

Indy Champs Foyt, Ward, Jones Preview '65 Race

POPULAR MECHANICS

MAY 1965
35 CENTS

Corvair Owners Report • How Good Are Corfam Shoes?

Unmasking Mars: What Our Flyby Will Prove

CAMPING FUN—26 pages: Clever New Outdoor Gear
Boating Cookery • Picnic Cooler Buyer's Guide • Parachute Tents



PM's Carry-All
CHUCK WAGON

FLEETSIDE PICKUP

Trim-lined Fleetsides come with 6½- or 8-ft bodies, and include such features as front and rear coil-spring suspensions, self-adjusting brakes and big 3-man cab. Larger body on tough ¾-ton chassis is the most popular camper choice. Four-wheel-drive is available for these models.

**STEPSIDE PICKUP**

Here are economical pickup models offered in the same range of body sizes and with the same features as the Fleetsides above. In addition, there's a big Stepside pickup with 9-ft. body on a tough 1-ton chassis — just the ticket for those who need extra room and ruggedness.

CARRYALL

Seats six with lots of luggage space in rear. Also available with seating for eight. Large double rear doors are offered in two styles — side opening or popular tailgate-liftgate type. Work-proved coil-spring suspensions, front and rear, smooth the miles away to let you arrive fresh and ready to go.

EL CAMINO

Here's the beauty queen of the Chevy line. Its versatility and good looks make it equally at home at a campsite or in a suburban driveway. Roomy 6½-ft. pickup box can carry over a half-ton of camping gear, or be fitted with special camper bodies such as the one illustrated at right.

For new vacation pleasure

Check the big Chevy choice in campers

What's the surest way to keep your camping vacation full of fun and free of headaches? Simple! Make a Chevy your way of traveling!

For variety in ways to travel and range of price tags to choose from, Chevrolet offers a real super-market of values. There are pickups with 6½-, 8- and 9-foot boxes to handle a wide range of camper bodies. Or you can put a unitized camper on one of the Chevy chassis-cabs. If you're headed for the back country, you can order 4-wheel-drive for most units.

Or, perhaps you like the new "traveling home" idea — roomy vans all fitted out with modern comforts and conveniences. You can choose a basic Chevy-Van body for custom fitting, or the big Step-Van fully equipped and ready to go. Either way gives luxurious traveling.

For carrying lots of people and equipment, and hauling a trailer, too, look at the versatile Carryall. You'll like its roominess and easy handling.

Pick a Chevy and you'll travel with comfort and confidence. Chevy chassis have proved their toughness and reliability in all kinds of demanding truck work. And you get a smooth ride that adds an extra dimension to your vacation pleasure.

With this big choice, and the Chevy reputation to back it up, you'll want to see your Chevrolet dealer soon. He'll be happy to give you a special camper brochure — or you can get one by writing to Chevrolet Division of General Motors, Detroit, Michigan 48202.



THE LONG STRONG LINE



STEP-VAN — This one's all new from Chevrolet. It gives mobile living at its luxurious best. Full stand-up head room, sleeping for four plus cooking and sanitary facilities. And you'll be pleasantly surprised at its low, low cost!



CHEVY-VAN — The roomy Chevy-Van is readily converted to provide handy cooking and sleeping facilities. Its 211-cu. ft. volume allows a variety of arrangements to suit individual preferences. Your Chevrolet dealer can give you full information about having such conversions done for you.



CHASSIS-CAB — Rugged Chevrolet chassis-cabs are offered in a range of wheelbases to fit many different sizes and styles of camper bodies. Big 3-man cab gives plenty of stretch-out room for comfortable traveling. Four-wheel-drive available for ½- and ¾-ton models.



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MAY 1965

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MAY 1965

VOL. 123 NO. 5

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INTERNATIONAL EDITIONS • AUSTRALIAN • SPANISH • CARIBBEAN • FRENCH • DUTCH

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NEXT MONTH: The vacation gold-rush is on, and June PM tells you how to join the nugget hunters. There's an owners' evaluation of pickup campers; a PM roundup on car air conditioners; a startling piece on our new inland missile range, a remarkable new crop forecaster and a variety of plans for building treehouses for junior

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Over the Editor's Desk

Glider Flight—40 Years Ago

You took me back 40 years when you printed the picture of the original *PM* glider in the January column, *Sidelights on Aviation* (page 26).

It was about 40 years ago that 12 of us—aged 10 to 14 years—built the glider out of bamboo fishing rods and muslin. We stiffened the muslin with rosin and gum arabic.

On one beautiful kite-flying day, we launched the glider by running into the wind. As I remember, we were able to get about 40 feet off the ground and travel about 200 feet.

In about a week, someone got the idea of running off the flat roof of a soap factory. We waited for a suitable Sunday when no one could catch us.

We drew straws to see who would go first. The boy got into it, and with the rest assisting ran off the roof. The soap factory had a tall chimney that was pumping out volumes of smoke, and he was caught in the updraft. I don't know how high he got, but to a 12-year-old it was a mile.

He had the presence of mind to head for the Wabash River. He went in with a mighty splash, and was hauled out wet and scared. The last we saw of the glider, it was floating down the Wabash.

That evening, ours was a group of chastened boys with very warm bottoms.

Our second glider four years later was of better construction and launched with rubber inner tubes.

Yes, out of the gang of a dozen, five are pilots or are otherwise connected with aviation.

Lafayette, Ind. A. L. McDOWELL

Thanks for sharing this delightful story of your first venture into aviation, Reader McDowell.

Do-It-Yourself Fire Truck

We've used this converted weapons carrier as a fire truck for a year and are very proud of its performance.

The conversion was done in my garage on my farm—mostly from about 3 a.m. until morning chore time. I stripped an old fire truck to get the water pump and other special parts.

Now we (the South Vienna-Harmony Township Fire Department) have a fire

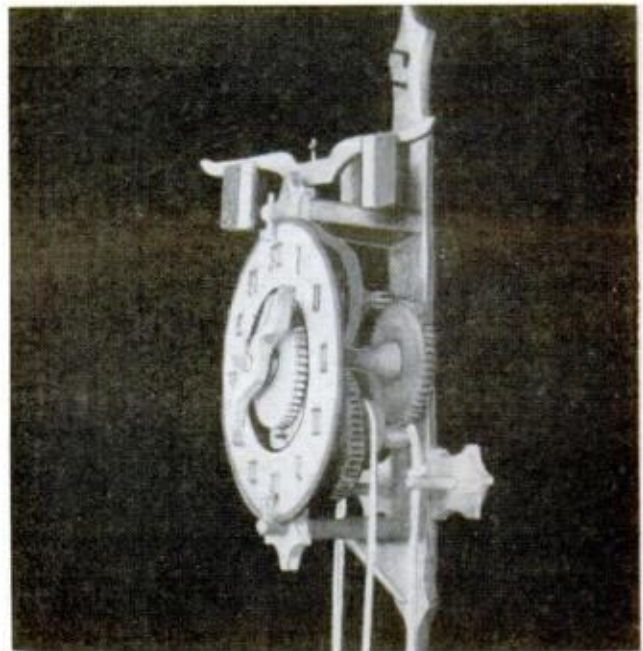


truck that can go across fields that other trucks can't cross to fight fires. It has a sprayer on the front that allows it to be driven through a grass fire, spraying the ground in front. A pressure hose on top throws a 100-foot stream of water.

South Charleston, Ohio LOWELL BALDWIN

Respects Old-Timers

Your clock project (*Early Swiss Wooden-Wheel Clock*, page 156, August *PM*) proved to be very interesting, and it furthered my respect for the early-day clockmakers.



It is also a challenge to present-day craftsmen, I might add.

I built two of the clocks—the first of mahogany (which proved to be too moisture absorbent) and the second of cherry. Wickenburg, Ariz. LOREN V. STONE

Two Feet Longer

My two sons (5 and 7 years old) and I built the *Hydro Dynamic* (page 144, March 1963 *PM*).

The hull is 15 feet, 11 inches long—which is longer than the original. Because of the extra 2 feet, I had room to put in back-to-

[\(Please turn to page 8\)](#)

Your study is illustrated with actual legal cases like these:



CONTRACTS Jensen wrote to Stone making an offer. Stone wrote his acceptance and mailed it. Then he decided to call it off and telegraphed Jensen to that effect. Jensen got the telegram before he received the letter. Can he hold Stone to the contract?

TRESPASS Gray sold Lewis an automobile which, at the time, was in Gray's garage, and told Lewis he could take it away any time within the next week. The following day, he notified Lewis to keep off his property. Nevertheless, Lewis went to Gray's garage and took the automobile. Is Lewis liable for trespassing?



CRIMINAL LAW Dane asked Ellis to lend him a dollar. Ellis gave him what they both supposed was a one-dollar bill. Dane later discovered that it was a ten-dollar bill, and he kept it for his own. Is he guilty of larceny?



SALES Hill made an offer to James, a farmer, of \$17 a ton for all the hay in his barns. James accepted the offer. The same night, the barns and all their contents were destroyed by fire. Who bears the loss of the hay?



TORTS Lloyd was a sales representative, and a very valuable man, employed by a leading company. He conceived a grudge against one of the company's bookkeepers, and threatened to leave the company unless the bookkeeper was discharged. Rather than lose Lloyd, the company fired the bookkeeper although it had no objection to him or his work. Has the bookkeeper a right of action against Lloyd?



PARTNERSHIPS Johnson and Mahon are partners in the hardware business. Johnson orders a small delivery truck from a local auto dealer. However, the hardware firm is engaged exclusively in a mail order business, selling only to out-of-town customers, and has no use for a delivery truck. Is the partnership liable for the price of the truck?



GOVERNMENT A city raises money by a tax on all real property in the city, then uses the money to build a public golf course in one extreme corner of the municipality where it is practically inaccessible to most of the citizens. Will this action be legally upheld?

DECEIT An insurance agent, in order to induce a man to take out a policy, told him that certain prominent men were members of the insurance company's board of directors. The policy was purchased because of that statement. In fact, the men were not directors of the company. The insured man could have discovered this by consulting public corporation records at the state capitol. May he maintain an action for deceit?



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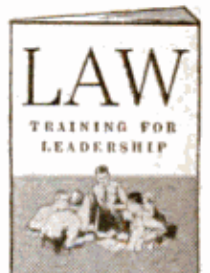
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Over the Editor's Desk

(Continued from page 6)



back seats which fold down to make two berths for overnight camping.

The boat is powered by a 45-hp engine, and performs very well.

Thank you for the good boat plans you have in *PM*.

Westminster, Calif.

BERT ANDERSON

What Kind Is It?

The response of people has been very gratifying toward the *Sidewalk Classic* (page 146, November 1963 *PM*) that I built for my children.

However, when they ask what kind of a car it is modeled after, I am at a loss to



answer. Some information about the year and the model would be appreciated.

North Providence, R.I.

N. T. LEPORE

It's really not modeled after one particular car. Designer Bob Woolson simply took the lines from several old-time autos and incorporated them into the Sidewalk Classic. (And rather successfully, too, judging from the number of letters and pictures we've received from pleased builders.)

The Editors

POPULAR MECHANICS

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In flavor, the milk is reported to be "virtually indistinguishable" from the usual pasteurized product. Because of marketing regulations, the milk has yet to be sold in Britain. But the company has been exporting it and selling it to steamship lines.

Satellites have finally enabled science to pinpoint the exact location of Bermuda—over 400 years after its discovery. By sighting the Echo I and II satellites against their star background, the Coast and Geodetic Survey has placed Bermuda 220 feet north and 105 feet west of the location determined by the Air Force in 1959.

A lunar "sea" has been found on earth. It's a 37-by-17 mile area near Sudbury, Ont., that was created in the same manner as a *mare* on the moon—by the impact of a large meteor, which melted rock and caused lava to flow.

The collision took place about 1.7 billion years ago, it's estimated, and it produced energy equal to the explosion of seven million megatons of TNT. By comparison, the largest hydrogen bombs are rated at less than 100 megatons.

The smooth, bowl-like depression is the site of a \$500-million-a-year Canadian nickel mining operation.

Don't underestimate the inner strength of the poet and dreamer. That's one conclusion that can be drawn from the results of a recent New York University study of the effects of isolation on human beings. Subjects spent from four to 72 hours in a soundless room, with vision cut off and

movement restricted.

"The Jack Armstrong, athletic, square-jawed type" tended to go to pieces when cut off from his normal environment, report the psychologists who directed the study. The "poet" type, the more imaginative and introspective person, showed much more stability.

Ten words will enable an astronaut outside of his spaceship to control his personal rocket pack; the pack will contain gas under pressure and nozzles to spurt it in different directions. Because the astronaut will be using tools (coupling space stations, making repairs), his hands won't be free to push buttons or work levers. So U.S. space engineers have developed a device that converts the sound of a spoken word into an electronic signal. It's thought that 10 such signals would be needed to steer a rocket pack.

Oranges can now be stored for as long as eight months. After being harvested, the oranges are put in a cold, low-oxygen atmosphere that prevents respiration of the fruit and so retards spoilage. So says the developer of the new system, one of our large appliance manufacturers.

Shrink the earth by about 45 percent in volume and South America would fit snugly against Africa, like two pieces of a picture puzzle. North America, Greenland and Europe would match up, too.

This fact has long given rise to scientific speculations. A recent one, by British physicist K. M. Creer, ties in with a theory of an expanding earth. If, says the scientist, the earth was once about 55 percent its present size and wholly covered by land, and if it then ballooned to its present size, the broken pieces of land mass would have shaped up just about the way they are now. Source of the tremendous energy needed to have caused this, however, is a mystery.

Laundered oil is big business. The industry came into being after the National Bureau of Standards determined that crankcase oil doesn't wear out; it only gets dirty. Today, member firms of the Association of Petroleum Re-refiners turn out some 400 million quarts of reprocessed oil a year. Some sports-car buffs prefer it, regarding it as a purer oil than the original product. In reprocessing, the oil is cleaned chemically and put through special filters.

Bidrin, a chemical that's injected into elm trees to poison the bark-eating elm

(Please turn to page 12)

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Science Worldwide

(Continued from page 10)

beetle, has been approved by the Department of Agriculture for use by professionals; it's too toxic to be sold to the public. Killing the beetle is effective because the insect carries, from tree to tree, the fungus that causes the disease. But if you read the April, 1964, issue of *PM*, none of this is news to you. Fighting Dutch elm disease with Bidrin was described in an article called *We Can Save Our Elms* (page 122).

The meteorological climate in Washington has been a changeable affair during the last 100,000 years. Right under the White House (where the political climate changes often enough) are the remains of a swamp where Labrador-type trees grew some 70,000 years ago.

Grains of pollen identify the trees and radioactive carbon dating tells when they grew, according to the U.S. Geological Survey. It was cold along the Potomac then, although the glaciers didn't get quite that far south. A few thousand years earlier, there were warm-country cypress swamps. And a few thousand years after the long cold snap, it was again

much warmer than now.

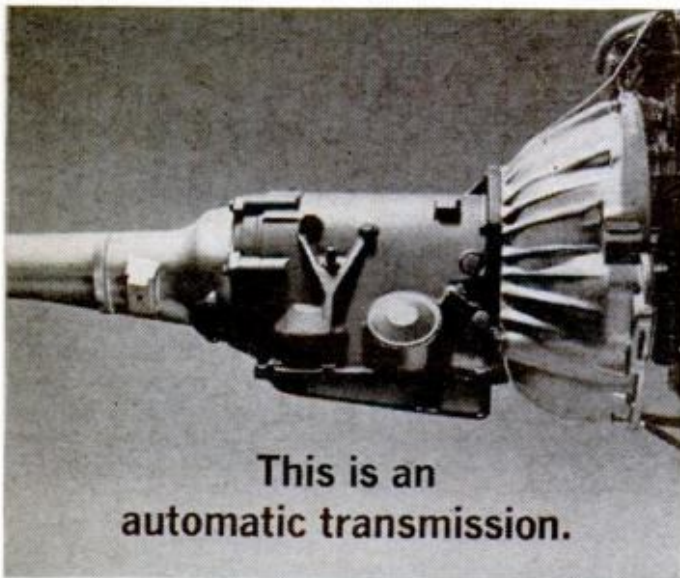
A shrimp's world is mostly blue. That fact was recently established by a scientist at the Scripps Institution in California. A lobster, on the other hand, sees green. The researcher pinpointed these colors by isolating light-sensitive pigments in the eyes of the sea creatures.

Is there life on Mars? That question has long intrigued scientists, among them Judie Herr, a science fair winner and freshman at Florida State. She has spent six years probing it.

Judie took a common moss and painstakingly made it adapt to a "Martian" climate. She introduced minute changes in the nitrogen and moisture content in the flask containing the plant until it was living in an atmosphere similar to that thought to exist on Mars.

This summer Judie and other scientists interested in Mars may be able to check the results of their experiments against brand-new findings sent back to us by Mariner IV. This ambitious space investigation is described in *Unmasking Mars: What Our Flyby Will Show*. You'll find it on page 78 of this issue.

(Please turn to page 16)



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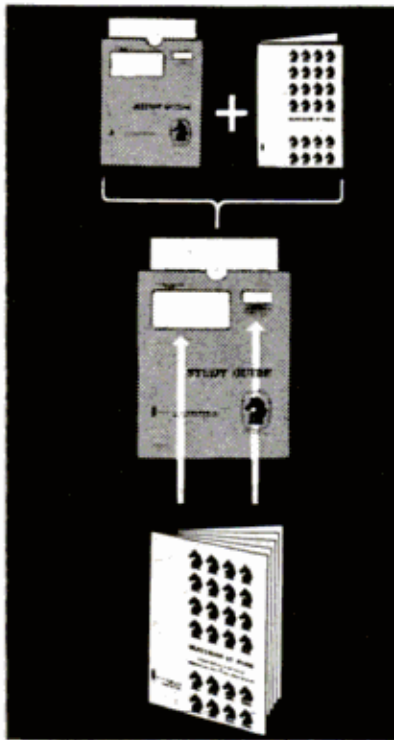
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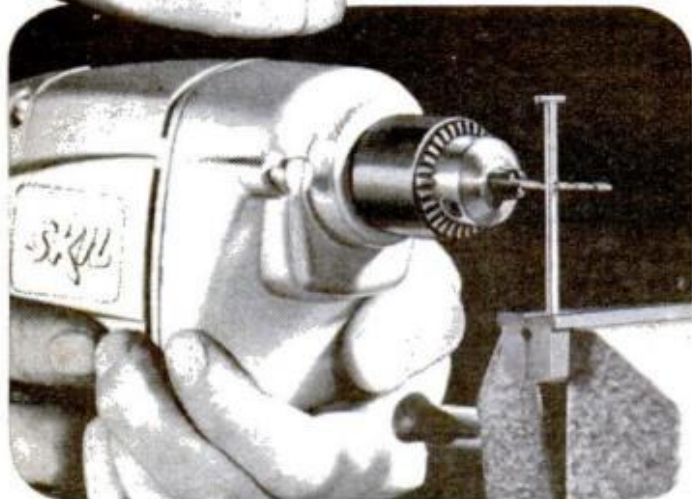
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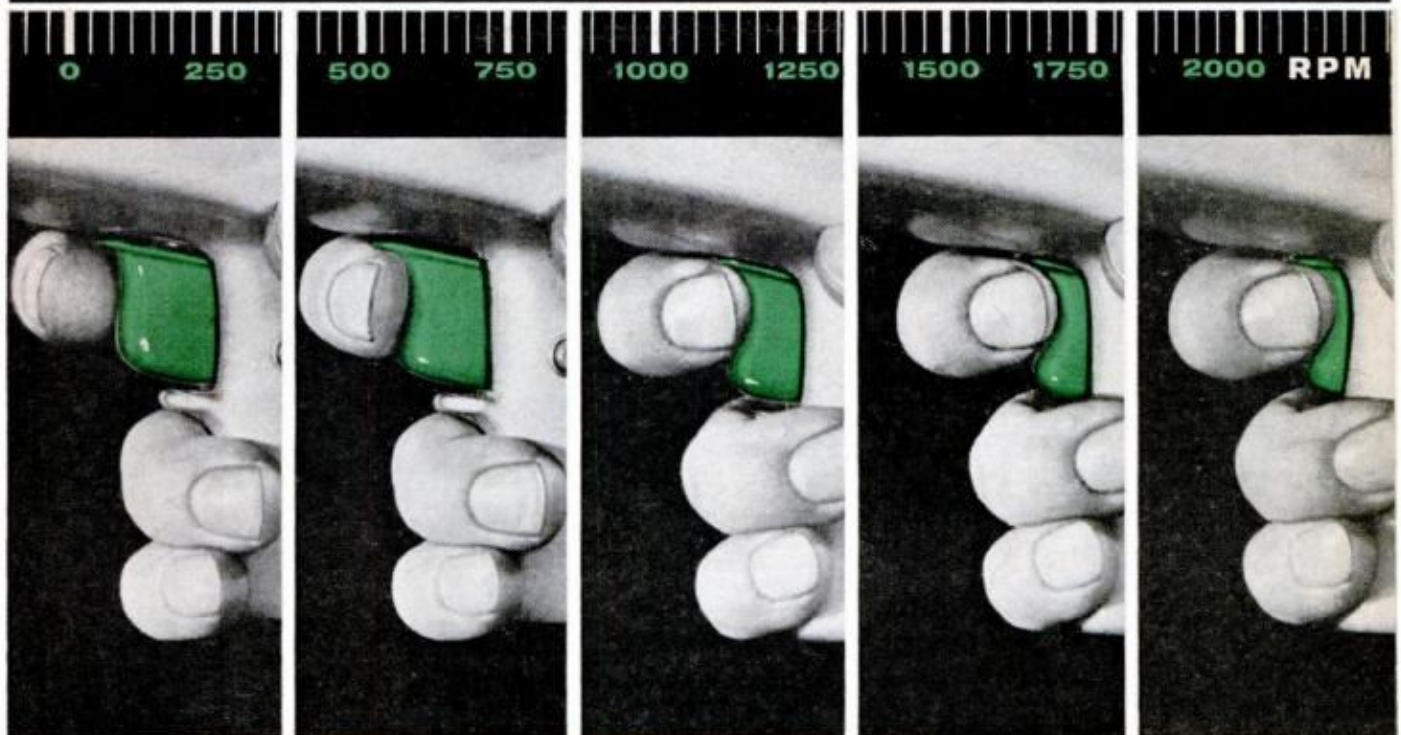
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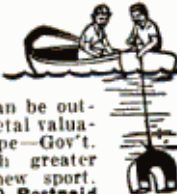


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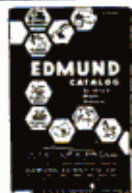


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Science Worldwide

(Continued from page 12)

High-school students tend to think they're smarter than they actually are, according to a study recently completed by the Russell Sage Foundation. Girls tend to rate themselves less bright than boys, though they may be equal or better, and "in their negotiations with the opposite sex are careful to play down any intellectual challenge."

A big food producer—Thomas J. Lipton, Inc.—has confirmed that it is experimenting with the use of radiation to soften vegetables for its dehydrated soups. Main advantage would be cutting the cooking time from 10 minutes to one. For more information on irradiated foods, read *Wonderful World of Irradiated Miracles* (page 85 March '65 PM).

The ability to produce an exact copy of the atmosphere of the sun has come close to realization at the University of California.

Physicists there have invented an easily controlled method of heating up a quart volume of gas to the temperature of the sun's atmosphere. By adding a whiff of this and a whiff of that to the superheated gas, they hope to make the light it gives off match precisely that of the sun.

If the artificial light is a perfect match, under spectroscopic analysis, then they will figure their gas mix is the same as the sun's.

Special trousers that attach to the seat of a car offer good protection to a child. That's the claim of the Dutch safety expert who designed them. He says the pants permit the child to sit or stand, but prevent his being thrown forward in a head-on collision.

The secret of good mixing—whether you're working with paint, milkshakes or cake batter—is to tip the bowl or container. That way, says a professor of chemical engineering at Purdue University, you get vertical currents in addition to the usual circular stirring motion. The mixing will be done faster and with less effort.

To blend coffee, cream and sugar faster, according to the Purdue scientist, you should move the spoon back and forth across the cup instead of round and round.

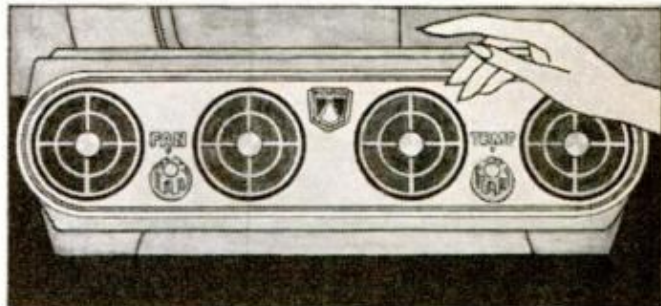
John F. Pearson
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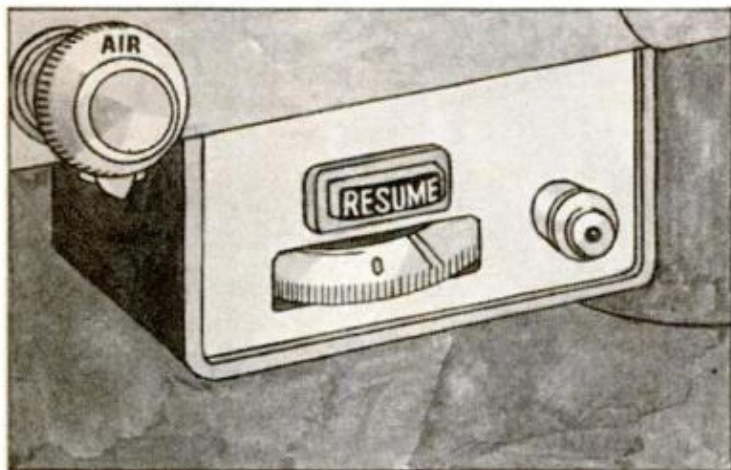
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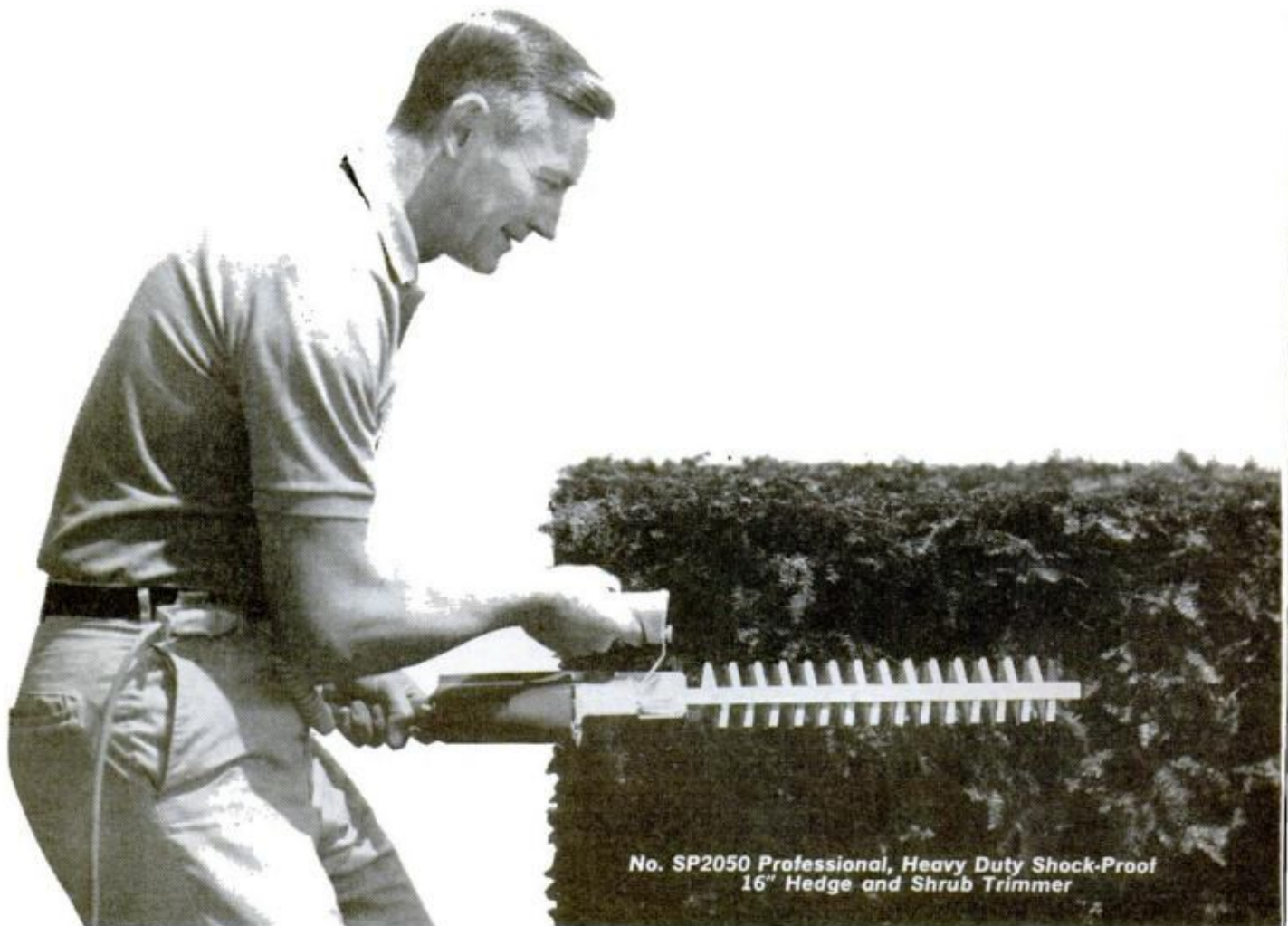


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Sidelights from the SERVICES

By William R. Kreh

Flip-top beer cans are helping Navy scientists date undersea deposits off Baja California. It works this way: People in Baja California get all their beer in cans because of the rugged roads over which it has to be transported. The scientists know that the flip-top can first appeared in the Cape San Lucas area a year ago. In recent dives in the Cousteau diving saucer, the scientists found flip-top cans buried under two inches of sediment.

This means, they say, that sediment is building up in the area at the rate of two inches a year and they claim the cans give them a better dating method than fossils or carbon 14 tests have in the past.

They can thank the Mexican fishermen who threw their beer cans overboard for the new science which has now been tagged "beerography."

An "impossible" job has been accomplished by the Army. It has developed a computer which generates Chinese characters from a keyboard and puts them on film for photo-offset printing. Until this, all Chinese printing had to be set by hand.

Pressed for time in a section of Vietnam about to be attacked by enemy guerrillas, an Air Force sergeant used his flashlight to get a disabled C-123 plane back into the air. S./Sgt. George H. Kirby found the aircraft had suffered a crack in a control brush block, preventing the propeller from operating properly.

With darkness approaching and guerrillas on the prowl, Kirby came up with a quick solution. He extracted the carbon core from a flashlight battery and fashioned it into a serviceable brush. Installed quickly, the makeshift item enabled the C-123 to take off and return to its home base.

Air Force scientist Edmond Dewan, Cambridge Research Laboratories, Mass., has learned to control his brain's electrical signals and says they can be hooked to machines so persons completely paralyzed could communicate.

An air gun originally designed to pitch baseballs for practicing batters is giving the Air Force clues as to which munitions are most effective for jungle warfare. The

(Please turn to page 30)

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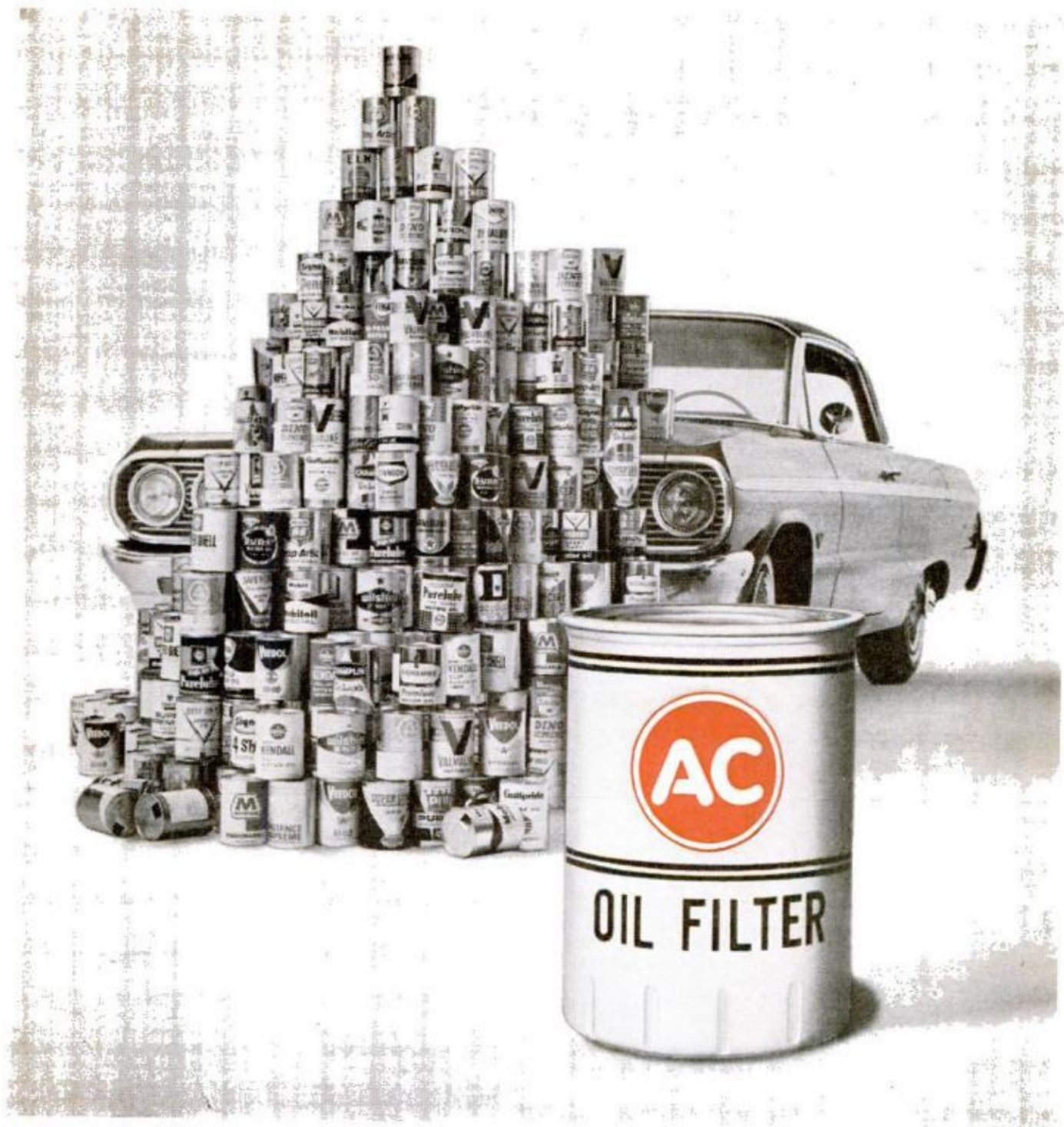
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Sidelights from the Services

(Continued from page 28)

Air Proving Center at Eglin AFB, Fla., has set up a jungle test range. It is testing air-delivered munitions against targets ranging from dense growth to simulated lakes, desert areas and hard-surface runways. The idea is to see which weapons are most effective against an enemy hidden in the jungle or set up in small clearings.

Instead of actually delivering the munitions by plane, the Center puts them on target from a 150-foot tower, using the pneumatic "pitching machine." The gun, which has also been used by forest rangers to break up potential avalanches in mountain regions, works with compressed air and lobbs in the munitions at the same speed and angle that aircraft would deliver them.



The Sprint, Army's new anti-missile missile leaves its underground cell the same way Polaris missiles are forced to the sea's surface—by a "hot gas generator" which creates pressure to pop the missile out like a dart from a blowgun. The missile's own propulsion system takes over once it's airborne.



Remote steering is possible on the Coast Guard's newest ship, the cutter *Reliance*. A little portable wheel that looks like a clock with a knob on its face is what does the trick. It's on an electrical cord that permits the skipper to handle his ship by hand from any point in the navigation area. This is especially valuable when navigating through tight places where vision may be blocked from the center of the ship's bridge.

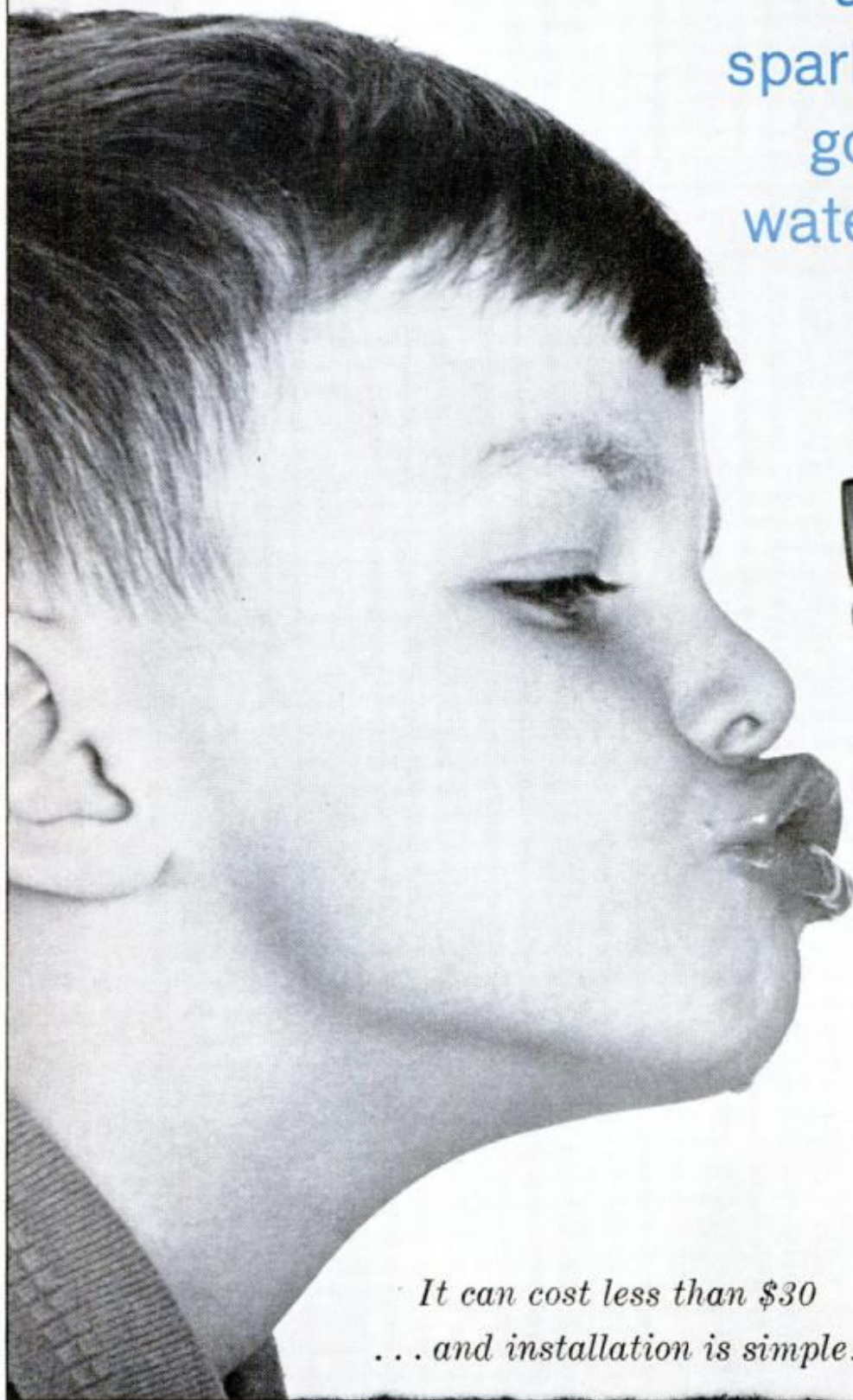


The leech battle in Vietnam and other jungle areas may have been won by the Army. Twenty volunteer GIs recently took part in a bloodletting which the Army says may lead to an effective repellent against leeches. The proposed repellent is brownish yellow, almost odorless and has a lanolin base. It was developed by the Army's Limited War Laboratory for use in Vietnam. During the rainy season, the giant leeches attack troops as they crawl through the jungles and mush through the swamps and rice paddies.

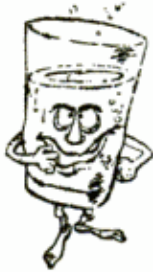
The volunteers let the blood suckers attack their skin as various compounds were tested. One captured for the testing was about 14 inches long. More testing is needed, but Army officials feel victory is in sight. The next rainy season in the delta region of Vietnam begins in May and the leeches may be in for a surprise they weren't expecting.

HOW TO GET GOOD WATER!

you can
give your family
all the pure,
sparkling clean,
good-tasting
water they can
ever use!



*It can cost less than \$30
... and installation is simple!*



CHLORINE — very necessary to kill bacteria. Awful to drink. Ruins coffee, mixed drinks and makes ice cubes cloudy and mushy. Easy to remove with an Aqua-Pure Taste and Odor filter.



SULPHUR — caused by hydrogen sulphide gas dissolved in water. "Rotten egg" taste and odor. Harmless—but distasteful in the extreme. Also easy to remove with the Aqua-Pure activated carbon Taste and Odor filter.



TANNIC ACID—water is brownish, has acidic taste. Caused by leaves, tree roots in contact with water. In excessive amounts, can be used to tan leather. In your drinking water amounts are usually harmless — but distasteful. Easily removed.



RUST — caused by old pipes — or — iron in solution that has been oxidized by chlorine. Ruins laundry, unpleasant to drink, clogs hot water heaters. Easily removed with an Aqua-Pure sediment filter.



DIRT — The list is endless! Sand, decayed vegetable matter, algae or "green slime" or other solids abound in ordinary drinking water. An Aqua-Pure sediment filter will often remove a pound or more of this dirt from the average home every month or so.



WORMS — Sounds like "scare" stuff, but small, thread-like nematodes live in the soil almost everywhere. These "worms" get into water, and you drink them. Easily removed with an Aqua-Pure sediment filter.



BACTERIA—if you have your own well, you have to worry about actual contamination of water, too. A low cost Aqua-Pure chlorine feeder is the simplest, most effective solution.

What's wrong with your water?

Is it safe? Is it clean? Is it good?



If you answer "yes" to these three questions . . . you are either very lucky . . . or . . . you haven't checked into your water supply lately.

City dwellers can be fairly certain about "safe" water. Municipal treatment plants use chlorine to kill bacteria.

But really *good-tasting* water, and really *clean* water . . . are rare. And, if you have your own well (pond or cistern), you'd better check safety, too. Wells can become contaminated overnight.

Over 18,000 different combinations of water problems have been identified in this country. About the only thing researchers haven't found is a plentiful supply of naturally *good* water.

This color panel at left shows a few of the more common problems. The chances are about 7 in 10 that you have at least one of these conditions right now, and in a degree severe enough to require action.

Is this "scare" talk? Not at all. Unless you are now drinking contaminated water, none of these common problems puts your family in actual danger. They just cause irritating inconveniences . . . and prevent you from enjoying some of life's basic pleasures.

Take bad-tasting, bad-smelling water, for example. You can get used to it. You might even forget what good water tastes like. Most people do, unless the taste is awful. But it'll ruin your coffee and food and wreck a mixed drink. And it's a poor excuse for satisfaction when you're thirsty.

Or take rusty, dirty water. You can learn to live with dingy laundry, rust-stained toilet bowl and sinks, sediment filled hot water tanks, and flat, lifeless drinking water. But . . . why should you?

You can even get used to contaminated water. Your body will sometimes adapt, and you might not even get sick. But . . . don't invite a guest to spend a weekend!

On the national scale, water problems are not getting better, but worse. Fortunately, the individual home owner *can* do something about them, and the answers are simple and inexpensive.

What can you do about it?



Fix it! A home water system is a lot easier to understand than an automobile or a vacuum cleaner. You can solve most water problems with just three simple low cost products.

Taste and Odor

Your problems may be excess chlorine, hydrogen sulphide, flatness, tannic acid — or what have you.

Your one best answer is a special Aqua-Pure filter that fits neatly under your kitchen sink to remove bad tastes or odors from the thousands of gallons of cooking or drinking water your family uses yearly.

It has thousands of tiny activated carbon crystals encased in a cartridge of unique design. These carbon particles have millions of active surfaces that reach out and grab taste-spoiling gases.

Once installed, you'll change cartridges once or twice a year—when water starts tasting bad again. That's all there is to it.

Dirt

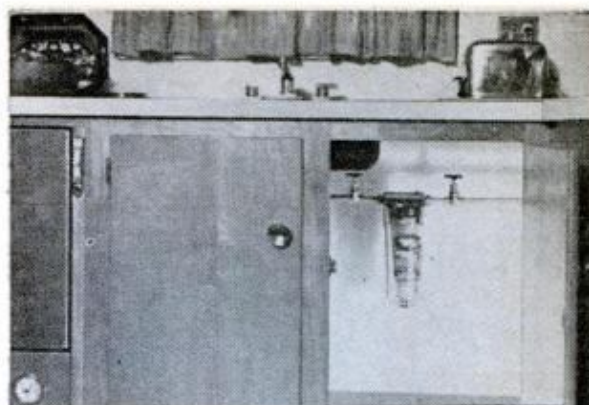
Another Aqua-Pure filter, installed in any convenient location on your main water line, filters out rust particles, algae, worms, sand, bits of organic matter, and all other solid contaminants down to 5-microns in size.

When you change cartridges — three or four times a year, usually—you'll hold your nose. "How", you'll wonder, "did I ever drink water containing that!"

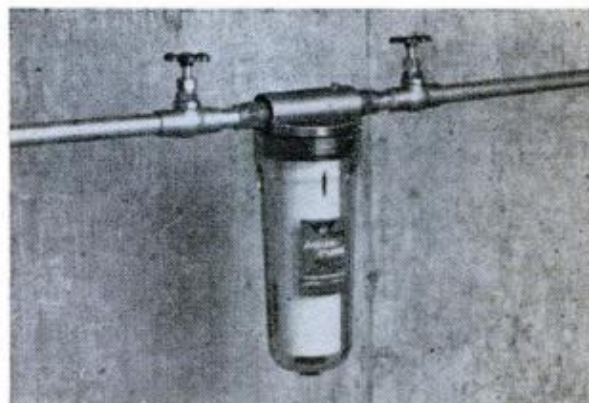
This filter will remove up to a *pound* of dirt and slime between changes.

Bacteria

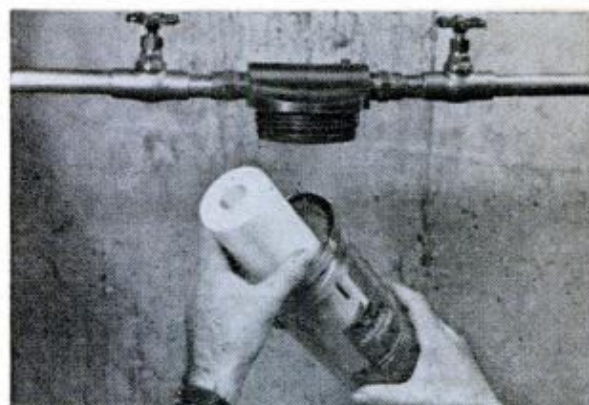
The Aqua-Pure chlorine feeder is a *must*, for well owners. It takes the place of the city dweller's municipal water plant . . . gives you a low-cost insurance policy against bacteria. See the following page for details.



Taste and Odor filter fits on cold water line under your kitchen sink. Activated carbon particles remove excess chlorine, sulphur, and other bad tastes or odors.



Sediment filter goes on your main cold water line. The filter has a $\frac{3}{4}$ " pipe thread. A stop valve on each side allows pressure to be cut off during cartridge changes.



Cartridge replacement is a two-minute job. You close both stop valves, drain pressure by pressing red button on filter, unscrew sump, and insert new cartridge.



Replacement cartridges. The white cartridge, left, traps solid particles. The activated carbon cartridge, right, gives good-tasting water. Carbon particles are encased in a unique polyethylene shell.

USE WELL WATER? POND OR CISTERN WATER?

Then you've got to be your own water engineer ...here's how

You can duplicate the work done by a million dollar municipal water treatment plant — for a cost ranging from \$59.95 to a top of \$119.85.

The \$59.95 price tag gives your family basic protection from bacterial contamination — a "must" for any private well. Here's how it works:

The Aqua-Pure Chlorine Feeder



Municipal water plants use chlorine to kill bacteria. Your well needs chlorine too — unless you're prepared to make a bacterial analysis every few days.

Aqua-Pure chlorine treatment isn't a complicated process. Your chlorine source is low cost, readily available laundry bleach — greatly diluted before being metered into your water.

The Aqua-Pure chlorine feeder is a small, simple metering device which connects to your water line just behind the pump. It is factory-set to inject just the right amount of dilute bleach into your entire water supply.

You wire the Aqua-Pure chlorine feeder directly to your pump's pressure switch — so it'll operate only when the pump operates. This means that every drop of water gets an equal amount of chlorine — with never an overdose.

The Aqua-Pure Chlorine Feeder puts you on a par with the city dweller. You've got water that's "safe" to use — but not necessarily clean or good.

The Aqua-Pure Sediment Filter

For \$29.95 you can get cleaner water than any city water plant delivers. You connect this filter just after your pressure tank, where it'll filter out the precipitated iron — as well as sand, algae, worms, bits of organic matter, and rust. Water from this filter really sparkles!

The Aqua-Pure Taste and Odor Filter

Your water may be pure and sparkling clean — but still bad-tasting. The Aqua-Pure Taste and Odor filter will put the finishing touch on your water system.

This is the Aqua-Pure unit you'll really enjoy! Cost? Only \$29.95.

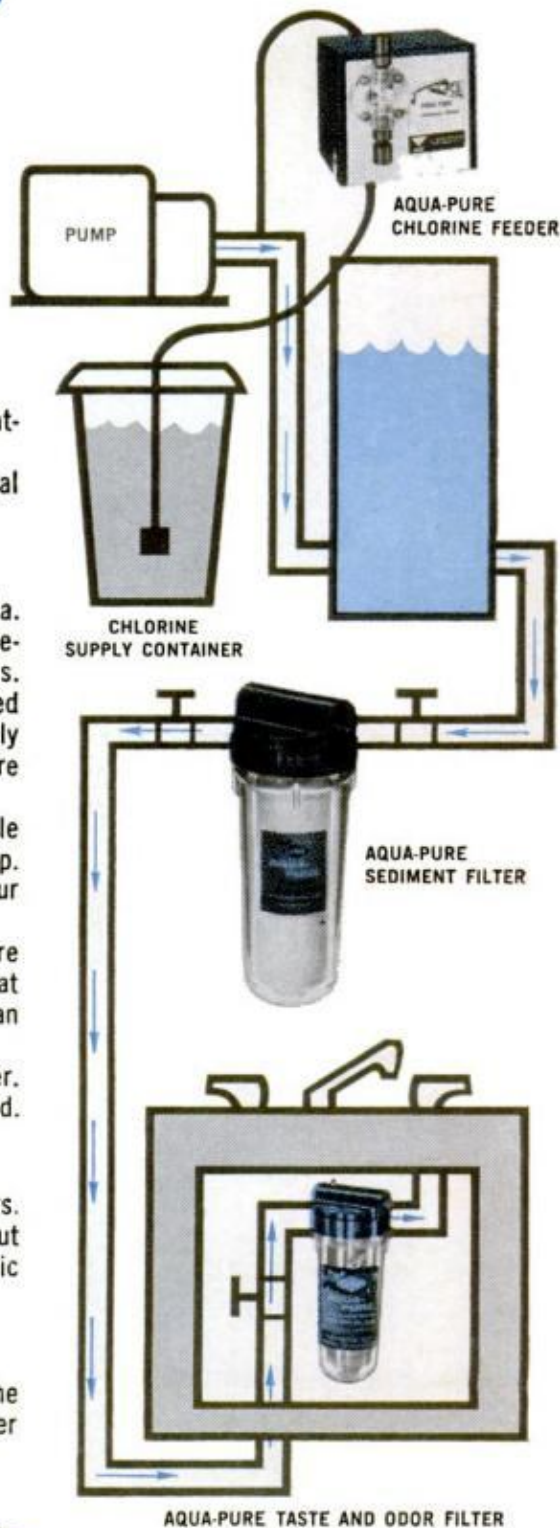
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Sidelights on
AVIATION

Flying submarines, now seriously under study by the U.S. Navy, may raise a few eyebrows around the country, but the news is turning down the corners of one man's mouth. He's Donald Reid of Asbury Park, N.J., and he's been working on one for 10



ARTIST'S SKETCH of flying sub proposed by Convair

years without getting any official attention. Convair Division of General Dynamics Corp., which got the \$36,000 government study contract, has designed a three-engine model.

Reid, who has gone through 20 models



ACTUAL MODEL of flying sub built by Donald Reid

using his own money, is working toward a "flub" that would use one jet engine for both flying and underwater propulsion.

The last five models have been man-size, and his son, Bruce, has been his chief test pilot. Bruce has had the flub in the air on short, straight-ahead flights, and underwater for short periods. This summer they hope to put the two together and take off from water, land and submerge.

The current model is a mongrel scrounged mostly from parts of crashed airplanes. It has a 65-hp Lycoming engine with propeller mounted above the fuselage/hull for flying and an electric-powered screw for underwater propulsion.

Reid says he was laughed out of Washington when he proposed such a vehicle to the Navy 10 years ago. "Now," he says, "I'll just finish it and give it to the Air Force."

Kevin V. Brown
Aviation Editor



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Take Charge of Your **CAREER**

By Richard Dunlop

TRAINED AUTO MECHANICS may not be quite as scarce as hen's teeth, but any motorist knows they are in short supply. This spring Chrysler Corp. dealers, acting with Federal Government support, are recruiting apprentices for a new program of mechanic training. Both young men and older men displaced by automation are being accepted.

"With the number of cars in use now approaching 72 million, the need for trained mechanics is growing every day," explains Chrysler president, Lynn Townsend.

The trainees will work in Chrysler garages for up to three years as apprentice mechanics at apprentice wages. Two nights a week for one year they will receive formal instruction in auto maintenance and repair at approved training centers in high schools or junior colleges near their place of work. Their on-the-job training will continue until they pass all requirements for skilled automotive technicians. Chrysler intends to offer the program first in the Detroit, Cleveland, Pittsburgh and Cincinnati regions. If you're interested, ask your local Chrysler dealer to let you know when things are ready to roll in your area.

Avoiding "Silent Firing" Industries

"Silent firings" are spreading among clerical jobs. The very expression has an ominous ring to it, for it refers not to people who are being discharged, but to people who would have been hired except for automation. Companies affected simply wait until an employee retires, is promoted or goes elsewhere, and then do not replace him. According to a Labor Department Bulletin, office workers doing sorting, routing, classifying, filing, posting, checking and maintaining records are the most likely ghosts-to-be.

The electronic data processing which displaces them is currently concentrated in firms manufacturing transportation and electrical equipment, in insurance and finance companies, and in government agencies, chiefly Federal.

As more computers are programmed electronically, even keypunch operators are no longer needed. Despite this, operators who have lost their jobs usually find no difficulty in getting keypunch jobs else-

where, and the demand for keypunch operators is still growing and will continue to grow. The reason? Many businesses, particularly smaller ones, find that they do not need electronic programming and actually prefer card programming.

Automation Loses a Round

In some industries there is a swing back from automation. Phelps-Terkel operates six clothing stores in the Los Angeles area. Some time back it introduced a punch-card accounting system to speed up the sending of bills to its customers. Then, with their recent statements, customers received a machine card with this note:

"You are holding the last punched card you'll ever receive from Phelps-Terkel. We've tried to make our peace with automation. But it hasn't worked. Ours is just not a machine business. Consequently, we are reverting to our slightly archaic yet highly personalized accounting methods. We think you'll like our new/old billing method better. We know we will."

On the back of the card was the wry note. "Please fold, bend, mutilate and staple."

President Dave Phelps reported that he received an eloquent reply from one customer. "Thank God for people," he wrote. Amen, we say.

Opportunities This Summer

Summer jobs at the New York World's Fair are open to young adults 18 years old or older. Exhibitors are hiring stock handlers, guides, waiters and all-around helpers. For information write to World's Fair Placement Center, New York State Employment Service, 48-09 108th St., Corona, L.I., N.Y. 11368.

Students at least 17 years old may also apply for summer jobs in Washington working for the government. It is hot along the Potomac in the summer, but summer "apprentices" who replace vacationing government employees have the chance to see their government from the inside out and obtain experience which can help them land a permanent job later on. Jobs require clerk-typist examinations and include general office work, mail clerks, messengers, typists and secretaries.

After you have gained your civil-service rating through your local Federal office, write directly to the personnel manager of the department or agency of your choice in Washington.

Father and Son Compete for Success

Grant Lawson at 52 years of age was the father of 18 children. He had been a wire-puller at Reynolds Metal Company's Dix-

(Please turn to page 38)

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REO RELIABLES
—the powerful performers

Take Charge of Your Career

(Continued from page 36)

on, Ill., plant for 17 years. Then Reynolds pulled the plant out of Dixon. Lawson had 20 mouths to feed and no job in a town where 1,125 other people were also out of work. Lawson and his 18-year-old son, Dale, both went to the State of Illinois Employment Office at nearby Rock Falls looking for work, but there was no work to be had without retraining.

Both Lawsons enrolled in their state's Dixon retraining program, which taught them maintenance skills and the psychology of mentally retarded patients. Father and son competed with one another throughout the 12-week course to see which one could get the best grades. Then they took the civil service exam required for jobs at Dixon State School. Both passed, but Grant scored three points higher than did his son Dale, an achievement for which he is most grateful. Today father and son maintain the equipment in the school and help retarded children take their first steps along the road which may some day bring them independence.

In Illinois towns which have been hit by plant relocations, the State is also retraining out-of-work men as auto body repairmen, service station attendants, auto mechanics, bookkeepers, farm mechanics, building maintenance men, television and washing machine servicemen, welders and nurserymen. If you would like a free list of schools offering courses in these technical specialties, drop a postcard to the Careers Editor, *Popular Mechanics*, 575 Lexington Ave., New York 10022.

Artistic Crime Buster

Richard Bingham, a 27-year-old regional planner for the St. Clair County Regional Planning Commission at Port Huron, Mich., has always "found himself picking up a drawing pencil." When he was a student at Port Huron Junior College, he drew "The Skipper," the cartoon symbol of the school. He took a course in architectural drawing and designing through the International Correspondence Schools, Scranton, Pa., to help advance himself on the job, and soon became a part-time member of area crime-busting teams. First the Port Huron police and then the FBI asked him to use his new skill in drawing composite portraits of wanted criminals based upon witnesses' descriptions. In his spare time, Bingham helps track down bank robbers and holdup men.

That's one way to add spice to your career. Maybe some of you have other examples PM readers would enjoy hearing about? If so, write us. ★★★

FAVORITES AT INDY:



A. J. Foyt... Rodger Ward... and friend

Foyt and Ward will again be riding the "Tiger" for history in the Indianapolis 500 this year. Each has won the Memorial Day Classic twice before—Foyt in '61 and '64, Ward in '59 and '62—and each will be driving with motor oil and Special Racing Fuels supplied by Humble to help him capture the legendary three-time win.

Take a tip from the champs and put a Tiger in *your* tank—with High-energy Esso Extra gasoline—at the sign of **Happy Motoring!**

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CLINIC FOR HOMEOWNERS

Q From time to time, we've noticed a disagreeable odor in our new bathroom. We have a septic tank. Plumbers we've called in say there is nothing wrong with the installation. But still the odor recurs intermittently. We're at a loss to account for it. Can you?—N.M., Ky.

A If your plumber says the installation has been made properly we assume the installation is properly trapped, that the septic tank and system are adequately vented, that all joints in the disposal plumbing are tight and that all traps are clear of obstruction. If so, it is difficult to even guess which of many possible defects is causing the odor. For example, a pin-point leak, in the disposal system (soil pipe) may permit gas to escape, yet not show as a water leak. This seems unlikely, but has happened. Another possibility is a partially or wholly clogged vent due to some object having been dropped into it. This too, is more or less unlikely but has occurred. On some occasions intermittent bathroom odors have been traced to gases from the vent, which, under certain atmospheric conditions, may drift into the bathroom through an open window before dissipating. With this in mind, we suggest you have the system checked again.

Q Last summer I coated all my hand tools and several small circular saw blades with light oil, wrapped the metal parts in pieces of flannel and placed in drawers in my bench. Later, in the fall, I found rust spots on many of the metal parts, especially on chisel and saw blades. Why did the tools rust in the first place, and why only in spots?—S.L., Fla.

A Yours is a common problem, especially in a humid climate. Oil cannot protect from moisture when it rubs off the surface or is absorbed by another material. This is what happened when you coated the tools with oil and then wrapped them in flannel. Some of the oil coating was absorbed into the fabric, or rubbed off in the handling, leaving certain areas of metal unprotected. Most fabrics will also absorb and retain moisture, especially in a drawer

or other enclosed area. Actually, you would have done better to coat the tools with a medium oil and leave them on top of the bench. Tools also can be protected against rust by coating with paste wax or with any of the clear spray coatings supplied in pressurized cans. But care must be taken when applying to cover all exposed metal. Tools so coated usually can be stored in drawers with little, if any, risk of damage, even during periods of high humidity. You must, of course, make sure the tools are clean and free of any oil before applying the protective coatings.

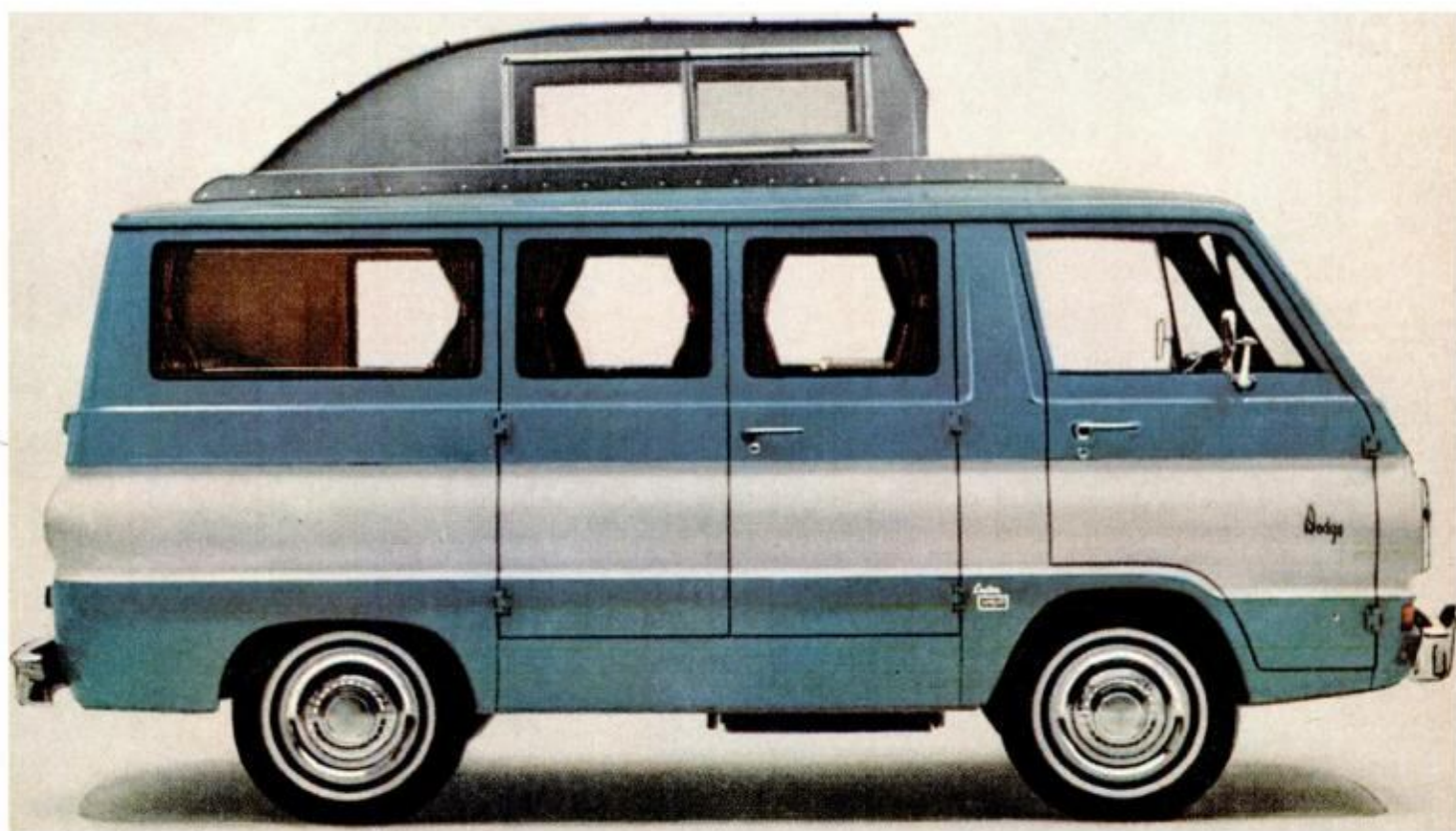
Q How does one drill small holes in plastered walls without chipping? I tried a hand drill with small twist bit but the plaster breaks away around the hole. In addition, the drill was ruined.—A.T., Md.

A The main reason the plaster chips or breaks away around the hole is that the plaster is not hard enough to prevent a slight wobbling of the drill, which enlarges the hole. The dulling of the drill is caused by the abrasive action of the plaster. Try using an ordinary nail as the drill. First, lay the point of the nail on an anvil and flatten it slightly by striking with a hammer. Then cut off the head and chuck it in your hand drill. Stick paper tape—or masking tape—to the wall over the point where the hole, or holes are to be drilled. Mark the location of the hole with pencil, then after the nail-point drill is started, use just enough pressure to keep it cutting. The "drill" will wear rapidly, but is easily restored.

Q Last summer I poured about 25 ft. of concrete walk, using a recommended mix. Now the whole surface is powdery and the entire walk seems to be disintegrating. What's wrong and how can I make repairs?—O.L., Mass.

A Judging from your description, we doubt if the walk can be repaired. We think it will be necessary to break it up and pour a new one. Probably, you failed to cure the concrete properly after pouring. After breaking up the old walk excavate for a gravel or crushed stone fill at least 4 in. deep. Then pour the concrete in a suitable form and after leveling and troweling allow it to take the initial set, then cover with layers of burlap, straw, or marsh hay and keep the covering damp by hosing for a period of several days—perhaps even a week in hot, dry weather. Do not permit the covering to dry out during the curing period.

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Noteworthy New INVENTIONS

By M. J. Pedersen

Freeloading automobile drivers, cruising around for a parking meter with lots of time left on it, may be in for a rude surprise one day. A newly patented meter, which sends out ultrasonic pulses every so often, "senses" whether or not a car is still beside it. If the car has pulled out, the meter will go back to zero; when a vehicle's parking time is up, the meter will signal for a policeman. This tattletale of a parking meter earned patent 3,166,732 for Nils Ljungman, Narberth, Pa., and James E. Brown, Jr., Philadelphia, Pa.

A rocking wheelchair, with a spring-centering rocking mechanism connected between the seat and the base of the chair, provides needed exercise for invalids. It won patent 3,167,350 for Mrs. Louise A. Kiel, Newton, Iowa.

Photo flashbulbs are being used by the U. S. Navy to fire rockets, with the burst of light igniting the solid propellant in a rocket motor. A secret for more than 12 years, this novel method, which is safer than explosive igniters such as black powder, was developed by Bernard Smith and Clarence E. Weinland, of Inyokern, China Lake, Calif., and was awarded patent 3,167,015.

Seven little boats, or compartments, fit together to form an ice cube tray-shaped boat that is virtually unsinkable, remaining afloat even if several compartments should be destroyed. With its telescopic compartments, which can be stored one inside another, the boat can be transported easily and assembled or disassembled quickly, and may prove useful militarily as floats or pontoons supporting floating bridges and the like. Patent 3,167,791 went to Motiejus Balciunas, Chicago, Ill.

Water control gate located in a stream or irrigation channel lifts automatically when the water level upstream gets too high and more than the prescribed pressure is put on the arc-shaped face of the gate. Allowing excess water to escape, thereby keeping the upstream water at a uniform level, the gate earned patent 3,168,814 for George R. Hurlburt, Farming-

ton, N. M. It is currently being used by the Bureau of Reclamation of the Dept. of Interior on spillways at the Missouri River Basin Project.

A runway coating that will prevent jet planes from skidding dangerously when landing in wet weather received patent 3,168,019 for Bernard S. Lynn, Los Gatos, Calif. The anti-skid compound, a mixture of mesh plaster sand, asphalt emulsion, water, Portland cement and powdered wood rosin, can slow down a jet three times as fast as a regular runway, is also easy on giant airplane tires.

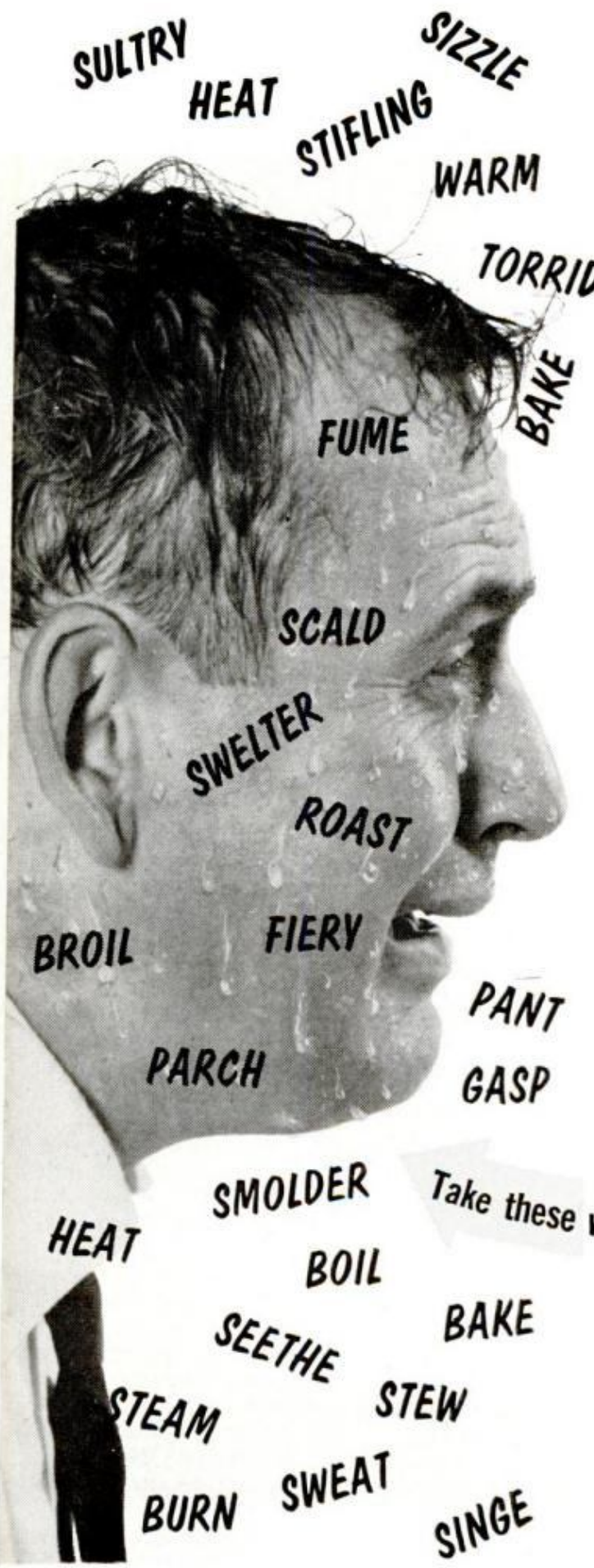
The gear control system of automatic transmissions, used for the past 15 years in millions of Ford cars, was finally granted a patent, 3,165,946. Robert W. Wayman, North Riverside, Ill., who applied for a patent in 1950, was unable to explain the delay in awarding a patent on his invention, which incorporates 106 separate ideas and is one of the largest patents ever granted in the transmission field.

Mechanized kisses will be forthcoming from a doll that won patent 3,169,343 for Sam Freimauer, Hillside, N.J., and Joseph Lieberman, Brooklyn, N. Y. A lever mechanism, acting upon a bellows attached inside the doll's head, simulates both the lip movement and sound of a kiss. Lift the doll's arm and the mouth pushes out and gives a loud smack.

Three-in-one flashlight functions as a fire alarm and pushbutton signaling device, in addition to its obvious uses. The fire alarm can be hand-set to sound an alert when the temperature in a given area gets too high, and the distress signal sounds for help with the push of a button. This multi-purpose device earned patent 3,171,109 for Andrew L. Appel of St. Louis, Mo.

Interchangeable heel for a shoe consists of a mortised, removable cap which locks onto a tenon protruding from the shoe. When heels become worn, they may be interchanged, to prevent lopsided wear. Charles Clark of Jersey City, N.J., was awarded patent 3,159,928 for his idea.

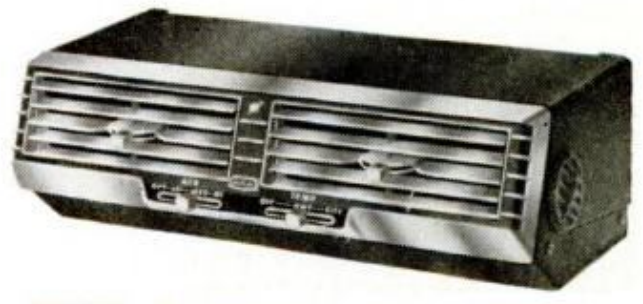
Computer guides camera on target to obtain clearer pictures taken from airplanes, satellites or missiles. Adjusting the camera or synchronizing the camera film to compensate for the movement of the plane, which is traveling at a supersonic speed and a high altitude, the computer earned patent 3,163,098 for Friend H. Kierstead Jr., Cuyahoga Falls, Ohio.



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AIMING AT HOLDING THE INSIDE shoulder as a marker, we found the Tiger (above) could do better at four mph faster than the standard Alpine (right). Tiger rack and pinion steering is slightly heavier than the Alpine recirculating ball system

Spotlight on Sunbeam's Tiger

How Much Bite Does New Ford Power Give It?

By Ed Nelson

IT HAS THE SKIN of Sunbeam's little, two-place Alpine. But under that slicked-up British hide beats a stout American heart—a 260-cubic-inch Ford V8.

You can call Sunbeam's Ford-powered eye-opener a Tiger in the clothing of a frisky kitten if you like. Or a heavily armed destroyer disguised as a yacht.

What does it mean? Among other things we'll come to, it means an extra \$1100 on the price tag. While the regular Alpine's ticket was cut \$200 this year to \$2399, the Tiger sells for \$3499. You wouldn't put out that extra cash because of a mysterious affection for Mr. Ford. What has the Rootes Group done to the old Alpine?

About the time they had trimmed down the ungainly tail fins from the Alpine to create the Series IV body, it began to get extra variety. A full synchromesh transmission was one move. And, coming as a shock to the purists, an automatic box was another, presumably for the ladies.

While the Tiger had the most interest for me, I wanted to try them all. For the ladies' version, I solicited help from "Norma." No sports car buff, she's an upstate grade school teacher. Her first reaction to the Alpine: "I like the way it goes—the way it feels under my feet."

We found, however, that the buckets, with all their advantages, were less com-

fortable than expected. The reclining feature is pleasant—one that should be adopted by more U.S. makers. But Norma complained of low-back strain; I found my seat somewhat too wide for Alpine's.

Even with 90 hp for 2180 pounds (a power to weight ratio of 24.2 lb./hp), the Alpine is a thoroughly spritely rabbit, partly due to the 3.89:1 rear axle. (The Tiger's, with 164 hp, is 2.88:1.)

The steering column, in every version from the Series IV automatic to the Tiger, telescopes with two and a half inches of adjustment. Most drivers will be able to stretch their arms out almost straight.

We switched to the manual transmission Alpine and found a delightfully smooth, quick-acting, exact box with ratios relatively close. All-synchro boxes are becoming less rare, happily, but Norma isn't used to the idea. "It seems almost like sacrilege" to shift into low while the car's under way, she said.

Actually, no test can tell you how the Tiger feels. While we were on the track, hopping back and forth from car to car, the idea grew stronger and stronger that the Tiger was actually bigger. Not awkward and wallowy, just bigger and stronger. We all knew better, of course—but the impression got so strong it was hard to ignore. Both suspension systems are firm, and I felt as many bumps through the Al-

(Please turn to page 46)

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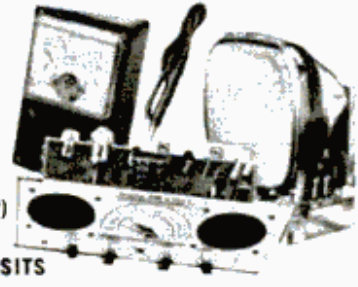
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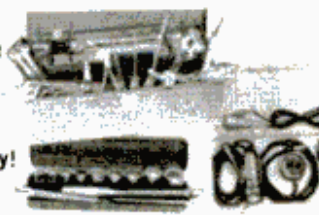
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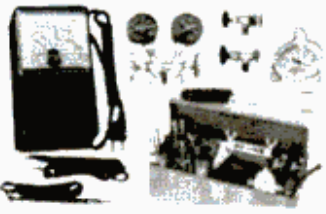
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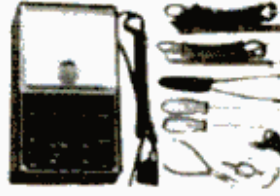
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Spotlight on Sunbeam's Tiger

(Continued from page 44)

pine seat and wheel as through the Tiger's. You could drive over a check and recognize whether the signature was phony. But while the Alpine felt as if it was dancing across the bumps, the Tiger seemed to ram through every one with brute power. Much of that is due to the even harder Tiger suspension system.

Further, the Tiger is heavier overall, with an extra 100 pounds on the front wheels. The extra weight was held to that figure by moving the Ford engine back five inches, shifting the battery from under the rear "occasional" seat to the trunk, and laying the spare down under the trunk floor instead of standing it against the wall. Moving the engine back, combined with the use of the bigger Ford transmission, chops the already scant foot room even more. Norma, who started driving a combine in Minnesota when she was 14, still could learn the rudiments of the heel-and-toe operation, but my shovel-shaped feet were a handicap.

How about performance? Here are our accelerations:

	0-60	40-60	50-70
Alpine	13.8 secs	7.8 secs	9.7 secs
Tiger	8.6 secs	4.2 secs	5.2 secs

Overall, the Alpine got 22.9 mpg and the Tiger 17.95. As you get used to the action of either car, you should settle down enough to do better. Particularly if you avoid the performance tests we tried.

Here, for comparison, are the steady speed fuel figures and corresponding speedometer readings for the two cars:

True mph	30	40	50	60	70
Alpine	31.46	29.85	29.31	24.48	21.56
Ind mph	27	36	25.5	54	63
Tiger	29.23	28.25	25.68	24.93	22.33
Ind mph	32	44	54	65	76

You'll note the Alpine speedometer was, surprisingly, reading slow. It was probably the fault of the snow tires on the rear.

Brakes were good on both cars. The required pedal pressure for a hard stop climbed only from 28 to 33 pounds on the Alpine, from 32 to 39 on the Tiger. Both sets felt solid and reliable.

How about the feminine reaction to this snarling Sunbeam? I was told, "I'm a little afraid of it—it's like riding a horse that wants to run away with me—it's all ready and waiting to be let go."

That's a good distillation of the difference. If it's a difference you want, and you want it \$1100 worth, a Tiger could make a nice new pet. ★★★



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far faster than oil-base paints, holds its color much longer, goes on without a priming coat (except for spot priming bare places), goes on over damp surfaces (just after a rain-storm, for instance), goes on over wood, masonry, stucco—any surface—and cleans up with just soap and water.

Less work, more wear.

The name is Du Pont LUCITE House Paint.



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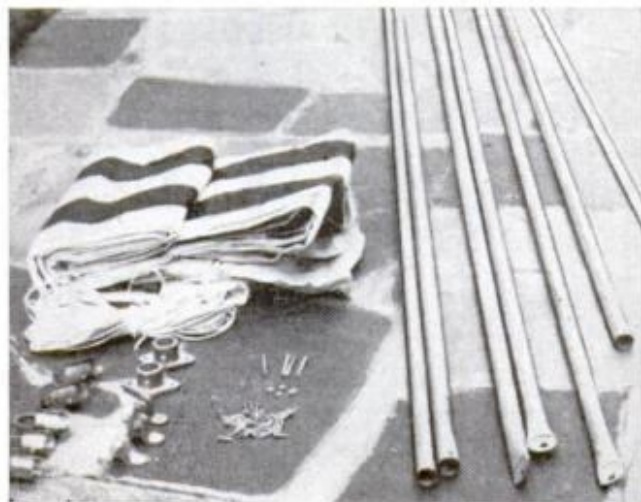
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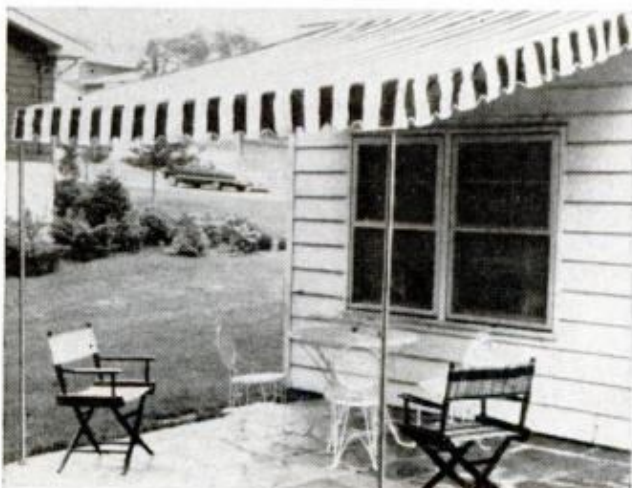
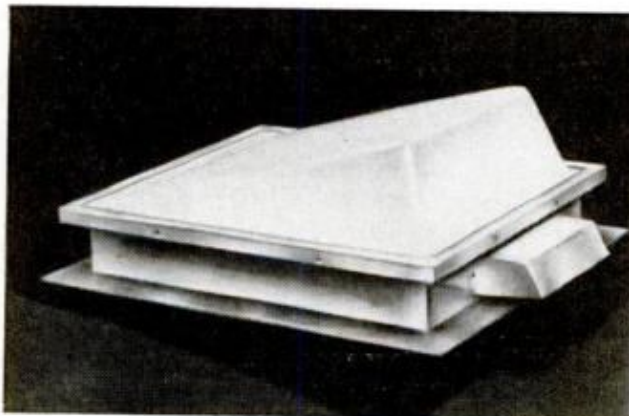
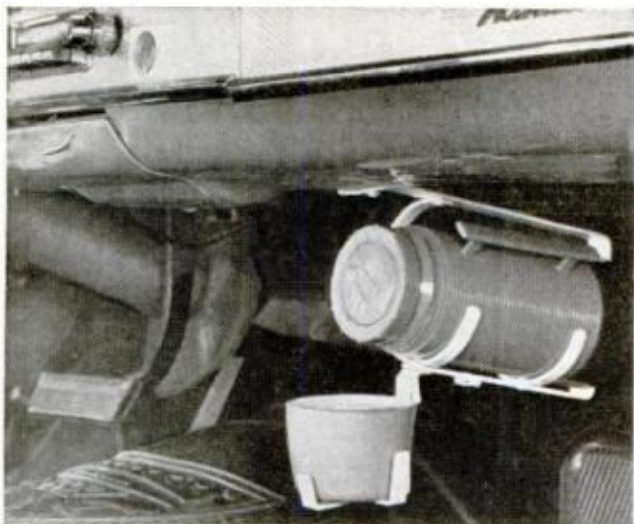
Keep Hot or Cold Drinks within easy reach while you drive. This aluminum rack, which clamps to the bottom lip of the dashboard, holds vacuum bottles up to 1-qt. size. No drilling required for installation. ▶
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Translucent Skylight has built-in 90 c.f.m. ventilating fan that makes it ideal for use in bathrooms and laundry areas. Dome is made of acrylic plastic. Frame is aluminum with polystyrene insulation, and has a nailing flange for easy installation. ▶
Measures 24x32 in., costs about \$100. American Cyanamid, P.O. Box 350, Wakefield, Mass.

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Economical Patio Awning kit (below and at right) is intended for do-it-yourself installation. Frame and poles are galvanized steel. Awning is canvas. Comes in eight colors and patterns, and sizes from 10x10 to 10x40 ft. Priced at \$84.95 to \$319.95. Patiomaker kits available from the Jensen-Lewis Co., 156 7th Ave., New York, N.Y.

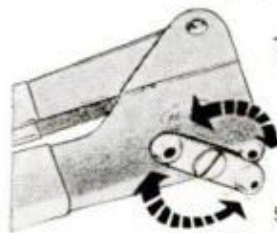




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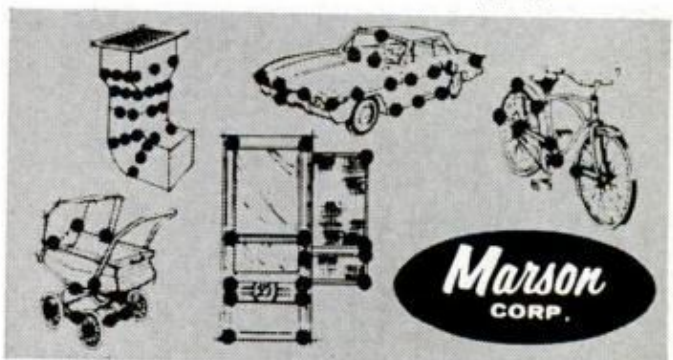
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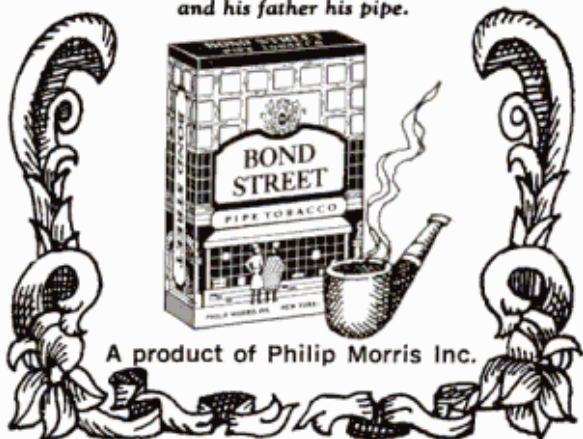
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Items from All Outdoors

The comfort cult has come to camping in full force, a trend that we have been following with some trepidation and considerable amazement. This change was best explained by Oscar Godbout, outdoors columnist for the New York Times. "For every three men who view the world through leaky canvas," he wrote, "there are two women urging him to do something about it."

Fishermen have been inquiring about the "Texas Hootie," a lure we described in the March issue (*Want to Be a More Complete Angler?* page 110) as resembling an old mop. You can get full information from Bob McCarty at Mathew's Sportsman Hdqtrs., Box 426, Port Aransas, Tex.

College students can now get physical education credit for a canoe trip into Superior National Forest in northern Minnesota. Sponsored by Ely Junior College in Ely, Minn., a course of instruction in woodsmanship, cooking, first aid and woods survival is available for anyone over age 16. All equipment is furnished by Canadian Waters, Inc., an outfitter famous in the north country.

Something different in outdoors adventure is a safari into the remote jungle that borders Brazil and British Guiana, an area accessible only by air. Once you have landed in the country you set up house-keeping in a mud hut and spend your vacation panning for diamonds. The trips are arranged by Diamond Safari International, Elm Grove, Wis.

Most handbooks on fishing seem designed to convince the angler that the experts are only expert at putting common sense into ponderous rhetoric. A refreshing change is Dick Wolff's *Fishing Tackle and Techniques*. In straight-forward, informative terms this book thoroughly evaluates reels, rods and lines and explains (with line drawings) their uses, care and upkeep. There is a chapter on how to fight fish that will send any novice to water with a feeling of confidence. It is available in paperback for 50 cents from Popular Library, 355 Lexington Ave., New York, N.Y.

STUART JAMES

Outdoors Editor

POPULAR MECHANICS

The ultimate total performance car— Ford GT!



Brakes clamped full on, the fabulous Ford GT slows for a corner in the Daytona 2000-kilometer endurance classic. In 12 hours and 27 minutes of savage punishment it out-braked, out-handled, out-sprinted Europe's and America's greatest entries. On the toughest proving ground of all it proved itself the world's ultimate road car.



The car it inspired— new Mustang GT!

Here's Mustang's brilliant new package for the driver who knows what Total Performance really ought to mean. Who else delivers exhilaration like this: a 225-horsepower V-8, fueled through a four-barrel carburetor. A three-speed fully synchronized floor shift. A straight-through exhaust system. Front disc brakes. Built-in fog lamps. The cornering power of Mustang's special handling package. GT insignia on the front fenders and the new symbol of Total Performance—the GT stripe—above the rocker panels. And, inside, a custom GT five-dial instrument cluster.

That's the basic GT package. But for even lustier appetites, there's a super-option—Mustang's 271-horsepower solid lifter V-8 and the four-speed manual shift. Both packages are available on hard-top, convertible or 2+2.

Happy news — and it's all spelled out at your Ford dealer's. Take a reading. Soon!

MUSTANG

Unique Ford GT stripe —
badge of America's greatest
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RIDE WALT DISNEY'S MAGIC SKYWAY AT THE FORD
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Popular Mechanics Shopping Guide

Worth Writing For

Prop problems? Selecting the right propeller for the right boat is the subject of the 20-page booklet, "From Horsepower to Waterpower." To help you get top performance, these points are discussed: what is meant by "standard" propeller, the relationship between horsepower and rpm, correct transom height, motor angle adjustment and boat loading. Copies of the booklet are free upon request from OMC Accessories, Outboard Marine Corp., Galesburg, Ill.

Your garden is of prime concern now. "How Does Your Garden Grow?" by Lucile Bush offers 8 pages of helpful tips for both indoor and outdoor gardeners. For example, advice for watering left-alone plants: insert one end of an old cotton clothesline in plant soil and the other end in a jar of water. The booklet is free from Johnson Wax, Consumer Education Dept. B-5, Racine, Wis.

All thumbs when it comes to tying knots? Diagrammed in red and white on heavy paper board, with matching rope, are 40 widely used knots—

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"Nothing But Noise?" is the title of a 24-page booklet designed to help you stop radio frequency interference in your car, boat or plane. If signals aren't getting through on your mobile rig, you'll find in the booklet the sources of engine electrical noises and the several methods of suppressing,

(Please turn to page 56)

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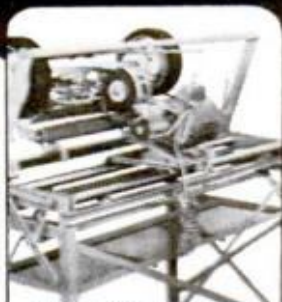
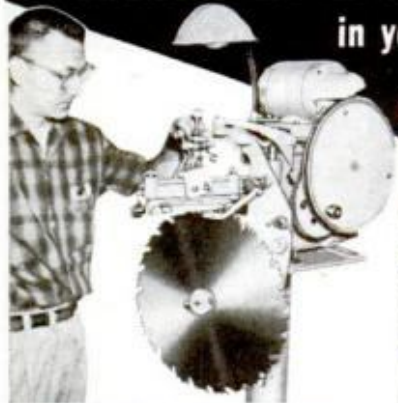
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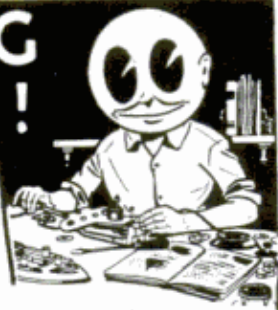
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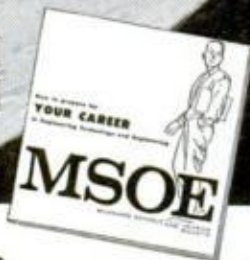


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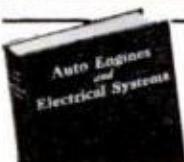
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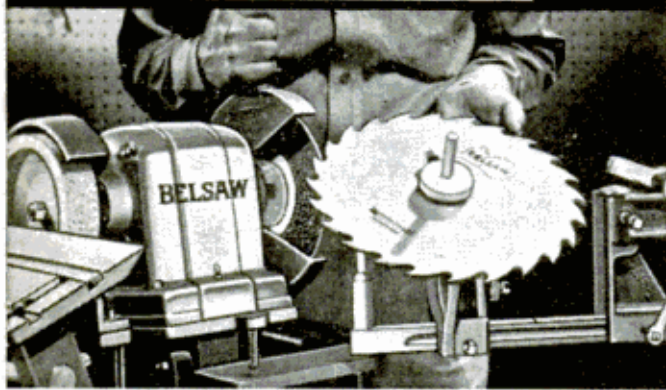
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FREE Book "990 Successful, Little-Known Businesses." Work home! Plymouth 872Y, Brooklyn 4, New York.

SIMPLE, Pleasant, mailorder can net \$12,000 year. Write Rutward, 2610 Bryant, Columbia Station, Ohio.

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

SELL Books by mail. 400% profit. Royal, Box 450-X, Cleveland 27, Ohio.

FREE Booklet! Profitable, spare-time business bronzing, Pearl-knotting baby shoes! Complete set-up on credit. Kiktavi, Box 34861-B, Los Angeles, California.

TO \$100.00 weekly! Mailing catalogs! Sample, instructions, 25c. Costar, GPO Box 972-PM, New York 10001.

BAKE New greaseless doughnuts in kitchen. Stores buy output. Start spare time. Profit 29¢ dozen. Small appliance. Free recipes. Montgomery, 3605 South 15th, Minneapolis 7, Minnesota.

STOP Throwing away boxtops! They're worth money! Some, 25¢! Inquire: "Box-tops-MB", Cedar Hill, Texas.

PROFITABLE Mail order business. Be independent. Details free. Ideal, Box 357-EA, Valley Stream, N.Y.

76 MILLION Prospects! Immediate profits! Selling Champion, AC, Autolite spark plugs. Precision reconditioned, silver-plated, guarantee 10,000 miles. Up to 308% profit. Free samples, details. Indy 500 Spark Plug Co., 4620 Braeswood, Houston, Texas 77035.

CONCRETE Facts: Cement Artists make big money. Home Shop—Simple Equipment—Copyrighted Methods and Formulas. Make, Color and Marble Glaze beautiful Cement Pottery without molds. Wishing Wells, Bird Baths, Waterfall, Rustic Garden and Patio Items. For free illustrated Brochure, write Hollywood Cementcraft, 602 E. Athens St., Altadena, California 91001.

FREE "Franchise Profit Letter" tells how unique NFR service is helping thousands seeking profitable businesses. Write today. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

SECRETS! Secrets! Mail order success revealed by internationally famous expert who discovered how to make home business fortunes. Beginners: Get free copy "How to Make Money in Mail Order." Discloses free advertising, profitable products, everything! No obligation. Write Mallico, 1554 Sepulveda, Dept. P-705, Los Angeles 25.

PACKAGE At home for profit! We supply everything. No "selling." Free home business details. HPC, 807HPK Sunset, Los Angeles 12.

REPAIR Hydraulic jacks. Details free. Write: Hydraulic Parts Supply, Box 3645, El Paso, Texas.

FREE Facts and descriptive bulletin. Be an air conditioning, refrigeration, and heating serviceman. High pay, jobs open everywhere, operate your own service business, no school or correspondence necessary. Write Doolco, Trouble Shooter, 2016 Canton, Dallas, Texas.

"MAILORDER—Stop looking!" Get your own catalog! Methods, 1809-FD, Lafayette Hill, Pennsylvania, 19444.

START Your own business on credit. Your own boss. Hundreds of dealers making \$100 to \$300 and more weekly. We supply stocks, equipment on credit. 300 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh, Dept. E-U-PPM, Freeport, Ill.

\$70.00 WEEKLY—home, spare time. Simplified mail bookkeeping. Immediate income, easy. Auditax, 34741a, Los Angeles 34.

MAKE \$46 From square foot plywood; jigsaw necessary. Free details. Woodart, Bridgewater, Mass.

EARN Money raising fishworms for us! Write: Oakhaven-38, Cedar Hill, Texas.

HAWAIIAN Jewelry sells fast because it is new and exciting. Details free. Chaudlers, Wailuku, Hawaii, Dept. 35.

MAKE \$50.00 Daily! Sell air operated vacuum cleaners to service stations for \$19.50. Your cost \$9.50 postpaid. Free details. Inka Industries, 2401 Crocker, Houston 6, Texas.

I MADE \$40,000.00 year by mailorder! Helped others make money! Start with \$10.00—Free proof. Torrey, Box 3566-Y, Oklahoma City 6, Oklahoma.

BUILD Custom cases at home for profit. Get orders by mail. We supply materials, instructions, everything. Free home business details. Customcase, 805CPK Sunset, Los Angeles 12.

IMPORT-Export opportunity, profitable world-wide. mailorder business from home, without capital; or travel abroad. We ship proven plan, for no risk examination. Experience unnecessary. Free details. Mellinger, J705, Los Angeles 90025.

MAIL Baby catalogs to new mothers for big profits! Details, catalog 25c. Volz-PM, Ypsilanti, Michigan.

SHARPEN And serrate steak knives, scissors, pinking shears, etc., for profit. One low cost machine. Free details. Beaver Machine, Box 121, Gardena, California 90247.

MAKE \$32 From 49¢ piece vinyl. PMA-1834 Edgeland, Louisville, Ky. 40204.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Box 327, Shenandoah Station, Miami, Florida 33145. (Founded 1935).

400,000 BARGAINS below wholesale! Many free. Liquidations, job lots, single samples. Free details. Bargainhunters Opportunities, Box 730-A, Holland, Michigan.

HOME Manufacturing opportunities. Formula catalog 10¢ Ideal, 179-P, Park Ridge, Illinois.

WATCH Repairing. Learn to repair American and Swiss watches in spare time at home. Tuition only \$5 monthly. Diploma awarded. Free sample lesson. No obligation. Chicago School, Dept. YRA, Fox River Grove, Illinois.

MAKE Money from old tires. Operators clearing \$400 weekly. Equipment costs \$800. Get facts. S & S Patents, Inc., 3511 N. Lincoln, Chicago 13.

HOW And where to raise capital. Details free. Financial, Box 785-PM, Springfield, Missouri 65801.

RAISE Capital money fast—easy proven sources—free particulars. Advisor, Box 48337-PM-1, Los Angeles 90048.

AMAZING Information on starting your own business. Details free. Snyder, Wyatt 4, Ind. 46595.

VACUUM Mold at home! Hundreds full 3-D plastic products. Big profit, new machineryless method. Free facts, samples. Nationwide Plastics, Box 23321-JE, Los Angeles 90023.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Quarter brings sample and special offer. Mailtrade, P.O. Box 357, Sheboygan, Wis. 53082.

MAKE 400% Profit selling books by mail. Specialties, Box 148A, Ypsilanti, Michigan.

\$6.00 HOURLY Possible with my instructions and plans. Details free. Jacobs Enterprise, 712 Willisie, Rapid City, So. Dak.

NEED More money? Unlimited opportunity in distributing products for home and industry. Details, write: Chandler, 16299 Canelones, Hacienda Heights, California 91745.

PROFITABLE Office-homework! Refundable nationalized system, \$1.00. Interstate, 37-1 Besch, Albany 9, New York.

PROFITABLE Catalog mailorder business! Vikari's, 468-PM, Third Avenue, Salt Lake City, Utah 84103.

\$60.00 DAY, Manufacturing concrete posts. Carlayne, 1803 Fremont, Rapid City, South Dakota.

BUY Appliances, cameras, watches, etc. at factory prices plus 10%! Free details! Cam Company, 436-13 Bloomfield Ave., Verona, N.J. 07044.

LEARN Correspondence school operation and management, put your own ideas across. Easy to understand operational guide. For information and trial offer write: Director, Dept. M-55, P.O. Box 652, Encino, Calif. 91317.

NET \$250.00 week. Pleasant mailorder. Write Crestmore, 409 West Liberty Street, Rome, N.Y. 13440.

OPERATE Restaurant or diner. Free booklet reveals profitable plan. Write Restaurant Business School, Dept. EC-55, 1920 Sunnyside, Chicago, Illinois 60640.

FREE Copy money-making mail order newsletter. Address Newsletter, 3207-PM Southern Hills, Springfield, Missouri 65804.

INSTALL Burglar alarms without previous experience or costly equipment. Big profit. Free details. Nasco, 11071 Massachusetts, Dept. P705, Los Angeles, 90025.

MOTEL Opportunity. Franchising, financing available. Turnkey job, low investment. Economical rates assure high occupancy, exceptional profits. Prime locations. Contact Econo-Lodges, Inc., Box 796, Parsons, Kansas.

COPUBLISH "Mail Sale Advertiser." leading mailorder paper. Copy and details 25¢. Vanroy Shirk, Lebanon, Pa. 17042.

OPERATE Your own big paying business. Details free. Bickel's, 29623-A Hoy Road, Livonia, Michigan 48154.

BUY Food wholesale! Save 50%. Food, Box 183-B, Bloomfield, New Jersey.

PROFESSIONAL Mailorder manual proves you can make money in mailorder. Shows you how. Reveals no-nonsense secrets of "pros", \$1.00. (Refundable). Best Book Company, 1175 York, Suite 18B, N.Y.C., N.Y. 10021.

FRANCHISES. A business for yourself. New directory \$1.00. Franchises, Box 807, Clarksville, Tennessee.

IMPORT-Export business made easy. Complete setup service; not just instruction. Hermes, 152 West 42, New York City 10036.

SELL Information by mail, 2400% profit. Instructions, \$1.00. Saxe, Milan, Ohio 44846.

TERRIFIC Money-making possibilities!! In Your Own "Mailorder Stamp Business." Stampco, 116-PD South Nevada, Colorado Springs, Colorado 80902.

FREE Details, home mailorder write: Eldee, 106-B Cumberland, Lawrence, N.Y.

HOW To develop and cash in on ideas. Details free. Willis, Dept. PM5, Box 75142, Los Angeles, Calif. 90005.

MAILORDER Classified advertising, profits unlimited. Write; Franklin, Box 304P, Salem, Ohio.

RADIO Mail order. \$50,000 in one month possible. No cost percentage plan. Walthay, Box 53-M, Los Angeles 90032.

YOUR Own mailorder business. W. L. W. Distributors, Box 62M, Struthers, Ohio.

WORLD'S Most unusual money making reports. Something really different. Write: Private Enterprise Reports, Box 16127C, San Francisco, California.

DIFFERENT! Outstanding profits from high quality mailorder businesses. 20 complete setup services. Not just instructions. Hermes Co., 152 West 42, New York City, 10036.

MOULDED Monuments. One man operation. No machinery. Local materials. Granitex, Dyersburg, Tenn.

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BECOME Tax consultant. Our students earn \$1,000-\$3,000 every tax season preparing returns evenings. Accredited. State approved. National Tax Training School, Monsey A-2, New York.

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DISCOVER How to build your second-income fortune. Get hundreds of plans worth thousands of dollars. Write, Daniel Evans, 1175 York, N.Y.C. 10021.

START Your own mailorder business with less than \$20. Details 25¢, refundable. Campbell, Box 5295-A, Phoenix, Arizona 85010.

DIRECT Rock bottom wholesale sources! Buy for pennies! Sell for dollars! Free Details, Joric, Dept. 505, Box 66151, Portland, Oregon 97266.

WE Dropship cheap cameras, transistors, gifts: Indo-European Export Post, Box 4429, Hong Kong.

READ Foreign Forum. Unique mailorder magazine! Copy, 25¢. Mounier's, 209 Armand, Ville Platte, Louisiana 70586.

INSTANT Traffic builders for retailers: fantastic profits. Hewig, Brooklyn, New York 11222.

AMAZING 400% Profit novelty candies, home made. Details 25¢. Smith, 2080 Wellington, Montreal.

FINANCIAL Freedom selling by mail: secret to success is importing at unbelievably low prices. W. Nooker, importer, 507-M 5th Ave., New York. Enclose quarter, postage and handling.

BIG Earnings full or spare time with new plastic shutters. Plus extra cash for installation. Every home a prospect! Free literature. Forms, Inc., Dept. P, 554 Adams St., Chicago, Ill. 60606.

HOW I make \$50 day operating Ad Market. Free details. Ad Market, Box 331, Harlingen 1, Texas.

BOOKKEEPING System. Substantial profit selling Start Service. Kern, Box 263, North Hollywood, California.

LIFETIME Repeat business. Men, women, 100% profit, 20% override. Details 35¢. Sales kit, \$8.95. Foster, P.O. Box 5144, Long Beach 5A, Calif.

SAVE Building costs, new material molded on site. 7217 Lisbon, San Diego, Calif. 92114.

SAWDUST. Tin-cans, newspapers. 200 uses. Instructions, \$1.00. Charles Company, 42-GPF, Norwood, Ohio.

MAKE Money, booklet called you can make profits tells you with many money making ideas. 35¢. Washington, 1506 Filbert St., Oakland, California.

OPERATE Home collection agency, details. Livingston's, Box 5332, North Charleston 1, South Carolina 29406.

100% PROFIT Possible! No risk. Learn how to invest in coins. James N. Mitchell Co., P.O. Box 121, Auburn, New York.

MAILORDER Profits and pitfalls revealed to you by experts. Write T. Potts Company, 218 Madison, Huntington, Indiana.

NEWEST, Hottest, moneymaker. Thriving prosperous 25¢ coin operated car wash wax business can be yours. Deal direct with leading manufacturer. Write: Porta Service, 208 North 49th St., Belleville, Ill. Immediate reply.

MAILORDER! Dollar-Pulling letters, 25¢. Rein, 32 New York, Freeport 20, New York.

ENTER The advertising business. Calendars, imprinted gifts, 1100 Items. Large weekly commissions. Permanent future. National Company, Dow, 1714 Stockton, San Francisco.

MAILORDER Catalogs. No inventory required. Discounts 40% up, postpaid. Send 25¢ for 32 page sample catalog, featuring 150 unusual, fast-moving products and complete details. Satisfaction guaranteed. Gaylords, North Adams 7, Mass.

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

MONEYMAKING OPPORTUNITIES

MAKE Plastic novelties for extra income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-3, Portland 12, Oregon.

MAKE Money writing short paragraphs! No tedious study! I tell you what to write, where and how to sell, and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-DA 6216 Clark, Chicago 26.

RAISE Rabbits and fishworms on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

START Your own home mailorder business, sparetime! Easy; Fascinating, profitable! Alfano, 19-PM Pine, Closter, New Jersey.

LEARN The secrets of repairing junk batteries. "Fabulous Profits" at home. Details, Batterymen, Prunedale P.O., Salinas, California.

UNUSUAL Money-making opportunities, Free literature. Eaton's, 708PM Gold, Centralia, Wash. 98531.

MAKE Figurines, plaques, lawn ornaments. Molds, plastercraft kits, liquid rubber. Sample and catalogue 10¢. Wooley Company, Box 29-B, Peoria, Illinois.

VENDING Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, 715 PMM Emsor Street, Baltimore 2, Maryland.

MAILORDER! \$25.00 Orders! Keep \$16.67! Distributing \$3.25 product. JanMar, Box 572-M, Washington, D. C. 20044.

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

BECOME A Notary Public! Win extra income, prestige, business contacts. Details free. Stationers Exchange, P.O. Box 617, Kilgore, Texas 75662.

CIGARETTES. Make 20 plain or filter-tip for 9¢. Factory-fresh pipe tobaccos. Mild tropical flavored Philippine cigars. Facts free. Moberly, Box 904, Owensboro, Kentucky.

SELL Titania gems: more brilliant than diamonds. Catalog 10¢. Diamonite, 2420-G 77th, Oakland 5, California.

EARN \$240.00 a month at home, spare time, doing only two \$5.00 invisible mending jobs a day. Big money paid for service that makes cuts, tears disappear from fabrics. Steady demand. Details free. Fabricon, 1532 Howard, Chicago 26, Ill.

OPPORTUNITIES 501 Ways to earn money. Part—full time, young—old, men—women. Free information. Opportunities, Box 1331, Merchantville, New Jersey.

MINK Raising information free. Lake Superior Mink Farm Inc., Superior, EE1, Wisconsin.

WATCH Repairing. Swiss and American watches. Develop skill step by step in spare time at home. Tuition only \$5 monthly. Diploma awarded. Free sample lesson. Chicago School, Dept. YRB, Fox River Grove, Illinois.

FABULOUS Mailorder. Can net \$10,000 year. Budget, Box 501P, Monterey Park, Calif.

BIG Money raising fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

NEW Instant invisible mending. Learn in one hour, repair in five minutes. Make \$150.00 week. Literature free. Louis Rosenstern, P.O. Box 6136-6, Philadelphia, Pa. 19115.

INSTANT Money! Plastics are the wave of the future. Big profits now! At home! Spare time! Materials costing 11¢ bring \$2.58 profits immediately! Free information! Rush name on postcard to: Warner, 1512 Jarvis, Dept. CL-2-DW, Chicago 60626.

OVER \$10.20 an hour. Spare Time at home! Rubber stamp industry needs small manufacturers. We furnish all equipment and know-how! Particulars Free! Write: Roberts, 1512 Jarvis, Room CR-2-DW, Chicago, 60626.

CASH From leathercraft. Free booklet tells how. Tandy Leather Co., Box 791J54, Fort Worth, Texas.

YOUR Own business. No inventory required. Suppliers ship for you. Details. Jenkins Publications, Box 1490, Oceanside Cal. 92057.

AMAZING Income from ideas. New manual tells how. Free details. Thompson, 9414 Aspen, Shreveport, La. 71108.

CAPITAL Available—ready prime sources. details free. Advisor, Box 48337-E, Los Angeles 90048.

HOT Money making line! Show line of business printing, advertising specialties, calendars. Watch orders pour in. All repeat items. Terrific commissions in full or spare time. No experience, no investment. Cash discounts to customers. Free bonus gifts to you. Free sales kits. Willens-David Lionel Press, Dept. W-27, Waukegan, Illinois.

AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, WP-528, 333 North Michigan, Chicago 1.

PROFITS Unlimited using your ideas. Details free. Kelly, 1012 Windsor, Santa Cruz, Calif. 95062.

WE Purchase items you make at home for us. Send stamp for details. Wolfe Specialties, Box 171, Center Line, Michigan 48015.

TURN Water into money. Amazing drinking glass demonstration sells restaurants, hotels, industry, homes. New safe, non-caustic invention eliminates clogged drain pipes; banishes septic tank and grease trap problems forever. Huge untapped market. Big repeats. Highest commissions. Details Free. Write Dick Watts, 35 S. 19th Ave., Dept. 455-C, Maywood, Illinois.

EASY Cash earnings from your ideas. Free details. Lachmann, 2144-D Esplanade Place, Gretna, Louisiana.

MAILORDER Business "newsletter" absolutely free. Wilko, 5050-H Windsor, Chicago, Illinois 60630.

BUILD Fishing pole & rod holders for pennies each to use or sell. Use from bank or boat. Plans 25¢. E. E. Edwards, Ardmore, Tenn.

\$25.00-\$75.00 Weekly Possible Clipping Newspaper Items. (Spare-time) Details free. Graham, 1255-N, Englewood, Colorado 80110.

WIN Cash prizes! Exciting magazine brings you monthly puzzle contests, aids, information! Year's trial, \$1.00; Sample, 25¢. Prizewinner, Box 11569, St. Petersburg, Fla.

MONEYMAKING Mailorder details 10¢. Pat, 270 East 60th Street, Hialeah, Florida 33012.

LOANS To little businessmen. Start or expand. Free details. David Magee, Box 331, Harlingen 5, Texas.

PROFIT—Mail our catalogs. Write McBride, Box 5383, Lubbock, Texas.

CO-PUBLISH Successful mail order magazine spare time. Minimum capital. Sample copy, full details, \$1.00. Trans-World Associates, 1730 Hamiel, Las Cruces, New Mexico 88001.

PART-Time photographers earn \$100 to \$300 per month. Book of 20 proven methods, \$2.00 postpaid. Unicam, Box 7272, Dallas, Texas.

TRAVEL And get paid for it! Free information. Write: Baer, 614 Washington, Genoa, Ohio.

FREE. Four steps to successful selling by mail; limited printing. Hurry! W. Nooker, 507-B 5th Ave., New York.

SIGNS Easily painted by you with our letter patterns, supplies, raised letters. Paulow, Crystal Falls, Michigan, 49920.

COLORFUL West Indies primitive rope string beads for unusual curtains or room dividers. \$5.50 dozen in quantity orders. Sample string, \$1.00. Primitive Artisan, 303 West 42nd Street, New York 10036.

MAKE Money yourself, not for others. Details free. Ashe's, Box 62, Elmhurst, N.Y.

YOU Learn window trimming in 1 book. Free details, write: Box 557, Whittier, Calif.

\$1000 MONTH Possible. Executive-style mail order business. Tired of losing money? Be the big fellow who starts the little fellow in his own business. Free details. Advertiser's Planning Service, 150 Broadway, Dept. M-1, New York, N.Y. 10038.

WRITE For pay! I do. Particulars. Ralph Underhill, Beebe, Arkansas 72012.

EARN \$1000.00 month operating Book-keeping Tax Service. Details free. Universal Bookkeeping, Box 664, Springfield, Missouri.

START A profitable subscription business in spare time! We need men and women (young and old) as representatives for all leading national magazines. Liberal commissions on all subscriptions. Supplies free. No experience needed. Send this ad with your name and address to: Popular Mechanics, Room 5-O, 250 W. 55th St., New York 10, N.Y.

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WHOLESALE Magazine subscriptions. Highest commissions! Bonus! Box 151EA, Freshmeadows, N.Y. 11365.

BECOME Independent with your own franchise business. Thousands earning handsome incomes. Request interesting facts today. National Franchise Reports, PM-528, 333 North Michigan, Chicago 1.

CHROME Plating. Instructions, equipment and supplies. Platers' Supply, P.O. Box 565, Lugo Station, Los Angeles, Calif.

YOUR Own sign shop—Signs. 1017 W. Mulberry, Springfield, Ohio.

BAKE New greaseless doughnuts in kitchen. Sell stores. Free recipes. Michael, 3605 South 15th, Minneapolis 7, Minn.

RAISE Pheasants on \$100 week plan. Little capital and space can make you independent. Free details. Great Central System, Columbus 1, Kansas.

BIG Money raising fishworms and crickets. Free literature. Carter Wormery, Plains, Georgia.

EARN \$240.00 A month at home, spare time, doing only two \$5.00 invisible mending jobs a day. Big money paid for service that makes cuts, tears disappear from fabrics. Steady demand. Details free Fabricon, 1586 Howard, Chicago 26, Ill.

AUCTIONEERING—Resident and home study courses. Auction School, Ft. Smith, Ark.

SHARPEN—Scissors, pinkers, tools. Inexpensive machines, supplies. Blackhawk's, Sheldahl, Iowa.

VENDING Machines. No selling. Operate a route of coin machines and earn amazing profits. 32-page catalogue free. Parkway Machine Corporation, 715 PMP Ensor Street, Baltimore 2, Maryland.

INVESTIGATE Accidents. Earn \$750 to \$1,400 monthly. Car furnished. Expenses paid. No selling. No college education necessary. Pick own job location. Investigate full time. Or earn \$8.44 hour spare time. Men urgently needed now. Write for Free Literature. No obligation. Universal, CPM-5, 6801 Hillcrest, Dallas 5, Texas.

MANAGE Motel or resort. Man, woman, couple can make high salary plus apartment. Pick your own location with our employment assistance. Learn at home. Free booklet. Motel Managers Training School, Dept. PMC55, 612 South Serrano, Los Angeles, California 90005.

\$15.00 TO \$30.00 an hour de-liming steamcleaner and laundromat coils. Little competition, large profit, total investment less than \$100.00. One steamcleaner coil can pay for total investment. Write for free information. Champaign Coil Company, 305 West Springfield Ave., Urbana, Illinois 61801, Dept. 5.

OIL Reclaiming. Plans, \$2.00. Holcomb, Box 681, Pampa, Texas 79066.

FREE Book "990 Successful, Little-Known Businesses." Work home! Plymouth 87Y, Brooklyn 4, New York.

MAKE A living with your camera, post-paid, \$3.00. Tole House, Box 2521-X, Hollywood, California 90028.

INSTANT Traffic builders for retailers; fantastic profits. Marvic, Brooklyn, New York 11222.

MAKE Money writing short paragraphs. Information free. Barrett, Dept. C-27-DB, 6216 No. Clark, Chicago 26.

START A magazine subscription business. Earn generous commissions on Popular Mechanics, Good Housekeeping and all others. Best commissions, bonus, all material sent free. No experience needed. Write Popular Mechanics, Room 5-P, 250 West 55th St., New York 19, N.Y.

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ESTABLISH Your own business. Low prices on used clothing, shoes, household goods. Unlimited profits. Free catalog. Northwestern Distributors, 2129 No. Western Avenue, Chicago, Illinois 60647.

SALESMEN Make big profits selling "do-it-yourself" sign kits to merchants. Information free. Signmakers, Inc., Dept. PM4, Box 6626, Denver 16, Colorado.

RAISE Rabbits for us on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

FABULOUS Opportunity for women, any age. Earn \$25 day or more as beauty advisor. No experience. Get details, sample Hollywood cosmetics: Studio Girl, Dept. OP-40, Glendale, California.

MAKE Up to \$50.00 daily soliciting delinquent accounts. Terrific commissions. General Finance Co., Dept. LG-76, Pickwick Bldg., Kansas City, Mo. 64106.

AGENTS. 400% Profit selling 25 letter collection book to stores, offices. Retail for \$19.88, sample \$1.00. Mutual adjustment Bureau, Inc., 505 Fifth Ave., N.Y.C.

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

CASH Or U.S. stamps for recommending our services. Write; Collectors Corner, (ASDA), Tannerville, N.Y.

YOUR Own business—Used suits \$1.50; overcoats 65¢; mackinaws 35¢; shoes 12½¢; ladies coats 30¢; dresses 15¢. Enormous profits. Catalog free. Nathan Portnoy Associates, 2109-AA Roosevelt Road, Chicago 8, Ill.

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SENSATIONAL New longer-burning light bulb. Amazing free replacement guarantee—never again buy light bulbs. No competition. Multi-million dollar market yours alone. Make small fortune even spare time. Incredibly quick sales. Free sales kit. Merlite (Bulb Div.), 114 E. 32nd. Dept. C-73J, New York 16.

FREE To salesmen who want more money. Send name, age and occupation for free copy Opportunity Magazine describing 200 new, fast sellers. Entirely free. Opportunity, 850 N. Dearborn, Dept. 17A, Chicago, Illinois 60610.

DISTRIBUTORS Wanted. Stainless razor blades. Buhl, Box 34, Princeton, Florida.

SELL Advertising book matches. Write us today, we put you in business by return mail; handling complete line ad book matches in demand by every business right in your town! No investment; everything furnished free! Top commissions daily! Superior Match, Dept. M-565, 7530 S. Greenwood, Chicago 19, Illinois.

HOT Money making line! Show line of business printing, advertising specialties, calendars. Watch orders pour in. All repeat items. Terrific commissions in full or spare time. No experience. No investment. Cash discounts to customers. Free bonus gifts to you. Free sales kits. Willens-David Lionel Press, Dept. W-28, Waukegan, Illinois.

ASTONISHING Automatic toilet bowl cleaner, deodorizer. Works when toilet is flushed. Housewives buy on sight for every bathroom, at only \$1.98 each. Make up to \$10.00 in hour, spare time. Free Sales Kit. Merlite, 114 East 32nd, Dept. G-71J, New York 16.

CALENDARS. Novelties. Full or part time. Liberal commissions. Fleming, 6535-A Cottage Grove, Chicago 37.

EARN Extra money selling advertising book matches. Free sample kit furnished. Matchcorp, Dept., PM-55, Chicago 32, Illinois.

LONG Needed invention. Man to contact service stations. Huge profits. Cyclo Mfg., 3816 Dahlia, Dept. 128, Denver 1, Colo.

25% COMMISSION. Sell tricks, jokes, toys. In your own, full or part time wholesale novelty business. Get started now, send \$15.00 for deluxe case, samples, instructions. Otis Novelty Company, Dept. 305, Wilmette, Illinois.

PRINTING, Office supplies, rubber stamps. Save 50%. Send \$2.00 for confidential list. Modern, Box 3P, Southfield, Michigan.

\$1,000.00 a month for making dramatic 3-second demonstration of amazing Lightweight Presto Fire Extinguisher. New chemicals used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-66J, New York 16.

EMPLOYMENT INFORMATION

MERCHANT Marine. Men, women, ships and boats. High wages. Travel. Captain, Box 501-P, Reading, Massachusetts.

DIRECTORY Reports. Construction, aviation, shipping, oilfields, government, manufacturing, trucking, etc. foreign-stateside. Helpful information plus job-getting tips on preparing application letters. Unconditional money-back guarantee. Only \$3.00 (\$3.25 airmail) Research Services, Box 6768-PM, St. Louis, Missouri 63144.

TREMENDOUS Job opportunities. Foreign-U.S.A., construction, trucking, manufacturing, government, shipping, thousands more. Up to \$2,000.00 monthly! Money-back guarantee. Directory plus application forms. Send only \$2.00. Worldwide Opportunities, Box 730-A, Holland, Michigan.

MEN. Women needed for Civil Service Employment. Write: Employment Opportunities Service, Box 3392, Boardman, Ohio 44512.

UPGRADE Yourself. Earn More. Contact key men in companies near you hiring in your field. We supply names from our datafiles covering over 2,000 locations. \$2.00. Specify field. Detwiler, Box 1894, New York. N.Y. 10001.

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A water glass helped make the new Mercs 50% quieter

Did you ever tap on an empty water glass; then a full one? Remember the difference? The full one isn't as loud because the water damped-out vibration. This simple principle of sound helps make the new 4- and 6-cylinder Mercs 50% quieter.

Mercury uses engine cooling water as the damper. It surrounds Mercury's new internal exhaust pipe. This "wall-of-water" prevents exhaust and mechanical noises from passing through the walls of the drive shaft housing. Unlike ordinary outboards, which pay for noise reduction by *sacrificing* power, Mercury's new silencing system actually *boosts* power to the prop.

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the cowling surface. To make sure that sound remains trapped inside, the cowling was made "sound-tight" by rubber-sealing all openings for controls and fuel lines.



Dyna-Float, aircraft-type suspension and mechanical isolation of the remote steering control arm completed the sound engineering program that made the new Mercs 50% quieter. Drop by your Mercury outboard dealer's and hear them yourself. Let him show you why you get less noise and more RUN for your money with Mercury . . . 100, 90, 65, 50, 35, 20, 9.8, 6 and 3.9 hp.



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Dutch Boy Paints. More years to the gallon.



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WHO'LL WIN at INDY?

'500' champs Foyt, Ward, Jones discuss this year's strategy, assess new car designs and rules, and speculate on the '65 winner

By Pack Bryan



A. J. FOYT, in an Offy roadster, prepares to lap Rodger Ward in last year's 500. Foyt went on to win with a record 147.350-mph average. Ward, in a rear-Ford-engined car, was second

THREE YEARS AGO they called them "funny cars." These were the light rear-engined racers entered by people such as Mickey Thompson, Jim Kimberly and Jack Zink.

Lotus-Ford had yet to be heard from. The heavy old roadster with the aging, front-mounted Offenhauser was still king.

Since then, Rodger Ward, Parnelli Jones and A. J. Foyt have each won the Indianapolis 500—still with old-fashioned roadsters. Yet the excitement since '62 has centered around rear-engined cars powered by special Ford V8s. In fact, these cars are the odds-on favorites for this year's 500.

Ward, Jones and Foyt had new rear-

engined cars last year. Each had his trusty roadster on hand, too. Ward switched to the rear-engined car and finished second. Foyt stayed with his roadster and won. Jones in his roadster dueled with Foyt for the lead, then dropped out after a fire during his first pit stop.

So why are roadsters now losing favor? Is Indy headed for another rut, this one "Powered by Ford?" *PM* went to the big winners, Ward, Jones and Foyt, to find out. They gave us some surprising answers in a taped interview.

Ward, with the best Indy record of any driver running—two firsts, two seconds, a third and a fourth in the last six races—said: "The rear-engined car is here to stay. I saw Jack Brabham's tests in October 1960 with a Cooper Climax and became convinced that this is the way we'd all have to go eventually.

"In '61 we had coil springs all around and were planning independent suspension for the following year. Logically, the next step would have been rear-engine independent suspension. But the car we had in '61 wasn't too successful (not that I'm complaining about third place). The following year our car owner insisted we go back to solid-axle, torsion-bar roadster construction. We won, but it still was a step backwards."

Still a Place for Roadsters

"I'd like to see a roadster with the horsepower we have in the rear-engined cars," said Foyt, another two-time Indy winner and four-time USAC national champion. "Front-engined cars aren't dead. If we'd had time this year, we'd have tried the Ford engine in my roadster. The problem with rear-engined jobs is the fuel system. It's hard for me to believe it's all right to have fuel tanks all around you. I'd like them to abandon rear engines."

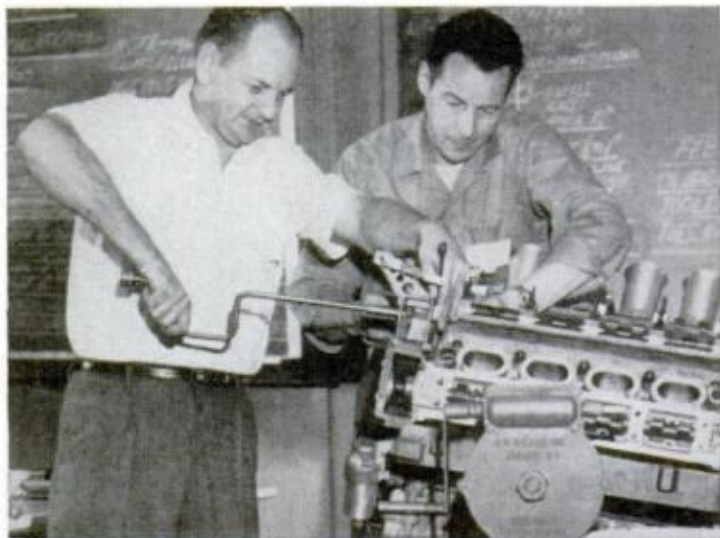
Both said they'd like to try a light, conventional roadster with Ford power. Foyt commented that one of the original roadsters, not offset as much as the later models, would probably do the job. (Later designs normally carried a 300-pound weight bias on the inside rear wheel for more bite on turns.) Jones added that a limited-slip differential replacing the solid axle would pick up speed.

Jones, first to crack the magic 150-mph mark, seemed to favor rear-engined cars, but explained: "One problem is the loss

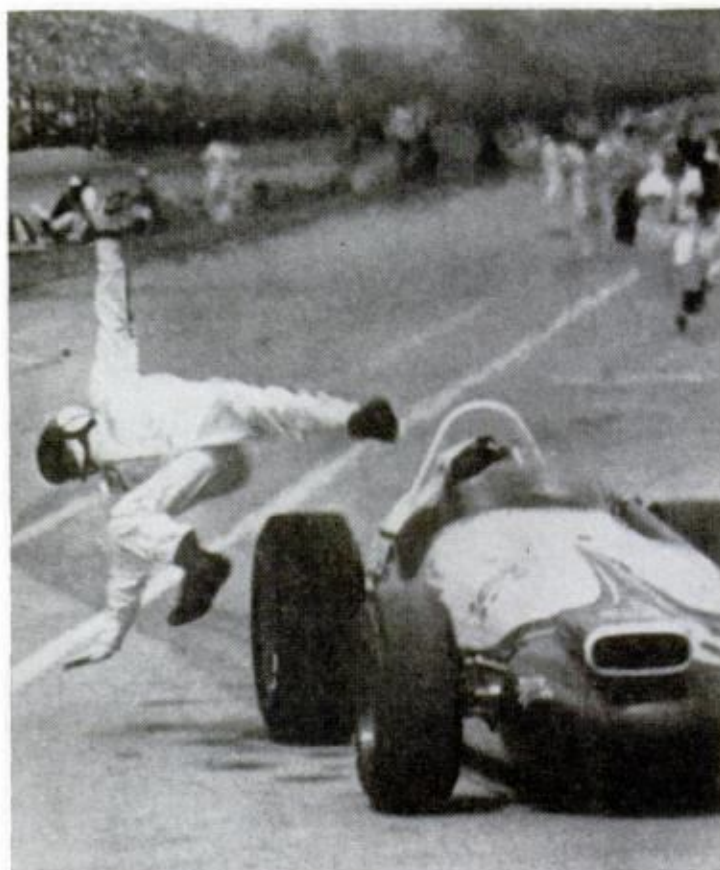
of 'feel' that someone's behind you. With a roadster, you could hear him coming. And we had a rule that you had to look back over your shoulder when going into a turn. With a big engine behind you, you can't see back. Any driver trying to pass better be sure he's all the way past before cutting in."

Jones went on: "The new tires have probably done more than anything to ob-

FORD ENGINE seminar in Dearborn this past February drew some of Indy's top mechanics. Specialists opened up on how to get the most from this engine



LEAPING OUT of his burning car in last year's race, Parnelli Jones rolled on ground to extinguish his burning clothes. Fire started during refueling

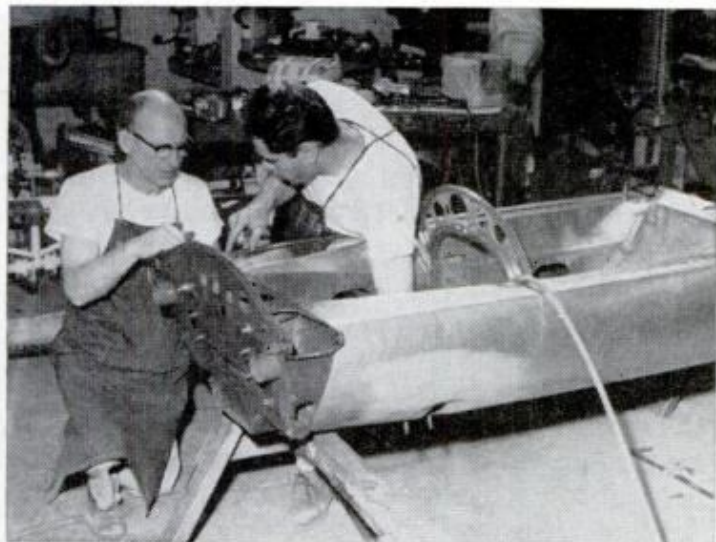


solete the roadsters. We're having a hard time building a car to keep up with them."

Foyt agreed: "They give much better side bite going into a turn and forward bite coming out."

In '64, Firestone made the first tires to last the full race. This year's tires are lighter, have a wider tread (up to nine inches) and different compound. Firestone claims four to seven more mph,

TO CONFORM to new Indy rules, Ed Kuzma (left) and helper rebuild Jones' Lotus. A heavier skin and a 50 percent larger fuel tank have been added

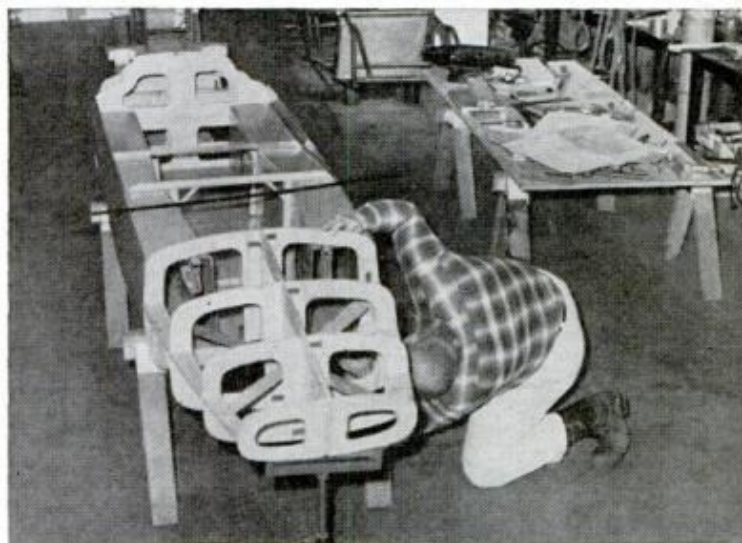


softer ride and durability as good as last year's.

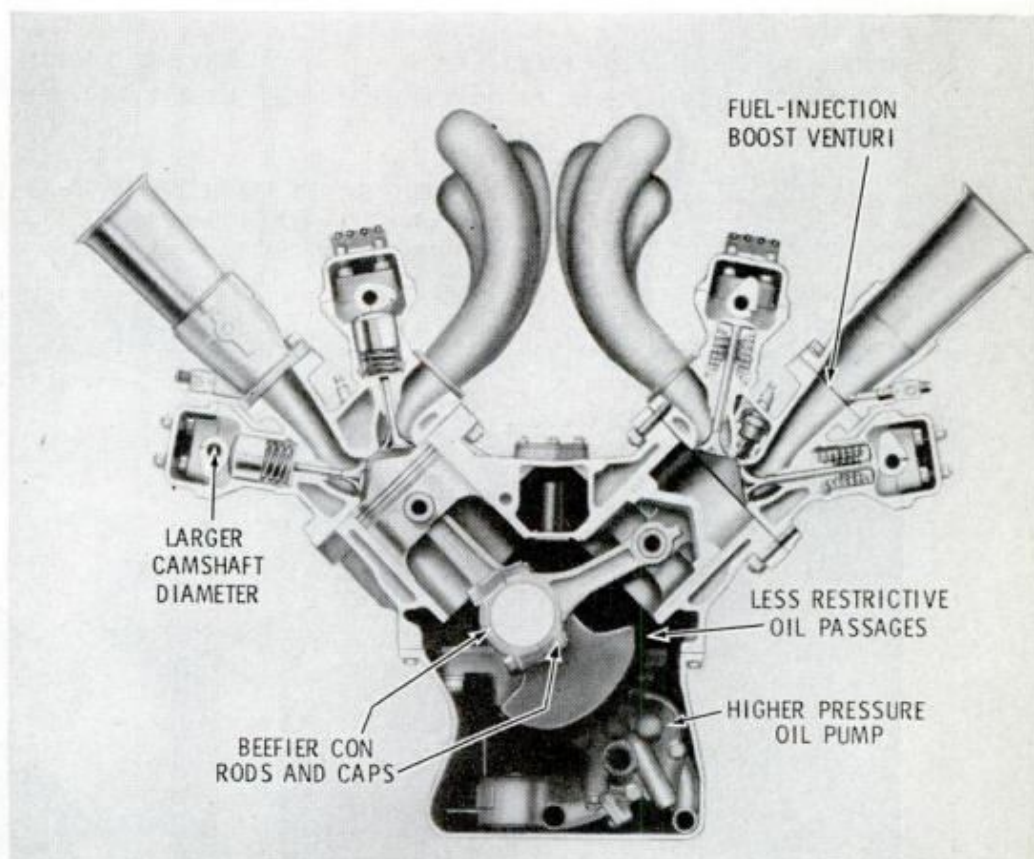
Firestone and Goodyear lease the Indy track and mile ovals throughout the off-season to conduct tire tests, and the front-running racers like the idea.

"You get a chance to try things on your car without pressure," said Jones. "You can try different ways through the corners and then sit down and figure out

NOSE MOCKUP is checked by A. J. Watson before skin is added. It's one of two Ford rear-engined cars to be driven by Rodger Ward and Don Branson



NEARLY HALF of this year's Indy entries will use this Ford twin-cam V8. Most changes from last year are for increased reliability, but fuel injection has boost venturi in the throttle bodies for increased mileage and power



why they did or didn't work."

Both Jones and Foyt bought Lotus cars for the coming season, but new rules regarding thickness of aluminum in monocoque shells and elimination of cowl tanks required that the cars be almost completely rebuilt.

Jones' "back-yard Lotus" will be wider and will carry more fuel. Otherwise they'll be similar. Foyt and Jones will also have a pair of British-made Lolas, which, along with the home-builts, will be stronger than the stock Lotuses. They seemed shocked that a thrown tire tread could have broken a rear suspension member in Jimmy Clark's Lotus and wrecked the car in the last 500. So maybe there is more sense than superstition in the long-time Indy practice of building a car twice as strong as is apparently needed.

Ward, as usual, will have a new car for the coming race. He placed second last year with a rear-engined machine, but it was heavy and didn't handle well. Ward claims it was better than any other roadster he's driven, but admits the 200 pounds it spotted the Lotus-Fords was too much. He expects the latest car to be more competitive.

It will be a semi-monocoque design. Engine and driver will be farther aft, with Ward in a semi-reclining pose. When such a car starts to spin, its rear end goes first and the farther back the driver sits, the sooner he gets the message.

The past few 500s have been described

as sprint races run between yellow-light periods. We asked Jones, Ward and Foyt whether they used any strategy or just met conditions as they came.

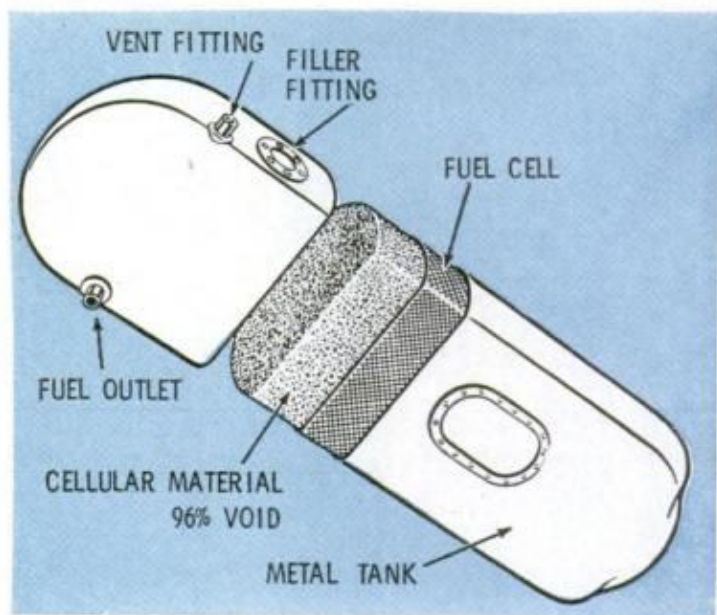
Jones, a smooth and extremely fast driver who likes to run out in front, but who's been plagued with equipment failure, said, "You can't decide it'll take so many mph to win and then run your 500 miles that way. I start out hard to build up a cushion. If I lose time in the pits, I'm still ahead. Once you've built up a lead, you can set an easy pace."

Help from the Pits

"I think everyone sets his race plans to a certain extent," said Foyt, "but as the race goes on you work with your crew, who tell you what's going on. Parnelli and I had a good duel going at the beginning of last year's race, and I was pushing. But after his pit stop, my crew told me he was out of the race. Ward was making many fuel stops and I lapped him twice, so all I had to do was hold 'er together for the rest of the race. I could have run maybe 6 mph faster, but I wasn't out to set a record. I just wanted to win."

Ward, a steady driver who lays back and relies on his equipment to bring him home in the money, said: "Until Firestone brought out their new tires last year, we could decide ahead of time pretty well how we'd run the race. We knew we'd have to make *at least* three pit stops for tires alone. Fuel was no problem.

RUBBER FUEL TANKS ARE REQUIRED this year. Here car owner J. C. Agajanian, driver Parnelli Jones, and engineer D. C. Cline examine Firestone's "Rasafe" tank (drawing at right), filled with foam baffling. It's claimed fireproof



"By the time you made your first pit stop, the race would have developed a pattern. You could tell who was going to be the toughest man and how your car was performing. I never feel it's important to lead early. Be within shooting distance and lead if you can lead easily. But you win by going 200 laps, not just the first few. It's more important to be able to run the last laps hard, if you need to. I'd rather overcome drivers because of their mistakes, rather than by charging.

"This year, strategy again will be important, because the rules say we have to make at least two pit stops. We can plan to stop on specific laps or, if we have the fuel capacity, run until a yellow flag."

Pitting During the Yellow

When the starter waves the yellow flag and yellow lights go on around the track, drivers must slow down and maintain position. There's been controversy over this rule; some say it means slow way down, others that it only means watch out.

"Pitting during the yellow flag isn't a big advantage," said Jones. "You don't have to slow down that much. You reduce speed and use extra care near the accident that caused the yellow, but then pick up the pace for the rest of the track. We don't have a close-up rule at Indianapolis . . ."

"Thank God," interrupted Foyt.

". . . that requires a drastic slowdown by the whole field assembled right behind the leader. I'm glad we don't. It penalizes

the chargers or leaders."

"If someone's hurt, I'll stop my car, like we all did last year," said Foyt. "But I won't chance wrecking a \$12,000 engine or throwing away a lead when nothing's wrong. If you've been running hard all day, you might have ring wear, and slowing way down will cause excessive blow-by, fouling your plugs. Then, under a bunch-up, the drivers who've been taking it easy all day can pull up on you. When the green light goes on they go right by you, because your own car won't accelerate. If a driver runs hard and builds a lead, he's entitled to keep it. I'll pit when I have to, on the yellow when possible."

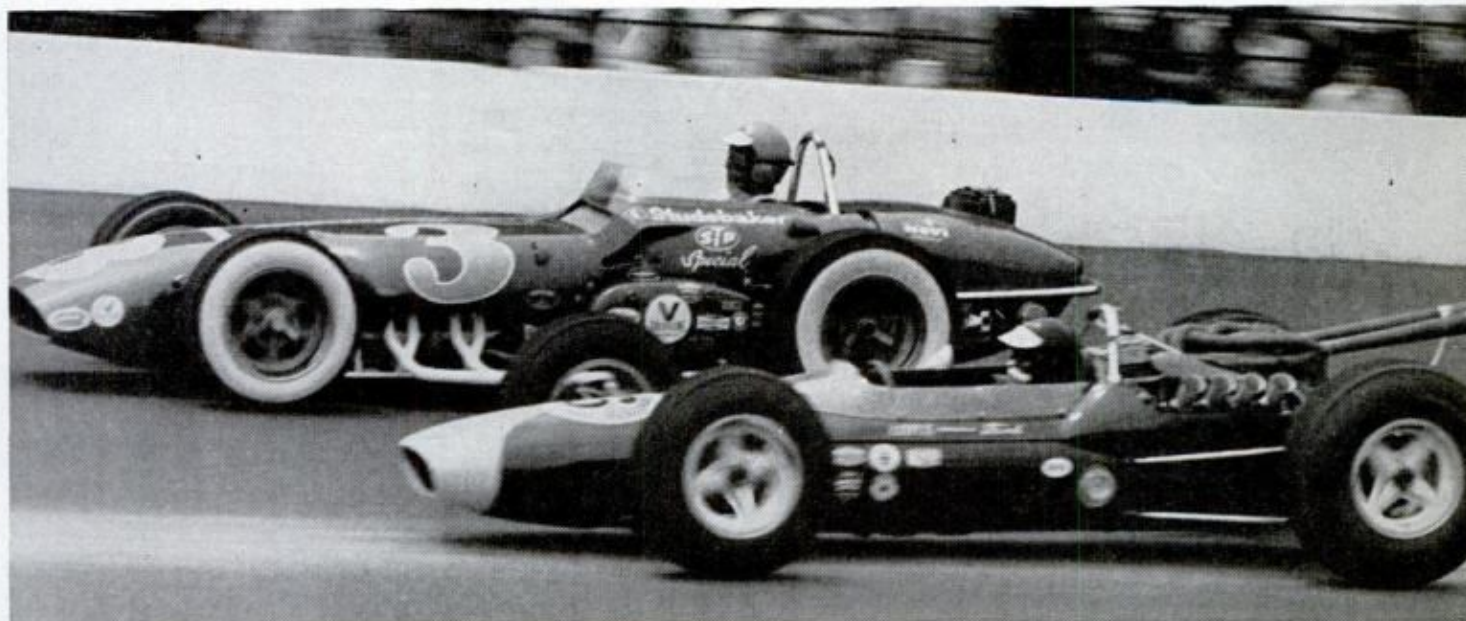
Ward disagreed. "As I read the rules, they say drop from race speed (about 150 mph average) to about 100 mph and then slow down even more at the scene of an accident. The 100 mph may sound fast, but on the Indy track it's slow. The problem is in administering the rule; every driver tries to protect, if not improve, his position. Officials must make snap decisions that can cost a driver \$100,000."

At Indy, "fouls" are penalized by calling the driver into the pits for "consultation." This lost time can erase a driver's lead and cost him the race.

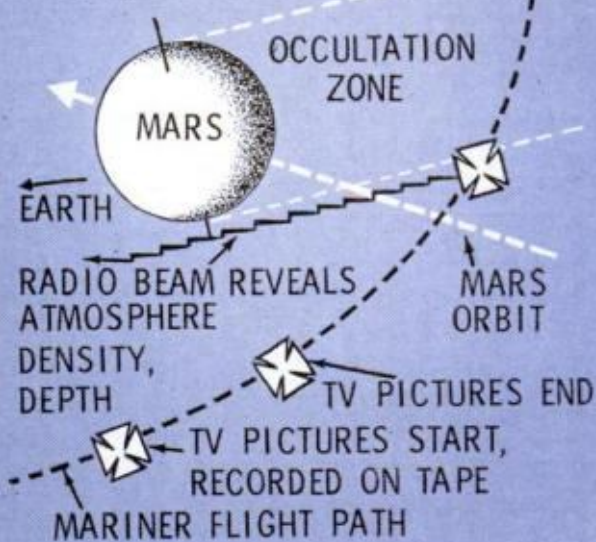
"I like the bunch-up rule on the mile tracks," Ward went on, "but it wouldn't work at Indianapolis. What they're considering now is a large clock face at the end of each straightaway, with numbers

[\(Please turn to page 226\)](#)

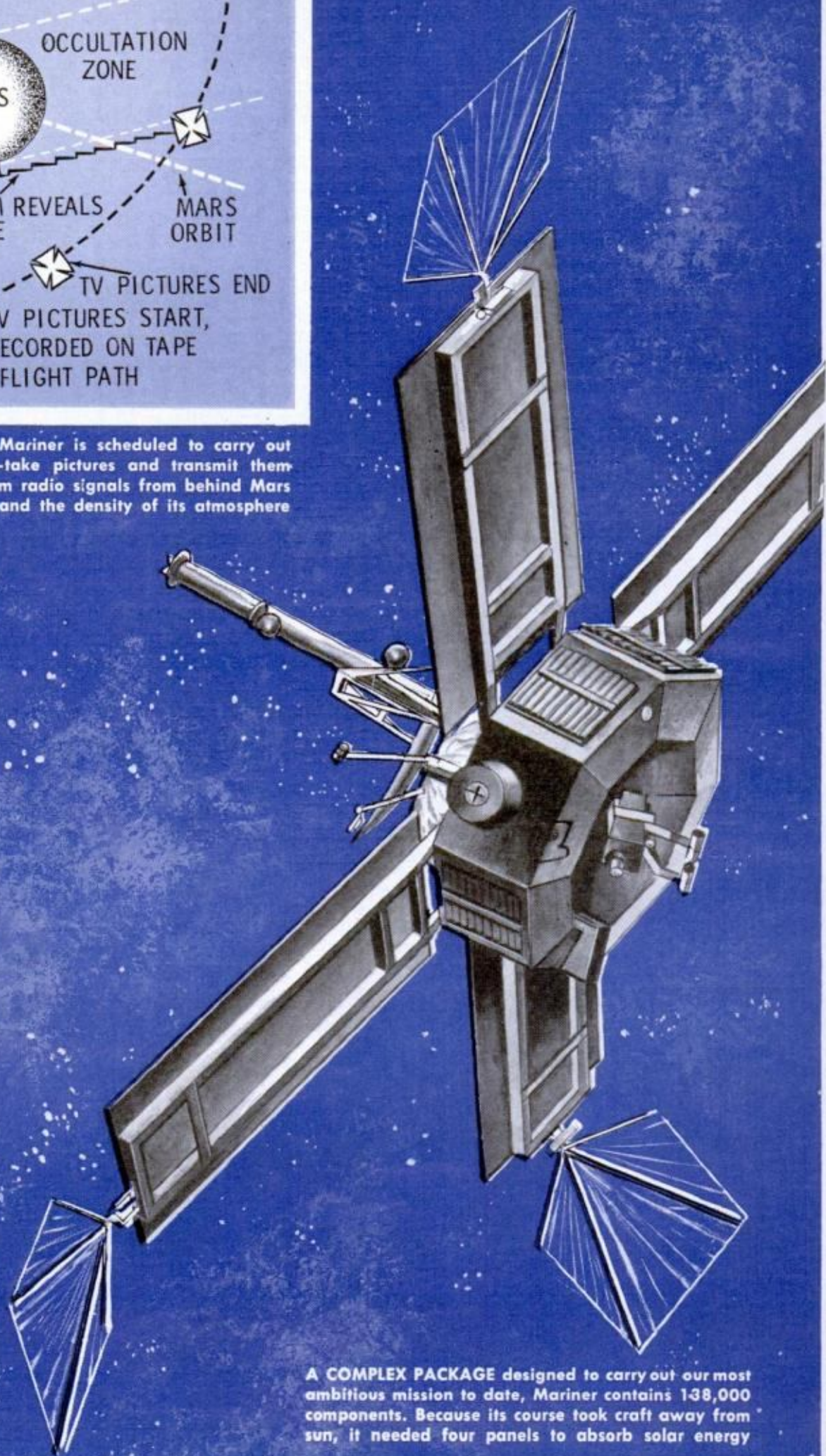
JIMMY CLARK IN SLEEK LOTUS-FORD (foreground) laps Art Malone's Novipowered Studebaker Special roadster in last year's race. Clark later dropped out with a collapsed left rear suspension after one of the tires threw a tread



START TRANSMISSION OF
RECORDED TV PICTURES



AT ENCOUNTER, Mariner is scheduled to carry out two experiments—take pictures and transmit them to Earth, and beam radio signals from behind Mars to test the depth and the density of its atmosphere



A COMPLEX PACKAGE designed to carry out our most ambitious mission to date, Mariner contains 138,000 components. Because its course took craft away from sun, it needed four panels to absorb solar energy

UNMASKING MARS

What Our Flyby Will Show

With luck, Mariner will photograph deserts, mountains and icecaps. It may also analyze Martian 'air,' solve the great canal mystery

By James Joseph

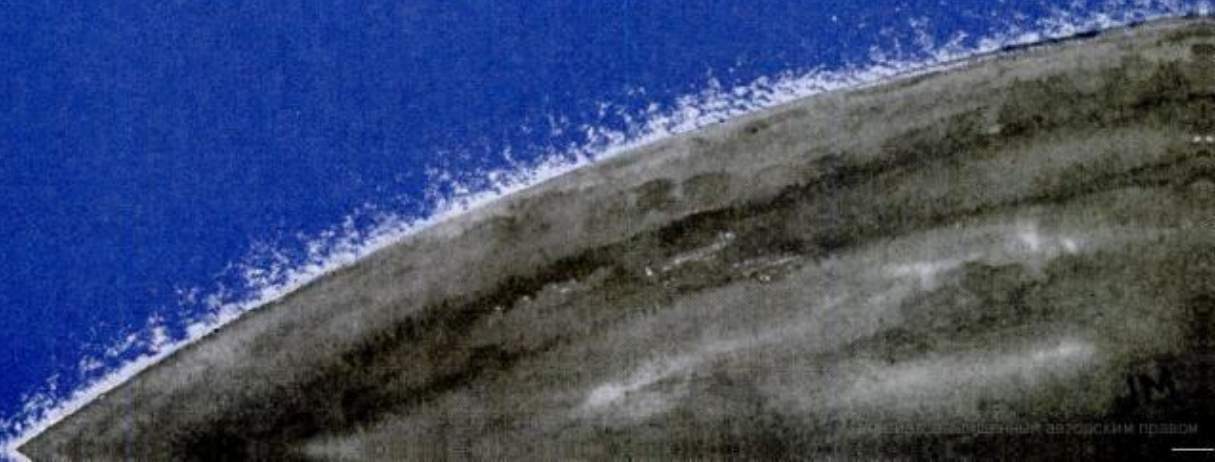
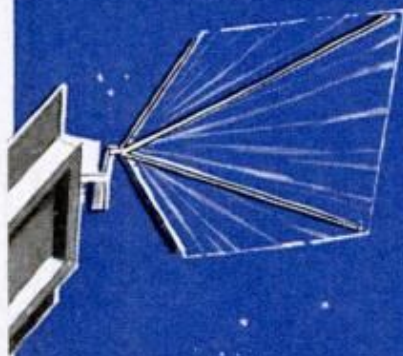
THERE'S A PINPOINT of reflected light in the southern Martian sky, a speck that grows slightly larger each evening since it first appeared. If there's a "man" on Mars with a telescope, he is certain to be concerned, for the object appears to be on a near collision course.

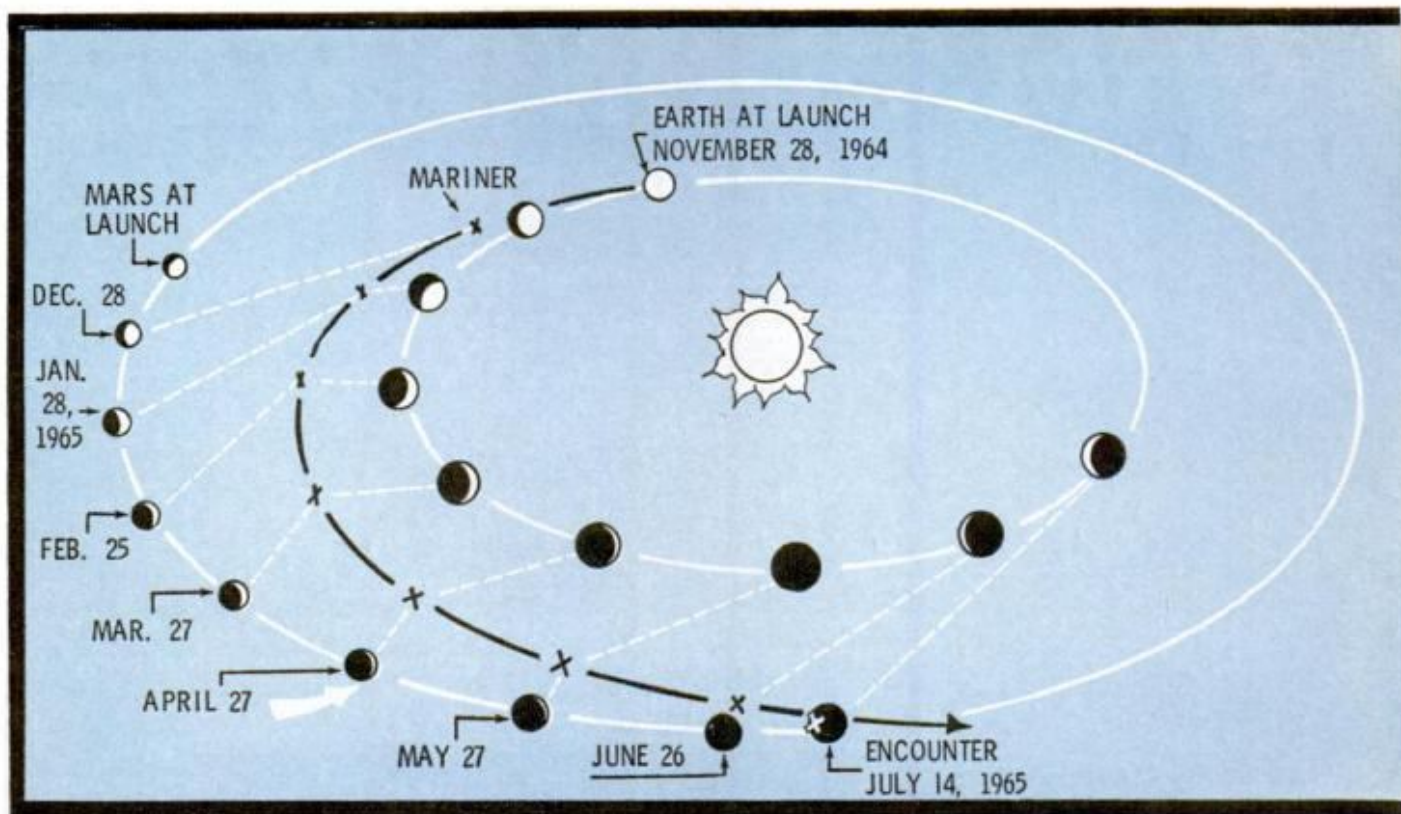
On the evening of July 11, 1965, the intruder sweeps in from the west but misses the planet by some 5400 miles as it cuts between Mars' equator and south pole. Moving at better than 11,000 mph (in relation to Mars), the object passes behind the planet and disappears in the east to become a piece of dead hardware endlessly orbiting the sun.

That piece of hardware is Mariner IV. The 13 hours and 20 minutes it may spend in the vicinity of Mars—that's the flyby time as designated by our scientists—would be the climax of a 325-million-mile trip that began seven and one-half months earlier at Cape Kennedy. If Mariner's 138,000 components are in good working order, and if the craft is properly oriented toward Mars, we should know a lot more about the "red" planet after July 14 than we do now.

Views 100 Times Larger

Mariner's most exciting assignment is to take 21 photos—all time allows—of Mars. The TV camera will pick up nothing smaller than two miles square, according to scientists at the Jet Propulsion Laboratory in California, which designed the craft and is directing the NASA-sponsored mission. If pointed at Earth from the same height, the camera might pick up the outline of a city but not its houses or streets. That would be about 100





times more than our scientists have ever seen of Mars.

"Even through the best telescopes the planet appears about as the moon does to the naked eye," explains Dan Schneiderman, Mariner's project manager. "Mariner's photographs would give us about what our telescopes see when they look at the moon."

Pictures that good could put an end to a lot of the speculation about Mars. Are there mountains, deserts and oceans on Mars? Are the deserts the scene of monstrous dust storms? Are the "patches"—the great areas that seem to change from green to brown with the seasons—really vegetation? Are they vast forests, as was once thought, or little more than arid plains with a scant spring growth of lichens?

Today, astronomers generally agree that the Martian "canals" don't represent the work of intelligent beings. But what *are* the many straight lines and streaks observed on the planet's surface?

The photo-mosaic map that Mariner may produce—a map covering an area 4000 miles long and 150 miles wide—could answer the above questions or at least provide some good clues to the answers. Mariner's TV vidicon is equipped with blue-green and orange-red filters to provide high contrast in the photos sent back to earth. Alternate photos will be taken through each filter.

In addition to TV, Mariner carries scientific sampling devices designed to function in seven different experiments. Some of the unknowns to be probed have intrigued man for centuries:

How dense is the Martian atmosphere? To find out, Mariner is scheduled to send radio signals that will pass through the atmosphere of Mars on their way to Earth. The extent to which the signals are bent and shifted in frequency will indicate how dense the atmosphere is and how far it extends above the planet's surface.

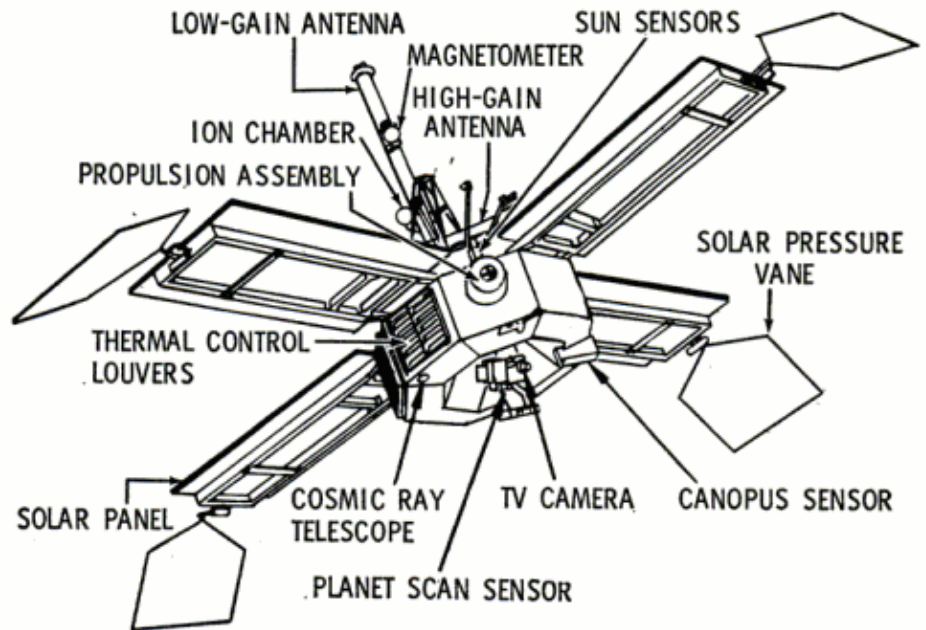
This is the "occultation" experiment. In the language of astronomers, occultation basically is an eclipse, what you have when a star disappears behind the disc of our moon.

If Mariner's trajectory takes it into the occultation zone behind Mars, the Earth will be in a direct line on the other side. Placing Mariner that precisely would be a fine bit of astronomical sharpshooting.

Spectrographic studies show that the Martian atmosphere consists mainly of nitrogen and argon, with only traces of oxygen and water vapor. Its density is thought to be only one-tenth that of Earth's atmosphere.

Precise knowledge will be essential if and when we try to land a capsule. A parachute system isn't worth a darn without an atmosphere to support it. That type of landing requires retro-rockets.

INCREDIBLE journey (left) of 325 million miles and 7½ months must be completed before Mariner flashes behind Mars. Arrow indicates where the craft was figured to be the day that this issue of PM hit the newsstands



TELESCOPE IN CAMERA (seen at bottom of craft) has focal length of 12 inches. Shutter consists of single rotating disk with four openings. Just above the camera is nozzle of rocket motor used in making course correction

Atmosphere also helps to control temperature. Scientists have determined that the Martian night is as cold as -150 degrees F. but that at midday at the equator it might be a comfortable 70 degrees F. Though this great range doesn't rule out the possibility of life (as we know it, anyway), it would take a hardy animal to withstand those extremes.

An atmosphere provides protection from cosmic rays, solar radiation and the bombardment of micrometeorites. It's a pretty safe bet that Mars' covering of gases—if it's as thin as we think it is—does little to shield its surface. Proof that it is thin would be another good reason for discounting the possibility of finding anything resembling "men" there.

Are the white masses at Mars' poles really icecaps? They grow and shrink with the Martian seasons and can be seen even with relatively small telescopes.

Early astronomers concluded that the masses were icecaps, much like those covering our own planet's poles. Later, scientists found that Mars' atmosphere was almost without moisture, and hit upon the idea that the white masses might be frozen carbon dioxide—Dry Ice.

Recent studies, however, indicate that the "caps" are indeed made up of ice crystals. But they melt rapidly, to indicate they're no more than an inch thick.

Mariner's atmospheric density tests and

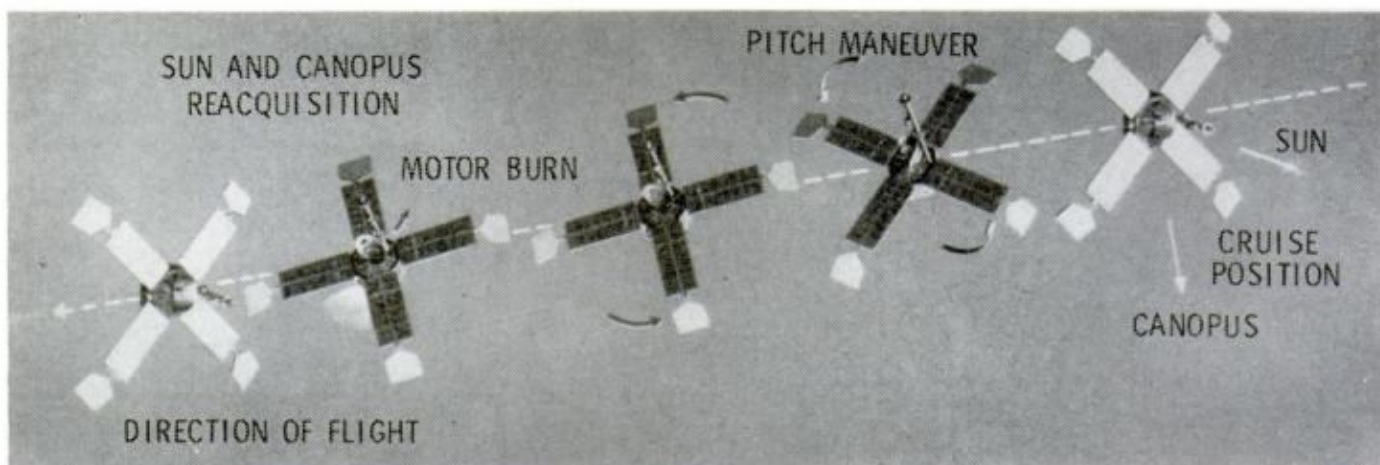
its polar photos should go a long way toward settling the question.

Has Mars a magnetic field? The instrument designed to determine this, called a helium magnetometer, is being flown for the first time on this mission. It measures not only the magnitude of a magnetic field but its direction as well. This equipment also provides the first opportunity to measure magnetic fields in interplanetary space at distances from the sun greater than Earth's orbit.

Is Mars surrounded by radiation similar to Earth's Van Allen belts? Four detection devices on Mariner will attempt to answer that question. Should strong belts be found, that wouldn't necessarily end future chances of landing men on Mars. After all, we on Earth manage to live under potent belts of radiation thousands of miles above our heads. A space vehicle would have to be sent in through a "thin spot," where the belt can be penetrated with less hazard. Mariner may lay the groundwork for a future mapping of such belts—if they exist.

Trip Guided by Stars

Mariner IV's 228-day journey—more than half finished as this is written—began at Cape Kennedy at 9:22 a.m., Nov. 28, 1964. Hurling first into a 115-mile-high orbit by its giant Atlas-Agena D booster and then into a rendezvous trajectory to



MIDCOURSE MANEUVER (above) was carried out when Mariner was 440,000 miles from Earth. Thirty-second "burn" of small rocket did the trick. If course hadn't been altered, the craft would have missed Mars by 151,000 miles



TWO OF BEST EXISTING photos of Mars (shown) were made with 200-inch Mt. Palomar telescope. Because much of the Martian surface has reddish hue, red filter produces fuller picture (right). Blue filter was used for other photo

Mars, the 575-pound craft shook earth's gravity and was on its way.

Just three weeks before, Mariner III had proved a dud when its fiberglass shroud failed to jettison, preventing its solar panels from opening. But Mariner IV's new aluminum shroud jettisoned right on schedule. Slowly, like a butterfly drying its wings, the power panels unfolded and locked into place at right angles to the craft.

Moments later Mariner's electronic brain, crammed with stored data and operational commands, ordered the sun sensors to seek the sun and lock on it. Sun "acquisition" would brake the craft's head-over-heels tumbling. It would also align the four power panels, each six feet long and three feet wide, to face squarely toward the sun. It was their function, not that of Mariner's rechargeable silver-zinc battery, to supply the craft's power during its long trip.

Sixteen hours after this was accomplished, the computer ordered Mariner—first spacecraft with the ability to stabilize itself by stellar navigation—to seek out the star Canopus and to lock on it. Stabilized only longitudinally, Mariner was spinning like a slow-motion top. Such lateral instability, were it allowed to continue, could affect the strength of Mariner's transmissions as it neared Mars. A second star-lock was imperative.

Canopus had been chosen with care. It is a huge star, located in the Milky Way, in a position perpendicular to Mariner's course. Furthermore, it is 1900 times brighter than the sun, making it fairly easy to pick out from among some 300 others lying along the craft's lateral roll axis.

On command, Mariner rolled to the right, its Canopus electronic-eye sensor sampling light from scores of stars. It successively locked on four bright stars—

[\(Please turn to page 222\)](#)



By Ed Nelson



Is a Chevy "Mustang" in the Works for Next Year? What Happened to 300L's Missing 30 Horsepower

BOTH GENERAL MOTORS, in the person of the **Chevrolet Div.**, and **Chrysler**, represented mainly by **Barracuda**, are scratching hard to come up with a stronger counterattack against **Ford's Mustang**.

For '66, **Chrysler** will make basic changes in the **Plymouth Valiant** and **Dodge Dart**, but the **Barracuda** still will share primary elements like the floor pan and suspension system with the larger volume "compacts." For **Chrysler's** sake, I only hope they sharpen up the body. As it stands, the **Barracuda** shell suffers from the stylists' effort to go in two directions at once—toward room for back seat passengers (which they achieved) as well as sleek exterior lines (which could be sleeker).

A bigger challenge to the **Mustang** may come from **Chevy**. **Ford** people see most of **Chevrolet's** moves as copies of **Ford** innovations—they think of the **Caprice** as a copy of the **Ford LTD**, and even consider the **Chevy II** as the **GM** version of the **Falcon**.

Without going into the merits of those claims, it's becoming clearer that the "**Chevy Mustang**" is due, by the current schedule, in the Spring of 1966. Like the **Mustang**, though, it'll be pre-dated, that is, registered as a '67. Will this car be the drastically re-done **Corvette** that is also rumored to be on the way?

HERE'S MY GUESS: The talk coming out of **GM's** Warren, Mich., Tech Center about a drastic new body is being **mistakenly** thought of as a reference to a new 'Vette. But **Chevy** has little reason to re-vamp the **Corvette** now; they just gave it a new engine, one that even competitors respect. At the time of the '65 introduction they gave it America's only four-wheel disc brakes. And the **Sting Ray** body—among the first of the new truly fast-backed breed—doesn't look that old. So I'm betting the new body will be on a totally new car.

Conversation in Detroit indicates **Pontiac Div.** wants a crack at that new body, too. **Pontiac** has been in love with the performance idea for years, but the **GM** no-racing rule has been enforced so well that

people are forgetting the division's stock car successes of a few years ago. The mahogany desk set in the **General Motors Building** hasn't yet decided whether **Pontiac** will get to share the new shell, however.

SPEAKING OF DISCS, they'll soon appear—maybe by '66 introduction—as extra-cost options on every **General Motors** car. Figure they'll be standard equipment on the higher cost models. The move will help support the industry's image of concern for public safety.

Spreading popular concern for vehicle safety, as well as today's long warranties, are responsible for a rising interest of manufacturers in enforced periodic inspections. The District of Columbia and 20 states now require them. The car manufacturers' association has donated money to support the program in the past, but interest from individual manufacturers (except **Dodge**) has been half-hearted. Now promotion of regular inspections will get the full treatment.

WORRY ABOUT DETROIT'S safety image won't stop horsepower increases, however. The Big Three all will boost horsepower next year. And **Chrysler** as well as Lincoln is preparing a monster engine with displacement in the area of 462 cubic inches. **Chrysler's** probably will be limited to use in the **Imperial** at first.

"Will it be a high-revving, high-performance engine?" we asked one of the insiders. He snorted, then barked back: "Cars are getting so damn big they just gotta have big engines."

CHRYSLER'S showpiece in Performance-cum-Luxury competition has been the alphabet series of its **Chrysler 300**. Last year's snarling entry, the **300K**, had a hot 390 hp. But this year, with growing fever for performance, the car took a step backward to 360 hp. Why?

Apparently the stylists won this battle with **Chrysler's** engineers. The hood line is so low this year that it wasn't possible to stuff in two four-barrel carburetors. Hence the **300L** lost 30 hp.

Inside Our



Fabulous Pivot-Wing Plane



Here's the story on what makes the amazing F-111 the most versatile aircraft ever built

By Kevin V. Brown

VETERAN TEST PILOT Dick Johnson, a slim, grim-faced icicle, nursed the strange-looking plane into takeoff position. He checked the controls, glanced at copilot Fred Voorhies, then started down the runway with a smooth roar.

The plane was off the ground in less than 3000 feet, climbing rapidly, when it began assuming a different shape. First the leading-edge slats and trailing edge flaps, down for takeoff, were retracted into the wings. Next the wings themselves began swinging back, locking at about 50 degrees in a more streamlined silhouette.

It accelerated steadily while climbing, reaching Mach .9 before leveling off at 30,000 feet. Then, simultaneously pushing forward on a pistol grip and the two throttles, Johnson and Voorhies swept the wings all the way back and, for the first time, plunged the extraordinary plane through the sound barrier.

And the amazing F-111, an aircraft conceived in necessity and born in controversy, flew past another milestone in a life that may yet see it become one of the greatest airplanes in history.

It's built to:

- Take off from raw jungle strips or catapult from decks of atomic carriers.

- Hover for hours at minimum speeds or streak supersonically across oceans.

- Skim unerringly at treetop level beneath enemy radar-and-missile defenses, or zoom into the stratosphere and outfly and outfight anything there.

- Carry any airborne weapon now in service, plus one new exotic system.

- Use these missiles and rockets, some with nuclear warheads, against pinpoint ground targets in guerilla warfare, or enemy aircraft in high-altitude combat.

It can do anything any other airplane can do, plus a few more things that all of the others can't do—high or low, fast or slow, anywhere in the world.

Some people call it the "B-111," since it *could* replace bombers. Others, because of its versatility, say it may be the last combat airplane ever built.

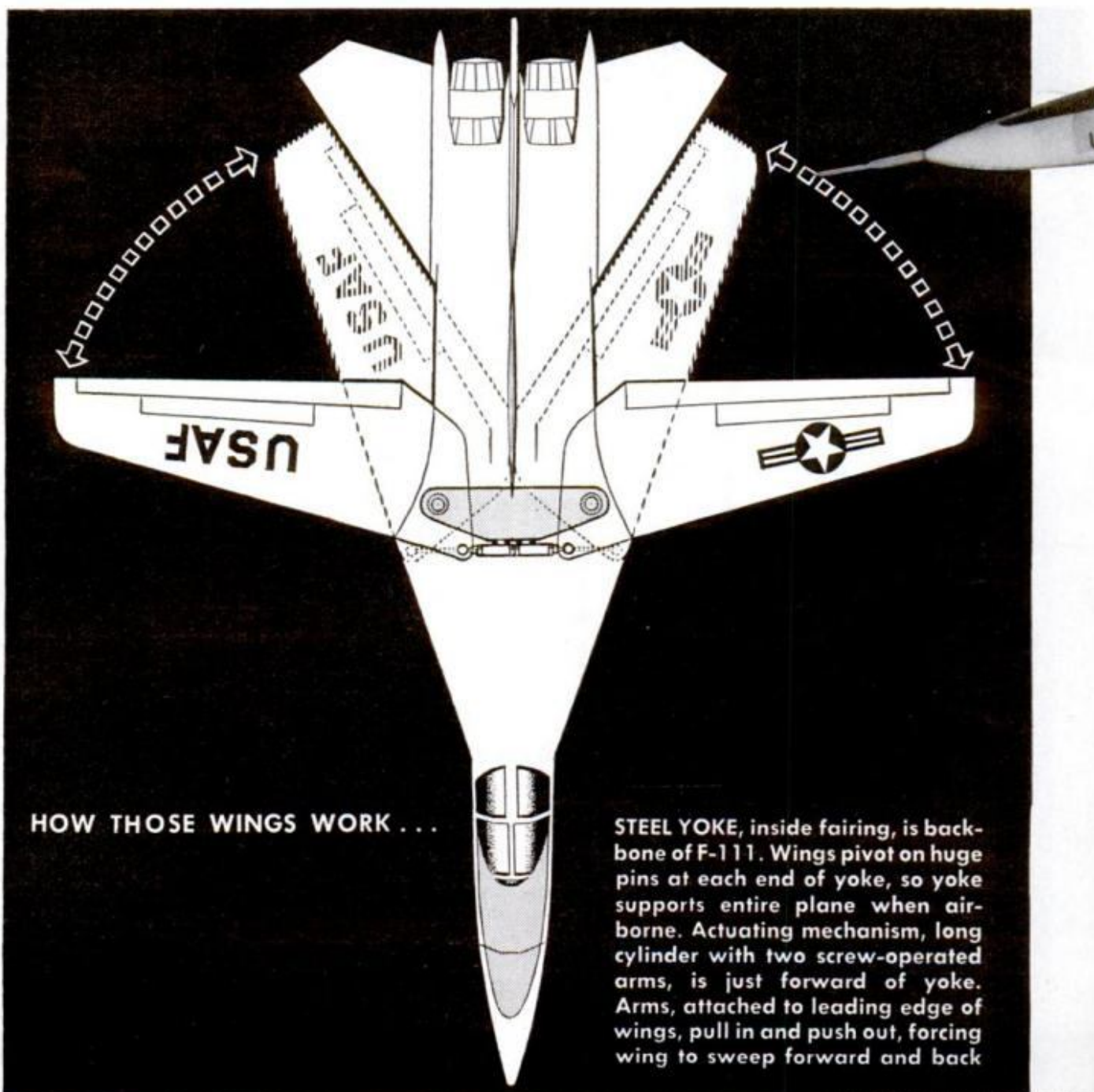
How could any one plane, contrary to all rules of aerodynamics and common sense, be so many things to so many people? The F-111 is all airplanes in one.

It's generally conceded that, if necessity is the mother of the F-111's invention, its father was General Frank Everest, then commander of the Air Force's Tactical Air Command.

He saw the coming problem of building

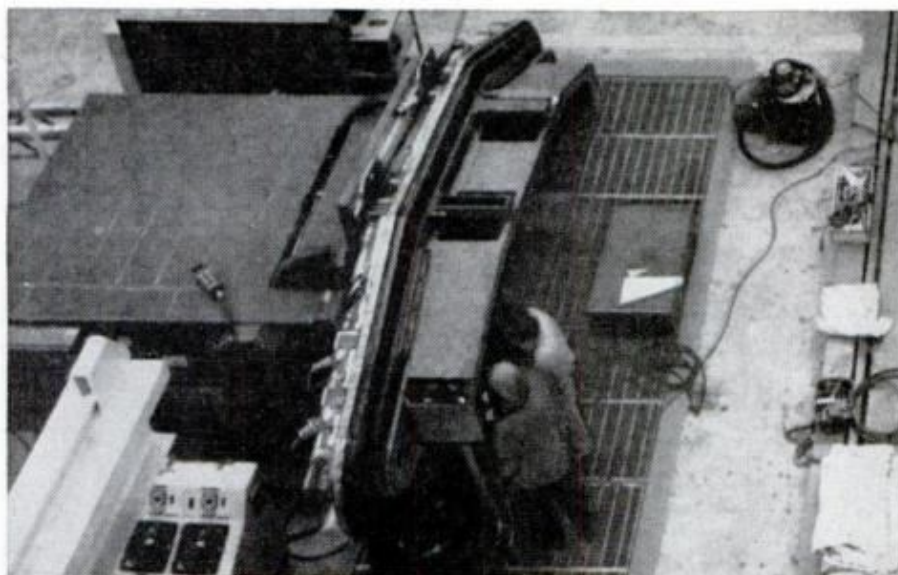


SWEPT FORWARD, F-111's wings are rigged for slow speeds, landings or takeoffs, with slats and flaps down. In this position, F-111 has wingspread of 63 feet; swept back, less than 32 feet. Stabilizers operate independently



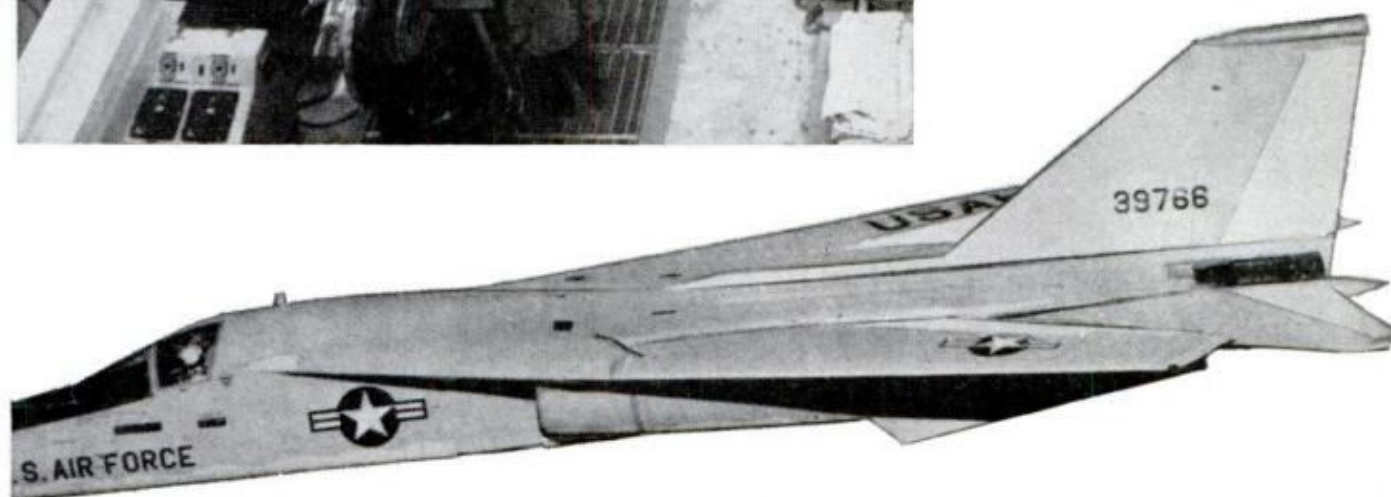
HOW THOSE WINGS WORK . . .

STEEL YOKE, inside fairing, is backbone of F-111. Wings pivot on huge pins at each end of yoke, so yoke supports entire plane when airborne. Actuating mechanism, long cylinder with two screw-operated arms, is just forward of yoke. Arms, attached to leading edge of wings, pull in and push out, forcing wing to sweep forward and back



YOKE, shown in rare assembly-line view, is the backbone of the F-111, supporting wings and entire airplane when airborne. Wings pivot from pins at each end of 14-foot yoke

SWEPT BACK, wings give F-111 appearance of delta-wing plane. Spoilers on upper surface have cut out and horizontal stabilizers now operate as both elevators and ailerons



longer and longer runways to accommodate TAC's larger and faster fighters, while the wars they were expected to fight seemed to be getting smaller and smaller.

Large runways are easily pinpointed and destroyed by an enemy. If they are built out of his range, then the fighters which operate from these runways also would be out of range of the targets.

The General's White Blackbird

So the general asked for a white blackbird. He wanted a plane that could take off or land anywhere, even a sod strip hacked out of a jungle, and yet fly across oceans without refueling. Further, he wanted a plane that could "loiter" for hours at subsonic speeds over a given spot to maintain aerial supremacy. But it also had to streak at speeds up to 1700 mph whether clipping the treetops or skimming the anvil clouds above 60,000 feet.

The basic breakthrough needed to make such outlandish performance possible was the variable-sweep wing. The plane had to have a wing that would stand almost straight out for short takeoffs and slow flight, then sweep back for faster subsonic speeds or even faster supersonic speeds. Once achieved, the controversy began.

The F-111, then a paper airplane called the TFX (for tactical fighter, experimen-

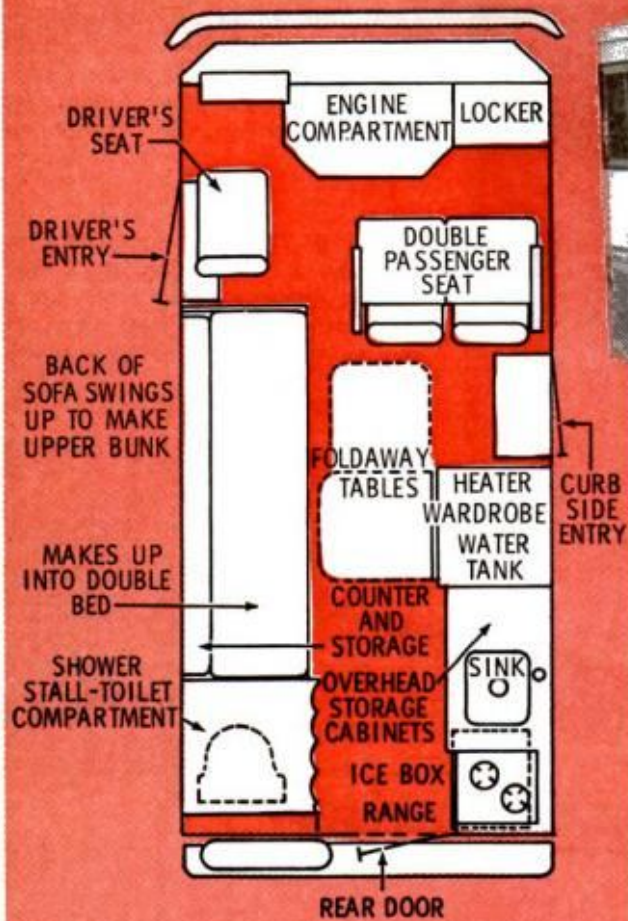
tal), was received with so much enthusiasm that the civilians in the Pentagon decided all three services should have it. The Army begged off early, but the Air Force and Navy were forced into a mixed marriage that neither really wanted.

That was only part of the controversy. The fight for the \$10 billion contract was spectacular and, when Boeing (thought by many to have the best design) didn't get it, screams of "politics" were cosmic. All of which merely points up the fact that no plane in history was born under such a cloud of suspicion. In spite of those who will always think of it as "second best," the product launched by the winning team of General Dynamics-Grumman is a remarkable and revolutionary aircraft.

The movable wings are only one of its many innovations. To examine those innovations at first hand, *Popular Mechanics* visited the General Dynamics plant at Fort Worth, Texas. It was here that the first prototype F-111 was made and test flown, and where the major portion of the initial order of 23 aircraft are being fabricated and assembled. Grumman Aircraft on Long Island will assemble the Navy version.

We walked up and down the assembly line at Fort Worth, looked inside some of the F-111s in various stages of construc-

(Please turn to page 214)



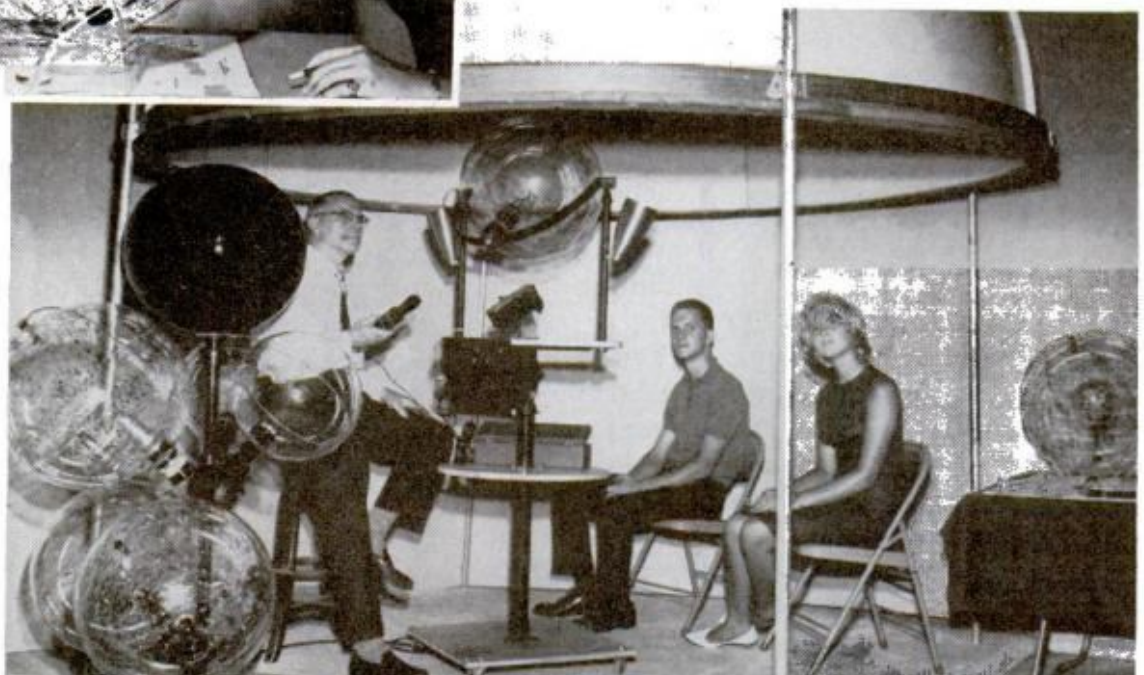
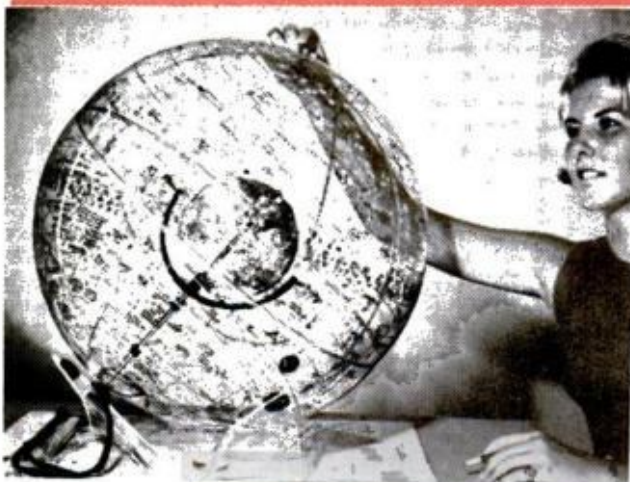
Sedan-Sized Camper

Four adults and two children are accommodated in a new camper which includes a separate toilet and standard kitchen facilities. The unit is 16 feet, 5 inches long and 6 feet, 5 inches wide. Its interior height is 5½ to 6 feet, providing headroom, storage space and two overhead bunks.

Quad Cub, with a Chevrolet chassis and Grumman body, sells for \$7490 from Quad, Inc., 1400 Burbank Blvd., Burbank, Calif.

Midget Universe

A variety of sky maps can be projected with this miniature planetarium. Light source within transparent Plexiglas globe projects star and planet locations (which are printed on globe) to inner surface of dome overhead. "Earth in space" (left) is one of seven different globes available. Maker is Farquhar Globes, Philadelphia.





CORVAIR

A Nationwide Survey Based on
995,118 Owner-Driven Miles

Style, Handling Snap Offset Wind Noise

*Marginal and boldface comments by Ed Nelson,
PM's Automotive Editor*

I DRIVE MY CORVAIR in sports car competition," a Florida production control man told *PM*. "It has won me a first, two seconds, and a third place; I don't think that's bad for the first four times out. The car handles very well in the turns and, with the 3.55:1 positraction rear end, gives me enough low end torque to compete."

The styling comments, too, supported the theory that owners of the new Corvaire feel they're edging toward the sports car—or "sporty car"—crowd. Another Californian told us his Corvaire, "sitting beside other cars, looks like something right off the track."

A telephone technician from Connecticut spoke for his

REAR ENGINE GIVES extra traction for hill-climbing as well as deep snow. This 110-hp test car climbed this steep hill in high gear with no strain



Owners Like

- Sleek styling (55.3%)
- Easy handling (47.3%)
- Comfortable bucket seats (25.2%)

But Dislike

- Excessive wind noise (13.4%)
- Cramped rear seat (12.6%)
- Water leaks (11.7%)



GAUGES ARE DEEPLY recessed, yet readable. Power-glide control is inconvenient, one engineer felt, but other owners didn't find it worthy of comment. PM testers found no distracting windshield reflections at night

Only two percent had considered any Plymouth, including Barracuda →

In the other five cases, an average 86.6 percent said they'd buy again →

fellow Corvair owners when he said, "The all-new styling is more competition for Mustang and foreign cars." And indeed, 19.4 percent of the owners reporting said they'd considered a Mustang before deciding on their Corvair Monza. (About 80 percent of Corvair sales are Monzas, so that's what we concentrated on.)

Nevertheless, Corvair owners aren't as overwhelmingly enchanted with their new cars as we've found the owners of other cars checked during the '65 model year to be. Although nearly 85 percent said they'd buy another Corvair, this is a bit below the average of the other five '65 cars on which we've presented owners' reports. And the percentage who called their Corvairs Excellent—only 50.8—is also the lowest below the 59 percent average for '65s reported.

A major complaint, as often seems the case lately, is traceable to the curved windows. Wind noise topped everything in the brickbat list; leaks, largely at the windows, were third; and the windows themselves were seventh.

The Corvair, increasingly, has the flavor of a more-or-less high performance little rig, so not many of the owners complained about fuel mileage. The 110-hp version of the Corvair engine is clearly the most popular: 77.8 percent of the owners have it. And the biggest overall fuel consumption figures came from the 23.9 percent who reported 19 to 20 miles per gallon.

For performance and fuel consumption checks, Chevy provided a four-speed, 140-hp Corvair. We hooked up the PM Tracktest fifth wheel with electric speedometer, odometer and fuel meter for precise results (and found the Corvair speedometer one to three miles an hour slow, the odometer a surprising 7 percent slow). Here are the mpg figures:

True mph	30	40	50	60	70
Fuel consumption	29.07	27.61	23.82	21.43	19.37

How about acceleration times? They don't give a full indication of the fun of driving the Corvair with its new parallel-link rear suspension, since they're taken, of course,

in a straight line. But, averaging several runs at each speed in each direction to compensate for wind and terrain variations, here's what we did, shifting at the 5500-rpm red line:

- 0-60 mph (true)—12.1 seconds, in 1st, 2nd and 3rd
- 40-60 mph (true)—6.0 seconds
- 50-70 mph (true)—7.3 seconds

Corvair this year got the bigger Chevelle's drum brakes. We checked them for fade with the regular six hard stops from 60. They got pretty aromatic, but didn't pull either way and required pedal pressure rose from 22 to only 30 pounds. In two extra stops it rose to only 32 pounds.

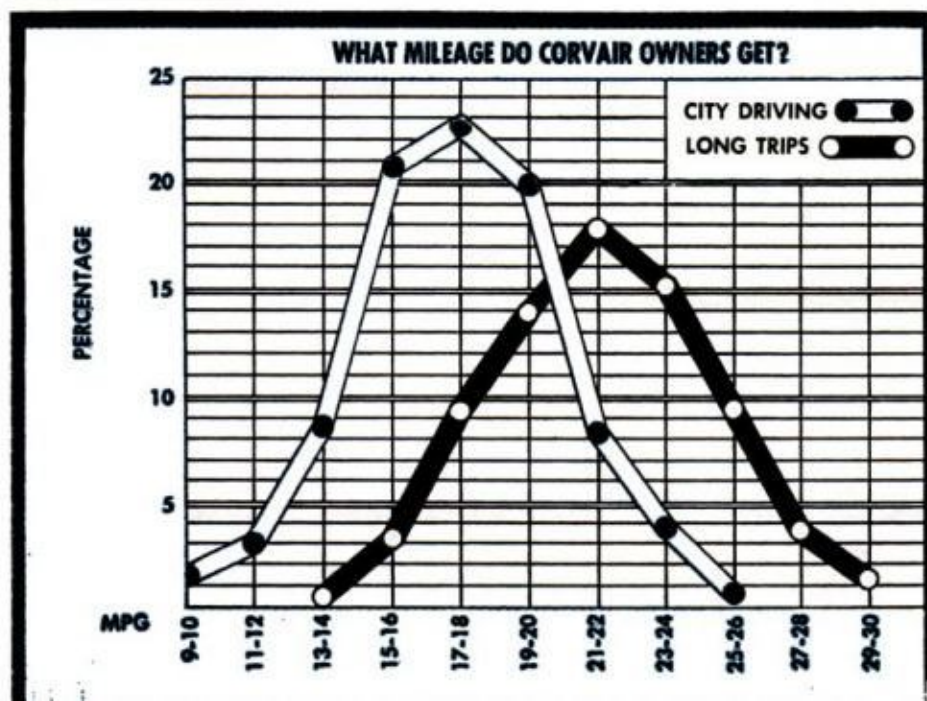
Now let the Corvair owners tell you in their own words what they've found about this sleek new compact. Here are remarks picked to illustrate the most widespread reactions, starting with the five most popular praises:

"I like its continental look. It makes people stop to look it over."—Michigan office supervisor.

"The new body style doesn't look like a box."—Texas pharmacist.



WEIRDLY CONVOLUTED Monza luggage compartment is dictated by the necessity for room to turn the front wheels. Filling windshield washers is easy. Only a few owners are still disturbed by lack of grille



CORVAIR ECONOMY isn't particularly outstanding for a small, lightweight car. But owners, who consider it a hot little semi-sportster, no longer demand great economy. Some commented that consumption is up slightly

A BURR ON THE timing mark cut into crankshaft pulley has, in some cases, gradually whittled away at Monza fan belts. The factory says warranty records don't show the problem, but owners might do well to check it



There's more than meets the eye to soft-line styling →

He switched from a '62 Corvair to an Impala—and back again →

And here we thought the buckets were supposed to hold you in place during hard driving →

Since these curves became popular, we haven't checked a car whose owners didn't complain about them →

Detroit should appreciate a man who appreciates what compromises he's making and why →

Ours, unhappily, was a prime example of leaks →

But assembly and workmanship complaints have been more common on other makes →

"It's easy to clean snow off and easy to wash."—Massachusetts machinist.

"It's fun to drive and easy to operate in traffic."—California banker.

"It's small and easy for a woman to manage."—Massachusetts housewife.

"It has made driving an American automobile fun again."—Pennsylvania radio announcer.

"The bucket seats are comfortable with plenty of adjustment room."—Michigan speedometer repairman.

"Bucket seats position the driver well."—Ohio steelworker.

"The bucket seats are large for freedom of movement and are comfortable on long trips."—Minnesota market analyst.

Although some owners may believe the Corvair is a candidate, the please-everybody car has yet to be built. Here are samples illustrating the five most common complaints:

"Wind whistles when windows are closed tight. Dealer tells me this is due to curved windows and occurs in all GM cars this year, even Cadillacs."—Connecticut retired man.

"The wind whistles in the door windows. My car needs to have the windows aligned."—Oklahoma service advisor.

"Very annoying whistles when I travel over 40 mph."—Connecticut corporate officer.

"I don't like the narrow back seat. I have fat friends."—Minnesota teacher.

"Armrests are in the way; both doors have to be open to knock down the back seat."—New York housewife.

"There's limited rear legroom, but I'll sacrifice it for the small overall size."—Connecticut banker.

"I would like to see a corrugated or rubber surface added to the fold-down side of the rear seat: things wouldn't be so apt to slide."—California personnel analyst.

"I have never seen one yet that didn't leak in the front compartment."—Retired Illinoisan.

"The windows don't seal against the wind and rain."—Georgia naval officer.

"It leaks tremendously along the dashboard area."—Connecticut executive.

"It's hard to hold on the road in a cross wind."—Ohio utility executive.

"The workmanship is poor—there's loose door paneling and carpeting, a piece of inside trim fell off, and the wheels needed aligning."—Illinois teacher.

"The front end sways on windy days."—Ohio steelworker.

"Poor assembly at the plant. The windshield wipers won't work, upholstery around the rear windows fits sloppily, and the turn signals won't release."—Texas pharmacist.

"I would buy another Corvair if they correct the poor workmanship and cheap materials; otherwise, I'll buy another make."—Illinois accountant.

Let's switch back to the bright side for the second group of praises—from easy parking to thrifty operation:

"Easy to move in traffic or to park."—Arizona druggist.

"The Corvair is easy to slide into and out of tight spaces."—New Jersey steel salesman.

"Everything on the dash is within easy reach."—Michigan office supervisor.

"There's no floorboard heat from the engine to cause hot feet in the summer and the engine noise is left behind."—Georgia sailor.

"I don't have to bother with water or anti-freeze."—Ohio executive.

"I like Corvair's engine in the rear for traction."—Colorado engineer.

"I wanted a small car that would fit my garage."—California warehouseman.

"A good size for a woman to handle."—New Jersey home-maker.

"It's compact, yet there's room enough to transport my family."—Ohio manager.

"I can wash it without a ladder or a stool."—Iowa business machine instructor.

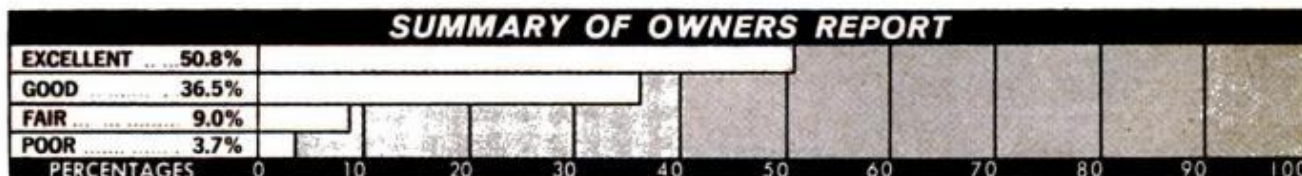
← This is the kind of pressure that gets results—if it's practiced widely enough

← There's little there to reach beyond an awkward Powerglide lever—and maybe a lighter

← Only 15¼ feet long, the Corvair can sneak into spaces that others can't

← Practically anybody can reach across the top with a chamois

(Please turn to page 212)



Best-liked features

Overall styling	55.3%
Ease of handling	47.3
Bucket seats	25.2
Traction in snow	21.5
Power and performance	14.1
Ease of parking	13.4
Dashboard	13.0
Rear, air-cooled engine	12.1
Size	10.9
Economy of operation	10.5
Roominess	9.3
Upholstery	8.5
Cornering ability	6.9
Instrument panel	6.5
Folding rear seat	6.1
Ride	5.7
Comfort	5.7
Steering	4.9
Front styling	4.9
Gas mileage	3.6
No hump in floor	3.6
Suspension	3.2
Interior	3.2
Easy cold starting	2.8
Rear styling	2.8
Corvair decision based on	
Styling	45.8
Economy of operation	25.9
Previous Corvair ownership	23.5
Price	16.6
Size	16.2

Least-liked features

Wind noise	13.4%
Rear seat	12.6
Water leaks	11.7
Wind sensitivity	11.7
Workmanship, assembly	10.9
Rattles, squeaks	8.9
Windows	8.9
Gas mileage	8.1
Carburetor trouble	7.3
Heating, defrosting system	7.3
Noisy engine	6.9
Dashboard	6.9
Suspension	6.1
Front end too light	6.1
Front styling	6.1
Gas fumes from heater	5.7
Shift-lever location	5.3
Rear styling	5.3
Air leaks	4.9
Bumpers	4.5
Transmission trouble	4.0
Lack of room	3.6
Rear fenders	3.6
Bucket seats	3.6
Fuel economy	
About as expected	46.2
Better than expected	5.7
Not as good	44.9
Buy another Corvair?	
Yes	84.9
No	15.1

Other car considered, if any

None	44.9%
Mustang	19.4
Volkswagen	5.7
Chevrolet	5.3
Tempest	4.0
Chevelle	3.6
Falcon	3.6
Is Corvair family's only car?	
Yes	44.9
No	55.1
Make of other car	
Chevrolet	18.2
Another Corvair	6.9
Ford	6.1
Pontiac	4.9
Oldsmobile	4.5
Buick	3.2
Make of car traded in	
Corvair	32.9
Chevrolet	18.3
Ford	4.5
Chevy II	2.4
Volkswagen	2.0
Plymouth	2.0
Dealer service	
Excellent	40.1
Average	38.9
Poor	19.0
Would you buy from him again?	
Yes	66.0
No	21.1

12-Month

A father-son test team reports on how well these new shoes wear and how your feet feel after living in them for a year

By Jackson Hand

LAST SPRING, I shelled out \$40 for a pair of shoes, more than I'd ever paid in my life. But I was overcome with an impulse to find out if they were any good. Though they looked like any other pair of handsome wingtips, they were constructed from a brand-new man-made material—Corfam.

They were given their toughest test the very first time I wore them. I got caught in a sudden downpour. Because it's next to impossible to get a taxi in New York City when it's raining, I slopped through puddle after puddle on my way to Grand Central Station. Water sloshed between my toes with every step. The shoes were too wet to keep on with any comfort, so I slipped them off once I found a seat on my train to the suburbs.

The next day I inspected the damage. The leather soles looked leached and gray enough to have been boiled in water. The insoles, also leather, had loosened and curled up at the edges.

The Corfam uppers were coated with

◀ **ALL THREE SHOES** have been worn for one year, but the two Corfam shoes (B, C) have never been shined. Cordovan leather shoe (A) was shined before every wearing, which was on an average of once every two and a half days. Corfam loafers (B) were worn almost every day by soccer-playing 15-year-old, both to school and at camp. Soles and heels shown on them are the second set they've had. Corfam wingtips (C) were worn primarily on "state" occasions, but began their in-use career with a thorough soaking

SWIPE OF DAMP CLOTH is all it takes to clean Corfam loafers that have never been shined in 12 months of hard use. The plastic material resists abrasion



Test of Corfam Shoes

the dirt of city streets. I rubbed a thumb over a toe, and the dirt came off. Encouraged, I put a damp rag to both shoes and, within minutes, they looked new and shiny again. And they were still soft and pliable. Score one point, I thought, for this man-made miracle.

I was so impressed that I soon bought a pair of loafers—also made of Corfam. They, too, were on the expensive side. But now, with more manufacturers producing Corfam shoes, you can run your own test this spring with an outlay of about \$15.

For the Real Test

Of course, one soaking doesn't authenticate a footwear miracle. Tough daily wear is what counts. And that's what Jeff, my 15-year-old son, specializes in.

When school started last fall, he adopted the loafers. Except for an occasional evening when I'd preempt them, he wore them almost constantly. When he made the soccer team, our backyard became a practice field—and those loafers played many a hard game at "inside right."

Jeff went through one pair of heels and soles. But the uppers are still almost as good as new. On the other hand, some of Jeff's friends have just about demolished leather loafers that were new at the start of school.

Now that it's a year since Jeff and I first stepped into Corfam shoes, here's a

brief evaluation of them:

- They are the lightest feeling shoes that either of us has ever worn. And on the scale they weighed two ounces less than any of several pairs of comparable leather shoes.

- I expected that the stitching would tear out, as often happens with plastic items. But it didn't—even where fine construction put seams almost at the very edge of the Corfam. The intact stitching may be due in part to the good workmanship in the shoes. (So far, Corfam is being used only by the better manufacturers.)

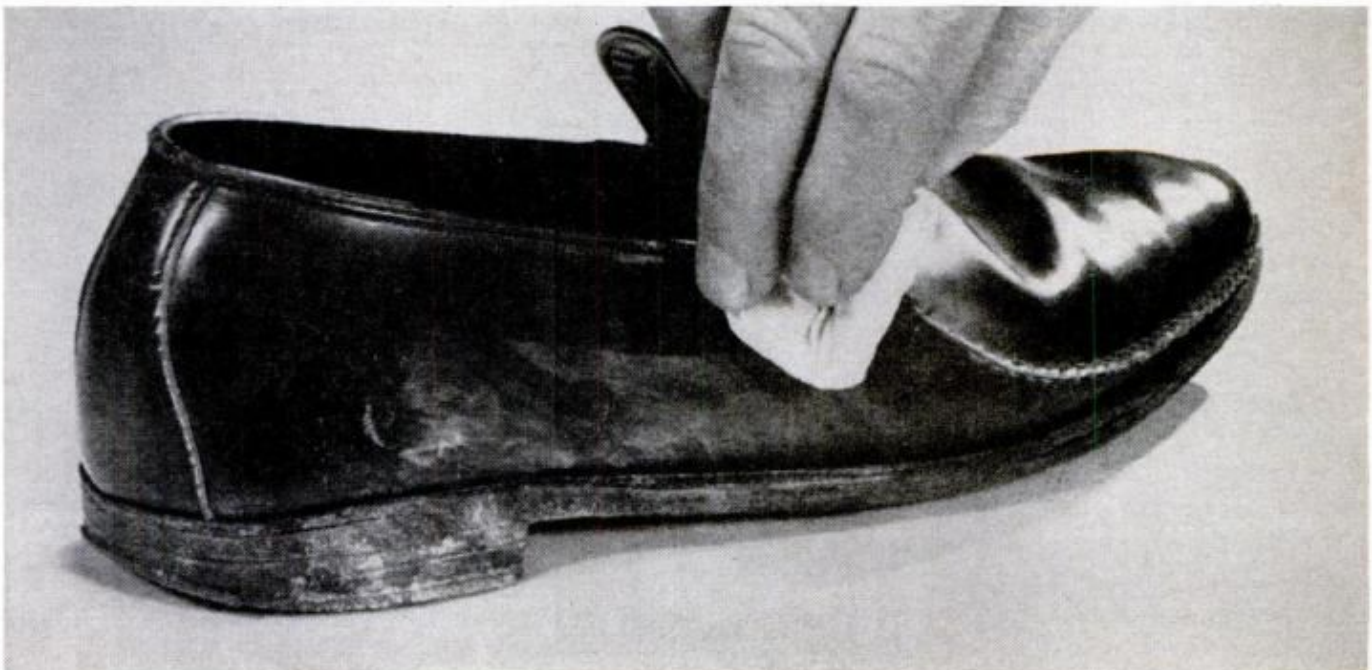
- Since Corfam is a plastic, I thought the shoes might develop an unpleasant odor. Neither pair did. The dress shoes I soaked in New York City smell only like their leather lining.

There is no offensive smell because Corfam, like leather, breathes and allows moisture to escape.

- Without shoving a meat thermometer into my foot I can't be positive—but I believe Corfam shoes are colder to wear in winter than leather. Perhaps the material has less insulating value than leather.

Neither of the two pairs of Corfam shoes has ever been given a coat of polish. A damp cloth is all that's needed. Corfam has a luster that just doesn't dull. Polish if you want to, but it isn't advised because wax tends to seal the pores. Experts say

[\(Please turn to page 192\)](#)





FOOT PLANTED firmly against small end, the brawny tosser stands ready to accept caber. It may take as many as six strong lads to carry caber onto field



UP SHE GOES. Stooping, the tosser slowly raises the tree trunk, careful to balance it against his shoulder. Here's where real strength pays off

It Takes a Braw Scot to...

TOSS THE CABER

Flipping a 285-pound tree trunk can be fun . . . if you're a Scot and as big as a tree yourself

By Patrick K. Snook

ASIDE FROM HAGGIS—a kind of pudding cooked in a sheep's stomach—there's nothing more peculiarly Scottish than "tossing the caber."

It's strictly a man's sport, for it takes lads of Paul Bunyan proportions to even lift the caber—a teenage telephone pole. The event is always the highlight of the many summer games, or "gatherings."

The caber is the trunk of a fir tree. It may be as long as 21 feet and weigh as much as 285 pounds. When the brawny competitor is ready, he places a foot against the caber's small end—it's a tree trunk, remember—and several assistants upend it. The tosser stoops and hoists it up, steadying it with his shoulder. With his fingers laced under the bottom, he raises the small end until it is at about the level of his elbows. Then, with the caber in precarious balance, the kilted giant lumbers into a good run.

He allows the caber to tilt forward as he gathers speed. Then, at the right moment, he gives a prodigious heave.

If his timing is good, the caber will hit on its heavy end and fall with its small end pointing away from the tosser and in a direct line with him. Though accuracy—not distance—is the point of the game, some champions can flip the tree trunk some 40 feet.

Last summer, I flew by Scandinavian Airlines to attend the Royal Highland Games at Braemar and saw a cherubic-faced farmer named Sandy Campbell in action. He stood six-feet-seven, weighed 20 stone (280 pounds) and had arms as thick as small trees. On that day he made two magnificent tosses, both falling within five minutes of the 12 o'clock position.

There are a number of stories about the origin of the sport. One indicates that it goes back to the early days of lumbering in the Highlands, when cut timber was carried out by hand.

When the trail crossed one of the region's many swift-running streams, the logger, like gargantuan Sandy Campbell, simply reared back and tossed it across.

EASY DOES IT. The contestant raises the caber until its end is near elbow level and sights ahead before lumbering into a run to build up momentum



UP AND AWAY. Putting every last ounce of muscle into the heave, the tosser ends up on his toes, his arms overhead. Caber is eased into slow arc

GOOD TOSS! Caber will land just about right on its thick end and fall almost in direct line away from tosser. Accuracy — not distance — pays off





No Slaving in This Galley

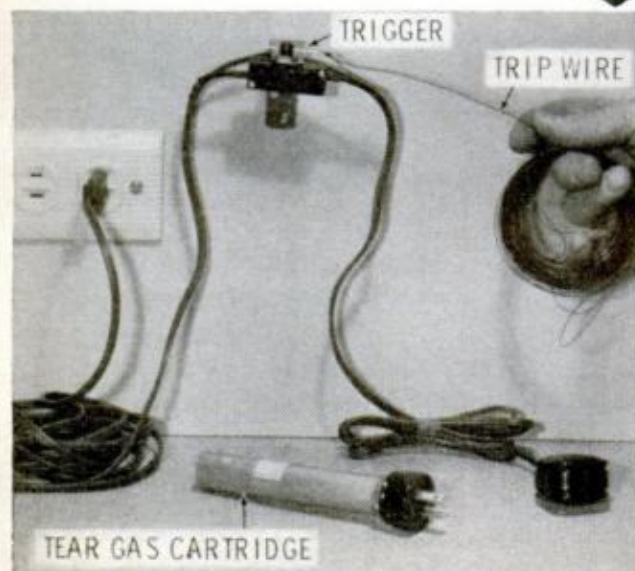
No cubbyhole cookery on the 1965 Hatteras 50. Designed to produce something more elaborate than coffee and sandwiches, the galley is equipped with a 14-cubic-foot refrigerator-freezer, four-burner electric stove, dishwasher, double sink and disposer. Boat's price? Only \$102,000.

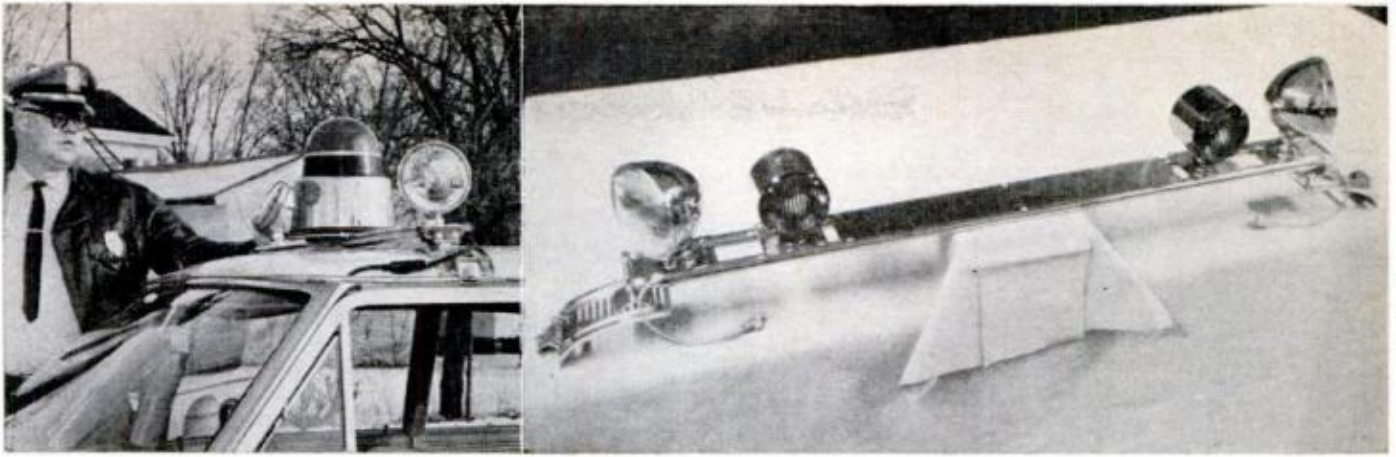
Old-Style Dory in Fiberglass

The Doryette is a traditional double-ended design executed in fiberglass which is available in a sailing version (\$495 with sails) and rowing version (\$294) from the Doryette Corp., 276 Alter Rd., Detroit, Mich. 48215.

Tearful Greeting

Intruders will likely be discouraged when they hit the trip cord of an electrically actuated tear gas cartridge. With the cartridge plugged into its socket, a tug on the trigger switch sets it off. The complete kit is \$18.95 from Tear Gas Devices, 65-D Broad St., Stamford, Conn.





Roof Lights Attach Like Car-Top Carrier

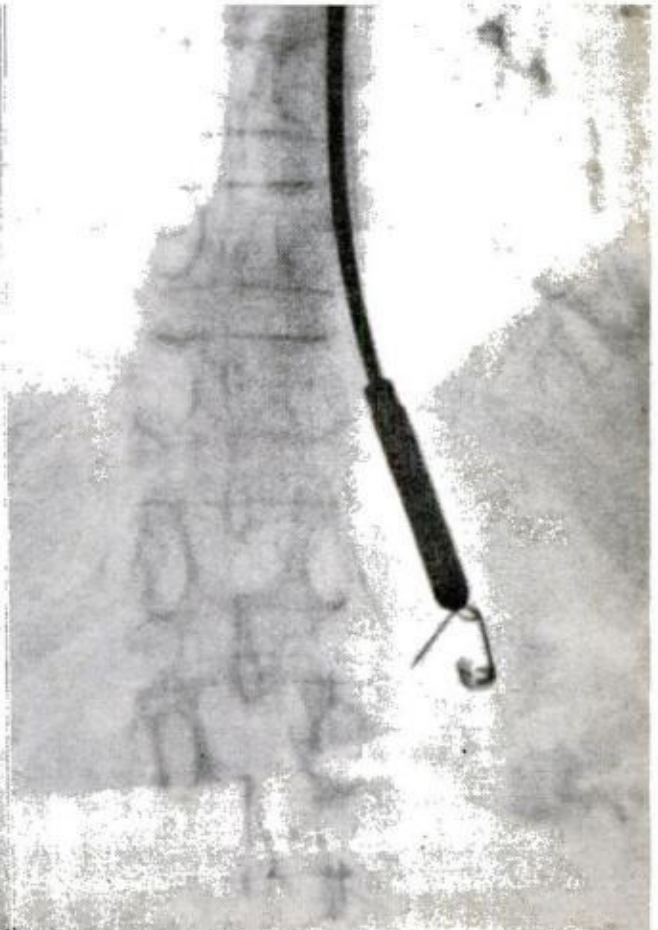
A removable roof rack can carry a rotating dome light and any combination of warning and flood lights. It mounts or dismounts in about 20 seconds, according to the manufacturer, allowing a patrol car to be turned into an unmarked car at will. Original installation takes about a half

hour, without drilling holes in the roof. The set of special flood lights has a 300-yard range and a 30-yard spread at a 30-yard distance. The Wood Lite was invented by William Wood, police chief of Holly, Mich., and is made by Industrial Die & Mfg., Fenton, Mich.

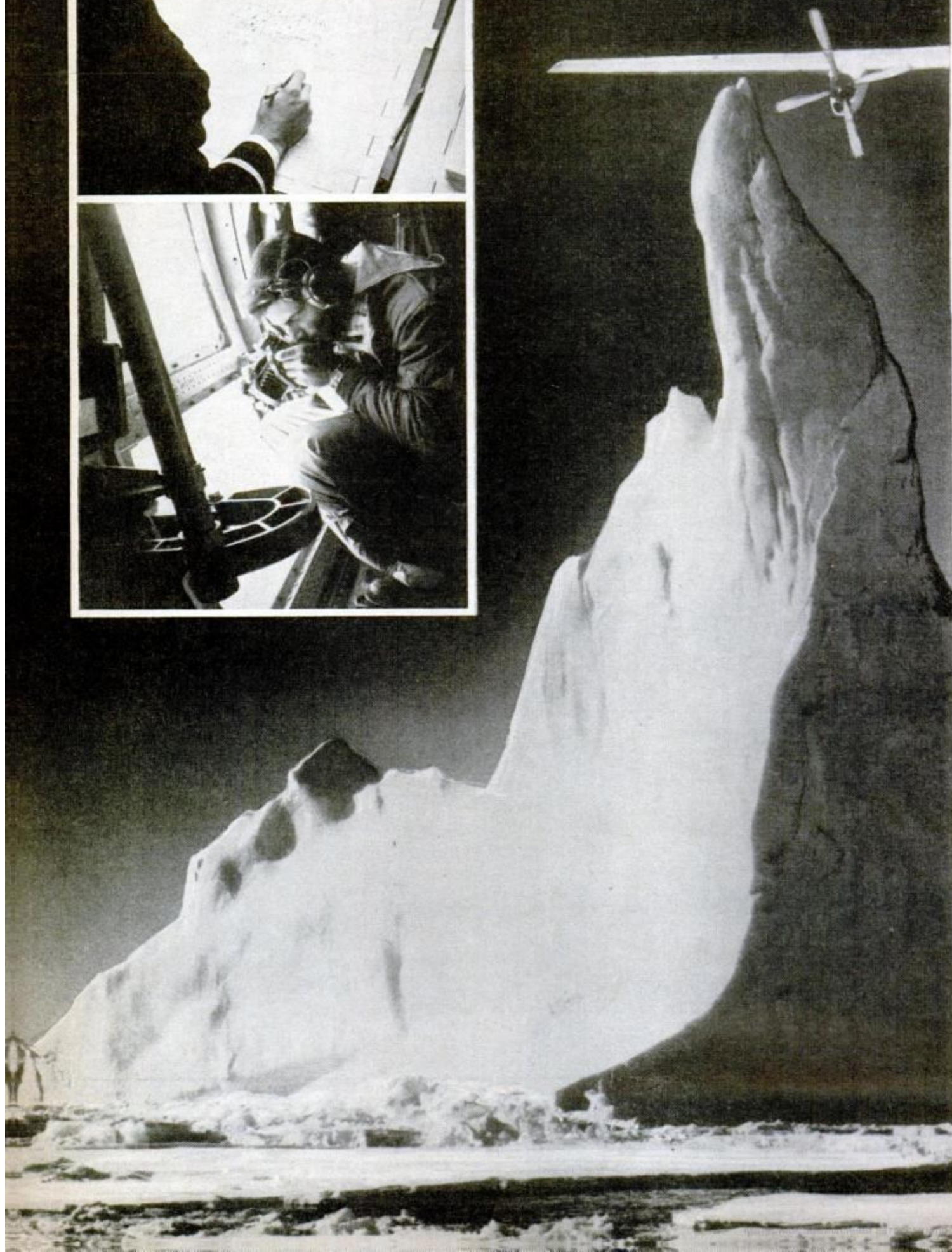
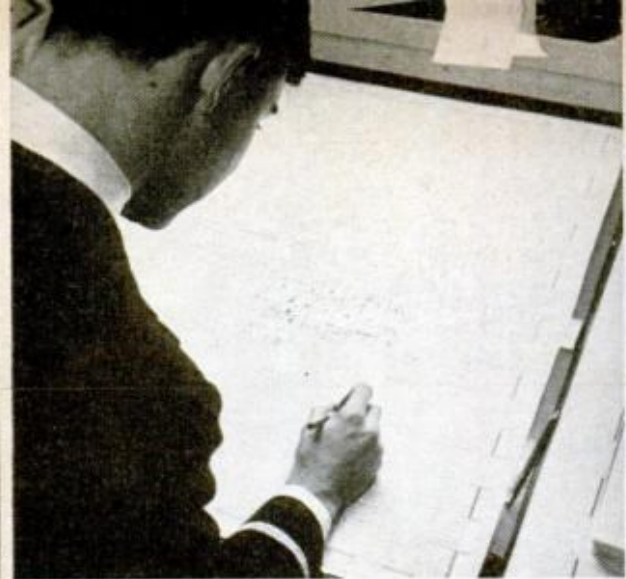
On-Off Magnet Unpins Pin-Swallowers

Removal of an open safety pin from a child's stomach can be done safely with a new General Electric instrument that pulls the pin out, rounded end first (lower right). The secret is in the instrument's iron tip, which can be magnetized at will.

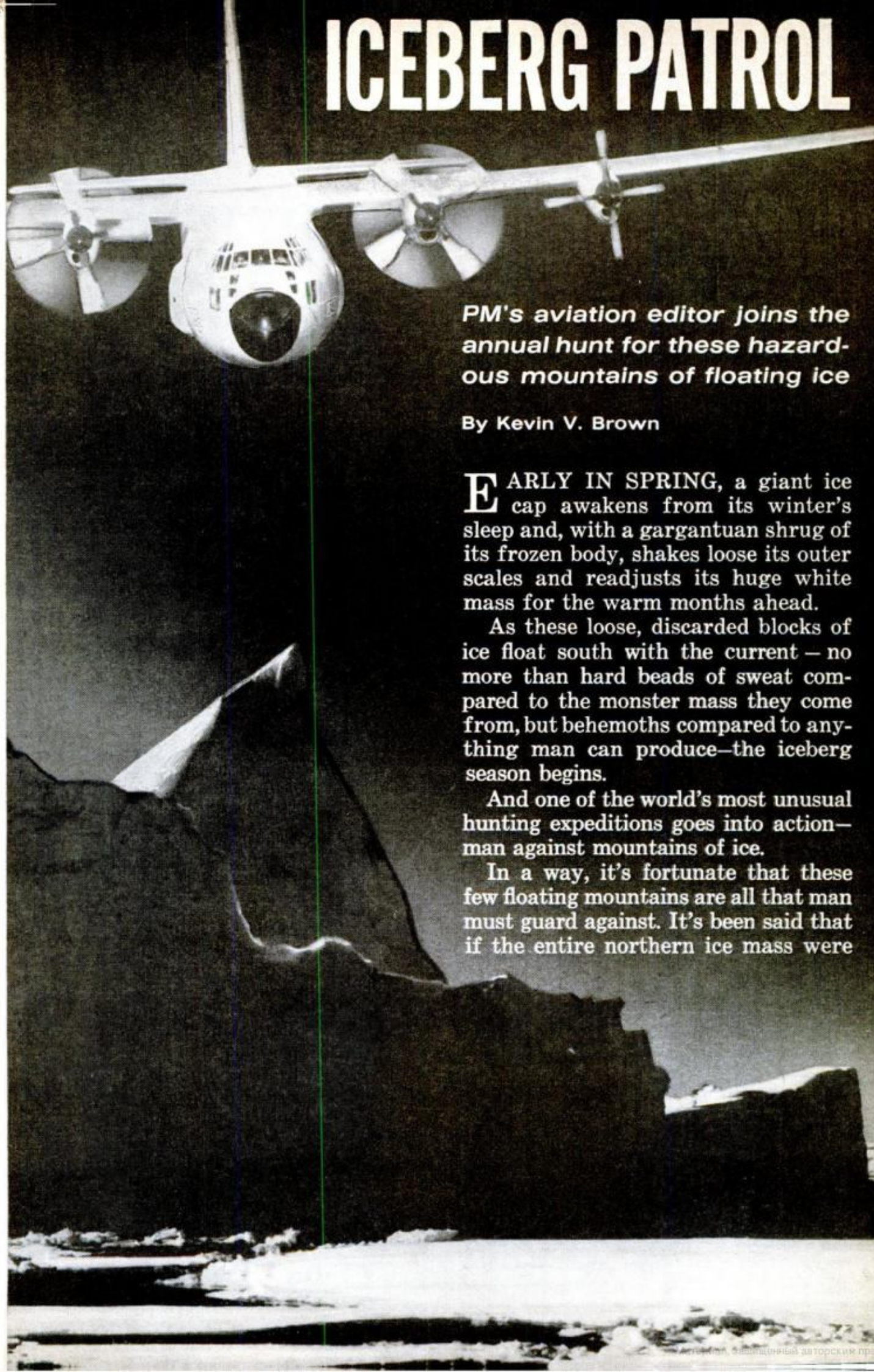
Watching under a fluoroscope, a doctor guides the instrument to the rounded end of the pin. Via cable inside the plastic tubing, he pushes a permanent magnet forward to contact the iron tip, causing it to be magnetized and pick up the pin.



ICE-PATROL OBSERVERS plot iceberg paths on chart in preflight preparations (top) and confirm estimates with "eyeball" observations during aerial patrol (bottom), taking pictures to establish exact sizes



ICEBERG PATROL



PM's aviation editor joins the annual hunt for these hazardous mountains of floating ice

By Kevin V. Brown

EARLY IN SPRING, a giant ice cap awakens from its winter's sleep and, with a gargantuan shrug of its frozen body, shakes loose its outer scales and readjusts its huge white mass for the warm months ahead.

As these loose, discarded blocks of ice float south with the current — no more than hard beads of sweat compared to the monster mass they come from, but behemoths compared to anything man can produce—the iceberg season begins.

And one of the world's most unusual hunting expeditions goes into action—man against mountains of ice.

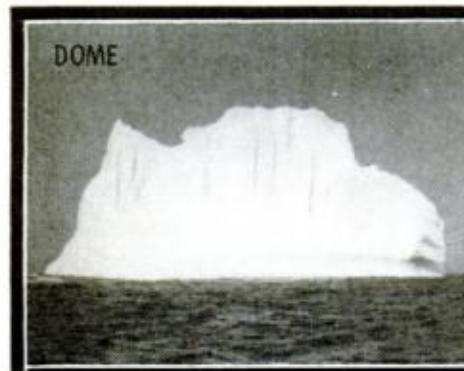
In a way, it's fortunate that these few floating mountains are all that man must guard against. It's been said that if the entire northern ice mass were



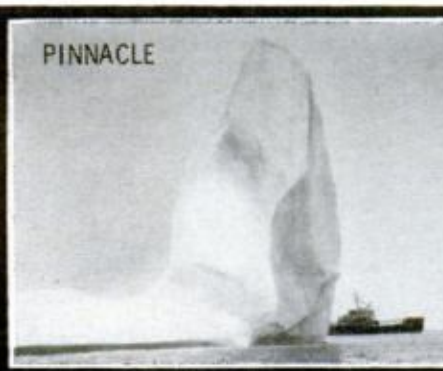
CARBON BLACK was spread on grounded berg to test its heat absorbing qualities in early Coast Guard attempt to destroy icebergs. Experiment failed, said straight-faced report: "No marked demolishing effect"



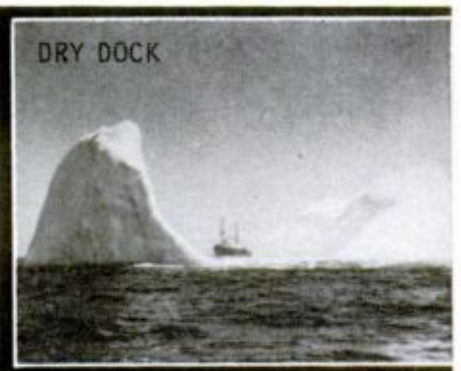
THERMITE BOMBS, which produce temperatures up to 4000° F. when they burn, were used in another experiment to melt or disintegrate icebergs. Thermite explosion made pretty pictures, but did nothing to berg



DOME



PINNACLE



DRY DOCK

suddenly to melt, it would flood the world.

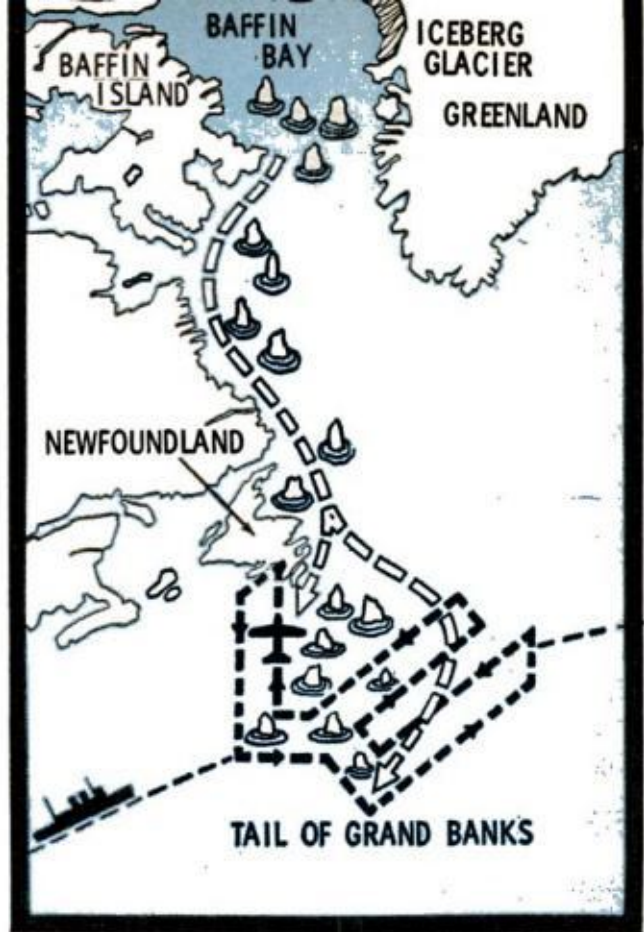
These frozen, broken chunks, however, are dangerous enough. They break off, or "calve," from the mother ice. Most of the bergs are blocked by land masses in both hemispheres or, if they reach open water, melt relatively quickly. But those icebergs that calve from the glaciers of western Greenland, by an accident of geography, are protected in the cold, narrow waters between Greenland and the eastern coast of Canada. Most melt before they reach the 48th parallel near Newfoundland, but many do not, floating with the current directly into the path of the most heavily traveled shipping lanes in the world—those between the United States and Europe.

It is here that the "unsinkable" *Titanic* rammed its way into an iceberg and history in 1912, going down on its maiden voyage with 1500 souls, and it is here that the International Ice Patrol tracks the icebergs now. While its work is paid for by all nations whose shipping benefits from the service, the operation itself is entirely the work of the U.S. Coast Guard.

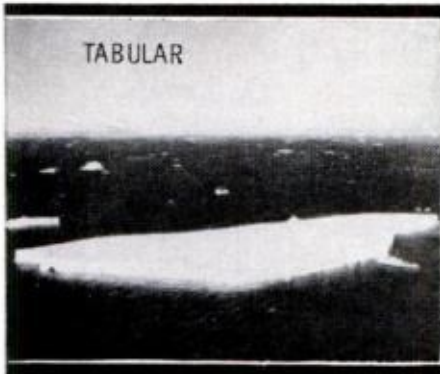
Years ago the patrols were done by surface ships, but today the major work is carried on by air. Turboprop Lockheed C-130 *Hercules* fly Coast Guard crews over the berg-packed waters of the Grand Banks, an undersea shelf southeast of Newfoundland, where most of the icebergs break out into open water and become a hazard to shipping.



CONVENTIONAL BOMBS were dropped on other bergs from Coast Guard planes, but only left pock marks behind. Coast Guard gave up, went back to tracking



ICEBERG ALLEY is icy strait between Greenland and Canadian coast. Bergs that drift south of Newfoundland are targets of aerial ice patrols



ICEBERG IDIOSYNCRASIES:
 Dome bergs have average speed and endurance. Pinnacles and drydocks sail faster and erode quicker. Tabulars are largest and slowest. Growlers are not bergs but smaller pieces that roll and hiss, churn ocean into foam

The patrol lasts from mid-April, when the bergs begin floating south of the 48th, until mid-May, when most of the big ones have melted. *Popular Mechanics* sent me out to fly one of these patrols during this critical period.

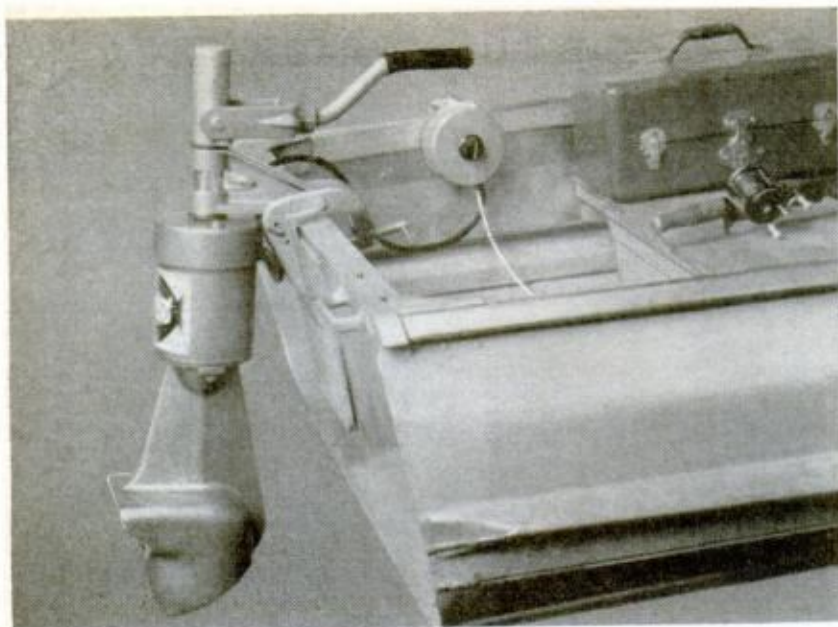
Search Starts Before Dawn

An ice-patrol day begins in pre-dawn darkness when the aircraft crew and ice-patrol personnel report to base operations at Argentia, Newfoundland. Ice-operations officer, Lt. Cmdr. Rudy Lenczyk, an intense young oceanographer with close-cropped hair, scours the weather forecasts and the previous day's sightings by the Coast Guard plane and other surface vessels. Then, with his two assistants, En-

signs Dan Neely and John Goras, who will fly the patrol as observers, he charts each berg, estimating where each will be today according to such variables as its type, its size, the ocean current, the wind, and the sea and air temperatures. Each has an effect, but nothing can equal an "eyeball" identification, and all three know it.

So, in calm but hurried silence, they check the reports on each berg, make their calculations, and mark their maps. The preflight preparations are just as vital as the flight itself, and they go on for several hours. Without them, the flight can become a haphazard series of sightings of no one knows what. Each berg must be identified on each flight, according to type,

[\(Please turn to page 206\)](#)



Little Squirt

Something new for fishermen is a whisper-quiet jet trolling outboard powered by a 12-volt electric motor.

It operates on a standard 12-volt auto battery. Weighing only 27 pounds, it features 360° steering and a remote rheostat for controlling speed. Height adjustment allows it to be raised or lowered as much as 3 inches on the transom.

The Jet-Trol sells for \$99.95 f.o.b. the Lawrence Mfg. Co., Chaska, Minn.



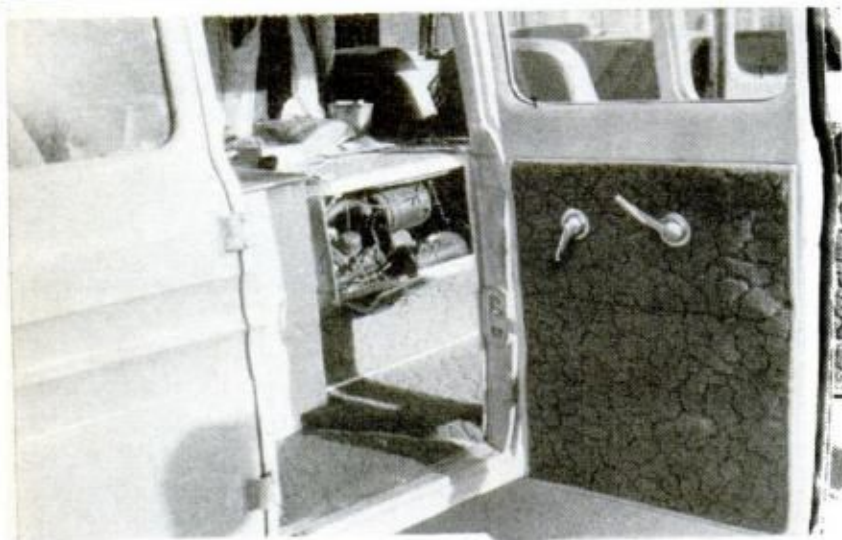
10-Door Camper

No, there wasn't a fire sale on car doors.

The 10 doors were already in place when the front two-thirds of one Corvair Greenbriar and the rear two-thirds of another were joined to make this camper. The pieces were widened a foot and mounted on a lengthened 1961 Buick frame. A 325-hp Buick V8 with Dynaflo sits midway on the frame.

The cabinets inside can be replaced by two seats, to carry up to 10 passengers.

Owner Glenn Goodban of Burbank, Calif., has logged over 30,000 miles on his camper and reports that, along with performance and comfort, he's getting 12 to 14 mpg.



Pushbutton TV Exams

It's exam time. The TV instructor asks a question. Students at home pick out an answer by pushing one of four response buttons—and learn immediately whether they're right or wrong.

Further, with the new Educasting System, they learn the reason why an answer is correct or incorrect.

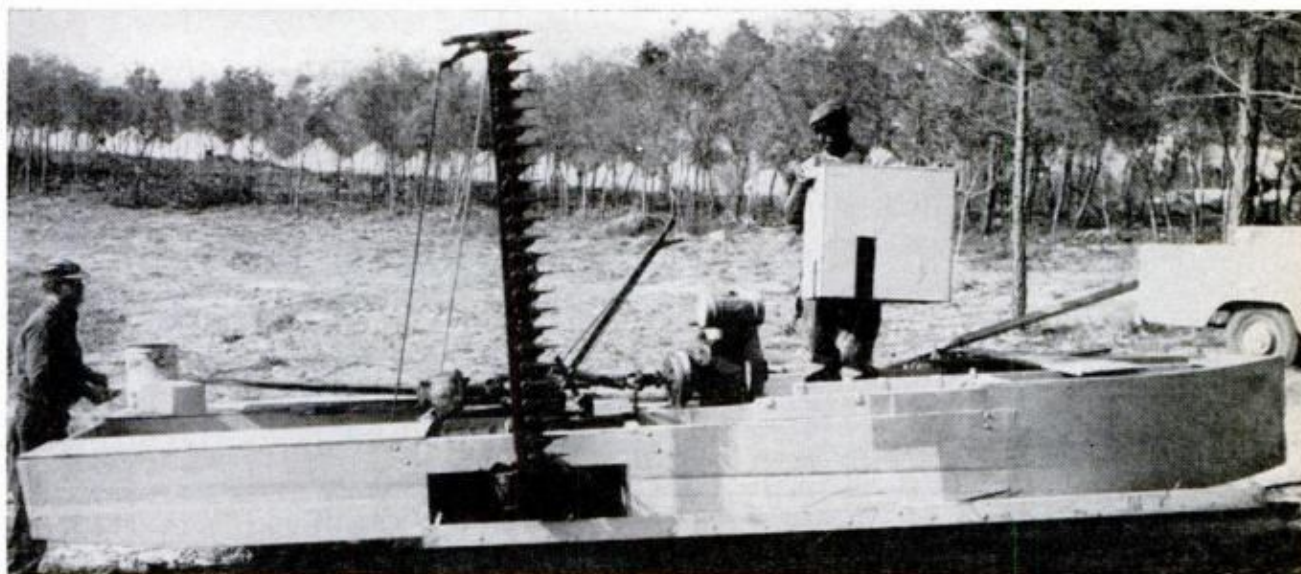
The Educasting system, which employs combined television and FM station operation, was conceived by TuTorTape Laboratories. Programming of the course was done by International Correspondence Schools.

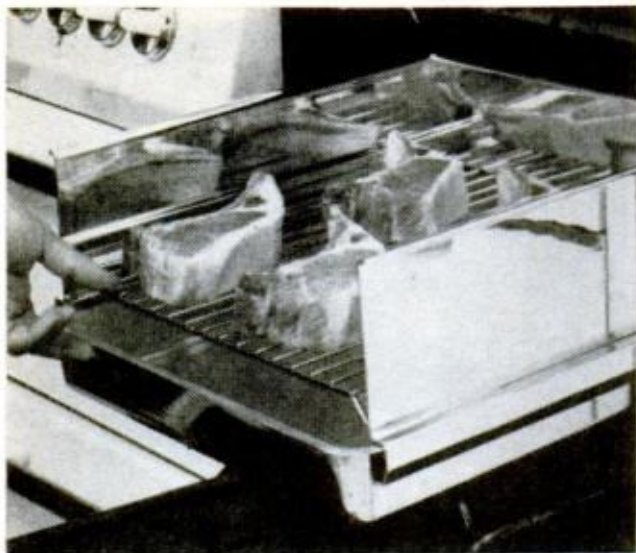


Wood Chewer and Floating Mower Are Builders' Tools

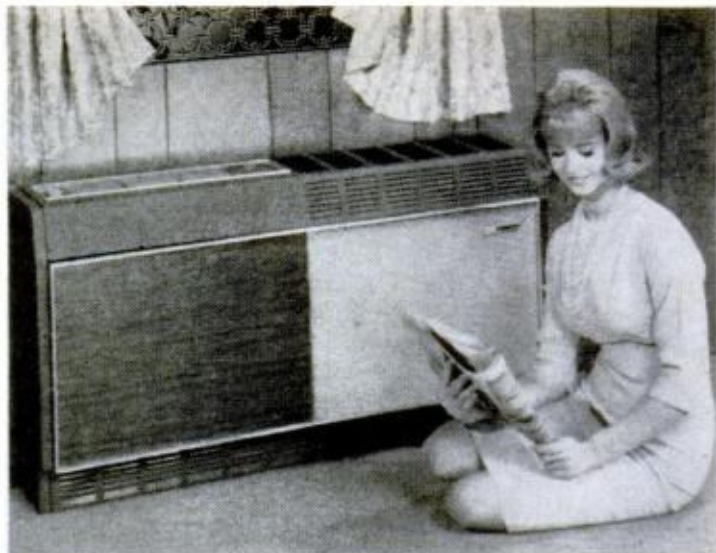
Building homes in Florida can call for some ingenious machines. For example, a boat-mounted mower (below and bottom left) clears fast-growing weeds from lakes in the Mackle Brothers' Deltona retire-

ment community. The rig, built by the construction firm, has a farm-type mower run by a concrete mixer engine. The Iron Beaver (bottom right) chews unwanted trees into lawn-base mulch.





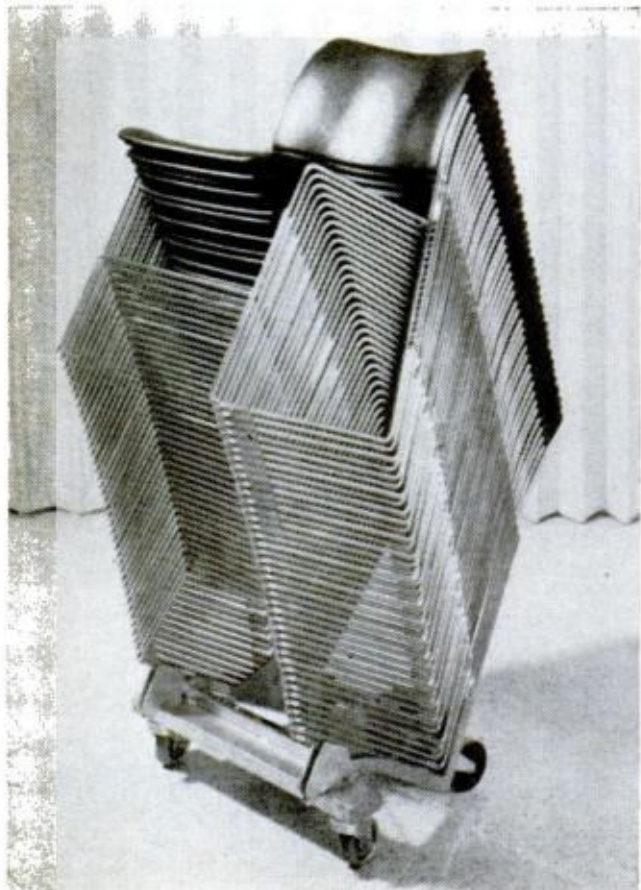
OVEN-SIZE BROILER eliminates greasy smoke and oven spatter. Adjustable grill, spatter guards and pan of aluminum comprise unit which fits any standard oven. Price: \$7.95. By Royal Cookware, Box 7103, Louisville, Kentucky

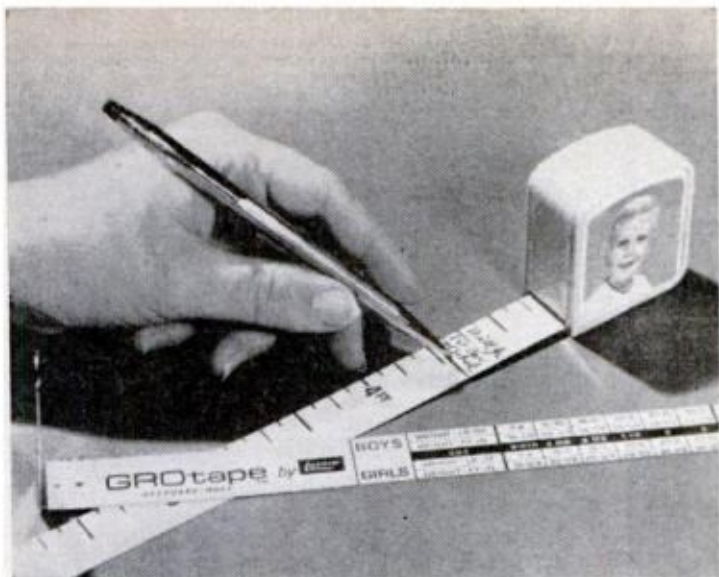


ROOM CONDITIONER heats or cools at touch of button, operating on household 110-volt current. The 49 by 26 by 11-inch unit houses both a vented gas unit and electric cooler. \$379.95 from Sears, Roebuck & Co., Chicago, Illinois

New for Your Home

NEW CHAIRS contoured to fit the body stack so closely that 40 pile just four feet high on a dolly cart, or snap together in rigid rows of six. Built of chrome-plated steel and vinyl-coated formed metal, chairs resist stains, withstand weather and pool-side use. Each weighs 13 pounds, costs \$35. By General Fireproofing Co., Youngstown, Ohio

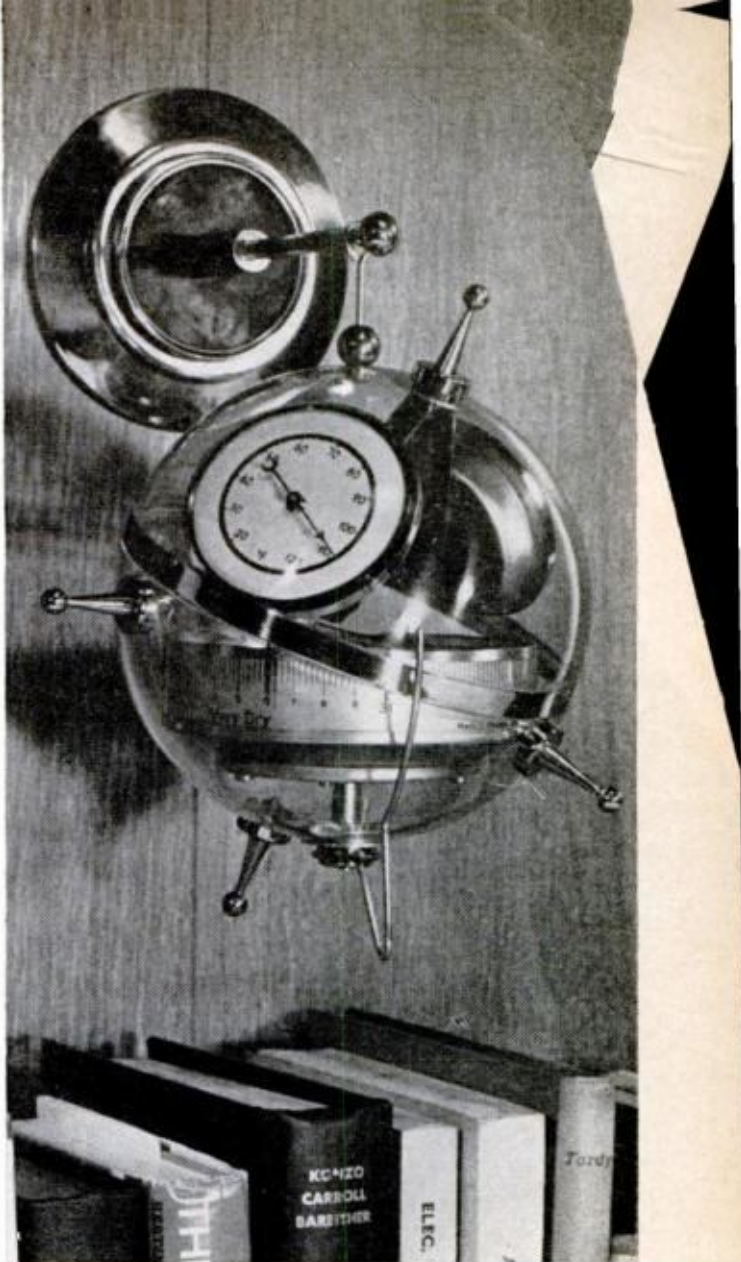


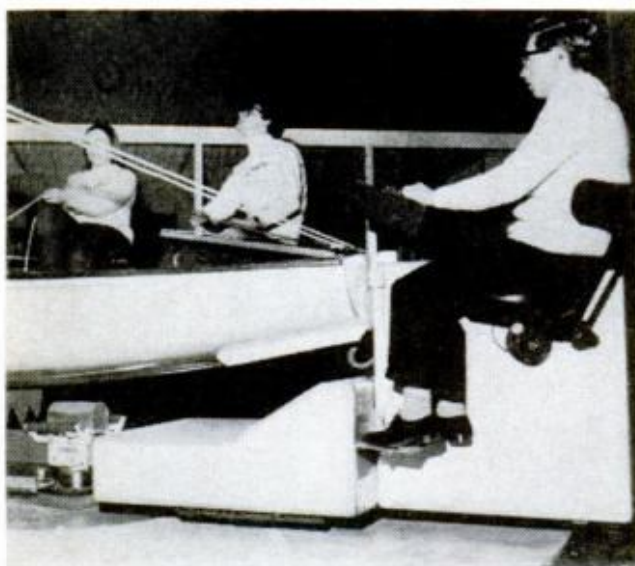


PORTABLE RULE works like automatic-rewind tapes, but keeps a permanent record of children's growth. Coated tape retains ball-point marks; shatterproof case holds photo. \$2.49 apiece from Lufkin Specialties, Saginaw, Mich.

WEATHER SPHERE houses three units: barometer, thermometer and hygrometer. Globe 5 inches across hangs on wall or stands flat. Unit forecasts 24 to 48 hours in advance. Price: \$24.75. Edmund Scientific Co., Barrington, N.J.

FOLDING BED weighs 3 pounds, folds out to 50 by 26 by 6-inch cot for kids at camp or home. Aluminum frame is sturdy; canvas cover, washable. Striped cover model: \$11.95. Goode Products, 7542 Maie Ave., Los Angeles, Calif.





Electronic Sail Trainer

A fully rigged 12-foot sailing dinghy which electronically simulates sailing conditions has been developed in England.

Intended to complement conventional sailing instruction afloat, the "Sail Trainer" helps build confidence by making it possible to repeat maneuvers in slow motion. The instructor can set wind strength and dinghy speed, and also control the angle of list, movement of the boom and the weather helm. Once conditions are set, the pupils can haul the boom, operate the tiller and shift their weight. The unit is made by T.P.I., Ltd., Box 2, Caterham, Surrey, England.



Head Light

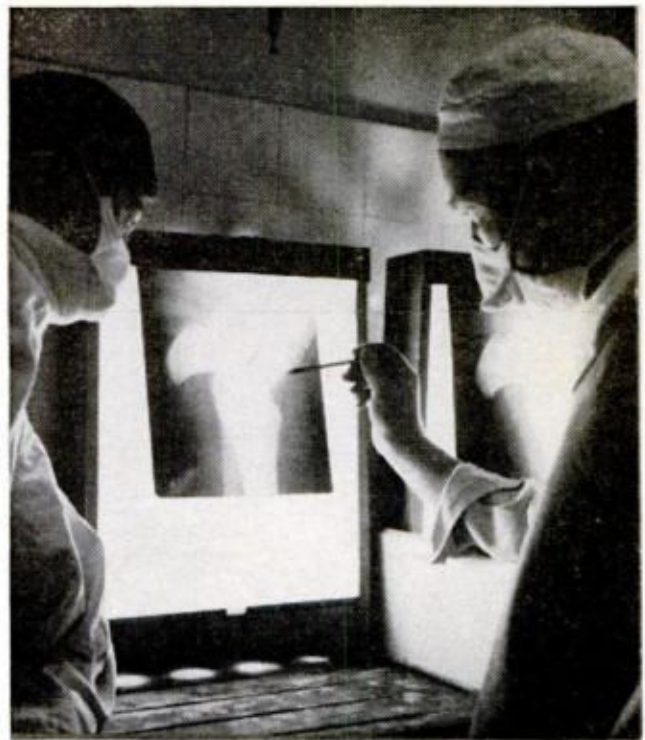
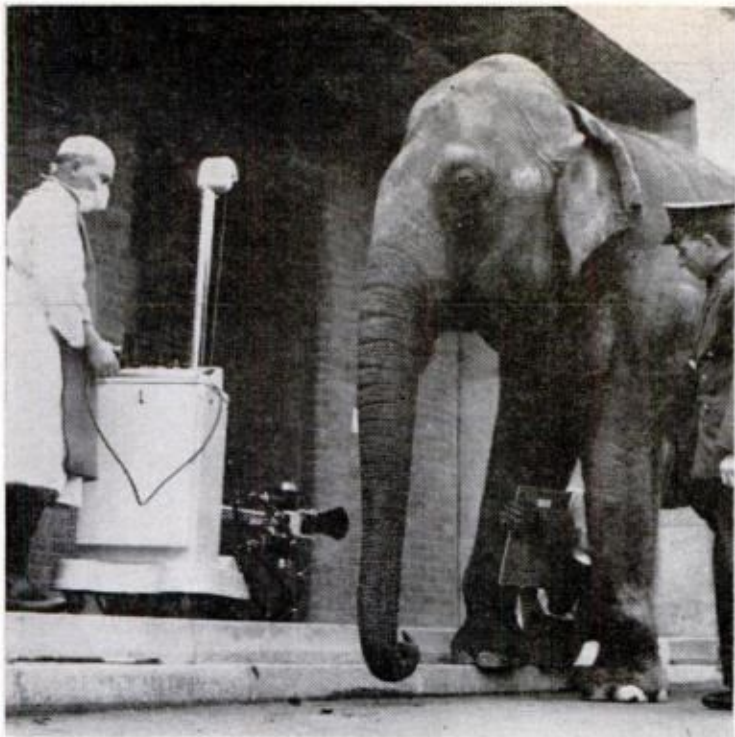
Adapted from coal-miner's light, a flashlight on a headband can be used for peering in dark corners, leaving the wearer's hands free. Mounted on a 360-degree swivel base, it can be pointed in any direction. Its battery is rechargeable. \$9.95; Puritron Corporation, New Haven, Conn.

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Seagoing Catamaran

Offering air-conditioned accommodations for 317 passengers and facilities for transporting 15 automobiles, Japan's first seagoing catamaran designed specially for carrying passengers was recently put into service on the Ondo Strait route connecting the islands of Honshu and Shikoku.





Think Big — and Get the Big Picture

Though robust of health in most respects, elephants are known to have chronic trouble with rheumatism of the leg. The impossible task of arranging hospital accommodations for Jumbo has been solved at the London Zoo by treatment with massive mobile X-ray equipment which is

either brought to the animal's own enclosure or set up in the hospital courtyard, resembling an out-patient clinic. An X-ray setup is shown in the photo, above left.

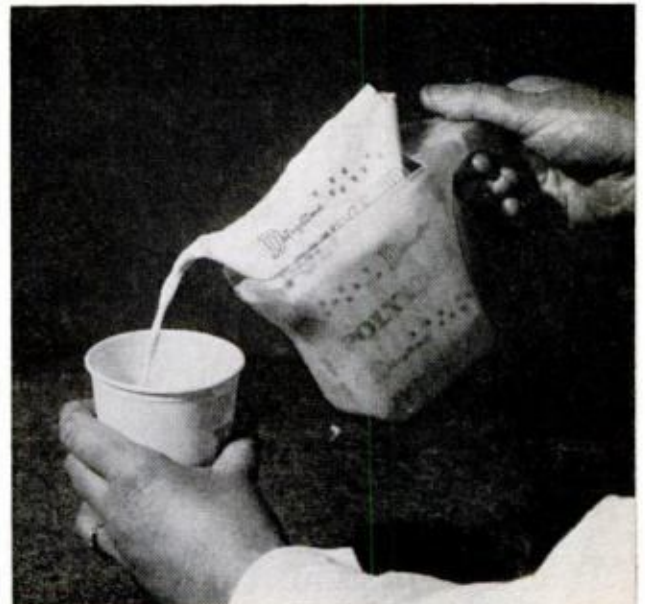
Veterinarians claim that this is the only system which gives them leg room to treat leg rheumatism.

Now the British Are Drinking Milk by the Sackful

Plastic bags have replaced milk bottles on 4000 doorsteps in Suffolk, England. Unbreakable, even if dropped from a table or piled in containers (lower left), the polyethylene bags are designed to relieve both the housewife and the dairy of bottle washing and collecting.

The plastic is sterilized by ultraviolet rays as it runs through the packing machine which fills 180 gallons per hour.

The dairy also provides each customer with a jug which holds the pint-size plastic milk bag and facilitates storing and pouring from the bag (lower right).



Buy a House That's



MARKET FOR USED HOMES like this one holds up year after year despite competition from new houses. Advantages include low taxes, more space for the money and locations in well established neighborhoods with many conveniences

SMALL FOUNDATION CRACKS like this one are usually harmless. But if numerous, or much wider than this hairline, they could mean a settling foundation



PEELING PAINT on this exterior window sill was caused by termites, even though sill was 4 feet above ground. Insects tunneled up between bricks



Structurally Sound



BINDING OF WINDOWS might be caused by build-up of paint on sash—but another reason might be that frame is out of parallel due to foundation settlement

EVERY NOW AND THEN a house won't have a clean-out trap on the waste plumbing system. Always check for one, and make sure it's conveniently located



Is that old house a bargain or a white elephant? Here are some tips that will help you find out—before you put down your cash

By Arthur J. Maher

WHEN THE SMITHS moved into their frame house in Queens, N.Y., they congratulated each other on finding a bargain.

After more than a year of looking, they'd found a two-story model with three bedrooms, large dining and living rooms, full basement, big eat-in kitchen, enclosed sun porch, ample storage space and a two-car garage—all for \$17,000—a modest sum in New York City's home market.

"We'd have liked a new home," recalls Mrs. Smith, "but in our price range that would have meant going so far out in the suburbs that commuting expenses would have killed us. Also, we'd have had to settle for a smaller house."

"We pay less than half the taxes a friend pays on his smaller suburban house," Mr. Smith adds. "What's more, our schools, sewers and sidewalks are already in. No future assessments to pay for them."

The Smiths, of course, are far from unique. Every year, at least twice as many Americans buy used homes as buy new ones, largely for reasons like the Smiths'. They go shopping for a used-home bargain, plunk down their cash and move in. With a contented sigh, they start paying off a reasonable mortgage. A rosy picture, indeed. Any pitfalls? You bet.

The man who buys in August may find, come winter, that his heating bill is astronomical. Or, when installing a washing machine, he may find that the first turn of a wrench breaks a long section of pipe, creating a \$100 plumbing job. Or, when he moves a piano into the living room, the floor may start to sag.

For, although buying a house is the largest financial transaction of most people's lives, few persons really examine a house they intend to buy. Result: The used-home buyer, after saving a bundle, often winds up spending that bundle on

a variety of costly unexpected repairs.

Arthur Tauscher, a New York consulting engineer who heads a five-city group of house inspectors, has compiled the following figures which indicate how much money one can expect to pay out for repairs:

Age of House	Probable Cost of Repairs Needed
2-8 yrs.	\$ 350-\$ 700
8-15 yrs.	750- 1500
15-30 yrs.	1500- 3000

These figures were based on over 5000 home inspections, and do not include houses that were poorly maintained, or which had such serious structural flaws as a sinking foundation. They also do not include the cost of interior or exterior painting. They show that, if you buy an older home, you should make sure there's enough cushion in your budget to handle the repairs.

One couple paid \$3000 less than the going rate in their neighborhood for a 40-year-old home. They didn't know that the speculator they bought it from had obtained it for a song because of its "run-down" condition. The only "renovating" he'd done was to slap a white water-soluble coating—probably calcimine—on the interior. When the couple went to

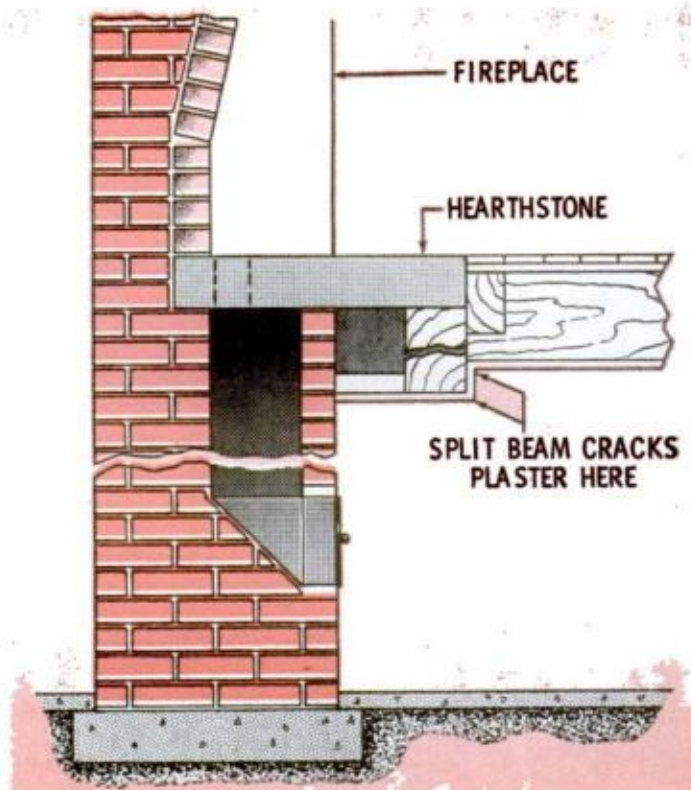
redecorate, no paint would take until all interior walls were scraped and washed—a back-breaking job. Shortly afterward, the porch structure was found to be so rotten it had to be ripped off and an entirely new one built. The couple's "bargain" was a white elephant.

So, when you buy a second-hand house, don't just walk through, while the agent points out the lovely kitchen or the big closets (which your wife would notice anyway). Look for anything that will mean additional cost after you move in. Then add that cost to the house price. Or point it out to the owner; he may deduct it from his price.

Take an exceptionally close look at all wood members—studs, plates, sill, grade beam, ceiling and floor joists and rafters—which are visible in the attic and basement. A flashlight will come in handy here. Look for:

Splitting: Some checking or cracking—especially in heavy timbers—is normal. Don't worry about small surface splits which are created as the wood dries out and shrinks. Look for large splits. One or two of these on a couple of joists still are not serious, but if you see many of them, or if the girder or main beam (which usually runs down the center of the base-

IF JOISTS AND BEAMS have been finished over, cracks in the finishing materials indicate beam or joist may have moved. Here, cracks in plaster on basement ceiling were caused by splitting of beam supporting massive hearthstone



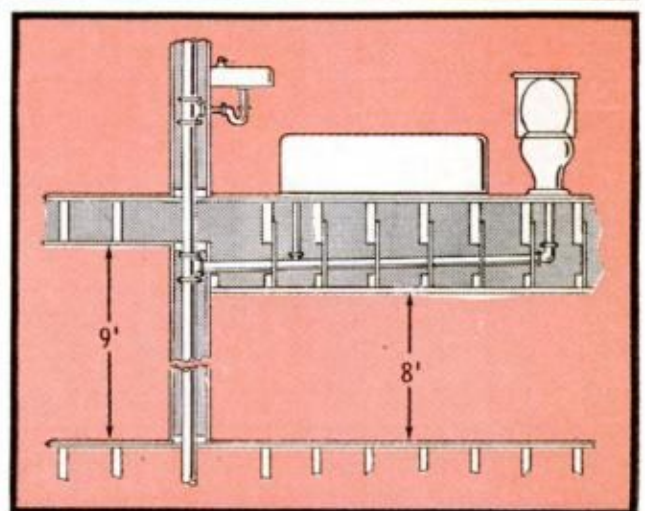
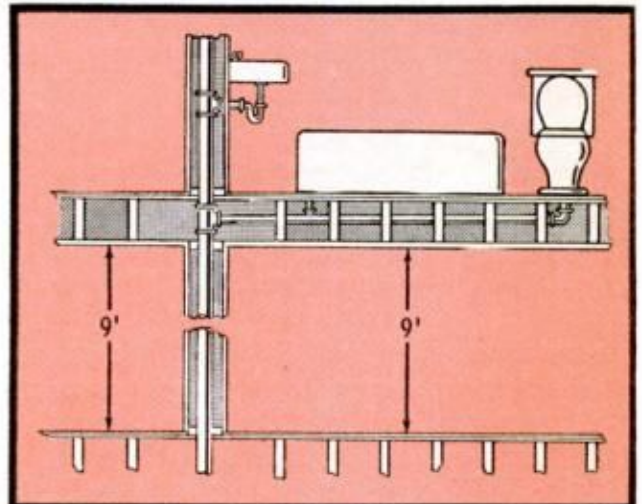
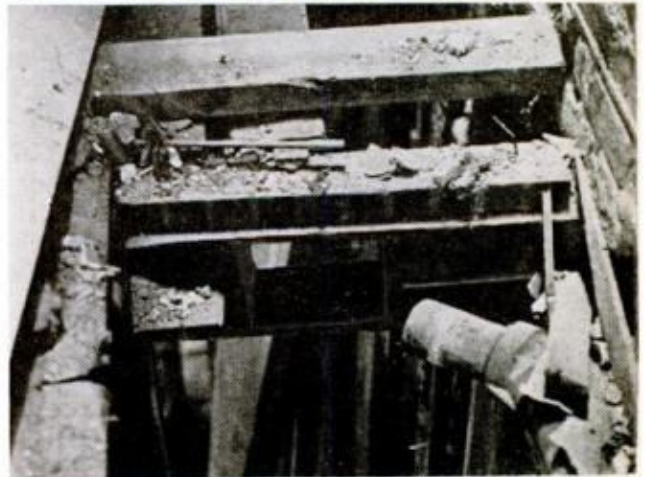
ment) is split, the damaged members will have to be reinforced or replaced.

Decay will take the form of either dry rot (the wood has begun to crack, powder and crumble) or damp rot (the wood seems pulpy, and is also accompanied by splitting and cracking). If you see either type of decay, rap the wood with a knuckle. A hollow sound means the condition may be extensive.

To correct either type of decay, you'd have to reinforce or replace the affected members. However, with damp rot you must also eliminate the source of moisture, which might involve waterproofing the basement walls or installing foundation vents. In an attic, it might involve installation of eave, gable and or ridge vents. Or it could mean repairing the roof.

Termites are most often found in wood—such as the sill—that is close to the ground or rests on a masonry wall. Their presence is often accompanied by damp rot. Unfortunately termites work inside the wood. Therefore, unless a previous searcher has cut into the infested member, revealing its honeycombed or hollowed-out interior, the only signs you might see are the shelter tubes which the insects build to cross over masonry surfaces and bypass termite shields. Finding even one such tube

IN BATHTUB OR SHOWER AREA, loose ceramic tiles should be fixed at once, as they let water into walls. Loose tile will move when pushed with heel of hand



IN BROWNSTONE HOUSES, ceiling height below upper-floor bathroom should be less than in adjoining rooms (bottom drawing). Otherwise, joists were probably notched for waste lines, as in photos and drawing at top. Check for floor sag, ceiling cracks



DON'T DO IT: Avoid the commonly recommended practice of jabbing wood for proof of termite invasion. A pierced pipe, wire, etc. could bring a lawsuit

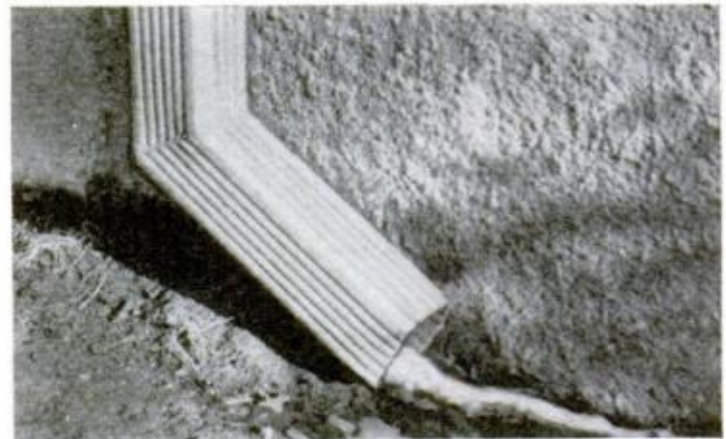
means trouble lies ahead for someone.

A serious termite invasion can cost thousands of dollars. But never panic at the first sign of a termite. A house in the New York area was recently sold for thousands less than it was worth because word got around that it was termite infested. An engineer realized the damage was actually slight, bought the house, spent a few hundred on repairs and pocketed a healthy saving. So, before you pass up an otherwise good house, get an estimate from a termite inspector.

Notches: In older homes, some floor joists may have been notched to accommodate plumbing or wiring. These generally cause no trouble unless the notches are very deep or very numerous. Repairing them may involve little more than beefing up the notched members. But such damage *may* sometimes be severe. An urban row house tells a story that was quite different. When a remodeler tore off the old plaster, he found several joists so deeply notched as to be virtually useless.



CRACKS OVER WINDOWS in masonry wall could mean the foundation is settling. Check for large cracks in foundation wall and in interior walls near windows



DOWNSPOUT DRAINING near foundation wall gives water a shortcut to the basement, especially if land is not properly graded to carry water away from house

Result: \$1500 added to the bill. The house originally had no plumbing wall. Some owner had installed a bathroom on the third floor, and, in order to run the fixture drains to the waste stack, had cut away parts of the second floor joists. Elsewhere in the same house, a stout beam had failed under the weight of a massive hearthstone. In both cases, some detective work on the buyer's part (see photos and drawings, pages 112-113) would have tipped him off to possible trouble.

Settlement: A certain amount of this is normal in every house, so don't be alarmed unless it is excessive. As you walk through each room, watch for large cracks in the wall finish, especially any that seem to have been patched repeatedly. Also, try windows and doors. Serious binding indicates frames are probably out of parallel—unless, as often happens with old windows—a careless workman has painted them shut. A sign of bad settlement is a gap between the baseboard molding and the floor.

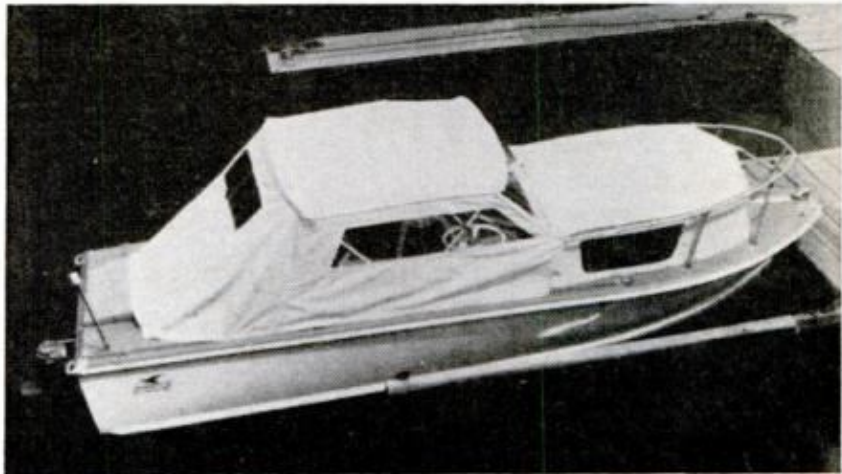
(Please turn to page 194)

Canvas Cover-Up

Utilizing add-on canvas units, Duratech's new 16-foot, 9-inch aluminum Sportboat offers a three-stage conversion from an open run-about for skiing or fishing to a completely enclosed camper-cruiser.

Starting with the open version, you can add a bow shelter (\$125), Navy top and side curtains (\$150), vinyl windshield (\$15) and stern curtain (\$60).

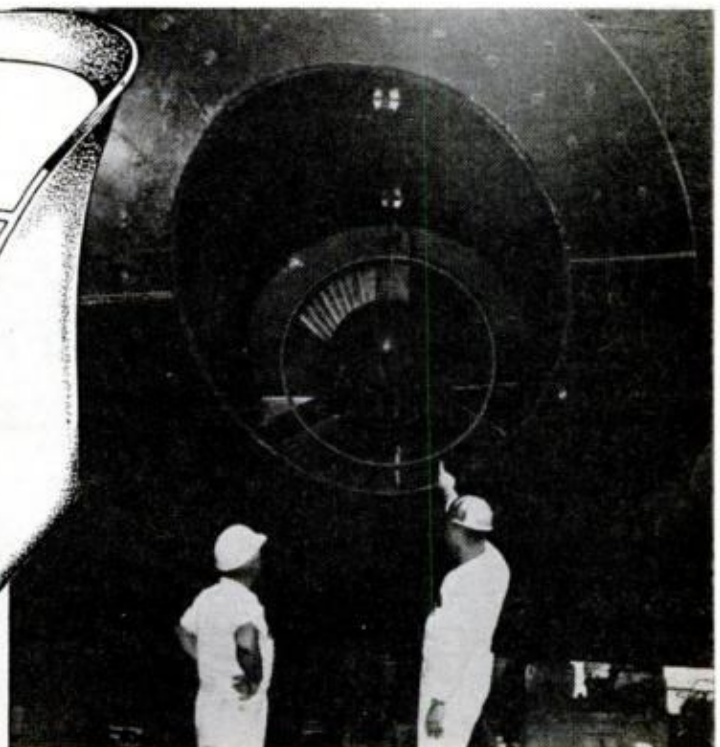
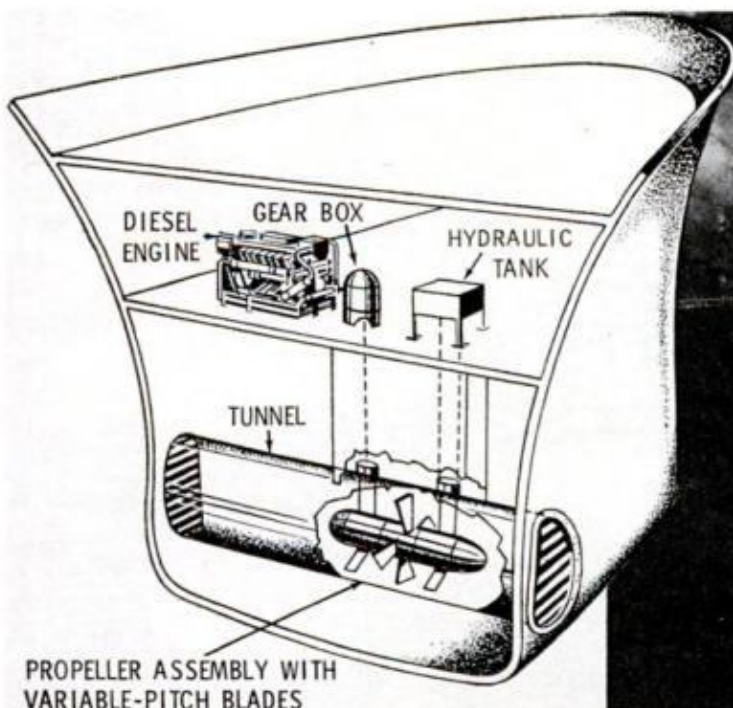
The 575-pound boat is rated for outboards up to 85 hp and has a beam of 6 feet, 7 inches. It's produced by Duratech Aluminum Boats, Penn Yan, N.Y., and all prices are f.o.b. the manufacturer.



Hole in Ship's Hull Holds a Built-In Tugboat

How can you make a 628-foot tanker turn on a dime? One way is to install a six-and-a-half-foot-diameter tunnel across the bow section and mount a variable-pitch propeller inside. The *Esso Bangor*, owned by Humble Oil and Refining Co., is saving 25 percent in port cost through reduced tug charges and

docking time with the aid of just such an installation. Called the "bow thruster," it pushes a jet of water through the tunnel in either direction, moving the bow closer to or away from the dock. The big four-bladed prop is powered by an 800-hp diesel engine and exerts 20,400 pounds of thrust. It's controlled from the bridge.



What's New for the Outdoors? More Luxury for Campers

Folding motels, portable TV, kerosene irons and gas heaters—this is called roughing it!

By Stuart James
PM Outdoors Editor

IN A DAY when camping was reserved for the rugged individualist, the famous quartet of Harvey Firestone, Henry Ford, John Burroughs and Thomas A. Edison made headlines by camping in comfort and style.

They traveled in a caravan of several cars, with a truck to carry the tents and equipment. They also had a cook and helper, drivers, men to set up the camp, and guards to keep away curious onlookers. Edison often complained that he had to slip away for a chance to think, because the camp was so crowded.

This foursome had no idea what they were starting. A recent survey estimates that there were 16 million people camping

in the U.S. in 1964. One thing they seem to have had in common was a desire to take all the comforts of home with them.

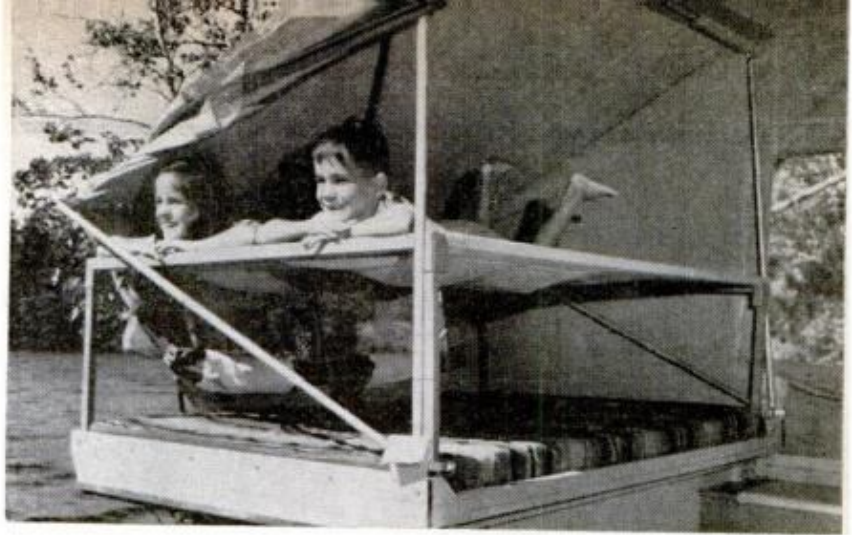
Last summer, for example, I camped in a public area at Lake Tahoe, Calif., with what I thought was the epitome of luxury: an Apache tent trailer with a Land-Rover to pull it, a complete line of Coleman equipment, and a full set of aluminum cookware. Being a dedicated backpacker, I was embarrassed by this wealth of equipment—until a couple from Spokane, Wash., rolled into the site next to mine.

What they removed from their loaded station wagon was astonishing, and when they were completely set up I took a notebook and paid a call on the complet

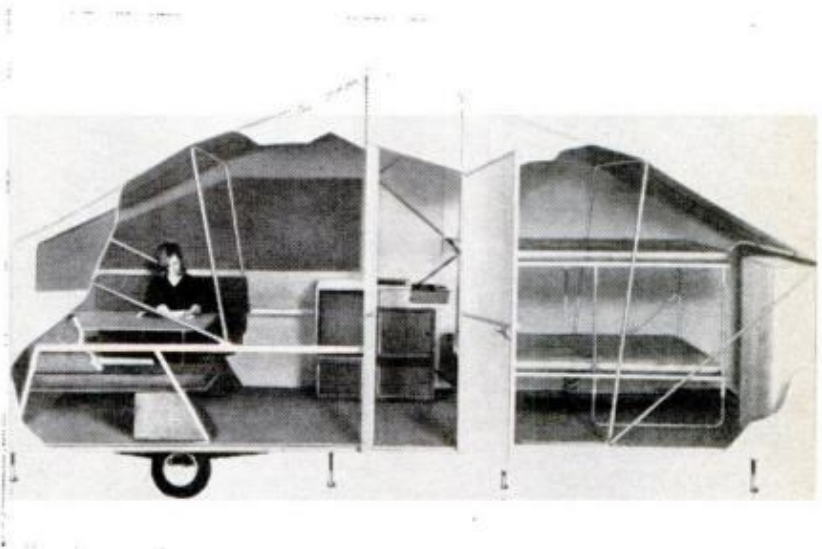
TENT TRAILERS are beginning to look like folding mobile homes. This luxury model by Starcraft is 18 feet long when opened and sleeps eight. The trailer cover raises to form a canopy, allowing headroom throughout the interior



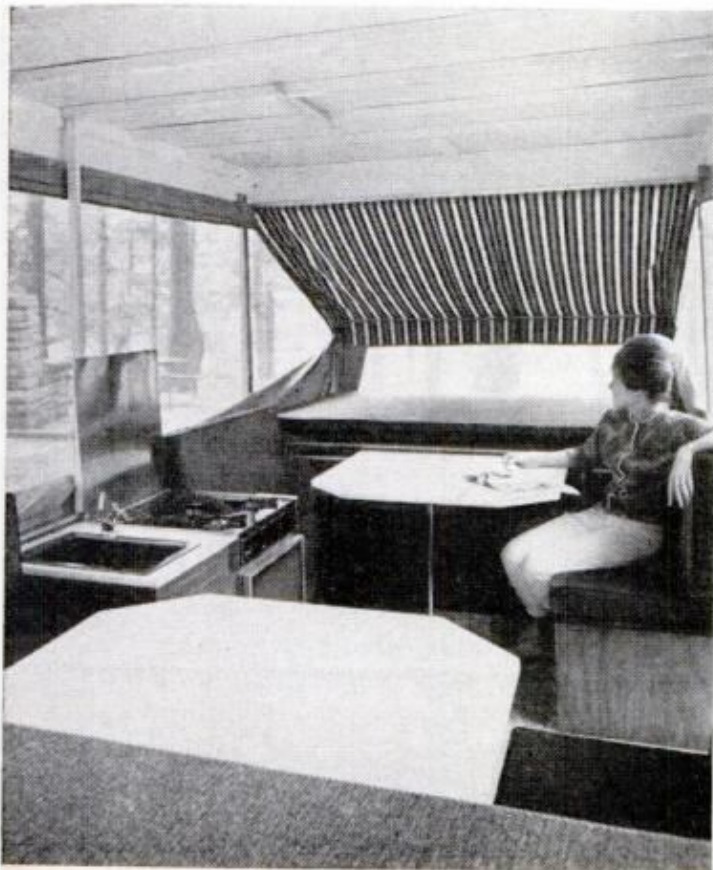
UTILIZING DETACHABLE upper bunks and double-deck folding cots, the Nimrod Riviera will sleep a total of 12 people. They also offer a folding sink and work table, and an ice box as optional equipment with their larger Americana model



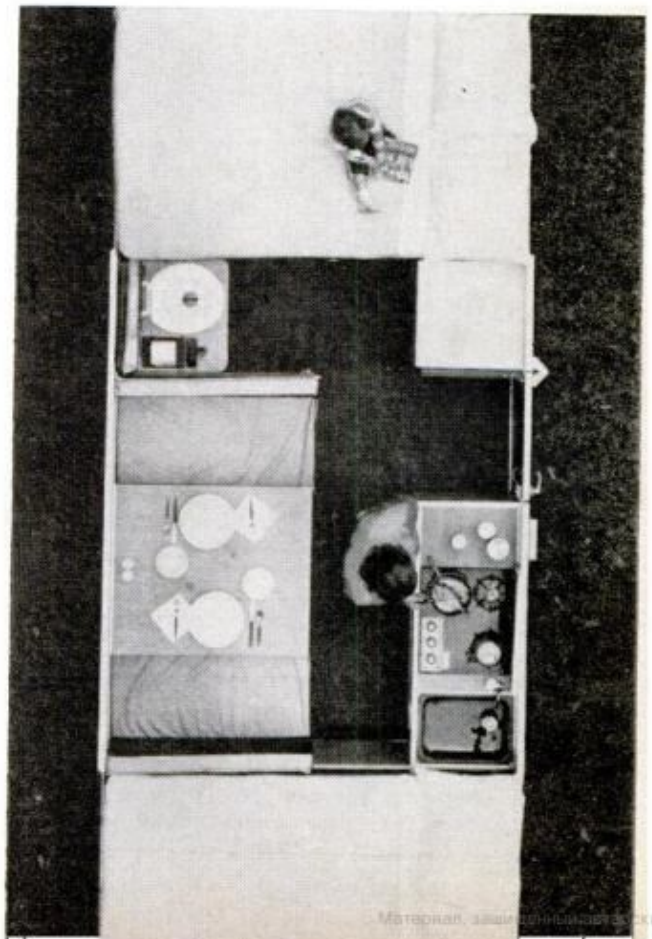
NEWEST ENTRY in the field is the Crusader, a tent trailer that unfolds into two rooms, with upper and lower double beds, and a dinette that becomes a bed. Kitchen unit, wardrobe and heating unit are offered as optional equipment



INTERIOR OF THE STARMASTER has two dinettes that convert to double beds, a gas range, ice box and a sink with a hand pump and a 20-gallon water tank

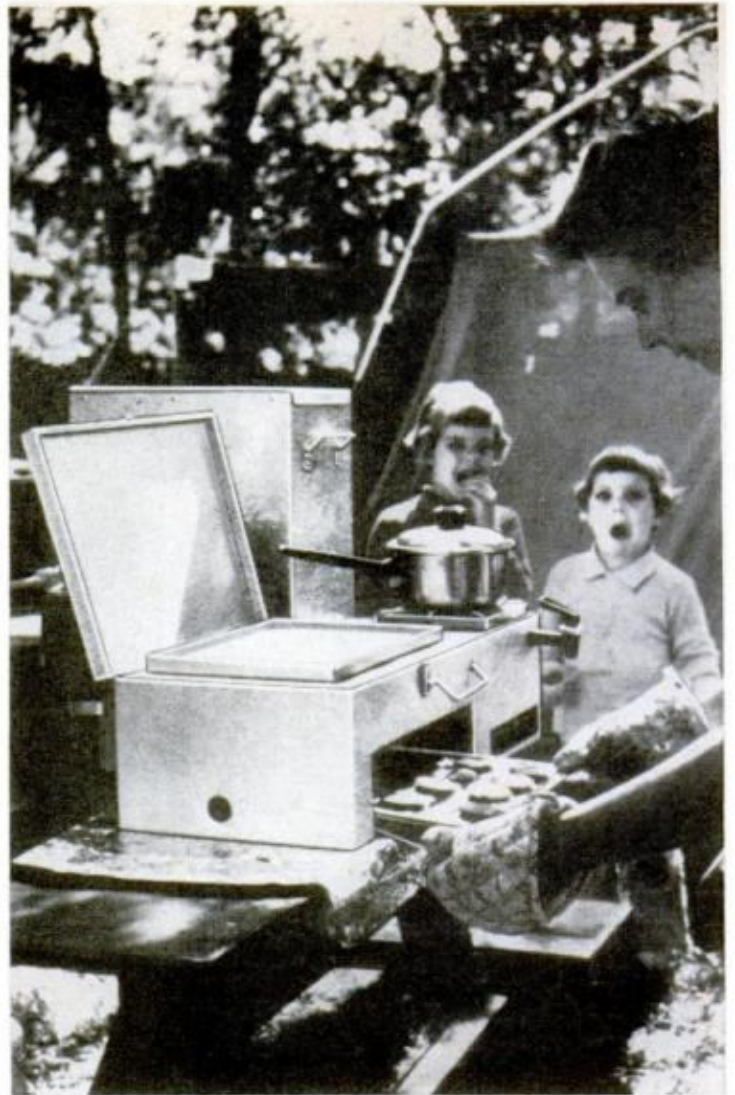


APACHE'S GOLDEN BUFFALO is a rolling motel, with two slide-out double beds, a dinette that becomes a bed, a gas stove and sink, and a chemical toilet





TRANSPORTATION around the camp ground is afforded by an Italian folding bicycle that is carried in a zippered case and can be assembled in 30 seconds



PROPANE STOVE by Frontier Fabricators cooks, grills, toasts, bakes, heats five gallons of water, and has attachment that converts it to a camp lantern

campers, as they might be called.

There was an 18½ by 9½-foot Wenzel umbrella tent that was divided into three rooms. It was supported by an exterior aluminum framework, eliminating guy ropes and any inside poles. For privacy in the public campground, they had erected a six-foot wall of canvas on guyed aluminum poles to make a 12-foot-square enclosure around the front of the tent. Inside the tent were two aluminum-frame folding cots that could be fitted as double bunks, and down-filled sleeping bags. Earlier, I had watched them fill their air mattresses with a device called an Exhaust Inflator, a small pump activated by a car exhaust but which pumps clean air.

In the enclosure before the tent were two folding camp chairs and a chaise longue of canvas and aluminum that folds flat for stowing. Their dining table and benches were a single folding unit that would seat four adults comfortably and

was the size of a narrow suitcase closed.

A Humphrey two-burner stove, two outside lamps mounted on stakes that can be pushed into the ground, a hanging lamp for inside the tent, and a large Escort portable refrigerator were all operated off a 20-pound LP gas cylinder. For charcoal broiling they had a "Piccolino," a full-size rotisserie with a grill and hand-operated spit that folds into a case about the size of a cigar box.

For heating the tent when they camped at higher altitudes there was a handsome little Therm'x Adventurer, a flameless heater that delivers 3000 B.T.U. for 20 hours on a tank of white gas or naphtha.

Portable Electricity

Despite the luxury, all this equipment still smacked of the outdoors—with two exceptions. When I arrived the couple was watching the news on television, and coffee was perking in an electric coffee



POCKET-SIZE folding stove available from Abercrombie & Fitch burns Heat-Tabs, a wafer-like fuel that produces enough heat for coffee or a complete meal



FAMOUS FOR THEIR MOUNTAIN STOVE, Primus of Sweden has entered the luxury market with handsome two-burner propane stoves imported by Therm'x Corp.

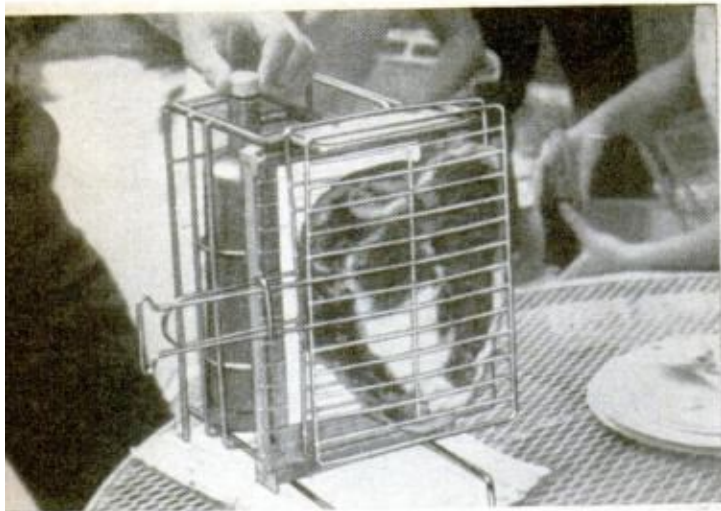
pot. It took a moment to recover from surprise and trace the electric wires to a 40-pound gasoline-driven Niagara alternator that hummed quietly in a corner of the compound, giving off a steady 900 watts of power.

This camp seemed unusual at the time, but after a month of visiting campgrounds in California and Nevada, watching women spruce up with electric hair dryers and press clothes with a kerosene iron, seeing reading lamps and hot water heaters that operate off an automobile cigar lighter, and listening to a mother call her children to dinner with a Tele-Mate, a two-way walkie-talkie with a three-mile range, I could only think of the impossible task of the State Department information service. If they can't convince Iron Curtain peoples about the living standard of the average American at home, just wait until they try to explain how he goes about "roughing it."

And the trend toward luxury in the out-

IDEAL FOR EMERGENCY LIGHT is a candle lantern from Trailwise of Berkeley, Calif. It is aluminum with mica windows and is 4½ inches long when folded

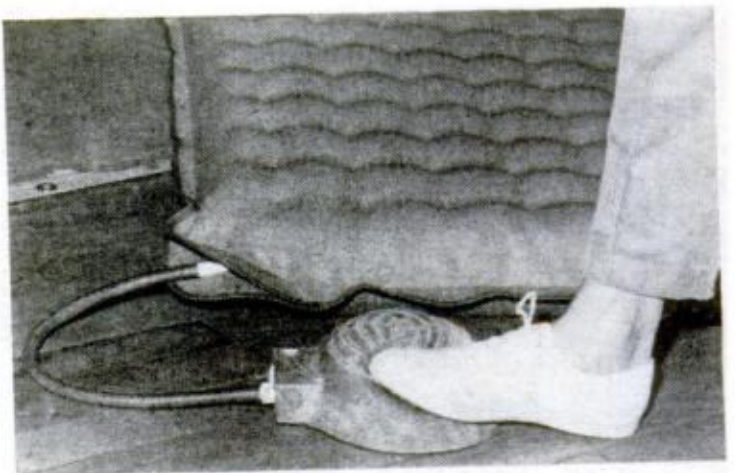




PRO-BA-CHI is a flameless broiler for steaks or burgers. It operates off standard propane bottle, and stands on end to keep drippings off heat unit



MANTLE LANTERN made by Knapp-Monarch gives light equal to 100-watt bulb. It is simple to operate and utilizes cans of butane fuel under pressure



TAKING THE HUFF AND PUFF out of inflating an air mattress, an inexpensive rubber air pump from Abercrombie & Fitch is easily activated by the foot

SMALLEST TENT TRAILER is the Holsclaw, a utility trailer with a double-deck sleeper top that provides ample room for three children and two adults

doors continues, explained by a statistic from a recent national survey indicating that one out of three campers in the U.S. is a woman, and just as it is her natural inclination to curtain and carpet a fishing shanty into a vacation retreat, she is determinedly civilizing the campsite—with equipment manufacturers eager to help.

While there is nothing startlingly new in camping equipment this year there are innovations in the old for greater comfort and convenience.

Tent trailers are expanding, offering additional sleeping room, and built-in dining areas, stoves and ice boxes. Wayfarer has put large screened windows all around one side of the tent for a "cottage" look in their Mark 5 model, and added fittings to accommodate three optional upper bunks

above the pull-out beds. Nimrod is offering a sink and work counter that folds away for traveling and pulls up for use. It is optional equipment with their Americana model. Besides dinette, sink, stove and ice box, the Apache Golden Buffalo has an LP floor heater and a chemical toilet. The dinette converts into a third double bunk, and the travel cover raises straight up to become the ceiling, eliminating the slope of the "tent."

Electricity can be carried anywhere with the Tiny Tiger, a 12-pound gas-powered generating plant for 12-volt equipment that is only ten inches long and seven inches wide.

The Camp'otel car-top camper features an outside stall shower. A five-gallon tank

(Please turn to page 190)



Boating Cookery

Fix a meal in foil before sailing, and they'll call you chef the first time out

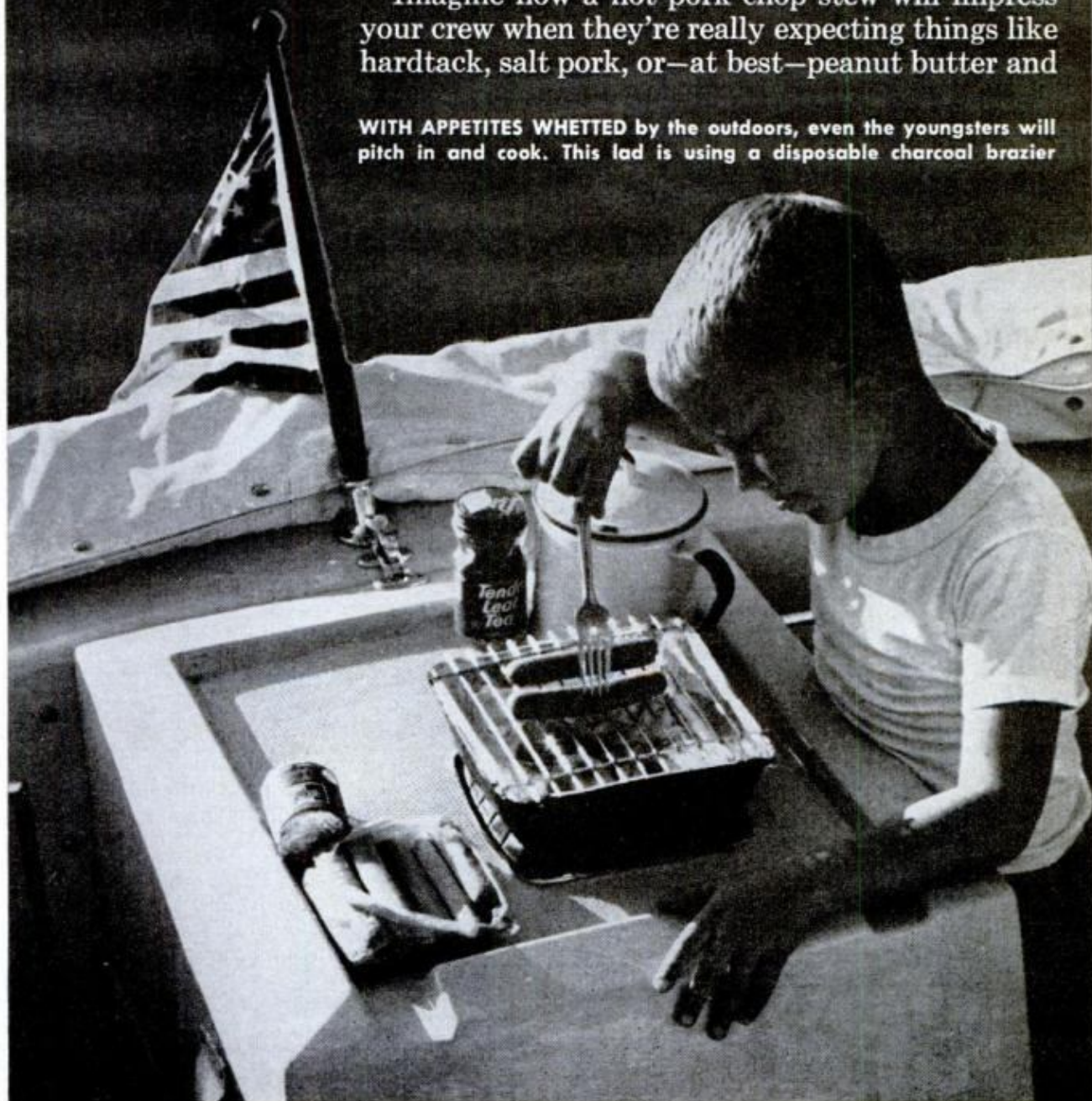
By Patrick Perrett

AS A SAILOR, you may possibly be inclined to run your boat aground, or foul anchors, or even lose things overboard.

But at mealtime (if you've managed at least to stay afloat) you can make your guests believe that your 16-footer is the *Queen Mary* when you magically produce piping hot—and appetizing—meals.

Imagine how a hot pork chop stew will impress your crew when they're really expecting things like hardtack, salt pork, or—at best—peanut butter and

WITH APPETITES WHETTED by the outdoors, even the youngsters will pitch in and cook. This lad is using a disposable charcoal brazier



jelly sandwiches. Here's how to do it:

At home you can prepare the stew in complete individual meals by wrapping in aluminum foil a medium-thick pork chop with onions, potatoes, carrots and other vegetables.

Then, about 45 minutes to an hour before your mealtime in the boat, place the wrapped packages on the grill of a charcoal burner. The moisture that remains after you washed the vegetables (don't forget to do *that*) is sufficient for steaming the contents of each package. Be sure to turn the foil packs frequently to avoid burning the vegetables. Then pass the individual packages around for the feast.

One tip: Be sure the foil package is completely sealed when you prepare the stew. Do this by double wrapping with two pieces of foil. You can use the same technique for vegetable dishes.

That universal favorite, the hamburger, can be prepared in advance, too. You can add your own individual touch by mixing ground round with pepper, garlic or hickory smoked salt, catchup, minced onions and a pinch of oregano. Form patties, insert wax paper between them, and wrap in foil. These packets can be frozen at home and stored in an ice chest in the boat. They'll keep for at least two days this way.

Obviously, you'll need more preparation for a boat meal than the two dishes just mentioned. And just as obviously, you won't want to take up valuable space in a 14 to 16-foot boat with a box of randomly selected groceries that's still half full (and occupying space) on your return trip.

So the first thing to do is make up a list of all meals plus menus for each. Buy the groceries, and prepackage and label the meals. Pack the imperishables in a can that is labeled for the meal at which they'll be used. The produce and perishables for each meal are packed in plastic bags, labeled and stored in an ice chest—with the last meal on the bottom.

During your planning, you've got to assume that when you're on the water all those who aren't seasick will have formidable appetites. So add some between-meal snacks, like fruit, raisins and cookies.

On a one-day outing, you can probably pack everything in a box or in an ice chest with the cold drinks. Even the dry, crisp things, when sealed in plastic bags, will stay that way in the cooler.

And you can just about double the ca-

capacity of an ice chest by freezing food, water and beverages at home and using them in place of ice.

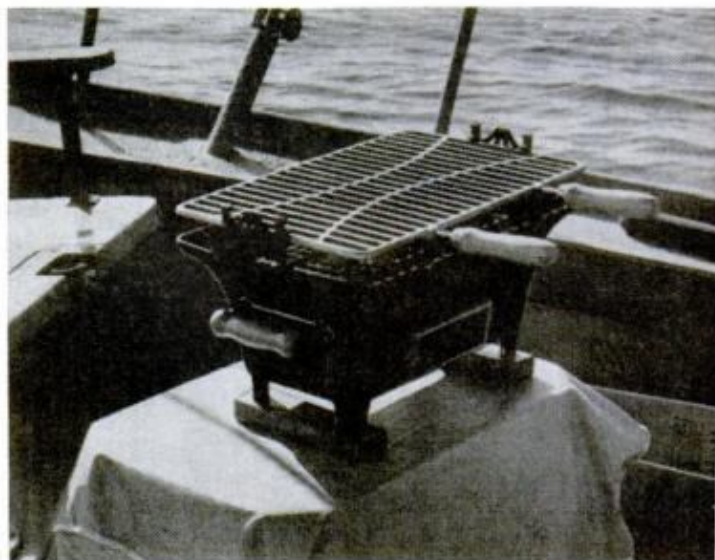
For several days of meals, you can sometimes plan to use one item for several meals. A canned ham, for instance, cut into thick slices can provide a hearty mainstay for dinner. The next day the remainder can be diced to add interest to morning scrambled eggs or sliced to provide delicious luncheon sandwiches.

Other space-savers among foods are the freeze-dried ones. You can buy complete meals prepared this way. Individual dishes available, to mention a few, are noodles Romanoff, several forms of potatoes (mashed, scalloped, hash brown, sliced, fried), ham omelettes, all types of soups, gravies and sauces.

MOTOR SHROUD for stern drive offers handy surface for cooking; auto floor mat keeps grill from skidding. Homemade table folds out of way on hinges



JAPANESE HIBACHI is a bit on the heavy side, but is an efficient stove. You'll need only a relatively few pieces of charcoal to cook an entire meal afloat



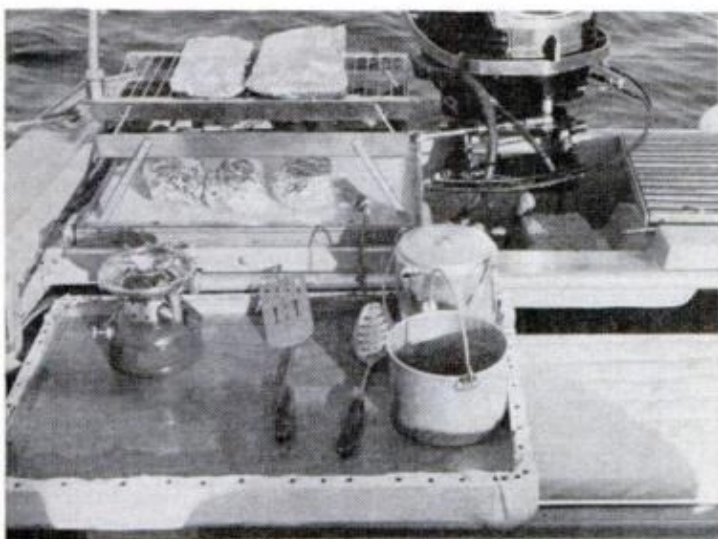
Most of the dried foods call for water. When milk is required, powdered milk is adequate and excellent with sauces.

How to Cook Aboard

But back to impressing your guests by cooking that piping-hot meal. You may prefer to go ashore to cook—and admittedly it's safer and easier that way—but every good seaman should be ready, willing and able to fix a meal while his boat is swinging from an anchor.

The most widely accepted stove for marine use—from the standpoint of safety—is the alcohol stove. It will not produce the amount of heat generated by most camp stoves, but an alcohol fire can be extinguished with water. Canned heat also provides a safe cooking fire. Kerosene

SHELF alongside motor well was made by an "old pro" boating chef to hold charcoal grill. Baked potatoes are being kept warm while pork chop stew cooks



EGG CARTONS are handy-sized containers for charcoal. You can use one carton of charcoal per meal, and start each fire simply by setting the carton afire



stoves are safe, but many people object to their odor.

Gasoline stoves using white leaded gasoline—the most widely used of all camp stoves—are not recommended as permanent stoves aboard any size boat. While completely safe ashore, where any escaping gas fumes (which are heavier than air) are dissipated along the ground, caution must be exercised if they are used aboard an open boat. If you must use a gasoline stove, place it as high above the deck as possible so it can be dumped overboard quickly if necessary. Butane and propane stoves also use gas that has heavier-than-air fumes which tend to gather in the bottom of the boat if there's any gas leakage.

Charcoal braziers are as good in a boat

SOLID-FUEL STOVE is especially designed for marine use. It's made of stainless steel, and guard rails hold utensils in place even if boat is in rough water



CHARCOAL BRAZIER that was designed for boat use is inserted into special metal fitting on the deck of the boat. It can also be carried ashore for use





SINGLE-BURNER STOVE is compact, taking up little boat space. Aluminum pot is part of carrying case for stove; lid of pan serves as cover or frying pan



ALUMINUM STAND to hold the stove is a real back-saver for the cook when you go ashore for meals. It's lightweight and folds away for storage in boat

PORTABLE CUPBOARD was designed by boat camper for on-shore use. To build one, first assemble all the items you wish to store and mock it up in cardboard



as they are on the patio. In addition to the Japanese hibachi, there are many lightweight aluminum and steel models. Some are designed to extend overboard to keep the fire entirely out of the boat.

Dishes and utensils should be planned carefully to eliminate unnecessary items. Minimum needs for an overnight trip include: pancake turner, slotted spoon, long-handled fork, two paring knives, carving knife, can opener and ice-pick. Plastic or paper cups, plates and flatware reduce galley chores and conserve fresh water.

A nesting aluminum cooking kit will supply all the utensils required for a full meal, and they take up little space. Frying pans lined with Teflon are ideal, since they require no grease for cooking, and they can be washed in cold water. A cast aluminum frying pan that is divided into three parts and lined with Teflon allows you to cook a complete breakfast at one time. This pan has all the advantages of cast iron, but is lightweight.

When you're carrying canned food and want it heated, one method often used is to place the cans in a net bag and drape them close to the motor's exhaust.

Among pieces of equipment, an efficient ice chest is a must. Best for boat use are those made of aluminum or Styrofoam. Both are lightweight and won't rust. (See *Coolers for Campers* on opposite page.)

Another handy bit of equipment for a small boater is a cupboard for food storage that he can build himself. Use marine plywood, and design it to fit your boat's cockpit arrangement. Rope handles will make it easier to move the box.

Sometimes such a box gives you your only flat surface to use as a counter during food preparation. Those who prefer to go ashore for cooking might want to build a cupboard with detachable legs, like that pictured at the left.

The most difficult meal to prepare on a long trip, whether it is tent camping or boating, is the first meal of the first day. The confusion of embarking, the lack of organized routine, just the chore of getting supplies and equipment in order, all contribute to making this first meal a culinary chaos. The wise thing is to eliminate it entirely by packing a separate picnic lunch that will require no cooking. This breathing space will give you time to adjust to new surroundings. The rest of the meals will come off like clock-work. ★★★

The Coolest Coolers for Campers?

Throw away ice chests with the paper plates? Or are permanent ones more sensible? We tested all kinds and even tried them in Death Valley

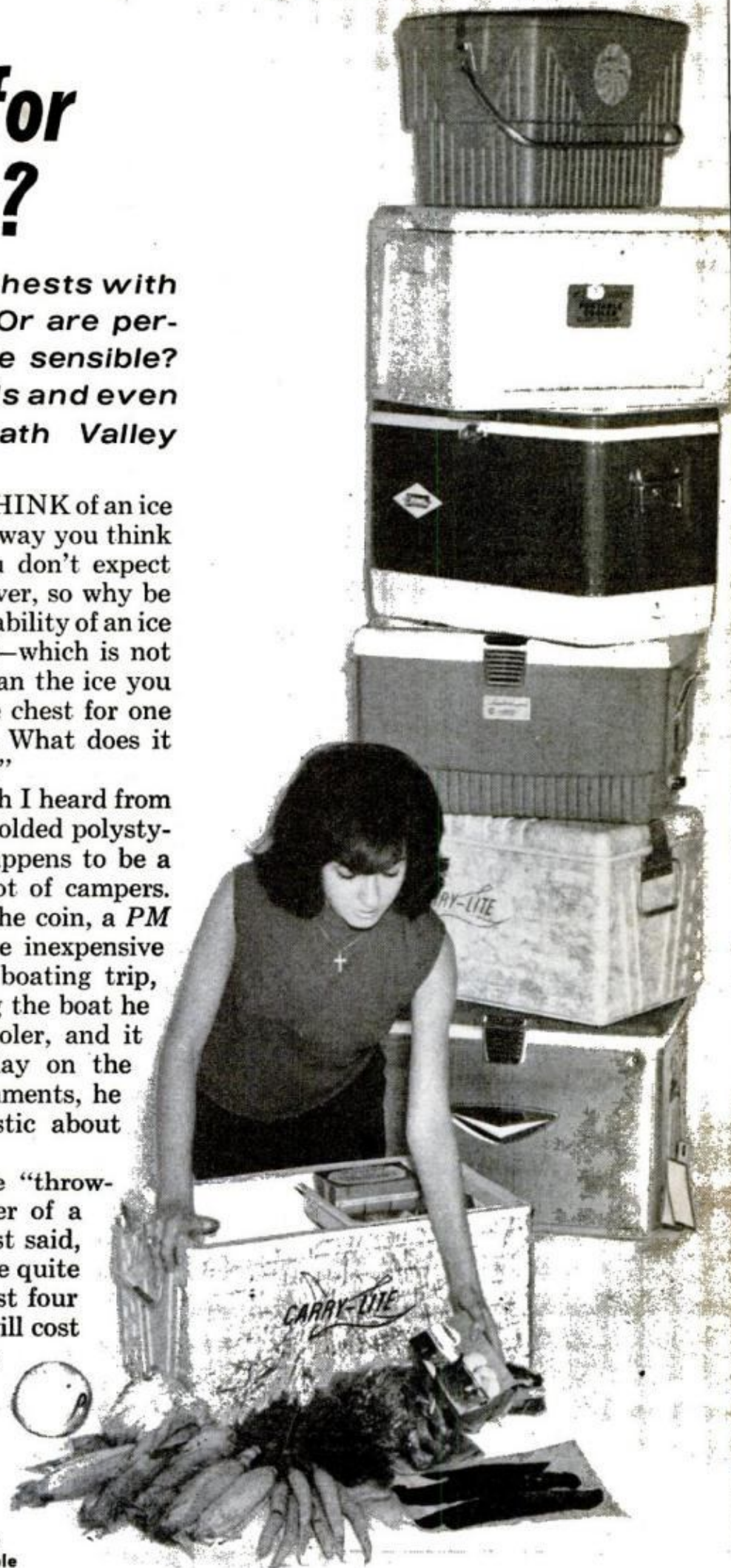
“YOU HAVE TO THINK of an ice chest in the same way you think about paper plates. You don't expect paper plates to last forever, so why be concerned about the durability of an ice chest that costs only \$3—which is not much more expensive than the ice you put into it? You use the chest for one trip and throw it away. What does it matter how strong it is?”

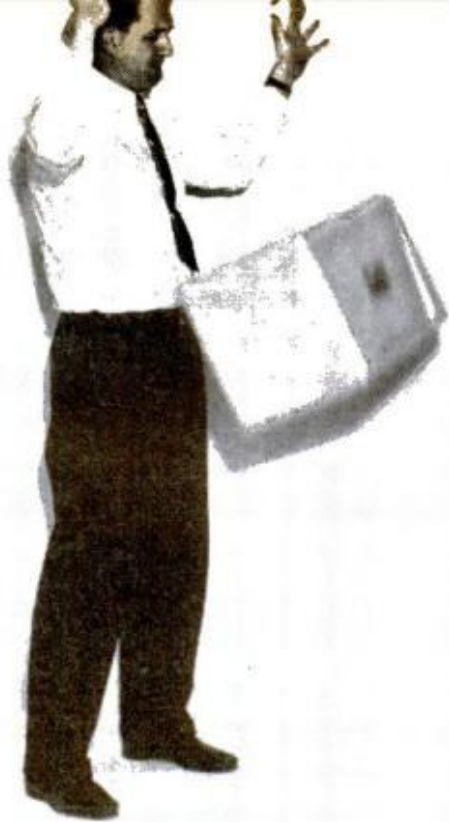
This was the sales pitch I heard from the manufacturer of a molded polystyrene ice chest, and it happens to be a growing idea among a lot of campers.

On the other side of the coin, a *PM* staffer took one of those inexpensive styrofoam coolers on a boating trip, and while he was loading the boat he tripped, dropped the cooler, and it split in half. After a day on the water with warm refreshments, he was less than enthusiastic about the savings involved.

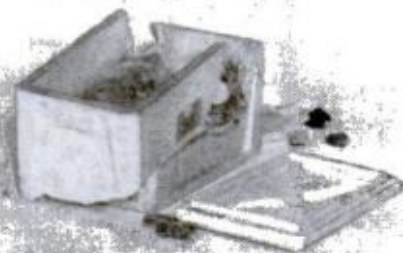
And in answer to the “throw-away theory,” the maker of a steel and plastic ice chest said, “In the long run it will be quite expensive. If you use just four in one full season, they will cost you about \$12. In three years the cost will be considerably more than the price of one

CAMP COOLERS range in size, price and materials, but their basic job is the same—to keep ice from melting for as long as possible



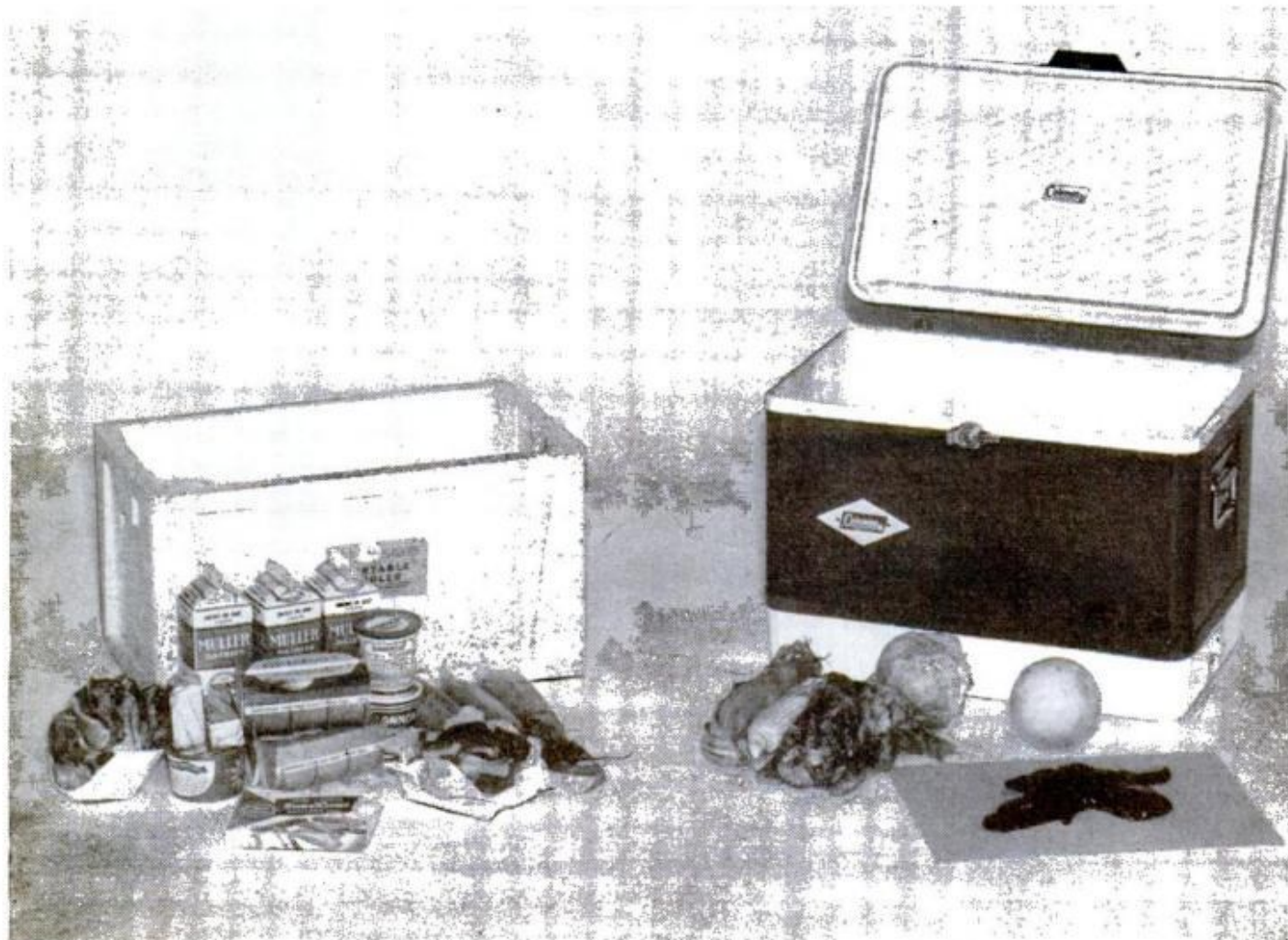


FOR DROP TEST of plain expanded polystyrene cooler we loaded it with 25 pounds of ice and 15 pounds of food and let it fall from a height of six feet



WHEN IT HIT the floor it literally came apart, the sides and bottom splitting from end to end. This type cooler is cheap, but is very prone to disaster

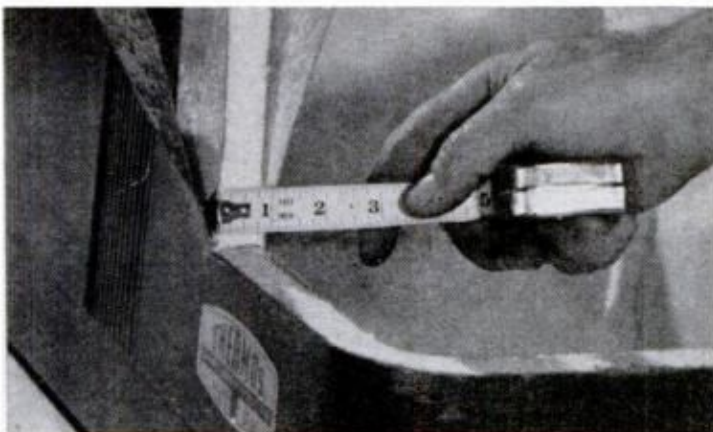
CAPACITY of average-size polystyrene model (left) and higher-priced, steel-encased Coleman. With 25 pounds of ice in each, the Coleman held the food shown before it in addition to all that standing before the Styrofoam cooler





PLASTIC-COVERED polystyrene cooler that sells for \$14 proved remarkably strong, surviving drop test and easily supporting the weight of a 230-pound man

CUTAWAY of new Thermos cooler shows the two thin layers of plastic that form a strong, rust-proof covering for the one inch of urethane insulation



PLACING 25-POUND chunks of ice in four different type coolers, we sealed coolers for three days. Only the \$3 Styrofoam chest contained ice when opened



good chest that will last the camping family a full generation."

There are, basically, four types of ice chests, and they have in common the fact that each one is simply an insulated box for holding a block of ice.

The molded expandable polystyrene box is the least expensive. However it also lacks durability. As a test of the strength of this type of box we filled one with 25 pounds of ice and 15 pounds of food, and let it drop from a height of six feet. When it hit the floor it literally exploded, the sides and bottom splitting from end to end.

A second type has a coating of plastic over the polystyrene base and a plastic insert for the interior. This raises the price to about \$14, but we put one of this type, a Carrylite, through more than ordinary punishment and it proved to be remarkably tough. We threw it across a room and bounced it off a wall, and kicked it down a flight of stairs. We filled it with ice and food and dropped it, and then we had a 230-pound man stand on the lid. After all this it was only slightly scuffed.

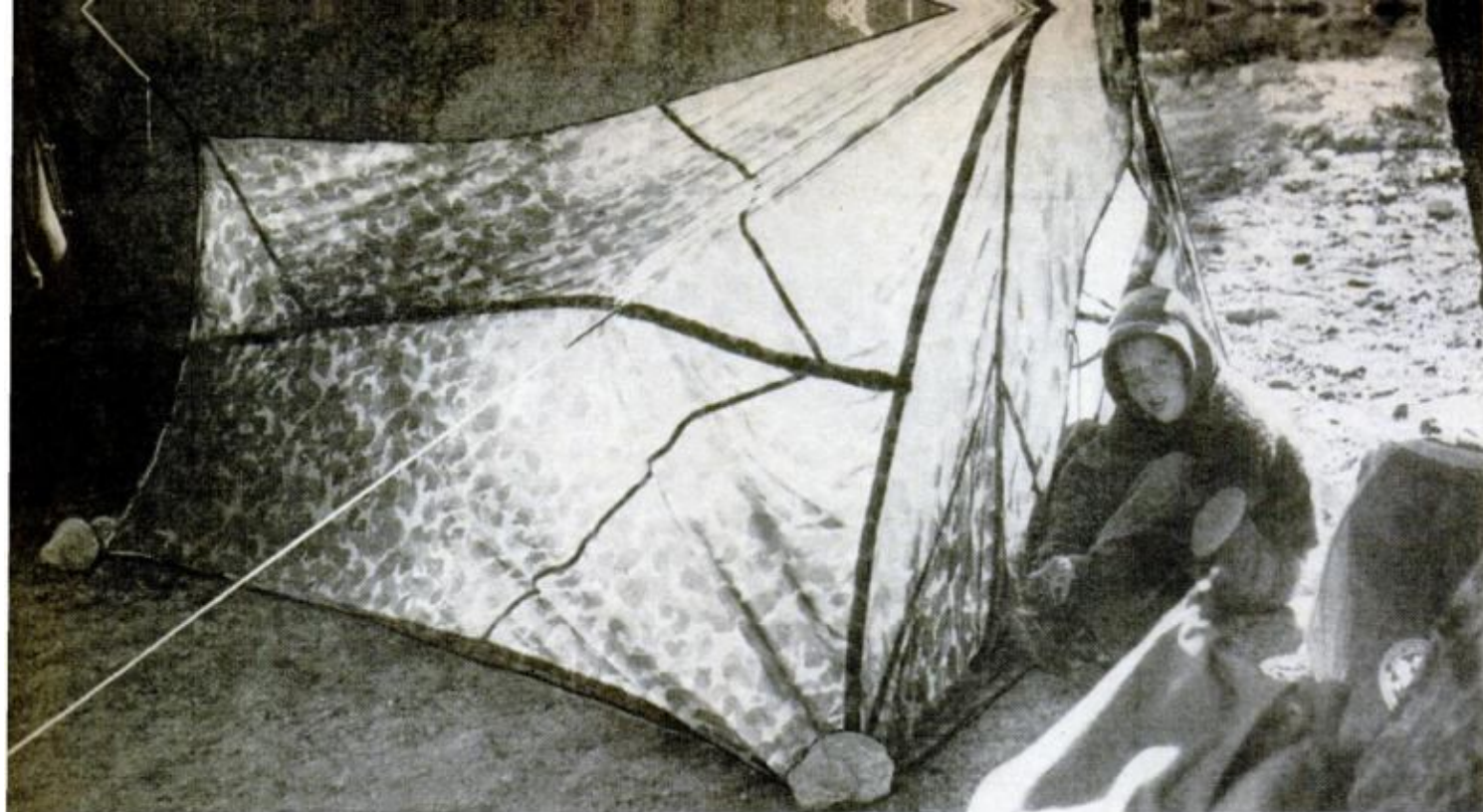
One make of chest, the Weberlite Go-Kooler "30," falls in between these two types. The sides and top are covered with a thin sheeting of steel and it sells for about \$5. It is more durable than the unprotected polystyrene, but it will break when dropped and severe punishment dents the metal.

The third type features a heavier and more durable plastic cover inside and out, and metal hinges and latch for the lid. You are now getting into the \$20 price range. We tested a Thermos and a Ted Williams model from Sears. They were both extremely sturdy, surviving the drop test and tumbling down stairs without damage. By banging them hard against a sharp-edged object, however, we were able to penetrate the plastic outer skin.

This last test was in line with a criticism often leveled against the more expensive coolers to the effect that a puncture will render them useless and the owner will be out a considerable sum of money. This was not the case. We used the Ted Williams chest after puncturing the side and there was no noticeable loss of insulation.

The fourth type is the metal chest, a steel or aluminum box, about an inch thickness of an expanded polystyrene insulation such as Styrofoam and a plastic

[\(Please turn to page 203\)](#)



WITHOUT POLES OR STAKES, the two-man mountain tent fashioned from a surplus military parachute withstands the wind and cold high in California's Sierra Nevadas. It is suspended between trees, and rocks hold down corners

Custom Tents from Parachutes

Spend just two hours and \$9—and wind up with a mountain tent. It's as easy as sewing a curtain

By Robert Talley

WITH ONLY A MARKING PENCIL, yardstick, scissors, minimum ability with a sewing machine and one full evening of time, you can turn a surplus parachute into a pair of two-man nylon mountain tents that weigh less than two pounds each and will fold into a package the size of a loaf of bread.

A standard 25-foot military parachute is ideal for the job. We bought one in mint condition for \$18, and to our surprise and delight we learned that the seams sewn in to hold the lines created the tapered panels of exactly the size required for the tent. And an added bonus was chute cord, more than enough top-quality nylon line for the tent ropes.

As a double-check in selecting a chute for size, measure along the outside edge of the canopy. It should be about three feet between the seams. You then measure along the seam toward the center, and at a point eight feet from the outside the

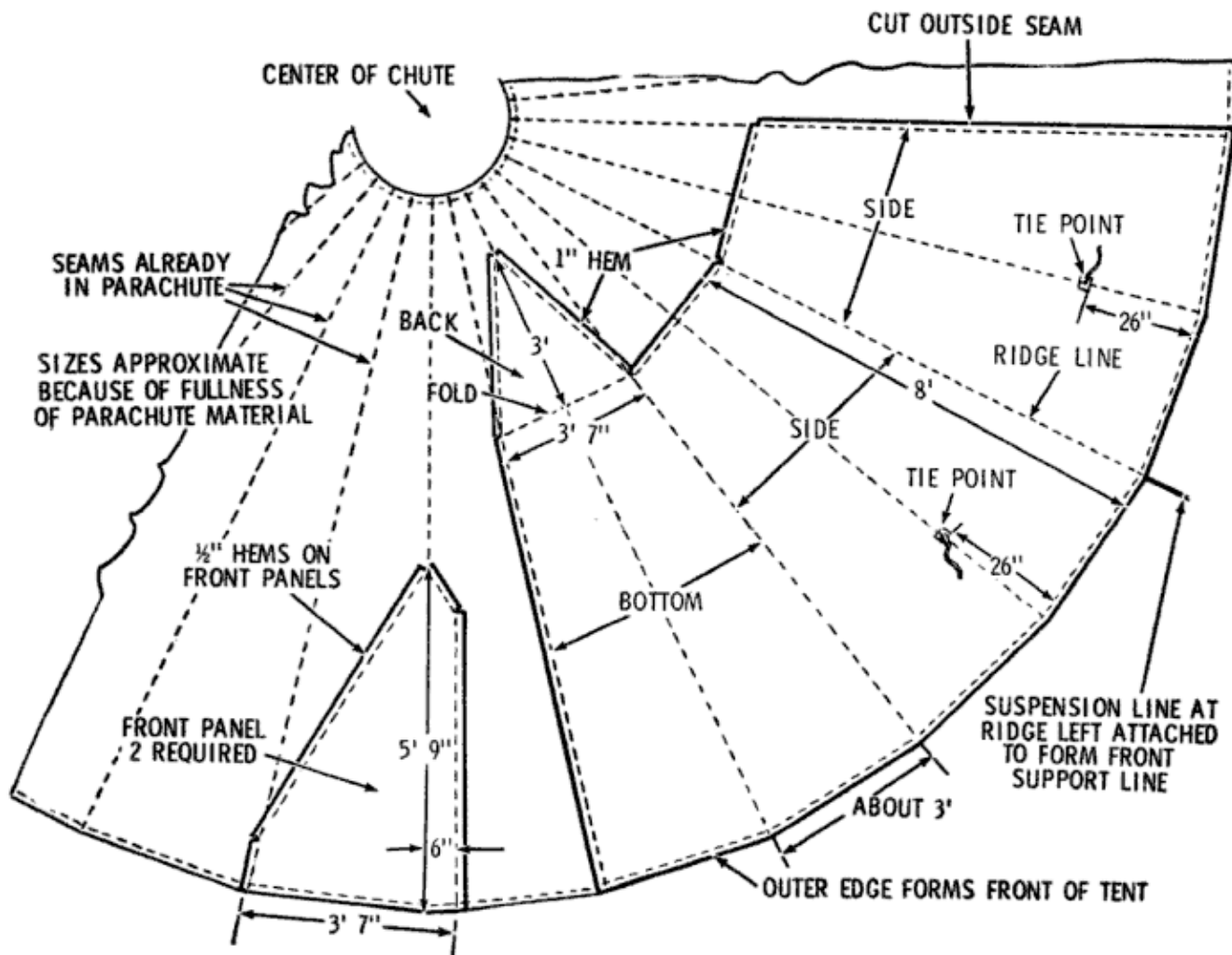
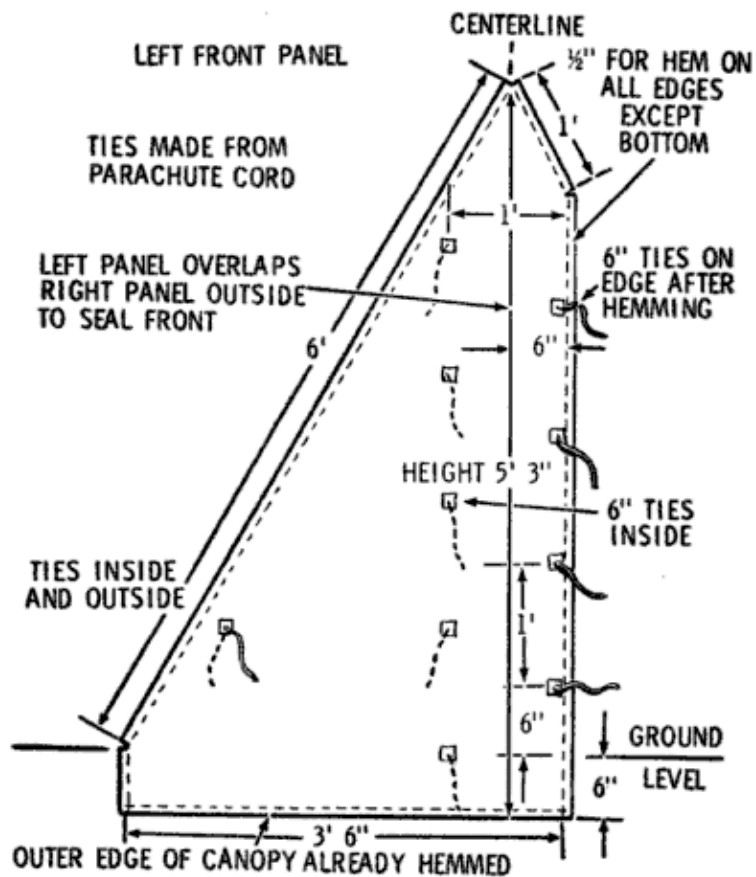
panels should measure about 23 inches from seam to seam.

Spreading the canopy on the floor, select six panels for the body of the tent and mark them off as shown in the large diagram at the right, making certain to leave an inch beyond the outside seams for a sewing edge. The next step is to remove the lines from the material, with the exception of the ridge line which is left intact. Cut the stitching around the cord at the center air vent. Then, at the outside edge of the canopy, make a small slit in the seam and cut the cord which will be inside. The cord can then be pulled out of the material, and the loose ends are trimmed close to the outer edge. The side in which the slits are made becomes the inside of the tent.

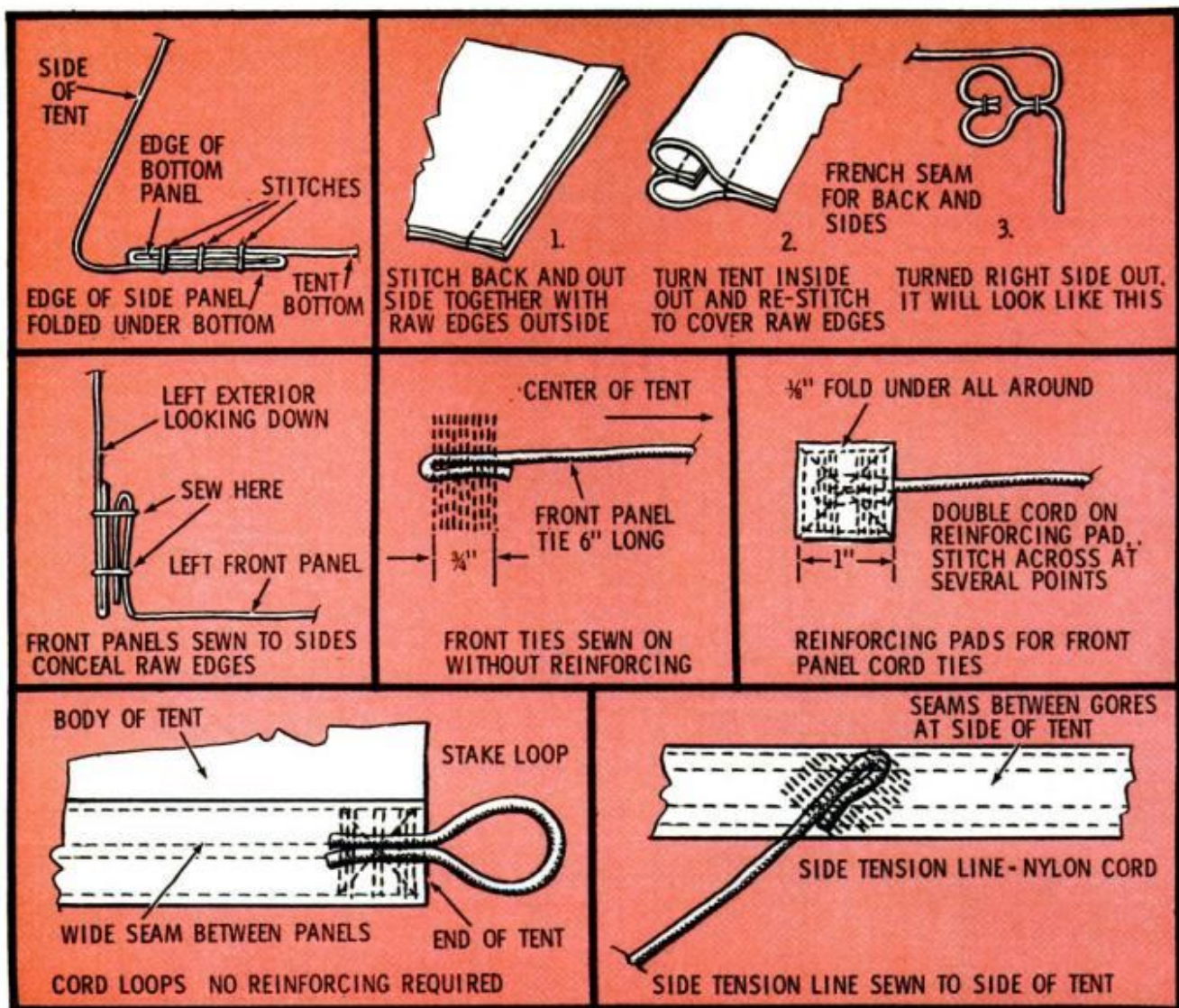
Double-check your measurements, noting that the back panel is left attached to the bottom, and then cut out the body of the tent. Sew the left side of the tent to

TWO FRONT PANELS are cut from the same pattern. The right side is attached first so the flap of the left will overlap. Each side has 11 tie lines. The dotted lines indicate ties are inside the tent

PARACHUTE CANOPY is spread flat and tent dimensions are marked on with crayon, following the natural panels of the chute. Rear panel is left attached to main body of tent and sides are sewn together



HOW TENT IS CUT FROM PARACHUTE



FRENCHED METHOD of stitching is used on seams to give them greater strength. Patches are cut from chute material, hemmed, and sewed to tent to reinforce front tie lines. Cotton or nylon thread can be used for the sewing

the bottom, overlapping the reinforced seam on the left side so that it goes under the seam on the bottom. Since nylon will stretch, all seams must be basted before sewing. Sew the back panel to the sides of tent, using frenched seam (above).

Measure and mark off two front panels as shown on page 129, leaving margins all around for hemming, except at the bottom. After cutting, the vertical edges of the front panels, and both sides of the bottom flap, are hemmed. Each panel is attached to the tent by starting at the lower outside corner and stitching across the ridge line, and down the other side. Each panel extends beyond the ridge line and when both are in place they will overlap. Sew them so that the left overlaps the right.

Twenty-two reinforcing patches are made (see above) and sewn into place, as shown in the front panel diagram. Six-inch tie lines are cut from the extra line and sewed onto the patches.

A 12-inch piece of cord is looped and sewed to the reinforced seam at the four bottom corners for staking down the tent. The side tension lines, about 10 feet long, are sewed on the reinforced seams on each side, 26 inches from the forward edge.

Extra cord is attached to the ridge line so it can be suspended between two trees.

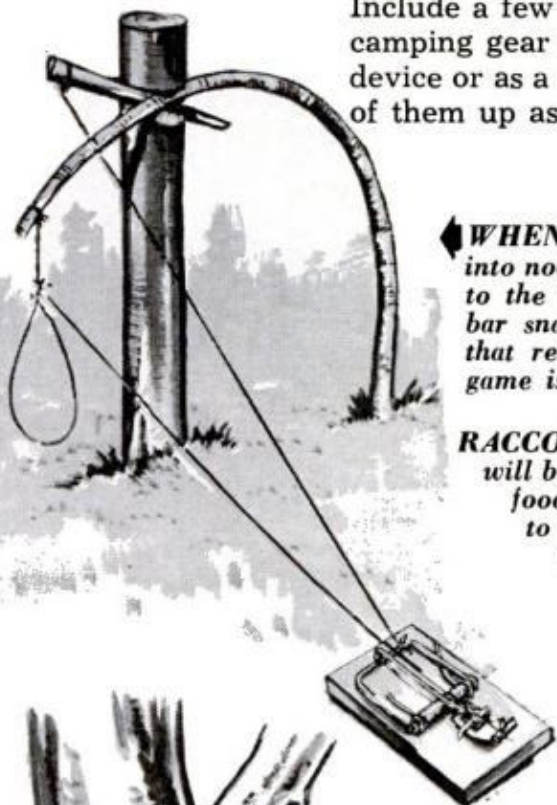
The nylon parachute cloth will resist light rain, but the finished tent should be sprayed with a waterproofing agent against the possibility of nasty weather.

We used two tents of this design on a September pack trip into the Sierra Nevadas. The 14,495-foot summit of Mt. Whitney was our goal, and we made our base camp at 12,000 feet. The nights were extremely cold, but with just an inexpensive plastic ground cloth covering the floor of the tent, we slept—comfortable and warm. On occasion the tents were buffeted by strong winds, and they held up without mishap. ★★★

Going Camping?

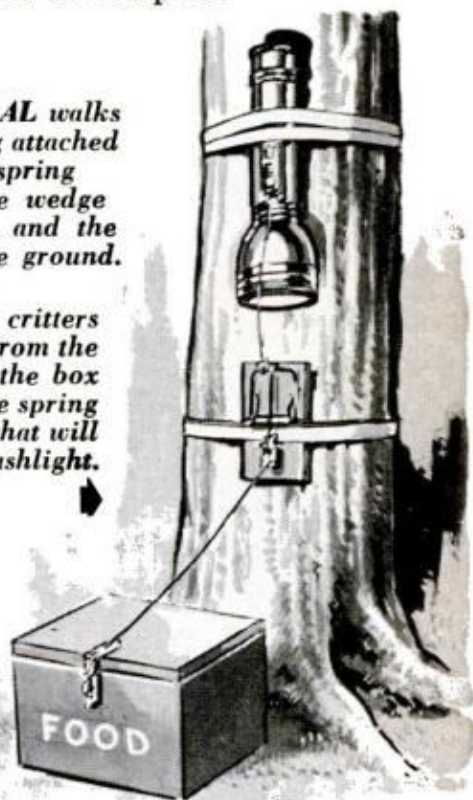
Don't Forget Your Mousetrap

YOU MAY NOT be able to build a better mousetrap, but anyone can make the old model do some unusual things. Include a few (they cost only about 10 cents each) with your camping gear next trip and find uses for them as a triggering device or as a spring clamp. As a starter, you can tack a couple of them up as holders for towels or hot pads.



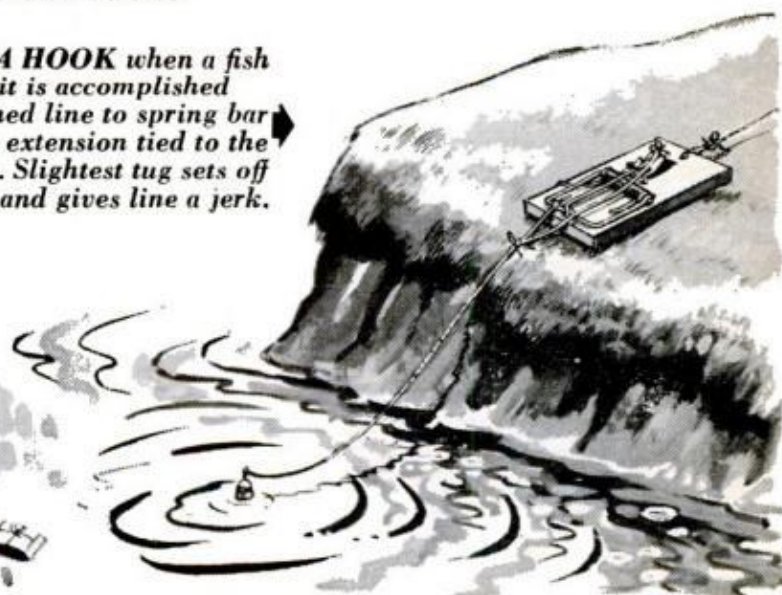
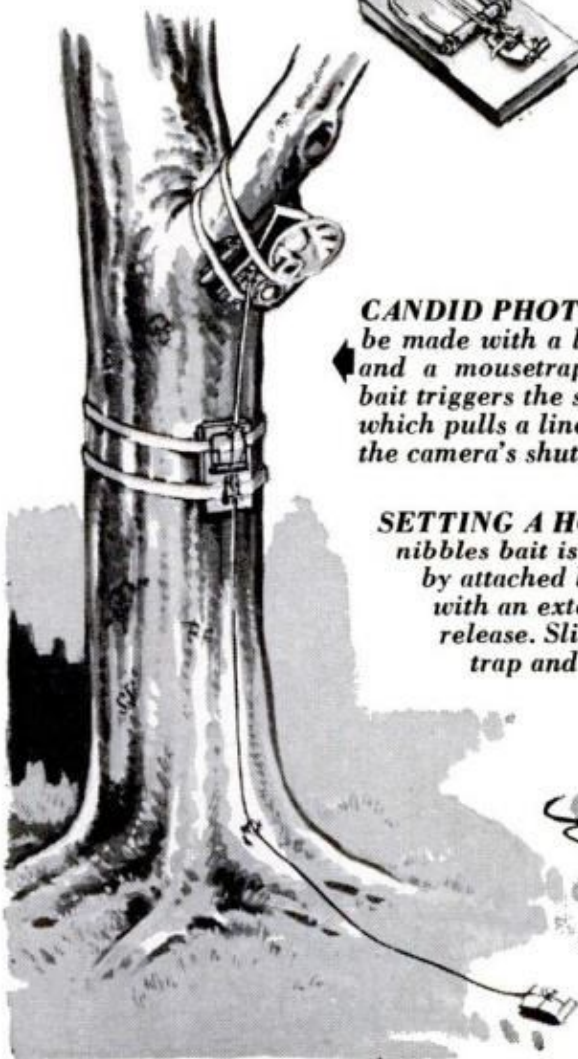
◀ **WHEN A SMALL ANIMAL** walks into noose, it pulls a string attached to the bait release. The spring bar snaps up, jerking the wedge that releases the sapling, and the game is lifted clear of the ground.

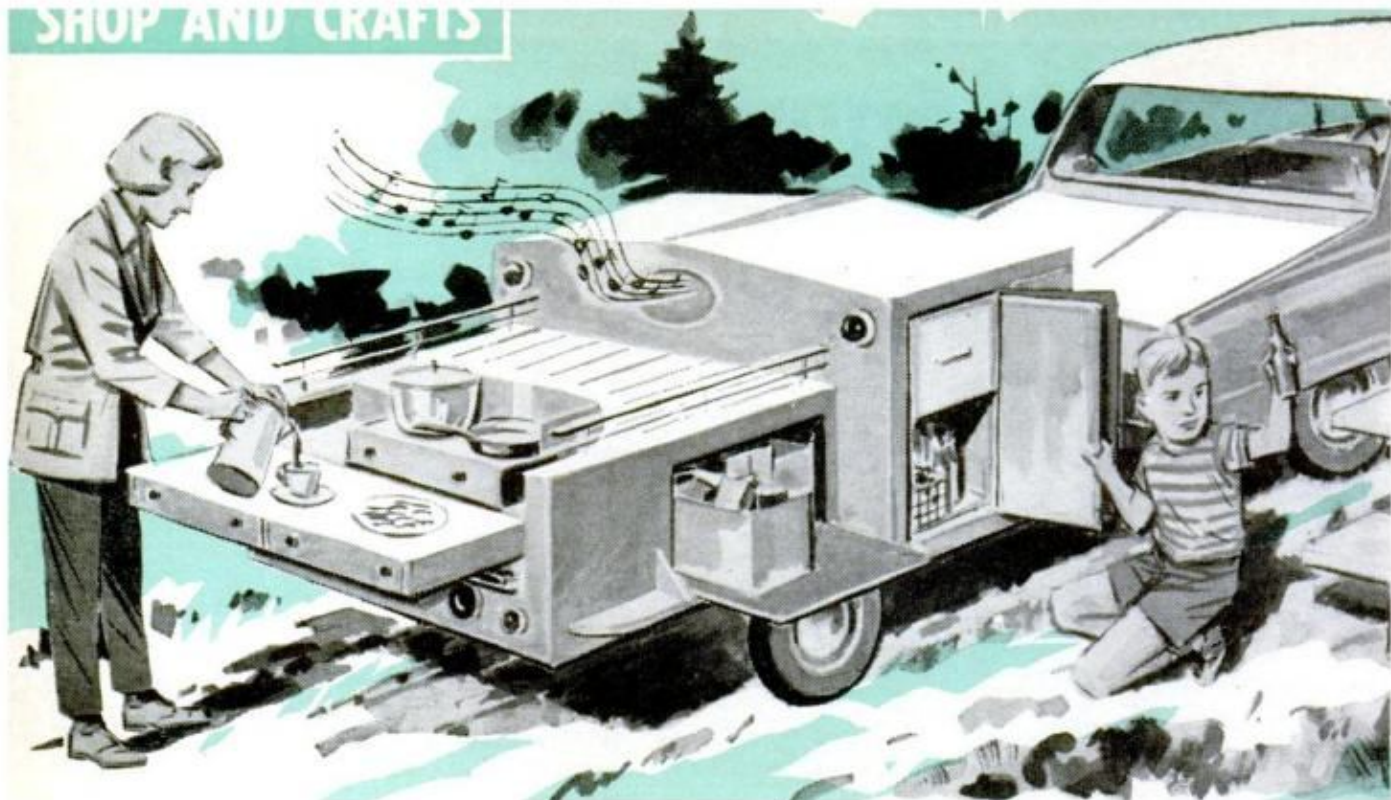
RACCOONS, skunks and critters will be frightened away from the food box if line from the box to the trap triggers the spring bar, pulling a line that will switch on a flashlight.



◀ **CANDID PHOTOS** of animals can be made with a lever-type camera and a mousetrap. Tugging the bait triggers the spring bar which pulls a line attached to the camera's shutter release.

SETTING A HOOK when a fish nibbles bait is accomplished by attached line to spring bar with an extension tied to the release. Slightest tug sets off trap and gives line a jerk.





Roadside Chuck Wagon

By Walter H. Gerber

OUR FAMILY can't wait for summer, this year. There'll be a two-week vacation and three long, holiday weekends for open-road exploring. And we've solved the irksome problems that marred our fun *last* season. We've built a carry-all trailer that contradicts that old saw: "You can't take it with you."

Like most U.S. travelers, we're budget-conscious, and we've never seen the point of crowding into a stuffy diner, anyway, when we've a chance to enjoy an outdoor lunch. So we always picked up a few groceries each morning, crammed them into the already-crowded car, and kept watch for those welcome signs (along the highways of most states) that announce: "Roadside Rest Area, 1000 ft." But we weren't the only ones on the lookout, and often, when we reached our lunch site, we found all the tables and fireplaces already in use. Lacking even camp chairs, we'd then end up trying to make sandwiches in the car—and now have red-and-yellow-polka-dot upholstery from the catsup and mustard stains!

Then, too, when we're in National Park country, we enjoy pitching a tent—but not when it means dragging our luggage into the rain to dig out the tent and bedrolls.

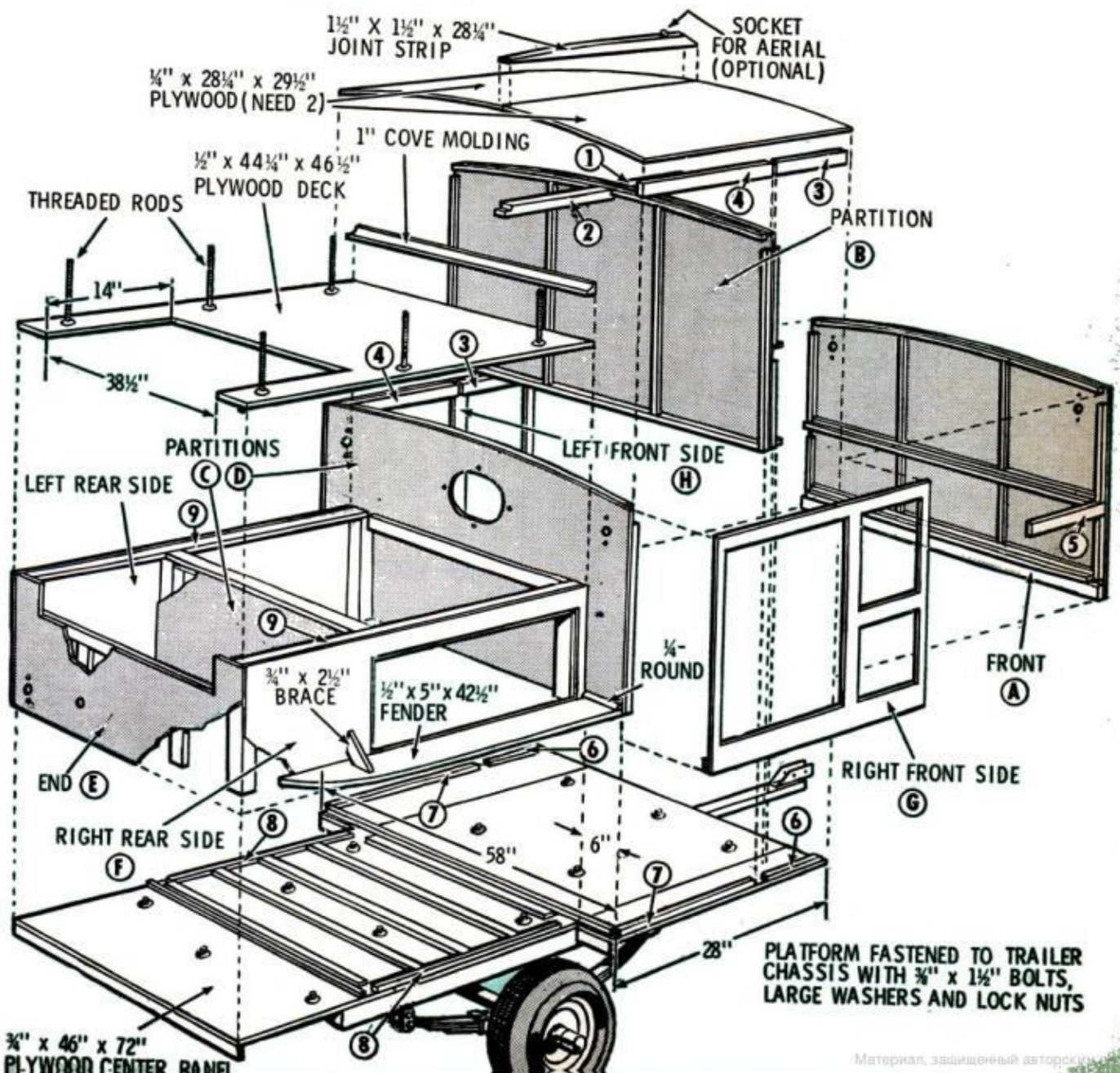
Also, there *are* times on most trips when you need to dress up to visit friends; but jackets and dresses from a suitcase always looked creased, and trying to keep them on hangers while driving along is rather like wrestling with a tent in a windstorm!

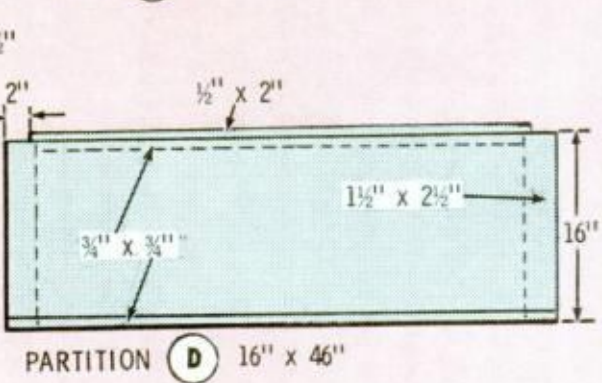
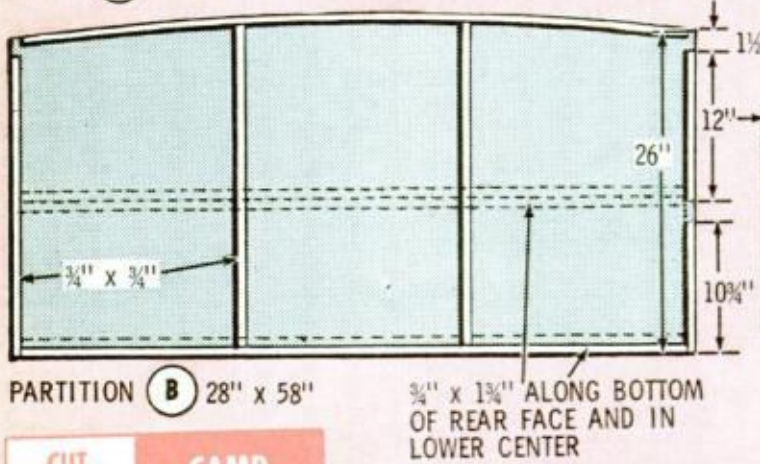
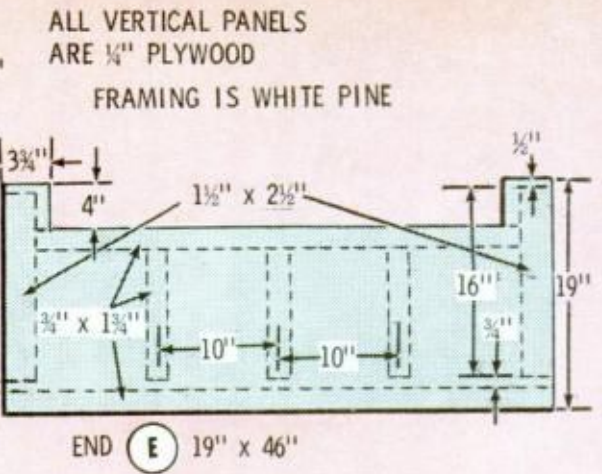
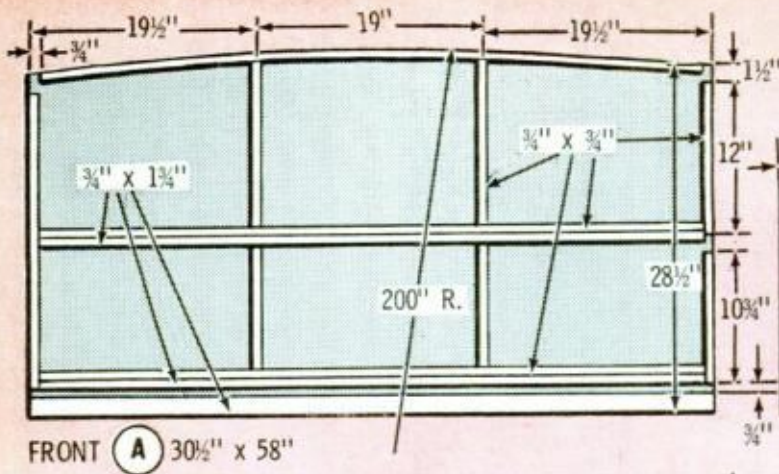
This summer we've taken care of these travel problems in advance. The trailer shown here and detailed on the following pages provides us with a hot-meal kitchen at the flick of a wrist. And there are storage compartments that let us stock up on several days' provisions (including an ice-box for perishables), keep our dress clothes hung up, and get at our sleeping gear without unpacking anything else! Though we designed it for a small foreign car, the trailer is guaranteed to take the travail out of travel whatever size car you drive. We even built in a hi-fi speaker for music while we dine. Since long-distance travel keeps your battery charged, it's safe to tie this speaker into a car radio—though for a better selection of good music, we carry a tape-recorder in the car which runs off its own battery.

There's no fuss involved in setting up the kitchen; lifting up and swinging back the hinged leaf opens up the stove pit and creates a work counter with two handy

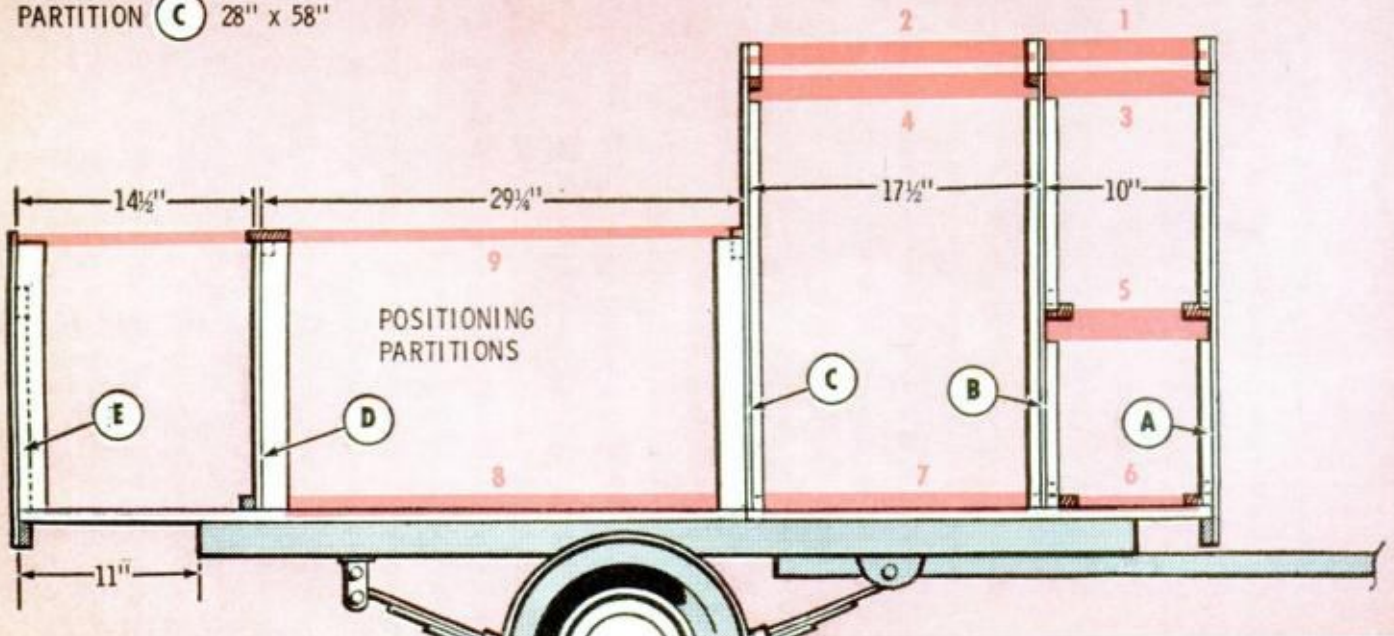
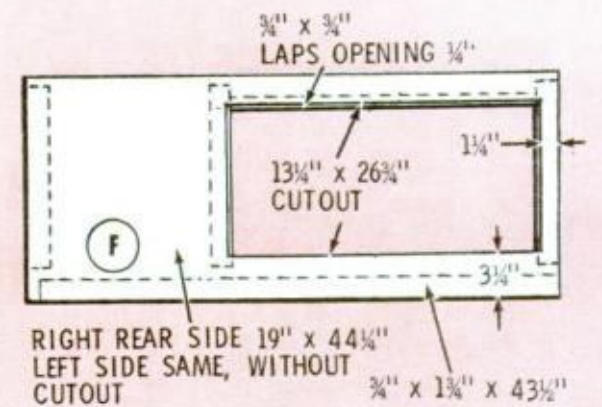
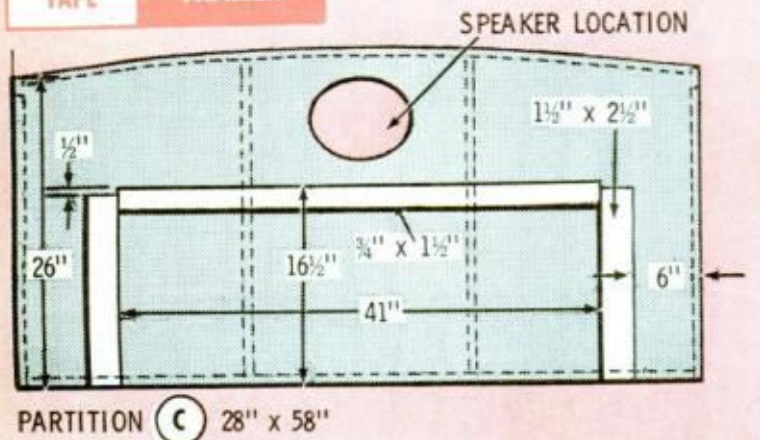


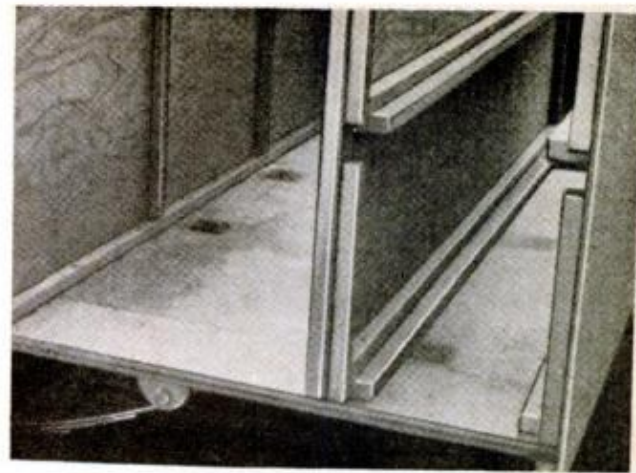
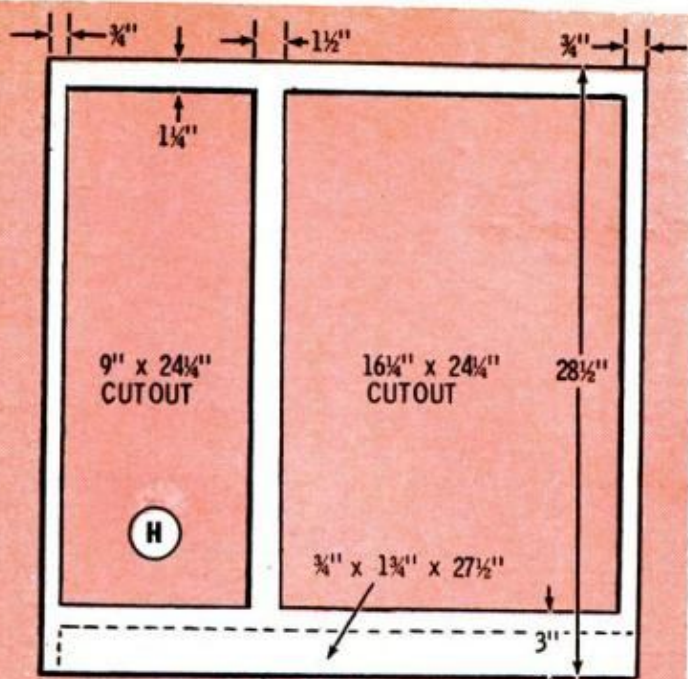
Meals become a vacation high-point when you take your kitchen along. In this issue we offer two nifty ways to do just that—the kitchen trailer shown here, and a fold-up version (page 139) for the car trunk



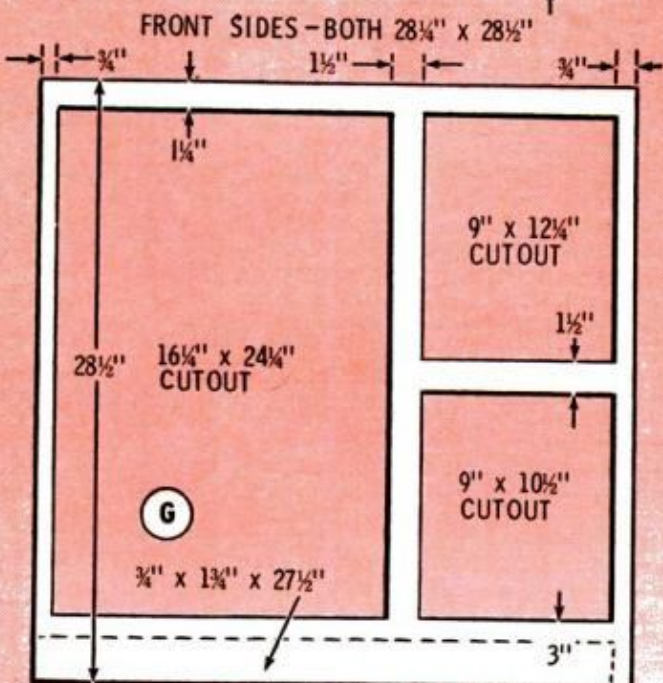


CUT, FOLD, TAPE
CAMP TRAILER

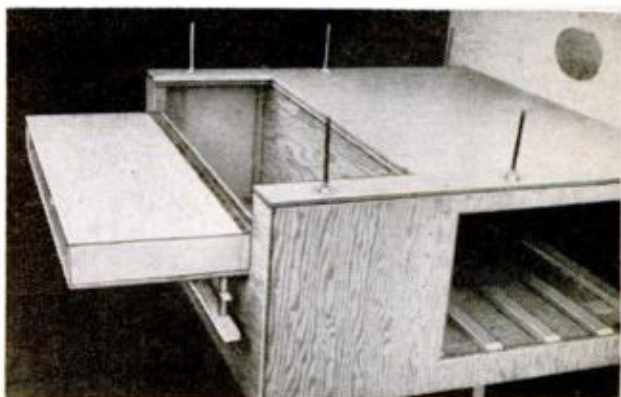




FRONT PARTITIONS are anchored to bed with screws through framing feet (above); add lateral bracing, then apply side panels with glue and screws (below). Rear deck laps all verticals, ties assembly together



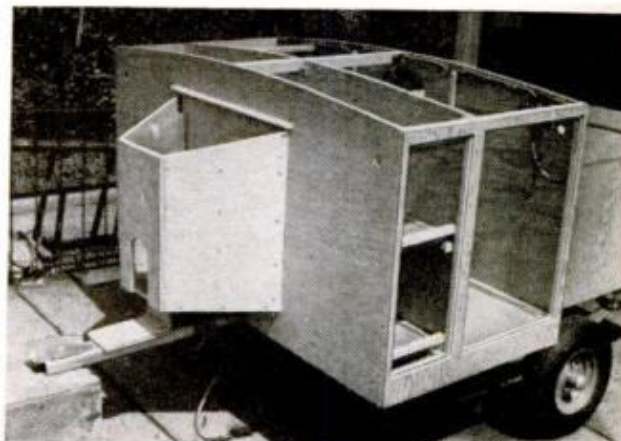
FRONT SIDES - BOTH 28 1/4" x 28 1/2"

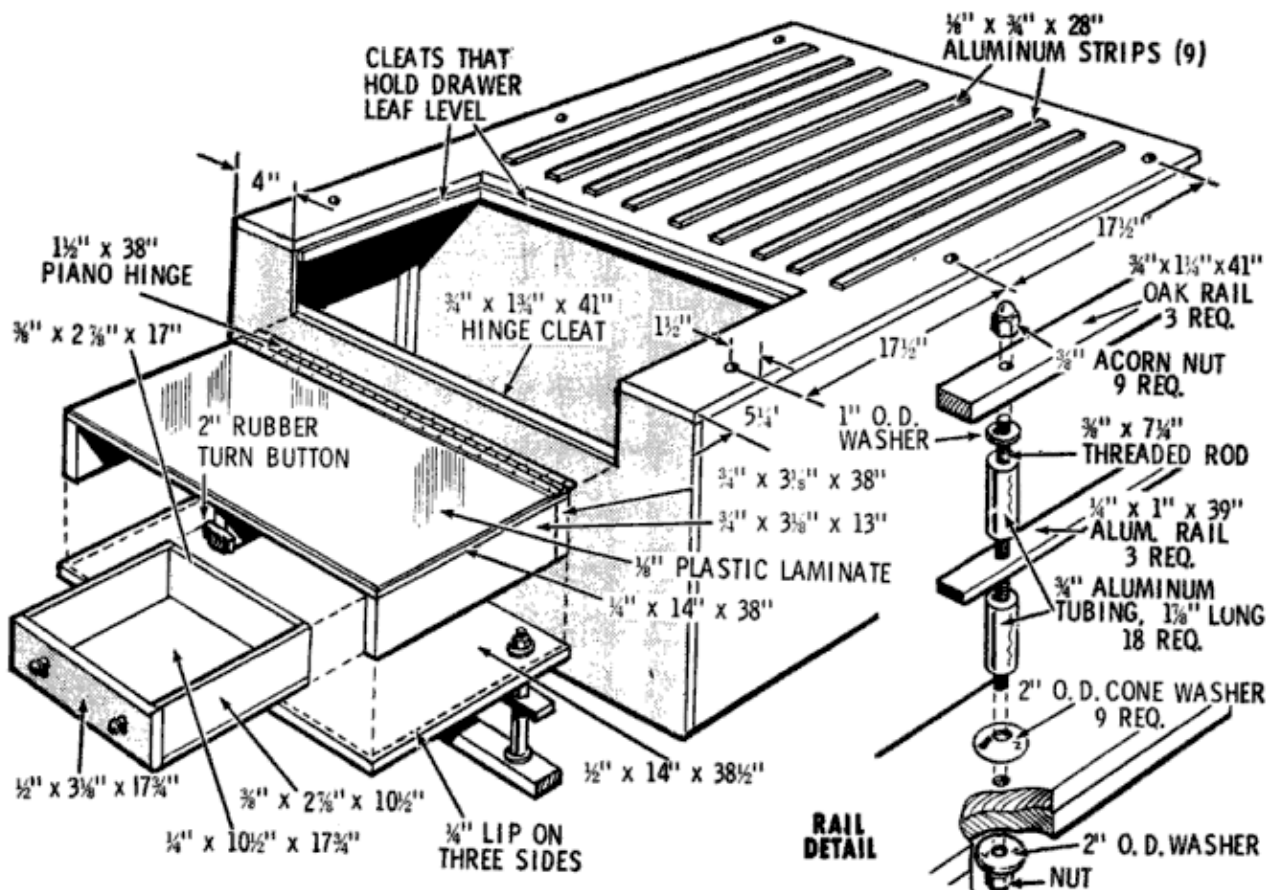


LATERAL FRAMING (SHOWN IN RED, LEFT)

Key	Need	Size (White pine)
1	1	1 1/2" x 1 1/2" x 10"
2	1	1 1/2" x 1 1/2" x 17 1/2"
3	2	3/4" x 1 3/4" x 10"
4	2	3/4" x 1 3/4" x 17 1/2"
5	2	3/4" x 1 3/4" x 10"
6	2	1/2" x 3/4" x 8 1/2"
7	2	3/4" x 3/4" x 16"
8	1	3/4" x 3/4" x 26 1/4"
9	2	1/2" x 2" x 44"

DRAWER LEAF swings back from stove pit, is held level by its own thickness. Water cooler bay (below) is screwed to front. Drop-door rests on tongue to form shelf for setting glass or pan under spigot



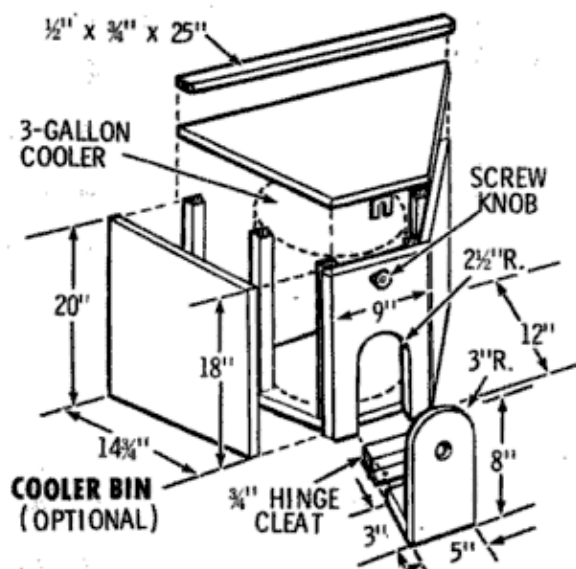
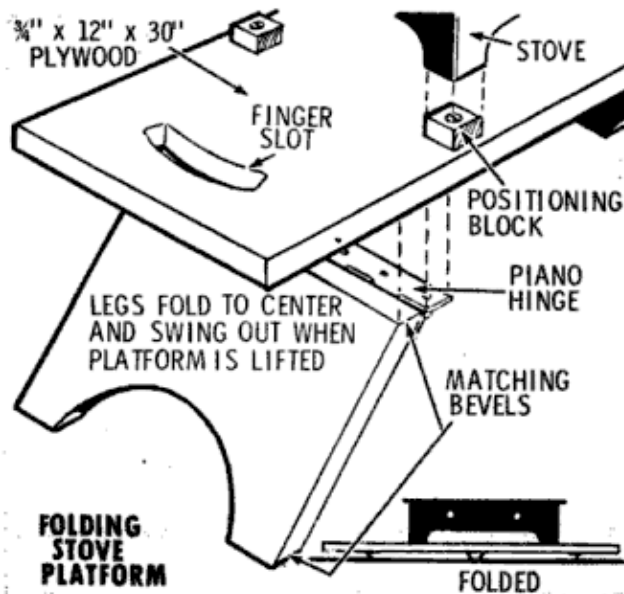


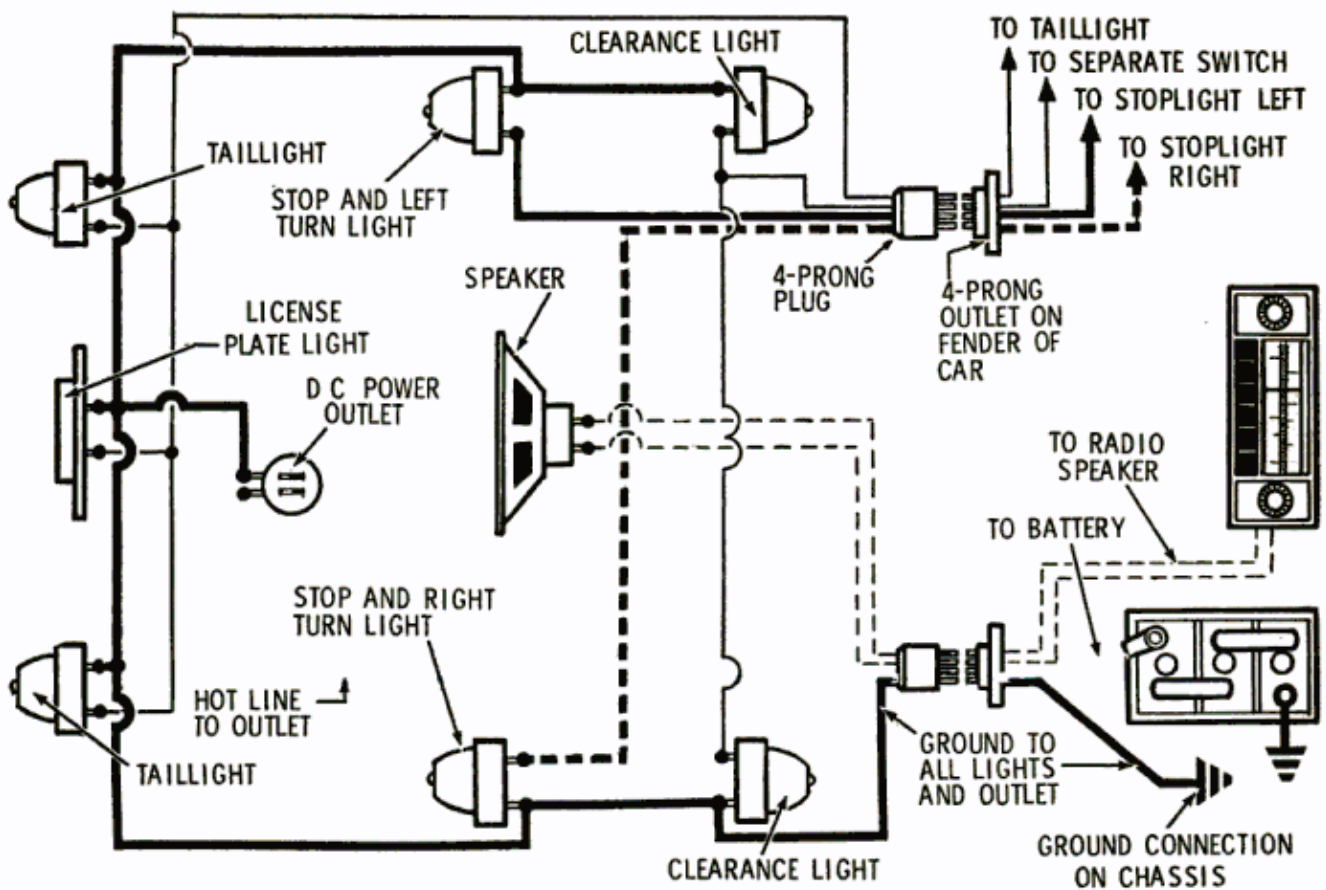
drawers for utensils and paper plates. For cleaning with one wipe of a moist cloth, I covered the work face of this leaf with plastic laminate. You can also plastic-coat the stove platform. The detail below shows how you bring the stove up to working height (our two-burner uses LP gas). When the folding legs are tapped out from under it—by inserting fingers through the grip slots—the platform sinks into the pit, leaving plenty of space around it to pack pots and pans.

To keep the closed drawer leaf from flying up when you sail over a bump, you can tie it down with slide-bolts or turn

buttons—although if you lash items to the railed-in deck, this will probably anchor the leaf. We usually tie down several folding chairs there. In a pinch, the leaf's large enough to serve as a snack counter for several people, and these chairs provide comfortable seating.

Access to the other compartment is by means of $\frac{1}{2}$ -in. plywood doors—each, of course, provided with a lock to prevent theft when the trailer is parked unattended. In the details provided, there are no lateral partitions, so each compartment runs full width. In the case of the luggage section, in front of the stove pit, access is from one





side only. The slats on the floor are to provide clearance of the bolt-heads, and to protect the plywood from wear when sliding heavy luggage, boxes—or even your spare tire—in and out.

In the first (full-height) compartment of the wider front section, the right door opens onto a 25-lb. commercial top-icer—in our case, Coleman's Station Wagon Cooler—held in place by heavy foam-rubber pads at the sides. The left door gives access to the wardrobe closet, where jack-

ets and dresses are on hangers hooked over a clothes rod that bridges the partitions. The "stacked" front compartments are, in our trailer, accessible through two right-hand doors and a single full-height door on the left side. These compartments can be altered to suit whatever you wish to carry in them. And if you don't require a center shelf, you can simplify the framing of panels A and B and use a single door on each side.

(Please turn to page 200)

HOW TO USE PM'S NEW "FILE FLAG" INDEXING SYSTEM

Introduced last month, these fold-out tabs make each issue self-indexing. The first of four such tabs in this issue appears on the story above (see page 134). Such tabs will be "built into" all our major craft and maintenance articles, so that you'll be able to "flag" the ones you want to refer back to, later. Then, if you keep

a file of all issues, you'll be able to locate plans or instructions you remember seeing—without that long hunt through a stack of magazines. You tab the pages for quick reference by following the three easy steps shown below. We've located every File Flag so that you'll be cutting away no essential part of the text or plans.

CUT



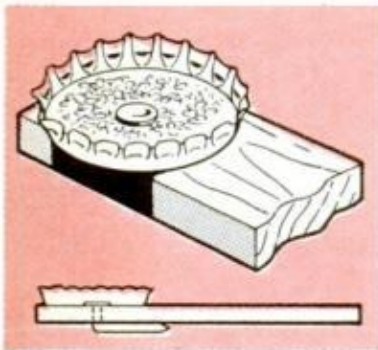
FOLD



TAPE



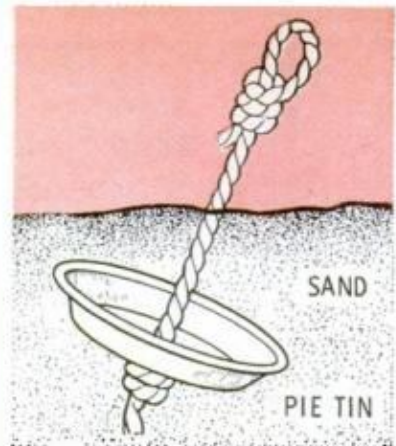
KINKS FOR CAMPERS



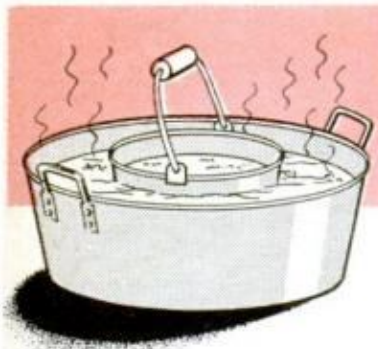
SCALING A FISH without proper tools for the job is easily accomplished by nailing a common bottle cap to a stick about 12 inches long, bending the nail over the back of the stick. This takes only minutes to make, and it works very effectively



WHEN TEMPERATURE drops unexpectedly, you can improvise a heater for your tent by placing a number of medium-size stones in your fire until they get hot, then filling a bucket with the hot stones and turning it upside down inside your tent



PITCHING A TENT on sand or loose ground where regular stakes will not hold is possible with guy lines made from heavy foil pie plates. Punch a hole through the center of pie tin, then pass a line through and knot it at the bottom



FOR MIXING beeswax with turpentine to make a waterproofing agent for your tent, melt wax on a stove, then add it to the turpentine in a bucket standing in a tub of hot water. This will provide enough heat without danger of open flame



KEEPING A RESERVE of dry matches is a wise move for every camper. A waterproof container that will float can be fashioned from two used shotshells of different sizes, a 16-gauge to hold the matches and a 12-gauge to slip over it as cover

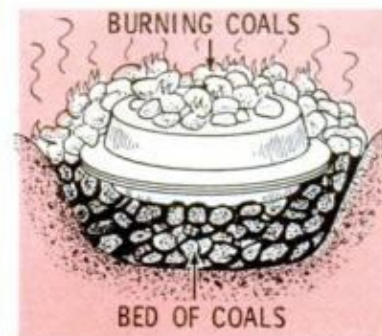


A CAMP TABLE is easily built with dry branches. Drive two stakes about four feet from a large tree, then tie cross pieces to the stakes and attach them to the tree for rigidity. Cross pieces for top can be tied down or merely wedged into place

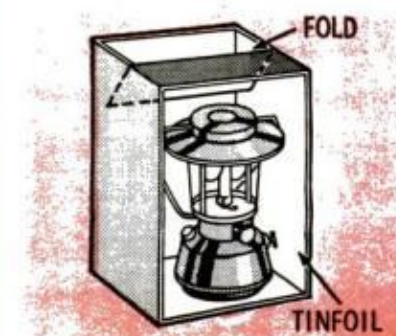
FIRE STARTERS that burn with intense heat come in handy when firewood is damp. Wrap a kitchen match with yarn, tie it off, and dip it in paraffin. You can make a good supply and carry them in a tobacco tin. Chip the wax off the end to strike

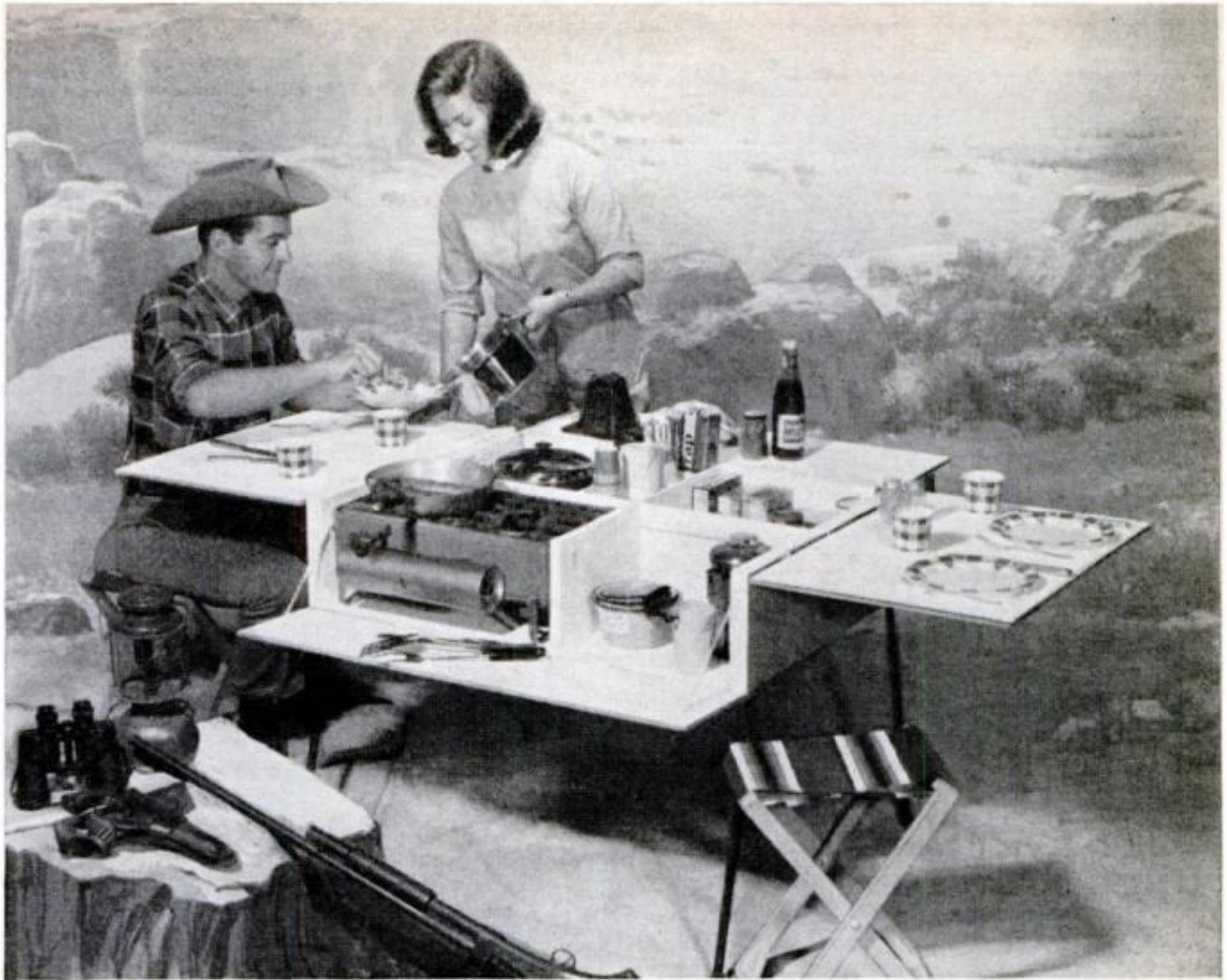


A SMALL, but effective, oven can be improvised by placing two pie tins face to face and burying them in a bed of coals. The space is deep enough for small fish, soda biscuits or bannock, the popular trail bread that rises only a couple of inches



GASOLINE LANTERN and a cardboard carton make an excellent heater. Stand carton on end. Cut half of the top away from the back and fold down to make a deflector. Line inside with aluminum foil. Then merely place the lantern inside the box





“Box Lunch” for the Trail

Here's a rig that takes the jagged edge off "roughing it." When you tote this box into the wilds, it spreads its wings into a de luxe camp kitchen and dining table

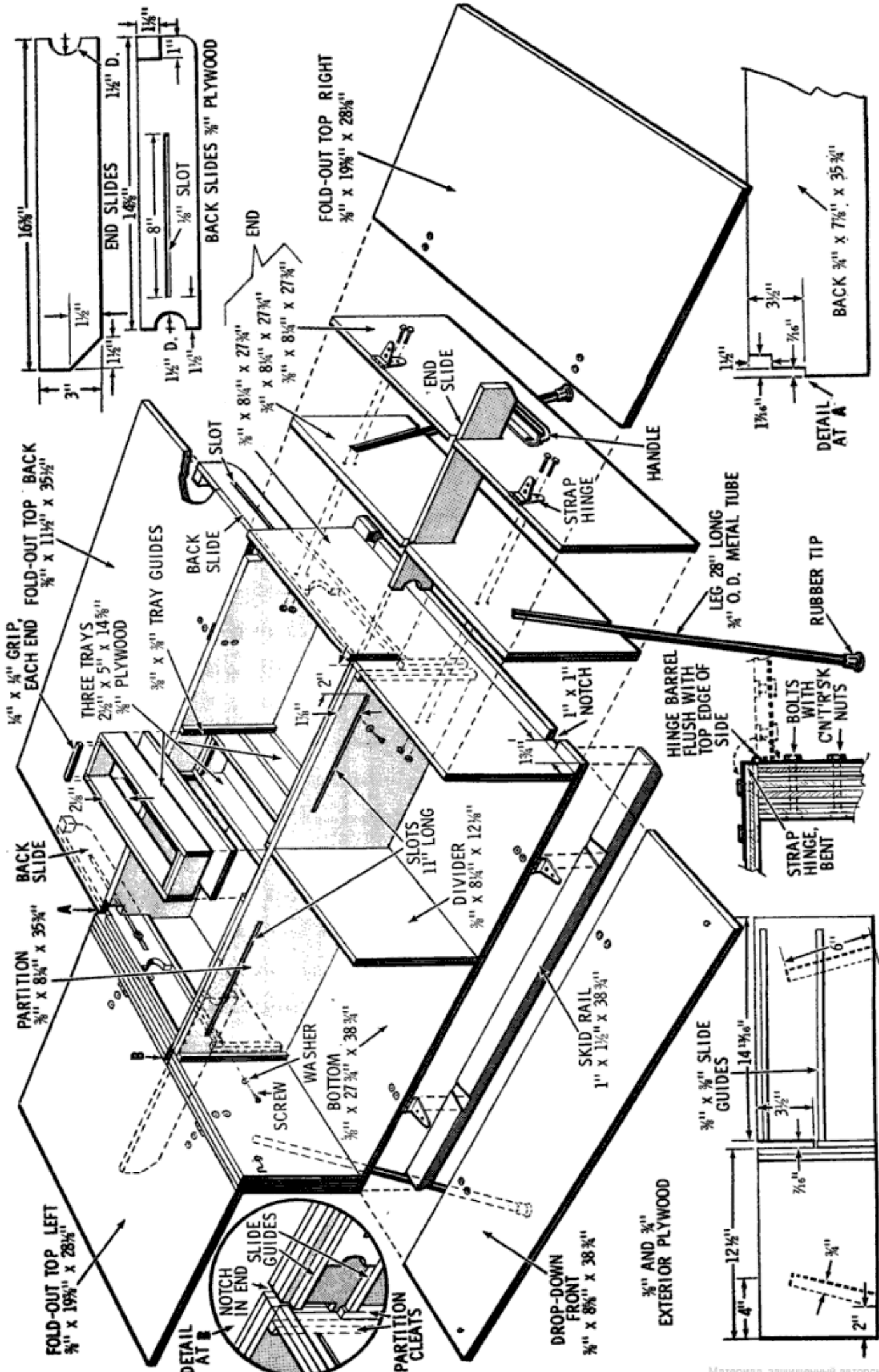
By Steve Ellingson

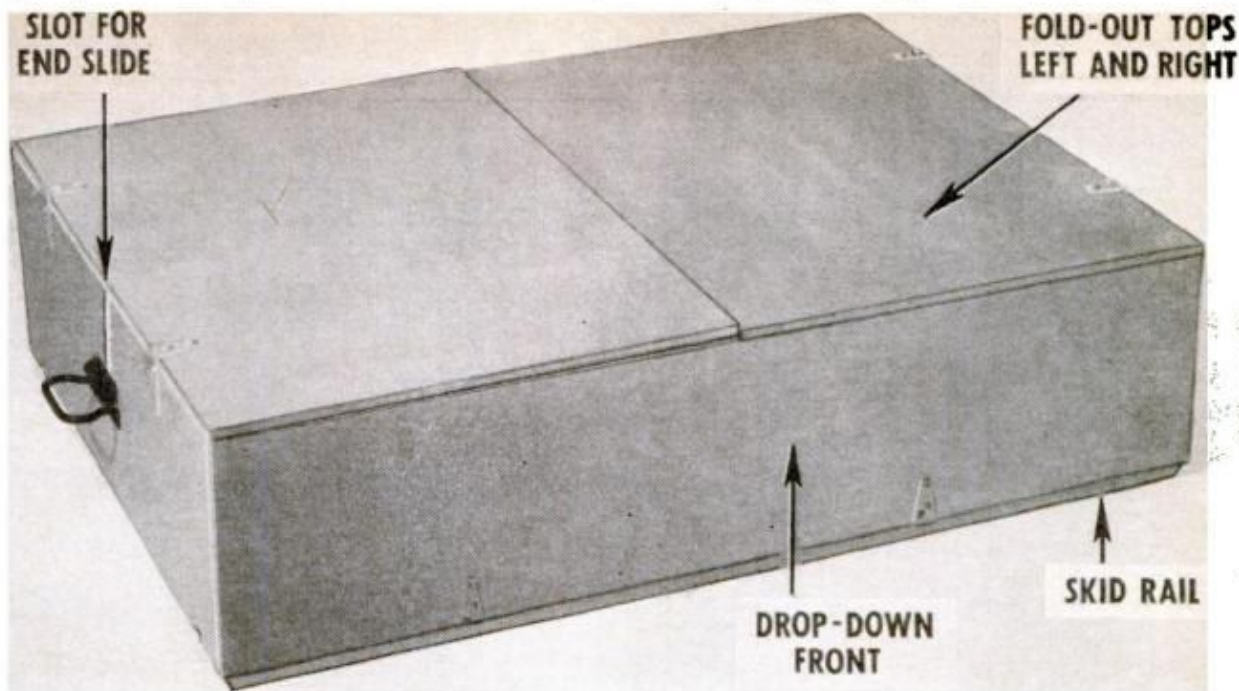
IF THE SMILES that young couple is wearing, above, are a bit smug, it's because these campers aren't dependent on *anybody* for their alfresco dining. When hunger overtakes them, on the road, they just keep watch for the next attractive spot, pull off, lift a compact box from the back of their car, and carry it between them by means of foot-locker handles. Reaching the chosen site, they insert four pipe legs into sockets, draw out slide supports, fold three hinged leaves onto them, unhook the drop-front—and they've got all facilities for a good, hot meal. There's a camp stove, ready for lighting, surrounded by compartments into which are neatly packed all necessary cooking utensils, a full pantry of packaged foods, and disposable table service. The three table

leaves will seat six people (on easy-to-make folding camp stools) and all the groceries are within everyone's reach—without fussy unpacking to carry items to a separate table. And when the dining's done, our travelers simply fold the unit back into a box, slip it off its legs, and tote it to the car—leaving the spot just as unspoiled—and uncluttered—as they found it!

And when they hit a campground, that night, they can pick their own site, independent of any cooking or table facilities provided. Any wonder our travelers look smug?

Using the basic dimensions on the following pages, you can adapt the unit to your own needs. The two partitions, for example, should be positioned to keep





NEAT BOX, 3 ft. long and 9 in. high, results when back flap folds in, front one raises and side leaves close toward each other; box fits most car trunks

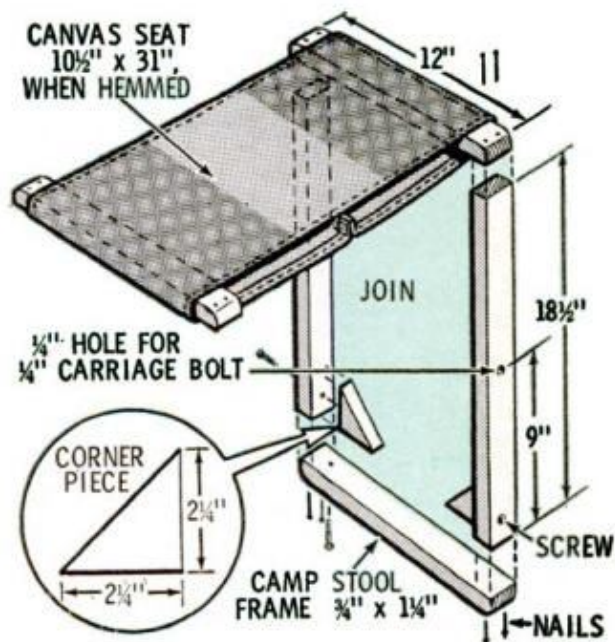
your cook stove from shifting or bouncing while you travel. The rear half of the box is divided into two compartments by means of stacked trays, held in place by vertical cleats. These trays hold silverware and small utensils, and are easily lifted out when you set the table up.

Materials costs are kept to a minimum. A panel of $\frac{3}{8}$ -in. exterior-grade plywood makes most of the parts. You'll need enough $\frac{3}{4}$ -in. ply for the inner layer of the end-panel sandwich that provides leg sockets at each side.

Note that slots which permit the *end* slides to travel are cut in the partition. But since the *back* slides are attached to the thick end panels, their travel-slots are cut in the slides themselves, with the anchor-screw driven into the panel. Those 1-in.-sq. blocks at the ends of the back slides are to provide surer seating for the leaf, since these slides run right along the panel's edges. The notch through which the slides move is widened at the top so these blocks will sink flush with the back of the box (see Detail A).

The two frames of each camp stool are identical, but the second is assembled through the first, like a chain link. Insert the canvas wrong-side out through the finished stool, machine-stitch the seam and then turn right-side out. ★★★

All dimensions and assembly details you need for building the camp kitchen and stools are given on these pages, but if you'd prefer to work from full-size plans, send \$1.00 for pattern 336 to Steve Ellingson, Popular Mechanics Pattern Dept., Box 2383, Van Nuys, Calif.



Preschooler's Desk Chair



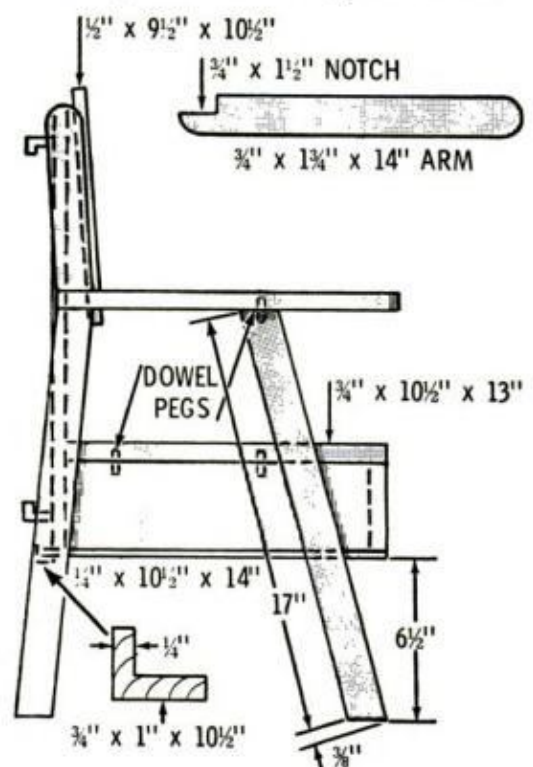
By Elma Waltner

AS ANY FOUR-YEAR-OLD will tell you, coloring is an exacting operation demanding plenty of flat work surface located at just the right height. This small desk not only meets these stringent requirements, but converts to a comfortable lounge chair for TV watching simply by pulling off the desk board and slipping it down behind the backrest. It also includes roomy underseat storage for coloring books, crayons and other treasures.

Construction is basically simple, with most joints glued and screwed. In locations where screws would show, such as the joints between the arms and front legs, hidden pegs and glue are used. The lift-out seat is held in place by pegs set in the top edges of the seat compartment sides.

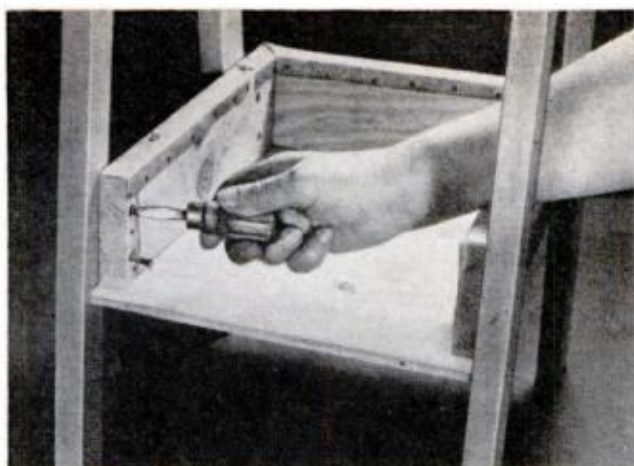
Both the seat and the backrest are padded with sheets of 1-in. foam rubber. Vinyl upholstery cloth was used on the chair shown here, since it wears well and can be wiped clean with a damp cloth. The arms, legs and desk board were left natural and given two coats of tough plastic varnish after having been sanded smooth. If you desire to cover the rear surface of the backrest with upholstery cloth, cut a sheet of vinyl slightly oversize, fold edges under and secure with upholstery tacks.

DESK BOARD stores behind the backrest, is held in place by two angle brackets and a lip on the rear edge of seat box

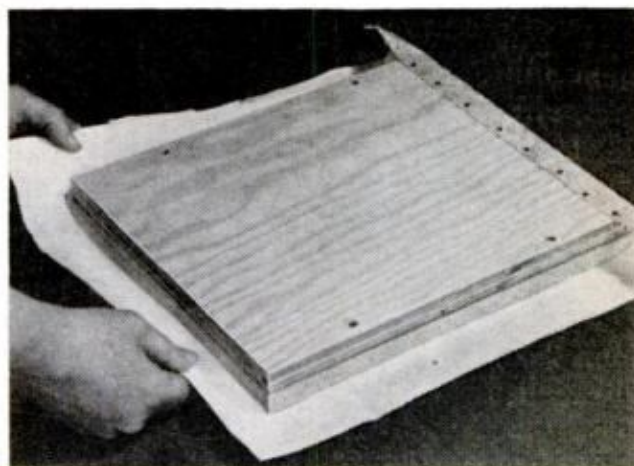


POPULAR MECHANICS

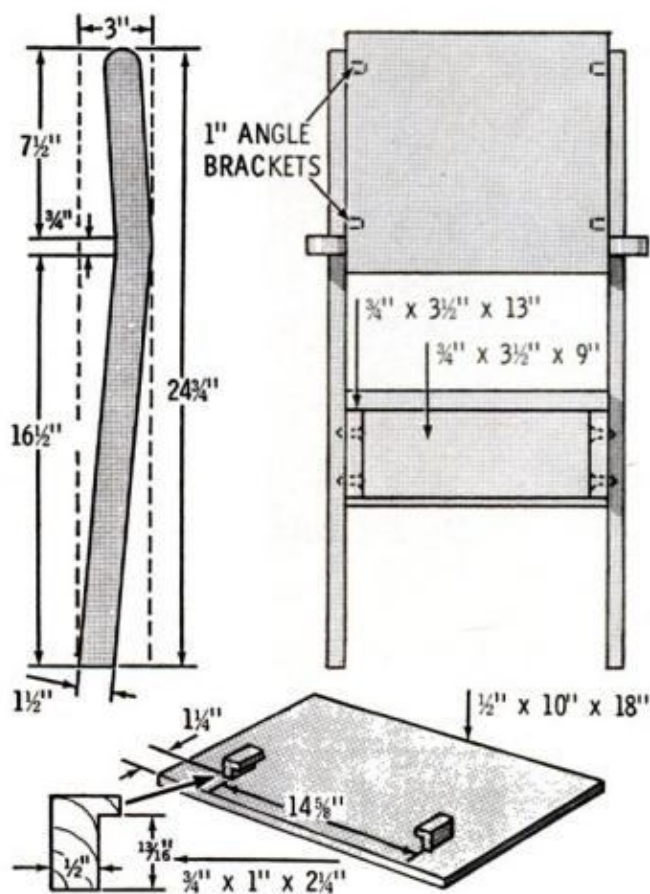
Материал, защищенный авторским правом



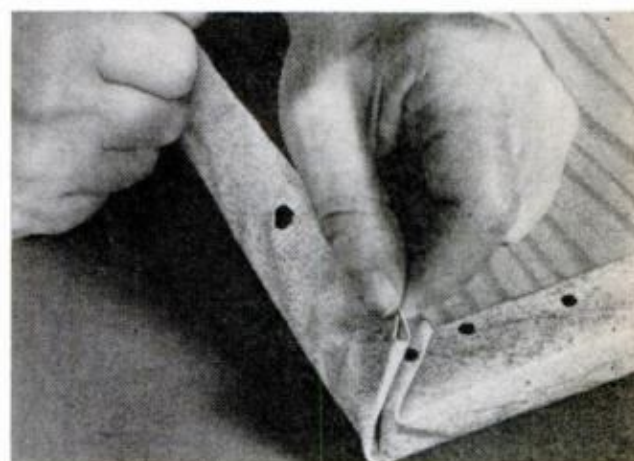
AFTER ASSEMBLING and covering seat box, attach the legs to it by driving screws from inside of box



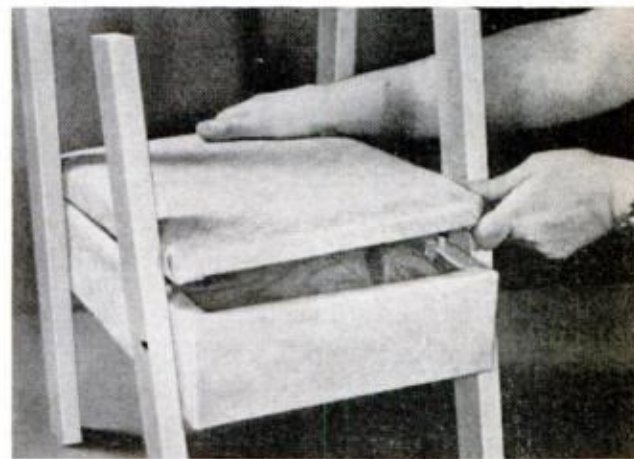
UPHOLSTERY CLOTH is pulled tight over seat and tacked in place, folding corners as shown below



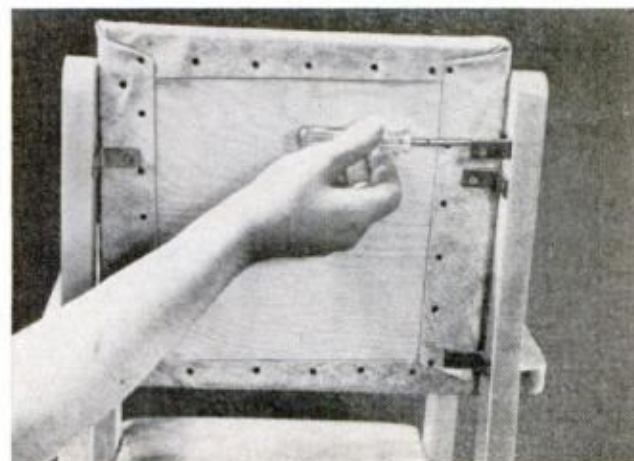
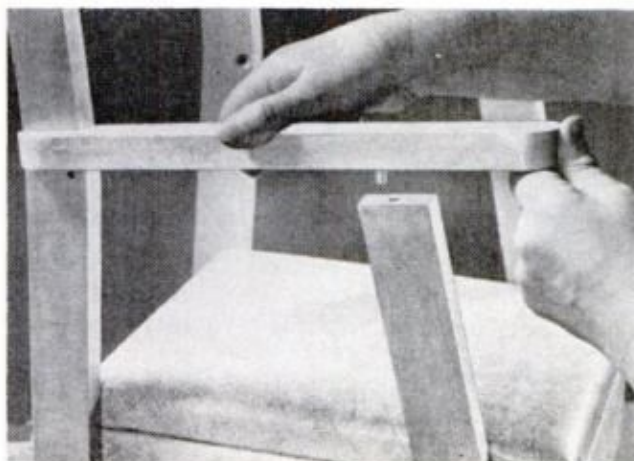
CHAIR ARMS are attached with screws driven through rear legs and pegged-glued joints at the front legs



AFTER UPHOLSTERING, place seat over storage box and mark locations for drilling holes to match pegs



ANGLE BRACKETS to hold the desk board when stored face opposite those used to install the backrest





Aeolian Harp

By Dennis D. Dorogi

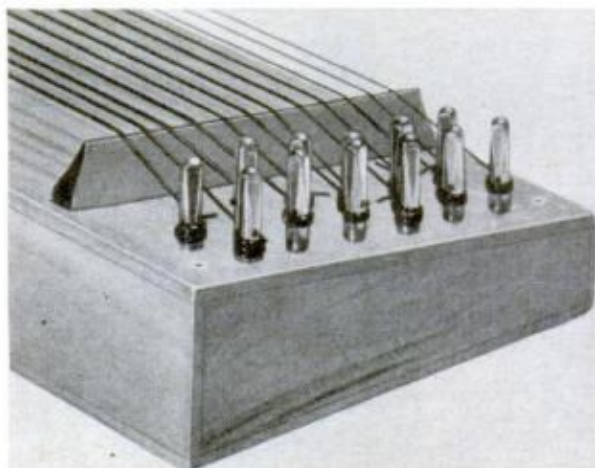
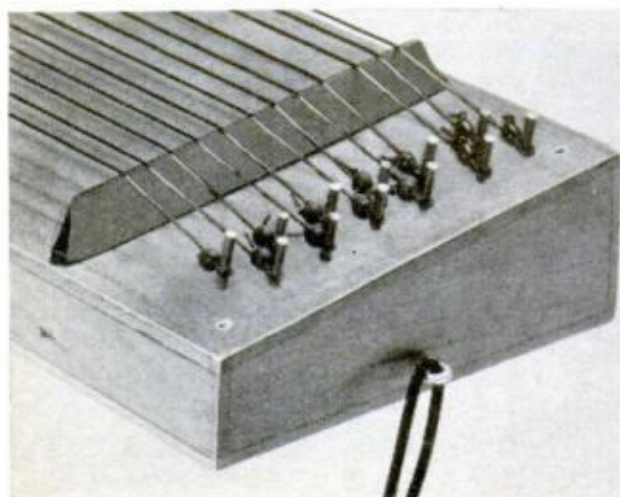
ALMOST UNKNOWN today, the aeolian harp works on a principle that was familiar as far back as biblical times. It is recorded that King David liked to hang his harp over his bed when retiring, so he'd be lulled to sleep by the sound produced as the night breezes played over the strings

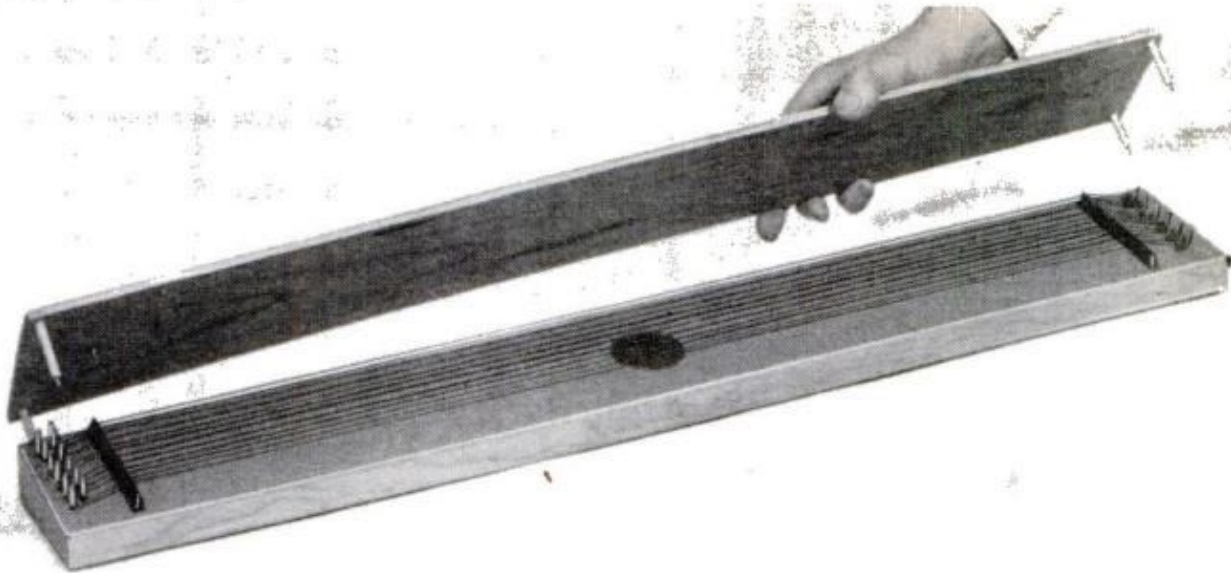
to set up varying patterns of vibration.

Basically, this harp consists of a long narrow sound box over which a dozen nylon guitar strings are stretched—four Gs, four Bs and four Es. They are attached to headless nails at one end and tuning pins at the other. These pins are designed

NYLON STRINGS are attached at one end to headless nails driven at an angle into the end filler block

TUNING PINS hold strings at the opposite end, allowing you to adjust tension with a tuning wrench

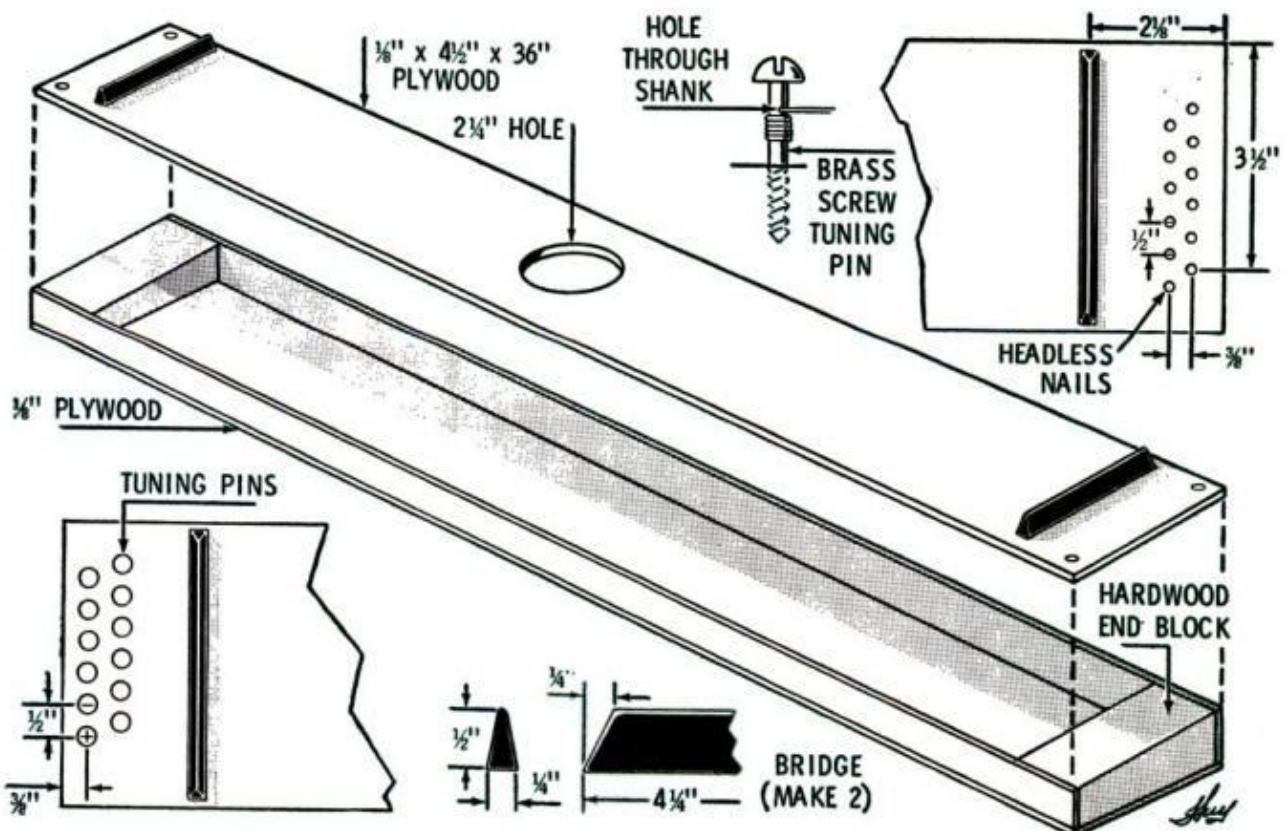
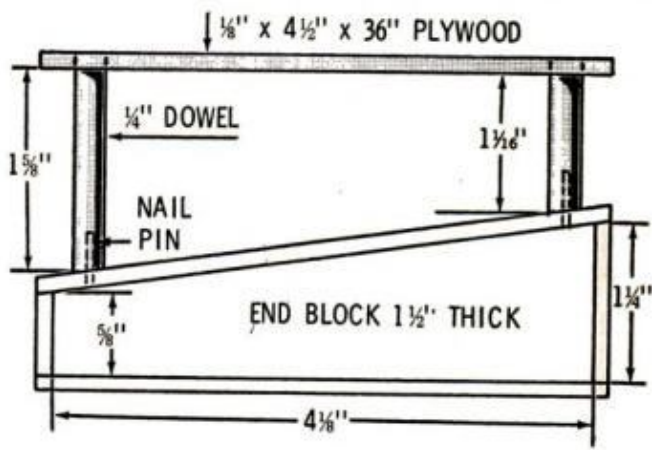




for use in auto-harps and zithers, and can be ordered at most music stores. Order a tuning wrench at the same time, since this is required to turn them. If desired, brass screws, drilled crosswise to hold the strings, may be substituted for the pins. All strings should be tuned to the same note, usually a low G.

The length of the sound box isn't important, so the instrument can be designed to fit any window. Place it on the sill and lower the window so it rests on the cover and holds the harp in place. The raised cover directs strong air current over the strings, producing an ethereal sound which varies with the wind intensity. ★★★

REMOVABLE COVER directs wind over angled surface of sound box. Nail pins in posts fit holes in box



Building PM's Patio-Garage

By Manly Banister, with Dick Chilson

LAST MONTH, Part I took the concrete work up through pouring the patio slab and the garage-wall footings. Now it's time to erect forms on top of these footings, for pouring the foundation walls. The forms detailed below and pictured in the photos were erected by a contractor we called in to speed up construction. They consist of plywood panels tied together by wire "tourniquets" with eyes at both ends that pass through holes in the panels and are secured with vertical steel rods. This assembly merely sets on top of the footing, and is held erect and centered by braces nailed to stakes (photo, next page).

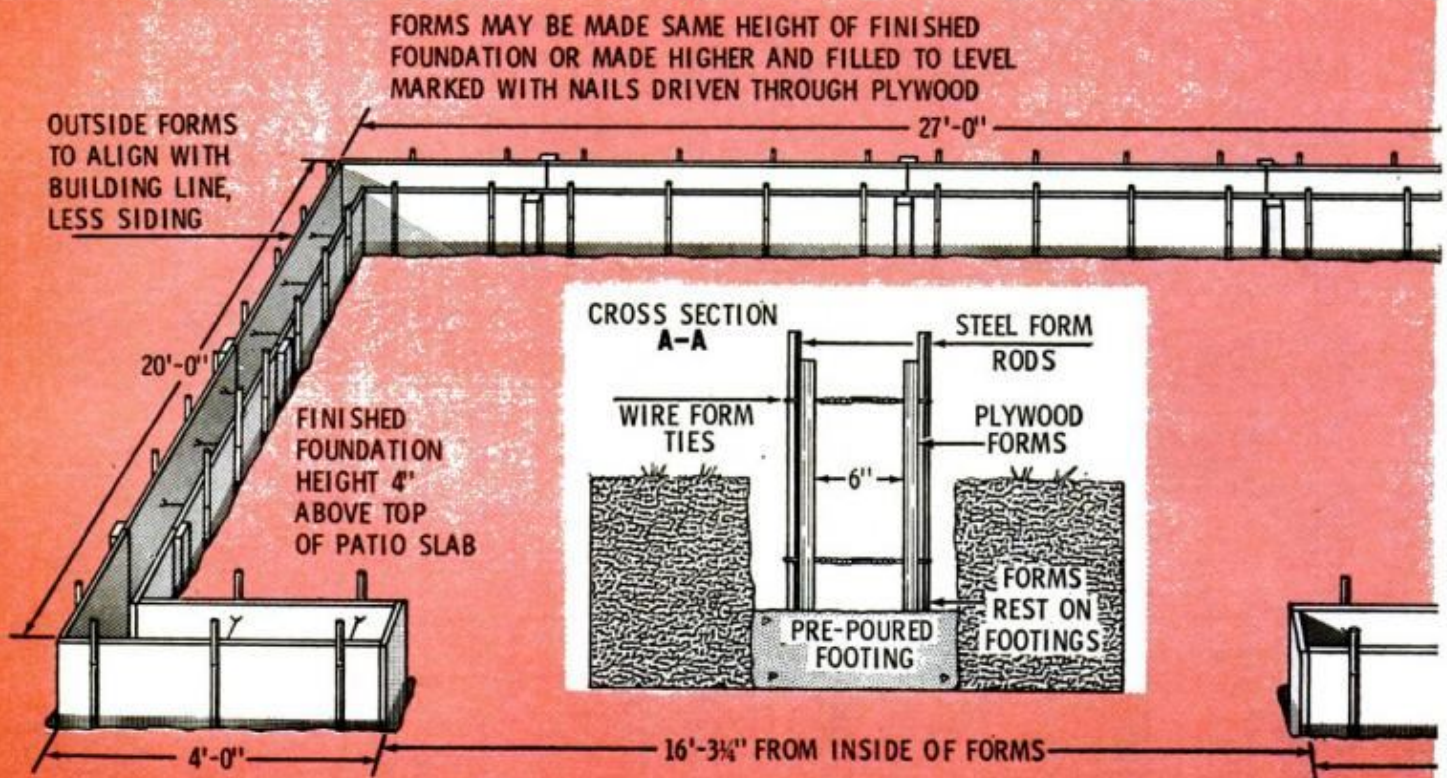
After the poured concrete has set, the rods are withdrawn and the panels stripped off. The lower tie wires are, of course, left embedded in the wall; before back-filling, the protruding eyes are clipped off on each side with wire cutters.

Since the forms shown were not custom-made for this job, they stand much taller than our foundation requires; if you build your own, you'd probably want to level them off at the height of the desired wall, regardless of how deep your footings might be—not only to save form material, but so you could pour the forms full, and rod-

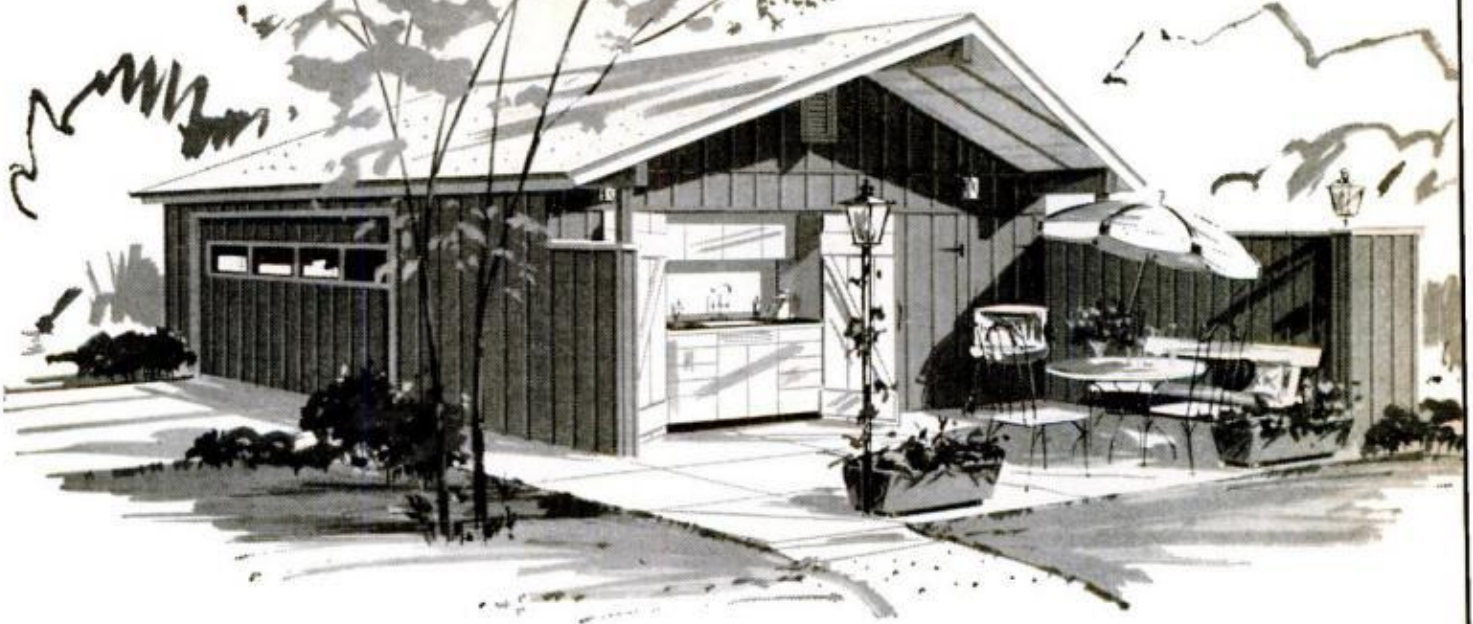
off along their top edges. When oversize forms are used, as shown here, nails are driven through the panels, along a leveled chalk line—then the concrete is poured to this level and the nails pulled out before the mix sets.

Of course, you can avoid erecting forms at all, if you prefer to lay a foundation of concrete block. In this case, you'd want to dig a wider footing trench so that you could get into it to lay your first course. Here, again, the depth of the footings would dictate the number of courses.

Whatever your method, you need a wall that stands an accurate 12 in. above your highest grade. Start from that point and adjust the form panels with a level—or, where the panels are over-height, scribe your pour line around the entire foundation, again checking with your level. To bridge the 16-ft. door opening, hang a straight-edged plank from the top of the "bulkheads" at the ends of the two short wall forms. Whatever the height of your forms, these bulkheads should be level with the top of the poured wall, and should be only tacked temporarily across the form panels. When the suspended 2x6 straightedge is leveled (see first photo,



NEVER WAS A GARAGE put to brighter purpose than this: built into its end wall is an outdoor kitchen to serve the patio



next page) by means of adjusting the form bulkheads up or down, nail the latter firmly in place.

The foot-above-grade wall allows for 4 in. of gravel fill, a 4-in. slab and 4 in. of foundation above the finished floor.

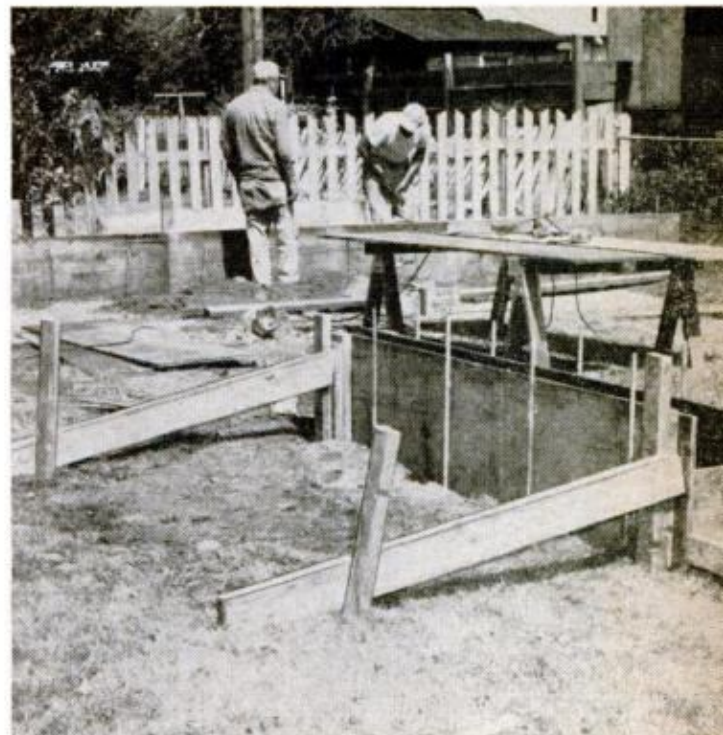
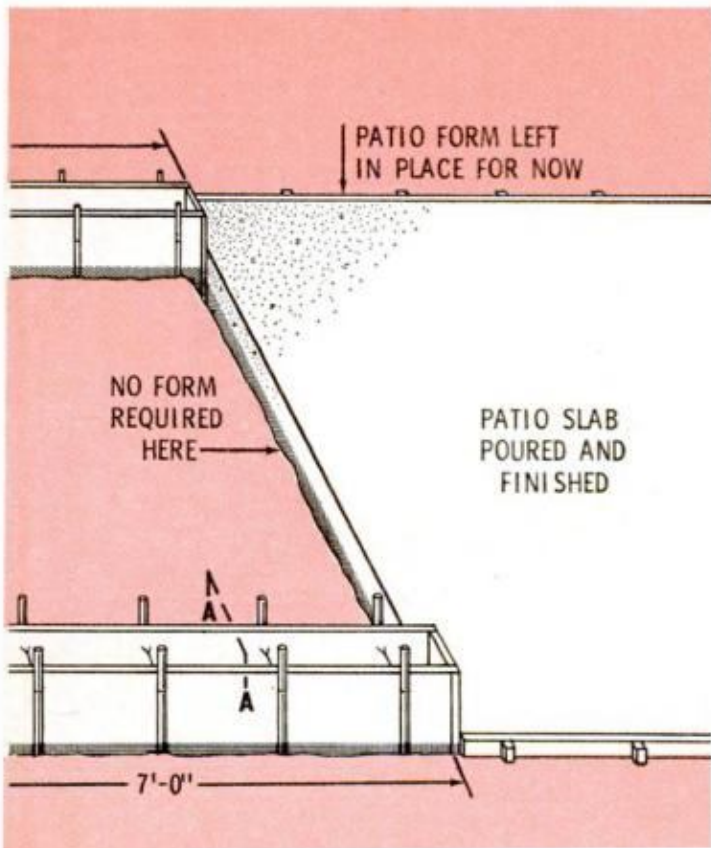
The best way to pour concrete into the forms is directly from the chute of the mixer, if you can position the truck to reach. It's a two-man operation: one holds a plywood panel against the far side of the form, opposite the end of the chute, to

direct the flow into the form, while the other rams and spreads the concrete for a solid fill, using a length of 2x4.

When the pour is completed and leveled, but before it sets up, insert $\frac{1}{2}$ x 10-in. foundation bolts no farther apart than 8 ft., to provide for tying the building down.

Assuming you've already stripped the sod from the area that is now enclosed by forms, you're ready to strip the forms from the poured foundation walls and spread a layer of gravel over the floor area, to

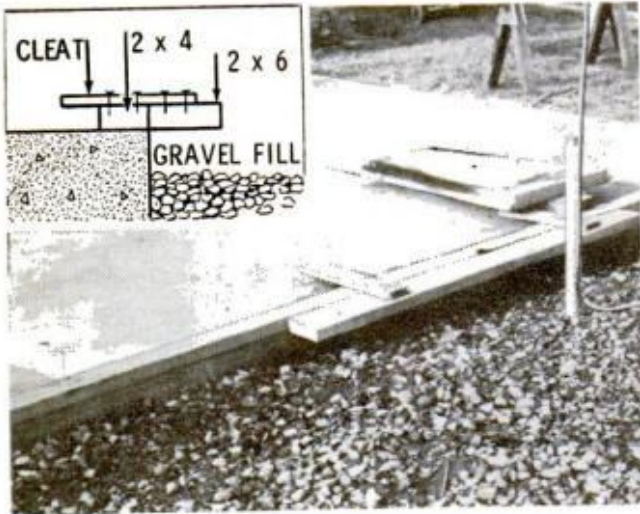
FOUNDATION FORMS are needed for back and end walls, and two short walls that flank 16-ft. door. Form below is higher than necessary for 12-in. foundation





LEVEL FOUNDATION FORM at door gap by hanging plank between bulkheads, adjusting them till it's level

ALONG PATIO EDGE, anchored 2x4 is form for garage pour. A 5-ft. 2x6 hangs over edge to form recess



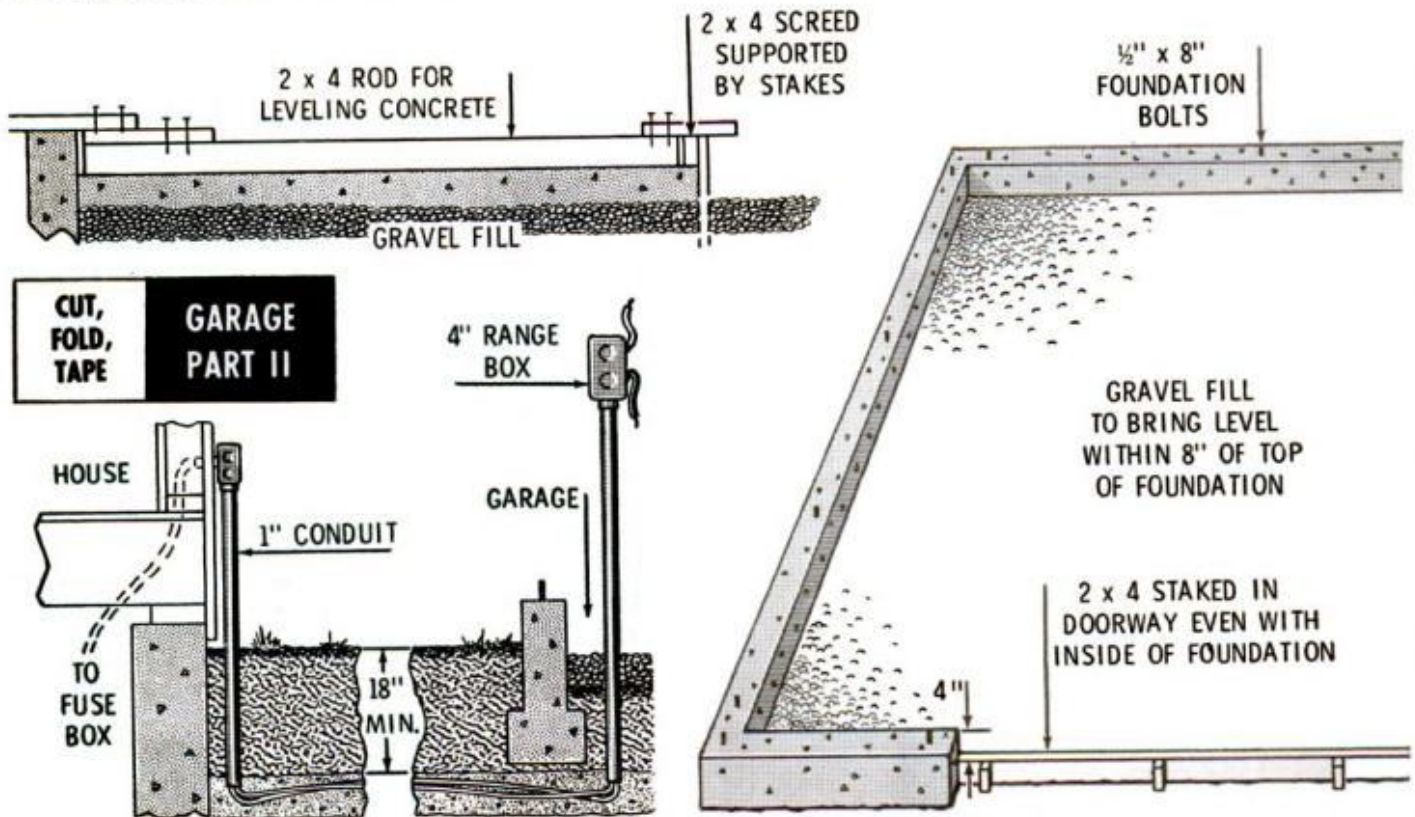
within 8 in. of the top of the foundation. *Never pour concrete directly on sod.* The sod eventually rots out, leaving a space for settling, and the sagging slab will crack. Incidentally, I used no reinforcing such as welded-wire fabric, because my area is not subject to frost heaving. Where winters are more severe, you may want to reinforce the concrete to prevent cracking.

Now's the time to dig a trench for the electrical wiring, and to bring it up inside the foundation through one-inch electrical conduit topped by a suitable box. The paths of the cables are shown in color on the sketch below right, along with the paths of the water line and drain pipe for the sink. I brought power cables from the service entrance of my house to just inside the 16-ft. door. I trenched 18 in. below grade and laid approved two-wire #12 underground cable in a bed of sand, covering it with more sand. The water line was buried in the same trench, before backfilling, while the drain pipe was trenched to a special drywell—in my case, a simpler method than tying it into my home drainage system.

The cables from the post lamps were brought across the garage footing before the patio slab was poured; these are now

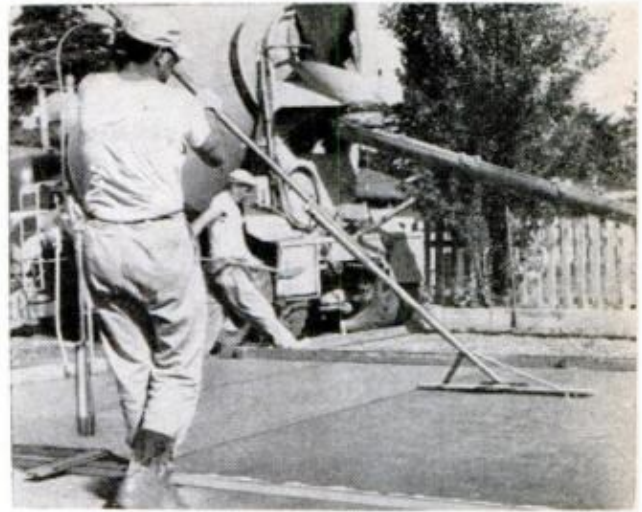
ARCHITECT'S PLANS

If you find that an architect's working blueprint is required to secure a building permit, you can obtain a standard 17 x 23-in. plan (Scale: 1/4" = 1'0") by sending \$1 to *Popular Mechanics Magazine*, 575 Lexington Ave., NYC





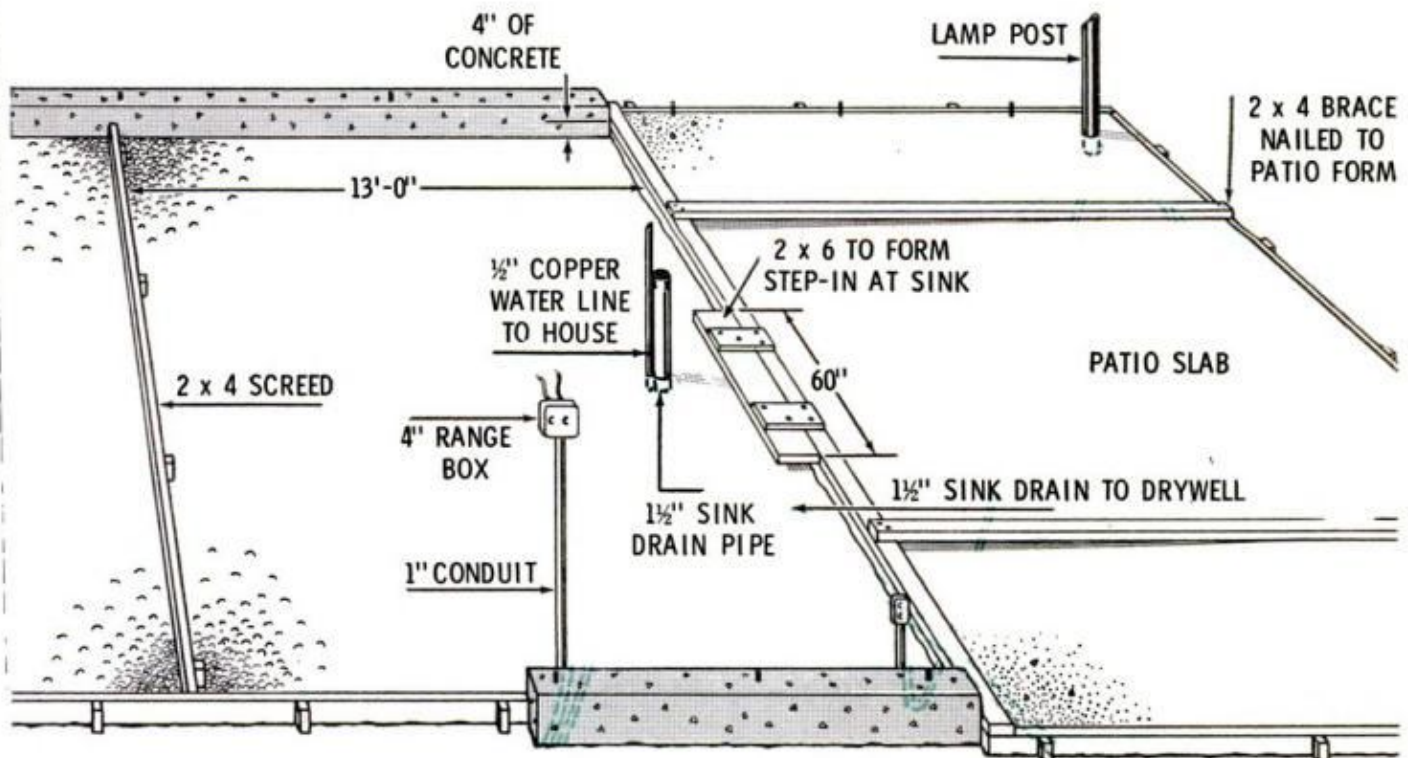
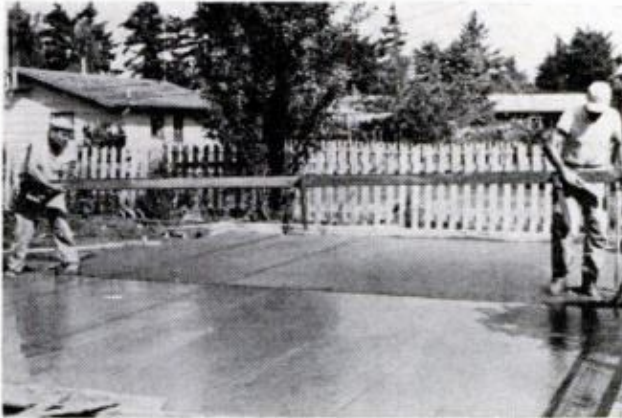
BECAUSE DRAINPIPE and waterline stick up, rod off to this point along patio, then fill rest of form



BULL FLOAT smooths surface after entire patio side of screed has been poured, rodded off, jitterbugged

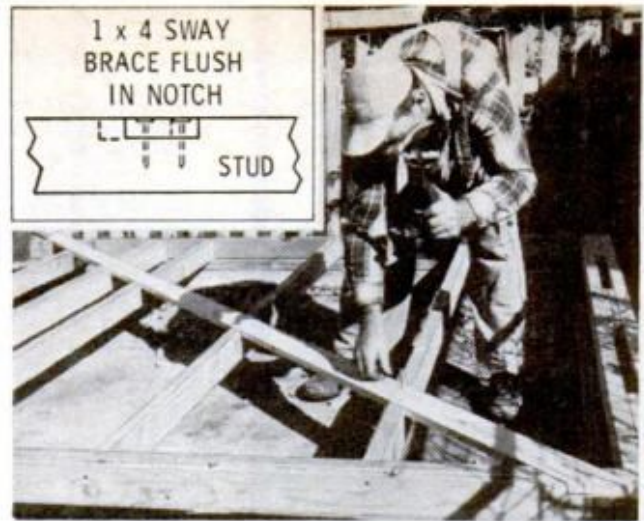
OUT COMES SCREED, once second half of pour has been jitterbugged; bull-float whole slab to close gap

STEP-IN BAY at patio-edge of pour is finished off with rubber float, after removing cantilevered 2x6

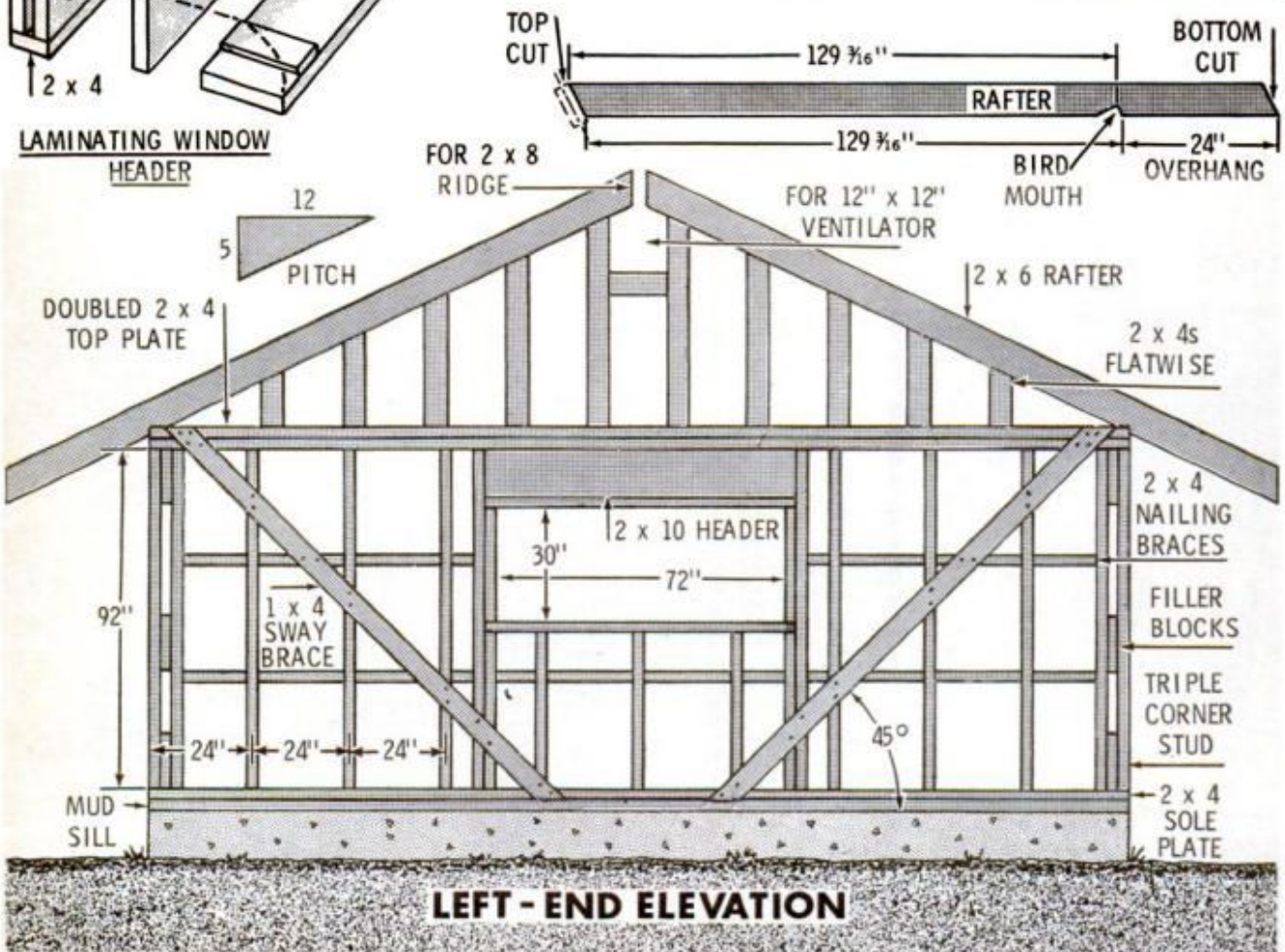
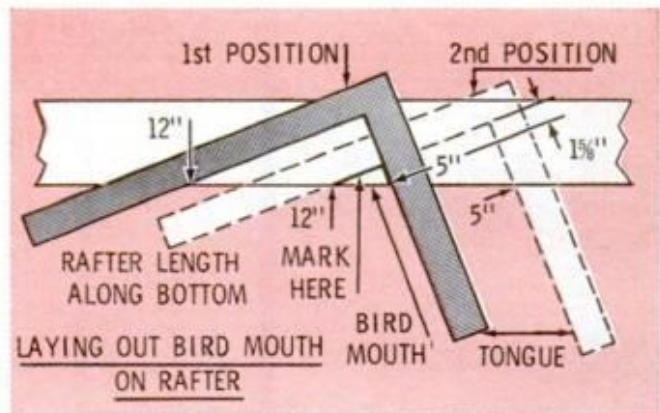
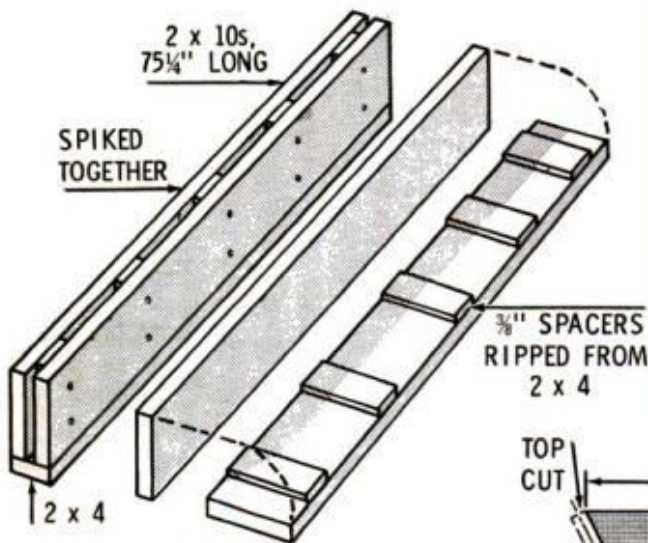




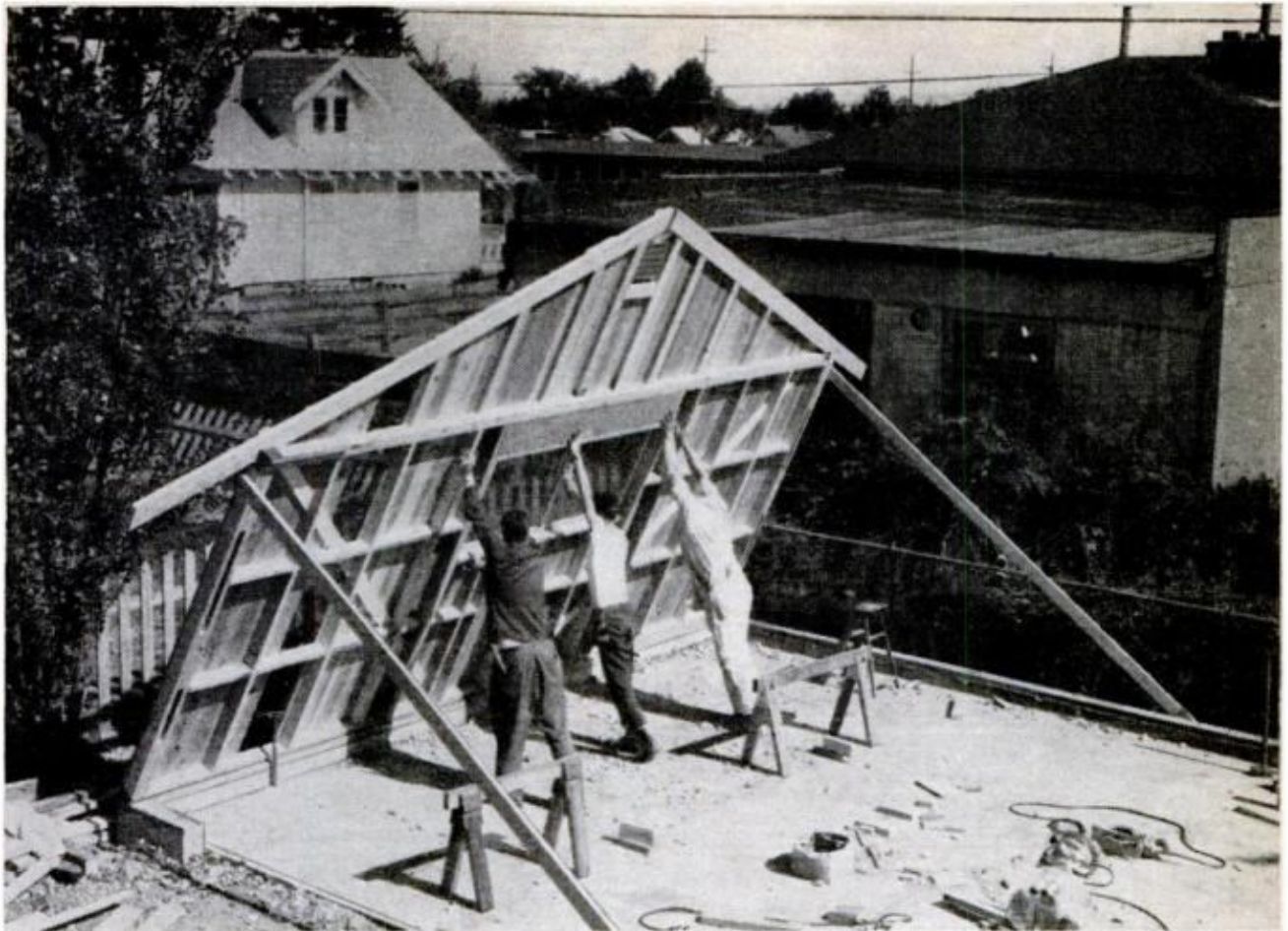
ANCHOR MUD SILL to top of foundation wall by drilling it to match protruding bolts, dropping it over them and turning the nuts up tight with a wrench



ASSEMBLE END WALL flat on slab. Here, a sway brace is nailed into notches angled across outer edges of studs to let brace into frame. Use two nails per stud



LEFT - END ELEVATION



RAISE WALL ONTO SILL and nail sole plate to it after setting it plumb by means of two side braces. These are attached with one nail so they'll pivot as they follow, preventing collapse if men should stumble

fed into a switch box located inside what will be the entrance from the garage to the patio. This switch will be wired to the entry box after the walls are erected.

Check the gravel level with a mason's line stretched across it; a dish in the middle can play hob with calculations for the amount of concrete you'll need.

The plan (page 149) shows how to lay out the floor area for the pour. Divide it in half with a 2x4 "floating screed" staked in place, and prepare a 2x4 rod for leveling the slab. The rod must be long enough to bridge half the area. Close the door gap with a 2x4 staked in flush with the inside face of the foundation wall.

Since the garage floor is to be 1½ in. higher than the level of the patio slab, lay a 2x4 on top of the slab along the edge and hold it there with 2x4 braces nailed to the patio form on the far side. To form the step-in bay for the sink compartment, measure in 4 ft. from the front edge of the patio, then cantilever a 2x6 over the fill (photo and inset sketch, page 148).

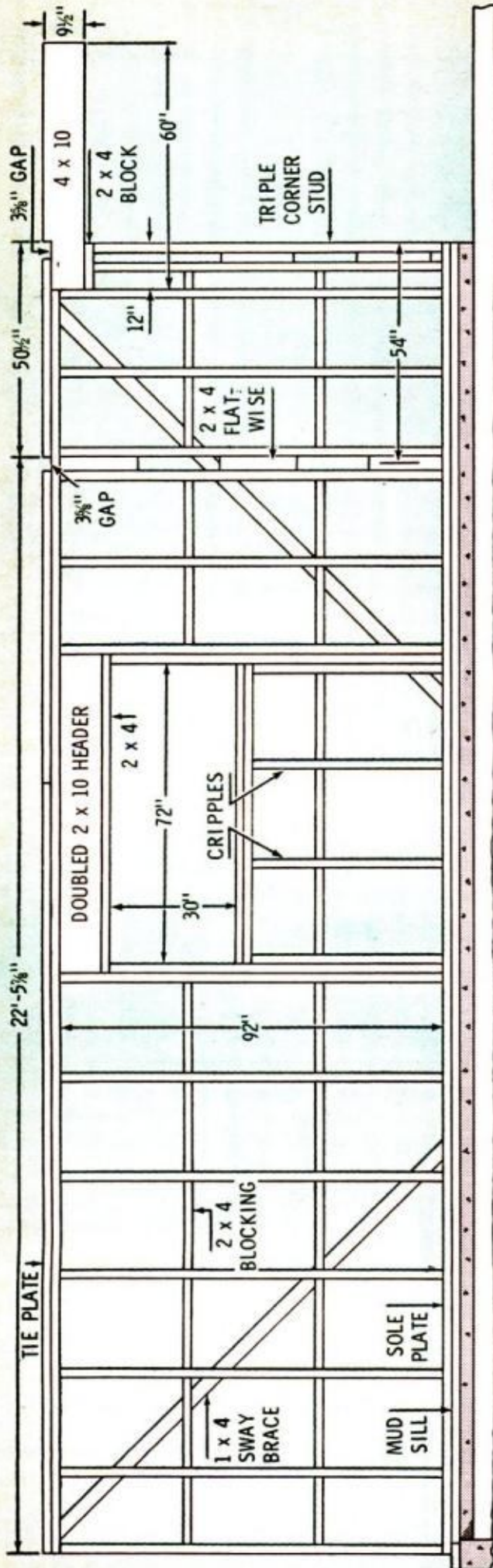
Our concrete was the same 1:3:4 mix used for the patio. The center screed simplifies both pouring and leveling, since you do half the area at a time. First, the half on the patio side is poured, leveled, jitterbugged and bull-floated; then all these operations except the last are re-

peated for the other half. Before bull-floating the entire area, pull out the screed. If any areas look low, shovel on more concrete and bull-float it down. As the concrete sets up, work it first with the wood float, then with a metal trowel. Don't overwork it until it's glass-smooth, since this makes for hazardous walking. When the concrete has set up enough to be firm, carefully lift away the 2x4 form along the patio; this uncovers the bay recess so you can work it with a rubber float.

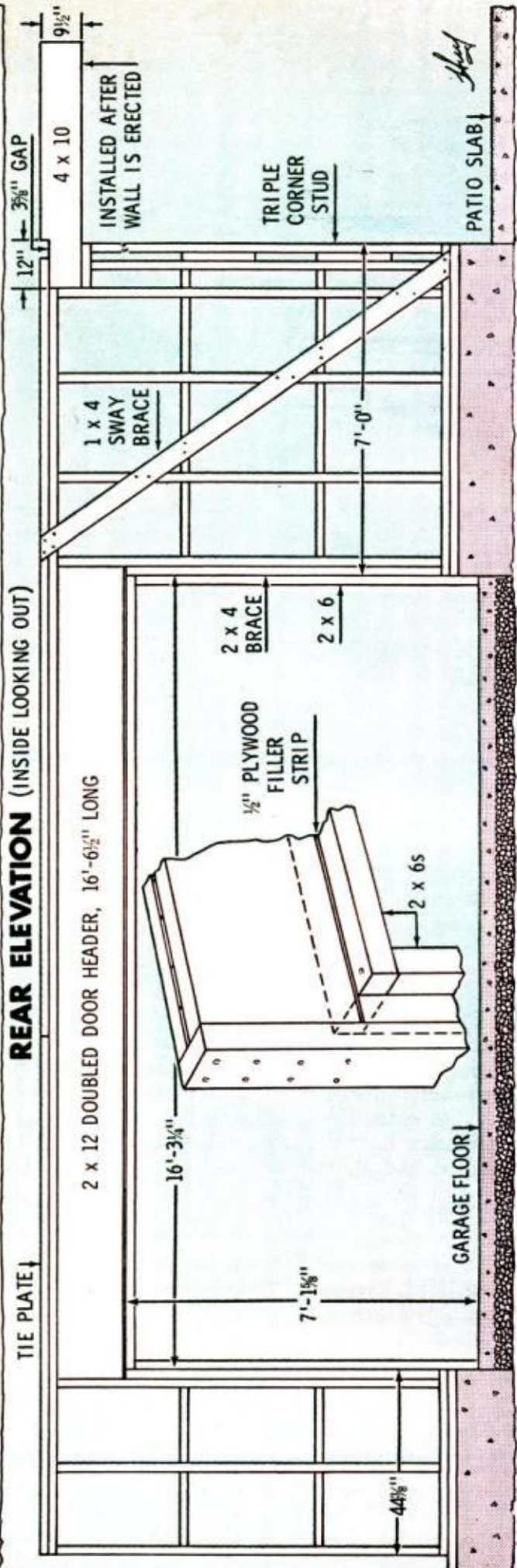
Your concrete work is now completed—except that if the weather's warm and dry, you'll want to prevent too-rapid curing by spraying the slab with a hose occasionally for several days.

By now you'll have ordered the lumber from last month's bill of materials. Be sure to stack it someplace handy, organizing the pieces in the order they'll be used. If my delivery men are any gauge, your lumber (Idaho White Pine, Western Red Cedar and Douglas Fir) will be dumped with the mud sill material on the bottom and the shiplap for the roof on top. A few hours spent sorting lumber (including the shiplap by length) saves time and vexation later.

Now, cut all foundation-wall studs to length. You'll need 32 studs 92 in. long. Cut only one from each 16-ft. 2x4 and lay



REAR ELEVATION (INSIDE LOOKING OUT)



FRONT ELEVATION

what's left aside; you'll use these pieces later, as studs for the patio wall. (Since that wall doesn't sit up on a foundation, the studs must be longer.) The photo at the right shows how an 8-in. circular saw can be used to gang-cut the 92-in. studs from the 16-footers. For working convenience, line up four saw horses on the garage floor.

You'll note from my framing plans on pages 150 and 152, and from the photo below, that I substituted horizontal sliding-sash windows for the conventional fixed-sash type indicated on the architect's elevations (pages 140-141, April '65 PM). Whatever your choice, be sure to have the sash on hand before framing the openings.

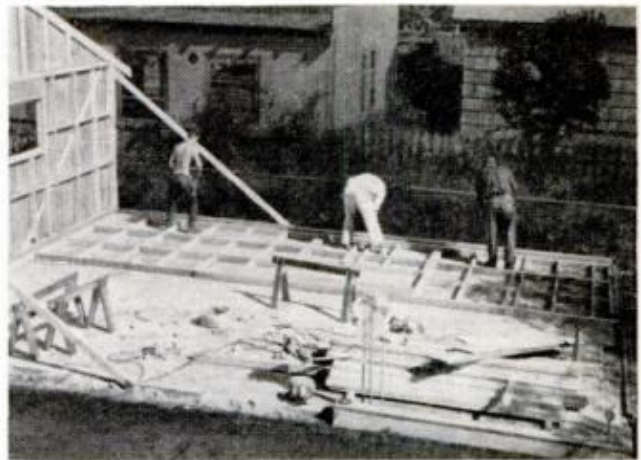
At this point, I figured how many pieces of the 1x12 Western Red Cedar siding I'd need for the back wall and the garage-door wall, and cut them to length. You'll note that the siding on these eave walls extends from the top of the tie plate to 4 in. below the top of the foundation.

When I'd cut all the siding I thought I'd need for my early work, I sliced some battens from the same 1x12 cedar. I cut these overlength, then trimmed them as needed when I nailed them on, later, after the walls were up. A radial arm or bench saw is essential for fast, accurate cutting of these 2-in. battens. If you don't have access to such a tool, you can, of course, buy ready-cut 1x2 battens.

All this assumes that you wish to reproduce the appearance of the garage presented here. The board-and-batten treatment
[\(Please turn to page 198\)](#)

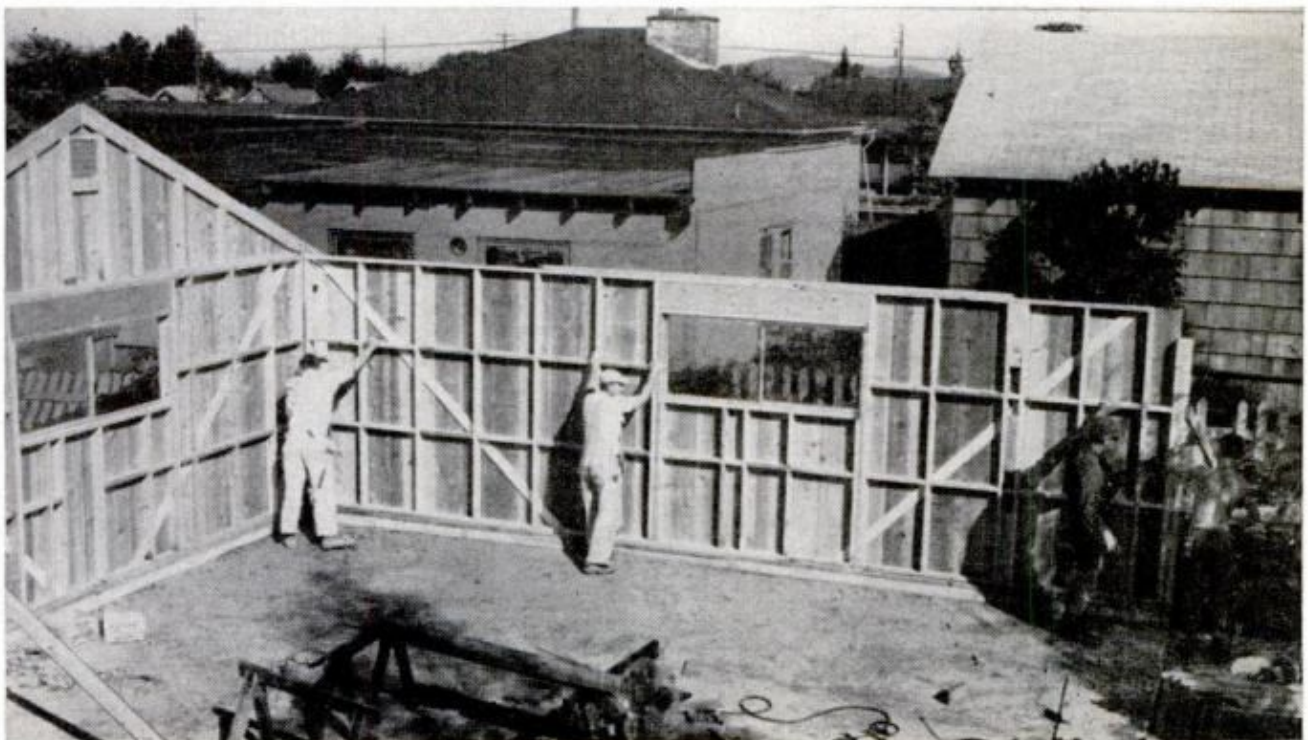


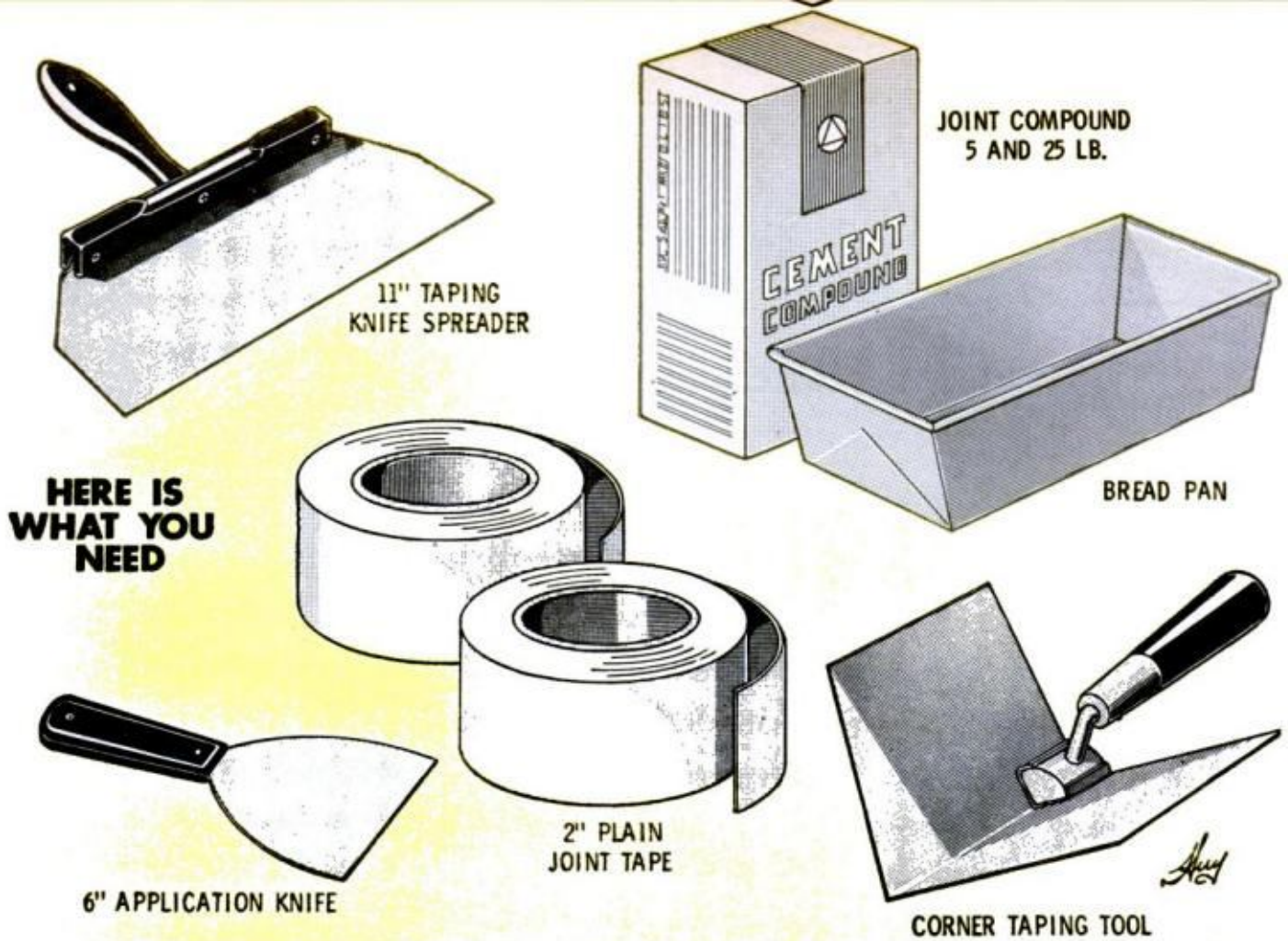
PORTABLE CIRCLE SAW makes fast work of gang-cutting studs from 16-ft. 2x4s laid edge to edge and scribed across with a carpenter's square, above



CONCRETE SLAB now serves as platform for assembling back frame, outer face up, so siding can be applied before wall is raised into place, as below

WALL RAISED, man (far right) nails 2x4 brace between end stud and ground stake. Other end of wall is then nailed fast to the corner of gable wall. After additional bracing, sole plate is nailed to the mud sill





Remodel with Drywall

By Steven J. Howard

Conclusion

WITH YOUR NEW ROOM neatly drywalled, you're ready to tape the joints (page 162, April '65, PM). But, before starting this phase of the job, remember that careless taping can make an otherwise professional-looking drywall job appear amateurish.

You start, of course, by buying supplies. When doing so, note that you'll see two products on your dealer's shelf which are often confused. One is called joint cement, the other Spackle. You want joint cement. It's used, in conjunction with paper tape, to fill and conceal joints between panels of drywall, cover nail heads, etc. Spackle is made for repairing cracks in finished walls. It should never be used in place of joint cement.

Joint cement, incidentally, comes in powder form, to be mixed with water, or pre-mixed. Powdered cement is less expensive than the ready mix and can save you a few dollars when you have to finish an entire room. But the ready mix is easier to use. It goes on smoothly and sets up

more smoothly than the powdered form. If applied carefully, it eliminates a sandpapering step between applications.

Another product you'll need is the paper joint tape mentioned before, which is used to cover joints between panels and in inside corners. (Outcorners, as explained last month, are squared up with corner bead, so need not be taped. They are merely covered with cement.) At first glance, this tape looks like a roll of plain paper. But holding it to a light reveals innumerable tiny burnt-in holes. The joint cement penetrates these holes to improve the bond between cement and tape. There's also a joint tape that has visible holes punched into it in a regular pattern, to serve the same purpose. Either type does the job well.

Another characteristic of drywall joint tape is roughened edges. This insures that the edges will feather out properly when covered with cement, eliminating edge marks and making the final wall surface smooth and wave-free.

As for tools, you'll need a 6-in. broad knife to apply the cement, and an 11-in. spreader-knife for feathering out the edges of the cement. Two optional but handy tools are a 14-in. plasterer's trowel and a cornering tool. The former can be used in place of the 11-in. spreader knife for feathering joint cement, while the latter simplifies the job of smoothing inside corner joints. Finally, if you use powdered cement instead of pre-mixed, you'll want a wooden paddle or a potato masher to mix it with, and an ordinary bread pan in which to mix it.

Once you've purchased all the above items, you're ready to begin. Assuming you've bought powdered cement, the first step is to mix it. Don't take this step lightly, as it's more critical to good results than most people realize. The container or pan you mix it in must be clean. Note the water-to-powder ratios given on the package of compound and follow them to the letter. Use lukewarm water. Add the powder to the water and stir vigorously with the mixing paddle, or mash with the potato masher for several minutes. Make sure all the compound is uniformly wet. If you prefer mechanical mixing, you can buy electric-drill attachments for this purpose. But don't use them at drill speeds of over 400 rpm, or you may whip bubbles into the cement. After mixing, allow the compound to sit and soak for about 30 minutes. This gives the material a smooth texture, free of lumps.

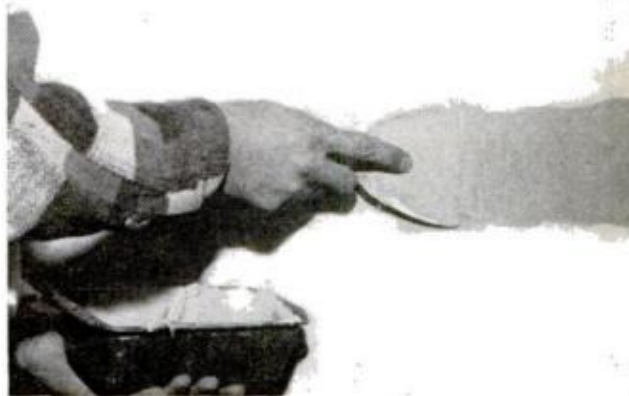
Generally, the mixture should be as smooth as soft whipped butter. To test for proper consistency, scoop up some compound on your 6-in. broad knife and turn the knife over. If the compound sticks for a few seconds before dropping off, you know it has good consistency. If it's too tacky it will adhere for a long time before dropping off. If too thin it will run off like cake batter. In either case, don't try to "doctor" this batch. Mix up a new one.

By the way, joint cement should be mixed, used and allowed to dry at temperatures of no less than 55° F.

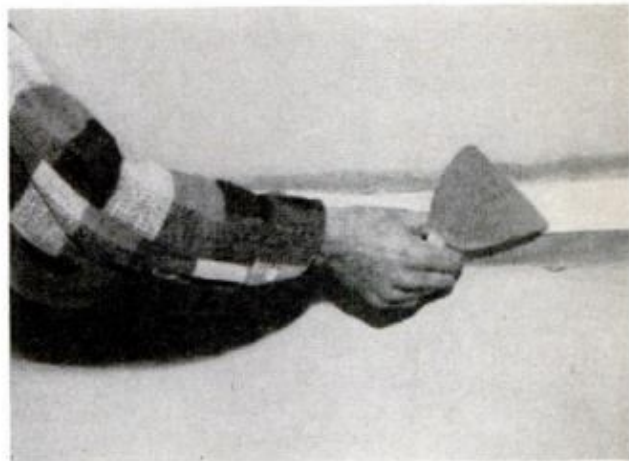
To begin the taping operation, take your 6-in. broad knife and run it across the nails in the drywall. If any project above the surface, they'll scrape against the knife. Drive them home, leaving a dimple in the plasterboard.

Now, start at the flat joints. (A flat joint is formed by two panels meeting straight-on—as opposed to corner joints.) Each flat joint forms a shallow valley where the tapered edges of the panel meet. Using the 6-in. knife, fill one of these valleys with a good application of joint cement (photo, top right), bringing the cement 1½ to 2 in. out beyond the edges of the valley.

HOW TO FILL AND TAPE JOINTS



APPLY JOINT CEMENT to the valley formed by the tapered edges of two adjoining panels of drywall



PRESS JOINT TAPE into the cement with the edge of applicator knife, then apply more cement over tape

NEXT DAY, when cement is dry, apply two more coats of cement. Feather edges to make joint invisible



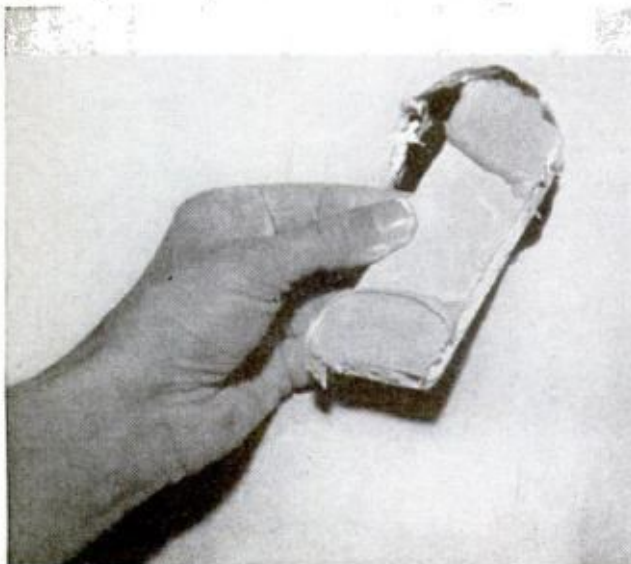


TO TAPE INSIDE CORNER, fold tape down its center, then press it into corner with knife or corner tool



FIRST STEP IN PATCHING a small hole is to draw 3-in. or larger circle around it, then cut out circle

CUT A RECTANGULAR support piece to fit behind hole, "glue" piece in place with contact or joint cement



Next, apply tape immediately, pressing it into the fresh joint compound with the knife blade. Use a steady, even pressure. After the tape's in place, apply a covering coat of cement, then draw the knife evenly along the joint to remove any excess compound. Now repeat the entire process for the next joint, and so on.

Inside corner joints are almost as simple as the flat joints. First, "butter" both sides of the corner with a good application of joint cement. Use the 6-in. knife, and extend the cement out about 2 in. to the side of the corner on each wall. Measure off enough tape to cover the corner from top to bottom and fold it down its center. Some tapes are pre-creased for easier folding.

Embed the tape into the cement so the fold falls into the corner, then smooth the tape down its length with the 6-in. knife or the cornering tool. Follow with a covering coat of cement as you did on the flat joints, bringing it out beyond the edges of the tape. This coat may also be smoothed with the knife or cornering tool.

Next come outcorners. Unlike the joints we've discussed so far, outcorners are not taped. As mentioned before, you will have covered them with corner bead. All you do now is apply a first coat of cement, right over the corner bead.

Now you're ready to cover the nails on the surface of the entire wall. Using the 6-in. knife, apply a coat of joint cement over each nailhead. To do this, first fill the dimpled area with plenty of cement, then scrape off the excess. In removing the excess, press hard on the knife to make sure the compound is level with the surface of the drywall.

After treating all nails, let the cement dry overnight. Next morning, if the cement has dried properly, it will have

A FEW HOURS LATER, cement a plug of plasterboard to support piece and allow patch to dry thoroughly



turned from gray to white. Over the nails, it will have shrunk while drying to form slight indentations. If any of the cement looks dampish or slightly gray, wait a few more hours before going ahead.

When all cement is dry, mix up a new batch and apply a coat to each joint and corner, using the 11-in. spreader knife or the 14-in. plasterer's trowel. Be sure to feather this coat 1½ in. beyond the edges of the previous coat. Then apply a second coat of cement to the nailheads, using the 6-in. broad knife.

When the cement has again dried thoroughly, sand all the joints and nailheads slightly. Then apply a thin finish coat to the joints and corners, feathering out at least 2 in. beyond the previous coat. Finally, apply a finish coat to all nailheads. Now let dry for the last time and you're ready to paint or paper the walls. Before doing so, it may be necessary to sand all cement once more, to insure a smooth surface.

Now, suppose you've had plasterboarded walls in your home for some time, and they've become damaged. This can happen in one of four ways: (1) nails can pop; (2) cracks can appear due to normal settling, usually extending from a top corner of a door or window frame to the ceiling; (3) holes could have been punched into the wallboard, probably by an active youngster; (4) massive breaks can run practically from stud to stud—usually as a result of heavy impact.

Several repair methods are possible for each type of damage. However, here we will discuss only the latest thinking in this area, and those methods which provide the most professional-looking repairs for the least amount of time and effort.

• **Nail Popping:** This damage occurs for only two reasons. Either nails weren't hammered in properly when the plasterboard was first installed, or the studs have shrunk, thus squeezing some nails out. The latter condition often becomes apparent during the heating season, in which case, repairs should be delayed until after the heating season. Otherwise further shrinking can occur and, with it, further nail popping. In addition, it's also best to wait until you're ready to redecorate the entire room, since the repairs will deface existing paint or wallpaper.

Start the repair by driving a new 1¼-in. annular ring nail 1½ in. above or below each popped nail. This will provide extra holding power to resist the forces that are working against the nails. While hammering, apply strong pressure with your free hand against the plasterboard to bring the board in firm contact with the stud. Dimple the surface of the board with your last



WHEN PATCH IS DRY, cover with joint cement, then apply two or three overlapping strips of joint tape

TO CONCEAL PATCH, let initial coats of cement dry, then follow with two more coats, as on joints



hammer blow, to make sure the head is below the wall surface.

Now drive each popped nail back in, also dimpling the board surface. Scrape all loose cement from around the nailheads—both old and new—and re-cover all nailheads with fresh cement, using the same procedures as previously described for new plasterboard.

• **Cracks:** As you probably know, cracks should be widened and brushed clean to assure a proper base for repair compound. After you've done this, fill the crack with Spackle, which was designed specifically for jobs such as this. Then dampen the Spackle with a sponge to assure a smooth surface when dry. After the Spackle has dried, sand lightly, then apply another coat of Spackle—this time feathering the



WHEN LAMINATING $\frac{1}{4}$ or $\frac{3}{8}$ -in. plasterboard over old plaster or plasterboard, spread joint cement on back of each panel with homemade tool (inset)

edges as you did with the joint cement.

This simple repair should prove effective. But remember that cracks can reappear in the future, because filling them does not remove the expansion and contraction of the framing, the vibrations or the settlement that caused the crack in the first place.

If a crack keeps reappearing, one sure remedy is not to fill it, but to hide it. To do this, just apply joint cement and tape as you would over a joint.

• **Plugging Holes:** Maybe you've read that you can stuff a hole in plasterboard with newspaper or some other material and patch it with Spackle. This method works, but leaves a fairly weak spot that is easily knocked out. The best way to repair a hole, then, is with a tight plasterboard plug. Here's how:

Draw a circle around the hole (photos, page 156). Make sure the circle is at least 3 in. in diameter—larger, of course, if the break is larger. Anything smaller than 3 in. wouldn't allow you to get your hand into the hole to install the support strip, as you'll see. A coffee cup or container makes a good circle outliner.

With a keyhole saw, cut out the piece outlined by the scribed circle. Then, take a scrap piece of plasterboard having the same thickness as the wall, cut a circular plug that measures a bit smaller in diameter than the hole. Cut a rectangular support piece of scrap plasterboard so its length is 2 in. or more greater than the

diameter of the hole in the wall and its width a bit less than the diameter.

Now, coat the ends of the support piece with a generous amount of joint cement or contact cement. Insert it into the hole and press it against the back of the wall. Hold it there until it takes hold, then let it dry for a few hours.

Next, coat the back of the circular plug with a generous amount of joint cement and insert that into the hole so it butts against the support piece. When that cement is dry, coat the patched area with joint cement and cover with several strips of joint tape and another layer of cement. Let it dry and coat with another layer of cement, sanding beforehand if necessary. Apply still one more coat of cement, let dry, sand if necessary, and you can paint or paper.

• **Massive Damage:** Unless you've got a couple of kids who like to see how much punishment household items can take, this type of problem isn't common. However, the repair is a good one to keep in mind should a large area become so badly marred over the years (without an actual break being made in the wall) that no amount of paint will conceal the damage. It'll save you the trouble of ripping down a whole panel for replacement.

Start by penciling a rectangle around the break, making sure each vertical line is drawn over the center of a stud. Cut along the horizontal lines with a keyhole saw and along the vertical lines with a plasterboard knife, but watch out for nails in the studs as you cut and work around them. When removing the damaged piece, pull all its nails from the studs.

Next, cut a piece of plasterboard of the same thickness so that it matches the outline of the piece you've removed, but is $\frac{1}{16}$ in. smaller all around. Fasten this replacement panel to the studs with plasterboard nails. Treat all nailheads, and the joints at the edges of the replacement panel, as you did with new plasterboard. Be sure to prime the replacement piece before painting.

If your walls are very badly marred, it may be simpler to cover them completely by building new walls right over the old. This can be done without noticeably reducing the dimensions of the room, with $\frac{1}{4}$ or $\frac{3}{8}$ in. plasterboard. Depending on the circumstances, you can either nail the new material directly over the old or use the lamination technique. The former method works only over old plasterboard, the latter over plaster or plasterboard.

Before installing the new wall, check the surface. You don't have to patch up every bit of damage, but any high spots or bumps in the old wall which might pre-

vent good contact between new and old should be scraped or sanded down. Loose plaster or wallpaper should be removed and any sizable holes should be patched with Spackle or joint cement. Glossy paint must be roughened with sandpaper.

If you employ direct nailing, you'll want to use a nail which is long enough to penetrate the studs 1 in. Such a nail is a 6d drywall type (1 $\frac{7}{8}$ in. long). Space nails 8 in. on wall, 7 in. on ceilings.

Spotting Studs

Possibly the toughest part of nailing plasterboard over an old wall is locating studs. You can probe beneath the surface of the wall with a nail to find a stud at a corner of the room, then keep in mind that normally studs are spaced 16 or 24 in. apart, center to center. Or you can buy one of several stud locating devices on the market.

If you decide to laminate the new plasterboard, plan the job as described last month to minimize the amount of taping and nailing you'll have to do. Then cut each panel to fit, if necessary, and lay it face down on a pair of sawhorses. Now spread joint cement over the back of the panel (see photo, opposite page).

Scrap Material Holds Panels

Install the first panel by pressing it into place. Use heavy pressure to insure an adequate bond. Now, install the next panel, making sure the joint between the two is tight. To hold panels in place until the adhesive dries, take several pieces of scrap plasterboard and lay them over the joint. Drive 8d common double-headed nails through the scrap piece and right into the joint. Any mark left by the nails will be covered later when you tape the joints. Three pieces spaced evenly along

the joint are enough. Remove them after 24 hours and tape the joints.

• **Specialty drywall materials:** In this article, and last month's, we've been concerned with standard, unfinished plasterboard. However, we wish to acquaint you with some other types which have specialized uses in remodeling.

One is a $\frac{3}{8}$ -in. material that comes with a wood-grain finish. Walnut, cherry and teak are among the grains available. Such panels cost less than comparable grades of wood paneling, and are installed with pre-colored nails that match the finish. In some cases, they may be installed with a combination of nails and adhesive, or with wood or metal moldings.

Prepainted Plasterboards

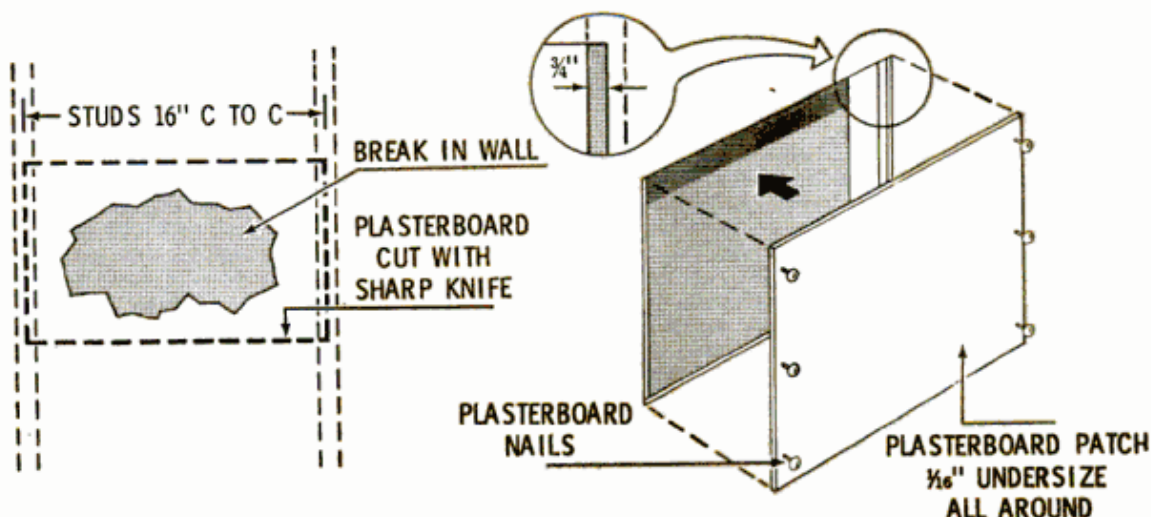
Another specialty plasterboard comes with a factory-applied pastel finish that's comparable to one coat of semi-gloss paint. By installing this product with matching nails and moldings, you can save a paint job, or put it off for several months without having to stare at bare, unfinished wall surfaces.

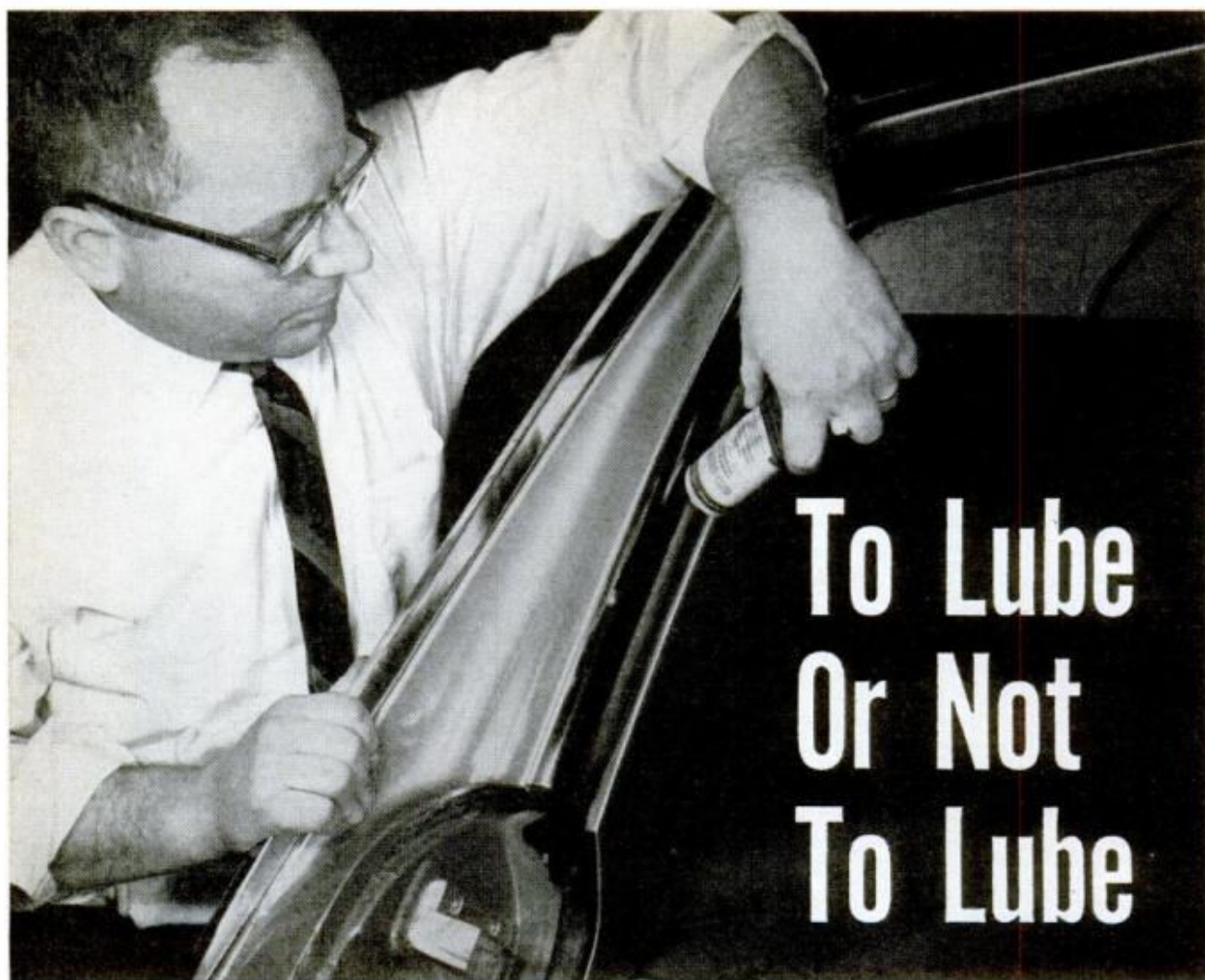
Insulating plasterboard is standard plasterboard with a covering of aluminum foil on the back surface, to serve as a reflective insulation and vapor barrier.

Vinyl-surfaced backerboard is a water-proofed plasterboard that is applied as a base material for ceramic tile and also plastic tile near bath tubs and in shower areas.

Pre-decorated vinyl-surfaced plasterboard comes with a colored vinyl overlay that has a textured finish. Applied with adhesives and/or colored nails and moldings, it needs no painting, and can be cleaned with soap and water—a good choice for family rooms, especially with small children in the house. ★★★

HOW TO MAKE A LARGE PATCH IN DRYWALL





To Lube Or Not To Lube

Creampuff or rattle-trap? The difference could be as simple as how carefully and thoroughly you lubricate your car. Here's the right way

PART 1

By Morton J. Schultz



JOHNS NEIGHBORS call him eccentric. On many a Saturday morning they see him working on his trusty '61 Ford, dabbing a little grease here, squirting a bit of oil there.

But that weekly puttering gets results. John's car is a creampuff. No rattles. No squeaks. In fact, it's tighter than many a '65 I've seen.

His secret is simple: **LUBRICATION**. Not the usual chassis lube every so-many-thousand miles, but a continuing program of applying just the right lubricant whenever and wherever the car needs it.

To get things into perspective, this type of lubrication involves three phases:

1. Lubricating body points.
2. Lubricating mechanical and other movable parts which play a direct or indirect role in the operation of the vehicle.

MULTI-PURPOSE GREASE, shown here being applied to striker of door lock, does job of two other lubes

3. Lubricating the chassis and gear cases, such as the transmission and differential. We've separated the cases from the mechanical parts in Phase 2 because they're usually treated at the same time as the chassis. The parts in Phase 2 might need lubrication before the chassis grease interval is reached.

"But is such thorough lubrication worth the time and effort?" you ask. "My owner's manual doesn't recommend anything but regular chassis lubes."

Well, if you can afford to trade in your car on a new one every year or so, we'd say the benefits might not be worth the trouble. But the buyer who wants several years of service from his car, with a minimum of trouble and repair bills, will find that thorough lubrication helps him achieve that goal.

Now, taking the three phases of our lube program in order, let's discuss lubrication of body points. Although a chassis may or may not require lubrication as often as some people think—that's the subject of next month's *Saturday Mechanic*—these body points should get fairly frequent attention. Fortunately, however, this is certainly one job you can do yourself: it'll take maybe one hour on a Saturday.

What are the benefits? Getting rid of a lot of little squeaks, rattles and other annoying noises, insuring that these parts operate freely, and protecting them against rust and wear.

Treating the Body Points

On most cars, there are more than 20 points on the body that should be lubricated. On others, they may be 30 or more, depending on the body style.

A big question is, of course, how often to hit them. No hard and fast mileage figure can be given. You won't hurt anything by hitting them too often, but you don't want to waste time either. So I can only say, "play it by ear."

What I do is lubricate these parts at least twice a year—in the fall to protect them against winter and in the spring to offset any possible winter-caused problem and get the car ready for the pleasure driving of summer. In between time, if any noise or binding problem develops when I operate any of the parts (such as opening a door or rolling down a window), I administer a shot of lube. If squeaks and rattles seem to develop throughout the whole car while driving, I lube all the body points again.

The chart on pages 162 and 163 tells you where to lubricate your car body and what types of lubricants to use. Might I suggest that you clip out the chart and keep it as a permanent reference? There'll



DRIED-OUT WEATHERSTRIPPING on a door can produce an irritating squeak when door is opened. Keep it pliable and noise-free with silicone spray lubricant



DOOR LOCKS, often ignored as lube points, should be treated with spray or motor oil and flake graphite

DON'T FORGET WINDOW CHANNELS. Silicone spray or grease lube will assure continued smooth operation



LUBRICATION CHART

UNDER THE HOOD

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Latch dowel	Multi-purpose grease or dry stick silicone	
Latch plate hole	Multi-purpose grease or dry stick silicone	
Safety catch	Multi-purpose grease or motor oil	If you use motor oil, it should be 10 weight. The safety catch might be in the latch plate or it could be hanging down from the hood. Lube either type
Hinges on both sides of hood	Multi-purpose grease or motor oil	Work the hood up and down to pinpoint all pivot areas, and lube them. Use oil sparingly
Hood torsion bar	Multi-purpose grease or dry stick silicone	In some cars, particularly some newer Chrysler models, this bar is part of the hood hinge assembly. Lube all pivot points, and any spots on the bar that touch the body or hood of the car

DOORS

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Door latch	Multi-purpose grease, motor oil or dry stick silicone	Lube rotary, toggle and lift-bolt-type latches with multi-purpose grease or motor oil. If you have a double toggle-type latch, use multi-purpose grease or dry stick lubricant. If motor oil is used, apply just a drop
Door latch striker	Multi-purpose grease, dry stick silicone or motor oil	Treat strikers for rotary and double-toggle latches with multi-purpose grease or dry stick lubricant. Strikers for toggle and lift-bolt types are treated with multi-purpose grease or motor oil
Door hinge pins	Multi-purpose grease, silicone spray or motor oil	No matter what type of hinge your car has, lube the top of the pin and all joints in the barrel. If you use grease, lay it on and work it in by moving the door back and forth. If you use a spray, apply it to the entire hinge barrel

**CUT,
FOLD,
TAPE** **AUTO
LUBE**

Door checks	Multi-purpose grease, chassis grease or motor oil	Lubricate the hold-open mechanism on all sliding surfaces. On spring-type and roller-type checks use multi-purpose grease or chassis grease. On folding-type checks use multi-purpose grease or motor oil. On any other type, use multi-purpose grease or motor oil. Don't forget to hit all pivot areas
Door weatherstripping	Silicone spray or special rubber lubricant	Door weatherstripping can dry out and create a squeak as it rubs against the metal of the body. To prevent this, lubricate weatherstripping around perimeter
Window channels	Silicone spray or grease	To keep windows operating freely, without bind, and to prevent squeaking as they move in the channel, lubricate the channel. If you use the tube silicone, put several dabs in the channel and run the window up and down a few times
Door light switch button	Silicone spray or dry stick	Apply lubricant to sides of button, then work it in and out a few times

Door locks	Silicone spray or motor oil and flake graphite	This is most important to do in the fall, before cold weather sets in. Spray silicone into push-button type locks and around tumblers. Then, insert the key into the tumbler and work it back and forth. Or you can spray the key and insert it into the tumbler. If you use motor oil, apply it only around the push buttons—never inside the tumbler—and lube tumbler with flake graphite
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THE TRUNK

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Trunk latch	Multi-purpose grease or dry stick lubricant	
Trunk hinges	Multi-purpose grease or motor oil	Make sure you hit hinge pins and all pivot points
Trunk lock	Silicone spray, flake graphite	Don't forget to work the key in and out a few times after lubing

STATION WAGON TAILGATES

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Tailgate latch	Multi-purpose grease or motor oil	Same procedure as for door latches
Tailgate check link	Multi-purpose grease or motor oil	Note that there are two lubrication points for each check link
Tailgate hinges	Multi-purpose grease or motor oil	Same procedure as for door hinges
Window channels	Silicone spray, tube	Same procedure as for door windows
Tailgate lock	Silicone spray, flake graphite	Same procedure as for door locks

FUEL TANK COVER

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Cover set in fender or body	Multi-purpose grease or motor oil	Lubricate hinge in same manner as door hinges. If tank cap has a lock, treat it in same manner as other locks
Combination cover-license plate holder	Multi-purpose grease or motor oil	Dab grease along the spring-type mechanism, or spread oil along it. Also, be sure to hit any pivot points

INSIDE THE BODY

LUBRICATION POINT	LUBRICANT TO USE	CONSIDERATIONS
Vent-window locks	Silicone spray or motor oil	If you have push-button-type vent locks, spray some silicone around the button and work in and out. On slide type, lube all sliding surfaces and work back and forth. Use oil sparingly
Glove compartment	Multi-purpose grease or motor oil, and spray silicone or flake graphite	Several dabs of grease or drops of oil along the glove compartment door hinge will keep it squeak-free and operating smoothly. Don't forget to put some silicone or flake graphite into the lock
Ignition switch	Silicone spray, flake graphite	Same procedure as other locks
Seat track slides	Multi-purpose or chassis grease	Apply to all sliding surfaces



ON DOOR CHECK MECHANISMS, be sure to hit all sliding surfaces and pivot areas with grease or oil

be another one next month to add to it.

● There are five types of lubricant you can use on body points—motor oil, chassis grease, flake graphite, silicone lubricant and a product called multi-purpose grease. The last one is a petroleum-base, light-weight grease which was originally developed for use on brake backing plates. It can be used in place of motor oil and chassis grease. It's sold under such trade names as Lubriplate No. 110, Delco Brake lubricant and Valvoline X-All Multi-Purpose Grease.

This grease does away with some of the disadvantages of oil. For example, oil can run and get on other parts, upholstery and clothes—especially since people have a tendency to use too much of it. Multi-purpose grease doesn't, even if you apply too much. Also, some oils gel in cold and thaw out in heat. This grease doesn't.

The only precaution you must follow with multi-purpose grease is not to get it on rubber or felt-type material, such as door gaskets, window channels and upholstery fabric.

The silicone spray and silicone stick lubes are also unaffected by temperature. They are used primarily in areas where there is rubber or felt, but also work on metal parts.

● Before lubing each point, wipe off the old lubricant with its accumulation of dirt, using a parts cleaning solvent.

● Apply fresh lubricant sparingly. Excessive oil, for example, can run all over the place. If you happen to get too much lubricant on a part, wipe the excess off.

● At every lubrication point where there are screws or bolts, give them a tightening. If any have worked loose, they could be creating a rattle.

● After lubricating each part, work the lubricant into the area by actuating the part. After treating door hinges, move the door back and forth a few times. ★ ★ ★

Auto Clinic

Q The bolts in the oil pan of my 1963 Corvair Monza come so loose that I can turn them back down by hand. It happens this way every two or three months. Should I use lock washers?—P.W.S., Michigan

A Nope—all you need are the correct bolts and a torque wrench. Chevy recommends you now use a 1/4-20 bolt in that oil pan and tighten them to from 40 to 60 pounds per square inch. And you can't torque them with anything but a torque wrench.

Q When I adjust the automatic choke of my 1957 Ford, water drips out. In fact, it's just rusted the choke piston fast. What's the cause?—A.H., Penn.

A Probably cracks or splits in the choke heat tube—that tube which runs from the choke housing to the manifold. If damaged, it'll cause a build-up of moisture inside the choke housing when air penetrates and mixes with the heat inside the tube. The job of this tube is to pass heat to the choke from the manifold so the thermostatic spring can ease off and open the choke butterfly. Don't try to patch it—replace it.

Q My 1953 Lincoln Cosmopolitan (low mileage, in good shape) has given me endless carburetor troubles, and no one can seem to pinpoint it. Despite overhauls and adjustments (float, etc.), the carburetor won't stop flooding. Have you any ideas?—F.D., Calif.

A One critical area on this Lincoln carburetor that's often missed in overhaul are those O-rings in the rear barrels. If they're damaged in any way, gas runs past them, down a little tubular affair and into the manifold, causing flooding. Replace those O-rings and see if the problem doesn't clear up.

Q A groan, resembling a vibration noise, seems to be coming from the transmission of my 1964 Chevrolet with powerglide. It's only noticeable when I back up and after the engine's been run awhile. Should I prepare myself for a transmission overhaul?—O.P.L., Mich.

A Not if it's like other complaints of the same nature we've been getting, and not if you have a 327 or 409 V8 engine. If so, the noise probably isn't coming from the transmission, but from the rear axle, and this should be checked *first* before going to the expense of having the transmission ripped apart. Seems it has to do with the lubricant put into the rear axle when the car was new—it doesn't always hold up when it gets hot. Chevy states that the problem can be corrected by draining the old lube from the rear and installing Positraction lubricant (part No. 3758791).

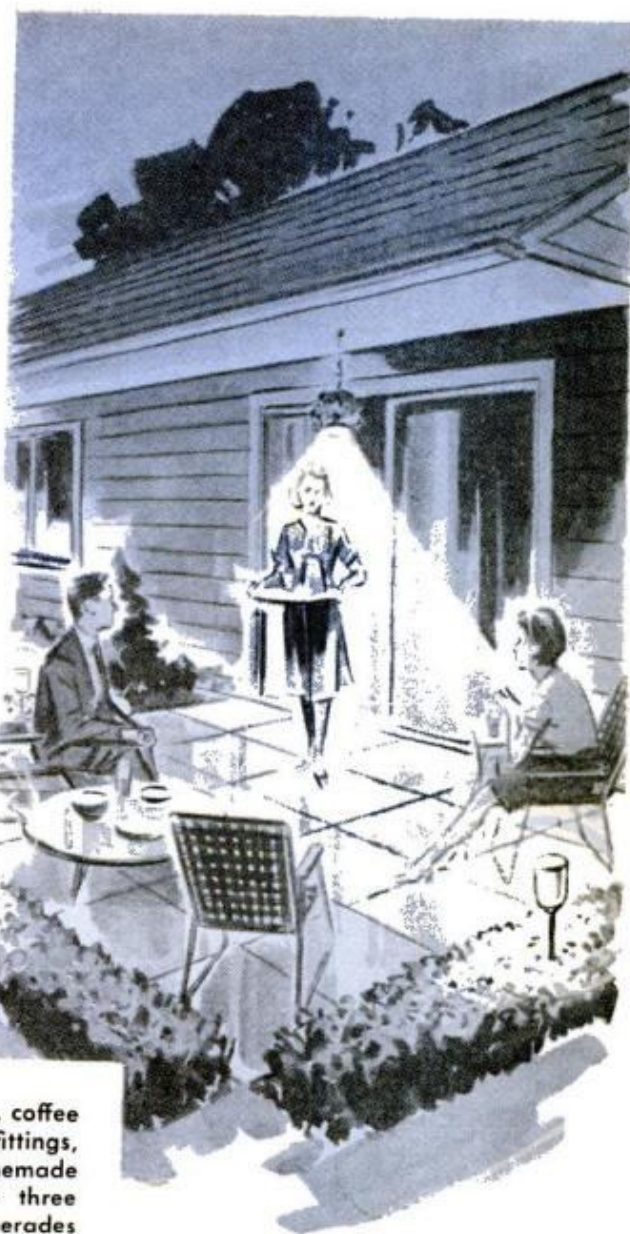
Monthly Service Tips

★ Owners of '63 Plymouths, Valiants, Chryslers and Imperials troubled by hard starting and engine cut-out, take heart! Ignition coils manufactured during a certain period were defective and can be replaced. They'll bear the number 2095233 and the build-date code 08-3 through 18-3 on the coil housing. Replace with coil part No. 2084847. But hear this: if your coil has a build code of 19-3 or higher, it's okay.

★ When you replace the dipstick in the fill tube of the '65 Pontiac Turbo Hydramatic, be sure to push it all the way or you can lose fluid. If the rubber grommet is too tight a fit for a firm seat, apply a film of the fluid to it.

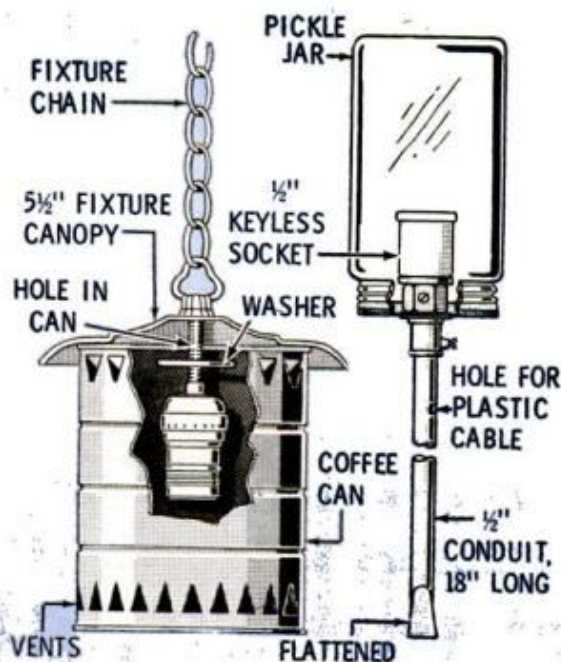
★ Water in the gas tank of your '63 or '64 Studebaker station wagon? It's the fault of a poor fit between gas cap and filler neck. Service bulletin F-1964-2 calls for installation of a water deflector (part number 1562555).

EDITOR'S NOTE: When we began Auto Clinic we had no idea how popular it would be with our readers. Little did we think we'd be so swamped with letters that we'd have to set up a special system with additional help to handle the answers. But that's what has happened. Much as we would like to continue the clinic as a free service to our readers, we find we reluctantly must make a nominal charge to help cover the cost of diagnosing and handling your car problem—if we are to continue to answer all inquiries personally. Write Auto Clinic, Popular Mechanics Magazine, 575 Lexington Ave., New York, N.Y. 10022, enclosing a self-addressed envelope and 25 cents in coin



Patio-Yard Lights

FROM SUCH COMMON, neatly made items as pickle jars, coffee cans and other food containers, plus standard electrical fittings, you can light up your patio and yard with smart homemade fixtures which cost you little or nothing. Among the three examples shown here, the double-duty one above masquerades as a hanging flower urn by day to become a patio light at night. It's simply a large can fitted with a porcelain socket and covered with plastic flowers and moss, wired to the outside. The hanging fixture shown below, left, is a coffee can fitted with a ceiling canopy. Light shines from the vent holes around top and bottom and from plastic cover capping bottom. Glass jars perched on conduit stakes make smart lights for your driveway and shrubs.—Joseph Braunstein



Sidewalk Surfboard

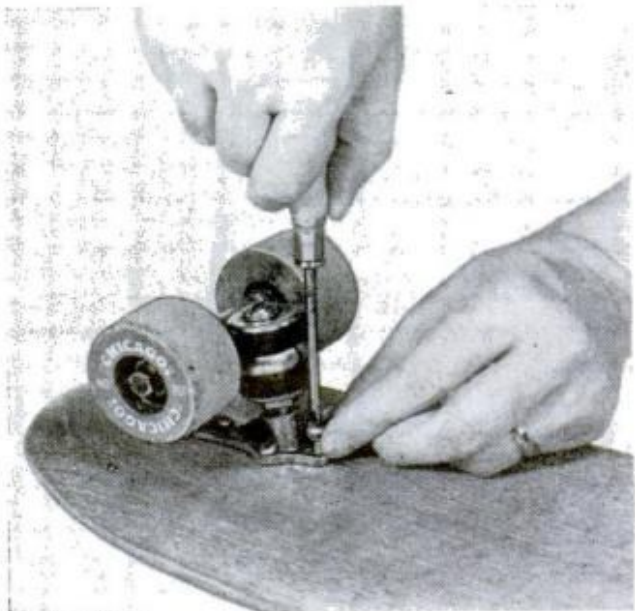
NOW THAT you've read about the newest fad for thrill-happy teenagers—surfing on wheels—in the November 1964 issue, we thought you might want to indulge your own suicidal instincts by making yourself a skateboard. It shouldn't take more than an evening to cut and shape the board and attach the wheels, and a coat of varnish will dry overnight.

The board can be cut from most any piece of $\frac{3}{4}$ -in. solid stock, but like their riders, skateboards receive many bumps and bruises, so for durability it's best to use a hardwood, such as birch or oak. When drawing the pattern for the board, use the grid method to assure an accurate outline. After laying out the pattern, cut the wood to shape on a bandsaw. As indicated in the drawing, the bottom edge of the board is rounded off. The easy way to do this is to tilt the bandsaw table; the hard way involves a plane, rasp, and plenty of elbow grease. Of course, you can go on your ear just as easily with the edges left square.

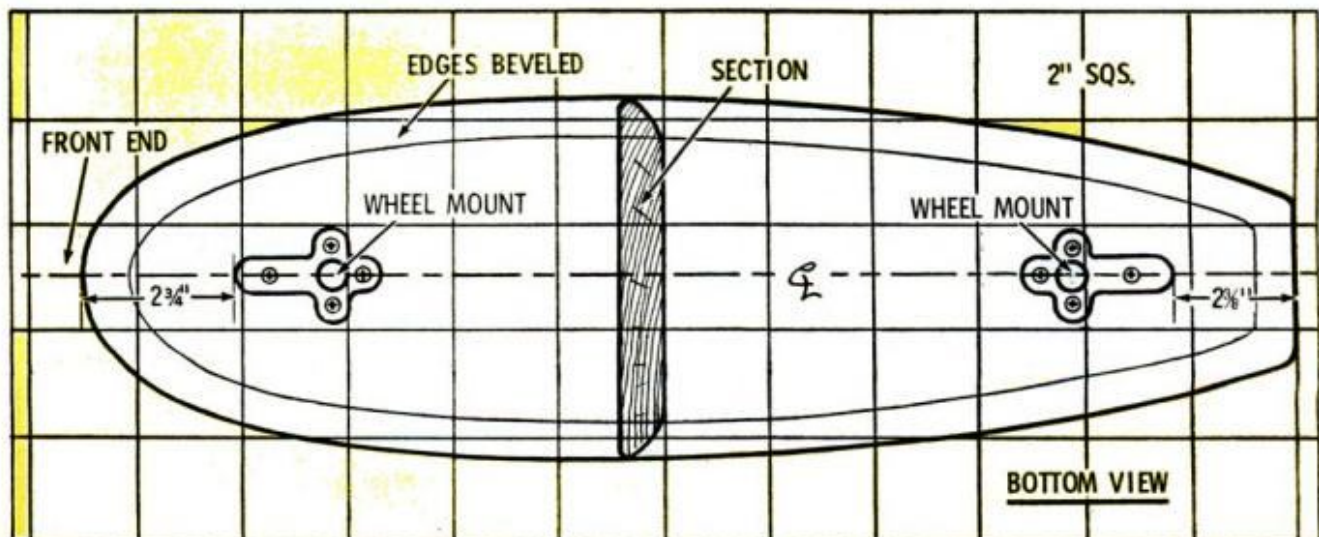
The heart of any skateboard is the wheel, axle and mounting plate. Technically, it's known as a truck assembly. Various manufacturers produce such units; one suitable assembly is the Chicago 76P which is available from Chiska Co., 422 N. Stewart St., Lombard, Ill. at \$4.50 per set, postpaid. Conventional roller skate wheels such as those salvaged from worn shoe skates are sometimes used, but the limited tilt-angle of such wheels makes the board much less maneuverable.



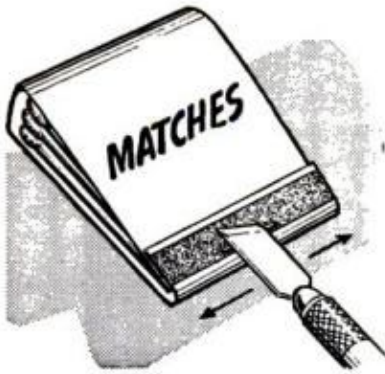
ONE FOOT points straight ahead, the other foot is placed crosswise so that the board may be tilted. Springy knees and S-like stance indicate fine form



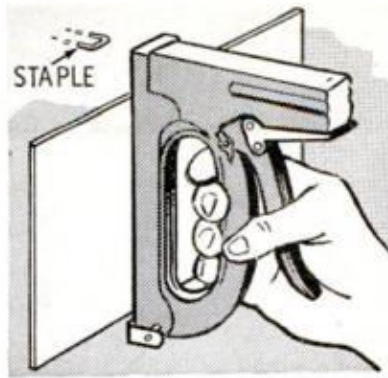
PROFESSIONAL-TYPE truck assembly has tilting action that makes it possible for rider to turn board by leaning to the right or left as in water surfing



TAKE A HINT FROM READERS



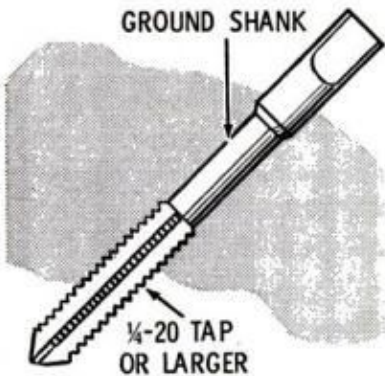
STRIKING STRIP on a matchbook makes a good substitute for an oilstone when sharpening your modeling knives. When the stone isn't handy, you can bring back that like-new edge by rubbing blade across this abrasive strip



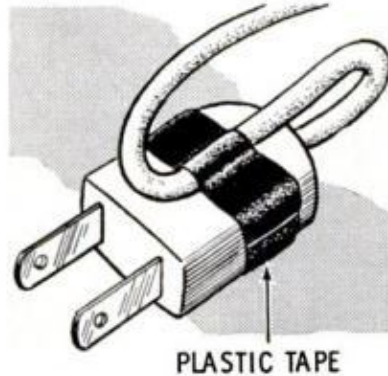
FOR MORE GRIP when applying plaster or stucco to a smooth surface, install a number of protruding staples on the surface. Just place a thickness of wood or metal under the gun when you're driving the staples



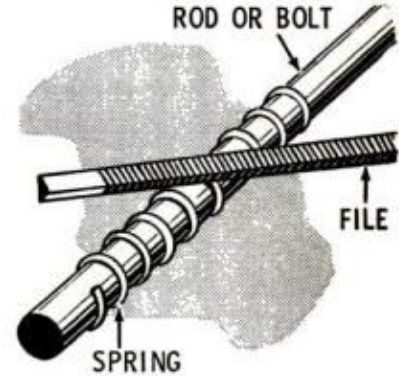
GROOVED RULER attached to the edge of your workbench is a handy accessory for measuring dowels and holding them while sawing. It also serves as a pencil holder and lip to keep objects from rolling off bench



YOU CAN MODIFY taps to thread deep holes in wood, plastic or soft metals by grinding the shank of the tap to a smaller diameter than the thread portion. This weakens tap a bit, so use it only in soft materials

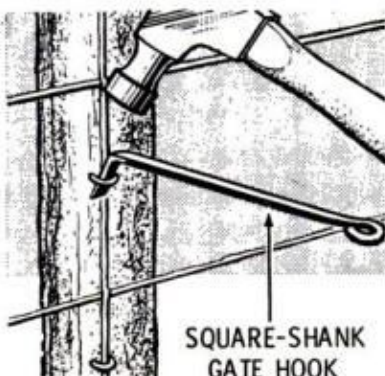


MANY PEOPLE have the bad habit of yanking the power cord to unplug an appliance, and this puts a strain on the connection inside the plug. To prevent damage to the plug, fold cord over plug and tape it securely

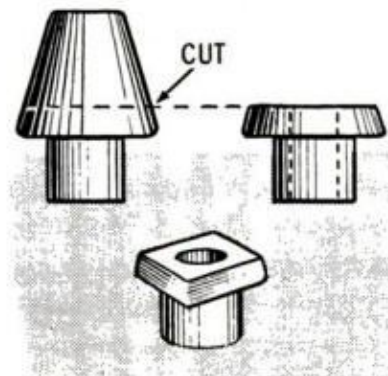


TO SHORTEN a spring that is too long for your purposes, just slip it over a bolt or rod large enough to fit snugly inside and use a file to cut at the desired spot. It keeps spring from twisting while you're cutting it

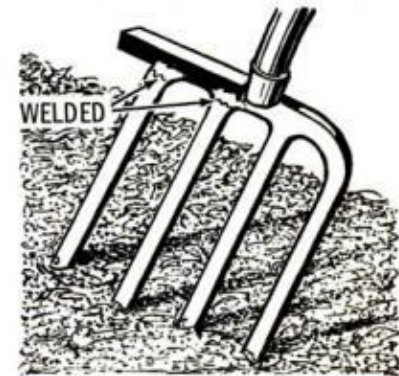
EXCELLENT TOOL for pulling stubborn fence staples is an old square-shanked gate hook. Tap the point in behind the staple to start it, then pry it out using the leverage you can apply through the long arm of hook



NEED A GROMMET in a hurry? You can improvise one from a removable pencil eraser by cutting off the upper portion of the head, leaving just enough to serve as a lip. The neck can also be shortened, if necessary



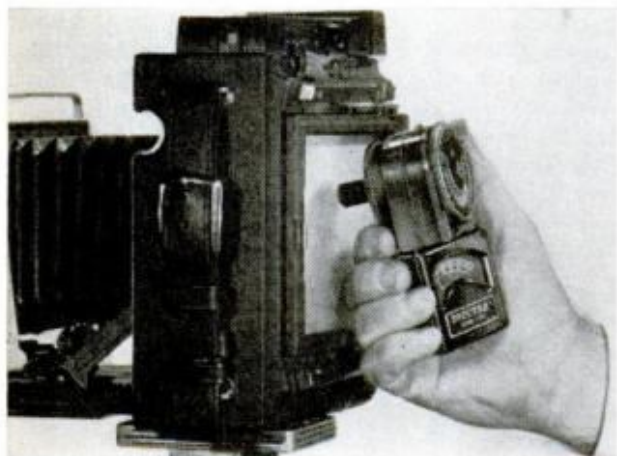
ADD MORE FOOT POWER to spades, shovels and spading forks by welding a short section of angle iron to the upper edge. This provides plenty of pushing surface for your foot and makes the digging job a lot less tiring



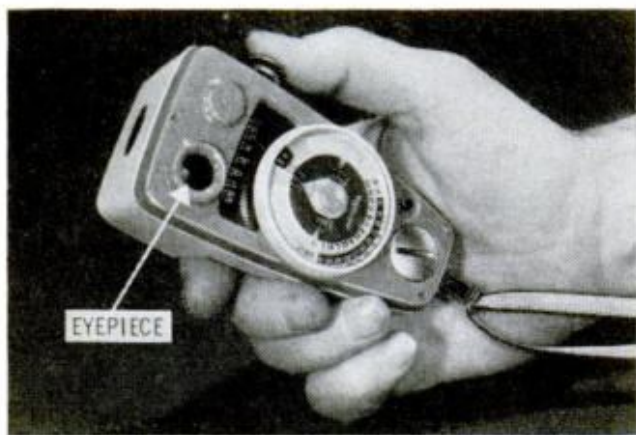


New for Camera Buffs

EASIER VIEWING of enlarger image is made possible by Accura enlarger foot switch. You plug the switch into the wall outlet, then plug enlarger and safelight into the switch. Depressing the switch turns enlarger on, safelight off, so you can view the image without interference from the safelight. Price: \$9.95. Accura, Ltd., 708 Byron Ave., Franklin Sq., N.Y.



ONE OF SEVERAL attachments for the Combi-500 CdS exposure meter is a device for reading from the ground glass. Thus, by determining exactly how much light is reaching the film from each area of the subject, you may compute an exposure and development combination that will give you the exact contrast gradation desired on the final print. Meter sells for \$145 with case. Attachment lists at \$14.95. Scopus, Incorporated, 257 Park Avenue S., New York, N.Y.



NARROW ANGLE OF ACCEPTANCE (9 deg.) of the Viewmeter 9 makes it ideal for telephoto photography or for quick readings of small areas of the subject. You aim the meter by looking through an eyepiece and centering a bright circle over the subject. Particularly useful when snapping backlit subjects. The scale of this sensitive CdS meter reads from ASA 6 to 3200 and speeds of 2 hours to 1/8000th sec. \$54.95 from Minolta, 200 Park Ave. S., N.Y., N.Y.

BRING 'EM IN CLOSE with the 800-mm Tele-Amitar lens. It is so long, it can be disassembled for carrying. Apertures range from F:8 to F:32. Ranges calibrated in both feet and meters. Tripod socket is located at center of gravity for maximum stability. Despite its large size, lens weighs only 7 lbs., 4 oz. Fits most 35-mm single-lens reflexes. \$197.75 from Sterling-Howard, 236 South Station, Yonkers, New York 10705





Underwater Camera Case

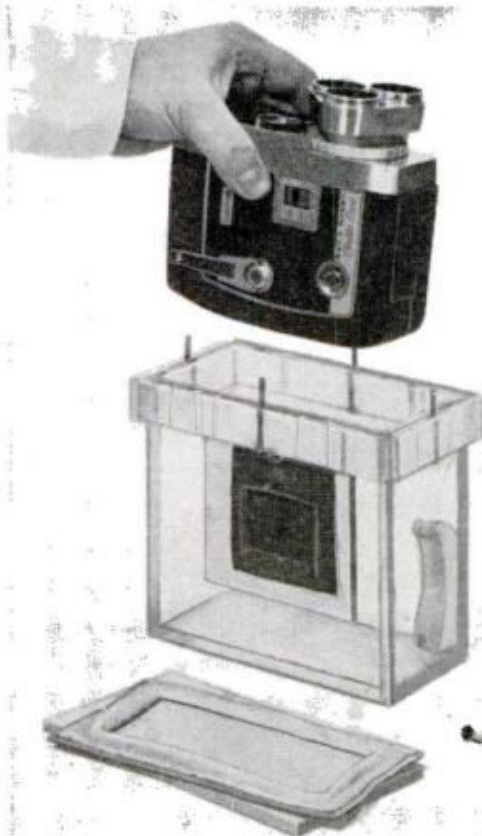
By Hank Clark

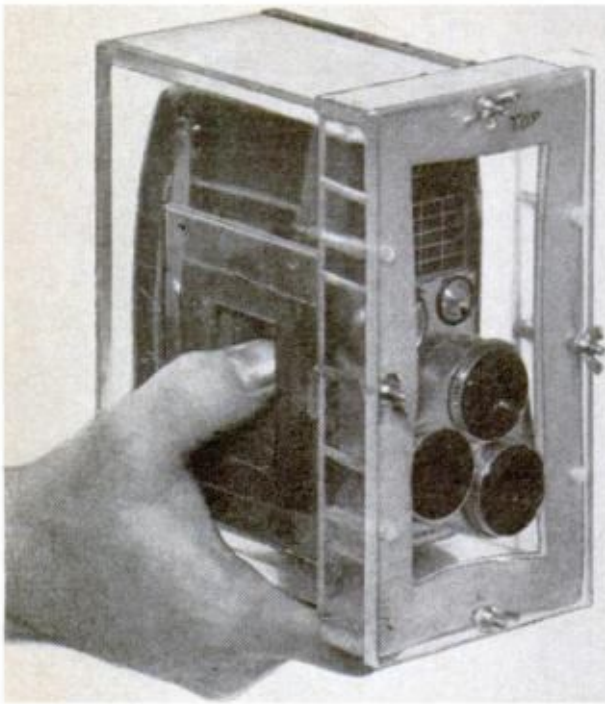
I WAS SCUBA DIVING on a hot July afternoon when I became intrigued with the idea of making some underwater movies. At first, constructing a watertight housing for my camera seemed like a pretty tall order, but after drawing up a few rough sketches I realized that a simple, plastic box would do the job.

I'm a rather inexperienced diver—a cautious 20 feet is just about as deep as I care to venture. With that in mind I constructed the box from $\frac{1}{4}$ -in. acrylic plastic and found it amply strong for the pressure at that depth. If you plan to make some really deep dives with your camera, it would be better to use either $\frac{3}{8}$ or $\frac{1}{2}$ -in. plastic.

The waterproof box detailed here is dimensioned for my 8-mm Bell & Howell turret rig. Cameras of different size and design will, of course, require adaptation of the plans. An opening cut in the side of the box provides handy access to my camera's release button. A small square of thin rubber cut from a bicycle inner tube or patch kit is bedded in epoxy or Pliobond cement to seal the opening. It is im-

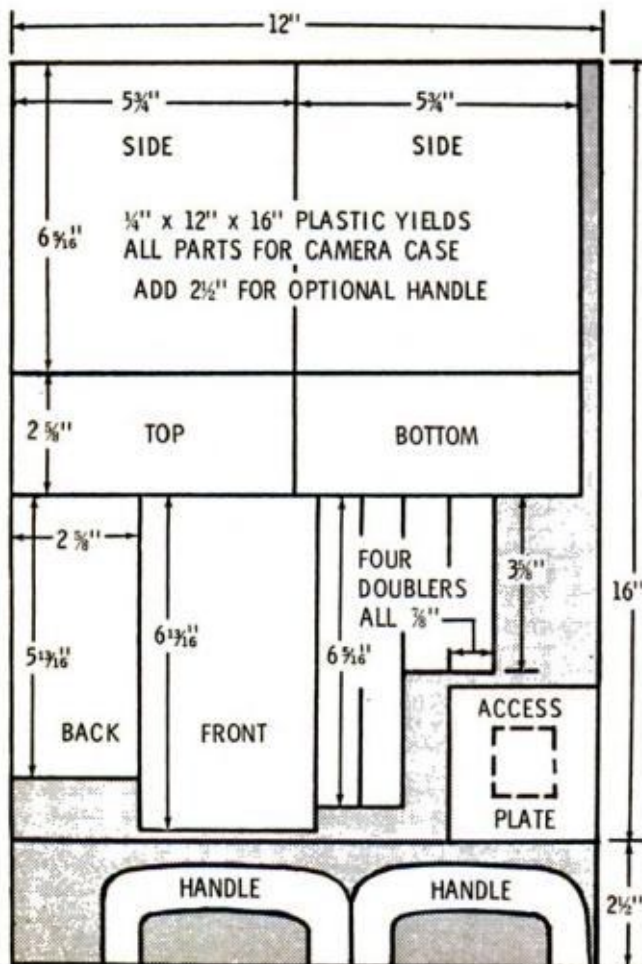
AFTER PLACING movie camera inside the housing, snug down wingnuts to compress rubber gasket





THE RELEASE BUTTON is operated by pressing on a flexible piece of rubber cemented to the housing with either Goodyear Pliobond adhesive or epoxy

CUTTING DIAGRAM shown below should be followed exactly. Optional handle is cut in two pieces which are then cemented together to form a double thickness



portant to choose a flexible piece of rubber for this purpose.

The best way to cut the plastic is with a fine-toothed circular saw blade. In a pinch, a 12-pt. hand saw may be used. Epoxy cement does a fine job of bonding the plastic parts together but it is absolutely essential to roughen the mating edges or surfaces of the plastic before applying the epoxy. Rubbing with a coarse grade of sandpaper will do the trick. Though epoxy is thick enough to fill minor nicks and other imperfections in the edges, ideally, each edge should be jointed after sawing. If your shop equipment doesn't include a jointer, the simple sanding block shown in the drawing will true the edges quite accurately.

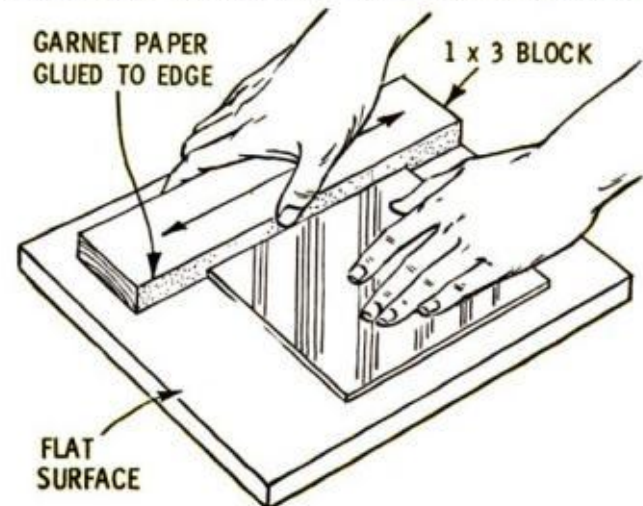
Epoxy cement holds with a bulldog grip, so to guard against epoxy oozing from joints and bonding the plastic case to the workbench top, be sure to lay down a sheet of wax paper before starting work.

Drilling the faceplate and doublers for 1/8-in. bolts should be done with care. To assure accurate alignment of the holes, it is best to clamp the faceplate to the doublers and drill through both in one operation. After the holes have been drilled, pass the bolts through and anchor their heads in place with epoxy.

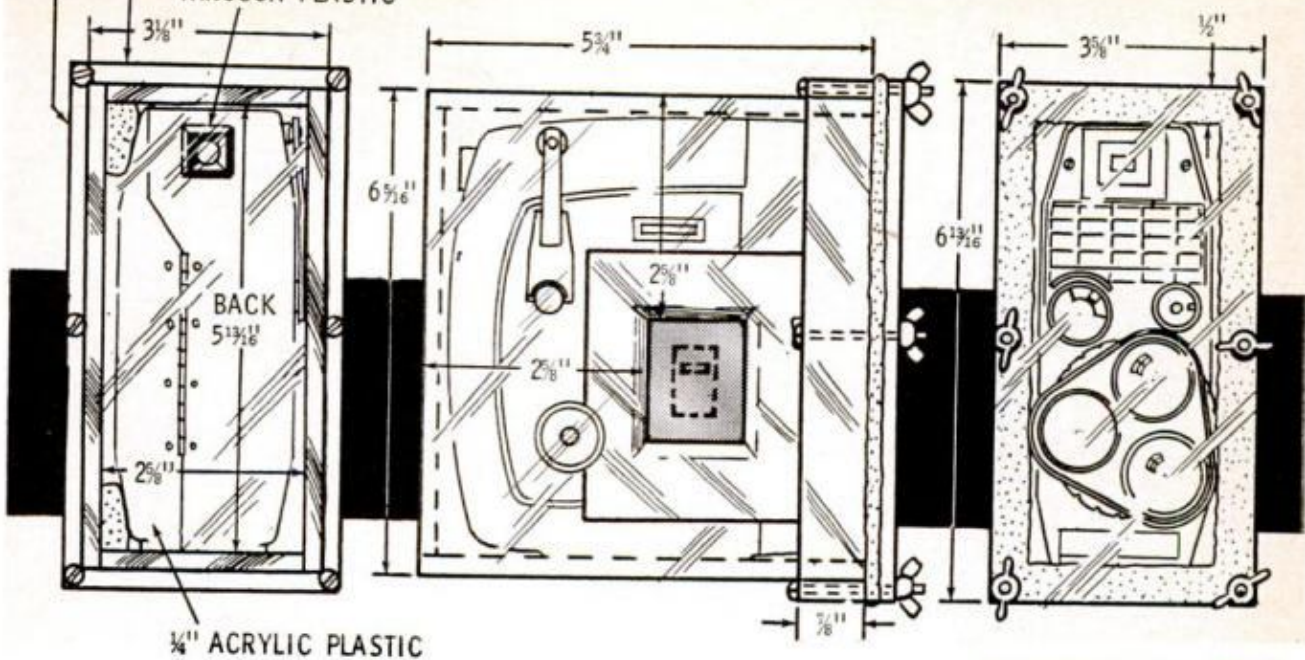
The 3/8-in. foam-rubber gasket that fits underneath the faceplate provides a water-tight seal when the wingnuts are tightened sufficiently to compress the gasket to a thickness of about 3/16 in. As a precaution, test the empty box under water.

If desired, two accessories may be added: a double-thick handle and a wire frame viewfinder. The handle will help you keep a firm grip on the case. The finder is necessary only if you find that your face mask makes it awkward to sight through the camera's built-in viewfinder. ★★★

GARNET PAPER wrapped around a 1 x 3-in. block is moved back and forth against the plastic to true edges after the piece has been cut to dimension

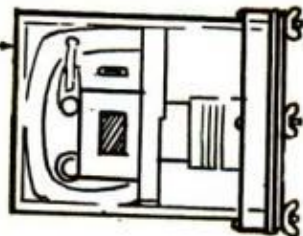


DOUBLERS
FINDER IS SIGHTED THROUGH PLASTIC



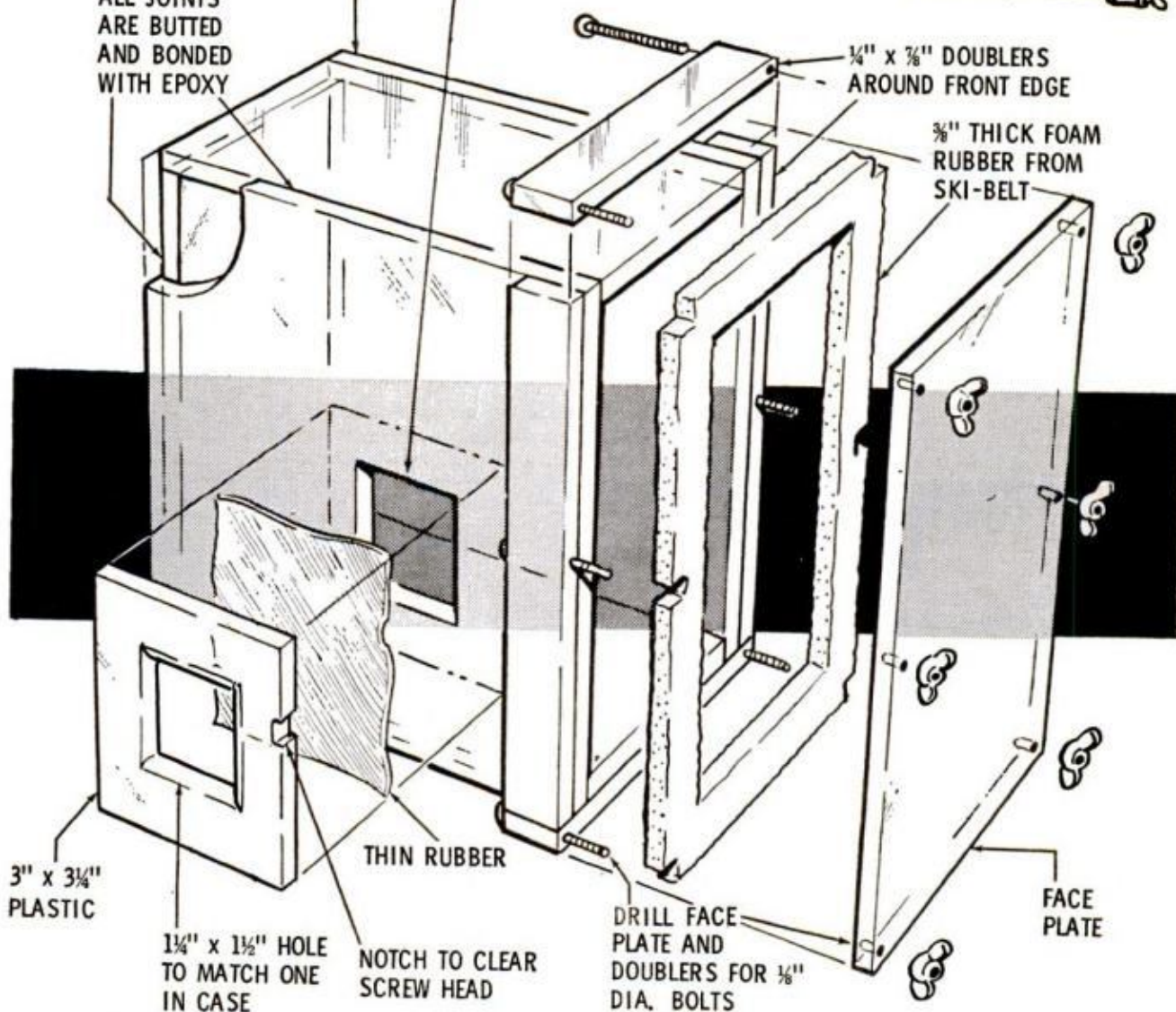
1/4" ACRYLIC PLASTIC

CASE CAN BE LENGTHENED FOR ZOOM LENS

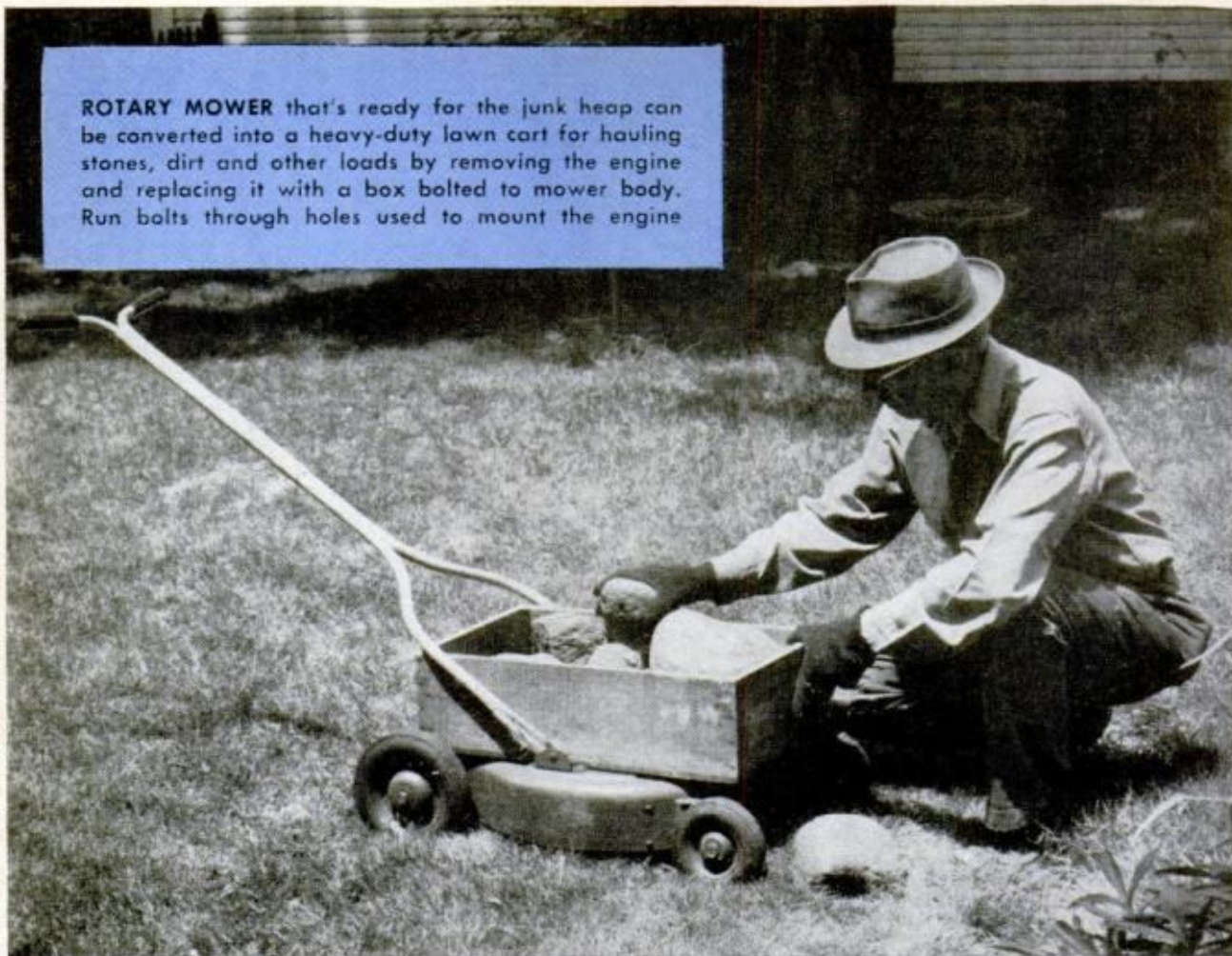


1/4" x 1/2" HOLE FOR RELEASE ACCESS

ALL JOINTS ARE BUTTED AND BONDED WITH EPOXY



ROTARY MOWER that's ready for the junk heap can be converted into a heavy-duty lawn cart for hauling stones, dirt and other loads by removing the engine and replacing it with a box bolted to mower body. Run bolts through holes used to mount the engine



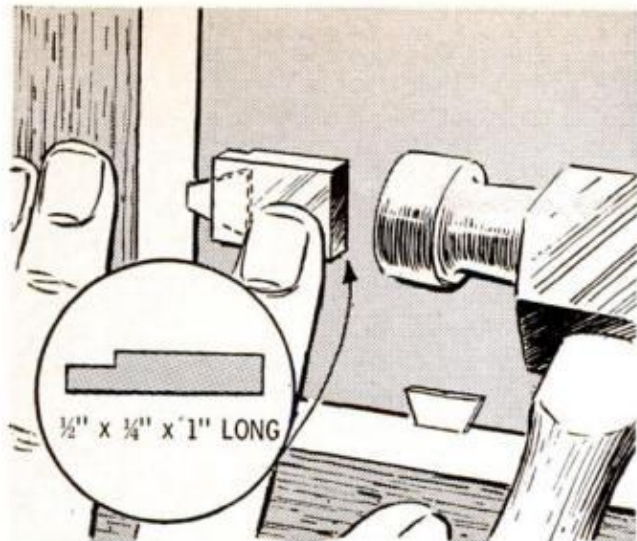
Solving Home Problems

OLD-FASHIONED eyewash can be made by dissolving a half teaspoonful of clean salt in a pint of warm water. It's fine for cleansing and soothing eyes after removal of an irritating foreign particle

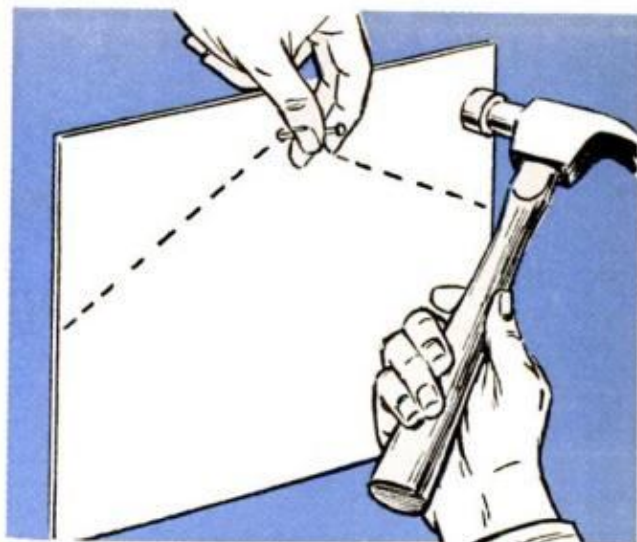


PUSH BAR installed vertically on bottom section of screen door protects screen by giving small children something to push against when opening door. Mount with countersunk screws and finish to match door

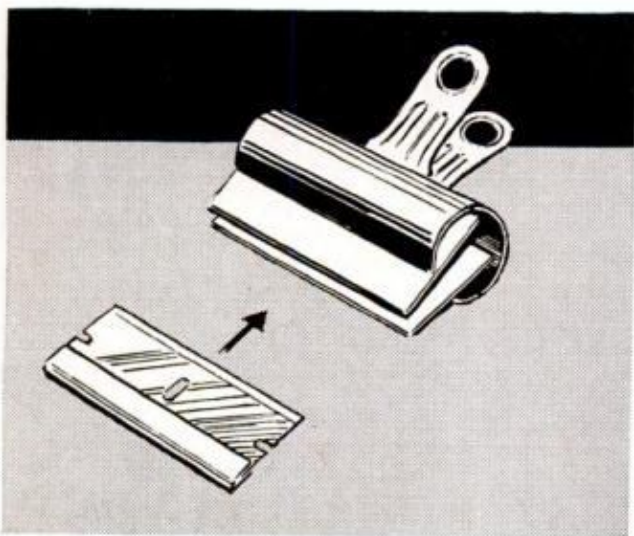




BETTER THAN THE DRIVER that comes with glazier points, this one holds the point flat against the glass and keeps it from bending up when being tapped in place. It's simply a notched piece of brass



FOOLPROOF method of hanging a picture exactly where you want it takes only a couple of minutes. Cut cardboard to size of the frame, punch hole where hook will fall when wire is extended and mark wall

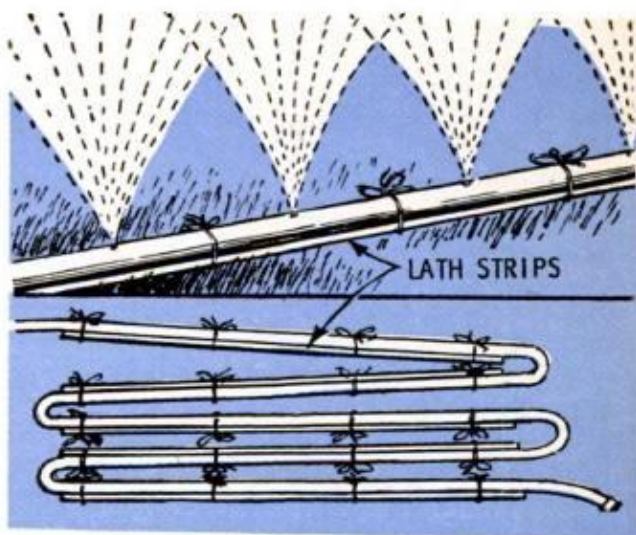


SAFETY HOLDER for a single-edge razor blade used in your office or shop is just a paper clamp. Insert blade between jaws of clamp and it will not only guard against accidental cuts but protect blade edge

EFFICIENT SKIMMER for removing the scum that forms when making jelly or preserves is a fresh, clean vegetable brush. Just be sure to rinse the brush thoroughly in warm water between skimming operations

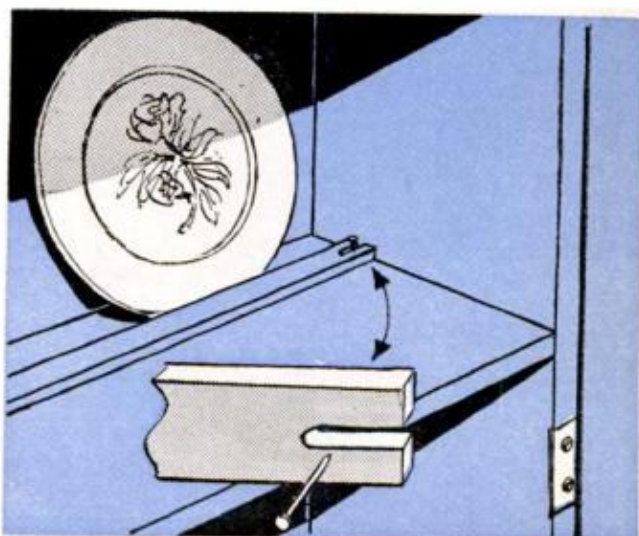


MAY 1965



SOAKER HOSE will lie flat and stay right side up if you tie it to short lengths of ordinary wood lath. Allow about 6 in. between lath sections so the hose can be folded flat for compact storage

REMOVABLE retaining strip for holding plates and platters upright against the back of a shelf can be made by notching the ends of a thin strip of wood to slip over two projecting brads driven into shelf

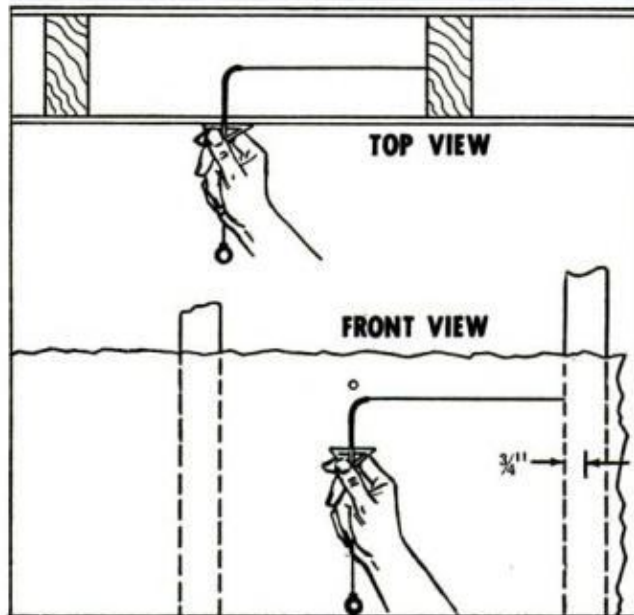


Shopping for Tools

Two-Speed Belt Sander offers a choice of 1700 sanding ft. per minute (sfpm) for rough work and 1400 sfpm for finishing. In addition, the motor is located between the belt pulleys, instead of on top, in order to reduce accidental tipping and gouging of the work. The Model 840 sells for \$110 and is made by Black & Decker Manufacturing Co., Towson 4, Md.

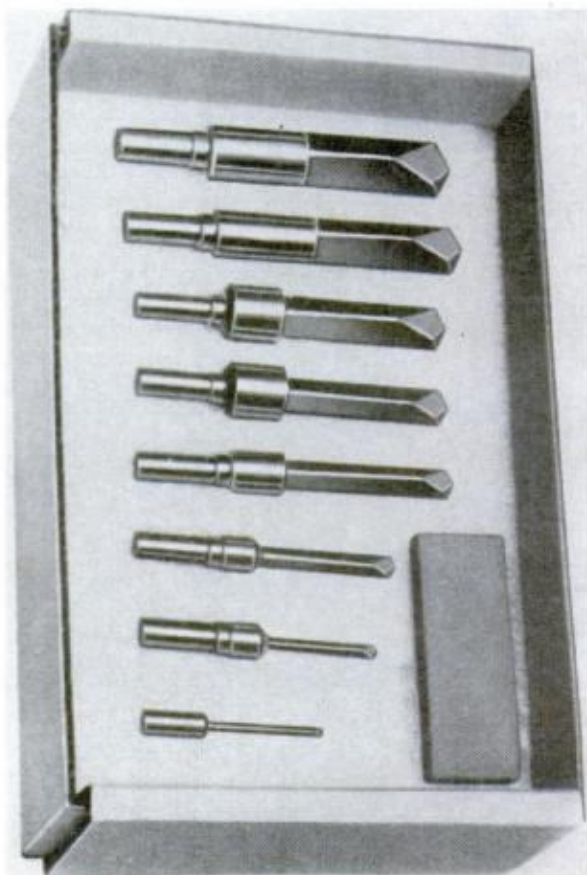
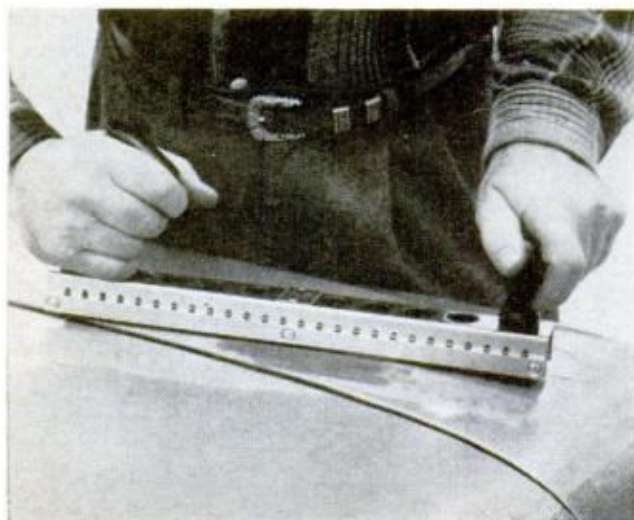


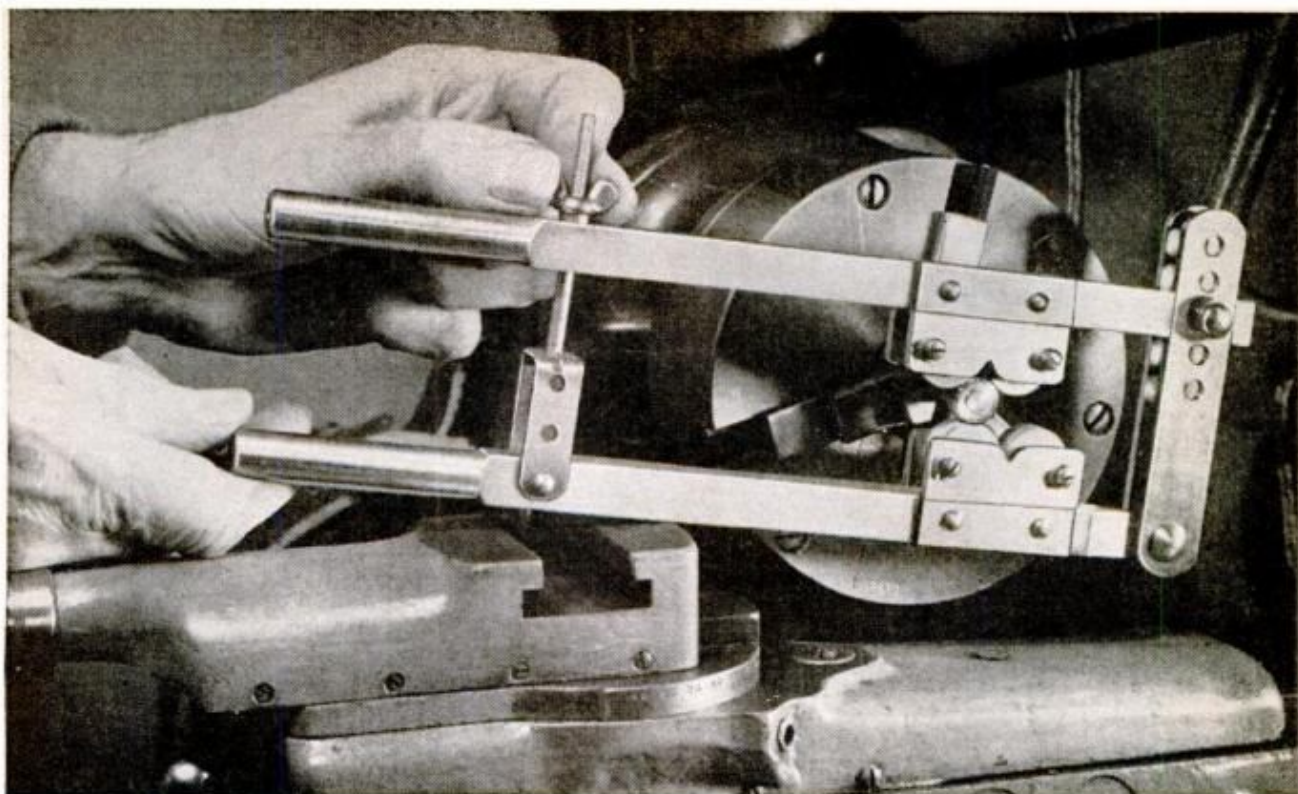
Finding Studs is a simple matter with this wire probe. You insert a curved tube through a hole in the wall surface (drawing, right) and push a wire through the tube until you feel a stud. You then withdraw the device and lay it on the wall surface as shown. A stud center lies $\frac{3}{4}$ in. from the end of the wire. Costs 79¢ from T. E. Morrison, 2658 Butler Ave., Los Angeles, Calif.



Extra Hard Drills, for removing broken taps, repairing molds, spotting holes in hard steel, etc., have full-length back tapers to prevent binding. Available in sizes from .078 to .500, at prices up to \$10.00. Set of 8 (bottom right) costs \$39.95 and includes sizes from $\frac{3}{32}$ to $\frac{1}{2}$ in. Foster Supplies Company, 6122 Milwaukee Avenue, Chicago, Ill.

Pro-File (below) is designed for dressing down auto body putty. Manufacturer says it cuts fully cured putty, thus eliminating need to shape the putty while still soft. Blades each have four cutting edges, which are rotated for longer life. Costs \$16.19 plus postage, from Hopkins Mfg., 428 Peyton, Emporia, Kan.





“Nutcracker” Knurler

By Walter E. Burton

WITH THIS HAND-HELD KNURLER you can do straight or diagonal knurling, using one, two or three knurls at a time, on rods, tubes, knobs, etc., mounted in a lathe, drill press, portable electric drill, bench vise or even in final position on a machine.

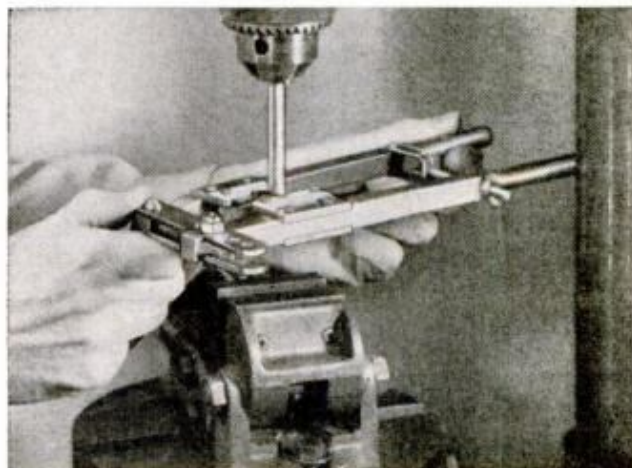
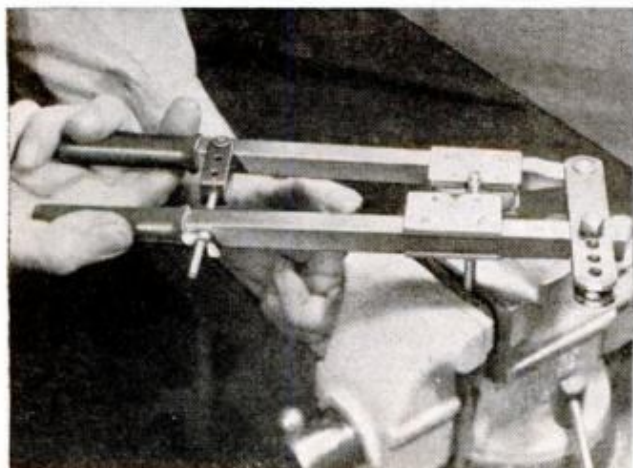
Its normal capacity is about $\frac{3}{16}$ to 2-in. diameter. However, by using smaller knurls and rollers closer together, somewhat smaller diameters could be accommodated, and by increasing lengths of the connector strips, larger diameters could be knurled.

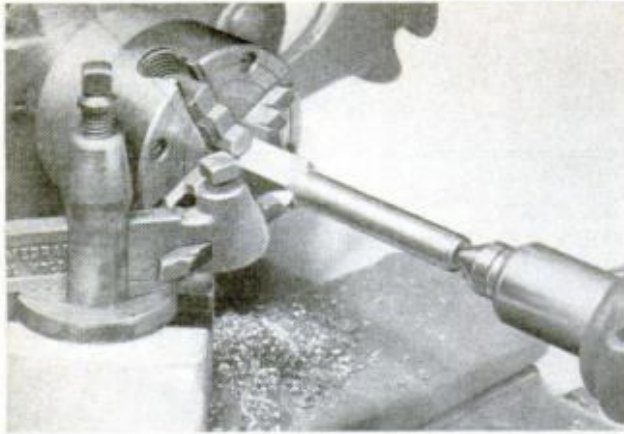
THIS HAND-HELD MODEL also can be used to knurl material held in a vise simply by placing the knurler around work, tightening the clamp screw and rotating

The tool uses $\frac{3}{4}$ -in. knurls $\frac{3}{8}$ in. wide, together with soft back-up rollers. Knurls are obtainable through most hardware dealers and generally come in pairs, either straight or diagonal, in fine, medium and coarse cuts. Straight knurls emboss longitudinal grooves parallel to the axis of the work. Diagonal ones produce diagonal grooves when used singly, diamond patterns when used in multiple. The knurls used in the original were Armstrong's No. 8275 (straight) and No. 8225—right and left (diagonal).

Chief material required for this hand

WHEN KNURLING material on a drill press, knurler is held so one handle is steadied against column. The drill press should be operated at slow speed

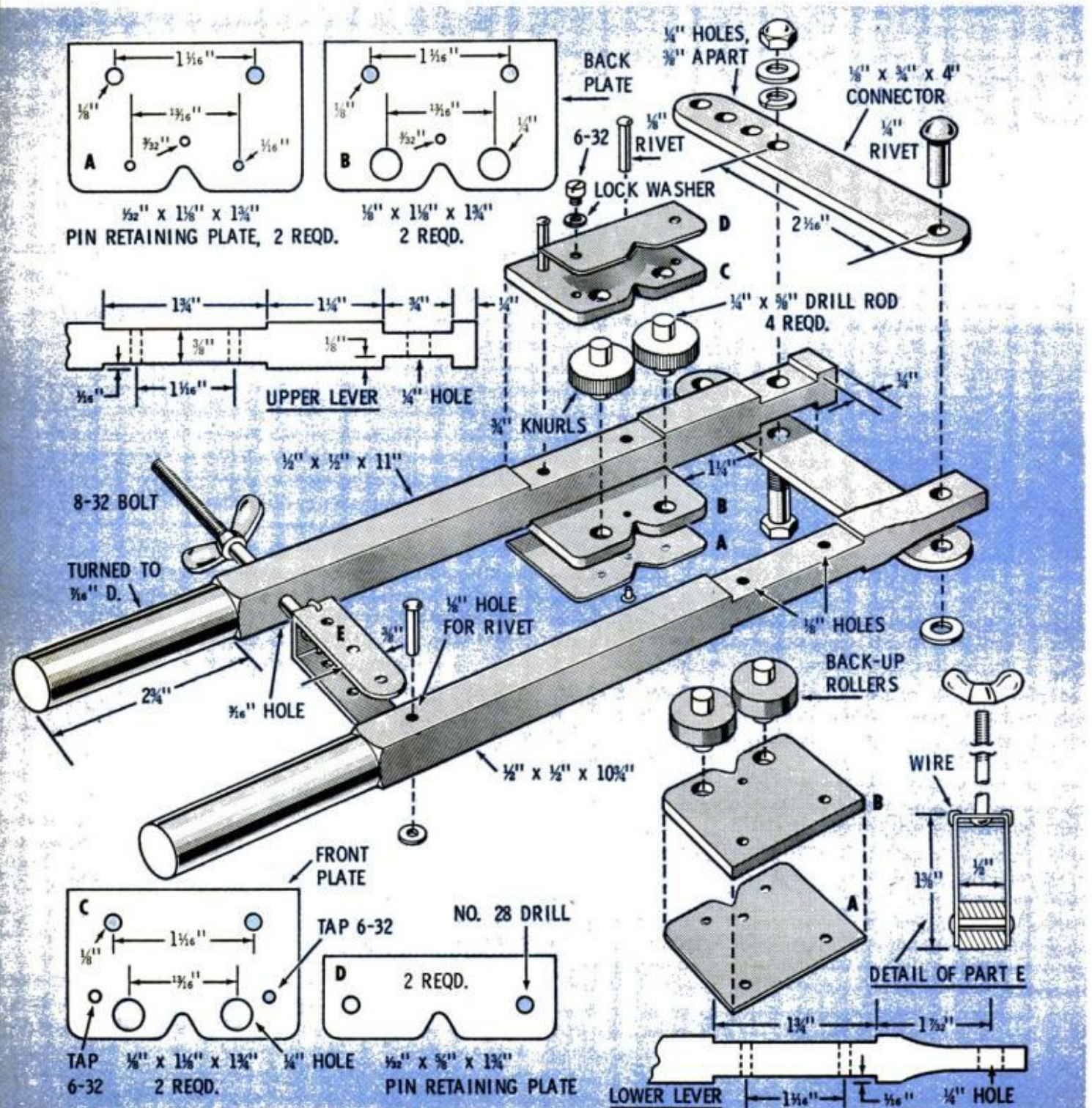




FIRST STEP in machining the levers is to turn down one end of each 1/2 in.-sq. bar to diameter of 7/16 in.

knurler is mild steel—about 24 in. of 1/2 in. x 1/2 in. bar, 9 in. of 1/8 in. x 3/4 in. strip and about 8 in. of 1/8 in. x 1 1/8 in. strip or plate. Ground flat stock can be substituted for the 1/8-in. strip, if desired.

The two levers, or arms, differ slightly in length. The upper lever is notched to produce a rigid right-angle joint between it and the two strips that connect the lever ends. You can cut both these notches and the shallower ones for the knurl-holder plates by milling, shaping, or filing. Depths of the plate recesses should be such that knurls have clearance to turn freely. For 3/8-in. knurls, you'll find 1/8-in. recesses provide sufficient clearance.



Outer ends of the levers are machined round to $\frac{1}{2}$ -in. diameter, to serve as handles. Rubber or plastic grips may be added, or pieces of plastic garden hose can be used as grips. Just heat the hose and handles before assembly with an infrared lamp or other means, so the plastic will soften and conform to the handle shape.

Two steel connector strips are pivot-joined to the lower lever with a $\frac{1}{4}$ -in. rivet. Toward the opposite end of each strip is a series of $\frac{1}{4}$ -in. holes permitting adjustment of the separation between the levers in order to accommodate various diameters of work. If you wish, slots can be used instead of a series of holes. A $\frac{1}{4}$ -in. bolt, with cap nut for a more finished appearance, fastens the connectors to the upper lever.

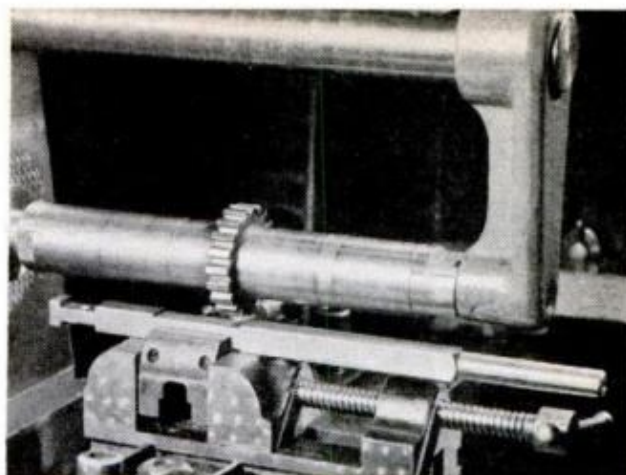
The knurl holders are pairs of $\frac{1}{8}$ -in. steel plates between which knurls or back-up rollers are installed. One pair of plates is offset along its lever (with respect to the other pair) a distance equivalent to one half the spacing between knurl centers in a pair. Thus, one knurl or roller in each holder is positioned midway between the two knurls or rollers in the other holder. Center-to-center knurl spacing in the tool shown is $1\frac{3}{16}$ in., so the offset is $1\frac{3}{32}$ in.

For convenience, plates are marked "front" and "back" on the drawing. Each plate is provided with a thin (about $\frac{1}{32}$ in.) piece whose purpose is to hold the $\frac{1}{4}$ -in. pins that serve as knurl axles in position. The cover for each back plate is the same size as the plate, and is riveted permanently to it. The front cover is only half as wide and is held by two 6-32 machine screws and lock washers, so it can be removed when knurls are to be changed.

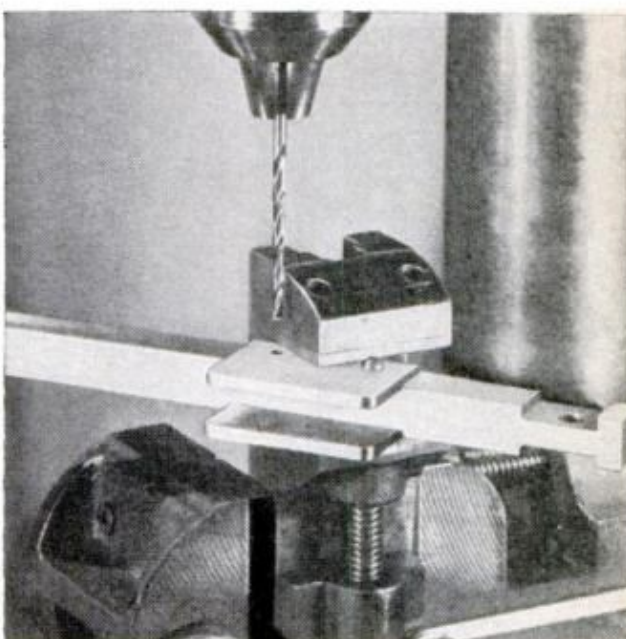
To assure alignment of knurl-pin holes, rivet the two knurl-holding plates temporarily to each lever before drilling the $\frac{1}{4}$ -in. holes for the pins. Later, rivet them permanently, with the back covers in position. Each back cover has a small hole opposite each pin end, so a punch can be used to force out stubborn pins.

The clamp screw is an arrangement for applying constant pressure other than by squeezing with the hands. The screw-and-yoke arrangement shown consists of a U-shaped steel strip pivoted to the lower lever with a 8-32 or slightly larger bolt extending from it, and passing through a hole in the upper lever. A wire through the yoke and screw-head slot prevents the screw from turning when the wing nut is turned. The $2\frac{1}{2}$ -in. bolt shown is adequate for the small- and medium-diameter work for which this particular knurler was intended. For larger work a length of 4 in. or so is desirable.

The tool holds two pairs of knurls or

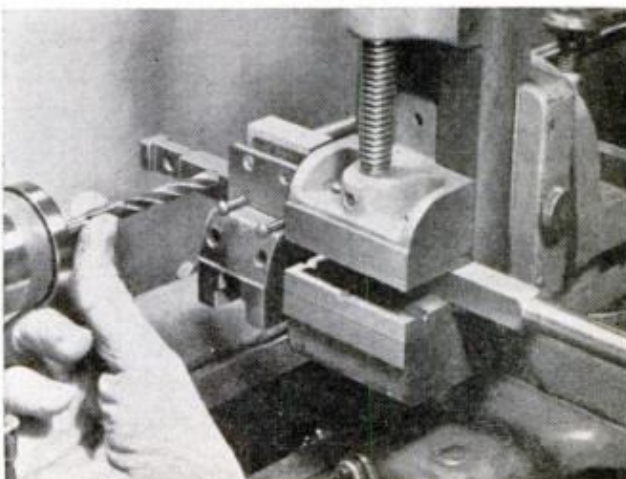


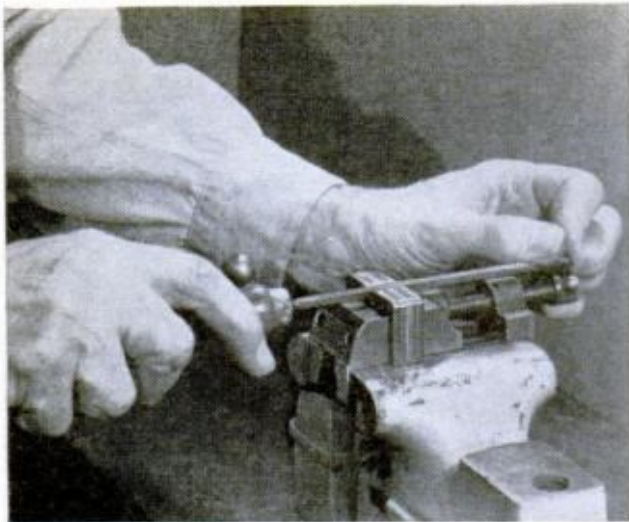
AFTER MILLING recesses for the connectors near the lever end, mill recesses for knurl-holder plates, positioning by measuring from bolt hole in each. End recesses are made $\frac{1}{8}$ in. deep, others $\frac{1}{16}$ in.



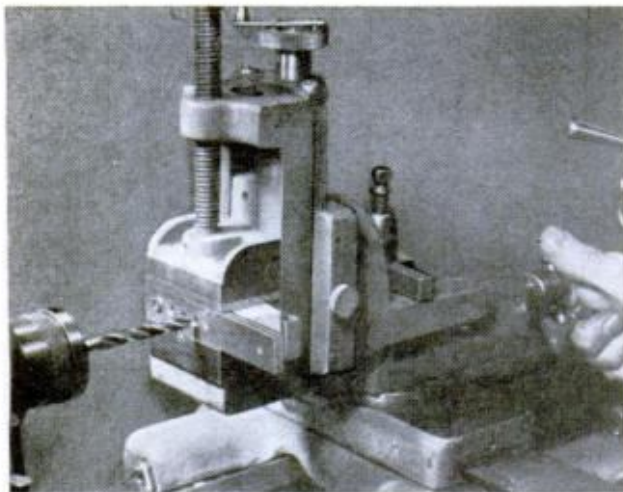
WHEN DRILLING holes for the rivets used to mount the knurler-holder plates, align the plates on the lever and drill one hole, then slip a rivet into it to hold them in place while drilling the second

HOLES FOR KNURL PINS can be drilled with the milling attachment in your lathe or on your drill press. However, positioning is slightly easier on the lathe



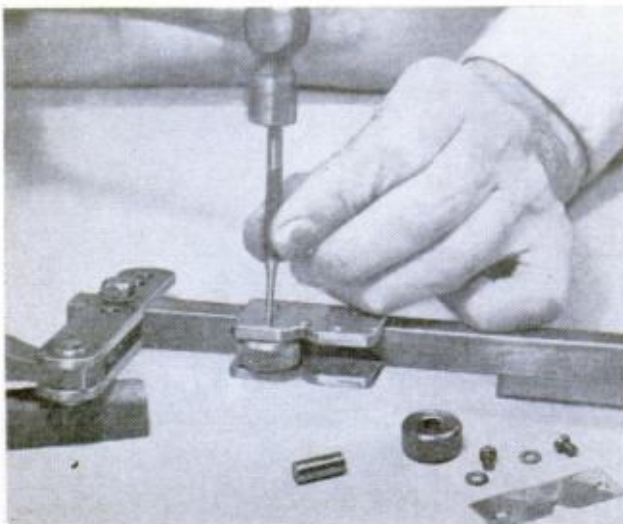


AFTER CUTTING the rounded notches in the knurl-holder plates and pin-retaining plates, stack them and clamp them in a vise for finish-filing. Once this is done, the plates can be riveted to the levers



DRILL BOTH connectors simultaneously in the milling attachment of your lathe. (While five adjustment holes are shown in this photo, it was later determined that only four holes would be required)

TO CHANGE KNURLS, remove the front pin-retaining plate and drive out the pins by inserting a punch through the holes in the rear pin-retaining plate. The same procedure is used to replace worn rollers

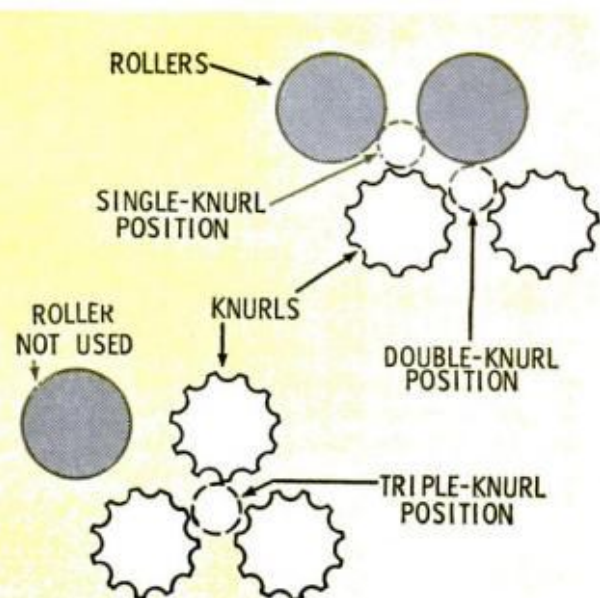


rollers. If you are using three knurls of a kind simultaneously, install two in one holder and one opposite them in the other. If you intend to use one or two knurls at a time, install two knurls in one holder and two back-up rollers in the other. Then merely switch from one position to the other, as required, for single or double-knurl patterns, as sketched below.

The back-up rollers are made of relatively soft material that will not flatten the knurled pattern as fast as it is formed. Each roller is machined to the same size as a knurl. The rollers shown were turned from a phenol-formaldehyde resin that happened to be in the shop scrap box. They have worked well with aluminum, brass and steel, and do not appear to wear away at an excessive rate. Of course, some wearing away can be expected, so it's a good idea to make up spare rollers for quick replacements. Other materials that might be used for rollers (depending somewhat on the materials to be knurled) include aluminum, various plastics and steel faced with a softer material.

Always lubricate the knurls, rollers and work, as in conventional machine knurling. Use slow speeds when knurling work on a lathe or other power tool, and steady the knurler against some fixed part of the machine or the bench. Longitudinal movement of the knurler to produce a knurler band wider than the knurl length may require considerable "push." When the work is done on a lathe, such push can be provided by the lathe carriage and toolpost.

One way to use the tool for knurling without power is to clamp the work in a vise and rotate the knurler by hand, much as you would manipulate a die stock. Another is to clamp the knurler in a vise and grasp the work piece in a chuck wrench, brace or hand drill. ★★★



Hidden Weight Locks Cistern

Many older homes and farms have old-fashioned cisterns for collecting and storing rain water, and whether these are still in use or not, there is the ever-present danger of small children removing the cover and falling inside. One way of eliminating this hazard is to suspend a pail of stones, a cement block or other heavy weight from under the cover. This hidden weight will discourage children from lifting the cistern cover.—G. E. Hendrickson

Dirty light bulbs mean dim lights, so when the bulbs used in barn or garage become dirty, wipe with a soapy cloth and dry well. Don't dunk them for this may loosen the cement holding base to glass.



Tire Swing for Tots

Designed for very young children, the modern tire swing at left was made by cutting out a discarded automobile tire and turning it inside out so that the tread formed the seat. It boasts a seat back for safety, plus plenty of places for small hands to hang on tight. Cutting will be a great deal easier if you use a razor-sharp knife which has been heated. Ideally, you should alternate cutting with two knives, so that one can be heating while the other is in use. A hot, sharp blade will cut through the heaviest tire, but be careful about overheating, for this can ruin the knife.

—Ben Brown

NEXT MONTH IN SHOP AND CRAFTS

- ★ **TREE HOUSES.** Summer is almost here, and as far as most kids are concerned, that means tree-climbing time. Next month PM brings you plans for a bevy of tree-top retreats that will delight any youngster. For those who don't have a shady elm in the back yard, we're also including a number of "pole houses"—sturdy little cabins that sit high above the ground on stilts, like a ranger's lookout tower. You'll find them all in the June issue
- ★ **SEPTIC-TANK CARE.** Few homeowners give much thought to their septic systems until something goes wrong, and then they find it hard to think of anything else. If you want to know the complete story on how a septic system works and what you can do to avoid problems with it, pick up a copy of the June PM. It debunks many myths about clogging and killing bacteria, but also include warnings on little-known sources of trouble. Don't miss it
- ★ **PATIO LOUNGER.** A rugged piece of outdoor furniture, this easy-to-build unit consists of two lazy-living seats with a roomy table between, all built into a long lounge frame with wheels at one end for moving it around the patio. Whether you add the optional sun umbrella or not, it's sure to enhance your enjoyment of outdoor living this summer
- ★ **FEATHERWEIGHT KAYAK.** An Eskimo might take issue with us about that name, but it's the best word we can find to describe this little 24-lb. boat. Carved from a single block of foam mounted on a plywood bottom, it's virtually unsinkable. You can "build" this lightweight for about \$36 by following the plans which will appear in next month's issue of PM

Troubleshooting Your

When that warning light flashes on and your engine's healthy whine drops off to a complaining drone, you're in trouble. But whether it's pump trouble or a bad thermostat, chances are you can fix it yourself

By Henry B. Notrom

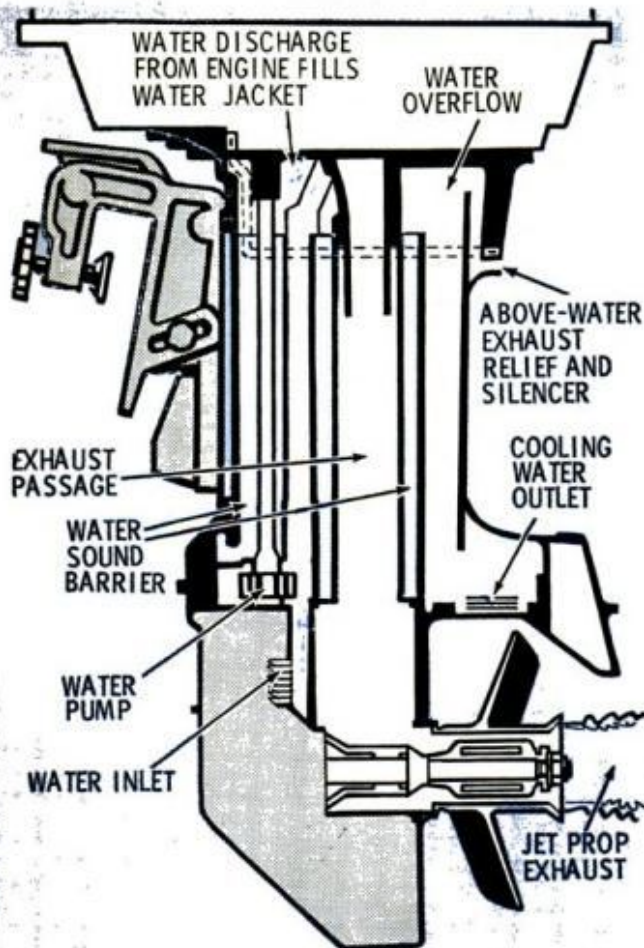
OUTBOARD ENGINE overheating is a widespread problem," according to Tom Smith of Vansen Boats, Inc., Plainfield, N.J. Basing this statement on the number of motors that turn up in his shop with problems caused by overheating, he adds the encouraging information that, "In most cases, the man who owns a water-cooled motor can handle cooling-system repairs himself."

This advice from a pro brings up two important questions: (1) How can you tell if your engine is overheating or on the verge of overheating; (2) What causes overheating and how can you pinpoint the trouble.

The first one's easy. Many engines have warning lights which flash the news that your engine's running too hot. All, however, have a cooling system outlet, usually located somewhere in the upper case, and the water that cools your engine should be coming from these holes if the system is functioning properly.

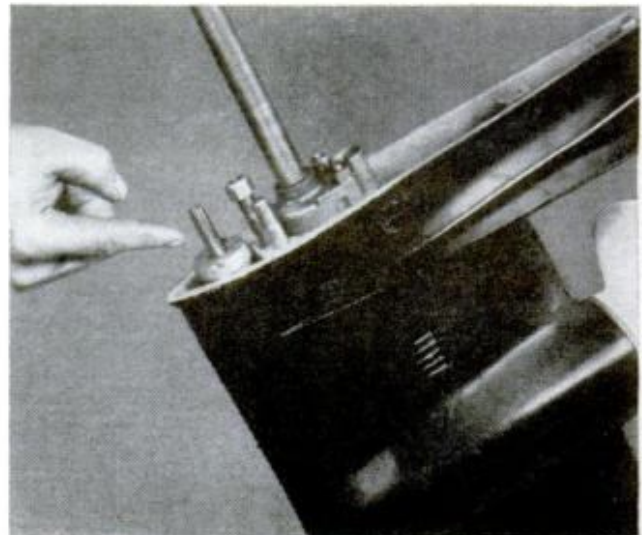
Another foolproof indicator is the sound of the engine. An engine that's overheating will begin to run slower, and this dropoff in rpm resembles the sound of slowly throttling back.

As soon as there's any indication of pos-



WATER JACKET surrounds exhaust passage on the '65 Mercs, above, acting as noise suppressor. After unbolting lower unit, below, slide it off the motor

SHIFT LINKAGE on Mercs is spring-loaded and must be locked in forward gear before lower unit is removed. Otherwise, you'll run into problems later



Outboard's Cooling System

sible overheating, *cut your engine*. Tilt the lower unit out of the water and check the water intake for seaweed or other obstructions, such as plastic bags (that people persist in throwing overboard). Clear the obstruction, re-start the engine and check the cooling-system outlet holes. If water's squirting out, you've solved the problem.

It's possible that in tilting the engine up out of the water, an obstruction may fall off before you see it. This could be misleading, so make sure you check the outlet holes after re-starting.

If the engine still shows signs of overheating, cut it and begin rowing. Never chance running an engine like this—it'll burn up in quick time.

"Ninety percent of the time," Smith claims, "overheating troubles are caused by a bad water impeller. However, there are other things that should be checked before ripping down the lower unit." As other possible causes, he includes engine timing that's too far advanced, improper fuel mixture and, in those engines that have them, a faulty thermostat.

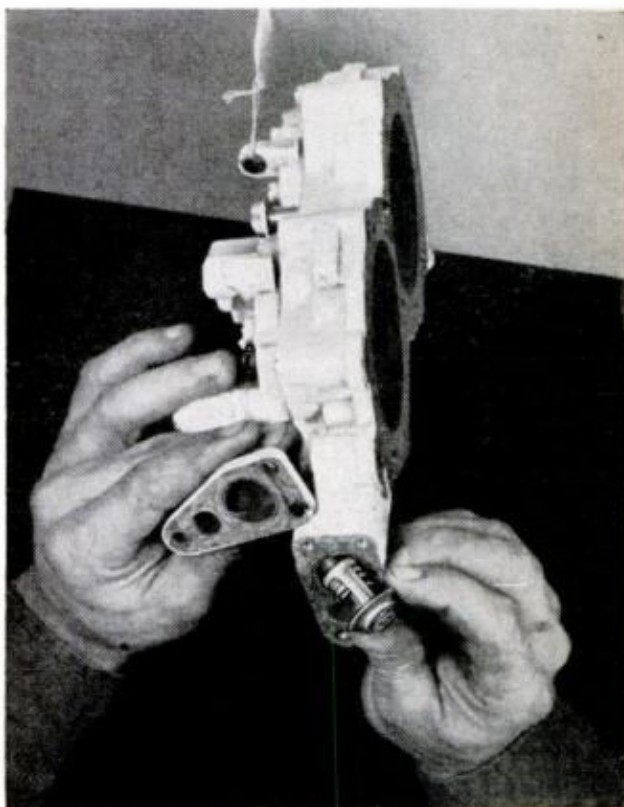
Timing is probably the least common cause of overheating, and while checking it isn't really difficult, a description of what is involved would require too much space to be included here. As for the fuel mixture, so much has been written on this that the only thing to do is to repeat those two old precautions: *measure* the oil to make sure you have the proper oil-gas proportions, and *mix it thoroughly*.

A bad thermostat, though, is easy to pinpoint. Simply remove the thermostat housing that sits on top of the head, remove the thermostat, rebolt the housing to the head and start the engine (in the water, of course). If a bad thermostat was preventing circulation, water will now circulate and come out the outlet holes. If that's the case, put in a new thermostat.

Failing all else, the water pump will have to be looked at, and chances are, replaced. Cost of a new pump, by the way, runs from about \$2 to \$4, depending on the motor.

Replacing the water pump isn't difficult if it's mounted on top of the lower unit, which is the set-up in most engines. Those engines that have the pump further up in the exhaust housing should not be tackled by anyone other than a qualified serviceman. This takes special tools and requires resetting the bearings.

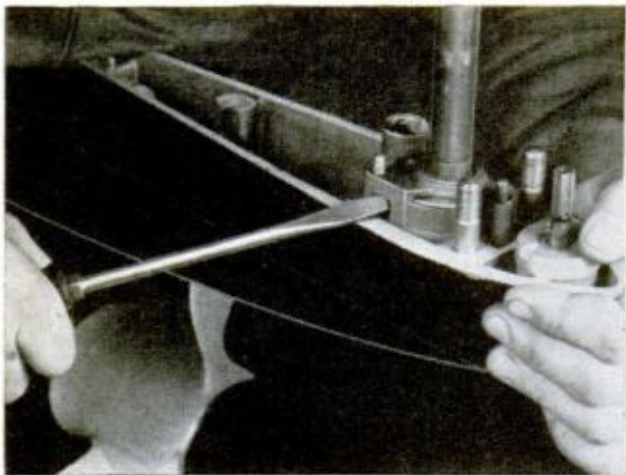
To begin the job, remove all nuts and



THERMOSTAT is located in the head and relatively easy to remove for checking. Evinrudes and Johnsons are equipped with thermostats, though Mercs aren't

SHIFT ROD mechanism on this Gale is located under a cover plate on the housing. You'll have to loosen this before lower unit can be removed from motor





IN ORDER TO CHECK the condition of the impeller, you must take off the housing which covers it. If the nuts are frozen, use penetrating oil and heat

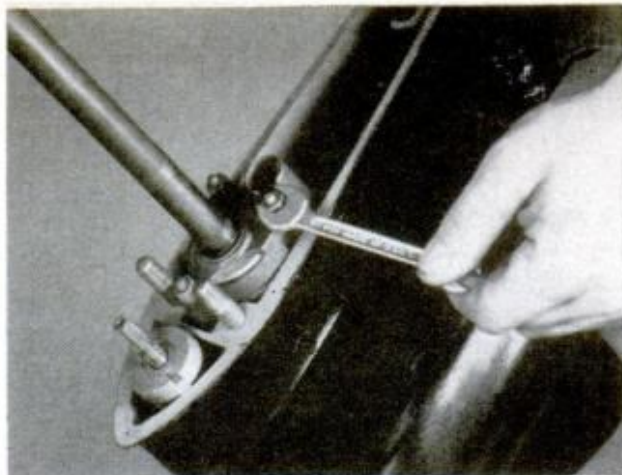
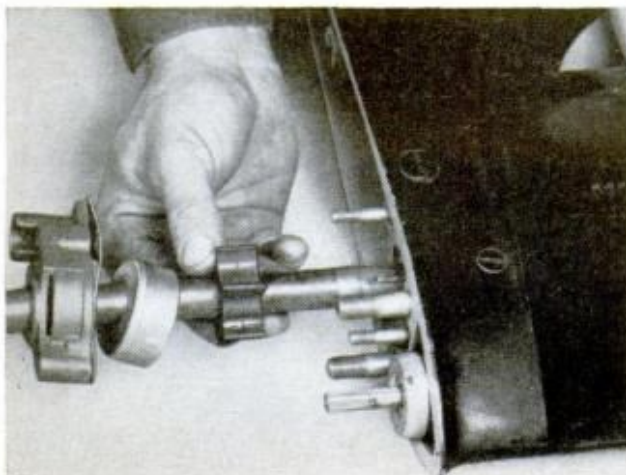
bolts that hold the lower unit in place. (The number and location of these vary from engine to engine.)

If you have a Mercury engine, the shift lever should be moved to the forward gear before disengaging the lower unit. This is a spring-loaded shift set-up. By keeping the shift in a forward gear, the linkage located in the lower unit and the entire shift mechanism will be locked in place and won't move unless you accidentally trip it. This'll make it easy to reassemble when you're done, since all you have to do is slip the lower unit back into position to make everything mesh.

If the shift is in any other position, the spring can slip and mess up the linkage position. You'll then have a job of repositioning the linkage to get it aligned for remating with the shift mechanism.

Shift position doesn't matter with most other engines since these have a shift-rod setup. However, you must disconnect the lower shift rod before you can drop the lower unit. To do this, locate the cover plate on the exhaust housing and remove

SLIP IMPELLER up the shaft to make inspection easier. When replacing it, make sure that the slotted bushing inside mates to the flange located on the shaft



ONCE YOU'VE REMOVED nuts holding housing, there's a good chance you'll have to pry up the impeller cover since it will probably bind in place

it. With some engines you'll have another cover plate beneath the top one. If you do, remove that, too.

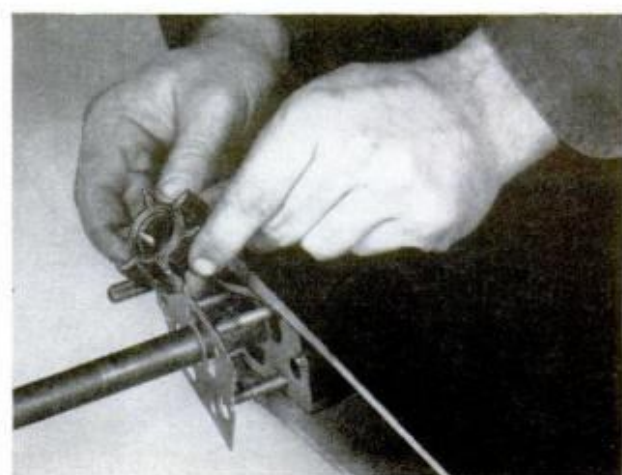
You'll see two bolts which connect the lower shift rod to the upper. All you're concerned with is the lower bolt. Loosen it until the lower shift rod drops in order to remove the lower unit. When it comes time to reassemble the unit, make sure the lower rod is butted firmly against the upper, and the holding bolt is tight.

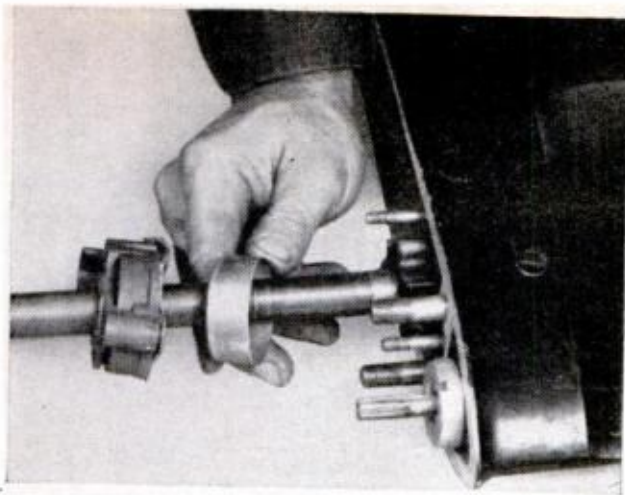
Once you've removed the lower unit, take it over to the workbench and remove the screws of the water pump housing. These screws might bind and refuse to turn, especially if the engine's been used in salt water, but don't force them because they can snap off. Instead, use heat and penetrating oil to loosen them up.

Run the flame from a propane torch over the bolts and squirt some penetrating oil in around the threads, then try to loosen them. If they don't loosen on the first try, repeat the heat and oil treatment.

With the bolts off the housing, chances are you'll have to pry up on the impeller

IMPELLER BLADES are made of synthetic rubber. They should be firm and straight for top efficiency. If you discover that blades are bent, replace impeller





SLIDE HOUSING and water impeller cover up the shaft away from the impeller and check the cover over carefully for wear or pitting on inner surfaces

cover to get it off since it tends to stick.

Once the impeller is exposed, inspect its blades. These have to be perfectly straight, but in time they may bend (they're made of synthetic rubber) and give rise to cooling troubles, such bends come about because of the movement of the impeller against its cover as the impeller spins to cool your engine.

Then slide the impeller off and inspect the impeller plate beneath. This seldom gets damaged, but if it looks worn or pitted, replace it. To reassemble, slide the impeller back on the shaft and into position. The bushing inside the impeller is slotted, so fit this slot over the small flange on the shaft to firmly seat the part.

Check the impeller cover before installing it, and if it's worn or pitted inside, replace it. Also, it's always a good idea to replace old gaskets with new ones.

There's one other spot that could be the cause of engine overheating, but only if the engine's been running in salt water. It would be wise to check the rubber grommet inside the water tube housing and the housing itself.

Every engine has at least two of these housings, equipped with grommets. They're located in the lower unit, on or adjacent to the water pump. However, in every engine, at least one is located in the upper unit. Fortunately, the ones in the lower unit go bad more frequently than their counterparts above.

We say "fortunately," because if the one in the upper unit is damaged, it means the engine will have to be torn down to get at it. This is not a job for the average outboard owner, and the only way to tell positively whether the upper unit water-tube jacket's causing the problem is to run the engine after you've repaired the water pump. If the engine still overheats, your next stop is a service shop. ★★ ★

MAY 1965

Outboard Clinic

Q My 1963 Mercury Model 110 suddenly developed a case of misfire that I've not been able to track down. Has anyone else complained of this?—L.T., Wisconsin

A There's been a new coil issued by the manufacturer to replace the old one which had a way of causing misfiring, and other ignition problems. The new coil (part number A-398-2545A1) is to go on 1963 and 1964 Models 39, 60, 110, 200 and 350, and the job is outlined in Service Bulletin 4, Section IV, dated September 18, 1964. The work isn't particularly difficult, but can't be tackled without the instructions in the service bulletin. This should dissuade you from bringing the engine to your dealer, though, since the work's to be done on a no-charge basis, according to the service bulletin.

Q My Johnson 1960 75 seems awfully hard to steer. Since I'm a new outboard owner (I just bought this engine used), can you give me a hint?—J.S., Maine

A If your problem's caused by running the engine in the wrong tilt position or improper trimming of the boat, I'm not going to be able to help you. Due to space limitations, this column must be limited to engine problems only, rather than those concerning hulls, trim or general boating. However, there was an engineering change issued by the company for this model that had to do with steering. It seems that the original exhaust outlet was so long that it impeded handling. A new outlet, much trimmer, was issued and proved to solve a lot of problems. But let it be understood that not even the new outlet will help unless tilt position and trim are correct.

As a service to the readers of *POPULAR MECHANICS* in solving problems relating to their outboard engines, you are invited to submit your questions to this column. All questions will be answered, either in the column or by mail. Address Outboard Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York, New York 10022 and enclose a 5-cent stamp.

Get All the Channels— Erect a Fringe-Area Antenna

Tired of poor TV reception and stopped by the new antenna's price? Do it yourself. It's not easy, but think of those bright new pictures

By Larry Steckler

TIRED OF SNOWDRIFTS obscuring your TV pictures? Annoyed with ghosts chasing each other across the screen? Suffering with weak and pale hard-to-watch viewing? Chances are you need a new roof antenna to put an end to these problems and bring back those stations you haven't been able to enjoy lately.

If you're more than 50 miles from the nearest TV transmitter, a simple antenna just won't do. For good reception you need a really sensitive highly-directive antenna mounted on a tall mast.

We tackled this problem recently at a summer home in Southampton, Long Island, about 100 miles from New York City in a relatively difficult reception area. Our solution was to erect a high-gain super

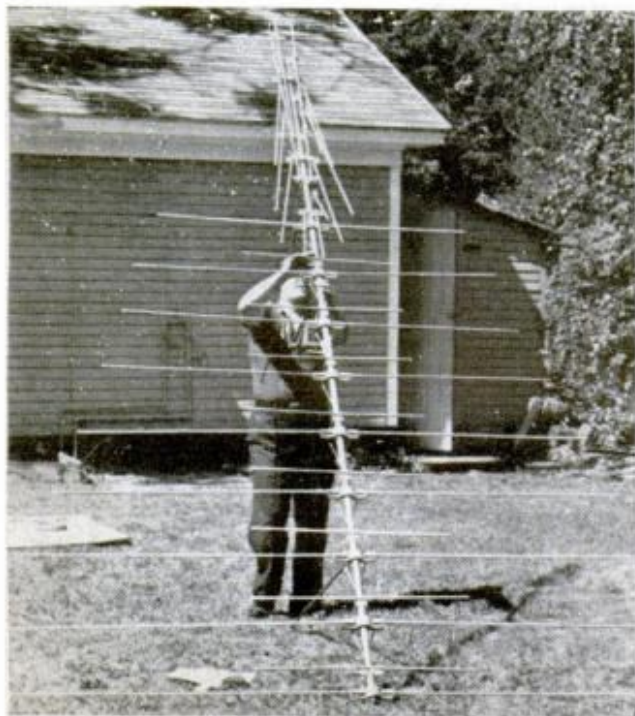
directional antenna atop a 20-foot mast attached to a sloping roof some 32 feet above the ground. This gave us an actual antenna height of more than 50 feet.

First steps called for selecting an antenna and mounting hardware. We chose a Channel-Master Crossfire for the antenna and a combination of mounting hardware that included a two-section 20-foot mast, tripod mount and base mount, ground rod, standoff insulators, lightning arrester, turnbuckles, guy wire, ground wire and lead-in wire.

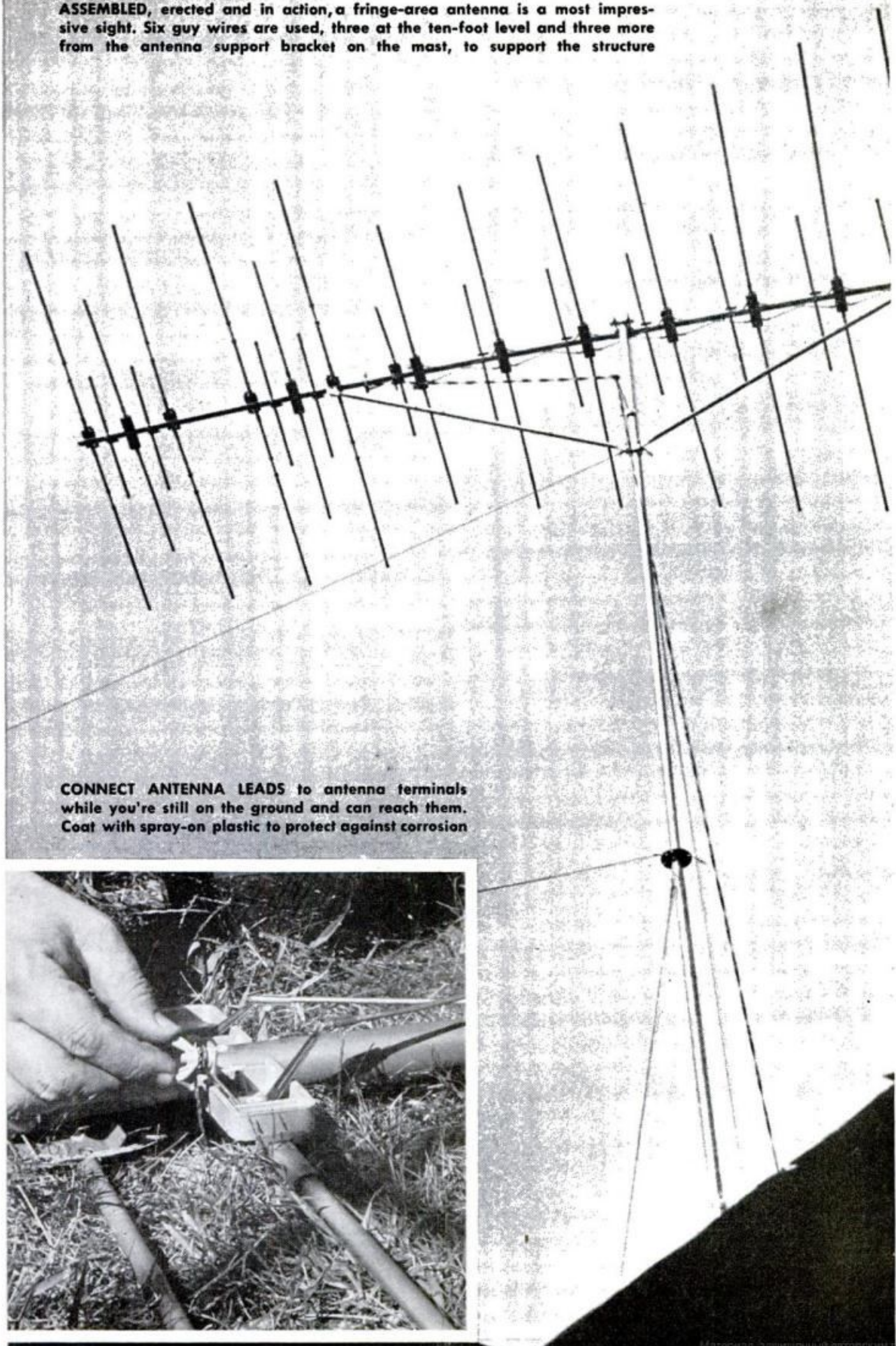
Our choice of mounting hardware was predicated by the location. Normally either the tripod mount or the base mount would be used to hold the mast in place. But because of the possibility of high winds we

UNFOLDING THE ANTENNA is a fast and reasonably easy task. Make sure all antenna elements are firmly locked open and straight. If possible, do this on roof

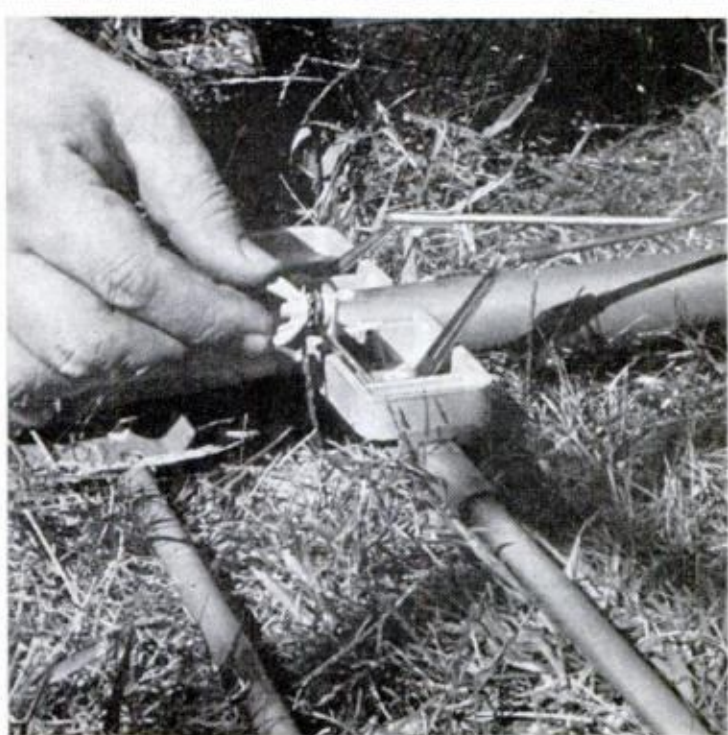
GUY WIRES must be attached firmly so they will not slip and loosen at any time after the antenna is installed. Don't be afraid to put a real test load on them



ASSEMBLED, erected and in action, a fringe-area antenna is a most impressive sight. Six guy wires are used, three at the ten-foot level and three more from the antenna support bracket on the mast, to support the structure

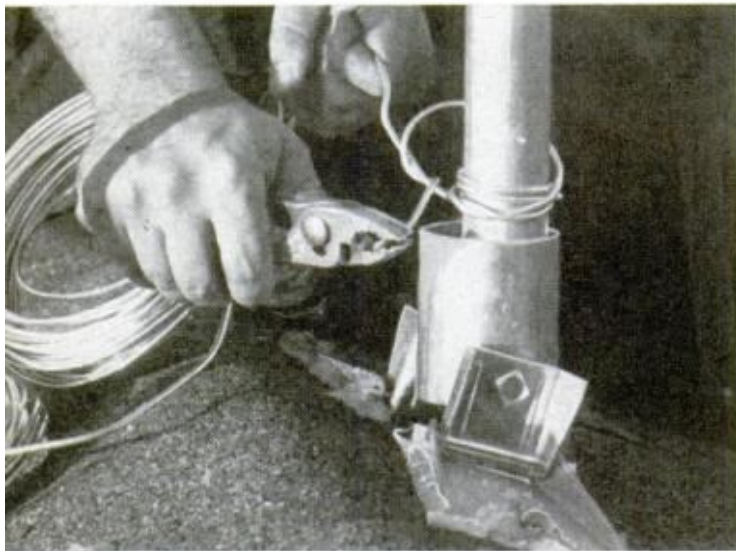


CONNECT ANTENNA LEADS to antenna terminals while you're still on the ground and can reach them. Coat with spray-on plastic to protect against corrosion



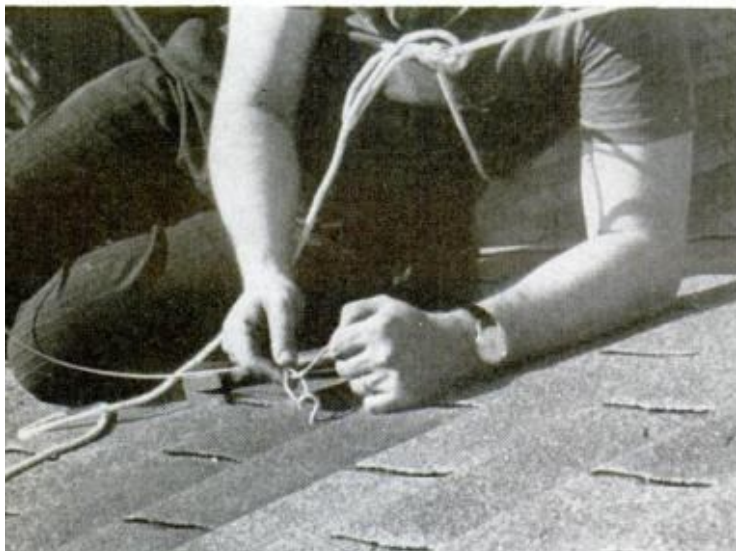


START MOUNTING BOLTS with a hammer. Be sure they are going into the rafters for a firm solid grip. Cover with silicone rubber or tar to prevent leaks



THE GROUND WIRE must be firmly attached to the antenna mast. Wrap several turns of wire around the mast and tie carefully. Other end goes to ground rod

ROOF ENDS of the guy wires are fastened to eye hooks screwed into the roof. Tie firmly. Later all slack will be taken up evenly with turnbuckles



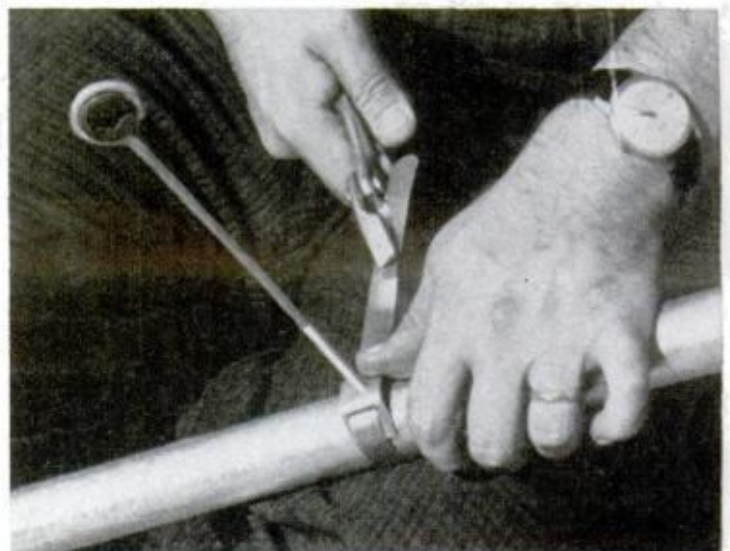
used both. A hurricane which hit just a few months later proved us right. Our installation held while many others in the area tumbled before the high winds.

We took as many basic steps as possible while still on the ground. The sloped roof would have made opening the antenna and hooking up guy wires rather difficult. If a flat roof had been the work area, all this would have been done on the roof. First we laid out all the parts, cut guy wires to size and tied one end of each guy wire to the appropriate ring on the antenna mast. Next we folded the antenna open and attached it to the mast. Then lead-in wire was connected to the antenna terminals and run through the standoffs we mounted on the mast.

Next it was time to climb the extension ladder to the roof to make our basic preparations there. We picked a site atop the roof peak and selected positions for the antenna mounts and guy wire tiedowns. The trick here is to make sure that the mounting screws go into something solid so they won't pull loose later. This means you have to locate the roof rafters. Also, once you make a hole in that roof you must seal it up after the screw or whatever has been put into place. If you don't, you'll be looking at water stains on your ceilings after the first good rain. The easy way to do this is with a tube of silicone rubber. Just make sure you use enough to completely surround every screw or eye.

Once the antenna mounting brackets were fastened in place with lag screws, it was time to haul the antenna up on the roof. When handling an assembled antenna you can't be too careful. It's clumsy and slow work. Two men can make quick work of the job, however, if one guides the an-

STRAP-MOUNTED MAST STANDOFFS must be tight so they cannot slip after the installation is complete. This type standoff is preferred over snap-on types



tenna around obstructions with a line tied to the mast and handled from the ground while another man pulls the antenna up.

When working with rooftop antennas, watch out for nearby electric cables. More than one antenna installer has been fatally injured when the antenna contacted a nearby live line.

With the antenna on the roof we extended the mast to its full length. Then we tied down one guy wire from the top mast section. Pick the side that faces into the prevailing wind. This will hold the antenna in place while you get to the other guys, and tie the antenna down properly. We used guy wires at two levels on the mast. There are three guys at each level separated by 120 degrees. This gives uniform support. Always set one guy to face into the prevailing winds—the direction the wind most commonly comes from—to provide maximum support. In an area subject to extremes of wind, snow and ice you may need six guys at each level.

Now we were ready to raise the antenna and insert it into the tripod mount. This again was a two-man job to keep the antenna from falling. With the mast in the mount, we then tied down the remaining guy wires. Using the turnbuckles, all the lines were tightened evenly. You can check this by watching the mast. It should remain straight and vertical.

Once the antenna was in place we attached the remaining standoff to the mast and ran the lead-in wire through it. Then came the lightning arrester which is fastened to the mast by its mounting strap. The lead-in runs through it too. Should lightning strike the antenna, the arrester will prevent the bolt of electricity from following the lead-in down to your set and

possibly doing extensive damage. The arrester grounds to the mast, so we used our length of ground wire to connect the mast to a 10-foot copper ground post.

Some readers may question our use of flat ribbon-type lead-in. But as we were in a quiet, relatively noise-free (electrical noise) area it was possible.

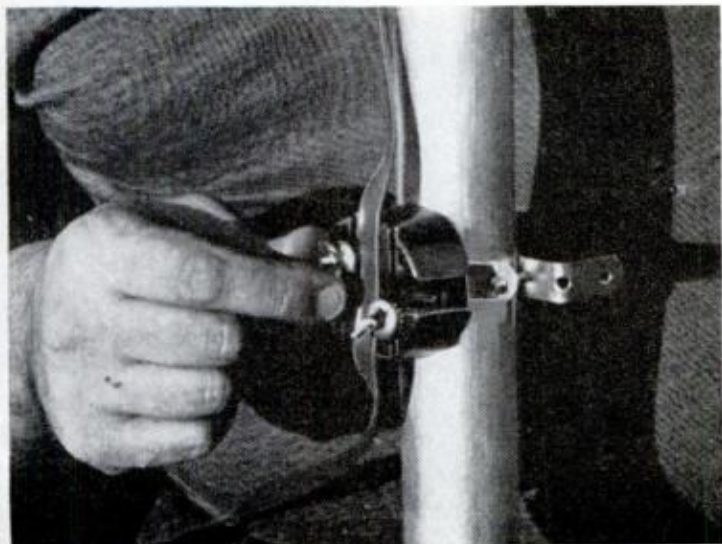
All that was left was to run the lead-in down the side of the house to the set and hook it up to the antenna terminals. Then final alignment adjustments were made by turning the antenna for the best pictures on all channels. A handy way to simplify this procedure is to use a portable TV in the yard where you can see it while rotating the antenna. If you've got a battery-powered TV, it can go right up on the roof with you. If you can't bring the TV out of the house, a "people chain" or CB radio can be used to relay instructions to the person rotating the mast.

In extreme fringe areas there are several accessories that can be added to the installation to make good reception possible. For example, in many areas you will want to receive TV programs that are originating from different cities located in different directions from your antenna site. An antenna rotator is the best bet here.

In some locations you may be too far from the TV station to get anything but snowy reception no matter what antenna you use. For greater sensitivity and less snow you can add a booster that will amplify the signal being received by your antenna to improve the picture.

Remember, no two antenna installations are exactly the same, but the general rules we have spelled out and the installation described here are typical and can be used as a guide for most installations. ★★

LEAD-IN runs through the lightning arrester. Make sure arrester contacts cut through the insulation and contact the wire or you will not be protected



COPPER GROUND ROD is hammered into the ground. Use the clamp on the rod to fasten the ground wire from antenna mast in place to complete grounding



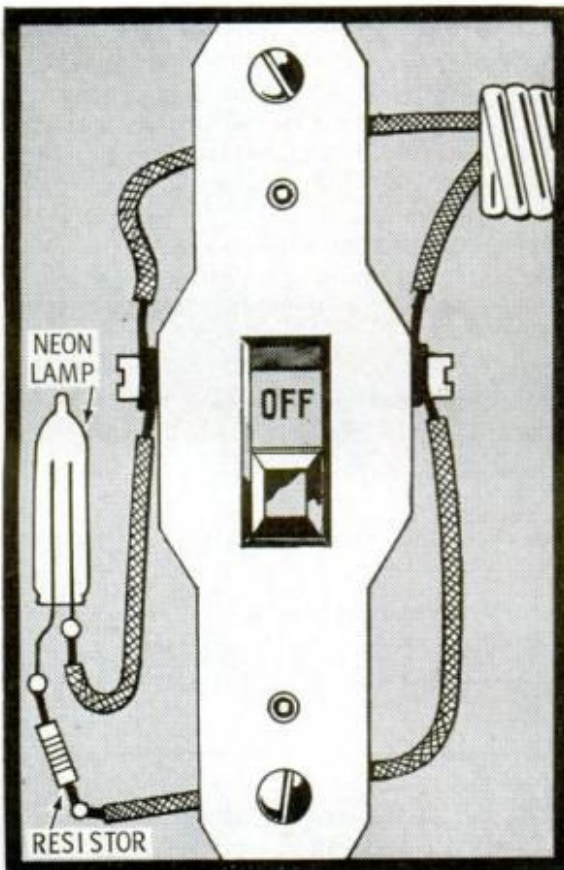
A THIRD HAND FOR YOUR SOLDERING GUN can be handy whenever you're caught up in a tricky soldering job which has both your hands filled before you even reach for the "gun". You can make a third hand that will keep your soldering gun hot out of a piece of 14-gauge wire. Bend it into a clamp that fits over the handle and trigger as shown in the photograph. If your gun has only one heat, your clamp won't need the second step shown.—Bruce Trump



Electronic Kinks



RESISTIVE LOAD TO TEST YOUR CB RIG can be made from a few odds and ends. A right-angle coaxial connector and seven 1-watt carbon resistors are all you need. The group of resistors are connected in parallel from the skinned back inner conductor to shell of connector. End result is a 7-watt dummy load with a resistance of about 52 ohms. In use they won't get warm even after several minutes of testing.—Elmer C. Carlson



ADD A LIGHT TO YOUR LIGHT SWITCHES and stop groping around in the dark. Connect an NE-2 neon bulb in parallel with the switch. Connect a 200,000-ohm $\frac{1}{4}$ -watt resistor in series with one of the bulb leads. Insulate all leads with tape. If the wall plate is plastic the glow can be seen through it. If the plate is metal drill a small hole and insert a small plastic jewel. When the switch is off, the lamp lights.—Henry R. Rosenblatt



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EXCLUSIVE OFFER— Save up to \$3.00 on a set of Classic 7 Cars "Matchbox" Series—Models of Yesteryear. See the Du Pont display and money-saving coupon where No. "7" products are sold.

More Luxury for Campers

(Continued from page 120)

of water rides above the car-topper, being warmed by the sun during the day. Tubular steel supports swing out from the sleeper to accommodate the canvas curtain and support the tank when in use. The Jiffy Port-a-Bath is a body brush that controls the gravity-flow of water from a storage tank above the bather. A large rubber mat catches all the water for tidy disposal. Only three quarts are required for a complete bath.

As the outdoor luxuries increase, so does the number of campers. There are about 7500 developed public and private campgrounds in the United States, but for



BEING PRIMED FOR STARTING, a new Coleman catalytic heater will maintain constant heat without fumes at below-freezing temperatures for 14 hours on 3 quarts of naphtha, white gas or a special fuel

the more popular areas such as Yellowstone or Yosemite you have to arrive early in the morning to avoid the "no vacancy" sign. To accommodate as many camping families as possible, the campsites in most national parks have been drastically cut in size, often jamming as many as 600 camps in an area planned for 300. There is constant expansion on both the state and federal level, but it is estimated that in five years 30 million Americans will be transporting the indoors to the outdoors.

The equipment has changed since the camping days of the famous foursome, but Edison would still have trouble finding thinking room. ★ ★ ★

**Looking for a truly efficient
big outboard, one that thrives
in fresh or salt water
and even shifts for itself?**

**This is it. The carefree, new 90 hp
Golden Meteor II (a Johnson, of course!)**



The new Golden Meteor II, with its new, straight-through induction system and 4-barrel carburetion, burns no more fuel than engines with significantly less horsepower.

Other members of the famous Johnson V-4 family include the two V-75 models (Electric and Electramatic) and the economical Electric V-60. Both the Electric V-75 and V-60 are available with a special high-thrust lower gear case for heavy loads.

Exclusive Electramatic Drive! This new electromagnetic transmission is standard equipment on the V-90, and on one V-75 and one 40. It shifts electrically, works automatically as you move the

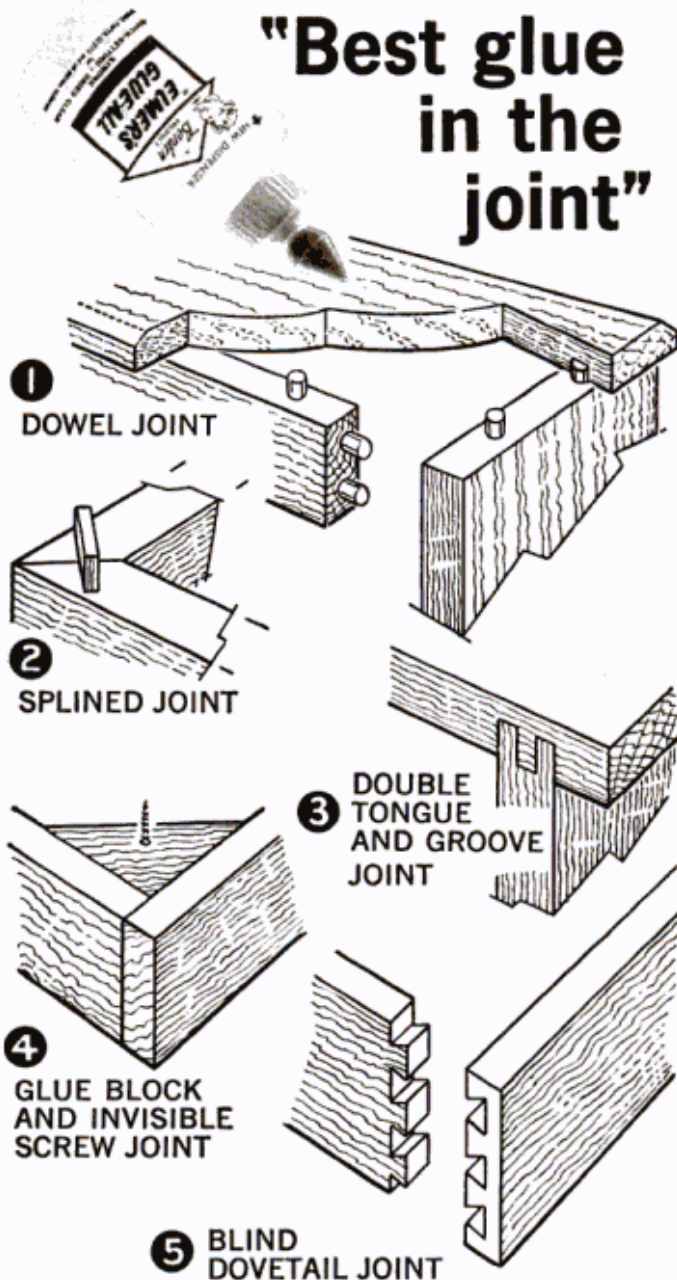
throttle forward or back—control comes with motor at no extra cost.

2-year warranty on every '65 Sea-Horse! All 17 new Johnsons, from 3 to 90 hp, are backed by a 2-year warranty*. All are quiet. All use a new 50:1 gas-oil mix to halve oil costs and lengthen engine life importantly. For the right engine to fit your needs, see your Johnson dealer. He's in the Yellow Pages. Johnson Motors, 1932 Pershing Rd., Waukegan, Ill. Div. Outboard Marine Corp. In Canada: Johnson Motors, Peterborough, Ont.

*For 24 months after purchase, Johnson will replace, without cost to the original purchaser, any part of its manufacture which upon inspection proves to have failed in normal use due to faulty material or workmanship.

Another carefree *Johnson* ... first in dependability 

"Best glue in the joint"



Fine furniture joints, like the five above, combine strong mechanical interlocks with maximum gluing areas. To give your woodworking projects even greater strength, use the best glue in the joint. That's ELMER'S GLUE-ALL—the versatile, clear-drying adhesive that comes in a convenient squeeze bottle with a non-clog dispenser top. To learn more about the many uses of this fine product—and those of ELMER'S other top-drawer glues—send us a stamped, self-addressed envelope, and ask for your free copy of "Elmer's Wood-Gluing Handbook": The Borden Chemical Company, 350 Madison Avenue, New York, N. Y. 10017.



One-Year Test of Corfam Shoes

(Continued from page 95)

that the same thing happens with leather.

Besides, if you're in the habit of stopping in at a bootblack's, you could save some money. Some businessmen get a shine every day. But even figuring every two and a half days—the frequency with which the cordovans shown with this article were polished—and at an average cost of 25 cents for a commercial shine, you would save about \$35 a year.

If you're wondering what really accounts for Corfam's virtues, you won't learn much from the maker, that chemical giant, DuPont. Corfam is pretty much top-secret. Officials describe it as a "poromeric shoe upper material." Poromeric is a combination of "porous" and "polymer," which at least tells us it's a plastic.

After the plastic is formed, it is made into a sheet. Within the sheet, tiny plastic fibers are interlaced in complex patterns. The basic stock is gray and has a feel similar to that of a felt hat. One side of the material is still that way when it comes to the shoe manufacturer. The other side is smooth and glossy (except for a suede shoe) and has color. In other words, it looks pretty much like shoe leather.

But Corfam has a built-in finish. And it doesn't soften in water, change color or lose its shape. These qualities make it ideal for certain types of shoes. At least one manufacturer has come out with a golf shoe that keeps your feet perfectly dry even though you've tramped through miles of grass heavy with morning dew.

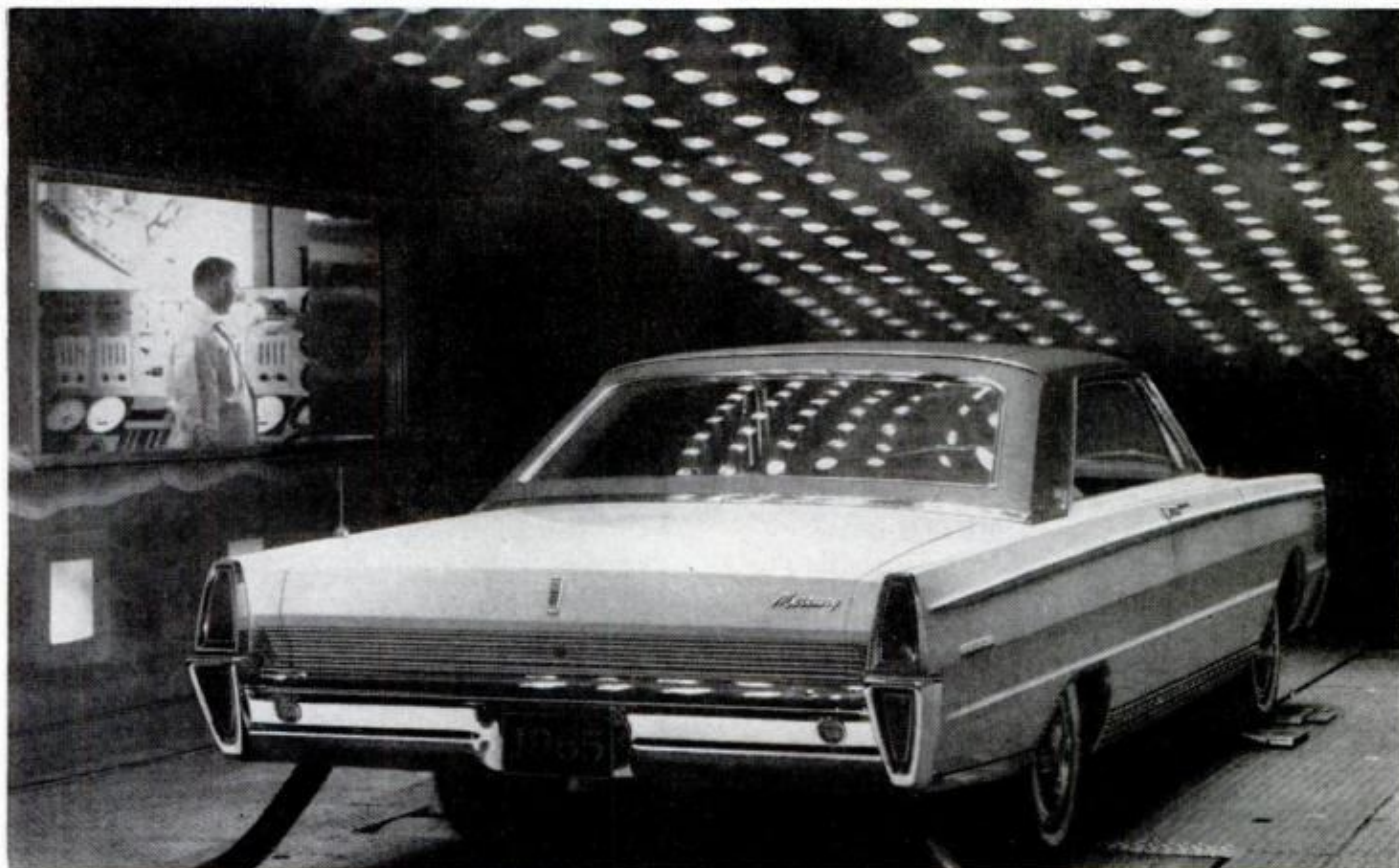
But it's a rare "miracle" product that doesn't have at least one flaw. Corfam is no exception. It is so darn good at retaining its shape that it doesn't give or stretch. When you put on a Corfam shoe in the morning, it feels just about the way it did the day you bought it. In a few minutes, it will give slightly under the warm pressure of your foot—but not much. *In buying a pair, you must be sure that the shoes fit your feet exactly. Corfam shoes won't "break in" as leather shoes do.*

Finally, the sixty-four-dollar question: Would I buy another pair of Corfam shoes? The answer is yes. I think that's the only way I can keep my soccer-playing son properly shod. ★★★

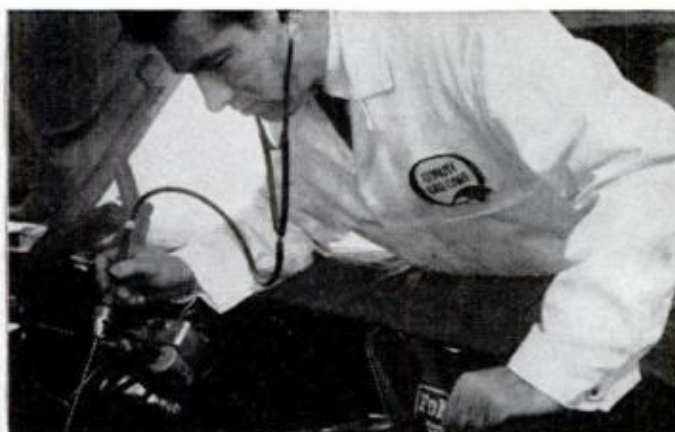
As though the "house" didn't have enough going for it already, an electronic device has been developed for a Las Vegas casino that keeps a running account of the intake and payout of a group of slot machines—up to 1000 at a time. Gamblers, it seems, don't leave anything to chance.

Engine runs smoothly in desert heat! This test proves quality of the cooling and air-conditioning

systems in Ford Motor Company cars. Keep the quality in your Ford-built car with Quality Car Care.



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RIDE WALT DISNEY'S MAGIC SKYWAY AT THE FORD MOTOR COMPANY PAVILION, NEW YORK WORLD'S FAIR

Structurally Sound House

(Continued from page 114)

If you see any of these faults, check the foundation for large cracks, or a possible gap where any two foundation walls meet. Also, hold a builder's level to the foundation walls to see if any are badly out of plumb. If it's a brick house, go outside and look for cracks in the exterior walls, especially over windows.

In evaluating a settlement problem, if you like the house, call in an engineer or contractor. He can tell you whether the settlement has ceased.

Watch Out for Water

Which brings us to a very common problem in old houses: water. The logical time to ferret out roof leaks and unwanted basement water is while looking for the structural flaws already mentioned. Signs of dampness on the rafters or underside of the roof sheathing may indicate repairs are needed on the chimney flashing, or the roof. Worse still, a new roof might be needed. Another sign would be peeling paint or water-stained ceilings and walls, even on the ground floor. At any of these signs, go outside and look at the condition of the roof shingles. Then ask the owner how old the roof is and what weight of shingles were used on it. A 250-pound asphalt roof should last 12 to 17 years in a hot zone, 17 to 25 years in a cool area.

In the basement, many old homes will have damp spots on the wall and/or small puddles on the floor, particularly where it meets the foundation wall. These indicate a minor problem that may be easily remedied (see *What You Can Do About Wet Basements*, page 154, October PM). A danger sign to be especially alert for is a water mark—like a giant bathtub ring—around the base of the foundation and on appliances, boiler, etc. This shows that water probably floods in during rainstorms. Correcting this can be costly, sometimes virtually impossible.

Since one of the homeowner's major problems is heat, look for insulation. Pre-World War II homes seldom have any except, possibly, in the attic, where three inches of rockwool or fiberglass would be the minimum to look for. A good test for wall insulation is, on a cold day, to feel the inside of an exterior wall. Then feel the surface of an interior wall. If both are almost the same temperature, the exterior wall is probably insulated. If the exterior wall is much colder, there's no insulation.

Now, regardless of how much insulation there may be, ask the owner to show you his heating bills for the past three years or more. Average them up and add the re-

sult to the mortgage and tax payments when figuring your budget.

Concerning the heating equipment itself, there are few checks a layman can make on its condition. However, find out how old the boiler is. You'll probably have to take the owner's word for this, but he may have a dated bill for the work. Now, look on the manufacturer's nameplate, near the base of the unit, to see if there's an indication of whether the boiler is cast iron or steel. The former generally lasts 30 to 40 years. The latter, 10 to 15 years. If the house has a forced warm-air furnace, ask the owner whether the heat exchanger, where combustion takes place, is guaranteed for five or ten years.

If possible, get the name of the firm which services the heating equipment and check with them on its condition. In some areas, the fuel supplier may give a free inspection.

If there's a separate hot-water heater, as opposed to one built into the heating boiler, its age and the material of the tank are also important. Galvanized steel should last two to six years. Glass-lined steel should last six to ten years and copper or monel should go for 15 to 20.

Hot Water Capacity Important

On the water heater's nameplate, incidentally, will be the unit's tank capacity. If the house has 1½ baths and no hot-water-using appliances other than a washing machine, the 40-gallon capacity should do for most families. Add 10 gallons for every appliance or bathroom. An electrical hot-water heater should be at least 66 gallons because of its low recovery rate.

Evaluating the plumbing is another difficult matter for the amateur. One thing you can do is learn if the plumbing is of iron pipe, or of copper or brass, which last much longer. A fast check is to hold a magnet to the pipes. It will cling to the iron, but won't respond to the other metals.

As you go through the kitchen and bathrooms, turn on all the faucets and flush the toilets. A sluggish flow of water indicates rust may have clogged the system (providing, of course, the local water pressure is okay). If the flow is sluggish, and you've been told the plumbing is brass or copper, there's probably a stray section or two of iron pipe somewhere—probably inside a wall. Examine all joints for signs of rust and leakage. Fortunately, although new plumbing can run into money, you can delay repairs until leakage or stoppage makes them necessary.

Finally, the wiring. Here, again, the average house hunter is at a disadvantage. And, to make matters worse, the home-

(Please turn to page 196)

Announcing... a new era in camp stove cookery.



NEW Coleman camp stove and accessory line!

NEW COLEMAN CAMP STOVE

A stylish new space-age contoured case distinguishes the all-new Coleman Camp Stove. Folded, with tank inside, it looks like smart airline luggage. Opened it features exclusive stainless steel Band-A-Blu[®] burners—plus world-famous Coleman performance and dependability. Line includes 3-burner & 2-burner models.

NEW COLEMAN TOASTER-GRIDDLE-BROILER

Thick cast aluminum distributes heat evenly for grilling, frying. With wire grid it toasts, broils. Built-in drip catcher keeps foods dry, tasty. A must for every family. 18½" x 9¾" x 1½".



NEW COLEMAN CAMP STOVE PROTECTOR

Protects your Coleman stove, makes it look like trim airline luggage. Zip-closing, mildew-resisting canvas, neatly bound. For all Coleman stoves—a quality cover for a prestige product.

NEW COLEMAN HIGH STAND

Supports stove, cooler, etc., securely at table height, yet weighs under 3 lbs., folds down to 2½" x 2" x 26". Neat, bright, light aluminum.



NEW COLEMAN OVEN

Flip it open, latch it closed. Simplified instant setup. Bakes frozen foods, prepared rolls and biscuits, or your own treats better, more evenly. Large, convenient, side-hinged door. Packs flat for carrying.

See them at your Coleman dealer today!

*Greatest Name in
the Great Outdoors*



The Coleman Company, Inc.
Wichita, Kansas



New silicone rubber sealants stop the leaks and fix the things you couldn't fix before

because these General Electric adhesive/sealants won't crack, shrink, harden or leak



Caulk tub and tile

Now you can caulk a bathtub, seal a storm window, stop a windshield leak, mend fabrics and restore 100 other things to usefulness yourself — before it costs you big money.

Developed in G-E chemical laboratories, these new silicone rubber adhesive-sealants are permanently flexible and just will not age.

Bathtub Seal stretches when tub settles. Pure white Bathtub Seal cannot shrink, dry out or wash away. With one application you will solve the constant problem of bathtub, sink and shower leaks. Reset loose tile, glue on towel racks and fixtures.

Clear Seal makes invisible repairs. Use transparent Clear Seal to mend tents, raincoats, leather goods, rubber boots, clothing. Seal basement cracks and aquariums. Mend plastic windows on convertibles.

Metal Seal looks like aluminum. It makes permanent, weather-proof repairs to storm windows, rain gutters and fixes small plumbing leaks.

Auto Seal repairs leaky windshields and convertible tops. Black Auto Seal will fix loose door gaskets, upholstery, even replace decorative chrome.

General Electric silicone rubber sealants will bond to glass, metal, wood, ceramic, fabric, leather, most rubber and plastics. They are available in most stores.

If you can't find them please tell us the name of the store where you tried to purchase them and send \$1.95 per 3 oz. tube to Silicone Seal, P. O. Box 1300, Long Island City, N. Y. Make check or money order payable to Silicone Seal and specify the tube(s) you want by name.



Repair rubber goods



Fix gutters, windows



Stop windshield leaks



Structurally Sound House

(Continued from page 194)

owner probably knows little about it himself. However, before entering the house, see if the cable running to the house breaks into three wires before entering from the street. A three-wire entry usually means the house has 220-volt service.

Also, read the nameplates and schematic diagrams on the distribution panel to see if capacity is 30, 60 or 100 amps. Today 100 amps. is considered minimum. Some other tip-offs on inadequate wiring are a profusion of extension cords in the living areas, a fuse box containing only four fuses and the owner's use of, say, 30-amp. fuses in sockets meant for 15 or 20 amps.

If a house is over 35 years old, find out if the original wiring is still in use. If so, the wiring insulation is probably so dry as to constitute a fire hazard. A complete rewiring is called for. Cost could easily run from \$600 to \$1000.

Rely on Horse Sense

From this point on, the inspection of a used house is largely a matter of common sense. For example, you know that loose exterior shingles have to be re-nailed or replaced, and that peeling paint means a paint job. Water stains under the gutters indicated the gutters are clogged and/or leaking. Similarly, you know that broken plaster inside needs attention.

Now suppose you've examined a number of houses and have narrowed the field down to one, which you plan to buy.

When you put a binder on the house, make the sale conditional on an examination by an engineer-house inspector. For, no matter how careful you are, a pro can pick up defects that escape your layman's eye. An Ohio couple last year moved into a year-old house that seemed almost perfect. A competent inspector would have noticed that the house was built on filled-in land, and that the concrete floor slab had already started sagging. Before long, the sag reached two inches in spots, threatening to break the radiant heating pipes embedded in the concrete. As of this writing, the couple has spent almost \$1000 on baseboard heaters to bypass the threatened pipes.

Where do you find an inspector? If none are listed in your classified phone book, under "Building Inspection Service," consult a bank or savings and loan to see who they use. Or, call an office of the Federal Housing Administration, or your city or state building department. Such agencies may hire outside inspectors, and often have a list of men they use. Inspection fees are usually reasonable. ★★★

GENERAL  ELECTRIC



Graham Hill wins the U.S. Grand Prix at Watkins Glen in a BRM sparked by silvery-plated Champions

Champions use Champions!
Year after year, the overwhelming majority of race winners choose Champion spark plugs – regardless of make of engine – because Champions deliver maximum performance. Why settle for less in your car?

To feel new power, instantly, install new Champions now and every 10,000 miles



Building PM's Patio-Garage

(Continued from page 153)

ment compliments many styles of homes and provided an ideal match for my own, but the garage framing could be covered equally well with bevel siding, shiplap clapboard or sheathing and shakes.

Following the three framing plans, you start by bolting each wall's mud sill to the foundation. Also, cut $1\frac{5}{8}$ x12-in. notches in the 4x10s that form the beams for the patio roof extension, though these won't be installed until the eave walls are up.

Begin actual assembly with the "triple corner studs" for all three walls. Note that the eave walls require triple studs on the patio ends only, since their opposite ends tie into the triple stud of the gable wall.

Frame the gable wall first. When the framing's done, rest the sole plate on the mud sill before nailing on the projecting siding. Though two of us would have been able to "walk" the wall upright, calling in another neighbor simplified the task, since he was able to keep the wall from falling while we planted the 2x4 "draggers"—those braces attached to the sides with a single nail so they'll follow the wall up—and muscled the wall into alignment with the mud sill. This aligning is easy: When the siding is snug against the foundation, it's safe to anchor the sole plate to the mud sill with 16d nails.

Note that in all three wall plans there's a double row of horizontal blocking equally spaced between sole plate and top plate. With a plywood "skin" or horizontal siding, you'd need only one row, but vertical boards call for more support, so I nailed each board at top, bottom and twice in between, along both edges. I used 8d box nails, since the heads would be covered when the battens were applied with 16d galvanized nails.

In applying tie plates of the eave walls, note that $3\frac{5}{8}$ -in. gaps are left in three places for tie plates of the patio wall (plans for which will appear in the final part, July issue). Once the roof boards are applied, you won't be able to nail these crossies in place, so it's a good idea to insert 3-ft. lengths of 2x4 now, nailing so they project inward from the eave walls. Later, you'll tie them into the patio-wall framing.

As the walls go up, they must be plumbed with a level and plumb-bob, secured in this position with braces nailed between the frame and nearby structures, trees or ground stakes. Also tie them to each other with temporary braces until we can roof them over, next month. They form quite a pocket for a heavy wind. ★★★

(Continued next month)

HYDE TOOLS FOR THE MAN WITH THE BUSY HANDS!

Double Header 2-in-1 putty knife tool removes old putty and special "V" blade applies smooth strip of putty, No. C94 \$1.19 each. Five Way Styrene plaster patcher and joint knife, No. 26 \$1.19 each.

Touch-EE, the paint brush without bristles, made of polyurethane, for smooth finish, no messy hairs.

No. C27—2" 29¢,

No. C28—3" 39¢,

No. C34—4" 69¢,

No. C35—5" 79¢.

Magnetic Brad Driver to drive in brads 1" and smaller 16 to 18 gage.

No. C22 \$2.69 each.

Strip-Zum, a new tool to shave off painted and unpainted wallpaper.

No. C31 \$3.29 each.

No. C94

No. 26

No. C28—3"

No. C22

No. C31

Popular best quality Hyde fix-up paint-up tools are sold in leading hardware, paint, building supply and lumberyard stores. Tools not available will be sent postpaid upon receipt of check or money order. **WRITE FOR FREE CATALOG**

HYDE TOOLS

SOUTHBRIDGE, MASS., U.S.A.

Rugged individual



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lasts like the Gravelly.**

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GRAVELLY



5705 GRAVELLY LANE
DUNBAR,
WEST VIRGINIA 25064

Roadside Chuck Wagon

(Continued from page 137)

The two-wheel chassis is a steel ready-made half-tonner, bought from Sears' catalog for under \$90, complete with tires. The 6-ft. bed is cut from a single 4x8 panel of 3/4-in. plywood. Trim 2 ft. off its length and 2 in. off its width to make the center panel, then edge-join two 6x28-in. wings to this to form a blunt T with a crosspiece 58 in. wide. Bolt this bed to the chassis securely, using large washers between the top face of the plywood and the nuts.

All vertical panels—plus the roof—are 1/4-in. plywood; the deck is 1/2-in. ply. Use good-grade exterior type throughout. The framing is mostly white pine 1x1s, which actually measure 3/4 in. square. All dimensions on the plan are actual sizes.

Assemble all parts with waterproof glue and flathead screws, countersinking the heads. Plug all screw holes and cracks with a good spackling paste. When attaching the fenders, be sure there's a minimum 2 in. clearance above the tires.

To protect all outside corners, I capped them with trunk-type metal corners. For a finish, I used marine primer and enamel on the exposed surfaces, but applied aluminum paint to the chassis, under car-

riage and kitchen pit. A tough outdoor varnish is all that's needed on the inside of the other compartments.

My wiring diagram is shown on page 137 as a suggestion. The two lower taillights, the amber clearance lights (toward the car), and the license plate light are burning whenever the car's headlights are on. The upper taillights come on only when the brake pedal or turn-signal is operated. I used '56 Impala style lights. The heavy black line is the ground wire to all lights and to a utility outlet mounted in the stove pit. The green wire is a direct line to that outlet from the 6- or 12-volt auto battery. The light line to the clearance lights can be hooked into the car's taillight, but I made them independent of the car lights for use in city traffic or rain.

All the wires are brought together in one place, to an 8-pole strip of binding posts. From here, two 4-wire cables run through the trailer tongue, emerging near the hitch, where they connect to two 4-prong connectors mounted on the bumper.

My chuck wagon's been thoroughly road-tested, at speeds up to 70 mph. It tracks obediently, hugging the road without sway. But you can tell it's rarin' to follow us into the wide open spaces this summer. Maybe we'll see you there. ★★

WANT TO BUILD A BOAT?

IF YOU'VE GOT the boat-building bug, why wait? *Popular Mechanics* offers plans for many different types of boats—from rowboats to a luxurious 24-ft. houseboat, plus such novelties as a speedy Class E iceboat and a 15-ft. kayak. A complete list of *PM* boat plans may be obtained by writing to Popular Mechanics, Bureau of Information, 575 Lexington Ave., New N.Y., N.Y. 10022. There's no charge, so why put it off? Send for your list today.

HYDRO-DYNAMIC. A 14-ft. three-point runabout. This crisply modern four-seater is designed for use with a motor in the 45-65-hp range. It can be built for less than \$75, and will top 40 m.p.h. with ease. *Plans & construction instructions—\$3.50*



PM-38. A 13-ft. 9-in. runabout. Even though the materials for this hull cost only \$38, it's easy on the eyes and will outperform boats costing hundreds of dollars more. *Plans & construction booklet—\$3.00*



PM JET. A 15-ft. 11-in. modified Garvey designed for hydrojet propulsion. Remove the foredeck and it becomes a roomy fishing boat that goes just about anywhere. *Plans & construction booklet—\$7.50*





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when you’re looking for your first used car.***

We’re Chevy dealers.”

You wouldn't be surprised to hear this at your Chevrolet dealer's.

At a Chevy dealer's, you get the treatment he hopes brings you back *next* time you're looking for a used car. Or even a new car.

He'll also welcome you with many different late-model trade-ins. As well as experienced used car salesmen who actually *wait* on you,

once you've looked the cars over.

And because Chevrolet dealers go out of their way for you, you don't have to go out of *your* way for them. You'll find at least one—complete with after-the-sale service facilities—right in your neighborhood. . . . Chevrolet Division of General Motors Corporation, Detroit, Michigan.



SEE YOUR CHEVROLET DEALER FOR THE USED CAR OR TRUCK YOU WANT



PHOTOGRAPHED AT FLORIDA'S SILVER SPRINGS

What has the tilt-up advantages of an outboard yet swings a prop as big as an inboard?



MerCruiser Stern Drive. MerCruisers, like an outboard, can run right up on the beach without damage to drive unit or propeller. MerCruiser's drive unit tilts up, to clear the bottom

of the boat . . . no fixed, angled shafts, struts, or rudders on the bottom. This makes MerCruiser easier to launch, easy to trail and lets you run safely in shallow water.

MerCruiser's drive unit tilts up on impact to slide over submerged objects. Hydraulic shock absorbers cushion the blow. The drive unit can be adjusted to different tilt angles like an outboard.

MerCruisers not only have the advantages of an outboard, but they swing a big, slow-turning propeller like an inboard. With gear ratios up to 2:1 you get tremendous low-speed thrust without sacrificing high-speed performance. MerCruiser's exclusive Jet-Prop exhaust buries noise and fumes far behind the boat, underwater drag is reduced, and engine breathing is improved. And, there are no shear pins to fail.

Ask your MerCruiser dealer to show you all the reasons why more people buy MerCruiser than all other stern drives combined . . . 60, 110, 120, 150, 190, 225 and 310 hp gasoline; 60 hp diesel.



Worldwide Sales and Service

MERCUISER
STERN DRIVE POWER PACKAGES

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Coolers for Campers

(Continued from page 127)

interior. Depending on capacity and make, the price of this type can range from \$20 to \$40.

While these expensive models offer extra features such as drains, storage trays, built-in bottle openers and chrome-plated carrying handles, their main feature is durability.

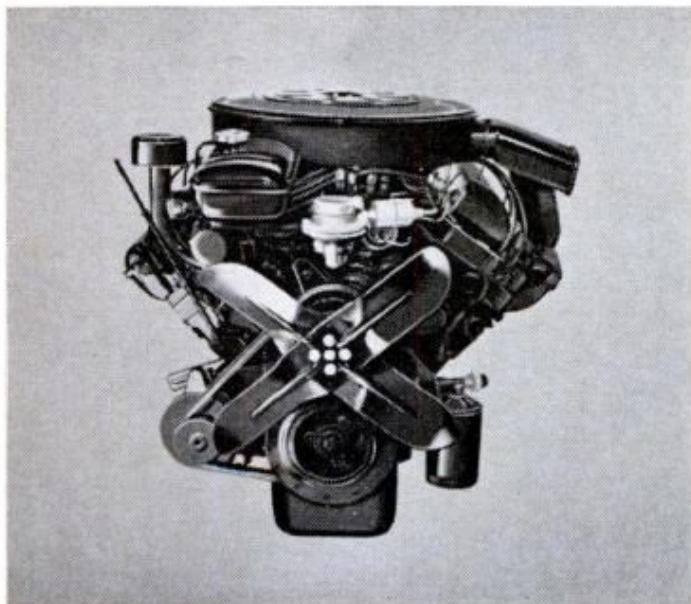
For this durability test we used a steel Coleman, a steel Thermos and an aluminum-cased Ted Williams cooler. We dropped them empty and loaded without damage, and then kicked them down 18 steel-edged concrete steps. All three were dented by the steps, but not badly. The latch flew off the Ted Williams chest, but it was easily put back on and it worked perfectly. There was no damage to hinges on the three coolers.

Dropped from a height of eight feet onto a pointed steel edge, all of the metal chests were dented, but none had the skins penetrated. The back of the Sears chest was pushed in a half inch beyond the edge of the lid, but it was easily straightened by hand. The impact was severe enough to split the plastic food trays inside the Sears and Coleman chests.

Late in June, 1964, I went into Death Valley with a Coleman Snow-Lite and a plain Penguin polystyrene cooler that I purchased in a hardware store for \$3.50. At Furnace Creek, where the thermometer registered 130 degrees in the shade, I put 25 pounds of ice in each cooler. We drove all day in tremendous heat. Except for the canvas top, the Land Rover was open. That night, after climbing out of the Mojave Desert, we stopped and checked the ice in both chests. There was a piece about the size of a coconut in each cooler and the piece in the polystyrene box was slightly larger.

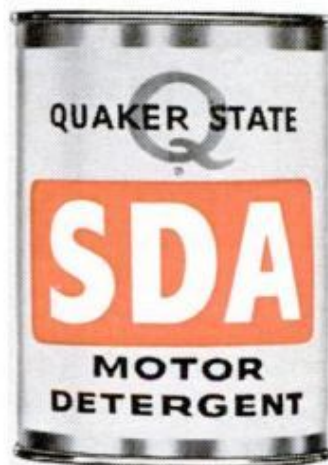
As a general rule I found that a 25-pound piece of ice would last about three days in either cooler.

In our office tests we placed a 25-pound chunk of ice and a quart of milk in four different coolers: the Weberlite "30" with metal sides, a plain polystyrene Carrylite, the Sears plastic model and the steel Coleman. We closed and sealed the boxes on a Friday at 3:30 p.m. When they were opened at noon the next Monday, only the inexpensive Carrylite still contained ice, a piece the size of an apple. But the water in each one was still ice cold, and on Wednesday at noon the milk was tasted and found to be fresh.—*Stuart James*



Get peak performance from your car engine . . .

This is tune-up time . . . time to ask your service man for Quaker State SDA. This super detergent additive in your crankcase oil peps up tired engines, restores full power. SDA dissolves away power-robbing varnish and sludge deposits, frees up sticking valves, and prevents rust and corrosion. The result—better engine

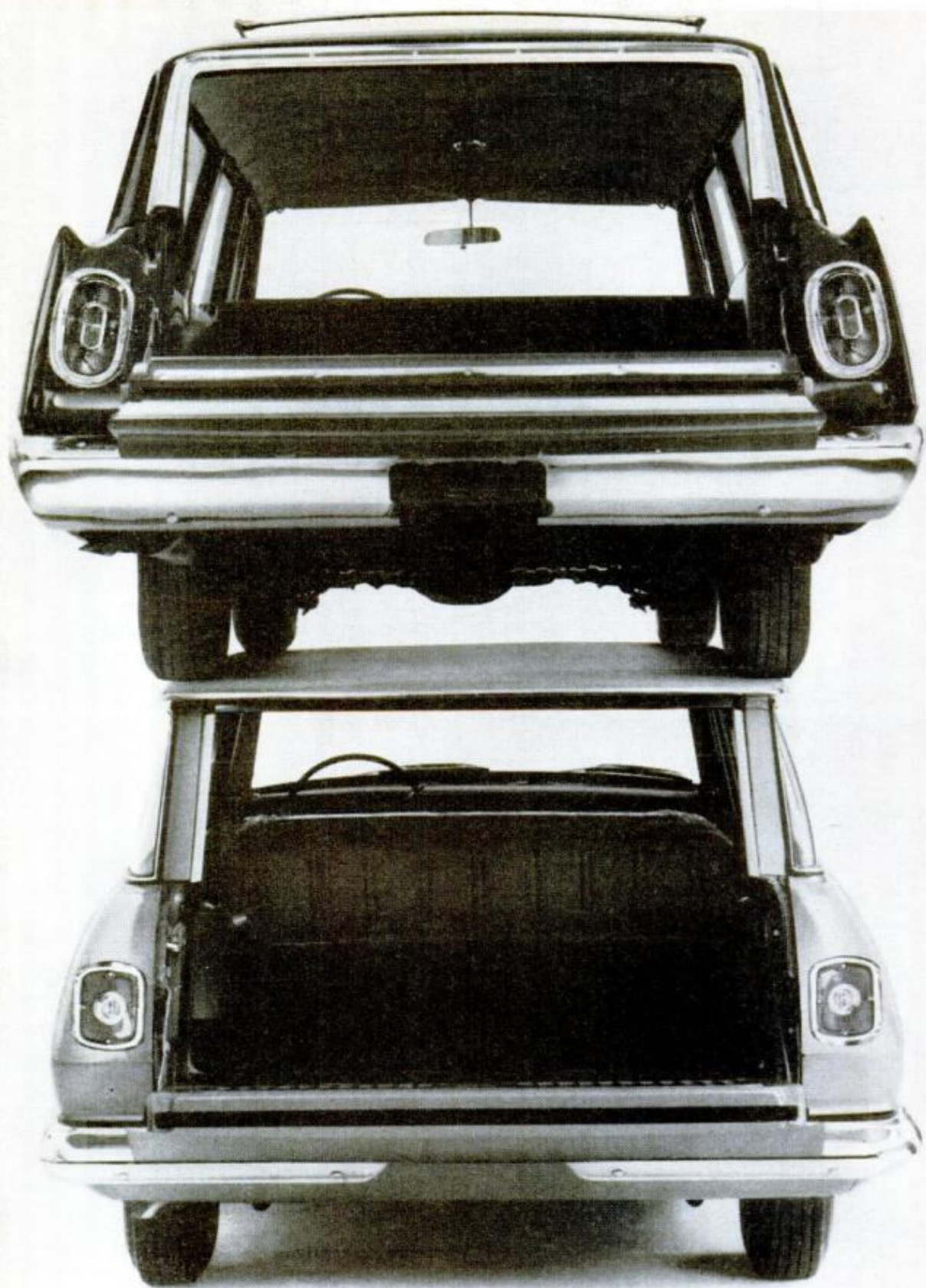


—give it this "2-minute tune-up in a 15-ounce can"

performance, less engine wear, and easier cold-weather starts for longer battery life. Have a cleaner, better-performing engine. Ask your Quaker State dealer for SDA . . . the 2-minute tune-up in a 15-ounce can!

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Oil City, Pennsylvania





170 cubic feet of station wagon.

This picture may look a little odd.

But so are most conventional station wagons when you consider how little they hold.

The two above average about 85 cubic feet each. The Volkswagen holds twice that: 170.

And even if you did put two conventional wagons

together you still couldn't carry the kind of things you can in a VW.

The Volkswagen has a 14-square-foot hole in the roof for sticking tall things out of.

And five big doors to stick things into.

On the inside, the VW has seats for 9 people



170 cubic feet of station wagon.

and room for 28 cubic feet of luggage.

But on the outside, it's only a scant 9 inches longer than the VW Sedan.

You can park it like a little sports car.

And everywhere you go, the Volkswagen engine is right behind you.

It goes over 20 miles on a gallon of regular gas. And you never have to pay for antifreeze, flushings, or radiator repair.

There isn't any radiator.

When you think about it, the VW Station Wagon not only holds a pile, it can also save you one.

Iceberg Patrol

(Continued from page 103)

size and precise location, latitudinally and longitudinally. If this is done, each can be identified again on the next flight, its drift can be charted, and a record kept on how much it has melted or eroded.

During these hours-long preliminaries some 400 bergs were charted. Commander Lenczyk took a few breaks to explain to me what icebergs are and how they behave.

"Tens of thousands break off from the Greenland glaciers," he said, spreading out a map of Baffin Bay, "but only ten percent may reach Baffin Island. Only ten percent of those reach the 48th parallel near Newfoundland. The others erode from too many summers, too much buffeting in the ice packs of Baffin Bay, or they melt once they leave the protection of the ice packs."

But, by sheer force of numbers, he said, enough will survive to drift south of the 48th and become a hazard in the shipping lanes. Their numbers vary from year to year. In 1957, more than 1200 were sighted; in 1958, only one. Last year, they spotted 400, about average.

Lenczyk described their types and the significance of each. "Tabulars, sometimes called *tabletops*, are long and flat and usually rare in this area. Since they do not have much superstructure, they don't sail with the wind but follow the current and seldom run aground.

"*Drydocks* have two peaks with an area resembling a cove in between, and *pinacles* have one peak. Both are good sailors, traveling well with prevailing winds—drifting up to 20 miles a day in a 30-knot breeze—but both erode faster than others because they ride higher and have more exposed surface.

"*Domes* are more rounded with an average speed and life span.

"Lastly, there are *growlers*, which are too small to be called icebergs. Most are pieces that have broken from, or are the remains of, icebergs. Too small to ride erect—most are smaller than an average-size house—they roll and hiss in the waves. Yet they can't be ignored, because they are dangerous themselves and usually warn of larger ice upwind."

Bombs, Explosives Useless

And, as any school child knows, it's the part that does not appear above the surface that counts. Icebergs, generally, are seven times as large underwater as they are above. Some northern tabulars are as long as 750 feet or as large as a good-size city block. The largest northern hemisphere iceberg ever officially sighted was

estimated at 1500 feet long and 550 feet high—or as long as five football fields and about forty stories high. Antarctic bergs bigger than Long Island have been recorded. Multiply *that* by seven and set it on your mantelpiece.

Such mammoth proportions are hard to visualize, but the Coast Guard at one time actually tried to find ways to destroy icebergs before they ever got to the shipping lanes. Their efforts were about as hilarious—and met with as much success—as the Navy's attempt to get rid of the gooney birds on Midway Islands (page 102, Sept. '62, PM).

They tried bombing the bergs out of the water. About all the bombs did was put a few pockmarks in the ice above the water. Virtually nothing happened to all the ice below the water. And, considering the number of bergs floating around, the Coast Guard decided this method was . . . well, impractical.

They tried Thermite explosives. When Thermite burns it produces temperatures up to 4000° F. All it produced on icebergs was a pretty explosive pattern. End of Thermite experiment.

Paint Bucket Attack!

Then they painted the bergs with carbon black. The theory was that the carbon had the capacity to hold heat from the sun's rays, which would penetrate the bergs and hasten thaw. Picture lonely little groups of Coast Guard seamen, climbing across icebergs all over the ocean, little buckets in their hands, painting icebergs black. It didn't pan out, somehow.

One other wacko suggestion was that planes fly over and drop plastic "greenhouses" over the icebergs, thus absorbing the sunlight and melting the ice. By this time, the Coast Guard had had it, and went back to tracking the bergs.

If you can't beat 'em, go along with 'em.

Pre-flight calculations reveal whether current, wind, temperature, or a combination will have the most effect on each berg. If temperatures are above 40 degrees, for instance, a small iceberg may last five days; larger bergs, last 12 to 20 days.

Current, too, is predictable. One, the Labrador Current, hugs the Canadian coast and takes a lot of bergs with it past the tip of Cape Race. The current forks here and takes more bergs past the continental shelf to the southern tip, or Tail of the Grand Banks. Beyond here, the sea floor drops from 100 to 1000 fathoms. Few bergs drift beyond this point.

The two key spots, then, comprise an area 100 miles south of Cape Race and the Tail of the Grand Banks. Both are watched

(Please turn to page 208)



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All eleven Western Wood designs are in our new "Vacation-Land Homes" booklet. You can buy a copy from your lumber dealer now, for a dime. It's really a bargain. There's a complete description, architectural rendering and floor plan of each vacation home. And there's a list of all the materials necessary to build any one of the eleven designs. After you pick the design best for your site and family, we'll provide you

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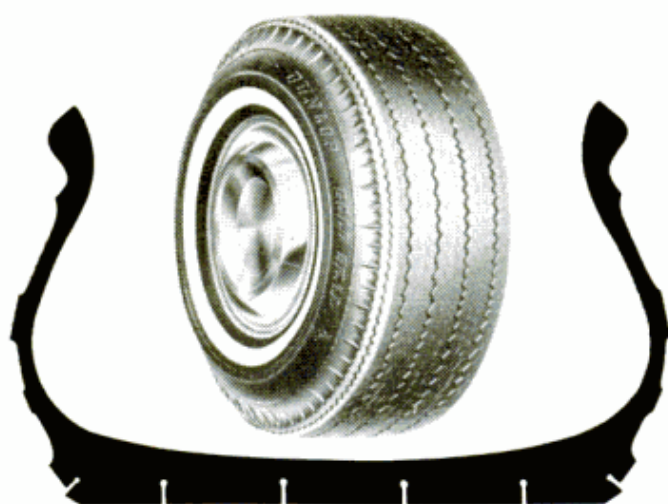
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You also get new mileage and traction advantages in the Gold Seal:

LOW PROFILE The new Gold Seal is designed low to complement today's road-hugging automotive styles.

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NEW INNERLINER Our new pressure-seal innerliner holds air four to five times longer than ordinary tires.

Ask your local Dunlop dealer to show you all the benefits we've engineered and built into the low profile of this new Gold Seal. From 100 mph safety to innerliner, it's the real tire for a change.

*We certify that Gold Seal Low Profile tires were in excellent condition after numerous tests at sustained speeds of 100 mph.
Tire Engineering Service Testing, Inc., Carson City, Nev.



DUNLOP

TIRE AND RUBBER CORPORATION, BUFFALO, N. Y. 14240

Iceberg Patrol

(Continued from page 206)

carefully. Our flight path was to take us beyond the southernmost known berg, swing east past the Tail, then start flying a grid pattern over the ice pack, each leg 25 miles apart. This would give observers an area to cover of about 12½ miles on each side of the airplane on each leg.

Maps marked, the crew and observers gathered their equipment. We all donned life preservers and headed for the flight line. It was dark and cold, but we could see the overcast. When our wheels left the ground, we knew we wouldn't see the sun that day—and we'd be gone 8½ hours.

Ensign Neely took his station in a seat behind the pilot, map board in his lap. Ensign Goras, headset on, patrolled the cargo compartment. The standard starboard and port cargo doors had been replaced by heavy glass doors. With binoculars, he could see long distances on either side. Neely, looking straight ahead over the pilot's shoulder, could tell him over the intercom where a berg was upcoming.

Fly Low and Slow

When we leveled off, I got my first of two surprises. We were only at 1000 feet, an altitude we would maintain for the entire trip. If the overcast were lower, we would fly at 500 feet, depending on electronic instruments for sightings.

The second surprise came moments later. The pilots cut both outboard engines and feathered the props. We cruised the rest of the flight on the two inboard engines. It not only conserves fuel, but slows the plane so it won't go by bergs too fast.

Growlers usually comprise the first and most common sightings, because there are so many of them. Even these are awesome. As we passed the first one, we could see it churning, rolling and bobbing in slow, heavy motions, allowing the sea to run over it, then throwing it off. It was a pale circle of bubbling green compared to the dark, dirty color of surrounding sea. As it churned it created a ring of foam, like a bobbing Pacific isle with a white coral reef. Then it was behind us. But even this small piece of an iceberg shook me. I felt insignificantly puny. It could roll over and crush a boat as easily as a man might squash a bug.

Neely marked each sighting on his map, using special symbols: a small square for a growler, a triangle for a berg, with identifying symbols behind it—S, M and L for small, medium or large; T, DK, D or P for tabular, drydock, dome or pinnacle, and a V for varying sizes. When we came

(Please turn to page 210)



spring free on a new M-50

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What's more, you'll like the way an M-50 takes to the road. How it cruises at a comfortable 40 mph. And

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Iceberg Patrol

(Continued from page 208)

to an area of several bergs, he would count them and jot the number down before the symbol. A typical sighting might read 7△VDK, for seven drydocks of varying sizes.

Back in the cargo compartment, Goras was using binoculars to identify far-away bergs. Occasionally, he would take Polaroid pictures, marking the backs of the prints with the coordinates. On an overcast day the prints could give no more than a visual record of a sighted berg; on sunny days they could give more.

Goras explained, "At this altitude, the camera is set on infinity, so anything that appears on the water will have the same size relationship, including the shadow of the airplane. We try to shoot a berg with the shadow in the picture. Since we know the size of the plane's wing, and our altitude, we can calculate the size of the berg from the size of the wing's shadow on the water."

Most days on the ice patrol are far from sunny. April and May around Newfoundland are 90 percent overcast and rainy—sometimes right down to the deck.

So they fly some days when eyeball inspections are impossible. On these days,

from about 500 feet with two props feathered, radar is used. But it is not dependable. A surface vessel will reflect the beams eight times better than an iceberg.

A special-purpose radar, a microwave radiometer, is also used. It distinguishes between boats and ice, but does not tell the observer what type of ice.

An airborne infrared radiation thermometer is now being tested. It measures surface temperatures, indicating currents, and theoretically should be able to distinguish, by the temperature spread, an iceberg from the surrounding water. However, mounting troubles have slowed this experiment.

Finally, they are also trying thermal photography, taking pictures through the fog whenever they have an iceberg spotted. But, a fast-moving plane has hindered any significant contribution to date.

What Lenczyk and the others hope for is more sophisticated radar, so they could ignore the weather and fly in anything with the efficiency of 'eyeball' flight.

On our flight, we saw each berg and they are something to behold. It's hard to imagine how anything so majestic can be so dangerous. Man, so far, can only find and follow them, and warn others to stay out of their way. That is the work of the International Ice Patrol. ★★★

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Owner's Report—Corvair

(Continued from page 93)

"I get cheaper license plates."—New York teacher.

Every couple of bucks helps.

There are more unhappy owners to be heard from, this group talking about problems from noisy rattles to an inadequate heater. Here are examples from their reports:

"I've taken it back five times to see what could be done about the rattles. Finally got the results I wanted by doing it myself."—Oklahoma secretary.

She may have a secondary career going. Good mechanics are hard to find.

"The curved door glass has no edging. Several people have walked into glass and some were hurt."—Connecticut banker.

"Curved window glass is attractive, but allows occupant to be drenched when opening the window in rain or snow."—Virginia computer marketing man.

Here's a styling 'improvement' that owners are resisting, at least until development is perfected.

"I decided to buy a Corvair because of economy—which I'm not getting."—California mailman.

"Dual carburetors are hard to keep in adjustment."—California registered nurse.

"Heater must be used to demist: a pain in the neck on a warm, rainy day."—Florida association executive.

It's a little more complicated with an air-cooled engine since you can't open air passages, yet leave the water supply closed.

"Defroster doesn't do a good job on ice. Problem is the location of the ducts."—New Jersey chemical engineer.

But there's more to praise, too. Owners also like the interior room, upholstery, cornering ability, the instrument panel, and the folding rear seat:

"I like the comfort and legroom. I'm six feet one."—Florida production control man.

"It's as roomy a car as you can find on the market."—Tennessee farmer.

Oh? Because the Rolls back seat is so cluttered with the bar, desk, phones and the like?

"The upholstery is easy to clean."—Ohio housewife.

"Vinyl design and quality looks as good as on cars I've owned that cost much more."—Illinois police officer.

"It's unbelievably agile on mountain roads."—Washington fire control agent.

"With this individual wheel suspension, you can adjust camber on the rear wheels

as easily as on the front. There's little lean on curves and quick steering."—Georgia naval airman.

And the camber change throughout wheel travel is nearly halved with 1965's parallel arms.

"It hugs the road on corners, is easy to control in light skids."—Massachusetts teacher.

"I like the recessed instruments. I can't stand to have people watch the speedometer."—Pennsylvania teacher.

Particularly maiden aunts.

"I like the fold-down back seat and rich-looking appearance. It's easy for a salesman to carry samples and small children can easily play back there on long trips."—Illinois salesman.

Here are the representative owners' statements demonstrating the final group of complaints:

"The motor should idle more smoothly and quietly."—New York salesman.

Our test car's engine sounded frantically busy, but a three-speed transmission would avoid lots of engine-racing noise.

"The engine noise should be dampened by more sound-deadening material."—California banker.

"The dashboard is too high, giving you a feeling of sitting in a hole."—Ohio engineer.

Others might call that a 'continental feel'; it's common enough in many imports.

"The dash looks cheap and the instruments aren't reliable."—California engineer.

"Padded dash, ha! Where's the padding?"—Minnesota ad agency analyst.

It may not seem like much, but rubbery resilience isn't what's needed. Other materials soak up impact better without flinging you back.

"With four in the car, the shocks are very poor. Each little bump is felt violently."—Ohio oil worker.

"The front springs seem to be weaker than before. They will bottom occasionally, whereas the '60 model would not."—Illinois machine operator.

Although the car's heavier now, the wheel rates are softer. They have gone from 86 to 71 in front, 192 to 149 in rear since 1960.

"The car seems to want to wander."—Colorado accountant.

"I have two cement blocks in front, which helps a little."—New York teacher.

Mr. Accountant, say 'Hello' to the nice teacher.

And that's the report from owners after racking up nearly a million miles in their new Corvairs. ★ ★ ★

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Fabulous Pivot-Wing Plane

(Continued from page 87)

tion, and talked to some of the people involved, including one of the test pilots. The general atmosphere is one of enthusiasm, and no one seems to have lingering ulcers from the years-long competition.

In fact, J. T. (Bing) Cosby, GD's F-111 program director—a jovial, non-ulcer type if there ever was one—said flatly, "We never had any doubt that we'd win."

Yoke Is the Key

Any story of the F-111 has to begin and end, not with the wings, but with the yoke that binds them to the fuselage. It is to the F-111 what a backbone is to a vertebrate. Once in the air, the whole airplane is supported by it.

Even the material is unique—B6AC tooling steel, an infinitely hard alloy never before used on aircraft. The yoke, which is 14 feet long, rests on top of the fuselage near the widest point in the wing fairing. At each end are two giant pins, 8½ inches in diameter. The wings pivot on these pins.

Forward of the yoke is the actuating mechanism, a long cylinder with two arms. The arms inside these cylinders are huge screws like those on hydraulic dump trucks. The outside ends of these arms are attached to smaller pivot points on the leading edges of the wings. So, as the huge arms screw out from the cylinder, the wings are forced back to the swept-wing position. As the huge screws retract into the cylinder, the wings are pulled forward.

The yoke, however, while not entirely new, is the key to the breakthrough. As Cosby explains it, "The old Bell X-5 and the Grumman F-10F had variable-sweep wings. But in each case they pivoted on one pin. When the wings swept back, the center of gravity shifted, so the whole mechanism had to move back simultaneously. It was cumbersome. We eliminated the problem with two pivots."

Flying Fuel Tank

GD eliminated a few other problems, too, including fuel tanks. The entire airplane, except for the cockpit and engines is a flying fuel tank. All empty space is used, including the wings—even when they're sweeping back and forth. Joints and rivet holes are sealed up. When fuel is poured aboard, it finds its own way into every available crevice.

Getting it out is easy. In the wings, for instance, five pounds of pressure is maintained. Two fuel pumps at the wing tips force the liquid into the fuselage. From there it is forced to the engines. Flexible

(Please turn to page 216)



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Fabulous Pivot-Wing Plane

(Continued from page 214)

hosing at the wing roots, with pivots of their own, keep the fuel flowing.

The slats on the leading edge of the wings are full span, and the full-span flaps are double-slotted. Slats and flaps are not new, but on the F-111 they've just about reached their ultimate. In test flights, the prototype has been averaging less than 3000 feet on takeoff rolls. This compares to 10,000 feet or more required by current operational fighters.

Another unusual feature of the wings is that they have no ailerons for roll control. Spoilers on the upper surfaces raise to reduce lift. Depending on which side is activated, the spoilers will drop one wing or the other.

Tail Section Moves Up and Down

The tail assembly is unusual on several counts. It has a normal vertical stabilizer and rudder, but no horizontal stabilizer. The entire horizontal tail section moves up or down to control pitch, but the two sides also work independently to control roll. So they're both elevators and ailerons or elevons. General Dynamics calls them "differential horizontal stabilizers."

Here's how they work: The spoilers in the wings are effective at slow speeds until the wing is swept back past 45 degrees. Then they cut out. The differential stabilizers now take over both roles. When the wings are swept all the way back (72½ degrees), the plane is, in effect, a delta-wing and the stabilizers operate the same as a delta wing's elevons.

The fuselage is one long tube of sophisticated equipment and innovations, the two most important of which are the cockpit and the twin engines.

The cockpit, or "module" as they now call it, is a self-contained capsule that could easily be identified with the *Mercury* and *Gemini* space capsules. All three are made by McDonnell Aircraft Co. The module holds the two pilots side by side, plus all the usual controls and the one unusual control for the wings—a pistol grip that operates like a slide trombone. It moves forward to sweep the wings back, and backward to sweep the wings forward. More important, the entire capsule can be blasted free of the plane in emergencies. An exploding wire separates it from the fuselage, and a rocket blasts it free.

The pilots, who wear no parachutes, ride the enclosed cockpit down just like a space capsule. Part of the upper fuselage, shaped like a flat paddle tail, rides down with it to give it stability, and a huge parachute

(Please turn to page 218)

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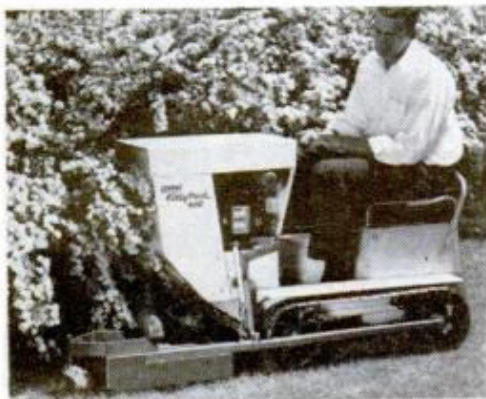


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(Continued from page 216)

blossoms out to float it to earth. If it lands on water, the capsule will float; if on land, an air bag cushions its fall. Survival gear in the cockpit will help the crew stay alive until picked up.

Turbofans with Afterburners

The engines, because of the plane's required versatility, created another problem. Like airframes, engines are built for specific missions. But the F-111 had to have power for high and low altitudes, high and low speeds, plus economy at long range. More white blackbirds. Its twin TF-30s, made by Pratt & Whitney, are turbofan engines with afterburners. The fans add efficiency and economy, which standard turbojets don't have at low altitudes, and the afterburners boost power for supersonic speeds.

Early problems with the engines caused some concern, but GD said they would be worked out.

On the underside of the fuselage is the bomb bay, which can carry 100 different types of missiles or rockets. Then there are wheel wells for the tricycle landing gear. The door to the main gear's well swings down and forward and doubles as a speed brake for quick slowdowns.

The F-111 could also be equipped with hard points (pylons) under the wings for additional weaponry, possibly six-barrelled cannons mounted in pods. The pylons would swivel to line up properly for any sweep position of the wings.

5000 Miles, Arms Folded!

The electronic gear is in the nose. One major feature is an inertial-guidance system that will make the F-111 virtually a manned missile. The system, based on gyros, can be set before takeoff and, with information fed through the autopilot, will sense any deviation from course or speed. The pilots, in effect, can fly a 5000-mile mission with their arms folded.

The F-111, unlike the Mach-3 B-70, has not gone in heavily for titanium, a metal that is more heat-resistant at high speeds. It carries about 1200 pounds of it, mostly in fittings and fasteners, and in the panels of the inlet area of the engines. Remaining skin surfaces are conventional aluminum alloys, and are considered sufficient up to Mach 2.5.

The basic differences between the Air Force and Navy versions of the F-111 are that the Navy plane has a shorter nose (because of reduced electronic gear), lighter weight and stronger landing gear

(Please turn to page 220)

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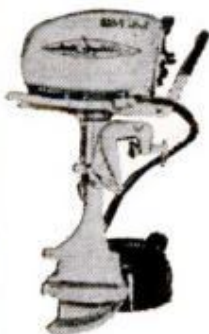
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(Continued from page 218)

(because of problems of operating from carrier decks), and larger wings (for increased "loiter" characteristics).

The Navy F-111 will be used primarily for defense as an air-superiority weapon, patrolling the skies near fleet task forces. It will use, for the first time, the new *Phoenix* missile system developed by Hughes Aircraft Co. Still very hush-hush, the long-range missiles apparently are guided by radar from the F-111 cockpit, taking over with their own guidance system when they approach the target. The man in the right seat, incidentally, will not be a pilot, but a bombardier-navigator.

The Air Force F-111 will be used primarily for offense as a penetration and interdiction weapon. It will fly at all levels from the deck to the stratosphere, and will have the ability to fly anywhere in the world in one day and land on sod fields. It will carry two pilots.

Val Prahl, another of the test pilots who flew on several of the F-111's early missions, provided a pilot's reaction to this remarkable new machine. His attitude, while "gung ho" enough, is surprisingly placid. Apparently, in spite of the weird

wings, there is nothing exotic about the plane's handling characteristics. His first remark was: "It flies like an airplane."

Prahl explained that, for a normal take-off, the wings are spread fully—about 16 degrees from perpendicular—with slats and flaps down. For landing, about 26 degrees of sweep is used. Climbs, descents and most subsonic flying have been done (to date) with about 50 degrees.

Prahl said that, in the Air Force version, the cockpit—the first side-by-side seating for a fighter plane—is compact but not cramped. While each man can fly the plane, the flight and engine instruments are oriented mostly toward the man on the left, and the weapon instruments toward the right.

General Dynamics has announced that its first two Air Force F-111s would be undergoing flight tests at Edwards Air Force Base in California in May, and Grumman has announced that it would unveil the first Navy F-111 on Long Island early the same month.

So, the F-111s are rolling off the line. We'll soon learn whether their performance will overcome the controversy they caused, and whether they can, indeed, fly into history as one of aviation's great and significant aircraft. ★ ★ ★

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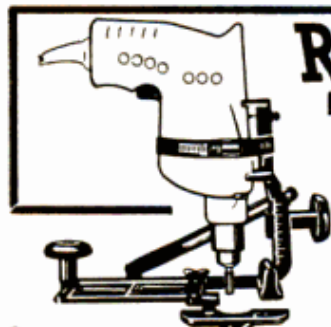
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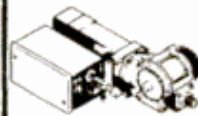


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Unmasking Mars

(Continued from page 82)

Alderamin, Regulus, Naos and Gamma Vela—that are seen in our southern sky.

Attitude data sent back by Mariner told technicians in JPL's Pasadena nerve center that the sensor still hadn't found Canopus. In each case, a radio signal was sent to the craft, breaking the sensor's "seeing" circuit. Gyros would then cause the craft to roll again. The rolling search finally effected a lock on Canopus.

Later, Mariner lost the lock briefly. The ground handlers ordered it to find Canopus again. The craft did just that.

Course Changed Enroute

Mariner was 440,000 miles from Earth when the most critical maneuver of the trip was made. Had anything or anyone failed at this point, the entire experiment would have been a washout.

The problem was to make a slight change in Mariner's course. If it continued on its trajectory, it would cross the path of Mars about 150,000 miles ahead of the planet, too far to carry out most of its investigations.

Besides, JPL scientists wanted the vehicle to pass behind Mars in order to perform the previously described occultation experiment, and to get the best angle of sunlight for photographs. They also wanted the vehicle to pass within 9000 miles of Mars. But even a pass no closer than 54,000 miles could produce some useful information. On the other hand, should the spacecraft approach within 1000 miles, scientists fear that the Martian gravity would capture it and make it crash. Mariner is unsterilized; if it hit Mars it could contaminate the planet with microorganisms from Earth.

[The theory that a very close pass would result in a crash may be tested next August 9. That's the reported target date for a Russian craft, Zond-2, to pass within only 900 miles of Mars. The American space expert who disclosed this information said the Russian probe "may be doing something more than a simple flyby." Zond-2, reported to weigh more than three times as much as its American rival, was launched Nov. 30, 1964, two days after Mariner.]

Like Hitting Second Base

At 7:25 a.m. Dec. 5, 1964, Mariner's handlers commanded the craft to break its lock on the sun and Canopus and to roll until its small midcourse rocket was in correct firing position. A 30-second "burn" of the 50.7-pound-thrust rocket

(Please turn to page 224)



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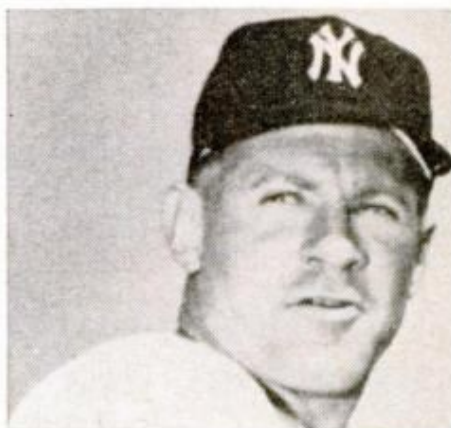


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by Whitey Ford

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Unmasking Mars

(Continued from page 222)

would increase orbital speed by exactly 29 mph. That would be sufficient, JPL engineers figured, to put Mariner within 5400 miles of the planet at flyby. An error of only 1 mph in acceleration would throw the craft 9000 miles off the mark. But there were no errors. Course was altered almost to perfection.

"It's like shooting from Los Angeles to New York," one JPL official commented, "and trying to hit home plate in Yankee Stadium—but actually hitting second base."

It is possible, of course, that hitches may still develop on the final leg of the trip. But even if the entire experiment should founder now, in some unaccountable outer-space catastrophe, Mariner already has made contributions to our knowledge of space. Millions of bits of information have been pouring into the Pasadena center about things such as radiation in space, cosmic rays and magnetic fields.

Mariner's photo mission will begin when the craft is 75 minutes from its closest approach to Mars—about 9000 miles from the surface.

First, a scan platform will sweep the TV camera and two planet sensors—one wide-angle, the other narrow—through a 180-degree search arc. "To the wide-angle sensor, Mars will look like a light bulb," explains Denton Allen, a JPL engineer. "The sensor's job is to find the bulb and home on it."

As Mariner gets closer, the narrow-angle sensor—its field of vision is 1½ degrees—refines the aim of the camera. On command from the electronic brain, the camera will begin taking its 21 photos, one every 48 seconds. The images will be stored on tape and not transmitted until Mariner has emerged from behind Mars.

Nail-Biting Climax

Because each picture consists of about 250,000 bits of data, and the transmission rate is only 8.3 bits per second, eight hours are required to send back a single photo. Between photos, Mariner is programmed to transmit an hour and a half's worth of engineering data. So, even if all goes well the entire set of pictures won't be received by JPL scientists until 210 hours—nearly 10 days—after Mariner's flyby.

But if this fantastic feat is carried off, if Mariner radios that it will begin to transmit its first picture of Mars across the more than 134 million miles to Earth—that surely will signal the start of one of the most suspense-packed waiting periods in the history of man. ★★★

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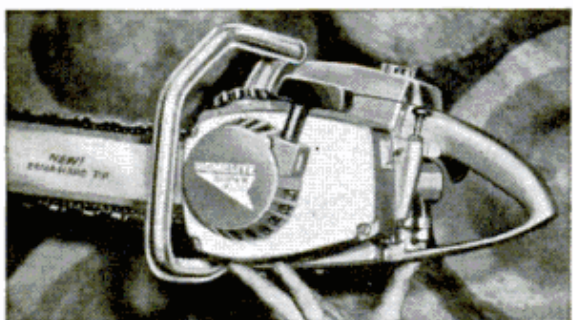
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Who'll Win at Indy?

(Continued from page 77)

from 1 to 100. As the leader crosses the starting line during yellow-light periods, the hand on the clock is punched back to zero. The man in second spot, running, let's say, 15 seconds behind, would know his position as soon as he crossed the line. If next time around he cut the leader's advantage to five seconds, he'd know that on the third lap under the yellow he'd have to drop back 10 seconds or be called in for a conference.

"As for pitting during the yellow, if it's a minor accident where the imposed slow-down isn't drastic, it won't help much. But on a long, slow yellow, it can save you one or two thirds of a lap."

We also got varying opinions on the new rule requiring at least two pit stops.

"They should have made it three," said Foyt. "No one would have to carry as much fuel, and the race would be safer and just as fast."

Jones agreed: "With a lighter load of fuel, you can run a little faster. We plan on three stops anyway, figuring the light load will make the car easier to handle."

Ward dissented: "Two stops are more than enough. Some cars may need three. This still puts a premium on choosing the right fuel blend for both staying power and peak horsepower."

Many experts feel the new regulation requiring two pit stops is a camouflaged effort to eliminate gasoline, whose only real advantage in the 500 is better mileage (by at least 50 percent). There's a general opinion that gasoline is more dangerous, but without scientific proof there was no justifiable reason to outlaw it.

We asked Jack Zink about this. A combustion specialist, Zink owned the winning cars of '55 and '56.

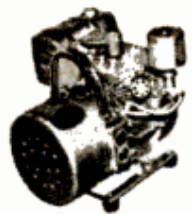
"One racing fuel isn't inherently more dangerous than another," he said, "but gasoline produces dense black smoke when burning in the open. This can cut visibility to zero." He proposed a smoke test, using instruments he developed, for various fuels.

He's happy about the two-stop rule, since his driver will be able to run lighter, but says, "Philosophically, I'm against it. The idea is to go 500 miles the quickest way, and any artificial restriction waters that down."

Pit stops will be more challenging this year, because another new rule has outlawed refueling with CO₂-pressurized tanks, which push more than 160 gallons a minute through four-inch hoses. Now gravity feed is the rule. Complicating this are saddle tanks along each side of rear-

(Please turn to page 228)

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Who'll Win at Indy?

(Continued from page 226)

engined cars, connected by crossovers and regulators.

"It'll be tough to find an easy and safe way to fill a rear-engined car," said Jones, a victim of a poorly handled refueling operation last year.

"They should have kept pressure fueling as a safety factor," contended Foyt. "I don't think it ever caused a fire at Indianapolis."

"I don't think the change is bad," said Ward. "The pit stop will be longer for everyone. Again, it will stimulate people to do the job a little better."

Other Cars Entered

There'll be lots of other drivers, car builders and pit crews also trying to do the job "a little better." Jimmy McElreath, a top young Indy driver, will have one of two new rear-engined cars patterned after the one built and driven last year by Jack Brabham, but stiffer and stronger. Both will use Offy power, but a new, lighter Offy engine, expected to be fully competitive. An early version of this car did 159.5 mph at Indy during tire tests.

Mario Andretti, an Indy rookie who scored impressively on the '64 USAC circuit, will drive another Brabham-type rear-engined car. Probably it will run an Offy engine.

Dan Gurney, an early leader in the Indy rear-engine revolution, had planned to drive a new Brabham, but his success in Europe resulted in so many orders for the Brabham factory that the star salesman had to look elsewhere for a new car. "Powered by Ford," of course, Gurney will be driving a new car built by his crew from parts supplied by Ted Halibrand, manufacturer of Indy running gear and cast magnesium wheels. Halibrand's aircraft-type design uses magnesium circumferential frame castings around which the aluminum body shell is built. Two of these cars performed well in practice and qualified last year.

Ford's Horses Upped

Jimmy Clark, a star performer for the past two years, leads a team of three new Lotus-Fords.

The Novi team will enter two front-engined, four-wheel-drive cars. The Novi engines now rev much higher—close to 10,000 rpm. Bob Unser will have his pick of the car built by Ferguson for last year's race (it made a fine qualifying time, but was lost in the second-lap accident) or a home-built twin.

(Please turn to page 230)

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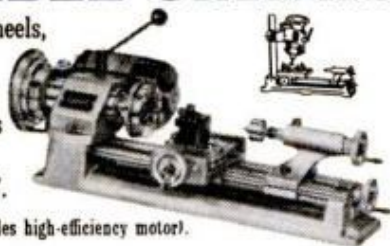
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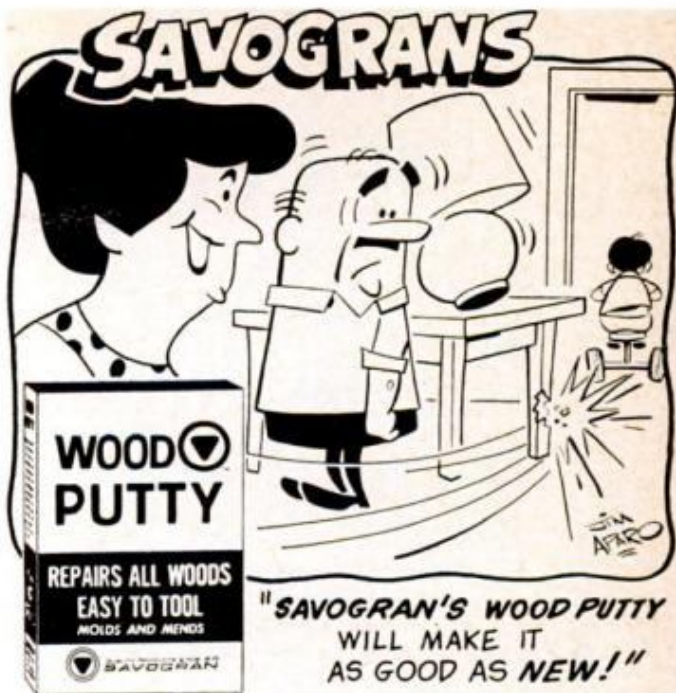
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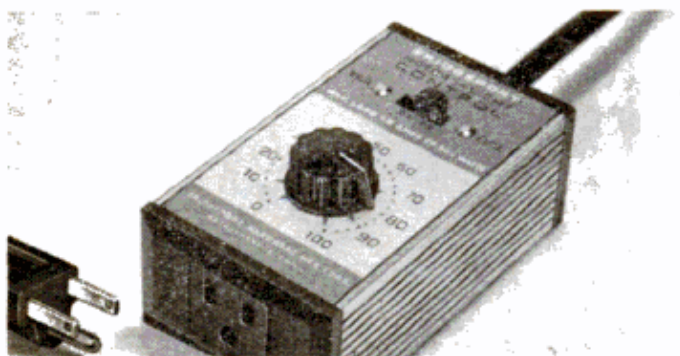
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Who'll Win at Indy?

(Continued from page 228)

But the engine behind most of this year's entries will be the Ford V8. Horsepower is up from 475 hp at 8000 rpm to 495 at 8800. At Indy, rpm means speed. It allows lower gearing for better acceleration.

Oil passages are less restrictive, and the oil pump puts out 30 psi more. Con rods and caps are beefier, and camshaft diameter is increased to reduce deflection. A boost venturi added to the fuel injection gives better mixing of fuel for increased economy.

In the past two years only selected teams were given the aluminum Ford V8s, and Ford technicians did all tuning. If something went wrong, the entire engine was replaced. One garage on Gasoline Alley was stacked with crates of replacement engines. Indy's top mechanics stood around—just watching.

Ford now sells its V8 to all comers, with Meyer & Drake the sales and service reps. This frees Ford of low-volume distribution, and keeps in business the company whose time-proved Offenhauser engine is rapidly being shoved aside by Ford.

This year, Ford has even okayed methanol. (The use of gasoline had been a Ford advertising feature, even though it cost about 40 hp and 3 mph at Indy.)

Smaller Engines Coming

Yes, we may be headed for a Ford-powered rut, but probably not as deep as the Offy roadster rut. As Ward puts it, "The next logical step will be a switch to smaller displacement to get closer to European requirements. The wall is down between road racing and American track racing."

The Offy has just about reached its limit, and it's doubtful that any other manufacturer will try at this late date to catch up with Ford's \$5 million Indy investment. But don't make any long-term predictions. Indy may well deserve its ultra-conservative reputation, but just when you start counting on it, somebody's garage doors open and out comes something new—like the handful of non-conformists entered this year.

Besides the four-wheel-drive Novis, there are two Mickey Thompson-built cars powered by rear-mounted Chevrolet engines with four-overhead-cam conversions. One has front-wheel drive. Loss of traction because of rearward weight transfer during acceleration, a problem with front-wheel drive, will be combatted by locating accessories as far forward as possible, and by the new wide-tread tires, according to one of Thompson's mechanics.

(Please turn to page 232)

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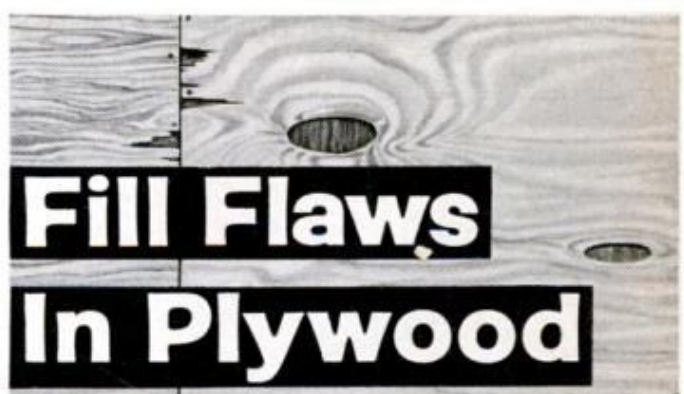
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Who'll Win at Indy?

(Continued from page 230)

The frame is essentially a 12-inch-diameter titanium tube (which also doubles as the fuel tank) just inside the right-hand wheels. Body skin and driver's seat are supported by brackets.

A pair of pushrod-Chevy-powered cars with offset chassis is being built for J. Frank Harrison, a Chattanooga, Tenn., sports-car enthusiast and newcomer to Indy. One car has an aluminum skin, the other a fiberglass one. The highest part of these cars—and the top of the driver's head—will be 32 inches off the ground, making them probably the lowest American-built entries. One builder has even designed a car with an Offy engine sitting transversely across the rear.

Who Will Win It?

With such a variety of cars entered, it's not easy to predict who has the best chance of winning. But we asked Ward, Jones and Foyt to try.

"I won't say Rodger or Parnelli or any of about 10 others who are harder to beat than the rest," said Foyt. "Any one good enough to make the race can win it easily. I've led plenty of races and even lapped the whole field on a mile track and then fallen out. Some driver whom I can beat nine times out of ten will go right by me. On this one day, he's right and really flying, and that's it."

"As A. J. said, everybody beats you if you fall out," Jones agreed. "But most of the competition will come from A. J., Rodger, Dan Gurney, Jim Clark, Roger McCluskey and Lloyd Ruby. Take some of these out if they're not in the right cars. On the other hand, there's always a rookie, in the right car, who'll surprise you. But a rookie is handicapped in not knowing what's going on. We're all glad they've raised the drivers' tests for rookies to 145 mph, closer to race speeds."

Ward chimed in: "Jim Clark and whoever's with him on the Lotus team will be tough. But the toughest on this track is Parnelli. He's the best at Indianapolis. Foyt is one of the great drivers of all time. He's the best from track to track, in my opinion. Gurney could be tougher this year; I feel he wasn't given the same equipment as Clark, and I think he's just as great. Roger McCluskey, who'll drive for Gurney, is also a great driver who could show his real potential. Bud Tinglestad could show more of his ability this year. McElreath could also get on this list."

I don't know what your guess is but to me the odds would seem to favor Ward this year. ★★★



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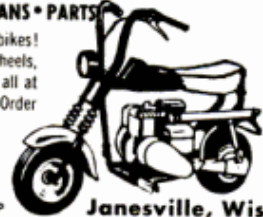


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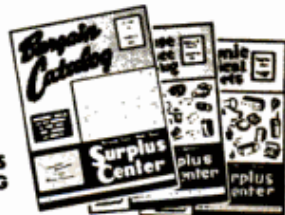
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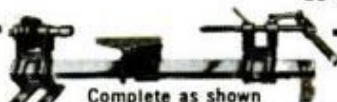
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- Long Rip Fence #354C at \$4.50
- Drill Press at \$29.95
- 1/2 hp GE Motor: \$12.95 (purchased with other item)
- \$18.95 (if purchased separately)

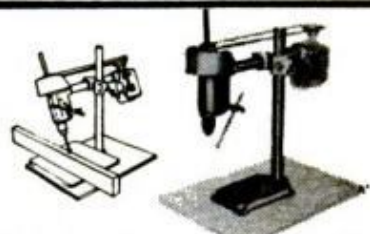
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32" RADIAL DRILL PRESS

\$29.95

F.O.B. Factory 1/2" Cap. Jacob's Chuck Inc Shipping Wt. 30 lbs.

DOES WORK OF \$90 UNITS... AND A GREAT DEAL MORE



Industrial quality precision machine with all features of standard drill press, many extras. Head raises, lowers. Greatly increased depth of throat. Can be pre-set to any angle or position for on-or-off table drilling... even horizontal drilling. All cast iron and steel.

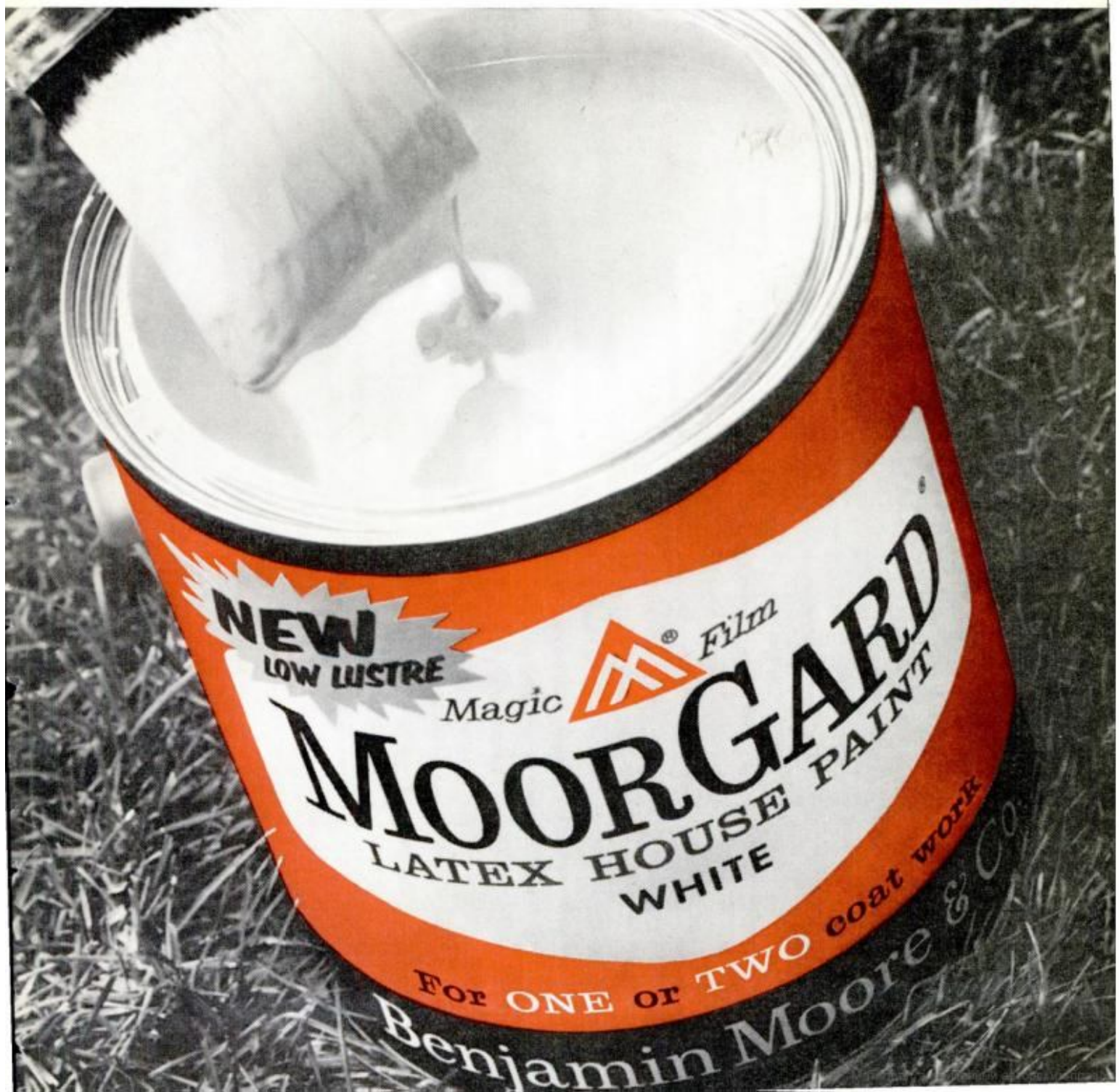
10-YEAR FULL SERVICE GUARANTEE

10-YEAR FULL SERVICE GUARANTEE Any part or parts of any AMCO power tool which may become inoperative for any reason within ten years after the purchase date will be repaired or replaced by the factory without cost to the purchaser. Your only cost: for postage.

the outside paint

the insiders use. People who know, use MoorGard. Word is getting around—new Low Lustre finish—slips on with ease—dries “bug free” in minutes, tools clean up in water. MoorGard Latex House Paint is your Magic Film of protection.

Benjamin
Moore paints 





The little Evinrude is the **BIG** one.

You're looking at a revolution in outboard motor design.

The motor on the right is the fishing man's perennial favorite—the Evinrude 5½ hp FISHERMAN — smoothest, quietest, most popular fishing motor ever built.

The motor on the left is the new 6 horsepower FISHERMAN.

Same full-range quiet, same twin-cylinder smoothness, same round-trip reliability. Same ability to survive a rock or slip a weed. Same luxury features. Same miserly ways.

What did we do to make it so small?

Three things, basically.

FREE! Two new catalogs. 1965 motors and boats. At your dealer, or write Evinrude Motors, 4136 N. 27th St., Milwaukee, Wis. 53216.

We redesigned the combustion chamber and angled the spark plugs to make the powerhead smaller and the hood shorter.

We changed to gear-type starting to make it lower.

We redesigned the fuel filter and throttle linkages to make it narrower.

Any other changes?

Yes. In the process, we added ½ horsepower and lopped 6 lbs. off the weight and 1½ inches off the height.

Now the little Evinrude is the **BIG** one.

In everything except size.

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