



POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, NO. 410426

REG. U.S. PAT. OFF.

*See
Nov 1960,
p. 16*



See page 104



In This Issue
HERE COMES THE CIRCUS
MAKE A FLIGHT BOW

Anniversary Feature
YOUR HOME—
1902 to 1952





Commander V-8 Starliner "hard-top" convertible.

Chrome wheel discs optional at extra cost—decorative and other specifications subject to change without notice.

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The Starliner is one of many dramatically advanced 1952 Studebaker Champions and Commander V-8s.

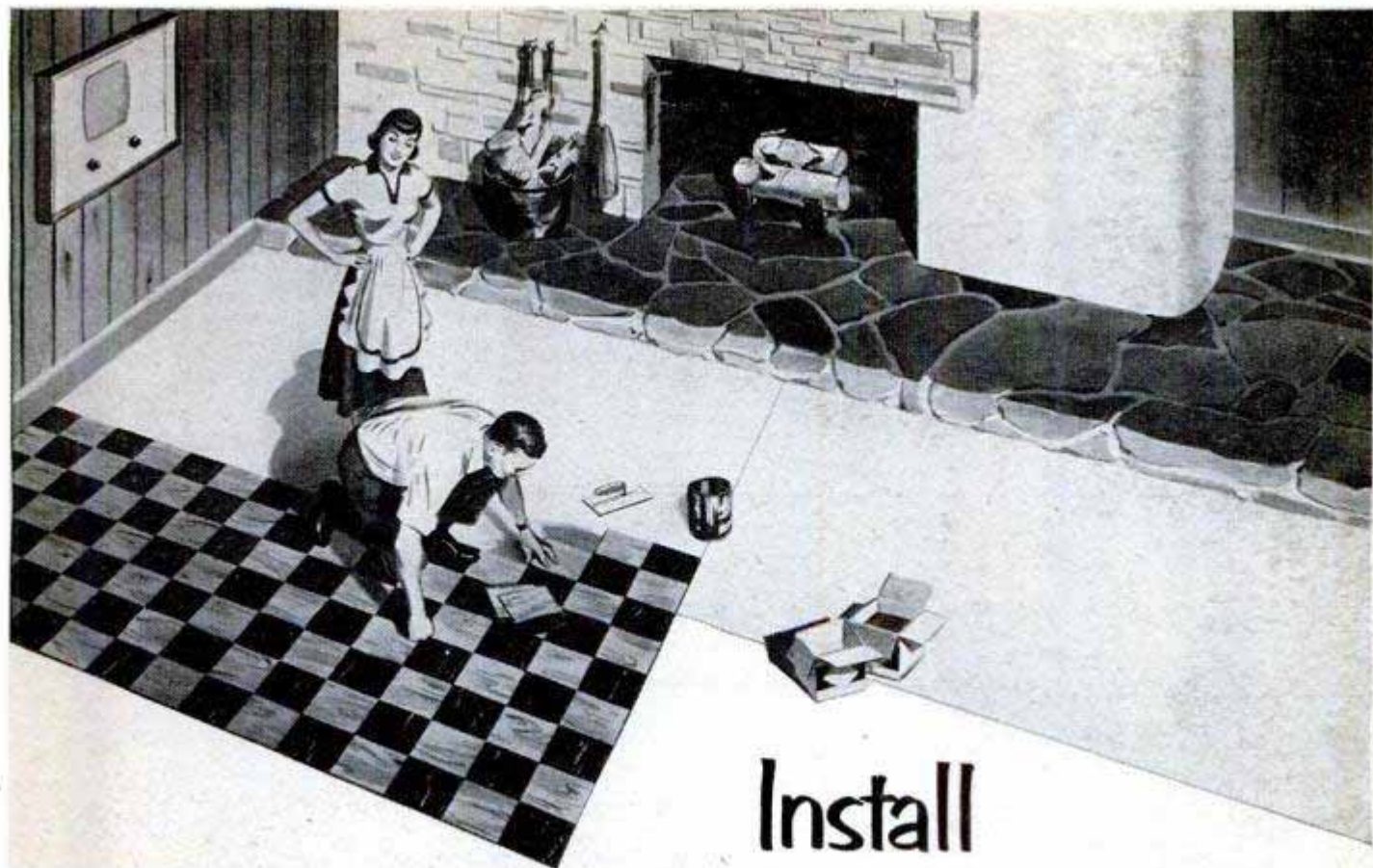
Stop in and arrange to try one out at a nearby Studebaker dealer's showroom.



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See Studebaker for '52

Studebaker, South Bend 27, Indiana, U. S. A.



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men?



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

Volume 97

MAY 1952

Number 5

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this month's cover

LOOK OUT! Everybody knows a plane can't fly without wings. That is, everybody but the pilot of that dive bomber on our cover, who apparently thinks he can fly on a revved-up engine and a prayer. Truth is, he forgot to fold down the wings of his carrier plane before heading down the runway of an air station. Aviators will argue that it simply can't be done, but this befuddled flyer managed to lift the 20,000-pound plane 250 feet into the air before it went into a spin and crashed. This is just one of the tall—but true—tales spun by today's "hangar flyers" when fog shrouds flight decks and landing strips. Ever hear of the helicopter that rescued a pilot while his crashed plane was still on the deck of its own carrier? Or the pilot who used his carrier plane's tail hook as a weapon in Korea? These are just **two of the tall tales starting on page 104**

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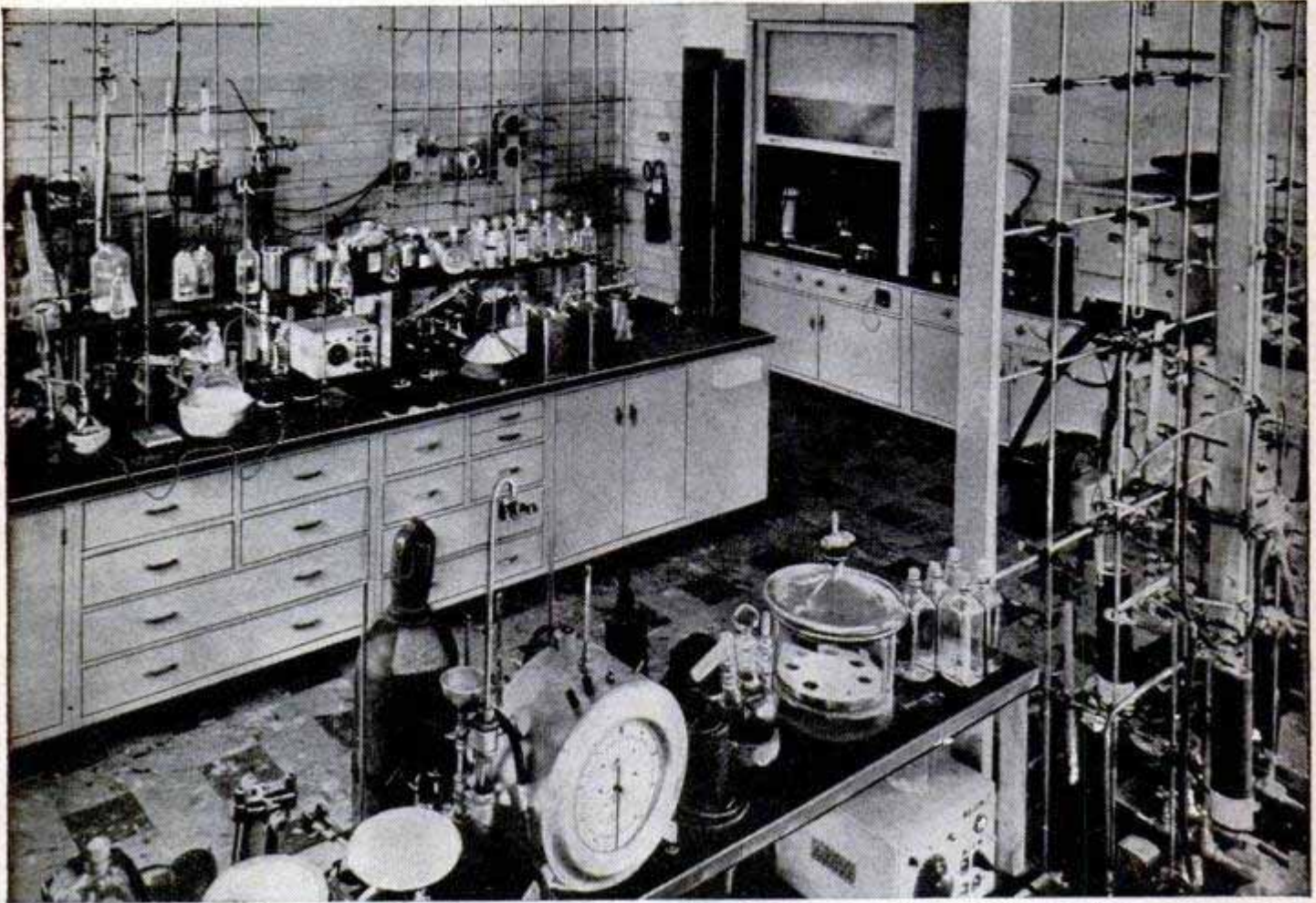
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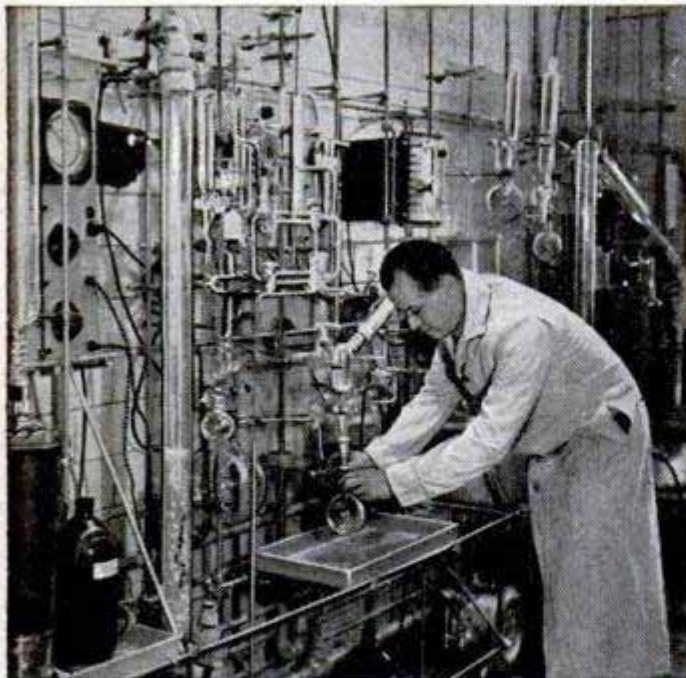
Other items, and manufacturers of available products described, are listed on pages 12, 14 and 16

These Great Laboratory



PETROCHEMICALS offer independent inventors great opportunity. Such synthetics as Nylon, Vinylite, Neolite are already indispensable to our expand-

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If you have an idea of this sort—or in the general area of petroleum products or applications—you are invited to submit it to the Sinclair Research Laboratories. In your own interest,

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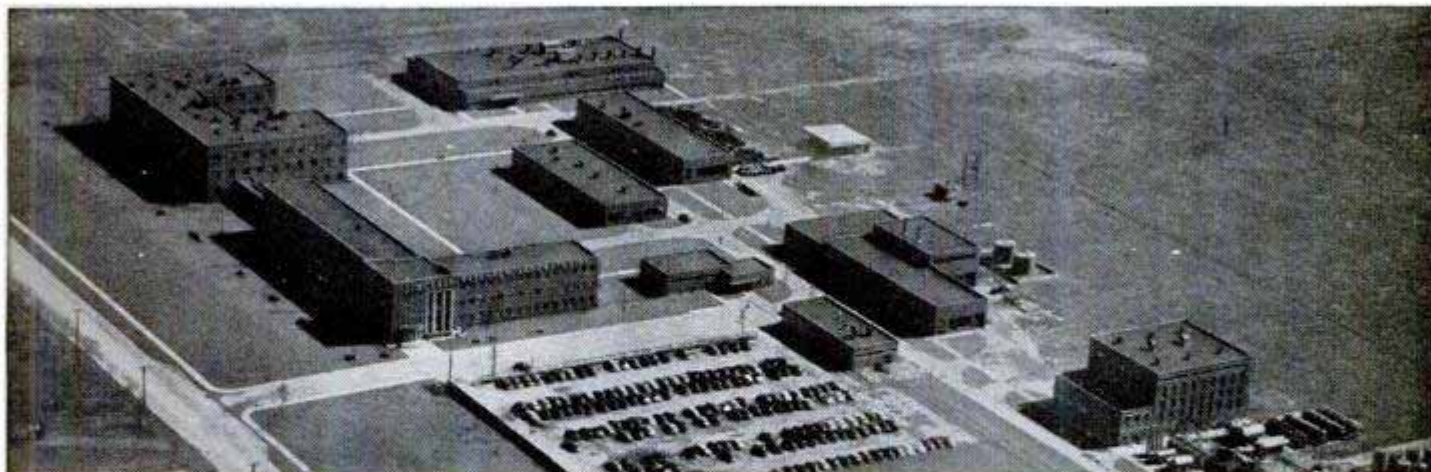
The inventor's idea remains his own property

If the laboratories select your idea, they will make a very simple arrangement with you: In return for the laboratories' work, Sinclair will receive the privilege of using the idea for its own companies, free from royalties.

This agreement in no way hinders the inventor from selling his idea to any of the hundreds of other oil companies for whatever he can get. Sinclair has *no control* over the inventor's sale of his idea to others, and has *no participation* in any of the inventor's profits.

HOW TO PARTICIPATE: Instructions are contained in an Inventor's Booklet available on request. Write to: W. M. Flowers, Executive Vice-President, Sinclair Research Laboratories, Inc., 600 Fifth Avenue, New York 20, N. Y.

IMPORTANT: *Please do not send in any ideas until you have sent for and received the instructions.*



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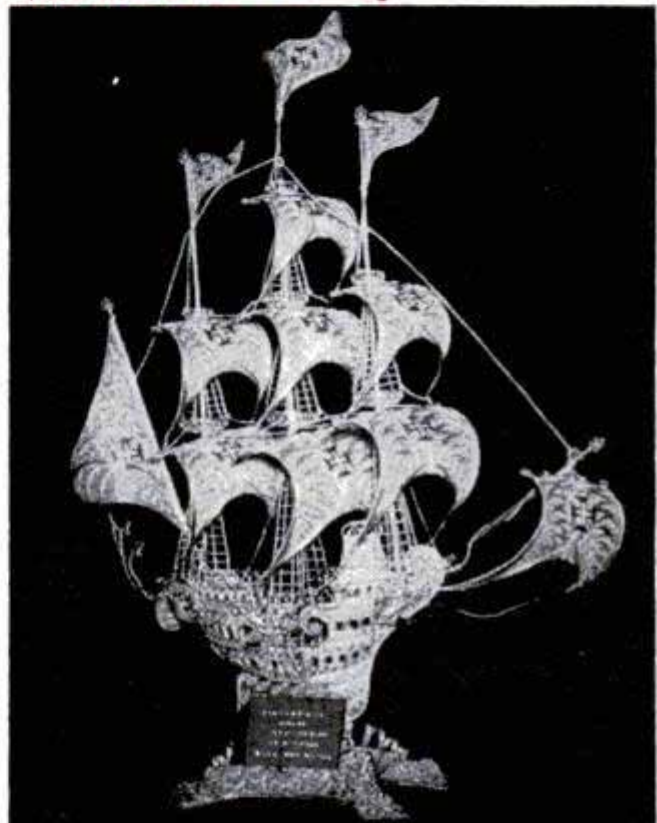
THE EDITORS



Golden Gift

One of the most beautiful gifts we received during our Golden Anniversary celebration in January was a golden caravel presented to *Popular Mechanics* by Alvaro Goncalves Pereira, magazine distributor in Lisbon, Portugal. It was made

Restauradores 13,



of silver wires wound into rosettes and spirals by Portuguese women using small pliers. Each sail or other part was then soldered in place by a jeweler and, finally, the whole caravel was gilded. The ship, which is 24 inches high, took three months to build.

A House to Make Life Easy

When a writer of science fiction builds a house, it is certain to be a modern one. Robert A. Heinlein of Colorado Springs, who wrote the movie "Destination Moon" and several current science stories, decided that his home would have to take care of itself. You'll see the result in our June issue—"A House to Make Life Easy." The house has no rugs. Its windows are sealed—its indoor climate manufactured for summer or winter comfort. Its dining table commutes between kitchen and dining

(Continued to page 8)



To the man who wants to enjoy
an ACCOUNTANT'S CAREER



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

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TRAIN IN MIAMI--AIR CAPITAL OF THE WORLD

(Continued from page 6)

space on wheels. The furniture is part of the house. If you're interested in modern living, don't fail to read the article next month.

Letter to the Editor

I wonder if you got the full significance of that prize-winning picture ("Family Album" by Sallie Sawyer Smith). Our son, a Navy veteran and a polio victim in Novem-



ber 1949, with seven months in an iron lung, was home on his first week end to see his three-week-old son for the first time. His father is taking a picture and his devoted sister snapped the one you published.

We feel your judges are to be complimented for their selections.

Louise Sawyer Smith.

Guided Missiles Have Air Bearings

To the Editor: There is a tale from the Harz Mountains in Germany about a man who built a clockwork leg to replace one he had lost. He wound this clockwork leg and it started him walking around. But he had not figured a way to turn it off, and even to this day (according to the tale) you can see his skeleton when the night is windy and dark—and if the lightning flashes just right—walking around with a clockwork leg in the forests and along the dikes.

The mechanical ingenuity shown by precision workmen and engineers working in the guided-missile field is an interesting story, too. For example, in long-range guided missiles, extremely sensitive gyro mechanisms are needed in order to assure that the expensive weapons land in close proximity to the target, often several thousand miles distant.

The precession axes of these gyros are "air bearings" which have as a lubricant a film of air .001 inch thick. The bearing surfaces must be dustfree and so perfect that

(Continued to page 10)



This story actually happened. The man's name has been changed and this is not his photograph, but the facts are true.

Everybody liked Dick Gray. He was a man's man. A star athlete. A whiz of a basketball player. A good husband. A hard worker.

But with all those interests, Dick Gray had a busy day every day. And Dick Gray was ambitious. He *could* study at a local college nights, but that would take hours of commuting. That's when a friend told Dick about I.C.S. and how he could study at home in his spare time.

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(Continued from page 8)

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It has been further calculated that if a watch were designed with air bearings, it would run for many, many human lifespans. Until something better comes along, this type of bearing is undoubtedly the nearest thing to perpetual motion that yet has been developed.

Victor Black,
Aerophysics Laboratory,
North American Aviation, Inc.,
Downey, Calif.



Rubberneck Bus

A British circus has found a new use for obsolete double-decker busses. They provide perfect personnel carriers for giraffes. A representative of the Chipperfield Circus found the bus of ancient vintage (circa 1933) awaiting the junkmen, and bought and remodeled it for Sambo, an 18-month-old giraffe, by removing the top-deck structure. When Sambo grows to his full height, a hole will be cut in the roof—and traffic will get the surprise of its life. J. L. Taylor of St. Annes, Lancashire, who reported this bit to us, comments, "Incidentally, this bus has carried hundreds of American Air Force personnel from Warton Air Base."

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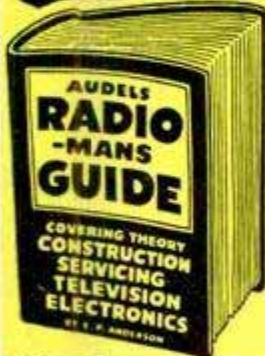
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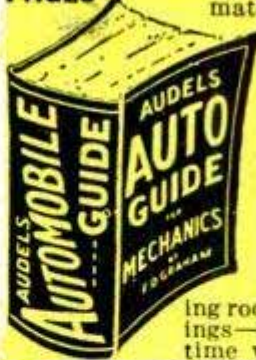


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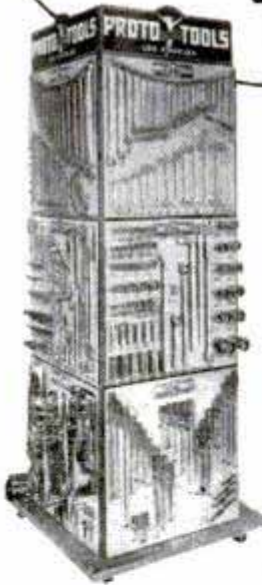
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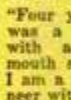
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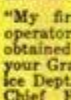
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- Microphone of advanced design (University of California at Los Angeles, Los Angeles, Calif.).....216

Radioactive Sugar

Tagged with an atom of radioactive carbon 14, "hot" sugar will give scientists new knowledge of chemical processes in living organisms ranging from man to bacteria. Because it is radioactive, the sugar can be traced as it travels in the body. From a study of its path and reactions, scientists hope to learn much that may prove useful in the fight against disease, including cancer and tooth decay. The cost of radioactive sugar makes today's grocery-store prices look puny—it sells for \$28,000 an ounce!

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

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Q: "What's that got to do with it?"

A: Anything that reduces this friction means that less of your tankful is needed to overcome friction and more of it can drive your car.

Q: "So?"

A: Tests show that motorists get an average of 8% more power from the same amount of gasoline after they change from whatever brand they have been using to Macmillan Ring-Free Motor Oil.

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A: Hundreds and hundreds of cars like yours were tested on a Dynamometer—the testing machine accepted by the automotive industry to measure power.

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Q: "I see. Macmillan Oil gives me enough extra miles from a tankful of gas to save me the cost of a Macmillan refill. Is that it?"

A: Exactly. If you are getting average mileage, with Macmillan you get an *extra 20 miles* from every tankful. But that isn't all.

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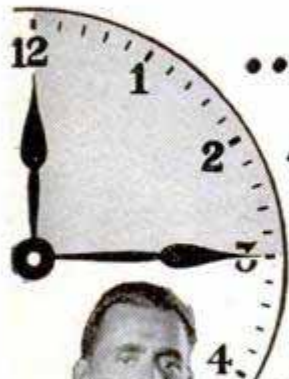
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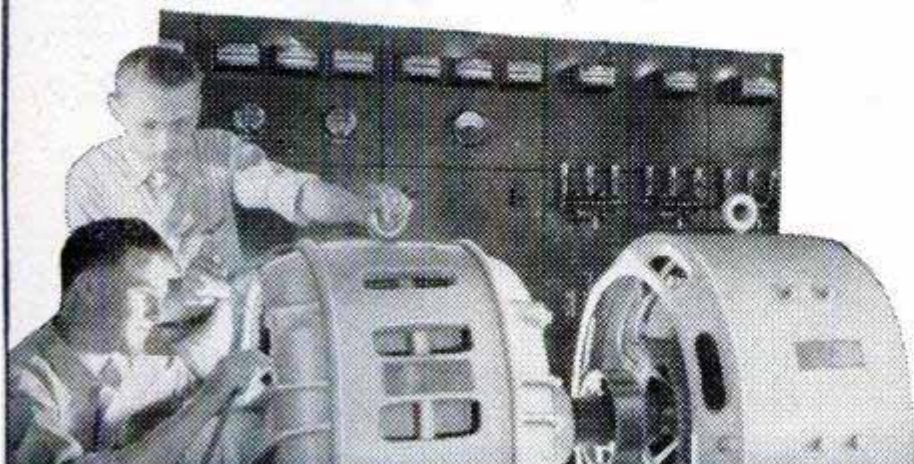
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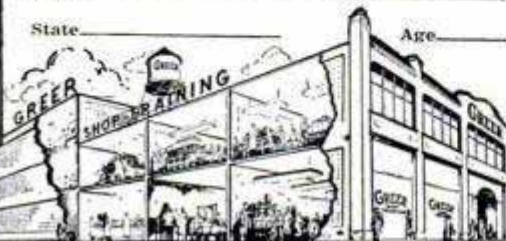
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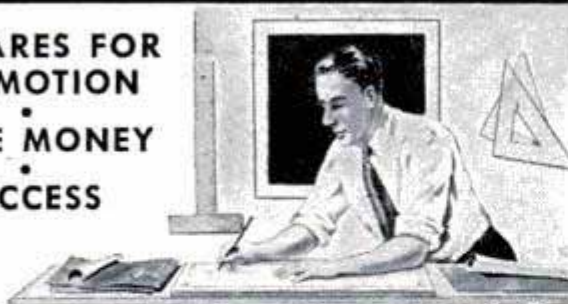
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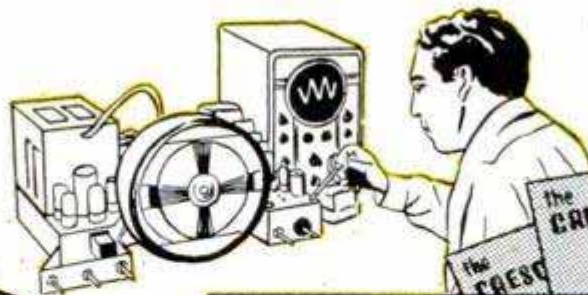
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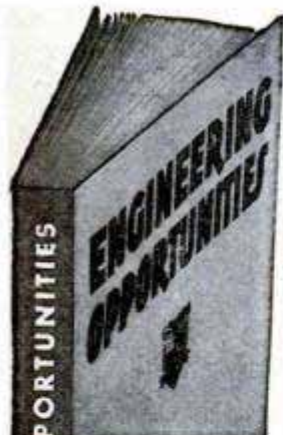
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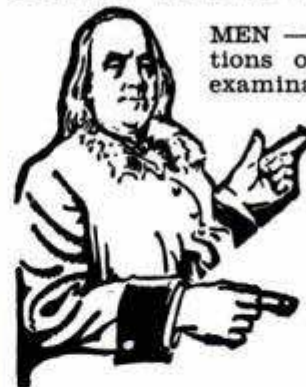
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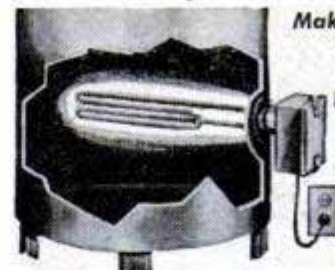
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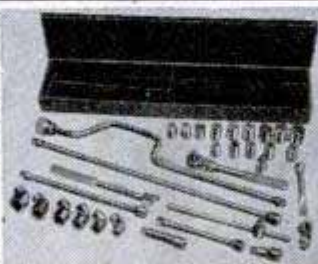
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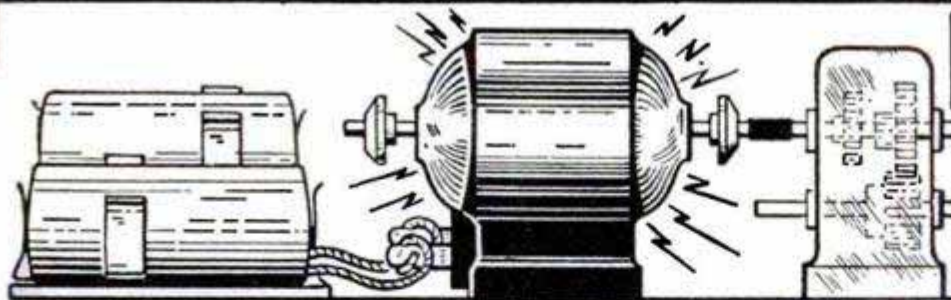
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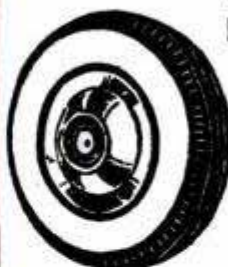
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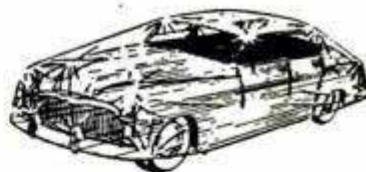
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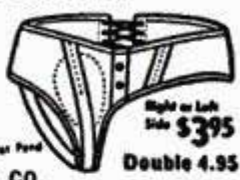


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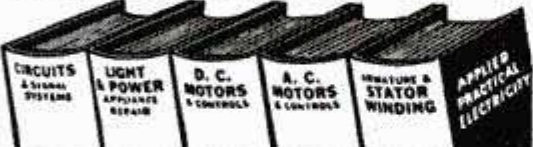
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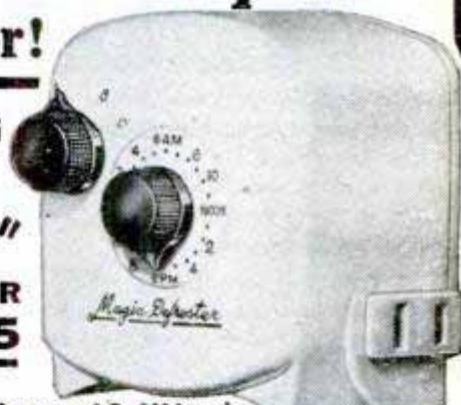
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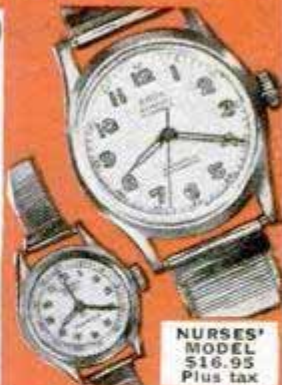
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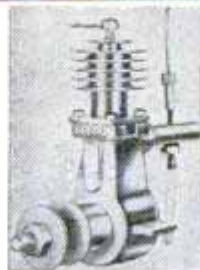
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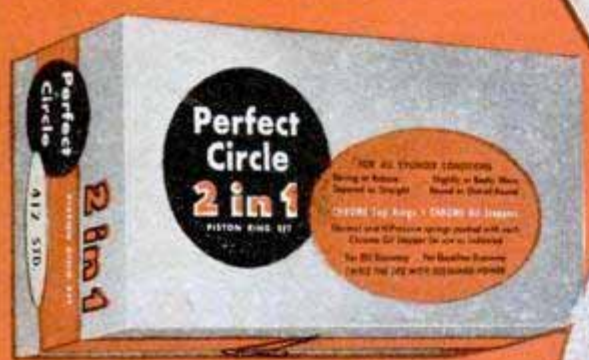
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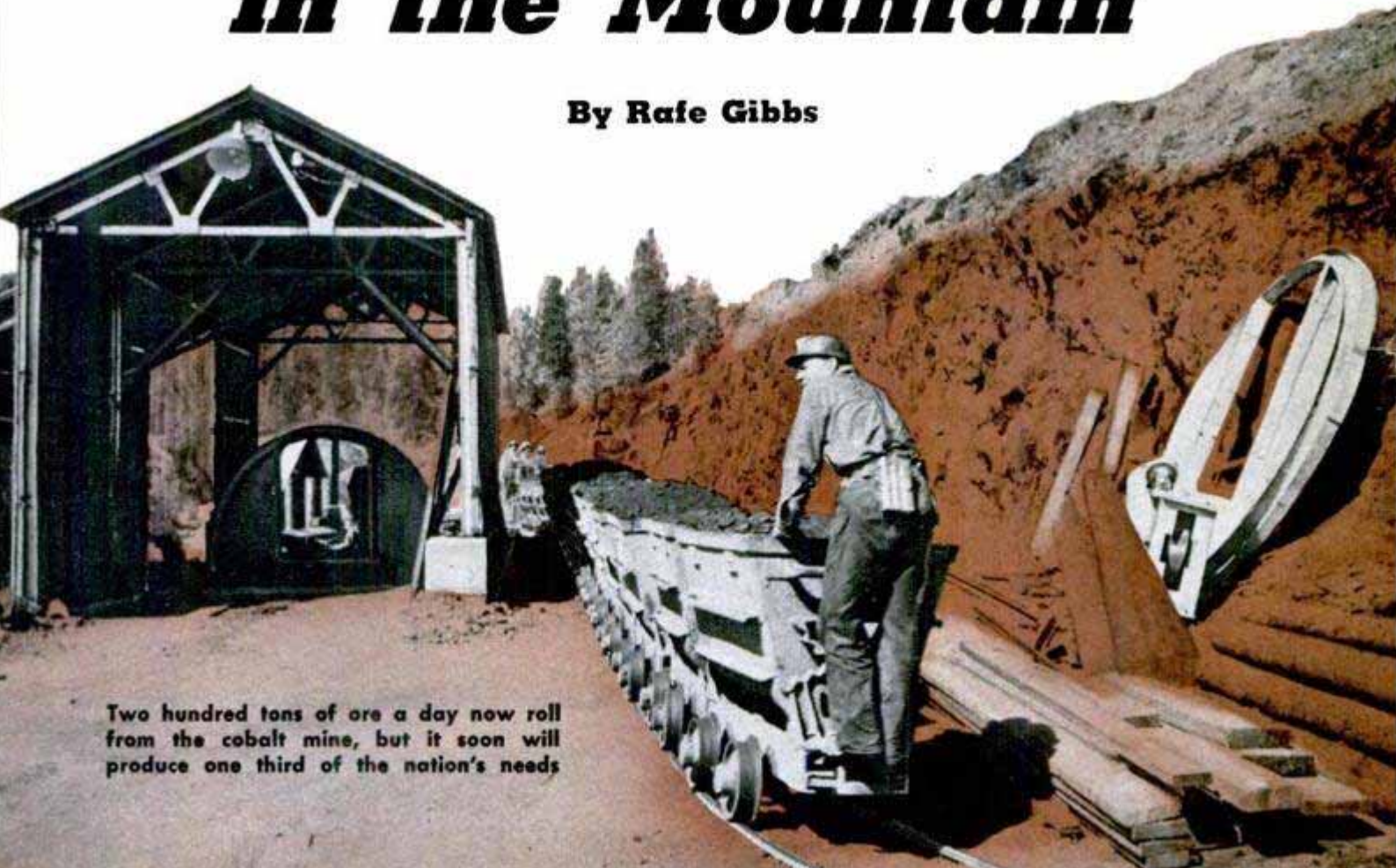
This is the hole in an Idaho mountain which leads to mine producing cobalt—scarce and vital metal

ON THE ROUGH fringes of Idaho's primitive area is a mountainside hole not very big in diameter. When one of the many deer ranging the slopes tried to investigate the hole, the animal got its antlers stuck. That hole is one of the most important in the nation today. It leads to rich deposits of cobalt—a fabulous metal that is vital to jet-airplane engines and guided missiles, a metal that has H-bomb possibilities.

The hole is the entrance to the Blackbird Mine on Blackbird Creek in Blackbird Canyon. The mine, a new development of the Calera Mining Company, a Howe Sound subsidiary, is America's hope that it won't be caught short on cobalt. Once called *kobold*—the German word for a mischievous spirit—because the ores containing it gave forth mysterious fumes, the metal has

THE RICHEST HOLE in the Mountain

By Rafe Gibbs



Two hundred tons of ore a day now roll from the cobalt mine, but it soon will produce one third of the nation's needs



Beside an old cabin of a gold prospector, a new pipe line is laid for the Idaho mine now producing cobalt

become a highly desirable spirit to have hovering over the nation's shoulder. Not only is it important to defense, but it is important to dozens of peacetime industries, including television and radio. It is important to the man who needs treatment for cancer.

The United States has long depended on the Belgian Congo for most of its cobalt (75 percent), but now cars heaped with cobalt-bearing ore are rolling out of that mountainside hole in Idaho. Two hundred tons a day—to be stepped up to 1000 tons upon

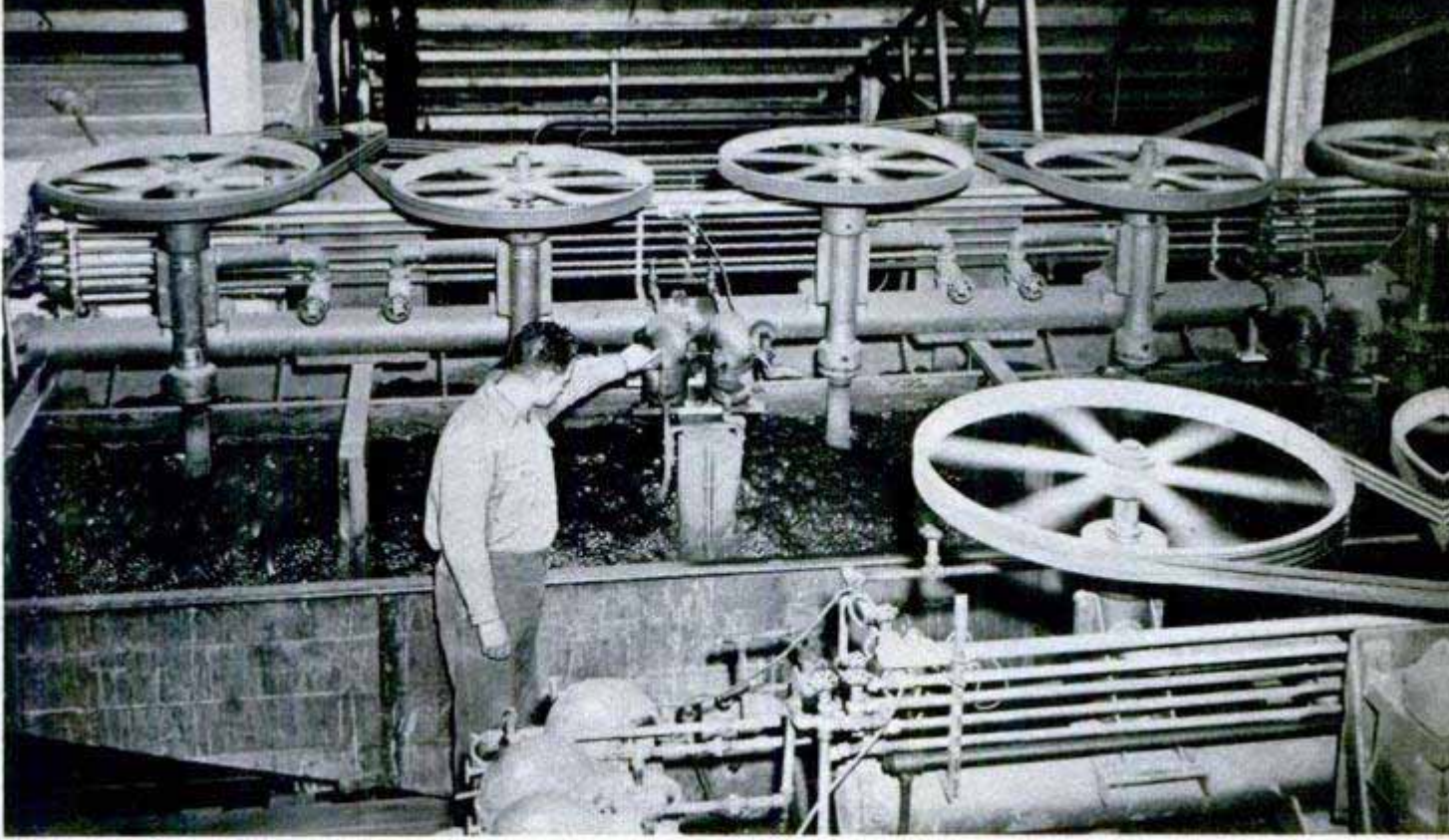
completion of a new refinery. By 1953, the annual Blackbird production of cobalt is expected to be at least three million pounds—36 percent of our 1950 consumption.

Near the mine, on an old ranch pasture beside Panther Creek, has sprung up a new town called Cobalt. Population about 450, and growing fast. Many cowboys from the area have traded 10-gallon felt headgear for one-gallon tin jobs, and spurs for pneumatic drills. They're helping ride herd on the mischievous spirit far from the sun.

Prospectors staked the original Blackbird

New roads to the cobalt mine had to be blasted through the mountains; one road took a carload of dynamite





Ore from Idaho mine gets a giant bubble bath in flotation process to extract the highly valuable cobalt

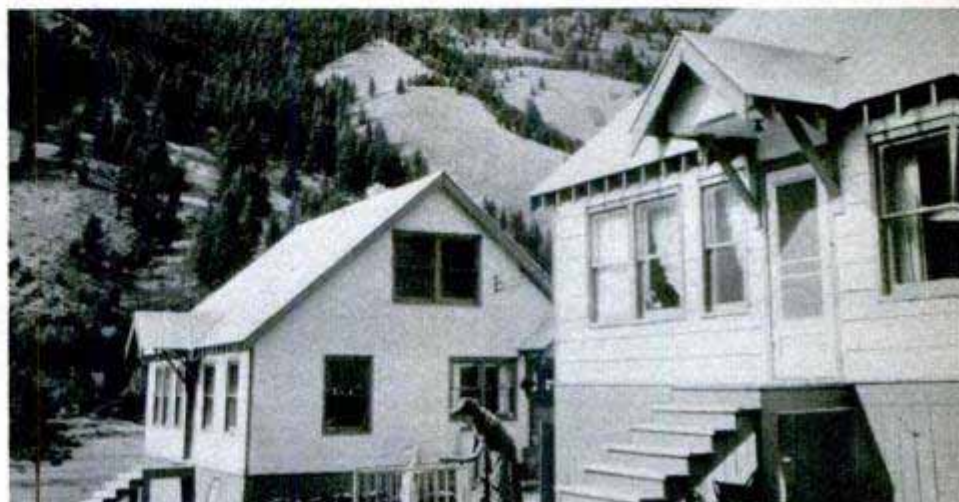
claims in the 90s. They gave the canyon its name when they flushed great flocks of ravens whose descendants still flit through the canyon brush. The early prospectors were after gold and copper. Plans were made for a smelter, and hundreds of cords of wood were cut and stacked on the mountainsides to feed furnace maws.

Most of the corded wood is still there, for the smelter never materialized. Isolation of the district and prohibitive operating costs killed the plans a-borning. Calera's construction workers, who bucked 25-below-zero weather in recent winters, warmed their hands over fires from the wood cut more than a half century ago. It was cheap fuel. Yellowed records found at the site showed that the early woodcutters had been paid 10 cents a cord to fell the trees and cut the wood into lengths that fit the furnace firebox.

There were other attempts to work the Blackbird — one company in the 30s was docked on the ore because the cobalt content was too heavy — but in more recent years the brush in Blackbird Canyon grew high and thick. The



Heavy equipment like the ore crusher above had to be trucked high into the mountains over rugged roads to the new town of Cobalt. Below, two samples of attractive modern homes built for the new employees of the Idaho mining community. The population is about 450





Men unload ore cars by hand because demand for cobalt was too great to wait for automatic dumping outfit

ravens continued to chatter undisturbed.

Cobalt has long been considered a valuable metal. The ancient Egyptians used its oxides in making pottery. The vases adorning Cleopatra's barge as it floated down the Nile had cobalt in their substance. So, too, had the famous Chinese vases of the Ming dynasty—that's what gave them their peculiar blue coloring. In the 17th century, when invisible ink was fundamental to royal intrigue, cobalt salts were highly prized.

These uses, however, were insignificant compared with those of today. Cobalt is tough stuff and is now used, for instance, as a binder for tungsten and carbide. The material made from this combination is so hard it serves as a diamond substitute. Cobalt gives jet engines the ability to withstand the terrific heat of terrific speed. Because of its "red hardness," it is also vital to high-speed cutting tools.

In July 1942 the demand for cobalt was as pressing as that for nylon stockings. The State Bureau of Mines and Geology at the University of Idaho sent Prof. Alfred L. Anderson down to have a look at the abandoned Blackbird Mine. Shortly thereafter, the professor rushed this message to the U. S. Bureau of Mines in Washington, D. C.:

"If the government wants cobalt, this is the place to come and get it."

The government did want cobalt, and the bureau immediately began intensive exploratory work. Howe Sound became interested, and in 1945—after two years of additional exploratory work on its own—started the staggering job of turning the old Blackbird into one of the world's greatest producers of cobalt.

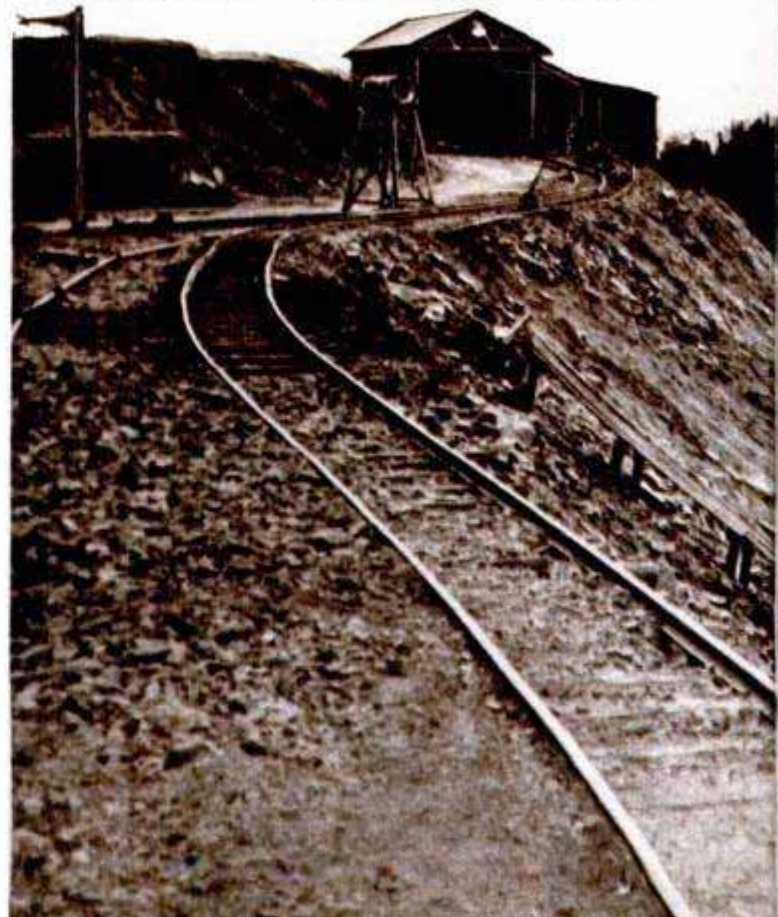
"We had problems," Edwin B. Douglas,

manager of the mine, told us when we went to the Blackbird recently. Douglas, we soon learned, is a conservative man. But he is also a hardy, square-jawed, pipe-puffing Scotsman who has a way of getting the job done.

The Blackbird is 107 miles from the nearest railhead—at Mackay.

"It was easy to have a carload of dynamite spotted at Mackay," said Douglas, "but getting the dynamite here by truck was something else again. Sometimes the roads wouldn't permit the trucks to roll, and the dynamite car would just sit while the people of Mackay got jittery."

There are two "main" roads leading to



the new town of Cobalt. An oiled highway is now being built from the south, but the road from the north, running 40 miles out of Salmon, is still rugged all the way. We took the north road.

Later, we checked in the W.P.A. guide for Idaho and read, "only the adventurous take this road." We wound around a narrow, mountain-clinging road that was breath-taking in more ways than one. Tumbling streams, sage, willows, poplars, huge boulders—all pressed back against the road that man had carved years ago. It reminded us of the stagecoach roads in Western movie thrillers.

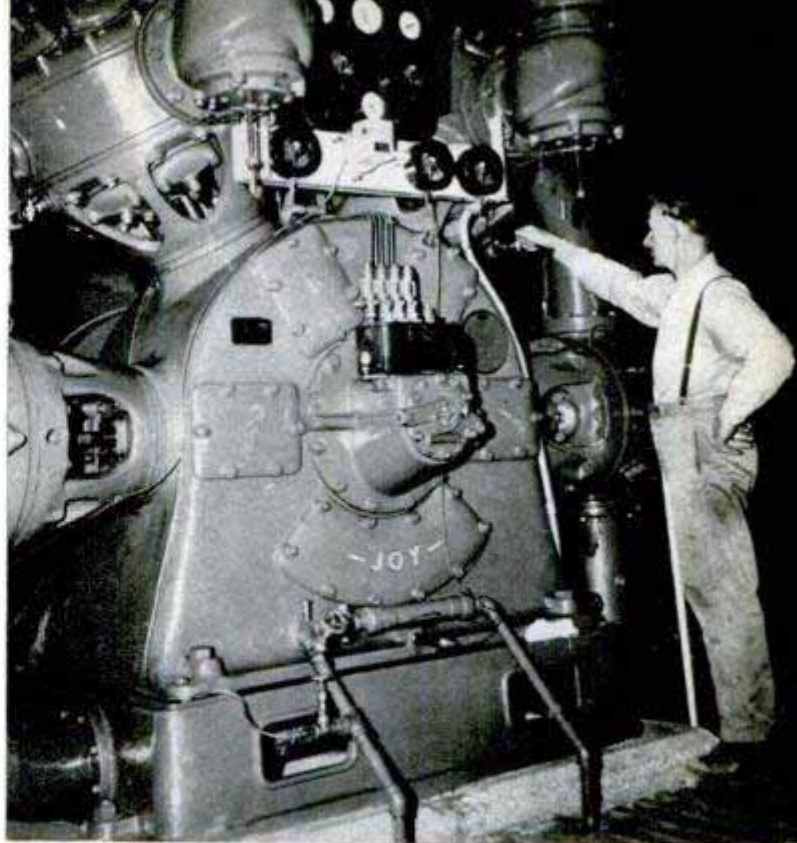
We mentioned this to Jim Caples, purchasing agent and personnel manager at the mine, who is a native of the area. Caples grinned:

"A four-horse stagecoach did travel the road as recently as 1929. I used to get jolted in it as a kid. The road was considered too rugged for motor transportation."

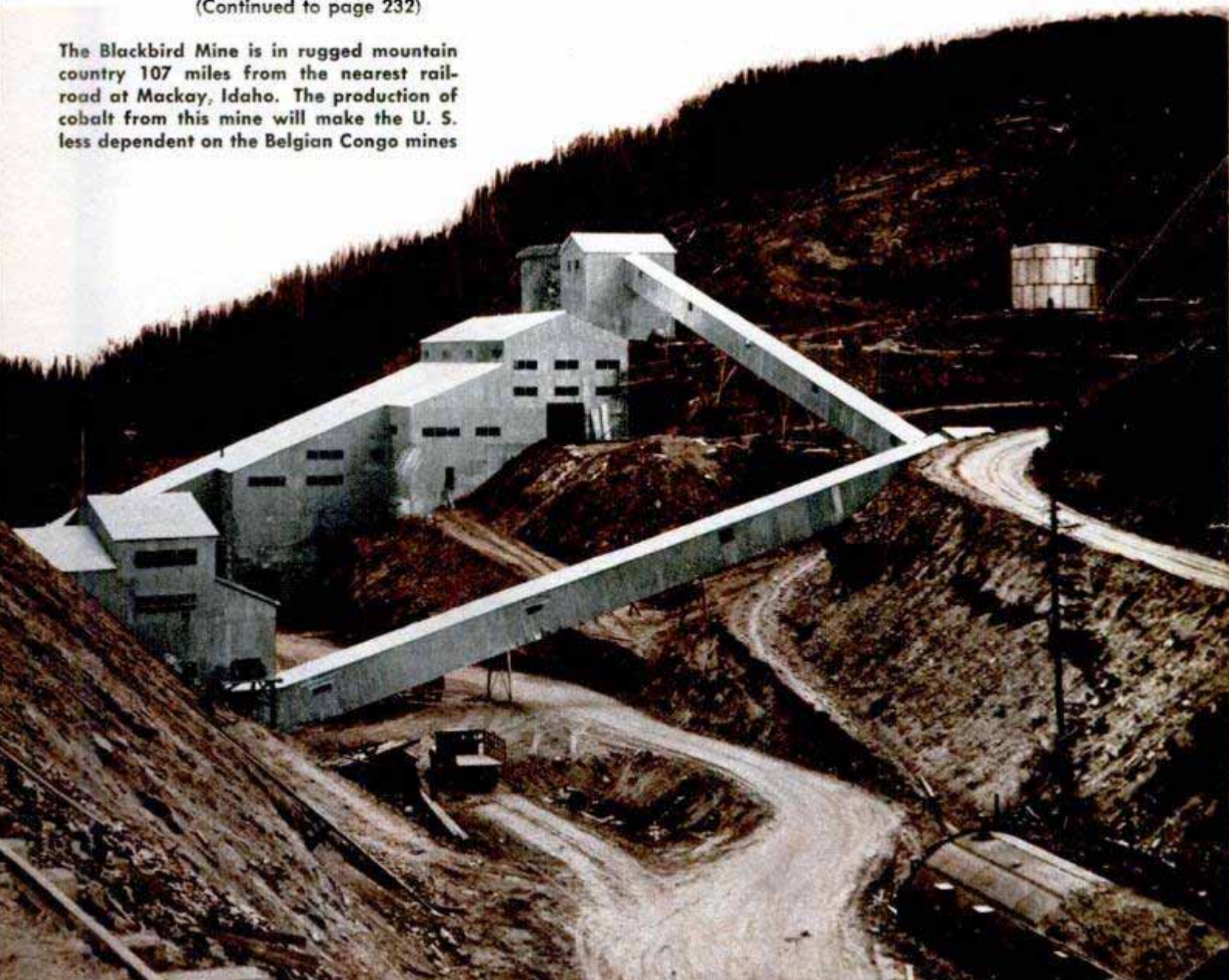
Getting dynamite to the mine was simple compared with hauling heavy steel equipment. Big tractors had to be hitched to trucks with 10 speeds. Tractors and trucks churned and groaned . . . but delivered the hard goods.

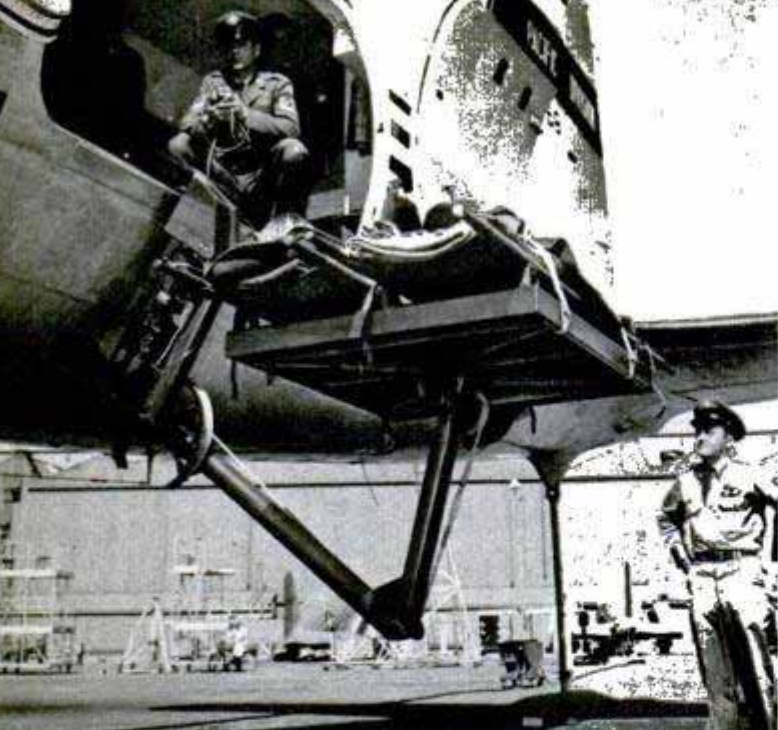
(Continued to page 232)

The Blackbird Mine is in rugged mountain country 107 miles from the nearest railroad at Mackay, Idaho. The production of cobalt from this mine will make the U. S. less dependent on the Belgian Congo mines



Pneumatic tools used far underground in the cobalt mine require lots of compressed air and the machine above supplies it. Mine tunnel extends 6400 feet





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Clamped to the side of the fuselage in one minute, an electric lifting arm can quickly hoist either two litter patients or 500



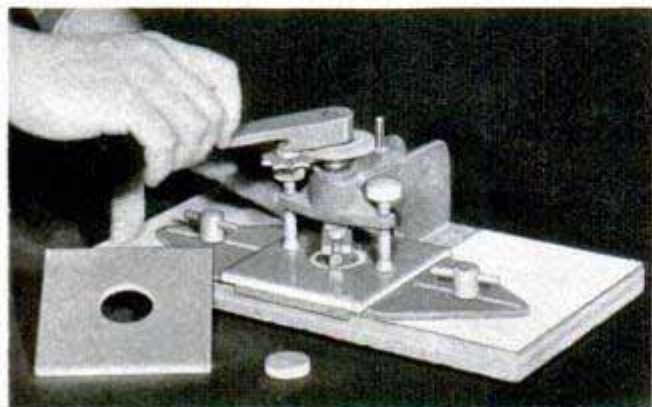
pounds of cargo up to an airplane. It completes the lifting arc in less than 15 seconds. Weighing only 140 pounds, the lift, which was developed by the Douglas Aircraft Company, can be used and stowed in any transport airplane.

Derrick-Wrecker Transfers Cargo

To solve a business problem, garageman Herb Nimtz of Three Oaks, Mich., built a strange vehicle combining a wrecker with a derrick. Only a few miles from his garage is a Michigan truck-weighing station, where trucks which are found to be overweight sometimes need their cargoes transferred before being allowed to continue. Nimtz also is called upon occasionally to pull wrecked trucks from ditches along the highway. The garageman started with an extended truck chassis and added a boom unit. The boom



normally measures 18 feet, but can be extended to 26 feet. Power for the winch, boom and cables comes from a 148-horsepower motor. Now Nimtz can pull trucks back onto the road and shift loads.



Circle-Cutter for Ceramic Tile Simplifies Tiling Around Fixtures

Perfect circles are cut in ceramic tile by a portable machine as easy to use as a can opener. The machine makes it possible to fit tile closely around pipes and other plumbing fixtures. Any size circle from 1¼ to 2 inches can be cut in less than one minute with the device. Clamps hold the tile in place while a handle is turned to cut the hole. The cutter measures only 5 by 7 by 13 inches.



British Superjets To Power Warplanes

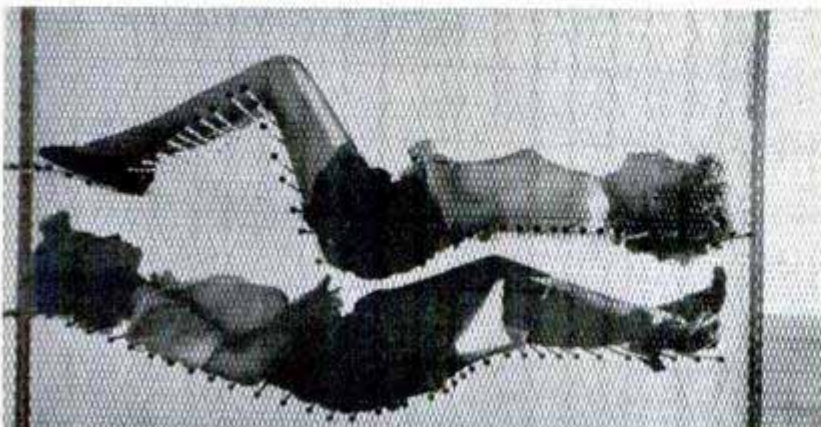
Two of Britain's newest, fastest warplanes will fly with Rolls-Royce Avon turbojet engines, rated among the most powerful in the world. Two will be in each De Havilland 110, a fighter heavily equipped with radar for bad weather and night interceptions. The 110 has sharply sweptback wings and a twin-boom tail. The Vickers Valiant, first four-jet bomber developed for the Royal Air Force, has four Avons completely concealed in its wings. Noteworthy features of the Valiant are large wing flaps, which can



be extended sharply to slow the plane, and unusually spacious bomb-bay doors. Performance details for the aircraft are secret.

Furniture Calculator Suspends Person in Mid-Air to Determine Contours

With a simple rig that suspends a person in mid-air, furniture designers can tailor-make a chair to fit the exact body contours of the subject. Rudolph Jegrt, an art instructor in Milwaukee, Wis., invented the contour delineator, which consists of two panels of steel mesh and some steel rods. The mesh panels are mounted two feet apart. A basic chair design is envisioned, and the rods pushed through the mesh to form the contour. The subject then climbs into the "chair" and the rods are shifted to match the subject's body lines.



Real clinometer is tiny, but this giant model better illustrates its role in positioning machine gun



nicians in learning dental anatomy. And it's only one of a vast assortment of ingenious giant and pint-sized models now playing a vital role in educating our armed forces.

The models usually do everything that the thing they represent can do. Cutaway spark plugs, three feet high, sputter and flash; monster carburetors demonstrate the working of each part; mockup rifles that look like cannons are cut away to show every intricate lever in operation. Complex instruments and computers, no bigger than your fist, are reproduced in size to accommodate an army of 60-foot giants.

LOOKING LIKE THE prehistoric jawbones of some man-eating menace in the dinosaur hall of a museum, a huge assembly of teeth, gums and other oral equipment wheels in and out of classrooms at the Army's medical university in Fort Sam Houston, Tex. It's a mammoth plastic model of the human mouth with removable teeth and other sections to show jawbone and tissue structure. It's used to aid tech-

The giant models are designed to do what a magnifying glass would do—blow up hairspring-sized working parts of small military equipment so they can be viewed and understood by whole classrooms of students.

At the other end of the scale are tiny prototypes of tremendous pieces of equipment that never could be brought into a classroom. Overcoming the limitations of

Models Teach Our

For demonstration purposes, a wooden enlargement of standard U.S. M-1 rifle takes and ejects wooden bullets





U. S. Army photo

Squad leaders practice calling firing order as the instructor flashes varicolored lights on a poster target

time and space, many of these accurate, small-scale prototypes would delight the heart of a model fan.

At the Navy's Special Devices Laboratory in Sands Point, Long Island, there's a center section of an ocean-going freighter which measures about eight feet from hull bottom to the top of the tallest crane. By turning cranks that activate winches on the Lucite deck, cargo-handling classes can

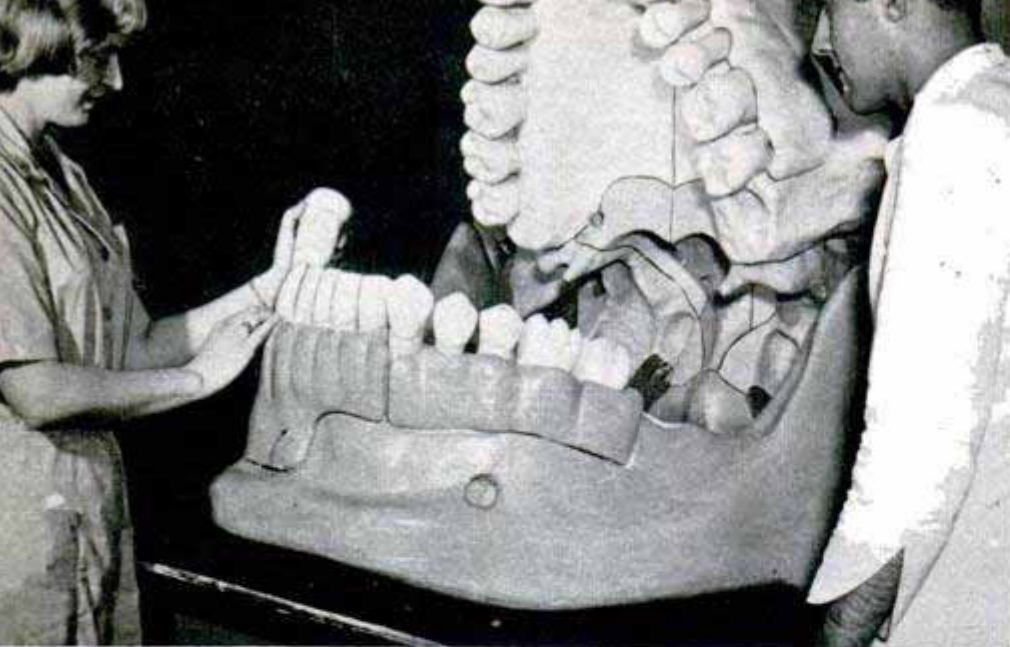
maneuver the deck cranes, pick up pepper-grinder-sized barrels or toy crates from a miniature wharf and stow them in the hold while the instructor watches through the transparent hull to see if they're doing it properly.

The structural parts of a miniature destroyer, 20 feet long, are made of clear plastic so student engineers can see the various steam, fuel and air systems, which

Fighting Men By Richard F. Dempewolff

Rear projection booth makes it possible to show Army training films to troops outdoors during field maneuvers





Huge "mouth" with removable parts showing bones and tissue aids dental-technician training

tiny coils of barbed wire, matchbox-sized pillboxes with match-sized guns sticking from their ports, tiny tanks that shoot fire from miniature flame throwers, sponge trees and hedges, and miniature villages that would do credit to an HO-gauge railroad layout. Other tables have entire cities on them, complete with model stores, factories, churches and streets. As the students lay down

are indicated by dummies in true scale and contour. On the six-foot bow of another destroyer, in mooring problems seamen operate little hand-cranked winches to raise and lower 10-inch scale-model anchors. In Navy classrooms, men flick the slide on tiny pocket blinkers, flashing messages back and forth at each other across the room as they would with the big signal lights aboard ship.

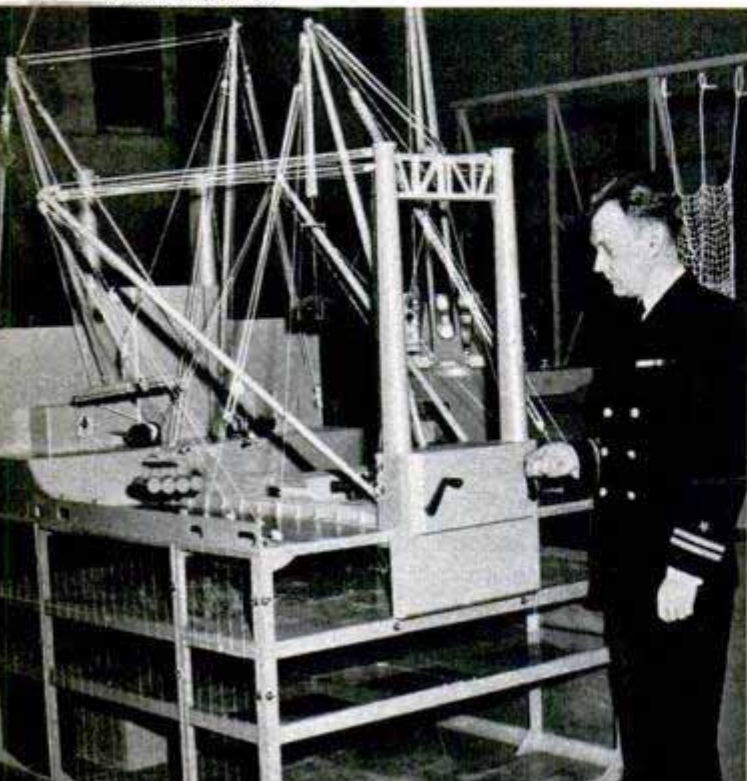
Down at Fort Benning, at the Army Infantry Training Center, entire battlefields and complete villages are reproduced in miniature on sand tables to save time and money that otherwise would be required in moving live companies to demonstrate logistical problems and tactical situations.

Classes move theoretical assaults across entire training areas reproduced on tables measuring about 30 feet square. There are battlefields with 1/2-inch-high tank traps,

their theoretical barrage, a man under the table pulls strings that activate a series of flaps on the board. Here and there an X pops up to show that the boys have wiped out a building. A flap in the form of a cloud of smoke obliterates "Main Street," to indicate that the forward observer has hit it "on the nose."

Throughout the services, these models are doing a yeoman job of training in conjunction with an array of other new aids, like the portable classroom recently developed by the Signal Corps. Packed in a case no larger than a regular traveling bag, the classroom consists of a roller-operated series of charts for lectures. The instructor sets it up in two minutes out in the field and reels a series of several dozen charts in front of his soldier audience as needed. Another innovation is the field moving-picture projection booth for daylight viewing.

Realistic cranes, working on model of center section of a freighter, simplify cargo-handling instruction
U. S. Navy photo



Giant-sized versions of spark plugs and carburetors help GI mechanics understand how an engine runs



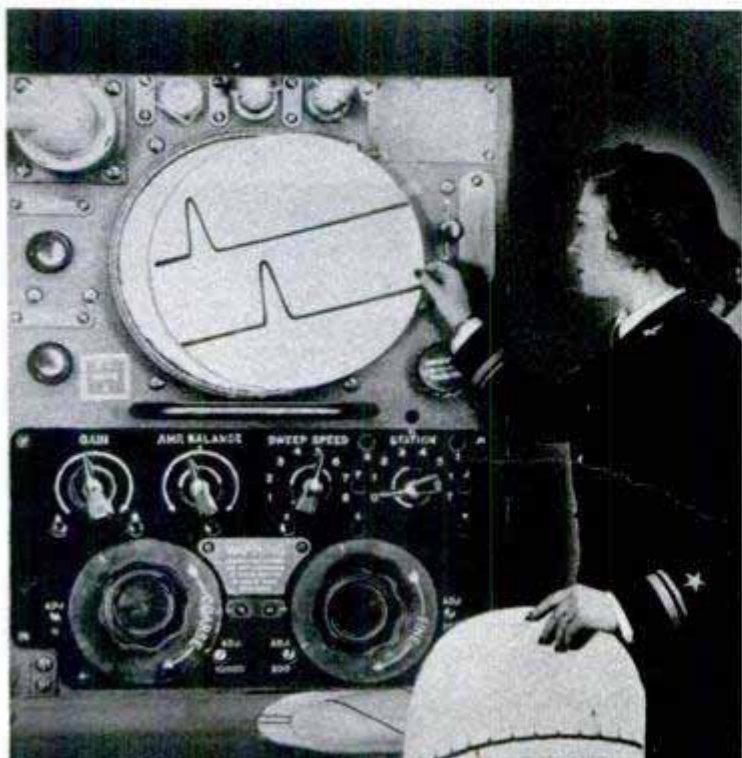
Made of 1 by 2-inch framing and wallboard, it can be set up in five minutes. It measures 4 by 6 by 10 feet when assembled and projects 16-mm. film from the rear of the booth to a three-foot viewing screen that faces the field class.

Air Force student navigators learn to identify the "signposts" of the sky with a portable and comparatively inexpensive planetarium. The "sky," on which all important stars through the fifth magnitude are projected, is a hemispherical screen that looks like a beach umbrella suspended from the ceiling. Beneath it is a globelike projector that can be adjusted to show how the night sky looks from any spot on earth at any time of year.

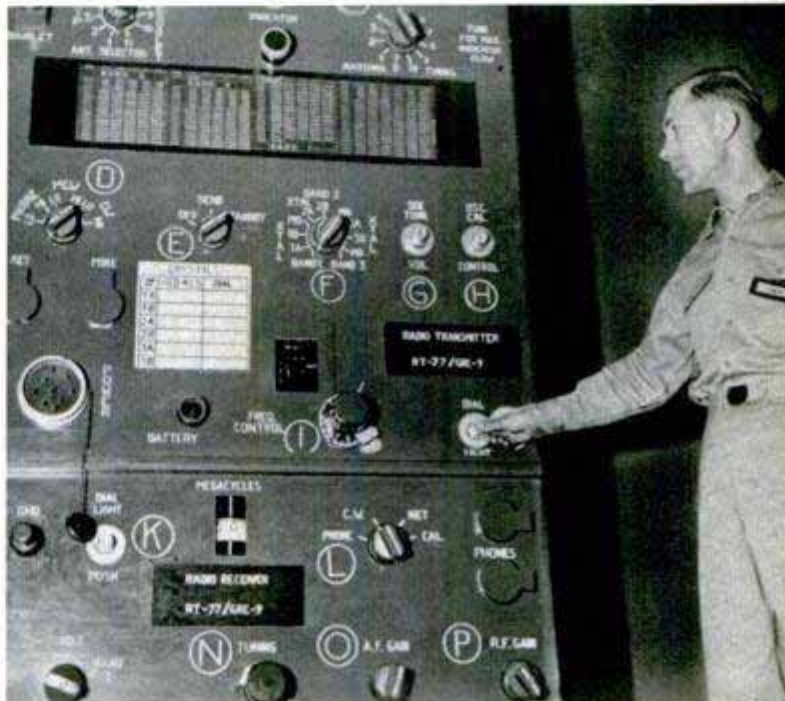
And out at Camp Atterbury, Ind., flashing lights on a painted panel are helping Army riflemen learn squad tactics. The 5 by 15-foot board is covered with a landscape sketch having colored lights at various points. The instructor switches on the lights in any order desired. Each light represents one type of enemy armament—for example, a red light is a machine gun and an orange light a single rifleman. Members of the training squad take positions in front of the panel. When the instructor flashes a certain bulb the squad leader must give the proper fire order, designating the range at which men are to fire on the target. If he gives the wrong order, another light flashes on and he must now correct the original order and give a new order to solve the more difficult problem.

In all the new training aids emphasis is on simulating reality so that when he's confronted by the real thing, there will be no doubt in the mind of the modern serviceman as to what to do and how to do it.

With an enlarged loran indicator as a prop, a WAVE instructress explains the various patterns of the scope



Actual dead-reckoning computer would fit in pocket, but this four-foot model is much easier to explain



Even students in the rear seats at lecture halls can see every detail on this blowup of small radio panel

Navigator trainees cluster around the mockup of an astrocompass, shown actual size in the foreground
U. S. Air Force photo





Gopher Exterminator

Compressed air is being used by the U. S. Bureau of Reclamation to kill gophers. They potentially cause thousands of dollars in damage through canal breaks on federal projects. Developed by William A. Batzner, the method employs calcium-cyanide powder. Fine particles are blown by compressed air into the runs dug by gophers where, upon exposure to moisture, they release hydrocyanic acid, which kills gophers instantly. Batzner mounted an old compres-

sor on a Jeep to make the outfit portable. He then attached 50 feet of $\frac{1}{4}$ -inch rubber hose to the air supply and installed an improvised metal chamber at the other end of the hose to hold the powder. Inside this chamber a valve controls the amount of air that may enter, thus regulating the amount of powder that leaves the chamber each time air is admitted. In front of the valve is a jet which releases air into the powder, while behind the valve is a small hole through which air and powder are blown into the hose inserted in the gopher run.

Synthetic Gravel

Mud can be transformed into "gravel" through a process developed at Cornell University. The technique may solve special road-building problems in areas where gravel is scarce. The synthetic gravel is made by mixing mud with inexpensive chemicals and sulphite liquor, a waste product of the paper industry. The material is fused into lumps and the lumps then are broken to resemble crushed rock. In tests, the gravel has been submerged in water for six months without disintegrating, and has withstood freezing and drops from a three-story height.



Air Becomes Efficient Weapon for Fighting Fires in Oil Tanks

Ordinary air is the latest weapon for fighting fire. In a new technique for extinguishing fires in oil tanks, air is forced into the bottom of the tank. As it rises to the surface it agitates the contents, bringing cold oil from the bottom of the tank to the burning surface and decreasing the vapors which aid combustion. Fire-fighting foams

do the rest of the job. In one test of the process, developed by J. L. Risinger of the Socony-Vacuum Oil Company, a fire in a tank holding crude oil was under control in 45 seconds. The technique also extinguished a fire in a tank holding 100,000 gallons of kerosene. The method may also be applied to oil tankers at sea.



German Model-Plane Builders Follow Sweptback-Wing Trend

Variety is the spice of design for the only air fleet Germany now has in place of its once-powerful Luftwaffe. Prominent among the newest model-plane designs at West

Berlin meets are sweptback wings, like those featured in the Boeing Stratojet bomber, and the clean lines of the British Canberra's fuselage.

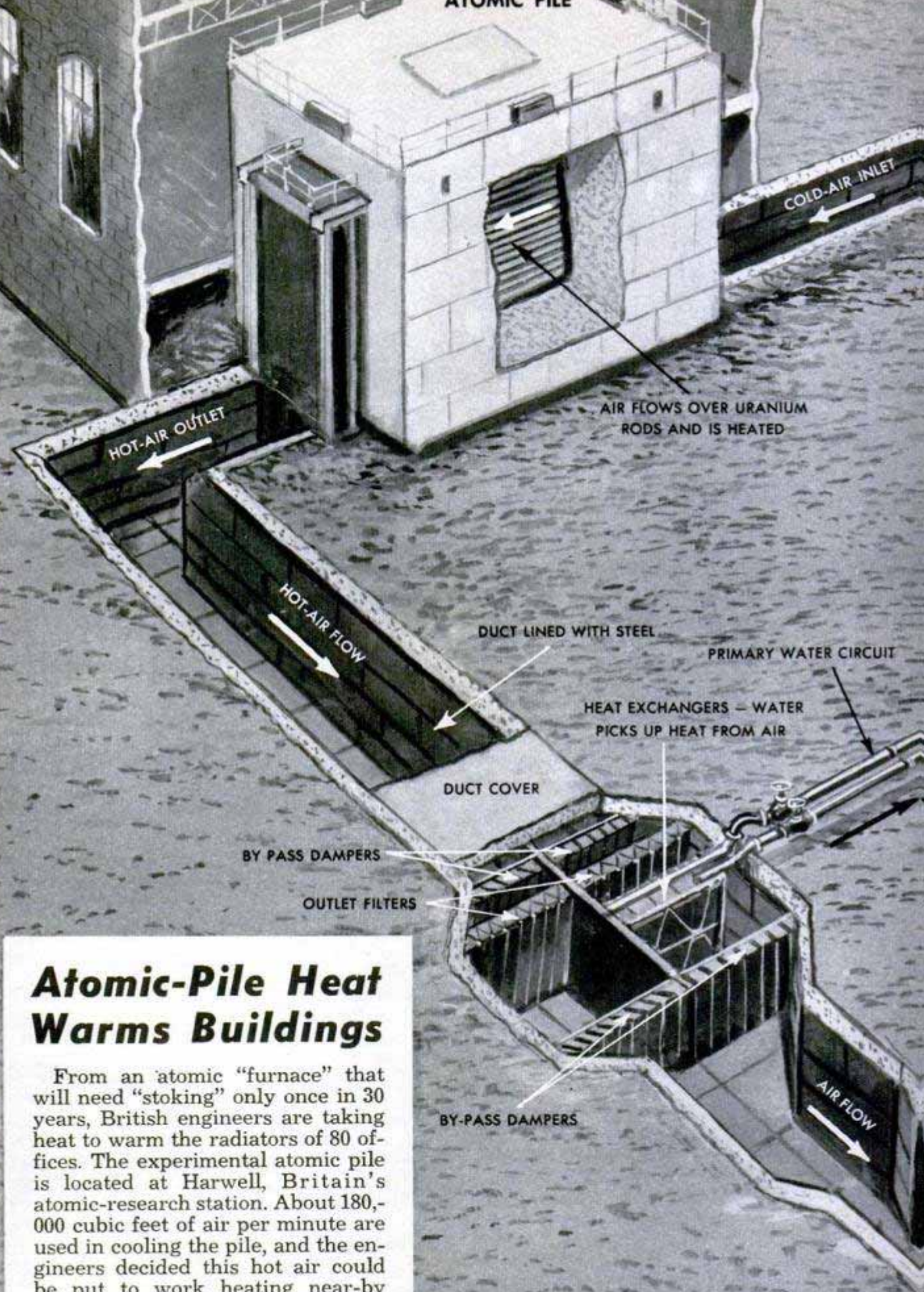
"Silent" Organ Has 24 Keyboards

Although 24 persons can play at the same time, not a sound is heard from an electronic organ unless the listener is wearing earphones. Invented by a British science teacher, the organ permits a group of students to practice simultaneously without interfering with each other. The teacher can listen to any one of his pupils simply by plugging in his earphones to the desired keyboard. The pupil hears only her own playing through her earphones, unless the teacher wishes to correct mistakes by playing the correct version on his own keyboard. Then the pupil's earphones are connected to the teacher's keyboard. All 24 keyboards are supplied by one tone and amplifier unit.



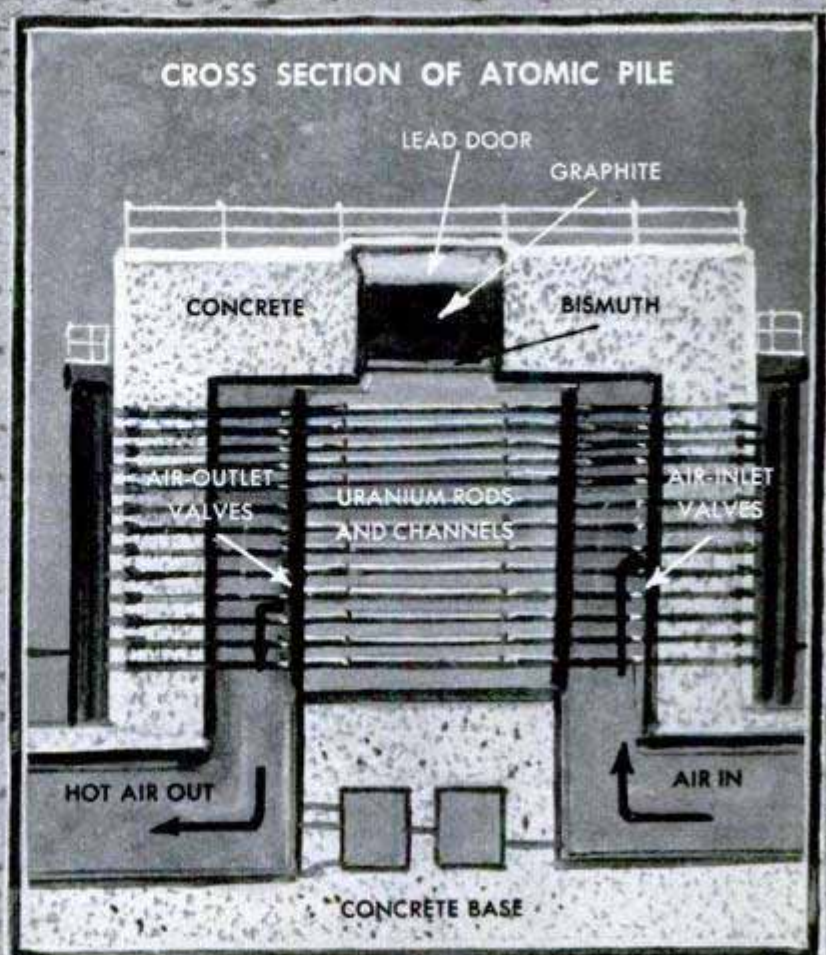
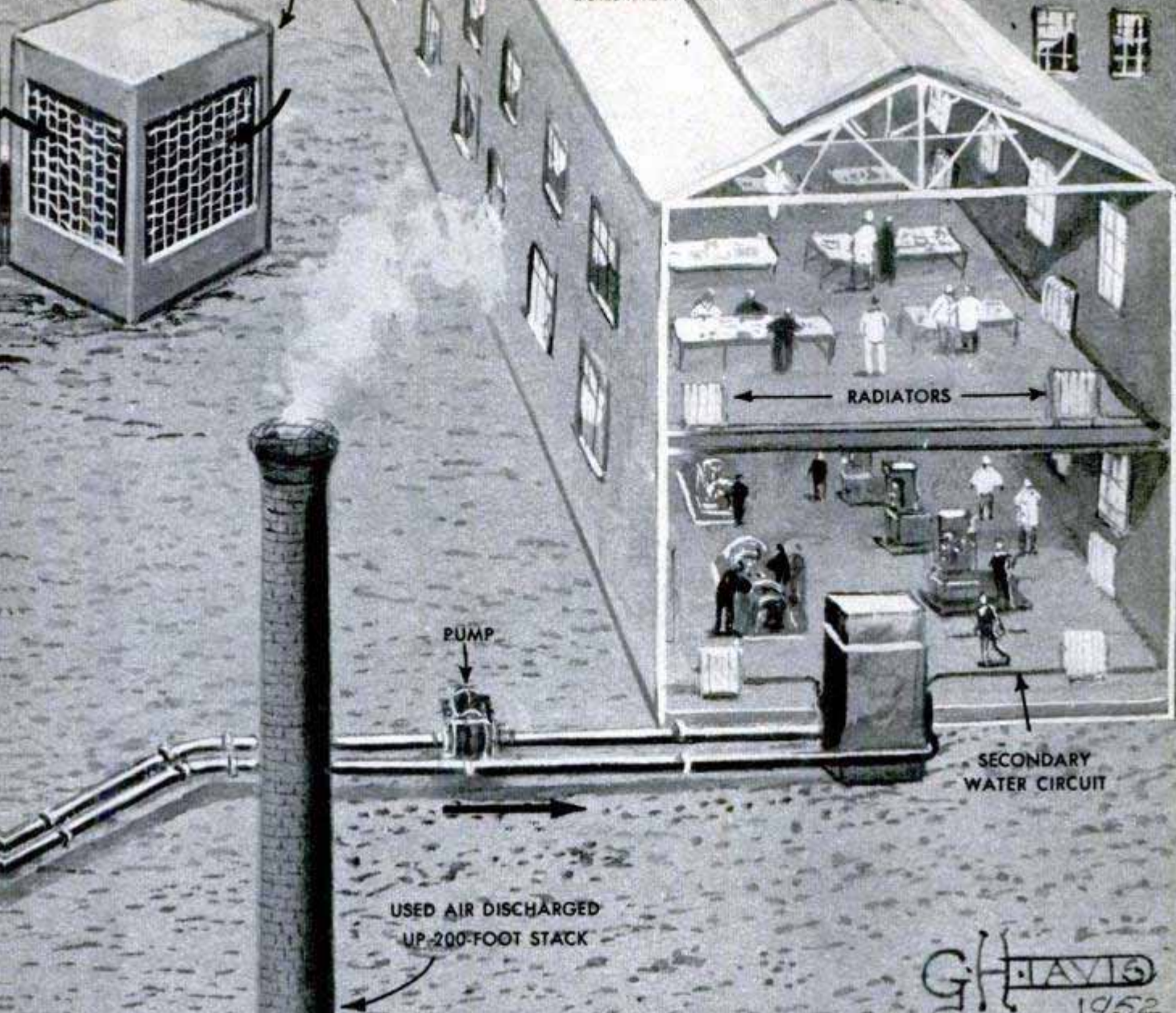
Los Angeles County leads all others in the U. S. in truck registration with 174,731 vehicles. Five Boroughs, New York, is second with 129,482, and Cook County (Chicago) is third with 109,634, according to the Automobile Manufacturers Association.

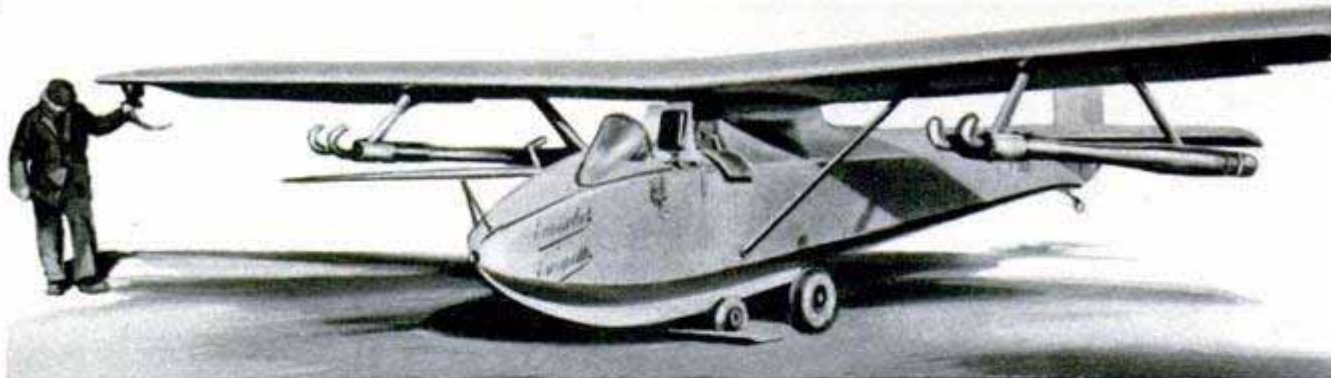
If you do not find the information you need in the index on pages 12, 14 and 16, sources of further information are available without charge from *Popular Mechanics*. Write to the Bureau of Information, 200 East Ontario Street, Chicago 11



Atomic-Pile Heat Warms Buildings

From an atomic "furnace" that will need "stoking" only once in 30 years, British engineers are taking heat to warm the radiators of 80 offices. The experimental atomic pile is located at Harwell, Britain's atomic-research station. About 180,000 cubic feet of air per minute are used in cooling the pile, and the engineers decided this hot air could be put to work heating near-by buildings. Now the high-temperature air is passed through heat exchangers which transmit the heat to water. The heat is transferred to a secondary circuit which passes through conventional radiators in the buildings.





Pulse Jets Power Glider

Flight tests of a small pulse-jet unit developed in France are taking place beneath the wing of an Emouchet glider. Each jet unit weighs 11 pounds. Two are mounted under each wing, the four providing the

glider with a total thrust of 88 pounds. This is double their total weight. Called an Escopette, the unit has a total length of a little over nine feet, an intake diameter of 7.3 inches and an exhaust orifice of 5.85 inches. No glider launch is necessary when the units are used.

Turntable Eases Garaging

Now Frank Enos of Sausalito, Calif., just presses a button to solve what had been a difficult problem. He lives on the side of a hill, with a garage 30 feet below the level of the road and at the end of a 150-foot driveway. Backing up the hill on wet mornings was sometimes a dangerous chore, until Enos devised a turntable and installed it just before the entrance to the garage. Pressing a button puts a 1/2-horsepower geared motor to work revolving the table after Enos backs out, and he drives forward up the hill. The turntable



deck is supported by 4 by 12-inch girders and 2 by 12-inch joists which are set on eight concrete piers.

U. S. Air Force photo

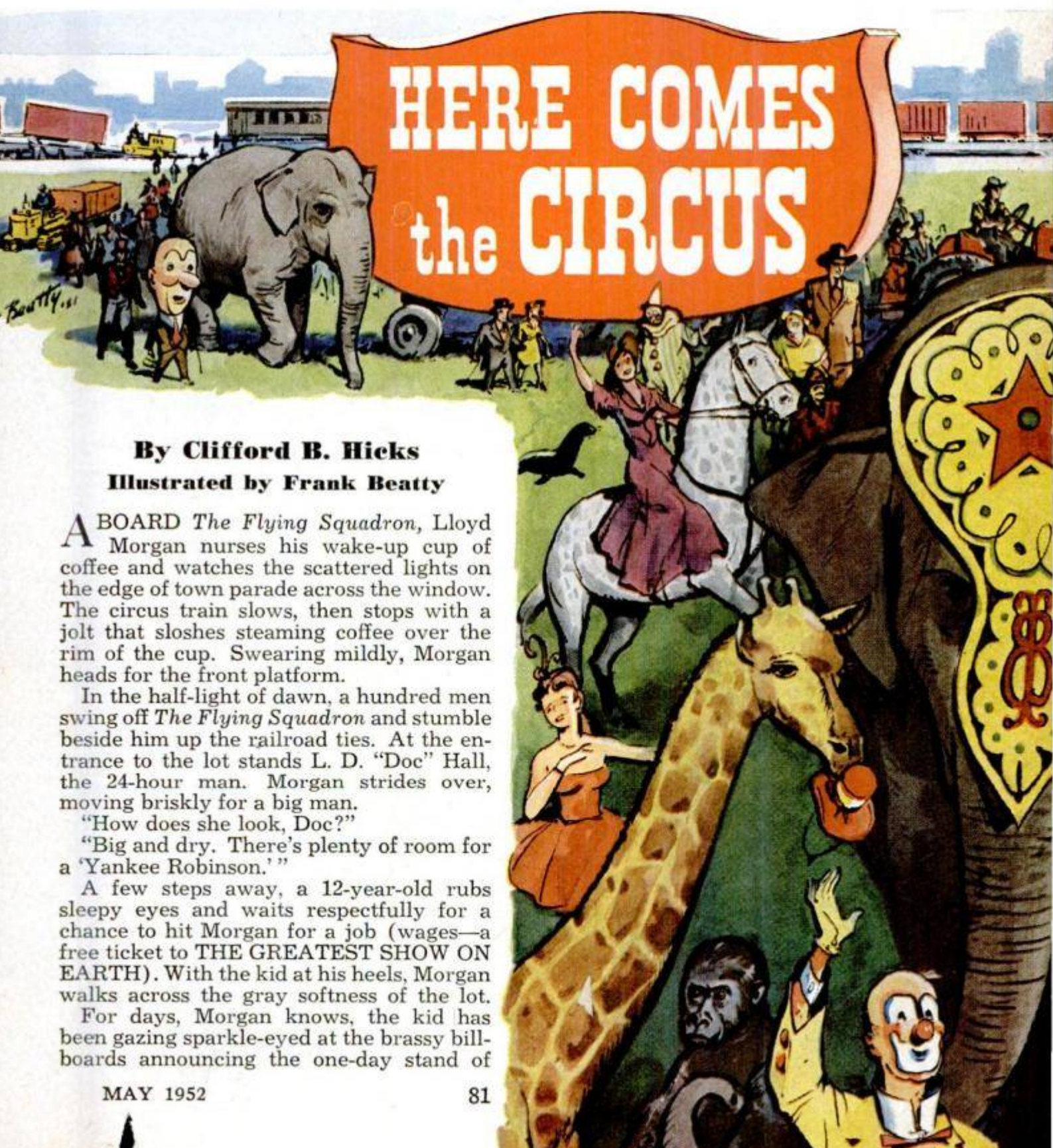


Breakable Hans Helps Air Force

Fractures of Hans' "almost human" bones are expected to save Air Force pilots from similar injuries. Built around a metal, rubber, nylon and ball-joint spinal column, Hans is a dummy the Research and Development Command made to simulate the human body in a series of drop, crash impact, deceleration and acceleration tests. Through a cylinder and sleeve arrangement his arms and legs rotate exactly like a man's. He has the measurements of a muscular 200-pounder. The dummy's metal and plastic collarbones, the most easily fractured bones in humans, will snap just as would a man's, and his vinyl-foam "skin" will show the effects of cuts or abrasions. Following each test the bones can be studied or replaced through zippered openings in the skin.

☐ Tetraethyl lead, the antiknock for gasoline, can now be made radioactive which may enable scientists to solve the mystery of what happens chemically to fuel when the compound is added to it.

Three trains haul the "Greatest Show on Earth"—72,000 tons of it—to three million spectators each year



By Clifford B. Hicks

Illustrated by Frank Beatty

ABOARD *The Flying Squadron*, Lloyd Morgan nurses his wake-up cup of coffee and watches the scattered lights on the edge of town parade across the window. The circus train slows, then stops with a jolt that sloshes steaming coffee over the rim of the cup. Swearing mildly, Morgan heads for the front platform.

In the half-light of dawn, a hundred men swing off *The Flying Squadron* and stumble beside him up the railroad ties. At the entrance to the lot stands L. D. "Doc" Hall, the 24-hour man. Morgan strides over, moving briskly for a big man.

"How does she look, Doc?"

"Big and dry. There's plenty of room for a 'Yankee Robinson.'"

A few steps away, a 12-year-old rubs sleepy eyes and waits respectfully for a chance to hit Morgan for a job (wages—a free ticket to THE GREATEST SHOW ON EARTH). With the kid at his heels, Morgan walks across the gray softness of the lot.

For days, Morgan knows, the kid has been gazing sparkle-eyed at the brassy billboards announcing the one-day stand of

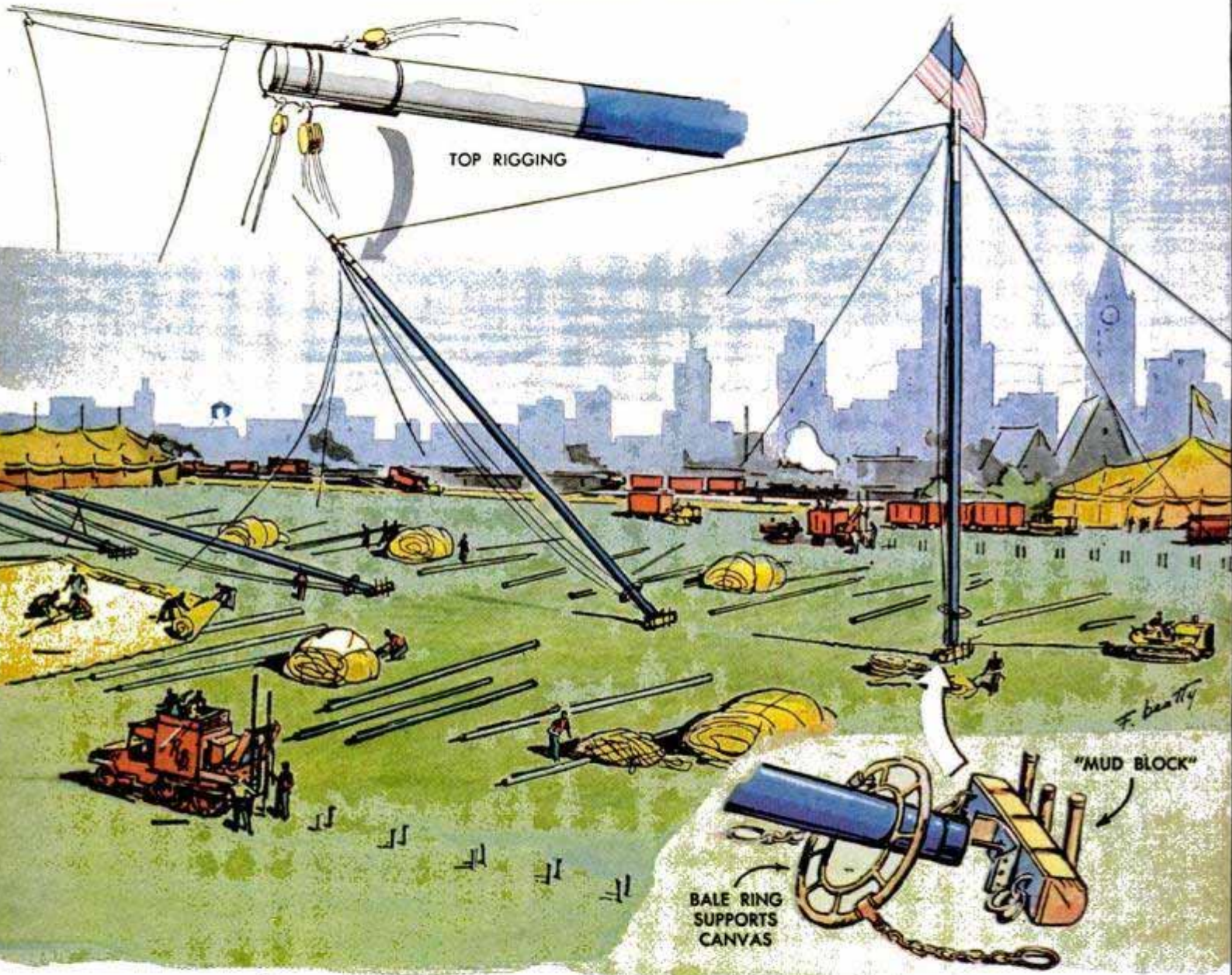
ELECTRICIANS, SAILMAKERS

27 ELEPHANTS

LIGHTS, PROPS,

EXECUTIVE STAFF, AGENTS, SIDE-SHOW PERFORMERS

Below, Number One pole, already towering 62 feet above the lot, acts as a skyhook to raise the other poles. Pivoting on a half-round timber against a "mud block," the second pole sways slowly and regally into position



Ringling Bros. and Barnum & Bailey Circus. Actually, there's a misstatement in the printed ballyhoo: *The Greatest Show On Earth* isn't the prodigious production under the big top, as advertised, but the spectacular sight of a vast canvas city going up at dawn, then melting away for another year barely 18 hours later.

It's Morgan's job as lot superintendent, to see that the world's biggest circus appears, pauses, then vanishes as smoothly as

a rabbit in the hands of the side-show magician. Even to Morgan it's a feat of legerdemain. Packed inside *The Flying Squadron* (first section of the circus train) and its two gaudy running mates are some 72,000 tons of circus, from ponderous pachyderms to gawking giraffes and the rarest of animals from every clime. There are people aboard, too — 1400 of them — from the *Fat Lady* with her 540 (count them) pounds to the star aerialist and lowliest

BIG TOP GEAR

SEAT WAGONS — COVERED WITH COLLAPSIBLE SEATS

SEAT WAGONS — CIRCUS CAN SEAT 8000 PEOPLE

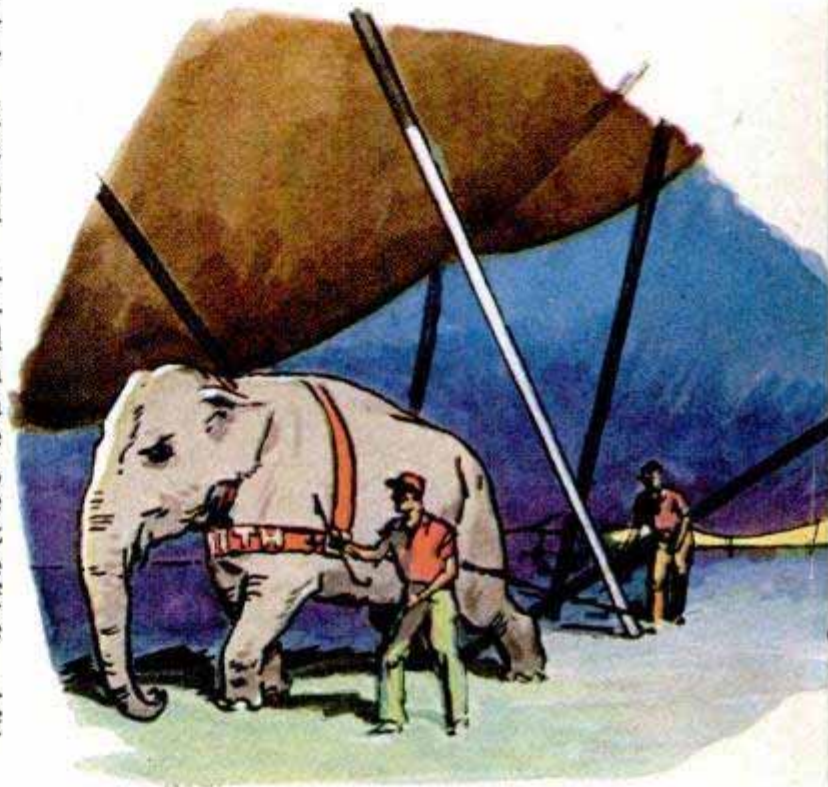
canvasman. Through split-second timing, under the direction of Morgan and the other boss-men, they are able to erect their vast patchwork city for about 430 performances before three million spellbound spectators each year.

And here's the whole spectacle, capsuled into this one-day stand in the sleepy-eyed kid's home town, a miracle of movement, the show behind the show, a sight well worth an alarm clock at dawn.

Pretending he doesn't see the kid, Morgan sets briskly about the business of staking out the circus with flag-tipped metal poles. There's a full 18 acres of room on the lot so he plots a Yankee Robinson, a straightaway layout with the midway, side show and big top visible to the customers, all the rest of the circus staked out in the privacy of the "back yard." On the vast grassy field, under the excited eyes of the 12-year-old, he pegs down the location of every single item now crammed aboard the circus trains.

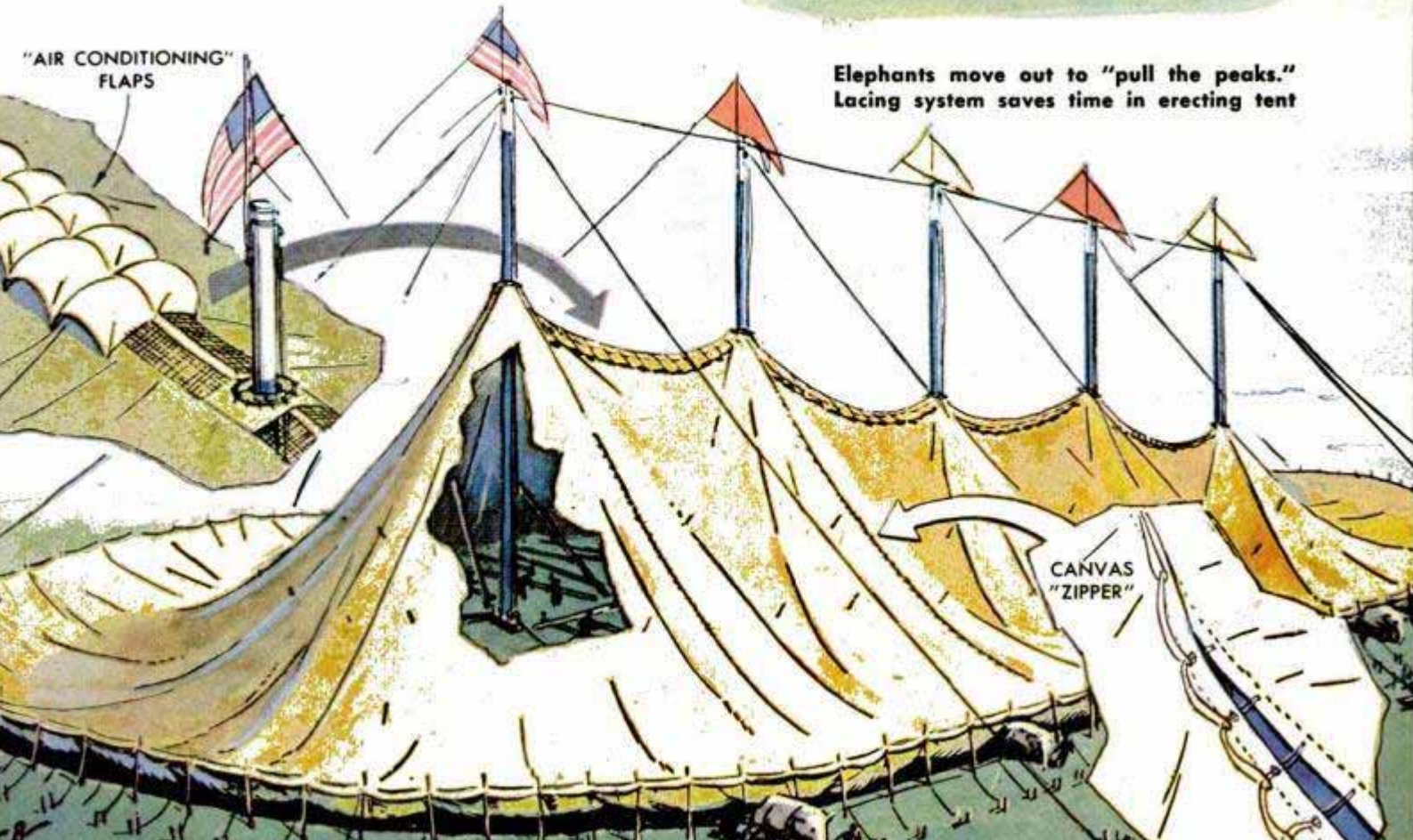
The gaudy trains themselves are a spectacle to tingle the spine of boy or man. Of

Below, tough old elephant moves sedately beneath the sagging canvas, pulling the quarter poles upright



"AIR CONDITIONING" FLAPS

Elephants move out to "pull the peaks." Lacing system saves time in erecting tent



BIG TOP POLE WAGONS, STAKES, 20 TONS OF CANVAS

the 69 railroad cars in the three trains, 49 are superlong (72-foot) flatcars. On these flats are 191 garish wagons, anchored end to end. Spotted strategically among the wagons are 27 "cats" and farm tractors which will pull them down the ramps.

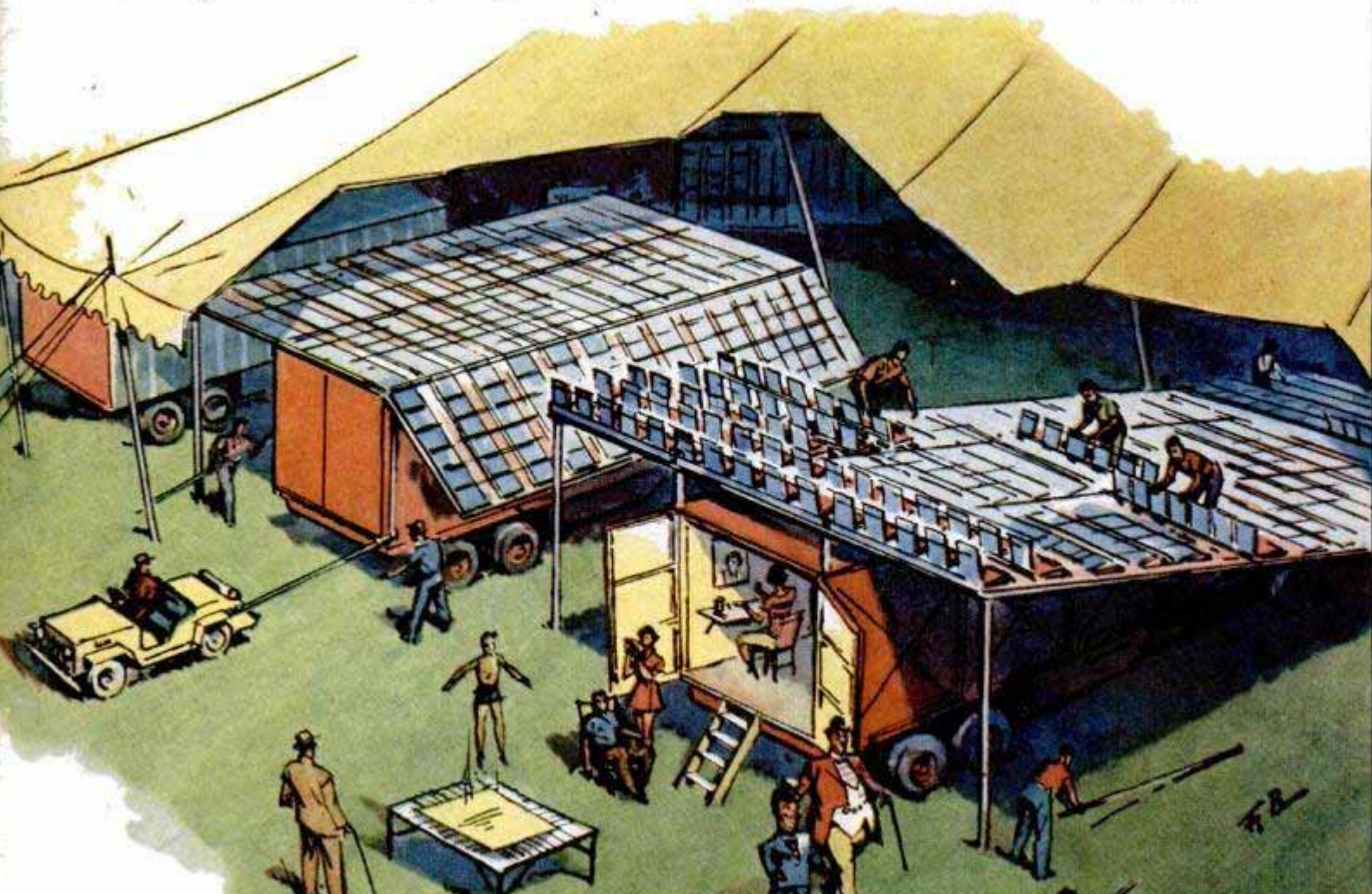
In *The Flying Squadron*, first to pull into the siding, Morgan and trainmaster Paul J. McClane have three horsecars (with folding stalls for 96 horses), two big stockcars (containing 144,000 pounds of elephant) and a parade of wagons containing the menagerie, kitchen, cookhouse, blacksmith shop and other service departments.

Close on the caboose of *The Flying Squadron* rolls the second section toting the big top itself, and bringing up the rear in the third section are 16 of the 26 seat wagons which soon will erupt into a huge amphitheater. Scattered throughout the three sections are 23 coaches; once Army hospital cars, they're now air-conditioned homes for circusfolk.

Gen. mgr. Arthur M. Concello, Morgan's boss, has a working crew of 1400 troupers, organized right down to the TINYTOWN MIDGETS, to erect the circus with the precision of an assembly line. Coordination is the secret of the circus' mobility. The show-folk are divided into special working crews, from property department to stables, the big canvas department to the iceman, the usher department to the veterinary. There's even—believe it or not—a chameleon department, highly organized and staffed with "bug men" assigned the sole responsibility of feeding, packing, moving, unpacking and hawking their miniature dragons through the big top daily.

Morgan finally takes pity on the kid at his heels and gruffly sends him off to find George Werner, canvas boss. In his search for Werner, though, the lad is delayed by a gang of "razorbacks" unloading the train. Along the tracks huffs a switch engine, cutting *The Flying Squadron* into two parts.

Seat wagons are hauled into position, their flaps cranked up and the 8000 seats slammed upright by ushers



The split is made between two special "run cars." Then, swarming like hornets, almost knocking the lad over, a crew of razorbacks heaves four steel ramps off the run cars. Out of nowhere appear two "polers"—heavy-set boss-men who direct the unloading of all three trains.

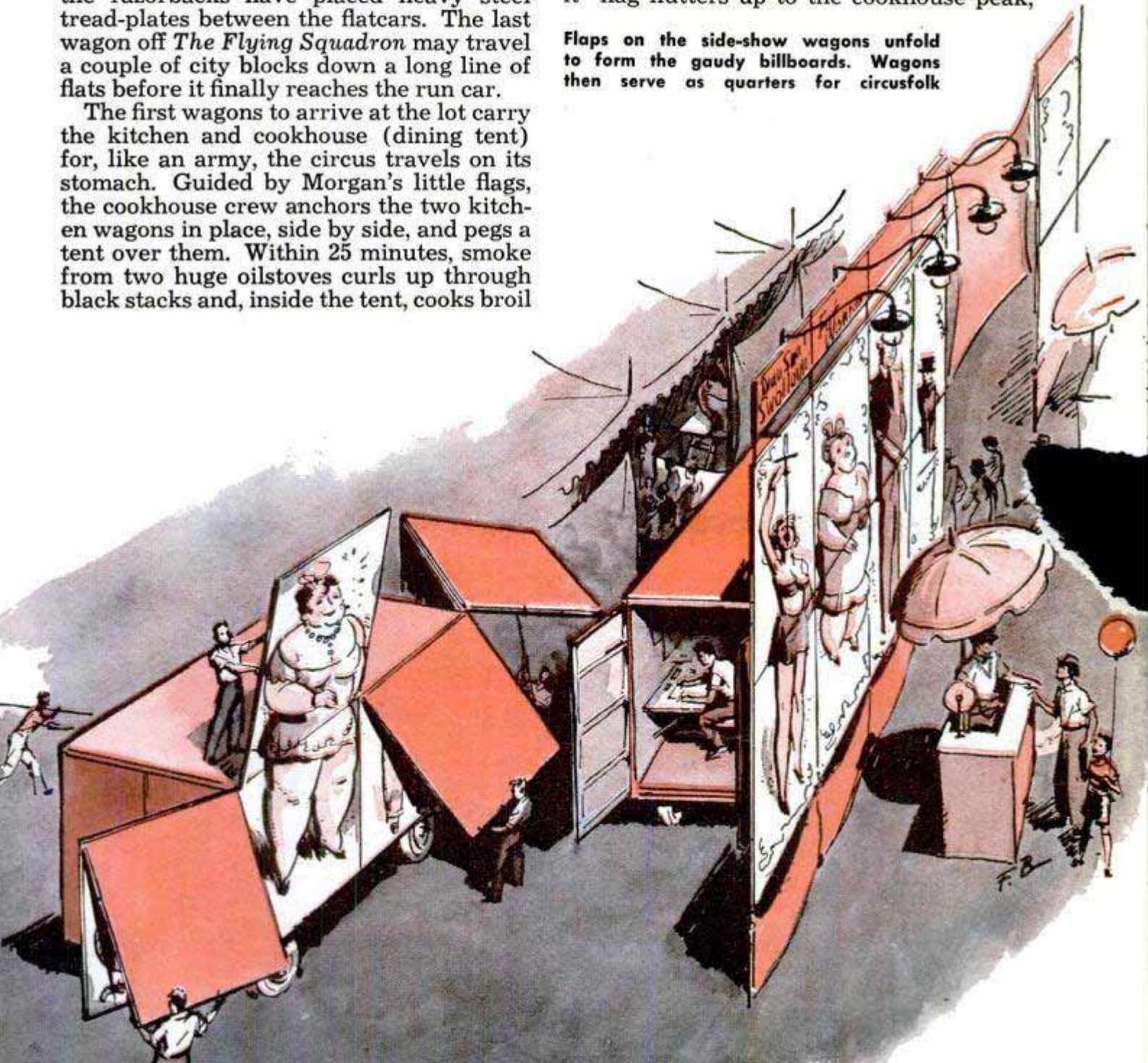
Then starts the modern circus parade—the procession off the train. Caterpillar tractors snarl down ramps towing bright, mysterious wagons. At the circus lot they drop their loads, pivot on a peanut shell, and race back to the siding where they wait for the poler's signal, then scurry up the ramps to pick off other wagons. Meanwhile the razorbacks have placed heavy steel tread-plates between the flatcars. The last wagon off *The Flying Squadron* may travel a couple of city blocks down a long line of flats before it finally reaches the run car.

The first wagons to arrive at the lot carry the kitchen and cookhouse (dining tent) for, like an army, the circus travels on its stomach. Guided by Morgan's little flags, the cookhouse crew anchors the two kitchen wagons in place, side by side, and pegs a tent over them. Within 25 minutes, smoke from two huge oilstoves curls up through black stacks and, inside the tent, cooks broil

mountains of bacon and scramble eggs by the thousands. Parked near by are the refrigerator car and a wagon containing—hold your hat, Mr. Barnum—a gigantic automatic dishwasher.

Meanwhile, the 142-man cookhouse crew has fallen upon its 14 red wagons. Poles and canvas are flopped into position. The 56 by 200-foot dining tent is larger than the big top of most other circuses. Even before the canvas is pulled to the peaks, its cavernous interior resounds to a drumfire clatter as waiters slam together the 100-odd collapsible picnic tables. Two hours after the circus pulled into town, the "come and get it" flag flutters up to the cookhouse peak,

Flaps on the side-show wagons unfold to form the gaudy billboards. Wagons then serve as quarters for circusfolk



and within the next 12 hours the world's largest land-traveling restaurant will serve 4200 top-notch meals to the "kinkers," razorbacks, performers and workers of the show.

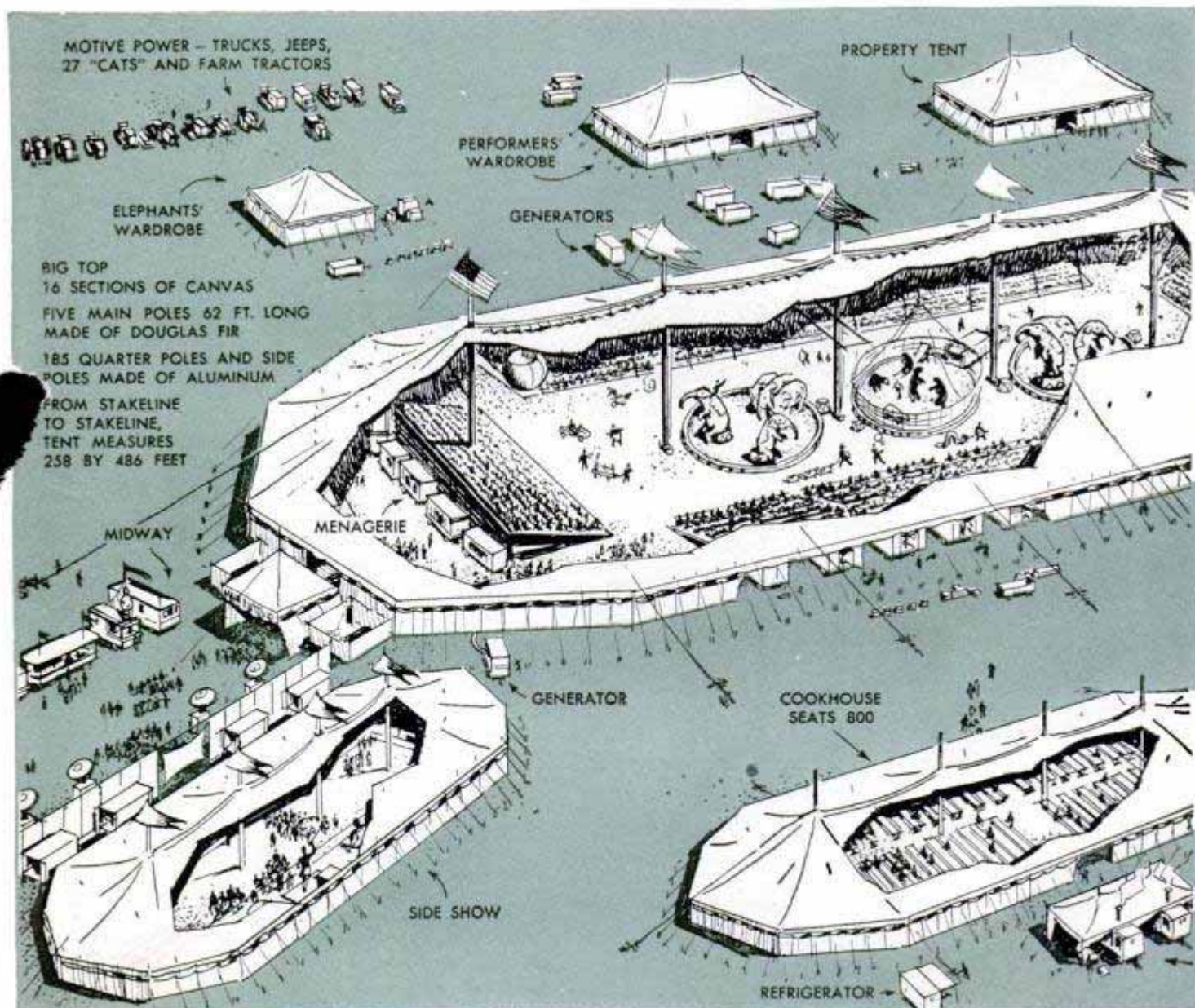
With *The Flying Squadron* unloaded, the second section is switched into position and split at the run cars. Off the train roll wagons bearing the big top itself, largest tent on earth. Over on the grassy lot Morgan has measured to the inch the exact location of each of the five main poles, for the "top" shrinks or stretches as much as five feet in either direction, depending upon the weather. Today he has marked off a huge oval stake line measuring a thumping 486 feet long and 258 feet wide, an area more than twice the size of a football field.

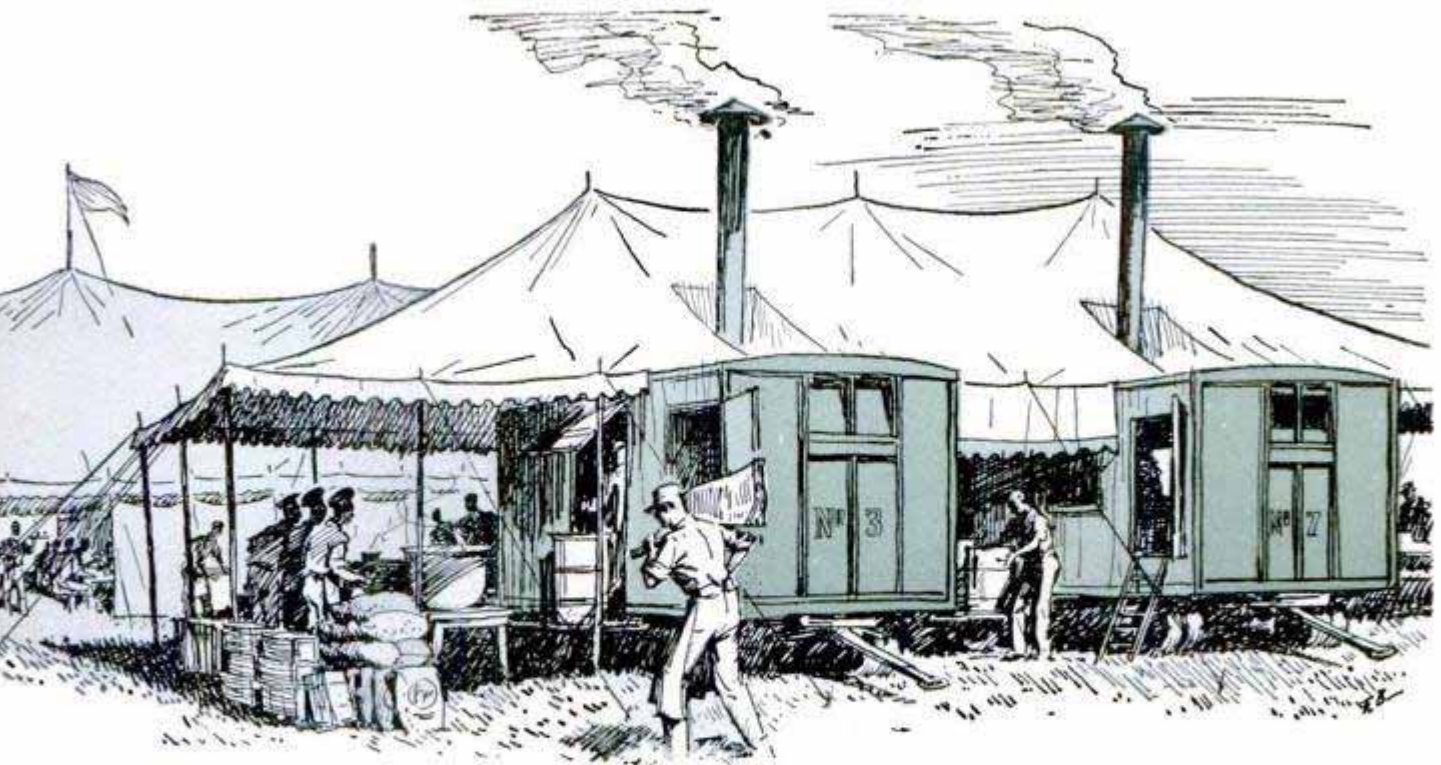
Around the perimeter of this oval crawl two huge stake drivers, one mounted on a converted Army half-track (the flashing sledges of yesteryear have all but vanished in the mechanization of today's circus). Two miniature pile drivers on the rear of the vehicles beat an unending tattoo, slamming the four-foot stakes into the

ground. And down the center of the oval marches a smaller stake driver, mounted on a Jeep, which pounds home the stakes that hold the big center poles in place.

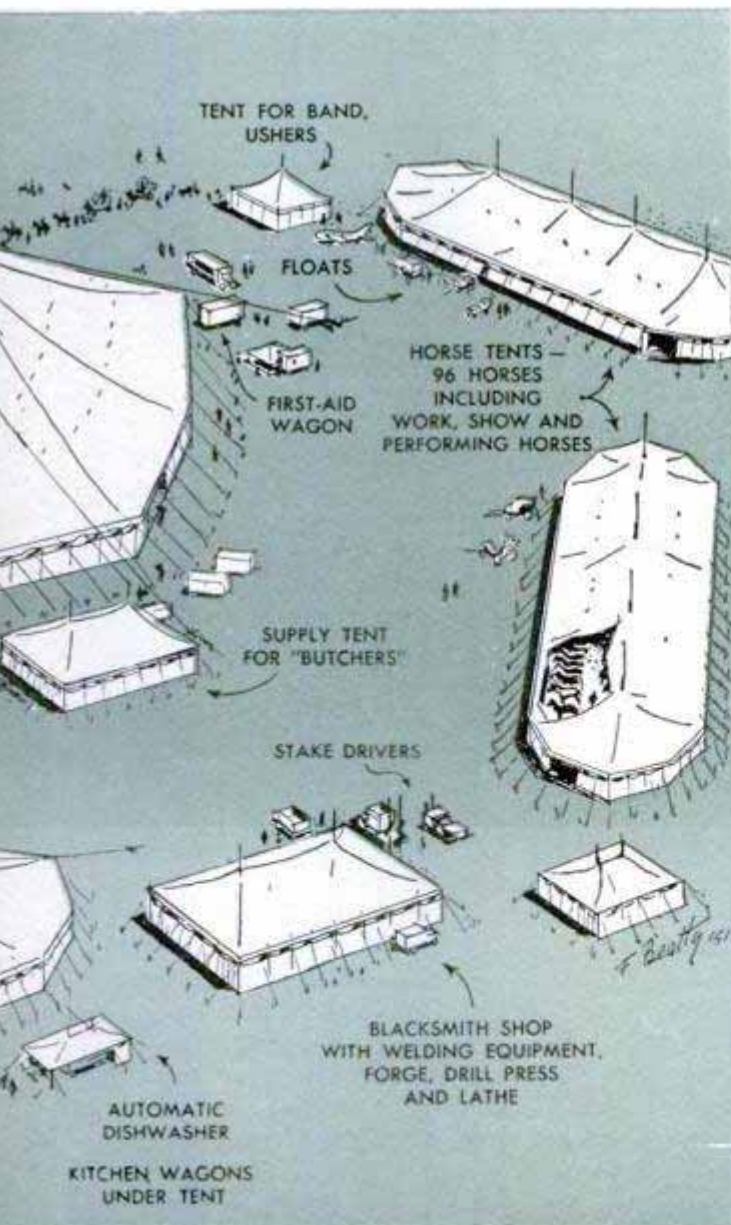
Now along the center line rolls the long pole wagon. As it arrives at each position, one of the five 62-foot main poles teeters off onto two crossarms which cradle it with the base just off the ground, the top several feet in the air. A crew of canvasmen slips a three-foot bale ring onto the bottom of the pole. Soon this ring will rest at the very top of the vast tent, supporting not only the canvas itself but much of the rope and tackle that rig the big top. Meanwhile 185 aluminum quarter poles and side poles thud to the ground all over the staked-out oval.

Number One, the first pole up, is the key to the entire top; it helps raise and lower the others, gives canvas boss Werner a hook high in the sky. First, though, it must be pivoted into place. A 2½-inch hawser, fastened to the top of Number One, runs out to the edge of the oval where it's tied to a heavily staked block and tackle. As a





Kitchen wagons, with tent pitched snugly over them, contain two oilstoves which turn out 4200 meals a day



cat sputters into position and picks up the rope, an undercurrent of tension, a half silence, seems to fall across the lot, for this is the one ticklish job of raising the big top each day. The cat claws forward and Number One pivots slowly and regally into the air, swaying now and then, guy lines jerking it back on course. When it stands straight and true, an American flag flutters up toward its peak. Though no one says a word, the kid watching from the side lines has a feeling the circusfolk have uttered a vast, collective sigh.

Meanwhile, under Werner's sharp eye, the 76,000 yards of flameproof canvas have been dropped piecemeal around the oval. The vast cloth roof is bright-new when the circus leaves winter quarters each spring. By midsummer it's faded and patched.

The kid by now has found Werner and begged a job on a canvas crew. Under the rough direction of the crew boss, the men attack one of the big pie-wedge sections, unfolding it, dragging it into position, then lacing it to the adjoining section. Three canvasmen finally strap the tent to the bale rings at the bottom of each pole. Then the kid tags after the men as they move off the canvas, where, emulating them, he grabs a guy line, holding in his hand a few inches of the 73 miles of rope that hold up the circus.

Werner waves his hand in an almost unnoticeable gesture, an order that somehow flashes instantly around the oval. Workers, moving as one man, slip the side poles into

(Continued to page 220)

Typical "Yankee Robinson" layout steers spectators along the midway at far left, then past menagerie into big top. The rest of the layout is the "back yard" for exclusive use of performers and workers



Detroit Listening Post

By Siler Freeman

SHORTAGES of new cars are not expected to develop this year. Relaxation of quota limitations for the second quarter plus higher prices for the 1952 models about eliminates the possibility that the post-World War II and Korean War scare situations will be revived.

Industrial circles are predicting that in the next few months, unless the defense program is given greater impetus than at present, government limitations on production and most materials will be only academic. This, of course, would stimulate even greater production of new cars and lead to a situation where the dealers would be forced to get out and seek customers.

The easing of the defense program also has dismissed most of the fears that 1952 would be the last big model-changeover year. Engine programs, held up by the freeze on machine tools, have been revived.

Dodge, close to realization of a V-8 engine similar to the Chrysler FirePower and DeSoto FireDome, is now almost sure of the new engine in its 1953 model. Buick and Pontiac of the General Motors group are pushing ahead with their V-8s for 1953. Packard may be in the same boat, although not so far along as Buick and Dodge.

But the big question today is: "What about Chevrolet?" The top seller in the field has been getting disquieting reports about its 1952 competition.

The new models which Chevrolet had started for 1952 were halted originally by the stepped-up defense program and the feeling that with production cut down, it would not be necessary to go to a completely new car. Later the Chevrolet high command decided it needed more than what was originally planned. So the design section is busy again.

The horsepower race is far from over, too. The increase in power among the higher-priced cars has been going on since V-8 engines became the standard. This year Cadillac is on top. But will it stay there?

It is evident that Chrysler is not satisfied to have its archrival advertising 190 horsepower while its own big power plant has only 180. A paper read before a recent Society of Automotive Engineers meeting

here by James C. Zeder, director of Chrysler engineering and research section, indicates the thinking of the corporation.

Zeder told of experiments with Chrysler's V-8 which have yielded as high as 353 horsepower. The compression ratio was stepped up above 12:1 and a very high octane fuel was used, Zeder said.

But even with standard compression ratios and regular fuels, he revealed a second engine which went over 300 horsepower. It is inconceivable that such an engine would go into any production model but the thinking is for more horsepower.

I recently asked William Graves, Packard's engineering chief, why such high power was being sought in automobiles when traffic conditions and highways were not yet ready for 100-plus-miles-an-hour speed. Graves said:

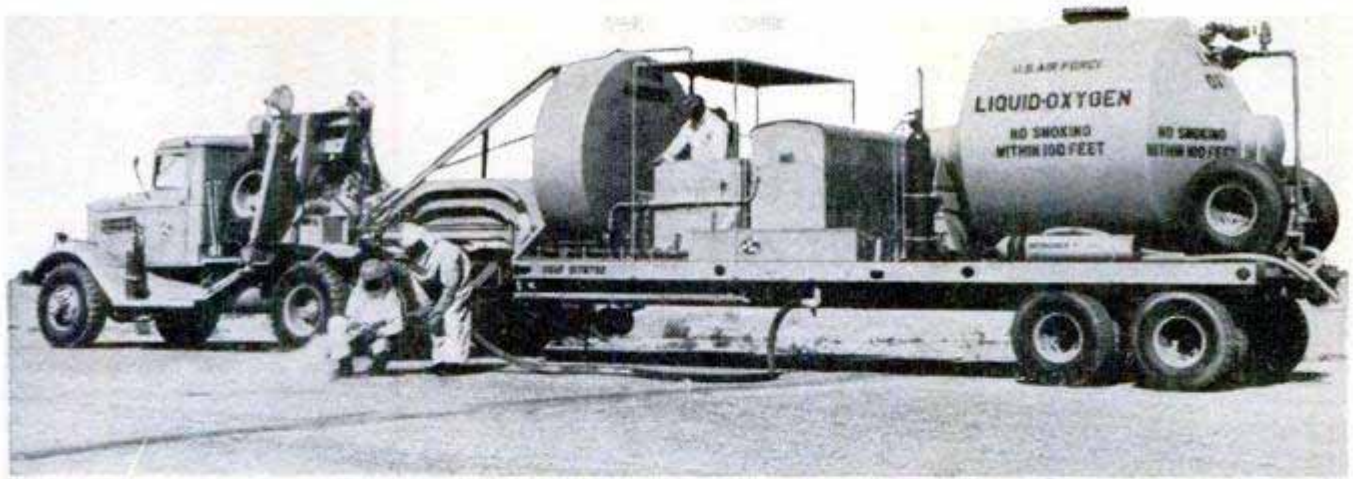
"It is true we haven't the roads to drive at such speeds, nor are other factors in balance yet to seek speeds in that range. But when you are paying around \$5000 for a car, you want an engine that will get away faster than the other fellow.

"With these big engines there are other problems which face the engineers. First, we must have brakes that go with the 100-miles-an-hour speeds. We must have the chassis to take such big engines and we must have tires that will be safe at such great speeds. But we are not going to back away from increased horsepower."

Tire companies already are working on their end of the problem. Dr. Arthur Bull of U. S. Rubber Co. told me they are experimenting with new tires which will take speeds of 100 miles an hour or more.

Doctor Bull mentioned Cadillac and Chrysler as two of three cars being used in his company's experiments. The Nash-Healey is another high-speed car.

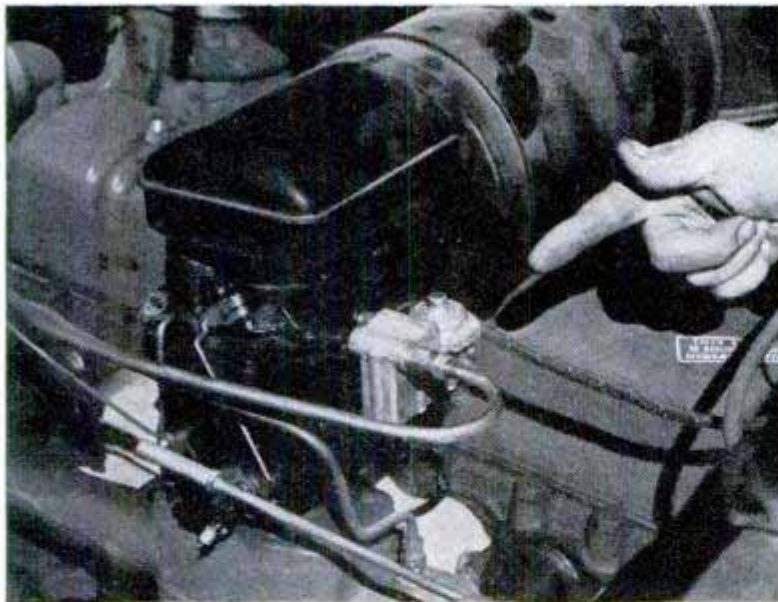
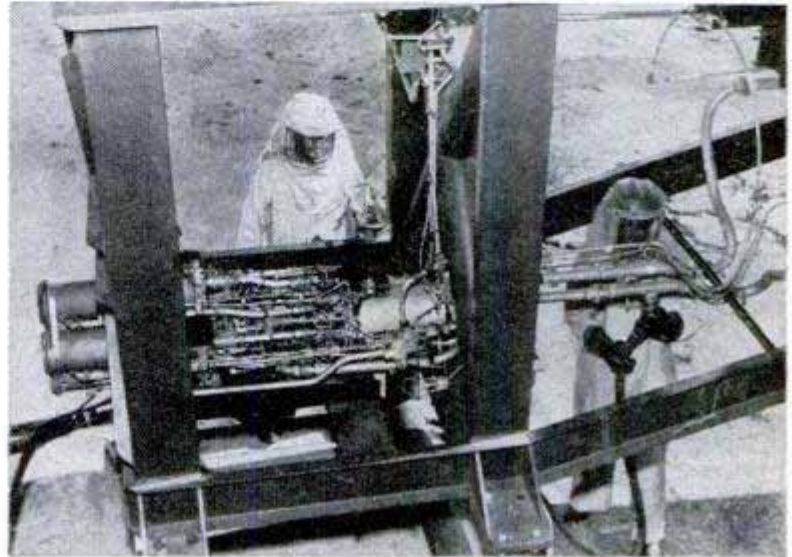
Packard has started the trend toward power brakes for these superspeed cars. Graves pointed out that power brakes not only give more effective stopping but cut down the reaction time for putting on the brakes. The brake height is about the same level as the accelerator pedal, which brings the foot smoothly and without lifting from the gas to the brake.



Republic Aviation Corp. photos

Jet-Fuel Truck

Quick fueling of rocket-propelled interceptors is possible with a new "one stop" servicing truck. Because of the highly volatile fuel they use, rocket planes must be fueled just before take-off and previous methods have required many hours. The truck carries two large tanks, eight bottles of pressurizing nitrogen, an engine generator, a fire-extinguishing system, a compressor and a pump. One tank holds 900 gallons of liquid oxygen; the other holds 700 gallons of a water-alcohol mixture.



Gasoline-Flow Regulator Gives Better Auto Mileage

Gasoline flow to automobile carburetors is reduced and smoothed out by a new pressure regulator. In cross-country tests it has added as much as three miles of driving per gallon. Most fuel pumps deliver from two to six pounds' pressure and move gasoline to the carburetor in pulsations. The new regulator standardizes the pressure at 1½ pounds and creates an even flow, preventing too rich a fuel-air mixture. It virtually ends carburetor flooding and lessens wear on the needle valve and seat.

The World Will Be Watching . . .

. . . As presidential candidates are nominated in the July political conventions. For the first time in history, TV will go all out to bring our foremost political figures within handshaking distance of millions of American voters. How will it be done? In four pages of detailed cutaway drawings in June, we'll show what you'll see on your TV screen, what goes on behind the scenes and the vast facilities for televising the greatest political show on earth, come July. Don't miss it.

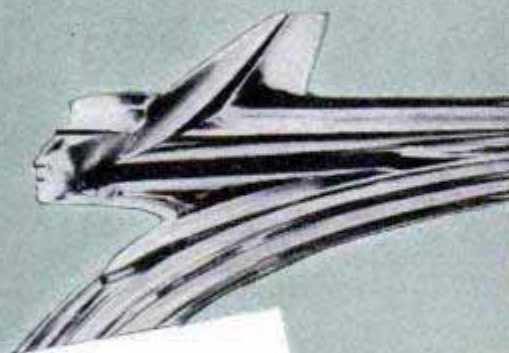
Atom-Powered Sub

The USS *Nautilus*, first U. S. atomic-powered submarine, will have a power plant based on an experimental model developed at the Atomic Energy Commission's test station near Arco, Idaho. Both the nuclear reactor and the associated propulsion equipment will be built by the Westinghouse Electric Corp., which also is building the turbine and gear assembly for the USS *Forrestal*.

The OWNERS REPORT



Floyd Clymer at the wheel of the Pontiac Chieftain which he drove 2792 miles. Top of horn ring interfered with his speedometer vision



THE POPULAR MECHANICS MOTOR SURVEY
AS CONDUCTED BY FLOYD CLYMER

I am the owner of a 1952 Pontiac, 6-cyl. 8-cyl. : Hydra-Matic Standard
 I have owned it approximately 2 1/2 months. Speedometer mileage is now 10461.
 Having tried both kinds, I find that my Pontiac operates satisfactorily using:
 regular gasoline premium (high test) gasoline
 My average gasoline mileage is 14-16 m.p.g. for city driving, and
20 m.p.g. for country driving.

I CHANGE OIL every 1500 miles, but also ADD OIL every _____ miles.
 I change oil every _____ miles.

Roadability and handling qualities are: Excellent Good Unsatisfactory
 Maneuverability in traffic seems to be: Excellent Good Unsatisfactory
 Acceleration is: Exceptional Very Good Average Poor
 Curb and road clearance is: Satisfactory Too High Too Low
 Here are my main reasons for purchasing a Pontiac: Holds to road good - Ease of driving - low upkeep - durability

Particular features I like are: New Dual-Range Hydra-Matic Drive New "Economy" rear axle Longer rear springs New chrome body moldings The advanced interior finish, upholstery, etc. The in-line, L-head engine

If you own a "Catalina" hard-top model, how would you compare it with similar body styles in other makes of cars?
 Specifically, what do you dislike about your Pontiac? Emergency Brake Cables freeze
Might like emergency brake in center of dash. Rattle in Hydra-matic
 Compression is too high for present premium gas
 Have you ever owned a Pontiac before? Yes No How many? one

Would you buy another Pontiac? Yes Possibly No
 How do you rate your dealer service? Excellent Good Average Poor
 How do you rate your Pontiac generally? Excellent Good Average Poor

GENERAL INFORMATION

What type of engine would you prefer in your next new car? In-line V-type
 No. of cylinders: 6 8 Valves: Side Overhead
 Would you like a passenger car with greater horsepower output? Yes No
 Approximately how much horsepower would you prefer in your next new car? 160
 What improvements would you like to see in your new car? V-Engine - large brake pedal

Based on my present experience, I want my next car equipped with: Standard trans
 Overdrive New Hydra-Matic Drive Other type automatic transmission
Dial Range

This questionnaire will be tabulated fairly, and your name will be held in strict confidence. Please mail promptly to:

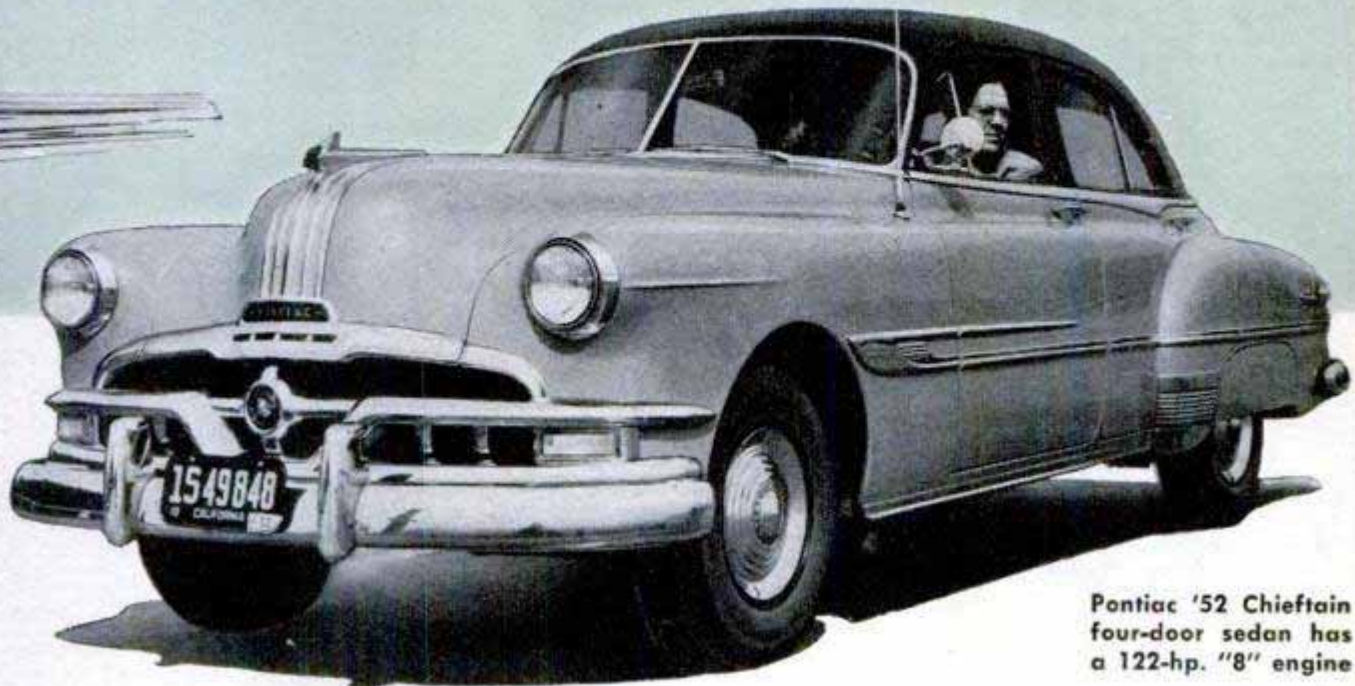
FLOYD CLYMER
 1268 SO. ALVARADO ST.
 LOS ANGELES 6, CALIF

My Name: [Redacted]
 Address: [Redacted]
 City & State: Klamath Falls, Oregon
 Occupation: law filer
 (Use other side for additional remarks)

The Oregon owner who filled out this questionnaire is typical of many owners in that he wants more horsepower in his next car and a V-8 engine; however, he indicates he also likes the present in-line engine

on the '52 PONTIAC

The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1952 cars who answered questionnaires sent by Popular Mechanics to 1000 Pontiac owners from coast to coast



Pontiac '52 Chieftain four-door sedan has a 122-hp. "8" engine

By Floyd Clymer

OWNERS of 1952 Pontiacs in our survey revealed they had owned an average of 2.9 Pontiacs before they bought their present car. This is an optimistic note that was reflected throughout the tabulations.

Quite a few owners shared the opinion of a Paducah, Ky., steam fitter who wrote: "I find Pontiacs operate more economically and are longer-lasting than any car in their price range I've ever tried." Others, such as a Milwaukee, Wis., bakery owner, a Greensboro, N. C., farm-machinery sales-

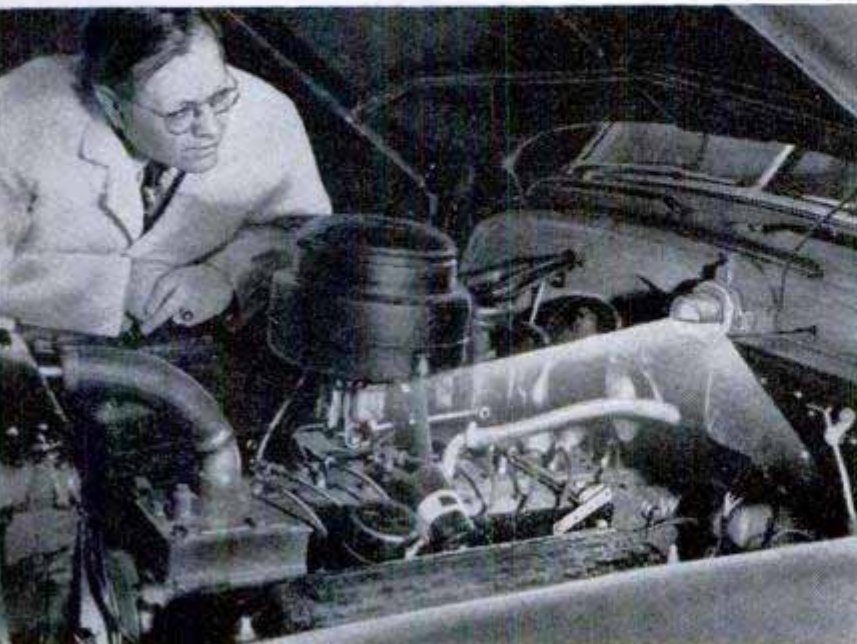
man and a Klamath Falls, Ore., saw filer, bought Pontiacs because they were impressed with excellent and courteous dealer service, which was rated "excellent" or "good" by 75 percent of all owners replying. To the question "Would you buy another Pontiac?" 70 percent said "yes."

Several traveling salesmen, such as one in Kentucky, wrote that Pontiacs are "extra tough and give fine service." Others, such as a Cottage Grove, Ore., physician, remarked that their local dealers gave the best trade-in value in the area.

A Salisbury, N. C., man wrote: "Most car manufacturers are ruining the front end of their cars. Some are broad and flat around the hood, some slope off so much they have the appearance of plowing into the ground with the radiator. But Pontiac lines are good."

These were the percentages for some of the direct questions we asked about the best-liked Pontiac features: New "Economy" rear axle, 51 percent; longer rear springs, 33 percent; chrome body moldings, 32 percent; interior upholstery and finish, 55 percent.

No one except a Racine, Wis.,



When hood is opened, the Pontiac Chieftain's engine is illuminated by handy light

Percentages from PM Poll

Owners of eight-cylinder models.....	96%
" " six-cylinder models	4%
Owners of Hydra-Matic models	75%
" " standard-transmission models	25%
Average gasoline mileage in country—	
six-cylinder models	20.2 m.p.g.
eight-cylinder models	17.0 m.p.g.
Average gasoline mileage in city—	
six-cylinder models	17.1 m.p.g.
eight-cylinder models	14.1 m.p.g.
Use premium gasoline	80%
Use regular gasoline	20%
Owners who change oil	100%
Average mileage for change of oil.....	1390
Owners who add oil (also change periodically)	5%
Average mileage for adding oil.....	1035
Maneuverability excellent	66%
average	33%
unsatisfactory	1%
Roadability excellent	73%
good	27%
unsatisfactory	0
Acceleration outstanding	29%
very good	57%
average	13%
poor	1%
Road clearance satisfactory	98%
too high	1%
too low	1%

Best-Liked Features

Dual-Range Hydra-Matic drive	69%
New "Economy" rear axle	51%
Longer rear springs	33%
Chrome body moldings	32%
Interior finish and upholstery	55%

Owners' Rating of Car

Excellent	55%
Good	38%
Average	7%

General Information

Prefer in-line engine.....	66%
" V-type engine	34%
" eight cylinders	95%
" six cylinders	5%
" side-valve location	51%
" overhead-valve arrangement	49%
" an increase in horsepower output.....	37%
Average horsepower output preferred....	130 hp.
<small>(Respective Pontiac horsepower figures were used for those owners who indicated satisfaction with present outputs)</small>	
Prefer an automatic transmission	78%
" standard transmission with overdrive.....	11%
" standard transmission only	11%
" Dual-Range Hydra-Matic drive	
exclusively	95%
<small>(The above figure means 95% of the 78% preferring automatic transmissions)</small>	
Prefer other type or make of automatic transmission	5%
Previous Pontiac owners	69%
Have owned five or more Pontiacs previously	12%
Will buy another Pontiac	70%
Might buy another Pontiac	28%
Will not buy another Pontiac	2%
Dealer service rated excellent	40%
good	35%
average	18%
poor	7%
Most frequent objections: 1. Body fitting and assembly; 2. Gas mileage; 3. Poor riding qualities or seating comfort; 4. Bad paint job, thin chrome; 5. Excessive engine detonation	
Improvements desired in next new car (in order of preference): 1. Better gasoline mileage; 2. New body styling; 3. One-piece windshield; 4. Better body fitting and workmanship; 5. Higher-quality paint and finish; 6. Better riding qualities or seating comfort; 7. More powerful engine; 8. Easier steering at low speeds, power-assisted or otherwise; 9. V-type engine; 10. Better visibility; 11. More genuine safety features; 12. Less brake-pedal pressure required	



Hand-brake lever is mounted on swivel bracket for ease of operation. Clymer liked red warning light

shovel operator said he bought a Pontiac because "they twisted my arm." But as usual there were some personal dislikes:

"Pontiac cars steer too hard."—Coquille, Ore., shovel operator.

"The car develops squeaks and rattles very soon. Better inspection of parts and assembly is needed."—Medicine Lodge, Kans., merchant.

"I took my car to five Pontiac dealers here and finally had to tune it myself. I sincerely believe they don't know their own product."—Detroit, Mich., maintenance superintendent.

"Not enough power in the six-cylinder

Clymer approves of tinted windshield glass during midday glare, but found it dimmed objects at dusk





On steep grades like this one, Clymer has high praise for Pontiac's new Dual-Range Hydra-Matic transmission

Hydra-Matic."—Nashville, Tenn., hospital supervisor.

"... Rides like a truck. Pontiac hasn't changed its body design for three years."—Chicago traveling salesman.

"Not enough room for passengers in rear seat of the Catalina model."—Gervais, Ore., building contractor.

"Tappet noise because of uneven pushers. . . . Rear window frosts when driving in cold weather."—Cloquet, Minn., construction worker.

A Detroit attorney wrote: "Nothing for me but Pontiacs. After owning 10 other makes, my last three Pontiacs convinced me Pontiacs top them."

A La Crosse, Wis., office manager, a Romulus, Mich., factory employee and a Detroit teacher were among several who said they want a one-piece windshield next time. A Hood River, Ore., physician suggested a radio speaker behind the rear seat and defrosters on the rear window. A Jersey City, N. J., electrician wants more

ash trays and a cigarette lighter in the rear.

A few owners, such as a Huntington, W. Va., Treasury agent and a Detroit truck driver, complained that the Fisher body has too many rattles.

The only objection a Birmingham, Ala., insurance man had was that "it is hard to keep the Hydra-Matic in high gear when moving slowly in traffic."

Here are some more owner comments taken at random:

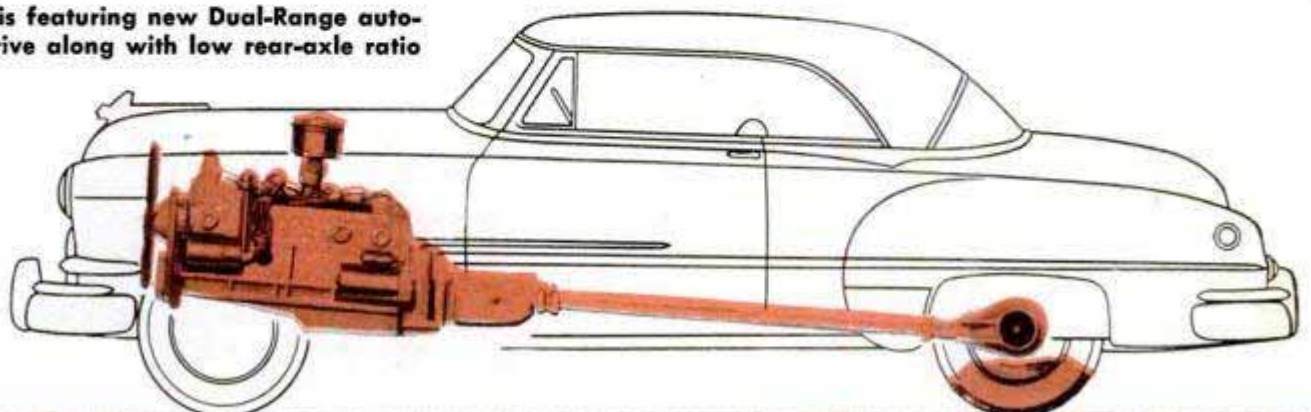
"The chrome body moldings are poor because they rust very easily. . . . I find I can drive a Pontiac all day with minimum fatigue."—Weirton, W. Va., millworker.

"Pontiac construction is much better than some others. . . . The brakes take too much pressure to stop."—Wauwatosa, Wis., construction engineer.

"Not enough soup for a 122-horsepower engine. I'd prefer 160 horsepower."—Seaside, Ore., truck driver.

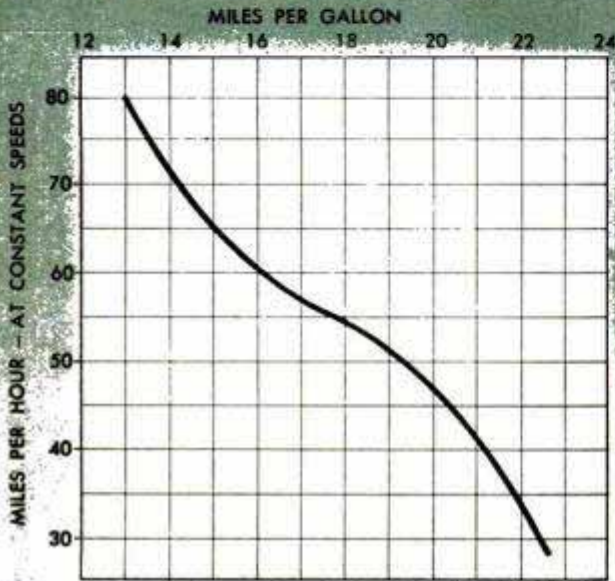
My Own Road Test and Report: I tested a 1952 Pontiac Chieftain four-door sedan,

Pontiac is featuring new Dual-Range automatic drive along with low rear-axle ratio





CLYMER'S ECONOMY TEST
PONTIAC CHIEFTAIN EIGHT 4-DOOR SEDAN
WITH DUAL-RANGE HYDRA-MATIC DRIVE*



MILES PER GALLON

At Constant 30 m.p.h.	22.30
At Constant 50 m.p.h.	19.40
At Constant 60 m.p.h.	16.10
At Constant 75 m.p.h.	13.60

MILEAGE - CROSS-COUNTRY

Detroit to St. Louis (new car, snow, ice, cold, medium traffic)	14.70
St. Louis to Oklahoma City (cold, snow, ice and slush)	15.30
Oklahoma City to Los Angeles (mostly cold and dry)	17.20

(Premium gasoline of various brands was used)

*All automatic transmissions, regardless of make, secure from 1 to 4 m.p.g. less than the same model car with conventional or overdrive unit

After the test car was broken in, Clymer's mileage (Oklahoma City to L.A.) just about hit the average reported in survey. Below, Clymer uses a hose to prove his observations on the waterproof Pontiac



"The car is well-balanced," says Clymer, "and the stability (even with some 'roll' on the turns) is quite good." He credits this to excellent shock absorbers

which has a 122-horsepower straight-eight engine. The route was from Detroit to Los Angeles via St. Louis and Oklahoma City. The speedometer showed 2792 miles at the end of the run, which included some special road testing on side roads in the mountains and desert. Various weather conditions prevailed from zero weather, snow, slush, hail and rain in the Midwest to 80-degree temperatures in the desert.

The car is well-balanced and stability (even with some "roll" on the turns) is quite good. It handles well and there is a safe feeling while driving it. It had no tendency to hop around or get out of control on corners, at high speed or on wet roads and in normal driving there was little wheel spin on icy roads.

Over long, hard stretches the car had a maximum speed of 98 to 100 miles per hour by speedometer (as in other makes, I found a variation on the high side of about six percent). On a slight downgrade the speedometer showed a little over 100. The acceleration is extremely good and the car will cruise mile after mile easily at 75 to 85 miles per hour.

The Fisher body I found to be waterproof in many miles of driving through snow, slush and rain. No rattles or squeaks developed and the body had a feeling of solidity.

The vision is good, although the rear window on the model I drove could be enlarged. The hood is rather long and does not drop as much in front as I would like, or as much as other modern cars do, probably because of the long straight-eight engine used in the Chieftain (the six-cylinder engine fits under the same hood). The hood

(Continued to page 264)

Electric Wrist Watch

You never wind the mainspring of an amazing new wrist watch because it has none—it is powered by a tiny electric motor. No larger than a conventional wrist watch, the electric timepiece runs a year on a tiny battery which has less volume than a penny. The battery is designed so it can be replaced easily by a jeweler. Its power output is at such an even rate that the watch is said to keep better time than conventional watches using mainsprings. The subminiature electric motor (its coils are wound with 3000 turns of insulated copper wire only $\frac{1}{8}$ the thickness of a human hair) develops 1/75,000,000 horsepower. Not yet in production, the watch was developed by Elgin National Watch Company.

Right, a subminiature battery keeps the electric wrist watch running for a year



"Steam Bath" for Face

Shaped to fit the face, a new "steam bath" manufactured in Germany opens the skin pores for a beauty treatment or provides medicinal vapor for inhalation. Though the electrical appliance generates clouds of vapor, the rim which fits against the face becomes only lukewarm. There is a signal light to show when the current is on and a safety switch which automatically cuts off the current should the signal light be ignored for any length of time. Medication to treat asthma and other illnesses which impair the breathing can be inserted in the "facial bath."

Transistors Cut Size Of Army Radios 10 Times

Replacing many conventional vacuum tubes, transistors are making it possible for the Army Signal Corps to reduce one portion of its radio-teletypewriter equipment from 100 to 10 pounds. An additional advantage is that the new equipment can be operated on $1\frac{1}{2}$ watts from dry batteries instead of 175 watts from a generator. The transistors, which are germanium-crystal devices, have an estimated life of seven years of continuous use, many times longer than the ordinary vacuum tube.

Chrysler and General Motors engineers have jointly produced a set of pure-gold master blocks accurate to .000001 inch for precision measurement of surface roughness of machined parts.

The Cars They Drive Are Classics

Restoring and driving some of the greatest cars ever built — the "classics" — is the fast-growing sport of thousands of auto fans.

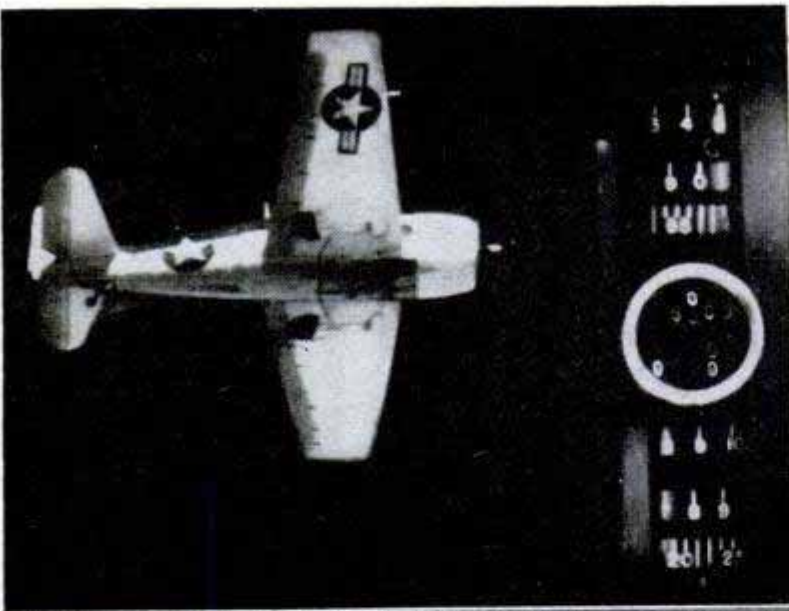
What cars are considered classics? In the classic hall of fame are the Marmon and Cadillac V-16s, the 12-cylinder Packards, some of the Auburns, Lincolns and Cords. The real king of the old-timers is the Duesenberg J, a juggernaut that has rolled into a legend.

A feature next month tells how to judge a classic and how fans go about restoring these special-interest cars to all their former glory. It's a must for auto fans.

Close-Up Photos From Miles Away

Left, airplane was three miles away when picture was made. Numbers on print show the azimuth and elevation of camera. In circle is reading of electronic stop watch

Below, missile-tracking camera is mounted on carriage of a 40-mm. antiaircraft gun

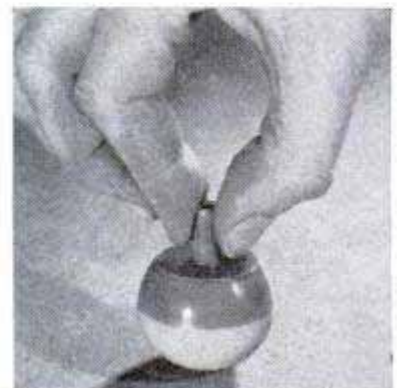


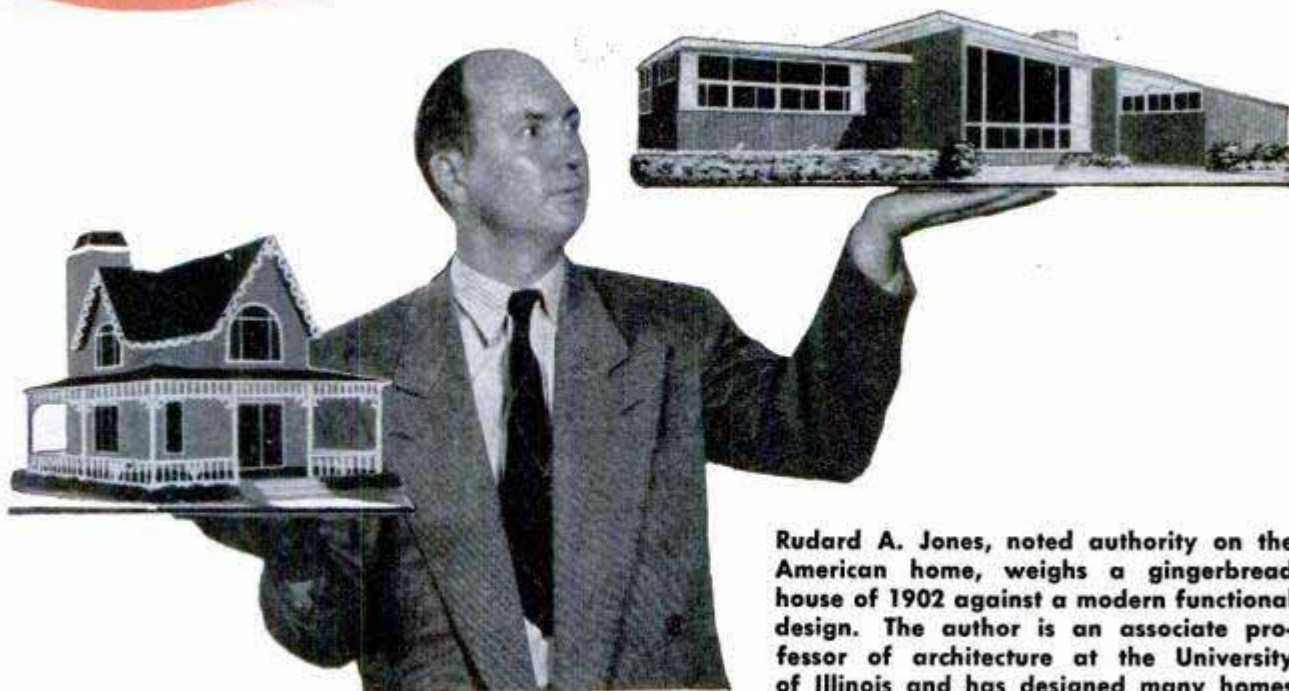
Airplanes and missiles flying at top speeds several miles away are photographed close up by the Navy's new telescopic camera. Built on the principle of an astronomical telescope, the camera is a 10-inch reflecting telescope that exposes motion-picture film at a rate of 120 frames a

second. The photographer tracks the target with 25-power binoculars. Azimuth and elevation settings and time from an electronic stop watch are recorded on each frame of film for reference purposes. The whole camera assembly is mounted on a 40-mm. antiaircraft-gun carriage.

Mystery Top

How does it work? A mysterious top, spun on a smooth surface in the ordinary manner, spins normally for a few seconds, then rolls over and continues to spin on its stem. Eventually, as it "runs down," the plastic top rolls over on its side and finally resumes its normally upright position. It comes in two-color combinations.





Rudard A. Jones, noted authority on the American home, weighs a gingerbread house of 1902 against a modern functional design. The author is an associate professor of architecture at the University of Illinois and has designed many homes

YOUR HOME—1902 to 1952

By Rudard A. Jones

University of Illinois Small Homes Council

TODAY'S HOUSE is changing — it is changing to meet today's living pattern. If we were to examine the very latest house in 1902, the year *Popular Mechanics* first appeared, and were to compare it with today's model home, we would be amazed at the difference in improved accommodations and livability.

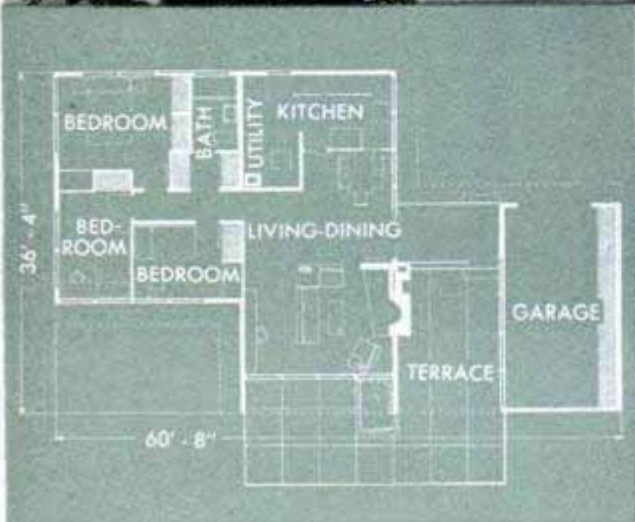
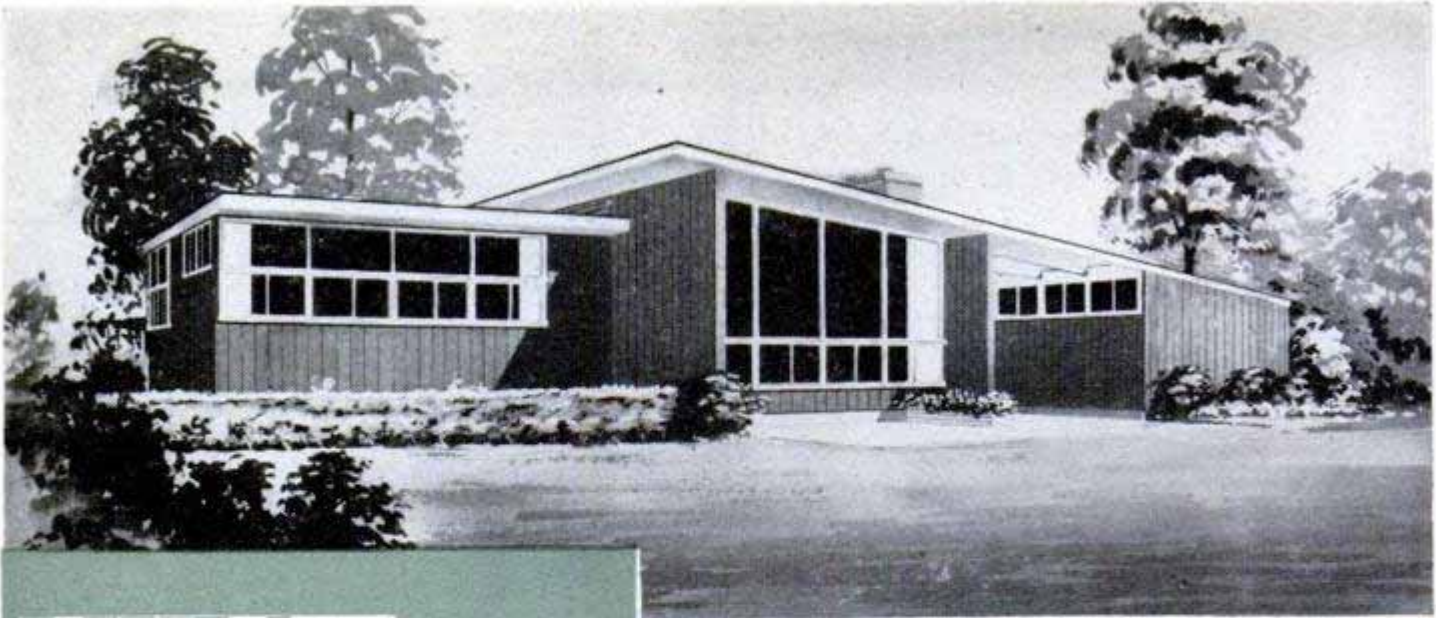
Granddad's new house was probably two stories with a gable or a pitched roof. Its normal complement of rooms would include a living room, a dining room and a kitchen with adjacent pantry on the first floor. The upper floor provided sleeping rooms and bath equipped with plumbing fixtures that were fundamentally the same as the fixtures of our day. Granddad's house had a hand-fired furnace in the base-

ment but its performance left something to be desired.

The biggest surprise to us would be the lack of electricity and the equipment and arrangement of the kitchen. The kitchen was a large room furnished with a bulky range on one wall and a sink located across the room. This, of course, was the very latest house in 1902—it was certainly not the average home, which had yet to know the advantages of central heating and modern sanitation.

What caused the changes from 1902 to 1952? Today's living pattern is one factor. Our families are smaller; predominantly they are urban; many housewives work outside the home. We live informally today; the servantless family promotes this idea.





Small Homes Council, University of Illinois

This modern house is called "typical of the best in contemporary homes" by housing experts at the U. of I.

Our transportation is keyed around the automobile and the house is influenced by this.

The modern house sacrifices space for convenience. The Jones family would like to have more space in the house we are planning for ourselves but we will accept smaller room sizes in order to have adequate storage, automatic heating, an automatic washer and drier and perhaps a dishwasher and garbage grinder. As a matter of fact, our key requirement is some sort of a playroom or family room and to obtain this convenience we expect to have a smaller living room and small bedrooms.

Instead of human help, the American family depends on the many devices and

services now available. The large family with the hired girl and the handy man is almost gone. Food preservation by canning, smoking, drying and freezing primarily is a function of commercial organizations rather than the home now.

In one way our housing picture has remained static. In 1902, the principal characteristic of housing in the United States was the single-family dwelling. In 1952, the majority of families still want to own a home of their own and this goal is one of the major impulses in today's life. True, the home must compete with the automobile for its share of the family dollar and, also, some of the dollar that might have gone to the house itself in 1902 now goes





Picture windows give visual extension to living space, says author Jones. This one is in the PM ranch house

for television, radio and similar devices.

It is easy to see the effects of technological advance on our homes during the last 50 years. The expansion of public-utility systems, the widespread use of electricity, the development of new materials and new structural systems and the improvement of construction methods have each contributed to the modern house.

Electricity plays a key role in today's home. Electricity lights our way; it powers our clocks, radios, ranges, mixers, refrigerators, toasters, roasters, cleaners, washers, driers, ironers, freezers and even our razors; it summons us to the door; it enables us to communicate rapidly and surely; it controls our heating systems. In some communities,

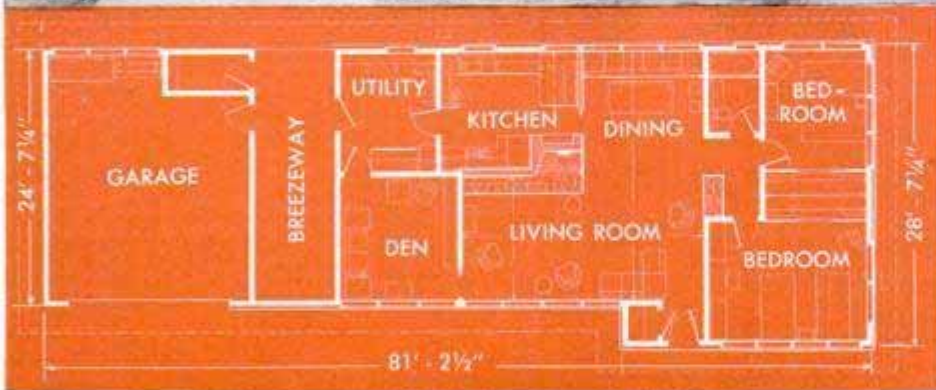
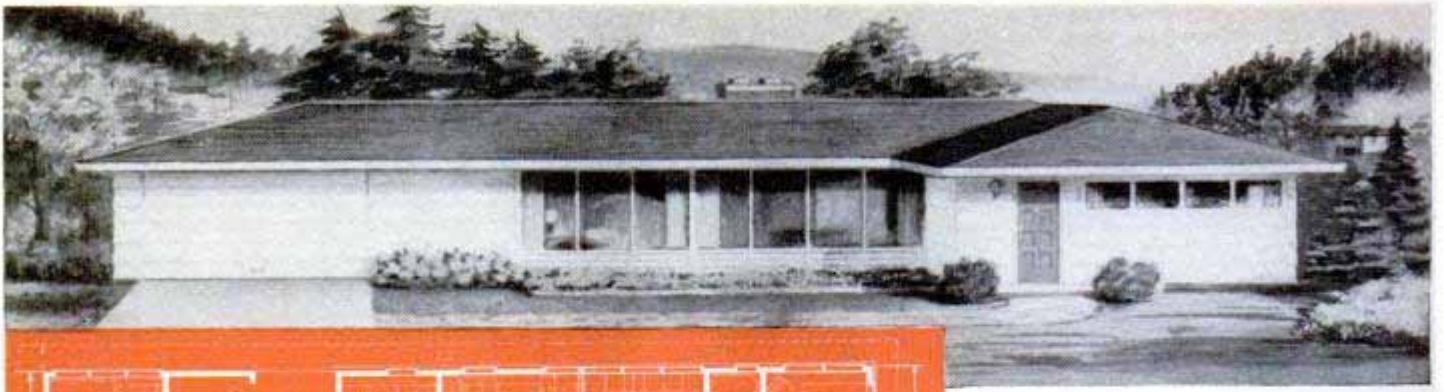
electric power is even an energy source for heating. All this has happened since 1900.

Electricity has affected our house indirectly, too. The expansion of the aluminum industry is based on electric power; the electroplating industry obviously extends from the availability of electricity.

The nonchalance with which we regard this 20th-century phenomenon seems incredible if we stop to realize that the tungsten lamp did not appear until 1911, the household refrigerator until 1917 and fluorescent lighting until 1938.

Home heating is probably more in the public eye than any other particular house feature. The last 50 years have seen extensive investigations in the theory of human





A big favorite with today's home builder is the ranch-type house all on one floor level. The one shown above is the PM ranch house built by Tom Riley in Portland, Ore. The exterior was designed around the necessary living space needed to house the Riley family with best modern planning



comfort. Notable studies in this field have been made by the American Society of Heating and Ventilating Engineers and at the Pierce Laboratory of Hygiene, New Haven, Conn.

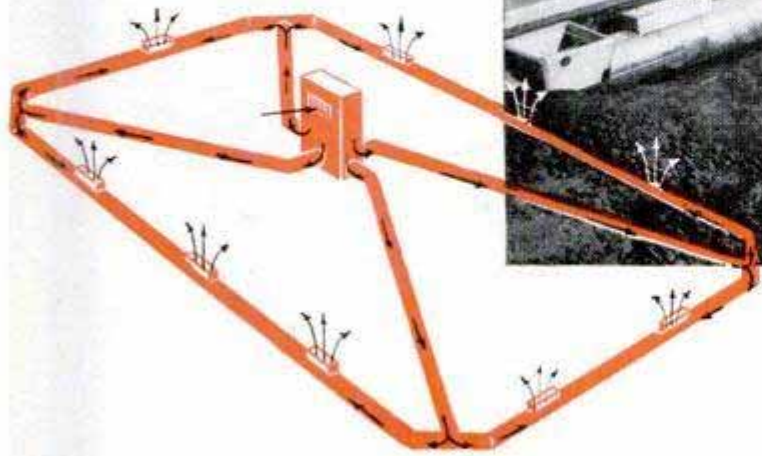
Home planning has always been influenced by the heating system and these systems have improved greatly in the past 50 years. At the turn of the century, interest in central heating first started to increase. Systems were usually the simplest warm-air, steam or hot-water types. A desire to improve warm-air-heat systems initiated the first Warm Air Heating Research Residence constructed at the University of Illinois in 1924.

The University of Illinois Engineering Experiment Station in 1939 arranged a similar type of investigation of hot-water and steam-heating systems. The idea of warm floors, walls and ceilings caught the fancy of many of us in the late 30s. Radiant heating (or panel heating, as engineers prefer to call it) had been used in Europe for some time in larger installations—it was slow in starting here. New homes began

Above left, kitchen for servantless home of today shows compact design and convenience. Just below is kitchen planned by G. E. with grill on terrace



One of the newest and best systems for heating houses built on a concrete slab is this perimeter, or "loop," system, according to author Jones. Ducts are embedded in floor with the perimeter registers beneath the windows. Heat passing through the ducts heats the floor by radiation. This plan saves fuel

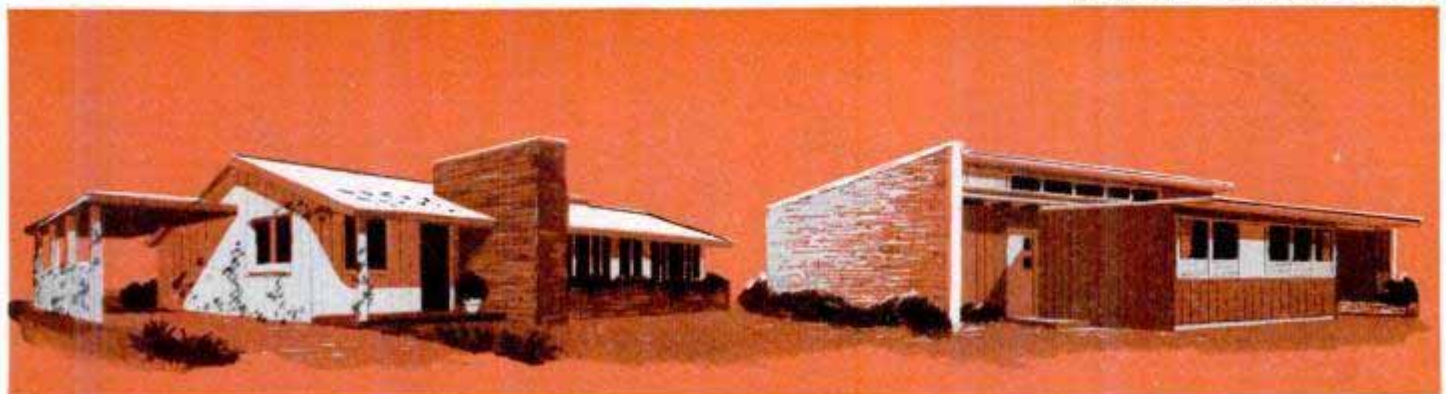
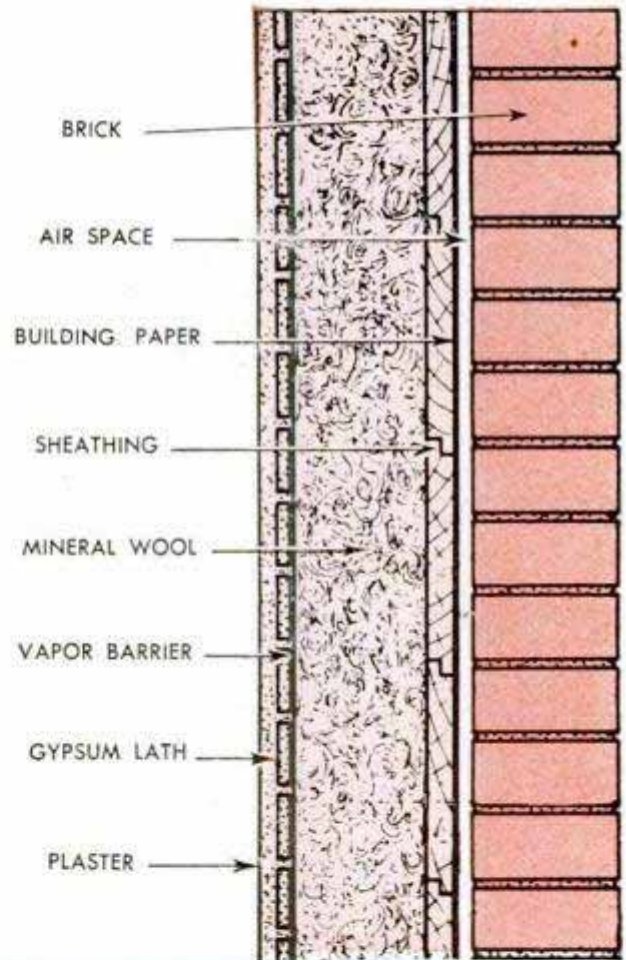


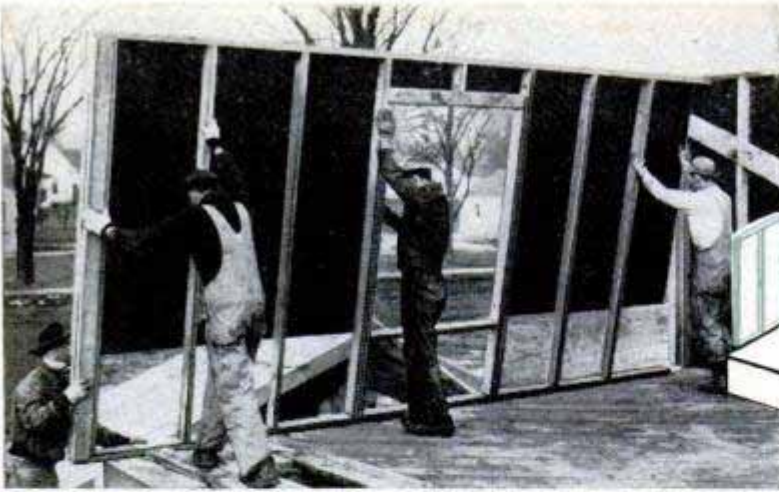
Courtesy National Warm Air Heating and Airconditioning Assoc. Below, insulation of houses is one of the great advances in housing during recent years. Cutaway below shows typical insulation of a brick house

appearing with concrete-slab floors that had pipe coils laid in the floor.

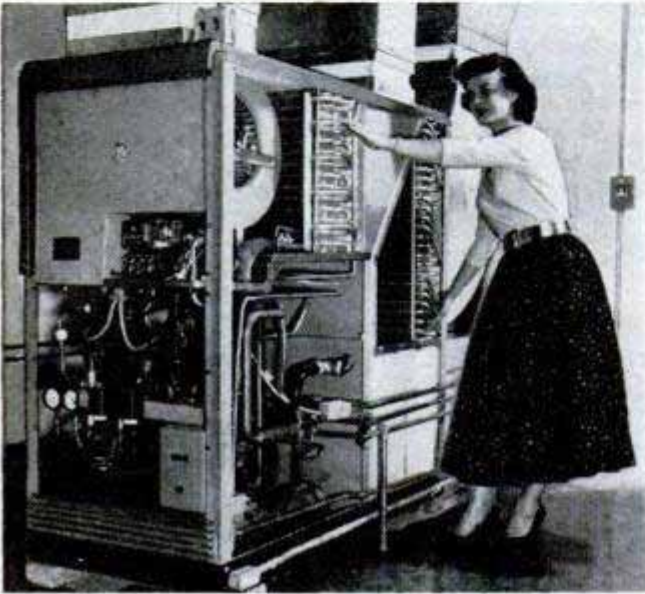
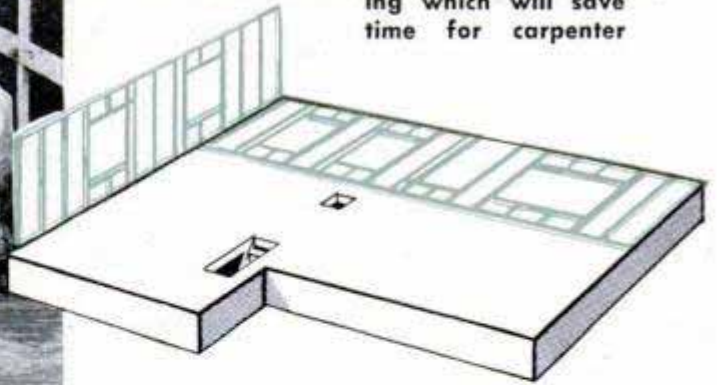
Later research and study showed that the heat losses of a concrete-floor slab were proportional to the edge length of the slab rather than to its area. Installation of edge insulation eliminated floor condensation troubles for houses without panel heating. A great increase in the number of houses built with concrete-slab floors instigated further investigations toward the heating of this type of house. Field studies showed that baseboard radiation was an excellent method.

Another outstanding new heating system is the warm-air perimeter system, used primarily for houses with concrete-slab floors. Perimeter heating involves the use of ducts below the floor slab, leading to warm-air-supply registers located around the perimeter of the house. Heat is supplied at the outer walls of the house where heat losses are greatest; the supply-duct location makes the floor warm. In the perimeter-loop system, a duct is looped around the entire house, warming the slab at the most





Among the improved construction methods is tip-up wall framing which will save time for carpenter



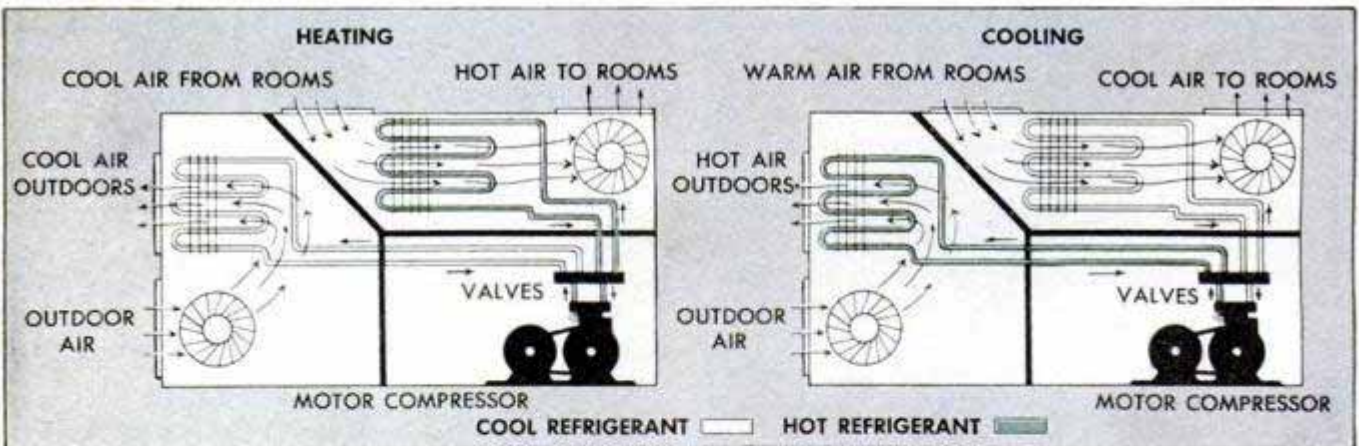
A far cry from old-time heating methods is the G. E. packaged heat pump that either heats or cools house

critical points. Radial supply ducts feed the loop duct.

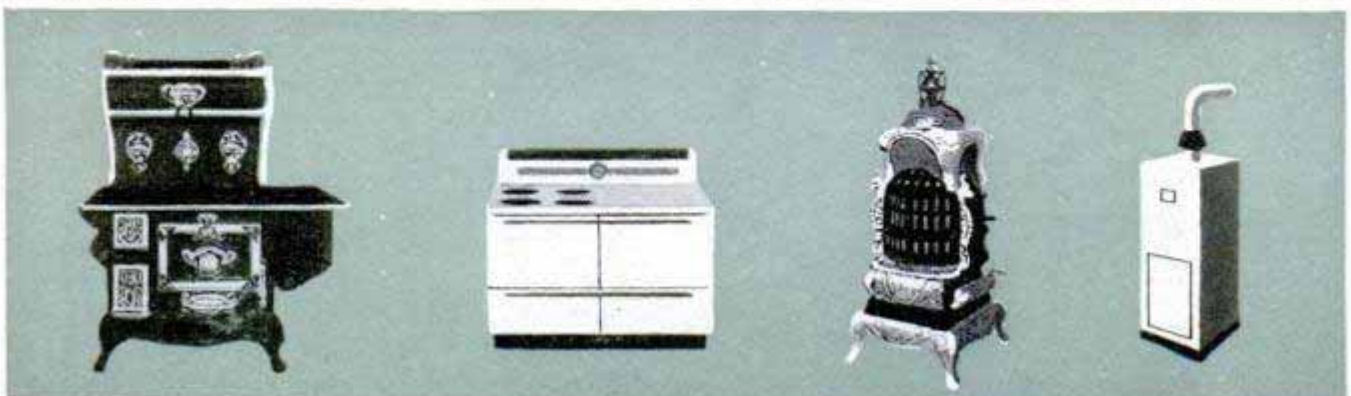
When Dad read the first issue of *Popular Mechanics*, most homes were heated with coal or wood. In 1919, the domestic oil burner generally became accepted. As late as 1940, however, the census showed coal as the leader, with wood second and oil third. In the last 10 years there has been a remarkable change. The tremendous expansion of the natural-gas industry now puts natural gas in line as a chief competitor of solid fuel. In the postwar years, gaseous and liquid fuels have been the choice of most new-home builders.

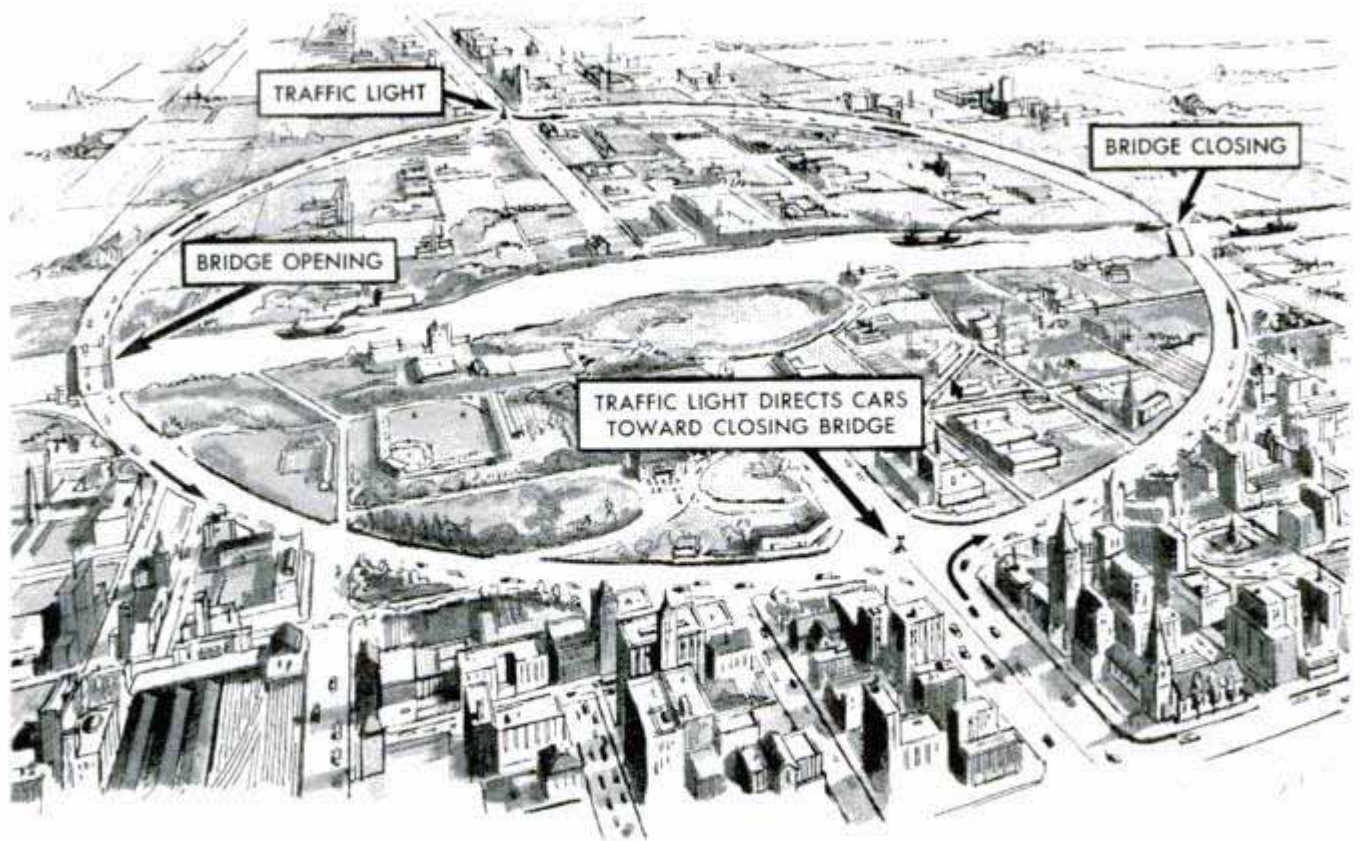
Recent years have seen much experimentation with the heat pump as a means for heating and cooling residences. This device offers the possibility of utilizing electricity

(Continued to page 258)



Below, there's 50 years of progress between old and new cookstoves, between parlor stove and gas furnace

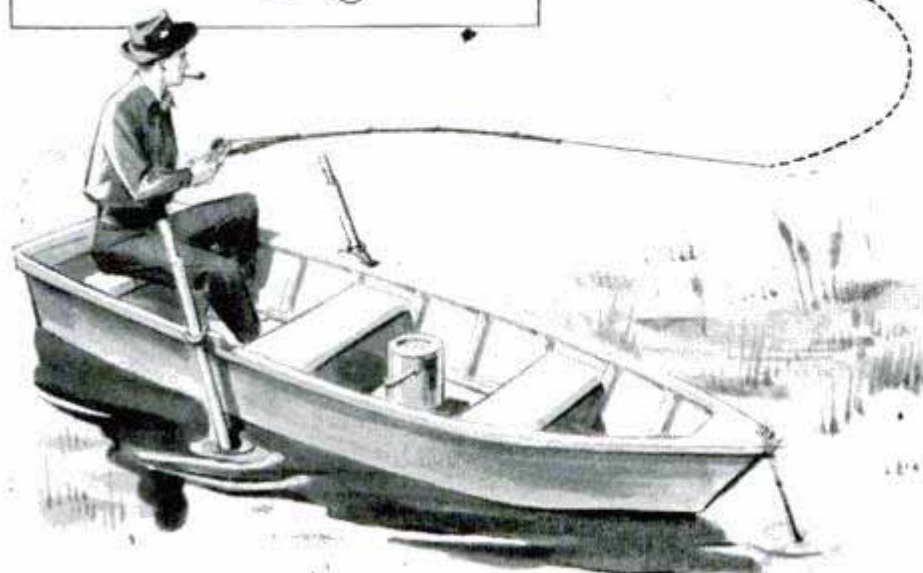
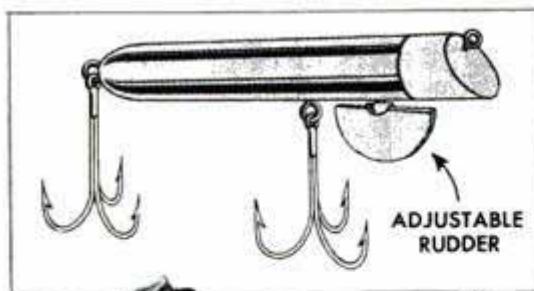




"Circular" Bridge Permits Continuous Traffic Flow

Traffic jams caused by drawbridges that open and interrupt flow along important streets and highways would be eliminated by a "circular" bridge. Actually, the bridge is simply a design to provide two choices for the flow of vehicular traffic. When one bridge is open, the other is closed and traffic flows without interruption. By the time the ship has reached the second bridge, the

first bridge has closed and traffic still flows continuously. The proposed bridge is about one mile in diameter and would be much cheaper to construct than a high-clearance bridge. The design was developed by Prof. Ralph G. Hudson of the Massachusetts Institute of Technology, who says that in some cases use could be made of existing streets and bridges.



"Torpedo" Lure Steers Itself

Fishermen can now cast with a lure that has an adjustable rudder which may be set to take a wide arc, right or left, on its return. Called a "guided torpedo," the plug is available in $\frac{3}{8}$ and $\frac{1}{4}$ -ounce weights for casting and in $\frac{1}{16}$ -ounce weight for spinning. The body of the plug has a finish of gold plate and its head is colorfully enameled in red and white.

Chemists now may use radioactive cellulose to learn exactly what wear, age, sunlight and other enemies do to clothes and many other products of everyday life.



See
Nov 1960,
p. 16

Hard to believe? You bet it is! But one Navy dive bomber did climb to 250 feet with wings folded before crashing in a spin

TALL TALES

From Korean Skies

By Arthur L. Schoeni

A NEW CROP of hair-raising tales has come to aviation since the jet age arrived. Swirling air battles over Korea with faster planes and new pilots provide "hangar flyers" with plenty of stories to recite when fog shrouds the carrier flight decks and landing strips. Freak escapes and mishaps, rivaling stories that came out of World War II, are almost daily occurrences.

The first American aircraft shot down in the Korean war was a helicopter. And it was destroyed by—of all things—a ground mine. The Air Force "pinwheel" was scouting along a road about 20 feet above the ground. Apparently, it flew over a land mine which was fired by some sort of proximity or acoustic fuse. The mine exploded, wrecking the helicopter.



Paratroopers making practice parachute leaps over Japan landed in the ocean when the wind changed while they were floating earthward. The men had no life jackets on, as they had expected to come down on land. A rescue helicopter hooked the chutes of four of the five men after they hit the water. Unable to pick up the fifth, the helicopter pilot used the downdraft from his rotor blades to keep the man's parachute inflated with air and literally blew him back to shore.

A Third Air Rescue Squadron's amphibian, piloted by Capt. Robert C. Mason, spotted an F-86 pilot ducking under water to avoid Communist bullets after he had crash-landed in a Korean river. Guided by radar, the rescue plane landed on the shallow river. It promptly got stuck in the mud flats. Attempts to launch a life raft and paddle to the fighter pilot were abandoned when enemy fire came too close. Lowering his plane's wheels, Mason plowed through the mud, picked up the pilot and got stuck again. He reversed the propeller pitch, opened the throttles and blew himself free, then took off down the river with all fingers crossed. The river was 6 feet deep and his plane drew 5½ feet of water.

Everybody knows an airplane has to have wings to fly. Navy fighters and dive bombers, because they operate from the cramped flight decks of aircraft carriers, have wings that fold upward or backward like a bird's. One Navy pilot tried to take off from the runway of an air station with the wings of his dive bomber folded upward. He not only tried to, he did! The powerful engine succeeded in getting the 20,000-pound plane 250 feet into the air before it went into a spin and crashed. The half wing extending from the fuselage to where the outer wing folded up apparently offered enough lifting surface to get the plane off the runway. Any aviator will still argue it can't be done.

Below, luckily damage was slight when an F4U's belly tank ignited as the plane came down on a carrier deck



Bullet entered cockpit, knocked off pilot's goggles, smashed piece out of canopy, but he was unscratched!

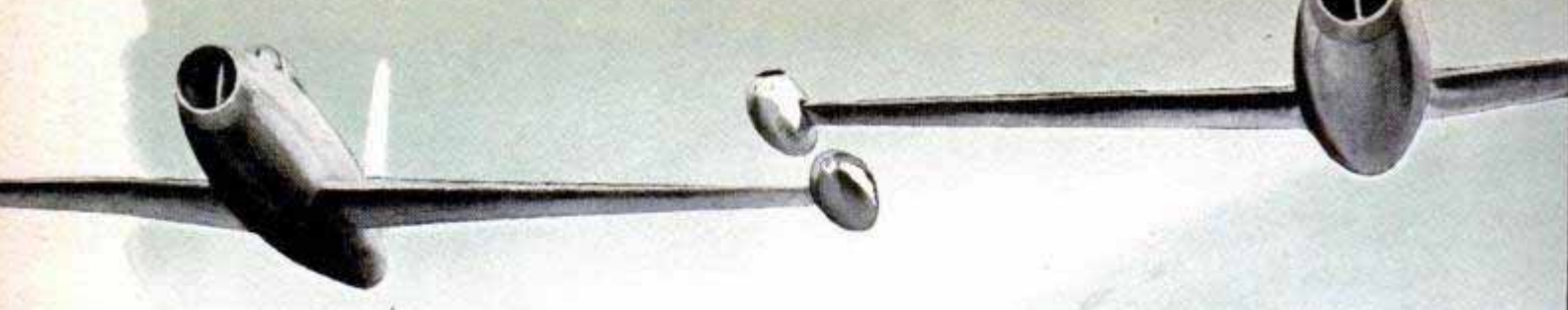
Helicopters have performed some fast rescues after pilots have gone into the ocean from carrier decks. Some hardly get their feet wet before the pinwheel lowers a sling to rescue them.

Oddest "save" in the books probably was made when a helicopter rescued Lt. (jg) K. R. Sutliff from his plane—while it still was on the deck of the carrier *Palau*.

Sutliff's plane caught an arresting wire but went over the side of the flattop, its hook still fouled on the wire. The only way the pilot could get out of the dangling torpedo bomber was for the rescue helicopter to come alongside and lower a sling to him.

Even with most of a wing flap knocked out by anti-aircraft fire, the pilot brought the plane in safely





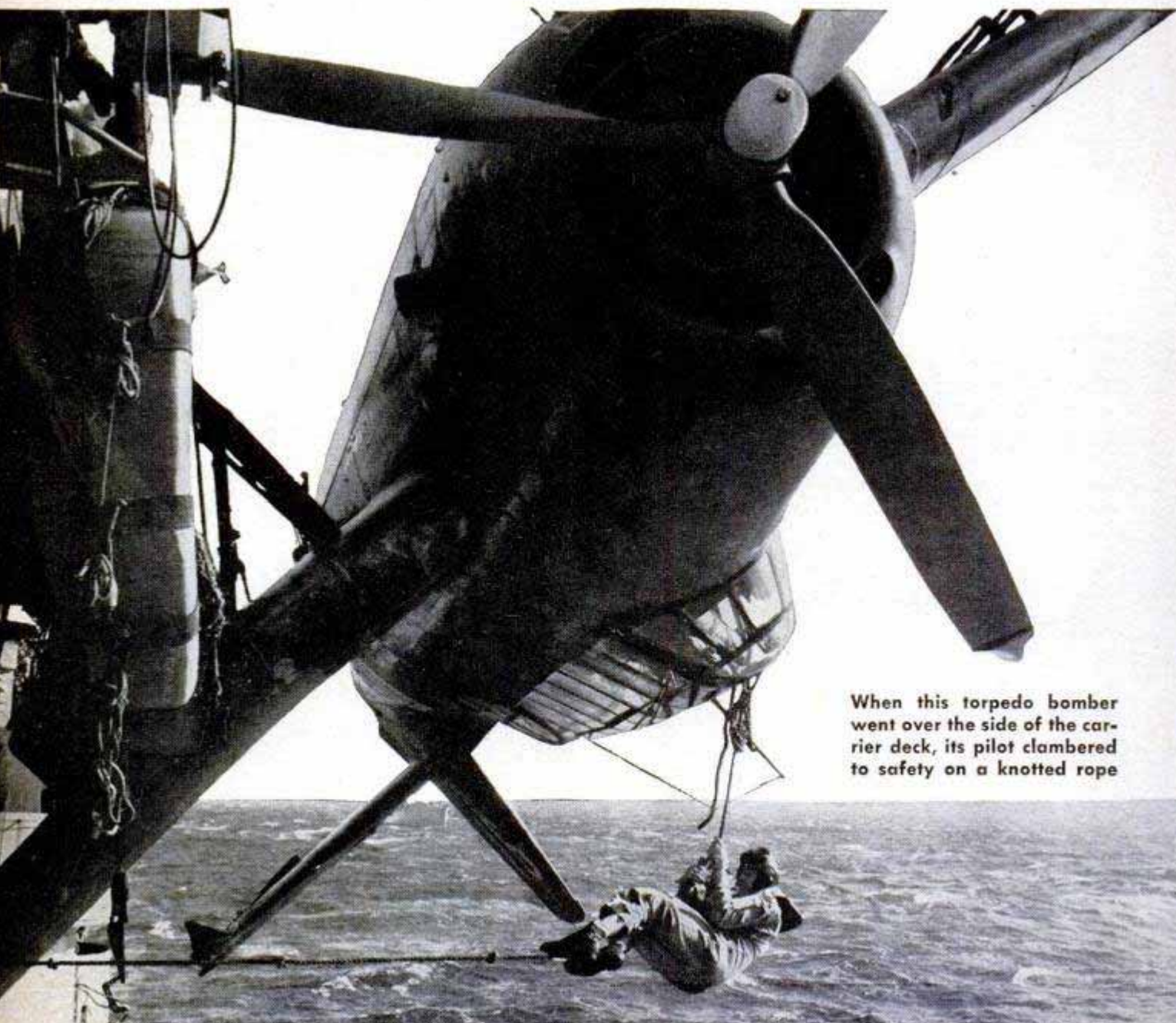
A few seconds after his ditching, Sutliff was back on deck again.

A similar accident happened to Midshipman Frank E. Toy aboard the *Palau*. His plane went over the side, still hanging onto the tough arresting-gear wires. Upside down over the cold green ocean, Toy stayed in the cockpit until deck crews rigged a cable from the plane to the ship. He climbed to safety like a monkey on a rope.

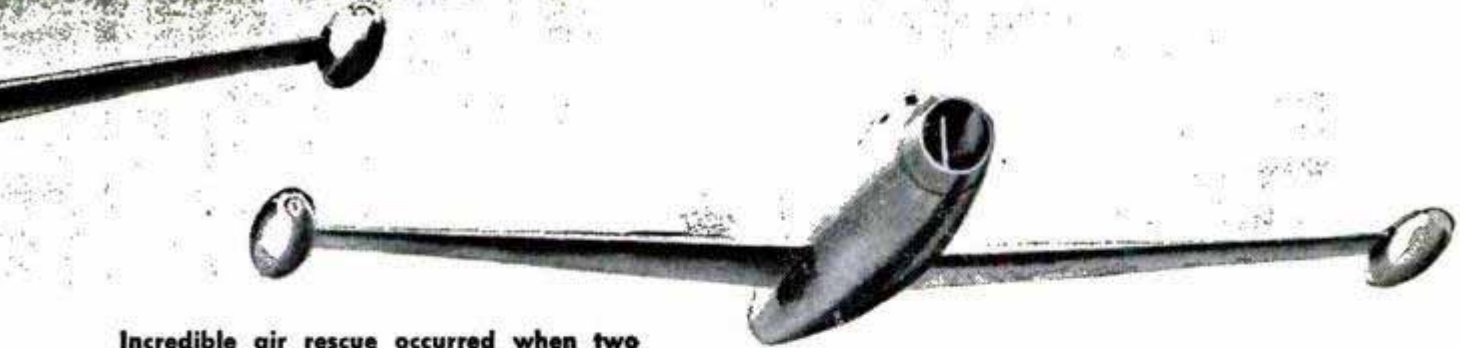
Navy and Marine fighter pilots specialize in low-altitude strafing of enemy troops. As a result, they come home frequently with wings and fuselages riddled with anti-aircraft fire. One of the more eager pilots was Lt. Wayne R. Cheal, a Navy pilot off the

carrier *Valley Forge*. Strafing a truck convoy at "steering wheel level," he felt a jolt, apparently from a bullet hit. When he got back to his carrier, he found that a rock, not a bullet, had damaged his Panther jet. Some North Korean apparently had been a baseball pitcher before the war. The same thing happened to Lt. Clinton W. Effinger, who flew an F-80 home with a one-pound rock lodged in the wing.

The jet engines that drive today's fighters are pretty tough to knock out with gunfire, more so than the piston engines of propeller-driven craft. One centrifugal-flow jet was hit by a bullet while Marine Capt. George Keys was strafing at treetop level.



When this torpedo bomber went over the side of the carrier deck, its pilot clambered to safety on a knotted rope



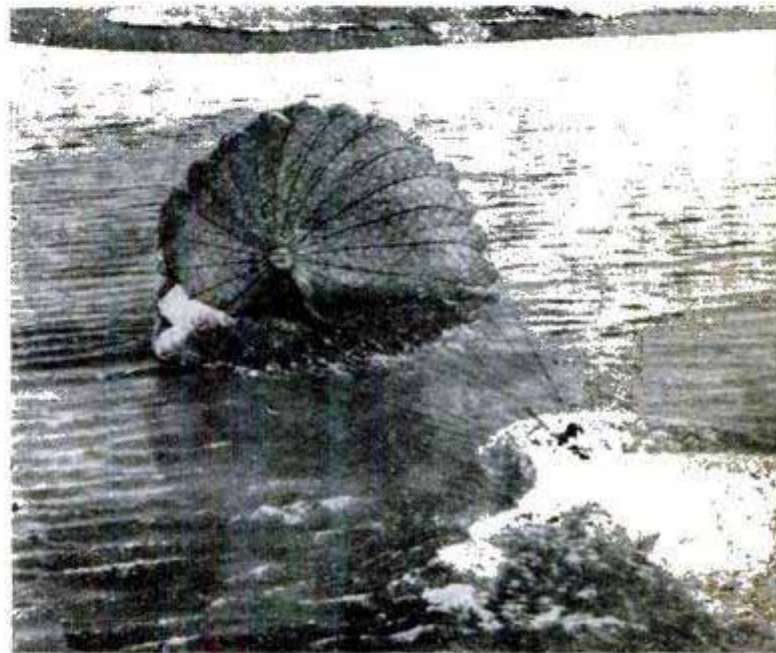
Incredible air rescue occurred when two pilots "carried" another plane on their wing tips after pilot lost consciousness

A bullet tore a 2½-inch hole in the combustion-chamber cover, passed through the engine and swirled several times around the turbine, revolving 12,000 times a minute. Curling the turbine blades to two thirds their normal area, the bullet was blown out the tail pipe. Captain Keys made several more bombing and strafing runs, then flew an hour and 20 minutes at normal cruising speed back to his base.

About the closest scrape with death racked up by an aviator probably was the experience of Flight Lt. Frederik Evert Potgieter, F-51 pilot in the South African Air Force. While he was on a strafing mission in Korea, a bullet from the ground penetrated his plane canopy, knocked the flying goggles from his face and left him unscratched. The combined force of bullet, goggles and impact bashed out a large hunk of canopy on the opposite side.

Landing a jet plane at 80 miles an hour on an aircraft carrier is ticklish business under normal conditions. That makes the

Below, paratrooper who landed in ocean during practice jump over Japan is blown to shore by powerful air blasts from rotor blades of a rescue helicopter



Below, by extending arrester hook of his carrier-based plane, one pilot cut Red communication lines





Above, its pilot almost completely blinded, the F9F is being "talked" down to land on the carrier deck. Left, the pilot is lifted from plane after landing

him instructions over the radio because the pilot could not see to fly his plane.

Jackson was injured when his low-flying jet, zipping along at 400 miles per hour over the Korean landscape, hit some wires. The impact smashed the canopy and bullet-proof glass and left Jackson unconscious for about 20 seconds. Somehow, his plane kept flying, going into a steep climb. Blood poured into his eyes, cutting his vision almost 100 percent.

By using his radio, Crow was able to tell

Arrester gear stops the jet as it lands on carrier but its nose breaks loose and heads for the water

feat of Ensign E. D. Jackson even more fabulous. Blinded by blood, he was "talked" 120 miles back to the *Philippine Sea* by his wingman, Ensign Dayl E. Crow. When he arrived behind the carrier, the landing-signal officer talked him to a landing, giving



the blinded pilot what to do to keep his plane flying level and when to lower his landing wheels. Jackson did not see the carrier deck until a flight surgeon leaped onto his plane after it had been stopped by an arresting wire and wiped the blood from his eyes.

An almost-unbelievable teamwork rescue saved the life of Capt. John L. Paladino, Thunderjet pilot in Korea. While flying over North Korea, his two teammates, Capt. Jack R. Miller and Lt. Wood McArthur, noticed him "flying all over the sky." The swift jet zigzagged crazily for a moment, nosed into a steep dive and then started climbing straight up.

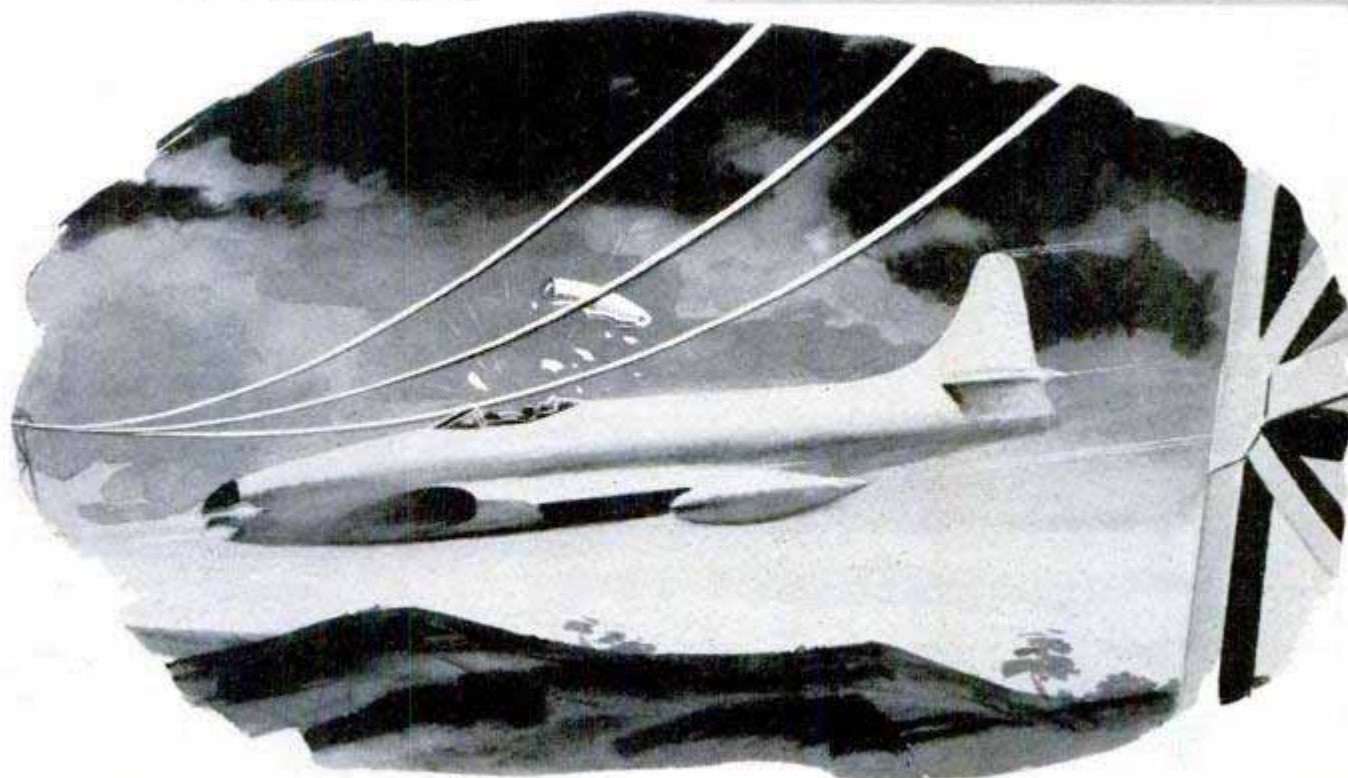
Believing Paladino's oxygen system was bad and he was suffering from lack of oxygen, the pair shouted over the radio for him to "snap out of it" and throttle back. He managed to do that, then passed out. Miller closed in and slid his wing tip under the left wing of Paladino's jet. Then he told McArthur to "pick up" the right wing tip. The two planes actually held the third plane up by its wing tips. There was no actual contact—the tips were kept apart slightly by fast-flowing air currents. In a few minutes they had steered the unpiloted jet back to friendly territory and eased it down to an altitude where Paladino could breathe. He revived quickly and reported afterward, "I had a death grip on the stick and a rotten headache. I sure was lucky to have my wingmates along."

When the fighting was roughest in the frozen north of Korea, a couple of Marine pilots, Capt. Philip DeLong and Lt. Harold Daigh, spotted six loaded trucks about 50 feet offshore on a frozen lake near Wonsan.

(Continued to page 254)



Above, flak did this, but the Mustang returned home safely. Below, when the pilot came back to his base, he was minus a cockpit canopy. He lost it when he ran into power lines on strafing attack, bottom





Westinghouse photos

Radioman, far right, remotely pilots the 15-man lifeboat, above. Stern fin keeps the boat level as it falls from the rescue plane. Below, boat can be controlled with push buttons by survivors

Lifeboat Has

FAR OUT AT SEA an Air Force plane crashes. Search planes head over the area, and the survivors are spotted in the water. Then an amazing series of electronic miracles begins.

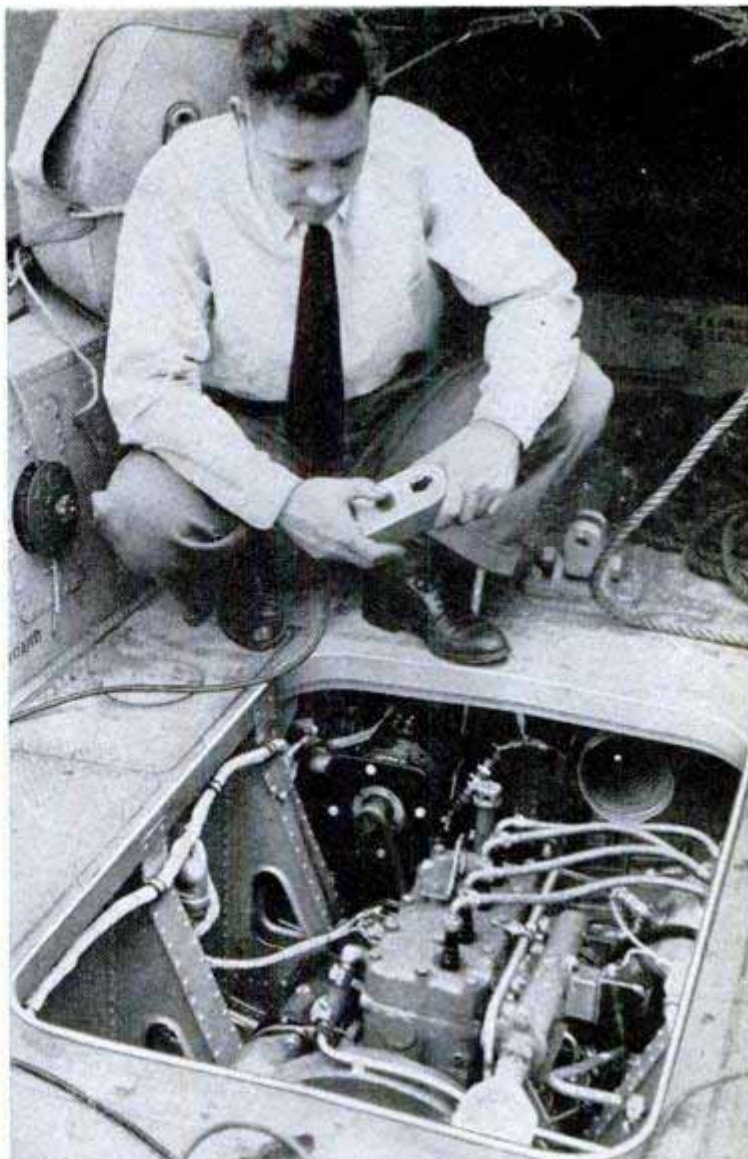
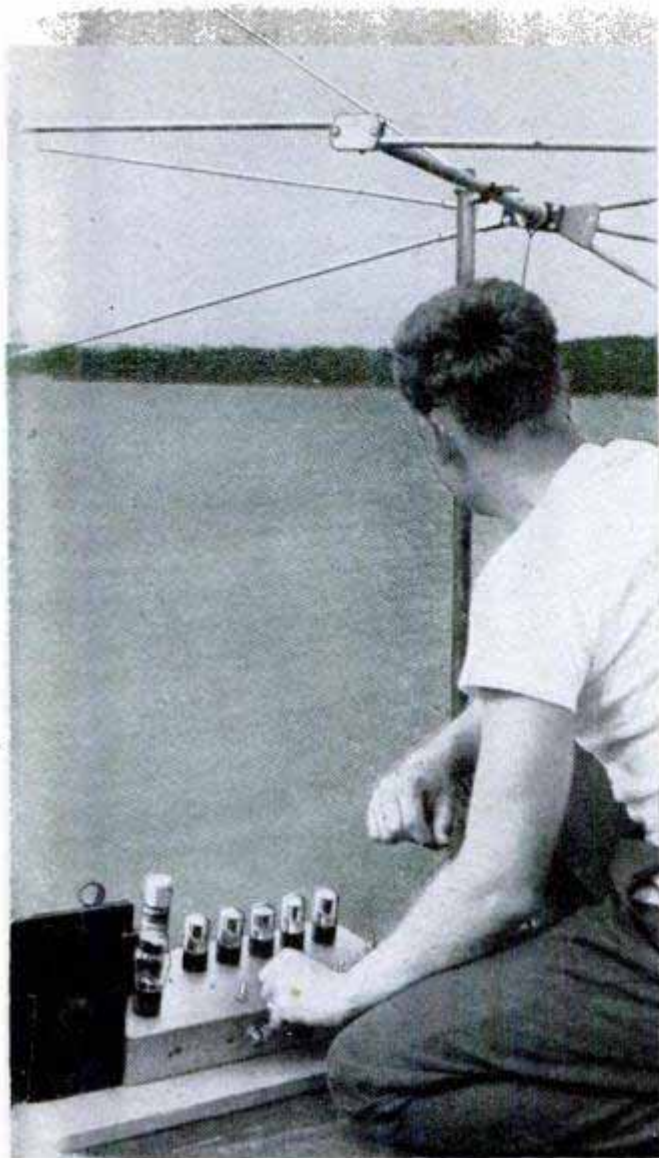
From the rescue plane drops a lifeboat shaped like a fat cigar. A stabilizing fin on the stern keeps it level until a parachute opens.

Once it is in the water, more amazing things happen. Parachute and fin are jettisoned. A guard that protects the rudder and propeller from crash damage is released. A sea anchor is dropped. Vents for the engine open and a blower starts clearing the engine compartment of dangerous fumes. The engine is cranked and choked. Soon it is purring. The clutch is engaged, the throttle advanced and the lifeboat is under way.

It heads toward the men in the water. The survivors climb aboard on a ladder that drops into the water. Then the lifeboat heads for shore or the nearest vessel.

Even though the survivors are too weak to





Above, engine is mounted below deck of the craft and can be entirely controlled by unit in hands of engineer. Or, if the passengers are too weak, the operation can be performed from plane by radio. Below, ladder drops into water for survivors

Invisible Crew

do any more than pull themselves aboard, the lifeboat will take them to safety. It is manned by an invisible crew of radio waves.

A radio operator in the rescue plane performs all the operations by remote control.

If the survivors are strong enough to run the boat, there are two systems they can use. One is a push-button control that starts, stops and steers the boat at the touch of a button. The second is a conventional manual-control system for use if the push-button system fails.

The 3500-pound craft carries 15 men, provisions for 10 days and fuel for an 800-mile cruise. Two-way radios provide boat-to-plane communications. There's a machine for distilling fresh water from sea water. A zippered canopy protects the passengers from sun or storms.





Rolled onto a gymnasium floor, the portable pit can be set up for either pole vaulting or high jumping



Welded-steel electrical conduit forms frame of the pit. The box into which the pole end fits is detached for high jumping



After the pit bottom is laid with loose wooden planks to give it a springboard effect, it is covered with a canvas tarpaulin

Portable Pit For Pole Vaulting

Quick change from outdoor to indoor use is possible with a portable pit for pole vaulting and high jumping. Designed and patented by Bob Hendershott, track and football coach at Klamath Falls High School in Oregon, the pit is made of welded-steel electrical conduit. The bottom of the pit is constructed of loose wooden planks for a springboard effect. A canvas tarpaulin covers the planking and a second tarp is tied over the entire framework. Wood shavings fill the pit to a depth of 16 to 24 inches. The unit is mounted on four airplane tail wheels and the box for the pole can be quickly disconnected when the pit is used for high jumping.

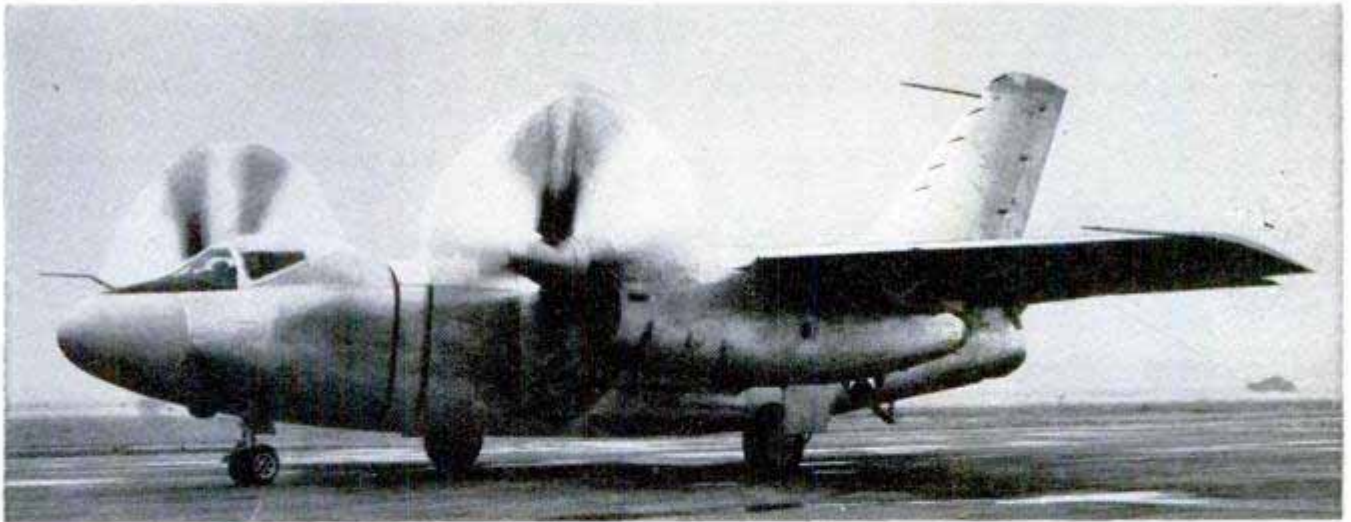
Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, *Popular Mechanics*, 200 E. Ontario St., Chicago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



Floor for a Pond

Carpenters at Natick, Mass., actually have built a floor for a pond! It's the novel answer to an old problem. None Such Pond has a mud bottom that has ruined swimming during the summer months. Sand dumped into the water gradually dis-

appeared. During the past winter, carpenters nailed together 16,000 board feet of spruce to build a floor atop the ice. Sand then was poured over the flooring and, with the first thaw, the floor and its blanket of sand sank to the bottom of the pond. It's hoped that the solid wooden floor will permanently cover the mud.



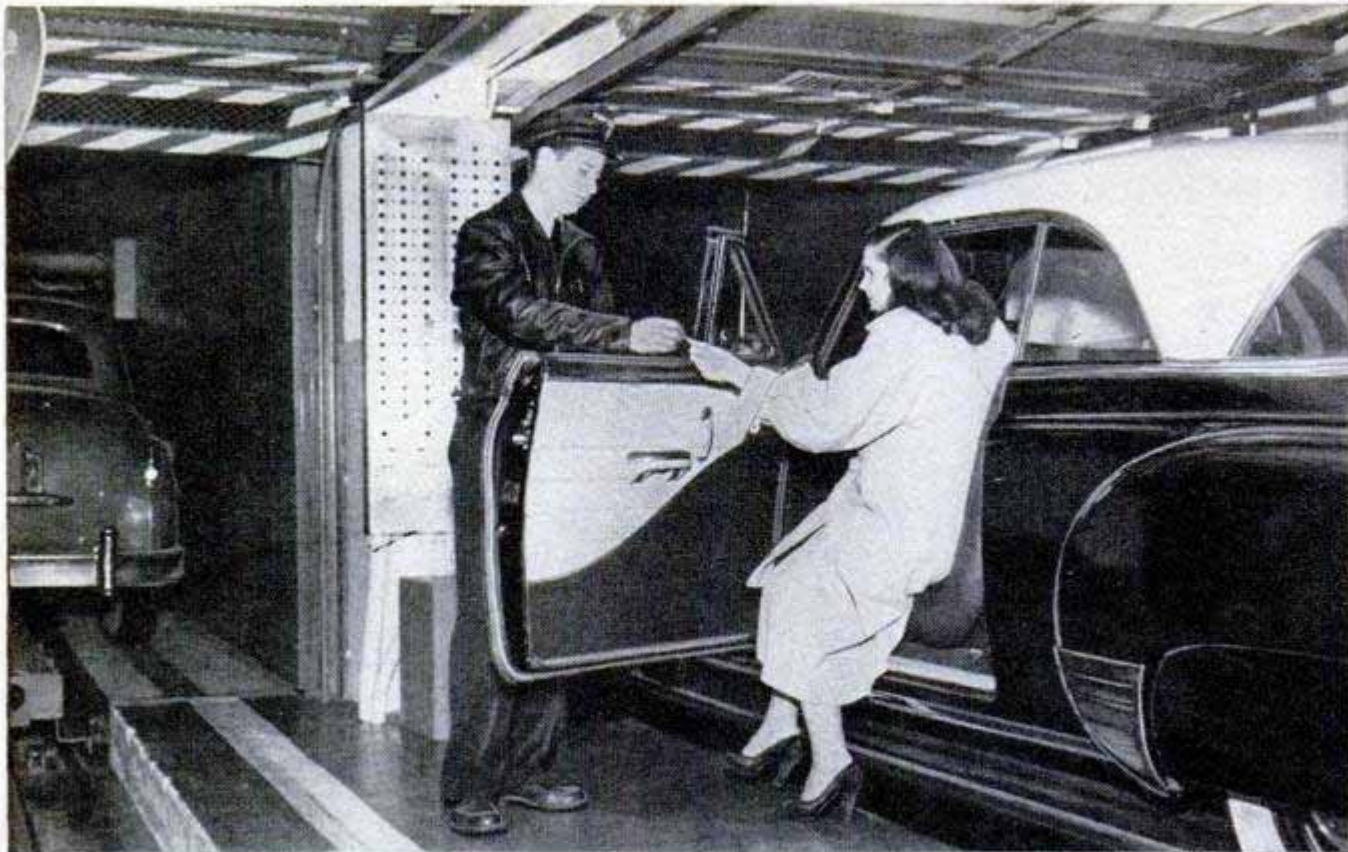
Heaviest Carrier Plane

Heaviest of the Navy's carrier planes, the new turboprop XA2J-1 is at Edwards Air Force Base, Calif., for further flight tests. It has a top speed of over 400 miles an hour and can carry a 10,000-pound bomb load. The craft's gross weight exceeds 26 tons. Neptune patrol bombers, about equal in weight, have flown off but never landed on carriers. The Savage's straight, 70-foot

wing has large high-lift flaps and a dual nose wheel that replaces a single wheel used on earlier versions.

Nylon Hypodermic Syringe

Virtually indestructible, a new hypodermic syringe is molded entirely of nylon. It is lighter in weight than the conventional glass type and will withstand sterilization by boiling, autoclaving or chemicals.



Customer at this parking garage merely rolls up to the entrance. Robots handle job of parking the car

PIGEONHOLE GARAGE

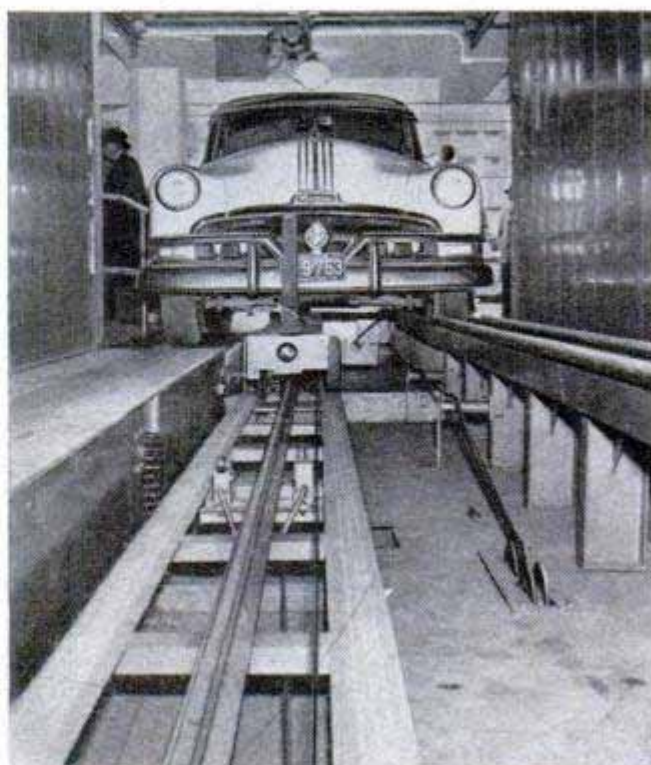
SOME TIME AGO a businessman named A. G. Dezendorf gazed at the Washington Monument while calculations tumbled through his mind. The monument, he knew, was 55½ feet square at the base and 555 feet high. Its lower 400 feet, Dezendorf calcu-

lated, contained enough space to park 648 automobiles.

The businessman knew that a conventional parking lot big enough to handle that many cars would cost a fortune, even if available. Why not a tall narrow building?

Attendant scans his 72-button panel to spot unoccupied stall, then presses button to start robot

Dolly on rubber tires rolls along angle-steel track. When it's in position, two arms clamp car's bumpers

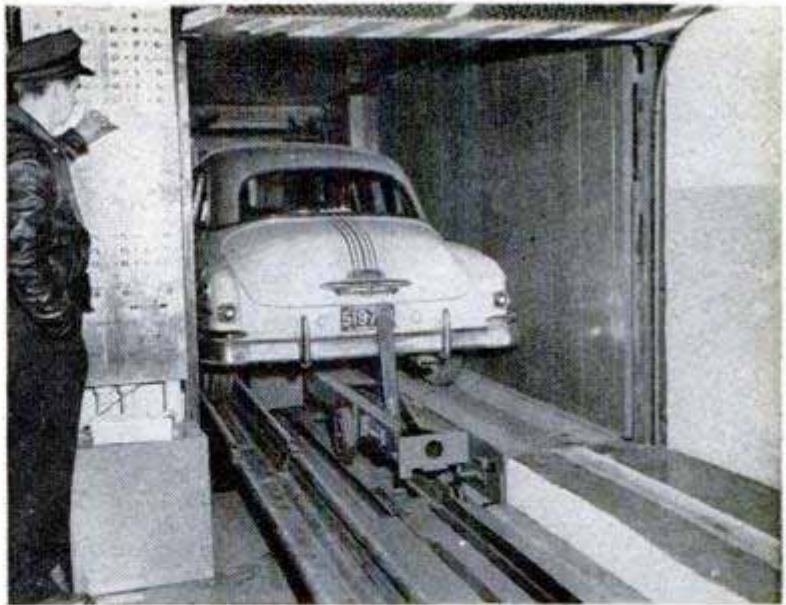


Today, on an area measuring only 25 by 72 feet, Dezendorf operates a fully automatic parking garage. In it, robots do all the work—not a hand touches the car as it travels to or from a stall on any of the 18 floors in the building.

The project requires but one attendant. Here's how it works: The customer leaves his car in an entrance lane. He may lock it if he wishes, as long as he doesn't set the hand brake. The attendant then presses a button which sends a 22-foot steel dolly on rubber tires under the automobile. The dolly moves along an angle-steel guide, propelled by a three-horsepower electric motor.

When the dolly is directly under the car, another motor swings two metal arms from a horizontal to a vertical position. From either end of the car these arms move toward each other until they press the car's bumpers.

Pressure against the bumpers starts the motor again, and the dolly rolls the car along the track and onto an elevator. The attendant, noting from green lights on a 72-button control board which stalls are unoccupied, presses a button to instruct the mechanism as to where the car is to be parked. The elevator moves up to the proper floor and the dolly rolls the car into the designated stall. The two clamping arms then drop to a horizontal position and the dolly moves off for its next load. The car remains in the stall because the floor slopes gradually away from the elevator.



Dolly moves off automatically, pushing the car into an elevator which moves up to the floor previously designated by attendant

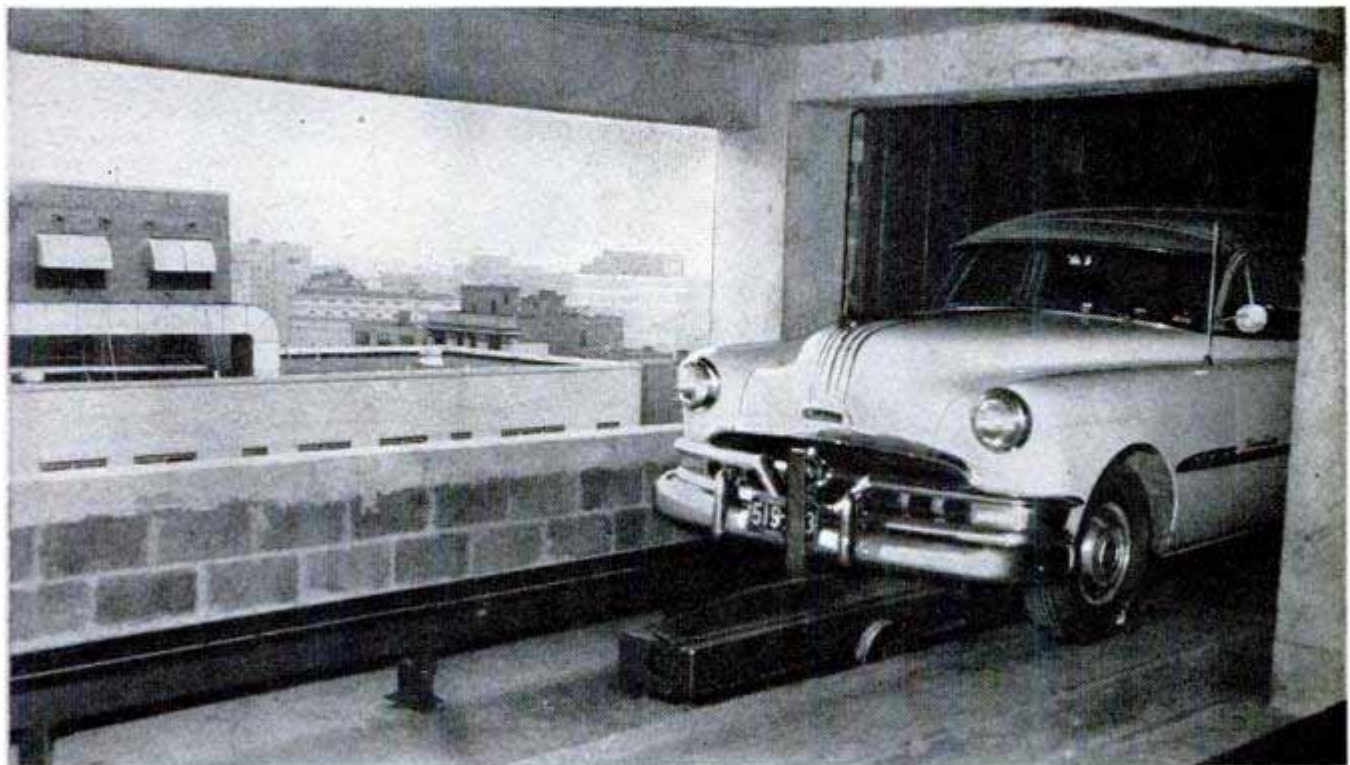
The front wheels rest against a concrete barrier.

When the owner calls for his car, the attendant presses the proper button and the dolly rushes off to the desired car, whisks it down on the elevator and delivers it to the owner. The attendant can deliver any car in the building within one minute.

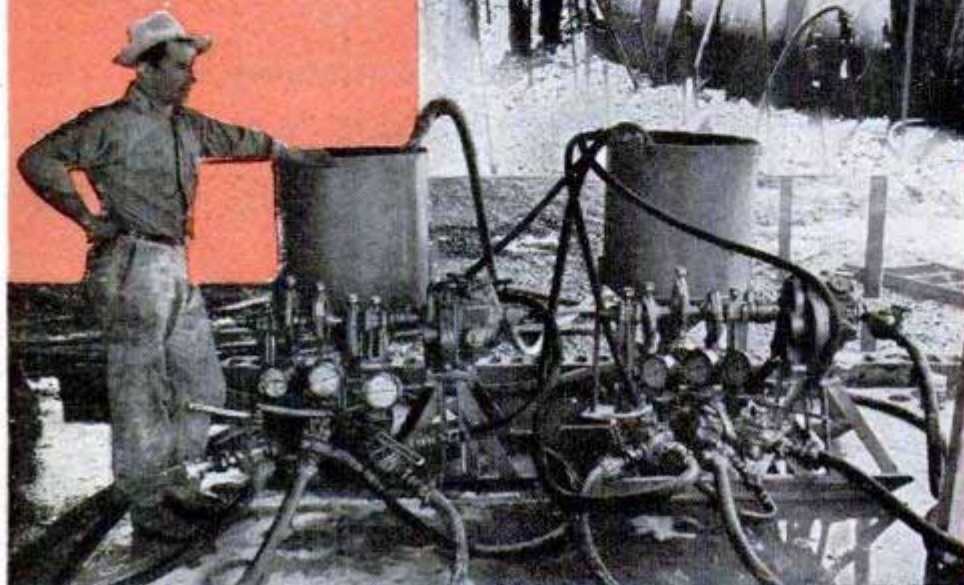
Should the attendant, at any time, push the button controlling an occupied stall, the mechanism cancels his instructions.

One side of each parking stall contains a trough-shaped runway for the car wheels, while the other is a broad slab of concrete. This allows for variations in widths of cars, thus permitting the garage to accommodate any size car from an Austin to a Cadillac.

At proper floor level, dolly pushes car into the correct stall, then on signal moves off for another load



What! ... No Concrete Mixer?



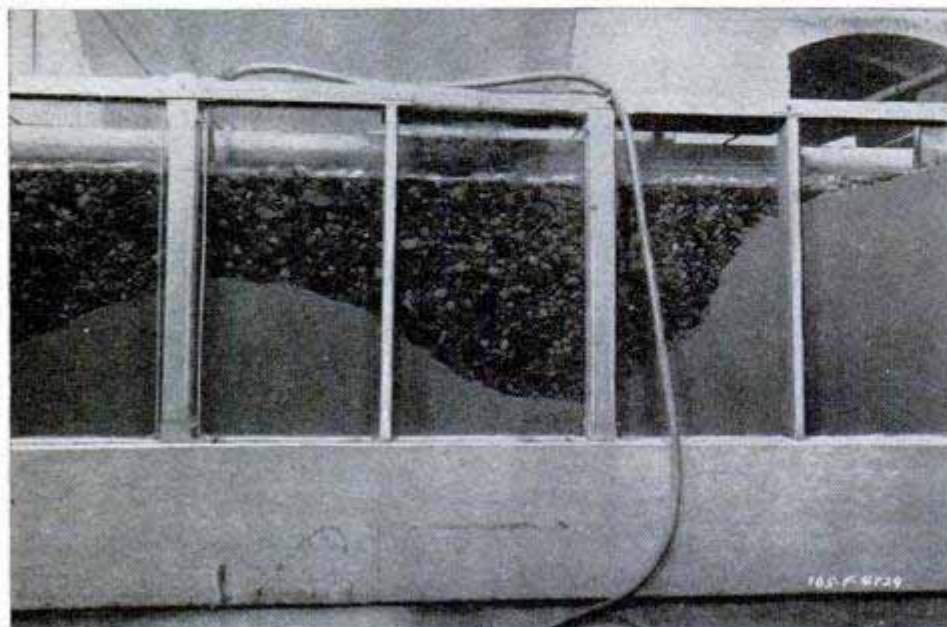
↑ Odd method of pouring concrete is used to cover installation of the powerhouse at the Bull Shoals Dam in Arkansas

← These pumps force grout or mortar through the bottom of the forms to flood installation, filling voids in rock



← Test core drilled from concrete poured by new method shows no weak, unfilled spots

CONSTRUCTION engineers have a new system for building big concrete structures. They simply dump rock and gravel into the forms, then pump a special mortar through the bottom of the mixture. The intrusion mortar is a combination of water, cement, fine sand and admixtures. It creeps into all voids between the rocks to form a dense concrete of high bond strength. The patented system recently was used to embed the scroll cases of the powerhouse at Bull Shoals Dam in Arkansas. It was faster and cheaper than usual methods.



Glass wall of experimental form shows how grout slowly moves upward from bottom

FEATHERED RACERS ON THE BEAM

TONY D'ANGELO is a good father but he couldn't stand being crowded out of his own home. "Son," he said to eight-year-old Jimmy D'Angelo, "something has got to be done." Jimmy looked around the backyard of the D'Angelo home in Culver City, Calif., at over 800 white rabbits and agreed that perhaps Dad was right. Something would have to be done.

After the last rabbit was traded or given away, Jimmy walked into the house with a pair of young squabs in his hands and, with an anxious eye on his father's face, announced that he guessed he'd raise a few pigeons. And that's how Tony and Jimmy D'Angelo got started in their favorite sport, pigeon racing.

That was back in 1937. From Jimmy's first pair of breeders, the D'Angelo loft has grown into well over 100 birds. In addition, they have given breeders to young Johnny Perkins, a neighborhood youngster, who has increased his flock to 45 birds and is also an enthusiastic racer.

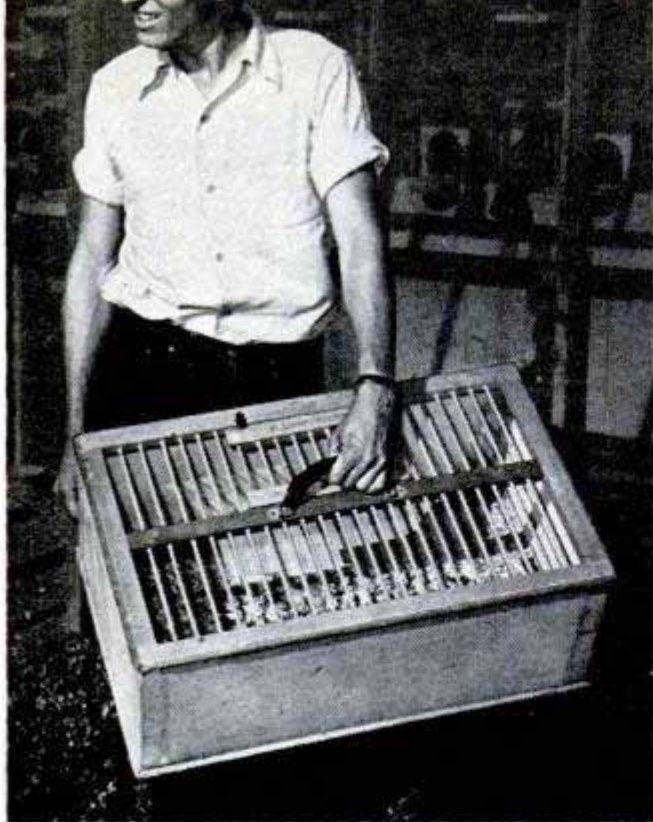
Pigeon raising requires little time and space. Feeding is simple. Their diet consists of just about what you would feed chickens. Peas, grain and corn. The corn is fed in the whole grain, uncracked.

By Shep Shepherd

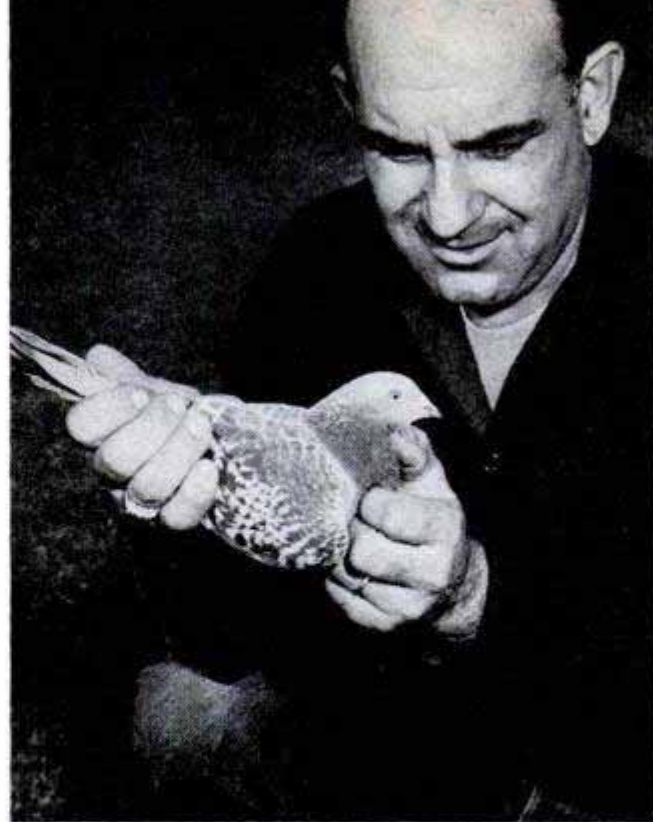


Three pigeons come in for a landing. In a competition, this is the most exciting moment. Above right, for taking off, the pigeon uses a tremendous downward thrust





Banded with code numbers by club officials, racing birds travel to the starting point in sealed crates

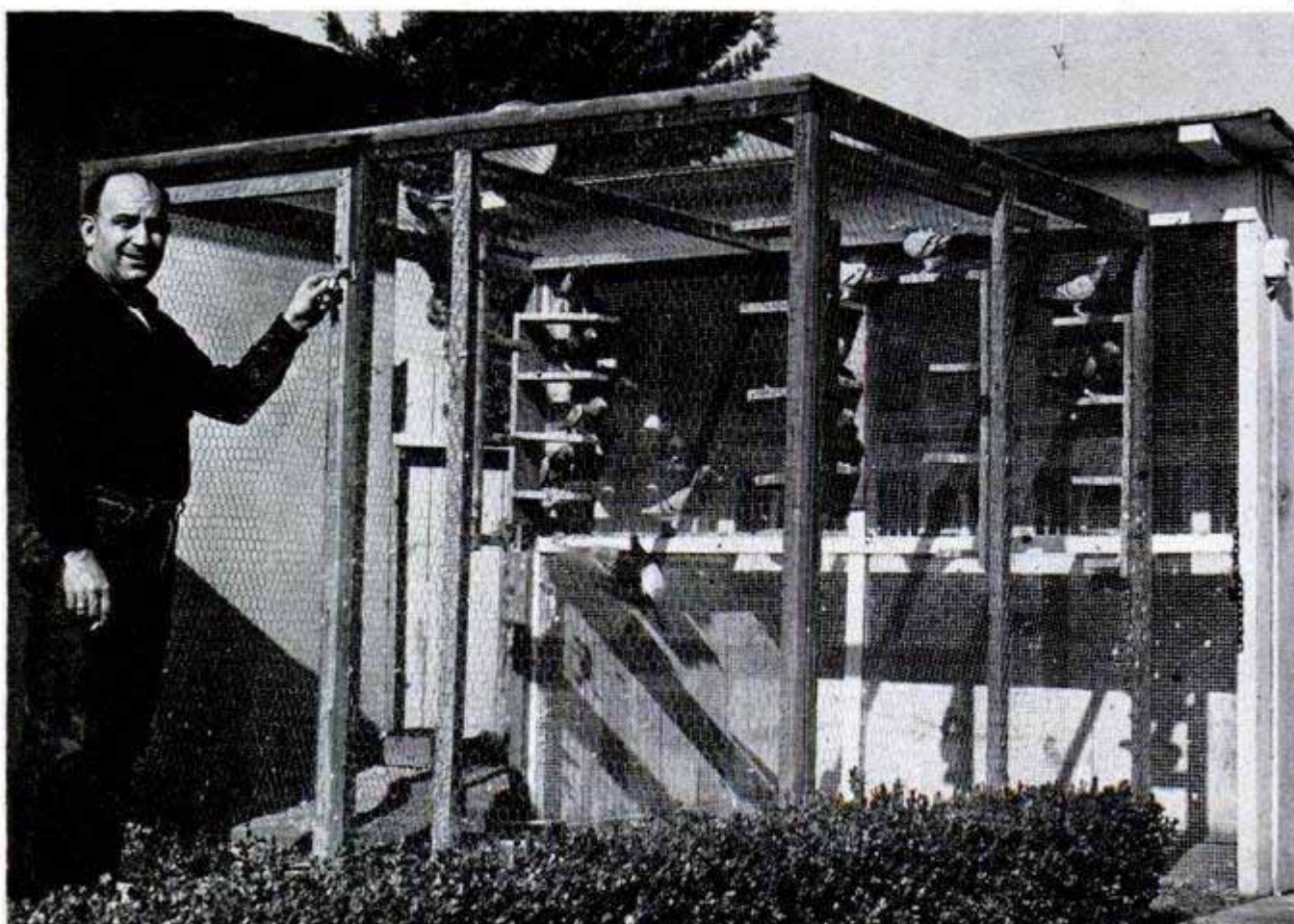


Susie is Tony D'Angelo's fastest bird — and, for that reason, is his favorite. In seven races, she's won six

Pigeons mate for life. The young cock selects a mate when he is about four months old. Though he keeps her for life, he doesn't always remain faithful. He'll take any female that happens along at the psychological moment. The hen lays her first eggs 10 days after mating and hatches the young in 18 more days. In exactly three weeks after the young appear, she mates again.

During the hatching and feeding of the young, the cock becomes thoroughly henpecked. He dutifully relieves mamma a couple of hours every day, sitting on the eggs while she gets out for a little exercise, usually from one to three o'clock in the afternoon. When the squabs are born, he even assists in feeding them. Members of the pigeon family, and this includes both

Raising pigeons doesn't require much space. As many as 100 birds can be housed in a 10 by 15-foot coop



male and female, regurgitate predigested food from their crops, which the babies obtain by thrusting their beaks down mamma's or papa's gullet. Pigeon fanciers call this food "pigeon milk."

The D'Angelos start training their young birds almost as soon as they solo. Early training consists of taking the pigeons a few miles away from home and releasing them. Tony starts with a seven-mile flight. Many trainers begin with two-mile flights but one California fancier makes his first release at 40 miles, his theory being that while he doesn't get all birds back, he gets the good ones.

Breeding usually starts in late January or February. Tony and Jimmy like to have either eggs or babies in the nest by the time the old-bird races start in April. The home ties are stronger at that time and such mental condition is important in a racer. Jealous birds are consistent winners when their mates are left at home, their suspicions forcing them to waste no time on the way home to investigate!

The old-bird races, which continue from

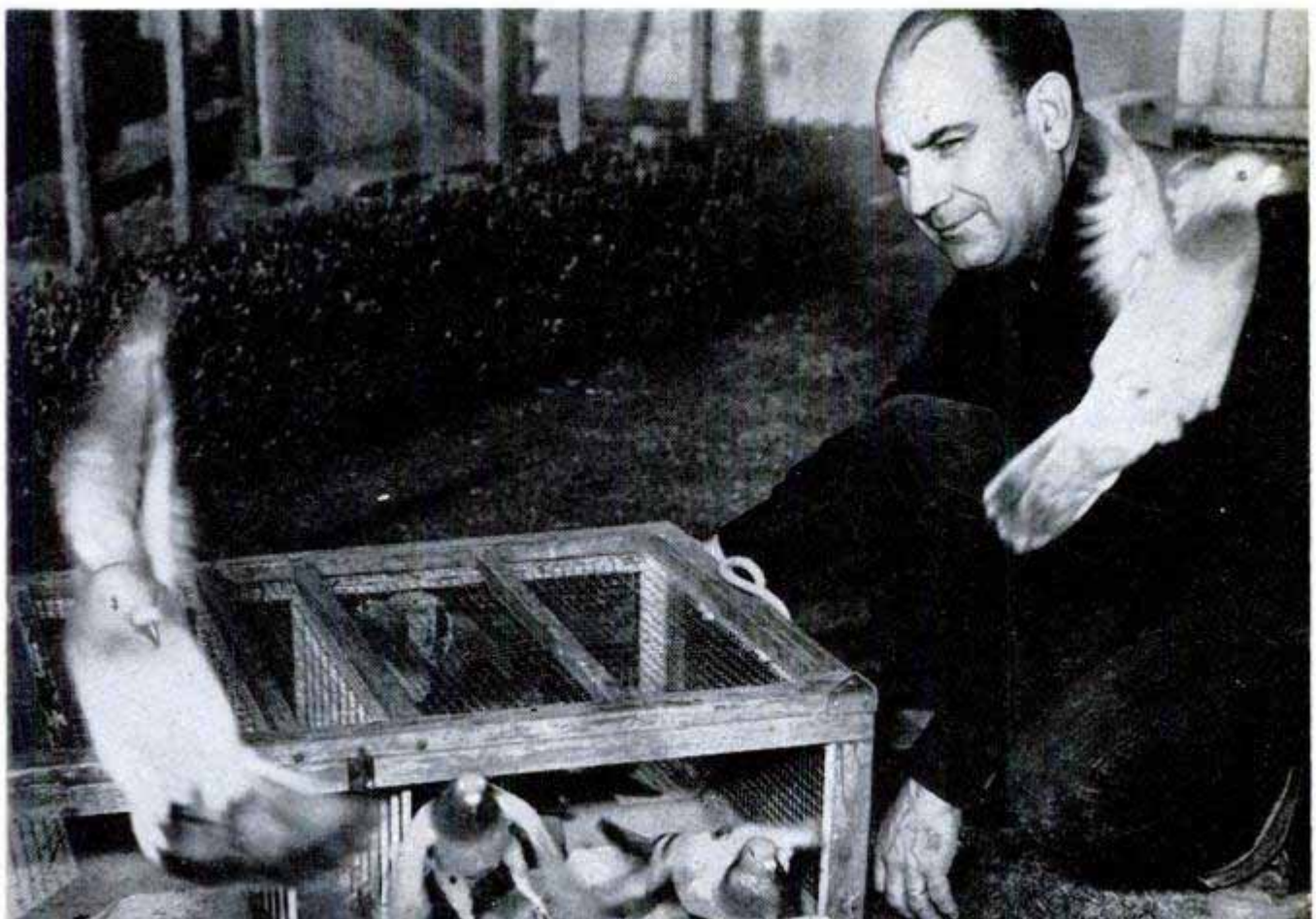


Each owner gets a sealed clock before the race. When his bird returns, he removes band from its leg, drops it in clock which registers the time

April through June, comprise ten races starting at 100 miles and increasing in distance until the final race of 600 miles from Klamath Falls, Ore., to the lofts in Los Angeles. This is for the clubs in southern California. Other combines have releasing points of comparable distances.

The D'Angelos belong to the Santa Monica club which is made up of 21 lofts

Pigeons take off on a practice flight. When released, they climb quickly in tight circles and head for home



operating with several other clubs to form a combine. These combines, or concourses as they are sometimes called, extend across the 48 states. From this entire setup one bird each year is selected for the Hall of Fame, which is the "Oscar" of pigeondom. Among the birds so honored was Cher Ami, the English pigeon that saved the famed "Lost Battalion" of World War I. Cut off by the enemy, the battalion had no means of communication except its pigeons. Food was gone and ammunition was fast running out. Two birds had been shot down trying to carry a request for help to the rear. Cher Ami, the last bird in the battalion, finally made it with one leg and part of his breast shot away.

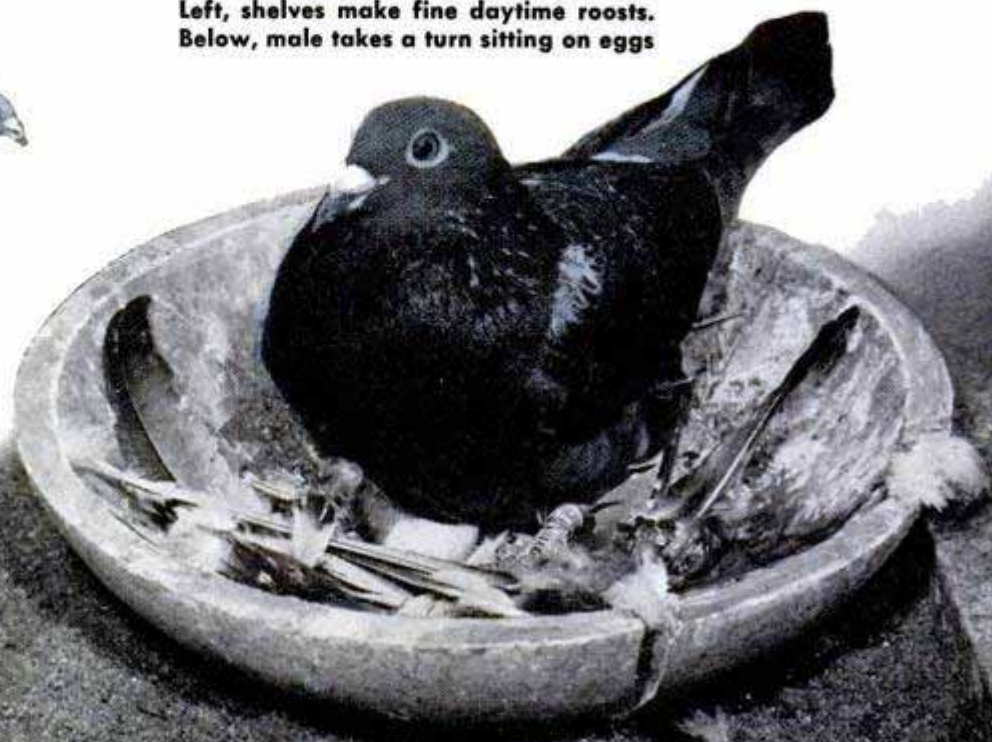
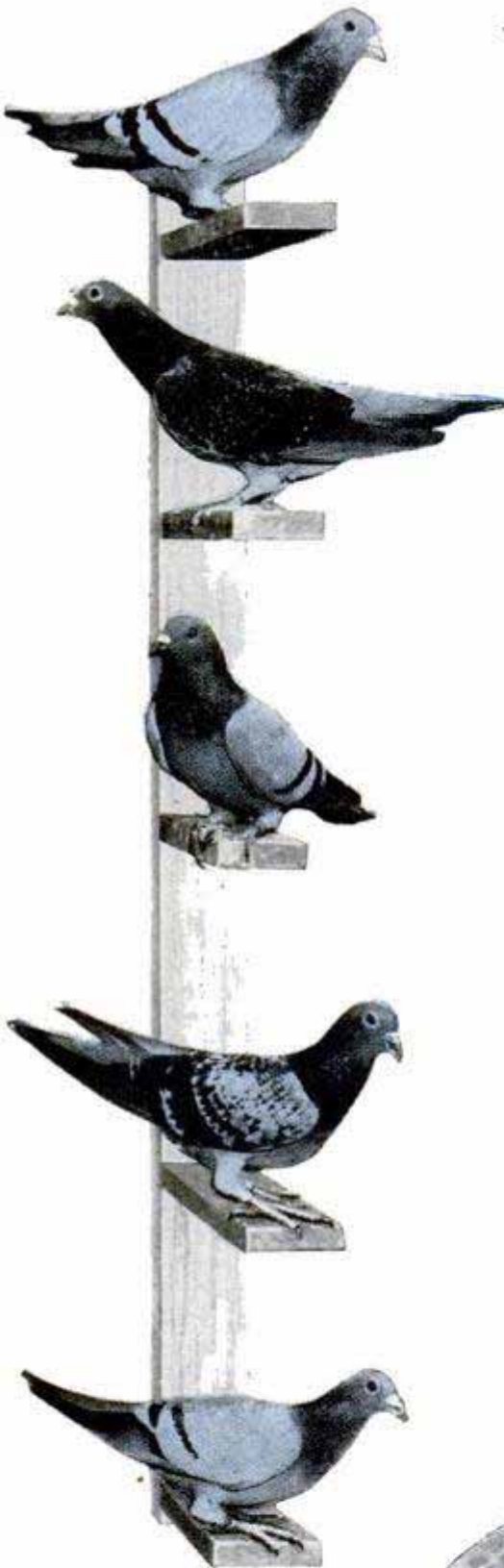
Another honored bird was President Wilson, who performed a feat similar to that of Cher Ami only a few days before the armistice in 1918. He, too, made his way to his loft despite serious wounds, and his message brought relief troops to a surrounded unit.

Occupying a place of honor in the Post Library at Fort Monmouth, N. J., is the body of Mocker, a red cock attached to the 77th Division during World War I. He carried a message back to the supporting artillery which brought counterbattery fire upon German guns that were holding up the division's advance. Wounded twice by shrapnel in the flight, the bird recovered and lived to the ripe old age of 20.

Pigeon races, though covering hundreds of miles, are reduced to yards per minute. The day before a race each trainer selects the birds he wishes to enter. He takes them to his home club where they are banded with code numbers unknown to him. They are then placed in sealed crates and shipped to the starting point for release the following morning. At a given time all the birds are released simultaneously under the supervision of members of the combine to which the competing clubs belong. The birds rise in tight circles, the age-old instinct takes over and they streak away in the most direct line for the home loft hundreds of miles distant.

As the estimated arrival time draws near, the owners perch on ladders, fences or roof tops, scanning the skies for the first sight of a homing bird. Even fractions of seconds are important. When the bird lands, the owner must remove the rubber band from its leg, place the

**Left, shelves make fine daytime roosts.
Below, male takes a turn sitting on eggs**



band in a metal capsule, drop it into a special clock and turn a handle. Then, and not until then, is the time recorded. Tony D'Angelo calls this the most exciting and often the most heartbreaking few minutes a fancier can live through. With prizes ranging up to \$1000, and pool money aggregating again as much, $\frac{1}{10}$ second can mean the difference between prize money or just another runner-up. The timing clocks register the time in fractions of seconds which, when the yards per minute are computed, makes it possible for as little as $\frac{1}{100}$ yard to separate a winner from a loser. With hundreds of dollars in prizes involved, some anxiety on the part of the owner can be understood when a bird decides to land on a roof or a wire for a short rest before entering the trap.

Tony was the victim of bad luck on one such occasion. Watching the skies from a stepladder, he caught sight of his first bird coming in fast and low over the house tops. Hurrying off the ladder, he missed a step and fell to the ground with the ladder on top of him. The bird, a well-trained racer, hit the landing board and waited for him at the trap. It took no more than 10 seconds for Tony to unscramble himself and reach the bird but the delay cost him \$400. Another owner, in a spasm of excitement, winged his bird with a shotgun, but such practice is frowned upon.

The West Coast speed record for pigeons is 1763 yards per minute. This figures out to almost exactly 60 miles per hour. Eastern or Central birds can beat this time. The California course is reputed to be the toughest in existence. The birds must rise

8000 feet to cross the mountains, where they may encounter snow and extreme cold. Updrafts and downdrafts buffet them coming out of the mountains, after which they hit desert heat and sand storms. If they can get by hawks, falcons and trigger-happy hunters, they stand a fair chance of getting home, provided they don't decapitate themselves on a wire while flying low.

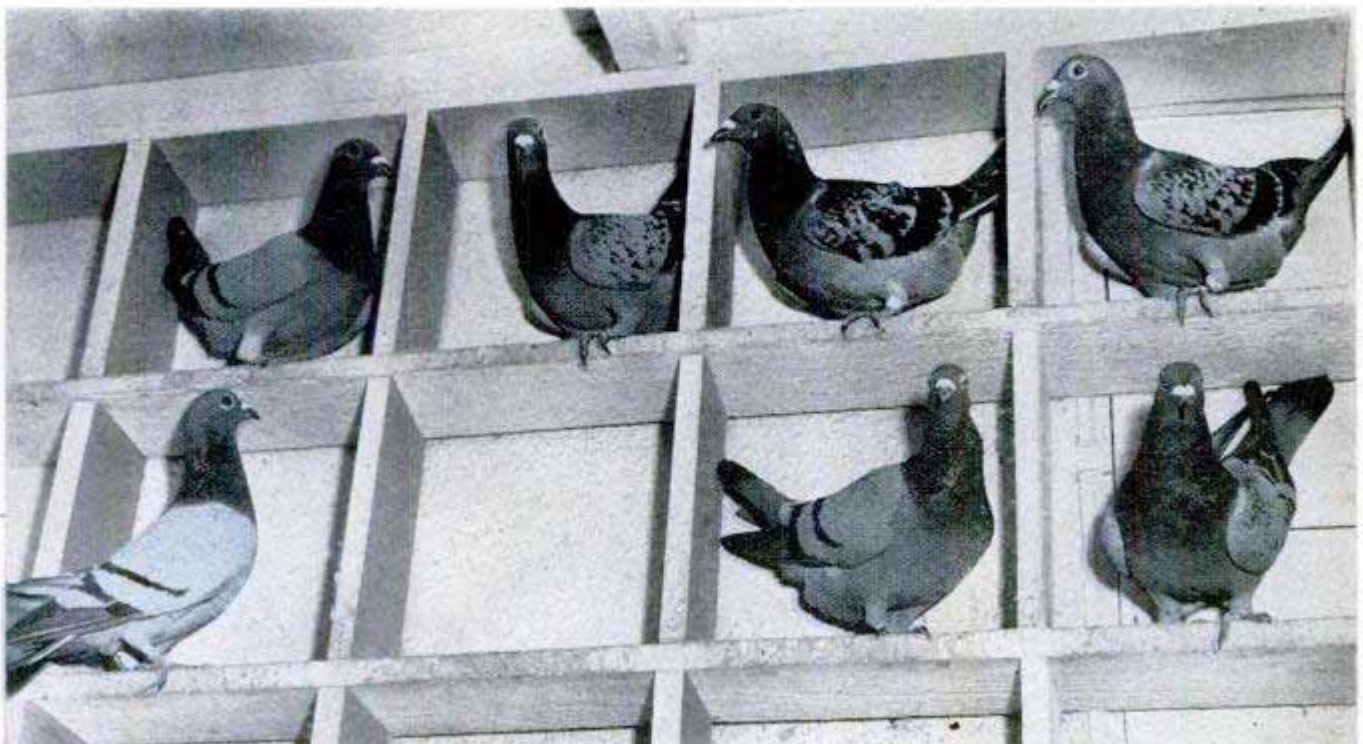
Racing pigeons can fly a 600-mile course from dawn to dusk under favorable climatic conditions, but there are times when they won't get home for two or three days. Rain and sand storms will put them down. They won't fly at night and many birds have been lost because they went down at dusk to roost in trees or barns where they became prey to cats and night-flying hawks. A romantic cock will sometimes follow a hen to a loft not his own. He won't stay there, but he possibly will dally long enough to lose the race.

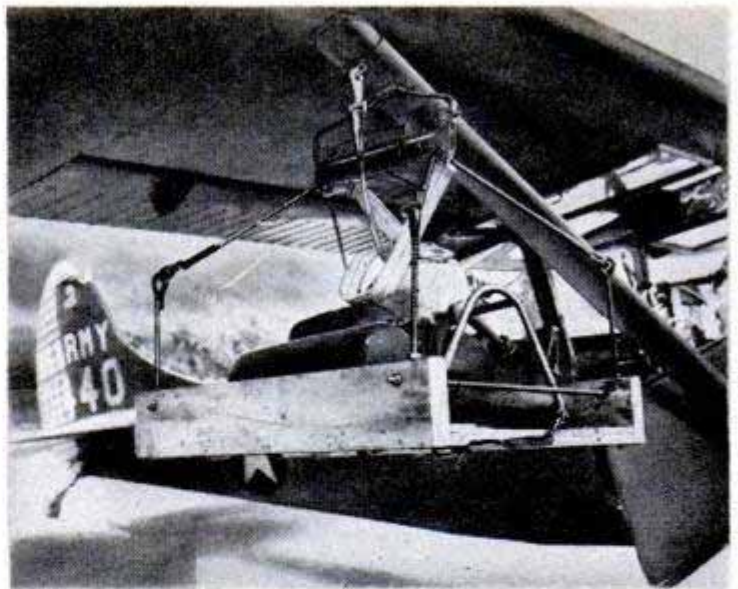
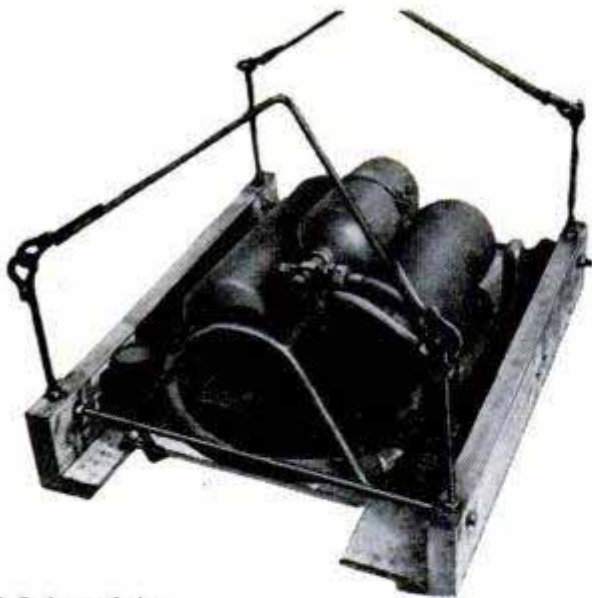
The period from the last old-bird race in June to the beginning of the young-bird races in September is given over to training the young birds. Young-bird races carry through to November. Four hundred miles is tops for the youngsters. An old bird is any bird hatched during or prior to the previous calendar year.

When the squabs are between 8 and 12 days old, they are banded with their permanent number. This is the number under which they are registered with the American Racing Pigeon Union and it is theirs for life. Pigeons reach their peak at two years of age though many fanciers fly birds eight or nine years. Tony retires his racers after

(Continued to page 236)

Pigeon housing is simple. Some boards nailed to the wall to form a bank of open squares are all they need





U. S. Army photos

Completely assembled, the flame-throwing unit and airlift platform weigh about 200 pounds

Rigging the units to L-19s for air drops takes a load off mountain-bound foot troops, who still have plenty to carry

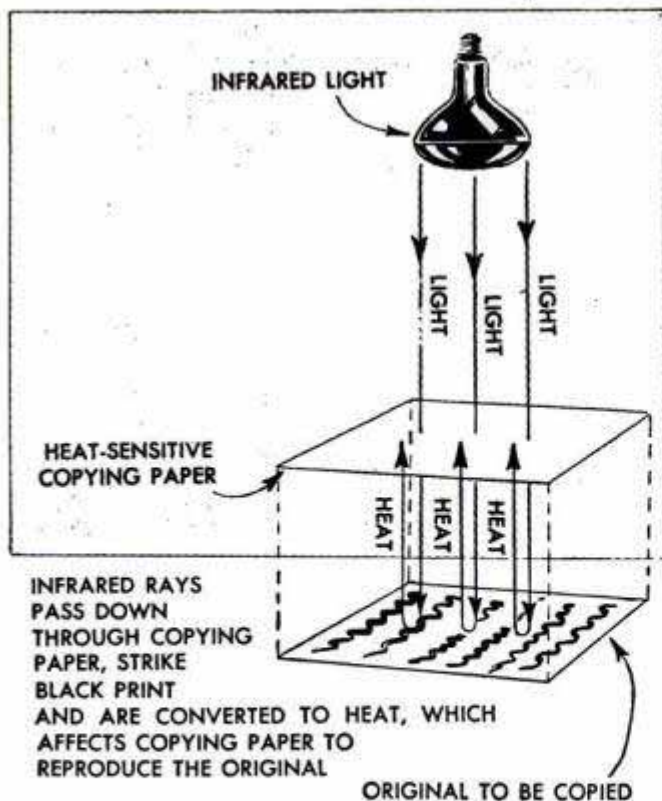
FLOATING FLAME THROWERS

Delivered to a front-line sector at the ground commander's request, an airborne flame thrower parachutes to the earth

IMPROVISED IN COMBAT, flame-throwing units dropped from the air were quickly effective in driving Communists from underground bunkers, caves and connecting tunnels in Korea. Maj. Clair L. George of the Second Infantry Division designed the airlift attachment when it proved impossible for foot soldiers to pack the heavy, bulky weapon into rugged mountain passes and retreats. An additional advantage of the airborne flame throwers is that they can be brought to bear against the target more quickly. The thrower is latched to a strong wooden platform by iron rods, and attached beneath the wing of an Army L-19 liaison plane. A control lever allows the pilot to drop the unit, weighing 200 pounds with its platform, and simultaneously open a parachute attached to it. Drops can be made with pin-point accuracy into otherwise inaccessible areas at altitudes of 100 to 200 feet. The minimum altitude for a drop is 50 feet.

Immediately after its delivery, the flame thrower is put into action by GI in Korea against a Communist underground bunker





Infrared Light Provides Heat to Copy Typewritten Pages

Four pages of solid typing can be copied in less than two minutes by a new office machine. The machine, which requires no darkroom, solutions, or negatives, uses infrared rays as the copying medium. The page to be copied is placed in the machine along with a single sheet of special paper. With the cover closed, a button is pushed

and in about 10 seconds the copy is produced. Inside the machine, the white space on the original sheet reflects the light, while the typed material absorbs the light and converts it into heat. This heat is transferred to the heat-sensitive paper in order to reproduce the original page. More than 120 sheets per hour can be copied.

Plastic Disk With Adhesive on Both Sides Takes Place of Thumbtack

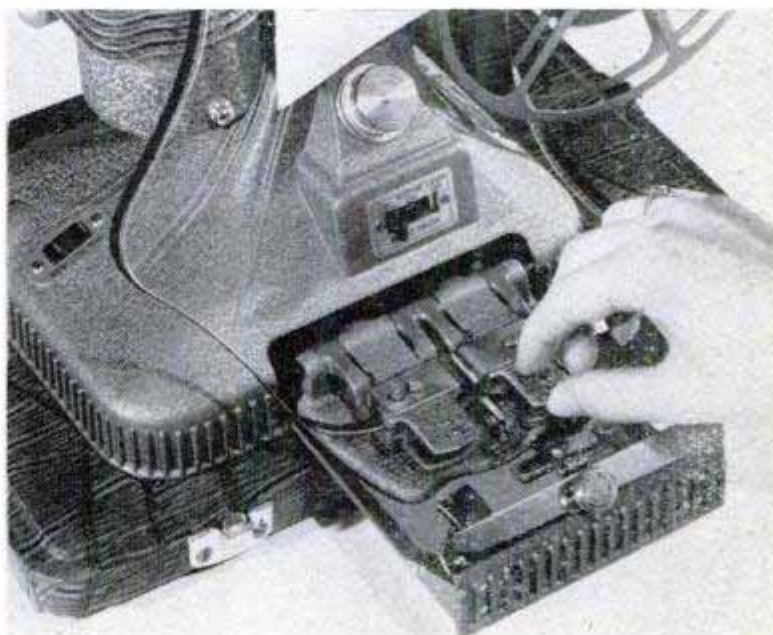
Now you can stick posters, photographs, advertisements and other notices to any surface, including glass, with a plastic disk. Unlike thumbtacks, the disks do not pierce the paper or the surface to which they are

applied. With adhesive on both sides, the disks adhere to metal, wood, paper and glass when you apply gentle pressure. The manufacturer claims the plastic disks may be used repeatedly.

Projector Has Splicer Built Into Base

Built into a drawer in the base of a new projector is a complete splicing outfit so you can repair breaks in film without removing film or reels. The splicer also can be used for editing, title insertion and reel connecting. A hand threader and safety-glass heat filter permit you to examine film, frame by frame, during editing. A master switch on the projector turns on the room light when the projector is turned off.

Twenty million motor trucks and busses have been built in the U. S. since 1904.

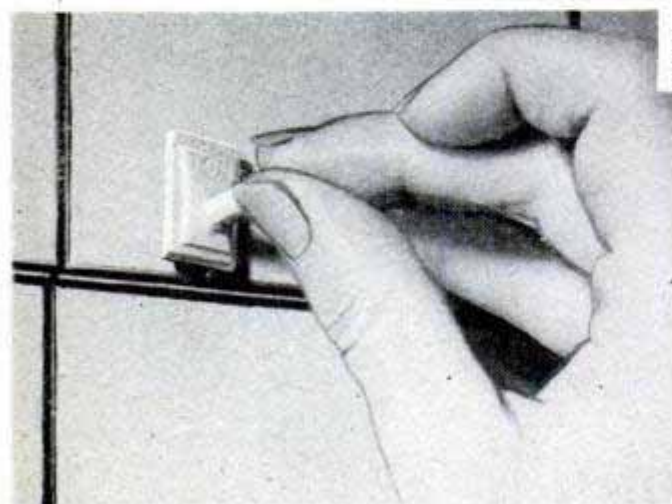
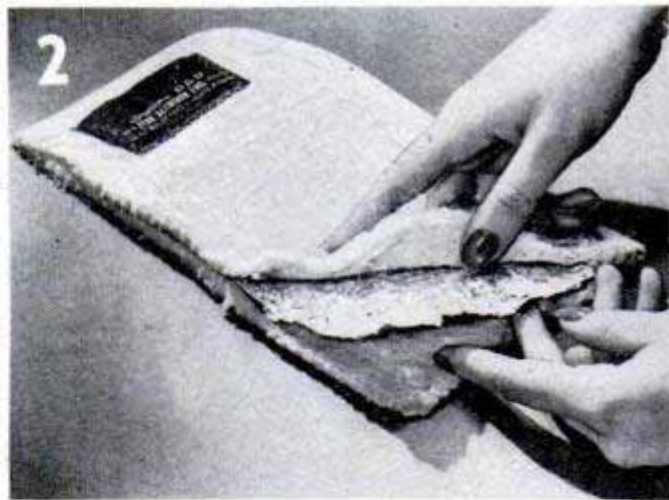


WHAT'S NEW FOR Your Home



↑ **MOISTURE INDICATOR** tells the lady of the house when to water her plants. Normally pink stripes on indicator turn blue when soil is dry

← **PLASTIC TRELLIS** gives colorful support to flowerpots and table centerpieces. It stands eight inches high and has a spread of five inches



1. **KIDDIE KEEPER** is a portable crib and bathtub for first few months of baby's life. Sides, inflated by mouth, keep child from rolling. Deflated crib folds up into a small package

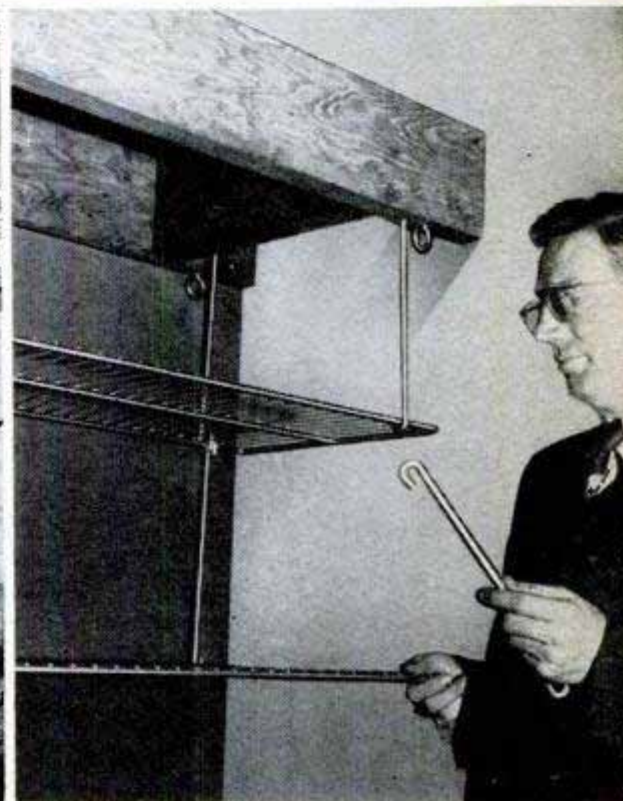


2. **IRONING PAD** has an aluminum-foil center which bounces back the heat to iron underside of garment while top side is being ironed. Perforations in foil permit passage of the steam so the pad stays dry. Full-size pad, not shown, fits standard-size ironing boards

3. **POT HOOKS** (shown in photos), towel racks and other wall fixtures are stuck to plaster and tile walls without screws. Tiny capsule of special adhesive is packaged with each fixture. It's punched with a pin and adhesive spread on back of hook or hanger. Fixture is ready for use in 24 hours



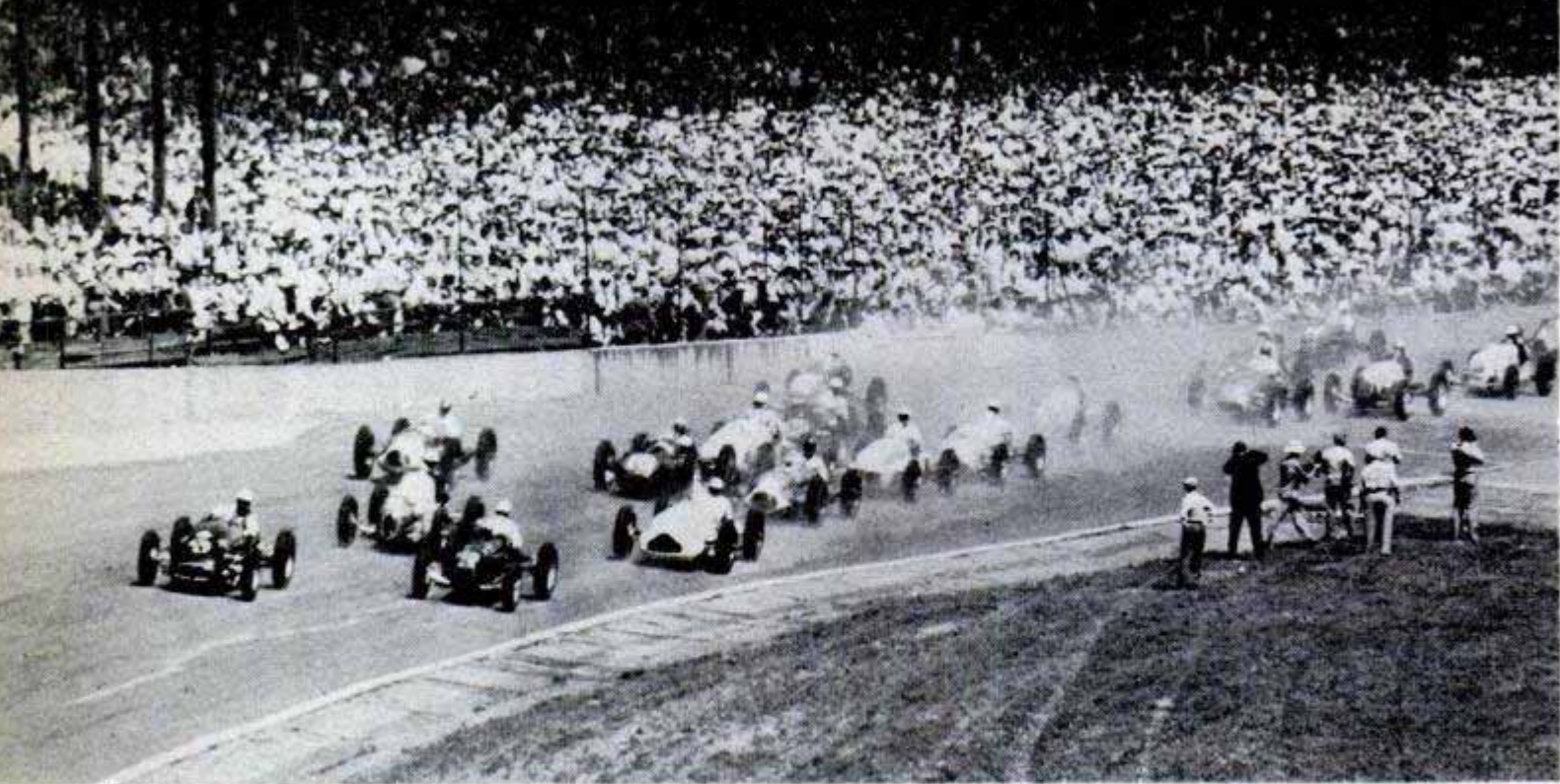
4. **FAN-DEHUMIDIFIER** fits into standard windows, has twin air directors that swivel in complete circle. Unit filters the air and takes out water at a rate of more than one quart an hour. Special mounting platform requires no screws. The unit projects only 9½ inches into room



5. **WIRE SHELVES**, when fastened overhead with four hooks or spikes, support each other. Shelves are 14 inches deep and 36 inches wide, can be hung from ceiling to floor if desired

6. **VALANCE** has built-in fluorescent tubes which cast soft light over windows or walls. Valance lights are available in five widths from 24 to 108 inches. Various units can be combined for different widths





At Indianapolis you will see race cars sporting tipped-over engines and magnesium wheels. Drivers say the champ will pilot a light car and . . .

HE'LL WIN THE SPEEDWAY ON

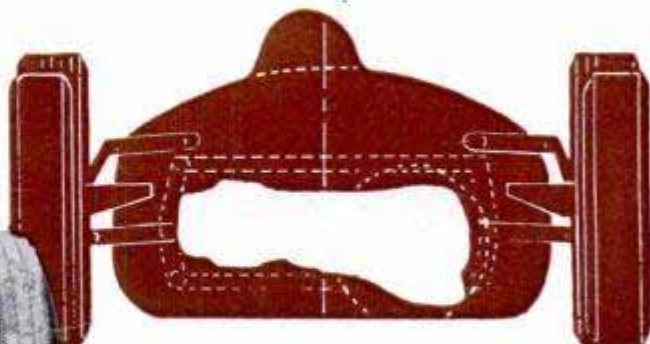
By Thomas E. Stimson, Jr.

TWO MILLION DOLLARS worth of race cars will be competing late this month for places in the starting line-up of the annual 500-mile Memorial Day race at Indianapolis Speedway.

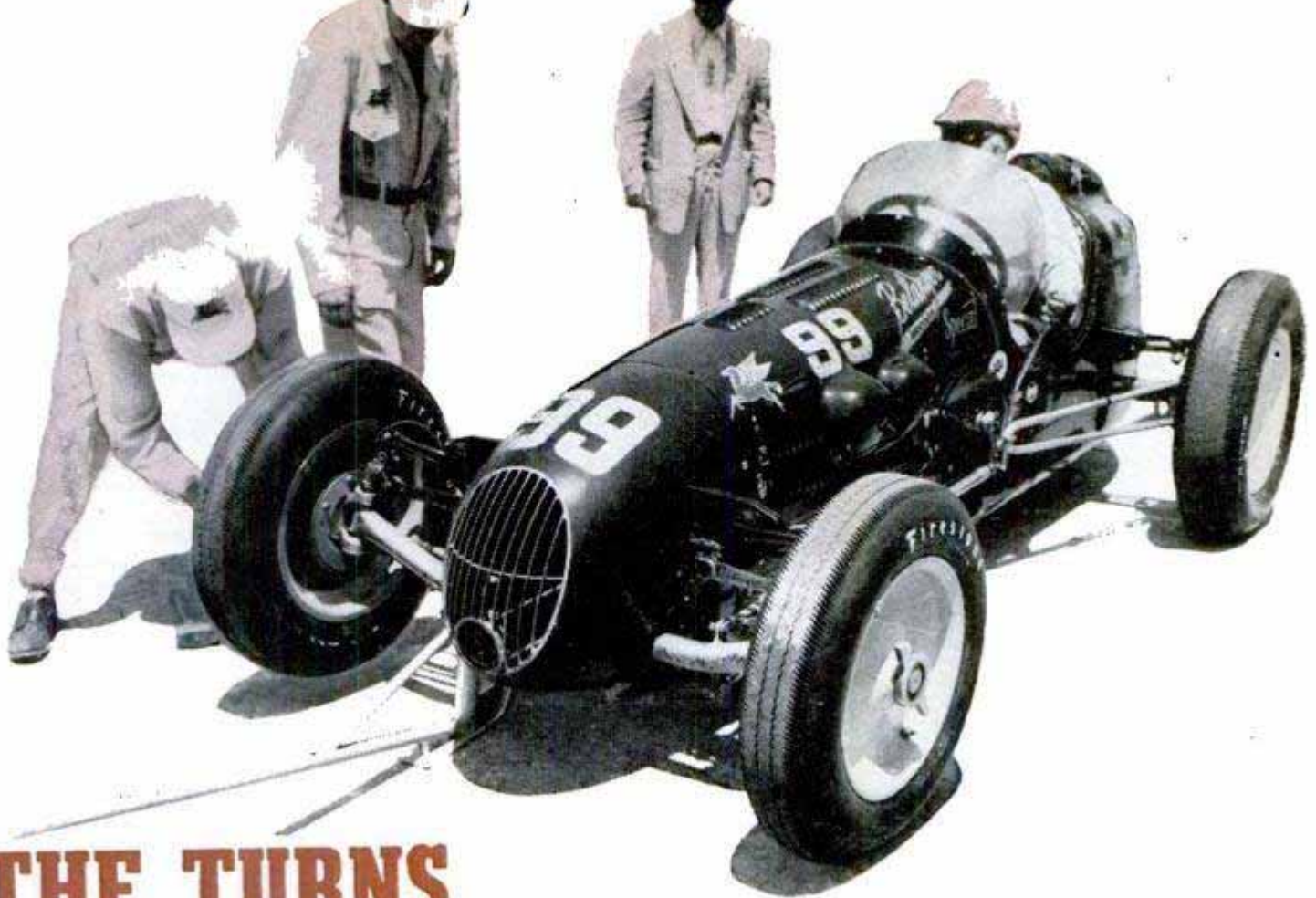
Never before have so much money, engineering brains and shrewd planning been devoted to America's blue-ribbon speed classic. Some 80 cars are entered, 30 of them brand-new creations built during the last few months. Only 33 cars, the winners of 10-mile qualifying-time trials, will start in the race itself.

Not only is the field the largest and flashiest in history, it represents the widest variety ever to compete at Indianapolis.

Most of the cars are powered with the four-cylinder, 270-cubic-inch Meyer & Drake racing engine that develops some 325 horsepower. Arrayed against this favorite will be a 176-cubic-inch supercharged Meyer & Drake, a turbosupercharged 350-horsepower Cummins diesel engine, a rebuilt DeSoto, a Cadillac engine sleeved down to meet specifications, a special overhead-valve Studebaker engine, possibly a



Diesel-powered car measures only 28 inches high at top of cowl. Diagram shows engine tipped on its side to lower the center of gravity



THE TURNS

Simple skid jack slides under the car to raise it for wheel change. Race can be won or lost in pits

double overhead-cam Mercury and at least one 12-cylinder Italian Ferrari. Also in the competition will be the pair of veteran Novis, the low-slung front-drive cars with supercharged V-8s that develop some 550 horsepower.

Last year's winner drove at a speed thought to be impossible for the Indianapolis track a few years ago, and this year the pace should be even faster. Drivers are guessing that it will require an average speed of 128 miles per hour to win the race, with the usual reservations for bad weather or wrecks. This would be two miles an hour faster than last year. This year the fastest car in the time trials may qualify at 140 miles per hour, another record.

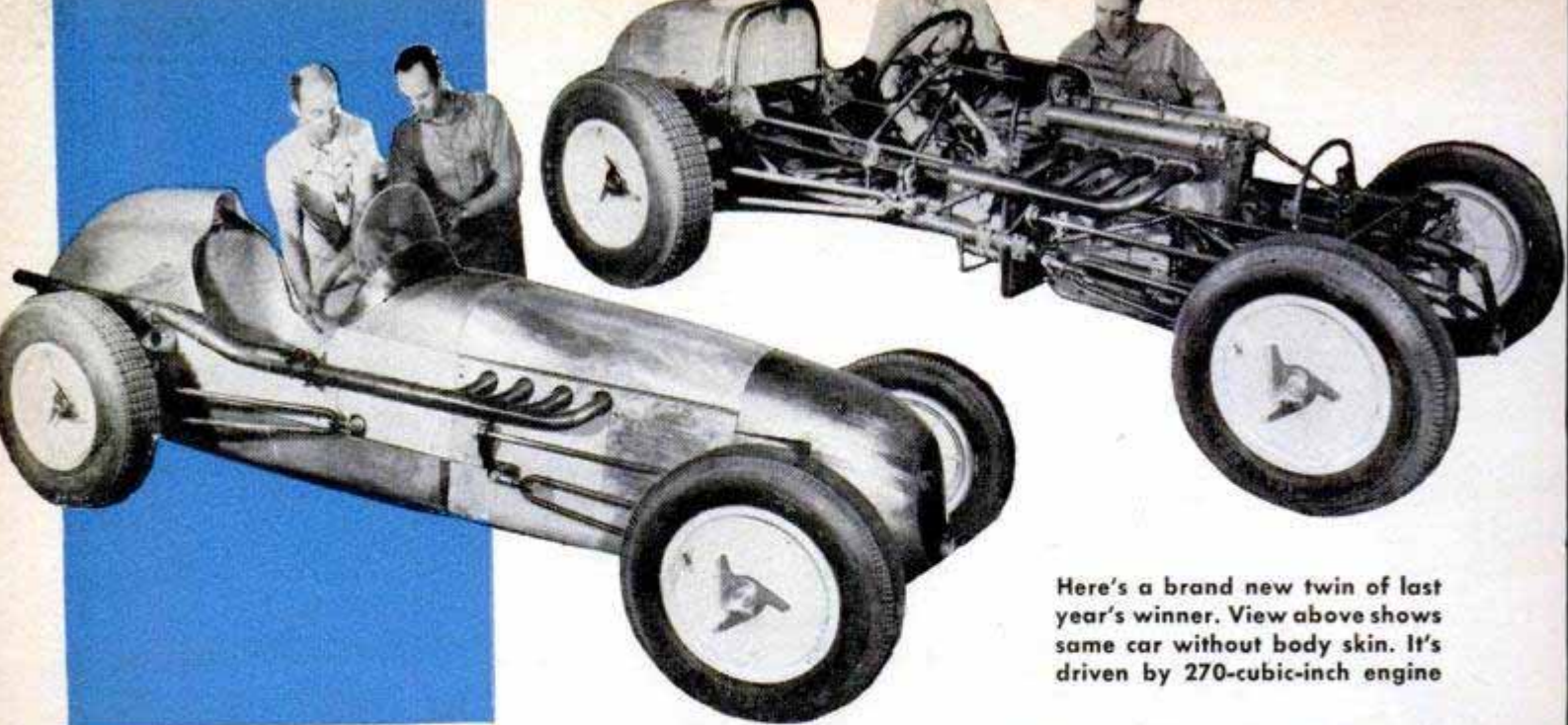
One of the reasons speeds are on their way up is because of the trend toward lightweight cars. Several years ago the average Indianapolis car weighed 1800 pounds. This year the average car will weigh some 1600 pounds.

A heavy car with a powerful motor can make record time around the track, as shown by the Novis, yet a light car with less power can go just about as fast if the driver takes advantage of his better acceleration when coming out of the turns. In fact, drivers are learning that the race can be won on corners as well as on straightaways.

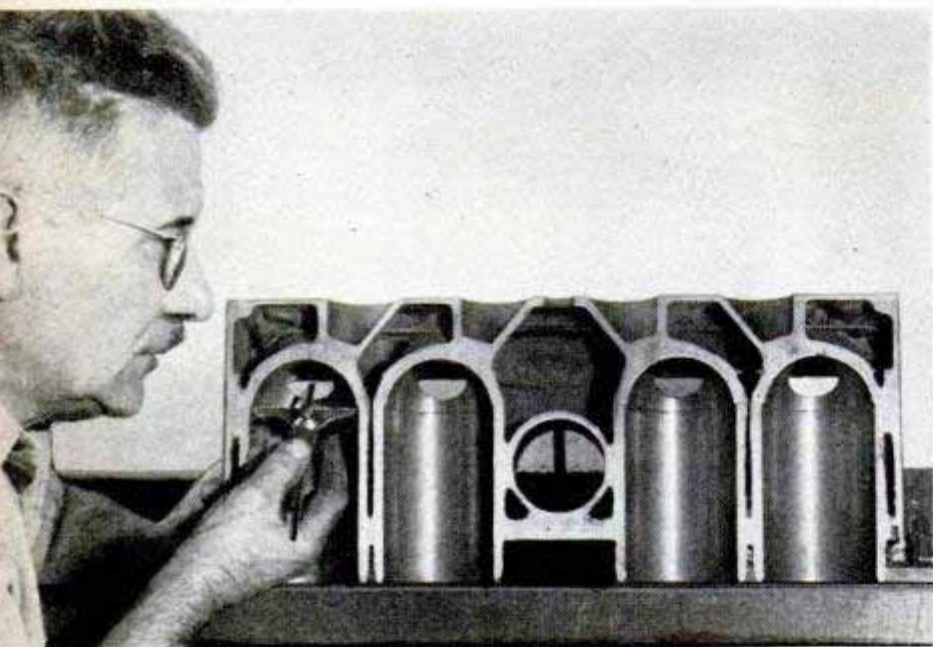
A light car usually can go through a turn faster and under better control than a heavy car, it has better acceleration and its tires don't wear out as rapidly. On the other hand a light car may not be as strong structurally and the driver may not have as good control on the straightaways. Handling a light car is definitely more tiring.

Most of the cars are using magnesium wheels instead of wire wheels this year to save 20 pounds per car. Many of them, too, are using hydraulically operated spot brakes of the aircraft type. These save as much as 40 pounds per car, compared to conventional shoe-type brakes. A spot brake consists of a pair of round pads, or "spots," of brake material which press simultaneously against opposite sides of a steel brake disk that revolves with the wheel. In addition to saving weight, it is said that spot brakes run cooler, stop a car more quickly, last longer and are simpler to maintain.

Many of the cars have gone to large rear axles, three inches in diameter, of chrome-moly tubing with $\frac{1}{4}$ -inch sidewalls. Weighing 32 pounds apiece, they save no weight but are good insurance against breakdowns from the terrific engine torque and the pounding of the fuel load that is located directly over the rear end.

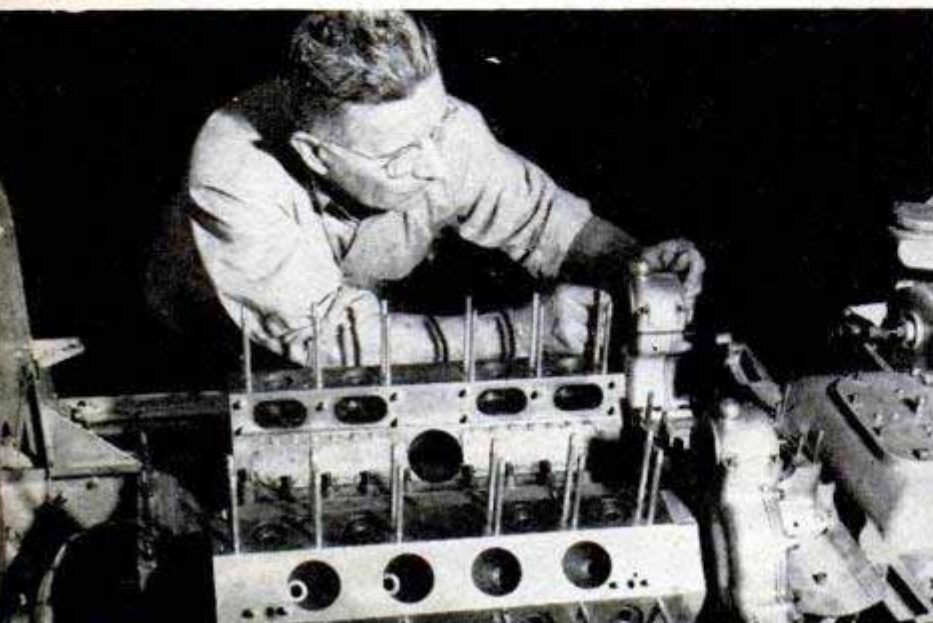


Here's a brand new twin of last year's winner. View above shows same car without body skin. It's driven by 270-cubic-inch engine



Test casting of the V-8 Novi engine, sliced in half for inspection, is checked for accuracy. Note hemispherical combustion chambers

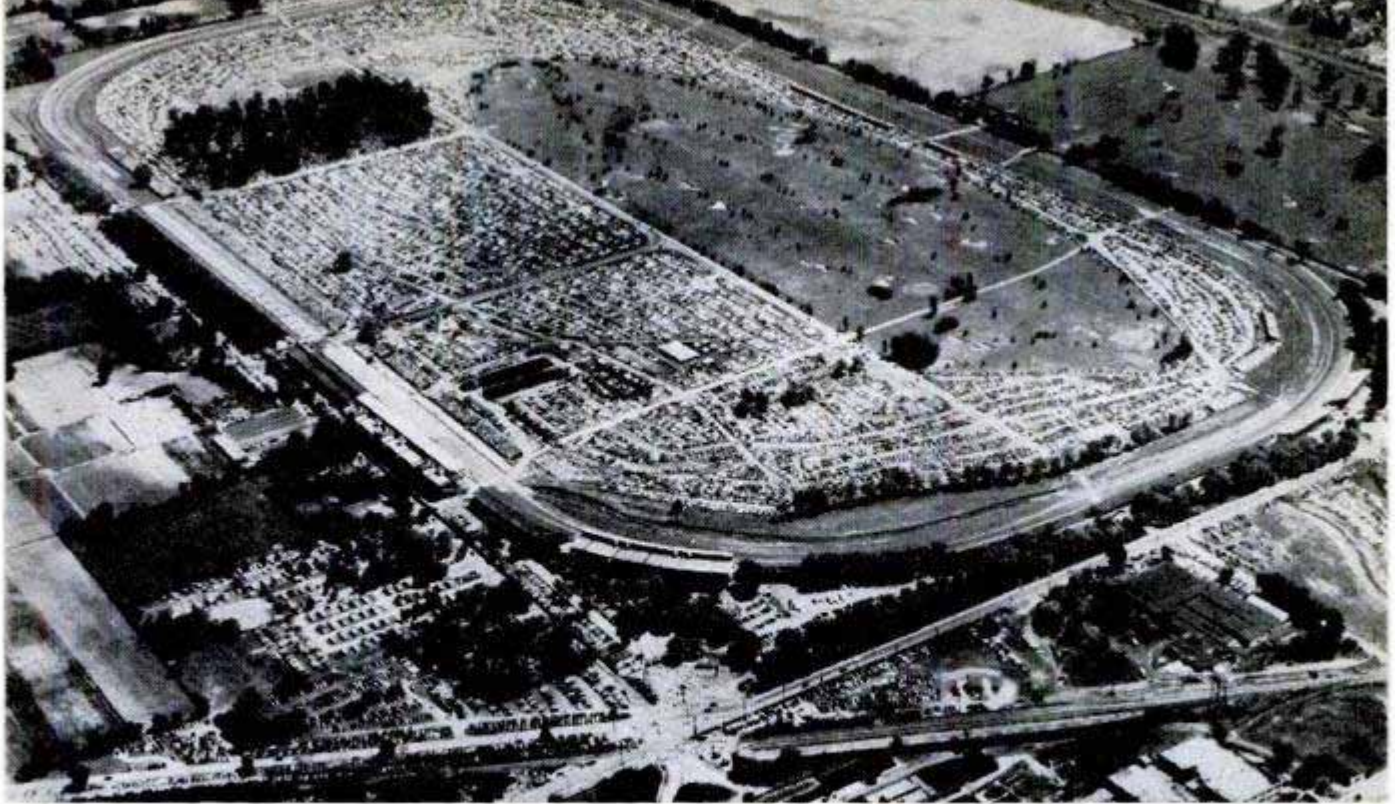
V-8 blocks of the engine are installed in one of the powerful and famous Novi Indianapolis cars. This engine develops 550 horsepower



Frank Kurtis of Kurtis-Kraft, Los Angeles, the country's leading race-car builder, has turned out 17 new Indianapolis cars for various owners since the last race at that track. Nine of them are of the new 4000 series and weigh 1550 pounds each. One will be powered with a cut-down Cadillac engine.

Lighter still will be a pair of the 500 series Kurtis-Krafts that were designed and built early this spring. These cars weigh 1500 pounds each, one being powered with the DeSoto, the other with a Meyer & Drake 270. The cars have frames consisting of a chrome-moly elliptical section plus a nine-inch-deep aluminum-sheet box that serves also as part of the skin. To save weight the cowl and fire wall are designed as structural parts of the frame. Another unique feature is a front-suspension system consisting of two torsion bars mounted in a crisscross fashion instead of parallel to the frame.

The Cummins diesel entry, also built at the Kurtis-Kraft shops, has a 104-inch wheelbase and is powered with a 401-cubic-inch six-cylinder diesel engine equipped with an exhaust-driven turbosupercharger. The car is so heavy (2150 pounds dry) that it can't compete on a pound-for-pound basis with the lighter cars, but its weight was compensated for, in a sense, by installing the heavy diesel en-



Aerial view of track shows grandstand at left, huge public parking area in center. Open area is golf course

gine on its side, in a horizontal position. This change permits an extremely low center of gravity and an offset drive line. The oiling system is of the dry-sump type, so no lubricating problems occur.

The diesel car stands 34 inches tall at the top of its headrest. The cowl is only 28 inches off the ground. Driver Freddie Agabashian almost has to peer out between the tires which stand 33 inches high.

Laying the engine on its side moves the crankshaft, drive shaft, gearbox and differential eight inches left of center, next to the driver instead of under him. About 20 percent of the total weight of the power plant and drive train are moved over. The net effect at Indianapolis will be to reduce the wear on the right tires in the turns, increase the traction on the left tires and permit faster speed around the corners.

Two other cars are using the same idea. One of the Kurtis-Kraft lightweights has its engine tipped from the vertical to permit an offset drive line. Another car, built by Harry Lewis for William Amsted of Indianapolis, has its engine in the conventional position and employs a transfer gear at the rear of the engine to connect with an offset drive shaft. The advantage of this is that the car can be tested with this arrangement and then restored to conventional center-line technique if the shift in weight isn't as effective as is hoped. Veteran mechanics point out that in some cases the idea seems to work, in other cases it isn't particularly effective. In most modern race cars, the same effect is sought by adjusting the left-hand shocks and torsion bars so that more

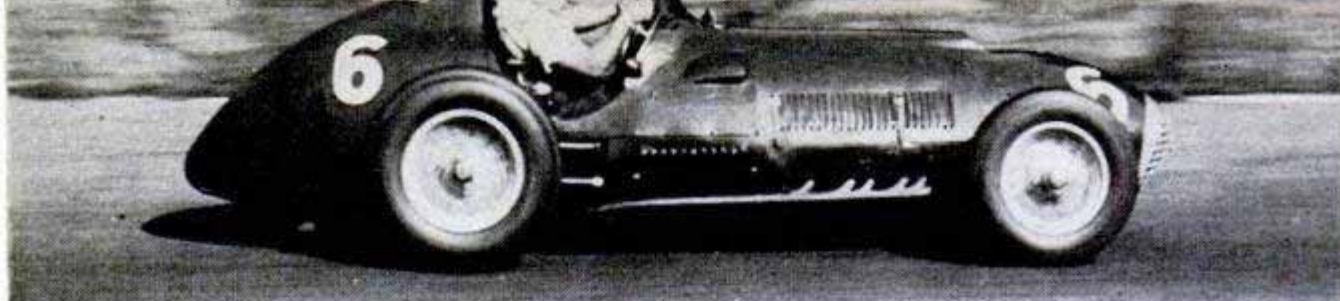
than half the weight of the car is carried on the left wheels.

The Belanger Special that Lee Wallard drove to first place last year won more than \$100,000 during the 1951 season, said to be more money than any race car ever won before. For this year's race, Lou Lesovsky of Los Angeles has constructed a duplicate of the car for the Belanger team. Each car weighs about 1600 pounds, is of chromemoly-tubing construction and is powered with a 270-cubic-inch Meyer & Drake.

One of the cars to watch will be the Ferrari which has a straightaway top speed of 173 miles per hour. Its 12-cylinder engine develops 380 horsepower at 7500 revolutions per minute. The car has a four-speed transmission mounted integrally with the differential in the rear of the car. Rear suspension is of the European De Dion type with transverse leaf springs, an arrangement that materially reduces the amount of unsprung weight. Two Ferraris placed first and second in last fall's 2000-mile Mexican road race. The Indianapolis entry is being driven by Johnny Parsons, 1950 winner.

Last year's race took a terrific mechanical toll and only eight cars were still running at the finish. Twenty-five broke down for such reasons as broken crankshafts, rods and pistons, overheated engines and cracked rear ends. This occurred partly because of the rule preventing changes in gear ratios or tire sizes after the qualifying trials.

The Indianapolis race is both a speed and endurance contest. Smart owners and mechanics try to figure out how fast they'll have to go to win, then select a gear ratio or



Crouched in cockpit, driver in last year's race pours on the speed as he comes out of a turn. This year cars will be built lighter, will negotiate turns faster

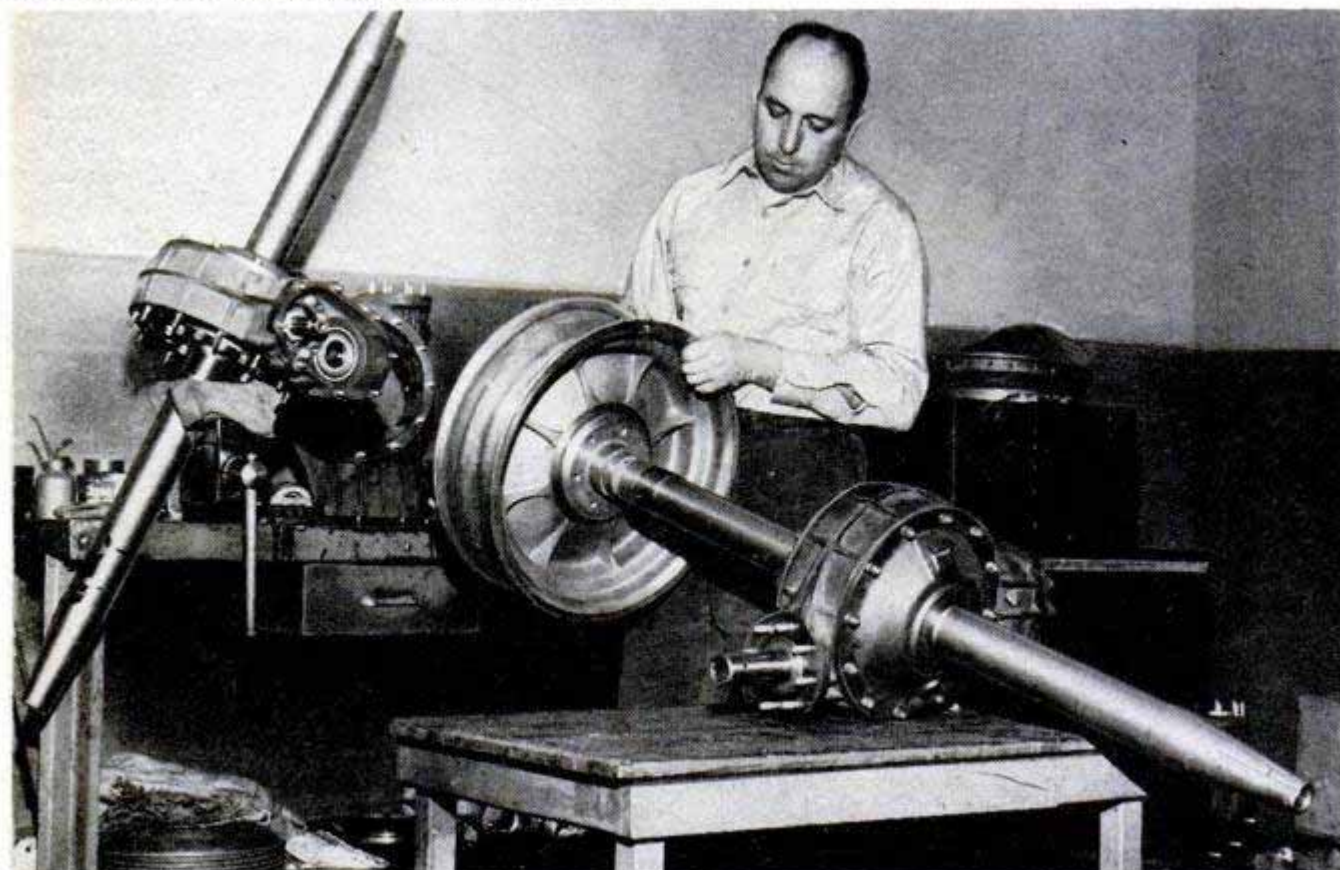


Spot brakes to be used this year consist of two cylinders which clamp the opposite sides of a steel disk

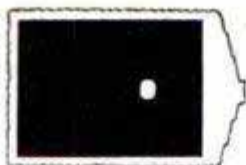
Car builder checks the fit of a new magnesium wheel on three-inch hollow chrome-moly axle. This year cars will average 200 pounds lighter than former racers

tire size that will give them the needed speed without winding up their engines too tightly. A high gear ratio gives speed and reliability but less acceleration, a low gear ratio gives speed and acceleration and also increases the chance of breakdowns because of increased engine revolutions. Last year most of the cars used fairly low gears. The mechanics figured that it was better to use a low gear and go fast enough to qualify—and later take a chance of hanging together during the race—than it was to start with a high gear and get left out completely. This year rules permit changing tire sizes or gear ratios after qualifying rounds.

Most of the cars will make their qualification runs equipped with fuel-injection systems using straight alcohol as fuel. This combination gives the highest-possible horsepower, an aid in making top qualifying speeds. Then, for the race itself, the cars will be changed over to standard carburetion and a gasoline-alcohol-benzol fuel blended in proportions of 40-40-20. This blend provides plenty of power and gives about twice the miles per gallon possible with alcohol alone.



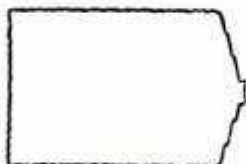
Black print with a white spot denotes negligible radiations in the area (1 to 10 roentgens)



Gray print with a white spot is evidence of a moderate amount of radiation (10 to 30 roentgens)



When print is all white or very light gray, it denotes that the radiations have been dangerous



"Print a Minute" Camera Acts as Atomic-Radiation Detector

Owners of Land "print a minute" cameras can convert them for use as radiation detectors with a clip-on device that glows when struck by radioactive rays. So equipped, the camera detects and measures the amount of atomic radiations in its vicinity after an atomic explosion. As the material glows, it exposes a tiny spot on the film, against which it is positioned. When the film is developed, this spot can be seen and its contrast with the surrounding area in-

dicates the radiation intensity. Because prints are developed in the camera, the tell-tale provides a quick test for radiation. The camera is left folded when used for this purpose. The material is clipped to the inside of the lensboard just to one side of the lens. When the camera is folded shut, the clip is adjacent to the film. It does not interfere with normal use of the camera. The detector clips are supplied to Land owners free of charge by the camera manufacturer.

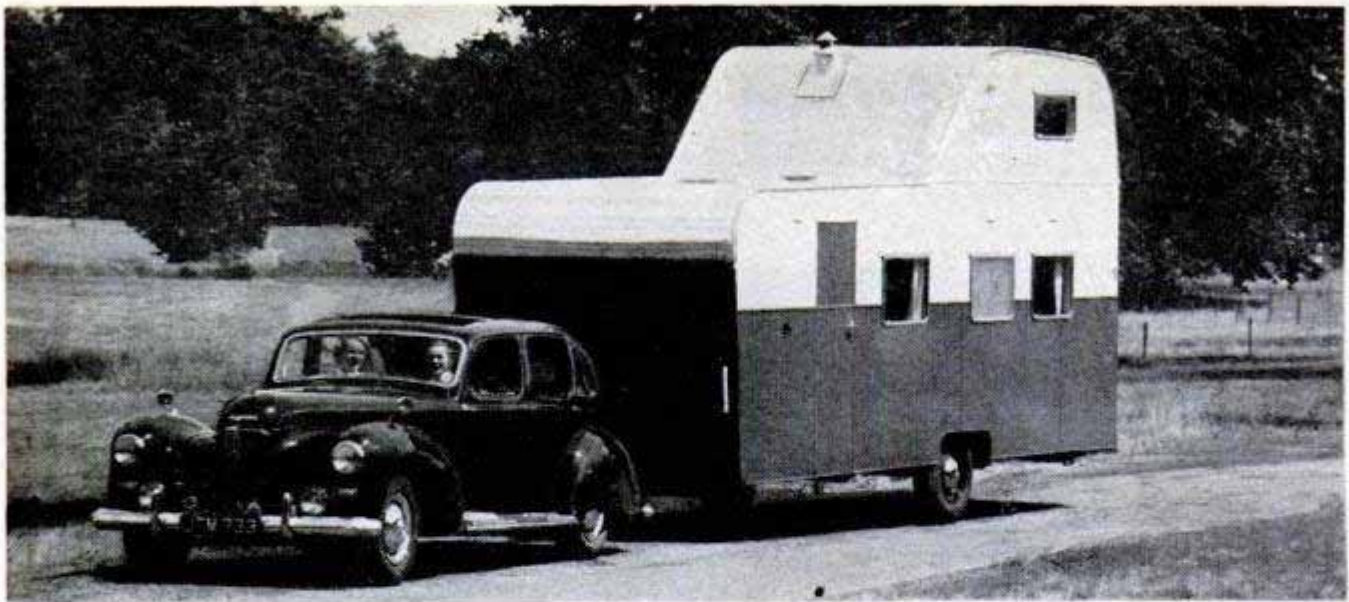
Blueprint Slipped From Filing Cabinet Without Removing Others



Up to 1000 blueprints may be filed in a new office cabinet which prevents wrinkles, creases and curled edges. The cabinet also is useful for storage of drawings, photostats and charts. Manila hangers are fastened to the items to be filed. Holes in the hangers slip over metal rods inside the cabinet. Any blueprint may be located immediately through an index file and can be taken from the cabinet without removing any of the others. The file accommodates drawings and blueprints up to 48 by 72 inches, and is provided with index cards and lock.

Sun Has Carbon Monoxide

There's carbon monoxide on the sun. Using a spectrometer and a lead-sulphide photocell, astronomers at the University of Michigan have identified carbon monoxide in the sun's atmosphere. Because of the heat of the sun, most of its atmosphere is made up of individual atoms, but carbon monoxide is stable enough to hold together. The discovery may yield more information on the temperatures and pressures of the sun's atmosphere and the abundance of carbon and oxygen in the sun.

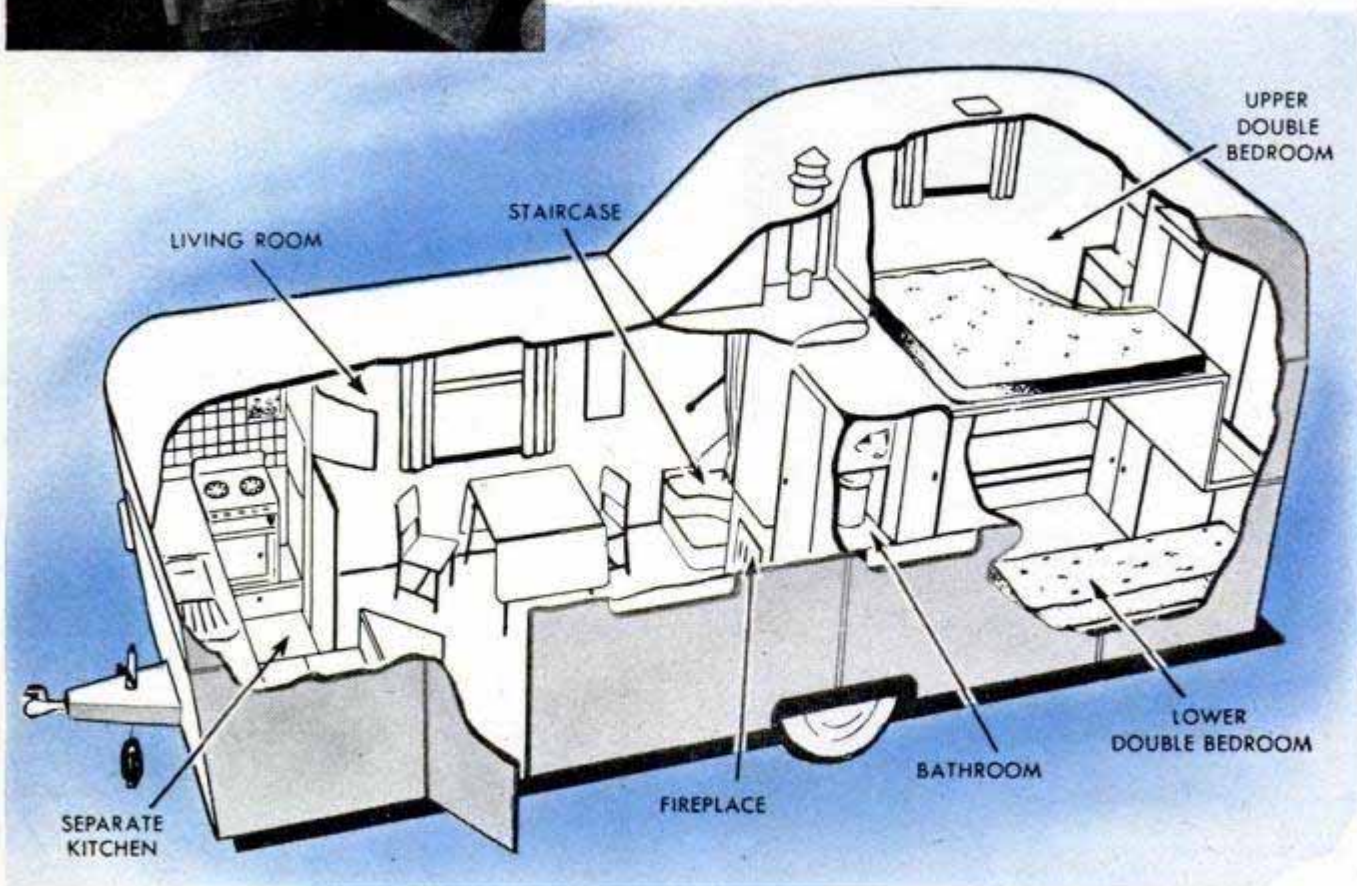


Only 24 feet long, the two-bedroom trailer maneuvers easily. Its over-all height is 12 feet 3 inches, including the chimney

Two-Story British Trailer

YOU GO UPSTAIRS to bed in a roomy British trailer built as a comfortable family residence. Two full-time double bedrooms eliminate the nuisance of converting living space into sleeping space nightly. The upper room is reached by a stairway from the living room. Other features of the trailer, which is called a caravan in Britain, are a complete bathroom, separate kitchen and a wood or coal-burning fireplace.

Left, stairway to second-floor room can be seen to the left of the fireplace. Below, a cutaway view of the roomy trailer



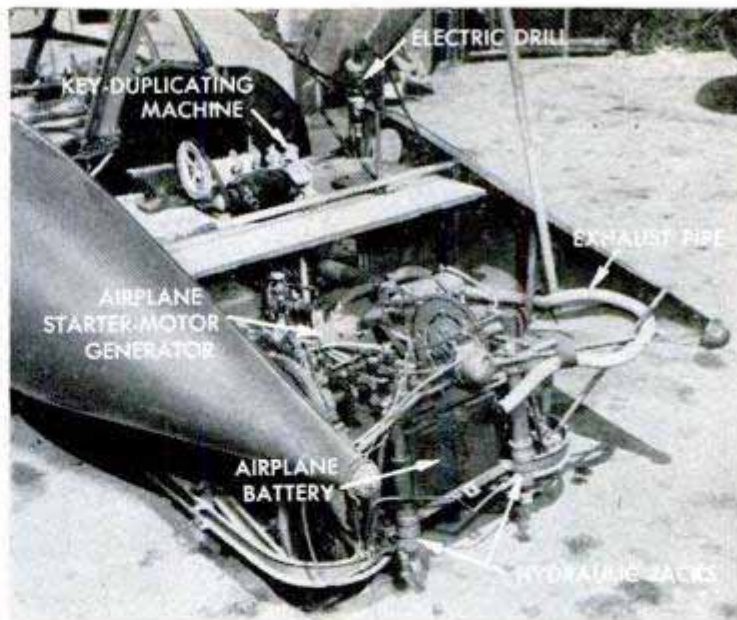
Retired Sailor Builds Cars For Handicapped Veterans

Using surplus airplane parts almost exclusively, a retired Navy chief petty officer builds oversize motor scooters for handicapped veterans. Also built into the compact vehicle are small power tools such as a jeweler's lathe, a key-duplicating machine, a knife-sharpening outfit and a shoe-repair kit so the veteran can earn his living right inside his car. The retired sailor, Edward T. Adkins of Watsonville, Calif., started to build the first vehicle, which he calls the "Vetmobile," while a patient at a Navy hospital. He did it to get a fellow patient, a discouraged amputee, "interested in something." The tiny cars are made of a drop tank split lengthwise and mounted on a strengthened motor-scooter chassis. A converted auxiliary starter-motor generator from a B-29 powers the machine. One Vetmobile built for a Dallas, Tex., amputee is equipped with a two-way radio.

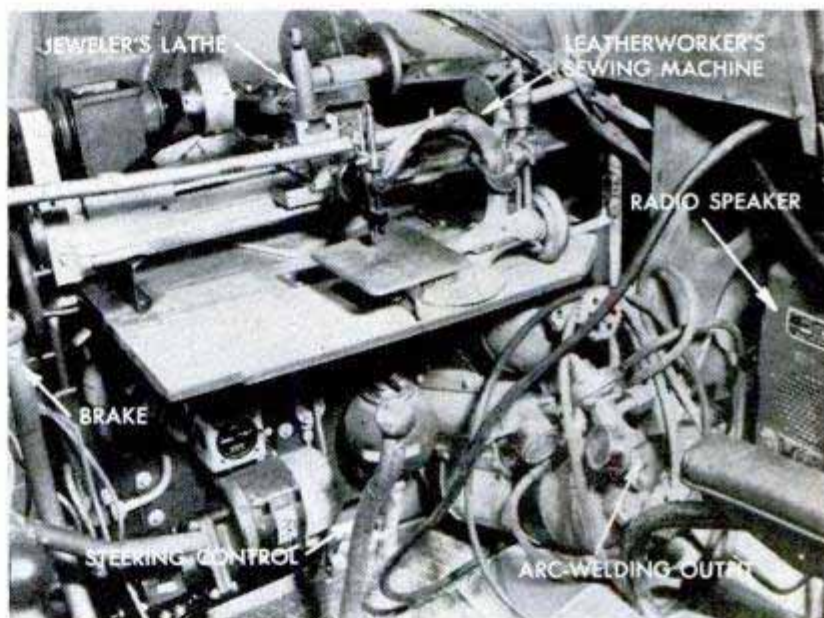
Belgian Helicopter Mail Service

In its first year of operation, a Belgian helicopter mail service covering a 268-mile route around Brussels has handled about 4,630,000 letters. The route connects Brussels and eight other Belgian cities. Only two helicopters are used in the operation which handles a daily average of 400 pounds of mail. The 268 miles are covered in 4 hours and 42 minutes, including loading, unloading and servicing time, for an average speed over all of 63 miles an hour. The service is operated by the Sabena Belgian Airlines. Bell 47-D1 helicopters are used.

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 from Bureau of Information, Popular Mechanics, 200 East Ontario St., Chicago 11



Power plant of the beefed-up motor scooter is a converted starter-motor generator from a B-29, operated by a battery



Inside the cab there's little room to spare. In addition to the scooter controls, there is a variety of power tools for the vet



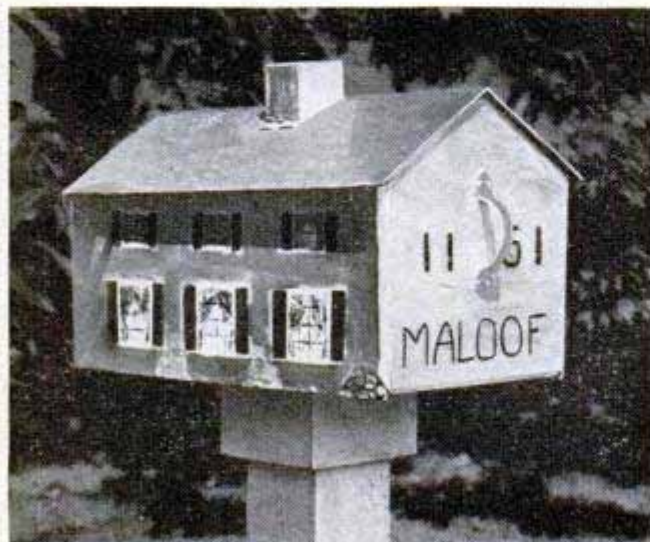
It may look like a machine gun, but it isn't. It's the antenna for the two-way radio. Seated in the cab is Ed Adkins, builder of the "Vetmobile"



THE GRANDPAPPY of all government services to become known by initials is R. F. D. which, everybody knows, stand for Rural Free Delivery. It began in West Virginia in 1896 as an experiment by the Postmaster General, and in one year expanded to 29 states. Today there are over 32,500 routes which serve 8,192,545 families. That means millions of mailboxes, and some of them are imaginative and artistic creations. The standard R. F. D. box is made of galvanized sheet metal and conforms to post-office regulations, but the Office of the Postmaster General permits the use of homemade boxes which conform in a general way to the standard box. Pictures on these pages show unusual boxes found along country byways



Left, one owner made replica of his home into mailbox; right, boxes on wheel are handy for the mailman

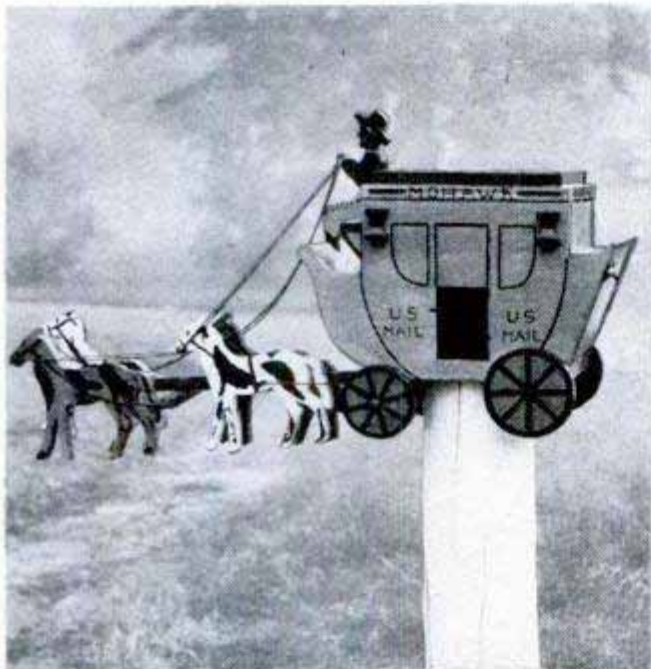




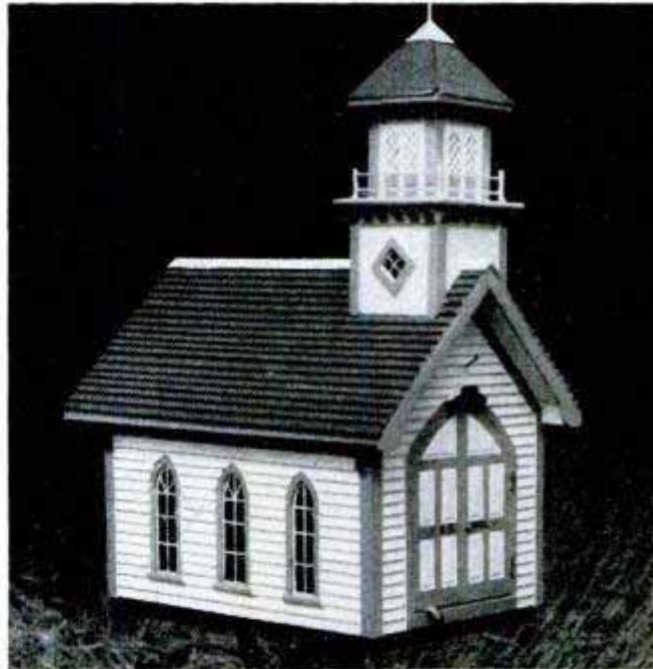
Rustic old-oaken-bucket-type well shelters mailboxes



Seven mailboxes repose cozily in this "doghouse"



Model of an early mail coach makes unique mailbox. Below, contractor adds a steam-shovel touch to box

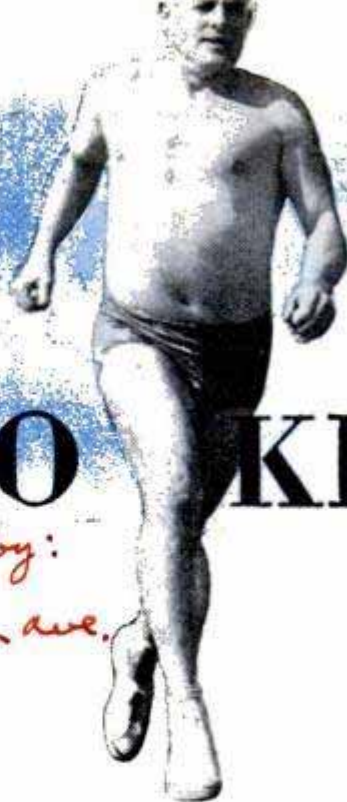


A retired minister fashioned this model of church to hold the mail. Below, occupation of owner not known





Walking and running are among best conditioners. Vary former with deep breathing, stretching and walking on outside edges of feet to strengthen ankles. If forced indoors you can jog in place, quicken pace, slow down to jog, then speed up until tired



HOW TO KEEP

his books published by:
C.V. Mosby Co.
3207 Washington Ave.
St. Louis 3, Mo.

By **Thomas K. Cureton**
Director, Physical Fitness Laboratory
University of Illinois

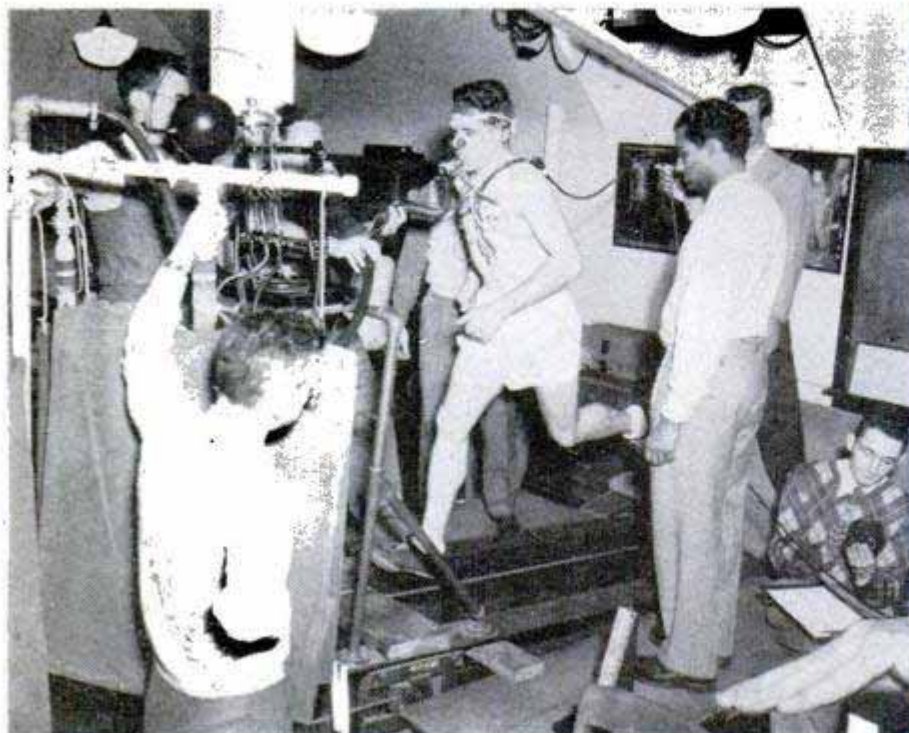
HALF THE NATION'S manpower is "dead"—in terms of physical fitness—at 40 years of age.

That isn't a wild statement phrased to attract headline writers. It is what I've found during 25 years as a professionally trained physical-fitness researcher, and in putting 40,000 men of varying ages through 14 and 18-item fitness tests. Many of them were world-famous athletes but the vast majority were average male adults. They couldn't swim and wouldn't have been able to run a mile in 10 minutes if their lives depended on it.

Most of us voluntarily stop living to the full extent of our physical potential well before we hit life's midway mark. We half-live the remainder.

There is nothing mysterious or difficult about getting, and staying, in shape. It means exercising more and, generally, eating less. Fortunately, too, it is inexpensive. Many of the most helpful aids, rhythmic exercises like walking, dancing, cycling and swimming, are free or nearly so. One of the very best, pushing away from the table when your actual food requirements are satisfied, even saves money.

One of several endurance tests in the fitness laboratory, a treadmill shows the length of time subjects can run up a grade at varying speeds





FIT

AT 50

When possible, cross-country running provides opportunity for sunshine and exercise. Here author Cureton jumps a fence during a regular run through fields near the campus

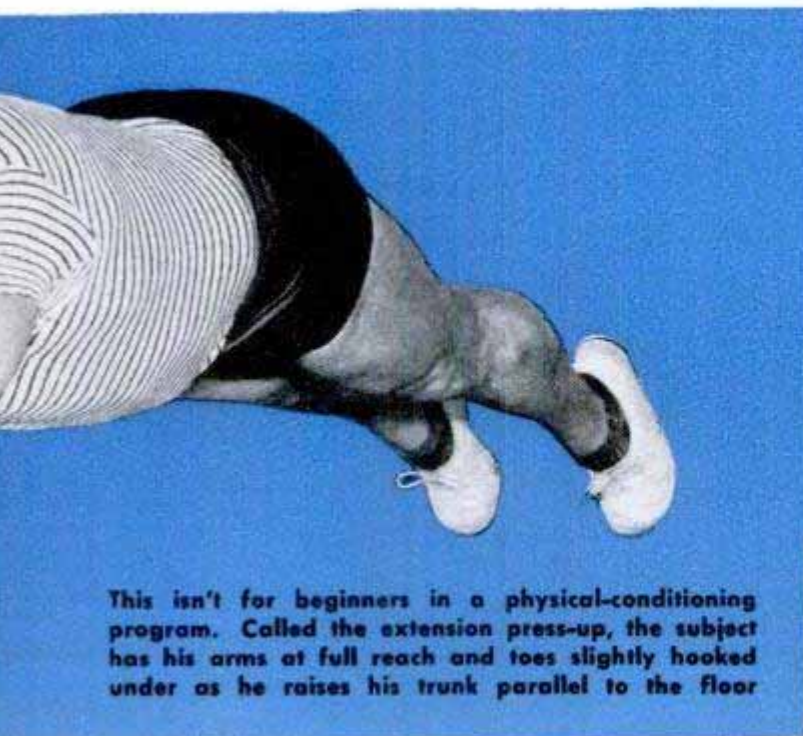
Don't misunderstand me. I heartily agree that eating is a pleasure, but overindulgence defeats its purpose. Paradoxically, not only does the average American overeat, but he permits his body machinery to deteriorate to the stage where it doesn't get maximum benefit from what is consumed. Without good circulation, for example, even the very best diet isn't accomplishing what it should for you, no more than top-grade fuel can correct all the troubles of a defective engine. Only a well-conditioned body uses food efficiently.

Too long an abdominal girth is also likely

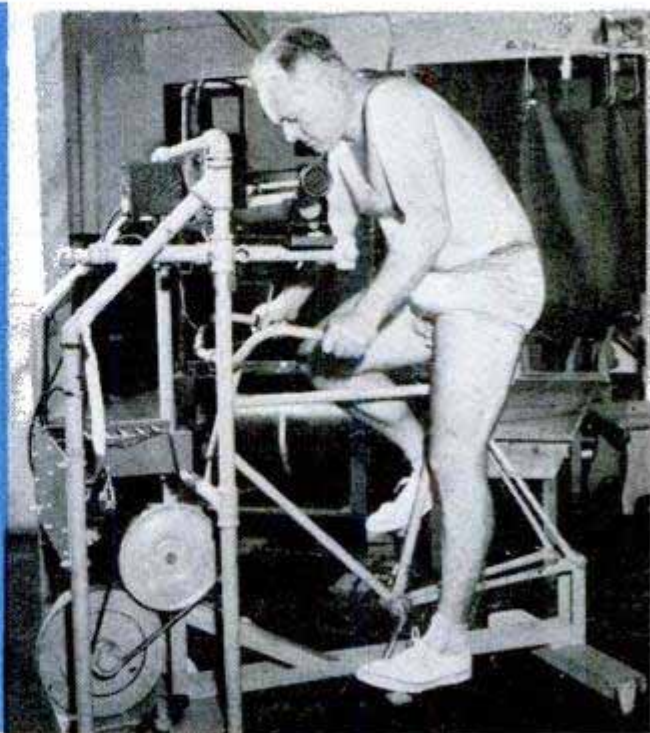
to mean a too-short lifetime. Insurance-company statistics indicate that men who are 35 percent or more above the average weight for their age and height also have a 150-percent-higher mortality rate.

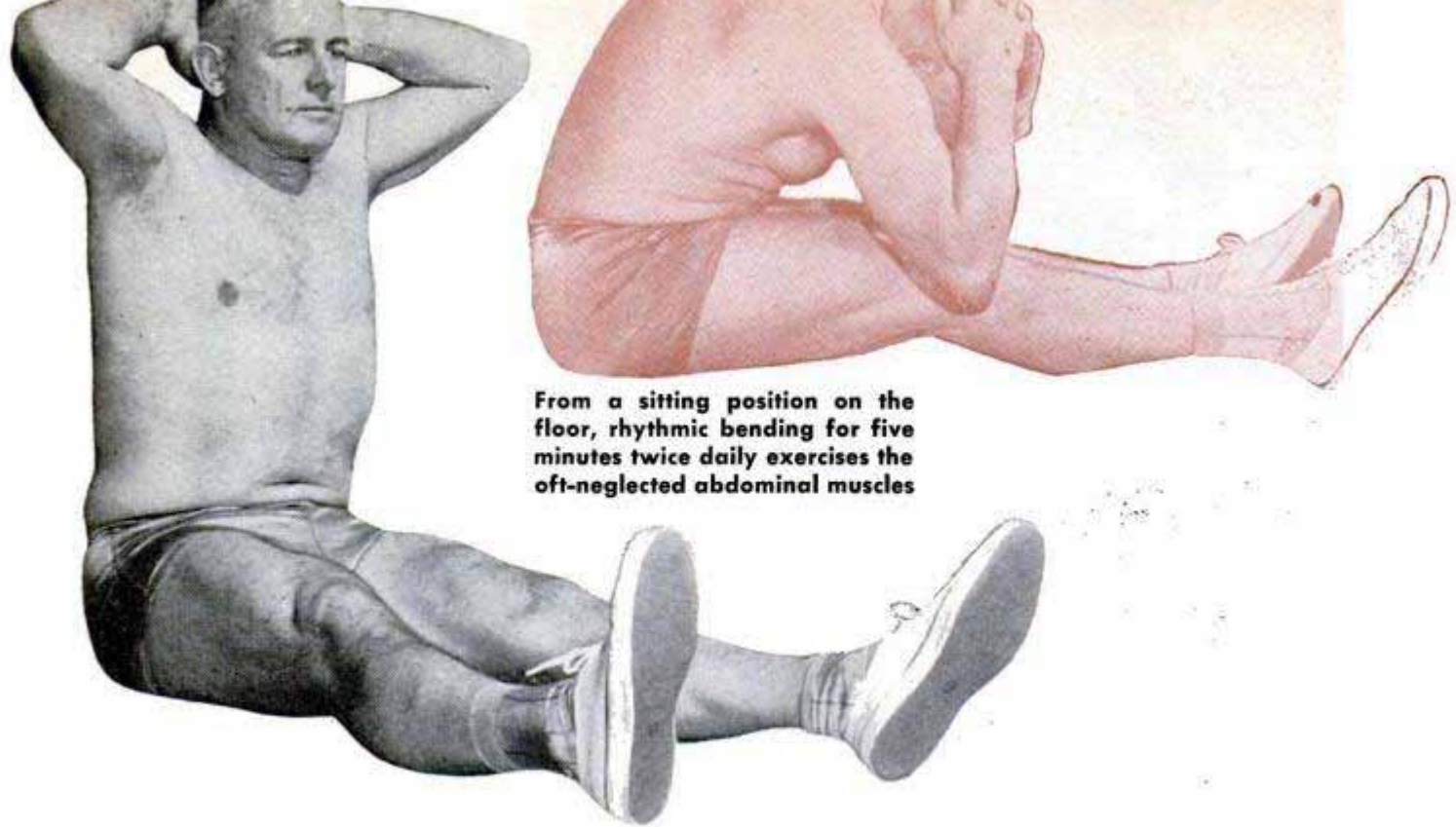
We can all delay the onset of old age's physical and psychological problems 10 or 15 years by following a simple, planned fitness program. Don't expect "to find time to exercise"; people rarely do. That's wishful thinking. To stretch out your vigorous

As a stamina test, subject pedals an ergometer bike as long as he can against a fixed amount of resistance



This isn't for beginners in a physical-conditioning program. Called the extension press-up, the subject has his arms at full reach and toes slightly hooked under as he raises his trunk parallel to the floor





From a sitting position on the floor, rhythmic bending for five minutes twice daily exercises the oft-neglected abdominal muscles



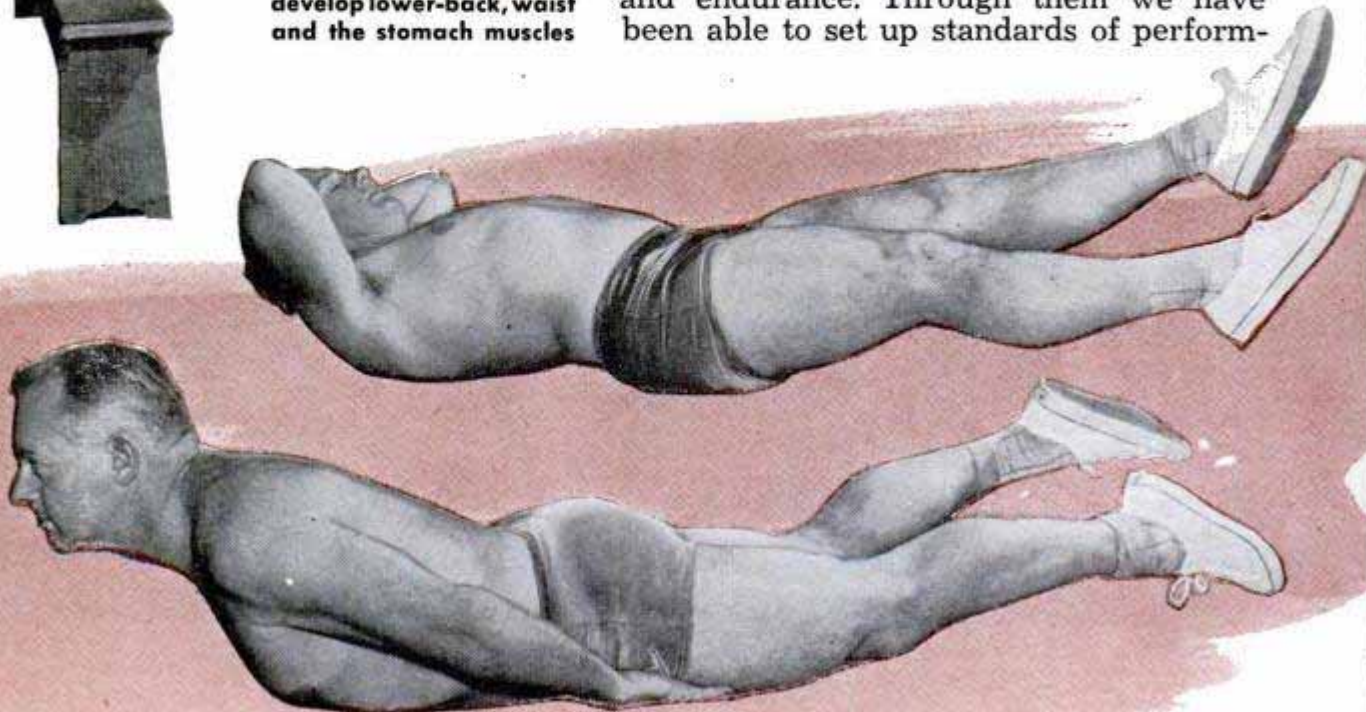
High among endurance builders is a step test, left. Practiced once or twice a day, it consists of stepping onto a chair or bench, using each leg alternately, at a rate of 30 steps a minute for periods of five minutes

Flutter kicks, done on the back and the stomach as many times as possible, develop lower-back, waist and the stomach muscles

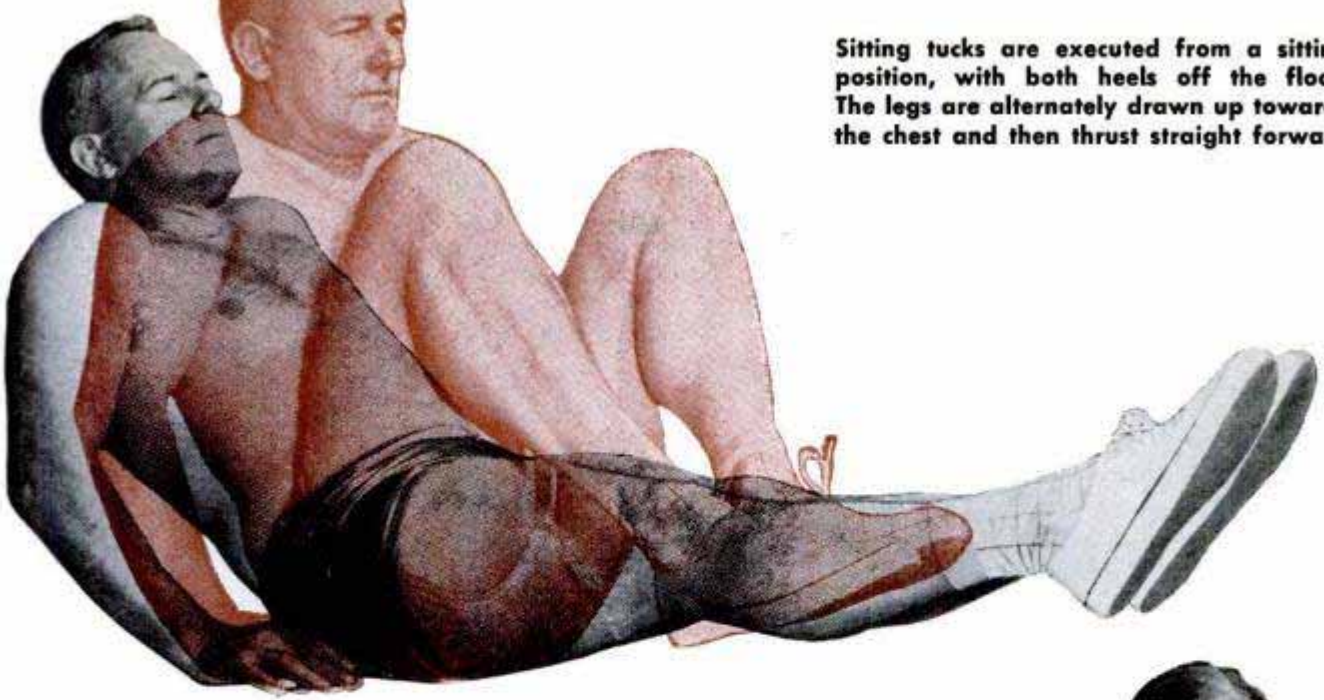
years you have to take the time to exercise, regularly allotting about two hours daily to physical work.

The classification middle-aged, often used as an alibi by those anxious to avoid exercise, can be misleading. I've known men in their 20s who were "middle aged," and others in their 40s with the mental and physical well-being expected in fellows half their age. I'd say the term might apply generally to the 26 to 60-year group.

In the last 10 years, the physical-fitness research laboratory I direct at the University of Illinois has tested more than 7000 men. Our job is "human engineering"—the study of physical efficiency, condition and work output. Through long research we have evolved tests that represent balance, flexibility, agility, strength, power and endurance. Through them we have been able to set up standards of perform-



Sitting tucks are executed from a sitting position, with both heels off the floor. The legs are alternately drawn up towards the chest and then thrust straight forward



ance to determine a person's motor fitness.

Along with standard gym gear like mats and horizontal bars, the laboratory has extensive scientific equipment such as apparatus to determine blood factors, an electrocardiogram machine and a photoelectric instrument which measures the oxygen content of arterial blood as it passes through the ear.

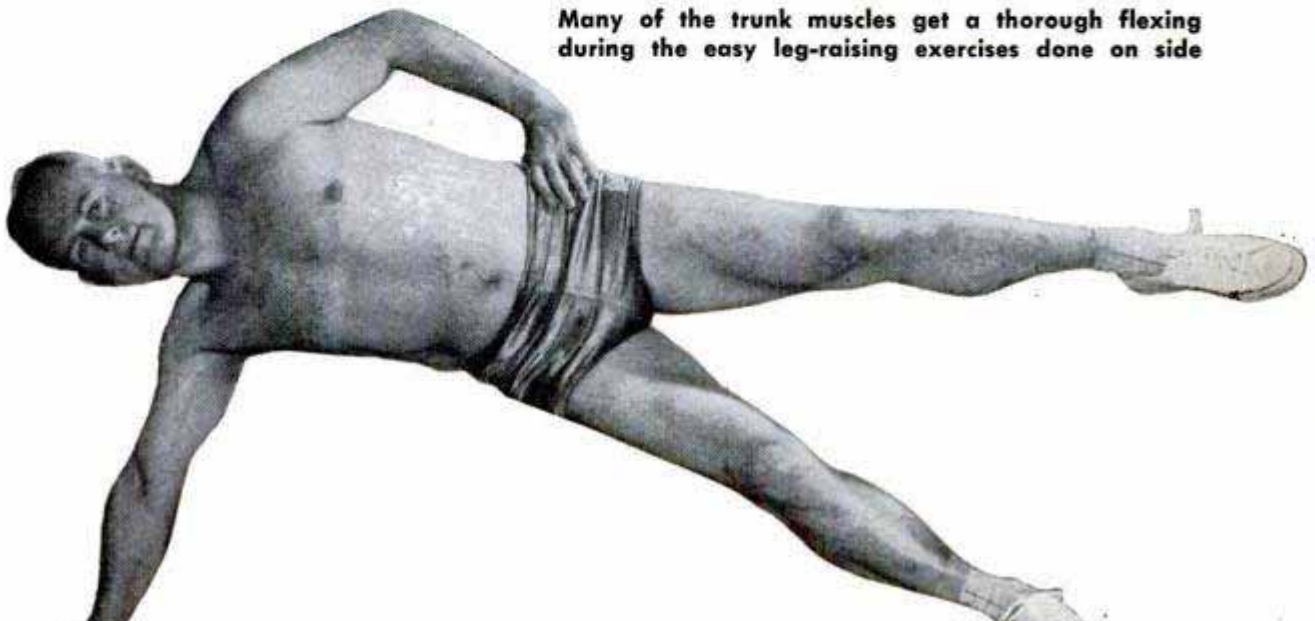
Our steady stream of volunteer subjects has included students, laborers, business and professional men, policemen, firemen and servicemen. To get a further basis of comparison I've tested and examined the stars of previous Olympic games, and I'm continuing the project in Europe this year by testing the former champions from nine countries. At the top end of the ladder, we want to determine the basic physiological reasons for the exceptional abilities of these superathletes.

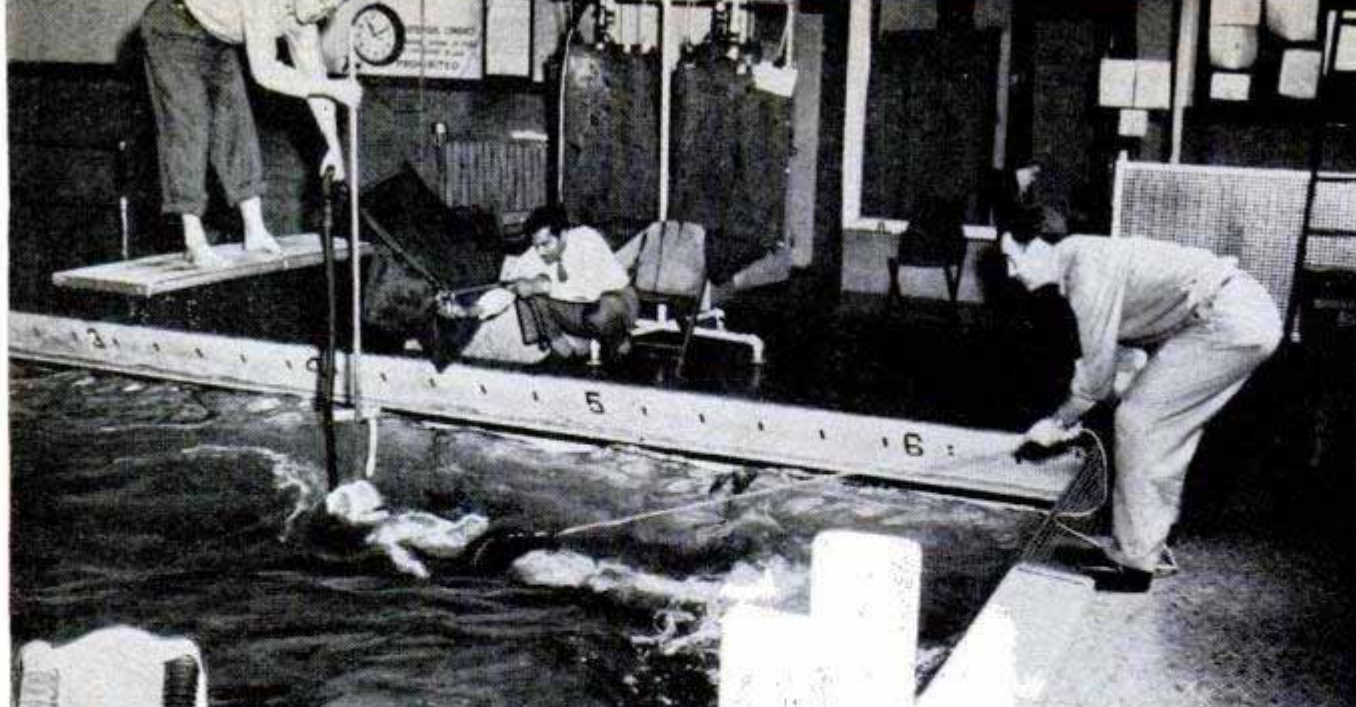
Working with all these people, we've been able to reach solid conclusions as to what a man's physical abilities should be—relative to his age, physique and other natural circumstances—as well as what they actually are. The evidence shows clearly



Performing squat jumps to limber up the legs and trunk, subject touches all fingers to the floor with one knee forward. He springs clear of floor and straightens up, repeating with the other knee forward

Many of the trunk muscles get a thorough flexing during the easy leg-raising exercises done on side





Olympic swimmers have aided the laboratory as test subjects. In experiment above, a swimmer is being held in position while apparatus held by man on board is used to gauge his oxygen intake

Close-up, left, of mouth-breathing equipment as used by swimmer in test

Assaying the proverbial "pound of flesh" is a calipers for measuring the fat layers covering body



that too little hard work and exercise, not too much, is what kills off the middle-aged or heads them for an early grave.

Sometimes a man tags himself as a "has been" when his first attempts at exercise, after years of inactivity, end with sore muscles and an aching back. He may even talk himself into interpreting those discomforts as danger signs, warnings that he is too old to flex his muscles even slightly. Generally that is a lot of poppycock. That soreness comes from sluggish circulation and overstretched muscles. It'll disappear when the heart, strengthened by exercise, starts pumping more blood and the tissues themselves make a gradual adjustment.

I don't urge going all out when you first start putting a rusty physical system back to work. Take it easy and gradually work up to the level of your abilities. Nature has many safety checks and you'll almost invariably find yourself stopping well before your heart is even close to giving out.

Age is no barrier if you're sincere about wanting to regain good physical trim. A fairly typical case involves a 59-year-old professor who came to us complaining of weak and painful feet, high blood pressure, insomnia and overweight. A little gardening and occasional fishing and canoeing about summed up his recreation. So far as regular exercise was concerned, he was a total abstainer. The deaths of several sedentary friends during the year turned him to us for a checkup and advice.

After an examination and interview, we recommended a program consisting of:

1. Two miles of walking daily, to and from work.
2. Home calisthenics before breakfast and before retiring.

(Continued to page 250)



Portable Rim-Circle Saw

Felling trees up to 30 inches in diameter, a one-man saw cuts from any angle. Its thinness permits cutting trees close to the ground. Powered by a one-cylinder gas engine, the saw weighs only 85 pounds



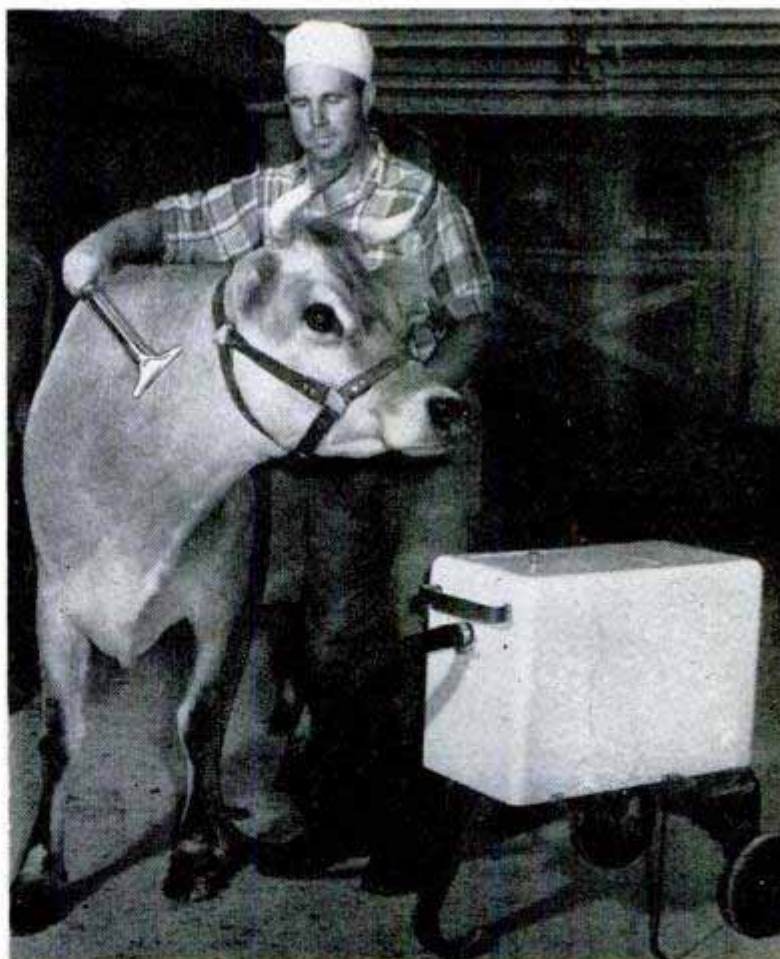
when used with a 3.6-horsepower engine, and only 76 pounds when used with a 2.2-horsepower engine. The 30-inch blade, with its outside cutting teeth, is held in place by three steel ball-bearing rollers. An aluminum-alloy frame guards the blade. The saw also can be used for cropping limbs.

Vacuum Cleaner For Animals

Cows and other animals are cleaned with a new vacuum unit designed especially for the work. It contains a baffle that stops most of the dirt, collects it and then permits the air to escape. The filter in a conventional vacuum cleaner would soon be clogged with dirt if used on animals. In addition to its use on cows and show cattle, the device is being used to clean brooder houses and to vacuum dogs at a boarding kennel.

Synthetic Remedy for Malaria

From hydrangeas that bloom at Easter, a team of scientists at the Lederle Laboratories has developed a potentially powerful synthetic remedy for malaria. Called Ch'ang Shan, the drug is the result of over five years' work by the scientists who started their research activities as a result of the shortage of quinine during World War II. Tests on laboratory animals indicate the synthetic drug to be 80 to 100 times more effective than quinine which has been in use for centuries.



□ A patent has been granted a device that opens and closes the door of the doghouse when the dog steps into or out of his bed.

There's a Knack to Mountain

EVERY SUMMER millions of tourists pour through the high passes of our Western mountains. And every summer highway patrolmen, picking up battered wrecks on hairpin curves, are more convinced that mountain driving is a lost art.

Year after year rangers in our loftier national parks, as well as truckers on our great deserts, stop to advise drivers how to handle a vapor-locked fuel pump or a boiling radiator.

Actually, mountain driving need be no more difficult than rolling across the flat lands. And statistics show that crashes are less likely on mountain grades than at city intersections. With a little planning and care, most accidents and mechanical failures in the mountains and the deserts could be avoided.

With this in mind, I drove across the Great Salt Lake Desert and into the heart of the Colorado Rockies to assemble up-to-date tips from the experience of rangers and patrolmen, truck drivers and garage mechanics, auto engineers and just plain, ordinary drivers in trouble.

One thing stood out: "Don't fail to visit the mountains just because you feel the high roads are dangerous," said expert after expert. With one exception, driving

Two were killed when this car plunged into a ravine in rough country, where one mistake can mean tragedy



By Verne O. Williams



is not a bit more dangerous simply because of the altitude. Quite likely this is true because other drivers on the road also become more careful when the drop beyond the guard rail is a thousand feet or so.

This exception is a curious phenomenon. A couple of cocktails taken in Denver at an elevation of 5000 feet can hit a driver much harder an hour later at 10,000 feet in a mountain pass. This is because the intoxicating effect of alcohol increases with altitude. So, as one patrolman put it, "Keep the antifreeze in the radiator."

Actually, this isn't good advice either, because such alcoholic antifreezes would boil too readily at high altitudes to be safe.



Colorado State Patrol photo

A much greater proportion of accidents results from other violations of the mountain-driving code. The Colorado Highway Patrol cited three frequent errors in the order of their seriousness:

1. Stopping the car on the highway to stare at an entrancing bit of scenery, sometimes the last seen in this world;

2. Driving on the wrong side of the road, occasionally through a psychological fear of the drop, but more often because of speeding around curves;

3. Coasting merrily down steep grades with the engine out of gear and providing no braking effect.

Little can be said about pulling off the

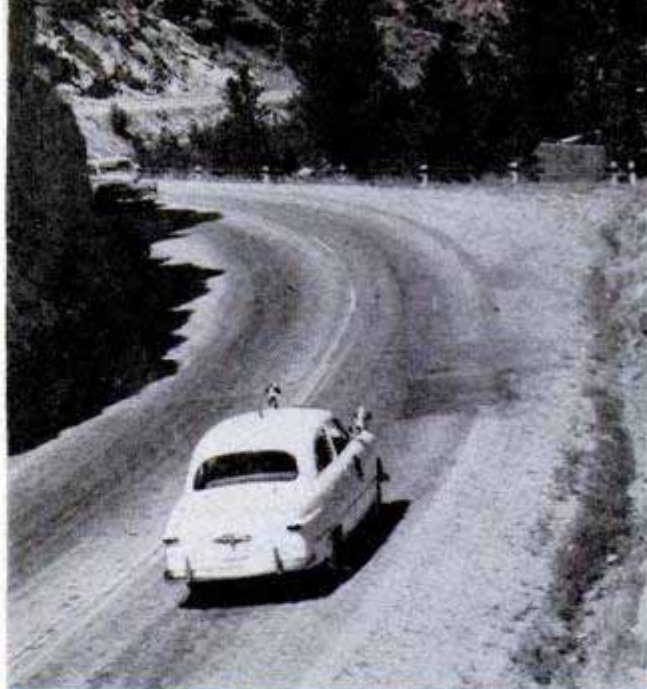
Two cars and a semi-trailer were involved in this crash, resulting from failure of the truck's brakes. Top, a ranger helps cure a vapor-locked fuel pump

road before stopping that hasn't been expounded for years by safety authorities. Not much more can be said about keeping to the right of the center line, except that topflight racing drivers think you should slow down in advance of a curve, then accelerate through it. To which may be appended a warning against ever slapping on the brakes in the middle of a rough, wash-board curve.

During postwar years, to get to the third error, highway patrolmen have discovered



WRONG WAY



RIGHT WAY

Keep to the right of the center line at all times, especially on curves. Car at the left is inviting disaster

that thousands of drivers, who had no intention of doing so, have literally been coasting down steep mountain grades.

This has resulted from the increased adoption of overdrive units on postwar cars. In the old days a man who ordered an overdrive unit usually understood quite well how it worked. Recently, however, rangers in the Rocky Mountain National Park, checking several runaway wrecks at the foot of 12,000-foot-high Trail Ridge Road, highest continuous auto highway in America, found the cars locked in overdrive. Other drivers, who noticed in time

When fog comes in, forget your miles-per-day record. Slow down or, better yet, stop and wait for clearing



that their brakes were failing, had to be assisted down the grades by a truck linked to the cars with a rope. They also had been coasting in overdrive. Their brakes may not have been good to start with, and gave out under heavy, continual use.

In alarm, park rangers erected two large signs on the lofty tundra's straightaway, warning motorists against making the descent in overdrive.

There was good reason to be alarmed. The overdrive unit on nearly all postwar makes is completely freewheeling up to about 30 miles an hour. After that its brak-

This can happen when alcohol and mountain driving are mixed. Intoxicating effect goes up with altitude

Colorado State Patrol photo





WRONG WAY

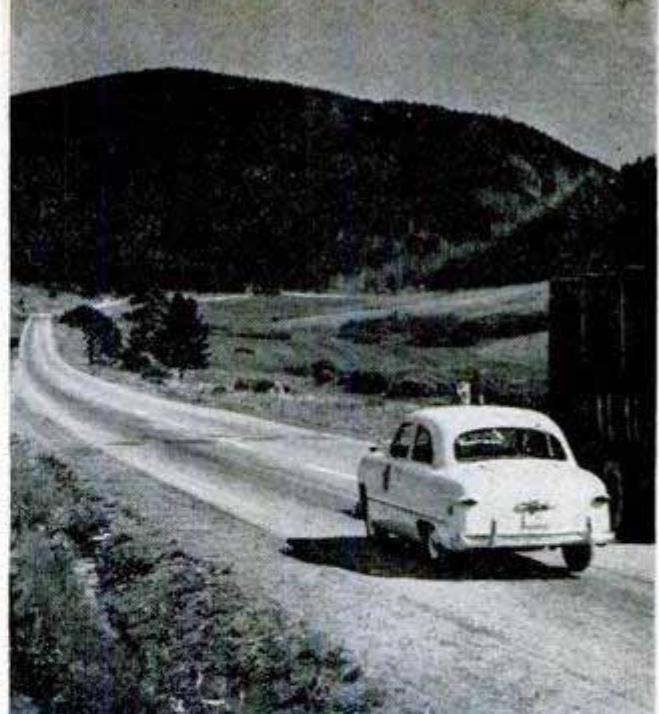
Don't try to zoom by a truck on a winding upgrade.

ing power is proportionate to its lower engine-to-wheels gear ratio and of little help. This leads the inexperienced driver to ride his brakes continuously down steep twisting curves and switchbacks.

The simplest remedy is to take your car out of overdrive, or "cruising gear," before entering the mountains at all. This will also prevent strain on the engine caused by climbing in overdrive.

Don't try to go out of overdrive at speeds above 30 miles an hour unless you have the presence of mind to use a simple trick. If you're whizzing down a grade in overdrive,

It's a long, steady pull on Trail Ridge Road with 15 miles above 11,000 feet. Careful mountain driving pays off here but it need not be any more difficult than driving on flat land if you follow advice of high-altitude drivers



RIGHT WAY

High altitude cuts pickup. Pass only on straightaway

shove the accelerator to the floor. This will snap the unit down into standard drive. Immediately set the knob to lock it there and let up on the accelerator. Neat trick, but it takes nerve on a runaway descent.

Postwar automatic transmissions present a different problem. I talked to a number of owners of late models thus equipped as they paused at a parking area midway down a long mountain grade. Each was satisfied with the performance of his car going up or down. However, one point was driven home quite emphatically.

As I walked around the back of a big





Overdrive is a great fuel saver, but in the mountains forget about economy. Lock it out so the engine will aid in braking



Colorado State Patrol photo

Head-on collisions are often caused by passing on an upgrade but statistics show mountain driving is safer than city driving

Steaming cars are as common as scenic spots but they can be avoided by some pretrip maintenance at your favorite garage



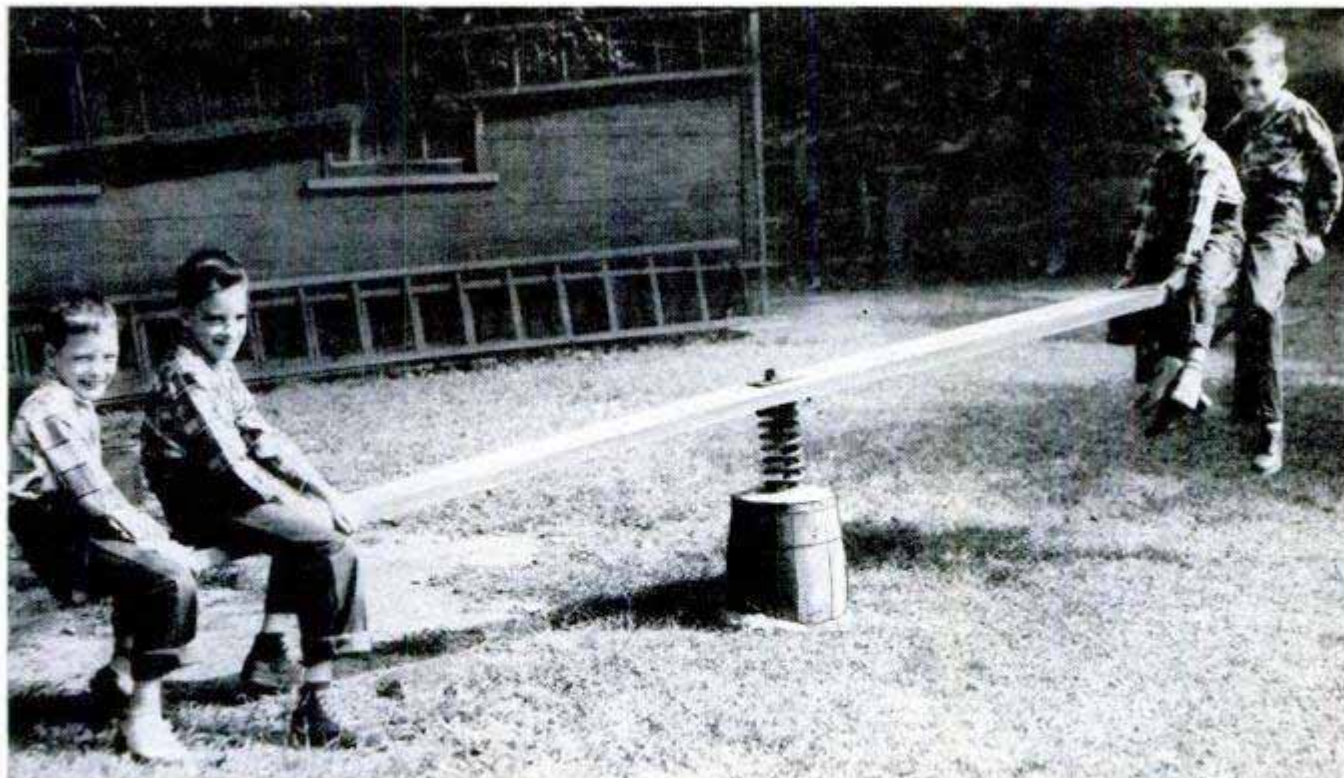
Dynaflow-equipped 1951 Buick sedan to speak to the owner, who had walked a few feet away, the car began rolling slowly backward out of the parking area. Jumping in, I looked for the emergency brake, couldn't find it, so I tromped on the foot brake. The horrified owner ran over and explained that he'd forgotten to slip his automatic transmission into the "P," or parking, position. Fluid drives simply won't hold a parked car on even a slight grade unless set for parking.

Likewise, such transmissions don't hold back as much as a conventional high gear when descending, largely because of the lower axle ratio. Therefore, for really steep grades these automatic shifts should be slipped into the low position. This will actually yield a gear ratio close to the average car's second gear, once you get up a little speed. There are some nearly perpendicular roads in the mountain country where these cars are really going to wear out their brake linings.

Also, if you've ever tried to drop back into low range in a clutchless model at 25 or 30 miles an hour, you know how the car heaves and the rear wheels skid when you've shifted. Of course, to shift down in an older model you used a technique known as double-clutching, a stand-by of the trucking lads. Well, you can do something similar in your new clutchless wagon.

Just before shifting from drive

(Continued to page 238)



Seesaw Merry-Go-Round

With an old automobile shock absorber, one ingenious craftsman has built his children a combined seesaw merry-go-round. First he poured a concrete base, using an

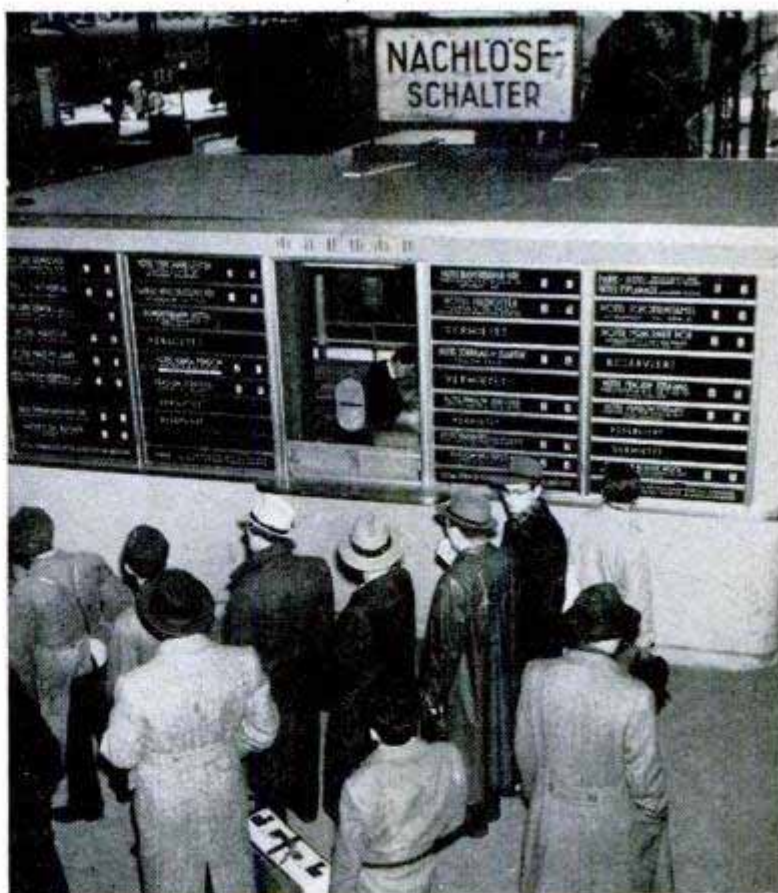
old nail keg as a form. Pins set in the concrete are fastened to a long plank, which is supported by the shock absorber. The spring provides live action to the plank when it is used as a merry-go-round or a teeter.

Munich Rail-Station Sign Flashes Hotel Vacancies

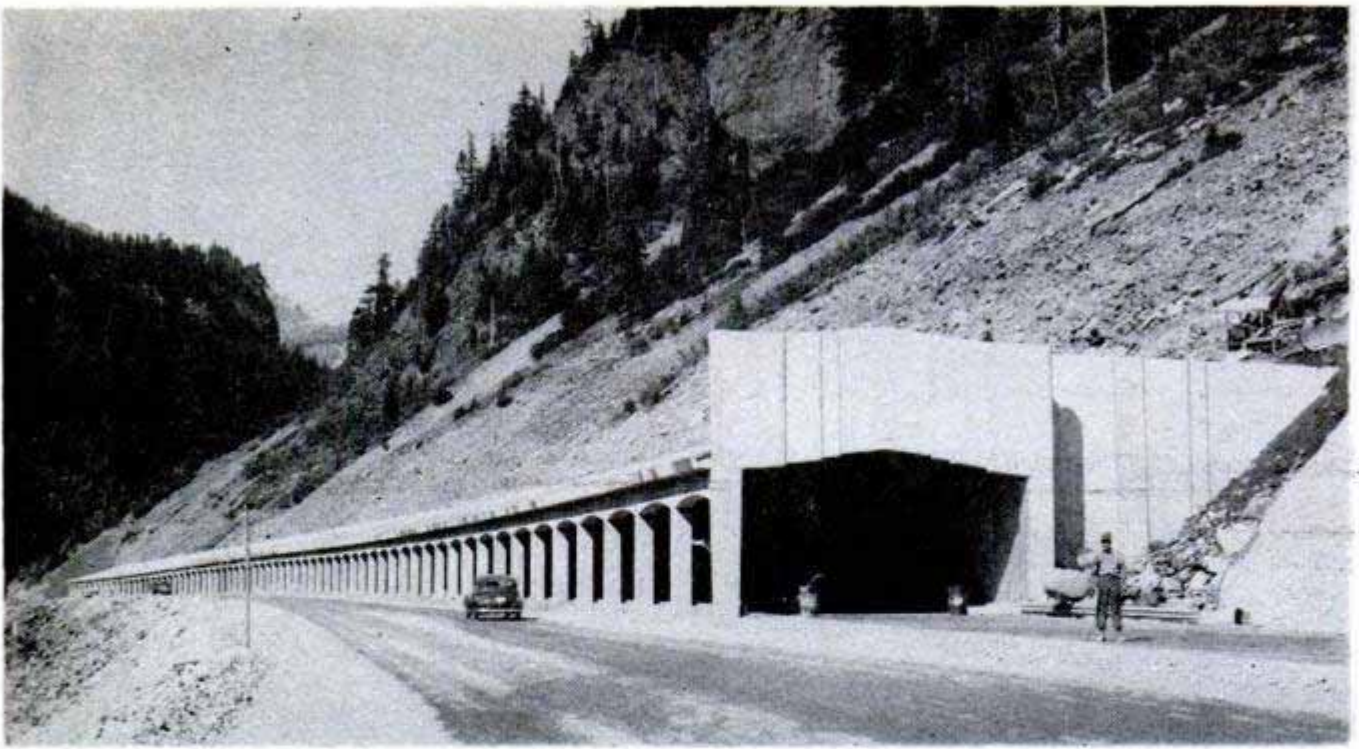
Available hotel accommodations are automatically posted on an electric information signboard at the Munich, Germany, railroad station. Room clerks at the hotels dial the number of vacancies available and the type of room. This data is translated into electrical impulses fed to the sign.

Chemical Turns Clods Into Garden Soil

Clay and other poor soils can be converted into lawns and gardens through a new chemical announced by the Monsanto Chemical Company. The chemical, now under test at agricultural experiment stations, is related to materials which are formed naturally in humus by bacteria. According to the company's chemists, even the raw subsoil turned up by steam shovels at new housing developments can be converted into soil suitable for lawns and flower beds. Only a few pounds of the chemical, called Krilium, are required per acre. The soil conditioner changes the



structure of clay, making it porous and crumbly. Krilium will be available only in small quantities in 1952, but will be in full commercial production next year.



Snowshed Protects Highway From Drifts and Rocks

Snowplows don't have to battle tremendous drifts any more along certain stretches of highway in Washington's Cascade Moun-

tains. Highway engineers took a hint from the covered bridge of early America and built a concrete-and-steel shed over part of the highway at spots where drifting is excessive. The roof of the shed also protects motorists from falling rock.



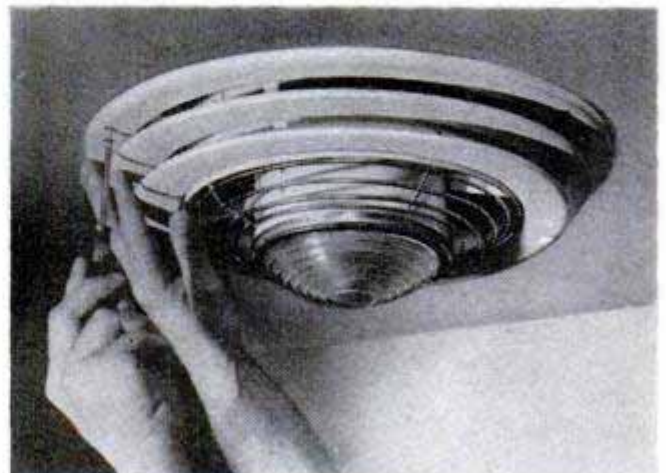
Army's "Hextent"

Soldiers in Korea gave the Army's new "hextent" its first combat-theater testing. The tent has a white lining which not only reflects light better but also provides insulation. Cold air is kept out and warm air sealed in by a ground cloth around the bottom. Included in the complete pack, which weighs 56½ pounds, is a clothesline on which soldiers can dry clothes in the tent.

Ceiling Heater Gives Light, Too

Combining three functions, an all-electric ceiling unit gives heat and light, and circulates the air with a fan. Especially designed for bathrooms, nurseries or other small rooms, the unit will heat up to 400 cubic feet. It is installed flush with the ceiling. The fan draws in air from the ceiling, heats it and gently forces it back into the room. The light is in the center of the unit.

☐ A supermarket in Beloit, Wis., has automatic washing machines so shoppers can have their laundry done while they shop.



RESTORING FADED TAPESTRIES

By Clinton R. Hull

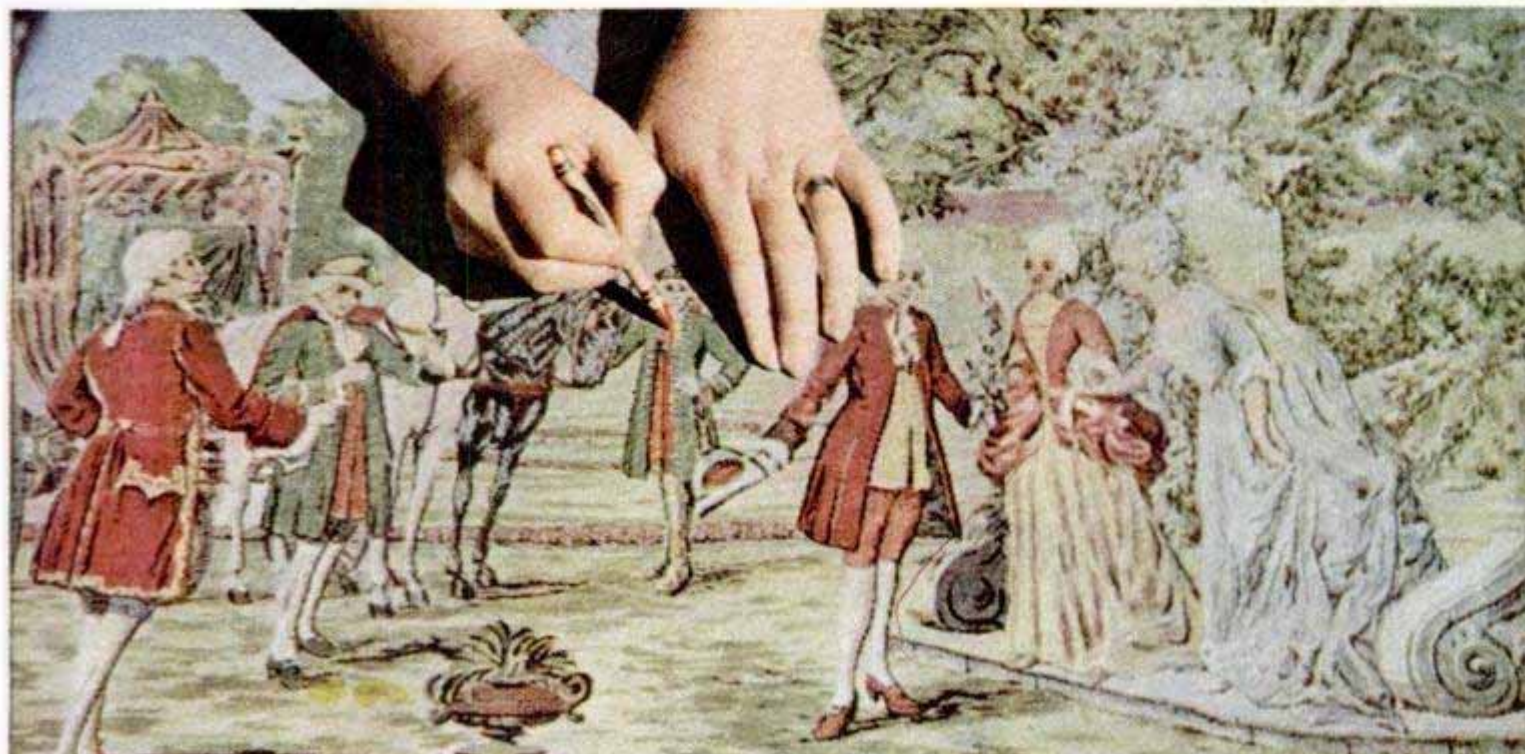
GOOD wall tapestries are expensive and yet, because they fade, many fine old pieces are discarded or tucked away in attic trunks to be forgotten. However, unless the cloth itself is damaged, it's no trick at all to restore faded tapestries to their original beauty, using nothing more than common wax crayons. The first step in restoring any tapestry is to wash it in mild, lukewarm suds and then dry it on a flat surface. Be careful to smooth out the edges so they will be straight and press with a medium-hot iron to remove any wrinkles. Coloring is done on a smooth hard surface, using a well-pointed crayon for following lines and dots. Hold the fabric taut between the thumb and fingers, as shown below, for even coloring and avoid overlapping of different colors on adjacent areas. This is particularly important in retouching faces. Use brilliant colors especially on Arabic,

Best results are had if colored crayons are applied to tapestry with a stroking rather than circular motion



Before-and-after examples show portions of faded tapestry restored to original beauty by crayon coloring

Italian and similar subjects. Although slightly off-color shades usually pass unnoticed on the over-all picture, it is well to check colors beforehand. While any of the colors may be removed with solvent and a blotter, it is not too easy, therefore care should be taken to avoid using the wrong shade. The colors may be more permanently set by covering the restored tapestry with wrapping paper and pressing it with a medium-hot iron. This tends to dull the brilliance somewhat and it will be necessary to again enliven the high lights with additional strokes of the crayon. Unless the tapestry is exposed to unusual wear, pressing is not absolutely necessary and restored tapestries even will stand gentle washing.



PLYWOOD DINETTE

Plainness of line plus a painted finish put this easy-to-build dinette set in the hammer-and-saw class. It's made mostly of plywood

MAYBE YOU want a lift from your present mixed group of dining-room furniture or, possibly, you have completed a new home and are looking for furniture you can build to outfit a small dinette. If so, here is a smart-looking set that is made to order for both the small home and the amateur cabinetmaker. Not only is it a junior size, it also does not require a lot of power tools

to build. Simplicity of design and joinery permits this furniture to be made with common hand tools if necessary. If, by chance, you should have a jigsaw or a bandsaw, for example, it can be used to speed the cutting of the curved parts, although they can be cut with a compass saw. In this case, they are cut slightly oversize, filed to the pattern line and finally sanded smooth. Where the

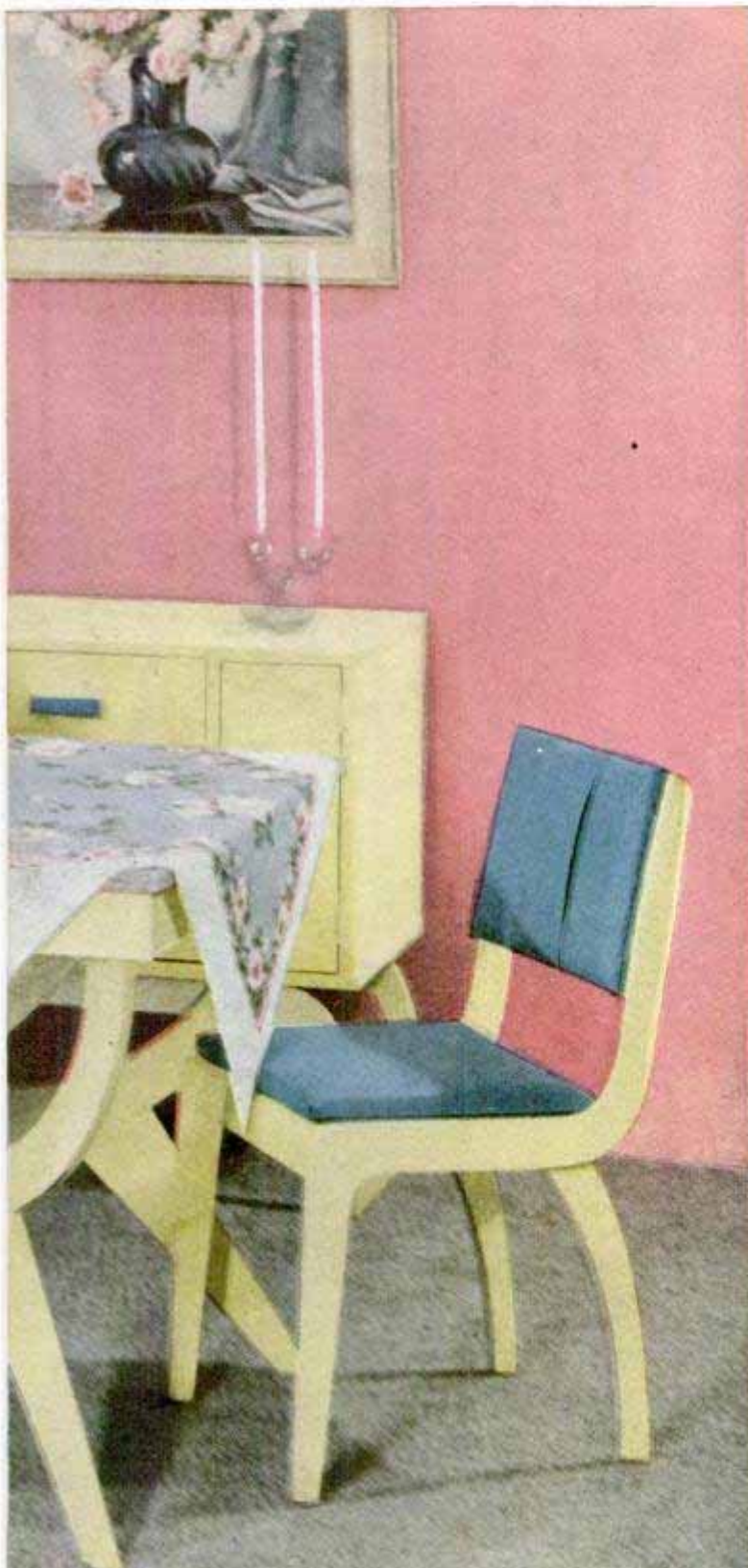


ENSEMBLE

drawings suggest rabbeted joints and you do not have a means of cutting them, cleats can be substituted where necessary. Thus, for the most part, this furniture can be built with a minimum of tools.

Lumber-core plywood is recommended for the table and chair legs rather than seven-ply material. The former has been found to give the necessary rigidity to this particular unsupported-leg design, and the lamination of the material gives great strength to the chair backs. If your local

PM color photos by Paul T. Hutchinson



Styled by John Bergen

Two-in-one functional unit serves as either buffet or combination china cabinet when topped with separate upper section. Choice is had between this unit and the conventional corner type shown at the left

lumber dealer does not stock lumber-core plywood, he no doubt will be glad to order it for you.

The complete set features seven pieces, which include a minimum of four chairs, table and a choice of either a corner china cabinet or a functional dual piece. The latter is designed to serve alone as a buffet. Complete, it will serve as a combination buffet and china cabinet. Unless your dinette is roomy, you probably will not build both. In the case of the corner china cabinet, the upper part lifts off for convenience during periodic rearrangement of the furniture. The original table top, including the extra leaf, was covered with linoleum and trimmed with a stock metal counter edging. However, the top also can be covered with



Plastic-upholstered seat and back cushions, padded with foam rubber, are easy to clean with a damp cloth. Upholstery is tacked to underside of plywood board which, in turn, is attached to chair with screws

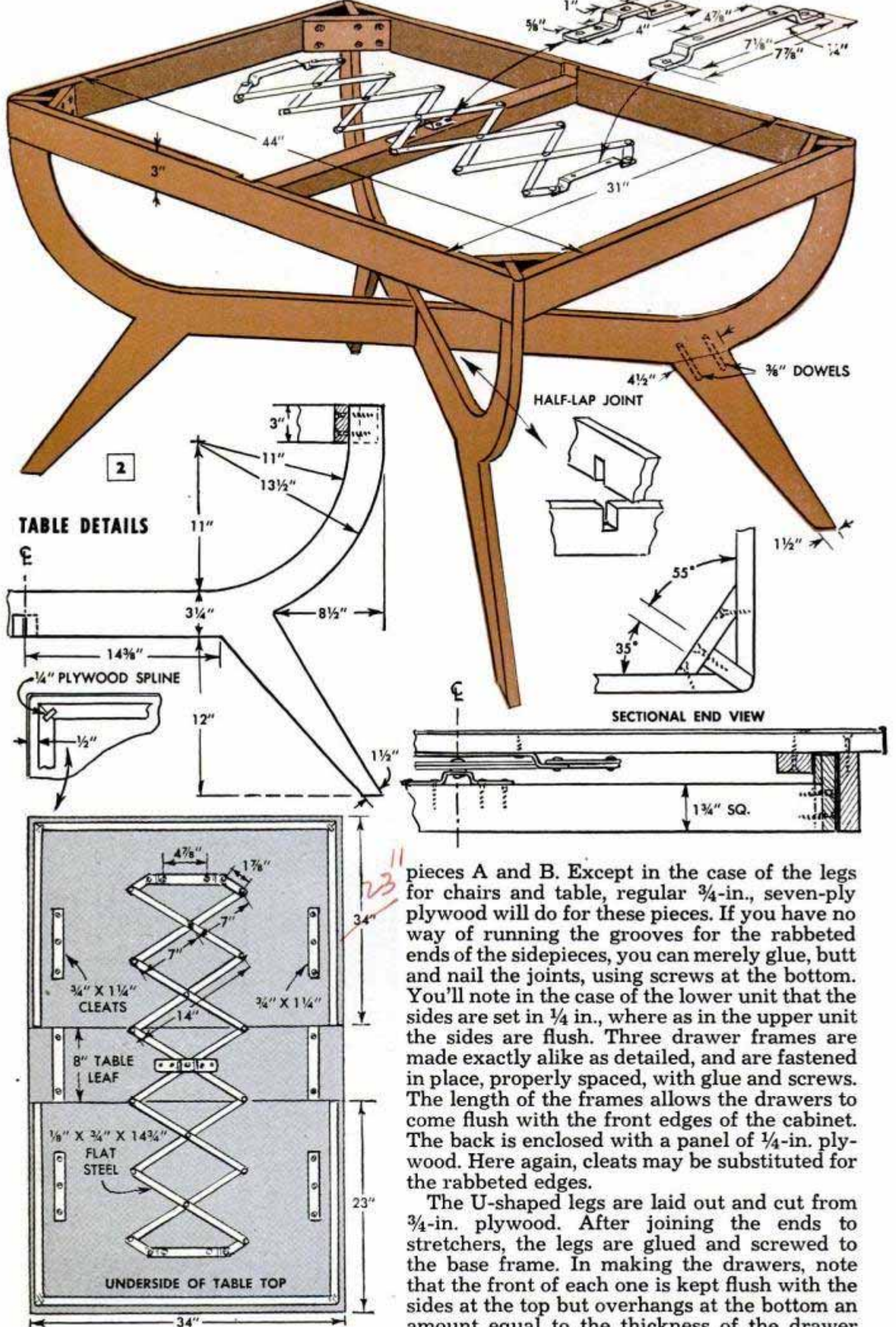
Extension table operating on "lazy tong" equalizer is designed for an extra leaf to increase seating capacity to six persons. Plastic or linoleum top, trimmed with metal edging, matches color keynote

any of the new plastic laminates which are practically impervious to wear. Or, the top surface can be painted like the rest of the table. The two halves of the extension top actually ride on furniture glides applied to the top edge of the table framework, with each section being fastened to a lazy-tong type of equalizer which actuates both sections when one is pulled open. The chairs feature padded cushions consisting of a plywood board upon which foam rubber is placed. They are upholstered with a plastic fabric brought around and tacked to the underside of the plywood. While the original set was made of poplar plywood and was painted cream and blue, it may be constructed of hardwood-faced plywood and varnished or lacquered.

The particular design of the chairs lends itself to mass cutting if a bandsaw is available. Nesting the patterns of identical units to economize on material and then roughing out permits stacking so that four or more units can be cut at one time. It is best to figure on cutting the duplicate U-shaped parts of the table and buffet in pairs to assure identical members.

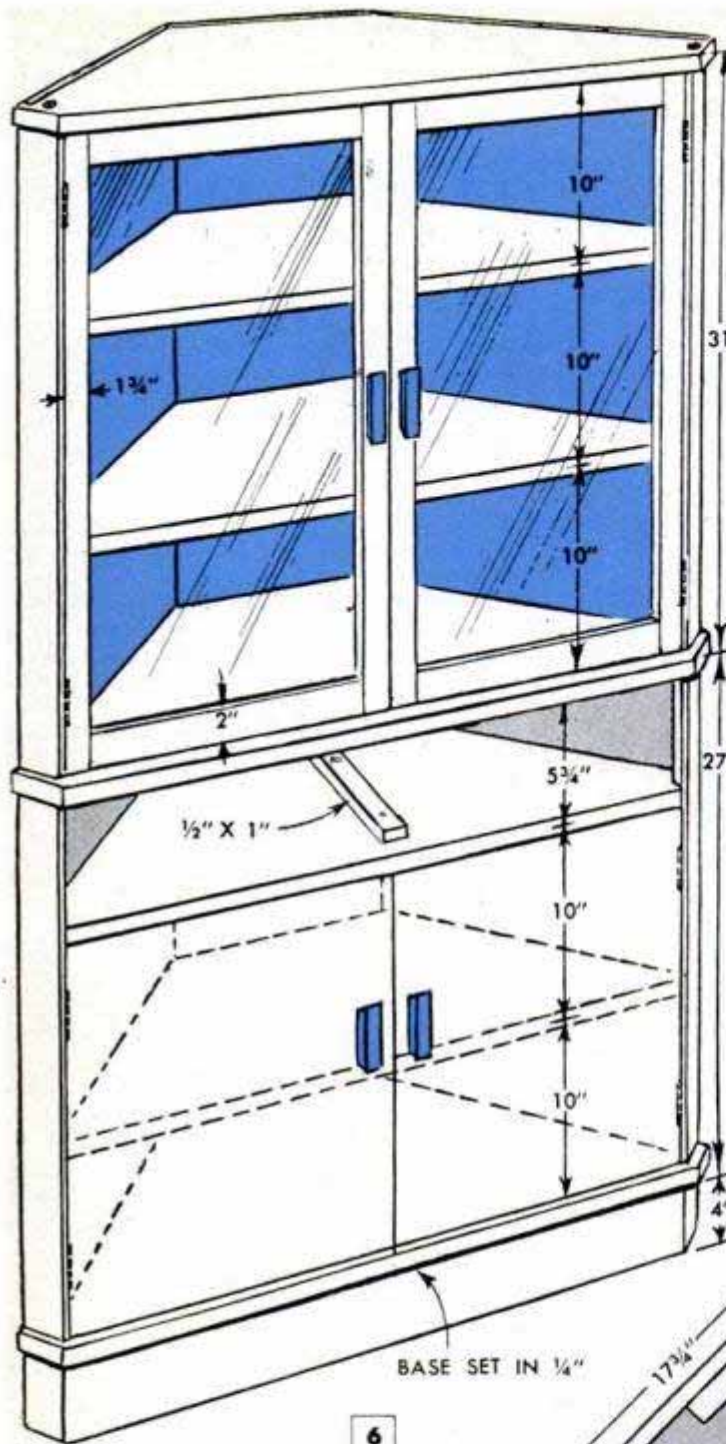
Buffet-china cabinet: Construction drawings for both units of the combination buffet and china cabinet are given in Fig. 1. Begin the lower unit by first making the base frame which measures 18 x 34 in. over all. This is doweled at the corners and notched and grooved for the sides and partitions,



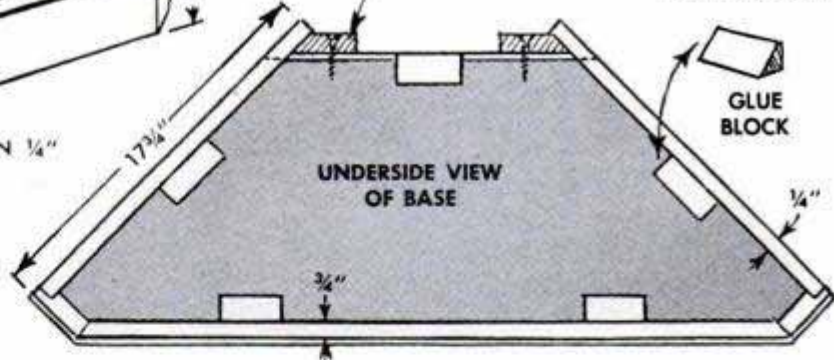
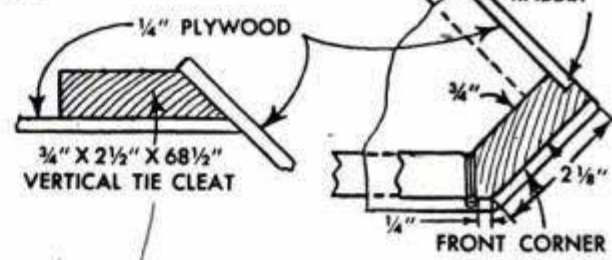
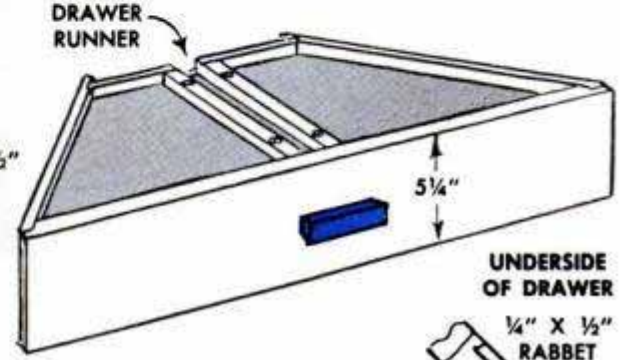
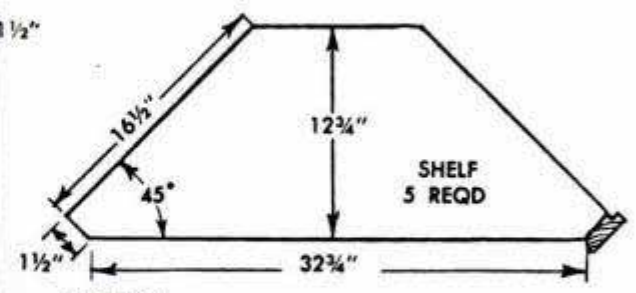
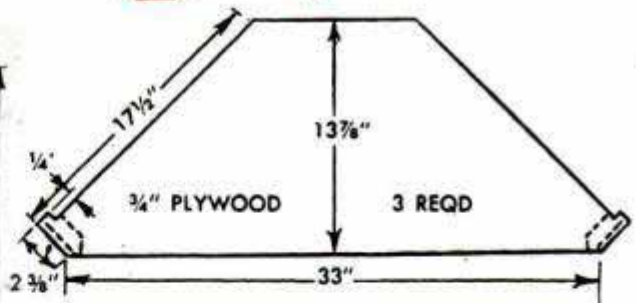


pieces A and B. Except in the case of the legs for chairs and table, regular $\frac{3}{4}$ -in., seven-ply plywood will do for these pieces. If you have no way of running the grooves for the rabbeted ends of the sidepieces, you can merely glue, butt and nail the joints, using screws at the bottom. You'll note in the case of the lower unit that the sides are set in $\frac{1}{4}$ in., where as in the upper unit the sides are flush. Three drawer frames are made exactly alike as detailed, and are fastened in place, properly spaced, with glue and screws. The length of the frames allows the drawers to come flush with the front edges of the cabinet. The back is enclosed with a panel of $\frac{1}{4}$ -in. plywood. Here again, cleats may be substituted for the rabbeted edges.

The U-shaped legs are laid out and cut from $\frac{3}{4}$ -in. plywood. After joining the ends to stretchers, the legs are glued and screwed to the base frame. In making the drawers, note that the front of each one is kept flush with the sides at the top but overhangs at the bottom an amount equal to the thickness of the drawer



CORNER CHINA CABINET



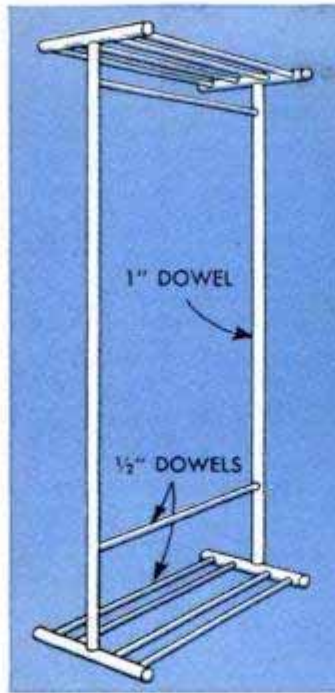
The back stretchers are then installed in the same manner and a cleat is fitted at each side for additional strength. Small angle brackets placed at the front and back rails are used to attach the seat, while the back cushion is fastened in place by driving screws through the two back rails, Fig. 6. Fig. 5 shows how the cushions are made and how the upholstery on the back cushion is divided equally with two folds before drawing it around the edge and tacking to the back. The raw edges of the material on the back are covered with a separate piece, hemmed around the edge and neatly tacked with blued gimp nails.

Corner china cabinet: This cabinet also is

made in two separate units which are held together with two long cleats screwed to both units at the back. Start by cutting out the shelves, making three of one and five of the other. The sectional view at the front corner shows how posts are fitted and screwed to the top and bottom shelf members. Plywood, 1/4 in. thick, is used to enclose the sides and back of both units and then the shelves are installed and nailed from the outside. A 4-in. base is added to the lower unit and attached with glue blocks as indicated in the underside view. Both the solid and glass doors are hinged in an identical manner to the front posts and finally the triangular drawer is added.

Designed especially to fulfill Lilliputian wardrobe requirements, this clothes rack will encourage tiny tots to hang their clothing and put away hats and shoes in an orderly manner. The rack, which is constructed entirely from lengths of dowel, is 2 ft. wide and stands head high to the child. Cut from 1-in. dowel, the uprights and endpieces may be assembled with screws, dowel or half-lap joints. After sandpapering all the pieces, assemble them first to see if they fit properly. This done, take the rack apart and reassemble it, this time using glue. Now paint or lacquer it to complete the job.

Miniature Clothes Rack Constructed From Dowels Teaches Small Children Orderliness



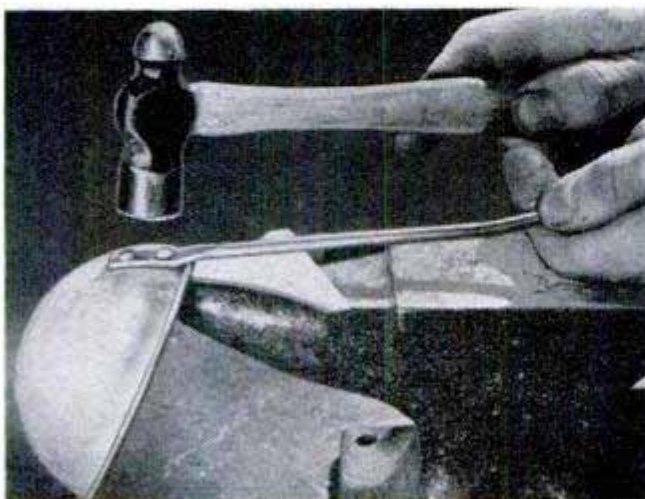
Typewriter Ribbon Taped to Paper Used in Tracing Border Designs

Taped along both edges to drawing paper or various textiles, discarded typewriter ribbons may be used for tracing border designs, provided that they are no wider than the ribbon. Unlike carbon or other tracing papers, the ribbon will withstand considerable pressure applied directly from

a pen or pencil without being punctured. For this reason, use of the ribbon offers the possibility of a number of design effects, obtainable mainly through the application of varying pressures on the tracing implement. The ribbon may be kept on the spool and any length desired cut off as needed.

Protecting Heads of Rivets While Peening Them

When installing new rivets or tightening old ones in kitchen utensils, tools and other articles, the rounded heads can be protected while being hammered by resting them on a sheet of soft aluminum, copper or lead which, in turn, is supported by a steel block or an anvil. If round rivet heads are backed by hard metal, such as steel, they will be flattened or otherwise marred.



Lubricating an Electric Clock

An excessively noisy electric-clock motor usually indicates a lack of oil, which can be applied to most motors without opening the case. To do this turn the motor so that the exposed pinion is at the top and, while warming it with the heat of a 60-watt bulb, apply a few drops of light household oil to the pinion. During the operation small bubbles will appear. As soon as the bubbling ceases remove the heat but continue to apply oil that will be drawn in around the pinion as the water cools.

Herman J. Hoffmann, Dakota City, Iowa.

Bumper Jacks Placed Under Trailer Provide Support While Parked

One trailer owner found that four bumper jacks, placed under the corners of a trailer, eliminate practically all sway and movement while the vehicle is parked. The jacks are of the double-expanding ratchet type and may be raised or lowered sufficiently for this operation without requiring the use of jack handles.

Clinton R. Hull, Costa Mesa, Calif.

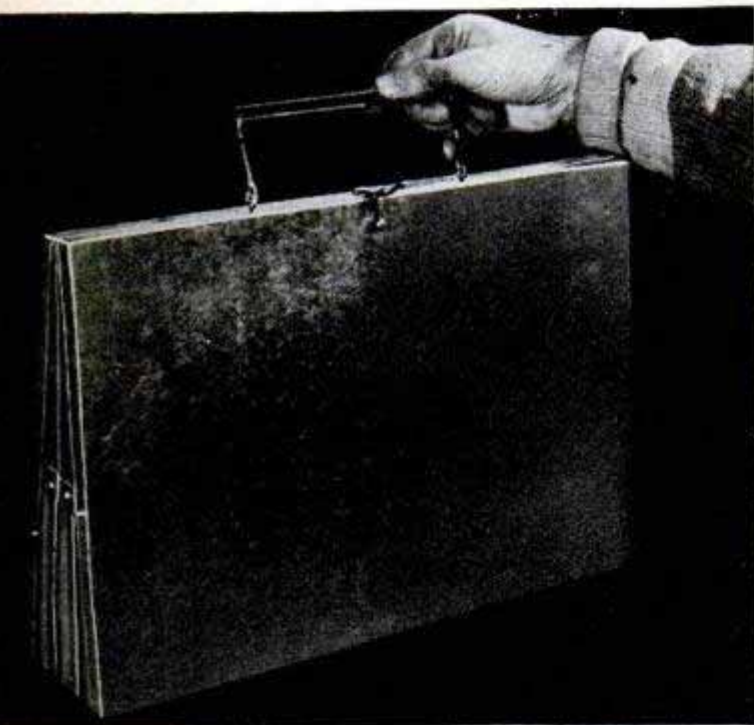


While the biscuits are shown in a pan for convenience in handling, food can be placed directly on the shelf

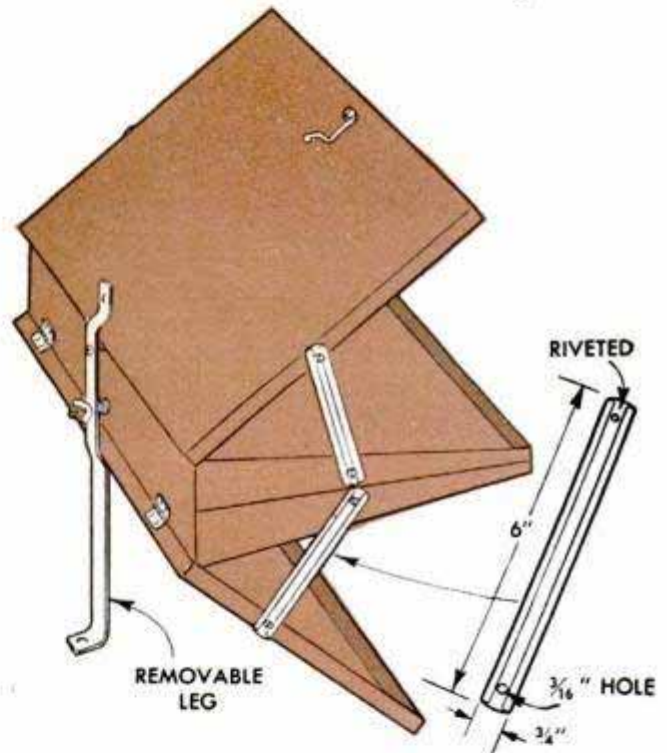
REFLECTING CAMP OVEN

By Walter E. Burton

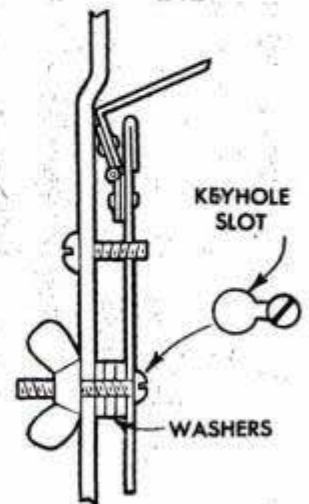
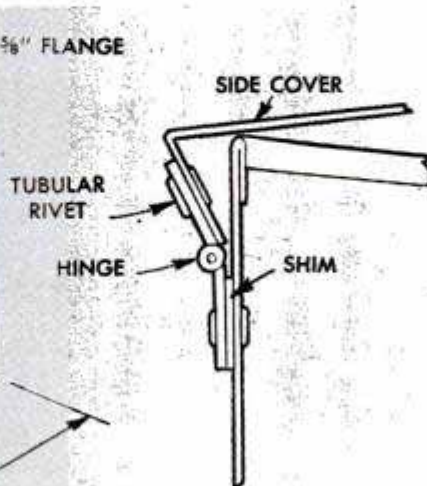
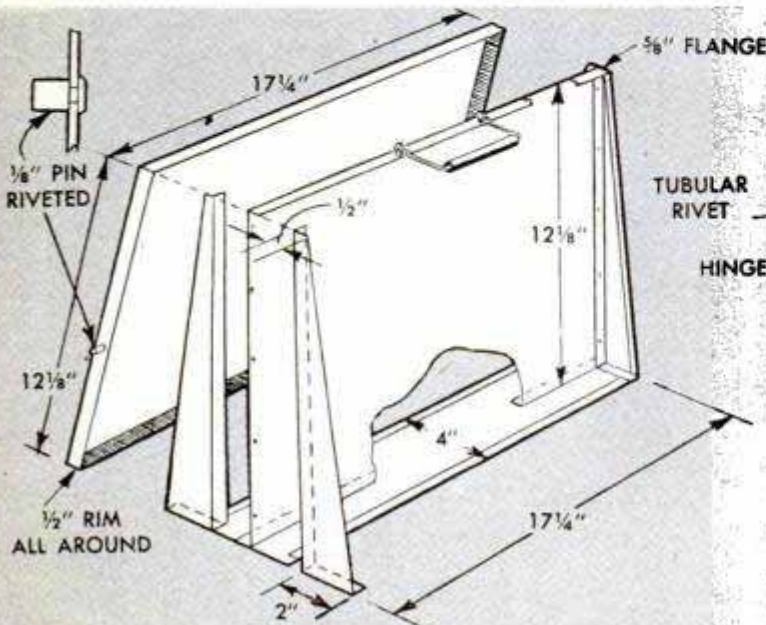
LIKE ANY reflector-type oven, this one is designed to be placed in front of an open fire where two inclined covers reflect heat waves against a center shelf on which food is placed. While the oven itself can be made of almost any sheet metal, the two reflecting surfaces should be of bright metal, such as polished aluminum or tinned sheet metal. Although not as good, bright galvanized iron will do for the reflecting surfaces. To help hasten heat absorption, it sometimes is helpful to blacken the underside of the center shelf with shoe polish.



Folded, the oven resembles a neat, metal brief case. Pivoted arms fold flush with sides of oven proper



This rear view of oven shows supporting leg and arms which snap in place to hold reflecting covers open

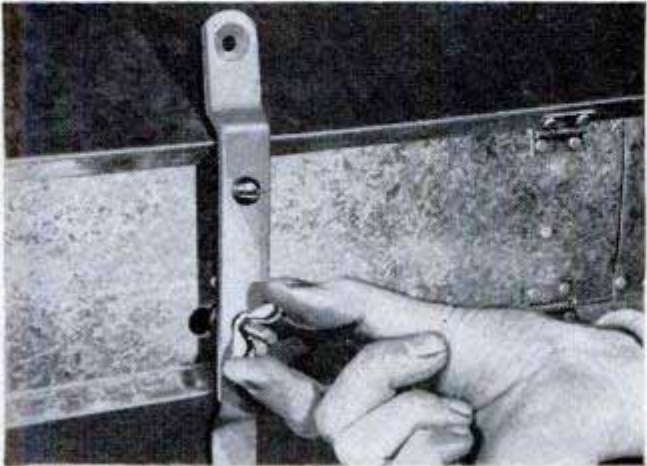




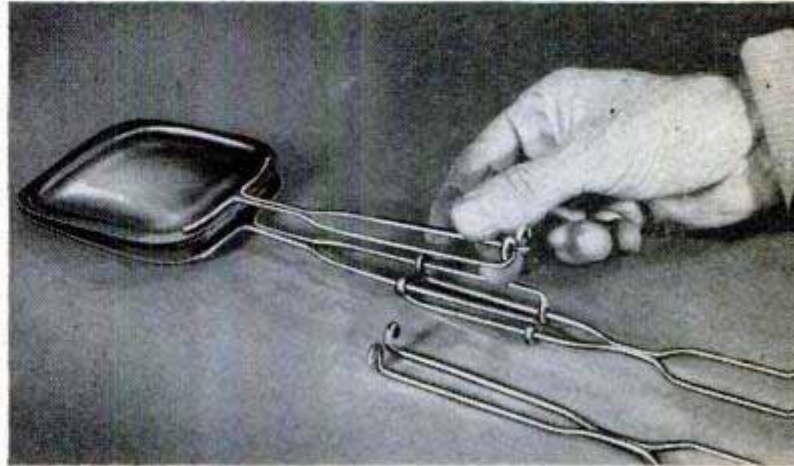
Cooking accessories, such as hamburger grill, fork and toaster, plus oven leg, all store inside the oven



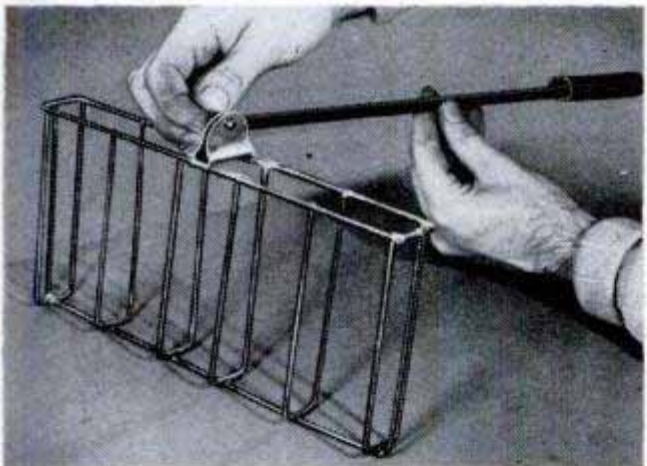
The latch is formed of stiff wire, each part being attached to respective covers with sheet-metal screws



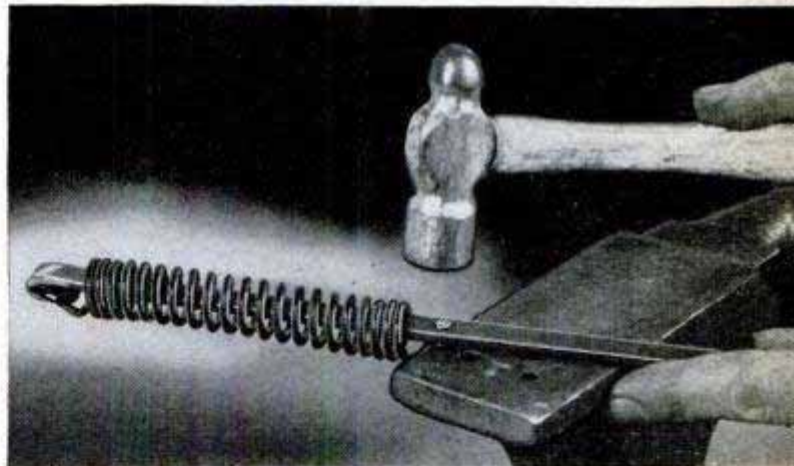
Leg which supports oven is made removable by means of horizontal keyhole slot which disengages screw



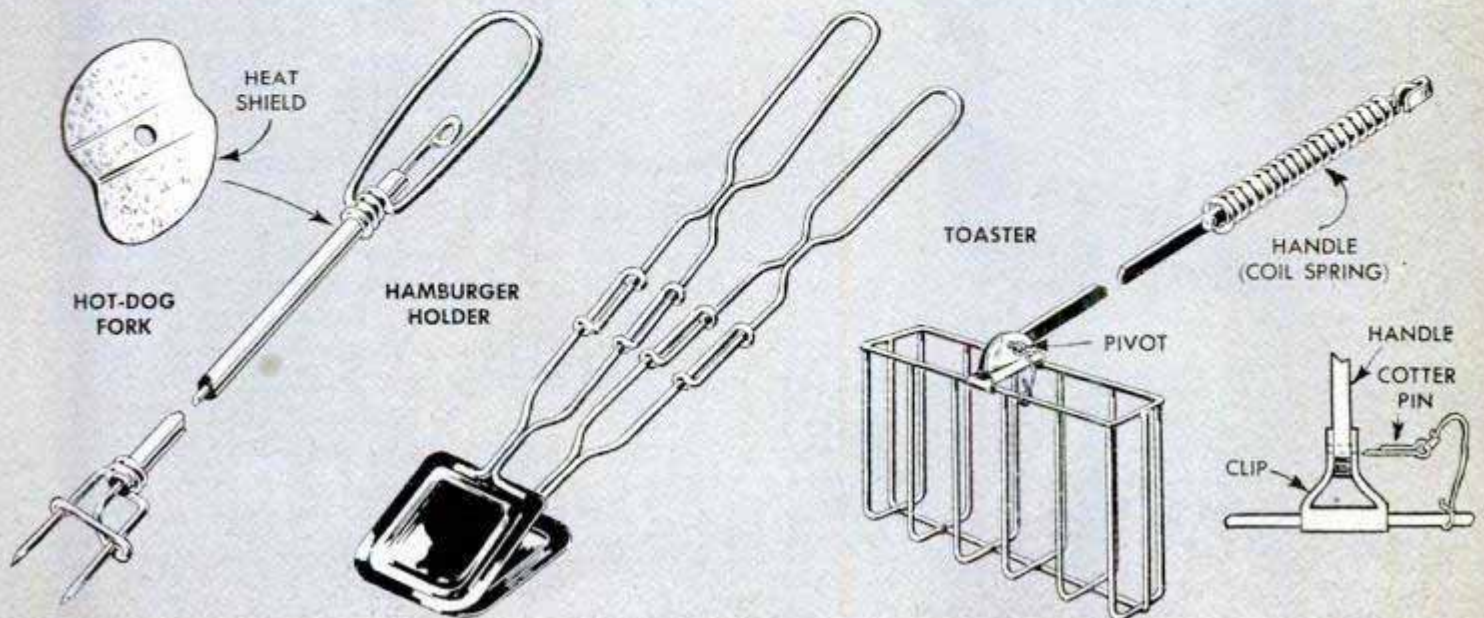
Commercial hamburger grill is used and the handles shortened so that unit can be stored inside the oven



The basket-type toaster holds two slices. Cotter pin in pivoted handle permits removal for storing



Toaster handle is fitted with "cool" grip formed by riveting coil spring to looped end of flat steel rod

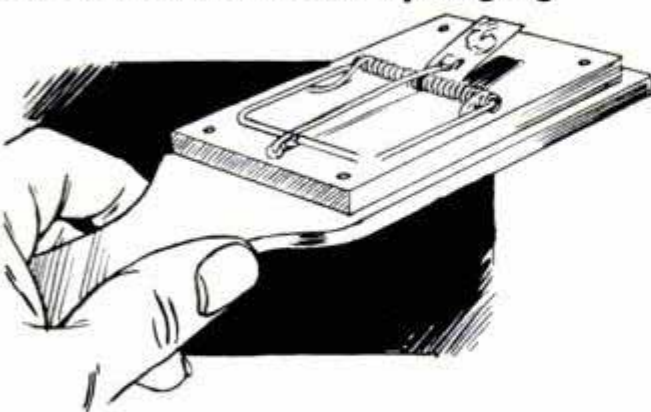




Handy Lawn-Mower "Holster" Carries Grass Clippers

Fastened to the handle of your lawn mower, this handy "holster" will keep your grass clippers close at hand for ready use whenever you are mowing a lawn. Cut from an old inner tube, a piece of rubber slightly longer than the clippers is wrapped around the mower handle and tacked in place at the lower end. The upper end of the rubber is cut to form a tab for easy insertion of the clippers.

Mousetrap Fitted With Handle Prevents Accidental Springing

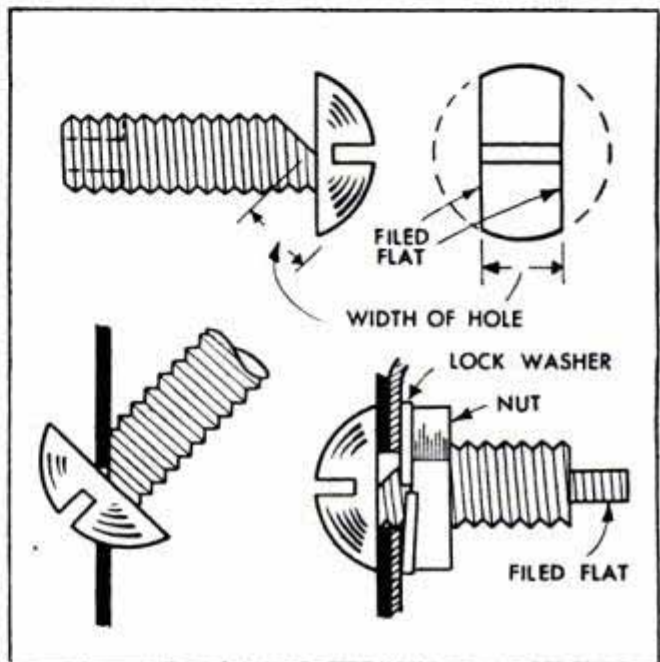


Placing a mousetrap after it has been set is a touchy job most people, especially women, dislike because of the fear of accidentally springing it. This fear is overcome to some extent by fitting the trap with a

long handle in the form of a wooden paddle. The long handle makes it much more convenient to place the trap under a bed or low dresser, and also to retrieve it. In addition to adding the handle, a length of string can be tied to the wire jaw so that the trap may be emptied without actually touching it.

Attaching Object to Thin Metal When One Side Is Accessible

This specially prepared screw will enable you to attach an object to a sheet-metal surface where only one side is accessible. Obtain a round-headed screw which is approximately $\frac{1}{2}$ in. longer than the total depth of the thicknesses through which it must pass,



and which has the same diameter as the hole to be drilled. Use a small triangular-shaped file to notch halfway through the screw just behind the head. Now file the head of the screw flat on two sides as shown. In the same manner, file the end of the screw shank flat, to provide a grip for the pliers when tightening. Insert the screw in the hole and mount the piece to be attached, followed by a locknut. Grip the end of the screw with the pliers and tighten.

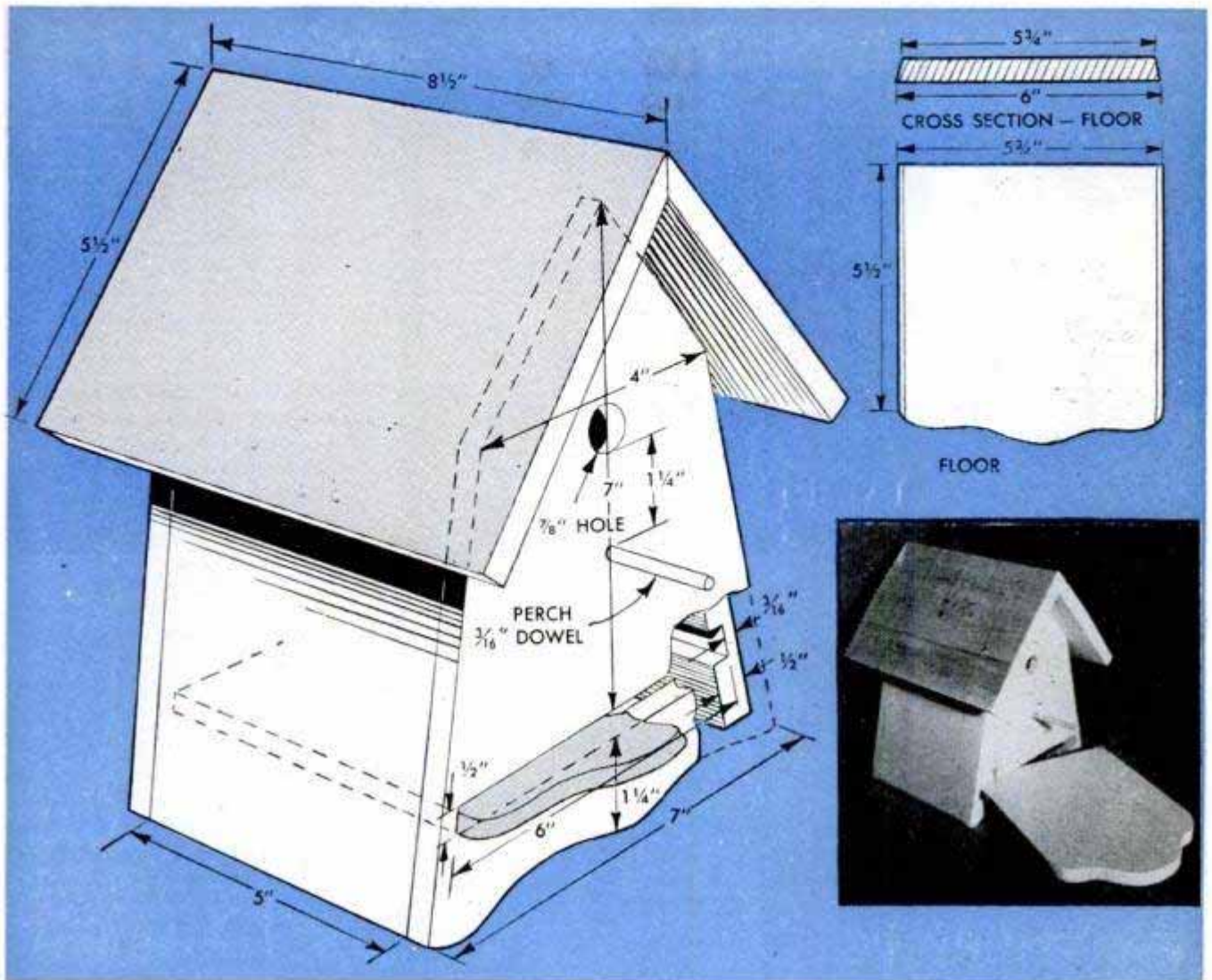
Ronald Tevonian, Forest Hills, N. Y.

Inexpensive Serving Trays From Cookie Sheets

Colorful serving trays may be made at little cost from large baking sheets of the type used for cookies. These are available at the dime store and are converted by painting them with enamel. If desired, decal transfers may be applied and the entire surface coated with clear shellac. Or, simply place a plastic serving mat in each tin.

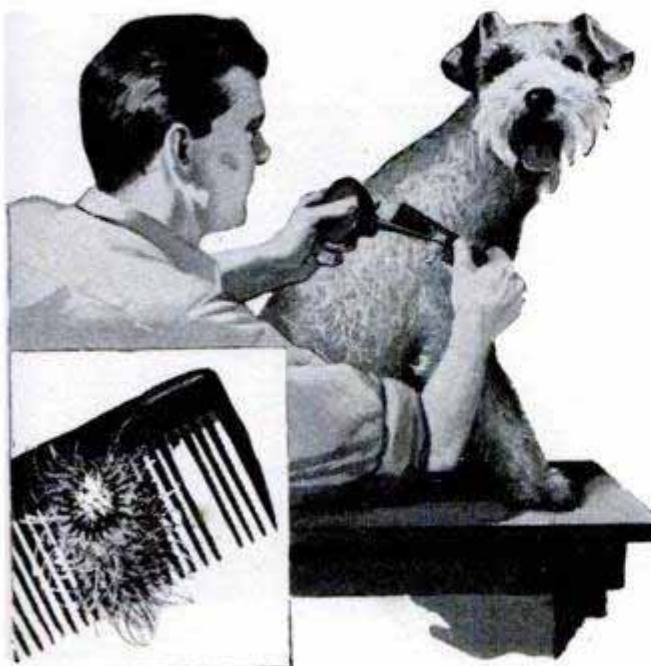
Blanche Campbell, Las Vegas, Nev.

WREN HOUSE FEATURES PULL-OUT FLOOR



Differing primarily in its provision for cleaning, this little wren house, with its pull-out floor, is a natural sales item that will start the enterprising home craftsman in business. A few simple jigs to assure identical parts will permit quick mass production of the house. In addition, assembly time is lessened by not having a bottom to nail in place. Dowel perch may be omitted, as the projecting floor serves as a built-in ledge

Burs in Dog's Hair Removed Easily When Softened With Light Oil



To spare both you and your dog the ordeal of removing burs that have become entangled in his hair, try this simple stunt of softening them by applying a few drops of a light machine oil or hair oil. This will enable you to comb the burs out easily without causing the dog discomfort.

Defrosters Dry Dirty Car Windshield To Facilitate Cleaning

By turning on the defrosters fully, you can quickly dry any muddy water that has splashed on a car windshield, after which it can be wiped off with a cloth. This will prevent smearing the dirt on the windshield, as it will if you attempt to remove it with the windshield wipers or by wiping it with a cloth when wet.

Jack Probst, Royal Oak, Mich.

Solving HOME



SERVING CUSTARDS or gelatine desserts on a picnic is simplified by using ordinary ice-cream cones as containers. The cones not only cut down the number of dishes necessary to carry along, but also prove especially appealing to the children

● **RAISINS** added to a cake batter usually sink to the bottom instead of remaining evenly distributed. To prevent this, dip the raisins in melted butter and sprinkle with flour before stirring them into the batter

● **YOUR VACUUM CLEANER** will do a quick, neat job of removing dust and grime from the back of the refrigerator and its motor compartment. Turn off refrigerator and then vacuum with the long furniture attachment

● **RAW POTATO** removes stubborn iodine stains from linoleum. Cut a slice from the potato and place it over the stain. Allow the potato to remain on the stain until all traces of the chemical have been absorbed

● **VENETIAN-BLIND CORDS** will last longer if they are rubbed thoroughly with beeswax. This affords smoother operation and prevents abrasion when cords scrape edges of slats. Renew beeswax after cleaning cords

● **PINT MILK BOTTLE** fitted with spray head forms handy clothes sprinkler. Cork is selected to suit neck of bottle and is drilled through the center for head from garden sprinkler. Head should be wedged in cork



REMOVING PAPER stuck to polished furniture is done without marring the finish by dabbing the paper with cooking oil and rubbing briskly with a cloth. Paper then can be peeled off readily



CORRUGATED CARDBOARD provides a convenient holder for storing and carrying crochet hooks. Hooks are inserted in corrugations and holder is left flat for storing or rolled and bound with a rubber band

PROBLEMS

SO YOU WON'T BE LOCKED OUT by the screen-door hook accidentally dropping into the eye when the door is slammed, simply fasten the hook to the doorstep or casing and the screw eye to the door frame itself

TO KEEP RUGS and carpets looking new sweep them once a month with a broom dipped in hot water to which a little turpentine has been added. This also helps protect the rugs from damage by moths

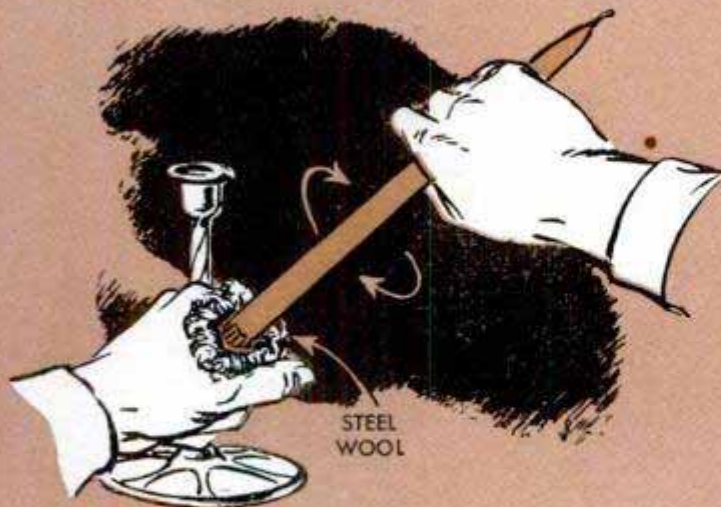
WOODEN CLOTHESPIN serves as emergency doorstep. Place clothespin on edge and press down on its upper arm while sliding pin under door. Tension of arms usually is sufficient to hold the door securely in place

WATER SCALE is removed from graniteware or enameled kettle by boiling out with solution of 1 qt. water, 1 tbs. salt and juice of 1 lemon. Add 1 tsp. vinegar to hot solution, boil from 20 to 30 min., wash and dry

LINING COPPER PLANTERS and flowerpots with aluminum foil eliminates possibility of plant being killed by copper corrosion. Edge of the foil can be tucked inside rim of the planter so the foil is not noticeable



LARGE FUNNEL is just the thing for applying fertilizer to individual plants. By holding the funnel as pictured and covering the spout with the fingertip, the fertilizer can be dispensed exactly where needed and the amount can be controlled easily



USE STEEL WOOL to quickly reduce the diameter of a candle so it will fit holder. Wrap the steel wool around base of candle and, holding wool tightly, turn the candle to remove wax evenly from all sides



WAX PAPER keeps screw-type lids from "freezing" on jars in which paint is stored. Wipe both cover and jar thread clean and put square of wax paper over the jar mouth just before replacing the cover

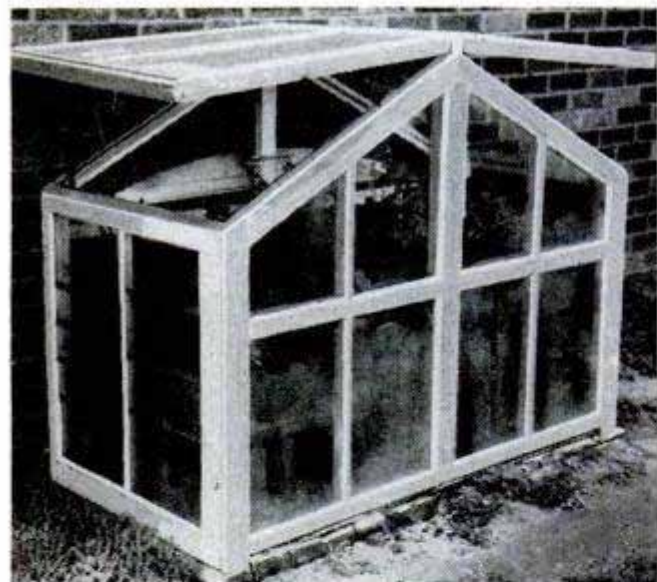
Wire Cradles Support Bottles Under Refrigerator Shelves



Suspended from shelves of a home refrigerator, pieces of coat-hanger wire bent to form cradles as shown will provide useful out-of-the-way storage for bottled beverages. The bottles can be slipped in or out of the cradles easily and utilize space that ordinarily is wasted.

Bess Ritter, New York City.

Miniature Hothouse Is Heated By Air From Basement



Supported on a brick foundation in front of a basement window, this small hothouse uses heat from the basement to maintain an inside temperature suitable for growing plants. A thermostat inside the house controls a fan which blows in warm air when the outside temperature drops below freezing. In cold climates it may be necessary to bring air directly from the furnace to

the hothouse. Assemble the hothouse from window sash, hinging the two sash that form the roof to provide ventilation on warm days. All joints should be sealed against entrance of cold air. Cleats may be fastened to the frames inside the end sash if desired, to support narrow shelves for holding small flower pots.

Grover Brinkman, Okawville, Ill.

Paper Plate Catches Paint Drippings

When painting directly from a can or improvised container, an ordinary paper plate placed under the container will effectively catch paint that overflows the rim and drips from the brush. The plate will also serve as a convenient resting place for the brush when not in use.



"Splints" for Misshapen Brushes

When the bristles of a paintbrush become misshapen because of improper handling or storage, they usually can be returned to their original shape by use of cardboard "splints." After the brush has been cleaned, ready for storage, cut a piece of cardboard equal to the width of the bristles and a little longer than twice their length. Carefully shape the bristles, fold the cardboard over them as indicated, and bind it with three or four rubber bands. After a period in storage the bristles usually will regain their original shape.—Ken Murray, Colon, Mich.

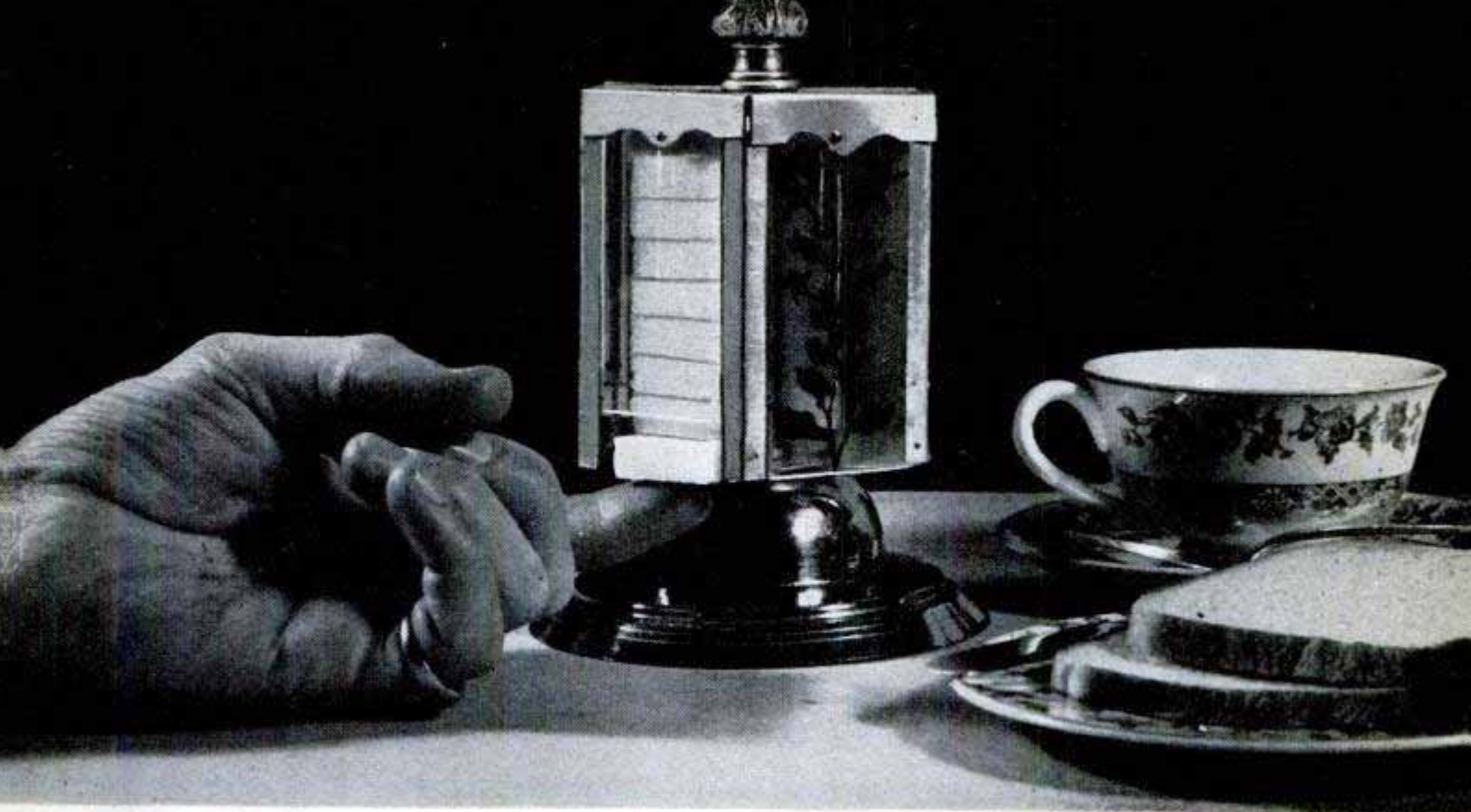


Paraffin Rustproofs Zippers

To keep new zippers from becoming rusty and difficult to work, rub them with a block of paraffin or a wax candle. Occasionally coat the zippers with the paraffin or wax as this will lubricate them as well as retard rust.

Blanche Campbell, Las Vegas, Nev.

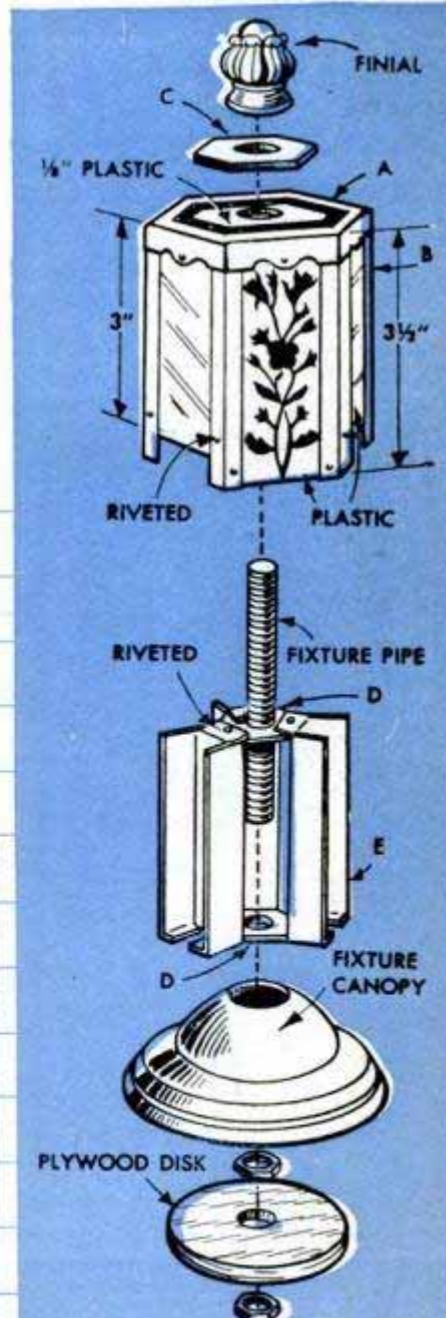
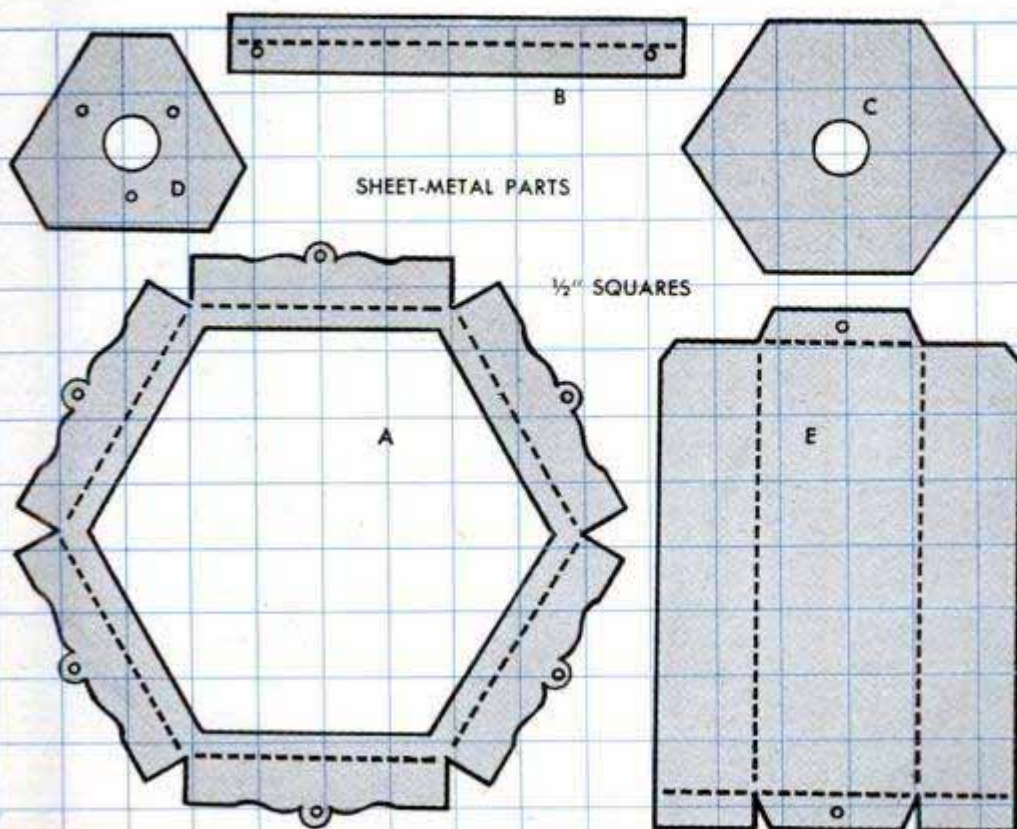
☐ Bottle corks which have become undersized due to long usage can be brought back to normal size by boiling in water in a covered pan.



LOAF-SUGAR DISPENSER

By Charles and Bertram Brownold

PATTERNED after a glass antique, this attractive sugar dispenser holds three stacks of sugar loaves so that the bottom loaf can be removed from each stack with the finger tip. The parts, shown in the pattern below, are cut from any workable sheet metal of a gauge heavy enough to hold its shape. The sugar channels, part E, are bent in a simple wooden form and are riveted to two endpieces, part D. Side panels and top are cut from clear plastic and riveted to frame, A, and six corner members, B.





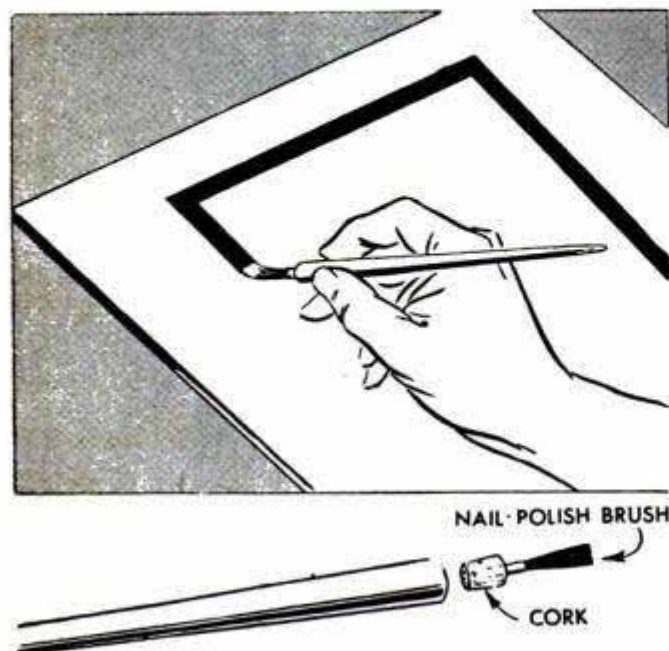
Caster Cup Used as Coin Tray At Refreshment Booth

Noting the difficulty experienced by customers in picking up change from the tables or counters of bazaar booths, especially when one or more coins might roll onto the floor, one lady provided each booth with a large castor cup. These permitted the change to be deposited without spilling or rolling and allowed the customer to gather it up with a single motion of his hand.

G. E. Hendrickson, Argyle, Wis.

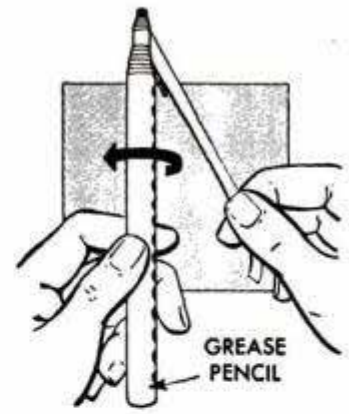
Nail-Polish Brush Can Be Used For Lettering and Line Work

A brush taken from a discarded nail-polish bottle and fitted into the handle of a penholder will provide a good drawing or lettering brush for producing lines up to $\frac{1}{8}$ in. wide. It may be necessary to fit the shank of the brush into the large end of a cork and ream the end of the penholder to take the cork, which is then wedged or cemented into place. The tip of the brush may be feathered to a point, if desired, for doing fine work.



Way to "Sharpen" Grease Pencils

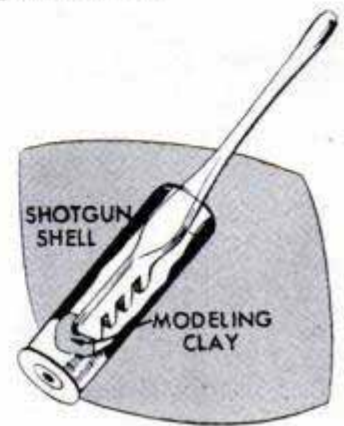
After the tab string is pulled back well beyond the first circle marking, a grease pencil may be "sharpened" more easily by unwinding the paper coil in an outward and downward direction. This action causes the paper coils of the pencil to separate cleanly on the scored line as the pencil is rotated.



Warren C. Riter, Rochester, N. Y.

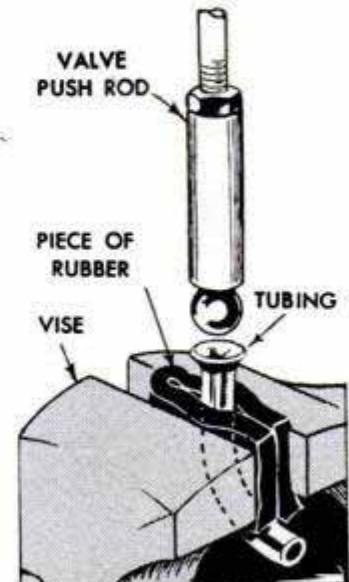
Glass Cutter Provided With Case Made From Shotgun Shell

To protect the sharp edge of a glass-cutter wheel from damage by other tools in a tool kit or drawer, store the cutter in a case made from a shotgun shell. Place a small portion of modeling clay or oil-soaked cotton in the bottom of the shell and, after the cutter has been placed in it, fold the top edge of the shell inward to hold the cutter in place.



Valve Push Rod Flares Tubing

Flaring of small-diameter metal tubing is done quickly and easily by using the ball end cut from a car-valve push rod. Cut the rod to a convenient length and mount the tubing in a bench vise, folding a piece of rubber around the tubing to cushion it from the vise jaws. Then place the ball end of the rod in the opening of the tubing and tap the rod with a hammer until the desired amount of flare is obtained. Be sure the tubing is secured near the end to be flared so that it will not buckle. — W. Shields, Bloomington, Ill.

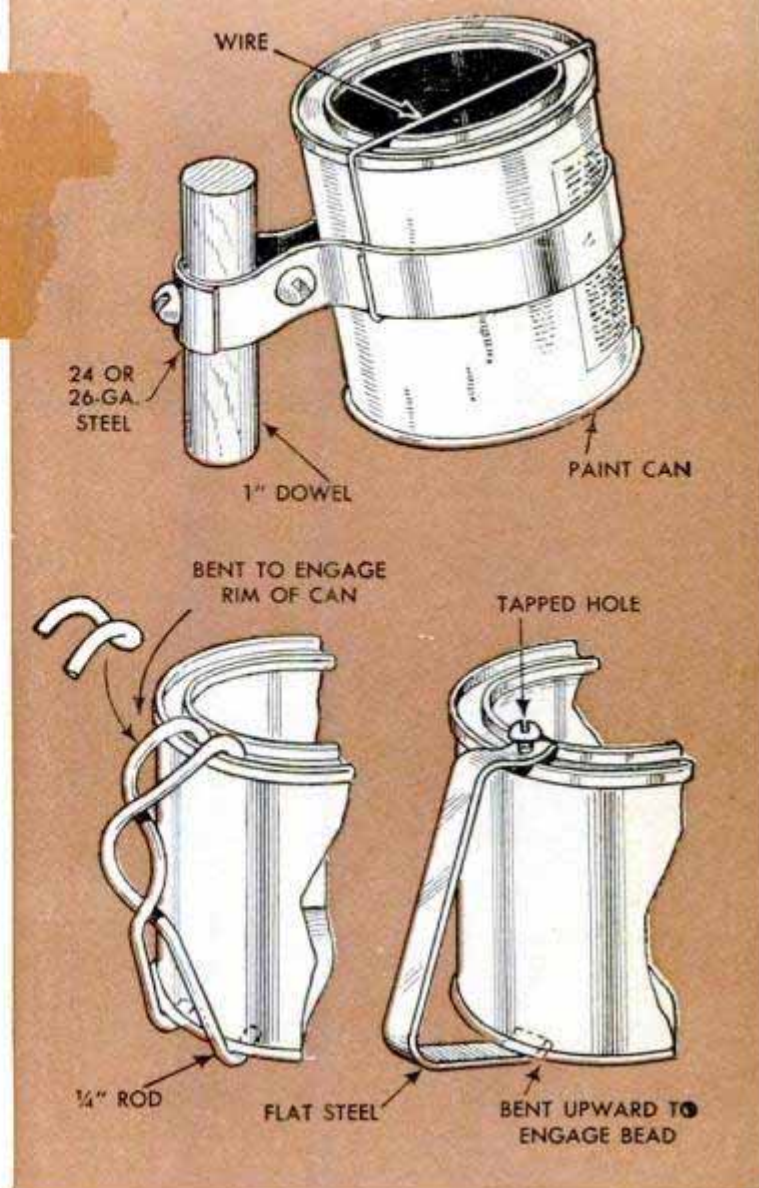


PAINTING HINTS

By
John Strickler

HOLDING a paint can without getting a handful of paint is no trick when you have one of the paint-can handles detailed at the right. Chances are that you have a piece of sheet metal, flat steel or a length of $\frac{1}{4}$ -in. rod on hand to make one of the three types of handles in just a few minutes. Note in the upper detail that a length of wire is stretched across the top of the can. With this, you can remove surplus paint from the brush without filling the rim channel of the can. The lower right-hand photo pictures a wooden paintbrush scraper that will cut your brush-cleaning time in half. Bevel one end of a piece of scrap wood to a chisel edge and, resting the brush on a flat surface, rub the bristles with the edge of the block. Start at the ferrule and work toward the ends of the bristles, forcing out excess paint which has accumulated in the center of the brush directly below the ferrule.

Paint-can handle of flat steel shown in use. Handle is bent to provide plenty of clearance for fingers



Hard-to-remove paint is pressed from brush with wooden block, as shown. Front edge of block beveled



Long-Lasting Crack Filler Has Cornstarch Base

If you have tried using glazier's putty as a crack filler for a wooden floor and found that it would not adhere, make a filler by adding a mixture of linseed oil and turpentine, as well as a little drier, to ordinary cornstarch. After kneading the materials to a puttylike consistency, coat the

cracks with linseed oil and press the substance into them with a putty knife. When hardened, sandpaper it to the level of the floor. If the floor is to be varnished, stain must be used to make the filler match the floor. Daub stain on the filler with a brush to obtain the desired color.

PLAN of the MONTH...



YACHT CHAIR

MATERIAL LIST

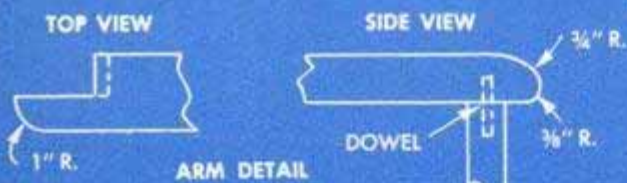
(Maple, Birch or Oak)

Yacht chair

- 4 pcs.—1½" x 2½" x 27¼"—Legs
- 4 pcs.—1½" x 2½" x 19"—Side rails
- 2 pcs.—1½" x 3" x 16"—Back posts
- 2 pcs.—1½" x 2½" x 5¾"—Arm stumps
- 2 pcs.—1½" x 2½" x 17½"—Arms
- 1 pc.—10" x 25"—Back (canvas)
- 1 pc.—15½" x 27"—Seat (canvas)
- 1 pc.—1" x 16¾"—Dowel
- 2 round-head wood screws, 3½-14
- 6 oval-head wood screws, ¾-10, and cup washers
- 4 butt hinges, 2" x 2"

Steamer chair

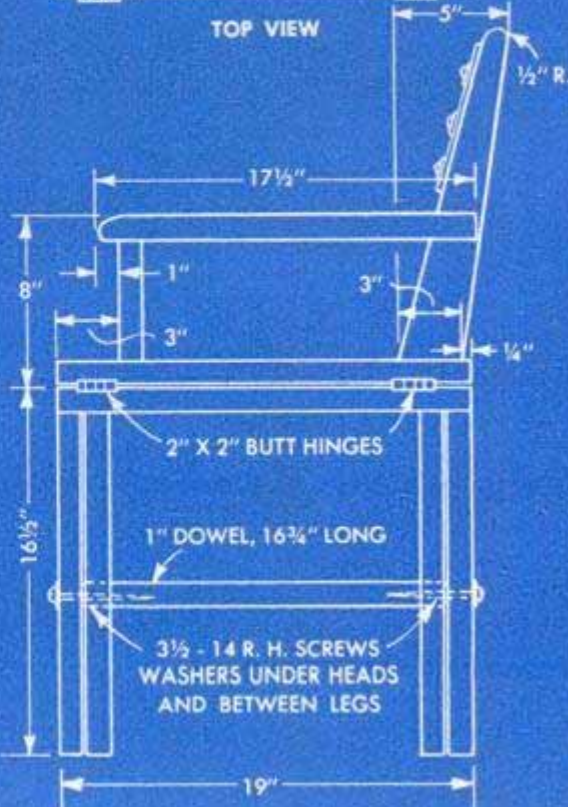
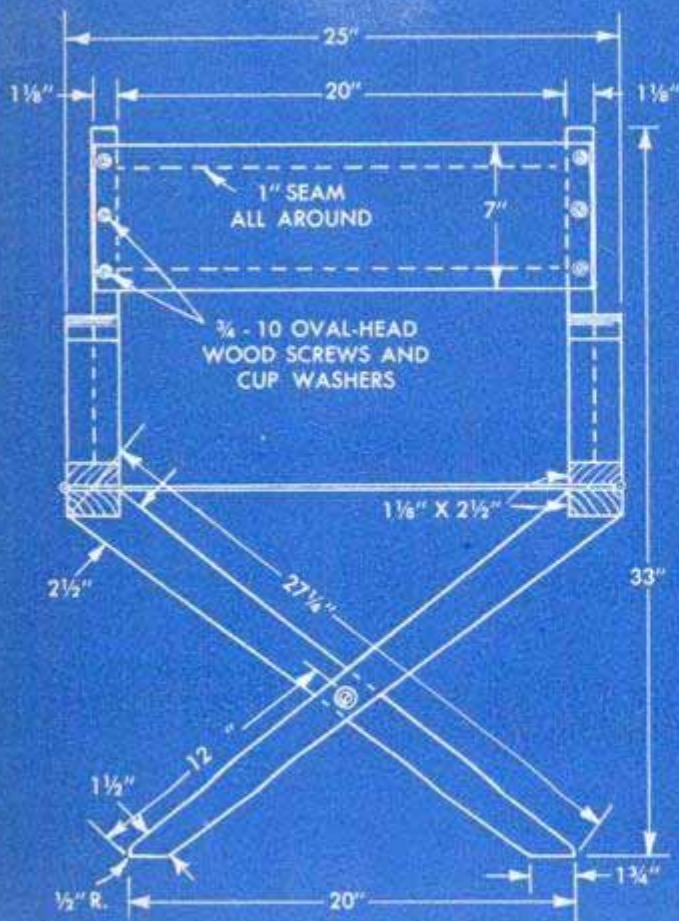
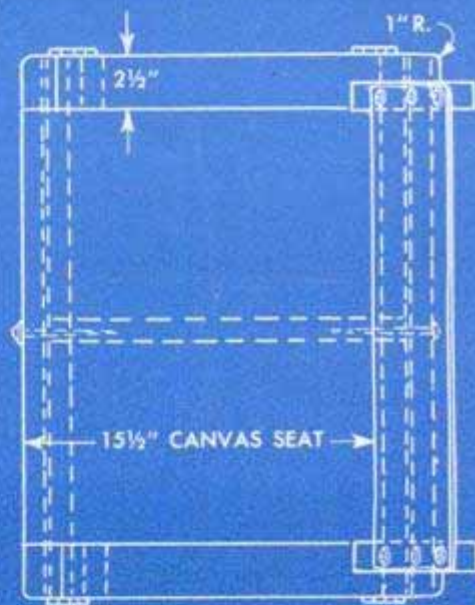
- 2 pcs.—1½" x 6" x 45"—Sides
- 2 pcs.—1½" x 2" x 39½"—Sides
- 1 pc.—1" x 18"—Dowel
- 1 pc.—¾" x 18"—Dowel
- 1 pc.—1" x 20½"—Dowel
- 1 pc.—¾" x 20½"—Dowel
- 1 canvas sling, 1½ yd. x 15½" wide
- 2 carriage bolts, ¾" x 3", with 4 washers
- 1 hemp rope, ½" dia. x 6 ft. long



SEAT CANVAS

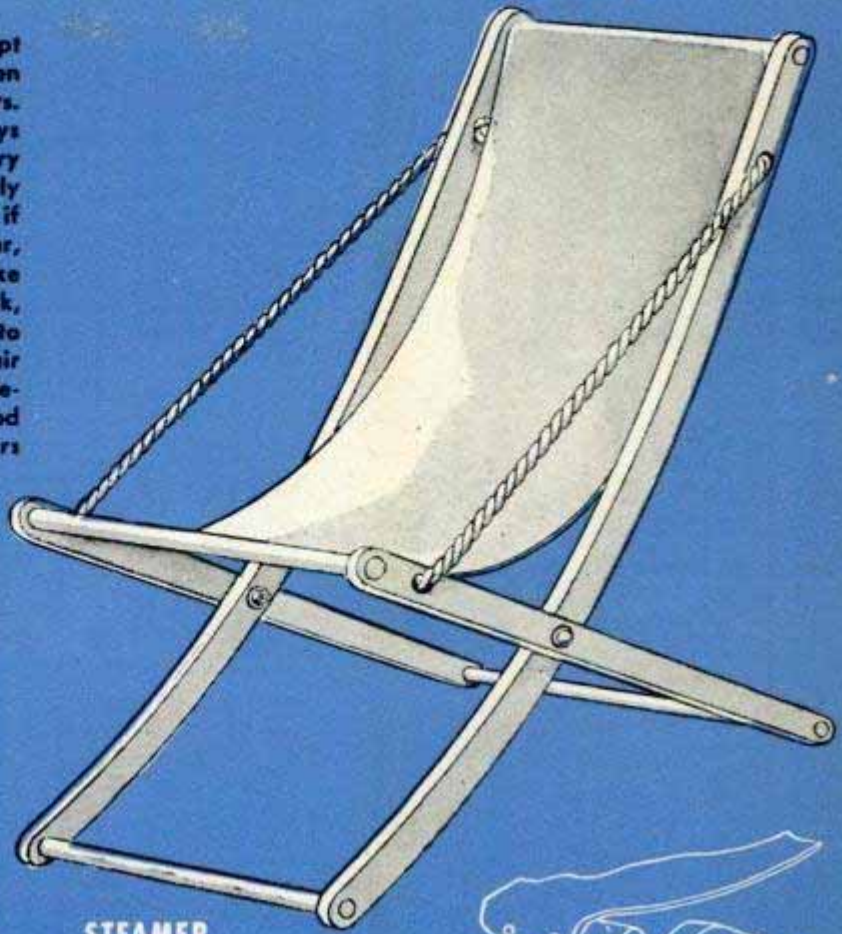


No. 4 CUT TACKS

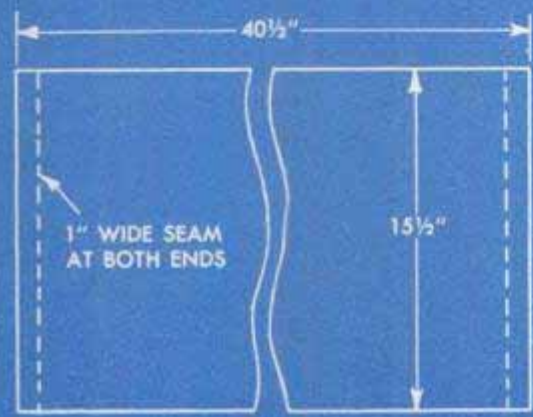


... Folding Porch Chairs

John Bergen, noted furniture designer, kept the small-home owner foremost in mind when he designed these two folding porch chairs. Not like the usual bulky type which always poses storage problem, these require the very minimum of space, as they fold so compactly that they can be tucked away in a closet if necessary. Easy to carry and stow in a car, either chair will appeal to those who like to picnic or spend a day at the beach. Oak, maple and birch are recommended woods to use. Both curved legs of the steamer chair should be bandsawed and drilled together. Select a heavy-weight duck material of good quality for the seats and backs of the chairs



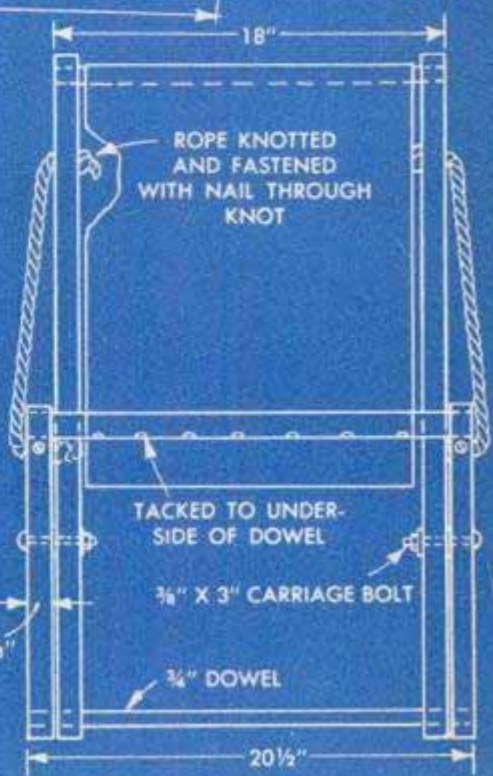
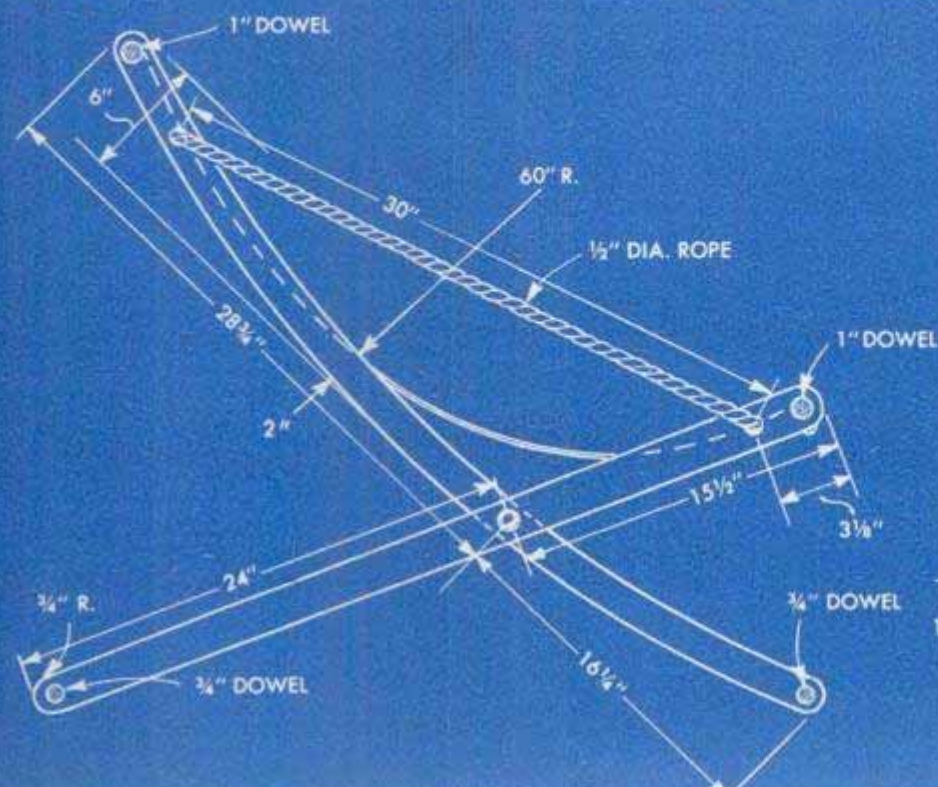
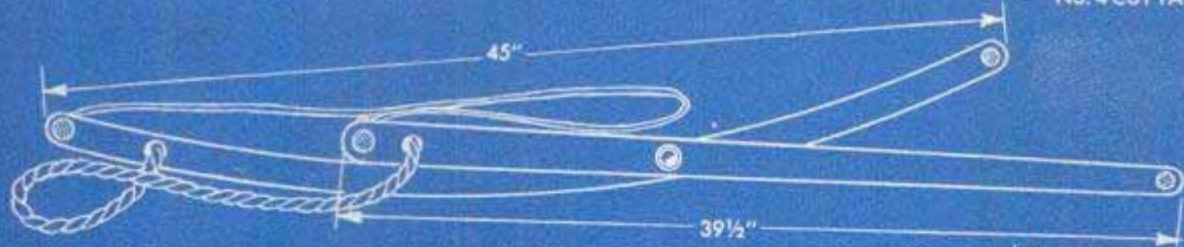
STEAMER CHAIR



CANVAS SLING



No. 4 CUTTACKS



How to Cut Large Metal Sheets With a Hacksaw

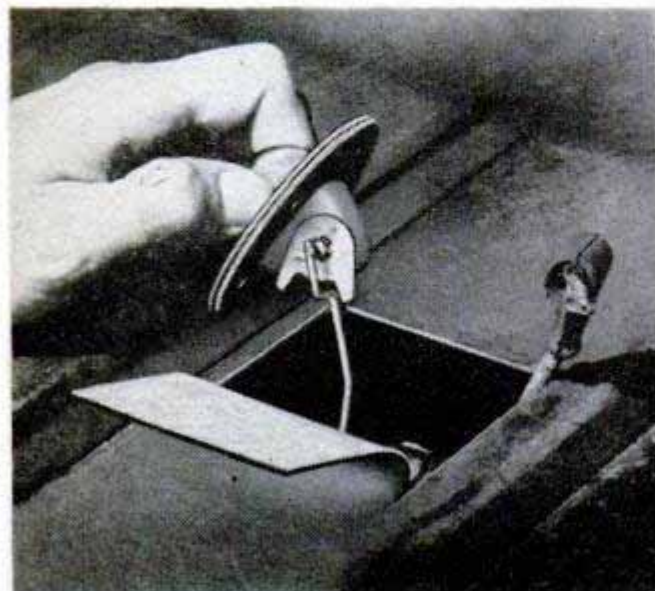


If you are faced with the problem of cutting a large piece of sheet metal with a hacksaw, try this method. First, cut one slot as deep as the saw frame will permit. Then start another about an inch away from the first and turn back the resulting strip as shown. Repeat this procedure until the entire sheet has been cut through.

Hugh Lineback, Stillwater, Okla.

Removing Gasoline-Gauge Float From Car Fuel Tank

When it becomes necessary to remove the gas-gauge unit from the fuel tank, you will find it easier to cut an opening in the floor of the trunk to permit access to the unit than to remove the tank. By taking measurements from the underside of the car, the



location of the opening in the floor can be indicated. A hacksaw blade is used to make the cut so that a flap of the metal floor can be folded back. After the repair is made, the metal is folded back in place, after which a little undercoating or putty will seal the opening effectively. However, if desired, a metal plate may be bolted over the opening to close it.

Improvised Money Belt

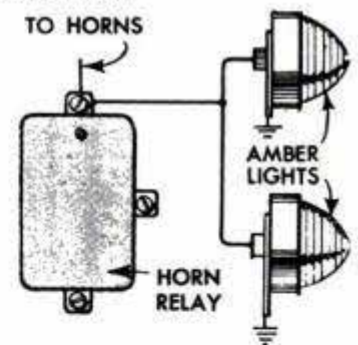
If you find yourself in a position where it is necessary to carry a large sum of money in currency you can do this temporarily, with reasonable safety,



by folding some of the larger bills to a narrow width and taping them to the inside surface of your trouser belt. When doing this it is a good idea to wrap the folded bills with cellophane taken from a cigarette package, then attach them with cellulose tape to the inner surface of your belt. This should not be considered a permanent method of carrying money but it may provide you with a greater feeling of security in an emergency.

Caution Lights Operate on Car When Horn Is Sounded

In order to give the driver behind him warning of a possible stop, one motorist wired the amber caution lights on the rear of his car so that they would glow whenever the horn was sounded. As



shown in the drawing, the lights are wired to the side of the horn relay leading to the horns themselves, providing current for the lights only during the time the horn button is depressed. The other side of the light circuit, of course, is grounded by attaching it to the frame of the car.

Fred Lettino, Astoria, L. I., N. Y.

Bottle-Cap Mailing Container

Taped together, two soft-drink-bottle caps form a compact mailing container for rings, loose stones and other pieces of jewelry. A large container may be made by joining together metal or plastic screw caps from jars and large bottles.

John J. Rea, Urbana, Ill.

RIDING TRAILER

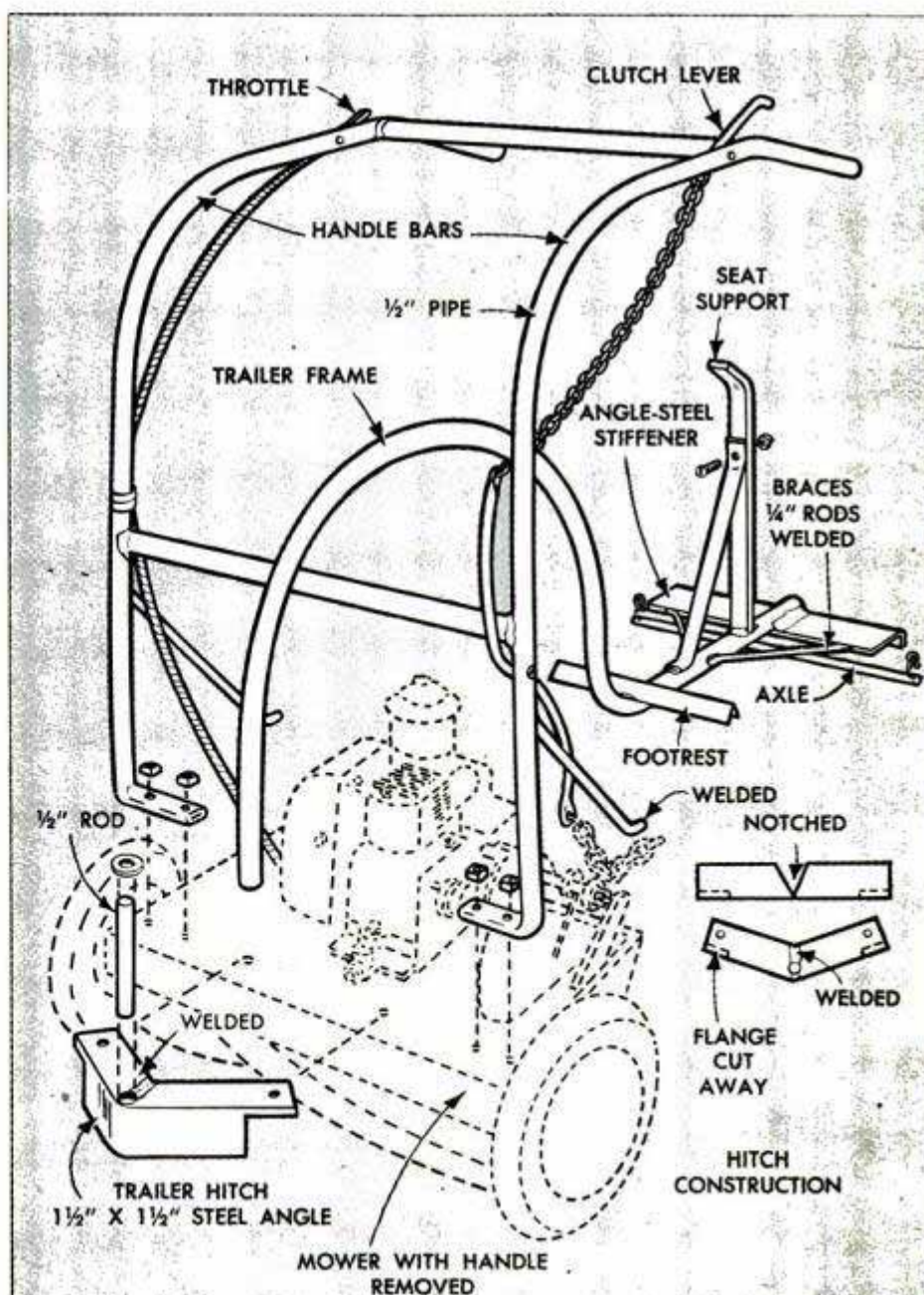
for power lawn mower

By Herbert P. Bryant

A BIG LAWN looks a lot smaller when you are comfortably seated on this power-mower trailer. Use of a riding trailer such as this one reduces grasscutting time as much as 20 percent since you can make faster, shorter turns and also speed up mowing above a normal walking pace on the straightaway. The trailer unit requires no alteration of the power mower other than removal of the regular handle and substitution of special handle bars and a trailer hitch.

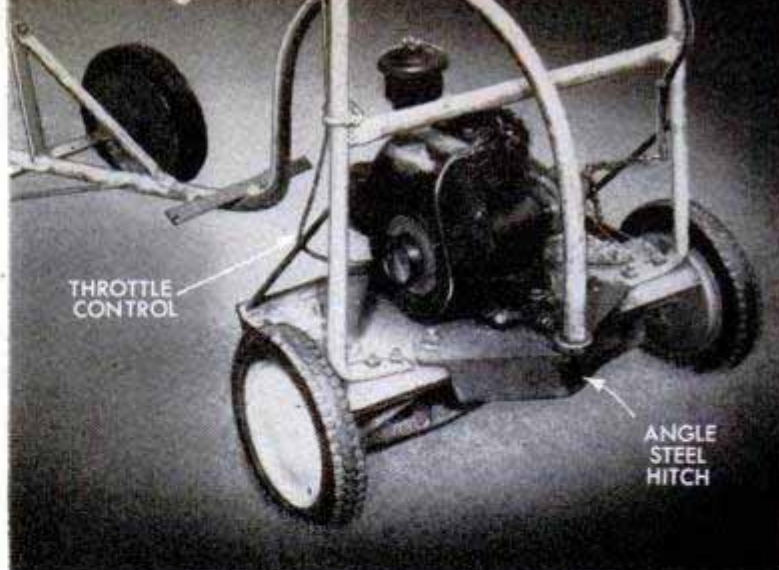
Dimensions given in the detail drawings of the trailer and handle bars on the following page are only approximate. They must be altered to suit different mowers. The detail at the right shows clearly the position of the trailer frame and handle bars in relation to the mower. An improvised extension of the clutch-control mechanism is located on the left handle bar and consists of a chain linkage which works through a bell crank attached to the handle bar below the cross brace. On some mowers the throttle may be utilized but on others an extension may be necessary.

Ordinary black pipe is used for the handle bars and braces. For the curved trailer frame extra-heavy pipe should be used as this unit is subjected to considerable bending stress. If you do not have facilities for making true-radius bends in pipe of the sizes required take the parts to your plumber. He can do the job at a nominal cost. Note that the lower ends of the

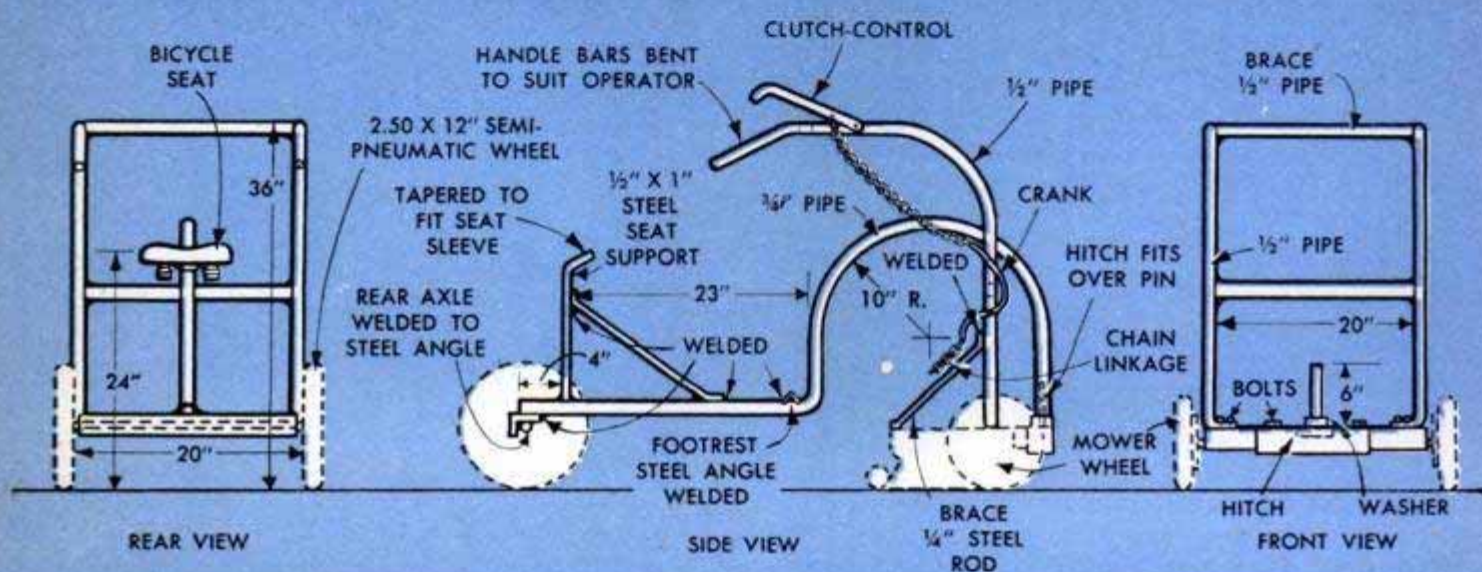




The lawn mower-trailer unit can be made to turn in its own length, an essential feature when mowing around flower beds and in irregularly shaped plots



This photo calls attention to the simplicity of the trailer hitch and manner of assembling the handle bars and controls. The regular mower handle is removed



handle bars are bent at right angles and flattened. Holes are drilled in the flattened ends for bolts which pass through holes drilled in the mower shield, or guard. This usually is of heavy sheet metal and will require no reinforcing. Handle-bar braces are welded in place as indicated.

The simple drawbar shown can be adapted to nearly all types of power mowers. It is made by V-notching a short length of steel angle so that it can be bent and the joint welded. Flanges at the ends are cut away to clear the mower guard and holes are drilled for bolts and a 1/2-in. steel rod, 5 in. long, which is welded to the drawbar angle in the vertical position and serves as a pivot for the front end of the trailer frame. It should be noted that the curve of the frame is stopped at a point about 8 in. from the end. The remainder of the pipe is straight so the parts can swivel freely without binding when it is placed over the pivot pin.

A short length of steel angle welded near

the center of the frame just below the bend serves as a footrest. At the rear end the frame is welded to an angle-steel stiffener which in turn is welded to the axle. The seat support is welded to the frame and braced as indicated. A bicycle-type saddle seat is used, and some filing may be necessary to fit it securely over the tapered projection of the support. Angle braces projecting to the rear support the handle bars and the lower ends of the braces are welded or bolted to the mower frame. The trailer wheels are 12 in. in diameter and are of the semi-pneumatic type having integral bearings. They are attached to the axle with cotter keys and washers.

Pruning Saw Carried Safely

When transporting or storing a pruning saw, the chances of being cut by the blade are less if it is reversed in the saw frame. The operation requires the removal of one wing nut.

Lantern Anchored Safely In Bucket of Sand



Sinking the base of a lantern into a bucket of sand will provide a quick and effective means of preventing the lantern from being blown over in strong winds. An anchor improvised in this manner is ideal for night signal lanterns that are used

as warnings in instances where a sidewalk has been torn up for repairs or a hole has been dug for planting a tree.

Carpenter's Square Scribes Lumber



Rough lumber for concrete forms can be measured and marked in one operation if the work is scribed with a burr bent on the end of a carpenter's square. The square should be one that is no

longer suitable for ordinary use. Hammer down one corner at the end of the body section (the longer arm) to upset the metal and form a sharp burr. Then, with the square located on the work, simply press it against the surface and draw it across to mark the wood.

Cork Disk Under Compass Point Protects Unused Drawing Paper

When drawing on a pad of paper, or with extra sheets placed under the drawing, it isn't necessary to puncture several sheets



of paper each time you use the compass. This can be prevented simply by gluing a thin cork disk to the end of a strip of cardboard which is then slipped under the top sheet. Now, by means of the cardboard tab, position the cork disk directly under the spot where the compass point will be located.

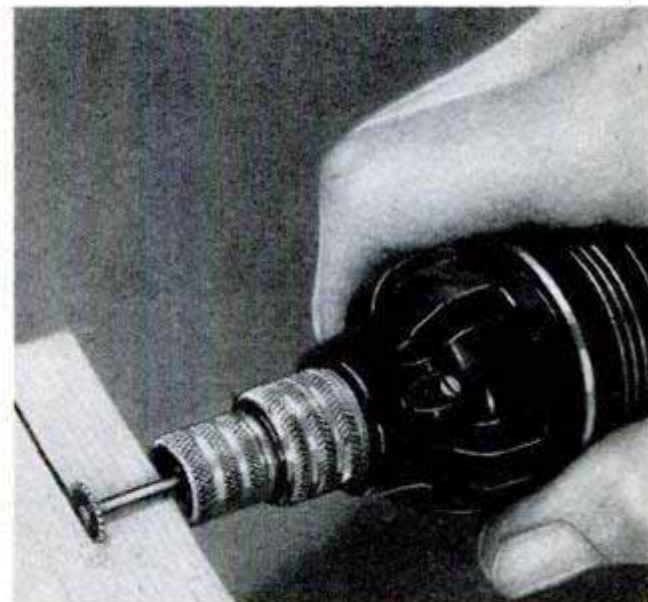
Small-Parts Containers for Shop Made From Coconut Shells



Shells of coconuts that are opened by sawing them through the middle can be salvaged for use as small-parts containers in the shop. Face-off the bottoms of the shells to provide bearing surfaces and screw them onto a narrow shelf over the workbench, as illustrated. Or screw each shell to an individual base, if desired, so that it may be carried wherever needed.

H. Moetzing, Toronto, Ont., Can.

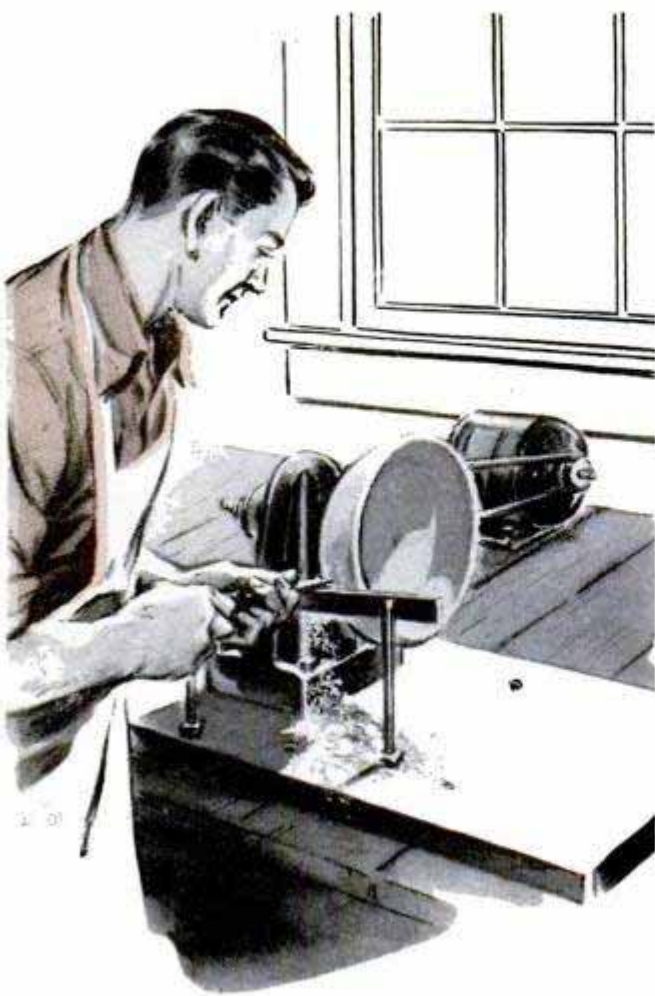
Small Hand Grinder Guided Easily



When using a small hand grinder for routing, grooving or slotting you will find it simpler to follow a given line by pressing the chuck ferrule against the edge of the wood as the tool is guided along. The cutter bit or saw may be set into the chuck at different depths to vary the distance between the bit and ferrule.

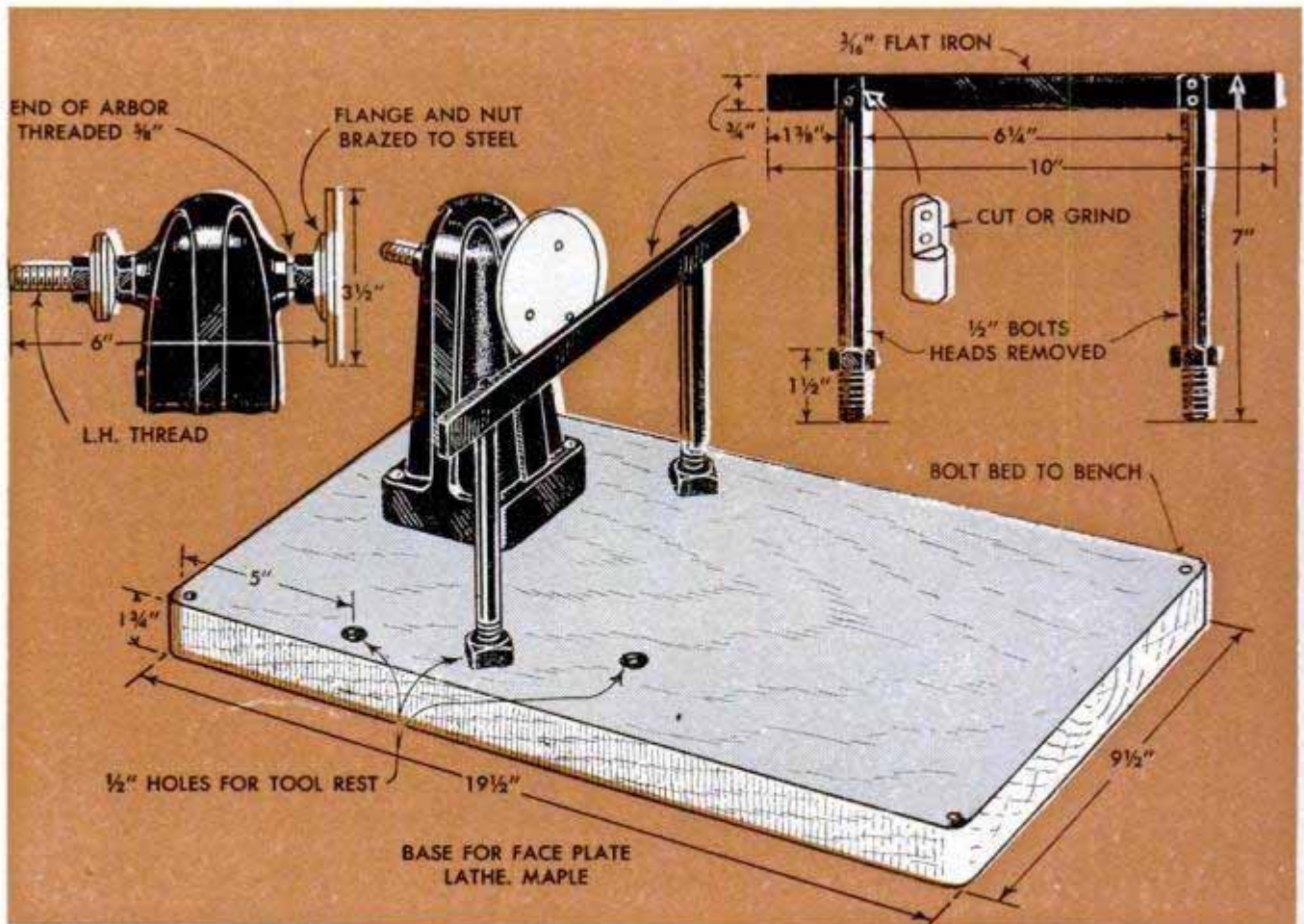
FACEPLATE LATHE From Polishing Head

By Dick Hutchinson



IF YOU ARE beginning a home workshop on a limited budget, the mere price of a polishing head will provide you with the basic part needed to make an excellent faceplate lathe, ideal for turning bowls, picture frames and trays. Fitted with a faceplate at one end and a grinding wheel at the other, you'll have a most convenient setup for sharpening your turning tools. Although a suitable faceplate can be purchased to fit the arbor of the polishing head, one can be made by centering and by brazing one of the arbor nuts and flanges to the blank cover of an outlet box. The faceplate end of the arbor is cut off so that it projects approximately $\frac{5}{8}$ in. to bring the mounted work close to the polishing-head bearing. The polishing head is bolted to a hardwood base, and a tool rest is made from two $\frac{1}{2}$ -in. bolts and a length of flat steel. The heads are removed from the bolts and flats are filed at the upper ends to provide seats for riveting the flat steel. The threaded ends of the bolts engage holes drilled in the base, the height of the rest being adjusted to bring its top edge about $\frac{1}{8}$ in. above the center line of the faceplate.

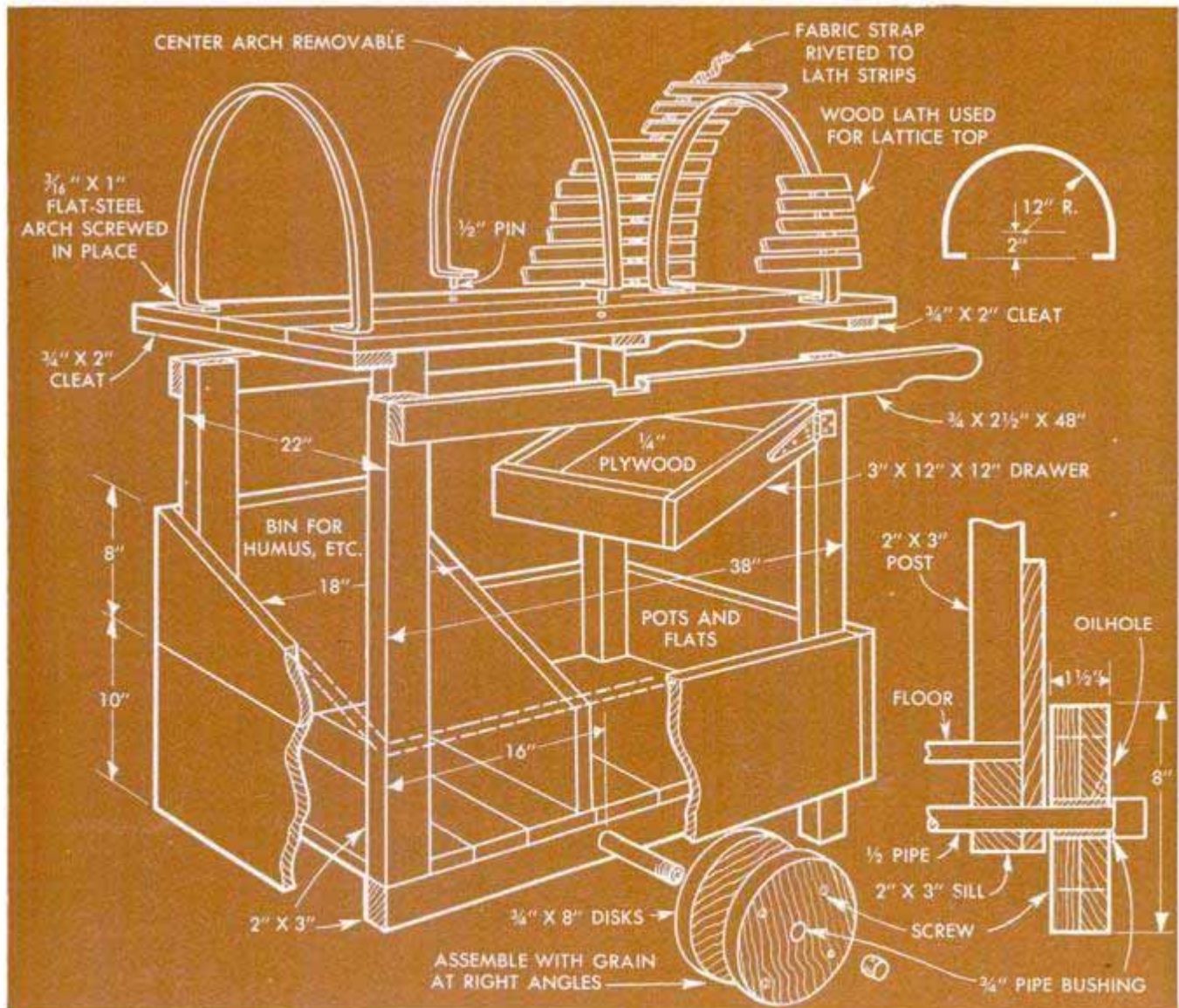
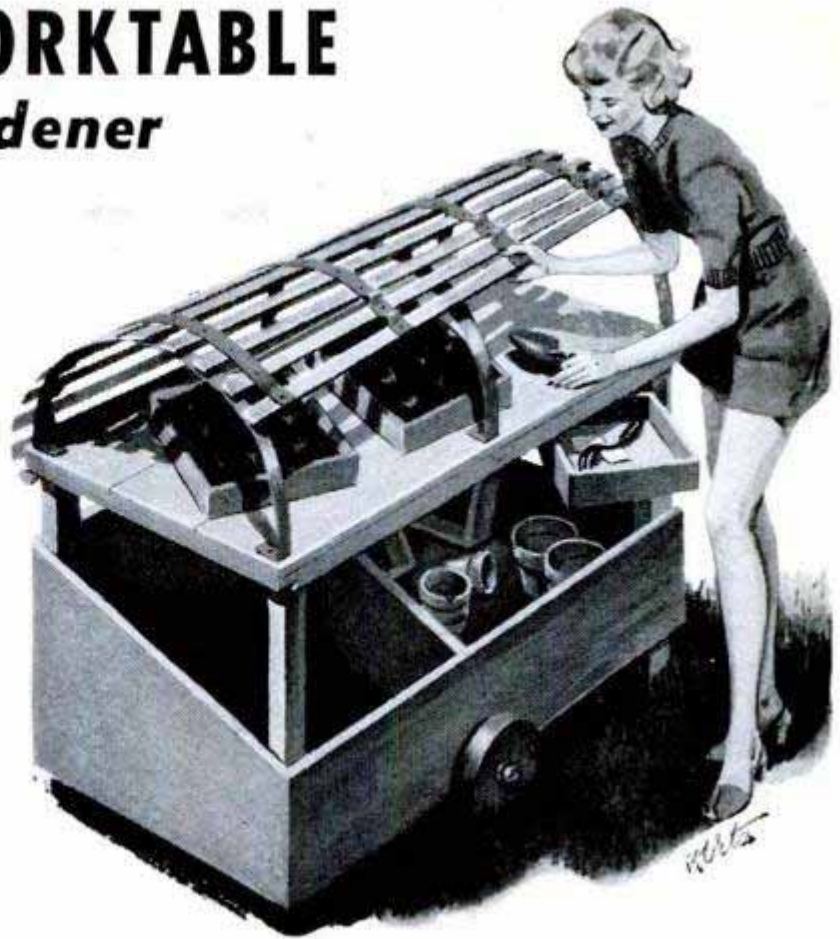
Tool rest can be positioned directly across the bed or set to permit turning edge of the work. The hardwood lathe bed is bolted to the top of the workbench



PORTABLE WORKTABLE

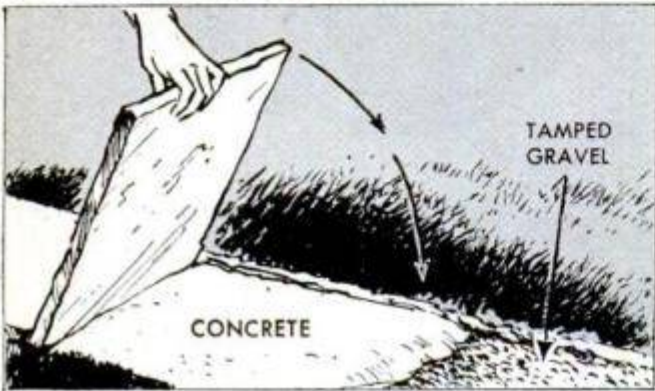
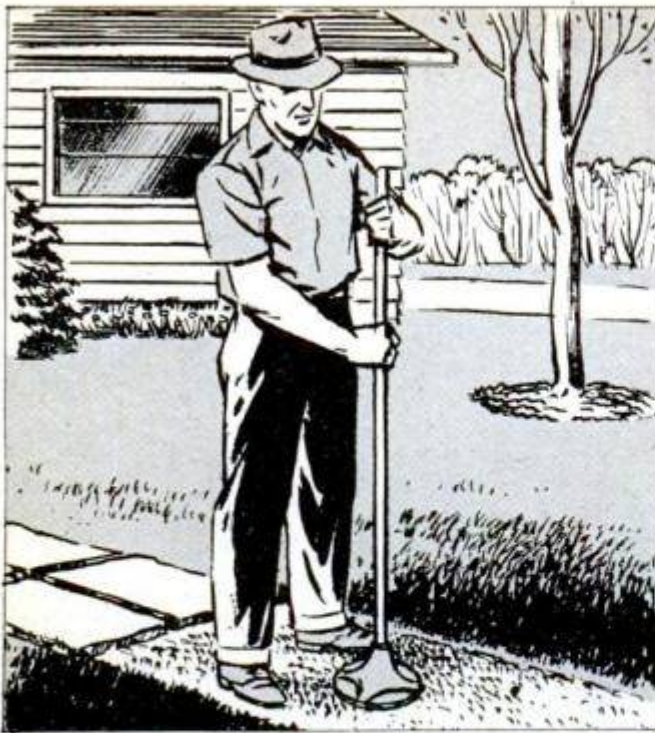
for the gardener

THIS combination worktable and "greenhouse" is sure to add to the enjoyment of working in your garden. A lattice, made by gluing and stapling wood lath to fabric strips, is drawn over three flat-steel arches to transform the table top into a lath house for hardening of tender seedlings. Fitted with wooden wheels, the entire unit can be moved easily from sun to shade as desired. When the lath house is not used, the lattice is allowed to hang at the back of the table and the center arch is removed to provide an unbroken expanse of work area. The body of the cart is divided into two bins—one for fertilizer, sand or sifted soil, and the other for pots and flats. A swinging tray for small tools is hinged to one leg.

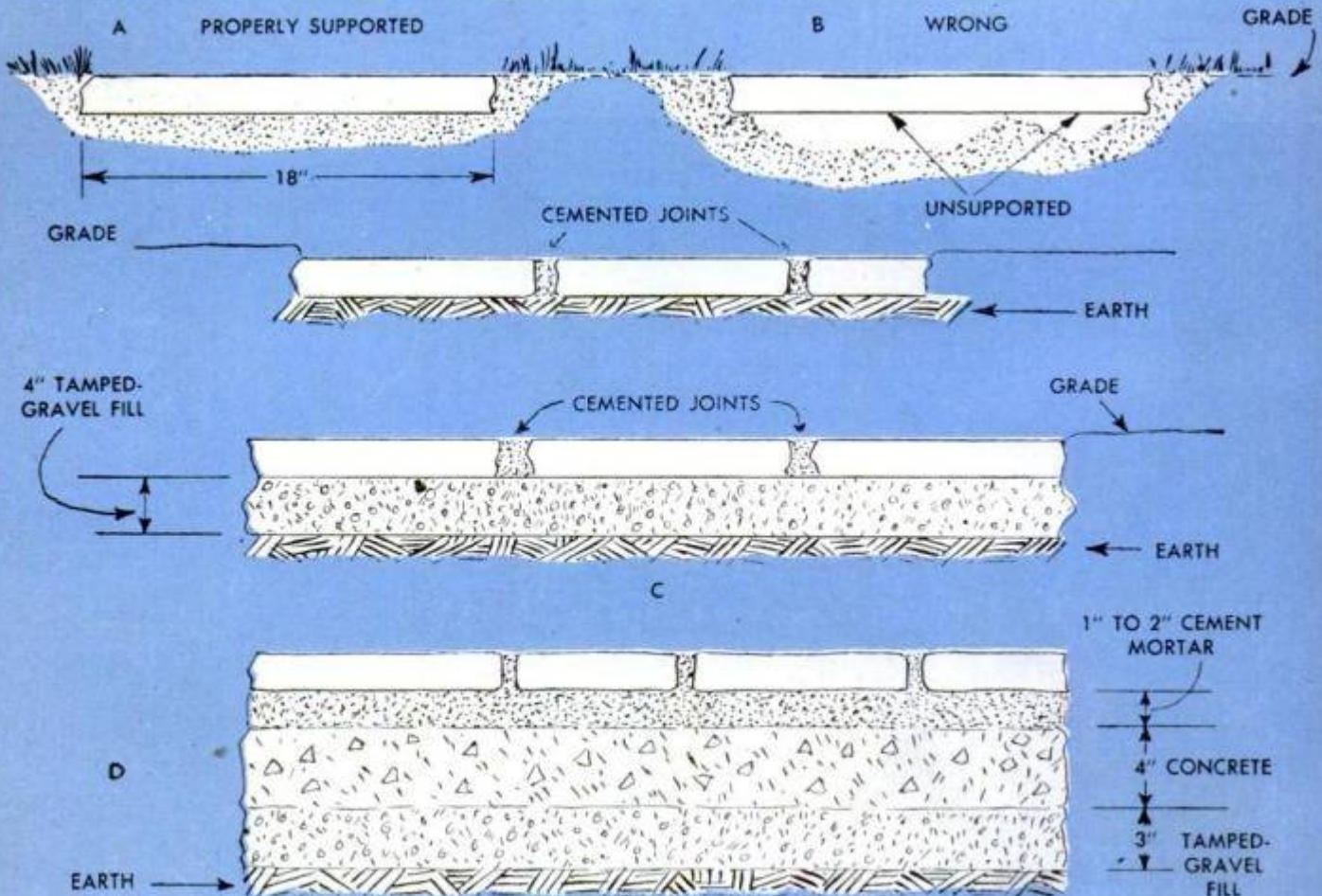


Laying

By Max Alth



LAYING FLAGSTONES is a natural for amateur stonemasons as there are no tricky corners to plumb and no mortar thicknesses to watch as in laying up a wall. The random patterns formed by simple stonework are what make flagstone walks, patios and driveways so very attractive. There are several methods of laying flagstone where only one layer, or course, is used. The first and simplest, is shown in detail A in the drawings below. Earth is excavated to a depth equal to the thickness of each individual stone and the recess is cut to a size and shape that will take the stone in a snug fit. In an area where the soil is firm and the drainage adequate this method is satisfactory, but it cannot be recommended as permanent construction. It is important to smooth the bottom of the excavation so that the stone is fully supported. If the bed of the excavation is uneven, portions of the stone will be unsupported as in detail B. This will cause the stone to tip sidewise. Some builders prefer to lay the stones edge to edge in a continuous excavation; the spaces between the in-

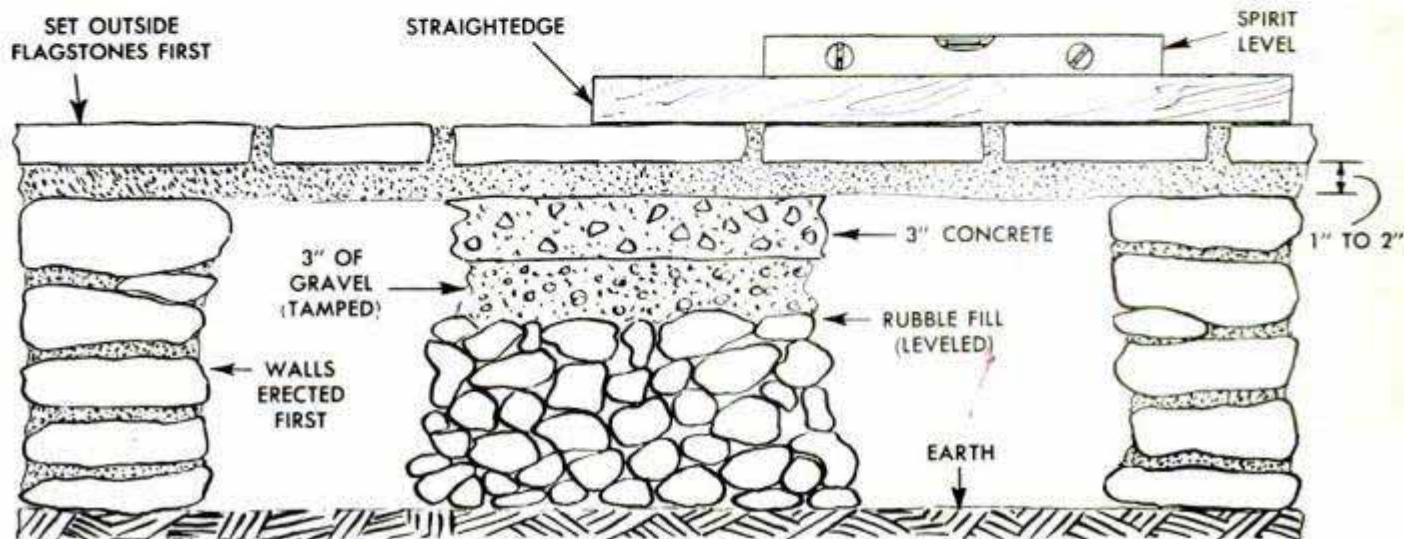
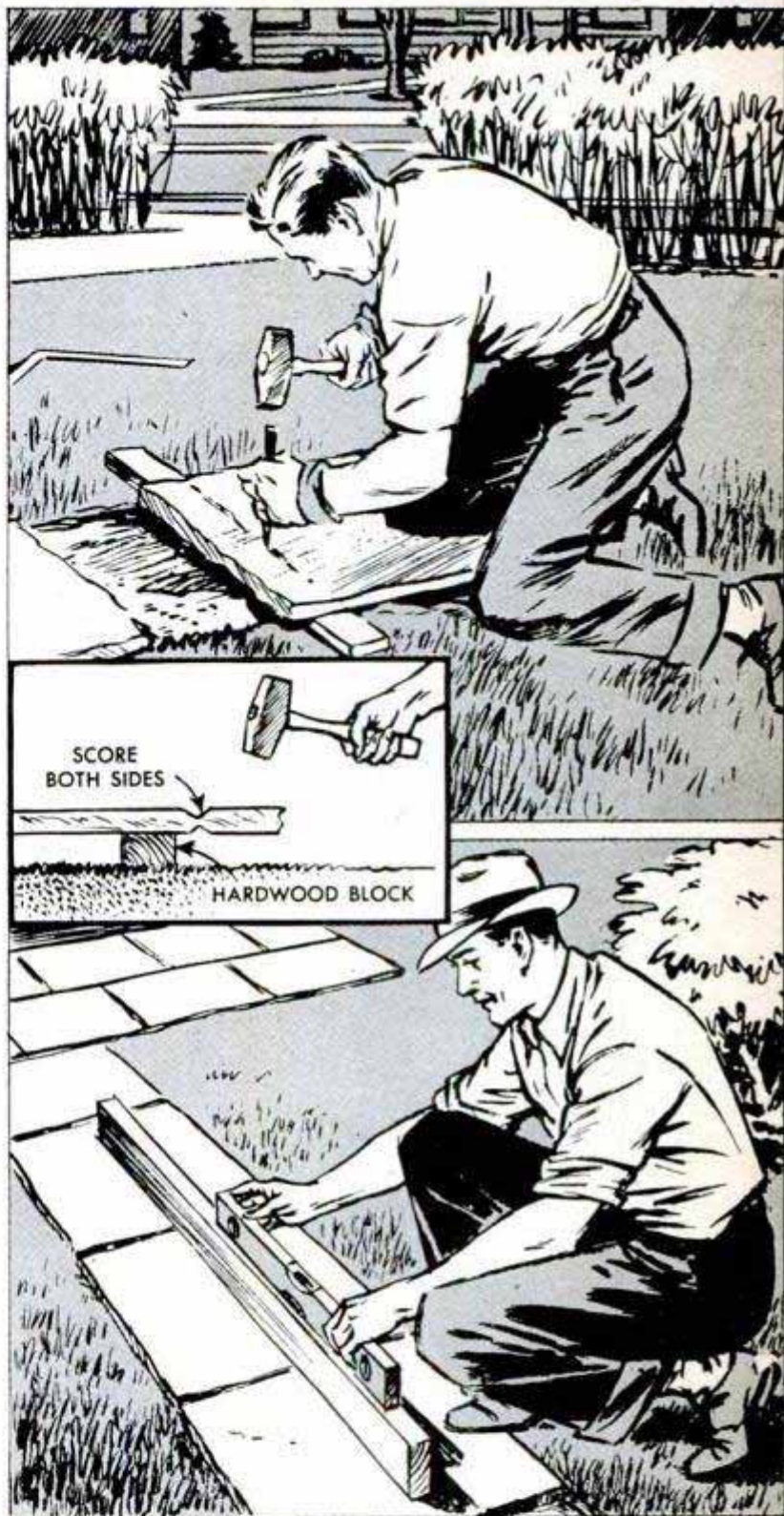


FLAGSTONE

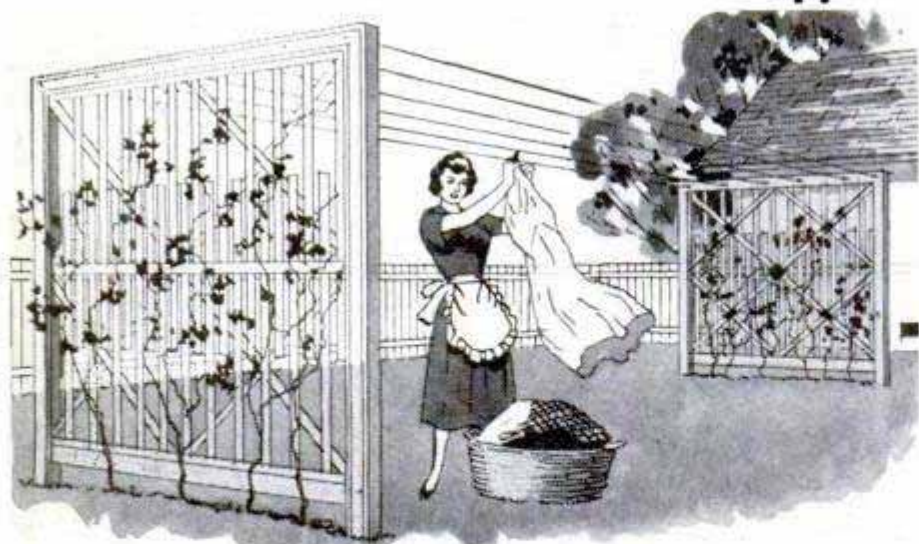
dividual stones being filled with cement mortar. The best and most permanent construction of a flagstone walk is shown in section in detail C. on the opposite page. Here a continuous excavation is made to the width required and to a depth equal to the average thickness of the stones plus an additional 4 in. for a tamped-gravel fill. After the gravel has been thoroughly tamped with a special tamper as in the upper illustration on the opposite page, the stones are selected and laid in cement-mortar joints. Some builders spread a 1-in. layer of concrete over the gravel as in the center illustration on the opposite page.

One approved method of driveway construction is shown in detail D. Depths given for the gravel fill and concrete slab can be varied to suit local conditions. The thickness of the concrete may be increased to 5 in. and the gravel fill to 6 in. where drainage and service conditions require greater support.

Patio construction is shown in the sectional view below. Walls always should be laid up first. On soft soils the walls should be placed on adequate footings but on gravelly soils and clay soils footings will not be required unless the walls exceed 12 in. in height. The structure consists of enclosing walls, a fill consisting of rubble, tamped gravel and concrete. After this is fully cured the flagstones are laid in cement mortar and the joints filled as indicated. Use a straightedge and builder's level to determine the necessary slope to shed water and to assure that the surface is fairly uniform. Flat stones can be cut to any size desired by scoring both sides with a chisel. To break the stone after scoring, support it on a wooden block and strike the surface lightly near the scored lines as in the upper right-hand detail. Stonemasons use various methods of breaking stone but this procedure is fairly reliable with large flat stones.



Trellises Constructed Inside Steel Frames Provide Permanent Clothesline Supports



To rid his yard of a clutter of poles and clotheslines, one homeowner erected trellises having steel frames set in concrete for permanently supporting all the lines in one area. The top and sides of each frame are constructed from 4-in. I-beams, while a wooden 4 x 4 forms the bottom member. I-beams are faced on both sides with 2 x 4s held in place by bolts that pass through holes drilled in the web of a beam. Trellises made from lattice are mounted on the 2 x 4s.

Lathe Used for Mixing Paint



Small cans of paint, up to and including the pint size, may be mixed thoroughly and quickly with a lathe of either the woodworking or metal-cutting type. Fit a band of sheet metal around the

center of the can and grip the ends of the band in the chuck. To mix the paint, run the lathe for a few minutes at slow speed so that the paint will slosh from end to end in the can as the chuck rotates.

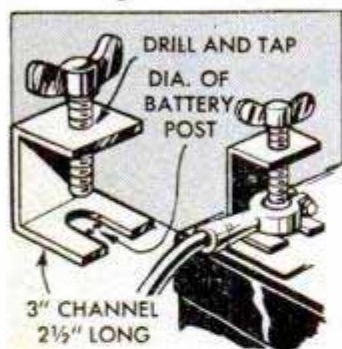
Rubber Glove Regains Shape From Inside Air Pressure



Usually turned inside out after being pulled off the hand, a rubber glove can be restored to normal shape once again by filling it with air and squeezing the glove as shown. After pushing the fingers back inside past the cuff, scoop the glove full of air and quickly pinch the open end shut to trap the air in the glove. Now squeeze the palm of the glove to force the fingers back to their original shape.

Before papering over old wallpaper, cover any grease spots that may be on the wall with a thin coat of shellac. This will prevent the grease from bleeding through the new wallpaper.

Battery-Cable Puller Saves Posts

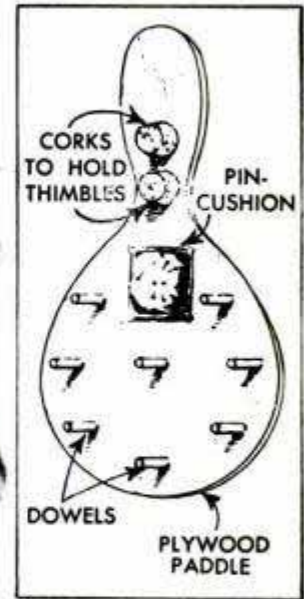


Car-battery posts will not be damaged if tight-fitting cable lugs are pried loose with this simple cable puller which is made from a section of steel channel and a thumbscrew. The puller exerts pressure

downward on the top of the post to free the lug. Use a 2 1/2-in. section of 3-in. channel, notching one side to fit around the battery post and tapping the other side for the thumbscrew. A bolt turned with a wrench will substitute for the thumbscrew. Additional bearing surface for the threads can be made by welding a nut over the hole in the channel. When the screw is tightened, the arms formed by the notched side of the channel lift the lug from the post.

This unique sewing kit can be made easily from a few odds and ends that are to be found in almost any household. Adapted from a child's paddle-ball toy, the kit makes it possible to display a variety of thread sizes and colors for easy identification and selection. Also mounted on the board are a pin-cushion and two corks used for holding thimbles. Thread spools are slipped over short lengths of dowel fitted into holes which have been drilled around the outer edge of the paddle as shown. After sanding the board, assemble the kit with glue and let dry. Now paint or stain the board as desired.

Sewing Kit Adapted From Paddle-Ball Toy Holds Spools of Thread for Easy Selection

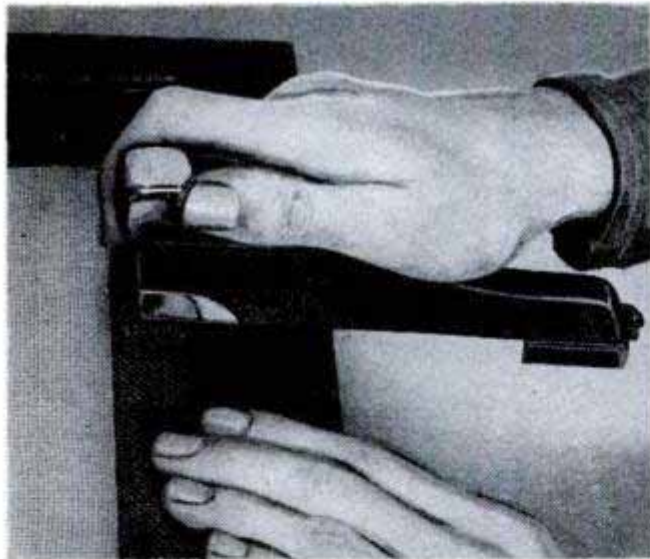


Thermoplastic Toys Mended Quickly Using Soldering Iron

Broken toys made of thermoplastic can be mended by assembling the pieces and applying a hot soldering iron to the broken joints. The pieces are permanently joined when the iron melts the plastic and fuses

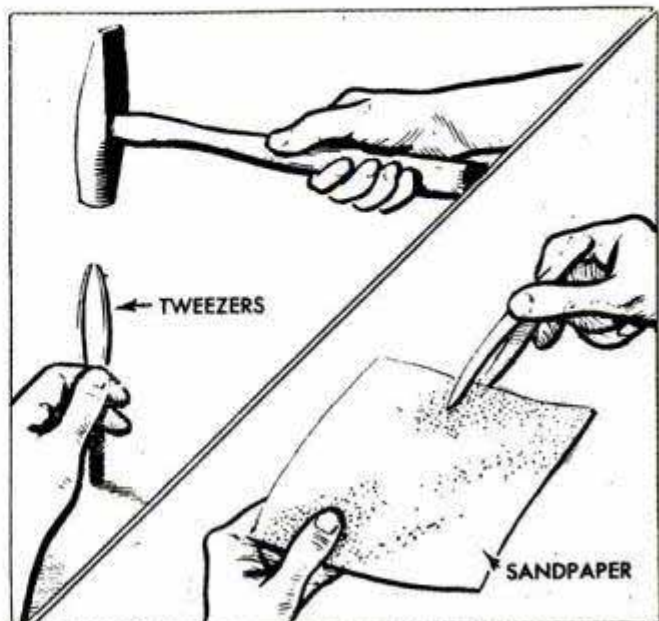
them together. After sufficient time has been allowed for the plastic to cool, the seams should be smoothed with a sharp knife and fine sandpaper.

Oscar J. Fisher, South Bend, Ind.



Tweezers With Sharpened Points Help Remove Splinters in Hand

Tweezers of the type shown often can be used effectively for extracting wood and metal splinters from the hands, provided the ends of the prongs are sharp enough. To sharpen them, hold the tweezers with the prongs pointed up and tap them lightly with a hammer to bend the points inward. Now sharpen them with sandpaper.



Stapling Plastic Screen

When applying plastic screen to a frame, better results will be obtained if the screen is stapled instead of tacked in place. The screen will have less tendency to pull or tear because a staple covers a greater holding area than a tack. Also, applying staples with a stapler is much easier than driving tacks with a hammer as one hand is left free to keep the plastic screen stretched tautly as it is being stapled.

Richard Hanscom, Elmhurst, Ill.

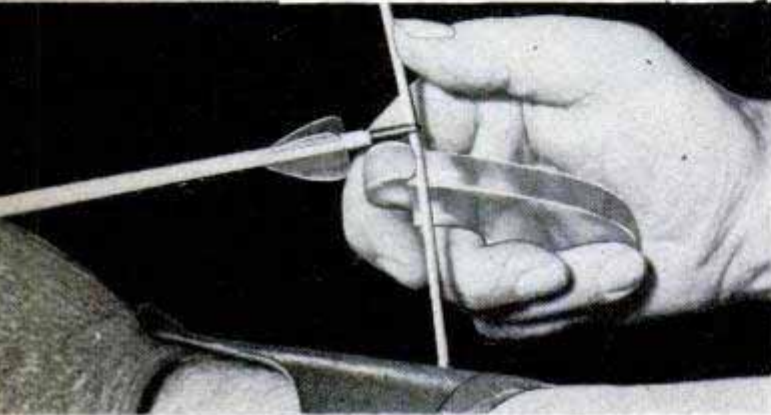
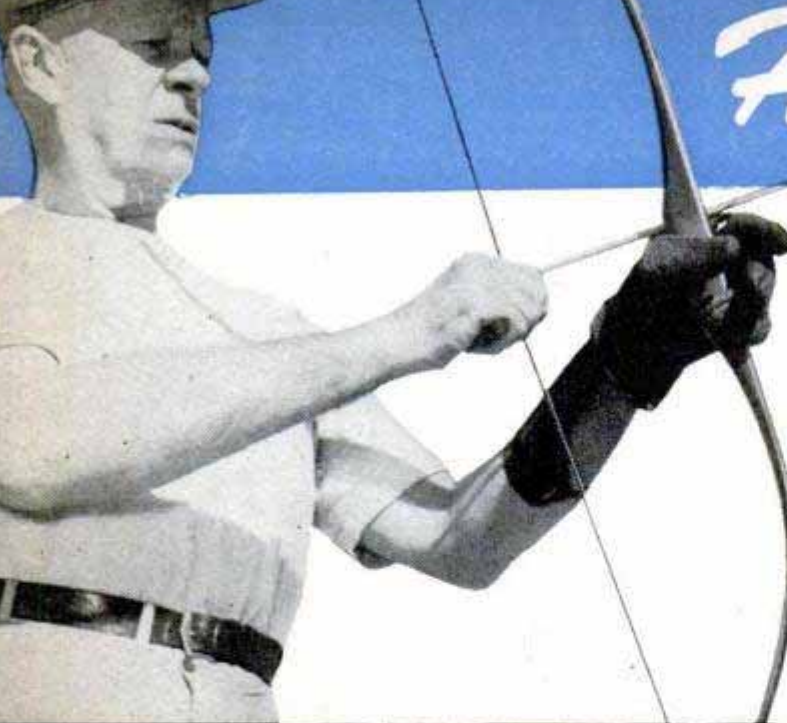
How to make

By Frank Reichstein

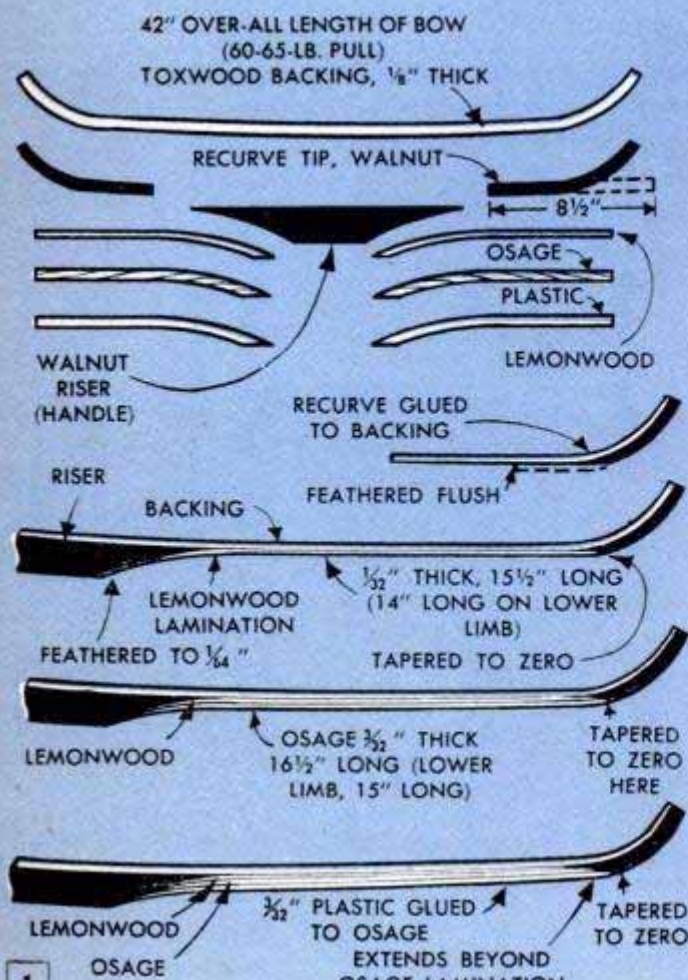
WOULDN'T YOU like to own a bow that will drive an arrow the length of five football fields? Then, according to expert bowmen R. A. Branaka and Clarence Haugen, you should take up flight archery. One of the first flight bows made by Mr. Branaka won a divisional national championship for Mrs. Branaka with a record shot of 395 yards. Mr. Haugen holds the divisional men's national title with a record shot of 547 yards.

Flight bows differ greatly from those made for target practice or hunting. They are short and sturdy, and because they are made of special laminated materials including several kinds of tough, springy woods, flight bows have tremendous driving power. Building a flight bow, as in Figs. 1, 2 and 3, is a procedure employing such hand operations as rasping, scraping, sanding and polishing a single piece to several sectional sizes. For this reason it is not possible to detail and describe each step of the process. The first step is to build the two bending forms detailed in Fig. 2, as you will need these as soon as you begin construction of the bow. One form is used for bending the recurve tips, Fig. 1, and the other is specially made for applying the glass-cloth (Conlon) strip to the backing as in the upper detail, Fig. 2. Special clamps are made for use with this form by bending $\frac{3}{8}$ x 1-in. flat steel to a U-shape and drilling $\frac{5}{16}$ -in. holes near the ends for a $\frac{1}{4}$ -in. pin which is inserted through a hole drilled in the form. The web of the clamp is drilled and tapped for a cap screw. This type of clamp makes

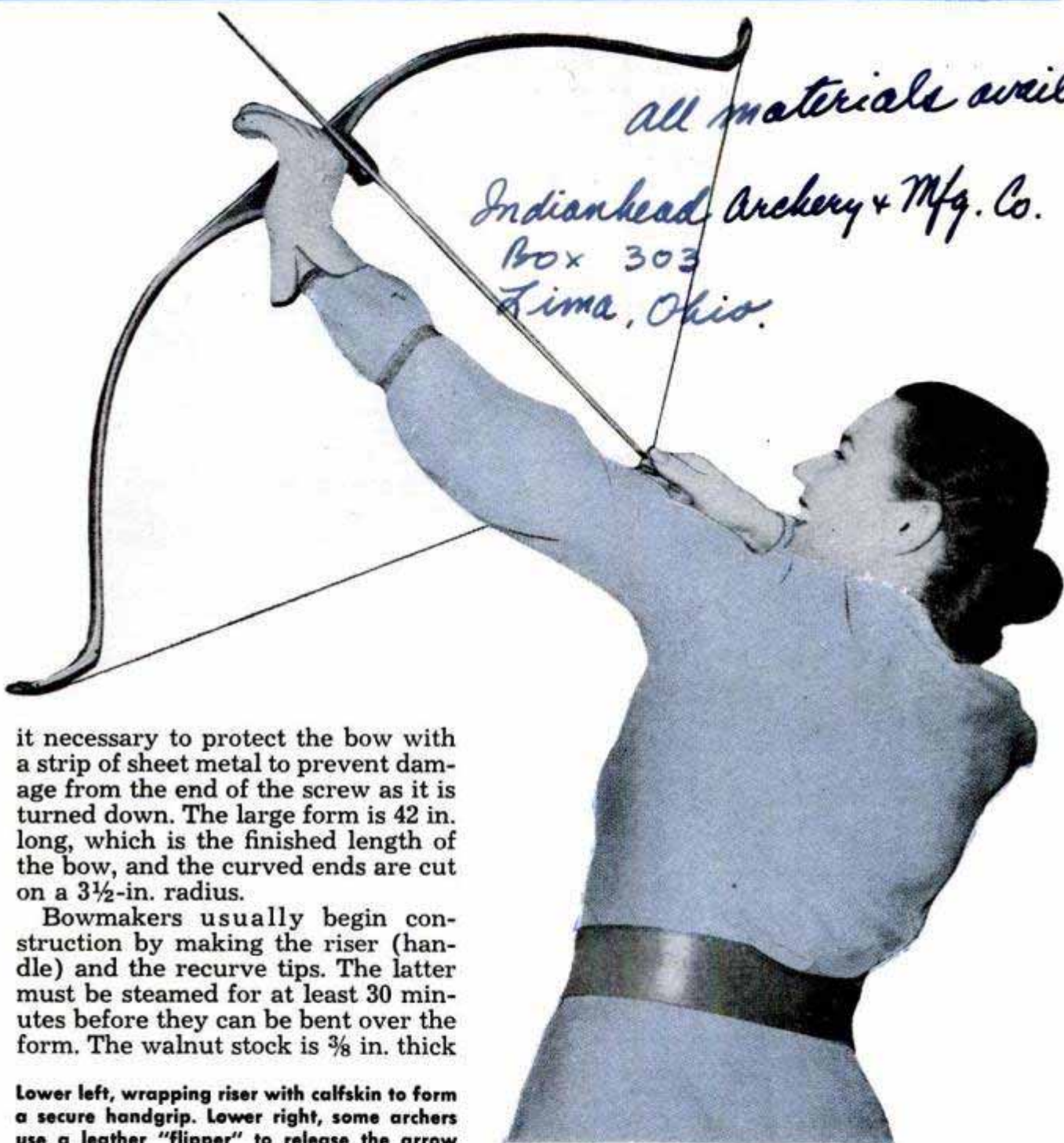
Flight bow being roughed with special scraper made from power-hacksaw blade. Operation is known to archers as tillering. Wood rasps also may be used



Many flight archers use a hook-type release. Hook holds the bowstring and a slight twist releases arrow



a FLIGHT BOW



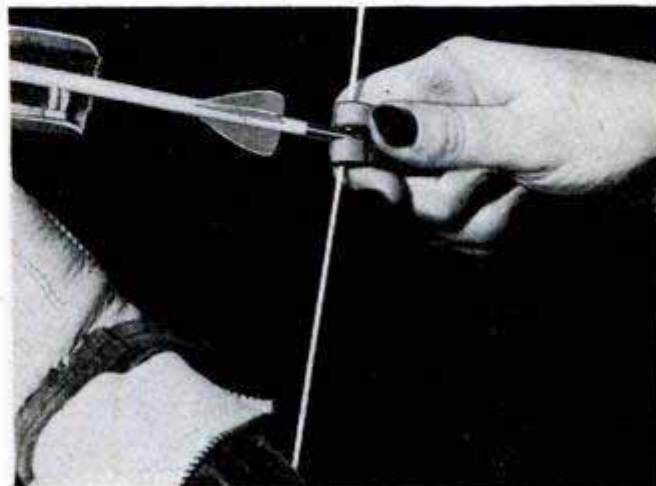
all materials available:

*Indianhead Archery + Mfg. Co.
Box 303
Zima, Ohio.*

it necessary to protect the bow with a strip of sheet metal to prevent damage from the end of the screw as it is turned down. The large form is 42 in. long, which is the finished length of the bow, and the curved ends are cut on a $3\frac{1}{2}$ -in. radius.

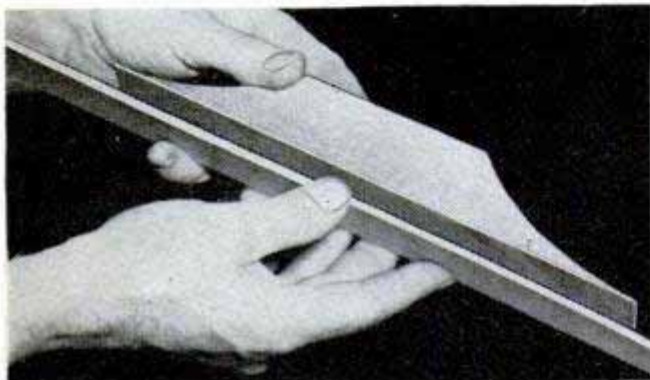
Bowmakers usually begin construction by making the riser (handle) and the recurve tips. The latter must be steamed for at least 30 minutes before they can be bent over the form. The walnut stock is $\frac{3}{8}$ in. thick

Lower left, wrapping riser with calfskin to form a secure handgrip. Lower right, some archers use a leather "flipper" to release the arrow

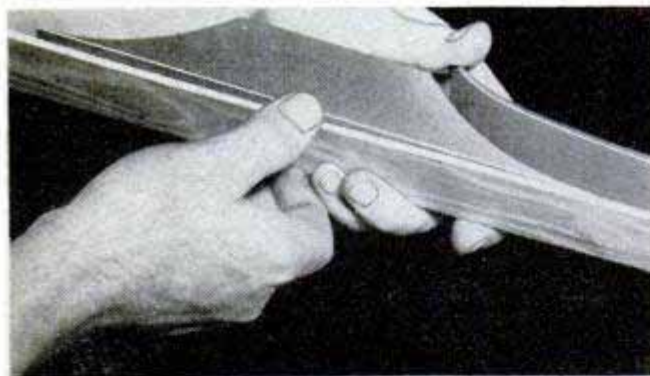




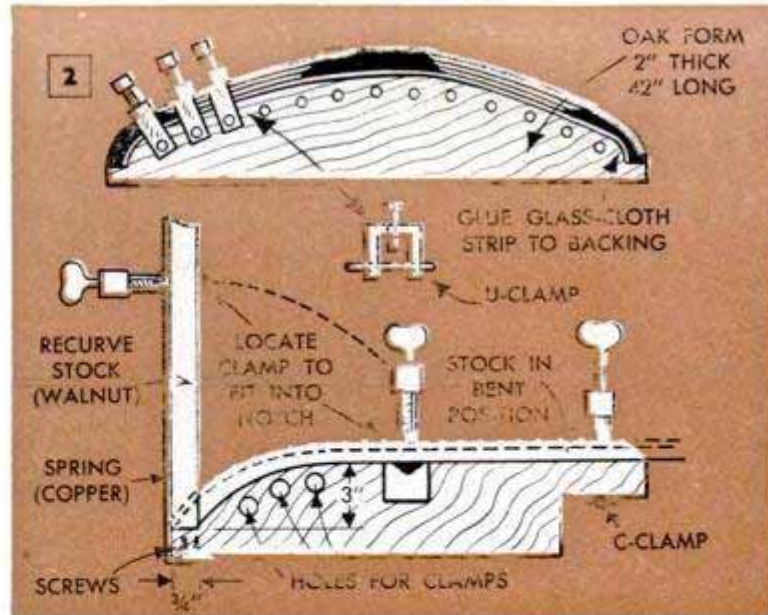
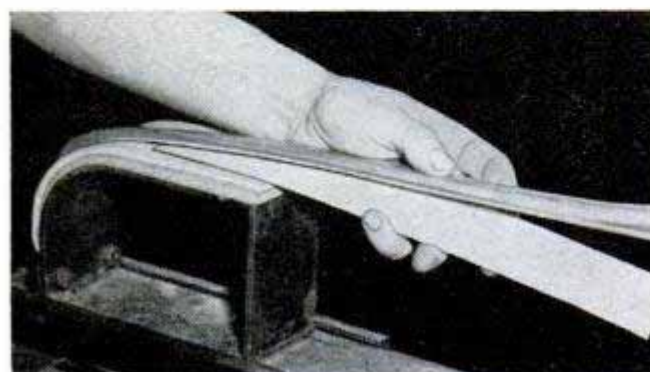
Arrows used in flight archery are made by professional arrow makers because they must be accurate



Riser is first glued to toxwood strip, which consists of resin-bonded layers of maple selected for grain

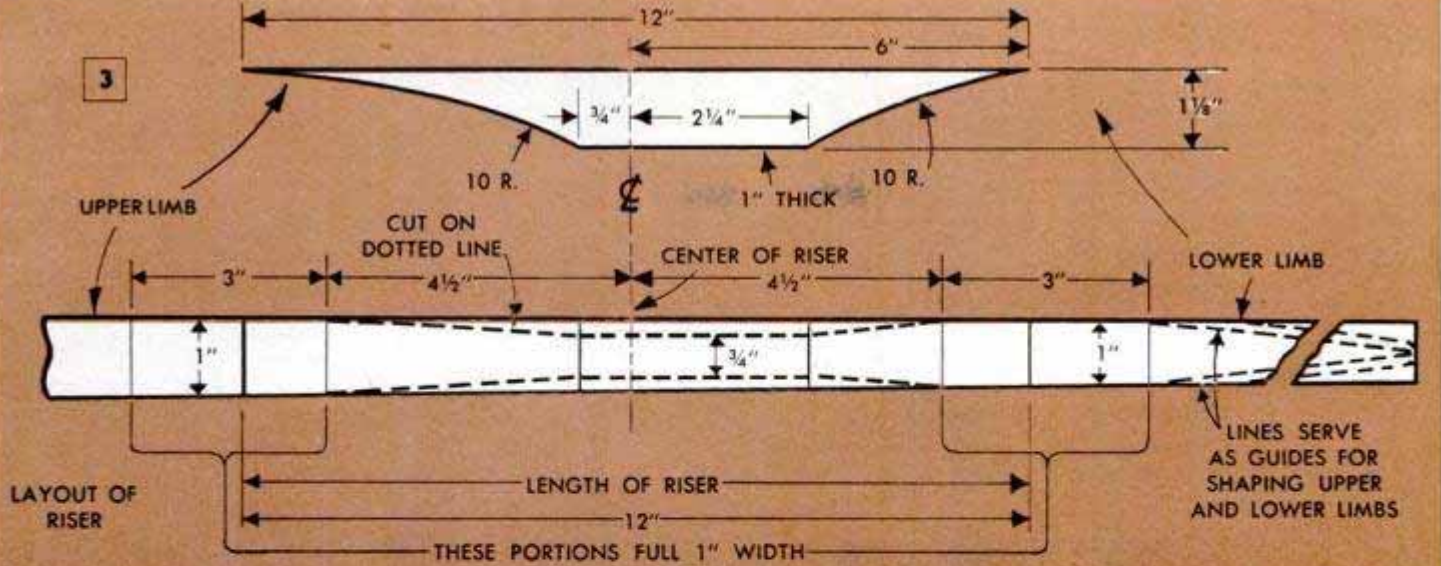


Above, the lemonwood lamination follows curve of the riser and is tapered to 1/64-in. thickness at the end. Below, professional bowmakers use a special bending jig of this type for bending recurve tips



and 1 in. wide. The tips are cut to 14-in. lengths before bending. The riser, Fig. 3, is cut with a 10-in. radius at each end. It should be noted that in the assembly of the laminations the riser is slightly off-center. Note also that the bow has two parts, the upper half being referred to as the upper limb and the lower half as the lower limb. After the riser has been sawed to the rough form and the curved surfaces smoothed by sanding, it is glued to the center of the toxwood backing strip. (Toxwood consists of thin layers of selected maple bonded with a special resin adhesive.) Before the glue dries, wipe off all the excess so that a smooth joint results. Next, the walnut recurve tips are steamed and bent. After drying thoroughly in the forms, they are removed and cut to 8½-in. over-all length and glued to the toxwood backing. The lower ends of the tips are feathered flush before the lemonwood laminations are applied. Note that these are 14 and 15½ in. long, Fig. 1. At the riser ends, the lemonwood laminations are tapered to 1/64 in., but are feathered or tapered to zero at the outer ends where they join the recurves. Apply the Osage laminations in the same manner, but note before cutting stock that one is 15 and the other 16½ in. long. Locate the center of the bow and measure 4½ in. each way. Then bandsaw the riser to the form shown by the dotted lines in Fig. 3. The recurve tips are tapered by hand, the dotted lines serving merely as guides to the rough size. At this stage the bow is ready for nocking and rough shaping, or tillering.

The recurve tips are nocked for the bowstring as in the center photo on the opposite page. Use a 3/16-in. round file and file the notch at approximately the angle indicated. The notch should continue around to the opposite side of the tip. Be sure that it is cut to the same depth and at the same angle on both sides of the tip. Brace (string) the



bow with a linen bowstring. Then hold it firmly in a padded vise and scrape the limbs to bring the bow to the proper tiller, or bend. This is one of those jobs that must be done by stages with frequent periods of testing with a spring scale. Bowmakers usually use a fish scale for testing. Scraping can be done with a cabinet scraper with fair success but bowmakers prefer a discarded power-hacksaw blade having one side ground to a cutting edge. As the scraping proceeds, check the pull with the spring scale, drawing the bowstring 24 in. from the center of the bow at each trial check. As each check is made, note carefully the arc of each limb of the bow. Both should flex to the same arc during the test. If not, scrape excess stock from the stiffer one until both flex uniformly when the bow is braced.

When tillering and scale checks bring the pull to about half the desired weight of 60 to 65 lbs., the bow is ready for application of the plastic, which is glued and clamped in place in the same manner as the other laminations. Application of the plastic will increase the pull somewhat beyond the 60 to 65-lb. limit and it will be necessary to continue the scrape-and-weight-check procedure until the desired pull is restored.

The final step in building up the laminations is the application of a Conlon (glass cloth) strip to the toxwood backing. A length of glass cloth slightly longer than the bow is placed over the large bending form. Coat the toxwood backing with glue and place the bow on the form over the glass-cloth strip. Then apply U-clamps and allow to dry thoroughly. Once more it will be necessary to scrape the bow to restore the proper pull. Work carefully and check frequently this time or you may exceed the limit. When the pull has been correctly established, sand the bow to a glass-smooth surface and apply two thin coats of varnish.



Upper photo, one of several types of plastic overdraw attachments. Center, cutting nocks (notches) in the recurve tips of a flight bow. Below, bowmakers finish the bow by dipping in tank containing varnish



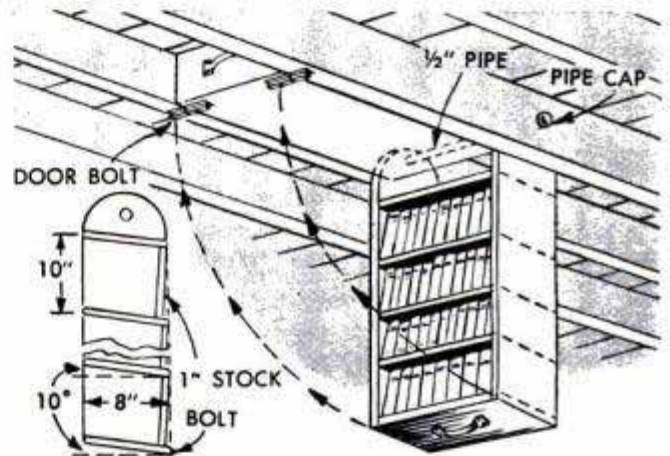
Using slabs of selected native stone set in concrete mortar, one homeowner constructed this attractive fireplace in his back yard to provide a gathering place for outdoor dining and recreation. The fireplace is erected around a cookstove having grates built for burning wood and has two compartments covered with concrete slabs which serve as tables in the preparation of food. Extending from the sides of the fireplace, slab-covered stonework furnishes benches for diners. The fireplace rests on a concrete foundation which also forms an apron covering the work area in front of the installation.

Outdoor Fireplace Has Tables and Benches Built Into Single Unit for Convenience



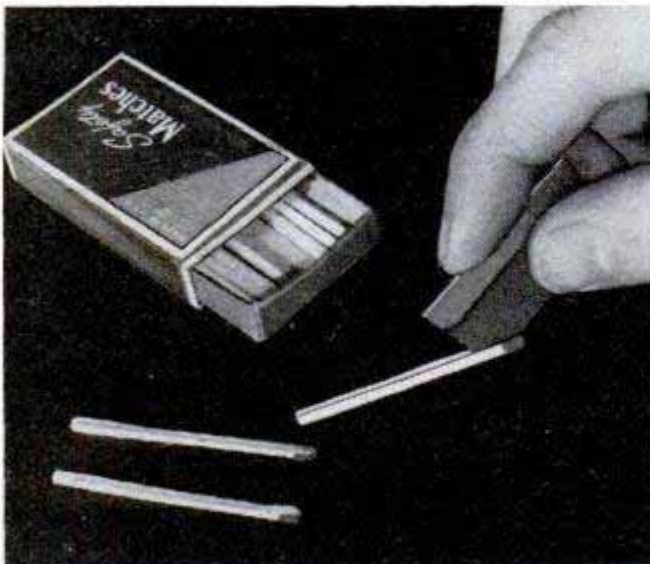
Box For Storing Little-Used Items Pivoted Between Floor Joists

This handy box is ideal for storing books and magazines, as well as seasonal sporting and camping equipment, out of the way between floor joists. One end of the box pivots on two lengths of pipe joined by a coupling. The pipe is inserted in holes drilled in adjacent joists and capped to hold it in place. If a ratchet brace is not available for drilling the holes, drill small blocks to take the pipe and screw them to the sides of the joists for support. The opposite end of the box, which is lowered to gain access to the contents, is held in place by sliding door bolts when stored. Shelves should be installed at a 10-deg. angle to help prevent the books



from falling out when the box is lowered. A list of the contents may be posted on the box for quick reference.

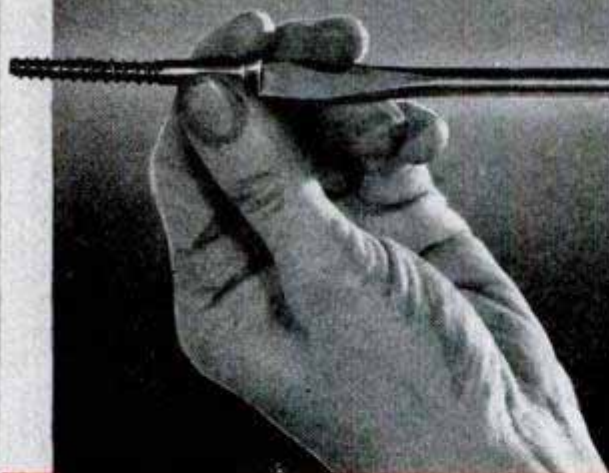
Supply of Matches Doubled By Splitting Each One



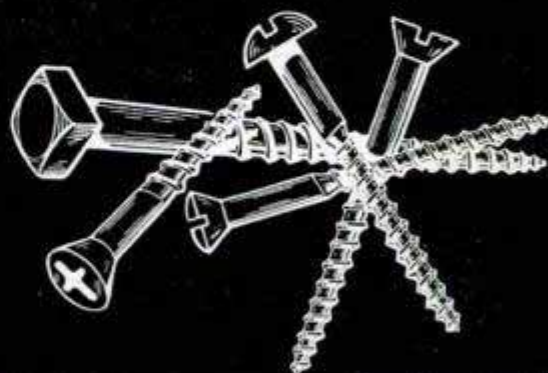
If you are on a camping or hunting trip and find your supply of matches running short, try splitting each one in half. You can do this with a safety-razor blade if one is at hand, or with a thin, sharp knife blade. The matches can be split quite accurately if you are careful in handling the blade. In most cases you will find that half a match will serve just as well as a whole one.

Repairing Plastic Toys

Plastic toys and novelties which have been cracked or broken often can be repaired by cementing with fingernail-polish remover or acetone. When applying the solvent, be careful that it is not spilled on the surface of the article.



1

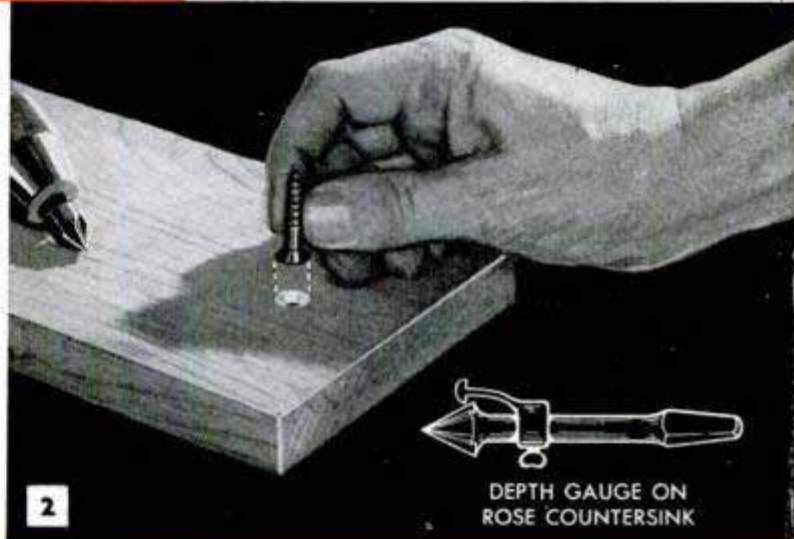


Fastening With WOOD SCREWS

By E. R. Haan

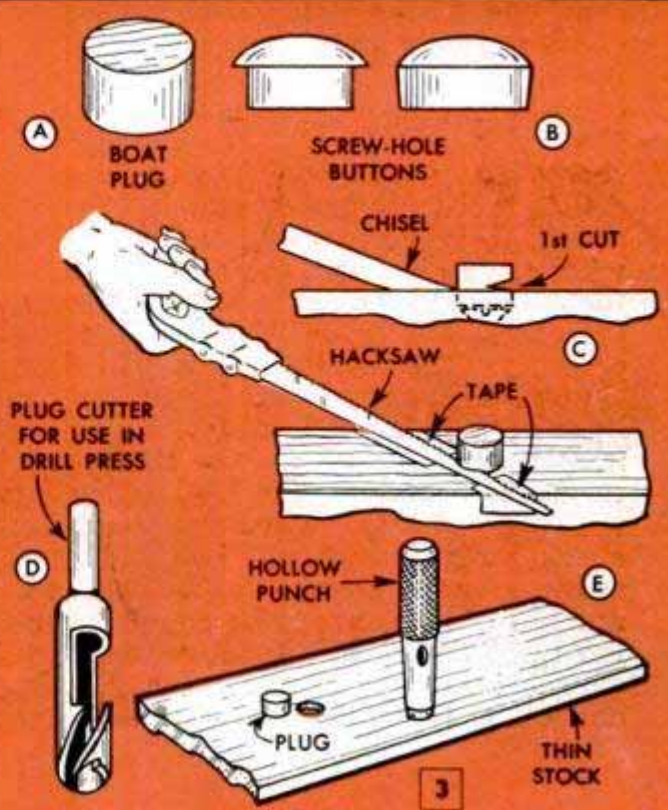
WOOD SCREWS have greater holding power than nails. They also permit work to be taken apart and reassembled without damage, using all the original parts. Modern wood screws are gimlet pointed. This is a comparatively recent development. Formerly, wood screws were made with blunt points similar to the modern cap screw and always required the drilling of suitable pilot holes. Wood screws most commonly used are made of steel as they are much stronger and the slotted heads will withstand high driving torques, either with hand or power screwdrivers. Wood screws also are made of brass, bronze, copper and stainless steel for special uses where resistance to corrosion is important. Steel screws often are plated with zinc, cadmium, brass or chromium to make them rust resistant and add to their holding power.

Types and sizes: Common wood screws are available with flat, round or oval heads having single or cross slots. The cross-slotted, or Phillips, head requires a special type of driver but provides four surfaces to take screwdriver thrust, or torque. Common screws vary in length from $\frac{1}{4}$ to 6 in. and are available in gauge thicknesses from No. 0 to No. 30. The sizes most commonly used range from No. 3 to No. 16. Larger sizes are rarely used in ordinary work. Lag screws have square bolt-type heads and are driven with a wrench. They come in fractional sizes. Certain types of screws also are available for special purposes, such as attaching ornamental-iron cabinet and door hinges, and latches. These are supplied with a square head similar to common

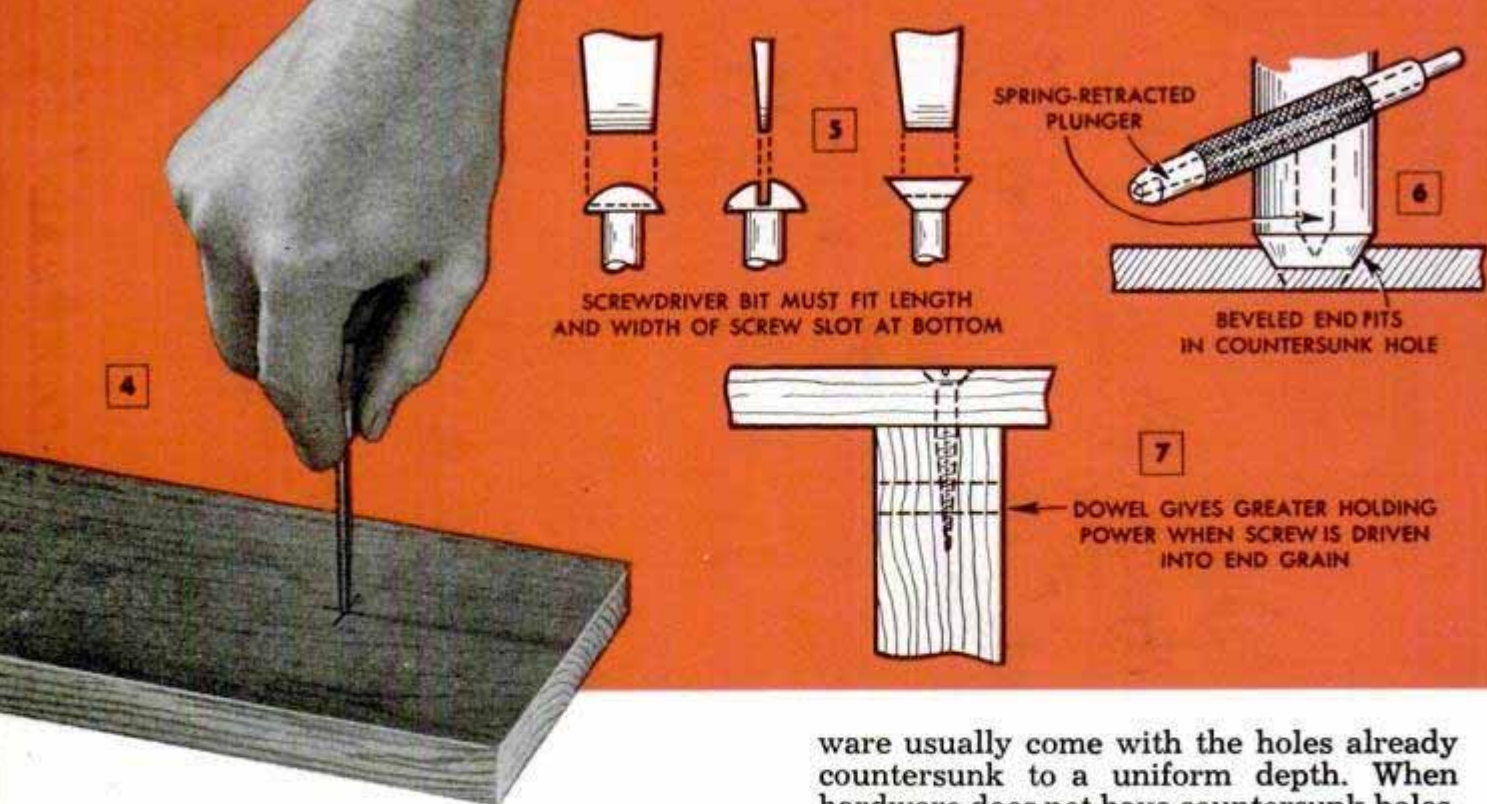


2

DEPTH GAUGE ON ROSE COUNTERSINK



3



lag screws, except the head is cross slotted.

Pilot and shank holes: Screws in the smaller sizes can be driven into softwoods without drilling either shank or pilot holes. For accurate work it is necessary to make a shallow starting hole with a punch or awl, Fig. 4. Larger screws will require shank and pilot holes for easy driving and to prevent splitting of the wood, especially when the screws are driven near the edge of the stock. When using twist drills for drilling both hole sizes, drill the pilot hole first. In softwood, the pilot hole should be about 70 percent of the core diameter, measured at the bottom of the threads, and should be drilled to a depth equal to about two thirds the length of the threaded portion. For hardwood, the figure is 90 to 100 percent, and the hole should be drilled to a depth approximately equal to the length of the threaded portion. The screw will drive easier in hardwood if the shank hole is slightly larger than the diameter of the shank. The shank hole always should be drilled to a depth equal to the length of the shank. When boring pilot and shank holes with auger bits, bore the shank hole first, then the pilot hole, as the larger bit will not center accurately or feed into the wood properly if the smaller hole is drilled first.

Countersinking: Holes for flat or oval-head screws should be countersunk to the proper depth so that when the screw is turned in, the edge of the head will be flush with the surface. When countersinking, check for proper depth by holding the screw over the hole as in Fig. 2. Where a number of holes are to be countersunk to the same depth, use a countersink depth gauge of the type shown in Fig. 2. Hinges and other types of screw-fastened hard-

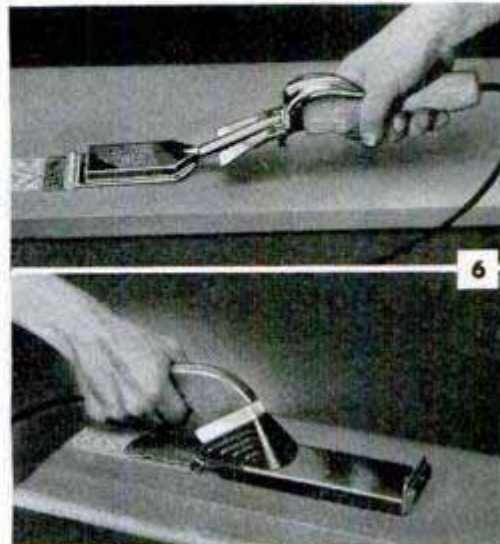
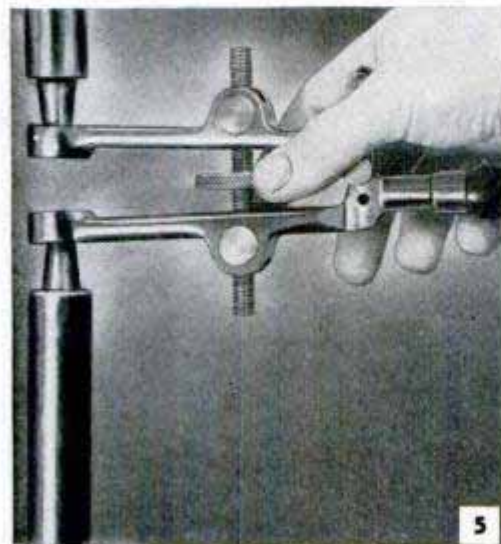
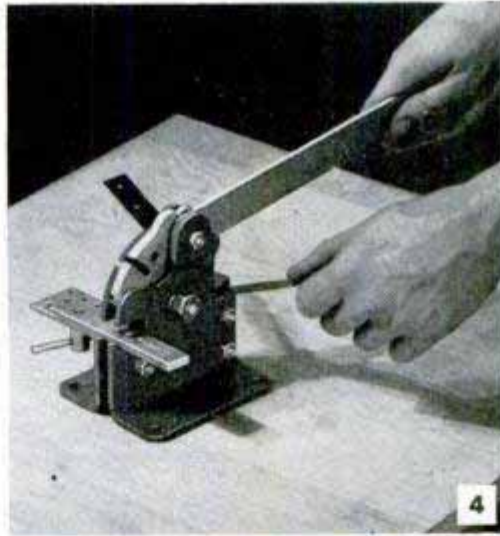
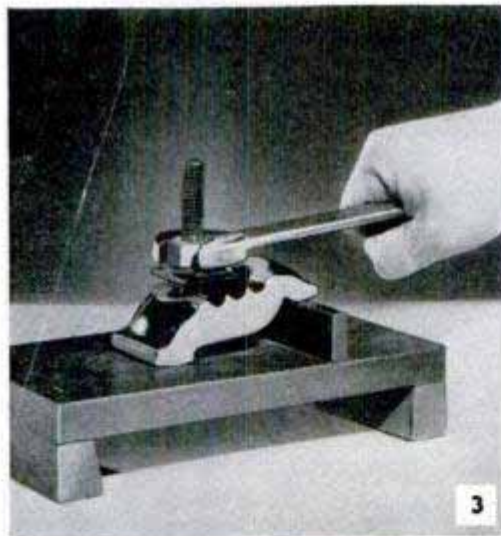
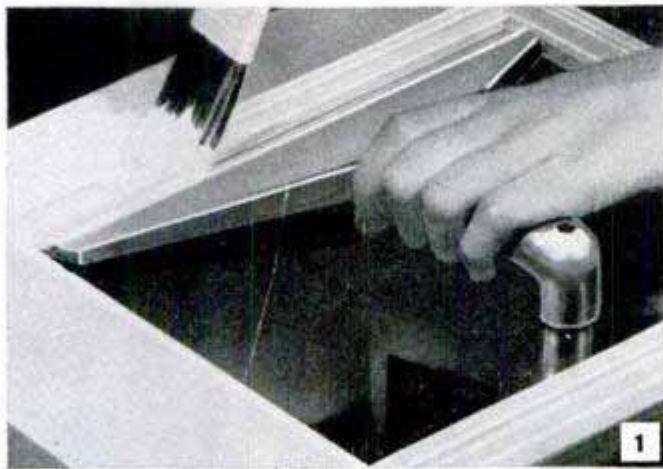
ware usually come with the holes already countersunk to a uniform depth. When hardware does not have countersunk holes, use round-head screws of a shank size that will fit the holes.

Counterboring: When it is desirable to conceal a screw entirely, counterbore the shank hole so that the screwhead can be sunk $\frac{1}{16}$ in. or more below the surface. The hole then can be filled with a suitable wood filler if the surface is to be painted. If the wood is to be stained or finished in the natural color, glue a boat plug or a screw-hole button in the counterbore as in details A and B, Fig. 3. Plugs are cut with the grain running horizontally so that by using a plug of the same kind of wood it is possible to match the grain quite closely. Plugs should project $\frac{1}{16}$ to $\frac{1}{8}$ in. above the surface when driven home. After the glue is dry, cut the plug nearly flush with a wood chisel or key-hole hacksaw, Fig. 3, C. Then sand flush.

Cutting plugs: Screw-hole plugs can be made on a drill press by using a plug cutter of the type shown in detail D, Fig. 3, or they can be cut by hand with fair accuracy by using a hollow punch of the type shown in detail E.

Tips on driving screws: It's important to use a screwdriver having a straight bit that fits the screw slot properly. The width of the bit, or blade, at the tip should be equal to or slightly narrower than the width of the screw slot at the bottom, Fig. 5. The thickness of the blade should be only slightly less than the width of the slot. When attaching hardware having countersunk holes, cabinetmakers lay out the holes with a centering punch of the type shown in Fig. 6. The correct method of starting a screw is pictured in Fig. 1. When it is necessary to drive a screw into end grain, insertion of a small cross dowel, Fig. 7, will add to its holding power.

SHOPPING FOR TOOLS



1. PAINTER'S BRUSH—the tedious job of cutting or enameling quarter painting with two exterior work. It is m 5½ and 9 in., and is for easy manipulation

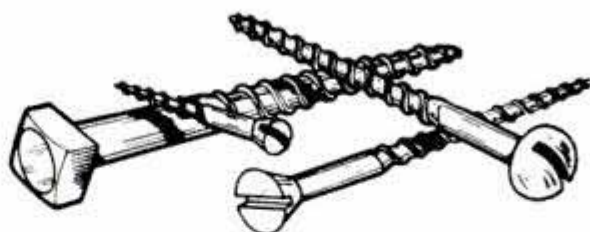
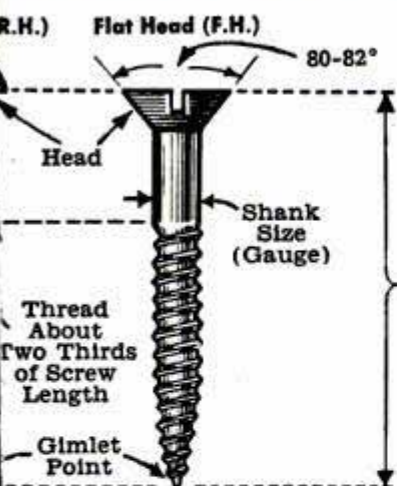
2. PORTABLE WELDER—type is made for home and others who need supplied in three types with accessories, also for with cart for 110 third type is designed

3. SELF-SETTING CUT—drill press and milling packing which must conventional clamping novel rocker-type bolt faces which permit loly at any height

4. FOUR-IN-ONE BE—forms, shears and punches to ½ in. by a single stroke. Supplied with punches three sizes, also bending and a rivet die for holding. Height of unit is 5

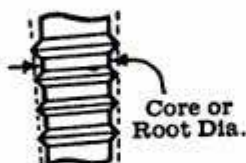
5. ELECTRODE DRESS—is designed for removing tip that forms on the. Furnished with replaceers for standard, trunc and radius tips in No. Tips can be dressed w

Get on WOOD SCREWS



DRIVING SCREWS

Screw must be thick enough to resist shearing. Entire threaded section should enter piece to which something is fastened. Use screwdriver having blade tip of correct thickness and width to fit screw slot snugly. Rub screw thread on soap or beeswax to make driving easier.



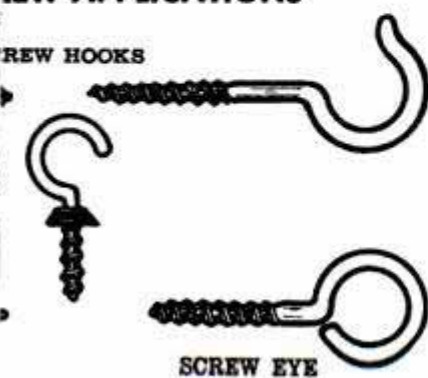
7	8	9	10	11	12	14	16	18	20	24
.151	.164	.177	.190	.203	.216	.242	.268	.294	.320	.372
$\frac{1}{32}-$	$\frac{5}{32}+$	$1\frac{1}{64}+$	$\frac{3}{16}+$	$1\frac{3}{64}-$	$\frac{7}{32}-$	$1\frac{5}{64}+$	$1\frac{7}{64}+$	$1\frac{9}{64}-$	$2\frac{1}{64}-$	$\frac{3}{8}$
22	18	14	10	4	2	D	I	N	P	V
44	40	37	33	31	30	25	18	13	4	1
49	47	44	40	37	33	31	30	25	18	13
51	48	45	43	40	38	32	29	26	19	15
53	52	51	48	45	43	40	38	32	29	26
16	15	14	13	12	11	10	9	8	8	7
.05	.332	.358	.385	.411	.438	.491	.544	.597	.650	.756

Screws have gimlet points; cone and diamond points are special. Length is measured from the threaded tip to the largest bearing surface of the head. Body diameters—gauge sizes—increase in steps of .013 in. Tolerance from speci-

fied sizes ranges from .004 in. plus, to .007 in. minus. A 10 percent variation of threads per inch is permitted. Head dimensions of wood screws are identical to those of machine screws of the same size and type.

IN EACH GAUGE										
1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2	5	
6-20	6-20	6-20	6-20	8-20	9-24	10-24	12-24	14-24	14-24	

NEW APPLICATIONS



LAG SCREWS — LENGTHS AND DIAMETERS (in inches)

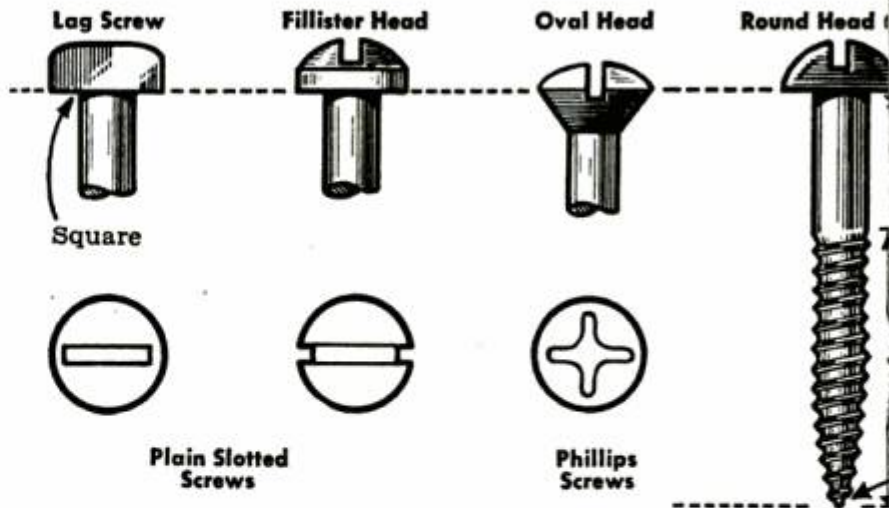
Lengths	Diameters			
	1/4	3/8, 7/16, 1/2	5/8, 3/4	7/8, 1
1	x	x		
1 1/2	x	x	x	
2, 2 1/2, etc., to 10	x	x	x	x
11 & 12		x	x	x
13 to 16			x	x

Popular Mechanics Data Sheet

WHEN YOU BUY SCREWS

Specify (1) length, (2) gauge number, (3) type of head—flat, round or oval, (4) material—steel, brass, bronze, etc., (5) finish—bright steel, blued, cadmium, nickel or chromium plated

Example: 1 3/4" No. 10 flat-head (f.h.) steel, cadmium-plated wood screw



Gauge Numbers		0	1	2	3	4	5	6	
Actual Cross Section of Screws		●	●	●	●	●	●	●	
Basic Decimal Diameter		.060	.073	.086	.099	.112	.125	.138	
Fractional Dia. Nearest 64th		1/16-	5/64-	5/64+	3/32+	7/64+	1/8-	9/64-	
Drill Number		52	47	42	37	32	30	27	
Pilot or Anchor-Hole Sizes	Hard-wood	Slotted Screws	70	66	56	54	52	49	47
		Phillips "			70	66	56	54	52
	Soft-wood	Slotted "	75	71	65	58	55	53	52
		Phillips "			75	71	65	58	55
Threads Per Inch		32	28	26	24	22	20	18	
Maximum Head Diameter		.119	.146	.172	.199	.225	.252	.279	

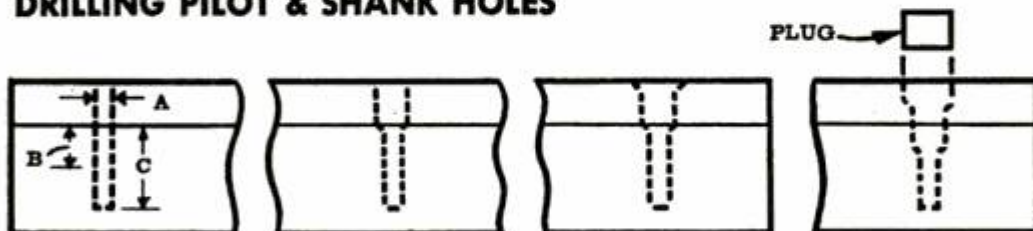
Drill sizes for body clearance holes are given in either numbered or lettered drill sizes. Dimensions are given in decimal or fractional parts of inches. In general, pilot holes should be about 90 percent of screw-core size for hard-

wood, 70 percent for softwood. In end grain and also in softwoods, such as pine, it frequently is unnecessary to drill a pilot hole.

There are nearly 300 standard wood screws of various sizes, lengths and types. Regular

SCREW LENGTHS MATCHING GAUGES									
Lengths In Inches	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Gauges	0-4	0-8	1-10	2-12	2-12	3-14	3-16	4-18	4-20

DRILLING PILOT & SHANK HOLES



1st: Pilot hole A: 70% of screw-core dia. for softwood—90% for hardwood. B: 1/2 thread depth for softwood. C: Full thread depth for hardwood

2nd: Shank hole equal in dia. and length of screw shank

3rd: Countersink so flat-head screws will be flush

Counterbore for plug to conceal screw first with auger bit but last with twist drill

Note: When using auger bits, first bore the hole for the plug. Then bore the body clearance hole and finally the pilot, or anchor, hole

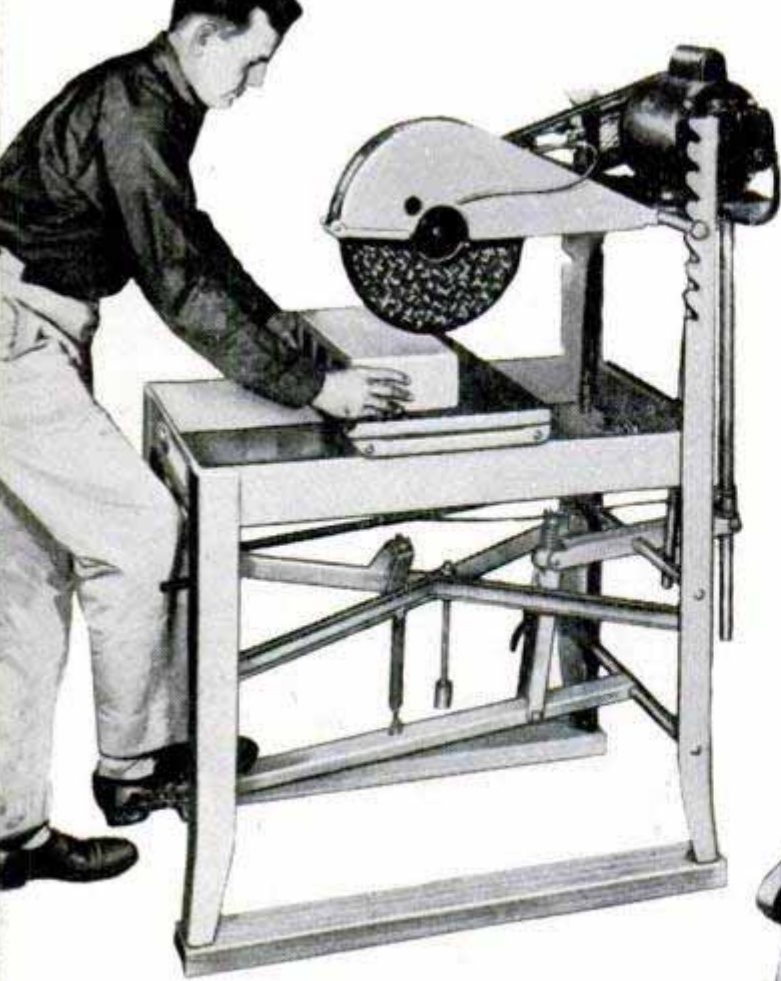
OTHER SCREWS



CUP HOOK



HANGER BOLT



7

GUIDE speeds up
g in sash, painting
ound and trim, and
s in interior and
de in two widths,
ted with a handle
in close quarters

of the generator
craftsmen, farmers
light welder. It is
s—generator only
generator and mo-
voltage a.c. or d.c. A
or use on 220 volts

MP for use with
machines eliminates
e used under con-
vices. Unit has a
er and curved jaw
king work secure-
without slippage

ICH TOOL rivets,
hes sheet metal up
ke of a hand lever.
and die plates in
g and forming dies
low or solid rivets.
n., weight 6 lbs.

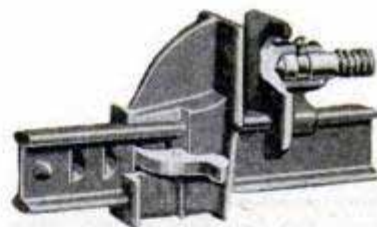
R for spot welders
g the "mushroom"
ends of electrodes.
table hardened cut-
cated-cone, domed
and No. 2 tapers.
hen current is on

6. HIGH-TEMPERATURE PAINT PEELERS are now supplied in two types and sizes having new ceramic elements giving 1000-deg. operating temperature. The larger size strips paint from large surfaces at the rate of 6 to 10 ft. per minute and is especially suited to paint removal on house exteriors, boats, and furniture

7. CONVERTIBLE MASONRY SAW converts to a track saw for cutting through concrete preparatory to installing water, sewer or gas lines. The motor-and-arbor assembly is simply removed from the regular stand and placed on a four-wheeled cart as shown in the right-hand photo. Cart is available as a separate unit

8. CARPENTER'S BAR CLAMPS are now available with a new locking device for the sliding jaw. A pivoted steel dog located on the side of the movable jaw engages notches spaced 1/2 in. apart and pressed into the center of the I-beam or bar which forms the body of the clamp. Jaw slides freely when the dog is released

9. SNAP-IN, SNAP-OUT GLASS CONTAINERS provide safe storage for the innumerable small parts and fasteners that must be kept in order in the shop. Baby-food jars in the 5 and 8-oz. sizes snap into pressed-steel holders which are available in 12 and 21-in. lengths holding five and eight jars with contents always in full view



8



9

Attractive Garden Ornament Constructed From Scrap Materials

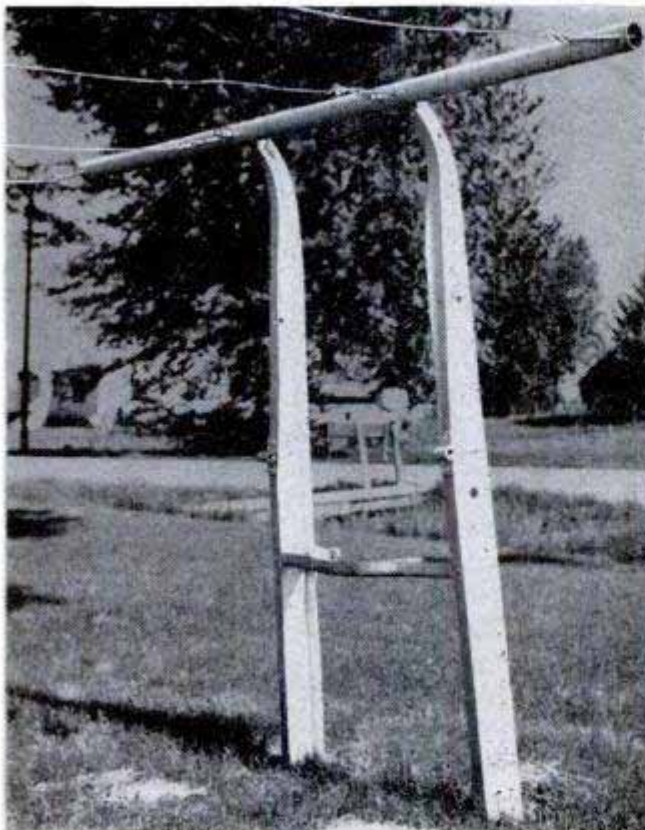
Requiring only simple tools and little more than scrap materials to make, this simulated "wishing well" will provide an attractive ornament for your garden or back yard. Materials needed for the job are a discarded keg, several lengths of 1 x 1-in. stock and a few shingles. Tin cans with the tops removed and fitted with wire handles are hung from a crosspiece to give the effect of well buckets. When completed, the ornament should be given one or two coats of brightly colored paint. Ferns or flowers may be grown in a pan containing soil set in the keg opening.



Automobile Frame Provides Sturdy Clothesline Supports

Cut in half, and with each half set vertically in concrete, an old automobile frame will provide sturdy clothesline supports. Each should be fitted with a 3-in. pipe crosspiece 4 to 6 ft. in length, depending upon the number of lines used. Crosspieces are drilled for eyebolts to which separate lengths of clothesline will be fastened.

A. M. Wettach, Mt. Pleasant, Iowa.



Tubing Shields Water-Color Brush

Pressing a section of rubber tubing over a camel-hair artists' brush forms a sheath that protects the bristles when the brush is not in use. Pressed over the large part of the brush behind the ferrule, the sheath will hold securely and provide clearance around the bristles, not disturbing the pointed shape of the brush. Rubber fountain-pen bladders can also be used for this purpose.

George Kapitan, New York City.



Stovepipe Cuts Strawberry Runners

A short length of stovepipe, fitted at one end with a carrying handle, furnishes an effective device for cutting strawberry runners. The handle is a length of dowel or broomstick, which is fastened across the pipe just below the top edge and held in place by screws. The top edge may be turned down to protect the hands from possible injury.

Mrs. Michael Fey, New York City.



KNOW YOUR CAR'S NERVOUS SYSTEM

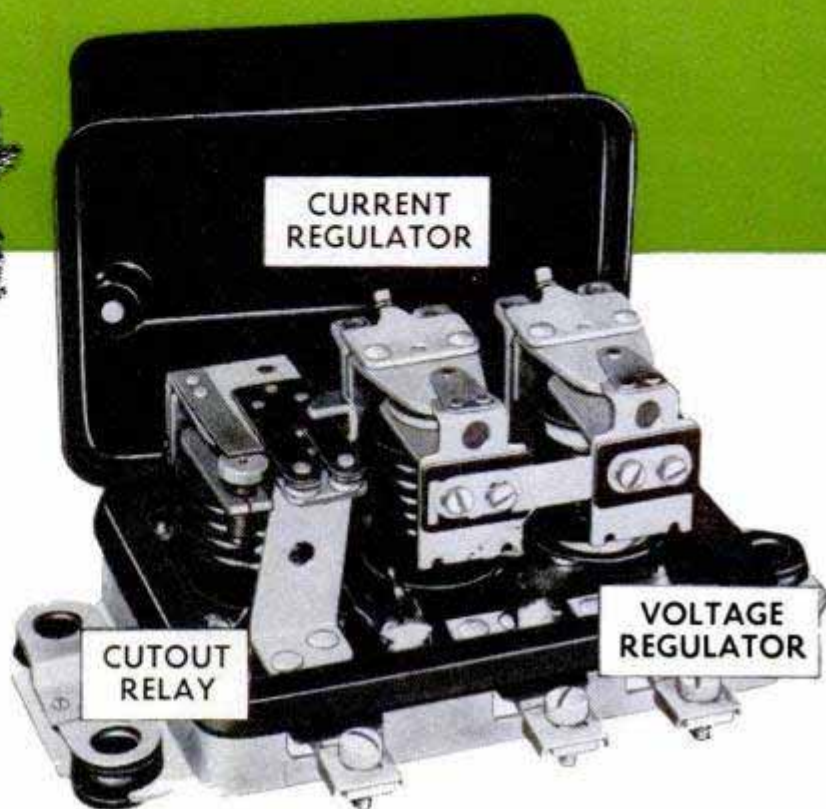
The Generator Regulator

By W. K. Mitchell
and Howard B. Birt

TODAY'S PASSENGER CAR with its many electrical accessories is, of necessity, equipped with a generator capable of very high current output. To prevent the generator from damaging the electrical system by producing too high a voltage, or ruining itself by producing too much current, it must be controlled by a generator regulator—the “watchdog” of the electrical system.

The basic function of the regulator is simple. Regardless of its type, its manufacturer, or its location in the car, the regulator does only one job—it limits the output of the generator. The regulator does this by controlling the flow of current in the field coils of the generator. Such control is effective because the output of the generator at operating speed depends on the strength of the magnetic field produced by the field coils. In turn, the strength of the magnetic field is dependent on the current flowing in the field-coil windings. This current flow is, therefore, the key to the generator output. To control the field current, the regulator intermittently inserts a fixed resistance in series with the field circuit at the proper time. Note the wiring diagram, Fig. 2.

The majority of modern passenger cars are equipped with a three-unit regulator similar to the one pictured above. This regulator is designed for use with the shunt-type generator found in most late-model cars. Its three units are the cutout relay, current regulator and voltage regulator. The development of this type of regulator has made it possible to limit generator voltage and current effectively at all generator speeds.



The data on regulator construction and wiring circuits described in the following paragraphs apply to Delco-Remy units, which are used on all General Motors passenger cars and various other independent makes. Although Ford cars use equipment of similar construction, they are wired somewhat differently.

The cutout relay is an electromagnetic switch which closes the generator-to-battery circuit when generator voltage is sufficient to charge the battery. When the generator slows or stops, or if for any reason the voltage drops to a point where it will not charge the battery, the cutout relay opens the circuit. This prevents a reverse flow of current from the battery to the generator, which could damage the generator.

As shown in Fig. 2, the cutout relay has two windings assembled on the same core. These consist of a series winding of a few turns of heavy wire (indicated by the solid line) and a shunt winding of many turns of fine wire (indicated by the broken line). The shunt winding is connected so that generator voltage is impressed on it at all times. The series winding is connected in series with the charging circuit so that generator output passes through it when the relay points are closed.

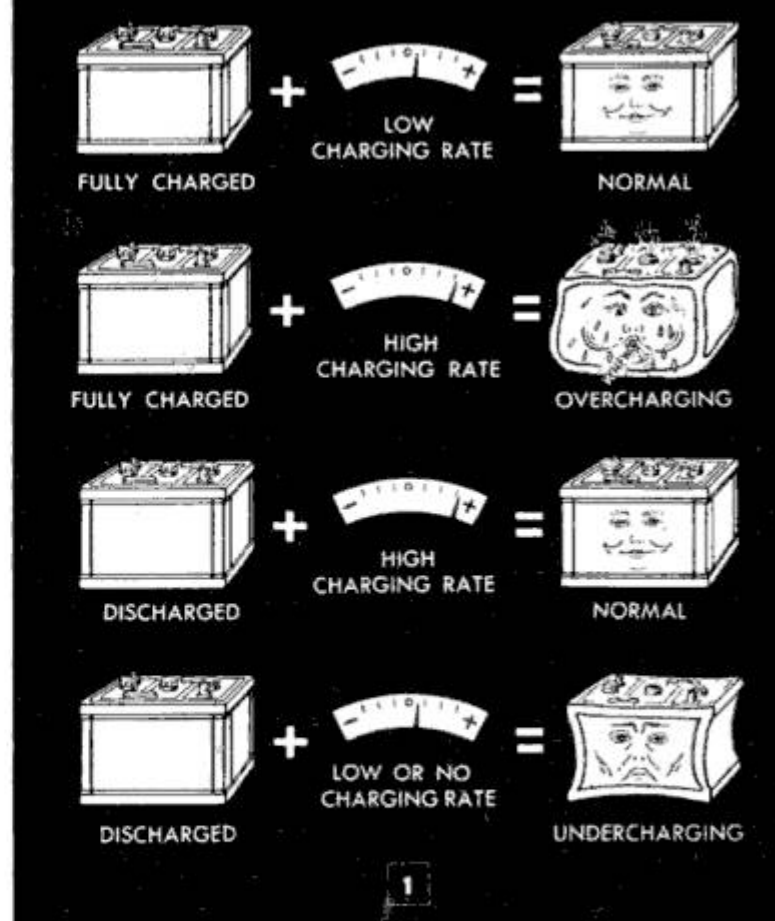
The cutout-relay core and windings are

assembled in a frame, and a flat steel armature is attached to this frame by a flexible hinge so that it is centered just above the end of the core. The armature has one or more contact points, depending on its type, which are located just above a similar number of stationary contact points. When the generator is not operating, the armature contact points are held away from the stationary points by the tension of a flat spring riveted to the side of the armature.

When the generator voltage builds up to a value great enough to charge the battery, the magnetism induced in the relay windings is sufficient to overcome the tension of the armature spring and pull the armature toward the end of the core until the contact points close. This completes the circuit between the generator and the battery. Current then flows from the generator to the battery, passing through the series winding in the proper direction to add to the magnetism holding the armature down and the contact points closed.

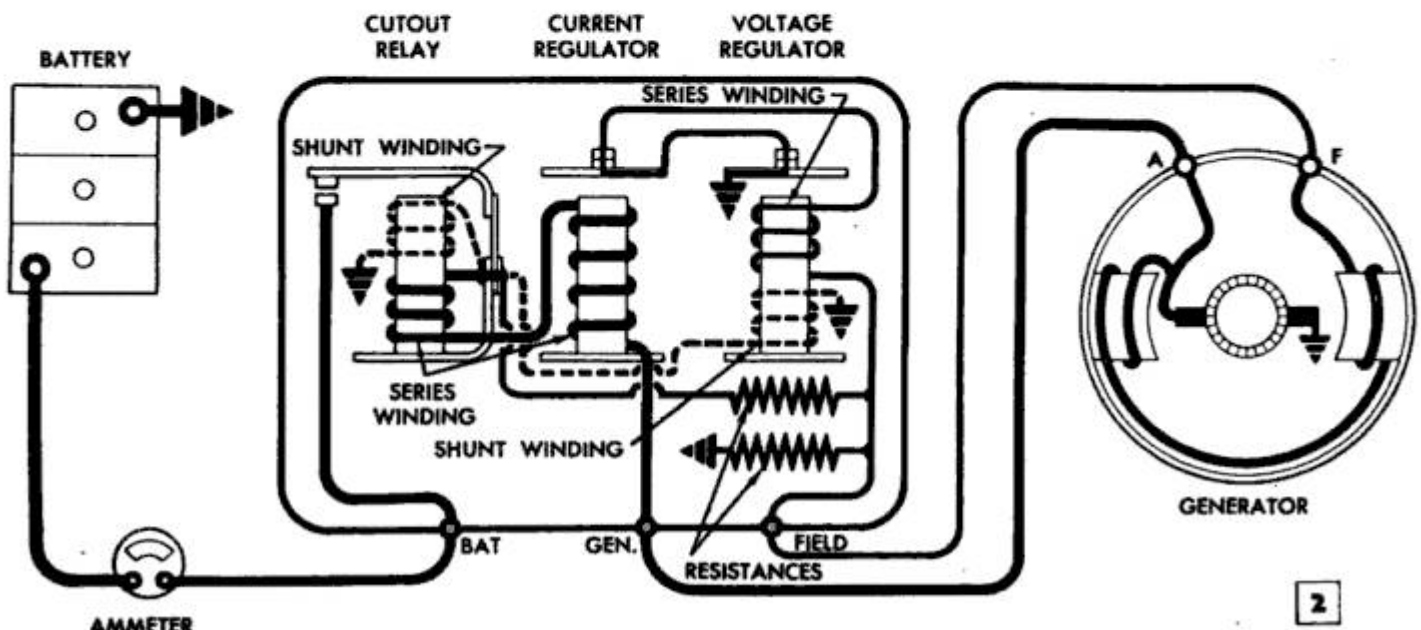
When the generator slows or stops, current begins to flow from the battery toward the generator. This reverses the direction of the current flowing through the series winding, thus reversing the series-winding magnetic field. The magnetic field of the shunt winding, however, does not reverse and the two windings now oppose each other so that the resultant magnetic field becomes insufficient to hold the armature down. The flat spring then pulls the armature away from the end of the core, the points separate and the circuit between the battery and the generator is broken.

The voltage-regulator unit prevents the voltage produced by the generator from becoming too high. It is similar to the cutout relay in that it has two windings on a single core, as shown in Fig. 2. It has a shunt winding consisting of many turns of fine wire (indicated by broken line) and a



series winding of relatively heavy wire (indicated by solid line). The shunt winding is connected across the generator, and the series winding is connected in series with the generator field circuit when the regulator contact points are closed.

The windings and core of the voltage regulator are assembled in a frame similar to that of the cutout relay. A flat steel armature is attached to the frame by a flexible hinge so that it is situated just above the end of the core. The armature carries a contact point which is just beneath a stationary contact point. When the unit is not operating, the tension of a spiral spring holds the armature away from the core so that the points are in contact with each other



and the generator field circuit is completed to ground through them.

When the generator voltage reaches the value for which the voltage regulator is set, the combined magnetic field produced by the shunt and series windings overcomes the armature-spring tension and pulls the armature down, separating the contact points. This action simultaneously opens the series-winding circuit and inserts resistance in the generator field circuit. The increased resistance reduces the strength of the magnetic field in the generator causing the voltage produced by the generator to drop.

Then, as the generator voltage drops, the magnetic field of the shunt winding in the voltage regulator is reduced. The opening of the contact points already has broken the circuit of the series winding and its magnetic field has collapsed completely. As a result, the combined magnetic field of the two windings is weakened enough to allow the spiral spring to pull the armature away from the core and the contact points are closed. This directly grounds the generator field circuit, and the voltage of the generator again begins to climb.

This cycle takes place at a rate of 150 to 250 times per second, limiting the voltage of the generator to a predetermined value. With the voltage thus limited, the generator supplies varying amounts of current to meet the varying states of battery charge

and the changing demands of the car's electrical load.

Despite the protection and control provided by the cutout relay and the voltage regulator, it still would be possible for the generator to damage itself by excessive current output. For example, when the electrical demand is heavy and the battery is in a discharged condition, the current output of the generator can increase without the voltage increasing to a value sufficient to cause the voltage regulator to operate. Consequently, the current output of the generator could continue to rise to a damaging degree.

To prevent this, the current regulator has been added. As shown in Fig. 2, this unit has only one winding, which is a series winding consisting of a few turns of heavy wire. The winding core is in a frame to which a flat steel armature is attached by means of a flexible hinge. As in the case of the voltage regulator the armature is placed just above the end of the core and contains a contact point situated directly below a stationary contact point. When the current regulator is not operating, the armature is held away from the end of the core by the tension of a spiral spring so that the contact points touch each other. In this position, the generator field circuit is completed to ground through the current-regulator contact points, in series with the voltage-regulator contact points.

Photos and information courtesy Delco-Remy Division, General Motors Corp.

Quick Checks of the Charging Circuit

Watch for	Possible Causes	Procedure
Fully charged battery, low charging rate	Normal operation	None required
Fully charged battery, high charging rate	Improper voltage-regulator setting Defective voltage-regulator unit Grounded generator field circuit (in either generator, regulator, or wiring) Poor ground connection at regulator Overheated battery (this will cause battery to accept high charging rate even though voltage-regulator setting is normal)	If battery temperature is O.K., operate generator at medium speed and disconnect lead from "F" terminal of regulator If output remains high, generator field is grounded either in generator or in wiring harness. If output drops to zero, the regulator is at fault and should be checked by a competent automotive electrician Generator output can be checked on the dash-panel ammeter
Low battery, high charging rate	Normal operation	None required unless high charging rate continues after battery reaches full charge
Low battery, low or no charging rate	Loose connections, frayed or damaged wiring Defective battery High circuit resistance Low regulator setting Oxidized regulator contact points Defects in generator	If connections and wiring are O.K., momentarily ground "F" terminal of regulator and increase generator speed. If output rises, the trouble probably is low voltage-regulator setting, oxidized regulator contact points, or open generator field circuit within the regulator If the output remains low, momentarily ground the "F" terminal at the generator. If this causes an increase in output the trouble probably is in the wiring between the regulator and the generator. If the output still is low, the generator is at fault and should be removed for careful checking If no charging rate is obtained, the trouble may be caused by malfunction of the cutout relay, a ground in the armature circuit between the generator and the cutout relay, or by an open field circuit in the generator

3

NOTE: Checks do not apply to Ford electrical system

When the generator current output reaches its rated maximum, which is the value for which the current regulator is set, sufficient magnetism is produced in the regulator winding to pull the armature down and open the contact points. With the points open, resistance is inserted in the generator field circuit so that the generator output is reduced. As soon as the current output starts to fall off, the magnetic field of the current-regulator winding is reduced, the spiral spring pulls the armature upward, the contact points close and again directly connect the generator field to ground. Generator output then increases and the cycle repeats. This cycle takes place 150 to 250 times per second when the current regulator is in operation, preventing the generator from exceeding its rated capacity, and burning itself up.

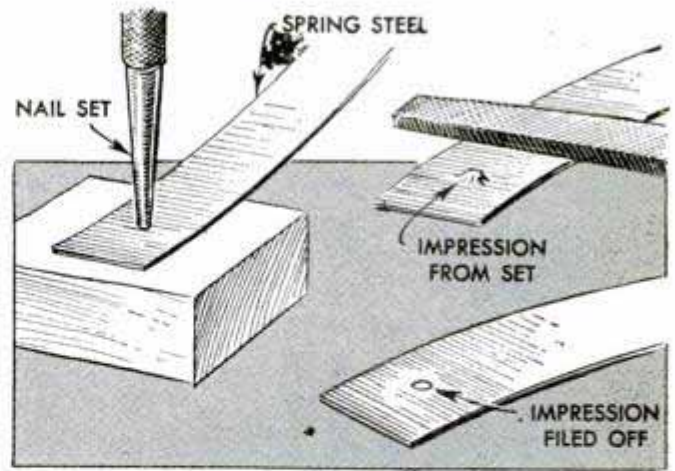
Whenever the electrical load is reduced (electrical devices turned off, or the battery brought up to a full charge) the voltage increases so that the voltage regulator begins to operate and tapers the generator output down. This prevents the current regulator from operating. It is obvious, therefore, that the voltage regulator and the current regulator do not operate at the same time. The flexible hinge which attaches the armature to the frame in each of the three units is a bimetal piece which compensates for temperature changes.

The average motorist can detect possible trouble in the charging circuit by maintaining a careful record of the state of charge of his car's battery and by watching the action of the ammeter on the dash panel. How the ammeter indicates trouble in the circuit is illustrated in Fig. 1. If abnormal operation is suspected, the quick-check procedure given in Fig. 3 can be followed to locate the source of trouble without using special equipment. Specialized equipment not usually found in the home workshop is required for proper regulator testing and adjustment.

After reconnecting any of the wiring in the charging circuit, repolarize the generator before starting the engine. After reconnecting leads, momentarily connect a jumper lead between the "Gen" and "Bat" terminals of the regulator. This allows a surge of current to flow through the generator, thus repolarizing it.

As temperature has a positive effect on the voltage required to charge a battery, it also must be considered in selecting the setting of the regulator. Where an auto is operated regularly in unusually high temperatures, it often is advisable to maintain a lower-than-normal regulator setting to prevent overcharge. Conversely, higher settings usually are required for regulators operated in extremely cold climates.

Hole Made in Flat Spring With Nail Set



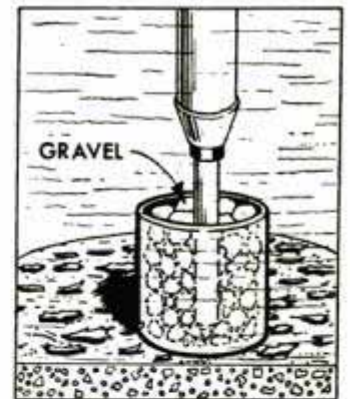
If you have occasion to make a small hole in a piece of clock spring or spring metal of similar thickness, an easy way of doing the job is to use a nail set. Place the spring on top of a hardwood block and use the nail set to dent the spring as much as possible. After this has been done, merely turn the spring over and file through the raised portion. The nail set can then be used as a "reamer" to true the hole if necessary.

Hugh Lineback, Stillwater, Okla.

Filter for Cistern Pump

To prevent leaves and other debris that might enter his cistern from clogging the pump-cylinder valves, one homeowner improvised a filter to fit over the end of the pump intake pipe as shown.

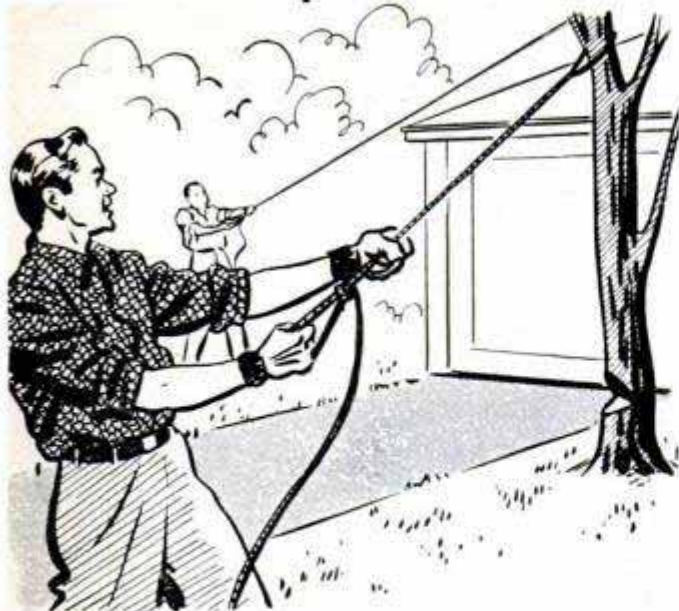
The filter consisted of a discarded gallon can with its top removed, filled with coarse gravel or crushed stone. If the latter is used, a screen should be placed over the end of the pipe to prevent the stone from being drawn into the pipe. Painting the can, or preferably, the use of a galvanized, copper or aluminum can, will give the most service insofar as resisting rust.



Square Serves as Marking Gauge

A combination square becomes a handy marking gauge if a small notch is filed in one end of the straight edge. To mark a board for ripping, set the square to the desired length and slide the head of the square along the edge of the board, holding the pencil point in the notch.

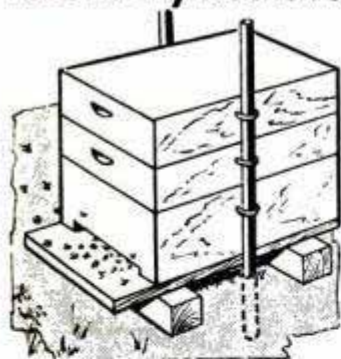
Loops Tied in Long Rope Provide Sure Grip



When pulling on a long rope, such as one used in guying a tree that is being felled, you will be able to maintain a surer, more powerful hold by knotting one or more loops in the rope where you grip it. You may grasp the loop normally or loop it about the hand at the wrist and grip it at the knot for the surest hold. Several loops, spaced at intervals suitable for accommodating additional men, could be provided for extra pulling power if needed.

Joseph Miles, Denver, Colo.

Superhives Anchored on Steel Rods Are Easily Removed and Replaced



When supers are added to a beehive to accommodate a heavy flow of honey, the possibility of their being blown off by the wind can be eliminated by using two steel rods as anchors. The rods are inserted through screw eyes driven into the sides of the hive and each super. Then the rods are pushed into the ground. This permits the addition or removal of supers by simply sliding them on or off the tops of the rods.

Wrench Kept Near Shutoff Valve For Emergency Use

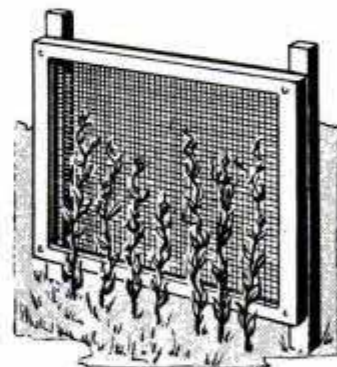
Kept near the shutoff valve of the gas meter in your house, a wrench will always be close at hand for shutting off the gas supply quickly in case of fire or other emergency. A discarded open-end wrench or an

adjustable wrench that has been set at the proper adjustment can be hung near the valve. Give the wrench a coat of bright paint or a coat of luminous paint to make it easier to locate in a dimly lighted room.

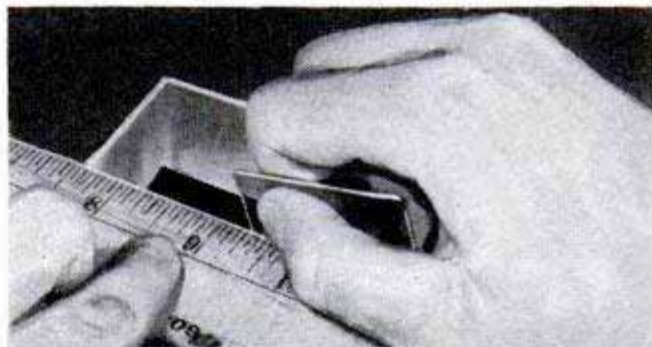
Hugh R. Fullagar, Chino, Calif.

Old Window or Door Screen Used as Flower Trellis

If you have a discarded window or door screen, it can be used as a trellis for sweet peas, morning-glories or other vine-type flowers. Just nail two stakes to the screen and anchor it as illustrated. The vines of the flowers will attach themselves to the screen wire strongly enough to avoid being blown down by an ordinary windstorm.

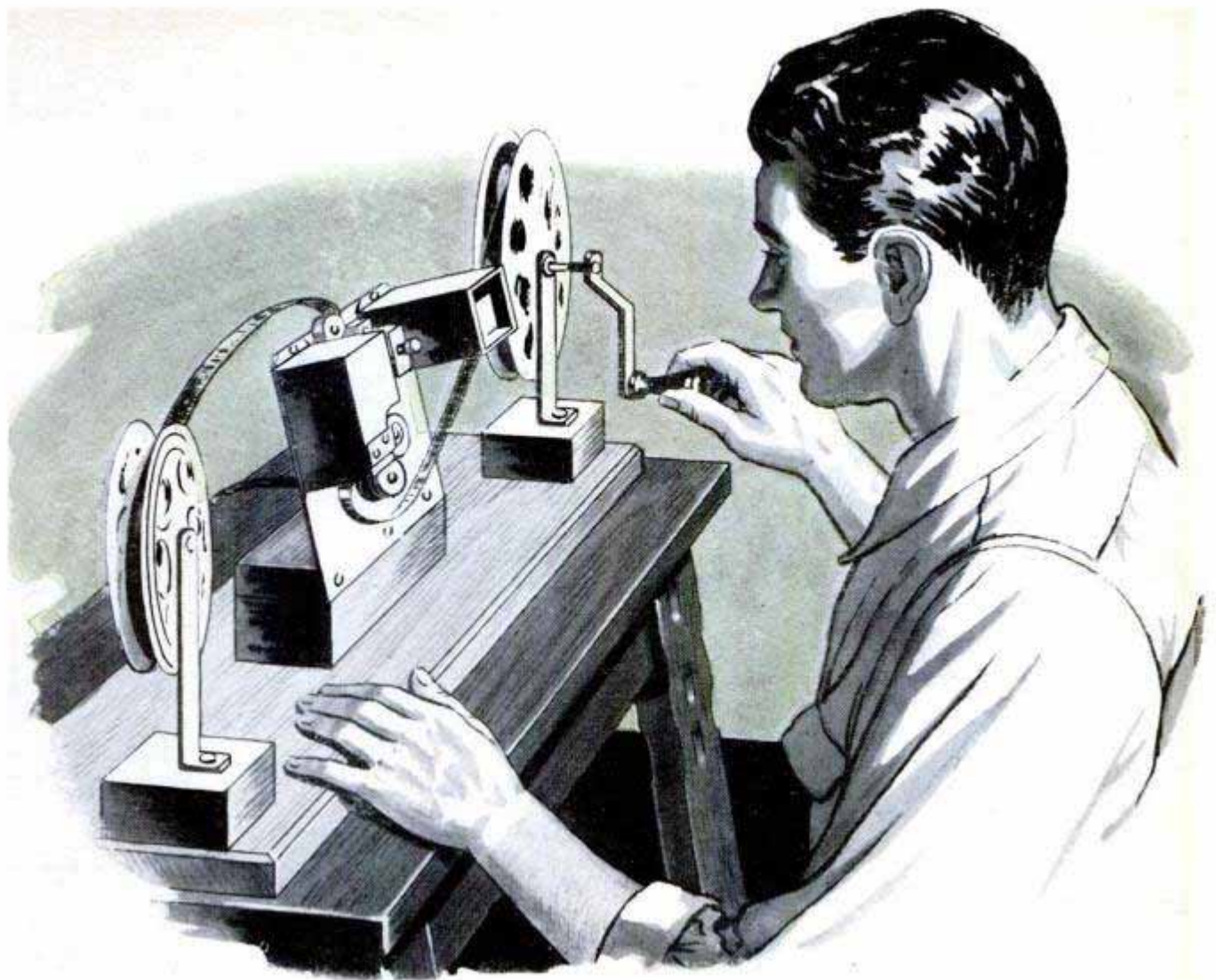


Cutting Tape Into Narrow Strips



Cellulose or photo tape may be cut into very narrow strips by pressing a wide strip on a sheet of glass and cutting it into strips of the desired width with a safety-razor blade. Use a straightedge, such as a ruler, to guide the blade. The tape strips are peeled off the glass as needed. The glass surface will not in any way interfere or damage the adhesive on the tape. If material other than glass is used, the possibility of damaging the adhesive will be greater.

John J. Rea, Urbana, Ill.



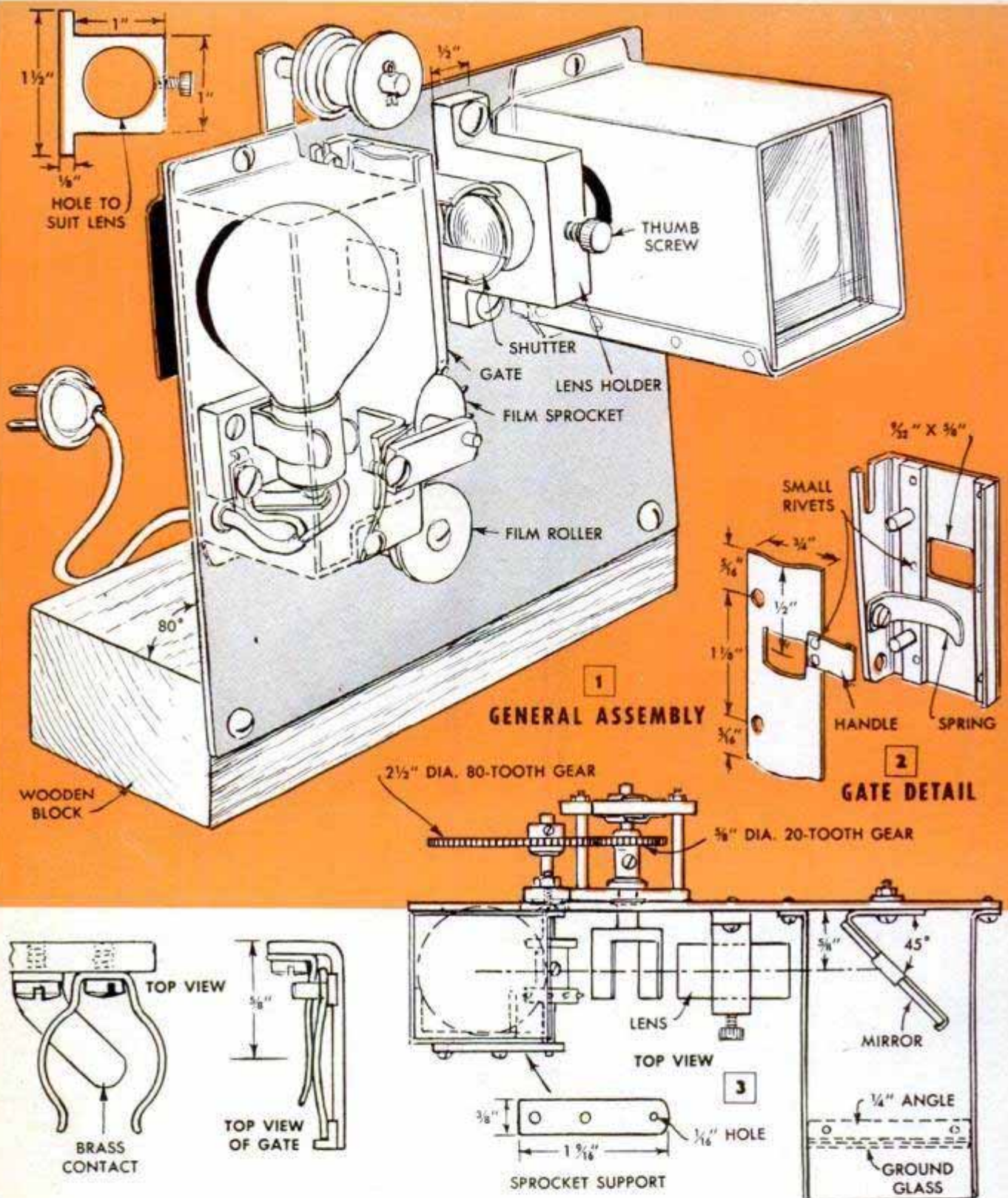
By Owen Wilson

SIMILAR IN operation to your movie projector, except that it is operated manually, this inexpensive 16-mm. viewer permits you to preview your home movies in continuous action on a small hooded screen. When used in conjunction with a regular film splicer, the unit provides a most convenient setup for editing. The original viewer was made for less than five dollars which included the cost of the lens and shutter. Spare parts from a discarded projector will further lessen the cost. Other than lens and shutter, the viewer is made for the most part of odds and ends.

Fig. 1 shows a general assembly drawing of the viewer itself. The spool rewinds may be purchased or improvised as shown. The first step is to cut and drill the panel according to Fig. 4. While sheet aluminum, $\frac{1}{16}$ in. thick, was used for the original panel, any sheet metal will do. To provide a more convenient viewing angle, the panel is fastened to a wooden block, the edge of which is beveled to tilt the panel 10 or 15 deg. It is important that the main parts of the viewer,

which include the lamp house, film gate, shutter, lens and viewing hood, be centered on a horizontal line 1 in. down from the top of the panel. The same is true in locating the parts out from the panel, all must be on a line $\frac{5}{8}$ in. from the panel as indicated in the top view, Fig. 3.

Patterns for both the lamp house and the viewing hood are given in the details accompanying Fig. 5. Each is provided with tabs for mounting, and tiny rivets are used in joining the seams. The lamp house is designed to accommodate a standard 115-v. round-type projector bulb, and by studying Fig. 1 and the detail above Fig. 4 you can see how the friction-type socket is made. The two parts of the socket are mounted on a fiber block to insulate them from the panel, the thickness of the block being sufficient to bring the center of the bulb $\frac{5}{8}$ in. out from the panel. Note in Fig. 1 that a hole is cut in the panel opposite the bulb and backed up with a baffle to vent the lamp house. Rollers for guiding the film are mounted above and below the gate, the lower one being mounted on a spindle attached directly to the panel, while the



1 GENERAL ASSEMBLY

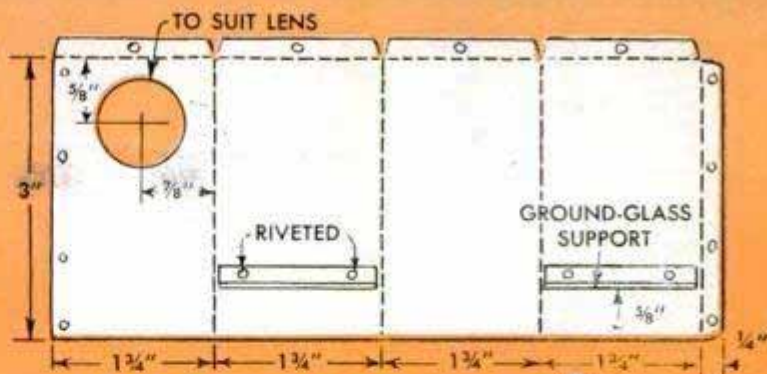
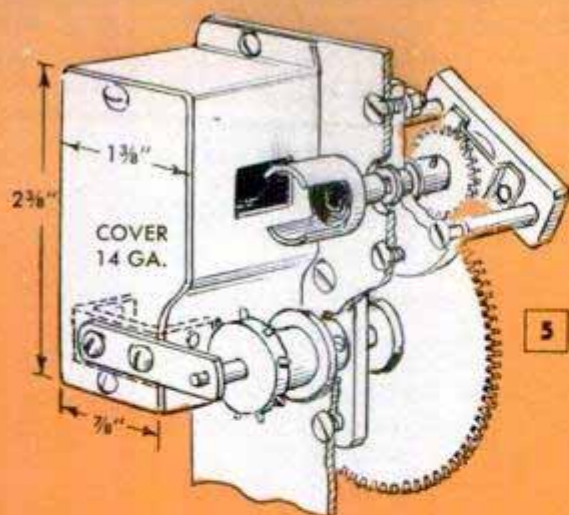
2 GATE DETAIL

3

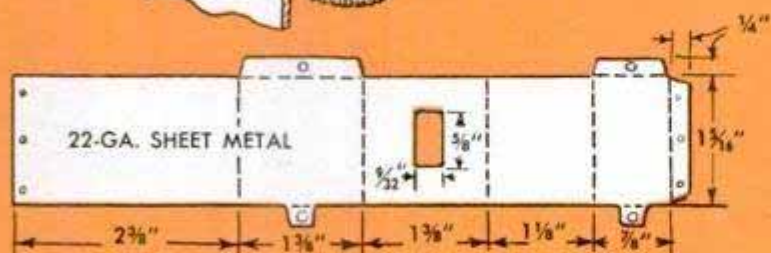
4

upper one is held by a stand-off bracket. The film gate detailed in Fig. 2 may be taken from an old projector or formed from brass. The top-view detail of the gate shown above Fig. 4, indicates how the flat spring of the gate holds the pressure plate against the film. The gate is mounted on the panel so that the windows in it and the lamp house are in alignment.

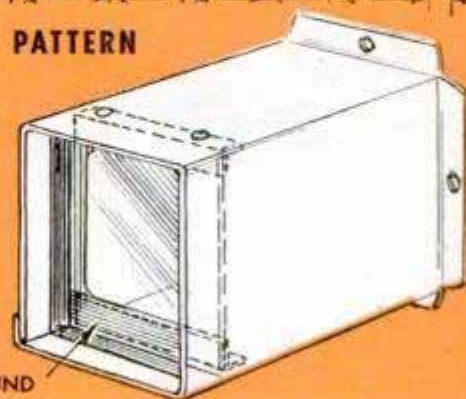
The sprocket and shutter mechanisms are detailed in Figs. 3 and 5. Note how they are placed in relation to each other to engage the gears properly. Here again, both the sprocket and the shutter must be mounted



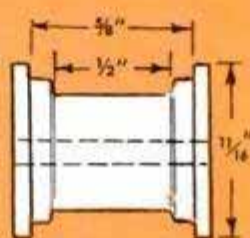
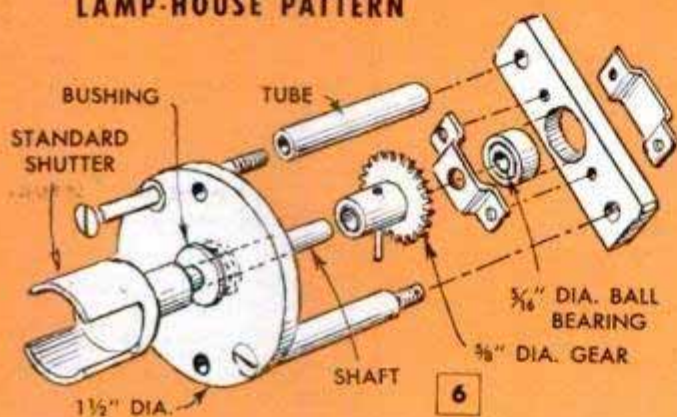
VIEWING-HOOD PATTERN



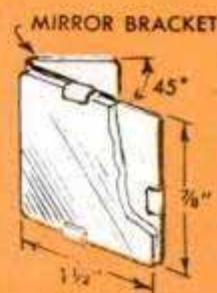
LAMP-HOUSE PATTERN



GROUND GLASS TAPED IN PLACE



FILM ROLLER



MIRROR BRACKET

so that they are centered on a line $\frac{5}{8}$ in. from the panel. A pull-apart view of the shutter mechanism, Fig. 6, clearly indicates how it is supported on the rear of the panel while Fig. 5 shows how the outboard end of the film sprocket is held by an arm which is fastened to the cover of the lamp house. The shutter rotates at a gear ratio of 4 to 1 between itself and the eight-frame sprocket. Both shutter and sprocket mechanisms should be adjusted to rotate freely.

The lens holder is cut to the shape indicated in the detail above Fig. 1. This is bored to suit the lens used and is fitted with a thumb screw to lock the lens in position

when in sharp focus. The image is transmitted to the viewing screen by a small mirror placed at a 45-deg. angle inside the viewing hood. This is pictured clearly in Fig. 3 and the detail to the extreme right of Fig. 6 shows how tabs on the mirror bracket are used to clamp the glass in place.

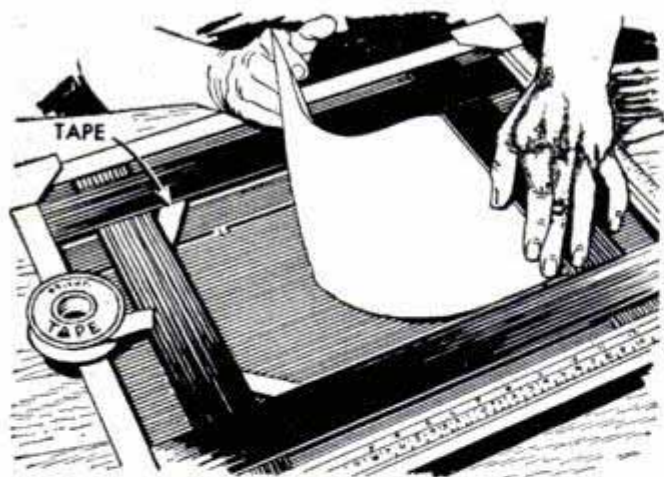
The reel support located to the left of the viewer should be a rewind type. The other support should be a take-up type having a 1 to 1 ratio and fitted with a long crank taken from a discarded can opener or like object because if a gear-type rewind is used to pull the film through the viewer, it will be difficult to control the speed.

Negatives Dried Quickly in Solution of Alcohol and Water

Here's one way to dry negatives in a hurry that requires little more than a large jar and a supply of denatured alcohol to do the job. First obtain a jar having an opening large enough to accommodate the largest of the negatives without a need for bending them when inserted. Partly fill the jar with alcohol and add water amount-

ing in quantity to 10 percent of the volume of the alcohol. After washing the negatives, dip them into the solution and remove the surplus afterward with a small squeegee or a clean windshield-wiper blade. If your enlarger does not overheat rapidly, you may then print the negatives immediately using a short exposure.

Tape Holds Paper Flat on Easel When Making Borderless Prints



When making borderless prints, the use of tacks or clamps to hold printing paper flat on an enlarger easel usually leaves marks which must be retouched on the print. To avoid this trouble, one photographer sticks strips of adhesive tape to the underside of the masking bands as in the

drawing. The mask is adjusted slightly larger than the over-all size of the print and the tape is pressed, adhesive side up, across the corners formed by the bands. This provides an adhesive surface at each of the four corners to hold the paper flat when placed on the easel.

Virginia Hanson, Los Angeles, Calif.

Negatives Protected in Developer By Use of Alternate Slots in Tank

To prevent thin film-pack negatives from buckling and coming in contact inside developing tanks designed to hold a dozen films, try loading only six negatives at a time in alternate slots. This will permit the processing chemicals to circulate freely, producing clean negatives free of blank spots that result when the films stick together.

Robert Hertzberg, Jackson Heights, N. Y.

Having no range finder on his camera, one photographer marked off a scale in feet on the strap of the camera case and used it to check distances before shooting.

Popular Mechanics Bookshop

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SHOP NOTES

Keep Your JOINTER Sharp!

Razor-sharp jointer blades make feeding easier, produce smooth, clean work to precise dimensions

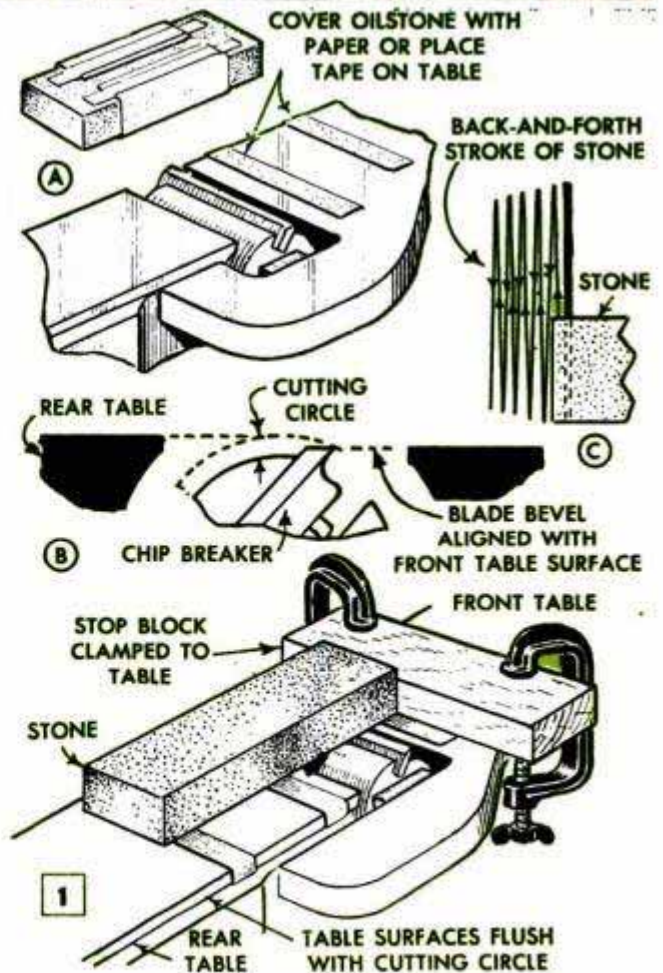
By E. R. Haan

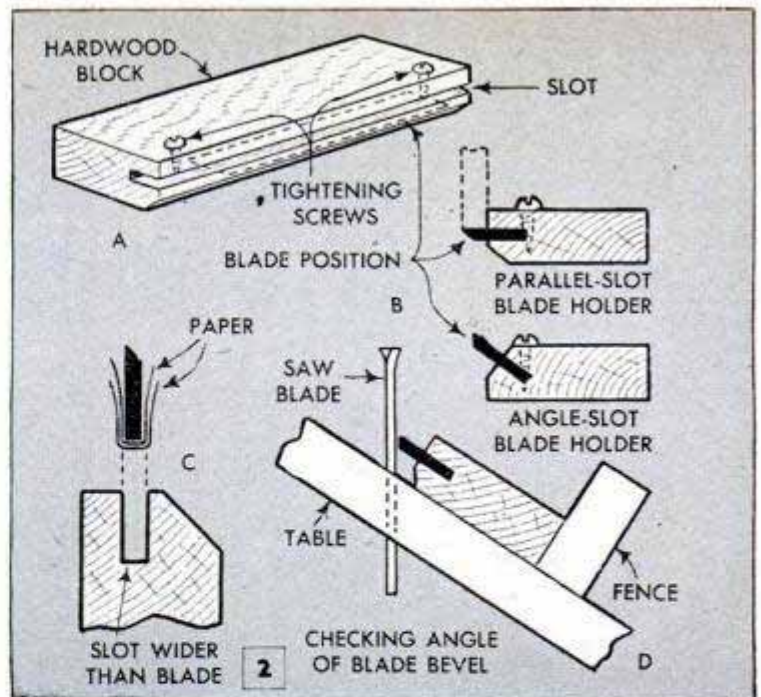
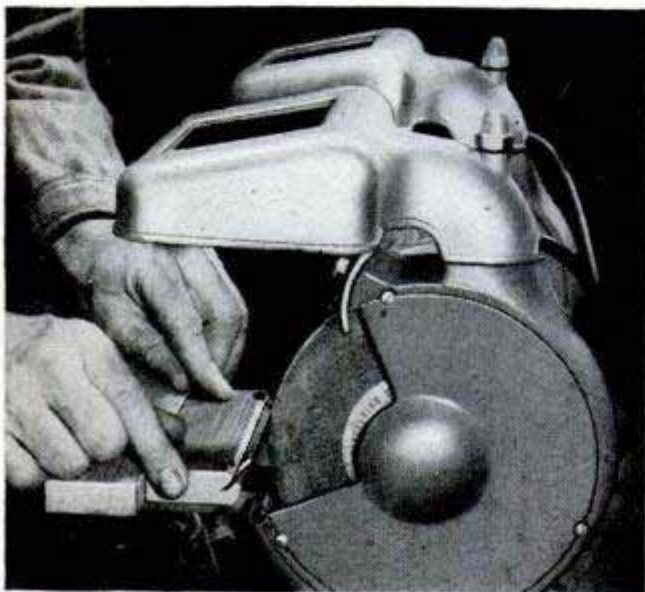


BY REGULARLY observing a few simple precautions you can keep your jointer cutting smoothly over a much longer period of time between sharpenings. Always brush abrasive dust and grime from the stock to be planed, using a wire brush. Don't plane wood on which there are traces of plaster or cement, or grains of sand and check used stock carefully to remove any embedded particles of metal.

Hand honing: When jointer blades have lost their keen edges they can be restored without removing from the head by hand honing the edges with a fine oilstone as in detail A, Fig. 1. Wrap a single thickness of heavy paper around the oilstone and tape it in place as shown or place two strips of masking tape across the table as indicated. Then lower the front table so that its surface lines up with the blade bevel. Wedge the jointer head firmly in this position and stroke the stone over the cutting edge in a uniform back-and-forth motion as in detail C, Fig. 1. Give each blade the same number of strokes. Continue the procedure until the blades are uniformly sharp.

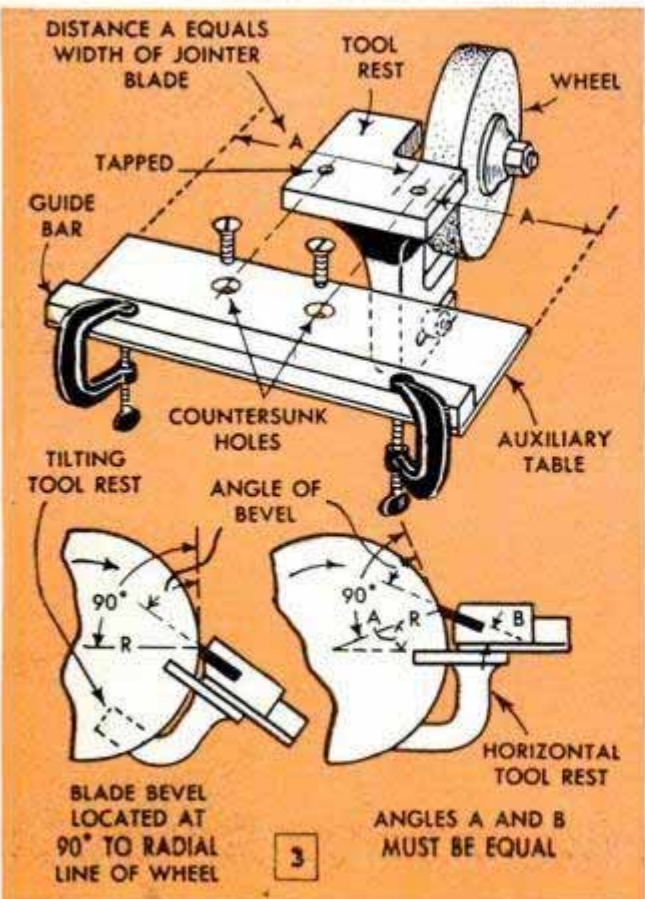
Power honing: Another method of honing, frequently used in woodworking shops, is to hone the blades while the machine is





running. Make the setup as in the lower detail, Fig. 1, but raise both tables to the highest point of the cutting arc. Use paper on the stone or tape on the table, as before, to protect the machined surfaces. Then start the machine and lower both tables uniformly until the stone contacts the cutting edges lightly. Move the stone back and forth in a full stroke two or three times, then stop the machine and examine the cutting edges carefully. The new bevel formed by honing should not be more than $\frac{1}{32}$ in. wide as otherwise the rear edge of the new bevel may strike the stock.

Grinding: After the blades have been honed once or twice and have again become dulled by use, they should be sharpened by grinding. Remove the blades from the cutterhead, as shown in the upper left-hand photo, and then make a hardwood holder of either type shown in details A and B, Fig. 2. The holder having the slot parallel to the sides as in detail A is the one to use when the grinder tool rest can be set at the required grinding angle. Otherwise the blade slot must be cut at the required grinding angle. Clamp screws driven into the wood across the slot hold the blade firmly in place while grinding. If necessary, wedge the blades in place with folded strips of paper as in detail C, Fig. 2. One simple method of determining the correct grinding angle is to place the blade and holder against the ripping fence of the circular saw as in detail D, Fig. 2. Tilt the saw table or the arbor until the blade bevel is flush with the side of the saw blade. The correct grinding angle then can be read on the tilt scale. One simple setup for grinding jointer blades on an ordinary bench grinder having a tilting tool rest is detailed in Fig. 3. As most bench grinders have only a small tool

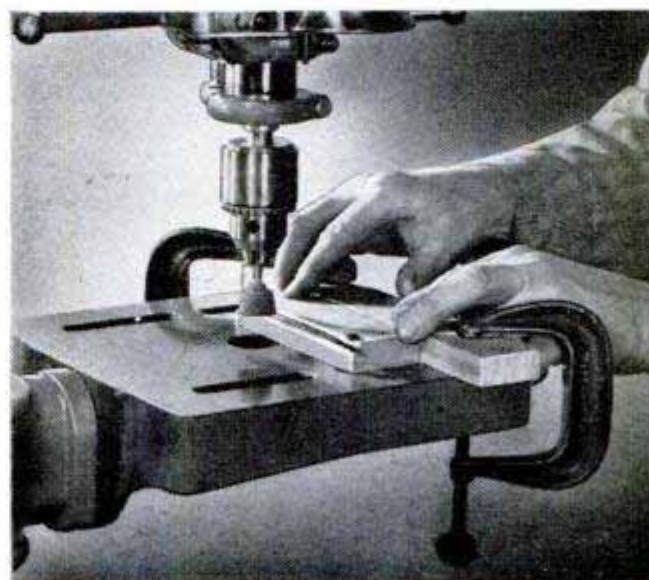
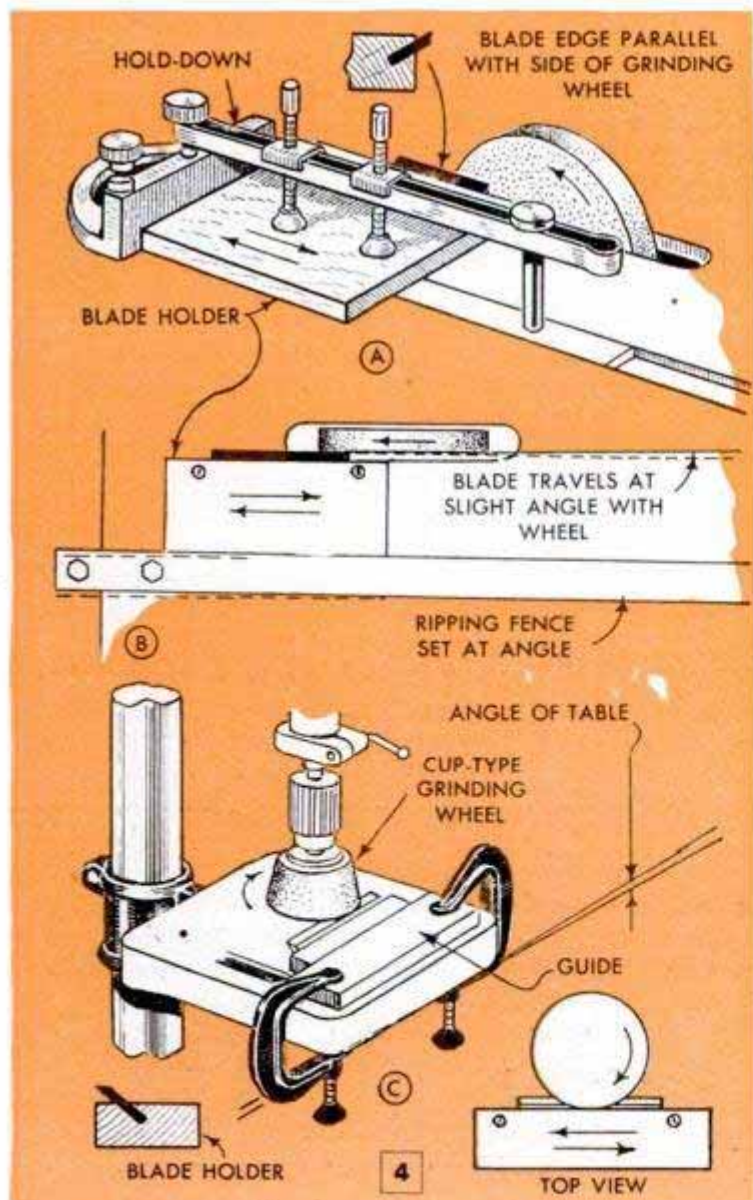


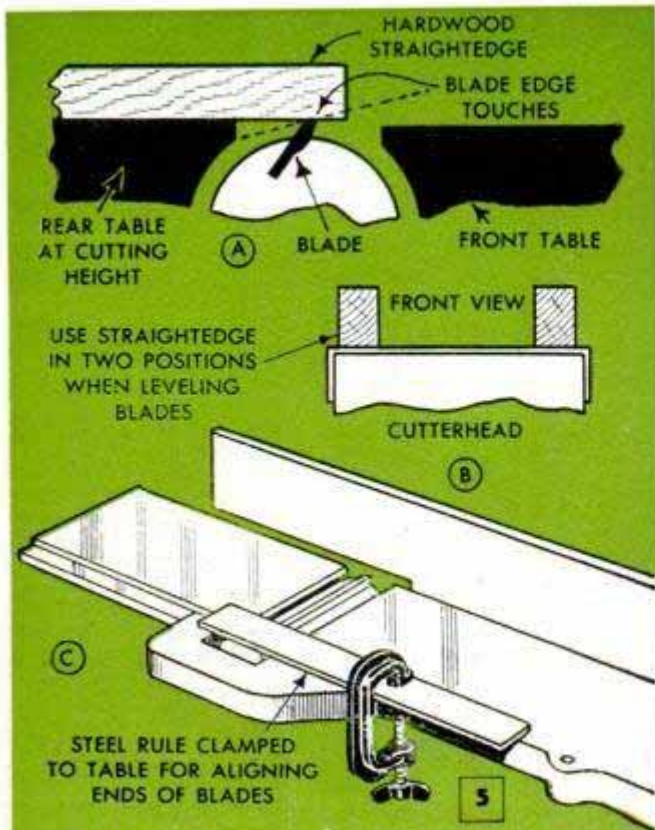
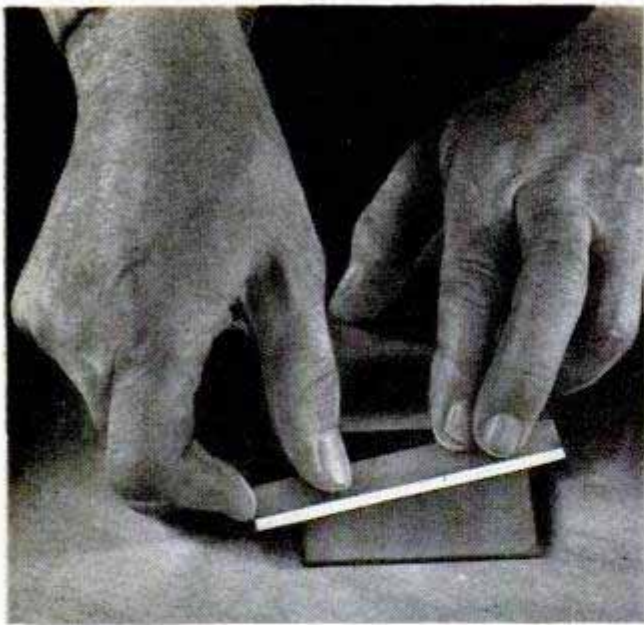
rest it is necessary to provide an auxiliary table of sufficient size to support the blade holder and permit it to be moved right and left a distance equal to the width of the blade. Drill and tap the tool rest for $\frac{1}{4}$ -in. cap screws and, after attaching the auxiliary table, clamp a guide bar or strip to its lower edge. An important point in connection with grinding is the location of the bevel of the blade in relation to the radial line of the grinding wheel. Note in the two lower details in Fig. 3 that the radial angles must be equal when either the horizontal or tilting-type tool rest is used. It is best to use a 6-in.-dia. grinding wheel as otherwise the blades will be hollow-ground more than is permissible. When grinding, keep the blade moving slowly in a uniform stroke to right and left, and dip it in lukewarm water at regular intervals to prevent overheating. To obtain a slight feed for each succeeding stroke, insert a strip of paper between the blade holder and the guide bar. Be sure to use the same number of strips for each blade.

Grinding on circular saw: If you don't have a bench grinder, you can set up the

circular saw to grind jointer blades as in Fig. 4, details A and B. If you use the straight-blade holder, the saw table or the arbor must be tilted as in the upper photo at the right of Fig. 4. With the angle holder use the setup shown in detail A or B, Fig. 4. Note that when the ripping fence is used as a guide, detail B, it must be set at a slight angle to the side of the grinding wheel.

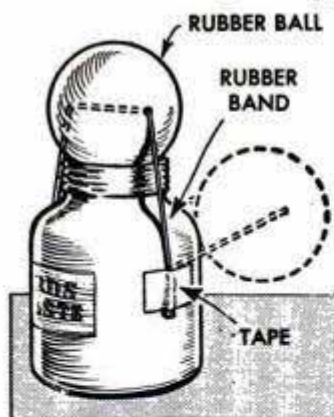
Grinding on drill press: When fitted with a cup-type grinding wheel the drill press can be utilized for sharpening jointer blades. The setup is quite simple and accurate, the blade holder being slotted at an angle with the face of the stock as in the sectional view, detail C, Fig. 4. Note that the drill-press table is tilted at a slight angle so that only the edge of the wheel contacts the jointer blade. In this case the blade is moved from left to right only. After one pass under the wheel the holder is lifted from the table and returned to the original position at the left of the grinding wheel. Before making the first pass of the blade be sure that the drill-press quill is locked firmly in position so that it just contacts the face of the beveled edge of the blade.





Remounting blades in cutter head: Before replacing the blades, be sure to remove the burr from the edge by drawing the flat side of the blade over a slipstone as in the upper left-hand photo. Some woodworkers, requiring exceptionally fine work, hone the cutting edges after grinding. This is done freehand, using a hard slipstone, and care must be taken not to round the bevel or turn the cutting edge. In replacing the blades in the cutterhead, first set the rear table at the normal cutting height and clamp a steel rule or metal straightedge to the front table as in detail C, Fig. 5, to provide a stop for aligning the blades endwise. Now place the blade in the cutterhead slot, replace the locking bar with the concave edge up and tighten the locking screws sufficiently to hold the blade in place. Be sure that one end of the blade contacts the straightedge lightly. Cut a hardwood straightedge and hold it near one edge of the rear machine table as in the center photo at the left. Raise the end of the blade until the cutting edge touches the straightedge as in detail A, Fig. 5. Place the straightedge at the opposite side of the table and raise the cutting edge to contact. Tighten the locking screws slightly to hold the adjustment. Now, turn the cutterhead slowly by hand to check the setting. If correct, the cutting edges will just touch the straightedge but will not lift it or move it forward as the head is rotated slowly by hand. Set the remaining blades, using the same procedure, and check the adjustment of all three before the final tightening of the locking screws. After tightening the screws, check again to make sure that the setting remains the same. This final setting of the blades is of the greatest importance in obtaining satisfactory operation of the machine. If one blade is lower or higher than the others, either at one or both ends, the machine not only will produce rough work but may vibrate badly due to the unbalanced cutterhead. It also is important to tighten the locking screws to a uniform tension. This assures preservation of the original adjustment and safety for the operator as well. Another good idea is to check the tension of the screws after operating the machine for a short time. As the final step, it may be necessary to reset the pointer on the depth scale. To do this, run a cut to exactly $\frac{1}{8}$ -in. depth then set the pointer to this reading. On some jointers, the ends of the blades are beveled and ground to a cutting edge for making rabbet cuts. Unless considerable rabbeting is done, it will not be necessary to sharpen these cutting edges each time the blades are sharpened. When necessary to sharpen the edges, grind and hone them freehand but be sure to preserve the clearance angle.

Quick-Acting Stopper for a Jar

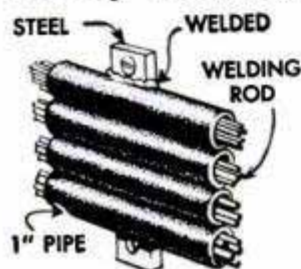


One shipping clerk fitted the top of a paste jar with a stopper improvised from a rubber ball to eliminate the necessity of unscrewing and replacing the metal cap each time the paste is used. A strong rubber band was cut and passed through the

ball after which the ends were taped to the sides of the jar. The band, which permits the ball to be rolled off and on the jar opening easily, should be under sufficient tension, nevertheless, to hold the ball securely in the opening in order to preserve the paste when the jar is not in use.

G. E. Hendrickson, Argyle, Wis.

Handy Welding-Rod Rack



Four lengths of 1-in. pipe welded side-by-side to a short length of flat steel make a handy rack for storing various sizes of welding rods. The rack is attached to the weld-

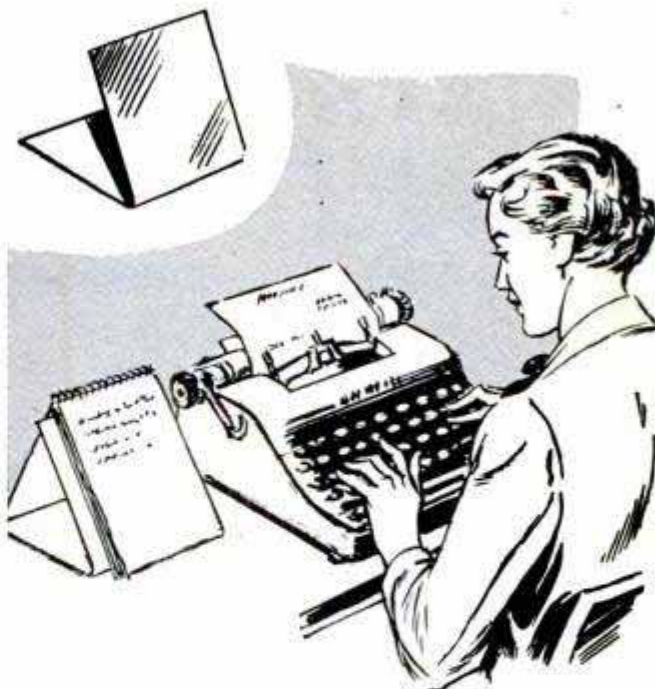
ing bench in any convenient position with bolts or by tack-welding. Some welders, using this type of rack, prefer to close one end of each length of pipe with a small metal disk and then weld the holders to the vertical support at an angle of about 45 deg. with the open ends up.

Roland Cueva, Los Angeles, Calif.

Working Plastics on Bench Lathe Aided by Oiling Cutting Tools

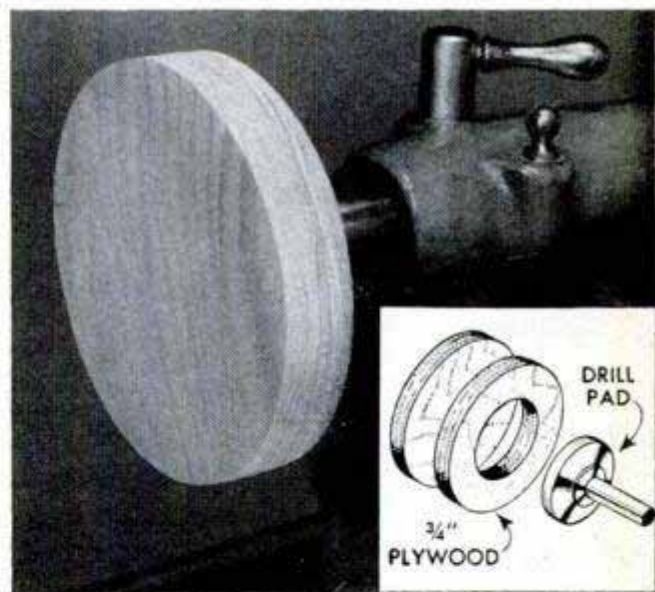
When machining plastics on a woodworking lathe, you can save considerable time and trouble by applying a nonalkaline lubricant or coolant to turning chisels, drill bits and taps. Apply lubricant before starting the work and from time to time during any of the operations. The oil prevents the plastic from heating, due to excessive friction at the dead center, and also helps prevent shavings from accumulating and piling up on the tool. For grinding and buffing the work on the lathe, fine steel wool that has been soaked with oil—about S.A.E. 30 weight—can be used effectively in place of sandpaper for accomplishing the preliminary smoothing operation.

Robert H. Harwood, San Diego, Calif.



Holder for Typist's Notebook

An inexpensive holder for a typist's notebook may be made by bending a piece of sheet metal to the shape indicated. Paint the holder to improve its appearance or make it from a sheet-metal bookend.



Cap Made From Plywood Disks Protects Drill Pad

Instead of using a makeshift backing to protect a lathe-tailstock drill pad against possible damage from the drill point, try a wooden cap like this one. It will not slip out of place and will "stay put" even when the pad is removed from the lathe. It consists of two disks of plywood, one of which is cut out in the center to slip snugly over the drill pad. The disks are glued together and should be about 1½ in. larger in diameter than the pad. Once in place, the pressure from the drilling will keep it in position.—Richard Hanscom, Elmhurst, Ill.

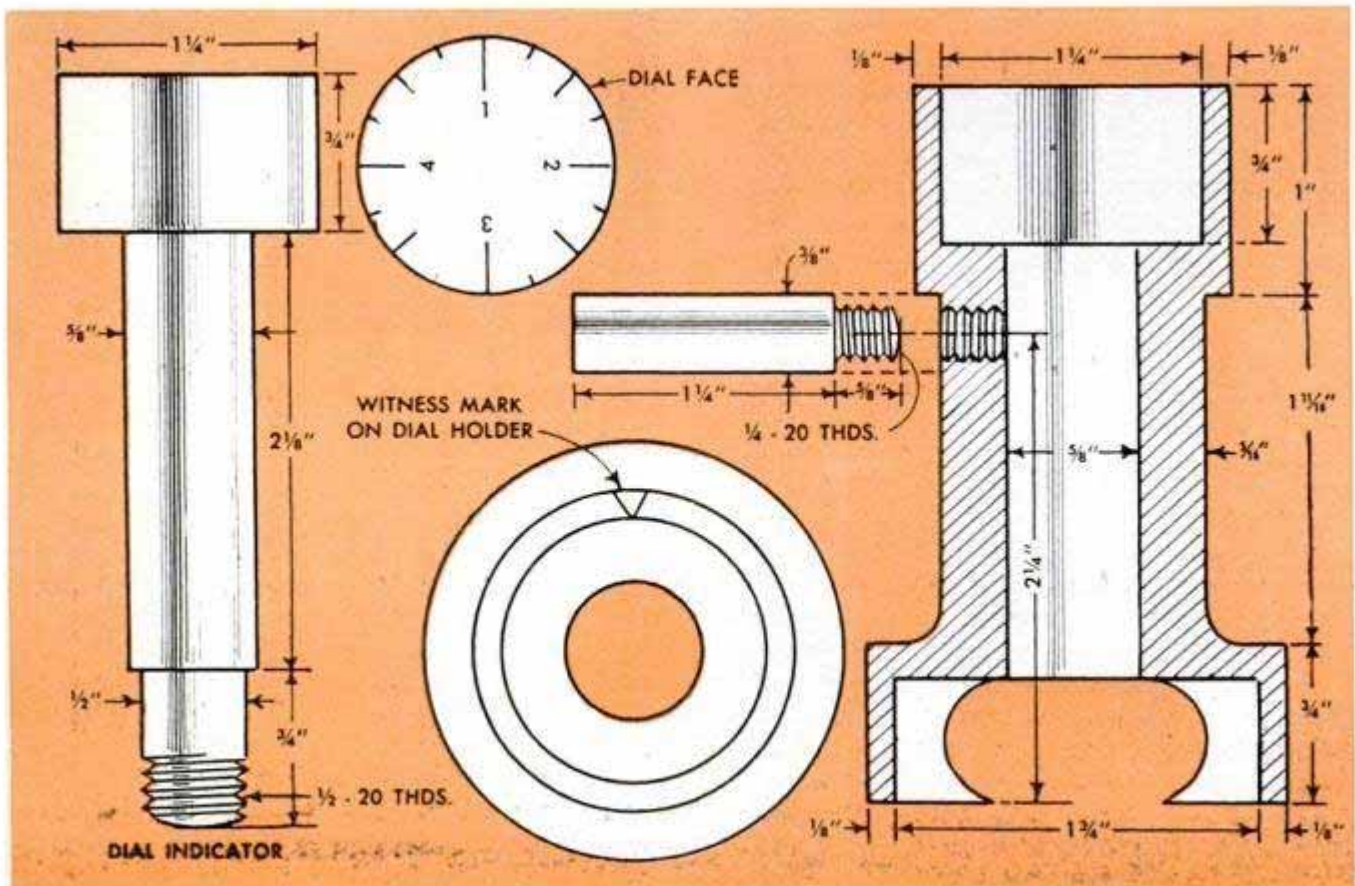
THREAD DIAL INDICATOR and CROSS-SLIDE STOP

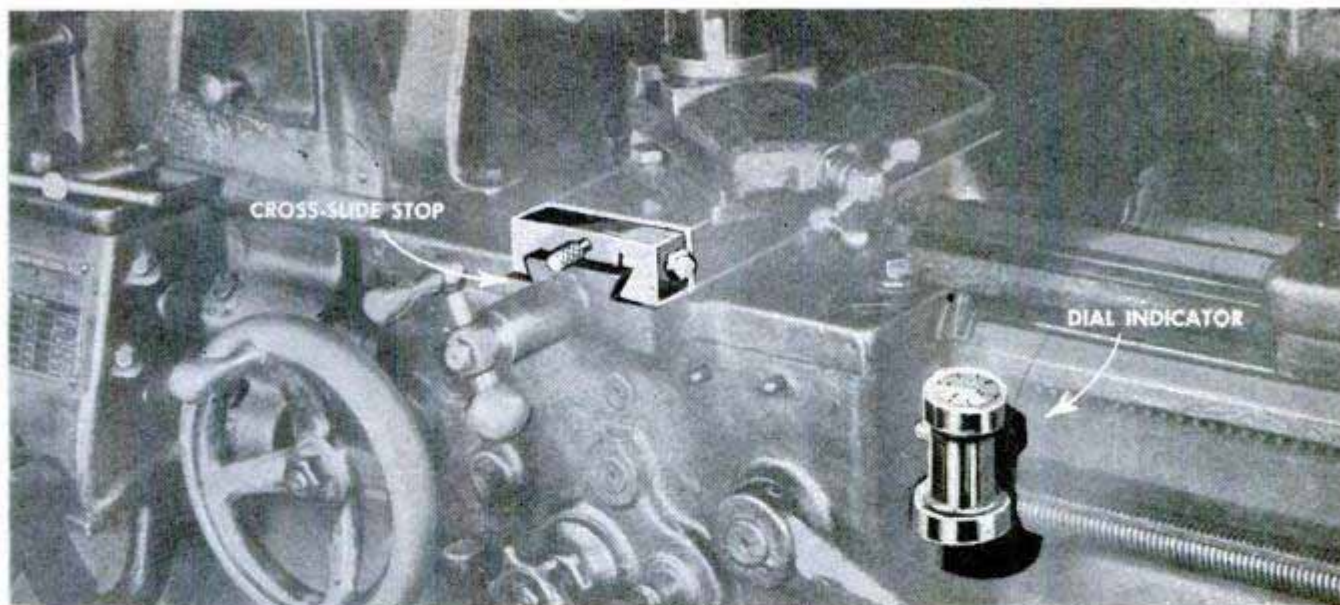
By C. W. Woodson



OWNERS OF SMALL metalworking lathes who like to make their own accessory equipment will find the construction of these accessories a satisfying challenge to skill in lathe operation. Both units are excellent training projects for advanced students in the school machine shop as the construction involves basic machining operations such as facing, shouldering, indexing, boring, milling and thread cutting. Only the fractional dimensions are given in the details, but in good work on projects of this type, dimensions of the moving parts usually are held plus or minus .002 in.

The purpose of the dial indicator is to permit the threading tool to be withdrawn from the work while the lathe carriage is disengaged from the lead screw and returned to its original position by hand, eliminating the slow return of the carriage by means of the lead screw. After the carriage has been returned to the starting position, the dial indicator will show precisely when to re-engage the carriage with the lead screw so that the cutting tool will enter the thread accurately for the next cut. The cross-slide stop clamps to the carriage dovetail and, while it permits the threading tool to clear the work, it can be set to limit the depth of cut. Usually the slide is tapped for the



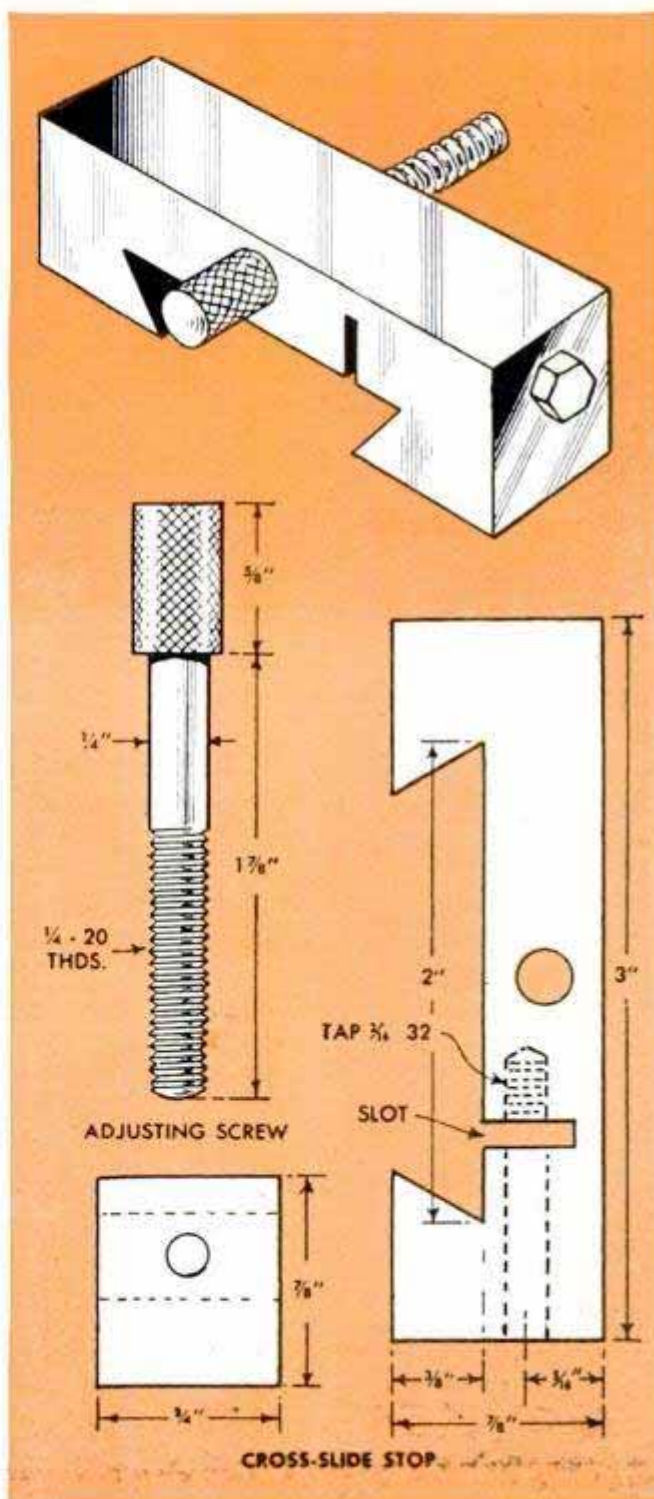


Dial indicator and slide stop speed up accurate thread cutting in lathe. Note position of the parts

adjusting screw but the size of the thread may vary on different lathes. It's a good idea to check the thread before making the screw.

The body of the indicator is a comparatively simple turn-and-bore job in 2-in. cold-rolled stock. Face off to length, then drill and ream for the dial shaft and bore the recesses for the dial and driving gear. Machine the outside all over and break the corners $\frac{1}{32}$ in. Drill and tap for the supporting arm but be sure that the hole is correctly located beforehand. Nearly all lathe carriages are drilled for a dial indicator however the location of the hole with relation to the lead screw may vary. Note in the body detail on the opposite page that the flange at the lower bell end of the body is cut through to form an opening for the driving gear. The opening can be cut roughly with a narrow hacksaw blade and then finished with a round-faced grinding wheel. The dial and its shouldered shaft are turned and threaded from one piece of stock, and the shaft and edge of the dial are ground to final fit. Index the face of the dial in the lathe and mark the divisions with a sharp lathe tool. Number the 90-deg. divisions as indicated. File or stamp a witness mark on what will be the rear edge of the dial housing when it is in position on the lathe. Assemble the dial and shaft with a 32-tooth helical gear fitted to the lower end and held in place with a hex nut.

The dovetail in the body of the cross-slide stop is cut with a lathe milling attachment. The body is then finish-ground all over and drilled, slotted and tapped as indicated. Don't forget to check dimensions carefully before cutting stock as those given in the detail may not agree with those of the lathe at hand. In the photo above, the two units are shown in place on the lathe.

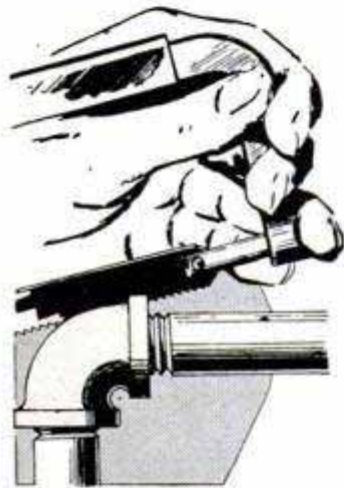


Dry Ice in Leaky Gas Tank Removes Vapors Before Welding

Searching for a safe, inexpensive way to weld a leaky gasoline tank, one man solved the problem by pouring about ½ lb. of crushed Dry Ice into the tank after emptying it. The "ice" is allowed to stand in the tank for fifteen minutes before welding is started. During this time the ice turns to CO₂ gas, expelling all oxygen from the tank and condensing all gasoline vapors to the lowest point in the tank. This makes it possible to use an acetylene torch without danger of the tank exploding. The tank can be refilled and used immediately afterward without having to remove the Dry Ice, which soon evaporates.

W. B. Atran, Quincy, Mass.

Removing Pipe From Fittings Without Damaging Threads



When salvaging pipe that has been seized into fittings, the thread on the pipe can be removed undamaged by sacrificing the fitting. Saw a slot in the fitting as shown, cutting just to the threads of the pipe. Then pour oil in the slot and rap the fitting a few times with a hammer. This will

loosen the threads sufficiently for removal of the fitting.

Indicator Shows Status of 10 Valves Serving Ranch Water System

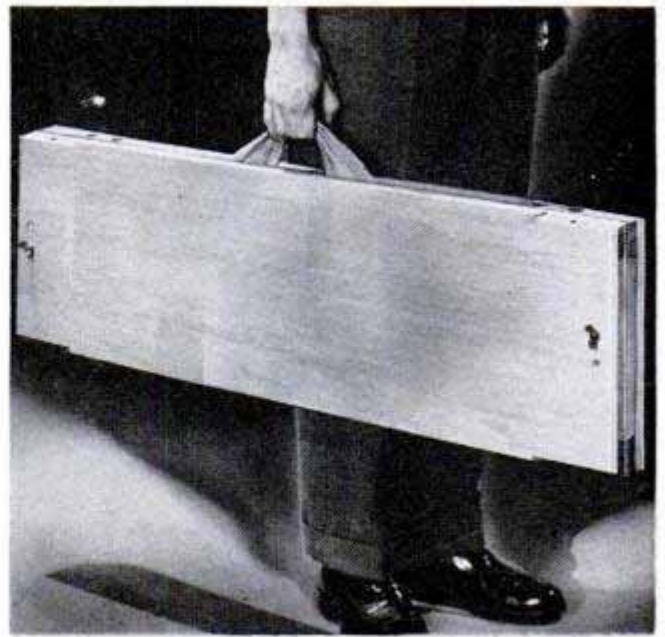


To avoid wasting water in a drought-covered region, one ranch owner devised this simple indicator to show at a glance the condition of 10 valves required in a water system affecting 100 acres of land. When a water valve is turned on or off, as the case may be, a nut used as a marker for

each valve is placed in the appropriate column beside the proper heading.

Hi Sibley, Nuevo, Calif.

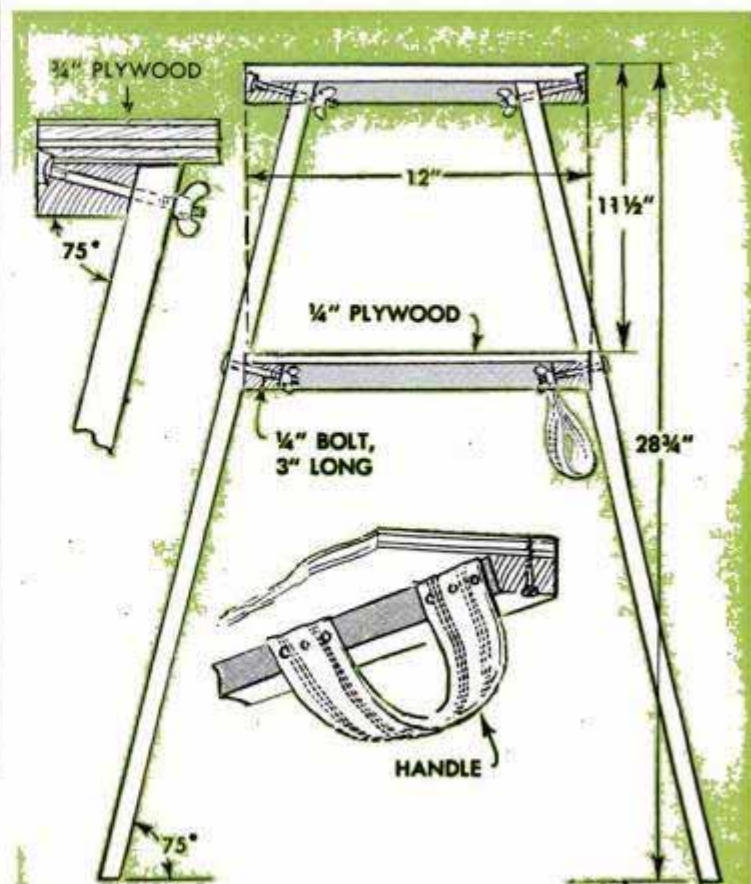
"SUITCASE"



By John Strickler

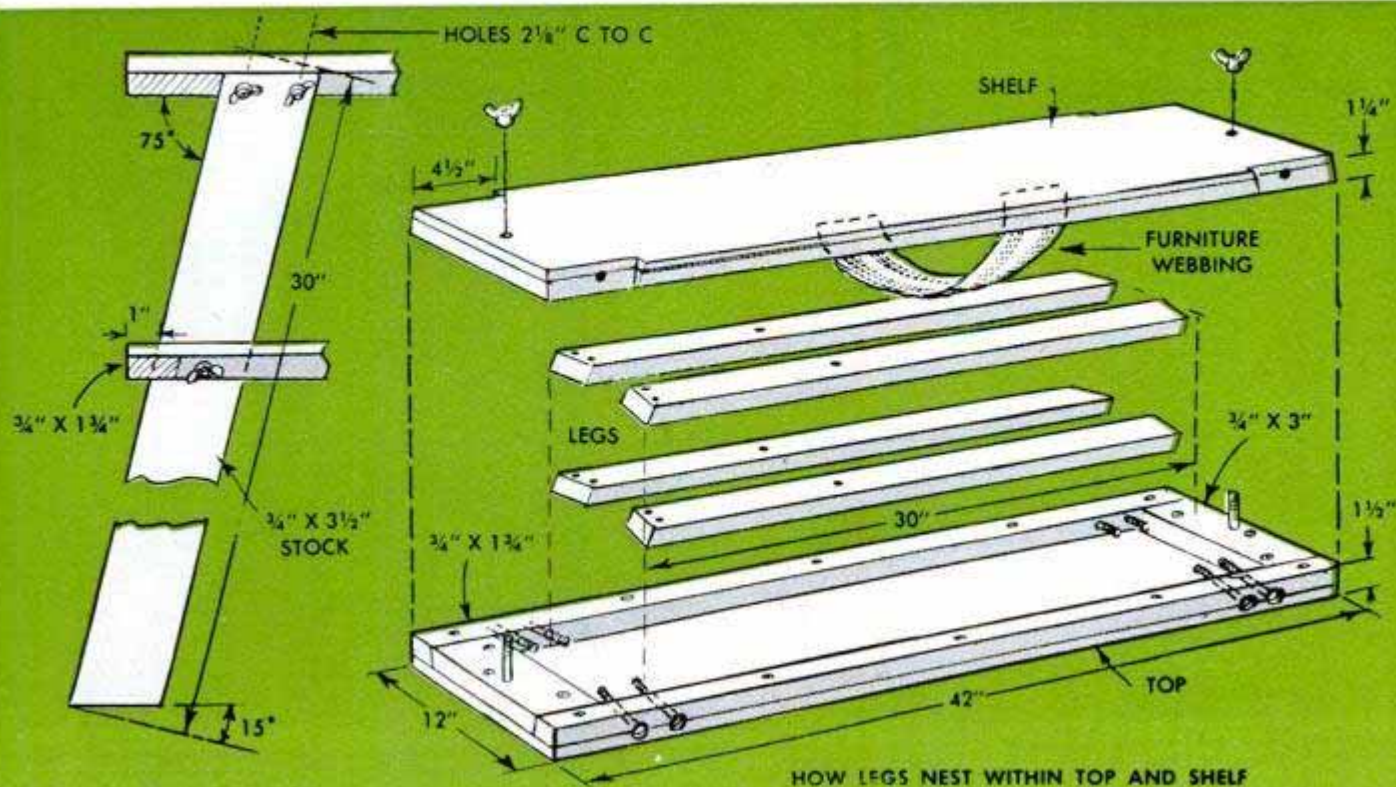
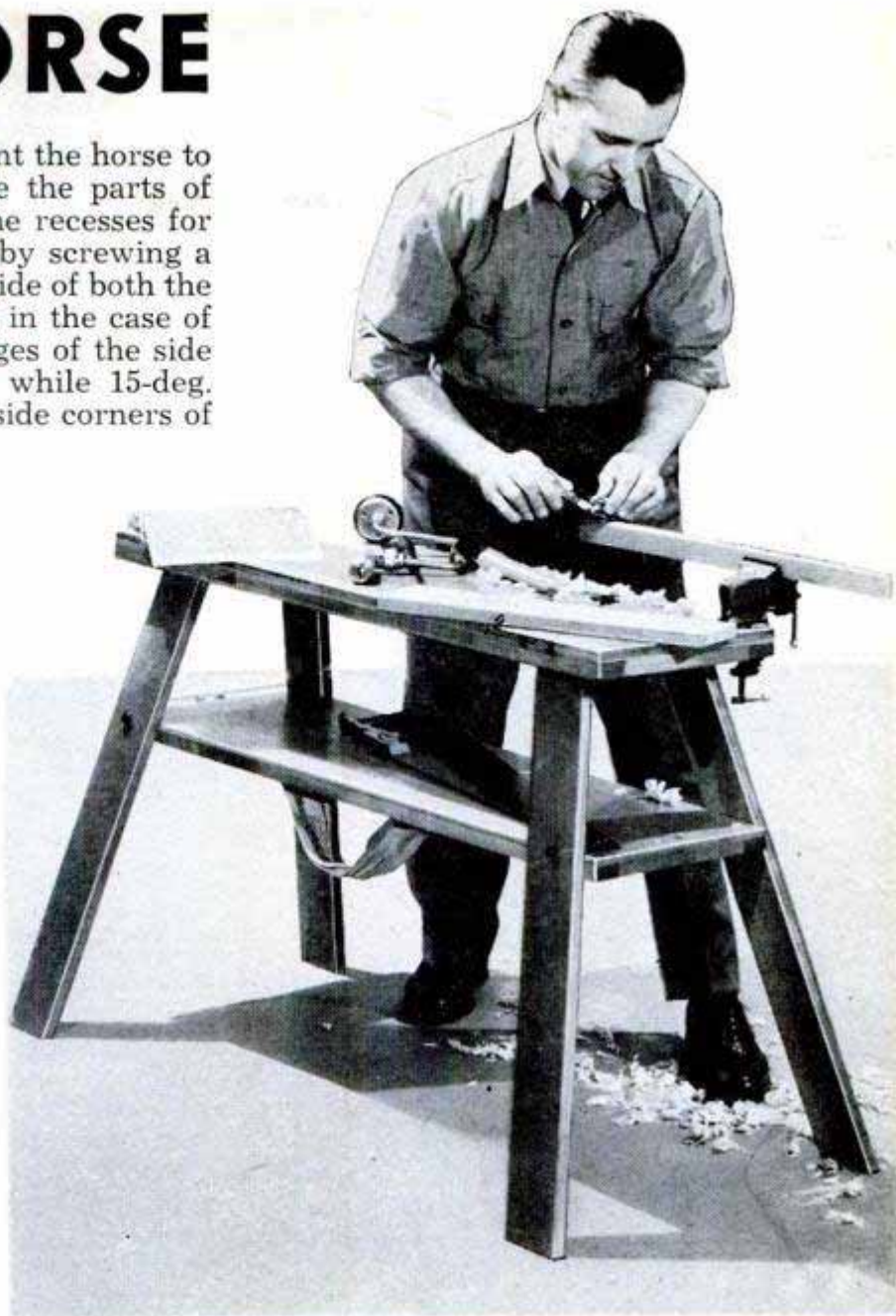
IF YOU HAVE wanted a sturdy, workbench-type sawhorse — one that can be set up quickly to make minor home repairs or for general tinkering — this one should fill your needs perfectly. Designed for packing the legs in a pocket formed by the top and shelf, the sawhorse is carried like a suitcase and takes no more space than an ironing board. This makes it easy to store in a closet, utility room or under a bed. It's made to order for the man who lives in an apartment, or a small home without a basement where space is at a premium.

The drawings give a clear idea of how the

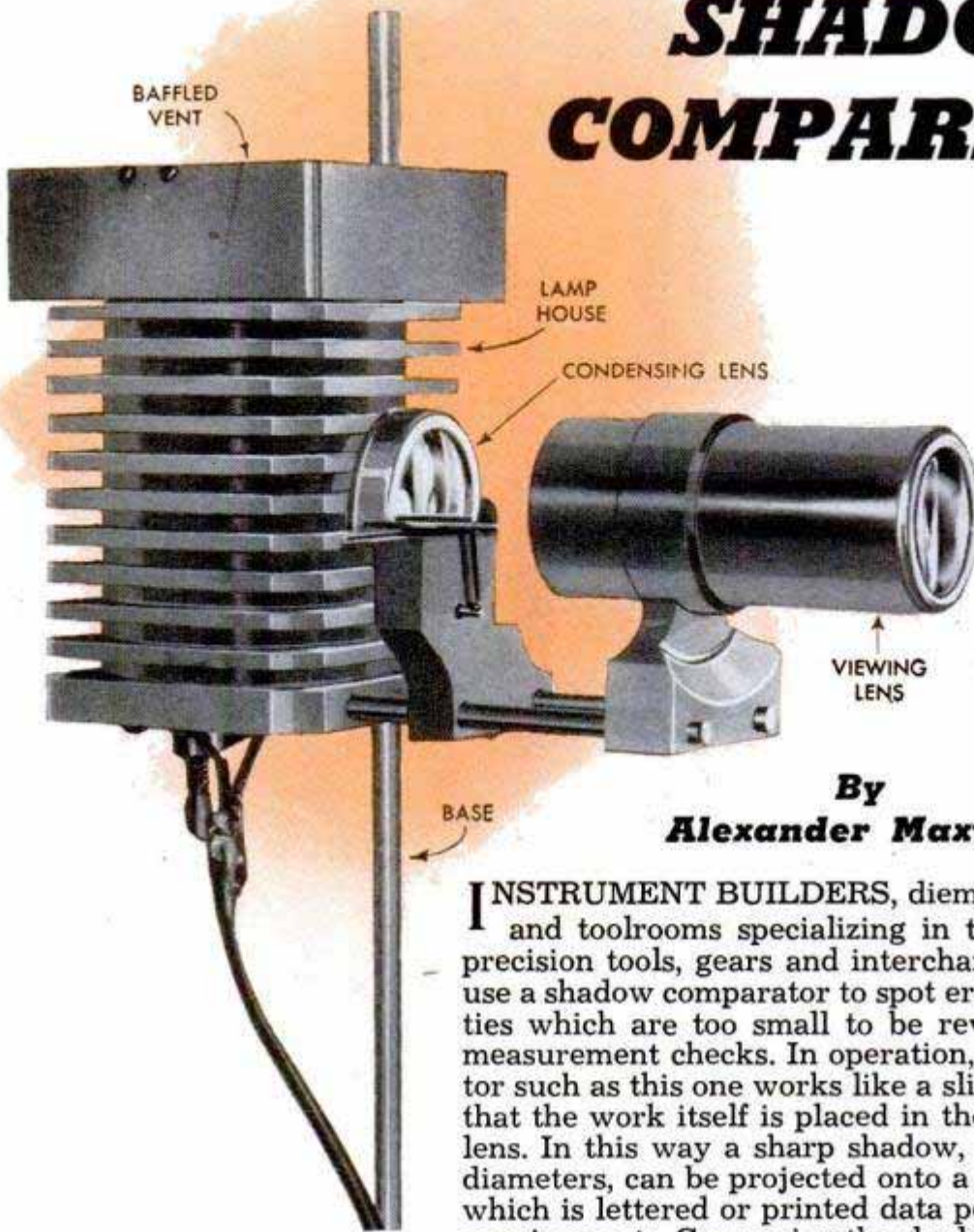


SAWHORSE

parts go together. If you want the horse to withstand hard usage, make the parts of hardwood such as birch. The recesses for storing the legs are formed by screwing a flat framework to the underside of both the top and the shelf. Note that in the case of the top frame, the inside edges of the side strips are beveled 15 deg., while 15-deg. notches are made at the outside corners of the shelf. The legs are made in pairs, right and left-hand. Compound cuts at both ends of each leg make the legs slant equally in two directions. Carriage bolts which lock the legs to the top are a wedge fit and are left permanently in place. Those holding the shelf are a loose fit, two of them being used to clamp the top and shelf together when packing the unit for storage. Note that the bolt holes in the edge of the top are counterbored to seat the bolt heads properly, while the side strips of the shelf frame are beveled 15 deg. to provide a flat surface for washers and wing nuts. A strip of upholstery webbing forms the handle. Finish the sawhorse with a coat of shellac and follow with varnish or lacquer.



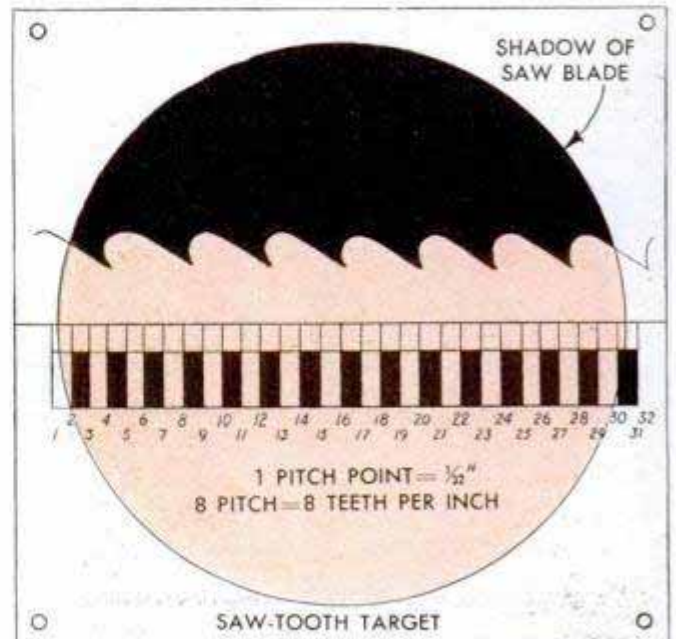
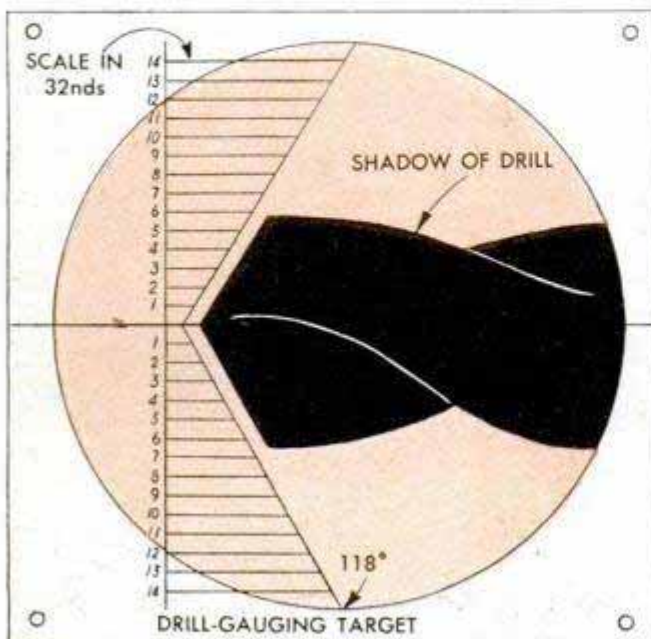
SHADOW COMPARATOR



By
Alexander Maxwell

INSTRUMENT BUILDERS, diemakers, school shops and toolrooms specializing in the development of precision tools, gears and interchangeable parts often use a shadow comparator to spot errors and irregularities which are too small to be revealed by ordinary measurement checks. In operation, a simple comparator such as this one works like a slide projector except that the work itself is placed in the focal plane of the lens. In this way a sharp shadow, magnified up to 20 diameters, can be projected onto a screen or target on which is lettered or printed data pertaining to the job requirements. Comparing the shadow of the work with the target or a precisely drawn profile will reveal wear progress and faulty grinding or machining in razor-

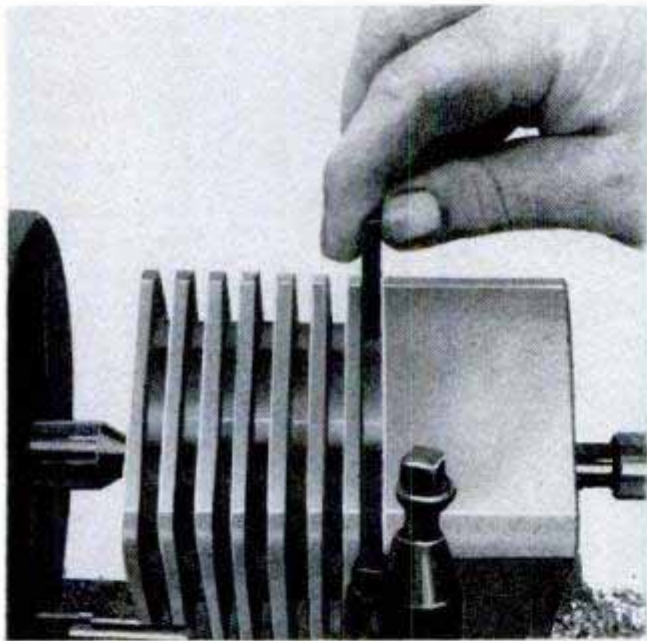
Shadow comparison reveals wear progress, faulty machining or grinding and other errors too small to measure



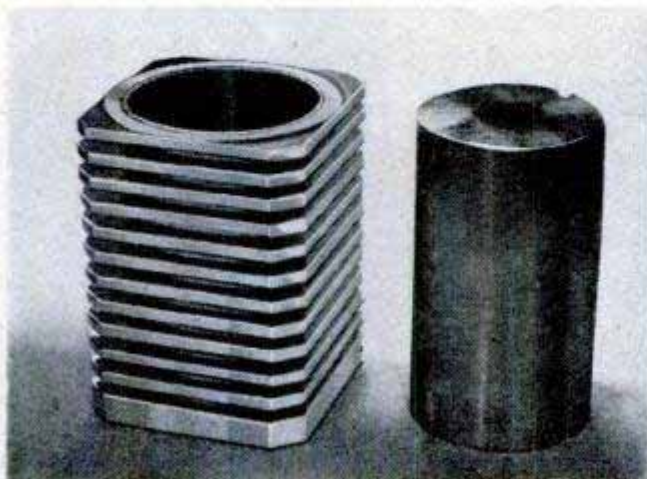
sharp clarity. Two typical targets are shown on the opposite page.

Location of the various parts of the unit is easily determined by study of the photo on the opposite page and construction details on the following page. The lamp house is made first, using a piece of machining aluminum or duralumin. Machine the fins to the dimensions and spacing given, then drill a clearance hole lengthwise through the piece for the metal-cutting bandsaw blade. The hole should be drilled in the waste inside the scribed circle indicating the size of the core. Allow for machining the cored hole after bandsawing as in the upper right-hand photo below. Next, the housing is bored for the condensing-lens barrel which may be purchased or made up as in the detail. In either case the condenser barrel must be a smooth press fit in the opening. The method of mounting the housing in a lathe chuck for boring the hole is

Cooling fins on lamp house are machined to precise dimensions and spacing. Corners of metal block are chamfered before machining to avoid metal fracture



After machining and coring, the lamp house is bored in the lathe to give a smooth inside surface. Bandsawing core saves nearly half the metal for further use



pictured in one of the photos. Note that the housing is secured to the chuck jaws with heavy wire to prevent it from shifting. Next, the housing is drilled and tapped for the guide rods, mounting bracket and the machine screws that hold the baffled vent and glare shield in place. The only dimension on the focusing mount for the viewing lens is the center-to-center distance between the holes for the guide rods on which it slides. It must be made up to suit the lens that is used. The details show only the general design of this part. This also is true of the condensing-lens mount.

The baffle consists of two sheet-metal plates secured to the top of the lamp house with spacers between. The glare shield is supported by brackets attached to opposite sides of the shield and to the top plate. Note that a hole, 2 in. in dia., is bored through the lower plate to provide ventilation. A socket for the 100-watt projection

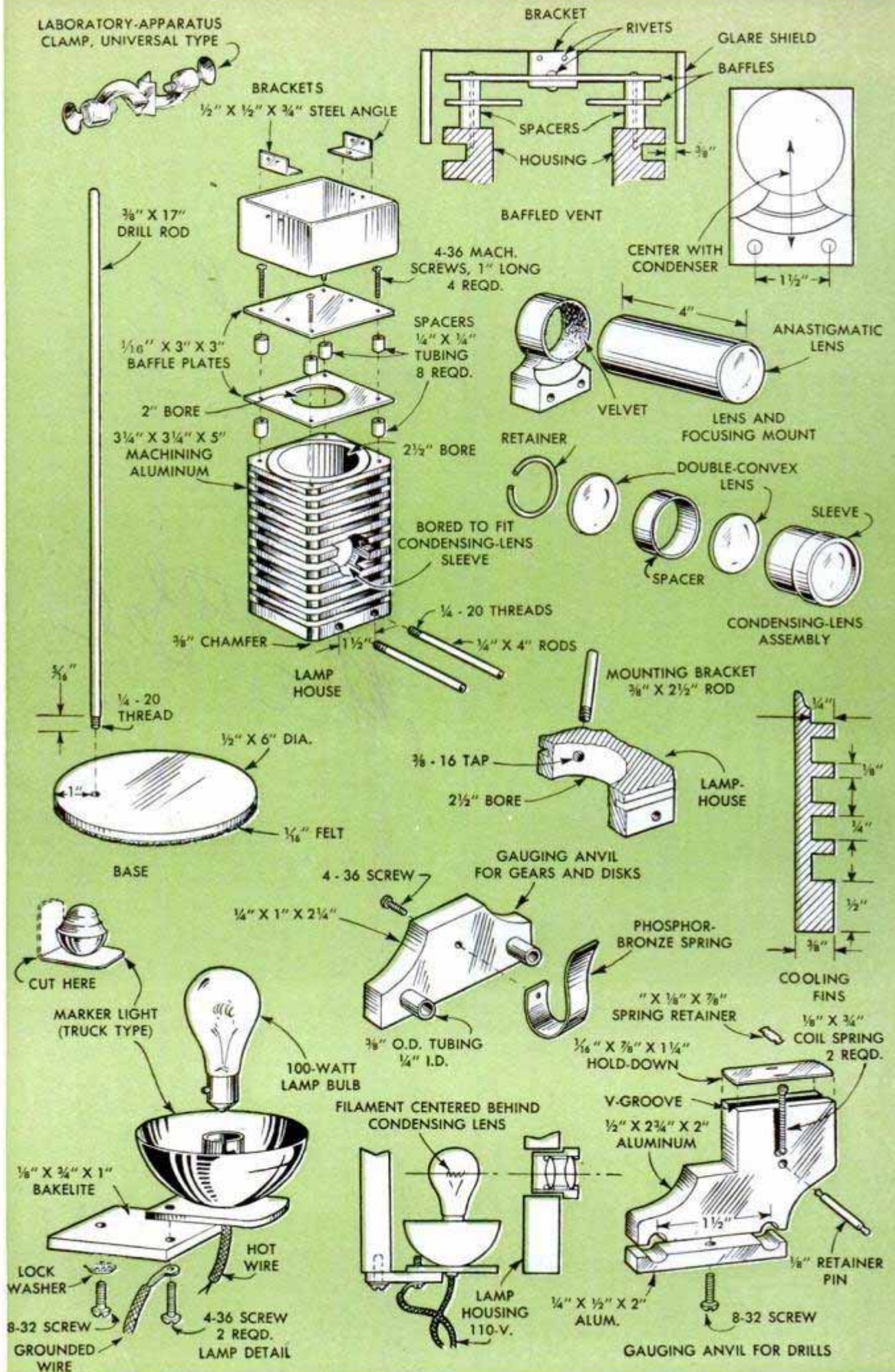
Lamp house is cored by bandsawing with a metal-cutting blade. A hole is drilled lengthwise through metal block for insertion of blade, which is cut and welded



Lens mounts can be turned in the lathe from brass or machining aluminum, or lenses may be purchased already mounted in a barrel. Cost is about the same



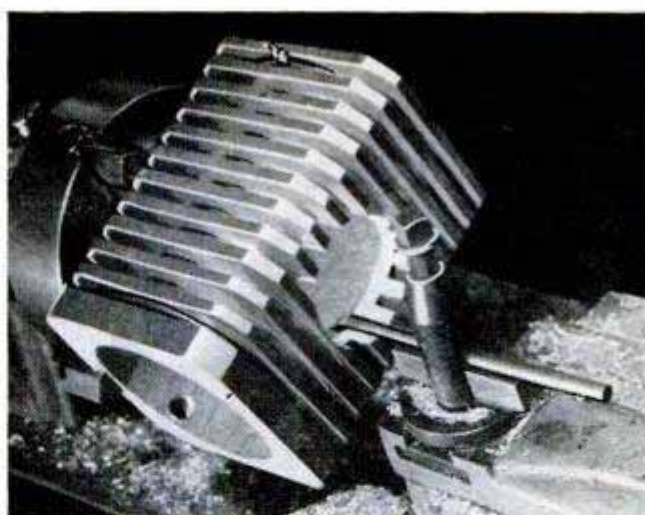
LABORATORY-APPARATUS
CLAMP, UNIVERSAL TYPE



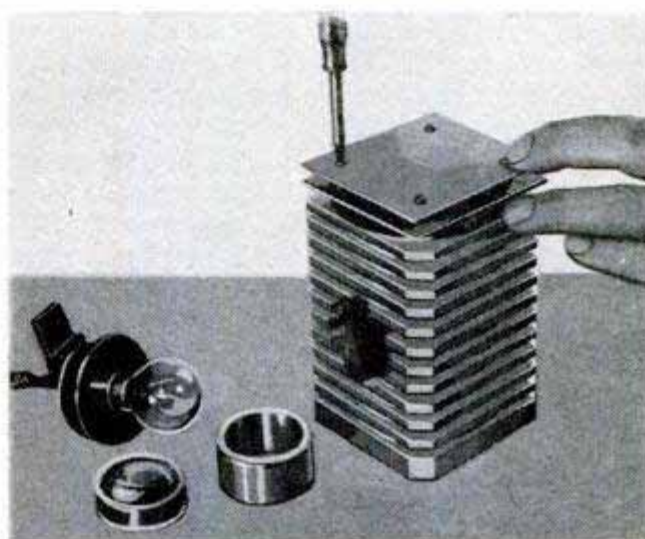
bulb is obtained by a simple adaptation of a truck-type marker light. Cut the marker-light bracket as indicated, attach it to a piece of $\frac{1}{8}$ -in. Bakelite and mount in the housing as shown in the details. The important thing in this assembly is to align the lamp filament with the center of the condensing lens. This may require the placement of spacing washers between the lamp bracket and the insulation, or between the insulation and the lamp housing, in order to lower or raise the lamp filament as required. Wire the socket as indicated and use a feed-through switch in the cord to control the lamp. The distance between the bulb and condenser must be determined by testing. Place the projector in the desired position, turn on the light and adjust the condenser so that the image of the filament does not appear on the screen or target. The light circle on the screen should be clear and bright.

A disk turned from $\frac{1}{2}$ -in. flat steel was used on the original unit to form the base. Cement $\frac{1}{16}$ or $\frac{1}{8}$ -in. felt to the bottom to protect polished surfaces and also to prevent the unit from sliding out of place. Drill rod was selected for the standard, or column, because it already is polished and is of a uniform size. The lower end of the $\frac{3}{8}$ -in. rod is shouldered to $\frac{1}{4}$ in. and threaded to screw into a tapped hole near the edge of the round base. Use a universal laboratory clamp for holding the projector on the column. The clamp provides an up-and-down adjustment on the column and also permits tilting the projector to any desired angle. If a laboratory clamp of the universal type is not available, then make a simple clamping fixture of the universal type by drilling and reaming $\frac{3}{8}$ -in. holes at right angles through a square block of mild steel. The holes should clear at the center of the block by $\frac{1}{16}$ in. Drill and tap into each hole for a thumbscrew. Many users will prefer this type of clamp as it provides a somewhat faster adjustment both on the mounting bracket for tilting the projector and also on the standard for raising and lowering the unit.

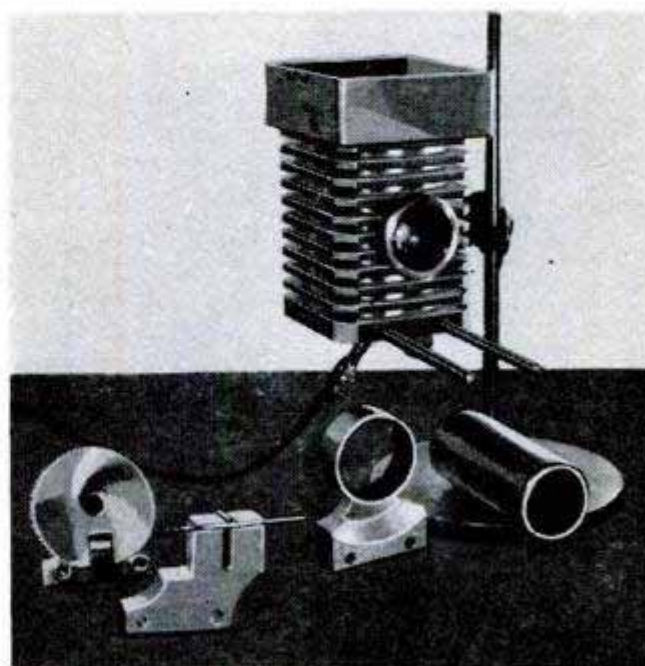
Only two holding fixtures or gauging anvils are detailed, as most users will make these to suit their own requirements. These slide on the guide rods between the condensing and viewing lenses, and provision usually is made for clamping them in a fixed position. A gauging anvil for twist drills is shown in position on the comparator pictured on page 204. Where a large number of parts are to be tested, it is best to improvise a suitable anvil or holder which will permit easy insertion and removal of parts of a uniform size. In certain types of work a holder having a movable section will prove to be useful.



Boring the lamp house for the condensing-lens barrel requires a tricky lathe setup. Mount in a four-jaw chuck and support the work securely by means of wire tightened around lamp house and chuck jaws as shown



Above, completed lamp house with the top baffle being screwed in place, also the condensing-lens mount and the lamp fixture completed and ready for fitting in position. Below, the completed projector ready for use, with a gauging anvil for twist drills. Other anvils or holding fixtures can be made as required



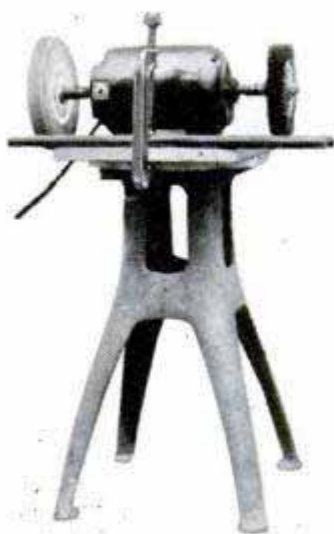
Telescoping Drive Shaft Saves Time When Tractor Powers Elevator



One farmer who uses his tractor to haul grain as well as power an elevator saves time with this drive shaft when changing the tractor from the wagon to the elevator. The drive shaft telescopes and has a universal joint at each end. These features make it unnecessary to have the power take-off unit of the tractor in perfect alignment with the power connection on the elevator, thus saving the time often required to jockey the tractor into exact position each time a load of grain is hauled from the field to the elevator. In this instance the drive shaft was assembled from the square portion of an old buggy axle which telescopes into a section of frame taken from an old hay loader. However, any square parts that telescope together may be used or a drive shaft of this type may be purchased.

A. M. Wettach, Mt. Pleasant, Iowa.

Floor Stand For Portable Grinder Made From Cream-Separator Base



Lacking the time to build a suitable floor base for his bench grinder, a farmer utilized a four-legged stand taken from a discarded cream separator. Almost all older-type separator stands are just the right height, having a flat top to serve as a mounting pad and splayed legs to give it unusual stability. In this case

the owner desired to retain the portability of the grinder so he bolted the motor base to a hardwood board and used a C-clamp to

attach the grinder to the floor stand. For a permanent installation the motor should be bolted to the flat top of the stand.

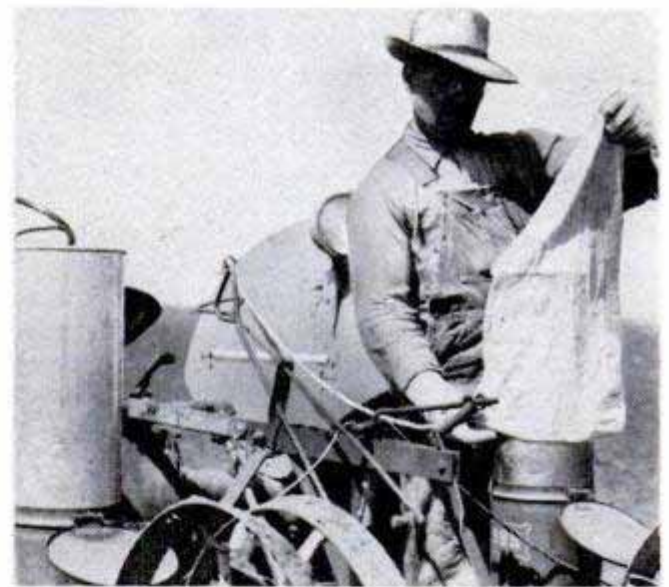
Pitchfork Tines Kept Clean In Bag Of Dry Sand

To prevent any possibility of injury from the sharp tines and also to prevent damage from rust, one farmer thrusts his three-tined pitchfork into a bag of dry sand when not in use. The bag is filled about two thirds full of sand with the open end tied securely and is placed in any convenient spot in the hay barn.

Ervin L. Strayhorn, Beebe, Ark.



Sleeves on Planter Hoppers Increase Seed Capacity

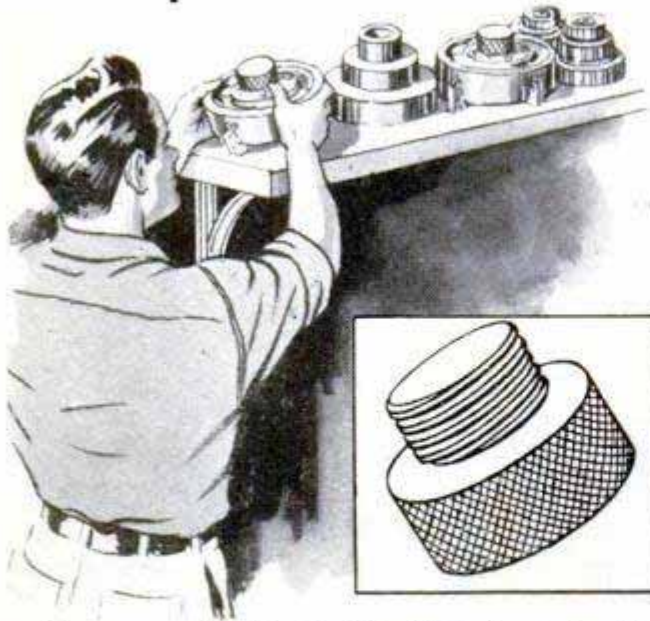


Many farmers find they can save time when planting by increasing the capacity of the hoppers on their planters so that seed can be carried the entire length of each row in a single loading. Sheet-metal sleeves, designed to serve this purpose, can be made at very little cost and attached quickly when needed by slipping them inside the hoppers. Fitted snugly, sleeves will not require fastening.

Water Cleans Gummy Shears

If shears are used to cut roofing, blades of the shears can be kept clean by dipping them in water frequently. Or, better still, keep them in a can of water between cutting operations.

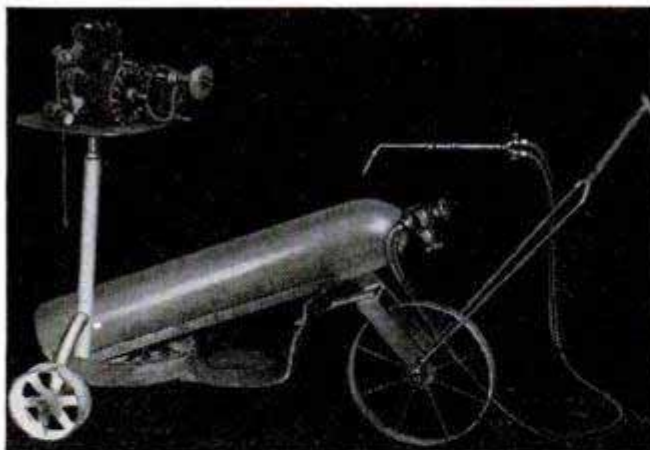
Plugs for Stored Lathe Chucks Protect Spindle Threads



If you are in the habit of storing chucks under the lathe, the threads can be protected against possible damage from falling tools and also kept free of chips and oil by using plugs such as the one detailed. These are turned from fiber or wood and should be threaded to screw loosely into the spindle openings of the chucks. If the latter are stored on a shelf or bench, the projecting plugs will necessitate placing the chucks flat side down, thus helping to protect the jaws from settling dust.

C. W. Woodson, Miami, Fla.

Portable Acetylene Welding Rig Carries Motor-Powered Grinder



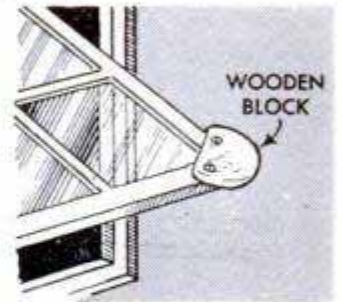
Steel pipe and heavy flat steel were used to construct this unique welding rig, which carries its own grinding wheel. Two lengths of angle steel form a bed on which the acetylene tank is held in a readily accessible position. Mounted on three wheels, the unit is easily manipulated as the front-wheel yoke is pinned to the frame to permit turning. The upright member supports a steel platform which, in turn, supports a 1½ horsepower air-cooled gasoline engine.

This furnishes the power for driving either a stationary grinding wheel or one that rotates on a flexible shaft.

L. H. Houck, Jefferson City, Mo.

Guards on Corners of Windows Prevent Head Injuries

When casement windows are used in shops and farm buildings, there is always the possibility that a workman may accidentally bump his head against a sharp corner of an open window and cause a severe injury. To prevent this, circular wooden blocks are screwed to the corners of the windows to shield the sharp edges. Painting the blocks to match the color of the windows makes them inconspicuous.



Lee H. Schimpf, Tulsa, Okla.

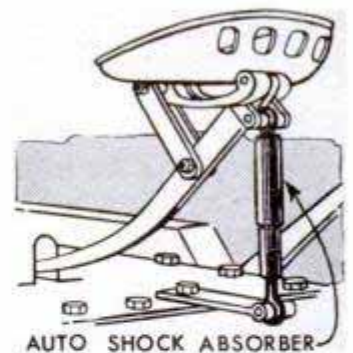
Locating Underground Pipe Leak

One man found that by pumping a thin mixture of white lime and water into an underground run of pipe he was able to tell the exact locations of any leaks. Even in extremely wet weather the lime rises to the surface of the ground, discoloring the soil in the area above the pipe that must be unearthed for repair or replacement.

H. Miller, Danboro, Pa.

Old Auto Shock Absorber Cushions Tractor Seat

To lessen the bounce of a tractor seat while driving over rough ground, one farmer installed an airplane-type auto shock absorber under the seat to cushion hard shocks and snub out the rebound of the seat.



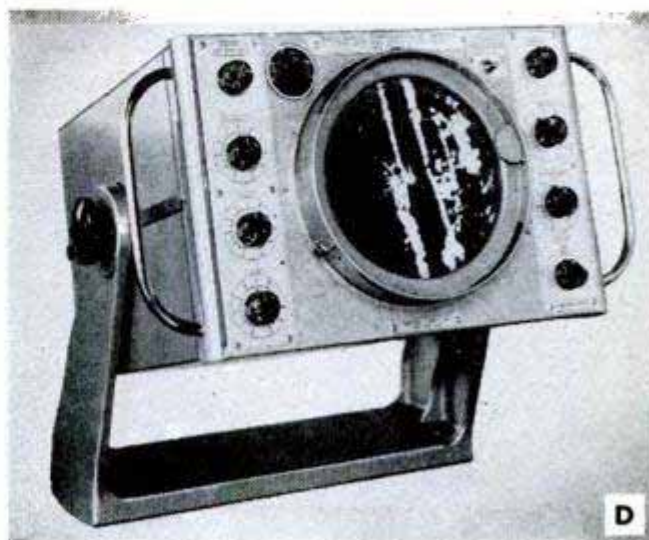
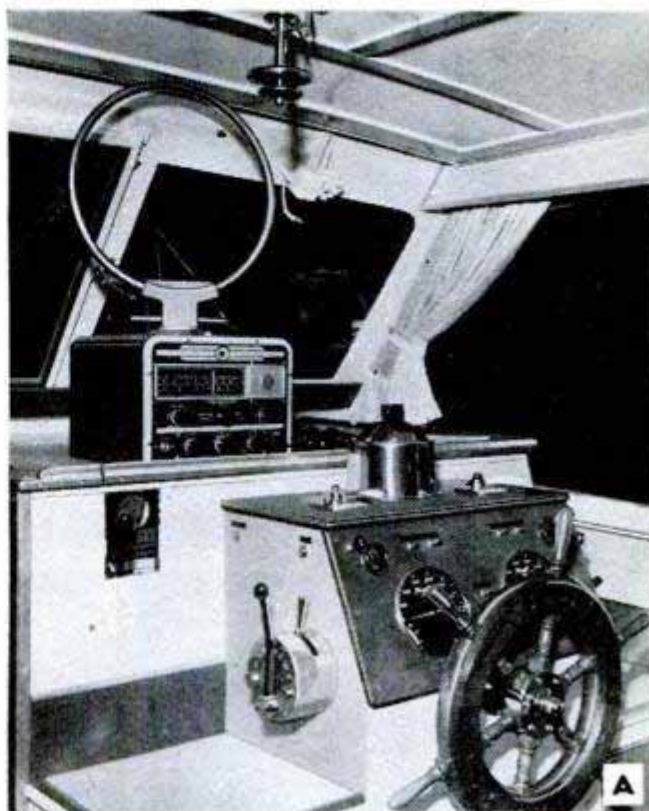
On most tractors the installation of the shock absorber is quite simple, requiring only a U-shaped bracket attached either to the seat itself or the seat column. The lower end of the absorber pivots on a bolt passing through the eye of a flat bracket attached to the transmission housing. The design and size of the bracket must be adapted to the tractor on which the installation is to be made.

Kenneth Gabrosek, Fly Creek, N. Y.

Radio and Radar Equipment For Small Craft

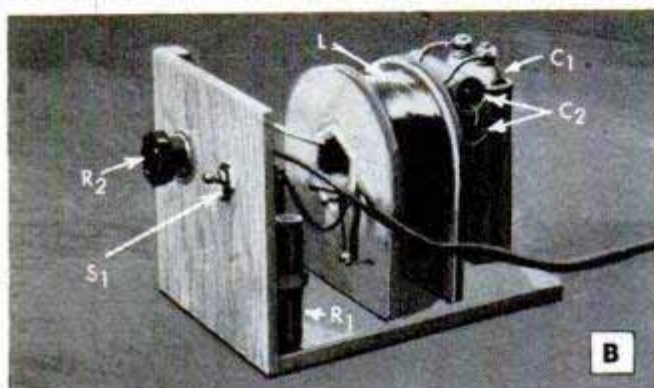
BOATING enthusiasts visiting the 1952 National Motor Boat Show in New York City had an opportunity to see the latest marine radio and electronic equipment designed by the Radiomarine Corporation of America for small craft. The radio direction finder shown in photo A is a popularly priced unit that weighs only 14 pounds. It is combined with a three-band receiver that permits reception on the low-frequency and radio-beacon band of 130-400 kilocycles, the marine-radio band of 1740-5600 kilocycles and also the standard broadcast band.

A five-watt radiotelephone is illustrated in photo B. This compact unit combines a four-channel crystal-controlled ship-to-shore radiotelephone and a superheterodyne entertainment receiver for the standard broadcast band. It is equipped with a built-in speaker and a hand microphone. A 30-watt two-way radiotelephone for medium-sized yachts appears in photo C; it combines a six-channel crystal-controlled receiver and an eight-tube receiver. The small-craft radar unit, photo D, operates on a wavelength of 3.2 cm. and has power and sensitivity to pick up objects as close as 75 yards and as distant as 20 miles.



TWO-WAY LOUDSPEAKER

★ ★ ★ *With Lifelike Sound*



By Dr. Richard C. Hitchcock

YOU WILL BE thrilled with the lifelike reproduction of this unit. Following a trend of advanced design for high-fidelity enthusiasts, this two-way folded-horn enclosure will reproduce your records with solid bass and clear treble tones that you probably didn't know were there. If you have a good audio amplifier, this is the loudspeaker to go with it. Extended-range loudspeakers in the proper enclosures do an excellent job, as far as they go, but horns or baffles large enough to go much below 100 cycles per second are usually too large for a living room. It generally is accepted that separate speakers are required to get good reproduction of both bass and treble tones. The low-frequency speaker (woofer) takes the lowest notes and goes on up to a few hundred cycles. The high-frequency speaker (tweeter) takes over at this point and goes on up to 15,000 cycles per second, and a network should be provided to divide the energy between the two types of speakers.

It is important that the amplifier used

MATERIAL LIST

Item	Req'd.	Dimensions, in.	Name
1	2	$\frac{3}{8}$ X 22 $\frac{3}{4}$ X 41	Sides
2	1	$\frac{3}{8}$ X 5 $\frac{1}{4}$ X 14 $\frac{1}{2}$	Cap No. 1
3	1	$\frac{3}{8}$ X 5 $\frac{1}{4}$ X 14 $\frac{1}{2}$	Cap No. 2
4	1	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 28 $\frac{3}{8}$	Back No. 1, hole for low-freq. spkr.
5	2	$\frac{3}{8}$ X 3 $\frac{1}{4}$ X 14 $\frac{1}{2}$	45-deg. corners
6	1	$\frac{3}{8}$ X 4 $\frac{1}{2}$ X 28 $\frac{3}{8}$	Brace No. 1
7	1	$\frac{3}{8}$ X 4 $\frac{1}{2}$ X 12 $\frac{1}{4}$	Brace No. 2
8	1	$\frac{3}{8}$ X 4 $\frac{1}{2}$ X 13	Brace No. 3
9	2	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 13	Top of bottom, front of back
10	1	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 22	Bottom
11	1	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 25 $\frac{3}{8}$	Lower front
12	1	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 3 $\frac{1}{4}$	Upper front
13	1	$\frac{3}{8}$ X 14 $\frac{1}{2}$ X 18 $\frac{1}{4}$	Back No. 2
14	1	$\frac{3}{8}$ X 4 $\frac{1}{2}$ X 14 $\frac{1}{4}$	High-freq.-spkr. base
15	2	$\frac{1}{2}$ X 6 $\frac{1}{2}$ X 6 $\frac{3}{8}$	High-freq.-spkr. mtg. left and right
16	1	$\frac{1}{2}$ X 6 $\frac{1}{2}$ X 5 $\frac{3}{8}$	High-freq.-spkr.-mtg. ctr.
17	1	$\frac{3}{8}$ X 15 $\frac{1}{4}$ X 22 $\frac{3}{4}$	Top
18	1		Low-freq. spkr. (woofer) Jensen P 12 P
19	3		High-freq. spkrs. (tweeters) Jensen P-5 TX*

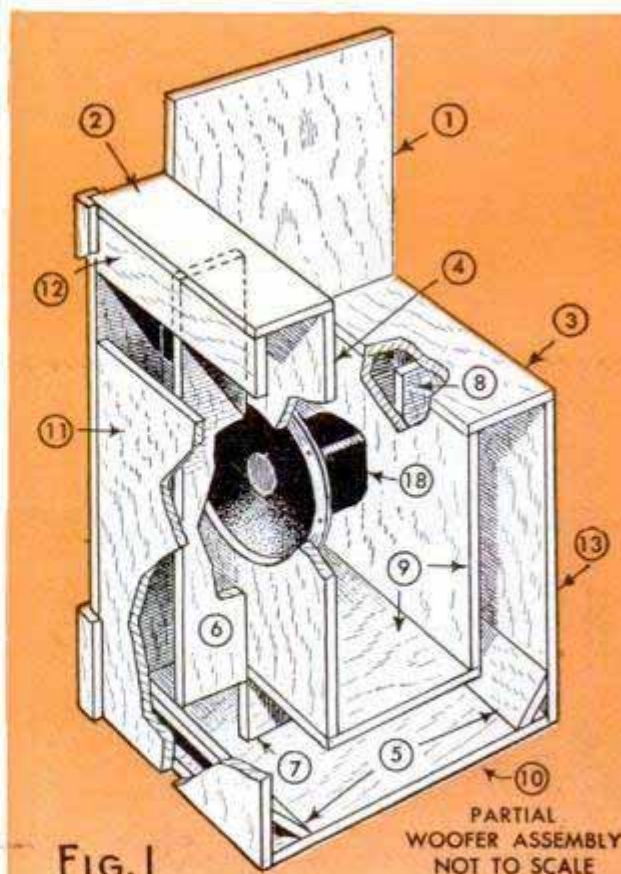


FIG. 1

PARTIAL
WOOFER ASSEMBLY
NOT TO SCALE

SYSTEM *Reproduction*

with this system have a minimum of hum. Most table-type radios do not have sufficient filtering and many radio receivers have inadequate output transformers for both very high and very low tones. Several construction articles for suitable audio amplifiers of the high-fidelity low-hum type have appeared recently in this magazine.

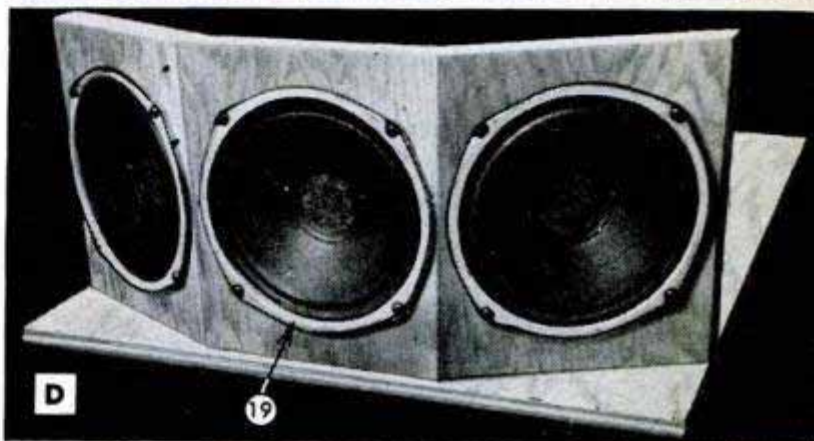
The loudspeaker system, shown in photos A and C, takes less floor space than a radio console. The space required is only 15¼ in. wide and 22¾ in. deep. The height is 41 inches. The three tweeters are a special feature. Mounted as shown in photo D, and Figs. 3 and 4, they spread the high tones over a wide angle at ear level. This spread removes the annoyance of high-tone beams from a single source. For example, spread over a wide angle, the high tones of the applause and laughter of an audience are re-created realistically.

The tweeters are five-in. extended-range permanent-magnet (PM) speakers. Ordinary speakers do very well up to 10,000 cycles, but the extended range continues up to 15,000 cycles, so the added cost of the

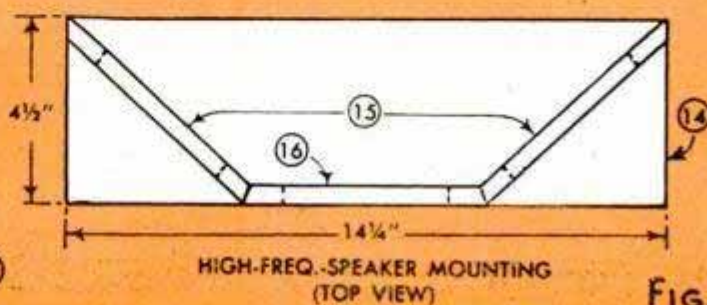
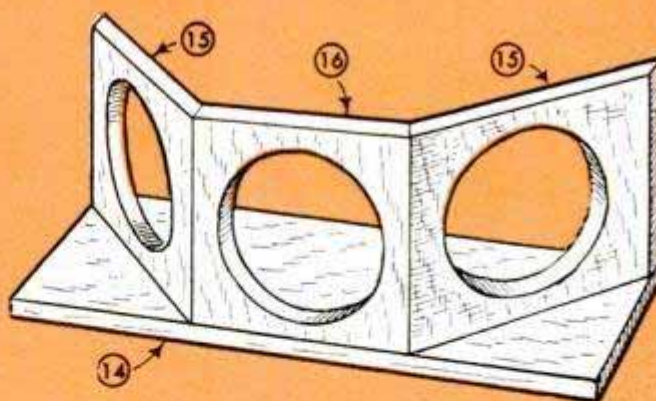
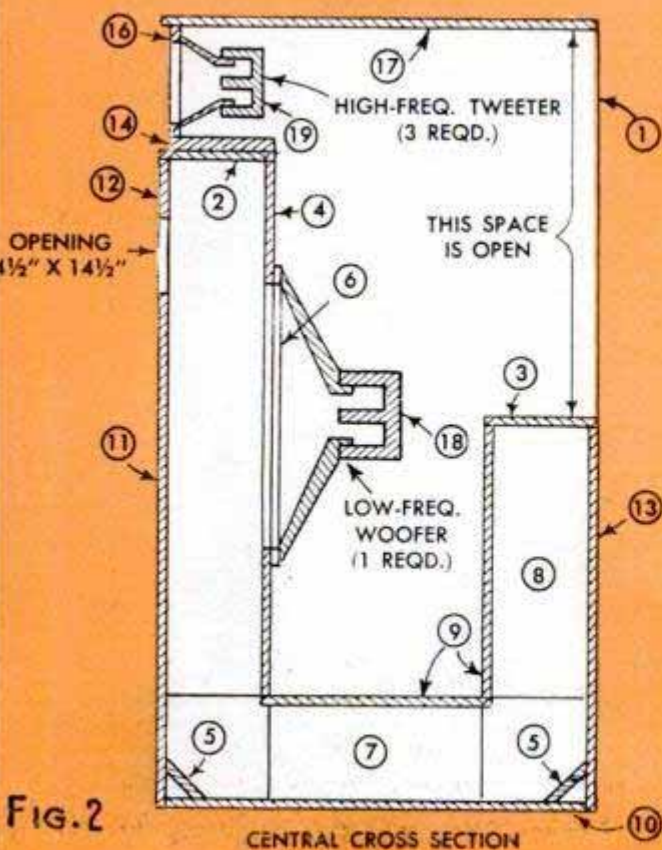
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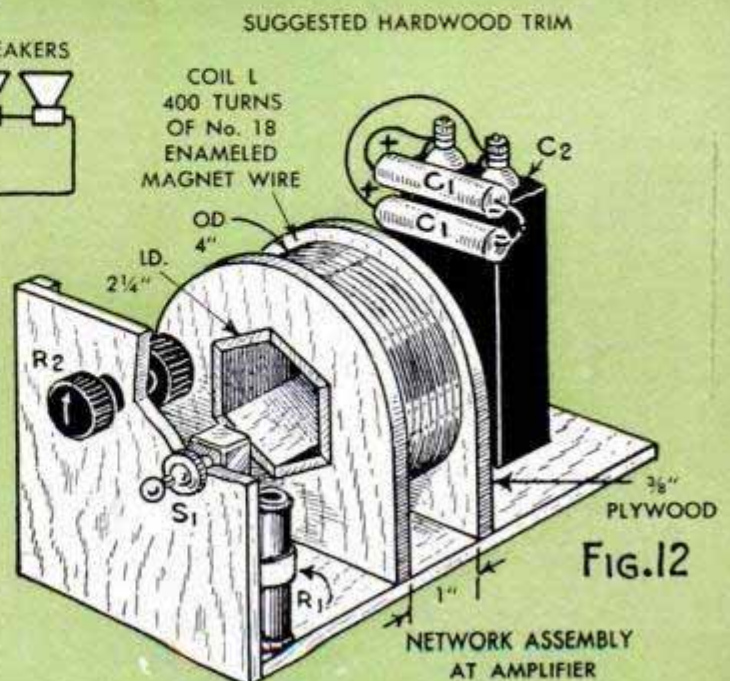
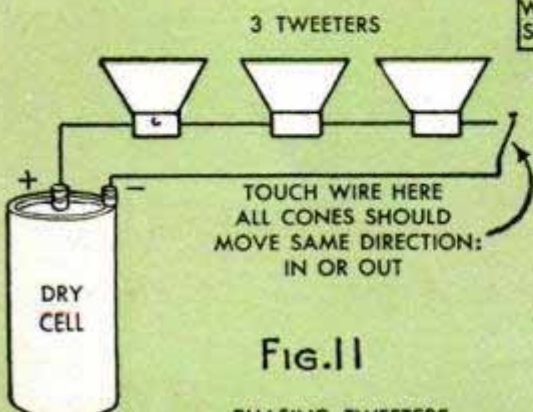
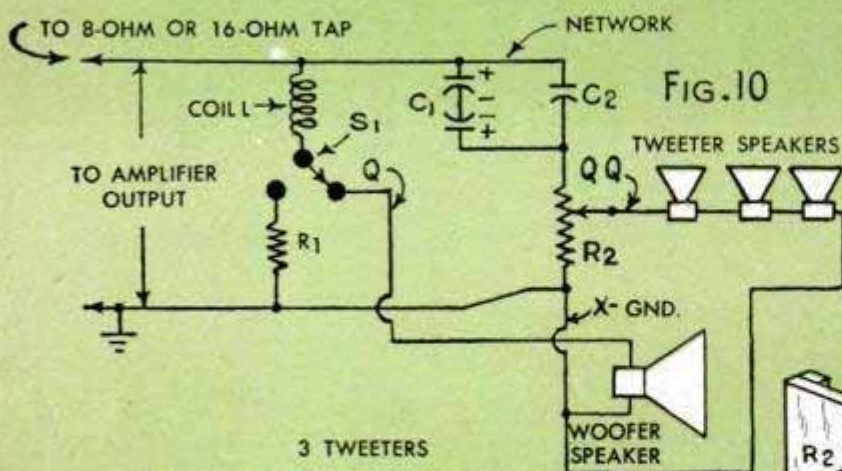
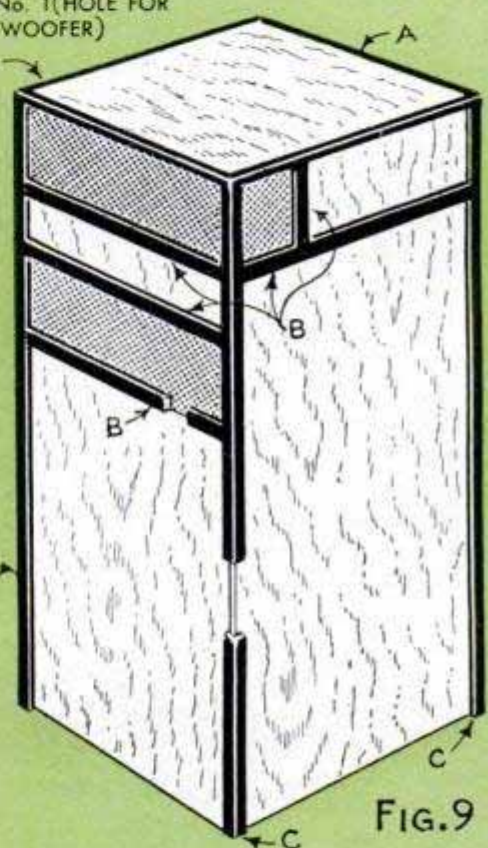
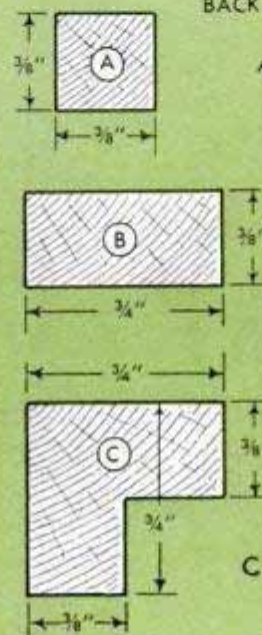
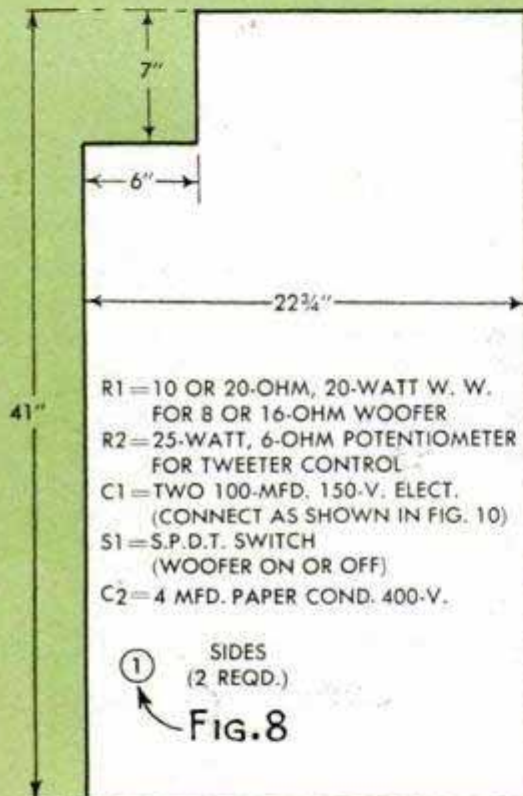
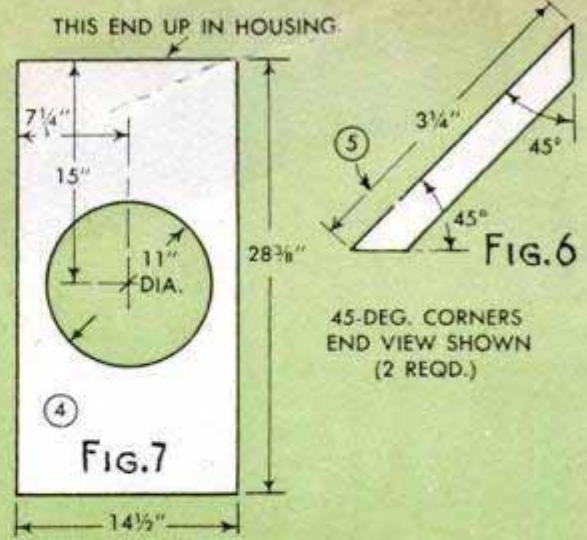
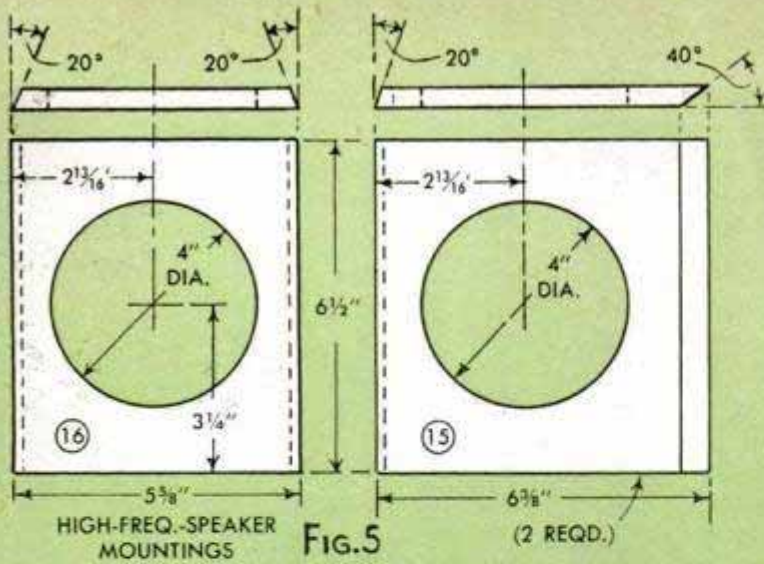


C



D



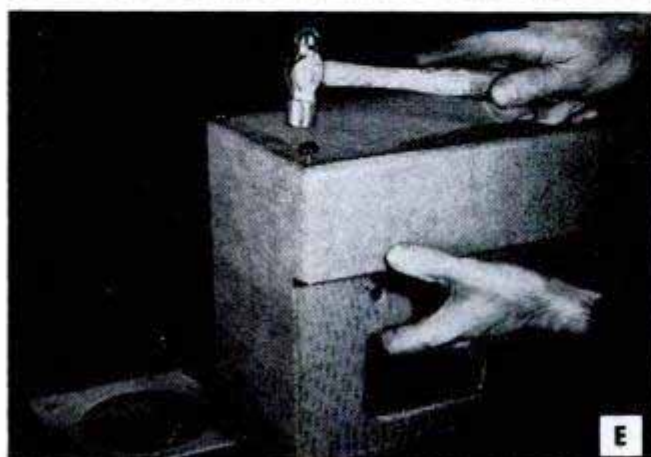
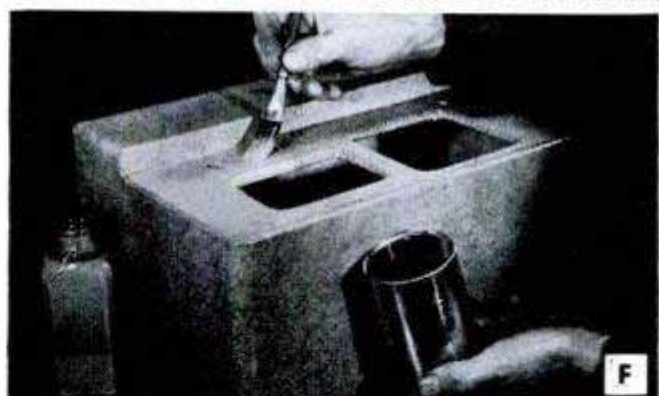
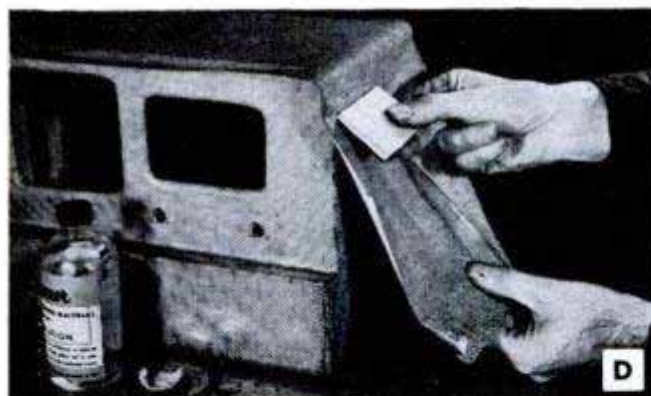
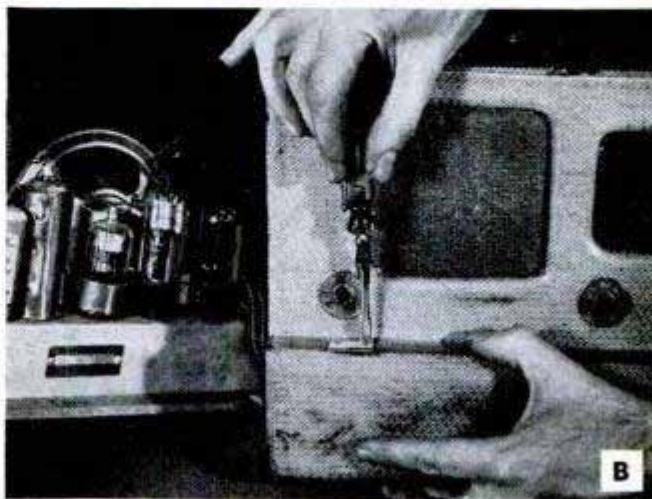


NOTE—Q, QQ AND X-GND. LEADS IN FIG. 10 GO TO SPEAKERS IN CABINET

Portable Cabinet Repairs

MANY old portable radio receivers are still in good working order electrically, but have been banged around until the covering on the cabinet is in poor condition and definitely unattractive. In rejuvenating the one shown in the photos, the old covering of woven cloth was left in place as it was not torn. Over most of this was placed a plastic-film veneer simulating leather, the panel and inside cover surfaces being finished with colored lacquer.

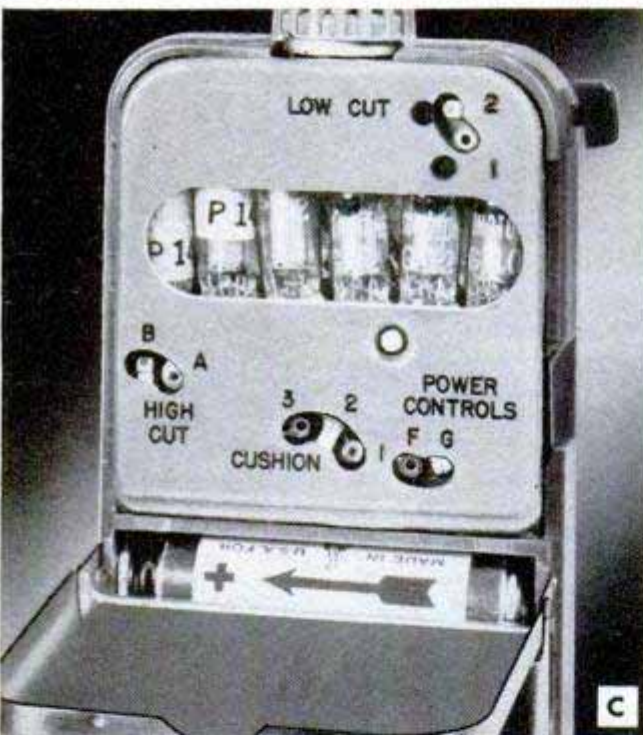
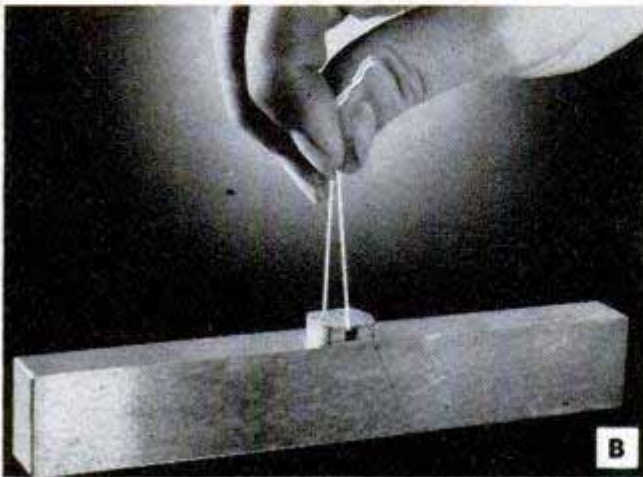
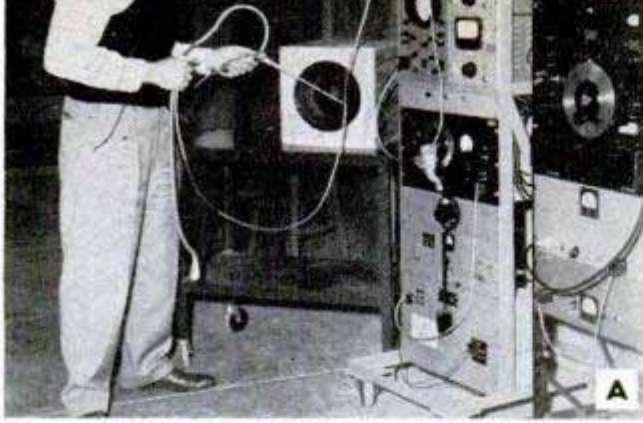
First, remove the control knobs and receiver chassis and set them aside. Then remove the handle, dial plates, speaker-grille screening, dial window and hinges and latches, as illustrated in photos B and C. Clean the old covering by washing it with a solvent such as a lacquer thinner, then apply the adhesive that is to hold the new finishing material in place. The plastic film used was smoothed into place with a rubber squeegee as shown in photo D. Use a razor blade for trimming and prick bubbles with a pin if necessary. New rubber-headed feet were installed, and the panel and inside cover were given a coat of light-green lacquer brushed over the original covering, see photos E and F. Small metal parts, such as dial plates, hinges and latches were given a coat of clear lacquer. The completed job appears in photo A. Lacquer and solvent should be used away from flame and in a well-ventilated room.

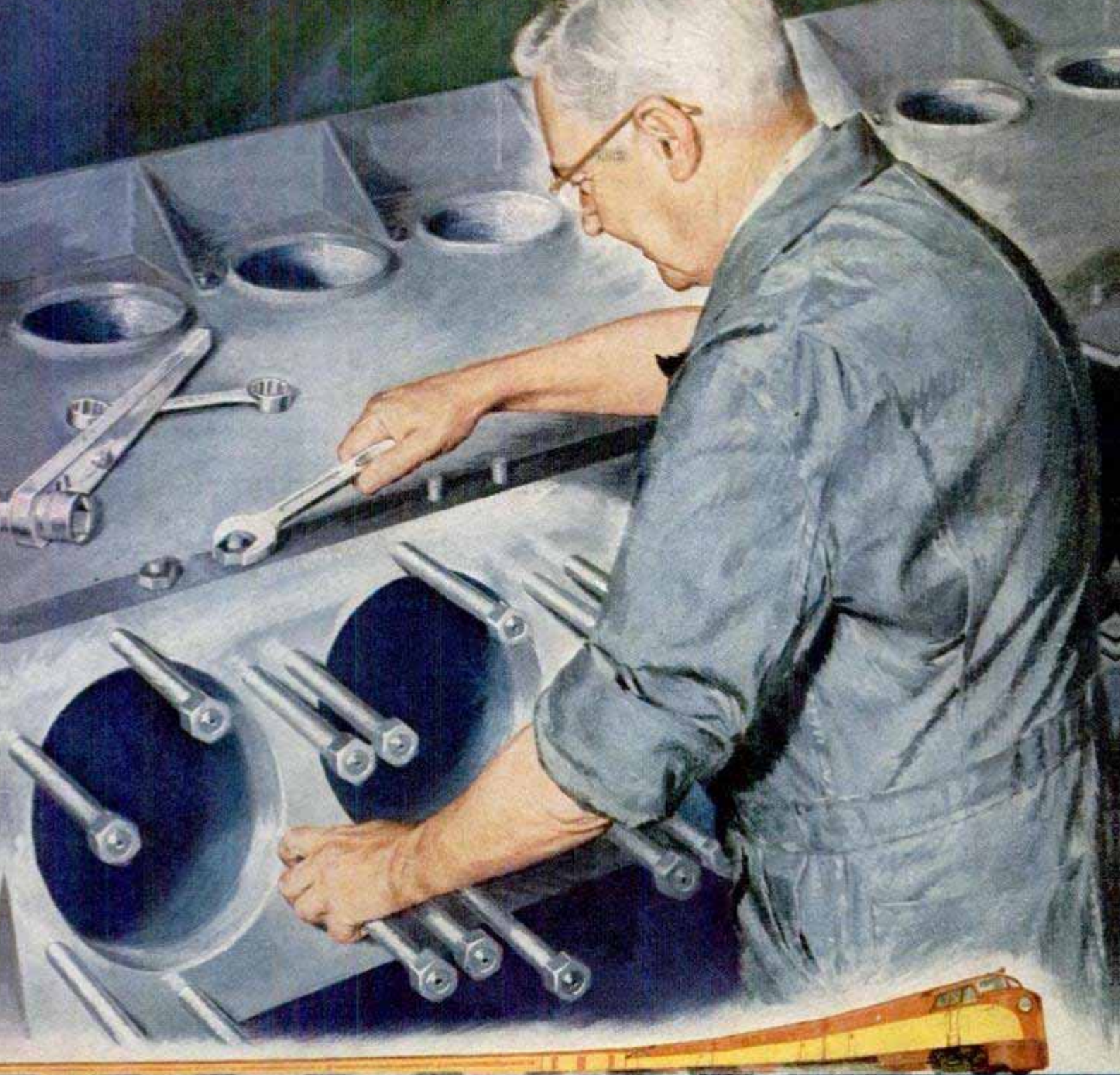


UNUSUAL MICROPHONES AND HEARING AIDS

PHYSICISTS and radio engineers have long sought the perfect microphone—a microphone which can hear every tone equally well from any place in its vicinity. Dr. R. W. Leonard, associate professor of physics at the University of California, Los Angeles, has taken a definite step toward this microphone in a laboratory-useful model of a “resistively terminated probe microphone.” The new instrument, shown in photo A, resembles a mechanic’s oilcan, the sound being picked up by what corresponds to the tip of the spout with the microphone near the handle. It utilizes a condenser microphone having an air tube terminated with sound-absorbing material.

The pocket-size high-gain hearing aid, illustrated in photos C and D, employs six subminiature-type tubes. It has been designed by Sonotone engineers for persons who, because of severe hearing impairments, previously had to use large hearing aids with external batteries or units powered by the electric-light lines. Specially designed low-drain tubes and a mercury A-battery are claimed to operate this hearing aid for more than 50 hours. The tiny but powerful permanent magnet from one of the hearing aid’s receivers can support an iron bar 300 times its own weight as demonstrated in photo B. The bar weighs 17½ ounces. A special magnetic pickup, held against the shell of any telephone receiver, permits telephone conversations to be amplified through the hearing aid as illustrated in photo E.





PERFECTION IS HIS STANDARD...

Like you, he recognizes no compromise with perfection... accepts only one quality of materials, workmanship, tools. You gauge the work of others by your own rigid standard and are proud to have others measure up to it.

Bonney wrenches are made to the same standard of perfection. That is why mechanics call them America's finest—unmatched for lightness, strength, balance, and precision.

Bonney wrenches are the pride of the men who make them... the pride of the men who use them.

BONNEY FORGE & TOOL WORKS



Perfection is the standard of the men who design and build America's Diesel engines... power plants carrying names like Baldwin, Cummins, American Locomotive, Fairbanks Morse, Hercules, Ingersoll-Rand, Worthington, General Electric, that set new standards of performance in

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You'll save money if you replace them with Hastings Piston Rings. They're engineered exclusively for replacement service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—for thousands of extra miles. It's the best money you can spend on your car.

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Helpful facts about filters...



Normal photograph



Taken with Yellow (K2) Filter



Normal photograph



Taken with Yellow (G) Filter



Normal photograph



Taken with Green (X1) Filter



Normal photograph



Taken with Red (A) Filter

Why they do so much for your snapshots

Taking snapshots without a filter can be like eating flapjacks without butter—their full flavor and appeal are often not brought out.

Examples of what some of the most popular Kodak Wratten Filters will do are shown on the left. For instance, the K2 Filter is perfect for making clouds look like clouds—white and fleecy. And for more dramatic sky emphasis, you have the more powerful dark yellow G Filter. Yellow filters, including the new Kodak Cloud Filter for use with inexpensive cameras, may be used with orthochromatic or panchromatic films.

For emphasizing background foliage and clouds—and at the same time giving a pleasing natural modeling to faces photographed against a blue sky—you can use the green Kodak Wratten Filter X1 (with panchromatic film only). And for the most spectacular, thrilling sky rendition of all, try the red A Filter (panchromatic and infrared films only).

As you use and enjoy filters, you will want to add to your collection. So be sure to see your Kodak dealer for a complete list of Kodak Wratten Filters. Prices start at \$1.65 (Kodak Cloud Filter, any size, \$1.72).



Warm up your distant color shots with a Kodak Skylight Filter—With this filter you reduce the bluish cast that often appears in distant scenes. Use it to get warmer-tone pictures of mountains, seascapes, sunlit snow scenes . . . pictures made in open shade under a clear blue sky and on overcast days. Requires no change in normal exposure. Prices start at \$1.65.



Reproduction from normal color transparency



Reproduction from color transparency using Kodak Pola-Screen

Darken the sky in your color pictures—A Kodak Pola-Screen does the trick—in color or black-and-white. Also offers the only sure way to subdue reflections from glass, wood, water, and other nonmetallic surfaces. The effect your Pola-Screen will have on the picture may be predetermined by looking through the Kodak Pola-Screen Viewer—a miniature screen which fits over the indicator handle of your Pola-Screen. Varying degrees of sky-darkening can be obtained by rotating the screen. Price of Viewer, \$6.75; Pola-Screens, from \$6.75.





A Kodak Close-Up Attachment gives you pictures like the one above at right

Move in on your subject this easy way—Slip an inexpensive Kodak Close-Up Attachment over your lens and you'll give your camera new picture-taking ability. You can "shoot" at closer range than is normally possible with a fixed-focus camera, and get big, clear images.

Use the attachment for head-and-shoulder pictures, close-ups of pets and flowers. The little story above shows you how easy it is—how pleasing the results. There are sizes to fit most Kodak, Brownie, and fixed-focus Cine-Kodak Cameras. Any size, \$1.63.

An inexpensive supplementary lens does wonders too

For extreme close-ups—Kodak Portra Lenses 1+, 2+, and 3+ give pronounced close-ups of subjects with both still and movie cameras. When you place one in front of your camera lens you step up its power for short-range photography of people, nature studies, and

table-top subjects. Kodak Portra Lenses are graduated in power as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. A 2+ lens and 3+ lens combined give the effect of a 5+ lens. From \$2.59.



Normal Close-up



With Kodak Portra Lens 1+



With Kodak Portra Lens 2+



With Kodak Portra Lens 3+



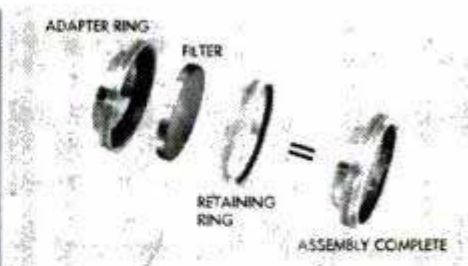
With Kodak Portra Lenses 2+ and 3+



Protect your filters this easy way—Kodak Combination Filter Cases are handsome leather cases that protect lens attachments and provide a convenient way to carry them. One compartment holds a Kodak Adapter Ring, Filter, Lens Hood; the second, three filters. Series V, \$4.25; Series VI, \$4.95.



Shade the eye of your camera—A Kodak Lens Hood helps to guard against light-streaked photographs by making it easier to keep sunlight from striking your lens directly. It also serves to reduce sky "flare" when pictures are side-lighted by the sun or by photo lamps. From \$1.65.



A single Adapter Ring accepts filters and other lens attachments—The two-element Kodak Adapter Ring is the basic unit of Kodak Combination Lens Attachments. Its nonrusting chrome plating matches perfectly the quality finish of your camera. Available in all series sizes. Prices start at \$1.29.

Your Kodak dealer is fitted by training and experience to give you valuable help in your hobby of photography. He'll be happy to "talk shop" any time.

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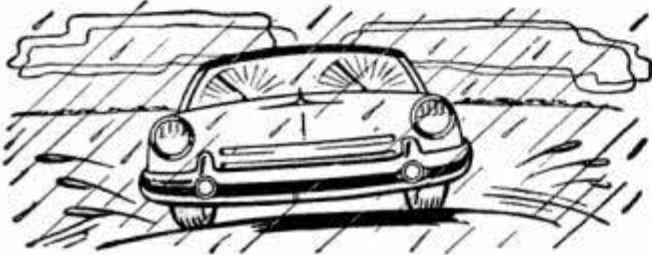
Care and Feeding of Engines

BY S. P. CORP

MAKE CHROME LAST LONGER

Chances are that calcium chloride or salt were used to melt ice and snow on your pavements last winter. Both have a chemical action on chrome plating. You may find your bumpers and other chrome parts pitted with small rust spots.

To improve appearance, and to prevent rust damage from spreading, borrow your wife's kitchen scouring powder and remove those rust spots. Then give all your chrome a coating of good wax. In fact, the chrome will last longer if you wax it every time you wash your car.



ROAD TAR AND OIL

Don't let spots of road tar or oil remain on the finish of your car. Use tar cleaner to remove them. If you use gasoline, be sure it's white gasoline—and be very careful with it. This is part of the thorough washing your car deserves. So is the job of washing away all salt accumulations under fenders, particularly where sheet metal is fastened together. Use a good polish to restore lustre, and don't worry if a little color shows on your polishing cloth—it is dead pigment, and is not a sign of damage.

CLEAN YOUR OIL PAN

Water always accumulates in the crankcase in winter. The wise way is to buy a set of oil pan gaskets, then drop the oil pan and give it a thorough cleaning. Clean gasket surfaces on both oil pan and engine block. Coat oil pan gasket surface with shellac, and, when tacky, place gasket on pan. Install all pan bolts before tightening any of them, to allow for movement in aligning bolt holes in engine block. Replace your oil filter at this time, too, so your new oil will have a fresh, clean start. Clean oil makes rings, bearings, and bearing surfaces last longer, and makes your driving a lot more fun.

USE SEALED POWER KROMEX RING SETS

Late model cars and trucks operate at higher engine speeds and higher combustion temperatures. Sealed Power KromeX Ring Sets are built for those conditions. Top compression ring and steel rails of oil ring have solid chrome faces to fight heat, friction, corrosion, abrasion! Write Dept. G-5, Sealed Power Corp., Muskegon, Michigan, for your free copy of the valuable new booklet, "More Power, Less Oil, Less Gas."



Here Comes the Circus

(Continued from page 87)

sockets in the canvas, then push the poles erect. Within 10 seconds the flat canvas oval has become a huge saucer.

A time-wrinkled elephant sways ponderously toward the tent, moves past the excited lad and lurches into the darkness until its bony head strikes the sagging canvas. The "bull man," with a touch of his hook, turns the animal around and hitches a rope to its harness. The hawser snakes along the ground, up the nearest center pole, around a pulley at the top and back down to the bale ring, where it has been tied off. Upon signal, the animal leans forward, testing the rope, then walks slowly out from under the canvas. The bale ring and canvas move up to "pull the peak."

The big top now has become a wrinkled, dark cavern, the quarter poles leaning at crazy angles, hundreds of men rushing about under the cloth roof. Elephants move sedately through the confusion, pulling each of the quarter poles into exact position. Standing on the edge of the tent, the kid leaps for safety as an elephant sways beside him, dragging an enormous plow around the perimeter, digging a ditch to drain the tent. Then the lad joins a crew of men who are "guying out" the canvas.

High up along the ridge of the big top, 60 feet above the boy, the "air conditioning system" has gone to work. On the outside of the tent, gigantic canvas flaps, 50 feet long, are trapping the slightest breeze, "breathing" up and down to pump cool air through the ridge vents. It's 20 degrees cooler under the top than it would be without the flaps.

Long before the last of the quarter poles has been pulled upright, riggers start weaving a web of tackle high above the ground, and cats claw seat wagons into position. There's an earsplitting clatter as ushers slam the seats erect.

The seat wagons have been called the foremost advance in equipment in the history of the circus. Each wagon is a big rectangular box, carefully pin-pointed under the edge of the big top, one end facing the center of the tent. Steel flaps, hinged along the top, hang down on both sides of the wagon. The flaps are swung up with jacks until they are level with the top of the wagon, making a broad platform. Then a Jeep, through a power take-off, turns a crank on the wagon, pivoting the entire platform on steel pins, the outer edge moving up, the inner edge moving down. The platform then rests at an angle with the lower end—toward the center of the tent—

(Continued to page 226)



just what
fishermen
ordered!

[AND MAN, HOW THEY'VE ORDERED IT]

FLEETWIN

7.5 O.B.C. certified
brake H.P. at 4000
R.P.M. Price F.O.B.
Factory, subject to
change without notice,

\$210



IT'S FLEETWIN ... by Evinrude! It zoomed into the favor of knowledgeable fishermen the day it hit the water!

Its popularity rides up and up, for there's no motor like it. See how *much* of so many good things it offers you...

It's wonderfully *light*! Fleetwin weighs only a few pounds more than most "fives."

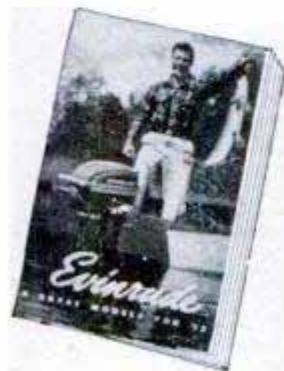
But... packed into those few pounds you'll find a noble bonus of **50% more power**. Power that whisks you to your fishing spots miles, miles faster. The smoothest, sweet-

est, sharpest power you've ever handled!

How about *trolling*? You couldn't ask for a finer trolling motor... for *this* one, owners will tell you, is *perfection*.

With Fleetwin's Duo-Clutch you've got "press-the-button" handling ease... you start in neutral, and "idle" anytime.

SEE YOUR EVINRUDE DEALER—let him give you a show-down demonstration of all that Fleetwin offers against the field! Look for his name under "Outboard Motors" in the yellow pages of your phone book. **CATALOG FREE!** Write today for catalog of the complete Evinrude line.



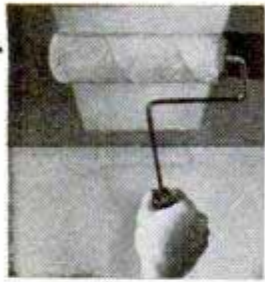
EVINRUDE MOTORS

4811 N. 27th St., Milwaukee 16, Wis.

IN CANADA: Manufactured by
Evinrude Motors, Peterborough, Ontario

EVINRUDE

Here's how for Home Painters



How to paint your ceilings—Use small brush for edges and a lamb's wool paint roller. Roller eliminates dripping... applies paint 2 to 4 times as fast. Easier to see places you have skipped if you start near main source of light.

Why paint masonry?—Masonry surfaces absorb moisture like a sponge. This weakens cement and mortar. Soon cracking starts due to temperature changes. But painting with Bay State Brick and Cement Coating prevents this—reduces indoor dampness.



What to do with brushes between jobs—If it's just for a few days, bristles will stay soft wrapped in kitchen aluminum. For longer—soak brush in "keeping" mixture of $\frac{2}{3}$ raw linseed oil, $\frac{1}{3}$ turpentine. Wrap bristles in newspaper to stop kinking.

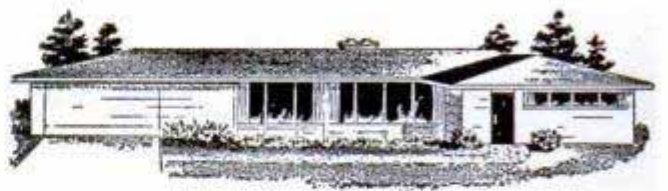
How to paint a window—Best bet is to hold strip of metal or cardboard on glass and against molding. Paint the wood, letting your brush lap over onto the shield. Shield protects glass pane efficiently. Best brush is an angular sash tool.



YOU can get all the painting accessories you need—and many more helpful tips—at your neighborhood Devoe dealer. You'll find his name listed in the classified section of your phone book. Why not stop in and see him at the sign of the Devoe diamond?



Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Restoring Organ Keys

Q—I own an old organ having genuine ivory keys, that is, the white keys are ivory. I believe the keys in the upper row are faced with either ebony or rosewood. I am not sure which. At any rate, the ivory keys are badly discolored and I would like to restore them to their original color. How can I do this without

damaging the ivory in any way?—B.R., Ky.

A—We do not believe you will find it practical to attempt restoring the keys to their original color. They can be bleached in several ways but we could not recommend the procedure as the results are not always reliable. However, grime and natural oils which accumulate and harden over long periods of time can be removed with a fair degree of success. One way is to make a fairly heavy paste by adding pure benzol to ordinary whiting. In order to apply this properly, it may be necessary to remove the keys one by one, replacing them in order after cleaning. Apply the paste, rub lightly and then rub off with a cloth or stiff-bristle brush before it hardens. (Caution: Do not apply the paste with the bare hands or rub with the fingers, as benzol is injurious to the skin. Do not permit the paste to come in contact with any of the finished parts of the organ, as benzol is one of the ingredients of paint and varnish remover. Avoid inhaling the fumes of the mixture.) After paste has been removed from the keys, rub them with a cloth which has been dampened in soapy water. Dry thoroughly before replacing.

Household-Tool Selection

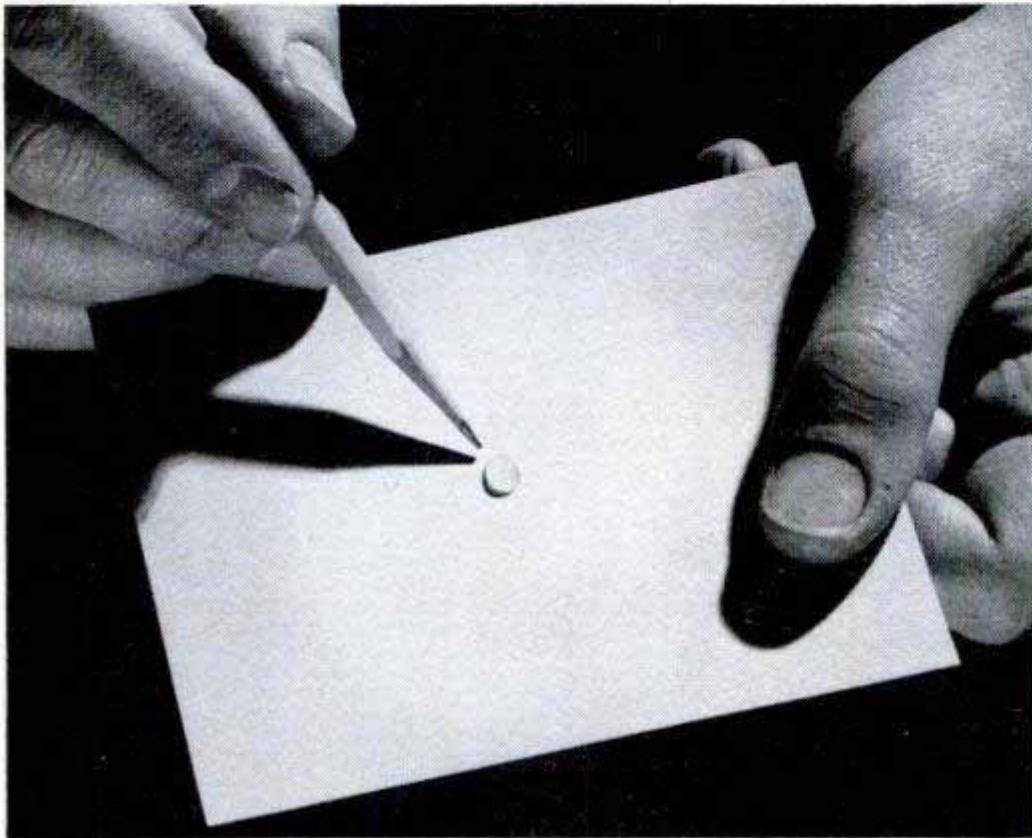
Q—I want to purchase a set of hand tools for household use. But what should I buy?—H.M., Calif.

A—Following is a list of hand tools selected on the basis of all-around home use but not necessarily calculated to cover every possible requirement:

Ripsaw, 26-in. blade (5 points per in.)	Combination square
Crosscut saw, 24-in. blade (12 points per in.)	Scriber
Compass saw	Miter box, 26-in. back- saw (optional)
Coping saw	Ratchet screwdriver
Hacksaw	Hand drill, $\frac{1}{4}$ -in. chuck cap.
Ratchet bit brace, 10-in. sweep	Oilstone, combination type
Auger bits— $\frac{1}{4}$ to $\frac{1}{2}$ -in. by 8ths or 16ths	Expansive bit, $\frac{7}{8}$ to $1\frac{1}{2}$ in.

(Continued to page 224)

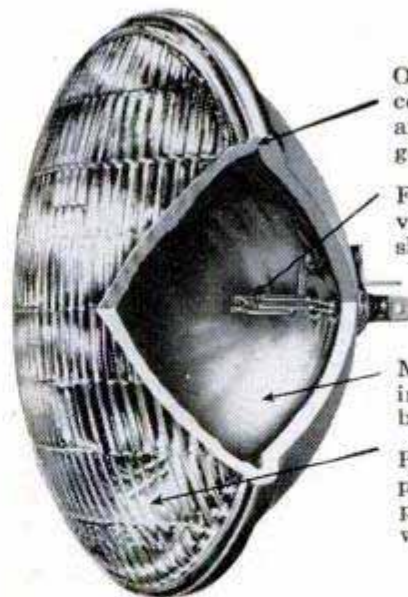
There is a difference in sealed-beam headlamps



...and this is it

All-Glass sealed-beam headlamps do not grow dim

When moisture collects inside a headlamp and deteriorates the reflector, it cuts light output. Unless your headlamps are All-Glass, you may be able actually to see traces of moisture inside. But there's one way to be *sure* your headlamps are not growing dim. Replace them with G-E All-Glass headlamps. Because they're *All-Glass*, all one big bulb, there's no way for water to get in. Tests show that General Electric sealed-beam headlamps average 99% as much light after years of service as when new. Be sure to specify G-E All-Glass headlamps.



One-piece All-Glass construction. Dirt and moisture can't get in.

Filaments held in vise-like grip. Can't shake loose.

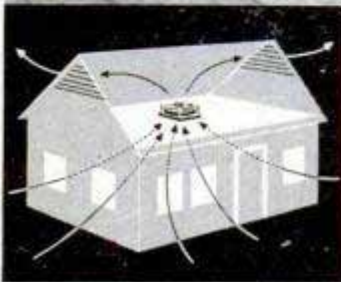
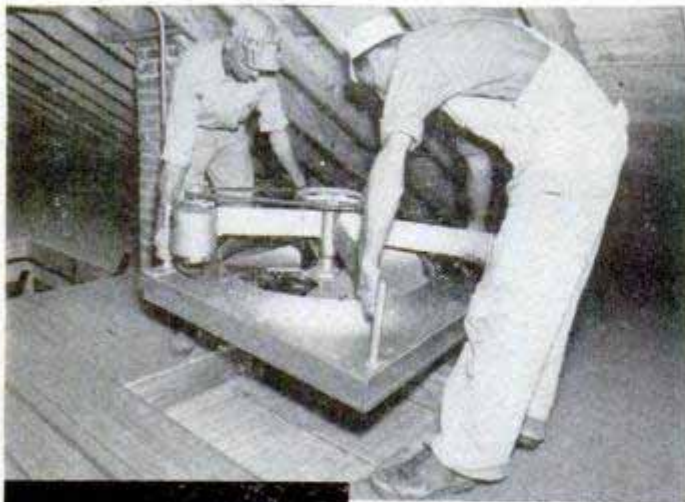
Mirror-like, built-in reflector. Stays bright.

Rugged, hard-glass precision lens to put light where you want it.

You can put your confidence in—

GENERAL  **ELECTRIC**

NEW ATTIC FAN IS EASY TO INSTALL



**COOL YOUR
HOME THIS
LOW-COST WAY**

Why suffer through another hot, humid summer?

The modern Hunter Attic Fan will pull cool, fresh air through every room in your home . . . drive out scorching, sticky heat. It's quiet and powerful, requires little or no maintenance, costs only a few cents a night. And it's backed by Hunter's 65 years of fan experience.

You can easily install a Hunter Attic Fan in your home. This compact unit is complete with automatic shutter and modern metal trim to cover the ceiling opening. No suction box to build; no accessories needed. Fan requires only 17 in. attic clearance. Look in your classified directory and phone the Hunter dealer. You can have cool comfort at low cost.



MAIL FOR FREE BOOKLET

Hunter Fan and Ventilating Company
Box 2858-P, Memphis 2, Tenn.

Send a copy of "Change Your Home
from Hot to Cool" to:

Name _____

Address _____

City & State _____

HUNTER ATTIC FANS

(Continued from page 222)

- Wood chisels, 1/4 to 1-in. by 8ths
- Rosehead countersink
- Nail set
- Nail hammer, size No. 2, 13-oz. head
- Cold chisel, 1/2 or 3/4-in.
- T-bevel, 8 or 10-in. blade
- Block plane
- Smooth plane, 8-in. frame
- Jack plane, 14 or 16-in. frame
- Level, aluminum frame, 18 to 24-in.
- Adjustable cabinet scraper
- Twist drills (fractional sizes) 1/32 to 1/4-in. by 32nds
- 4 flat files with handles (selected according to requirements)
- Combination pliers (slip-joint, side cutting)
- Long-nose pliers
- Tinner's snips
- Ripping bar, 18 to 24-in.
- Marking gauge
- Folding rule, 72 in.
- Adjustable wrench (two sizes according to requirements)
- Pipe wrench, for pipe up to 2 in.
- Spokeshave

Cleaning Oil Painting

Q — I have an old and cherished oil painting which I would like to clean as it has become darkened and dingy in appearance due, I suppose, to an accumulation of dust and grime. But what solvent can I use to remove the grime without softening the oil paint?—V.H., N.D.



A—If, as you say, the painting is very old, then it is quite probable that the oil paints have become thoroughly oxidized and would not be damaged by careful use of a cloth dampened with pure turpentine. However, there is still some risk of damaging the painting by this procedure. It cannot be recommended without examining the painting closely to determine its condition. Although there are several methods of restoring old paintings, we have only one suggestion. Fold a soft cloth to make two thicknesses that will cover the painting. Dampen the cloth with lukewarm soft water and wring it until it no longer drips. Spread the doubled cloth over the surface of the painting and press it lightly into contact. Allow to remain for five minutes or so, then lift it off. Rinse the cloth and repeat the procedure. Several applications of the damp cloth should remove most of the accumulated dust from the surface. Then, if desired, you can brighten the painting by going over the surface with a tuft of cotton dipped in pure linseed oil. Wipe off any excess oil and protect the surface from dust until the oil coating is thoroughly dry.

Grindstone Repair

Q — I have an old grindstone of the treadle-drive type which I still use for grinding edge tools. It is a very fine grained stone but seems to wear out of round in a comparatively short time, making it necessary to true it up frequently. This practice is reducing the diameter of the stone at such a rate that soon I will have no stone left. Isn't there some treatment that will equalize the wear on the stone and at the same time not affect its cutting properties?—W.T., Pa.



A—Some users coat the soft spots of the stone with white shellac cut about 50 percent with alcohol. Before coating with the thin shellac in this manner, the stone must be clean and thoroughly dry so that the shellac will penetrate before drying. The shellac, in theory at least, tends to bind together more firmly the loose particles in the softer parts of the stone and thereby helps to equalize normal wear. An older treatment made use of raw linseed oil instead of shellac. One part turpentine is added to three parts raw linseed oil.

Get more **KICK** out of life!

Power riders get more ZING out of life — have barrels of fun. Never a dull moment — always something exciting to do — when you own a Harley-Davidson 125! Now's the time to get into this fast-growing sport and treat yourself to an endless round of thrilling good times with other throttle-twisters. See

your Harley-Davidson dealer — or send

us 25¢ for literature on the 1952

models and a copy of the

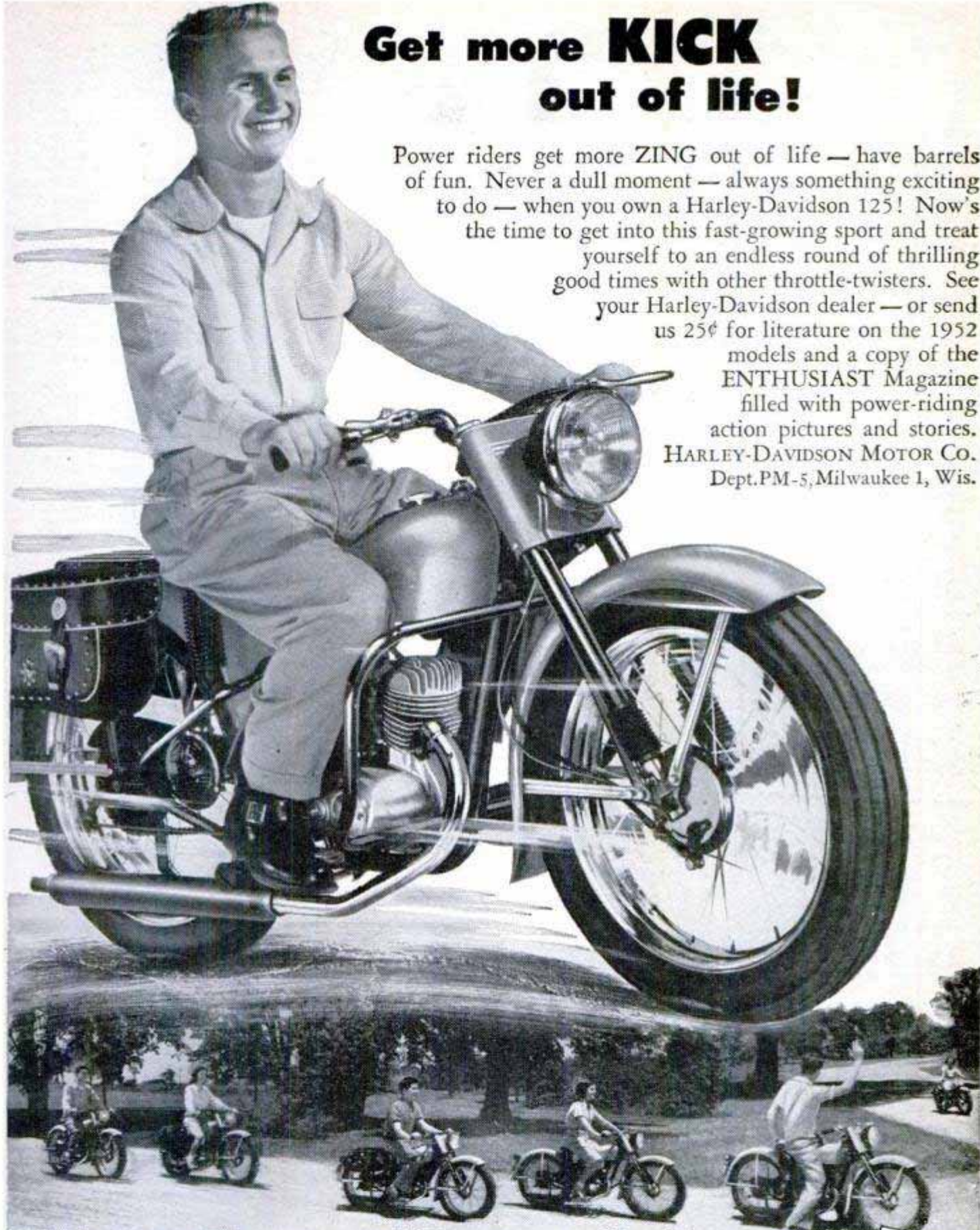
ENTHUSIAST Magazine

filled with power-riding

action pictures and stories.

HARLEY-DAVIDSON MOTOR CO.

Dept. PM-5, Milwaukee 1, Wis.



Harley-Davidson **125**

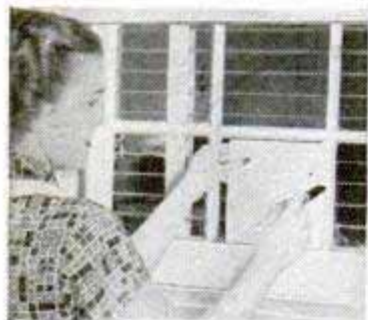
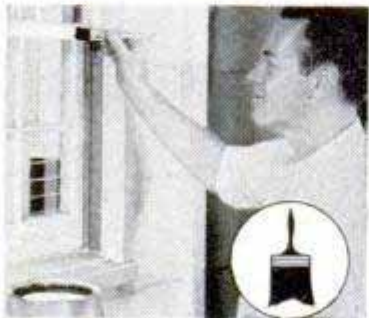
WITH *Tele-Glide* FORK

Pointers for home painters **Windows:**

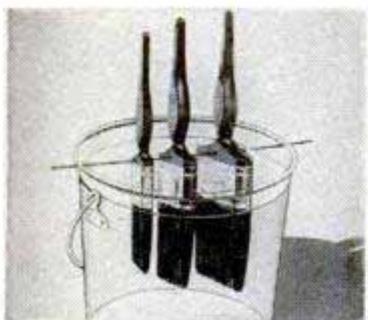
For a lasting job, remove *all* old or cracked putty. Hold tip of an electric soldering iron against putty until it is softened. Scrape out with putty knife.



Don't let your brush "fishtail" (see insert) by painting window frame with oversized brush. Use small nylon-bristled brush—one designed for the job.



Use a protecting strip of cardboard or sheet metal when painting near glass. Leave window slightly opened during drying, so it won't stick shut later.



Clean brushes with thinner after daily use. Suspend brush in thinner overnight. Bristle tips should not touch bottom of can. Work out thinner before repainting.

JOB AFTER JOB you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name **NYLON** on the handle. Be sure to pick the size brush designed for the job . . . and demand Du Pont nylon bristles.

150th Anniversary



Better Things for Better Living
... through Chemistry

The best brushes have
**DU PONT NYLON
BRISTLES**

about four feet off the ground. "Seat men" now dive into the wagon, unloading supports and steel plates to build the "bible"—an extension right on down to sawdust level. Bolted to the platform are collapsible seats which are slammed upright. The seat wagons are so spaced that they form one vast arena seating 8000 people, the ring of seats broken only by the main entrance and by a few aisles through which the performers enter. The compartments beneath the seats then become dressing rooms for the performers.

Meanwhile, Edward "Whitey" Versteeg's 52-man crew of electricians has swept into the tent to erect the blinding banks of flood and spot lights. Versteeg has seven generators on wagons at strategic points. Seven miles of heavy cable lie coiled like spaghetti across the lot to light the 40-odd tents.

About eight hours have passed since the first section of the train backed onto the siding. It's 1:15 in the afternoon and, suddenly, standing on the edge of the cavernous tent, the kid sees the tip of the crowd break through the gate. He finally locates Werner, who slips him a pass, and he joins the crowd as it hustles to the best seats. Outside, big-top men are still tightening the ropes to a rhythmic chant heard nowhere else on earth. A few minutes later there's a brassy fanfare from the band and it's time for "the most prodigious production on the face of the earth, a superspectacle of stirring pageantry."

While the popeyed crowd watches the superspectacle, there's still a show to be seen out in the back yard. Tank wagons rumble across the lot, toting thousands of gallons of water for everything from elephant baths to pink lemonade. In the kitchen, cooks work on the evening meal. Late in the afternoon, just after the big performance is over and "lot lice" are trying to slip into the back yard without authorization, there's a lull—just about the only one during the hectic day. The performers, no longer bespangled daredevils, but ordinary folks from Oshkosh or Oslo, write letters, play with their children and drift over to the cookhouse for dinner.

But at 5:30, long before the overture for the evening performance, the kitchen already is packing its gear. You can feel an undercurrent of urgency around the cookhouse, too, and as the last kinker finishes his dessert the big tent already is echoing to the clatter of tables vanishing into wagons. About the time the "World's Biggest and Most Perfectly Trained Group of PERFORMING BEARS" touches off the evening performance, the cookhouse crew strikes its tent and heads for the train. Over

(Continued to page 228)

CHANNELLOCK *Belongs*

Made only by
CHAMPION DEARMENT!

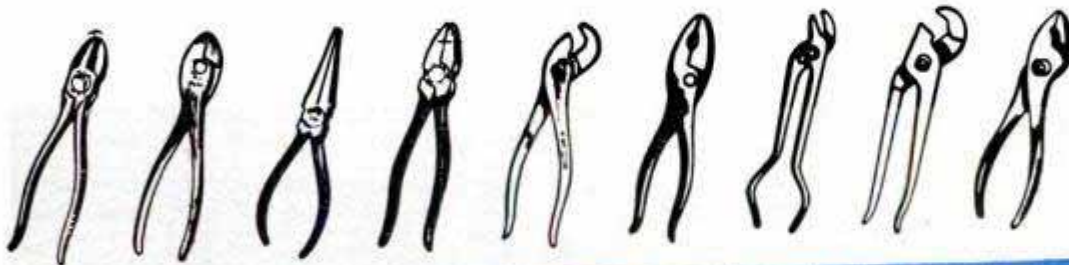


Wherever
PLIERS ARE USED!



When Mom or the kids get in a fixin' mood you can bet they'll do a better job when Channellock pliers are handy. Channellocks are easy to use, simple to adjust and—well, darn good pliers. They are made by Champion DeArment who for nearly 3/4 of a century have been making and selling highest quality tools. The next time you're shopping for tools ask to see Channellock pliers. Heft 'em, use 'em, test 'em—then buy 'em. On almost every job requiring tools, you'll find a use for Channellock. And remember, Only Champion DeArment makes Channellock. Send for Catalog Today.

CHAMPION DEARMENT TOOL CO., • Meadville, Pa.



Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"



Only CHAMPION DEARMENT...

makes

CHAN NEL LOCK

TRADE MARK REG.

U. S. PATENT OFFICE

on the rail siding there's a steady parade of packed wagons moving up the ramps.

As animals and floats complete each act, they move out of the big top and keep right on moving to the trains. On the midway, the side show is collapsing and grab joints have vanished. By the time the performance has climbed to its brassy finale, the back yard is, once again, just a dark grassy field. Only the big top remains.

At 10:45, to the strains of the 28-piece band, 8000 spectators head for the exits, herded politely but firmly by the ushers. Elephants parade in at their heels and join forces with the tent crew to jerk most of the quarter poles. Six hundred men start tearing out the inside of the big top. Lights wink out. By midnight the tent is a vast ghostly cavern.

There's a quiet but sudden exodus from the big top. Six men stay behind, one beside each of the main poles. The canvas boss mutters "let 'er go" and the men loosen the tent at its peaks. It settles gradually, like a parachute. The six men have 45 seconds to reach the edge, but each carries a razor-sharp knife in case he should fall beneath the smothering folds. About 600 men rush in from every side, trampling the air out of the canvas and unlacing the 16 sections. Within 10 minutes the biggest canvas roof in the world has been torn apart

completely and rolled into neat bundles.

Whitey Versteeg has reeled up his cables with his line-winder by now, and most of the gear is packed aboard the trains. There's one floodlighted generator at the rail siding. In the midnight silence its big lights wink out. A cat wheels up and tows the generator up the ramps.

Somewhere in the distance a switch engine sounds a lonesome whistle. The train creaks and groans into motion.

Aboard *The Flying Squadron*, Lloyd Morgan nurses his midnight cup of coffee, wondering whether it will rain, as forecast. There's not much grass on the lot in the next town. Tomorrow may be a "soft," a muddy day, but he knows there'll be a sleepy 12-year-old waiting, rain or shine, to hit him for a job.

Paper Made of Glass

All-glass paper has been developed at the National Bureau of Standards and may prove especially valuable as an air filter in gas masks. In making the paper, fine glass fibers are mixed with water and formed into continuous sheets in a papermaking machine. No other raw material is used. The paper has been tested in gas masks and respirators. In the tests, only one smoke particle in 100,000 passed through.

I tried 'em all—
then I **BOUGHT** a **SAVAGE!**

That 'gunsmith' craftsmanship
really sold me!



Extra-
dependable
1.6 h.p.,
4-cycle Briggs
& Stratton
engine.

COMPARE the Savage Yard Chief with *any* other power mower on the market. You'll see instantly what a big difference genuine precision-manufacturing can make. Fine machining to closer tolerances gives you clean cutting and smooth, easy operation. Higher quality materials and extra-rugged construction assure you years

and years of service. Notice the tougher "Sta-Temp" blades. Totally enclosed chain and sprocket. Convenient finger-tip controls. External oil cups. The famous Timken bearings. Big traction-grip tires. It's a mower you'll be proud to own! Write today for free illustrated folder. Savage Arms Corporation, Lawn Mower Division, 99 Broadway, Chicopee Falls, Mass.



SAVAGE

21-INCH Yard Chief

SAVAGE Makes a Complete Line of Lawn Mowers for the Home. Ask your dealer to help you select the Savage hand or power mower best suited to your needs.

TRUE SAVAGE CRAFTSMANSHIP

Savage lawn mowers are produced with the same care and skill that have made Savage rifles and shot-guns world-famous.





Hose it —

MARFAK stays put, won't drip off!

★ This Hose Test is convincing proof of why *Marfak* lubrication lasts longer — does a *better* job of protecting your car's chassis. *Marfak* is specially compounded to withstand the "washing action" of rain, road water. That's mighty important this time of year. And bulldog-tough *Marfak* clings to points of wear and friction, resists jar-out, squeeze-out. As a result, *Marfak* lasts for 1,000 miles or more. And you enjoy "cushiony" driving that lasts! Get *Marfak* lubrication today. See your Texaco Dealer, *the best friend your car ever had.*



THE TEXAS COMPANY
TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on TV every Tuesday night. See newspaper for time and station.

SELF-CONTROL STARTS HERE



and to restore CAR PERFORMANCE OIL-CONTROL STARTS HERE

To stop oil-pumping, replace worn engine connecting rod bearings

Worn engine bearings trap you between poor engine performance and high operating costs.

When main and connecting rod bearings are worn, your performance goes up in smoke! Worn bearings let excess oil reach combustion chambers, where it burns to performance-stealing carbon on pistons, rings, valves and spark plugs. Even new piston rings can't cope with these excessive amounts of oil for long. Give new rings a chance—check for worn engine bearings, too. Replace with Genuine Federal-Mogul Bearings, engineered for the job of oil-control. Ask your mechanic!

FEDERAL-MOGUL SERVICE
(Division of Federal-Mogul Corporation)
DETROIT 13, MICHIGAN



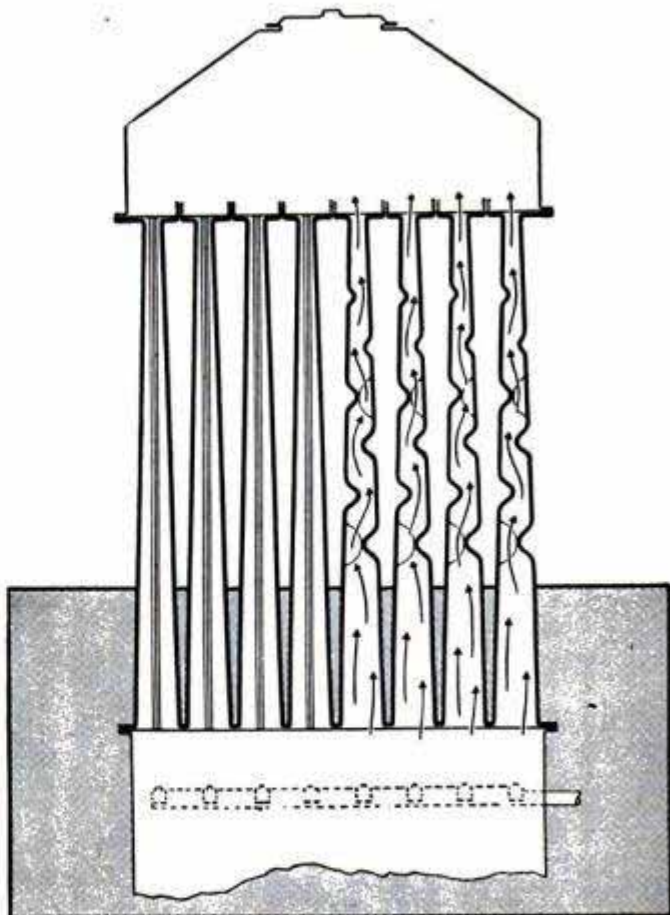
CONTROL OIL-PUMPING

WHERE IT STARTS—REPLACE WITH

FEDERAL-MOGUL

OIL CONTROL

BEARINGS



Wedge-Shaped Furnace Flues Increase Efficiency

Located directly over the burners, a series of wedge-shaped tubes forms the heart of a new gas furnace. As hot gases rise, they follow a winding path around indentations in the flue side walls, producing a "scrubbing" action which results in low fuel costs and long furnace life. Electric welding assures gastight operation of the furnace. The absence of baffles eliminates trouble from condensation. A large rectangular cleanout plate provides easy access to the interior of all flues.

Automatic Weather Stations

To find out how much rain is falling 60 miles down the valley from California's Shasta Dam, a Bureau of Reclamation man simply dials a number and an automatic weather station radios in a report. Six automatic rain-gauge transmitters are being spotted at critical points in the 4600-square-mile watershed south of Shasta Dam so reclamation engineers can prevent floods along the Sacramento River. When the transmitters report heavy rainfall, the flow of water from Shasta Dam is reduced at the proper time to provide channel space in the river for the rainwater. The rainfall readings are flashed on a screen at the Shasta power plant, where the flow of water into the river is controlled.



There's a **CRESTOLOY** **PLIER** for **EVERY** JOB

Here's Buster again . . . busting his thumb. The pliers he's using are good pliers but they're not made for heavy cutting. Perhaps he has learned a lesson and will send for a copy of "How to Use Hand Tools." His best bet however, is to look at the Crescent display board at his Hardware Dealer's. There he will quickly discover that the right tool for this job is a **CRESTOLOY** No. 2150 Lineman's Plier. It's light-weight but stronger, streamlined with hand-honed cutting edges. Ask for **CRESTOLOY TOOLS** at your hardware dealer.



**HOW TO USE
HAND TOOLS**



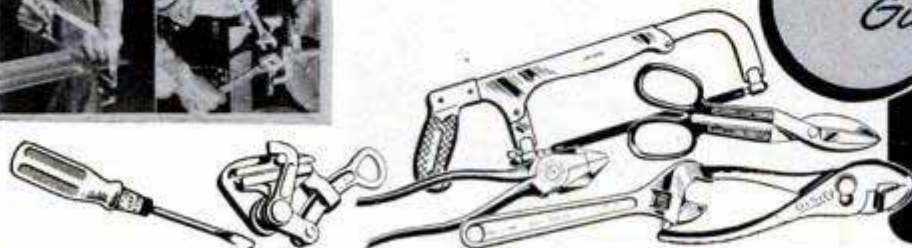
◀ **FREE BOOK!**

Has all the answers. It tells what tools to use and how to use them. Fully illustrated. A postcard will bring it to you. Send today.

CRESCENT TOOLS

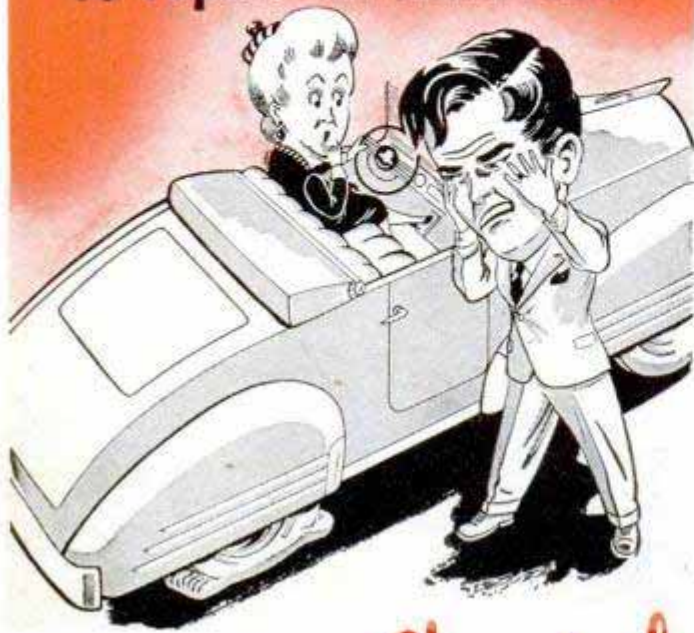
Give Wings to Work

*Sign of the Artisan
Symbol of Excellence*



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by **CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK**

There is **ONE**
SURE, SAFE Way
 to repair an innertube



BOWES Chemical **PROCESS** **TUBE REPAIR METHOD**

● There are other methods of tube repair . . . the "cold patch" . . . the "vulcanized patch" . . . and . . . in most cases they work—but

**If You Want the ONE SAFE,
 SURE METHOD . . . Drive In
 Where You See BOWES
 This Emblem . . .**



● When you go to a station that displays the BOWES emblem, you are assured of *Sure, Safe* Tube repairs by the BOWES Chemical Process tube repair method.

Don't take chances . . . look for the BOWES emblem and be **SURE** of **SAFE** tire repairs.

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, IND.

The Richest Hole in the Mountain

(Continued from page 69)

To supply electricity for the mine, the Idaho Power Company had to string about \$1,000,000 worth of new lines across 99 miles of the mountain country from Montana. Linemen call a trail carved near the mine the "Burma Road." Under compression and with all brakes set, power wagons can go down, but only a mechanical "cat" can climb it.

A span of wire stretching across Panther Creek Canyon is almost a mile long—one of the longest spans in the world. Each strand of wire, 5/8-inch copperweld, had to have a special steel core so that it would withstand the weight and tension of the big jump across the canyon.

Improved telephone lines—and service—are on the way, but the mine is now on a 15-party line and officials must compete with lonesome wives of ranchers in the remote area for talking opportunities. The other day an important call from New York to the mine got tangled up with a conversation to the effect that "Uncle John's wife forgot to wash the milk cans, and he swore at her. . . ."

Deep snow comes early to Blackbird Canyon (elevation 6850 feet at the mine) and stays late. But snow didn't stop construction. Last winter, during building of the ore mill, men were kept busy with shovels and brooms merely finding pieces of steel delivered before the snow fell.

"The men wore two pairs of gloves," recalled Douglas, "but even three are pretty ineffective when you're handling steel in freezing weather."

Three winters ago the really big snow came. For 10 days, some 40 construction workers were marooned at the mine. The eight-mile stretch of road to the town of Cobalt was blocked as thoroughly as a blasted tunnel. All food, except beans, ran low. Arrangements were made to drop other assorted foods from the air when the mineworkers were cheered by the sight of a snowplow bucking up the canyon. They wouldn't touch beans for weeks.

But always the work at the mine went on. That is, except for last summer. Fire struck in the surrounding timber. All the men at the mine were called out to help fight it. Bulldozers, big cats, too. 'Round the clock for seven days.

Calera has now pushed the Blackbird's main tunnel 6400 feet back into the mountain. There are more than 20,000 feet of underground workings. About 28,000 feet of diamond-drilling has been accomplished.

Although demand for the mine's product

(Continued to page 234)

COMPARE FEATURES! QUALITY! PRICE!



\$46⁹⁵ Cash

Bench Saw with blade, miter gauge, rip fence, machine pulley.

ONLY \$5.00 DOWN

COMPLETE OUTFIT AS SHOWN

\$110⁰⁰ Cash Complete Bench Saw with motor, motor pulley, two side table extensions, power tool bench, tool light, and Powr Panl.

ONLY \$11.00 DOWN ON EASY TERMS

SEARS
ROEBUCK AND CO.



Table stays level, work lies flat for all cuts
Double-row precision ball bearings; need no oil
Floating motor mount keeps proper belt tension

DUNLAP 8-inch ball-bearing TILTING ARBOR Bench Saw

REG. U.S. PAT. OFF.

We've made many comparisons . . . and we know of NO other bench saw of this size and type that equals it in quality, features and performance at this low price. It's one of the best power tool values we've offered . . . ever! And you can have it in your shop for only \$5.00 down on Sears Easy Terms.

—Tilting arbor lets you cut to any angle up to 45 degrees . . . while the work itself stays level. You can work faster, easier, and more accurately.

—Floating-drive motor mount supports motor behind saw . . . smotherers vibration . . . permits easier tilting . . . keeps proper belt tension. You can remove motor and use it with other power tools.

—Super-lubricated sealed precision ball bearings have larger oil chambers than are usually used . . . NEVER need further lubrication. NEVER get out of line. (They form integral unit with arbor shaft.)

—Improved fence design accurately squares fence directly against front of table. Can be used on either side of blade. Easily removed.

—17x14-inch table of cast semi-steel; top and sides machined. ONE lever locks fence at BOTH front and back! 8-in. combination blade (½-in. bore) gives up to 2¼-in. depth of cut. (Use at least ½-H.P. motor; 3450 R.P.M. with 2½-in. pulley, 40-in. belt; or 1750 R.P.M. with 5-in. pulley, 44-in. belt.)

—Complete Outfit (as shown) includes CRAFTSMAN ½-H.P. 3450 R.P.M. ball-bearing capacitor motor (110-120 volt, 60-cycle A.C.); 2½-inch motor pulley; 2 grid-type side table extensions; 40-inch belt; adjustable steel power tool bench; tool light; and Powr-Panl (remote control for light, motor, etc.)

—Convince yourself! See this great DUNLAP saw value TODAY at your nearest Sears Retail Store.

These Accessories make your saw much more useful

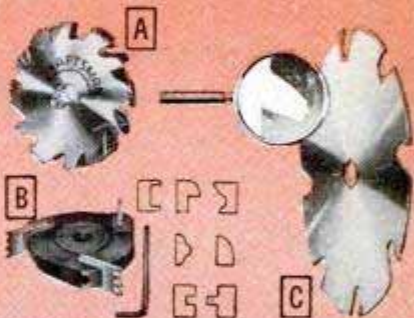
A CRAFTSMAN 6-in. Dado Set. Dadoes, rabbets, grooves, etc., with ½ or ⅝-in. arbor bench saws. Set. . . . **\$9.50**

B CRAFTSMAN Molding Cutter Head. Fits most bench saws with ½ or ⅝-in. arbors. 4-in. diameter. With Allen wrench. . . . **\$4.50**

Cutter Bits for above molding cutter head. 1-in. wide bits cut and styles as shown. Per set. . . . **\$2.95** up

Your nearest Sears Retail Store will furnish you with exact selling prices which will not exceed O.P.S. ceiling prices.

C CRAFTSMAN 8-tooth Carbide-tipped Saw Blade. Costs you MUCH LESS than other carbide-tipped blades! Lasts 20 times longer than ordinary blades. Safer—8-tooth design eliminates kickback. Teeth project only .020 in. above non-cutting edge. Rips, crosscuts, miters, 5½ to 10-in. diams. . . . **\$10.85** up



CRAFTSMAN and **DUNLAP** Tools by **SEARS, ROEBUCK and CO.**
Famous for fine quality . . . precision performance . . . low price!

is "hot," the mine itself is cool. Average temperature is 48 degrees. And no pumping of water is necessary. All of which make for pleasant working conditions.

The ore is milled on the spot in a huge new plant. A refinery being rushed to completion near Salt Lake City will handle the concentrates shipped from the mill.

There were dark days before scientists obtained satisfactory concentrates. Floatability of the mine's cobalt is so nearly the same as that of its pyrite and pyrrhotite (iron sulphide), it did not seem possible at first to accomplish a separation of these minerals by standard flotation methods. A combination of roasting and floating was devised, but the combination raised the cost of operation, so research was continued.

Finally, in the spring of 1949, a company metallurgist working in the mine laboratory came up with the right treatment. The mine's ore yields twice as much copper as cobalt, but the cobalt is worth 10 times as much as the copper. There is also some gold, but no one seems the least excited about that.

Even in these days of labor shortages, Calera has had little trouble getting workers. The hunting and fishing in the area are a major inducement. There's no limit on the mountain scenery.

The new town of Cobalt is being planned

for comfortable pleasant living — not just living. The company-built homes are attractive, white bungalows, gay with green trim. Many miners are erecting their own homes under a self-help program. Employees are advanced up to \$2500 for the purchase of building materials and, when necessary, for skilled labor.

Already the town has a modern grade school, a clinic with two registered nurses in attendance, a volunteer fire department, Parent Teachers Association, Rod and Gun Club, Ski Club. Cobalt, as of July 1, 1951, replaced the "town" of Forney, which was really just a name on the map and a ranch house where the scattered residents of the area came to get their mail.

Residents of the new town, with all its modern touches from movies to home freezers, are still well aware that they are living on one of the nation's last frontiers.

Sawdust Useful as Mulch, But Nitrogen Must Be Added

Homeowners and gardeners may find sawdust and other wood wastes useful for mulching or soil improvement, say U. S. Department of Agriculture soil scientists. Addition of supplemental nitrogen will be necessary, however, to overcome the nitrogen-depleting effect of the sawdust.

DO IT TODAY! SWITCH TO

MILD

KENTUCKY CLUB

Notice how much better your pipe tastes—how much fresher your mouth feels when you switch to Kentucky Club.

Look for the blue tin with the picture of the red-coated rider. Send for free catalog showing fine pipes and how to get them at big savings. Mail Pouch Tobacco Co., Wheeling, West Va. Dept. 92



"Look! Another man switched to Kentucky Club—the thoroughbred of pipe tobaccos."



GET SET
for Summer!

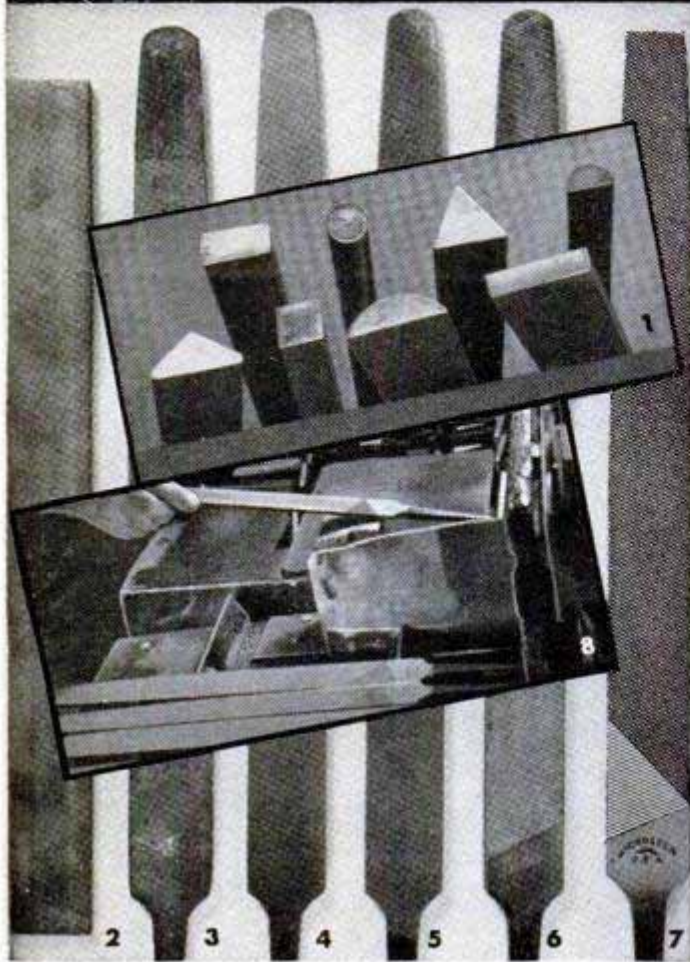
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How a quality file is born



NICHOLSON file quality begins with steels (1) made to carefully determined specifications. . . . File blanks (2) are machine-forged to uniform shape (3). . . . For teeth cutting, blanks are annealed by precisely controlled heating and cooling (4). . . . Blanks are then straightened, ground to remove scale, precision-smoothed to assure teeth of even height and sharpness (5). . . . Teeth are cut by Nicholson-designed machines renowned for their accuracy (6). . . . A scientific process gives the teeth exactly the right uniform hardness—after which files are cleaned, further sharpened, tang-softened to prevent breakage, and oiled to prevent rust (7).

Every step of manufacture is checked. Furthermore, the finished files are given a series of final tests by trained inspectors (8)—after which these world leaders in quality files are ready for you to enjoy using. At hardware dealers everywhere.

FREE BOOK, "FILE FILOSOPHY," tells lots more. Write.



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NICHOLSON

A FILE FOR EVERY PURPOSE

Feathered Racers on the Beam

(Continued from page 121)

the fourth year. They often live 18 to 20 years.

The homing instinct of this feathered fraternity has ever been a mystery to man. A new owner must start with birds too young to fly or breeders which he keeps penned. Attempts to settle older birds in new homes have never been marked with success. The D'Angelos purchased a homer from a loft in Cuba and kept him for four years. One day he disappeared and two weeks later a letter arrived announcing that the bird, for which they had paid 175 pesos, was back home. Another bird, Big Red, whose home loft was in Hempstead, N. J., was conscripted by the Army and sent to Fort Crowder, Mo., where he was used for training younger birds. After serving faithfully for three years he went AWOL and turned up three days later back in Hempstead, 1600 miles away.

There has been a marked increase of interest in pigeon racing during the past few years. City dwellers especially have found that the small space required and the ease of feeding and raising make them an ideal hobby. They are clean and quiet enough not to disturb neighbors. A few yards of chicken wire covering a shallow shed built on the side of the garage, a sand floor and not much else are needed. Birds may be obtained from any fancier. Prices for breeders range from nothing to \$1000 per bird for championship stock depending on the purchaser, his position and intent. Many youngsters have started at no greater cost than lending a helping hand now and then to some near-by breeder. Young Johnny Perkins made a habit of dropping over to the D'Angelo house and helping clean out the cages. Tony made him a present of a pair of birds and now Johnny has a string of 45.

Pigeon hobbyists rave about the excitement of the sport. It has another characteristic that can't be denied: There is no other hobby that will stick to you like homing pigeons. They're like boomerangs. You can't throw them away!

Acid-Immune Metals

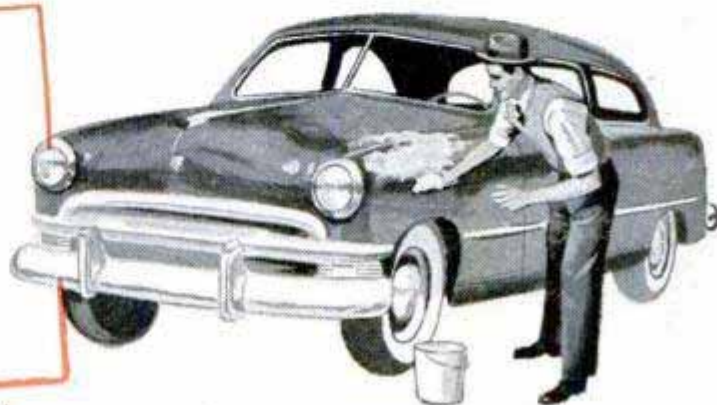
Immunity to sulphuric-acid damage is claimed for two new metals. Ferrolum is made by bonding lead and steel to combine lead's immunity to sulphuric acid with steel's strength. Copper's high electric conductivity and heat-transfer value are added to lead's acid resistance to form the other new metal, Cupralum.

Now... an easy way to wash your car

DU PONT CAR WASH

Floats away grime... saves you time

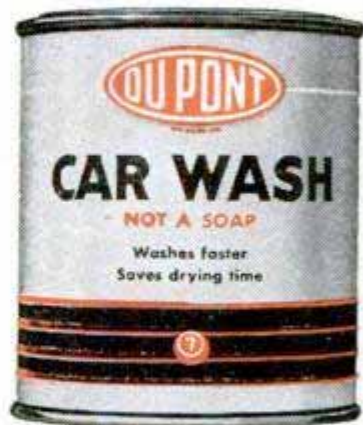
**JUST
SPONGE
IT ON**



**THEN
RINSE
IT OFF**
(AND LET IT DRAIN)

It's a wonderful new detergent... gets your car spotlessly clean

You'll never know how fast and easy it is to wash a car until you've used remarkable new **Du Pont Car Wash**. Just a tablespoonful in a pail of water produces a bucketful of fluffy foam. Then this ideal solution goes to work... makes the most stubborn dirt, grease and oil disappear in a wink. Simply rinse it away, let it drain, and your car will dry—with no streaks or spots! Next time, let Du Pont Car Wash make the job a cinch for you.



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pay MORE!

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NOW ONLY \$44.¹⁵

Model R, as shown with f/4.5 lens
Model S, with f/3.5 lens \$49.05
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Prices Subject to Change.

The only range finder
"35" under \$50! Models R and S

The all-metal CIRO 35 . . . America's finest dollar-for-dollar value in candid cameras! Though packed with features to delight the experienced fan . . . it's as easy to use as an ordinary box camera. Coupled range finder helps prevent out of focus shots . . . and the CIRO 35 is the only camera under \$50.00 that boasts this wonderful aid! All models have coated lens; built-in flash synchronization; film counter; and scale focusing. See them at your Graflex dealer's!

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Vacuum-operated wipers stall when engine vacuum is cut on long climbs. Electric wipers are the answer

There's a Knack to Mountain Driving

(Continued from page 146)

to low, stamp hard on the accelerator. Shift immediately, then let up on the accelerator gradually. With fluid drive this procedure will step up engine revolutions to match the effect of the lower ratio.

Since most drivers will take a lot of downgrades in high gear regardless, they should know the tricks of better braking. As a General Motors engineer put it to me, a brake is simply a device for converting momentum energy into heat. And this heat can be a murderer. The expression "burned out brakes" is often heard after a runaway wreck in the mountains. With modern hydraulic brake systems it is usually a misnomer.

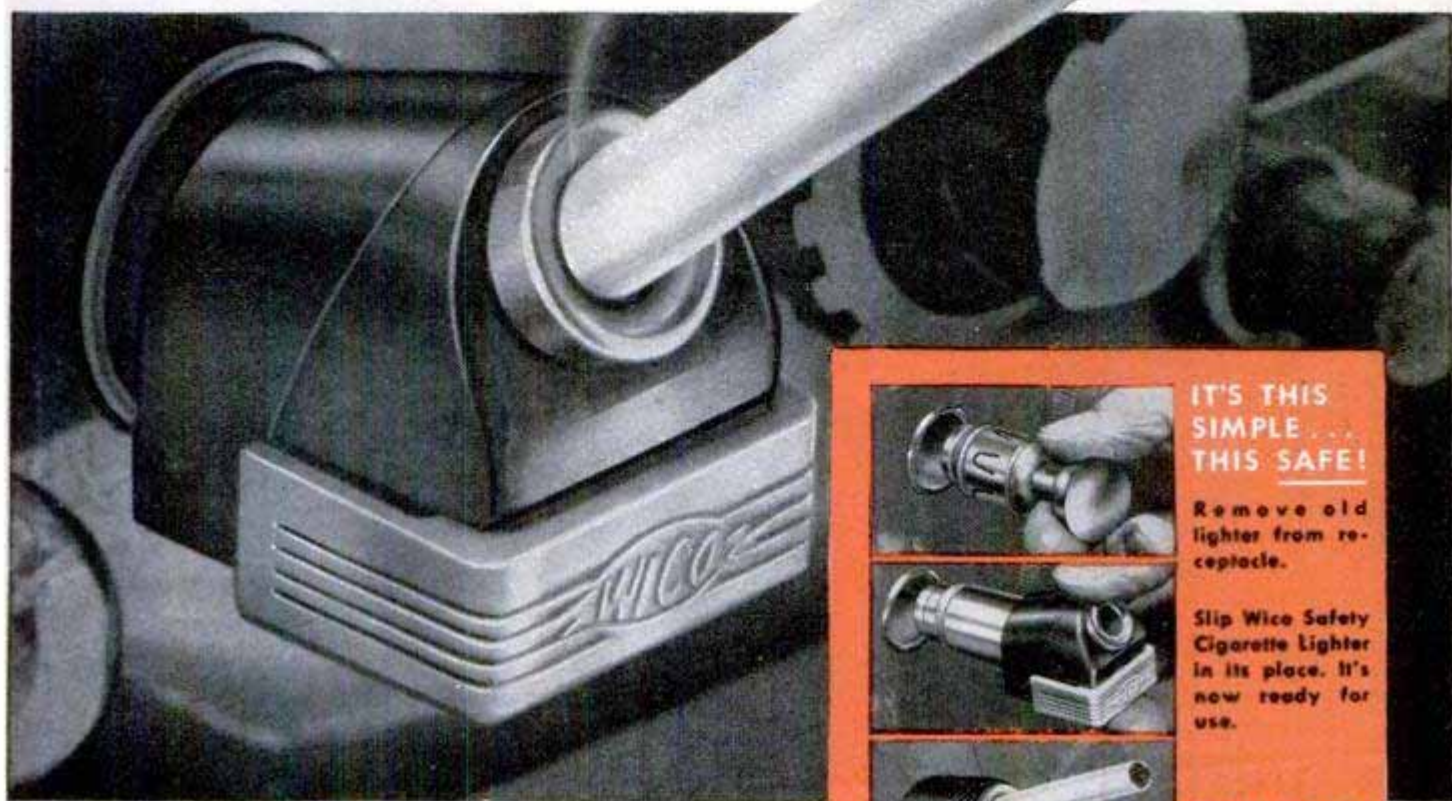
What happens more often when a driver "rides" his brakes down a long grade is that the heat from the brake drums actually boils the hydraulic-brake fluid in the wheel cylinders. Since the gas bubbles thus caused are compressible, the brake pedal may hit the floor board without taking hold. Even pumping the brakes may not help. Thus, on long descents it is much better to make a series of brake applications, allowing a time interval after each application for the heat to dissipate. If the brakes still get mushy with severe use, stop for a few minutes and let the system cool off.

It scarcely need be added that no car should be taken on a highway trip without having the brakes correctly adjusted to allow adequate reserve pedal travel.

Of course, before you can come down a mountain you have to go up it. Two typical

(Continued to page 240)

This automobile lighter could save your life!



TAKE your eyes off the road for a split second and *anything* can happen!

Yes, tragedy can take the wheel in *the four seconds it requires to light a cigarette*. Play it safe with the new Wico Safety Cigarette Lighter!

No need to take your eyes off the road ever! It lights your cigarette and takes the first few puffs.

The Wico fits into the present lighter receptacle of your car. No installation or new wiring needed.

ONLY \$2.95 at auto dealers, accessory stores, gift shops, department stores, and gas stations. Or you can use the coupon to order direct from the factory. Get yours *today!*



WICO ELECTRIC CO.
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Producers of specialized fine ignition equipment for more than 50 years.



IT'S THIS SIMPLE... THIS SAFE!

Remove old lighter from receptacle.



Slip Wico Safety Cigarette Lighter in its place. It's now ready for use.



Place cigarette firmly in the lighter.



Push plunger in for a moment pump once or twice.



Remove lighted cigarette and enjoy your smoke in safety!

WICO ELECTRIC COMPANY
WEST SPRINGFIELD, MASS.

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Enclosed is my check (or money order) for \$2.95. Please ship immediately Wico Automobile Safety Lighter for car _____ (Make)

(Year)

Name _____

Address _____

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ORIGINAL AND STILL FIRST

1927



1952

It was back in 1927 when AC first offered to automotive engineers an improved method of supplying gasoline to the carburetor — AC Fuel Pumps.

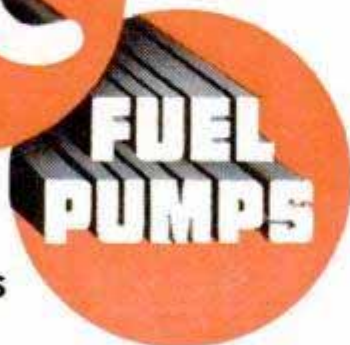
They were so sound in design, so reliable in service, that they were adopted as the industry's standard.

More than 100,000,000 have since been built. Over 40,000,000 are in daily use.

This 25 years of leadership is evidence of the superior quality of AC Fuel Pumps — proof that there are none better.



AMERICA'S
FIRST AND
FINEST



ORIGINAL
EQUIPMENT ON
9 OUT OF 10 CARS
ON THE ROAD



AC SPARK PLUG DIVISION GENERAL MOTORS CORPORATION

upgrade problems, fuel-pump vapor lock and radiator boiling, are also met with on the deserts which lie across many of the routes to our Western playgrounds.

In both instances heat is once more the enemy, this time from the engine. Typically, vapor lock in the mountains occurs after you have climbed a steep grade at low speeds and then stop to admire a view. When the car is cranked again, it either fails to start or acts as if it were out of gas.

Automotive engineers call this business of turning off a hot engine and letting it stand the "soak" test. They mean by this that carburetors and fuel pumps soak up heat from the engine block. The air under the hood may reach a temperature of 135 degrees F. after you stop on a hot day.

This is enough to vaporize some of the gasoline in your fuel pump or fuel lines. In the mountains this happens at a lower temperature because of the lower atmospheric pressure at high altitudes. Then a weak fuel pump cannot get a grip on the frothing stuff in the line and you're stuck.

The basic cure for this trouble lies in the hands of the auto engineers. They should locate fuel pumps in a cooling air stream and shield the gas lines. About all a car owner can do when caught with a vapor lock is to wait for the gasoline to cool off, helping it a little perhaps by pouring cold water over the fuel pump.

Occasionally at high altitudes another type of fuel-vaporization trouble occurs on hot days, usually while the engine is idling. The gas in the carburetor may boil and the resulting pressure forces extra fuel into the intake manifold. This trouble, called percolation, causes the engine to kill as though it were being choked. Best cure is to hold the accelerator to the floor while cranking the starter.

If you plan to drive your car consistently at high altitudes, it will pay to get smaller jets for your carburetor. These proportion the gas more properly to match the decreased oxygen in the air.

Overheated radiators as you climb a mountain or cross the desert can be avoided by forethought. Before starting a trip make sure your radiator isn't clogged, and that the fan belt is properly adjusted. With the car in good shape, boiling on a grade occurs chiefly from "lugging" the engine; that is, forcing it to pull grades in too high a gear. On the desert, cars sometimes heat up when you travel directly with the wind.

If the radiator does boil, use great caution in removing the cap to add water. Most modern cars are equipped with a pressure-type radiator cap which permits steam pressure to build up quite a head before the cap

(Continued to page 242)

You CAN Take It With You!

BECKER *Self-Contained* SPRAY GUN

NOTHING ELSE TO BUY

TAKE IT ANYWHERE—the first completely portable spray gun. Needs no compressor, motor, or electrical outlet. Pressure-powered with an inexpensive CO2 cartridge that sprays up to 21 liquid ounces, depending on viscosity. Extra cartridges, 10 for \$1, postpaid, or buy from your dealer.

PAINTS • VARNISHES • ENAMELS
MOTH-PROOFS • INSECTICIDES

Every home needs a Becker Spray Gun for dozens of jobs in the house, workshop, garden or garage. Complete instructions furnished for effective results. Order yours today for the season ahead.

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There's an AC Aluvac Element to fit most every type of filter on any make of car.

AC SPARK PLUG DIVISION  GENERAL MOTORS CORPORATION

DRIVING COMFORT at its best! The New *Electric Throttle* With Foot Control

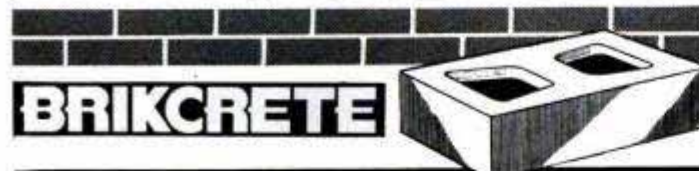
The Electric Throttle ("Speed-selector") sets whatever speed you choose electrically — releases instantly at a touch on the toe-button, or by applying foot brake. Banish foot and back strain for good! Install it yourself. Price, \$17.50 F.O.B. Check or C.O.D. Salesmen, Dealer and Manufacturer agent inquiries welcome. Give car, make, and year.

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BUILD FINE GRANDFATHER CLOCK NOW
The simple sensible Red-i-Kut way as thousands have — **SAVE HALF. SHOP TESTED PLANS "SPIRIT OF THE CENTURY"** Narrow waist 83" tall or stately straight side **"SPIRIT OF AMERICA."** **EASY-TO-FOLLOW** *photomark* plans tell all—plus **BROCHURE** of heavy brass weight Westminster, tube chime, movements, *gorgeous* dials, 3/4" solid mahogany case kits. Send \$1.00 today — Both plans \$1.50 NOW.
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Brikrete manufacturers operate compact, self-contained plants under franchise privileges in protected territories. Each is an independently owned unit in a country-wide chain, using local materials and local labor to supply the world's most modern masonry for local building needs.

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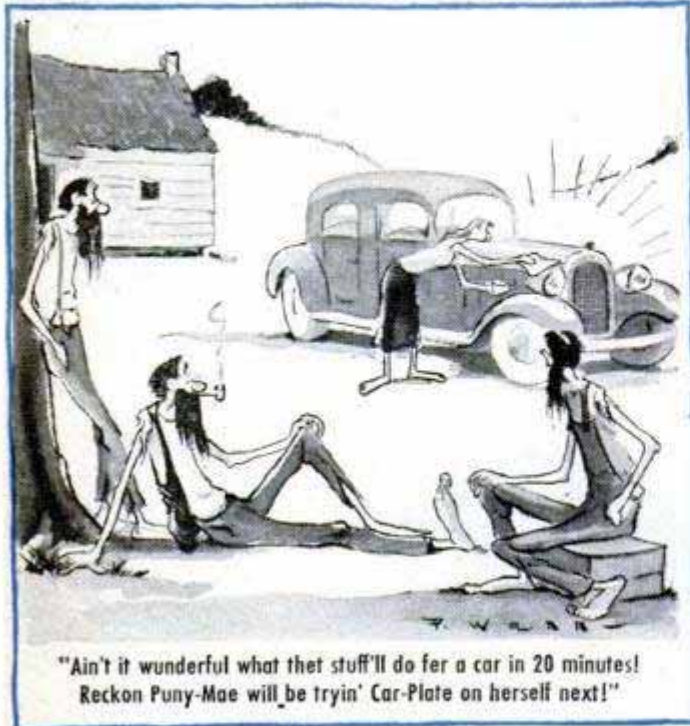
Brikrete offers much to men looking for a community enterprise on a nominal investment. We supply complete equipment; easy terms when desired. Liberal cooperation. Write today for Brikrete Book No. 2—while territory is still open.

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Yep...sure is easy
to give your car long-lasting wax protection!



Johnson's Car-Plate
Waxes any car in 20 minutes!



Spread it on—no rubbing—let it dry!
Wipe it off—no rubbing—that's all!

Johnson's Car-Plate is the no-rubbing auto wax described in Reader's Digest. It gives a brighter, longer lasting shine than even hard-rub professional wax jobs costing \$15 or more! Don't delay. Wax your car the easy way. Pick up a can of Johnson's Car-Plate today.



Clean first with Johnson's CARNU

The easy way to prepare the finish on your car for a Car-Plate waxing is to clean it super-clean with Johnson's Carnu. For exceptionally dirty cars, ask your dealer for Johnson's Heavy-Duty Cleaner.

Protect your car's chrome trim. Clean with Johnson's Chrome Cleaner—protect with Johnson's Car-Plate.

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opens, allowing steam to escape with a rush.

Sudden changes in the weather in both mountains and desert should be anticipated. Fogs close in quickly in mountain passes. Either early or late in the season, snow may fall without warning. If you're planning such an off-season trip, carry a set of chains in the trunk.

When pulling up a heavy grade during a rainstorm you may find that vacuum-operated windshield wipers falter and stop as you bear down on the gas. If so, you can keep the windshield clear by releasing the accelerator at intervals. Cars with electric wipers won't encounter this difficulty.

On the desert, cloudbursts strike unexpectedly. Do not camp in a drywash or attempt to cross one in which there is any amount of water flowing during bad weather. To cool the car interior some drivers carry a chunk of Dry Ice. Since that leads to rolling up the windows, confining the fumes given off by the Dry Ice, safety authorities strongly advise against it. Use a pan of ordinary ice. Then, too, you can buy or make (see *Popular Mechanics*, May 1949, page 221) your own evaporation cooler to fit on a window. One of these will reduce the temperature of the dry desert air 10 to 20 degrees. You can also obtain a device which is a sort of secondary radiator to aid in cooling the engine.

But, as American Automobile Association touring advisers in the West emphatically told me, the modern car needs no special equipment on the main-traveled highways in either desert or mountains. However, one of them also told me that he never crosses the Great Salt Lake Desert without carrying one gallon of water—in canteen, Thermos or water bag, and a spare fan belt. Always check your spare tire too, he added, which is good advice on a highway trip just about anywhere.

see
} p. 142

Planet Bumped Moon Long Ago

Some 100,000 years ago, a minor planet about 125 miles in diameter collided with the moon and exploded. Big chunks of matter, thrown violently in all directions, ripped long grooves in the lunar landscape. According to Dr. Harold C. Urey, Nobel prize winner of the University of Chicago, this collision produced Mare Imbrium, the best known of the "seas" of the moon. Actually, these flat formations are not seas at all but vast dry plains. Doctor Urey believes that the collision occurred in the last days of the moon's formation.

☐ Lubrication oil synthesized from natural gas is being tested in 57 cities, and may solve many lubrication problems.

THIS ONE-TWO PUNCH

adds power—pep—miles
in auto performance!

- K.O.'s top-cylinder wear
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1 MARVEL INVERSE OILER

Tested and proven through years of scientific research. Now available in one quart model. Visible oil reservoir feeds oil automatically in proportion to engine needs direct to upper cylinder area. Install a Marvel Inverse Oiler for better motor performance, longer engine life . . . more engine-hours per dollar!

2 MARVEL MYSTERY OIL

A specially developed top cylinder oil for today's high compression engines. Ideal for use with hydraulic valves. Contains no ingredients or graphites harmful to engines. All-around lubricating action insures smoother, carefree driving . . . protects and adds years to the life of your car.

*Be engine wise . . .
Marvelize NOW!*

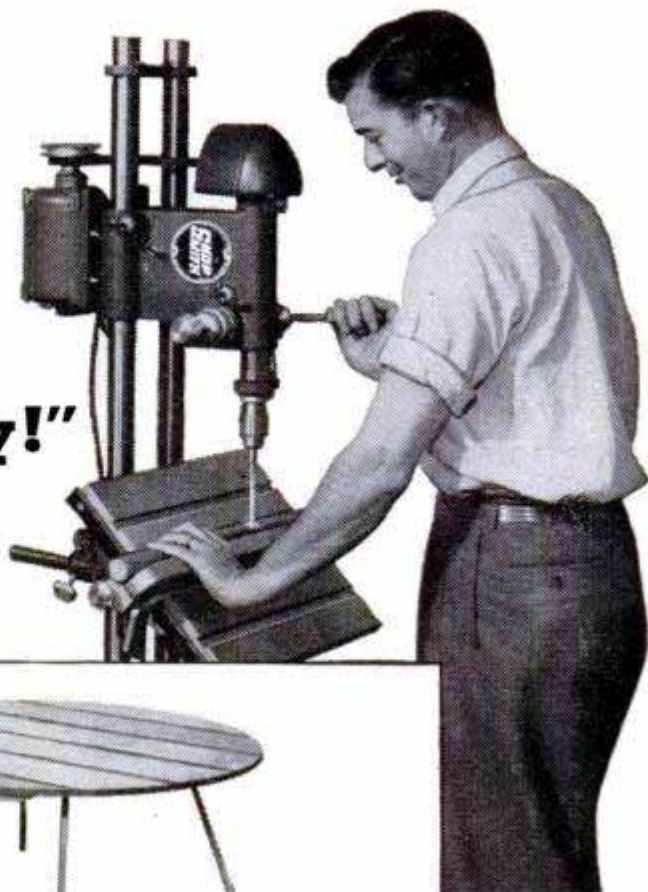


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**"SHOPSMITH makes
the toughest jobs easy!"**



"I'll match SHOPSMITH against any power tool for regular performance. In accuracy, capacity and quality of construction, it ranks with the best of them. And when it comes to difficult or unusual operations, like cutting out a circular table top or drilling into the ends of boards, SHOPSMITH has no equal!

"Take the garden furniture I just made, for example. The frame for the chair is doweled and glued. You can see that tricky angles were involved. With any other drill

press, drilling holes for the dowels would have required complicated jigs. But not with SHOPSMITH. I just set up SHOPSMITH as a horizontal drill, laid the work flat on the table and fed the drill in from the side. Saved myself a couple of hours on that one operation alone.

"All the way through, SHOPSMITH's flexibility made the tough jobs easy. There's hardly a sawing, sanding, drilling or wood-turning job that can't be done faster and better with SHOPSMITH!"

SHOPSMITH is a complete power workshop . . .

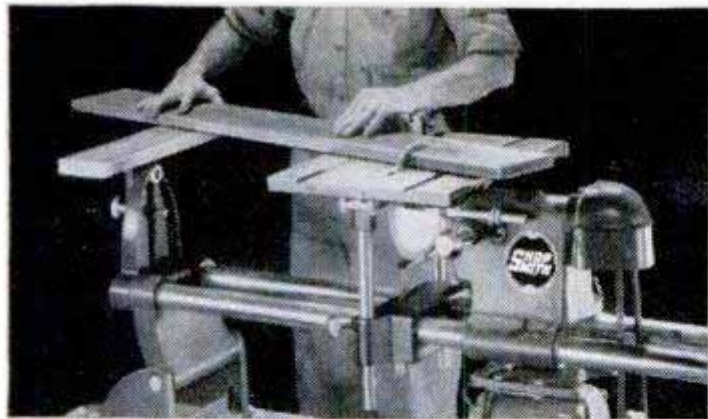
- 8" circular saw • 12" disc sander
- 33" wood lathe • 15" drill press
- Horizontal drill

SHOPSMITH complete **\$189⁵⁰**
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*Special 1/2-hp., capacitor-type,
120-volt, 60-cycle motor. . . . **\$34.50**



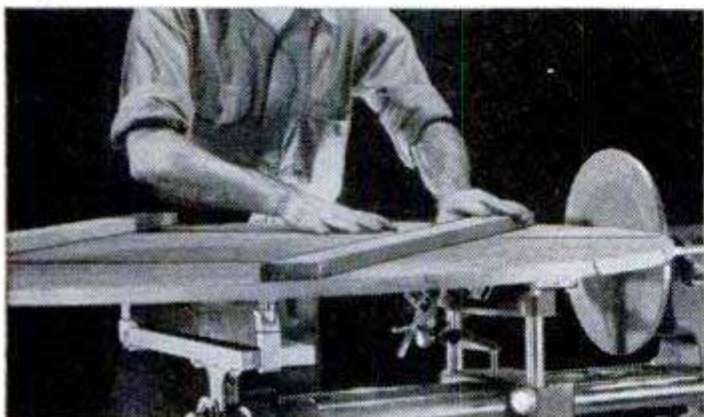
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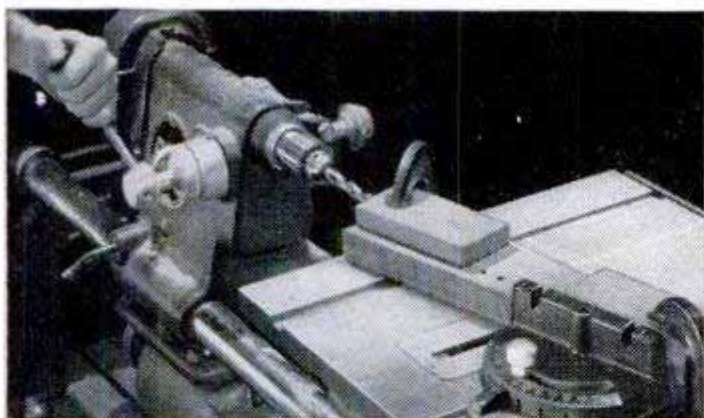
2 "ROUND TABLE TOP was cut with SHOPSMITH jig saw (\$34.95). It was a simple operation. I used the SHOPSMITH lathe center as a pivot and supported it with the table extension and rip fence. With this ready-made jig, the job was a cinch!"



3 "SMOOTH SANDING. It was just as easy to sand the edge of the round table top. Using the same pivot setup, I simply substituted the sanding disc for the jig saw. By rotating top slowly, I got a perfect circle and a beautifully smooth, right-angled edge."



4 "DUPLICATE TURNING. The wheels for the chair were turned together on SHOPSMITH in the lathe position. The things I like about the lathe are its big capacity (15" swing, 33" between centers), its time-saving sliding tool rest and its rugged precision."



5 "END DRILLING. The framing members for the chair were end drilled for dowels the easy way—with SHOPSMITH set up as a horizontal drill. This exclusive SHOPSMITH feature is a real time-saver. More important, every joint fits perfectly!"



6 "ROWS OF HOLES. Here's another case where SHOPSMITH not only saved me time but did a better job. To drill lacing holes in the chair frame, I used SHOPSMITH as a vertical drill and used the rip fence for a guide—an easy, natural way to align holes."

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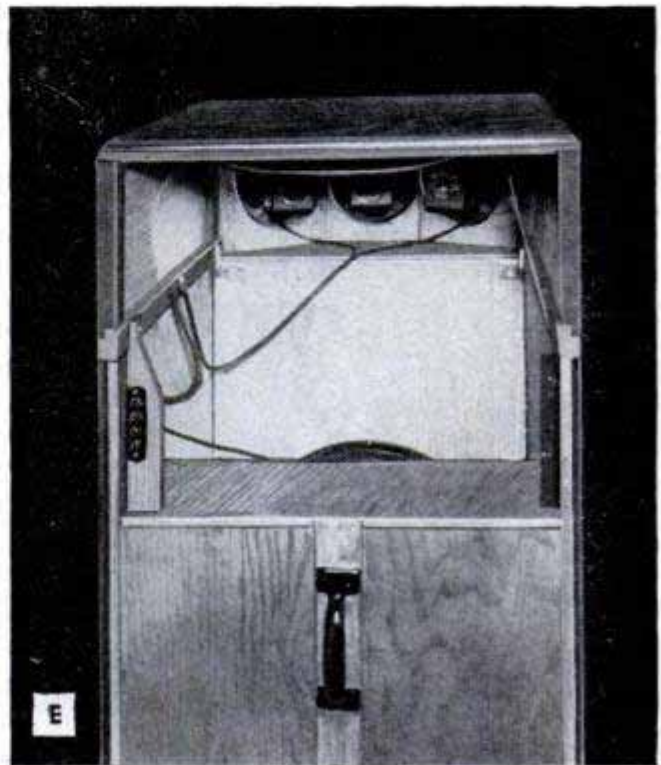
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Two-Way Loudspeaker System With Lifelike Sound Reproduction

(Continued from page 213)

speakers specified is justified. The woofer is a single heavy-duty 12-in. PM speaker, front-loaded with a specially designed resonator and folded to conserve space. Most



of the construction material is ¾-in. plywood. Braces give the stiffness of much heavier material. Wire nails and glue are used to make the joints airtight. Use water-resistant casein glue mixed with very little water. Incidentally, do not place this speaker system in operation until a day after assembly. Use large round-head wood screws to fasten the woofer securely. Lock washers are an added precaution against loosening caused by vibration of the heavy bass response. Note the vertical braces, items 6, 7 and 8, placed centrally between the sides, item 1 in Figs. 1 and 2. Also note the angles on items 15 and 16, the tweeter mounting boards. Some home-workshop saw tables show 0 deg. when the saw is set to cut 90 deg. You should cut a scrap piece and check the angles before making items 15 and 16. Fasten the tweeter assembly to item 2 (see Figs. 1 and 2) with wood screws, using a short-handled screwdriver.

Detailed construction diagrams appear in Figs. 5, 6, 7, 8 and 9. The suggested trim, shown in Fig. 9, is black walnut, but any close-grained hardwood is acceptable. In applying trim, observe that the woofer "mouth" should be a full 4½ x 14½ in., as indicated in Fig. 2. Do not run the trim into

(Continued to page 248)

You can raise 8 Tons



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You don't have to be a circus strong-man, Perma-Jack's slick-working Timken thrust roller bearing makes the job easy. Floors squeaking in your homes, beams sagging?—stop the squeak, stop the sag—bolster them with a Perma-Jack—America's top-quality floor-leveling post with the five exclusive features. Capacity rated at 8 tons, but independent testing laboratories put a stress of 12 tons on Perma-Jack before it showed the first sign of paint cracking.

Here are the five exclusive features that make Perma-Jack best:

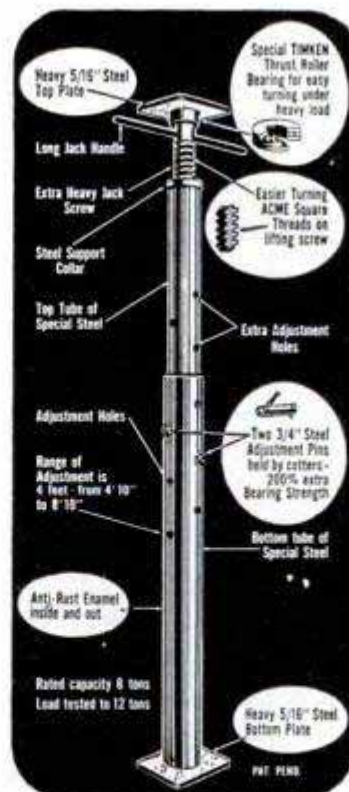
- 1 Easy-Action Timken Roller Bearing
- 2 Easy-Turning Acme Square Screw Threads
- 3 Extra-Heavy Top and Base Plates
- 4 Two Extra-Heavy Support Pins
- 5 Anti-Rust Baked Enamel Finish Inside and Out



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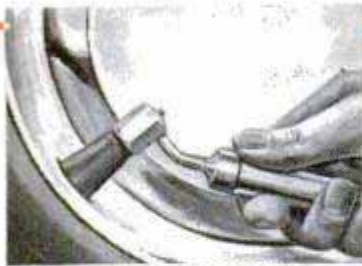


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Check your tires while they are cool. Recommended tire pressure is based on ordinary outdoor temperature . . .

takes into account heat generated in running. For correct pressure—check tires *before* long drives.

Re-gap spark plugs regularly.

No engine performs efficiently if plugs fail to deliver a consistently full, hot spark. Worn plugs may increase gas consumption as much as 10%. Good, economical practice is to check gap every 5,000 miles . . . install new plugs every 10,000.



KEEP SPARK "HOT"



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Check your oil filter this quick and easy way. When the engine is warm—feel the outside of the filter housing. If it's cool, filter is probably clogged . . . can't trap any more abrasives and sludge. Next step is to get in a new

Purolator Micronic* Refill. Purolator's accordion-pleated plastic-impregnated element provides up to 10 times more filtering area . . . removes abrasive particles as tiny as .000039" in diameter from your engine's oil stream. Yet a Purolator* Refill costs as little as \$1.60. Takes just a few minutes to install.

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Check your oil filter every time you change your oil

PurOlator
(ENGINEERED FOR EVERY MAKE OF CAR)
Micronic OIL FILTER



this opening. A good place to install the grille cloth is under the trim. Do not use steel wool for finishing because particles of steel may get into the fields of the PM speakers.

The main idea of the final network, photo B and Figs. 10, 11 and 12, is to get a maximum of low-frequency energy into the woofer. The parts specifications for schematic circuit diagram Fig. 10 are given above on Fig. 8. Enamelled copper wire is preferred for the coil; single cotton-covered is next in preference. Make the coil sides of $\frac{3}{8}$ -in. plywood, 1 in. larger than the coil's outside diameter. The center can be a cardboard tube. A few small brads will hold the tube to the coil sides. Use as little metal as possible near the coil. The coil can be held by two washers and a bolt for winding in either a lathe or hand drill. However, it also can be wound when held in the hand. Wind the wire in layers using tape between the layers, both to hold the turns and to make a neater following layer. The exact number of turns is not critical. The high-note control, Fig. 10, is necessary because of the high efficiency of the tweeters. As you play this assembly for the first time, you will be satisfied with a setting of half or less of the high-note control, R₂. Later, as you become used to high fidelity, you will probably want more of the clear high tones. The woofer can be switched in and out by means of the single-pole double-throw switch, S₁. Potentiometer control of the woofer is not recommended. This network unit is placed near the amplifier and is connected to the speaker system by means of cabled leads Q, QQ and X-ground indicated in Fig. 10. These cabled leads run to a terminal strip on the rear of the enclosure unit, photo E. When wiring circuit Fig. 10, note that only the positive (plus) connections of a dual electrolytic condenser (C₁) are used. Do not use the common negative. If separate electrolytic condensers are used, connect the negative leads together, but to nothing else. Paper condenser C₂ improves the high-frequency response. This network connects directly to the amplifier output; it will work satisfactorily with either the 8 or 16-ohm standard-impedance tap on the audio-amplifier output. The standard impedance of the five-in. tweeter speakers is four ohms. With the three connected in series, phasing is very important, see Fig. 11. Connect them in series for testing with a 1½-volt dry cell and note the motion of each speaker cone; they must all move the same way if they are phased properly. Detailed student material list R-409 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

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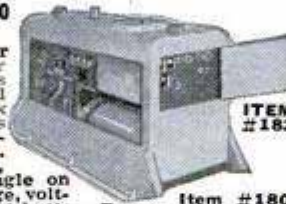
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Item #199—Power Unit PE-99—7.5 KW—120 Volt—Single and 3-Phase—60 Cycle A. C. Master generator driven by a 4 cylinder, V-type, air cooled, Wisconsin engine with magneto ignition, push button start. The self-excited, drip-proof generator is driven from 5 parallel V-belts. Control panel contains engine and generator instruments, including circuit breaker, emergency start-stop buttons, volt meter, ammeter. Complete semi-enclosed unit mounted on steel skid. Weight 1885 lbs. F.O.B. Chicago.... **945.00**

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TYPICAL PERFORMANCE DATA

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
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• 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 1/4" 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**

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These precision engineered D.C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have oversized lifetime grease-sealed ball bearings, air cooled commutator, dial type rheostat for easy point control, a high low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep. 7 1/2 HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V-belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps. 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Shipping weight 107 lbs. \$350.00 Value. Item #65. **119.50**
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How to Keep Fit at 50

(Continued from page 140)

3. A cool bath six days a week and a short, hot bath one day, all followed by vigorous towel rubs.

4. Golf or a long hike once a week.

5. Ultraviolet baths three times weekly.

6. Fewer fried and starchy foods and more fruits, vegetables and proteins.

That wasn't a rigorous schedule. Yet, in six months that man's over-all fat was reduced 28 percent, his abdominal fat 46 percent. His blood-pressure measurements improved 20 to 41 percent. There was only a two-percent drop in weight, indicating the flabbiness had been converted to solid tissue. His back became 10 percent stronger, his legs 7 percent stronger, and his chest expansion increased 4 percent. All this, remember, in a man nearing his sixtieth birthday.

Results like that show what a conscientious older man, working entirely by himself after our initial suggestions, can do to recondition himself. While his distance from death was probably lengthened, equally important is the fact that he'll likely live those remaining years more fully and in better health.

Here are the basic principles of a good fitness program, one that most men can adapt to their own circumstances without much difficulty. It requires neither elaborate conditioning equipment nor any particular athletic proficiency.

1. Exercise for the promotion of blood flow. The illustrations with this article comprise a well-rounded group of exercises, giving all parts of the body rhythmic exercise. In rhythmic actions like walking and swimming, the big muscles in your legs and back push the blood back toward the heart, make your heart stronger and serve to tone up the whole cardiovascular system. Inactivity causes large numbers of capillaries to close up. When rhythmic exercising gets your blood moving again, it causes new capillaries to open and your blood pressures (systolic and diastolic) will lower because the ejected blood encounters less resistance and circulates more freely.

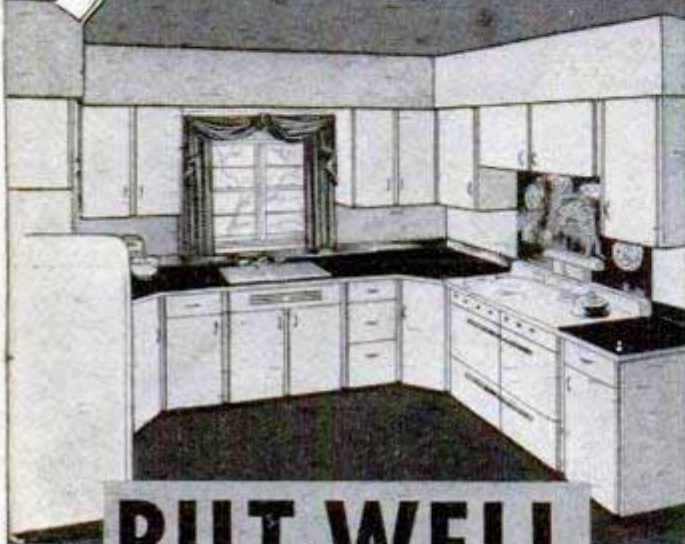
2. Get good doses of natural or artificial sunlight at least three times a week.

3. Bathe, shower and swim regularly in water at 72 degrees or cooler. Hot water brings blood to the skin surfaces, which can hold half of the supply, and draws it away from vital organs like the heart, pancreas and liver, where it is needed.

4. Walk at least two or three miles daily at a brisk pace and swim two or three times a week. These two activities rank among

(Continued to page 252)

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**to assemble your
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for Kitchen or
Storage Walls**



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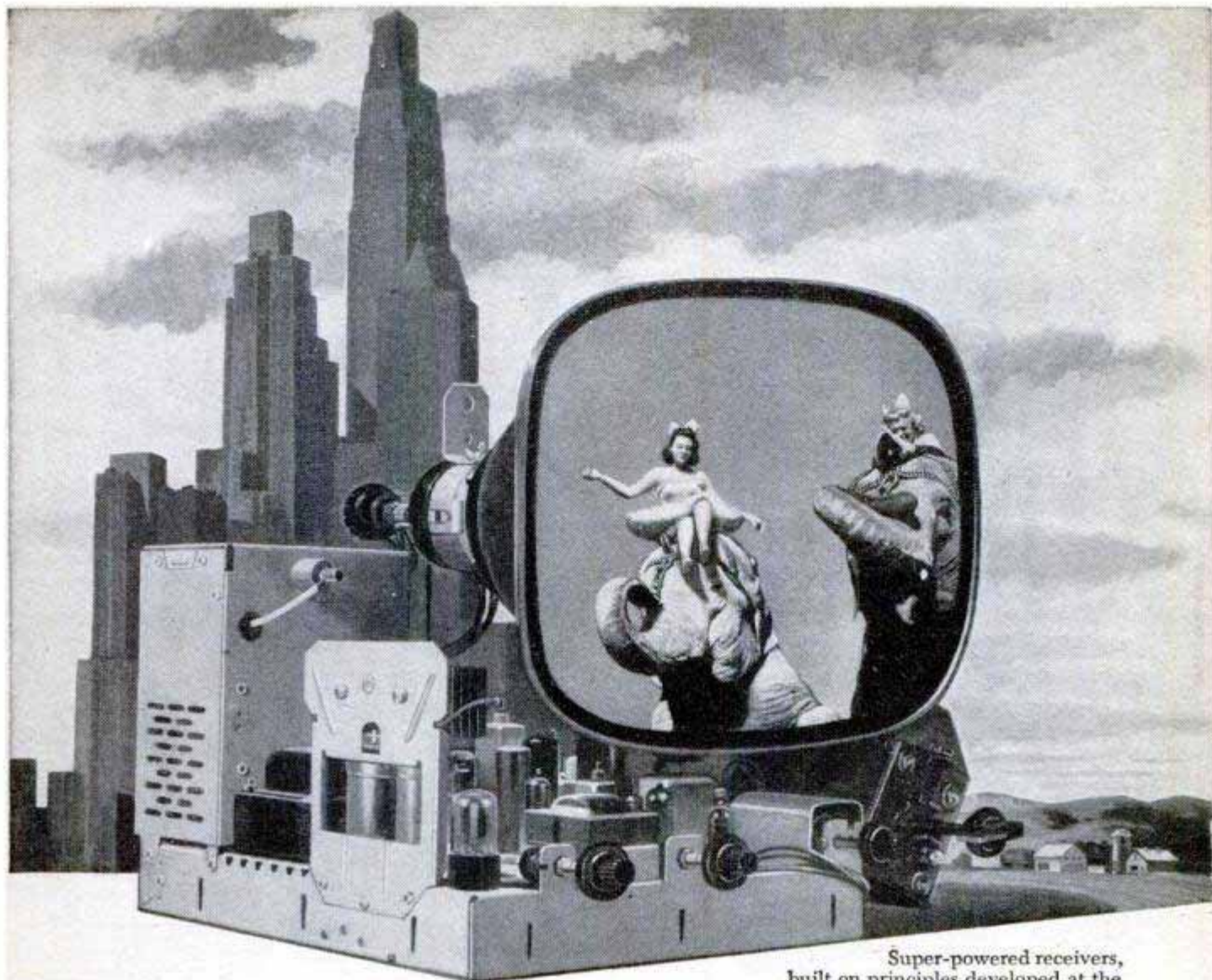
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New Super Sets widen television's horizons!

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television's first double-shielded tuner—brings in TV at its best. Result: stronger pictures in the country, steadier pictures in problem areas, and better pictures than ever in areas of normal reception.

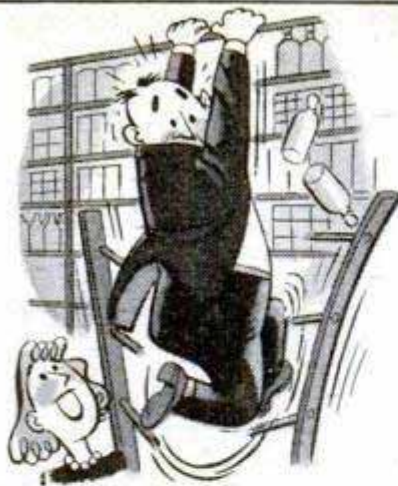
Development of the new RCA Victor "Picture Power" Super Sets is another example of research and engineering at work for your benefit. This pioneering means fine quality and performance from all products and services of RCA and RCA Victor.

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BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

the very best conditioners. Other good rhythmic exercises are climbing, cycling, rowing, horseback riding, dancing, jogging, skiing, skating and paddling. Vary them so that you'll have a different one for each season of the year. Tennis is helpful as a means of staying in shape, but it can be too fast for the unfit. Group games like bowling, volleyball and golf are good for social mixing, but they have little value in physical conditioning.

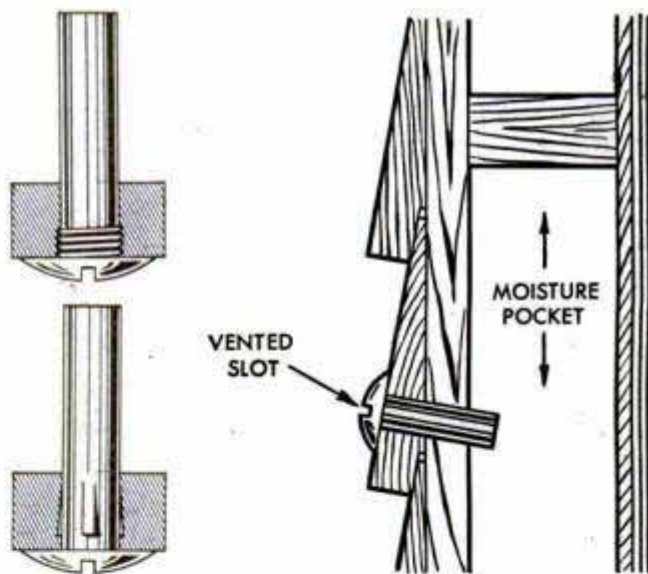
5. Eat green and yellow vegetables daily, and cut down on fat meats, light breads, eggs, coffee and fried foods. Stewed and fresh fruits, lean meats and broiled or baked fish are also healthful. Drink 6 to 10 glasses of water daily.

6. Don't overeat or overindulge in toxic poisons—alcohol or tobacco.

7. Sleep according to need, but be sure to get plenty after strenuous exercise. Most athletes sleep 8 to 10 hours, or more.

8. Maintain normal and emotionally stimulating activities.

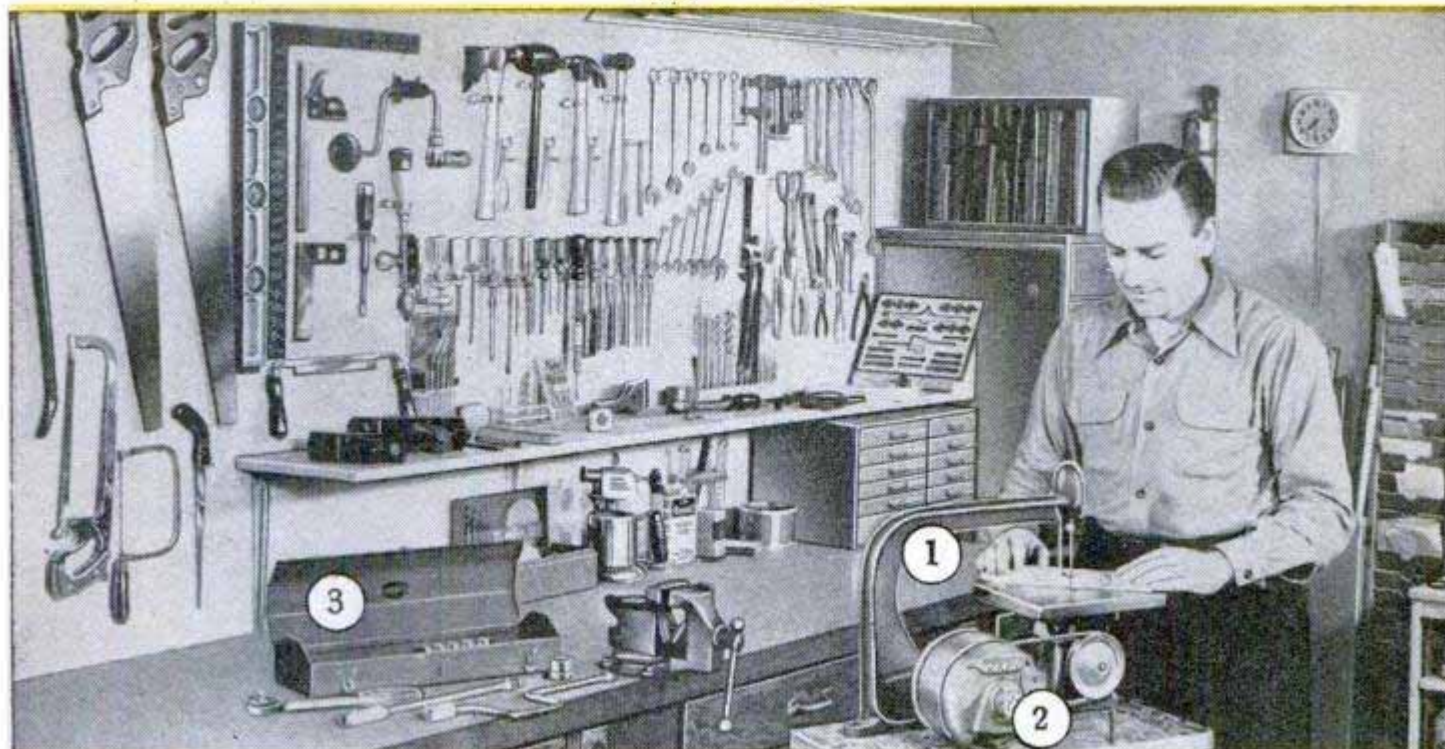
Nothing difficult or involved about that program, is there? But you are on the way to a longer and fuller life if you'll follow it faithfully.



Vent Tubes for Walls

Fabricated from strong, nonrusting alloy, small vent tubes for walls are quickly installed to prevent the lifting, peeling and blistering of paint on siding of frame homes. The vents are designed to relieve pressure, circulate air, release pocketed moisture and reduce condensation on inner walls. One type is installed in a drilled hole by tapping the vent with a hammer; the other has a portion of the tube threaded and is locked in place by screwing it into position. Both models are two inches long and have slotted, domed caps that shed water.

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craft Tool is precision-built, fully-guaranteed . . . the kind of tool you'll be proud to own. And they're yours on easy Western Auto terms. See, try and compare Westcraft this' week!

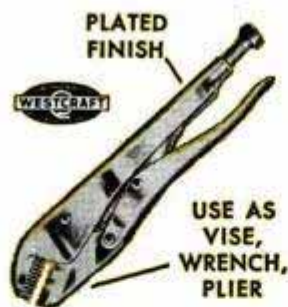
① **Tilt Table Jig Saw** does accurate jig, scroll, sabre sawing in wood and plastics to 1" thick. Scotch yoke, oilite bearings. 5" blade, adjustable guides. . . . (2H1102) **\$19³⁵**

② **1/4 HP Electric Motor**, 1725 rpm, 115 volt, 60 cycle AC. Split phase. GE guaranteed for 1 year. Use with jig saw, washer, churn, paint sprayer, etc. . . . (2H1600) **\$16⁹⁵**

③ **Westcraft 17-pc. Socket Set.** 1/2" sq. drive, alloy steel, chrome-plated. Twelve 12-pt. sockets, 1/8" to 1". 36-tooth rev. ratchet, 4 fittings. . . . (HR2961) **\$19⁴⁵**



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One enemy soldier deserves an A for effort—he hit the leading edge of a jet's wing with this rock

Tall Tales From Korean Skies

(Continued from page 109)

Machine-gun bullets failed to set them afire, so they dropped a 500-pound bomb. The ice broke and the trucks sank out of sight.

Flying over the enemy lines in Korea, an Air Force B-26 light bomber took a direct hit from an anti-aircraft shell. The explosion blew the pilot, Lt. John H. Blake, right through the plastic nose of the plane but did not kill him. He parachuted down and dodged Communists for 30 days before being rescued by a Third Air Rescue Squadron Albatross.

Nobody in Korea ever thought of a carrier airplane's tail hook as a weapon. But Capt. George E. Mouzakis, Marine Corsair pilot, lowered his hook while flying low over enemy territory and ripped out a few enemy telephone lines with it.

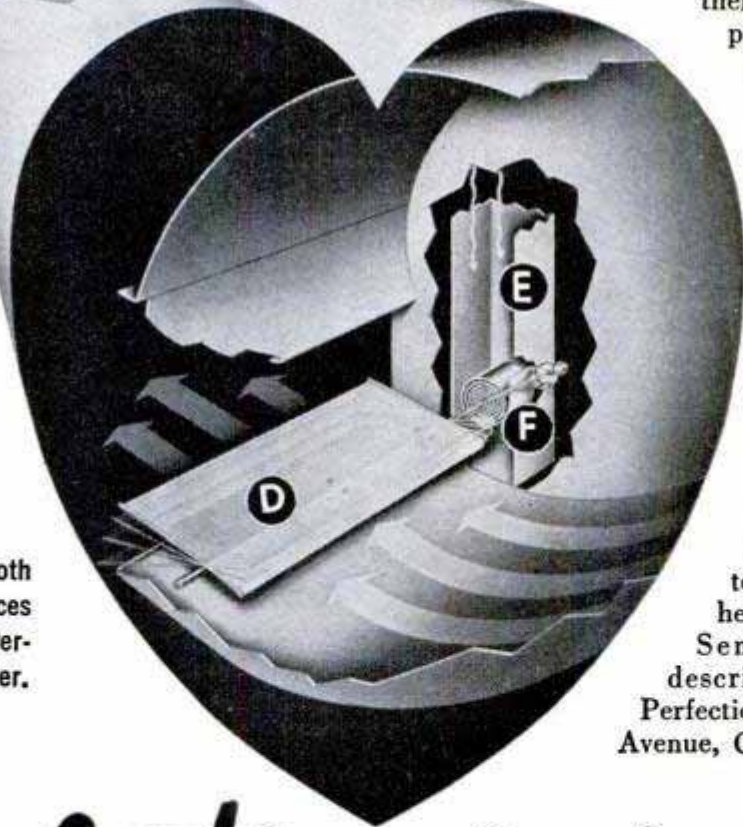
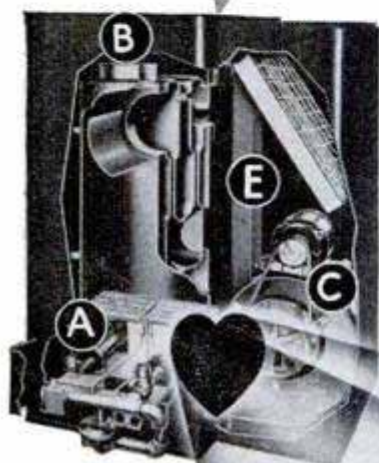
It is amazing how an airplane can fly with a large chunk of wing or tail shot off. Marine Corsair pilot Lt. Robert H. Wilson got his fighter back to friendly territory minus four feet of one wing, knocked off in a mid-air collision. Then there was Ensign Neil Armstrong, Panther jet pilot, who lost three feet of his wing when he hit a telephone pole while strafing trucks near Wonsan. He nursed the plane back to 14,000 feet and headed for friendly territory before bailing out.

Sometimes a crash landing is made in combat and the pilot walks away from it. Ensign R. R. Sanders was flying over Korea

(Continued to page 256)

How the greatest furnace invention in 29 years gives far greater heating comfort!

Perfection Regulaire*, the greatest advance in warm air heating in 29 years, regulates the amount of air flow in exact proportion to the furnace output. It provides a wonderful new measure of warm air comfort never before possible. Secret of Regulaire* performance is a heat-sensitive coil which expands and contracts at different temperatures. The coil moves the vane which opens and closes a portion of the blower outlet—automatically providing the equivalent of a 1000-speed blower!



How Regulaire* Works—After thermostat is set at desired room temperature, burner (A) comes on at Coasting Fire, then turns to High Fire if the rooms are cold. When the furnace bonnet (B) becomes warm, the Regulaire* Blower (C) begins quiet delivery of warmth with vane (D) closed. Warm air is drawn down duct (E) and warms therma-coil (F) which gradually opens vane (D) to gently increase flow of warm air to your rooms. It is this therma-coil and vane—sensitive to the slightest change in bonnet temperature—plus a 3-stage burner, that regulates the flow of warmth to your rooms, and assures perfect heating comfort in any weather. Send for free descriptive folder describing Regulaire* in detail. The Perfection Stove Company, 7364-A Platt Avenue, Cleveland 4, Ohio.

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Extra Speed...
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HOME JOBS!**



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(including useful
accessories.)

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sharpens, buffs, burnishes, cleans!**

THIS Black & Decker Tool has extra power to handle heavier-duty drilling in wood, metal, masonry and plastics . . . a 3000 R. P. M. spindle speed that pays off in faster, smoother sanding . . . and unmatched versatility for driving a whole raft of other attachments! Comes complete with $\frac{1}{4}$ " Jacobs drill chuck, sanding discs, lambswool bonnet, auto polish and wax. Compact, perfectly balanced, weighs only 3 $\frac{1}{2}$ lbs., operates on AC or DC, quality-built for years of service.

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when his engine quit. Below were rice paddies, definitely taboo for forced landings, so he decided to try to land on a dirt road. Suddenly trees loomed up ahead. One wing hit a foot-thick tree and was sheared right off. The plane hit the road, skidded 100 feet on its belly and stopped. As Sanders walked off, he could hear the radio still blaring in the cockpit.

If you think that tale demonstrates how tough a modern plane is, listen to this hair-raising tale of an F9F pilot who was trying to land his plane aboard the famous carrier *Essex*. On his first attempt, he came down too hard. The plane bounced back into the air, still flying. The landing hook in its tail caught a length of nylon tape from the top of the arresting barriers. Farther up the deck, the Panther crashed into another jet waiting to take off. The impact knocked off the parked plane's canopy, narrowly missing the pilot's head, and sheared off a wheel from the errant Panther.

Continuing over the carrier's bow, the plane barely missed hitting the water. The nylon tape, tangled in the landing hook, dragged in the water and the jet exhaust threw up spray as the plane staggered back into the air for a second try at landing. Meanwhile, the deck was cleared of all planes and a line of tractors was placed behind the barriers to stop any second "miss" of the arresting cables.

The pilot came in fast again, this time bringing the plane down on its one wheel. Because the arresting hook was fouled with the nylon cable, it failed to catch any wires. Panicky, the pilot applied full power. The plane sheared off the rest of its landing gear on the tractors, skidded 300 feet up the deck on its slick belly and knocked off its flaps and tip tanks. Still going full blast, the plane again flew off the bow of the carrier and into the air.

Picking up his microphone, the pilot advised the ship in a masterpiece of understatement, "This is becoming a rather rugged flight!" With no wheels or flaps, he decided to fly to shore and try a belly landing. Twenty miles from the beach, he ran out of fuel and had to ditch the plane in the ocean. The pilot turned in his Naval aviator's wings after that episode.

Chemical Kills Algae in Lakes

Better swimming in small lakes is forecast through use of a chemical which kills blue-green algae. These algae are responsible for heavy summer growth in lakes. Extremely small doses of the chemical, developed by University of Wisconsin botanists, will kill the undesired algae without disturbing fish or other plant growth.

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. . . carburetors, clutch discs,
voltage regulators, fuel pumps,
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(Continued from page 102)

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NOW — give your woodworking projects a *fine piano finish*... 10 times faster than hand sanding!

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HEAVY SANDING



Leaves no fur—
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Levels glued,
butt, miter joints



Chamfers edges—
fits frames



Sands large areas
at high speed

for heating more economically than with electrical-resistance heating. The heat pump operates as a reverse-cycle refrigerator to extract heat from the surrounding air, ground or water.

It is popular today to say that housing is a handicraft industry—and this statement is largely true. Mechanization has affected this industry less than many others and this accounts partially for increasing costs. Many of the products that go into the house, however, are produced by highly mechanized means and the techniques of industrial production are being applied to the construction of the house itself. Nevertheless, the fact remains that the basic tool of house construction is the hammer, not the power-driven automatic nailing machine.

Studies conducted by the University of Illinois Small Homes Council in 1947 show that construction time can be saved even on one house by the use of improved construction methods. These included precutting, tip-up wall framing and clear-span roof construction with the use of wood trusses. Working with a carefully prepared cutting schedule, the builder can make maximum use of standard lumber sizes. Cutting may be done with power equipment at one time. In the use of tip-up construction, the carpenter has the advantage of working on the flat surface of the previously completed floor. Walls may be sheathed before being tipped in place. Roof trusses may be built on the floor and then erected with a minimum of labor. This makes possible the quick enclosure of the basic outline of the house and the formation of a large open room. When dry-wall construction is used, the contractor installs both ceiling and side-wall finish at this time, before the erection of interior partitions. This is a saving, as it eliminates much cutting and fitting around walls.

Large operative builders carry these operations to a greater degree of productivity. Precutting may be done at a central plant or at the site itself. Subassemblies of walls and roof sections may be made similarly. Specialized crews work on limited jobs with maximum efficiency. This is essentially a prefabricated operation.

Production-line methods are seen at their greatest development in the factory-built house—a product from a central plant which is shipped to many builders. Here the construction of major parts of the house may be followed down a series of assembly lines. Final assembly, of course, must await delivery of the house to a site. The housing

(Continued to page 260)

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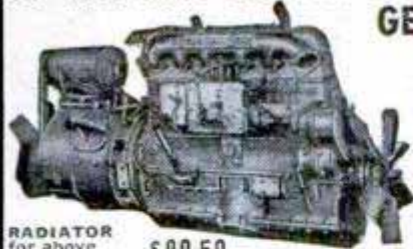
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industry will always involve more on-site labor than other mass-produced items.

Factory-built housing is gaining. Prefabrication of this sort is primarily a development of the last 50 years, with the major expansion occurring after World War II. Last year the largest manufacturer of these homes produced over 10,000 units.

Many factory-produced prefabricated houses demonstrate the principle of stressed-skin construction, which has been studied at considerable length by the Forest Products Laboratory, Madison, Wis. In this system, there are savings in framing lumber, as the interior wallboard and the exterior sheathing of the wall are glued to the framing members for added strength. In this way, these skins form a part of the structure itself.

Building has been undergoing a major evolution in the past few years. After much study by interested groups, recommendations have been made for the reorganization of materials on the basis of a common-denominator dimension, or module, of four inches. Gradually, different material sizes are being changed so that they may be coordinated with each other. Modular coordination means saving in labor and materials. The basic idea is to join two materials without special cutting and fitting.

With most framing members spaced at 16 or 24 inches in the average house, and with most sheet materials manufactured in multiples of two or four feet, house design and construction can be coordinated on an even larger multiple module than the simple four-inch one. Although the design of houses on the basis of 16 inches or 24 inches appears logical, few house plans have been developed around this scheme.

In 1950 the Lumber Dealers Research Council gave a grant to the University of Illinois Small Homes Council to study planning on this basis. This study resulted in 28 plans which demonstrated the idea of planning with room units. The dimensioning and structure of these houses are based on the 16 or 24-inch module. A most important feature of the plans is the coordination of the window openings with the structural frame. No extra framing is required for windows, as they are framed by eliminating one stud where the window is to be placed.

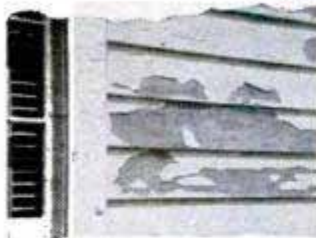
Architects and builders are constantly searching for ways to improve the American house. Today we believe in planning the house inside out—we arrive at a convenient interior arrangement and allow it to be expressed on the exterior. We are not concerned with a "style" but with good design and honest use of materials.

(Continued to page 262)

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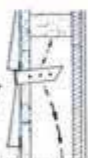


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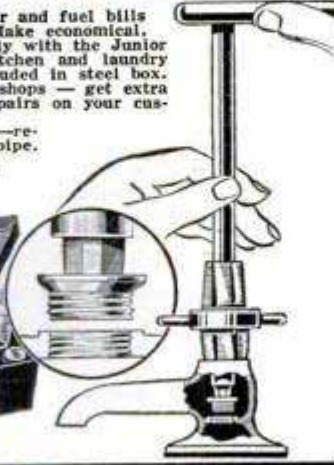
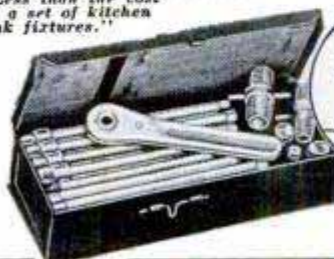
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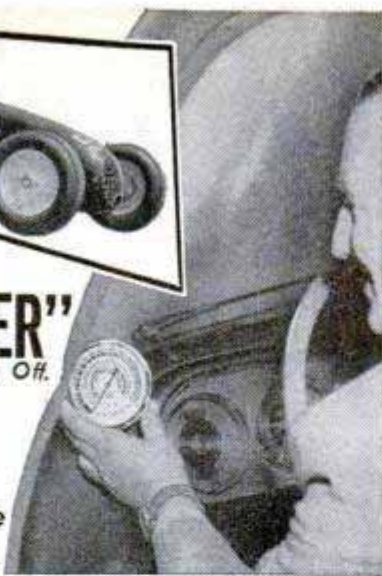


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We are turning our houses around. The alley is gone—our back yard is now our private garden. The living rooms of the house face this garden. We put the garage and the services on the street side.

To combat the problem of reduced space, we are using more open plans, more double-purpose rooms and more glass, which serves to give a visual extension to the living space as well as greater quantities of light and sunshine.

Architects are looking forward to many improvements in the future house. Although the mechanization of the house seems complete, it is certain that new devices will be developed for household consumption. The possibility of larger packages for site assembly is intriguing. Why not an entire bathroom rather than three fixtures? The central utility core is so basically sound that its eventual use is almost certain, although its first introduction met with failure. The trailer-size package which unfolds into a house (as demonstrated by the Acorn prefabricated house) seems destined to make an impression in the prefabricated field. Perhaps someone will solve the problems of panel construction and we may be able to purchase several standard wall sections at the nearest lumberyard when we want to add a room or build a house.

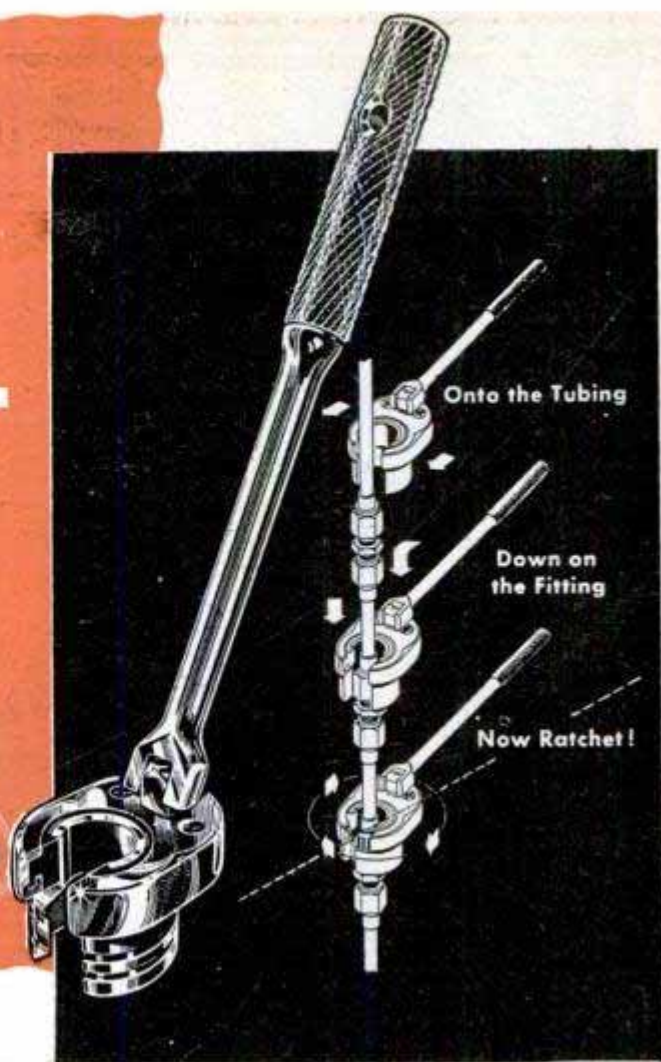
As our natural resources are expended, we must expect to see an increased interest in the sun as a source of energy. Solar energy will be used to heat more homes—we have the know-how now.

I expect to see the principle of the "open room" construction extended even further. I predict that the day will come when the average house will be a large open shell. It will be equipped with a package utility core and kitchen having permanent positions. All other partitions will be readily movable storage units. With this flexibility, we could remake our house to suit the needs of the moment and the building industry will have made its newest and greatest contribution to American living.

Only **TAC** has perfected the
**open-end
 ratchet wrench ...**

This TAC Open End Ratchet Wrench is doing spectacular jobs in the Armed Forces and Defense Industries. Made in Socket Type and Crowfoot type.

Sizes 3/8" to 4". Will operate with as little as 7° ratcheting arc on fittings, tubing, pipe, rod, cable, etc. Fully protected by patent
TAC does what no other tool can do.



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 Los Angeles 45, California



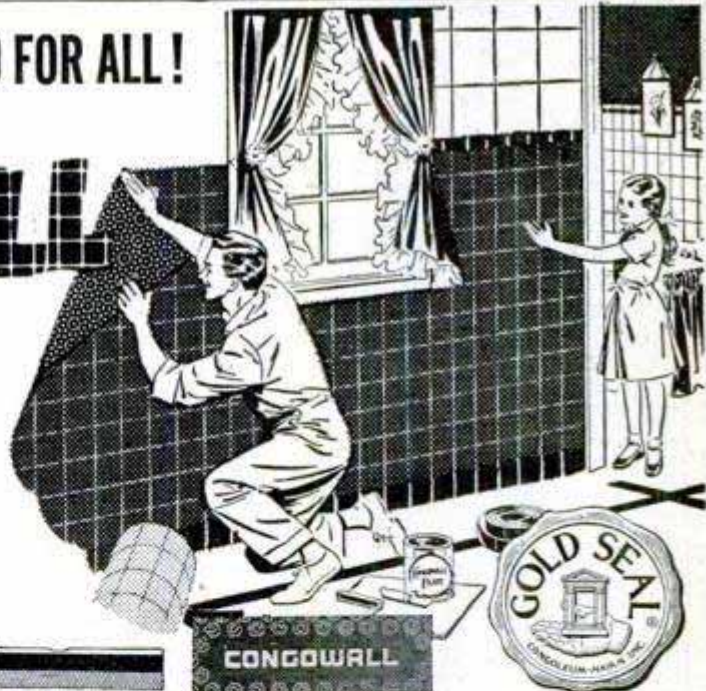
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 FEELS... } like never needs
 CLEANS.. } TILE refinishing!



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And there's nothing to it. Because, tough, sturdy and durable as it is . . . Congowall is *really* flexible and easy to handle. A *cinch* to install! Just paste it up, that's all. Congowall locks itself to your wall . . . and stays there! It's up *successfully* in 3,000,000 homes!

Congowall's baked enamel surface looks and feels like expensive ceramic tile . . . even to the mortar lines. And like tile, it cleans quickly with a damp cloth . . . stays bright and beautiful for years.

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

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Spare Time
**\$3.00 AN
PAYS 3 HOUR**
and **MORE**
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UNIVERSAL Lawn Mower Grinder

Here is a business you can start in your own garage or basement. Sharpen hand and power mowers on the Universal Grinder and make \$3.00 to \$5.00 an hour.

G. Spurlock of Arkansas writes: "I have had my Universal Grinder only 2 months. Live 2½ miles from town. Yet have already made \$227 net profit." J. L. Peterman of Pa. says: "I averaged \$100.00 a week in May, and made \$1,000.00 spare time this season."

REMEMBER—Only on the UNIVERSAL GRINDER can the inside face and edge of the stationary blade, as well as all of the reel blades, be ground to the proper clearance

ALL IN ONE SET-UP

WITHOUT REMOVING ANY BLADE FROM THE MOWER
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Please send me full facts about the Universal Lawn Mower Grinder and its big money making opportunities.

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**The Owners Report on the
1952 Pontiac**

(Continued from page 94)

is locked and the control knob is inside the car, which is good as it discourages theft of under-hood units.

The panel which houses the instruments is rather small but practical. I was impressed by the very large and easy-to-read numerals on the mileage indicator. Two duct-type ventilators are easily operated by separate knobs on the dash. The heater

ACCELERATION TESTS

**Pontiac Chieftain "8" 4-Door Sedan
With Dual-Range Hydra-Matic Drive**

¼ mile from zero..	20.35 seconds—High drive range
	19.10 seconds— Low drive range
½ mile from zero..	33.10 seconds—High drive range
	31.90 seconds— Low drive range
0 to 30 m.p.h.....	4.50 seconds— Low range only
0 to 60 m.p.h.....	15.10 seconds—High drive range
	14.90 seconds— Low drive range
Top speed (by speedometer).....	98-100 m.p.h.
	Actual top speed about 6 per- cent less (speedometer variation)

located under the front seat offers equal distribution and is extremely good.

Headroom is exceptionally good and the driving position is comfortable, as are the cushions, although they could be slightly longer to give more support under the knees, which would be more restful for a long-legged six-footer like myself. The windshield is of two-piece construction, which is usually more economical for replacement than the curved, one-piece type.

The engine has a high compression ratio of 7.7 to 1 (6.8 to 1 on models with conventional transmission), is extremely smooth and, in spite of the apparently gaining popularity of the V-8 engine, 66 percent of the Pontiac owners in our poll prefer a straight eight. Gasoline mileage is good for a car of its size and weight (see economy chart).

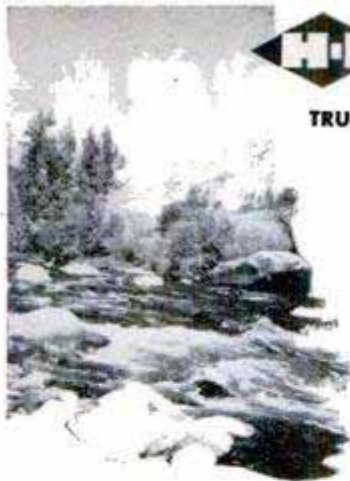
The brakes are good. The emergency brake is easily operated by the left hand and a pivoted bracket acts as a guide for the cane-handle lever. The pivoting seems to eliminate any binding and makes for ease of operation. An excellent feature is a small electric warning light which flashes on and off when the hand brake is applied and the ignition switch is on. There is, of course, no clutch pedal but the single pedal for the brake was not made wider.

The Dual-Range Hydra-Matic transmission (new this year) is definitely an improvement, although the changes in shifts

(Continued to page 266)



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TRUCKEE RIVER, NEV.—Nevada is famous for both its matrimonial divorce mart and the battling brown trout who lurk in Truckee River waters.

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For your protection, Custom-crafted H-I Registered Fly Rods each bear their own registry number. When you buy one, your dealer sends its number and your name to H-I's Registered Rod Dept. where they become a permanent record.

Registered Fly Rods..

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- Old Hi's Hi Test—Compare it with the finest. \$50.00.
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OLD GOLD (level or tapered)—New impregnation process gives this line of selected silk a wear-resistant, glass-smooth finish. 25 yd. coils. Level: \$2.10—\$3.20. Tapered: \$8.85—\$11.00.

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UTICA AUTOMATIC—A fishing tested "streamliner." New upright model. Free stripping . . . lightest weight, largest line capacity of any auto reel made. \$8.50.



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ROCKFORD, ILLINOIS: Enclosed is 25c (not stamps), send Handy Calculator to:

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seemed more noticeable than in the previous Hydra-Matics, especially when downshifting. Actually, the driver has the option of two driving ranges. He may choose either high or low driving range with the selector lever, as the shift indicator has been split into two positions—1-2-3-4 (actually four speeds forward—No. 4 compares to an overdrive for cruising), positioned to the left of "DR." It is excellent for highway cruising and more economical.

Speed in the low range is, of course, slower than in high range. However, the amazing top speed in low range was 77 to

1952 PONTIAC SPECIFICATIONS

ENGINE

	6-cylinder	8-cylinder
Type	In-line, L-head	In-line, L-head
Bore and stroke.....	3-9/16 in. x 4 in.	3 3/8 in. x 3 3/4 in.
Piston displacement	239.2 cu. in.	268.4 cu. in.
Brake horsepower	100 (or 102*)	118 (or 122*)
Compression ratio	6.8:1 (or 7.7:1*)	6.8:1 (or 7.7:1*)
Transmission	3-speed conv.	(3.90:1 rear-axle ratio). *Optional on all models at extra cost is G. M. Hydra-Matic Drive with Dual-Range shift control and an extra-high rear-axle ratio (3.08:1), in which case the high-compression engine is standard

GENERAL

(Figures on 4-dr. sedan models)

Steering ratio	19:1	19:1
Steering wheel, lock to lock.....	4 1/2 turns	4 1/2 turns
Turning radius	19.79 ft.	19.79 ft.
Road clearance	8 1/8 in.	8 1/8 in.
Tire size	7.10 x 15	7.10 x 15
Recommended tire pressure.....	24 lb.	24 lb.
Weight (unladen).....	3403 lb.	3503 lb. (with Hydra-Matic)
Wheelbase	120 in.	120 in.
Tread, front	58-1/16 in.	58-1/16 in.
Tread, rear	59-1/16 in.	59-1/16 in.
Height, over-all	65 3/8 in.	65 3/8 in.
Width, over-all	75-11/16 in.	75-11/16 in.
Length, over-all	202 1/4 in.	202 1/4 in.

INTERIOR DIMENSIONS

Front-seat width	59-15/16 in.	59-15/16 in.
Rear-seat width	58 1/2 in.	58 1/2 in.
Headroom, front	36 in.	36 in.
Headroom, rear	35 3/8 in.	35 3/8 in.
Legroom, front	42-9/16 in.	42-9/16 in.
Legroom, rear	40-11/16 in.	40-11/16 in.

CAPACITIES

Oil	5 qt.	5 qt.
Water	18 qt.	18 qt.
Gasoline	17 1/2 gal.	17 1/2 gal.

80 miles per hour by speedometer. An extremely low gear is available where utmost power is needed for hills, snow or mud.

There is a tendency for the car to "creep" while standing with engine running when the lever is in "drive" position. The shift lever does not have a parking position, a feature many drivers would appreciate. A light on the shift indicator would be an improvement and, until the driver gets accustomed to the Dual-Range lever positions, there is apt to be some confusion because the high range and the low range are not indicated separately except by two small

(Continued to page 268)

IT'S LEJAY FOR WAR SURPLUS — BARGAINS GALORE

HYDRAULIC EQUIPMENT

No. 8—Double Action Cylinder 1 1/2" bore, 5" stroke, 1/2" shaft. Lifting capacity 1760 lbs. with 1000 P.S.I. input. Overall length 15 3/4". Ball bearing mounts. **\$7.95** on both ends.

No. 6—Double Action Cylinder 1 1/2" bore, 26" stroke, 1" shaft. Lifting capacity 1760 lbs. with 1000 P.S.I. input. Overall length 35". Bolt mount at bottom, clevis at top. \$55.00 Value—now only **\$15.95**

No. 3—Double Action Cylinder 3" bore, 24" stroke, 1-3/16" shaft. Lifting capacity 7070 lbs. with 1000 P.S.I. input. Overall length 34 1/2". Clevis mount both ends. Cost Gov't. \$176.00—**\$27.50** Only.

No. 2—(As Illustrated) Double Action cylinder 4" bore, 18" stroke, 1 1/2" shaft, lifting capacity 12,500 lbs. with 1000 P.S.I. input. Overall length 30 1/2". Clevis mounting at bottom, threaded shaft at top. Cost Gov't. **\$29.75** over \$300.00—Special.

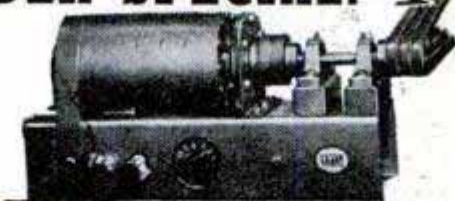
No. H.12—Hand Pump with handle. Built in check valve—Capacity 2000 lbs. Pressure. \$55.00 Value... **\$11.25**

No. 194—Pesco Type pump for oil, water, air, 1/2" pipe thread ports. Splined self-aligning shaft. **\$12.50**

No. 211—Pesco Type pump for oil, water, air, 1" pipe thread ports. Splined self-aligning shaft... **\$15.25**

WELDER SPECIAL!

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Powerful 200-250 ampere Welder built for light or heavy duty work. Heavy duty Aircraft Generator. Built in Arc-Stabilizer and HI-LO switch with dial control. Complete with all parts including pulley as shown and ready for assembly (You save \$29.60) No. AW9 Kit **\$67.90** complete.

(2 or 3 jobs quickly pays for it.) Same Welder, Factory assembled ready to go. Part No. 100... **\$97.50**



Accessory Kit EXTRA! A \$14.95 Accessory Kit Complete for only \$12.95! Includes Welding Helmet, Electrode Holder, 5 lbs. Ass't Rods, Two 10 ft. Welding Leads with terminals and ground clip, plus Audel's Welding Guide. Sold with any Welder Kit... Special Price **\$12.95**

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Item E. No. VP52—Vickers Positive Replacement Hydraulic Pump. Pumps .507 cu. in. per rev. 8 gals. per min. at 3750 RPM. 1000 P.S.I. Ship wt. 5 lbs. **\$19.49**



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MOTOR GEAR UNIT

No. E9—Eclipse 24V. motor gear unit. Gear ratio 4 to 1. Can also be adapted for 2-1 or 40-1 ratio. Gear unit with separate A. C. Motor makes perfect garage door opener, hoist, pump jacks, hay lift, etc. Works good on 6 or 12 volts. Cost Gov't. \$221.00—while a few last. **\$12.95**



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New Century Ball Bearing Motor 1/6 H.P. 1750 R.P.M. Compound wound, 6.4 Amps. Totally enclosed with base. Regular \$35.00 Value. Our Special **\$24.95**

SPECIAL MOTOR A 1/2 H.P. Emerson 24 volts D.C. motor, self contained fan, 4000 R.P.M. Delivers 1/10 H.P. on 6 volts 900 R.P.M. or 1/4 H.P. on 12 volts 1800 R.P.M. A real buy... **\$5.95**

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115 Volt A.C. Motor New Deleo Ball Bearing Motor 1/2 H.P. split phase 1725 R.P.M., 60 cycle 115 volts for vertical or horizontal mounting. With 3 1/2 feet heavy rubber cord and safety switch. Very Special at... **\$16.45**



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Of finest hand-forged Swedish steel honed to a razor edge... with hand made, saddle stitched genuine leather sheath. A Sportsman's treasure! Beautifully etched, 3 3/8" blade with blood grooves on both sides. Overall length 7 3/8". Colorful handles in genuine moisture-proof birch wood.

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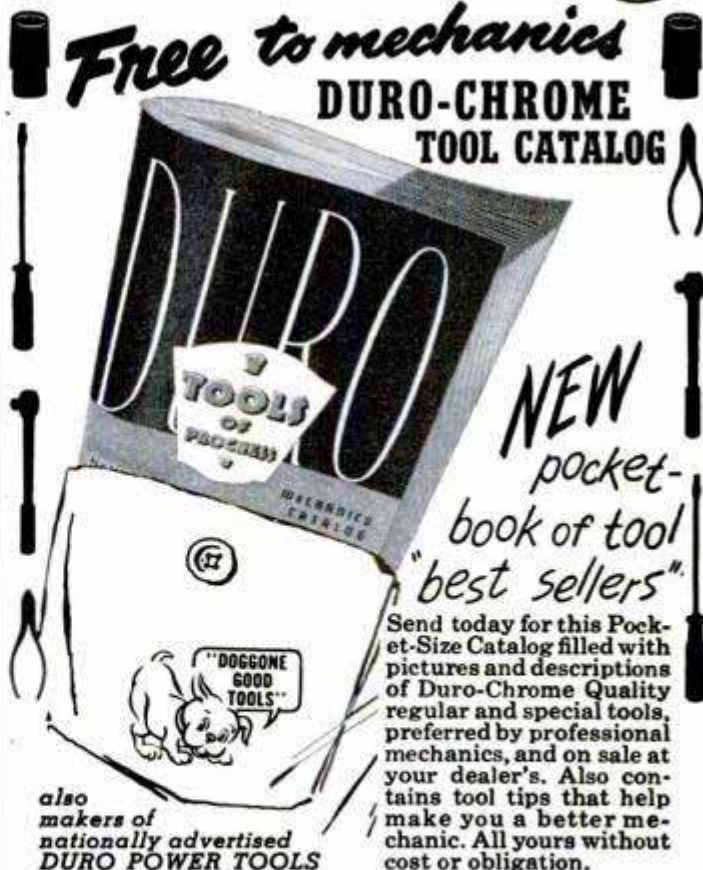
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MAY 1952

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America's best liked torch!

25 ways better...
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Complete
information
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arrows. There is no marking to show which one is low and which is high.

The steering is rather stiff, which many drivers will like, and the ratio is not bad for a car of its size and weight by American standards.

The test car had rather stiff springs and the ride was not as comfortable as I had expected, although when the car is loaded this condition would naturally change. The trunk space is ample and the lid is counterbalanced and self-locking. The hood also is counterbalanced. A clever gadget under the hood is an engine floodlight which goes on when the hood is opened.

The car had the new blue-tinted glass which seems to be gaining in popularity. The heavy blue panel at the top of the windshield is a real advantage when driving through snow or bright sunlight but is a disadvantage at twilight.

According to our survey of Pontiac owners, many persons regard Pontiac as the reliable "work horse" of the G.M. family.



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Folding for easy portability, a desk-top reader for microfilm requires no darkened room. Under ordinary room light, the projected image shows up sharp and clear on an 18 by 18-inch screen. This screen permits a 17-power magnification of the microfilm. If desired, the image can be projected on a larger vertical screen or on a light-colored wall for group reading. The complete unit weighs only 17 pounds with its case, in which there is space for screen, lens, rolls of microfilm and an extra projector lamp.

☐ In 1951 the prefabricated-housing industry sold 50,000 ready-built homes with an estimated total value of \$382,630,000.

Records as it rolls!

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for motorists, engineers, architects, teachers, draftsmen, traveling men, service men, yachtsmen. Dependable product of German craftsmen famous for precision accurate instruments. Gauges on both sides measure exact distances between any locations, on any scale, American or foreign. With handsome leather case.

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650-16	5.42	700-15	4.54
700-16	5.04	670-15	4.74
650-15	4.44	710-15	4.94
760-15	5.04	550-17	4.64
600-20	\$7.14	650-20	7.94
750-20	8.54	700-20	8.64
825-20	15.92	1100-20	14.94
32x6(8)	\$8.64	32x6(10)	9.94
900-20	13.94	1000-20	13.94
1100-20	14.94		

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750-16	7.75	760-15	6.27
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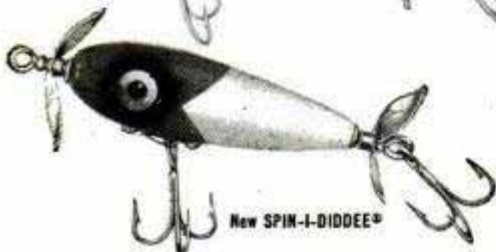
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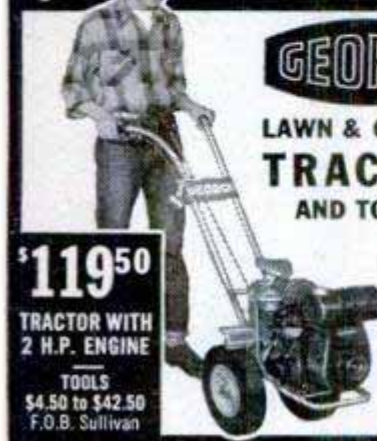
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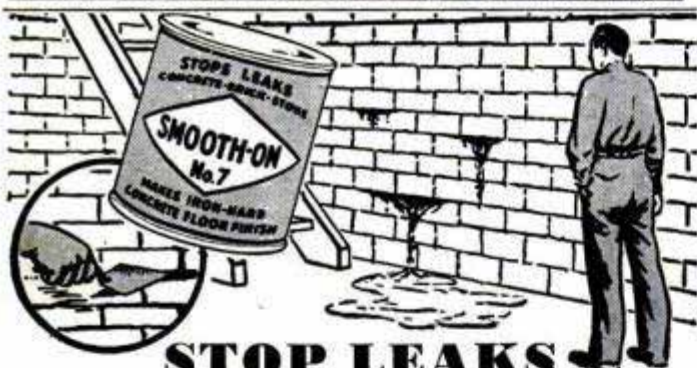
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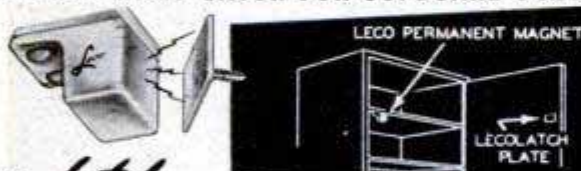
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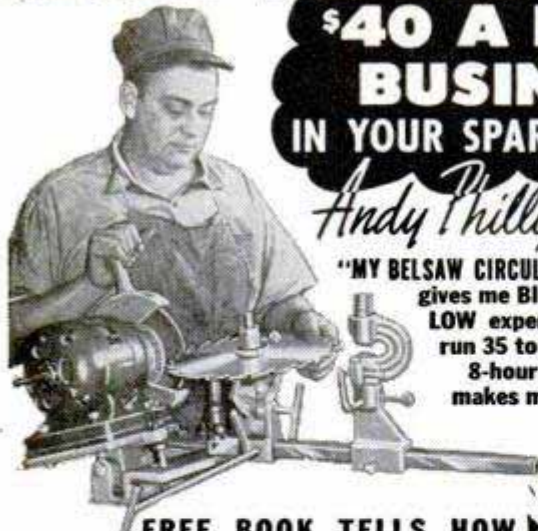
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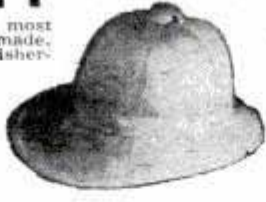
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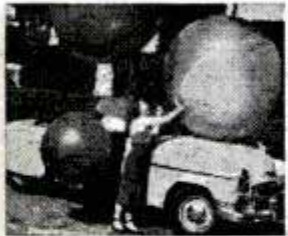
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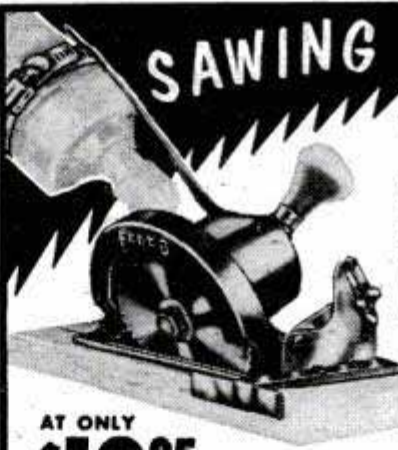
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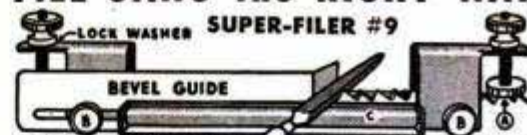
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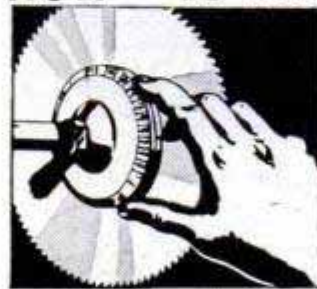
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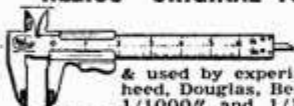
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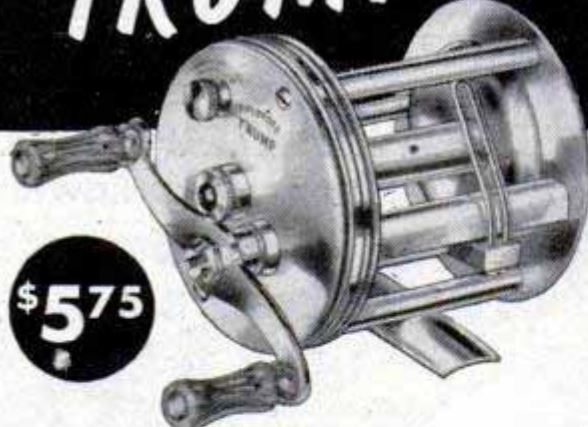
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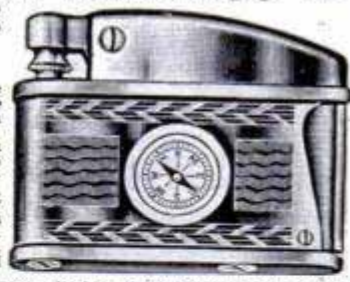
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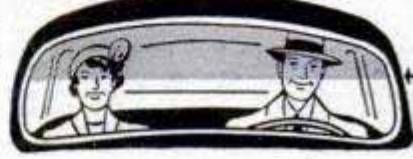
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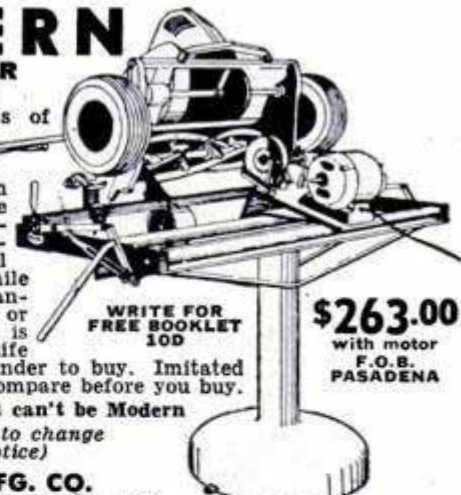
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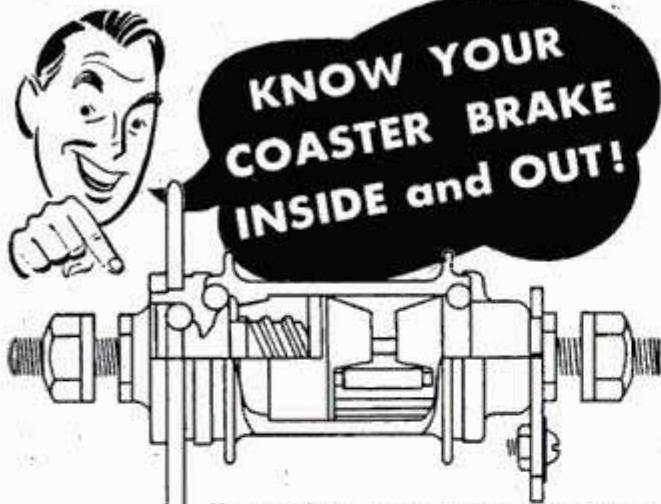
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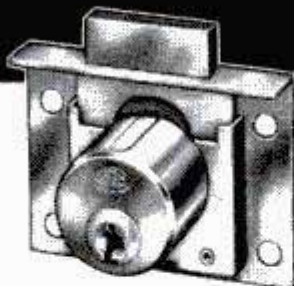


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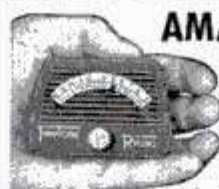
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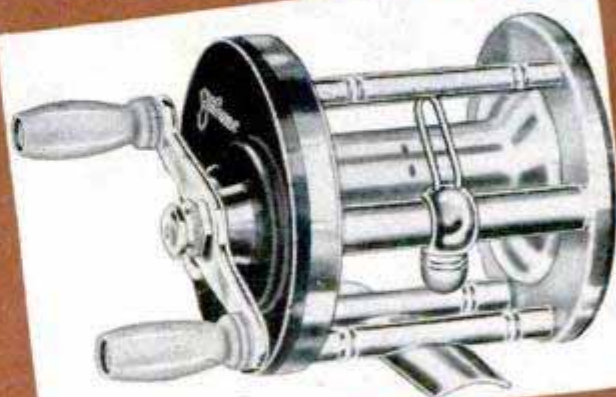


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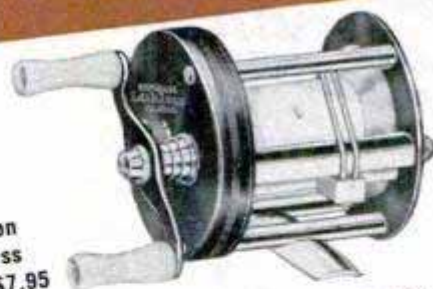


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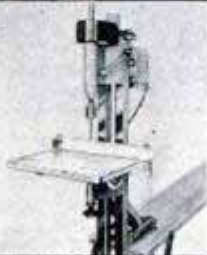
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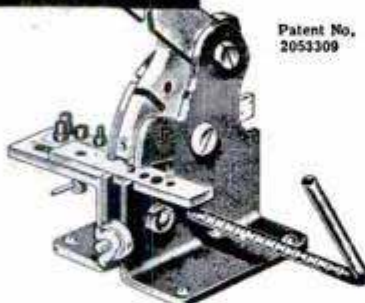
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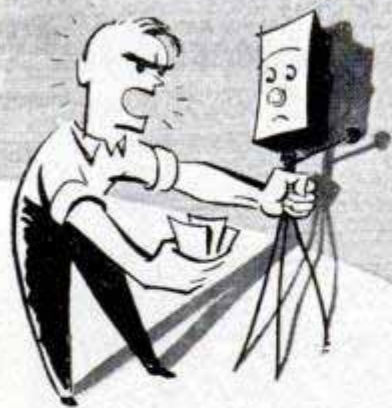
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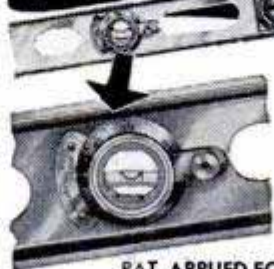
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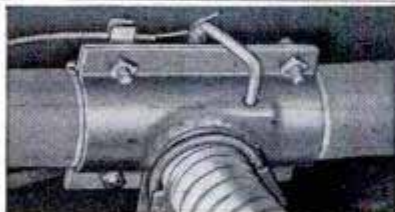
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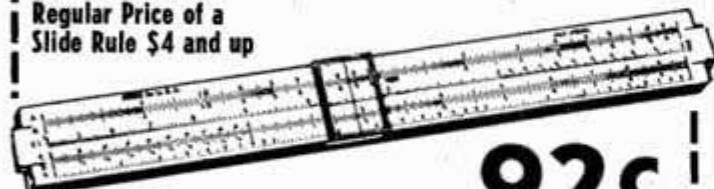
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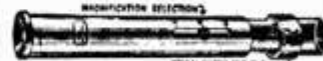


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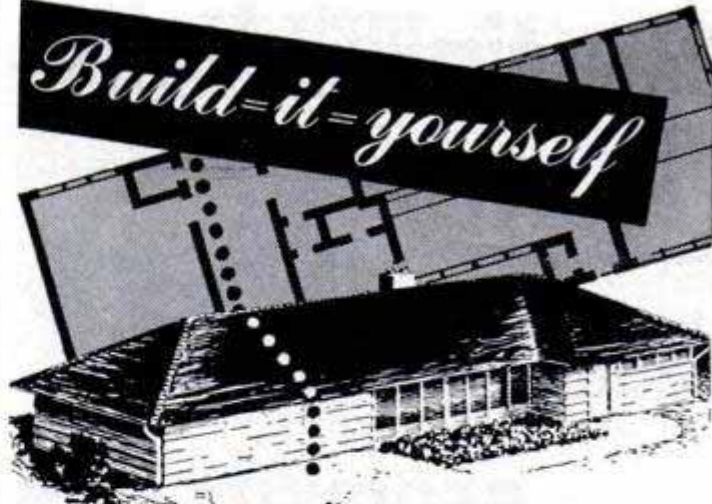
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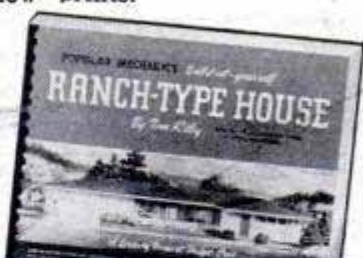
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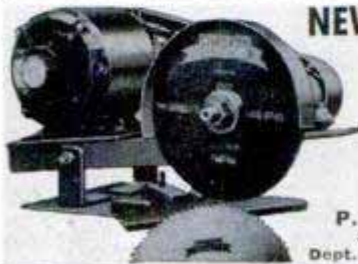
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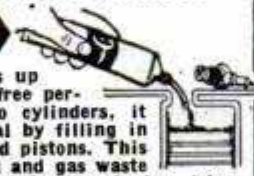


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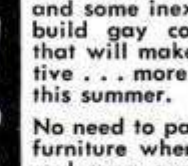
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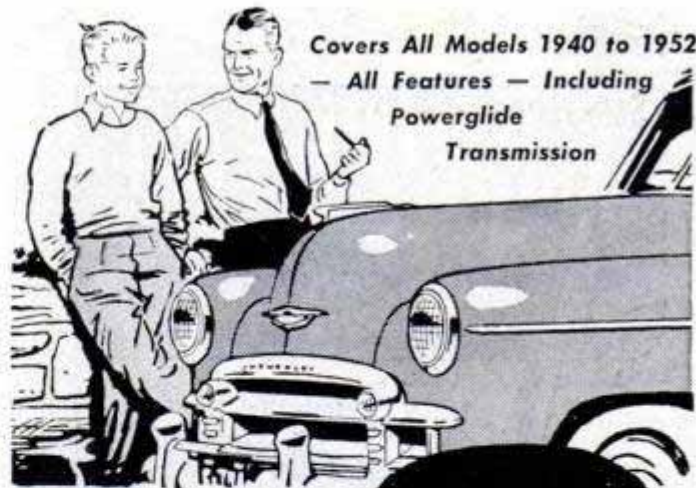


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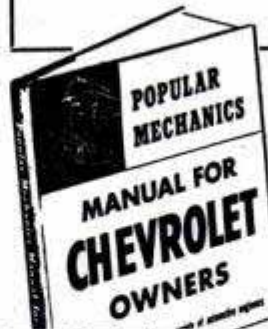
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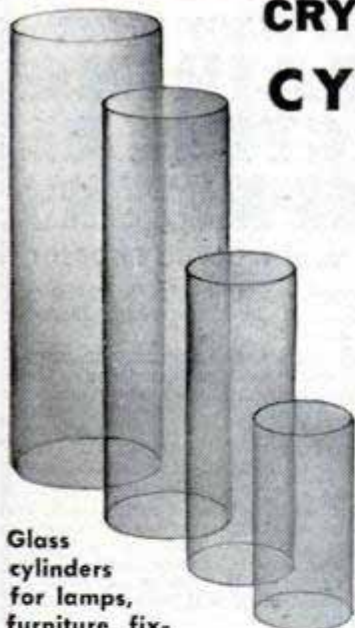
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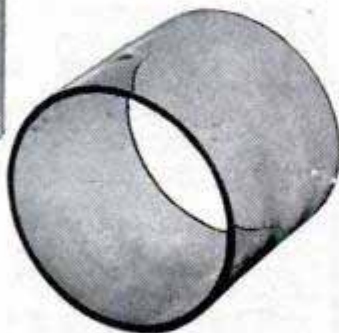
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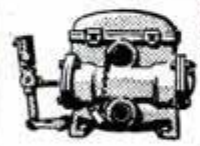


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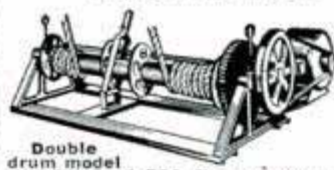


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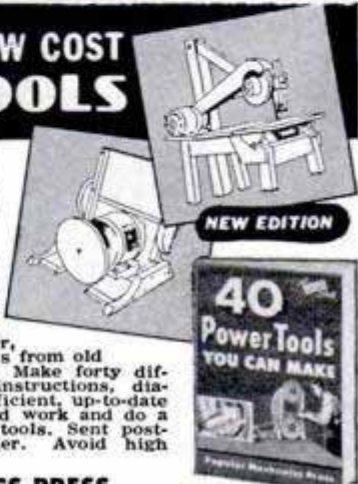


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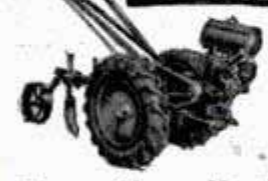
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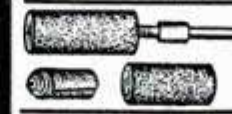
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POWER CUT-OFF MACHINE cuts steel pipe and rods, and cuts grooves, notches, bevells, etc. up to 4-inches. Smooths longer pieces. Cut-off saw for wood, brick, tile, rock, and concrete. Size 15x15. Ball bearing arbor, uses 1/4 HP motor **\$28.50**

Immediate Delivery. Order direct, cash, or C.O.D. or send for folder.

VYKE BRAKE CO., P-1116 So. 27th St., Omaha 5, Nebr.

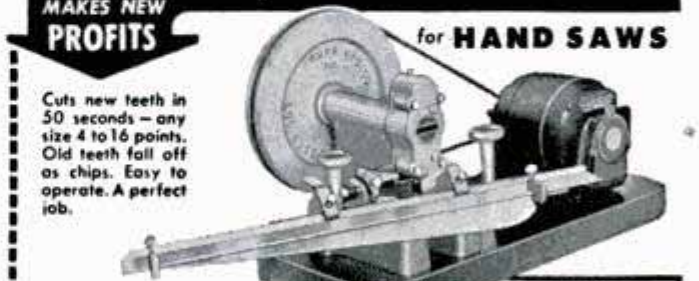


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Cuts new teeth in 50 seconds — any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job.

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Our **FABRICATING EXPERTS** will advise you. Foam rubber as low as 25¢ per square foot.

MICROPHONE
Telephone type, highly sensitive with excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the radio "ham" and professional recording studio, broadcasting, home recording, public address, etc.
Complete with cord & plug . . . **329**

4WAY SWIVEL LAMP
Has 3 ft. flexible stand with 4 joints to adjust position. Can be used on 6-12-24-110 volts by changing the bulb. Ideal for gunsmith, workbench, desk, etc. **329**

EYE LOUPES **99¢**
An indispensable aid in fine inspection work. Available in 2 $\frac{1}{2}$, 2 $\frac{3}{4}$, 3 $\frac{1}{4}$, 4 & 5 power, each

7 PIECE DRAWING SET
A Real Palley BARGAIN! Has a 4 $\frac{1}{2}$ " compass, with pen & pencil part, a 4 $\frac{1}{2}$ " divider, a 3 $\frac{1}{2}$ " reverse bow compass for pencil & ink, a 4 $\frac{1}{2}$ " ruling pen, capsule of extra leads. Complete in a velvet lined case. **ONLY 325**

EXACTOR HYDRAULIC REMOTE CONTROL MASTER & SLAVE
Consists of two units. Designed to operate controls on boats, machinery, engines, motors, etc. without need for rods, cables, pulleys, etc. When connected with $\frac{1}{4}$ " tubing & filled with oil they act as a precision, remote controller. When Master handle is moved, Slave arm responds in exact motion. Range is 0 to 90 degrees. Combination Master & Slave for **4250**
MASTER only - For an extra control . . . **2125**

HAND LINE
Rot-proof, weather resistant, hard linen line. Originally used as hand line in fishing for tuna, marlin, etc. Also has many uses around farm, factory, etc. **NEW IN 300 ft. lengths. 169**

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SAVE UP TO 85% IN WAR SURPLUS

2 WAY INTERCOM Made by DICTOGRAPH for convenient, 2-way conversation. Can be used anywhere, from room to room, house to house, office to stockroom etc. Carries sound as far as 500 ft. Operates on standard flashlight batteries - no tubes. Has Alnico speakers, carbon microphone and switches. Unit consists of 2 complete stations (in orig. cartons) and approximately 25 ft. of wire. Complete instructions included.
BELL WIRE - for use with above - 100 ft. \$2.98
11.95 A \$17.50 VALUE

100% WOOL FILLED SLEEPING BAG
The bag with everything you desire in comfort & convenience. Square box construction. Outer covering is vat dyed, Forest Green, combed Zelon treated, poplin, Waterproof with heavy sateen lining. Insulated with weather-strip. Has detachable head flap and side closing. 100" Talon zipper. Double mattress pocket. Two bags may be zipped together. Overall size 36" x 80".
19.95 39.00 VALUE

NAVY Sealed Beam LAMP
U.S. NAVY portable search-spot light. Has pistol grip and aiming sight. Makes an ideal search, spot or emergency light for auto, boat, etc.
12V. light - 4" lens . . . **4.29**
24V. light - 4" lens . . . **4.79**
Set of 3 filters: red, green, amber (specify type lamp) **99¢**

DOUBLE TRIGGER SIGNAL LAMP
Has interchangeable, colored filters and controlled, directional beam. The 4" parabolic, Pyrex mirror reflector is movable by trigger in handle. Other trigger is off-on switch. Lamp housing is all metal with crackle finish. Kit comes complete with extra Red and Violet filters, 2 bulbs, 25 feet of cord, all in handy wooden carrying case. Operates on 12V-DC. **5.95**

ALNICO SPEAKER
Model No. 510540-2. Permanent magnet type. Sturdy die-stamped steel frame with 4 hole mounting. Requires only two wire hook-up. Makes an ideal speaker for small radios, multiple communication systems, inter office systems, test equipment, etc. 4" dia. **2.49**

NEW SELF CONTAINED DIVING UNIT
Enjoy freedom of breathing & movement under water. Has self-operating, rust-proof regulator & outlet valve. 480 cu. in. compressed air cylinder allows 1 1/2 hour underwater. Has perfected mouth-piece, 2 flexible hoses to regulator & free-movement harness. Standard equip. with Navy. **99.75**
DeLUXE Navy MODEL-2 hour diving time. **249.50**

"ARBALETE" SPEAR GUNS
Most efficient underwater gun made. Powerful, accurate, silent. Uses "crossbow" principle. Rubber powered. Has safety catch and will float when spear is released. Range 14 ft. **24.95**
DeLUXE MODEL - Range 20 ft. 2 sets of elastics. **34.95**

SNORKLE BREATHING TUBES - Plastic with rubber mouthpiece. Allows breathing while eyes are underwater. Straight type \$1.95
CURVED TYPE - Has automatic seal when immersed \$2.95

SURPLUS WATERPROOF BOOTS NON-SKID
Assures complete foot and shoe protection in the coldest weather. Specially designed to keep the feet warm and comfortable & the shoes dry. Has 9 inch leather boot top, rubber shoe & sole with felt inner sole. Reconditioned - in excellent condition. **5.95** NEW **7.95**

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Has a 6 inch, polished Vanadium blade & Handle made of leather and fibre discs. Complete with tanned leather sheath. Only **1.98**

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The Very POPULAR CENTER FOCUS Model with Coated, Achromatic Lenses. Combines higher resolving power with extreme image brightness and amazing clarity. An IDEAL GLASS FOR ALL AROUND USE DAY or NIGHT! Has Lightweight, Precision made, Aluminum housing. Field of view is approx., 375 feet at 1000 yds. Complete with Leather Carrying Case and Neck Straps. **47.95** (PLUS FED.TAX)

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Big, Powerful Lenses give maximum image brightness & needle-sharp vision. Individual eye focus, Wide field of view. With Leather Case and Straps. **33.95**

IDEAL NIGHT GLASS (plus Fed. Tax)
BRIDGE FRAME WINCH HOIST
Certified for Safety! Has 4 to 1 power ratio. Lifts up to 1500 lbs., on 1 line or has 6000 lbs., cap., on 5 lines. Gears & ratchet are machine cut for precision & safety. Takes 135 ft of $\frac{1}{4}$ " or 100 ft $\frac{5}{16}$ " cable. **19.95**

SWIM FLIPPERS
Top quality rubber. Has pebble tread bottom. Adj. heel strap . . . Re-inforced for strength. Vented for air & drainage. Ideal for diving and swimming. **7.95**
Med., Sizes: Small, Med., Large

DIVING MASK
Soft rubber mask fits over eyes. Heavy duty glass shield. Adj. headband. **2.59** **2.69** **3.95**

SURPLUS MINE DETECTOR

A scientific "wizard" for discovering objects buried in dirt, sand, mud etc. Gives both sight & sound signal. Unit consists of exploring rod with detector head, amplifier resonator and headset. Amplifier contains many valuable electronic and radio parts such as oscillator, tubes, antenna etc. Detector is battery operated, easily portable & comes with carrying case. Adaptable to many uses in radio & electronic research. **ONLY 14.95**

NAVY WADING SUIT
Makes surf and stream fishing a pleasure! Ideal for ranchers, oil fields or any use where necessary to protect body or clothes from moisture, silt, muck etc. Made of rubberized canvas. Has vulcanized seams, built-in rubber gloves and boots. Sizes: Small, Med., Large. **7.95**

CONVERTED MODEL - Same as above - Converted to waist length with bib & suspenders. **9.95**

16 POCKET VEST
The ideal jacket for the Rifleman or Hunter . . . Has 14 individual, outside pockets for shells, glasses & other accessories. 2 large (11" x 8") inner pockets, a leather holder for knife, gun or tool. Sturdy, yet lightweight with tie-straps at back for adjustable fit **3.49**

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Here is a precision compass of unusual accuracy & dependability. Has a prismatic, hair-line guide for sighting at distant object and at same time reading degree of setting. Needle is jewel mounted. Has luminous dial for night use and canvas carrying case. **NEW 3.95**

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STRONG - LIGHTWEIGHT - NYLON FISHING LINE. ROT-PROOF AND WATERPROOF . . .
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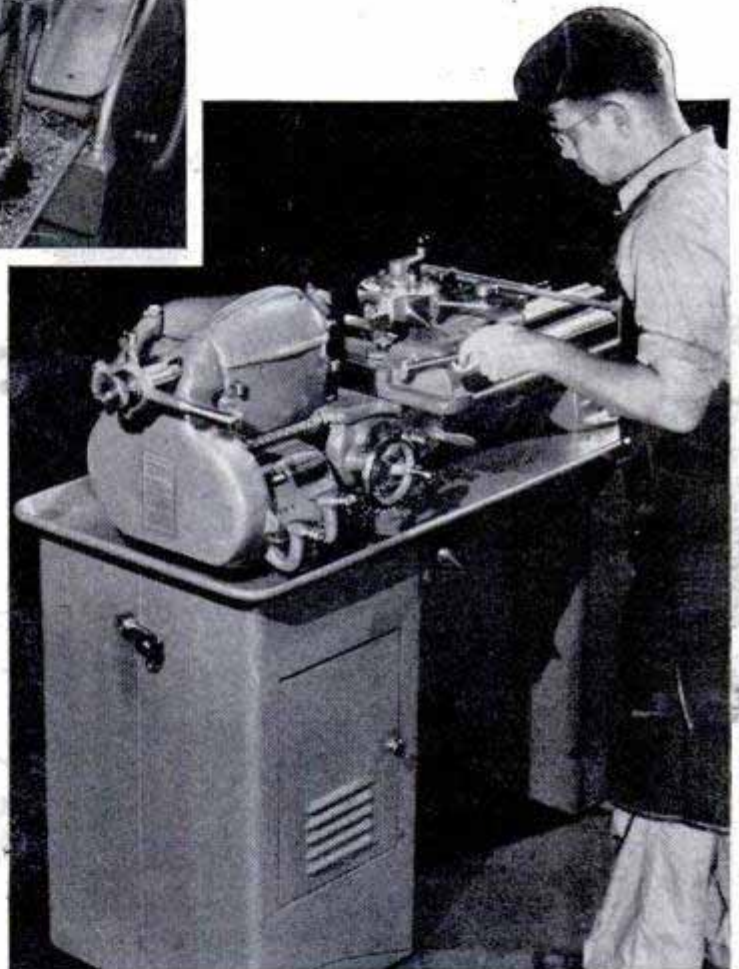
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South Bend 2-H Precision Turret Lathe—1" collet capacity, 16 1/4" swing, 96 power turret feeds, 48 cross slide feeds, 48 carriage feeds, 48 thread cutting feeds.

South Bend Precision Turret Lathes keep efficient the machining of small duplicate parts. Their remarkable accuracy and positive controls simplify the holding of close tolerances with only normal machine handling care. Finishes are commonly produced that otherwise would require additional operations. Simplicity of tooling makes job changes quick and economical. Wide ranges of power feeds and thread cutting feeds assure maximum efficiency on every job. They are particularly suited for second operations. Available in 3 sizes: 1" collet—16" swing; 1" collet—10" swing; 1/2" collet—9" swing.



South Bend CL930-Z Precision Turret Lathe—1/2" collet capacity, 9 1/4" swing, 48 carriage feeds, 48 thread cutting feeds, handlever cross slide, handlever turret.

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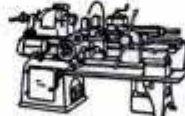
TOOLS & ATTACHMENTS



9" and 10" BENCH LATHES



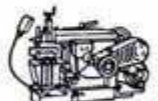
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1/2" and 1" Collet TURRET LATHES



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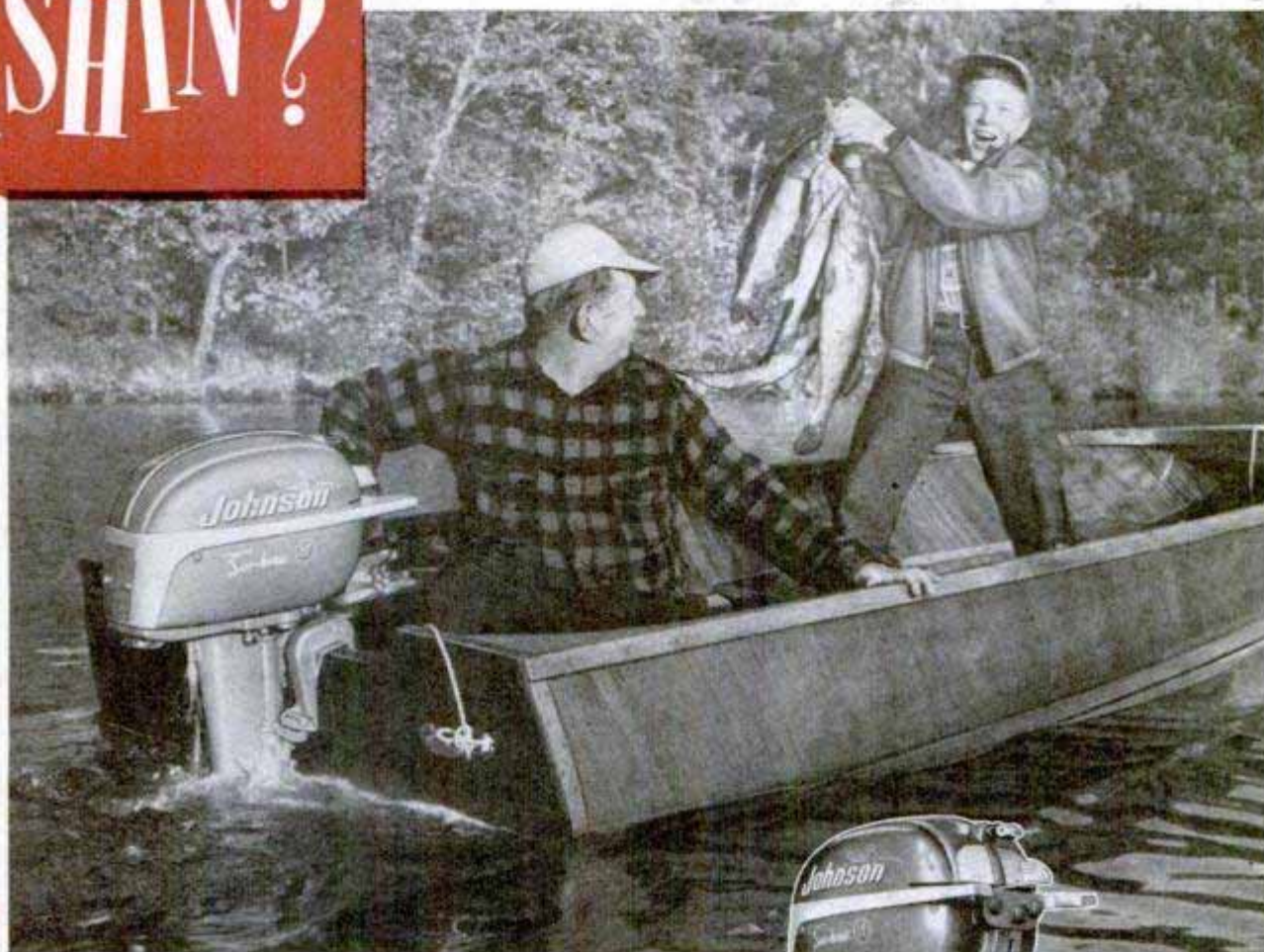
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OBC certified brake hp at 4000 rpm. *All prices f.o.b. factory, subject to change without notice.



SEA-HORSE
10

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SEA-HORSES

FOR DEPENDABILITY





These baseball stars pick
Camels

FOR FLAVOR
FOR MILDNESS



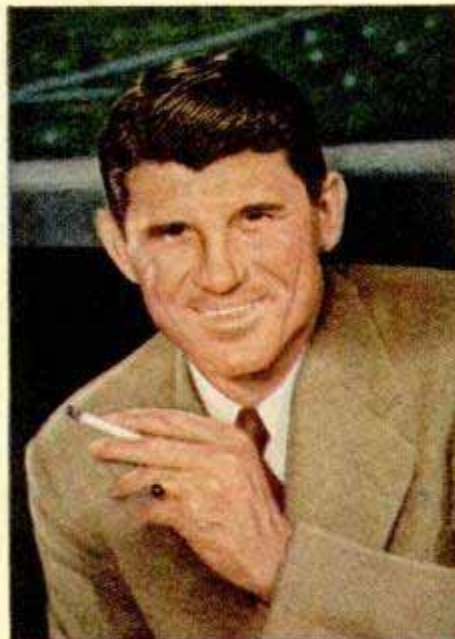
Ed Lopat Yankee 21-game winner has tried different cigarettes. Says Ed, "I picked Camels for mildness and flavor. No other cigarette gives me so much smoking pleasure!"



Early Wynn 20-game winner for the Indians is a Camel smoker, too. Early reports: "For steady smoking, my choice is Camels! They're mild and they taste great!"



Allie Reynolds Yankee pitcher of double "no-hit" fame. Allie stated, "I've smoked Camels a long time and I know how mild a cigarette can be! Camels taste great!"



"Preacher" Roe (22-3 in 1951) and other Dodgers—Carl Furillo, Clem Labine, Clyde King and Billy Cox—are Camel smokers. "We all agree on Camel mildness," says "Preach."

TEST FOR **MILDNESS**...TEST FOR **FLAVOR**...SEE WHY

CAMEL IS AMERICA'S MOST POPULAR CIGARETTE
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Smoke Camels for 30 straight days. See how flavorful Camels are, pack after pack... See how mild Camels are, how well they agree with your throat as you steady smoke. You'll know why Camel is by far America's most popular cigarette!

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Make your own sensible 30-Day Camel Mildness test in your "T-Zone"
—T for Throat...T for Taste

