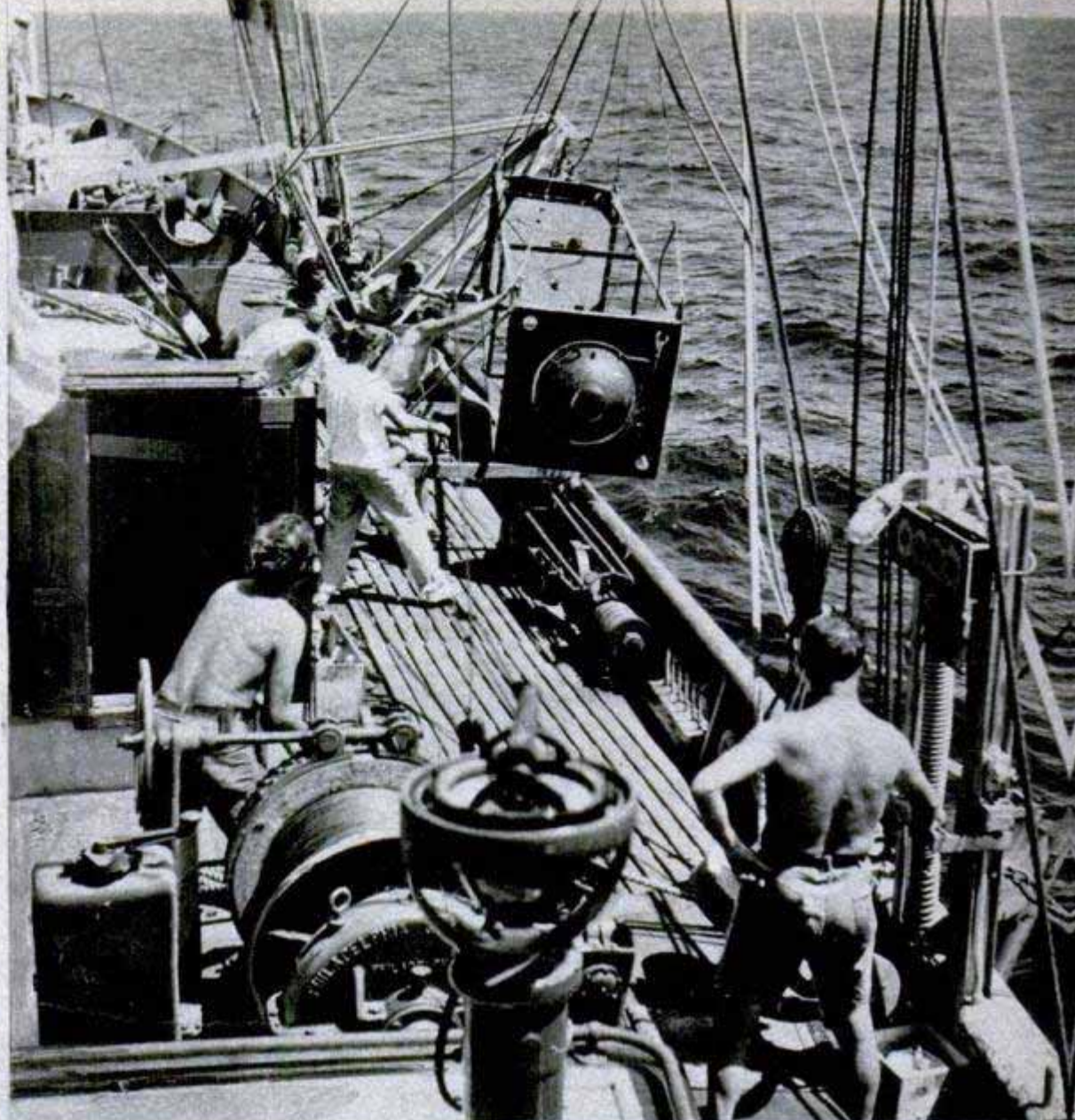
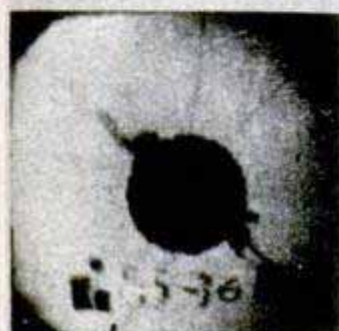
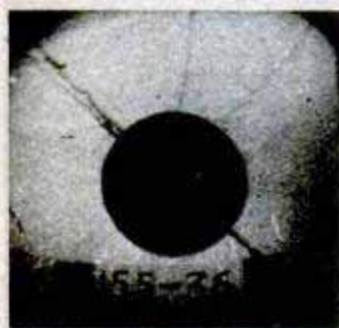
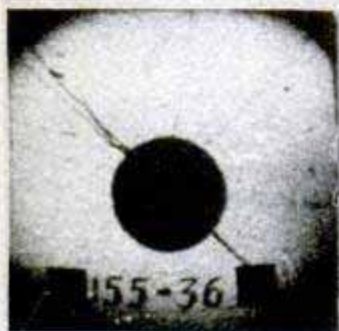
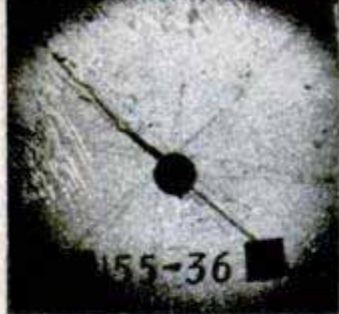
cause of its low center of gravity. It takes right-angle turns safely at 55 miles an hour. Story is now building four-seater models of similar design.

Parachuted Lifeboats Are Radio-Guided to Survivors

Radio will soon guide empty lifeboats, dropped by parachutes for rescues at sea, directly to the survivors. By maneuvering a stick on a small control box, an operator in a plane dropping a boat can hold the craft stationary until survivors have boarded and then set it on course. Its 100-foot parachute is jettisoned by an explosive charge when the craft hits the water. The 15-man boat has rations, gasoline and survival equipment for 800 miles of travel, and

it can be restocked by air for longer distances. The system is expected to be completely installed in all Air Force rescue boats by early 1952.

¶ In event of enemy attack, the amount of radioactive material required to contaminate the water supply of a large city is so great that this danger seems extremely unlikely, according to Brig. Gen. James P. Cooney of the Medical Corps.



Photos by David Owen, Woods Hole Oceanographic Institution

The rig goes over the side. Left, some explosion photos. Top, the unexploded charge. Next photo shows actual explosion. Others record changing size of bubble made by explosion

The Navy Films a Blast TWO MILES DEEP

IT'S DARK 12,000 feet below the ocean surface and quiet, too. It had always been dark and quiet there until scientists of the Naval Ordnance Laboratory set out to photograph explosions two miles underwater. By taking such pictures they interrupted the age-old silent blackness with bright lights and loud noises.

These scientists not only wanted photographs of explosions under terrific pressure, but they wanted them shot at a rate of more than 20,000 frames a second! To do this, they joined forces with scientists from the famed Woods Hole Oceanographic Institution in Massachusetts.

This combination of skills resulted in a box-kite-like rig that automatically sets off an explosion at any desired depth and shoots 100 pictures of the explosion at a rate of 30,000 a second. It does all this with no help from the surface. The entire operation is automatic once the rig goes over the side of the ship.

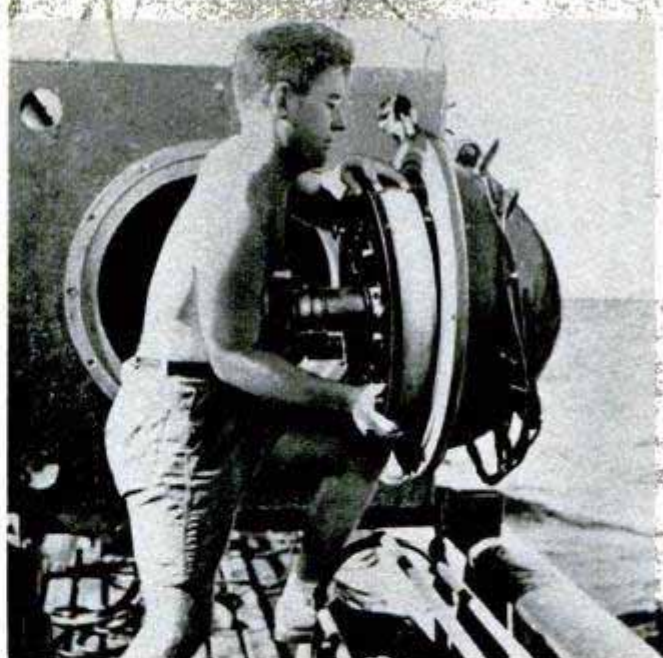
The scientists needed a compact camera that would not only withstand tremendous pressures and explosive shocks, but would work at

high speeds on miniature storage batteries. S. J. Jacobs of the Navy lab and A. A. Klebba of Woods Hole designed the camera. A rotating mirror shifts the picture from one frame to another at a speed of 30,000 a second. One hundred framing lenses provide 100 pictures at that speed when the mirror revolves 18,000 times a minute. The camera is shock-mounted in a spherical pressed-steel case 22 inches in diameter with 1¼-inch-thick walls. It shoots through a bulletproof glass port one inch thick.

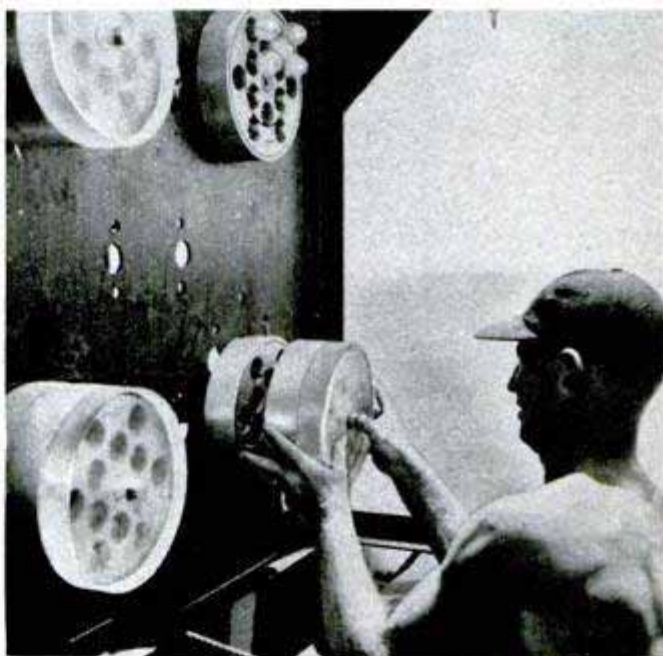
Mounted at one end of the boxlike metal frame, the camera aims toward the opposite end where four clusters of flash bulbs are sealed inside protective cases. The explosive charge is suspended between the camera and lights just in front of a diffusion screen.

The Woods Hole Oceanographic Institution furnished the ketch, Atlantis, for the project. When the Atlantis arrives at a pre-selected clear-water area, the equipment is lowered over the side. Its only connection with the ship is a slender steel cable. When the desired depth is reached, the ocean pressure closes a depth switch. The camera motor starts and when it gets up to proper speed, a centrifugal switch opens the shutter, fires the flash bulbs and detonates the explosive. The round of 100 pictures is taken, the shutter closes and the motor stops. The equipment is then hauled back to the surface. The entire operation calls for precise synchronization as it is timed in milliseconds!

When the film is developed, the scientists have a record of an explosion under tremendous pressure. To build a tank for such experiments would cost about a half-million dollars. With the help of the Atlantis, the Navy uses nature's own laboratory, the ocean depths, at no charge!

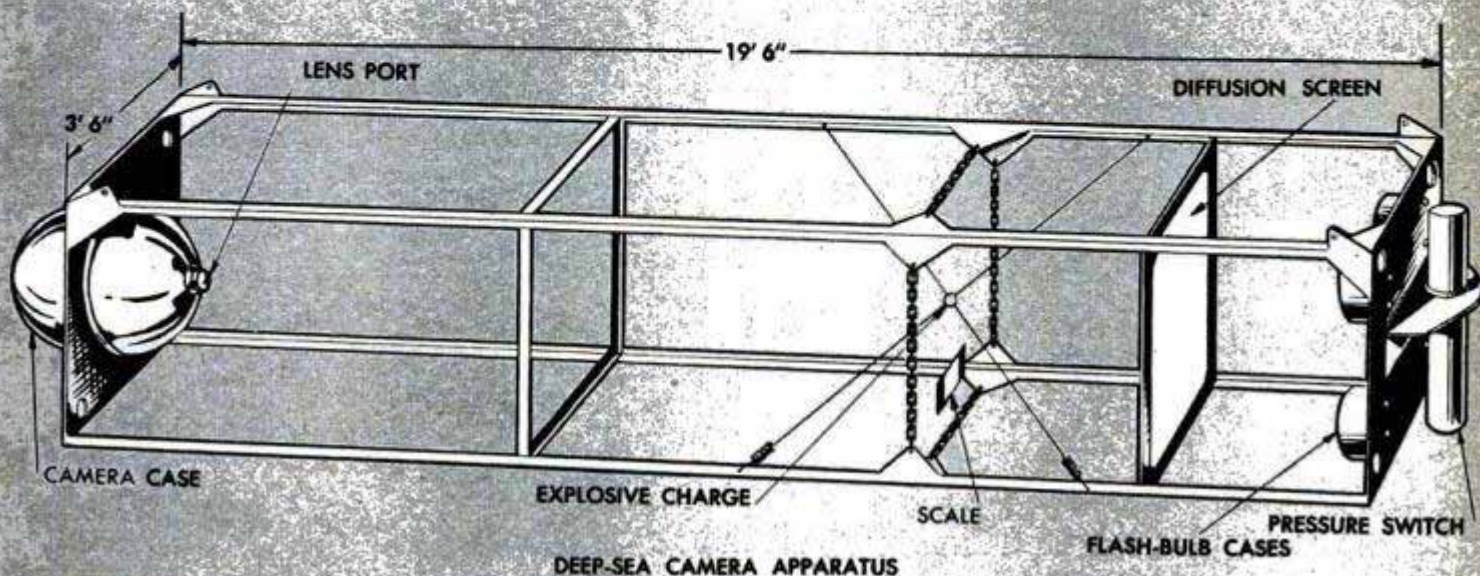


Above, the high-speed camera is sealed in a round, thick case that protects it from pressure and shock



Above, many flash bulbs are needed to illuminate the bubble. They are sealed inside these plastic covers

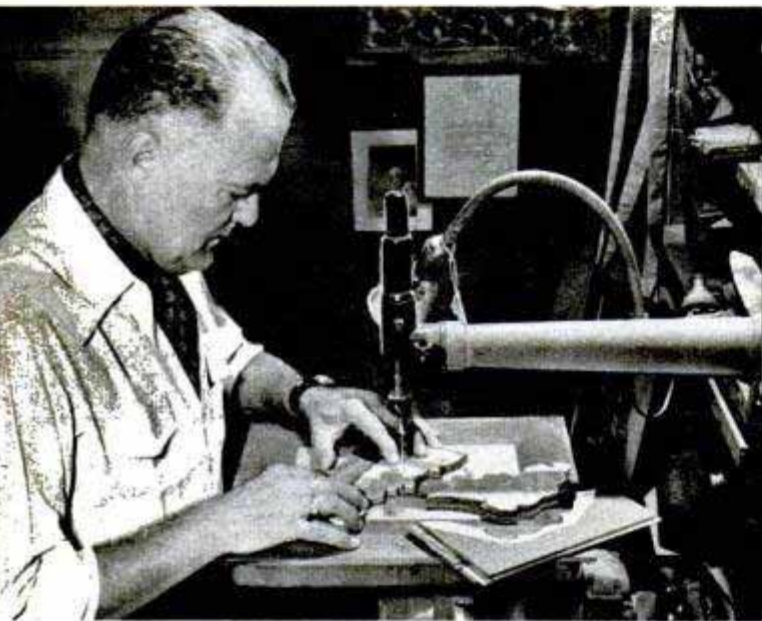
Below, drawing of the underwater rig. The pressure switch is mounted at right, behind the light board



PORTRAITS IN WOOD



While model Joye Stoddard poses, Gresh sketches the lines that will soon guide the blade of his jigsaw



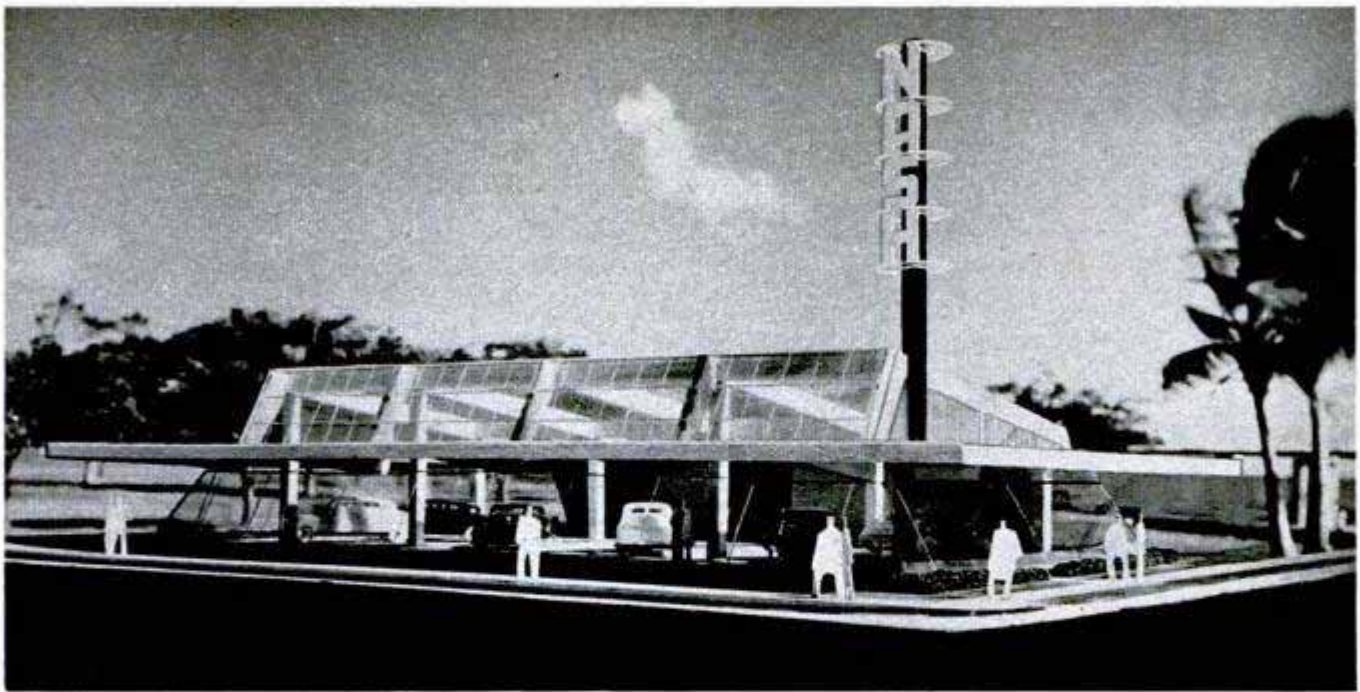
At the jigsaw, with the sketch glued to the wood, the artist skillfully cuts out every definite form

In assembling, the problem is selecting the properly shaded woods to match every detail of hair and skin

WORKING with a jigsaw instead of a brush, Earl Gresh of St. Petersburg, Fla., is an artist in wood. By skillfully cutting and blending thin veneers in a wood inlay, he turns out portraits that are remarkable for their shadows, highlights and careful detail. Gresh, a champion speedboat racer and well-known dance-band leader in the 1920s, has never had an art lesson in his life. After the depression of the '30s wiped out his boat-designing business, he started a small wood-novelty company in his garage. It was there that he discovered his flair for making delicate wood inlays. Gresh pencil sketches the subject and glues the sketch paper to the top of a pad of previously selected wood veneers of colors that match the model's skin and hair tones. The sketch lines guide his jigsaw cutting. In assembling the portrait after the sawing, Gresh's problem is selecting the proper shade of wood to duplicate each highlight and shadow in the sketch.

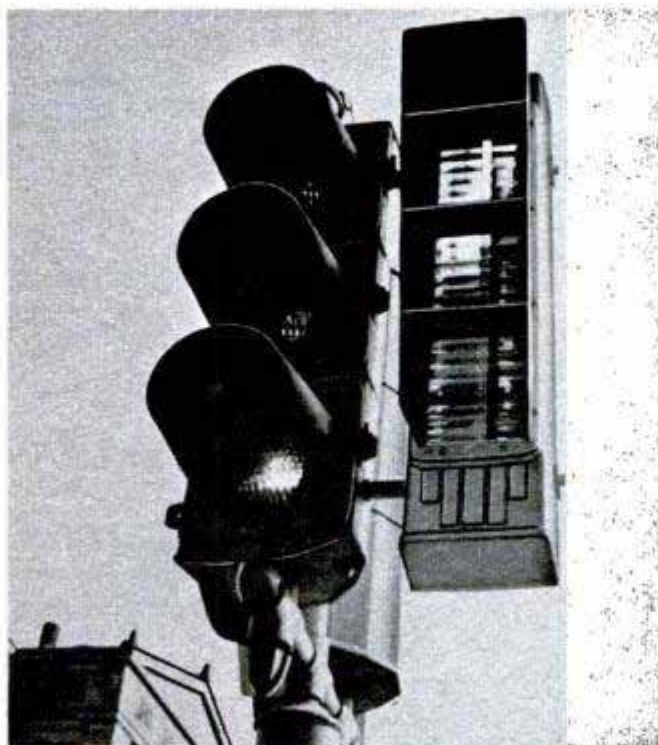
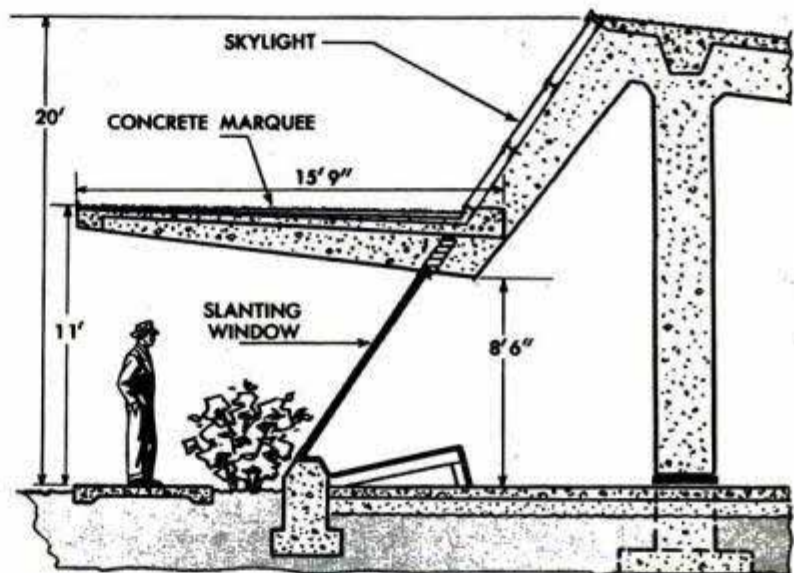
After the final step, six coats of clear lacquer, the veneer "painting" is an attractive portrait of Joye





Nonreflecting Glass Forms Showroom Walls

Annoying reflections, common to most store windows, won't exist in a new Honolulu automobile showroom because of its unusual design. The cars will be lighted naturally from slanting skylights above the marquee. The full-length window walls are slanted backward 30 degrees. Because of this tilt, the glass reflects the underside of the marquee which is completely in shadow, thus causing no noticeable reflections. The daylight from the skylights illuminates the cars so brightly that the reflections cannot be seen. This makes the cars clearly visible from all angles.



The Main Flo-Control Traffic Light, Inc.
956 Robert St., Jackson, Mich.

JUNE 1951

Traffic-Light Timer

Motorists know at a glance how much longer the light will stay green when the traffic light is equipped with an attachment that "meters" time. The device consists of a vertical column of green light that diminishes as the "go" time runs out, thus showing exactly what proportion is left at all times. The timer can be set for any duration from 15 to 60 seconds.

Oil and Gas Reserves at New High

New supplies of crude oil and natural-gas liquids developed in the United States last year, estimated at 3.3 billion barrels, have brought proved reserves of liquid hydrocarbons to an all-time peak of 29.5 billion barrels. Natural-gas reserves are now up to 185 trillion cubic feet. The reports were made by the American Petroleum Institute and the American Gas Association.



Each year Chris Busch's old-time threshing party attracts about 200 cars full of people to his farm near Colton, Wash.



In 14 years the collection of steam-powered equipment has grown to 24 engines. Most of them cost from \$50 to \$200



His boyhood days in the wheat fields are recalled by an old thresherman, peering into the boiler of an 1890-model rig

Revival IN THE WHEAT FIELD



Chris Busch, Jr., shares his father's enthusiasm for old steam engines

By O. A. Fitzgerald

FOR ONE SUNDAY each fall, the Chris M. Busch farm, three miles south of Colton in eastern Washington turns harvesting back half a century. As many as 800 people have flocked to the farm to see it done. Some come to pitch bundles, haul wood or water, help tend separator or hold down one of the many other jobs necessary to keep a steam outfit rolling. Mostly, however, folks come to see threshing as it used to be.

Just for the thrill of helping run an old-time steam-engine outfit, just to hear the shrill toot of its whistle, many have driven as far as 600 miles for the day. Four of these old-time harvesting parties have convinced Busch there are enough old-time threshermen around to warrant its continuation. In fact, the 1950 party saw plans laid for an association of old-time threshermen to make sure that once a year, at least, they will get a chance to turn back the calendar.

Spark plug of this old-time threshing re-

vival is an eastern Washington farmer who collects old threshing-machine engines the way some people go after salt shakers, cream pitchers, antique furniture, or even match folders. Already he has 24 of them parked around his place, some saved from the unhappy fate of the junk pile. And Busch has his eye on several more old machines he'd like to see in his yard.

Steam-engine collecting poses difficulties not experienced by other hobbyists. Old engines can be had for \$50 to \$200 apiece. He has found more of them lying around out West than most people realize. Storage space isn't his principal headache. He has plenty of land for permanent parking. Getting the monsters to their new home usually is the most difficult task.

The Busch steam-engine collection and his annual old-time threshing party are no publicity stunt. Both stem from the fact that ever since he was eight years old, working in the grain fields of northern Idaho, he has loved steam engines. His first



Complete in all details, the $\frac{1}{3}$ -horsepower midget at left is a copy of one in the Busch collection. It has been tested to 120 pounds of steam

threshing job was driving the team on the water wagon. Easily the biggest thrill of his life came when he landed the job of engineer and had complete charge of the engine.

"There's no machine that gives you quite the sensation you get from handling a steam engine," he declares.

Chris Busch knows he isn't alone in pinning for the old steamers. In his address book he has more than a hundred of them. Practically all are old-time threshermen.

When his big harvest is done, Busch picks out the engine he is going to use for the old-time threshing party. It gets a thorough oiling and clean-up. Its boiler is filled, and a wagonload of firewood is brought in. Then Busch sets the date and sends a letter to all the hundreds of friends on his special mailing list. The last Sunday in September is the customary date.

"This is the happiest day of my life," beamed Otto Loeffler, at the throttle of a 36-year-old engine at the last party. For 33 years Loeffler operated a threshing outfit in eastern Washington. Standing on two partly filled sacks of grain, he cut bundles before they went into the thresher.

Pitching bundles from one of the stacks was Frank Trapp of Colton, Wash. "Chris Busch ran header box for me when he was a little boy," this old-timer recalled. When the separator broke down during the 1950 harvesting party, one of the visiting thresh-

ermen commented, "I'm sort of glad this happened. Now we'll have more time to visit."

Then they took time to inspect the other machines in the Busch collection. Some were in their prime when Chris was a boy and the oldest was doing its stuff around 70 years ago. Busch has been collecting the engines for 14 years.

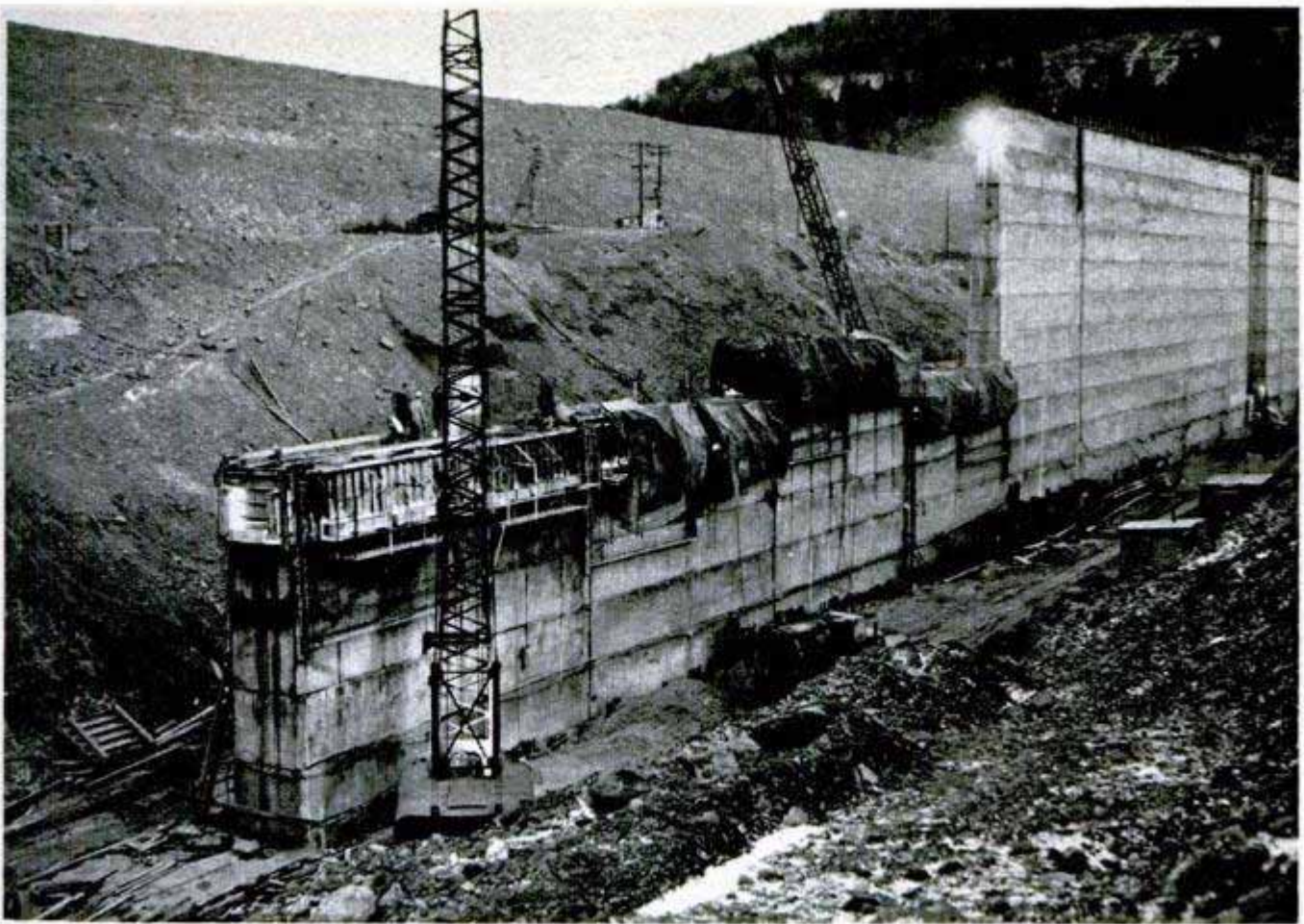
Old-timers climbed into the engineer's seats of the silent engines. Almost reverently they caressed the cold throttles, sighted down the engine top to where, in their memories, a thresher chewed up bundles of grain and turned out a stream of golden grain. There were friendly arguments as to which engine was the best. Two old-timers became involved in a heated discussion of which of two was the "best buy."

While the old-timers looked over the old engines and relived their threshing days, the youngsters had a steam-engine show all their own. Doing its stuff in the shadow of the big one was a peanut-size version of a Minneapolis engine. This $\frac{1}{3}$ -horsepower midget was made by W. C. Frick, machine-shop instructor and his classes at Lewiston, Idaho, high school. Complete in every detail, even to flues and governors, it carried 40 pounds of steam and had been tested to 120 pounds.

There was a big one just like it in the Busch collection.

It takes a lot of wood and water to thresh grain this way. Revival is customarily held late in September

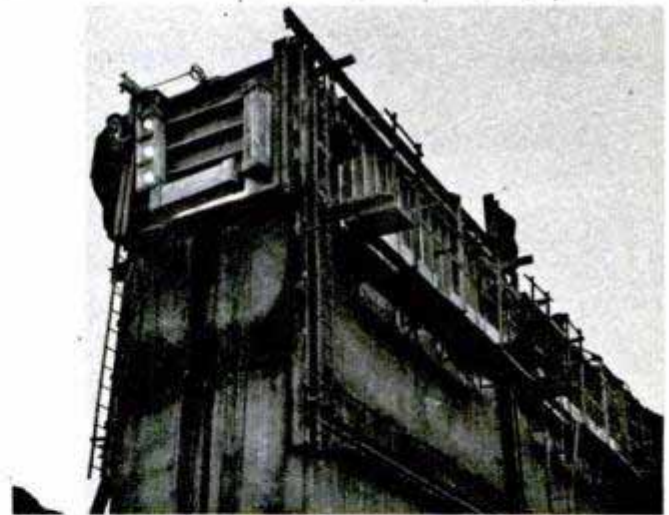
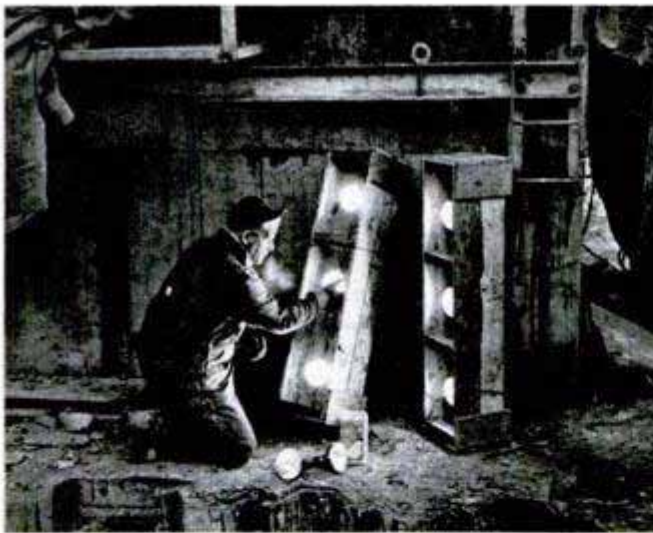




Banks of lamps glow around the just-poured upper sections of the wall. They warm the concrete for 72 hours

Workman prepares a bank of 250-watt lamps. They have proved better than steam pipes or gas heaters

Lamps are wired around sides of huge section of concrete. In severe weather, others are placed on top

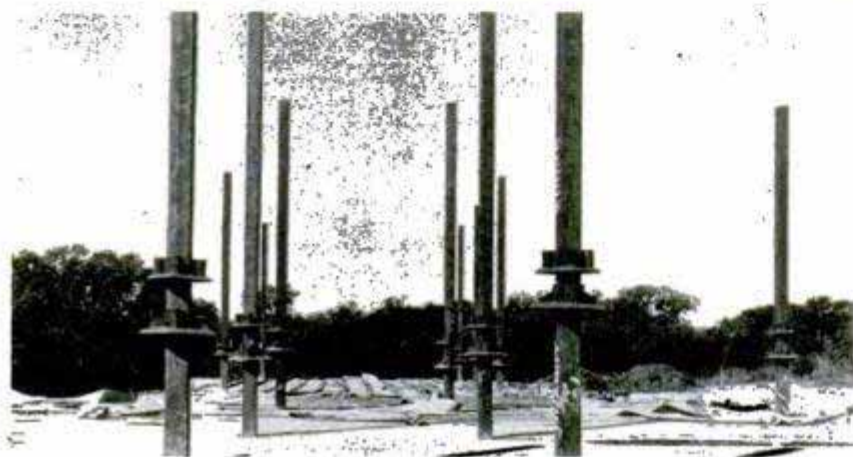


Concrete "Set" in Winter With Infrared Lamps

Rays from infrared lamps helped "set" newly poured sections of a big concrete wall in New York State during freezing weather last winter. The cut-off wall was built as part of a program to increase the water supply to New York City. It was poured in sections more than 46 feet long and 8 feet high. As soon as each section was poured the 250-watt infrared lamps, mounted in troughs, were placed on each side. They maintained a temperature of 55

degrees for a minimum of 72 hours to assure proper setting of the concrete sections. The construction company found the lamps more efficient and cheaper to use than steam pipes or gasoline hot-air heaters.

☐ Argentina has developed a single-seat jet fighter plane armed with four 20-millimeter cannon, its designer and pilot the former technical head of Germany's wartime Focke-Wulf aircraft company.



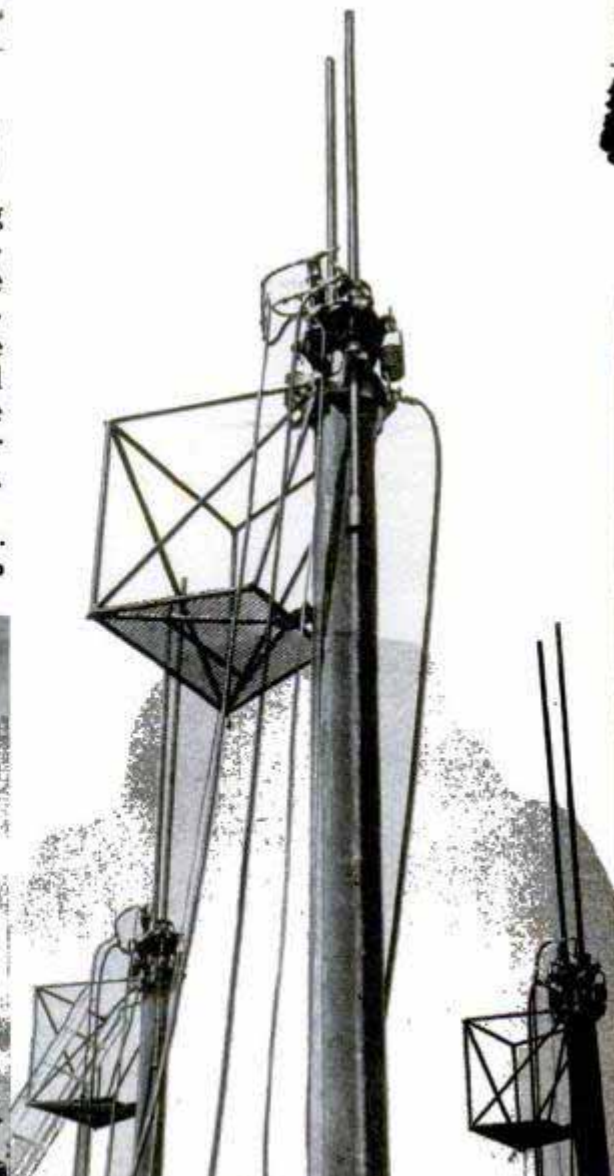
With the second floor and roof slabs already in place in the background, above, another second-floor section is ready to be raised in the foreground. The base slab acts as bottom of form for casting additional concrete slabs

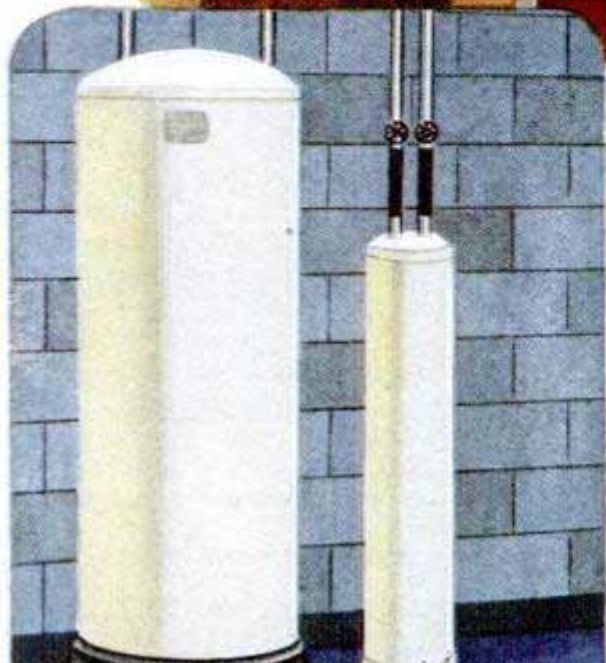
After the foundation and base slabs have been poured, left, the supporting steel columns are set and anchored

Precast Layers Form Building

"RAISING THE ROOF" describes a new building method developed by the Institute of Inventive Research, San Antonio, Tex. Concrete floors and roof are cast at ground level and raised into position by automatic power-lifting equipment. Only edge forms are needed, since the additional concrete slabs are poured on the base slab over a separating medium. They are then welded to the supporting columns of pipe, steel or concrete by collars placed in them during the pouring.

Hydraulic lifting equipment, right, raises the slabs into position. The finished product, a Trinity University building in San Antonio





Korta

▲ 15-ton hydraulic press utilizes cylinder from dump truck. See story on page 200

◀ To learn more about the advantages of soft-water service in the home, turn to page 170



Don't try to "walk" into a boat unless you want to go swimming. Stepping onto the seat or gunwale, like this, is sure to push the boat away from the dock



Enter boat from a crouching position, holding boat against dock with one hand while reaching for opposite gunwale with other. Step into center of boat



"Paddle your own canoe" Safely

Handle your boat correctly and save a life—maybe your own. If you know how to board a boat and seat passengers safely, or what to do if the boat capsizes, a passenger falls overboard, or you are caught in a sudden squall, your boating trips can be highly enjoyable instead of terminating in possible tragedies

By Frank N. Stephany

NEITHER you nor I would consider letting our families ride in a car with an inexperienced driver in heavy traffic. But, on an occasional vacation or week-end trip, we willingly expose them to even greater danger by "piloting" them on a ride in a boat of which we know as little about handling as the inexperienced driver knows about the car.

It may be only a canoe, a rowboat, or one of several types of small boats fitted with an outboard motor, but all of these boats have one thing in common—they are subject to "pilot error," the primary cause of boat accidents. However, the fact that you're not an expert at handling the boat need not dampen your enthusiasm nor affect the safety of your excursions. Just be careful on the water, avoiding larger craft and watching the weather. Take a few preliminary precautions, such as seating yourself and the passengers properly, and keep in mind the best things to do if emergencies should arise. With the able assistance of La Nore Morehouse, author of "Know Your Canoeing," and assistant to the Safety Services Director, Chicago Chapter, American Red Cross, the editors of *Popular Mechanics* hope this story will help reduce the number of boating accidents due to unfamiliarity with the craft and the water.

Whenever you venture out in a boat, your best life insurance is knowing how to

To board canoe from beach, bow paddler steadies boat while stern paddler slowly makes way back to position. Bow paddler enters and moves amidships

*Old-Town Canoe Club
Old Town, Maine*



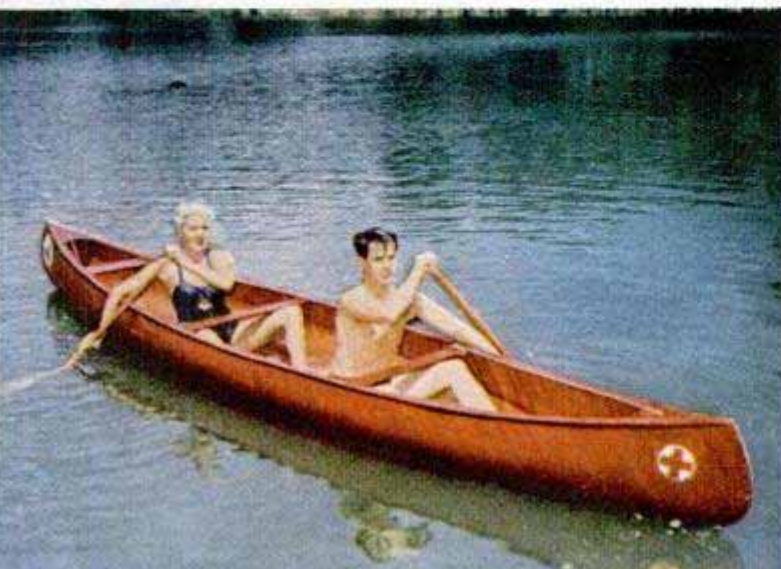
Overloaded craft could be death trap for these canoeists, and the man in the motorboat the "killer." The bow wave from the dangerously close motorboat will wash over the side of the canoe, possibly swamping it

swim—at least sufficiently well so you can accept an unexpected ducking without becoming panicky, and are able to swim a short distance back to the boat. This, of course, holds true for your passengers as well. Remember that a wooden boat, or a metal one with watertight compartments, will support the weight of several persons even though it is capsized or swamped. Never attempt to swim for help. The shore line always appears much closer than it actually is. Instead, hang onto your boat and calmly wait for help to arrive.

If a squall comes up, canoeists may choose to sit in bottom of the craft, thus lowering center of gravity, or remain kneeling for better control of canoe

Boarding a canoe or other small boat from a dock by placing one foot on the near gunwale or end of a seat and stepping into the boat is likely to result in an unexpected soaking. The safe method, which is just as easy, is to crouch down on the dock and place one foot in the center of the boat. While grasping the gunwale and the edge of the dock in one hand, reach for the opposite gunwale with the other hand, and lower yourself gently into the boat. Entering a canoe from a beach may be done in two ways. The canoe can be

Losing or breaking paddle is no cause for alarm. Canoe will make fair speed if hand-paddled as pictured. Note how arm is immersed to elbow during stroke





Capsized canoe is excellent life preserver. Canoeists keep heads above water until help arrives, one holding wrists of the other. Each may release an arm to swim craft toward shore



Swamped canoe can be swum or paddled ashore, above, after entering as shown below. If possible, paddle is retrieved and secured under thwarts. Then legs are kicked to "swim" into canoe



floated in 4 in. or more of water, and the paddlers, grasping the gunwales, step smoothly into their positions. The second way, which can be done without getting the feet wet, is to launch the canoe stern first. The bow paddler stands at the edge of the water and steadies the bow between his legs. Then the stern paddler steps into the bow and slowly makes his way back to the stern, keeping his weight low and sliding his hands along the gunwales. When the stern man is in position, the bow paddler enters the canoe.

Overloading any small boat is particularly dangerous, as it reduces the distance from the gunwale to the surface of the water. This results in taking on water from small waves or comparatively slight heeling of the boat. The number of people carried safely depends on the weight of the occupants, the conditions of the water and the characteristics of the boat. A canoe under 16 ft. long is considered a one-man canoe. Two men of average weight, carrying light duffel, usually can use a 16-ft. canoe; three men, a 17-ft. canoe; and four men, an 18-ft. canoe. To keep the center of gravity as low as possible, all passengers should sit on the bottom of the canoe and the paddlers should kneel. If you are alone in a canoe, take up a position near amidships. Kneeling in the stern will bring the bow out of the water and make the canoe difficult to control. A rowboat may be considered fully loaded when the seats are occupied. If an outboard motor is used or if there is danger of rough water, less weight should be carried. Never allow your passengers to stand up in the boat or sit on stem, transom or gunwales. Seat them to distribute their weight evenly throughout the length and breadth of the boat.

Before going out on the water, check up on the weather and take note of the wind as well as the current. If the weather is uncertain, stay close to shore. Remember that an offshore wind may cause the center of a lake to be dangerously rough even though the water is smooth near shore. Also, if you are just going for a ride, travel upwind or upstream first, so the homeward portion of the journey will be the easiest. If you are

caught in a squall while canoeing, you may sit in the bottom of the boat or remain kneeling. Although kneeling does not lower the center of gravity as much as sitting in the bottom, it has the advantage of allowing you to retain paddling efficiency. On a small lake, it is sometimes better to drift with the wind than to attempt to make headway against it. In a rowboat, seat as many passengers as possible on the floor and get the weight amidships so the bow and stern will be buoyant. Then head into the wind, as in Fig. 6. If you have an outboard motor, throttle down until there is just enough speed to control the rudder, as too much speed will cause the bow to bury itself in the waves. When the squall subsides, head for the nearest shelter, but if the wind should again pick up, turn back into it. When the stern of a boat is exceptionally buoyant, you can quarter downwind at low speed, if desired, but don't try this unless you are sure that the boat will not take water over the stern.

If a paddle is broken or lost, a canoe can be returned to shore by hand-paddling. Sit in the bottom of the canoe and grasp the gunwale with one hand. Then tilt the canoe slightly and immerse your free arm up to the elbow. After two or three strokes on one side, lean toward the other side and take a few more strokes with the other arm. Don't try to turn the canoe around. If you want to travel in the opposite direction, turn yourself around in the boat.

Should your canoe capsize, swim back to it and hang onto the bottom until help arrives. If the water is chilly, you can keep warmer by swimming the canoe toward shore with one hand. A swamped canoe also will support the occupants and, in fact, can be paddled to shore. Enter the canoe amidships, with hands directly over the keel. Kick your legs to bring them to the surface of the water, and then swim forward, simultaneously drawing the canoe under your body. Move slowly and steadily to keep the canoe from rolling. When your hips are over the gunwale, roll sideways and sit in the bottom of the canoe. Then, turn, lock your legs under the center thwart and spread your feet well apart. In this way, you are able to control the rolling action of the submerged canoe with your legs. The canoe can be "swum" back to shore with a breast stroke or, if you still have the paddle, use a shallow "sweep" stroke to propel the canoe. Point the canoe toward shore before entering it.

If one of the passengers falls overboard, grab him quickly and hang on—but be careful not to upset the boat. If he is out of reach, immediately extend an oar to him or throw him a buoyant cushion or rope. Then, keeping yourself low in the boat, bring him

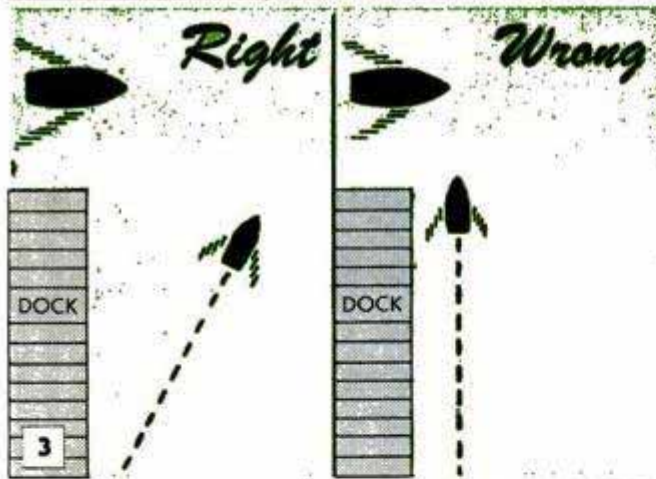
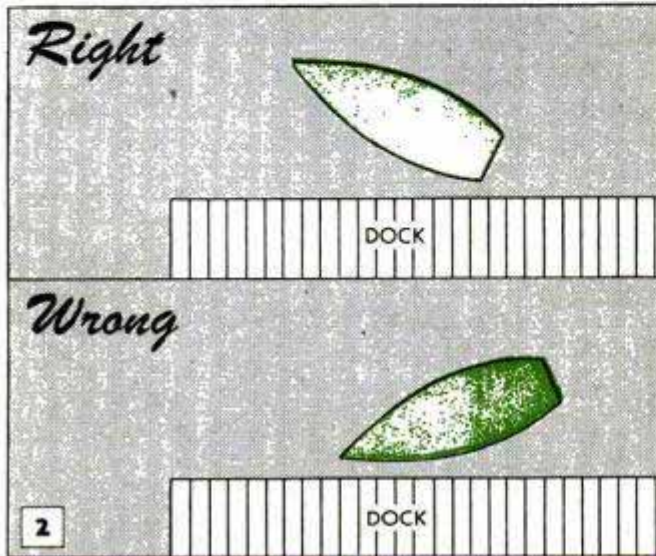


Canoe is boarded from dock in same way as rowboat, bow paddler first. Enter from crouching position, transferring body weight smoothly to center of boat





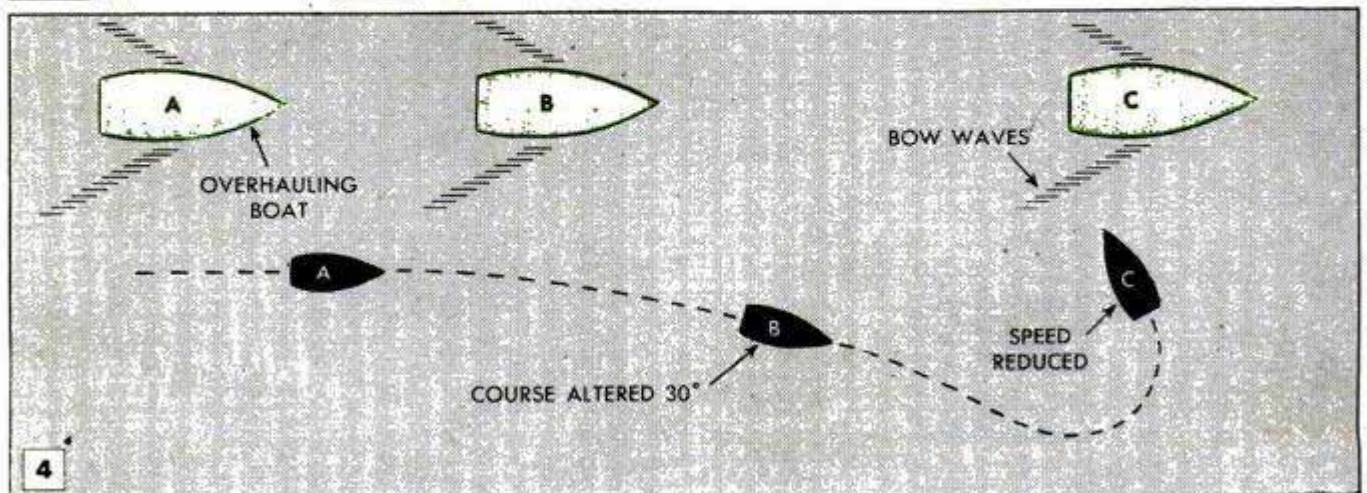
Proper weight distribution in rowboat, left-hand photo, permits maximum speed and best control. Weight too far forward makes rowing a chore. Also, the boat will take on water from small waves washing over the bow



aboard amidships, in a canoe, or over the stern, in a rowboat. If the person is nearly drowned, slip your arms under his armpits and haul him gradually into the boat.

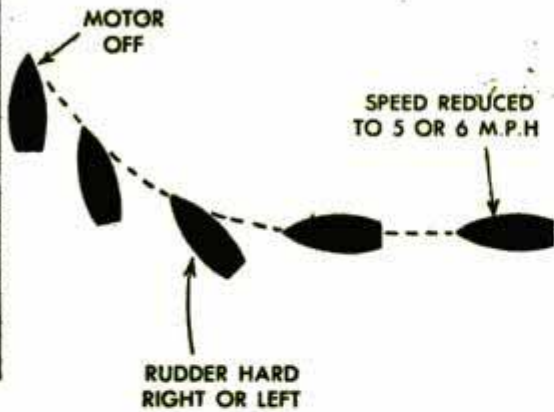
Should you fall from a canoe in deep water, you can re-enter the boat, as in Fig. 1, without capsizing it. Simply place both hands in the near bilge, amidships, as in detail A, and then kick your feet to bring your legs upward and plane your body. As the canoe is drawn under you, place one hand on the opposite bilge, B, turning the arm to keep the elbow high. With most of your weight supported on this arm to keep the canoe from tipping, work your body forward until you can roll into a sitting position, as shown in detail C.

When using an outboard motor, give the bow of the boat a slight shove away from the dock before starting the motor. As the boat begins to make headway, watch the corner of the stern nearest to the dock, and do not turn until it can clear the edge of the dock, Fig. 2. If you cannot see over the dock, head slowly away from the dock, as in Fig. 3. There is danger of collision in running parallel to the dock, as you may not have time to turn away from the path of a boat passing in front of the dock. Fig. 4 shows the safe procedure to follow when you are being overhauled by a larger, fast-





Docking



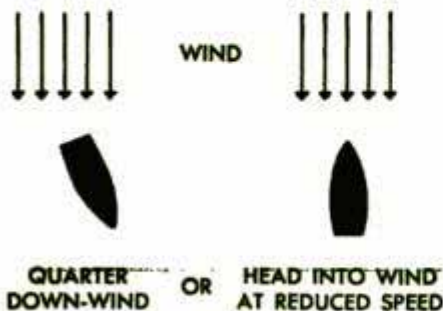
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er boat. As the boat begins to overtake you, detail A, alter your course 30 deg. away from the overhauling boat, detail B. Then, as the large bow wave approaches, turn and head directly into it, detail C, reducing speed so the bow will lift with the wave.

Correct procedure for docking is shown in Fig. 5. Instead of coasting into the dock at an angle, head straight for it and throttle down to 5 or 6 m.p.h. Roughly a boat length and a half from the dock, throw the rudder hard to one side to begin swinging the boat parallel to the dock. Hold the steering lever in this position and slow the motor to as low a speed as possible. Done properly, you will find that forward motion has been almost entirely lost, with the boat brought up parallel to the dock. Cut off the motor before the boat begins to gain headway. A heavily loaded boat may require more room to respond to the hard rudder.

You are responsible for the wake of your motorboat. Give canoes and rowboats plenty of distance, and if you must pass fairly close to them, reduce your speed. Stay clear of docks, bathing beaches and diving rafts—swimmers are sometimes hard to see. For your own safety, avoid all large boats and treacherous waters.

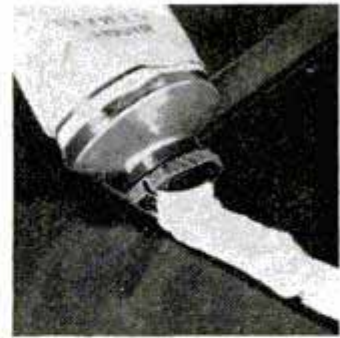
Squall



6

Cement Spread From Flexible Tube Through Saw-Slot in Cap

On a job where it is necessary to apply a large quantity of cement from a flexible tube, a slot in the cap will enable you to spread it more rapidly and efficiently. Before slotting the tube, which is done with a hacksaw, remove the cork or cardboard disk inside the cap. Cut the slot just deep enough to break through the inner surface. When storing the cement after use, replace the disk so that the container will be sealed tightly.

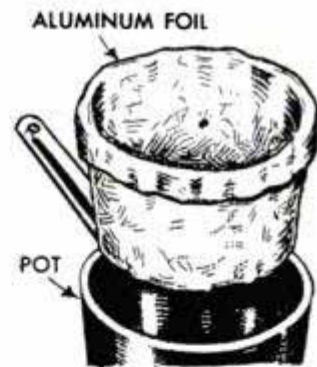


Summer Treatment for Fireplace

After giving the inside of your fireplace its usual spring cleaning, apply a coat of light-colored calcimine to the walls of the fire pit. This will give them a cool, clean appearance for the summer and can be easily removed with warm water and a brush when the fireplace is to be used.

Foil-Lined Gluepot Cleaned Easily

Lining almost any small cooking utensil with aluminum foil provides a gluepot that can be thoroughly cleaned in a jiffy. After the glue job has been completed, the foil is lifted out of the pot, leaving the utensil unsoiled. Any remaining glue can be left in the foil lining and reheated when needed.—Ted Dash, Bronx, N. Y.

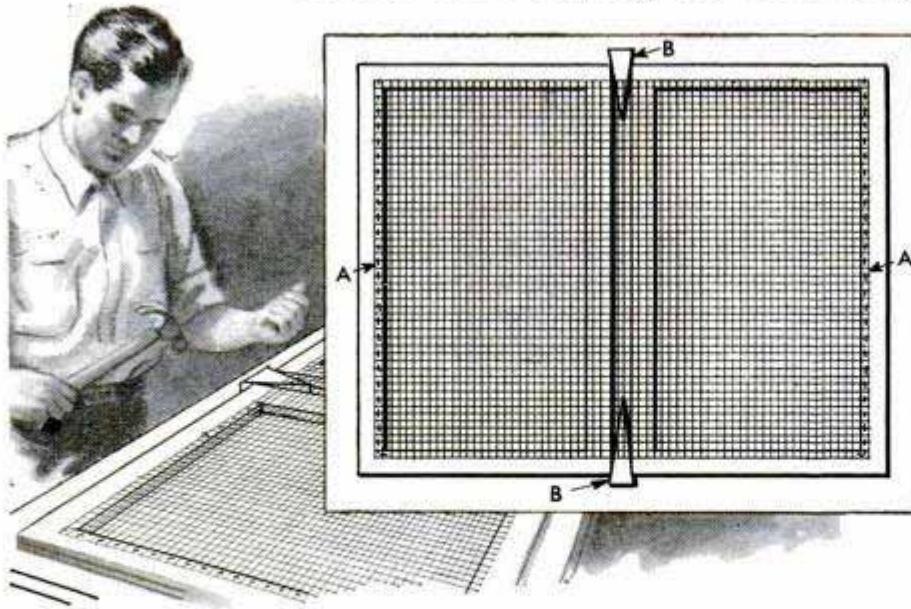


Cardboard Matchbook Cover Quiets "Shorted" Horn

The next time your auto horn "sounds off" and won't stop, don't get excited and start pulling loose all the wires under the hood. Instead, calmly wrap the cardboard cover from a book of matches around the horn wire near the end of the steering column, and slide it over the wire into the opening in the column. A short circuit in the horn wire at this point is often the cause of horns sounding continuously. If this is the case, the cardboard cover, acting as a temporary insulator, will stop the noise.

Julius C. Anderson, Brooklyn, N. Y.

Wedge Blocks Between Two Window Screens Stretch Wire Tightly for Mounting

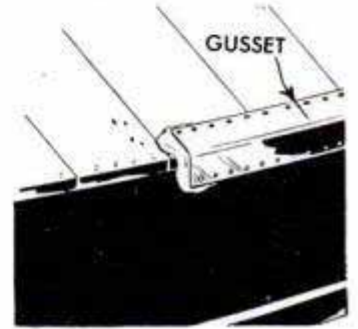


Here is an efficient method of attaching window screening to frames which requires a minimum of time and effort and assures a neat job. Two frames are laid side by side and covered with a length of screen which is tacked to the outside edges of each frame, A. Wedge blocks, B, are then driven between the frames, thus stretching the screen tightly. While the frames are held in this position, the screen is simply tacked around the other edges. Then the frames are cut apart and trimmed. — R. E. Reese, St. Petersburg, Fla.

Rowboat Chines Trimmed With Metal Gussets to Guard Against Scuffing

Flat-bottom rowboats which are beached frequently are subjected to a lot of wear and scuffing at the chines. In time this will cause leaks which necessitate extensive repairs. One owner of rental boats protects the chines from excessive wear by installing metal gussets formed from strips of sheet metal, preferably copper, about 4 in. wide. After cutting to this width, the strip is bent to form an angle and is attached to the bottom and side planking with small flat-headed screws or copper nails spaced about 2 in. apart. Before attaching the strips, nonhardening marine putty is rolled

into long, round strips about $\frac{1}{2}$ in. in diameter and pressed into the corner of the angle to form a water-tight joint. Where the angle must take a bend near the bow and at the stern, cut narrow notches at intervals along one leg of the angle so that it will take the bend without buckling.

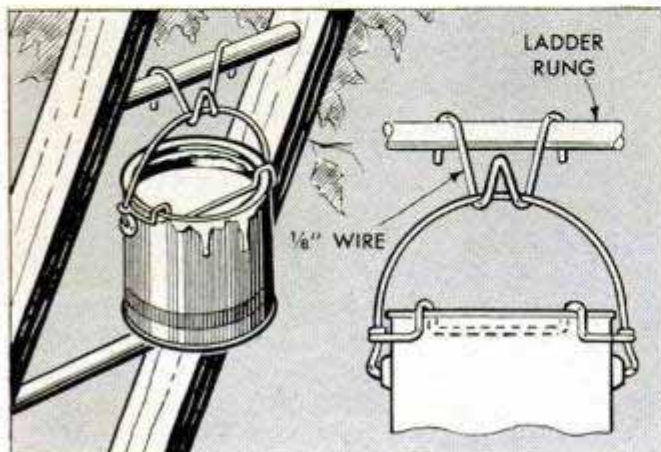


Backfiring Motor Clears Carburetor Jet in Emergency

Often, rough idling of a car engine is due to a partially clogged low-speed jet in the carburetor. Of course, the proper treatment is to take the carburetor apart and clean it out thoroughly, but in an emergency, the clogged jet can sometimes be

cleared by causing the motor to backfire. Interchange the high-tension wires to the No. 3 and 4 spark plugs, start the motor of the car and race it. However, care must be exercised in this procedure as it could cause a fire.—H. W. Swope, Danville, Pa.

Paint Bucket Hung on Ladder Rung Steadied by Device Made From Bail



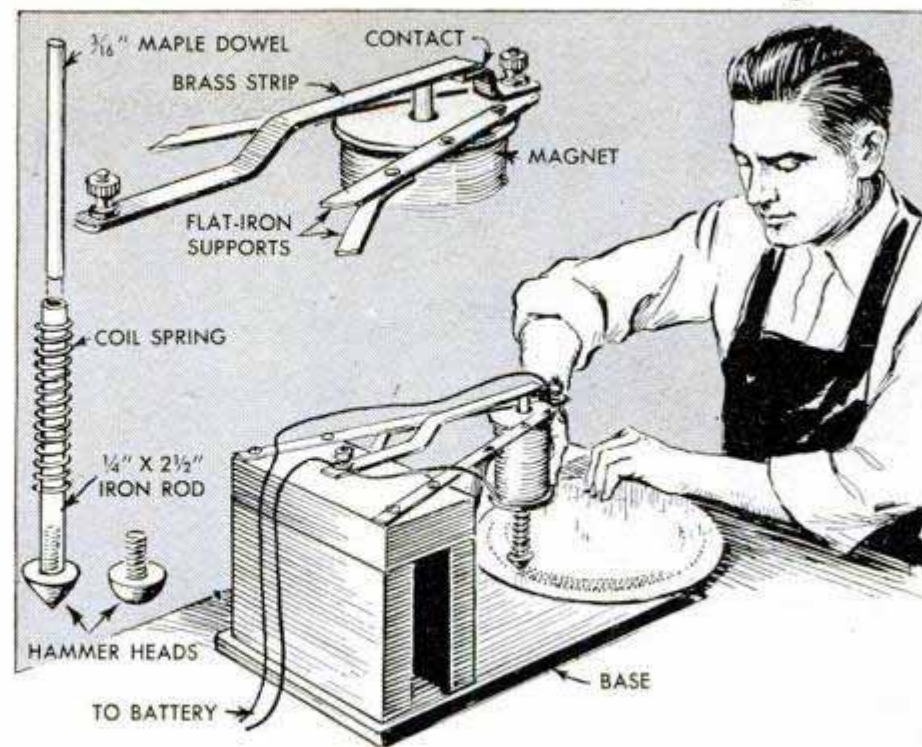
The bail from an old paint can, formed and fastened to a bucket of paint, as shown, makes an inexpensive guard against spillage when painting from a ladder. Note the straight section of the wire which spans a portion of the bucket opening. This is used for scraping excess paint from the brush. The hook which holds the bucket to the ladder rung is formed from wire a little heavier than a bucket bail. It provides two separate points upon which the handle of a bucket is hung, thus preventing the bucket from twisting.

John Strickler, Detroit, Mich.

With this battery-driven tool you can make hammered ash trays, coasters or other articles of soft metal in only a fraction of the time usually required to do the work by hand. The tool, which features easily interchangeable hammer heads and is inexpensive to construct, may be driven with a 6-volt battery or by 110-volt a.c. through a doorbell transformer. To build the unit, first obtain or turn a wooden spool, approximately 2 1/4 in. in diameter and 3 in. long, and drill a 5/16-in. hole through the center. Wind about 15 layers of No. 16 enameled wire on the spool, covering its full length. Then, drill a 1/4 x 2 1/2-in. iron rod at one end

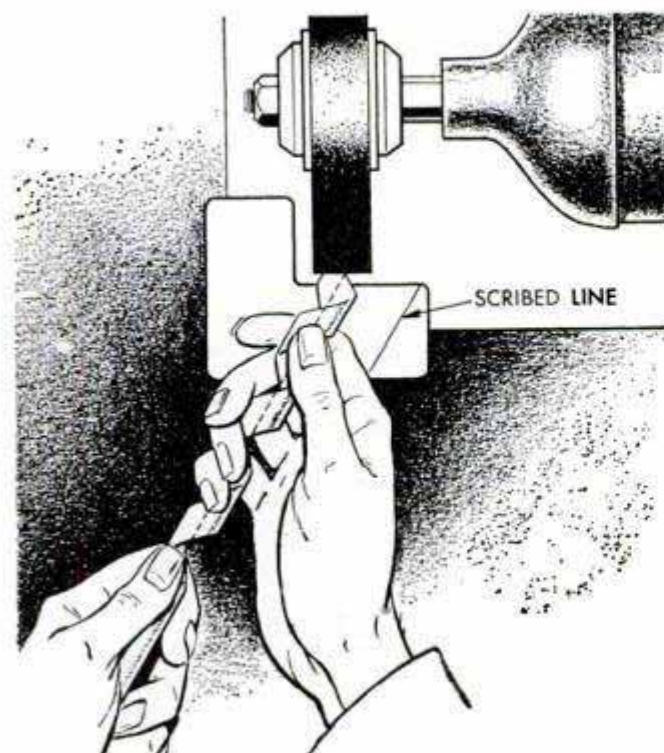
to receive a length of 3/16-in. dowel. Drill and tap the other end for a small machine screw, the head of which has been ground to shape for use as a hammer. The spool-and-rod assembly is supported between brackets which are mounted in a hardwood base as shown. A brass strip, which serves as the contact-breaker arm, is fastened to the base by a single bolt and nut. One of the wires from the coil is wrapped around the bolt and held in place with a thumb nut. The other wire from the coil is attached to a terminal bolt on the brass

Electrically Powered Peening Hammer Saves Time When Embossing Metal



contact piece in a like manner. In operation, the electrical current energizes the coil and causes the iron rod to be drawn upward. The dowel at the end of the rod pushes the breaker arm off the contact point, breaking the circuit. This releases the rod from the magnetic grip, and the spring drives the hammer head against the work. At the same instant, the brass strip drops back on the contact point, thus closing the circuit and causing the sequence to repeat. — R. Morrow, Carrington, N.S.W., Australia.

Line Scribed on Grinder Tool Rest Serves as Drill-Sharpening Guide



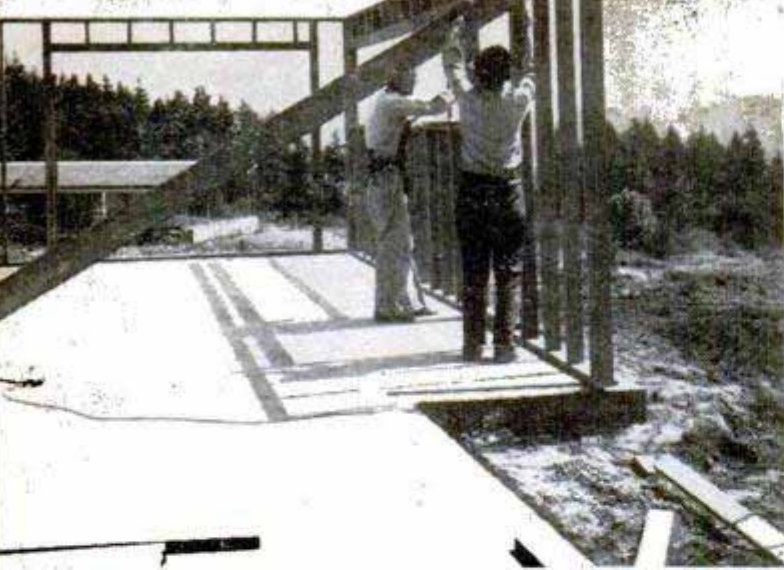
A deep line, scribed at a 59-deg. angle on the surface of a grinder tool rest, provides a handy guide for holding twist drills at the proper angle when sharpening. It is necessary only that the shank of the bit be held parallel with the line. This method is especially helpful in sharpening small drills, as the short lengths of their lips, or cutting edges, make them difficult to gauge in the usual way. If guide lines at angles other than 59 deg. are desired, they can, of course, be scribed on the tool rest and used in a like manner.

Edward Morton, Hartford, Conn.

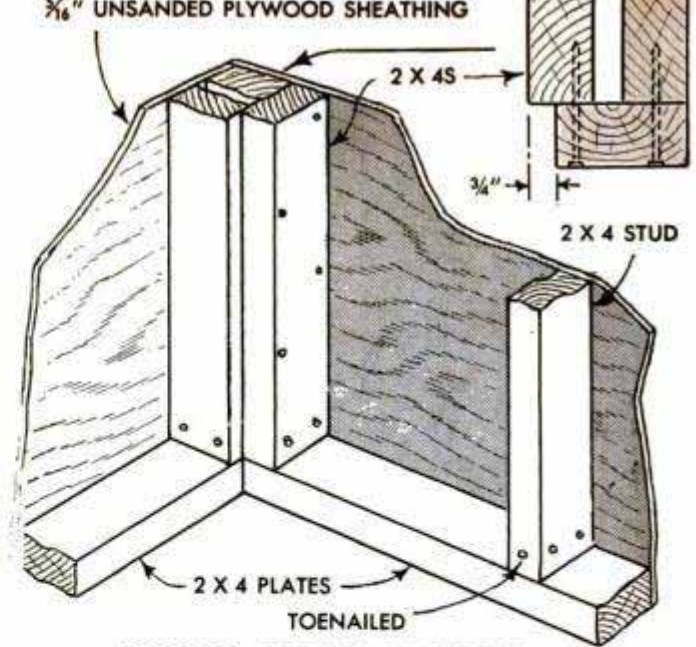
Strong Sewing Thread

If you need some strong white sewing thread for replacing buttons, etc., dental floss will be ideal. It is very strong for its size, is waxed to minimize tangling and is already in a handy container.

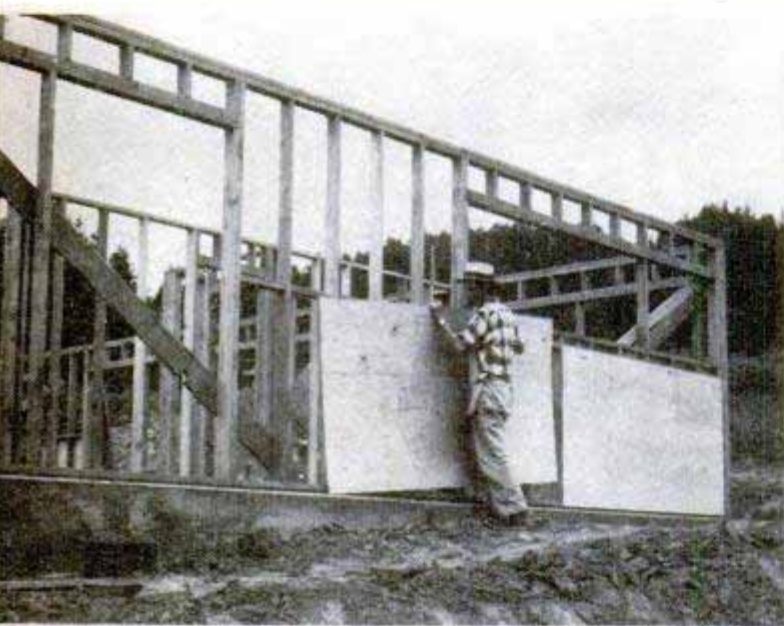
Andrew Vena, Philadelphia, Pa.



After the walls are "prefabbed" flat on the subfloor, they are raised, plumbed and braced. Later a second top plate will be added to tie wall sections together



TYPICAL CORNER FRAMING



Sheathing the outside with 4 x 8-ft. sheets of plywood goes fast and results in a wall 50 percent stronger than shiplap. Below, R. J. Coffman, Portland brickmason, is laying the "island wall" fireplace

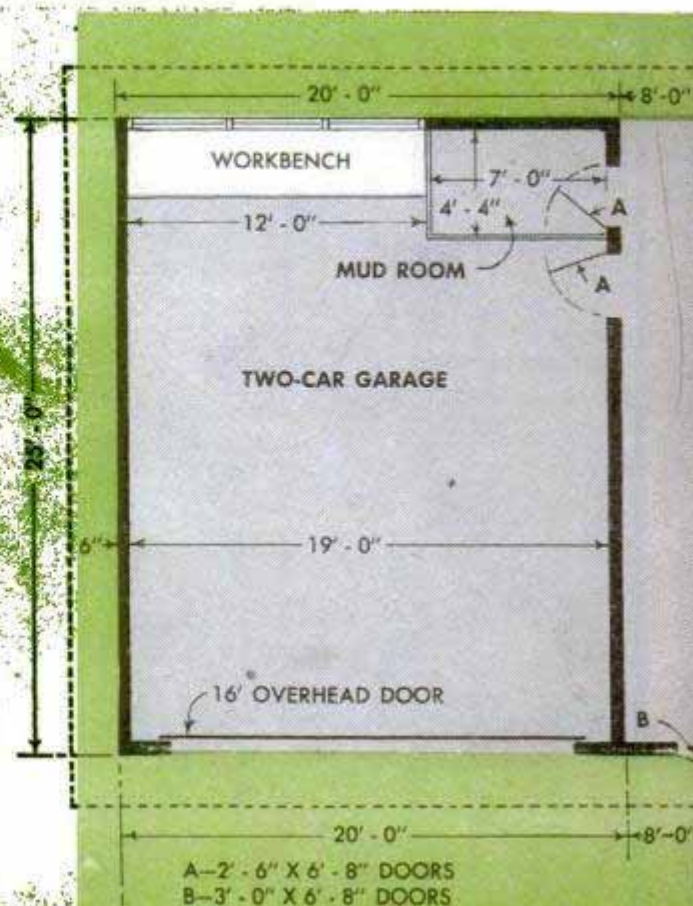


How I Built

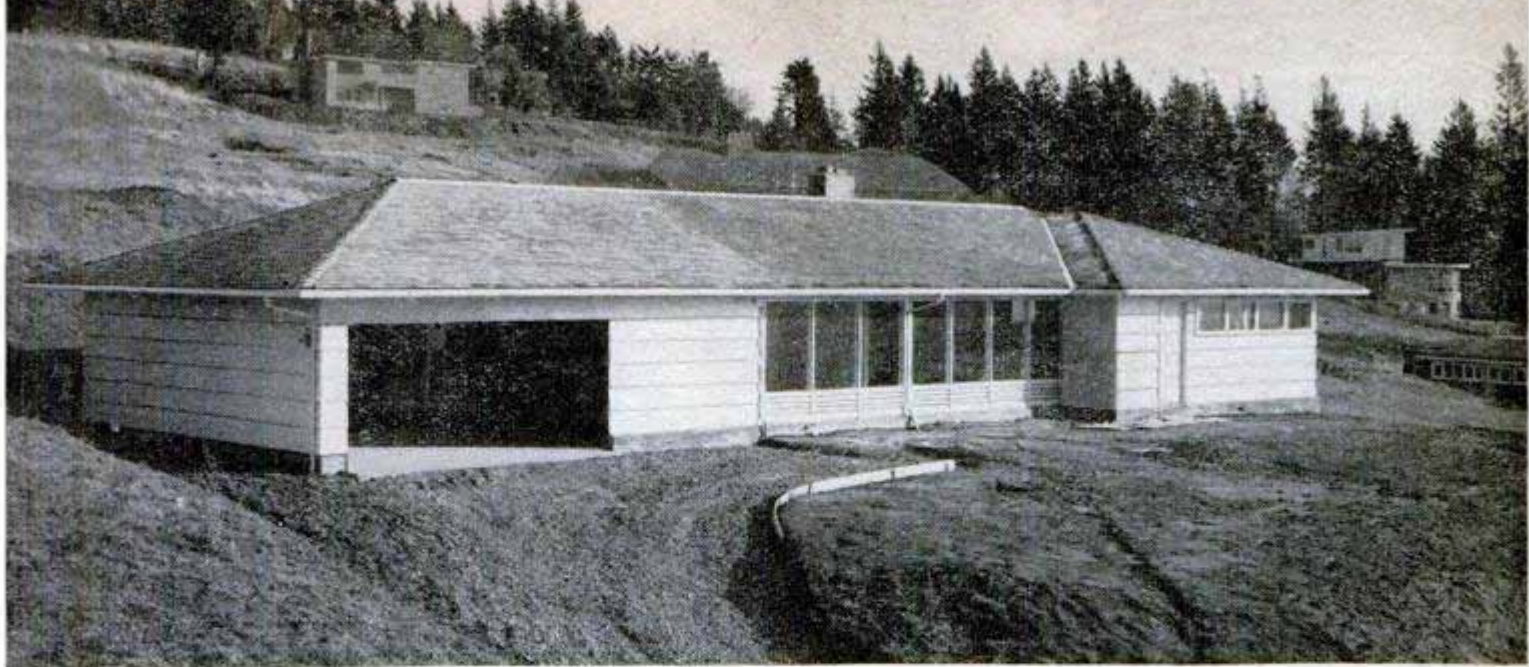
PART II

By Tom Riley

AFTER the PM ranch house has been completed to the point discussed last month, the next step is to raise the exterior walls and brace them in position. As you remember, these were framed flat on the subfloor with the bottom plate nailed to the lower ends of the studs, which means that all you have to do when raising the walls is spike the bottom plate to the subfloor.



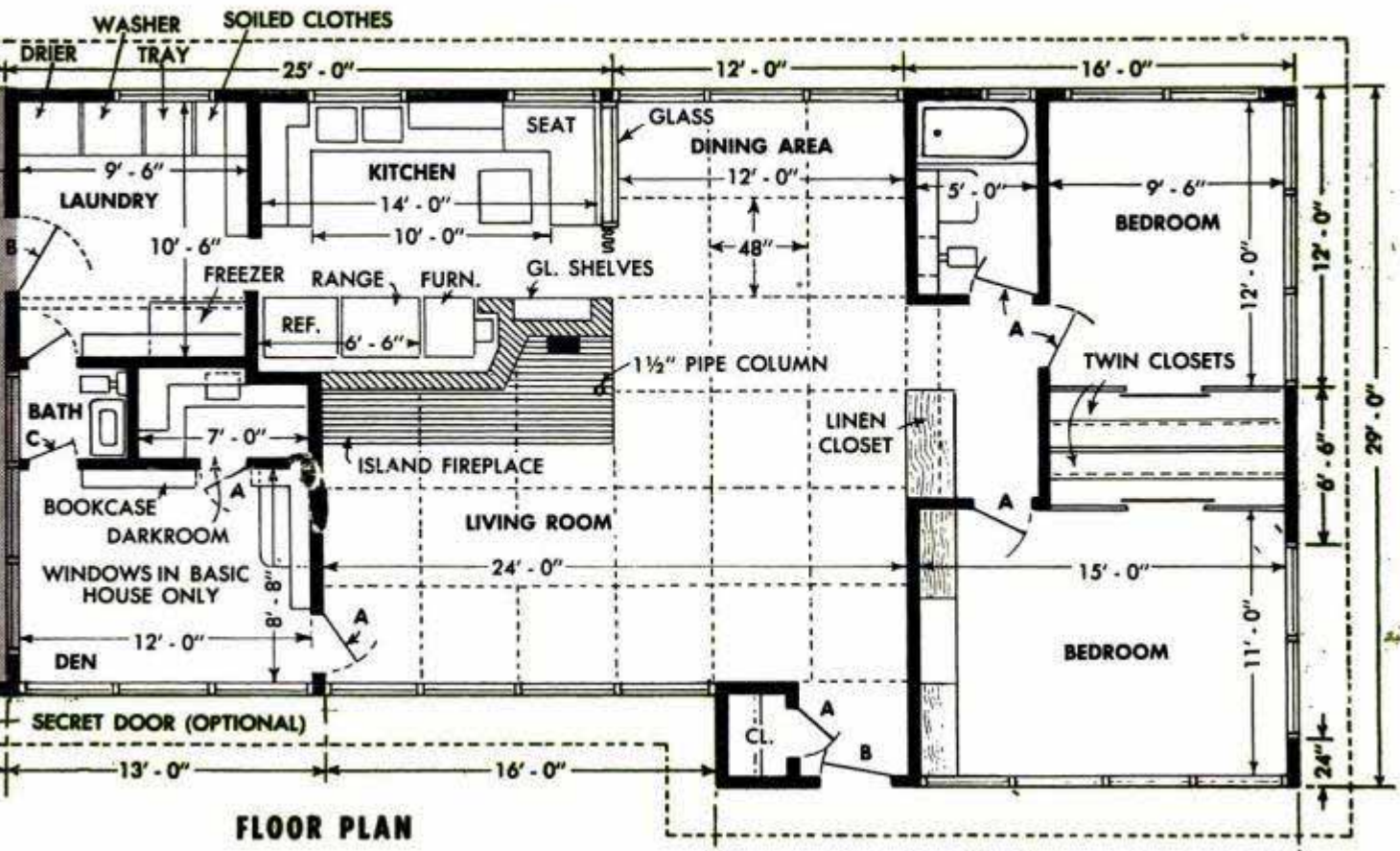
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the **POPULAR MECHANICS** Ranch House

This deviates a bit from ordinary practice in that the sole, or bottom, plate usually is spiked to the floor first and then the studs are toenailed to it after the walls are raised. When plumbed and braced in position, the individual wall sections are tied together with a second 2 x 4 plate which is placed on top of the top plates and spiked to them. Lapped at the corners and straddling abutting wall sections, the top plate thus ties all walls together. With the exception of the partition between the kitchen and dining area, which is installed after the ceilings

are paneled, the interior walls are erected next in the same manner and tied to the exterior walls with a top plate as before. I used unsanded plywood, called Plycord, to sheath the exterior walls and, while this material is not generally stocked by the local lumberyard, they can order it for you. It's less expensive than "reject" grade and comes $\frac{7}{16}$ in. thick. Sheathing with plywood goes fast, being merely a job of nailing 4 x 8-ft. sheets horizontally to the studs with 6d common nails spaced 6 in. apart. As the floor plan is based on a 4-ft. module,





Here I'm beginning to box-in the roof overhang with 2 x 4s which later are faced with clear-grade 1 x 6 boards

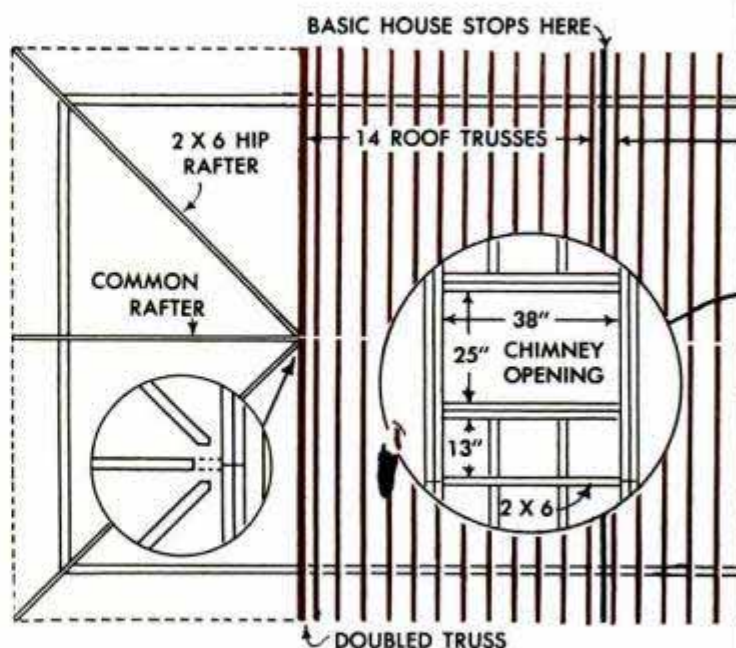
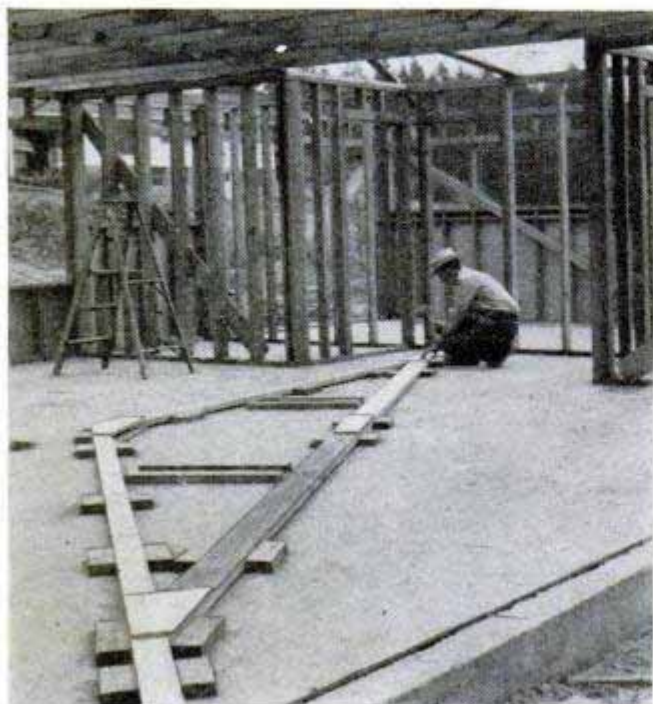
very little cutting of the sheets is necessary, other than around window and door openings. Although the use of plywood or a composition-type board saves a lot of time and produces an exceptionally strong, windtight wall, common wood shiplap, laid diagonally, can be used if preferred.

Now comes the truss-type roof. Here, I found that architect Whelan's contention—that a truss roof is easier for the amateur home builder to erect than the rafter type—certainly is true. Prefabricating the trusses right on the floor of the house is a lot easier than doing it up in the air. And, requiring no more lumber than the conventional rafter-type, the trusses actually are as

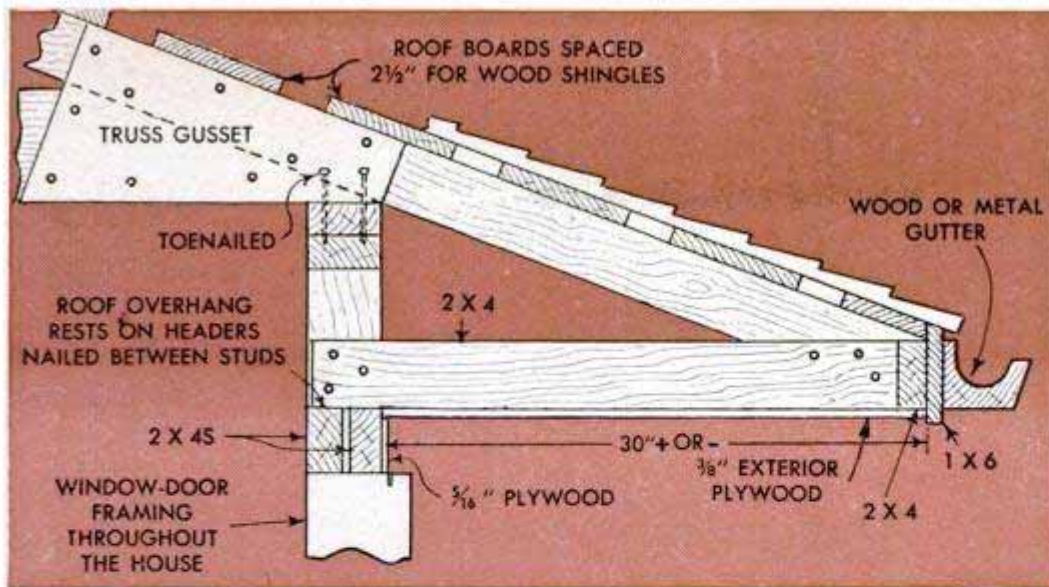
All parts of each roof truss are nailed together in this simple jig which is laid out right on the subfloor. This method assures all trusses being exactly alike

much as 200 percent stronger. To be sure that all trusses would be alike and thus assure a straight ridge line, I assembled them in a jig which was laid out full size on the subfloor, as shown in the photo below. By using scraps of 2 x 4 nailed to the subfloor along the penciled truss outline, I improvised a jig, or form, which would hold corresponding members of each truss in exactly the same position for nailing. Then, using the carefully cut pieces of the first or master truss as patterns, I pre-cut all the parts for the 42 trusses required, 28 for the basic house and 14 more for the garage and breezeway. Plywood scraps from the subfloor are salvaged for use as truss gussets.

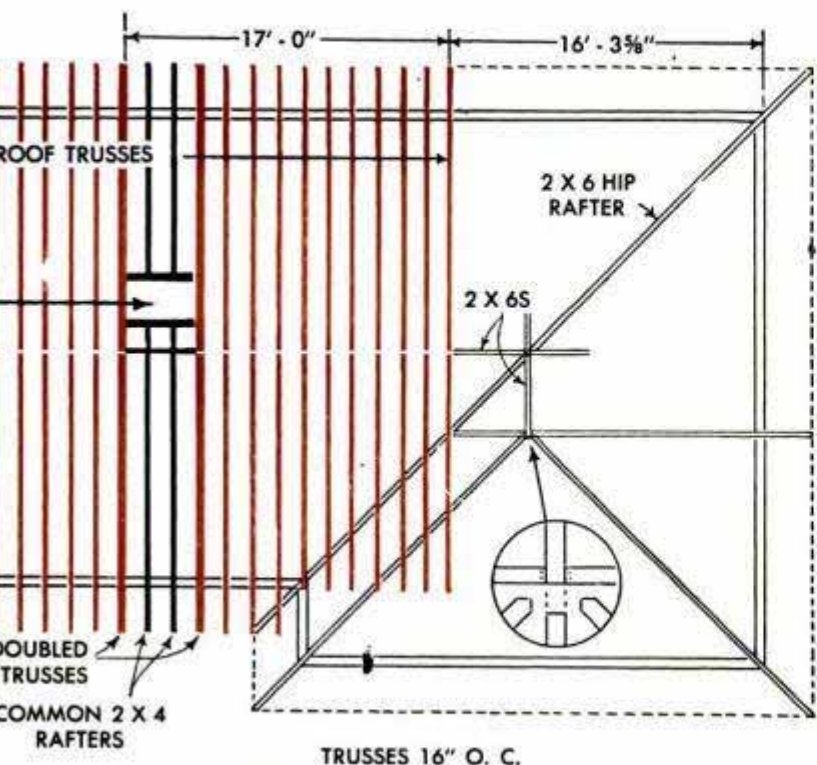
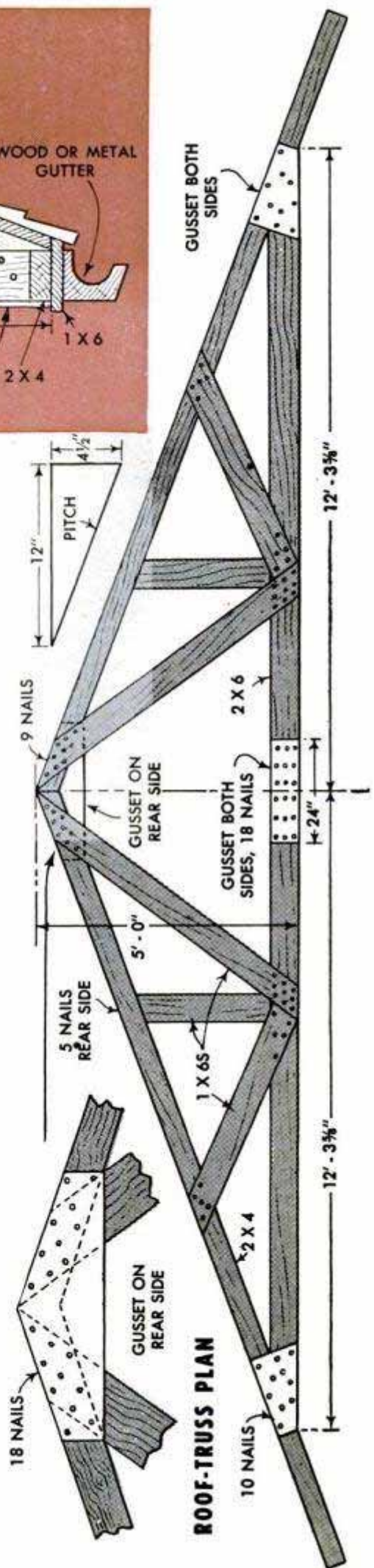
You'll need help to hoist the trusses in



TRUSS AND HIP-RAFTER PLAN



Here is a view of the bedroom end of the house. Note that the window louvers are larger than those in the living room. Both bedrooms feature three "clerestory" windows on one wall which allow beds to be located under them. Right, roof-truss plan is used to lay out the assembly jig on the subfloor. Below, this plan gives location of trusses and shows how hip rafters are tied in



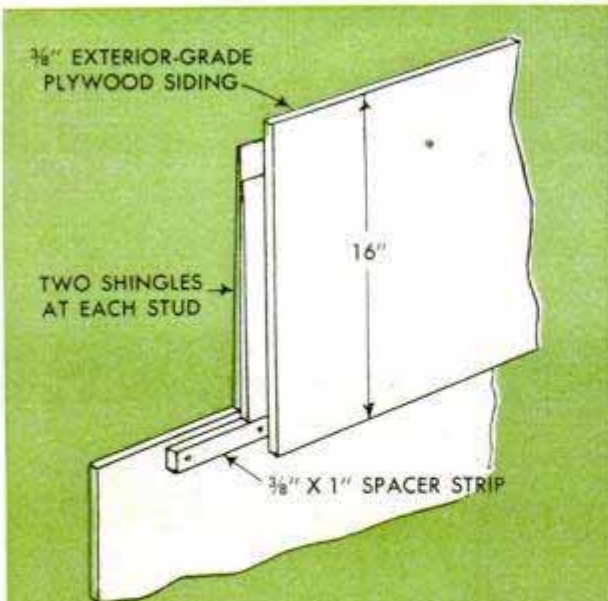


With today's quiet, compact heating units, furnace can be located right in the kitchen. Here you see me installing the reverse-type plenum which the General Electric furnace required. The entire hot and cold-air distribution system is installed under the floor. With the help of a friend, I saved \$200 on the installation

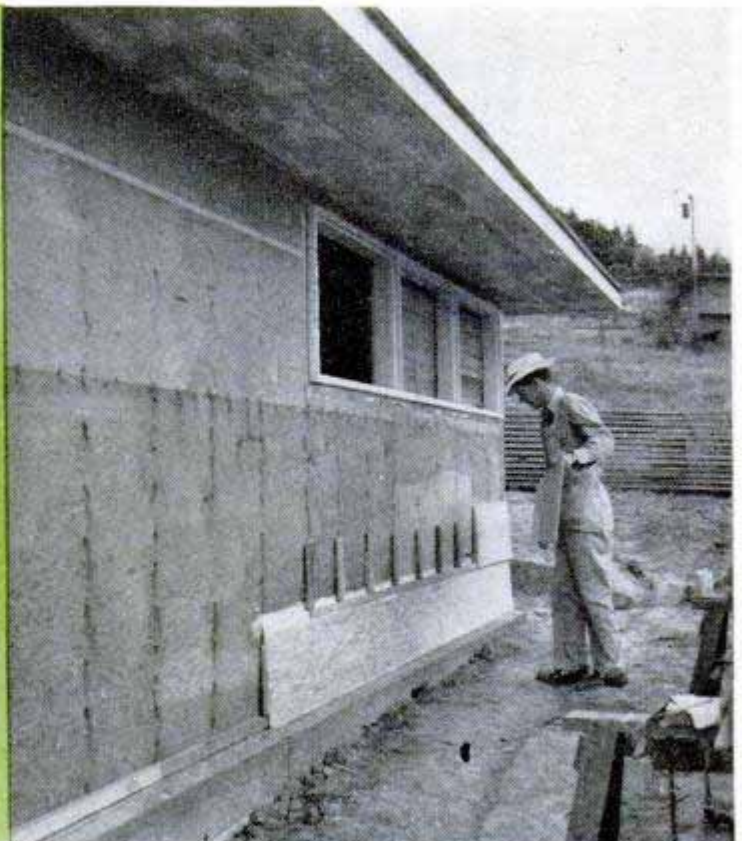


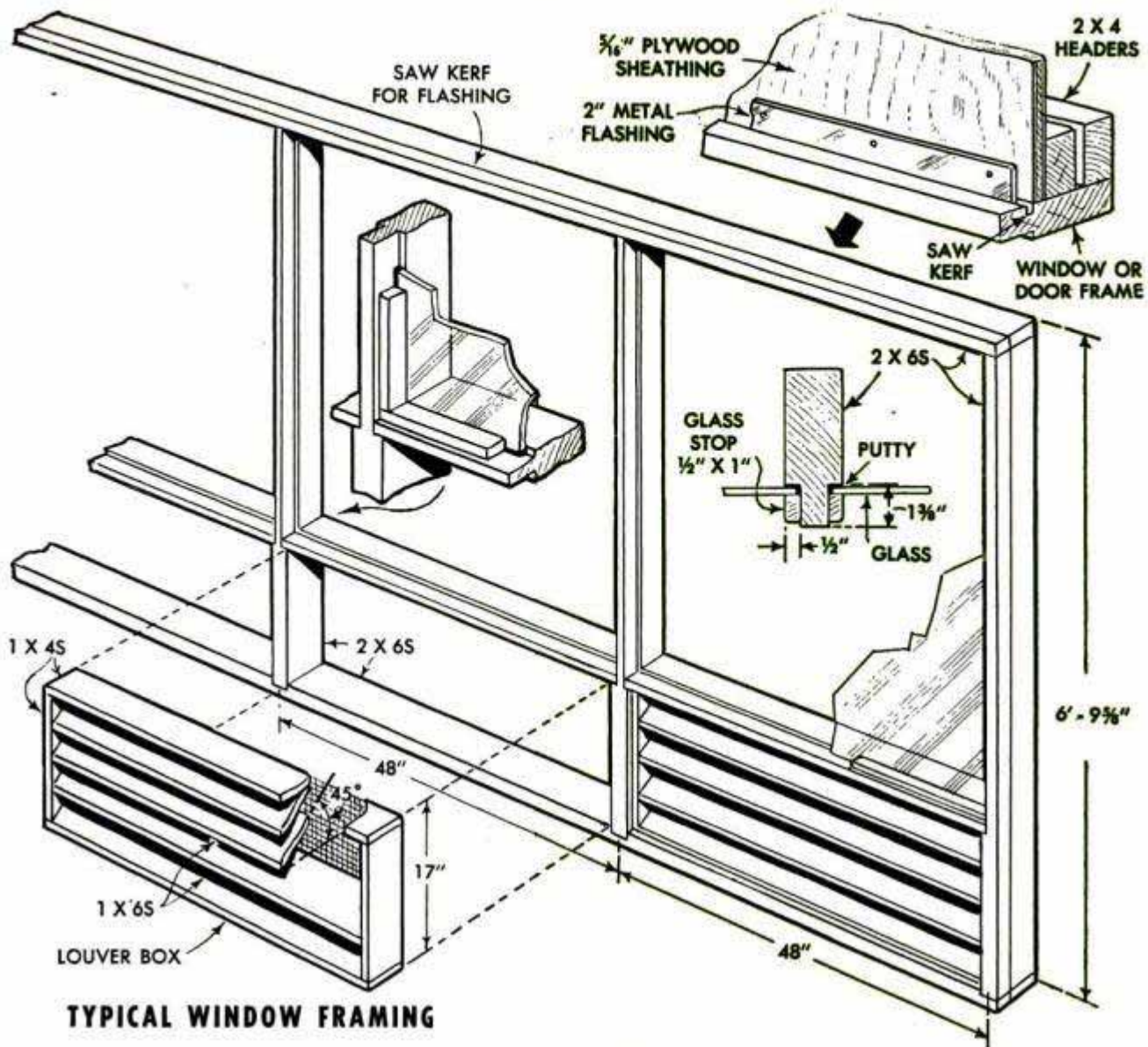
This view of the crawlspace under the floor shows my friend Mel Wilkening installing the 4-in. heating pipes which branch off from the oil-fired furnace

place. By following a method employed by contractors, Norman Chapman and I had little difficulty. We first hung several trusses upside down across the house, resting the ends on opposite walls. Beginning at a point 16 ft. 3⁵/₈ in. from the bedroom end of the house, we flipped the first truss upright with a long pole and a rope. Then with the first truss plumbed and braced, we raised the next one in the same manner, and so on, spacing each one 16 in. on centers and bracing with roof boards as we went along. Note that the front ends of the first six trusses rest on the partition wall



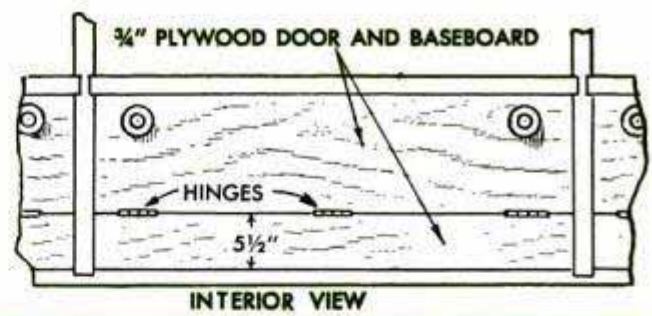
Here's something new in siding. Using exterior grade (marine) plywood, I ripped it into 16-in. strips and backed it at each stud with two cedar shingles and a 3/8-in. spacer strip along the bottom edge. The effect is very modern, only six panels high



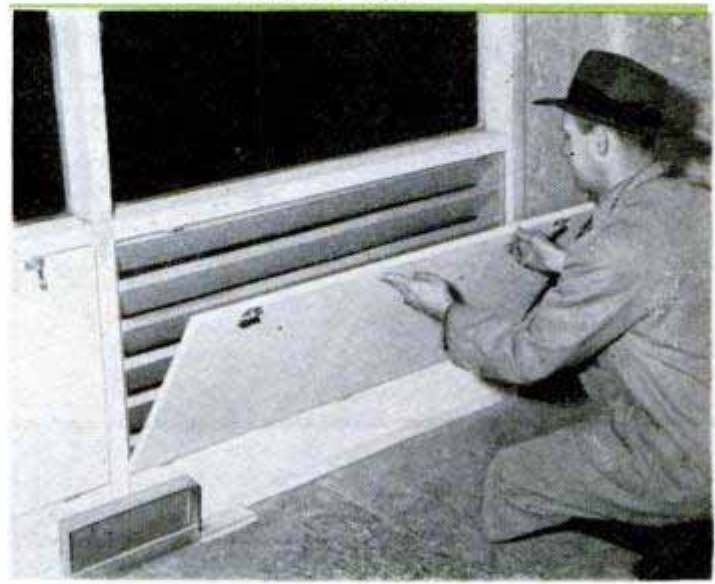


TYPICAL WINDOW FRAMING

of the vestibule closet and the header over the entranceway. Truss and hip-rafter plan shows how hips are framed with 2 x 6s. However, before these are installed, 2 x 6 ceiling joists must be set on edge over this part of the house. These are placed at right angles to the trusses and are butted against the first one and spiked to it. After the hips are in place, the rest of the area is filled in with jack rafters which are toenailed to the wall plates and to the face of the hips in the conventional manner. The chimney opening is framed between doubled trusses according to the rafter plan. Although the basic version of the house, shown in Part I, pictures the house with a gable end, you also can frame this end with a hip if desired. With the roofing members all in place, the overhang is framed completely around the house, first spiking 2 x 4s to the angle-cut ends of the trusses and



INTERIOR VIEW



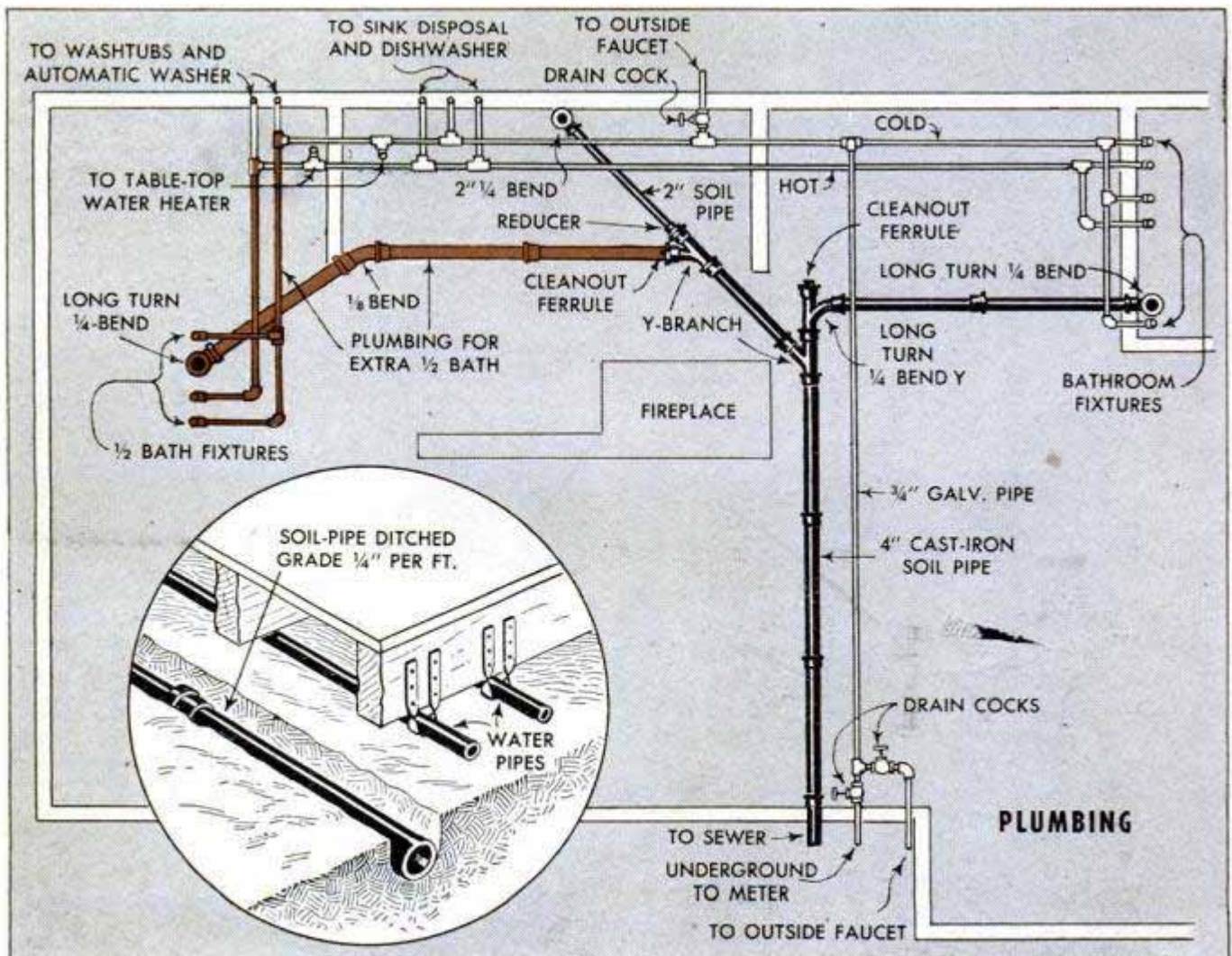
Right, Wayne C. Leckey, assistant craft editor, tries out louver ventilator, a feature of the large windows. "Air wall" type register fans the heat over window area like your auto-windshield defroster

rafters, and then facing the 2 x 4s with boards of 1 x 6 clear lumber. You will notice in the overhang detail, that the short 2 x 4 pieces that form the soffit framing (boxing of the overhang) are placed on top of the window headers and spiked to the face of the studs. I used wooden shingles on the roof, which meant that the 1 x 6 roof boards had to be spaced 2½ in. apart to allow for "breathing." An 8d nail, which is used to nail the boards, is just the right length to use as a spacer. If metal gutters are to be used, they should be hung before shingling; wooden gutters can be installed afterward. In laying the cedar shingles, Vinita and I followed the recommended practice of spacing them ¼ in. apart to prevent buckling when wet and nailing them with only two nails per shingle to permit shrinking and swelling without breakage. The hole for the vent-pipe stack was located and cut later.

From here we moved inside to build the fireplace. As mentioned in Part I, the "island wall" fireplace forms a brick wall between the kitchen and living room, which is bricked from the concrete footing to the ceiling. Common brick are used almost entirely, except on the living-room side of the wall. Here, for a distance from the subfloor to the top of the fireplace opening, we used

Arizona field stone to relieve the plainness. I had the fireplace built, but after watching Robert J. Coffman and jotting down every step, it's a job you can do yourself if shown exactly how. For the most part, it's a case of stringing chalk lines from the footing to ceiling and then laying courses of brick to these lines. Above the ceiling, the fireplace measures 2 x 3 ft., has a double flue, and extends about 2 ft. above the ridge line. Limited magazine space does not permit detailing the fireplace completely, but the instruction book which I am preparing will show every step.

Besides being easy for anyone to make, the windows are a novel feature of the house. Comparing prices of ready-made window units, I figured I saved at least \$300 by making the frames myself and glazing the large ones with crystal glass and the small ones with double-strength glass. The simple stunt of running a saw cut around the frames to take a 2-in. strip of metal flashing gives a weathertight joint that is permanent regardless of shrinkage or settling. The louvers below the glass provide excellent no-draft ventilation. As shown, they are merely simple boxes fitted with slanting louver boards, backed with copper screen wire and fitted on the inside with hinged transom-type doors. The draw-



ing on page 163 shows the assembly of the living-room frames which is typical of the other frames. In addition, three casement-type sash, which I purchased from a mail-order house, are used in the bathroom, kitchen and utility room.

Treatment of the exterior walls is a matter of personal preference. I used the new plywood-siding idea in which 4 x 8-ft. sheets of $\frac{3}{8}$ -in. exterior (marine grade) plywood are ripped into 16-in. strips and then lapped as detailed, only six widths being used from grade to overhang. A deep shadow line is obtained by backing up the plywood with two cedar shingles at each stud. Besides lending itself to fast coverage, plywood siding makes an attractive, inexpensive and durable job. Exterior-type plywood also is used to box-in the soffit or underside of the overhang.

The plumbing layout is designed to accommodate all modern appliances, such as garbage disposal, automatic washers, etc., and the extras cost very little more to install at this time, including the extra half-bath off the kitchen. While the plumbing can be installed before the subfloor is laid, I did it afterwards, calking and leading some of the soil-pipe fittings before placing them under the floor. In installing the heating system, I enlisted the aid of an old schoolmate, Mel Wilkening, whose experience and advice helped me save over \$200. Using a forced hot-air system, we located "air wall" registers, which fit in the baseboard, directly below the windows in the living room and bedrooms. This new idea in air registers does not just spill warm air into the room but spreads it over the walls. Thus, moisture condensation on the glass is greatly reduced by a defrosting principle and, by heating the coldest radiation area (the windows), an even temperature is obtained throughout the room. The island-wall fireplace provides a built-in niche in the kitchen for the oil-fired, General Electric furnace which looks and sounds like a refrigerator. Small, 4-in. round pipes, that fit together like sections of stovepipe,



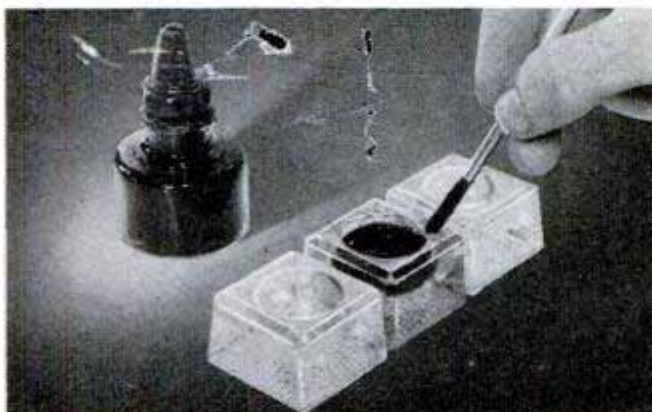
While plumbing can be installed before the subfloor is down, I did it afterwards. Layout plan on opposite page accommodates all future appliances you might consider owning and costs little extra to include now

are used in the distribution system, and are placed under the floor in the crawl space. I had the furnace installed by the dealer but did the rest of the job myself, including installation of the ready-made plenums which are large sheet-metal ducts that attach directly to the furnace. Cold-air ducts were formed in the usual way by boxing-in two floor joists with sheet metal.

Both garage and breezeway floors are 4-in.-thick slabs poured over a 4 or 6-in. gravel fill. If a ready-mix service is available in your locality, I suggest that you order your concrete from them. It's both economical and convenient. Unless you can enlist the aid of a couple of extra helpers, it's best to pour one slab at a time so that it does not set before you can finish troweling it. It's also wise to lay a vapor barrier under each slab to prevent damp and cold floors in winter.

(To be continued)

Open-Type Saltcellars Provide Handy Paint-Mixing Cups for Artists



Open-type glass saltcellars, which are used to serve individual portions of salt to diners, make excellent paint-mixing cups for amateur artists. They are fairly heavy, and will not tip easily or skid around when mixing paint in them. Being of heavy glass, they can be easily cleaned and are not readily broken.

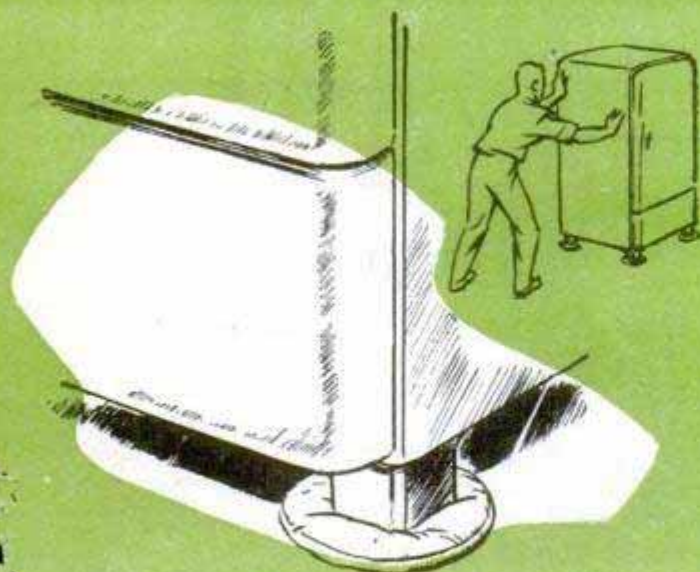
☐ The next time you go fishing for carp, try some of the following baits: Pieces of marshmallow candy, canned corn and small white currants or raisins.

see opposite page

WAXING FLOORS is less tiresome if a towel-covered dust mop is used to polish the waxed surface. A turkish towel is excellent for this purpose, as the coarse texture of the material quickly cuts through the top film of wax and speeds polishing. To reduce the pressure that must be exerted on the mop handle, weight the mop by placing a brick or other heavy object on top of it before wrapping with the towel. Use safety pins or spring-type clothespins to fasten ends of the towel

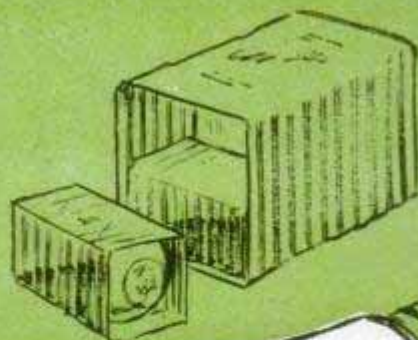


GARBAGE-CAN COVER held in place with screen-door springs cannot be disturbed by stray dogs, and the contents will not spill if the can is tipped over. Hooks on the ends of the spring, which engage the handles, are easily detached for removing the cover



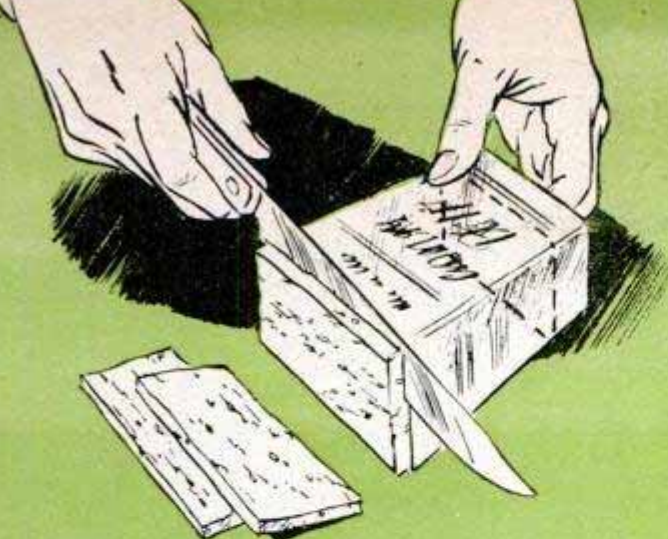
MOVING A REFRIGERATOR or kitchen range is easier if an ordinary powder puff is placed under each leg. With the weight resting on the smooth powder puffs, danger of marring the linoleum also is eliminated

Solving HOME PROBLEMS



PENCIL
MARK

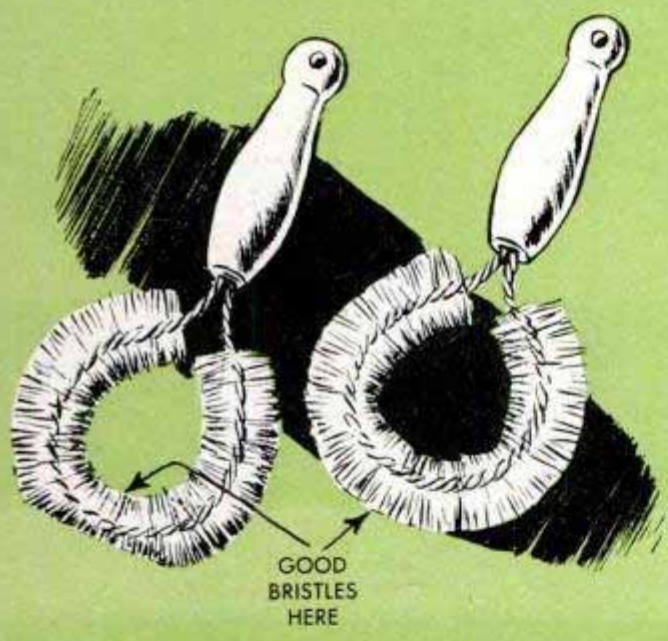
BURNED-OUT LIGHT BULBS often become mixed with the good ones, thus requiring that all bulbs be tested before returning those to be renewed. To save this trouble, mark burned-out bulbs with a grease pencil



NEAT, UNIFORM SLICES can be cut from canned meat by using top edge of the opened container as a guide for the knife. Cut the bottom free from the sides of the can with a rotary-type opener and press against the bottom to expose the meat for slicing

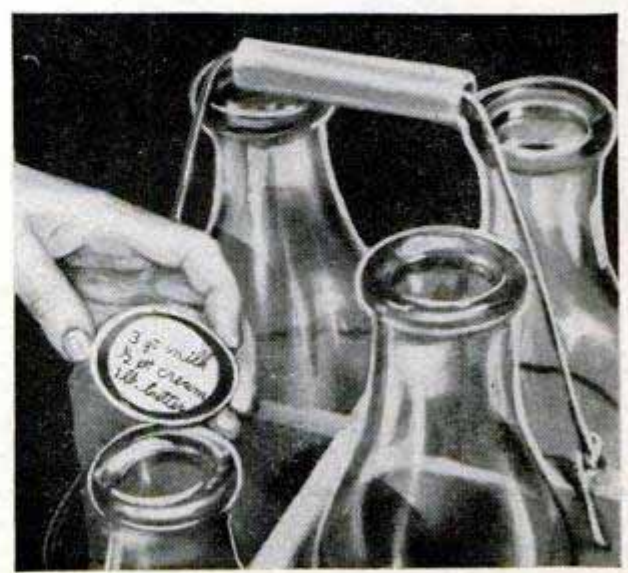


FLIES STAY AWAY from a screen door when wads of cotton are fastened to the outside of the door, as above. Presumably the cotton, which is tied or pinned to the screen, looks like spider webs to the flies



IF THE BRISTLES of a kitchen brush, left, have become worn on one side after prolonged use, they can be renewed simply by removing the wire from the handle, bending it to a reverse curve, and then replacing it

NOTES TO THE MILKMAN, which are inserted in the neck of an empty bottle, frequently are blown away, or sometimes slip inside the bottle where they are difficult to retrieve. To avoid this annoyance, write the note on the inside of a bottle cap and replace the cap on one of the bottles. Rinse off any milk that may have remained on the cap and then write the note with a soft pencil so it can be read easily. Be sure to advise the milkman that you plan to write his order on the bottle cap





Adjustable "Leg" for Trailer Provided by Auto Jack

A screw-type auto jack, welded to hinge from a trailer drawbar, as shown, provides a ready support for that end of the trailer. As it is easily adjusted to any desired height, the jack is especially convenient for keeping the trailer level when it is parked on uneven ground. The metal hanger shown at the left of the jack is a drawbar link taken from a piece of old farm equipment and welded to the drawbar of the trailer. This holds the jack securely when in the folded position.

Stopping Car-Door Rattle

Building up the rubber cushions with which many car doors are fitted is an effective way to stop door rattles. Apply layers of tire-patch material over the cushions until the thickness of the rubber holds the door tightly against the latch when closed.

Rupert Stround, Oswego, N. Y.

Nail "Corkscrew" Flares Tubing



The next time you have to flare the end of a small copper tube and there is no tool at hand for the job, try this substitute. Just drive a fairly large nail through a piece of broomstick or dowel to serve as a handle,

and then bend the nail to the shape indicated. A vise will hold the nail for bending. In use, insert the end of the nail in

the tube and rotate it so that the bent portion of the nail presses against the edge of the tube. Fairly heavy pressure on the handle will be necessary, and you may have to grip the tube lightly in a vise.

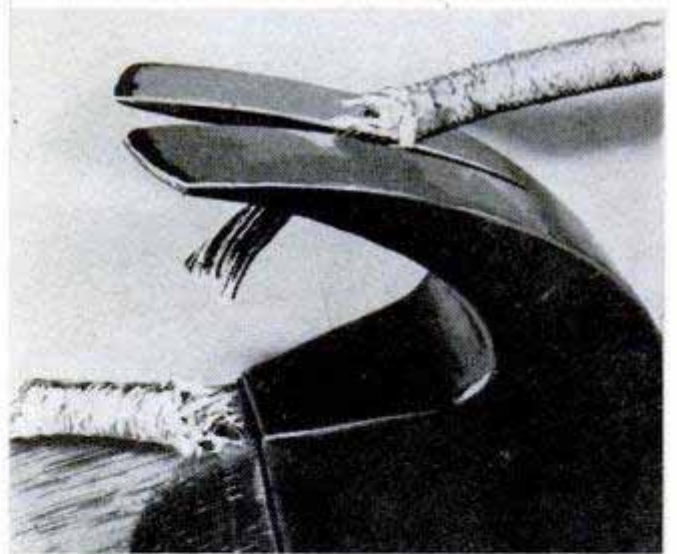
Barrel Serves as Fence Post On Rocky Ground

If you ever find it necessary to run a fence over a rocky area where holes cannot be dug for posts, use empty barrels and fill them with rocks to weight them sufficiently to hold the fence in place. If the fence is higher than the barrel you use, it will be necessary to insert a post before filling in the rocks. Then nail the fence to the barrel and also to the post where the wire projects above the barrel. You will find this method better than the usual one of piling rocks around a post supported on top of the ground. To make the barrels last longer, impregnate them thoroughly with creosote.

Victor Lamoy, Upper Jay, N. Y.



Claw Hammer Removes Insulation From Electrical Wires



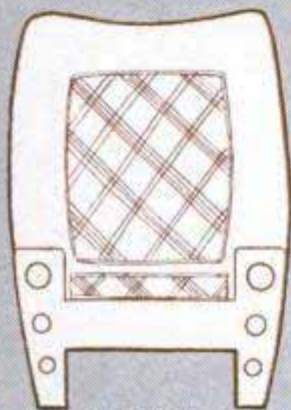
When you are doing an occasional job of electrical wiring and do not have a wire-insulation stripper at hand, use the claw of a hammer. Just drop the wire into the claw at the point where you want the insulation removed, give it two or three twists as you press down, cutting through the insulation, and then pull. The wire will be stripped clean if the inner edges of the hammer claw have not been dulled.

Ed Packer, Chicago.

DOUBLE-DUTY LAWN CHAIR

By W. S. McAlister

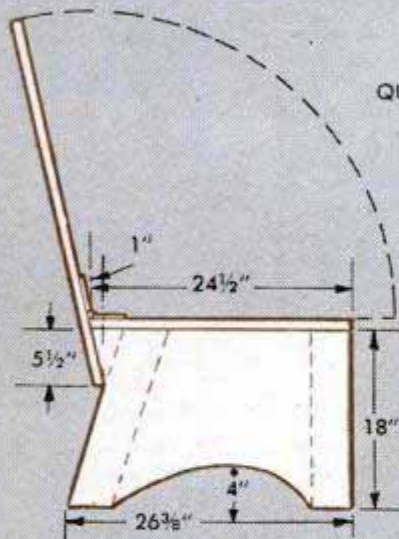
Here's a novel trestle-table design adapted to lawn use either as a table or chair. Refinements include fitted seat and back cushions, and use of waterproof plywood instead of solid stock for the frame panels and top. The two front views below suggest modern and colonial-design treatment of the top and legs, but for hand-tool construction use the simple design shown in the perspective view. Assemble the parts which form the legs, seat and arms with screws and angle brackets. Detachable hair-filled cushions are box-type construction, the covers being made with welted seams



MODERN



COLONIAL



QUARTER-ROUND MOLDING

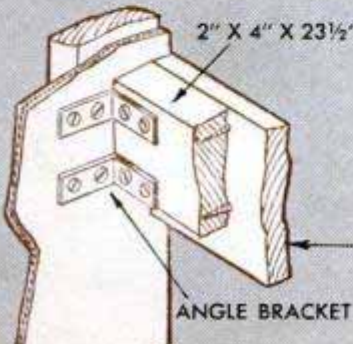
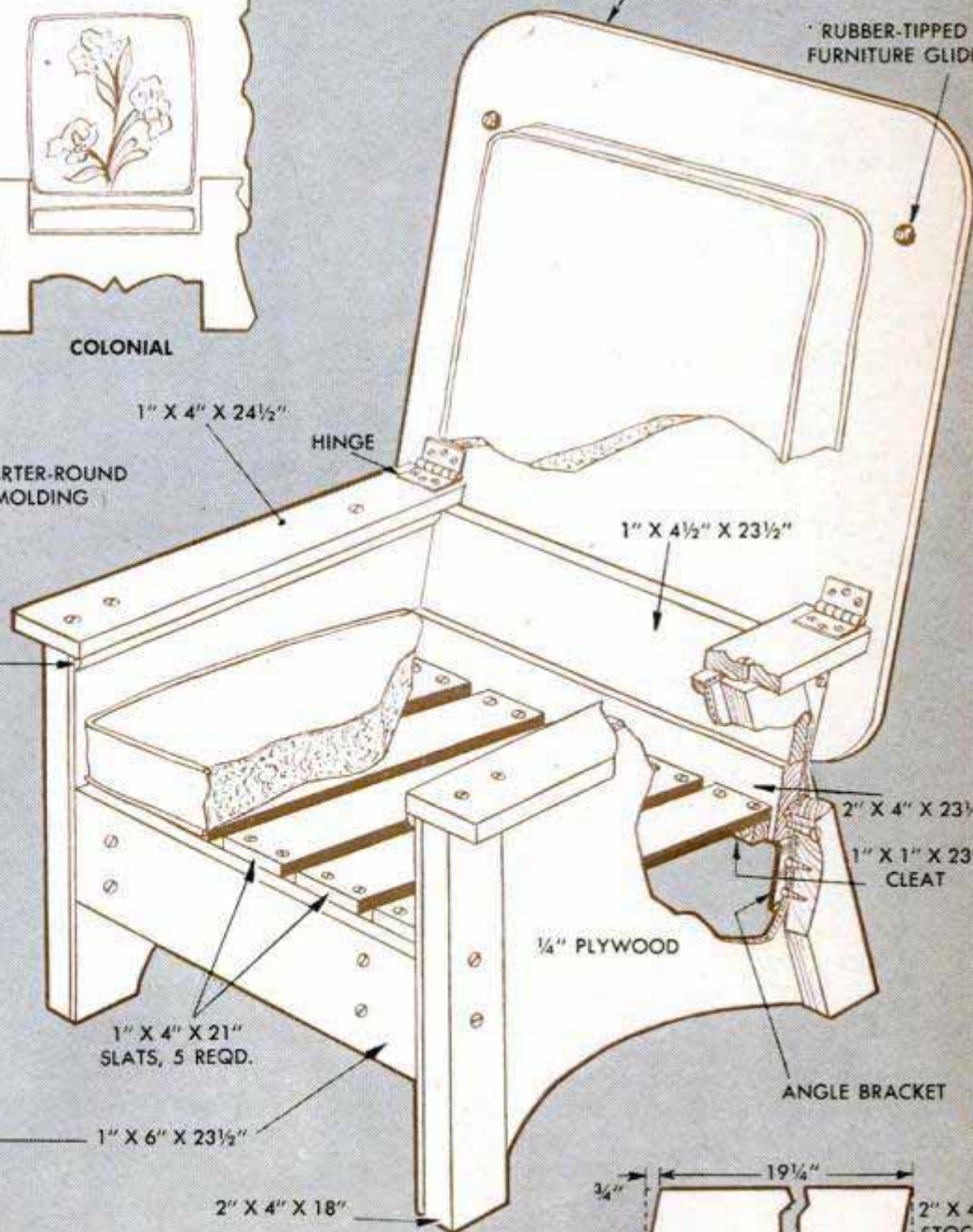
1" X 4" X 24 1/2"

HINGE

1" X 4 1/2" X 23 1/2"

3/8" PLYWOOD, 32" SQUARE

RUBBER-TIPPED FURNITURE GLIDERS



2" X 4" STO



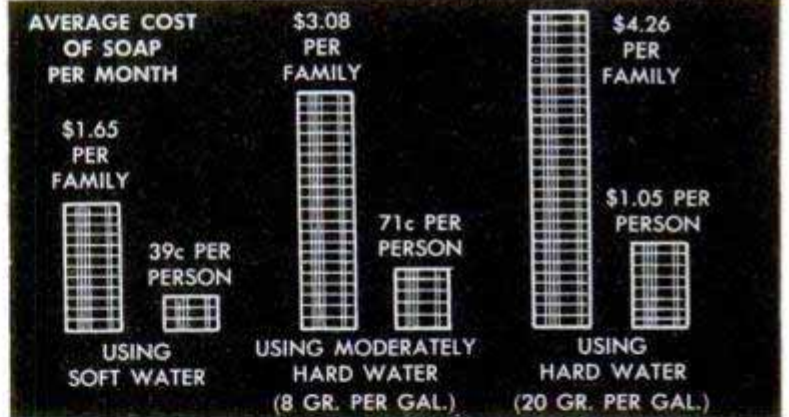
Photos and technical information courtesy Culligan Soft Water Institute

SOFT WATER *Works for You*

Hard water costs you money and extra labor every day you use it in the home, the industrial plant and on the farm. Fabrics washed in soft water last 33 percent longer, and cost of soap is reduced 70 percent

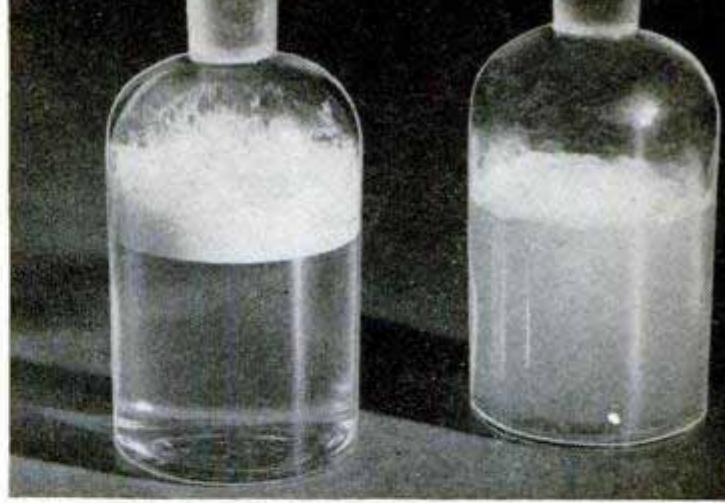
SOFT WATER can be one of the most important helpers in your household by easing daily cleaning tasks and greatly reducing soap costs. Clothing and fabrics washed in softened water require less washing-machine time, dry soft and white, and last at least 33 percent longer. Dishes and glassware dry sparkling clean without toweling and bathtub "ring" disappears. There will be no rusty discolorations on porcelain-enameled kitchen and bathroom fixtures and no sticky soap "curd" in the washing machine and hard-to-clean cooking utensils.

In its journey to your water faucet, subsurface water dissolves and carries with it in solution such hardness-forming minerals as calcium and magnesium, iron and manganese. Over most of the United States and Canada, these minerals are present in varying quantities in the soils and rock forma-

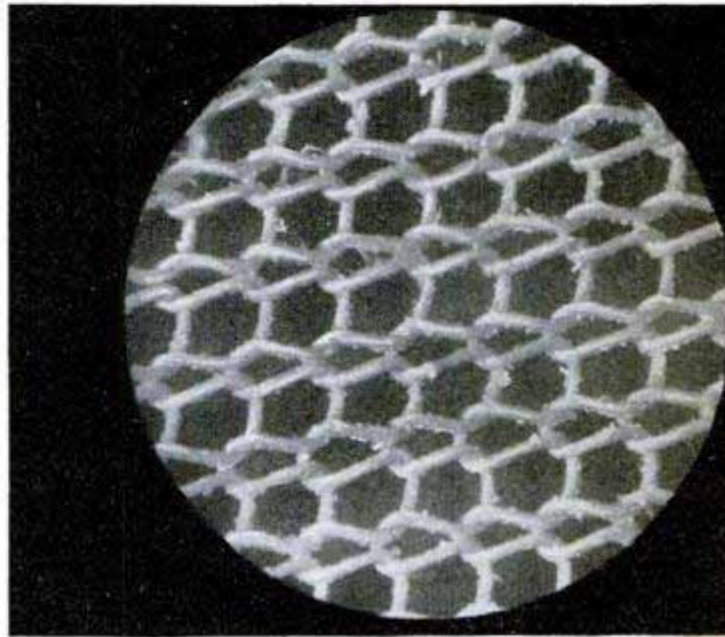


tions through which the water flows. The first two minerals are the principal offenders, although the latter two also contribute materially to water hardness in many localities. Iron and manganese produce the rusty-brown stains on porcelain-enameled sinks and washbowls in your kitchen and bathroom. Calcium and magnesium form the hard scale in pipes, boilers and water heaters, and combine with elements in ordinary soap to form an insoluble curd that leaves the sticky film on utensils, in clothing and fabrics, in the washing machine and in drainpipes from the sink and lavatory. Water hardness is measured either in grains per gallon or parts per million. One grain per gallon is equal to about 17 parts per million and 51 parts per million equals, for practical purposes, about three grains per gallon. Three-grain water is too hard for efficient household or commercial

uses. Yet 85 percent of the water in the United States and Canada is three grains or harder. The main part of the three-grain hardness content will be composed of calcium and magnesium with traces of iron and manganese. The chart on the opposite page shows graphically the increase in the monthly cost of soap per family, and per person per month when moderately hard to hard water is used. Of course, this chart is not all-inclusive and the figures are only average. The insoluble curd which remains in fabrics after washing in hard water (see the lower photo at the right) often becomes an indirect cause of infection from clothing which is in contact with the skin. The curd serves as a protective coating for certain bacteria which cause skin infections. Graphic evidence of the difference in soap reactions in hard and soft water is pictured in the upper right-hand photo. In the bottle at the left the soap is completely dissolved in soft water, forming a rich, creamy suds. In the bottle at the right, containing hard water, the water itself still contains undissolved particles and is clouded with curd. An equal amount of soap produces less than half the normal amount of suds. The end result of scale deposit, often called "liming," is seen in the cutaway water heater pictured on the following page. Long before being opened for exhibition purposes, this heater had passed the stage of usefulness. In this connection it should be pointed out that where a water-softening service is installed and connected to plumbing which already contains considerable scale from hard water, the scale will be gradually dissolved by the action of the softened water. It also should be remembered that when a water softener is connected to an old installation the hot water will be harder

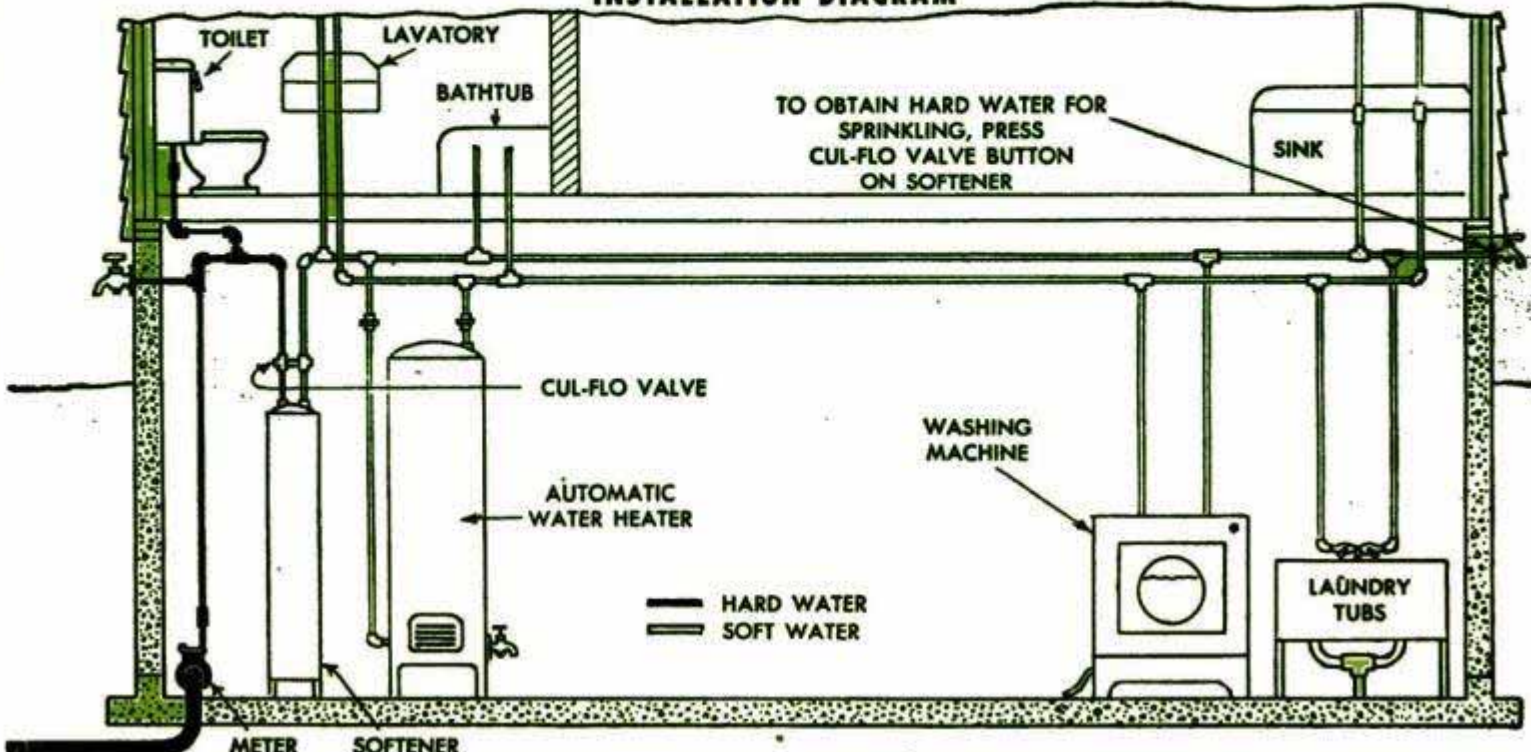


In the bottle at the left, soap has been completely dissolved in soft water, forming rich, thick suds. In hard water, equal amount of soap produces weak suds



Insoluble soap curd formed in hard water clings to fabrics, gradually building a coating that can harbor and protect bacteria which cause skin infections

INSTALLATION DIAGRAM

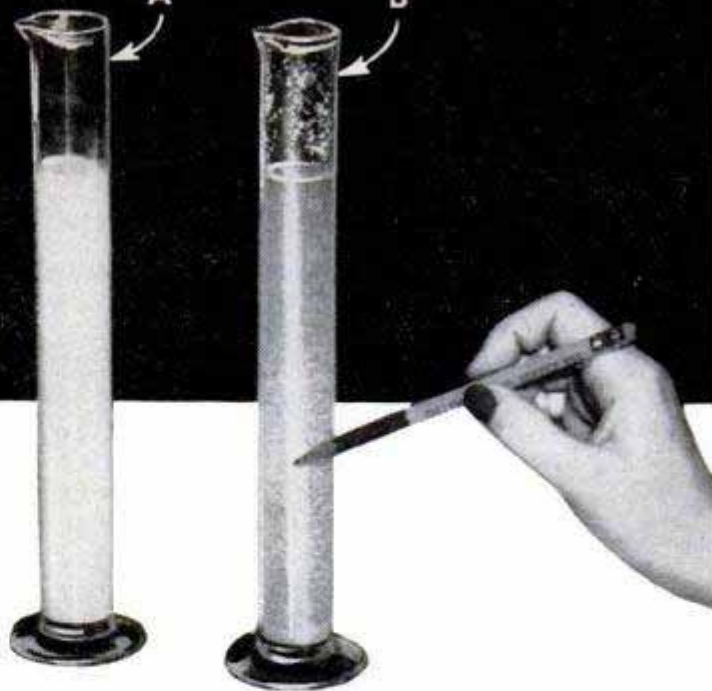




Cutaway view of water heater shows scale along sides of tank and material collected at bottom as a result of heating unsoftened water over long periods



Above, soapsuds overflow the tub when you use soft water for bathing. A quick flushing will leave tub sparkling clean. Below, hard-water curd can greatly reduce efficiency of your washing machine



than ever for a time until the scale is dissolved from the pipes.

Details on the preceding page show installation of a water softener of the type which is serviced periodically on either a monthly or bimonthly basis. Another type which contains the same softening agents is purchased outright by the homeowner and is especially designed for periodic professional service. In both types the length of the time between service periods depends on the amount of soft water which is used. The popularity of the service-type softener, in which the tank, or container, is changed every two weeks or once a month as required, is due to the fact that this installation assures a plentiful supply of soft water without investment or labor on the part of the homeowner. The combination owner-service-type softeners, which are purchased outright, are more widely used on farms, in outlying suburban homes and in industrial plants not readily accessible to frequent service. Homeowners and others who desire to prepare for the installation of a water softener should contact a local soft-water service dealer to determine where and how the unit should be connected into existing plumbing, or that which is being installed.

Domestic hot-water heating systems should be drained before installing a softener so that the entire system can be refilled with softened water. The softened water gradually will dissolve the scale deposit in the radiators, boiler and pipes. The introduction of soft water to old, heavily scaled pipes will not cause leaks unless the pipes are completely rusted through. At the end of the first heating season it's a good idea to drain the hot-water heating system again to clear away sedimentation and also scale which is in solution. When refilling the system add a corrosion inhibi-



It's in dishwashing that the cleansing combination of soft water and soap really shows up. After washing, dishes and silverware dry sparkling clean. In composite photo above, right-hand glass and spoons at far right were washed and rinsed in hard water. Spoons and glass at left were washed in soft water

tor of the type recommended for this purpose. This will prevent rust.

In industry, when cutting oils used in high-speed machining operations are mixed with water, a thorough emulsification is essential for satisfactory cooling of cutting tools. On the opposite page, container A shows how cutting oils combine with soft water. Container B holds cutting oil mixed with hard water. Note the separation of the components. In a matter of seconds the cutting oil will separate from the water, showing an almost complete lack of emulsification. Among other industrial users, garages featuring a car-washing service have found that soft water cuts car-washing time and gives better results. A car washed with soft water dries without streaks and water spots. Softened water used in auto cooling systems prevents formation of scale and sediment, just as it does in home hot-water heating systems. If softened water is used from the time the car is new, hard scale and rust will never be a problem.

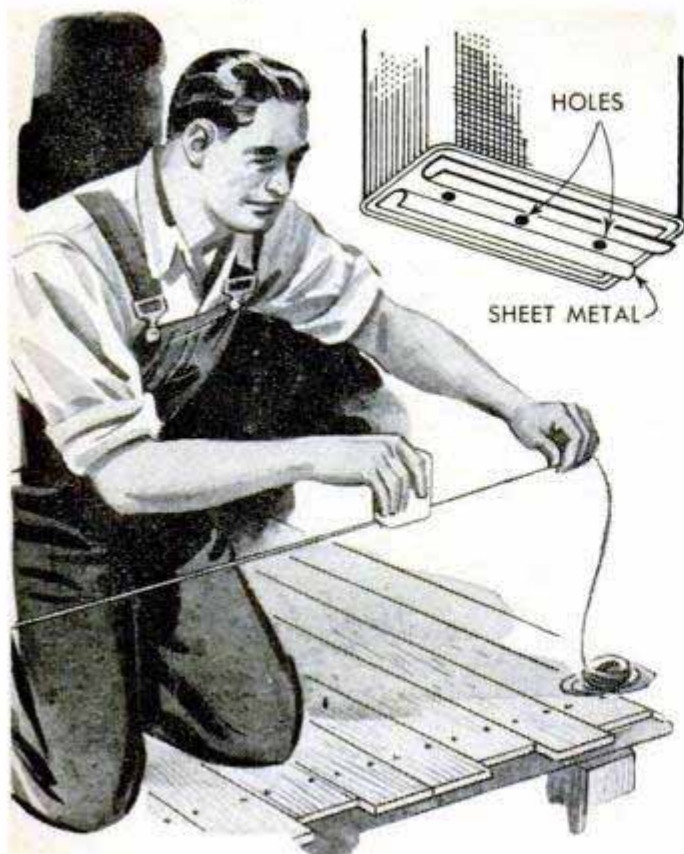
Softened water aids in all cleaning operations, from photographic processing to daily cleaning of kitchen utensils. Farmers, and dairymen especially, use large amounts of soft water for washing bottles and milking equipment. The use of soft water, with proper washing and drying procedures, will prevent the formation of milkstone on milk cans, milk coolers and milking machines, thus eliminating the necessity of a periodic acid wash in order to keep dairy equipment up to required cleanliness standards. China dishes, glass and silver-

ware wash bright and dry clean with no traces of the waxy soap curd. In the photo above, the glass and the two spoons at the right have been washed in hard water. Note the dull, hard-water film which remains after washing and rinsing. The glass and the two spoons at the left were washed in soft water and air-dried without wiping. This same hard-water curd prevents successful home dyeing of fabrics and makes rug washing a hopeless task. Dyes dissolved in softened water give uniform results. It's easy to home-clean a rug of average size by simply building a suds in warm, soft water. Then dip the scrubbing brush in the foamy suds and apply to the rug with a light, circular stroke. Wipe the suds off the surface of the rug with a cloth wrung out in clear, soft water. When washing a rug the important thing is to avoid getting it too wet. Dip the brush only in the foamy suds, never in the water, and wipe the surface dry as you go. Change the water and build a fresh suds frequently, and always rinse the brush and wiping cloth thoroughly after each application to remove the dirt which collects in the bristles and cloth.

TEST YOUR TAP WATER

You can find out how hard your water is by performing a simple test right at home. POPULAR MECHANICS has arranged with the Culligan Soft Water Institute to give every reader a testing kit free. Write to the Culligan Soft Water Institute, 1815 Shermer Ave., Northbrook, Ill., and ask for the water-testing kit. The instructions are included.

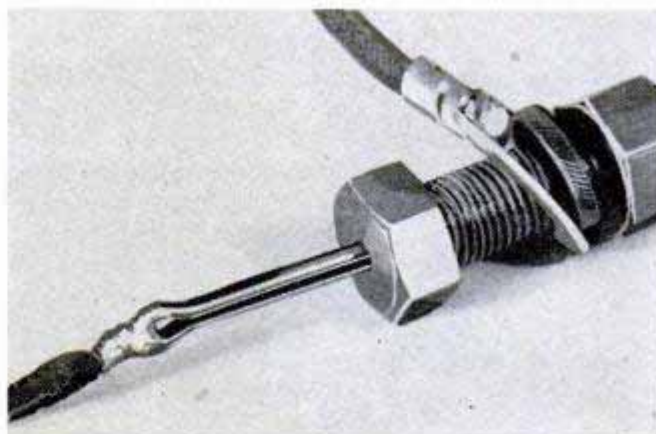
Punctured Spice Can Filled With Powder Charges Chalk Line Quickly



If you dislike using a piece of chalk to cover a chalk line, this powdered-chalk container will serve your purpose ideally. It consists merely of an empty spice can which has three equally spaced holes drilled on a center line in the upper end. Two sheet-metal guides are bent to a U-shape and soldered on opposite sides of the holes as shown in the detail. Then, when the can is passed over the line, the powdered chalk will be distributed uniformly.—John E. Hyler, Peoria, Ill.

Brass Bolts and Cotter Pins Provide Plug-In Jacks

When working on a job where a number of electrical attachments are necessary, such as model-train layouts, you can make the connections neatly by use of these homemade plug-in jacks. Each unit consists of a bolt, nut and a cotter pin. The bolt is, of course, of a size suitable for the purpose at hand and is drilled lengthwise through the center to take the cotter pin as shown in the photo. Brass bolts are preferred as they do not corrode rapidly, but steel ones can be used. In use, the bolt is installed permanently with a contact made to the bolt by means of the usual type of terminal. The wire carrying the other side of the circuit is soldered to the head of the cotter pin, which is inserted in the hole of the bolt.



Pipe Cap Removes Barrel Bung

Persons who have broken or split a stave in a barrel when hammering it to force out a bung will appreciate this idea of



using a pipe cap to avoid the damage. Select a cap that is slightly larger in diameter than the bung, place it over the latter and then strike the cap. In this way, the blow of the hammer is distributed uniformly around the bung chime and the bung is "popped" out by the vibrations with considerably less possibility of damaging the wooden stave.

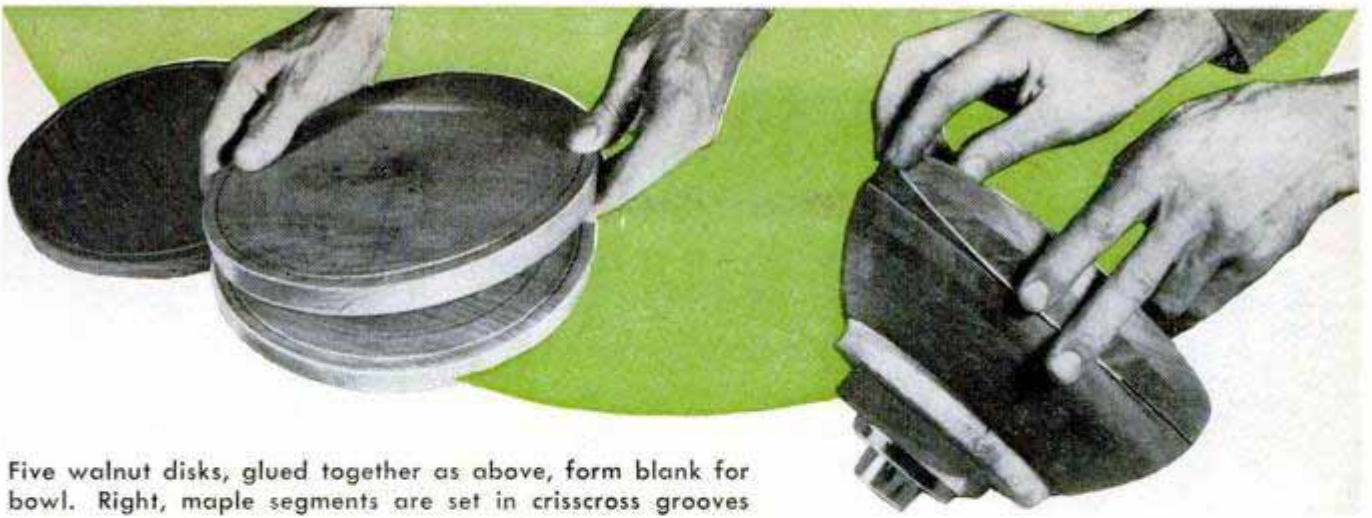
A. H. Waychoff, Phoenix, Ariz.

Glass-Topped End Table Serves as Home Display Case for Small Models

Do you have an end table with a drawer directly underneath the top? It is a relatively simple matter to convert it into a display case for small models and hobby work. It is necessary only to replace the present top with a piece of plate glass and place your models in the drawer beneath it. The method of attaching a top will be determined by the construction of the particular table. In some cases, the top can be completely replaced with glass. In other cases, it may be necessary to cut out the center of the wood-

en top, leaving a strip 1 in. or more wide around the outside for mounting purposes. If this is done, rabbet the edges of the cut-out portion of the top so that the glass can be set flush with the upper surface of the top. The table can still be used for its regular purpose of supporting a lamp or other objects.—Bess Ritter, Yonkers, N. Y.

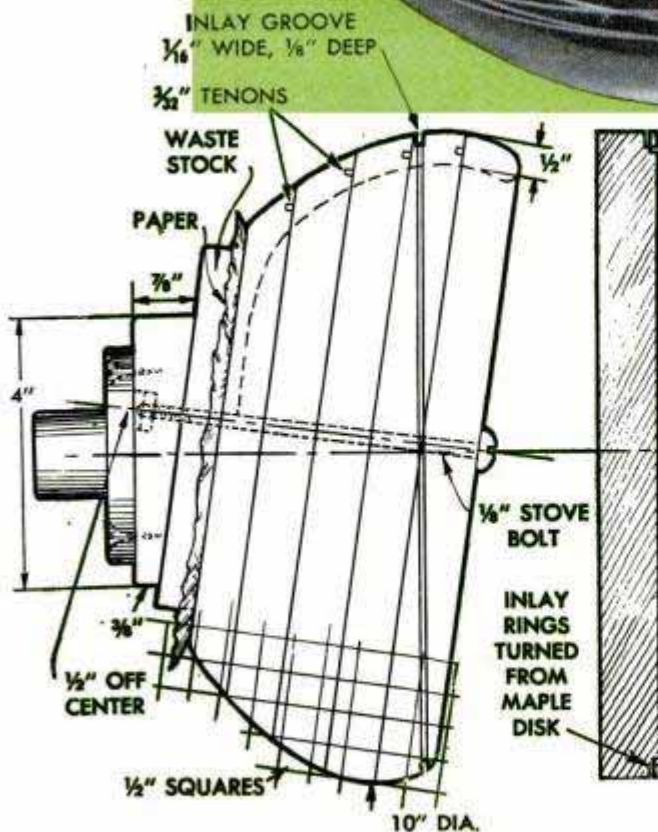
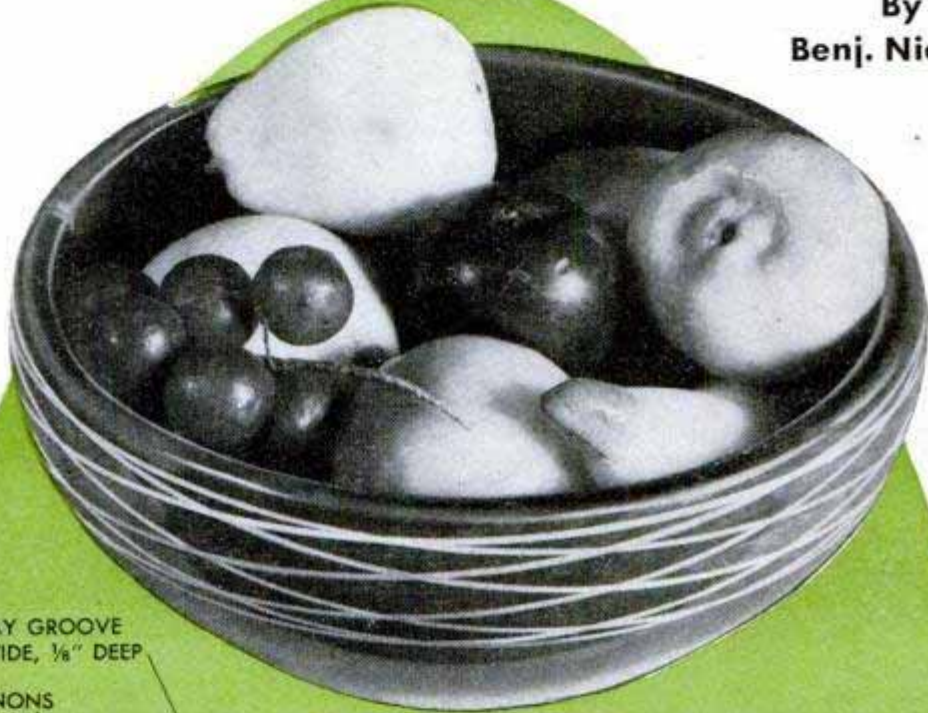
☞ A rubber band, slipped around the finished pages of a book, makes a handy bookmark which will not easily be lost.



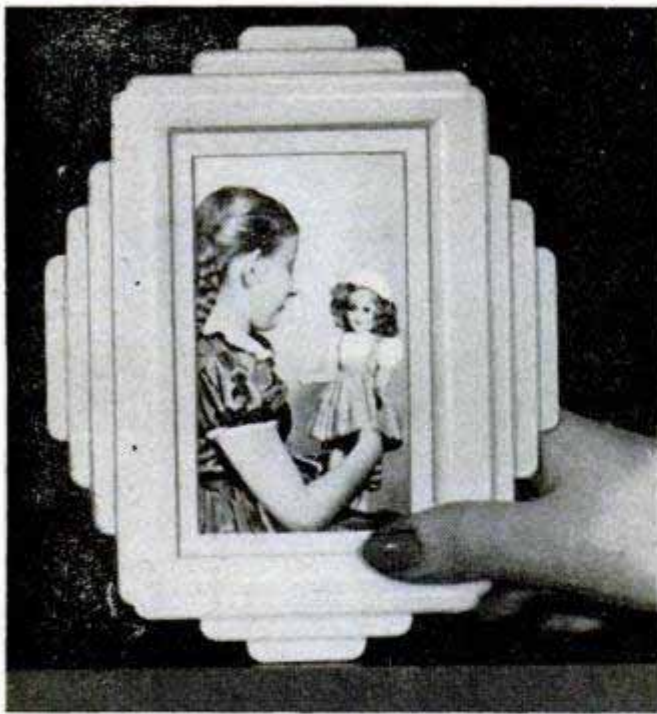
Five walnut disks, glued together as above, form blank for bowl. Right, maple segments are set in crisscross grooves

Inlaid Walnut Bowl

By
Benj. Nielsen



Stacked disks forming bowl blank are turned to shape and waste stock glued to bottom is marked off in eight equal divisions. Blank is bolted to tapered hardwood block which is screwed to faceplate. One division mark on waste stock is aligned with index mark on tapered block and first groove is cut (250 r.p.m. maximum). Then, inlay ring, turned from maple disk, is glued in groove. Ring is trimmed flush with surface, bolt is loosened and bowl turned to align next division mark on waste stock with index mark. Grooving and inlaying are repeated until all eight rings have been used. Then, tapered block is removed, inside of bowl is turned and bolt hole sealed with plug



Wall Protector for Light Switch Provides Snapshot Frame

Unusual frames for snapshots and bill-fold-size portraits can be made inexpensively from plastic wall protectors of the type which fits over standard light-switch plates. The prints may be cemented to the back of the frame around the edges of the opening and the frame merely leaned against another object for support. However, if an easel-type stand for the frame is desired, the print should be cemented to the face of a piece of cardboard which, in turn, is cemented to the back of the frame. The easel is made by cutting a second piece of cardboard, the same width but an inch or so longer than the first. Score it across the width to fold about one third of the way from one end. The smaller section of the cardboard is then pasted to the upper surface of the cardboard photo backing so the lower section will hinge at the score and can be swung outward to support the frame.

H. Leeper, Canton, Ohio.

Small Coil Spring Conveniently Separates Groups of Keys on Chain

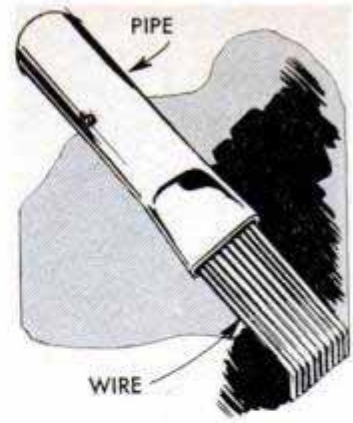
Two groups of keys, such as those which are used around the home and those used only at the office, may be kept conveniently separate, but on the same chain, by placing a small coil spring between the groups as shown. In this manner it is easy to select the desired key from its particular group.

John J. Rea, Urbana, Ill.

☛ To thread fishing line through a hook at night, insert the eye of the hook through a piece of white paper, which then will provide a background so the hook eye can easily be seen.

Simple Tool Removes Carbon

A scraper for removing carbon from the cylinder head and pistons of a car motor is easily made from a short piece of pipe or tubing and several lengths of piano wire. To make the tool, cut a desired number of equal lengths from

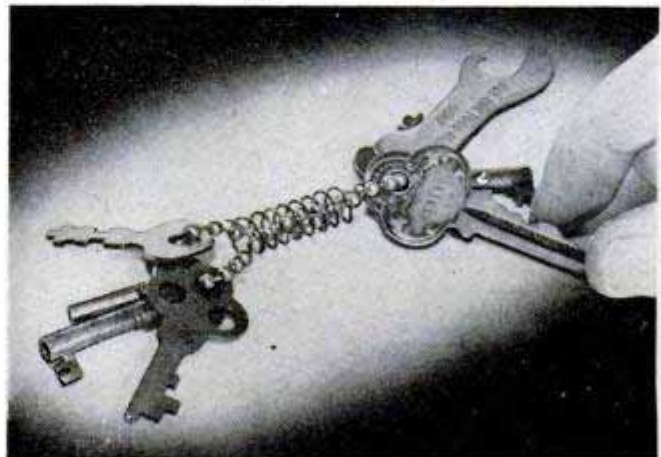


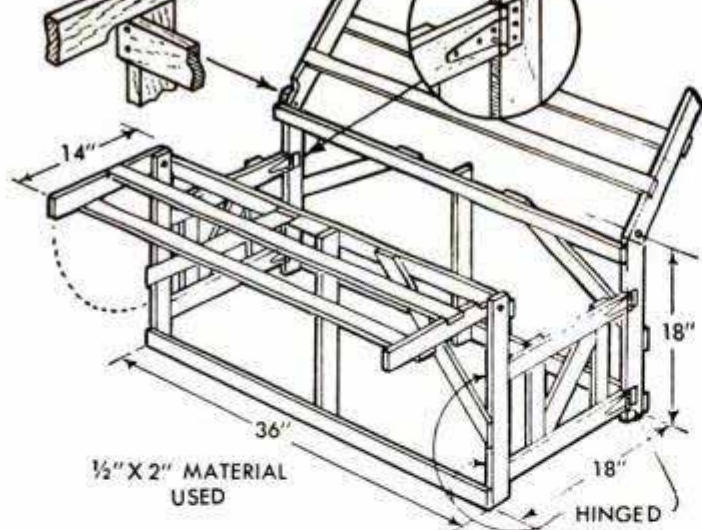
the piano wire and insert them in one end of the pipe or tubing. Then flatten the latter with a hammer until it grips the wires tightly. The free ends of the wire should be locked in a vise and bent as indicated. Then the ends of the wires are squared by grinding. You will find a tool of this type highly efficient because of the fact that its scraping edge is flexible and will adjust itself to the surface being scraped. Since piano wire is highly tempered and quite hard, care must be taken when using it on aluminum pistons or aluminum cylinders as you may score the soft metal quite deeply. Scoring, of course, is to be avoided.

William B. Eagan, Louisville, Ky.

Cement Keeps Gasket From Slipping

If a gasket, such as the one on the water pump of a car, tends to slip out of line while the parts are being assembled, it can be held in place easily with rubber cement. The surface of the metal and the underside of the gasket are coated with black rubber cement, and the cement is allowed to dry until tacky. Then the gasket is positioned, laying the cement-covered surfaces against each other. Although the cement will keep the gasket from slipping during assembly, it does not interfere with later removal when repair or replacement is needed.—Joe Tezak, Glendale, Calif.

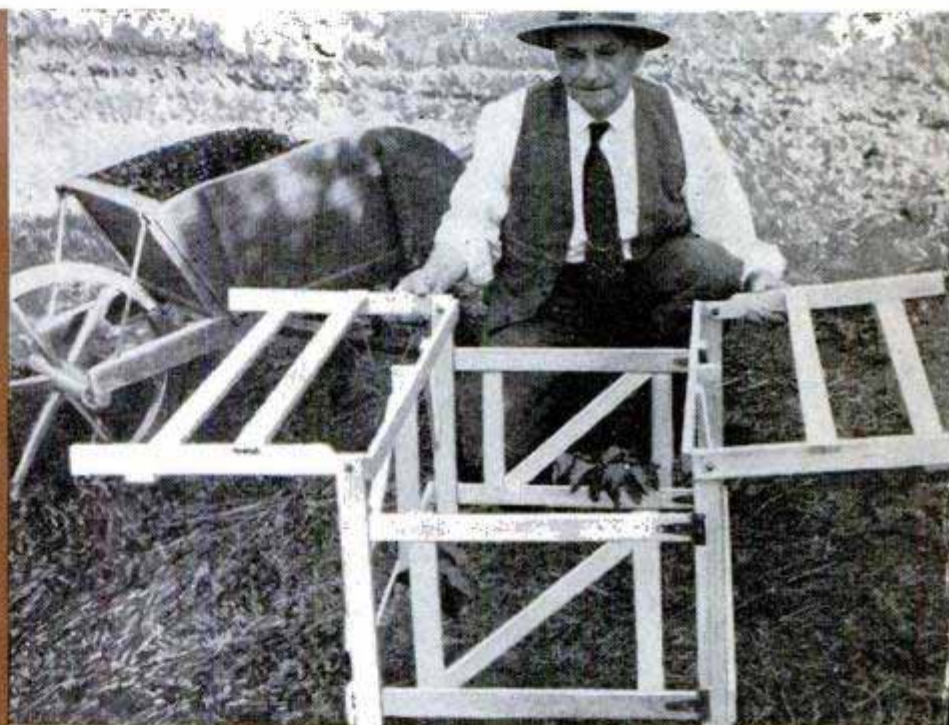




Simple construction of folding rack is detailed above. The leaves are supported in the open position by stakes driven into the ground. The end members are hinged on opposite sides to fold flat for storage, as shown in photo at the right



Folding TOMATO RACK



QUICKLY assembled for the summer tomato season or folded compactly for winter storage, this handy rack will accommodate six tomato plants of average size. It consists of an open framework, hinged at the ends, and two leaves which are bolted loosely to the corner posts so they can be folded flat against the side frames for storage and then swung outward when in use. After the rack is set up, two slats are nailed across the top as in the lower right-hand photo. Note that one arm of each leaf is notched to permit folding either leaf over the center of the rack if desired. It is best to place two plants in the center portion of the rack and two under each leaf at the corners. As soon as the plants are in the ground, surround each one with a 12-in. ring of dehydrated lime to discourage cutworms. Then, as the plants mature, spread a mulch of oat straw beneath the frame to retain moisture.

Frank E. Brimmer, Vestal, N. Y.



STAINING is EASY with BRUSH or SPRAY

By Sam Brown



WATER STAIN is the least expensive to buy and is best for color clarity, permanence and lasting brilliance. However, a water stain raises the grain of the wood, making it necessary to sand the surface after staining. A stain of average intensity is made by adding 1 oz. of the dry powder to 1 qt. of hot water (just below the boiling point). Add more water for lighter tones. Keeps indefinitely. Apply the stain with brush or spray and wipe immediately with a clean cloth to even up the color tone. Stain surface-dries in 15 min., but requires overnight drying before sanding. Available in all the common wood-stain colors



PIGMENT OIL STAIN is simply thinned paint. It is colored with a paint pigment instead of a soluble dye. A good pigment stain can be made by thinning any paint or enamel with turpentine or a recommended solvent. Ready-mixed pigment oil stains are available anywhere in wide range of popular colors. They are sometimes referred to as "pigment wiping stains" or "uniforming stains." The colors are permanent and do not bleed through any ordinary finish. Stain is easy to apply with a simple brush-on-and-wipe-off technique. Dries flat in 20 min. and can be coated with other finishing materials after 8 to 12 hrs.



SOLUBLE OIL STAIN is available in powder form for mixing with any light oil or solvent such as benzol, turpentine and naphtha. A small amount of asphaltum or 4-hr. varnish usually is added to give the stain more body. Also available ready-mixed and known as "penetrating stain." Although this stain has great penetrating power, it is less flexible in that it cannot be controlled by wiping and lacks the durability and permanence of the water stains and pigment stains. It must be sealed with shellac or sealer to prevent bleeding through the finish. It dries flat in a few minutes but requires 12 hrs. to dry thoroughly



NON-GRAIN-RAISING STAIN contains the same dyes used in water stains but the solvent used is a nonaqueous liquid. This stain has most of the good features of water stain without the grain-raising fault. Although you can mix your own with stain powders and suitable solvents there is little or no saving in cost. Nearly all nonraising stains can be reduced with alcohol for lighter tones, but special reducers are available and should be used wherever possible. Stain corrodes metal and should be stored only in glass or earthenware containers. Dries in 10 min. to 2 hrs. Available in a wide range of stain colors



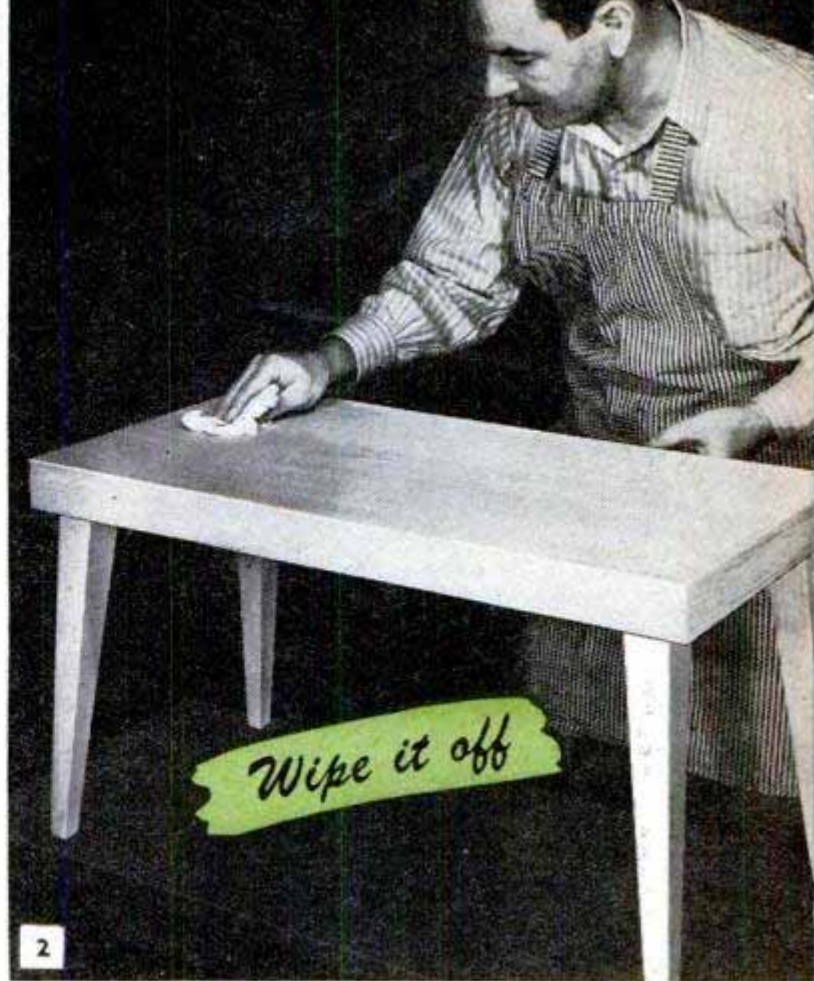
SHADING STAINS dry ready for finishing coats in 30 to 60 seconds and can be applied only with a spray gun. Those containing alcohol as a solvent are a little slower, but still not slow enough for brush application. In regular practice, these stains are applied between the top coats, the first shading coat usually being blown on over a sealer. Almost infinite flexibility of color tone is possible by use of this type of stain, using only the stock browns and reds in which it is regularly supplied. Reduce with lacquer thinner or alcohol solvent as directed on the container. Skill in setting and triggering a spray gun is necessary to apply stains successfully. Practice on waste stock



IN MODERN wood finishing, staining is largely confined to the use of just two types of stain, the NGR (non-grain-raising) and the pigmented stains. With these, you can do any job of wood staining easily and quickly. NGR stain is tops for all open-grain woods, while the pigmented oil stains are excellent for soft woods and also certain close-grained hardwoods, such as maple and birch.

How to use pigmented stain: Be sure the work is well-sanded, using a fine garnet sandpaper for the final smoothing. After sanding and dusting, apply the stain with cloth or brush, as shown in Fig. 1. Let the stain dry 5 to 10 min. or until it begins to set, or "flat," and then wipe with a soft cloth, with the grain, as shown in Fig. 2. Normally, you remove all the stain that will come off with moderate wiping. The result will be a color much lighter than the stain itself; the wood takes on a new color without appearing painted. Let the stain dry a couple of hours and then top it with shellac, lacquer, or varnish and finish with wax.

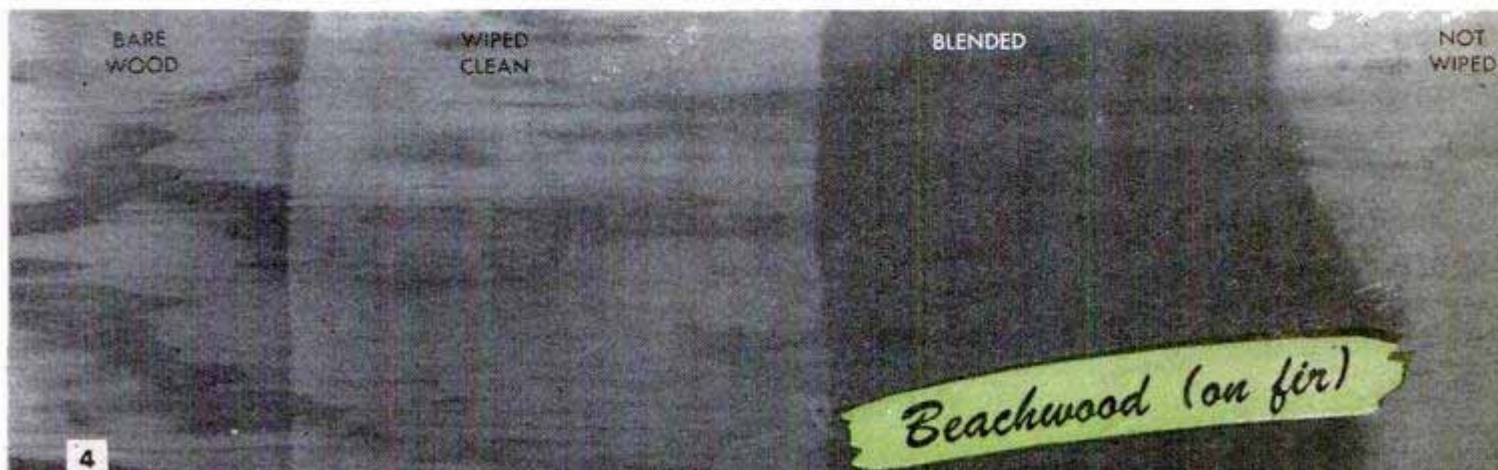
Blonding: Since pigment stain actually is thin paint, it permits blond effects not possible with other stains. Clean wiping should be the rule, and this automatically limits the color range to moderate lightening of the original wood color. You can't, for example, blond-finish black walnut. On light-colored woods such as maple and birch, a blond finish is easily obtained with white-pigment wiping stain. Fir plywood, being a little darker, blonds best with an off-white



PIGMENT STAINS are best for brown or blond tones. The job pictured above is a blond, or Beachwood, finish on maple. Stain is simply brushed on, wiped off with a soft, dry cloth



OIL COLORS added to white-pigment stain, above, will make any desired color. Below, the blond, or Beachwood, finish on fir plywood. Note grain variations with different treatment





5

SAGE-GREEN COMBED FIR is only one of many color effects that can be worked on combed (striated) fir plywood with the use of a pigment stain. First, apply plywood sealer. Dry 3 hrs., then rub lightly with fine steel wool. Next, add a small amount of chrome-green oil color to white wiping stain. Brush stain on wood and, after 5 min., wipe off with cloth, working with grain of wood, but leaving stain at full intensity in grooves. Dry 2 hrs., then apply a coat of white shellac or water-white lacquer. When finish is thoroughly dry, rub with fine steel wool and finish with wax



6

REDDISH-BROWN MAPLE is typical of the finishes used on Early American furniture. Apply a red-maple wiping stain to the bare wood and wipe off clean after 5 min. Dry 30 min. Spray or brush sanding sealer or white shellac (2-lb. cut). Dry 1 hr., then sand with fine sandpaper, and brush or spray a second coat of same stain. Wipe clean except on edges and moldings to high-light finish. After 30 min., brush or spray one coat of rubbing varnish or water-white lacquer



7

EBONIZED OAK is a popular black finish on oak, the grain of the wood being filled with a white filler. Sand the wood glass-smooth and spray a coat of reduced black lacquer, applying just enough to get a uniform solid black. You also can use a thinned black enamel or black shellac for brushing. When dry, apply a white filler, allow it to dry flat, then wipe off clean with a coarse cloth. Dry 2 to 24 hrs. depending on type of filler used. Top the finish with a water-white lacquer of the nonraising type



8

AMBER MAPLE, sometimes classified as "blond," is done with a light-amber wiping stain. Buy stain ready-made or make your own by adding brown and red oil color to white wiping stain. Apply stain to bare wood and wipe off clean. Spray a coat of sanding sealer. Smooth with fine sandpaper. Then spray two coats of water-white lacquer and rub with No. 280 abrasive paper with soapy-water lubricant. Wipe dry, rub with fine steel wool and finish with wax



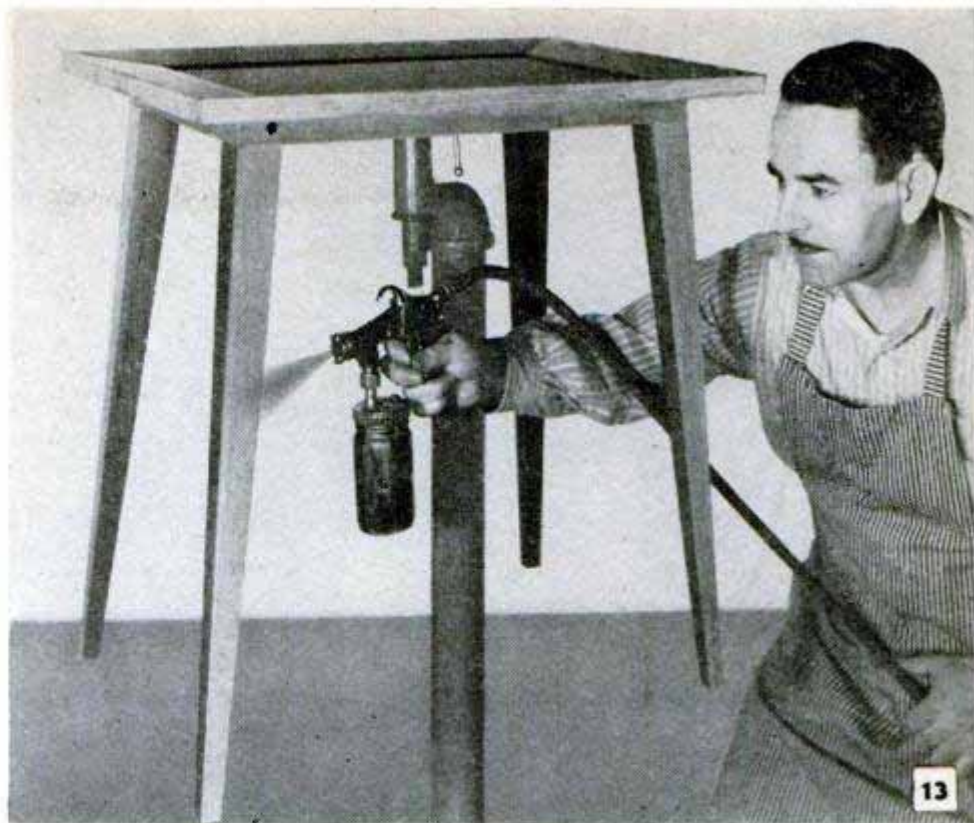
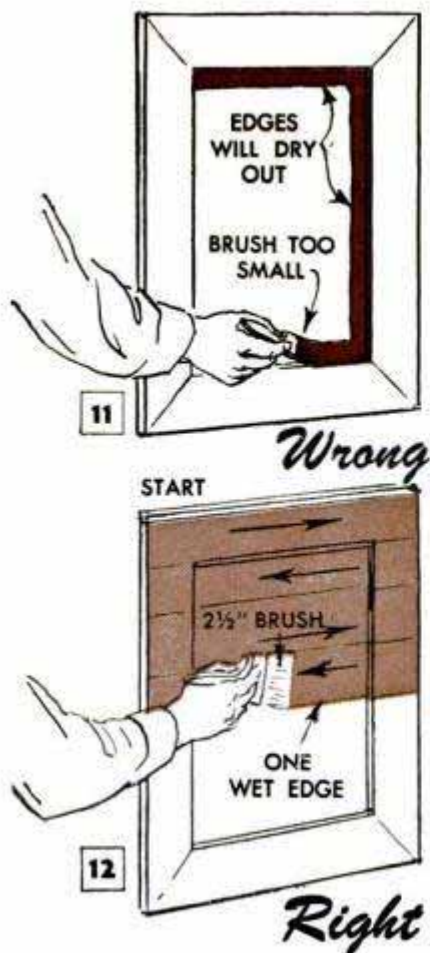
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DOVE-GRAY WALNUT is done by first bleaching wood with a two-solution bleach. Dry 12 hrs. and sand lightly with fine sandpaper. Apply a light-gray wiping stain and wipe off clean. After 30 min., apply a second coat of stain, wipe off clean, shading only lightly at ends and edges. Follow with sanding sealer. After 1 hr., sand with fine sandpaper. This produces the popular open-grain finish. For a level finish, substitute a dove-gray filler for the first pigment-stain coat. Top with water-white lacquer



10

CORDOVAN MAHOGANY is a new reddish-purple finish produced by special nonraising stain recently made available. Apply stain, dry 30 min. to 1 hr., then apply mahogany filler colored very nearly a solid black. Wipe off clean with a coarse cloth just as the filler begins to set, or flat. When filler is dry, spray or brush a coat of sanding sealer. Sand with fine sandpaper after 1 hr., then top-coat with a water-white lacquer or rubbing varnish. Polish to high luster



NONRAISING stains are ideal for use on nearly all open-grain woods. Stain dries very quickly and is best applied with a suction-type gun, but smooth work without laps can be done with 3-in. brush by working fast with brush and cloth

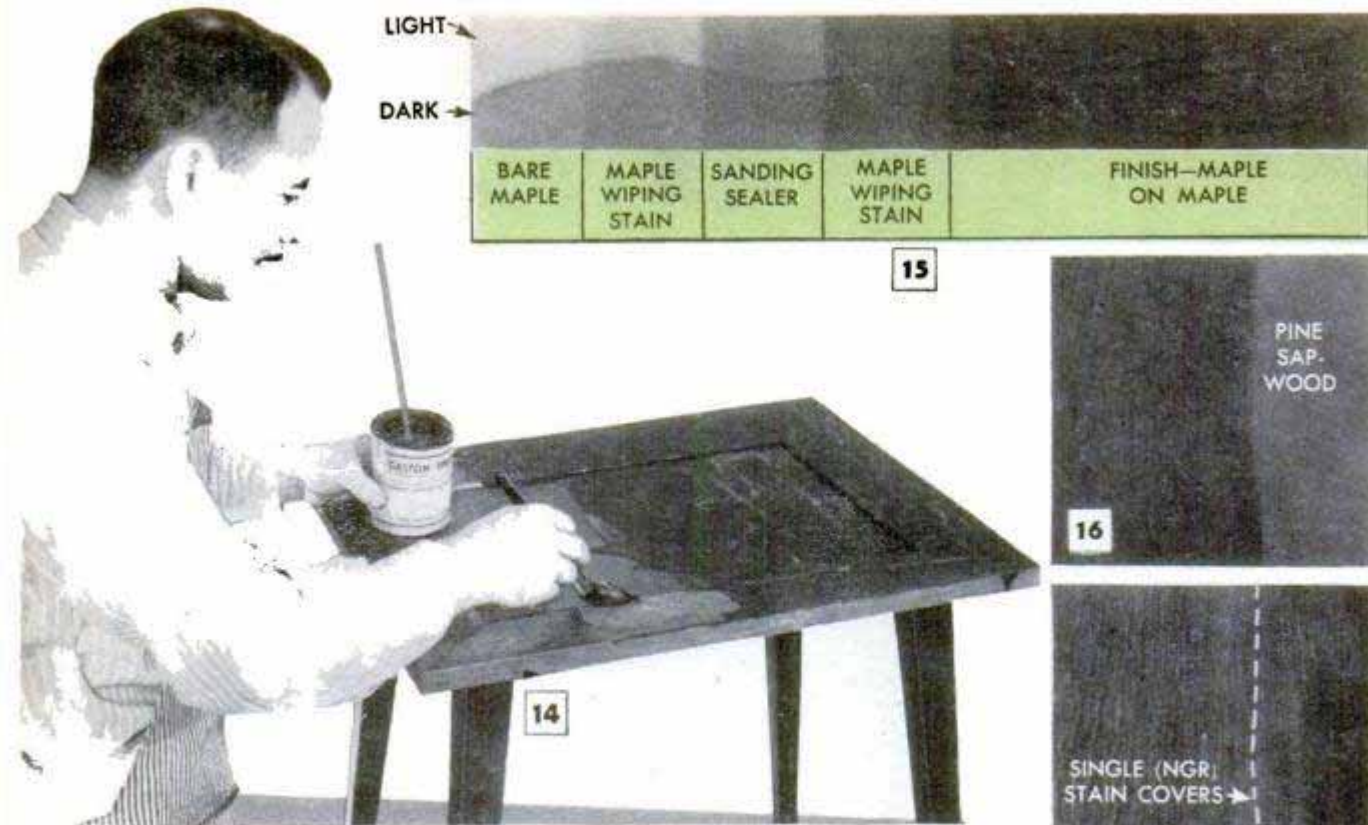
or light-gray stain, especially prepared to produce one of the new gray colors. Fir and other similar woods will take a more uniform color if the grain is equalized with a coat of clear plywood sealer. Fig. 4 shows Beachwood stain on fir applied over a sealer. Note how the wild grain of the wood is subdued. Interesting color effects can be obtained by toning white-pigment wiping stain with a little oil color, mixing this separately with turpentine, Fig. 3, and then adding to the stain until the desired color is obtained. Always make a test panel as the wiped stain is not nearly as strong as the stain itself.

Standard finishes: Six standard finishes using pigment and NGR stain are given on the opposite page. Learn how to apply these and you will know just about everything there is to know about wood finishing. With a change in stain and filler color you can produce any kind of finish.

Using NGR stain: Buy this in popular wood colors and be sure to order the special solvent needed. By far the best method of application is with a spray gun as most NGR stains are formulated for fast drying, some being ready for the top coats in 10 min. If you intend to brush the stain, be sure to get the brushing-or-spraying grade. Most NGR stains can be slowed down a bit with the addition of special retarders which are available. Even so, the stain surface-dries very rapidly. A uniform color is most readily obtained by using a large brush

and applying the stain in a very wet coat. Fig. 11 shows what to avoid. The cutting-in technique with a small brush is perfect for varnish top coats, but with NGR stain the edges will be dry before you can get over the surface. On a small table top, such as that in Fig. 11, the best procedure is to start at the upper left-hand corner and, using a well-loaded brush, spread the stain quickly from side to side with fast, sweeping strokes, Fig. 12. Wipe immediately with a soft cloth to uniform the color and pick up the excess stain. No matter what approach you use, the essential thing is to get the stain on fast and follow up immediately with the wiping cloth before it sets. Divide the surface into convenient areas that you can cover in a few seconds. Do the legs, rails and top of a table in separate operations. On large table tops, dilute the stain to half strength with an equal amount of reducer and apply two coats, wiping each one. If you spray NGR stains, use a narrow spray pattern, but fan it out by holding the gun farther from the surface. Best practice is to mount the work on a turntable as in Fig. 13, where you can shoot all inside edges and surfaces first. Always do the work in good light (daylight is preferable) so that you can properly evaluate the color density as you go along. On wood having sap streaks or other color variations, give the light wood a slightly heavier application to obtain uniformity of color.

Double staining: On certain finishing



DOUBLE STAINING with pigment stain gives even, uniform color even though wood may vary in color. Panels above and at right show how sap streaks are treated

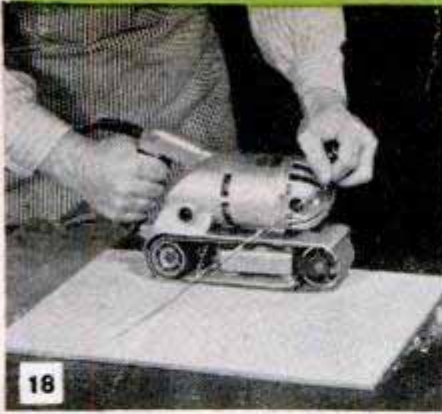
jobs, you can obtain an even, mellow tone by applying a double stain coat. This can be worked with either a pigment stain or NGR stain, Fig. 14. In ordinary procedure, the first coat is applied and allowed to set and dry before brushing or spraying a second coat. In Fig. 15, the panel is double-stained with a coat of sanding sealer between the stain coats. The sealer gives an exceptionally smooth surface over which to shade the second coat of stain. Wipe the first stain coat clean and allow it to dry thoroughly before applying the sealer. Sand the sealer lightly after it dries. Then apply the second coat of stain and shade with a cheesecloth pad until you have the color depth desired. Careful work with the pad on the second coat of stain will enable you to produce perfect color blends.

Staining sapwood: Many jobs, especially large table and cabinet tops, will have some sapwood of a lighter color which must be equalized when staining and finishing. Sap streaks in certain of the lighter woods usually will "drink" a lot of stain and become darker than the heartwood. On the other hand, on dark woods, such as walnut, the sapwood often is quite dense and will remain light under one and, sometimes, under two coats of stain. As a rule, the light areas on pine will equalize under a single coat of NGR stain, Figs. 16 and 17, but, if there is any doubt about the outcome, coat the light areas with a reduced sealer coat before applying the stain. The wash sealer coat will prevent fast absorption of the

stain. On the other hand, if the sapwood remains light under the first coat of stain, equalize the color by applying reduced NGR stain over the first coat before it is dry. Pigment stains are worked in much the same way and because of the slower absorption and ease of control they often are best for blending sapwood. In any case, be careful to allow sufficient drying time between the stain coats and the top coats.

Job schedules: Figs. 5 to 10 inclusive outline briefly the procedures used in producing six of the most popular modern finishes on various kinds of wood. Most of these procedures are quite simple to carry out without any previous experience in wood finishing. The manufacturer's instructions also tell you how to prepare the materials used. Figs. 18 to 29 inclusive picture a complete double-staining routine on a table top. On this job, an NGR mahogany stain is used for the ground color and a mahogany wiping stain provides the shading coat. With only a change in stain colors and filler, the same schedule will apply to any open-grained wood and, by simply eliminating the filler, to close-grained woods. Many of the light-colored, open-grained woods, such as korina, take an attractive finish when filled with a natural-colored paste filler over the bare wood. Follow with a pigment wiping stain in the new light-gray color. On some light woods it may be necessary to sand the surface thoroughly to remove all traces of the filler except that embedded in the pores of the wood.

Finishing Schedule



SAND all parts before assembly, using No. 2/0 belt, 3/0 for handwork



DUST work thoroughly, using a brush, tack rag to pick up dust



NONRAISING STAIN is easily applied with suction gun. Dry 30 min.



WASH COAT of white shellac or clear lacquer over stain is optional



FILLER used on all open-grain woods, except open-grain finish



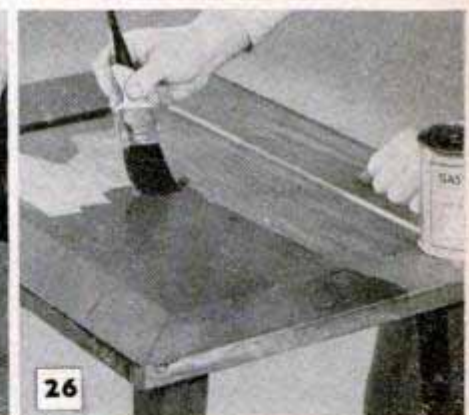
WIPE FILLER across wood grain with coarse cloth. Finish with grain



SEALER is sprayed or brushed. Shellac (2-lb. cut) also can be used



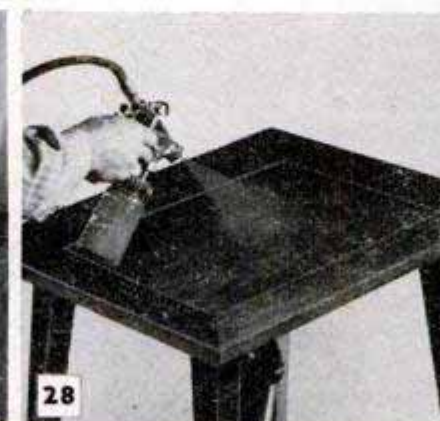
SMOOTH sealer with No. 6/0 garnet paper. Dust off, use tack rag



PIGMENT STAIN in mahogany color is brushed on. Can also be sprayed



WIPE STAIN with coarse cloth, shading lightly; leave more stain at edges



TOP COAT can be lacquer or varnish. Let it dry before rubbing



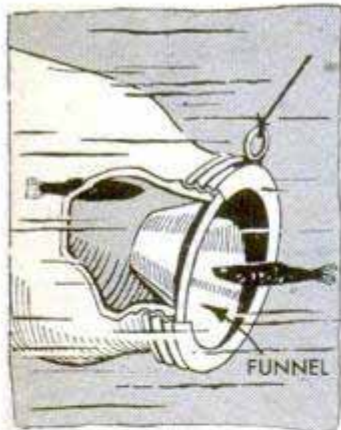
RUB with rubbing compound on a felt or burlap pad. Work with grain

Flexible Floor Mat for Laundry



One woman, who was tired of standing on a concrete floor in her laundry, had her husband make up a flexible floor mat of wood slats nailed to strips of old V-type fan belting. This provided a mat that could be rolled up and stored when not in use. A mat of this type not only provides a cushioning effect under your feet, but also keeps you off a floor that may be damp and wet while doing the laundry.

Glass Jar Provides Minnow Trap



Needing live bait quickly, one fisherman improvised a minnow trap from a small funnel and a fruit jar of the 1-qt. size. He removed the spout from the funnel and placed the bell end in the mouth of the jar. Next, he cut a slot in the ring member of

the two-piece jar lid so that the round wire bail on the funnel would protrude. Then he screwed the lid down tightly to hold the bell end of the funnel in place in the jar as in the detail. A cord or a short length of fishline, tied to the bail, supports the trap in a horizontal position when in the water.

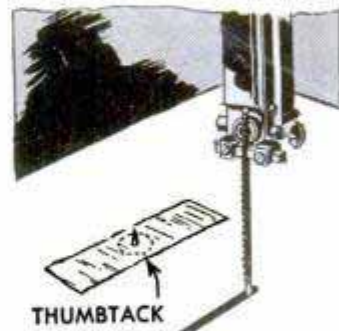
Patching a Leaky Swimming Pool

It is unnecessary to drain a concrete swimming pool or other concrete tank to make repairs. Just mix the necessary cement for the job and, when ready to apply

it, mix a trowel or two of the cement with about one third that amount of quick-setting plaster of paris. Press this into the hole under the water to stop the leak immediately, and then proceed with regular cement to complete the job.

Thumbtack Used as Pivot To Cut Circles on Jigsaw

The next time you want to cut a disk or circle on a jigsaw and have no suitable pivot point at hand, a thumbtack will serve as a temporary pivot. Just push it through a piece of adhesive



tape, and stick the tape to the saw table with the point of the tack upward as indicated.

G. E. Hendrickson, Argyle, Wis.

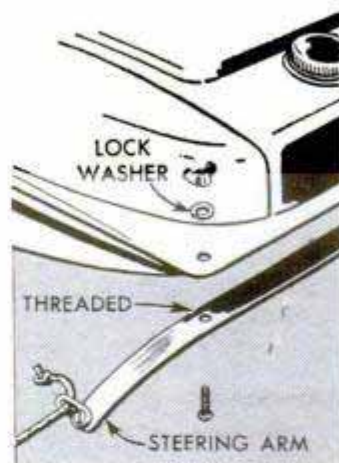
Rubber "Torch" Starts Campfire

Excellent fire starters for lighting campfires in wet weather can be made by cutting an old inner tube into 3-in. squares. Such a piece will burn for about 10 min. and will ignite damp firewood. If the rubber is wet, it can be dried by rubbing between the hands for a minute or two. In an emergency the burning rubber can be impaled on the end of a stick for use as a torch.

E. K. Harden, Cincinnati, Ohio.

Outboard-Motor Steering Arm Made Quickly Removable

For quick removal of the steering arm from my outboard motor when it is necessary to carry it in the trunk of my car, I tapped the bolt holes in the arm and turned machine screws tightly into the holes. Then I flowed solder around the heads



of the bolts to prevent them from working loose. When I assemble the arms on the motor, I use lock washers and wing nuts so that the arms can be tightened in place and also removed without the use of a wrench.

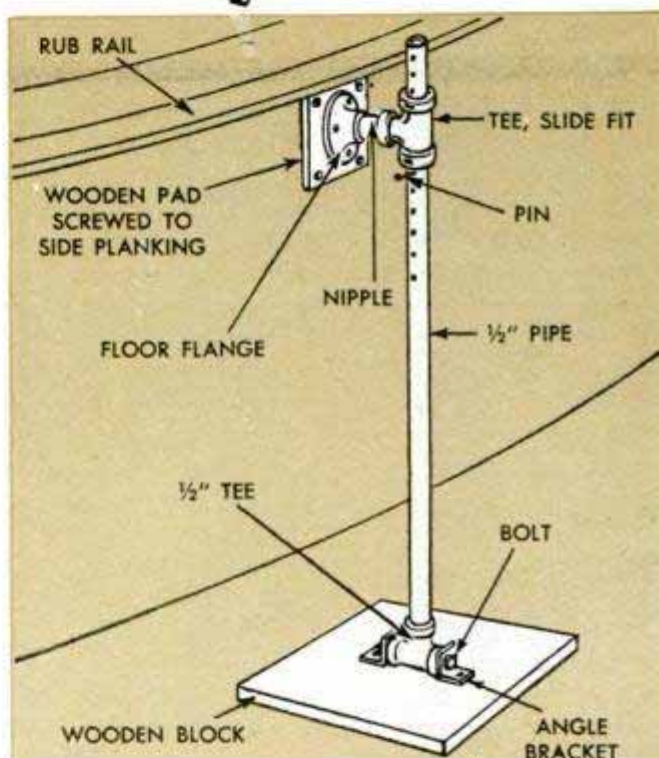
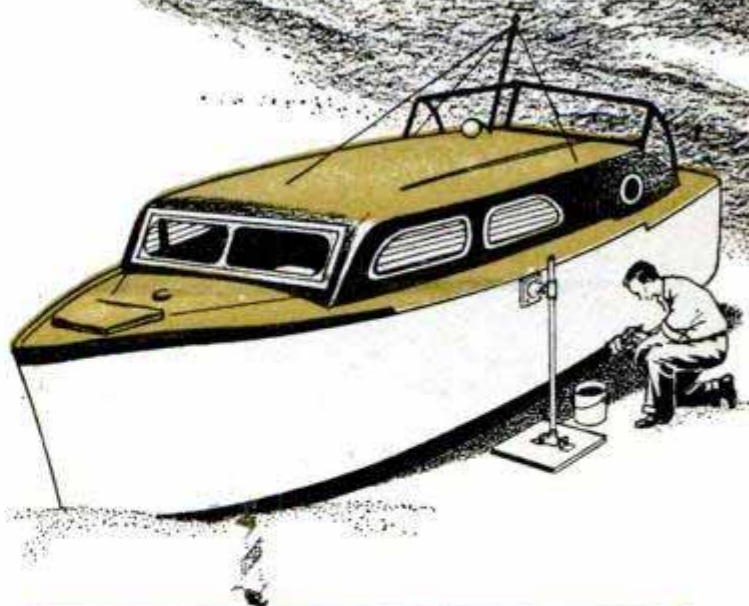
Clinton R. Hull, Costa Mesa, Calif.

Bits of thread can be removed from a wool rug by brushing a damp mop over it.

BOAT "CRUTCHES"

By C. L. Newcomb

OWNERS of small power boats and even sailboats, of the flat-keel type, can paint and make repairs below the water line simply by beaching the boat, if a pair of "crutches" is used to keep the craft from heeling to one side. This, of course, can be done only with a boat having a keel or skeg that will protect the propeller when the boat is aground, as the weight of the boat is supported by the keel, the crutches serving only to steady it. The crutches, one of which is mounted on each side of the boat amidships, are lengths of pipe drilled with a series of holes. Metal pins inserted in the holes prevent pipe-tee brackets from sliding down the uprights, and pivoted wooden blocks provide self-adjusting "feet" to keep the pipes from being embedded in the sand. Note in the detail how the block is pivoted by passing a bolt through two angle brackets and a pipe tee. The pipe tees forming the brackets are assembled to floor flanges which are mounted on wooden pads, the pads, in turn, being screwed permanently to the hull just below the rub rail. To use the crutches, select a beach with a gentle slope and slowly run the boat aground until the keel at the bow just touches the bottom. Put out the anchor astern to permit kedging off if necessary. Then adjust the legs in the sockets so they touch bottom, and set the pins in the holes to keep the boat from heeling when it settles. The crutches can be used in two ways. The boat can be beached in water that is shallow enough for working on the hull, or it can be beached during high tide. In the latter method, the boat is left high and dry when the tide goes out. Be sure that the boat is not beached during a particularly high tide, as the next tide may not be sufficient to float it. To refloat the boat, it usually is necessary only to take in the crutches or secure them against the sides out of the water, and shove off by hand or power. If the boat doesn't float easily, the stern an-



chor line may be taken up and the boat pulled off, using reverse power if necessary. If greater working clearance is needed under the boat, a couple of 4 x 4s can be slipped beneath the keel as the boat begins to settle. The crutches are then adjusted accordingly to steady the boat.

Rubber-Stamp Facing Renewed by Cleaning With Dry Toothbrush



Rubber stamps which leave a smudged impression are not necessarily worn out. Before discarding them, try cleaning the type face of the stamp with a toothbrush. After accumulations of dried ink, dust particles, etc., are removed, most rubber stamps will again leave a clear impression.

☞ Unshelled pecans will stay fresh indefinitely if they are sealed in a fruit jar.

CLEANING THE AUTO *Interior*

By Ed Packer

HOW ABOUT trading a few hours of easy work for a car interior that looks clean and new? You can do most of the job with your vacuum cleaner by attaching the flexible nozzle and giving the rug and upholstery a thorough going over. It will aid the work of the vacuum cleaner if you first brush these parts thoroughly to loosen embedded dirt. Next, go over all the fabric in the interior with a mild soapsuds or a shampoo such as is supplied for this purpose. There also are available rug dyes, fabric finishes, cements and specially prepared materials that renew rubber mats and running boards. However, for coating rubber you also can use a solution of drop black and turpentine. Refinishing kits for the worn steering wheel and window sills come in pressurized containers for use in spraying the finishing material into hard-to-get-at places. Mask adjacent fabric before spraying. Use cement to secure the edges of the rug. Examine the sponge-rubber weather stripping around all the doors, especially at the lower edges. There's a special adhesive made for cementing the weather stripping back in place.

Scrub the fabric with a sponge and mild soapsuds. Remove all the lather with a windshield-wiper blade



Embedded dirt and lint are easily removed from the fabric with a vacuum cleaner, using flexible nozzle

REMOVING SPOTS FROM UPHOLSTERY

CANDY: Candy, other than chocolate, usually can be removed by rubbing with cloth soaked in hot water. Removal of chocolate requires volatile solvent such as carbon tetrachloride.

CHEWING GUM: Use a dull knife and keep spot wet with carbon tet while working out gum.

ENAMELS, LACQUERS AND PAINTS: Use the solvent recommended for thinning the material.

FRUIT: Scrape off pulp with dull knife and sponge spot with very hot water, just under boiling point.

ICE CREAM: Proceed as for candy or fruit.

LIPSTICK: Wet the area with carbon tet and apply blotter. Repeat until stain has been picked up.

TAR: Moisten with carbon tet and work the tar loose with a dull knife, or a wide wall scraper.

WATER SPOTS: Sponge the area with a wet cloth. Follow this with rag moistened with carbon tet.

Rubber cement is used for applying patches to floor mats after both surfaces have been carefully cleaned





A thin mixture of drop black and turpentine makes a good dressing for the rubber mats and running boards

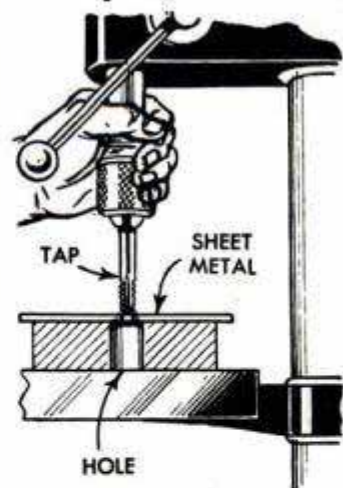


Above, to make seat covers fit snugly, compress the seat by standing on it while attaching them. Below, after cleaning the headliner and brushing thoroughly, spray on a light coat of fabric finish with spray gun



Drill Press Used to Tap Thin Metal

When tapping holes in thin, soft metal, difficulty of holding the tool at the desired angle throughout the operation often causes the threads to be ragged and may result in scratching the surface of the work. This trouble can be avoided by doing the job on the drill press. Clamp the work in position, as shown, and lock the tap in the chuck of the drill press. Then tap the hole by turning the spindle with one hand while applying a firm, steady pressure on the drill-press handle with the other.



"Beacon" Helps Visiting Friends Locate Your Home at Night

Fitted with a flasher socket and placed on a front-window sill, a blinking table lamp becomes a prearranged "beacon" by which arriving guests can readily find your house. The flasher unit can be purchased at any electrical-supply store and is screwed into the lamp socket in the same manner as a light bulb. The bulb is then screwed into the flasher socket.

Arthur Trauffer, McClelland, Iowa.

Paper Disk Prevents Paint Skin

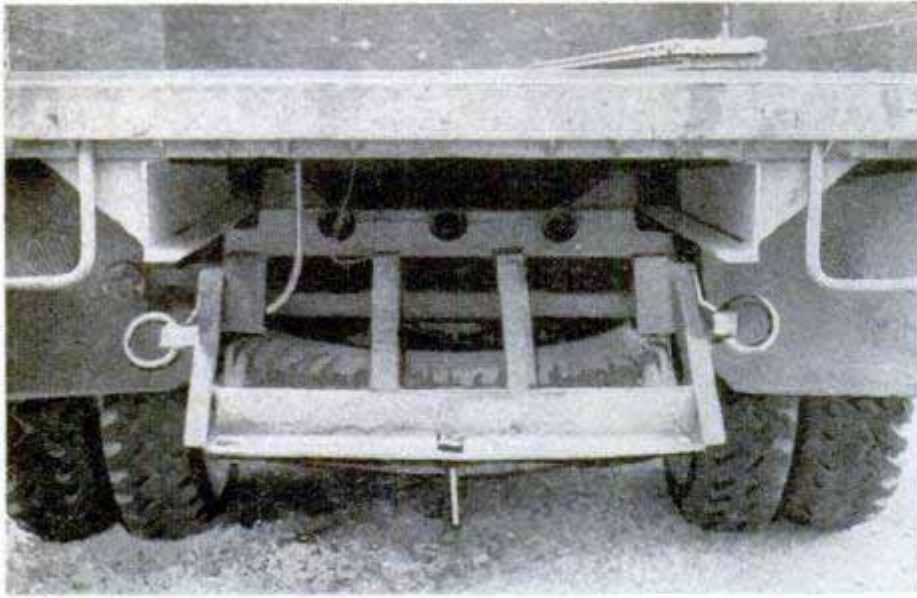
A partly used can of paint, though it be tightly covered, will form a skin at the surface which must be removed by straining. To prevent this waste and have the paint ready for immediate use, cut a disk from paper or cardboard to approximate as closely as possible the inside diameter of the paint can, and place the disk on the surface of the paint before covering the can. When the paint is to be used again, run a knife blade around the edge of the disk and lift it out of the can.

George J. Cole, Long Island City, N. Y.



☐ An effective method of keeping gilt picture frames from drying out and cracking is to give them a light application of lemon oil every two or three months.

Sturdy Trailer Hitch for Dump Truck Welded From Scrap-Iron Pieces



This all-purpose trailer hitch is constructed entirely from scrap pieces of angle steel and welded directly to the chassis of a dump truck. Designed and positioned so as not to interfere with the tilting of the truck bed, the sturdy attachment can be used for the most rugged towing jobs. Heavy rings at each side provide for quick and easy "hooking on" with chain or rope, while a simple kingpin arrangement at the center of the hitch will accommodate trailer and wagon drawbars. — Kenneth R. Imig, Watseka, Ill.

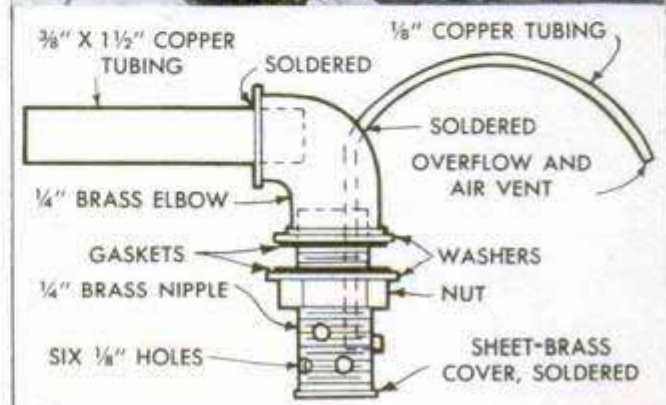
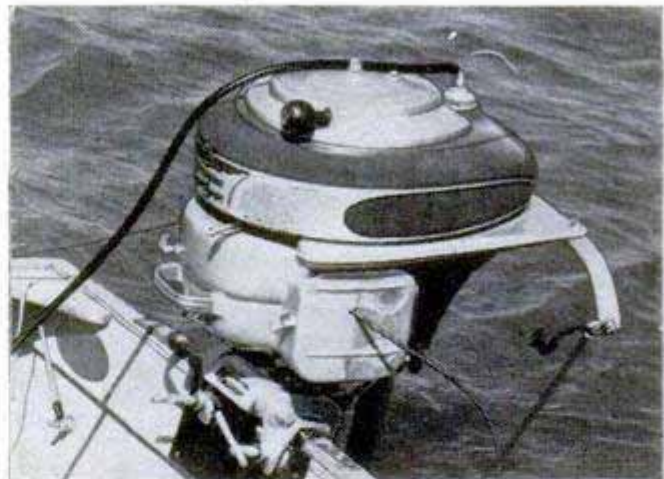
"Popping" of Torch Welding Tip Prevented by Countersinking Flame Hole

Other than improper flame adjustment, "popping" in an acetylene-torch welding tip is most commonly caused by sparks entering the blowpipe and igniting the fuel before it reaches the outside air. It has been found that such trouble can be avoided simply by countersinking the flame hole of the welding tip. This provides a shell which acts to catch the sparks before they enter the fuel stream. The countersinking should be $\frac{3}{32}$ in. deep and should be done

with a drill $\frac{1}{16}$ in. larger in diameter than the flame hole. If, after lighting the torch, the tip seems to overheat, let it cool and polish with a few light strokes of a whetstone. An added advantage of countersunk welding tips is that, after a little skill has been acquired in the adjustment of the flame, a medium-sized tip can often be successfully used to do work ordinarily requiring the use of tips both larger and smaller.—M. J. Fenley, Jr., Velasco, Tex.

Nonspill Outboard Gas-Tank Cap Permits Refueling While Motor Runs

When adding reserve gas to your outboard-motor tank, spillage, as well as the bother of stopping the motor, can be avoided by use of this modified gas-tank cap and an ordinary hand-operated fuel pump. One hose from the pump is attached to a reserve gas can while the other is fitted over a length of $\frac{3}{8}$ -in. copper tubing which, in turn, is soldered to a $\frac{1}{4}$ -in. brass pipe elbow. A $\frac{1}{4} \times 1\frac{1}{4}$ -in. brass nipple is turned into the other end of the elbow and extends through a hole which has been cut in the regular gas cap. The nipple is held to the cap by two washers, two gaskets and a nut. The latter is tightened from the underside of the cap and holds the entire assembly against the shoulder of the elbow. The gaskets are the type impervious to gasoline and are coated with aircraft-gasket compound before being set. Six $\frac{1}{8}$ -in. holes are drilled in the nipple below the nut and a sheet-brass plate is soldered over the bottom opening. A length of $\frac{1}{8}$ -in. copper tubing is located and soldered as shown. Besides serving as an air vent, the tubing provides an overflow which emits a fine stream of gasoline if the tank is too full.



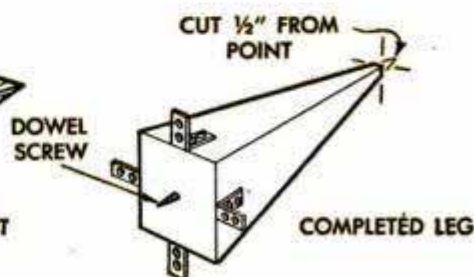
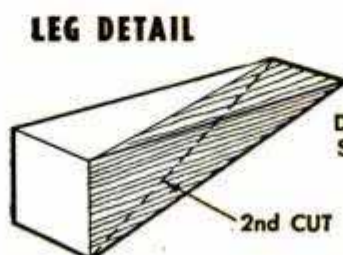
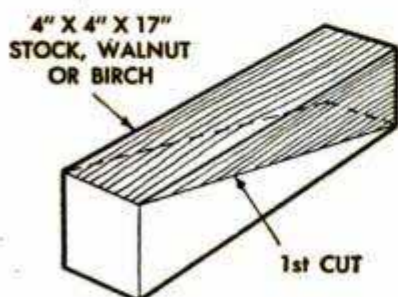
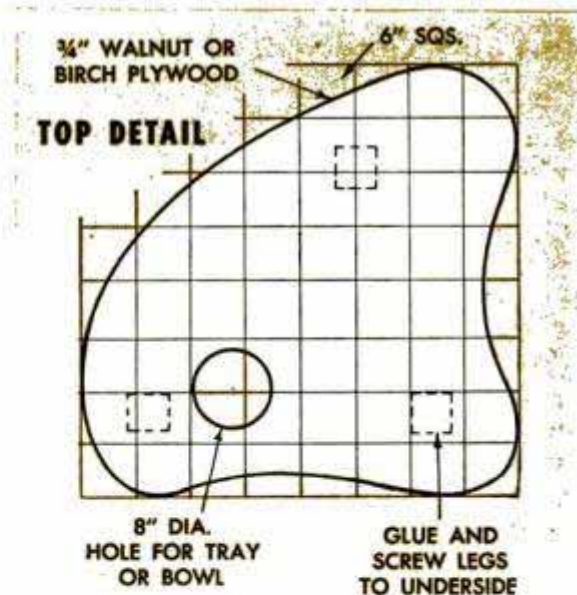
PALETTE COFFEE TABLE

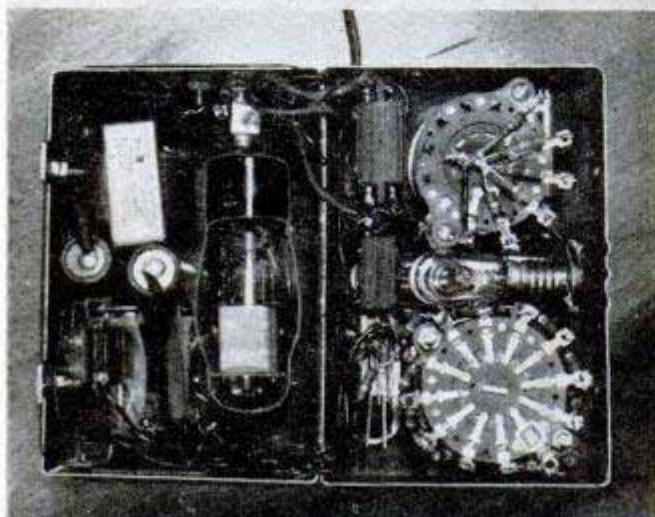
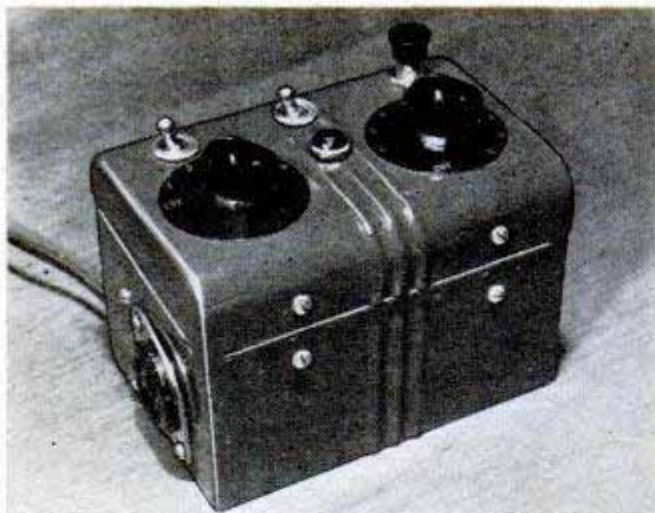
By George Daniels



COMBINING simplicity of construction, plain utility and good design, this coffee table gets its name from the top, which is shaped like an artist's palette. If you have a small bandsaw for making the curved cuts you can easily complete the table in one evening, ready for finishing. Use birch plywood for the top if you like light, modern finishes. Use walnut or mahogany if the table must match other furniture finished in darker colors. Make a full-sized pattern of the top on heavy paper or cardboard from the squared detail below, and use this to lay out the outline of the top directly on the surface of the plywood. Saw just outside the pattern line with a bandsaw or a keyhole saw and then sand the edges smooth with slightly rounded corners. Legs of the original table were cut from red cedar, but birch or walnut will

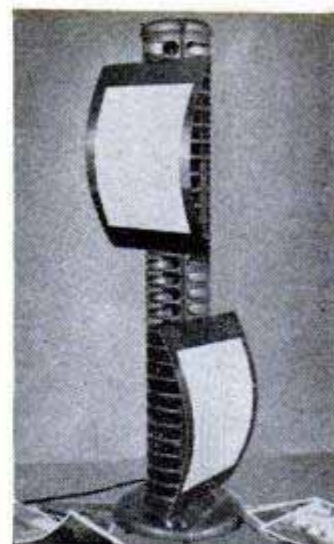
do. Lay out and make the first diagonal cut on each leg. Then turn the piece onto the adjacent face and make the second cut. This results in a tapered leg which gives the appearance of standing splayed when it is attached to the underside of the table top. Plane the sawed surfaces smooth and attach each leg to the underside of the table top with a dowel screw, glue and four angle brackets. Now, scribe and cut the opening for the bowl, or tray, taking the measurements directly from the tray you intend to use. To finish birch, apply a white filler to the edge of the plywood. Allow to dry, and then apply a blond or a white wiping stain. Finish with sealer and water-white lacquer.





Ferrotyped Prints Dried Quickly By Mounting Plates on Heater

One photographer finds that an electric heater of the type shown in the photograph serves as an excellent drier for ferrotyped prints. The ferrotype plates are bowed to engage the slots of the cylindrical element guard, and, when the prints are dry, they drop from the plate to the table



top. The average time it takes to dry the prints is from 6 to 10 minutes.

Paris W. Williams, Jr., Van Nuys, Calif.

Shadowless Stills Taken Using Only One Light

Attempts to rid still subjects of all shadows by use of numerous lights usually results only in creating many smaller shadows. However, by making the shot a time exposure, and with the aid of a single, low-watt light, a shadowless picture can be taken. The light is held by hand and moved from place to place over the top of the subject throughout the time of the exposure. Of course, the light, as well as the person holding it, are kept out of camera range during the shooting. As the negative is being exposed, it records all the various positions of the light as one. All shadows are thus removed.

Electronic Timing Unit Built in Card-File Box

If you are planning to make a photographic electronic timing unit, a 3 x 5-in. steel card-file box, as illustrated, will provide a neat appearing receptacle for the unit. These boxes can be obtained from any office-supply store.

Extra Photoflood Reflector Improvised From Sheet of Aluminum Foil

When you need an extra photoflood reflector for a particular setup and don't have one on hand, you can improvise a suitable reflector from a sheet of aluminum foil. Turn the photoflood bulb into a drop-cord or extension-cord socket and fasten one edge of the foil to the socket with cellulose tape or a piece of string. The foil is easily bent to cast the light in the desired direction.—Hugh Lineback, Stillwater, Okla.

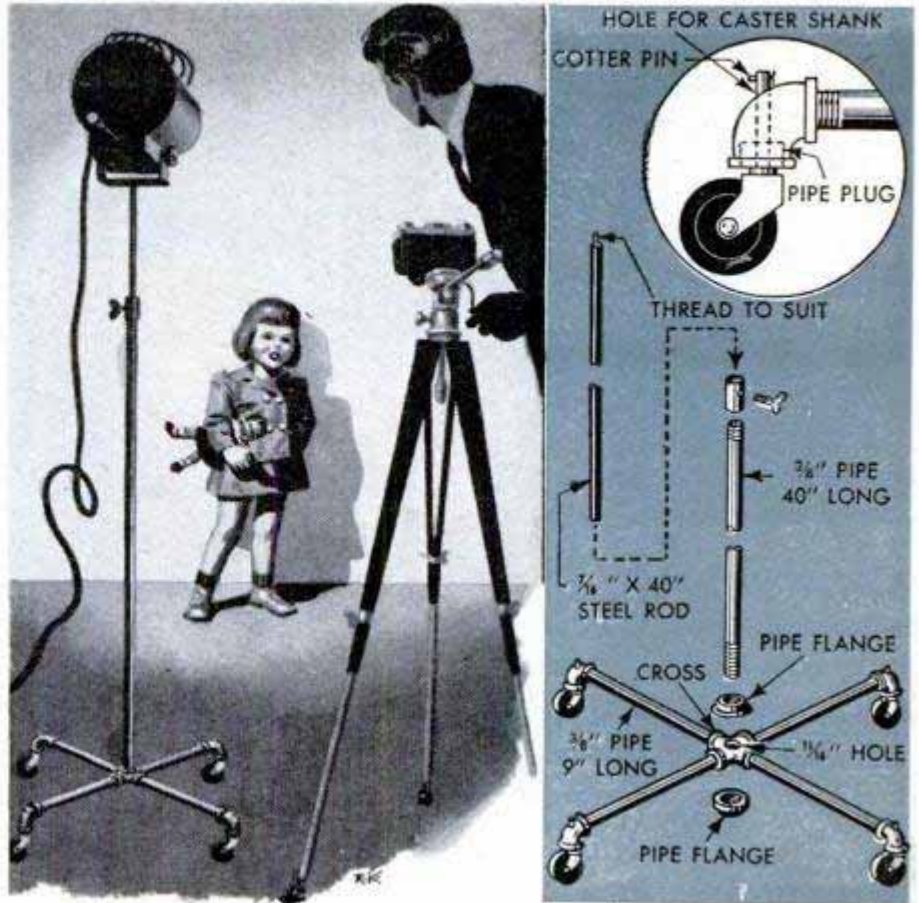


Detergent Improves Negatives

Water spots from sediment in the water supply won't detract from negatives if the latter are soaked in a solution of ordinary household detergent after washing. Soak the negatives for two minutes in a solution of 1 teaspoonful of detergent to 1 gallon of water. Then rinse and dry.

Photographic Spotlight Stand Made From Pipe and Fittings

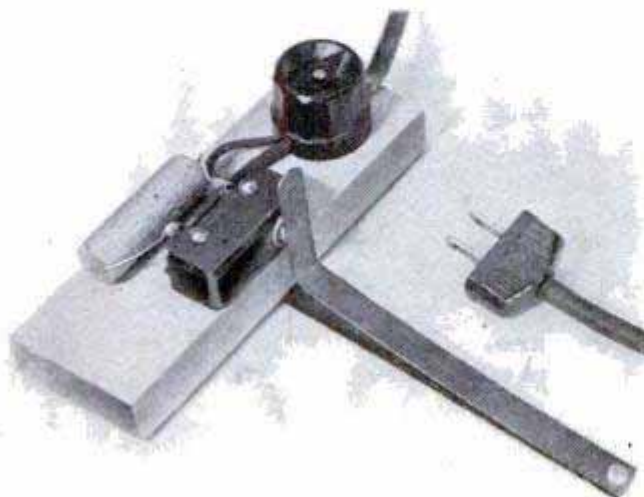
Made from $\frac{3}{8}$ -in. pipe and fittings, this spotlight stand can be assembled in the average home workshop, and is adjustable from $3\frac{1}{2}$ ft. to $6\frac{1}{2}$ ft. in height. Black pipe and fittings are just as good as galvanized, for this purpose, and will cost less. You will need 76 in. of pipe, four 90-deg. elbows, two flanges, one coupling and one cross, or four-way fitting, plus a 40-in. length of $\frac{7}{16}$ -in. rod, four furniture casters and a thumb-screw. To make the stand, cut the pipe into five pieces, one 40 in. long, and four pieces 9 in. long. Thread the long pipe about double the normal distance on both ends, the short pieces being threaded the usual distance on both ends. Screw the coupling on one end of the longer piece to provide sufficient thickness to tap for the thumbscrew. If there isn't a suitable screw at hand, one can be made from a short length of $\frac{1}{4}$ -20 bolt, which is slotted about $\frac{1}{2}$ in. deep at one end to take a sheet-metal wing. The latter can be peened or pinned in place. The cross and two pipe flanges are assembled on the long pipe as indicated, the cross being bored out in the center to take the threaded end of the pipe with a sliding fit. The short pieces



of pipe are screwed into the cross, the feet being screwed to the outer ends. The feet are made from the elbows, which are plugged and then drilled to take the casters as indicated. Be sure to drill small holes near the ends of the caster shanks for small pins or cotter keys to keep the casters from falling out when the stand is lifted. The steel rod, which supports the lamp, telescopes inside the pipe standard and is locked in position with the thumbscrew.

Foot Switch for Photo Enlarger Has Hacksaw-Blade Pedal

Fast, positive control of an enlarger lamp can be had by improvising a foot switch from a normally open sensitive switch



and an old hacksaw blade. A single outlet is wired in series with the switch and both are mounted on a wooden block, the switch being positioned so that the button extends over the edge of the block. The hacksaw blade is broken into two lengths. One length is bent at a 75-deg. angle, roughly $1\frac{1}{2}$ in. from the end, to form an arm which will depress the switch button. Then, both blade sections are riveted together at the outer end, inserting a washer or nut between the two parts to serve as a spacer, and the lower blade section is screwed to the underside of the block. To form the blade, heat it to a reddish glow and let cool to room temperature. If a heavy load of direct current will enter the switch, a .1 mfd. radio-type condenser, connected across the switch terminals, will prevent arcing.

Camera Rigged for Self-Portraits With String and C-Clamp



Even though he had no timing unit on his camera, one photographer was able to take a picture of himself with the aid of the device shown in the illustration. Tying a length of string to the shutter-release lever and attaching an ordinary C-clamp to a leg of the tri-

pod was all that was necessary. With the string looped through the clamp, the photographer simply posed and pulled the string to trip the shutter.

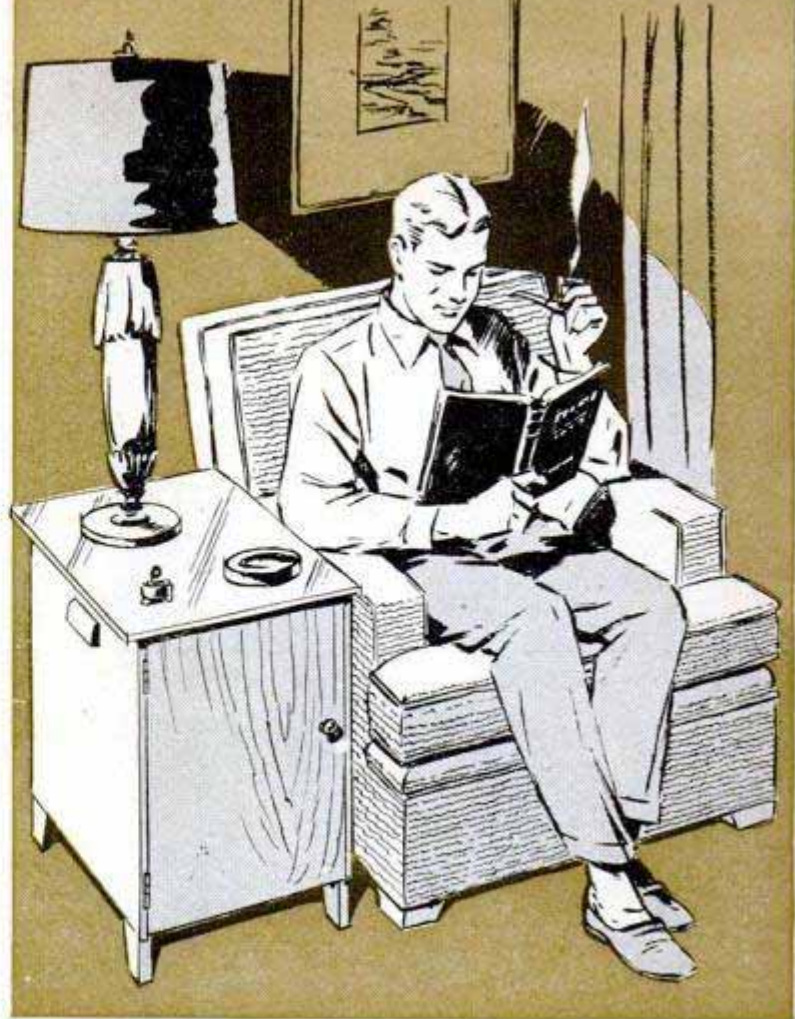
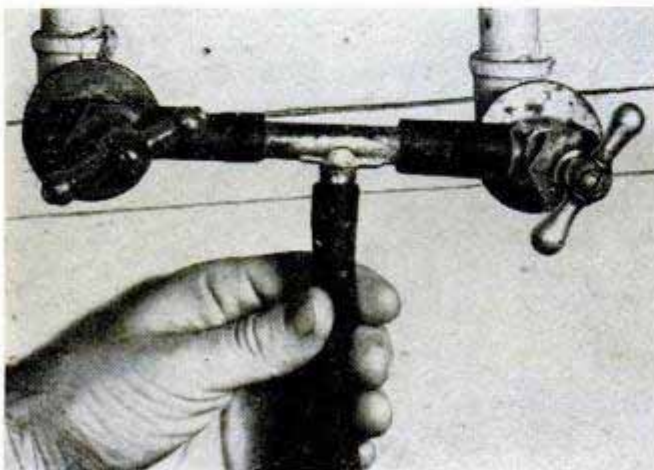
Solution Eliminates Drying Rings

Using heat to speed drying ferrotyped prints frequently results in "eggshell," or imperfections caused by uneven drying. This problem can be eliminated, however, by soaking the prints in a chemical solution for five minutes before drying. The solution consists of either glycerin or monoethyl-ether acetate, 1 part, and water, 10 parts. The monoethyl-ether acetate is available under the names Carbitol Acetate or Diethylene Glycol.

T-Fitting Makes Mixing Faucet

If you use the basement washtubs for photographic processing and the tubs do not have a mixing faucet, one can be improvised very easily with a $\frac{3}{8}$ -in. copper T-fitting and some short pieces of rubber hose. Turn the tub faucets so that their openings face each other. Then use the two short pieces of hose to connect the copper T-fitting to the faucets as shown in the photograph.

Robert Hertzberg, Jackson Heights, N. Y.

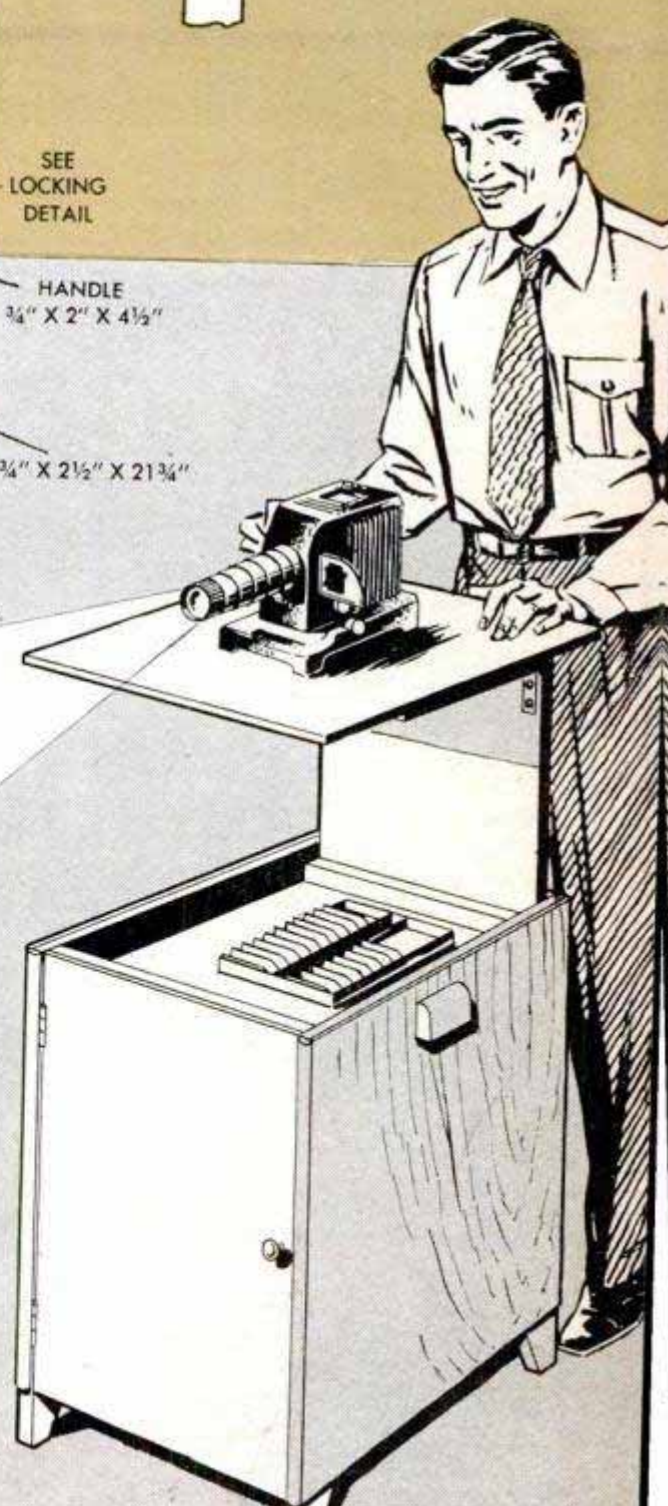
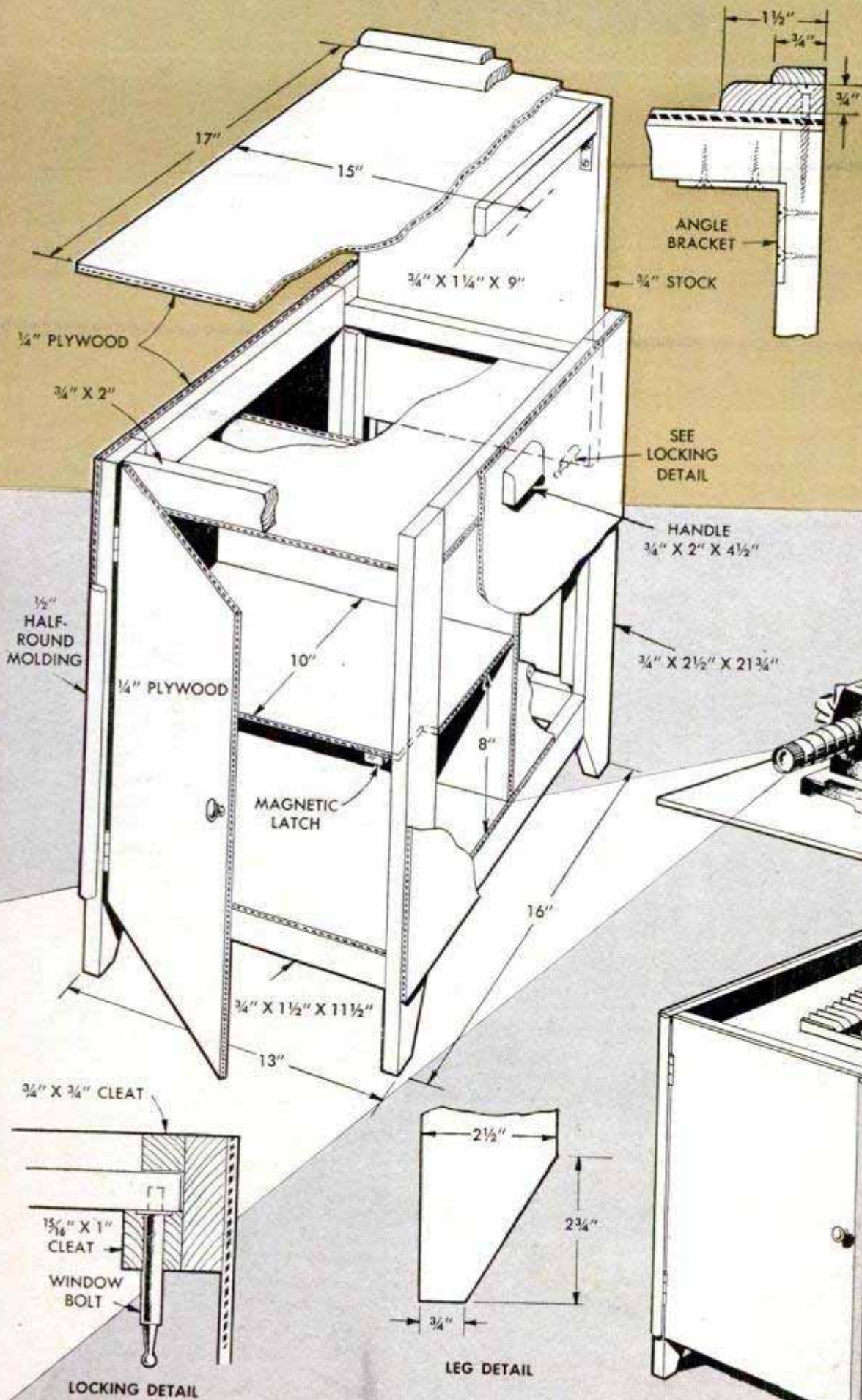


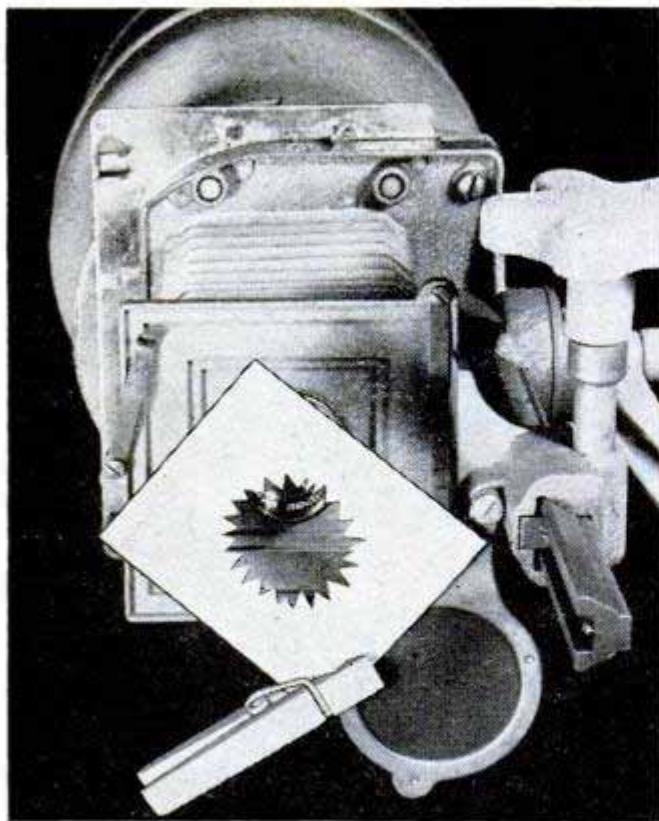
By Robert Hoppough

BECAUSE of the inconvenience usually involved in setting up a slide projector, many photographers don't show their color slides as often as they would like. One color fan solved this problem by building a convenient cabinet which stores all the equipment except the screen and doubles as an attractive chair-side table. When slides are to be shown, the adjustable top is simply raised to hold the projector at the desired height. The cabinet is made by covering a frame of $\frac{3}{4}$ -in. stock with $\frac{1}{4}$ -in. plywood, the frame members being doweled and glued together. The top extension rides in grooves formed by two cleats screwed to each of the rear uprights and, when closed, the extension serves as the back of the cabinet. Plywood partitions divide the cabinet into three storage compartments, while a sheet of plywood installed directly under the top rails provides a tray for the slides. The adjustable top is fastened to the extension as in the upper right-hand detail, wooden cleats and angle brackets being used to hold it rigidly in place. Note that the extension is mortised to receive the bracket arms flush with the surface so they will clear the rear crossrail. An ordinary spring-loaded window bolt installed in one of the inside cleats engages a hole drilled near the lower edge of the extension, locking it automatically in the raised position.

PROJECTOR CABINET

doubles as end table





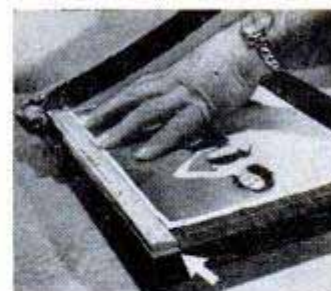
Vignetting Projection Prints By Use of Cardboard Cutout

Although hard-edged projection prints are suitable for most types of picture composition, there are certain subjects that call for vignetting and, in some cases, dodging during exposure. To leave both hands free for this job, one photographer attaches the vignetter to the filter mount with a spring clothespin as pictured. To avoid light reflections, coat the cardboard vignetter with flat-black photographic enamel.

ⓘ Unless a bellows-type camera is closed slowly, air pressure can buckle the film or even damage the bellows.

Improving Your Photo Trimmer

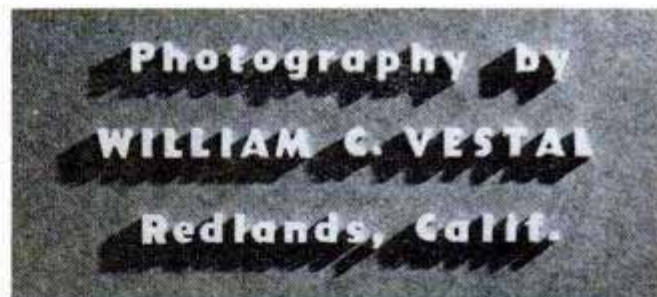
If you have been bothered by having photo prints slip under the guide while being trimmed and thus twist out of square, try the following kink: Remove the rule from the trimmer, after marking its position on the board, and rabbet the latter to a depth of about $\frac{1}{32}$ in. The rule guide can then be placed in this rabbet, which will bring its leading edge slightly below the surface of the trimming board where prints cannot slip.



Louis Hochman, Sherman Oaks, Calif.

Photographer Labels Albums With Novel Name Plate

One photographer, who specializes in preparing albums of homes and weddings, uses the novel label pictured below to identify his work. After arranging letters from a movie-titler outfit on a sheet of fiberboard or hardboard, he lights them to cast a long shadow and then photographs them. Prints from the resulting negative are gummed on the back to provide the labels.



Popular Mechanics Book Shop

How to Paint With Brush and Spray

Here are the answers to the many problems facing the average man who desires to do his own painting. The book contains 144 pages that serve as a complete guide to painting. It gives information on painting your house inside and out, as well as furniture and floors. Novelty finishes, silk stencils and the use of roller and spray gun are also among the subjects included. A handy Material Directory is part of the book. Price, \$2.50.

Money From Ideas

If you have an inventive trend of mind, here is a book that will help you cash in on your ideas. It tells how to apply for a patent, how to make working drawings, which inventions

are profitable and how to get them manufactured, financed, protected against infringement, etc. A remittance of \$2.50 will bring this money-making book to your home.

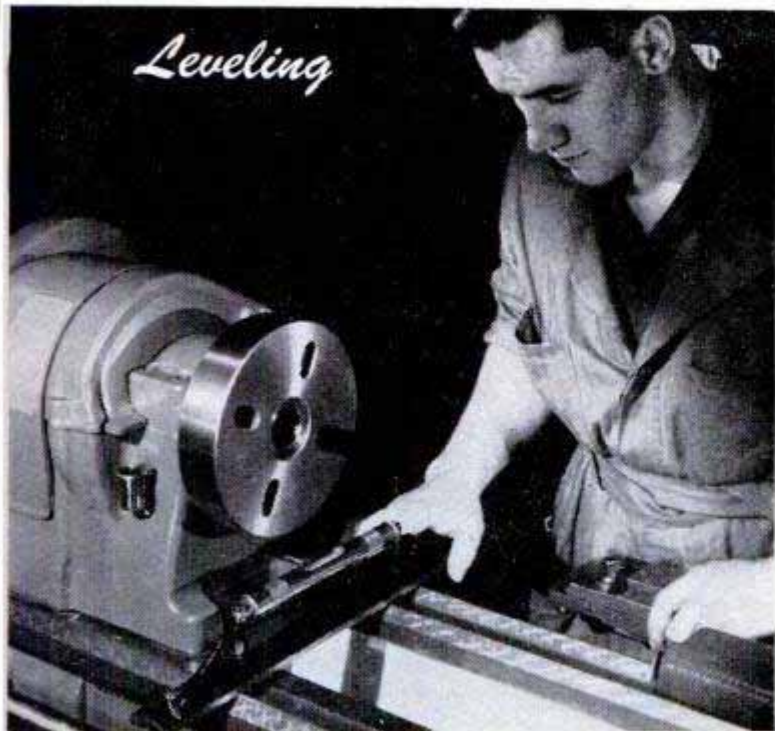
What to Make for Children

All the money in the world wouldn't buy everything you want for your children. But here is a book by the editors of *Popular Mechanics* that will show you how to make, at little or no cost, many of the things so dear to the hearts of youngsters—things such as nursery and playroom toys, dolls and doll-houses, gymnasium equipment, things to ride and toys that "work" and "go." Send \$2.00 for this book and make some of the toys to keep the little hands in your home busy.

All books available from Popular Mechanics Book Dept., 202 East Ontario Street, Chicago 11

SN 56

Leveling



True up your lathe for precision

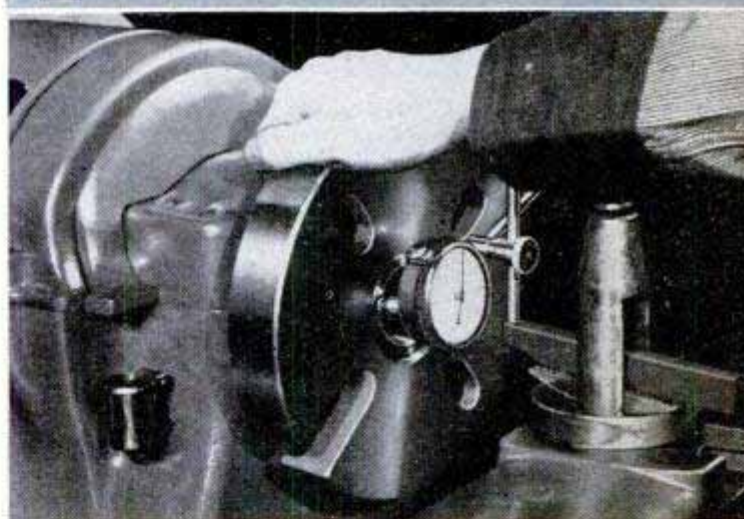
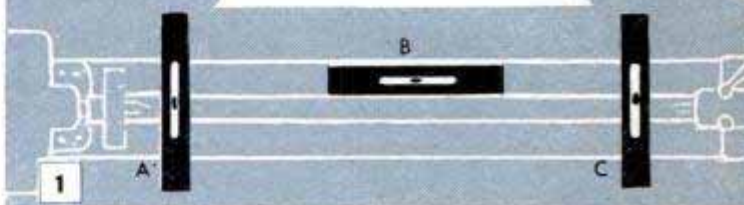
By E. R. Haan

WHEN GIVEN good care and occasional adjustments to compensate for wear, any well-made metal-turning lathe will do precision work for many years. Some of the things to watch in making periodic checks and adjustments are the bed level, spindle end play, spindle-bearing clearance, alignment of centers and clearance of gibs in the carriage, cross-feed and compound rest. You can also test the accuracy of face-plates and chucks.

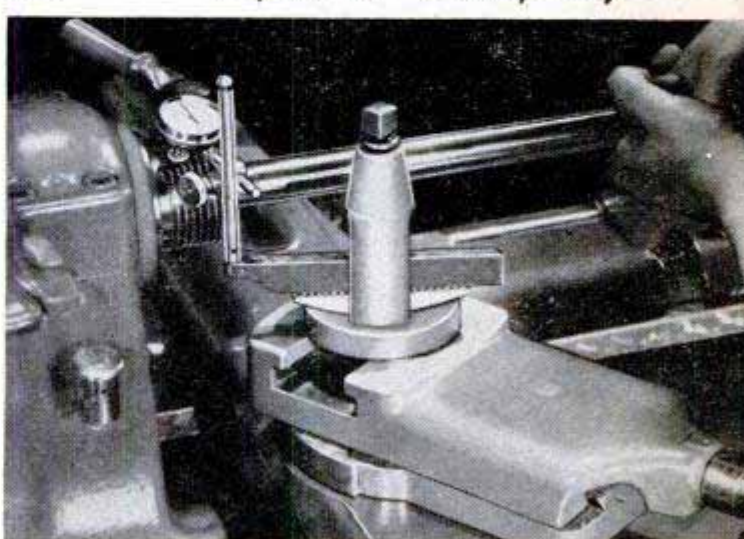
Keep the lathe level: Even the best lathes cannot be expected to give precision results if they are not level. If the bed is twisted slightly, headstock and tailstock are thrown out of alignment, causing tapers when turning and boring. As a lathe can be thrown out of level by wind, slight earth tremors and settling of buildings, don't neglect to check the bed occasionally with a precision level, both crosswise and lengthwise as in Fig. 1. Use leveling screws, metal shims or hardwood wedges under the feet to bring the bed level, and then recheck for level after the hold-down bolts or lag screws have been tightened. The lathe or the bench on which it is mounted should be bolted to a rigid floor.

Spindle clearances: Clearances vary with different types of bearings and with the size of a lathe. Adjustments should be made in accordance with the manufacturer's instructions. Before checking the spindle clearances, see that the bolts holding the headstock to the bed are tight. Then loosen the belt on the cone pulley to release the

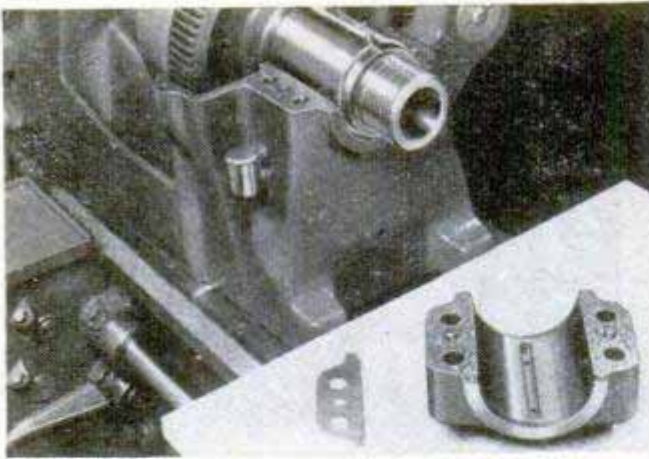
1



Spindle end play



Bearing clearance



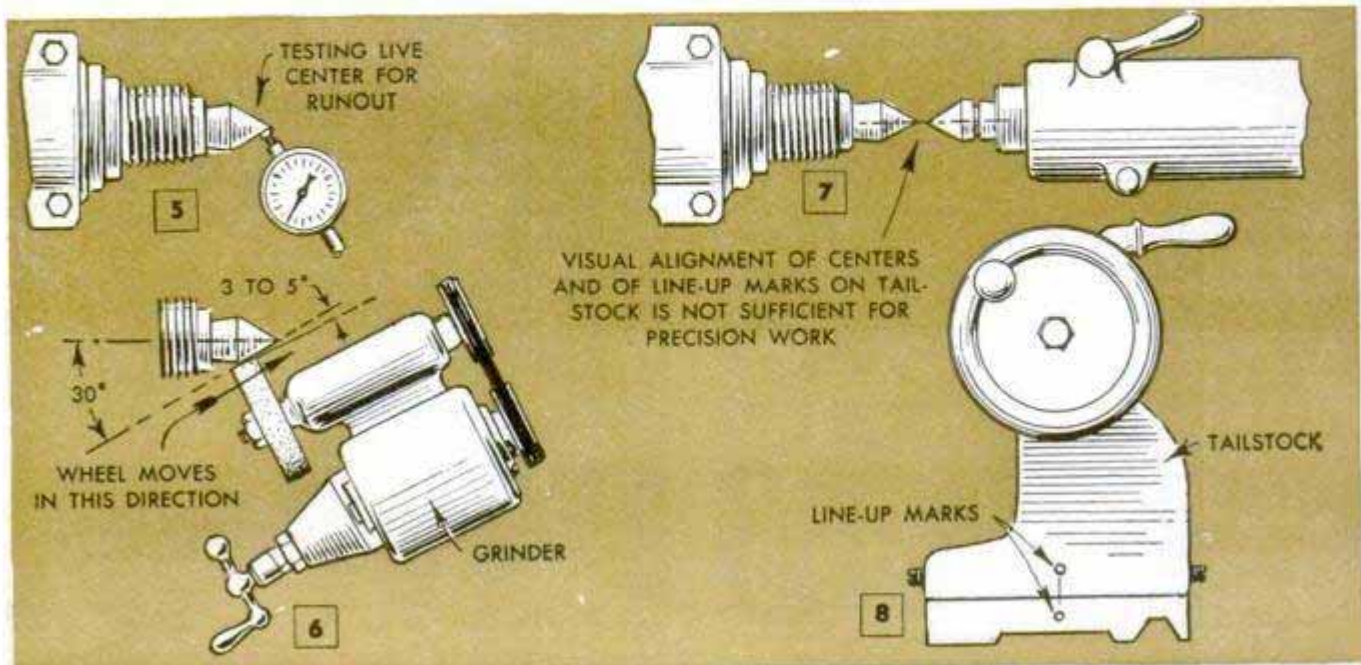
4 Shim laminations

tension on the spindle. Also have the back gears unmeshed. Excessive end play of the spindle may cause chattering and inaccuracy. To check the amount of end play, use a dial indicator. First, screw a faceplate on the spindle and, after the spindle has been pushed all the way back into the headstock, mount the indicator on the tool post, as in Fig. 2, so that the button rests against the end of the spindle—not against the faceplate. Pulling the faceplate in the opposite direction will cause the indicator needle to move, showing the amount of end play. On small lathes having split spindle bearings, end clearance generally should be from .001 to .002 in. If end play is excessive, loosen the setscrew holding the spindle takeup nut at one end of the spindle, and turn the nut until the correct end clearance is obtained. Then retighten the setscrew.

Bearing clearance: Spindle bearings of most small metal-turning lathes should be rather tight so that there is a slight drag when turning the spindle by hand. To check bearing clearance with a dial indicator, set it up so that the button rests against the top outside surface of the spindle as in Fig. 3.

Then use a test bar to lift the spindle, thus moving the indicator needle. A greater clearance than .002 may indicate the need of a bearing takeup. If the clearance is less than .001 in., chattering, heated and scored bearings may result. To reduce clearance of split spindle bearings, first clean off the headstock thoroughly so that no dirt or chips can get on the bearings or spindle. Then loosen and remove the bearing cap and also the laminated shims, Fig. 4. Peel off only one lamination from each shim, wipe the shims clean and remove possible burrs caused by peeling. Then replace the shims and bearing cap, tighten the bolts and recheck the bearing for clearance. If it's still too loose, remove another lamination; if it is too tight, substitute a shim half as thick as the lamination removed. Sometimes a lamination is taken off one shim only, and if this is not enough, a lamination is then removed from the second shim. This method avoids the necessity of replacing a lamination with a thinner shim if the bearing is too tight. Follow the same procedure on the other spindle bearing. Then run the lathe at a moderate speed. If the bearings become uncomfortably hot, readjust the shims.

Alignment of centers: Both centers must be located directly over the center line of the lathe for precision cutting. Centers will be inaccurate if they are not seated properly and, therefore, all contacting surfaces are thoroughly cleaned before assembling. A scratch or burr on the side of a center or sleeve may also cause incorrect seating. Then, the center itself may be worn so that it is not true. To test the live center, use a dial indicator mounted on the tool post with the button touching the side of the center near the point, as in Fig. 5. If the needle fluctuates when you turn the spindle by hand, there is runout. The tail-



stock or dead center can be put in the sleeve that fits the spindle and checked in the same way. Hardened centers (tailstock center is always hardened) are re-ground and polished; soft centers are turned. Grinding is done with a tool-post grinder set at 30 deg. from the lathe center line with feed screw on the left as in Fig. 6.

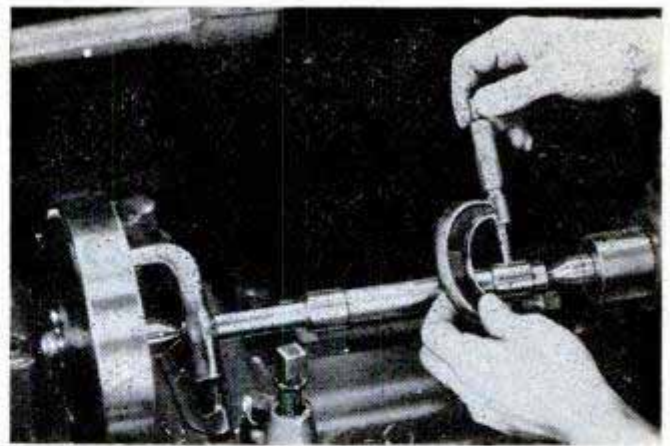
With both live and dead centers re-pointed, they may still be out of alignment for precision work, even when visually checked by bringing them together, Fig. 7, and by having the line-up or "witness" marks on the tailstock aligned, Fig. 8. One way to check alignment of centers is to turn a cylinder about 1½ in. in diameter, 14 in. long, with two collars turned about 10 in. apart. Finish both collars with a fine cut without changing the adjustment of the cutting tool. Then measure the collars with a micrometer as in Fig. 9. If both are the same diameter, the centers are in alignment. If not, loosen the clamp bolt of the tailstock, and adjust the tailstock by releasing one of the two setover screws and tightening the other one as in Fig. 10. Then reclamp and make another test cut on the collars. Some lathes have tailstock gibs for takeup adjustment to compensate for wear.

Adjusting gibs: The carriage, cross-feed and compound rest are provided with gibs to take up excess play, which may cause loss of precision. Gibs should be snug but not too tight, as this causes feeding to be jerky and inaccurate. Start gib adjustments by tightening them until the slide is too tight. Then loosen them just enough to make the slide work freely. Gibs are either straight or tapered. Straight gibs have a number of adjusting screws, Fig. 11. These should be turned uniformly. Tapered gibs have only one adjustment screw and a lock screw to hold it.

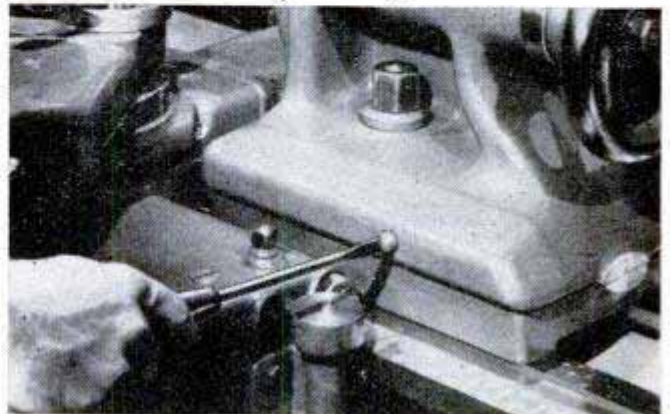
A loose carriage can undo careful adjustments on the cross-feed and compound rest. There are gibs and also bearing plates on the carriage to eliminate excess vertical and horizontal play. The bearing plates contact the underside of the ways, and are sometimes fitted with laminated shims. The carriage should be tight enough to prevent it from lifting, yet loose enough to avoid binding when moved along the ways with the handwheel. On some carriages, play between the gears connecting to the handwheel and the rack on the bed can be minimized by loosening the screws on the apron, pushing the gear case toward the rack, and tightening the screws.

Faceplates and chucks: Figs. 12 and 13 show how a dial indicator is used to check the accuracy of faceplates and chucks. The indicator is mounted on the tool post and the faceplate or chuck is turned by hand.

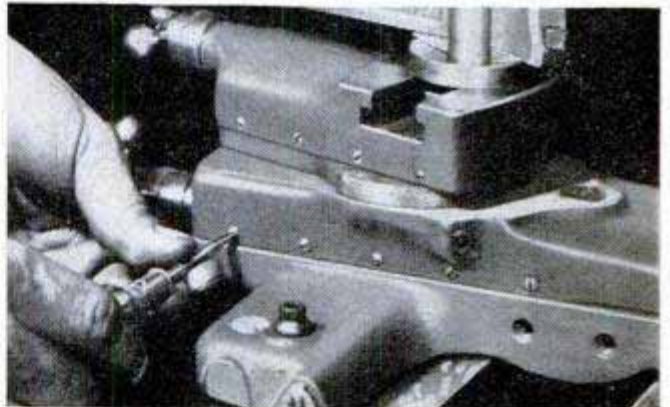
Photos courtesy South Bend Lathe Works



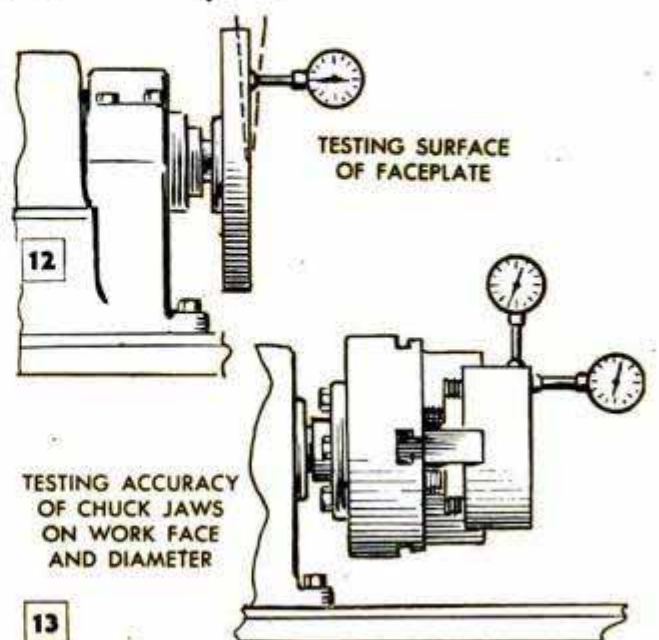
9 *Testing alignment*



10 *Tailstock setover screw*

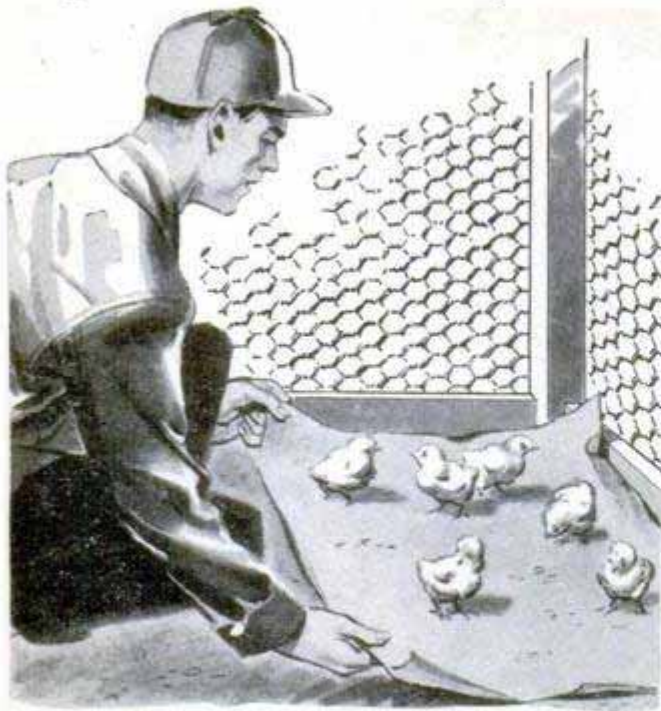


11 *Gib clearance*



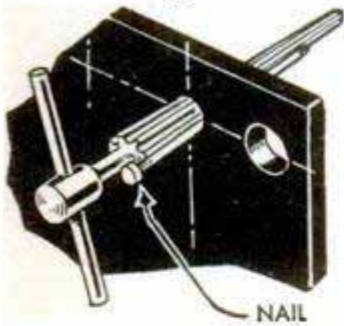
13

Large Cloth Gathers Baby Chicks



Baby chicks, which are allowed the freedom of a small pen for sun and exercise, are often difficult to get back into the brooder quickly enough to avoid an approaching storm. One poultryman solved this problem with a large cloth, made by cutting open a feed sack, which he spread in one corner of the pen. The chicks were then driven into the corner, on top of the cloth, where they were collected simply by gathering up the edges of the cloth.

Increasing Reamer Capacity



Sheet-metal workers often use this emergency kink when the required hole size exceeds the capacity of the largest taper reamer in the kit. After the reamer has been started and has

progressed through the hole to a little more than half its length, withdraw it slightly and insert a nail through the hole and position it between two of the cutting edges. Then continue the cut to the end of the reamer. In this manner the cutting capacity of the tool may be increased up to $\frac{1}{4}$ in. by using nails of various sizes.

W. H. McClay, Pasadena, Calif.

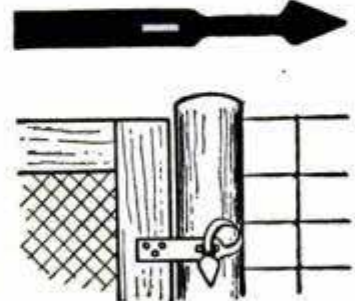
Length of Small Coil Spring Used to Clean Out Tubing

A length of small coil spring, of the type used for hanging curtains, can be used effectively as a "snake" with which to clean

the inside of small-diameter tubing. The flexibility of the spring permits it to follow the bends, when forced into the tubing, while the individual turns in the coil act as tiny scrapers against the tubing wall. If a smaller spring is required, use a speedometer cable. By rotating the spring inside the tubing, using a hand or power drill, a very thorough cleaning job can be done.

Emergency Gate Latch

If a metal gate latch breaks, here's a way to make an emergency repair quickly. Cut a short leather strap to the form shown in the detail, slotting it as indicated. Drive a



large staple into the post and nail the square end of the strap to the gate stile. Then slip the slot in the strap over the staple and pull the pointed tongue through the staple to hold the strap in place.

Gas-Welding Discoloration Prevented by Smoke Film

To prevent discoloring a stainless-steel or plated molding, when doing a welding job near it, the usual policy is to remove the molding. An easier precaution is simply to cover the molding with a thick layer of black smoke by playing a yellow flame over it. This will protect the surface of the molding from contact with oxygen in the air, so that even though the molding gets very hot, it will not be discolored.

Jackscrew Supported Firmly On Discarded Brake Drum

When it is necessary to place a jackscrew on soft ground for a vertical lift, or if the jack must be located at an angle to exert pressure sidewise, one house-moving contractor attaches it to a large truck-type brake drum.



This is done with bolts or, if the drum is to serve as a permanent base, with a tack weld. When placed on soft ground, the edge of the drum will cut into the soil as pressure is applied, giving a firm bearing which prevents tipping or sliding sidewise.

L. H. Houck, Jefferson City, Mo.

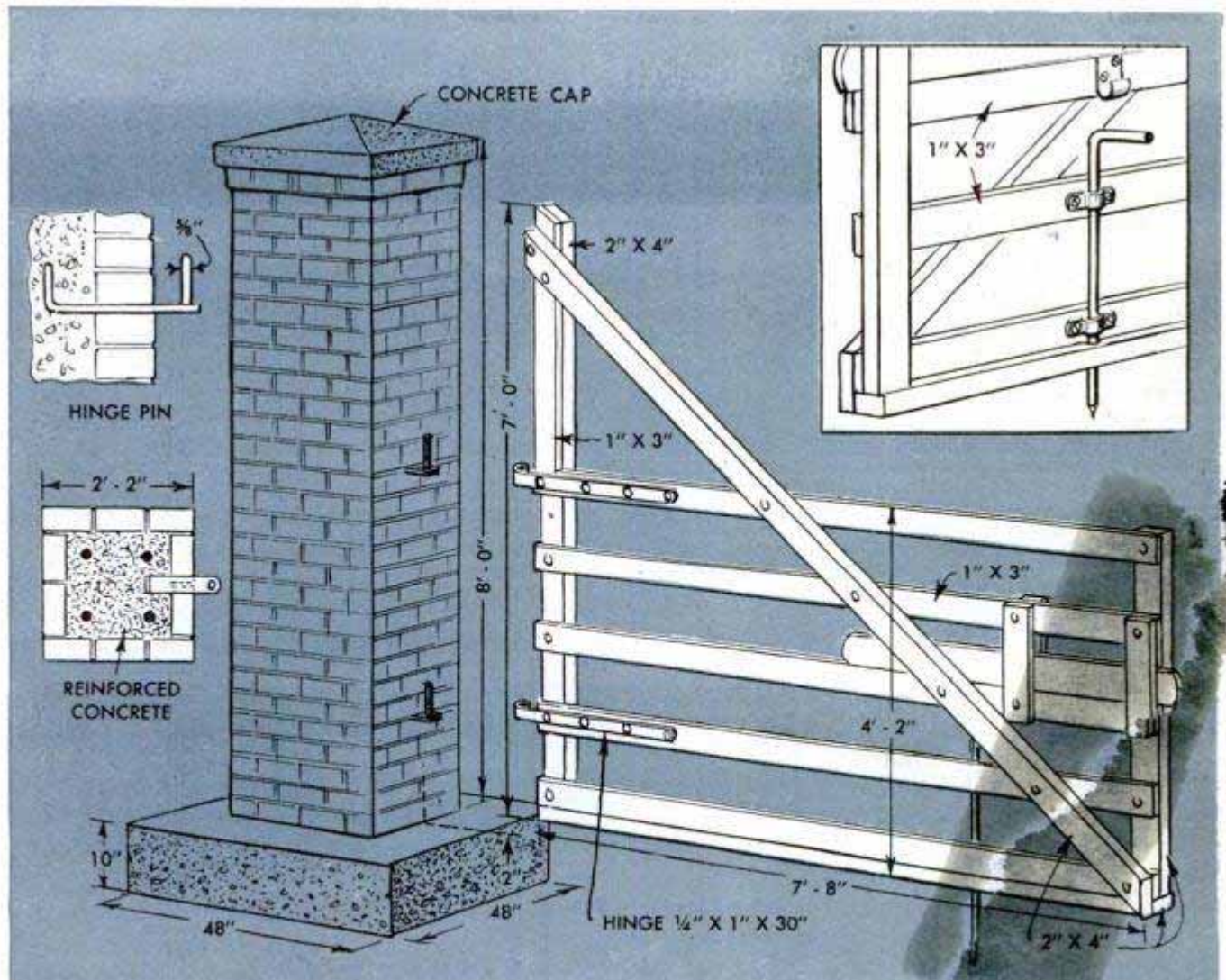


Farm Manual (55ed.)

Build a Better Farm Gate

HUNG from reinforced-concrete posts, this nonsag farm gate permits passage of all standard field implements while being especially designed to keep out livestock. The members of the two-piece gate are assembled with $\frac{1}{4}$ -in. carriage bolts. A stop, made from a length of rod, and a sliding bolt are fitted to one gate section, the tapered end of the stop engaging a pipe socket set in the roadbed. The posts are poured on concrete footings, veneered with

one course of brick, and fitted with concrete caps. Note that the hinge pins are welded to L-shaped brackets of flat steel, the bent ends of which are embedded in the concrete. Reinforcing rods are set in the footings when the latter are poured, and extend the full height of the posts. If preferred, 10 x 10-in. oak posts, set at least 3 ft. in the ground and guyed, may be used instead of the reinforced concrete. The lower portions of the posts should be creosoted.



How to Build a 15-Ton HYDRAULIC PRESS

60 0
Tools

By L. H. Houck

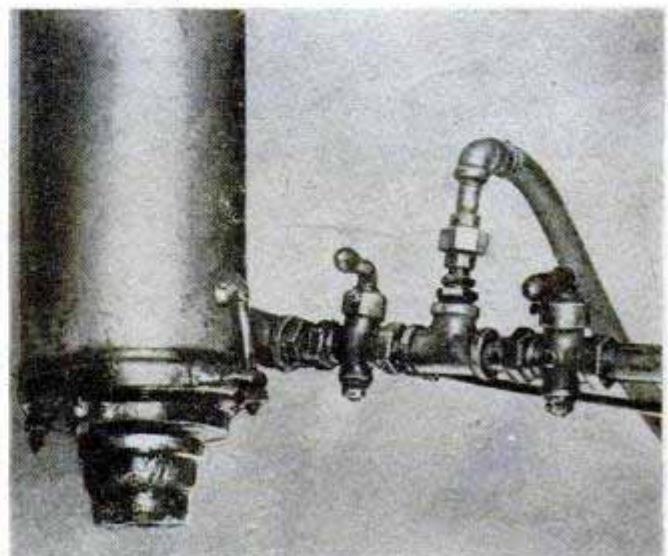
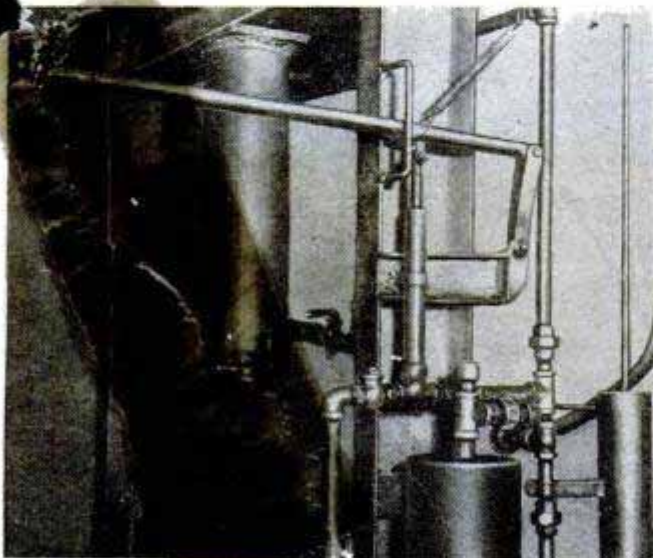
SHOP-BUILT and shop-proved for heavy duty, this fast-acting press has several unusual features that adapt it to a wide range of work, requiring plunger pressures up to 15 tons. That makes installation of press-fit bushings, bearings, and keys a simple job, and you also can handle just about any kind of arbor work that can be set up under the plunger. The design of the press frame gives you a lot of latitude in the choice of salvage materials and parts for its construction. As you will see from the illustration on the opposite page, the press beam is a 36-in. length of railroad rail, but you can use instead two lengths of 6-in. channel with spacers, or webs, welded between the channels to provide the necessary rigidity. The uprights can be built up by welding two heavy steel angles together to form channels. Changes in height and width dimensions also can be made to suit special requirements. The principal feature of the press is the pneumatic plunger return which speeds up duplicate operations as much as 50 percent. When it is desired to raise the plunger quickly after a work stroke has been completed, air under pressure is admitted to the hydraulic cylinder below the piston by means of a manually operated valve. This raises the plunger automatically and forces the hydraulic fluid back into the reservoir. As the piston comes down on the next stroke, residual air below the piston is bled off through an

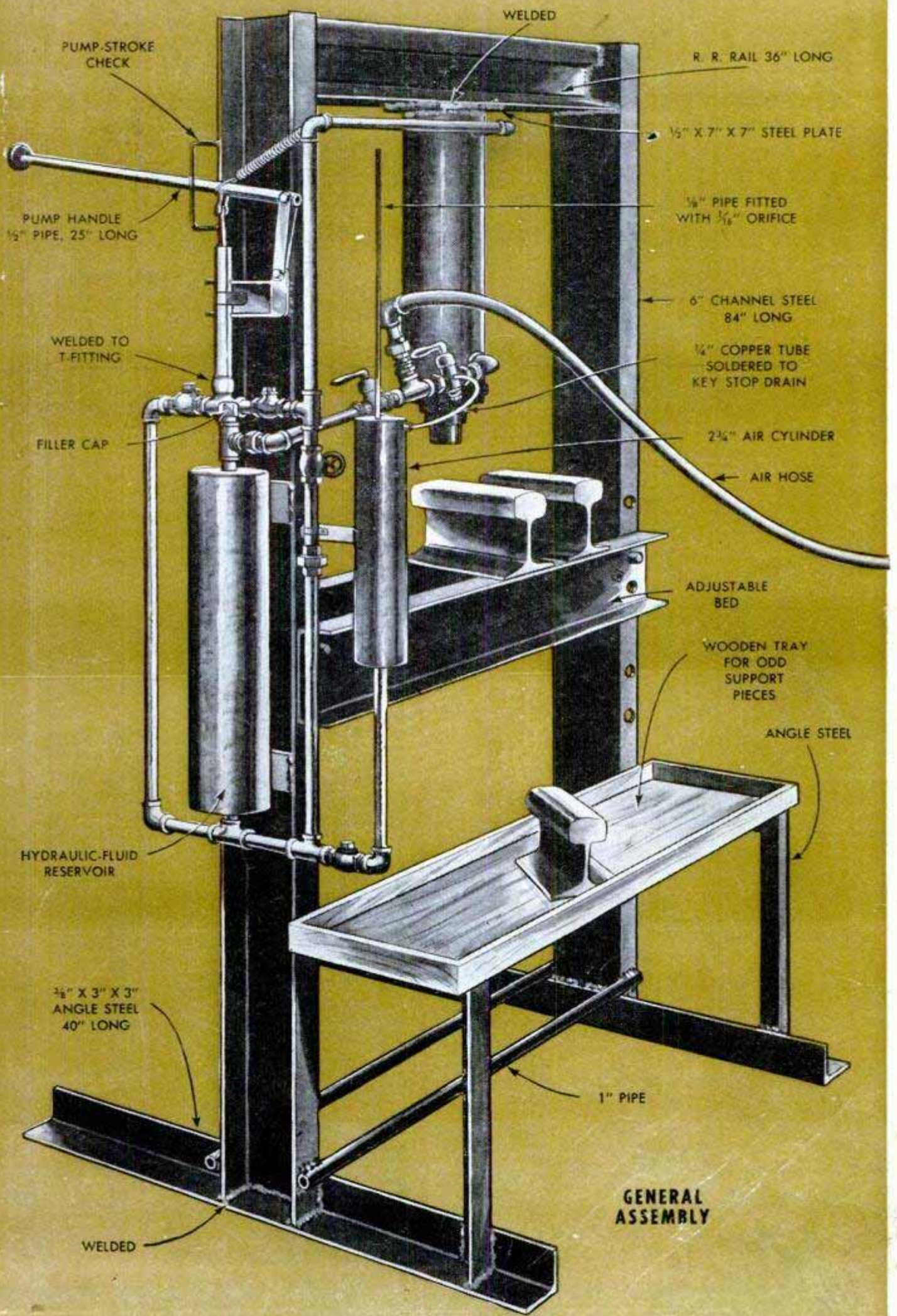
expansion tank. The sequence of operation is quite simple to carry out, even with one hand. To bring the plunger down on the power stroke, the valve at the right in the right-hand photo below, is opened, admitting air under pressure to the hydraulic-fluid reservoir. This forces fluid from the reservoir into the hydraulic cylinder. If necessary, additional pressure on the plunger is built up by a few strokes of the hand pump. Then, to return the plunger, the right-hand valve is closed and the left-hand valve opened to admit air under pressure below the piston. The valves used are of a special type known as key stops, having a reversible check and drain tapping. However, ordinary stop valves having a drain tapping can be used. Note in the general-assembly illustration on the opposite page that the air-bleeder line leading to the air chamber, or expansion tank, is soldered into the drain tapping in the body of the valve. The drain tapping in the body of the right-hand valve is closed with a plug.

In making the pipe connections to the hydraulic reservoir and pump, it is important that the check valves be properly located. Note especially the position of the check valves in relation to the pump in the assembly view on the opposite page, and also on page 202, and be sure that you have them installed so that they permit fluid to flow under pressure to the hydraulic-press

A hand-operated hydraulic pump gives the operator delicate control of pressure applied to the work

Valves control air pressure to hydraulic cylinder and reservoir. Press can be operated with one hand





PUMP-STROKE CHECK

WELDED

R. R. RAIL 36" LONG

1/2" X 7" X 7" STEEL PLATE

PUMP HANDLE
1/2" PIPE, 25" LONG

1/8" PIPE FITTED WITH 1/16" ORIFICE

WELDED TO T-FITTING

6" CHANNEL STEEL 84" LONG

1/2" COPPER TUBE SOLDERED TO KEY STOP DRAIN

FILLER CAP

2 3/4" AIR CYLINDER

AIR HOSE

ADJUSTABLE BED

WOODEN TRAY FOR ODD SUPPORT PIECES

ANGLE STEEL

HYDRAULIC-FLUID RESERVOIR

3/4" X 3" X 3" ANGLE STEEL 40" LONG

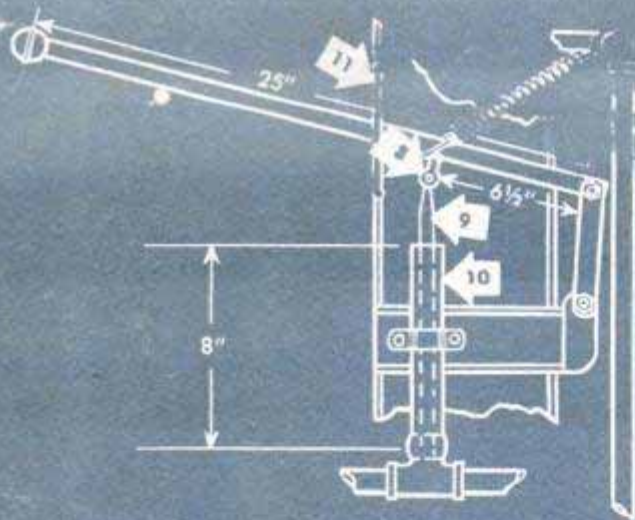
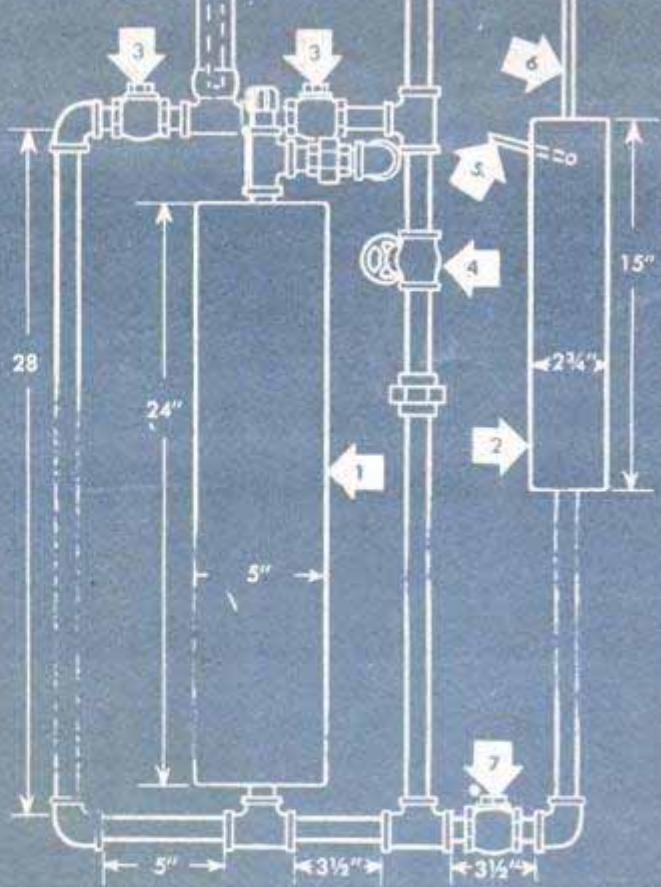
1" PIPE

GENERAL ASSEMBLY

WELDED

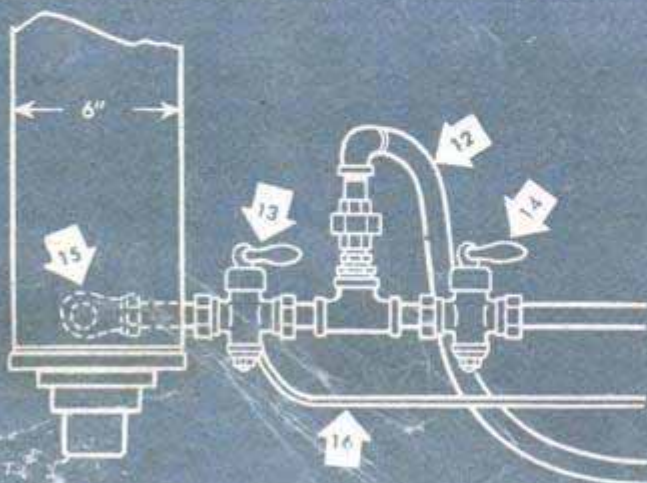
TANK AND PIPE DETAILS

1. Reservoir tank for hydraulic fluid. A short nipple is welded to the openings at each end
2. Small-diameter air-expansion tank. Air and residue fluid enter tank through bleeder tube
3. Check valves, left and right, admit fluid on the pump upstroke, release it on the downstroke
4. Hand valve is closed to prevent the passage of fluid which is being pumped into cylinder
5. Copper tube, soldered to drain opening of key stop, bleeds off air used to raise the piston
6. Small-diameter pipe, fitted with orifice, is welded to opening at the top of the air tank
7. Check valve prevents passage of fluid into air tank, permits fluid residue to pass into line



PUMP DETAILS

8. An auto brake-rod yoke is welded to the pump handle to straddle arc hinge to pump plunger
9. The pump plunger is 1/2-in. round steel, 10 in. long, drilled and tapered to hinge in the yoke
10. A 1 x 8-in. steel rod is bored to receive the plunger and welded to a T-fitting in the line
11. A 1/4-in. U-shaped steel rod, welded to straddle the pump handle, serves to check pump stroke

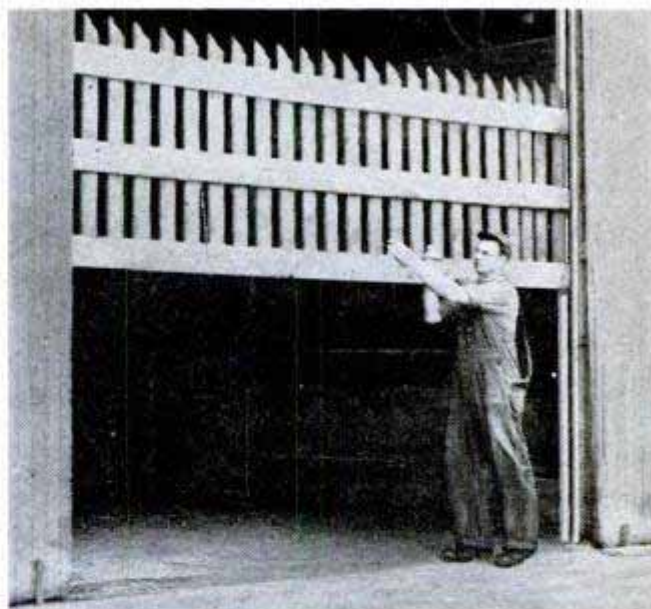


AIR UNIT DETAILS

12. Airline supplies pressure to lift the extended piston and to force fluid from the reservoir
13. Key stop on left admits air pressure to press cylinder, speeds raising the extended piston
14. Key stop on right, with drain plugged, admits air to reservoir, forcing fluid into cylinder
15. Airline is welded to opening in press cylinder, admitting air which raises the extended piston
16. Copper bleeder tube is soldered to key-stop drain opening and leads to fitting in air tank

cylinder above the raised piston. As an example, when the hand-pump plunger is raised, vacuum opens the check valve at the left (see the detail on the opposite page) to allow fluid to enter the pump cylinder. The down stroke of the pump plunger opens the valve at the right and closes the one at the left, forcing fluid to the hydraulic-press cylinder. This manner of utilizing the pump gives the operator a very delicate control of the amount of pressure applied by the plunger.

The hydraulic pump is a simple unit consisting of a handle pivoted in the manner shown and fitted with a return spring, the cylinder being welded to a pipe tee at its lower end. The pump cylinder is made from a 1 x 8-in. length of steel shafting center-bored longitudinally to a diameter of $\frac{1}{2}$ in. The pump plunger is a length of $\frac{1}{2}$ -in. steel shafting, 10 in. long, flattened and drilled transversely at the upper end to form an eye for attachment of the handle yoke. The plunger should be lapped into the hole in the cylinder to assure a tight, leakproof fit. The keyed detail drawings on the opposite page give you the general dimensions of the other parts of the hydraulic assembly. The hydraulic-press cylinder is of the type used on dump trucks. Note in the assembly illustration on a preceding page that the upper end of the cylinder—the lower end becomes the upper end when the cylinder is inverted—is welded to a $\frac{1}{2}$ x 7 x 7-in. steel plate which in turn is welded to the press beam as indicated. Note also that the platen beams, which support a platen or fixtures on which the work is placed, are adjustable vertically. Make sure that the rows of holes drilled in the legs of the channels are located so that the beams will be exactly at right angles to the press cylinder when all parts are assembled in working position. A wooden tray at the back of the press frame holds the various fixtures and blocks when not in use.



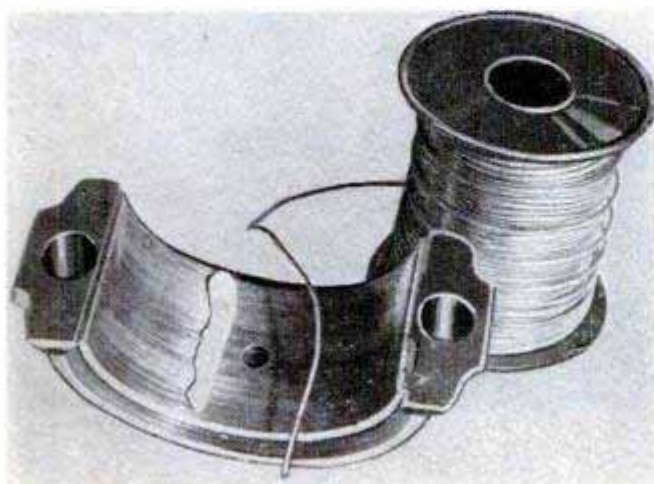
Counterbalanced Dairy-Barn Gate

The gate pictured was installed in a dairy barn where it effectively bars entrance of livestock and at the same time admits an abundance of light and ventilation to the interior. Held in grooves at each side of the doorway, the gate is the type that lifts in the same manner as many garage doors. It is counterbalanced with a 5-gal. bucket filled with sand, which is attached to one side of the gate by means of a rope and pulley arrangement.

Making Carborundum Pastel Board

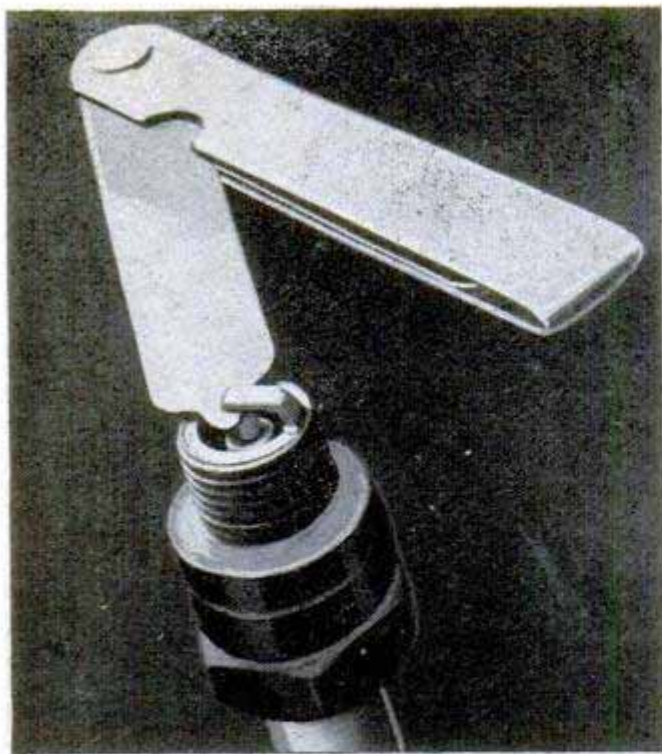
After being stored in rolled form over a period of time, carborundum pastel paper usually is very difficult to flatten. However, the paper can be flattened by mounting it on a sheet of heavy cardboard to form a pastel board. To do this, a sheet of photo-mounting tissue is cut slightly larger than the pastel paper. "Tack" the tissue to the back of the paper by heating two or three spots on the tissue with the tip of a medium-hot clothes iron. Then iron the tissue-backed pastel paper to the cardboard.

Fuse Wire Doubles as Plastic Thread for Checking Bearing Clearance



One mechanic found that he was able to use ordinary fuse wire for checking the clearance of bearings, in place of the special plastic thread manufactured for that use. The bearing cap is removed and a short length of 5-amp. fuse wire is laid across it. Then the cap is replaced and the bolts are drawn to the specified tension. This flattens the fuse wire so that when it is removed it can be miked to determine the clearance.

☞ Before tapping a blind hole, fill it with cutting oil. As the thread is cut, the chips will be forced out with the oil.



Pipe Lengths Welded to Bumper Hold Warning Flags

When it is necessary to display signal or red warning flags on trucks operating on the highway or on certain types of contracting jobs, the problem is how to attach the flags so that they are readily seen and yet are easily removed when not required. One practical solution is to weld



short lengths of pipe to the ends of the front bumper, as illustrated, to form sockets. The warning flag is attached to a 30-in. length of pipe of a smaller diameter that will telescope loosely into the sockets. The short flagstaves made in this manner are bent slightly at a point approximately 6 in. above the lower end so that when they are in use they will not drop through the sockets.

Grover Brinkman, Okawville, Ill.

Identifying Feeler-Gauge Blades

The "popular" blade on a feeler gauge, the one which is used more frequently than the others, can be made easily recognizable by grinding the end of it as shown. In the event that two or three blades are used quite often, each one can be identified by grinding it a different shape and memorizing the respective thicknesses.

Stacks of Corrugated Roofing Lifted Safely With C-Clamp



Roofers handling sheets of corrugated roofing will find use for this simple kink when it is necessary to hoist the sheets to roof level by means of a tackle or a rope windlass. Just stack five or six

sheets and attach a C-clamp at the edge, near one end. Be sure that the clamp is securely tightened. Then attach the windlass rope or the lower tackle block to the clamp.

Herbert E. Fey, New Braunfels, Tex.

Ink "Flowing" Checked By Pencil-Lead Film

After inked lines have been erased from a drawing, any subsequent use of ink on the same spot is likely to "flow," resulting in ragged lines. To prevent this, rub the erased area with a soft-lead graphite pencil and complete the inking over it.

Index File for Magazine Articles

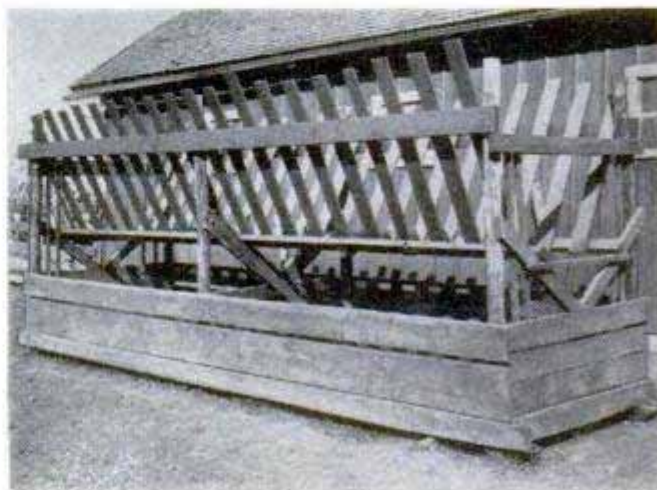
With a file containing the index pages of each magazine saved, persons who use this type of reference material can quickly locate the article they want. Simply cut out the index pages, punch holes in the margins and file them in a loose-leaf notebook.

Pat Fey, Columbus, Ohio.

Movable Hayrack Saves Feed

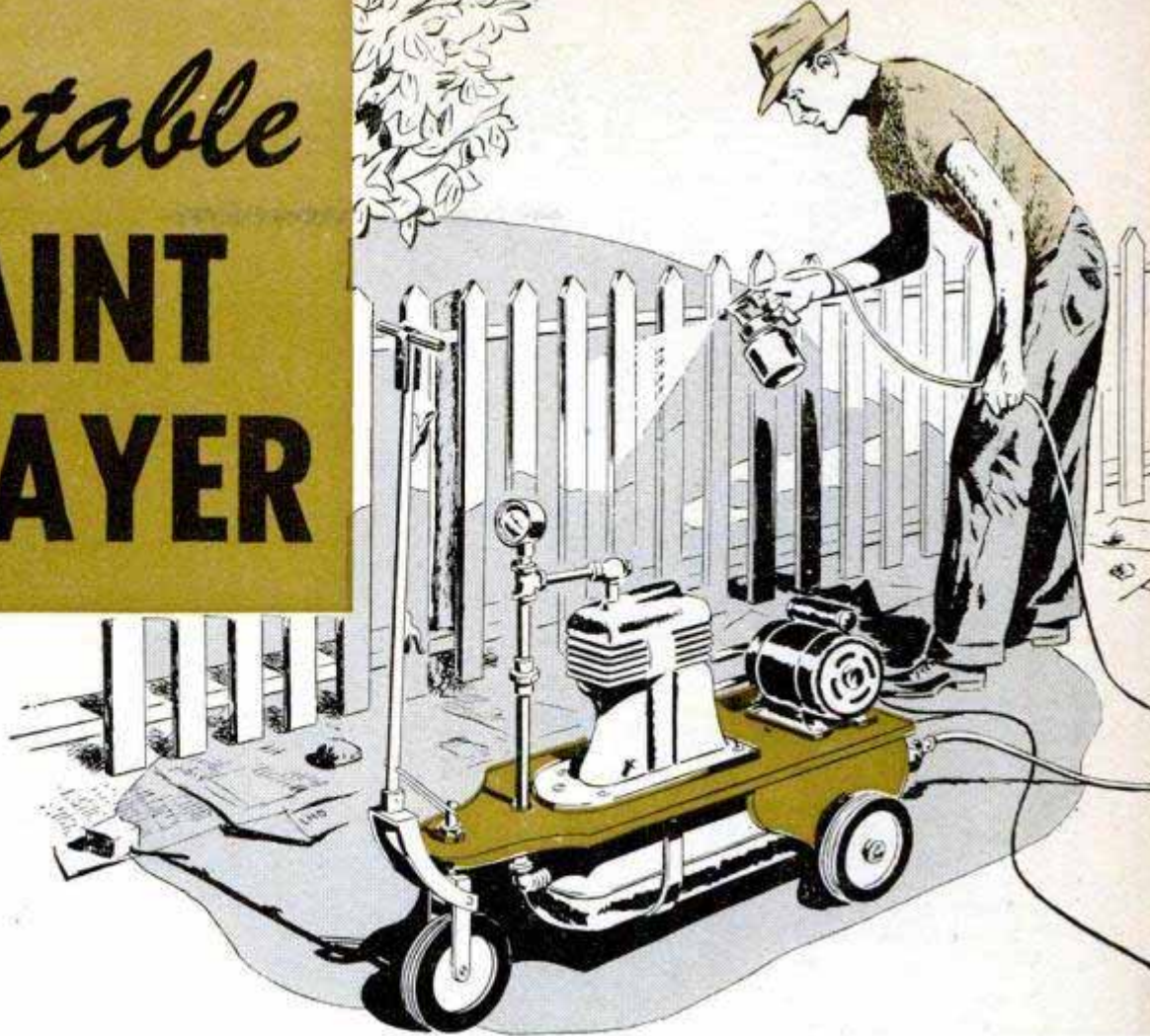
This large-capacity hayrack has its base boarded up to save the hay and shatterings worked out by the cattle. Being firmly mounted on skids it may be readily moved by tractor wherever needed.

A. M. Wettach, Mt. Pleasant, Iowa.



Portable PAINT SPRAYER

By
Hi Sibley

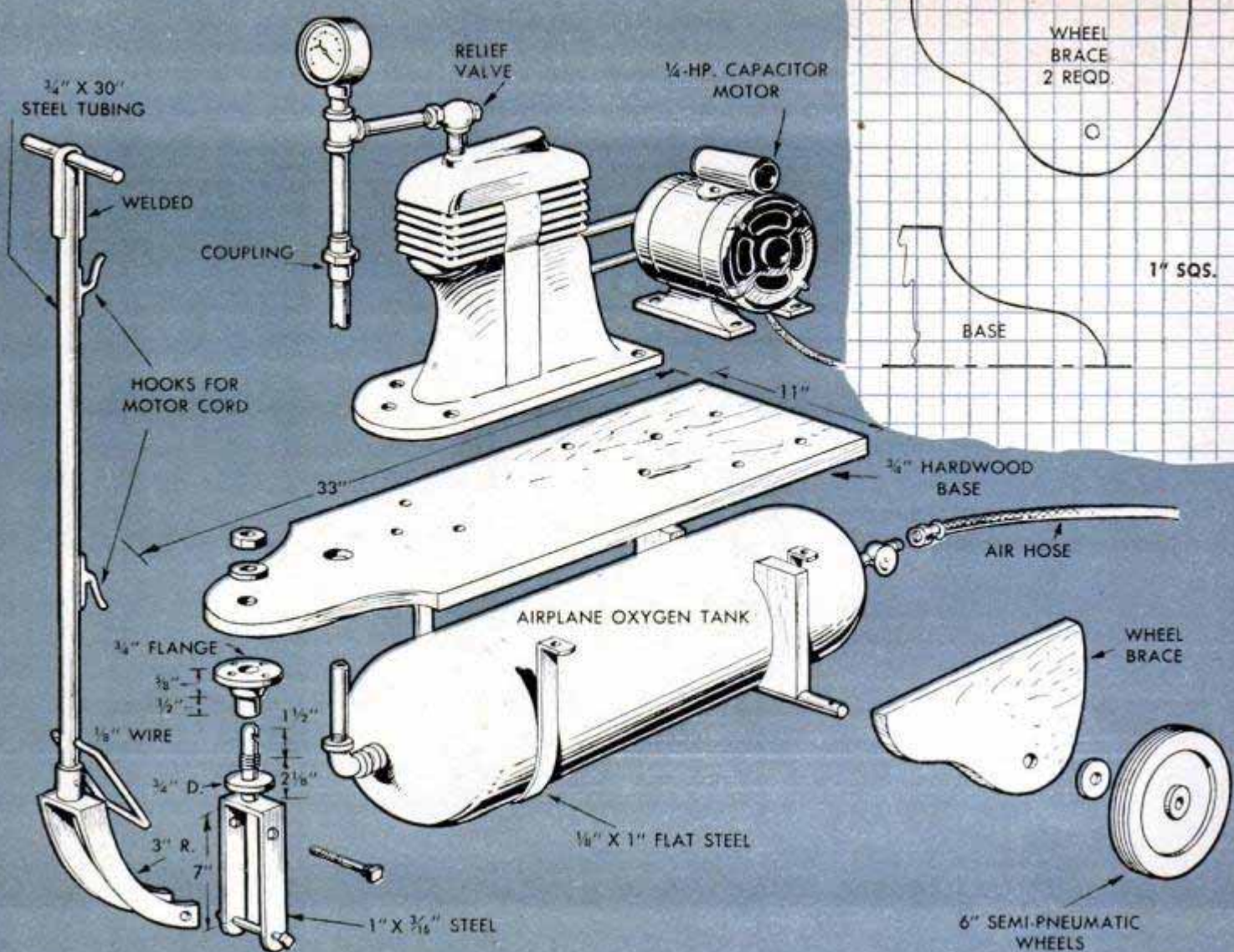


BY USING a number of unrelated parts, you can build this handy paint-spraying unit which has several outstanding advantages for both indoor and outdoor use. Tricycle construction with semi-pneumatic wheels gives the truck the required stability either on rough ground or smooth floors, and the capacity of the compressor unit with its pressure tank is sufficient to handle any sprayable paint, lacquer or enamel. Use it around the home for painting screens, fences or even the house and garage. It does a "factory" job on home-shop projects in wood or metal, and you can't beat it for refinishing furniture with either enamel or varnish.

The compressor can be any of the ordinary belt-driven piston or diaphragm types available either new or secondhand. The motor should be of the capacitor type and of $\frac{1}{4}$ to $\frac{1}{2}$ hp., depending on the size of the compressor used. To operate a bleeder-type spray gun efficiently, the compressor should deliver from 2 to 3 cu. ft. of air per minute, at 30 to 50 lbs. of pressure. On the original unit, an airplane-type oxygen tank serves as the pressure tank. The air line from the compressor to the tank is made up from $\frac{1}{4}$ -in. iron pipe and fittings, and should include a relief valve and pressure gauge as shown in the detail on the following page. Make sure that the relief valve is in working condition before installing, and also that it is of a size suited to the

type of compressor you are going to use.

Note particularly the assembly of the pressure-tank cradle which is built up from flat-steel bands, or straps, and hardwood saddle blocks. The latter are curve-cut on one edge to a radius equal to that of the tank and are rounded to an inside curve on the lower edges, the curve having a radius equal to that of the rear axle. In the assembly, the wheel braces are drilled near their lower edges to fit over the ends of the axle and are screwed to the saddle blocks and the edge of the base or platform. The base is cut from hardwood and one end is bandsawed to the shape shown in the detail on the following page. The upper right-hand detail on the same page shows how to lay out the curves for the wheel braces and the curved end of the base. Both the compressor and motor are bolted to the base in the positions shown. Although not indicated in the detail, it's a good idea to elongate the holes for the bolts holding the motor, as this provision will permit adjusting the belt tension. The caster-wheel yoke and towing handle are assembled from steel tubing, or pipe and fittings, and pieces of steel shafting. Hooks are formed from short lengths of steel rod and welded to the handle column to provide storage for the long motor cord when the unit is not in use. After bending, the wheel yoke is welded to a spindle $3\frac{5}{8}$ in. long which is turned down about $\frac{1}{8}$ in. for a distance of $1\frac{1}{2}$ in.



from each end. The remaining section at the center is threaded as indicated in the detail above, and a notch is filed at an angle near the top end of the shaft. A $\frac{1}{8}$ -in. wire bail attached to the handle is hooked into this notch to hold the handle in the upright position when not in use. In assembling the wheel yoke, a washer is first placed over the spindle to form a bearing seat. Then the spindle is inserted through the flange and short pipe nipple, which have been screwed to the underside of the hardwood base, and a washer is placed over the spindle. A nut is turned down onto the

threaded section of the spindle and drawn fairly tight to hold the assembly securely. The handle yoke is attached to the wheel yoke by means of a bolt passing through holes drilled near the upper end of the wheel yoke.

Each time you use the sprayer it is of the greatest importance to clean the gun thoroughly immediately after use. Fill the container about half full of paint or lacquer reducer, open the nozzle slightly and blast out the entire contents of the container. This procedure will remove all paint or lacquer residues from the small passages.

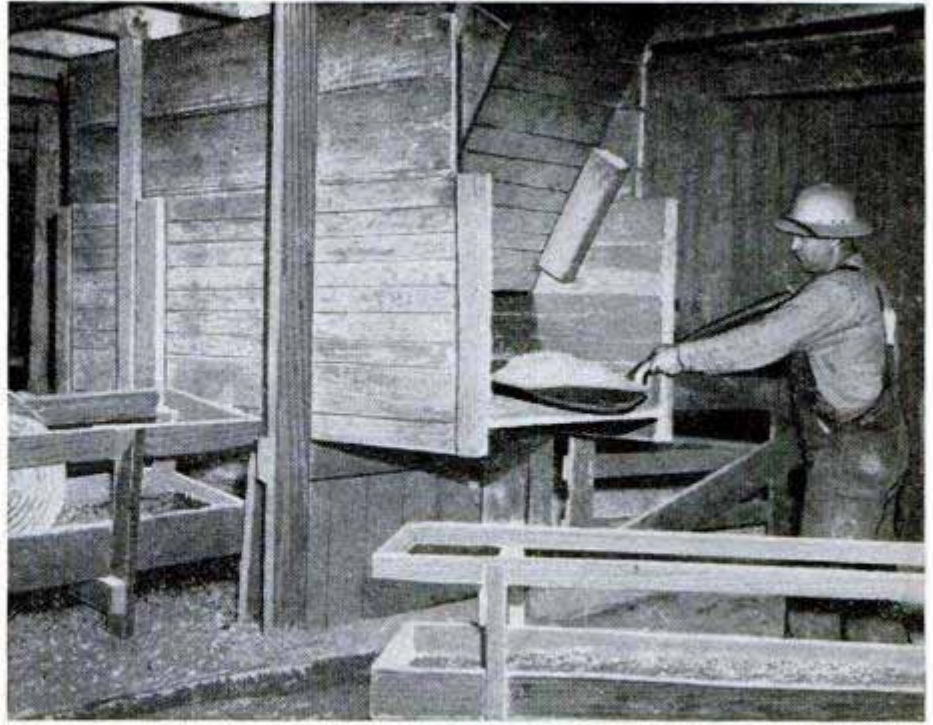
Twin Cupolas Installed on Granary Save Time When Storing Grain

To prevent the loss of time in frequent changing of the portable-elevator distributor when filling side cribs, one farmer installed twin cupolas on his granary. These are spaced on the ridge so that a single length of the distributor will fill both cribs half full, from one end, with a single setting of the elevator. Then the elevator is moved to the second cupola and the process repeated. The short length of the distributor also reduces any tendency to become clogged with ear corn.

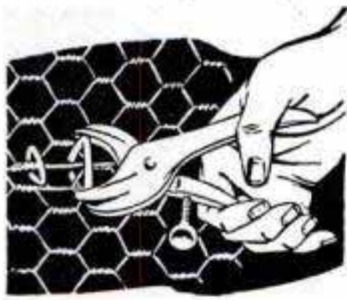


By storing chopped hay, grain and feed supplement in the haymow of his cattle barn and using a self-feeder type of delivery hopper, one Illinois farmer was able to reduce the time and labor usually required to feed livestock on the first floor of the barn. The different feeds, in this case chopped hay, ground grains and supplement, were mixed in the correct proportions and then directed into the hopper from which the mixed feed was quickly scooped into feeding bunks. If desired, the bed of the hopper can be hinged so that the front can be swung down, permitting the feed to flow directly into the bunks.

Self-Feeder Type Granary Hopper Saves Considerable Labor in Barn



Small Hog Rings Used to Join Lengths of Woven-Wire Fencing



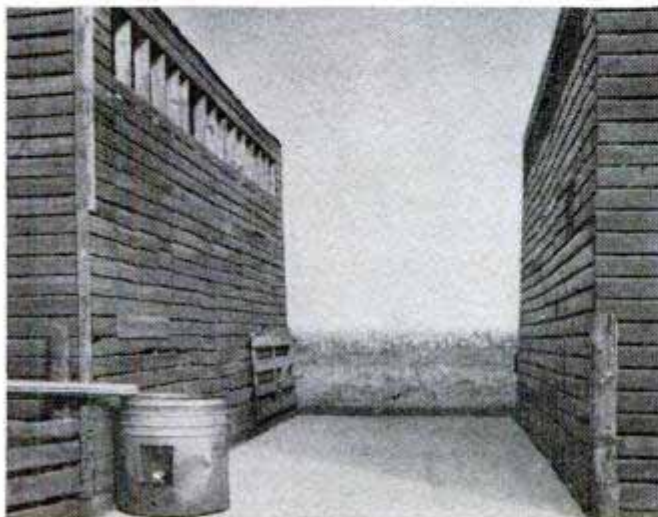
When it is necessary to join lengths of chicken-wire or woven-wire fencing, edge to edge, in order to increase the overall height of the fence, one farmer

uses ordinary hog rings in the smallest size available. First, he staples the two lengths of wire to the posts, one above the other. Then he simply hooks the rings over the stay wires and closes them with a special closer, similar to pliers, which is made especially for this purpose. Ordinarily, the rings are spaced about 4 in. apart.

Kendrick Martin, Hayward, Calif.

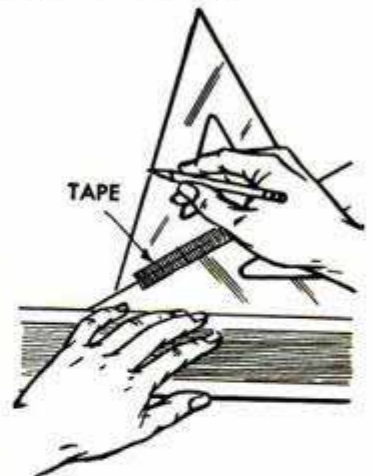
Concrete Feeding Floor Between Two Corncribs

A concrete floor between adjacent corncribs, provides a handy feeding place for livestock. Feed stored in the cribs is close at hand and by swinging a gate across the opening at one end of the cribs, livestock can be easily sorted and loaded onto a truck at the other end.



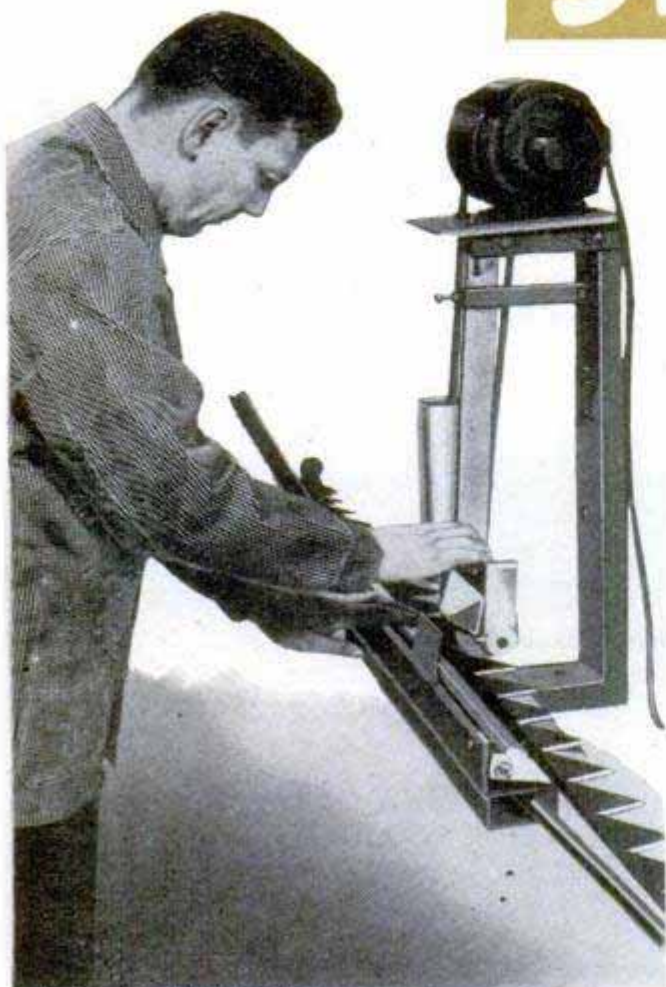
Parallel Lines at Special Angles Inked Directly From T-Square

To ink parallel lines directly from the T-square at angles of 75, 105 and 120 deg., one draftsman saves time by taping a 30 and 45-deg. triangle together as detailed. This has proved to be a more accurate and flexible method than those ordinarily employed to ink parallel lines at angles other than the ones provided by the regular triangles. The triangles, which are taped together as a unit, speed up the tedious job of inking fine-line shading, special cross-section lines and perspective drawings where there are a number of parallel lines at the same angle on large views.



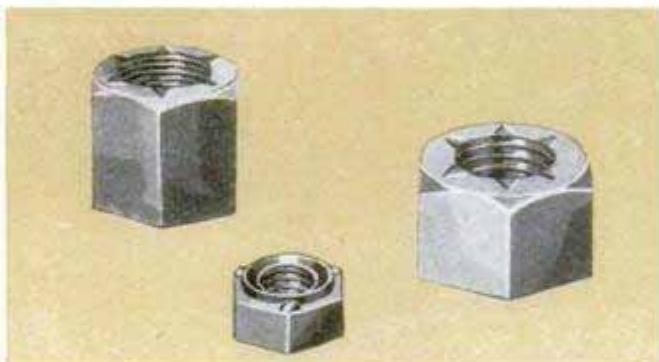
A. J. Ackerman, Binghamton, N. Y.

SHOPPING



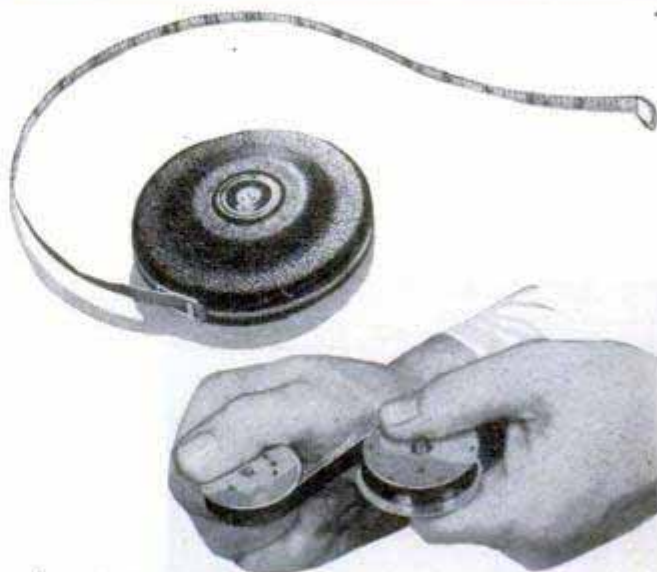
Lantz Mfg. Co., Valparaiso, Ind.

MOTOR-DRIVEN SICKLE GRINDER sharpens all sizes of mower sickles from 1 to 7 ft. long without a change of grinding wheels. The grinding-wheel arbor is mounted on a swinging arm which is pivoted vertically in a channel-steel frame, the arm being operated in a manner similar to a swing saw. Uses the standard beveled sickle-grinding wheel which grinds two edges on adjacent knife sections at one stroke of the swinging arm. Table, or holder, is specially designed with a spring tension for proper grinding pressure



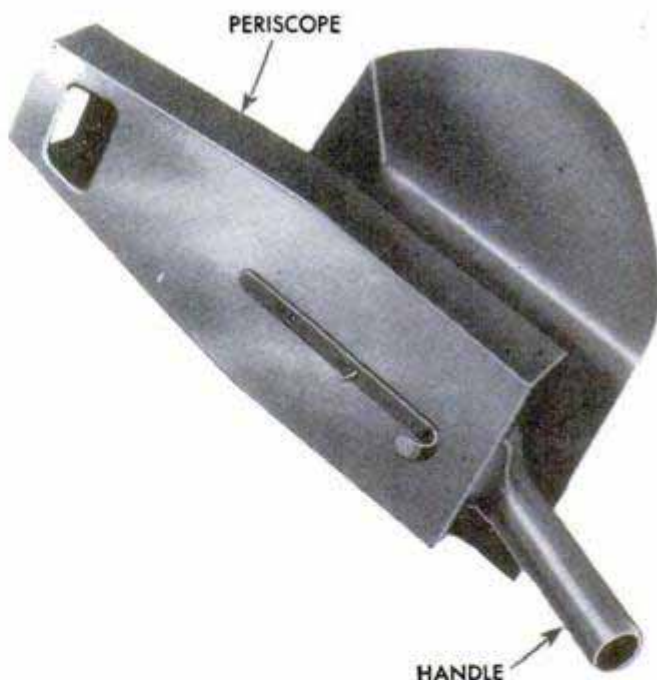
Grip Nut Co., 308-T S. Michigan Ave., Chicago

SELF-LOCKING NUTS with special thread deflectors are designed to withstand severe vibration and tension without loosening. Available in all the standard sizes with various thread specifications and also as high nuts and thin nuts. Come in steel, stainless steel and various nonferrous metals according to individual specification. Also furnished in a special weld nut with projections which have been redesigned to give a firmer, more uniform metal-to-metal contact



Master Rule Mfg. Co., 40 Mulberry St., Middletown, N. Y.

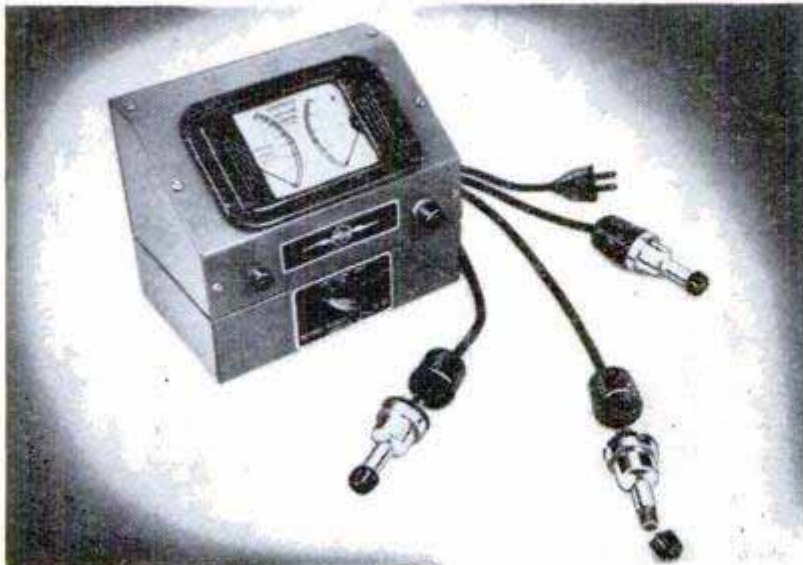
SELF-RETRACTING TAPE RULE reels its entire length of 50 or 100 ft. back into the case when a button on the side plate of the case is pressed. It is said to be the first self-retracting tape rule that rewinds automatically, a feature which eliminates the necessity of rewinding the steel-tape rule by means of a folding hand crank. Power for rewinding the tape is supplied by a specially designed spring motor driving through a planetary gear shown in the lower photo above. Weight is 23 oz. Available in 50 and 100-ft. lengths



Industrial Products Co., Philadelphia 33, Pa.

NEW WELDER'S SHIELD fitted with a novel periscope is designed for work where the welder cannot normally see to make the necessary weld in fabricated work. Often its use eliminates the necessity of cutting out sections of the work in order to reach the part to be welded. Shield is of conventional design, the welding glass being pivoted in such a way that it is easily moved out of the line of vision when necessary by means of a finger-operated trigger

FOR TOOLS



Hastings Instrument Co., Inc., Hampton, Va.

DIRECT-READING VACUUM GAUGE fitted with a five-position switching attachment gives an accurate $\frac{1}{2}$ -second response and is a reliable electrical indicator capable of measuring absolute pressures from 0 to 1000 microns of mercury. These features make the gauge ideally suited for leak-detection warning work or for pressure-operated control systems. The length of the cable from the indicator to the pickup tube does not affect calibration, so extensions for remote readings may be added whenever desirable

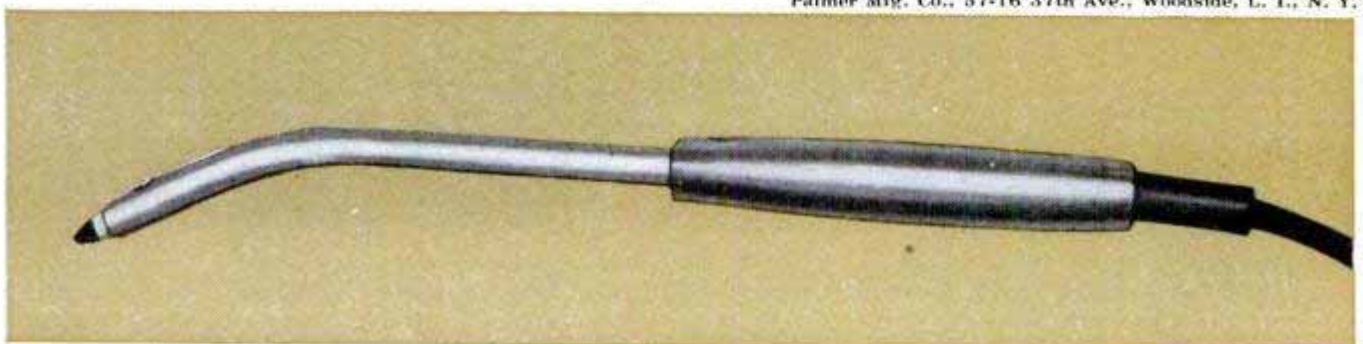


Coffing Hoist Co., Danville, Ill.

MIDGET HAND-OPERATED HOIST, or puller, weighs only $9\frac{1}{2}$ lbs., yet handles a 1000-lb. load on any lifting, stretching or pulling job. The lifting mechanism in the head is completely enclosed and the dual-purpose handle can be made to serve either as a straight lever or as a crank simply by swiveling the handhold at right angles to the straight section. Two ratchets, one on the lever and one on the lift mechanism, make it possible to lift heavy loads in close quarters permitting only a partial stroke

ELECTRIC SOLDERING IRON which operates on 6 volts from a battery, or from a transformer on 110-volt line, is especially useful to instrument makers, radio servicemen and others who do soldering on small parts where faultless solder connections are essential. The iron, which weighs only 4 oz., requires no filing or tinning

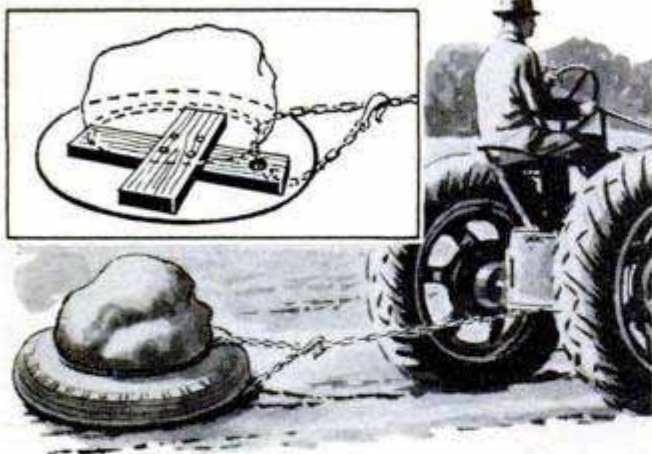
Palmer Mfg. Co., 57-16 37th Ave., Woodside, L. I., N. Y.



Simplex Level Co., Detroit 7, Mich.

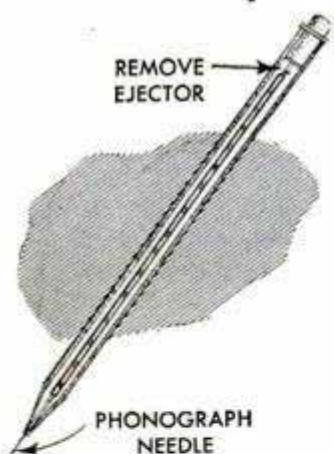
ALL-METAL LEVEL for plumbing door-jamb and window frames is 6 ft. 6 in. long to give maximum bearing in either horizontal or vertical position. Has adjustable, replaceable spirit vials which can be adjusted or removed with a screwdriver. New method of mounting vials gives extra protection against breakage. Level body is made entirely of extruded metal, making it lighter and stronger without any sacrifice in accuracy. It also is available in standard lengths ranging from 24 in. up

Stone Sled for Moving Boulders Improvised From Auto Tire



The need to do heavy lifting, in order to clear a field of boulders or otherwise transport them, is completely eliminated when using this unique stone sled. Made from an old truck or auto tire, a heavy stone is loaded simply by rolling it over the tire onto a heavy plank frame in the center. The frame consists of two thick planks which are crossed and spiked together inside the tire as shown. While in transit, the stone is held on the sled by the thickness of the tire. A chain, by which the sled is drawn, is attached to one of the planks.

Automatic Pencil-Scriber Does Fine Layout Work



Not satisfied with the performance of an ordinary scriber on a critical layout job, one machinist quickly devised one that suited his purpose by using a steel phonograph needle and an inexpensive automatic pencil. He simply removed the leads and the

ejector from the pencil and inserted the needle. Then he replaced the ejector mechanism. In this way the sharp needle serves as a scriber point and is retractable in the same manner as the lead.

R. C. Brophy, Santa Fe, N. Mex.

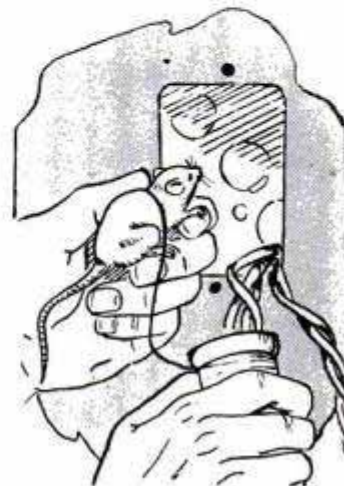
Tips on Typewriter Care

If your typewriter is acting sluggish, blow it out with an air hose or hand pump, and oil all obvious places. Do not wash the machine with gasoline or kerosene as these fluids will cause the rubber rollers and other rubber parts to swell. Keys usually

stick because burrs have formed on the edges of the type bars. Remove them by touching lightly with a file. Clean erasure particles from the slots in which the keys pivot with a thin piece of wood, such as a toothpick. Correct paper slipping by rubbing the roller with sandpaper and scrubbing it with alcohol.

Pet White Mouse Put to Work Fishing Wire Through Conduit

Fishing new electric or telephone wires through large-diameter conduit and around sharp bends is facilitated by using a white mouse to pull a length of string through the conduit. The string, in turn, is tied to a stronger cord which is pulled through and the

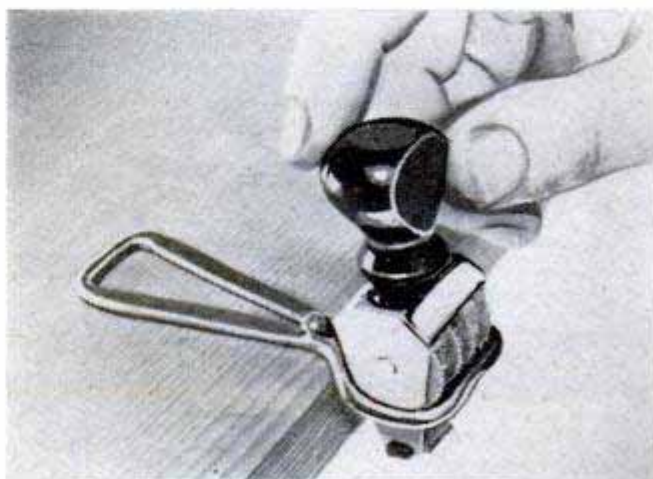


procedure is repeated until the cord in the conduit is strong enough to handle the wire. The original length of string is tied around the mouse so it will not slip off, and the mouse is encouraged to go through the conduit by the scent of a piece of cheese placed at the other end. The scent can be blown through the conduit with an electric fan.

Ross C. Carnahan, Columbia, Mo.

Handy Date-Stamp Holder Formed by Bottle-Cap Lifter

Desiring a means of keeping his date stamp always at hand for frequent use, one shipping clerk found that a bottle-cap lifter attached to the edge of the table with a wood screw was just the thing. The lifter holds the stamp in a vertical position where it is easily reached and at the same time keeps it from being misplaced.



TELEVISION TODAY

A—Television's version of the walkie-talkie is the experimental "walkie-lookie," a portable TV-transmitting station weighing only 53 pounds. Recently demonstrated by the RCA Laboratories division of the Radio Corporation of America, before the Institute of Radio Engineers in New York, this battery-operated TV transmitter sends both voice and video signals for a mile. It is expected to have wide use in news coverage and in industrial operations. It also has obvious military applications.

B—Combination console-table TV set provides the homemaker with a television set that can meet any decorating scheme. It can be used either as a table model or, by attaching the legs which are shipped with each set, it makes a console as illustrated. It employs a 20-in. rectangular tube.

C—This personalized Roundup-Time, TV Director Chair for children saves wear and tear on good furniture and also keeps the children off the floor. It is provided with a Chow Tray, and also a writing-desk attachment shown in the inset photo.

D—One of the television conveniences for owners of home sets is the Lazy-Bones station selector that permits the TV viewer to change reception from one station to another while at ease in an armchair 15 feet or more away from the set. All that is necessary is to press the hand-held switch. No fine tuning or other adjustments are needed. Pressure on the switch revolves the motor-driven turret tuner and brings in station, picture and sound automatically.

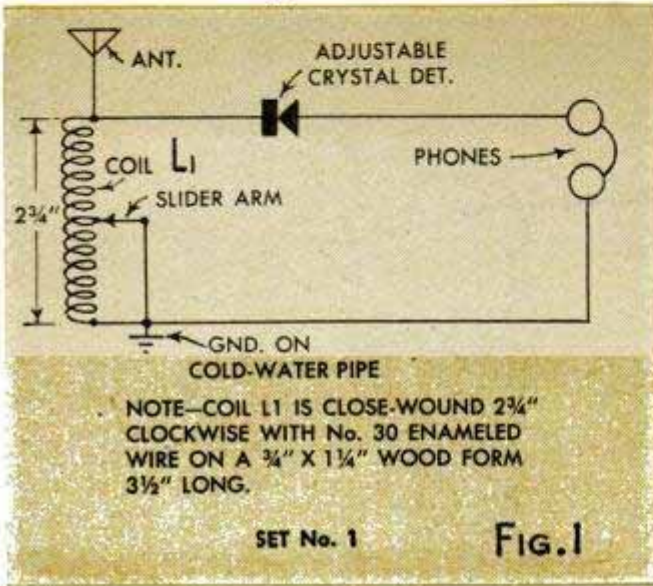


LOW-COST RECEIVERS *for*

By Stan Johnson



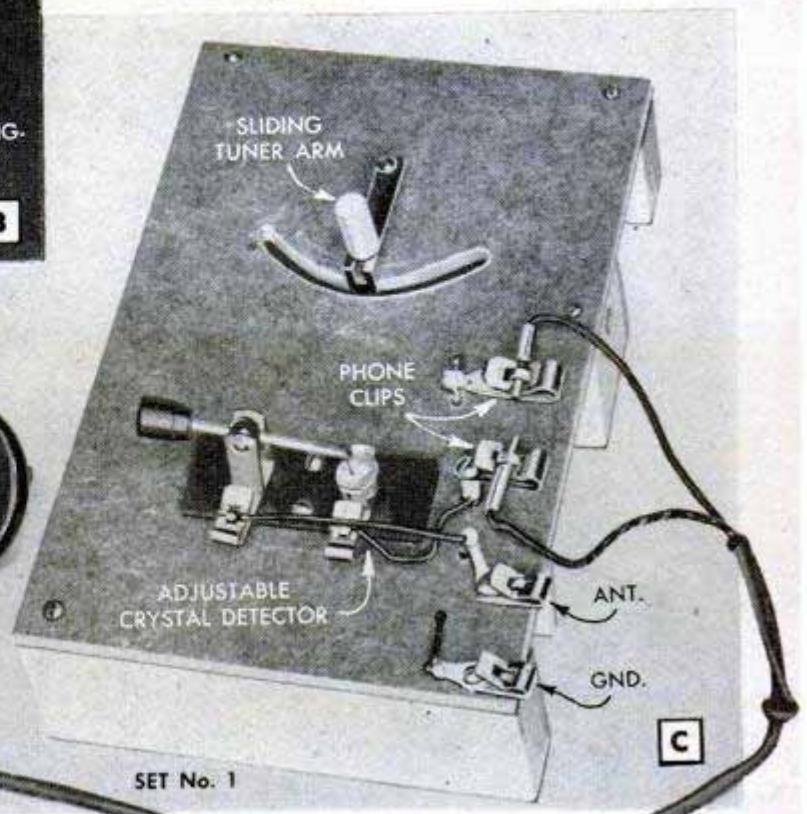
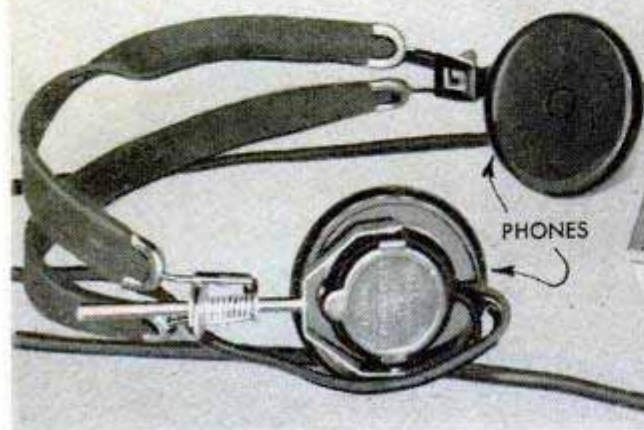
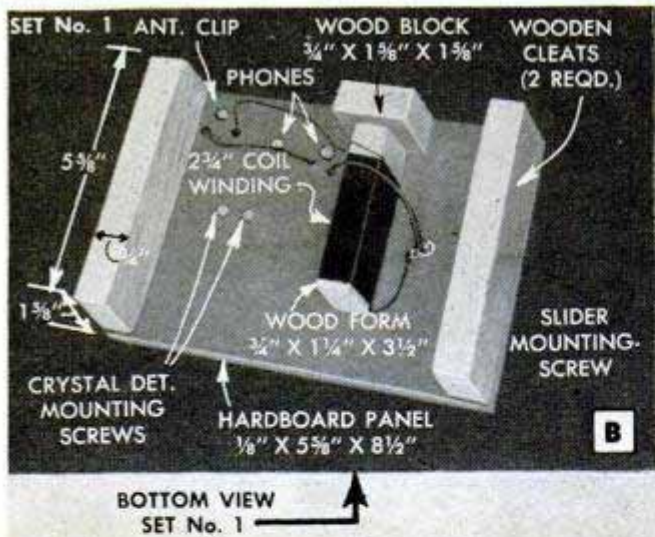
A



SUITABLE radio-construction articles for beginners and junior builders are not as plentiful as they should be, as every Boy Scout leader knows. The main requirements are low cost, simplicity of design and reasonable efficiency. Both of the broadcast-band receivers described in this article meet these requirements. Set No. 1 is an extremely simple receiver that employs an adjustable galena-crystal detector. It will give very satisfactory reception on strong local stations. It has the added feature that it can be modified to form the No. 2, one-tube set, with very little added cost as the same simple chassis base and tuning coil are employed.

The 3Q5-GT tube in set No. 2 will give greatly increased headphone volume on the same stations. It employs a 1N34 germanium fixed-crystal detector, and the tube operates on flashlight cells. Set No. 2 has the same receiving range as set No. 1 because the tube acts merely as an amplifier for the signals that the crystal detector is able to pick up. Distant reception with any crystal receiver depends on your location and the type of antenna and ground system employed. With a good long and high outdoor antenna, and a ground connection made to a cold-water pipe, the average range is about 25 miles for powerful broadcasting stations. Under exceptionally good receiving conditions, much greater distances have been covered.

Complete construction details for set No.



JUNIOR BUILDERS

1 appear on page 212. The set is built up on a small hardboard panel supported by a pair of wooden cleats. The panel is slotted, as shown in photo C, to provide space for the "slider" to contact the coil underneath. The slider is made from two Fahnestock clips flattened and bent to form a wiping contact; they are joined by means of a small wood screw run into a wood dowel, $\frac{3}{4}$ -in. long, which provides a tuning handle. The mounting details for set No. 2 are clearly shown in the pictorial wiring diagram, Fig. 2. The tuning-coil construction is the same in both sets.

The schematic circuit diagram for set No. 1 appears in Fig. 1. Top and bottom views are shown in sketch A and photos B and C. Anchor the coil ends in holes on the wood form. Make the turns tight and as close together as possible. The winding is $2\frac{3}{4}$ in. long. Mount the coil form on the bottom of the panel directly under the slot by means of a wood screw through the wood end block and, on the other end, by a tiny brad through the panel. Once in place, the slider arm should be worked back and forth a few times to wear off the enamel on the wire for good contact. All circuit

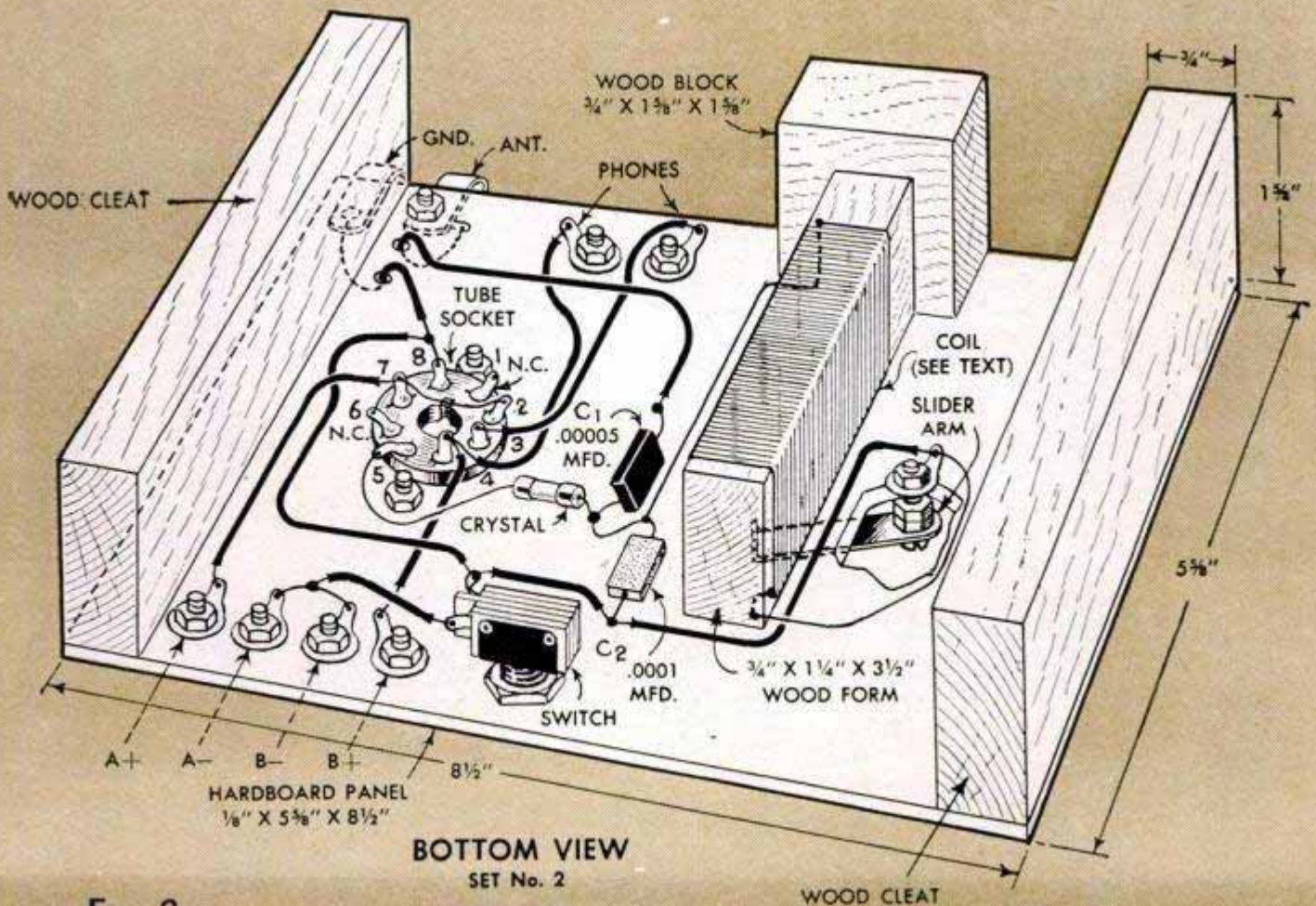
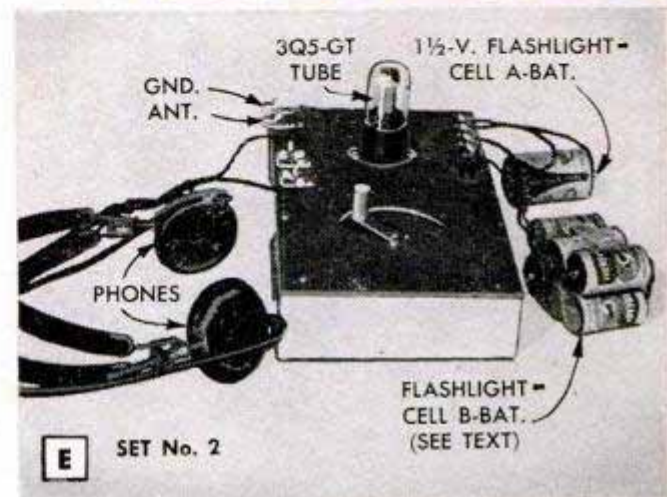
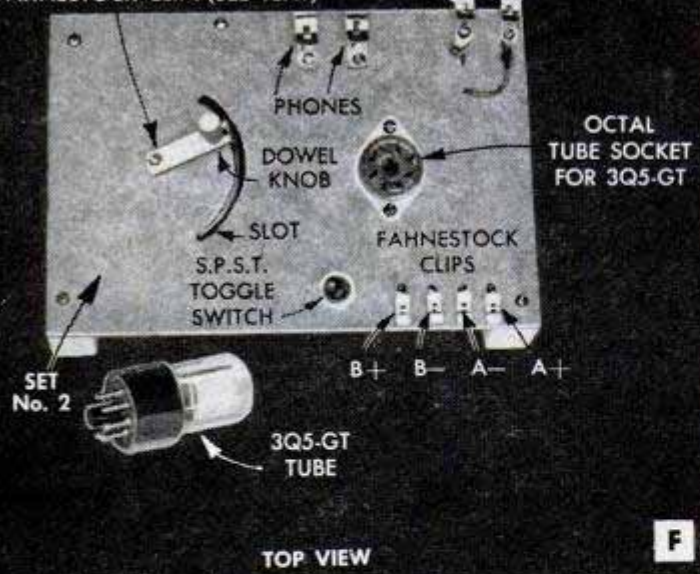


FIG. 2

NOTE

MADE FROM 2
FAHNESTOCK CLIPS (SEE TEXT)

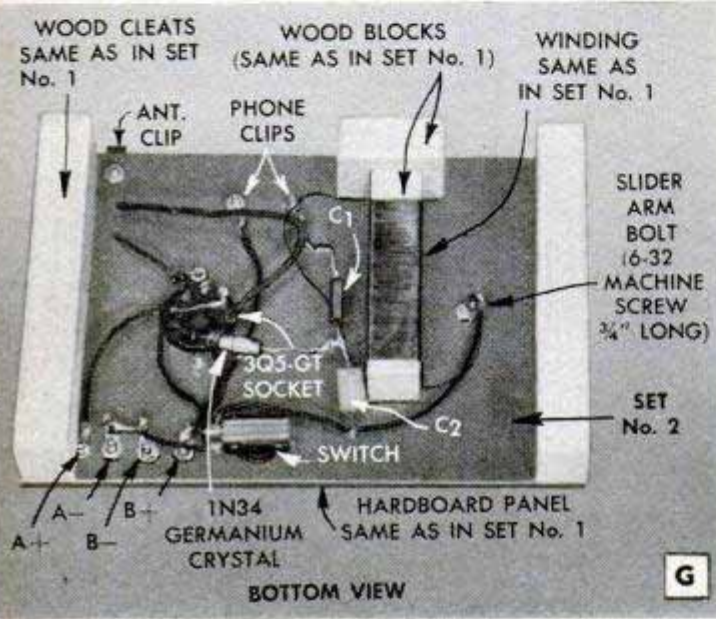


SET No. 2
3Q5-GT TUBE
TOP VIEW

F

connections should be carefully made with rosin-core wire solder. The phones should be sensitive, 2000-ohm type. To tune the set, merely find a sensitive point on the crystal detector and move the tuning arm across the coil until you hear a signal, then adjust for the desired station.

Sketch D and photos E, F and G show various views of set No. 2. The adjustable crystal detector is removed and the fixed 1N34 germanium crystal substituted. This is mounted under the panel as shown in Fig. 2. Cut a hole 1¼ in. in diameter for the tube socket and mount the extra Fahnestock clips and the s.p.s.t. switch. The flashlight-cell B-battery consists of six size C, 1½-volt cells connected in series to give 9 volts. This is the minimum usable B-voltage and it is enough for considerable amplification. However, it can be raised to either 22½, 45 or 90 volts without changing the set in any way, if stronger signals are desired. The A-battery is a single standard-size 1½-volt flashlight cell. A schematic circuit diagram for this set No. 2 appears in Fig. 3. The two fixed condensers, C1 and C2, make the one-tube set tune more sharply than set No. 1, which is an advantage. For the reception of strong local stations, the ground on set No. 2 can be omitted for the easier separation of interfering stations. For maximum battery life, always turn off the switch when the set is not in use. Detailed material list R-401 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



BOTTOM VIEW

G

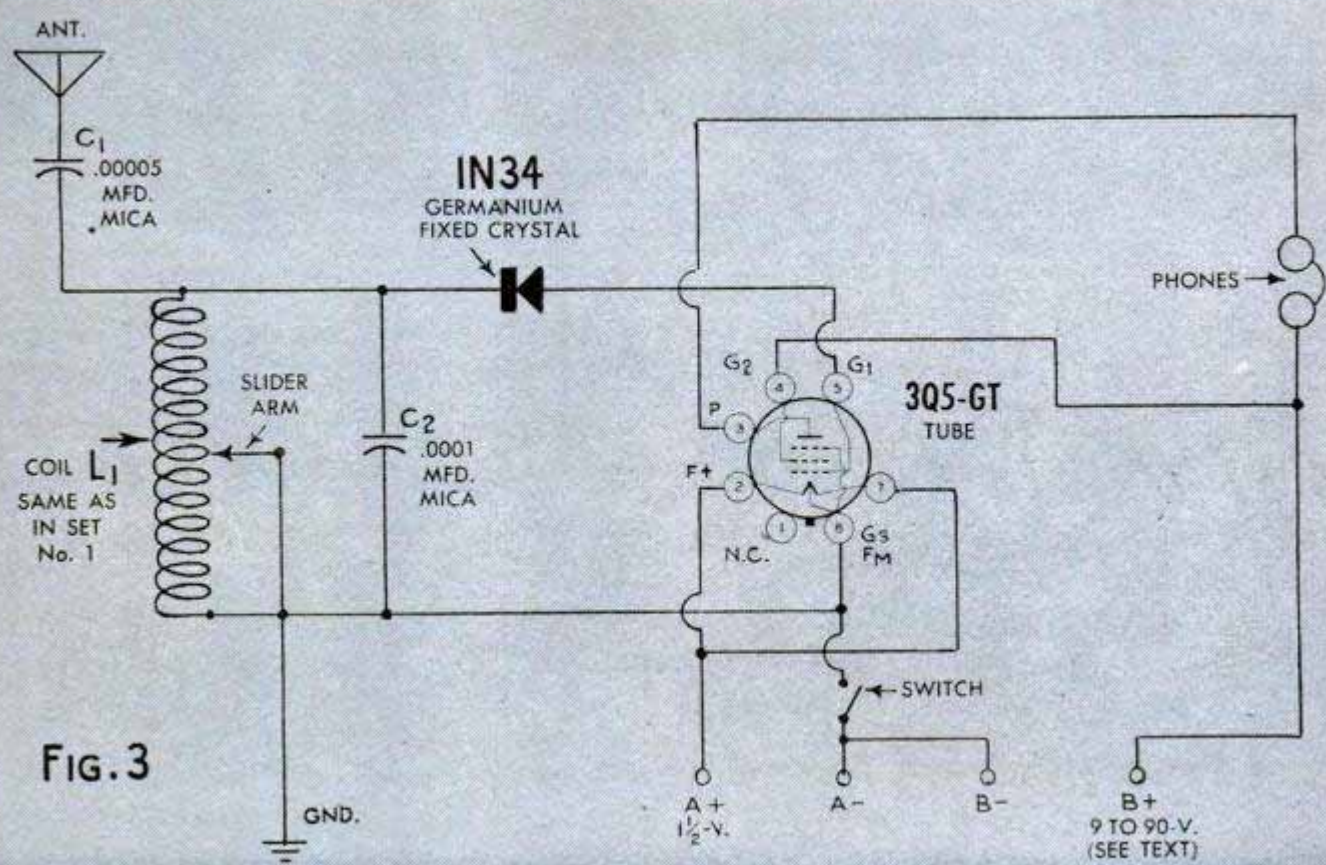


FIG. 3

FIG. 3 - SET No. 2

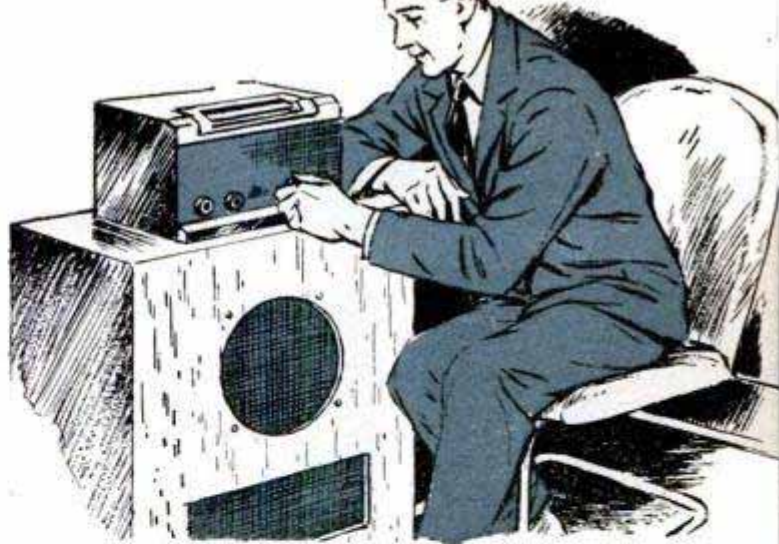
NOTE: TUBE SOCKET

How To Build A BASS-REFLEX ENCLOSURE

CRITICAL music lovers interested in high-fidelity reproduction realize that with ordinary speaker installations it is usually difficult to obtain colorful bass notes without boom or objectionable resonance. You can bring out those necessary bass notes with this homemade bass-reflex speaker enclosure. Enclosures of this type are ideal for testing high-fidelity AM and FM tuners and audio amplifiers.

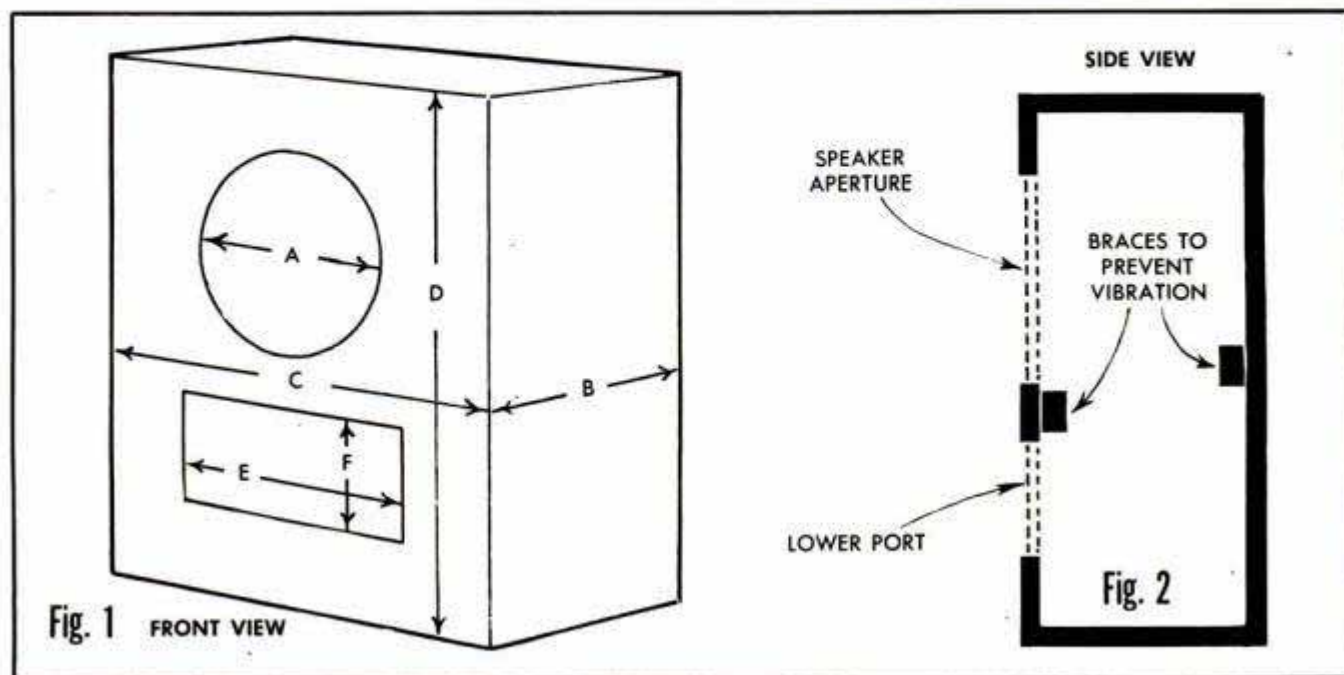
Made from $\frac{3}{4}$ -in. plywood stock, this simple cabinet can be given a stain and finish to match other room furnishings. All inside dimensions are given in the chart below. Column A gives the speaker aperture, B is the depth of cabinet, C shows its width and D is the height. The length of the lower port is given in column E, and F is its height. In the dimensions chart, B, C and D are minimum for the speaker sizes listed.

Braces across the inside of the back and front panels keep the cabinet from vibrating at its mechanical resonate frequency.



Pad all the interior walls (except the front wall where the speaker is mounted) with two layers of $\frac{1}{2}$ -in. Fiberglas pads, available from radio-parts houses. Ozite under-rug padding will also serve the purpose. Back the speaker aperture and lower port with flocked grille screen. The speaker opening, A, may be centered with respect to width, but not to height. Locate the center of the speaker about one third of the distance down from the top. The lower port, should be kept as close as possible to the speaker opening.

DIMENSIONS CHART						
Note: All dimensions are inside measurements.						
Speaker Size	A	B	C	D	E	F
15"	13 $\frac{3}{4}$ "	12"	23 $\frac{3}{4}$ "	31 $\frac{7}{8}$ "	12 $\frac{3}{4}$ "	5 $\frac{1}{2}$ "
12"	10 $\frac{3}{4}$ "	11"	22"	28 $\frac{7}{8}$ "	10 $\frac{5}{8}$ "	5 $\frac{1}{2}$ "
10"	8 $\frac{3}{4}$ "	10 $\frac{1}{2}$ "	19 $\frac{3}{4}$ "	26 $\frac{1}{4}$ "	8 $\frac{5}{8}$ "	4 $\frac{1}{4}$ "
8"	6 $\frac{7}{8}$ "	9 $\frac{1}{2}$ "	16"	22 $\frac{1}{8}$ "	6 $\frac{1}{2}$ "	3 $\frac{3}{4}$ "

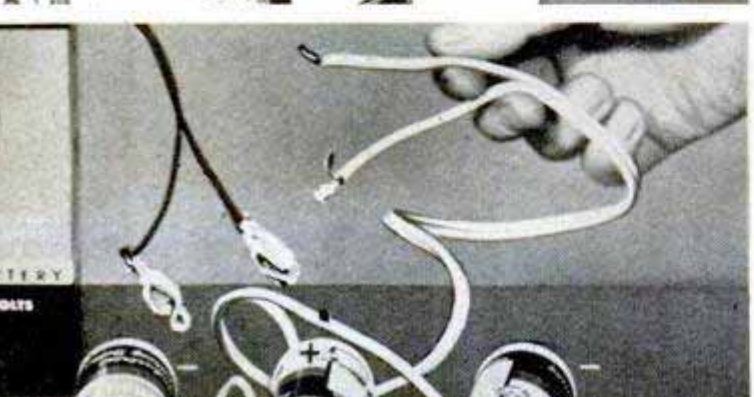
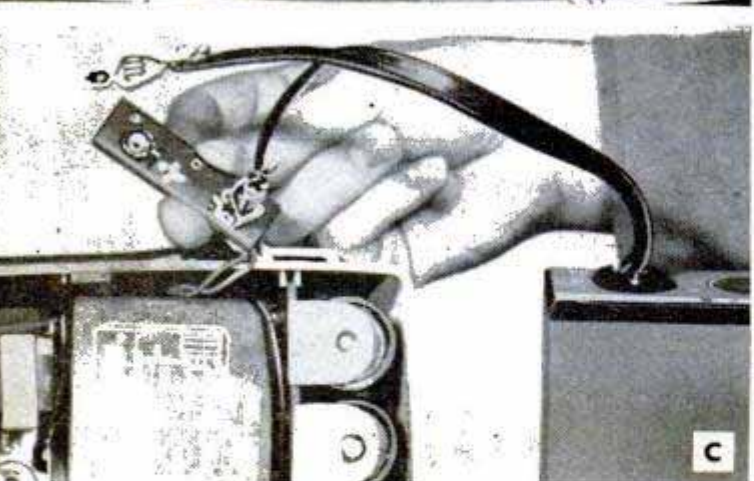
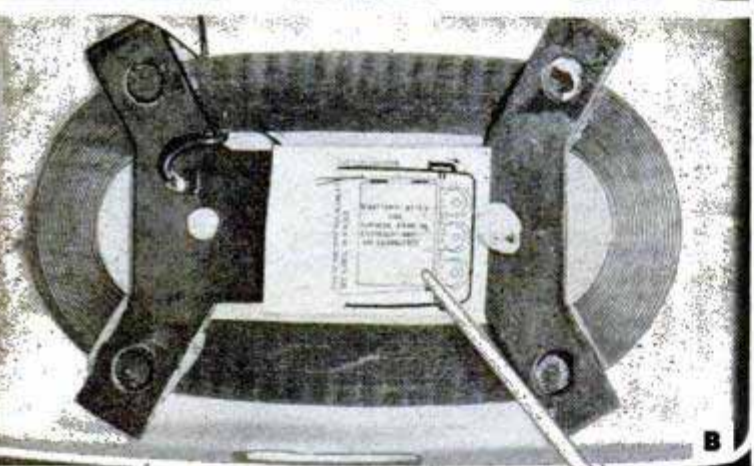
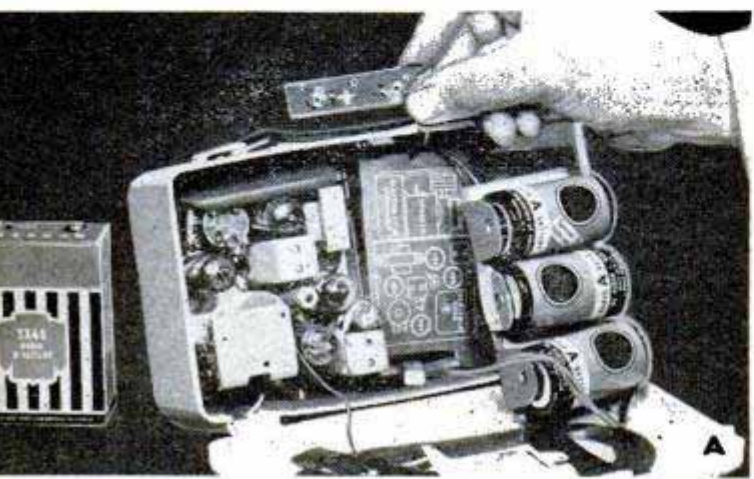




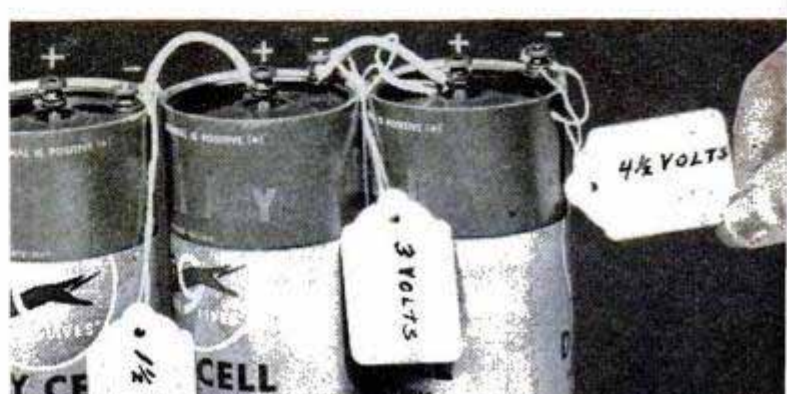
Emergency Replacement Batteries For Portable Receivers

MANY GROUPS operating in the civil-defense program have pointed out the important part that battery-operated receivers will have to play if bombs fall in vital locations, knocking out power-line facilities. Most of these sets in urban localities are of the portable type and are used at the beach and on outings where electric service is not available. It is not always possible to locate exact duplicate replacement batteries when they are urgently needed. The following illustrated hints will be of assistance in using those batteries that may be easily purchased, some of which may not have been manufactured for radio use.

B-batteries of the compact type, shown at the left in photo A, are usually available and should be duplicated for size if possible; the A-battery has much shorter life and must be renewed often. If your set uses a single $4\frac{1}{2}$ -volt A-battery, you can usually substitute three $1\frac{1}{2}$ -volt flashlight cells connected in series as shown in photos A and D. Check the terminal strip carefully for polarity as indicated in photo A. The battery diagram is usually attached to the rear cover of the cabinet, photo B. If a B-battery of correct size is not available it is often possible to obtain a larger size, of the specified voltage, and connect it externally with small spring clips for stationary operation, photo C. It is possible to obtain certain voltages for a long-life external A-battery from No. 6 dry cells connected as shown in photo E. For convenience, various voltages are labeled. Beginning at the positive end, the first tap would be negative $1\frac{1}{2}$ volts, the second 3 volts and the last would be $4\frac{1}{2}$ volts. These are common $1\frac{1}{2}$ -volt ignition-type dry cells.



Next Month—
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SAVE GAS .. Up to 1 Gallon in Every 4



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(measures miles per gallon)
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Mile-O-Meter is a gasoline mileage gauge as well as a motor tune-up indicator, very important in running your car economically.

Fits all cars. Permanently mounted. Checks Spark Plugs, Carburetor and 31 other Motor adjustments. Shows how to increase miles per gallon at every speed. 1 to 5 minute installation — 4 color Easy-To-Read Dial. No holes to drill. Mounting bracket fits dash or windshield frame. No experience needed. Complete instructions and 16-page mileage book included. Tested and proved by leading Automotive Associations and manufacturers. Makes a perfect gift. (Beautifully gift wrapped at no charge.) Over 1,000,000 in use today.

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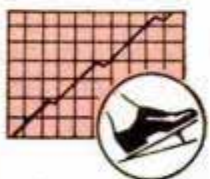
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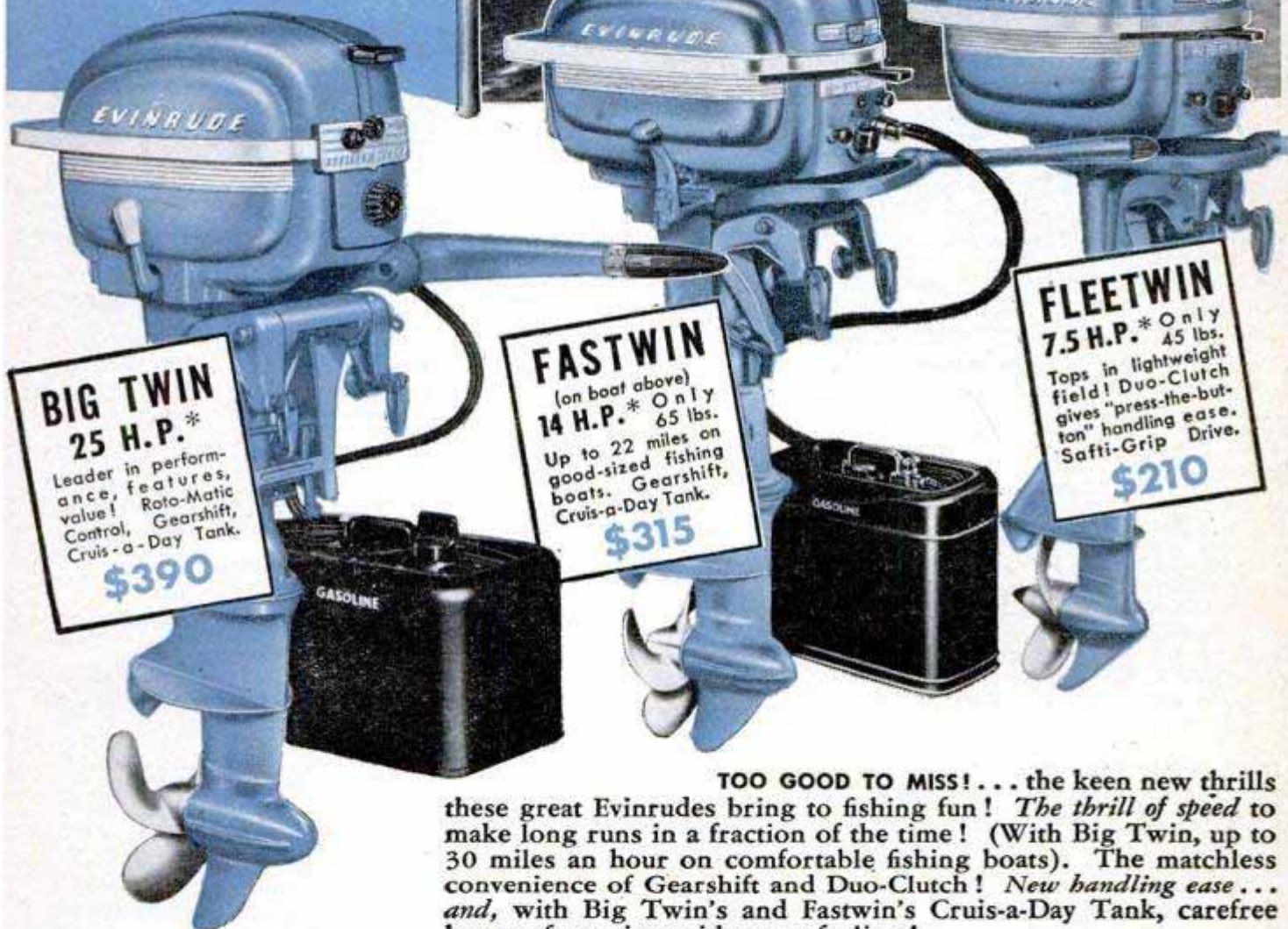
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Tops in lightweight field! Duo-Clutch gives "press-the-button" handling ease. Safti-Grip Drive.

\$210

TOO GOOD TO MISS! . . . the keen new thrills these great Evinrudes bring to fishing fun! *The thrill of speed* to make long runs in a fraction of the time! (With Big Twin, up to 30 miles an hour on comfortable fishing boats). The matchless convenience of Gearshift and Duo-Clutch! *New handling ease* . . . and, with Big Twin's and Fastwin's Cruis-a-Day Tank, carefree hours of running without re-fueling!

All this and trolling, too! Yes . . . even Big Twin, with its eager 25 horsepower, throttles down to a slow and steady gait that wins the most finicky fisherman! Dollar-wise, compare them against the field—for power, performance, features, *fun*—and you'll want to get your order in! See your Evinrude Dealer—look for his name in your phone directory under "Outboard Motors." *Catalog Free*—write for it today!

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*Power ratings are O.B.C. certified brake H.P. at 4000 R.P.M. All prices are F.O.B. Factory and subject to change without notice.



CATALOG FREE! Write today for full-color catalog of complete Evinrude line for 1951.



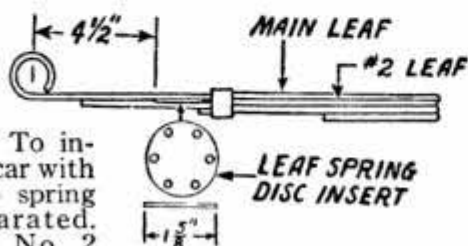


Care and Feeding of Engines

BY S. P. CORP

SLAP-HAPPY SPRINGS

Ever hear a slapping racket when you're driving over rough roads, especially in wet weather? Slap-happy springs! Lubrication won't fix it, but a plate-type disc inserted next to the main leaf of each rear spring will quiet it down. Most service stations sell these discs. To install, lift rear of car with bumper jack so spring leaves are separated. Pry main and No. 2 leaves apart with a screwdriver and insert discs with smooth side down. If springs are covered, cut a $2\frac{1}{2}$ " slot in side of cover, $4\frac{1}{2}$ " from each end of spring and insert discs. Then peen over the slot in the cover. This should remove cause of slapping.



MORE ABOUT TIRE CARE

Now that the air is full of rumblings about rubber shortage and synthetic tires, let's talk some more about making tires last longer. It's a good rule to stop at a service station at least once a week to have tire pressure checked.

While you're doing this, inspect the tire-wear pattern.



A tire that shows wear on the outside edges indicates underinflation. To avoid this, *never check a hot tire*. There is a normal build-up of 3 to 5 pounds over recommended tire pressures as the tire gets hot while being driven.

Never bleed a built-up tire pressure. This built-up pressure prevents excessive sidewall flexing, a cause of tire-damaging heat. A tire carrying 24 lbs. may get up to 27 lbs. under normal driving, or 29 lbs. at high speed. This is normal build-up. Such pressure should not be bled while tire is hot.

On the other hand, center tread wear means overinflation, and that, too, may shorten tire life. Keep pressures correct, and rotate tires every 2500 miles.

RE-RING FOR SUMMER

To get full enjoyment from your summer vacation trip, put in new Sealed Power Piston Rings now—save gas, save oil, and get the thrill of restored power! The Sealed Power MD-50 Steel Oil Ring is the best oil control ring ever built—the only ring with the Full-Flow Spring. Controls oil even in badly tapered and out-of-round bores.

Ask for free booklet, "7 Ways to Save Oil." A card will bring it—just address Sealed Power Corporation, Dept. G-6, Muskegon, Michigan. For triple wear, get Sealed Power Chrome-Faced Rings.

Masterpieces in Crystal

(Continued from page 86)

glass and not only cause ugly specks but may give the whole piece a reddish tint. At Steuben, such a piece is dumped in an ash can immediately. Standards are so high that the tiniest pin-point bubble or hair-line flaw consigns a piece to the junk heap.

"The toughest thing to make," says one gaffer, "is an air twist. Unless you're careful, you get blisters along the edge." The gaffer makes an air twist by taking a blob of molten glass, patting and turning it on the surface of a steel table until it has four square sides. With a tweezerlike implement he squeezes a deep groove down the center of each side. Then, by gathering more molten crystal around the whole square, air is trapped in the four deep grooves. Quickly, now, the gaffer grabs the end of the gob with a plierlike tool, pulling and turning the glass. The trapped air stretches out into thin lines that twine around each other.

The tiny bubble you often see, buried in the heavy crystal base of a bud vase is "duck soup," according to the masters. The gaffer simply starts his base with half enough crystal. Then he punches a tiny indentation in the center of the bottom. Meanwhile the bit gatherer comes in with a fresh gather. This is fused over the base, trapping air in the indentation. The hot glass expands the air, which forces itself into a perfectly round bubble.

Steuben craftsmen sneer at forms and molds for the production of handblown glass. Their limit is usually the tiny, cup-shaped applewood paddles the boys use for what they call, irreverently, a "ball-bearing job." By rotating a small gather in this, they make the little knobs around the foot of a crystal bowl. However, some pieces must be partially formed in a steel mold.

A sparkling ring of bubbles, shaped like quartered melons, around the base of the famous Ballad Bowl are created by dropping molten crystal into a form shaped like a steel cocktail shaker, with gearlike serrations on its inside wall. Meanwhile the gaffer is spinning a thick crystal cup. When the two pieces are ready, the now corrugated piece from the mold is jammed into the cup. The two pieces fuse together, sealing off a dozen wedge-shaped grooves of trapped air. He shoves the whole thing in the glory hole, softens it up and keeps working it until it becomes a squat bowl base. All that trapped air around the edges has been squashed into glittering bubbles.

The gaffer also uses a cuplike steel mold to produce the unique cane twist, or long white swirls you've seen in paperweights.

(Continued to page 224)

The Case of the Lucky Camera



This handsome top-grain leather field case for Kodak "Pony 828" protects its camera well—opens in an instant for quick action. \$6.50.

A slippery rock! Looks like this camper is heading for a fall. But his camera is lucky. It's snug and protected in a smart Kodak carrying case--therein lies a moral: Protect your camera with a Kodak case for carefree snapshotting next time you go camping.

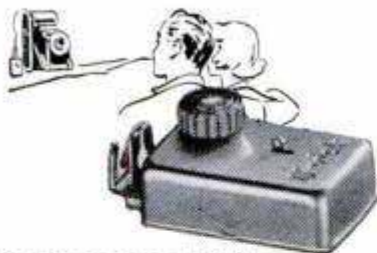
A smart idea at *any* time, for that matter. Kodak camera cases are designed and constructed to take the hardest knocks and come up smiling. *See your dealer for the one that fits your camera.*

OTHER KODAK CARRYING CASES

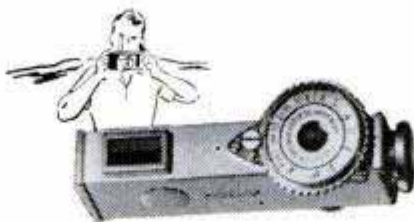


Kodak Snapsack for Kodak Tourist Cameras. Rugged pouch-type leather case. \$3.95.

FOR ADDED FUN AND FINER SNAPSHOTS . . .



Get into the picture yourself—Attach a KODAK AUTO RELEASE to any camera which has a cable release . . . set it . . . you have 10 seconds before the shutter clicks. (Swell for honeymoon couples!) Good for flash shots, too. \$4.25.



You can even focus on a fly with the neat little KODAK SERVICE RANGE FINDER. Split-field military-type. Adjusts down to 2 feet. Use independently of camera—or attach by means of special bracket provided on many models. \$14.58, including case.

- De Luxe Field Case for Kodak Tourist Cameras—\$10.50
- Field Case for Kodak Flash Bantam *f/4.5* Camera—\$6.50
- Field Case for Kodak Pony 135 Camera—\$6.75
- Field Case for Kodak Duaflex Cameras (simulated leather)—\$2.50

Prices are subject to change without notice and include Federal Tax where applicable.

Your Kodak dealer stands ready to help you get better pictures. Talk with him every chance you get.

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WITH

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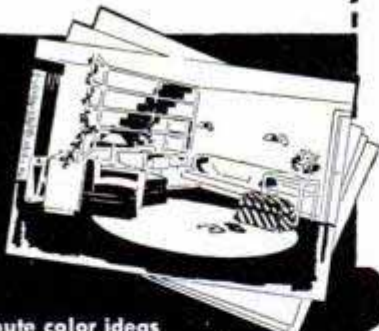
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- ★ Washes perfectly, over and over
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The secret of this amazing paint is its exclusive *synthetic rubber emulsion* formula. The rubber film forms a tight, durable surface that dirt cannot penetrate. See your Glidden dealer today.

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you can easily carry out in your own home!
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rooms. Practical, made-to-order
for planning home improve-
ment. Send 10 cents
(coin).

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Cleveland 2, Ohio

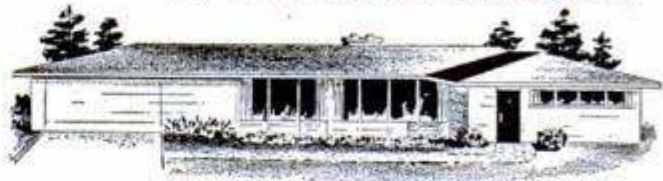
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Tell me where I can buy Spred SATIN.

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Hedge Trimming

Q—I am thinking of planting about 60 ft. of hedge along my sidewalk. There are no trees near by and drainage is good. How far should the plants be set from the edge of the walk? Should the plants be cut back close to the ground after setting out? How is such a hedge trained, or trimmed?

L.T., Mich.

A—It is not possible to give complete answers to your questions in the space available. In general, just how far the hedge plants are placed from the edge of the sidewalk will depend to some extent on how the hedge is to be formed, or trained. Ordinarily, 15 to 20 in. is a fair average distance for a deciduous-hedge planting that is to be trained to grow along a sidewalk. Deciduous-hedge plants usually are cut back to within 4 to 6 in. above the ground at the time of planting, but, in some cases, plants that have been nursery-grown especially for hedge will not require such close cutting back. Usually in such cases the top growth is reduced by about 25 to 30 percent to lessen the burden on the root system during the first growing season. Consult your nurseryman at the time of purchasing the plants. A correctly shaped deciduous hedge is somewhat narrower at the top than at the bottom. The top should be trimmed slightly rounded rather than flat. Maintaining a hedge with the sides sloping inward admits more light and air to the inner branches, encouraging them to a full growth of foliage at the center and along the bottom of the hedgerow. Seasonal clipping of the deciduous hedge should begin after the first strong growth of the spring has been well started and should be carried out on schedule thereafter until growth stops in the fall.

Condensation Under Windows

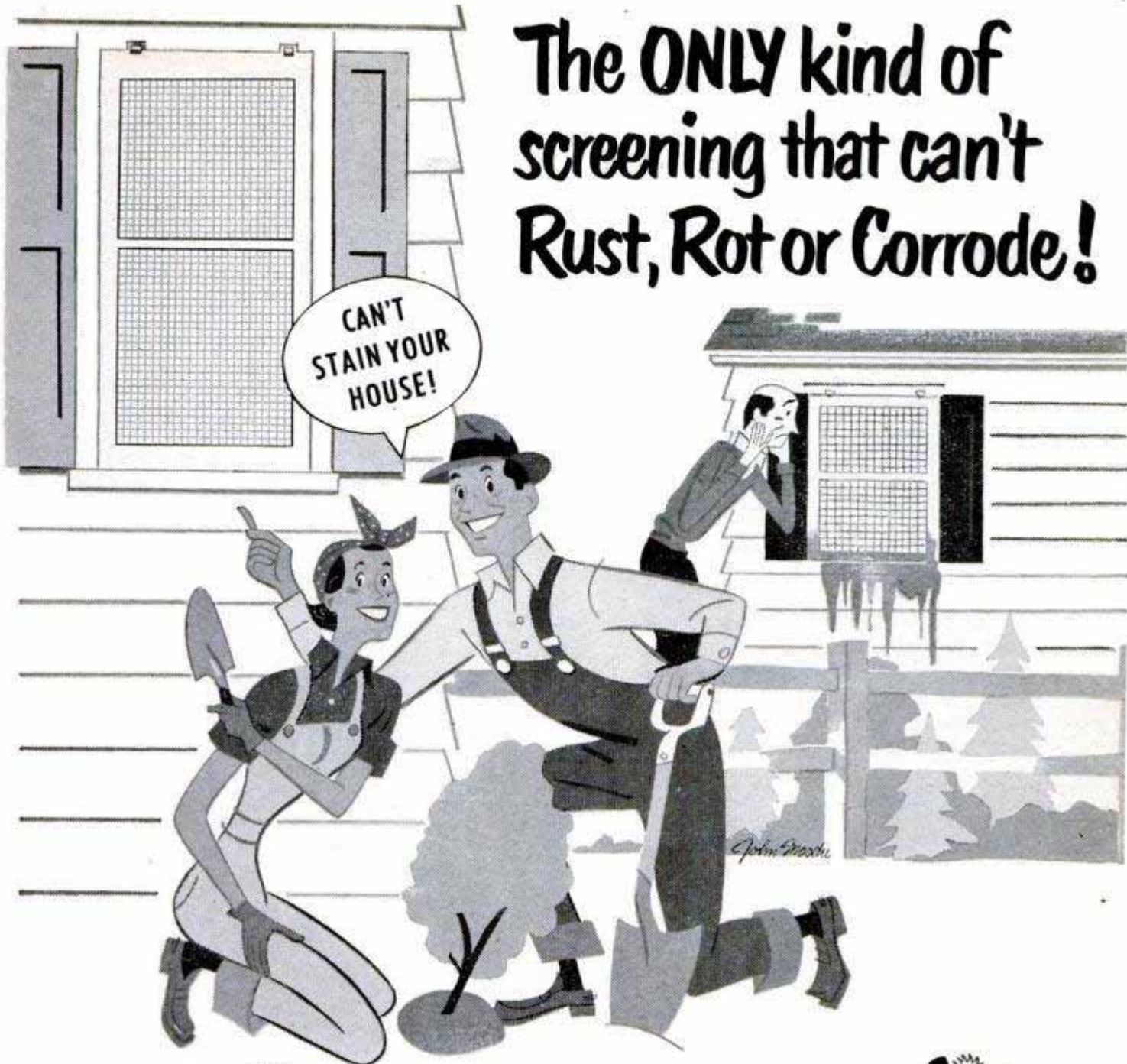
Q—Moisture collects on the wall areas directly under the windows in three rooms on the north side of my home. Walls are insulated. Why does moisture collect only on the area under the windows and not on the rest of the wall surface? Does the moisture come through the wall?

C. T., Minn.

A—Is the wall area under the windows insulated? In some cases, insulation is omitted under the windows and below fire stops, especially when a fill type or blow-in type of insulation is used. Lack of insulation in these areas of the wall is a probable cause of the trouble you describe. Of course, the only permanent remedy indicated in this specific case is to apply insulation under the windows, preferably the same type of insulating

(Continued to page 222)

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NEEDS NO PAINTING to protect it, because: Neither snow, rain, smoke, fog nor salt air can harm Lumite screening! Cleans easily with a damp cloth.



LASTS LONGER, because Lumite screening has greater resistance to blows, and because it can't rot out! It won't sag or bulge when properly framed . . . and it's easy to handle.



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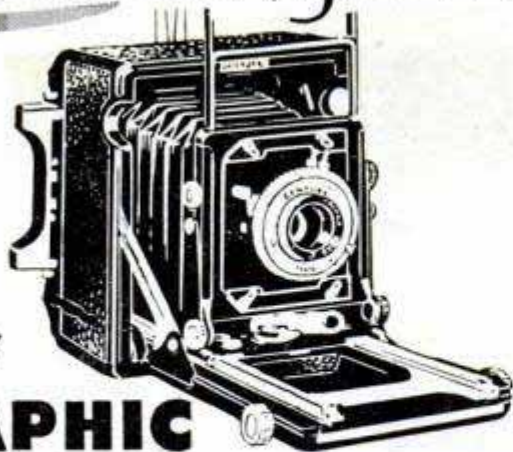
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(Continued from page 220)

material that was used in the rest of the wall. However, it should be kept in mind that insulation alone is not a cure for moisture condensation under all conditions. The moisture that collects on the wall surfaces under your windows comes from the air in the rooms, not from the outside.

Varnish Didn't Dry

Q—Recently I varnished a floor in a small bedroom after removing the old finish and bleaching the hardwood flooring to restore the color of the wood. The new varnish has never dried properly. After several weeks it still is sticky in spots and none of it has dried hard. What caused this failure and what can I do to remedy the defect? B.U., Ill.



A—There are several causes of this trouble, but among the most common are failure of the finish to dry due to the age of the finishing materials, lack of adequate air circulation during the drying period, and the presence of residues from a bleaching solution. Also, if the temperature of the room is below 65 deg. for any length of time, the varnish may not dry properly. Of course, the finish in this condition will never be durable. The only permanent remedy is to remove it entirely and build a new finish on the bare wood. After you have removed the varnish from your floor, wash the surface thoroughly with a medium to strong soda solution to neutralize any residues that may remain from the bleach you used. Then, when the wood is thoroughly dry, apply filler, sealer and as many coats of floor varnish as are required to produce the desired results. Have all the windows and doors open during the drying period. In some rooms it is necessary to use a fan to assure adequate air circulation.

Red Spider

Q—Something is wrong with my evergreen plantings. Last year, and now this year, I have noticed that the foliage appeared to be dying, that is, the needle clusters turned a grayish-white color in the affected areas. Nothing is visible except that the clusters seem to be matted together by a fine silkl-like material. What is this, and is it the cause of the trouble? W.T., Mo.



A—Probably your evergreens are infested with red spiders, or, perhaps more properly, spider mites. These tiny insects make their appearance with the coming of warm weather and, unless checked, they can seriously damage an evergreen planting in a comparatively short time. One recommended procedure requires that the foliage be sprayed early in the season, before new growth starts, with a miscible-oil solution made especially for protecting evergreens. Be sure to follow the manufacturer's directions in all details when applying this spray. However, in your own case, it probably is too late in the current season for this spray, but you can discourage the spiders quite effectively and thus give the trees some measure of protection for the balance of the season simply by hosing the foliage periodically, using the full water pressure and directing the stream of water upward as much as possible so that it strikes the underside of the needle clusters. Dusting with sulphur, although more difficult to carry out effectively, also helps to deter the insects. In midseason, spraying with lime-sulphur (summer strength) and rotenone compounds is a fairly common practice. Carry out the miscible-oil (dormant) spray procedure during the following year for full protection.

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Car-Plate

gives a lasting "diamond shine"
in 20 minutes!

5,000,000 car owners have proved it's better!

Great news! The quick and easy way to wax your car is actually the best way!

Without rubbing and in 20 minutes, Johnson's Car-Plate gives your car a brighter, tougher, longer-lasting shine than former hard-rub methods that required many hours.

No wonder more than 5 million car owners have used Car-Plate since Reader's Digest published an article describing this sensational chemical discovery.

Just spread Car-Plate on the clean finish of your car . . . let it dry . . . and wipe lightly. That's all you do!

Get Johnson's Car-Plate today at your service station or regular wax dealer's. A 10-oz. can only \$1.00—does any car twice!



HOW TO CLEAN BEFORE YOU WAX

Wax should always be applied to a CLEAN car. The finish should be free of road film and decomposed paint. For this reason it is important that you clean your car thoroughly before applying Car-Plate. For quick, easy cleaning, Johnson's Carnu is recommended. It does the job fast and safely—leaves a perfect surface for a sparkling Car-Plate finish.

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In the Home, as in Industry, the choice is **WISS METAL SNIPS**

The superior quality of famous **WISS** Metal Cutting Snips has made them the first choice in the home and in industry. Every pair is rigidly tested and guaranteed to cut easily and efficiently for an unusually long time. Carefully adjusted blades are set precisely to reduce wear and permit maximum cutting power with a minimum of effort.

WISS METAL MASTER COMPOUND ACTION SNIPS



Compound leverage produces amazing cutting power with minimum effort. Will cut holes, circles and complicated patterns in metals to 18 gauge. Rubber grips recommended. M 1 (Cuts Left) 10" long; M 2 (Cuts Right) 10" long; M 3 (Cuts Straight) 10" long.

WISS SOLID STEEL STRAIGHT CUTTING SNIPS



Economical in price, these snips meet government specifications. Made of a specially selected grade of solid tool steel. For general metal-cutting. Four sizes, 8" to 12 $\frac{1}{4}$ " long.

WISS SOLID STEEL COMBINATION SNIPS



Will cut straight, curves or irregular shapes with ease. Two sizes, 7" and 13" long.



**J. WISS & SONS CO.
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Toothpicklike sticks of white milk glass are placed in standing position around the inside wall of the mold, and molten crystal poured in. Then the gob is taken out and more glass is gathered around it. The piece is then twisted until the white glass rods swoop around in gentle curves.

Even more intricate than the forming of crystal at Steuben is the work done in the little shop in a far end of the plant. Here, before lathes and racks, each containing some 50 copper grinding wheels, sit men like Joe Libisch, grinding classic art work on the sparkling crystal. Though the wheels cut concavities, finished figures, like those adorning the bowl President Truman gave Princess Elizabeth for her wedding, appear to the eye to be in bold relief.

Joe began copper-wheel engraving at the age of 12, apprenticed to an engraver in Hungary. He still doesn't take any chances. "See, here's my 'try' glass," he'll tell you, holding aloft a goblet covered with everything from deep cuts to an incredibly tiny seal of Great Britain, cut with a wheel smaller than a pinhead. "Anything new or difficult," he explains, "goes on the try glass before the bowl."

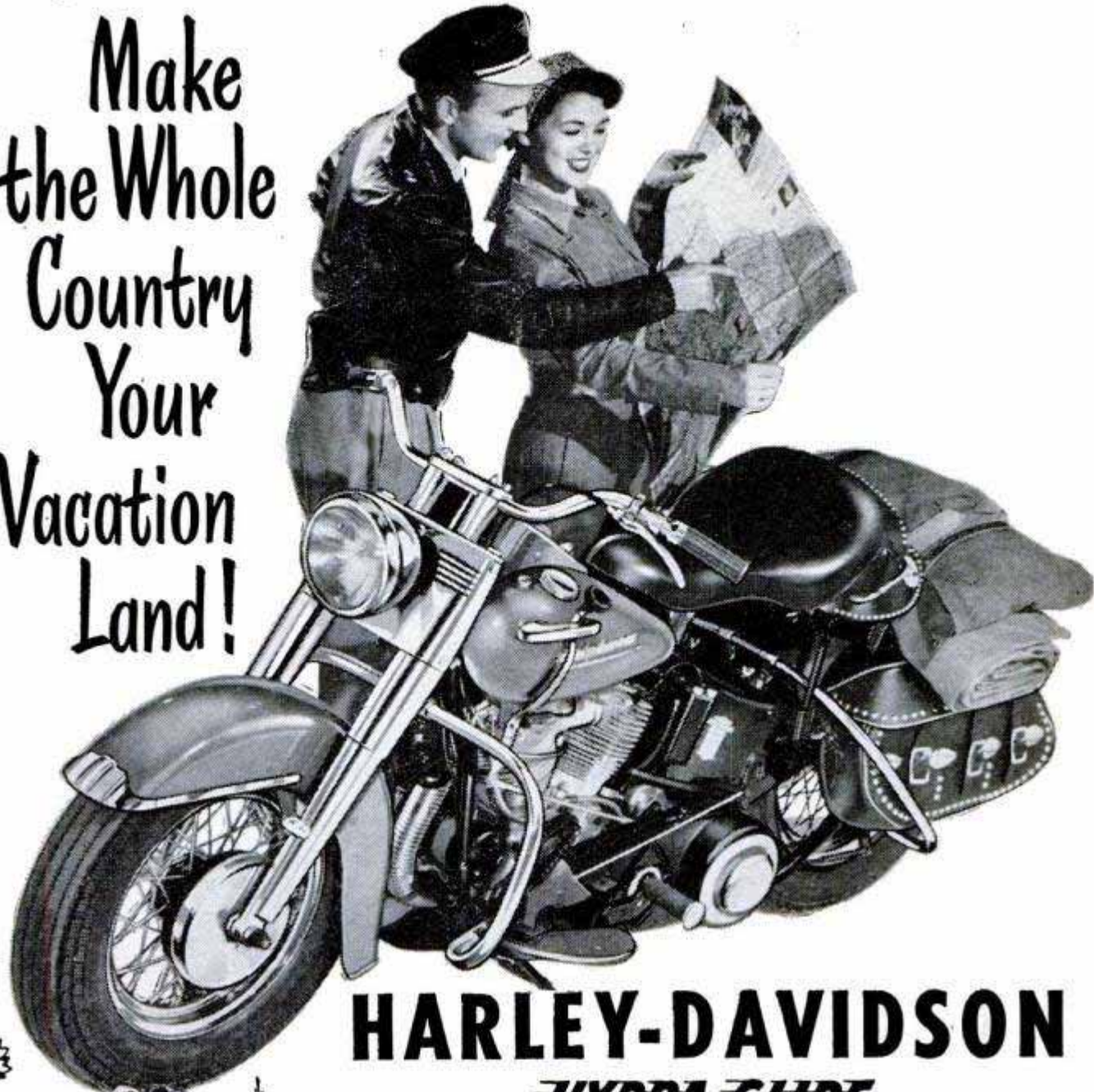
Joe starts an intricate engraving by transferring the design from paper to a crystal surface. "The design is on tissue," he explains, "and the back of the paper is smeared with tallow, usually. But we use shaving cream." By tracing the design, the outline is transferred to the bowl in shaving-cream lines. A fine cut is made with a tiny wheel so the outline won't wear off. Then, Joe goes to work cutting away the crystal, using some nine grades of emery, virtually all his wheels, and an abundance of patience.

One famous engraved piece is the Bowl of Legend, with seven separate scenes marching in a grand parade around the bowl's rim; Paul Bunyan, Rip Van Winkle, Johnny Appleseed, Uncle Remus, Davy Crockett, Pecos Bill and Sleepy Hollow. "It took more than a month," Joe recalls. On every face he carves, he must switch wheels to get different effects on nose, mouth, eyes and cheeks.

"Switching wheels is tough," says the master engraver. "On the Tiger Bowl, no two cuts were alike. It took me a couple of weeks just to make the tiger alone."

Whether it's a simple, undecorated nut dish or a piece like the heavily engraved Valor Cup, designed by John Gates, and claimed to be the most exclusive piece of glass in the world, time and cost mean nothing to these craftsmen. They are all out, as boss Houghton puts it, "to grab on to the coattails of immortality."

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For 110-120-volt, 25-60 cycle AC or DC. 6-ft. cord; plug. With 10 HIGH SPEED drill bits, 1/16 to 1/4-in. (Not carbon bits as in some sets); 4-in. cloth buffing and 3-in. grinding wheels; 4 3/4-in. rubber sanding disc; 5 1/2-in. sheepskin polishing bonnet; 6 sanding discs; paint mixer; auxiliary handle; adapter; horizontal stand for using drill as a bench tool; 13x6 1/4x 6-in. steel carrying case. See this super value at your nearest Sears Retail Store TODAY!

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case that acts
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Here's the finest saw of its capacity we've ever seen . . . a super-powered, **contractor-type saw** . . . precision-built for continuous heavy duty use! Rips, crosscuts, angle-cuts, siding, flooring, rafters, plywood panels (even concrete, tile, etc. with cut-off wheel) fast and accurately! Easy to handle; weighs only 12½ lbs.! Sealed precision ball bearings throughout! Direct drive gear train permits compact design; perfect balance. Safe! Blade is on right side; away from operator! Depth of cut at 90°, 0 to 2-3/16 in.; at 45°, 1-11/16 in.

Built-in ripping guide; die cast aluminum housing. Has helical cut bronze gear; telescoping saw guard; sawdust blower; trigger switch. **Underwriters' Labs. approved** (industrial standards). Heavy duty universal G. E. motor, 110-120-volt, 25-60 cycle AC or DC.; rated ¾-H.P.; develops 1¼-H.P. No-load speed 4300 R.P.M. With 6½-in. combination blade 10-ft. 3-wire cord; plug; lubricant; wrench. See this saw at your Sears Retail store TODAY!

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These handy accessories will make this electric hand saw a universal cutting machine!



Each \$1.19*



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There's a New World in Textiles

(Continued from page 125)

Jersey factory and used as bristles for paintbrushes that had a bounce and sheen that couldn't be dulled. Some of the milk is now going from cows to carburetors. Casein fiber is kinked and curled with heat to make a tangled mass that is mixed with wool and an oily chemical by the Fram Company for their carburetor air filters. When a casein-fiber filter is filled with dirt, you just throw it away like a soiled paper plate and put in a new one at low cost.

Weirdest of all the synthetics is the "disappearing" fiber developed by the Southern Regional Research Laboratory of the Department of Agriculture. It is made of ordinary cotton that has been partly converted by chemical treatment to carboxymethyl-cellulose (a substance also used in ice creams and soapless soaps). This unique fiber behaves like ordinary cotton when dry but readily dissolves in water. When spun into yarns and woven into fabrics along with more delicate fibers, it provides the necessary strength in the warp or supporting threads of the fabric. The soluble cotton fibers can later be washed away, making it possible to achieve fancy open-work patterns on standard looms.

Tricky weaving is producing unique fabrics, too. The Air Materiel Command has developed a cotton fabric for Arctic use. It's as warm as wool, and gets that way by means of weaving the material into myriad tiny boxes called a honeycomb weave. Two layers of this are as good as a heavy wool blanket. Another is the same outfit's basket weave which, by means of grouping several strands of fiber together in weaving, results in tarpaulins and tents so strong they're almost indestructible.

In the hunt for better and better fabrics, good old cotton and wool haven't been forgotten. They still account for 80 percent of all textile products. Many companies have developed special treatments for them that let them retain their best qualities, but make them shrinkproof, wrinkleproof, fire-resistant, or give them other qualities that are inherent in the synthetics.

Dow Corning's fabric treatment with De-Cetex 104, a silicone product, is spectacular. Clothes treated with it shed water like oilskin and have a smooth, springy feel. You can stand in the rain all day in a De-Cetexed gabardine suit, then shake off the droplets and wear it again. The creases stay put. Even a De-Cetexed nylon net is so water repellent that drops won't go through its openwork, but will sit on top like tiny crystal blisters.

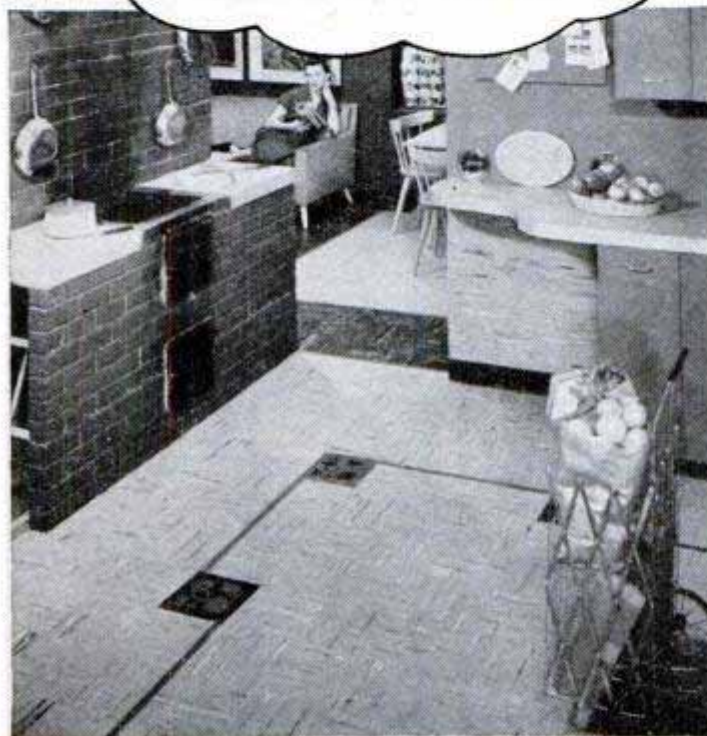
(Continued to page 230)

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*anyone can do it in
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save real money!*



**You can have a floor like this in your kitchen
for only \$1975***

ANYONE can install their own Kentile Floor! The tough, durable squares go down one at a time . . . for just a small section or whole rooms at once . . . and colorful Kentile is ready for years of hard wear as soon as it's down. It's quick, easy, fun!

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Your Kentile dealer's low price includes adhesive, instruction booklet and this handy Ken-Kit that contains all of the simple tools needed to do a neat, long-lasting job.



**Or one like this in your living room
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Write for your **FREE** copy of the **Kentile Color Booklet** showing all of the sparkling, modern colors in low-cost Kentile Floors.

make your own floor the only one of its kind.

And, when you've finished, you'll have an attractive floor that will give almost unbelievable service . . . modern colors that can't wear off because they go clear through to the back of each tile . . . simple and inexpensive to clean with just mild soap and water. And the fresh Kentile beauty needs only an occasional no-rub waxing to always look new.

**Price based on a 8' x 9' kitchen and on a 12' x 15' living room*

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A rubber band and a wad of paper can start real trouble—and so can worn engine bearings! Worn connecting rod and main bearings in your car engine mean disappointing performance—sluggish pick-up in traffic . . . lack of power on the road. *Worn engine bearings cause oil pumping!* You can't expect new piston rings to correct oil pumping when it starts at the bearings. Give new rings a chance to do their own job—replace worn engine bearings, too. Ask for genuine Federal-Mogul bearings—your mechanic knows they're *engineered* for the job of oil control!

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CONTROL OIL-PUMPING

WHERE IT STARTS—REPLACE WITH

FEDERAL-MOGUL

BEARINGS

OIL CONTROL



To make any fabric flame-resistant, DuPont has what it calls Erifon. By running bolts of cloth through a series of special salts baths, and rollers that squeeze the stuff into the fibers, out comes a material that won't support flame. The characteristics of the fiber aren't changed and the fire resistance isn't removed by cleaning, washing or weathering. The material will singe and char, but the instant the flame is removed the smoldering stops.

Melamine-treated fabrics do much the same thing, and more. Melamine, a thermoplastic set by heat, is being baked into all kinds of cotton clothing fabrics today at Dan River Mills in New Jersey under a special new formula. It gives a permanent set to natural cotton fiber that makes it springy, longer wearing and highly tear-resistant. It won't shrink. It sheds water and wrinkles and becomes mildew-resistant. These qualities are said to be permanent.

Perhaps the greatest eye-stopper fabric treatment of all is one that had sportswear buyers in Los Angeles gawking one recent foggy day. Looking skyward, they saw a bathing beauty in a glowing swim suit floating on the mists. Later, they saw she was standing in the Plexiglas nose of a hovering helicopter, but her dazzling suit was visible long before the machine. The secret was a unique fluorescent Celanese satin that glows in daylight, or nightlight, without benefit of special lamps.

The startling material is dyed with Cold-fire—a combination of chemicals, color and diatomaceous earth—invented by Bob and Joe Switzer of Berkeley, Cal. First used as fluorescent dye for special military fabrics, it is now going into red hunting caps and jackets that scream you right out of the woods.

Besides the fabrics already mentioned, many more are still in the works experimentally. DuPont has Dacron, now being tested in fire hose, industrial belts and filters as well as curtains, sport shirts and summer suits. It's supposed to have higher resistance to some chemicals than Orlon. New, rugged acrylonitrile fibers called Acrylan, another yet unnamed from the Chemstrand Company, and a new Monsanto fiber are on the way. Celcos, a new Celanese fiber combining the best characteristics of acetate and viscose rayons, already is being blended with wools for carpets that are tougher, but just as luxurious as pure wool and less expensive.

Despite it all, textile men point out that the perfect fiber is yet to be invented. "A fabric that is wonderful for some reasons may be horrible for others," they warn. "The idea is to choose the right one for the right purpose."

TERRIFIC VALUES - SURPLUS - SAVINGS UP TO 85%



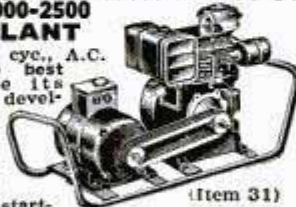
Portable LIGHT PLANT

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500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1 3/4 hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. Be prepared if war or storm knocks out power lines.

(Item 24) Reg. \$275.00 value. **\$143.50**
700-800 Watt Plant (Item 44) same as Item 24, but larger generator. **\$169.95**
1000-1200 Watt Plant (Item 45) same as Item 24, but larger generator & engine. **\$199.50**

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110-120 v. 60 cyc., A.C. Absolutely the best made because its heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or 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 and instructions included. Wt. 220 lbs. Reg. \$585.00. Special at... **\$299.50**
GENERATOR ONLY and control box. \$169.50
Drive it with your engine or tractor



(Item 31)



1/4" DRILL

(Item 34) Hi-power, long-life, smooth running. Alloy steel gears; built-in blower. Cutter-Hammer switch, Jacobs hand-tite chuck. 110-120 v. AC-DC 1000-1600 rpm. Cap. 1/4" in steel, 1 year guar. Wt. 4 lbs. Terrific value at **\$12.95**.

38 Pc. DRILL KIT

(Item 35) Includes above drill, buffers, polishing, cement, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs. Complete in heavy steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth \$38.50. Our Special, only... **\$19.85**



FIRE or BURGLAR ALARM

(Item 46) Completely automatic. Wind and bang anywhere. Thermostatic element sets off loud clanging bell if heat reaches 140° (setting adjustable). A fool-proof burglar or signal alarm when used with trip cord attached to door, window, invalid's bed, etc. Sturdy metal constr. assures lifetime of protection. Ideal for homes, stores, whse., gar. etc. Wt. 3 lbs. Easily worth \$20. Special... **\$4.95**

GAS ENGINE

(Item 25) Air-cooled. 1 1/2-2 h.p. Complete with gas filter, air cleaner, governor, fuel tank. Ready to run. Speed range 2000-3600 r.p.m. 5/8" shaft. Rope start. Ideal for pumps, air compressors, power tools, generators, etc. Factory warranty and instructions incl. One of the best made. Wt. 40 lbs. Worth \$72.50. Special... **\$46.50**



GAUGE TESTER

(Item 27) Precision made of solid bronze by Star Brass Co. Calibrated weights (incl.) acting against hydraulic piston, provides quick accurate testing of all pressure gauges up to 3000 lbs. per sq. in. Brand new in hardwood cases. Wt. 100 lbs. Reg. \$435.00. Our Spec... **\$135.00**

HYDRAULIC HOSE

High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum \$1 per lgh. **INSIDE DIAMETER, 1/4" 50c per ft. 3/8" 60c, 1/2" 80c, 5/8" 90c.**

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HEAVY DUTY ARC WELDER



(Item 38) Use as portable or shop welder. 250 amps. D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to 1/2" plate using 1/4" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs. **\$99.75**

SPECIAL BONUS (while they last) 5 lbs. asstd. welding rods and \$5.95 helmet incl. with welder.

DUAL TUBE LIFE SAVERS



(Item 54) The new approved type made by Genl. Tire for Navy. 2 rubber cells for double protection. Easily inflated by mouth to 55 inches. Wear one as life preserver. Adj. to fit adults or children. Tie together for raft or big luxurious mattress. Invaluable on boats or beach. Wt. 2 lbs. each. Our Spec. (a fraction of cost) **99c each, 6 for \$5.**

HIGH PRESSURE HAND PUMP



(Item 53) Positive displacement type. Cap. 550 gph. Completely self priming. 3/4" pipe thread inlet and outlet. Use for fuel or water transfer on boats, trailers, air craft, etc. Ideal for insecticides, emerg. sump pump or as vacuum pump. Wt. 15 lbs. Govt. cost \$95. Our Special... **\$12.95**

FIRE EXTINGUISHER



(Item 39) Fully charged at 1,000 lbs. P. S. L. or other) with CO2 (carbon dioxide) the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. **REFILLABLE** at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. **\$19.50** value. Special... **\$6.95**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful continuous duty motor. 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **\$6.35**; 9" Fan, wt. 6 lbs. **\$7.45**; 10" Fan, wt. 7 lb. **\$8.45**; 12" Fan, wt. 8 lbs. **\$9.45**.



CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emer. agency pays back cost. Wt. 10 lbs. Worth \$20.00. Our price... **\$8.95**
(Item 55) With larger tank (1000 cu. in.)... **\$10.95**



RUBBER HOSE

New genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%. (inside) **1 1/4" 14.75 1 1/2" 14.75 1 3/4" 14.75** Length 25 ft. 40 ft. 30 ft. Price **9.25 14.75 14.75** If specified we will send special hose for gas or oil at same prices.



TERRIFIC VALUES!

AIR HOSE

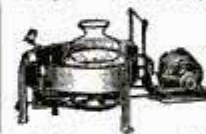
(Item 11) 1/4" Diam. heavy duty, double braid, suitable for gas stations, spray painting, air tools, etc. 20 ft. with standard swivel couplings. Wt. 4 lbs. Reg. \$8.50 val.—only **\$2.95**. Five 20 ft. lghs. (100 ft.). Wt. 20 lbs. Only **\$13.75**.



EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2 1/2 lbs. Usually \$4.50—Special 40 ft. **\$1.99** Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **\$4.95** 100 foot length (one piece)..... **\$4.85**
TRENCH-LAY WIRE (Item 51) Anaconda #10 —2 cond., for buried service to barns, outdoor lights, etc. Absolutely impervious to soil and moisture. Wt. 25 lbs. per 100 ft. Special surplus price: 100 ft. coils, **19c per ft.**; 250 ft., **18c per ft.**; 500 ft., **17c per ft.**

POTTERS WHEEL



(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Reg. 1/4 hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs. **\$145 value at... \$59.95**

GEM CUTTER

(Item 49) Complete Prof. Lapidary mach. for cutting, shaping, grinding and polishing precious and semi-precious stones. Precision built with big horiz. power driven gem cutter, built-in cutting lubricator; genuine 6" supercharged diamond saw, lap wheel, abras. whls., 2 scratch whls., 4 felt whls., grinding and polishing compounds, brushes, dop cement and sticks, cutting oil, ext. cord, asstd. gems, complete instructions. Requires 1/4 hp. motor (not incl.). Wt. 22 lbs. Worth \$99.50. Our Special... **\$39.95**



ELECTRIC HAND SAW

(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6 1/4" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in saw-dust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2 1/8". 1 year written guar. Wt. 12 lbs. Drastically reduced... **\$39.95**



SPRAY OUTFIT

(Item 37) Twin cyl. piston type compressor direct-connected to powerful 110-120 v. AC-DC motor. Built-in air tank eliminates pulsation and provides steady flow of air at 25-30 lbs. Sprays lacquers, enamels, insecticides, etc. Does beautiful work on autos, furniture, farm equip. 1 qt. spray gun, relief valve and 10 ft. air hose incl. Full instructions and 1 year guar. Wt. 11 lbs. Regularly \$50. Spec... **\$22.95**



ANGLE DRILL

(Item 23) Fits into chuck of any electric or pneumatic drill or flex. shaft. Operates at any angle in a full 360° arc. Makes possible drilling, grinding, carving, routing, etc. in close cramped quarters. Makes impossible jobs easy. Made by Kett Tool Co. Complete with built-in chuck (1/4" capacity) and adjusting key. Hardened alloy gears. Precision built for heavy duty. Lists at \$39.95—while they last... **\$9.95**



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(Item 56) 210 gal. per min. Centrifugal turbine type. Unexcelled for fire-fighting, irrigation, sprinkling systems, swimming pools, drainage, fuel transfer, etc. Built by GM for the army at cost of more than \$145. Tremendous volume, will deliver 210 gpm with 5.3 hp. down to 40 gpm with 1 1/2 hp. 2 1/2" stand. pipe thr. inlet (can be reduced to 2" if desired). Twin 1 1/4" outlets, dynamically balanced, 3/4" shaft, hi-speed ball bearings. Easy fast priming. (instr. incl.) Wt. 36 lbs. Sensational value... **\$39.50**



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(Item 30) Penn Electric Model 110 BPO2, best made. For pumps and air compressors. Heavy duty. Will handle up to 250 lbs. press. and up to 5 h. p. Autom. unloader valve, for easy starting. 110-220 v. A.C. or D.C. 2 pole. Wt. 5 lbs. Reg. list \$17.50. Our Spec. **\$9.45**.



All items brand new. Prices f.o.b. Chicago area. 10 day Money back guarantee. Send check or M. O. **MASTER MECHANIC MFG. CO., DEPT. 48 Burlington, Wis.**

There's No Age Limit For Mountain Climbers

(Continued from page 137)

shoes are worn. Rubber soles are best on dry rock; felt or hemp on wet.

No boot or shoe, however, can keep you on a mountain if you don't assume the right position in climbing. The natural tendency when you get up on a high place where a fall might be your last is to cling like ivy to a college wall. But this is one case where you abandon instinct.

"You can't hug a mountain and climb it at the same time," explained Exum. "The body must be kept well away from the rock. Otherwise, the frictional advantage is lost. As much of the body weight as possible should be brought to bear on the feet. Another point—always test the rock before putting your weight on it. And this is vitally important—never fail to have at least three points of contact with the rock. That is, two feet and one hand, or one foot and two hands."

If the point of ascent is icy or covered with frozen snow, you can unsheath your ice ax and cut yourself some steps. After you get good, you can use that same ice ax for descending a snow field down the mountain. This is glissading or skiing without skis. The ice ax serves as an anchor.

Now, let's suppose you have decided to climb the Tetons during the summer with Exum or one of a half-dozen of his other guides in the park. You pick a date sometime between about June 15 and September 30 and at least a month before then you start getting yourself in shape. Plain, ordinary hiking or cycling is good. An office worker climbed 23 stories of stairs every morning for two months to get ready for his Teton ascent.

You arrive a week early to get used to the high altitude. The valley itself, once an outlaw lair and now bustin' with dude ranches, is about 6700 feet in altitude. From the valley you get an abrupt view of one of the most stupendous outcroppings of granite in the Western Hemisphere—a 7000-foot rise without foothills.

The Grand, Middle and South Tetons are the historic Trois Tetons of the early French voyageurs. More than a century ago, trappers ignored the North Star and charted their course by the Tetons. They are ideal for climbing because of the firmness of the rock.

The day's mountaineering class is conducted above Hidden Falls, a spot complete with pitches, overhangs and chimneys. Before you try these, you learn such fundamentals as tying knots and belaying, and

(Continued to page 234)

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everybody knows

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THAT'S a short way of saying that through outstanding quality, unsurpassed value, and wide variety, Nicholson and Black Diamond brands constitute the most extensively used files in the world.

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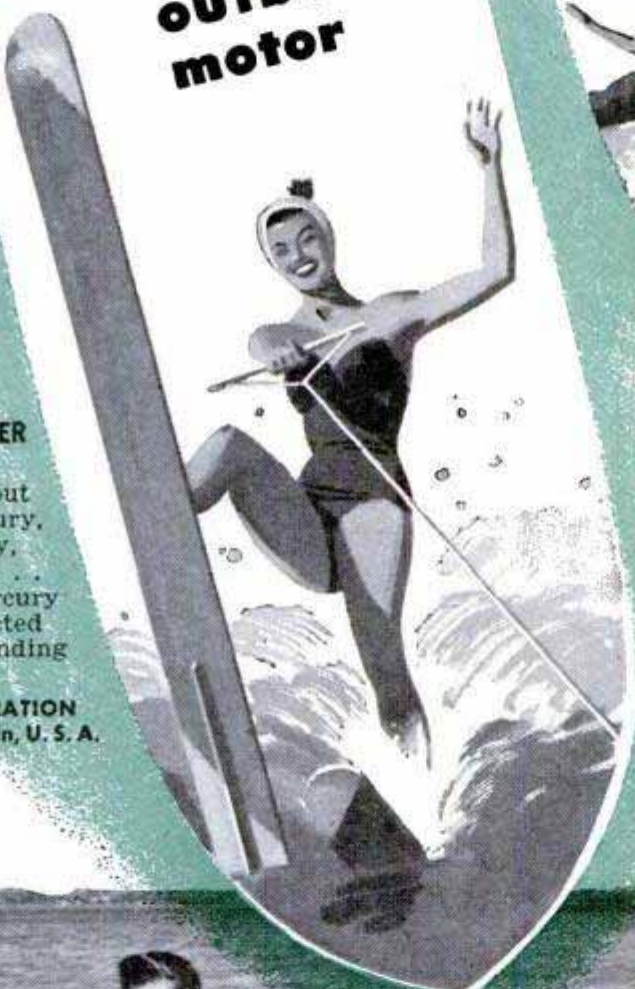
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Your family will want to enjoy the thrills and fun of water skiing. And it's easy to learn. You don't need an expensive inboard power boat. Any one of four MERCURY models from the 7½ h.p. Rocket to the 25 h.p. Thunderbolt on your boat gives you plenty of speed and power for water skiing. See your MERCURY dealer for a demonstration.



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body posture in climbing. Before supper you are rappelling over cliffs as if the feat were nothing more intricate than shoving a lawn mower—regardless of whether you are man or woman. About a third of the Teton climbers are women.

The next morning you are ready for the climb. Chances are it will be up the Grand, the highest in the park. It will provide the thrill of sitting on top of the world—providing, of course, you get to the summit.

You soon realize you must save your wind, so you don't talk much as you go up, up. Some of the climbers are complete strangers to you, but you feel a growing bond with them. Your thoughts steal from Benjamin Franklin, and you paraphrase him to yourself: "If we don't hang together, we will drop off the mountain separately."

You think this particularly as you leave the comfort of evergreen-covered slopes, start up bare rock crusted with patches of snow and ice that never fade. The wind begins to blow, and you wonder why it had to pick your particular day.

You welcome the rest periods. Lunch is oranges, sandwiches and chocolate that seem to have come from the heavens you are approaching.

More climbing. Loose shale. Careful here. Then treacherous, steepening slopes. You learn to spot quickly good handholds, good footholds.

Finally, you come to a rock wall that seems to go straight up for almost 50 feet.

"You are not going to climb that?" someone asks.

"That," says Exum, "is easy."

First, he shows you how to traverse a series of small ledges that come into view only as Exum points them out. Then, utilizing body friction for all it's worth, he negotiates the short chimney leading to the top of the pitch. And funny thing . . . you do it, too.

At last you are at base camp, where you will have supper and spend the night in a sleeping bag cached there for you. Top covering, a blanket of stars.

Early the next morning you gaze down canyon walls to the now distant green valleys and become eager for the final climb to the Grand's roof. You are glad that Exum has decided everyone in the party is equal to the task of going on up. You know all these people well now.

More ice and snow for you to scale, but your sense of caution is quickened and you keep an eye on the rope between you and the next man. Not tight. Not loose.

You come to the cooning place, a horizontal traverse 800 feet from the summit. Along the vertical wall is a crack. Maybe

(Continued to page 236)

WARNING! Your engine may have to last a long time! This spring swing to . . .

MARVEL *mystery oil*



Here's the perfect upper-lube to save the precious engine of your car — keeps valves free, ring and piston wear down. Definitely a must in high-compression engines, for greater pep, power and performance. Add Marvel Mystery Oil to gasoline, crank-case oil, or use in Marvel Inverse Oiler. *Be engine-wise and Marvelize now!*



Install a Marvel Inverse Oiler for proper and controlled feeding to critical upper cylinder areas. Visible supply in 1-qt. glass container.

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MUCH MORE SPEED FOR OUTBOARDS!



of all makes from 7½ to 50 HP on racing runabouts is provided with the famous Michigan "AQUA-JET" propellers. No rebuilding of lower unit is necessary. Each propeller is specifically engineered for the motor on which it is to be used. Other propellers for superior performance for practically every outboard in every application. Write for 1951 catalog, the "Outboarder's Bible," FREE. Michigan Wheel Co., Dept. 1-2 Grand Rapids 3, Michigan.

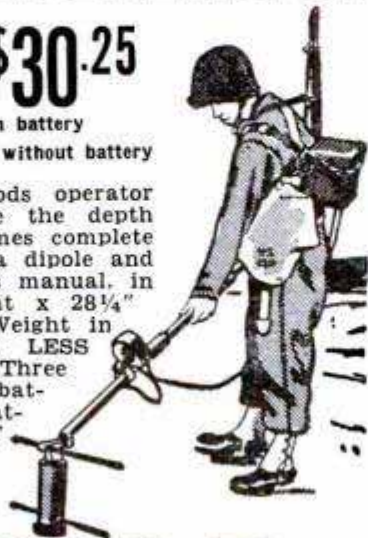
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\$30.25

with battery
\$19.75 without battery

By lengthening dipole rods operator will be able to increase the depth sensitivity. This unit comes complete with spare tubes, antenna dipole and reflector, and instructions manual, in wooden chest 9½" height x 28¼" length x 15½" depth. Weight in operation is only 22 lbs. LESS Batteries. Power supply: Three 45 volt and one 6 volt batteries. Uses standard batteries. Original COST \$364.00. Shipping weight appr. 80 lbs. F.O.B. New York. No C.O.D.'s. Send Order to:



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Here's why Cars that **WASTE OIL**
are headed for
PREMATURE OLD AGE

OIL WASTE warns you that
rocking chair pistons
are wearing out
cylinder walls

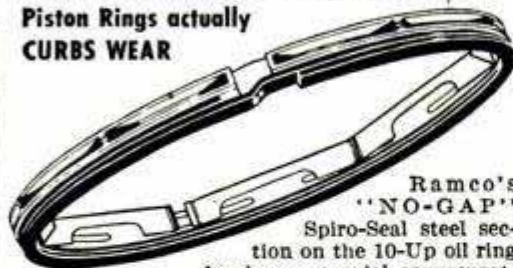


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25 feet long, two feet deep. You can take your choice—go "cooning" by crawling along the crack, or dropping your feet below and using the crack for handholds. Cooning looks safer. That's what you do.

You make the mistake—once—of looking down. Just air—for 3000 feet. You turn your eyes quickly away and sigh when you are back on safer rock. The mountain quiet is broken only occasionally by sounds of "On belay!" then "Climbing!"

Two hundred feet from the top Exum says:

"You can unrope now. No difficulties from here on."

Golden words. You half-scramble up that last bit of rock.

Then Exum grabs your hand and grins: "Congratulations! This is it—the top."

You understand how Dimitri Mitropoulos, conductor of the New York Philharmonic Orchestra, felt when he paused in a climb of the Tetons with Exum, gazed ecstatically off into the big beyond, and said:

"I have just two great loves in life. Music—and mountain climbing."

The Frozen-Fish Factory Goes to Sea

(Continued from page 77)

Though in normal operation the catch will travel from net to freezer in about two hours, it is possible for a fish to make the journey in five minutes. "The speed of processing is a big advantage over any previous method," says Bromfield. "Flavor is much better when the fish are frozen soon after being caught. Vitamin content is 50 to 75 percent higher than under the old system. Furthermore, the filleters can work faster because the flesh is firmer and easier to cut when fresh."

There are other advantages. Under the old system, fish were stowed in pens between layers of cracked ice. As the ship rolled its way back to port, fish on the bottom would be damaged by the shifting weight of those above. The jagged ice would tear them into mush. "Often," says Bromfield, "only the top layer of the catch would be salable for table use. Anywhere from 10 to 30 percent of the fish would have to be sold at a low price for fertilizer and animal food. On the Oceanlife, every fish caught commands a top price."

Bromfield still isn't satisfied. "All that gurry going over the side is a terrible waste," he says.

Already the hulls of two bigger and better floating factories are under construction. Twice as big as the Oceanlife, they'll be about 235 feet long. Besides freezing

(Continued to page 238)



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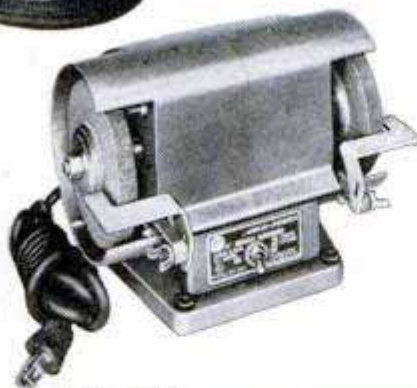
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Handle.
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plants, they'll have laboratories to test the quality of every net load of fish and to figure ways of keeping more flavor and vitamin content in the product. A second processing plant will take the gurry and convert it into useful by-products. Each ship will have a capacity of 1,000,000 pounds of frozen fillets. They'll be on the water in about two years.

"Fishing vessels of the future out of New England ports will all have to be of this type," says Bromfield, "if New England is going to stay in the fishing business." Meanwhile, his erstwhile scoffers are busy agreeing with him. "As long as we have Bromfields," they say, "we'll stay in business."

Fill 'er Up With LPG

(Continued from page 68)

LPG. In another position, it opens the LPG valve and closes the gasoline valve. In the third position, both valves are closed.

When you are running on gasoline and wish to change over to LPG, the switch closes the lines from both fuels until the engine consumes the gasoline in the float bowl of the carburetor. After running a block or two, the engine will cease to fire and then the switch is operated to open the LPG valve. After a few revolutions the engine will start and run on the LPG.

When running on LPG, to change over to gasoline the switch is simply moved from one to the other. The fuel pump fills the carburetor almost instantly and progress is resumed with the engine ceasing to fire only momentarily.

The engine starts readily on either gasoline or LPG. With gasoline there is a brief warming-up period until the inlet manifold becomes warm enough to help vaporize the gasoline. When starting on LPG, however, there is no need for warming up insofar as the fuel is concerned. It enters the engine completely vaporized and is ready to go when cold. However, the wise operator will take it easy until the engine oil becomes warm enough to circulate freely.

When running on LPG, the carburetor bowl is empty and the air from the fan keeps the bowl cool. Also the gasoline in the line remains cool. For these reasons, the engine will have a pronounced "flat spot" in it for a few seconds after the switch is made to gasoline even though the engine block is thoroughly warm and the heat indicator is up to operating temperature. The cold gasoline is dumped into a cold carburetor, but warms up very rapidly after the carburetor bowl fills.

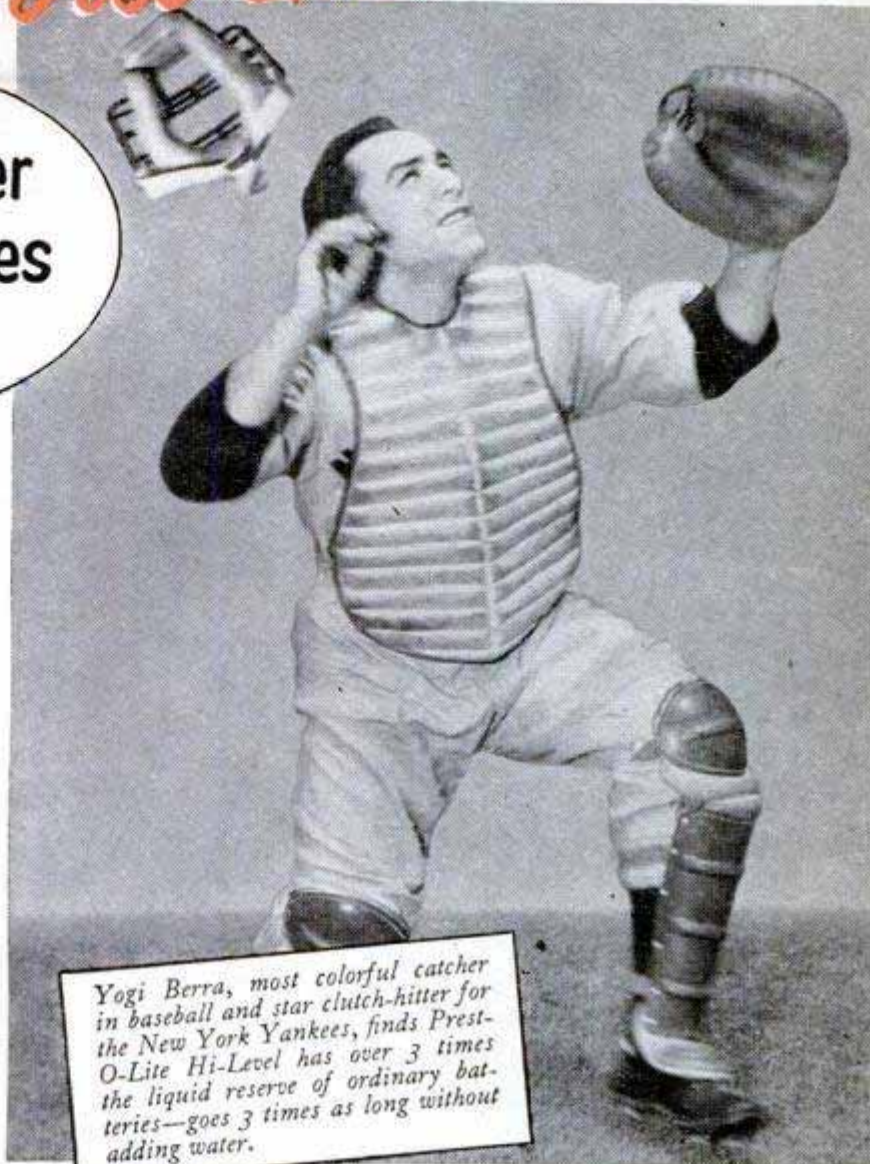
When installing conversion equipment, it is necessary to anchor the tank securely

(Continued to page 240)

Yogi Berra SAYS

"I add water
only 3 times
a year"

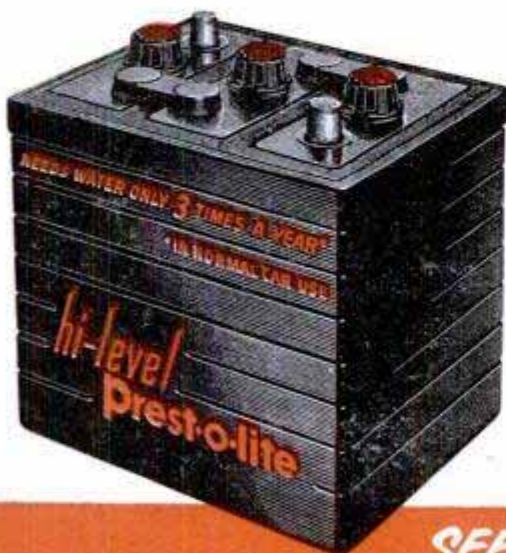
PREST-O-LITE HI-LEVEL BATTERY...



Yogi Berra, most colorful catcher in baseball and star clutch-hitter for the New York Yankees, finds Prest-O-Lite Hi-Level has over 3 times the liquid reserve of ordinary batteries—goes 3 times as long without adding water.

needs water only 3 times a year

IN NORMAL CAR USE



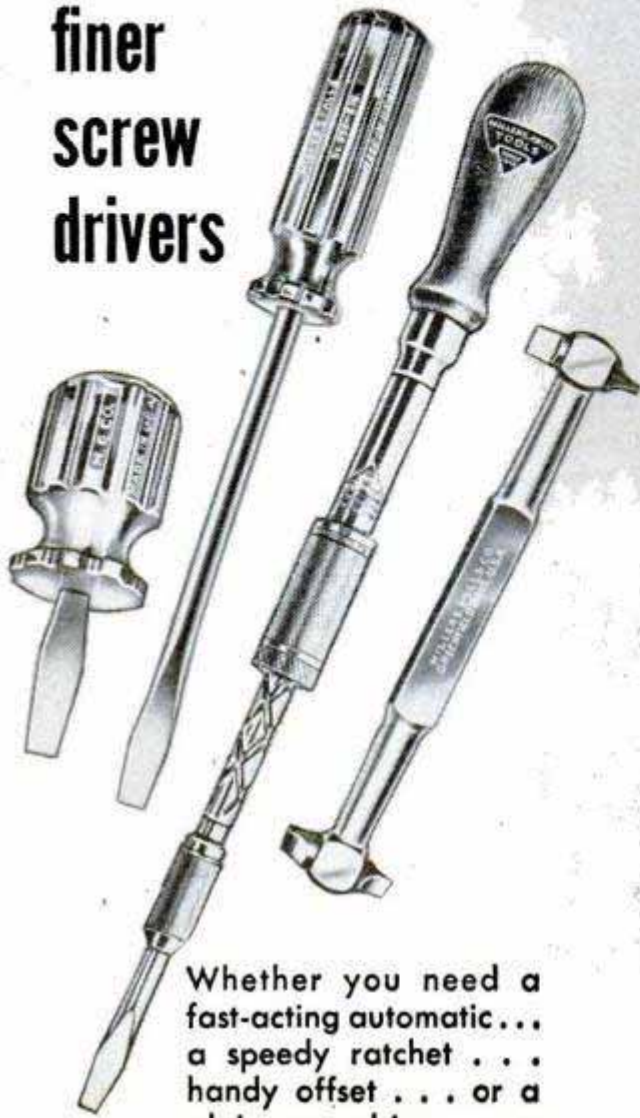
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to avoid any movement of the heavy unit. High-quality copper tubing should be used and it should be covered with loom to prevent chafing on the chassis to which the pipe should be securely clamped. It is advisable to double flange the pipe in the SAE fittings with the aid of a suitable flanging tool. A coil, or loop, should be used on both sides of the filter to absorb vibration.

It is well to use a suitable sealing compound on the tapered threads of all fittings as the pressure is quite high. The smallest leak will result in considerable waste of the gas which is under pressure at all times. All joints should be carefully tested with thick soapsuds and a paintbrush just as soon as the LPG tank is filled and turned on for the first time.

The tank can be filled by any dealer in LPG that is equipped to refill the ordinary bottled-gas containers as the fill fittings are all standard.

As more automobiles, trucks, busses and farm tractors are being converted to LPG every day, it may not be too long before facilities for handling it will be widespread.



Headset Aids Blind Minister

In Mobile, Ala., a switchboard-operator's headset and mouthpiece are aiding a blind minister in his work. By using the gear, the Rev. Reese Farnell, Jr., is able to record in Braille the conversations he holds with the 50 or more persons he "visits" daily via telephone. The minister reads these notes with his fingers when he makes his next call to the same person. The Rev. Mr. Farnell uses the headset because the tool with which he punches out the Braille characters requires the use of both hands.

☐ Aureomycin, the germ-killing drug, now is available to dentists in three forms—cones, paste and soluble tablets—for use in combatting infections of the gums and teeth.

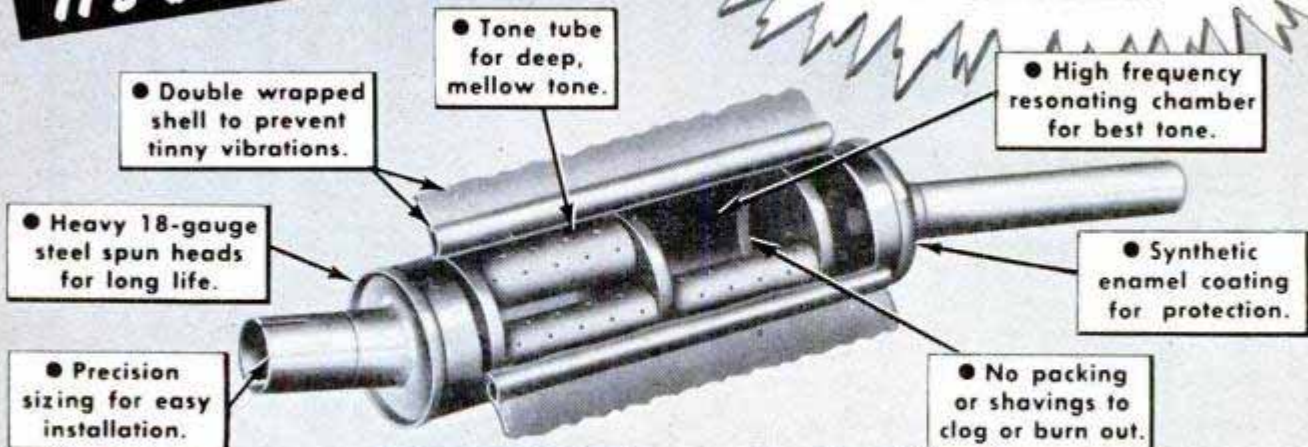
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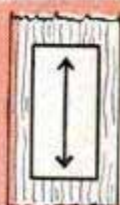


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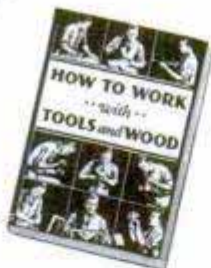
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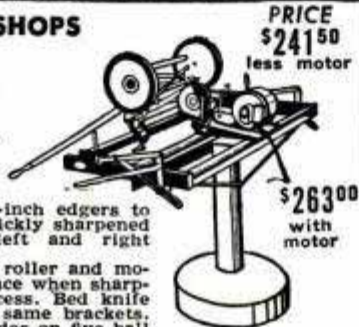
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GOLF COURSES • PARKS
101 OTHER JOBS

Sharpens All Reel Type Mowers • Hand, Power or Gang • 10 to 20 Minutes • No Dismantling • No Extra Attachments Needed. All reel type mowers, from 5-inch edgers to 36-inch power mowers, are quickly sharpened to extreme ends of both left and right twist blades.



ORDER NOW
Immediate Delivery

Handle, wheels, roller and motor remain in place when sharpening is in process. Bed knife is sharpened in same brackets. Grinding head rides on five ball bearing races. Easy to operate. Also sharpens chisels, joiner knives, planer blades. Big profit maker. Own your own business. Send Today for FREE Illustrated Bulletin No. 10-C. Prices Subject To Change Without Notice.

MODERN MFG. CO. 160 N. FAIR OAKS AVE. PASADENA, CALIFORNIA

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PLEASE NOTE: Our Tires are NOT Retreaded or Re-Capped. We Serve TRUCKS—BUSES—PASSENGER CARS

GOOD USED TIRES

WE PERSONALLY SELECT YOUR TIRES. A TRIAL OF ONE TIRE WILL CONVINCE YOU.

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TUBE GIVEN WITH EACH PASSENGER & TRUCK TIRE AT NO EXTRA COST — SEND THIS AD!

600-16	\$5.32	670-15	\$6.12	710-15	\$6.32	760-16	\$6.92
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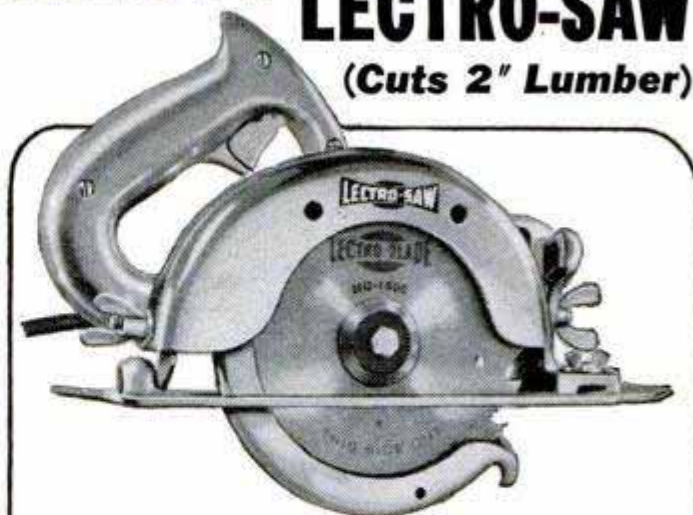
600-20	\$9.72	32x6(8)	\$11.72	1000-20	\$22.52
650-20	9.82	32x6(10)	12.32	1100-20	22.52
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(Cuts 2" Lumber)



Fast Adjustment! Quick-changing, built-in depth and bevel adjustments permit cuts from 0" to 2" depth; bevels from 45° to 90°.

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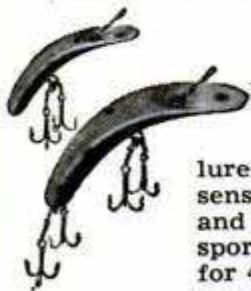


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Any 1/4" or 3/8" Drill a Powerful Saw
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Every-
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with 4"
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Crosscut
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"ARCO-SAW" is a rugged tool with
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dangerous, direct drive with drill
sideways). Works like a high priced
Portable Saw.



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SAW'

CUTS 1-5/16", or 2x4 by turning over
ONLY ARCO GIVES YOU ALL THESE
FEATURES: Safety-yoke assures
rigid connection and absolute safety—
Visual guide and wide shoe-
plate for straight, square cuts—
Big handle affords firm grip for
two-hand operation—Precision one-
piece gear box—Self-lubricating life-
time bearings—Lowest priced,
quality Replacement Blades.

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MONEY BACK GUARANTEE

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Sample 25c — Price List 3c

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ALL NEW 1951 KING MIDGET AUTO

World's Lowest Priced 2 Passenger Car

Drive it for 75c per week. Amazing performance. Surprising comfort. All steel construction. Full accessories, top and heater. Ready to run or assemble it with our bolt together parts. Rider agents wanted, earn your car free. Send 25c for detailed literature or \$1 (refunded first order) for actual assembly book and service manual filled with photos, drawings, specifications, etc.



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For Store Fronts and Office Windows. Anyone can
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FINE TOOLS
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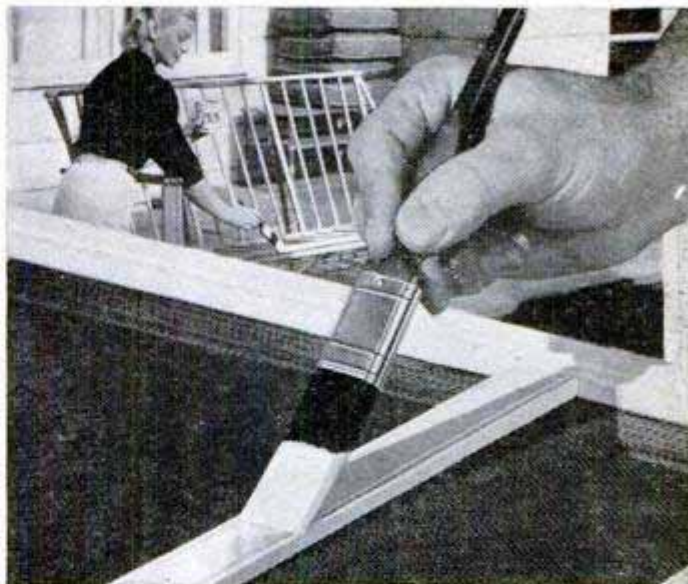
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SOLD EVERYWHERE

3-IN-ONE Oil

JUNE 1951

POINTERS FOR HOME PAINTERS



How to improve your paint jobs...
make your brushes last longer



Start in corners of walls,
ceilings and floors, and paint
away from them. Use a strong
stroke and work steadily so
paint doesn't set before ad-
joining strip can be applied.



Don't let your brush "fish-
tail" (see insert) by painting
narrow or round surfaces
with a large brush. Use small
brush—one designed for the
job—bristled with nylon.



Clean brushes with thinner
after daily use. Suspend
brush in thinner overnight.
Bristle tips should not touch
bottom of can. Work out
thinner before painting again.



When you store brushes
for longer periods, clean
thoroughly and wrap securely
in the manner shown here.
Brushes stay in better con-
dition when kept in shape.

For best results use NYLON PAINT BRUSHES

Job after job, you'll get best results with a nylon paint brush. Tests made by an independent research laboratory prove nylon brushes paint smoother. And durable Du Pont nylon bristles don't break off, even on roughest surfaces. They last 3 to 5 times longer than ordinary bristles . . . are clean and sanitary. Nylon paint brushes are made by leading manufacturers in all types and sizes. Look for the word NYLON on the handle.



Better Things for Better Living
. . . through Chemistry

The best brushes have
**DU PONT NYLON
BRISTLES**

247

P&C Hot Forged Tools

**Stay
on the
Job
longer**

Really tough jobs—in industry or at home—prove that special analysis alloy steel and scientific heat treating make P&C tools last longer. More than 300 P&C tools are easier and faster in everyday use or on special jobs. Your hardware dealer recommends P&C hot forged tools; ask him for the P&C tools you need.

Write for new folder on P&C tools —“the BEST tools money can buy”.

P&C

**P&C HAND FORGED
TOOL COMPANY
PORTLAND 22, OREGON**

**best
white tape
made**

ONLY
98¢*

The new “Evans White-Tape” has everything you'll find in tapes costing over \$1.50—plus.

- snow-white blade with bold, legible, jet-black numerals and graduations. Graduated in 32nds for first 6 inches.
- sturdy die-cast case heavily chrome-plated, calibrated for quick reading inside and outside measurements.
- blade 1/2" wide made of finest high carbon steel—tempered—Bonderized—enamelled—baked.
- blade replaceable in seconds—without tools—without even opening case. And Evans replacement blades cost far less.
- every “Evans White-Tape” is unconditionally guaranteed.
- exclusive Evans automatic brake gives smoother push-pull action with absolutely no “creeping” of tape into case.
- underside is white, too. Mark with ordinary pencil, remove mark with flick of thumb.
- unheard-of low price*: 10-ft. \$1.49; 8-ft. \$1.19; 6-ft. 98¢. Prices higher in far west and Canada.

Evans

& CO. • Newark 5, N. J.

Sold only through retailers.

Makers of Evans 6-ft. Folding Rule and “Folding Yardstick”



STOP DRIP

caused from condensation on cold water pipes. Turn idle basement space into play or work rooms. Keep store rooms dry. Just wrap cork-filled



NoDrip TAPE pipes and joints. Do it yourself. Clean and easy to apply. Roll covers about 10 feet of 1/2" pipe, \$1.69. Higher west of Rockies and Canada. Get at Hardware, Department Stores,

or sent postpaid. Write for free circular. J. W. Mortell Co., 522 Burch St., Kankakee, Ill.



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Dept. PM-651—Wheeling, W. Va.



SHEET METAL BRAKES

Forms angles, flanges and Pittsburgh locks. 26 gauge steel, heavier aluminum. Cam locking. Portable, can be bolted to bench, or clamped to edge of truck. All steel, reinforced. Shipped Exp. Coll. 30" size. Wt. 54 lbs., \$26.50. 36" Wt. 66 lbs. \$31.00. 48" Wt. 100 lbs. \$45.00. Floor mountings, portable. 32" high, 30 lbs. \$7.00. 12" BRAKE. Fits in vise to form difficult compound bends, up to 20 gauge steel. Not illustrated \$12.50 PP. 5" Wide Pliers forms locks, "S" slips, etc. \$ 2.50 P.P. IRON BENDER. 1/4x2" capacity. 9 parts. All steel. \$10.00 P.P. Immediate Delivery. Order direct, cash or C.O.D. or send for folder. **VYKE BRAKE CO., P-1116 So. 27th St., Omaha 5, Nebr.**



LAWN ORNAMENT-NOVELTY PATTERNS

28 Lawn Ornament Patterns, 25c. Other Patterns; 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 10c each. 25 Novelty Patterns, 30c. All 62 Full Size Patterns, \$1.00 Postpaid. Strother Pattern Service, Dept. CG-8, Box 128, Belington, W. Va.

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Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for local yards—do “custom sawing” for neighbors. BELSAW lasts a lifetime. No crew needed. Power with old auto engine. Beginners get excellent results. Send postcard for FREE BOOK, “How To Make Lumber.” **BELSAW MACHINERY CO** 8116 Field Bldg, 315 Westport Rd, Kansas City 2, Mo.

IMPORTED GERMAN BINOCULARS SAVE 60% 12 1/2 MILE RANGE

PRECISION LENSES 3.95 PLUS TAX

New, low cost binoculars from a famous German manufacturer of fine optical instruments. Center focusing adjusts to your own eye strength. Money back guarantee. Compare with glasses at \$15.00 or more! Send check for \$3.95 plus 80c tax... we pay postage, or order C.O.D.



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GROBAN'S WAR SURPLUS SPECIALS

ALL BRAND NEW

FULLY GUARANTEED

DIRECT CURRENT GENERATORS



For welders, plating, truck and marine use, D. C. appliances, lights, etc. Aircraft quality — lifetime grease sealed ball bearings. Heavy duty.

Item #131—Brand new Electric Auto-Lite 12 volt Direct Current electric generators, rated 18 amps. Complete with blower and pulley. Use for trucks, tractors, loads, battery chargers, etc. Part No. GEP-4805A. In original sealed U. S. Army cartons. \$40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only..... **15.00**

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Shpg. wt. 70 lbs. F.O.B. Chicago. **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heintz. Gov't. Acq. Cost \$380.00. Shpg. wt. 70 lbs. F.O.B. Chicago. Each individually packed in wooden box..... **35.00**

Byron-Jackson "PUP"

CENTRIFUGAL PUMP UNIT

\$3800.00 Value

COMPLETE WITH FULL ENGINE AND PUMP INSTRUCTIONS

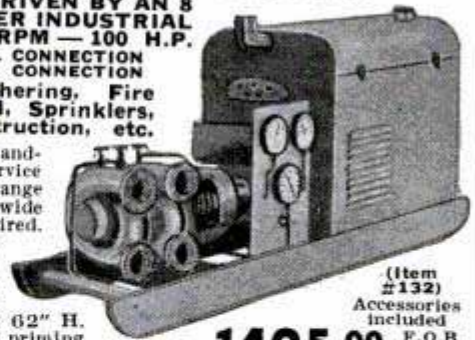
2 STAGE MODEL "PUP" PUMP DRIVEN BY AN 8 CYLINDER MODEL C-36 CHRYSLER INDUSTRIAL ENGINE. ENGINE SPEED 2400 RPM — 100 H.P.

600 GPM AT 175 PSI — PARALLEL CONNECTION
300 GPM AT 375 PSI — SERIES CONNECTION

IDEAL FOR: Pick-up, Gatering, Fire Fighting, Salt Water Disposal, Sprinklers, Irrigation, Dewatering, Construction, etc.

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping is interchangeable for either parallel or series pumping applications.

Overall dimensions, 114" L x 29" W x 62" H. Weight 4080 lbs. Now, complete with full priming equipment, operating instructions and performance data....



(Item #132) Accessories included F.O.B. Chicago

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Hydraulic Cylinders—Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purrolator hydraulic oil filter. Permanent element type. 3/4" female pipe thread ports. Capacity 16 gallons per minute. A \$13.00 value. Now postpaid. **4.95**

ITEM #4—All steel double action hydraulic cylinder. 1 1/2" bore, 2 1/2" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. **4.95**

ITEM #33C—Double action hydraulic cylinder, 1 1/2" bore, 4 1/2" stroke. Clevis mountings at both ends. Uses 1/2" pipe fittings. **8.95**

ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A \$45.00 value. **10.95**

ITEM #16C—Double acting hydraulic cylinder, 1 1/2" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$55.00 value. **16.95**

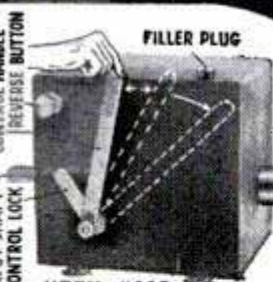
ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 1" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft. 3/4" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago. **21.50**

ITEM #31C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/4" piston rod. Clevis mounting at base and shaft. 19 1/2" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses 3/4" tubing fittings. Value \$102.00. Ship- **22.50**

ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1 1/4" stainless steel shaft. Gov't. acq. cost \$176.00. Shpg. wt. 26 lbs. F.O.B. Chicago. **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for..... **32.50**

new! HYDRAULIC SPEED REDUCER



WITH FINGERTIP CONTROL

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure 3/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Over-all dimensions 7 1/2"x7 1/2"x11 1/4". Gov't. acquisition cost, \$428.00. Shipping weight 26 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

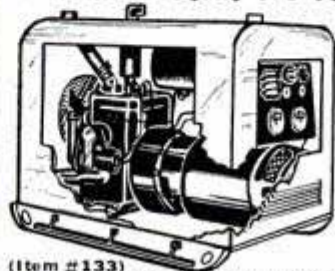
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(Item #133) Totally enclosed power unit with 2 cylinder water-cooled Hercules Model BXB engine direct coupled to generator. American Bosch magneto ignition, crank start, 4 gallon gas tank, 3 qt. oil capacity. Skid mounted with handrails for carrying. Complete with full instrument panel including test light, circuit breaker, killer button, oil pressure and water temp. gauges, voltmeter and ammeter. Shipping wt. 560 lbs. F.O.B. Chicago

395.00

Write for information on other size generating plants ranging from 600 watts to 100 KW.

GENERAL MOTORS — ALLISON

BRAND NEW CENTRIFUGAL PUMP

200 GALLONS PER MINUTE

- For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering



This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't. acq. cost \$145.00 F.O.B. Chicago Now Only **39.50**

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

LOGAN HEAVY DUTY HYDRAULIC PUMP or MOTOR

For operating hydraulic cylinders and hydraulic motors on tractors, bull-dozers, construction machinery, lift trucks, industrial applications, etc. Delivers 10 GPM at 600 RPM at 1000 PSI using 6 HP. Has a 3/4" inlet, 1/2" outlet, 3/4" shaft with flat and keyway for direct or pulley drive. For greater capacity tap out ports to 3/4" for 16 gallons per minute. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value FOR ONLY... **22.50** F.O.B. Chicago (Item #78)



HYDRAULIC CONTROL VALVE ITEM #26. Four-way control valve for use with two hydraulic double-action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Ship. wt. 6 lbs. A \$60.00 value, postpaid. **12.95**

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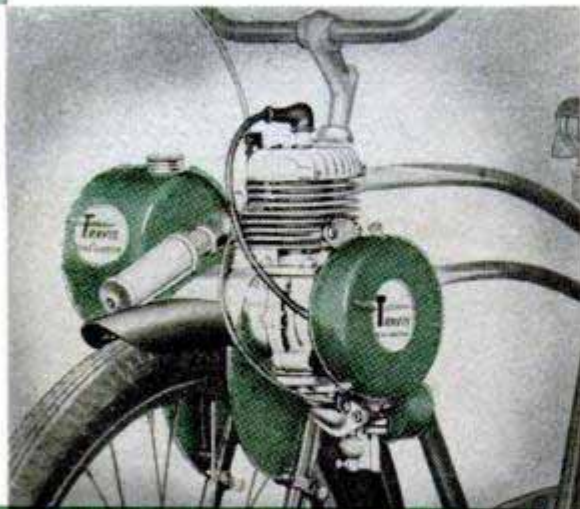
Installed on any bike in
less than 30 minutes.

Here's your most economical transportation to work, to school or to play... over 150 miles to a gallon of gasoline. *World's lowest cost motorized transportation.* Powerful 1½ h.p. motor weighs only 17 pounds and is perfectly balanced. Drives on front tire and has no belts, pulleys or gears... fits any bicycle.



Safest of all for children! Single control gives speeds up to 30 mph. Bike is always under control of coaster brake—compression is released when gas is turned off. Fully guaranteed for 90 days against defective workmanship or material.

Dealer's Note: A few territories are still available—write or wire direct.



TRAVIS BIKE MOTOR

Manufactured by STARBRAND CORPORATION
1202 N. SHERMAN DR. • INDIANAPOLIS 18, INDIANA

I Time the Champions

(Continued from page 92)

sided" timing trap that I developed for occasions when it isn't practical to use a photocell trap.

This trap consists of a pair of bicycle handle bars on which a medium-power hunting scope is mounted. The handle bars and the scope rotate on a pedestal. One of these devices is set up on shore at the start of a measured mile, a duplicate is placed at the other end of the course. Each contains an electric switch that functions when the handle bars are turned at exact right angles to the course. The switches are connected to my timing instrument.

The timing official at the starting line tracks the oncoming boat by turning the handle bars so that he keeps the cross hair of his scope fixed steadily on the oncoming craft. Thus, automatically, the oncoming boat trips the switch and starts the clock at the instant that it crosses the starting line. Meanwhile, at the far end of the course, the other timing official begins to track the boat. His pedestal switch automatically stops the timer when the boat crosses the finish line.

It's possible to get a false reading with this apparatus if either man fails to track the boat smoothly and surely. To avoid this chance, an official witness is assigned to each timing official. The witness peers through a fixed sight that is aimed across the course and he wears a pair of ear-phones that are hooked in series with the timer circuit. If he hears a click in his phones at the instant that the boat crosses in front of his sight, the tracking is perfect and is accepted as official.

Any moving object that you can see can be timed with these trackers if the object is moving across a known measured distance in front of the scopes. The apparatus is accurate to within one foot at a distance of 1000 feet. I developed it primarily for clocking the speed of aircraft, and it is also ideal for timing boats or cars at locations where the photocell units can't be set up.

No timing system is accurate unless the race course itself has been accurately measured. I employ a licensed surveyor to measure off the start and finish lines and, to make doubly sure, I check his work. At some of the dry lakes of the California desert where the Southern California Timing Association and other automotive speed groups hold time trials, it isn't always physically possible to measure off a one-mile course and still leave sufficient distance at each end for the cars to attain maximum speed by the time they hit the

(Continued to page 252)

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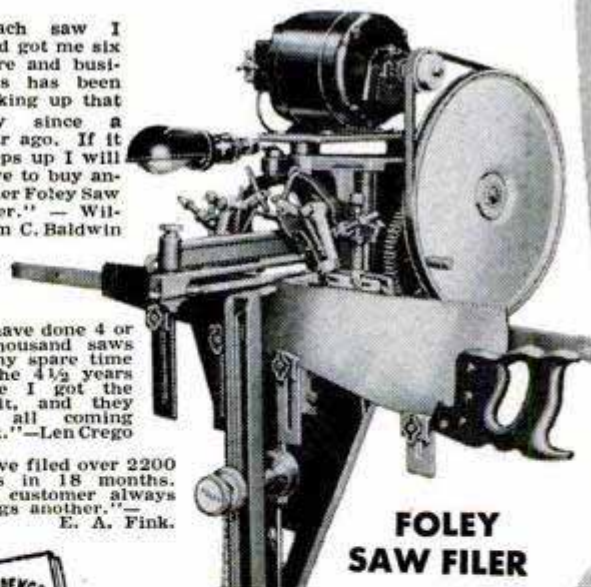
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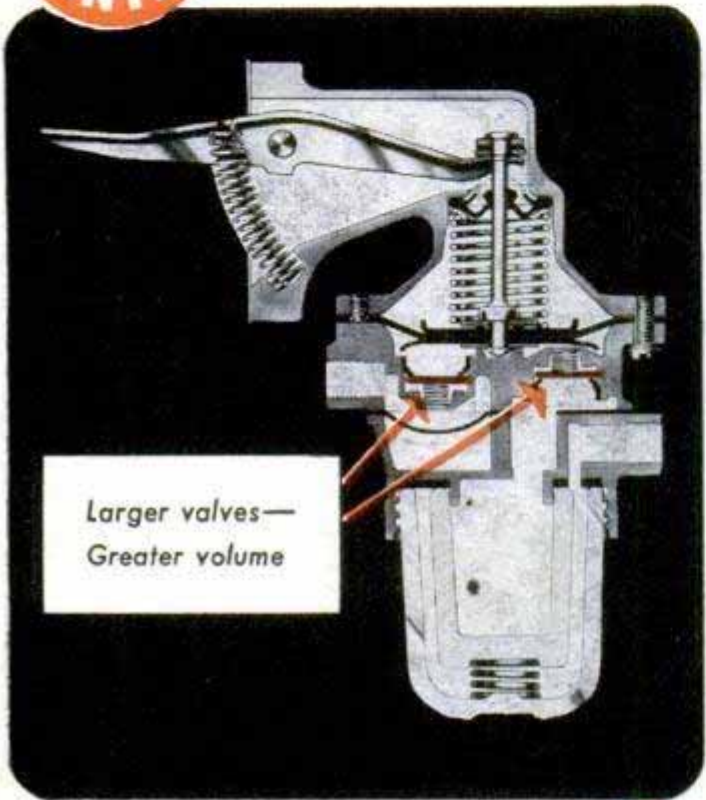
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course and then to decelerate. At those locations we use a speed trap that is only 132 feet long. By referring to a speed chart we can read off, at once, the rate in miles per hour at which the car traveled through the trap.

On a long course across water the driver of a fast boat sometimes has trouble in steering a straight line when there is no outstanding object near by which he can use as a guide. Sometimes we use a bright searchlight mounted on a pole far beyond the finish line as a guide for the drivers, sometimes we use a pair of six-foot weather balloons 50 feet in the air, in line at the end of the course.

My present timer is calibrated to 750 miles per hour, the approximate speed of sound. I think it will be satisfactory for timing any surface vehicle that I'm apt to clock in my lifetime, but if anyone has ideas about driving at supersonic speeds, I'll build a new clock that will give him his exact time to a fraction of a mile per hour!

The Owners Report on the '51 Chevrolet

(Continued from page 98)

For approximately 200 miles between Bend and Portland, over the Warm Springs cutoff, we traveled in the Cascades over snow and slush-covered roads and sometimes icy stretches. The car had good stability, although like all modern cars it perhaps was a little light on the rear end where traction was needed most. A heavier rear end would have helped on the slick roads we encountered.

There is no question but that the 1951 Chevrolet is considerably improved over recent models. Brakes have been greatly improved and the new 11-inch drums are the largest used on any car in the low-priced field. Bonded lining is used, which eliminates rivets. The brakes are smooth and positive with no tendency of fading even at high speeds.

The squeaking and chattering which prevailed in some previous models has been eliminated for 1951. The steering seems to be better than on earlier Chevrolets. The wheels respond quickly to the slightest turn of the steering wheel without too much turning, which I think is good. In my opinion, the steering-gear ratio is about right for the type of car that Chevrolet produces. The turning radius is quite short, and that's also a good feature. (See specification on page 254.)

The hand brake has close ratchet graduations which make for ease of operation in

(Continued to page 254)

BUILD YOUR OWN ARC WELDER OR LIGHT PLANT

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instructions included rated 300 Amps. 30 Volts. Ship. wt. approx. 70 lbs. PRICE F.O.B. K. C., MO.



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200 amp 28 Volt. Gov't. cost \$300.00. Instructions for converting to welder or light plant included. Wt. approx. 70 lbs. **\$15.95**

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BRAND NEW INCL. BUILT IN CHECK & RELIEF VALVE. For hydraulic jacks, presses, hoists, etc. For operating hydraulic cylinders to pump oil or hydraulic fluid under pressure. Has built in check valve, and is capable of delivering 1000 lbs. pressure. Wt. 10 1/2 lbs. A \$50.00 value. Instructions incl. Price **\$12.50**

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10-1 or 5-1 ratio, 90 degree angle. Shaft driven 1/2" spline shaft with 3 mounting holes 5/16". Gears held in forged and machined aluminum housing with two needle bearings, one bronze bearing, and three high speed shielded bearings. Sealed self lubricating chamber. Price **\$5.50** paid

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Including built in relief and bypass valve. Capacity 400 G.P.H. 1/2" drive spline shaft, 3/4" pipe inlet and outlets. Rotates either direction or in any position. Ideal for gasoline, oils and various types of sprayers. Engineering data incl. (Stock #600) only **\$7.95** Postpaid



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Including Built in Motor. Applicable for 24 V. D.C./A.C. or 110 V. A.C. The motor is explosion proof constructed, making it ideal for pumping GASOLINE, FUEL TRANSFER, HOT WATER HEATING CIRCULATOR, USE IT AS COOLANT PUMP, FUEL BOOSTER, OIL PUMP, etc. Discharge connection is for 1" hose. Rated Capacity 300 G.P.H. Direction & Engineering data incl. A tremendous bargain! Stock No. 1200—Only **\$9.95**

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Here is a pump for air, fluid, pressure or vacuum. Standard 1/2" pipe thread. Delivers 300 G.P.H. at 2000 R.P.M. Runs forward or reverse. Self aligning shaft. Spline terminal for direct drive, readily replaced with a pulley. Use them for oil burners, MILKING MACHINES, COMPRESSORS, VACUUM PUMP, etc. Engineering report and instructions incl. Now only **\$9.95** Postage Paid

Adel Self-Priming ELECTRIC PUMP
For pumping light oils, oil burners, fluid metering, fuel pump, tool post grinder, coolant, pressure lubricating pump, etc. Double ball bearing series wound motor, continuous duty. 1/30 H.P. rated 12000 R.P.M. Applicable for 24 V. D.C./A.C. or use on 110 Volt A.C. Size 6 3/4" x 3 1/2" x 3 1/4". rated 3 G.P.H. Remove pump and use motor as high speed grinder, etc. Diagram and instructions incl. **\$9.95** Postpaid

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Brand new. Stock No. PF713 -20. For any liquid pumping job. 375 G.P.H. at 3750 R.P.M. 1000 P.S.I. .410 cu. in. per rev. Gov't. **\$12.50** postpaid cost \$100.00.

VICKERS CONSTANT DISPLACEMENT HYDRAULIC PUMP
Stock No. PF713 -25. Brand new. Powerful, compact. Rated 1000 P.S.I. .507 cu. in. per rev. at 3750 R.P.M. 400 G.P.H. or use as motor. **\$14.50** postpaid

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both applying and releasing. The heating and ventilating system works exceptionally well. The instrument lighting is good (with the exception of the Powerglide position indicator) and a rheostat control switch can be turned to apply any degree of light on the instrument and speedometer panels.

Another thing I noticed on the Powerglide model is that a portion of the vision

1951 CHEVROLET SPECIFICATIONS

ENGINE (REGULAR)

Type.....6-cyl. OHV, in-line
Bore and stroke..... $3\frac{1}{2}$ x $3\frac{3}{4}$ in.
Piston displacement.....216.5 cu. in.
Brake horsepower, gross.....92 at 3400 r.p.m.
Compression ratio.....6.6 to 1
Transmission.....3-speed conventional
Powerglide Option: All models equipped with Powerglide automatic transmission are also equipped with larger engine:
6-cyl. OHV, in-line; bore and stroke— $3\frac{5}{16}$ x $3\frac{15}{16}$ in.; piston displ.—235.5 cu. in.; brake hp., gross—105 at 3600 r.p.m.; compression ratio—6.7 to 1.

GENERAL

Weight, curb (4-door sedan—
style De Luxe).....3270 lbs.*
*(Add approx. 135 lbs. for Powerglide models, due to heavier engine and trans.)
Wheelbase.....115 in.
Tread, front..... $56\frac{1}{16}$ in.
Tread, rear..... $58\frac{3}{4}$ in.
Height.....Styleline 4-door— $65\frac{3}{4}$ in.
Fleetline 4-door— $64\frac{7}{8}$ in.
Height.....Loaded 4-door— $63\frac{5}{8}$ in.
Fleetline 4-door— $62\frac{3}{4}$ in.
Over-all width..... $73\frac{15}{16}$ in.
Length..... $197\frac{13}{16}$ in.

Inside Dimensions (4-door sedan)

Front-seat width.....60 in.
Rear-seat width.....Styleline— $58\frac{3}{8}$ in.
Fleetline— $58\frac{5}{8}$ in.
Leg room, front..... $42\frac{3}{4}$ in.
Leg room, rear.....Styleline—41 in.
Fleetline— $38\frac{5}{8}$ in.
Headroom, front.....Styleline— $35\frac{3}{8}$ in.
Fleetline— $34\frac{3}{8}$ in.
Headroom, rear.....Styleline—35 in.
Fleetline— $34\frac{1}{8}$ in.
Tire size.....6.70 x 15
Recommended tire pressure.....24 lbs.
Road clearance..... $7\frac{7}{16}$ in.
Turning radius.....Right—18.5 ft.; Left—19 ft.
Steering wheel, lock-to-lock.....4.05 turns
Steering ratio.....19.4 to 1

CAPACITIES

Oil (Refill).....5 qts.
Water.....15 qts.
Gasoline.....16 gal.

of the speedometer and instrument panel is obstructed by the gearshift lever or the position indicator. This should be improved. The nonlighting and general appearance of the indicator are not in keeping with the rest of the instruments or interior finish.

The choke is manually operated, which I like. The engine can be started only when the shift-lever indicator is in neutral (marked N) or parking (P) position. This is good. It eliminates danger of starting the engine when the car is in gear.

(Continued to page 256)

Make Ur-Own ROTARY TYPE POWER MOWER

THIS IS NOT A KIT
But A Complete Mower Assembled
As Illustrated

Model 50M KEEN MOWER. Add your electric motor or gas engine. Concealed blade for safety, 3 cutting heights, 1 1/2" to 3 1/2". Ball bearing rubber tired wheels. 18" cut. Cuts to within 1/2" of sidewalk. Weight 48 lbs. America's Greatest Power Mower Value. Order Now **\$44.95**
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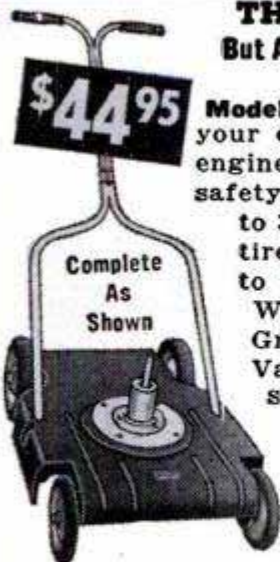
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Write for FREE Folder for information on "Make Ur-Own" and other models with gasoline engines or electric motors.

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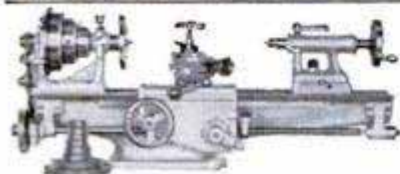
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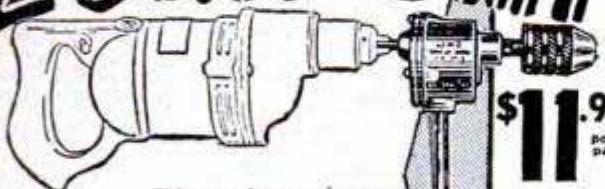
Small but mighty, this deadly open-water hooker is heavy enough to make long casts easier. Sinks and runs medium depth. Special "lip" gives special action—fools the wise ones. 5/8 oz. At your dealer. \$1.25 ea.



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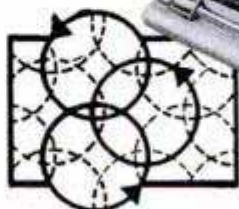
This attachment gives you two drills in one. It converts any 1/4 inch electric drill to 1/2 inch capacity. Reduction gears reduce the drill speed 5 to 1, the average speed of a 1/2 inch drill, and thereby increases the power. Absolutely indispensable for all shop work and home craftsmen.

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The road-holding of the car is excellent, and I should say that the 1951 model is the best Chevrolet I have ever driven so far as roadability is concerned.

The doors are very solid and the assembly of the body seems to be far better than in previous years. No squeaks or rattles developed in the entire test of the car, and many of the miles covered were over twisting, winding and rough roads. We also encountered some rain and snow. There were no leaks in the windshield or the windows.

On long hard pulls and many stretches covered at high speed, the heat indicator remained at normal. No water was added during the entire trip.

Chevrolet long has had the reputation of being a miser when it comes to using oil, and our test was no exception. Not a drop of oil was added and, in my opinion, Chevrolet's cast-iron pistons do assist in oil economy, although personally I would prefer aluminum pistons. There is no question that cast-iron pistons do have some advantages, the principal ones being the fact that they can be fitted with very little clearance, thus reducing noise and also aiding in keeping oil consumption down.

The engine is extremely free of vibration except at wide-open speed (93 to 95 miles per hour by speedometer) when the weight of the cast-iron pistons can readily be detected by the feel of the steering wheel. I'd call it "cast iron pistonitis," which actually is the inertia effect of the reciprocating masses.

The vision is good. Personally, I like the two-piece windshield, and certainly it is more economical when replacement is necessary than is the one-piece curved type which seems to be increasing in popularity.

I found the radio to be excellent. There is considerable space in the trunk and the lid is counterbalanced which makes it convenient. It opens and closes easily.

Like all Fisher-built bodies, the doors can be locked without the use of a key. I consider this an excellent feature and have always liked this arrangement even though there is the danger of occasionally locking the keys in the car.

The engine in the Chevrolet will remain in operation even though the ignition key is removed. Personally, I do not think that this is a good arrangement. I have known drivers sometimes to remove the keys without turning off the ignition switch, and the engine continued to operate.

The counterbalanced hood is fine. It can be opened with very little effort, and I like the fact that the hood remains open without the use of a supporting rod. It is easy to operate. The Chevrolet hood can be opened

(Continued to page 258)



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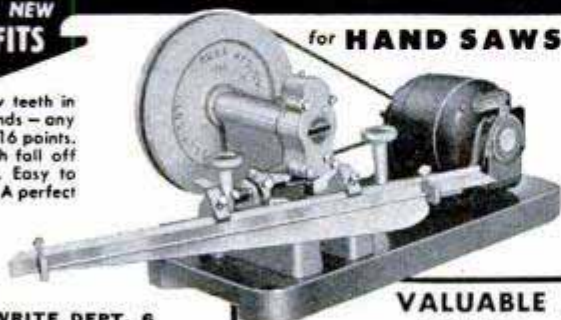
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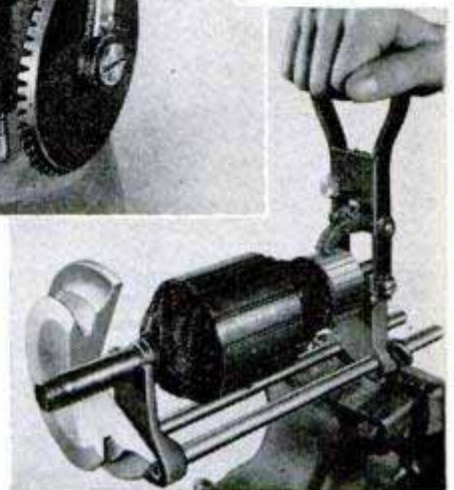
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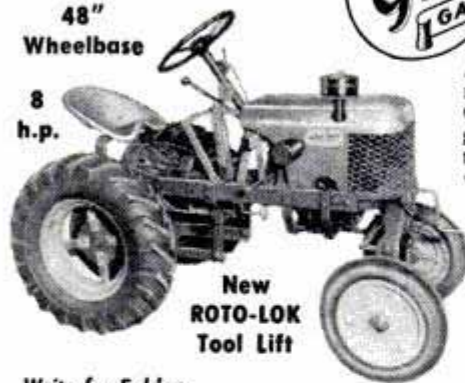


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from the outside even though the doors of the car are locked, and I don't think that this is good. I prefer a hood lock that can be released only from the inside of the car.

Another thing I like about the Chevrolet is the roominess in the driver's compartment and the comfortable driving position.

Chevrolet's new automatic transmission, which they call Powerglide, was a revelation to me and its operation was much better than I expected. There is absolutely no feeling of a change in gear ratios as the Powerglide model accelerates from a standing start to its top speed. There is no jerk at any time and even the expert can't feel when the change in gear ratio takes place.

There is some "mushiness" in the effort of the car getting under way up to about 30 miles per hour when starting in drive position, which ordinarily is used for starting in average operation of the car.

There definitely is a slippage as the Powerglide model gets under way. However, my tests show that this slippage is not as great as the average driver thinks it is. The feeling of the slipping occurs from a dead start up to about 30 miles per hour. The unit becomes positive at about 35 miles per hour or slightly better. From then on it drives as though there were a rigid connection between engine and rear wheels.

Engineers tell me there is only about 12 percent slippage from 0 to 30 miles per hour in this new transmission. I tested the car alongside a Chevrolet with conventional transmission, and when the throttle is fully depressed in the Powerglide model the engine does seem to be revving up more than necessary with slippage occurring.

My tests showed, however, that when a conventionally equipped Chevrolet accelerates alongside a Powerglide model, although the low-gear and second-gear engagements are positive on the conventional model, its engine (especially in low) is revving up very high when the car is traveling at the same speed as the Powerglide model. The operating smoothness of the Powerglide makes one forget that the car actually is gaining momentum quite rapidly in acceleration period. I found the Chevrolet Powerglide reaches its top speed from about 40 miles an hour very quickly.

The mileage a Powerglide owner may secure depends much upon the lightness of his foot on the throttle. The careful driver of a Powerglide can greatly increase his mileage if he will allow the car to accelerate from a standstill by depressing the throttle slowly and holding it about one third open until the car gains momentum to about 30 miles per hour. Pushing the throttle down

(Continued to page 262)

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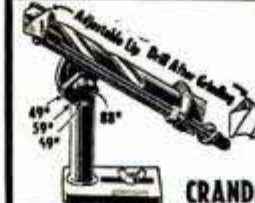
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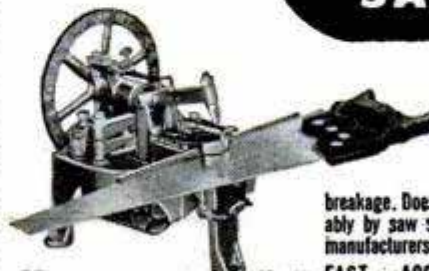
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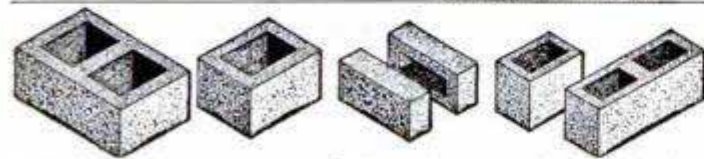
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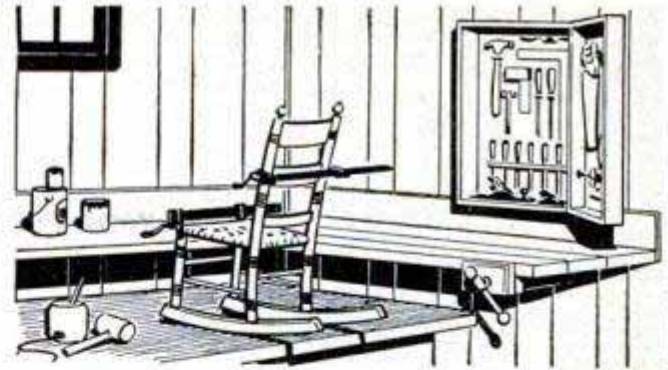
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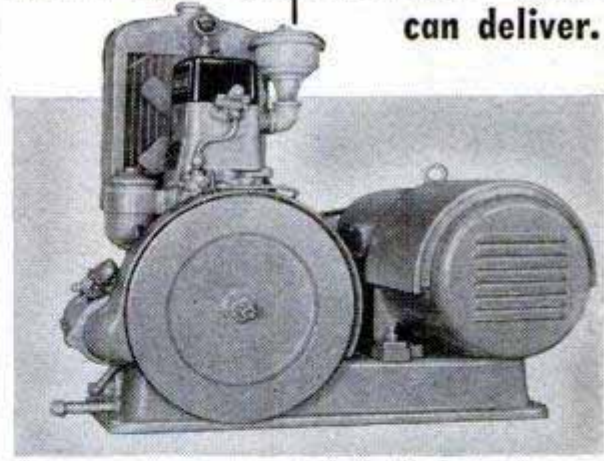
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as far as possible is more wasteful of gas while accelerating than the same procedure on a conventional-transmission-equipped model. I used regular gasoline in all of my tests and I found it entirely satisfactory in a Chevrolet.

I would like to put in a word for a standardized shift for automatic-transmission cars. If something isn't done about this we shall soon be in the unhappy situation that pertained to gearshift positions many years ago. Remember when Buick and Dodge had shift positions that were entirely different from those used in cars equipped with standard gearshifts?

Let's see what makes the Powerglide tick. The Powerglide is made up of torque converter, planetary unit and clutch, oil pump and hydraulic controls. Actually, Chevrolet combines the principle of a simple fluid coupling with a hydraulic torque converter. Hydraulic torque conversion means using a fluid to provide the proper ratio of speed and torque.

The operation of the car in its smoothness reminds me somewhat of the even flow of power that drivers of early day steam cars will recall. On the steamer, as the throttle was opened a steady flow of power was transferred to the rear wheels. The very same smoothness is evident in Powerglide operation. Powerglide smoothness of operation and its various gear ratios also are somewhat similar to early day friction-driven cars with their numberless gear ratios.

Personally, I was very much pleased and impressed with the operation of the Powerglide. It was far better in its simplicity of operation and in its smoothness in change of gear ratios than I had expected. There is only a slight tendency for the car to creep when standing with the shift lever in (D) position.

The 1951 Powerglide-equipped Chevrolet is the best Chevrolet I've ever driven or tested. I've never found the ideal car and I never expect to. All makes have some features that are both liked and disliked—but owners' ratings, as well as my own, are high on the 1951 Chevrolet.

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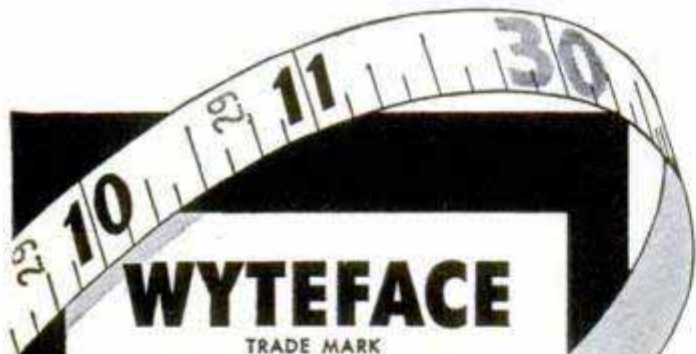
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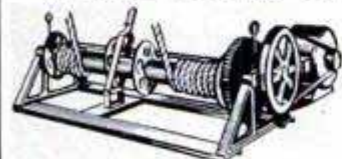
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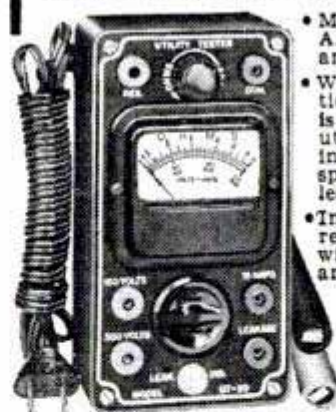
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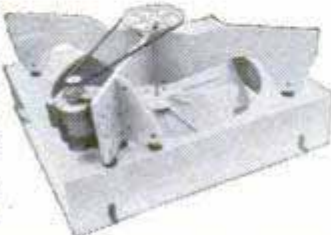
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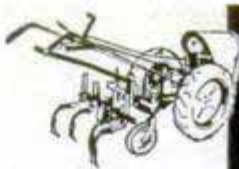
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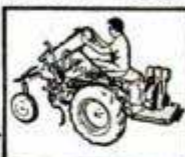
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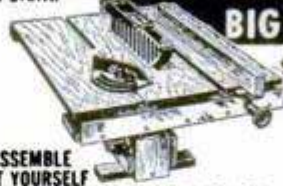
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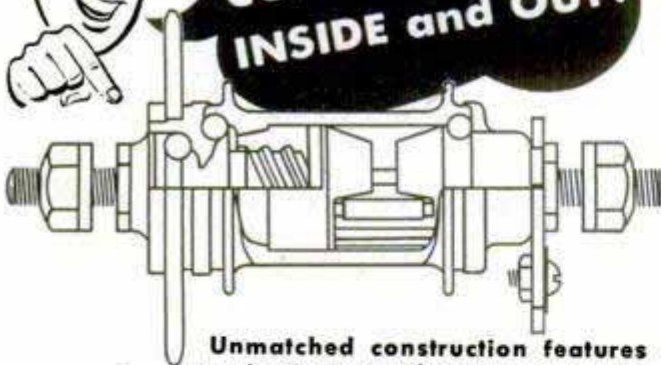
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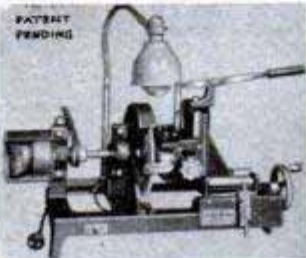


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That DANDY BOY quick implement hitch sure is a dandy. Change from garden tool to lawn mower in a minute. The lawn is cut and trimmed and the place looks swell. Lawn mowing and weed cutting is quick fun with my DANDY BOY and its many attachments.

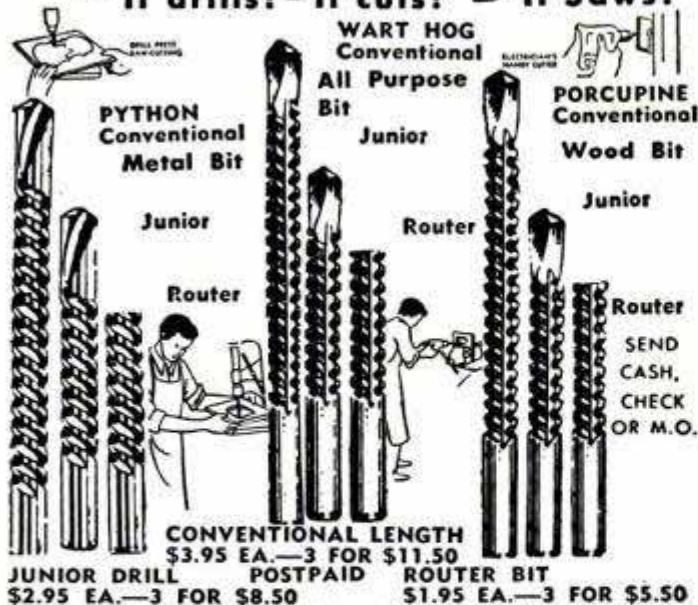
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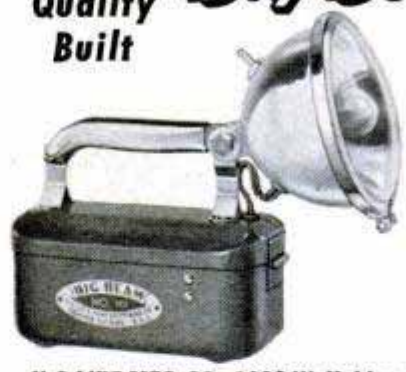
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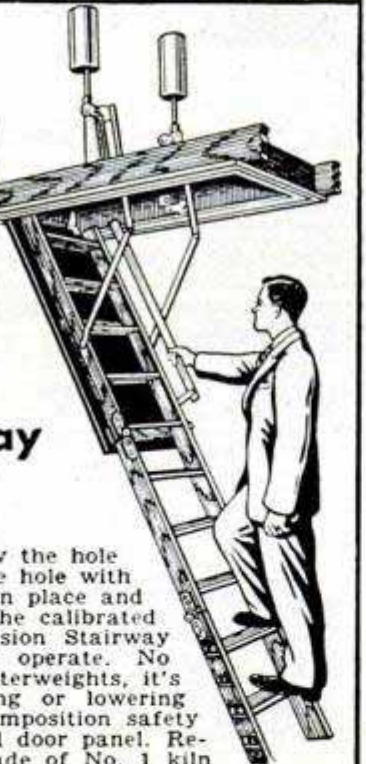
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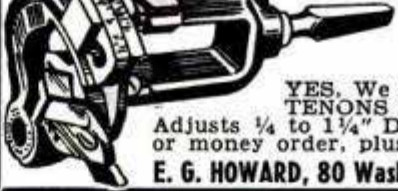
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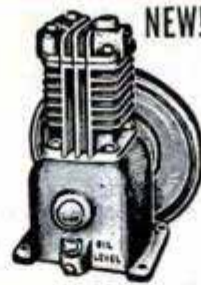
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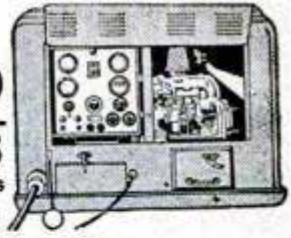
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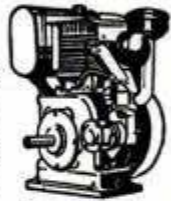
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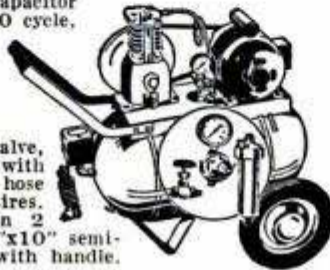
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PM-6



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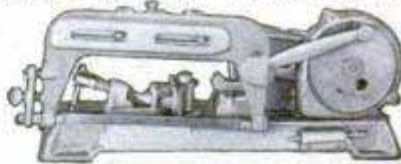


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8.15

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
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