

Build PM's Back-Yard Beauty – All-Purpose Toolshed

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POPULAR MECHANICS

MAY 1970
50 CENTS

ELECTROLUNG

– 1000-Foot Scuba?

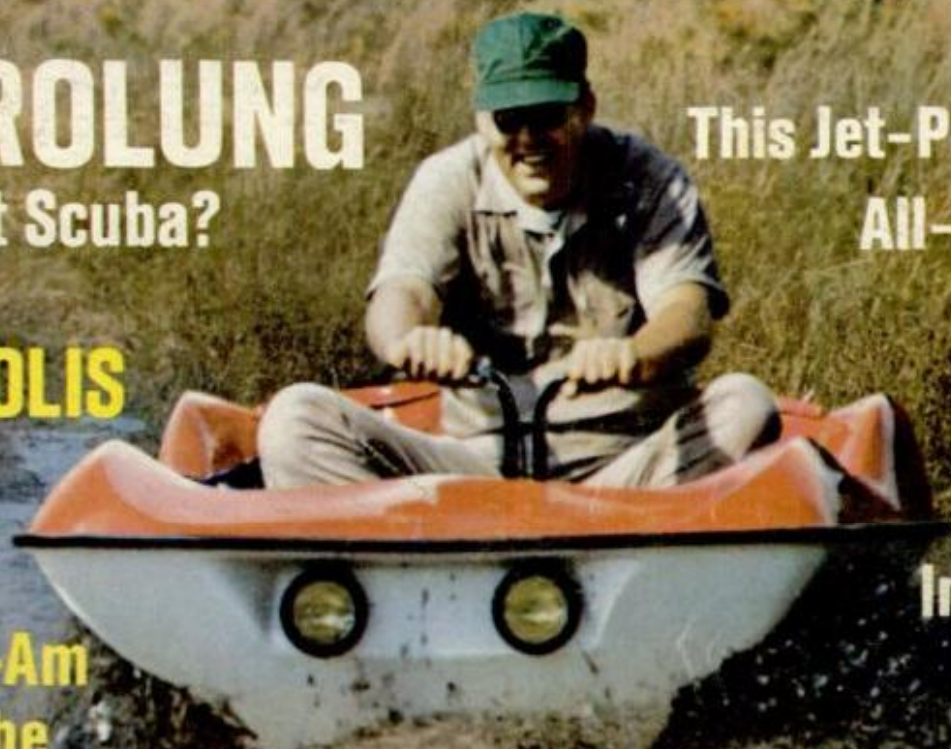
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INDIANAPOLIS

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PREVIEW

Can the Can-Am
Kings Blitz the
Brickyard?



This Jet-Powered

All-Terrain

Vehicle

Really

Moves

In Water

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CAMPING '70

IDEAS • TIPS • EQUIPMENT

SPECIAL
32-Page Keep-It
SECTION

- New Mini-Cameras
- Stay-Hot Serving Cart
- Four Exciting Weekend Projects
- Saturday Mechanic • 4-Channel Stereo

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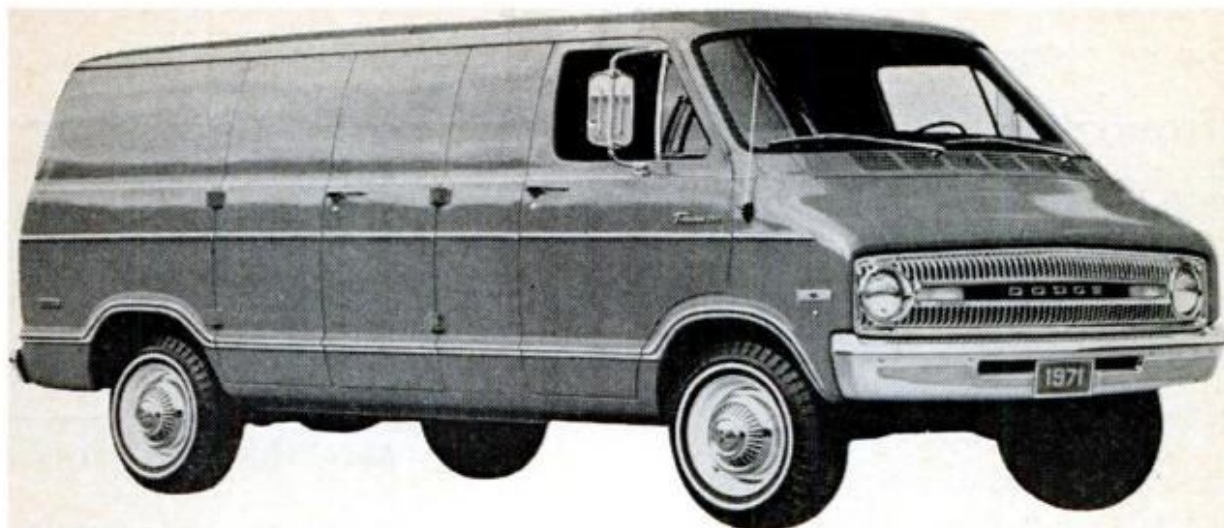
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This Jet-Powered All-Terrain Vehicle Really Moves in Water

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'71 Cars: Something New at Last? Sneak preview of Detroit's upcoming offerings.
New Tools for Treasure Hunters. Diver tells secrets of world's most successful finders.
PM Owners Reports. Buyers rate their Olds Toronados and Dodge Chargers.

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What's new Pussycat?

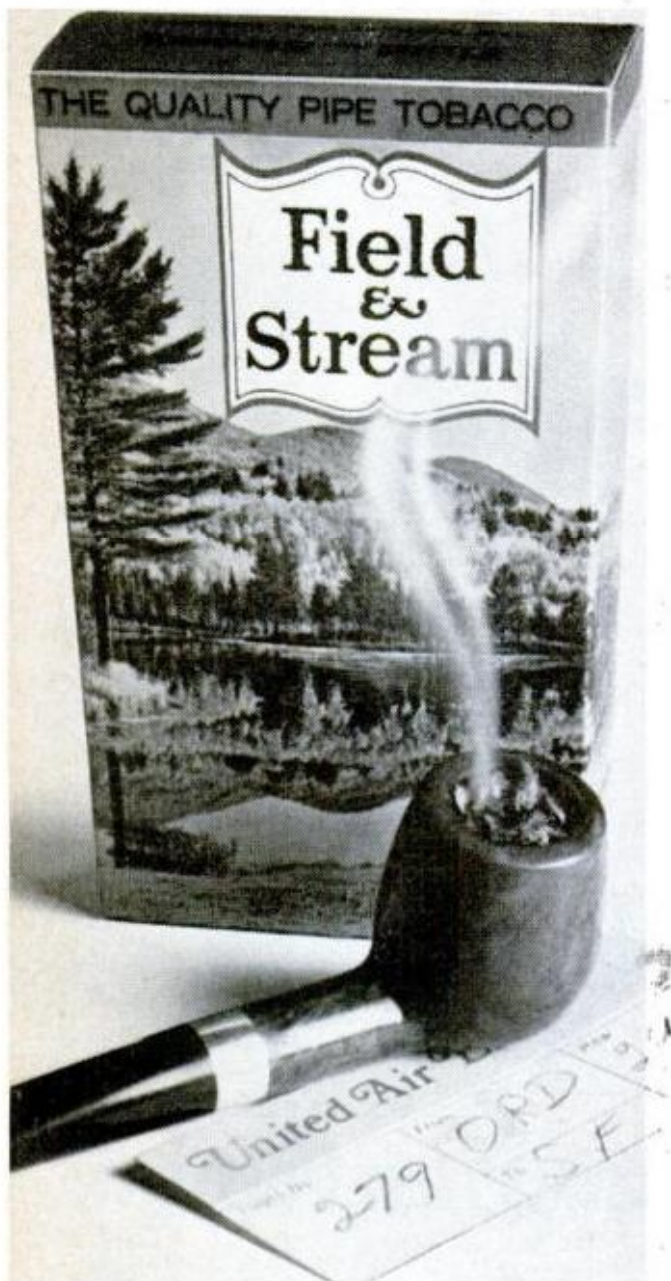
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LETTERS TO THE EDITOR

Uncannily timely

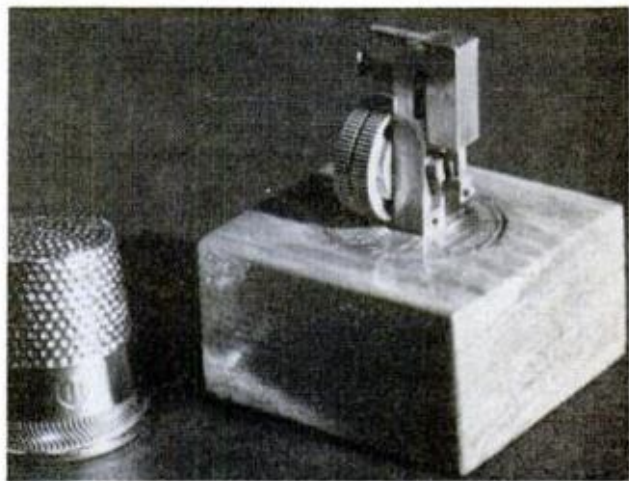
I can hesitate no longer to express my appreciation for your publication. In the two years that we have been receiving the magazine, hardly a month has passed that we have not found some item of immediate interest in the current issue.

A year ago we had a fire in our home. The very next issue of *PM* had an article on fire-detection systems that prompted the purchase of the system we have since installed. This past summer an article on paths and walkways helped with the construction of a brick patio and walks in our back yard. This winter, following the frustrations of many hard starts on cold Minnesota mornings, your article on automatic chokes was a lifesaver.

These are only a few examples. Timeliness of the articles has been uncanny.
NEW HOPE, MINN. THOMAS F. CARROLL

Thimbleful of power

I enjoyed the News Brief about the fellow who puts sailboats in light bulbs (*Mini-Mini-Boats*, page 112, Feb. *PM*). However, I am more interested in things



that move. Enclosed is a snapshot of one of a number of model steam engines I build in my spare moments. This one will fit in a thimble and is actually a high-speed engine.

NEW YORK

ANDREW SPRAGUE

End that muskrat ramble

There's a serious flaw in the plans for *Pontoon Fun Raft* (page 138, March *PM*). Apparently raw, or possibly painted, Styrofoam in the floats is exposed to the water. Styrofoam should be covered by hard-

(Please turn to page 8)

POPULAR MECHANICS

“ Our biggest task today is finding trained personnel to fill the executive and supervisory openings generated by our company's continued expansion. And this problem exists throughout the industry. Few careers offer so many positions with excellent salaries, fringe benefits and opportunities for advancement. To help meet our ever-growing need for trained executives, we strongly recommend such courses as the Food & Beverage Management Courses of the Educational Institute of the AH&MA to our own employees, and to all newcomers in the field. ”

—James E. Durbin,
Executive Vice President, Marriott Motor Hotels.



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LETTERS

(Continued from page 6)

board (or even wire netting) because muskrats love to burrow in this stuff and will ruin a good float in short order. These animals live all over America.
NOPEMING, MINN. B. J. TERRELL, MD

Rocks, shoals—and now muskrats! That's a hazard they didn't tell us about in Power Squadron.

Not so new

Congratulations to the party who made the *Flip-Over Ladder-Chair* (page 175, Feb. PM). I have one that was manufactured in the early 1900s. It has dowels in the chair back and a wire locking device.
SIOUX FALLS, S.D. J. E. MARRION

We published it because we figured a lot of those old chairs would be wearing out about now.

Doesn't prove a thing

Easy-to-Fix Cars (page 83, Feb. PM) doesn't prove anything.
I am owner of a Ford, and those easy-

to-fix parts don't help because the biggest problems occur in the engine and the transmission. If the manufacturers would worry more about quality and craftsmanship in the mechanical parts, they might be able to sell somewhat better.
PALO ALTO, CALIF. PAT KENNEALLY

Liters or not, he likes us

Why do you quote and write in liters, meters and cc? Have you gone high hat? Put on the dog?

This is the U.S.A. I'm not buying a foreign subscription.

Young and old of several families read (or try to read) my magazine. You should realize this!

Even so, in spite of it, well, hell, I like PM.

BROOKSVILLE, FLA. C. B. BARNHILL

Shucks, we're just plain folks. Thanks a bushel (35.238 liters) fer writin'.

Uptight in Colorado

I've just finished reading *To the Summit by ATV* (page 102, March PM). First off, he should not have done it. People doing
(Please turn to page 10)

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LETTERS

(Continued from page 8)

dumb things like that will just get all off-road vehicles banned. Wheels start erosion, tearing up tundra that takes 100 years to grow. There are other places that are just as challenging to drive without destroying the ecology. Second, you should not have printed the article because everybody will go do it just to prove he can. A lot of people in Colorado are already uptight over this situation and you didn't help a bit.

DENVER

FRED HENKE

Best project yet

When Mr. Clyde Lammey's plans for a hall clock came out (*PM's Handsome Hall Clock*, page 124, Oct. '69 *PM*), I knew at once that this was the one I had been waiting for.

I used black walnut, some of which had lain in my workshop for several years, but had to buy the longer pieces for the waist portion of the cabinet. My total outlay for materials was just under \$30.

I completed the clock just in time to present it to my wife for Christmas.

The enclosed photo does not do justice to the clock, but it does prove to me how well the plans were presented by Mr.

Lammey.

I read *PM* regularly and make many projects but this is the best yet.

KINGSPORT, TENN.

CECIL H. DAVIS

Any readers who want to build the clock but missed the two-part (Oct.-Nov.) article can get Xerox copies of the pages for \$1.40. (In fact, any past articles can be obtained the same way. Figure 20 cents per page plus 15 cents for mailing.) *PM* also has a revised catalog of plans, publications and projects available for 25 cents for postage and handling.

Order any of them from Popular Mechanics Service Bureau, Dept. JL, 224 West 57th St., New York, N.Y. 10019.

Instant inflation

The *Shelv-A-Grill* indoor barbecue grills (Exciting New Products, page 180, March *PM*) were tagged with amazingly low—and, unfortunately, erroneous—prices. A spokesman for Jenn-Air Corp., the maker, reports that the single and twin units sell for \$360.75 and \$419, respectively. ★ ★ ★



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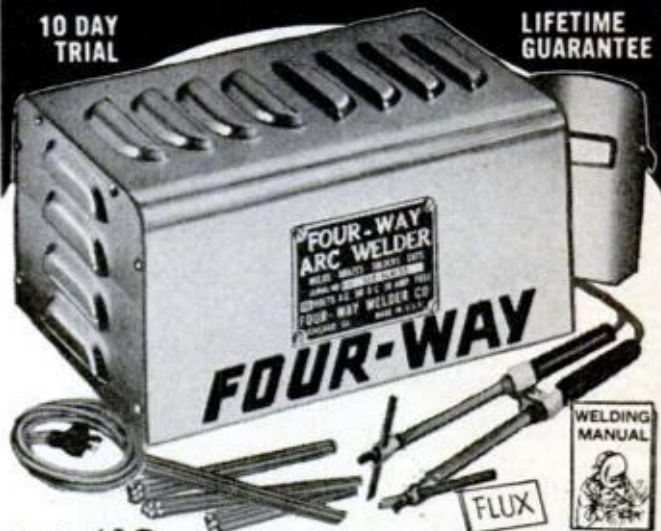
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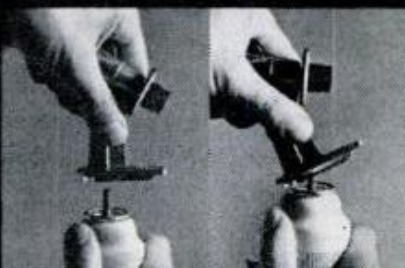
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Was Apollo Too Successful?

Nine months after the whole world watched Neil Armstrong climb down that ladder on the moon some Americans are "bored" with space, and we're breaking up the scientific team and mothballing the engineering complexes that produced what President Nixon called "the greatest event since Creation." What was the name of that movie last year? *Goodbye, Columbus?*

The President put his name on the plaque Armstrong and Aldrin left on the moon and he telephoned them while they were there, but he cut America's space budget to the smallest total since John Glenn orbited the Earth. The Vice-President says on to Mars by 1985, but we won't make it by "stretching out" our effort. Perhaps NASA was *too* successful with Apollo. It violated the "Catt Concept," enunciated by Britisher Ivor Catt. According to Catt, the most secure project is the unsuccessful one, because it lasts the longest. Since most layoffs follow completion of a project, only a fool or a brave man completes one unless he is already entangled in its successor.



Seven thousand people, we read the other day, rode snowmobiles into Yellowstone Park last winter. It was only three years ago we sent Dan Fales on the *first* snowmobile safari through the park. If you've been wondering what has happened to Dan, we suggest you plunk down a dollar for a copy of our new sister publication (*Sports Afield's* offspring, to be precise), *Rod & Gun*. It's the handsomest, slickest, most exciting outdoor magazine we've ever seen. Because of the great job he did as Boating and Outdoors Editor of *PM*, Dan was "drafted" to be Executive Editor of *R&G*.

Dan's successor on *PM*, as you've no doubt discovered, is George Reiger, a 30-year-old, 6-foot 3-inch fishing nut, naval officer and Princeton graduate who joined us last summer after two tours of duty in Vietnam, two years of teaching Vietnamese and small-boat handling at the Naval Academy and six months as language officer at the Paris Peace Talks. A bachelor when we hired him, George disappeared one Friday in January. When he showed up on Monday, he had a bride, secretary to Alabama Congressman, Jack Edwards. On a delayed honeymoon in March, George and Barbara explored the new Arkansas River waterway in a houseboat. You'll read about it in a couple of months.



Editor

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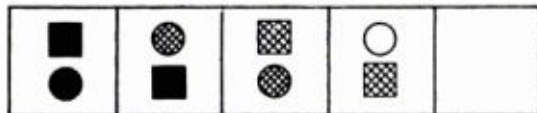
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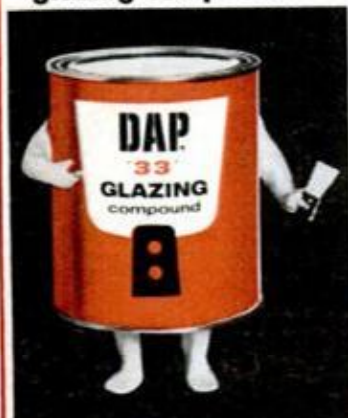
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here's a book that will help you select the tour which will best suit your budget and holiday duration. Called *The World Travel and Vacation Almanac*, it lists 2744 separate travel tours with brief description of each, a 100-page guide to countries and cities and lots more. \$2.50 from Enterprise Press, 230 Park Ave., New York, N.Y. 10017.

IF YOU HAVE BOUGHT a radial-arm saw and want to know how to get the most out of it, Black and Decker's new radial-saw manual leaves nothing out. Written by Howard Silken, an expert in the use of the radial saw, the book deals specifically with the DeWalt R-1450, but the many tricks and jigs given can be applied to any make saw. Send \$3.95 to Home Industry Tool Distributors, Inc., 2 Merle Ave., Ocean-side, N.Y. 11572. ★★★

A new supersmall electromagnetic device for taking precise measurements of heart performance and blood flow has been developed by Dr. Alexander Kolin, professor of biophysics at the UCLA School of Medicine. The wire-like detector is inserted into an artery by means of a hypodermic passed through the skin. A magnetic field generated outside the patient creates a voltage in the blood streaming through the artery. Made up of two tiny electrodes spaced about an inch apart inside a thin tube, the meter senses the voltage and thus measures flow rate. The device, says Dr. Kolin, can be as small in diameter as 20/1000ths of an inch, only a bit larger than a human hair. The smallest instruments of this type now used are too large for introduction into the bloodstream without surgery.

Those old tires, beer bottles and plastic containers that litter many roads could be used in the construction of new highways. That's the idea of Texas A&M's Dr. Douglas Bynum, an engineer, who says that ground-up glass, rubber and plastic are useful pavement additives. Rubber tires make a good binder for asphalt, and crushed glass is an outstanding aggregate. Powdered plastics improve the pliability of asphaltic concrete and plastic chips can be used as an aggregate.

A clean bill of health for DDT is given by James W. Wright, an official of the World Health Organization. He says that no toxic effects from DDT were reported in over 20 years by the estimated 200,000 spraymen working on antimalaria campaigns around the world nor by the 600 to 1000 million people living in homes that have been sprayed repeatedly. Millions of lives have been saved by the insecticide, according to the official, who asserts that limiting its use in malaria-threatened countries could result in a major disaster. In addition to malaria, DDT is used to fight insect-transmitted diseases such as dengue, plague and sleeping sickness.

One of the world's tiniest engines—smaller than an ordinary paper clip—is made by North American Rockwell's Rocketdyne Div. The mini-engine develops a scant 1/100th of a pound thrust and is designed to be used to change the attitude of an interplanetary spacecraft. Two of these engines firing together for a fraction of a second could move a spacecraft a quarter turn in about 15 or 20 minutes, according to a Rocketdyne engineer. Because fabrication involves working with tolerances of 1/10,000th of an inch, some components are made by a jewelry concern.

A computer reads your electric, water or gas meter automatically through your telephone line—and without ringing your phone or perceptibly tying up the line. Bell Telephone has developed such a system, which it plans to test in 150 homes at Holmdel, N.J. Here's how it works: After an attendant establishes a connection between the utility's computer and special equipment at the phone company's central office, the computer calls the subscriber's number. The call automatically goes to the meter, traveling over special circuits so that the bell is not rung. Gadgets at the meter convert mechanical dial readings into electrical pulses that are sent back to the utility's information collection center.

An electronic collar and NASA's Nimbus 3 weather satellite may combine to tell scientists about the migratory habits of elk. The 23-pound collar contains an antenna, transmitter, receiver, batteries and solar cells for recharging. It's sealed against water and can withstand temperatures of minus 40°F. It will be fitted around the neck of an elk among the 7000 on a refuge in Wyoming. A system aboard the Nimbus 3 will interrogate the collar twice daily from orbit, obtaining info on air and animal skin temperatures, altitude above sea level, light intensity and location. In addition to NASA, the experiment is sponsored by Smithsonian Institution and Department of the Interior. ★★

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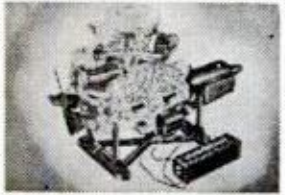
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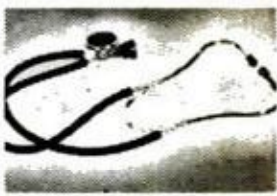
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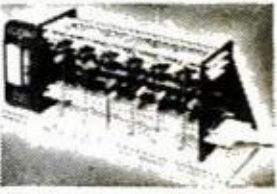
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DETROIT

LISTENING POST

BY ROBERT LUND

WHAT NEXT, AFTER THE MINIS are launched? There's nothing nailed down on this, but the next trend could be two-in-one automobiles—cars that could be used for conventional purposes or as recreational vehicles. The long-range thinkers who rough out the basic package three to five years ahead of production are looking at the idea. The concept may sound like old stuff to those of you wheeling around in Broncos, Blazers, Scouts and Jeeps. But those are basically work vehicles that can also be used as passenger cars. The new type of car under consideration would be a switch on the utility car in that it would be an everyday automobile first with features built in so it could double as a recreational vehicle. If it comes off, much of the credit will go to Borg-Warner, which has developed a four-wheel-drive system for nonutility cars—meaning standard passenger cars.

HOW ABOUT A REMAKE of Chevy's small car under the Pontiac label, say next spring, after Chevy has popped the cork? The Tempest followed Corvair, remember? Chevrolet brought out Corvair in October, 1959, and Tempest followed in November, 1960. Pontiac general manager Jim McDonald answered the question *comme ci, comme ca* at a press conference. "We've traditionally served GM a notch above Chevrolet," he replied, "so if the market is sliding that way, we have to look in that direction." That may sound like a strong maybe, but don't bet on it. Talking to McDonald privately, *PM* asked if the division has ordered tooling or asked for bids on tooling to produce a small car. McDonald says, "Positively not." So if Pontiac has a small car in the oven, it's a long way from being served up. At the same bash, *PM* asked Steve Malone, Pontiac's chief engineer, if the industry is coming to the bumperless car. There have been a couple of no-front-bumper jobs in recent months. It started with Plymouth's Superbird and then Pontiac's Firebird showed up minus a front bumper. Malone says he can't see the idea spreading to many cars. "You have to consider the entire vehicle," he explains. "You can carry it off on an intermediate or a specialty car, but I don't think you'll see the bumper—front or rear—done away with on the big cars." The nose section of Firebird is made of polyurethane plastic—Pontiac calls it "Endura"—a material that has a retention characteristic causing it to return to its original shape under minor impact.

GM AND FORD have apparently decided to steer separate courses in a couple of areas where they've been traveling tandem. GM has never liked the idea of going along with the long-hood, short-deck look in cars popularized by Ford. Not that GM is anti the tight-rear, elongated-hood shape. But the leader in sales figures it ought to lead in styling too, rather than follow a theme pioneered by a rival. Starting this fall, GM will begin to break out of the Mustang mold by stretching out the aft end of its big cars. The change won't hit you as a new shape, because the transformation will be made gradually, over a period of several years. But GM is going to a more balanced distribution of metal—less hood, more rear. In another area, there's evidence GM and Ford don't see eye-to-eye on ways of improving service features of their respective cars. Ford is all for making parts easier to get at and easier to repair. GM goes along on the accessibility angle, but believes emphasis should be on reducing the need for service and the chances of something going wrong, rather than on making parts easier to repair.

WITH THE INDY 500 COMING UP, it seemed like a good time to put a couple of questions to old never-say-die, Andy Granatelli, winner of last year's contest. Here's how it went. *Listening Post*: "Are we reaching a peak on speed at Indianapolis?" *Andy*: "Hell, no! You have to have one constant factor in racing—the track. Cars and drivers improve against that constant. We'll see a 175-mph qualifying lap at Indy this year or

(Please turn to page 24)

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DETROIT LISTENING POST

(Continued from page 22)

next. If USAC had really let us innovate, you'd see safe speeds in the 180-mph bracket right now." LP: "What's Detroit's emphasis on safety going to do to racing?" Andy: "Nothing. Racing's survival and progress have always depended on ongoing safety developments. We have the fly-apart chassis now and fuel cells that are nearly fireproof. Next, you'll see water-filled crash walls, speedway walls, a continuous ribbon of safety lights and all kinds of new safety ideas. Racing will always get faster—and safer." LP: "Suppose there were no strings, no financial restrictions, anything goes. What kind of car would you build?" Andy: "That's easy. It'd be an all-new STP-Turbocar, an improvement on No. 40 [Granatelli's Indy entry of 1967 that stopped five miles short of victory]. It would make the hair stand straight up on every racing fan in the world. You couldn't build seats fast enough to handle the audience."

IT'S A LONG WAY from Andy Granatelli and Indy 1970 to Rene Thomas and Indy 1914. It's a long way from Indianapolis, U.S.A., to Villa Indianapolis, 15 Rue de la Paix, Colombes, France. That's Rene Thomas's address. Who's Rene Thomas? He participated in the 500 four times: 1914, 1919, 1920 and 1921. He won the race in 1914 in a Delage, average speed 82.47 mph. That was the only time he finished in the money. Thomas is now 84 years old. He still drives his own car and takes in the races at Le Mans, Rouen and Reims. He has raced everything except trains and horses. Bicycles, motorcycles, cars, planes, you name it. He fell out of a plane while stunt flying in 1910, breaking his shoulder in three places and acquiring a nickname he has carried for 60 years. He is known in France as "The Death Deceiver." Thomas raced cars for eight companies—LaCoste & Batman, Prima, Delage, Le Gui, Peugeot, Sneider, Talbot and Sunbeam. If you want to know anything about those makes, drop him a line. He doesn't read or write English, so you'll have to translate into French. (It says at the beginning that this space is supposed to stick to stuff on Detroit. This detour just once, with your indulgence, please, for an old champion.)

THERE'S BEEN TALK about early introductions of the '71 cars. The theory is that sales of the current cars have been so disappointing to Detroit that the auto companies would like to push the off button as soon as possible and move in with a fresh batch of cars in the hope of signing you up

for a '71. Yes and no. Each company sets a minimum production target at the beginning of the model year and these goals are used to order a certain number of door handles, instrument panels and other components that can't be carried over to the next model year. Good times or bad, the minimum "buy" on these items must be used up before a new model goes into production. It will be July or August before parts inventories are used up, so the new cars won't be out any earlier this year than last. That means you'll see most of them between the final week of August and the first week of October.

MID-ENGINE FORD isn't a Ford at all. The company won't be making such a car but it will be instrumental in importing one. Ford's year-old working arrangement with Alejandro de Tomaso has resulted in a Ford-powered, midship-engine car that will be in select Lincoln-Mercury dealer showrooms in the autumn. The name is "Pantera," Italian for panther. De Tomaso of America is already promoting the machine and Linc-Merc dealers are preparing prominent display areas for the



foreign car they'll be selling and servicing. It's powered by Ford's 351 V8, weighs 2860 pounds, has a wheelbase of 98.4 inches and a length of 167 inches. It has monocoque chassis and independent suspension front and rear. Other technical features of the car, which will be priced under \$10,000, include ventilated disc brakes front and rear with 464-sq.-in. swept area. Transmission is a Zed-F five-speed. Cast magnesium wheels and low-profile radial tires are standard.

The Italian car, first seen here at last month's New York Auto Show, gives Ford the jump on other U.S. makes (namely Corvette) in getting a mid-engine car to market.—B.H.

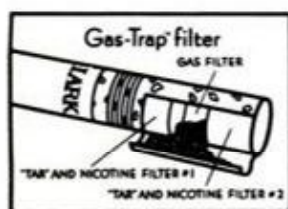
AN AGENT at American Motors says *Listening Post's* prediction that AMC will be the second (to Ford) U.S. carmaker to bring out a mid-engine vehicle and the first domestic car manufacturer to produce a mid-engine in the United States is half-safe, half-cocked. It's definite that AMC

(Please turn to page 26)

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DETROIT LISTENING POST

(Continued from page 24)

has a mid-engine upcoming, probably next spring. But according to the Man Who Knows, it will be built in Italy. It will be a limited-production job with about 36 to be built the first year. At least one exists now. It's called AMX/3 and is powered by AMC's 390-cu.-in. V8.

1971 CHEVY VANS number 36 models in $\frac{1}{2}$, $\frac{3}{4}$ and, for the first time, 1-ton ratings. Two basic body styles are the side-windowless Chevy-Van and Sportvan wagons. The luxury Beauville, shown here, is the top of the Sportvan line. Most prominent change is the extended front end. The engine has been moved forward, resulting in more usable floor space, easier access to the rear, greater passenger protection in a collision and outside engine servicing through a conventional front hood. Front-seat entry is easier, too, since wheels are



ahead of the doors. The side-loading door is of the sliding type and conceals an inside step. Short and long-wheelbase models are 110 and 125 inches, respectively; overall lengths are 176.9 and 200.9 inches, both are 79.9 inches wide. Vans in the new line are bigger in all dimensions than previous models. Standard powerplant in six-cylinder models is 250 cu. in. putting out 155 hp. Standard V8 is 307 cu. in. in half-ton vans, and 350 in $\frac{3}{4}$ and one-ton models.

—B. H.

GROOVY HIGHWAYS might be the bane of motorcyclists, and many drivers of cars have also cursed and wondered about their effectiveness. Many states began grooving curves on new freeways and turnpikes after NASA tests showed that grooving dramatically cut down hydroplaning and skidding on wet pavement. (See *Farewell to Wet-Weather Skids*, page 124, March '67 PM.) Now the National Safety Council reports accidents on grooved surfaces have dropped 30 to 60 percent compared to the same curves ungrooved. ★★★



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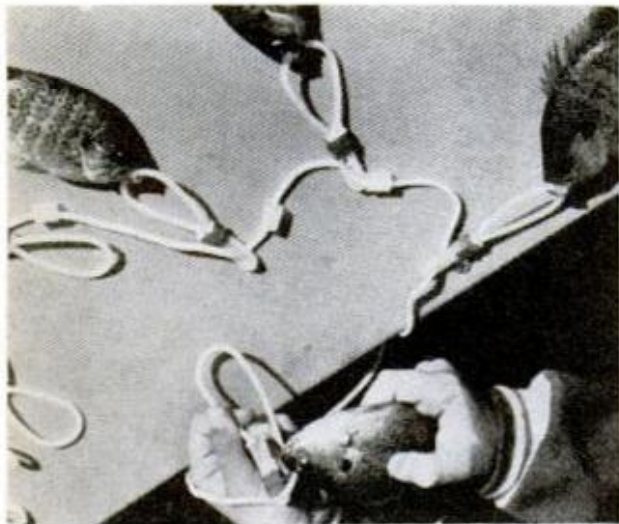
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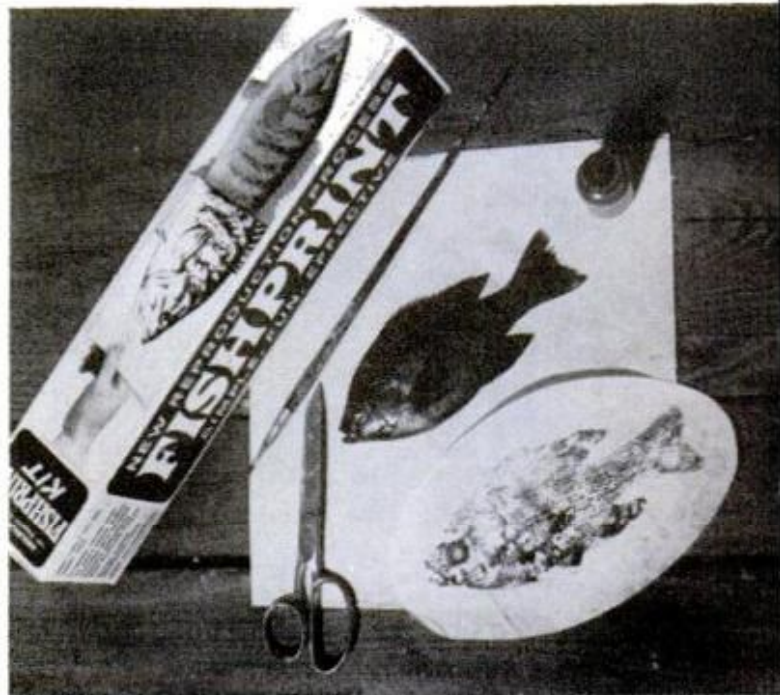
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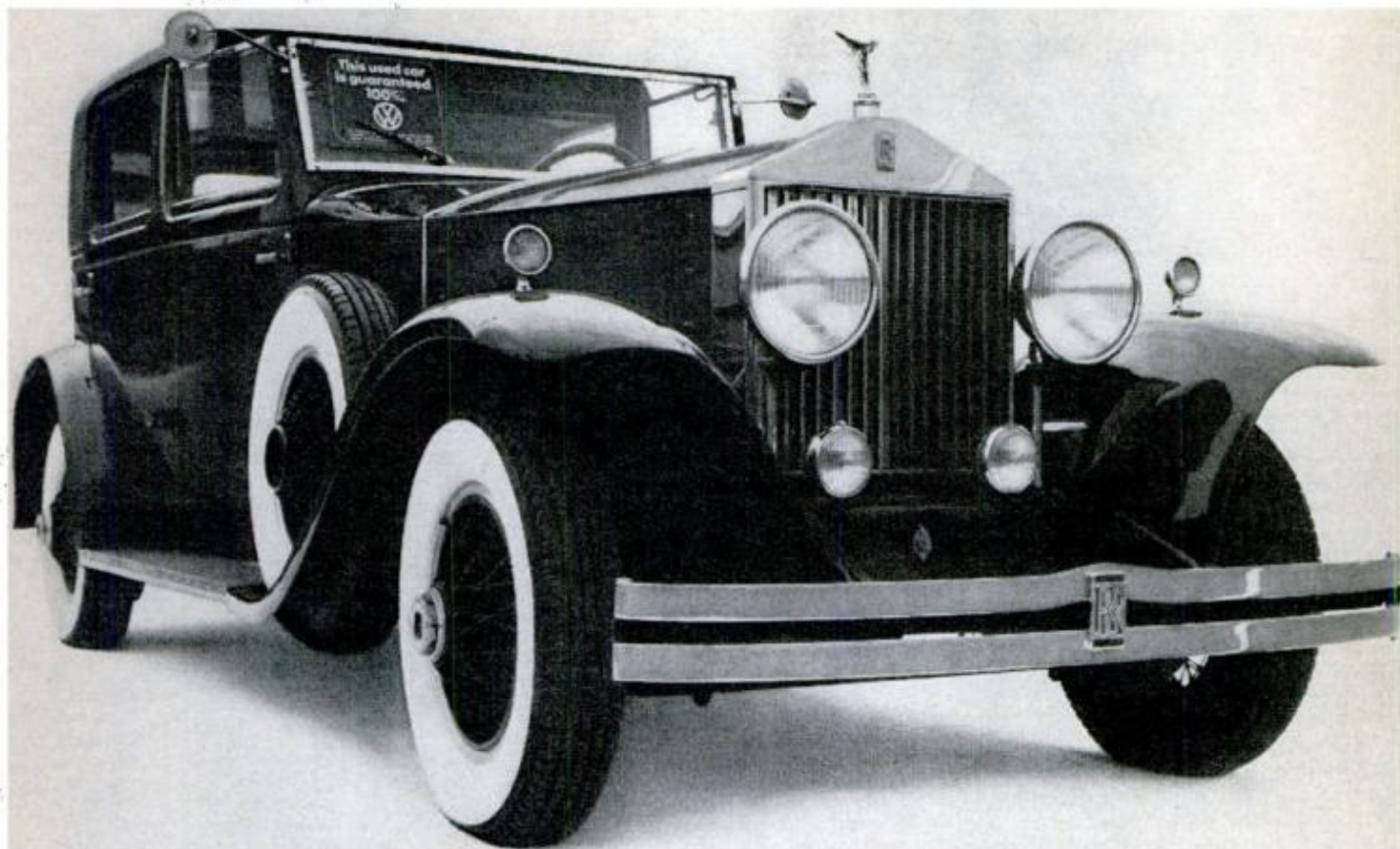
BASS AND BREAM are on their spawning beds this month, and new products are on the market to aid anglers in catching, keeping and "recording" them. From Commerce-Pacific comes the Depth/Range Finder Reel RF-70 (right) with its patented Memory-Lok. Later in the season when bass school in deep water, this device will enable you to set the reel so your lure will return to the same depth automatically. Ideal for still fishermen and trollers, the reel is also claimed to be an aid to casters who set it so that their lures always shoot out the same distance. But what angler wants to make more than a few casts to precisely the same spot? For more information, write Commerce-Pacific, 161 W. 24th St., Los Angeles, Calif. 90007.



ALL-NYLON FISH STRINGER (left) has been developed by DeWitt Plastics (26 Aurelius Ave., Auburn, N. Y. 13021). It will neither corrode nor rot, and once the fish is hooked on the stringer (both lips should be hooked so the fish can breathe properly and live longer) and the lock slid into place over its plastic socket, a positive locking action is created that eliminates sprung clips—and escaped fish! Free-sliding clip means fish can be attached and spaced up or down the cord without lifting the entire stringer from the water. In 6, 10 and 15-foot lengths, each stringer sells for \$1.35. ★★★

WHILE GYOTAKU (ichthyography) has been fairly popular in Japan for years, only recently has a kit for this process been made available to Americans. India ink and rice paper are the essential components used in making a silhouette (right) of any fish that you would like to record without actually mounting it. An unfortunate feature of the system is that unless you fillet one side before you make the print, you'll be unable to eat any part of your catch because the fish is washed in soap and water before copying, and the ink solution itself is poisonous. While I had some difficulty in coming up with a decent facsimile of our experimental sunnies, I may just lack the proper knack. The kit is great for kids who want to keep a record of their first fish. For more information, write Anglecraft Inc., R2, Gardiner, Me. 04345.





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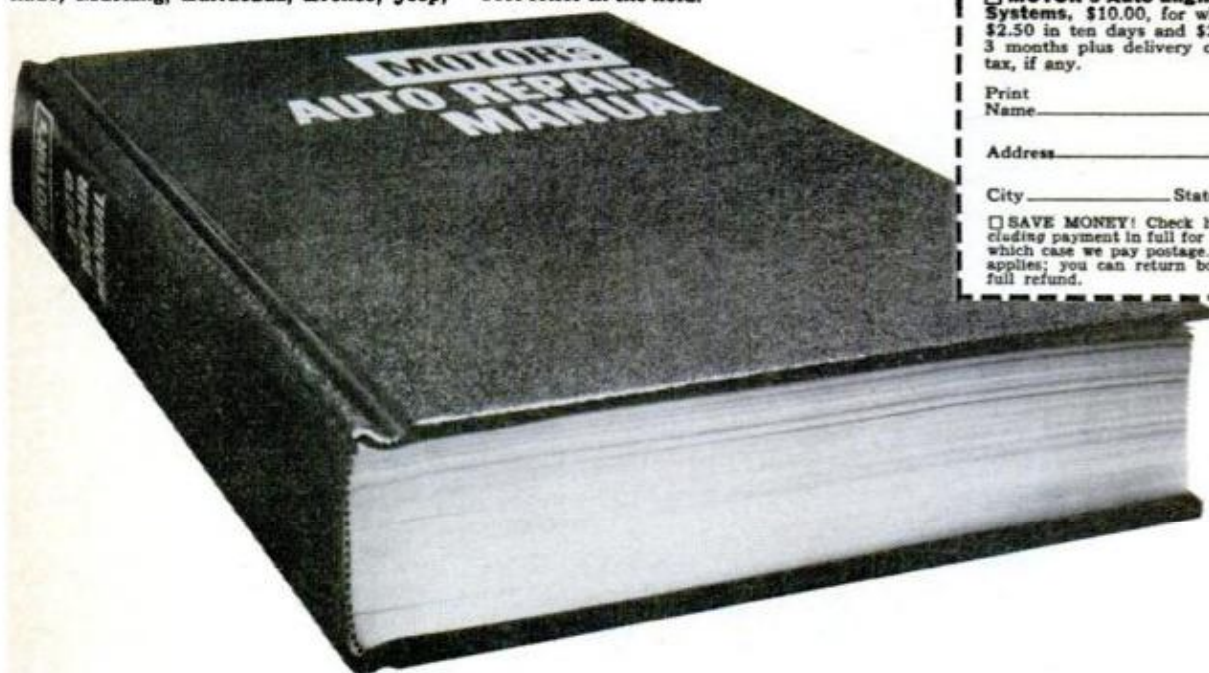
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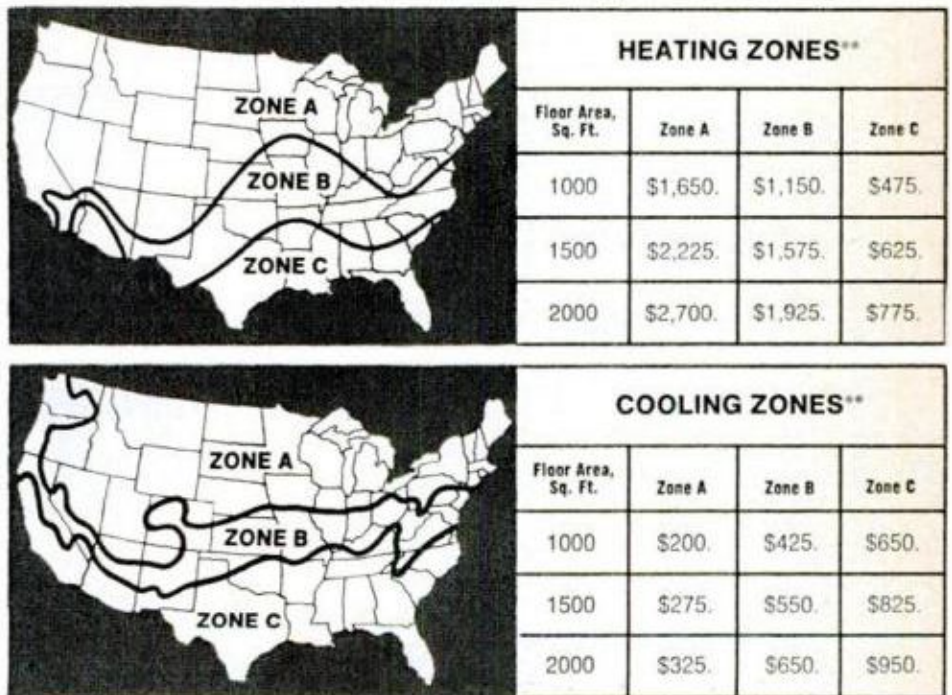
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Drivin' with Dan

Will pollution problems with engines affect racing? Does an airfoil add speed or just improve handling? How does an AAR Cuda differ from standard Cuda? Dan Gurney answers these and other automotive questions

PEDAL POWER gets Dan around Daytona's pits during practice for the 24-hour endurance race. Dan co-piloted a Ferrari 512 with Chuck Parsons. Their car, entered by Luigi Chinetti's North American Racing Team, needed a last-minute improvised bubble in the roof to make a little rattling-around room for the top of big Dan's helmet. Running 116.434 mph, the 5-liter Ferrari qualified in seventh place. The car was running in the top five until midnight of the first day, when, racing in the dark on the road portion of the circuit, Dan nudged the rear of a slower car and had to stop for repairs. After dawn of the next day, the transmission seized and the race was over for the team. Pedro Rodriguez and Leo Kinnunen won in a Porsche at a record 114.866 mph



Q. Do you think motor racing will be affected by the pollution criticism being directed at the internal combustion engine?—R.T. Sargeant, Los Angeles.

A. To a certain extent, yes. Racing and racing engine efficiency should help lead the way toward smaller engines that get more miles per gallon of fuel. It stands to reason that if we double our miles per gallon, we should do the same work for half the pollution. I feel that smaller cars make more sense on the highway, anyway. Good performance means agility and safety to me.

Q. Why hasn't the Chevy V8, which powered every winner in the Continental Championship and won every Can-Am in 1969, been campaigned in Formula 1 where every race last year was won by a Ford V8?—Gary Maugle, Quakertown, Pa.

A. The Chevy is too large for Formula 1 rules (430-CID Chevy vs. 183-CID Ford Cosworth). The "Ford" that you mention was designed and built in England for Ford of Great Britain by Cosworth Engineering.

Q. Is a car faster with an airfoil, or does it just handle better?—David Smith, Duncan, Okla.

A. Usually it just handles better. Often it enables the car to achieve better lap times. Basically the tires are pressed down on the road harder with an airfoil (they don't spin as easily) but there is very little added weight to cause more centrifugal force. Acceleration and deceleration are increased where wheel spin was the limiting factor before adding a wing.

Q. I see Plymouth has an AAR Cuda now, presumably named for your racing team. What is the difference in the AAR Cuda and standard Cuda,

(Please turn to page 38)

one quart of your new oil change will be dirty oil... unless you change your filter, too.

Think about it next time you ask the guy to change your oil. Think about how there's a full quart of yccch-y, dirty oil lurking in your oil filter just waiting to dirty up the fresh, clean oil you're putting in.

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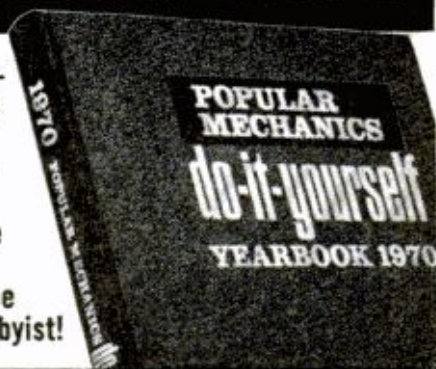
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DRIVIN' WITH DAN

(Continued from page 36)

and did you or will you have anything to do with this car?—Ben Calloway, Memphis.

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Q. I am a 15-year-old girl whose dream is racing cars. I have tried drag racing but wonder if you think I have a chance of getting involved in other kinds of racing such as Indy?—Catherine Haas, Staten Island, N. Y.

A. I don't doubt that it might happen some day, but at the moment, they don't allow girls in the pits at Indy, much less in a racing car on the track. There are quite a few girls in SCCA road racing. If you are a real winner with natural ability, you'd be a sensation. It's a long, hard road to the top.

Q. Do you know if a crankshaft can be cut and rewelded to make two pistons fire at the same time?—W. J. Hull, Clyde, Ohio.

A. It can be, of course, but it would be a vibrator. I think you can change the cam and ignition and do the same thing.

Q. How do you feel about airconditioning and power steering on high-performance cars like the 428 Mach I Mustang? Do these accessories slow down a car much or hurt its handling?—Mike Cibor, Detroit.

A. It all depends on the purpose of the car. Unfortunately you just can't have everything in the same vehicle. You must sacrifice performance for comfort as a rule. The extra weight does hurt the handling under above-average cornering demands. These items also rob horsepower and impede acceleration.

Q. I am building a soap-box derby car and wonder if you think a wedge design or regular soap-box design would be better aerodynamically.—Gary Alexander, Sweetser, Ind.

A. I would say the regular soap-box design
(Please turn to page 40)


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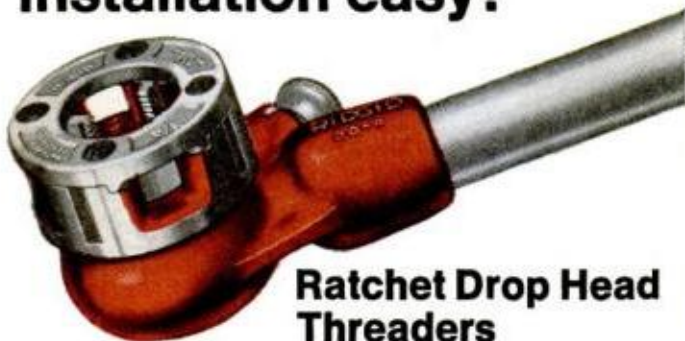
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DRIVIN' WITH DAN

(Continued from page 38)

is better. The idea of the wedge is to give increased down force as the car goes through the air. This down force adds cornering power, but the wedge actually creates more air drag than the soap-box shape.

Q. I'm not especially strong but I find I can place my hand against the side of just about any make car and make it bow inward as if it were so much plastic. Can you confirm my suspicions that manufacturers are using thinner, cheaper body metals? —Karl Wolfshohl, McAllen, Tex.

A. I suspect they are using thinner body metal, but doubt that it's cheaper. The shape of various panels has a lot to do with ability to resist deflection or bowing in. The egg is an example of a strong, thin shape. Curved panels are usually stronger than flat. Remember the old-fashioned oil can?

Q. Is the Plymouth Superbird legal for street use? —Gregg Rafter, Winnipeg, Can.

A. Yes, it certainly is. It is a real eye-catcher and a conversation piece as well as being a fine road car.

Q. I understand that accelerating on a curve will help in making the turn. Is this true, and what are the physical principles involved?—Emmett Henley, Bakersfield, Calif.

A. This is not necessarily so. Really, you have four patches of rubber in contact with the road and the more evenly you can divide or spread the loads involved in negotiating the curve at the highest speed possible, the better off you will be. I know this doesn't answer your question, but it certainly contains the seed of something you could write a book on. And such a book doesn't seem to be in the library, either.

Q. Did you ever drive the Baja 100? Why or why not?—Chris Neri, Plymouth, Mass.

A. No, I haven't had a car nor the time, thus far.

If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 74).

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summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

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In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

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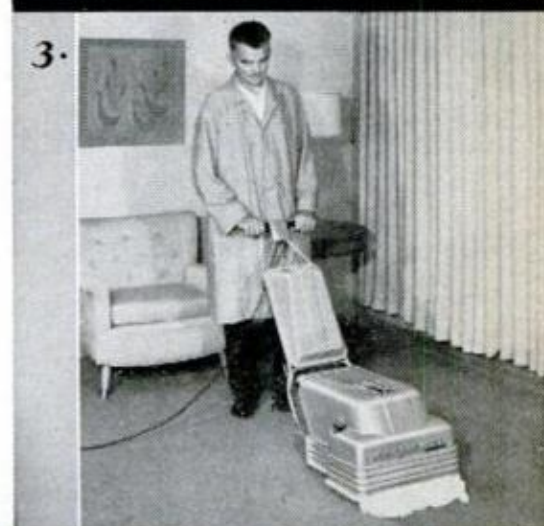
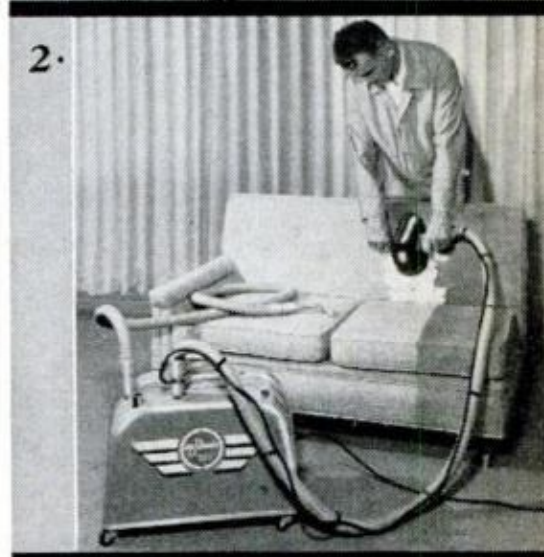
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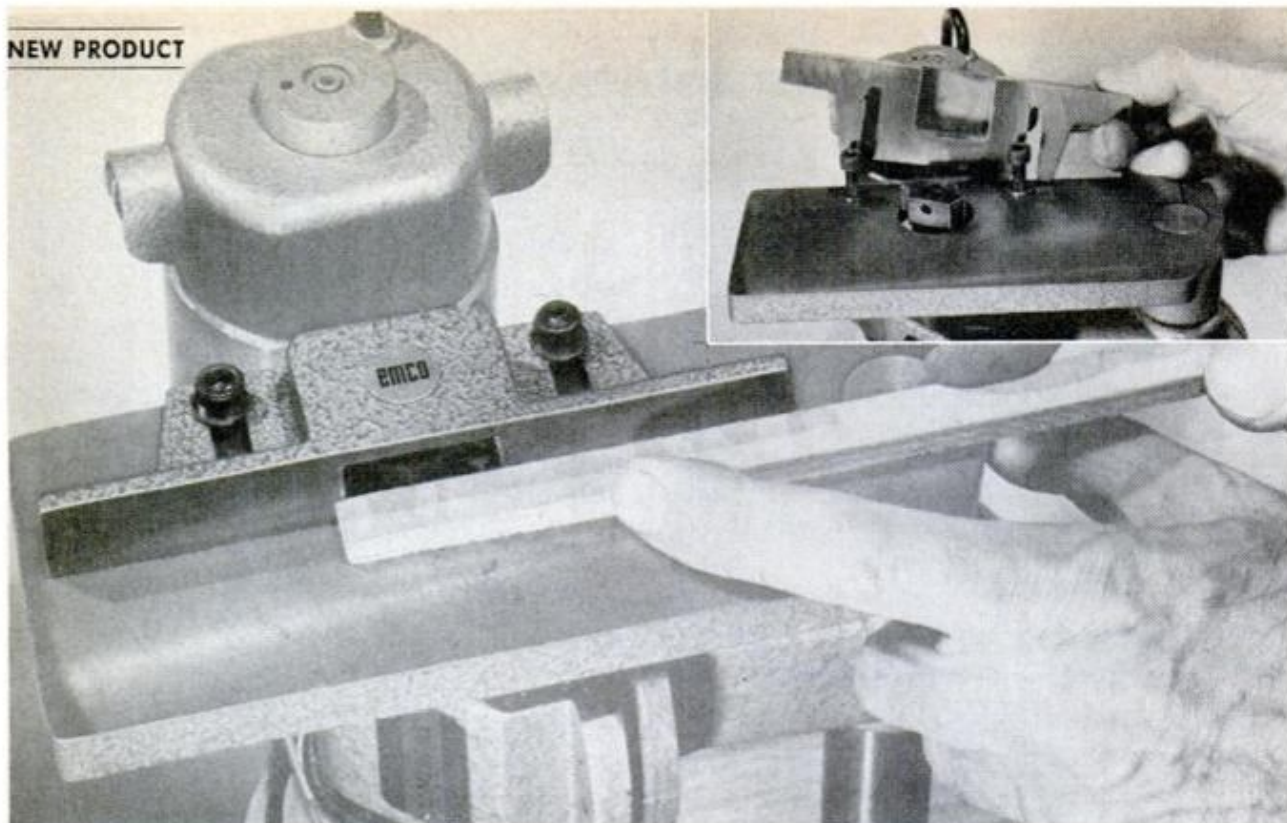
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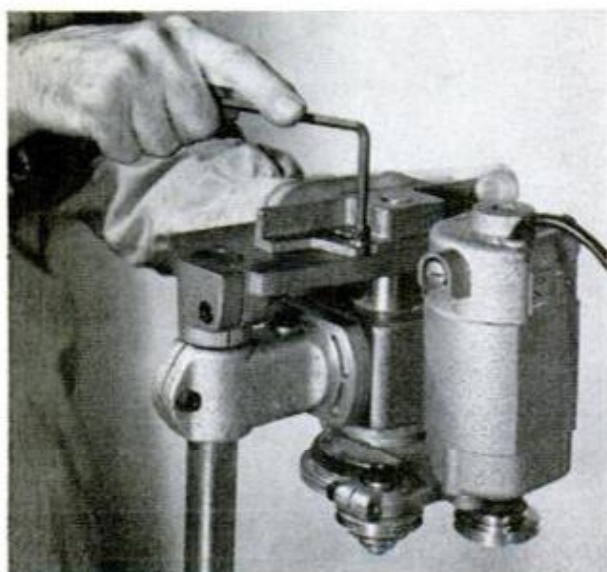
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USING JOINTER to smooth edge of fir plywood strip. Care must be exercised when workpiece end is reached

New Jointer Attachment for Your Unimat

By WALTER E. BURTON



GUIDE FENCE is secured to table by two bolts. To change depth of cut, loosen bolts and move the fence

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The setup illustrated required a spacing block almost $\frac{1}{2}$ in. thick between the spindle head and vertical-column arm, plus a clamping bolt or pin of appropriate length, to align the cutter with its table hole.

I tested the jointer on edge-smoothing, rabbeting and beveling wood and hardboard. It handled all chores effortlessly but, since the fence does not adjust independently like the tables on a real jointer, care must be taken at the end of each pass to prevent the workpiece from biting in. The Emco jointer attachment sells for \$19.95 from American-Edelstaal, Inc., 350 Broadway, New York City 10013. ★★

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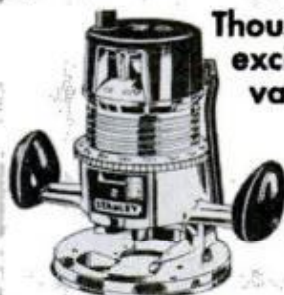
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(Continued from preceding page)

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(Continued on next page)

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(Continued from preceding page)

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(Continued from preceding page)

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(Continued on next page)

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(Continued from preceding page)

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SLOT Machine banks \$5.95. Catalog 35¢. Refundable. Coffco, P.O. Box 522, Lake Zurich, Illinois 60047.

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HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Low heat

I live in a recently acquired, older home, equipped with hot-water heating. Originally coal-fired, the boiler is now fitted with an oil burner and room thermostat controls, but I don't keep warm in cold weather. I'd like to do something about it before another winter. But what?—A.E., N.D.

The answers to two questions may provide a solution or at least point the way. Is your heating system controlled by one or more than one room thermostat and where are they located? And are you reasonably sure the system is of adequate capacity to provide comfortable room temperatures in your locality?

Assuming that your system has adequate capacity, and also that the pipe lines and radiators are in good condition, the remedy could prove to be the relocation of the thermostat, or 'stats. Often, and especially in older converted installations, thermostatic controls are placed where there is inadequate air circulation or they may be affected by a nearby radiator. This possibility should be checked by someone who is acquainted with your particular heating system.

Streaky ceiling

I built my own home, a small ranch type, only a couple years ago. I was then told (erroneously, I know now) to apply creosote to the framing to preserve it. Now there are brownish streaks in the ceiling plaster directly under each attic joist. Fresh applications of paint just don't conceal the streaks. What can I do now?—G.H., Tenn.

As a stain, creosote will penetrate almost anything other than metals. There just isn't any simple solution. I can suggest, for example, that you cover the streaks with wooden box beams, but with joists on 16-inch centers that's a lot of beams, even in a small room. Or, I can tell you to take off the paint down to the plaster—and the stains—and coat the ceiling with white shellac. That's right, white shellac. It's available, but you may have to shop around to find it. One brand is B.I.N., made by William Zinsser & Co.

As a rule, white shellac will seal the

bleeding creosote. It can do no harm and it's worth a trial. You can paint over it, of course, but I wouldn't apply any other coating for a while, just to make sure that the shellac will seal out the stains completely.

While I can't conscientiously recommend that you box-beam the ceiling, this could be done and it might not be too far-out a solution in some rooms if the beams were, say, painted the same color as the ceiling.

Wet attic

Last winter, my attic was dripping water. I've checked for roof leaks and have been told the water comes from sleet blown in the vents—that it may work in under shingles during a driving rain. But the shingles have sealed tabs. I've even watched during the rain and no leaks are visible. Where can the water come from?—W.H., Miss.

The water comes from inside the house, not through the roof or in the vents. Every time you or other family members exhale, shower, prepare food, boil the teakettle or do the laundry you contribute to moisture in the room air. This can build up to several gallons in a 24-hour period. Warm, moist air seeks the colder, dryer air outside the house and forces its way through common building materials and insulation by what is known as vapor pressure. Unless your attic vents are of ample size, this moisture-laden air is trapped in the attic. It condenses on any material—rafters, roof boards and nail tips, mainly because these areas are at a lower temperature.

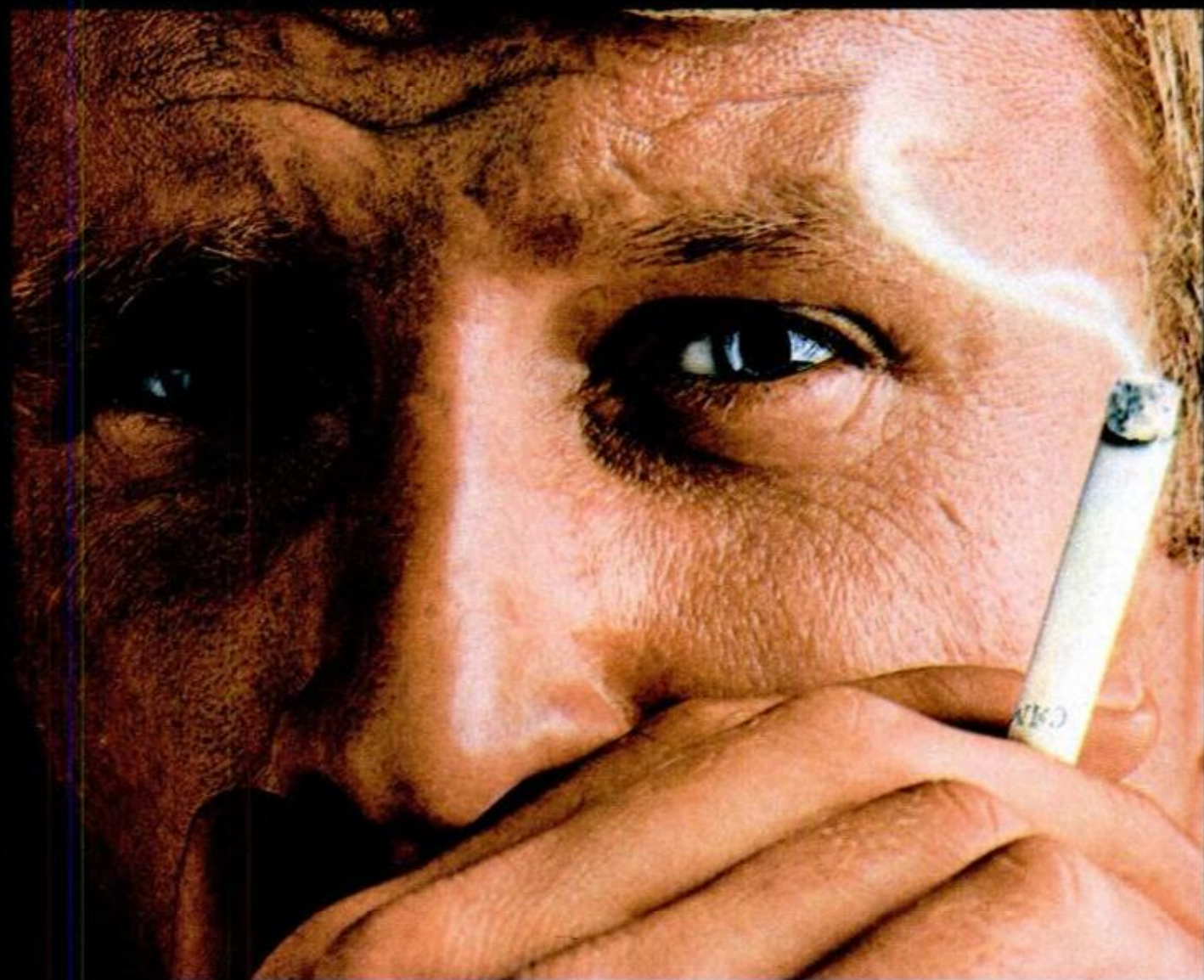
Attic vents or louvers should provide at least one square foot of free area for each 100 square feet of attic floor space. This is minimum, especially where there are low pitched roofs. Enlarge the louvers, if necessary, and do everything else possible to lower the moisture content of air in rooms. Don't let the teakettle boil; install a fan in your bath or shower stall; air the house after laundering, and if you have a clothes dryer or your house is heated by a gas floor furnace, be sure they are properly vented to the outside.

Leaky water pipe

How can I stop a slow leak in a water pipe?—J.J., Utah.

It's best to replace the leaking pipe or have your plumber do it. Should replacement be delayed for some reason, there is a device that can be clamped around a pipe for stopping a leak temporarily. ★★★

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SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

All washed up

The windshield washers of my 1969 Buick won't work unless they are primed. What's wrong?—W. S. Goodlett, Big Spring, Tex.

The trouble is most likely a dirty pump intake or exhaust valves which are not sealing. Remove the check-valve assembly, which is held by four screws, and clean it. After cleaning, check the operation of the valves by attaching a hose to the assembly's intake pipe (that's the large one). You should be able to blow through it, but not draw through it. Attach a hose to each exhaust outlet (there are two—they're the small ones). You should be able to draw through them, but not blow back the other way.

Jumping around

I've been told that you should never try to start a car with a d.c. generator by jumping over from the battery of a car that has an a.c. generator (alternator). If so, why not? Is the reverse true?—Robert Clark, Cincinnati.

You can jump a battery in a generator-equipped car with one in an alternator-equipped car, and vice versa, but you better make sure you don't cross polarity—only then will you have problems, like burned-out diodes in the alternator. Make sure you connect the positive of one battery to positive of the other, and negative to negative.

Gassed

When my 1969 ½-ton Dodge pickup (318-cu.-in. engine) was new, I was getting 15 miles to the gallon but used 8 quarts of oil in 2000 miles. At 4300 miles, the dealer replaced rings and valve stem seals to solve the oil problem. Now I'm getting 10 miles to the gallon. The dealer says the rings are of a different type, and that I'll have to be content with this gas mileage. I would appreciate your opinion.—James O. Walker, Indianapolis.

It sounds to me as if the mechanic did a good ring job, but upset one of the engine's basic settings. The type of ring would have no effect on gas consumption. I would make sure that basic specifica-

tions are on the button, especially ignition timing, distributor breaker-point gap and, of course, carburetor settings.

By the book

The coolant in the radiator of my 1969 Pontiac Catalina checks out 1½ inches below the mark when cold. This is 1½ inches lower than the book calls for. A pressure test reveals no leaks and I get no flash of the warning light. What's wrong?—John J. Drumm, Oswego, N. Y.

Nothing. I don't know what book you checked or what mark you're speaking of, John, but the owner's manual for your car says that the coolant level with a cold engine should be about 3 inches below the bottom of the filler neck. You might even be too high.

Foul-up

My 1969 Corvette fouls plugs as fast as I put them in. I'm on my fourth set in 17,000 miles. The dealer can't find the trouble. He just keeps replacing the R44s with the same kind. That's the plug that came with the car. Help!—L. L. Runion, Black Mountain, N. C.

Did you say Black Mountain? I've got a hunch that this is your problem, L.L. The R44 is a normal-heat-range plug for average driving conditions. It's probably too hot for your driving if it is, as I suspect, over hill and dale. I'd switch to an R43 or R42S, which are colder plugs.

Gearing for work

I have a 1969 Jeep Wagoneer with 327-cu.-in engine that has 28,000 miles on it. The dealer says I should replace the fiber-toothed timing gear with a steel one as all fiber gears break on these engines between 30,000 and 35,000 miles. Is this correct?—Philip Subry, Denver.

He's got the right idea, but the wrong facts. Yes, fiber gears are known to break, but why do the job until it's necessary? Your gear may last for 60,000 miles or the life of the car. But if it does break, replace it with an aluminum gear—not steel. A steel gear will give steel-to-steel contact since the timing chain is of steel. This

(Please turn to page 76)

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AUTOMOBILE CLINIC

(Continued from page 74)

will make one hell of a racket. An aluminum gear in contact with the steel chain won't make noise.

Cougar siesta

My 1969 Cougar is very hard to start when it's hot. The dealer has tried to correct the problem, but has failed. Can you tell me if he's missed something?—Lester P. Walsh, San Diego, Calif.

There has been a problem of this sort with these cars which the company has tried to correct in steps. First of all, if the car is equipped with a 351-cu.-in. V8 engine, have the dealer apply the provisions of Service Letter 41 (8/4/69). He should replace the six-gauge battery cables with four-gauge. If this doesn't work, he should relube the armature shaft at the nose of the starter. Finally, new starters have been issued if all else fails. The new starter for a Cougar (and Montego, which also has the trouble) with automatic transmission is C20Z-11002-B. The one for a car with standard transmission is C5TZ-11002-D.

Brake hang-up

I've had no end of trouble keeping brake shoes on the right front wheel of my 1965 Pontiac. A set of shoes wears out in 10,000 miles, while I get 25,000 miles or so from the other wheels. A mechanic told me to remove the self-adjusting mechanism, but I can't believe this is the cause. Do you agree?—J. Dunbar, Cleveland.

With you—yes. A self-adjuster works or it doesn't, it just won't adjust. It will never overadjust. Your problem, obviously, is a set of shoes that is hanging up. Look for a weak retracting spring or a sticking wheel cylinder.

Exhaust pipe revisited

Having followed your column and having found its accuracy amazing, I felt upon reading your answer to Neil Walton (see Auto Clinic, page 68, Dec. '69 PM) that I must write that you may have oversimplified his problem. International Harvester has been having troubles with the exhaust pipes on its 196-cu.-in. Four since 1967 and the solution might involve as many as five different problems:

1. Manifold flange warpage as mentioned.

2. The pipe from the small Four is being used by mistake.

3. An original-equipment pipe or another brand is being used. There's a new pipe made by IHC to correct the trouble that's available only at IHC dealers. It is aluminized and won't discolor after being run.

4. The installation procedure is critical and the manifold flange bolts must be tight and double-nutted before the tail-pipe is installed.

5. On some Scouts the wrong spring package was installed at the factory. This spring can hit the exhaust pipe, cracking the flange.

If Mr. Walton will contact IHC in Chicago the company will correct the problem—no charge. I know all about this, because IHC put 14 exhaust pipes, two exhaust manifolds and a leaf in the front springs on my 1969 Scout until the problem was cured.—Peter Gilbert, Henniker, N.H.

Thanks for the valuable information, Pete.

Service Tips

● Chevrolet says that some of its 1970 models with the Quadrajet carburetor may have a slow engine idle, because the fast-idle speed was incorrectly adjusted in production. The fix is simply to turn the fast-idle speed screw one full turn to provide an engine speed of 1800 rpm when the fast-idle cam is at the second step position and the engine is hot.

● Ford and Mercury warn that some 1969 models with the 302-2V engine may have been built with a 302-4V mechanical lifter camshaft. If your 302-2V engine has a rough idle that no amount of fixing can correct, tell your dealer to check the shaft—it should be marked "UA." The shaft for the 302-4V carries a "VE-B" or "VE-D" identification, which is located between the last lobe and bearing journal.

● Chrysler says that some early production 1970 Barracudas and Challengers may be leaking water from the airconditioner evaporator housing into the passenger compartment. The cause is a missing bracket that's supposed to stiffen the lower flanges of the housing. The correction is provided by service bulletin 70-24-2. ★ ★ ★

GOT A PROBLEM WITH YOUR CAR? Ask Mort about it. Send your question to Auto Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.

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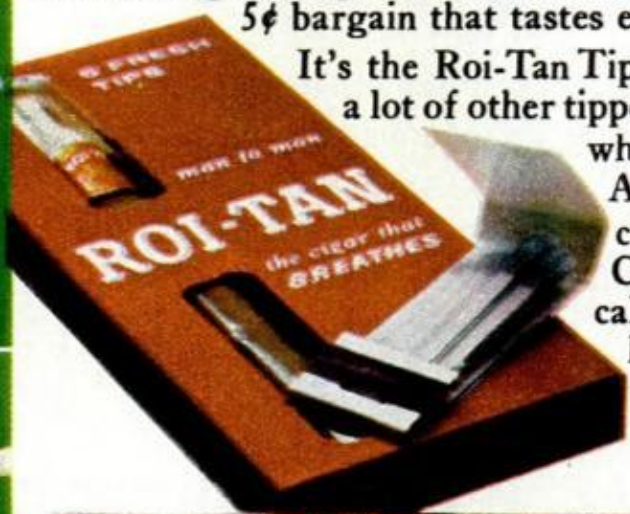
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Roi-Tan The Crowd Pleaser.





HE EARNS \$30,000 A YEAR BEHIND THE WHEEL

His 'office' is a \$25,000 tractor. From it last year he handled an \$80,000 business. He's one of a new breed—the 'contract driver.'

By E. D. FALES Jr.

AT 2:00 P.M. THE OTHER DAY, J. A. Selman, a California businessman and flier, put away his golf clubs, spent a few minutes looking at plans for his new \$35,000 hunting lodge in Oregon, then kissed his wife goodbye.

When next he saw his modern hilltop home in Los Angeles he had visited 19 states, enjoyed some scenery that he likes, caught a mess of fish in Florida and earned \$5000—not bad for three weeks driving a truck.

Selman is a new breed of driver, the "contract truckman." He owns his own "tug"—a spick-and-span \$25,000 International trac-



MAYFLOWER VAN 3829, dodging blizzard on Loveland Pass, heads south for Colorado Springs. Selman (below) readies New Jersey shipment for California

tor—and runs 60,000 miles a year hauling household goods for Aero Mayflower. He does very well. His gross income this year will be \$80,000. He splits 52-48 percent with Mayflower, which means he keeps about \$41,600. He must make his own payments for fuel, tires, repairs and taxes, and hire loaders in each city. This leaves him a handsome clear profit: close to \$30,000.

When *PM* assigned me to ride with Selman recently, I wanted to know two things: What's a contract trucker's life like? How do you get such a job? A few other drivers like Selman gross \$60,000 and even \$95,000, among them a retired colonel and an airline pilot. This means clear earnings of about \$20,000-\$32,000.

I joined Selman in the Colorado Rockies as he headed for California with two big shipments: one the furniture of an East Orange, N.J., family bound for Van Nuys; the other belonging to a Wilmington, Del., family moving to San Diego.

It was 10 a.m. Standing in Clear Creek Canyon, I heard the air horn. Then came a sound like a jet climbing out of mile-high Denver, and the yellow Mayflower rig came soaring up out of a tunnel. I flagged it.

Fourteen wheels (tires, \$100 each) and 24,000 pounds of freight came to a grumbling stop. Selman waved down

SUPERVISING LOADING, Selman checks number and condition of cartons. Like ship's captain, he has full responsibility. He hires and pays his helpers



from the sparkling cab. I hiked up the ladder. There was a loud explosion of air and I thought a tire had blown. But it was just Selman releasing the brakes. His hand played over the 13-speed gearshift-and-progressive-splitter lever and we began to roll.

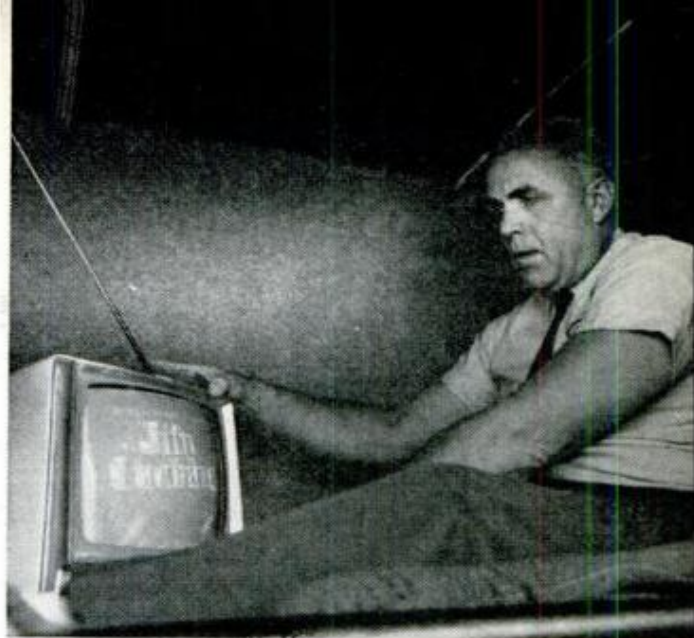
"Hi!" Selman shouted. Full of western friendliness, he reached across the cab and gave me a rock-crusher handshake. The windshield was huge. There were business-like files, a red radio telephone and a dispatch board. Behind green curtains: a roomy bunk and a TV. The cab was quieter than many, although the new smokeless Detroit Diesel under us packed 318 hp. Selman was an agreeable, no-nonsense type; I sensed that he could make quick decisions.

He was about to make one. He frowned at the 13,000-foot peaks. Black clouds swept down, with long white trails. "I hate snow," Selman said. Then, as if to reassure himself, "It isn't supposed to snow up there today."

Selman lifted his phone: "This is Mayflower van 3829 calling Denver." The radio operator patched him by phone to Mayflower's Denver dispatcher at Buhler Transfer Co. "I'd like to get a quick report on the Loveland—and Colorado Springs," said Selman.

The Loveland lay due west. But Colorado Springs was 60 miles south. The dispatcher came back: "A snow-

RADIO-TELEPHONE REPAIR is made by technician at all-night truck stop. Efficient use of the radio has played a big part in increasing Selman's earnings



PORTABLE TV in the bunk behind driver's seat in his big tractor helps Selman get to sleep. Cabin bunk saves motel bills and time hunting a truck stop



SELMAN'S HAND ON THE WHEEL is ready on the trailer emergency brake. He has logged 600,000 accident-free miles. Below: The author interviews Selman



storm has just hit the Pass. But Colorado Springs is clear."

"That settles it," Selman said. He swung his 55-foot rig in a U-turn. Then he headed back 30 miles to get on I-25. And away we went on our new course, roaring south toward Colorado Springs and New Mexico.

Selman was trying to go around the storm. I began to see how he makes big money: by thinking ahead—and using that radio to the limit. Our lights showed a clear road. Selman drove like a man who loves the road. "You like the work, don't you?" I said.

"Love it. Nothing like it," he said.

"How did you get to be a contract truckman?"

He downshifted for a grade. "Six years ago I was making \$10,000 commission driving a bakery truck. I saw an ad: Mayflower wanted a driver. They would train me, but I'd have to buy my tractor. I decided to risk it."

Selman knew that some freight drivers were getting \$275 a week mileage pay. But Mayflower had a better idea: he could keep *half the revenue from everything he could haul*, a 50-50 split,

and Mayflower would drum up the business. He learned it costs the average family about \$1500 to move and a van can hold from two to four shipments. He flew to Indianapolis to the Mayflower school.

"When I graduated I invested in my first tractor, a little gas job," he said. (Mayflower assigned him a small van to match.) "You can't make big money that way but after all I was new, and my tractor couldn't pull a big van. I decided to try to work up to a big tractor and some seniority. And I saw I could do a lot more business with a radio telephone."

On his first night Mayflower sent him to Chicago. "I was scared," he said. "My light trailer kept skittering on ice. I *couldn't* have a wreck on my maiden run. That night I learned to hate snow."

But he learned something else. The Chicago load was for Florida. "Two days later," he said, "I drove into balmy sunshine. It was great! I felt wonderful and I'd made \$500. I knew I'd made the right decision."

He didn't get rich that year or the

(Please turn to page 186)

BIG WELCOME HOME by wife Margie Ann at Corona, Calif., makes up for many days Selman spends on the road. Though he often works without weekend breaks, his reward is plenty of accumulated time for fishing



How the Airlines Hope to



BOARDING PASSENGERS pass between poles of gradiometer, unaware that light arrow (arrow) can signal warning

Stop the Hijackers

A magnetized gateway that can detect a gun or knife now screens passengers boarding jet planes. If it doesn't spot a skyjacker, the airlines hope a 'behavioral profile' will

By MORT SCHULTZ/Photos by Irv Dolin

HE FLASHED THE BADGE as I was about to board the Miami-bound Eastern Airlines jet at Washington National Airport.

"Keep your hands where I can see them and come with me," he ordered.

His hand was in his coat pocket. So, undoubtedly, was his gun. I obeyed.

A minute later he identified himself as a member of the Federal Aviation Administration, frisked me, and said:

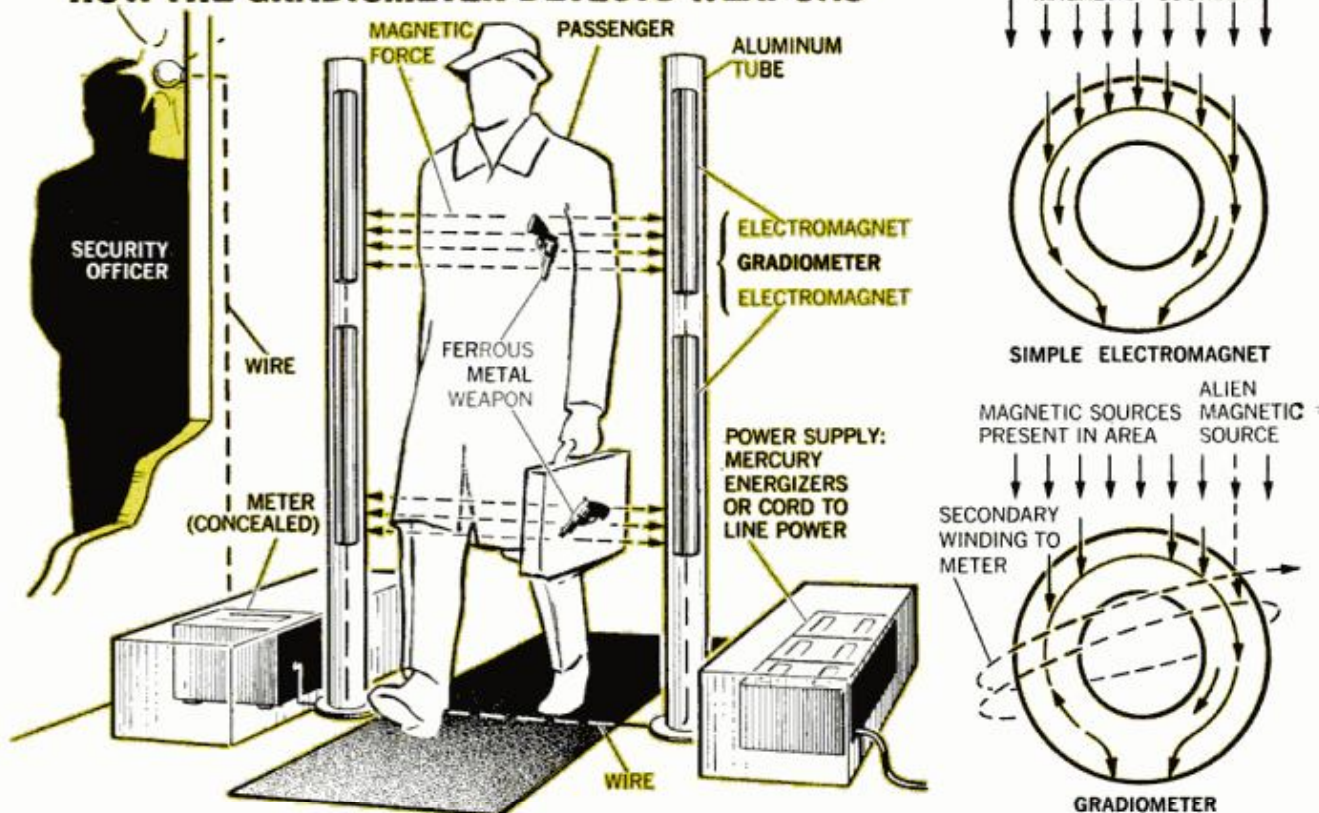
"That's how the gradiometer works. If you were really a hijacker, you would now be facing a jail term."

It was a game, of course, but I

wanted a first-hand feeling of how airports are now set up to catch hijackers. The instrument referred to is a unique weapons detector that is the heart of the system. Its purpose is to keep people armed with guns and knives off planes.

The gradiometer measures disturbances (or deviations) in the earth's magnetic field. These are created when ferrous-metal objects pass nearby. The increase in magnetic force is recorded on a meter or other signaling device. An airline attendant is thus warned that the passenger who just walked by

HOW THE GRADIOMETER DETECTS WEAPONS



HOW IT WORKS: A simple electromagnet senses a magnetic force in a nonmagnetic environment. Two electromagnets are used in each sensor of gradiometer so magnetic forces in an area (desks, girders) can be accounted for and read-out meter zeroed. When an alien force (dotted arrow) is introduced, gradiometer detects it. Secondary winding measures it to determine if it's equivalent to the force of a potential weapon

may be carrying a concealed weapon.

The gradiometer went into regular use last October following some seven months of testing by FAA engineers to determine the degree of magnetic field disturbance created by weapons of different sizes. Now weapons can be distinguished from other ferrous-metal objects that people often carry on board a plane, such as keys and golf clubs.

The comparatively long test period was used to develop a "behavioral profile" of a typical hijacker. This was needed to assist airline personnel in picking a possible hijacker from a crowd rushing to board an airliner.

This "profile of a hijacker" is based on behavioral traits of known sky pirates. Passengers who exhibit such traits get a careful screening as they pass through the gradiometer's "force field."

The gradiometer is hidden so every boarding passenger must pass it. An ideal location would force them to walk slowly in single file or two abreast.

Unlike X-ray, the gradiometer doesn't "look" beneath garments or into bags. A passive device that emits no energy, it is, in essence, a measuring instrument. It is an outgrowth of the magnetometer, developed more than 50 years ago by the Navy for detecting sea mines. A magnetometer contains an electromagnet, the strength of which depends on how much current is passed through a wire coil surrounding a metal core.

The magnetometer can detect the presence of metal in a nonmetal environment, such as beneath the sea. However, it can't tell the difference between a cigaret lighter and a gun, or keys and a knife—in other words, between an innocent metal object and the weapon a hijacker normally carries.

The gradiometer can make the distinction. Its electromagnets employ a second winding around the metal core capable of picking up and measuring magnetic force in much the same way as a voltmeter measures volts. This

force, shown on a meter, allows an operator to determine if it's equivalent to that given off by a mass of metal the size of a pistol.

Metal emits a force proportional to its mass. Disturbances created by a gun, then, are greater than those created by keys. An operator who sees a reading of, say, 1 to 4 on the gradiometer would know that the passenger who just passed through the "field" was not carrying a gun. However, he'd be suspicious if the reading was 5 to 9.

Naturally, the gradiometer is not foolproof. No one can say for sure that a disturbance is being created by a gun or an innocent object of equal size. However, the airline can ask that the person submit to search, especially if he falls into the pattern of the behavioral profile. If he refuses, as is his right, the airline can refuse him passage, which is its right.

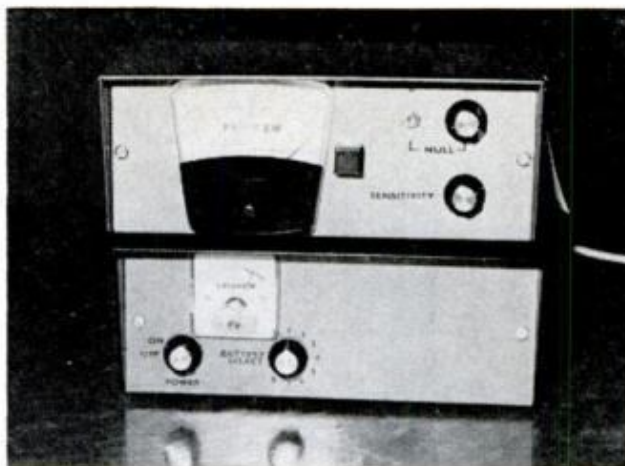
Why has it taken this long to develop the gradiometer? Why wasn't it done some 60 hijackings ago in 1961? Malcolm Schwartz, president of Infinetics, Inc., of Wilmington, Del., says the gradiometer was in existence in 1960, but was too expensive to produce.

"Advancements in the state of the art to allow us to manufacture the electronic circuitry with greater efficiency now permit a reduction in price," Schwartz says.

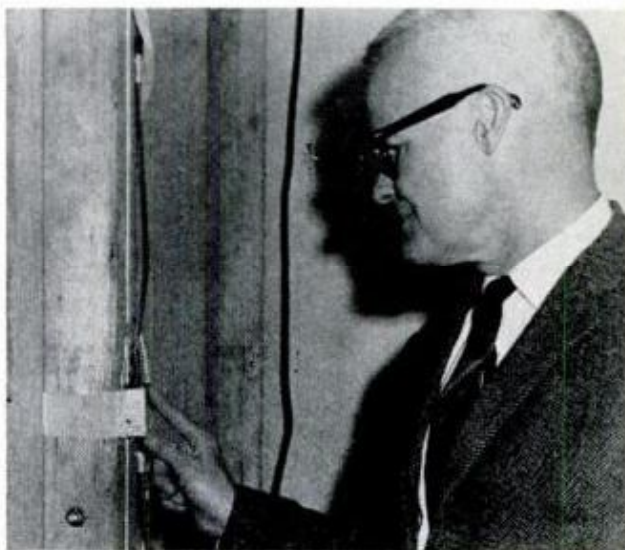
The man developing the antihijacking program for the FAA is Dr. Homer L. Reighard, deputy air surgeon in the office of aviation medicine. Dr. John T. Dailey, psychologist member of the medical-engineering task force, developed the behavioral profile of a hijacker.

Which airports and airlines are being protected by the gradiometer are classified data. However, Dr. Dailey told me that several FAA teams are now roaming from airport to airport with gradiometers.

"These teams act like traffic cops who are equipped with radar," he says. "A hijacker won't know whether an airport is under surveillance, just as a



GRADIOMETER PEDESTAL hides power supply (bottom)—eight 6-volt mercury energizers—and meter (top) with null control to zero out any local magnetism



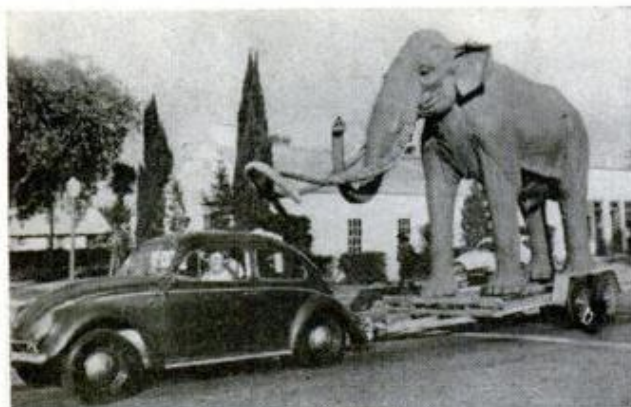
WARNING LIGHT connected to meter flashes if a "hot" reading is registered. It's concealed behind a partition and monitored by a security officer

speeder doesn't know if there's a radar-equipped patrol car behind a clump of bushes. We're hoping that the threat of being caught will deter him."

Another job is to train airline personnel in the use of the gradiometer and familiarize them with the behavioral profile. Screening of flights will eventually be their job.

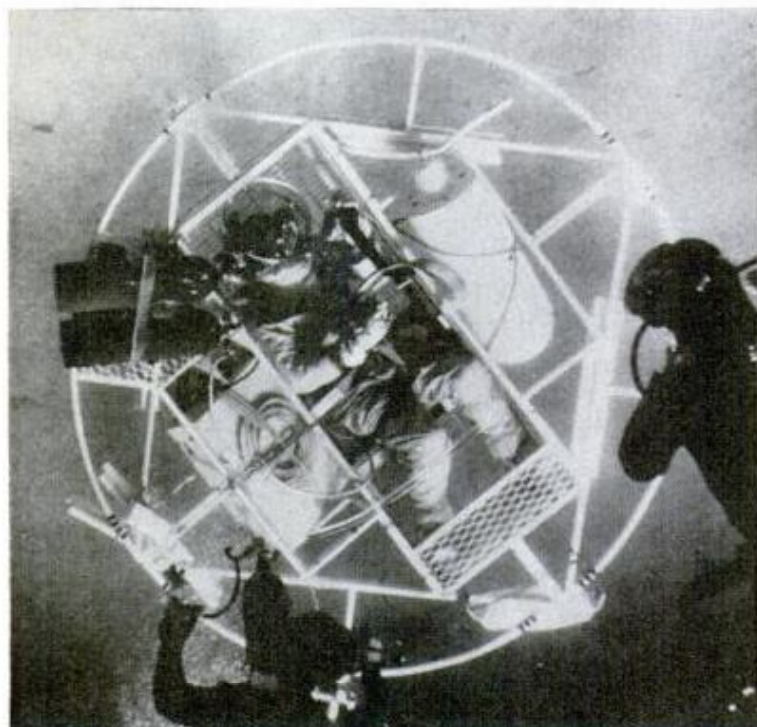
It's safe to assume that airports the size of JFK in New York, O'Hare in Chicago and Miami International will have gradiometers. Equally certain is that carriers with routes to Florida and the Caribbean will have immediate protection.

"That doesn't mean that other airports and airlines won't eventually be protected," Dr. Reighard says. "In time, we hope that all will." ★ ★ ★



Prehistoric beasts are back again in Los Angeles

Strange animals that, some 40,000 years ago, roamed the area that is now Los Angeles are reappearing in that city's Hancock Park. This time, though, the mastodons, saber-toothed tigers, ground sloths and camels are molded of fiberglass and toted to the site behind a Volkswagen (upper left) by sculptor Howard Ball. The scene at lower left is of the animals in place. At right, Ball makes one of the clay models he uses as a mold for the fiberglass.



Underwater tests for space 'lifeboat'

Shown in underwater tests is a space rescue system called MOOSE (for Manned Orbital Operations Safety Equipment). If a spacecraft were damaged, the astronaut would climb into a frame (left) and activate foam plastic to form a heat shield (right). Aided by a rocket motor, he'd re-enter the atmosphere and parachute to the earth.



A 'P-38' From Piper?

Well, not exactly. But the Twin Comanche's counterrotating props are the first since World War II's famous fighter. Result: a safer, easier-to-fly small airplane



By **BEN KOCIVAR**

AS THE MAN SAID, the more things change the more they stay the same. Or here we come again around full circle. Historically, and with a propeller idea. All of which is by way of introducing the fact that one of the world's most popular manufacturers of the small twin-engine airplane has reached back to the days of the Wright Brothers and made its two propellers rotate in different directions. It's Piper, and the company is introducing the idea once again in its newest PA-39 Twin Comanche.

I was the first aviation reporter allowed to fly the PA-39 late this winter. I can report that it is as close to being a "feet on the floor" airplane as anything since the original Ercoupe, which had no rudder pedals because the rudder and ailerons were interconnected.

On takeoff and landing, the new Twin Comanche C/R (for counterrotating) rolled straight down the runway as power was applied and reduced.

The only corrections that had to be made were in response to the strong winter gusts that hit the strip.

In the air, I experienced stalls both power-on and power-off. There was lots of warning of the impending stall, and when it happened the plane just gently lowered its nose and recovered level flight with little loss of altitude.

Counterrotation sounds logical, of course. In our well-balanced world, wouldn't you think everything should be symmetrical?

Well, that's not the way it worked out. In the years since the Wright Brothers, plane builders decided it was cheaper and simpler to have all engines turn the same way. It saved on the number of spare parts, made for quicker interchanges and smaller inventories for dealers. But it also created a bit of a problem. The rudder had to be used to correct for the yaw brought on by having both propellers go the same way.

As the Wright Brothers found out,

the fast-moving propeller has a gyroscopic action that tends to hold an airplane on a fixed axis and resists steering. This was why the Wrights used two propellers, turning in different directions to balance each other out. In order to do this, they connected the propeller shaft to the engines with a chain. To make one propeller turn in the opposite direction from the other, its chain was crossed in a figure eight.

Piper's solution is more sophisticated. It involved a few changes in the air-cooled 160-hp Lycoming engine. They reversed the direction of the propeller in the right engine by changing the firing order of its cylinders from 1-3-2-4 to 1-4-2-3. Several engine components had to be modified, and the prop is different, too, with blades pitched the opposite way from the left one.

But more interesting than the engine changes are the aerodynamic reasons for making them.

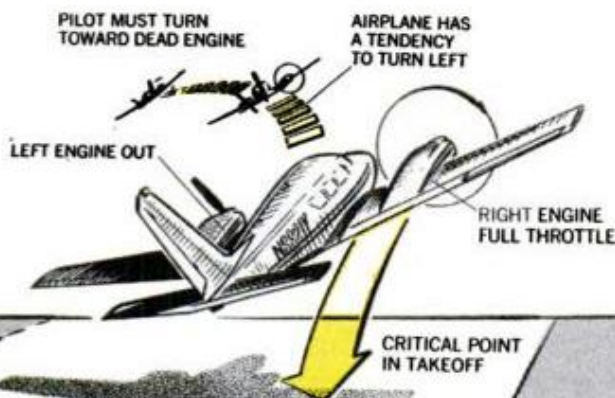
Possibly one of the most misunderstood and erroneously named factors involving airplane engines and propellers is "torque." Thousands of pilots still think that, because the propeller turns to the right or clockwise, the resulting force in the other direction is

RIGHT ENGINE FAILURE in situation illustrated would cause a slight pull to the right. This holds for both conventional and counterrotating planes

what makes the plane try to turn to the left. This force exists, but is negligible.

The real reason the plane tries to go to the left is the result of side-wash and direct propeller yawing moment. This is commonly known as the "P" effect, and you counteract it by changing the angle of the rudder to maintain directional control. The trouble with this is that it sets up needless air drag. At slow flying speeds, particularly with one engine not operating, this extra drag can slow a plane down to the point where it can no longer climb.

But let's get back to the "P" effect. The side-wash part of this is the swirl or corkscrewing of the propeller slipstream against the fuselage. This swirl, according to Piper, can be compared to a large coil spring. At slow speed and high power setting, such as on takeoff, this "spring" is compressed and the swirls of air are close together. This causes the air to hit the tail surfaces and fuselage at a sharp angle, and



Technical Art by Fred Wolff

LEFT ENGINE THRUST VECTOR LINE INBOARD CLOSE TO FUSELAGE

CONVENTIONAL PROPELLER ROTATION

RIGHT ENGINE THRUST VECTOR OUTBOARD

PIPER TWIN COMANCHE

BOTH ENGINES CREATE SLIPSTREAM IN SAME DIRECTION: TENDS TO MAKE PLANE TURN TO LEFT

PROPELLER WASH

LEFT ENGINE FAILURE ON TAKEOFF WITH CONVENTIONAL PROPELLERS

it takes lots of right rudder to overcome the tendency to turn left.

As airspeed is increased, however, the swirl lengthens like a spring that is stretched. Then the angle at which the side-wash hits the plane surfaces is decreased and it takes less right rudder to correct direction.

But the most significant effect on directional control, according to Piper, is the direct propeller yawing moments. These come from the difference in thrust produced by the blade of the propeller going up while the other blade is going down. The amount of this difference depends on the attitude of the plane, that is, the angle at which it is pointed—called the angle of attack.

When the plane is in a climbing attitude and the nose is pointed up higher than the flight path it makes, the down-going side of the propeller is providing more thrust than the upgoing blade. But when the plane is pointed down

and flying at a reduced angle of attack, the upgoing blade has more thrust.

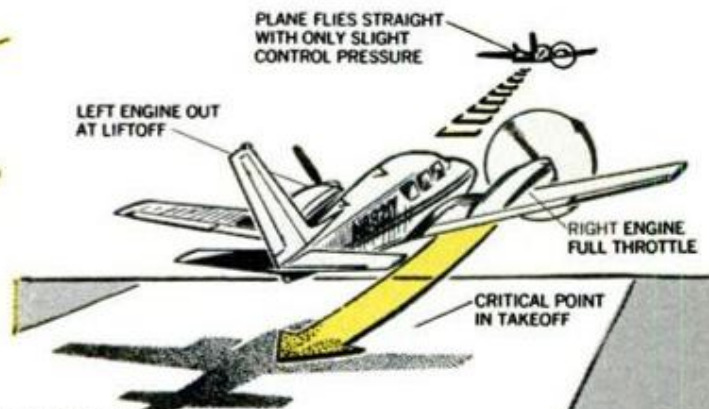
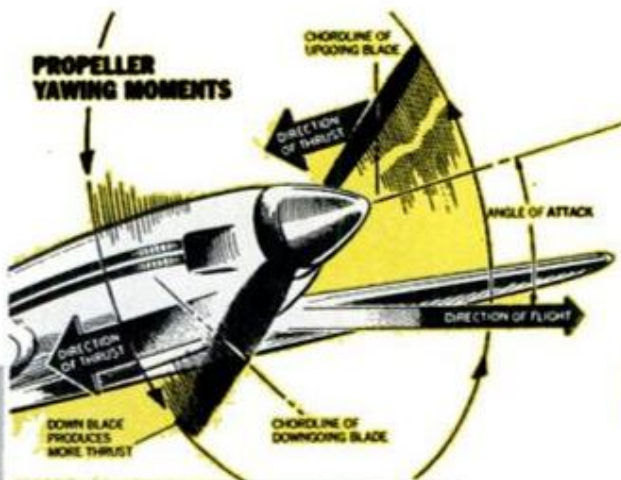
Thus, if you were to draw a line showing the resulting thrust of both blades of the propeller, the line would not line up with the center of the propeller but with the blade providing more thrust.

On takeoff, when speed is low, the engine is at full throttle and the angle of attack is high, you need lots of right rudder to keep the plane going straight.

During World War II, many single-engine fighters swerved off the runway when power was applied too abruptly or if not enough rudder was applied. One of the hottest fighters, the Lockheed P-38 Lightning, as a matter of fact, was the last twin-engine plane to use counterrotating props to compensate for this.

This effect is noticeable, not only at takeoff and landing, but any time power settings are changed on a plane; the pilot must compensate by slight pressures

(Please turn to page 204)



LEFT ENGINE THRUST VECTOR INBOARD CLOSE TO FUSELAGE

COUNTERROTATING PROPELLERS

PIPER TWIN COMANCHE C/R

RIGHT ENGINE THRUST VECTOR INBOARD CLOSE TO FUSELAGE

BOTH ENGINES CREATE SLIPSTREAM THAT IS BALANCED— AIR FLOWS EVENLY OVER FUSELAGE AND TAIL SURFACES

PROPELLER WASH

LEFT ENGINE FAILURE ON TAKEOFF WITH COUNTERROTATING PROPELLERS

Can the Can-Am Kings



McLAREN M15 cools down in pit lane. The boss, in cockpit of this the prototype of three cars entered, talks to Denis Hulme and team manager Ted Mayer. Test laps over 168 mph took place before '69 season was even over! That kind of preparation should make the team a hard one to beat

Blitz the Brickyard?

When the 1970 Indy 500 field roars down the front straight to take the green, it will be streaked with the orange of machines McLaren running to win—just like in the Can-Am

By BILL HARTFORD, Auto Editor

THE RACE REALLY STARTS on May 1. That's when an expected eighty cars can start practice. The Memorial Day spectacle of speed is just the last heat in a month of eliminations at the Indianapolis Motor Speedway. It's a climactic run for the money by the top thirty-three cars and drivers who have already competed—negotiating for the best ride, outwitting mechanical gremlins and running against the clock—to win the honor of starting.

It's impossible at this writing, three months before the gentlemen start their engines, to pick the starters. Late in May of last year, for example, Colin Chapman withdrew his four-wheel-drive Lotus after Andretti went into a wall because a lightweight wheel hub failed in the Hoosier sun. No second chance for 4wd designs this year. The United States Auto Club has turned thumbs down on putting power to all four: A successful design would outclass the field.

The field this year will again see some imported cars—by no means economy models—challenging the famous American marques. Easily able to afford a fuel consumption of two mpg from the turbo-Offy in its new

M15 Indy car will be Bruce McLaren Motor Racing Ltd. The McLaren team is backed by both Goodyear and Reynolds Aluminum, but the real payoff is that they put as much hard work and long hours as money into their racing efforts. It has paid off well. The immaculate preparation of the M8Bs and the driving of McLaren and Hulme have made the Canadian-American Challenge Cup theirs for coffee breaks.

McLaren and Gordon Coppuck designed the semimonocoque M15 as a single-seat version of the Can-Am car. They're powering it with the tried and true 2.6-liter, 650-hp, four-in-line, \$25,000 Offy. The 475-pound powerplant bolts to engine-bearer plates on the rearmost bulkhead that terminates the monocoque—nothing radical in this design. The engine in the test car, or mule, at left is exposed but will be covered for qualifying.

Three cars are scheduled for Indy but as of this writing only two drivers have been named: Denis Hulme and Chris Amon. McLaren himself has indicated that he does not plan to drive. Hulme, with a fourth-place finish in both '67 and '68, is no stranger to Indy.

The 1967 World Driving Champion

DUE



LEONARD

McCLUSKEY

OVERDUE



GURNEY

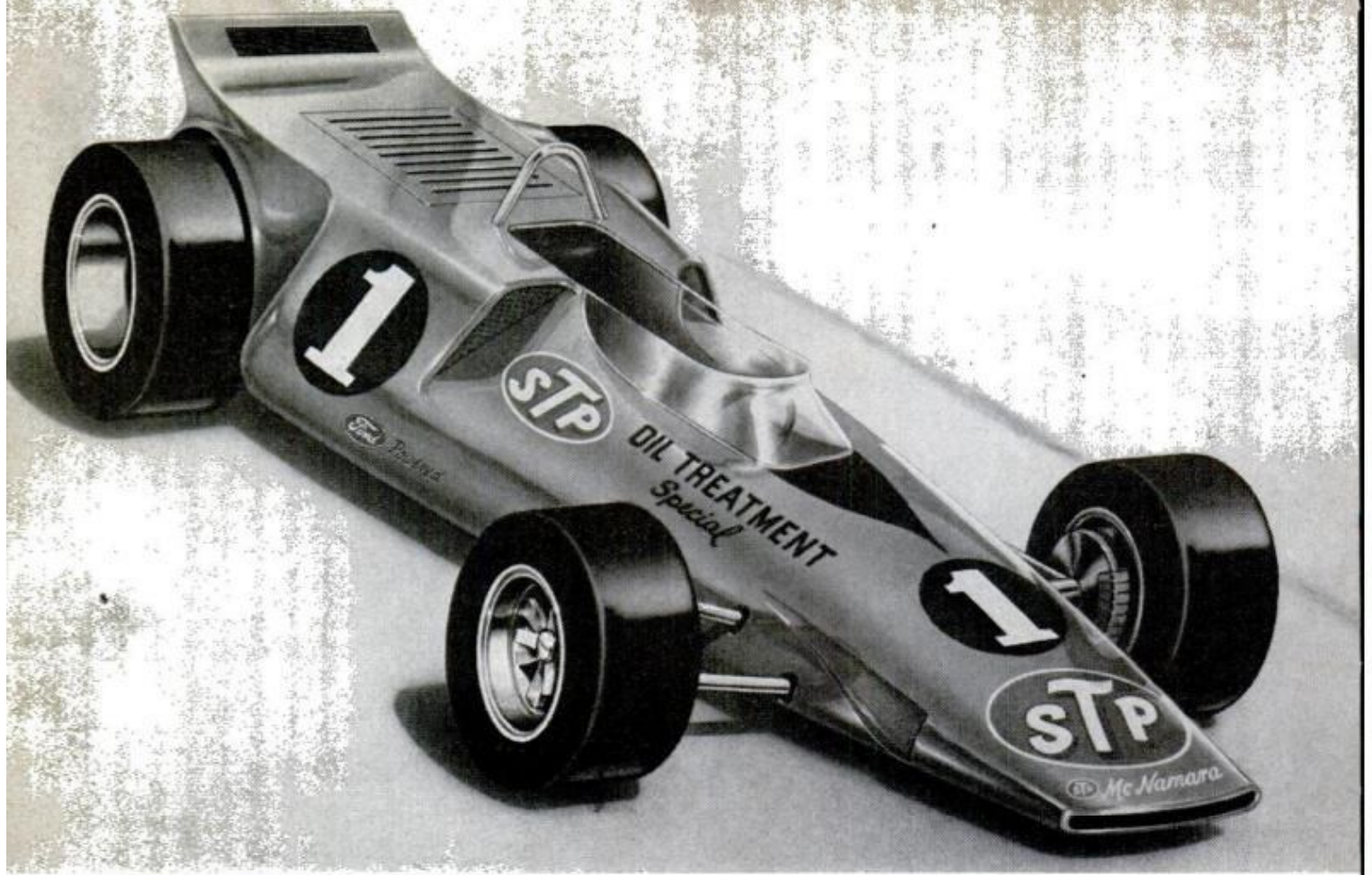
RUBY

COULD DO



YARBROUGH

AL UNSER



CAR OWNER ANDY GRANATELLI and champion driver Mario Andretti—last year's dynamic duo—are back with a new car. The STP-McNamara T-500, which will be running turbocharged DOHC Ford V8, is built in Germany

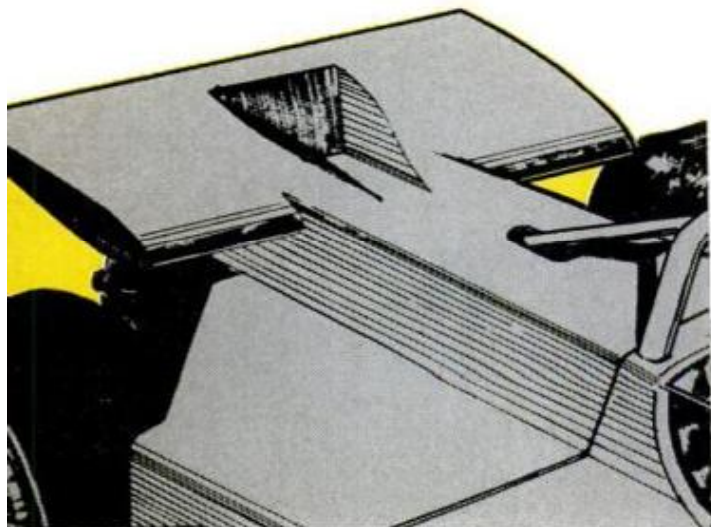
was running second to Andretti last year when clutch trouble grounded him with 55 laps to go. Grand Prix driver Amon has never started at the Brickyard but has run enough practice for a good driver to feel and master the humps and ripples of a circuit.

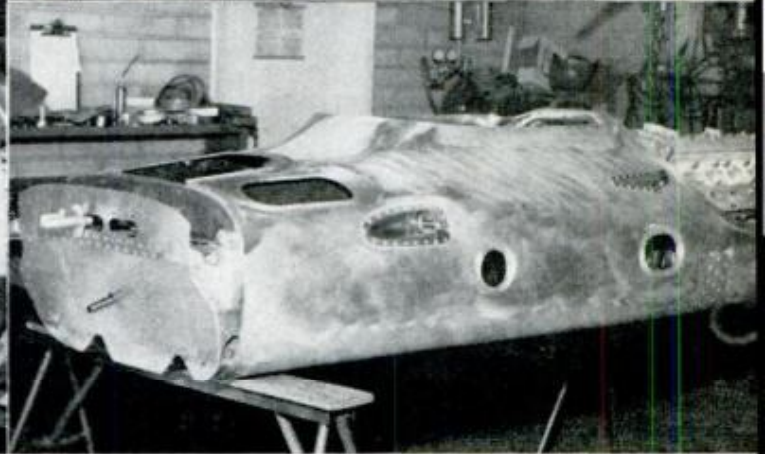
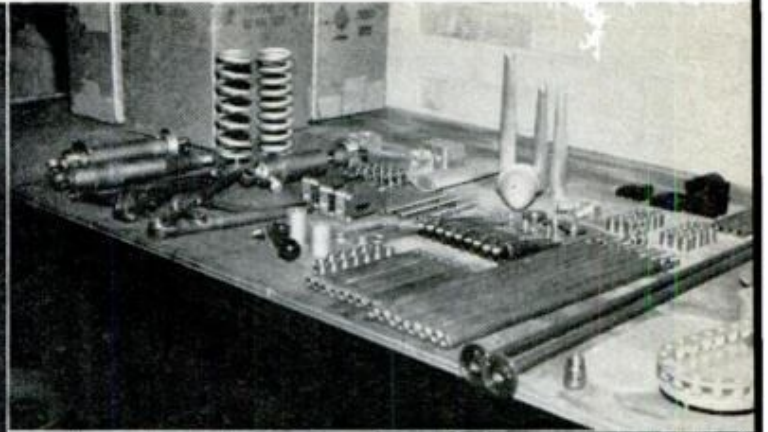
The McLaren team and car is a strong one, but with an historical disadvantage: "New cars rarely win the first time out." This is Andy Granatelli speaking to *PM* not about the McLaren but about his own new car, the STP-

McNamara. Francis McNamara, who has been building Formula Vee, Ford, III and II cars at his factory in Lengries, Germany, contracted four cars for Granatelli's 1970 racing effort: the Indy machine, a "supercar" for the USAC 500-miler at the new Ontario (Calif.) Speedway in September, plus cars for USAC mile oval tracks and road courses, respectively. All but the Ontario car are expected to be at Indy. In addition, last year's winning Brawn-Hawk will be a backup. So far, only Andretti has been signed to drive.

The T-500 Indy car is a two-thirds monocoque chassis with a DOHC, turbocharged Ford V8 supplying the power. Visible in the drawing above is one of the outboard-mounted Airheart ventilated discs that Mario will be riding hard—not so much for stopping, but for more go. The '69 champion is a master at working throttle and binders at the same time for the flying start and then for the four turns per lap—

1970 EAGLE from All American Racers sprouts rear spoiler that's part of chassis and within the rules





CAR BUILDER CLINT BRAWNER positions steering gear assembled from some of machined parts on workbench. Brawner built the '69 winner, was this far along on new monocoque chassis or "tub" earlier this year

this way he's always got lots of pressure in the turbocharger system for instant acceleration. It's something a driver has to do and do well to overcome the acceleration lag inherent to the turbos.

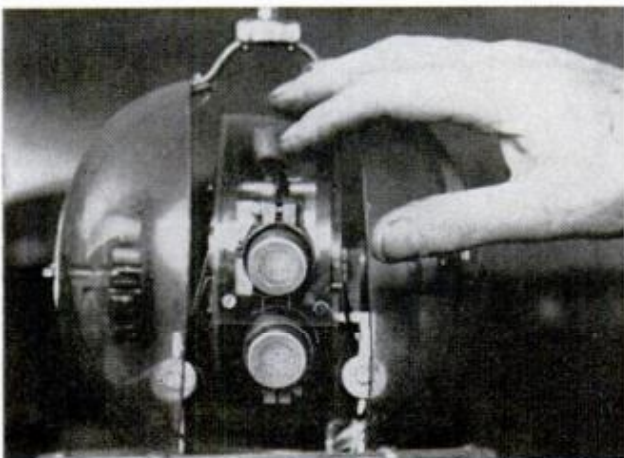
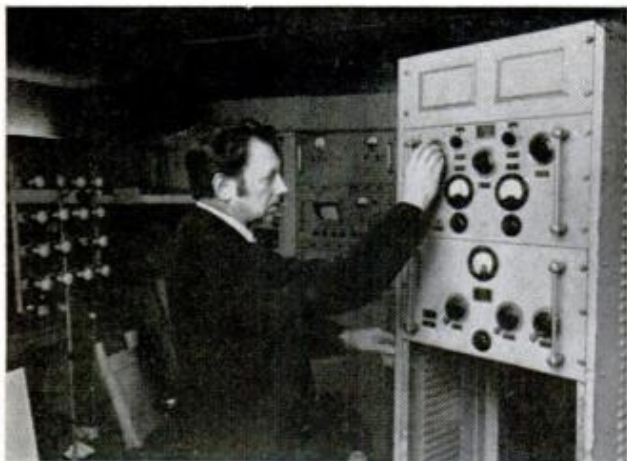
Granatelli is quick to claim that he has the best driver in the business, but he also knows the competition and, among others, considers Roger McCluskey overdue for the big win. It could well be McCluskey's year: He's got a ride in a car that is little more than a chassis in the photos above, but is now a strong, fast (turbocharged Ford), Clint Brawner and Jim McGee-designed championship car—son of last year's winning wheels. McCluskey, champion of USAC's stock car division in '69, and sprint car champ in '63 and '66, has been driving Indy since '61 with a lot of those mechanical gremlins along for the rides. This year he'll be looking for everything to hold together for all 200 laps.

Last year, as the year before, Dan Gurney placed second in the one race

he'd like to win more than any other. He's been driving his own Eagles since 1965, with 1968 a triumphant year for the machines: Bobby Unser first, Dan second and Denny Hulme fourth.

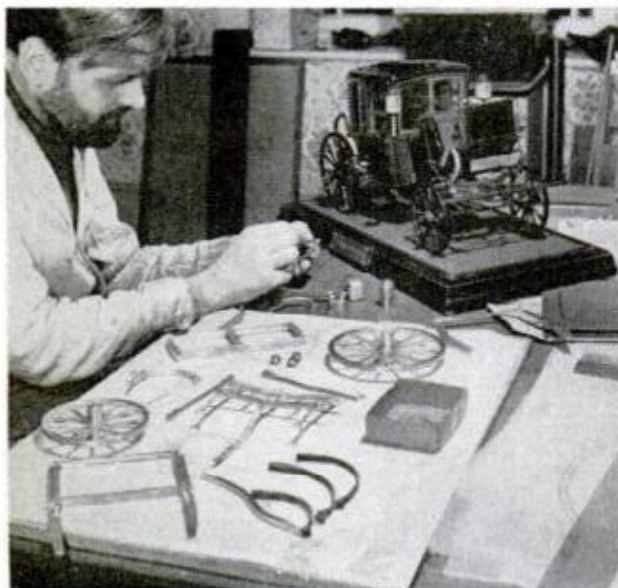
This year overdue Dan's entry is a new 1970 Eagle powered by a turbo-Offy—an engine he's never run at Indy. The car differs from previous Eagles in details of suspension geometry, fuel capacity and, visibly, in its aerodynamics. Sketched at left is what Dan refers to as a "growth"—a spoiler that beats USAC's no-spoiler-wings regulation by its dimensions and being integral to the engine cover. This is how it appeared on the blueprints earlier this year. Less prominent on the car are aerodynamic "fences"—two folds in the skin that run back from the nose on either side of the chassis to prevent the airstream from spilling off. Wasting no space, AAR has designed them to shroud cooling water lines that run back to the engine. Top view of the monocoque reveals its spear-point

(Please turn to page 201)



Inventor controls his robots up to two miles away

One of England's most ingenious robot inventors is Dennis Weston of Leeds. His best-known creation is Tinker, a six-foot-tall robot that can be programmed for such tasks as washing a car (upper right). Tinker is activated by some 430 motors and can be controlled up to two miles away via Weston's control panel (upper left). A TV camera in the robot's head even transmits a picture to the operator. In the two lower photos, Weston is shown at work on a new creation, Percy. Electronic sensors in the head (right) receive high-frequency signals that enable Percy to calculate the best route past objects in his path.



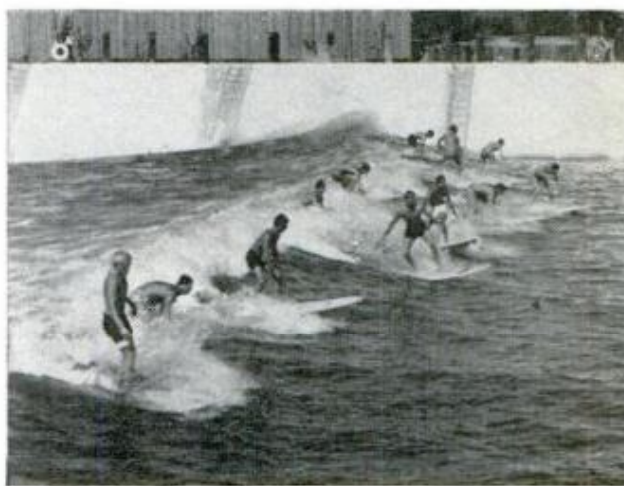
Carriage builder thinks small to make it big

A job of restoring old carriages led Eric Homewood of England to a new vocation of making one-inch-scale models. They sell for about \$1000 each and back orders total \$190,000.



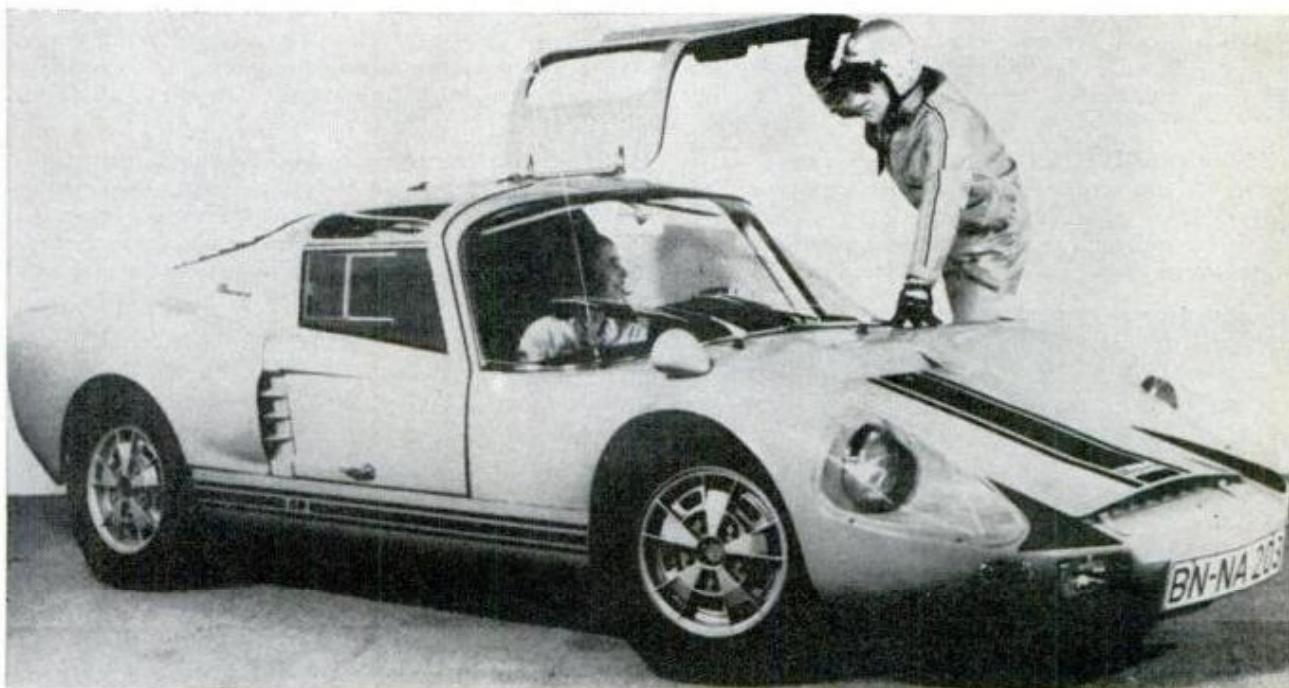
Fast train for Expo

A "21st Century Train" will be shown by Japan National Railways at Expo 70 in Japan. Driven by linear motors over a magnetized rail, it will be designed to travel 300 mph.



Surf's up in the desert

Every 40 seconds, a five-foot wave carries surfboard riders the 400-foot length of a man-made lagoon at Tempe, Ariz. The waves are created when water, pumped into a huge concrete reservoir, is suddenly released (left-hand photo) through submerged gates.



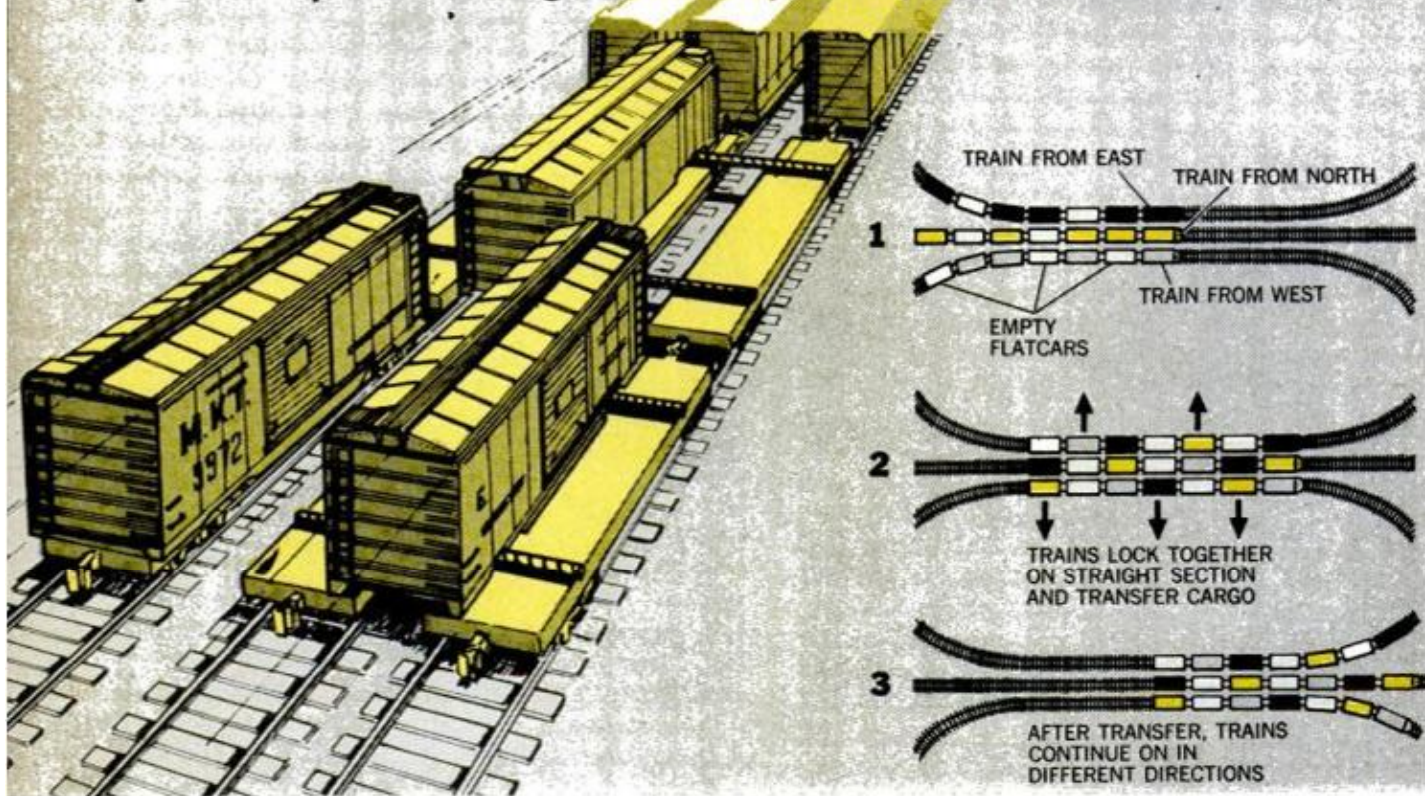
Sleek German sports car gets lots of speed from 75 hp

The low-slung Gepard, shown recently in Germany, will do 125 mph with its 75-hp NSU 1200 engine. The body is formed from the lightweight and tough plastic, Leguval, developed by the Bayer Co.

Just patented

PM'S PICK OF THE NEW INVENTIONS

Prepared in cooperation with Roger S. Shashoua, Director, International Inventors Assn., Inc.

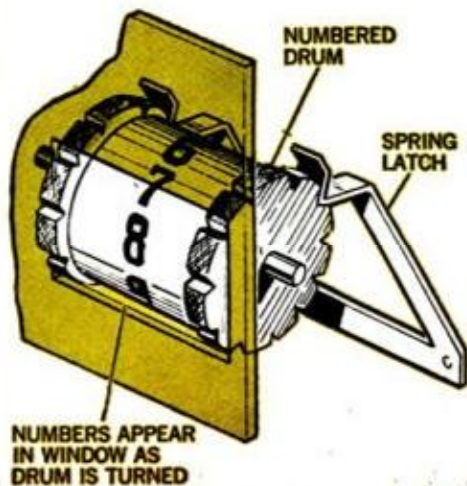


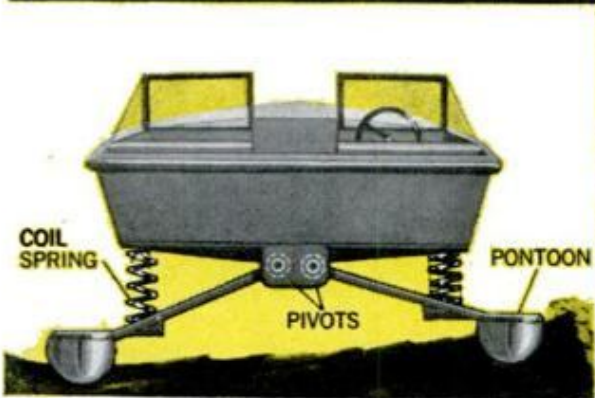
1. TRAINS SWITCH CARGOES without even stopping in this ingenious plan to speed freight handling. The idea is to have trains from different parts of the country come together on parallel tracks. While on this straight section, they are adjusted to the same speed and locked together. Cargo compartments are then transferred from one train to another

across worm-type conveyors extended out from the sides of the cars. At the end of the exchange, the trains swing off in different directions, each carrying only cargo bound for its particular destination. The fast, on-the-run transfer system is designed to eliminate the tedious process of switching the cars around in freight yards to make up trains

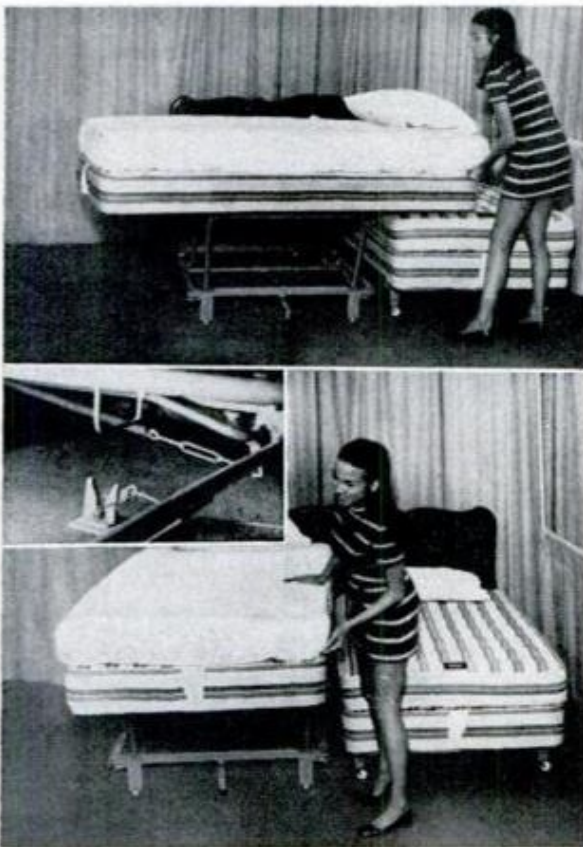
2. YOU WOULDN'T FORGET to have your car greased or the oil changed with this handy dashboard reminder. Rows of numbered wheels in windows let you preset mileages at which filter changes and other servicing jobs should be performed. Starting

with the current mileage, you just dial the appropriate number for each future check, then watch your speedometer's mileage counter to see when the number comes up. There's also a place for recording trip mileages so you can remember them easily

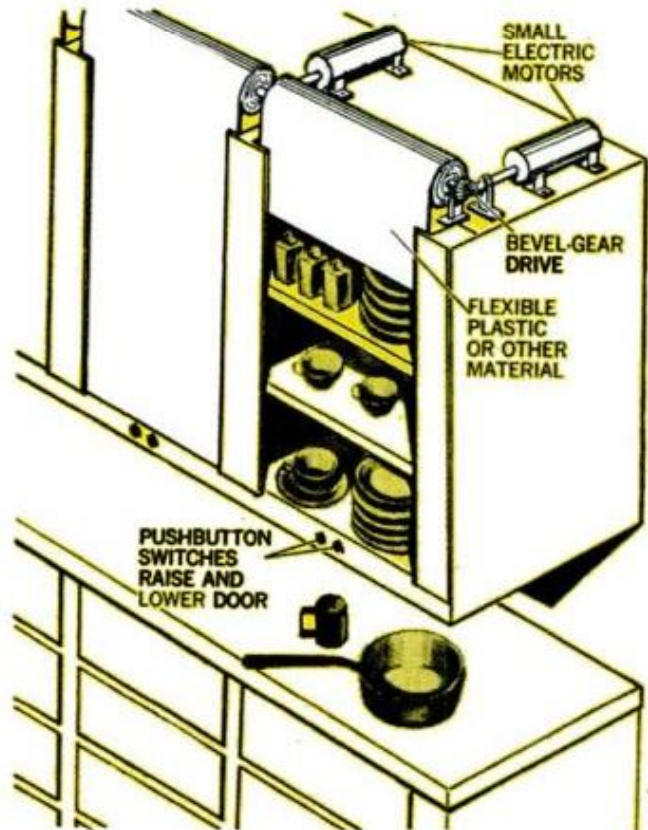




3. KNEE-ACTION SPEEDBOAT skims over waves as smoothly as a car takes bumps in the road. It's supported on four independently sprung pontoon floats that ride up and down to absorb shocks and keep the boat level. Since the hull itself never touches the water, it can maintain high speeds even through rough seas. The system is also intended for stabilizing aircraft carriers, military pontoon bridges, marina docks and various other floating structures that must remain level



4. REVOLVING BED springs up to waist-level height, then rotates in any direction to ease the job of bedmaking. The mattress rests on a spring-loaded frame held down by a latch underneath (inset photo above). Releasing the latch allows the mattress to pop up, clearing the bed next to it. The mattress can then be turned on a central pivot so that all sides are reached easily from one position without leaning over

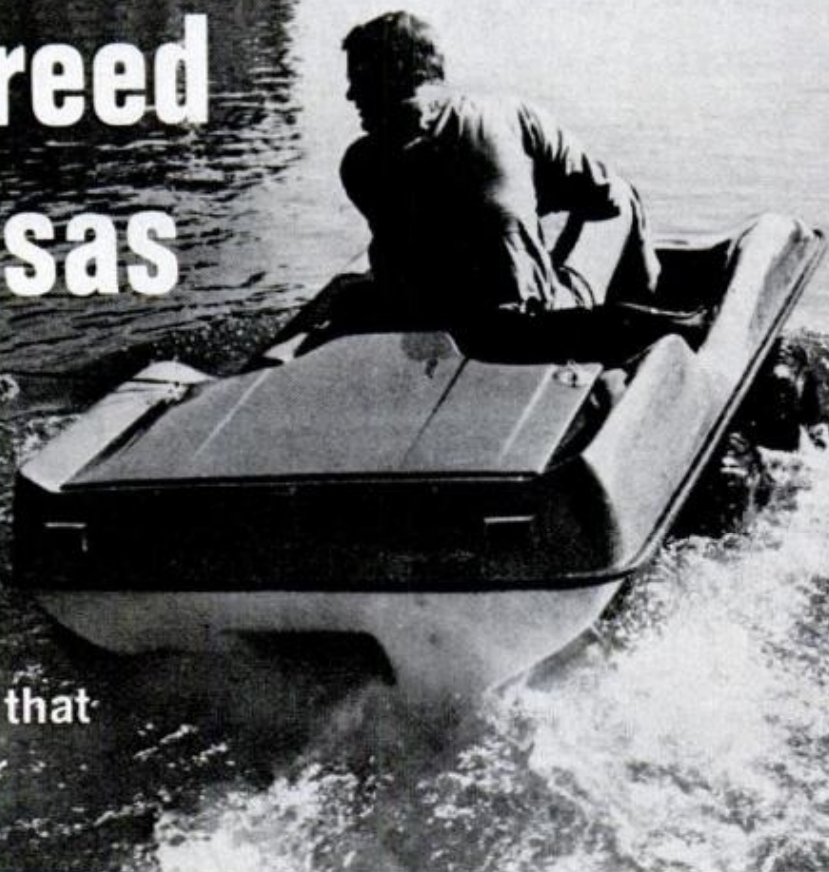


5. YOU CAN'T BUMP YOUR HEAD on these motorized kitchen-cabinet doors. Instead of swinging outward, the flexible panels slide in tracks and roll up like window shades. Each door is powered by a small reversible electric motor at the top of the cabinet. The motor is controlled by two pushbuttons. One button sends the door up and the other brings it down. The motors and roller mechanisms can be hidden from view behind a decorative edging strip along the ceiling

Inventors of the items shown on these pages are as follows: 1. Leonard Schoonman, P.O. Box 8075, Greensboro, N. C.; 2. Russell Forrest Egner, 621 Sheridan St., Chillum, Md. (No. 3,310,025); 3. George Levinson, Brooklyn, N. Y. (No. 2,952,234); 4. Robert Angus Associates, 1835 Vauxhall Rd., Union, N. J.; 5. Samuel S. Otis, 516 Walnut St., Winnetka, Ill. Readers wishing to bring new inventions to the attention of Roger S. Shashoua can reach him at the International Inventors Assn., Inc., 608 Fifth Ave., New York, N. Y. 10019.

THE HUSTLER: A New Breed Of Arkansas Traveler

At last someone has come up with an all-terrain vehicle that really moves in water



By **GEORGE REIGER**, Boating and Outdoors Editor

Photos by Burton McNeely



WHAT MAKES THE DIFFERENCE is Jacuzzi 8-inch marine jet. Nozzle is in recess between rear tires

FOR TWO AND A HALF DAYS I drove the Hustler through soupy muck and smashed through thick palmetto so high I couldn't see over it, leaped ditches at speeds only a suicidal maniac (or a *PM* tester) would attempt, and raced through water and plowed up 50° embankments at speeds no conventional ATV could take.

After thoroughly wringing out the vehicle on River Ranch Acres in Central Florida, I can list results: one headlight jolted from its socket, a damaged drive belt on the jet pump, some leaking at the midriff seam after long driving in water—and one mighty impressed (and mildly bruised) outdoors editor.

All all-terrain vehicles claim water as one of their elements. But most



STEERING REVERSE enables you to drive off trailer and continue journey when end of road is reached



BALLOON TIRES with 1½ pounds air pressure never suffered a puncture in scrambling over rocks and logs



LEAPS FROM DITCH BANKS soaked driver and sometimes flooded interior, but the engine never quit



IMAGINE TRYING TO RUN this bank from deep water with family car! Note water draining from jet

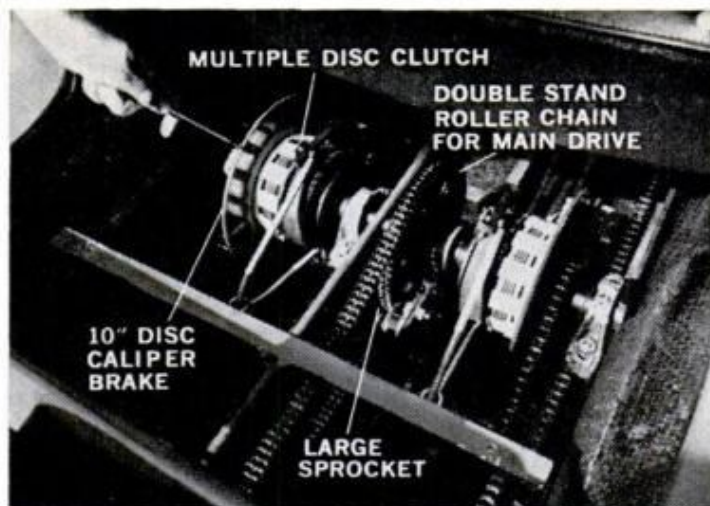
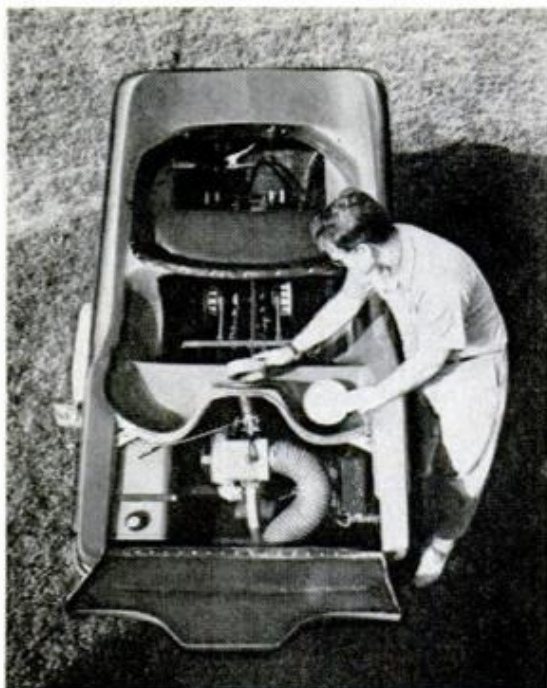
splash along at two and three mph when their churning wheels are immersed in water. Then one day three boys from Arkansas dropped an eight-inch Jacuzzi marine jet propulsion unit into a fiberglass and steel-frame body with a 20-hp Kohler engine. The result: An ATV that did better than 8 mph in water during our test and might have added another 4 mph had not my man-handling damaged the drive belt.

The jet pump is a \$250 option that's controlled from the front seat. Ride into the water, throw the jackshaft into neutral (lever under the front seat), put the jet pump into gear and—roar—away you go! All controls are hand operated (put your feet where they'll be most comfortable), and water steering is the same as that used on land, though

you may have to lean a little into turns to get your "boat" around corners.

Other features of the Hustler include neoprene motor mounts for easy engine installation and removal (just 10 minutes for takeout!) as well as the best vibration isolation in the industry. A five-inch duct hose takes hot air from the block, and the outside dual power-tuned muffler gives a 15 percent greater hp rating over straight-pipe designs, enabling the 309-cc, two-cycle Kohler to get itself and driver up to 35 mph—in reverse as well as forward!

Roger Hurt, the 25-year-old engineer responsible for so many of the Hustler's features, is especially proud of the quality of workmanship in *his* ATV. There are only two bronze bushings used anywhere in the machine, he pointed out,



DISC BRAKES are 10-inch caliper type. Adjustable chains run on the largest sprockets possible to avoid slippage

OVERSIZE PAPER AIR FILTER (left) is convenient between two back seats, provides fresh, cool air to carburetor

and they're at two low-pressure points in the steering mechanism. "Elsewhere we use a total of 44 ball, roller and needle bearings," he added.

"We're also the only manufacturer combining a steel frame with a fiberglass hull. Some give you A.B.S. plastic with everything bolted on, but our system not only provides greater damage resistance, but even if you do bust up the body, your frame keeps things in line so you can limp home for repairs."

Another happy feature of this ATV has to do with its origin. Jacuzzi Jet Pumps are made in Little Rock. Not all of the other components come from Arkansas, but at least Roger, his broth-

er, Bill, and partner, Lowell Chrisco, chose 100-percent American parts. Even if you're not moved by this patriotism, it means you should have little difficulty obtaining parts and service.

Sorry I didn't give the Hustler a snow, sand or mountain test, but anyone familiar with Florida's interior (during the wet season) can vouch for the strenuousness of our workout.

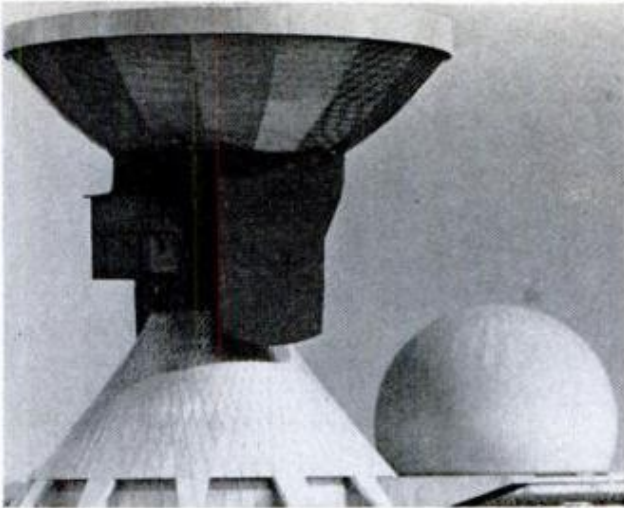
The machine weighs 644 pounds and can carry its own weight in gear and passengers. Price with the pump is \$1945. For more information, write Bill Hurt Jr., Hustler Corp., Box 1283, Jonesboro, Ark. 72401. And try to keep all six wheels on the ground! ★★



WITHOUT JET PUMP, Hustler in deep water churns up a mighty froth while I sit and wait for a tailwind

WITH JET UNIT'S THRUST we even make a little wake on our way out for an afternoon's angling along shoreline





New ear in Bavaria

A new antenna for satellite communications with North America is in operation at Raisting, Bavaria. An earlier antenna (rear) is now used for communications with East Asia.



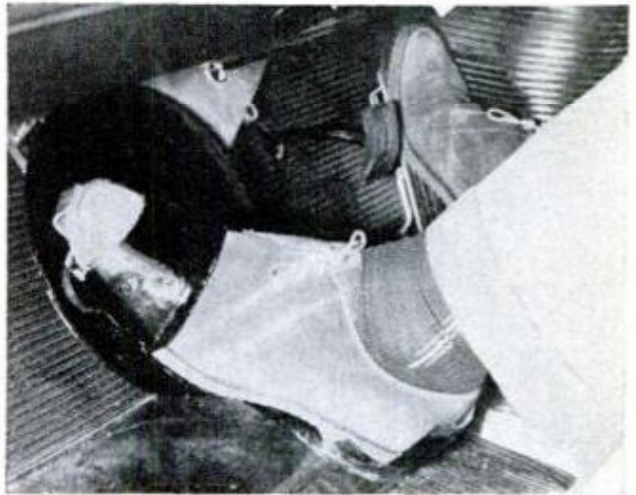
Big noise in the cornfield

Firing every 2½ minutes, this noisy, but harmless, propane-gas cannon scares birds from test plots of corn. Thus, no grain is lost to birds and yields can be accurately checked.



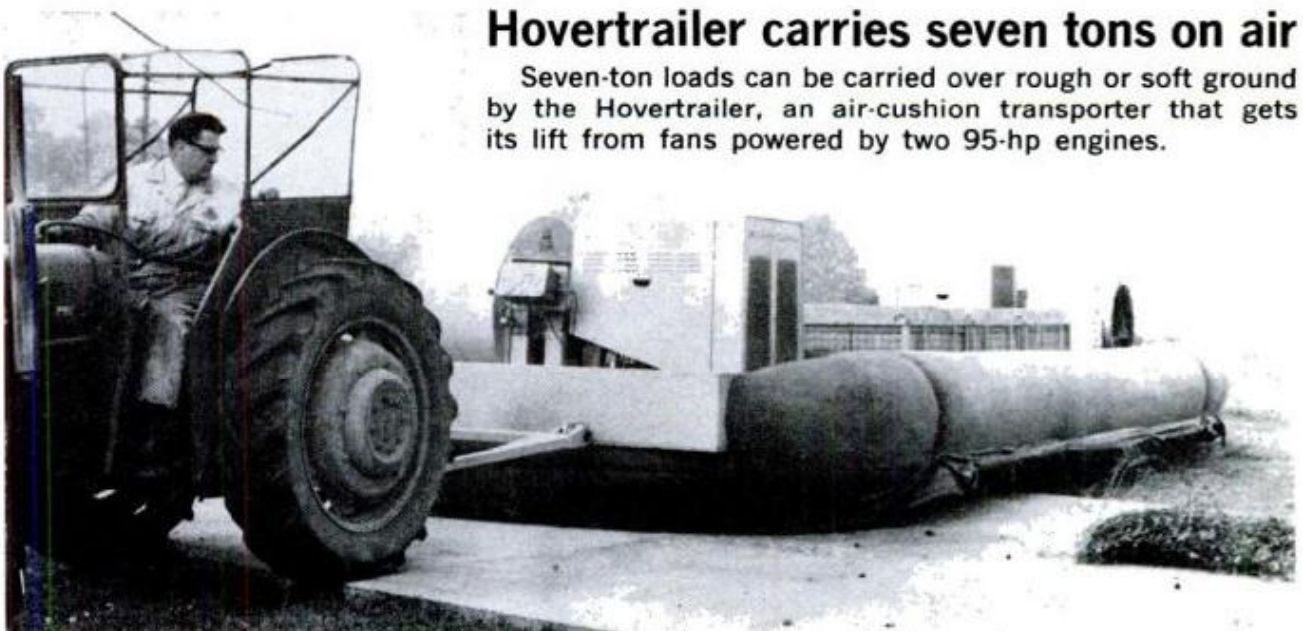
He steers his car with his feet

Paralyzed in his arms, Nigel Harvey of Ealing, England, steers his car with a foot-operated disc that he turns. He selects gears with his knee, operates a hand brake by shoulder.



Hovertrailer carries seven tons on air

Seven-ton loads can be carried over rough or soft ground by the Hovertrailer, an air-cushion transporter that gets its lift from fans powered by two 95-hp engines.





**PM OWNERS REPORT
PLYMOUTH BARRACUDA**

A Nationwide Survey Based on
1,052,499 Owner-Driven Miles

Sizzling and Sexy, but Too Much Concession To Styling

By **MICHAEL LAMM**
West Coast Auto Editor

Photos by Irv Dolin

STYLING SOLD most buyers on the Barracuda initially, but now that they've had a chance to live with it, styling is what they grumble about most.

The long-snout, bobbed-tail treatment might look bosso, baby, but it sure cuts into interior space. Several owners in our survey aren't too happy with front legroom; absolutely no one raved about the rear. There's two inches less front legroom in the '70 Barracuda than in the '69, and rear-seat abbreviation has several owners spontaneously suggesting Barracuda be made a two-passenger car so there'd at least be some trunk.

Well, no pony car has much trunk, but the 'Cuda seems to take it one step beyond by planting the spare tire dead center in what little room is left. Here are a few random owner comments: "Trunk? What trunk?"—New York teacher. "Won't hold golf clubs."—California chemist. "I'd like more back seat, seeing as how they forgot the trunk. How about going back to the fastback with

'CUDA'S STYLING spurred most sales; later, owners cry out for more trunk and legroom, less tuck-under





SEAT BELTS retract cleverly through slots by hinge arms, can't catch in door or between seat sections



DARN LITTLE space in rear seat and 2 in. less up front than in '69, yet drivers rate comfort high

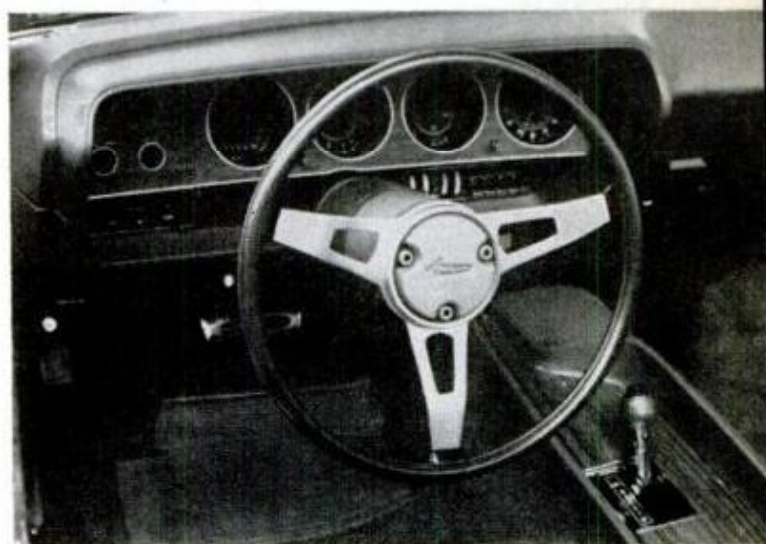
its lay-down rear seat?"—Texas salesman. Or "Move tire from middle to wheel well." Easily said. An optional collapsible spare costs only \$13, but what salesman will tell you it's available?

Which brings up another common complaint: door pox—dings, the parking-lot disease. "Dings?" writes a California lab tech, "Need some? I got 'em." And an Illinois bookkeeper says: "Need chrome down sides to avoid parking nicks." Here again, a good salesman could have saved these people a lot of grief by suggesting the optional vinyl belt molding strips. These are standard on Gran Coupes and 'Cudas, cost \$14 more on Barracuda models.

A more minor styling irk came from the radical tuck-under of the lower body edges. This causes the body to get dirty more quickly, and small stones chip paint near wheel wells.

Generally, though, owners like their Barracuda's looks more than a little. "Real eyeball appeal."—Louisville engineer. "It's only 186 inches long and very sporting."—Brooklyn lawyer. "I got tired of Ford's better idea," says a department store manager. An Indiana wholesaler took his teen-agers' advice: "Have girl 18 and boy 16 who dig the body style. Now so do I." The Barracuda draws from the young. In our sample, 55.2 percent are 20-29 years old.

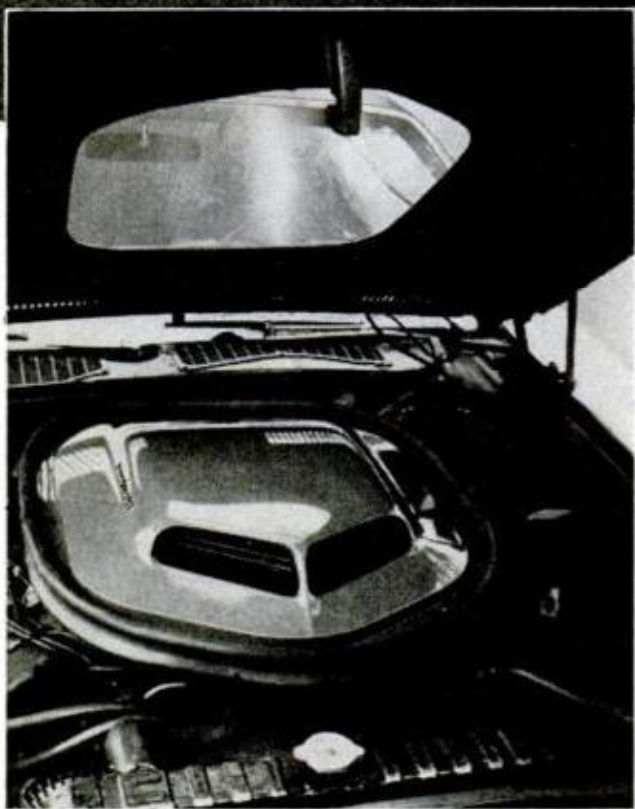
In the go department, nothing but



BARRACUDA shares dash with Dodge Challenger. Radio hides at steering column, heater controls at left



NO TRUNK, moan most owners—a situation not aided by spare being mid-mounted. Lip stands very high



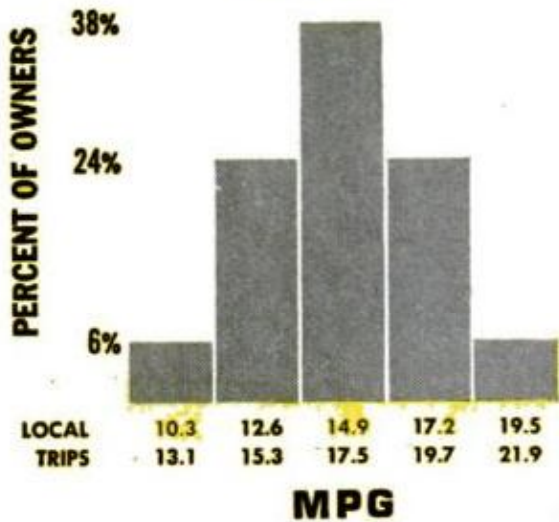
SUPERLONG SNOOT houses \$98 Shaker air cleaner on 440 6-bbl. V8. One owner says it merely serves as excuse for poor idle adjustment. Shaker picks up cooler outside air so oxygen-richer charge reaches cylinders, giving milliseconds better acceleration

rhapsodizing. "Poor man's Corvette," says one Kentuckian. Michigan business exec: "Fantastic pickup and go." The owner of a 440 six-barrel: "Very good acceleration in quarter mile," but then he wrings his hands about gas mileage. A Michigan beauty operator purrs, "When I step on it, it moves." She's talking about the 340 four-barrel V8, an optional, very good engine Chrysler tends to sweep under the rug.

As for handling, a Staten Island draftsman notes, "Being a previous Corvair owner, I find handling surprisingly good. Cornering without body lean is excellent." Says a Minnesota gymnast, "It reacts!" A Nebraska trailer manufacturer adds, "Handles well without power steering or power brakes."

Most Barracuda owners feel their cars are put together well enough, with only 16 percent fingering bad workmanship specifically. Of these, predominant complaints center on rattles (big windows, especially), leaks (windshield, rear glass, trunk), engine not starting because trans selector won't close the switch in Park, and window alignment. On the more serious side, one owner

BARRACUDA FUEL MILEAGE CHART
318-cu.-in. V8



Summary of 1970 Barracuda Owners Reports*

Total miles driven.....1,052,499

Average miles per gallon:

225-cu.-in. 6, local driving	17.0
long trips	19.8
318-cu.-in. V8, local driving	14.9
long trips	17.5
340-cu.-in. V8, local driving	12.3
long trips	14.8
383-cu.-in. V8, local driving	11.4
long trips	14.6
426-cu.-in. V8	n.a.
440-cu.-in. V8, local driving	8.7
long trips	n.a.

Engines:

225-cu.-in. 6	14.8%
318-cu.-in. V8	53.1
340-cu.-in. V8	5.9
383-cu.-in. V8	20.7
426-cu.-in. V8	1.5
440-cu.-in. V8	4.1

Transmissions:

Automatic	73.7%
4-speed manual	13.5
3-speed manual	12.8

Why the Barracuda?

Style	70.2%
Past experience	11.7
Size	10.6
Performance	9.1
Economy	6.8
Price	5.7
Handling	5.7

Specific likes:

Styling	64.9%
Handling	49.4
Performance	22.4
Comfort	20.1
Economy	17.0

Power	13.5
Ride	12.7

Specific dislikes:

Trunk space	23.8%
Workmanship	16.1
Wind noise	11.9
Rattles	10.3
Rear legroom	10.0
Dealer service	8.9
Fuel economy	5.8

What changes would you like?

Transmission	19.0%
Workmanship	13.5
Legroom	13.1
Rear vision	10.1
Seat style	9.3
Quality of materials	5.5

Had any mechanical troubles?

Yes	43.5%
No	56.5

What kind of trouble?

Carburetor	12.2%
Transmission	11.3
Windshield wipers	9.6
Electrical	8.7
Brakes	7.8
Power-steering leak	7.0
Cold starting	6.1

Did you repair it yourself?

Yes	7.3%
No	92.7

Dealer repairs satisfactory?

Yes	69.9%
No	30.1

Is the Barracuda your only car?

Yes	43.9%
No	56.1

Other cars owned:

Plymouth	39.9%
Chevrolet	22.4
Chrysler	18.4
Dodge	11.2
Oldsmobile	8.6
Volkswagen	7.2
Barracuda	6.6
Ford	6.6
Valiant	6.6
Pontiac	6.6

Power options/accessories:

No power options	26.4%
Automatic transmission	73.7
Power steering	45.7
Radio	45.6
Power brakes	27.9
Airconditioning	21.0
Console	17.9
Vinyl top	17.9
Light group	14.7
Stereo tape	13.1
Whitewall tires	11.1

What options/accessories would you order next time?

The same	55.7%
Airconditioning	9.4
Rear defroster	9.0
Power steering	8.6
Stereo tape	6.7
Power brakes	5.5

Age distribution of owners:

15-29 years	61.9%
30-49 years	24.2
50-plus	13.9

Would you buy another Barracuda?

Yes	65.9%
No	34.1

*Percentages may not equal 100% due to rounding and/or insufficient data.

had an engine burn up at 1100 miles, but the dealer replaced it without question. One woman reports the factory left off a front shock absorber.

In the area of misengineering, here's another quick rundown: "Heater controls on wrong (left) side, unlighted." "High front seatbacks block vision." "Please put vents back in windows!" "Tach scale all wrong." "Car too low for our area—won't clear snowbanks."

There were a few complaints, too, about materials. "More metal and less plastic," pleaded a number of owners. However, those who paid the \$82-\$137 extra for Elastomeric bumpers said they were glad they did.

Owner/dealer relations run hot and cold, as always. Fair numbers said they had long waits for parts. Typically, "Parts not available. Dealer service poor, doesn't seem to care, only interested in selling new cars." But on the other side, "When I do have trouble, I take mine to my dealer. His work is al-

ways satisfactory." Or, "My transmission went out. Warranty covered everything. No complaints."

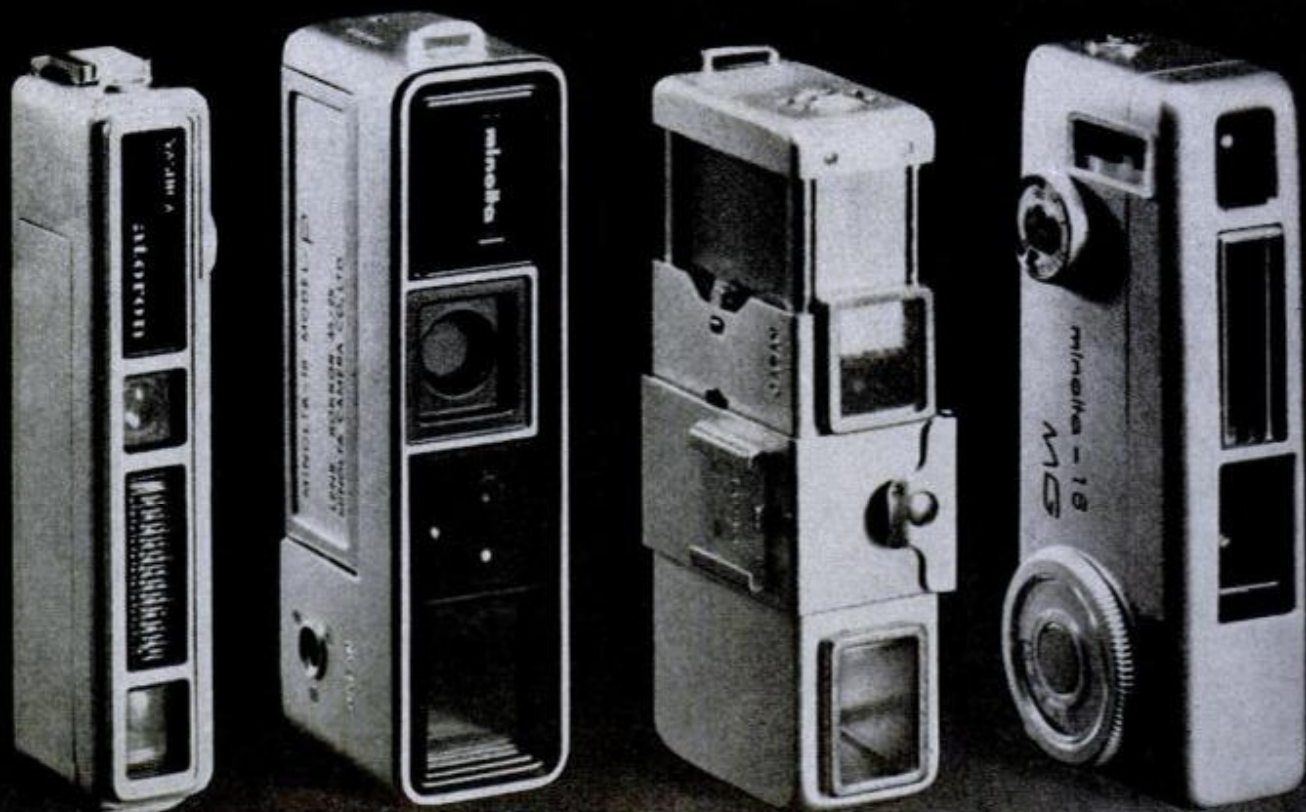
Summing up, these words from a Massachusetts modelmaker who's owned 12 Plymouths since 1945: "Was sold on looks, expected durability and performance, got all these and more. My next car will be another Plymouth product." ★★★



HANDLING RANKS second as reason for buying. Hard cornering makes driver press power-window buttons

The Biggest Little Cameras

Ultraminiature cameras, once a curiosity, are now loaded with almost as many convenience features as their bigger brothers. Here's a look at what these versatile, pocket-sized performers can do and how to shop for one

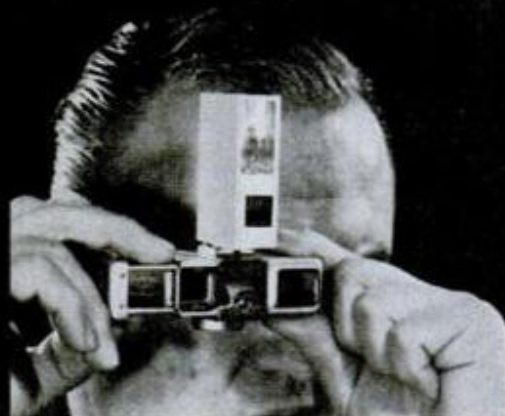


YASHICA ATORON
\$110

MINOLTA 16 PS
\$29.95

MINOLTA 16 II
\$39.95

MINOLTA 16 MG
\$79.50



HANDY CLIP-ON FLASHGUNS are now available for all mini-cameras. This battery-powered Minolta gun takes tiny AG-1 flashbulbs

MINI-CAMERAS are growing bigger every day—not in size but in the features they offer and the jobs they'll do. Physically, they're still slim, watch-like jewels half the size of a pack of cigarets—a whole photographic system small enough to slip into a shirt pocket.

Over the years, these finely crafted mechanical marvels have been refined and advanced to the point where there's practically nothing big cameras do that an ultraminiature can't do almost as well. Several models now have built-in automatic exposure controls. All offer accessory flash units for photography in poor light and at night. At least one, the new

Minox, even gives you high-speed electronic flash.

Ultraminiatures have also grown in number. In addition to the original Minox, first of the pocket cameras, there are now five other mini-models on the market. Rollei, famous for its long-popular twin-lens reflex, has introduced a tiny new Rollei 16S. Yashica, a maker of 35-mm cameras, has added an ultra-

in the World

By BURT MURPHY

PHOTOGRAPHY

Photos by Robert D. Borst



MINOX C
\$199.50

ROLLEI 16S
\$199.50

PUSH



PULL



CLICK

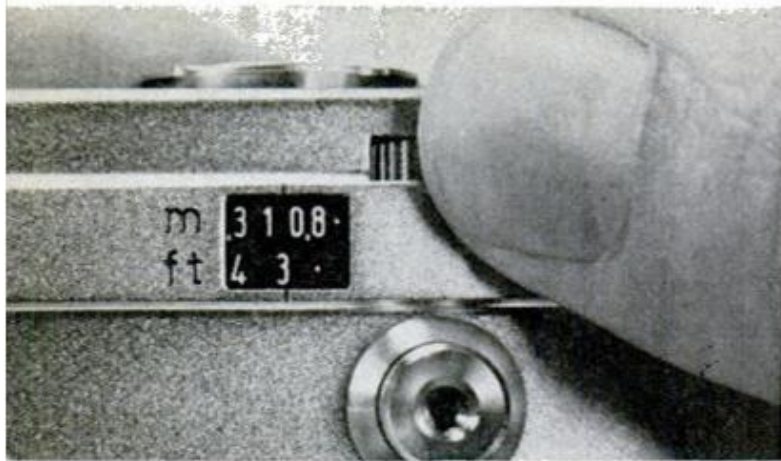


LATEST MINOX, the Model C, has the familiar telescoping body featured on earlier models. The two halves slide apart to reveal the lens in the center. A quick push-pull of the mechanism advances the film and cocks the shutter for the next picture, permitting rapid-fire shooting. Newest feature to be added is high-speed electronic flash

miniature called the Atoron. Minolta offers a choice of three different models, the 16 II, the 16 PS and the 16 MG. Prices range from a modest \$29.95 for the least expensive Minolta, the 16 PS, up to \$199.50 for the latest Minox, the Model C.

Mini-cameras do have their limitations and aren't designed to replace other photographic equipment completely. They're more like having a second car just for fun—a flashy two-seater sports model in addition to the family sedan. You can slip one in a pocket and carry it wherever you go without packing along a lot of bulky gear. A mini is handy to have on trips and outings where photography is not the main objective, but where you might want to take some spur-of-the-moment snapshots. It can be inconspicuous in situations where you don't want to make your picture-taking obvious. It can also be helpful in business for recording documents, displays, construction progress at building sites, accident damage and so forth. With the aid of automatic exposure controls and supplementary flash, you can shoot under almost any photographic condition without having to stop and figure out complicated adjustments.

Two different film sizes are used in the minis. The Minox C and Yashica Atoron take 8-mm film, similar to 8-mm movie stock. The Rollei 16S and the three Minoltas have adopted the larger 16-mm format. There are advantages and disadvantages on both sides. The 8-mm models are noticeably slimmer, lighter and hand-



TURNING A THUMB KNOB on the Rollei 16 above focuses the lens and simultaneously shows distance on a scale in a small window. Button below and to right of the scale is the shutter release. Photo at right shows miniature battery in the Minox C that powers the automatic exposure system. Battery lasts about a year, is easily reached by sliding out the camera's end cap

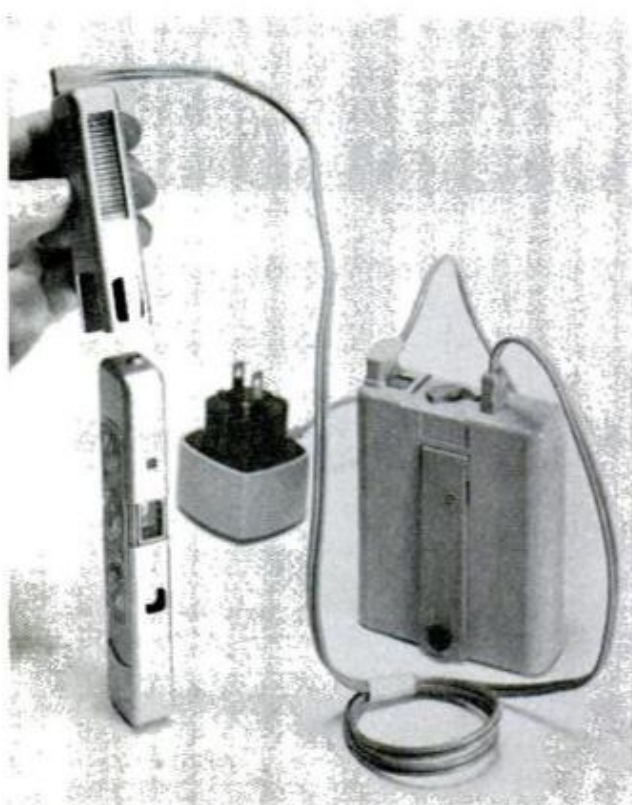


ier if you're concerned with size alone. On the other hand, the 16-mm models, while somewhat bulkier, have an edge in increased image size, theoretically making sharp prints easier to produce.

Neither the 8-mm nor 16-mm film size, however, is designed to provide jumbo enlargements. They yield small, wallet-size prints of acceptable snapshot quality, and these are what you usually get back from the processor. Somewhat larger prints, up to about 3½x5 inches, are available on special

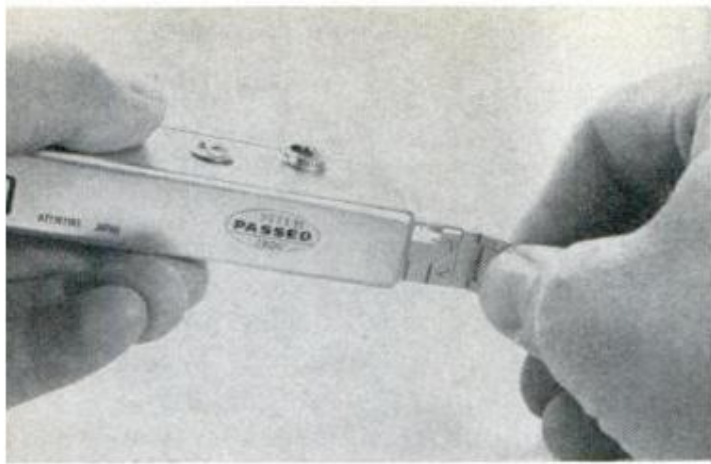
order in some cases. Bigger blowups from the tiny negatives are possible, but they require high-quality custom processing and must usually be made in a two or three-step operation involving intermediate copy negatives.

Most mini-camera makers supply their own film and processing. In general, a processing envelope comes with the film when you buy it and you use this to return the exposed roll for developing and printing. Several types of color and black-and-white films are



NEW ELECTRONIC FLASH, just introduced for the Minox C at left, slips onto the camera, automatically making contact with the flash-trip mechanism. Flash is powered by a pocket-sized battery pack that can be recharged from an a.c. outlet. Below, a tiny crank on the Rollei 16 rewinds exposed film back into the supply container so it can be removed





NOVEL PULL-OUT TAB advances the film and cocks the shutter on the Yashica Atoron above. Like the Minox, the Atoron uses tiny 8-mm film, permitting an exceptionally slim body. At right, drop-in film cassette, used in most mini-cameras, makes loading and unloading easy. This Minolta cassette is a one-piece, sealed container, requiring no threading



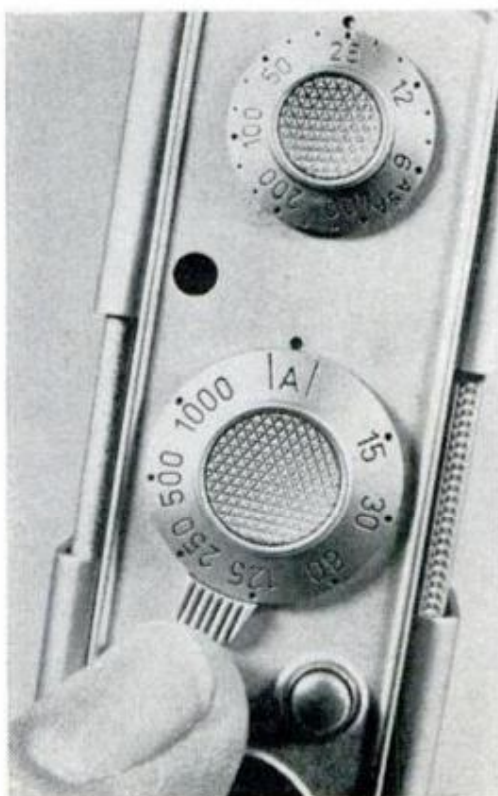
available, providing a reasonably wide selection. Typical costs are \$1.10 to \$1.60 for a 20-exposure roll of film, with processing running to an additional \$2 for transparencies and up to \$6 for color prints.

All of the ultraminiatures except the Rollei use sealed film cassettes that just pop in and out without requiring any threading. With the Rollei, the film must be threaded manually into a take-up compartment, then rewound into the original container after exposure.

The familiar push-pull film advance long used on the Minox is now found on two other models, the Minolta 16 II and the Rollei 16S. The telescoping mechanism advances the film and cocks the shutter in one quick, easy motion, making fast shooting a breeze. The other two Minoltas use less-fancy wheel advances, and the Yashica Atoron features a pull-tab advance.

Focusing is fixed on the Minoltas but adjustable on the Minox, Rollei and the

(Please turn to page 208)



WARNING INDICATOR on the Minox C at left tells you if exposure will be longer than 1/30th of a second. If small round window between the two dials lights up, it means you'll need flash or a tripod to assure a sharp picture. Lower dial sets shutter speed, upper one ASA film speed. Most minis can be mounted on a tripod for steadiness. A removable clip provides tripod socket and flash shoe for Minolta 16 II below



Build This Back-Yard Beauty

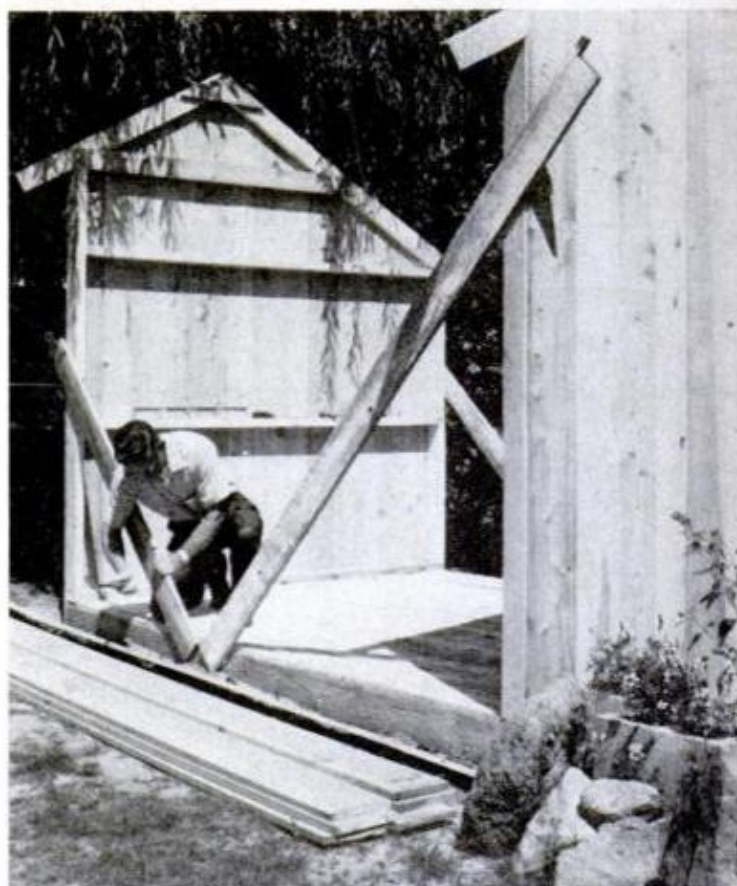
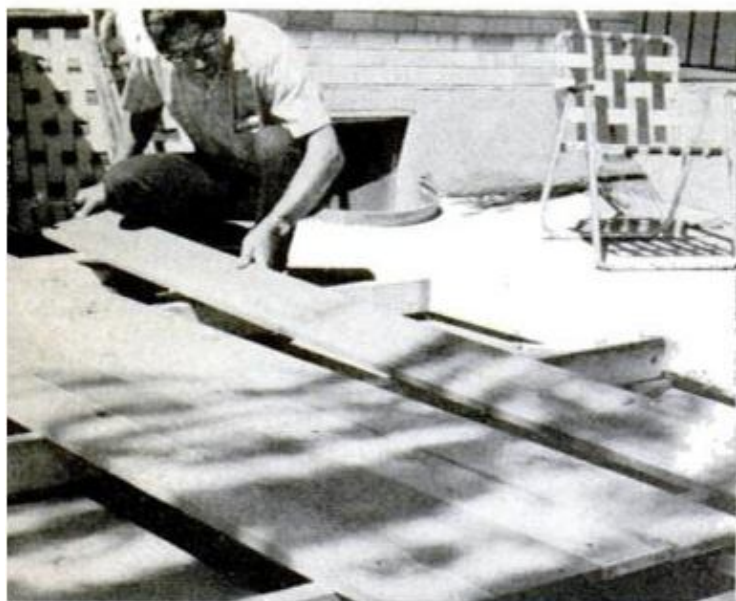
Its western styling makes it a handsome playhouse for youngsters, and when they outgrow it, you'll have roomy storage for all your garden and yard tools

By BRAD SNYDER

WHETHER YOU NEED a playhouse for the youngsters, a summer office, pool cabana or more storage space for yard equipment, a lawn building lets you make greater use of your property.

Once we decided to build one, the next step was to decide its architectural style. This was solved by selecting the Western-style model shown which matched our home exterior. Elevations for it (and the alternate Western Side Door) are shown on these pages. Complete building plans for both versions are available at \$2 per set from PM's Reader Service Dept., 224 W. 57th St., New York, N.Y. 10019. To order plans for one of four other styles—Cape Cod, Barn, Swiss Modern or Vermonter—write to the plan designers, Alpine Enterprises, Box 9332, Colorado Springs, Colo. 80909.

Though the house could have been



SHED FRAMING rests on four piers (upper left); flooring is then nailed to joists and trimmed in place

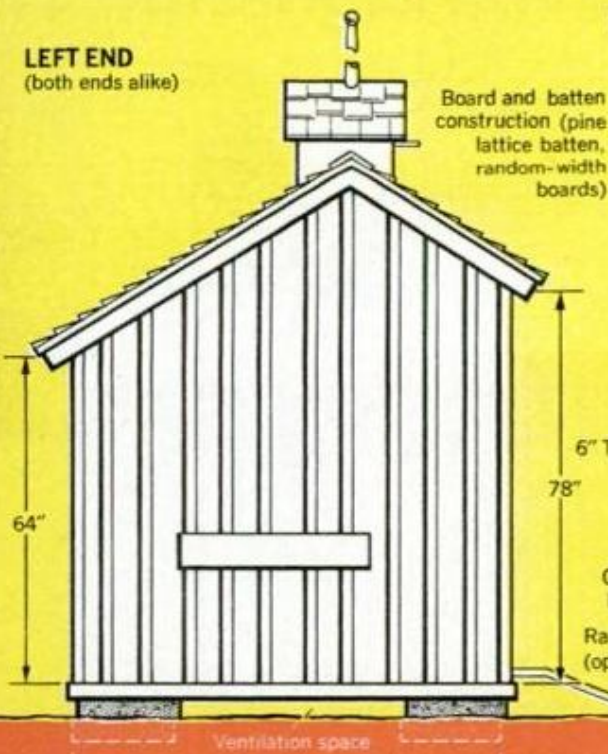
TO SPEED CONSTRUCTION, each wall is assembled on the ground (left), then hoisted into place as a unit

END WALLS ARE PLACED (above) and temporarily held with diagonal bracing. Ends equal width of platform



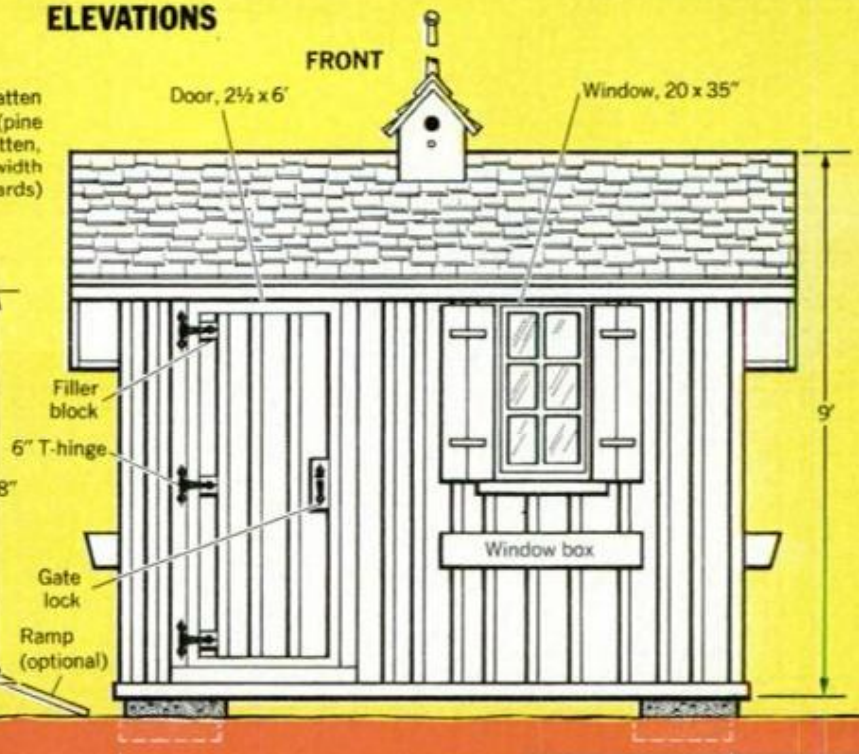
ELEVATIONS

LEFT END
(both ends alike)



Board and batten construction (pine lattice batten, random-width boards)

FRONT

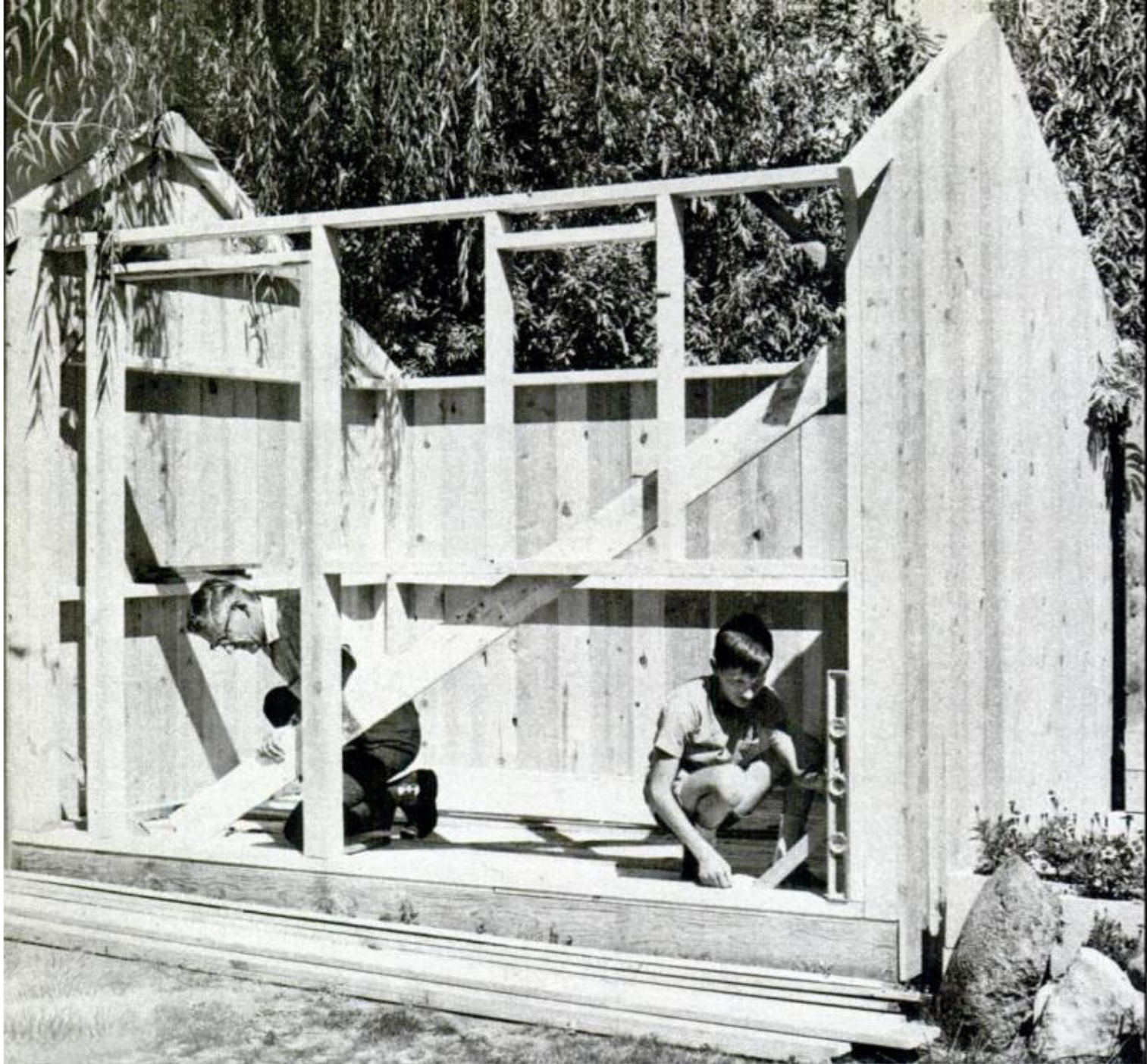


Filler block

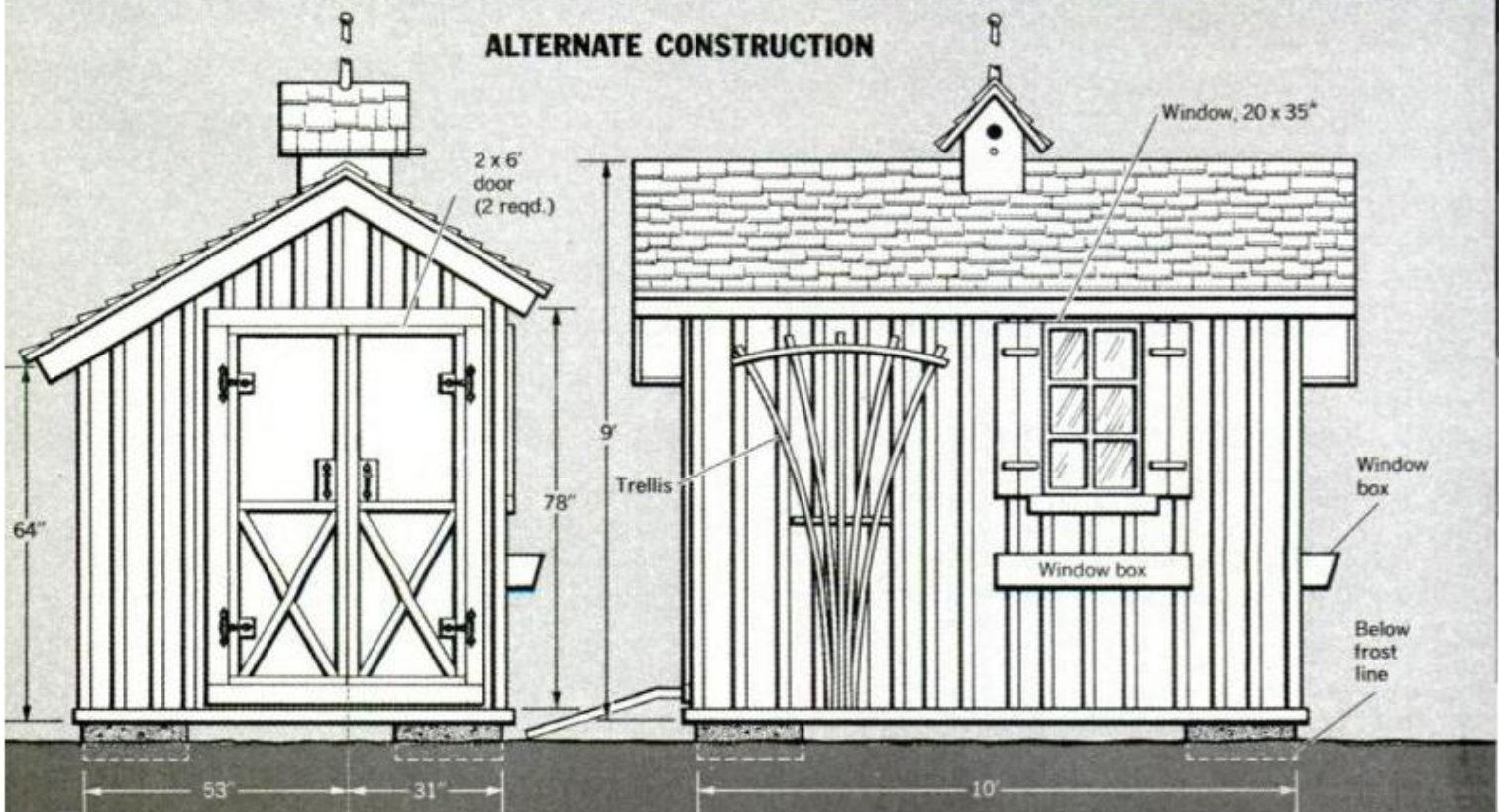
6" T-hinge

Gate lock

Ramp (optional)



ALTERNATE CONSTRUCTION



HINTS FROM READERS

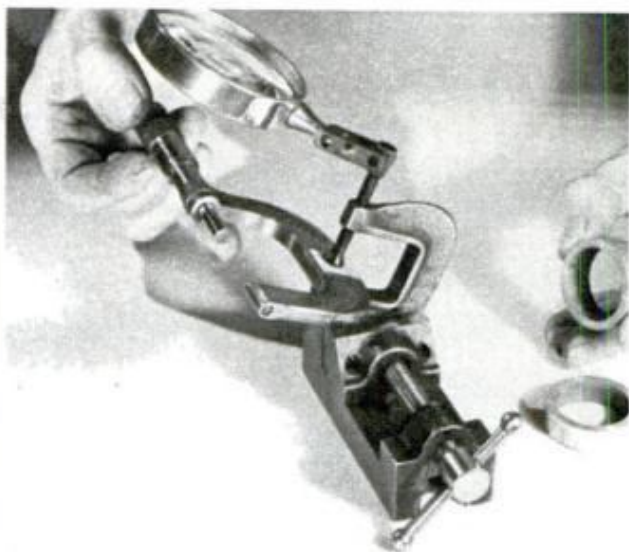


PREASSEMBLED ROOF FRAMING is hoisted into place and fastened to 1x6 ridge board installed at the peak

built on a slab, I elected to construct it on four concrete-block piers (in my area, exempt from tax assessment). After evaluating exactly what would be stored in the shed, I actually built it slightly larger than shown on the plans. Extra attention to details—window boxes, cupola birdhouse and ornamental hardware—yields the touches that elevate this little house from the construction-shanty look frequently found in home-built yard structures. I kept complete labor and materials records while building the house; they added up to about 35 hours of labor and \$228.19. (This is a 1969 materials' cost; I'd recommend a slightly higher budget this year). ★★★



ROOF SHINGLES are laid 5 in. exposed to weather; 3/4-in. exterior-plywood door is hung with T-hinges



Improvised bench micrometer

A conventional micrometer can be temporarily converted into a bench-type tool by mounting it in a small drill-press vise which serves as a base. Since most micrometers have the index line on the side, it's best to tilt the tool for easy reading by grasping it in a C-clamp held by the vise as shown. (Check the micrometer to see if clamp pressure affects zero setting.) For easier reading, mount a magnifying glass on the C-clamp.—Walter E. Burton

Camper's 'washboard'

A washboard improvised from a corrugated fruit juice or vegetable can will serve nicely for scrubbing socks, hankies and other small items when you're camping. Though the can may be used in its conventional shape, you'll have a wider working area if you cut out both ends and flatten the can.



COMING: THE SAFE 1000-

This new electronically regulated breathing rig may revolutionize skin diving. It's over 100 times more efficient than standard scuba, permitting a diver to go deeper than ever before and stay down longer.

By JOHN F. PEARSON, Science Editor

WALTER STARCK KEPT AN ANXIOUS EYE on his buddy Bill Schwicker. They were down better than 200 feet, a depth uncomfortably close to the safe maximum for the standard scuba Bill wore. Though prettier than many other waters, the luminous, magically blue Caribbean can be just as deadly.

The divers had released a chemical in the area and were scooping stunned fishes from the bottom and popping them into specimen nets for later study. Bill was in trouble. His movements were uncoordinated and his hands trembled. As a result, with each fish he would also bring up a handful of sand.

Even when not watching his buddy, Walter was keenly aware of Bill's presence. There was a loud rasp and gurgle each time Bill sucked air through his regulator and expelled it into the water.

Finally Walter signaled Bill that he'd been down long enough. Bill waved and swam off, trailing bubbles as he ascended. Soon the gurgle of the scuba grew faint.

In contrast, Walter's rig was virtually silent. Every minute or so it emitted a low, three-second *ssst* as additional oxygen was injected into the system. This was a test dive with the Electrolung, an electronically regulated, closed-circuit, mixed-gas unit that he had helped develop.

The two divers had been working a ledge along the face of a cliff that angled to meet the ocean floor hundreds of feet below. Walter descended to the 250-foot level, inspecting giant sponges and black coral trees projecting from the cliff face. He glided past schools of small fish that paid him little attention. That was one of the things the Electrolung was designed to do—permit a diver to become an unobtrusive invader of the world below the surface of the sea.

Even though his oxygen partial-pressure gauges showed he could stay down for five more hours, Walter decided to surface. At 40 feet he made his first decompression stop. Above, he could see Bill clinging to their boat's anchor line while continuing to decompress. Walter went up to 30 feet, where he switched to pure oxygen to speed the process. After brief stops at 20 and 10 feet, Walter surfaced alongside Bill.

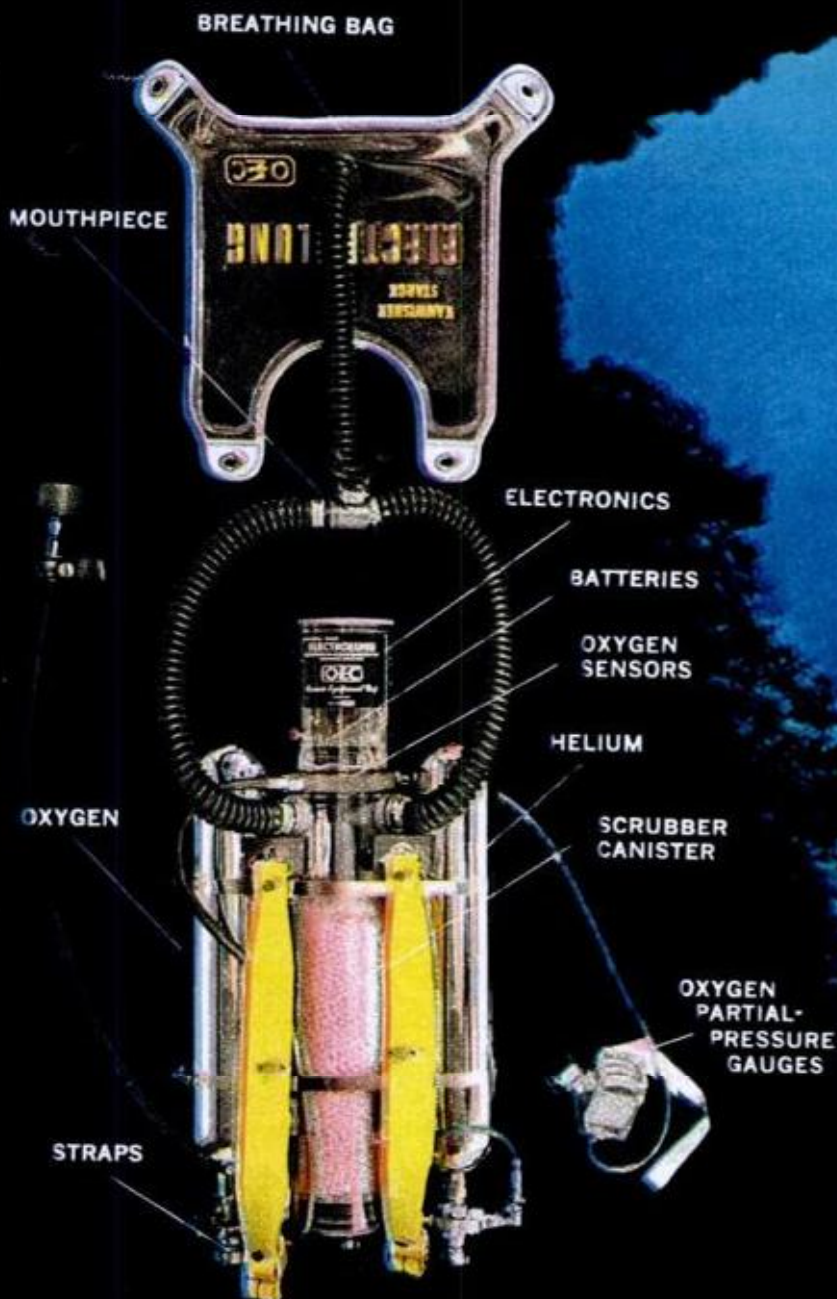
"How'd it go, Bill?" The question came from another member of the party after the two divers had boarded.

"Fine," Bill said. "No problems."

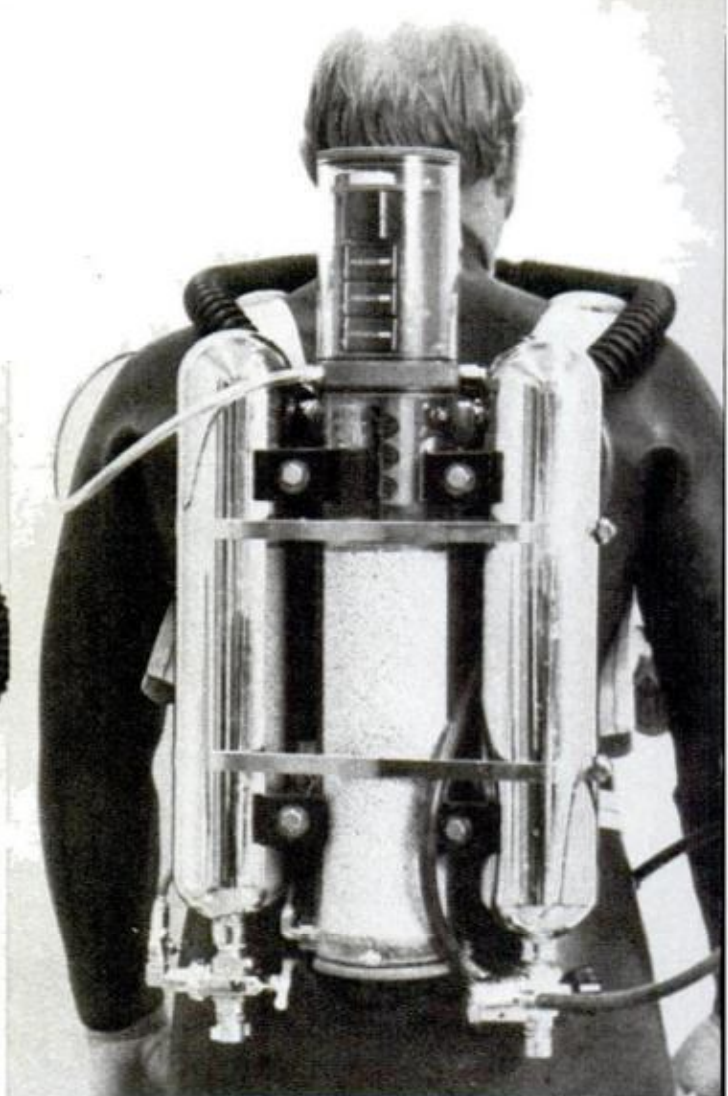
Walter grinned. "That's not the way it looked from where I was sitting."

Bill was surprised to learn that at the deepest part of his dive he'd become

FOOT DIVE



CORAL REEF IN CARIBBEAN is explored by diver wearing Electrolung. There are no bubbles as no gas is exhaled into water



COMPACT, 35-POUND ELECTROLUNG uses gases very efficiently, permits six-hour dives regardless of depth

clumsy and uncoordinated. But the proof lay in his specimen bag, which contained as much sand as fish.

Bill's experience illustrates one of the shortcomings of the standard compressed-air breathing apparatus. On deep dives nitrogen in the bloodstream causes the effect called "nitrogen narcosis." The result is like that of having had one too many. Though the diver thinks he is in good shape, in reality he is incapable of handling any problem calling for quick or involved thinking.

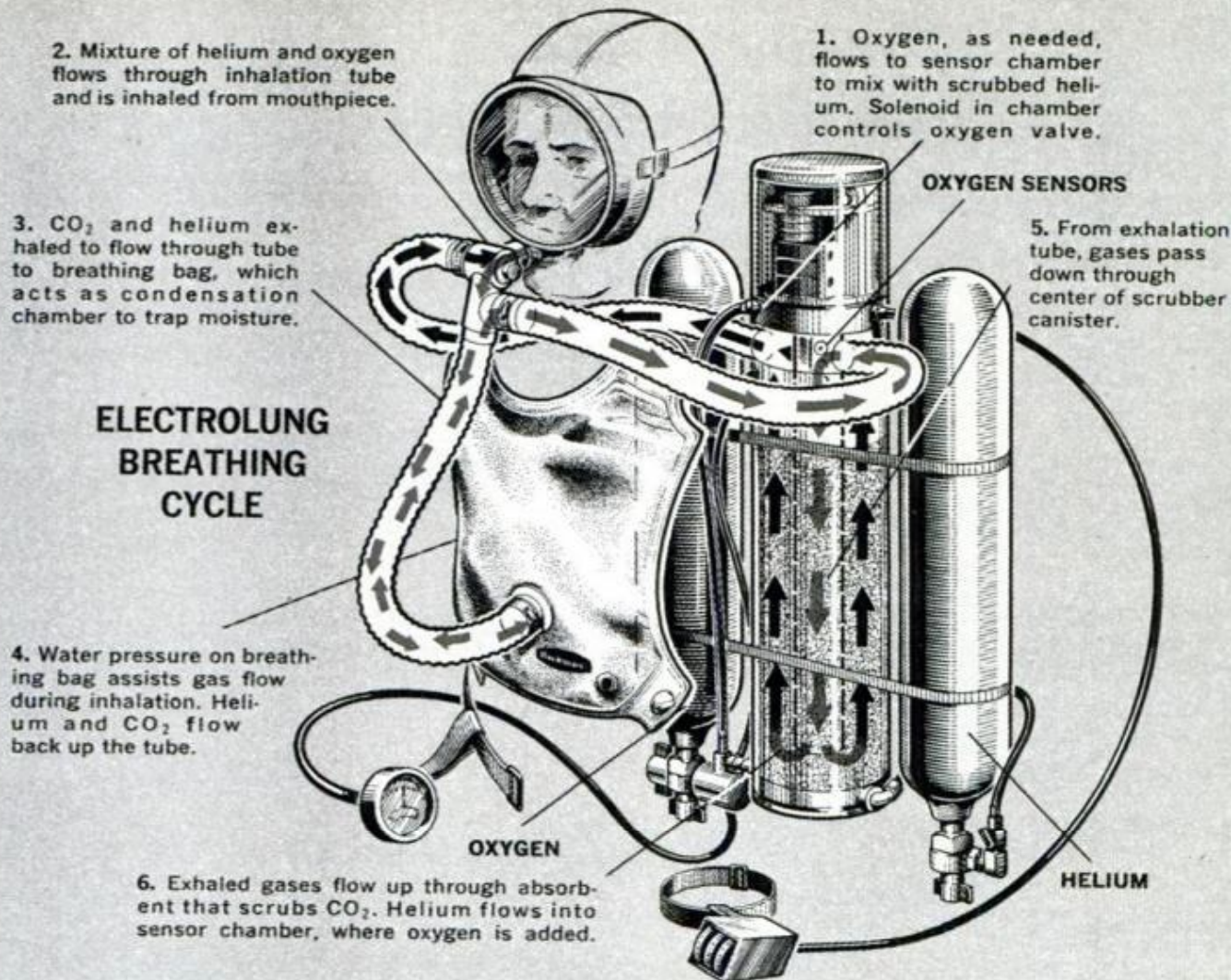
In addition, the density of the nitrogen increases so greatly with depth that it inhibits ventilation of the lungs, resulting in a CO_2 buildup in the lungs. As a result, any extra effort required of the diver will cause him to struggle for breath even though there is plenty of oxygen available.

Conventional scuba is an open-circuit system: The diver breathes compressed air through a mouthpiece and exhales

into the water. Though reliable, it is a very inefficient system. Each exhalation wastes large volumes of gas. Thus, a twin-tank unit weighing close to 100 pounds will last two hours at 30 feet and about 30 minutes at 200 feet.

A step-up in efficiency was achieved with the semiclosed-circuit units, in which an oxygen-rich mixture is continually added at a slow rate. Part of the gases are rebreathed and part expelled. This type of unit permits a diver to stay down significantly longer, but it's cumbersome and has depth limitations.

The semiclosed units are an improvement over standard apparatus, but still not good enough. Walter A. Starck II (to use his full name) had specific objectives in mind in seeking an improved scuba. He wanted an apparatus that would enable him to go deeper, stay down longer and that would be free of fish-frightening noise and bubbles. The tall, soft-spoken Ph.D. is a



HEART OF SYSTEM ARE ELECTRODES that "read" oxygen level, trigger valve to maintain proper gas mixture

marine biologist at the University of Miami and specializes in the study of fauna found around coral reefs. A veteran diver, he has spent much of his life exploring off the Florida Keys and coral reefs in many parts of the world.

Starck felt certain that a closed-circuit apparatus would meet his needs. He was mulling over its design when, in February, 1968, he met Dr. John Kanwisher on a Bahaman expedition.

Kanwisher, it turned out, had built a crude working model of a closed-circuit unit some years before. A biophysicist at the Woods Hole (Mass.) Oceanographic Institution, he has made a close study of the physiological aspects of diving, has done research with porpoises and is credited with having taken the first electrocardiogram of a whale. Dr. Kanwisher also is an expert in electronics and has invented a special electrode used in breathing systems.

The two scientists put their heads to-

gether and produced, in less than two months, a prototype of a closed-circuit unit that they named the Electrolung.

"The problem," says Dr. Starck, "was not in building a working system. John and others had done that. The problem was to build a completely *reliable* system."

The Electrolung has two tanks. One contains oxygen; the other, helium (or some other inert gas). A clear plastic canister contains a chemical that absorbs carbon dioxide, permitting the helium to be breathed again.

Scrubbing of the CO_2 is continuous, and the helium is used over and over. Oxygen is injected into the system at intervals in response to the diver's physiological requirements. If he's working hard, he'll burn up oxygen faster and will need more frequent "doses."

At 200 feet, the lung is said to be 100 times better in gas utilization than

(Continued on page 210)

Build This Handsome



Electric Serving Cart

Plug-in food warmer under a lift-up top keeps side dishes piping hot and flavor perfect when you entertain.

By WAYNE C. LECKEY, Home and Shop Editor

IF YOU MAKE the mistake of showing your wife this elegant Early American serving cart, you might just as well start building it. She won't give you a moment's peace until you do.

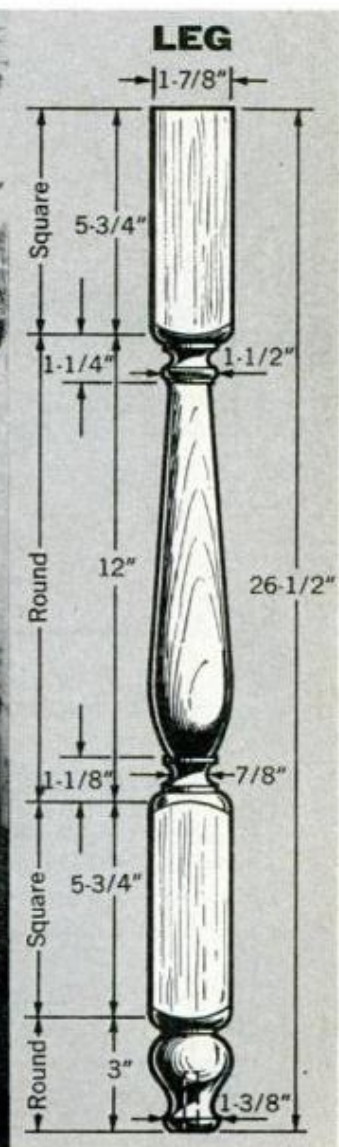
That's how much she'll love its rich fruitwood finish, its built-in electric warming tray, its retractable cord, its felt-lined silver and linen drawer and its easy-rolling ball casters.

You'll need such special tools as a wood lathe and router, but don't worry about being an expert at finishing. Its

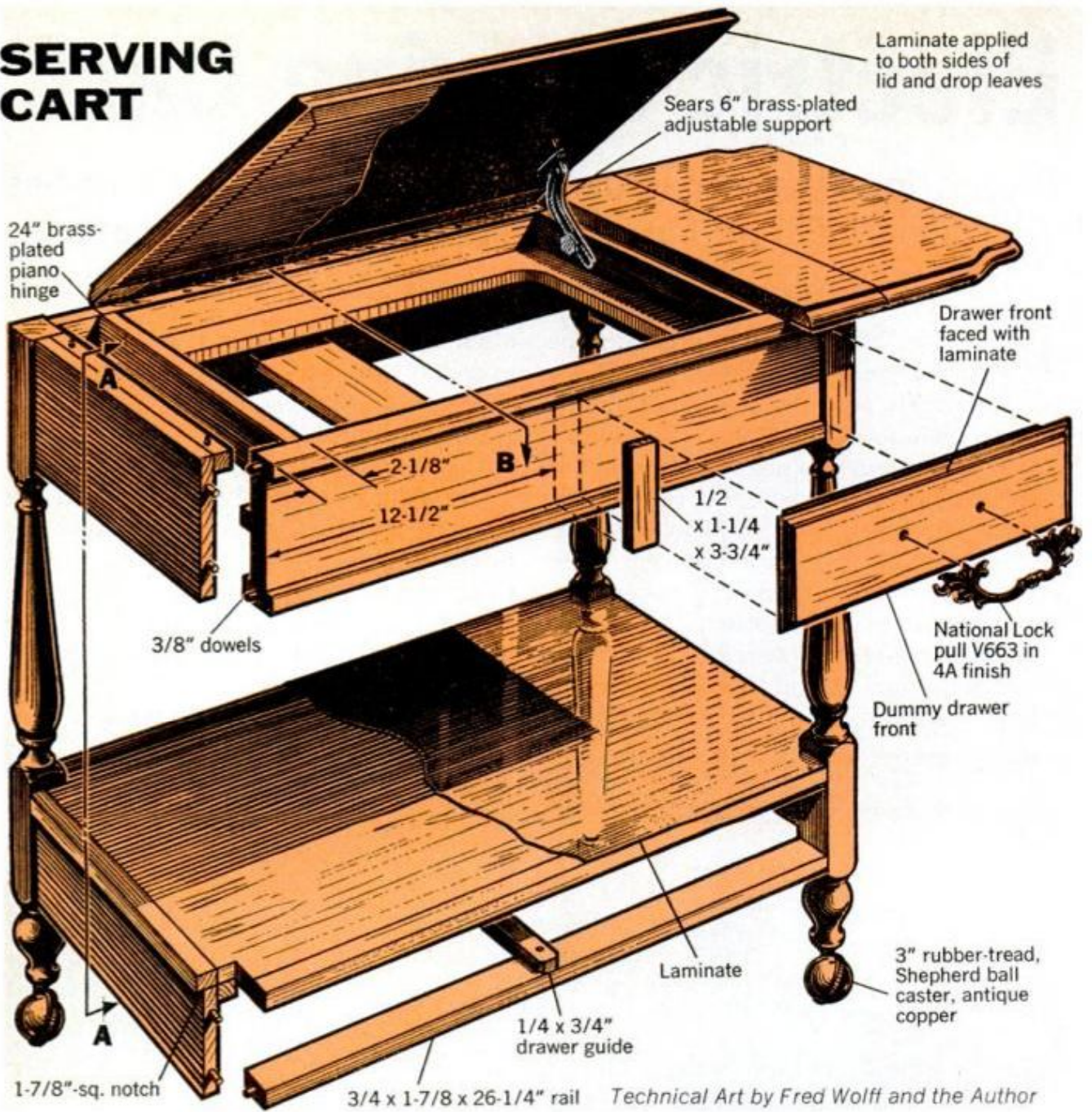
slick finish is a decorative laminate—you just cement it on and that's it. (See *How to Work With Plastic Laminates*, page 154, March PM.)

We covered the original cart with Consoweld's Colonial cherry and used solid cherry for the turned legs and exposed edges of the top, drop leaves, drawer fronts, lower shelf and front crossrails. These surfaces were later stained and finished to closely match the cherry laminate.

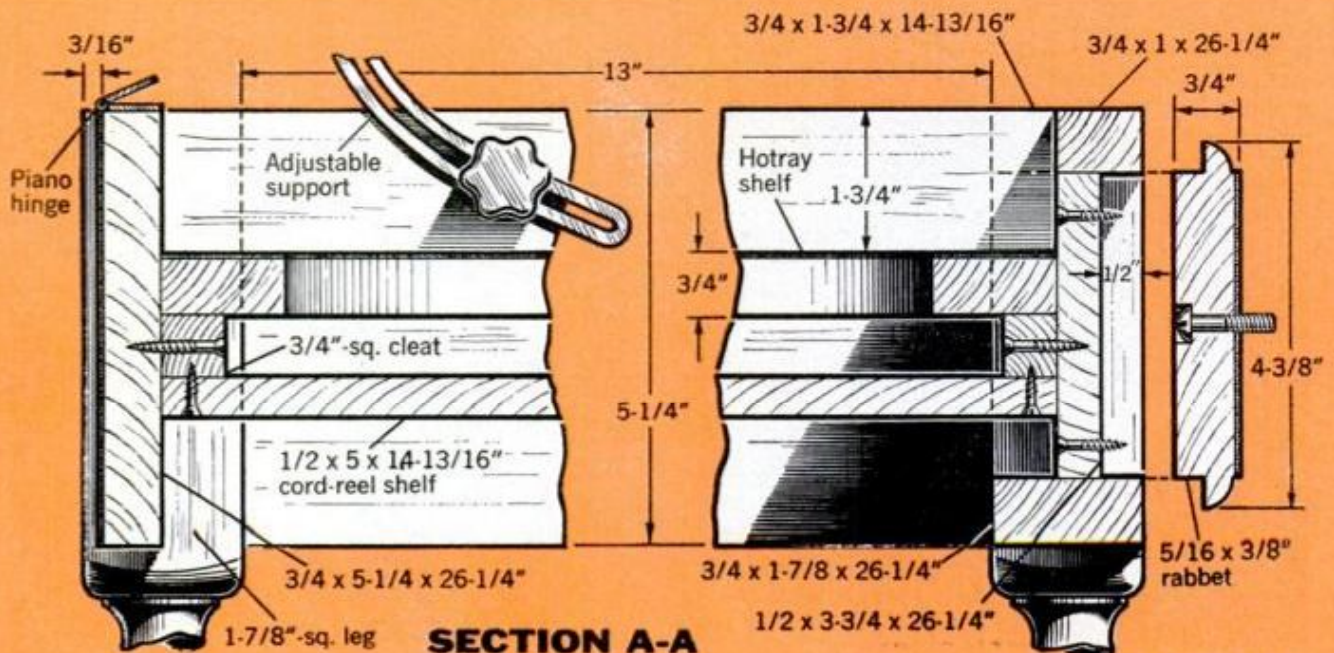
First turn the four legs from 1 $\frac{7}{8}$ -in.

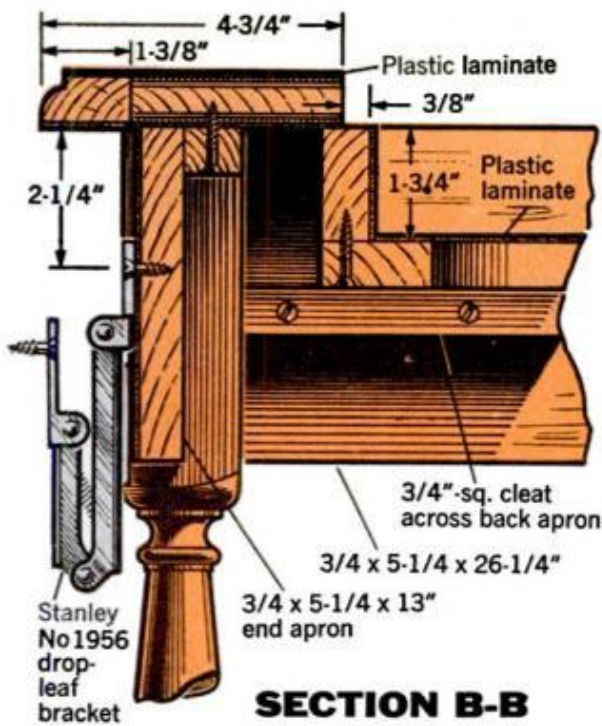


SERVING CART

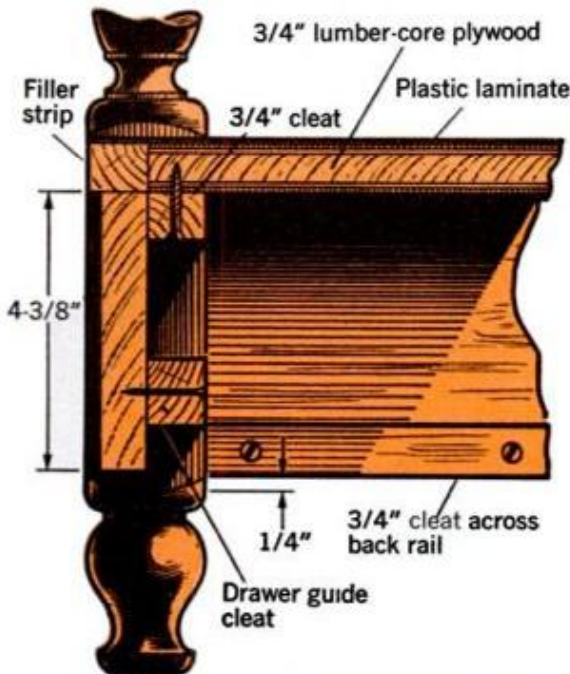


Technical Art by Fred Wolff and the Author





SECTION B-B



turning squares. To turn all four alike, make a full-size cardboard template to mark off the round and square sections of the leg. Mount each turning between centers so the top of the leg is at the headstock end of the lathe. This way, with a bit in the tailstock, you'll be able to bore holes dead-center in the ends of the legs for casters. Take caliper readings directly from the template.

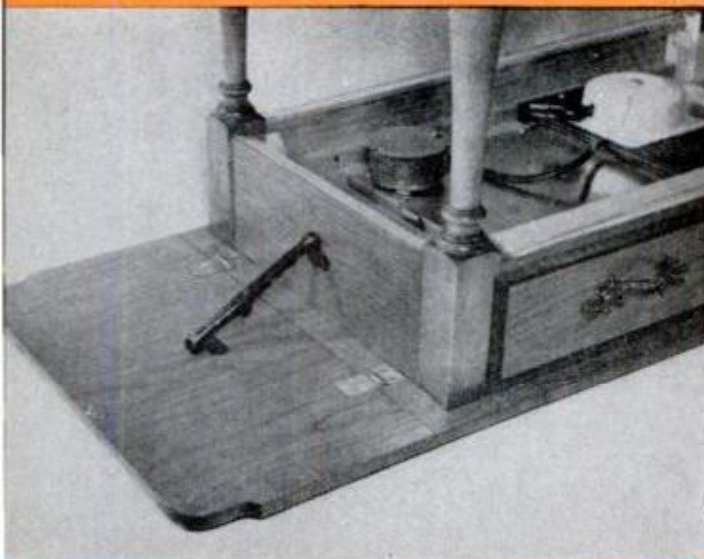
Next cut the four end aprons. The two top ones are 5 1/4 in. wide; the two bottom ones are 4 3/8 in. Cover the aprons with laminate before you trim them to size and bore the dowel holes. The upper aprons are kept even with the tops of the legs and 3/16 in. in from the face. The lower aprons are 3/4 in. from being centered on the square portion of the leg to allow for the bottom shelf which rests on them. Now dowel and glue the aprons to the legs. Cover and cut the top and bottom back aprons to size and bore for dowels. They're 26 1/4 in. long and the same widths as the end aprons, set in the same amount and cut from fir plywood.

The recessed front apron is built up as shown in section A-A. Top and bottom rails of cherry are glued and nailed to a center piece of 1/2-in. fir plywood. Then a filler block of cherry is glued to the front to divide the recessed apron exactly in half. The ends are bored for dowels as before to align with holes in the legs. The top surface of the top rail is later covered with laminate so the lid will be flush with the rest when closed.

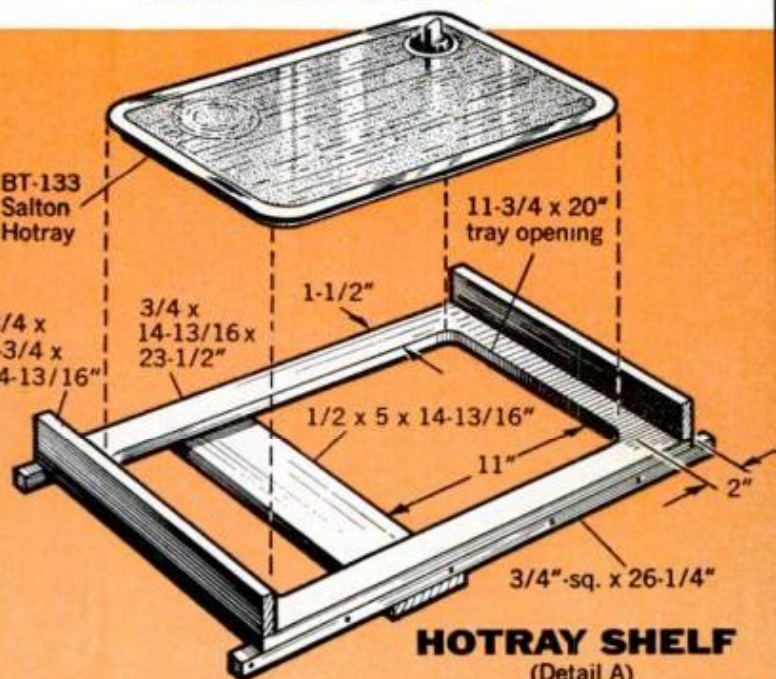
Cut the lower crossrail 26 1/4 in. long from cherry and bore for dowels. Now glue the parts to the end assemblies. Do this at one time, preferably with clamps. Keep the assembly square.

While the glue is drying, make the recessed

(Please turn to page 182)



UNDERSIDE VIEW of drop leaf shows bracket which holds leaf up. It's surface-mounted with four screws



HOTRAY SHELF
(Detail A)



AUTOMOTIVE

Why Winnebago Is Number One

'Giving people what they want at a price they can afford' made Winnebago the leader in motor homes. We chose the 18-footer to test both motto and motor home

By JAMES M. LISTON, Executive Editor / Photos by Jerome Drown

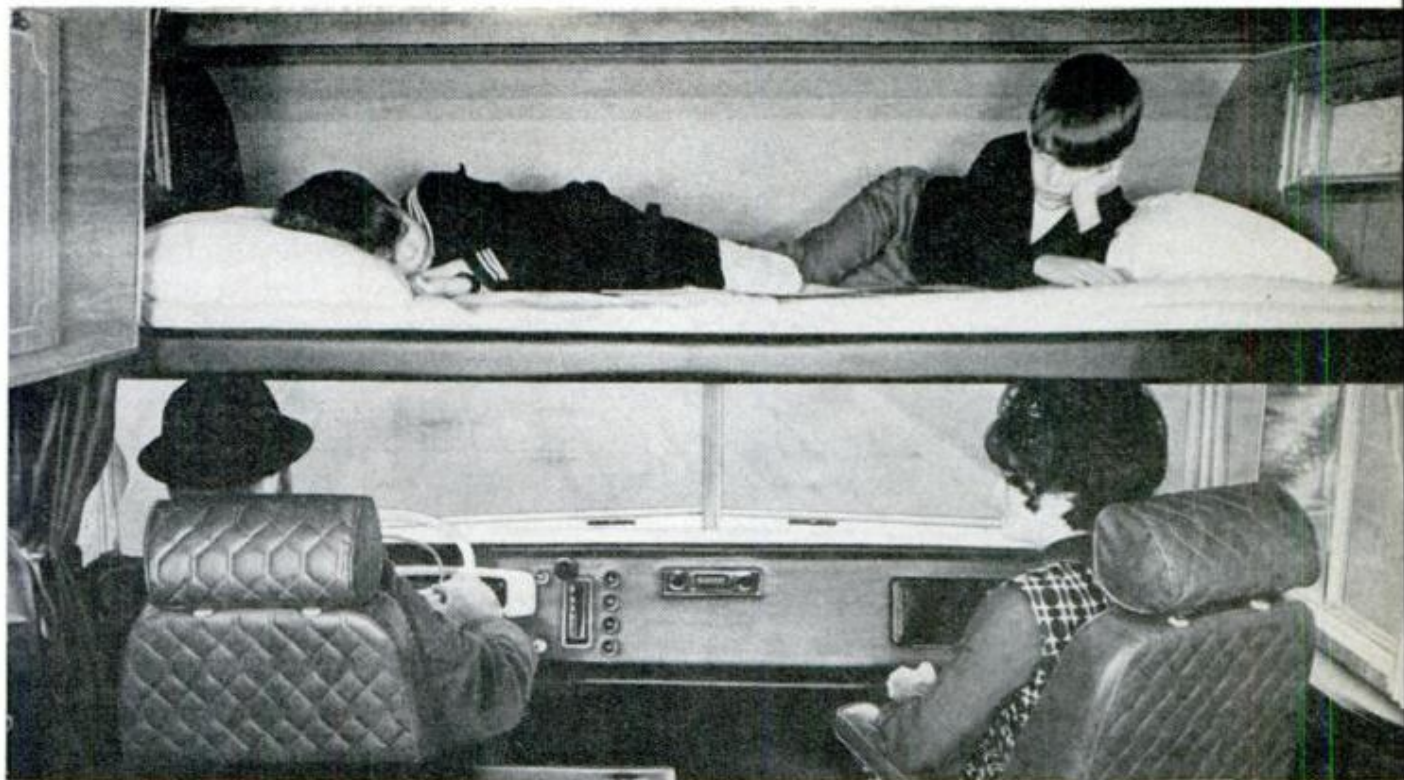
WINNEBAGO INDUSTRIES, the company the little town of Forest City, Iowa, built to keep the town from folding, builds more motor homes than any of its competitors—and sells four times as many.

I had often wondered why. The Winnebago is anything but streamlined. It makes no secret of its trailer origin. It's boxy and angular and—it would seem to any user of Detroit products—overdue for a redesign that would turn its sharp corners into graceful curves.

"Why is the Winnebago number one?" I asked president John V. Hanson, the former furniture-store proprietor who got Winnebago started when it was stalled.

"Would you like the one-hour talk or the one-minute explanation?"

"One sentence, if possible."



FOLDING BUNK OVER DRIVER'S COMPARTMENT is favored by kids, holds two adults, has screened, swing-out windows at head and foot. Driver and co-pilot have swivel seats with armrests. Full power and automatic transmission encourage women to do relief driving. Blackout curtain (left) shields the driver at night

"The key to our success is knowing what people want and producing it at a price they can afford."

What people want—when they can afford it—is a vacation home they can drive. Like a good motel, it needn't be plush, but it must have all the conveniences people now consider essential: good beds, a bathroom with shower, storage, a modern kitchen, and heat, light and airconditioning.

Like others, Winnebago offered all this in its trailers. But many people shy away from towing. It's illegal to carry passengers in a trailer. And most people like to enjoy the roominess of a home on wheels while they're rolling, not just when stopped. Winnebago recognized this three years ago and switched its main effort to motor homes. Vacation homes—not overstuffed land yachts—that are mass-produced.

The company builds all its vehicles in Forest City; the economies offset freight charges. Winnebago manufactures its own windows, cushions, seats, and mattresses, fiberglass lavatories, holding tanks and showers. It laminates its own Thermo-Panel materials (a

sandwich of aluminum, Styrofoam and plywood used for walls, roof and floors) and builds all its cabinets.

Winnebago now turns out 150 vehicles a week, will soon be capable of turning out 400. Because of mass production efficiency, the company claims that it offers as standard equipment much that its competitors have on their option lists.

The Winnebago motor home comes in five models, from the F-17 (F for Ford chassis, 170 hp) which is 17 feet, 4 inches long, 7 feet wide, and sells for \$6500, to the D-27 (D for Dodge chassis, 212 hp) which is 27½ feet long, 7½ feet wide and sells for \$11,210. The F-17 is about the size of a compact station wagon. The D-18, no longer than a standard wagon, with 104-inch wheelbase, sells for \$8500 and has the same engine, dual rear wheels, and most of the conveniences of the best-selling D-22. I chose to test the D-18, between the bottom-of-the-line model and the big seller.

The \$8500 price tag is downright reasonable for a vacation home with automatic heat. At that price a completely



SIDE LOUNGE has colorful, stain-resistant fabric covering 5 inches of foam rubber. Bath has shower with an automatic water heater, marine-type toilet



FULL DOUBLE BED, 49 by 73 inches, is made of back and seat of lounge. Dinette also converts to double bed. Lavatory is concealed in cabinet at the right



GENEROUS OVERHEAD STORAGE explains angular exterior design. If wall curved to roof line, half of storage would be lost. Magnetic catches hold doors

furnished cottage—with beds for six, range, oven, refrigerator, and wall-to-wall carpeting—would be a real steal. Still better, at the drop of a hint this vacation home can move itself from Maine to California.

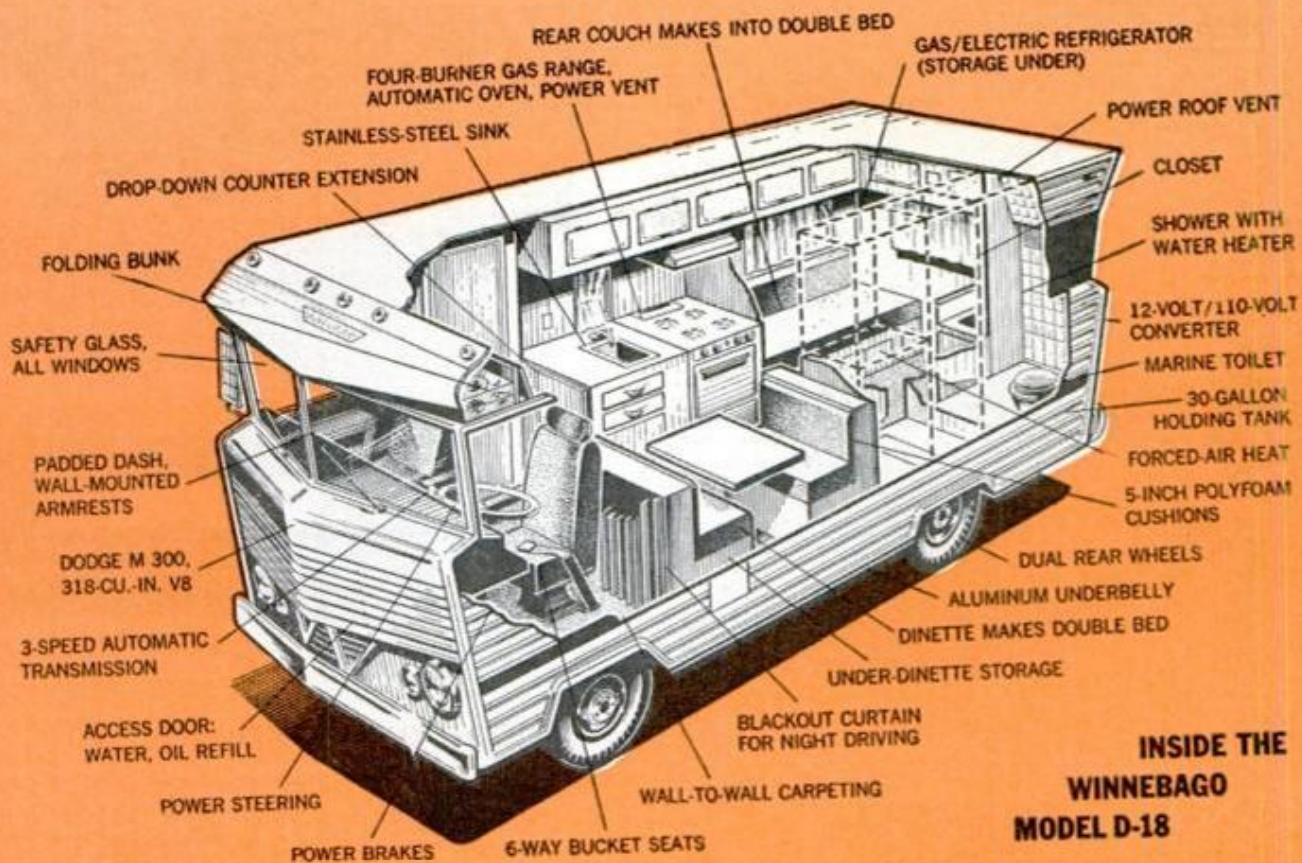
The D-18 I picked at the factory had accumulated 22,000 miles and over a year of use by outdoorsmen and Winnebago employees and their families. It hadn't had tender, one-owner care; it would give me a good idea of what the vehicle was like after the "new" had worn off. Some optional equipment had been added: A 2500-watt Onan power plant (\$751), a 10,000-B.T.U. roof-mounted air conditioner, radio and trailer hitch—total, \$1289.

You don't test a motor home on a track. You take it out on the road and live with it for a while. With my wife in the co-pilot's seat, I headed the Winnebago south on Interstate 35 on the first leg of a circuit that would swing through Kansas to Denver, eastern Wyoming and South Dakota's Black Hills and return to Forest City.

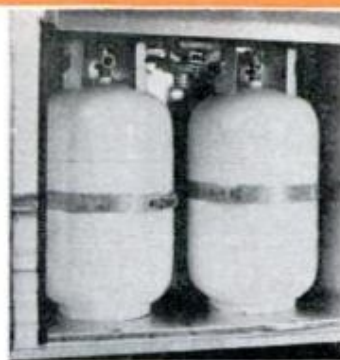
It was dusk when we set out, and we passed several motels displaying "no vacancy" signs. As darkness came on and we bored into it, Dorothy said it seemed strange to be starting a trip so late—and with no idea of where we were going to stop for the night.

We had nothing to worry about. We could park this vehicle anywhere overnight parking was not prohibited because we were—as the industry terms it—"self-contained." (Primarily this means the vehicle has a holding tank for waste water and sewage; it's not necessary to have a sewer hookup at a campground to use the plumbing.) We were also self-sufficient; we didn't need an electric hookup. We could operate off twin batteries or use the gasoline powerplant. We also had 36 gallons of water aboard. If necessary, we could pull into any suitable off-the-road parking area, draw the curtains, and enjoy complete privacy.

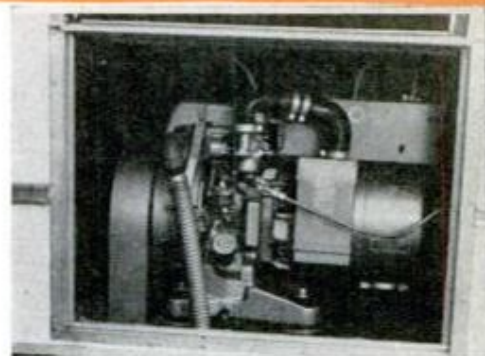
Not having to hunt a motel—or a restaurant—we covered 120 miles be-



**INSIDE THE
WINNEBAGO
MODEL D-18**



DOUBLE 20-POUND LP TANKS are standard equipment. Gas is used for cooking, heating—and for gas-electric refrigerator when camped



POWERPLANT is optional equipment. The 2500-watt generator runs the roof-mounted airconditioner, powers all electrical equipment when electric hookup is not available

fore bedtime and swung into one of those new private campgrounds that are the perfect answer for anyone with a trailer, camper or motor home. For \$2.50 we had water, electric and sewer hookups, and the use of a swimming pool, hot showers, a Laundromat, and a general store for provisions.

We converted the rear couch and were bedded down in less time than it takes to carry your bags into a motel. In the morning it was chilly. I flipped the thermostat to 72, and the forced-air furnace clicked on. Almost immediately the vehicle was comfortable. I started frying bacon on the range, turned on the power vent above it and there was no smoke, no cooking odor. The fan is more effective than those found in most kitchens. There was

plenty of hot water for washing dishes. The extension on the end of the counter gave the dishwasher a place to set things. We had the whole place ship-shape in less time than it would have taken to be served in a restaurant.

Driving a motor home on a four-lane divided highway is a breeze; driving on a narrow, two-lane road with trucks coming toward you a high speed is work and demands your best. The Winnebago is 7½ feet wide, 9 feet, 3 inches high. The closer you are to trucks, the more their blast buffets you. If you have a strong, steady crosswind, a passing truck can cause you to wander dangerously close to the center line. The solution, of course, is to slow down. Winds that don't affect the average car

(Please turn to page 185)



Self-propelled trailer

Starting with a second-hand 28-foot Air-float travel trailer, Californian Paul Prigg added the front end of a wrecked Chevrolet truck to turn the vehicle into a motor home. Prigg says that he spent a total of \$3500 for the rig—\$1600 for the trailer, \$1100 for the truck and another \$800 to put the two together and add the wide windshield. He also salvaged and utilized the front-wheel drive from the truck, so his unique vehicle has hydraulic brakes on the front wheels and electric brakes on the rear. Prigg recently drove the camper from California to Florida and back. Mileage at 45 mph was 12 mpg.



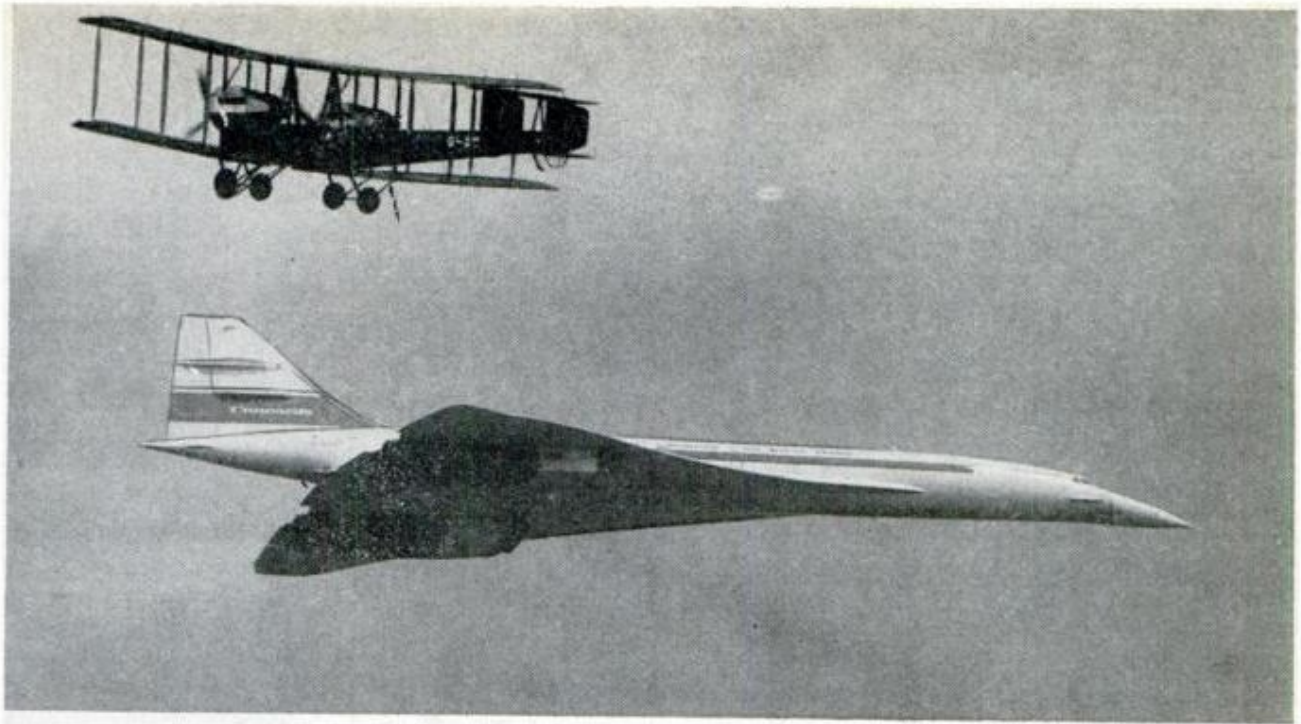
Gadget warns speeders

Drivers needn't take their eyes off the road to see if they're exceeding a speed limit when they use the British "Speedset." The device sounds a warning if, for example, the "30" button has been pushed for a 30-mph zone and the car goes faster than that.



Sees with sound

New Zealander Ivan Pivac, who is blind, can walk crowded streets with unique sonar spectacles that took 10 years to develop. Tiny receivers in the bridge pick up signals from objects and transmit them to his ears, enabling him to avoid collisions.



Half a century of aviation progress

Some 50 years of aircraft development are illustrated in this photo of a Vickers-Vimy bomber and a Concorde supersonic transport during a flyby near Paris, France.



Antique firearm disguised as a walking stick

A London antique dealer is the owner of an unusual firearm that was used by an 18th century bandit in Bavaria. Shaped like an alpenstock (walking stick), the weapon consisted of a hollow metal tube over which a flintlock fitted to fire a lead ball from the barrel.

Once You've Beat The World, What Do You Do For an Encore?



The owners get all choked up when they talk about their Mustangs. Most feel a touching tenderness, but a few fly into uncontrollable rages. Here's a small sampling

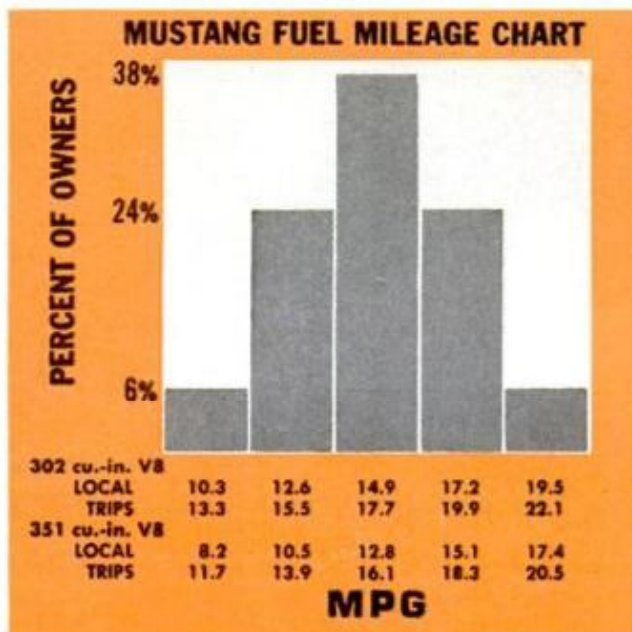
By **MICHAEL LAMM**
West Coast Auto Editor

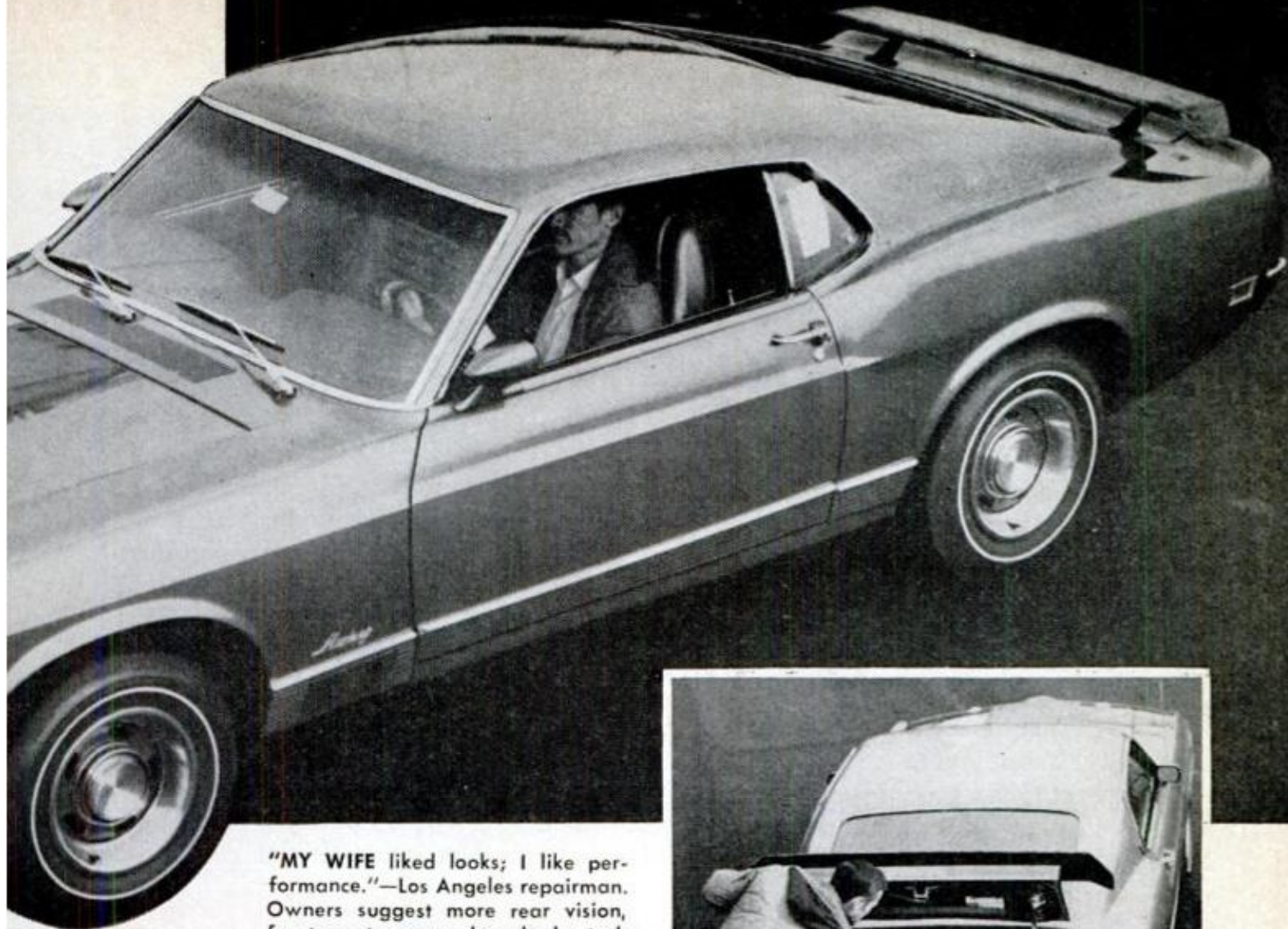
Photos by the Author

MUSTANG ALREADY HOLDS a special place in American car-dom. As *the* pioneer ponycar, it became *the* industry determiner of the 1960s. Had it not been for Mustang, the Camaro, Barracuda, Javelin, Firebird, Challenger and the rest most likely wouldn't exist today. Nor would the vogueish long-hood, short-deck look.

Good or bad, the Mustang's influence remains strong. It also strongly affects owners' feelings. No one can remain ho-hum or even especially objective about his Mustang.

So rather than follow our usual format of lumping together owner opinions into categories, we've decided to let five representative Mustang owners air complete sets of praises and gripes. These are set down as they came in on our questionnaires. Before we jump in, though, remember that most owners,





"MY WIFE liked looks; I like performance."—Los Angeles repairman. Owners suggest more rear vision, front vent panes, less body tuck

given the chance to put down *any* opinion, tend toward extremes. If they've been handled roughly by dealer or factory, here's where they get back. Conversely, people basically happy with their cars tend to overlook even gross flaws. When we at *PM* write up our *Owners Reports*, we try to sift out or balance these extremes. But in this case, that's very hard to do.

A Minnesota adman filled out his questionnaire like this:

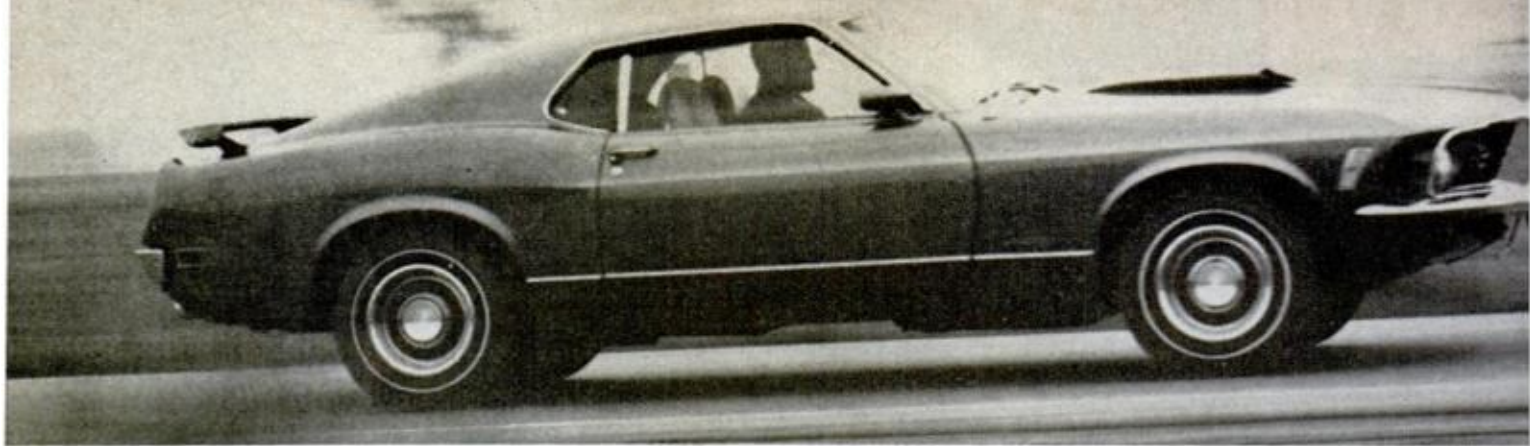
Any mechanical troubles? "Yes. Both windows fell out. Brake fluid leaked onto linings. Brakes had to be relined." Dealer repairs satisfactory? "Dealer couldn't get replacement windows." Why did you buy your Mustang? "Was trading a miserable Maverick that I couldn't stand after 3 months." How's workmanship? "Motor's great. Body and interior crappy. Everything's glued on." What about comfort? "Front okay. Back seat horrendous." Praises? "The go of the thing. It moves like a blue bat. And it's great looking." Com-



SPOILER makes deck lid heavier than coil springs can hold, so it takes one hand to keep trunk open



DRIVER can't see clock, and glovebox won't hold beans. Otherwise, cockpit layout rates very high



MUSTANG'S A GOER even with Six. One owner boasted clipping quarter mile in 12.56 with new 351-in. V8

"Cut-corner bodywork. Hood overrides bumper. Cramped inside."

Next, comments from an Alabama architect: Mechanical problems? "None." Dealer policies? "Excellent." Why did you buy? "Pleased with our 1965 Mustang at 80,000 miles; also 1959 Ford at 130,000." Workmanship? "Excellent." Comfort? "Front seats very comfortable but seatbacks too high. Rear seat all right for small car." Complaints? "None." Praises? "You can't buy bet-

ter for the money. No repairs, good mileage, excellent styling."

A New York telephone installer: Mechanical trouble? "Minor." Dealer? "Bad. Quoted price of \$3178 one day; when I picked up the car it was \$3378. I accepted only because I had no other transportation." Why the Mustang? "Wanted 1970 Camaro. When told they wouldn't come till after January, went to Mach I." Workmanship? "Not bad. But a crumpled rear fender cost \$598

Summary of 1970 Mustang Owners Reports*

Total miles driven 947,619

Average miles per gallon (samples too small to tabulate 200, 428, and 429-cu.-in. engines):

250-cu.-in. Six, local driving 16.6
long distance 20.8
302-cu.-in. V8, local driving 14.9
long distance 17.7
351-cu.-in. V8, local driving 12.8
long distance 16.1

Engines:

200-cu.-in. Six 3.1%
250-cu.-in. Six 7.1
302-cu.-in. V8 41.1
351-cu.-in. V8 44.4
428-cu.-in. V8 3.5
429-cu.-in. V8 0.0

Transmissions:

Automatic 72.6%
3-speed manual 15.2
4-speed manual 12.2

Body styles:

Coupe 64.2%
Fastback 33.0
Convertible 2.8

Series:

Mustang (std.) 55.7%
Mach I 32.5
Grande 10.5
Boss Mustang 1.3

Why the Mustang?

Style 46.3%
Past experience 27.5
Size 16.1
Economy 8.7
Handling 7.3
Performance 6.9

Specific likes:

Styling 56.1%
Handling 49.1
Comfort 26.6
Economy 17.8
Performance 16.4
Ride 12.2
Power 9.8
Size 7.9

Specific dislikes:

Rattles 9.3%
Rear vision 8.9
Light weight 7.4
Ride 7.4
Workmanship 7.4
Trunk too small 7.0
Rear seat too small 7.0

What changes would you like?

More rear legroom 12.8%
Ashtray location 7.8
Snot style 7.8
Rear vision 6.7
Workmanship 6.1
More trunk space 5.6

Had any mechanical troubles?

Yes 36.4%
No 63.6

What kind of trouble?

Carburetor 21.2%
Ignition 16.3
Electrical 8.8
Clutch 6.3

Did you repair it yourself?

Yes 4.2%
No 95.8

Dealer repairs satisfactory?

Yes 70.2%
No 29.9

Is the Mustang your only car?

Yes 44.5%
No 55.5

Other cars owned:

Ford products 50.0%
Chevrolet 10.9
Buick 9.4
Pontiac 7.8
Oldsmobile 6.2
Volkswagen 5.5

Accessories/power options:

Automatic transmission 72.6%
Radio 61.4
Power brakes 40.0
Power Steering 32.4
Airconditioning 25.6
No power options 24.0
Stereo tape 12.6
Whitewall tires 12.1
Vinyl top 8.2
Racing mirrors 7.3

What accessories/options would you order next time?

The same 51.0%
Airconditioning 10.9
Power steering 7.5
Stereo tape 8.1
Power brakes 7.1
FM radio 5.2
Traction-Lok 4.7

Age distribution of owners:

15-29 years 49.8%
30-49 years 31.8
50-plus 18.3

Would you buy another Mustang?

Yes 73.1%
No 26.9

*Percentages might not equal 100% due to rounding and/or insufficient data.



"RIDE, ROAD CONTROL GREAT. Feels solid. Acceleration takes getting used to."—New York designer

to straighten." Comfort? "Back seat useless." Complaints? "Dealer service, warranty, rattles." Praises? "Handles great, also like stereo, looks, gas mileage with 351 V8."

A claims coordinator from East Orange, N. J.: Mechanical trouble? "Yes. Radio suppression capacitor in alternator came loose, threw rotor out of balance, ruined unit." Dealer? "Very fast service, and they had the parts in stock." Why the Mustang? "Fast, agile, impressive car to drive. I enjoy driving it." Workmanship? "Above average." Comfort? "Front fine. Never have folded up the rear seat." Praises? "With a 780-cfm Holley it turns 12.56 in the quarter. Not bad for a 351 with four-speed. Very comfortable on trips. Good-looking car." Complaints? "Noise. I glued \$24 worth of foam inside body panels to stop outside noise coming in. Still working on squeaks, rattles."

A California college student had this to say: "Starter broke right away—Bendix." Dealer fix it? "Yes, but service is generally horrible, abysmal." What do you think of dealer? "He's a charlatan. Once sold, you're systematically ignored." Workmanship? "Good as any." Comfort? "Very comfortable front; rear is a lesson in masochism. Trunk is about the size of a glovebox, and glovebox won't hold owner's manual unfolded." Complaints? "Too expensive. Gas mileage absurd. Service a laugh." Praises? "Great looks, great power, ability to lure pretty girls." ★ ★ ★

MAY 1970



CLIMBING out of rear seat takes contortionist, but doors are big and open wide for loading groceries



MUSTANG'S 28.8-in. REAR LEGROOM sets industry record for tightness. Most riders also bump heads



"SATISFIES ME as it is. Very economical and easy to handle. It's a fine little car and I love it"

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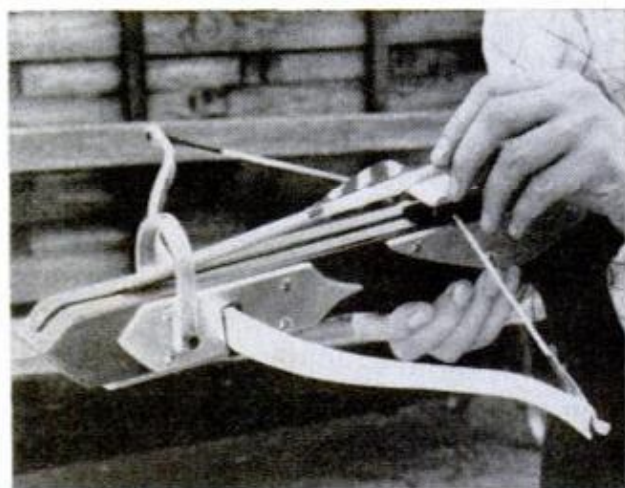
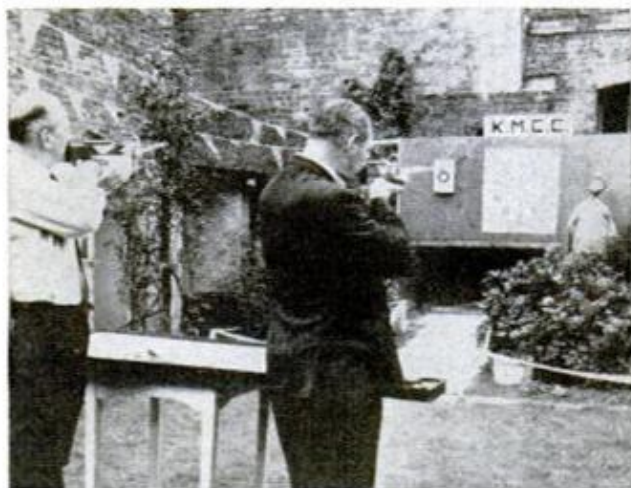
Three-legged 'clam'

Suspended on three metal legs, this lightweight, clam-shaped plastic "caravan house" is the invention of a French architect.



Inner-tube art

Large inner tubes that are tied together form a "Body Ball"—a work of art and also a plaything, says the sculptor who did it.



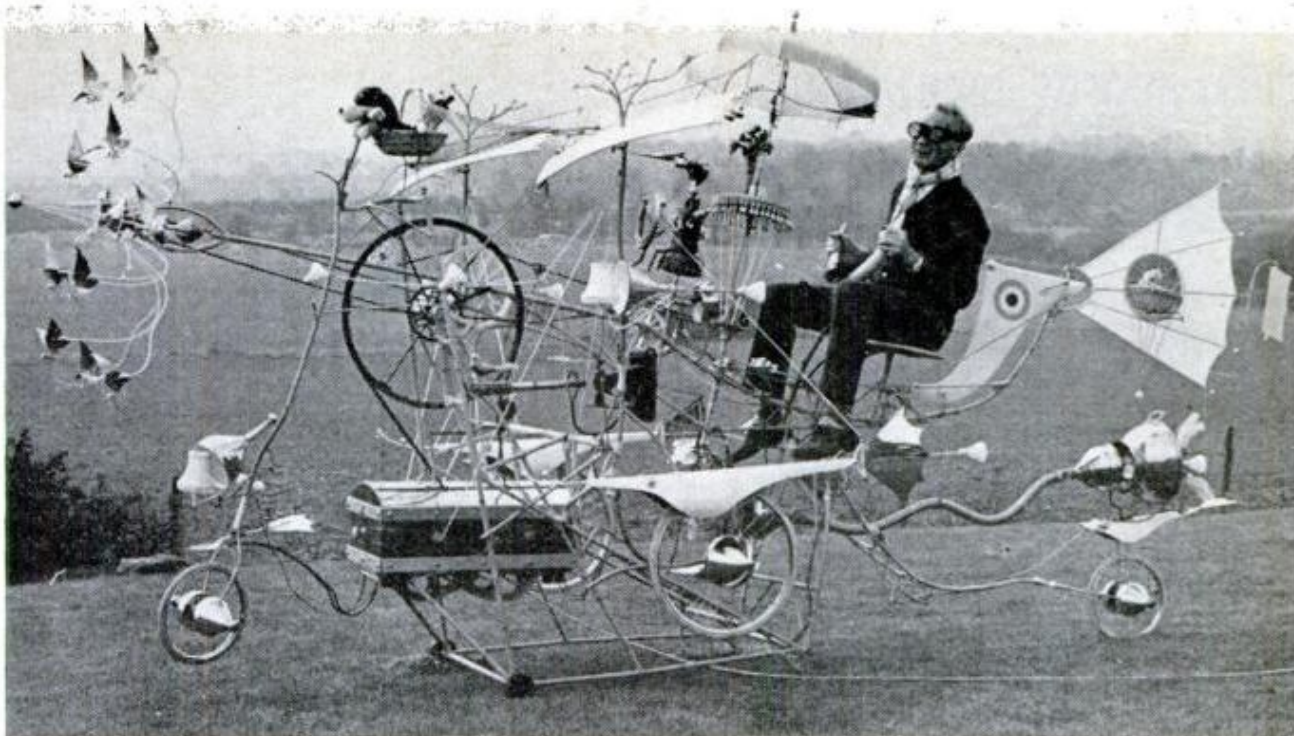
Darts too dull, so pubkeeper installs crossbow range

The traditional game of darts wasn't exciting enough for one pub owner near London, so he installed a crossbow range at his establishment. The 17-inch bows fire 9-inch bolts.



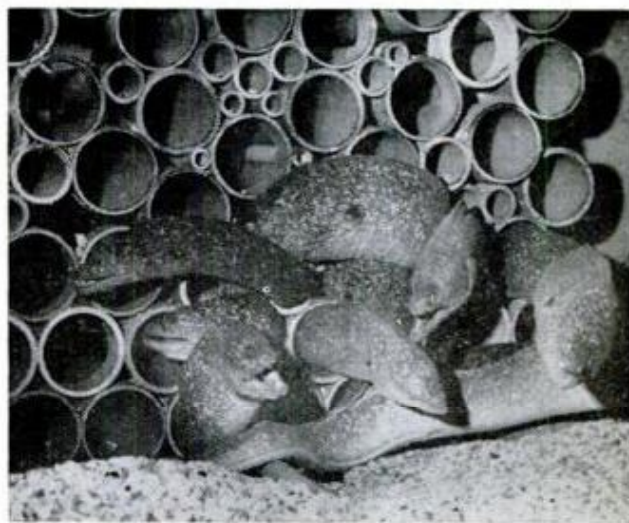
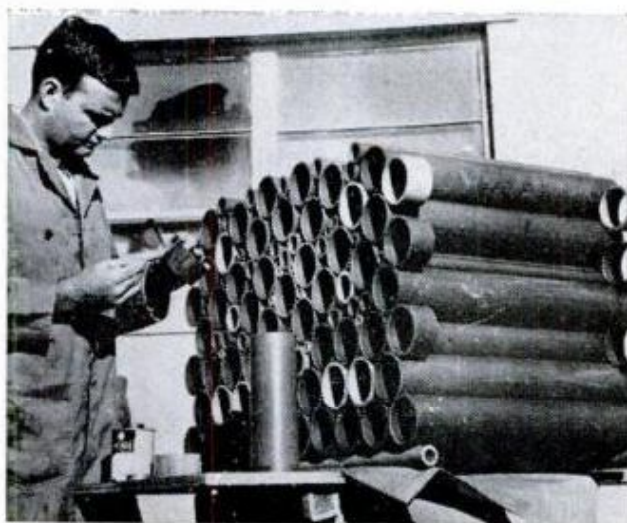
Former racing driver now builds 15-mph models

Able to zip along at 15 mph, this little gas-powered racer was built by former racing driver Tom Barnard. He plans to set up an assembly line and sell the cars for about \$500.



Gentleman's plane

The "Featherstone Kite Open Basket-Weave Gentleman's Flying Machine" might, at first glance, appear to be incapable of flying. In this case, as with many of inventor Rowland Emmett's other creations, the first impression is correct. It won't fly. Fortunately, Emmett's genius has enabled him to incorporate enough never-before-seen details on the flying machine that no one really cares if it doesn't hit Mach 1. Emmett's in the cockpit (above); the regular pilot appears at far right. Tail assembly appears at right.



Plastic pipe—a home away from home

To simulate the natural home of moray eels (who like dark crevices) yet display them for visitors, Marineland of the Pacific, Los Angeles, created an "apartment" of plastic pipes.

Newest improvement in hi-fi listening: NOW IT'S 4-CHANNEL STEREO!

Quadrasonic sound uses four separate speakers to literally surround you with music for a realistic concert-hall effect. Here's how the system works and what you'll need to add to your present gear.

By WALTER SALM

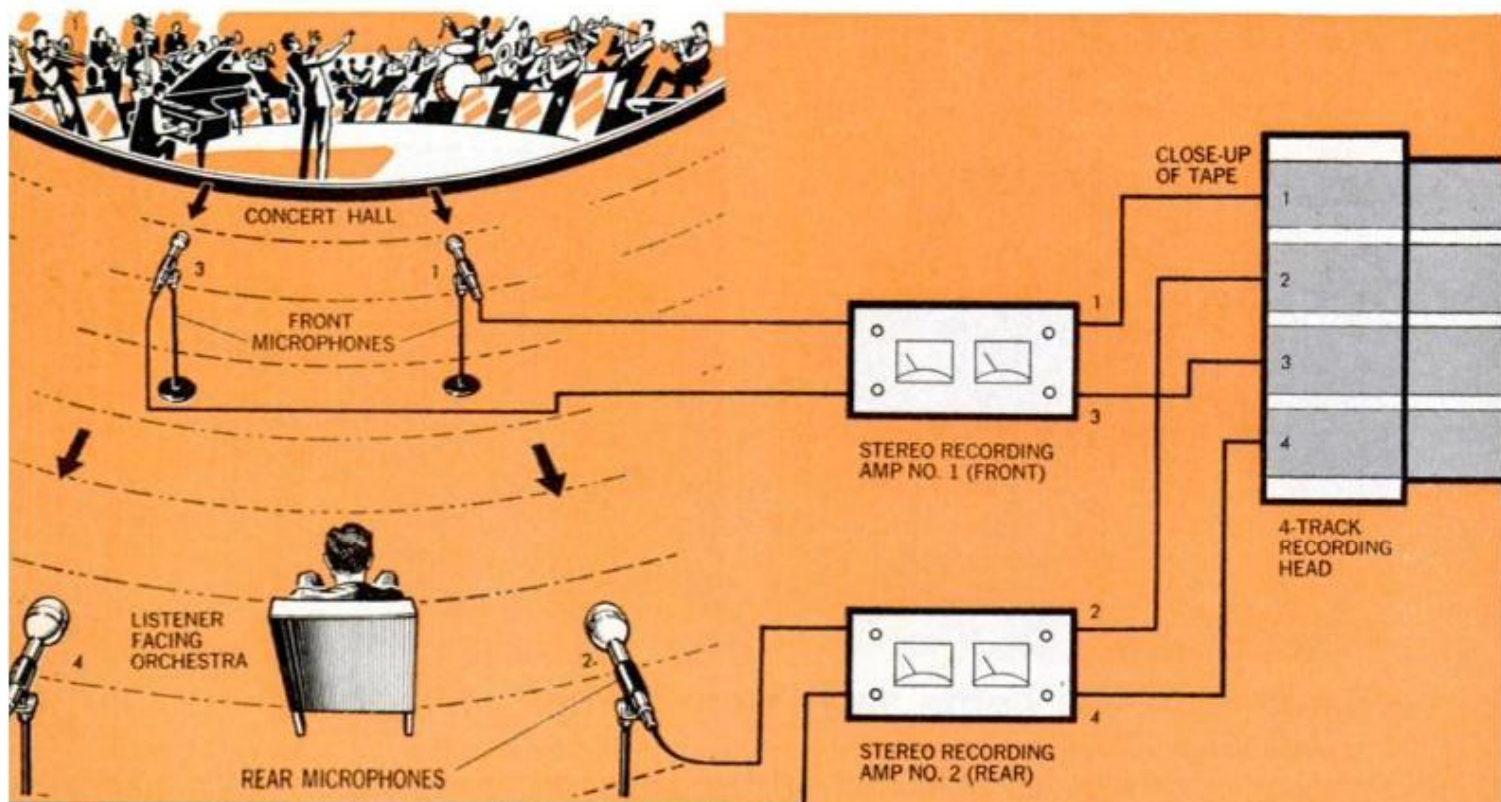
Technical Art by Peter Trojan

THERE'S AN EXCITING new kind of hi-fi listening looming on the horizon. It's known by several names—"Surround Sound," "Quadrasonic Stereo" and "4-Channel Stereo." Whatever the name, what it amounts to is the use of four separate channels to deliver music to your ears instead of the usual two in conventional stereo. The idea is to recreate in your living room the full richness of sound as you would hear it live in a concert hall.

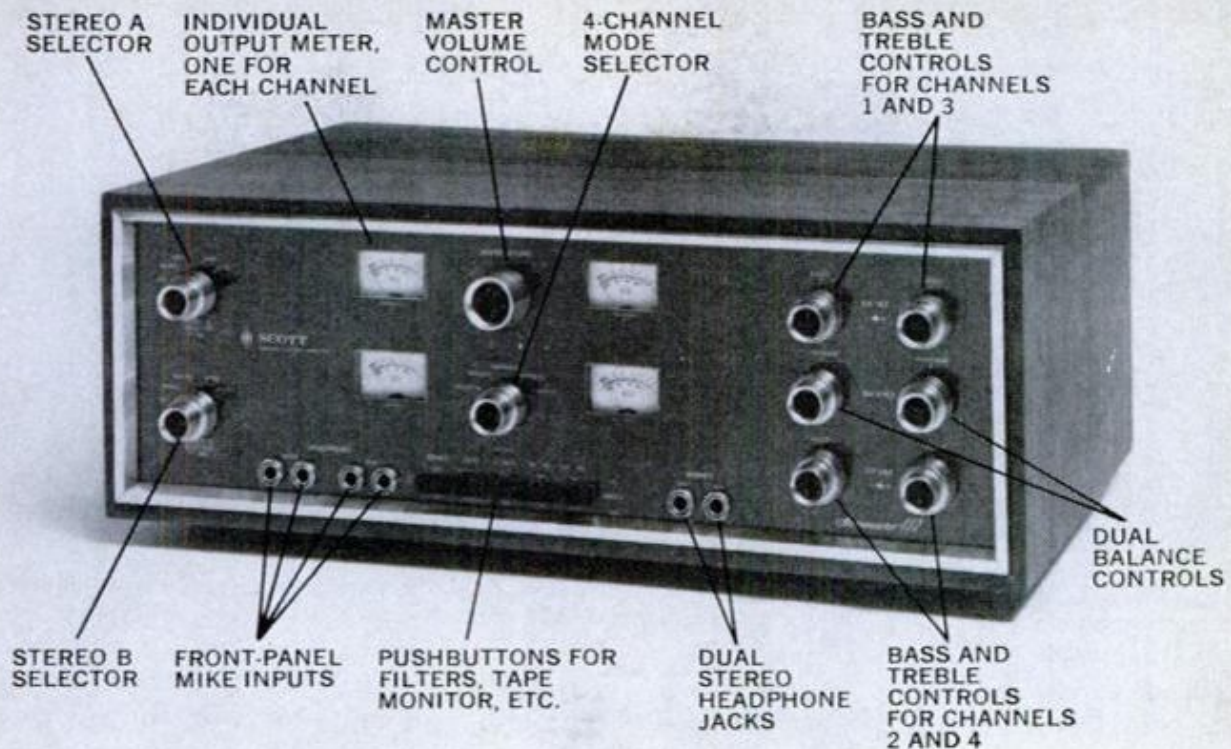
Proponents of the system claim that four-channel stereo is as much of an advance over two-channel stereo as the latter was over early single-channel monaural listening. The reason is this: When you listen to live sound in a concert hall or any other large room, you hear it

from many different directions. Part of it is beamed directly at you from the source in front. But a lot of it bounces around the room and is reflected off the walls, floor and ceiling, surrounding and engulfing you with sound. A good bit of it caroms off the rear of the room and is actually heard from *behind* you, although you may not be aware of it.

Conventional stereo brings you essentially the direct sound from in front, but omits the subtle side and rear reflections that enrich and reinforce the music. Surround sound is designed to increase the realism of home listening by using two additional channels to bring you the missed reflections from the rear of the room. In recording four-channel stereo, microphones are placed at the rear of the



SCOTT'S NEW 4-CHANNEL STEREO AMPLIFIER



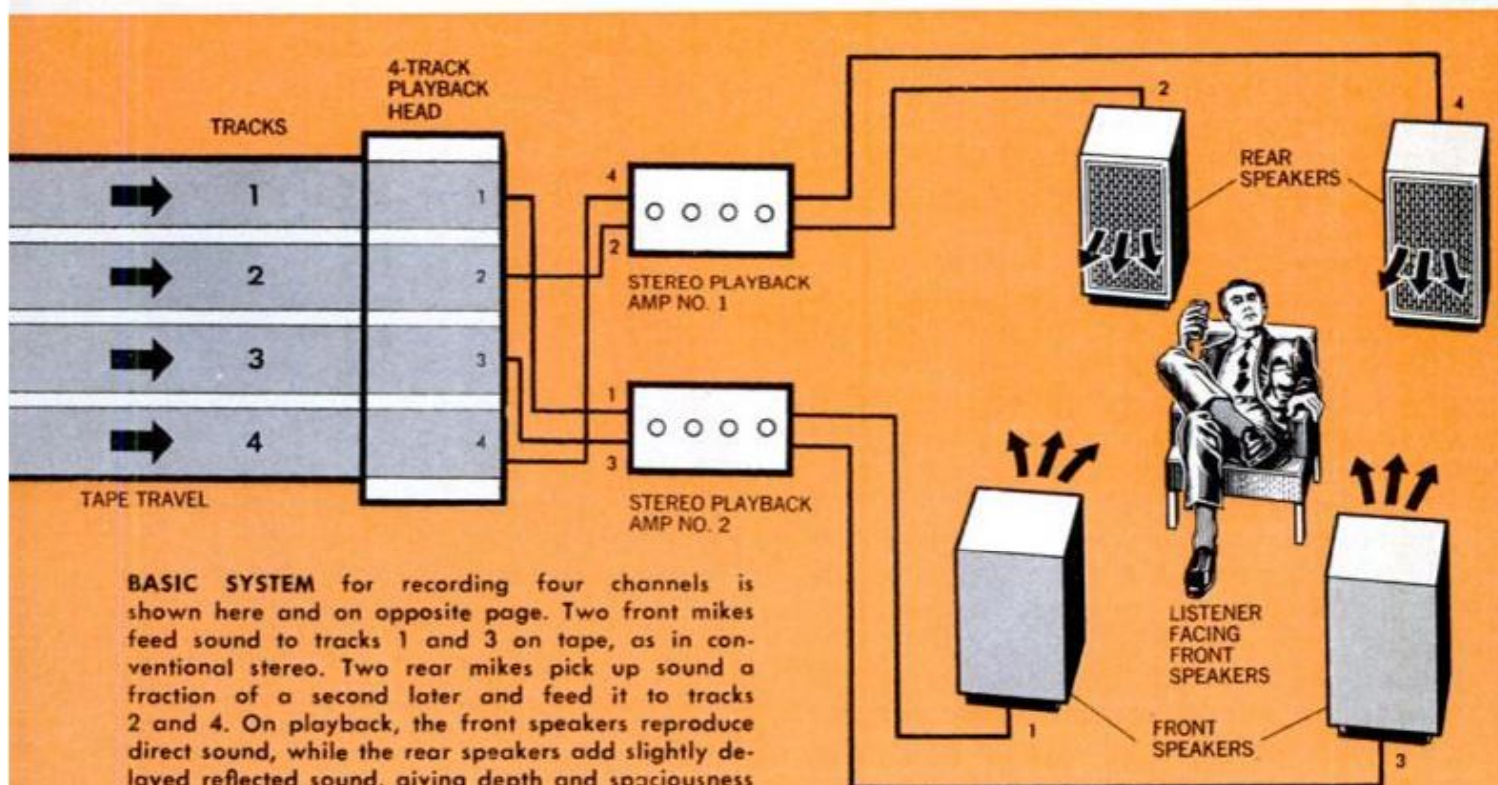
FIRST OF ITS KIND, Scott's new four-channel Quadrant amplifier combines two complete stereo systems

in one unit. It has four mike inputs and individual controls for each channel. Price is \$599.95

concert hall in addition to those up front near the orchestra. The rear microphones pick up the reflected sound a fraction of a second later, creating a rich, reverberant effect.

To listen to four-channel stereo in your home, you need a second stereo amplifier feeding an additional pair of stereo speak-

ers placed at the back of the room. Sound from the forward microphones reaches you through your regular stereo amplifier and front speakers. The added sound from the rear microphones is fed to the second amplifier and rear speakers so you hear it from behind you just as you would in a concert hall. You are literally surrounded



BASIC SYSTEM for recording four channels is shown here and on opposite page. Two front mikes feed sound to tracks 1 and 3 on tape, as in conventional stereo. Two rear mikes pick up sound a fraction of a second later and feed it to tracks 2 and 4. On playback, the front speakers reproduce direct sound, while the rear speakers add slightly delayed reflected sound, giving depth and spaciousness



USING TWO SEPARATE stereo amplifiers stacked together, Teac's tape system both plays and records

on four channels simultaneously. Current model is \$799.50 but will soon be replaced with newer units

by sound, producing a sense of depth and spaciousness similar to that experienced when listening to live music.

Eventually, you'll be able to listen to four-channel stereo from records and FM radio broadcasts. Both of these are still in the future, however. For the present, tape recordings offer the easiest way of bringing quadrasonic sound into the home. The basic two-track, alternate-direction tape system currently in use for regular stereo can, with relatively minor modifications, be adapted to record and play four-channel stereo. Instead of recording two pairs of tracks in opposite directions, all four tracks are recorded simultaneously in the same direction. Tracks 1 and 3 carry sound from the right and left front microphones, as in conventional two-channel stereo. Tracks 2 and 4 add sound picked up by the right and left rear microphones.

Several tape recorder manufacturers already have four-channel reel-to-reel machines on the market. These include Telex, Teac, Crown and 3M Wollensak. In addition, Scott has just introduced a basic four-channel amplifier that can be used with any quadrasonic program source—tape, records or FM radio. These first units are expensive, running around \$500 to \$600 or more, but prices are expected to drop as interest grows and the machines go into mass production.

Vanguard already has a few four-channel tapes on the market, and more are expected to be available soon. Columbia Records has a large library of tape masters

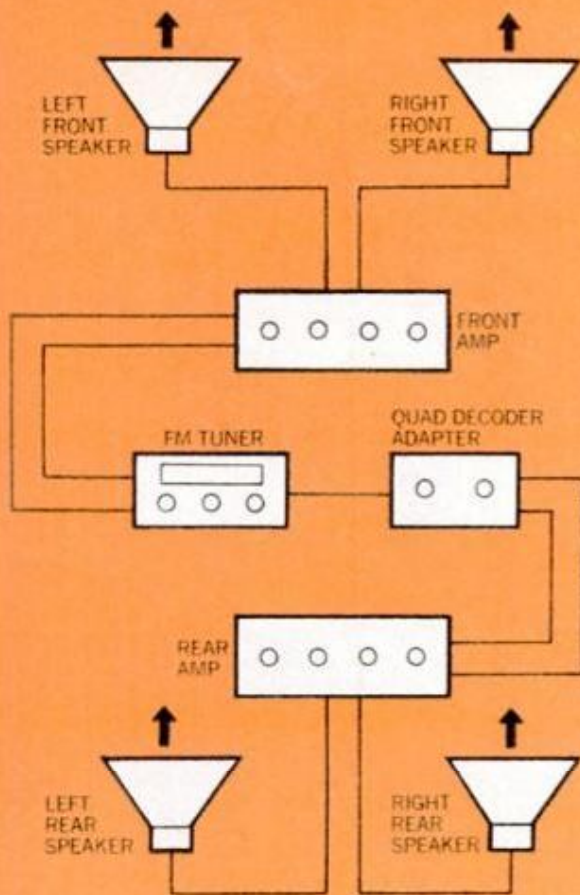
originally recorded with four channels but released with only two for conventional stereo play. Now Columbia plans to re-release these tapes using all four channels. By sticking to the 1-3, 2-4 alternate track system, quadrasonic recordings remain compatible with many current two-channel tapes and tape machines. You could play four-channel tapes on an existing two-track machine and get conventional stereo. Later, when you switch over to new four-channel equipment, you could play the same tapes and get the full four-track effect.

The fact that quadrasonic stereo doubles everything required for conventional stereo doesn't necessarily mean it has to cost twice as much. In fact, the second



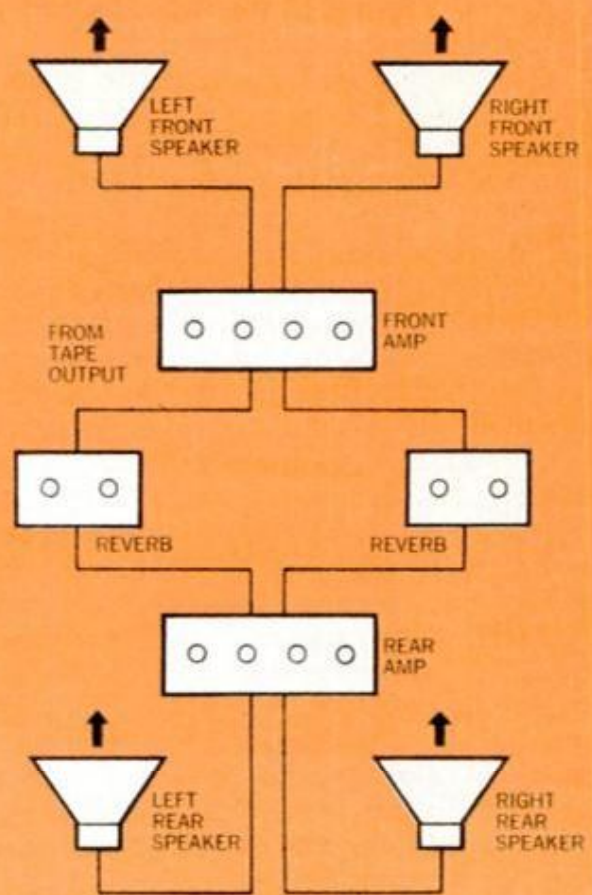
COMPACT AND PORTABLE, this 3M Wollensak model plays four-channel quadrasonic tapes, but records only conventional two-channel stereo. It's \$599.95 with 60-watt amplifier, \$499.95 without the amplifier

FOUR-CHANNEL FM STEREO



FUTURE SYSTEM for receiving four-channel FM broadcasts will require a special decoder adapter hooked to your regular FM set. This will split off two additional FM signals to feed speakers at the rear of the room. You'll also need a second stereo amplifier to power the speakers, as in diagram above

SIMULATED FOUR-CHANNEL STEREO

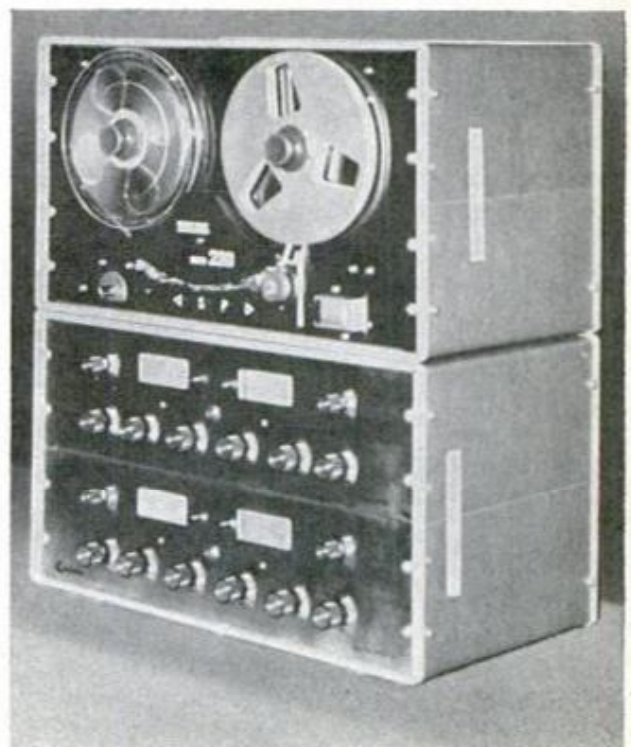


YOU CAN SIMULATE the sound of four-channel stereo with two low-cost guitar-type reverb units connected to your amplifier's tape output jacks. Feeding their signals through a second stereo amplifier to the two rear speakers produces a slight delay or echo effect, adding depth and richness to the sound

half of the system can cost relatively little. This is because the two rear channels require much less power than the front ones and can have a substantially narrower frequency range, probably not more than about 8000 cycles. Almost any low-cost stereo amplifier and a pair of \$10 or \$20 economy speakers will serve nicely.

Exactly how four-channel stereo will be broadcast has not yet been decided. Several systems have been proposed and it will be up to the FCC to determine which one gets the nod. Experimental quadrasonic broadcasts have been tried using two separate FM stations, one to transmit the front two channels and one the rear two. These are similar to early

AVAILABLE IN FOUR MODELS, the Telex four-channel tape machine at right ranges in price from \$500 for a playback-only deck without recording amplifiers to \$1544 for a complete record-playback unit



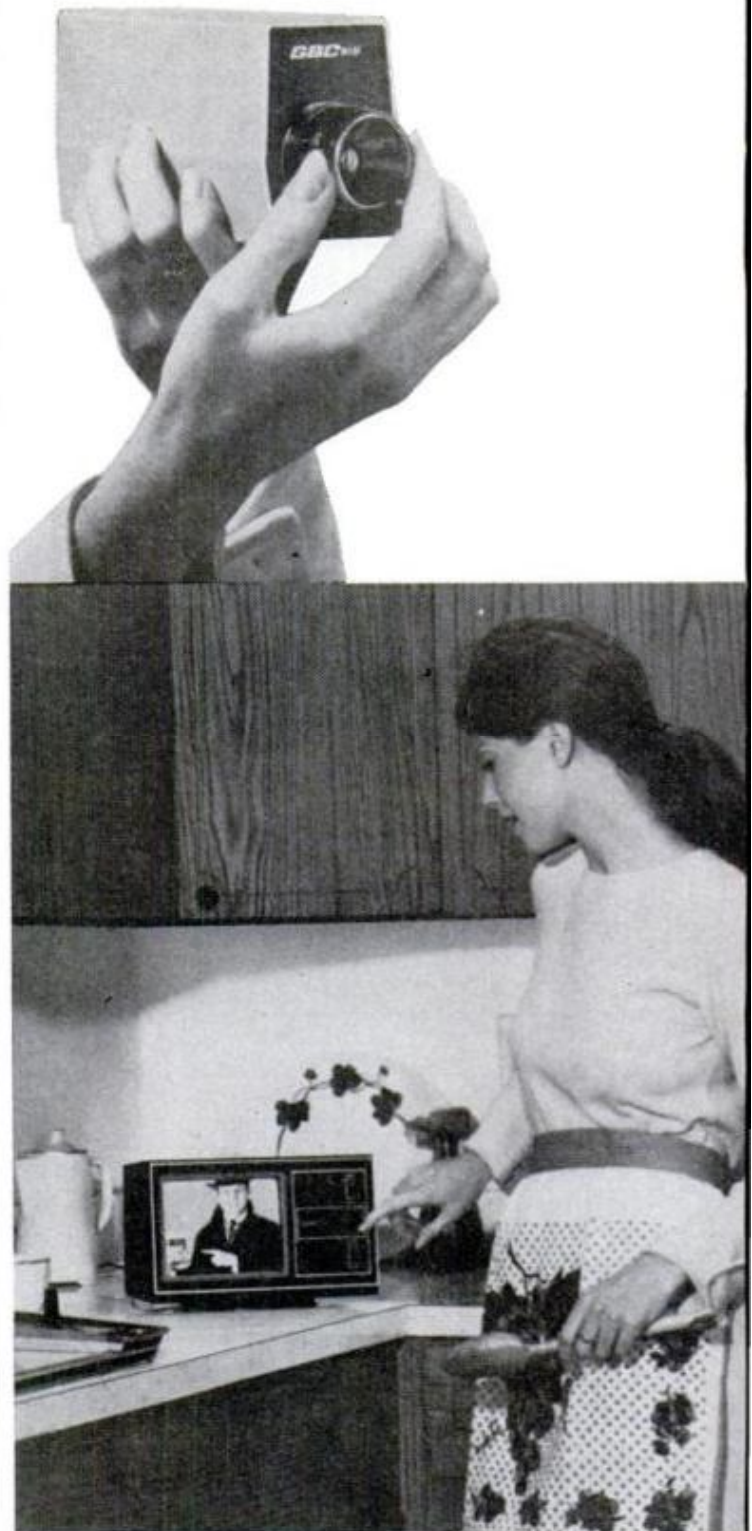
experiments with conventional stereo where an FM and AM station teamed up to make simultaneous broadcasts.

Eventually, you'll be able to receive four-channel FM stereo simply by hooking a small decoder adapter to your present FM tuner or receiver. As in conventional FM multiplexing, the method is based on the use of subcarrier frequencies to transmit the additional channels over the main broadcast band. In the Halstead/Feldman system, one of the leading contenders for FCC approval, the two front channels are transmitted over the main band and a subcarrier frequency of 38 kilohertz. The rear channels are transmitted over two additional subcarrier frequencies of 72 and 92 kilohertz. The 8-kilohertz channel band-width brings the total FM station deviation to 100 kilohertz on either side of the main carrier—the extreme limit allowed by the FCC. The problem is that this leaves no margin of safety at the edges of the band, and it's possible that one station's signal could spill over into an adjacent station's band, causing interference. Whether this objection can be overcome is still not certain.

Bringing up the rear in quadrasonic developments are four-channel disc recordings. These pose even greater difficulties. It's hard to imagine how a stylus could handle four channels simultaneously from a single record groove. Several companies, however, are working on the problem. One outfit, the Audio Data Co. in New York, claims to have developed an encoder-decoder system something like FM multiplexing that can add two extra channels to a regular stereo record groove. The discs can be played on present equipment and will require only a decoder adapter attached to your amplifier.

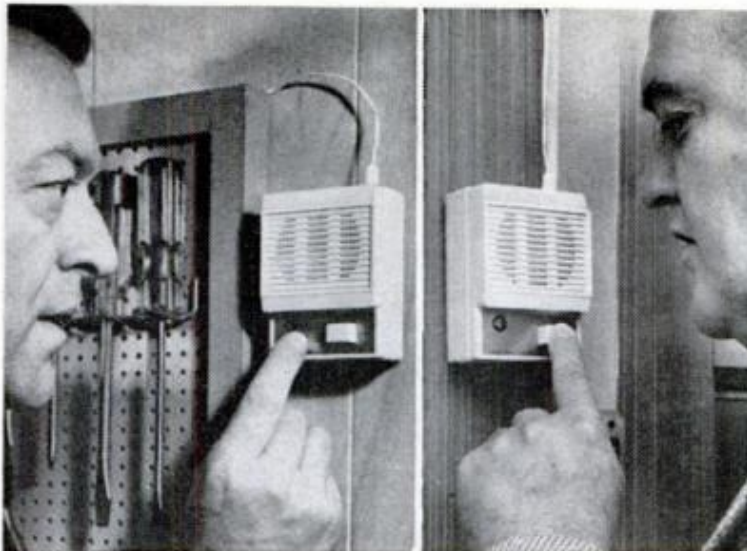
In the meantime, for those who like to experiment, a kind of simulated four-channel stereo can be rigged up with a couple of inexpensive reverb units of the type sold for use with electric guitars. These reverbs produce a slight time delay or echo effect similar to that supplied by the two rear channels in quadrasonic stereo. You can connect the units to the tape output terminals on any conventional stereo amplifier, one for the left channel and one for the right. The outputs from the reverbs are then fed through a second stereo amplifier to an extra pair of speakers at the back of the room. ★★

NEW IN



YOU CAN HAVE YOUR OWN closed-circuit TV with this low-cost system for home use. Priced at \$350, it consists of a small TV camera (top photo) and a 7-inch monitor set joined by a cable. Watching the monitor screen, you can check callers at the front door, keep tabs on children playing out in the yard or put on family TV shows for amusement. Called the Mini-CCTV, the system also includes an intercom so you can carry on a two-way conversation between camera and monitor. GBC Closed Circuit TV Corp., 74 Fifth Ave., New York, N.Y.

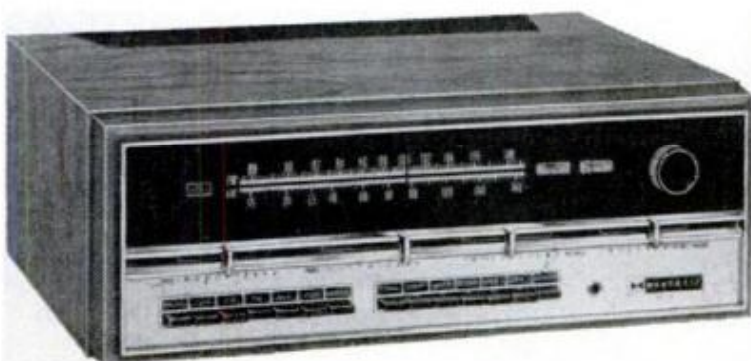
ELECTRONICS



INEXPENSIVE INTERCOMS let you talk between any two locations in your home up to 66 feet apart. One unit can be mounted outside the house at the front door so callers can announce themselves without your having to open the door first. It can also be used for listening, such as for checking on a baby sleeping in another room. The battery-powered transistorized units are said to be sensitive enough to pick up sounds from as far as 8 feet away. Each station can call the other, even when power is not turned on. Price, about \$10, includes wire. Telco, 3710 E. 10th Court, Hialeah, Fla.



THERE ARE 14 SPEAKERS in this unusual console designed for fine hi-fi reproduction. It contains four 15-inch woofers, four 8-inch mid-base, four 6-inch mid-range and two 5-inch horn tweeters. Special controls permit the system to be adjusted to suit different room acoustics. Prices are \$950 finished and \$725 for a semi-finished kit. LWE Div., Acoustron Corp., 2418 Bartlett St., Houston, Tex.



NEW KIT-BUILT STEREO RECEIVER from Heath is an outgrowth of the famous AR-15 introduced several years ago. The latest version, the AR-29, is rated at 100 watts with a frequency range of 5 to 30,000 cycles. Harmonic and IM distortion are less than .25 percent, even at full power. Assembly is simplified by modular plug-in parts boards, self-test circuitry. AM/FM/FM stereo kit is \$285. Heath Co., Benton Harbor, Mich.

BE YOUR OWN BOAT TESTER

PART 3: ON THE WATER

By BOB WHITTIER

DOES YOUR BOAT handle well on high-speed turns? Is its power rated to hull shape, length and weight?

MANY FORCES start working on a boat when you open its throttle, but there's no need to drag a computer aboard to sort them all out. It's enough to have an appreciation of these forces that cause things to happen during acceleration.

The propeller-thrust line of an outboard or stern drive is an appreciable distance below the keel; thrust is therefore applied that far below the hull's line of resistance in the water. When the throttle is shoved forward the boat's bow rises in the air. While the weight of the rig remains unchanged, it is now supported by fewer square feet of bottom area.

Bottom loading temporarily increases at a time when speed is still relatively low, and acceleration is slowed. Since modern hulls tend to be short and wide, a lot of drag exists at this stage. That's why boats with marginal horsepower tend to plow along for some distance before they gradually get up onto plane. That's also why powerful motors are common.

Now, take any handy propeller and put it on a stick to resemble the propeller shaft. Hold this in front of you with the stick angled like a propeller shaft will be when a boat is in bow-high attitude during acceleration. Pick one blade to watch and rotate the prop slowly, remembering that in an actual boat, water will be flowing

into the propeller at an angle. You can readily see how the *actual angle* at which your chosen blade *meets the oncoming water* will vary in the course of each revolution. This makes the stern of the boat "walk" to one side. It isn't a serious problem but when you open the throttle of a light and powerful boat and feel the sideways movement of its stern, it can be a puzzling matter if you don't understand the cause.

The spinning crankshaft and flywheel make an outboard motor want to turn the other way in its steering pivot. The flywheel of an inboard engine and the twist it imparts to the propeller shaft make the boat want to roll in the other direction. Some pre-World War I speedboats rolled right over from propeller torque when their throttles were opened quickly!

While a boat is getting up onto plane watch what happens to your forward vision in various speed ranges. Momentary blocking of forward vision by the bow during quick takeoffs is of little consequence. But if you have to travel a long distance within a speed limit, you may not want a boat that puts its nose up so much at low and intermediate speeds that vision is impaired.

Once you get onto plane and are mov-



BIG WAKE AND WAVE under tug's stern creates suction on the hull that limits the boat's maximum speed



DESPITE ENGINE WEIGHT AFT, most houseboats carry enough weight forward to plane at flat angle

ing swiftly, release the steering wheel cautiously to see if the boat will stay on course. Sometimes you find one that'll slam over into a turn immediately when the wheel is released and this is not good; it is tiring to hold pressure on the wheel to stay on course, and if you should impulsively happen to let go of the wheel to grab a windblown cap the boat could get away from you.

On a test drive, make sure that any tendency to veer off course is something that can be corrected with appropriate adjustments—friction adjustments, trim tabs or an exhaust snout placed at an angle on the motor to compensate. Otherwise, no sale.

How well a boat accelerates and what its cruising and top speeds are depend not only on the power and weight, but on the propeller installed. Typically, a two-blade, high-pitch, small-diameter prop will give high speed with a light load, but will produce sluggish acceleration. A four-blade, low-pitch propeller of larger diameter will push a heavy load onto plane easily but top speed will be limited. In between these extremes may be several three-blade propellers, each tailored for a particular gross weight for the whole rig. In test-driving a boat always ask what propeller is installed and judge acceleration and speed accordingly.

The tilt of an outboard or stern drive lower unit can be altered by means of a pin-and-hole arrangement. In general the prop shaft should be parallel to the keel line of the boat but you often may find it worthwhile to experiment with other settings.

It's a little known fact that there is a horizontal fin called the cavitation plate just above the propeller of an outboard or stern drive that keeps air from being sucked down into the propeller. It is large enough to create a surprising amount of

upward or downward pressure when speeding through the water at some angle of tilt.

You may encounter cases in which a forward-tilted lower unit produces so much uplift on the cavitation plate that steering friction is considerably reduced, making for light, "wild" handling. There are other cases in which a lower unit tilted too far aft has so much download on its cavitation plate that it tends to pull down the stern of a boat in sharp turns. So don't forget the possibility that water pressure on a cavitation plate is not parallel to water flow.

While running straight en route to a test area, observe the attitude of the boat in the water and the riding qualities. It's normal for conventional boats to list slightly due to propeller torque. Usually the weight of the driver on one side when running solo will counter this adequately, and sometimes an additional correction is made by locating the battery or a gas tank on the high side. If the boat still lists, there might be a defect such as a warped bottom.

Conventionally shaped planing boats in the runabout class normally tend to list *into* the wind when running crosswind, so don't worry if you notice this.

The aspect of ratio of length to width of the bottom's planing surface also affects riding attitude. Typically, a short, wide hull will plane at a higher angle than will a long, narrow one. If the angle is too high or too low, it will cause drag.

You'll hear much patter around boat clubs about the smooth wake of this or that boat, the inference being that somehow a particular designer has waved a magic wand, uttered incantations and come up with a hull that has a smooth wake and therefore is somehow better. A large wake does not indicate a poorly de-

signed boat, just one that is heavier, or less powerful in proportion to its weight, than another boat.

Around boating men, you hear references to "wet" and "dry" boats. This is nautical lingo for spray-throwing qualities. A wet boat is one that drenches you with its own spray!

Things like how deep in the water or high on the surface a boat runs, the location and size of spray rails, the shape of the bottom and wave size determine spray-throwing characteristics. If there's a touchstone to the spray matter, it is this. Take a boat of any length. *The wider you make it, the blunter must be its bow*, and the more it will butt into waves and throw spray forward. It's the spray thrown ahead of a boat that is picked up by the wind and dumped back on you. Other things being equal, a boat whose bow throws spray out to each side is

. . . put a new boat through a series of figure-eight turns of gradually decreasing size.

likely to be dryer than one which throws it forward.

Riding and handling qualities on waves are important, for every boat meets its share of rough going. You can try running over the wakes of other boats to simulate rough water, but if it's a comfortable rough-water boat you want, only a test run on genuine wind-driven waves will tell the true story.

The real key to riding quality is the relation between the length of the boat and the distance between the wave crests. Whether it's a pram or an ocean liner, any boat will give you a rough ride when the distance from wave crest to wave crest is nearly the same as the hull's waterlength line because of hull pitching action.

For use on large lakes and coastal waters, a boat with a long hull that will straddle the crests of two or more waves at once will keep pitching action at a minimum.

It's wise to put a new boat through a series of figure-eight turns of gradually

decreasing size. This reveals how a boat will act in right and left turns and when going at all angles to the waves. How a boat goes into these turns depends on how easily the bottom shape lets it lean into a bank.

The purpose of banking is to resist centrifugal force. The deflected propeller thrust encourages banking. In fact, it produces such a powerful banking force it can easily overturn a boat if you swing the steerer over too abruptly. As your turns become sharper, you will feel more reaction.

A boat that is banking too little for its speed and the sharpness of the turn tells you so by a feeling in the seat of your pants of sliding across the seat to the outside of the turn under the influence of centrifugal force. One that banks too much or too abruptly feels as if it were giving you an unpleasant up-and-down seesaw ride as you go from a left turn into a right one and vice versa. One that banks just right makes you feel secure in the seat, regardless of the tightness of the turn.

As your turns get really tight, be on the lookout for signs of "spinning out"—the stern is swinging so far out that there's danger of the boat turning end-for-end. To test for this, drop a wad of paper on the water, go some distance away, bear down on the paper and see how well the boat responds to a quick, slight avoiding motion of the wheel.

Another sensible test is to pick out a buoy or other fixed object on the water to use as a reference point and pass somewhat to one side of it. As you pass it, turn and watch to see how much the boat drifts to the outside of the turn. A boat that drifts to the outside (through inadequate banking or inadequate keel area) is a dangerous one, for some day when operating on a winding river or in a busy channel you might make a fast turn and find



AUTHOR TESTING A BOAT with a relatively long, narrow hull designed to reduce pitching in choppy seas

yourself drifting helplessly to the outside of the turn—right into the shore or another boat.

Light, fast boats sometimes “porpoise”; they gallop up and down rhythmically as they move along. Porpoising usually results from an improper relationship between the boat’s center of lift and center of gravity. As it goes faster it rises out of the water more and rides on the aftermost part of its bottom. Then the center of lift is too far back. The bow drops, bounces up, drops again, and this continues indefinitely.

True porpoising can take place even on calm water; don’t confuse it with an occasional up-and-down bouncing of the bow caused when you meeting a stray wave from some other boat’s wake. Porpoising can usually be stopped by moving weight forward in the hull. Rarely, at least in new boats, porpoising is caused by a hump, hollow or hook in the planing bottom as a result of bad workmanship or hull distortion.

One last thing. Sometime during your test run, throttle back to the engine’s normal cruising rpm and get a good idea of the boat’s cruising speed. Modern motors are so smooth it is often hard to throttle back to proper cruising rpm without the aid of a tachometer. If there’s no tach, a good salesman will know his motor well enough to help you pick out cruising rpm by sound.

Most outboard motors have an “economizer linkage” built into their throttles and spark advance mechanisms. These linkages are designed to adjust the throttle and spark settings to the most economical positions when the motor is throttled to cruising rpm, hence you can see how important it is to know what kind of speed the boat delivers at this particular engine setting.

A smaller motor that has to be run nearly wide open in order to maintain a satisfying speed will often burn more gas and wear out faster than a larger motor that is able to give the same speed while just loafing along at its designed cruising rpm.

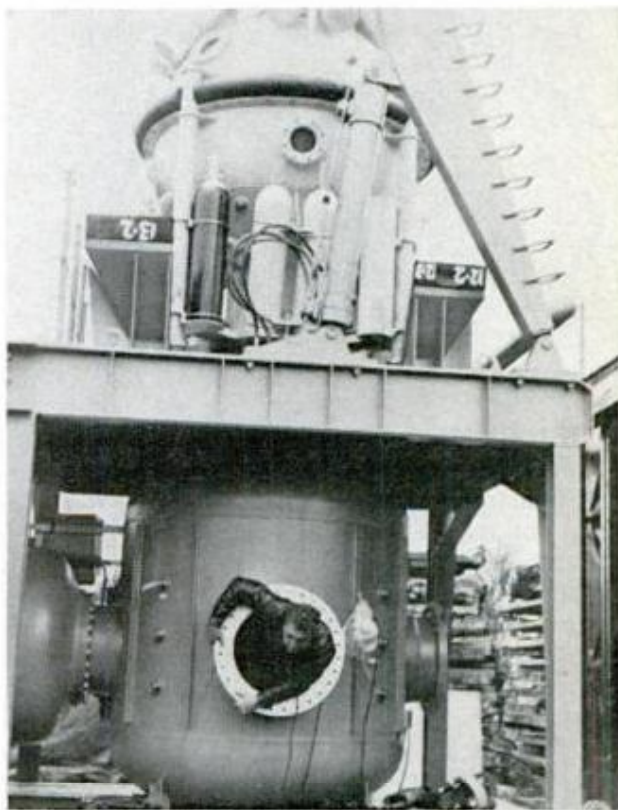
This ends my third and last installment in the boat-testing series. If you follow my suggestions you should have no trouble picking out a boat that will give you all the comfort and performance you desire. ★★★

MAY 1970



Largest walking dragline

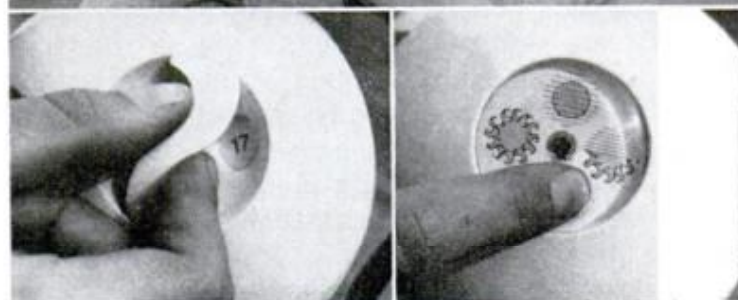
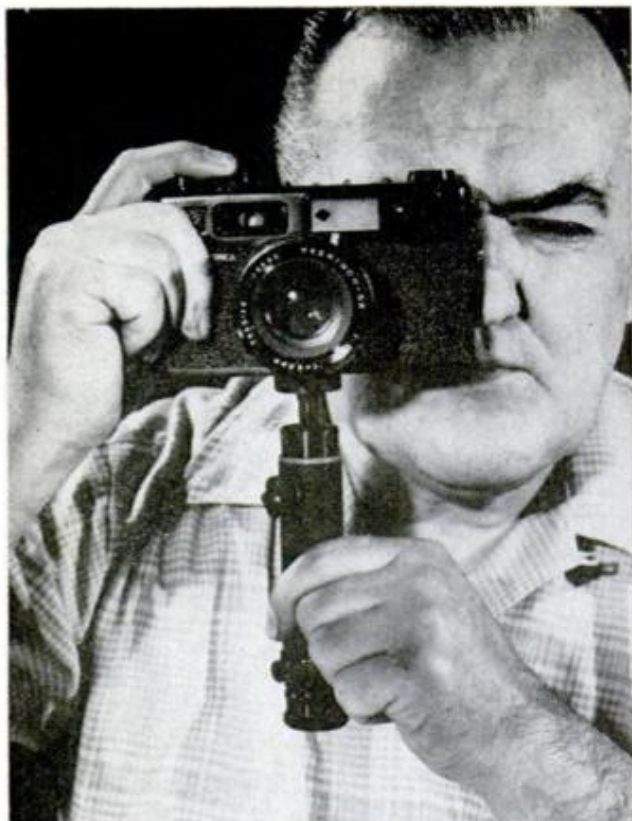
Able to lift 195 tons (130 cubic yards) in its huge bucket, the American-made Marion 8900 is shown at work in an Australian coal mine. It can travel 800 feet per hour.



Deep-sea bell

A new system by Strongwork Diving of England has a 6-foot diving bell (top) that clamps to a decompression chamber and frame on deck. The pressurized bell can descend to a depth of 600 feet.

NEW IN



A DETACHABLE HANDGRIP that turns into a tripod is a feature of the newest 35-mm Yashica (above). As a handle, the grip screws into the tripod socket to help you hold the camera (top photo). Folded up inside is a three-legged attachment that slides out and screws onto the lower end of the handle (left, above). This forms a shorty tripod to support the camera for tabletop photography or long time exposures. It can also be used as a chest pod for steadier freehand shooting. Called the Electro 35GT, the new model has a built-in exposure system that automatically sets the speed from 1/500th of a second to 30 seconds depending on light conditions. While it has a fixed lens, supplementary telephoto and wide-angle lens attachments are available. There's also provision for adding flash. Price, about \$142. Yashica, Inc., 50-17 Queens Blvd., Woodside, N. Y.

THIS STRANGE-LOOKING BALL is actually a camera—a far-out design conceived by students at London's Royal College of Art. Its object: to simplify picture-taking and get rid of projecting controls that stick out around conventional cameras. A recessed knob (lower photo at left) advances the film and cocks the shutter. To set the correct exposure, you turn another recessed control to the appropriate weather symbol (lower right).



LOW-COST RAPID-FIRE CAMERA has a spring-motor drive that lets you shoot as fast as you can press the shutter release. The wind-up motor automatically advances the film and cocks the shutter after each shot so you're ready for the next one. Called the Ricoh Compact Hi-Color 35, the 35-mm camera has a built-in exposure system, f/2.8 lens, speeds up to 1/300th second. Price is \$75. Lenco Photo Products, 2414 W. Devon, Chicago, Ill.

PHOTOGRAPHY



BORDERLESS PRINTS are easy to make with this vacuum-operated enlarging easel. The device connects to any standard household vacuum cleaner and draws air through tiny perforations in the top. This holds printing paper flat and wrinkle-free and eliminates the usual hold-down clips that produce borders. Two sizes take prints up to 11x14 inches for \$29.95, to 16x20 for \$49.95. Hudson Photographic Ind., 2 S. Buckout St., Irvington, N.Y.



QUICK-CHARGING ELECTRONIC FLASH takes only three hours to restore its batteries to full power—about half the time usually required. The Capro FL-7 strobe, shown with its accessory charger above, gives 50 flashes per charge, recycles in seven seconds. Price for gun and charger, \$49.95. Ehrenreich Photo-Optical, 623 Stewart Ave., Garden City, N.Y.

MAY 1970



ONE-LEGGED CAMERA SUPPORT has a stirrup-like fitting at the bottom. You just slip your foot into the stirrup to anchor it firmly to the ground. A swivel allows the telescoping leg to tilt in any direction for easy positioning of the camera. Called the Stirrupod, the device was invented by New York photographer Bill Tetlow who hopes to market it soon.



GUNSTOCK CAMERA MOUNT gives you a steady support when you're working with long telephoto lenses. The lens platform slides along a rail so you can adjust the camera to any desired position. Squeezing a trigger in the pistol grip actuates a cable to trip shutter. Price of Soligor mount is \$29.95. Allied Impex, 168 Glen Cove Rd., Carle Place, N.Y.

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HOW to Troubleshoot Some of Those 'NEWFANGLED GADGETS'

Hidden headlights, antennas, electronic voltage regulators—some are gimmicks, some advancements, but all might need fixing

By MORT SCHULTZ

IN RECENT YEARS, car owners have had many new devices offered as options or provided as standard equipment. If you know something about them your chances of accurately troubleshooting a problem will be much better.

Windshield radio antennas have been offered as an option for a couple of years. However, the trend seems to be to provide the antenna as standard equipment.

The antenna placed inside the windshield has little effect on FM reception. The only adverse reaction may be a faint "swishing"

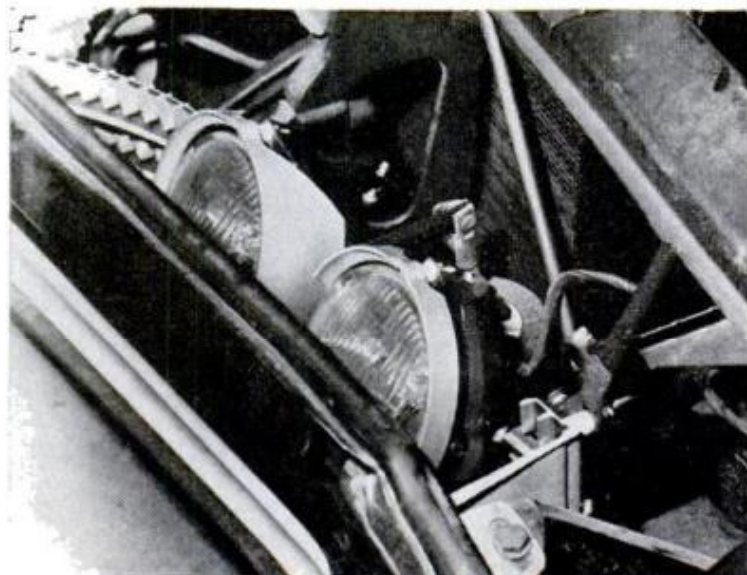
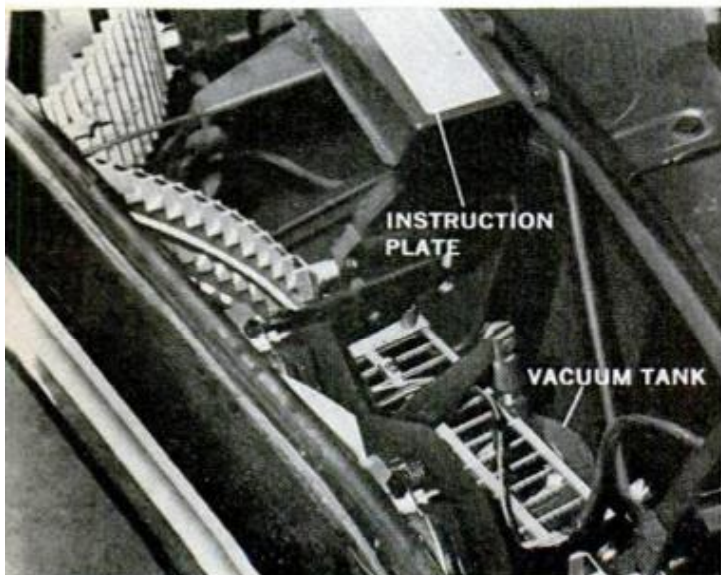
sound on weaker FM stations as wipers pass over the windshield antenna elements. This is normal. There's nothing you can do about it.

AM reception, on the other hand, can present a problem if the AM antenna trimmer isn't set carefully. This adjustment is supposed to be done by the dealer. It must also be made whenever the radio is removed from the car for repair.

If your radio doesn't receive distant stations that other AM car radios get or if a relatively strong AM station fades in and

EACH HEADLIGHT ASSEMBLY on '69 Riviera has its own vacuum tank. Disconnect it to actuate manually

MECHANICAL LINKAGE connects vacuum tank to headlight assembly. Check for smooth operation





HEADLIGHT COVERS on Toronado are actuated by vacuum. If vacuum fails, remove hoses to lift cover by hand

out, the trimmer adjustment is not set right. To adjust it, set the volume control full and tune in a weak station at about 1400 kc. and turn the antenna trimmer-adjustment screw until you receive maximum volume. The screw is usually found just above the tuning shaft. Peak volume normally occurs when the screw is about one-quarter turn from clockwise position.

Transistorized voltage regulators have been offered by some manufacturers as an option since 1963. Others have them as standard equipment. Here's the line-up:

CHECK FOR SUCTION by hand if no vacuum gauge is available. Also make sure check valve is working

Ford Motor Co. provides transistorized voltage regulators on the 1968-70 Mark III, 1969-70 T-Bird and 1970 Continental.

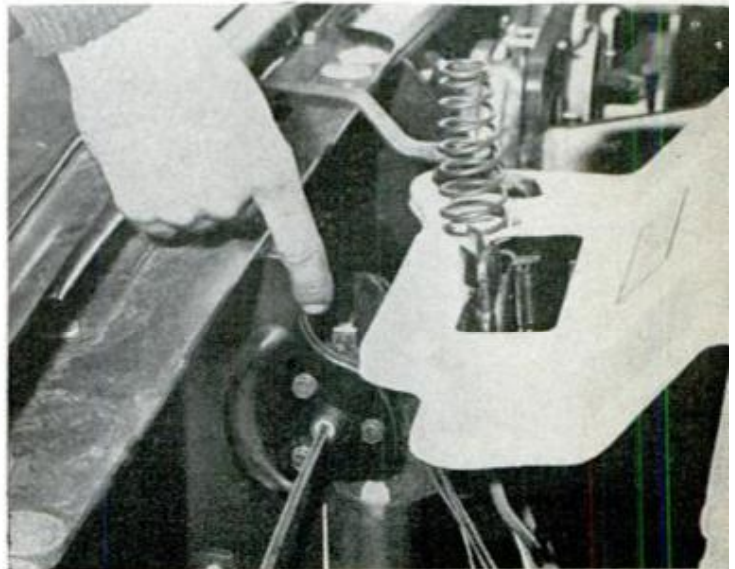
Chrysler Corp. has transistorized regulators as standard equipment on the 1969 Imperial and on all 1970 models.

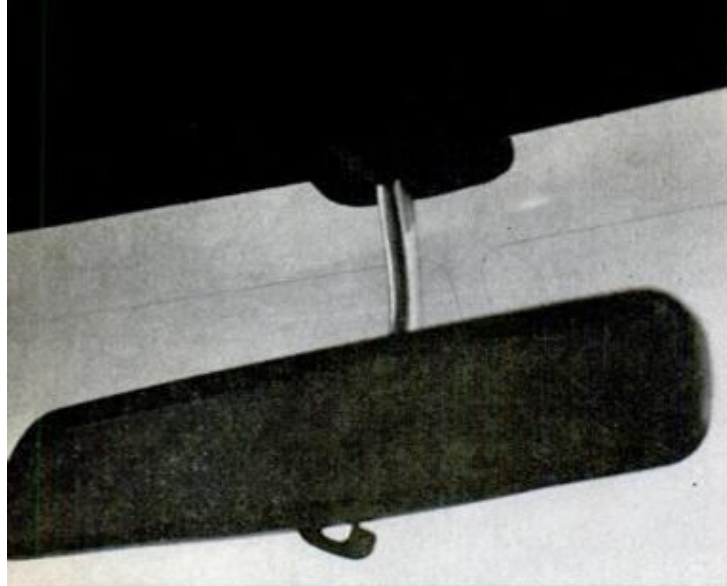
GM has treated transistorized regulators pretty much as an option although they're standard on the 1969 (but not the 1970) Pontiac Grand Prix and the Olds 4-4-2.

AMC adopted the unit as standard equipment in 1963.

There are differences in units from

ELECTRIC MOTOR on '70 Dodge Charger operates bar-linkage to each headlight cover. Check connections





WINDSHIELD ANTENNA, barely visible above, is fast becoming standard equipment. The trimmer adjustment screw is in the radio. On the '70 Olds, it's behind the dial knob. See text for tuning procedure



model to model. For example, on Ford products, the Grand Prix, the Olds 4-4-2 and some other late-model GM cars there are integral microelectronic units that are fitted right to the alternator. That's how you'll recognize one. There are no interconnecting wires to connect the separately mounted regulator to the alternator.

Two tests are required to check on integral voltage-regulator performance. First check the voltage-limiter range. If the voltage-limiter test doesn't provide a reading of 13.5 to 14.5 volts (engine at operating temperature), test the supply voltage before replacing the unit. Otherwise you could throw away a good regulator while keeping your problem.

This regulator is switched on by applying battery voltage from the ignition switch. A resistor wire is in series with

the supply circuit. If the circuit is disconnected or defective, there will be no regulator action and no alternator output.

Supply voltage is tested by connecting a 12-volt test light or voltmeter between the regulator or supply lead and ground. Turn on the ignition. If the light doesn't glow or the meter shows no voltage, the supply circuit is disconnected or broken.

An electronic voltage regulator used on some GM cars from 1963 to 1969 can be recognized by the deep fins of its case. This unit is distinguished from all other transistorized regulators because it can be adjusted. Others aren't adjustable, and if a malfunction occurs, the unit must be replaced.

The GM regulator has a removable plug in its case. The slotted adjusting screw beneath the plug allows an increase or decrease of 0.3 volts for each notch the screw is turned. If a voltage reading of 13.5 to 14.5 (engine at operating temperature) can't be obtained, replace the unit.

The 1969 Imperial has an insulated brush alternator that has both brushes insulated from the alternator frame. It's identified by the short metal strap that connects the positive brush to the heat sink. This alternator has one field terminal, and its transistorized voltage regulator has three terminal posts.

All 1970 Chrysler Corp. cars have an isolated field terminal alternator that has two field terminals. Its transistorized voltage regulator has two terminal posts. It cannot be interchanged with the regulator used in the 1969 Imperial.

If the transistorized voltage regulators of either the '69 Imperial or the '70 models don't meet the following test results, replace the unit:

Ambient Temperature Near Regulator	Voltage Range
80° F.	13.8—14.4
140° F.	13.3—14.0
Above 140° F.	Less than 13.8

The voltage output of the transistorized voltage regulator in AMC models is tested by connecting a 1/4-ohm resistor into the circuit. If a voltmeter doesn't show the following, replace the unit:

Ambient Temperature Near Regulator	Voltage Range
40° F.	14.3—15.0
80° F.	14.0—14.8

Most disappearing headlight covers op-

erate by vacuum. Some function by electricity, such as pre-1968 Dodge Chargers, Corvettes and Buick Rivieras.

If disappearing headlights of the vacuum type fail to work, first check vacuum hoses from manifold to the cover control motor, from the control motor to the distribution valve, from the valve to the headlight switch, and from the vacuum reservoir. These hoses are color-coded for easy identification. Replace those that are split, pinched or kinked.

Now, test each section for adequate vacuum. If you have a gauge, vacuum should be 18-21 inches at the manifold and no less than 14 inches at other outlets. If you do not have a gauge, place your finger over each outlet. You should feel a strong pull.

If vacuum is okay, the problem is in front of the hookup, probably inside the control motor, or with a jammed linkage or binding cover. If you get adequate vacuum at the manifold but not at other points, the problem is a damaged vacuum reservoir, distribution valve or check valve. Most times, the fault lies with the check valve.

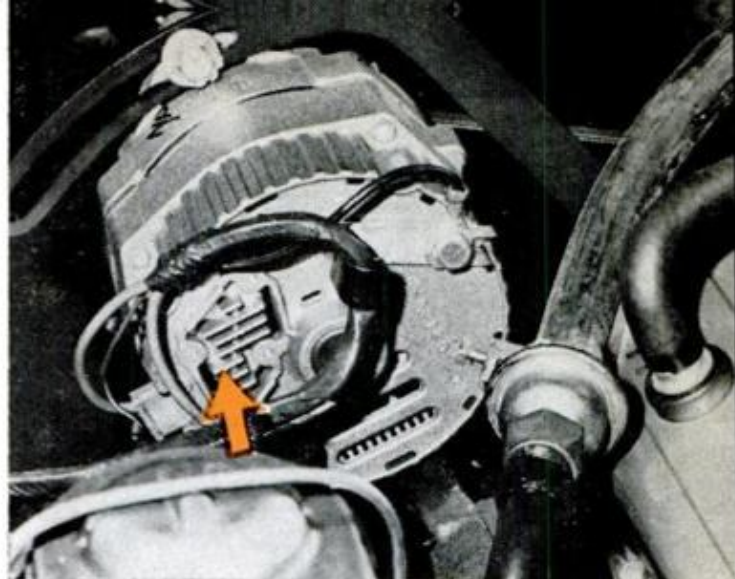
Retractable headlights having electric motors function when current is sent to the electric motor. A failure could be caused by a bad switch, faulty wiring or a malfunction in the motor.

Before tearing things down, however, check the linkage that controls the covers. It could be jammed by dirt, so clean it off and lubricate. Another quickie repair is to rap the motor housing with a hammer. (Electric motors sometimes stop because brushes are stuck.) If this fails to free the brushes, repair or replace the motor.

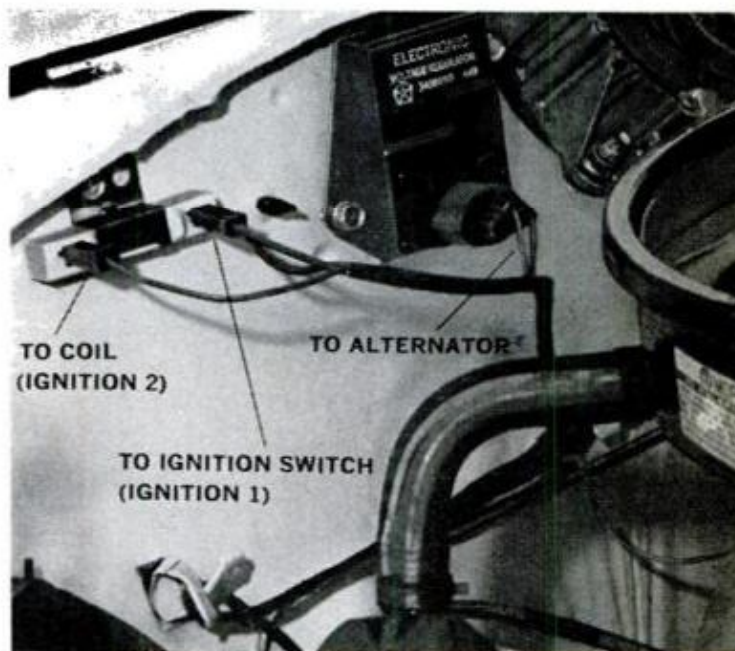
Keep in mind that if you allow a vacuum-operated headlamp system to remain inoperative for a time, the covers open as vacuum escapes. As soon as the engine is started and vacuum builds up, the covers close unless you turn on the lights.

Cars with disappearing headlights built after 1968 have a safety factor. Should vacuum fail, covers are automatically opened by springs inside the control motor.

Rear-window defrosters have been available to new-car buyers for about five years. Up until now, they have been blower motors that direct warm air on the rear window. Chrysler and Ford still use them. GM and VW, however, have switched to an electric element in the window that's



ELECTRONIC VOLTAGE REGULATOR, integral to alternator in '70 Corvette, has no adjustment points. Electronic unit below, in 1970 Chrysler cars, is tested by checking the voltage at Ignition 1 terminal



optional on most models. If it's not working, check the fuse first. If blown, there's a short in the circuit that has to be traced. If the fuse is okay, then the cause of the trouble is an open wire, a bad relay or switch, or a faulty ground.

The unit that prevents the rear wheels from locking during a panic stop is, as of now, relatively rare. It's an option on the 1969 and 1970 Mark III and T-Bird, and 1970 Continental and El Dorado.

Troubleshooting consists of listening for an audible click when you turn on the ignition, and testing brakes with rear wheels off the floor. Put transmission into drive, accelerate to about 30 mph, and apply brakes hard. Rear wheels should cycle (stop and go) about five or six times. If not, trouble can be with control module, solenoid or sensors. ★ ★ ★

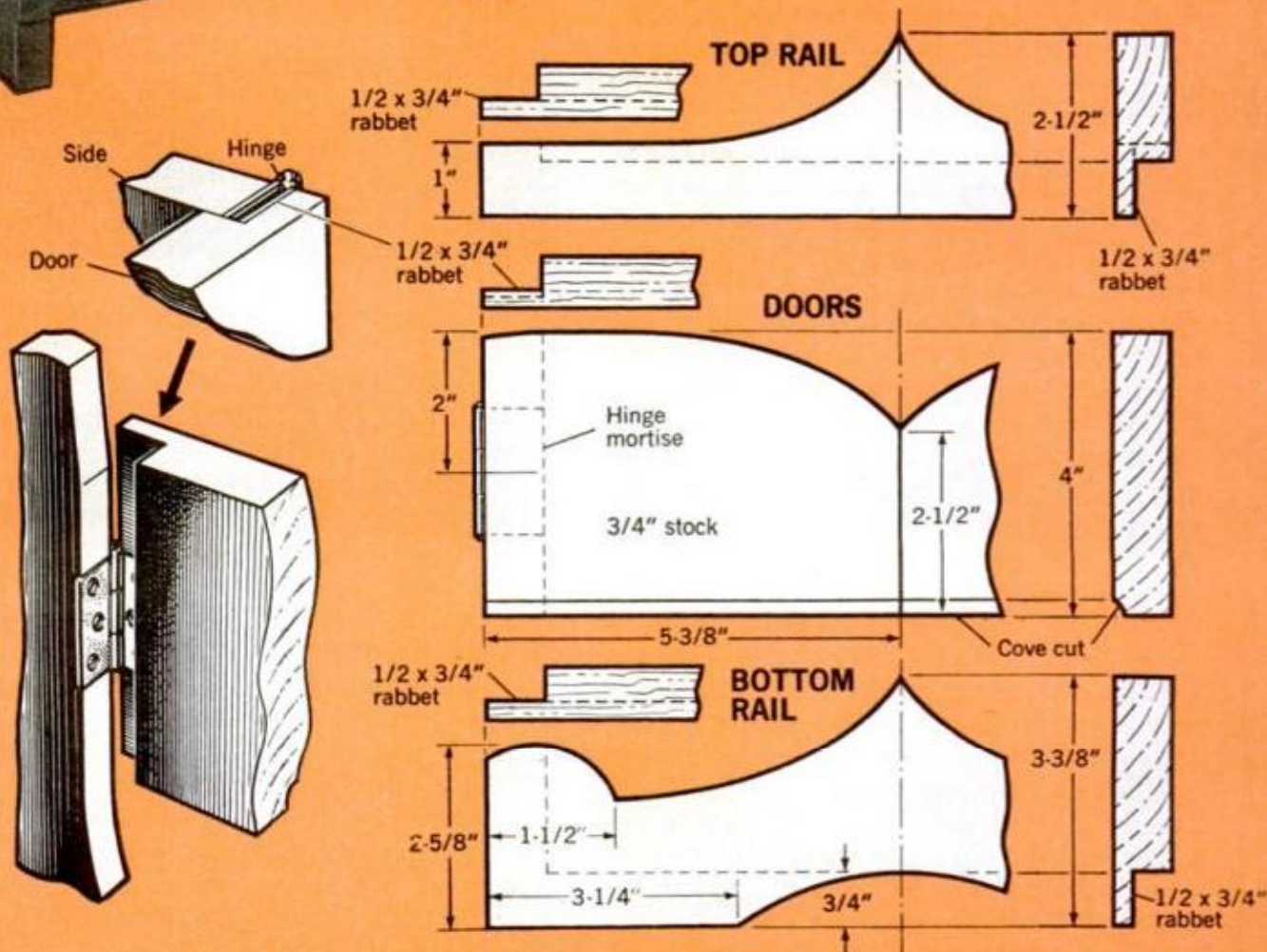
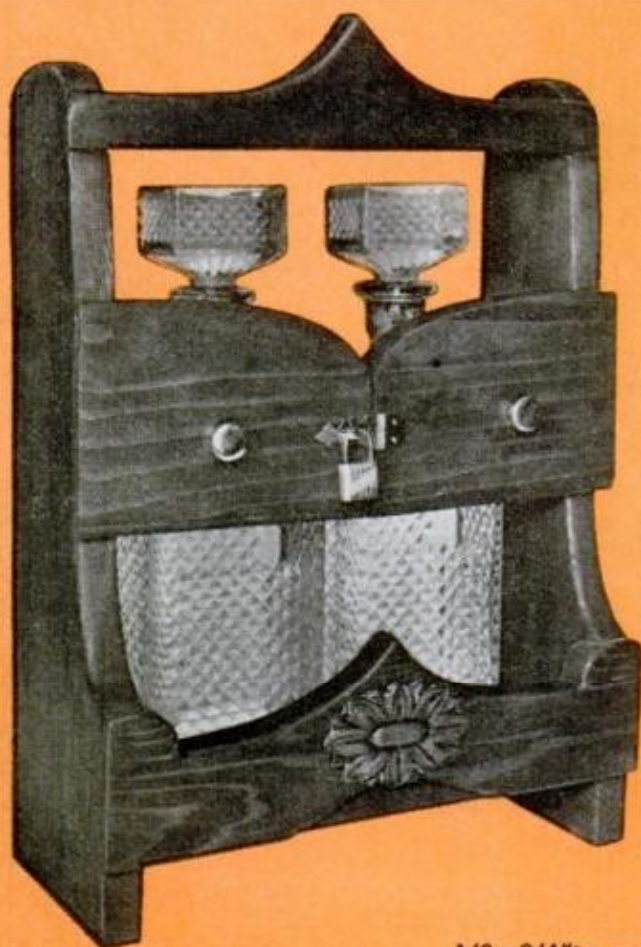
Workshop Projects You

Decanter Cabinet

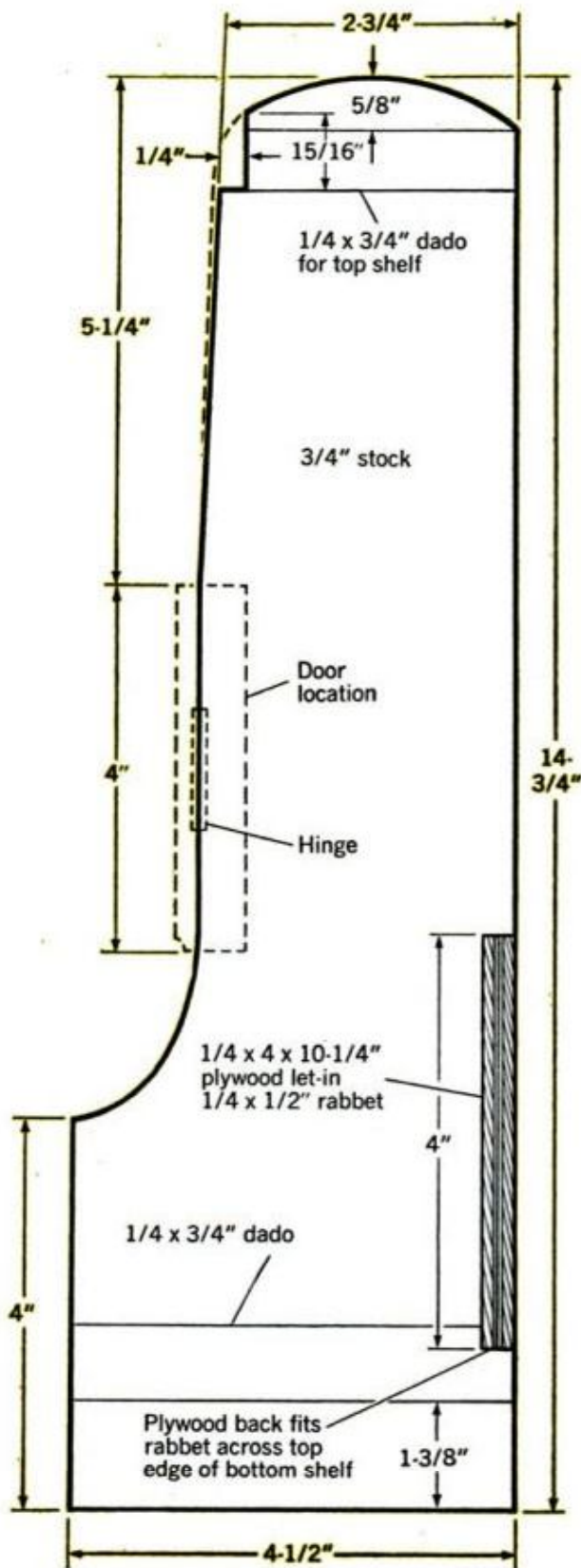
Fancy decanter bottles are meant to be displayed, not tucked away in a cupboard. This little wall cabinet will let you show off two of your favorite bottles and still keep their contents under lock and key.

I made this cabinet from $\frac{3}{4}$ -in. fir; pine, cherry and walnut are other fine choices. You may find it necessary to alter the dimensions to suit your bottles. Both side members are alike except for being made right and left-hand to receive the $9\frac{3}{4}$ -in. shelves and plywood back. Run the shelf dadoes before bandsawing side members.

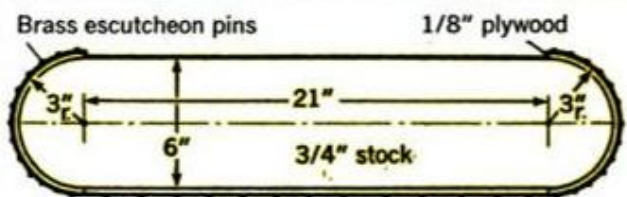
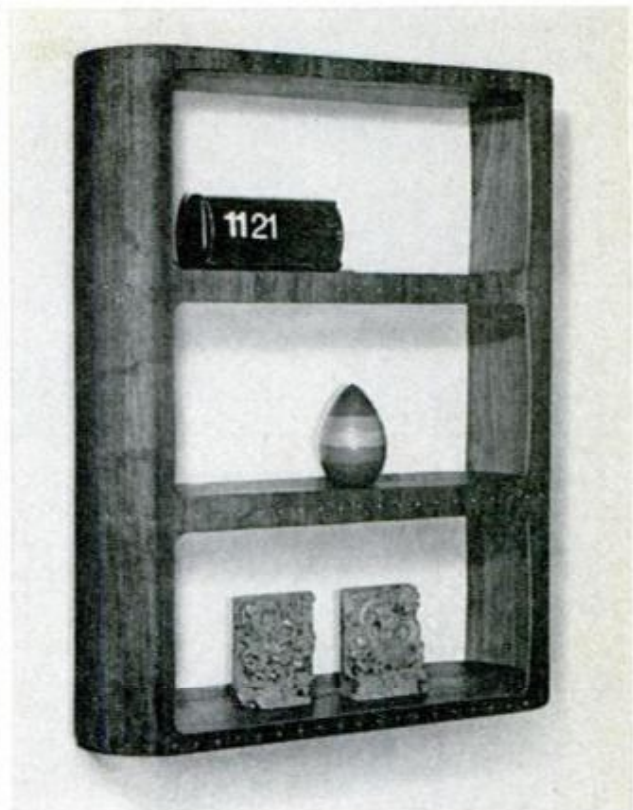
Front pieces, including doors, lap the side members. Make the rabbets on your table saw before bandsawing. Make gains for the hinge leaves so they are flush with the surface. Since there is no room for screws, attach hinges to the doors with epoxy cement. Leave about $\frac{1}{16}$ -in. clearance where doors meet. Sand parts well, stain and finish, and add padlock and hasp last.—*Bob Corley*



Can Build in a Weekend



Technical Art by Peter Trojan



Wraparound Shadow Box

Handsome simple in design, this wrap-around curio shelf is equally as simple to make. It consists of three identical shelves of hardwood "wrapped" with a 1/8-in.-thick panel of marine plywood.

Overall size is a matter of choice, but make sure the cutout panel is large enough to go around the rounded ends of the shelves. Cut and sand the rounded ends of all three shelves while they're tacked together to assure identical pieces.

To wrap the shelves, first soak the ends of the plywood in hot water. Then stand shelves on edge, center the panel over them and start nailing across the front of the shelves. Drive 1/2-in. brass escutcheon nails 1/2 in. apart in straight rows. Then, nail by nail, start wrapping the soaked ends. An extra hand will help to bend the panel and hold it as you drive nails. Leather, plastic and even cardboard can be used as a covering.—Paul Airomi



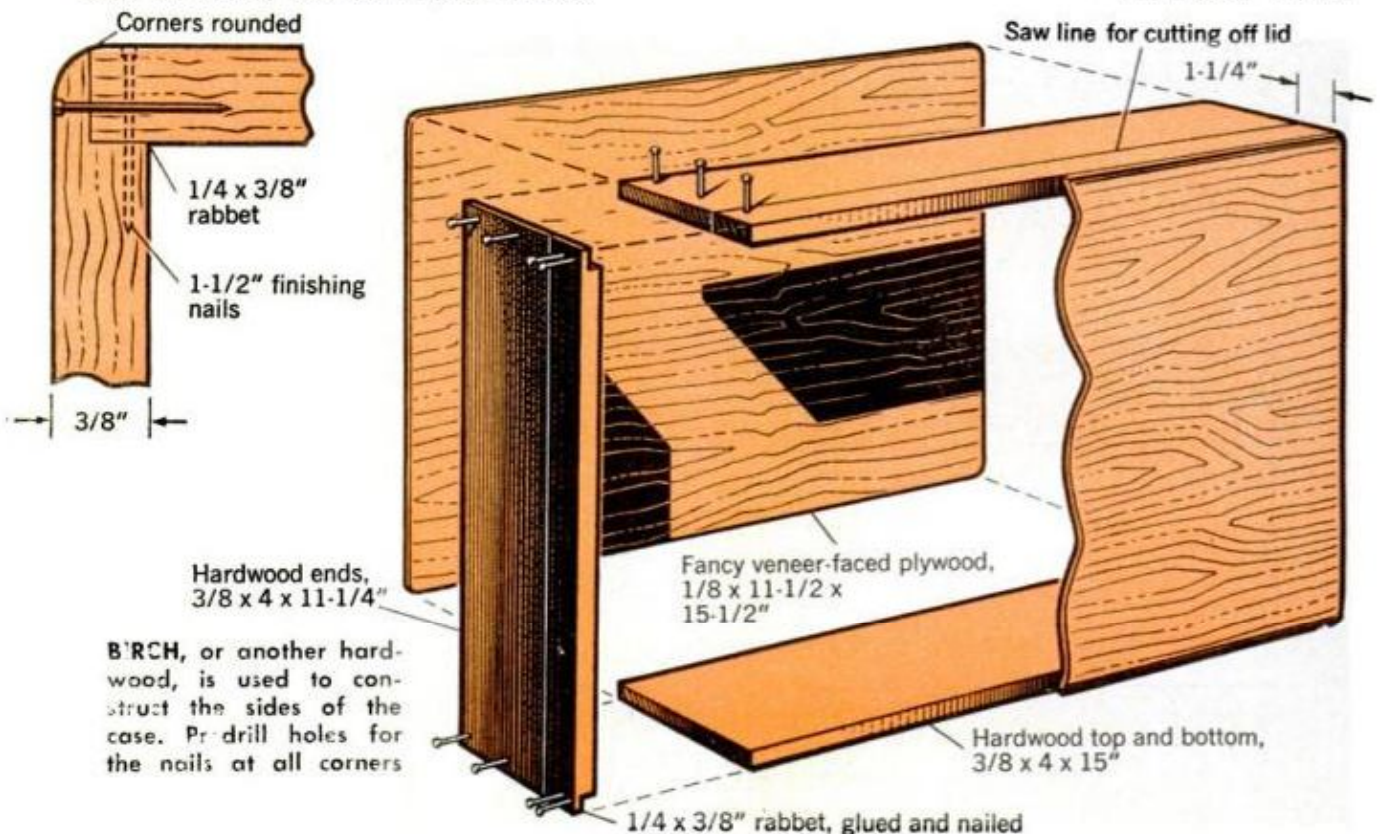
Handsome Carrying Case

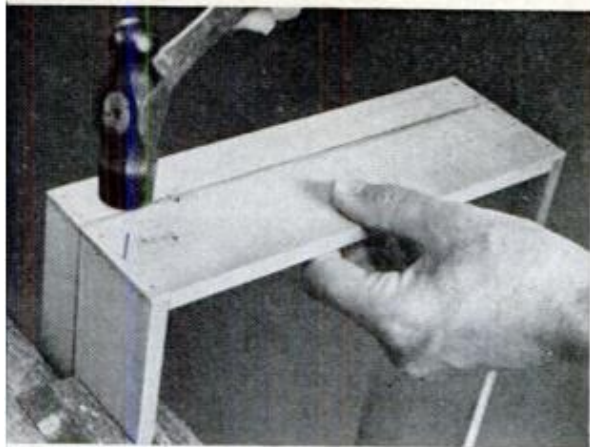
With sides of fancy-grain plywood and the rest covered with simulated vinyl leather, this classy carrying case has anything but a home-made look. It's a fully enclosed box sawed through around its perimeter to form a cover, hinged, covered with vinyl, which is slit with a razor blade, and fitted with luggage hardware.

Fasten the hardwood-plywood top and bottom with glue and hold them with C-clamps, then round all edges slightly. Before applying the vinyl with contact cement, finish exposed plywood surfaces with two coats of clear sealer.

—Kenneth Wells

FITTED with standard luggage hardware, this smart-looking attaché case can be used for school, business or your hobbies

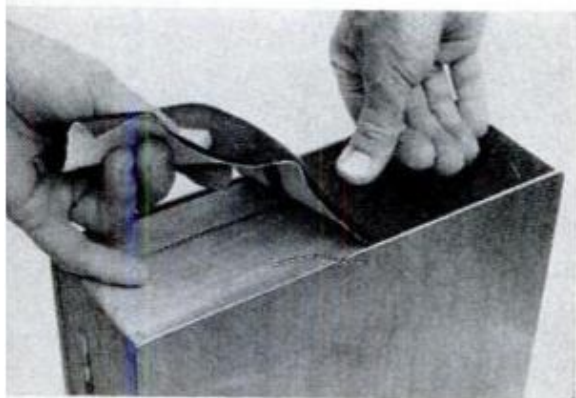




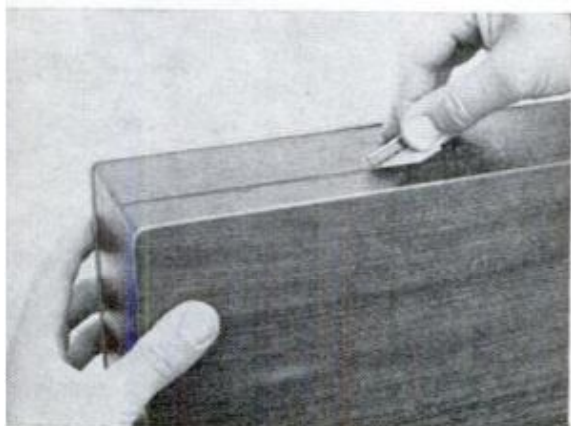
RABBETED CORNERS are glued and nailed. Next, mark sawing line on sides



BOX IS CUT, then plywood sides only are given two coats of a clear sealer



USE CONTACT CEMENT to bond vinyl to box perimeter, put joint at bottom



CUT VINYL carefully along the cover line using a single-edge razor blade

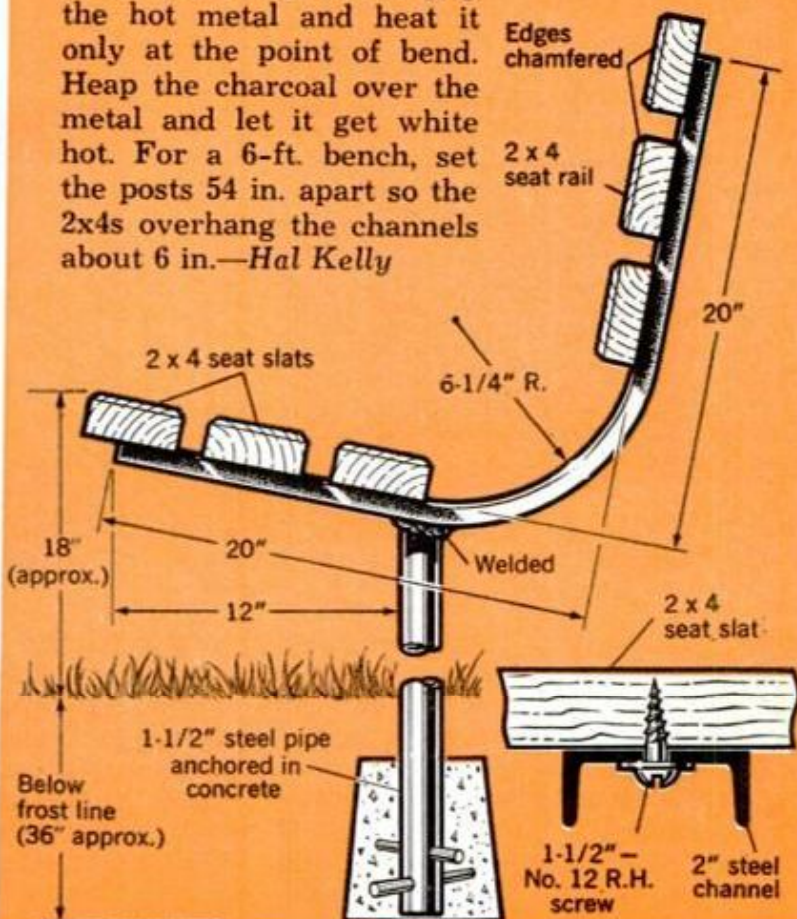
MAY 1970



Park Bench for Your Yard

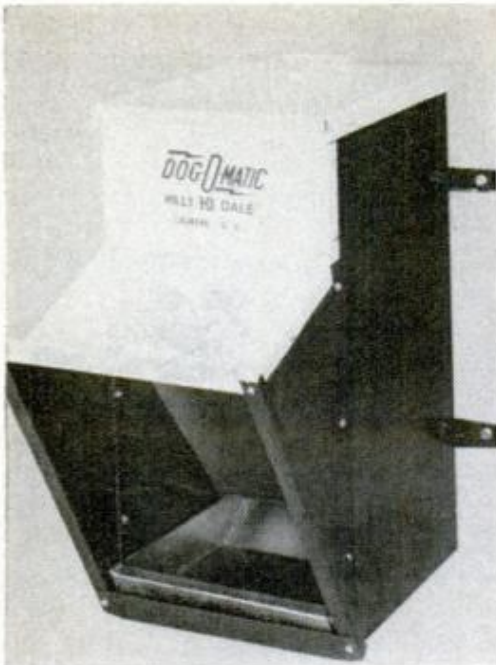
Supported by two or more 1½-in. steel posts set in concrete, this permanent park-type bench is solid as a rock and will last for years. The 2x4 seat slats and back rails are screwed to curved pieces of channel iron which are welded to the tops of the pipe posts. When a slat or rail needs replacing, it's easy to back out the screws.

While it's possible to bend the steel channels cold, they'll bend easier if heated. This can be done with charcoal in the brazier of your patio grill. Chalk a pattern on your concrete driveway and bend the channels to match. Use pliers to grip the hot metal and heat it only at the point of bend. Heap the charcoal over the metal and let it get white hot. For a 6-ft. bench, set the posts 54 in. apart so the 2x4s overhang the channels about 6 in.—Hal Kelly

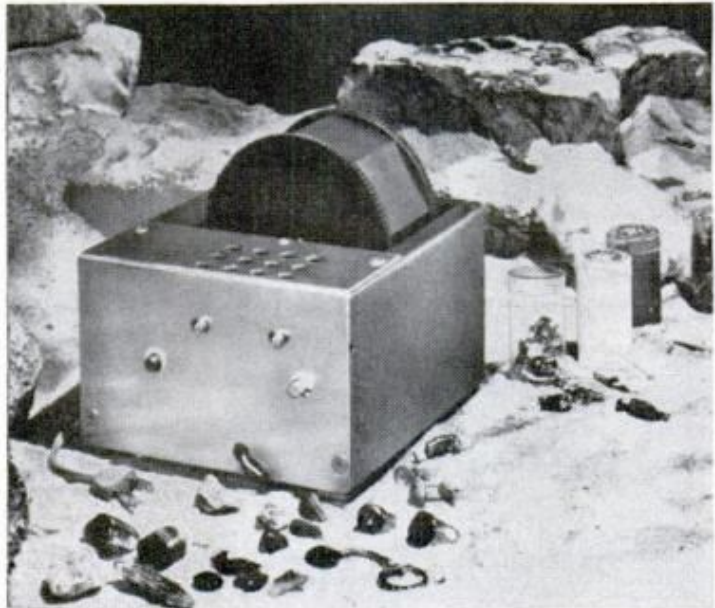


EXCITING NEW PRODUCTS

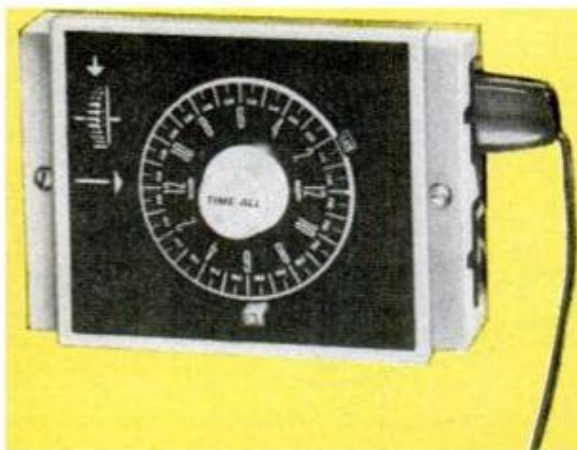
By CATHERINE BILSKI



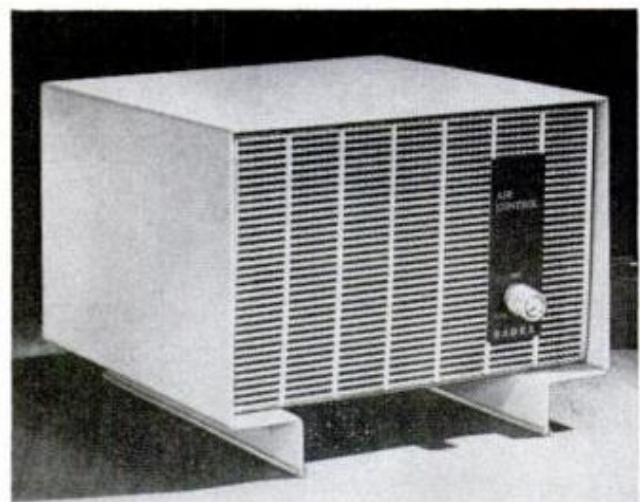
DON'T WORRY ABOUT YOUR DOG not being fed while you're away on vacation. Food will be available to him at all times with the Dog-O-Matic feeder. Just fill the tray, press food injector all the way down and lock into place. The tray holds up to 25 pounds of dog food and keeps it fresh and dry. For limited feeding just fill the tray with desired amount of food. If your dog likes wet food, just add water. Priced at \$24.95 from Saunders & Sons, 14590 Hubbell St., Detroit, Mich. 48227.



CONVERT ROUGH ROCKS into sparkling gemstones for rings, tieclasps, pins and other jewelry with the Electric Rock Tumbler set. In addition to the tumbler, the set includes a basic rock polisher, four types of gemstones, three grades of grit, jewelry settings, glue for mounting and complete instructions. The deluxe model is priced at about \$30 from Skil Craft Corp., 325 West Huron, Chicago, Ill. 60610. It's great fun for the entire family.



GIVE YOUR HOME that "lived-in" look and discourage burglars with the Intermatic Time-All. This high-capacity unit allows you to turn on (or off) automatically the lamps in your home when you're away. It can also be used to control fans, heaters, TV programs, whatever. Model E-911 retails for \$12.95 and is made by International Register Co., 4700 W. Montrose Ave., Chicago, Ill. 60641.



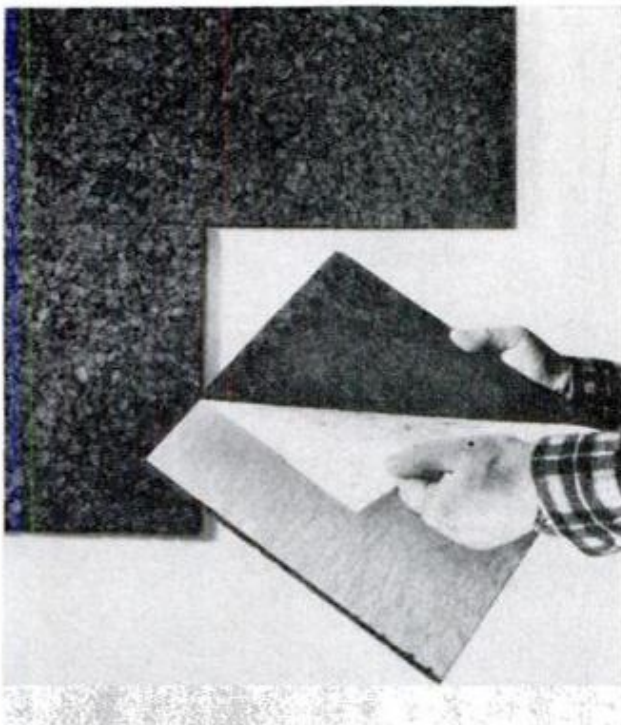
PURIFY THE AIR in your home by eliminating odors with the Radex Air-Control. This small, portable, electronic device employs the principle of adsorption by activated charcoal, which collects odors much like a sponge soaks up liquids. The disposable charcoal filter can be replaced for \$3 postpaid. The unit sells for \$39.95 and is made by Envair Corp., 2201 Oakton St., Evanston, Ill. 60202.



FOR A WEEKEND OF CAMPING or just an afternoon picnic, the Swinger cooler, will keep beverages frosty cold. In addition, it's also great for carrying wet swimsuits, icing down fish or for use as a tackle or toolbox. Available in colors, the cooler sells for \$8.95 from Covey Corp., 8101 Carpenter Freeway, Dallas, Tex. 75247.



A LOT OF TRASH can be compacted neatly in a bag by a new major appliance called the Trash Masher Compactor, recently introduced by the Whirlpool Corp., Benton Harbor, Mich. You simply put in paper, bottles and cans, turn a safety key switch and push a button. Contents are compacted under approximately 2000 pounds of pressure. Price, \$225.



ACCENT YOUR WALLS with self-sticking, natural cork wall panels. Easily applied by peeling off the backing paper and pressing them on the wall, they're ideal for any room or for use as a bulletin board. A box of four 1/2 x12x12-inch panels sell for around \$3.50 from Decro-Wall Corp., Executive Blvd., Elmsford, N.Y. 10523.

MAY 1970

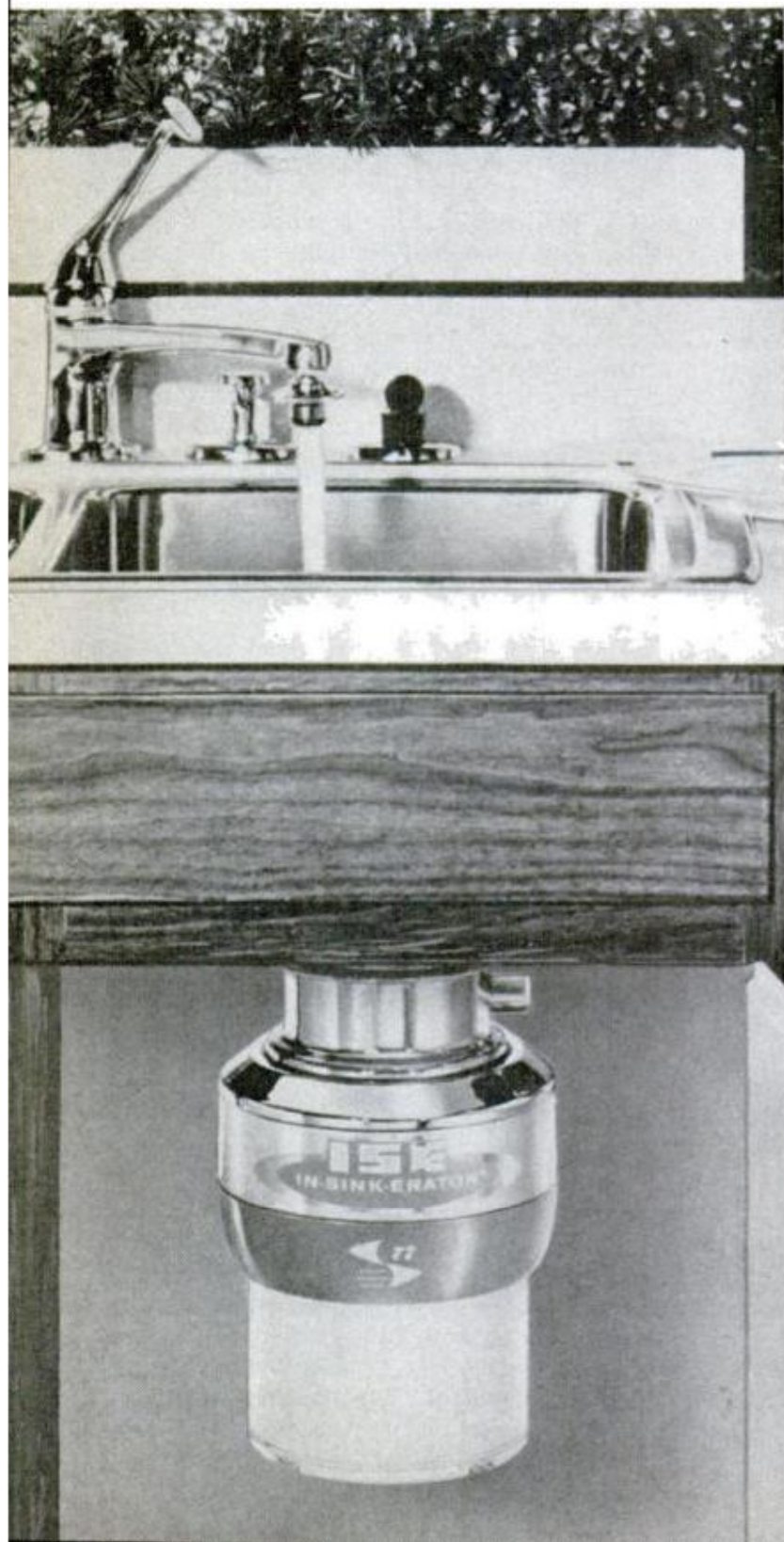


PLUG-IN, THERMAL JIGSAW called the Marvel Maker cuts through a 6-in. block of Styrofoam like butter. Low-voltage transformer provides low or high heat for the blade. Exciting as a toy and handy for modelmakers, designers and florists, it sells for \$12.95, with foam, extra cutter. Lancer Industries Inc., 5782 Thornwood Dr., Goleta, Calif. 93017.

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What You Should Know About Garbage Disposers

By STEVEN J. HOWARD



FEW CAN ARGUE with the advantages of a garbage disposer. It creates a more healthful condition by quickly ridding a home of food wastes and, from a practical viewpoint, it cuts down considerably the number of trips to the trash can.

In simple terms, garbage pushed into a disposer is whirled around (about 1725 rpm) and flung against shredders. The shredders have dull edges that pulverize garbage into tiny particles which drop through discharge holes in the drain so they can flow into the sewerage waste line.

Of the two types, continuous and batch feed, the first lets you deposit garbage into the unit while the unit is running. It is operated by an off-on wall switch.

A batch-feed unit does one load

BEFORE STARTING DISPOSER, cold water is turned on to provide continual flow during grinding. With the grinding complete, turn off and flush the unit

When you are ready to plunk down the cash for one, you'll probably wonder how they work, which is best and why the price difference. Here are the answers

Before You Buy One

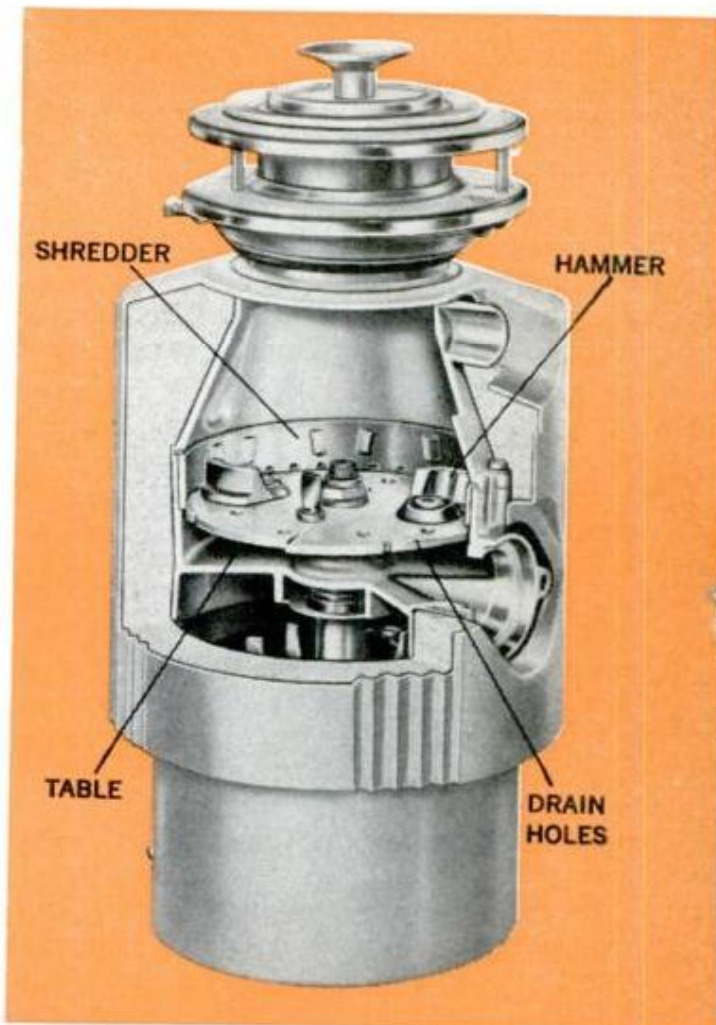
of garbage at a time. This unit runs only when a cover is placed over its opening and is turned to the lock position. When the cover is turned in the opposite direction the unit shuts off automatically.

Generally, a batch-feed unit costs about \$15 more than a continuous feed. However, if there is any chance of a youngster turning on a continuous-feed system and poking inquisitive hands through the opening, the smartest move is to buy a batch-feed unit. The cover protects those precious fingers.

Not all disposers can handle all kinds of waste, so check the manufacturer's literature before deciding on a model. Most expensive models will easily dispose of bone, corncobs and seafood shells, but some units aren't geared for this type of heavy-duty operation.

No disposer is designed to shred metal objects such as bottle tops and cans, or glass, crockery, rags, string, paper cartons,

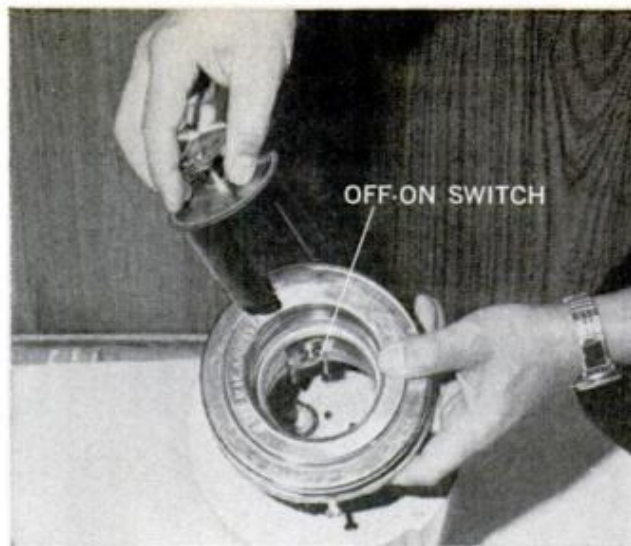
REVERSE ACTION in this disposer is possible by flipping the switch at the bottom. On some models, the reverse action is automatic if jamming occurs



HOW IT WORKS. Revolving table starts when motor is turned on, hammers fling waste against shredders which pulverize garbage into small particles

rubber, plastic or cigaret filters. These materials can damage the disposer and clog drain lines.

A garbage disposer will not cause the absorption field of a septic system to flood. The average field handles about 50 gallons of water a day per person. The average disposer uses 6 gallons of water a day, which is about equivalent to an 80-second shower. Inexpensive to operate, a disposer



TO DISTINGUISH a continuous-feed disposer from a batch-feed unit, look into its throat. The continuous-feed models have a rubber baffle covering the opening. The batch-feed type comes with a cover that is manually placed in position to trip the on-off switch. If there are children around, the latter type is advisable

consumes about 3 cents worth of electricity a month.

If you have a septic tank, the U.S. Public Health Service advises that you can safely use a garbage disposer if your septic system meets the following standards:

House Occupants	Min. Tank Capacity
4	750 gallons
6	900 gallons
8	1000 gallons
10	1250 gallons

Price range

The least expensive models are equipped with a low-capacity ($\frac{1}{3}$ hp) motor which doesn't produce sufficient torque to handle the heavier types of food waste (melon rinds, corncobs, fruit skins). Furthermore, they generally handle only one quart of garbage at a time. Prices begin around \$25.

Better quality disposers boast $\frac{1}{2}$ -hp heavy-duty motors. These will accommodate two quarts of garbage at a clip. Price difference between the latter and the highest quality models is about \$30 because the most expensive units have extra features such as noise-reducing insulation and automatic unjamming.

Disposer dos and don'ts

- The most important operating tip to remember is to make sure that the cold water is running when the disposer is turned on and left running for a few seconds after the unit has been turned off. This flushes out any residue that may remain, thus eliminating chance of odors.
- Never operate a disposer with hot wa-

ter running. Tests have shown that cold water causes grease and fat to congeal into tiny globules that flow easily. Hot water melts grease which can then coat a drain line and eventually cause a stoppage.

- Although garbage disposers are self-cleaning, fill the sink with cold water frequently and let it drain out all at once to flush the drain line. This gets rid of waste and detergent scum. Since some detergents are caustic, periodic flushing will get rid of them before they damage the disposer.

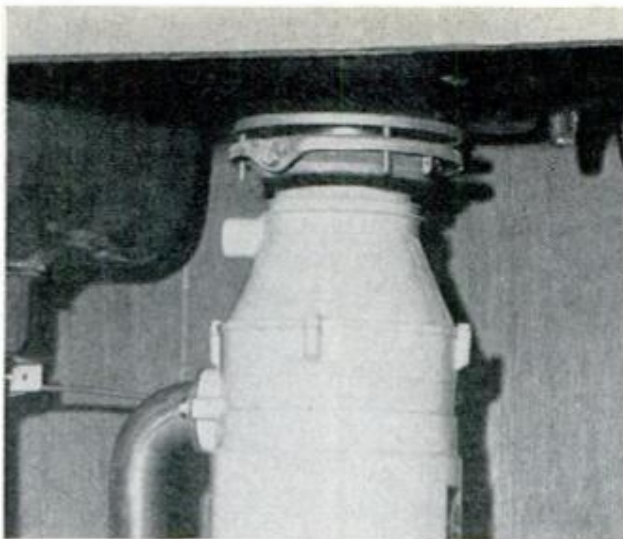
- Never pour a chemical or solvent compound down the drain of a garbage disposer. This stuff will damage the unit. You can, if necessary, pour a drain cleaner down the drain of the other bowl of a double-bowl sink.

- Don't let food scraps remain in a unit for any length of time. "Stored" waste leads to odors and could cause the unit to jam.

- If you have a dishwasher hooked up so it drains through the garbage disposer, run the disposer for several seconds before starting the dishwasher, then turn it off. This flushes away wastes that could cause a backup of discharge water from the dishwasher. After the dishwasher has finished, run the disposer again for several seconds to flush away particles that may have been discharged into the disposer by the dishwasher. Never feed (or run) a garbage disposer while the dishwasher is running.

- To prevent objects from accidentally falling in, always keep the cover in place when the disposer is not in use.

If you operate a disposer properly, and



BEFORE INSTALLING a disposer, be certain that the warranty covers do-it-yourself installation; also that the sink has a standard 4-in. drain opening

don't overload it, it should not jam. However if a foreign object accidentally drops through the drain and causes clogging, follow these steps:

Clearing a jammed unit

More expensive units usually have an automatic reverse action switch which kicks in when the disposer is overloaded by a jam.

Unjamming a less expensive model must be done manually by flipping the reverse-action switch.

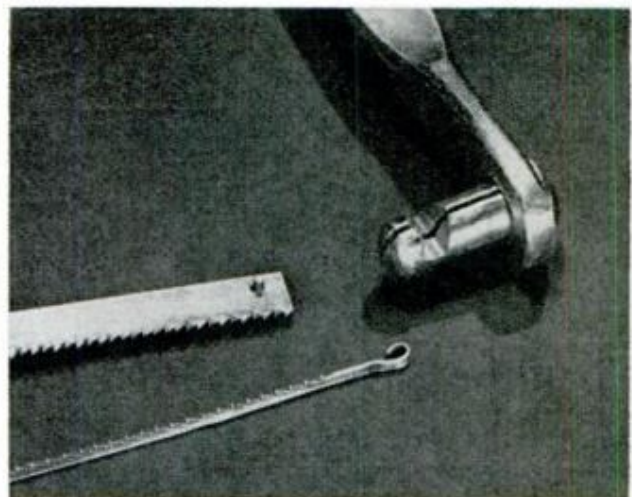
If a jam is stubborn, and won't loosen with reverse-action, turn off the disposer and fish out the jamming object with pliers or ice tongs. *Never* poke your hands in to do the unjamming.

Most garbage disposers today have built-in overload protection. If such a disposer jams for more than 30 seconds an overload switch will automatically cut off the current to keep the motor from burning up.

When you notice that the overload protection has been activated, turn off the unit and free the jam. Some models automatically reset themselves when the overload switch cools. With the others, wait five minutes to let the switch cool; then press the reset button.

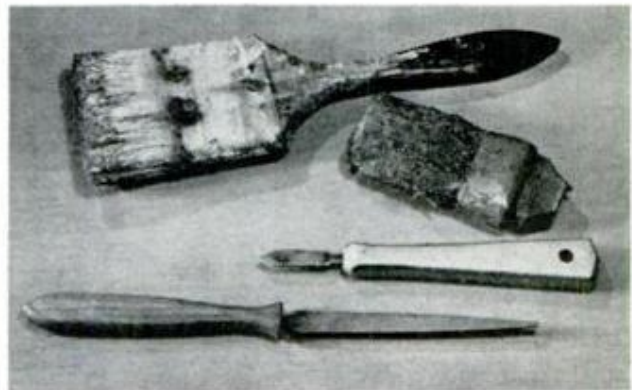
Most disposer manufacturers require that their units be installed according to the local code, and many codes stipulate that the work must be done by licensed plumbers and electricians. Since it is possible that a do-it-yourself hookup will void the warranty, check this point out before starting the job. ★★ ★

HINTS FROM READERS



Using coping-saw blades

You can adapt saw frames (designed to accept pin-end metalcutting blades) to hold coping saw blades of the same length. Simply file a notch in the blade-holding part at each end to accommodate the coping blade loop; the blade slit is probably already wide enough for the new blade. Photo shows blades positioned to cut on the pull stroke. They could, of course, be reversed in the frame so they cut on the push stroke.—*Walter E. Burton*



Handles from old paintbrushes

Don't throw away an old paintbrush just because it no longer is useful for painting purposes. If the handle is sound, it can be sawed off and put to use as a handle for a file, scribe, punch or other small tool. After cutting the handle, clean off all of the old dirt, then paint and refinish if necessary. Finally bore a longitudinal hole to receive the tool tang. If a ferrule is desired to discourage splitting, cut a groove or shoulder around the handle near the end and make a couple of turns with small wire.—*Norbert Walters*



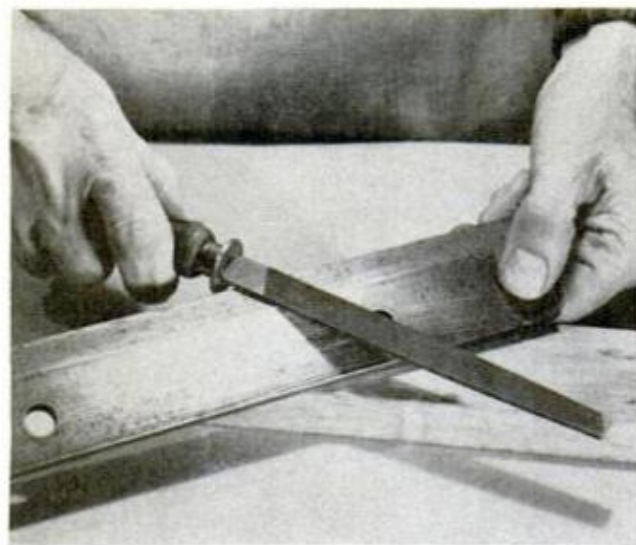
A PUZZLE TO STUMP YOU

If you are a whiz at puzzles, you may solve this one in less than five minutes. More than likely, however, it will take much longer. In fact, you may simply have to give up.

All you have to do to solve it is to arrange the 10 pieces in a perfect square. Sounds easy, but wait until you try it. If you finally run out of patience, you'll find the solution on page 169.

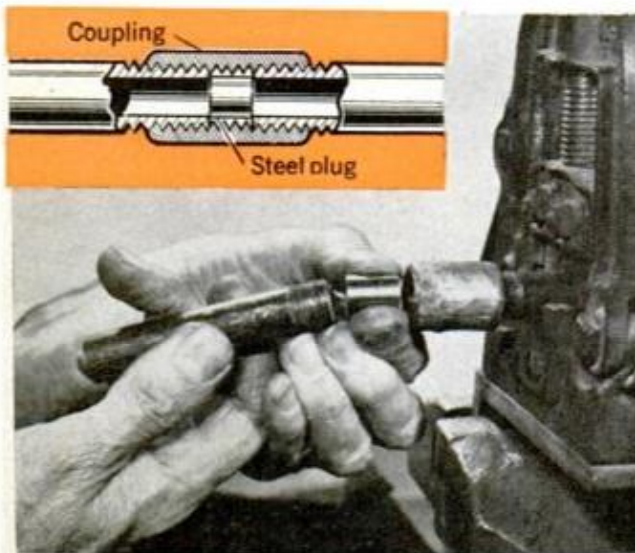
The parts of the puzzle can be made any size as long as you make five identical pieces of both shapes. You can cut them from cardboard or $\frac{1}{8}$ -in. hardwood or plywood. This type of puzzle can be quickly mass-produced on your table saw, nicely finished, then boxed as gifts or for sale.

—Kenneth Wells



Washer protects knuckles

When you file an ax or knife blade, the correct way is to file toward the cutting edge, but if you are not careful, a slip of the file can cause a nicked finger. To prevent such an accident, slip a large flat washer over the file so that it will keep your knuckle away from the cutting edge. The washer should have a hole large enough so that it will rest against the file handle. While the washer provides a safeguard, ax filing is always done with short strokes where only the outer end of the file contacts the blade. Thus your fingers are a safe distance from the cutting edge.



Holding pipe nipples

Short lengths of pipe threaded at one end are often held in a "nipple chuck" for threading the opposite end. Usually the chuck consists of a length of pipe clamped in a vise and fitted with a straight coupling. However, because of the thread taper, the workpiece can become overly tight in the coupling and be difficult to back out without damage. You can solve this problem by inserting a steel plug in the coupling. This way the workpiece cannot become "frozen" in the coupling since the plug will prevent the pipe ends from coming close together.

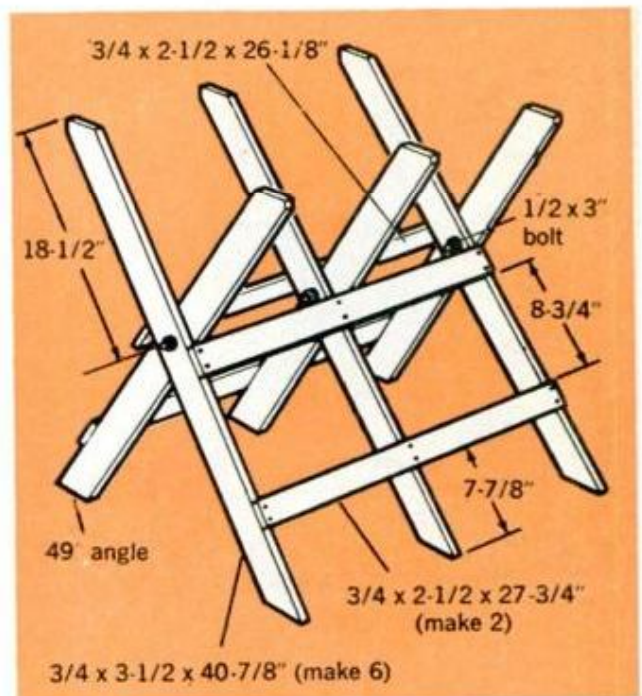
Sawbuck Does Double Duty as Table



Like most fireplace owners, I spend considerable time every fall cutting up a winter's supply of logs. Tiring of using a makeshift sawhorse, I built this versatile sawbuck. It takes little space to store; I simply fold and hang it on the garage wall. And, by adding the third pair of legs, it's possible to cut short logs without having the saw bind. The extra length also makes the buck a solid outside work table.—*George O. Guesmer*

Quick reference to PM projects

I have many years of *PM* in my workshop library. Locating a particular project was frequently a time-consuming task until I "cataloged" the projects by cutting out the monthly tables of contents and filing them in a folder. Now it's a snap to find what I want.—*Dick Scalone*



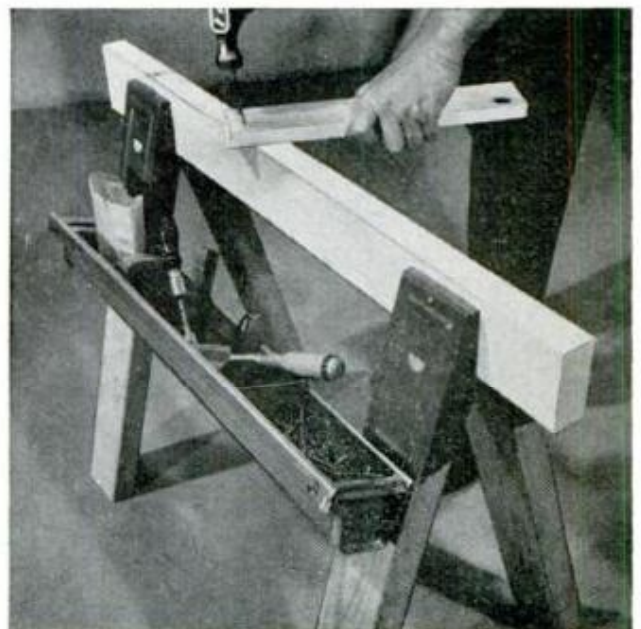
Quickie tool trough for sawhorse

When working on a sawhorse, I used to have my tools strewn about the ground. Thus, it was a necessary nuisance to do a lot of bending. To save my back, I've attached a length of gutter, complete with end pieces and dividers, to provide a handy tool tray.—*Ken Patterson*

Neater way to bleed radiator

Next time you have to bleed a hot-water radiator, use a plastic bag over the valve to catch the water and spray. I find that the bag is easier to handle than a small metal container and does a fine job of protecting floor and furniture.

—*R. M. Woodbury*



18 Great Tools That Make Yardwork Easier

Four pages of new and improved garden and yard tools that do the job better in less time

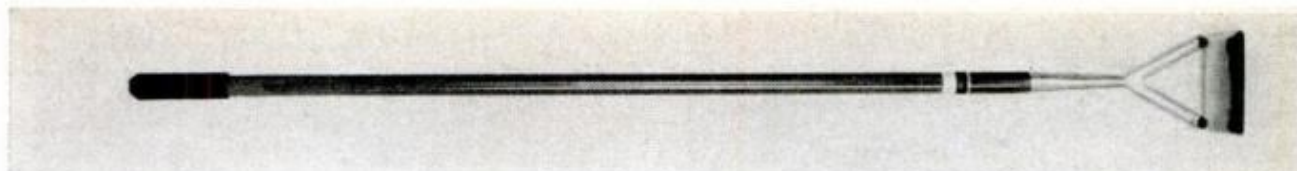


HOSE REEL with front, rather than side, discharge has been introduced by True Temper Corp. Of heavy-gauge steel, reel neatly coils 200 ft. of $\frac{5}{8}$ -in. o.d. hose and may be mounted on house. Price: \$21.

ELECTRIC TRIMMER, which operates off tractor battery (above), is now also offered as an independent tool with a battery mounted in the handle. Key-Lectric Trimmer, \$45. Toro Manufacturing Corp., Minneapolis, Minn.



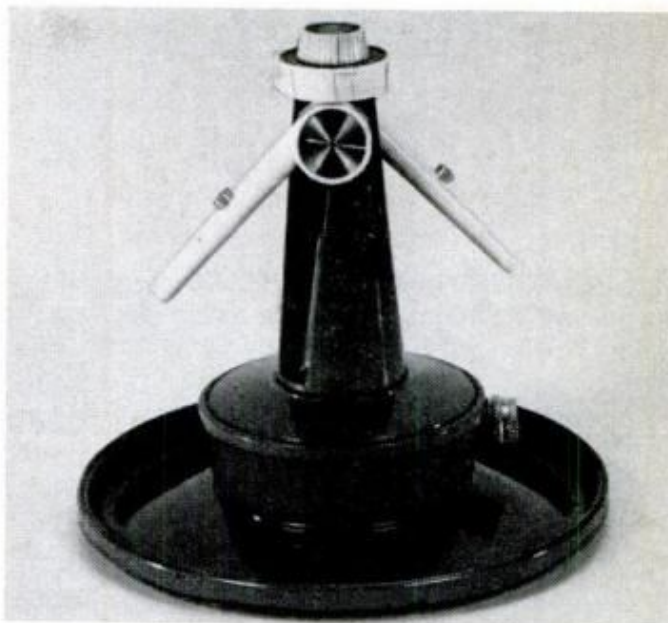
NONKINK COILING is the boast made for Flatline garden hose by Amerace Esna Corp., 436 E. Mansfield St., Bucyrus, Ohio. With water turned on, hose opens to $\frac{5}{8}$ -in. i.d.; when water is turned off hose assumes easy-to-handle flat shape. Sold at hardware stores, a 50-ft. length costs \$10.



DUTCH HOE features rustproof stainless-steel blade and durable PVC-covered handle. Price: \$20. Wilkinson Sword, Inc.



TREE PRUNER adjusts to any height between 6 and 12 ft., is made of lightweight aluminum. Dual-leverage pulley system triples cutting power. Priced at \$15. Seymour Smith & Son, Inc., Oakville, Conn.



ROTARY SPRINKLER coverage adjusts from a 5 to 50-ft. dia. by twist of a knob to raise arms vertically from 0 to 90°. Price: \$10. Burgess Vibrocrafters, Grayslake, Ill. 60030 makes it.

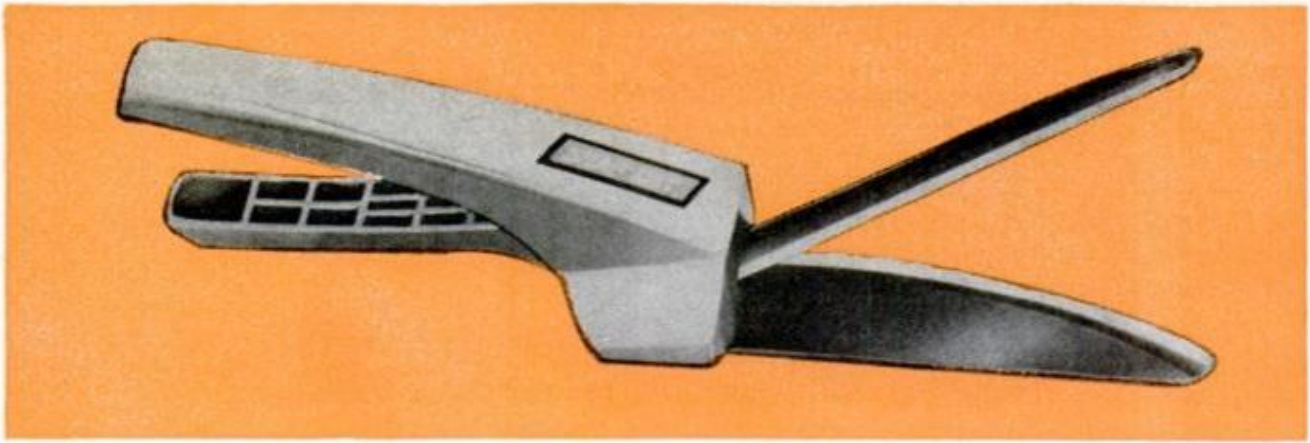
POST-HOLE DIGGER claimed to be the first coated with Teflon-S has 13-ga. steel blade and handle in 4, 6 or 8-ft. length. Costs about \$12. Union Fork & Hoe Co., 500 Dublin Ave., Columbus, Ohio.



BROADCAST SPREADER has an 8-ft.-wide distribution pattern, a vibration anticlog agitator and a fingertip calibrated setting control. It's priced at \$27 by True Temper Corp.



POINTED SHAPE of this trowel makes it the ideal tool for thinning small seedlings or dibbling holes up to 8 in. deep. Fine Point trowel, priced at \$4, is manufactured by the Wilkinson Sword Co., Mountainside, N.J. 07092.



SELF-SHARPENING GRASS SHEARS are designed to cut like a mower. The sweep blade slices across the stationary bed-knife to cut all types of grass. Designed to maintain correct tension, shears are priced at \$2.49. Seymour Smith & Son, Inc., Oakville, Conn. 06779, is the maker.



CORDLESS ELECTRIC GRASS SHEARS never need lubricating, come with charger that brings batteries back to full power with an overnight charge. Self-sharpening blades are coated with Teflon-S. \$35. Made by Disston, H. K. Porter Co. Inc.

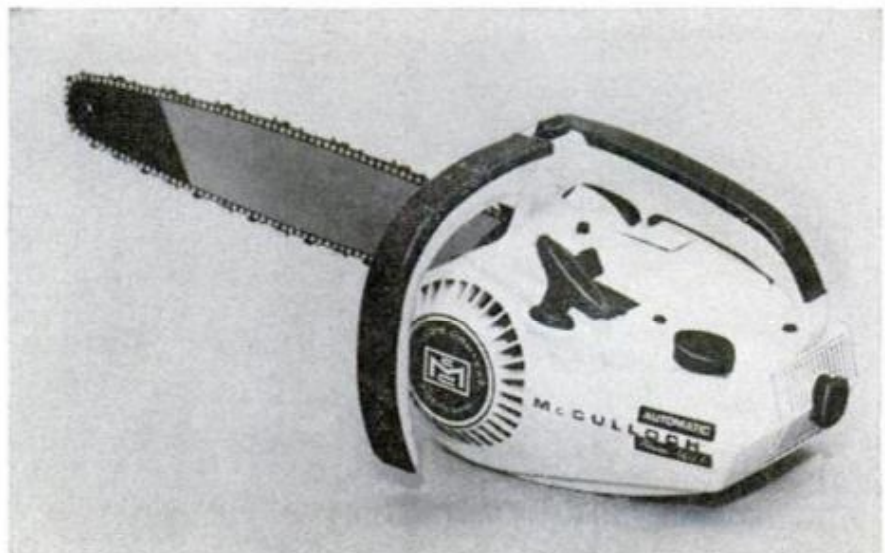


JUMBO EARTH AUGER drills big holes fast, is sold in two sizes and three lengths. The 1 $\frac{3}{4}$ x 24-in. drill shown costs \$6.50. Johnson's Industrial Supply Co., 1941 Karlin Dr., St. Louis, Mo.



AUGER can "pin" slope: pea gravel in the holes slows fertilizer runoff

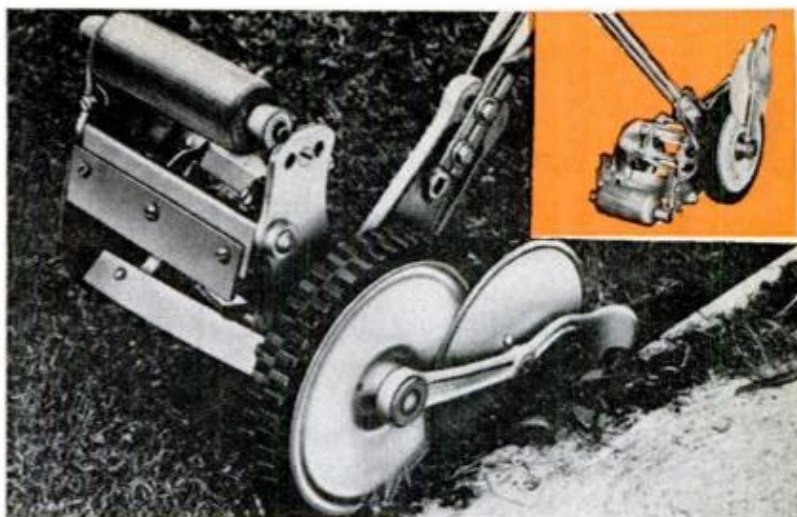
IMPROVED VERSION of the world's lightest chain saw, Power Mac 6A has built-in automatic chain oiling and a longer, 16-in., bar and chain. An updated manual oiling system operates independently for additional oiling in rugged cutting operations. \$200. McCulloch Corp., 6101 W. Century Blvd., Los Angeles, Calif. 90045.



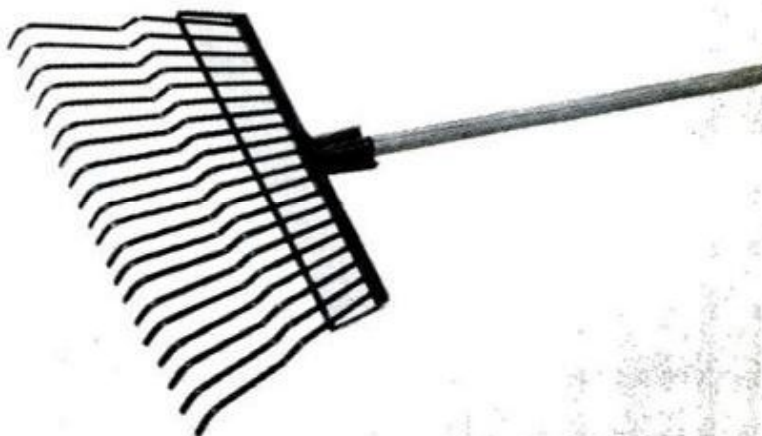


NOTCHED V-BLADE DESIGN lets the ESC Scuffle Hoe from True Temper Corp., Cleveland, Ohio, 44115, cut weeds off below the surface where it counts. \$5.

NEW LAWN COMB RAKE features 20 flexible dogleg tines, is available with a 19-in. head width and a 54-in. handle. \$4. Union Fork and Hoe Co. makes it.



HANDY YARD TOOL gets where other cutting equipment won't. The 6-in. mower does the trimming (inset); for edging you simply 'flip' it over. Model 1706, \$26. Pennsylvania Lawn Products, Inc., Waynesboro, Va., makes it.



GARDEN SPRAYER dubbed Ladybug has one-gal. capacity, comes complete for \$25. H. D. Hudson Manufacturing, 154 E. Erie St., Chicago, Ill. 60611.



ROSE CHIMNEY over newly planted rose produces superior plant when filled with Soil-Aid mixture. For information, write Boise-Cascade Bark Products, Box 2885, Portland, Ore. 97208.

SUPER SCOOPER SAVES

Faced with a king-size digging chore? Let this conveyor do the heavy lifting for you.

By SVEN CORSAK as told to HARRY WICKS

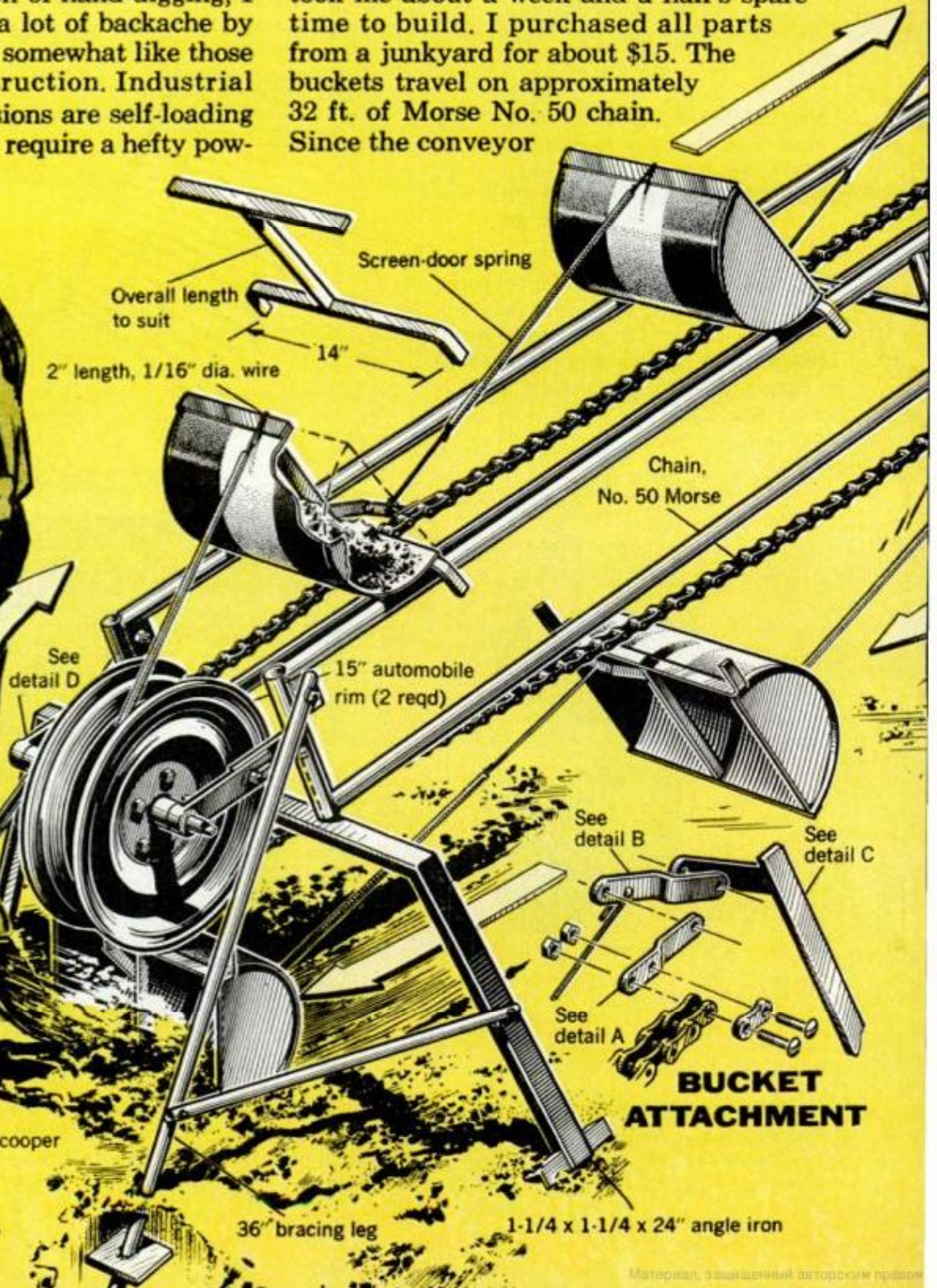
Technical Art by Fred Wolff

WHEN MY WIFE AND I decided to build our own swimming pool (it's the one shown in the photos of *Build This Poolhouse*, page 124, April PM), the thought of digging a 20x40-ft. excavation 10½ ft. deep didn't fill me with enthusiasm. After one session of hand-digging, I figured I could save a lot of backache by building a "trencher" somewhat like those used in heavy construction. Industrial versions are self-loading and require a hefty power

source for digging; my version is intended simply to carry soil that's pushed into its buckets up out of the hole. A small electric motor provides ample power. Basically, my scooper is easy to build and has no critical dimensions. It took me about a week and a half's spare time to build. I purchased all parts from a junkyard for about \$15. The buckets travel on approximately 32 ft. of Morse No. 50 chain. Since the conveyor



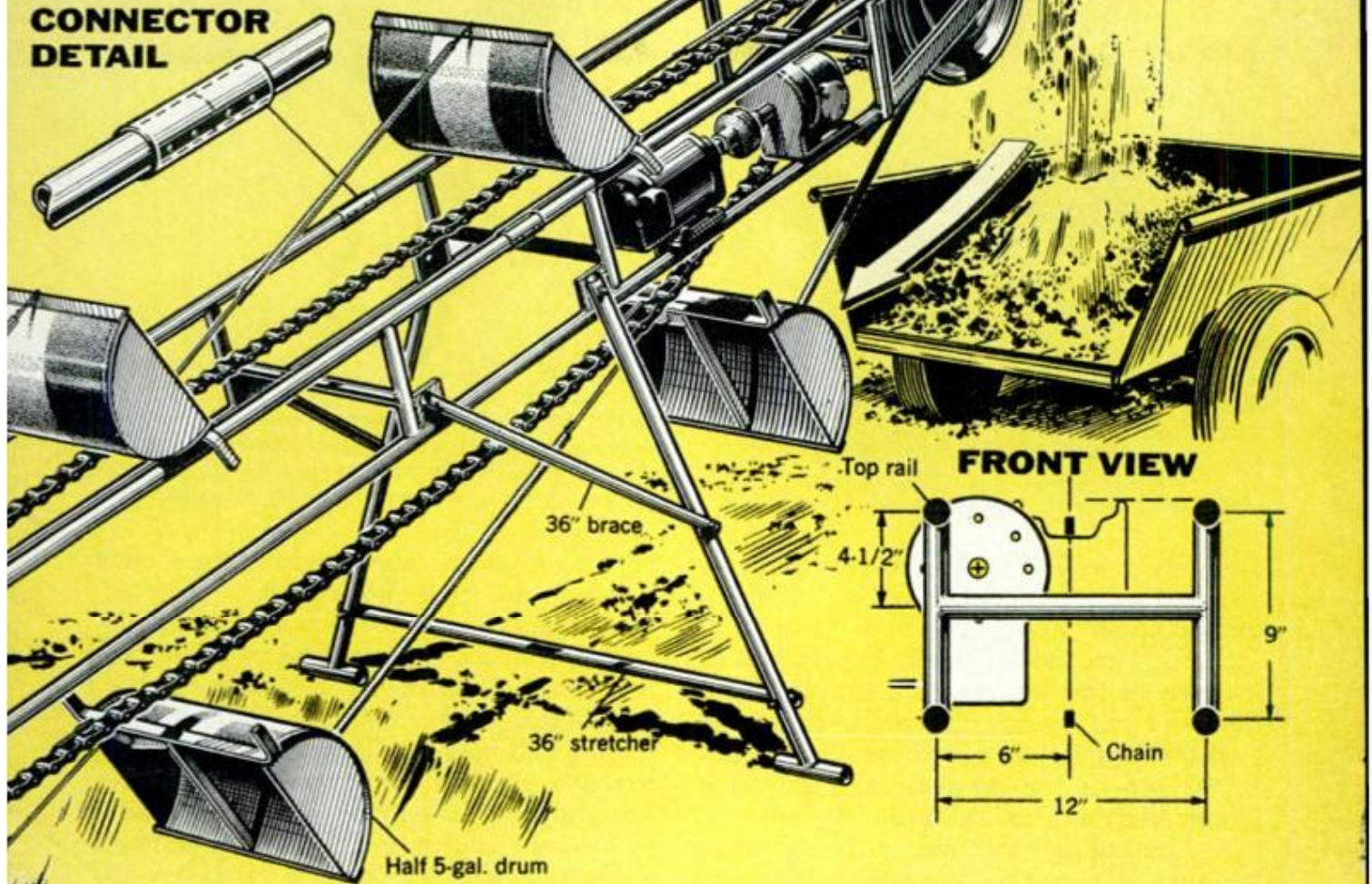
Push dirt to scooper



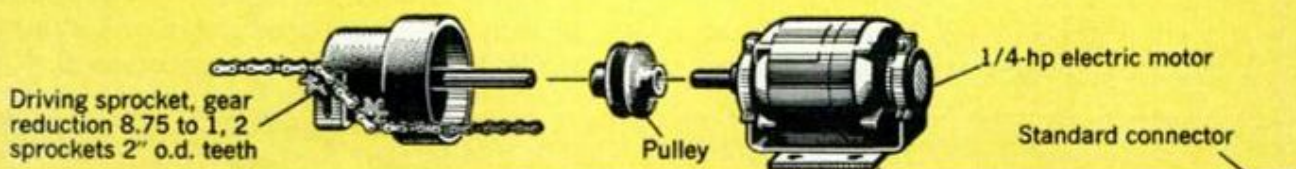
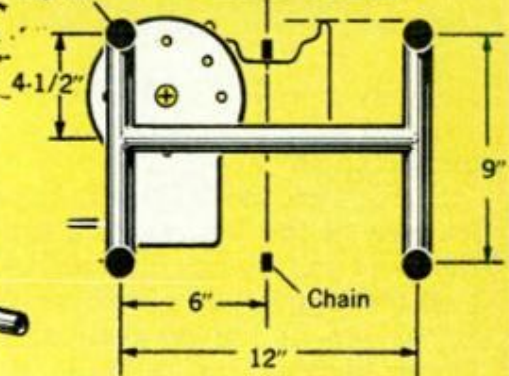
BUCKET ATTACHMENT

YOUR BACK

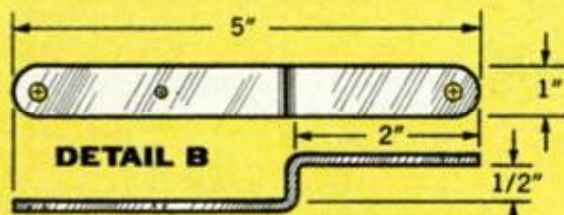
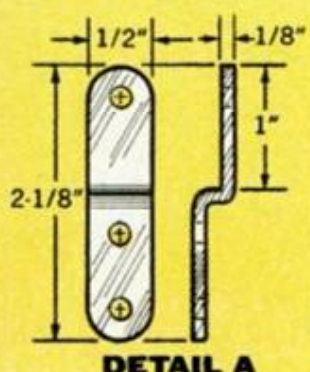
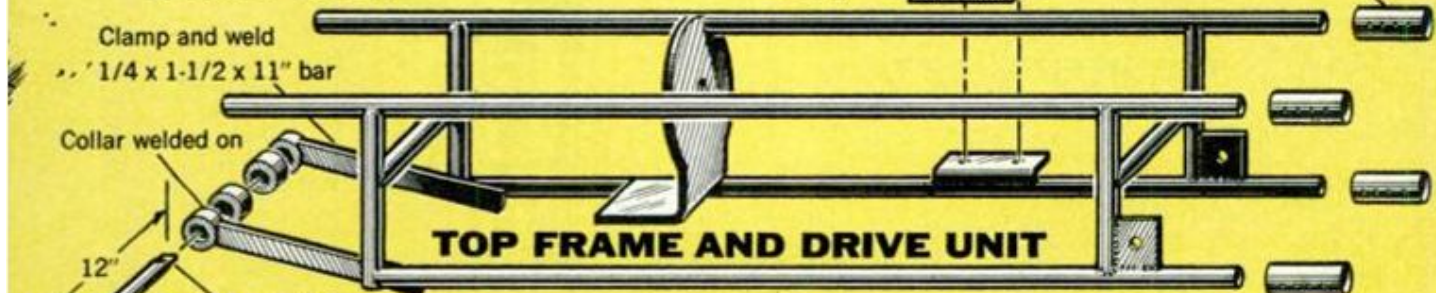
CONNECTOR DETAIL



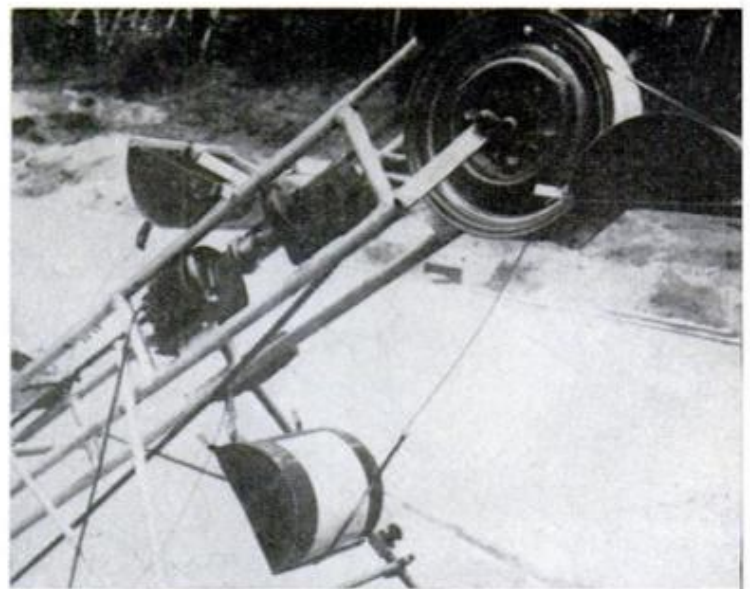
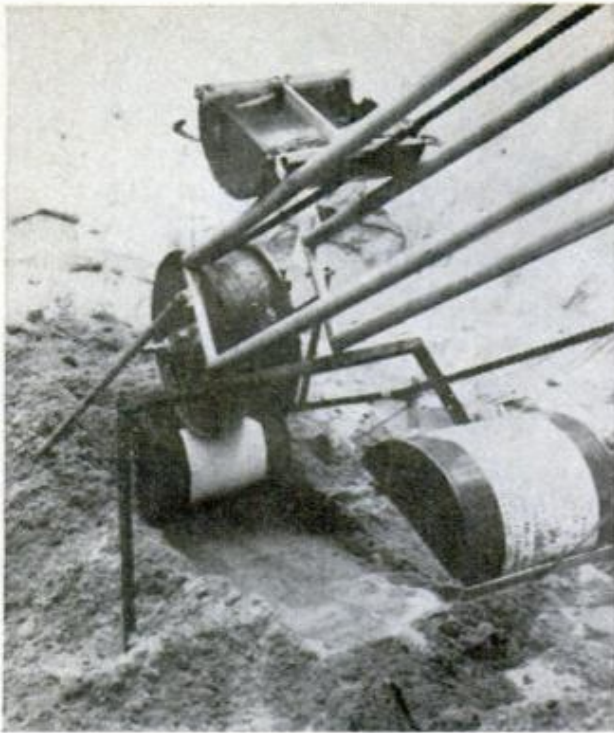
FRONT VIEW



TOP FRAME AND DRIVE UNIT



Entire frame of 1-1/2" o.d. thinwall conduit except verticals at ends



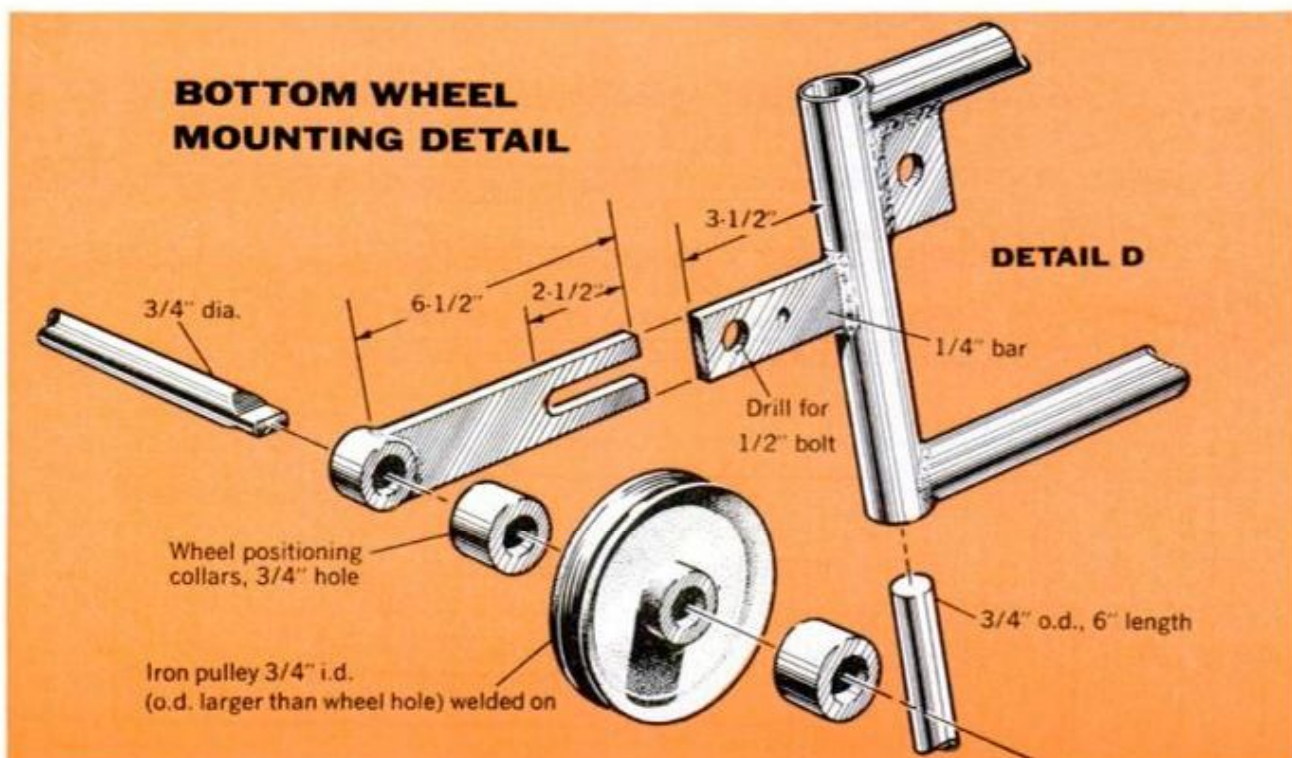
LOOSE SAND in excavation is pushed into each bucket as it makes turn. Owner solved the problem of holding the buckets back as they discharge soil at top by adding a screen-door spring to each bucket

has only four loaded buckets to move at a time, I suspect I could have used a much lighter chain.

Buckets are hand-loaded. As each makes its turn at the bottom, you simply scoop the sand in. About 10 seconds later, the load is dropped into a small trailer parked at the top of the excavation. The frame length shown was designed to suit the hole I had to dig; this can be shortened or lengthened to satisfy your particular job. (Editor's note: The Scooper in the drawing on pages 166-167 is shown in an exaggerated near-horizontal position for

layout reasons. In use, the machine stands closer to 60° from horizontal.)

Besides the chain, the major parts obtained from the junkyard were 8:1 reduction gear, 1/4-hp motor, two auto wheels, five 5-gal. drums and six 10-ft. lengths of thinwall conduit. The time the scooper saved is obvious when production figures are compared. Digging by hand I was able to produce approximately 30 trailer loads a day (about 15 cu. yds.). With the scooper in operation, this figure was upped to a healthy 70. Thus, production was doubled while necessary effort was decreased. ★ ★ ★



HINTS FROM READERS

Mirror warns of hazard

Until a hazard can be permanently corrected, a mirror placed at floor level and tilted to reflect light upward can serve as an effective warning. Because of constantly changing reflections, the mirror attracts the eye as one approaches, particularly if the mirror is placed to reflect light from a window or lamp. The photo shows how a mirror placed in front of an air compressor will warn passersby to keep ankles clear of the moving pulley.

—John Menke



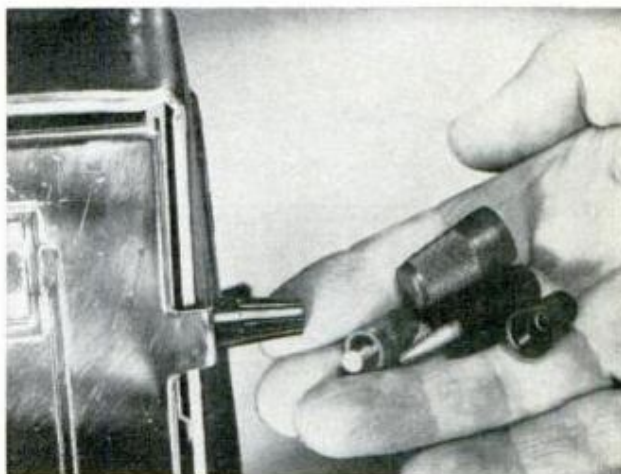
Carpet-and-plastic work pad

For a soft pad on which to handle optical equipment or other delicate items, slip a scrap of carpeting into a plastic bag and staple or seal the end shut. The plastic covering prevents the carpet from absorbing dirt, keeps carpet lint out of the parts handled and is easily cleaned with soap and water. Carpet samples are perfect for such pads and can usually be obtained for little or nothing from the rug department of a furniture store. A rug with deep pile makes the best pad.—Walter E. Burton



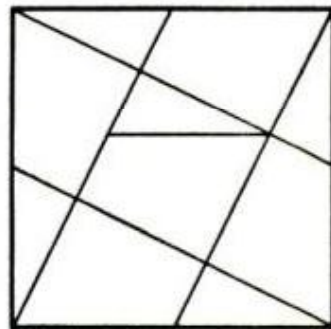
Neat knobs by the dozen

Needing a knob to replace one on an appliance, I found that a solderless connector of the type used in electrical work makes the neatest knob you ever saw. Threaded on the inside, these connectors can be turned onto threaded studs, or you can attach them to drawers with stovebolts from the inside. You can even fit them with threaded shanks by turning screws tightly in the connectors and then sawing off the screw heads. They come in black or white.—Nello Suffredini



Solution to puzzle on page 160

Like any puzzle, once you know how to work it there's nothing to it. But this one can be a real teaser. If you solved it right off the bat, you are above average. If you have had to peek at the solution, you are one of many who have failed to figure out that the key to the puzzle is the triangular piece which forms the center square. This is a great party game when the pieces are made 12 in. square from 1/4-in. plywood or hardboard and played on the floor. Pieces can be painted different colors if you wish.

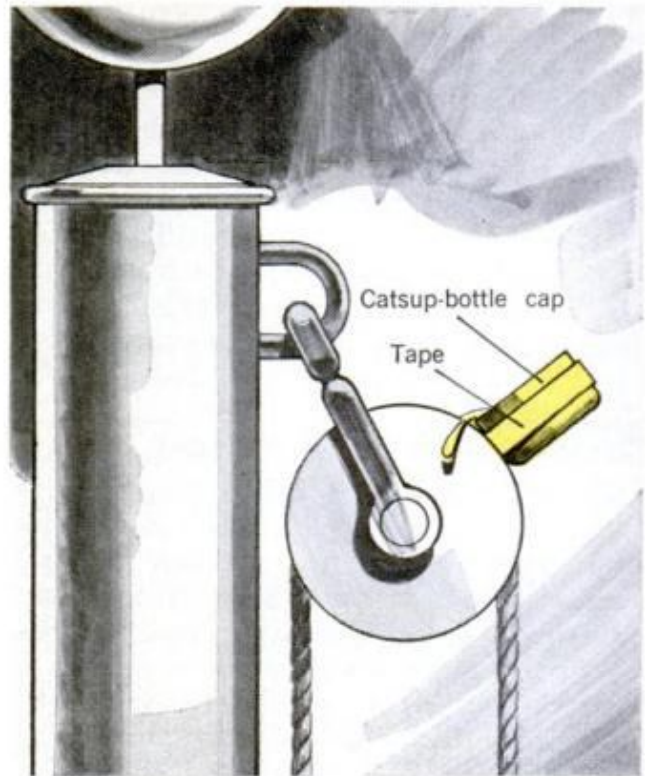




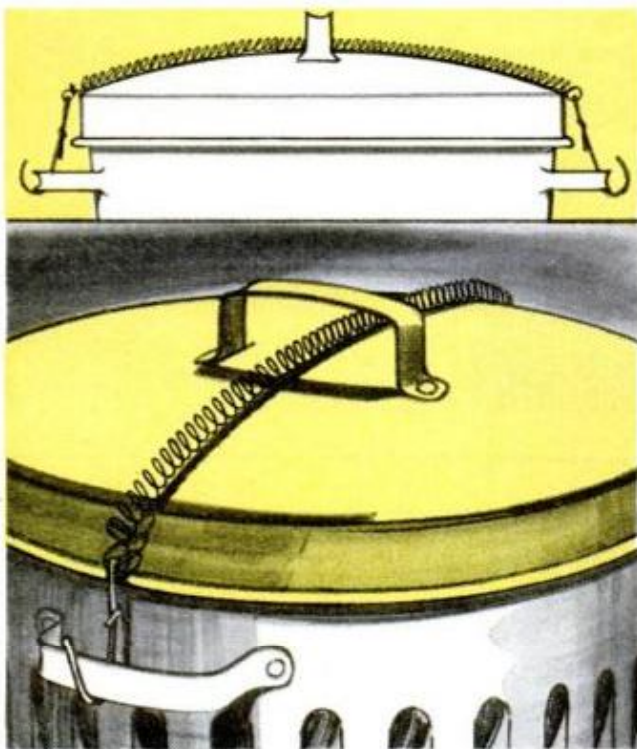
SOLVING



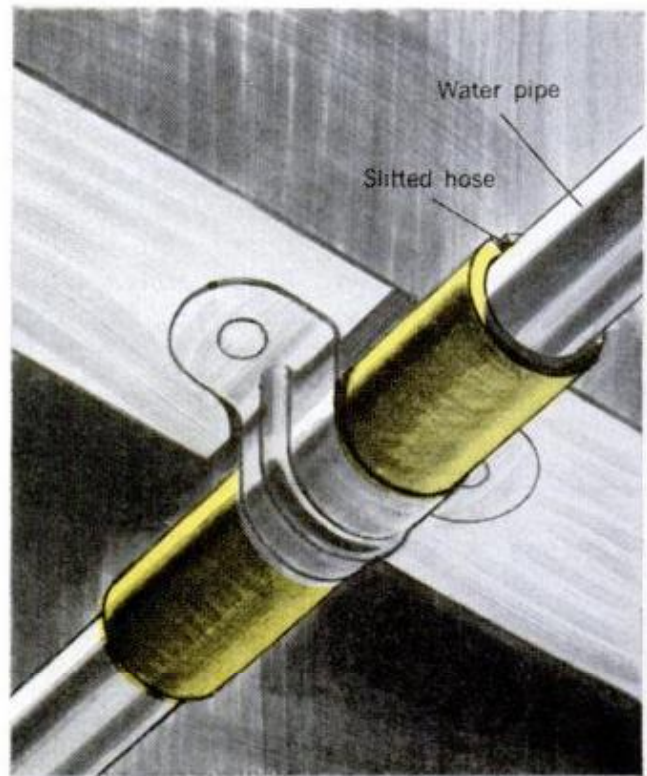
GYPSUM BOARD EDGES can be quickly smoothed or chamfered with the use of a discarded vegetable grater. The type shown has different degrees of coarseness and can be used to best suit the job.—Victor H. Lamoy



A FLAGPOLE PULLEY can be oiled by taping a catsup bottle cap to the rope. Just fill the cap with light oil and pull it to the top. Then jerk the rope slightly and oil will flow on pulley.—Ed McGinley



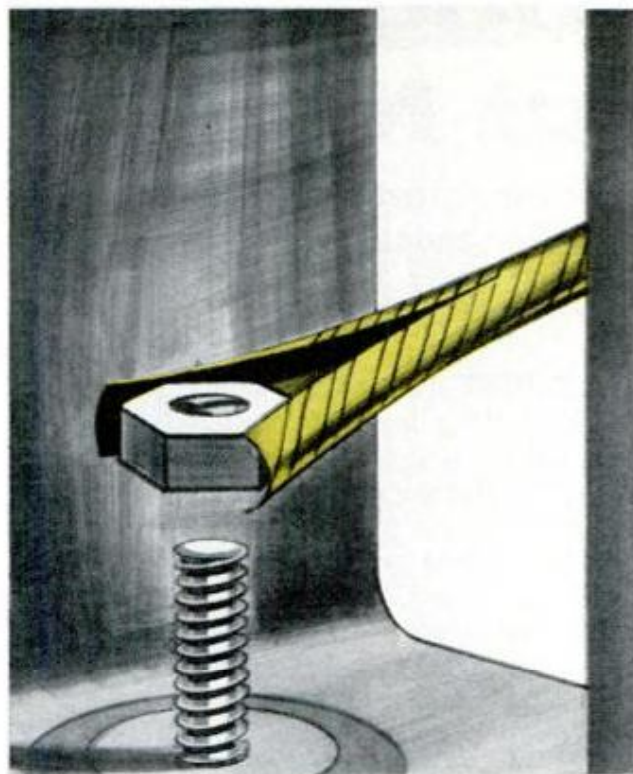
STOP SCATTERED GARBAGE by dogproofing the cover of your refuse can. To do this, simply pass a screen-door spring through the handle and attach a wire hook at each end with cord.—Joseph W. Gorrell



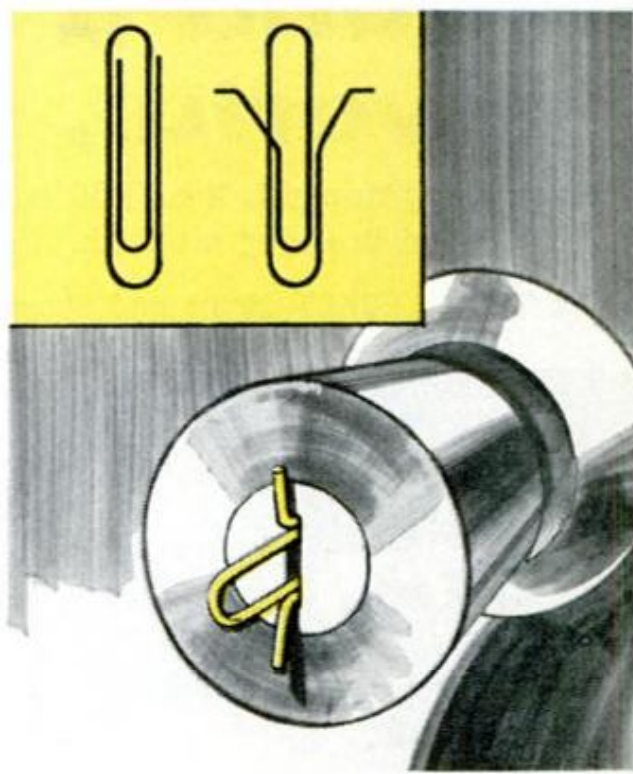
ELIMINATE CLANKING PIPES by using a short, split section of garden hose as a cushion between the pipe and each pipe strap. You'll find that this procedure will stop both side and end play.—Albert T. Pippi

HOME PROBLEMS

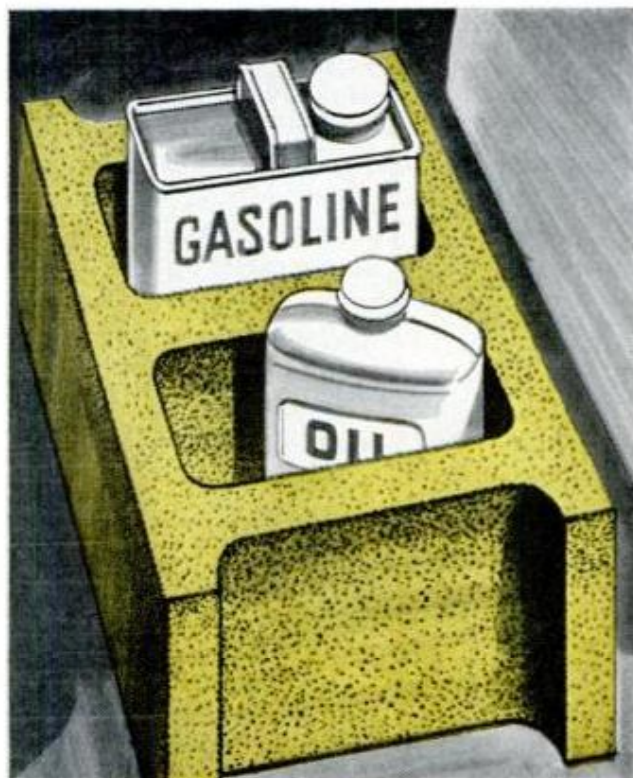
Illustrations by Adolph Brotman, Worman Associates



HARD-TO-PLACE NUTS AND SCREWS can be carried to position and then started through the use of an ordinary sipping straw. Just slit one end to hold the part snugly until threads are caught.—R. T. Stewart



WHEN A CHILD LOCKS HIMSELF in the bathroom and can't remember how to unlock the door, don't panic. A bent paper clip will operate the lock from outside in absence of the emergency key.—Mike McNeilly



GASOLINE CANS and other vertical containers that are usually stashed in an automobile trunk won't tip over and leak if you park them in a concrete block. Use a 12-in.-size block for a gas can.—P. E. Fiechter



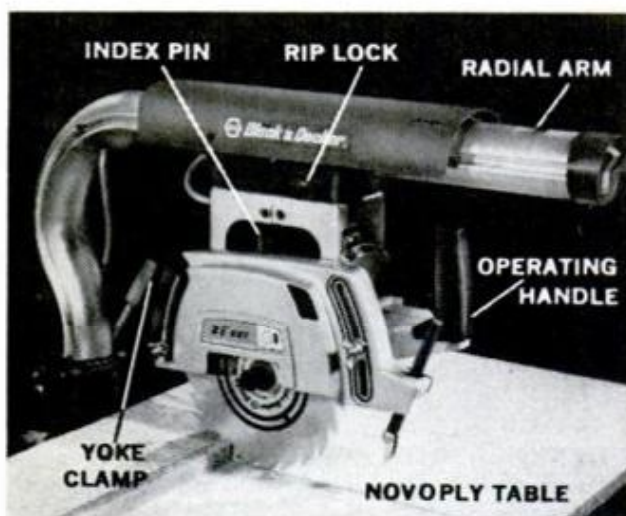
A DROP AT A TIME can be dispensed from a plastic bottle if you back off the top slightly and drill a hole through both cap and bottle. To use, line up holes; to close opening, tighten the cap.—Joseph Braunstein

Black & Decker's new low-cost radial:

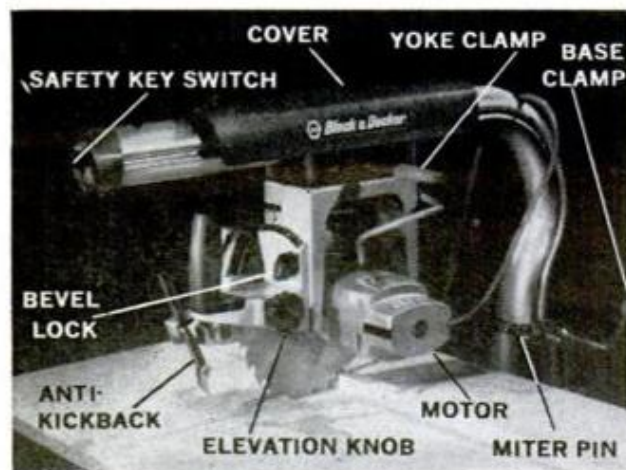
I Found It Rugged, Powerful, but Noisy

A 58-pound lightweight, the 7700 is a saw the carpenter can tote to the job without breaking his back. It produces 'sandpaper-smooth' cut

By WAYNE C. LECKEY, Home and Shop Editor



CONTROLS, as well as major parts of machine are shown and identified here. Table rests on steel frame



I'VE JUST ASSEMBLED and put Black & Decker's new \$99.95 radial-arm saw through its paces and, believe me, it's a honey for the money.

I found it has just one fault—it's overly noisy. Its blade spins at a top speed of 5200 rpm, which is 1750 rpm faster than conventional saws. And while this extra speed adds more cutting power, the two-hp, ball-bearing universal motor produces a whine that can be ear-splitting in a small home shop. For on-the-job contracting, that wouldn't mean a thing.

Unique in design, this low-cost beauty performs all the basic cuts in woodworking with accuracy and smoothness. It will crosscut, rip, miter, bevel-miter, bevel-rip, dado and plough. Its 8-in. blade cuts to a depth of 2 $\frac{7}{8}$ in. and crosscuts a 1-in. board up to 10 $\frac{1}{2}$ in. wide.

The machine has all the safety features of its deluxe big brothers—antikickback protection, blade guard and key-controlled switch. The one thing it doesn't have is a sawdust discharge spout.

The tool is a unique piece of engineering, from its sturdy one-piece extruded arm to its clever depth-of-cut adjustment. The conventional arm-raising-and-lowering crank found on most radial saws has given way to a rack-and-pinion adjust-

SPECIFICATIONS

Motor	120-v. universal	Spindle dado capacity—width	13/16 in.
No-load rpm	5200	Ripping capacity—width	19 $\frac{1}{2}$ in.
Rated amps.	10	Bevel adjustment	0 to 45°
Max. hp	2	Miter locating pin	0 to 45° R or L
Max. watts output	1680	Scales	Bevel, miter
Standard guard	8 in.	Column diameter	2 $\frac{1}{2}$ in.
Standard blade	8 in.	Worktable size (Novoply)	22 x 32 in.
Arbor size	5/8 x 15/16 in. long	Machine height	19-3/8 in.
Max. depth of cut	2-7/8 in.	Machine width	32 in.
Max. depth of cut at 45° bevel	1-7/8 in.	Machine depth	28-13/16 in.
Crosscut capacity	10 $\frac{1}{2}$ in.	Net weight	58 lbs.

SAFETY-GUARD EXTENSION COVER offers maximum protection at rear of blade. Wingnut permits setting to clear work



ment. Here the motor and blade are raised and lowered by an elevation knob that's located on the saw assembly itself. With your right hand on the knob you loosen the locking wingnut and turn the knob back or forward to regulate the depth of cut. The nut locks the setting.

The saw comes knocked down in nine basic parts, along with a bag of bolts and an exceptionally clear book of instructions.

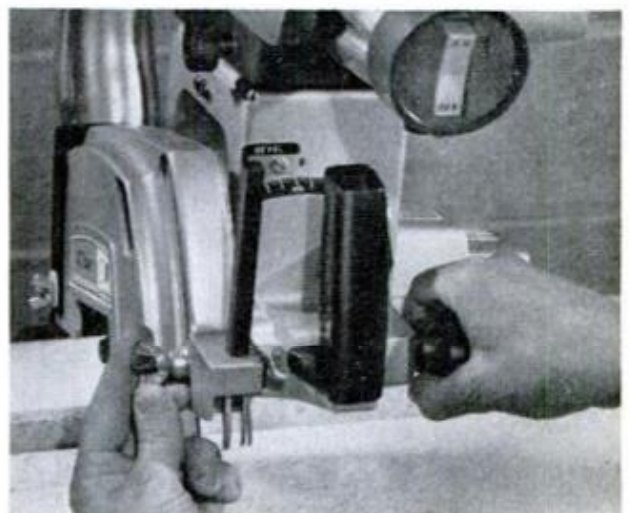
You can see this precision tool at your local B&D dealer. For more information write Black & Decker Mfg. Co., Towson, Md. 21204. ★★ ★



TO ROTATE SAW in switching from crosscut to rip and back again, you depress index pin with finger

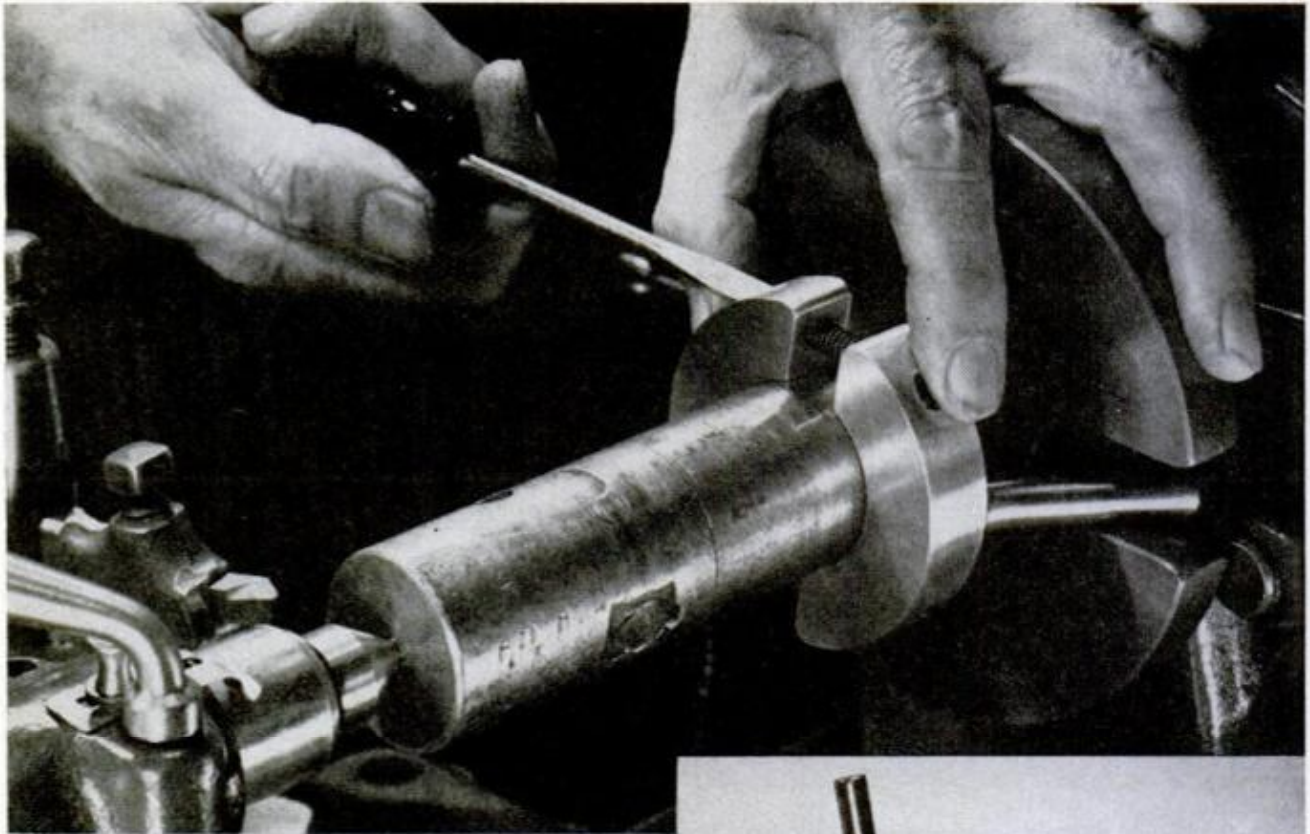


TO SWING SAW for mitering, you release clamp handle, pull miter pin and move arm to suit desired angle



SAW RATHER THAN ARM raises and lowers as you turn knob with right hand after loosening wingnut

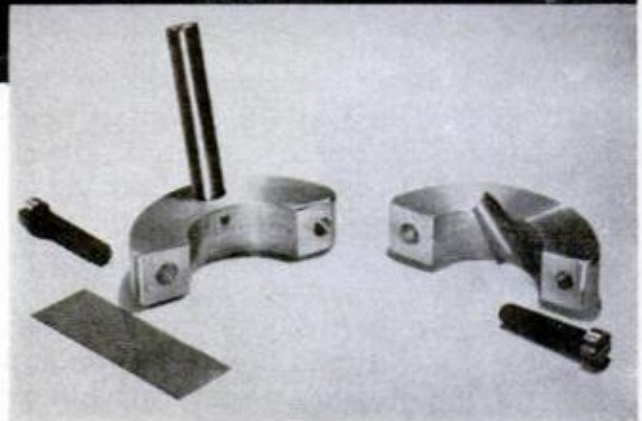
MAKE THIS SPLIT-RING LATHE DOG



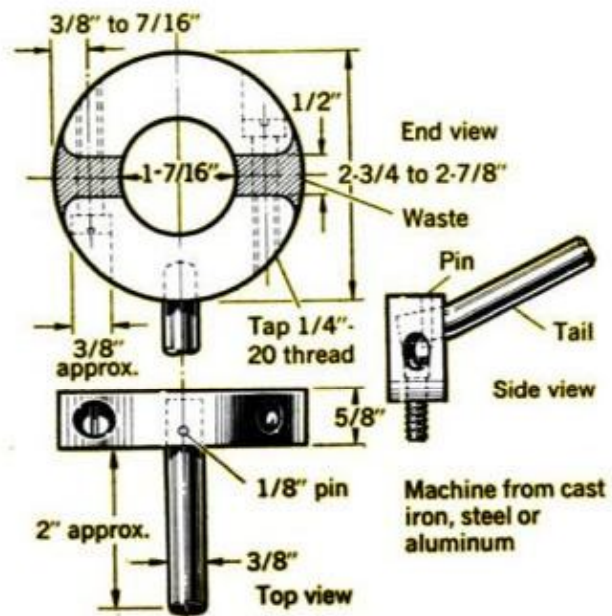
THIS SPLIT-RING lathe dog utilizes the gripping power of two concave surfaces—drawn toward one another by two cap-screws—to hold a workpiece without marring. Although the split ring could be of steel or cast iron, I used aluminum because it is easy to machine.

The dimensions given provide a work-diameter range of about $1\frac{5}{16}$ to $1\frac{1}{2}$ in. By using longer bolts or shims you can stretch these limits even further. Several such dogs, made up in sizes to cover a considerable range of workpiece diameters, are sure to make a useful addition to the conventional types of lathe dogs you already may have.

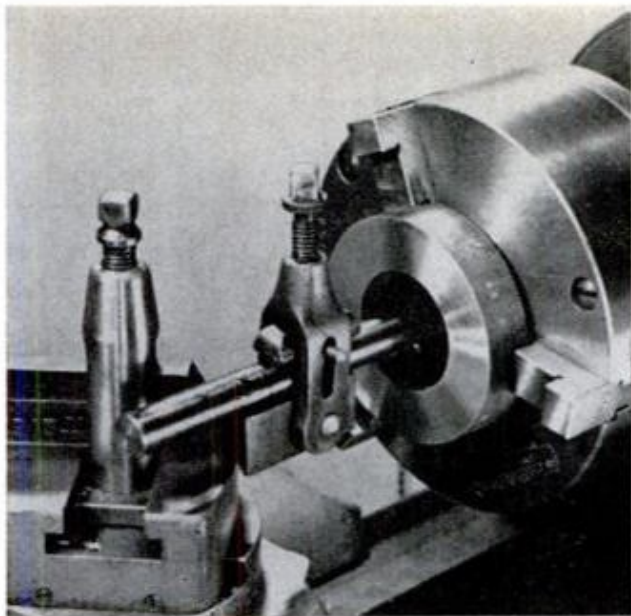
To make the split-ring dog, cut the blank from aluminum, mount it in a chuck and surface both faces. Then drill a $\frac{3}{4}$ -in. centerhole and bore to a $1\frac{7}{16}$ -in. diameter. Next rechunk the piece so the jaws grip the i.d. of the work and machine the rim smooth. The two clamping-bolt holes are blanked-in with a No. 7 bit and counter-bored with an end mill to bring the bolt heads below the ring's surface. The tail of the dog is a $\frac{3}{8}$ -in. steel rod (projecting 2 in.), which engages the faceplate slot. Install the dog so that the clamping screws, in normal forward rotation, travel head-



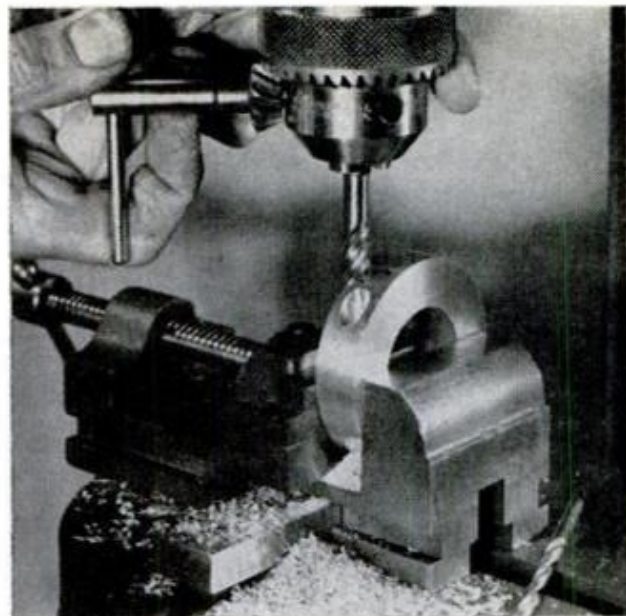
PLASTIC TAPE, shown partly applied to dog segment (right, above), protects the workpiece from marring



Machine from cast iron, steel or aluminum



RING-SHAPED BODY BLANK is set up on the lathe as shown above for boring the ring's inside diameter



END MILL is preferable for counterboring clamp- ing screw holes because of the sloping hole edges

first; otherwise a screw tip could form a hazardous hook.

To cushion the concave surfaces of the segments, strips of self-adhering plastic tape, ordinary friction tape, or other thin material can be applied. Trials will indi-

cate whether a particular lining material has a tendency to creep under heavy or prolonged torque action. By making the screws tight, much can be done to eliminate any creep that might exist.

—Walter E. Burton

Emergency file handle

To protect your hands from the sharp point of a file tang, simply screw on a solderless wire connector (type used in electrical work). They're available in a wide range of sizes.—W. G. Greenwood

Repel insects when painting

If you plan to paint your house with oil-base paint during the hot months, part of the job is to keep bugs out of the wet paint. Just add two tablespoonfuls of citronella oil to the gallon.—L. Rueff

NEXT MONTH IN SHOP AND CRAFTS

IS THIS THE WORLD'S BEST WORKSHOP? When photos of this fabulous workshop were first brought to our attention, we could hardly believe what we saw—a shop that appeared to have everything that a woodworker dreams about. To confirm that it was for real, we sent Workshop Editor Harry Wicks to Minneapolis. You'll learn what he found in June *PM*.

FOUR WAYS TO HIDE TRASH CANS. What can be done to hide the cluster of trash cans in the back yard? Since that's a frequent query from *PM* readers we commissioned designer Gerald Geerlings, A.I.A., to create four out-of-the-ordinary enclosures to shield this eyesore from view. There's sure to be one that will blend with the architectural style of your home. You'll find them in the June issue of *PM*.

FIVE WEEKEND WORKSHOP PROJECTS. Each of these useful items can be built over a single weekend and, for the most part, scraps lying about your shop will probably fill the bill for materials. Pick up the June *PM* and get complete plans for building a wheelbarrow planter, pipe rack, wall caddy, chairside table and electric shoeshine stand.

DECKS YOU CAN BUILD. With summer close at hand, thoughts turn to outdoor living—cookouts, parties and just plain sitting and relaxing. Here's a roundup of the latest design ideas for insuring maximum outdoor comfort while investing minimum effort. You'll find the ideas in *PM* next month.

You Can Improve Your Lathe Work With Indicators

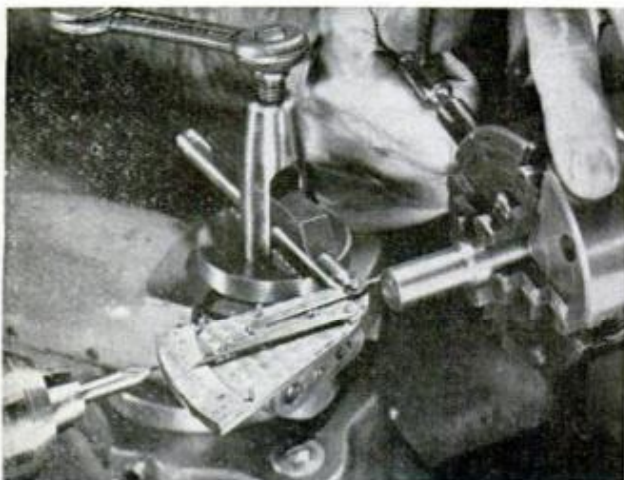
By WALTER E. BURTON

A TEST INDICATOR not only greatly improves lathe accuracy, but frequently saves you time to boot. This versatile instrument, which measures or compares movement and dimensions in thousandths of an inch (or as little as 0.0005 in.), can be used to check tapers, help center work on a faceplate, determine the degree of trueness of centers, help position holes accurately and let you know quickly whether chucked work runs true.

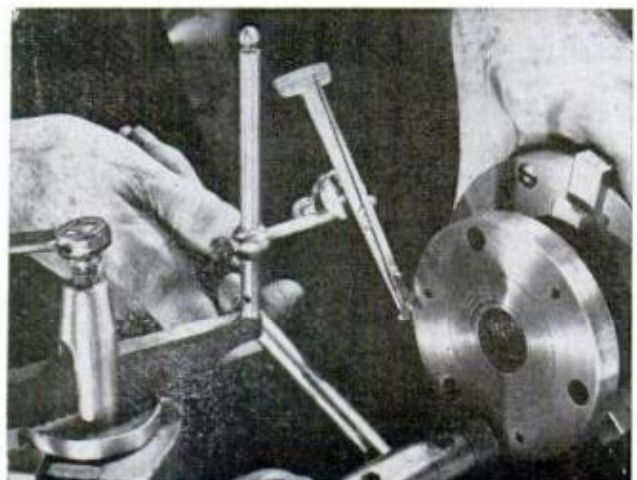
There are two general indicator types of interest to a lathe user. One consists of a

system of levers that terminates in a pointer which moves over a rather short, curved scale having a total range of perhaps 0.030 in. This is often called a universal test indicator or universal indicator. The second type has a gear system that moves a pointer around a circular scale; appropriately it is called a dial indicator. A well-made dial indicator is likely to be more sensitive than the simpler, usually less costly, lever type. Dial indicators sell for \$20 and up.

A lathe test indicator is generally

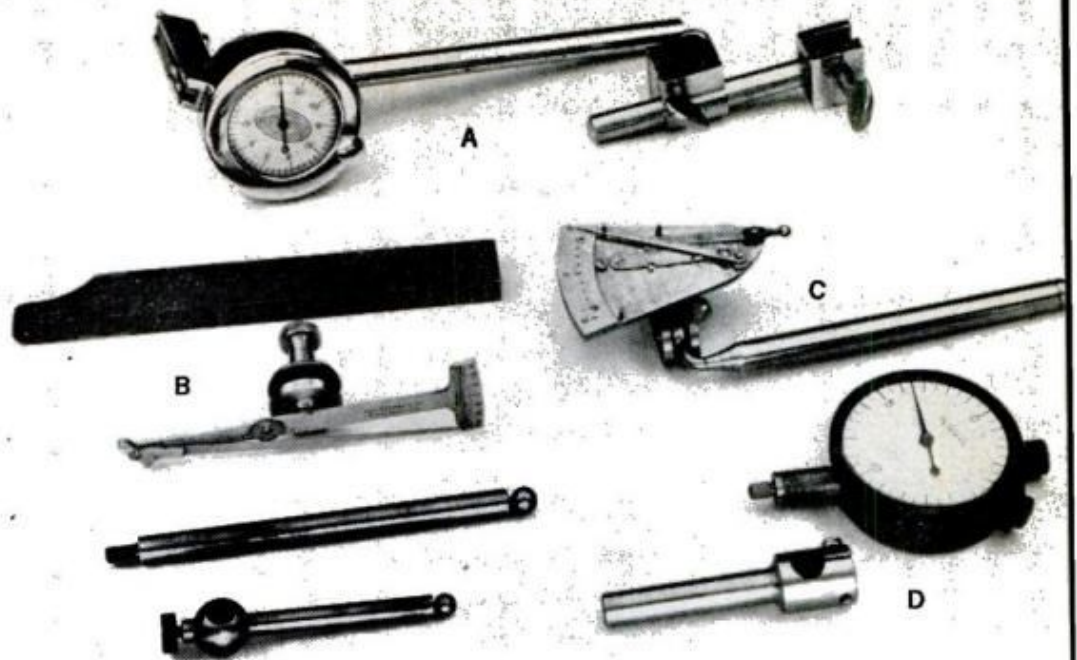


CENTERING TURNED PIECE in four-jaw chuck before drilling. Indicator point engages the circumference



ADJUSTING CHUCK PLATE before making face cut. If hammer blows must be struck, move the indicator

TYPICAL INDICATORS at right, accumulated over the years in a home workshop, include: A. dial indicator, B. Starrett's test indicator and its three-piece stand, C. shop-made indicator and D. Federal dial indicator. Most hardware stores and retail power-tool outlets stock a variety of these indicators; several mail-order sources are listed at end of the text

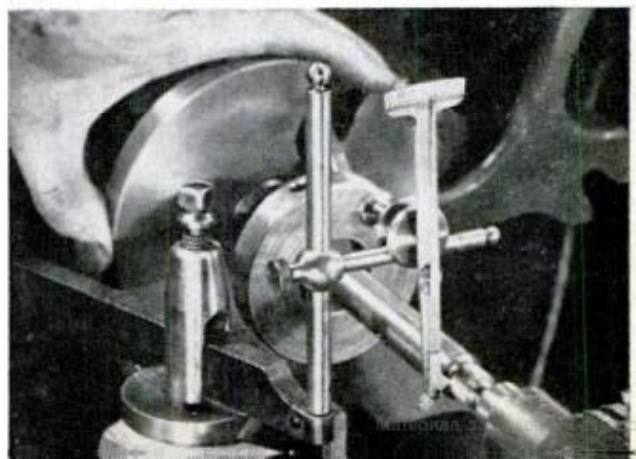
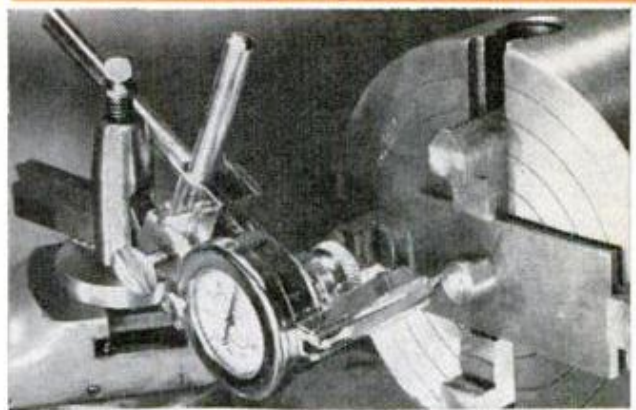
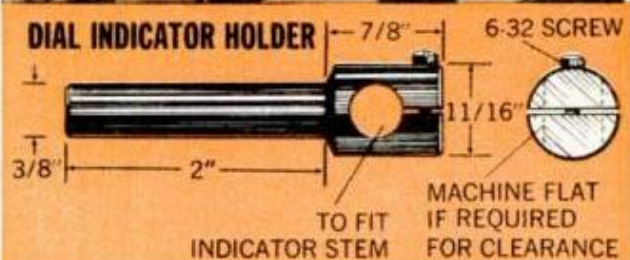
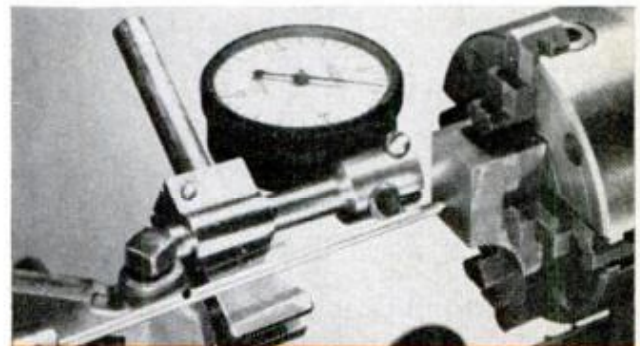


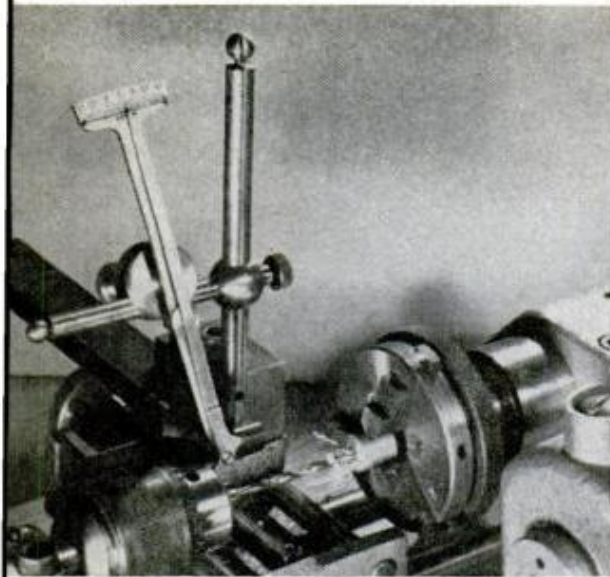
mounted firmly on the top slide or other part so its sensitive contact point (feeler) presses against the surface to be checked for roundness, movement, taper or other quality. Various combinations of bars, shafts, swivels and clamps, which can often be shop-made, position the indicator. Available attachments can adapt indicators for easy measuring of holes, checking internal surfaces, and measuring at a 90° angle to the indicator spindle. Some manufacturers offer contact points in quite a variety of shapes.

A dial-indicator stem (typically of 3/8-in. diameter) is the portion through which the movable spindle operates, and which provides a means to mount the instrument. You can make holders to fit your needs. For example, the short rod near D in the photo above was machined from a steel bar to fit the 3/8-in. hole in the clamping sleeve that came with the indicator in the background. The large end was drilled to accept the 3/8-in. indicator stem, slotted and provided with a 6-32 clamping screw.

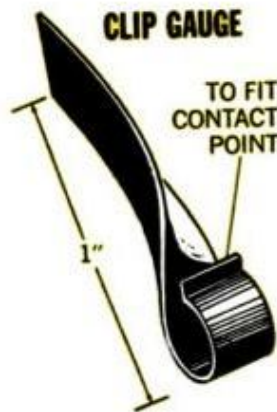
Indicators should be handled with about the same care you give your watch. Protect them against dropping, bumps, excessive dust and other foreign material; dust seals are available for some models. When the contact point of an indicator slides over a surface, as in testing the trueness

DIAL INDICATOR contact point (right, above) presses against flexible shaft whose tip engages punch mark that is being centered. Dial indicators are sensitive, show slightest side movement of rod. Indicator holder (sketch) is shop-made, does job adequately. Lower photos show toolmaker's button being centered and circular saw arbor tested for trueness





INDICATOR FEELER is used to test for depth of hole. O indicates the stopping point



TO MEASURE FOR THICKNESS, contact point is equipped with a shop-made retractor clip made of tin-can material



of a cylindrical piece in a chuck, be sure that surface is clean. A very thin oil film will contribute to smoother sliding and help reduce point wear. When testing work where lathe-spindle movement is involved, the spindle customarily is rotated by hand.

In some applications of an indicator to lathe operation, it is not necessary to determine how much a dimension varies or something moves, unless the point of minimum movement or variation has been reached. Thus, when centering cylindrical work in an independent-jaw check, the piece is shifted until the indicator pointer stands still or shows movement within acceptable limits. In other applications, the indicator scale is used to determine how much a movement or dimension varies. For example, when measuring a taper between centers, the indicator is used to show radius changes at points 1 in. apart.

Other ways you can use indicators to improve accuracy or save time:

- *Centering work in an independent-jaw chuck.* The work generally is either a piece machined to a reasonably true cylinder, or has several points that can be positioned on the same circle. Mount the indicator on a toolpost or fasten it to the top slide (as with a magnetic base). Position the contact point to bear against the important circumference—outside or inside. Rotate the chuck by hand and note run-out before you actually touch the indicator to the work. Adjust the chuck jaws so that run-out seems to be within limits of the indicator's contact-point movement.

Then bring the point against the work until it touches the high spots but not necessarily the low ones. Rotate the workpiece slowly and note the pointer movement; take care not to jam the work so tightly against the indicator that the instrument may be damaged. Adjust the chuck jaws until the indicator shows little or no run-out.

When some work, such as a ring of rather thin section, is in a chuck, jaw pressure tends to distort it. Then the indicator might show four high spots where the jaws engage it. It might also show other spots where jaw pressure affected previous machining. When centering such work with the aid of an indicator, avoid excessive jaw pressure.

- *Chucking work for drilling of center holes.* Sometimes a piece that has been machined in a chuck or is otherwise reasonably uniform is to be provided with center holes. Simply use a test indicator to determine when, by adjustment of chuck jaws, the outside surface is running true. Then use a center drill in a tailstock chuck. If necessary, first face off the end of the piece so the drill won't be deflected. The indicator can also help you center an existing hole for reboring or reaming.

- *Aligning chucked work for facing.* Clamp the piece lightly, mount the indicator so its contact point bears against the surface to be machined, and use a soft hammer to tap the piece until this surface shows reasonably true rotation. Tighten the jaws. Retest to determine whether

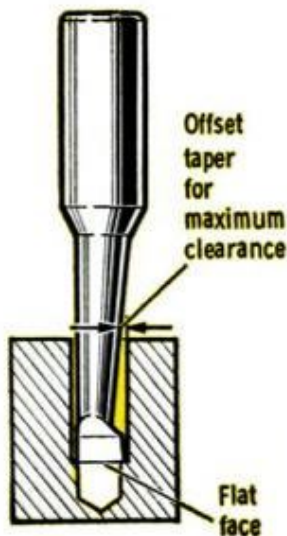
(Please turn to page 188)

New tools you should know about



Durable roof brush

All roof coatings can be applied with its No. 4515 roof brush, claims Wright-Bernet, Inc., 1524 Bender Ave., Hamilton, Ohio. About \$2.50.



Boring bars with longer tool life

High-speed boring bars made in five sizes by Enco Manufacturing Co., 4520 W. Fullerton, Chicago, Ill. 60639, have carbide tips, are claimed to last up to twice as long as conventional bars. Half-inchers shown, \$59.



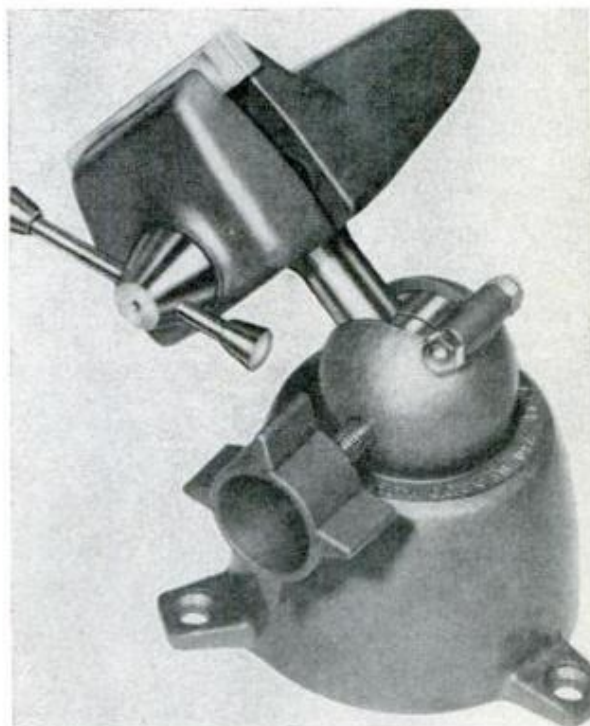
Sander hugs the work

Low center-of-gravity design of Black & Decker's professional belt sander No. 836 eliminates tilt-gouge action found in high-profile tools. At builder supply houses, \$60.



Tool removes sheared-off screws

Broken screws, bolts and studs are easily removed with these extractors. Simply drill hole in buried screw and pound correct-size extractor into hole. Flutes grip stud as extractor is turned with wrench. Set 70007, \$6.50, Vaco Products, 510 N. Dearborn, Chicago, Ill.



Workholder tilts and rotates

This workholder features a vise-head that turns a full-circle within the $\frac{5}{8}$ -in. throat of locking unit in base. Dubbed PanaVise, it also tilts vise jaw 90° either way. Model 301, \$19, is made by Colbert Industries, 10107 Adella Ave., South Gate, Calif. 90280.

The Forgotten Handtools:

Cabinetmaker Scrapers

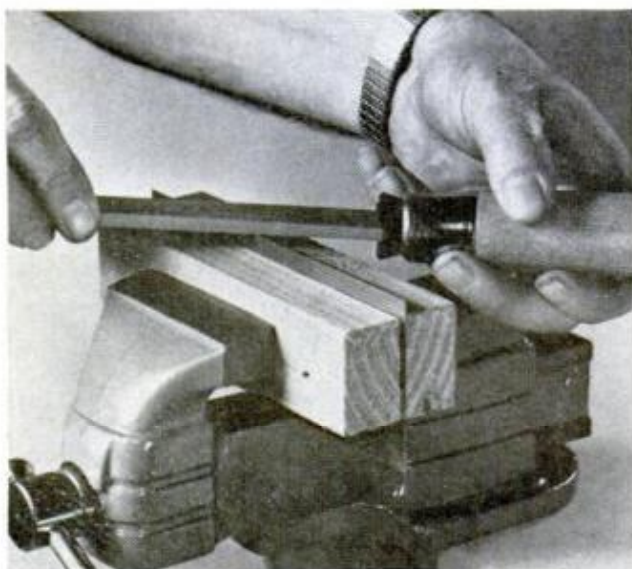
By JOHN BURROUGHS

BEFORE SANDPAPER became widely available, the scraper was one of the cabinetmaker's more important tools. It was used primarily to smooth off blade marks left by hand-planing. Today, since most woodwork is now machine-cut and power-sanded, the scraper, unfortunately, has fallen into near oblivion.

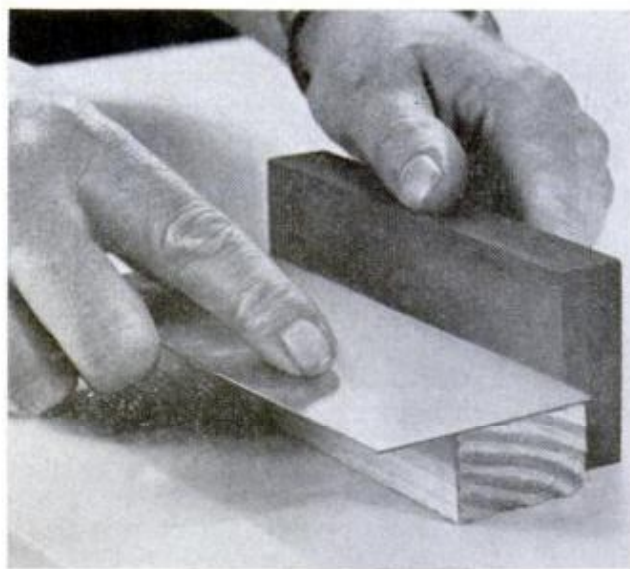
But not complete oblivion, for there are some jobs that scraping does better than sanding. Scraping is preferable, for example, if the surface you're smoothing isn't all of equal hardness—such as when

you're finishing glue-joints flush or finishing repairs made with wood filler. Carefully scraped hardwood acquires a smooth gleam that's hard (if not impossible) to match with sanding. Scraping is sometimes the fastest, cleanest way to remove old paint or varnish from furniture you plan to refinish.

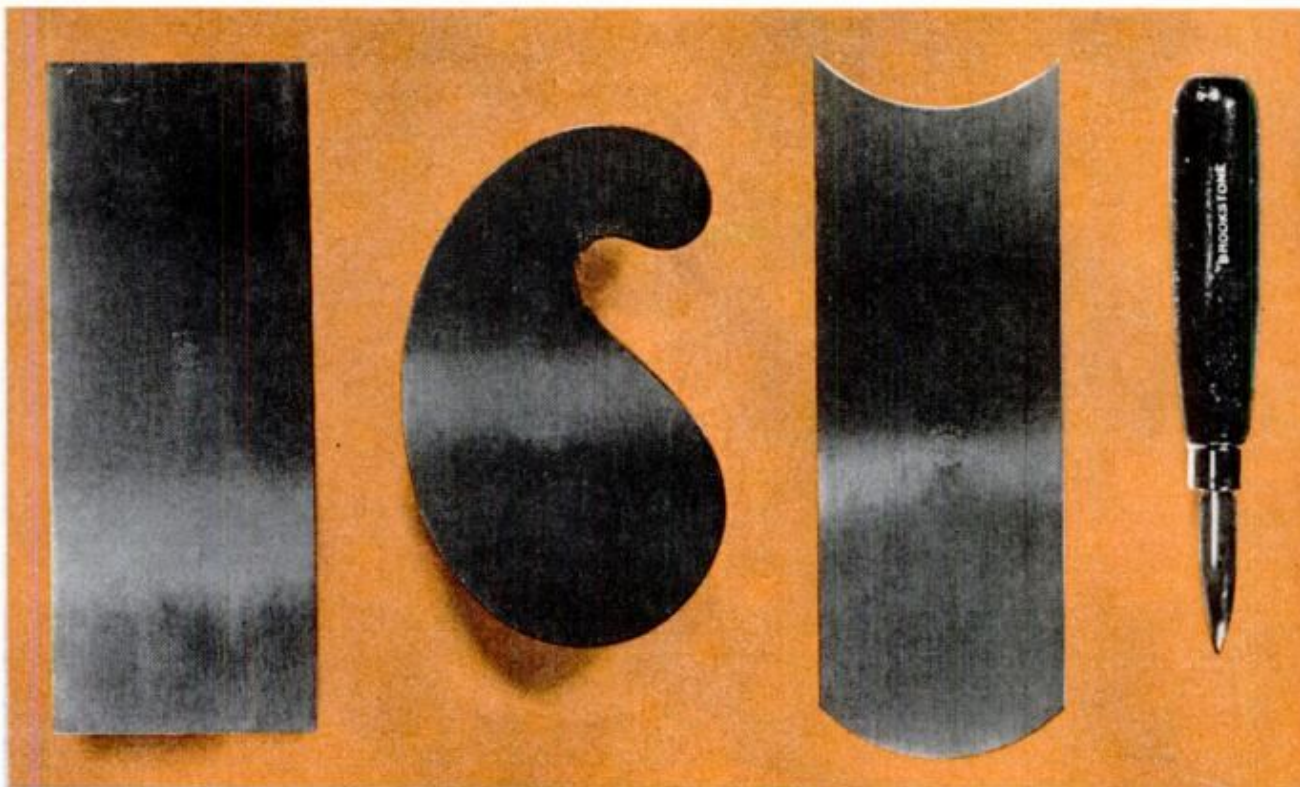
The scraper itself is simply a thin spring-tempered steel blade having either a straight or curved edge. (The rectangular scraper measures 2¼x6 in.). The edge is first filed and oilstoned perfectly



UNFINISHED EDGES of new scraper are draw-filed with single-cut file to prepare blade for sharpening



TO TRUE THE EDGE, slide the scraper back and forth on a wood block against an oilstone set on edge



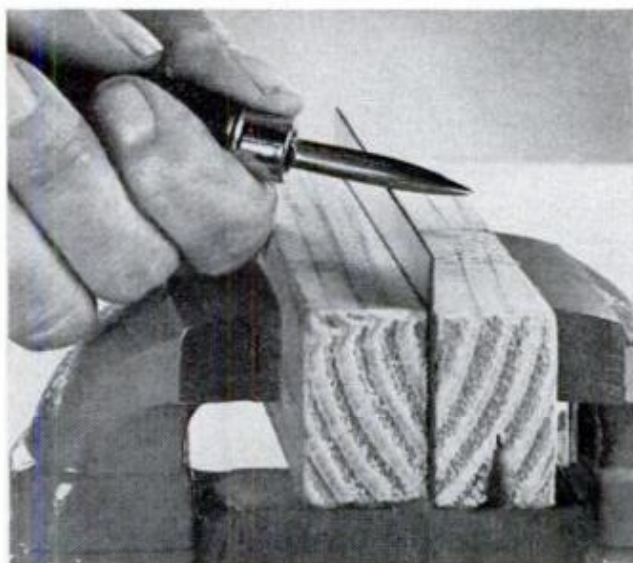
SET OF THREE cabinet scrapers, plus burnishing tool, sells for less than \$5. Text tells where to buy it. Complete instructions for using the burnisher (far right in photo) are furnished with the tools

square. It is then "turned" with a burnisher—burnished over to form a hooked cutting edge. The burnisher, which is file-hard steel polished glass-smooth, is stroked several times with firm pressure along the square edge of the scraper at gradually increased angles until it has a turned-over sharp, even burr.

While a scraper can be pulled toward you, experienced cabinetmakers, when scraping a flat surface, ordinarily push the tool. The blade is grasped with both hands and sprung into a shallow arc with the thumbs. Then it's tilted forward until the

cutting edge cuts and it is canted slightly for shearing action. Scraping with the grain of the wood leaves the smoothest finish; scraping across the grain at an angle removes wood more rapidly. The scraper's cutting edge can be reformed with the burnisher several times before re-oilstoning is necessary.

The set of three alloy-steel scrapers, pictured together with the burnisher, is available by mail from the Brookstone Co., 10924 River Rd., Worthington, Mass. 01098 for \$4.60 plus 70 cents mailing charge. ★★★



TO "TURN" SCRAPER'S EDGE, burnisher is stroked at angle with pressure to burnish hooked cutting edge

MAY 1970



FRENCH-CURVE SCRAPER does a great job of removing paint or varnish from furniture to be refinished

181

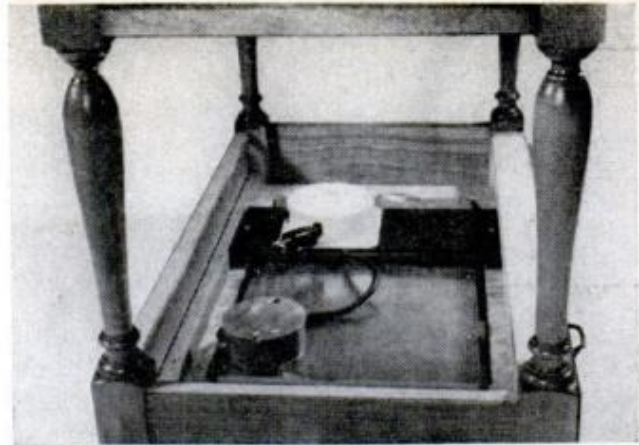
ELECTRIC SERVING CART

(Continued from page 121)

shelf for the Salton warming tray (Detail A, page 121). It consists of a $\frac{3}{4}$ -in. fir-plywood panel with a hole in it to fit the flanged tray. Two $\frac{3}{4}$ -in.-square cleats are glued to the front and back edges, and two $\frac{3}{4} \times 1\frac{3}{4}$ -in. members are glued on edge at the ends. (Here it's wise to check the $14\frac{13}{16}$ -in. dimension against the actual inside width of the cart.)

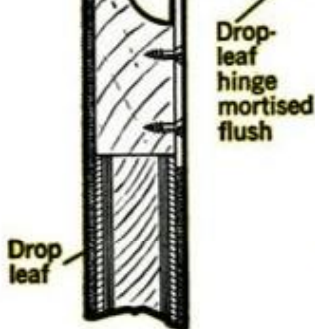
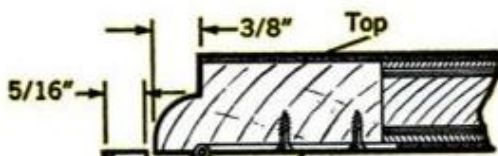
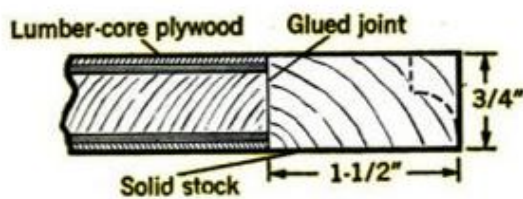
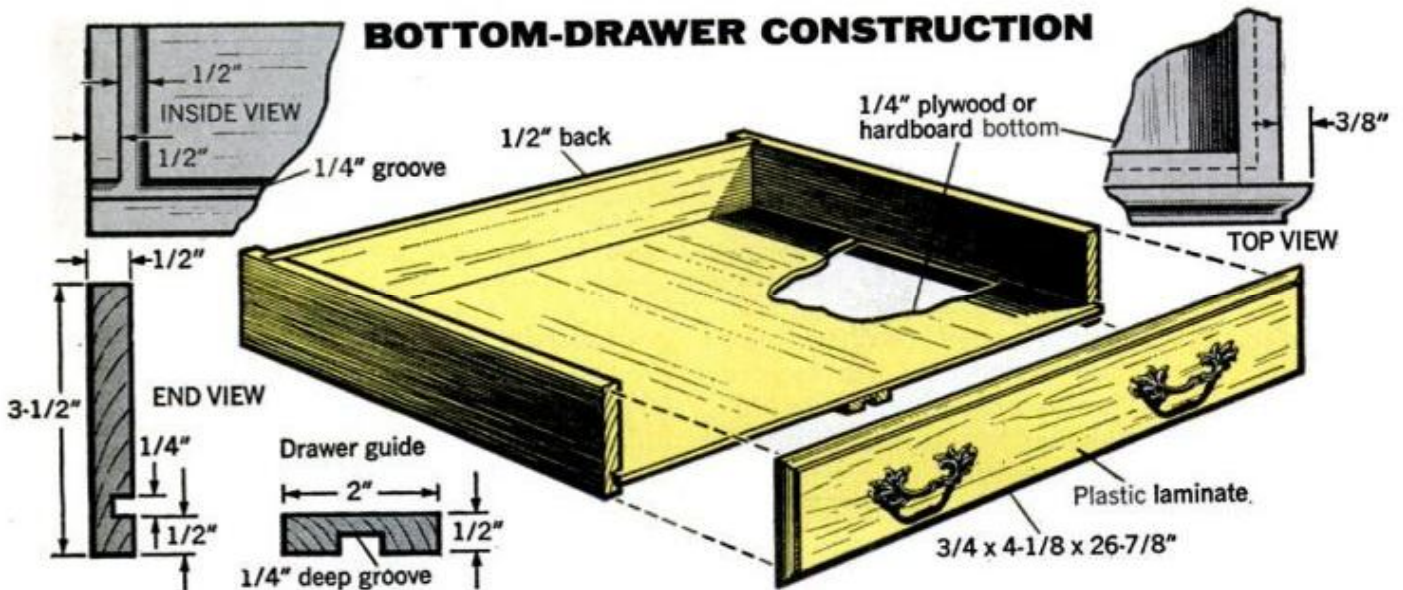
Since the tray shelf is also faced with laminate, it's easier to cover it before it's installed. We covered the shelf top and inside surfaces of the ends with yellow

(Please turn to page 184)

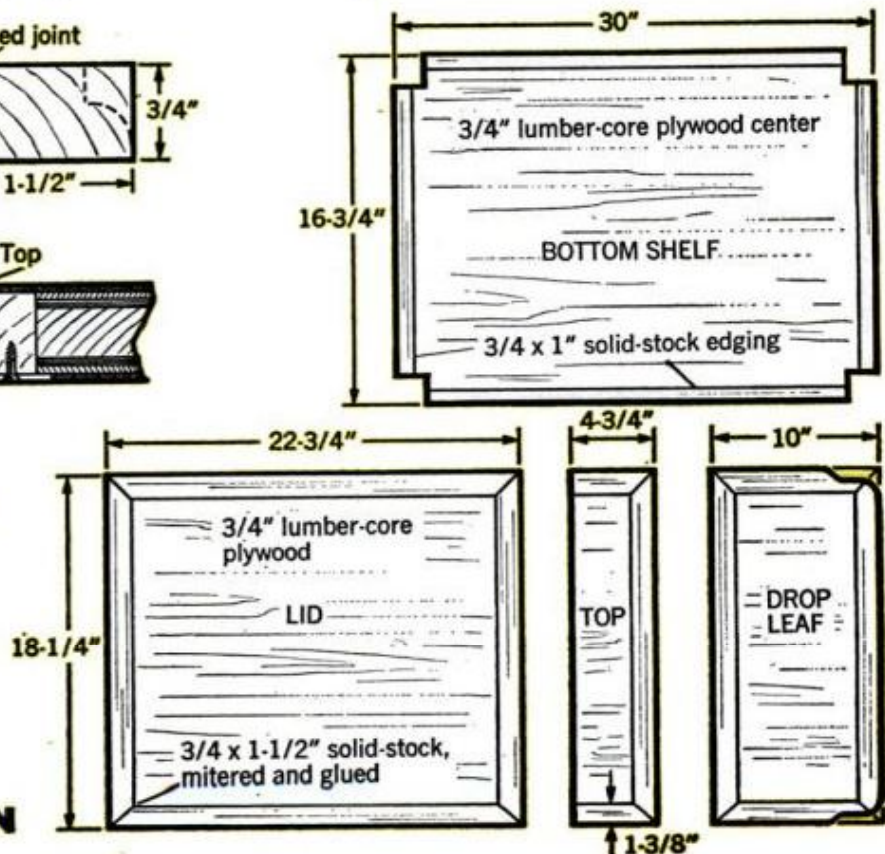


RETRACTABLE REEL, which holds 6 ft. of electric cord, is wired to junction box that comes with tray

BOTTOM-DRAWER CONSTRUCTION



LID AND LEAF CONSTRUCTION



That's a comment made by one off-road magazine editor. And what he's talking about is the new SCOUT® 800A ... the vehicle that's drawing enthusiastic response from off-road editors everywhere.

Here's why:

More Under The Hood. A SCOUT's new 304 cu. in. V-8 churns out 193 horsepower ... and brings the hilliest horizons closer than ever before. And in independent tests, the SCOUT 800A beat the wheels off of every competitor in mileage runs — in spite of all that new muscle.

More Behind The Engine. There's a shifttable 3-speed automatic. So you can use it like a manual ... or notch it into "Drive" and get the advantages automatically. Greater torque multiplication, smoother take-offs, better towability and gas mileage make this transmission the one that's getting more popular every day.

For an all-wheel drive, there's a single-lever transfer case. So you get out and going faster than ever. Easier, too.

More Underneath. Front axle rating for the big V-8 is a burly 2500 lbs. And that's attached to a frame bred from INTERNATIONAL's big trucks. There's an improved rear suspension that lets you plow through the rough without getting roughed.

There's more. As another editor said, "... has to be reported as even

better than the best SCOUT ever built." If you won't take their word for it, see for yourself. Your INTERNATIONAL® dealer has a test drive waiting.



The Scout®

**"If you haven't driven it since its early four-banger days...
you won't believe it's the same rig!"**



INTERNATIONAL HARVESTER COMPANY
CHICAGO, ILLINOIS 60611

The rule

New! extra-long 20-ft Stanley Powerlock® • lightweight • non slip lock, power return • 3/4" x 20' blade clad in Mylar® • about \$6.98

STANLEY
helps you do things right

P.S. Made by the same Stanley that makes the finest power tools

ELECTRIC SERVING CART

(Continued from page 182)

laminate. After installing it, we added 1 3/4-in.-wide strips of the laminate to exposed parts of the aprons. The 1/2 x 5-in. crossmember, screwed to the shelf cleats, supports the self-winding cord reel.

To make the bottom shelf, glue 3/4 x 1-in. strips of cherry to the edges of a plywood center panel, notch the corners for legs and cover the top with laminate. Attach the completed shelf to the cart with screws through cleats glued to the end aprons. (Study section B-B.)

Make the lid, top and drop-leaf parts essentially the same way, but make the edge pieces 1 1/2 in. wide and miter the corners. Note that the narrow top sections are banded only on three edges. Both top and bottom surfaces of the five top parts are covered with laminate, then the edges are shaped. Use a standard drop-leaf cutter and its mate to shape the hinged edges. The other edges can be shaped with less of a shoulder or even with a different-shaped cutter. Mortise the drop-leaf table hinges flush with the laminate. Be sure the barrels of the hinges are centered exactly on the shoulder of the shaped edge.

Attach the narrow top sections to the

cart with cleats and screws from below and let them overhang the ends 1 3/8 in. The lid should fit between the two with 1/16-in. clearance at each side. It's hinged at the back with a piano hinge mortised flush with the laminate. The lid should overhang front and back 3/4 in. Adding an adjustable support like the one shown completes the lid. Fit the drop leaves with surface-mounted, spring-loaded brackets.

The drawers complete the job. The two upper ones are dummies, of course; they're actually made and attached before laminate is applied to the inside of the tray shelf. The fronts are pieces of cherry, rabbeted around the back, faced with laminate and shaped. Attach the pulls before you screw the fronts in place.

Make the front of the bottom drawer as just described, and the rest is typical drawer assembly (see construction details, page 182). Attach a grooved guide to the bottom to ride on a rail screwed to the front crossrail and to a cleat added to the back apron. Note in section B-B (page 121) how drawer rubrails are nailed to the end aprons.

Wire the plug-in Acopian cord reel to a junction box mounted on the tray bottom. Use wire suited for 167° F., and be sure the tray is properly grounded. ★★★

WHY WINNEBAGO IS NO. 1

(Continued from page 125)

can be a problem for motor homes; you must learn to live with them. In this respect I found the Winnebago no better or worse than other motor homes I have driven. Headwinds at turnpike speeds make for conspicuous gas consumption. Holding 70 mph all day against a stiff Kansas breeze, we got only 4.4 mpg. At a steady 50, with little or no wind we registered a 7.1 average.

The eyes of the driver—and co-pilot—of a Winnebago are 6 feet 10 inches above the road. From this vantage point you can see over the roofs of cars ahead. You can spot trouble ahead and anticipate your moves. Because the view is great, it makes even traffic jams bearable. But rear visibility depends on side mirrors. On multilane expressways, where drivers overtake you in the right lane, cars can be lost in the blind spot between your right rear bumper and the mirror. This is the only visibility fault of the Winnebago. It could be easily remedied with the addition of a convex wide-angle mirror to give "panoramic" rear vision.

A weekend stopover with relatives pointed up another advantage of the mo-

tor home: People are glad to see you when you bring your own guest room. At this time we took inventory of the toll a year's hard use had taken of the vehicle. All appliances were in good working order with the exception of a leaking broiler connection. Plastic countertops, paneling, cushions, drapes and upholstery were still like new; maintaining a neat home was easy. A screen at the driver's window needed replacement. A small leak had developed at a union near the toilet bowl. It needed tightening. The engine needed a new alternator belt and a tune-up. Taking into account all the equipment aboard, the Winnebago passed her one-year, hard-use test better than most homes I've owned.

Who can afford a \$9000 motor home? A lot of retired people apparently. Father-son partnerships let Dad winter in the South and give the young family a summer home. Five to 10-year financing is common.

The motor home is fast becoming the equivalent of the vacation home, but there is a difference. Owners find that a motor home is the only vacation cottage that gives you a complete change of scenery and really lets you get away—from uninvited weekend guests. ★★★

and new pal

Utility pull-push
tape rule 6' model,
about \$1.45

Utility tape rules come in
6', 8', 10' and 12' lengths
with replaceable blades

Lifeguard™ blade
clad in Mylar® resists
oil, acid, abrasion

Simulated leather
case of extra strong
Cyclac®

Lightweight taper
design fits palm
or pocket

STANLEY
helps you do things right

\$30,000 BEHIND THE WHEEL

(Continued from page 82)

next. "After expenses I cleared about \$6300," he said. But he did buy a better tractor so the company gave him a bigger van. His seniority began to help. He got more and better assignments. Result: in his third year his gross jumped to \$40,000. After expenses he cleared about \$18,000, of which \$3000 went toward a new gas tractor.

We were pulling into old Santa Fe, N.M. I spotted a good motel. "Where will you go?" I asked Selman. He patted the curtains.

"Here's my home," he said. "Not many motels like trucks because we break up driveways, so I use my bunk." (It also saves him \$10-\$20 a night.)

The big van headed down the road toward a bright new truck stop where it would be checked while he slept. It was his 19th night away from home this trip.

Any good job has its disadvantages, too. Selman's is no exception. One price he

"I try to make Monday deliveries and keep busy on weekends . . ."

must pay is loneliness—long stretches away from his wife, Margie Ann. Another is a fantastic amount of paper work. He's always buried in receipts and record-keeping. Luckily, Margie helps with this at home.

Next morning we were whistling toward California. Selman whooped, "Isn't that great? Look at all those mountains!"

The whole bright morning was rushing toward us. "Been in 48 states this year," Selman said. "I never get tired."

"How do you get started? Can anybody gross \$80,000?" I asked.

"Well, like any business, it depends on how hard you work. Mayflower has several hundred drivers. I judge 15 percent earn big money. You've got to be strong. It takes a good man to drive three days and then help carry pianos upstairs."

We pulled into an Albuquerque truck stop. A man flagged us.

While they worked the rig over, we went into the trucker's restaurant. Over coffee I asked, "But how does a beginner get the money to start?"

"You start small—a little gas truck. My first cost \$7500. You can get one for \$3500. If you want to be a contract truckman, you apply to any Mayflower driver—like me. I size you up. If I think you're the

type I give you a green card. You fill it in. A recruiter comes to see you.

"You've got to have a good driving record. Legally, you've got to be perfect, no crimes. You take a lie test. Then Mayflower sends you to the Indianapolis school for 30 days. You get paid a salary plus your hotel bills. When you graduate, you go on a student trip with an old hand. And you buy your tractor."

With full diesel tanks we thrummed west on I-40.

"I'd recommend Indianapolis for truck bargains," he said. "Mayflower won't sign your note. But they'll take out monthly payments for you. As soon as you can, you should go to diesel. There's no comparison. I made it three years ago. My first International cost \$15,000. I had only 238 hp but this, plus the radio, was enough to put me in the big money."

Next year Selman will graduate to a still better International, with automatic transmission, and an automatic antiskid device—for ice. "And I'll get another smokeless diesel," he said. "People are beginning to dislike trucks putting out trails of smoke. A smokeless engine makes us look better. And it doesn't mess up that purty name Mayflower on the van."

I asked why a big diesel was so important. "Two reasons," he said. "No plugs, points, pumps, tune-ups, carburetors. I used to spend \$1750 a year on repairs. The 'down time' cost me lots of money."

"With the big diesel I can roll. It used to take 10 minutes to crawl over a bad hill. Now I'm over in a minute. And I can accelerate. You save a lot of time and money by fast acceleration after any slowdown."

As much as his diesel, Selman depends on his radio. He uses a new type. "You just lift it and talk," he said. Radio service costs him only \$16 a month plus 30 cents a minute for air time. He really keeps the radio hot.

"You've got to keep planning ahead," he said. "I try to make Monday deliveries and keep busy on weekends when everybody is sleeping," he said. He often turns a weekend into an extra \$800 or more.

He tossed me a directory. "Where's the nearest radio control? I thumbed the pages. "Grants, N.M.," I said. Grants was 35 miles ahead.

He began calling. "Mayflower to Grants. Grants, give me a land patch, please, to Los Angeles code 213 number 666-1593."

After a while, Mayflower Los Angeles said hello. "I am van 3829," Selman said. "Westbound on I-40 in New Mexico with two loads. ETA San Diego tomorrow noon. Please hire two helpers. I will be at Van Nuys, Calif., at 8 a.m. next day with the

(Please turn to page 188)

Our new fishing motors, the 9½, 6, 4 and 1½ hp, all have the same Johnson dependability as Mr. Chenoweth's 1938 Sea-Horse. They also have the benefit of 32 more years of improvements in engine performance, hydro-dynamic design, fuel economy and corrosion resistance. We're so sure of them, we back every Sea-Horse from the 1½ up to the 115 hp with an exclusive 2 year war-

ranty*. That's a lot of warranty. But then, a Johnson is a lot of outboard. Right, Mr. Chenoweth?

Visit your Johnson dealer. Or write for a free catalog. Johnson Motors, Waukegan, Ill. 60085, Dept. PM-75.

*For 24 months after purchase. Johnson Motors will replace or repair without cost to the original purchaser any part of its manufacture which, upon inspection, proves to have failed in normal pleasure use due to faulty material or workmanship.

Johnson is the way to go!
FIRST IN DEPENDABILITY • Div. Outboard Marine Corporation



Sea-Horse
9½

JAY CHENOWETH
PAINTING AND DECORATING
LICENSED CONTRACTOR

FEATHER RIVER DRIVE • CHESTER, CALIFORNIA
BOX 611 92020

Johnson Outboard Motor Co.
Waukegan Ill.

Dear Sirs:

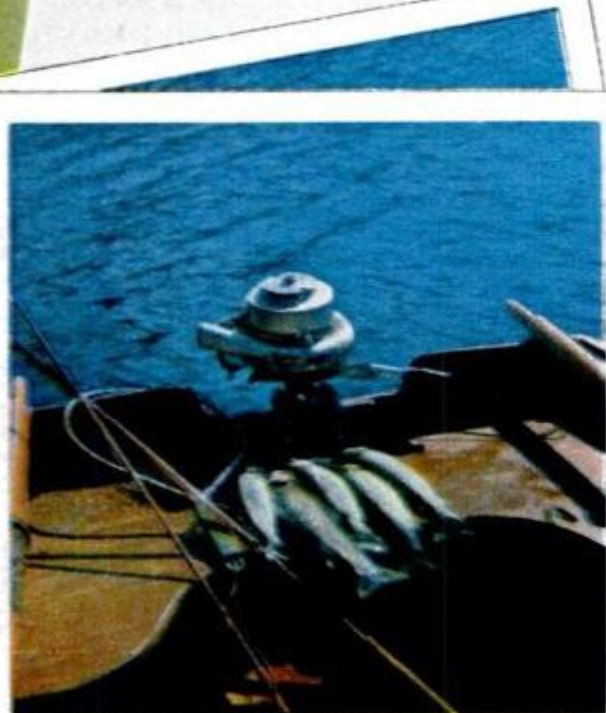
Enclosed are two snapshots of a Johnson MS-38; wired together, welded together, mended with epoxy, thirty one years old and still catching fish.

It is phenomenal the dependability of a Johnson regardless of age. I have been using outboard motors for thirty eight years and have owned nothing but Johnsons..I have never had to row in because of motor failure.

I hope that a great part of the outboard world appreciates as I do the fine product you have been manufacturing all these years..

Very truly yours,

Jay Chenoweth



\$30,000 BEHIND THE WHEEL

(Continued from page 186)

second shipment. At Van Nuys, I'll need only one helper."

"Roger," said Mayflower LA.

"And," Selman said, "please line up new shipments for a week from tomorrow."

He stopped that night at Kingman, Ariz. Next noon he rolled up to a home in San Diego. The customer was waiting with \$2500. So were two helpers. At 6 a.m. next day he arrived at Van Nuys to deliver furniture to the handsome home of Ed McGrath, an IT&T executive. Selman collected \$2800 more.

Time: 3 p.m. Selman worked his radio one last time. His wife's voice came on the speaker. "Hello, Margie Ann," he said, tired now. "I'll be home at 4. And I've decided to take a week off. Let's get out the plane and fly up to the lodge in Oregon for a little fishin'." ★★

LATHE WORK WITH INDICATORS

(Continued from page 178)

something shifted during tightening. While you tap the piece into alignment, be careful not to transmit damaging shock to the indicator; move it out of contact first.

● *Centering a punch mark.* A punch mark used to denote the location of a future hole in a chuck or faceplate-mounted piece can be centered precisely with an indicator. On a slender, rather flexible rod (say $\frac{1}{8}$ to $\frac{3}{16}$ in. in diameter and 10 in. long), form a sharp point. Clamp the other end in a tailstock chuck, and bring the rod against the workpiece until its point rests in the punch mark. As you hand-rotate the lathe spindle, adjust the rod until there seems to be little sidewise movement. Then bring the indicator contact point against the rod close to the work, and make further adjustments until the indicator pointer stays in one place as you turn the spindle through a full revolution.

● *Using button to position work for drilling.* Clamp a toolmaker's button to the workpiece and, by customary measurements from edges, position it precisely with respect to desired hole location. Mount workpiece in chuck or on faceplate and (with indicator) check to be sure it's held so that axis of the proposed hole is parallel to lathe axis. Place indicator point against the button circumference (with indicator mounted on toolpost), and adjust workpiece until this surface runs true. Remove indicator and button, and machine hole to diameter.

● *Testing live centers.* Mount the indicator to bear against sloping surface of the

center, rotate spindle by hand, and note degree of run-out, if any. The center should, of course, be smooth—not scarred from wear or rough handling. If it is not true, machine or grind it to the proper angle, and retest.

● *Checking arbors, mandrels.* Such pieces customarily are machined between centers, so they can be mounted the same way for testing. Bring the indicator feeler against the portion to be checked, then rotate spindle by hand (if dog and faceplate are used), or rotate arbor or mandrel on the stationary centers (which may be lightly oiled). Center holes must be clean.

● *Measuring taper on a piece mounted between centers.* Clamp indicator on the toolpost, with the top slide positioned to move parallel to the lathe axis. Using a reference, a bar of known straightness and uniformity of diameter between centers, adjust the slide until it moves truly parallel to the bar. Substitute the tapered piece to be measured, and bring indicator point against its surface. Using micrometer collar on the top slide, move the indicator exactly one inch (or some multiple thereof) along the lathe axis. Difference in readings at the two positions will correspond to one-half of the difference in diameters at these positions. As in other tests of work between centers, the centers must be in alignment.

● *Checking straightness of tubing or rods mounted between centers.* Use indicator on the toolpost to check surface of a bar or tubing for straightness. This can be done either by rotating the piece or moving the carriage along the bed. In the case of tubing or pipe, ends must be carefully trued or they are not likely to rotate uniformly on centers. When the piece checked does not have a precisely machined surface, this method can be used only for a relatively rough test. Although a piece such as a length of soft aluminum tubing can be straightened by tapping it with a hammer while it is mounted in a lathe, it is not recommended that a lathe employed for precision work be used as a straightener. Hammering on shafting mounted in the lathe could cause serious damage.

You can undoubtedly find many more uses for these indicators. You don't have to buy one if your toolbox lacks such an aid: The shop-made lathe indicator in the photo on page 177 is the custom-built instrument described in *Make This Handy Indicator for Your Shop* (page 196, Jan. '68 PM). Commercial versions are available by mail order from Sears and Edmund Scientific Co., Barrington, N.J. Indicators made by L. S. Starrett Co., Lufkin Rule Co. and others are available at most well-stocked hardware stores. ★★

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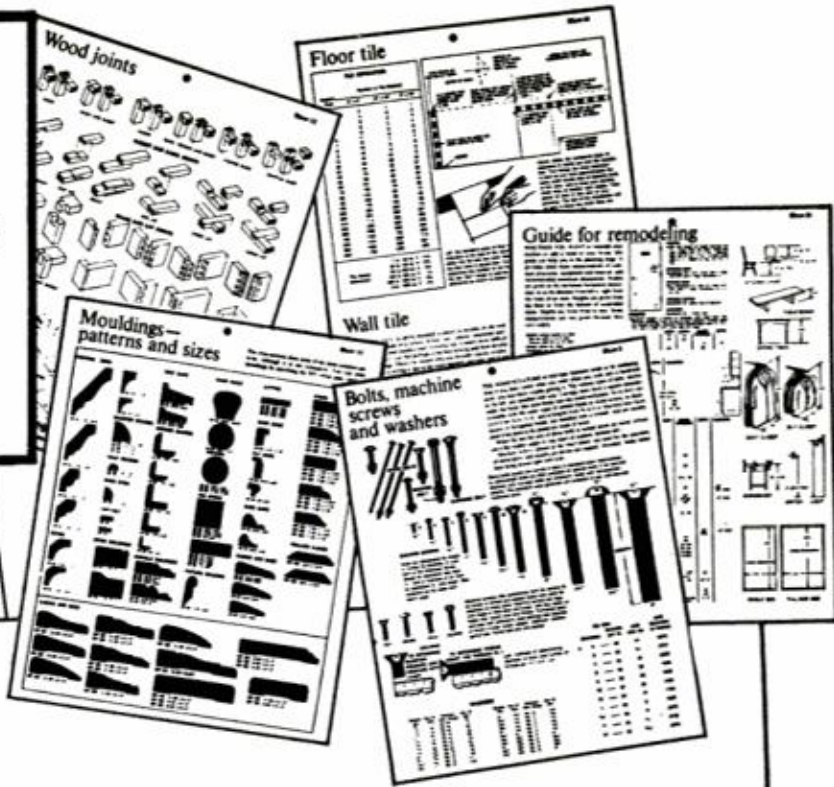
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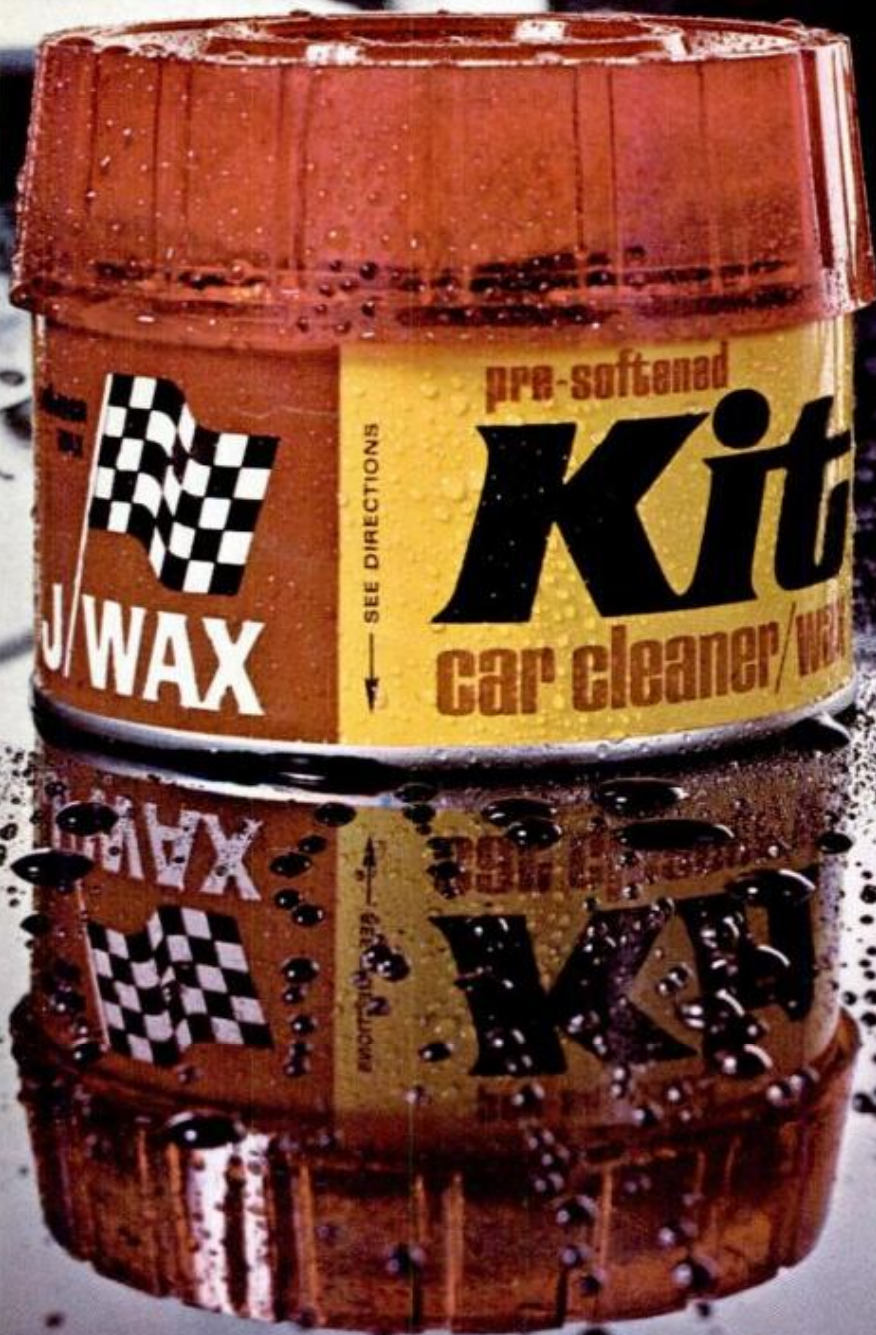
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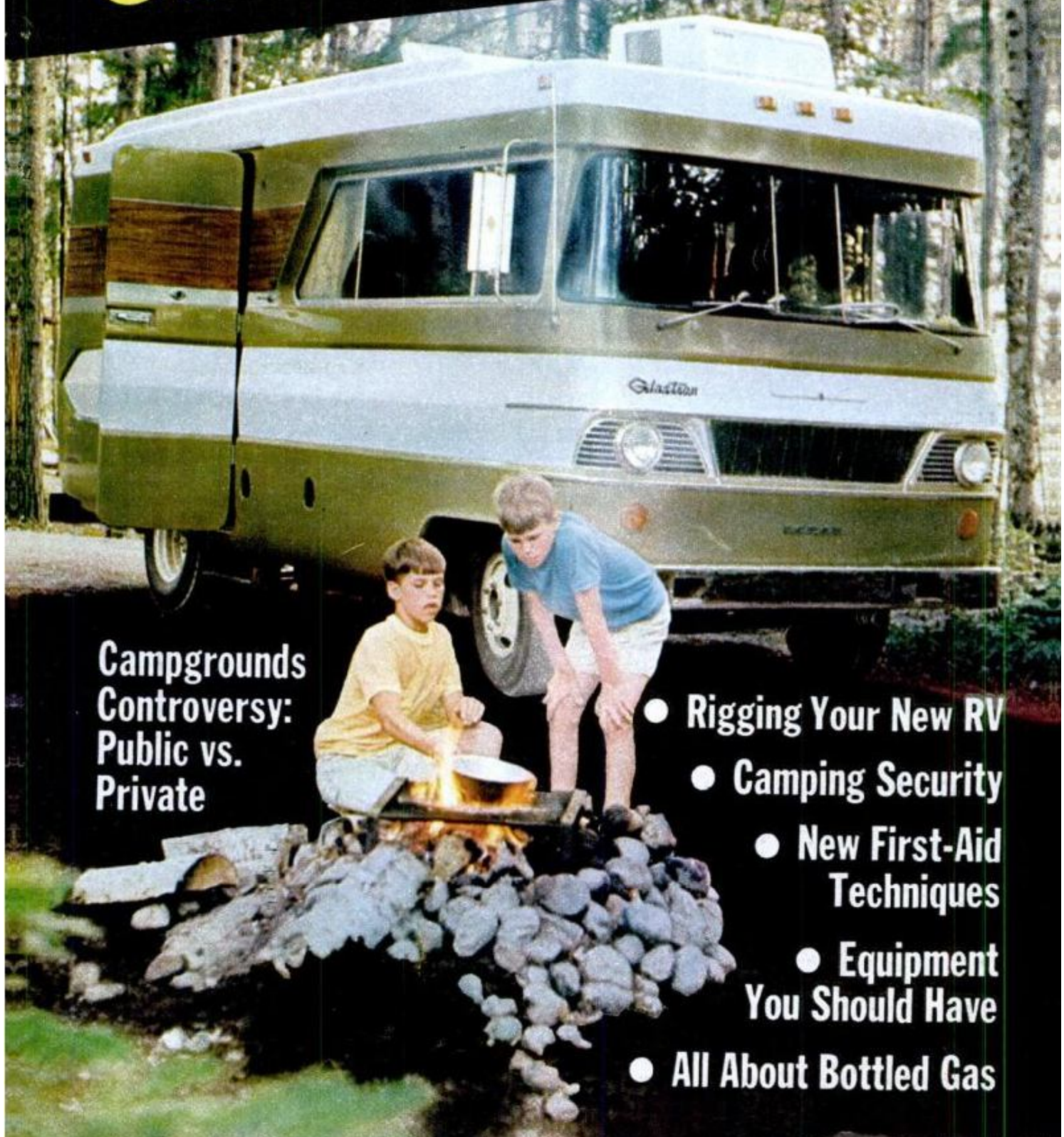
SPECIAL SECTION

POPULAR MECHANICS

CAMPING '70

**Campgrounds
Controversy:
Public vs.
Private**

- Rigging Your New RV
- Camping Security
- New First-Aid Techniques
- Equipment You Should Have
- All About Bottled Gas





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The Only Way to Go

The first motorized camping trip we ever took was in a 1921 Nash. We pitched a tent in dusty school yards and small town parks and took three days to get from Omaha to Colorado Springs. Fifteen years ago we were the travel editor of a national magazine. We plugged family vacations in the family car and told our readers to be sure to allow \$8 a night for a motel room for four.

Those days, like free camping in the school yard, are gone forever. Now you get color TV in every room and a swimming pool you pay for whether you use it or not. The \$20 motel room is as responsible as anything else for the boom in travel trailers, tent trailers, pickup campers and motor homes. Increasingly they're the *only* way to see America and to experience the refreshing solace, if not solitude, of wild places.

The camping vacation is still the *best* vacation—the biggest change, the most renewing in spirit, the most productive of memories and the least expensive. In this special section, *Camping '70*, which we hope you'll tear out and save, we've packed ideas, suggestions and new equipment to make it easy, simple, comfortable and safe.



Editor



GEORGE W. REIGER

Outdoors Editor

JAMES M. LISTON

Executive Editor

This One



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MAY 1970

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The New Look in Campgrounds

By V. LEE OERTLE

SOMEWHERE BETWEEN 40 MILLION AND 50 MILLION PEOPLE will attempt to use approximately 600,000 campsites during the season just ahead. That's a little like stuffing five pounds of cheese into a two-pound bag! Last year as many as 60,000 persons tried to jam into Yosemite Valley in a single day. The time when national park, monument and state park campsites were always available has gone forever.

The trouble is that too many American families think only of well-known parks at vacation time. Names of parks like Yellowstone, Grand Canyon and Great Smoky Mountains tumble easily out of every camper's bag. But the truth is that a world of freedom and relaxation can be found in areas outside these heavily visited parks.



Hundreds of new **privately operated** campgrounds have opened just this year. Considering the growing crush of humanity on the one hand and the luxury and varied facilities at these new campgrounds on the other, it might make sense to plan your overnight stops **between** the popular areas and then drive into them for your daily fun.

With their (1) clean restrooms (2) uncrowded laundries, and (3) well-managed general stores, private campgrounds offer new hope for the American camper. Campers desire spaciousness and comfort, quiet and cleanliness—and franchised campgrounds are trying to take the strain off public sites.

On the following pages we show how private grounds are a definite part of the new look for camping '70.

The Case for Public Campgrounds

By V. LEE OERTLE



WARM-WATER SWIMMING HOLE by a chilly trout stream, Bridger National Park, Wyoming



BUDDING CAMPERS learn ropes from a friendly ranger in Florida's Everglades National Park



THE HIGHLIGHT of all national parks, as well as most national forests and state parks, is scenery. No private campground can compete with Yellowstone's geysers, Haleakala's crater or the great gorge of the Grand Canyon.

And there are these other advantages in the public parks:

1. Regular rangers (not summer help) are generally experts in their field. They can provide information about natural wonders, where the best fishing is, and how to find Indian petroglyphs, as well as assist the new camper. In the face of summer crowds which threaten to engulf our best parks with choking dust and the shrieks of unwatched children, the patience and eternal friendliness of the rangers is a miracle in itself.

2. Individual campsites in a state or national park are generally to be found in a natural setting which will add to your camping enjoyment. Shade trees, cold-water trout streams, deep mountain lakes and spectacular backdrops are routine at the Cascades or Yosemite. Camping in the best national parks provides a true outdoor experience.

3. Rates are generally lower at state and national parks, except at overvisited areas such as Yosemite or Yellowstone. Even then, rates are generally on a par with private campgrounds in the area or slightly below their average fee.

4. Some state and national parks remain open throughout the autumn, winter and early spring seasons. During those slack periods, camping is ideal. Crowds disappear, except in a popular desert region such as Death Valley. Few private campgrounds can compete with public parks when it comes to providing both scenic beauty and readily available sites.

5. Public parks are generally designed for stays of one to three weeks (unless long stays are prohibited, as they are in a few busy locations). Private campgrounds, by contrast, seem to cater to the overnighter. Many campers feel that the mode of life in a public campground is much more relaxed, casual and enjoyable.

6. If you're a backpacker or a man who really wants to explore nature, the public parks cater to you more specifically than to the man with a motor home. You can obtain a fire permit and get off the beaten path. Private campgrounds discourage such adventure. ★★★

FOAMING FALLS serve as fitting backdrop for spectacular Genesee Gorge in New York's Letchworth State Park, a bit southwest of Rochester

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The Case for Private Campgrounds

BASIC ADVANTAGE of privately owned and operated campgrounds is all-year availability. In addition:

1. Only privately operated campground franchises offer a cross-country reservation system. If you're a good planner you can set up an entire trip across many states well ahead of departure and have reservations confirmed at each stop for specific upcoming dates. Uncertainty about overnight sites is eliminated.

2. Physical facilities of most new private campgrounds outclass those of the older public parks. The new franchised campgrounds have set a higher standard—much as the motel industry outclassed the cabin court.

3. A certain standardization exists in all private campgrounds. In franchised units such as Safari Camps or Kampgrounds of America (KOA), a family quickly accepts the familiar layout of playgrounds, restrooms, camp store and other facilities.

4. Cross-country camping trips can be budgeted closely with reasonable accuracy. Advance estimates of overnight fees can be more accurate than is possible with public-park camping. (When space can't be located in a public campground three or four nights in a two-week vacation, motel bills will wreck the budget!)

5. Private campground operators erect better highway signs directing you to their sites. They're easier to find at night. Most are on good roads near major routes.

6. Virtually all privately operated campgrounds have a manager-in-residence. In

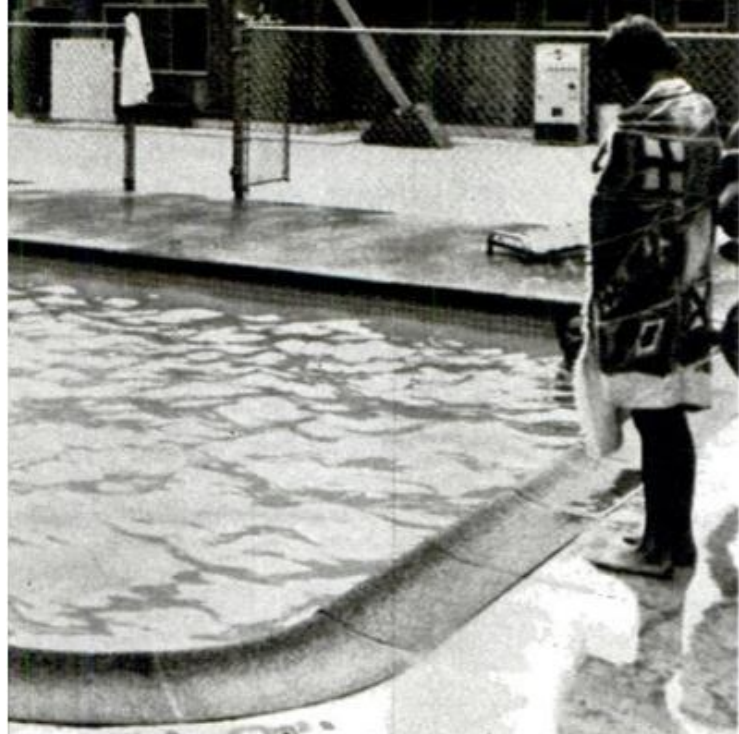


MANY KOAs have swimming pools or are near lakes or rivers. All offer free hot showers



COMFORTABLE LOUNGE adjoins laundry. (Below) Kids unwind after long day on the road





case of a late-night arrival, or in an emergency requiring medical or mechanical services, most campground operators can steer you to quick assistance.

7. Knowing where you will stay each night during a two-week vacation is a plus when it's important to keep in touch with home. Businessmen can take calls at specific times and campgrounds, if desired. And, most private campgrounds keep a bulletin board for easier friend-finding.

8. Most private campgrounds offer coin-operated washers and dryers, a camp store, hot showers and ice—conveniences that save you time seeking them out in towns during the day. A central recreation hall provides a great place for teen-agers to relax in the evenings, friends to get together and travelers to swap experiences. On rainy days, it's a real kid-saver.

9. In hot weather, electric power is highly desirable when you consider the growing number of coaches with rooftop airconditioning. Virtually all private parks furnish electrical outlets at camping sites. Most self-contained coaches have refrigerators operating on electric power (which is cheaper) or LP-gas. (Portable generators are sometimes limited to specific operating hours in public campgrounds.)

10. Pet lovers find their animals are barred from many public grounds. Virtually all private areas allow pets on a leash.

11. Most private areas provide sanitary dumping facilities or sewer hookups.

12. Nearly every private campground is designed to accommodate recreational vehicles. In national parks and most state parks, campgrounds are developed for tents only and RVs merely tolerated. Strong sentiment exists in some quarters to bar recreational vehicles from public campgrounds and allow tents only. ★★

Ranch Camps



By JAMES M. LISTON

KAMPGROUNDS OF AMERICA (KOA), with over 300 franchises the largest privately-owned system in the United States, is fast becoming the camper's Holiday Inn. Soon it may be every man's home on the range.

A new venture—Ranch Kamps of America—which lets you camp overnight or vacation at a ranch, promises to be the greatest idea since ranchers discovered dudes. You can now stay at a dude ranch on a camper's budget. Most guest ranchers don't accept overnights and the cost of a one-week stay is out of reach of many families. But RKO daily rates are only slightly more than those of KOAs and you are charged only for the facilities you use. These range from Saturday-night barn dances to horses (by the hour) and trout (by the pound) from well-stocked lakes and streams. Rates are \$4-\$5 per car. (KOAs are generally \$2.50-\$3.50 per car for two, plus 25 cents for each additional person.)

This year RKOAs at Chugwater, Wyo.; Swan Valley, Mont.; North Palm Springs, Calif.; and Nephi, Utah, will take campers—and more RKOAs are being planned. Last summer, the writer camped at the historic Diamond Ranch, a 75,000-acre working cattle ranch 42 miles north of Cheyenne and 13 miles west of Chugwater. Campsites, showers, laundry, heated swimming pool and other features are (spelled backwards) AOK, but the big barn for evening fun and square dancing, and the tremendous horizon (100 miles around the fence) of this spread are alone worth driving in to see. The kids can ride trails, hike, rock-hunt, fish—really feel the West on an RKO. The only problem: getting them to leave. The 1970 KOA *Kampground Directory* has full information on the RKOAs. Write: Kampgrounds of America, Inc., Box 1138, Billings, Mont., 59103. ★★

How to Rig Your New Recreation Vehicle

By V. LEE OERTLE

IT MAY BE A DISAPPOINTMENT to learn that the window-sticker price doesn't cover all those flashy accessories you want for your new camper, trailer or motor home. The advertised price just about covers the bare necessities. But if the salesman insists that *everything* is a necessity, don't believe it!

Although it's possible to drive away in a showroom-fresh RV without 10 cents' worth of extra hardware, you wouldn't enjoy it. In fact, in some states your rig might not even pass legal muster without some accessory equipment. For example, California RV owners must use outside mirrors on both sides of their rig.

So how does an eager new camper owner know what he really needs for safe, legal and convenient travel? We've boiled away the sales pitch to arrive at the three classes of RV rigging: *Must Have*, *Nice to Have* and *Luxury Equipment*.

CARS towing trailers *must have* special equipment:

1. Load-equalizing hitch (\$60 to \$150) for trailers weighing over 2000 pounds.
2. Frame-mounted hitch (\$30 to \$40) for light tent-trailers and travel trailers.
3. Set of high-quality clamp-on side-view mirrors (about \$15).
4. Electrical coupler installation (about \$15) tying in the lights and electric brakes of the trailer to the car.

Nice-to-have options would include such things as heavy-duty shock absorbers (from \$40 to \$60 extra), a transmission cooler for towing large trailers (\$57 up), fiberglass variable-pitch radiator fan (less than \$20), hill-holding brake device such as an Almico (about \$50), wheel chocks (\$5 to \$15), folding front-window awning

for the coach (metal, about \$20 to \$45), an extra five-gallon LP-gas tank (\$15 up), and an outside roll-up awning (\$35 up).

If you're considering a **VAN** or **PICKUP CAMPER**, there are two general divisions: equipment for the truck and accessories for the camper. Let's start with the truck.

If you order a Camper Special, your problems are simplified. But if you start with a bare truck, you *must have* the following items:

Heavy-duty tires, preferably flotation type in sizes 8.00x16.5, 8.75x16.5, 9.50x16.5 or 10x16.5 (\$65 to \$90 per tire and \$35 per wheel). The greater the tire's width, the better stability, traction and flotation you get. I'd consider an 8.00x16.5 an absolute minimum for carrying a camper. Greater safety and satisfaction result from each step up in tire size.

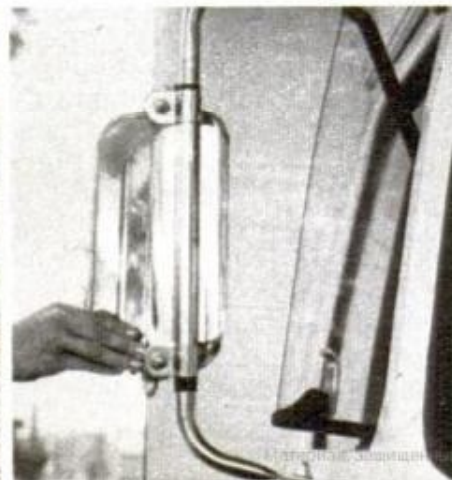
Heavy-duty springs front and rear are mandatory. Just make sure that the truck is rigged for maximum GVW rating. This simply means installing springs and tires (and axles) that match the highest legal rating for the particular vehicle.

Electrical equipment should include a 72-ampere-hour (or larger) battery, heavy-duty alternator, heavy-duty flasher unit.

Side-view mirrors, large and husky, are a must (\$20 to \$40 a pair). A large rear bumper should also be classed as a necessity even though truckmakers still call the rear bumper optional. The total cost of the options listed to this point run from \$200 to \$300 more than the standard pickup truck. Without them no pickup can be considered an efficient coach carrier.

Nice-to-have equipment includes power steering and power brakes (particularly disc brakes) because they reduce the ef-

COUPLER PLUG (left) is a must for trailer lights, brakes (\$10 to \$25). Stabilizer jacks (center) steady parked trailer (\$9 to \$20 for four). Large mirrors are recommended for trucks, motor homes



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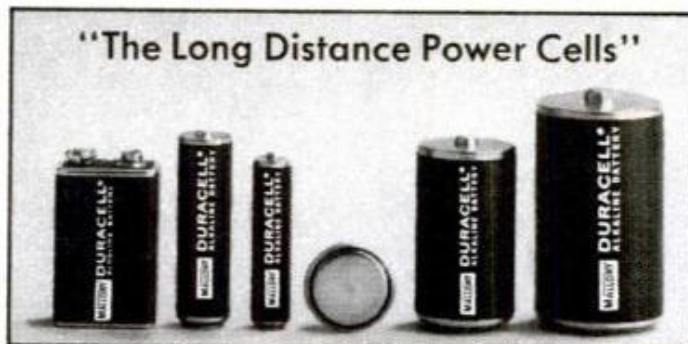
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EXTRA VENT WINDOWS are bargain at any price. They freshen atmosphere, release trapped heat

fort of driving. The average camper spends as much time behind the steering wheel as at the campsite. Power steering could run from \$80 to \$200, plus another \$65 to \$100 for power brakes. They're both worth the price. Electric windshield wipers and washers are great for off-road trips. Custom cab options, such as quality seats and padded armrests (from \$75 to \$150 extra), make life more pleasant.

Luxury equipment includes airconditioners (\$275 to \$400), chrome bumpers (\$25 to \$50), stereo tape recorders, cruise-control and light-dimming electronic devices.

If you're considering a **TENT-TRAILER**, you'll find deluxe units are generally well-equipped. However, all models under the top-line designation need extra equipment for ultimate convenience. For example, many tent-trailers still need a water tank (\$20 to \$50), 12-volt light fixtures (\$5 to \$15 each), ice chest (\$10 to \$25) or a campstove (\$15 to \$35). A spare tire and wheel (\$30 to \$60) make a good addition. Plastic windows (\$15 to \$50) help keep out rain and allow light to enter the trailer.

Any self-propelled **MOTOR HOME**, be it a \$5000 van-bus or \$20,000 luxury coach, comes pretty well equipped for normal camper operation. Yet there are options the motor-home owner would find appealing: a roof-mounted, low-silhouette airconditioner, for example, (\$200 to \$500); a portable electric powerplant to handle it (\$350 to \$650); big truck-type side-view mirrors that give a better view (\$20 to \$40); and plush carpeting in place of floor mats. (Carpeting is warmer, but debatable because it collects dirt.)

Instead of a standard wall heater, luxury motor homes often have a forced-air furnace as an option. If you're planning winter trips, that extra \$250 to \$300 is probably well spent.

Another concern of RV buyers is a well-balanced **POWER TRAIN**. Some tips:

1. Heavy loads require a large engine. Remember that a big engine loafing will outlast a small one straining to move a load. In many cases, the large one will yield better fuel economy.

2. Three-speed automatic transmissions are still the best bet for most RV owners. An automatic unit can be handled by anyone, so all car and truckmakers recommend them for recreational use.

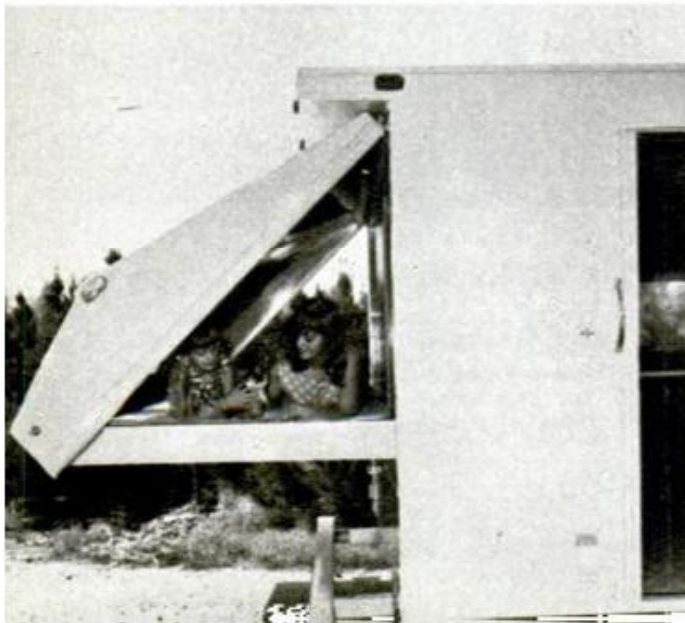
3. Too much gear reduction is worse than not enough. Don't overdo it! Exces-

BEDROOM EXTENSIONS are sometimes optional, make sense for big families, increase living area

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crisp 5-speed gearbox makes beautiful music, and you...you discover the difference between a great turn and an ordinary one. Try a CS-3C like the one below and on the left, above. Or, a DS-6B 250, a slightly bigger twin, also shown above.

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A high-contrast, black and white close-up photograph of a Goodyear tire tread. The tread pattern is a classic zig-zag or chevron design, with the ridges and grooves creating a strong geometric pattern. The lighting is dramatic, highlighting the texture and depth of the tread.

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Hi-Miler, Nyloglas, Tracker—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio



Nyloglas tire: Four nylon cord body plies and two fiberglass belts that extend around the tire to help hold the tread firm and fight squirm.



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TOWING HITCH, of 1-inch steel bars arc-welded together and bolted to frame, is best type

sive gear reduction in the axle ratio results in high engine rpm at cruising speeds. Higher rpm raises operating temperature, hence the rate of wear. So select higher axle ratios cautiously, a step at a time.

ALL COACHES, whether motor home, truck camper or travel trailer, have the basic function of providing sleeping, dining and sanitary facilities. Among the universal options:

You can replace the standard manual water pump with a 12-volt electrically pumped water system for \$30 to \$125. A larger capacity water tank (\$20 to \$50 extra) which holds 40 to 70 gallons of water is worthwhile for long trips, belongs in the *nice-to-have* category.

A portable powerplant falls into the *luxury* category. It serves two functions: operating a 110-volt air conditioner and powering a large electric refrigerator.

Sanitary systems fall into three main categories: (1) The recirculating toilet (from \$195) in which a basic charge of about four gallons of water is repeatedly used and refiltered; (2) a flush-type marine toilet in which a standard flushing unit is connected to a waste-holding tank (from \$200 to \$500), and (3) an incinerating toilet (from \$395 to \$600). ★★★

TRAILER DOLLY (shown) or load-equalizer hitch is required for safe towing of large trailers



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Bring Your First Aid Up-to-Date

By WILLIAM W. CONNER, M.D.

VACATIONERS are frequently far from medical help when an injury occurs—so it's important to know alternate first-aid methods for some common ills:

Fishhook penetration: The old recommended method for removing a fishhook



was to force the point out through the skin and cut off the eye so it would pass through the hole thus made.

An equally good, and often less damaging to the victim, method employs an 18-inch length of string which is looped around the bend of the hook and held slack. With your other hand grasp the eye of the hook and press the shank down in the direction of the point. At the same time the shank is depressed, give the string a sharp jerk—and out snaps the hook. A little disinfectant over the wound, and you're ready to bait up again.

Snake bites: America has only four types of truly venomous snakes: rattlesnake, copperhead, moccasin and coral snake. Other snakes may bite when alarmed, but they lack venom and fangs.

A new method used by doctors in handling snake bites is to remove a patch of skin from the site of the bite about the size of a half dollar, along with the underlying tissue. The venom usually collects here in large quantities, and removing the tissue rids the victim of most danger. The limb is then treated with antivenom injected into an artery, and a new piece of skin is later placed over the wound. Most of this is obviously best left to the doctor. What, then, can be done in the way of first aid?

First, allow the victim to expend as little energy as possible. This helps slow down circulation and delays absorption into the system. Second, apply a snug tourniquet about two inches above the bite. That is, between the bite and the heart. It is a good rule of thumb that if you cannot eas-

ily push your finger under the tourniquet, it is too tight. A greater danger results from applying it too tightly than too loosely; a leg can be lost if the blood supply is cut off for too long. Third, transport the victim to a hospital or a doctor.

Note that no mention is made of cutting or sucking on the bite area! However, if the accident occurs where it may take many hours to reach a doctor, and the bite was from a moccasin, a snake whose venom is particularly destructive to injected tissue, your first aid should be more extensive. The area of the bite should be cut out. All that is necessary is a clean, sharp knife. The venom itself provides good anesthesia. Make a circular incision about two inches in diameter with the fang marks in the center. Cut deep enough to include the fat that lies under the skin. The venom may have blackened the fat, and by picking out all of the blackened tissue visible, you can remove much of the stored venom. A careful cleaning of the wound with a good disinfectant before and after the operation and a sterile or clean pressure-dressing will suffice to ward off infection until you get medical help.

More complications can arise from an infected wound than from the snake bite itself! So avoid making any cuts in the skin unless a long delay in reaching the doctor is unavoidable.

Bleeding: Bleeding from any cause can usually be treated most effectively by applying firm pressure with a clean cloth directly on the wound. Forget tourniquets and pressure points unless the bleeding is from a severed limb.

Burns: Perhaps the most common vacation mishap is a burn—sunburn, campfire burn, lantern burn and others. The treatment is similar for all. The prime consideration is to stop tissue damage as quickly as possible, and the best counteractant for heat is cold. So plunge the burned area into cold water immediately—a cold stream, a pail of drinking water, or over the side of a boat. Hold it in the water until the pain subsides. Many otherwise serious burns treated in this simple manner can be reduced to not much more than a moderate sunburn. A clean and dry dressing or a small amount of antibiotic ointment can then be used to cover the area. Avoid the age-old "goo treatment" or butter, baking soda and the like. These applications often make matters worse. ★★★





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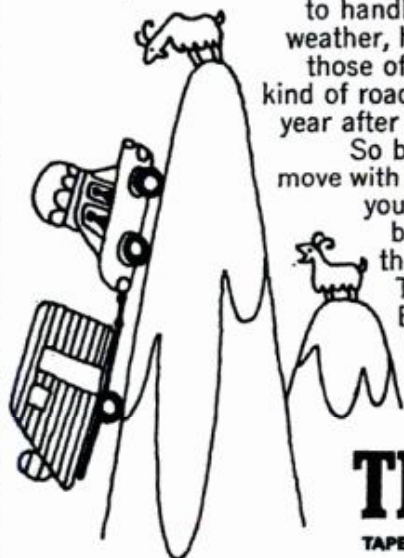
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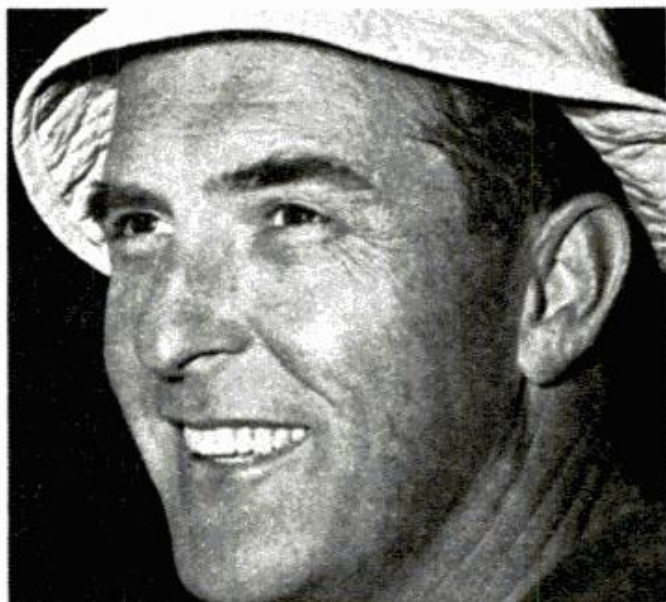
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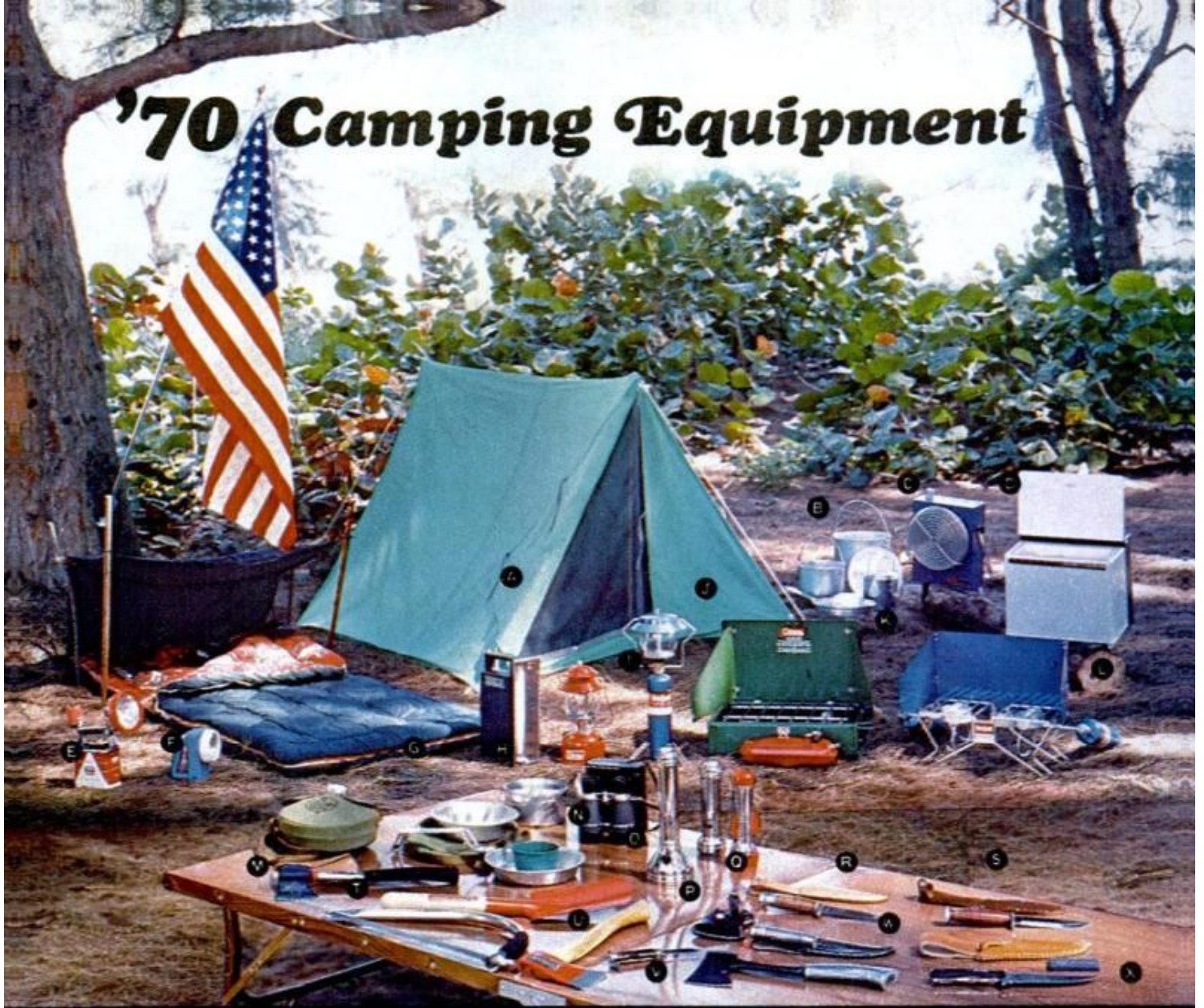
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'70 Camping Equipment



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- A** Tent, here an adult pup, 5x7x3½ feet.
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- C** Adjustable catalytic propane heater.
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- E** Powerhead lantern with six-position arm.
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- G** Sleeping bag: Make it water resistant.
- H** Fluorescent lantern, 100-hour battery.
- I** Gasoline lantern, single mantle model.
- J** Instant-lighting propane lantern.
- K** Folding campstove, two-burner model.
- L** Propane campstove.
- M** Two-quart aluminum canteen for hikers.
- N** Lightweight aluminum five-piece mess kit.
- O** Field glasses for spotting birds, game.
- P** Adjustable three-cell searchlight (dim to bright).
- Q** Pair of flashlights (always a spare).
- R S** Six-inch-bladed hunting knives are handy for a variety of camping tasks.
- T** Belt ax, also can be used as hammer.
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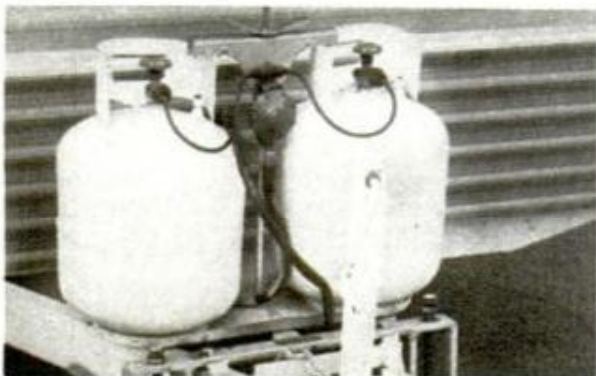
Camper's Guide to Butane/Propane

NO MATTER WHOM YOU ASK about LP-gas, the reaction is never mild. Almost all campers hold it in awe, view it with suspicion or regard it as mysterious. It seems strange in view of the fact that LP-gas, better known as butane-propane, fires virtually all appliances in recreational vehicles. It's the handiest fuel you can get outside of an electric wire, yet it's the least understood. Because it's so versatile and popular in the outdoor world, *PM* has gathered these easy-to-remember rules about handling butane and propane.

LP-gas stands for *liquified petroleum* gases. It might be either butane or propane, or a mixture of both. Some other gases may be mixed with them, but only in minute quantities.

One of the strange advantages of butane-propane is that it can exist as either a gas or a liquid. That makes it easy to package in those familiar lemon-shaped bottles bolted to every coach and camper. The second characteristic is that LP-gas is compressible. By altering either the temperature or the pressure it can be changed to liquid or gas. A single five-gallon tank may contain up to 270 times more LP-gas as a liquid than as a gas, so it is transported as a liquid, then burned off as a gas in coach appliances.

Butane-propane burns clean and leaves no sooty deposits on cooking utensils. It's odorless, too, producing no unpleasant fumes. (That strong odor is an added chemical to warn you of a leak.) And butane and propane gases are *not* poisonous. If inhaled, either gas would make you sleepy, but under ordinary circumstances with a proper amount of oxygen,



TWIN LP-GAS TANKS double the range. When one tank is emptied, you simply change to the second by shutting one valve, opening another



VALUE OF LP-GAS lies in portability. Taken anywhere, it offers quick, clean-burning fuel

breathing in small amounts is harmless.

As for those tired tales about LP-gas being "extremely unstable and explosive," that's sheer poppycock! When handled with only routine caution it's safer than gasoline. Because LP-gases are heavier than air, they flow to the lowest point when released in the atmosphere. Naturally, a spark can set it off just as a spark can set off fumes hovering over spilled gasoline. Realistically, any fuel is dangerous when leaking into a closed area with a flame nearby.

The effects of temperature on LP-fuels show why a mixture of butane and propane is best.

In warm climates *butane* is the best choice because it has a higher boiling point: It converts from a liquid to a gas at temperatures over 32° F. Below this, butane will not function as a gas fuel. In cold climates *propane* is more logical because the boiling point is minus 44° F. That means propane functions normally at very low temperatures, while butane cannot.

But that isn't the whole story. As the temperature rises in propane fuels, so does the pressure. This creates some problems, since high-pressure storage affects leakage, container strength and sealing. That's why the best LP-gas fuel is a mixture of butane and propane. The exact chemical composition determines the temperature range, and it is the local LP-gas distributors who give you the proper mixture for local temperature and atmospheric conditions.

All LP-gas tanks must have relief valves. When the internal pressure exceeds a certain point the valve pops and LP-gas escapes into the atmosphere, which reduces

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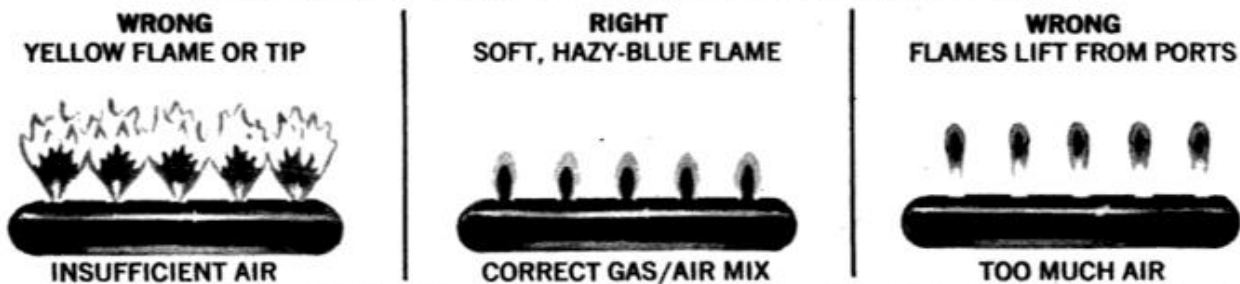
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HOW BURNER FLAME SHOWS PROPER GAS/AIR SETTING



internal pressure. Rapid temperature increases usually cause the valve to pop off whenever the tank pressure rises past 375 psi.

Many beginners, when attempting to change their first tank of butane-propane, place a large wrench on the tank fitting and proceed to twist it off. It should be remembered that all LP-gas tanks have left-hand-threaded fittings! Turn the wrench *clockwise* to loosen the line for refilling; *counterclockwise* for tightening. A loose-fitting wrench should never be used on brass fittings. Carry one of the right size in your coach toolkit. Don't depend on the serviceman at LP-gas stops to have the size you need.

Incidentally, it may be illegal in some areas to ask an LP-gas attendant to refill your tank while it's in the coach. If you must remove the tank for him, all that's necessary to do is to shut off the main tank valve, then loosen the main tank fitting (remember, turn it clockwise). In hidden compartments LP bottles are usually held in place with metal straps and wing-nut restrainers.

All LP bottles are marked for vertical or horizontal mounting. *Never install an LP bottle until you check that rating.* Vertical bottles mounted horizontally will result in the relief-valve freezing (from contact with liquid butane-propane) which could spew gas into the atmosphere. Even where such a condition was not dangerous it would bring about a terrible waste of fuel.

How to adjust burners: Range burners are the cause of most complaints. But in about 95 percent of the cases the problems are related to the air-shutter adjustment. Considering the fact that roughly 20 to 30 cu. ft. of air is consumed with every cubic foot of LP-gas, you can readily understand the importance of air-shutter settings!

Here's a simple method of adjusting burners according to the flame-tip. First, check the *color* of the flame. Sick yellow flame indicates lack of air, so increase air-shutter setting. Second, check the *shape* of the flame. Hard, sharply defined flame indicates too much air, so reduce air-shutter setting. The ideal flame is a soft hazy

blue. Third, watch the height of the flame. If it appears to be hovering over the burner orifices there's too much air. Reduce the air setting until you have a hazy blue flame that extends all the way down to the burner.

There shouldn't be any problem with noxious fumes from butane or propane because they burn clean and soot-free. However, eye-stinging fumes can occasionally be traced to a burner operating in a draft, a restriction in the air shutter or dust in the burner ports. Thoroughly vacuum-clean all range and oven burner orifices after a few trips, and give them a periodic cleaning thereafter.

LP-gas refrigerators make ice in 20 minutes—or else make no ice at all! Even a few degrees off *true level* will affect the efficiency of the gas box. Since self-levelers are not standard in all gas refrigerators, it is still necessary to make the coach exactly level. Carry stabilizer jacks; you'll need them.

On LP-gas lamps, the new mantle is tied over the nose of the burner after removing the globe. Light the mantle and let it burn completely out, leaving a chemical ash coating. Open the gas valve and hold a match below the mantle; in a few seconds the mantle will become incandescent. When an old mantle shows signs of cracks or punctures you must replace it or it will crack the globe. Keep insects out of the globe; they cause blackening of the mantle and a weak yellow flame. Adjust the air shutter if blackening is a problem after a new mantle is attached.

Never test for leaks with a lighted match! Instead, brush a wet, soapy solution onto all line fittings. Where you find gas bubbles, shut off the main tank valve and take these steps: Shut off all LP-gas equipment in the coach, including the gas lamp. Test the tank fittings first, then open the tank valve and follow the lines back through the coach. Starting with the regulator itself, brush your soapy solution onto all trees, elbows, sweat fittings, pilot valves, burner orifices and range manifolds. If simple repairs don't stop the leak, shut off the gas at the tank again and call a trained serviceman. Keep the coach aired until the leak is repaired. ★★★



Sears sized up the weather and discovered two new ways to camp dry and sleep tight.

Nothing ruins camping trips like cold, wet weather.

Sears didn't want anyone to suffer through it. So they worked out new ways to beat the weather.

This new tent is one of them. It has a 100% waterproof floor that runs 6 inches up the tent's sides. Even if the tent sits in a puddle, not a drop gets in.

For the tent fabric, Sears chose a rugged cotton drill with a special finish that sheds water like a duck. So whatever the weather, your family camps dry.

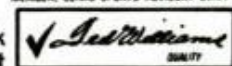
Sleeps well, too, because Sears had a great idea for sleeping bags. They went to the U.S. Weather Bureau to find out the tem-

peratures you could expect across the country. Then had bags made to match them. Warm, cool and cold night bags. In three sizes, too, including king.

Tomorrow, see the great new camping equipment at the Sears Sports Center in a Sears, Roebuck and Co. store. Or the Catalog.

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This check mark certifies this tent and sleeping bag met the standards set by Ted Williams, Chairman, Sears Sports Advisory Staff, and were personally tested and approved by Sir Edmund Hillary, Staff Advisor.

This Cool Night Bag looks as good as it sleeps. It's made with light new fabrics in bright new colors.

Zip in, zip up tight. These new nylon zippers have gaskets that seal drafts out.



Camping Security and Common Sense



NEAR YUMA, ARIZ., a 68-year-old man, asleep in the back of his pickup camper coach, was awakened by the sound of his truck engine starting. Puzzled, he sat up on his cot and peered through the coach window into the truck cab. Two dark figures huddled there, evidently unaware of his presence. The keys had been left in the ignition. Now the truck started slowly across the hardpan of the area. The truck-owner fumbled under the cot and grabbed a 12-gauge shotgun he kept there. There was a loud blast, a shattering of glass, and the truck veered to a stop with the driver-thief slumped wounded over the steering wheel. His passenger bolted out the door and disappeared. It might have ended differently.

Camping is no longer an exclusive activity of outdoor lovers, and security has greatly deteriorated in the past decade. In California's beautiful Jedediah Smith State Park last season campers reported equipment worth over \$1000 stolen in a single weekend, a park ranger told me.

Astonished, I asked him for specific information. What types of equipment? His list included cameras (a favorite), fishing tackle, outboard motors, portable camping stoves and lanterns, sleeping bags, binoculars, axes and a score of other commonly toted items.

"Campers presume that all visitors to a park are, like themselves, recreational campers," another ranger told me. "But, in actual fact, a great many potential

thieves drift through our campgrounds. We can't possibly police every campsite, nor watch all the gear that visitors carelessly strew about."

Is the situation really this grim? That's a tough question. My family has traveled hundreds of thousands of road-test miles in all kinds of campers, trailers and motor homes. We've stayed in campgrounds fenced and nightlighted. Yet I'd have to say that most of our overnight stops have been along deserted highways where no campgrounds existed. In all that time we've never been molested. Yet the fact remains that robberies and even occasional assaults on people camping in remote areas seem to be on the increase.

This means all campers should know that while probably 99 percent of all campers are honest, law-abiding outdoor lovers, a tiny percentage of them are out for trouble and special caution should be exercised nowadays.

Preventing theft

The solution is not better police work. What's needed is more theft-prevention work by campers. To this end, *Popular Mechanics* suggests:

1. Keep valuables out of sight! Along your route to camping areas, keep cameras, binoculars, purses and expensive tools hidden. Don't leave your favorite driving gloves, flashlight or movie camera on dashboard or rear window ledges while you enter a restaurant or purchase groceries. At the campsite, lock your car and camper before hiking away on side trips.
2. Eliminate the easy pickings. Lanterns, ice chests, sleeping bags and other compact camping equipment should be covered, set inside the tent, or at least placed out of sight of roadways. Most campground thieves cruise roadways looking for unprotected gear at open campsites.
3. Where camping areas are adjacent to lakes and rivers, lock your boat and outboard motor at night. Remove ignition





keys and run a chain and padlock through the boat trailer winch-stand to some solid object.

4. The simple act of parking with the tongue of a trailer facing into the campsite is enough to discourage a lot of impulsive thievery. If your family takes an overnight backpack trip, keep everything locked in the coach during your absence. For trailer-towers, trailer stores carry locking-ball devices that can be inserted into the trailer coupler to prevent theft.

5. When you temporarily abandon a campsite with your camping vehicle, there are several ways to post your intent to return. Make or purchase a small sign bearing your name and on which you can write the time you'll return. Some campers leave a pair of camp chairs (which might disappear), or notify a park ranger. Several campgrounds have firm rules that limit absence to one overnight trip. It depends on the park policy.

6. If you unload your pickup camper coach at a campsite, take the precaution of running a length of chain through one of the coach tie-down eyebolts to a nearby tree, camp table or other solid object.

Picking an overnight site

The old saying about "safety in numbers" is certainly true when you stop along open highways. Where you find a wide clearing during the travel season, two or three camping vehicles will con-



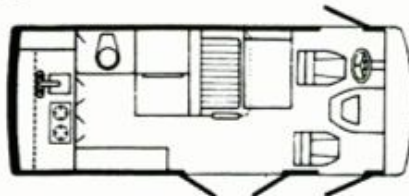
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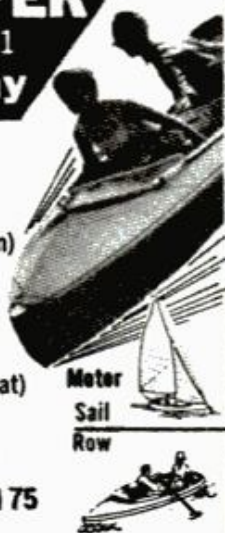
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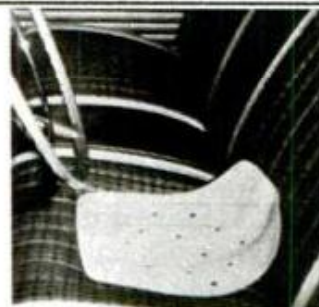
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gregate. If you're forced to park where traffic is light and no other parked campers are found, try to get far enough off the highway to hide your vehicle. Sometimes all that's necessary is to turn in behind a signboard or grove of trees, or drive a short way up a country lane.

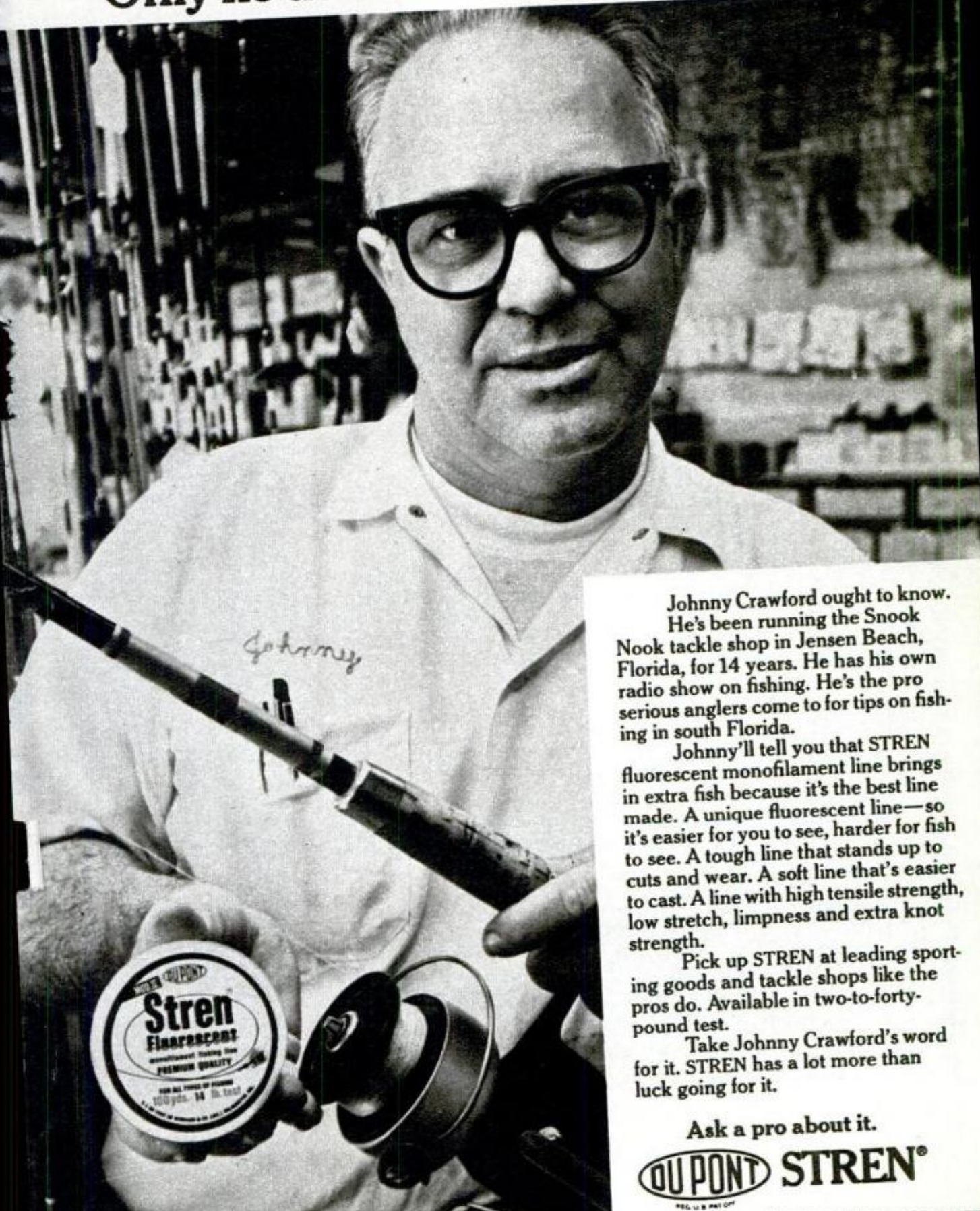
Many all-night service stations allow recreational vehicles to park on the apron behind their main building. If you find a friendly station don't abuse your host by demanding water, electricity or sewer outlets. Usually farmers are tolerant of over-night campers if they observe a few common sense rules. For example, parking in farm lanes and blocking gates will infuriate your host. Fields of stubble or cleared fields are generally a safe bet, but don't drive out across them. Park as close to the fence as possible. Just one discarded paper cup, cigaret wrapper or bean can *should* get you ousted. If you arrive before dark, ask permission politely. Leave without an argument if turned down. Personally, I like to offer a modest payment when a farmer is kind enough to allow us over-night space on his ranch. Three to five dollars is not too much to pay when other space is virtually impossible to find.

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