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POPULAR MECHANICS

AUG. 1970
50 CENTS

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Fighters'
Newsletter

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California's New Superspeedway —
Will It Steal the Show from Indy?

How to Stop Your House From Sweating

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AUGUST 1970

1

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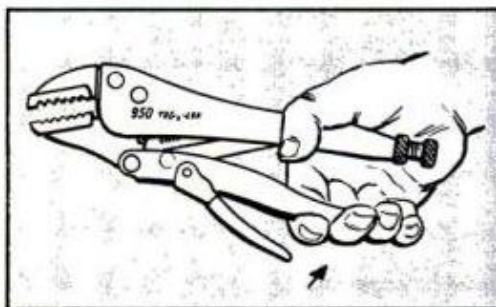
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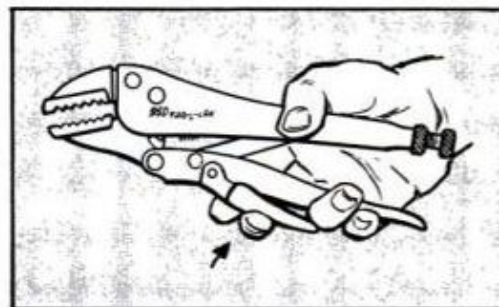
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†Average of all tests run simultaneously by independent test fleet during last 12 months.



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Perry Oceanographics new two-man wet submersible, the Shark Hunter

NEXT MONTH IN POPULAR MECHANICS

Too Fast in Fog. How to keep from getting killed when visibility is bad.
First Report on the '71 Fords and Mercurys. And a look at the pint-sized Pinto.
PM 'Helps' Chevy Test the Vega. PM editor tells how it performs.
How to Choose a Speaker. How to select the best and match it to your components.

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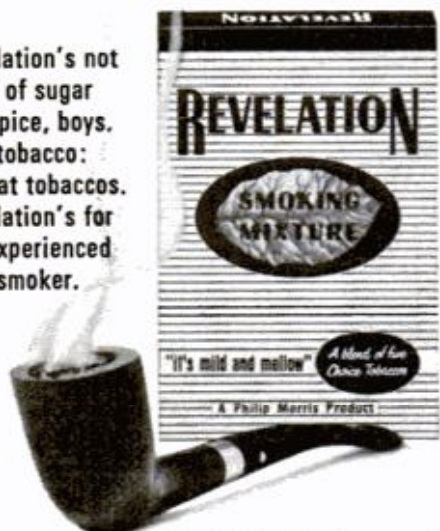
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LETTERS

TO THE EDITOR

Campground controversy

Enjoyed the special section, *Camping '70*, in your May issue—especially the information on the trend toward private campgrounds.

The author of *The Case for Public Campgrounds* (page S6) seems completely unaware that private campgrounds are controlled by state rules, regulations and codes—plus any the county and city care to add—that are completely unrealistic as far as preserving the rustic feeling (at least here in California).

State and Federal campgrounds are completely immune to building, health and safety codes that private campgrounds are forced to comply with. Paved streets, curbs, gutters, fences and the like take away the "out in the country" feel the camper is looking for.

The Title 25 state rule book has campgrounds and recreation vehicle parks lumped into the same book with mobile home parks. The result: Very few private campgrounds exist in California. The money required to build a campground to mobile-home specifications cannot be reimbursed with fees that must compete with state parks, which do not have to make the fees to pay for land, improvements and payroll.

LONG BEACH, CALIF. MRS. C. L. ORCUTT
CAMPGROUND FRANCHISE OWNER

But aren't you agreeing with our author? He, of course, did not discuss the economics of campgrounds except in relation to the campers. It would seem that the laws that stifle ownership of campgrounds in California should be the subject of strong complaint to your legislature. (Or invite Governor Reagan out to spend a few nights in a tent.)

World's cleanest?

Is This The World's Best Workshop? (page 146, June PM) doesn't show a workshop as such; all it is is a beautiful display of tools which I'll bet the owner never uses (outside of vacuum cleaners).


I do not have a photo of a shop "better" than the one shown, but the one I have does not have the antiseptic appearance of the one in your story. However, all the tools I own are put to use.

BYESVILLE, OHIO PAUL PALLAT

Okay, your shop's messy and our shops (Please turn to page 8)


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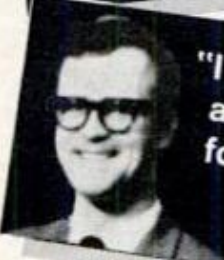
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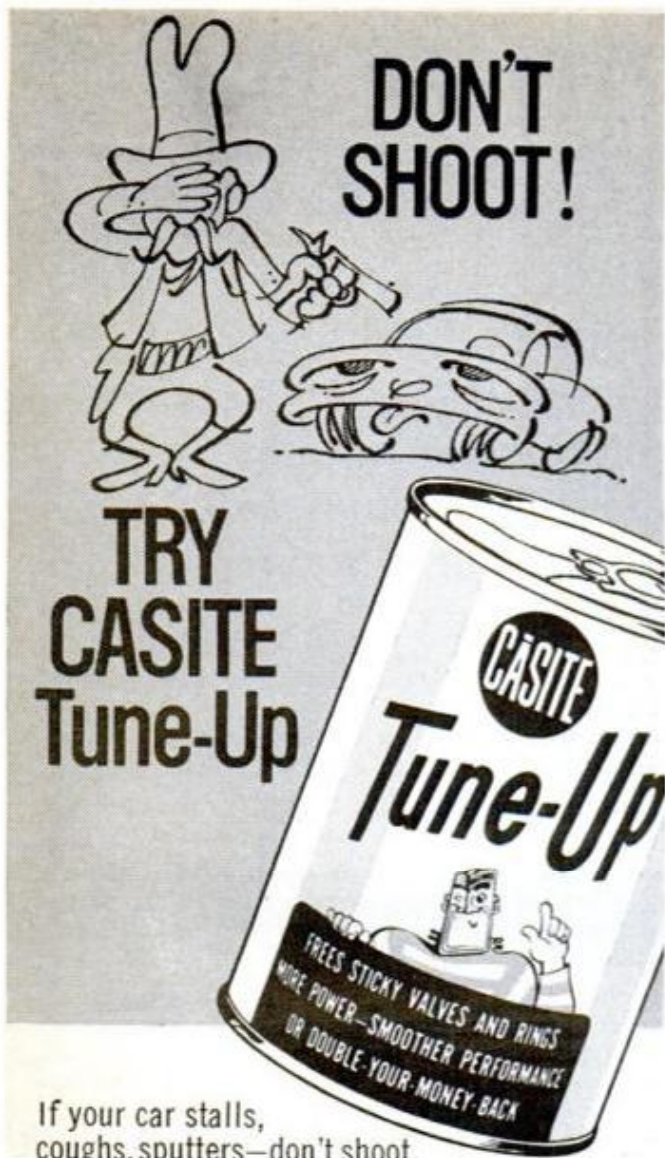
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- Commercial Art
- Computer Programming
- Dental Assistant
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Miss _____
(Circle title and please print)

Address..... Apt.No.....

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Interested in a career not listed? Write here: _____



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LETTERS

(Continued from page 6)

are too. What really bugs all of us is that our wives will see that clean shop in our June issue—and there go all the excuses.

Soft touch for cars

In regard to the source of the automobile finish described in *Cars With a Velvet Touch* (page 123, June PM), I wish to note that Velvetronics is a wholly owned subsidiary of Lee Myles Corp. The address is 59-24 Maurice Ave., Maspeth, N.Y. 11378.

LEE MYLES CORP.
 MASPETH, N.Y.

ALFRED J. MODICA
 EXEC. VICE PRESIDENT

Take me to your liter

I was somewhat amused by the letter from a Florida reader (*Letters*, page 6, May PM) bemoaning the use of the metric system in your publication.

Perhaps he is not aware that the metric system has been legal in the United States since 1866, and since 1893 the Bureau of Standards has used the metric system to determine how much a pound weighs and how long a yard is. The name of the awkward system he is enamored of is the *British* (not American) system.

Anyone capable of multiplying and dividing by 10 and willing to invest a bit of time in understanding the metric system will find it extremely easy to use and will discover why 90 percent of the people on earth use it.

(I'd walk a kilometer for PM, love it a kilogram and a centiliter and would rather turn down a liter of fine brandy than miss it.)

MINNEAPOLIS

ROGER E. WIEBE

Fan of Mort

Mort Schultz does a good service to many people in *Automobile Clinic*. Thanks—both for them and for myself.

COLORADO SPRINGS

WARREN F. TYLER

Chicken power for cars?

My wife has been telling me about a TV show she saw concerning a man from England who was running his car on gas made from chicken manure. Do you have any information on this? If so, I would like to know how the manure is processed to get this gas. Also, about how costly would it be?

We have lots of chicken manure.

CLAYPOOL, IND.

J. D. BARRETT

We didn't see the TV show, but the man
 (Please turn to page 10)



Al Unser put Autolite spark plugs to a brutal test winning the 1970 Indy 500*. But you know what? You're tougher on yours. Because city driving fouls plugs worse than racing. So Autolite originated plugs with longer tips that reach the hottest engine gases. They burn themselves clean. Next time, ask for Autolite spark plugs. They pass the toughest test at Indy. And the toughest test there is. Your kind of driving.

***Autolite also sparked Indy winners in 1969, 1968, and 1967.**



A USAC sanctioned event.



Autolite 



We pass the toughest test.

**SAVE \$200 or MORE —
INSTALL YOUR
OWN AUTO AIR
CONDITIONER**



Supreme Unit



Super Unit

It's not too late to enjoy cool driving this summer. Comfy-Kit gives you all the cooling power you can use, and by installing it yourself you can save up to \$200. That's like being paid up to \$50 an hour for your time . . . while you have the satisfaction of doing it yourself.

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Comfy-Kit will loan you the tools you need for installation, furnish you an easy-to-follow instruction book and give you a 12-month/12,000 mile warranty on your unit.

Thousands of satisfied users are enjoying cool driving in sweltering heat. You can save money and drive cool, too with Comfy-Kit. Mail coupon today.

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- Enclosed is \$165.00 for Supreme Unit*
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- Enclosed is \$8.00 deposit for a set of four tools, which will be returned to me when I return the tools.
- I would like to see the instruction book before I order. I enclose \$1.00 for the instruction book only. I understand this will apply on any future Comfy-Kit order.

Name _____
Address _____
City _____ State _____ Zip _____
My car is a _____ (year) _____ (model) _____
Engine displacement _____ Horsepower _____
Power Steering _____ Yes _____ No _____
Floor shift _____ Steering column shift _____
Smog pump _____ Yes _____ No _____
Please ship via _____
*plus state tax where applicable

LETTERS

(Continued from page 8)



we heard about is Harold Bate. He explains that "the manure is placed in an oil drum at a low temperature for 36 hours (top photo). The resulting gas given off is methane. This is drawn off and bottled. A simple adapter on a carburetor enables the gas to be piped into the car's fuel system (bottom photo). An added advantage is that when the car is converted to methane, it will still run on gasoline." Bate figures he can produce the running equivalent of a gallon of gasoline for 3 cents.

Plans for Back-Yard Beauty

Judging from our mail, the instructions for ordering plans of PM's Back-Yard Beauty (page 110, May PM) were not clear. Both versions of the yard structure—the Western-style model and the alternate Western side door—are included in the \$2 set of plans. (Many readers thought they had to order each separately.) Order from PM's Reader Service Dept., 224 West 57th St., New York, N.Y. 10019. ★★

TOM McCAHILL SAYS:

“You can pocket \$5 to \$7 an hour if you’re good enough to fix these things.”

The coming of the automobile built a multimillion dollar service industry in a few, short gas-eating years. The same thing has happened in the electrical appliance field. Manpower is desperately needed now to repair appliances.

But there is one big difference. Anybody with a few simple tools can get started in appliance repair. No expensive equipment is needed.

What is needed is the right kind of training. You can’t strike it rich in today’s job market with nothing more than muscle. Nor can you hang onto an old-time job skill while an electronic monster with buttons replaces men around you. It’s like driving a buckboard down the Jersey Turnpike. The fuzz would locate you fast and send you out to pasture.

If you want an up-to-date job skill with good opportunity—why not take a look at the Electrical Appliance Repair field?

This field is loaded with opportunity because every house in our high speed land is loaded with appliances. There are about four times as many appliances as we have men, women, children and babies in the good old U.S.A. There are over a billion of these electrical gadgets being used, abused and broken. If you know how to do fast repair jobs on them, how much you can earn can well depend on how much you want to earn.

The opportunities in this field are all the better because you can prepare for them fast. There’s one short, sweet course you can take right in your own home and it covers everything. I’m referring to a home-training course offered by the Appliance Division of National Radio Institute—one of the biggest and oldest home study schools of its kind.

NRI gives you the whole works. Their training covers basic electricity and how to use test instruments. They cover the electrical and mechanical operation of every type of appliance from toasters and coffee-makers to dishwashers; from vacuum cleaners and automatic laundry equipment to air conditioners and refrigerators. They even show you how to fix farm and commercial appliances and small one-lung engines.

The training is designed to be interesting, practical and fast. You can make \$5 to \$7 an hour extra fixing



appliances in spare time starting soon after you enroll. They give you all you need to know to do fast, profitable repair service. They even include equipment without charging you extra. And the full cost of the training is surprisingly low.

If you are driving a buckboard in today’s job market, at least find out what the Appliance field can do for you. NRI sends you a fancy, illustrated book about their training so you can judge for yourself. There’s no obligation and they don’t send a salesman to pressure you. All I say is get the facts and see for yourself. Send the coupon today while you are thinking about it.

Tom McCahill

AVAILABLE UNDER NEW GI BILL
If you served since January 31, 1955 or
are in service, check GI line below.

APPLIANCE DIVISION, NATIONAL RADIO INSTITUTE 600-080
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OK—I want to see for myself. Send me the free book on Professional Appliance Servicing.

Check for facts on new GI Bill.

NO SALESMAN WILL CALL.

Name _____ Age _____

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City _____ State _____ Zip Code _____

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WHAT'S NEW OUTDOORS

BY ROB KINSON

WHEREVER YOU CAMP, fish or travel, you can have pure water with the Quench Water De-Salter/Purifier.

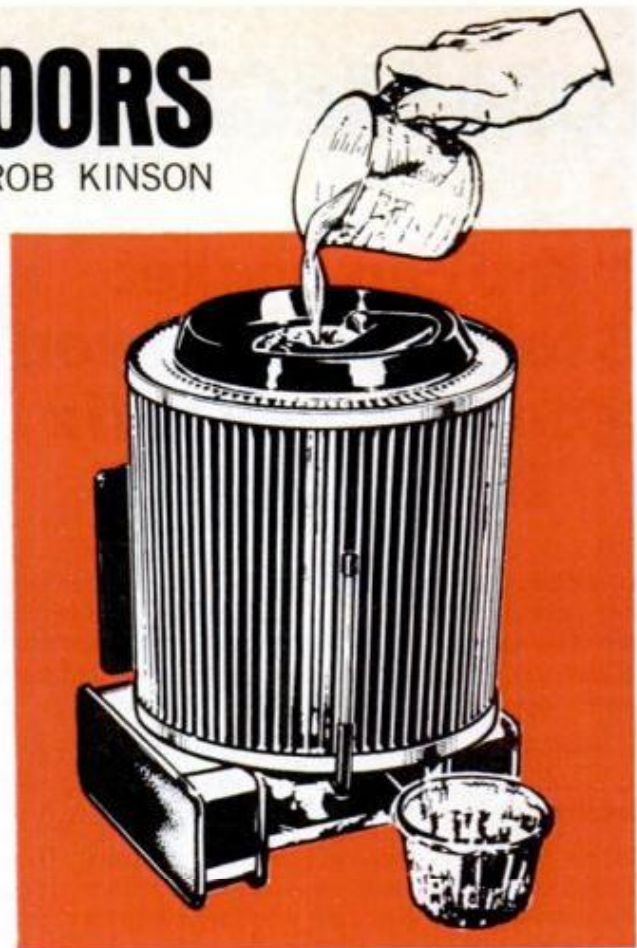
Operating by distillation, the Quench Water De-Salter removes all solid impurities, salts, minerals, pollutants and objectionable taste from your water, making it safe for drinking and cooking, making ice cubes and beverages, laboratory experiments and for special dietary requirements (salt-free). It's also an economical replacement for bottled-water service. And the manufacturer says it's as easy and safe to operate as a coffee pot!

The DeSalter comes in two models, portable (Model 200) or electric (Model 100E), and is available at Abercrombie & Fitch, Orvis Co., Oshmans, or directly from Terraqua Marketing Div., Exri International, Box 26019, Denver, Colo. 80226.

DISPOSAL OF SOLID WASTES is one of the nation's most pressing pollution problems. The Departments of Agriculture, Interior, and Health, Education and Welfare have established a research project at Madison, Wis., to develop ways of transforming discarded cans, bottles, plastics, paper and other solid trash into materials that can be reused in the economy.

The Interior Department's Bureau of Mines is working on ways to reprocess the \$1 billion worth of metal waste lost each year into an acceptable, low-cost state for reuse by manufacturers.

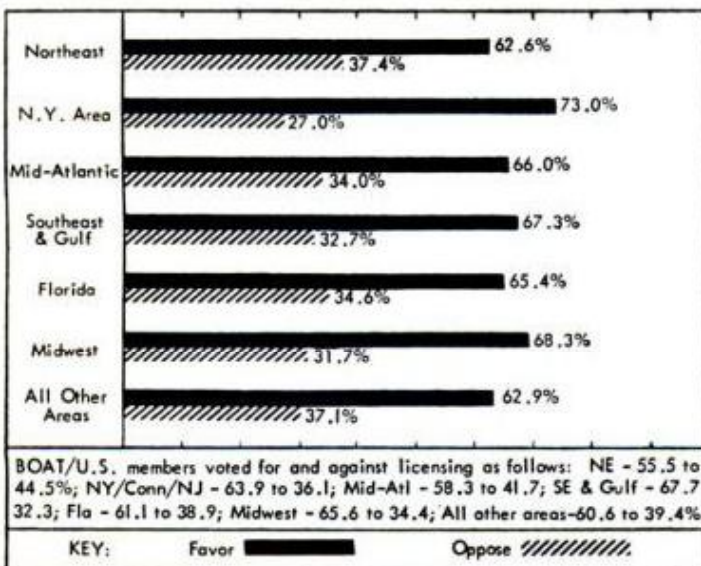
About half of the refuse collected is paper and wood products. The Department of Agriculture's Forest Products Labora-



tory is developing ways of converting this paper waste into boxes, corrugated board and tissue paper. Reuse of only half of the 35-million tons of paper waste would, in effect, save the timber from a million acres of forest land.

SHOULD WE LICENSE recreation boat operators? In a nationwide survey of 10,000 boatmen, more than two-thirds (69.9 percent) voted yes. The results of this poll, conducted by the Boat Owners Assn. of the United States, conflict with industry-sponsored surveys and the views of many state and federal boating administrators. "It appears the less experienced (under three years), small-boat (less than 26 ft.) owners favor licensing most strongly," the report observed. The survey further indicates 78 percent of those who favor licensing do so for *all* operators, rather than limiting the licensing to certain age groups or types of boats. The highest vote (46 percent) was for a written and operating test.

Richard Schwartz, executive director of BOAT/U.S., says the results indicate "the majority of the nation's recreational boatmen feel a licensing program is necessary to assure a minimum competence in boat handling." ★★★





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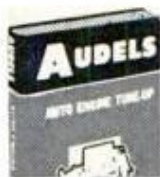
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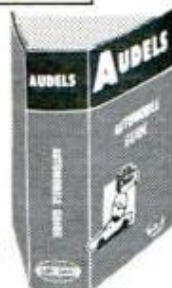
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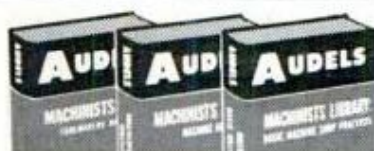
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Ecology—E-c-o-l-o-g-y

This is the year of Ecology. Litterbugs who didn't know what the word meant six months ago are climbing on the bandwagon. We're all for pollution control, and so is everybody else. Clean air and pure water are the Mom and apple pie of 1970. Take a stand on Vietnam—one way or the other—and you've got opposition. The same goes for integration, law and order or tight money. Attack pollution, and everyone's with you.

Once a college wasn't big-time unless it had a 50,000-seat stadium. Later prestige required a cyclotron, more recently a computer or a hyperbaric chamber. Now academic status is a Department of Environmental Science.

We certainly don't want to be accused of being *for* pollution—God forbid! On our first trip down the Colorado River nine years ago, we found ourselves wondering how long it would take to fill the canyons up with beer cans. We've been back three times since; the thirsty nature-lovers are making progress. As long as we put beverages in cans or no-return bottles, jerks will throw them away. Maybe the answer is an edible container. No one litters with ice cream cones.

It's strange that pollution fighters haven't zeroed in on big trucks and buses—diesels especially. Smog crusaders should have saved the streetcar.

We don't like our oysters garnished with sewage or our air enriched with sulphur dioxide any more than you do, but it's going to take more than breast-beating and preaching to clean things up. The *Pollution Fighters' Newsletter*, begun in *PM* last month, will appear in each issue to report what's being *done* all over the U.S.



Maybe Apollo Was Too Successful, we wrote in the May *PM*. Before the issue was in your hands came the agonizing cliff-hanger of Apollo 13. We still say Apollo is a success. And, although no one would order such an emergency for a "drill," we may have learned more about what Man can do in Space by the heroism of Jim Lovell, Fred Haise and Jack Swigert, and by the cool improvising of their ground controllers, than if the astronauts had actually walked on the Moon.



The new house that Wayne Leckey, *PM*'s Home and Shop Editor, had just finished building in Aurora, Ill., when *PM* moved to New York in 1962 wasn't on Ontario St. But the sign means almost as much to Wayne. It's a souvenir from the Popular Mechanics Building in Chicago. Because he put in 22 years there, no one disputed Wayne's claim to it. The silver bowl is a more recent trophy, an expression of his fellow staffers' esteem and affection on the occasion of Wayne's 30th anniversary with *PM* this past January. Asked why he had stuck with us for three decades, Wayne choked up. He finally answered, "Because I love this magazine." It's a love that shows through every one of the 50 or so pages Wayne is responsible for in each issue of *PM*.



Robert P. Crowley

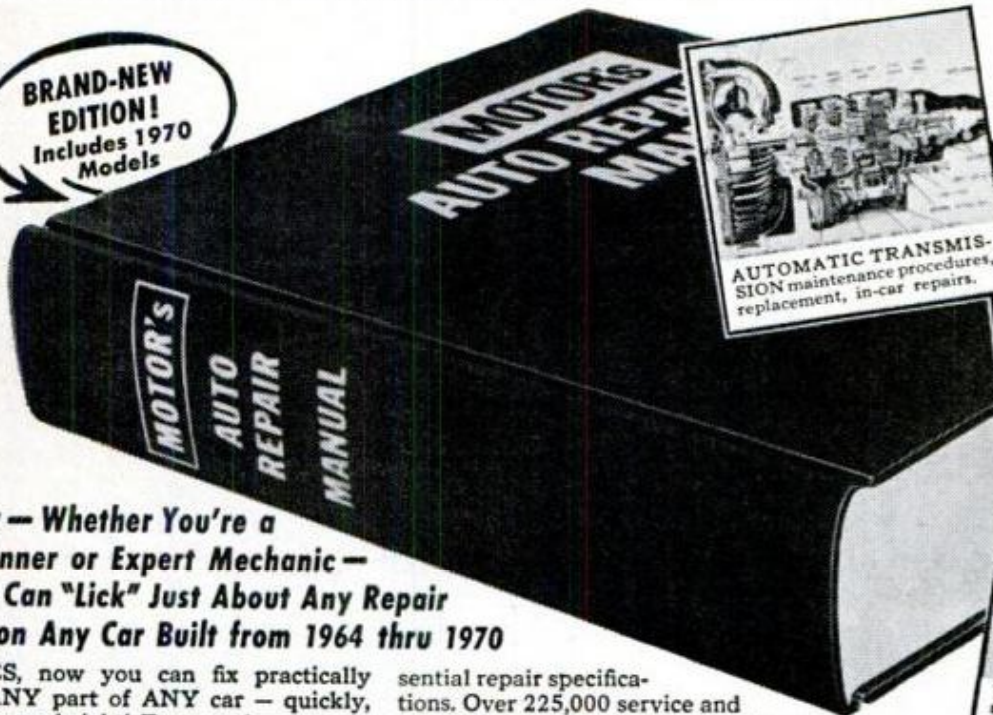
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Live and healthy after 950 days on the moon. The "earthling" that apparently achieved this feat, according to NASA, is a streptococcus mitis microorganism. It was found in a camera recovered from Surveyor III, which was soft-landed on the moon three years ago. The Apollo 12 crew brought it back with them. The organism was placed in a broth and "the first signs of life were observed after four days of incubation," report NASA scientists. "On the fifth day the tube was turbid with growth." Streptococcus mitis is a common respiratory organism. It does not ordinarily harm man, and the retrieved organism produced no disease in animals inoculated with it.

Synthetic diamonds of gem quality—and weighing more than a carat—have been produced by General Electric researchers. This is a dramatic accomplishment in view of the fact that before this GE's largest industrial diamonds weighed but a thousandth of a carat. The big gem rocks are made by putting small synthetic diamonds (made from graphite) in a chamber, applying pressures of about 60,000 atmospheres and heating them to temperatures over 2500° F. It takes about a week for the gem diamonds to slowly "grow." GE officials say their one-carat stones are too costly to compete with natural diamonds. The company has no plans to market them, regarding them as a scientific achievement.

Instant color movie film and 35-mm transparencies are future products of the Polaroid Corp. In a recent demonstration, a scene was shot with a standard motion picture camera. The film was run through a "black box," which took a minute, and then was projected. Polaroid officials did not disclose technical details, but said the new film does not make use of the dye-developers that are the basis of the company's color film for prints. When the new film will be commercially available is another company secret.

"The first major change in wire making since jewelers in ancient Egypt began drawing gold wire through drilled stones." That's Western Electric's characterization of its new method of producing wire through a process called "continuous hydrostatic extrusion." The method involves using a fluid to force wire rod through a high-pressure chamber and out of a die. There is no metal-to-metal contact, and only one pass through a single die is required to achieve desired fineness. (Conventional wiremaking requires drawing wire through as many as 24 dies in tandem.) Advantages of the new method include lower equipment costs, reduced space and power requirements and less wire breakage. There are said to be indications that this wire is stronger than drawn wire of the same gauge.

The Atlantic Ocean is very young and once was relatively shallow. These findings were recently reported by scientists aboard the Glomar Challenger, research ship with special drilling equipment for obtaining deep-sea cores. Fossils found in sediment samples, said to be the oldest yet obtained from the ocean bottom, indicate that the Atlantic may have been formed about 150 million years ago, during the age of the dinosaurs. Among other evidence, the predominance of limestone in the sediment "suggests that these deposits were formed at an early stage in the creation of the Atlantic, long before it reached its present depth," said the scientists. The character of the sediment also adds support to the theory that the continents once were joined.

The first total synthesis of a gene—an organism's basic hereditary unit—has been accomplished by University of Wisconsin scientists. The feat makes it possible for chemists to create genetic material from simple organic chemicals, building blocks known as nucleotides, instead of having to take bits of material from living cells to form new genes. The gene synthesized is a giant yeast molecule. ★★★

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SOLUTIONS FOR MECHANICAL HEADACHES

AUTOMOBILE CLINIC

BY MORT SCHULTZ

All aglow

My 1968 Ford is having alternator idiot-light problems. Although I have replaced the alternator and regulator, the light stays on unless the engine is revved to half-throttle or is at operating temperature. What do you suggest?—Rod Edgerly, Guilford, Me.

The conditions most likely to cause this are a weak ignition switch and a bad diode in the alternator. Since you have already replaced the alternator, set your sights on the switch.

Stretch out

My 1969 Dodge with slant-Six 225-cu.-in. engine and manual transmission always jerks and hesitates if I don't race the motor when I let out the clutch, which is properly adjusted. It makes no difference whether the engine is hot or cold. My dealer is stumped.—Maurice Van Hecke, Minneota, Minn.

No need to be. This trouble can usually be eliminated by providing for a longer accelerator-pump stroke. The accelerator pump is controlled by a linkage which is bent to change the stroke. Also be sure that engine idle is on the high side of the specs. Set it at no less than 650 rpm.

Diesel dilemma

I drive a Mercedes-Benz 200D (D for diesel). I had no trouble starting the car for the first 2½ years. However, things have changed. After pulling out the dashboard glow switch and getting a red glow, I pull the starter. But instead of an instant start as before, cranking now takes 10 revolutions before it fires. Glow plugs have been replaced and a new battery installed. Do you have some ideas?—O.F. Depperman, Clearwater, Fla.

Yes—five of them. First, replace the main fuel filter and clean out the in-line filter. Second, check the starter draw. If more than 300 amps., the cables, starter or both are at fault. Three, test the conical spray of the fuel nozzles to be sure that sufficient, but not excessive, fuel is being delivered. Then, adjust the intake valves. And finally, if all else fails, take

compression and cylinder-leakage tests to detect an internal problem.

Mired down

My mechanic has advised me that my engine needs desludging to avert serious damage. It's getting only five pounds of oil pressure at idle. The car is a six-cylinder 1967 Tempest, and he says that oil-screen clogging is not an uncommon problem. Can you tell me why?—E.R. Hughes, Woodbury, N.J.

I can tell you what I have heard from guys who know this car best. And they say the factory oil change recommendation is too lengthy. Pontiac recommends a change of oil every 60 days or 6000 miles, whichever comes first. These fellows say to change oil every 60 days or 2000 and you will not have trouble. Replace the oil filter at every other oil change.

Danger: wet disc brakes

The disc brakes of my 1969 Volvo 145 become so badly saturated when I'm driving on an expressway in rainy weather that they are completely worthless for the first 50 to 100 feet after I apply them. The same is true if I simply take the car through a car wash. The Volvo serviceman advises that I apply a little pressure to the brake pedal often to dry the brakes off, which seems quite ridiculous. If disc brakes are this poor, I think they should be outlawed as dangerous. Or are my brakes defective?—M.C. Lorning, Suffield, Conn.

There is probably nothing mechanically wrong with your brakes. An advisement from Volvo says to do what the serviceman told you: Apply the brake pedal now and then while driving in wet weather to allow friction to dry off the brake. Ridiculous or not, this is where the present state of disc-brake design stands.

Misguided gas gauge

My 1969 Chevrolet fuel gauge and that of a friend act the same way. With a full tank of gas, it stops registering two marks short of full. When the gauge reads empty, the 20-gallon tank takes only 12 gallons. The dealer has installed new gas-tank

(Please turn to page 24)



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AUTOMOBILE CLINIC

(Continued from page 22)

registering units three different times. Now he tells me that this is the way it is supposed to be. Pardon me for being skeptical.—Paul Wuermser, Richardson, Tex.

No apologies necessary. Suggest that he stop installing tank units and get to the real problem, which could be one of three things: (1) a loose connection or poor ground in the wiring; (2) a faulty gauge; (3) a gas tank which isn't mounted properly (maybe it is off pitch). By the way, the fuel-tank capacity of your car is 24 gallons—not 20.

Condensation correction

I have a 1969 Buick Electra. While driving during a heavy rain, water splashes beneath the hood and onto the insulator attached to the hood. The insulator gets soaked. Subsequently, the water drops on to the engine and distributor, causing condensation inside the distributor cap. This makes starting impossible until I remove the distributor cap and dry out the condensation. Is there a solution?—M.R. Sweigart, Ephrata, Pa.

The thing we've got to figure out is how water gets beneath the hood in the first place. The most probable way is through the hood molding attaching screw holes. Try sealing these with some dum-dum. I'm pretty sure the trouble will dry up.

Switcheroo

I just bought a new Oldsmobile which has 15-inch wheels. The dealer says that I can use the 14-inch snow tires (mounted on 14-inch rims) from my old car on the rear wheels of the new one. Will I damage anything?—John C. LaPiana, E. Syracuse, N.Y.

No. Contrary to what you may have heard, you can mount 14-inchers, as long as the lugs line up, without damaging axle or differential. The only alteration this causes is with the speedometer, but this is slight and you can adjust your driving to compensate for it.

Difficult differential

My 1966 Rambler Classic six-cylinder with twin-grip has developed a very bad hum in the differential at 37,000 miles. It

occurs in all speeds, under load and at drift. The dealer can't find the cause. Can you?—William Witherow, Coaldale, Pa.

First, drain all the lubricant from the differential and replace it with lubricant designed for the Twin-Grip rear. Someone may have put regular grease into this rear, which will cause no end of noise. If this doesn't help, then the problem is probably bad axle bearings, pinion bearings or side-carrier bearings.

Peacemaker

Settle an argument, please. One of us says that you can tell if an oil filter is still doing its job by feeling to see if it is hot. The other says "no." Who is right?—Pat Fallow and Fred Lefferts, Birmingham, Ala.

Whoever said "no." Although the filter itself may be dirt-clogged, hot oil will usually circulate through the filter's shell.

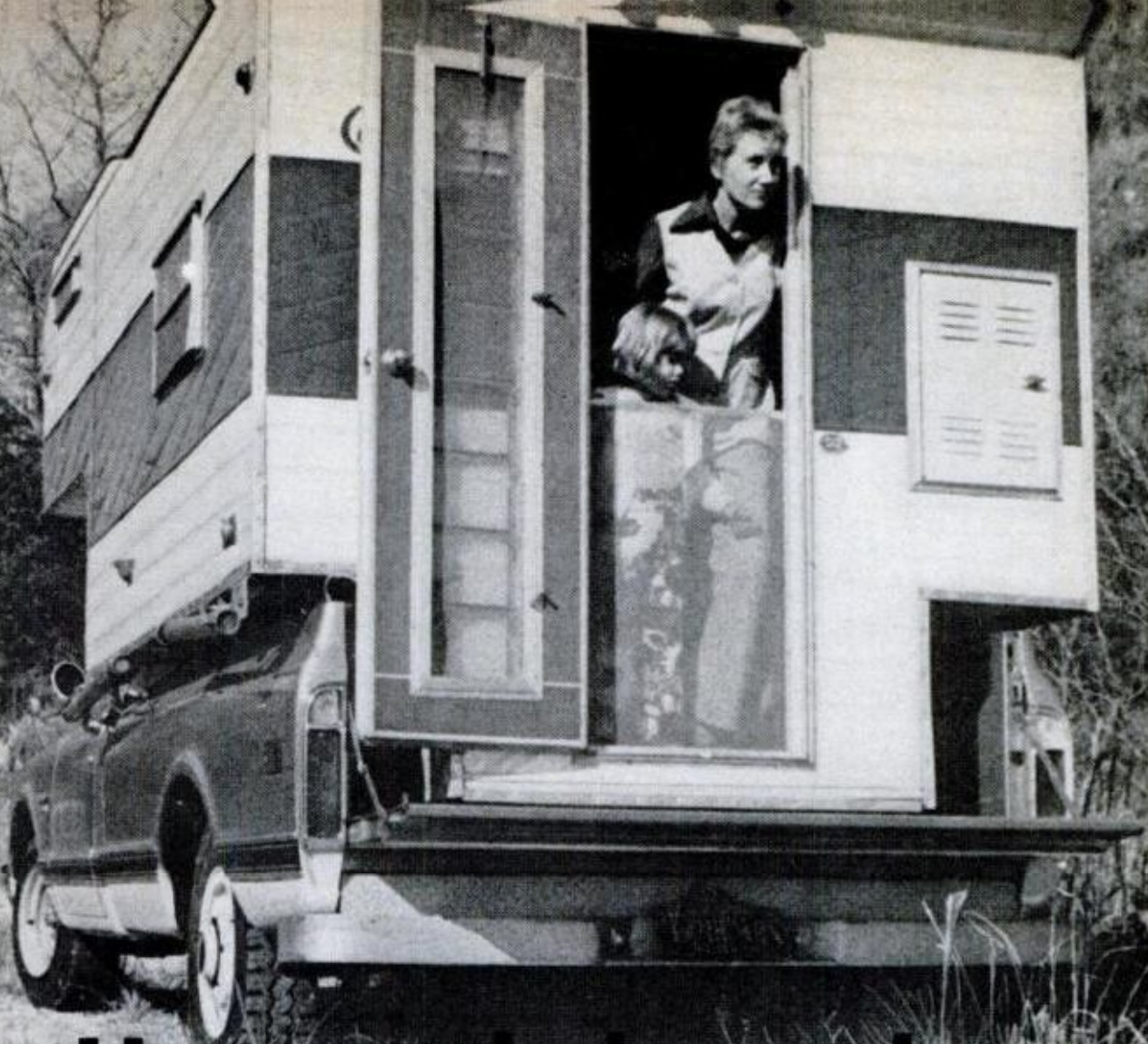
Service Tips

● **Rambler owners** who have M-11 and M-12 automatic transmissions in their cars had best understand a characteristic of those transmissions to avoid an unnecessary repair bill. If you drive at full throttle in the "2" range and approach or exceed the recommended maximum engine speed of 5000 rpm at about 78 mph or more, a 2-3 upshift will automatically occur. Many guys have been replacing control valve assemblies and governors because of this. Won't help. It's a built-in characteristic.

● **Chrysler-built 1970 models** with 318-cu.-in. engines that experience an oil-pump or distributor driveshaft failure should be taken back to the dealer pronto-like. The problem is a result of an irregular oil-pump mounting surface on the rear main-bearing cap. Clearing up the defect is outlined for your dealer by service bulletin 70-9-4 (12/17/69) for Chrysler-Plymouth, service bulletin D70-9-2 (1/21/70) for Dodge passenger cars, and service bulletin 70DT-9-1 for Dodge trucks.

● **The 1970 Oldsmobile 4MC carburetor** has a plastic choke-shaft seal. Do not discard this seal when removing the float bowl to work on the carburetor. It is a permanent part of the bowl, and a replacement is not included in a repair kit.

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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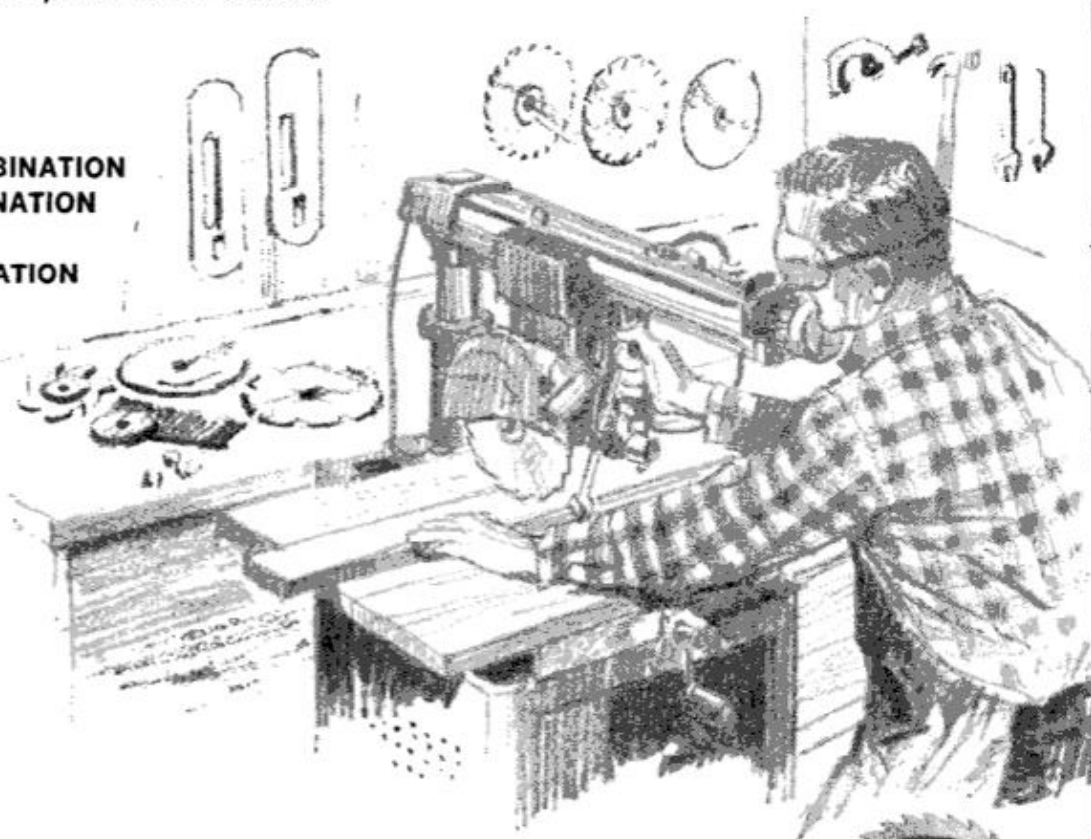
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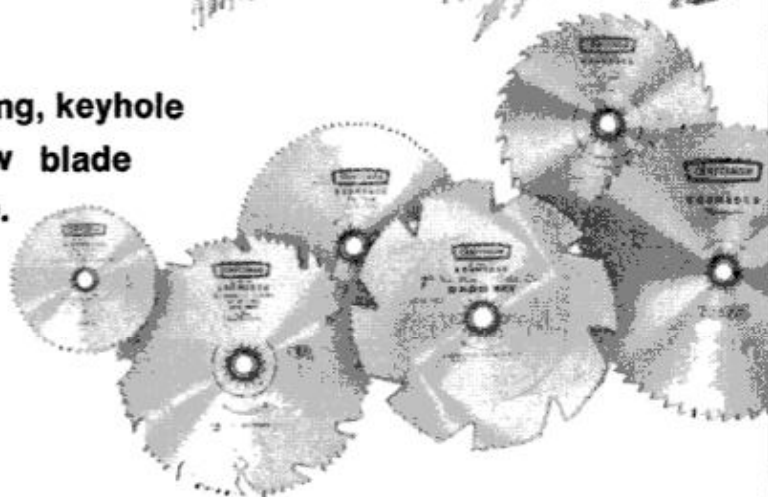
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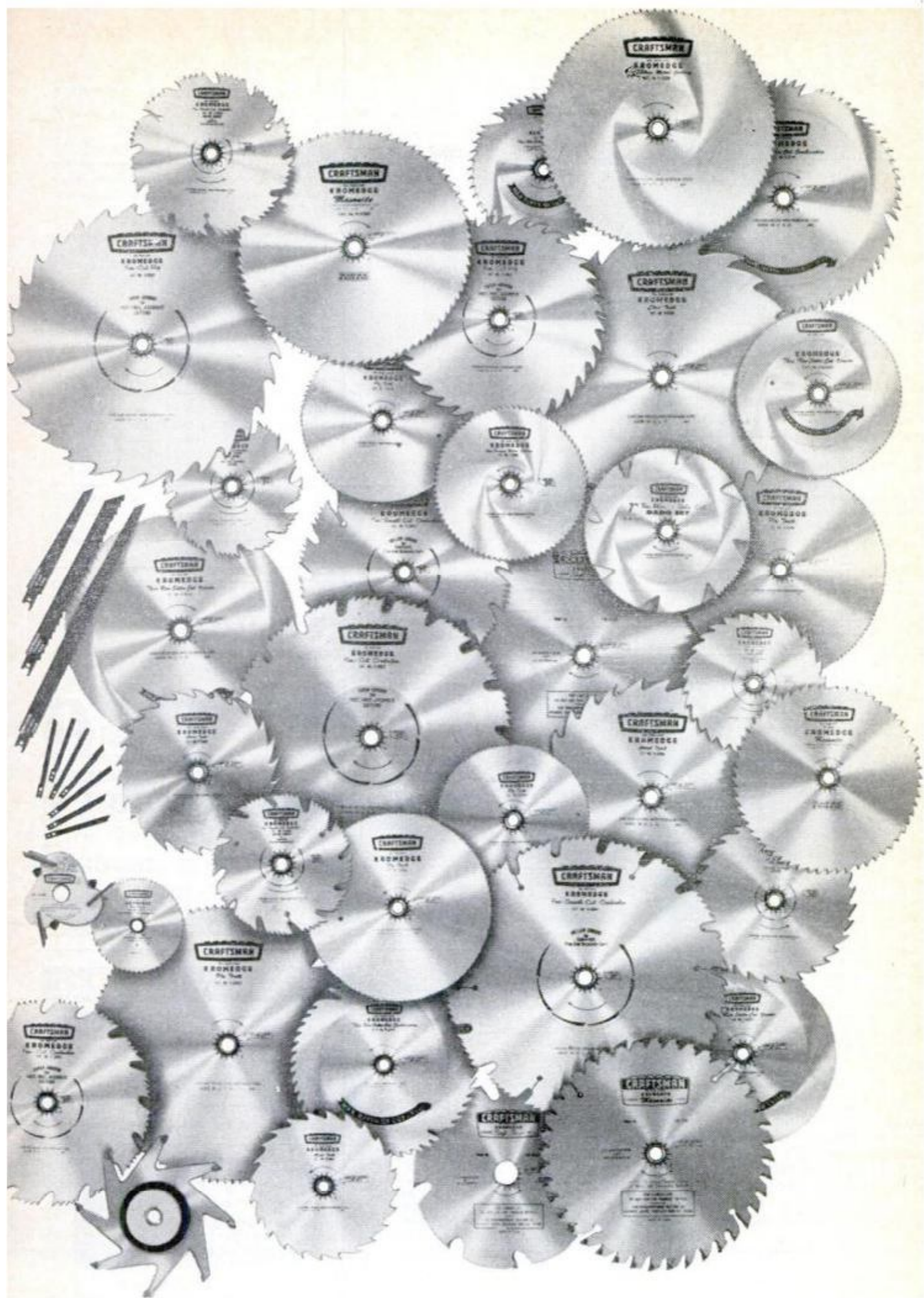


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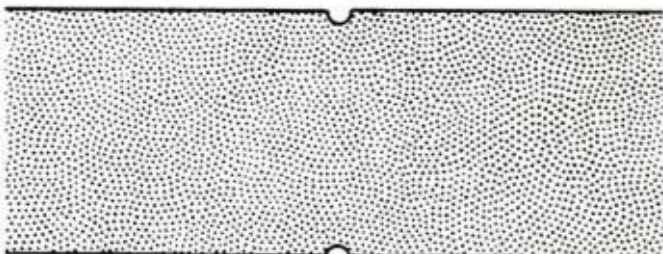
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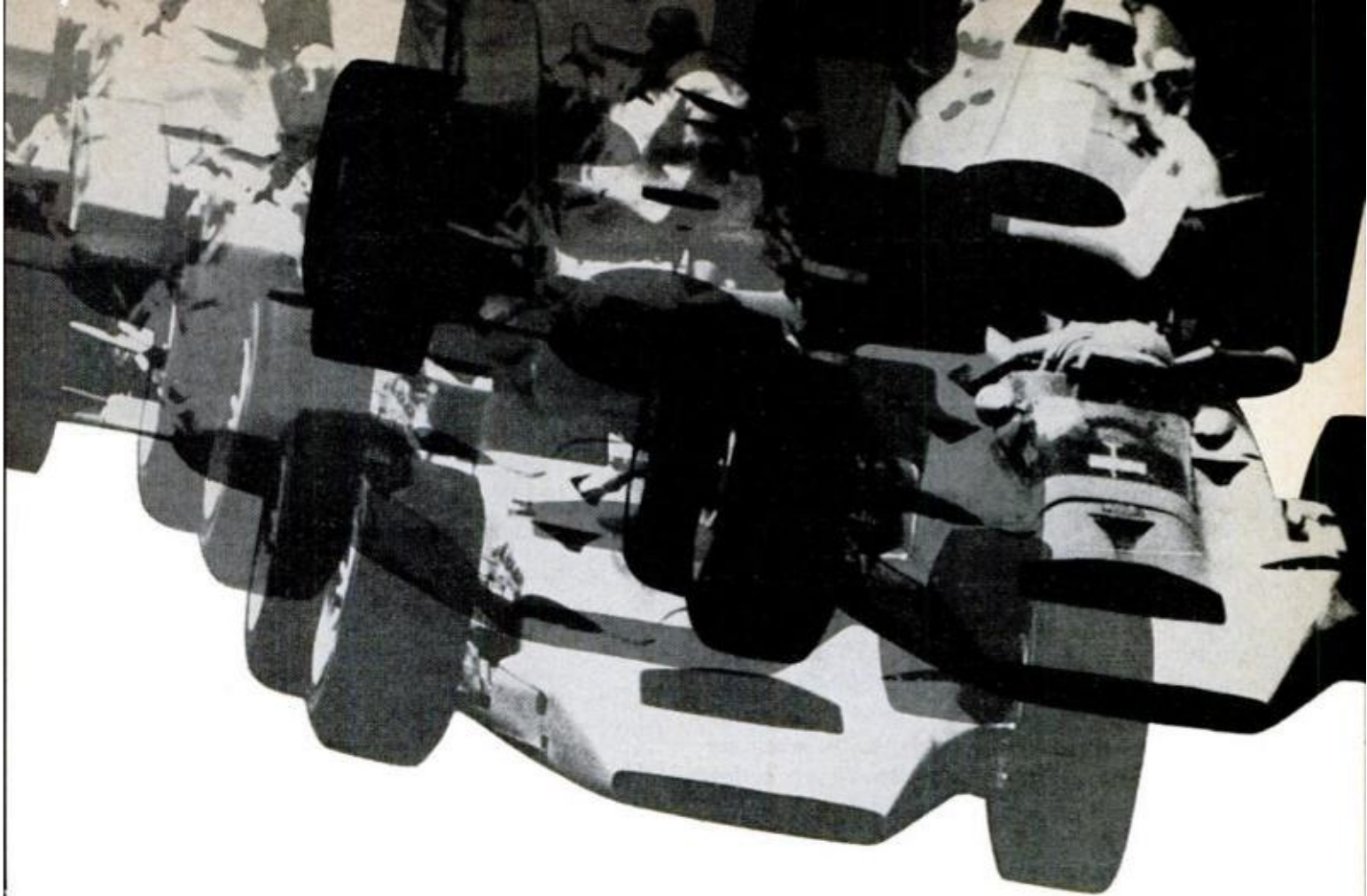
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Drivin' with Dan

How can a manufacturer enter a model in Trans-Am? What are the new Cam-Am cars to watch this year? Why have you stopped making Formula A Eagles? Dan Gurney answers these and other automotive questions

Q. *How many cars does a manufacturer have to make to have a model eligible to compete in the Trans-Am series?—Frank Selby, San Angelo, Tex.*

A. SCCA says the quantity must equal 1/250th of the total 1969 production for that company, with a minimum of 2500 cars. The actual figures this year were 8200 for Chevrolet (Camaro), 7000 for Ford (Mustang), 2800 for Dodge (Challenger), 2500 each for AMC (Javelin) and Plymouth (Barracuda). These figures were supposed to be met no later than 10 days prior to the first race but the deadline was extended and now it is my understanding that all manufacturers have met these minimums.

Q. *How many cars did you have in this year's Indy 500 and what caused your first and last pit stops which appeared to keep you from winning?—Rick Simon, Omaha.*

A. There were 9 Eagles in the starting field of 33 and 5 finished in the first 12 positions. My first stop came early because I felt something that led me to believe part of the suspension may have broken. We were unable to locate it, so I simply made the best of it. Later we discovered a couple of problems there. The last stop occurred because my engine vapor-locked under the suddenly reduced tempera-

tures brought on by slow running under the yellow flag at the 172nd lap.

Q. *Are there any new cars to watch in the Can-Am series this year?—Peter Becker, Elkhart Lake, Wis.*

A. The two most likely to be watched are Jim Hall's new Chaparral 2-J and the new March 707. At this writing not much is known about the Jim Hall Chaparral, which is supposed to have a new device for improving cornering. The March car, I understand, is more straightforward but its designers seem to be able to come up with a competitive Formula 1 car following that procedure and it will be interesting to see if the same method works in Can-Am.

Q. *Do they still run the East African Safari? If so, do you know who won this year?—Paul Cheval, Montreal.*

A. Yes, they do. This year's event was contested by factory teams from Datsun of Japan and Lancia and Ford of Germany, plus many private entries. Datsuns (1600 SSS) finished 1-2-4 with a Peugeot 504 3rd. I understand it was the culmination of a very serious effort by the Datsun team which was sadly marked *(Please turn to page 32)*



RUNNING AT INDY in the 1970 Eagle with turbo-Offy power, Dan placed third. The finish was good for 700 points in USAC's Championship Trail and for \$58,977.49 of the million-dollar purse. Dan's steady performance for 500 miles was slowed by minor suspension problems and a vapor lock condition that developed under the yellow flag.

The winning team lines up behind Champion spark plugs.

Spark plug design really does make a difference.

Hockey great Phil Esposito and basketball star Bailey Howell proved it in an acceleration test.

They chose up sides and led their teams in two relay races. Each team had a Buick, a Chevrolet, a Pontiac and an Oldsmobile. Both teams were perfectly matched, with one exception. The cars in Esposito's team were powered by Champion Turbo-Action design spark plugs, while Howell's team used a

competitive brand of different design.

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DRIVIN' WITH DAN

(Continued from page 30)

by a fatal practice accident for one of its drivers. Run through the African wilds, this is certainly the most unpredictable, if not the most dangerous rallye in the world.

Q. Has there been a confirmation of the exact cause of the accident which took Bruce McLaren's life?—Alex Gunther, Allentown, Pa.

A. Thus far I have not heard of a definite cause, although there are indications that he lost (blew) the engine at a very fast part of the race course and there are also reports that the rear body work may have been blown off the car about the same time. The tragedy occurred when the car spun at high speed into a solid barrier which was placed for the protection of course marshals.

Q. I've just learned that you aren't making Eagle Formula A cars this year. Since Eagles won the first two Formula A championships, I don't understand that.—Bobby Nickles, St. Paul.

A. The time for building "A" cars is approximately the same time to be building Indianapolis cars and we concentrated all our efforts on a large build of new 1970 Indy Eagles this year. However, we have obtained the North American distributorship of a Len Terry-designed car called the Leda/Eagle with which we are most impressed, and it's quite likely that we will return to making Formula A Eagles in the near future.

Q. I was reading an English racing publication recently and noticed a reference to "tyres." What are they talking about?—Billy Presley, Decatur, Ga.

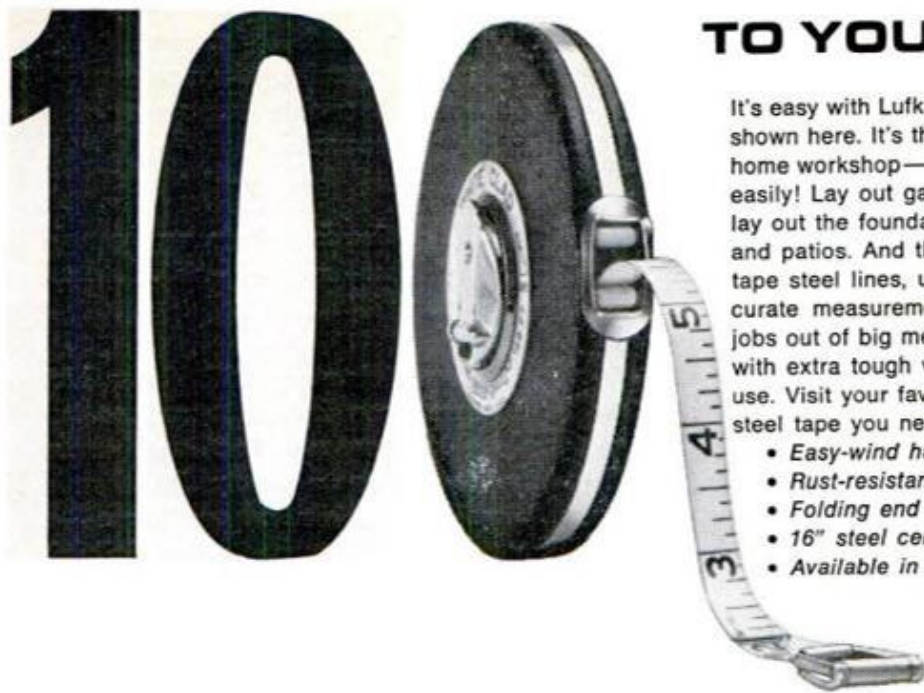
A. That's tires, as spelled by Her Majesty and subjects. You might also have noticed "aluminium" (aluminum) and "litre" (liter).

Q. What do you consider the world's closed-course speed record?—Tommy MacPherson, Walnut Creek, Calif.

A. The recognized record was set this year at the new 2.66-mile Alabama Speedway where Buddy Baker drove a Dodge Daytona stock car around the high-banked track at 200.447 mph—not bad for a 3900-pound car, eh? It was in NASCAR racing form, powered by

(Please turn to page 34)

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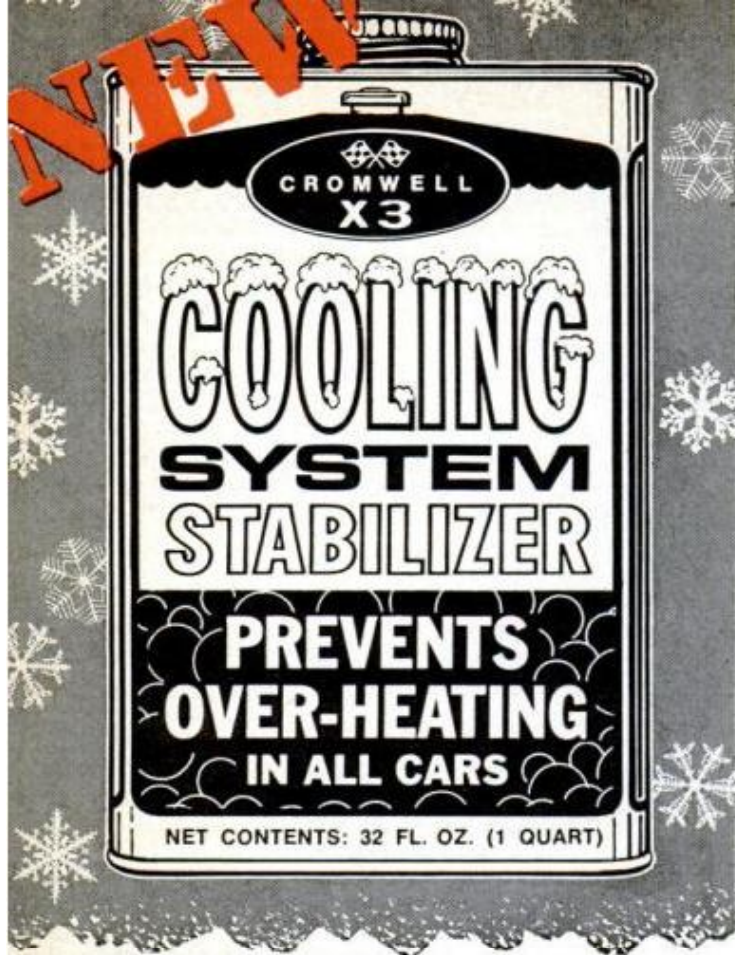
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DRIVIN' WITH DAN

(Continued from page 32)

Chrysler's 426 hemi engine. The record may stand for some time since Baker was using side window glass (meaning less aerodynamic drag on the car), which has since been ruled out for safety reasons.

Q. Was that you or Swede Savage on the pole in the Bryar, N.H. Trans-Am race?—M.V. Putnam, Southampton, N.Y.

A. It was Swede driving my AAR 'Cuda, No. 48. Chrysler has been forced to reduce our Trans-Am team to a one-car effort, and I chose to keep my guarantee to young (23) Swede whom I promised a ride on our Trans-Am team this year. I will race as Denny Hulme's teammate in the McClaren cars in the Can-Am series this season.

Q. I'm going to try to see all three North American Formula 1 Grand Prix races this year. Can you give me the dates?—Nancy Meiers, Chicago.

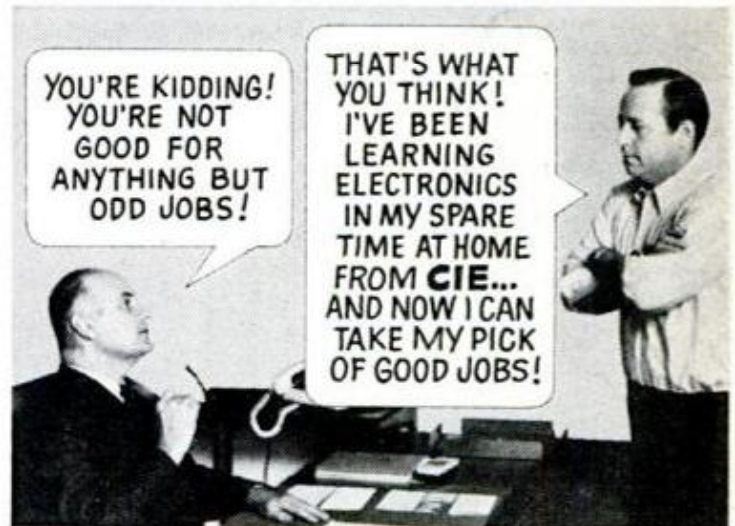
A. Canadian Grand Prix, St. Jovite, Sept. 19; U.S. Grand Prix, Watkins Glen, Oct. 4; Mexican Grand Prix, Mexico City, Oct. 25, and you just might see me at all three.

Q. I am 53 years old and have just started racing stock cars. I have a 1964 Chevelle six-cylinder 230 stock with coil suspension. My problem is with suspension geometry. I drive on quarter-mile tracks with moderate success, but want to be a better competitor. If you could tell me how to get through the turns better, it would be a big help.—Charles Koons, Bay City, Mich.

A. I'd need a lot more information before I could even attempt to give you any helpful advice for use at various tracks. I advise you to enter into as many discussions with your fellow drivers and mechanics as possible so you can absorb the fundamentals of handling. Cambers, spring rates, roll-couples, rake, spring arches, camber curves, roll centers, weight distribution, tire and brake combinations, shock absorbers and center of gravity are all important. ★★★

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 22).

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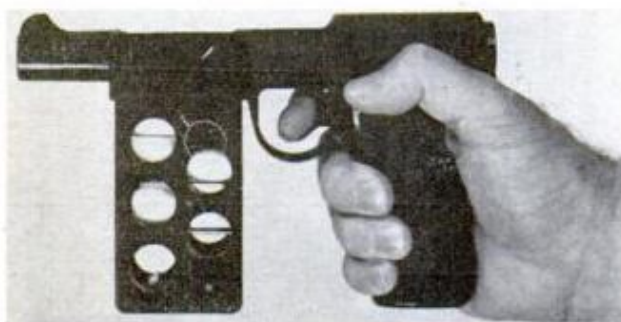
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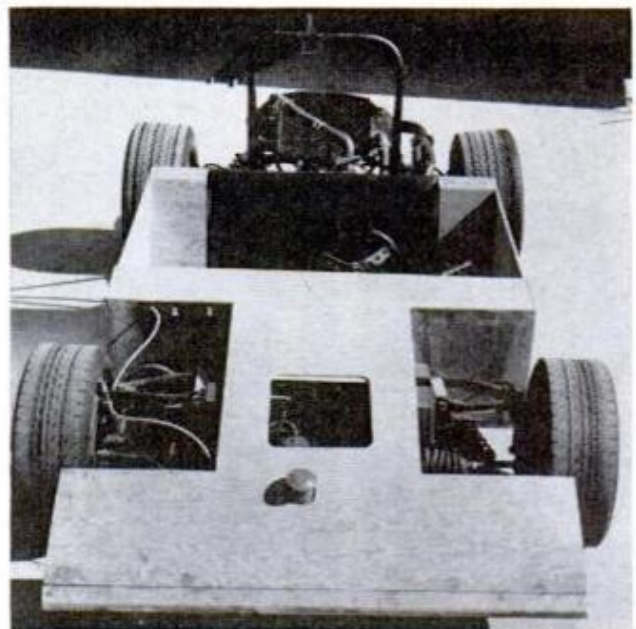
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WASHINGTON, D.C.—Possibility of using satellites to help control and preserve our natural resources will be tested late next year by a series of unmanned earth resources technology satellites (E.R.T.S.). A report by the National Aeronautics and Space Administration contends that aerial photos taken on various Apollo and Gemini flights show that space vehicles equipped with sensing devices and flying at altitudes of a few hundred miles may help estimate crop yields, flood damage, health of forests, consequences of forest fires, and many of man's effects on an increasingly populous planet.

AKRON, OHIO—Firestone Tire & Rubber Co. is now building a pilot plant for pollution-free disposal of worn-out tires. If the project is successful, Firestone will set up 10 full-scale plants around the country, each capable of converting 100,000 tons of scrap tires per year into reusable chemicals and raw materials.

WASHINGTON, D.C.—National Park Service has developed the idea of Environmental Study Areas (ESAs) as part of a plan to teach us appreciation and the value of our natural environment. In a booklet, ESA Guide, just published, the service explains how a group of scouts, students, or any interested individual can set aside an area of land for studying and preserving nature. These natural laboratories could also guide city and industrial planners in construction around, rather than destruction of, our vital natural surroundings.

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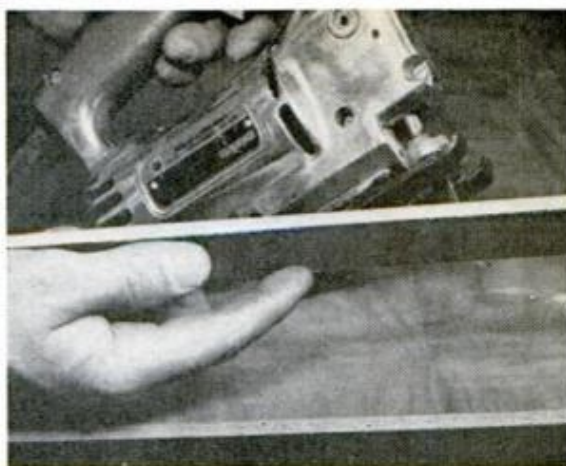
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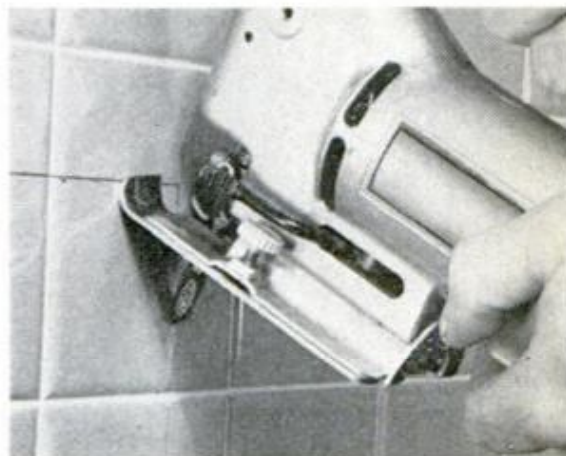
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(Continued on next page)

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(Continued from preceding page)

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(Continued from preceding page)

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DETROIT

LISTENING POST

BY ROBERT LUND

CHRYSLER IS WORKING up two small cars, *PM* learns. The first will be out a year from now. It's generally known that this will be a dieted-down version of a car Chrysler has offered before, but with some new hardware to disguise its ancestry. What's not generally known is that the company has a second job in the works for the fall of 1972, a completely new machine that'll be styled, sized and priced more in line with Ford's Pinto and Chevrolet's Vega.

We'd also bet that somewhere in the back room Ford is working up another body style for Pinto—most likely a wagon—for early next year. At the beginning of the run, Pinto will come in a single body style, a two-door, against a four-flavor assortment for Vega—sedan, fastback, wagon and panel truck. Ford figures that's giving GM too much of an edge, so Pinto will be expanded to a two-car line as soon as Dearborn can get the necessary production machinery set up.

Speaking of Pinto, if you're a do-it-yourselfer, Ford service people say you'll be able to buy the tools required for at-home service for about \$10.

CARS COMING IN THE NEXT FEW MONTHS will show the first results of a long-term drive by Detroit to simplify and consolidate vehicle components. A for-instance in the area of simplification: dual headlights and concealed lights are on the way out. Several makes will drop dual and hideaway lights this year and other firms will follow over the next two or three model years. In the consolidation department, Detroit is working to package radios and tape players in a single unit. The music machine will be portable—pull 'em out, slide 'em back in—to thwart thieves and to give carmakers a toehold in the booming market for carry-it-with-you entertainment equipment.

ALL THE AMATEUR SEERS have had a shot at predicting what cars of the future will be like and what will replace the internal combustion engine. Why not give a professional prognosticator a crack at it? Best man in the business is, of course, The Amazing Dunninger. Dean of the see-all, know-all profession, Dunninger practically invented the mindreading, E.S.P., predict-the-card-before-you-pick-it trade. "Let me set you straight," Dunninger declared when *PM* talked to him, "I'm not psychic and I don't tell fortunes. I read thoughts." Could he read the thoughts of the product planners and tell *PM* what auto firms are working up for 1975 and beyond?

"I don't see anything too different from what we know now," Dunninger replied. "The basic package—a box mounted on four wheels—will remain the same, although I wouldn't be surprised if General Motors or Ford came out with a two-seat, three-wheeler for women to use to do the shopping. Obviously, we're going to see more mid-engines and turbines will be used in some of the high-priced cars. But the piston engine will be the engine for many years to come." How about steam, electrics, battery-powered cars, natural gas engines? Dunninger laughed. "I don't think you'd want to print the thoughts bouncing around on those ideas. Let's just say they don't look too promising."

DUNNINGER'S RIGHT on one count—every company has at least one two-seater in the doodling stage. But when will they be built? Executives who have the authority to order new types of vehicles put into production are reluctant to give the go-ahead on two-person cars. That's not to say someone won't eventually produce one. But the decision-makers feel cars aimed at the family trade should have a rear seat, even if it's too small for an average-size adult.

BACK AT THE CRYSTAL BALL, a leading supplier to the auto companies predicts

(Please turn to page 64)

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DETROIT LISTENING POST

(Continued from page 62)

carburetors will be no more by 1974. Bendix says its fuel-injection system will be used on a few '72 cars, spread to more makes in '73 and probably become standard equipment by 1974. There's no carburetor with f.i. Carb makers believe Bendix is overoptimistic in forecasting that f.i. will be used industrywide by '74. But they aren't taking the threat lightly, as evidenced by their efforts to come up with a more efficient, less expensive product.

AN IMPARTIAL SOURCE who's had a once-around-the-track with Vega at GM's Milford, Mich., proving grounds says there's none of the rocking and shaking in the passenger compartment you frequently feel with a four-cylinder engine. He says GM has done a near perfect job of mounting, isolating and insulating the engine so vibrations aren't transmitted to the passenger section. The same source says the car he drove was equipped with Powerglide, if you've been wondering what automatic transmission GM would offer.

DON'T LAUGH, but would you go for a paint job on your car to match the marbelized grain effect used on ladies' bowling balls? The reason we say don't scoff is because the idea comes off better than it reads on paper. We've seen a couple of '70 model Fords scooting around that've had the treatment—a mottled green and a blue—and they're striking cars. Ford denies knowledge of who the customizer is.

A SUPPLIER SOURCE selling to Chrysler says Big C has a car in the works—apparently for next year, although it could be earlier than the '72 model year—with the back seat facing rearward. Front and rear seats share a common back. The car is said to be a three-door.

SOME OF THE SAME self-styled arbiters of styling who tried to horse-laugh Volkswagen off the road 15 and 20 years ago are now giving the guffaw to Gremlin. This could be a good omen for American Motors. The critics are offended by Gremlin's backside. They say it's chopped off too tight, giving the car an unfinished appearance. But the flat rear could be a plus for AMC's mini in the same way the Beetle shape has been a winner for VW. The Chevrolet and Ford compacts are handsome vehicles, but there's no strong identification feature to distinguish them at a glance from MG, Fiat, Toyota, et al. Gremlin, like Volks, can be spotted immediately. ★★★

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QUESTIONS ANSWERED

HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

Buzzing faucet

There's a peculiar buzzing sound when the cold-water faucet of my bathroom is opened. When it's opened wide the sound sometimes stops, but not always. It's not a hammering, but rather a high-pitched buzz. I have an expansion chamber on the plumbing. What causes this and how can I silence it?—C.T., Ill.

Among the more likely causes are a loose washer or worn threads on the valve stem. Sometimes you can cure this by re-packing. Shut off the water at the meter, unscrew the faucet handle and packing nut directly underneath it. Replace the washer and, if the packing (washer or string-type) is worn, torn or otherwise damaged, replace it. This simple repair often cures a noisy faucet. If not, it's usually best to replace the faucet.

If you have an unusually long run of pipe in the basement to the faucet, the

pipe may vibrate slightly to cause the noise. Such vibration can often be stopped by wrapping cardboard around the pipe at each hanger.

Stained marble top

I have a marble-topped chest with two small stained areas near one end. I've washed and scrubbed them with strong detergent, but this did not remove them entirely. I don't know what caused the stains. The top is smooth, not pitted. What should I do next?—T.A., Ohio.

I've had fair success rubbing out "unknown" stains on marble by making a paste of whiting and furniture restorers' rottenstone, and rubbing this on with a block cut from softwood, such as basswood. The block's surface must be clean, with no ground-in grit or other coarse abrasive. Scrub with a wire brush, then plane smooth and flat. Should the film of rottenstone tend to dry and the block stick to the surface, add a few drops of water occasionally. While this procedure does take a lot of elbow grease, it usually gets acceptable results on most of the common stains.

If this doesn't work, try rubbing with acetone on a cloth pad. This will usually

erase old stains originally of an oily consistency. Begin rubbing at the outer edges of the discolored area and work inward with circular strokes. Wipe the area clean during intervals as the work progresses.

Should this fail, I'd apply hydrogen peroxide—about the strength of an ordinary hair bleach. This usually does it.

If you believe the stain to be an aged ink, make a "poultice" of several layers of cloth or blotting paper wet with denatured alcohol and dusted with whiting. Apply only a few minutes at a time, then lift poultice and wipe clean. Reapply if necessary.

Freshening an old trunk

I've just acquired one of those old, hump-backed trunks, now so popular. On opening it, I'm greeted with a peculiar odor that's very disagreeable. It looks as if the thing has been varnished inside, over the paper lining. How to get rid of the smell?—W.D., N.H.

Most likely it's the varnish, perhaps augmented by the stale odor of mothballs. You can freshen the interior somewhat by placing the trunk—opened and with tray removed—in the sun. You may need to

repeat the performance over several sunny days before you get an appreciable result, but with some persistence you should be able to reduce the odor to a much more bearable level.

If you aren't satisfied with the result, you might rent a wallpaper steamer and remove paper and varnish or, if no steamer is available, wash the interior and tray with a detergent, dry them in the sun and then cover them with wallpaper in an appropriate pattern or one that duplicates the old pattern as nearly as possible. Or, after cleaning and drying, coat them with white shellac—preferably applied with a spray, but you can do a fairly neat job with a brush.

Borers in fireplace wood?

I'm told I'll bring wood borers and other insects into the house with fireplace wood. Will the borers find their way into my furniture?—F.D., Pa.

It's not impossible, but very unlikely. Stack the wood some distance from the house and cover it with a plastic sheet to keep it dry. It's a good idea to raise the bottom tier of logs clear of the ground. Bring in only enough wood for the evening fire. ★★★

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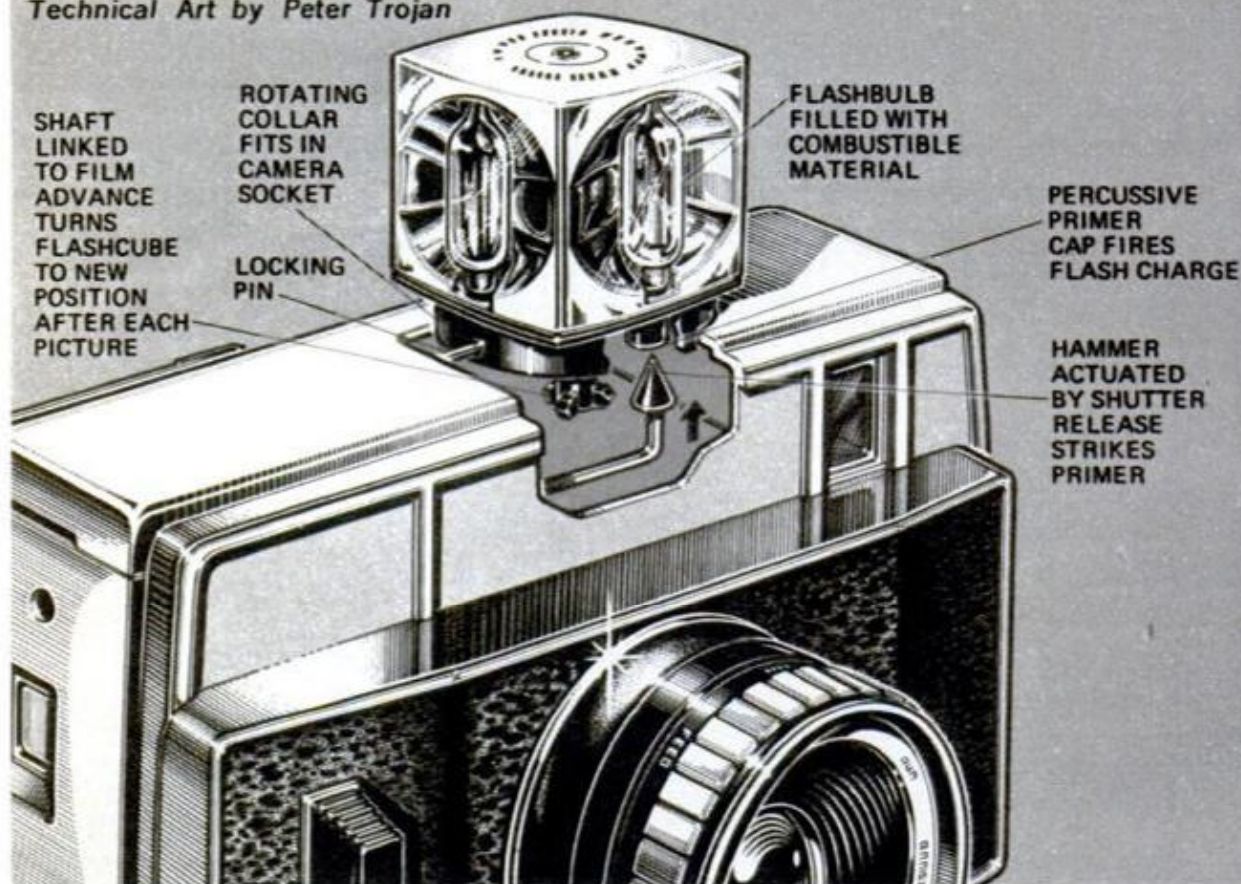
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THE FLASHCUBE THAT FIRES ITSELF

Technical Art by Peter Trojan



Detonated by a tiny explosive charge, these new bulbs give you a bright flash without the need for battery power. Result: A sure shot every time

YOU'RE ALL SET to take a flash picture at an important event. You pose your subjects, press the shutter release—and nothing happens. Almost everyone, at one time or another, has had this frustrating experience. The batteries in your camera, grown weak with age, can't fire your flash and you're left with no way to take a picture indoors or at night.

This can't happen with the new flashcube shown here. It requires no batteries to fire it, yet will work any time, anywhere, no matter how long your camera has lain around unused. Its secret lies in the fact that it's fired explosively, like a bullet, instead of electrically. Built into the base of each bulb is a small powder-filled primer cap—like that in a bullet shell. The bulb is packed with a highly combustible mixture of zirconium wool and gas sealed inside the glass under pressure.

When the camera's shutter release is pressed, a tiny hammer linked to the mechanism strikes the base of the bulb, setting off the primer charge. This ignites the combustible mixture in the bulb, producing an instantaneous flash of great brilliance. In other respects, the cube is similar to conventional types. It contains four bulbs, backed by miniature reflectors, and is automatically rotated into position for each new shot by the film-advance lever. To change the cubes, you just discard a used one and stick on its replacement.

The ingenious self-firing flashcube, developed by Sylvania Electric in a joint effort with Eastman Kodak, is expected to be announced soon. Sylvania will manufacture the cubes and Kodak will supply Instamatic cameras engineered to fire them.—*Sheldon M. Gallager*



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ON-THE-GO

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BY WADE MITCHELL

WANT TO RV-TRAVEL THROUGH EUROPE? Here are two ways to do it. Join the Winnebago International Travelers (Forest City, Iowa) and jet to Europe with other members. Fully-equipped motor homes await you. Daily insurance coverage, campsite fees and gasoline are included in the eight-country tour at a cost of \$1120 per couple. It's a complete package deal. The second method: Fly via KLM Royal Dutch Airlines to Amsterdam, where you pick up a Volkswagen Campmobile. Then you're on your own. Each VW camper includes a guidebook to campgrounds, route maps and other detailed information. Price: \$365 for two weeks or \$405 for three, including air transportation. Contact any KLM sales office.

HOLIDAY INNS ENTERS RV PARK FIELD. This giant of the motel world has announced plans for Trav-L-Parks for overnighters in rec vehicles. Each Trav-L-Park will offer from 100 to 200 spaces or more, a large lodge-store with recreation facilities, coin-op equipment, gift shop and other concessions. The parks will also include sanitary dumping stations, utility hookups and picnic areas. Trav-L-Park will accept reservations without requiring advance payments: Eight new Trav-L-Parks are scheduled to open during the 1970 summer season, and more later. (If you can't lick them—join them!)

DETECTOR ALARM FOR BUTANE-PROPANE GAS. If you're worried about a build-up of LP-gas from unseen or undetected leaks in your system, get a new Girard Detector Alarm. It continuously samples the surrounding atmosphere and sounds a piercing audible alarm whenever a concentration of butane or propane reaches 30 percent of explosive level. The maker claims it can stand vibrations of RV travel. About \$83.95 from B&G Specialties, Box 194, Artesia, Calif. 90701.

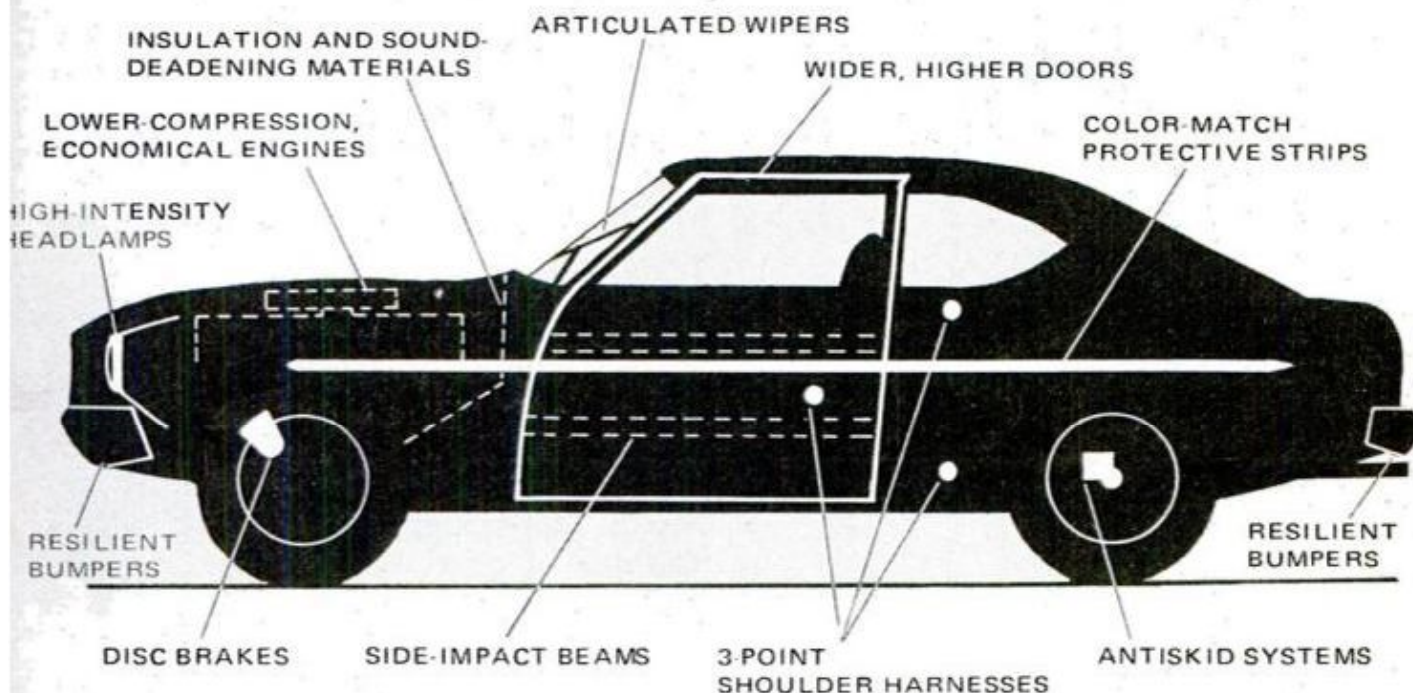
SUPERPOWERFUL AIRCONDITIONER FOR RVs. For coach owners living and traveling in southern climates, an airconditioner for the coach is often needed, but available models sometimes lack capacity. Now Artic-Kar of Dallas, Tex., is offering a 34,000-B.T.U. model with 800-c.f.m. air capacity, powered by a 3500-watt generator. The maker claims it'll cool up to 1200 sq. ft. of coach living area, and that includes all motor homes and travel trailers currently available. Price of the complete package, including generator, is between \$2300 and \$2500. Controlled by a thermostat, the unit has a 22x48-in. grille mounted flush with floor level.

FORD'S CAMPGROUND OF FUTURE A STARTLING SKYSCRAPER! To avoid disturbing ecology of outdoor surroundings, Ford's recreation experts designed a way-out high-rise "camp" that is actually a motel in the clouds. Called the Holiday Village, the radical idea envisions a central lodge constructed like a suspension bridge with steel cables supported by sunken piers. Prefabricated rooms are added to the cable network. Below it, actual campsites would be divided into three classes, from plush to primitive, to suit the camper's whim. Sites would be separated by green belts or natural screening.

CREDIT CARDS FOR CAMPGROUND FEES? We predict that at least one bank card company will approve use of the cards for campground recreational facilities, including overnight fees. Since motels are already allowed charge cards, why not private campground operators? The practice is sure to spur longer and more frequent visits to private campgrounds. With a charge card, any family can vacation when time permits, regardless of temporary financial problems. On a typical two-week vacation, a private campground rental would be about \$30 to \$40, compared to \$150 for a 10-day stay in a motel by the same family.

★★★

How the 1971 Cars Really Will Be Better



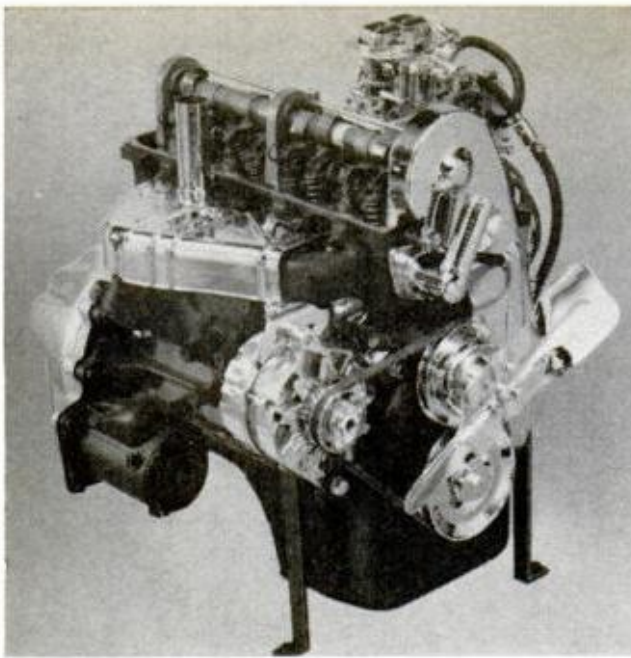
More real improvements like these—not from every manufacturer and not on all models—are on the way

By **ROBERT LUND**, Detroit Auto Editor

STUDENTS OF THAT INDUSTRIAL FERTILITY RITE known as the Annual model change frequently get the feeling that Detroit lays on the superlatives and adjectives thicker than it lays on changes in its cars. The difference between old car and new might not amount to a hill of beans, but Detroit doesn't regard that as reason to muffle the bombast and bamboozle.

In trumpeting trifles year after year, the auto companies have fallen victims of their own flimflam. They've whooped it up and failed to match the merchandise with the flummery so often that when they do make meaningful changes in cars, the reaction from the customers is a skeptical yawn. That's the boy-who-cried-wolf predicament the industry finds itself in as it prepares to launch the '71 cars.

- This you can believe about the '71s, no tinsel or frosting on the facts:
Most cars will have better brakes.
Most makes will be safer than their '70 counterparts, aside from improve-



OPTIONAL ENGINE for Ford Pinto, an overhead cam, four-cylinder, two-liter (122-cu.-in.), 95-hp design, is made in Germany. Camshaft cover is removed from this specially chromed display engine. The standard 1600-cc engine for the car is the 75-hp, ohv unit proven in Ford of England's Cortina, Capri models

ments that'll be made in their brakes.

You'll get better fuel mileage and spend less on gas. But at a sacrifice of power.

Mufflers and tailpipes may last longer than on current cars.

Most '71s will run quieter than the '70s.

You won't have to make as many trips to the repair shop.

You tall guys who have to shoehorn your way behind the wheel won't have quite as much trouble. On some models.

Bumpers won't be quite as fragile as they are now.

● And the bad news:

Car prices will go up again next year.

Excluding bumpers, the '71s will not be less susceptible to damage in accidents than the '70s.

The new cars won't be any easier to service than cars now on the road. Exception: the small cars coming from Chevrolet and Ford.

That list of changes may not strike you as the most inspired array of innovations Wheelsville has come up with since the self-starter. There are no blockbuster ideas—no turbines or fuel-injection systems. (F.i. has been put off

until next year, the '72 models.) But modest as the revisions and refinements slated for this year might appear, they are real, wheels-on-the-ground improvements.

The one change that will be common to more than 90 percent of the new cars will be a reworking of engines—involving changes in carburetion, spark advance, some cam shafts and use of thicker gaskets between cylinder heads and block—to enable them to run on unleaded gas. An engineer who heads a spy-on-the-opposition operation for a Big Three company tells *PM* he looks for compression ratios to settle down in the area of 8.5 to 9.25 to one, versus the present 9.25 to 10.75.

All of GM's '71 cars will be able to use lead-free fuel. Chrysler says 93 percent of its engines will operate on low-octane gas. (The target figure the car companies have settled on is fuel rated at 91 to 92 octane.) Ninety percent of the engines going in Ford products at the beginning of the '71 model run will be modified to operate on unleaded fuel and the remaining 10 percent will be changed over in the course of the model year. American Motors is also aiming at a 90 percent figure and will probably come up to 100 percent by the time its '72 cars are ready.

If you usually drive a six-cylinder or a small V8, you won't notice much of a change in the way a '71 operates or the size of your gas bill. But if you've been wheeling around a big engine requiring premium fuel, you'll notice: (1) less zip on the getaway and, (2) a definite reduction in what you spend on gas.

Ask a dozen engineers how much power the big get-up-and-go engines will lose as a result of the gentling-down process and you'll get 9000 opinions and two pounds of "on the other hand." The best information available is that the reworking of oversize engines coupled with the use of low-octane fuel will cut horsepower about 10 percent.

But there may be a trade-off improvement for the loss of power—

longer life for mufflers and tailpipes. The theory is that removing lead from gasoline will cut down on the corrosive elements that cause mufflers and pipes to rust out.

Detroit will put a lot of emphasis on more economical engines on the '71 cars, more miles of go on fewer gallons of gas, even without the switch to lead-free fuel. Both of the small cars coming from Chevrolet and Ford will have four-cylinder engines. Under ideal conditions, they may give better than 25 miles to the gallon.

Another industry-wide trend on the '71s will be in the area of brakes and skid-control equipment. Almost without exception, every make that doesn't already offer disc brakes will have the item this fall. And that includes the small cars.

Chevrolet has confirmed that it will have front disc brakes on the Vega 2300. Ford has developed a novel single piston disc for all of its small vehicles and personal cars—Pinto, Mustang, Maverick, Cougar and the made-over version of Maverick coming from Lincoln-Mercury. Even Buick, a long-time holdout on discs, will phase out its aluminum drum brake in favor of a disc. GM will install discs as standard equipment on all of its full-size '71s, no exceptions.

GM will also offer its antiskid system as an option on Pontiac and Chevrolet for the first time this fall. The item is presently limited to Buick Riviera, Olds Toronado and Cadillac Eldorado.

Chrysler will finally get around to offering a skid control unit in '71. The antiskid devices on Ford and GM cars control the rear wheels only. GM put itself in the embarrassing position of saying four-wheel control was the only way to go and then came out with a two-wheel unit. The first four-wheel system offered by an American automaker will be on Chrysler cars. But only on a couple of the company's top priced products.

The advantage of four-wheel control

(Please turn to page 186)

Have the Muscle Cars Had It?

The de-emphasizing of power doesn't mean the demise of muscle cars, contrary to what you may have heard elsewhere. The muscle cars are going to survive and may come back stronger than ever a year from now. But they'll undergo a change.

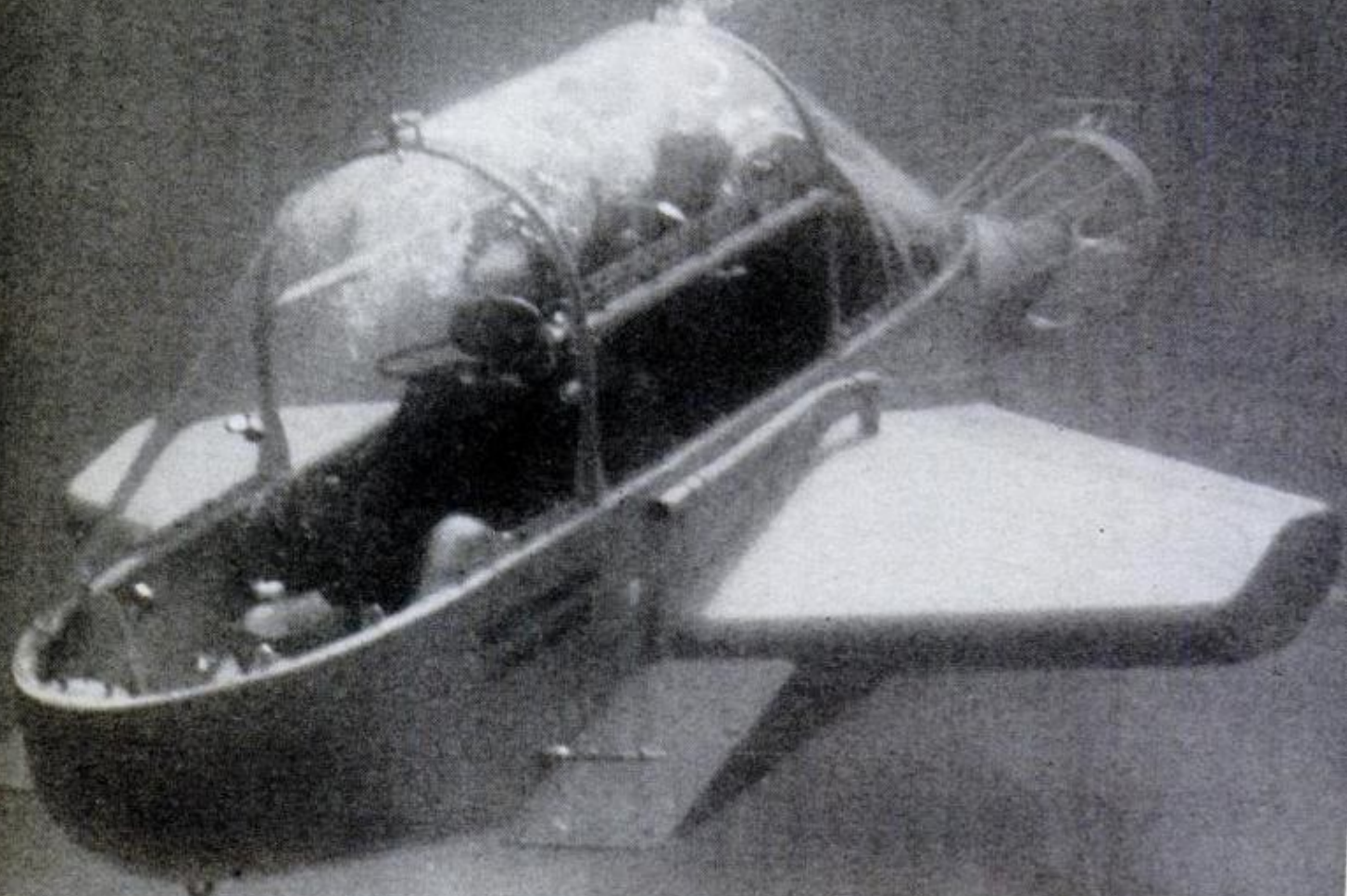
The criticism of muscle machines by Congress, the insurance industry and safety groups has finally got to Detroit. Something has to be done to cool the critics. But Detroit isn't about to close the gold mine because there's a little low-grade ore mixed in with the bullion.

The strategy is to create a new image for the muscle cars, a compromise that'll pacify the critics and still keep the customers happy. The automakers hope to carry this off by retrenching on the speed angle and recasting the cars in a new role. Hard ride, a lot of feel in the handling of the car and equipment that increases the relationship between man and machine will be favored rather than accessories that relieve the driver of control. Pontiac is already using this approach on Firebird.

Keeping the muscle merchandise alive in '71 in the face of widespread criticism is a prelude to plans the auto firms have for the cars a year from now. Both GM and Ford expect to offer fuel injection on a limited basis on their '72 models. (It will be the Bendix system mentioned in *Detroit Listening Post* last March.)

The companies want to build real volume on f.i. and they can't do that if they limit the item to luxury cars. They don't produce enough Cadillacs and Lincolns to attain important volume. But they can get volume by offering f.i. on performance cars in the \$4000 to \$5000 price range.

Detroit figures muscle-car customers are free spenders and they'll put out an extra \$500 to \$600 for f.i. without blinking. So the muscle machines will still be around in '71, but the selling pitch will be altered to appease the critics.



Should Your Next Boat Be a Submarine?

Whether you want to spear fish, search for treasure or merely explore the undersea world, the Perry Shark Hunter is a good way to get there

By GEORGE REIGER, Boating and Outdoors Editor

Photos by Denny Breese

I HOVERED 30 FEET below the surface a half mile off the beach of Grand Bahama Island. Denny Breese sat on the bottom 20 feet below me making adjustments on his bulky underwater camera. Suddenly movement beyond the oval edge of my face mask made me spin in place.

"A shark!" I thought. Something glided silently from the blue haze of deep water, banked about on one wing-tip and passed before the camera below. It was John Perry's *Shark Hunter*, a tiny, two-man "wet" submarine that's—as far as sharks are concerned—the living end!

John Perry, president and founder of

Perry Oceanographics, Inc.—a company devoted to undersea exploration and research—has long felt that some antishark and sharkproof vehicle should be developed for scuba (self-contained underwater breathing apparatus) divers. Thus, in between development of *Deep Diver*, *Shelf Diver* and other sophisticated research subs built at Perry's Riviera Beach, Fla., plant, the *Shark Hunter* was born.

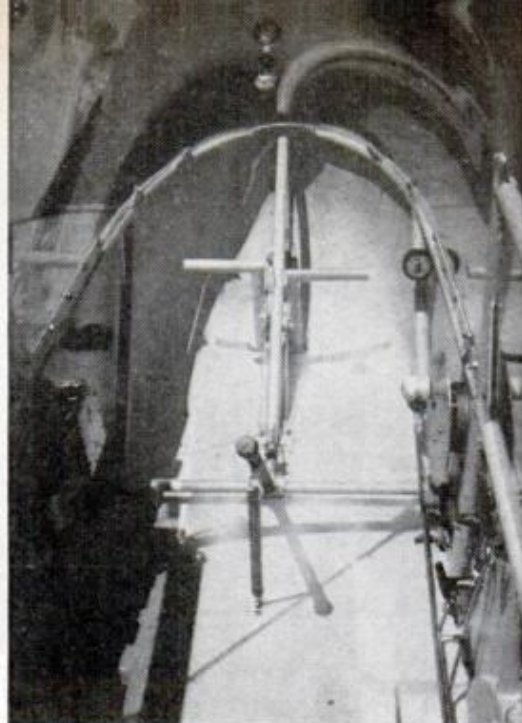
Though its passengers are completely enclosed when riding through shark-infested waters, *Shark Hunter's* Plexiglas "watershield," side panels and canopy provide excellent visibility. With either side panel removed, a spear gun

CRUISING THE DEPTHS (left), John Perry looks for a sandy strip to take *Shark Hunter* in for a landing

AUTHOR'S WEIGHT won't upset sub's balance (right) when it's lifted by one or both special canopy hooks

WITH SUB SETTLED ON BOTTOM (below), it's easy to switch crews or to get out to explore nearby areas





SCUBA TANKS AFT (left) purge wing tanks with compressed air for quick ascent. Joystick and rudder pedals (center) enhance "pilot's" sensation of flying underwater. Through-hull fittings (right) connect the batteries

can be thrust out to take aim at a cruising shark. In addition, the electric motor's silent operation makes it possible to creep close to wary prey.

But this sub is not just for hunting sharks. After we had taken a few pictures I climbed in behind Perry, who was piloting the craft himself. Despite an initial feeling that I was sitting in a ditched aircraft, with all my instincts hollering "Out!", we descended and I settled down to enjoy the view of the undersea world around us. I quickly realized how valuable *Shark Hunter* will be to diving clubs, explorers, trea-

sure hunters or just plain underwater tourists who want to see a coral garden without having to fight hazardous currents or confront dangerous fish, armored in nothing but a wet suit. And because no swimming is involved, a normal 100-minute supply of air lasts up to 50 percent longer, depending on water temperature. (The colder the water, the higher the rate of air consumption; divers breathe faster when water is cold.)

Shark Hunter rides easily on the surface at tow speeds of six to eight knots, or under self-propulsion. You open a

FIRE ONE! John Perry steadies sub on course while Mitch Michaud takes aim with SMG 4-barrel spear gun

AFTER A DIVE, Mitch checks out tail assembly. Note rudder and protective cage for three-blade propeller



hand-controlled valve in the bottom to flood the hull and wings when you want to submerge. Although Perry recommends a 50-hp outboard on any boat used as a tow vehicle, we got by with a Hydrocycle equipped with a 20-hp Chrysler!

An airplane-type joystick determines the descent angle through forward externally mounted bow planes. Airplane-type foot pedals activate the rudder aft the three-bladed prop. Flooding of the hull and wings provides neutral buoyancy from which the sub is planed up or down. To surface, you blow wing tanks with compressed air from two standard scuba bottles carried aboard *Shark Hunter*. Two other scuba bottles with regulators supply breathing air to the crew. A separate tank (called a Q-tank) provides emergency negative buoyancy for quick dives to avoid collisions when *Shark Hunter* is operating near the surface. Also, when this tank is flooded, it helps hold the sub in position, enabling the crew to park on the sea bottom and leave the sub for short excursions.

The sensation of being in an underwater aircraft is enhanced by the location of the instruments. Depth indicator, air-pressure gauges and fore-and-aft attitude trim controls are at waist level next to the pilot's seat. The compass is fixed to the Plexiglas water-shield at eye level.

An important safety feature is the quick exit possible through the open canopy hatch which flops to one side with enough width to give even the biggest man with an air tank sufficient room to bail out in a hurry. If for some reason the canopy can't be swung back, the hinge along the fixed side made from a single stainless-steel rod with eight hooks can be jettisoned with a forceful shove of the hand, thereby dropping the entire canopy section clear of the sub.

I had a chance to check *Shark Hunter's* escape facility during the second day of our test, when, unable to clear

(Please turn to page 190)



Fastest page in the West

Veteran cowpuncher Cliff Hicks rides the 190-acre range of the Stanley Brown Co. with a "Private Page" in his shirt pocket. When he hears a three-second beep on the unit, he knows he's wanted back in the office, so he shuts off the unit and hustles back.



Out of the trash can

Dr. S. L. Blum of the Illinois Institute of Technology displays a piece of pipe made from trash. Other products IIT has made of waste include a wrench, building tiles, door-knob, sewer pipes and decorative tiles.



IS THIS POLAROID'S NEXT CAMERA?

It has no shutter, develops its own pictures and is slim enough to slip in a shirt pocket. Here's a sneak preview

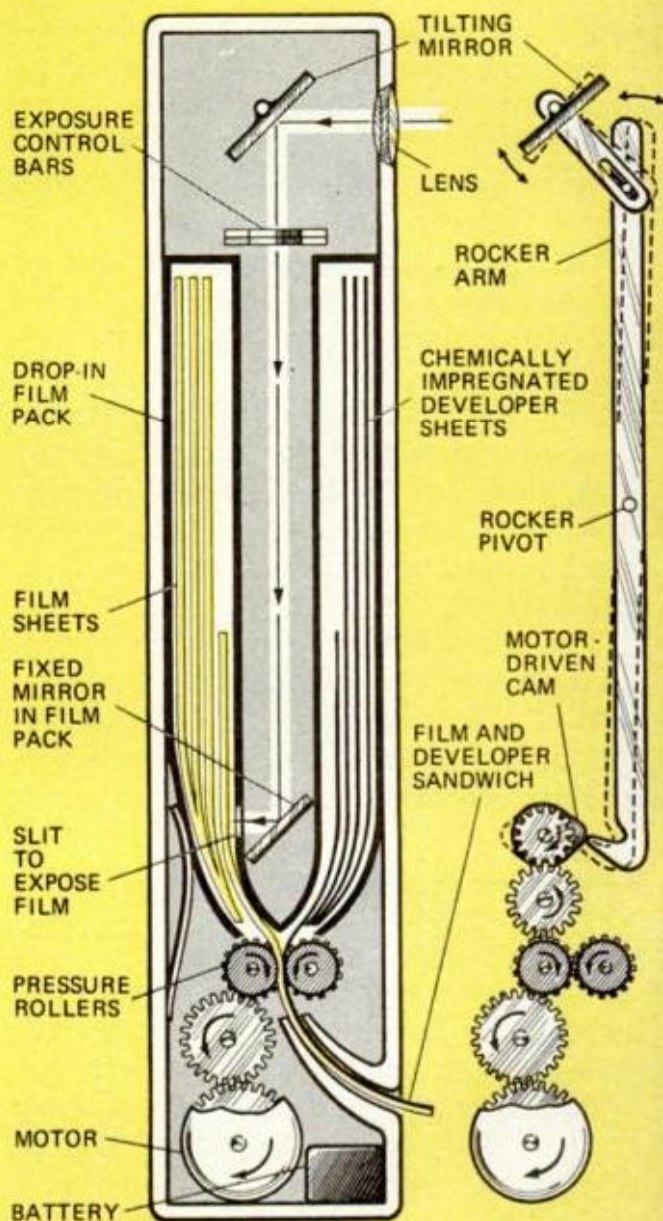
By SHELDON M. GALLAGER

YOU'RE LOOKING AT one of the most amazing cameras ever invented. No one has seen it yet, and no one but its maker knows just when it will be put on the market. It's a brand-new Polaroid. Like its predecessors, it turns out almost instant prints in both color and black-and-white. But here's where the similarity ends. Unlike earlier models, it has no shutter and no bellows to space the lens away from the film. The result is a thin, flat, wallet-sized camera slim enough to slip in a pocket.

The drawings shown here are based on patents issued recently to Edwin H. Land, inventor of the original self-developing Polaroid process. Through these art concepts, *Popular Mechanics* brings you an advance look at this remarkable new Polaroid design.

The trick is done literally with mirrors and some slick space-saving engineering. The film, instead of being exposed all at once, as in a conventional camera, is exposed a strip at a time as it moves past a narrow slit—something like the trace on a TV tube. Light entering the lens is reflected by a mirror at the top of the camera down to a second mirror near the bottom. From here it is reflected through the slit and onto the moving film.

Now hang onto your hats—this is just the beginning. The upper mirror is pivoted and geared to tilt at the same relative speed as the moving film. As its angle changes, it transmits progressively different portions of the scene onto the film as the film passes the slit. Since film and mirror are moving to-



CUTAWAY VIEW above shows how U-shaped film pack slips into camera, holding film sheets in one half and developer sheets in other half. Motor-driven rollers pull down one sheet from each side of pack, squeezing them together to form a sandwich. This simultaneously exposes the film sheet and starts development process. Detail view at right, above, shows how cam drives rocker arm to tilt upper mirror, reflecting image onto film in progressive segments as the film sheet moves past narrow exposure slit

TRANSLUCENT EXPOSURE INDICATOR
READS "NO" IF
LIGHT IS POOR

LIGHT BULB

EXPOSURE WINDOW

VIEWFINDER WINDOW

TILTING MIRROR
TRANSMITS DIFFERENT
PARTS OF IMAGE
PROGRESSIVELY

ADJUSTABLE OPENING
VARIES LIGHT TO
EXPOSURE INDICATOR

KNOB SHIFTS
SLOTTED BARS TO
VARY DIAPHRAGM
OPENING

ROCKER ARM
TILTS MIRROR
BACK AND FORTH

TWIN PACK HOLDS
FILM SHEETS IN ONE
HALF, DEVELOPER
SHEETS IN OTHER HALF

MIRROR

LENS

MIRROR



FILM MOVES PAST
SLIT AS IMAGE IS
REFLECTED ONTO IT
A STRIP AT A TIME

ROTATING CAM
MOVES ROCKER ARM
BACK AND FORTH

FIXED MIRROR
INSIDE FILM PACK

FILM
SHEET

FILM AND DEVELOPER
SANDWICH FEEDS OUT SLOT

BATTERY

PRESSURE ROLLERS
SQUEEZE FILM
AND DEVELOPER
TOGETHER

MOTOR

Technical Art by
Howard Shafer and Fred Wolff

gether, the image is, in effect, "rolled" onto the film in one quick, continuous motion.

The rate of film travel past the slit determines the speed of exposure, thus eliminating the need for a shutter. The optical path runs vertically through the camera from top to bottom instead of from front to back. This does away with the need for a fat, bulky housing.

A tiny battery-powered electric motor, linked to a miniature gear train, drives the film through a pair of pressure rollers. At the same time, a rotating cam moves a rocker arm back and forth. This tilts the top mirror up and down in time with the moving film.

Like other Polaroids, the new model

Film packs, while disposable, actually contain part of the camera's mechanism.

is designed to take easy-to-load, self-contained film packs. One big difference, however, is that the new packs, while being disposable, will actually contain part of the camera's mechanism. Each one is divided into two compartments, one for photosensitive film sheets and one for chemically impregnated developer sheets. As a film sheet is drawn past the exposure slit by the pressure rollers, it's simultaneously squeezed together with a developer sheet, starting the development process. The sandwich feeds out a slot at the bottom of the camera and in a few seconds is ready to be peeled apart to reveal the finished print.

Built into each film pack is the exposure slit and the fixed lower mirror that directs the image onto the film. Thus, when you discard an empty pack and slip in a new one, you will be replacing a part of the camera's optical system each time. This arrangement insures a precise alignment between slit and mirror in each new film pack.

Another ingenious system lets you vary the amount of light entering the camera to suit changing conditions. A

pair of sliding bars with wedge-shaped slots in them forms an adjustable diaphragm. Slid one way, the tapered slots come together and narrow the opening, reducing light to the film; the other way, they spread apart, letting in more light.

The bars are moved back and forth by a knob as you need more or less light. Attached to the bars is a pair of slotted blades that forms an adjustable opening similar to the diaphragm. Light entering a small window passes through the opening in the blades and is reflected onto a translucent exposure indicator. On the other side of the indicator is a tiny light bulb that serves as a standard of comparison. If light entering the camera is weaker than the bulb, the word "NO" appears in the indicator, telling you there is insufficient illumination for taking a picture. In this case, you simply open the blades wider until there's enough light striking the indicator to overpower the light bulb and wash out the "NO." Since the blades are linked to the sliding bars, this automatically adjusts the diaphragm opening so sufficient light will reach the film for a good exposure.

While the camera's speed is not known at this time, it's possible to estimate what a typical exposure might be. A three-inch-long sheet of film moving past a slit 15/100ths of an inch wide at a speed of nine inches per second would produce an effective exposure of 1/60th of a second—comparable to the shutter speed on many simple cameras. In actual time, however, this would take one-third of a second—a long time to hold a camera steady. For this reason, the new camera may be best suited to photographing subjects where there is little or no motion.

Accidental camera movement may not be as severe a problem as it might seem, however, because only a small slice of the image is being put on the film at any given instant. A bit of blur at one point would not affect the total picture, as in a conventional camera, and might not be noticeable. ★★★



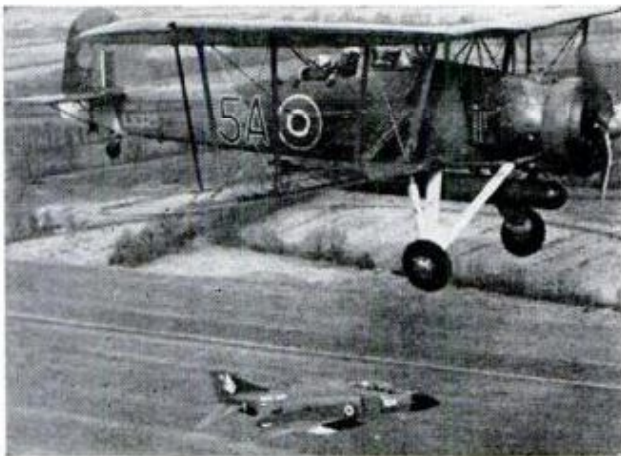
Trying it for size

This Boeing 747 will never fly. It's a mock-up used to test ability of new hangar at London's Heathrow Airport to handle giant planes.



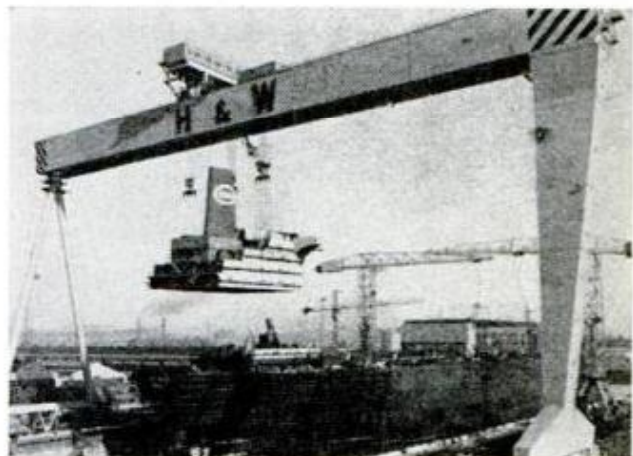
For rescues on ice

New sled is speedy and safe in rescues of victims who have plunged through ice. For safety, line from sled is secured on shore.



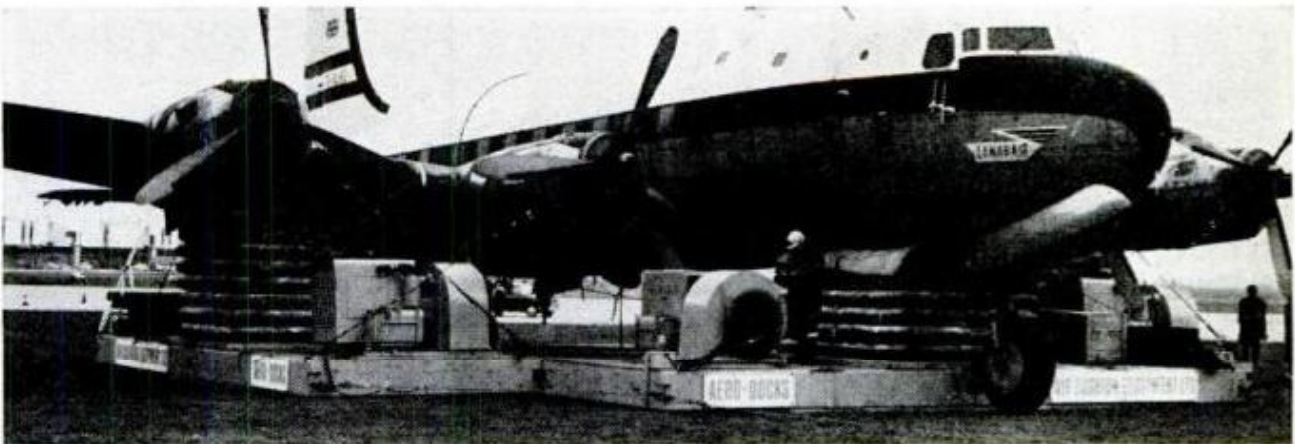
Swordfish still flying

When the engine of this Swordfish—last of British Navy's World War II torpedo bombers—wore out, "new" parts were found in a war museum. Flying below it is a Navy Phantom.



Big but delicate

This huge crane in a Belfast, North Ireland, shipyard, has quarter-inch precision in its movements, despite its size. It's shown here dropping a ship section into place.



Air cushion used to move crippled planes

Slipped under wings and body, hoverplatforms and inflatable bags can transport a damaged plane on cushion of air. Developed in Britain, the system prevents further damage to the plane.

A SAND MOBILE?



By FRANK TAYLOR

SEND A SNOWMOBILE into the desert to track bighorn sheep? The idea may sound crazy, but this is exactly what the California Dept. of Fish and Game decided it could do with the aid of a conversion kit called the Skat-Trak (Carlesimo Products, Inc., 29800 W. Eight Mile Rd., Farmington, Mich.). By removing the front skis and substituting a pair of variable-tension spring-control wheels, three Scorpions were made into all-terrain vehicles that climbed sandy mountains, plowed through low vegetation and spun across gravelly flatlands to help California rangers estimate the number of bighorn sheep in a desert section 50 miles south of Death Valley.

The bighorn shuns man and his civilization and prefers to roam the high reaches of the deserts, getting his water from vegetation. Just to reach the vicinity of the animals, four-wheel-drive vehicles are necessary. And when

Richard Weaver of the Fish and Game Commission and his associates had gone as far as their trucks could take them, they launched the converted Scorpions and continued the search.

Summer is the worst time to venture into south California's wilderness. But temperatures of 120°F. mean it's the best time to find desert bighorns, for the animals then seek permanent water sources at least every three days.

The intense heat and gritty, mountainous terrain were unusual conditions for snowmobiles since they were designed for cold climates and soft surfaces. However, the Scorpions took the test in stride, and their 2-cycle, 15-hp engines sped over the rough desert terrain at better than 20 mph.

The first area Weaver selected for his search turned out to be perfect ground for the "sandmobile" concept. A steady east wind had drifted sugar-like sand against the granite face of the

Marl Mountains creating a long, smooth incline of loose grit almost to the top.

With careful throttling and use of switchbacks, the men churned up the steep slopes until suction discs, not treads, were needed to go farther! Downhill, they found little resistance and raced one another merrily.

While no one spotted a bighorn, there was ample indication that sheep were near—more than had previously been suspected.

Weaver found several sheep spoor the wind had not yet covered with sand. And when Indian trails on an old railroad map indicated water in good supply near Old Dad Peak, he deduced that sheep might use the watering site.

The sandmobiles soon delivered the party to the entrance of a ravine. Dismounting and selecting a narrow foot path, Weaver led the men into a canyon that ended, after many confining twists and turns, in a deep pool of water sparkling under a narrow shaft of sunlight.

At least 150 gallons of the precious fluid had been trapped, providing a water source for all kinds of wildlife, but especially sheep. Abundant spoor in the mud near the "tank" showed this to be a major water hole for them. And Indian petroglyphs on the canyon walls attested to its use by early man.

The trip back by sandmobile was tiring, but the day had been rewarding. A new source of water had been located and a close watch would be maintained by the Fish and Game Dept. to make sure it didn't dry up, leaving bands of sheep without water.

While the men hadn't actually seen sheep, Weaver had proved they existed in considerable numbers and also found converted snowmobiles to be practical for desert travel. Sand, although abrasive, had not seriously worn either belts or rollers, and maintenance of the air-cooled equipment was no more difficult than it would have been in snow country.

Bighorns now have a mechanical friend in the California outback—the versatile snow—er, sandmobile. ★★ ★

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RANGER DICK WEAVER puts sandmobile through paces before setting off with others on sheep hunt



RACING DOWNHILL is coolest part of desert driving—but hazardous without sure grip on brake handle



THROWING WEIGHT to the uphill side keeps machine balanced and is the best way to turn up an incline



THREE SANDMOBILES can fit into a panel truck but four husky men are needed to handle the loading



Mitey small

Diodes used in tone generators for Touch-Tone telephones look like mites on thumbnail. Only one five-thousandth of a square inch, each unit contains four diodes. When buttons are tapped, tones tell Bell switching equipment to connect that phone with another.



U-haul power

In Munich, Germany's first electric bus gets its power from batteries carried in a trailer. Batteries provide power for two hours' operation, can be recharged in seven minutes, or a trailer with fresh power pack can be attached. All city's buses will be electric.



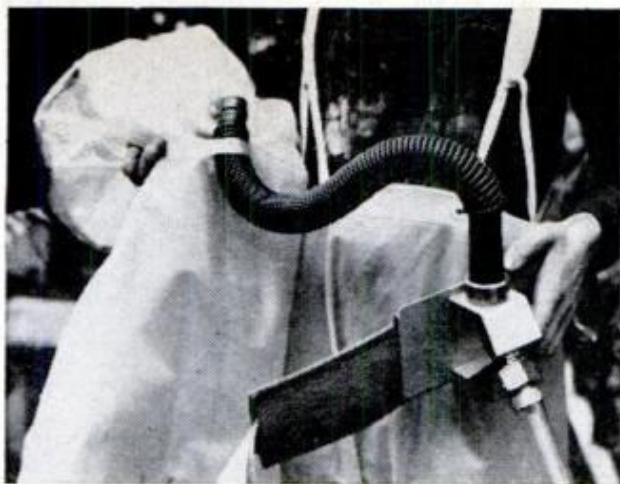
Dual exerciser

New YMCA Exerciser is a double slant board with ends elevated 9 inches above floor. With legs and hips on the board, players kick a 6 to 20-pound ball up ramp. Competition is fun when rhythm is speeded up. Invention was donated to YMCA by Paul Chamberlain (right).



Car of the future?

The Automodule, by French inventor J. P. Ponthieu, has a sphere-shaped plexiglass passenger compartment. Powered by a conventional gas engine, it has many electronic gadgets. Because wheels are in a diamond configuration, it can turn within its own length.



'Spacesuit' for greenhouse

So many pesticides and other chemicals are used in gardening these days that one English firm is suggesting that greenhouse workers might need the protection of a "spacesuit." Actually a byproduct of work that Martindale Electric Co. is doing in atomic research, the suit is equipped with a hose (detail above) through which fresh air is pumped to the user.



Hot paint

A new electrically conductive carbon paint has been developed by British scientists that will carry a weak electric current and heat the rooms of a home. At the top and bottom of each wall a foil strip (covered by a wood protector) carries current to the conductive paint. Grayish-black carbon paint can be covered with ordinary paint (far left).



Front-end loaders for Channel flying

Five cars and 22 passengers can be loaded into a "flying ferry" (the cars through the front) for a regular hop British Air Ferries makes between England and the Continent.

When Will You Have a Waterproof Ignition System?

By MORT SCHULTZ



Your family car could get as wet as this Army vehicle and still start right up if only it had a few extra parts

BOB MANSFIELD'S CAR won't start in rain, drizzle, fog, snow or when the humidity is high. Since Bob comes from an area that often experiences sticky weather—Salem, Mass.—he's a good customer of the bus company.

Bob's car is one of more than 9 million which suffer ignition failure each year in wet weather. Automobile companies and ignition component makers claim that the problem results from inadequate maintenance. They cite as one chief cause dirt in the engine compartment that absorbs and retains moisture.

However, most of the 300 letters complaining of wet-weather failure that *PM's Automobile Clinic* received last year were written by owners of new cars or by owners who swore that their autos receive tender loving care.

Robert S. Kretschmar, general manager of the Massachusetts Div. of the American Automobile Assn., contends: "The highest percentage of breakdowns experienced by drivers in wet weather is caused by ignition components that get wet. It is within the car industry's technical know-how to prevent this by producing ignition systems which will resist moisture and deterioration."

What would be involved in devising a weatherproof ignition system?

The U.S. Army's ignition system consists, essentially, of a waterproof case that contains the distributor and coil; and of sparkplugs and wires that are shielded in stainless-steel jackets.

According to Joseph Steyaert of the Tank-Automotive Command in Warren, Mich., "Something as sophisticated and expensive as the Army's ignition isn't, of course, needed in civilian cars."

Mercedes-Benz cars, in fact, are equipped with a weatherproof system. Among the components is a polyester distributor cap sprayed inside with a colorless lacquer containing silicone.

This isolation material, as it is called, keeps condensation from sticking to the cap where it can mix with the nitric acid that is formed inside a distributor cap when warm air interacts with nitric oxide given off as the distributor rotor transfers current to the distributor cap contacts. The acid forms a conductive path that leads to crossfiring. This can prevent starting and also promote stalling and backfiring.

Another component in this system is a new distributor rotor that incorpo-

rates a polycarbonate resistor suppressor. Putting suppression ahead of the distributor cap assures that excessive voltage won't burn away the isolation material as current passes from rotor to contact. Resistance at the rotor also eliminates the need for expensive resistor-type sparkplugs.

A plastic cover inside the distributor housing keeps dirt and water from points, cam and wires. Additional protection is provided by a snap-on jacket of molded plastic over the distributor housing.

Mercedes sparkplugs, too, have been jacketed in an extraordinary way. These covers are made of polyester on the inside and aluminum on the outside to provide positive, long-lasting protection. The cost of this ignition system is only \$15 more than that of a standard system, says Peter G. Hundt of Mercedes-Benz of North America!

If your ignition system is functioning adequately in wet weather, keep it that way through periodic maintenance:

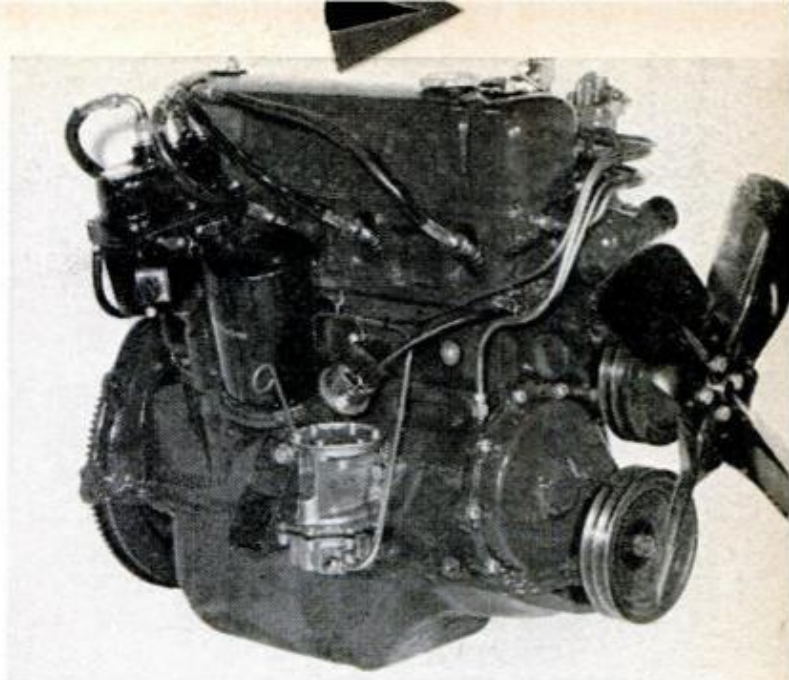
1. Make sure sparkplug electrodes are clean and gapped to specifications.
2. Periodically wipe dirt from ignition cables, distributor cap, sparkplugs and coil.
3. Be sure ignition dwell angle and tuning are set to specifications.

If your car gives trouble in wet weather despite these precautions, there are several different kinds of protective coatings for the ignition system. Most contain a silicone that repels moisture. Be sure that it is sprayed on during a dry period.

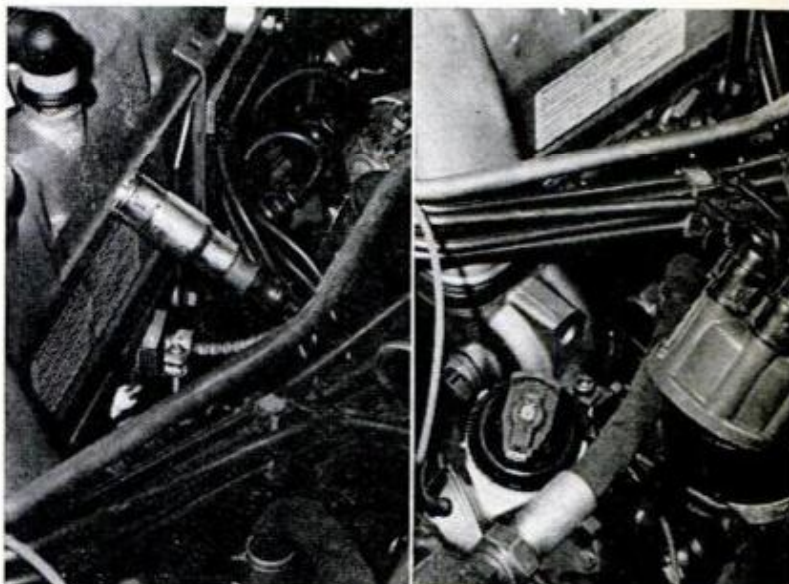
Spray the outside of the distributor cap, ignition wires, coil and sparkplugs after first wiping everything clean. The coating won't last forever, but it'll have to do until manufacturers provide waterproof ignition systems. ★★★

MERCEDES DISTRIBUTOR CAP is coated inside for moisture runoff. Plastic cover fits distributor

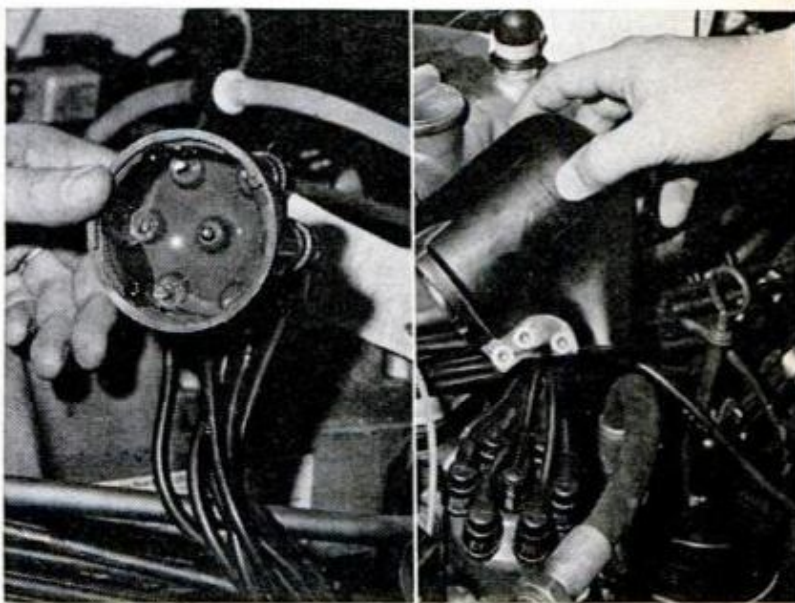
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SEALED DISTRIBUTOR AND COIL and stainless braiding and jackets on wires and plugs waterproof Jeep ignition



MERCEDES PLUG BOOTS are aluminum, polyester inside. Distributor has internal cover, resistor built in rotor



How the Gremlin



Lost Its Tail



The man who designed Gremlin has made an almost complete circuit of the track. The only auto company Richard A. Teague hasn't worked for is Ford.

An alumnus of the Art Center School, Los Angeles, Teague started styling cars for Olds and Cadillac in 1948. He moved to Packard in the 1950s and became director of styling for that company in 1953. In 1957 he transferred to Chrysler as chief stylist for the Chrysler Div. He made his last move in 1959, when he joined American Motors as assistant automotive design director. He was elected vice president of styling for AMC in 1964.

Cars are more than meat and potatoes to Teague. They're also the frosting on the cake. He restores old cars as a hobby. His current restoration project is one of the first Packards off the line—a 1904 job. The 46-year-old designer has owned more than 285 automobiles. "That was the number I came up with last time I counted them," he explains.

Teague was interviewed at AMC's design studios by PM's Detroit editor, Robert Lund.

AMX-GT, the AMC show car of several years ago, provided general shape on which Gremlin is based

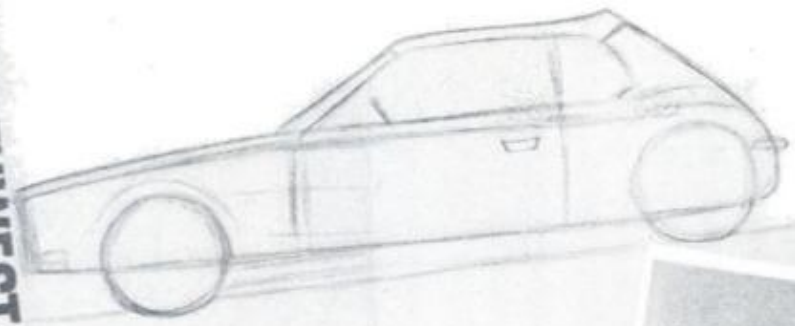
PM: American Motors describes Gremlin as a subcompact. What's the difference between a compact, subcompact and minicar? Your definition?

TEAGUE: You left out a category—micro. That's below a mini. There's nothing chiseled in concrete that says this is a mini, this is a compact and this is something else. One man's opinion is as good as another. Personally, I'd categorize a mini as somewhere between 155 and 165 inches. I'd peg Gremlin and the cars coming from Ford and GM as minis. The VW Beetle would then be a mini, too.

Why the ski-slope rear on Gremlin? Was it done this way as an identification gimmick?

Absolutely. As an identification shape. The general shape of the car was based on a preliminary car we showed around the country a couple of years ago, the AMX-GT. This drew a tremendously favorable reaction from people who saw it. From a designer's standpoint, it was the ultimate in a GT-type car, a two-place, selfish, personal, little car with a very bobtailed rear, minimum overhang. We got such a good reading on this that when we got

NORTHWEST ORIENT
THE FAN-JET AIRLINE



FOR MOTION DISCOMF
Call stewardess for bag d

FIRST SKETCH of the car that became the Gremlin was done by Teague in June, 1968, on an airline motion-sickness bag. "It was the first piece of paper I could grab and the plane was hitting pockets as I sketched," he told PM. Dream car and early versions are at right. The bottom car is almost the production version

into the G program, we thought we should take a strong look at it. Gremlin evolved out of this.

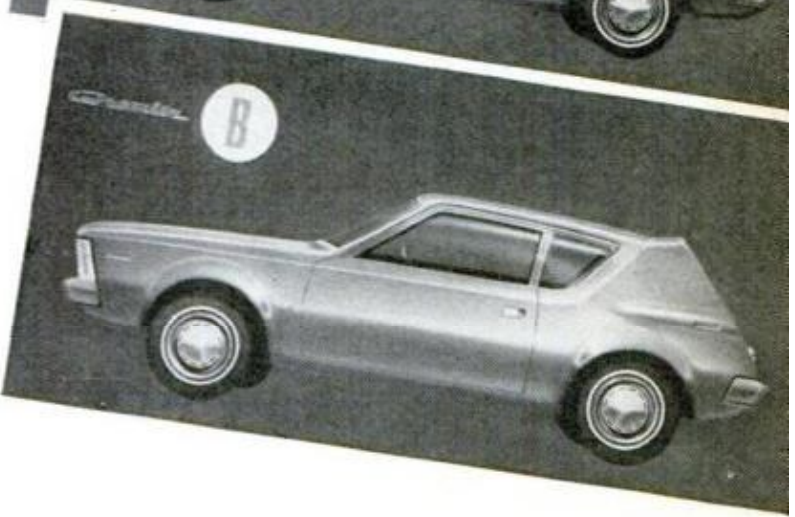
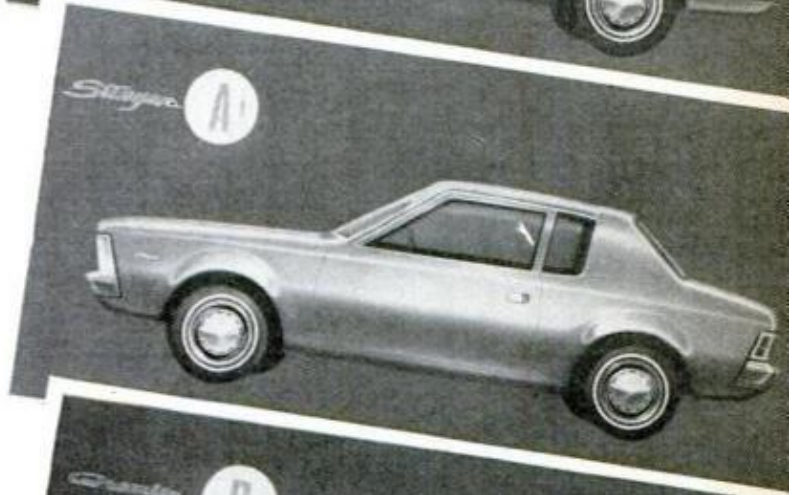
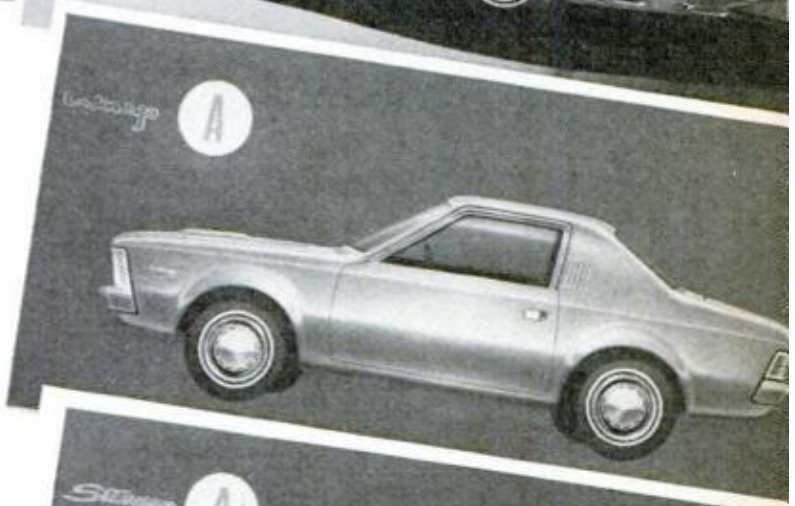
To what extent did you borrow sheet metal or other components from existing cars for Gremlin?

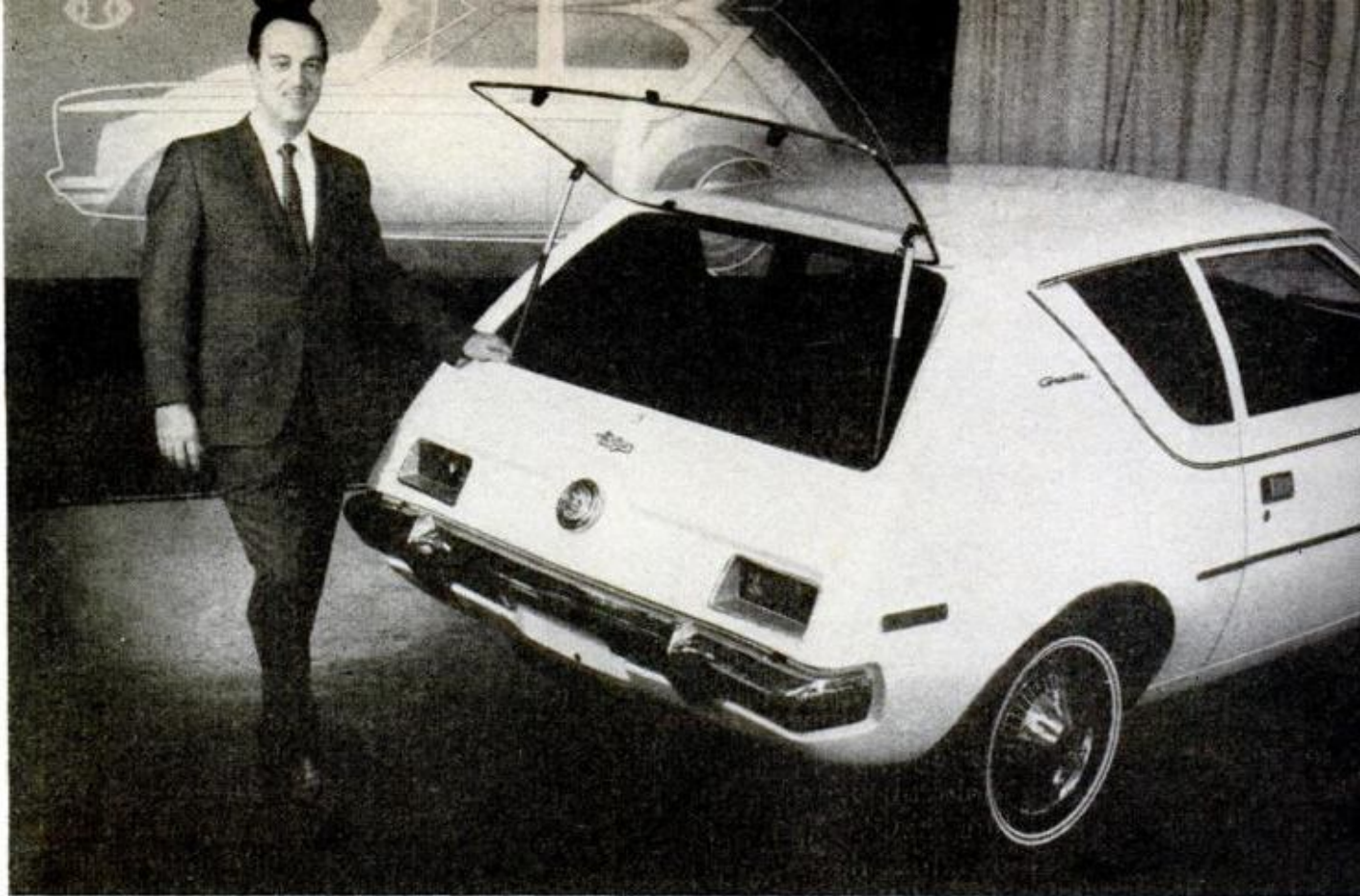
There's a lot of interchangeability sheet-metalwise between Gremlin and Hornet. Bumpers, for one. That's a high-service item. Frankly, we had to move fast to get the car out first. We knew GM and Ford were working on small cars, so we accelerated development of the G car.

What's the advantage of being first? Is it psychological?

Partly psychological. But it's more than that. It proves again this company can do the unexpected, as we did with the AMX. We were the first out with a two-place, low-price sports car. The only thing prior to AMX in a domestic car was Corvette, which is \$1500 to \$1600 more on the sticker price than AMX.

AMX has been an enormously
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FLIP-UP BACKLIGHT in station-wagon tail gives Gremlin its versatility, observes the AMC styling v.p.

successful car. I'm not talking just sales figures. Over and above the numbers it's been a psychological success for us, to use your term. It's brought kids and young people back into our camp. We didn't have them four years ago, before AMX and Javelin.

A publicity handout says Gremlin was derived from Cavalier, the idea you brought out in 1966. I don't see the connection. The thing I remember about Cavalier was the interchangeability of sheet metal. Left front and right rear fenders were interchangeable. So was the hood and deck lid.

And the doors. They had a diagonal switch—left front, right rear and right front, left rear. From a design standpoint, Cavalier begat Hornet. We took a strong look at Cavalier when we were doing Hornet to see if we couldn't effect the interchangeability feature into Hornet. Cavalier wasn't a phoney. It could have been built exactly as you saw it, but with one black mark, one minus.

The minus was that because the car

was on a 108-inch wheelbase—that's Hornet exactly—and because of the interchangeability feature, it would have meant moving the people forward six inches. If you did that, you'd have an intrusion of the front wheelhouse into the cab. The only way you can get around it is to go to mini wheels—those little 12-inch wheels. At that time we couldn't convince management it wasn't as serious a problem as some people thought.

Will we ever see the interchangeability of sheet metal on an American car that you worked into Cavalier?

I don't know. We took a strong run at it in the build-up program on Hornet. We even tried a car with a 114-inch wheelbase. That was too much, but it solved the problem of the intrusion. The overall length of the car was still short. What we did was move the wheels out to the ends of the car, so it had practically no overhang. It didn't come off from an appearance standpoint.

Getting back to Gremlin, do you run



EXPERIMENTAL CAVALIER explored the idea of interchangeability of parts such as fenders and doors

into safety problems in designing a small car that you don't encounter on a larger car?

No. Safety rules are safety rules. You have to meet them, regardless of the size of the car.

But you know the argument that in an accident you're safer in a big car.

If you have to be in an accident, there's no question you want to be in a heavy car, if you had your druthers. Weight soaks up inertia.

The other companies talk about cars weighing 1800 to 2000 pounds. Gremlin weighs 2600 plus. This is the most rugged car we've ever built, big or little. There's a lot of metal: in the front, rear, A-pillar, you name it.

There's also a lot of glass for a car its size.

Yes, that's me. I like a lot of glass.

You sealed the rear quarter windows on Gremlin. Is that a tipoff on something to come? With airconditioning coming on the way it is, do you think we'll eventually see sealed windows all around?

No question about it. I made a proposal to do that two years ago on one of our senior cars. Ten or 15 years from now I think you'll see airconditioning as standard on 80 to 90 percent of the cars made. Then we'll definitely see sealed cars.

AUGUST 1970



INTERCHANGEABILITY APPROACH is used in Gremlin's sharing basically the same front end as Hornet

Did you put anything in Gremlin that you don't have in your other cars to go along with the easy service, easy repair idea?

Everything we've got in Hornet and something extra. There's a removable panel on the inside of the C-pillar, just below the side glass. Despite all you hear about bolt-on fenders in the front, there are very few cars made today where you can remove the rear fender. But with this removable panel the bump man can get in there with his hammer and tools and bump the quarter panel out without replacing it.

Would you say car designers are less subservient to the engineering department today than they used to be? Engineers used to say, "Here's the guts of it. Put a box around it, but don't go beyond limits we've defined."

They still do. And we still argue with them. We win a few. They win a few. It's a give-and-take business.

Are designers getting away from the idea of starting out with a clean sheet of paper in styling cars? There seems to be a lot of borrowing from existing cars and adding something new to come up with a half-breed.

You never get your full druthers. Not just here, at other companies, too. The way you handle that is when you

(Please turn to page 182)

91

Last month, *PM* reported the dramatic rescue of 17-year-old Nancy Burns, trapped in a car at the bottom of a river in Miami. Nancy is alive today because she kept her cool in the kind of accident that claims the lives of 400 Americans a year. What would you do if your car plunged into a lake or river?

By KENNETH ANDERSON



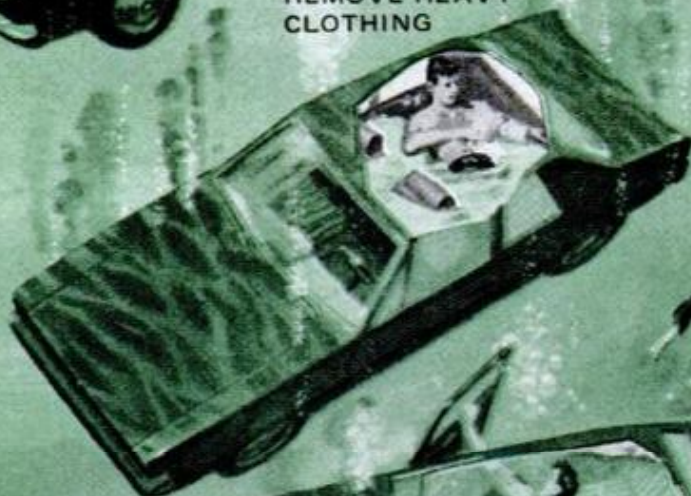
IF POSSIBLE,
JUMP OUT WHILE CAR
IS ON SURFACE



DON'T TRY TO OPEN DOOR.
OUTSIDE PRESSURE IS
TOO GREAT. MOVE
TOWARD REAR
WHERE AIR BUBBLE
IS FORMING



REMOVE HEAVY
CLOTHING



PUSH OFF FOR
QUICK RISE
TO SURFACE

WAIT UNTIL CAR SETTLES.
WITH INSIDE AND OUTSIDE
PRESSURE EQUAL, DOOR
CAN BE OPENED



A dramatic illustration of a car flying through the air above a highway bridge, with a person falling into the water below. The car is a light-colored sedan, possibly a Mustang, shown in mid-air with motion lines around it. The bridge is a concrete overpass with a guardrail. Below the bridge, a person is seen falling into a body of water. The background is a hazy, greenish landscape.

What to do If Your Car Goes Into the Water

IT HAPPENS EVERY DAY in the United States. A car misses a sharp turn or caroms off another auto after a minor collision—and plunges into a lake. A car swerves to avoid a dog on a highway—and skids into a river. A car careens off the pavement after a blowout—and lands in a canal.

The 1969 accident at Chappaquiddick Island that claimed the life of Mary Jo Kopechne made national news. But the happier fate of 17-year-old Nancy Burns, rescued from a car on the bottom of a river in Miami, went virtually unnoticed by the nation's press until reported by this magazine (*The Face in the Mustang Window*, page 88, July PM). Most such occurrences make only the local papers.

An average of about 400 deaths a year occur in the United States in this manner. Probably an equal number of persons are trapped in cars that go into deep water and live to tell about it. But the tragic irony is that nearly all drivers or passengers involved in submerged-car accidents can save themselves by doing certain things during the first few minutes after the auto hits the water. The files of the National Safety Council contain many ex-

amples of underwater rescues of people who thought they faced certain death in a car on the bottom of a lake or river.

A truck driver moving his rig along U.S. 62 east of Paducah, Ky., noticed a fresh set of skid marks heading off the road toward Lake Kuttawa. He had heard that two cars recently had gone into the lake and stopped his truck to investigate. As the trucker waded out into the lake in the direction indi-

The diver . . . kicked at a window with all the strength he could muster.

cated by the skid marks he became aware of a muffled tapping noise.

He moved toward the source of the sound and discovered a submerged station wagon. Inside were a young mother and child, their faces barely above the rising water level, their lives sustained by a trapped air pocket. The trucker smashed a hole in the window, unlocked the door, and pulled the woman and child to safety.

Near Schenectady, N.Y., a four-door sedan swerved off a road and into the Mohawk River. The driver of a following car witnessed the mishap and summoned police. Although it was after sunset, police quickly located the car in 12 feet of water—the headlights were still on. A rescue squad diver went to the river bottom to determine whether there were any bodies in the car and was startled by the sight of two wet, frightened people staring at him through the windows.

The diver tried to pull open a door but it was jammed. He flexed a leg and kicked at a window with all the strength he could muster. The window gave—and there was such a change in pressure that a door on the opposite side popped open and the occupants were swept to the surface and safety. Approximately 30 minutes had elapsed from the time the car went into the river.

In East St. Louis, Ill., a motorist ac-

companied by two teen-age boys swerved to avoid hitting a dog on a highway and the car went into the Mississippi River. One of the boys punched out a window with his fist, and the three occupants swam to shore. In Chicago a woman attempting to move out of a parking space at Belmont Harbor suddenly found herself sinking in 10 feet of Lake Michigan water when her car shot forward over a barrier. The woman simply rolled down a window and pushed toward the surface.

Although Nancy Burns was submerged only about 15 minutes, Miss Kopechne's death might also have been averted, in the opinion of the Edgartown, Mass., diver who recovered her body. John N. Farrar, captain of the Search and Rescue Div. of the Edgartown Volunteer Fire Dept., was quoted as saying that persons in submerged cars have remained alive as long as five hours, depending upon the amount of air captured in the car when it settled into the water.

It appeared that Miss Kopechne, said Farrar, was holding herself "in such a position as to take advantage of the last remaining air." He added that although he found no air in the car when he reached it, eight and a half hours after the accident, the fact that several windows were either open or broken "would not prevent an air bubble from having formed in the top."

Dr. Bernard Kuhn, a Lexington, Ky.,

. . . a victim could remain alive in a submerged car for at least an hour.

safety consultant, has conducted an intensive study into exactly what happens when a car drops into the water. Under ideal conditions, he estimates that a victim could remain alive in a submerged car for at least an hour. Working with the Michigan State Police, the Michigan State Highway Dept., the American Red Cross and the Indiana University Dept. of Health and

Safety, Kuhn had a series of cars dropped into 12 feet of water from a pair of car haulways. The car models included a two-door compact, a standard two-door sedan, a four-door sedan, and a four-door station wagon. One haulway was positioned so its tracks ended 18 inches above the water, the other, 56 inches above the water.

Cars were rolled into the water with windows closed, one window open, and more than one window open. The cars also were dropped into the water upside down, rightside down, or leftside down by the crane used to retrieve each auto after a test. Scuba divers were in the water to examine the occurrence of air bubbles, rates of water-fill and damage to the car.

The experiments revealed these life-saving facts: After a car hits the water, it will float for a moment or two. The experience has been compared to being in a leaky boat—you know the car is going down but for a very brief time you are floating. In the Michigan tests, one car did not sink below the surface for six minutes and three seconds.

The advice of safety experts: Remain calm, but think fast! During the first moment after hitting the water, get yourself and your passengers out of the car quickly and head for dry land. In most cases the car will be no more than a few yards from shore. If you can't open a door, scramble through a window. But try to get away from the car before it begins to sink.

The heaviest end, usually the end containing the engine, will sink first, pulling the car down at an angle. If you are still inside, move toward the back of the car. You still may have a chance to get out by breaking or opening a rear window. Tempered glass usually will yield to a sharp blow with a pointed object like a Phillips screwdriver or a punch. Some safety consultants recommend that every car carry tools of this sort in the glove compartment for emergencies in which the passengers must escape through a window.

Water will bubble up through holes

in the floor and firewall, where the steering column, accelerator and other controls penetrate the interior compartment. The water level on the inside will be about two feet lower than the outside water level at first, but the difference will narrow as the car fills with water.

After the outside water level reaches the outside of the doors at the bottom, the doors will be held shut by water pressure. You will not be able to open them again until the pressure inside the car equals the outside water pressure. Don't waste time and effort trying to force open a door during this period. It's as useless as trying to open the doors of a car buried in sand.

The air bubble that originally filled the interior of the car will become partly displaced by water and what remains will become compressed at the highest

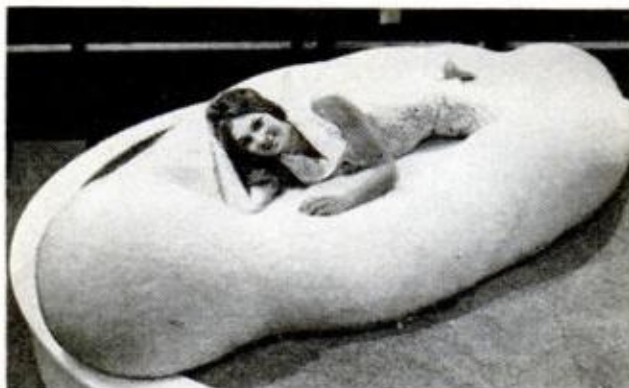
You won't be able to open doors until pressure inside equals outside water pressure.

point of the passenger compartment. In some cases, the air will be pushed into the trunk compartment when the car noses down in the water.

If you are small enough, or the windows are large enough, you can still escape through a window while the car is settling toward the bottom. But be prepared for a powerful rush of water against your body if you roll down the window of a partly submerged car. Also, if the windows are electrically operated, they may not open. Dirty water will short-circuit the car's electrical system; clean water will not hamper the electrical system immediately.

Your last option is to position yourself in the pocket of trapped air and wait until the car settles on the bottom. Dr. Kuhn's tests showed that this usually happens within eight minutes from the instant of the cold plunge. In some cases you get a bonus of air that moves from the trunk compartment to the top

(Please turn to page 182)



No four-poster, this

Though it looks more like a giant glob of dough, this bit of furniture is actually a bed. Made of foam covered with fleecy fabric, it was shown recently in London.



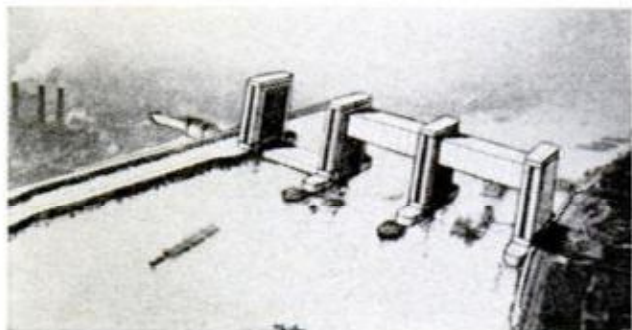
Lens system gives sight

The "bioptic telescopic system" of Dr. William Feinbloom, New York, is a multimicroscopic lens group that gives 50 percent vision to this boy, born with 1 percent vision.



German hovercraft

The Germans are getting into the air-cushion business with the Hovercraft Ber 209. It has a 45-hp engine for lift, plus a 68-hp powerplant that drives it about 55 mph.

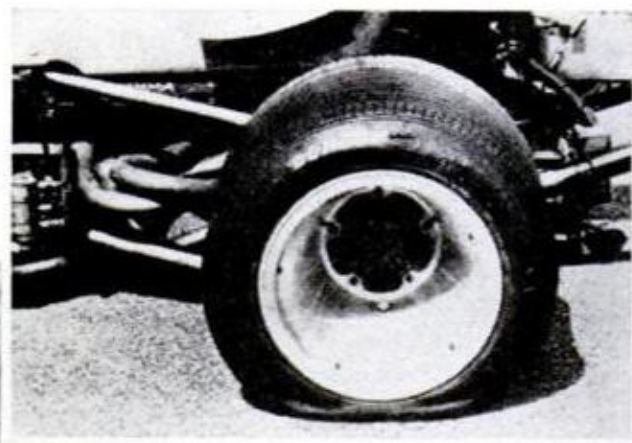


Flood protection for London

Massive gates that can be raised and lowered are being suggested as a means of protecting London from floods. This drawing illustrates how they'd span the Thames.

Flat-out race driving

Five bolts around the inside of a racing car's wheel rim (boltheads are visible at right) hold the tire bead against its seat on the rim and prevent loss of control when a tire leaks. Jackie Stewart proved it by driving a Matra-Ford 130 mph on a flat tire.





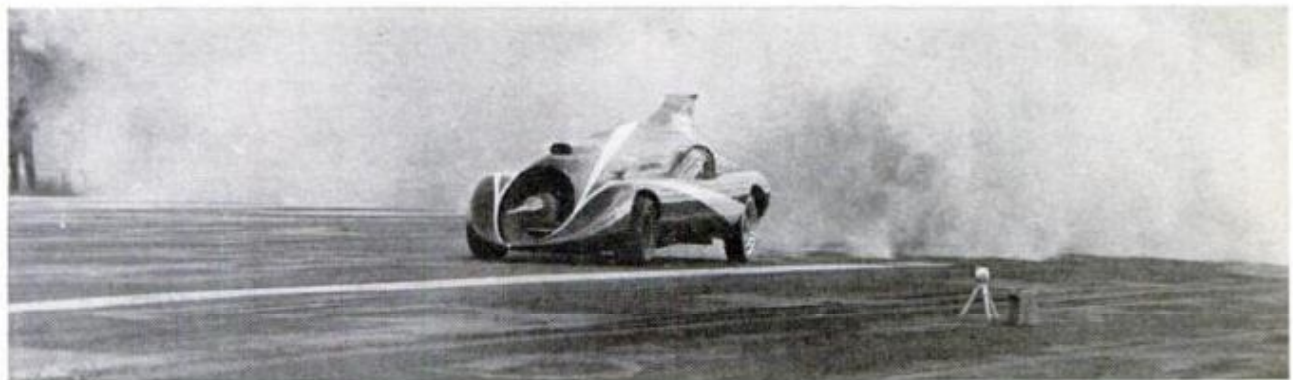
First prototype of Formula Vee 1600 racers

The first prototype of the Sports Car Club of America's newly adopted Formula Super Vee (Formula Vee 1600) was recently shown by Beach Racing Cars, the builder. The class uses a VW engine, transmission and some wheel and brake components, but body, chassis and suspension may be altered more than the extent allowed under Formula Vee 1200 rules.



Umbrella for getting out of cars with

All the user has to do to open a new German umbrella is point it out a partially opened door and push a button. The umbrella pops out the top of the handle and spreads open.



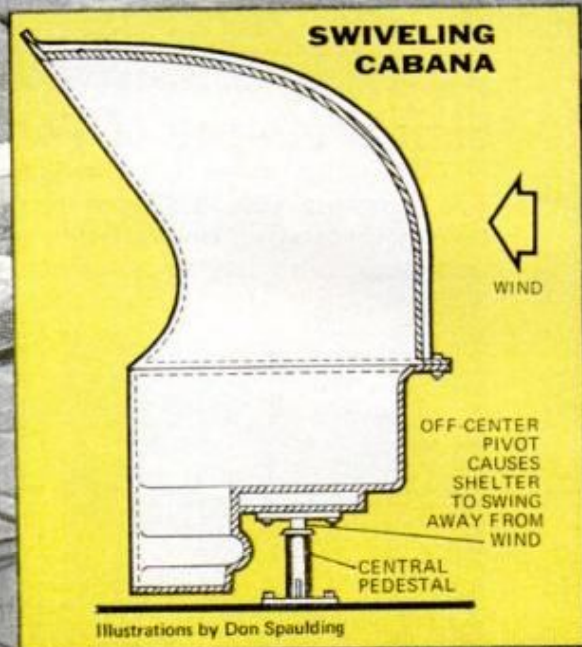
Arfons and Green Monster warm up for 700-mph try

Taking off like a Saturn rocket, Art Arfons hits 200 mph in 8 seconds during a demonstration of his Green Monster. He'll eventually attempt to crack 700 mph and the sound barrier.

Just patented

PM'S PICK OF THE NEW INVENTIONS

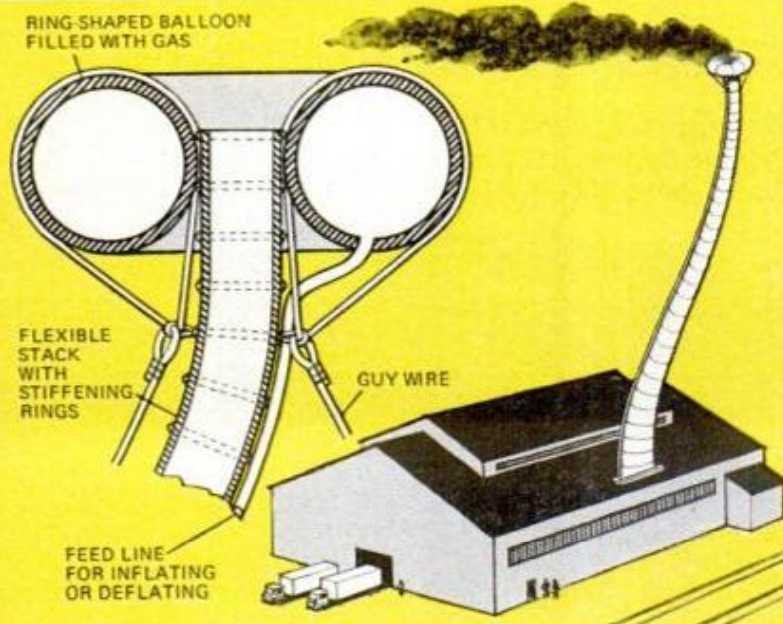
Prepared in cooperation with Roger S. Shashoua, Director, International Inventors Assn., Inc.



Illustrations by Don Spaulding

1. **SWIVELING CABANA** works like a weathervane, always turning away from the wind. The object: to help keep you warmer on breezy days, especially if you've just come out of the water from a swimming pool. The hooded, semicircular shelter is mounted on a central ball-bearing pivot so it swings easily

in any direction. The long roof overhang at the front acts like a tail vane, keeping the back of the enclosure pointing into the wind. When the wind isn't blowing, the shelter can also be rotated manually to any desired position to provide more shade from the sun or privacy from nearby houses



2. **FLYING SMOKESTACK** at left is one clever answer to the pollution problem. The stack is made of lightweight, flexible material and is carried aloft by a balloonlike collar that's filled with gas. The idea is to send it way up in the sky—much higher than a conventional masonry chimney could be built—so industrial waste products are dissipated harmlessly into the upper atmosphere. When not in use, the tube can be flattened and rolled up on a large drum for storage. As it's unreeled through a slot in the factory roof, springlike stiffening rings inside expand to give it a round shape and keep it from collapsing. A feed line runs up the side of the tube for pumping gas into the collar or letting it out when the stack is to be lowered. Guy wires keep the tube anchored in a vertical position so that winds can't blow it off to the side

Inventors of the items shown on these pages are as follows: 1. Harry J. Battistoni, Unionville, Conn. and Alice M. Vandergift, 289 Oakville Dr., Pittsburgh, Pa. (No. 3,456,980); 2. Robert M. Secor, Wilmington, Del. (No.

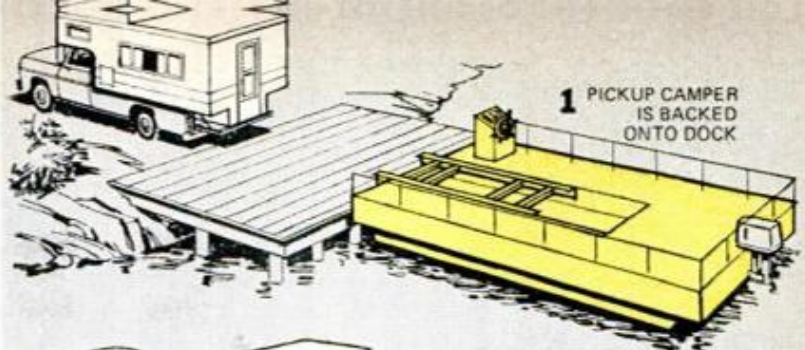
3,489,072); 3. Karl Rudi Muller, Kritzstrasse 40, 85 Nuremberg, West Germany; 4. Arland B. Judkins, 466 Luther Rd., Auburn, Calif.; 5. Roger T. Baer, 650 Corcoran Ave., Santa Cruz, Calif. Readers wishing to bring new inventions to the



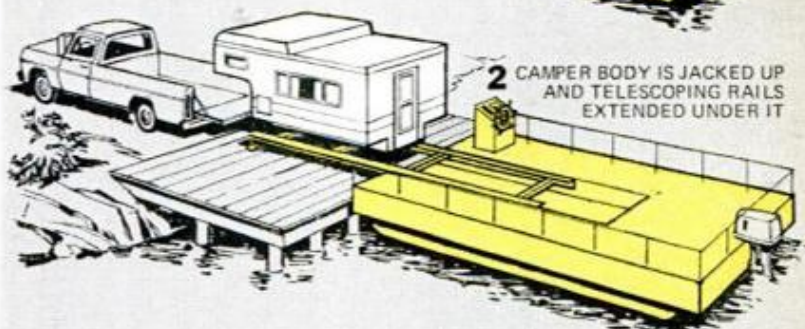
3. POP-OUT WINDSHIELD makes it easy to get out of a wrecked car if the doors are jammed. You just pull two handles and these peel away a flexible mounting strip between the glass and the window frame. With the strip removed, the windshield is easily pushed out, clearing the way for a quick escape. The system could also be applied to train and bus windows

5. PELLET-SHOOTING BOW at right is designed to provide the sport of hunting with a bow without the loss of costly arrows when you're working in dense underbrush. The device consists of a slotted metal tube that clamps to the hand grip on any standard bow. A magazine holds 1/4-inch steel balls—the kind sold as sling-shot ammunition—and feeds them by gravity down into the tube. A sliding hammer attached to the bowstring is pulled back and released to fire one pellet after another. A small magnet on the underside of the tube holds each ball in place as it drops from the magazine so it can't roll down the tube before you're ready to shoot. The pellets are said to have good striking force, penetrating 1/4-inch-thick wood with a 45-pound bow, and can be fired in rapid succession much faster than arrows. The attachment can be quickly removed and the bow used in the conventional manner whenever desired

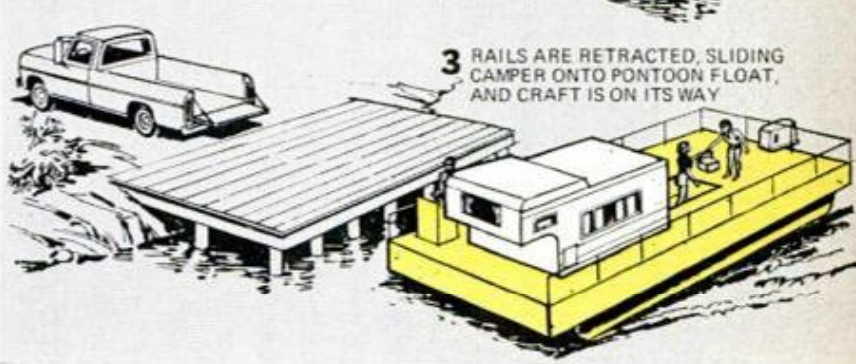
attention of Roger S. Shashoua can reach him at the International Inventors Assn., Inc., 680 Fifth Ave., New York, N. Y. 10019.



1 PICKUP CAMPER IS BACKED ONTO DOCK

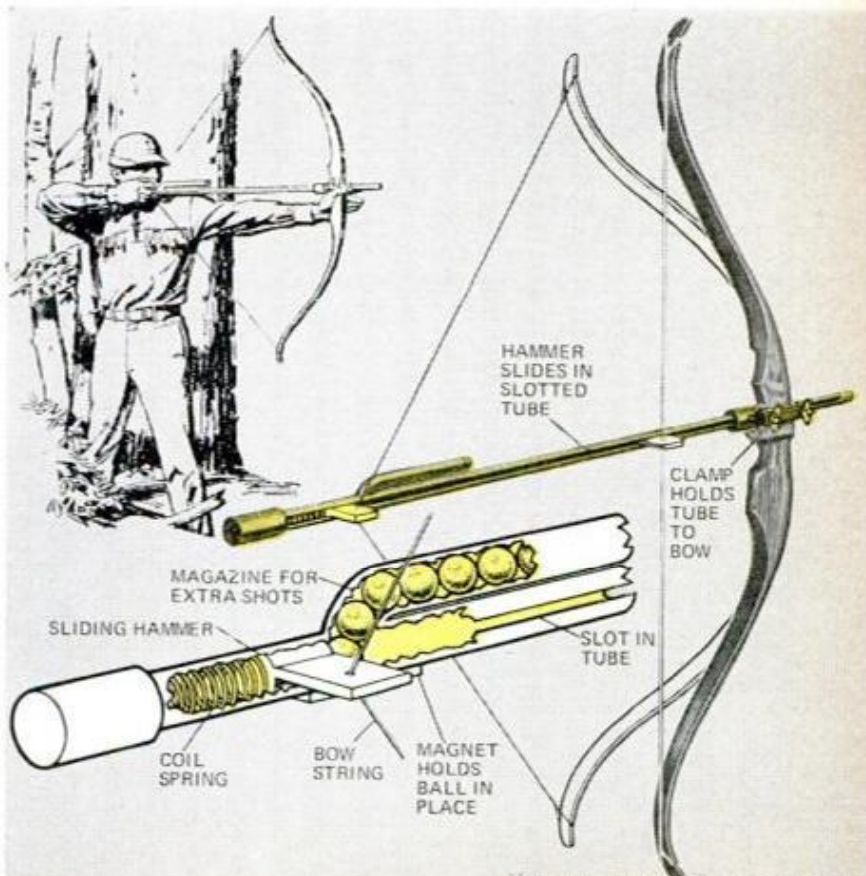


2 CAMPER BODY IS JACKED UP AND TELESCOPING RAILS EXTENDED UNDER IT



3 RAILS ARE RETRACTED, SLIDING CAMPER ONTO PONTOON FLOAT, AND CRAFT IS ON ITS WAY

4. PICKUP CAMPER CONVERTS TO HOUSEBOAT in this ingenious invention, enabling you to use the same living quarters for vacationing on either land or water. To make the switch, the pickup truck is backed onto a dock and the camper body is jacked down onto sliding rails extended out from a pontoon float. The rails are then retracted and the camper is lowered into a recess in the float's deck, becoming a cabin for the houseboat. Controls for an outboard engine are located at a separate pilot's station beside the camper near the bow



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OUTDOOR RECREATION

The Muddy-er The Merrier

By BILL KILPATRICK



TROPHIES make even the muddiest going okay

GIVE MAN any kind of conveyance and it's certain he'll soon be racing it. No exception is the comparatively recent phenomenon of ATV (All-Terrain Vehicle) racing.

Last year saw the beginning of organized events run under the auspices of the National All-Terrain Vehicle Assn. (NATVA). Entry lists and crowds were small at first, but this year this newest form of often-muddy mayhem will attract hundreds of entries (some being "factory teams") and thousands of fans throughout the country. Is it exciting? Believe us, the word "all" in "All Terrain" is taken quite literally, the result being some of the most spine-tingling, head-to-head competition you're likely to see. ★ ★ ★

GOOFY GOING marked NATVA's Eastern Regional Championships at Thornburg, Va., in which most ATV makers were represented. ATVs hit 30-35 mph, even in mud





THAT'S US going over on our ear. Unbelted, we flew out unharmed. If belt is worn, roll bar is a must



TYPICAL ATV RACING action sees drivers bucking each other despite such obstacles as mud and water



SCARED TO DEATH at first, we eventually got with it, earned an invitation to join the Attex factory team



OFTEN during race, intended "line" must be altered as track deteriorates. Here, ATV slides on mud bank



Space-Saver Hutch Built in a Closet

This attractive living-room storage center adds a lot and steals no floor space

By **ROBERT D. BORST**/Photos by the Author. Styling by Robert Lofgren

AS THE STACKS of books and record albums grew, it became quite obvious we were going to have to provide some sort of built-in that would attractively house the collection. Not wanting to take floor space from the living room area, I solved the problem by creating a built-in hutch in a closet.

The wall between the living room and our son's bedroom proved to be an ideal location. Since that bedroom boasts a second closet, there is more than enough space for the youngster's clothing. And by building the unit as shown in the section drawing on page 104, there is still storage for toys, games and the like.

All the work is done from the living room side. After ripping out the closet back, I installed the header (doubled up 2x4s) and supporting studs. *Caution:* Before ripping out studs, determine whether or not the wall is a bearing wall (with ceiling joists resting on the top plate). If it does support the weight, build a temporary wall of two-by-fours parallel to, and about 1 ft. from, the existing wall, to carry the load until header and studs are placed.

With framing completed, I installed a 3/4-in. plywood sheet on the inside of the bedroom doorjamb. Later this was painted and fitted with corkboards to serve as a bulletin board.

To keep cabinet construction simple, I used 3/4-in. A-D grade plywood wherever possible.

The top goes in next. Wanting a maintenance-free durable surface, we chose to use white Formica. For an elegant look, the counter was thickened to 1 1/2 in. To do it, on the bottom side I simply added 3/4-in. material along the edges and wherever the top rests on a vertical (wall inside the cabinet). Do the carpentry first and

when satisfied with the fit, cart the top back to your shop to do the laminating. (See *How to Work With Plastic Laminates*, page 154, March PM). When fitting the top, allow at least 1/8 in. for the thickness of the laminate (1/16-in. for each self-edge on the ends).

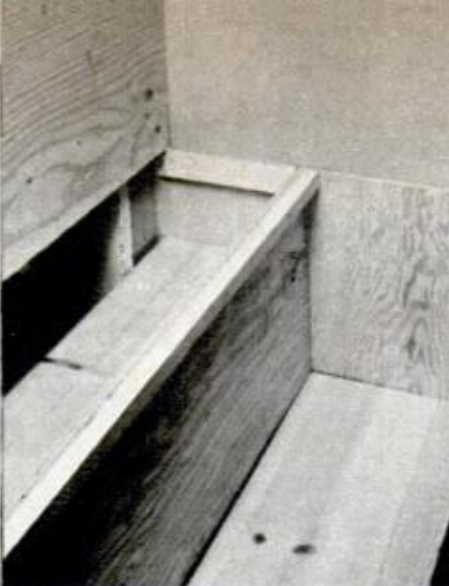
Since my wife is particularly fond of louvered shutters, they were chosen for the cabinet. Though it's not exactly a snap to stain the shutters to match the paneling, you can come pretty close by mixing several stains. I used birch prefinished paneling but the shutters were pine.

Thus, the grains differ. You'd have to custom-order the shutters if you wanted



CLOSET in boy's bedroom now serves for toy storage; on living room side it's handsome built-in hutch





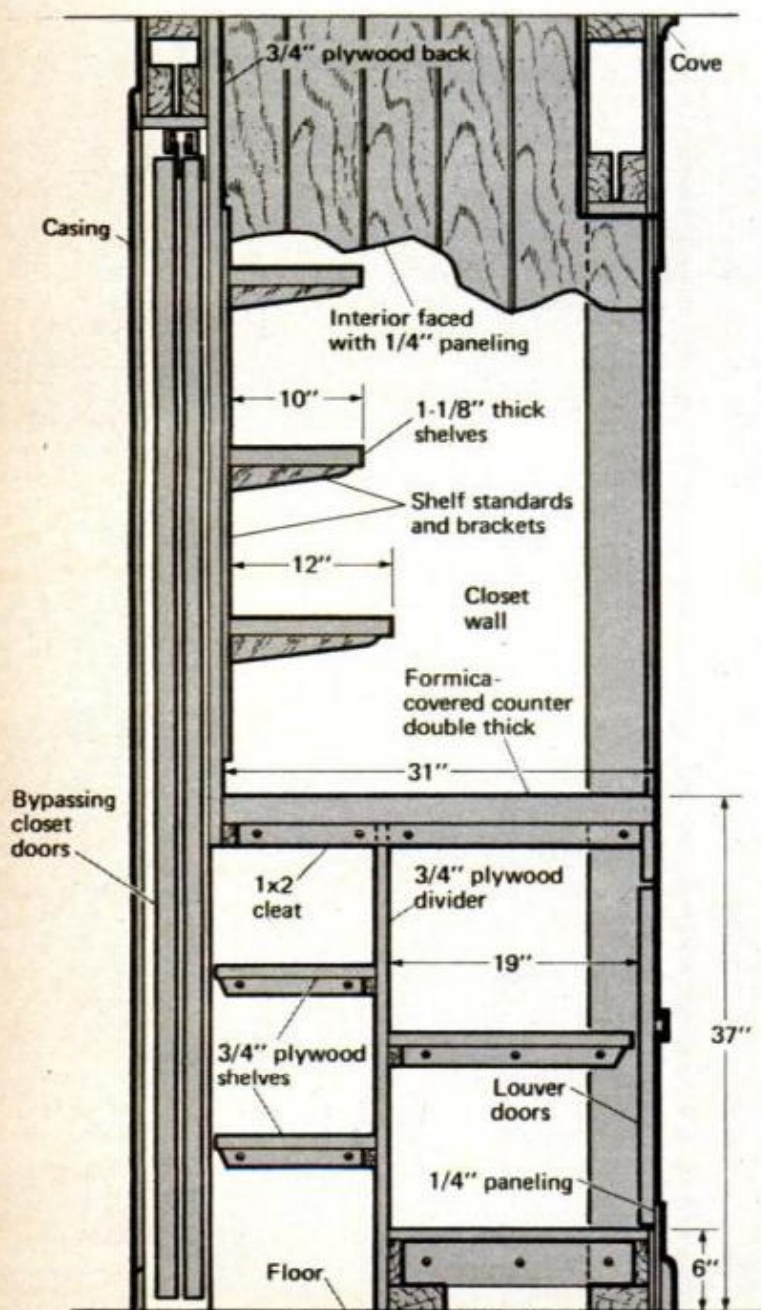
BACK OF CLOSET is ripped out and $\frac{3}{4}$ -in. plywood is nailed to back edge of the doorjamb. The cabinet (above) is framed and Formica countertop installed, using screws and corner braces

them in birch, and the added cost makes that idea impractical.

The storage area inside was primed and finished with a semigloss enamel. Since it is enclosed, I'm certain it will be years before a paintbrush touches these surfaces again. The shelves above are adjustable; to blend with paneling, I chose copper-finished standards and knife brackets. ★★



PANELING was installed using adhesive and, as pros do, an adequate amount of brads. Face of unit (below) was covered with single piece to avoid horizontal joints. Section drawing, shows upper portion used for books while bottom area is halved





Driving in a cloud

The Cloud Car, a chassis covered with a plastic and foam-rubber body, is only the beginning, says its London maker. He plans others—driven by pedals or electricity—to look like a hamburger, octopus or monster.



Portrait of a tiny pair

The two relatively bright white dots in the upper center of this photograph are two uranium atoms. They were recently photographed by a powerful electron microscope at the University of Chicago.



Bank tellers and customers are on TV

Customers and tellers in the Surety National Bank, Los Angeles, no longer come face to face during business transactions. Rather, they see each other via closed-circuit television. In addition, the customer using the newly installed Telestation system employs a special card and dials a secret number when doing his banking. Customers are shown in the bank's lobby in the left-hand photo; a teller in another room appears at right. The new, automated banking system is described as virtually theftproof.

PM Tests Wellcraft's New Air-Slot Hull

**A good ski boat – but
doesn't fill all the
manufacturer's claims**

By **GEORGE REIGER**
Outdoors Editor

JUMP! SPIN INTO A TURN, race up behind the photographer's boat, sheer away, figure eight—whoops! Watch your cavitation! Hour by hour of hard driving proved the sturdiness of Wellcraft's latest design, and the Airlot hull won the approval of Cypress Gardens' crew of professional waterskiers.

This boat is another brainchild of Englishman Dick Cole whose previous contributions to boating have included the Evinrude Gull Wing and the Thunderbird

1. AMPLE SPACE for sunbathing is provided in boat's forward area. **2. PLENTY OF CASTING ROOM** from each of boat's two seating sections. **3. BOW OVERHANG** keeps spray off windshield and out of rider's eyes. **4. AIRSLOT** passes its hull integrity test with flying colors.

1



2



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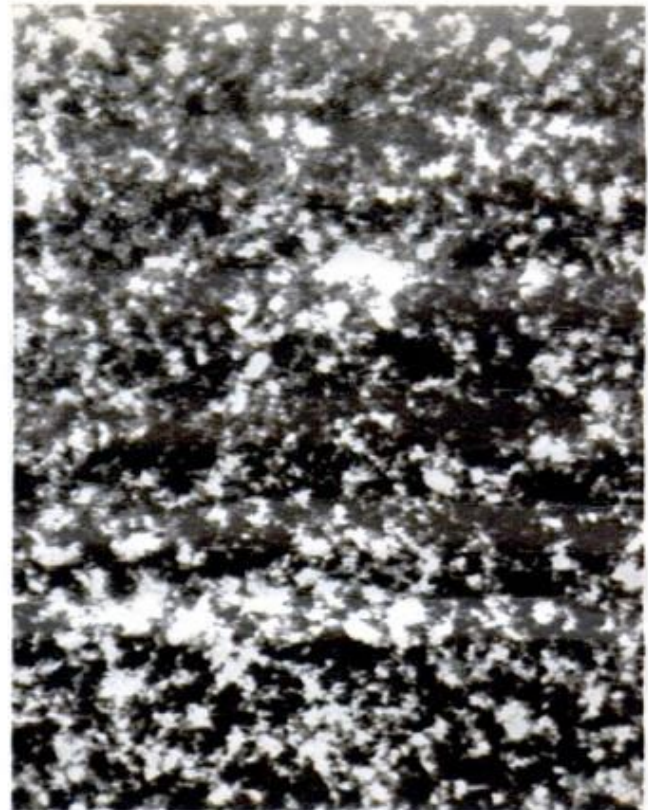
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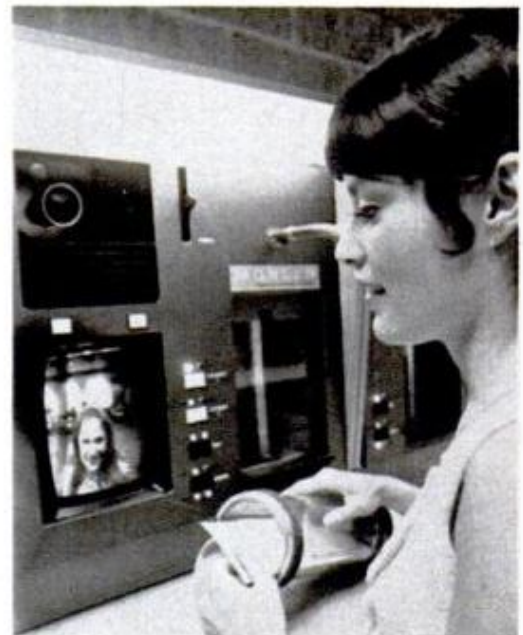
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Comanche. In 1958 Cole introduced the cathedral hull, and at first glance the air-slot design seems to be only a late model of that version. It has a center V-hull with two V-shape sponsons which work like outriggers in taming excessive roll.

However, to talk of platform stability in the same breath with V-hull is a contradiction of terms. You'll have to go to rafts or a johnboat for that. And with two men fishing off one side, or even with one hefty driver (such as Tom Dauer, *PM*'s art director), any V-hull will list at rest or roll while underway at slow speeds, even with air-slot design.

What really makes Wellcraft's Airslot distinctive is its overhanging deck-

line up to and around the bow. It's designed to capture air and force it between the main hull and sponsons, softening the ride through choppy water. We found the overhang more valuable in containing spray that would otherwise have obliterated our vision on runs across the whitecaps.

The Airslot is best seen out of water on a trailer. About halfway aft, running along the boat's bottom on either side of the keel, is a diagonal slot that looks like an inverted step. These slots are intended to provide two leading edges aft the main hull edge, two lifting points for the sponsons so the boat will rise up all together on takeoff, thereby eliminating the rearing-up character-



SLOW TROLLING with a 115-hp outboard and a 16-foot boat is well nigh impossible, but Tom Dauer and the author still managed to throttle down enough to fish Florida's St. John's River during its renowned shad run, catching the fish on tiny silver spoons. At right, all 115 horses are needed to keep a kite skier airborne on a calm day. Recently introduced from Australia, the Delta-Wing kite enables the best Cypress Gardens skiers to fly it after they drop the tow rope, then glide above the crowd before making their graceful beachside landings

istic of some planing hulls when accelerating to high speeds.

But here's where press releases and our experience didn't match. The boat we tested *did* assume a nose-up attitude on takeoff despite the slots, and because of its considerable beam (6-foot, 9-inch) and weight (1050 pounds), the 16-foot model with passengers and skiers needed all 115 hp to get up on plane.

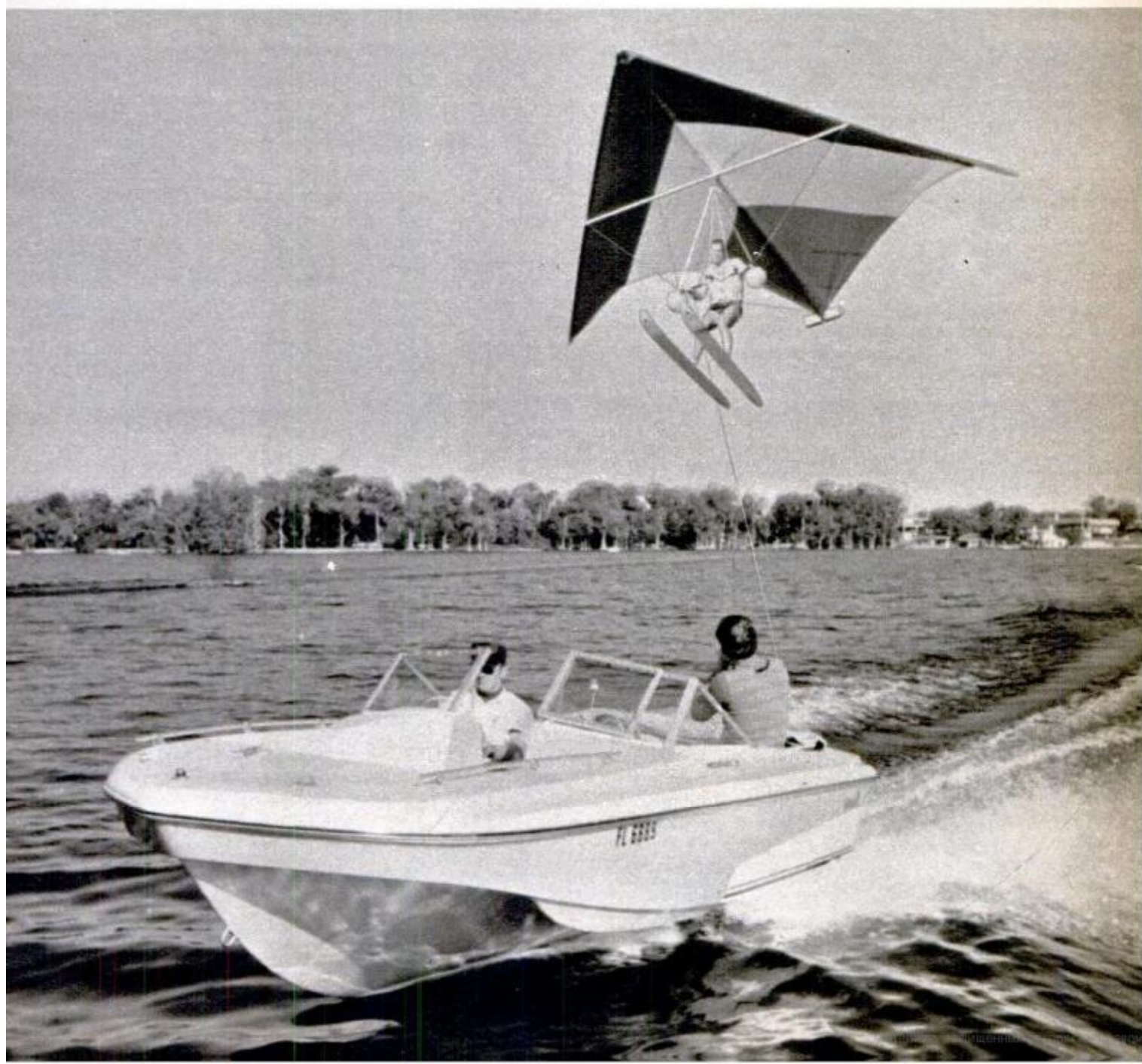
This is not to knock the Airslot's ride. At high speeds she's exceptionally smooth. She jumps and slaloms with less strain and fewer bruises for the driver than any hull I've tested this year. My criticism lies with the admen who *italicized* the promise that the Airslot would not rear up on takeoff. Even

with the maximum OB rating of 125 horses riding the stern, a hydrofoil-like rise could probably only be achieved by putting all your weight forward—an impossibility while waterskiing.

But the gals at Cypress Gardens loved the Airslot. We had no trouble getting a pair (redhaired Rhonda Kidby from Australia and Florida Cracker Lynn Shuler) to come on test runs.

The Airslot is also available in an 18-foot open outboard model and a 24-foot trailerable cabin version.

For further information write Wellcraft Marine Corp., 8151 Bradenton Rd., Sarasota, Fla. 33580. Sorry, you'll have to get the girls' addresses on your own. ★★★





INDY 1970 saw two McLarens start the race, both qualified by Peter Revson who did not finish. Carl Williams placed ninth in No. 75



MARIO ANDRETTI leaves pits to qualify in third row. He finished sixth despite trouble with suspension



LLOYD RUBY started in 25th spot, streaked through pack before going out with oil leak



AL UNSER, 1970 Indy winner, will be looking for a repeat of his victory in the No. 2 Johnny Lightning Special when USAC runs a second "500" at the all-new Ontario Motor Speedway

Auto Racing's New Supertrack— Where the Fans Come First

Ontario Motor Speedway's inaugural race, the California 500 for USAC Championship cars, promises to rival Indy!

By **BILL HARTFORD**, Auto Editor/Color Photos by Richard George

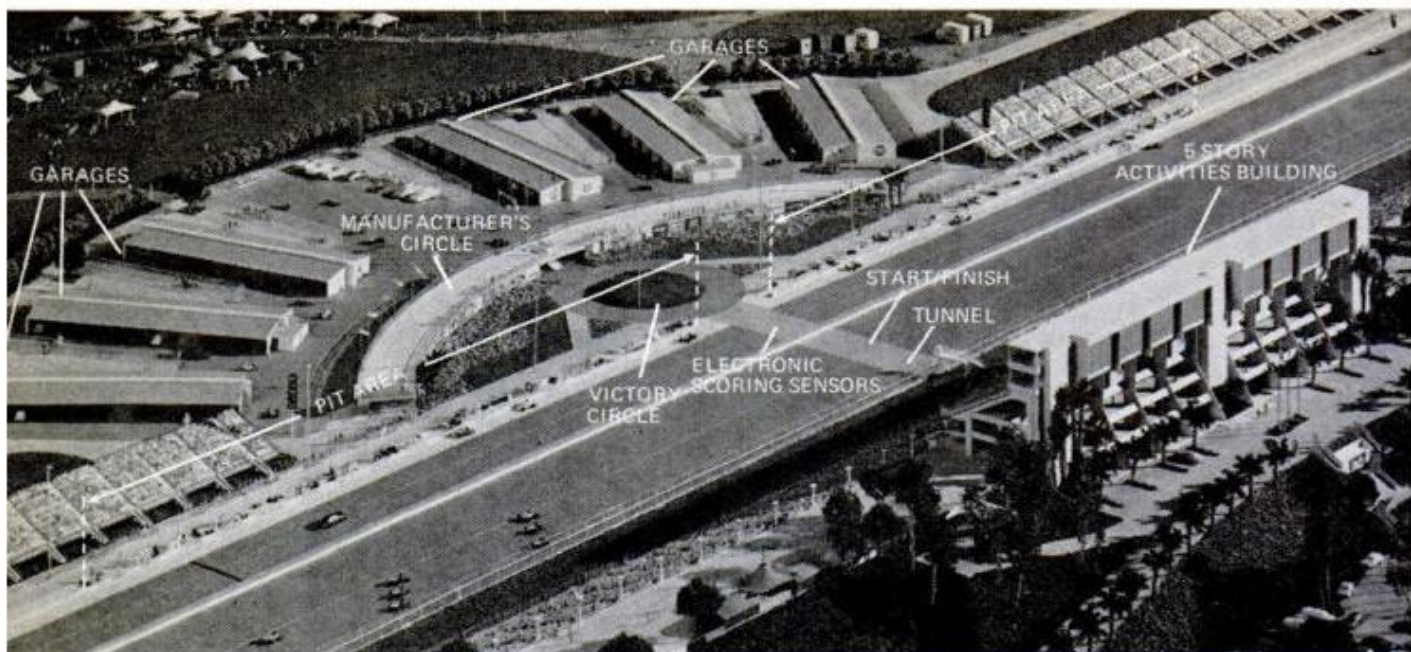
THE FLAG UNFURLS and flashes white in the hot afternoon sun. It's the last lap. You bolt off the hard, wooden bench straining to hear the announcer as the cars roar by. The scoreboard has not yet reflected the position changes from the spinout and melee of the lap before, and you're not quite sure if the car behind the leader is on the same lap or not. The hesitation in the public address system's rattle of times and speeds indicates that the announcer isn't sure either. The checkered flag flaps anticlimactically.

It's not the typical finish, but several important races this year (aren't they all important to the fans who are there?) ended in similar confusion. The ganglia connecting the timing, scoring and announcing functions at auto-racing events has been, at least up until Sept. 6 when the Ontario Motor Speedway opens, made up of flesh and blood—optic nerves, stop-watch thumbs, vocal cords—and old black telephones. At the California 500 USAC Championship race that officially opens OMS, however, black boxes, computers, high-speed printers and display pylons will keep track of who's on first.

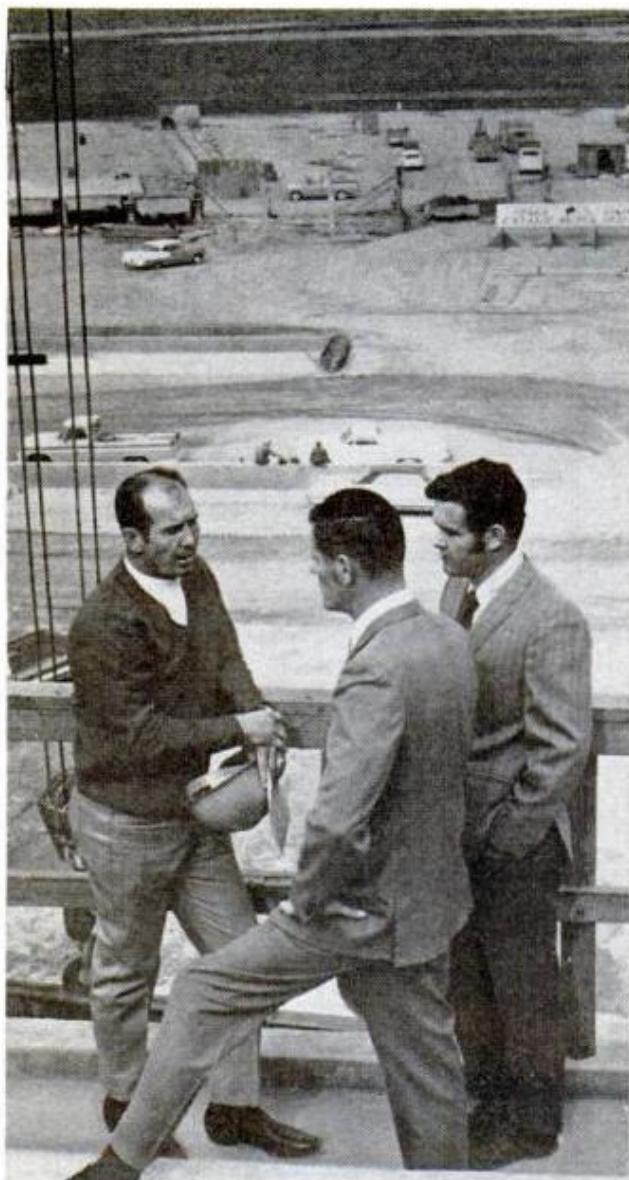
Each car in the 500-mile event will have mounted underneath, between the nose and front-axle line, a small transmitter. Under the start/finish line is the receiver that picks up the car's signal, detects and identifies it and records lap time to 1/1000th of a second. The IBM 1130 computer that gets the input information can handle over 50 cars going close to 200 mph. The interconnected high-speed printer will read out race order for officials and press while three 50-foot-high pylons display for fans the positions of the cars.

Expansion of this system, slated to be in use early in the '71 season, will include a large scoreboard for additional race information that will be obtained from more complex programs written for the computer. An instant forecast of who will overtake whom on what lap is an example of the degree of communication possible.

Instant and accurate timing and scoring is only one way in which the fans will fare well at the Ontario plant, about 40 miles east of Los Angeles. Electronics will also be the technology behind a supersound system and a system of signal lights (instead of flagmen) to communicate with drivers running on the 3.19-mile road course. Race officials stationed at the corners will activate



OMS MODEL details facilities around start-finish line. All building and structure heights and elevation were determined by the spectator sight lines



AL UNSER, Bobby Unser, Parnelli Jones (right to left) chat above start-finish line earlier in year

the lights—the colors of which are the same as the signal flags—but the chief steward will be able to override a cornerman's signal from his superior vantage point in the activities building's control tower.

The 28,000-watt public-address system (compared to 14,000 watts at Indy, 20,000 at Cape Kennedy) may mean that fewer fans, if any, at Ontario will have to watch the race with a transistor radio squashed to their ears to find out just what it is they're watching. About 450 speakers specially designed to penetrate the roar of highly tuned, unmuffled racing engines will blanket the facility. They'll be positioned strategically throughout the 140,000-seat permanent grandstand and bleacher sections and the unlimited-capacity infield area.

Electronics is even a moving force in the sale of tickets to OMS events. As of this writing over a million dollars worth of tickets have been sold, some of them through Ticketron, an instant ticket-purchasing system with a network of electronic box offices across the country. The computerized ticket-sales system prints out on the spot a ticket for any of the 140,000 reserved seats.

Prices for the 500 range from \$8 to \$25. The general-admission infield tickets are available on race day for \$5. Infield seating is strictly bring-your-

POPULAR MECHANICS



THREE-IN-ONE FACILITY includes drag strip and road circuits as part of the oval. Back straight is 30 feet higher than front straight; first row of stands is 30 feet above track for 100-percent viewing of the oval

own, picnic-style in the landscaped, parklike setting where the rule is pedestrians only—no spectator cars. Of the 140,000 reserved seats, 85,000 are permanent, extruded-aluminum jobs—comfy, contoured, splinter and maintenance-free. They are in the three, 50-foot-high sections of permanent grandstands that stretch from turn four to turn one along the front straight.

The back straight is roughly 30 feet higher in elevation than the front—which is one factor in 100-percent grandstand viewing of the oval. The other is that the bottom row of the stands is 30 feet above the track. This setup also ensures that at least 85 percent of the road circuit can be seen from any point in the grandstands.

All the statistics about this auto-racing superbowl are too overwhelming to detail. Numbers, dollar figures and construction details—cost: \$25.5 million; 700 acres total, 300 acres of parking; tram service to gates and infield; two infield lakes; eleven VIP suites with closed-circuit TV leased at \$30,000 a year; Victory Circle Club with 5000 memberships at \$250 a head; elastic bonding of track-shoulder soil to eliminate dust and water erosion; miles of safety walls and fencing—will be taken for granted once the racing starts.

AUGUST 1970

And great racing it will be—with all four major sanctioning bodies in on the action. After an Aug. 9 invitational, celebrity race, with the \$50,000-purse going to the Motion Picture and Television Relief Fund, practice is on for the United States Auto Club's 500. Qualifying on Aug. 29-30 will determine the 33 starters. Guaranteed purse of \$500,000 with additional awards money should put the total figure in the three-

(Please turn to page 197)



TIRE-TESTING Firestones last April after the surface dedication ceremonies is Mario Andretti in his STP-McNamara. Rodger Ward, '59 and '62 Indy winner, now OMS PR director, had honor of the first laps



Old 'billboards' and old craft still flourish

Paintings on outside walls of this shop depict the steps in handmaking shingles—which, despite modern technology, is a booming business in the Bavarian town of Berchtesgaden.



'Mole' digs Mersey tunnel

After two years of drilling through rock, the 300-ton "Mersey Mole" recently completed a second tunnel under the Mersey River at Liverpool, England.

Emergency by pushbutton

With a Veritek blowout simulator, a driver-training instructor can deflate a tire in a half second to simulate an emergency situation. The device also reinflates the tire.

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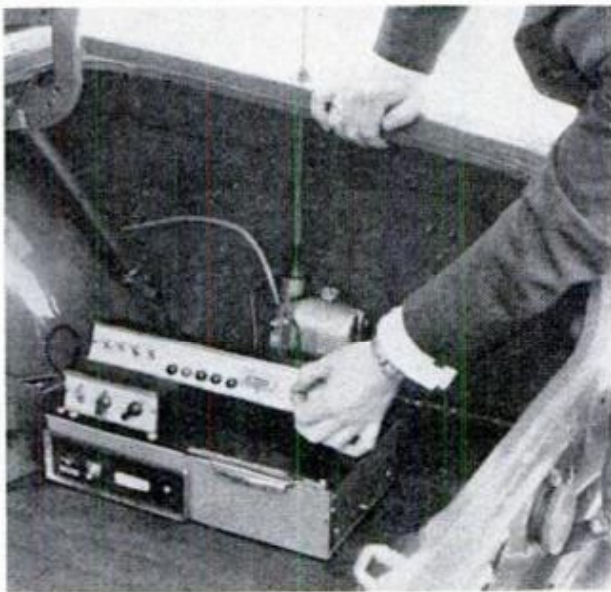


Raising the roof by air

Five electric fans that raised air pressure $\frac{1}{4}$ p.s.i. lifted the 274-ton prefabricated roof of this storage tank into place for welding.

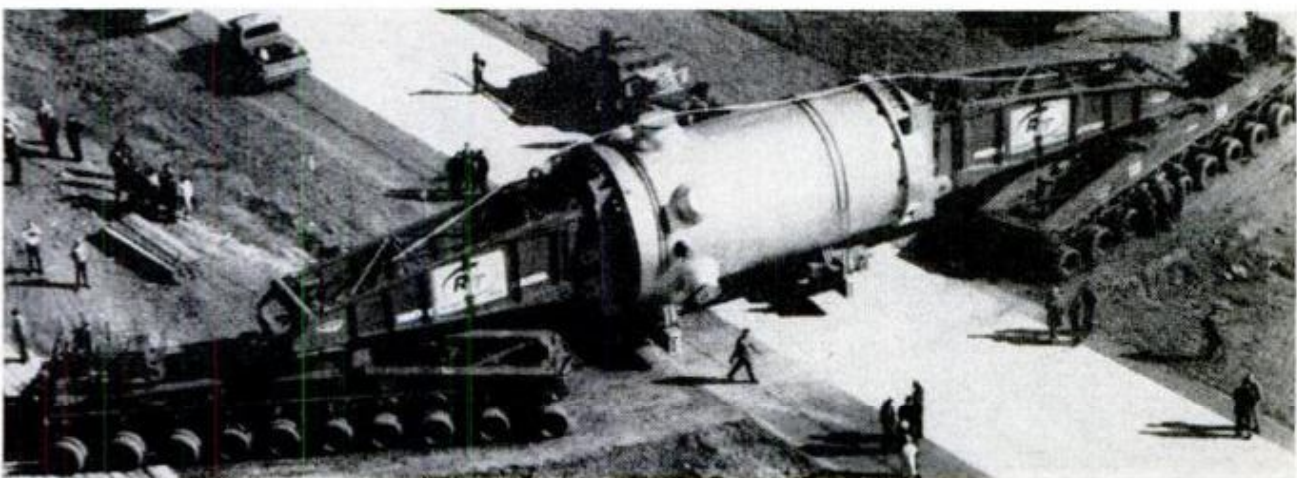


POPULAR MECHANICS



Gadget-filled car does everything but the driving

Peter Daykin of Blackpool, England, can start his car from bed (upper left) via walkie-talkie. But that's only one of many electronic activities controlled by the car's "nerve center" (lower left). A moisture sensor (bottom edge of top right-hand photo) sets off windshield wipers when it rains; a light-sensitive cell (lower right-hand photo) switches on parking lights in the evening; headlights dim when another car approaches; perfumed airconditioning comes on when needed; and a public-address system lets him correct other driver's errors.



Heavyweight gets headed off at the overpass

When an overpass couldn't take the 500-ton load of a Babcock & Wilcox reactor container, its 180-wheel carrier was routed down and around the bridge and up a specially built ramp.

You Can't Please All of the Owners All of the Time



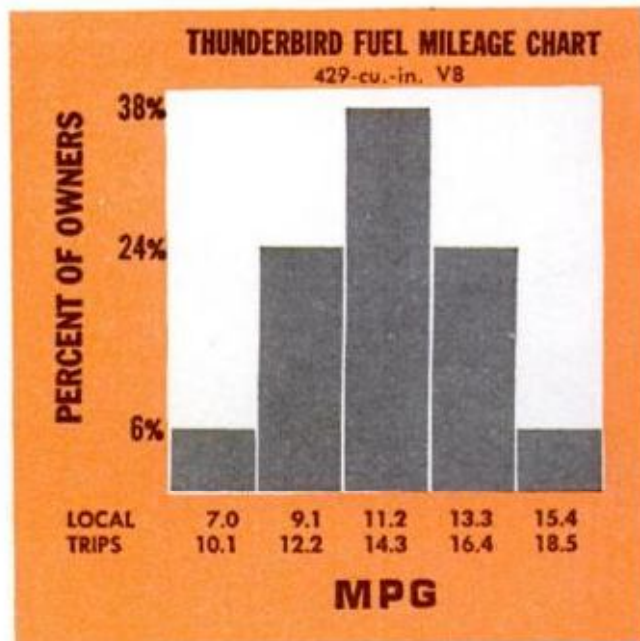
By MICHAEL LAMM, West Coast Auto Editor / Photos by the Author

Some owners who bought a T-Bird for looks soon find that its concessions to styling make it a bit hard to live with

THUNDERBIRD OWNERS consider styling important. When we asked, "Why did you buy a T-Bird?" 41.7 percent replied, "Styling."

Then when we asked, "What changes would you like to see?" 18 percent came back again with, "Styling."

Most serious complaint centers on the low rear-roof area. There's more sheet-metal back there than glass. Many owners complained of sparse and distorted rearward vision. A few voiced similar gripes about forward visibility. "Low front seat, high dash, long hood combine so I can't tell where the front stops. Usually in somebody else's rear bumper!" Another owner said, "I keep knocking the emblems off my hood."





STANDARD RADIAL-PLY TIRES help softly sprung 'Bird corner; there's still understeer and tire scrub

Another, "Too little grille protection."

This prow, sometimes snidely called the "Pontiac nose," leaves most owners cringing when they park. The extruded aluminum central grille costs "only" about \$40, but replacement usually also involves debranging, straightening and rechroming the bumper, plus painting. So a parking collision can end up costing in three figures.

Here are a few other common complaints that result from styling: "Not enough rear legroom." "Difficult to enter and exit without bumping head." "Spoked wheel-covers get bent in car wash or by a high curb." "Move front license to middle—it detracts." "Rear window distorts, reflects, too small." "From a safety standpoint, standard equipment should be a remote-control *right-hand* rear-view mirror because of blind spot from right roof pillar."

The high front seatbacks and too-large inside rear-view mirror also came in for grumbling. One owner called the "flight-deck" cockpit claustrophobic.

In fairness, though, most Thunderbirders admit they still like the car's lines and styling. In fact, more than like—they glory in it. They also have high praise for the car's silence and excellent riding qualities.

'Birders' replies indicate they are not real auto enthusiasts and don't know too much about the inner workings of their cars. When they say, "Handles beautifully," they refer to the fact that it's easy to steer and park, not that it corners well. And when they praise its brakes, as many do, most don't know

AUGUST 1970



WALL-TO-WALL TAILLIGHTS house sequential turn signals. Backup light is hidden behind center emblem



DEEP, UNCLUTTERED TRUNK brings praise. Tools fit into recess at right, and entire area is carpeted



PLENTY OF ELEGANCE, comfort and luxury in wrap-around seat; rear seems short on head, legroom

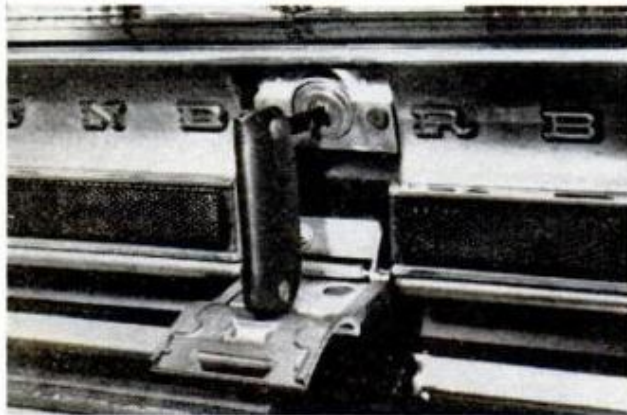
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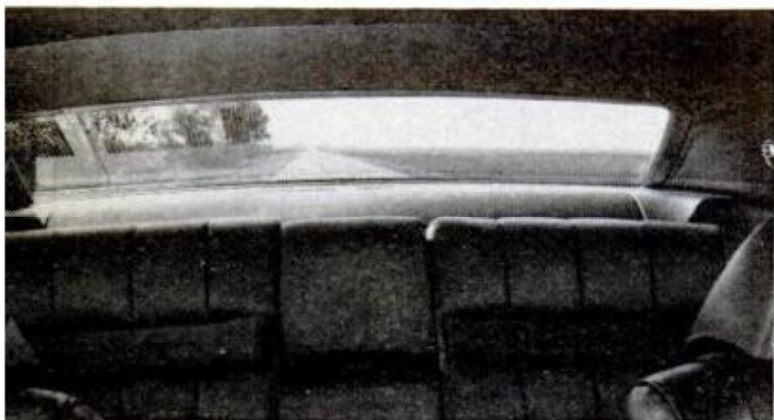
REPEAT BUYERS numbered 40.9 percent. Owners enjoy pampering, appreciate all that standard equipment



FAKE MAGS seem out of place, hide standard front discs. Nonskid braking system costs \$195 extra



HERE'S REASON for buying vacuum trunk release—it takes both hands to unlock the deck lid with key



that power front discs are standard. Nor did many know that all 1970 T-Birds come with radial-ply tires. A few do comment on these items, but they're in the minority:

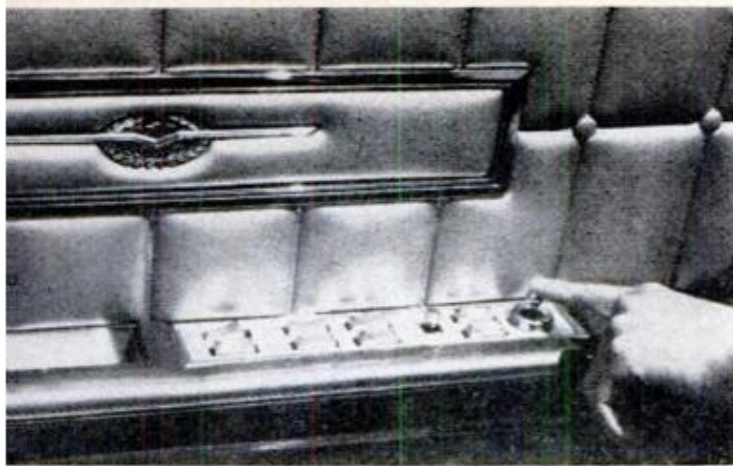
"Sure-Track [optional non-skid] braking system sure is magnificent," writes a California butcher, "and car handles like a dream, considering how heavy it is." "Takeoff is like a jackrabbit," says a Virginia businessman, "plus I think the radial tires contribute to the excellent handling." A Michigan motel operator: "I like the way my 'Bird hugs the road." A Texas housewife, "The 429 engine delivers all the power I can use, and the disc brakes are very good." These people have been doing their homework.

While gas mileage doesn't rate especially high, neither is it surprisingly poor. Few complaints in this department, likely because no one expects too much.

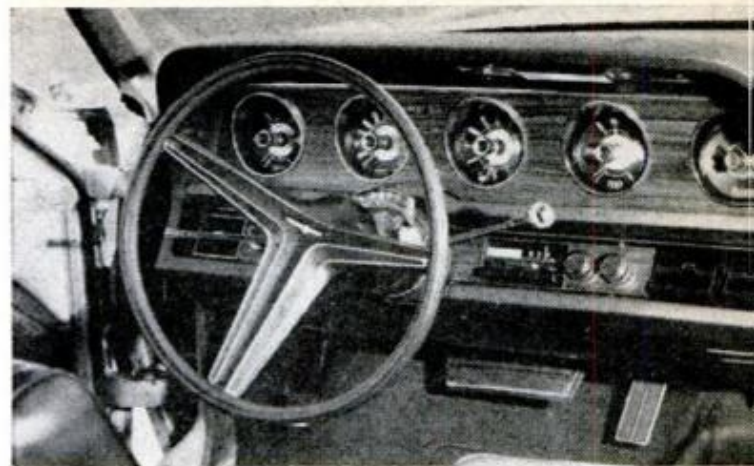
However, several owners feel the Thunderbird is overpriced. "For a car of this price, quality is poor." "It seems to me that a car listing for \$7185.64 should have a little tighter construction." "My only complaint is the high price—\$6320." But another owner at least partly parries with, "Everything's standard on the T-Bird."

Nearly half of all respondents (40.9 percent) had owned Thunderbirds before. Several trade every year, staunchly maintaining this is the least expensive way to buy. Other views: "This is

TOO-SMALL REAR WINDOW blocks view, distorts, reflects. Most 'Birders moan about poor rear vision



CONTROLS for power windows, seats, locks, remote rear-view mirror fill the door with a maze of wiring



SIMPLE, ATTRACTIVE GAUGES are easy to check. An optional warning-light group fits above windshield

my fourth. I buy every three years on model changes." "Have owned one every other year for 10 years. This 1970 is the best." "My sixth in 12 years." "Fifth one." And so on.

Under *specific dislikes*, 14.4 percent fingered workmanship. This makes an interesting comparison with the 1970 Mustang (*Owners Report*, page 128, May PM) in which only 7.4 percent of the owners considered workmanship below par. An Ohio bus driver said of his T-Bird, "I could have gotten the

same quality and workmanship in a smaller Ford for less money—I mistakenly bought something I thought had a little more perfection."

But generally, not too many owners complained of mechanical problems. The ills cited tended to be minor, mostly electrical, and quite a few had to do with accessories—power windows, power seats and the like. "Speed control has never worked properly." "Air compressor pulley loose, bolt out, belt came

(Please turn to page 192)

Summary of 1970 Thunderbird Owners Reports*

Total miles driven	1,352,080
Average miles per gallon:	
Local driving	11.2
Long trips	14.3
Body styles:	
2-door hardtop	20.2%
2-door landau	77.2
4-door landau	2.7
Why the Thunderbird?	
Styling	41.7%
Past experience	40.9
Comfort	6.6
Ride	5.4
Size	5.0
Specific likes:	
Style	51.8%
Comfort	42.8
Handling	39.2
Ride	33.3
Performance	17.2
Power	12.2
Roadability	9.0
Specific dislikes:	
Workmanship	14.4%
Poor visibility	10.0
Styling	9.6
Gas mileage	6.4
Seat style	5.2
Rattles	5.2
Windshield wipers	5.2
Dealer service	3.6
What changes would you like?	

Styling	18.0%
Seat shape	7.3
Rear visibility	6.8
Less body tuck	6.4
Rear legroom	5.1
Ashtray location	4.3
Better workmanship	4.3
More headroom	4.3
Had any mechanical trouble?	
No	59.6%
Yes	41.4
What kind of trouble?	
Electrical (general)	33.6%
Windshield wipers	7.5
Alternator	7.5
Airconditioning	7.5
Ignition	7.5
Heater	6.5
Did you repair it yourself?	
No	99.1%
Yes	0.9
Dealer repairs satisfactory?	
Yes	65.7%
No	34.3
Is the Thunderbird your only car?	
No	59.9%
Yes	40.1
Other cars owned:	
Big Ford	25.6%
Mustang	19.4
Chevrolet products	13.8
Another T-Bird	12.5

Pontiac products	6.2
Volkswagen	6.2
Cougar	5.6
Accessories/power options:	
(Note: automatic transmission, power steering, and power disc brakes standard)	
Power windows	61.1%
Airconditioning	55.8
Stereo tape deck	50.7
Power seats	44.4
Radio	31.2
Tinted glass	23.7
Tilt steering wheel	20.9
Rear defroster	14.0
Reclining seats	10.2
Power door locks	9.6
Bucket seats	7.9
Remote trunk release	6.7
What accessories/options would you order next time?	
The same	81.0%
Rear defroster	5.1
Cruise control	4.0
Reclining seats	4.0
Tilt steering wheel	2.8
Age distribution of owners:	
15-29 years	23.1%
30-49 years	56.1
50-plus	20.8
Would you buy another Thunderbird?	
Yes	85.6%
No	14.4

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



Mini street sweeper

No toy, the Ford-powered unit shown at Frankfurt Auto Show by Faun-Werke Nurnberg has two brushes and articulated trailer. Length is 3.74 meters; width, 1.5 meters.



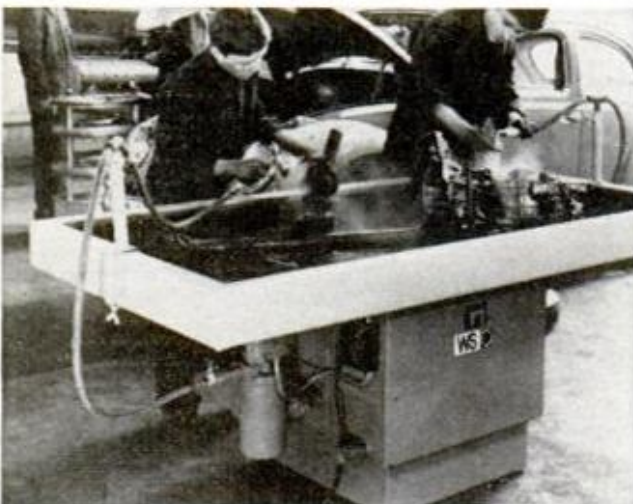
Youngest 'top wrench'

Richie Petty assures dad Maurice Petty that pit tools are okay for Daytona 500 to be run later in the day. Richie and Pete Hamilton got team off to winning start.



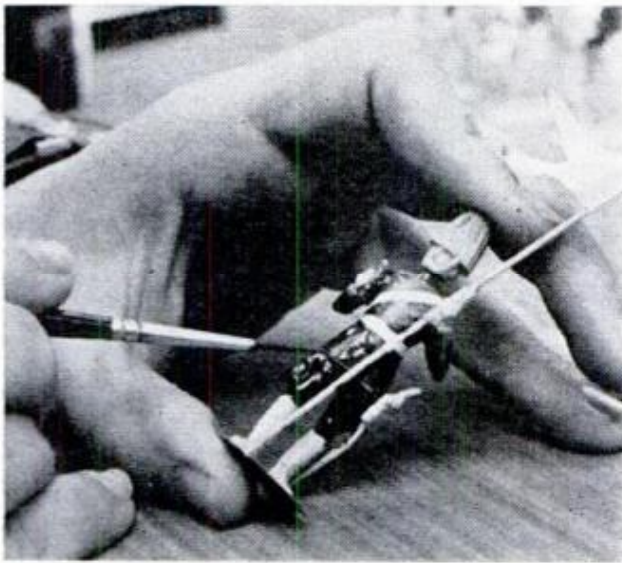
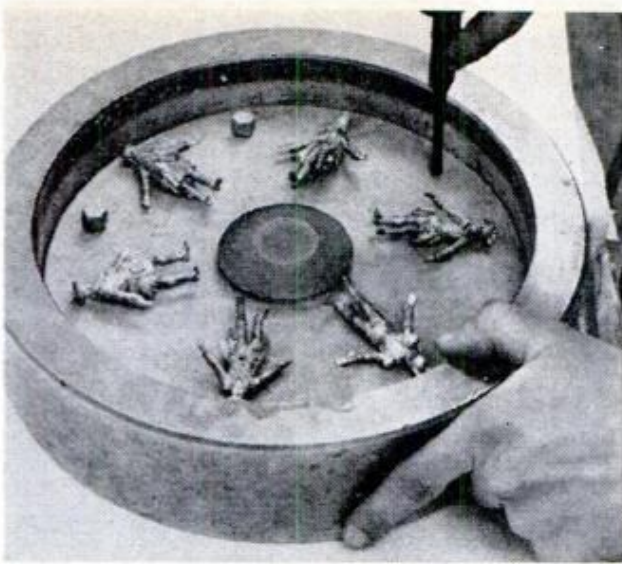
Lighters enable ships to make door-to-door deliveries

Lash (lighter aboard ship) vessels can make door-to-door delivery of cargo. The 43,000-ton Acadia Forest (shown) recently lifted 73 lighters aboard in New Orleans and carried them to Rotterdam, where they were moved via waterways and canals to their destinations.



Auto-parts dishwashers

Well of Peromat parts-cleaning unit (left) holds 80 liters of cleaning solution. Pump feeds hot solution through hand sprayers. Robomat (right) cleans large assemblies in 5 to 10 minutes. Both were shown at Frankfurt Auto Show by Winfried Schaferbarthold, Germany.



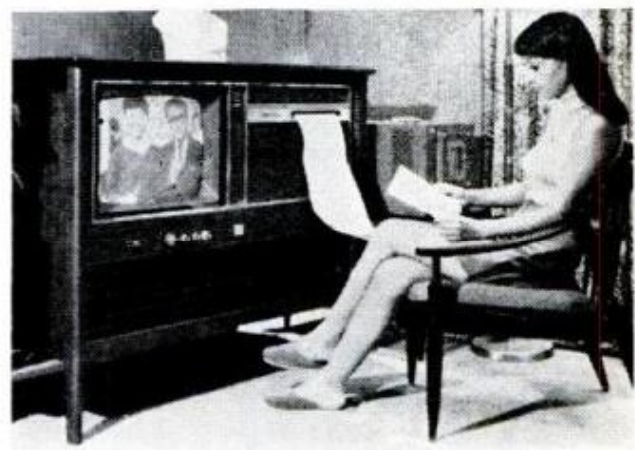
Serious about toy soldiers

Playing with soldiers is a serious pastime among the 500 or more war games addicts in Britain who demand complete authenticity of uniforms, terrain and tactics when they wage famous battles. To get a large army, war gamers often buy good originals and cast their own troops (upper left), then paint them (lower left). At upper right, Charles Grant measures a movement of musketeers, and the two photos at right show realistic settings for Vietnam and Waterloo battles.



Printed news from TV

Reading news items from a "wireless newspaper," this girl demonstrates a new television set developed by Matsushita Electric Co. of Japan that delivers printed news in the owner's home. The set is expected to be available in Japan this year.



New in Electronics

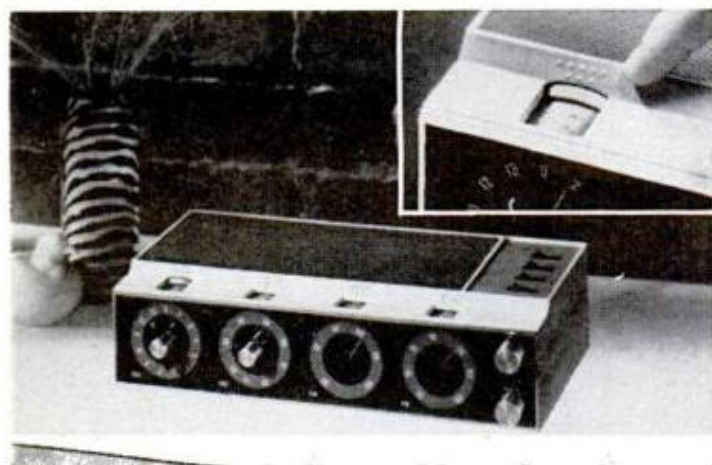


WISH YOU COULD PLAY both cassette and cartridge tapes on the same machine? You can do just that with this Aiwa two-way stereo car player. The slot accepts either the small

cassette (left, above) or larger 8-track stereo cartridge (right). The 12-volt player also provides automatic reversing on both. \$159.95, Selectron, 4215 W. 45th St., Chicago, Ill.



DOUBLE-DUTY SPEAKERS at left serve as useful pieces of furniture as well as providing stereo sound for a hi-fi system. Upholstered on top, the enclosures can be used either as extra seats or hassocks, saving wall space. Each unit is about 18 inches square and contains a 12-inch bass woofer and a high-frequency tweeter. The hardwood cabinets have a walnut-grain finish and rollers on the bottom to make them easy to move around the room as needed. The price is \$199.90 per pair. Magnavox Co., 270 Park Ave., New York, N.Y.



UNUSUAL TABLE RADIO not only offers AM and FM reception, but also gives you the audio portion of TV broadcasts. The idea is that you can listen to TV programs even when you can't watch, such as when you're working on a project or your wife is busy in the kitchen. The RCA Audio Center covers VHF and UHF channels and sells for about \$80. The controls are marked in braille (inset photo above) so that blind persons can easily operate them.



YOU CAN ERASE tape cassettes in one quick motion with this bulk eraser. You just slip a plastic handle into the tape's spindle holes and slide the cassette across the top. As the tape passes over a battery-powered electromagnet, it's wiped clean of all previously recorded signals. \$15.95, Magnasonics Corp., 19017 Parthenia St., Northridge, Calif.

YOU SEE IT AT EVERY DOCK during every boating season. Toward summer's end when a guy thinks he's got it made, the powerplant fails. Chances are it hasn't had any care since the owner fitted out the rig in the spring.

Gasoline marine engines and outdrives won't perform well for a full boating season without a mid-season service. It's the best and easiest way you have of preventing inconvenience and mechanical damage. Here's how to go about it:

Start the engine, putting the fuel and cooling systems under pressure, and examine fuel lines and cooling system hoses for leaks. Make sure everything's tight.

Squeeze cooling-system hoses. If they feel mushy, they are deteriorating inside and may not last the rest of the summer. Replace them now.

Bring the engine to normal operating temperature to allow a maximum of residue to suspend itself in the motor oil. If you can get to the drain plug in the bottom

of the crankcase, remove it to drain the oil. If not, place an oil sump pump in through the dipstick tube and pump out old oil.

Clean or replace the oil filter. Most engines use a cartridge filter that has to be replaced, but some have an element that can be cleaned in kerosene.

By the way, if oil pressure ever drops when the engine's being run at high speed, the oil filter may be plugged. If you don't carry a spare, head for the dock at low engine speed.

Add fresh motor oil designated for API Service MS. It contains additives to protect the engine against rust and scuffing, and to minimize harmful deposit accumulations that can cause sticky piston rings and plugging of screens, oil passages and other engine parts.

Remove flame arrestors if your carburetor is so equipped and wash in mineral spirits. Allow them to dry thoroughly before reinstalling. Use new gaskets.

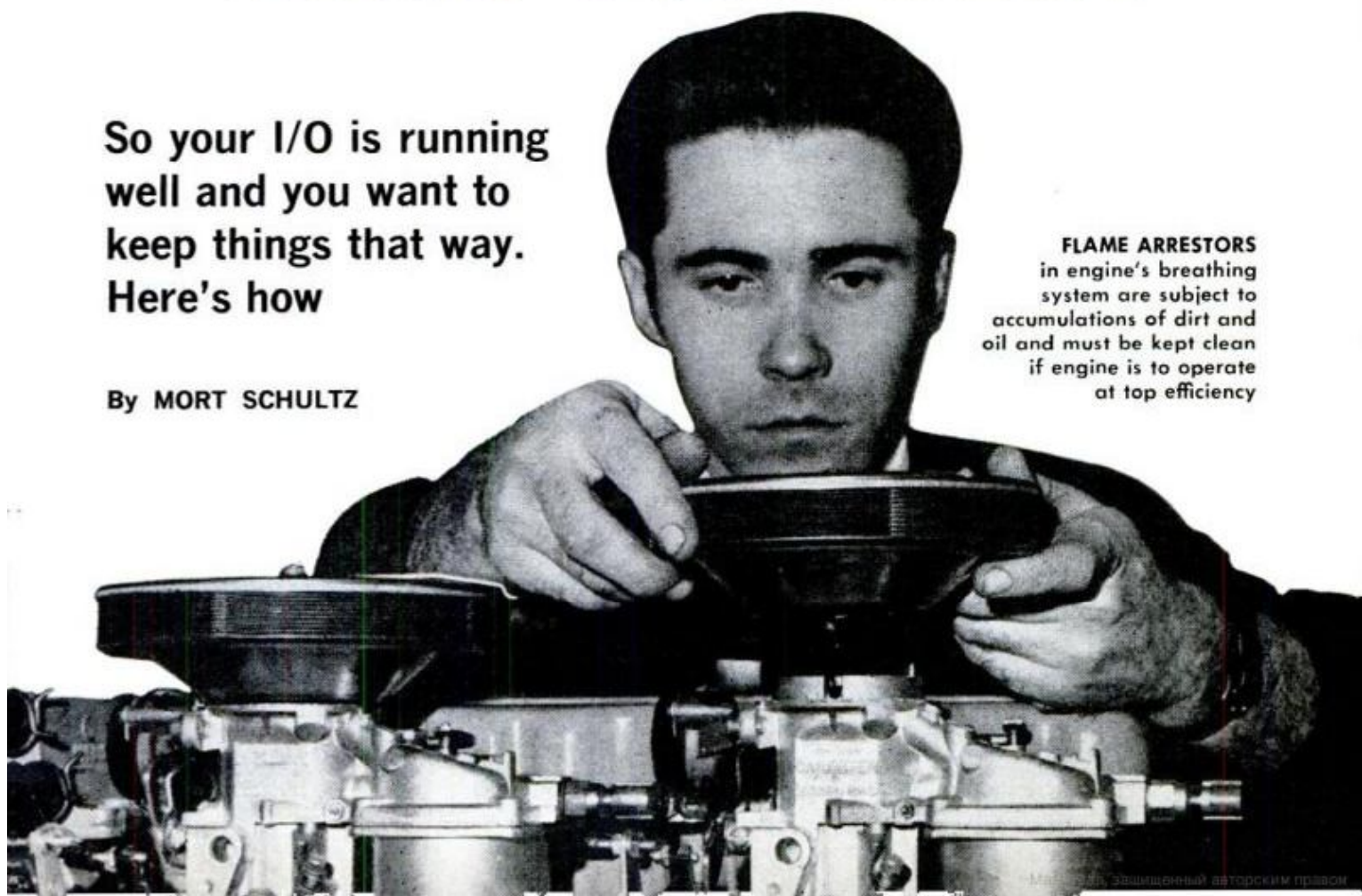
Flame arrestors must not be tightened

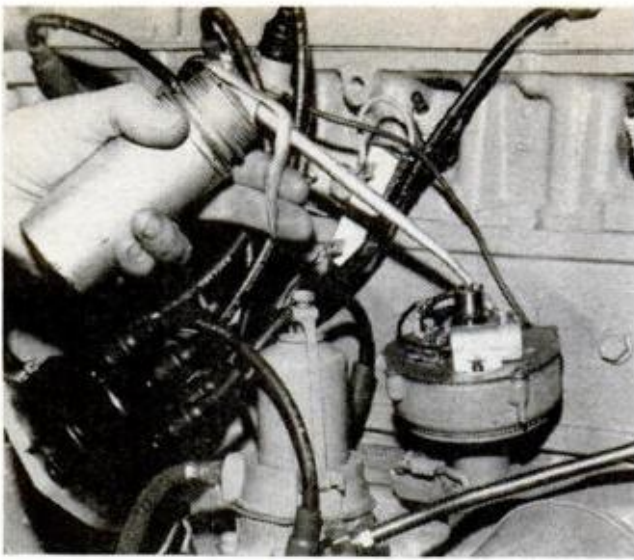
Give Your Stern Drive A Mid-Season Lift

So your I/O is running well and you want to keep things that way. Here's how

By MORT SCHULTZ

FLAME ARRESTORS in engine's breathing system are subject to accumulations of dirt and oil and must be kept clean if engine is to operate at top efficiency





A LITTLE OIL on felt wick prevents distributor cam wear which might lead to an expensive replacement

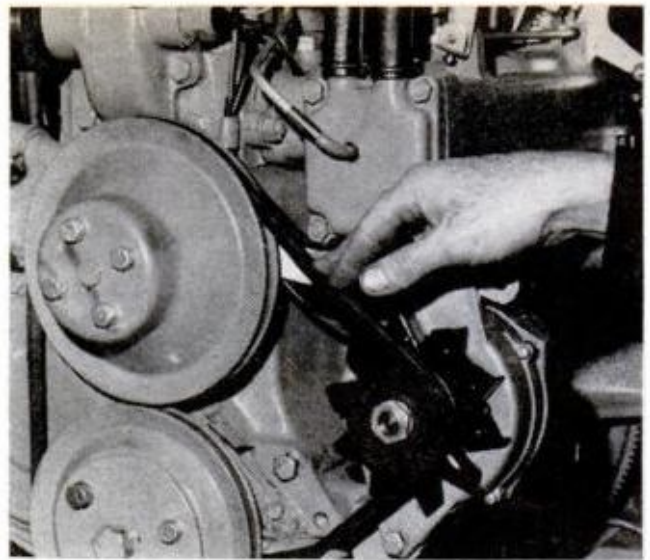
too much. Overtightening causes the element in the arrestor to compress and act like a choke to the carburetor.

Close fuel-line valve to keep gas from pouring out, and clean or replace the fuel filter. Some setups have a sediment bowl-type filter at the fuel pump. To clean it, remove the bowl, take out the filter and wash all elements in gasoline or kerosene.

If you have the type of sediment filter bowl that drops down, prevent gas from spilling into the bilge by loosening the screw holding the bowl and slipping a plastic bag over the bowl. Then remove bag and bowl as a unit.

The other type of fuel filter used on marine engines is installed between fuel pump and carburetor. Its paper element can't be cleaned but must be replaced.

After servicing the fuel filter, run the engine for several minutes and check



DRIVE BELTS should have about a quarter-inch of free play. If more than this, belts should be tightened

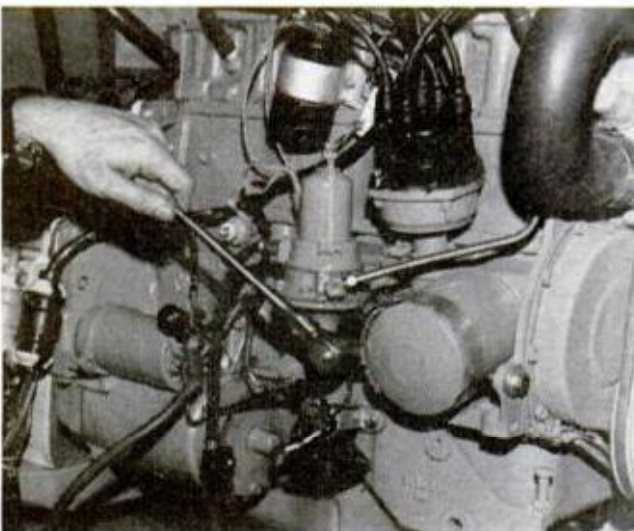
around the filter connections for leaks.

Some marine engines are equipped with positive crankcase ventilation systems like the one on your car's engine. This must be cleaned to prevent engine blowby, loss of oil and shoddy engine performance.

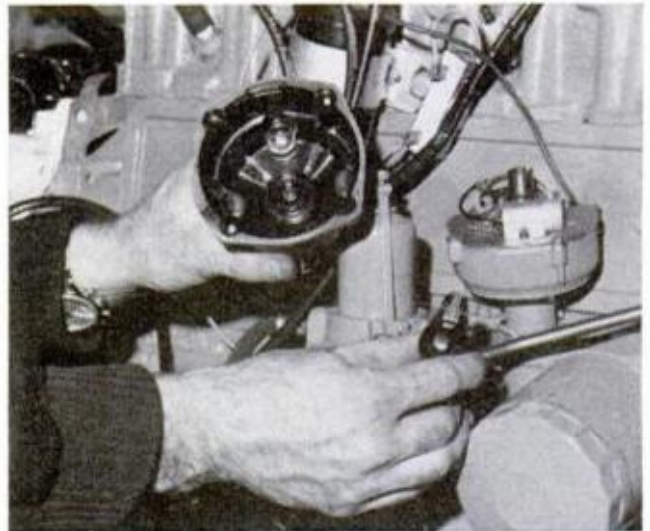
Pull the PCV valve from the engine valve cover. Start the engine and place a finger over the valve. You should feel strong vacuum. If not, remove the PCV valve from the hose and shake it. It should click. If not, replace the valve.

If the valve does click but there's little vacuum, then there's a blockage in the hose or the carburetor passage. Clean the carburetor or nipple to which the hose connects by hand twirling a drill bit of suitable size (about 1/4-in.). If the vacuum is too low, replace the hose.

Most water pumps have sealed ball bearings requiring no lubrication. Similarly,



USE A STRAP WRENCH to remove the old oil filter! The new one should be tightened only by hand



IF ROTOR OR DISTRIBUTOR CAP CONTACTS show traces of arcing or if parts are cracked, replace them

POPULAR MECHANICS

many of today's engines have a.c. generators (alternators) and starter motors with sealed bearings. Where d.c. generators and starter motors have provision for oiling, put three or four drops of SAE 30 engine oil into the oiler.

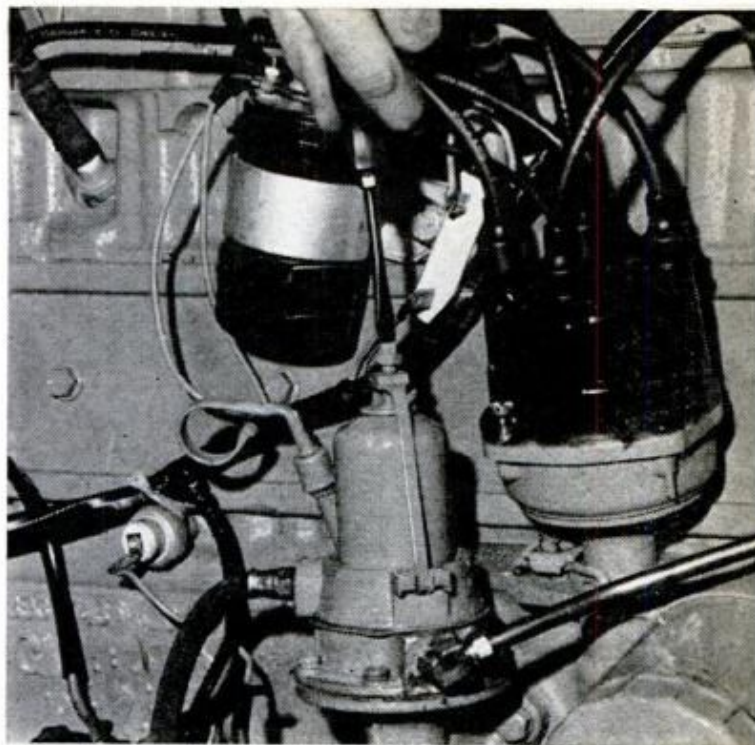
Remove the distributor cap and rotor and place about three drops of SAE 10W engine oil on the felt wick on top of the breaker cam. Be careful not to get oil on breaker points. If badly burned or pitted, replace points.

Check shapes of the rotor and distributor cap before putting them back on the distributor. Apply about five drops of SAE 10W oil to the oil cup on the distributor housing if one is there.

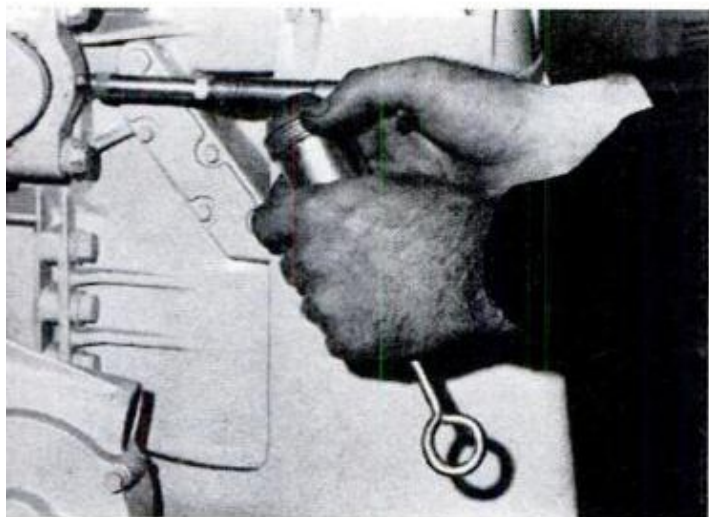
Examine secondary wiring and spark-plug boots. If they're cracked or the insulation is mushy, replace them.

Pull the sparkplugs. Good plugs are light tan or gray in color, and the elec-

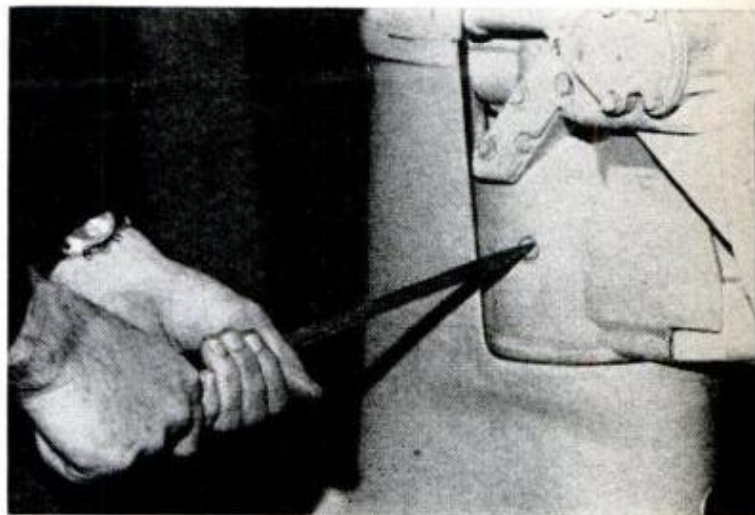
(Please turn to page 191)



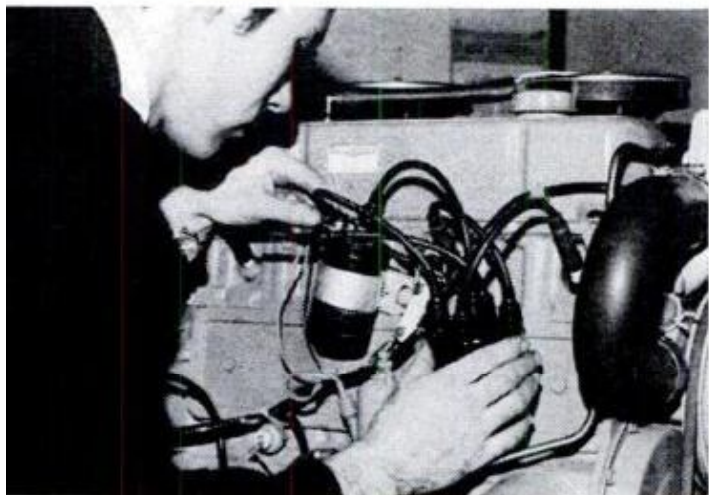
FUEL FILTER for this stern-drive engine is at the fuel pump inside the cover that is being removed



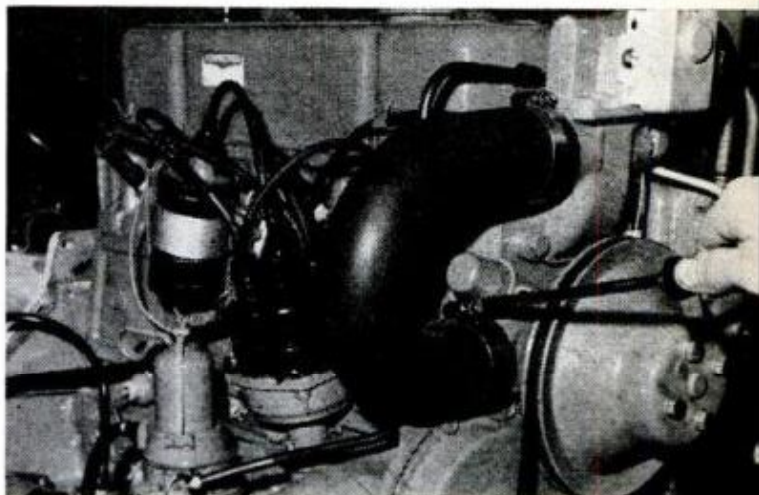
TRUNNIONS on both sides of this unit require lubrication at midseason. Type "A" lubricant is used



UPPER CASE DRAIN PLUG is being removed so oil can be drained from the lower unit and upper case



WIRES CARRY CURRENT. They can't do a decent job if they're corroded or damaged. If so, replace them
AUGUST 1970

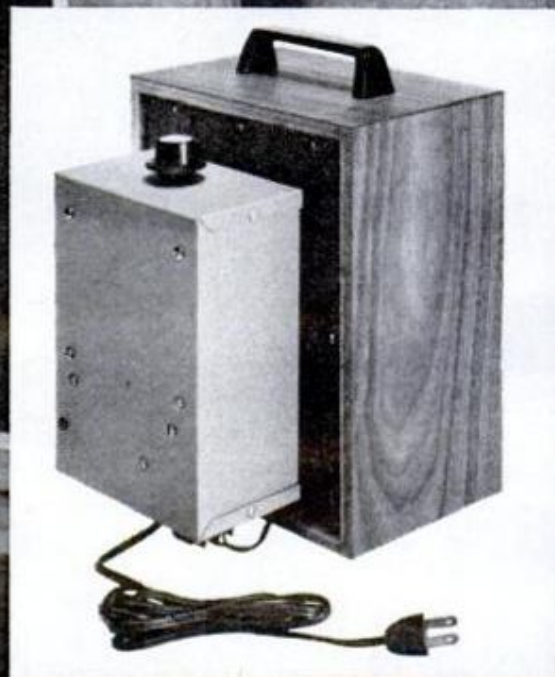


HOSE CONNECTIONS can work loose over period of just a few weeks. Double check by tightening clamps

Portable Speaker You Can Plug In Anywhere

With this special transmitter and receiver, you can broadcast hi-fi throughout your house over existing wiring in the walls. Here's how the system works and how to build it

RECEIVER RIDES PIGGYBACK on the rear of a small, portable speaker. All you do is plug speaker into any handy wall outlet to hear music from your hi-fi set



By **GEORGE J. WHALEN** and **RUDOLF F. GRAF**/Photos by Robert D. Borst

WHEN YOUR HOUSE was wired for a.c. power, you got an added bonus free of charge. Those same wires snaking through your walls can also be used to carry music from your hi-fi set to any room where you want an extension speaker. The system is called multiplexing—making one pair of wires to do two jobs at once. With this arrangement, you don't have to string separate wires to permanently installed remote speakers. You can carry a single, lightweight speaker from one location to another as you need it—in a bedroom, playroom, out on the back terrace—anywhere you have an electrical outlet to plug into.

The system consists of two easily wired electronic units—one to transmit the audio signal from your hi-fi set to the a.c. line and one to receive the signal at the remote speaker. The transmitter connects to the speaker terminals on your amplifier and plugs into a nearby wall outlet. The receiver plugs into a distant outlet and two wires go to the speaker. These are the only connections you make.

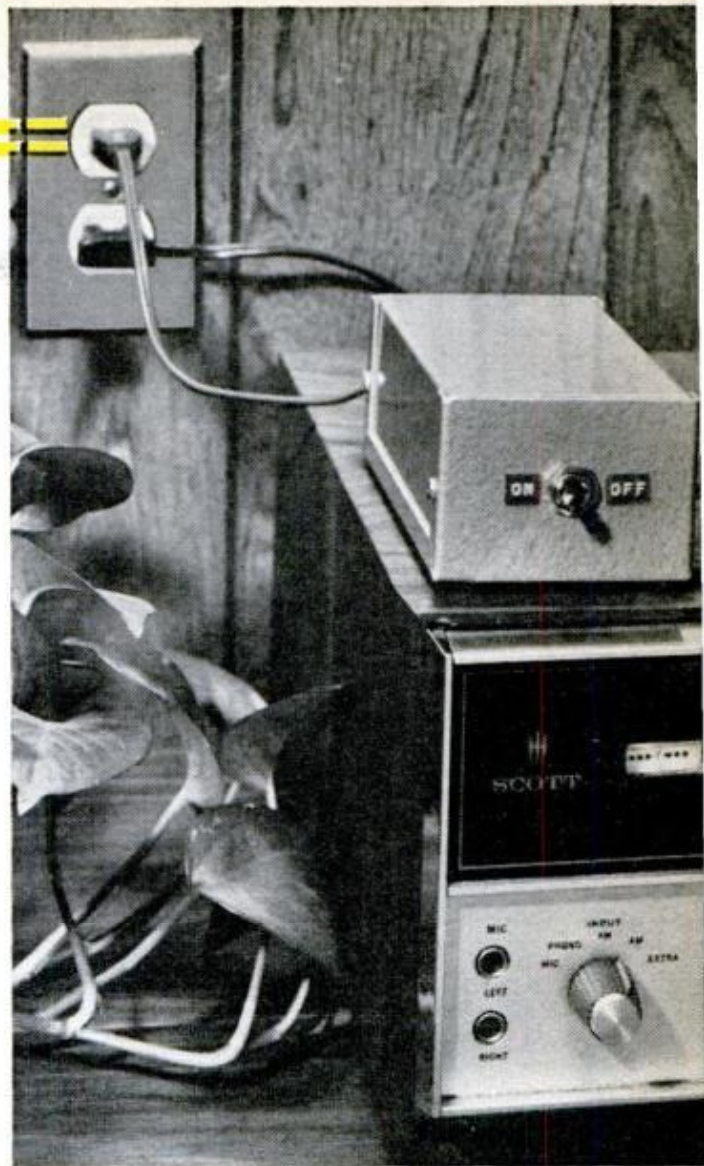
You can build as many receiver units as you like. They will all pick up signals from the same transmitter so you can have speakers playing in various parts of the house simultaneously if you wish. Each receiver has its own volume control so you can adjust it independently of other units.

Both the transmitter and receiver incorporate identical 455-KHz IF transformers. These are detuned through capacitors to a frequency of about 400 KHz. This is the carrier frequency that rides the a.c. line to transmit audio signals over the wires. Because it's outside the range of commercial AM broadcasts (550 to 1600 KHz), there is no interference with radio signals. The transmitter and receiver are connected to the a.c. through coupling capacitors that isolate their circuits from the line voltage while allowing the audio signals to pass through.

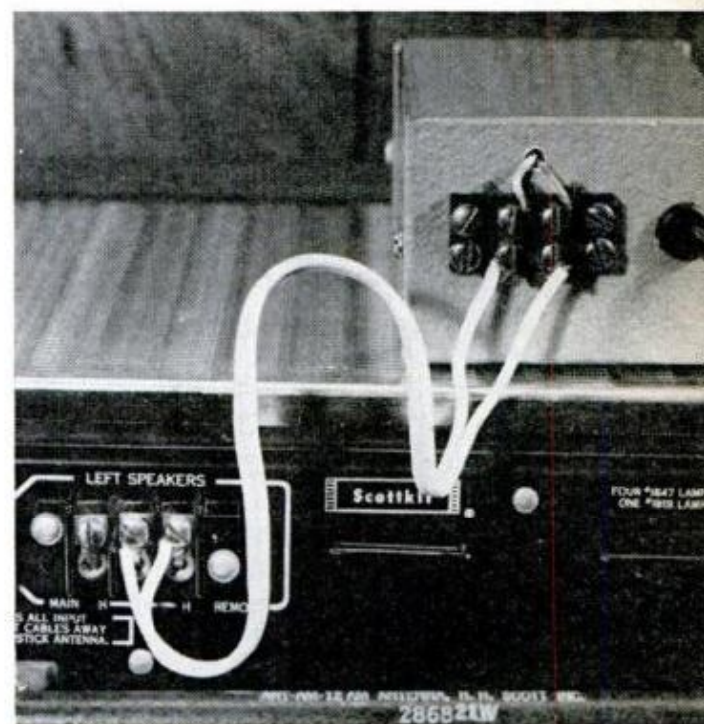
To simplify construction, the receiver uses a prewired 3-watt audio amplifier module available from Lafayette Radio, 111 Jericho Turnpike, Syosset, N. Y. 11791. This is a printed-circuit board requiring only seven connections—two on the input side, using shielded cable, two on the output side to the speaker terminal block, two to ground and one to the power supply. Follow the instructions packed with the amplifier for making these connections. The accompanying wiring diagram shows the circuit board as it actually appears and will also help to guide you in locating the proper hookup points.

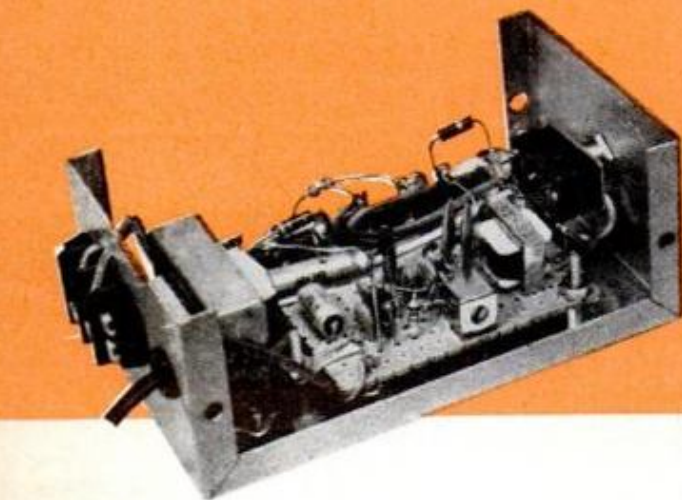
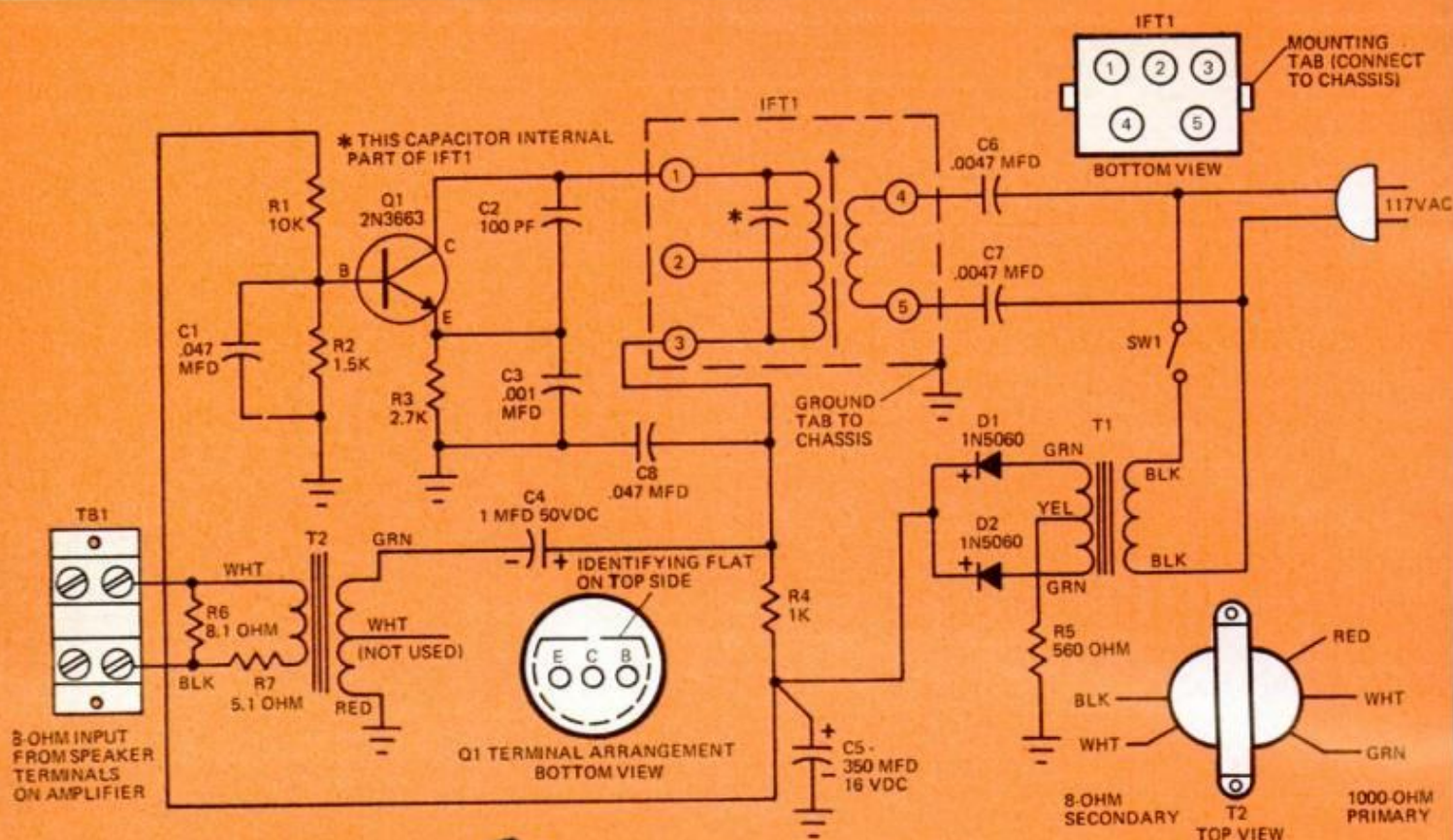
The two IF transformers and the miniature audio output transformer used in the transmitter are also available from Lafayette Radio. Other parts can be obtained from Allied Radio, 100 N. Western Ave., Chicago, Ill. 60680. The diodes specified can be either General Electric or Motorola. If you have any difficulty purchasing them locally, you can obtain the Motorola HEP types from

AUGUST 1970



TRANSMITTER UNIT plugs into wall outlet near hi-fi set, requires only two connections to the set's speaker terminals, as shown below. System is monaural; a stereo version is possible, but would need two separate transmitter frequencies





Allied Radio, as indicated in the parts lists.

The receiver unit, the larger of the two, is housed in a 7x5x3-inch gray metal case. The smaller transmitter requires only a 5¼x3x2-inch box. In both cases, the power supply components are installed directly on the inside of the metal boxes. Small parts are wired on pieces of phenolic perforated board with flea clips for making connections. Mount these boards on standoff spacers so they won't touch the sides of the boxes. The IF transformers are secured to the perforated board with contact cement. Use spacers when mounting the amplifier module in the receiver and be careful that the foil surface does not touch other parts.

TRANSMITTER PARTS LIST

- | | |
|---|--|
| C1—.047-mfd. disc capacitor | R5—560-ohm, ½-w. resistor
±10% |
| C2—100-picofarad disc capacitor | R6—8.1-ohm, ½-w. resistor
±10% |
| C3—.001-mfd. disc capacitor | R7—5.1-ohm, ½-w. resistor
±10% |
| C4—1-mfd., 50-w.v.d.c. electrolytic capacitor | SW1—S.p.s.t. toggle switch |
| C5—350-mfd., 16-w.v.d.c. electrolytic capacitor | T1—Miniature control transformer with 117-v. primary, 24-v.d.c. secondary at 200 ma., Stancor Type P-8395 (Allied 54A3442) |
| C6, C7—.0047-mfd., 1000-w.v.d.c. disc capacitors | T2—Miniature audio output transformer with 1000-ohm primary, 8-ohm secondary (Lafayette 33T8550 or equiv.) |
| C8—.047-mfd. disc capacitor | IFT1—455KHz IF transformer (Lafayette Type 99T6301) |
| D1, D2—GE silicon diodes, Type 1N5060, or Motorola HEP 156 (Allied 22A3859) | TB1—2-terminal barrier strip Case—5¼x3x2½" gray metal box (Premier PMC-1006) |
| Q1—GE transistor, Type 2N3663, or Motorola HEP 50 (Allied 22A3875) | Misc.—Phenolic perforated board for chassis, flea clips, 4 spacers, terminal strip, 6-32 hardware, hookup wire |
| R1—10K, ½-w. resistor
±10% | |
| R2—1.5K, ½-w. resistor
±10% | |
| R3—2.7K, ½-w. resistor
±10% | |
| R4—1K, ½-w. resistor
±10% | |

The only controls involved are a simple on-off switch for the transmitter and a combination on-off switch and volume control for the receiver. After the parts are assembled, it may be necessary to adjust the IF transformers for good alignment. Plug in both units and turn them on. Set your radio or hi-fi set to a comfortable volume level, then switch off or disconnect your main speakers to be sure you're listening only to sound from the remote speaker. If you can't hear the transmitter's signal, tune IF'2, the IF transformer in the receiver, by turning the core in or out until you do hear the signal.

If this still doesn't bring in the sound, the

FOR MORE RECORDING FUN, ADD

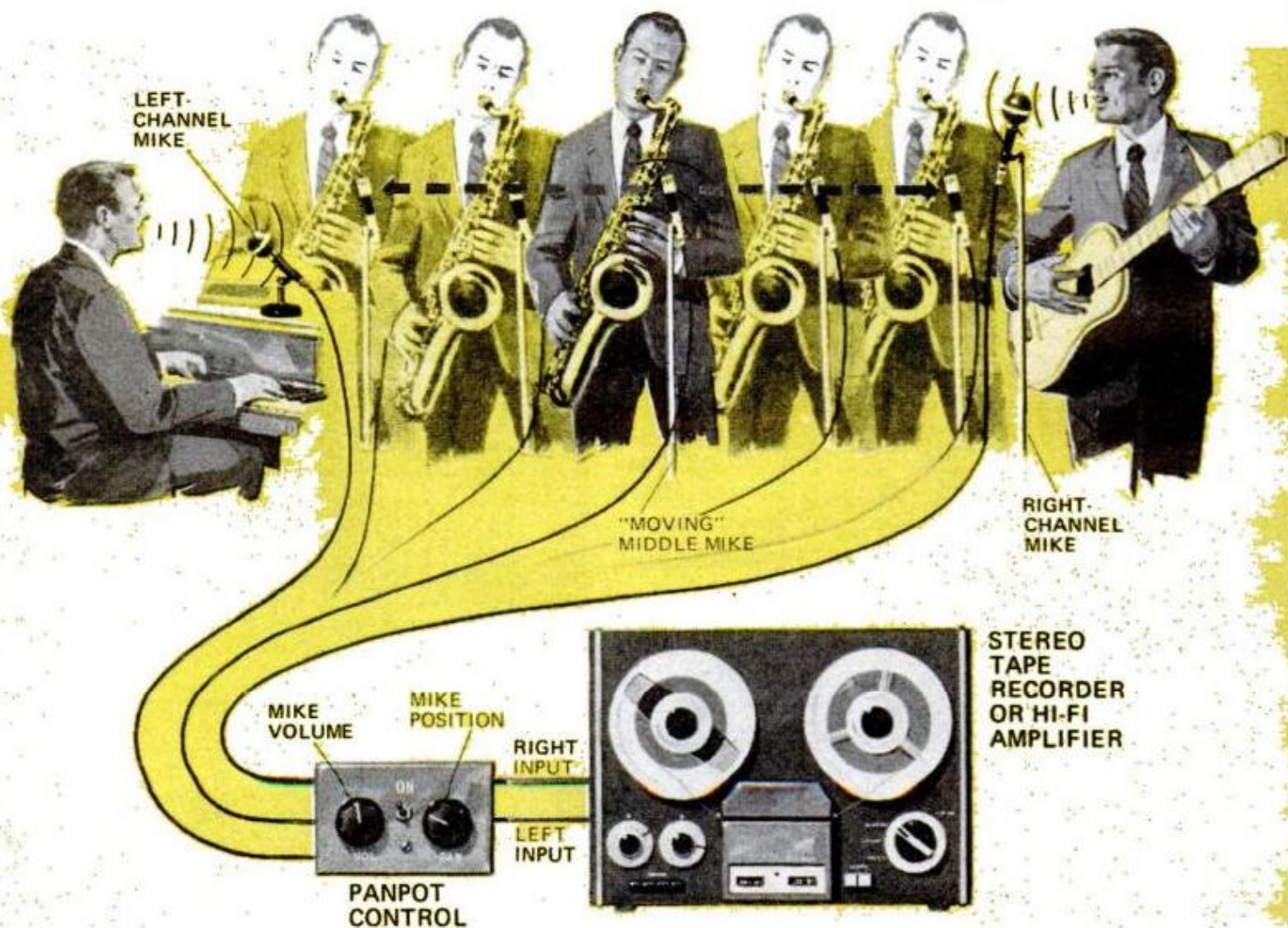
This easy-to-build control lets you hook a third microphone



THREE MIKES can be hooked into two stereo channels with this versatile panpot control. Drawing below shows how sound from middle mike can be shifted electronically so it appears to come from dead center or anywhere in between the right and left channels

HOME RECORDING SESSIONS often call for a third microphone to feature, say, a solo performer against a musical background. If you splice in a third mike with a Y-connector, you destroy your stereo effect by grounding the two right and left channels together. You could use a mixer, but this is both expensive and limited in function. It merely adds the third mike to either the right or left channel separately. It can't make your soloist appear to be coming over both channels simultaneously.

Professional recording engineers get around the problem with an ingenious little control called a "panpot." This has the effect of creating a third microphone channel without shorting the other two together. It also does some special tricks. By varying the control, you can make your soloist seem to be coming over either the right or left channel or anywhere in between. You can even make a performer appear to walk across the room by adjusting the control *while* you're recording.



STEREO
TAPE
RECORDER
OR HI-FI
AMPLIFIER

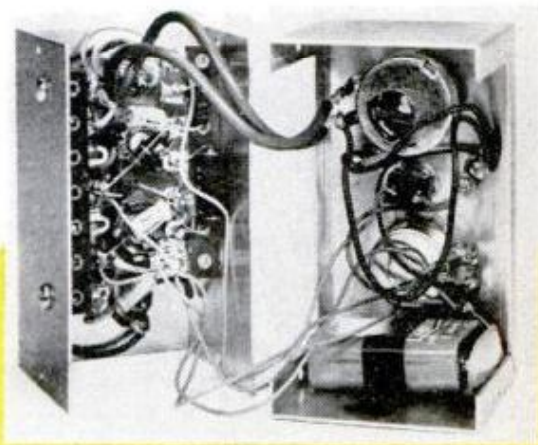
A MIDDLE MIKE

By WALTER G. SALM

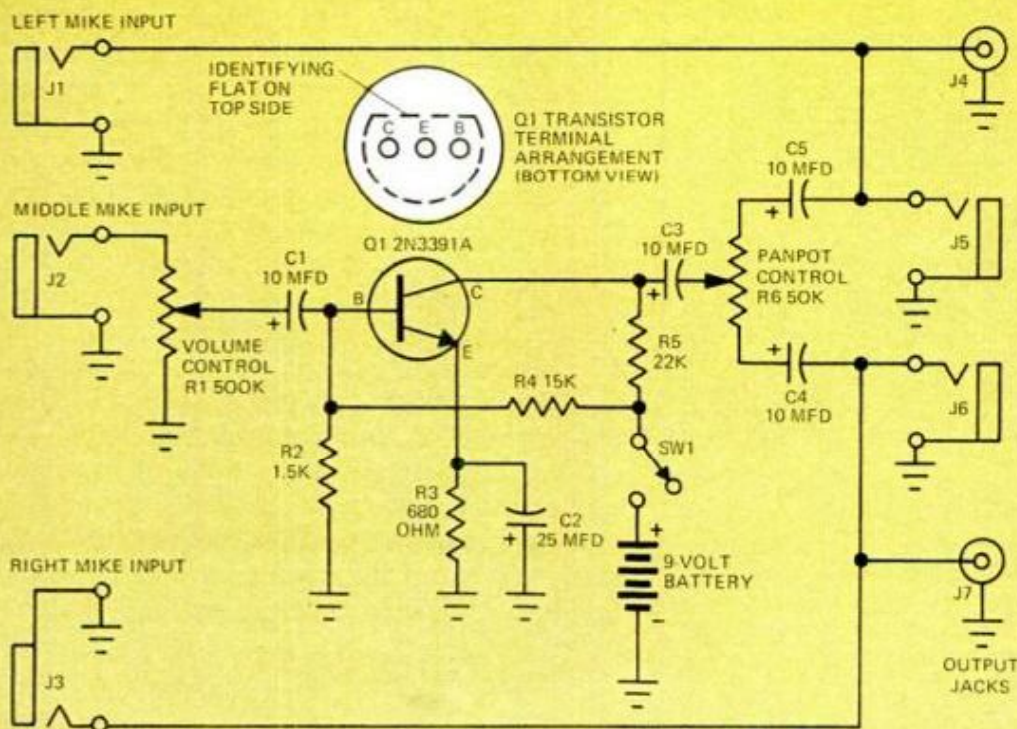
into a stereo recorder. It does some surprising tricks, too

Commercial panpots are costly and not readily available for home recording. You can, however, make your own for about \$12 worth of parts. The one shown here operates on a 9-volt transistor-radio battery and has two controls—a 50,000-ohm potentiometer for electronically shifting the middle mike to the right or left and a 500,000-ohm potentiometer for adjusting mike volume. A single transistor provides amplification for boosting volume on the middle mike. Coupling capacitors isolate the right and left channels so they don't short together.

There are three input jacks on the back, with the middle one for the third mike. Two pairs of output jacks give you a choice of either phono or phone-type connections for running patch cords to the regular right and left mike inputs on your recorder or amplifier. All parts listed are from Allied Radio, 100 N. Western Ave., Chicago, Ill. 60680. Small components are wired between two lug-type terminal strips mounted inside a minibox. **★★★**



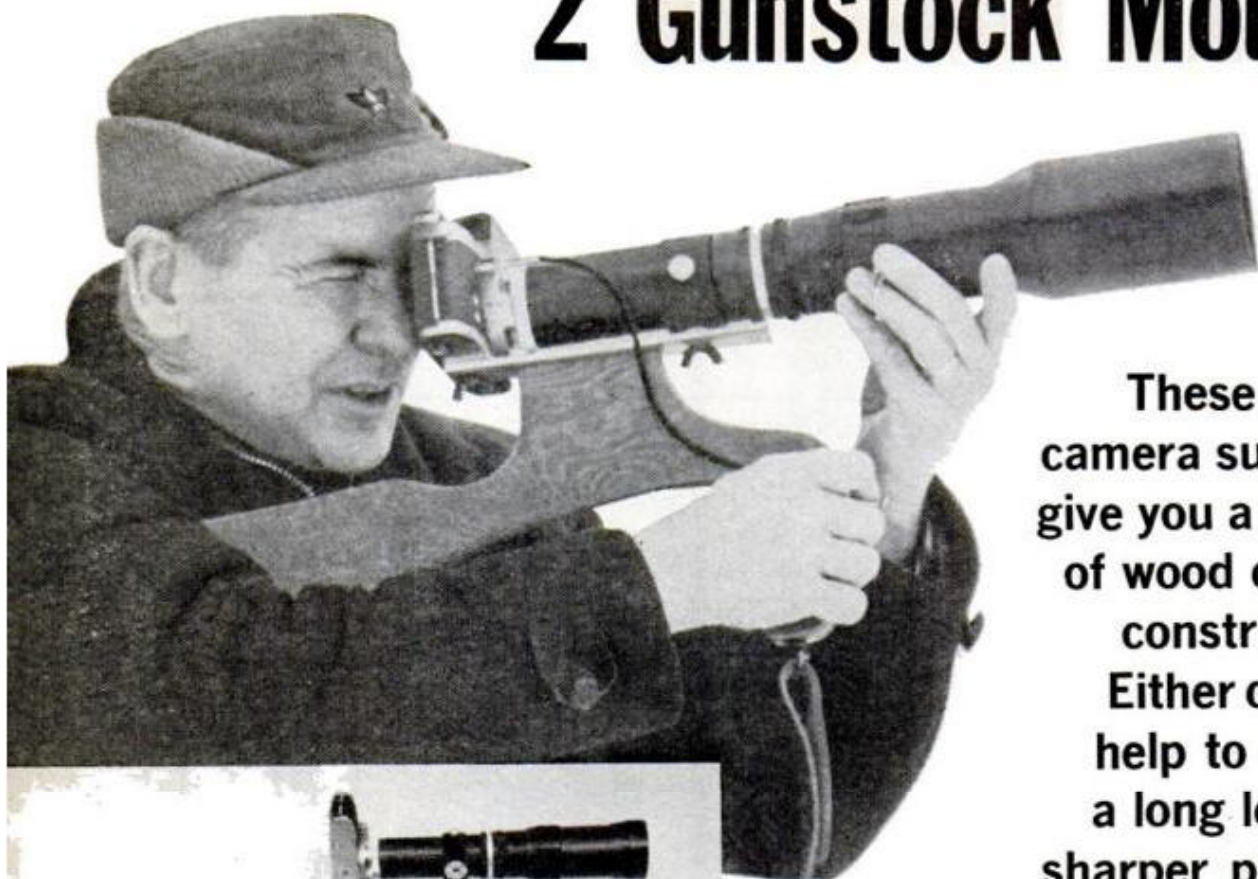
JACK ARRANGEMENT on rear of panpot control is shown in photo at upper right. Three bottom jacks are inputs for microphones with center one for middle mike. Four top jacks are outputs and give choice of either phone or phono connections. Easiest way to mount parts is to wire them between two lug-type terminal strips attached to opposite sides of metal box, as in lower photo at right



PARTS LIST

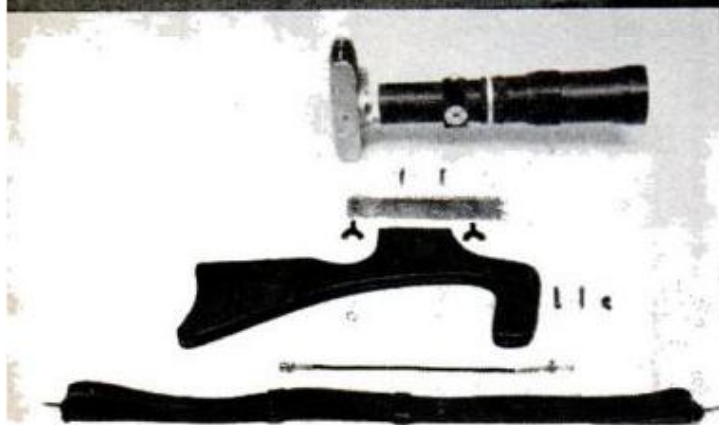
- R1—500K potentiometer, audio taper (46A3773)
 - R2—1.5K 1/2-watt resistor (45A5000C-1500)
 - R3—680-ohm 1/2-watt resistor (45A5000C-680)
 - R4—15K, 1/2-watt resistor (45A5000C-15K)
 - R5—22K, 1/2-watt resistor (45A5000C-22K)
 - R6—50K potentiometer, linear taper (46A3763)
 - C1, C3, C4, C5—10-mfd, 15v electrolytic capacitors (43A6625)
 - C2—25-mfd, 15v electrolytic capacitor (43A6628)
 - J1, J2, J3, J5, J6—phone jacks (47A4955)
 - J4, J7—phono jacks (47A4902)
 - SW1—SPDT miniature toggle switch (56A3201)
 - Q1—2N3391A transistor (49D30-2N3391A SPR)
 - Case—2¼x2¼x4-inch minibox (42A7619)
 - Misc.—9-volt battery, battery clip, hookup wire, lug terminal strips, hardware
- (Part numbers listed above in parentheses are from Allied Radio, 100 N. Western Ave., Chicago)

2 Gunstock Mounts



These handy camera supports give you a choice of wood or pipe construction. Either one will help to steady a long lens for sharper pictures

By **SHELDON M. GALLAGER**

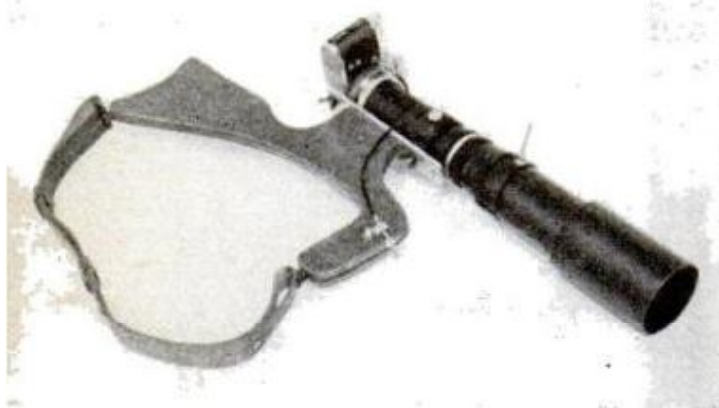


GUNSTOCK MOUNT is easily jigsawed to shape from plywood or solid stock. The aluminum bar on which the camera is mounted can be drilled at several locations to suit different lens-camera combinations

SHOOTING with a telephoto lens requires a steady hand or the slightest camera movement, magnified many times, will cause blurring and ruin your shot. Here are two handy mounts for long lenses that will help to minimize camera shake and give you sharper pictures. One is made of wood, shaped like a gunstock, and the other uses pipe fittings to form a sturdy cradle with hand grips. You can pick the type that best suits your particular needs.

The gunstock mount shown on this page was designed by R. S. Hedin. It's a simple cutout jigsawed from $\frac{3}{4}$ -inch plywood or solid hardwood. The camera and lens are fastened to the mount by means of an aluminum bar screwed to the top of the stock. The bar is $\frac{3}{4}$ -inch-wide aluminum of the type sold in hardware stores. It overhangs the stock at either end so that $\frac{1}{4}$ -20 wing bolts can be run up and into the sockets on the camera and lens.

Most long lenses have their own tripod socket on the barrel. You can anchor the lens to the front end of the bar through this socket and the camera to the rear end through its socket. If your lens doesn't have such a socket, you can lash it to



STANDARD RIFLE SLING can be added if you like, but is not essential. Note how the cable release is attached to the stock's hand grip so you can operate it with your finger like the trigger on a gun

for Telephoto Shooting

the bar with a large hose clamp. Pad the clamp with a strip of felt or rubber inner-tube to keep it from marring the lens. A cable release is held in a clip on the hand grip so you can work it just like a trigger on a rifle. You can shape the clip from a small piece of steel strap hacksawed from a metal corner angle. A cutting diagram for the stock is shown on the following page.

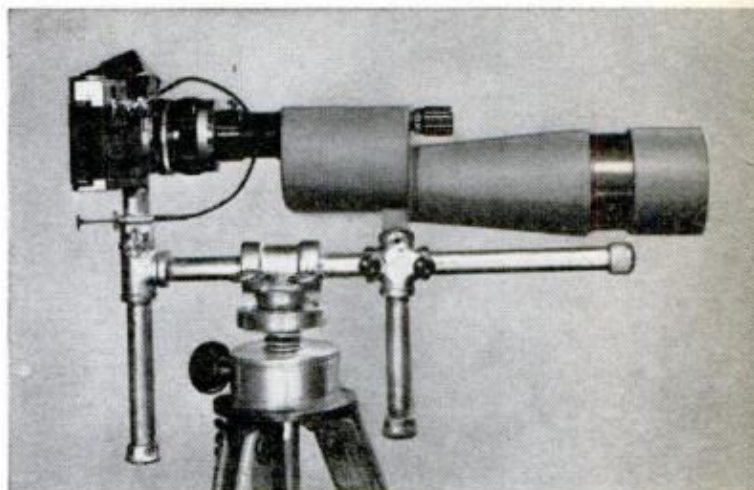
The pipe-frame cradle shown at right was designed by Walter E. Burton. It can be either hand-held or mounted on a tripod. The front support slides on the main pipe rail so it can be easily adjusted to suit lenses of different lengths. The arrangement is especially helpful for supporting lenses not originally intended for use on a camera, such as a telescope, spotting scope or field-glass monocular.

All fittings are standard $\frac{3}{8}$ -inch pipe except for the central tripod support, which is a $\frac{1}{2}$ -inch tee. The tee slides on the rail so the entire cradle can be moved forward and backward or rotated sideways to turn the camera vertically. File away the threads in the two opposing arms of the tee and make a split sleeve of sheet brass or other metal to fit between the tee and the rail. Drill and tap the tee for two $\frac{1}{4}$ -20 wing bolts to lock the tee on the rail. Insert a pipe plug in the lower opening, saw it off flush and run a $\frac{1}{4}$ -20 tapped hole through it for attaching to the tripod screw.

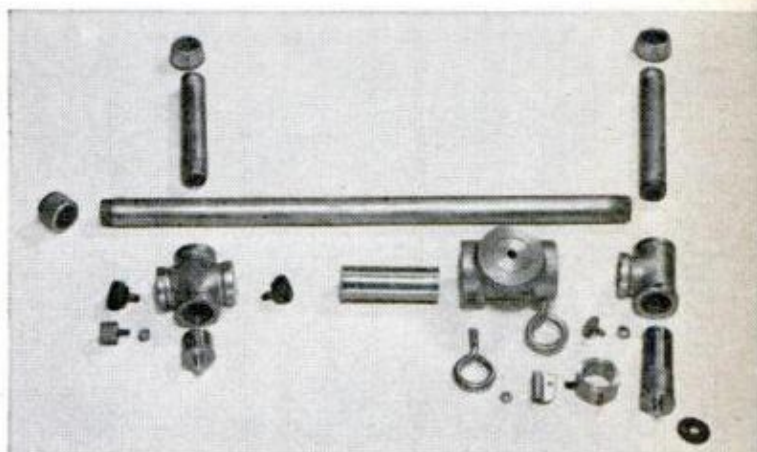
The posts that support the camera and lens can be machined from solid stock, as shown in the drawing on the following page, or they can be short lengths of pipe. The important thing is that they must be removable so they can first be screwed into the camera and lens sockets and then slipped into the cradle. For this, remove the threads from the upper openings in the front and rear fittings to make a smooth, sliding fit for the posts.

If you use pipe sections for the posts, screw pipe caps onto the upper ends and drill and tap the caps for $\frac{1}{4}$ -20 bolts run up from the inside. Tighten the bolts snugly against lock washers so they can't loosen. The threaded shanks extending up through the caps are then screwed into the

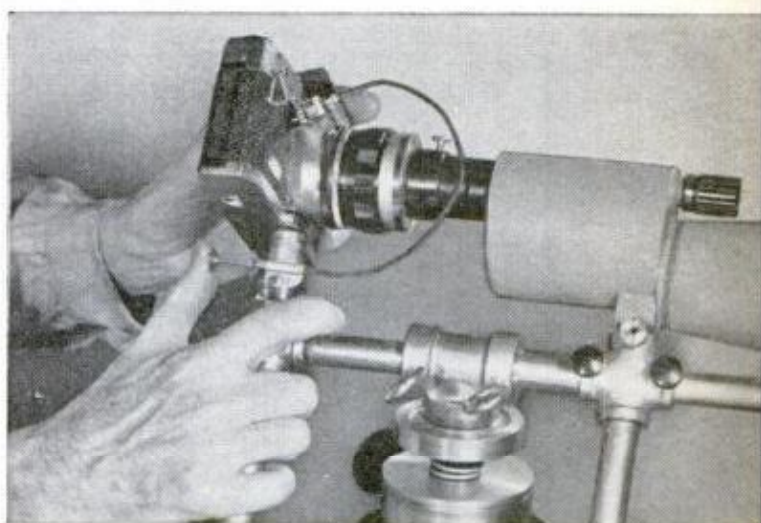
AUGUST 1970



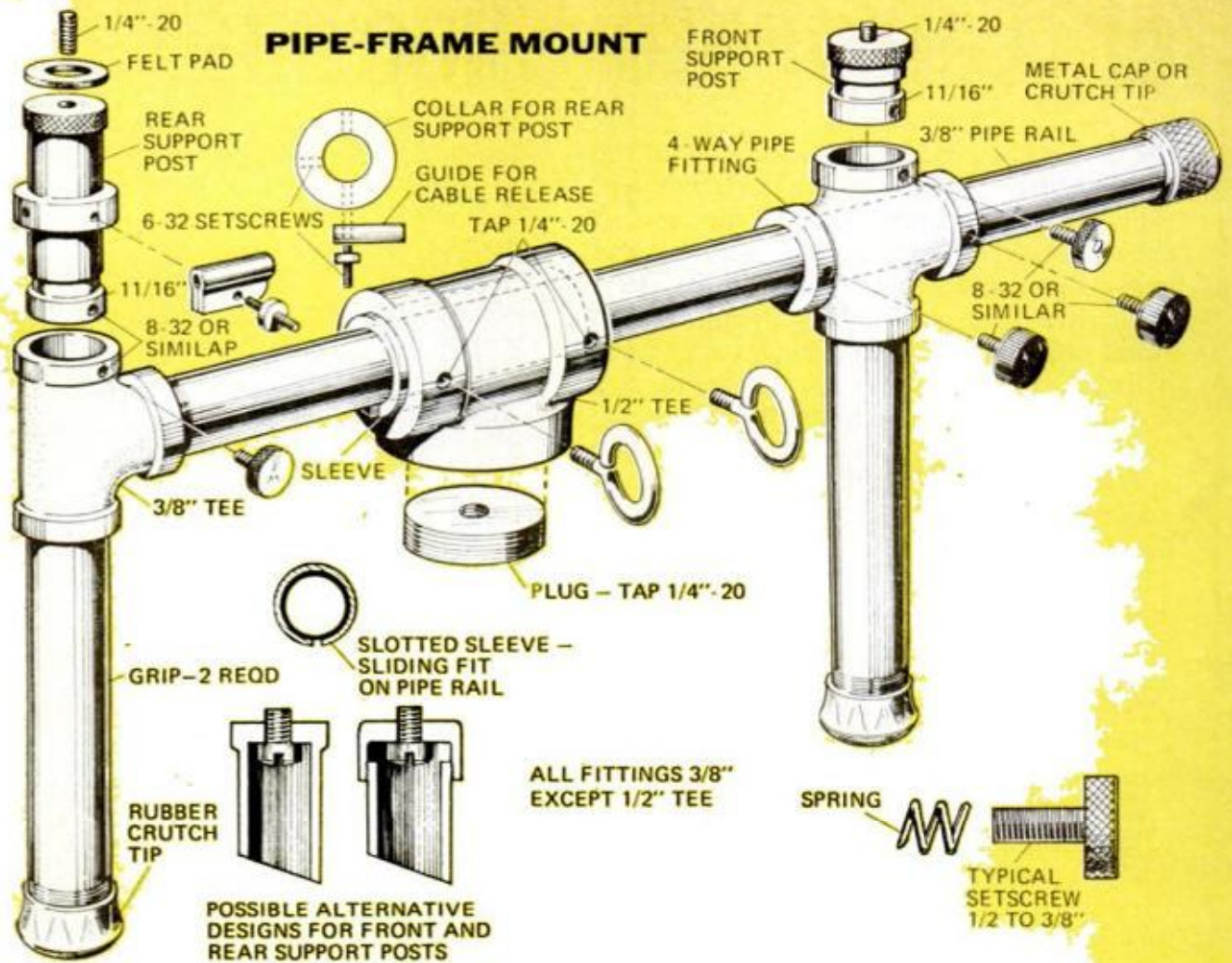
ADJUSTABLE PIPE CRADLE makes it easy to attach lenses of different lengths to a camera. It can be held by hand grips or mounted on a tripod, as here



ALL PARTS are standard pipe fittings except for posts that support camera and lens. These are shown machined here, but can also be made of pipe lengths



SWIVEL ACTION of tripod support permits entire cradle to tilt sideways for shooting with camera turned vertically. Wing bolts lock cradle in place

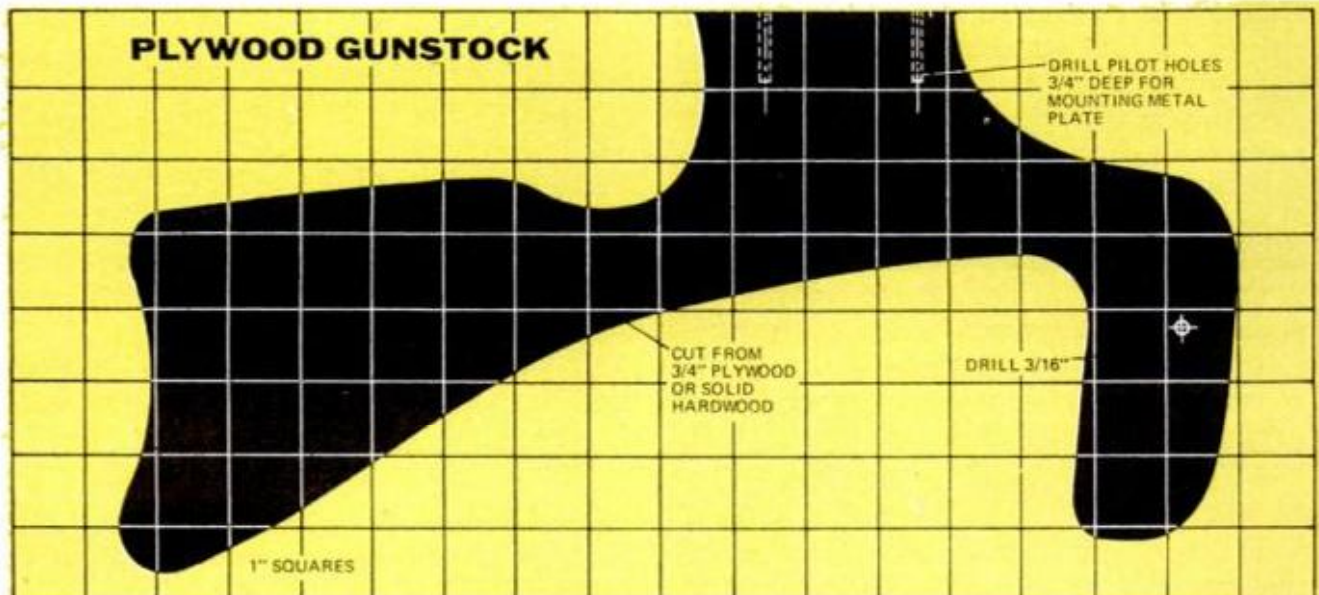


sockets in the camera and lens. The lower ends of the posts should be unthreaded so they'll slip easily into the reamed openings in the cradle fittings. The posts are locked in place by setscrews.

The two side openings in the four-way fitting must be reamed or filed out so the piece will slide on the rail. This type of fitting, called a cross, may not be readily

available at plumbing stores, but can be obtained from building-supply dealers or shops that make pipe railings.

The release cable is clamped in a guide on the rear post so you can operate it with your thumb while holding the rear hand grip. The length of the main rail is determined by the amount of travel you want. That shown is 12 inches long. ★ ★ ★



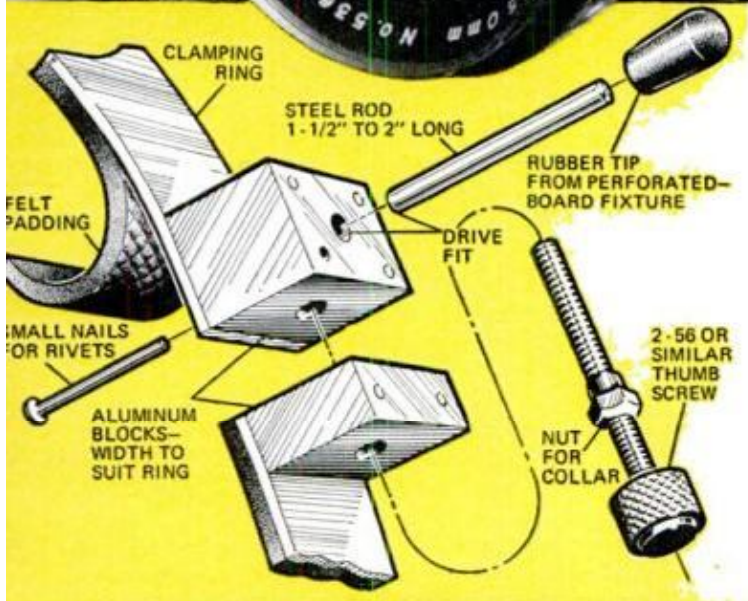
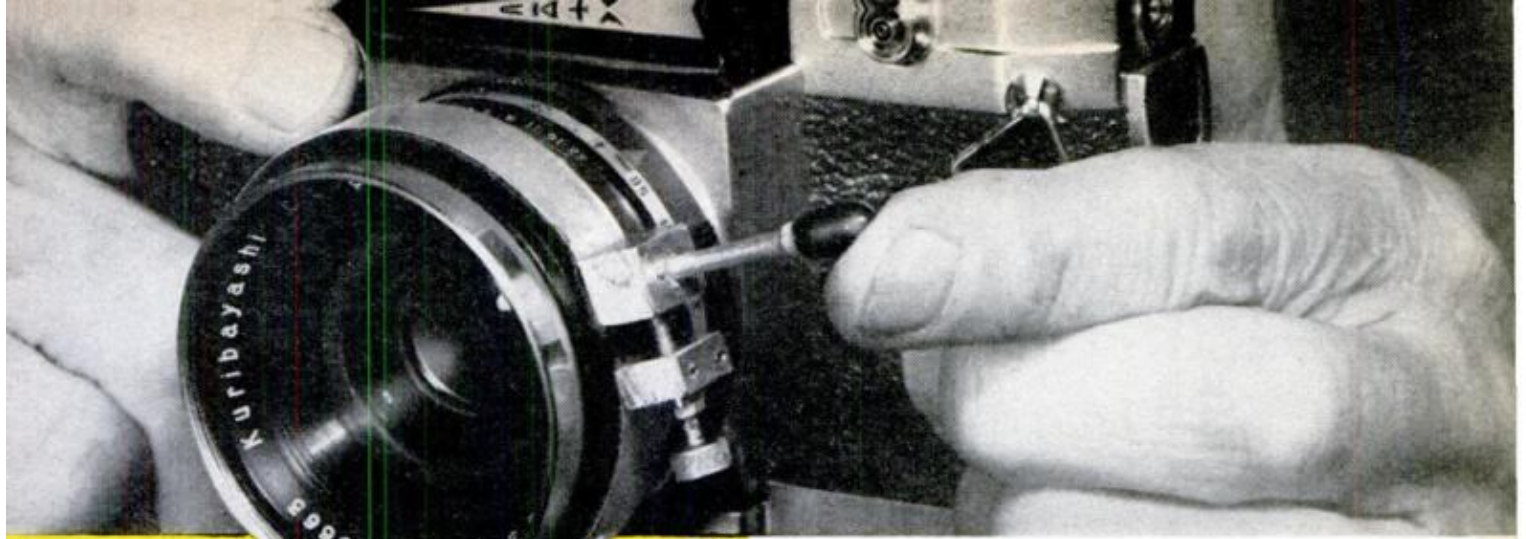
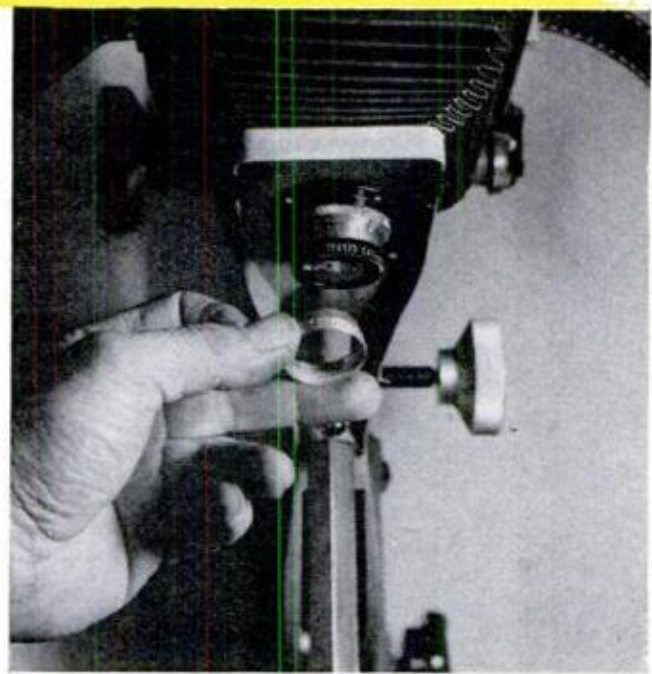


PHOTO HINTS

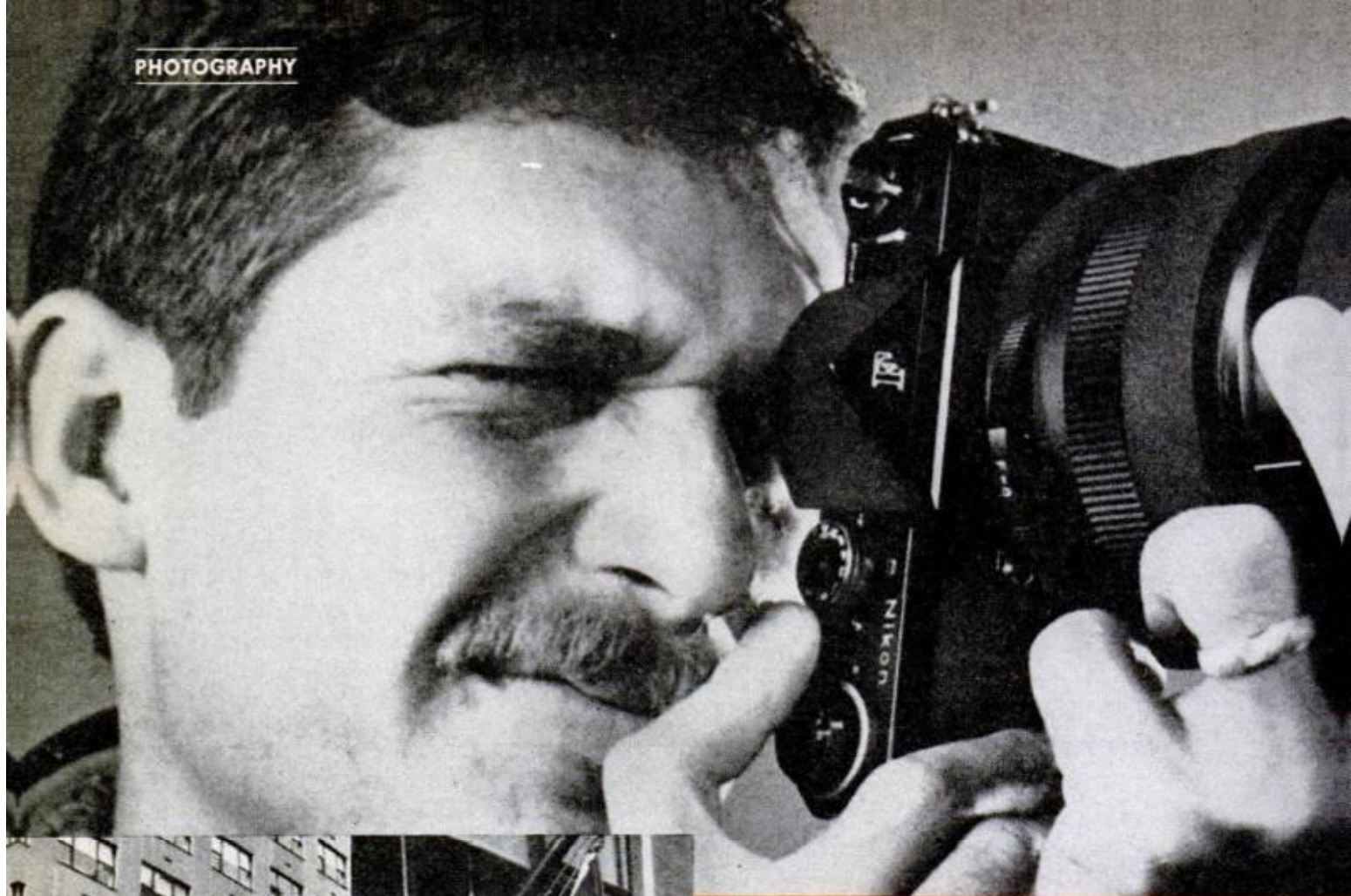
ADDING A LEVER to the focusing ring on your lens can speed focusing and give you a visual indication of how far the lens is racked in or out. The lever shown here is a short rod driven into a small aluminum block. It's clamped to the focusing ring by means of an aluminum strap padded with felt. To tighten the strap in place, a bolt extends through a hole in one block and into a threaded hole in the second block. Tiny nails with the points peened over serve as rivets to fasten the blocks to the strap.—Walter E. Burton



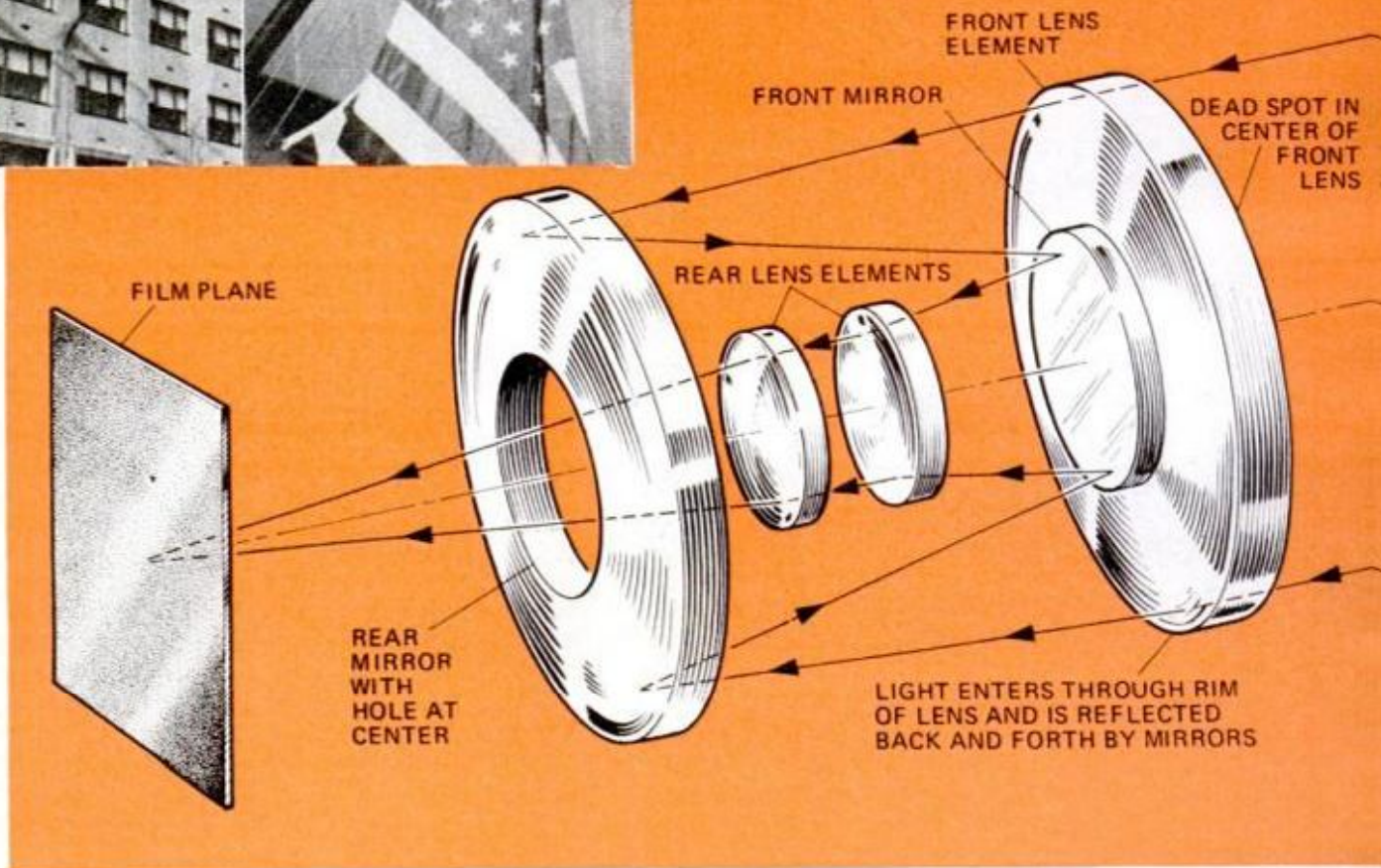
WANT BIGGER IMAGES than your enlarger normally gives? Try fastening an inexpensive close-up lens over the enlarger's regular lens. This trick is especially helpful where the enlarger column is too short to permit raising the head for jumbo blowups. Accessory close-up lenses come in several diameters. Pick a size that closely matches your enlarger's lens diameter and tape it on.—Arthur L. Ramos



EXTRA ROLLS OF FILM can be kept within easy reach in a shotgun-shell belt of the type that hunters wear. The pockets for 12-gauge shells are a perfect fit for 120 or 620-size film. The belt keeps your "ammunition" handy and saves a lot of space in your camera bag. Exposed rolls can be slipped into pockets on the opposite side from those holding the new rolls to keep them separate.—David A. Ives



CLOSE-UP OF FLAG at near left shows what you get with 500-mm mirror lens compared to same view taken with standard 50-mm lens at far left. Magnification is 10 times that of a normal lens. How the mirror principle works is shown in drawing below



New Mirror Lenses: Short in Size but Long on Reach

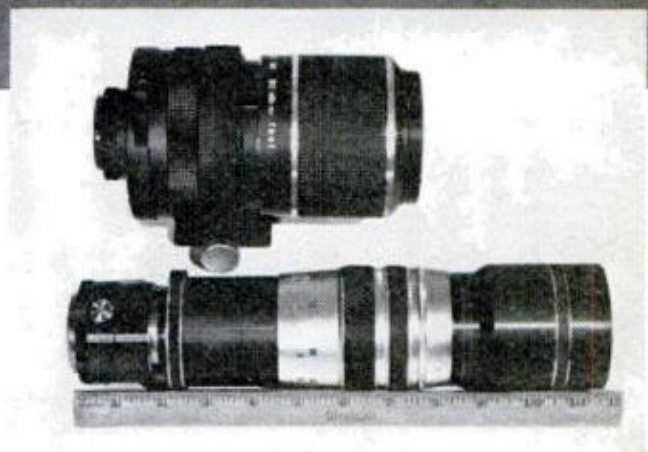
These ingenious telephotos fold the light beam in two to give you high-power magnification in a compact, easy-to-handle lens

By BOB BERGER

HIGH-POWER TELEPHOTO LENSES are customarily long, heavy and cumbersome. Now there's a new breed that gives you the same long reach in half as much length. It's called a mirror lens because it bounces the light beam back and forth between reflective surfaces to create a long optical path in a small amount of space. In effect, it folds the beam in two so it can be shoehorned into a short, compact lens barrel (see opposite page).

Mirror lenses are made to fit most 35-mm single-lens reflex cameras. They're handy to use and surprisingly inexpensive. The 500-mm Lentar shown here—a whopping telephoto by normal standards—is less than eight inches long, weighs under three pounds and sells for about \$75. By contrast, a conventional 500-mm lens may measure as much as two feet, weigh up to 10 pounds and cost \$400 to \$500.

Unlike regular telephotos, most mirror lenses do not have adjustable f/stops. You vary your exposure entirely by speed. The aperture is fixed at about f/8. While this is a relatively small opening, today's fast films let you shoot at speeds up to 1/500th or 1/1000th of a second. High shutter speeds serve to minimize camera

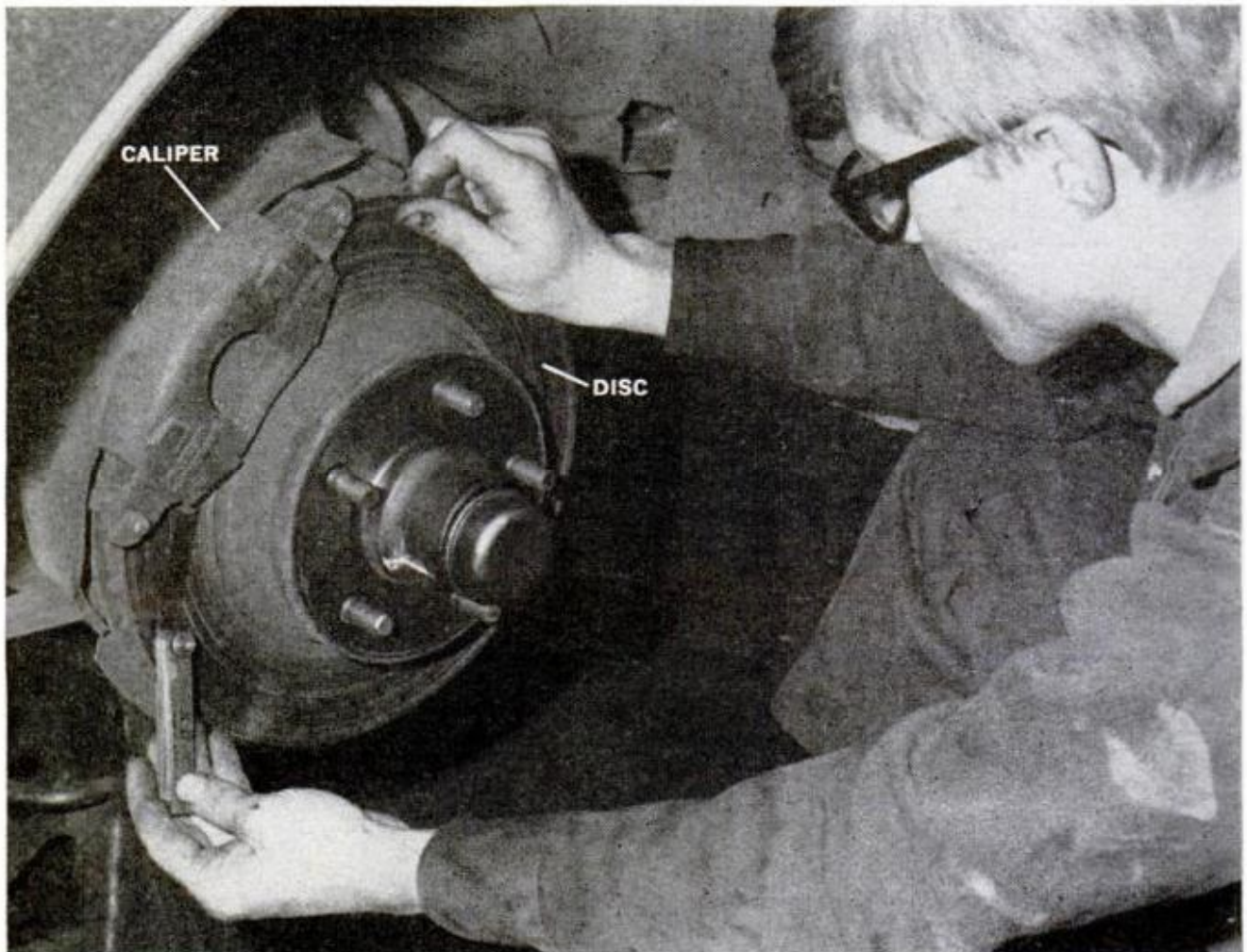


SIDE-BY-SIDE COMPARISON shows striking difference in length between 500-mm mirror lens (at top) and a conventional 300-mm telephoto almost a foot long. Mirror lenses are chunky but easy to manage

shake—a problem with all long lenses.

Where there's too much light for a proper exposure even at your highest shutter speed, you can reduce the brightness with a filter over the lens—a yellow one for black-and-white or a gray neutral-density type for color. Some mirror lenses, like the Lentar, have built-in filters that you swing into place simply by turning a ring to give you effective apertures of f/11 and f/16. Mirror lenses are available in a number of low-cost types ranging from \$75 to about \$100. One large mail-order source is Phoenix Camera, 129 E. 45th St., New York, N. Y. 10017. ★★★

How to do a complete DISC BRAKE JOB



CHECK DISC for trueness with feeler gauge. This one's damaged from driver's constant riding of brake pedal

Soon, all cars will have those long-lasting, sure-stopping discs on their front wheels; know how to fix them

By **MORT SCHULTZ**

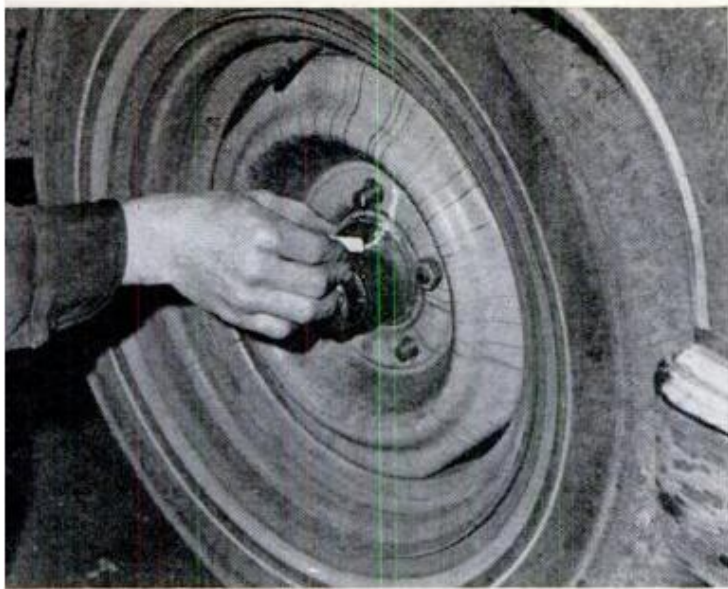
REPAIRING DISC BRAKES, quite literally, is a snap. The main assemblies of this type of brake are the disc and caliper. The disc corresponds to the brake drum of a conventional brake. The caliper assembly contains pistons which activate pads by hydraulic pressure when the brake pedal is pressed. Thus, the piston and its associated parts (seal, dust cover

and, in some designs, springs) perform the same function as a wheel cylinder in a drum brake. The two pads which press against the disc to stop the car perform the same as linings in a drum brake.

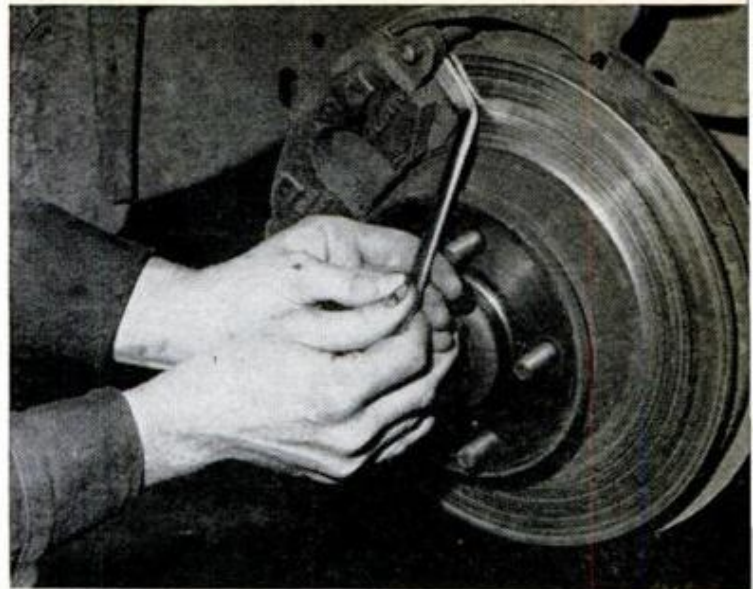
Basically, there are two variations of disc brakes: opposed-piston and single-piston. The opposed-piston setup employs four pistons, two opposite the other two, that press the opposing pads against the disc. Single-piston disc brakes have one large piston. It acts against the inner pad which, when it presses against the disc, clamps the disc against the outer pad.

The accompanying photos show how to

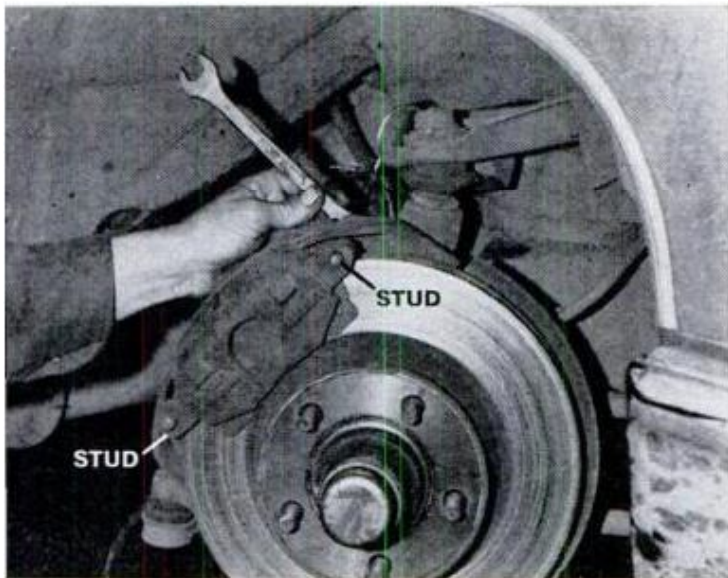
POPULAR MECHANICS



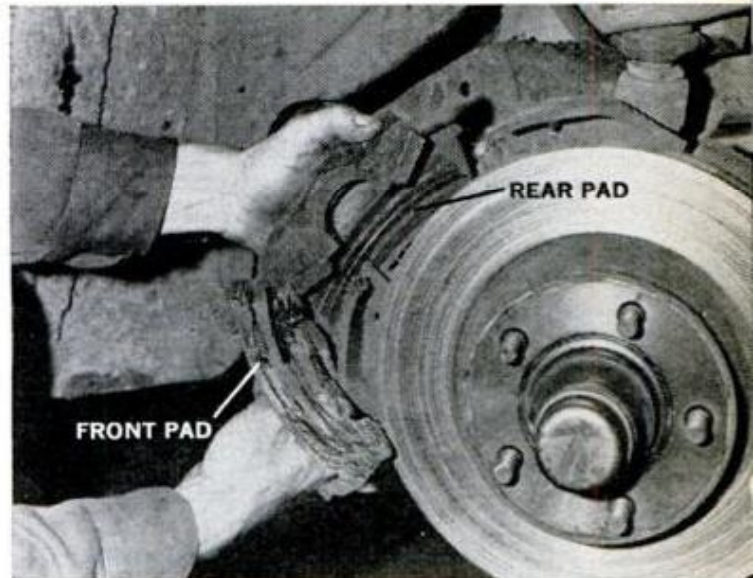
1. BEFORE REMOVING WHEEL, mark the hub and wheel so it goes back same way for wheel balance



2. IF PAD CAN'T BE MOVED to insert a feeler gauge, check for disc trueness with a dial indicator



3. IN THIS SINGLE-PISTON SETUP, caliper must be removed for access to the pads by removing studs



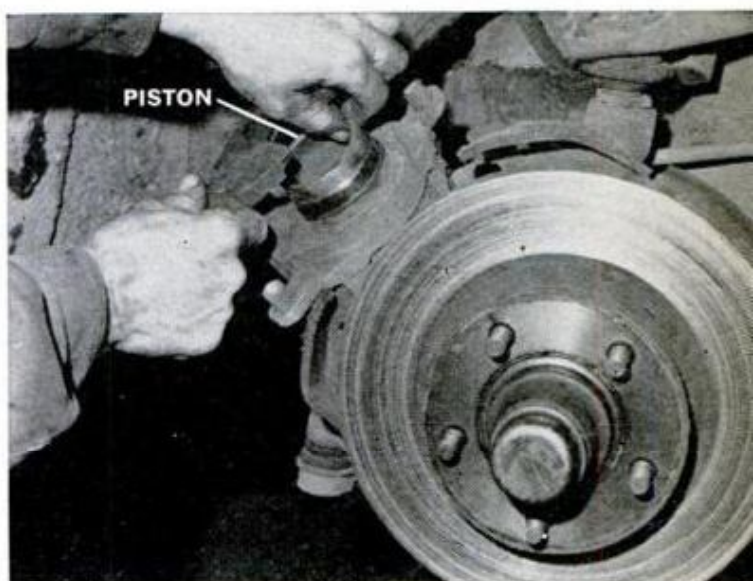
4. REMOVE BRAKE PADS. Replace if less than $\frac{1}{16}$ inch remains. These pads are down to the metal

repair a single-piston disc brake. The same general procedure is used in repairing the opposed-piston type. Check your service manual for the type you have.

The chief enemies of a disc brake are water and dirt that get inside the piston cylinder, causing the piston to seize and a pad to be compressed against the disc at all times. Repair consists of removing the piston and cleaning out the cylinder. The following major overhaul procedure will enable you to replace pads and fix almost any problem that may arise.

Photo 1. Before removing the wheel and tire, mark the wheel and hub. When you remount the wheel, make sure the mark on the wheel lines up with the mark on the hub to retain wheel balance.

Photo 2. Many times when pads are to



5. REMOVE PISTON from cylinder by hand; push on brake pedal for an assist of hydraulic pressure

be replaced, the disc has to be turned on a lathe to true it up. Since it costs about \$7 per disc to have this done by a brake shop (you don't have the equipment), it pays to be sure. With most designs, testing disc trueness can be done with a feeler gauge. Pull the front pad away from the disc.

If you can't get at the pad to pull it away from the disc, the disc should be removed and taken to a shop where it can be checked for trueness with a dial indicator.

Insert a flat feeler gauge between pad and disc as shown in the lead photo. Use a feeler-gauge size that will have a slight drag put on it when inserted. Turn the disc slowly by hand, feeling for spotty tightness and looseness. The feel on the feeler gauge must be the same all around the circumference of the disc. If it isn't, the disc needs to be trued.

Photo 3. The pads are removed. In the case of an opposed-piston brake, this can usually be done without dismantling the caliper by removing the caliper splash shield and lifting pads out with pliers. If pads are going to be reused, mark their position and be sure they go back where they came from. With the single piston brake, as here, the caliper must be removed from the disc to get at the pads. This is done by removing the caliper studs.

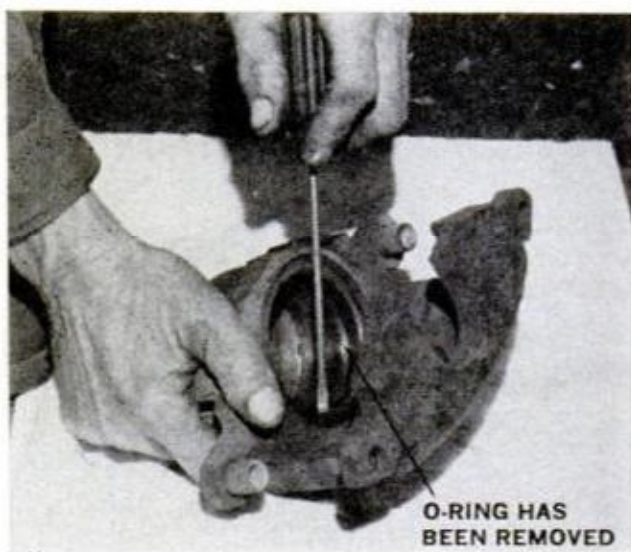
Photo 4. Remove the two pads. Pads can be retained if they have 1/16 inch or more of lining left, although 1/16 inch is stretching it. The lining of a new pad is 1/2 inch thick. The pad you see here is down to metal.

The caliper can now be dismantled for overhauling if a piston is seizing. When you first remove the wheel and tire, you can check for seizing: Turn the disc by hand. A very slight drag should be felt, because pads are always in contact with the disc, even when the brake pedal isn't applied. If drag is heavy (compare it with the opposite wheel or with disc brakes of another car, if you're not sure), the piston has seized.

Photo 5. Remove the piston (or the four pistons if you're working on an opposed-piston type). Many times, this can be done by having someone activate the brake pedal *very slowly* (otherwise, you could get splashed with brake fluid). Hydraulic pressure forces the piston partially from the cylinder so it can be grasped. Work



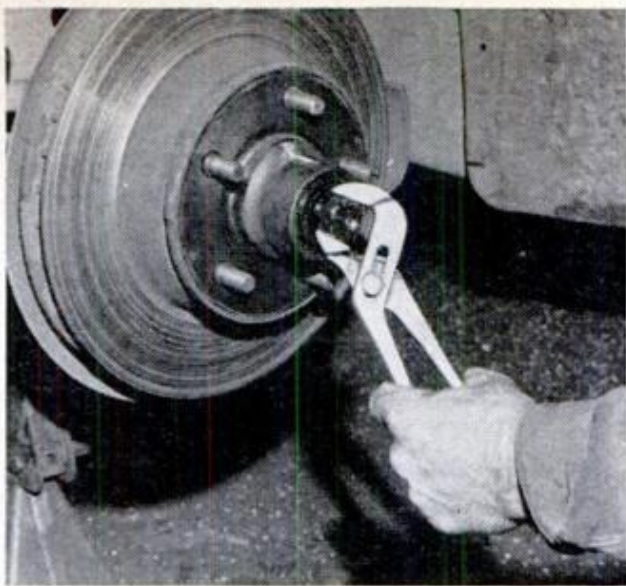
6. AFTER SINGLE-PISTON CALIPER is removed, remove the metal-rimmed dust cover by prying it off



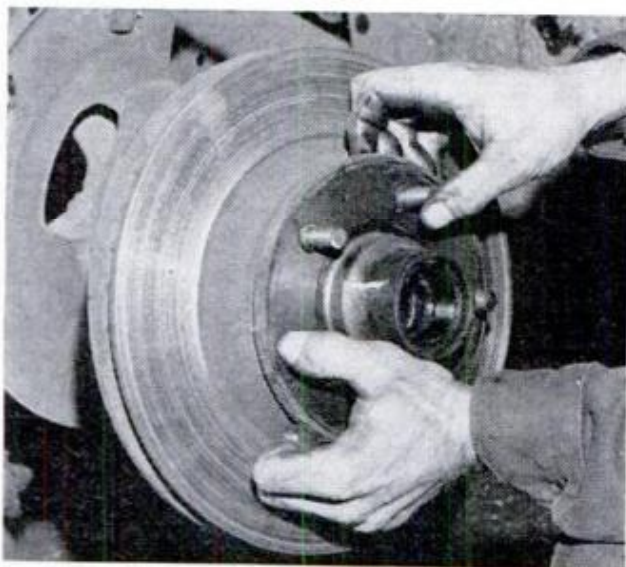
7. AFTER REMOVING O-RING from cylinder, carefully clean the ridge with screwdriver or similar tool



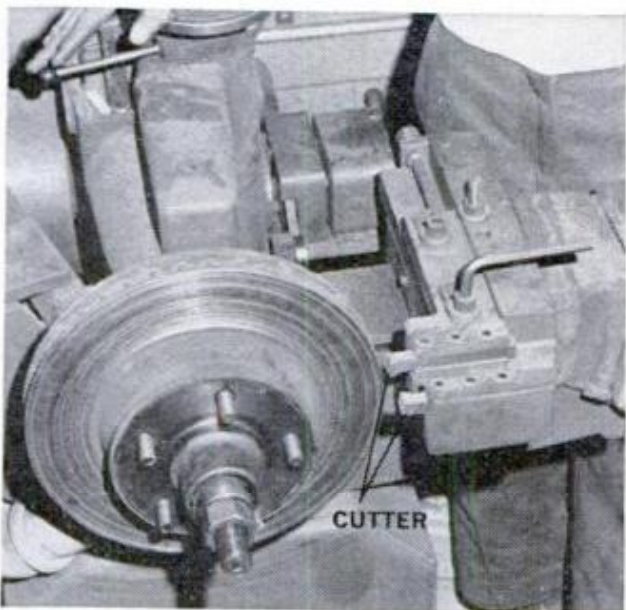
8. PISTON RETAINER, dust cover, O-ring, piston are removed. Rebuild kit has new dust cover, O-ring



9. TO PULL OFF DISC: Remove hub dust cap, cotter pin, wheel nut and the outer wheel bearing



10. SCREW WHEEL NUT back on spindle loosely; jerk disc toward you to pop the rear wheel bearing



11. DISC SHOULD BE CUT both sides at same time; check specs for maximum metal that can be cut

AUGUST 1970

the piston from the cylinder by hand. Do not use pliers or other tools. If hydraulic pressure doesn't force the piston from the cylinder, bring the caliper to a garage that has air pressure, which can be used to blow a seized piston from the cylinder.

Photo 6. On single-piston brakes, disconnect the brake hose from the caliper, and plug or position it so fluid isn't lost. The caliper is now free. Lay it down and remove the piston and dust cover, as here. Most dust covers have a metal rim. Crimp the rim, pry the cover off and throw it away. On an opposed-piston brake, the front half of the caliper containing two pistons is removed from the car. The rear half can be overhauled on the car.

Photo 7. The cylinder wall has a ridge around its circumference into which an O-ring fits. The piston rides on this ring to prevent contact between it and the cylinder wall. Pull the O-ring from place and discard. Now, with a screwdriver, ream dirt out of the ridge.

Photo 8. Parts of the disassembled caliper from left to right are a piston retainer, dust cover, O-ring and piston. Get a disc-brake rebuild kit that contains a new dust cover and O-ring.

Use brake fluid or brake assembly fluid as a lubricant when reassembling the caliper. First clean the piston with kerosene. Use crocus cloth if the piston is rusted. Clean the cylinder with crocus cloth, using brake fluid or alcohol as a honing fluid. Now, lubricate the O-ring and press it into its ridge by hand. Press the piston into the cylinder by hand. Use plenty of lubricant. Finally, put on the dust cover.

Photo 9. If the disc needs turning, remove the hub dust cap, cotter pin and wheel nut. With the wheel nut removed, take out the outer wheel bearing.

Photo 10. Screw the wheel nut back on to the spindle loosely and jerk the disc toward you. This will pop the rear-wheel bearing from the disc and cause it to fall on the spindle.

Photo 11. Be sure that the disc is cut both front and rear at the same time. Note the two cutters. If only one cutter is used, the disc will not true up, but will "walk" as the cutter hits a high spot. There is a limit to how much metal you can safely take from a disc. Check your manufacturer's recommendations.

After the disc and caliper are back in place, bring brake fluid up to level and bleed the brakes in the usual manner. ★ ★ ★

ALL-TIME GREATS No.4

Nesting Party Tables

Great projects never die, but sometimes we forget how popular they were. A hit in PM 33 years ago, this one is now updated with modern materials

By WAYNE C. LECKEY, Home and Shop Editor

Technical Art by Peter Trojan
Photos by William Aller

WHEN IT COMES to storing, these individual serving tables are no problem. They all nest neatly within a lamp table to become part of it.

You'll find them handy whenever a small chairside table is needed to hold a drink, ashtray or TV sandwich. They're perfect, of course, for a children's party.

The project is the fourth in a series of "all-time greats" which we plan to publish from time to time (see *A Cabinet for Your Guns*, page 154, Jan. '70 PM) and is patterned after a similar set of tables that made a hit with countless readers in October, 1937.

The best way to wind up with four identical nesting tables is to mass-produce them. For example, the four top shelves can be bandsawed at one time, likewise the four center shelves and the four bottom shelves. Stock for the eight backs can be ripped 11¹³/₁₆ in. wide, then crosscut into 19¹/₂-in. lengths. Stock for the fluted aprons is grooved, kerfed on the back and then ripped crosswise into four strips 2 in. wide.

Run the miters on the eight backs before you cut back the front edges. To cut the latter, run your table-saw blade as high as it will go and set the fence for a 3/4-in. cut. Then rip four of the backs for a distance of 8 in. Do the same with the other four after resetting the fence to the left side of the blade. This will produce four right and four left-hand members. Finish the cuts by sawing in from the edge on a 3/4-in. radius, then round off the top corners.

The tops and front edges of all 12 shelves are covered with decorative laminate in whatever color you prefer. We used J-M's Melamite (gypsy red) to contrast with white painted tables. If you haven't applied decorative laminate before, see *How*

to Work With Plastic Laminates, page 154, March PM. The edges are banded first, then the surfaces, except the four top shelves. Wait until these shelves are nailed in place.

You can save a lot of masking if you paint the inside surfaces of the backs before installing the shelves. Glue and nail the mitered edges, keeping the assemblies square, sink and putty the nailheads and spray with two coats of white semigloss lacquer.

Any void found in the plywood at the front edges should be puttied beforehand, of course, and sanded smooth. The center



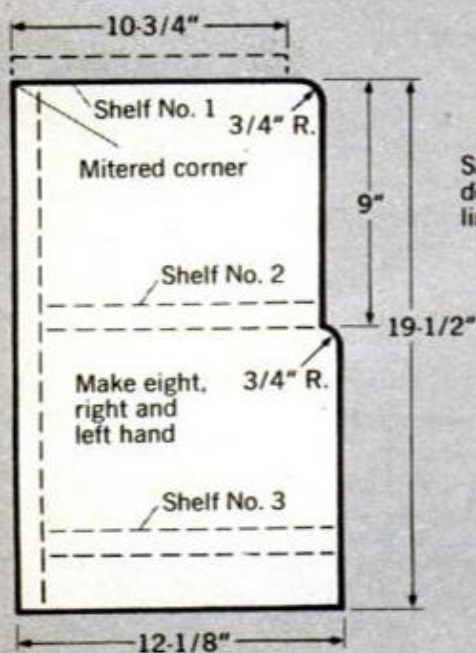
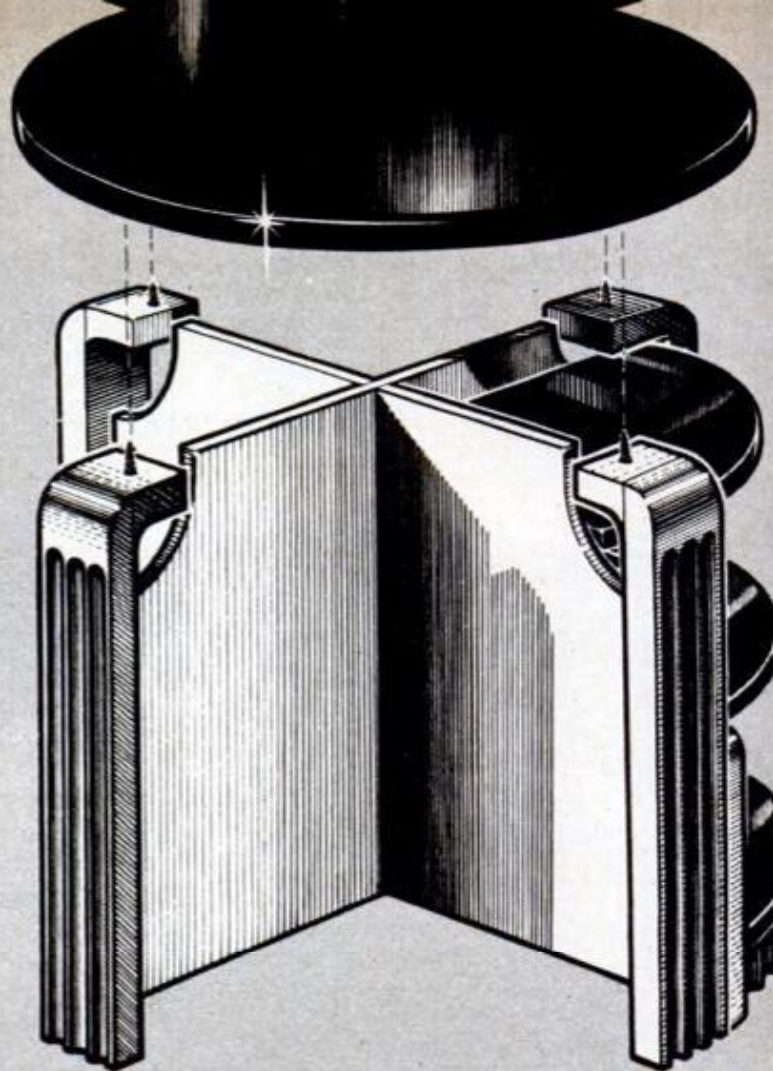
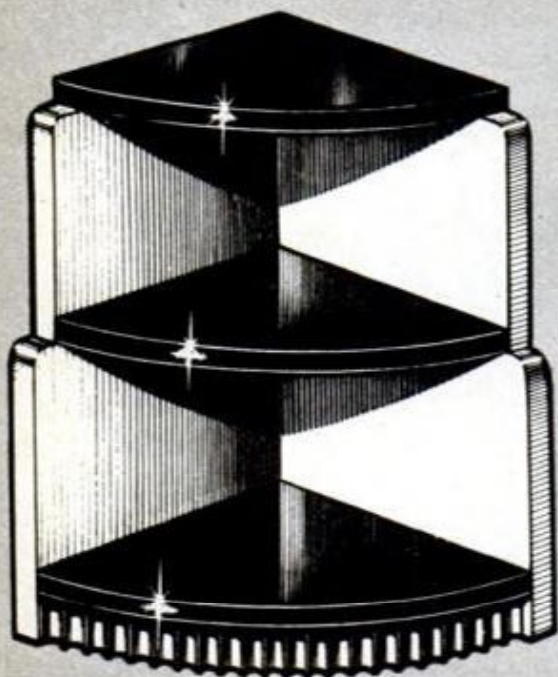
WHEN NESTED, the four individual tables become a part of the main table and provide handy shelves

POPULAR MECHANICS

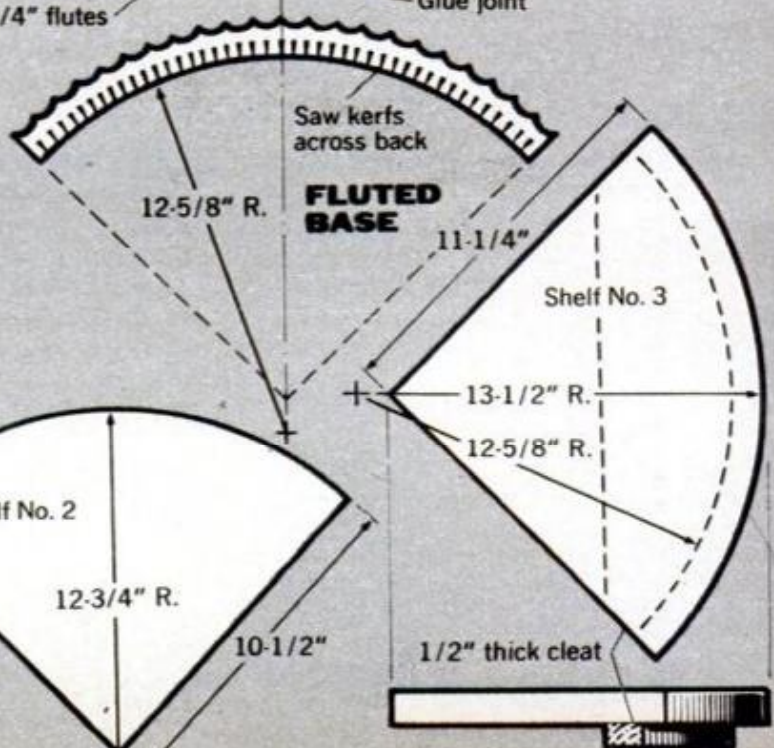
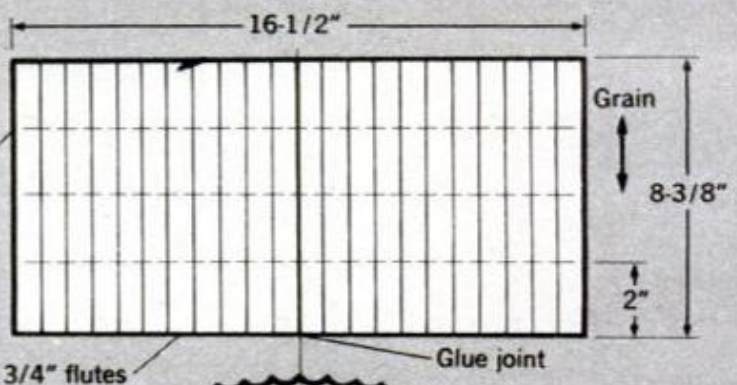


Nesting Party Tables

(ALL-TIME GREATS NO. 4)

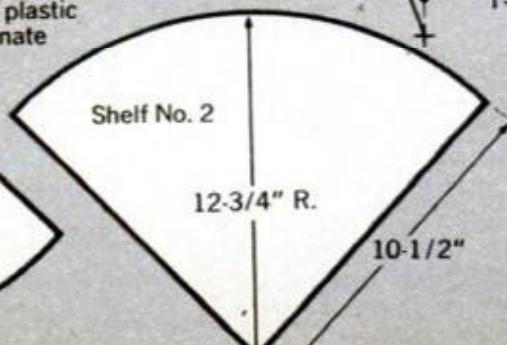
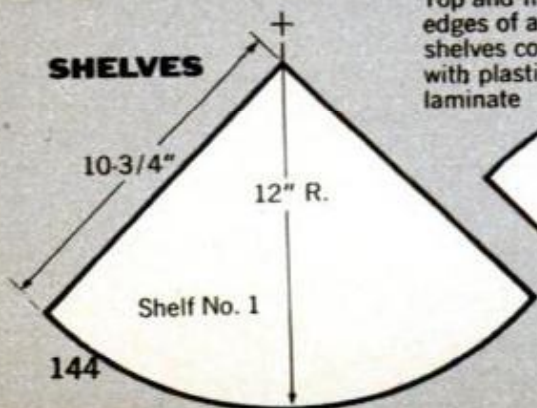


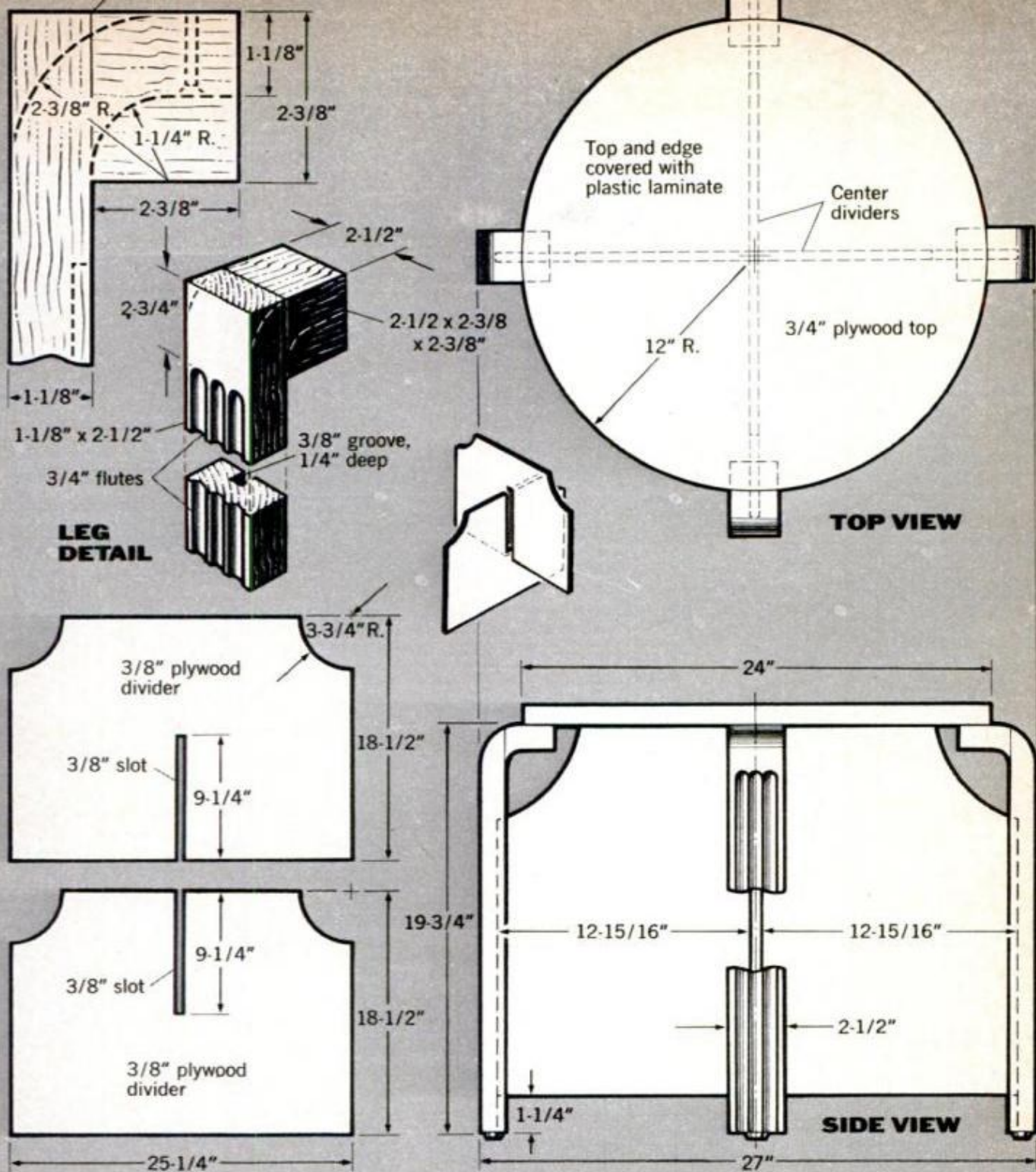
Saw on dotted lines



All stock 3/4".
Top and front
edges of all
shelves covered
with plastic
laminare

SHELVES





and bottom shelves are nailed in place from the back, while the top shelves are nailed down from the top.

This leaves the fluted aprons. Two pieces of 3/4-in. pine, 8 1/4 in. wide, are edge-glued to make a board 16 1/2 in. wide. Notice that the grain must run vertically. Twenty-two flutes are made across the board, either with a 3/4-in. core-box router bit or a molding head on your table saw. If you make them on your saw, use a 3/4-in. scrap for a spacer. Set the fence to make the first cove and make the cut. Then with the work brought back against the fence and held intact, back the fence

away and drop in the 3/4-in. scrap. This is done each time as you work across the board. The last cove cut should arrive at the very edge of the board.

Now a series of 1/2-in.-deep, closely-spaced saw cuts (kerfs) is made on the back of the board, with the grain, and completely across its width, after which the board is ripped crosswise into 2-in.-wide strips. The kerfing permits bending the strips so they can be glued to the curved cleats which are screwed to the underside of the bottom shelves. Notice that the cleats are set in 7/8 in. from the

(Please turn to page 192)



Build This Picture-Bar

By WAYNE C. LECKEY, Home and Shop Editor

Technical Art by Fred Wolff

WHO SAYS a bar has to stand around taking up space? And who says a bar has to serve just as a bar? Not this one! It's designed to hang on the wall and it does double duty as a handsome decoration. It's a conversation piece for a man's den, and when you let down its picture front, it holds all the ingredients you need for offering quick hospitality.

We started off by buying a three-dimensional wall accessory that's made by the Turner Manufacturing Co., 2309 S. Keeler Ave., Chicago, and making the shelf to fit it. But you don't have to buy the same picture. You can make a

**A handsome wall
decoration
opens to
reveal a
compact bar
for the den.**



front of your own from stock picture-frame molding and fit it with any painting you like. In this case, detail B shows how the counter is glued directly to the glass rabbet of the frame.

Start with the storage cabinet. Exclusive of shelf A, it's assembled from six walnut pieces, all rabbeted for a 1/4-in. back. I used a piece of red Marlite (hardboard) for the latter but a scrap of prefinished wood paneling could be used just as well. I picked red to match the red in the picture front.

The lower half of the cabinet consists of three 4 1/2-in.-wide pieces doweled to shelf A at the top and mitered and glued at the bottom.

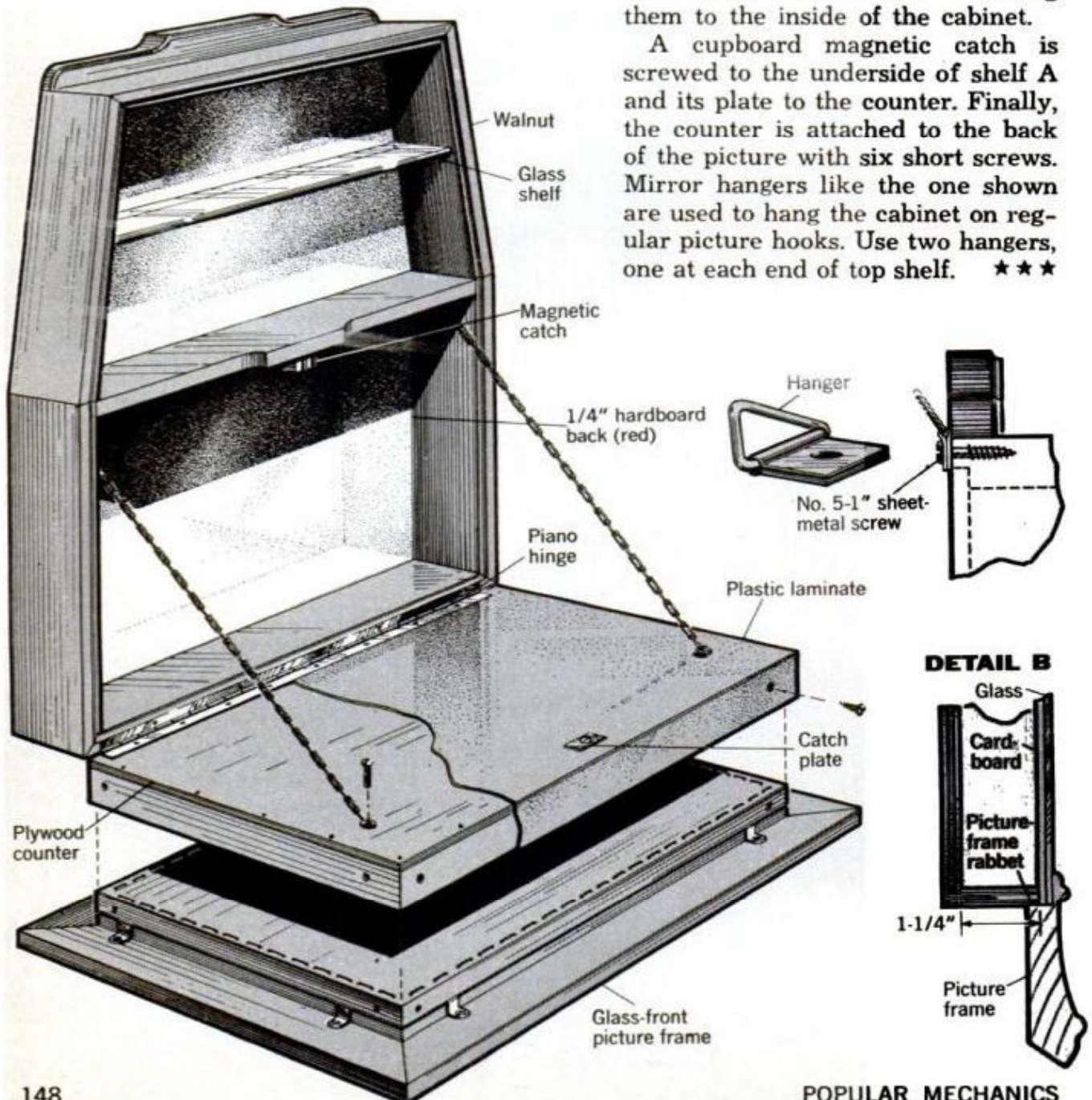
The tapered three-piece upper half of the cabinet is doweled to the lower half, flush with the sides, then a 3/8-in. cove is

run all around inside with a two-flute, pilot-type cutter in a portable router.

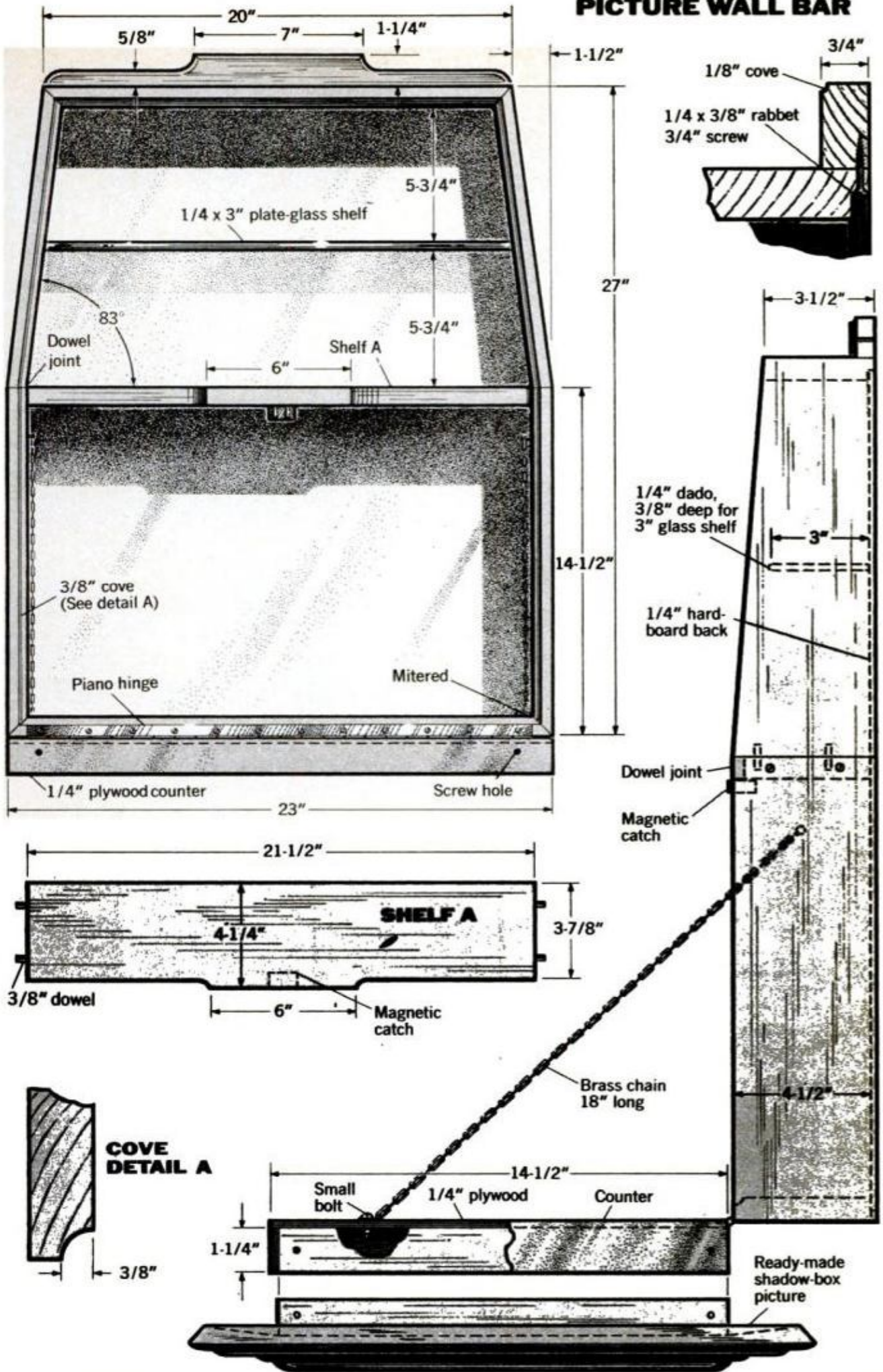
Note that the 3-in. glass (medicine cabinet) shelf rests in 1/4-in. blind grooves and is inserted from the back. The grooves must be cut, of course, before the upper unit is assembled. The very top cap member is attached with two flathead screws turned through the rabbet before the back is added and nailed in place.

The 1/4-in. plywood counter has three sides (it's open across the back) and was made to fit down over the back of the "shadow-box" picture front. It's covered with white decorative laminate—first on the sides, then the top—and finally is hinged to the lower edge of the cabinet with a piano hinge. It's supported by two-brass-link (furnace) chains, with tiny bolts attaching the chains to the counter and roundhead screws attaching them to the inside of the cabinet.

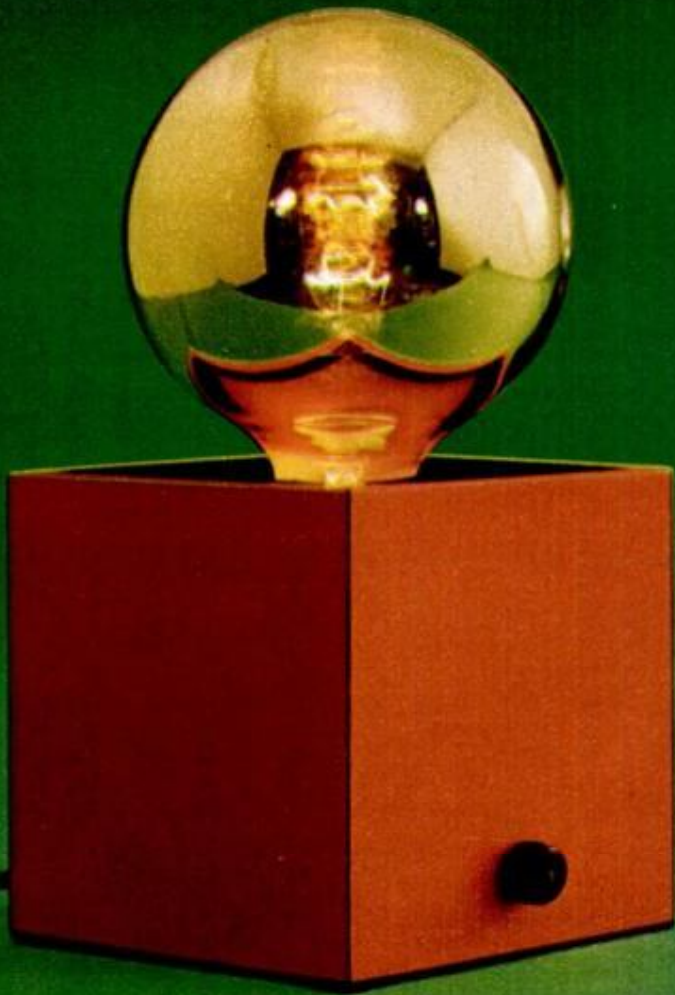
A cupboard magnetic catch is screwed to the underside of shelf A and its plate to the counter. Finally, the counter is attached to the back of the picture with six short screws. Mirror hangers like the one shown are used to hang the cabinet on regular picture hooks. Use two hangers, one at each end of top shelf. ★★★



PICTURE WALL BAR



THEY'RE



Color Photos by Sam Kimura

FUN TO MAKE!

WEEKEND PROJECTS

■ CRYSTAL-BALL LAMP

■ EXCITING DICE GAME

■ TABLE TOP BOOK RACK

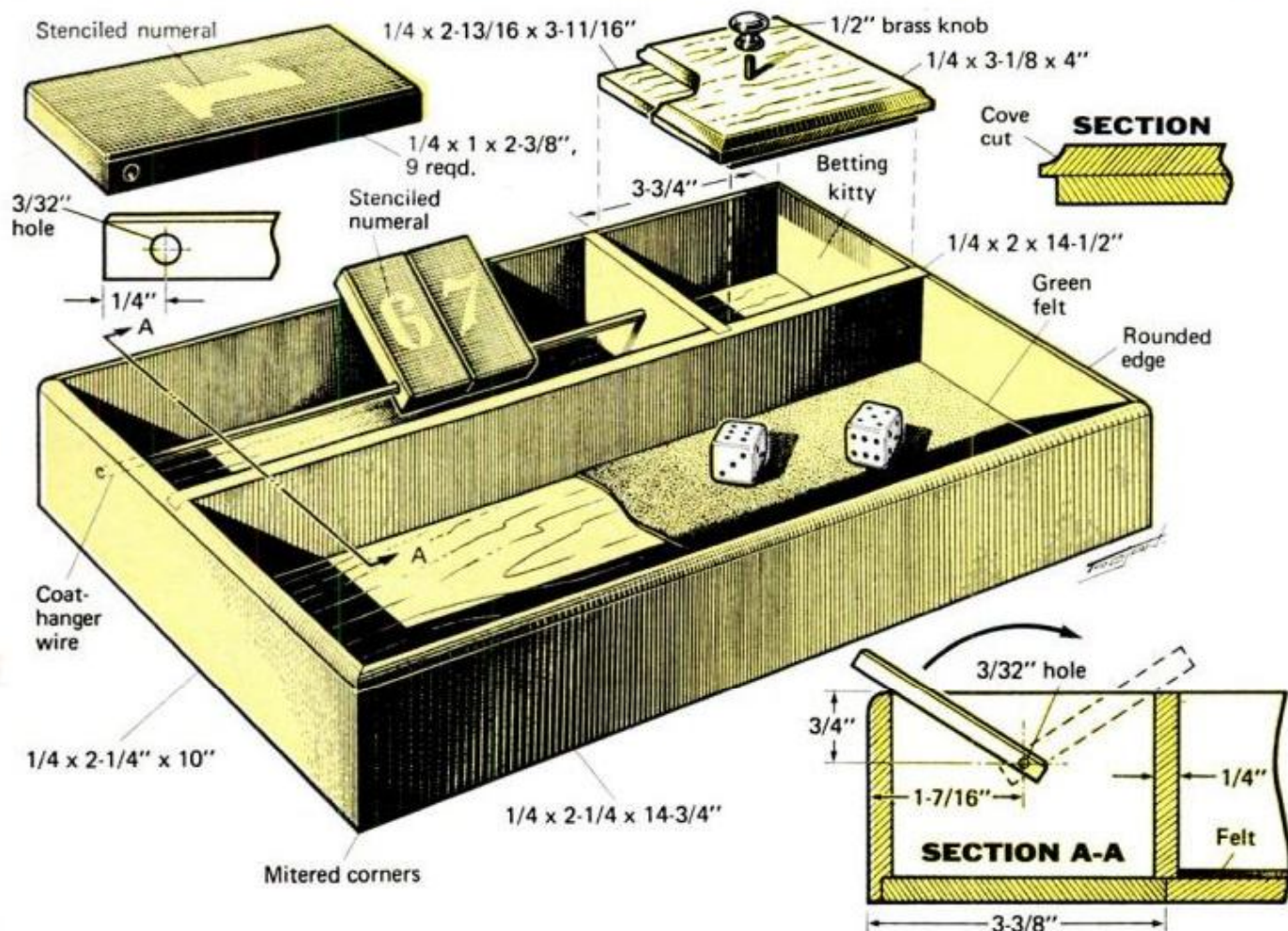
■ DOGGIE REMINDER

Technical Art by Peter Trojan

Exciting Dice Game

THE WINNER of this game is the player who makes the lowest total score after rolling the dice for as long as he can flip numbers. For example, if a four and a five are tossed, the player has the option of flipping the nine or any combination of two numbers which equal nine, such as 8 and 1, 7 and 2, 6 and 3 or 4 and 5. A player continues to roll the dice until he is stuck and can no longer flip a number. The total of unflipped numbers is his score. With luck it's possible to flip all the numbers. Whether you're playing for small stakes or just for the fun of it, it's a great party game.

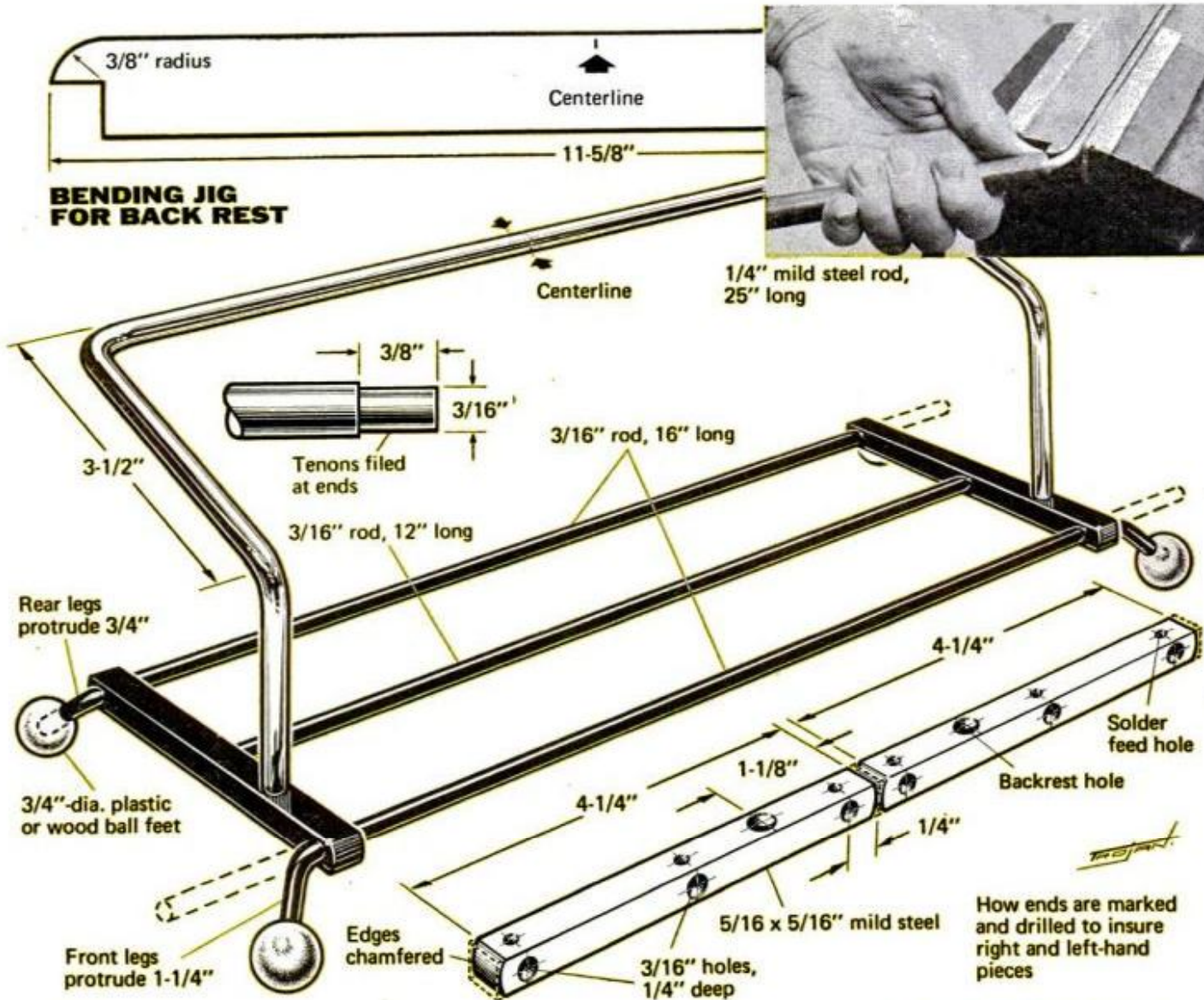
The original was made from scraps of Marlite hardboard paneling, and the drawing below shows how you can make one like it. When drilling the holes through the nine, numbered tabs, drill halfway through from each edge and you'll wind up with centered holes.

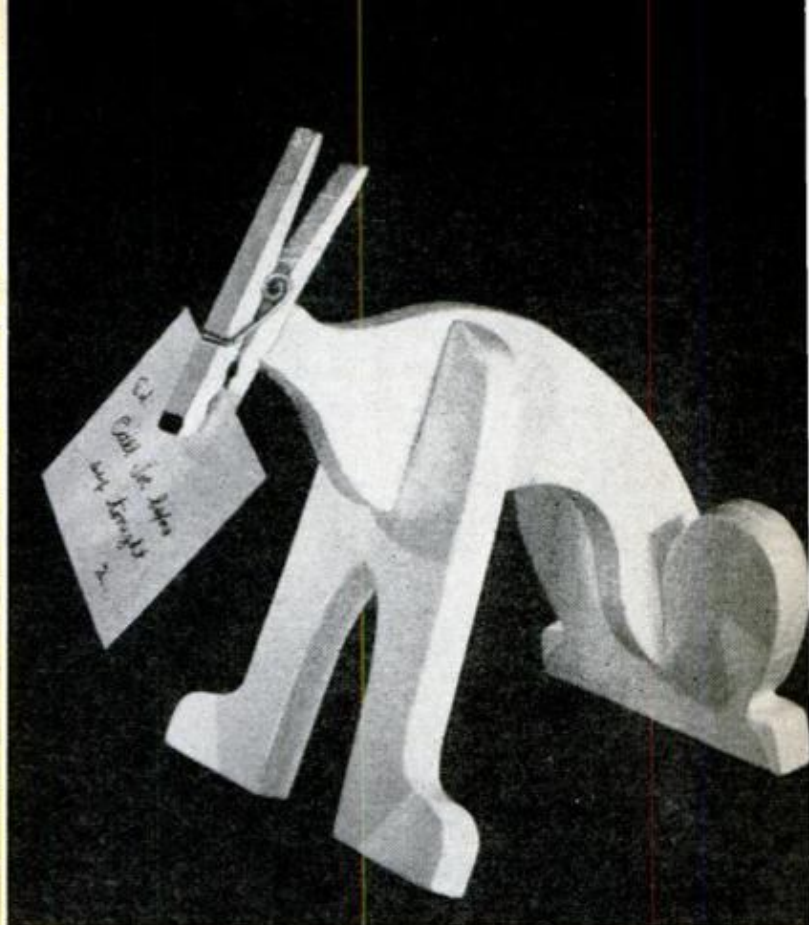
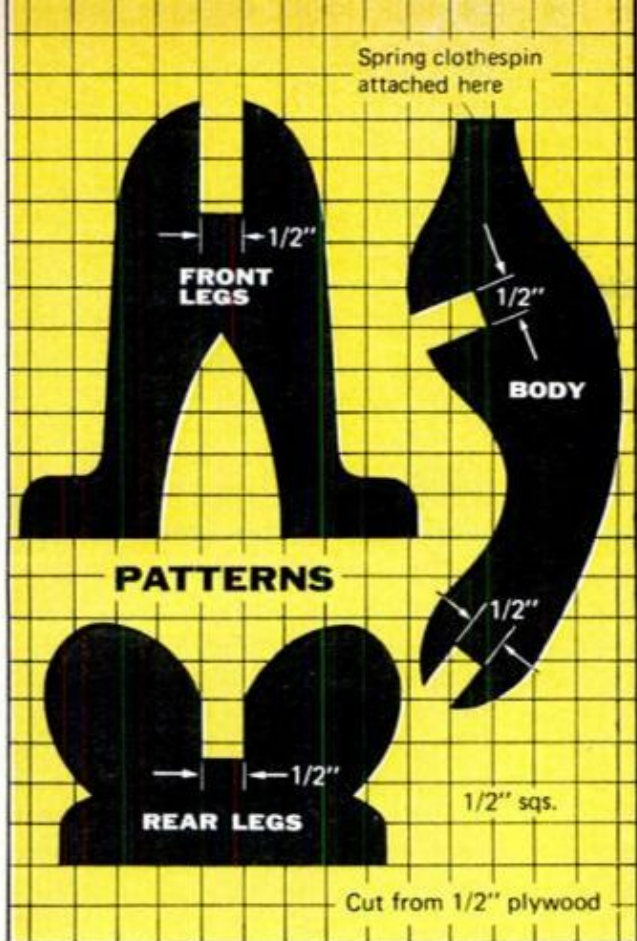


Tabletop Bookrack

Designed for paperbacks, this smart-looking metal rack will hold 36 or more books. It's a bend-and-solder project and the photo below shows how the bending jig is used in a vise for making neat bends at each end of the brass-rod backrest. It's later attached to the ends of the steel base by peening the tenoned ends. Notice that the holes for the 3/16-in. rods in the end pieces are drilled clear through except for the middle holes.

The various parts are soldered by first applying flux to the feed holes provided, heating the metal with a torch and touching solder to the holes. Capillary action causes the solder to flow around the joint. The legs are bent after soldering by slipping a piece of pipe over the protruding rod, and then fitted with ball feet of wood or plastic. Paint the steel parts flat black, polish the brass and coat with clear lacquer.—Kenneth Wells



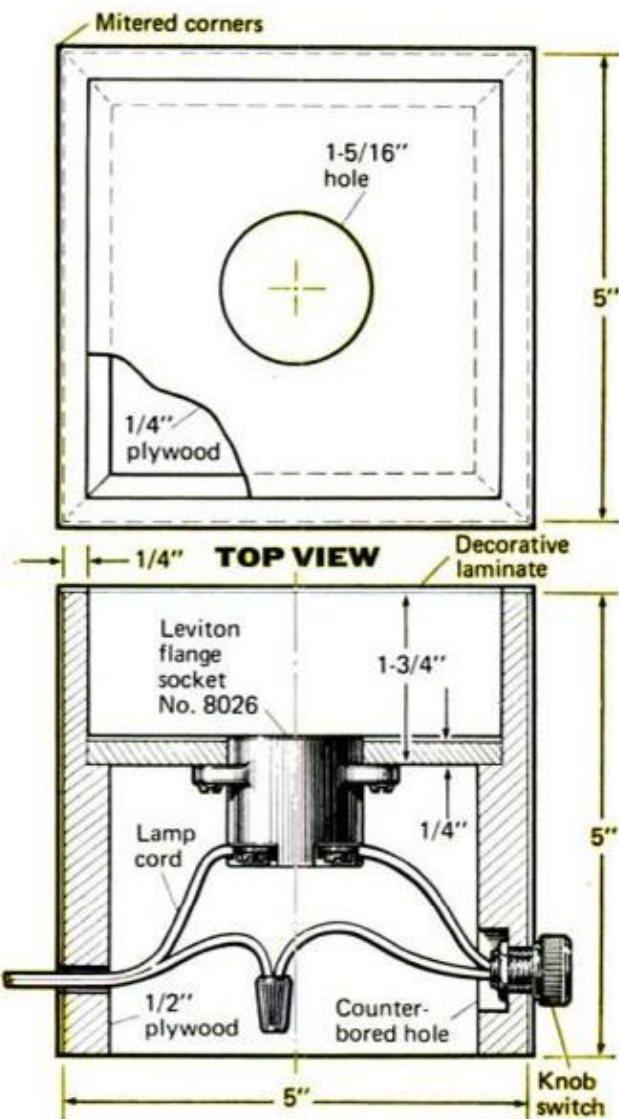


Doggie Reminder

An important note won't go astray when Fido has it clamped tightly in his clothespin mouth. His body consists of three parts, and—if you make the notches a friction fit—he can be put together without nails or glue. Enlarge the patterns and trace them on $\frac{1}{2}$ -in. plywood or solid stock. You can saw out three or four as quickly as one by stacking the pieces and tacking them together in the waste. Spray the parts before assembling. Attach the clothespin head with a screw after you take it apart.—*Harry F. Yates*

Crystal-Ball Lamps

Fitted with mirrorlike bulbs that are highly decorative in themselves, these smart TV lamps (see color page) are conversation pieces whether on or off. The bulbs are the new Tovibulbs which come in silver and 24k gold and are 5 in. in diameter. When lighted, the torchlike filament gives a dramatic effect. The bases are wood cubes of $\frac{1}{2}$ -in. plywood with recessed tops and are fitted with flange-type sockets as shown at the right. The finish can be a decorative laminate, marble or wood-grain ConTac paper or paint. The switch hole must be counterbored on inside before assembly.—*Gary Gerber*



Build This Early American Bedroom Set

PART 2 — DRESSER, CHEST AND MIRROR

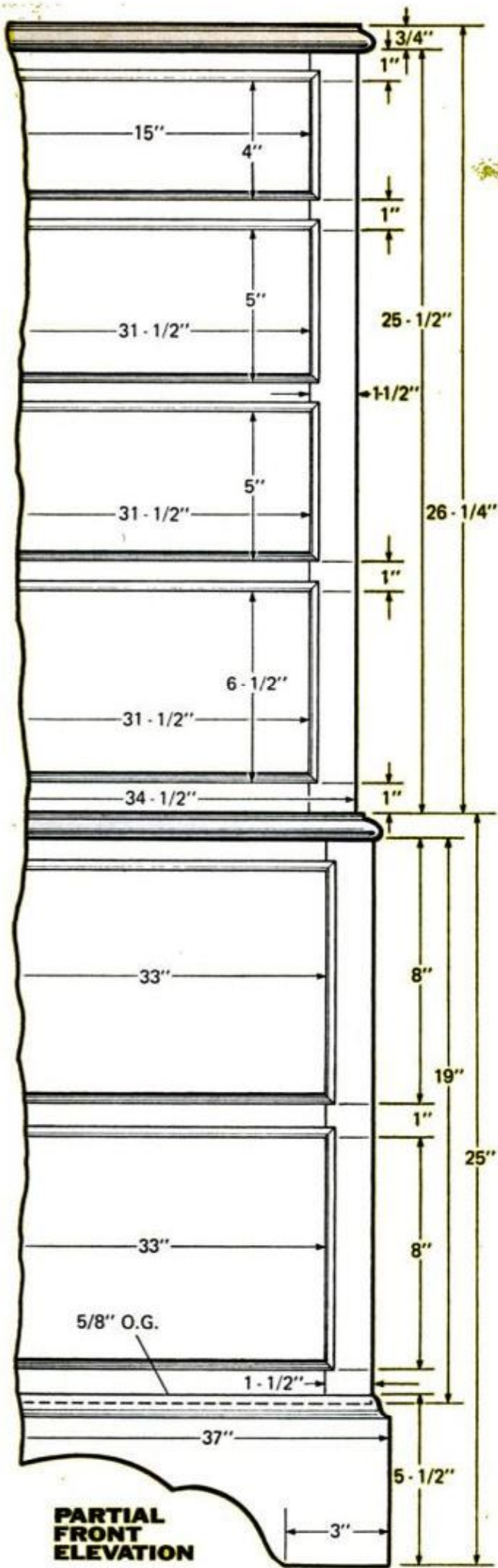
By M. J. JOHNSON

TO COMPLETE the four-poster bed which was detailed last month along with the night stand, narrow slots are finally mortised in the turned legs for conventional bed-rail locking plates. These can be made right after the legs are turned. Steel pins are inserted crosswise through the slots for the locking plates to hook over. The bed rails are 5 in. wide and 76 in. long and are fitted with cleats on the inside to support regular wood bed slats.

Construction of the triple dresser and the chest on chest is basically the same, differing mainly in overall size of the units. In each case you start by making a front drawer-frame assembly from 1 and 1½-in. solid strips, ¾ in. thick. The two-drawer frame for the lower section of the chest measures 19x36 in. overall, the frame for the upper section measures 25½ x 34½ in. and the frame for the 11-drawer dresser measures 28½ x 59 in. The members which form the drawer openings are spaced as shown and the whole frame is put together with glue and dowels.

The completed frames are glued to the edges of ¾-in.-plywood (veneer-faced) end panels. Here the panels measure 18¼ in. wide for the lower section of the chest, 17½

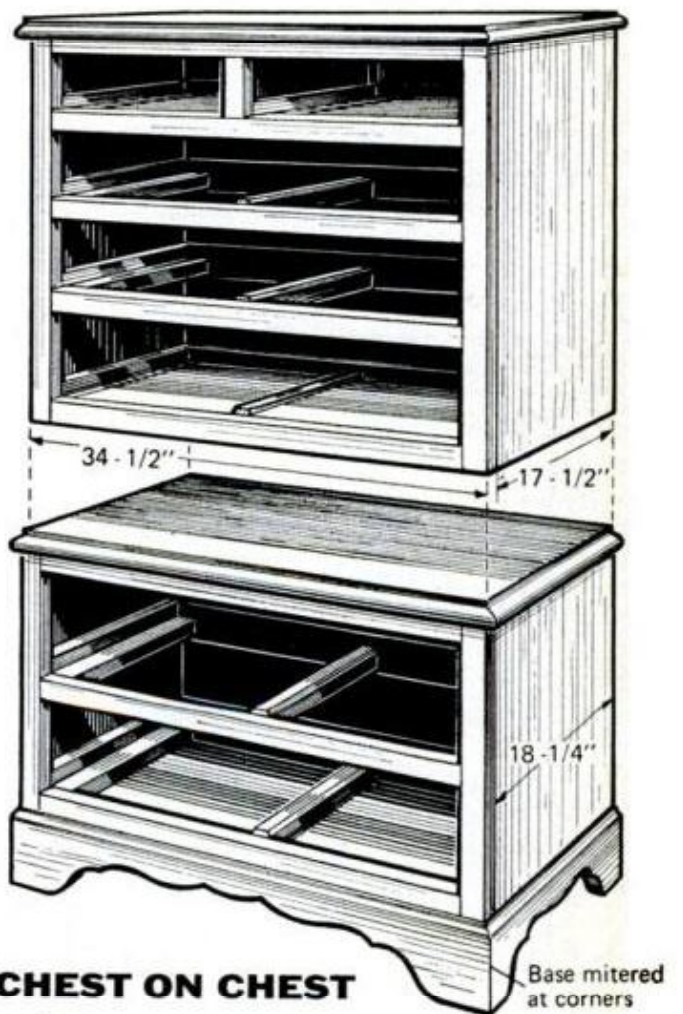




PARTIAL FRONT ELEVATION



UPPER SECTION of seven-drawer chest has a setback of 1/2 in. at sides and front. It's flush along back

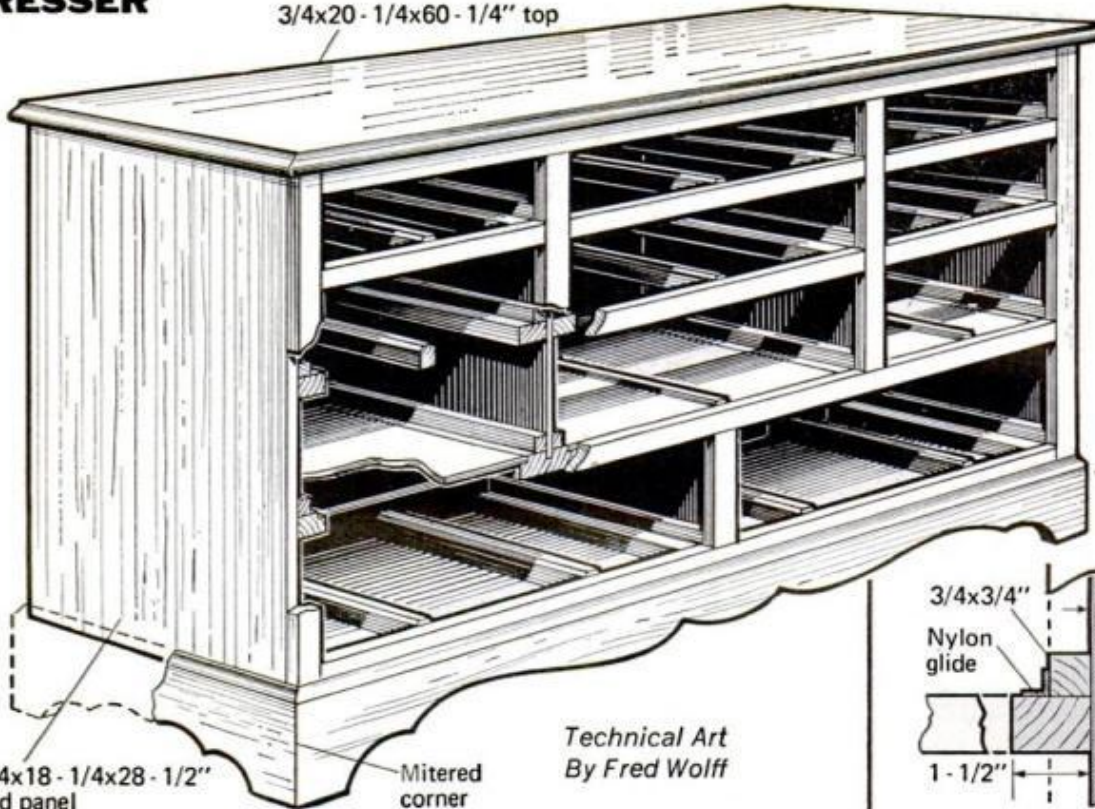


CHEST ON CHEST



DRESSER

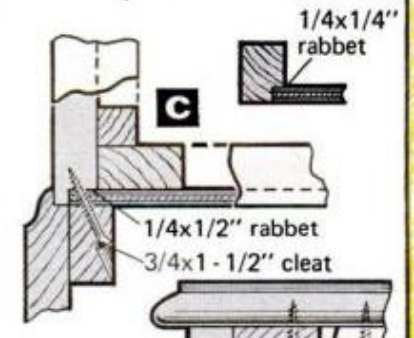
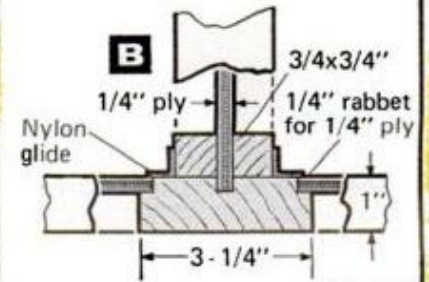
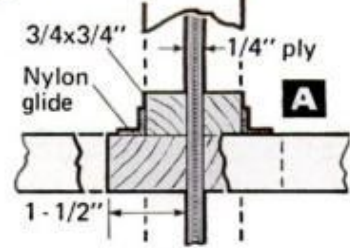
3/4x20 - 1/4x60 - 1/4" top



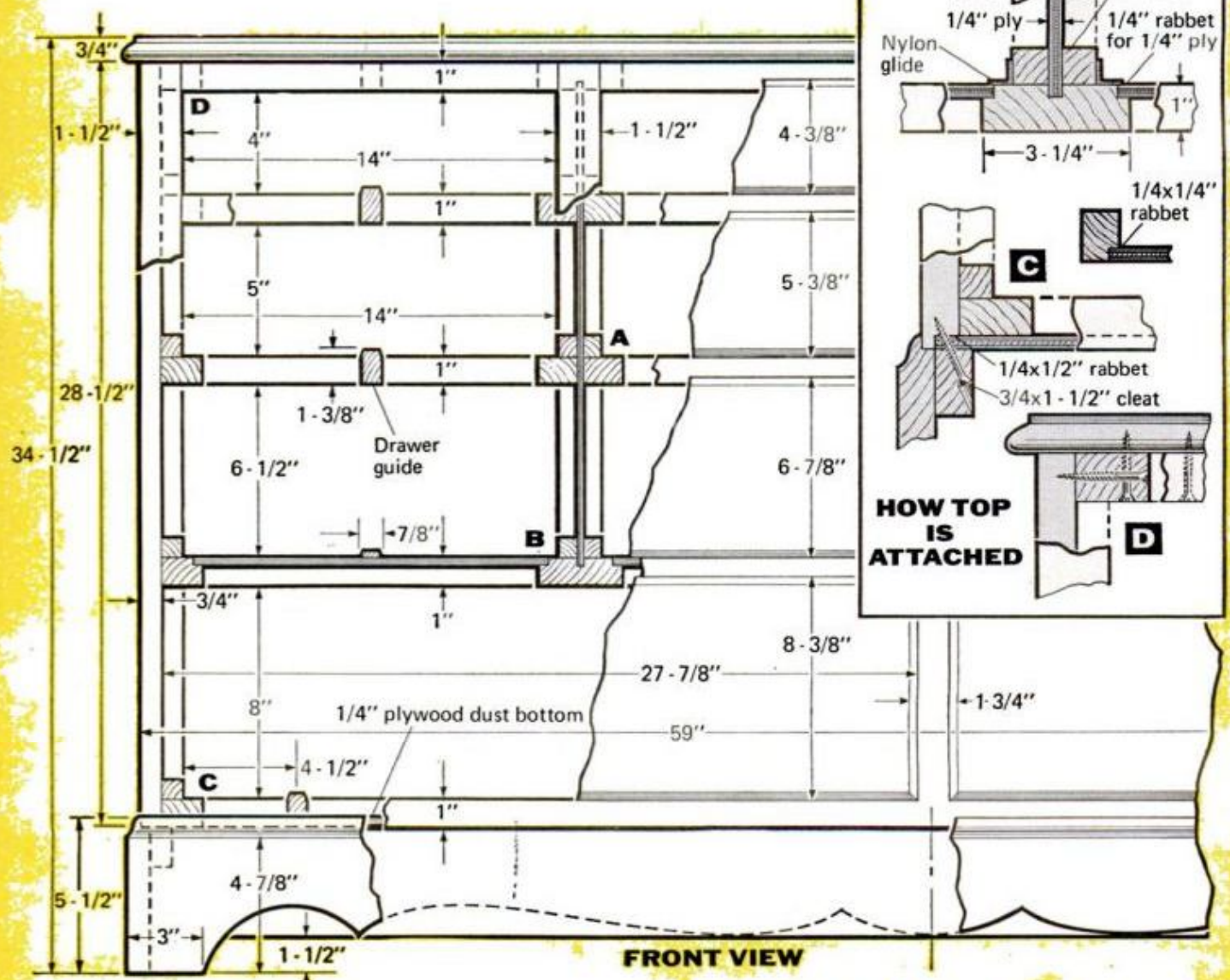
3/4x18 - 1/4x28 - 1/2" end panel

Mitered corner

Technical Art
By Fred Wolff

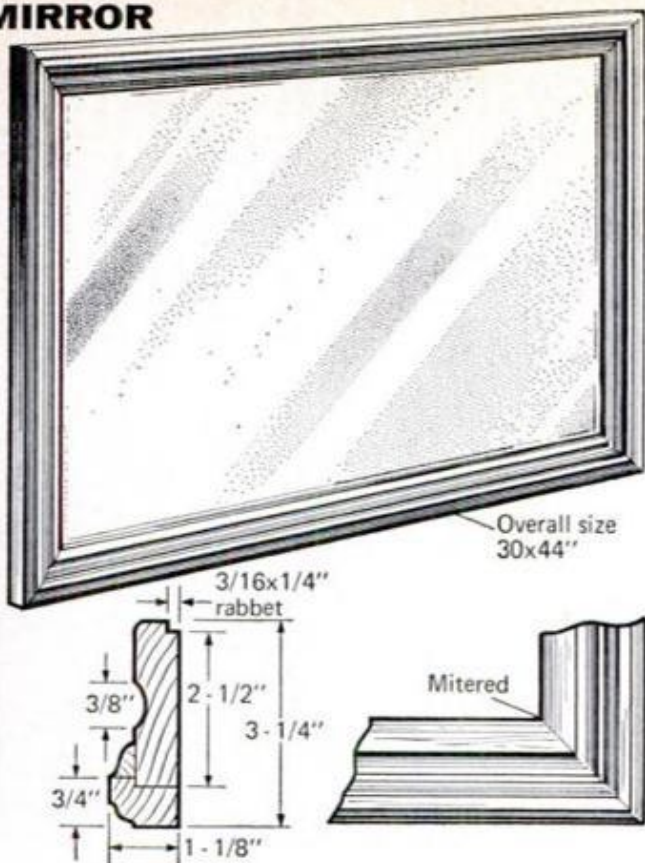


HOW TOP IS ATTACHED



FRONT VIEW

MIRROR



TWO PULLS ARE USED on long drawers, one on short ones. Early American hardware suits finish

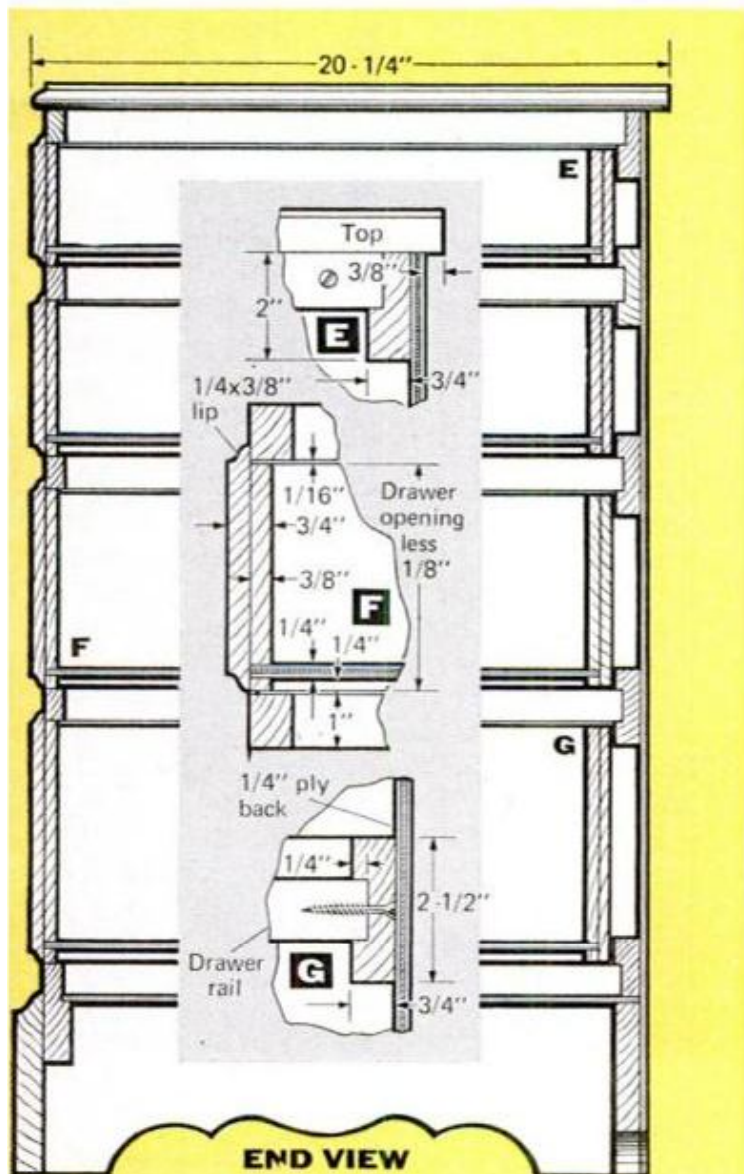
in. for the upper section and 18 $\frac{1}{4}$ in. for the dresser.

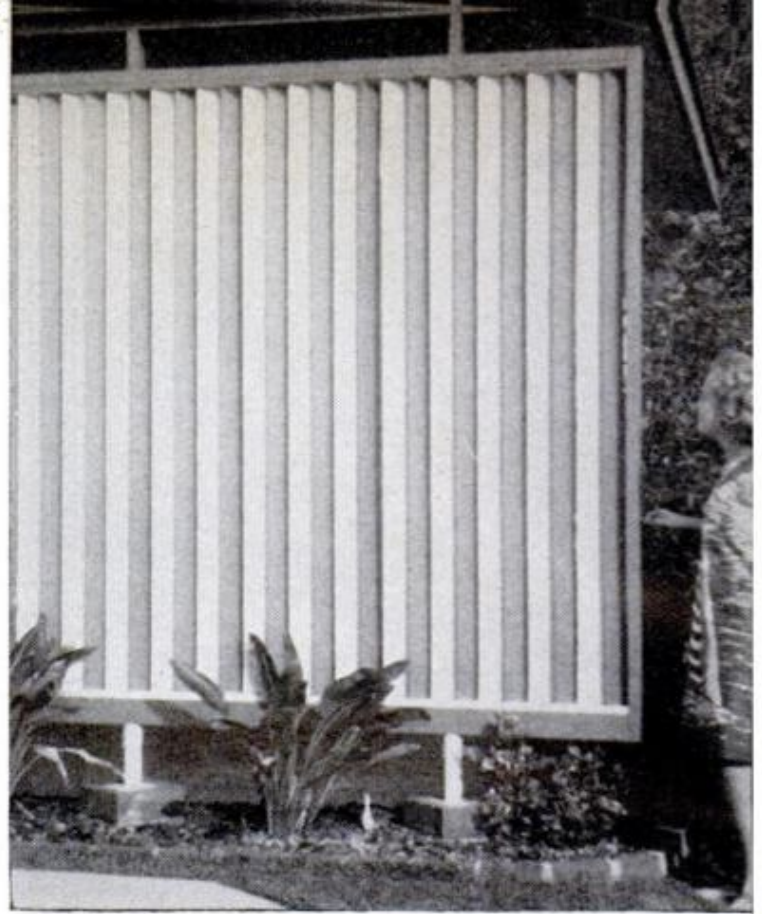
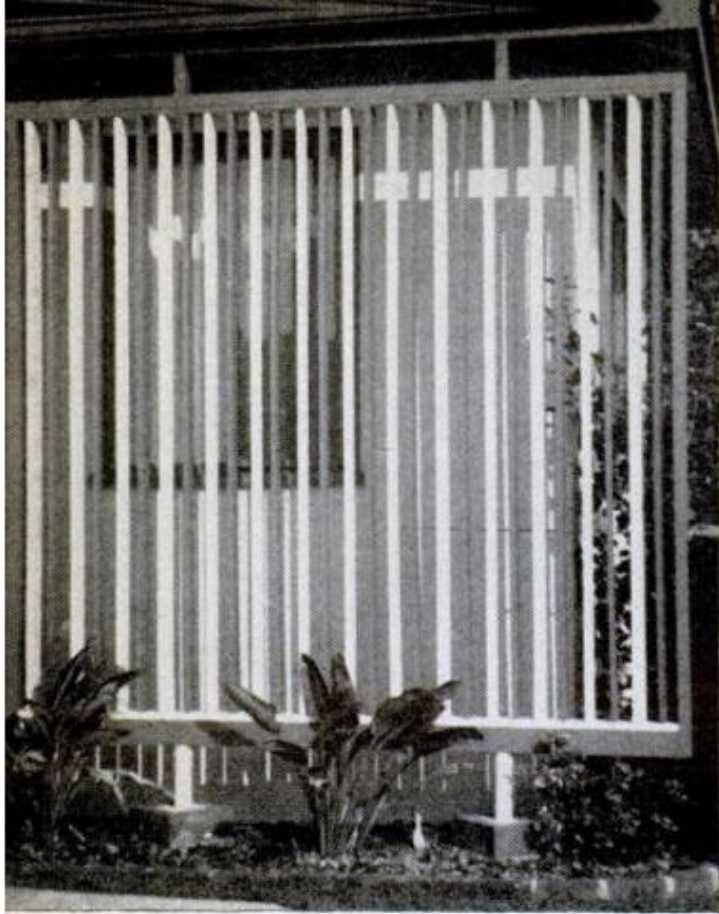
Notice in detail C, page 156, that the end panels for the lower chest section and those for the dresser are rabbeted along the bottom edges for a $\frac{1}{4}$ -in. dust bottom. Rabbets are likewise made in the lower front frame members. Rabbets also are made along the rear edges of the end panels for $\frac{1}{4}$ -in.-ply backs. Nail the dust bottoms in place to help hold the assemblies square.

All drawers in both dresser and chest ride on rails at each side and are guided by center tracks as in all good case-goods construction. Detail C shows how the L-shape side rails are made from 1 x $\frac{1}{2}$ and $\frac{3}{4}$ x $\frac{3}{4}$ -in. pieces and glued to the end panels in line with the 1-in. front cross members. The exception is at the top (see detail D) where only a 1 x $\frac{1}{2}$ -in. member is used. Details A and B show how the intermediate drawer-support rails are made, those at junctures A being the same as at C. In detail B a single member takes the place of the two 1 x $\frac{1}{2}$ -in. pieces and is grooved down the center for a $\frac{1}{4}$ -in.-plywood divider.

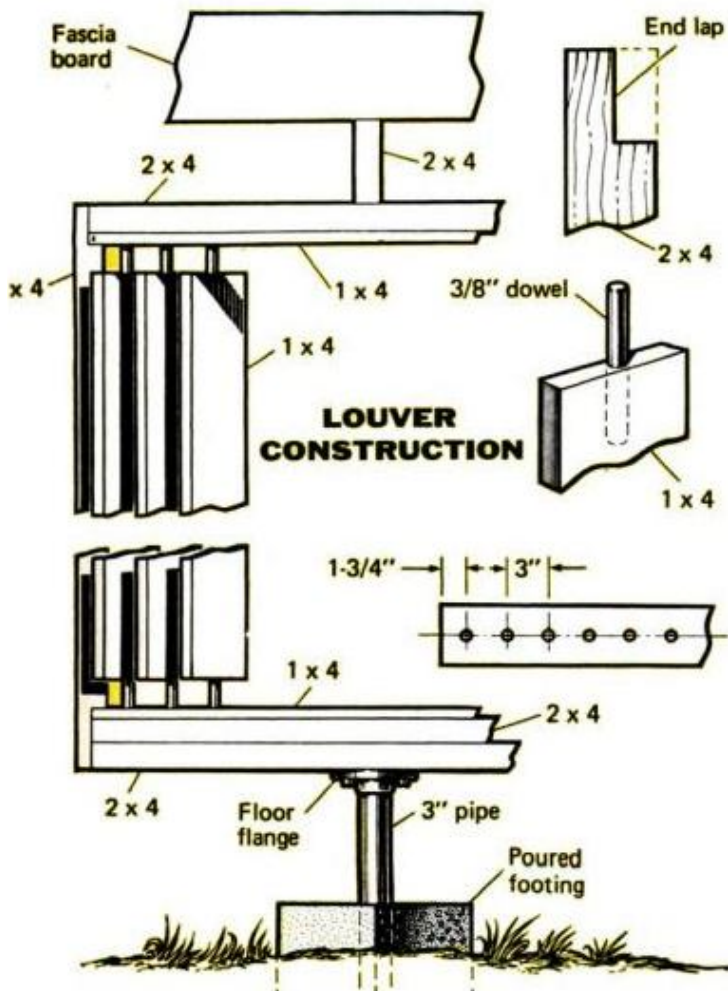
The drawer-support rails are anchored at the back in grooved cross-rails as shown in detail G at left. Notice in detail E how the shape of the

(Please turn to page 199)





Privacy Screens That



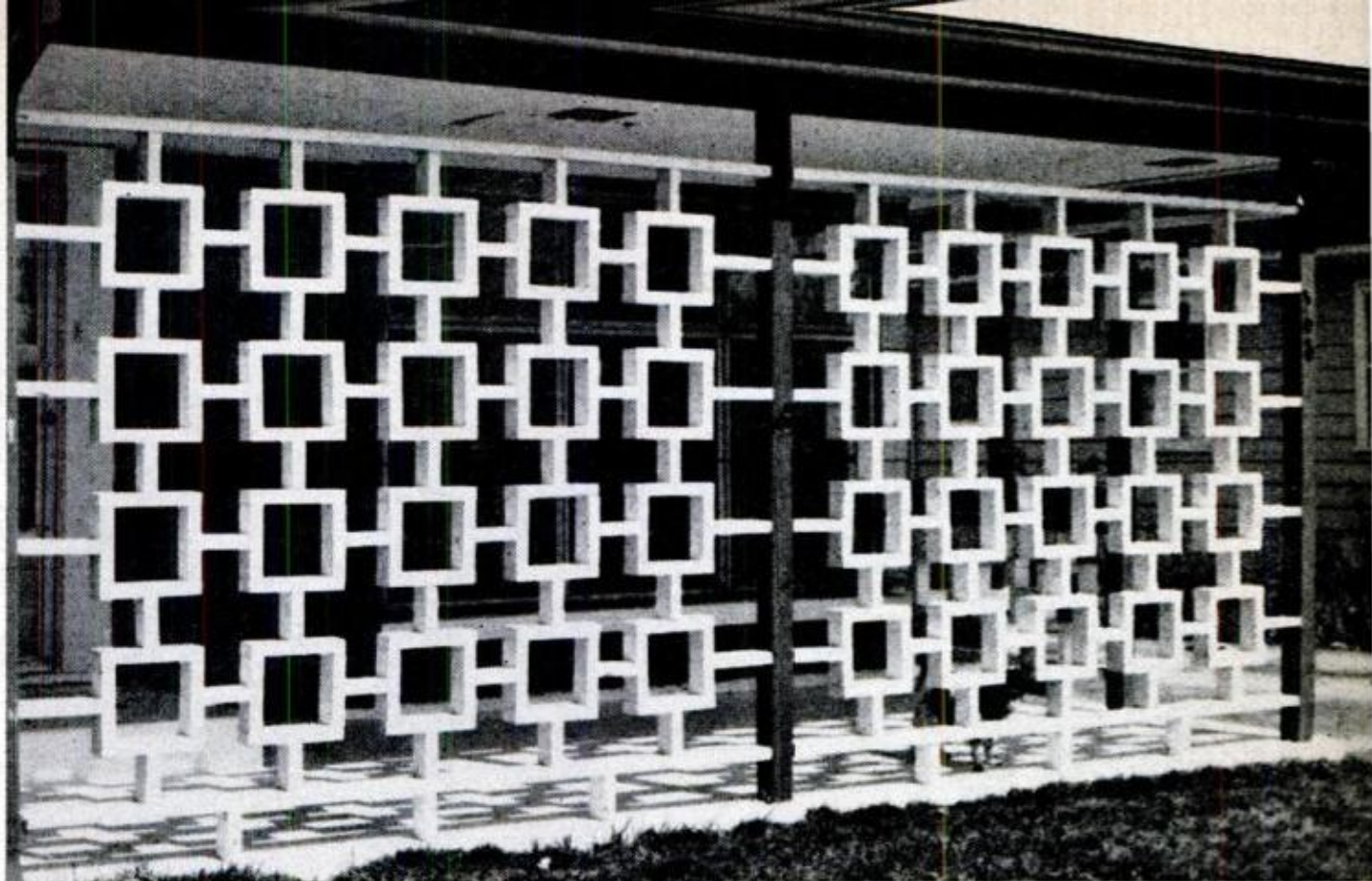
THERE WERE several reasons why my wife and I decided to add a fence to our home. For one thing, the bedroom on the southwest corner was unbearably hot every summer and, for another, we wanted privacy when entertaining on the patio. The screen we selected (above) satisfied both requisites with a bonus to boot: It features movable louvers that let cool breezes in or shut them out, as we choose.

Redwood was our choice when it came to picking which wood to use. It's good looking when installed, it weathers attractively and, most important, it is long lasting. The frame is constructed of 2x4s with the top and bottom rails doubled up for strength. The louvers are of nominal 1x4 stock with a $\frac{3}{8}$ -in. hole drilled to approximately a 1-in. depth on both ends to receive the dowels upon which they pivot.

Make certain that you extend your footings (for the posts) below the frost line in your area; a frost upheaval could twist the framing and make the louvers inoperable. If you add a long rod and hinge across the back, you can tie the louvers together and move them as one.

Robert W. Hoffner

POPULAR MECHANICS



Get Admiring Glances

BUILT ALMOST ENTIRELY of scrap, this handsome fence (above) satisfies a champagne taste on a beer budget. By sizing the grille-like squares to suit the cut-offs I had on hand, the only items I had to buy were four 10-ft. 2x4s, nails and the paint.

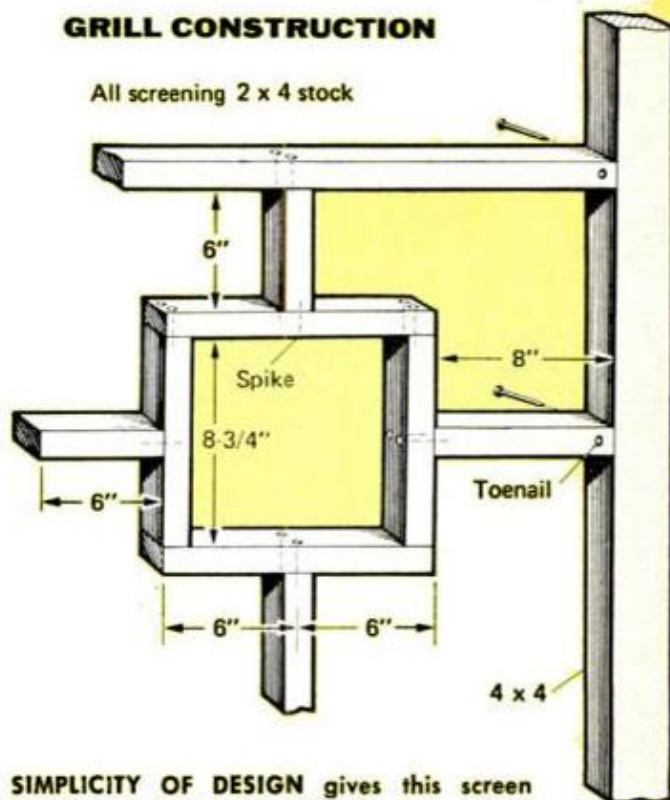
I built the fence in two 8-ft. sections on the patio floor. Then, as each section was completed, it was raised and fastened to the supporting posts with galvanized 10d common nails.

Before starting construction, you'll be wise to make a scale drawing of the area to be screened. Though the fence shown consists of 12-in.-sq. blocks and 6-in. stringers, the overall length of your fence could cause a change in these figures. Thus, dimensions shown in the drawing at right should be considered merely as a starting point when you lay out your own design.

All of the hardware used should be of the nonrusting type. Then, whether you decide to paint or stain the wood, the handsome appearance of your fence will not be marred by rust or weathering.

—Adam F. Wojnowski

GRILL CONSTRUCTION



SIMPLICITY OF DESIGN gives this screen its elegant look. Fence is simply squared boxes connected with 6-in.-long stringers

EXCITING NEW PRODUCTS

BY CATHERINE BILSKI



HAVE A BARBECUE indoors or out with the Ball-B-Q charcoal grill. Besides a unique design, it features a 340-sq.-in., split-level grill. Removing the post converts grill to a compact "table-topper" that also fits in your fireplace. Smoke escapes at rear; no vents to adjust. It may also be used as an ice bucket or warming oven. \$29.95 from Kermil International, Inc., 261 Great Arrow Ave., Buffalo, N.Y.

TRIM INCHES OFF your tummy, hips, thighs, tone body muscles and stimulate circulation with the Hula-Twist exerciser. Three separate swivels create a planetary movement that lets your body move freely. Two separate discs allow your feet to move back and forth. Sells for \$14.95 postpaid from Hula-Twist, 691 Arden Ave., Glendale, Calif.



KEEPING YOUR CAR CLUTTER-FREE is not a problem when you have the Car Kangaroo carryall. It slips easily over the front seat, and stretch sides assure snug fit. There are pockets in front for maps, tools, coins, whatever, and nine pockets facing the rear for games, toys, tissues, newspapers. \$8.95 from Halo House, Dept. S, 119 E. Meyer Ave., New Castle, Pa. 16105.



POPULAR MECHANICS

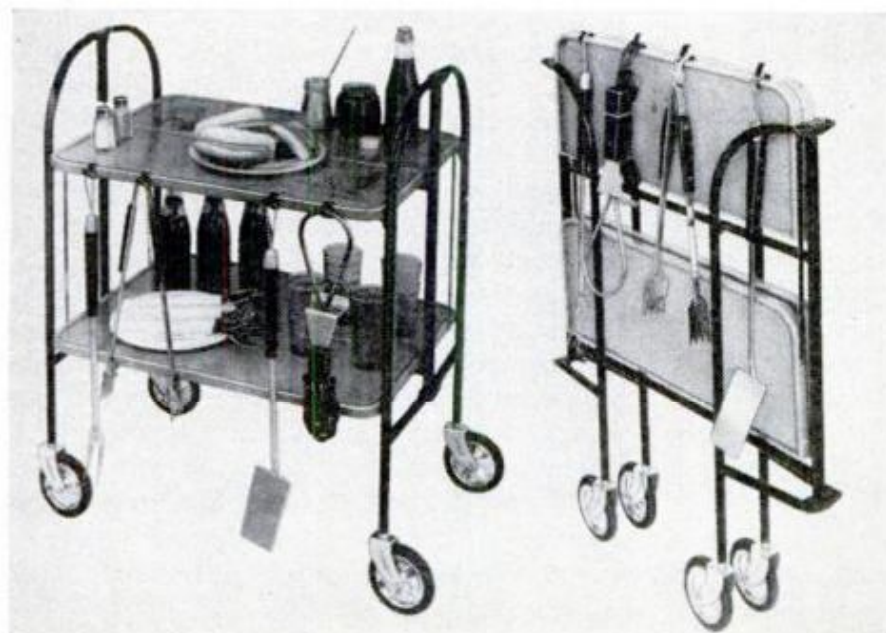
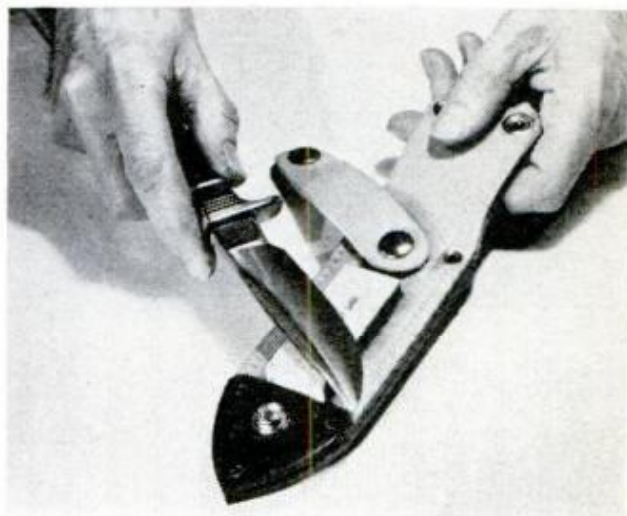


HAND VACUUM PUMP which weighs less than a quarter of a pound will deliver and hold a full vacuum up to 25 inches. It's useful for starting a siphon, cleaning aquariums, bleeding fluid lines and more. Mityvac retails for \$4.95 from Neward Die and Manufacturing Co., 2066 W. 11th St., Upland, Calif. 91786.

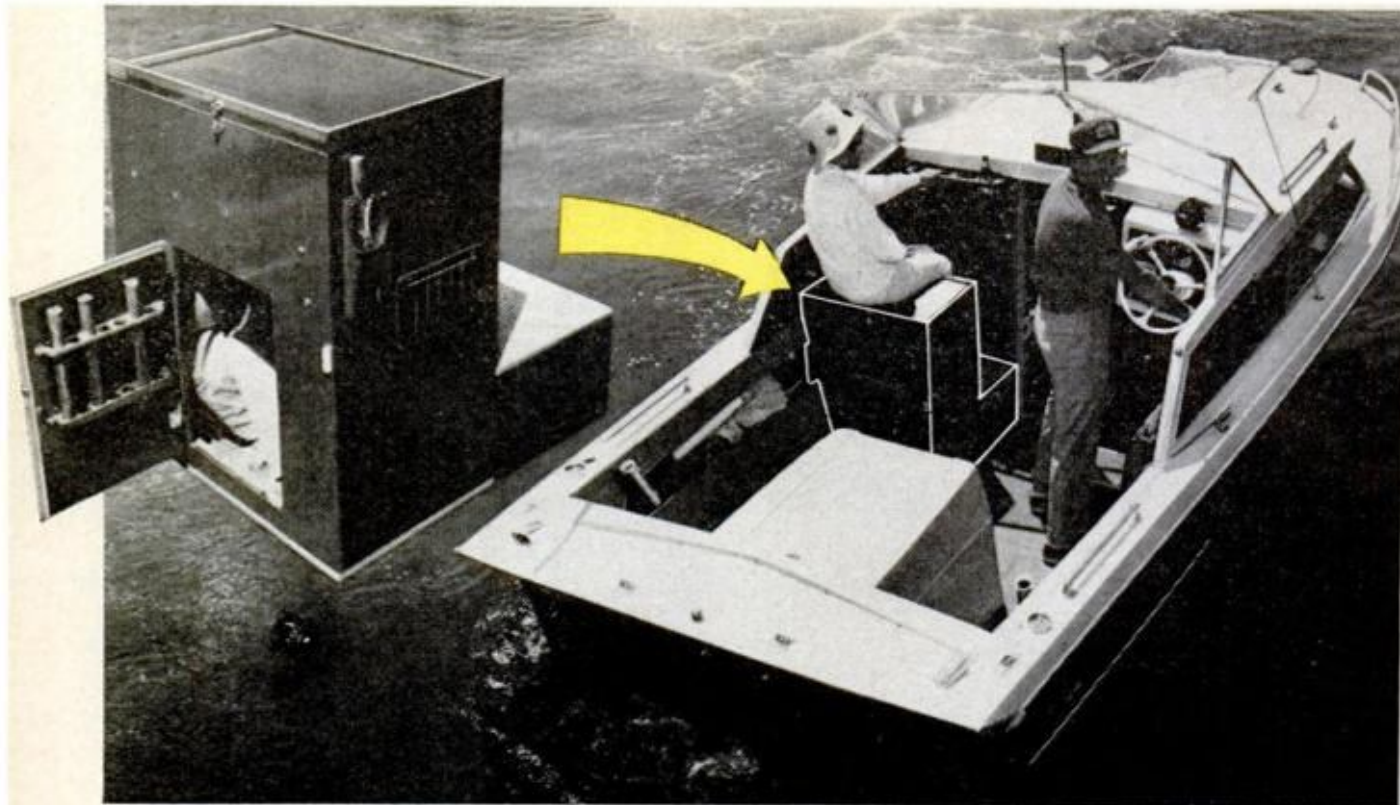
AN OILSTONE attached to the sheath of this sportsman's knife makes it easy to keep the knife sharp in the field. Another feature of the Locknife "450" (below) is a snap-on loop that permits the sheath to be attached to the wearer's belt. Price is \$27.95; Locknife, Inc., 11717 E. 23rd St., Independence, Mo. 64052.



GET EXTRA WEAR from shoes and boots. Sole Saver spreads on like butter, dries to tough "crepe" sole to give additional wear to serviceable footgear. Available in quart (\$5.95), pint (\$3.95) and half-pint (\$2.25) sizes from Carpet Products Co., Central Square, N.Y. 13036.



GET THINGS ROLLING at your next barbecue with the Fold 'N Roll Bar-B-Q-Cart. Made of heavy metal, it has two 18x24-inch shelves with six plastic clip-ons from which you can hang your barbecue tools (tools not included) and rubber casters to make it roll easily. It folds to 2 $\frac{3}{4}$ in. thickness. Another use is as a kitchen utility table. Available with black frame and burnt orange, avocado or harvest gold shelves. Cart is priced at \$22.95 from Habny's, 261 Huntington Ave., Buffalo, N.Y. 14214.



Put that wasted space beneath the seat to work Build This Cockpit Galley

ANY SMALL-BOAT OWNER is grateful when he can dream up a scheme that will let him get more use from his limited floor space. The skipper of the craft shown did just that when he custom-built this cabinet. It provides a compact cooking center, a storage locker and a companion helmsman's seat.

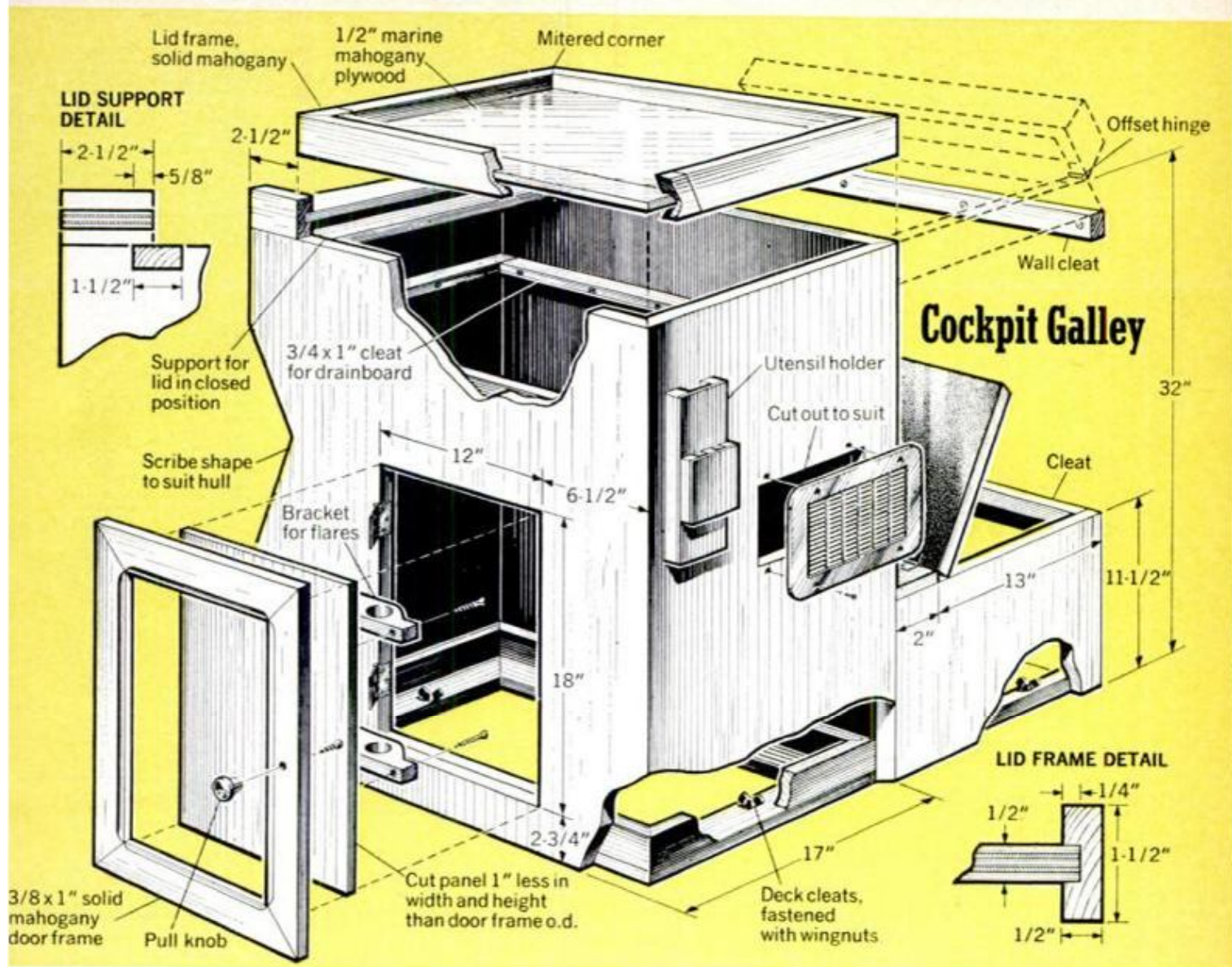
Lacking standing headroom and adequate walking-around space, the cabin was ruled out as the place to locate a galley. But once it was decided to put the galley in the cockpit, two conditions had to be met: It had to be compact, and it had to be out of the way whenever shipboard activities shifted to fishing, skiing, skin diving or cruising. The design shown meets these requirements because the center becomes a seat when the lid is closed. For user comfort, you can add a flotation cushion.

Swing open the top and the galley is immediately ready to use. The molded fiberglass drainboard and sink is equipped with a combination spigot and pump attached by hose to a 5-gal. jerry can stored inside the cabinet. The sink empties

through a fitting in the side of the hull via a rubber hose.

The interior of the galley cabinet may be outfitted as desired to facilitate storage of cooking utensils and other kitchen supplies. The storage locker is convenient for similar storage and is within easy reach of the chef's hands. The skipper used the original cabinet cupboard to stow life preservers which often are crammed into inaccessible corners of cabins.

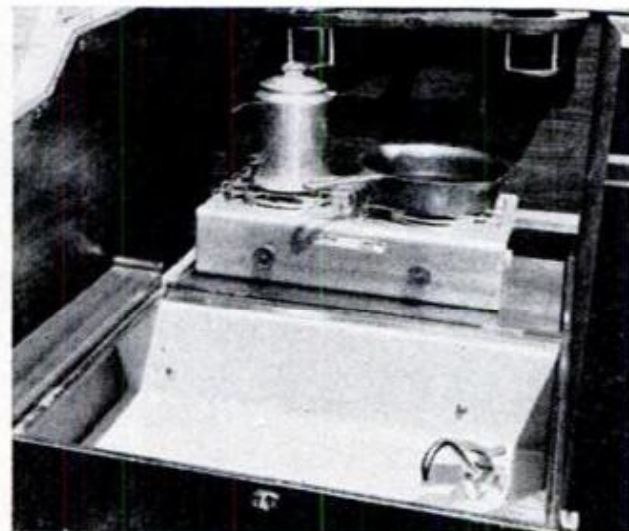
Since cockpit layouts vary widely, every skipper must custom-design or adapt this cabinet to fit his particular boat or accommodate a different size of stove or sink. However, the measurement given here may be used as a general guide. The skipper who built this cabinet had to fold open a 17-in.-wide top into a 15-in.-wide space (distance from cabinet to cabin bulkhead is 15 in. and fuel tanks did not permit moving the cabinet farther aft). His solution was to split the top with a bevel cut (to give added strength while closed), then fasten the pieces with two offset hinges. The stove is bolted to the underneath side of the lid. Stove depth



in the closed position determined the height of the sink.

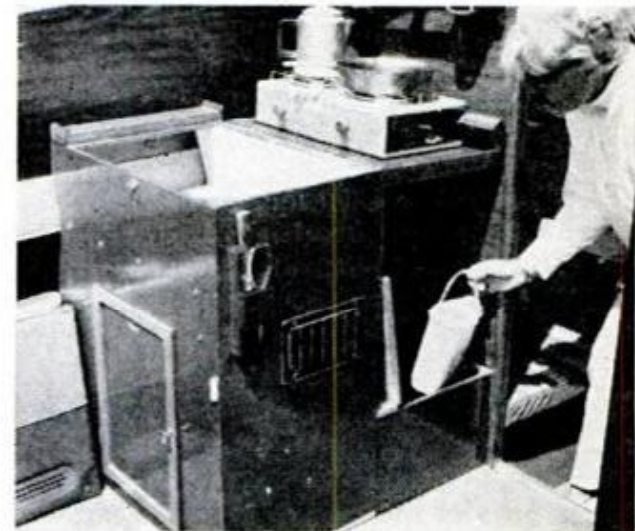
Mahogany was used for the exposed wood and finished with three coats of sealer and two of spar varnish.

TWO-BURNER Coleman LP picnic stove uses a canned fuel; the molded sink and drainboard rest on cleats



Before constructing your galley cabinet, purchase the stove and sink unit. Then measure available space carefully and design the cabinet to match hull contour and interior appointments.—Patrick Perrett

WALL-MOUNTED CLEAT supports opened lid, storage locker below keeps the life preservers accessible



Take the 'Sweat' Out of Condensation Problems

By STEVEN J. HOWARD



Your home's not likely to rot and collapse during your lifetime, but moisture can give you financial problems

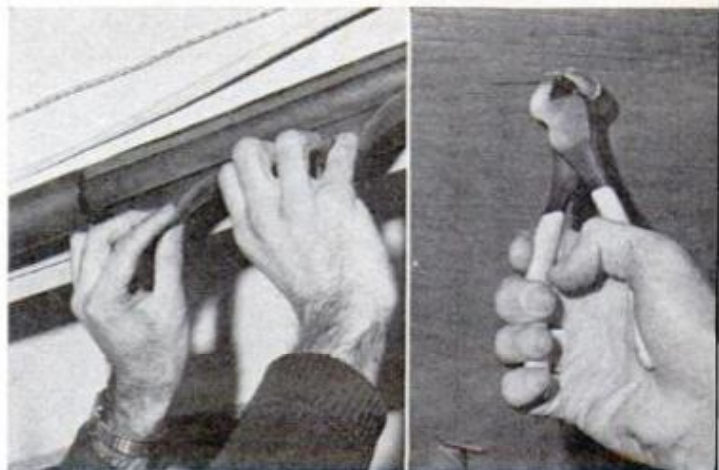
DAILY LIVING ROUTINE for a family of four can put more than six gallons of moisture into the air every day. Cooking, showers and baths are the prime manufacturers of unwanted moisture in the home. Unless you provide a means for removing excessive moisture, paint will blister and peel on the exterior and structural members on the inside may be seriously damaged as a result of rot and mildew.

Homes that are built tighter and with better materials today don't "breathe." A quality house will have a vapor barrier built in; thus moisture is no problem. But, most older houses lack a vapor barrier and proper venting.

First, determine for certain whether you have a condensation problem. Keep in mind that vapor is not the problem—it's *condensation*. Look for telltale signs in the attic, basement and on window frames.

Condensation in basements appears in warm weather when warm moist air from outside reaches colder basement walls,

floors and cold-water pipes. Sometimes, however, dampness in a basement is from water leaks through a wall. To find out for certain, tape a pocket mirror to the wall and leave it there for a day. If it's covered with moisture at the end of this period, you have a condensation condition. Condensation problems in the attic, how-



MINOR PROBLEMS are easily corrected. Cold-water pipes (left) are wrapped to stop sweating. Nails through roof sheathing (right) are snipped flush

POPULAR MECHANICS



ELECTRIC DEHUMIDIFIER is worthwhile investment to prevent mildew forming on stored items. The cost of a high-quality dehumidifier will exceed \$100

ever, usually occur during cold weather.

A partial solution for peeling paint on the siding is to remove all paint down to bare wood and repaint with a latex primer and finish coat. On inside walls, create an artificial "vapor" barrier by priming with an aluminum paint before applying two decorator coats of paint. The more coats you apply, the better chance you have of creating a barrier.

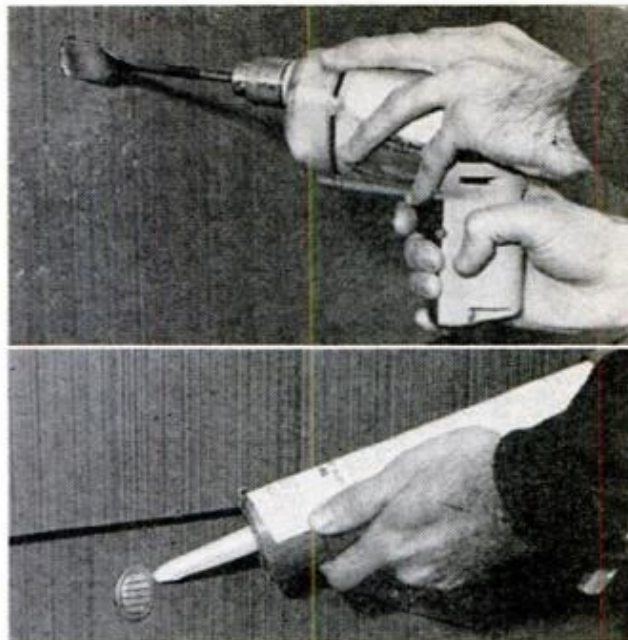
Probably the best way to prevent condensation from ruining paint is to install vent caps in the siding to insure air circulation in the walls (see drawing, page 166). You'll find them in hardware stores. Space these vents every 16 in. at the top and bottom of each bay (between studs) in the affected area.

Since most moisture is produced in the kitchen and bath, it's usually best to create the artificial barrier in these rooms or to cover walls with a vinyl-coated wallpaper.

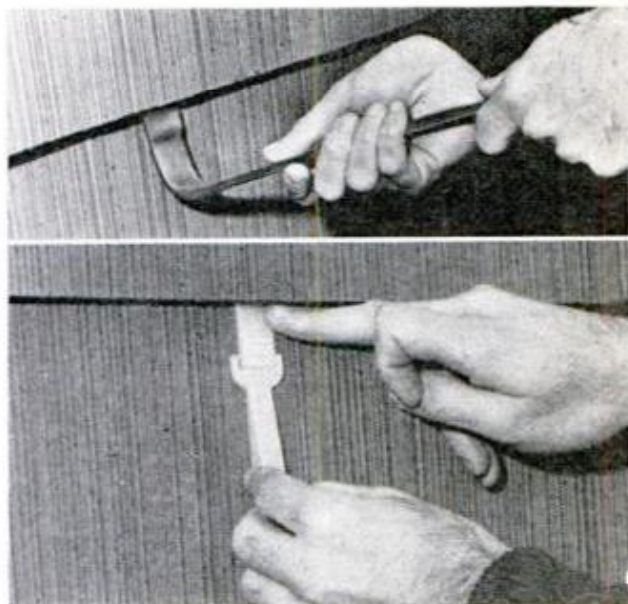
You can keep the moisture level in these rooms down by opening a window but exhaust fans are advisable. Make sure any exhaust fan you buy can handle the job. Fans are measured in cubic feet per minute (c.f.m.), which refers to the amount of air the fan can exhaust from a room in a minute. To determine the size fan you need, multiply the room's length by width by height to obtain cubic feet of volume. To dissipate moisture, a fan should com-

TAPE A POCKET MIRROR to the basement wall and leave it there for 24 hours; you can then determine whether dampness is caused by leak or condensation

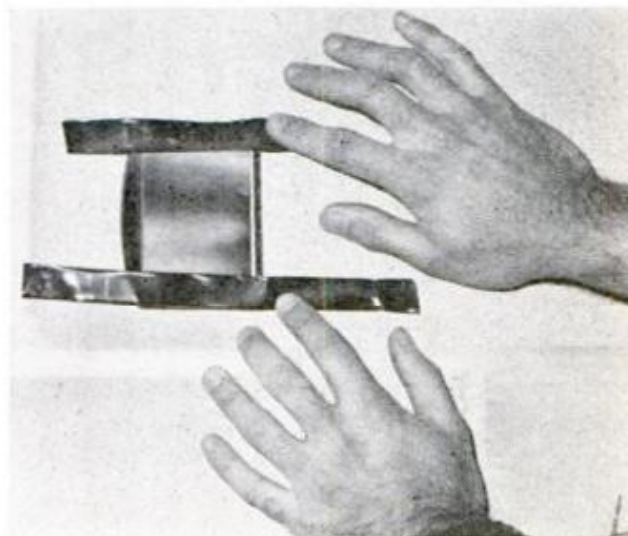
AUGUST 1970



HOLE IS DRILLED to suit vent being used and vent is tapped into place. To protect against water seepage at the hole, apply caulking to the installation

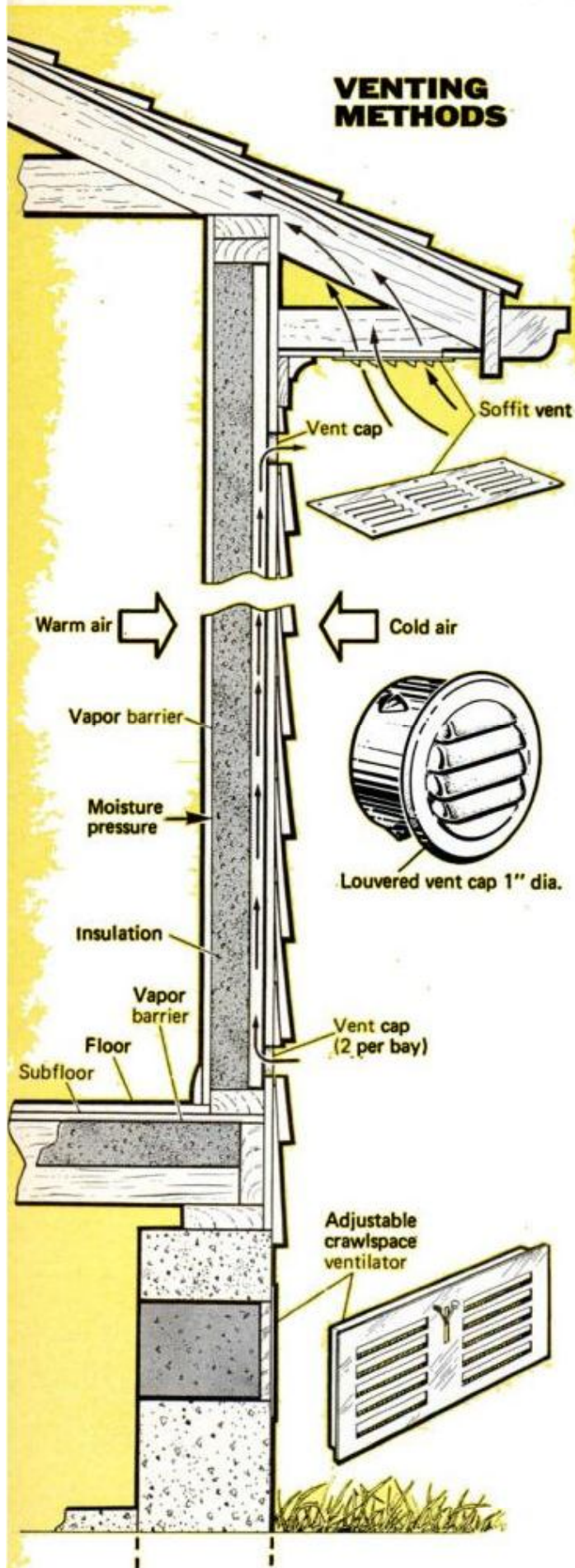


SHINGLED HOUSE can be vented by prying a shingle loose and driving plastic wedge behind. Type shown is by Shur-Line Manufacturing Co., Lancaster, N.Y.



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VENTING METHODS



TO PROTECT EXTERIOR WALLS from moisture that penetrates them from the warm side, you must provide for adequate ventilation to keep air in circulation through the walls

pletely exhaust the air in a room every two minutes. Thus, divide the cubic feet of the room in half to determine the *minimum* c.f.m. rating needed.

In an unheated, unfinished attic, condensation can form on cold metal surfaces, such as soil pipes and shingle nails that protrude through the underside of the roof boards. Proper venting of an attic depends on the louver size. The total area of louvered opening should be at least $\frac{1}{4}$ in. per square foot of attic floor area. Use at least two louvers located at opposite points in the attic to give complete coverage.

Never finish a basement without first curing a condensation problem. Excessive condensation may prevent use of the area for storage because of mildew.

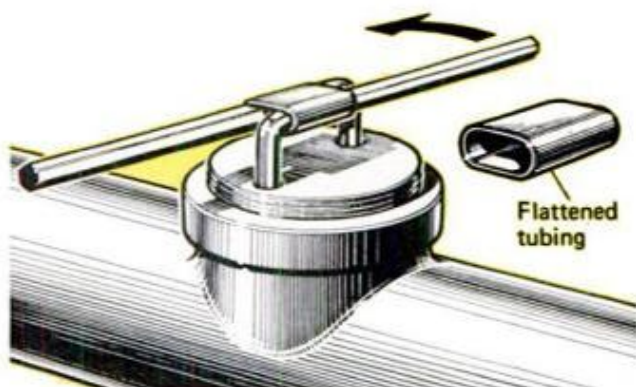
Sweating cold-water pipes during warm weather can be corrected easily by wrapping the pipes with a tape made especially for the job and sold through hardware stores.

Condensation can be prevented from forming on basement walls by installing on the walls a material that combines moisture-resistant insulation with an integral vapor barrier. For added protection, first coat the wall with a bituminous compound. Nail furring strips (that have been treated with a preservative to prevent rotting) to the wall and then attach insulation to furring. Remember to keep the vapor barrier face on the room (warm) side.

If you have a situation where mildew forms on stored books, clothes, luggage, furniture and the like, consider buying an electric dehumidifier. Although dehumidifiers and airconditioners both reduce humidity, a dehumidifier is not an airconditioner and, in fact, tends to increase temperature in the area where it's used. Thus, if dehumidification is required in a living area of a home, especially in summer, you might be better off buying an airconditioner. Dehumidifiers will do the job more economically in areas where comfort isn't a factor, such as basements, attics and closets.

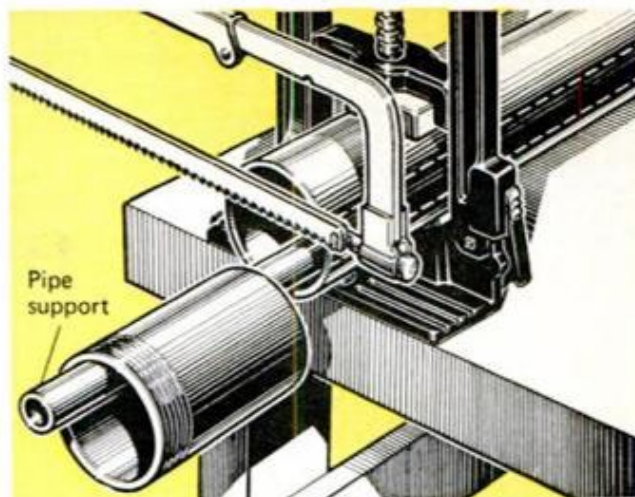
What size should you buy? There are too many variables to establish a hard-and-fast rule. Dehumidifiers, depending on capacity, collect from 10 to 48 pints of water daily. Select one according to the volume of space you want to dry out and your own opinion of the severity of the moisture problem. To be safe, buy a model with a higher capacity than what you believe is necessary. And, for best results, keep windows and doors shut in the area being dried. ★ ★ ★

HINTS FROM READERS



Improved spanner wrench

Lacking the right size spanner wrench when removing a drain plug recently, I made a homemade version using two Allen wrenches. I inserted the short legs in the holes so that the long shafts engage when turned. Keep them tightly together by sliding them into a short length of flattened tubing—*Peter Legon*



Pipe prevents injury

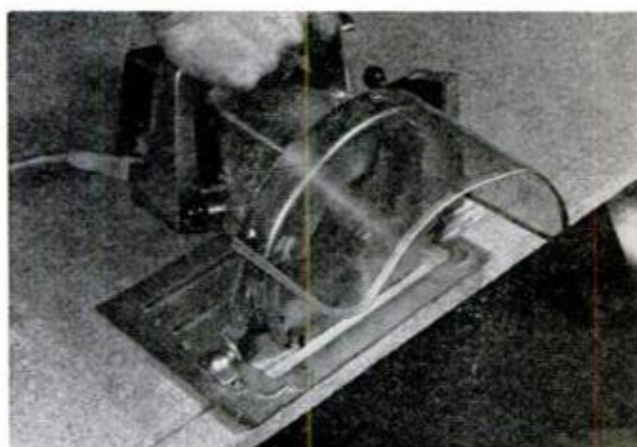
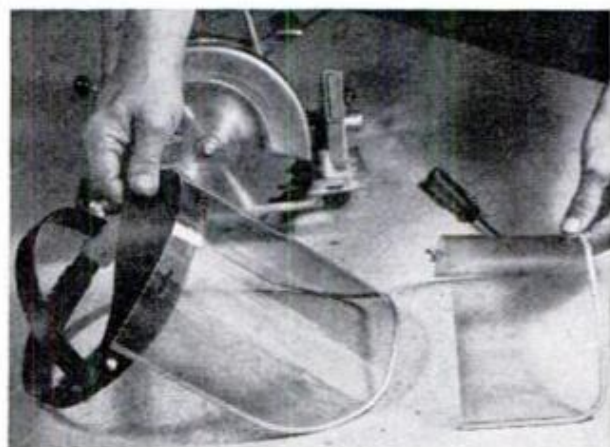
Save your toes from a piece of pipe that drops when it's cut free by inserting a length of smaller-diameter pipe into the pipe to be sawn before cutting. Make certain that the length of pipe serving as a "catcher" is long enough to support the weight of the length to be cut off.

—*Russell M. Kendrick*



Scale speeds wrench adjustment

Here's a good trick for increasing accuracy and speeding up the job when you're presetting the jaws of an adjustable wrench. Simply etch or scratch a scale on the stationary jaw and an index mark on the movable jaw. To make the scale easily readable, fill the lines with a small amount of black paint and let it dry. It's particularly helpful when reaching into blind places. —*Wilber H. Fulker*

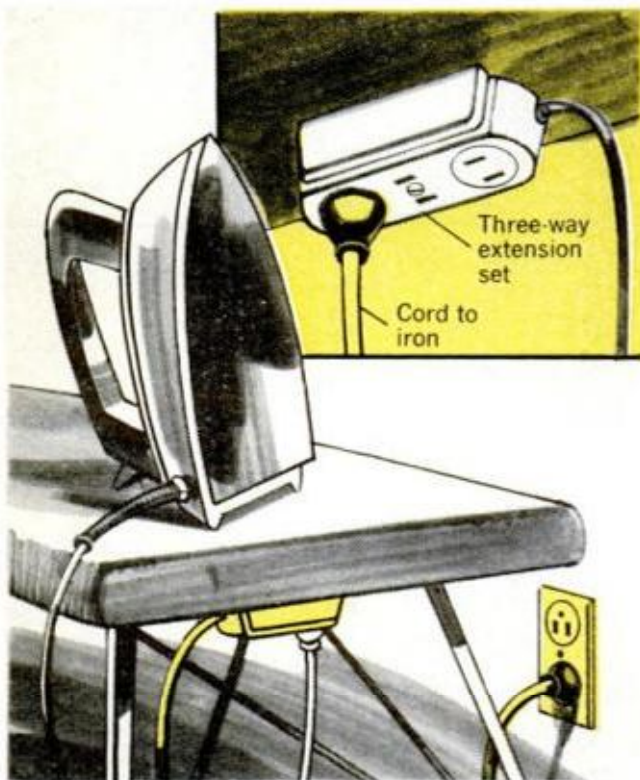


Shop-built shield for portable saw protects eyes

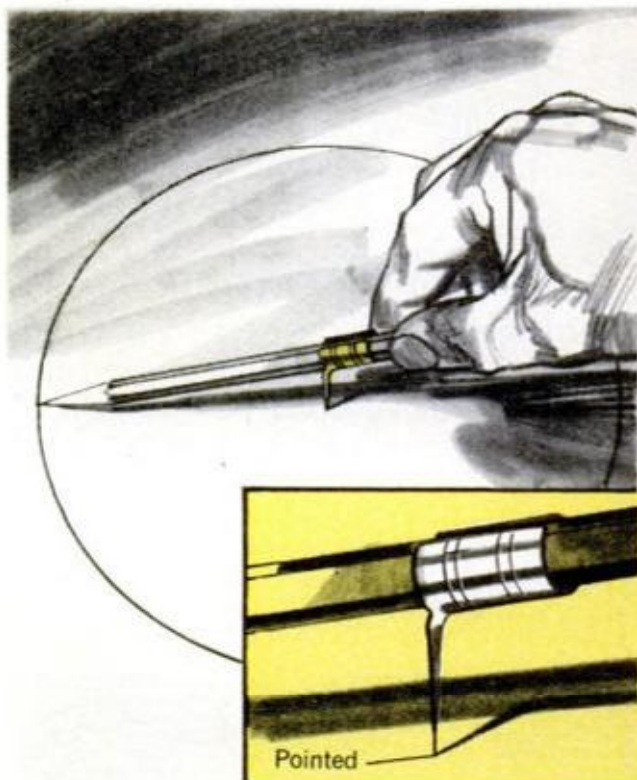
Keep your circular saw from spewing sawdust into your eyes by making this simple guard. I used a section of plastic from an old face shield such as that shown at left. After cutting plastic to suit the saw, attach it to the saw's housing with sheet-metal screws. Make certain that screws do not interfere with the retraction of the blade guard. To be safe, check this before hooking up the saw to a power source. The shield can be quickly removed if desired.—*C. Wayne Close*



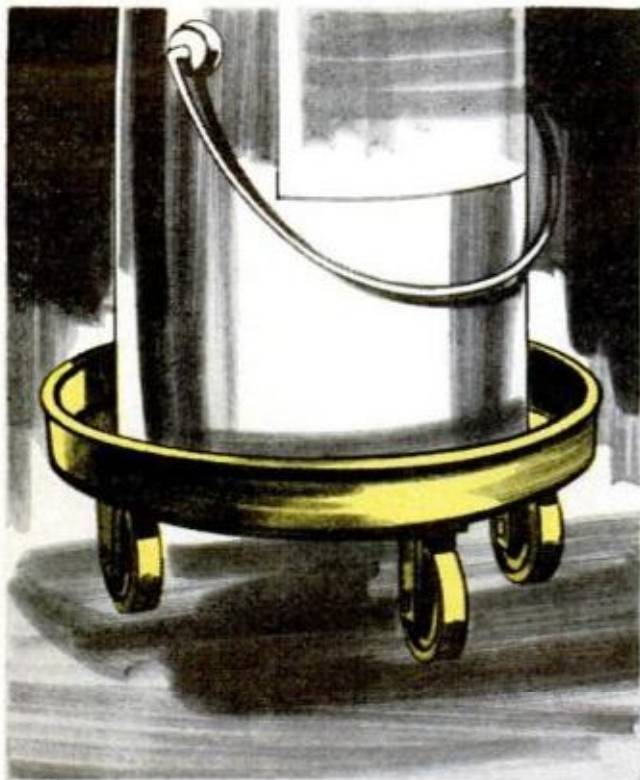
SOLVING



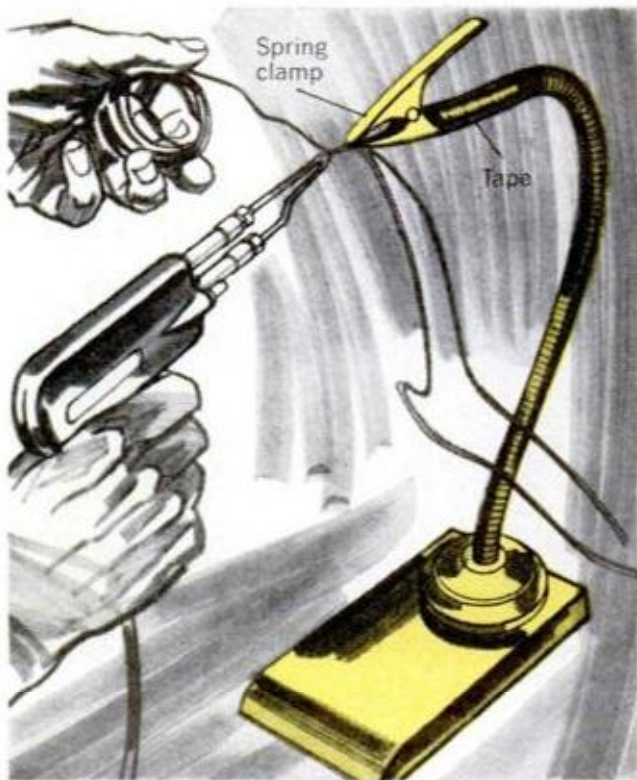
YOU CAN ELIMINATE long-cord drag when ironing by mounting the extension cord to the underside of the board. Simply anchor the receptacle and plug the end of the iron cord into it.—Albert T. Pippi



A PENCIL CLIP, bent at a right angle and filed to a point, will make a pencil an instant compass. Simply slide the clip along the pencil to the desired radius and scribe the circle as shown.—Ray Moore



I'VE NAMED THIS "INVENTION" of mine the Roll-Around. To make it you need a garbage-can cover, swivel casters and 16 ¼-in. stove bolts. Rolling sure beats carrying the trash cans.—Eric E. Swanson

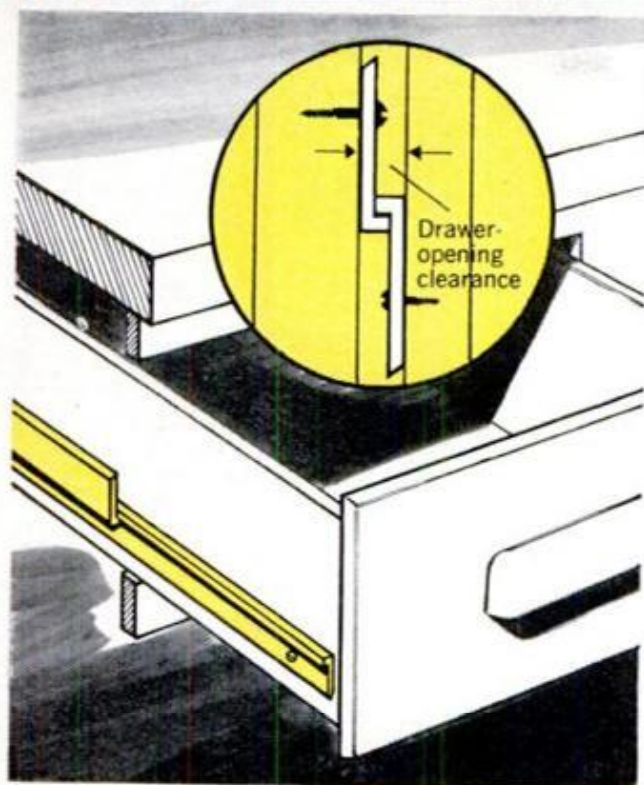


IF YOU REMOVE the socket and wire from an ordinary gooseneck lamp, you'll have a handy "third hand" for holding small objects for soldering. If necessary, you can weight the base to anchor it.—A. Weber

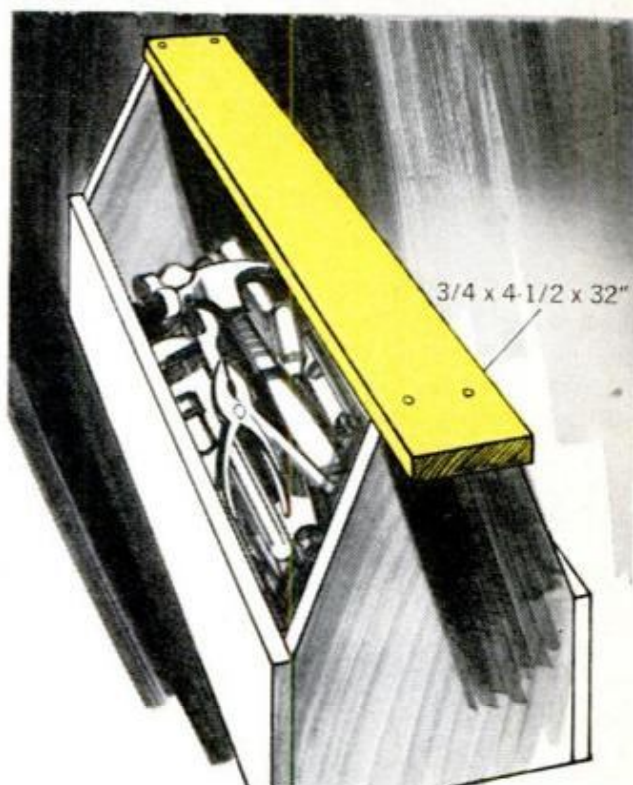
POPULAR MECHANICS

HOME PROBLEMS

Illustrations by Adolph Brotman, Worman Associates



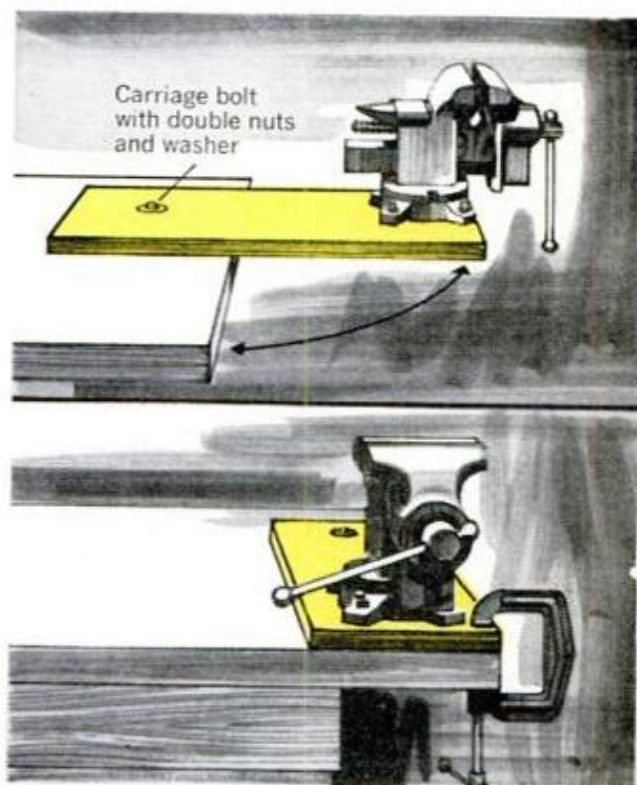
DON'T THROW SCRAPS of countertop moldings away; they make fine drawer slides when the lips hook each other, as shown. Adding a little silicone spray or liquid soap will insure easy sliding.—Victor H. Lamoy



ADD A FLAT HANDLE to your toolbox and it will double as a pint-size sawhorse. If you build the box at least 16 in. high, it will also serve as a "stepladder" for overhead jobs.—John F. Dinges



A SAFE SUBSTITUTE for scaffold planking is a ladder laid across scaffold ledgers with boards on top. Weight is evenly distributed and there is no sagging or springing of the ladder.—Victor H. Lamoy
AUGUST 1970



A BENCH-MOUNTED VISE is a necessity, but many times the tool gets in the way. You can swing it out to one side if you mount it on a pivoting board. A C-clamp holds the vise secure when used.—A. Weber

New tools you should know about

CHAINSAW SHARPENING by hand has been eliminated by Quickcut Power Sharp System for Lombard and Homelite XL series chain-saw owners. A stone-activating knob is disengaged and turned to bring screw against stop. With chain tight, run saw, adjust screw until sparks show. When they stop, saw is sharp. American-Lincoln, Toledo, Ohio 13601.



LOW-COST JIGSAW boasts 2.5-amp. "burnout protected" motor that delivers 3500 strokes per minute. Saw features splinter-resistant shoe and an automatic blower to keep the cutting line in view. Model 432 is double insulated, weighs 3 1/4 lbs. and retails for \$28.95. Skil Corp., 5033 N. Elston Ave., Chicago, Ill. 60630.



ELECTRIC DRILL KIT from the Stanley Works, New Britain, Conn. 06050, contains a set of three twist drills and a sanding-polishing kit that includes a sander-polisher disc, sandpaper and a polishing bonnet. Called Ranger, the 3/8-in. drill sells for \$20.

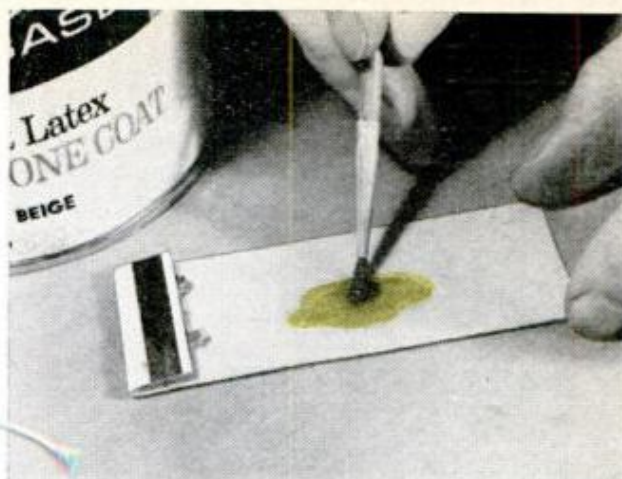


PLASTIC CAPS for use with both quick-twist and quarter-twist baby food jars let you hang them on 1/8-in. perforated hardboard. Dubbed Handy Dandy, they are sold in packs of 10 for \$1. The same manufacturer also offers a package of pressure-sensitive labels for identifying screws, bolts, nuts, nails and a variety of other shop supplies. The labels are available in sets of 120 printed and illustrated, plus 20 blanks. Priced at \$2. Handy Dandy, Wickliffe Industries, Inc., Box 286, Wickliffe, Ohio 44092.

HINTS FROM READERS

Color to match? Try this 'swatch'

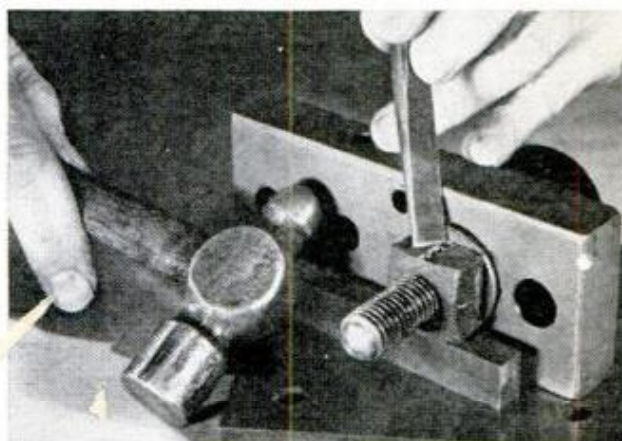
Next time your wife goes shopping to match rugs, draperies or other accessories to a newly painted room, have her try this trick. Simply apply a dab of the paint to the inside of a matchbook and allow to dry. You'll find that the actual sample is more reliable for critical matches than the chips in color charts, and a matchbook a fine way to carry a swatch.—*William Swallow*



Remove a stubborn nut quickly

Occasionally a frozen or rusted nut is difficult to remove with either torch or cold chisel. A fast method that I use is to drill a row of holes through the nut as closely together as possible. Then I finish up with a cold chisel and hammer. Actually, I have found that this stunt reduces chiseling time by as much as 80 percent.

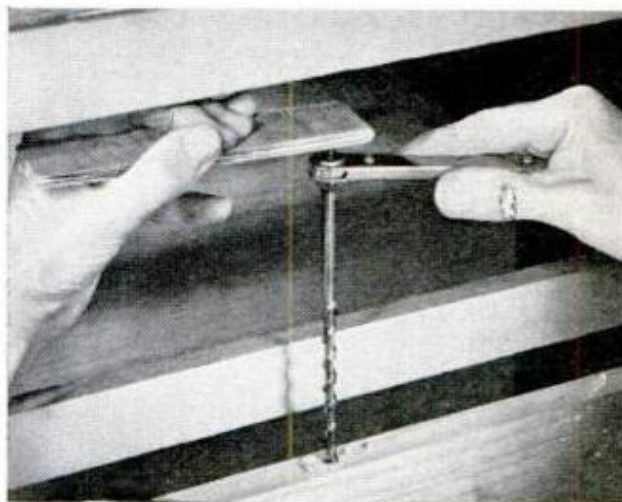
—*W.M. Webbert*



Wrench subs for brace

You often come across a boring job where there just isn't enough room for swinging the brace and bit. On those occasions, I use the bit alone with a box-end wrench slipped over the square shank. You can exert more than enough power to drill the hole to the desired depth.

—*Wilfred Beaver*



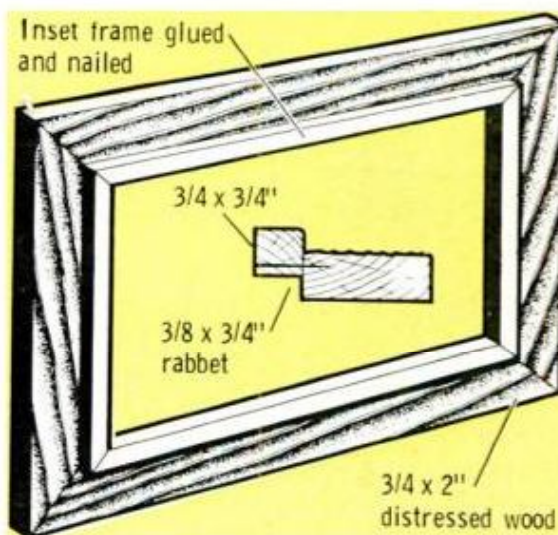
Get pen working fast

Fine-tipped pens, such as those the artists and accountants use, come from the factory treated with a waxy coating. This means a thorough cleaning with a solvent is required before you can get the ink flowing. A quicker method that I've discovered is to pass the point over a match flame for a second or two. This not only removes the film, but notably improves the pen's ink flow control.

—*Leonard Michal*

Easy way to make 'rabbeted' frame

Using scrap pine you can make an attractive picture frame by gluing an outer frame together and antiquing with a propane torch and wire brush. Then assemble an inner frame of a size to form the picture-holding "rabbet," paint it white and fasten to the first frame with glue and countersunk nails. The job goes quickly and looks great.—*Norbert Engels*



Flexible-Shaft Machine Rolls to the Job

By WILLIAM G. WAGGONER

Technical Art by Peter Trojan

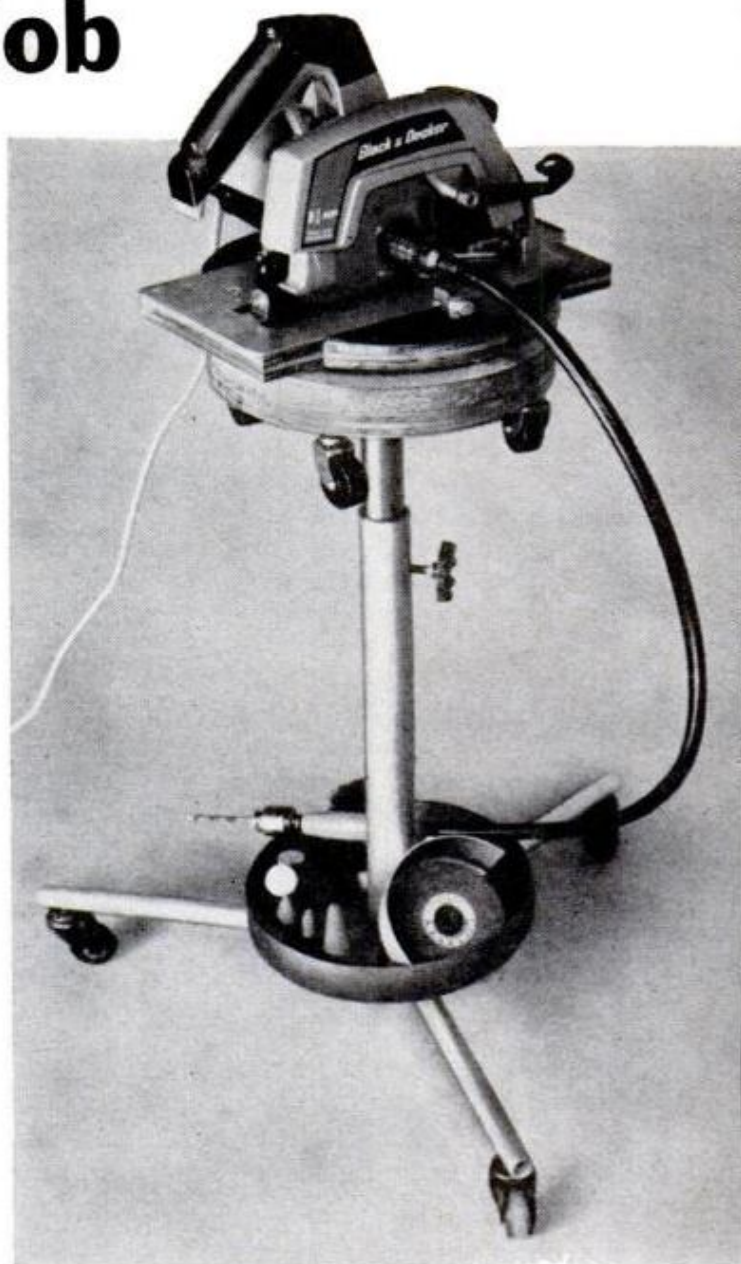
SIMPLY DESIGNED and easy to build, this novel flexible-shaft setup has many features as can be seen in the photos.

As a power source, the circular saw offers many advantages. It saves you the price of a high-speed motor and it revs up sufficiently to permit use of mounted stones such as those used in rotary electric grinders. If you use a grinding wheel, say for grinding welds, a 4-in. wheel is usually well within safety limits for your circular-saw speed. But, always check the grinding-wheel speed limits and, of course, use a guard and goggles as you do for all grinding operations.

Most small circular saws have $\frac{5}{16}$ -in. x 24 threaded arbors. You can purchase a chuck that will screw into the saw arbor, thus eliminating any machining for the setup. You may have a flexible shaft that has a female connection for fastening to a motor shaft. If so, it is a simple machining job to provide a threaded fitting for the flexible shaft opening.

To make the stand you bore a hole in the center of a skillet, insert the pipe post and weld it to the underside. Then you butt the three pipe legs against the post and weld them to the pan.

To make the locking handwheel you grind a bolt head to fit a valve handle and



WITH CASTERS REMOVED, turntable sits firmly in place on bench, still retains its swivel feature

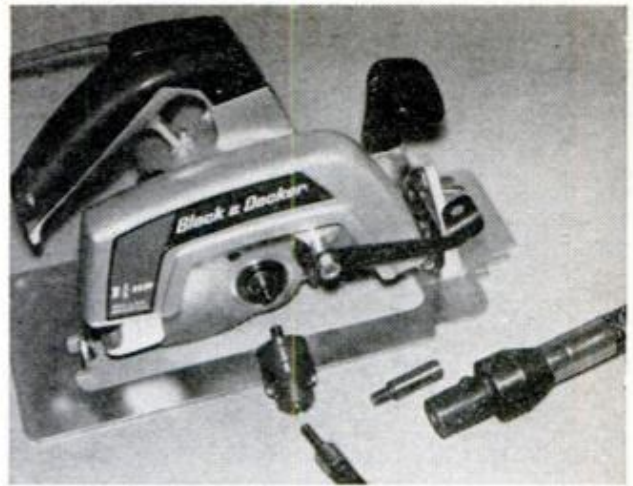




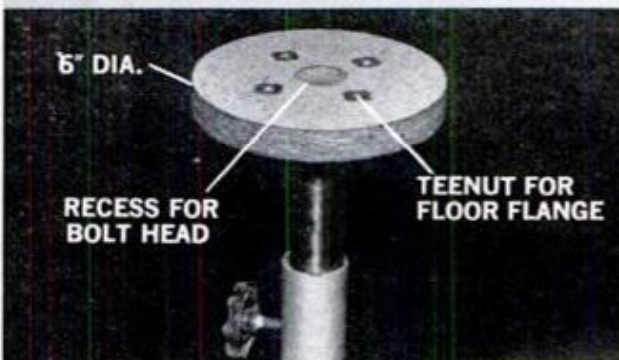
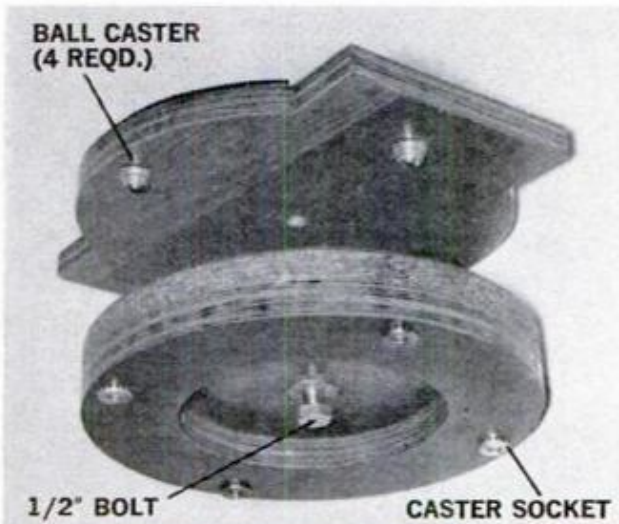
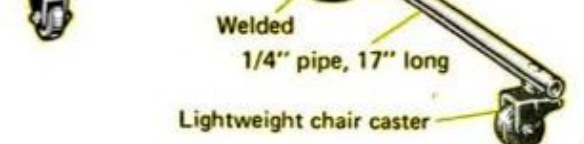
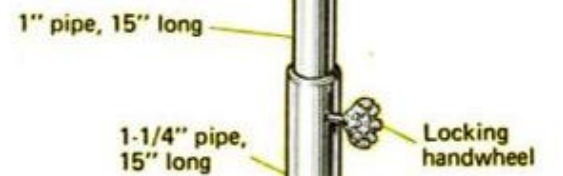
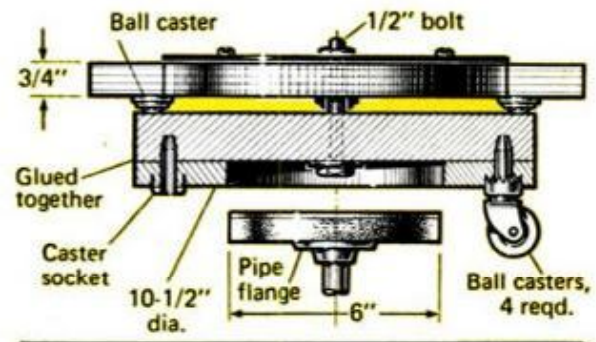
OPERATIONS NEAR FLOOR, such as grinding welds, are a snap because liftoff turntable rolls on casters

hold it there with liquid solder. For the turntable center, select a 1/2-in. bolt that's just long enough for its body to extend through the turntable before the threads begin. Hacksaw away any excess. You can thus fasten the 1/2-in. nut firmly without binding the turntable.

Center your saw on the turntable top and glue sections of hardboard (the same thickness as the shoe) snugly against each side of the saw base. One side of the shoe hooks under overhanging screwheads, while the other side is held by a storm-sash turnbutton. ★★★



CHUCK is threaded 5/16 x 24, fits most 6 and 7-in. circular saws. Machined connection is seen at right



Build This Wood Planer For \$100

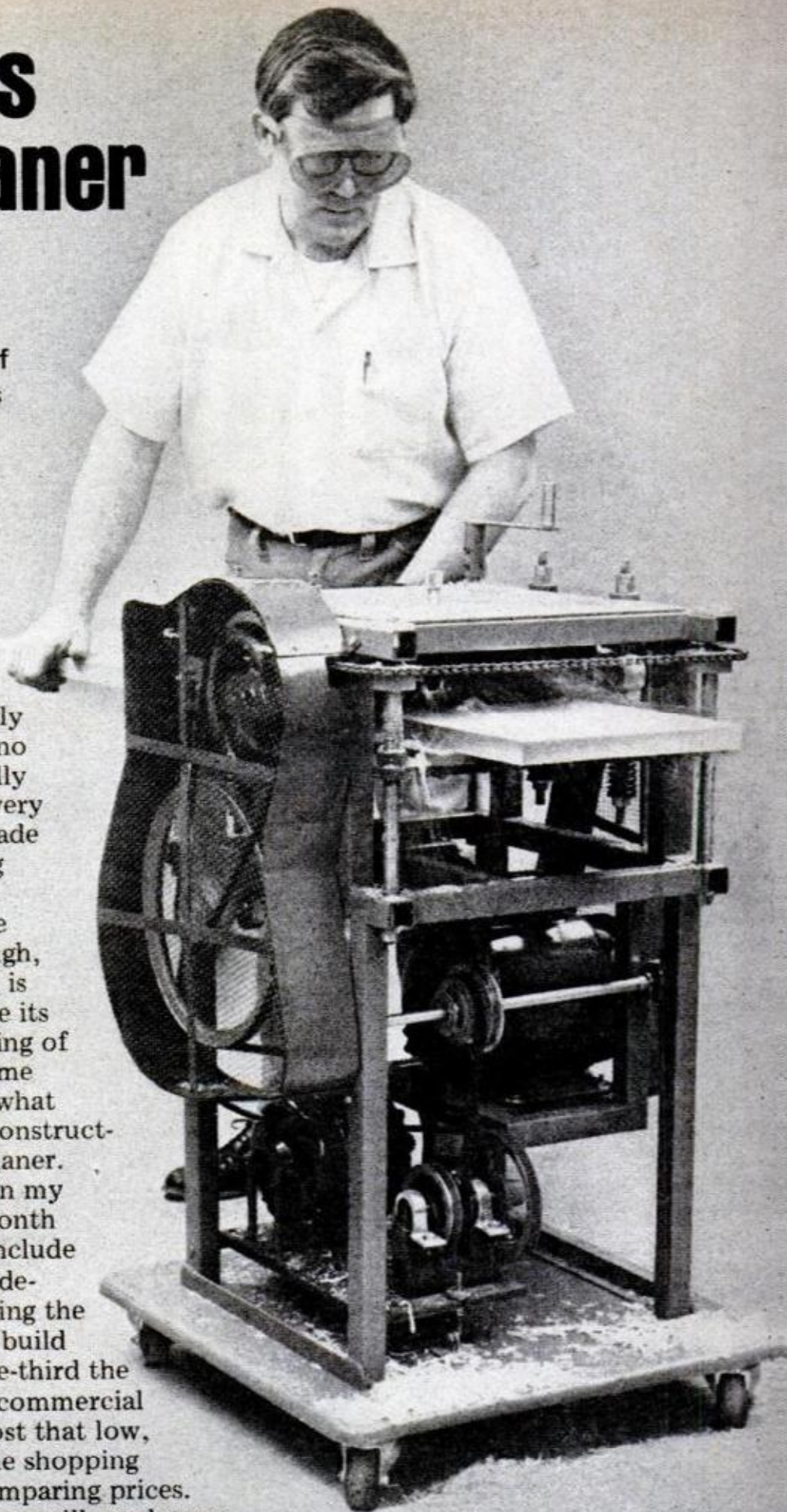
This shop-built version of a great power tool stacks up impressively when compared to those offered commercially for \$300 and up

By RONALD GUY

AS your wood-working experience grows, you suddenly realize there is virtually no "bad" lumber. You finally reach the point where every piece of scrap, or low-grade lumber, is hoarded along with dressed stock for future projects. To make use of that lumber, though, a trip to the lumberyard is usually necessary to have it mill do the dressing. Tiring of those trips (too much time waiting to be served) is what sold me on the idea of constructing my own thickness planer.

I built the one shown in my spare time over a one-month period. (This does not include the many hours I spent designing the rig and drawing the plans.) My total cost to build was \$96.34, roughly one-third the cost of comparable commercial versions. To keep the cost that low, I spent considerable time shopping around for parts and comparing prices.

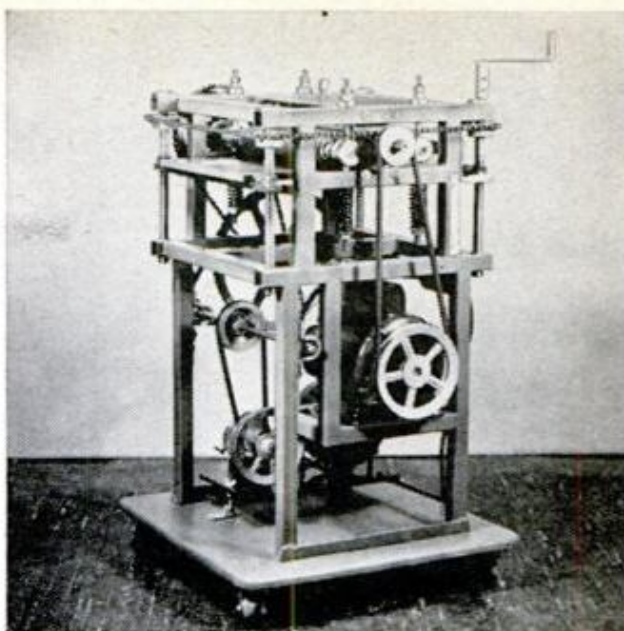
The major tools that you will need are a metal lathe, drill press and an arc welder. Nice to have, but not absolutely necessary, are a power



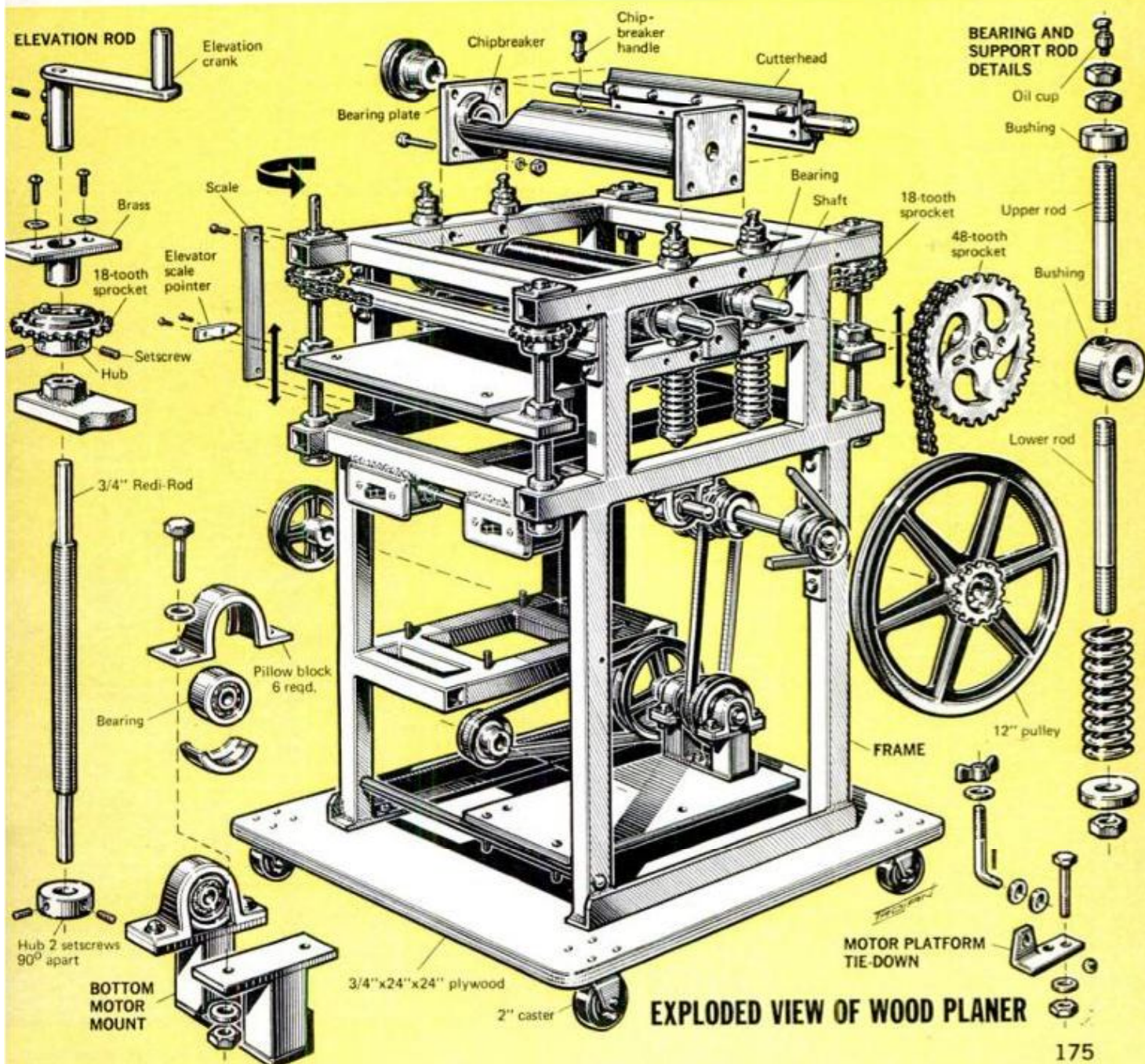
Photos by the Author and Rose Marie Guy

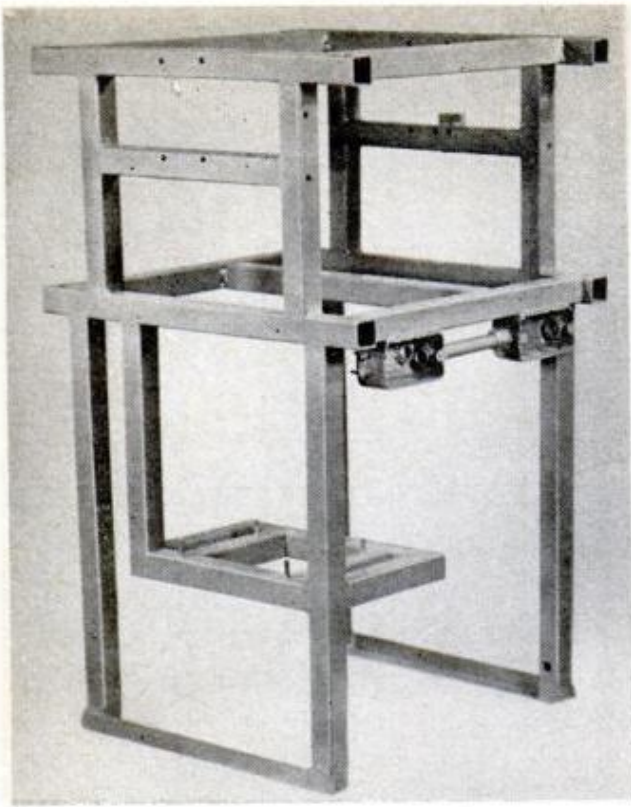
hacksaw, portable drill and a disc sander for grinding weld beads. Lacking these tools, you could do the major portion of cutting and then cart the bundle of parts to a machine shop for assembly. If you decide on this approach, I recommend taking the drawings to the shop first for an estimate. Then, if cost is within your budget, you can start shopping for parts.

After testing various styles of cutterheads, I decided to make a simple two-knife design of flat 1 x 2½-in. steel. Despite its simplicity, it compares favorably with more elaborate types. To keep cost down, all chains and sprockets are common bicycle-stock items. The main frame is 1¼ x 1¼-in. heavy-wall steel tubing, with a little angle iron here and there as needed. The planer bed is a sheet of ½-in. steel plate but some other material, even



FINISHED PLANER (minus guards) is shown from out-feed side. Castor-mounted tool can be moved easily





FRAME IS ASSEMBLED and all holes are drilled for mounting bearing plates, pillow blocks and guards

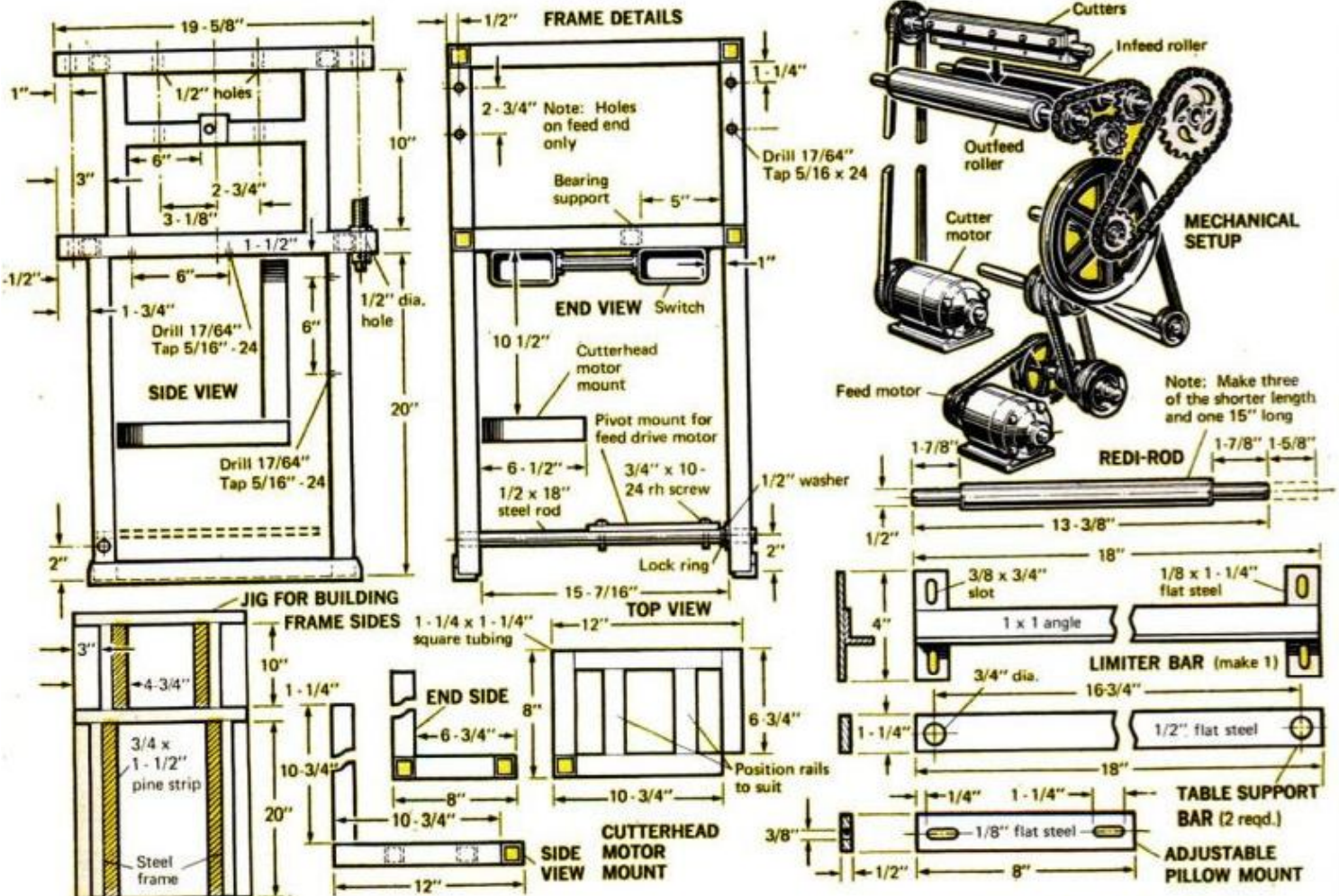
wood, could be substituted if necessary. Table elevation screws are $\frac{3}{4}$ -in. Redi-Rod available at hardware stores. Feed

rollers are of $\frac{3}{4}$ -in. cold-rolled shafting, $1\frac{1}{2}$ -in. water pipe, wood and radiator hose.

I suggest purchasing all materials before you begin construction; that way if you can't find exactly what's needed, or desire to substitute, you can make allowances in dimensions.

● *Making the frame.* Cut all members slightly overlong, then grind or file ends square and bring each piece to exact length. Next, lay out and drill all holes; accuracy is critical. At this point, you can tap those holes that require threads. Now make a jig, using a double thickness of $\frac{3}{4}$ -in. plywood to hold all base parts in correct alignment while they are welded. Clamp all parts in place, weld the first side and grind down the beads. Flop the frame on the jig and repeat the welding procedure. Remove from the jig and finish by welding the inside joints. I used a $\frac{3}{32}$ -in. rod (mild steel, general purpose) at 75 amps. for outside joints, increased to 85 amps. for inside ones.

After making the second side, take both sides and set them upside down on a firm, level surface. Working carefully, set the spacer bars between the two side frames,



sure each is absolutely centered, then take a No. 7 drill, and, using a hole in the plate as guide, drill all the way through the frame. Do this for both plates at all four corners, then remove the plates, enlarge holes in the frame to $\frac{1}{4}$ in. and tap the No. 7 holes in the plates $\frac{1}{4}$ in.-20.

● **Cutterhead.** Make sure that the steel bar is straight and true. Lay out centers carefully so the head will run true and not vibrate. Also, lay out holes for blade mounting bolts and thread $\frac{1}{4}$ in.-20. Slot the blades and make up the back-up strips.

● **Chip breaker.** Cut a piece of 4-in. i.d. heavy-wall steel tube lengthwise (slit it) and you'll wind up with an ideal curved piece to which you need only add $\frac{1}{4}$ -in. steel-plate supports made to fit over the exterior of the cutterhead bearing shells. File or grind the bottom to shape so stock being planed will tend to "push up" the chip breaker. You'll probably have to experiment with this. Make a jig to hold everything in alignment when welding on supports, or temporarily set the bearing plates in the frame and use those as your jig. Everything has to align well or it will bind.

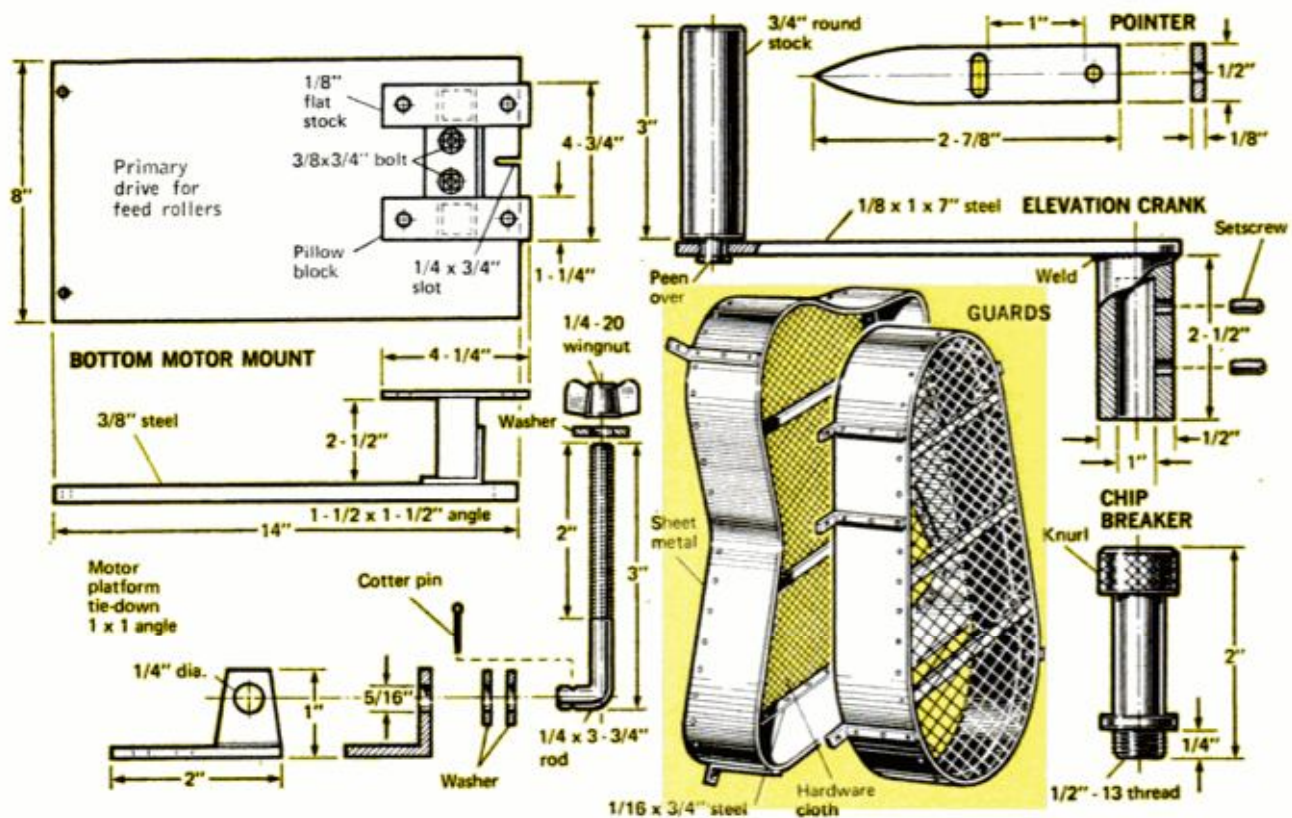
● **Assembly.** Mount the bearing plate on the right side (feed drive assembly) of the machine; place cutterhead in the chip breaker, push long end of shaft as far as possible into the bearing plate. Hook

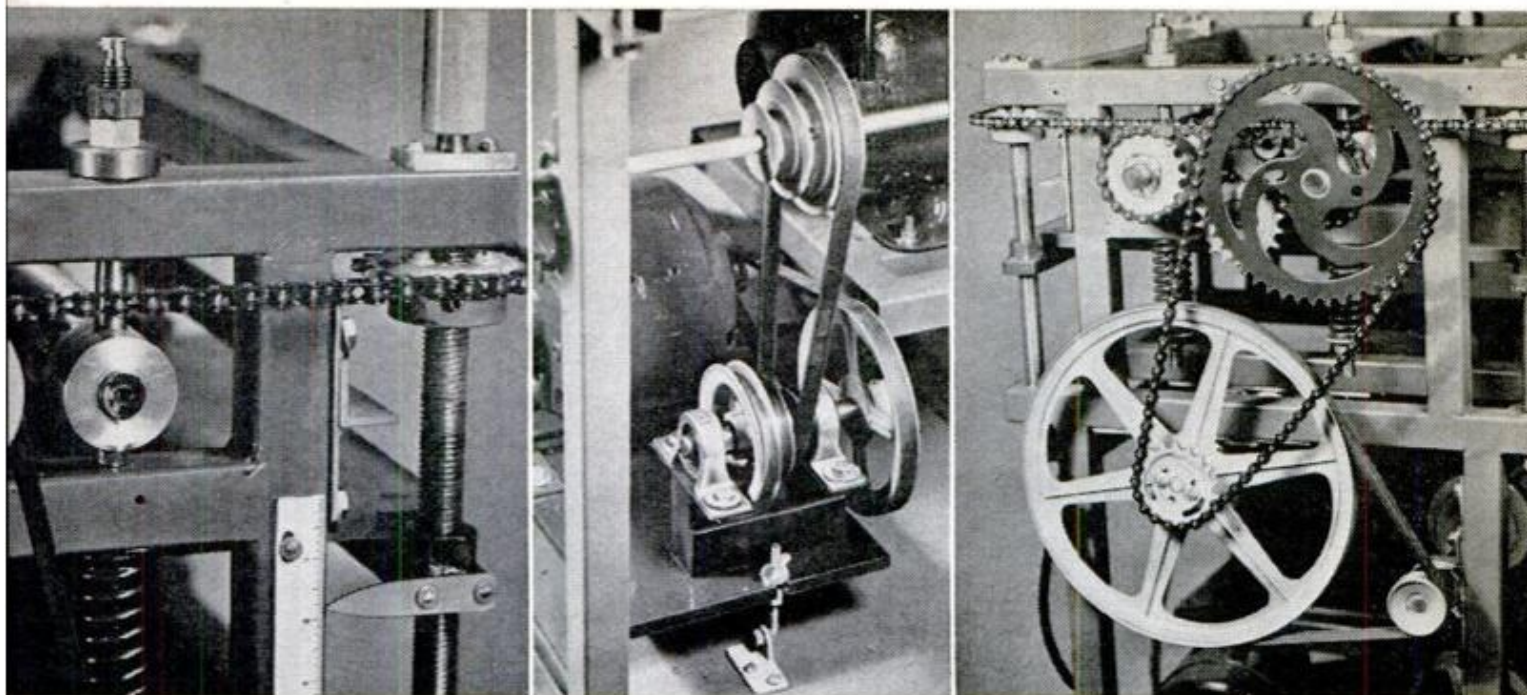
chip breaker support over bearing shell support and push it on, while continuing to push the shaft into the bearing. Now take the other bearing plate, turn it sideways so it will go through the frame, push it on the cutterhead shaft and hook the free end of the chip breaker support on the bearing shell. Continue pushing as far as possible, then rotate the bearing plate into correct position and fasten it permanently. Center cutterhead and lock the bearing setscrews. Be sure the chip breaker moves freely.

● **Feed rollers.** Clean the inside of the rubber tube thoroughly and rough it with a file before applying contact cement. Brush the cement on the wood core (already on the shaft), pour the cement into the hose, then immediately pour it out; let both dry thoroughly, then refill the hose, pour it out again and immediately slide the hose over the core. Let it dry 24 hours. If it's not correctly constructed and roller height is improperly adjusted, you will have trouble with the outfeed roller. The infeed roller, being all steel, is easier.

● **Feed roller bearings.** Turn and bore as shown, using brass, aluminum or steel. Then drill a $\frac{27}{64}$ -in. hole all the way through both sides. Tap $\frac{1}{2}$ in.-13 (again through both sides at once). This is a must to insure that support rods are being true in relation to the bearing.

● **Support rods.** Use cold-rolled $\frac{1}{2}$ -in.





DEPTH-OF-CUT SCALE is shown at left: note oil cup on top of rod. Center photo shows the three-step pulley arrangement plus the hold-down that keeps belt tight between step pulleys. At right, the small sprocket behind a larger one is the idler sprocket described in text. Pulleys are of 2 and 12-in. diameter

steel for these. Cut to length and thread them $\frac{1}{2}$ in.-13 in the lathe! This must be done so they'll be straight in the bearings. Notice that the upper support rods are drilled all the way through $\frac{1}{8}$ in. and then counterdrilled $\frac{1}{4}$ in. for a short way at the top to accommodate oil cups. I had to drill mine from both ends to get the $\frac{1}{8}$ -in. hole all the way through. It's necessary though, so the bearings can be oiled when the guards are on the machine.

● **Assembly.** Install the lower rods through holes in frame, install springs and washers and put the nuts on the bottom but do not tighten yet. On the right side (feed-drive assembly) of the machine place the bearings on rods, then install the upper rods and tighten all securely in bearings. Install shaft collars and fiber thrust washers on feed rollers and push the long end of the shaft into the bearings just installed. Next, install bearings on left side of machine, tightening rods securely into the bearings. Center rollers in the frame and lock the shaft collars to hold them.

Since the support rods are designed to slide up and down in the holes in the frame, you should be able to move the entire roller assembly up and down. If you have a problem, take out the upper rods and enlarge the holes enough to give these rods a little clearance. (I mentioned

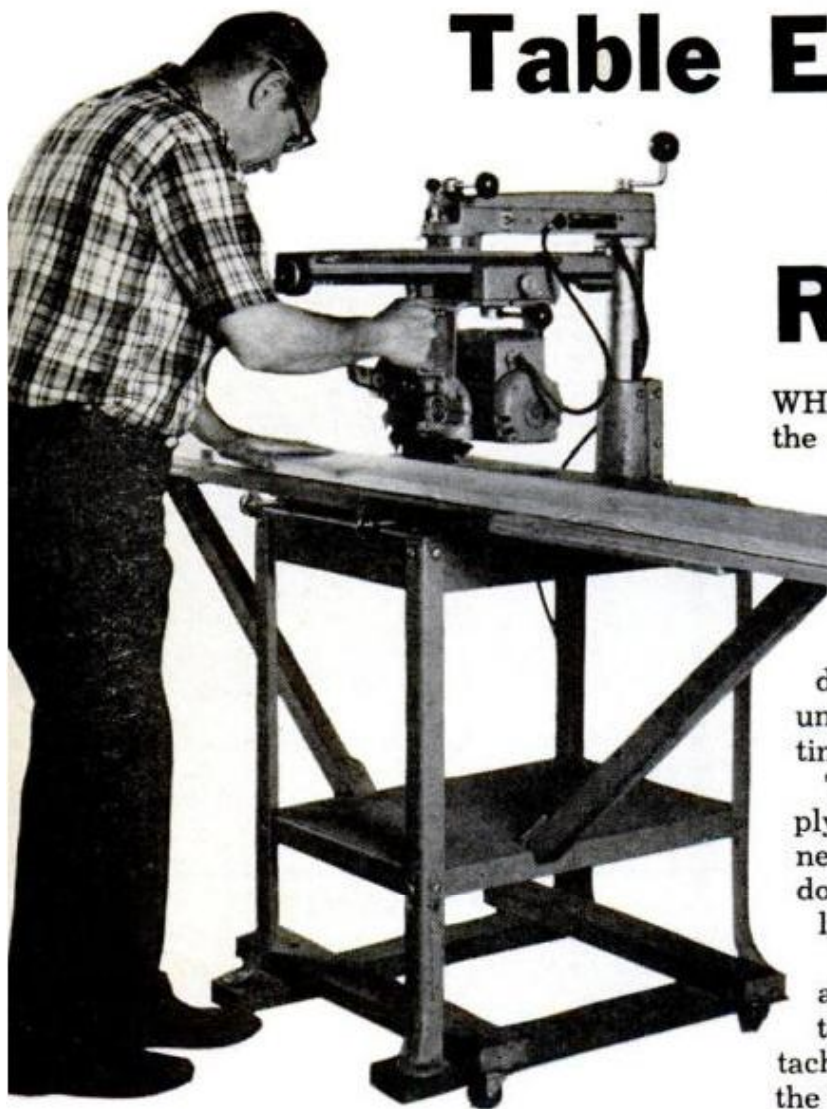
(Please turn to page 194)

MATERIALS LIST

Amt.	Size and Description (Use)
32'	$1\frac{1}{4} \times 1\frac{1}{4}$ " heavy-wall steel tubing (frame)
3' ea.	$\frac{3}{4} \times \frac{3}{4}$ ", 1×1 " & $1\frac{1}{2} \times 1\frac{1}{2}$ " angle iron (frame)
3'	$\frac{1}{8} \times 1\frac{1}{4}$ " flat iron or steel
2'	$\frac{1}{8}$ " x 1" flat iron or steel
1 pc.	$\frac{1}{2} \times 13\frac{1}{2} \times 20$ " steel (planer bed)
18"	$\frac{1}{4} \times 3$ " steel (bearing plates and chip-breaker support arms)
14 $\frac{1}{8}$ "	4" I.D. steel tube or pipe (chip breaker)
4'	$\frac{3}{4}$ " shafting (feed rollers)
4'	$\frac{1}{2}$ or $\frac{5}{8}$ " shafting (feed reduction drive)
8	18-tooth $\frac{1}{2}$ "-pitch bicycle-type sprockets
1	48-tooth $\frac{1}{2}$ "-pitch bicycle-type sprocket
3	Bicycle chains, 3 extra links $\frac{1}{2}$ " pitch
1 pc.	$\frac{3}{4} \times 24 \times 24$ " plywood (baseboard)
4	2 $\frac{1}{2}$ " heavy-duty swivel casters
6	Self-aligning-type ball bearings (pillow block bearings, $\frac{1}{2}$ or $\frac{5}{8}$ " depending on shaft used)
2	Dayton bearings, 2" O.D. with 1" bore and 2 set-screws (cutterhead bearings)
<i>Note: Cutterhead shaft must be sliding fit through bearing race which must be locked to the shaft</i>	
1 ea.	1 $\frac{1}{2}$ ", 6" pulleys
2	3-step pulleys
1 ea.	2", 12" pulleys (feed roller drive)
1 ea.	3", 7" pulleys (cutterhead)
<i>Note: All pulleys are for 1725-rpm motor</i>	
1	$\frac{1}{4}$ -hp motor (feed roller drive)
1	$\frac{1}{2}$ -hp motor (cutterhead)
2	12" high-speed steel knives (heavy as possible) aluminum, brass or steel stock
18"	2" dia. stock (hubs, roller bearings)
2 pcs.	$\frac{3}{4} \times 36$ " threaded rod
4	$\frac{3}{4}$ " nuts
2	$\frac{1}{2} \times 1\frac{1}{4} \times 18$ " steel (table supports)
1	$1 \times 2\frac{1}{2} \times 20$ " steel (cutterhead)
2	$\frac{1}{8} \times \frac{3}{4} \times 12$ " steel (cutterhead backup strips)
1 ea.	28, 29, 43" belts (for feed drive)
<i>(Note: Belt size for cutterhead drive is determined by motor used)</i>	

Miscellaneous—Four $\frac{1}{2}$ " shaft collars, two $\frac{3}{4}$ " shaft collars, 24 $\frac{1}{4}$ "— $20 \times \frac{1}{2}$ " setscrews, assorted nuts and bolts, steel scrap material for guards, electrical wiring, switches, paint and rivets, four 5" heavy springs, 48" of $\frac{1}{2}$ " c.r. shafting for roller-bearing supports, four fiber washers $\frac{3}{4}$ " hole, four $\frac{1}{4}$ " oil cups (remove wicks if any), 12 $\frac{1}{2} \times 13$ nuts, one $1\frac{1}{2} \times 12$ " pipe for infeed roller, one $1\frac{1}{2} \times 12$ " rubber radiator hose for outfeed roller

Table Extensions For Your Radial Saw

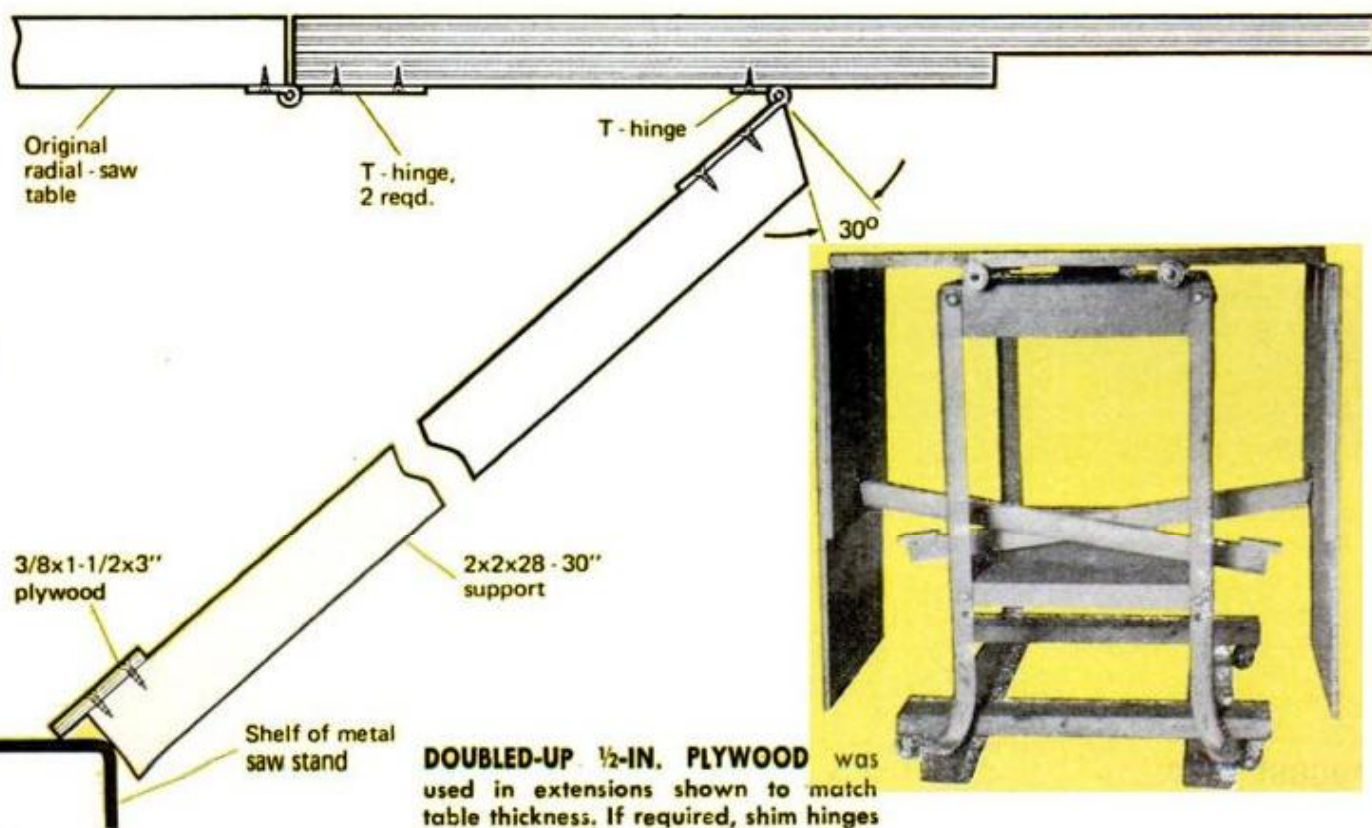


WHEN YOU'RE CUTTING long boards, the weight of the outboard section often makes the sawing operation a dangerous one. To avoid an accident under those conditions, I've rigged my radial-saw table with a pair of fold-down extensions. With proper support under those extra-long workpieces, cutting is a snap.

The extensions shown were made of plywood built up to match table thickness. Hinged to the saw table, they drop down when not needed, yet automatically engage when raised into position.

To fasten them to the saw table, lay a long board across and clamp the extensions to it. Use wood screws to attach them, and, if necessary, shim under the hinges to make the extensions flush with the tabletop. Notice in the drawing (below) that the supports are offset 2 in. so that they pass each other when in the folded position.—R. S. Hedin

IT'S LIKE HAVING AN EXTRA HAND when your radial saw is equipped with table extensions for ripping or crosscutting long pieces. Extensions hinged to table fold down out of the way when they are not needed



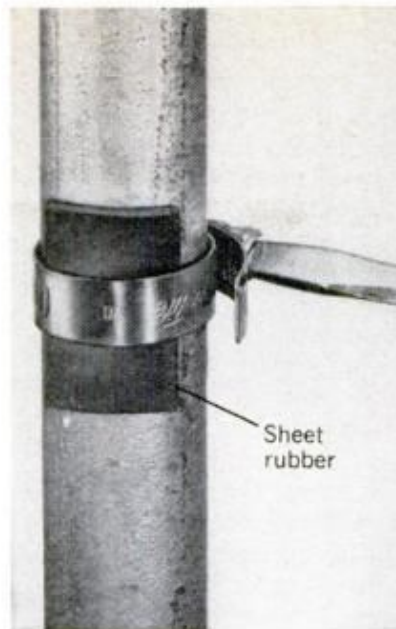
HINTS FROM READERS



Screwdriver substitute

Recently, when removing the clock from my car, I needed a screwdriver smaller than any I own. I finally removed the screw after selecting an Allen wrench and grinding a simulated screwdriver tip on the long leg that would enter the tiny hole. This makes a handy tool, yet by leaving the short leg as is, the wrench still serves its original purpose.

—Robert A. Blair



Stop pipe leaks

If you've ever had a water pipe burst on a Sunday you know that the only solution is to turn off the water in the line until you can get to a hardware store for materials. A temporary stopgap that I've used successfully is a scrap of rubber (from an old inner tube) and a hose clamp. Since the clamp is adjustable, you simply tighten it until the leak stops.

—Mike O. Hoffman



Compartmented drawer

It makes good sense in any shop to have several partitioned drawers for storage of small parts and tools. Instead of kerfing drawer sides, I hit upon the idea of using flat curtain rod. With the curved ends sliced off, it's a simple matter to cut lengths to suit the various drawer sides. Use small screws to fasten and 1/4-in. tempered hardboard for dividers.

—William Swallow

NEXT MONTH IN SHOP AND CRAFTS

28 PAGES OF IDEAS FOR IMPROVING YOUR HOME. Whether an apartment dweller or homeowner, you owe it to yourself to pick up the September issue of PM. It's jam-packed with no-nonsense projects for home betterment. All ideas shown have been used by others and have proven to be as practical as they are attractive. You'll discover an attractive basement bar, "use-full" walls, how to convert a "greenhouse" sunporch into a family room for year-round use and a roundup of new home improvement materials.

PLASTIC PIPING MAKES YOU AN "INSTANT PLUMBER." It's rigid, lightweight and heat-toughened and, happily, it's easy to fabricate and install. If the plumbing code in your area permits its use, polyvinyl dichloride tubing may be the answer to your plumbing woes. Learn how to handle the stuff in the next issue.

HOT TIPS FOR USING GLUE GUNS. An electric glue gun is a versatile tool that you can turn to every time you need a flexible bond in a hurry. A timely article corrals offbeat uses that thermal glue guns can be put to—there are some you probably would never have thought of. Look for it in the September PM.

FOUR WAYS TO HIDE TRASH CANS. PM readers often ask what can be done to hide the cluster of trash cans in the back yard. We commissioned designer Gerry Geerlings, A.I.A., to create several unusual enclosures to shield that eyesore from view. One of his four ideas is sure to blend well with your home. See them in PM next month.

YOUR CAR . . . INTO THE WATER

(Continued from page 95)

of the passenger compartment as the car levels out on the lake or river bottom. And the tests indicate that a car will level out in a wheels-down position about 85 percent of the time regardless of the position in which it enters the water.

In his report to the National Safety Council, Dr. Kuhn calculated that an air bubble of 6.8 cu. ft., the largest observed in his tests, would be sufficient to keep a man alive for an hour. Even a much smaller bubble should contain enough oxygen to sustain the driver and a few passengers until the water pressure has become equalized so that the doors can be opened. There should be enough time to discuss escape plans if there are passengers aboard. Once you get through the open door, you can simply push upward from the car toward the water surface. Chances are the water will not be extremely deep or the car far from shore and you should have little difficulty in reaching safety after you get to the surface.

If you cannot swim, try to float. You don't have to float on your back. In fact, many muscular men are pulled into a vertical position in water by the weight of their legs. The U.S. Army technique is to let the arms and legs dangle freely but to kick the legs for added buoyancy. Raise the head several times a minute for fresh air, or take a breath whenever the mouth is above water. Avoid rapid breathing and breath holding—both can be self-defeating in a water environment.

If you are wearing heavy or cumbersome clothing, discard as much of it as possible before leaving the car. Wet clothing will not keep you warm and will hamper you on the surface.

The Michigan-Indiana tests, and the experience of those who have survived submerged car accidents, show that the impact of the car hitting the water and the rough ride that may precede the impact will cause the contents of the passenger compartment to bounce around. Seats may come loose and passengers tossed about.

If you're driving, hold on to the steering wheel and hope that your seat belt is fastened securely. When the car suddenly becomes a leaky boat it will be in your favor if you are sitting in a normal position. That way, you won't be disorientated and waste time hunting for door locks or window controls, as you would if you landed upside down on the back seat.

If your car plunges into deep water, the accident does not have to end tragically if you will keep cool and remember what to do. ★ ★ ★

HOW GREMLIN LOST ITS TAIL

(Continued from page 91)

do the first one, the one you're going to have to do "a make" from some day, you try to get everything you can into it. That makes it easier to work up the next one.

Gremlin carries the long-hood, short-deck theme to the ultimate. How long is the industry going to stay with this shape?

You'd have to ask Jeanne Dixon. This is a come-and-go thing. Hoods get short and decks get long, and then it swings the other way.

If the industry stays with the small-car concept, do you look for smaller cars than Gremlin?

I don't know. But I think it'll be a cold day in July before you see the larger companies building cars smaller than the minis coming out now. Anything below 161 inches—where we are on Gremlin—will be long in coming. But I'm just guessing.

What do you personally think of the trend to smaller automobiles?

I like it. I'll show you a Hornet two-door with a 304 unit. That's what I drive. Small cars are a thing with me.

Now that Gremlin's out, is there anything you wish you'd done differently?

Yup. I don't think any designer has ever done a car he's completely happy with and wouldn't change if he could go back.

There isn't anything about Gremlin that leaps out at me as a mistake. If I'd designed it just for my selfish self, I might have put more glass in the side or maybe chrome upper door frames to brighten it up. But the car was built to cost and that's a restriction you deal with.

American Motors is moving much faster than the other companies in bringing out new products. What's the secret?

We don't have the red tape. This is a shirt-sleeves, first-name company. Chapin and Luneburg (Roy D. Chapin Jr., AMC board chairman, and William V. Luneburg, president) are in here once or twice a week. We don't have to wait two or three months for a reply to a memo.

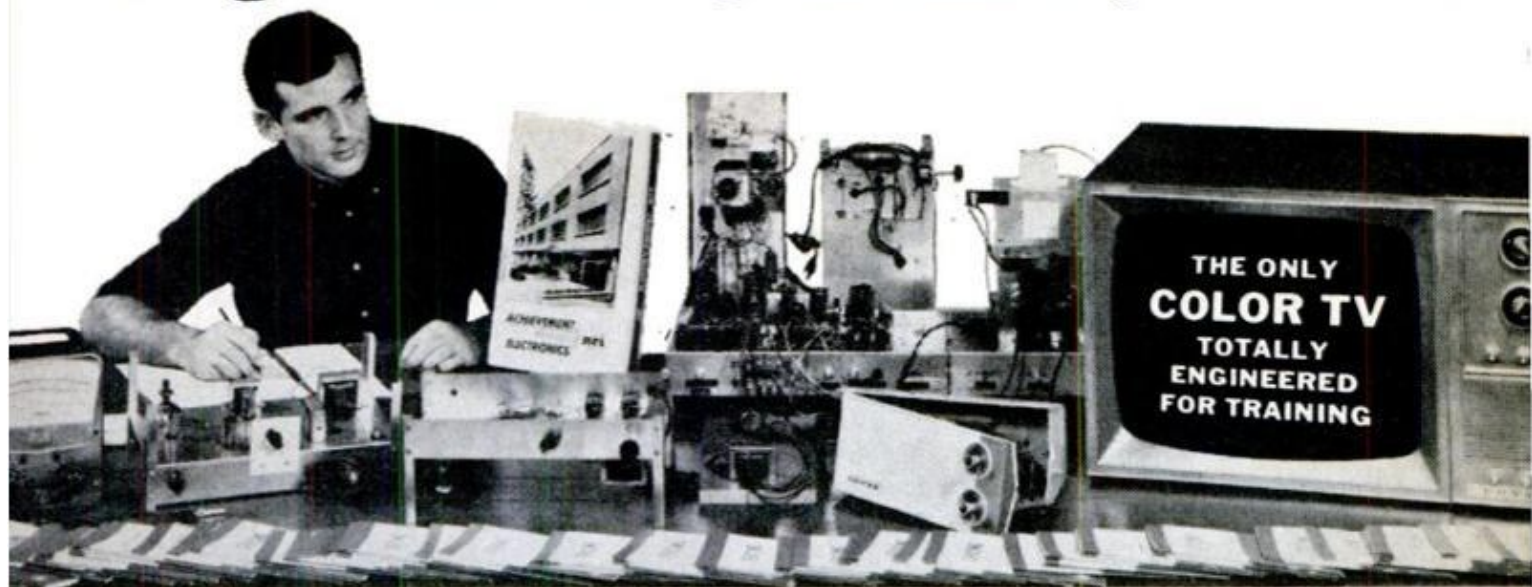
Some of your contemporaries think you have the toughest job in town.

Because we've got only 64 people?

Because you have to bring out a new car every six months.

It isn't all that tough. The people we've got are damned clever, imaginative, hard-working. If you have the right crew, you can bring out a new car every six months. No sweat. ★ ★ ★

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'71 CARS—THEY'LL BE BETTER

(Continued from page 73)

over a two-wheel system, Chrysler says, is that the four-wheel unit not only prevents the car from skidding when braking, it also enables the driver to steer the front wheels. You get the braking action but not the steering feature with the two-wheel system.

Also in the safety area, Ford will put side impact beams in the doors of its full-size and intermediate cars in '71. But it will be a year from now before Ford installs guard rails in its smaller cars. GM will put steel beams inside the doors of its mini car. All auto companies are working in this direction and by the time the '72 cars are ready, impact rails will probably be standard on all makes.

Another area where everybody is zeroing in is bumpers. Back at the beginning we said bumpers won't be *quite* as fragile as they are on current cars. But bumpers

The '71s . . . tightest, best constructed cars to come out of Detroit in umpteen years.

will still buckle if you ram into something at a snappy three mph or more.

Starting with the '71 cars, Ford will lead a movement to try to get all American automakers to mount bumpers a uniform number of inches from the road. This will take a couple of years to work out.

Rubber-plastic composition bumpers will show up on more Ford, Chrysler and American Motors cars this fall.

Olds recently introduced a new wrinkle in bumpers—no pun intended—on its Rallye 350 that other GM divisions would like to get their hands on for '71. The car has a highly corrosion-resistant bumper. But if it begins to show a thin spot or is scratched, the car owner can touch it up with a lacquer kit.

Detroit will take a step back in the direction of more functional bumpers on the '71s. But taking the vehicle as a whole, the new cars will not be less susceptible to body damage than the '70s. You won't see any major developments on this front before the '72 models.

There's been a lot of conversation about making cars easier to service. (See *Easy-to-fix cars*, page 83, Feb. *PM.*) Easier from the standpoint of the Saturday mechanic who wants to do his own work and from the standpoint of making parts more accessible and less complicated to repair or replace when the job's done by a profes-

sional repairman. There's no question this is a coming thing. But you won't see it as a major movement on the '71 cars.

An interesting development in the self-service era is a device GM is working on that will enable the car owner to re-aim his own headlights when they get out of alignment. It's doubtful this will be available in '71, but if it is, it'll probably show up first on Cadillac.

The small jobs coming from Chevrolet and Ford will be service-'em-yourself cars, but no more so than Maverick and Hornet. A scout who's seen an advance on the text for the owner's manuals covering the small GM and Ford cars reports that the number of items requiring service and the frequency of service is the same as on current cars.

If you're driving a two or three-year-old car and decide to trade it on a '71, you'll find yourself spending less on service than you put out on the old car, whether you tinker with it yourself or have it serviced by a pro. Reason: The '71s will be the tightest, best constructed cars to come out of Detroit in umpteen years. Maybe the best ever. This has nothing to do with pride of workmanship, building a better mousetrap or because the industry's got religion on putting more quality in the product. The motivation is money.

The Big Three have been plunking down \$300, \$400 to \$500 million per company per year for the past four years on warranty work—paying dealers to repair goof-ups and muddled mechanisms built into cars on the assembly line. The only way Detroit can get out from under this back-breaker is by building 'em better. The goal, to put it bluntly, is to keep you out of the repair shop for the first year when the warranty is in force.

But you can't hook an improvement in quality to a timing device that will cause the whole 15,000 pieces to fall apart the first hour of the first day after the guarantee expires. The quality has to be engineered in just this side of permanently.

The push on quality is tied in with another industry-wide target—reducing noise levels from engines, mufflers and stresses on metal that cause cars to creak, rattle and groan. De-noising cars could become as big a crusade in Detroit as safety and pollution control.

Modern automobiles aren't supposed to make a lot of racket. If they do, it's a sign something's wrong. At best, noise is a source of irritation to the owner and a frequent cause of automobiles bouncing back on dealers for warranty service. This is where the drive to curb noise ties in

(Please turn to page 188)

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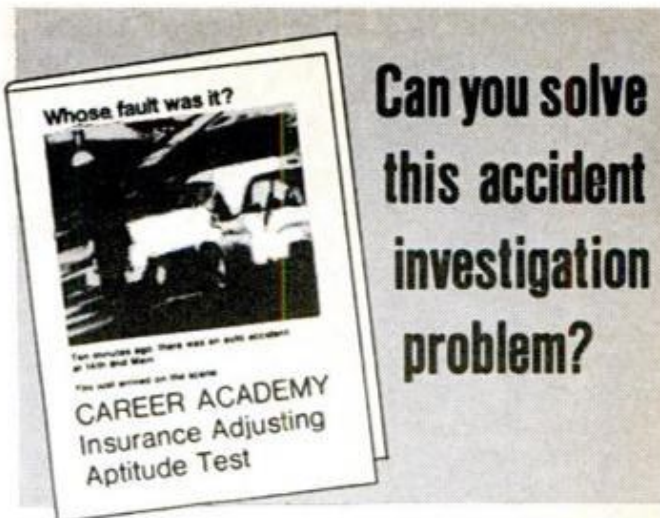


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'71 CARS—THEY'LL BE BETTER

(Continued from page 186)

with the program to beef up quality. If Detroit can get rid of noise, it can save millions in warranty claims. The auto firms will try to do just that by putting more insulation and better sound-deadening materials in critical areas in the '71 cars.

For instance: The only noise you'll hear from the airconditioner on the new Chrysler cars will be about on a par with a cat pitter-pattering across the living room carpet.

The '71s will also see Detroit take a first step toward doing something about making it easier for big men to get in and out of automobiles. Cars aren't going to get any bigger, but doors are.

The engineers with the measuring sticks argue that oversized people aren't too uncomfortable once they get seated in an automobile. It's the awkwardness and gymnastics they have to go through snak-

In addition to wrapping up into the roof, doors will also wrap down and under.

ing their way in and out. The solution is to put bigger doors on the box. As this is written, we don't know which of the '71s will have wider doors. Some will, some won't, depending in part on whether a car is due for new sheet metal or a cosmetic conversion. In addition to wrapping up into the roof, doors will also wrap down and under. How? By doing away with the rocker panel. If you don't see this on the '71 cars, you'll see it on the '72s.

As usual, every company will have a few items in the nobody-else-has-anything-like-it category. Here's a rundown on some of the novelty hardware you'll see a few months from now: The "slap-stick" automatic transmission on Barracuda and Challenger models this year will be extended to Belvedere and Coronet in '71. A first-time item for Chrysler will be a tilt steering column for its intermediate-size cars. Chrysler has offered this option before, but not in its mid-size makes.

Dodge thinks it's finally found a solution to the problem of protecting the body and paint job from bumps and bruises in parking lots. It's a strip of aluminum about an inch wide. The aluminum has a flange top and bottom to form a trench in the center. A plastic material, which appears to be virtually indestructible, is set in the trench and fused to the back of the alumi-

num. The plastic projects out beyond the lip edges of the aluminum, so if the door of an adjacent car is banged up against your car, it hits the plastic. The protective strip idea isn't new, but the plastic inset in this version is superior to anything used for the purpose heretofore. We saw a demonstration of it and the plastic is so tough it will tear before it will break, crack or pull away from the aluminum backing. The plastic can be produced in four colors to harmonize with the body color of the car.

Chevrolet's mini will have a manual steering column lock. The device will be standard on cars with a floor shift. The gadget looks like a telegraph key. It will be mounted on the steering column slightly forward of the ignition slot. The telegraph button must be depressed before the ignition key can be removed from the cylinder. This locks the steering column and transmission.

All Ford products from top-of-the-line to the low-priced Pinto will come with a new type of high-intensity headlamp. The new light throws a much longer beam than anything available on American cars up to now. Cougar and Mustang will get articulated windshield wipers to give a larger wiping pattern. The 429 Cobra jet engine now offered by Mercury will be extended to Mustang.

On the basis of information available when this pre-preview was put together, there'll be the inevitable disappointments and why-didn't-they-do-this afterthoughts when the new cars come out.

There will still be a messy scramble of seat belts and shoulder harnesses to untangle, although GM is said to have worked out a three-point belt in place of the four-point hook-up now used. Headrests on the '71s will continue to leave something to be desired in the way of visibility. The car companies have been playing around with various see-through materials and new configurations for headrests in an attempt to improve rear-view and peripheral visibility, much of which is blocked off by the solid head supports now used in U.S. cars. Another item relegated to the list of improvements-in-incubation is the air bag. Instrument panels of some '71 cars are being designed to accommodate air bags, but the bags won't be installed until '72.

Finally, if '71 is your year to buy a car, you're likely to find your friendly neighborhood dealer more hat-in-handish than he was a few years ago. He's been hurting for business this year. The treatment you receive when you go shopping for a new car may be as pleasant a surprise as anything you'll see on the '71 cars. ★★★

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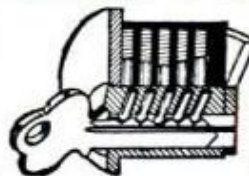


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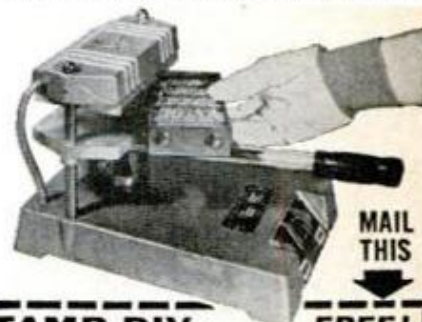
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YOUR NEXT BOAT—A SUB?

(Continued from page 77)

my ears during an abrupt dive, I needed to bail out immediately. Anxiety may have inspired me, but I found no trouble getting through the open space and shooting to the surface!

Power is provided by three 12-volt lead-acid batteries, each delivering 93 amperes and all encased in a watertight box near the stern. The Perry-adapted GE motor puts out 4½ hp, with a 5-to-1 gear reduction ratio providing two forward and two reverse speeds at 500 and 900 rpm for a top underwater speed of 3½ knots.

The sub's recommended operational depth is less than 100 feet, though Perry has tested it to 150. And I'm sure that if the enthusiastic Perry divers have their way, it will have been tested to 200 feet by the time this gets in print.

With a gross weight of 1580 pounds, 16 feet long, 8 feet wide and 5 feet high, *Shark Hunter* is expected to be priced between \$4000 and \$5000. John Perry believes it will find its primary market among underwater specialists or clubs of skilled amateurs who have the time and resources to put such a sizable investment to work. Even at \$5000, it's no more expensive than many small power boats.

The biggest problem during our two-day trial off Freeport came when some of the lead ballast shifted and was lost, making submergence difficult and then impossible. However, our *Shark Hunter* was a pre-production model, and Perry assured me that the final version would have the ballast in a sliding tray, making it impossible for it to shift accidentally or be lost.

Perry has been designing submarines since the end of World War II, during which he served as a Naval antisub pilot and first became intrigued with submersibles. Today his assistants are fiercely loyal and proud of the vessels they have produced. When some tourists stopped by Perry's tender the *Undersea Hunter*, in Freeport and asked whether it was the Cousteau boat, Mitch Michaud replied, "Cousteau who?" ★★★

NEXT MONTH IN PM

TOO FAST IN FOG. A gripping narration of a chain collision on a fogbound New Jersey Turnpike—plus tips on driving in fog.

THE STORM THEY STILL DON'T BELIEVE. It was Hurricane Camille that smashed her way across Southeastern United States a year ago, leaving a swath of death and destruction.

ATOMIC POWER TO KEEP HEART BEATING. First report on a nuclear-powered pacemaker.

SERVICING YOUR STERN DRIVE

(Continued from page 125)

trodes aren't burned. They can be reused.

Carefully clean plug ends with a small wire brush and file the center electrode flat and bright with an ignition point file. Reset electrode gap by bending the ground (side) electrode and checking with a pin-type feeler gauge. Plugs used in most marine engines are set .030 to .035 inch. Install the plugs finger-tight and tighten a half turn with a sparkplug wrench.

Plugs having carbon on the firing end indicate the engine has been running with an over-rich fuel mixture because of a faulty choke, clogged flame arrestor, improper idle adjustment or dirty carburetor.

A plug wet with oil indicates worn valve guides or piston rings, or excessive cylinder wear. Try a hotter plug. It may relieve plug fouling for a time.

Plugs showing burned electrodes and blistered electrode insulators reveal over-advanced ignition timing, a cooling system stoppage, plugs of incorrect heat range, or plugs too loosely installed.

Check drive belts for splits, fraying and tension. If you're really ambitious, go over the entire engine with an engine cleaner.

To work on your outdrive, you have to pull the boat out of the water and you'll need a lubrication chart—one's probably in your owner's manual.

Some units have only one oil drain plug. The unit shown has three separate units to be checked: lower and intermediate units, and upper case.

The best time to drain outdrive oil is after the unit has been run awhile so the lubricant flows readily. Most outdrives require an SAE 90 hypoid gear oil; a few require SAE 10W-30 or SAE 20W-40 motor oil. Check the lube chart.

Many outdrives have so-called sacrificial anodes attached to protect paint and housing from the electrolytic action of salt water. At mid-season, these are usually corroded to 50 per cent of their original size. If so, replace.

Remove the propeller for inspection. Trim nicks and burrs with a file, but be careful not to remove more metal than necessary. Check for cracks and bends; if badly damaged, replace the prop. Lubricate the prop shaft with an antiseize compound or a waterproof grease before replacing prop.

Finally, inspect the entire outdrive's outside closely for paint damage and corrosion. Sand or wire-brush damaged areas to bare metal and apply an antifouling paint containing no copper or mercury. Usually, a matching color is available in an aerosol spray can. ★★★

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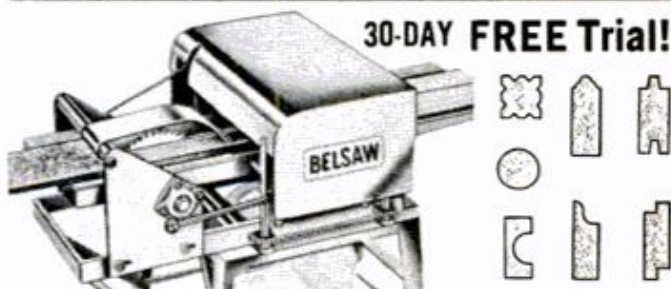
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THUNDERBIRD OWNERS REPORT

(Continued from page 119)

off, helluva noise." "Wipers noisy and dealer can't make them quiet." On the more serious side, starters, relays, voltage regulators, alternators, batteries and headlights went out with fair regularity.

One complaint voiced over and over was that there's often a long wait for parts. Two to three weeks isn't uncommon.

Among annoyances owners would like to see T-Bird get rid of: "Hidden wipers," "bucket seat locks," "incompetent mechanics," "high seatbacks," "tiny glove compartment," ". . . radio antenna in windshield. Should be in another window because you can hear the wipers swish in the radio speaker."

Some liked various aspects of their earlier models better. "Go back to classic styling. The 1970 is too GM-ish." "Bring back Swing-Away steering wheel." "My 1967 390 got better gas mileage, and I think it was quicker."

Interestingly, Thunderbird owners—in their own minds—pit their cars against the big luxury makes, not other personal specialty cars, when they compare. "We checked out Cadillac and Lincoln and T-Bird, liked T-Bird best." "I think Thunderbird quality is as good as the Mark III my husband drives, and I like my car better. Thunderbird is in a class all by itself." ★★

NESTING PARTY TABLES

(Continued from page 145)

front edge. You can now complete painting.

To build the circular parent table, start with the legs. These are cut to size from 1 1/8-in.-thick pine and grooved down the center on the inside for a distance of 16 in. to accommodate the two plywood dividers. Blocks are then glued to the upper ends of the legs, scribed with a compass, bandsawed and sanded. Three 3/4-in. flutes are run in the face of all four legs and stopped 2 3/4 in. from the top. Then holes are drilled for flatheaded screws for attaching the legs to the circular top.

The dividers are made alike except one is slotted down from the top. Add a little glue to the slots and slide them together, then add glue to the grooves in the legs and insert the dividers. They should be flush with the tops of the legs.

This leaves the circular top which is cut from 3/4-in. plywood and covered with matching decorative laminate. Complete the painting before attaching the top, and finally hammer metal furniture glides into the ends of the legs. ★★



Robot traffic controller

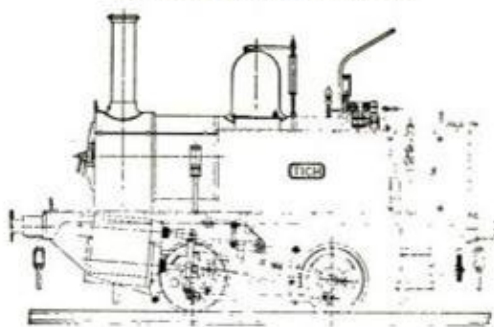
Japanese police are experimenting with an electronic robot to divert traffic from one lane to another. They also plan to add a tape recorder so the robot cop can give verbal instructions to motorists.



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WOOD PLANER FOR \$100

(Continued from page 179)

earlier that a certain tolerance was built into the machine.)

To construct and assemble the table and elevating mechanism, place the table supports on lower section of the frame. Drop corner screws through 3-in. holes, slip through the hubs of sprockets, turn through the nuts in table supports and put on a washer. Continue turning until a 1/2-in. section of the screw is as far through the frame as it will go and put on the shaft collar beneath. Do all corners, then check to make certain all four ends of table supports are the same distance from frame. Now bring sprockets nearly to the top of the screw (until they just miss the upper frame member) and lock to corner screw securely with two setscrews.

Next, install the chain, and finally, put the upper bearings in place and tighten down with screws. Install the crank and check to see if the table supports move up

. . . this machine has feed speeds of approximately 6, 12 and 24 feet per minute

and down smoothly. If not, take off shaft collars on bottom of screws and lift shafts out of the way. Enlarge holes slightly and reinstall screws and collars. Now try again and, if okay, bolt on the table. Check to insure that there is no twist in the table. If there is, shim one or more corners.

Next, install the blades, adjust the feed rollers and finish the slight amount of work still left on the chipbreaker. These steps done, there are left only the fabrication and installation of the feed-roller drive and the guards.

● **Blades.** Take two hardwood blocks about 1x1x2 in. and place them on the table on each side of the cutterhead. Bring the table up so blocks are about 1/4 in. from the head. Now, loosely bolt the blades to the head and rotate the head so a blade is pointing straight down; adjust the table up until a blade projects about 3/16 in. from the head. Lightly press down the back of a screwdriver blade on one end and tighten the bolt on that end. Repeat on the other end. Now check that the blade rests equally on a block on each end, then install the second blade. It is important that both blades project equally.

● **Outfeed roller.** Adjust the table so the blades just tip a block of wood as the head is rotated; then, using that same block (but without moving table hereaf-

ter during adjustments), adjust the outfeed (rubber) roller as follows: Tighten the nut on top of the top support rods to raise the roller just enough so that you can slide a wood block under either end. Go underneath and put considerable tension on the springs on the lower rod. Slightly lower the roller by easing back a little on the upper nuts until you can put the block under the roller, turning the roller backward by hand. Drop the roller just enough so that it is hard to keep it from forcing the block out when the roller is turned in an opposite direction. The outfeed roller should never have to travel more than 1/32 in. vertically when a piece is coming under it (1/64 in. is even better). Power to move the piece out is supposed to be provided by pressure of the springs. The rubber hose will be torn loose from the wooden core if the rubber is distorted too much. You can prevent this only by correct adjustment.

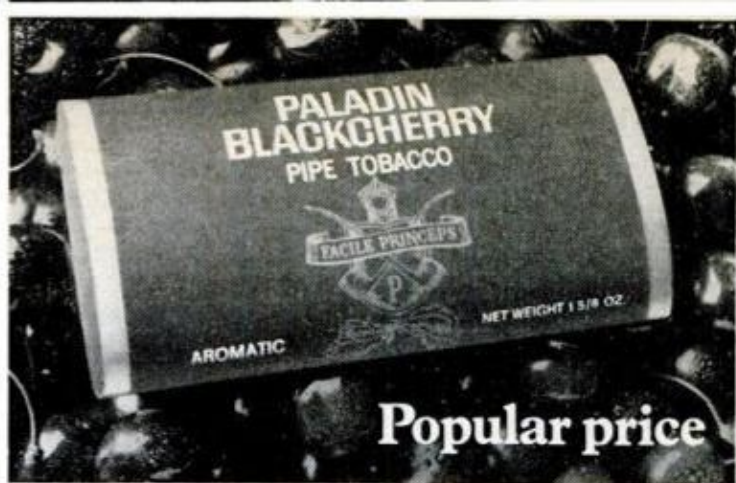
● **Infeed roller.** It is adjusted similar to the outfeed, but you won't need quite as much pressure on the springs. Because of varying stock thickness coming into the machine this roller will have as much as 1/4-in. vertical travel.

● **Chipbreaker adjustment.** With the table adjustment as it has been for roller adjustment, take the same block of wood previously used and set it on the table to support the chipbreaker in that position. Now bore a No. 7 hole into the side of the chipbreaker so that a 1/4-in. bolt installed in it will rest on the side of the bearing plate. Thread the hole 1/4 in.-20 and install a short bolt. This will keep the chipbreaker from dropping down too far when stock is first being fed into the machine. Remember the chipbreaker has to be set so it will be pushed up when stock starts through; then it rides atop the stock during the planing process.

Construct the feed drive as per the plans, giving special note to the mounts for the pillow blocks. These are designed to give considerable extra adjustment. As designed, this machine has feed speeds of approximately 6, 12 and 24 feet per minute. This is achieved by using a pair of three-step V-pulleys used early in the reduction drive. The feed drive motor and first stage of reduction, with one three-step pulley, are mounted on a metal platform bolted to a 1/2-in. rod. This serves as a pivot on one end to facilitate keeping the belt tight. From this, the second step pulley is driven. A 2-in. pulley, mounted on the same shaft, drives a 12-in. pulley on another countershaft. The latter pulley is mounted on a common hub with an 18-tooth sprocket connected by chain to a

(Please turn to page 196)

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(Continued from page 194)

48-tooth sprocket mounted on the outfeed roller shaft. The two feed rollers are then connected by chain running on 18-tooth sprockets mounted on the shaft of each. Thus, when the outfeed roller turns, so does the infeed. For simplicity I used belts and pulleys as far as I could. In the final drive stages, I had to go to chains and sprockets to avoid slippage and insure synchronization.

Assuming all prior adjustments are correct, you are now ready to hook up the feed drive. Connect the large 48-tooth sprocket to the 18-tooth one on the same hub with the large pulley. The chain should be snug but not tight. When the stock passes under the outfeed roller it pushes the roller up slightly and the chain must give a little. Next, hook up the chain between the two rollers, adjusting the idler so that when the machine is idling the chain is fairly tight. Stock passing under the rollers, especially the infeed roller, removes a lot of pressure from the chain so it must run without any slack when idling. Now you must adjust the belt tension from the 12-in. pulley to the 2-in. one. This must also run rather tight to avoid slippage, because you have a high torque load with low speed. The next belt tension to adjust is between the step pulleys—this is simple because of the pivoting platform mount. At this stage you should have adjusted the belt tension between the drive motor and the first countershaft. This need be no tighter than normal for a belt.

Expect to spend some time getting all adjustments just right so the machine runs smoothly and feeds correctly. I found this the most exasperating part of the job but, once fixed properly, the machine rarely needs adjustment.

● *Finishing touches.* With the feed drive system installed, you are ready to hook up the cutterhead drive and test the planer. Start off with light cuts and slow feeds. As you become familiar with the machine you'll be able to get the maximum from it. Install the depth-of-cut indicator as soon as you get the basic outfit operating right. The final items are the guards, which I strongly urge you to build. They can be made in an evening. For safety, construct the top cover for the planer; it can be of 1/4-in. hardboard. These parts keep hands away from moving parts.

● *Some observations and hints.* Never stand in line with the cutterhead of a planer. If it should throw a knife, you don't want to be the "catcher." Remember that a machine with a welded frame doesn't have the rigidity of a heavy-duty,

cast-iron type. Thus it won't take as heavy cuts and as much abuse. I powered the cutterhead on mine with a 1½-hp motor and am happy with it.

It is good practice from time to time to check and, if necessary, retighten the bolts holding the cutter blades. Though I haven't had one come off yet, an occasional bolt has worked loose.

When you want to change blades remember to lay a piece of wood on the table, and raise the table until the blade is resting on the wood, just as it did when you first installed the blades. You can then reinstall the sharpened blades in exactly the same position as they were when you removed them. Otherwise, you may have to readjust the feed rollers. ★★★

NEW SUPERTRACK

(Continued from page 113)

quarters of a million range, or nipping on the heels of the Indy classic. (The purse at Indy this year topped a million for the first time: \$1,000,002.02, to be exact.)

Second major event, Nov. 21-22, will be the all-new drag racing Supernationals. It promises to be the biggest event in National Hot Rod Assn. (NHRA) history with purse pushing \$250,000.

NASCAR, the National Assn. for Stock Car Racing, is next on the grid with a 500-mile Grand National event Feb. 28, 1971—two weeks after the Daytona 500.

Scratched this past spring by the international sanctioning body were plans by the Sports Car Club of America (SCCA) and OMS to run another U.S. Grand Prix in May, in addition to the U.S. Grand Prix in Watkins Glen, N.Y., in October. It appears that GPs will continue to be doled out one to a country and that some other super SCCA race for the road course will be conceived (maybe F1 cars running for money but no championship points).

In any event, the spring of '71 will bring a big road race—whether it's F1, Can-Am or Trans-Am remains to be seen.

Unlike the Indianapolis Motor Speedway, where only one race is run each year (but what a race it is!), OMS will be dealing in on all the wheeling it can. The climate allows year-round operation and that's the goal. The track has been open for several months for tourist ride-arounds, and will have other attractions—like a hall of fame and technical tours.

Extensive use of OMS for testing and promotion is another goal of the organizers. This would include the usual tire and car testing programs as well as safe-driving contests, driving schools, other activities

(Please turn to page 198)

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NEW SUPERTRACK

(Continued from page 197)

related to the "Sport of the Seventies."

If drivers start arriving for practice for the California 500 in the order they finished the Indy 500, first out will be Al Unser, followed by Mark Donohue, Dan Gurney, Donnie Allison, Jim McElreath, Mario Andretti, Jerry Grant, Rick Muther, Carl Williams, A.J. Foyt, Bobby Unser and Sam Sessions, just to name the drivers who were still running when the checkered flag dropped. The other top USAC stars—the likes of Ruby, Johncock, Pollard, Leonard, Bettenhausen, McCluskey, Rutherford—who chalked up DNFs mostly due to mechanical failure, are sure to be out to start their second 500 on this year's Championship Trail.

Drivers' reactions to the new oval, patterned after Indianapolis right down to the 9° slope of the four curves, has been positive from the start. "Good passing track . . . wide and safe," exclaimed Mario Andretti after running test laps last April along with Al Unser, Joe Leonard and Bruce Walkup. (Width of the oval varies from 55 feet in the back straight to 70 in the front.) All four drivers found the track exceedingly smooth and none detected any dips. Andy Granatelli, owner of the STP-McNamara (which suffered seizure of the right rear half shaft and kept Andretti's speed down at Indy) feels that California 500 speeds will be a bit faster than Indy and that the so-far-unattainable 175-mph pole may be realized at OMS. (Pole position record speed at Indy stands at 171.559 set by Joe Leonard in 1968 in the turbine STP-Lotus.)

Spectators on qualifying weekend may witness a bit of milestone if 175 mph is achieved, but what about tradition? No "54th annual 500-mile race" here. No ghosts of Ray Harroun, Wilbur Shaw or Jimmy Clark. Wending one's way to Indianapolis is a pilgrimage for the real enthusiasts of racing, a lark, folk festival, a boy-meets-girl rite of spring for others. All OMS has is 350 legendary bricks at the start-finish line under victory circle, a gift from the Indianapolis "brickyard," which takes its name from the original paving of more than three million bricks still under today's asphalt.

But wait until Sept. 6. When the race is over, after the fans slog through what seems like three million discarded beer and soft-drink cans, after 33 cars run a groove in the track and the echo of high-revving turbo-charged Offys and Fords is stilled, tradition will have begun: The first annual Ontario Motor Speedway 500-mile race!

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(Continued from page 157)

rails at top and bottom differ from the others.

Dresser and chest have matching scroll-cut bases which are mitered at the front corners. Detail C shows how the top molded edges of the base pieces are rabbeted on the inside to lap the end panels and front cross rails. A $\frac{3}{4}$ x $1\frac{1}{2}$ -in. cleat is used here also for added support. The rear member of the base is not scrolled in either dresser or chest.

Detail F shows how the drawer fronts lap the openings. Notice that all four edges are shaped but only three sides are rabbeted. There is no lip, or rabbet, at the bottom of the drawers. Typical drawer construction prevails: $\frac{3}{4}$ -in. material for the fronts, $\frac{1}{2}$ -in. for the sides and backs and $\frac{1}{4}$ -in. plywood or hardboard for the bottoms. Study the drawers in other furniture you have to see how they are made.

Since the tops for the dresser and chest are shaped around three sides, they must be build up by edge-gluing solid stock. Plywood could be used for the tops by gluing mitered strips of solid stock to three edges of $\frac{3}{4}$ -in. fir ply and then covering the whole top with decorative laminate. This way the exposed edges would be of solid stock which is ideal for shaping and finishing. The top for the lower section of the chest could be made this same way except for covering it with laminate. Dowels or screws can be used to attach the upper section to the lower one. Screws are used to fasten the dresser top as shown in detail D.

The molding for the mirror frame is built up of three separate pieces as detailed on page 157, then mitered at the corners and glued and nailed. The edges are rabbeted to receive a plate-glass mirror. Sturdy picture hangers are used to hang it. ★ ★ ★

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Man's first venture beyond the orbit of Mars into the outer solar system will begin with the launch of two spacecraft, Pioneers F and G, in 1972 and 1973 on missions of about two years each.

These unmanned spacecraft will be the first to penetrate the asteroid belt and reconnoiter the giant planet Jupiter, a trip of more than half-a-billion miles.

One goal of the mission is to assess hazards in deep space and to develop technology and experience for Grand Tour missions to the outer planets—Jupiter, Saturn, Uranus, Neptune and Pluto—planned for the late 1970s.



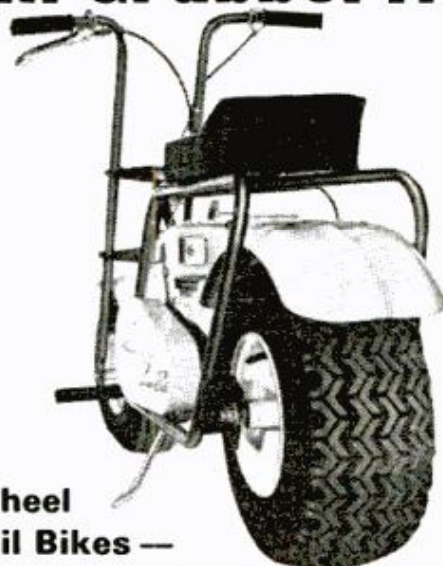
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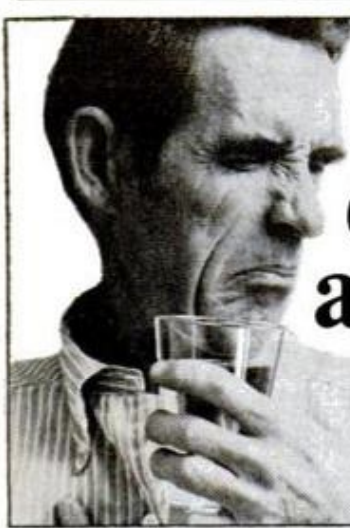


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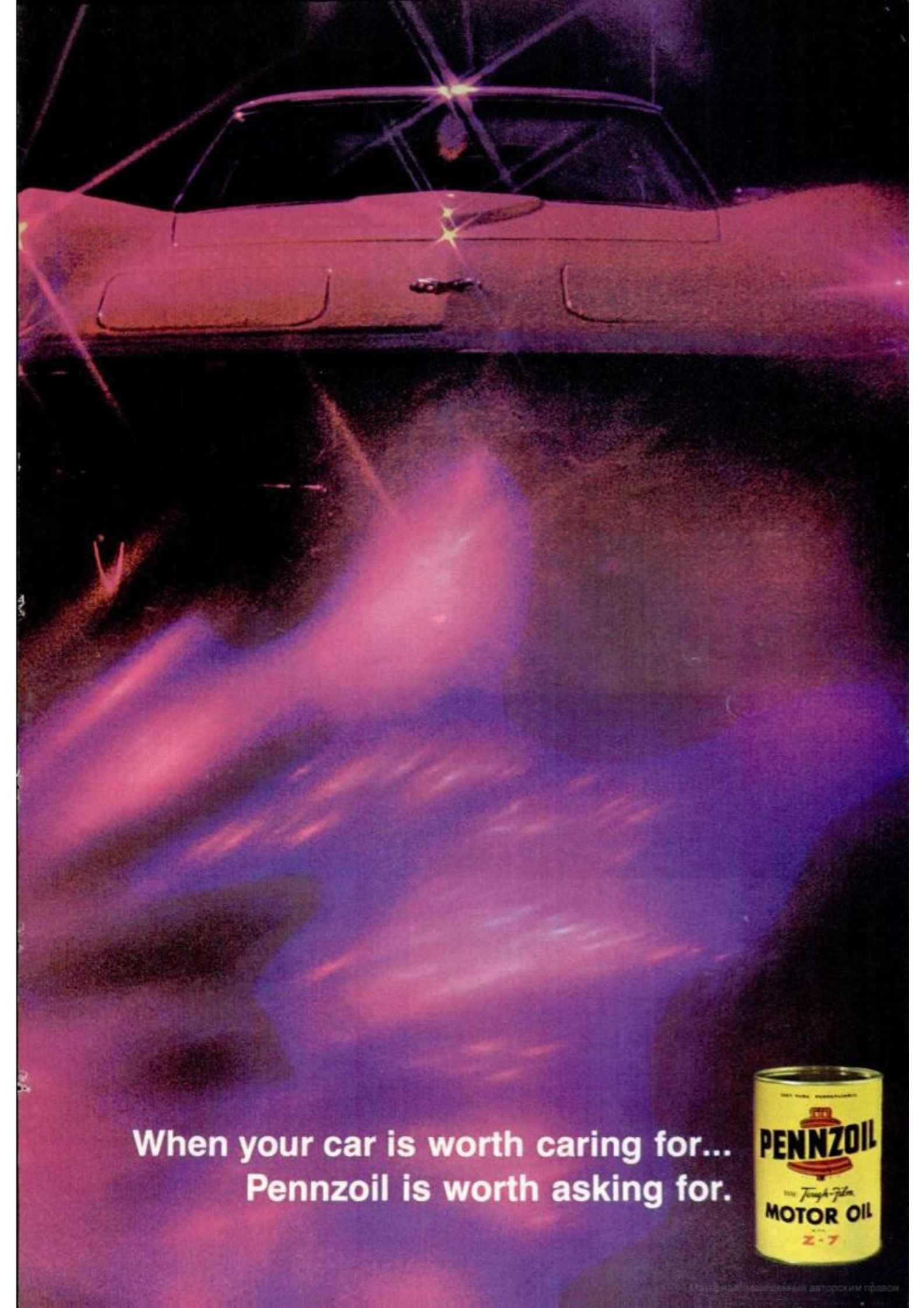


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