

Popular Mechanics

20 new metalworking tools that make you an expert



RETURN OF THE CONVERTIBLE:
Sporty '77s you can have now
PLUS a look at the '80s

HAVE BUSHELS OF FRUIT FROM AN ORCHARD ON YOUR TERRACE

SOLAR ENERGY:
Complete guide to home systems

TVs AND STEREOS YOU CARRY IN ONE HAND



SPRUCE UP YOUR HOME
24 PAGES

- Make your own
- Outdoor furniture
 - Garden shed
 - ...and more!

MURDER OF THE ORIENT EXPRESS
The end of a great rail system

Compact
power with
economy.

Our
dependable
55.



Our two-cylinder, high-performance compact has been one of our most popular outboards for six years. Its combination of power and outstanding fuel economy makes it ideal for bassin' and skiing rigs which fit a modest budget. Easy to own. Inexpensive to operate.

This motor's ability to squeeze maximum power from every drop of fuel means you can enjoy being a good dad even when the kids and their friends want to ski all day. You'll also enjoy its compactness—a full four inches lower off the transom than comparable horsepower competitive motors. So it's easier to see and ski over... or fish over.



Little wonder
the world runs
more Johnsons
than any other
outboard.

If you need more power, look at the 55's two big brothers—our 70 and 75 hp. What makes all three different from competitors also makes them better: Johnson features such as exhaust tuning, patented Pressure-Back piston rings, breakerless MagFlash® CD electronic ignition. That's why these high-performance compacts deliver power like they're bigger, use fuel like they're smaller.

And if you boat in the ocean, rest assured these are "salt water" motors

— built to resist corrosion inside and out—with stainless steel drive shafts, Lyfanite treated aluminum. See them at your Johnson dealer or write for free catalog. Johnson Outboards, Division Outboard Marine Corporation, 4732 Sea-Horse Drive, Waukegan, IL 60085.



First in Dependability
Johnson
OUTBOARDS

Our disc brakes make a persistent little sound to let you know the system needs attention.



The Delco Lining Sensor is the secret.

The Lining Wear Sensor is the device that triggers a high-pitched whining sound when the inboard pad wears down to a predetermined thickness. Just keep your ears open. When you hear the whine, it's time to have your AC-Delco Service repairman check your brakes. You can help avoid costly damage to your brake's rotor and to your car's front end components.

You'll find the Lining Wear Sensor built right into Delco Disc Brake pads for most General Motors applications.

A feature found on most Delco Disc Brakes is the design of the eyelet rivets in the brake

pad. They let wear debris fall through rather than build up in the rivet hole. This helps prevent rotor scoring and helps extend rotor life.

There's a Delco brake for practically every make.

Delco also offers top quality brake parts for drum brakes. All Delco Drum shoe linings feature the Delco Crown Ground Finish to help reduce brake pull and squeal.

So the next time your brakes need servicing, see your AC-Delco Service repairman. He has the quality Delco Disc and Drum Brake parts to give you dependable braking.



This One



ONQ6-HCC-U9KR

**Go
with the names
you know.**



AC-DELCO DIVISION OF GENERAL MOTORS CORPORATION

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APRIL 1977 1

Popular Mechanics®

On the cover
Artist Ed Valigursky captures the excitement of the world-famous Orient Express as it races through Europe on its way from Paris to Istanbul. The Express makes its last run next month after nearly 100 years of service.



APRIL 1977

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There's only one way to judge how effective a dandruff shampoo can be for you.

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Four times more than the leading dandruff shampoo.

Seven times more than the next largest selling dandruff brand.

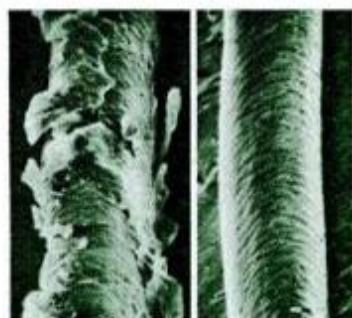
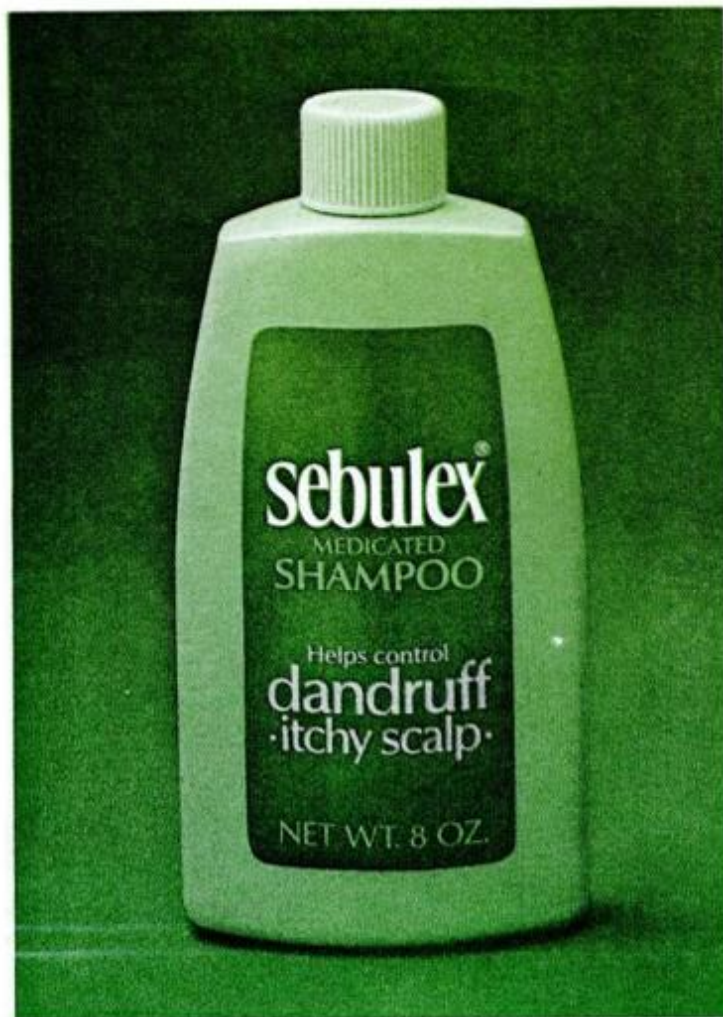
If you're out to control your dandruff, to help stop the oiliness and itching, use what more doctors recommend—Sebulex.

Sebulex cleans away everything in sight

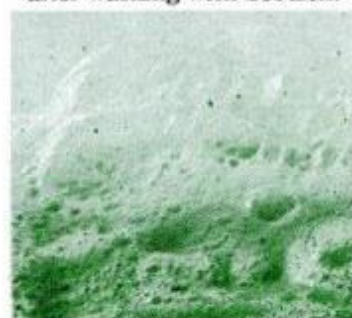
Extra strength cleaning agents in Sebulex penetrate, peel and float away dandruff. They carry medication down to the scalp and follicles of the hair to quickly relieve flaking and itching.

You come away from a Sebulex shampoo with hair that's fresh and really clean, right down to the roots.

And with regular shampooing, it will stay that way.



Magnified hair before and after washing with Sebulex.



consistency of Sebulex right out of the bottle.

Sebulex builds to a concentrated, creamy lather that really gets dandruff off your back.



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That's where we shine.

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Sebulex has the lowest pH of the leading non-prescription dandruff shampoos.

That's because it contains a special combination of medicated ingredients. They could be the key to the dandruff control you're looking for. Try the medicated action of low pH Sebulex.

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Effective dandruff control, pleasant to use

The first thing you'll notice is the thick, rich

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recommended by
specialists

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beautiful smoking
experience.**

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JOHN A. REGINA
Advertising Production Manager

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Motorcraft oil filters.

If they're tough enough for Alaska, they're tough enough for you.



The testing place: Fairbanks, Alaska. Just 120 miles from the Arctic Circle. Brutally cold, then dusty and hot.



The test vehicles: 50 privately owned cars and light trucks. Some had to be thawed before parts could be installed.



The test filter: Motorcraft, made for most cars and light trucks. In these rugged conditions, a filter has to be tough.



Left outside on a frigid night, a car's oil has to be constantly heated. Even so, in the morning it's thick, and tough on the filter.



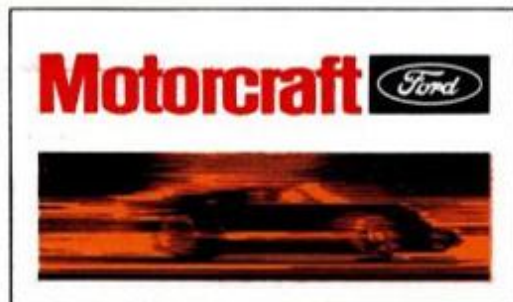
In the summer, it was as high as 90 degrees around Fairbanks. Hot, dry, dusty. Dust in the oil is a tough problem for filters.

Alaska is tough on people. Tough on auto parts. That's why we took Motorcraft oil filters to Alaska. And had an independent testing company test them in 50 Ford, GM, and Chrysler cars and trucks in rugged pipeline country.

The filters were changed at recommended intervals. But along the way they had to handle the sluggish oil flow in the bitter cold. And then contend with the choking dust of the baking summer.

The result: after six months of these unbelievable temperature extremes and driving conditions, only one Motorcraft filter couldn't take the punishment.

No matter what you drive... wherever you drive, ask for Motorcraft oil filters... from Ford. They're tested tough in Alaska.



TESTED TOUGH

LETTERS TO THE EDITOR

First air freight still lives

Congratulations to your staff for a fine job on the 75th Anniversary section of the January issue. My wife and I were especially interested in the account of the first delivery of air freight (100 pounds of silk from Dayton to Columbus, Ohio) in 1910. My wife's father is a grandson of Rev. David M. Martens, a Lutheran minister in Columbus who kept a diary that came to our possession. In it we found a card with a patch of red silk cloth attached. An inscription reads: "This silk is the first merchandise ever transported by aeroplane. AVIATION DAY DINNER, NEIL HOUSE, FRIDAY, NOV. 18. TO OUR NEWSPAPER FRIENDS THE MOREHOUSE-MARTENS CO." One of the minister's sons, Charles Martens, was proprietor of Morehouse-Martens and, while the year was not noted on the card, we assume the event was held in 1910; that the scrap of silk came from the 100-pound roll mentioned in *Popular Mechanics*; that the cargo was delivered to Morehouse-Martens; and that the writer of your 1910 article knew what he was talking about.

CLARENCE C. BROWN
MYERSTOWN, PA.

What else is new?

In your article about differentials (page 86, Jan. '77) you tell how to use the parking brake when one wheel is spinning. You said the same thing recently—in the April 1927 issue, page 680. You must think folks got a short memory.

PAUL KABELA
FAIRFAX, IOWA

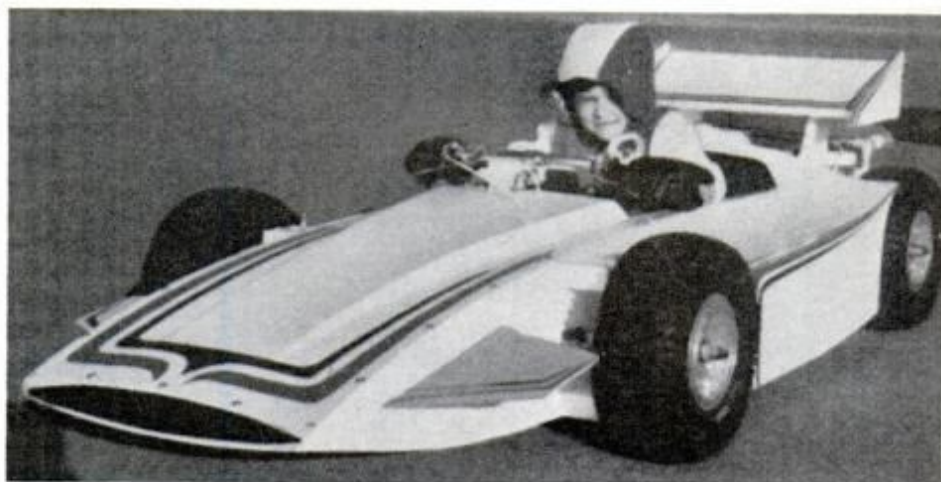
Mmm hmm.

Historic wipers

As an employee of a manufacturer of windshield wipers, I find it incredible that you list the electric windshield wiper as first "produced" in 1923 (page 65, Jan. '77). Nearly all cars in those days had hand cranks and magneto ignition, with no way to operate electrical equipment. Further, the vacuum wiper prevailed for some 30 years before GM went all-electric in '58.

NAME WITHHELD BY REQUEST

Robertson's The Book of Firsts reveals that "The first electric



Sleek Mini-Indy, built by Robert and son Mark Churilla. Cousin Kevin at the wheel.

windscreen wiper unit was *The Berkshire, produced in the U.S.A. in 1923 and introduced into Britain by the Houdaille Hydraulic Suspension Co. of New Bond Street, London, in May of the same year; price, £2/15s including motor.*"

Don't forget farming

Since your "forum" on "significant inventions, discoveries and events of the past 75 years" (page 63, Jan. '77) omitted an important field, I feel constrained to point it out. I refer to food and fiber production, commonly known as farming.

I recognize that yours is not a farm magazine nor one particularly aimed at farm family audiences. However, agricultural exports contribute significantly to the balance of trade in this country. In the past five years U.S. agricultural exports have almost tripled in value, grown 75 percent in volume. Some years it's all that keeps the country from a trade deficit.

From my own biased position I think that agriculture is at least as important as automobiles, hunting, fishing, yachts and airplanes. The next time you put together a panel of experts, I'd like to suggest that while meeting, they work on empty stomachs, don't wear any clothing of natural fiber, or use anything produced from the forest industry. Better yet, why not look for an agricultural expert for your panel? I know there have been scores of significant agricultural inventions and discoveries in the past 75 years. As far as the future is concerned, food production will have to be a

matter of increasing interest and emphasis.

I enjoyed your article on big farm tractors in your August issue. I'm sure that most people in this country have little feeling for the capital requirements and managerial abilities required of agribusinessmen today. It's like the man whose car was stuck and was worried that the farmer making ready to pull him out would damage his \$10,000 Cadillac. The farmer said, "If you feel that way about it, I'll just take my \$20,000 tractor and go on home."

BURTON J. STANLEY
BELLAIRE, MISS.

Mini-Indy mighty pretty

My son and I built the Mini-Indy from your plans (page 36, Aug. '75) in about a year of spare time. It does 35 mph with a 3-hp Clinton engine. Believe me, it draws a crowd and turns heads. Thank you for publishing those plans in your magazine—to which I have been a subscriber for some time. I save every issue. Our "Indy" driver (photo above) is my nephew Kevin.

ROBERT AND MARK CHURILLA
BOURBONNAIS, ILL.

Happy ham in Jeddah

I look forward to getting *Popular Mechanics* every month, and especially like the article on amateur radio (page 82, Jan. '77). It explained to a lot of CBers what radio communications really is, and probably will push some toward more fun and more effective communication. I started in CB but became an ama-

(Please turn to page 26)

The government says every CB can have 40 channels. Panasonic says every CB should have a lot more.

Big Wheelers™ RJ-3250.
One of an exciting new line
of 40-channel CB's
from an ol' buddy, Panasonic.

3-Position Delta Tuning.
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Noise Blanker/ANL Switch.
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background noise.

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with incoming calls.

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Push it for instant
communication in an
instant emergency.

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The legal maximum.

Detachable Mike.



VU/Modulation Meter.
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or too soft.

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On-Air LED Indicator.
Lights up when you're
"on-the-air."

PA System Control.
Turns your CB into a
public address system
(with an optional
external speaker).

S/RF Meter.
Measures signals
coming and going.

Antenna Warning Indicator.
Lights up any
antenna problems.



Quick-Release
Reversible Bracket.
Prevents theft.
The RJ-3250 slips in
and out instantly.
No more fumbling with
connections.

Panasonic 1-year parts and
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Backed by a nationwide
network of service centers.

*For one year after purchase, Panasonic will repair or replace parts of the RJ-3250 if purchased and retained in U.S.A. Customer must bring it to an authorized service center. Warranty does not cover damage in-transit or damage from abuse, misuse or commercial use. Proof of purchase must be shown for in-warranty service.

Panasonic.
just slightly ahead of our time.

THIS COUNTRY NEEDS MORE AIR CONDITIONING REPAIRMEN. NOT MORE ENGLISH PROFESSORS.

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APPLIANCE CLINIC

BY PAUL MANN



Seeing spots

White clothes coming from my General Electric Filter Flo automatic washer 14 with Mini Wash have faint grayish spots on them. This makes me wonder if oil is getting into the tub during the wash cycle since there is indication that oil is leaking from below. Does oil in the tub sound possible to you, and how do I fix it?—Strother B. Purdy, Milwaukee, Wis.

You're right—it sure sounds like an oil leak, especially since oil is showing up beneath the machine as well. The failing part that most often causes this is the shimming around the transmission main seal. This part cracks, which allows water to get into the transmission. Oil is forced out of the transmission, and some of it winds up in the tub where it stains clothes.

To definitely pin the blame for the trouble on the transmission, remove and examine the underside of the agitator and the agitator shaft for oil. Another indication that spots on clothes are caused by oil is failure of subsequent washing to remove them.

Okay, what do you do? If your machine is less than five years old, contact GE. The transmission is covered by a five-year warranty, and GE will replace it for you. If the machine is more than five years old, I would have the transmission replaced with another. This will cost you about \$55.

An overhaul is not recommended since it may not be done correctly. Even if the job is done right, the cost of overhaul almost equals that of a new transmission.

Gemini twins

Did you know that the Frigidaire Gemini 159 refrigerator has a hard fiber cover about 8 inches wide at the base? If so, then you know that this cover is lined with some sort of insulation material that flakes loose and spreads itself all around the fan and motor. This mess prompts me to ask two questions: 1. How is one supposed to clean this unit? 2. Can I leave this cover off the refrigerator?—Stewart Russell, Hemet, Calif.

Did you know that I have two answers to your two questions? The first answer is that you can use your vacuum for cleaning. If vacuuming won't get up all loose stuff, reverse the vacuum and blow the material off. Cleanliness is necessary if the refrigerator is going to operate at maximum efficiency.

The second answer is that you should reinstall the cover the way you found it. The insulation provides a noise-deadening effect, but more important, the cover assists in directing air properly over the condenser. Leaving it off will disrupt proper airflow and will affect the cooling performance of your unit.

Base hit

The base of our Sears room air conditioner stays wet and water drips into the room. The serviceman says this is normal, but our instruction book says the base should be dry. With hot weather a month or two away, I would like to solve this problem if possible.—William Reed, Abingdon, Ill.

There are two major reasons why this happens:

1. A cold metal base pan extending into the room develops a significant amount of condensation. Run your hand under the base. If it's wet, dry the pan off thoroughly (air conditioner "off") and cut a ¼-inch-thick

piece of foam rubber to the size of that portion of the pan extending into the room. Cement the foam rubber to the base. This will help keep humid room air from contacting the cold base.

2. The air conditioner is not tilted properly toward the outside. Run the unit to allow water to build up. Then shut it off and remove the front grille. Check along the edge of the base pan to find where water is accumulating the most. If water is building up in the right-hand corner, insert a wooden wedge beneath the extreme right-hand corner between the base pan and sill (see illustration).

If water is accumulating in the left-hand corner, drive a wedge under the extreme left-hand corner of the base pan. If water is building up in the center of the base pan, drive wedges under both corners.

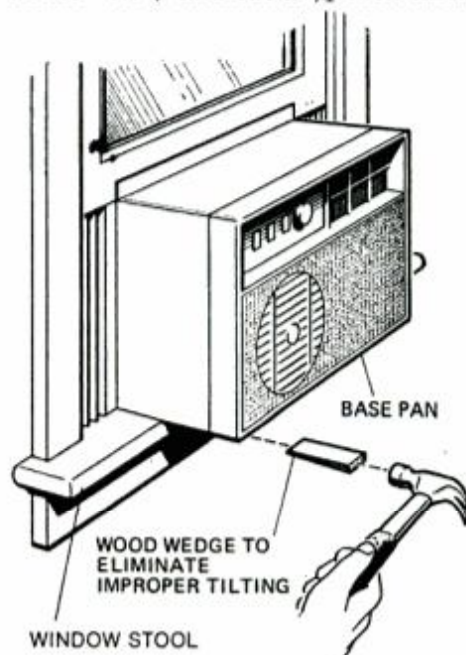
Armed conflict

We own a 1972 model Sears dishwasher. The spray arm no longer revolves, and the water gushes. Do you have any suggestions?—Mrs. Lloyd Morrison, Hillsdale, Mich.

First, see if the spray arm has ever been removed from the diffuser where it sits. Check to see if the nut holding the arm to the diffuser was put on backward. This nut has a flat and a conical side. The flat side must face up. If the nut is reversed, the spray arm may jam against the diffuser.

Second, the spray arm may be split. Remove the nut and pull the spray arm off to take a look. Replace it if it's damaged.

Removing the spray arm from the diffuser will also reveal the third possible cause of trouble if it exists. Something such as a bone or a fruit pit might be lodged between the spray arm and the diffuser. If so, its removal will solve your problem. ★★★



If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N. Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

I can't taste numbers. I can taste Winston Lights.

I was looking for a cigarette with low tar. But the low tar cigarettes I tried had no taste. Now I smoke Winston Lights. I get the low tar I want. But more important, Winston Lights are all taste. Winston Lights are for real.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

13 mg. "tar", 0.9 mg. nicotine av. per cigarette, FTC Report DEC. '76.

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Bigfoot's feeding ground: We hid a case of Canadian Club here, then ran like crazy.

Here's how you can find the C.C.



This scene taken from a priceless 16mm movie film (1967) shows a female Bigfoot on the banks of Bluff Creek in California.

able 17½ inch footprints so common in the area. Each man had studied firsthand accounts of the creature's behavior, including most of the confirmed Bigfoot sightings. And yes, at times each man struggled with a special kind of fear.

For more than 165 years tales of Bigfoot, a massive 8-foot-tall, 500-pound humanoid, have haunted the natives and visitors in the rugged Pacific Northwest. Considerable evidence indicates that Bigfoot is in fact now stalking the dark forests and lurking in the dank ravines along the Cascade Mountain Range.

Keep your ears open! Watch your back!

Our burial party moved with caution once we learned that thousands of respected people from around the world believed in Bigfoot's existence. So with a 48-pound case of Canadian Club strapped firmly to one man's back, we deployed five other men to cover his front, rear and flank.

Each man was carefully trained to spot the incred-

On November 5, 1976, after hours spent threading our way through this primeval forest, we found Bigfoot's feeding ground, buried the case of C.C. and quickly returned to civilization. But for the rest of our lives we will never know what some of us suspected all along...that Bigfoot himself was watching our every move.

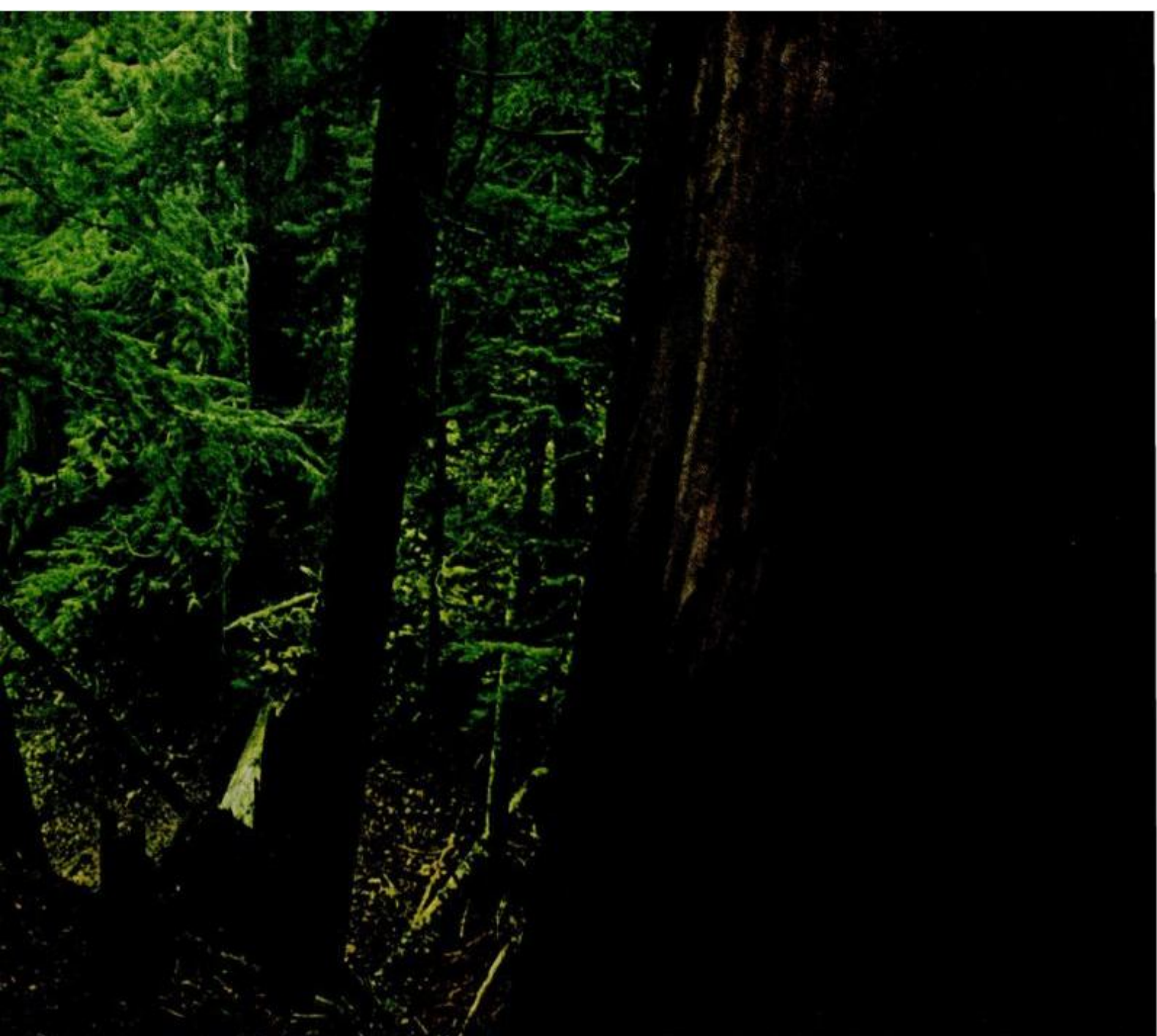
Directions for a few brave souls.

The buried C.C. is located almost the same number of miles south of Canada's Good Hope Mountain (elev. 10,617) as it is north of Bluff Creek in northwestern California.

You'll know you're on the right track when you stumble on a temporarily dormant volcano. Now proceed somewhere between 6 and



This plaster cast of a Bigfoot footprint measures 17½ inches in length, 7 inches in width.



6 YEARS OLD. IMPORTED IN BOTTLE FROM CANADA BY HIRAM WALKER IMPORTERS INC., DETROIT, MICH. 86.8 PROOF, BLENDED CANADIAN WHISKY. © 1977



A fallen Douglas fir makes a mighty handy bridge across a treacherous mountain stream.

miles (as the eagle flies) from this mountain's frigid peak to an eerie pile of broken green rocks.

Standing high on this unnatural rock pile, walk 65 paces due east to a stream. Turn and walk 70 paces due south. Then freeze in your tracks. Because exactly 11 inches below the soft, virgin forest floor 12 bottles of C.C. are resting peacefully.

Most people will choose to enjoy the smooth taste of Canadian Club in the security of their own homes and never venture into Bigfoot's feeding ground. And for that, nobody can blame them. But, if you are the brave one who searches for and finds our delicious treasure, we strongly advise you not to linger in the forest.

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"The Best In The House"™ in 87 lands.



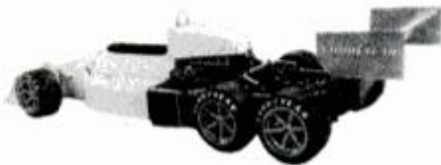
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IMPORTS & MOTORSPORTS

1977 Racing season

As the 1977 racing season moves into high gear, another six-wheeler gets set to make a splash on the Grand Prix circuit. March Engineering's new racer, the 240, could be called a four-wheel-drive racing vehicle: Power is put to the pavement through both pairs of rear tires. The standard Hewland gearbox is used, but the pinion shaft extends to a second differential.

As with the Tyrrell six-wheeler, featured in the January '77 PM



(*What's Behind Those Four Little Wheels?*), the advantage of four smaller tires is in reducing the frontal area of the rubber for an aerodynamic benefit. In this case, though, the four small tires are on the rear. So designer Robin Herd also expects improved acceleration and top speed with the extra rubber on the road.

The March six-wheeler, still under development, won't make it to Long Beach, Calif., for the second running of the Grand Prix West on April 3rd. But sure to be there is Tyrrell's six-wheeler with its slippery new body shape for '77. With Patrick Depailler at the wheel, the car set a new lap record in pre-season testing at the Paul Ricard circuit in France.

The very first Long Beach Grand Prix, held last year on March 28th, was voted "best race operation of the year" by Formula One entrants, drivers and mechanics. Quite a distinction for the new event, which is in addition to the traditional U.S. Grand Prix held every October in Watkins Glen, N.Y., making the United States the only country with two dates on the GP calendar.

The National Association for Stock Car Auto Racing (as if you didn't know what NASCAR stands for!) led all other racing series in attendance during 1976. Figures compiled each year by Goodyear show the Grand National Series ahead with almost a million and a half spectators. Nice way for NASCAR to start its diamond jubilee season of motorsports in the U.S.—racing on the sands of Daytona Beach began in 1902.

Spoiling for a race



It's something that BMW fans have been waiting for—the 320i to go racing, decked out in spoilers, air dams, wings and what all. Since its introduction last year (see *First-hand report*, page 90, Sept. '76), there's been speculation about the race shape the sports sedan would take, who'd be at the wheel and who'd tweak the car in the pits. The word's out: The racing 320i above was built to Group Five specs by BMW Motorsports in Munich, Germany; driver will be David Hobbs and campaigning will be done by Team McLaren. The McLaren BMW will run in the 1977 International Motor Sports Assn. Camel GT series.

BMW's two-liter engine is a super powerplant for Main Street, but it needs some tricking for the track: That's why the car will be powered by the two-liter, 16-valve Formula Two engine—hardly showroom stock!

New Eagle hatched



At Indy, one of the chassis to be reckoned with has been Dan Gurney's Eagle. The championship car has evolved over the years and has been refined to the nth degree in the All American Racers shops in Santa Ana, Calif. For '77, however, Dan has gone to an all-new shape. As shown here, the car has an offset chassis with weight bias to the left for racing counterclockwise on oval tracks. Dan doesn't expect a quantum leap forward in top speed, but is hoping for a significant gain in fuel efficiency to meet United States Auto Club fuel rules.

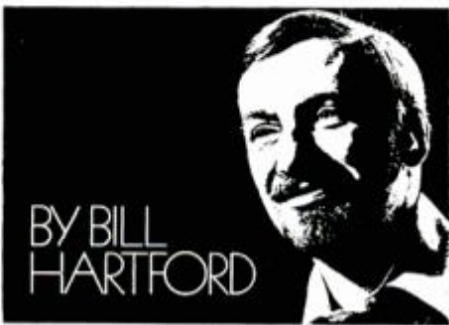
SCCA and Formula Vee

After all the references to NASCAR, IMSA, USAC and other motorsports terms in this column, figuring out what SCCA stands for should be easy. The Sports Car Club of America sanctions, among other series, Formula Vee racing. Engines for the lightweight, open-wheel racers are taken from stock Volkswagens. Ah, but what's stock now that VW has gone to water-cooled engines for its new generation of cars? True, the Beetle is still alive, but nevertheless the air-cooled engines currently used in Formula Vee will be phased out this year so that regulations governing FV worldwide will be identical on January 1, 1978. The water-cooled engine is getting some good track testing in the Scirocco in the Trans Am series this year.

Racing in the sun



When we listed the advanced driving and racing schools in operation from coast to coast (page 10, June '76), we missed one that has the distinction of being the only IMSA-approved driving school open during the winter months—East of the Mississippi, that is. The Precision School of Racing can be reached at Box 18083, Tampa, Fla. 33609. You must be at least 18 years old to enroll and the starter course tuition is \$500. That's two days of racing instruction with certification toward a competition license. A lot of money? Well, look at it this way: For winning last year's Indy 500, Johnny Rutherford collected a check for \$256,121. ★★



BY BILL
HARTFORD

Next time you go camping

Take the Bus.

Introducing the '77 VW Camper Bus. And what a fabulous idea. The VW Bus may be the most versatile and most comfortable family vehicle ever. And in the Camper Bus version, it may be the most civilized recreational vehicle ever.

You can go anywhere in comfort,



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because the VW Camper Bus has everything, including the kitchen sink.

In fact, it also has an icebox, and a water pump, and closets, and a dining table, and bedroom enough for two adults and a child. And with the optional pop-up top, you can sleep two more children.


So the same wonderful machine you use to carry your big family and all its gear to and from home can also be your home away from home. Or a great way for just the two of you to get away.

And not only does it save renting a cottage, its VW economy saves plenty on fuel, too. The '77 VW Camper Bus has a fuel-injected 2-litre engine which gets an estimated 28 mpg on the highway, and

20 in the city with standard transmission in the 1977 EPA tests. Of course, your mileage may vary depending on your driving habits, your Bus' condition and whether you choose optional equipment such as an automatic transmission.

Visit your Volkswagen Dealer soon, and see how easy it is to take a vacation from the hassle of ordinary family transportation. Or for that matter, how easy it is to take a vacation. In the new 1977 VW Camper Bus.



The '77  Cammobile Bus.



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If you need or want radials be sure to see this great McCreary tire before you buy. It has an open pattern tread to shed water and provide excellent traction. There are 2 shoulder to shoulder steel belts to give you protection against cuts and bruises. The polyester cord body gives good handling plus a comfortable ride. You'll really appreciate this radial when you drive on it.

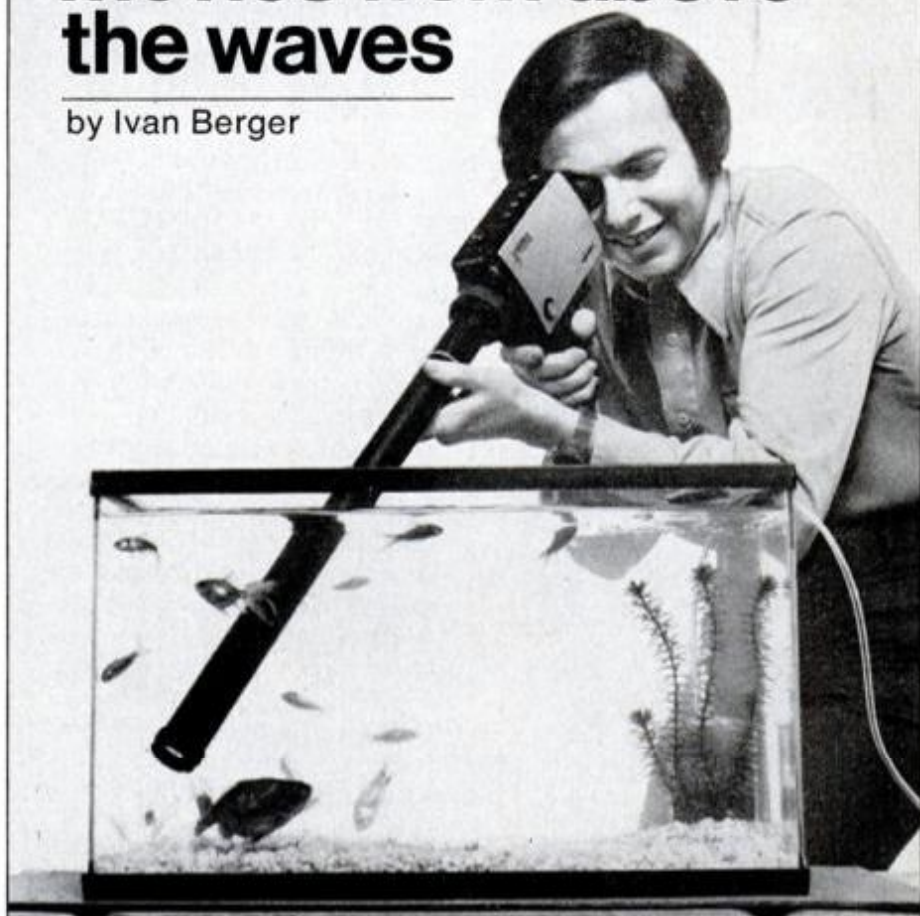


MC CREARY

Tire & Rubber Company
Box 749 Indiana, PA 15701

Take underwater movies from above the waves

by Ivan Berger

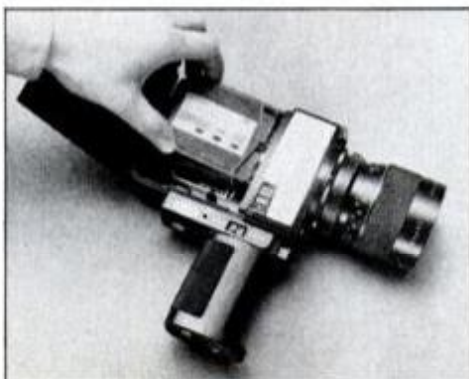


PM photos: Benn Mitchell

Wet lens, dry camera: Carena's lens can be replaced by this accessory—handy for shallow-water sealife or shooting from boats. It's \$100.



Regular lens (above) zooms 10X from wide 6.5-mm to 65-mm tele. Camera's film compartment (below) is big enough to hold sound cartridges, though camera is silent.



The Carena Zoomex 7610-IM is unusual: You can take its lens off and add such accessories as an underwater lens (above), a macro lens, and adapters that let you use long lenses made for 35-mm still cameras or a microscope.

The regular lens is a 10X two-speed power zoom f/1.8, whose range goes from an unusually wide-angle 6.5-mm to a 65-mm tele.

The camera itself accepts both sound and silent cartridges (though it does not record sound) of film from 25 to 250 ASA (covering all of today's popular Super-8 films and then some). You can synchronize an external tape recorder for sound, though.

The exposure system has both backlight compensation and full manual ride, and the shutter operates at the standard 18 and 24 frames per second, a semi-slow-motion 36 fps, and single-frame for animation. The camera is heavy (nearly 4 lbs.) and expensive (\$500), but you can't match its features. ★★★

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SCIENCE WORLDWIDE

Glass wire tougher than steel

Some people in Atlanta, Ga., have been telephoning each other on light waves guided through hair-thin glass "wires." The system, set up by Bell and Western Electric, involves an experimental laser-driven network several miles long. The 144 glass-fiber "lightguides" in 1/2-inch cable handle up to 50,000 simultaneous conversations. The system is compatible with the regular grid.

Though a successful experiment, tiny surface flaws and microscopic damage to the glass-fiber surfaces caused early lightguides to deteriorate rapidly when exposed to atmosphere and handling. Now researchers at Bell Labs have come up with a method for making nearly mile-long glass fibers that withstand a pulling force of 600,000 pounds per square inch. That's more than stainless-steel wire of the same diameter can take. Sur-



face defects on the new fibers are removed by "fire-polishing." A coating of resin, applied after "rods" are softened by a focused laser beam, protects against handling damage. In the photo above, a Bell researcher checks a finished fiber coming through a light box.

Students may fly Shuttle

Student-developed experiments will be carried out aboard the Space Shuttle. As presently envisioned by NASA, the program may even allow for actual in-space work by student crew members. The idea got

a shot in the arm when Sen. Frank Morse—who sits on the National Advisory Board of the Forum for the Advancement of Students in Science and Technology (FASST)—encouraged NASA to establish an office to work with FASST in developing a student payload program.

NASA's response was that it intends to conduct nationwide competitions for both secondary school and college students, as well as instructors or faculty advisors, on experiments and demonstrations to fly the Shuttle. While no specifications are set on types of experiments, they are expected to cover a broad spectrum, including such projects as studies on the effects of zero gravity on biological processes and evaluating solar and cosmic radiation damage to various materials. Information is available from FASST, 1785 Massachusetts Ave. N.W., Washington, D.C. 20036.

The menacing "macho"

He's the driver who shoots by you as though you are standing still. If you ever catch up with him, it's apt to be where the emergency squad is scraping him up along with scattered wheels and wreckage. Just another drunk? A suicide-prone nut? A drug-driven madman?

More likely, says a recent study by a team of Maryland officials and Johns Hopkins University scientists, he's a "macho" personality. The term describes a high-speed, everybody-get-out-of-my-way driver. Findings in the seven-year background study of more than 200 male drivers involved in fatal or near-fatal crashes, revealed that they were more impulsive, belligerent, verbally expansive and extroverted than other men drivers. Most had more alcohol-related problems, many traffic violations and convictions for other illegal activities.

While more than half drank before or while driving, investigators call alcohol more of a symptom of the macho personality than the cause of driving behavior. Machos, they believe, drive that way drunk or sober. Only three of 182 fatal crashes studied were judged probable suicides, and only four percent were wearing seat belts when they "lost it." What can you do about a "macho"? Give him a lot of room. He needs it to do his "thing" without taking you, too.



Parachutes go underground

Special parachutes are about to go down into the nation's mines to help "bail out" working miners in any of several underground emergencies. In case of fire or explosion, for instance, the chutes, anchored to the ceiling or walls of passageways, would unfurl to block the flow of dangerous gases or direct a flow of fresh air wherever it might be needed.

The unique chute, developed by the Interior Department's Bureau of Mines and now being constructed by Goodyear Aerospace, has two basic components. A hemispherical center forms a sturdy inner structure to plug air flows, while a squared-off skirt flares out around the edges to fill in irregularities in the rocky walls and ceilings.

Goodyear has cobbled up a homemade mine tunnel, with fans to simulate movement of air and gases, to determine the best way to secure the chute for most effective deployment in emergency situations. The first prototype chute and tunnel (above) have been built to half-scale. If tests prove out, a full-scale parachute of final design will be built for testing and production this year. ★ ★ ★



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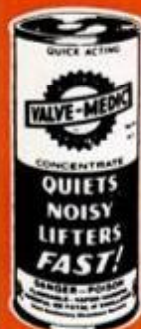


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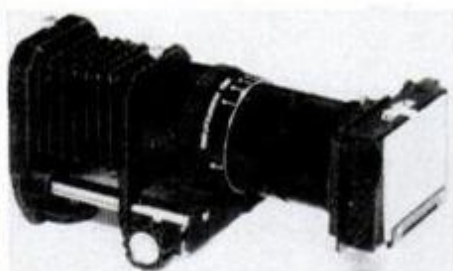
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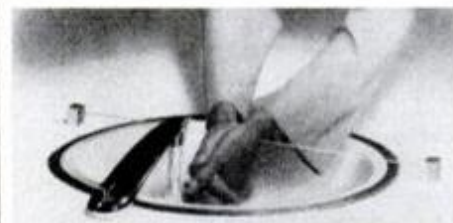
Duplicate your slides

Duplicator system for 35-mm SLR cameras yields 1:1 dupes or magnifies portions 5X. Bellows adapts to most cameras. \$80. Spiratone, 135-06 Northern Blvd., Flushing, N.Y. 11354.



To measure sun's clout

Solar energy researchers need sophisticated equipment, and this is it. A parabolic mirror tracks the sun, focusing rays on a black chrome target. It uses heat transfer fluids that can be flowed at different rates to detect and measure a variety of solar effects. They go for \$4000 to \$8000 depending on instrumentation. Alpha Solarco, 1014 Vine St., Cincinnati, Ohio 45202.



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Water flows when hands break light beam, stops when they're removed. Aquatron installs on any sink; \$230. Qualco, 1 First St., Los Altos, Calif. 94022.



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And be very careful about the motor oil and filters you use. Because they both protect your car's engine.

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Use it regularly and you'll help avoid expensive engine repairs.

And help keep your car from growing old before its time.

The fact is, more people buy Quaker State than any other motor oil in America. So look for Quaker State Motor Oil and Filters wherever they care about cars.

Because we'd like you to keep your car longer, too.

QUAKER STATE HELPS CARS LAST.



Your motorcycle: How to keep the fuel flowing

by Cliff Gromer

Motorcycle gas tanks are above the engine (just as on Henry Ford's Model A) so fuel delivery is guaranteed by gravity. (The one exception is Honda's Gold Wing which, because of its low-mounted tank, actually needs a fuel pump.)

Under the gas tank is a fuel shut-off valve. This valve usually contains a removable settling bowl and screen filter which should be cleaned regularly to prevent dirt from reaching the carburetor. Always turn off the valve when the bike is parked. This will prevent fuel from leaking onto the ground if there's a malfunction, or even into a cylinder (in case the needle valve inside the carb isn't seated properly).

Manual fuel shutoff valves have been eliminated on some new motorcycles. A solenoid activated by the ignition switch, or a vacuum-operated valve is the key to this automatic type of system.

Controlling the mix

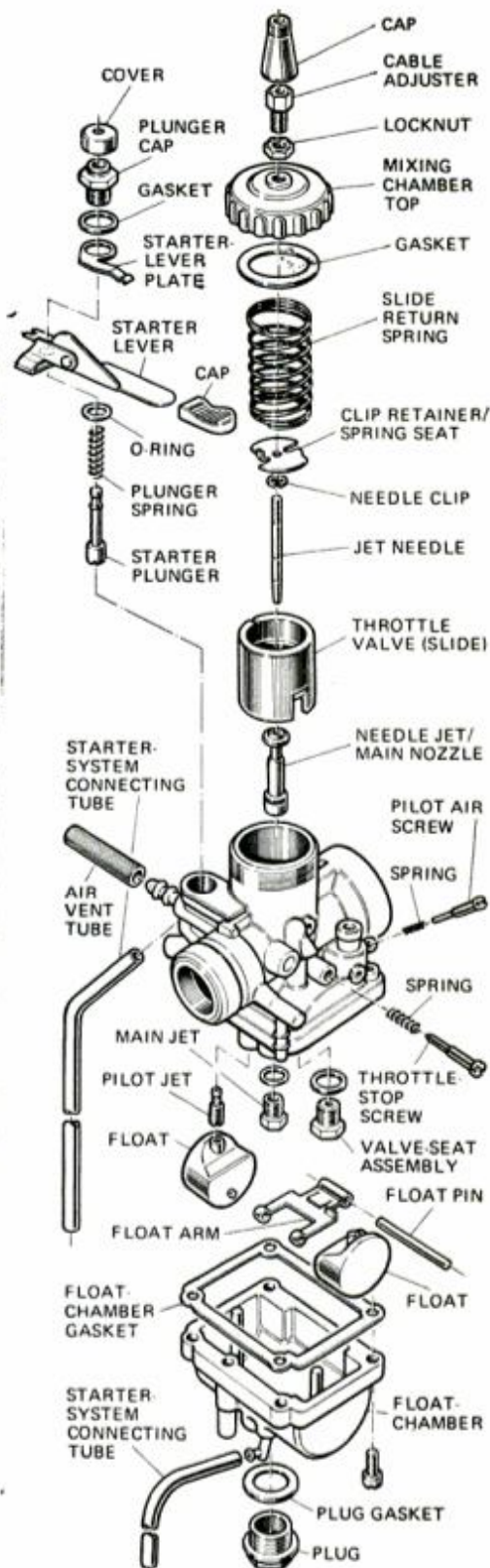
Carburetors are basically mixing machines, combining fuel and air in a ratio of one part fuel to 14 parts air—the best ratio for combustion. Fuel from the gas tank first enters the carb float chamber—a small bowl that usually holds about two ounces of fuel. A float mechanism and needle-type shutoff valve inside the bowl maintains a constant fuel level.

The trick from here is to move the

fuel into the cylinders at a precise ratio to the incoming air. This isn't difficult at idle or small throttle openings: Suction of the cylinders (or crankcase in the case of two-strokes) creates a vacuum at the engine side of the carburetor slide. This vacuum draws fuel from the float chamber and some air from the atmosphere through a special passageway. Air and fuel premix in a chamber in a ratio determined by a metering screw that adjusts to allow a little or a lot of air to enter the mixing chamber.

At large throttle openings the slide is raised and the vacuum is not as strong: The carburetor has to create its own vacuum to mix the fuel and air. The venturi design does the trick. This narrowing of the throat diameter causes the speed of the airflow to increase which creates the vacuum. Fuel entering the airstream at full throttle comes from an opening that connects the venturi area directly to the float bowl. This is the main jet and the fuel flow is determined by a long, slender metering needle that fits into the main jet and is connected to the slide. As the slide lifts to allow more airflow, the needle lifts with it to permit a greater fuel flow.

It's a simple arrangement, and all that's left for you to do is to keep the air filter clean and the gasoline fresh. ★ ★ ★



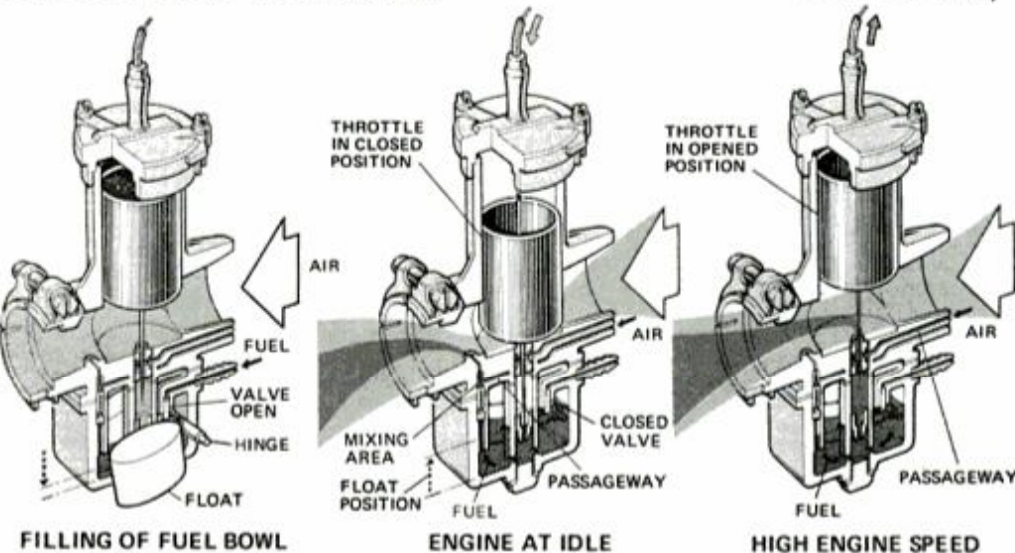
TYPICAL CARB PARTS

Gravity feed from tank to carburetor is used in typical motorcycle. Parts of Japanese carb are shown above.

At far left, fuel flows into chamber, raising level of float. Rising float closes valve when fuel level is high enough. At left, center, carb is shown as it would be with engine at idle. Throttle slide is lowered and only small amount of fuel enters airstream. At near left, engine runs at high rpm and carb slide throttle is in raised position opening throat area or venturi. Greater volume of fuel is mixed with air (see text).

CARBURETOR OPERATION

PM art: Peter Trojan



LETTERS

(Continued from page 6)

teur in 1969. I've been involved in emergencies, nets, chit-chat and have kept in touch with friends in foreign lands. Here in Saudi, where I work and where villages can be 5 to 600 miles apart, I have to rely on radio. Thanks for the informative article. Wonder what Anthony Curtis's call is? Sure would like to work him.

RICHARD D. HARRIS
JEDDAH, SAUDI ARABIA

Tony Curtis' call is K3RXX. You'll probably be interested to know that Tony, who freelanced articles to us for some time, joined our staff in January. You'll be seeing a lot more of his byline in future issues.

More happy hams

Thanks for the article on amateur radio. The author is knowledgeable. Many amateur radio clubs offer code and theory classes for persons wishing to obtain a license. Tuition is either minimal or nothing. 73.

ROBERT O. WILSON, W8JRN

Your article on ham radio was fantastic. I hope some of your CB readers will join the amateur fraternity. A complete course to prepare newcomers is available from the American Radio Relay League for \$7. It's called *Tune In the World With Ham Radio*. After completing the text and code cassette course, applicants can write ARRL, Newington, Conn. 06111, and they'll be set up with a ham volunteer to take the novice test. ARRL also has lists of classes all over the country teaching amateur radio.

RICH CASEY, WA9LR1
CHICAGO, ILL.

Unhappy CBer

Citizens band radio has fast become a bit of Americana and I can't help wonder if this is also a small indication of our current intellectual level. Listening to the CB channels, you invariably hear kids and adults alike spouting the most trite, banal, inane, juvenile, redundant and often obscene stuff imaginable. It is frightening.

KEN GREENBERG
SKOKIE, ILL.

Kudos for car care

I keep a record of important articles from your magazine. They are good reference material when needed. Last year my semiannual car inspection cost me \$74 for new rear brakes. This year, with inspection coming up, I remembered your September article *How to Overhaul Drum Brake Systems*. I replaced the front drum

brakes, got the car inspected, and the bill was \$6.97. JOHN M. CUMMINS
PORTAGE, PA.

Old-hat front-wheel drive

Re your article, *Front-Wheel Drive Has Arrived* (page 92, Dec. '76)—not only has it arrived, but it has been here for nearly a quarter of a century. Don't you and your author know that the reason for the spate of transverse engine, integral gearbox, front-wheel drive cars is that the patent on the granddaddy of them all—the English Mini—has recently expired?

I have no personal ax to grind, having never owned one of these cars. But such a glaring omission astonished me. Your contributor should have done his homework.

AL BURNETT
CAITHNESS, SCOTLAND

Both author and editors were aware of the Mini, as well as a number of other front-wheel drive cars of years gone by—including the U.S.A.'s Cord of nearly half a century ago. Had we planned a definitive history, we also would have credited Alec Issigonis, the brains behind the entire transverse engine concept. With space at a premium, our "history" was limited to a brief acknowledgement that there had been a number of other front-wheel drives in the past. Our emphasis was on the VW Rabbit since that is the current news.

Sunspots and CB

Your article on sunspot effects on CB radio (page 96, Dec. '76) raises some questions. We were holding out until 40-channel CB came in, but now wonder if they, too, will be affected. Will it be possible to buy a CB that operates in the 900-MHz range you mentioned in the near future? We intend to buy a combination AM/FM stereo and CB. Will we have to have two antennas, or is it possible to install one to serve the separate components? MRS. J.R. EICHOITZ
FORT RILEY, KANS.

The 40-channel CBs will be affected by sunspots just as much as the 23-channel sets. The 900 MHz was just a suggestion; no one knows what frequencies will become available or when. Several companies make single antennas that will serve both CB and AM/FM.

'Seeing eye' slip

Your item on the seeing-eye phone monitor, "Bejed Probe" (page 81, Dec. '76), was described as a "new Bell unit for the blind." You are partly right. It was developed by two

engineers in Portland, Ore., and given to the Telephone Pioneers of America, Chapter 31. We, in turn, manufacture the item and sell it at cost. The price is so low that most blind people can buy one.

I work for Bell and appreciate them, but do feel that Telephone Pioneers deserve credit for their dedication to the handicapped.

In addition to Bejed, we now have a "Sound Probe" that enables deaf mutes to call for help through use of the telephone.

J.E. CHURCH, VICE PRESIDENT
CASCADE COUNCIL, TELEPHONE
PIONEERS

We're on your side, Mr. Church. Our source for the item was Southern Illinois University, where a Bejed was used by a blind employee. The report we had said that Bejed was "... designed and built by a couple of Bell Telephone engineers," so we assumed it was Bell's. Glad to know it belongs to the Pioneers and that you're using it so effectively.

Another tip on old oil

Another use for old engine oil not mentioned in Mr. Lund's article on the subject (page 30, Sept. '76) or in your reader mail is lawn rollers. Up north, water must be drained from rollers each fall to prevent freezing, or expensive antifreeze must be added. I now use old engine oil, which never needs attention.

WENDELL L. HUGHES, M.D.
HIGHLAND BEACH, FLA.

It takes a pro to know

Regarding your article *Viva La Differential* (page 86, Jan. '77), it is important to deal with a mechanic who knows what he's doing—particularly with limited-slip differentials. An independent garage quoted over \$400 to stop noise and vibration in the differential of my '70 Cutlass Supreme. I have reason to believe them honest enough. However, I took the car to my dealer who replaced the lube. This cost \$35, and the differential is quiet.

ARTHUR P. SAMUELSON
SAN FRANCISCO, CALIF.

A successful conversion

Convert Your Leaf Blower to a Snowblower (page 57, Nov. '76) was a welcome sight to me. The driveway from the road to my house is almost one-fourth of a mile long and is next to impossible to travel in the winter months. After reading your article, I promptly constructed the frame pictured. I am very pleased and wish you would print more articles of this nature.

PAUL RAUB
GREENVILLE, PA.



"Santa Claus is a Winnebago dealer in Sacramento."

Hank and Peggy Tavener, Sparks, Nevada.

"We thought our Christmas vacation trip was ruined," Hank recalls, "when we found a serious water leak on our '73 Winnebago Indian. But a dealer in Sacramento, California saved our holiday.

"It was Friday afternoon, so he put two men on our repair job. They worked hard, stayed overtime and had us back on the road in five hours. Maybe that dealer wasn't Santa Claus, but my family thinks so. Service like his is one big reason we recently bought our third Winnebago."

Expert, coast-to-coast service, a part of the Winnebago Homeowners Plan, is important to consider when you're buying a motor home. To help you judge such "hidden" values — as well as models, features and floor plans — we've published an authoritative Motor Home Buyer's Guide. It's more than 100 pages packed with facts and honest advice. Because we honestly believe the more you learn about

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PM TOOL TEST

Stihl chain saw



Stihl has added a couple of new wrinkles to its extensive line of chain saws. The first is an improvement in the safety chain-stop system. They've cut the time it takes the chain to stop from 125 milliseconds to 60 (six hundredths of a second). It may seem like hairsplitting, but if you get into a situation where your foot slips as you're cutting and the chain starts



Stihl's chain stop instantly disengages the clutch when hit. Forward, it locks the chain even while the motor is on.



The double trigger includes a standard throttle control, throttle lock button and a half-power lock for starting.

coming back on you, those fractions of a second become precious.

The Stihl 031AV we tested sells for about \$300 with electronic ignition and the chain stop. It's a hefty, well-balanced machine that gives you a solid feeling of control. With a 14-in. bar, it performed well cutting firewood and old oak railroad ties we ran it through.

Many saws use a brake system that clamps the crankshaft. Stihl's clutch disengagement device overcomes the problems these other brakes can develop from crankshaft stress and slippage from lubrication leaks. Remember that chain saws pack a lot of power and sharp teeth. Manufacturers stress safety in their designs, but safety in the field is up to you.

The other development is a master control button within thumb reach so you don't have to let go of the handle to operate it. The single lever has a start position, four semichoke levels, full choke and stop settings.

The innovation is convenient, and also adds a degree of safety since you can keep both hands on the saw all the time. Now the switch is standard only on the 042AVEQ model, a professional-quality saw. But Stihl plans to build it into every saw in its line.—M.M.



The 15½-lb. saw is easy to control. In case you slip or the saw kicks back, your forward hand hits the chain stop.

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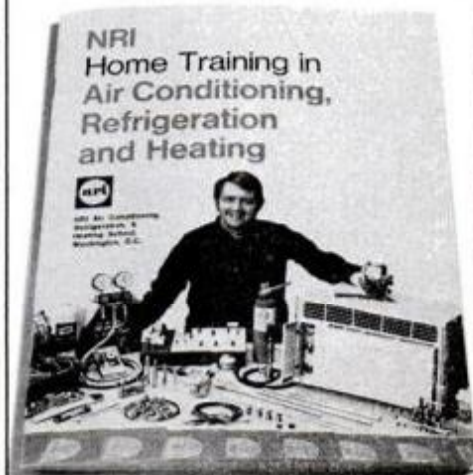
NRI's Master Course in Air-Conditioning, Refrigeration and Heating comes with a window air-conditioner for hands-on experiments. You get bite-size lessons, fine professional instruments and expert instruction every step of the way. A Circuit Demonstrator, Control Simulator, tubing and joint-making demonstrator, leak detector, and system analyzer are included.

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Where do the pros get their training?

Almost half of the successful TV servicemen have home study training, and among them, it's NRI 2 to 1! A national survey* performed by an independent research organization showed that pros named NRI most often as the recommended school and as the first choice by far among those who had taken home study courses from any school.



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also build a 4-speaker Quadraphonic System! Instruments include a triggered sweep 5" oscilloscope, digital integrated circuit color TV pattern generator, a CMOS digital frequency counter, and NRI's electronics Discovery Lab. You get both TV and Audio training for hundreds of dollars less than the combined cost of courses at another school.

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*Summary of survey results on request.

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DETROIT LISTENING POST

Update on GM's electric

If and when General Motors brings out an electric, it will not be a one-seat, two-person car as widely reported. It will "carry four people and groceries," go at least 100 miles between charges and have "a top speed of 50 mph." That is from one who ought to know: Pete Estes, president of GM.

"We're working very hard on this," Estes adds, "but there's still the matter of cost and we need a breakthrough on battery development. The most promising at the start would be a zinc-nickel oxide battery and after that a lithium hot-metal battery. But that's a long way off." So is the electric car. Estes doesn't see it much before the end of the 1980s.

Chrysler's plug-in project

Chrysler is also working on an electric as a partner with three other firms, including General Electric. The government has coughed up \$265,000 in seed money for this one. The specs call for a car that will go a minimum of 75 miles without recharging, that can be recharged in six hours, have a top

no exaggeration. GM figures the cost of redoing its cars will run \$2.5 billion a year every year between now and 1980. And that's for gasoline-engine cars, which GM knows something about. The government is asking the Chrysler/General Electric group to develop an all-new car for about 1/10th of 1 percent of what GM will spend in one year. Good luck, guys.

Air bags: yea or nay?

Cooperating with the government, the auto companies will install air bags in 440,000 '80 and '81 model cars. This will be the now-or-never test for air bags. After the results are in, the government will decide whether to make bags mandatory on all cars or drop the idea. That decision won't be made before late 1981 or early 1982. The beyond-1980 cars are on the boards now.

An air-bag car requires a different steering wheel or instrument panel than a non-air-big car. On small cars, the bag is stored in the wheel. On larger cars, the bag is in the instrument panel. The design guys don't know which way to go. They have to be ready to swing

true you have to time your fill-ups a lot more closely if you're burning diesel fuel than you would with a gas-engine car. But this isn't much of a problem. The companies that sell diesel cars—Mercedes and Peugeot—will give you a directory of stations that handle diesel fuel. VW's Rabbit is now on sale and with GM bringing out diesel cars later this year, there's going to be a big increase in the number of stations handling diesel fuel. Three of the major oil companies have asked the auto firms to project the number of diesel cars they expect to sell between now and 1980. You still won't be able to diesel-up at every corner station. But you'll see a lot more diesel pumps than now.

VW's winners and losers

Past few years have been real downers for VW from a sales standpoint. The company has been clobbered by the Japanese cars.

Strange twist to this is that while VW's stock has been going down with U.S. car buyers, it has been going up with American auto-makers. American Motors is using a VW engine in Gremlin. Chrysler will put a VW engine in its forthcoming front-drive subcompact. The new cars coming from Ford this fall to replace Maverick and Comet are said to look a lot like VW's Audi. Over at GM, the Rabbit is being used as a mule to test components for the new compacts GM will bring out in 1979.

Detroit obviously thinks well of VW. But if VW had a choice, it would gladly trade the attention from the auto companies to be back on top with car buyers.

Watch those eyes

Eye injuries related to car batteries nearly tripled from 1973 to

(Please turn to page 34)



American Motors sent a Jeep to the shrink and look what happened: It's only an experiment in downsizing, but it may have production potential.

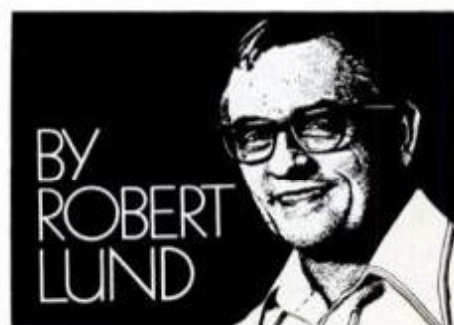
speed of at least 55 mph, not cost more than 15 cents a mile to operate (figured in 1975 dollars) and with a life expectancy of 100,000 miles. Retail price in the area of \$5000.

Chrysler and its partners have a lot of experience and there's no doubt they will come up with something. But the government has a funny idea of what it costs to develop a new car. To give you an idea of costs, if this project was to outfit a guy with a new wardrobe, hat to shoes, \$265,000 would buy about half of one shoelace. That's

either way. So they are doing two sets of drawings and mockups—a with-bag version and a without-bag. All of which will eventually be tacked on the price of the car.

More pumps for diesels

One reason diesel cars have never gone big in this country is that diesel fuel isn't as widely available as gasoline. Only about 10 percent of the service stations in the U.S. handle diesel fuel, and people are afraid they won't be able to find a diesel pump when they need it. That scare has been overdone. It's





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DETROIT LISTENING POST

(Continued from page 33)

1976, according to Jim O'Neil, safety specialist for the National Society for the Prevention of Blindness. Among the reasons cited for the sharp increase are public ignorance of the explosive nature of the car battery and lack of proper instructions for the use of jumper cables.

"Battery explosions may result from improper connection of jumper cables, accidental shorting or sparking, or examining a battery with an open flame," he said. These explosions may result in severe eye injuries, even blindness."

Car batteries are filled with a mixture of water and sulfuric acid which under certain conditions, as during rapid charging, can generate hydrogen and oxygen gases. A spark or open flame can ignite this highly explosive mixture producing a blast forceful enough to send battery acid and fragments flying.

Ignition of the gas can also take place by internal sparking in old batteries which can occur when conductors between cells become cracked. Corrosion deposits on terminal posts present an additional hazard, if fragments that have been scraped or chipped off them get into the eye.

The National Society for the Prevention of Blindness recommends protective eyewear and this step-by-step procedure for connecting jumper cables:

- Extinguish all cigarets, matches and lighters.
- Turn off the ignition in both cars, and make certain the vehicles aren't touching each other.
- Remove the caps from both batteries to vent dangerous gases.

1. Connect one clamp of the jumper cables to the positive (+) pole of the dead battery.

2. Connect the other end of the same cable to the positive (+) pole of the booster battery.

3. Connect the second cable to the negative (-) pole of the booster battery.

4. Finally, clamp the other end to the engine block of the vehicle with the dead battery, on the side away from the battery.

After starting the disabled car, remove the cable from the engine block first, then remove the other end of this cable from the booster battery. Now disconnect the other cable, first from the recharged battery and then from the booster battery. Finally, replace all of the battery caps. ★ ★ ★

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Chrysler proudly announces the first all-Chrysler stern drive ever made: the new "Chrysler 300"!

The "300" is engineered to give you more of what you demand from a truly great stern drive. Ease of handling. Maximum performance. To accomplish this, it took the expertise of Chrysler's finest engineers.

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The "300" introduces a husky "inverted yoke" steering/suspension system that provides amazingly easy steering performance at all speeds.

Patented Self-Energizing Clutch

Incredibly compact and lightweight, the "300's" patented self-energizing clutch makes all shifting surprisingly smooth with no noisy jolts when it is engaged.

And that's not all. The "300" lower unit was thoroughly tested in one of the world's few computer-controlled water test tunnels. The unit dramatically cuts water turbulence and cavitation at high speeds.

Plus, the "300's" big capacity, advance-design exhaust located above the cavitation plate increases top speed. Gives more than adequate reverse thrust. Makes steering easy on quick take-offs.

The "300" is precision-mated with five proved-dependable Chrysler quality powerplants: the 265, 240 or 195 hp. gas and the 130 or 105 hp. diesel. It accommodates most standard stern drive controls and can replace most competitive stern drives with a simple reshaping of transom cut-out.

The "Chrysler 300" Stern Drive. One more reason why Chrysler keeps on earning its reputation as the pacesetter in modern marine power.

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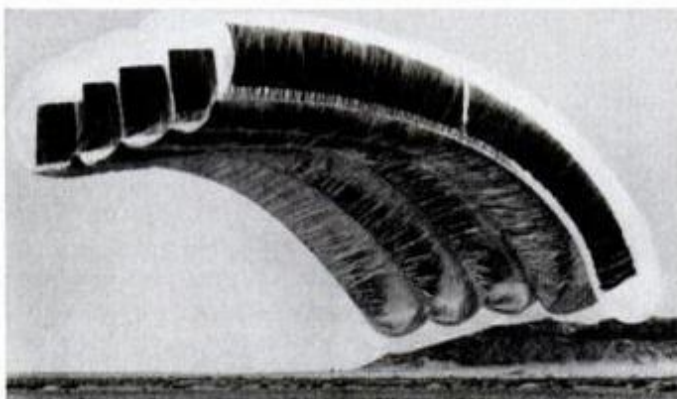
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Formula-One tabletop bar

Blown Formula-One engines used to be junked. Now a couple of ex-Grand Prix drivers mount them in glass tables, so bottles slip into the bores, and sell them for about \$1300. Planners International, Ltd., 47 Curzon St., London W-1, England.



Plastic 'clouds' make desert rain

Double-walled plastic structures, black on top, soak up sun's heat, inflate and rise as artificial "clouds." Hot humid air rising from the desert condenses on the cool underside, falling as rain. The prototypes, launched in a Sahara test, worked.



Portable house

Knockdown Cozy Hut measures 79 inches square and is self-crating. Insulated panels go up in 20 minutes, complete with wall-to-wall carpet and electric light. Foam-Alum Co., 426 Old Wire Rd., Springdale, Ark. 72764.



Scrub that 8-track tape

Dirty cartridge tapes can now be cleaned and polished with a Sound-Track Scrubber that runs on your player. Drop the cartridge in the scrubber and hit the switch. Robbins unit, about \$12, is sold at most audio shops.

Thunderbird for 1977.

At \$5,434*,
it's hard to believe.

Thunderbird. Leaner, cleaner and 10 inches trimmer in size. Its refined suspension system and wide stance mean you can expect agility and sureness to complement Thunderbird's legendary quality and comfort.

So it's almost unbelievable that the Thunderbird shown below, equipped just as you see it, is just \$5,434.

Skeptical? Visit your Ford Dealer—test drive a '77 Thunderbird.

FORD When America needs
a better idea,
Ford puts it on wheels.

Base sticker price: \$5,063*

Power Front Disc Brakes	No charge
Power Steering	No charge
Automatic Transmission	No charge
302 Cubic inch V-8	No charge
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AM Radio	No charge
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Steel-Belted Radials	No charge
White Sidewalls	45
Vinyl Roof	132
Color-keyed bodyside moldings	51
Dual Accent Paint Stripes	39
Deluxe Bumper Group	72
Remote Control Mirror	14
Color-keyed Belts	18

TOTAL \$5,434

*Excluding title, taxes and destination charges



THUNDERBIRD

FORD DIVISION



ALL OUTDOORS

Rubber bumper breakwaters

For boatmen who anchor or tie up at slips along the bumpy side of a channel or inlet or even a wide-open, unprotected bay, there's good news from nearby junkyards and dumps. Construction of a conventional barrier to form a sheltered harbor or deflect the waves could be prohibitively expensive, but the use of a discarded-tire floating system is proving to be a cheap and successful substitute.

Old tires that have been tied together to create a big floating breakwater, as developed by Richard Candle, research engineer for the Goodyear Tire & Rubber Co., have shown the ability to fend off chop and reduce waves into ripples. So far, 19 such tire breakwaters have been installed on inland and coastal waters, while additional sunken reefs built up of old tires have been submerged off Marco Island, Fla., and other fishing resorts to attract a variety of fish. Ropes and chains tying the breakwaters together have had a tendency to corrode, abrade or fatigue, however, in tests that have been conducted by the University of Rhode Island's Sea Grant program in cooperation with Goodyear.

But now their research discloses that the perfect connecting material may be the scrap-trimmed edges of conveyor belt material, a by-product primarily used for horse fences and crate strapping. The edging can be linked through the old tires and secured with non-corrosive nylon bolts and nuts.

In addition to attracting fish, the tire breakwaters protect eroding shorelines at a reasonable cost.

Water sled

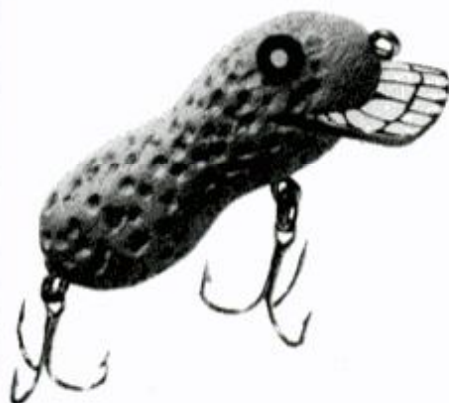


Inflatable action is assured when you are aboard this new 17-foot Sea Sled, claims Bonair Boats, Lenexa, Kans. It seats five, planes at slow tow speeds.

Solar site

For northern Wyoming travelers passing through Lovell on Routes 14A and 310, there is a chance to see solar heating and cooling in action at the visitors' center of the Bighorn Canyon Recreational Area. The National Park Service's first solar-energized installation has been set up to provide up to two-thirds of the energy required for the 7900-sq.-ft. building. Copper panels and tempered glass face south to absorb the sunlight. National Park Service officials estimate a fossil-fuel savings equal to the amount required to supply electricity to 28 average homes.

Peanuts are popular



New smiling peanut lure is reported to be catching attention. Equipped with a built-in fish-call rattle, "The Prez" is from Cotton Cordell Tackle, Hot Springs, Ark.

On the trails

One guide of new paths to hike and new places to travel is as close as your nearest mailbox. A query to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, requesting information about campgrounds or historic sites of interest will get you a list of book and booklet bargains that can be ordered from Washington. Many are as satisfying as an income tax refund—which, in effect, they are since tax dollars have helped research and prepare them.

Among recent handsome hard-cover volumes is *Lewis and Clark*, a 429-page history of the famous explorers' trek, followed by an up-to-date report on many landmarks along the way that can still be visited. The \$8.35 book is a companion volume to *Explorers and*

Settlers, Prospector, Cowhand, and Sodbuster, and others in this historical series.

Five hundred miles of trails, campsites and shelters in the Great Smoky Mountains National Park are all recorded in color on a map prepared by the Jones Publishing Co., York Building, Asheville, N.C. 28801. The map is \$3 printed on durable paper; \$5 on waterproofed paper.

Guidebooks named *Hiking Trails in the Mid-Atlantic States and Hiking Trails in the Northeast* are new and of special interest to backpackers. \$6.70 each, postpaid from Greatlakes Living Press, 21750 Main St., Matteson, Ill. 60443.

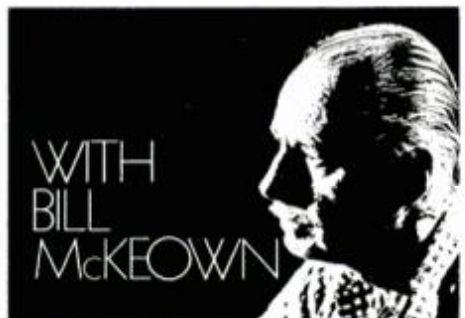
Quick camp cooking

Recipes for freeze-dried food, living-off-the-land supplies, foil utensils and backpack favorites are all in *One-Burner Gourmet*, \$4.95 at bookstores or \$5.70 postpaid. *One-of-a-Kind Cookbook*, \$5.70-by-mail collection of regional, ethnic, old-time and wild-game dishes also tells how to preserve, pickle and put up in brine, plus how to build a smoker and make your own soap and cosmetics. These books are also from Greatlakes Living Press.

Canoe classes

There is a chance for beginners to brush up on paddling techniques before the season starts by checking with Grumman canoe dealers. A new *Learn-to-Canoe Directory* now available lists classes for canoe training being held by parks, clubs, YM and YWCAs, the American Red Cross and others. Many sessions are held indoors on heated swimming pools, and the free book lists location of classes and information state by state. It makes a good companion guide to go with the *Rent-a-Canoe Directory*. Both are

(Please turn to page 41)



Coleman™ Coolers: everything you'd ask for... and then some.

"Roomy... but not awkward." Take Coleman's new model 5286, with 12-gallon capacity. Holds a couple of cases of cans, plus room for ice.

"A latch you open with one hand." Okay, just lift up. Our simple snap latch is inside the lid, so it can't break off.

"Built to last." That's a Coleman Poly-Lite®, with a tough high-density polyethylene hide. You don't have to baby this baby!

"Easy to keep clean." Spills (and odors) wipe right off the one-piece plastic liner. And inside or out, it can't rust or corrode.

"A handle that doesn't bang knuckles." These swing out or slide up, so you can lift the cooler out of even the toughest spots.

"Holds the cold." Urethane insulation is the best. And you get it from Coleman. To keep your cool for one, two, three days... even more.

Coleman coolers and jugs (all of 'em) are the ones with urethane, the best insulation going. Like an expensive refrigerator.

And once we've taken care of the cold, Coleman concentrates on toughness. So you can knock 'em in a car trunk, bang 'em on a rock, drag 'em over a rough dock after you've just iced down your limit of fish.

Go with a Poly-Lite® like the 5286 here, or one of our "steel-belted" Snow-Lite® models. Big

coolers. Smaller ones. Coleman has everything you're looking for.

The great outdoors is too good to miss.



The Coleman Company, Inc. • Wichita, Kansas



**How come
I enjoy smoking
and you don't?**

It's got to be my cigarette. Salem gives me great taste. And enough fresh menthol to keep things interesting.

You'd enjoy smoking, too, if you smoked Salem.

Salem.

Warning - The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

18 mg. "tar", 1.2 mg. nicotine av. per cigarette, FTC Report DEC. '76.

ALL OUTDOORS

(Continued from page 38)

also available by mail from Grumman Boats, Dept. P, Marathon, N.Y. 13803.

Pocket products

A little larger than five playing cards and a lot more valuable is a set of Survival Cards that will fit easily in a shirt, hip or backpack pocket. Printed on 3x5-inch waterproof plastic, the cards give emergency information on where to find water, how to construct a shelter or start a fire, first aid, hunting, trapping, fishing, wild edibles, emergency signals, and tips for the desert, arctic and tropics. The set is \$2.50 postpaid from Survival Cards, Box 805, Bloomington, Ind. 47401, but the type is quite small so be sure you don't lose your glasses.

For a pocket in a fishing vest, there is a spiral-bound note pad with water resistant pages called *Fish'n Stats*, \$2.90 postpaid from Vanderbrush Associates, Box O, North Chili, N.Y. 14514, or from tackle shops. Spaces are provided for recording date, location, water conditions, air, technique and catch, with subdivisions for underwater structure, bait, barometer reading, wind and even oxygen percentage in the water. *Fish Tales*, a slightly larger fishing log is \$4 at marine



Troll motor convenience is offered by a winch and sliding-track mount by Hanson Hoist, Sandpoint, Idaho. For motors to 15 hp, it's called Trol'r/Mot'r/Lift'r.

stores carrying Beckson products.

If you're an inland fisherman, boatman or skindiver in Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Mississippi, Missouri, Nebraska, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia or West Virginia, you're likely to be in luck. Adventure Maps, 306 East 32nd St., Joplin, Mo. 64801, has printed detailed underwater contour charts of 150 noted fishing lakes in these states. Prepared on tearproof waterproof plastic, they show natural and man-made structures that may be hiding the biggest bass around. The maps are \$3 postpaid.

Eastern coastal fishermen can aid their luck with studies from the National Oceanic and Atmospheric Administration (NOAA). Called the *Anglers' Guide to the United States Atlantic Coast*, the publications are divided into eight sections covering Maine to Florida, showing shore facilities, offshore reefs, typical fish and other features. Each section is

Two-for-one boating is possible with Hydrocat hull changing quickly from bolt-on power to sail deck. Stevenson Projects, Del Mar, Calif., has \$7 plans or kits.



Double-duty coolers, like new Sun Packer from Thermos, can flip top into a serving tray fitted to hold cups, cans, utensils. Raising bail handle locks lid in position.



Smooth-course reading in rough seas now is done with new \$150 electronic compass system from Airborne Sales, Culver City, Calif. For small or large power, or sail.



Van plans from T&H Van Works Unlimited, Canoga Park, Calif., offer full-size van patterns, kits to make measuring or cutting unnecessary when van customizing.

about \$1.60 to \$1.80 from the Government Printing Office.

Take-along trends

The recent dealer preview of gear for out-of-doors by the National Sporting Goods Assn. displays more colorful clothes and tents, more compact tackle and accessories, more savings if you make some of your equipment yourself.

Sew-it-at-home sleeping bags and parkas, tents and packs are now packaged by a number of companies and are a bargain if you don't put a price on your time. Excellent flintlock and muzzle-loader arms kits are now on the market, and Country Ways, Minnetonka, Minn., adds do-it-yourself cross country skis, mountain banjos and dulcimers—indoor off-season projects for outdoor use.

★★★





HOMEOWNERS' CLINIC

White patches on brick wall

My two-year-old red brick house is "growing" several white areas just above the foundation. Whatever it is can be scrubbed off, but an unsightly residue remains that defies removal. What is it? How can I remove it and prevent recurrence?—D.F. Roberts, Reading, Pa.

The "growth" you describe is known as efflorescence and is caused by certain salts in the masonry that are activated by moisture. One effective remedy is to scrub the walls with a wire brush or a stiff-bristle scrubbing brush and a medium-strong solution of trisodium phosphate—a good handful of the powder to one gallon of water. You may have to repeat scrubbing to get the surface of the bricks clean. Hose the areas immediately after scrubbing. When using the solution, wear rubber gloves and protect your eyes from splatters with goggles or a face shield.

Repairing leak in toilet tank

A tiny puddle of water on the floor of my basement power room turned out to come from a crack in the back of the toilet tank. The crack seems to be only hairline in width but does permit a drop-at-a-time leak. Can I stop this leak in some way, or must I replace the tank?—R.D. Camp, Springfield, Mass.

I'd try repair before replacing. Shut off the water at the valve, flush the tank and wipe dry in the area of the crack. Then force epoxy putty into the crack with a putty knife, making sure the crack is filled all the way along the length. Allow it to dry for the time indicated on the container.

Wood flooring on a budget

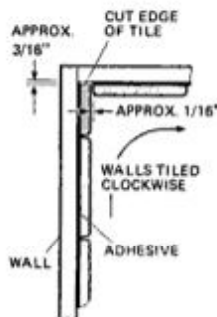
I'd like to lay new wood flooring in our family room, but have a shoe-string budget. Can I use softwood such as pine? Would you?—A.L. Wilson, Cleveland, Ohio.

As a rule, softwoods don't wear as well as oak and other hardwoods. I think if I were doing the job I'd stick to a hardwood. Although yellow pine is fairly durable, it's not overly attractive. White fir is a more handsome wood but less durable.

You might consider buying a low-grade hardwood and cutting out the worst imperfections. Many people think that minor flaws add to the character of the floor.

Ceramic tile over wallboard

I need to know whether ceramic tile can be applied in a bathroom over wallboard that has been coated with a water-base paint. Local opinion



seems to be conflicting—no definite "yes" or "no." Can it be done?—Mrs. C. M. Conlan, Jr., Burleson, Tex.

Assuming the walls are still in sound condition, it is possible to install ceramic tile by the so-called "dry" method, using primer and adhesive specifically formulated for use on this material. If the tub is used for showering, then the walls around the tub should be double-primed and special attention paid to the grouting, particularly at the point where the tiles meet the tub. Also the wall should be thoroughly cleaned before applying the primer. Work around the room clockwise and set the tile at the inside corners as shown to hide tile cuts.

Unsticking a stopper

I have an old glass cruet in which the stopper is stuck fast. I've tried heating it in soapy water and also applying penetrating oil, but haven't had any luck. Can you offer a solution for unsticking a stopper?—Alice Holmes, Macon, Ga.

I've used lighter fluid with reasonable success. Squirt a few drops of fluid around the stopper, then apply a light, twisting pressure until it can be removed. You may have to repeat the process several times.

Window 'sings' in pitch

When I lower the screen in a triple-track aluminum window, I get a moaning sound if the wind is blowing. The pitch is high or low and varies with the velocity. Makes me think of a haunted house. Have you

any suggestions for stopping the annoying noise?—Andrew Duchay, Chicago, Ill.

I've had a similar experience with the metal weatherstripping in a door. The cause was vibration of the metal stripping. I'd suspect that a screen vibration produces the same noise. Try placing a length of transparent tape across the screen diagonally. You might also run another strip of tape on the opposite side of the screen. This would have the effect of stiffening the screen and it probably will silence the noise.

Cabinet fill-ins

I'm redecorating my kitchen and have purchased new cabinets. My new ones don't fill the wall space. There must be a filler available!—William Top, Topeka, Kans.

Yes, there is. You can get fillers from a cabinetmaker. They range from 1 to 3-in. wide. You can trim them as needed. Just fit them between the cabinets or between the cabinets and walls. Screw or bolt them to the cabinets.

Laying a brick walkway

I'd like to lay a brick walkway leading to our front door, but have no idea where to begin. What base should I use?—A.M. Walker, Northbrook, Ill.

The walkway can be laid on concrete or on sand and gravel. Bricks laid on concrete should be mortared with $\frac{3}{8}$ to $\frac{1}{2}$ -in. joints depending on the brick size. On a sand and gravel base, lay the brick fairly snugly together and sweep enough sand in between the joints to fill them.

Your local dealer can help you estimate the amount of brick and other materials needed. You'd be wise to purchase SW-grade (severe weather) brick. ★★★

Do you have a home maintenance or repair problem? Send it to Homeowners Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.49 postpaid. Send orders to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.

Putting the accent on comfort made Volaré America's best selling wagon.



The proof is in the putting. And we put more value into Volaré than any wagon lover could ever rightfully expect. Put one through its paces. Discover for yourself the best-selling combination of size, comfort and economy that leaves Volaré virtually without competition.

Volaré offers more cargo space than other small American wagons. Other small American wagons in Volaré's class just aren't. Comparisons don't exist. Better you should compare Volaré to big station wagons (83% as much space as a Chevrolet Impala wagon); or mid-size wagons (more passenger space than a Chevelle wagon). Pinto? Pacer? C'mon.

**24 mpg/
17 mpg.**

Volaré puts out some pretty impressive EPA estimates for highway and city driving, based on 6-cylinder 2-barrel engine and manual transmission. Your mileage could differ depending on how and where you drive and your car's optional equipment, and will be lower in California and certain other areas. But considering Volaré's huge cargo capacity, 24 and 17 are nothing short of fantastic, sensational and terrific. To put it mildly.



The liftgate is gas assisted for ease of operation. At various times there have been 1-way tailgates, 2-way tailgates, 3-way tailgates, even vanishing tailgates. Everybody tries to design their own tricky way to get into the cargo area. But the test of a good tailgate is simply this: It should work. It should get out of the way in a hurry, yet close easily and efficiently. (Volaré's does.) What it shouldn't do is pad out the price with rattle-prone gadgetry. (Volaré's doesn't.)

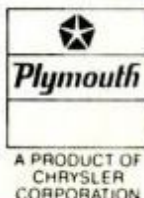
Volaré's isolated transverse suspension. Underneath the comforts of room, size and price is a ride that compares favorably to big wagons. It results from isolating, bending and mounting torsion bars in transverse fashion. Given time, other wagon makers may someday duplicate Volaré's isolated transverse torsion bar suspension. Maybe. Someday.

Hidden spare tire and lockable storage compartment. The difference between Volaré and other small wagons is that it doesn't just pretend to be a wagon. Like big wagons, the spare tire is under the cargo floor, out of sight. And, like big wagons, there's a hidden storage compartment on Premier models to keep that "out-of-sight" camera out of sight.



Even the price is comforting. It all comes down to price. And it's our contention, nobody has more features coming down on a lower price than Volaré. Just \$3941* for the base Volaré Wagon to your left. The Premier model shown above is, of course, more expensive. Putting the accent on comfort paid off. It has more people putting their money on Volaré than any other wagon in America.

*Manufacturer's Suggested Retail Price excluding: taxes, license, destination charges, whitewalls (\$39.25) and deluxe wheel covers (\$32.00). Prices higher in California.



Volaré. The small wagon with the accent on comfort.

OUR TOUGH CHEVY PICKUP IS A TRUCK WITHIN A TRUCK.

A Chevy pickup is tough in the right places. With two steel walls in the Fleetside tailgate, body sides, doors, front fenders and hood. Plus extensive rust protection throughout.

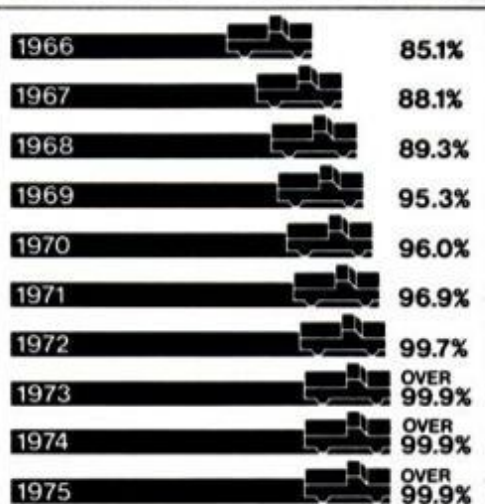


Cargo box has a full inner wall of steel extending all the way up the body side on Fleetside pickups. It protects the outer wall from dents.

Front fenders have an embossed inner wall of steel under the exterior sheet metal. Plus a self-washing inner fender skirt to help protect engine compartment from salt spray and flying stones.

Hood is fabricated from two pieces of steel welded together for rigidity. You also get two walls of steel in the doors, upper cab panel, windshield pillars and front cowl.

For protection against rust, inner surfaces of both inner and outer front fenders are sprayed with a zinc-rich primer before assembly and final priming. And pickup box steel floor, sidewalls, front panel and tailgate are totally immersed in an electrically charged primer, drawing paint into seams and crevices for corrosion protection.



Chevy has an impressive record for building trucks that last. The chart above shows the percentage still in use in each of the 10 most recent model years recorded. 96% of all Chevy trucks registered during those model years were still in use on July 1, 1975 as reported by R. L. Polk & Co.



BUILT TO STAY TOUGH



IT'S NEW
NOW



Semi-car for double viewers

People who wear bifocals for the first time often encounter difficulties when trying to drive a car, negotiate stairs or play a piano. Now a British oculist has devised a bifocal clinic with space-saver versions of the trouble areas. To test their vision, patients sit in half a car, climb up and down steps going nowhere and play a small piano. Lens adjustments are then made on the spot.



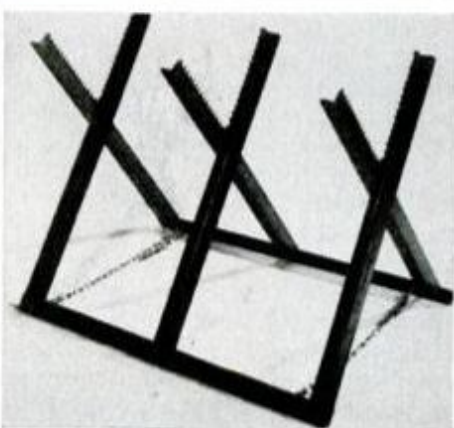
60-second CB antenna

Remove this 16-foot base station CB antenna from its small carton and pop it open like an umbrella. Three capacitive loading stubs are screwed in place and that's it—a one-man, one-minute job. The half-wave 40-channel dipole is called Golden Hawk. About \$50. Channel Master, Ellenville, N.Y. 12428.



Angled holes on the nose

If you've ever tried to bore a precisely angled hole with a portable electric drill, you'll appreciate this tilting drill jig. With it you can drill exact angles on any horizontal, vertical or overhead surface. The stand accepts most 1/4, 3/8 and 1/2-inch drills and rotary tools. About \$15. Extra slides can be permanently mounted on different tools for quick interchangeability. Readi-Press JK-700 Radial Drill Press is made by Jimcraft Corp., Box 2004, Saginaw, Mich. 48605.



Adjustable sawbuck with teeth

Fold it to a compact 2 x 31 x 34 inches and carry it to the woodpile or woodlot. The metal Gator-Buck opens its toothed jaws to accommodate any size log you can handle and is locked at the desired setting with chains at the base. Teeth hold work for safe chainsaw cuts. Three forks permit sequence cutting without "clinch." Logs Nos. 1 and 2 come off ends, No. 3 is cut at left center, No. 4 at center right. \$40. Energy Associates, Box 524, Old Saybrook, Conn. 06475.



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Best yet, a RISLONE quart costs only a couple of dimes more than mini products, and replaces a quart of oil. That makes RISLONE a big bargain on your auto retailer's shelf. Get more for your money in volume, in quality, in performance!



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Fill 'er up— with Gasohol

Take 90 gallons of unleaded gas, add 10 gallons of pure ethyl alcohol and you wind up with 100.25 gallons of a fuel called Gasohol. This "molecular expansion" is one of several curiosities surfacing in a Nebraska project that soon may find us growing at least a part of our automotive fuel.

Gasohol research began five years ago when the Nebraska legislature saw a chance to build new markets for Midwestern grain, while helping to stretch depleted fuel supplies. Today, under Dr. William Scheller, head of chemical engineering at the University of Nebraska-Lincoln, the interesting program is fast approaching fruition. If you can't yet buy Gasohol at your local service station, indications are that you may, before too long.

The new fuel is a blend of plant-derived anhydrous (water-free) alcohol and unleaded gasoline. One advantage is that the alcohol can be made from wet, moldy grain unfit for human or animal consumption. And there's enough such low-grade grain to supply a 20-million-gallon-a-year alcohol plant in Nebraska alone. Another plus: Alcohol is cheap to make by known, efficient methods that can produce 2 1/2 gallons from (for instance) a single bushel of mildewed corn.

Everything gets used

That isn't all. Of 100 pounds of grain fed in, a third returns as alcohol, a third is carbon dioxide usable by industry (soft drinks, for one), and a third is high-yield cattle feed. Unused protein in the feed is being extracted for possible use in deficient diets of underdeveloped nations.

But the major thrust in Nebraska has been to provide automotive fuel. Already, the project's 2-million-mile road tests look mighty good. Two groups of Department of Roads vehicles participated in the tests, one burning only Gasohol, the other commercial unleaded gas. At the million-mile mark, the two groups interchanged fuels.

Researchers were watching six things: consumption, cylinder wear, exhaust emissions, condition of valves and valve seats, sparkplugs and exhaust systems.

In two years Gasohol produced no adverse effects anywhere, but several



1972 Ambassador (top) ran 32,000 miles on Gasohol with no ill effects. Dr. Scheller (right) checks emissions in lab.

pluses emerged. The Gasohol-powered cars registered mileage increases from five to eight miles per gallon. The Gasohol did not "separate" at extreme temperatures like other alcohol-blend fuels such as methanol.

Price? Gasohol costs no more than unleaded gas, due partly to a 3-cent-a-gallon tax break on fuels containing 10-percent alcohol, and partly from Gasohol's unique expansion factor.

Public reaction? A service station in Holdrege, Neb., was furnished 20,000 gallons with a stipulation that any left after a year must be destroyed. It was gone in two weeks! In all, the station pumped 90,000 gallons of Gasohol in 10 weeks.

A few years away

Some 1400 questionnaires asking customers for reactions were mailed and drew a surprisingly high 50-percent response—all indicating they would buy Gasohol.

When can you get it? Dr. Scheller figures three years to build a plant and get the fuel moving—after approval is given. He warns it will be regional, since the grain belt can't supply the nation. But a 10-percent fuel saving there means more gas for people elsewhere.

—Warren H. Spencer

The 40-channel Cobra 29XLR. From the sleek brushed chrome face to the matte black housing, it's a beauty. But its beauty is more than skin deep. Because inside, this CB has the guts to pack a powerful punch.

The illuminated 3-in-1 meter tells you exactly how much power you're pushing out. And pulling in. It also measures the system's efficiency with an SWR check. In short, this Cobra's meter lets you keep an eye on your ears.

The Digital Channel Selector shows you the channel you're on in large LED numerals that can be read clearly in any light. There's also switchable noise blanking to reject short-pulse noise other systems can't block. The built-in power of DynaMike Plus. Automatic noise limiting

and Delta Tuning for clearer reception.

And the added protection of Cobra's nationwide network of Authorized Service Centers with factory-trained technicians to help you with installation, service and advice.

The Cobra 29XLR. It has 40 channels. And it has what it takes to improve communications by punching through loud and clear on every one of them. That's the beauty of it.



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Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

CAR CLINIC

BY MORT SCHULTZ



Up the power alley

I own a 1976 Toyota Celica GT which has a problem I understand is common. Under gradual acceleration the engine jerks and hesitates as if it were badly in need of a tune-up, which it isn't. I've seen the dealer three times and received the same answer each time:

"The manufacturer knows of the problem and they are working on it, so just keep checking with us until we find the answer." Could you possibly have the answer?—Nick Papinchak, Coraopolis, Pa.

Replace the power piston in the carburetor. The original one is too weak, but a new power piston has been issued by the company.

They love me in Coraopolis

My 1974 Dodge Dart, purchased new, has been plagued from day one with a leaking radiator. It's been repaired time after time only to develop a leak somewhere else a short while later. I've replaced the radiator pressure cap, but that hasn't helped. Now a radiator repair shop tells me the Dodge Dart radiator isn't strong enough to withstand 16 p.s.i. pressure. All the Dodge people tell me is to replace the radiator. I want to know what you think.—A.J. Ciarrocca, Coraopolis, Pa.

I think what the "Dodge people" think—that you got a bum radiator to begin with. Dodge has been putting 16-p.s.i. pressure systems in Darts for years. You're one of only a handful I know who has such a problem.

If it's on record with your dealer that you have been having trouble with the radiator from "day one," Chrysler may bear the cost of a new radiator. Work through the dealer on this or get in touch with the company by mail.

Super squeak squawk

About a year ago I had my Volkswagen dealer reline the brakes of my 1971 Super Beetle. Since then, the brakes have been squeaking loudly whenever the pedal is applied. I've lived with this for 12 months, but that squeaking is driving me up the wall. It's also embarrassing. All the dealer has done is blow dust off

the drums. He says the problem is unfixable and I should learn to live with the noise. Can you help me?—Dave Kvindlog, Cedar Rapids, Iowa

The problem is not unfixable, so you don't have to live with it. Have all four drums cut and install new shoes lined with Mintex brake linings. These are available at VW dealers under an exchange program authorized by the company. Mintex linings are softer than the original ones and don't make noise.

Steers by itself

The alignment of my 1975 Oldsmobile Starfire had, at 8000 miles, started to pull to the left. The car wouldn't travel in a straight line without hands on the wheel (not that I make a habit of driving without hands on the wheel). The dealer corrected the problem under terms of the warranty. Now at 20,000 miles, the condition has reappeared. I've had the wheels aligned at a local garage, but this time the pulling hasn't stopped. Is there something the local mechanic missed, or should I consider this as natural?—Mark Fuller, Syracuse, Ind.

It isn't uncommon for a car to "lose" wheel alignment in 8000 or 12,000 miles. In fact, hitting a bump hard enough can throw wheels out of alignment 10 minutes after re-alignment has been performed.

But why does it seem that your local mechanic has failed to realign the wheels properly? While I can't say for sure, if he didn't align wheels to proper specification, the misalignment condition would continue. Those specifications are as follows; caster, $-1/4$ to $-1/4$ degree with $-3/4$ degree being desired; camber, $-1/4$ to $+3/4$ degree with $+1/4$ degree being desired; toe-in, 0 to $1/8$ inch.

Unequal tire wear would also cause pulling. Take the car back to your mechanic or dealer. This condition does not have to continue.

Weird appetite

I recently bought a 1975 Ford F-100 half-ton pickup equipped with a 360-cu.-in. engine. It's a good vehicle except for one thing: It eats coolant. The cooling system has been pressure-checked twice and gone over thoroughly by my mechanic. I have replaced the radiator pressure cap. The truck has a coolant recovery tank which is sometimes full, sometimes half full and at other times is empty.

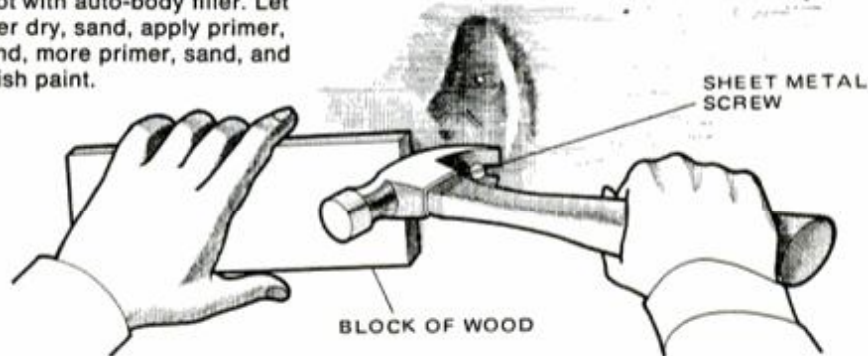
Despite all and regardless of weather or driving conditions, I find the coolant level is anywhere from a quart to three quarts low every couple of days. Any answers?—Gordon K. Thompson, El Paso, Tex.

Yes, but you aren't going to like

(Please turn to page 50)

Undoing unsightly dents

Often a dent can't be pounded out from inside. So what to do? Drill holes in the panel, insert sheet-metal screws, place a piece of hardwood across surface and pull dent out with claw hammer as shown. Use slow, steady pressure. When dentless, the area can be finished by removing screws, sanding surface with 40-grit production paper and filling spot with auto-body filler. Let filler dry, sand, apply primer, sand, more primer, sand, and finish paint.



CAR CLINIC

(Continued from page 49)

them. You bought a used truck and probably don't know the treatment it received by the previous owner. If the engine was ever run while overheated, the head gasket could have been affected. The coolant you are losing may be seeping into the cylinders through a leaky gasket. Let's hope so, because the alternative isn't pleasant.

The engine could have an internal crack, which is allowing coolant to leak into the lubricating system. You can check for this disaster by drawing out the oil dipstick and allowing some oil to drop on a hot exhaust manifold. If the oil "sizzles," you've got coolant in the oil. I'll pray that's not your problem.

Missing part

Man, do I have a gripe. I want to replace the master cylinder on my 1967 Chevrolet Impala. The car has drum brakes on all wheels. My service manual says that the master cylinder should be replaced only with another cylinder having the same two-letter identification which is stamped on the end of the cylinder. The Chevy parts places have no such

cylinder. Is this another case of the manufacturer short-changing owners of older models?—James E. Cheatham, South Gate, Calif.

No—it's just a case of a change in design outstripping manual instructions that are 10 years old. If your car is equipped with a Bendix brake system, order your master cylinder using part No. 3912145. If your car is equipped with a Delco Moraine brake system, order your master cylinder using part No. 5463267.

Perhaps the easiest way for you to identify the system as a Bendix or Delco is to take the old master cylinder to a Chevrolet dealer's parts department.

How does this grab you?

The brakes on my 1969 Toyota Corona grab the first few times I apply them, especially in damp weather. One dealer replaced the shoes with another type and turned the drums. No help. A mechanic replaced the springs with heavier ones, which helped for a while. The problem is irritating and scares passengers to death. Is this characteristic of the car, as one dealer told me, or can something be done?—Tom Tingdale, Santa Barbara, Calif.

It's characterisitc, Tom, and all you can do is apply brakes easy-like for the first few times out of the barn. Anything a mechanic will do for you, such as replacing linings with American-made parts, reversing springs on the shoes or replacing springs, will provide relief for, at most, 1000 miles. Sorry.

Sounding-off department

I'm sounding off for every owner of an older model that appears to have been forgotten by the manufacturers we patronized. My car is a gem of a 1961 Oldsmobile Super 88. It has (get this) 21,000 original miles. My gripe is that I'm finding it ridiculously difficult to obtain a simple switch—the four-position high-to-low heater, vent and defroster switch. It has gone bad.

The switch (part No. 575930 according to the parts book) was ordered by a dealer. The switch Olds sent was a one-position on-off switch that didn't fit. The dealer reordered, figuring the company made a mistake. Same outcome.

What's a guy to do when he has to keep a really great car that still has many years of life left, parked at the curb, because the company doesn't feel it profitable to stock parts for



STAR PERFORMERS IN SPORTS

by Joe Garagiola

The great Bobby Jones took his first swing at a golf ball at age five, won his first tournament at age nine and the Georgia State Amateur Championship at 14. Between 1922 and 1930 he won 13 major golf crowns including the U.S. Amateur 5 times and the British Open 3 times. He was only 28 when he retired from competitive golf in 1930.



"WHEN YOUR CAR NEEDS SERVICE, GIVE IT THE STAR TREATMENT WITH MOPAR STAR PERFORMER PARTS"

Keep your car a Star Performer and ask for MOPAR renewal parts at service time. It's one of the surest ways to help keep your car in good driving condition. That's because MOPAR parts meet or exceed the original factory specifications of the vehicle for which they're intended—whether it's a Ford, GM, AMC, Chrysler, Dodge, Plymouth, import or light truck. So depend on MOPAR parts to help put back new-car performance and for all the high-quality parts your car will ever need. Remember, the best-kept cars are part MOPAR.



it?—Daniel R. Bachrach, New York.

I don't know. We asked Oldsmobile and got a vague answer, to wit:

"It may be possible the owner has an airconditioned car which would use a different switch part number—584278."

My source of information said he checked with Oldsmobile engineering, and "they advise that drawings of 575930 and 584278 have been destroyed." This statement seems to support your contention, Dan, that after a model passes a certain point, automobile makers seem to lose interest. In any event, try ordering this switch using part No. 584278. It is probably the one you need.

Sniffing trouble

My 1975 Pontiac LeMans has bad breath. It gives off a smell that resembles the odor I once experienced when staying overnight in Savannah, Ga., where sulfur water comes from the taps. Is there an inexpensive way to clear it up? My dealer says the catalytic converter has to be replaced, but that costs \$200. Help.

—Henry Singer, Hallandale, Fla.
The dealer is probably wrong. The odor your car is giving off, which I liken to rotten eggs, is hydrogen sulfide. It's true that the smell has be-

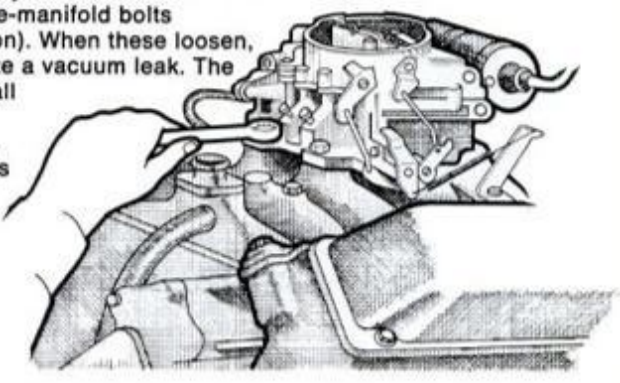
PM CAR CARE

TIP

Screw loose

One habit you should get into is tightening those innocent-looking bolts and screws on an engine. I'm talking specifically of carburetor base, bowl cover and assembly fasteners and also valve-cover and intake-manifold bolts (illustration). When these loosen, they create a vacuum leak. The engine will idle rough or stall and can give forth with a banshee-type shrill whistle. When any of these problems strike, an unsuspecting driver is faced with a dilemma.

What's causing the condition?
Who would ever suspect a few loose screws?



come quite common since cars with catalytic converters have been produced. However, it is not true that the converter is usually to blame.

The reason for the odor in most instances is simply an improperly adjusted fuel mixture. The odor generally can be eliminated by readjusting the carburetor to exact manufacturer specifications. This is what auto-manufacturer and Environmental Protection Agency investigations have found.

Seeking truth

My husband would like to know where he can get a shop manual for a 1973 Chevrolet Caprice. The local dealer told him he would have to go to school to get one. True?—Mrs. Lucian Boteler, Philpot, Ky.

False. GM, Ford, Chrysler and AMC have liberal policies concerning manual availability. Your husband will want to get in touch with the Chevrolet Manual Distribution
(Please turn to page 52)

MOPAR HAS A STAR-STUDED PARTS LINE TO HELP RENEW THE PERFORMANCE OF PRACTICALLY EVERY CAR AND TRUCK ON AMERICA'S HIGHWAYS.



MOPAR Star Performer Parts are available at auto parts stores, many service stations, and independent garages.

STAR PERFORMANCE TIP

Give your car the Drip Test. After your car cools off, lay paper underneath. Oil or colored drips could mean your car needs service. Have your mechanic check it out.



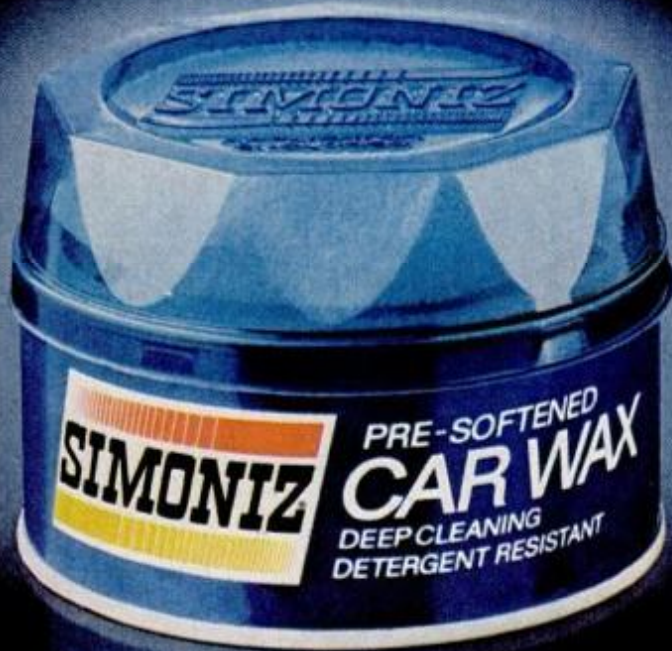
Mopar



STAR PERFORMERS



ORIGINAL SIMONIZ.



SIMPLE SIMONIZ.

There are shines
and there are *Simoniz* shines.

Original *Simoniz* gave you a great shine.
But it took hours of hard work.

With today's *Simoniz* Pre-Soft,
it takes less than an hour of not-so-hard work.
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It's real *Simoniz*. Made simple.

SIMONIZ. ACCEPT NO SUBSTITUTES.

SIMONIZ IS A REGISTERED TRADEMARK OF UNION CARBIDE CORPORATION



CAR CLINIC

(Continued from page 51)

Dept., Helm, Inc., Box 07150, Detroit, Mich. 48207.

As long as we're on the subject, here are up-to-date addresses to write if you want to order service (shop) manuals or to get a list of what's available in technical literature from the company for your American-made automobile:

■ AMC—American Motors Corp., Owner Relations, 14250 Plymouth Rd., Detroit, Mich. 48232.

■ Chrysler (Dodge, Plymouth)—Chrysler Motors Corp., Service Dept., Box 40, Detroit, Mich. 48231.

■ Ford (Lincoln, Mercury)—Helm, Inc., Box 07150, Detroit, Mich. 48207.

■ Buick—Tuar Co., Box 354, Flint, Mich. 48501.

■ Cadillac—Cadillac Motor Car Div., GM, 2860 Clark Ave., Detroit, Mich. 48232 Attn: Service Publications.

■ Oldsmobile—Oldsmobile Div., GM, 920 Townsend St., Lansing, Mich. 48921. Attention: Service Publications.

■ Pontiac—Drake Printing Co., 2000 West Eight Mile Rd., Ferndale, Mich. 48220.

SERVICE TIPS

■ Chevrolet jogs our thoughts this month with an obvious, but often overlooked fact: that you shouldn't interchange inch and metric dimensions.

Specifically, if you change the lug nuts on the wheels of your Chevette or LUV truck for such reasons as installing custom wheels or adding theft protection, remember that your vehicle uses metric lugs. If you should use inch nuts instead, you will be creating an unsafe driving condition.

■ If you are going to drain the cooling system of your Plymouth Arrow or Dodge Colt equipped with a 1600-cc engine, you must *not* try to remove the radiator drain plug completely. This plug has a small tab on the inside portion which has been put there to keep the plug from falling out. If you should try to remove the plug all the way, the tab will slice across the threaded portion of the radiator, causing damage. The plug has a groove cut into it that will permit drainage while the plug is still partially inserted in the radiator.

■ If you should follow the instructions given in the 1976 Capri II shop manual to time the ignition of the V6 2.8L engine, you will wind up with the wrong setting. The manual depicts the crankshaft pulley as being marked in 3° increments when in fact they are in 2° steps. ★★★

GOT A PROBLEM WITH YOUR CAR?

Just ask Mort about it. Send your question to the Car Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems that are of general interest will be published in the column.



"Why Valspar Grandpa?"

Grandpa's a real craftsman with a lot of good answers based on experience. He grew up with Valspar and he knows it's the most reliable clear finish money can buy.

Find out for yourself just how great Valspar is. The next time you start something you can finish, finish it with Valspar . . . America's finest clear finishes since 1806.

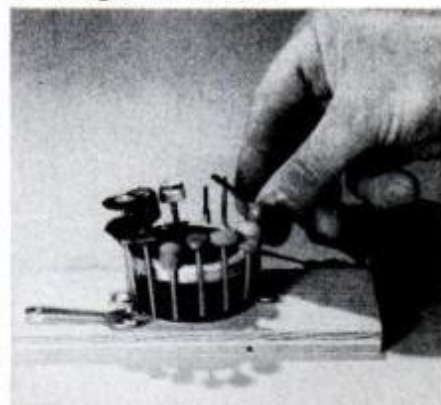
If you have a wood finishing question, send for our "How to finish paneling, floors and furniture" booklet today. It's free.
The Valspar Corporation, P.O. Box 269, Bound Brook, New Jersey 08805.

Valspar

SEE NORTH CAROLINA BEFORE YOU GET HERE.

HINTS FROM READERS

TV magnet is holder



The circular magnet from the yoke of an old TV picture tube can be fastened to a board and used to hold drills and other small shop items.—*Ken Patterson*

Snap-hook key retainer



A snap-hook makes a good key ring holder, particularly when keys are used often. The snap attaches to belt loops for easy removal.—*Lee H. Schrimpf*

Plate glass work surface



Plate glass is an excellent work surface for assembling objects that must rest squarely on a flat surface. Waxed paper keeps glue off the glass.—*Walter E. Burton*



North Carolina Travel Package

Before you plan your vacation this year, send for the free North Carolina travel package. It's full of facts about things to do, and where to find them.

Take a good look at North Carolina before you come. And you'll enjoy it a lot more while you're here.

I'd like your free travel package.

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North Carolina Travel, Room 430,
P.O. Box 77, Raleigh, NC 27611

I love tobacco. I don't smoke.

**Walt Garrison,
football and rodeo star.**

You don't have to smoke to enjoy tobacco. All you need is a pinch of "smokeless" tobacco between your cheek and gum. You'll get full, rich tobacco pleasure.

Look for it in three great brands. Skoal. Copenhagen. And Happy Days. Each is dated for freshness.

**Smokeless tobacco.
A pinch is all it takes.**



For a free booklet that explains how to get the full enjoyment of "smokeless tobacco"—as well as a few free pinches that you can try for yourself—write to "Smokeless Tobacco," United States Tobacco Company, Dept. P99, Greenwich, Connecticut 06830.

The Striders "4 for 3" Shock Sale. Take it from us, it'll make it for you!

Gabriel's Shock Test Team — Richard Petty, Al Unser, Parnelli Jones and Dan Gurney — four of the most respected names in auto racing. They have been putting their driving skills to work testing Gabriel shock absorbers.

And now one of the most popular shocks they've been testing is being offered at substantial savings during Gabriel Striders "4 for 3" shock sale. When you buy three Striders® at your participating dealer, you get the fourth one free. Striders, the heavy-duty shock absorbers you adjust to "Regular", "Firm", or "Extra Firm" for the ride you want. Tested and approved by the Gabriel Shock Test Team, and now available at a 25% savings.

So look for the Gabriel "4 for 3" sign, and get yourself a big 25% savings on America's most popular adjustable shock. The deal is tough to beat. The savings are easy to take.

Offer ends May 31, 1977.

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A Victorian period Medical Officer's pouch and belt of the Grenadier Guards.



**Traditionally smooth.
Untraditionally priced.**

A rare combination of hearty Canadian grain and pure glacier-fed spring water; aged in the clean dry air of the Canadian Rockies. You can buy a more expensive Canadian, but not a smoother one.

Windsor. A rare breed of Canadian.

Would you believe... Water pump runs on its own water

In a brook that winds through a deep glen on Richard Russell's century-old Pennsylvania farm, a red cast-iron pump clunks away. No visible power source drives it. Yet it goes day and night, shoving 30 gallons of water an hour through 600 feet of pipe, lifting it 54 feet. When the water isn't sprinkling fruit trees, gardens or lawns, it streams from the mouth of a pottery frog in a goldfish pond (lower left)—all for free.

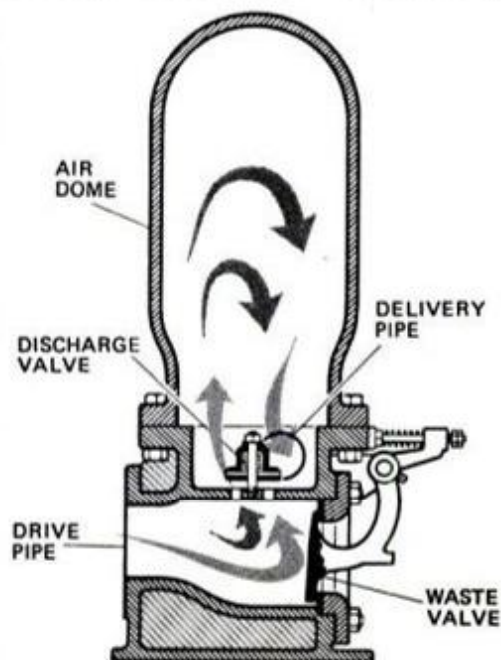
The device is a hydraulic ram pump, familiar to 19th century farmers but little known today. Russell became curious when he found ancient pipes running from his barn down to an old creek bed. How, without power, had the farmer gotten water up that steep hill? One old-timer knew: "Them fellers had *ram* pumps. Worked off flowin' springs."

Plumbers in the area had never heard of ram pumps. Phone calls to pumpmakers finally led Russell to the Skookum Co., 8524 North Crawford St., Portland, Ore. 97203. Skookum, it developed, was still in business, still made ram pumps to order and happily made one for Russell.

How a ram pump works

A ram pump works off water pressure. Water flowing into it through a "drive pipe" forces an outlet or waste valve to close abruptly, stopping the flow. The momentary build-up of pressure is intense—like the "water hammer" bang you get in your home pipes when you shut off a faucet suddenly. This pressure sends a powerful spurt of water out a discharge valve to a delivery pipe (diagram, lower right). The two valves alternately open and close, repeating the process over and over to produce a continuous series of spurts. Air pressure in a dome dampens the spurts to a smooth flow.

The ram action packs a surprising wallop. A two-inch-drive ram will deliver 2700 gallons a day through a 60-foot lift on a head of only 6 feet between spring and pump. A stream flow of 25 gallons a minute is all it takes. A one-inch ram will pump 100 to 2100 gallons a day, depending on head and lift, three-inch rams up to 20,000 gallons. ★★



PM WORKBENCH

PM EXAMINES PRODUCTS AND SERVICES

Gardening bench kit

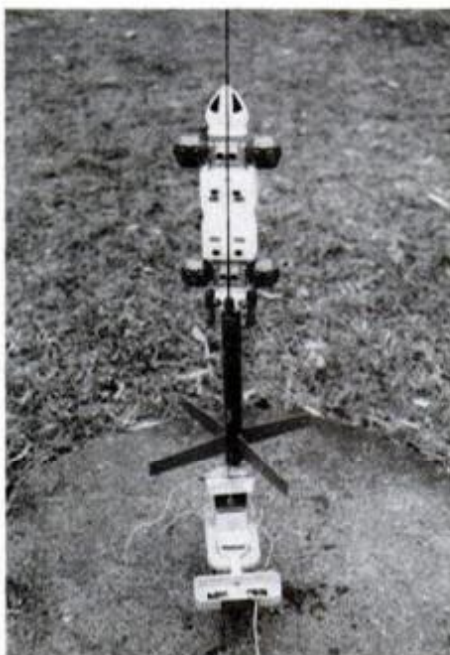


If you're looking for an attractive and useful gardening bench, this could be it. Shop-Vac Corp., Williamsport, Pa. 17701, offers the bench above as a kit. You'll only need a couple of hours for assembly. The fairly stiff price of \$299 is backed up by some nice features: select hardwood frame, veneered plywood storage cabinet, sliding shelves and doors plus a durable, wood-grained Formica work surface. Hardware is provided and accurate; predrilled holes assure square alignment. Metal guides screwed to the bottom of the counter hold a wood tool drawer and two plastic tubs for soil.

Kit rocket that flies

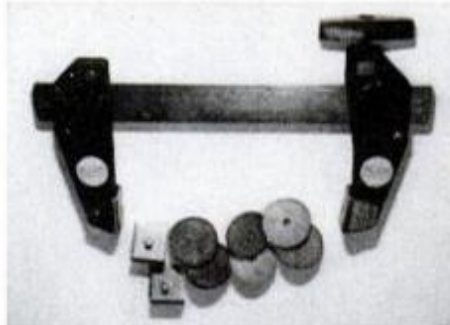
Remember the model rocket rage in the 1960s? Well, now low-priced models with dramatic, but safe, flight paths are available to model-

ers who have a scientific bent. Centuri Engineering, Box 1988, Phoenix, Ariz. 85001, makes the Eagle (from Space: 1999 on TV) for \$17 (less battery). Remote electric launch wires trigger a three-stage engine for a blistering blast-off, 300-ft. flight and a smooth parachute landing.



Cam-action bar clamp

Record Ridgeway Tools of Sheffield, England, has introduced a versatile new bar clamp that sells through its distributors for about \$18. Both clamping arms (one has a tightening handle for tension control) slide along a 1/4 x 1 1/4-in. steel bar that can be any length you want. Swivel

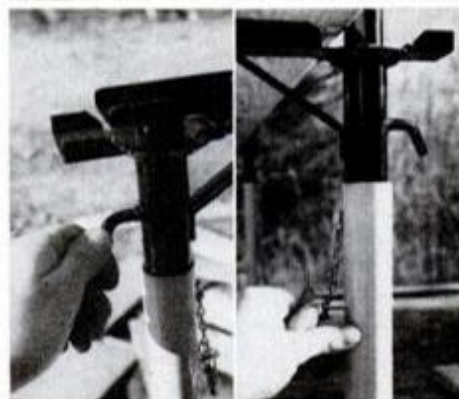


pads at the end of each arm hold plain, serrated, rubber-faced or 90° angle clips provided. Arms can reverse for inside pressure.

Foldup workhorse

Little Giant Industries, 57 West South Temple, Salt Lake City, Utah, makes a variety of ladder and scaffold equipment. The sawhorses that we tried are innovative with solid foldup engineering and other easy-to-use and long-lasting features.

The metal legs have rubber-capped feet for good traction. The center legs swivel 90° to provide solid, four-point support, although their height is not adjustable for irregular ground contours. Scaffold boards can be locked to the upper frame, which fits inside the legs and can be raised or lowered by inserting a steel pin through a series of predrilled holes in the frame and the tubes. Remove planks and the horses fold flat for storage. A pair sells for \$79.95.



If you've come across a new product with some special features, let us know about it. Write to PM Workbench, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.

"Before I put my Olds wagon in this garage, I put this garage in my Olds wagon."

When I drove my new Custom Cruiser home, I picked up this specially-designed lightweight garage on the way. Which should give you an idea how Olds builds its full-sized wagon. Practical dimensions outside, plenty of room inside for the 1009 pounds of materials needed for my new garage.

I can flip the tailgate down for loading, or sideways like a door, with the window up or down. Even the hinges are concealed for easier loading. I ordered the new rear-facing



off my back when they built the Custom Cruiser. It's not just a spacious wagon. It's a car that looks good in any garage.

They really built one for me!



third seat because you can open it with one hand without climbing in; and I ordered the roof rack with adjustable crossbars.

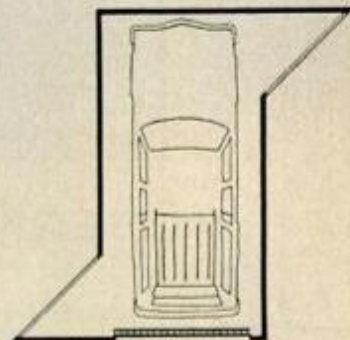
Yet this is more than just a roomy station wagon. It's an Oldsmobile.

It doesn't ride like a wagon. It's smooth, quiet, and a luxury to drive. Standard equipment includes Turbo Hydra-matic transmission, power brakes and steering, steel-belted radials. And it includes a 350 V-8 that can still give good gas mileage. (EPA estimates: 19 mpg in the highway test; 14 mpg, city. Your mileage depends on how you drive, your car's equipment, and its condition. In California,

EPA estimates are lower.)

And this is one wagon that's built for comfort. There's cut-pile carpeting that runs the length of the loading space and up the sides. There are two lockable storage areas, one underneath the load floor and one in the left side. There's a center armrest up front; you can even have velour upholstery, if you like. And the electric rear window is standard.

Oldsmobile took a big load



Garage is 10' x 20'; with added triangular wings: total, 225 sq. ft. For complete building plans and list of materials, write Department W-1, Oldsmobile Div., Lansing, MI 48921.

Oldsmobile

CUSTOM CRUISER

Can we build one for you?



styling,
storage &
convenience

outdoor comfort was never like this before



The 1977 Wilderness travel trailer takes to the road with 11 new features designed for family pleasure and comfort. Starting with all new styling in all 15 of its trailers and 5th wheel models, Wilderness features include thoughtful expansion of storage capabilities and heating systems balanced to the trailer size. Some of the new features include -

In the 1977 Wilderness, the emphasis is also on choice. You can select a trailer from 17' to 31' in length or a 5th wheel from 20½' to 30½'. All are self-contained and equipped with full galley.

Easy access, lock-secure storage for 110V plug-in cord.



Positive catch hardware on all overhead cabinet and wardrobe doors.

**1977
WILDERNESS**

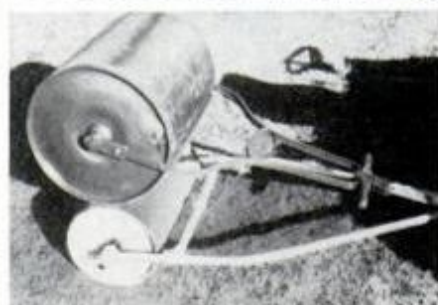
Fleetwood Enterprises, Inc., P. O. Box 7638, Riverside, CA 92503 PM-4
Please send me a free, full-color brochure on Wilderness Travel Trailers.

Name _____
Street _____
City & State _____ Zip _____



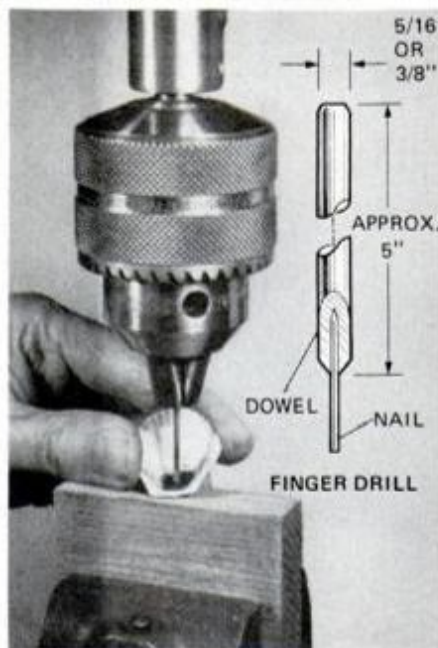
HINTS FROM READERS

Piggyback levelers



Add more weight to a tamping job by using two rollers. Upper one pins into a steel plate on lower roller. Baling wire keeps them from drifting.—C. A. Haugh

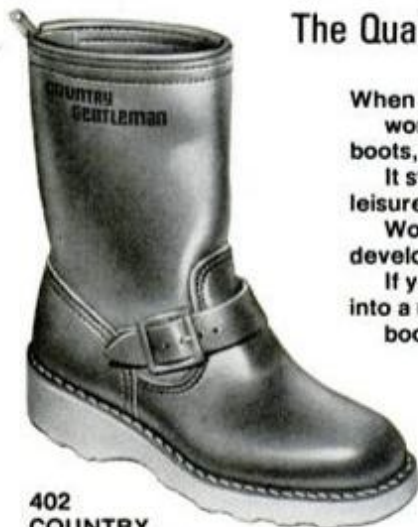
Drilling holes in seashells



For drilling shells, use an abrasive such as fine sand and a drill bit made of a nail with its head cut off and end filed flat. Add water to the abrasive. Drill slowly with light pressure, raising the bit so abrasive can flow. For very fragile shells, use the finger drill above.—W. E. Burton

WOOD N' STREAM[®]

The Quality Name In Outdoor Boots



402
COUNTRY
GENTLEMAN

When you're looking for quality workmanship and great styling in boots, look for the name, "Wood N' Stream". It stands for the finest in outdoor and leisure footwear made in America. Wood N' Stream boots were developed for the active outdoorsman. If you're one, you'll fit comfortably into a new pair of Wood N' Stream boots or shoes.

402 — The "Country Gentleman" in Mesabi Rowdy leather, black zipper boot, leather welt, wrapped leather covered cushion-insole, Neoprene crepe sole and heel.

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A Division of Bata Shoe Co., Inc.





"Valvoline won me over!"

"I picked up a Valvoline booklet the other day that showed me how to change my own oil. And believe it or not, it was as easy as they said...I even saved myself some money!"

People were turning to Valvoline for lubrication and protection even before America had cars. In fact, Valvoline has been winning the world over since 1866.

With winning performances from the international racing circuits to the inter-

state highways, and everywhere in between. It's Valvoline. With unbeaten engine protection for whatever you drive, wherever you drive it. Millions of people prove it everyday. Valvoline® Motor Oil is winning them over. With quality.

Valvoline®

Winning the world over since 1866.



Valvoline Oil Company, Ashland, Ky.  Division of Ashland Oil, Inc.

Материал, защищенный авторским правом

December 1, 2 and 3:

A Mercury Marquis is rated superior overall to a 1977 Cadillac deVille based on 30 tests.

The new Cadillac deVille is a fine automobile about the same size as the new Mercury Marquis. But out of 30 individual tests of automotive qualities, the Marquis won 26. And was rated superior overall by 37 out of 50 big-car drivers.

Call toll-free 800-443-4221
and hear some of the reasons why.





Ride. Based on smoothness, steadiness and quietness over various types of roads, Marquis won all tests.



6-passenger seating comfort. Marquis won 43 to 7 with the judges actually seated in both front and rear.



Convenience. The Mercury Grand Marquis' convenience features won 8 tests, Cadillac's won 2.



Trunk Capacity. Marquis held more and was judged more convenient to use, winning 48 to 2.



Judges for all tests, big-car owners drawn at random from L.A., rode/drove the cars over various types of roads.



Quality. Marquis won 5 out of 6 tests of quality, including door solidness, carpeting, even stereo performance.

Test Program	Number Preferring	
	Marquis	Cadillac
Styling		
1. Front End	34	16
2. Side View	36	14
3. Rear End	29	21
4. Overall Exterior	34	16
5. Interior Styling	25	25
Ride		
6. Riding Comfort	33	17
7. Handwriting Test	27	23
8. Quietness	35	15
Driving		
9. Cornering Ability	28	22
10. Right Front Visibility	35	15
11. Parking Brake	36	14
12. Windshield Washer Operation	48	2
Quality		
13. Door Solidness	34	16
14. Carpeting	40	10
15. Upholstery	24	26
16. Sun Visor	30	20
17. Stereo Performance	37	13
18. Trunk Carpeting	48	2
Convenience		
19. Door Handle Operation	38	12
20. Rear Door Window	48	2
21. Glove Compartment	49	1
22. Window & Door Lock Controls	35	15
23. Ash Trays	23	27
24. Assist Straps	21	29
25. Front Center Arm Rest	46	4
26. Key Design	45	5
27. Interior Lighting	41	9
28. Spare Tire Convenience	47	3
Six Passenger Comfort		
29. Seating Comfort	43	7
Trunk Capacity		
30. Spaciousness/Convenience	48	2
Superior overall	37	13



To hear what impressed some of these big-car owners about the Marquis, call 800-443-4221 (except Wyoming). Or write: Nationwide Consumer Testing Institute, Box 700, Times Square Station, New York, N.Y. 10036. Better yet, go to your Lincoln-Mercury dealer and test Marquis yourself.

MERCURY MARQUIS

LINCOLN-MERCURY DIVISION



THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

Custom paint touch-up sprayer



If you're hankering to touch up the custom paint job on your car, cycle, boat or model, here's an aerosol sprayer that lets you use any color, any time, anywhere, in any type of paint.

You mix your paint in the 6-ounce bottle, thin as directed, screw on the power unit and spray as you do with an aerosol can. There's enough propellant to shoot about 16 fluid ounces. Make sure the surface is clean and free of dirt and grease.

I touched up a wagon tailgate with the Preval sprayer, and then I later ran some water-based latex house paint through it. Both went on beautifully, in a smooth, even pattern.

The entire sprayer retails for \$1.98, or you can buy extra power cylinders at \$1.50 and cappable jars at 50 cents each. The Preval Auto Sprayer is available at most car parts stores, or write Preval Sprayer Div., Precision Valve Corp., Box 309, Yonkers, N.Y. 10702. —M.L.

Handy for a dab of lube



STP meets that occasional need for a dab of grease with Lube in a Tube. It looks like they've simply taken their honey-consistency engine oil additive and stuck it in a tube.

Which is fine, because it's handy for out-of-the-way spots

like hood latches and distributor cams. But since it's also very sticky and somewhat runny, I can't recommend it for door strikers or places where there is any chance of clothing touching.

STP says you can also use Lube in a Tube directly into an engine crankcase or transmission. Price: 99 cents for a 7-ounce tube at most parts counters. —M.L.

Spray-on gloves aid cleanup

It's like putting on invisible gloves before you tackle that dirty job. Greasy hands clean up in a flash after you've protected them with Foam Glove, an aerosol that coats and protects the skin to make washing a breeze.

Instead of having to scrub for



hours, you merely wash your hands in soap and water for a minute or two. Foam Glove comes out of the can like shaving cream. You rub it into your hands until it dries and disappears. Then work all day in grease, paint, inks, even solvents. Foam Glove leaves no residue and doesn't irritate the skin.

The 7-ounce container costs \$2.99 plus \$1 for shipping and handling (N.Y. residents add sales tax). It is available from Valley Research Systems, Inc., Box 294, Hewlett, N.Y. 11557. —M.L.

Electroplate at home

Any child can run the Ranco EP-1 Electroplater. It's simple and safe—low voltages and nothing toxic. It uses house current and comes with six "pens". These contain electroplating solutions of 24K gold, copper, nickel, black nickel, a false chrome (real chrome is available but contains toxic chromic acid), and it's crucial that the plating



surface must be absolutely clean.

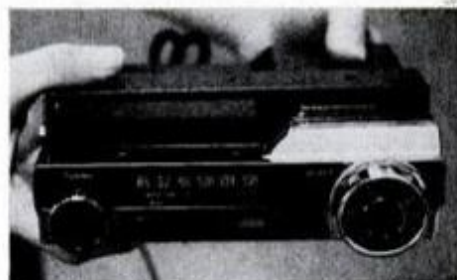
Frankly, we can't recommend this unit to the casual home plater unless it's for nonautomotive hobby use. Car and motorcycle parts will come out of a plating shop looking a lot better, and for \$410 (plus \$17 to \$37 for replacement pens), you can drop off quite a bunch. For more information, contact Micro Materials Corp., 100 Grand St., Westbury, N.Y. 11590. —M.L.

TV and FM car receiver

Listen to TV shows on your car radio? Actually, you lose surprisingly little by not seeing the show on a screen. Hearing the audio portion of a TV program lets you "see" a lot more than you would imagine possible.

The Audiovox FMC-TV radio converter plays not only TV audio through your car radio but doubles as an FM converter and weather-band receiver as well.

Hookup needs no special skill or tools and takes about 20 minutes.



The converter fits atop your console or under your dashboard. Price: \$59.95 from Audiovox Corp., 150 Marcus Blvd., Hauppauge, N.Y. 11787. —M.L.



Marlboro



Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

10 mg. "tar," 1.1 mg. nicotine av. per cigarette, FTC Report Dec. 78

Marlboro Cigarettes are made with 100% Virginia tobacco.

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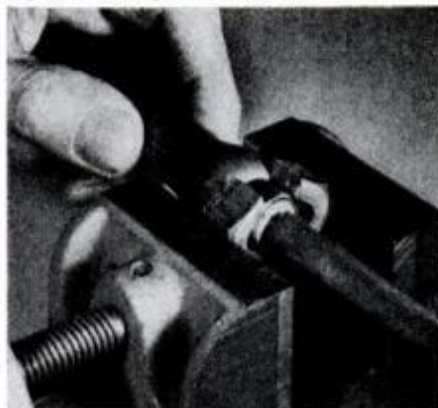
Whether you work on your car yourself, or have your service station do it, be sure to check the radiator cap. It's the easiest component to forget, yet the easiest to replace. And regular replacement is vital. A faulty cap will not keep the pressure in the cooling system within safe limits. So be safe. Install a Stant Lev-R-Vent® Pressure Cap... the safest, most dependable radiator cap available anywhere. And for expert tips on cooling system care, write for "The Stant Cooling System Fact Book." It's free.

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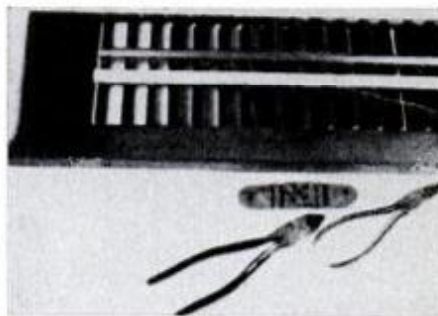
HINTS FROM READERS

Split nut tightens ferrule



Tighten a loose ferrule by squeezing it in a vise between two halves of a nut. Nut threads dent ferrule to anchor it.—*W. E. Burton*

New life for old louvers



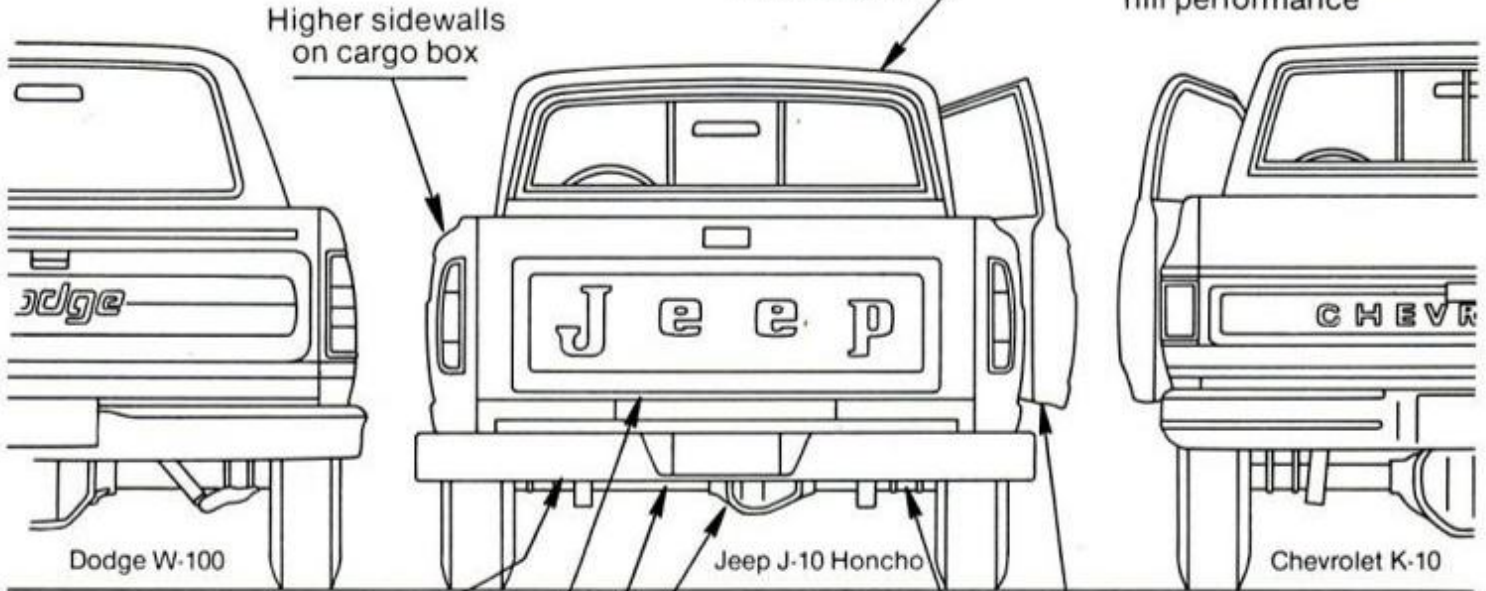
Replace broken metal control stick loops on louvers with wire. Use a jig to make a string of loops. Glue them into the control-stick groove. Attach loops to slats with heavy staples.—*C. L. Beard*

Paintbrush holder



Two nails in a paintbrush allow it to rest on a table or hang on the pail.—*Ken Patterson*

Jeep Pickup puts down the facts... (and the competition)



Extra heavy-duty frame

Lower tailgate loading height

Higher ground clearance

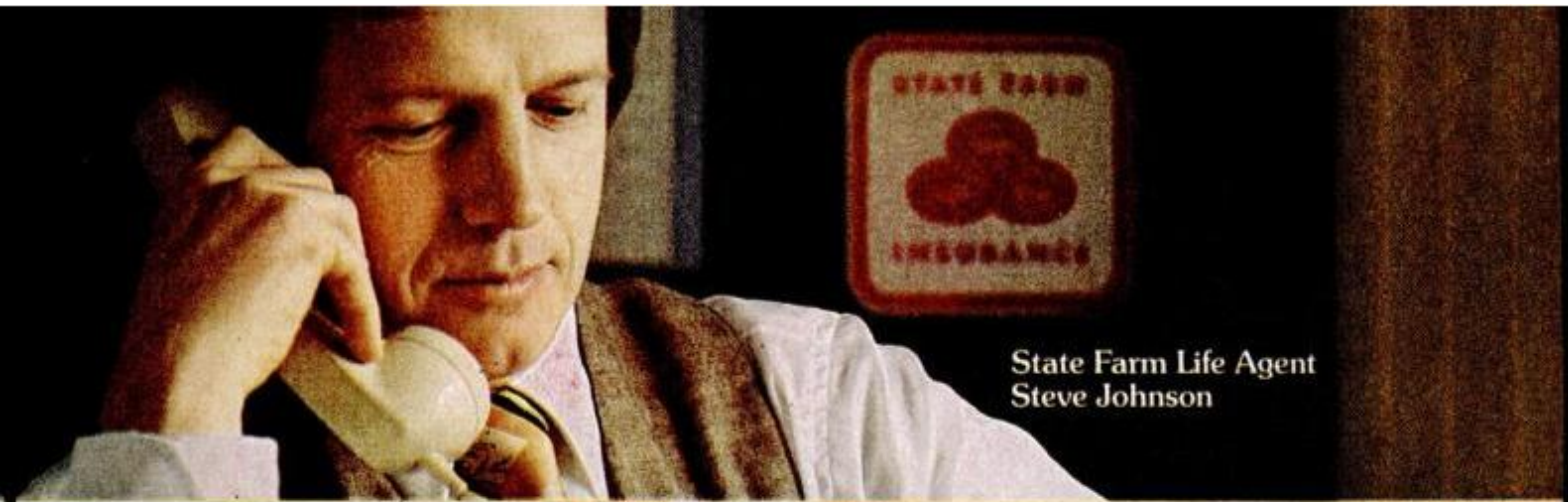
Low entry height

5-leaf steel springs front and back

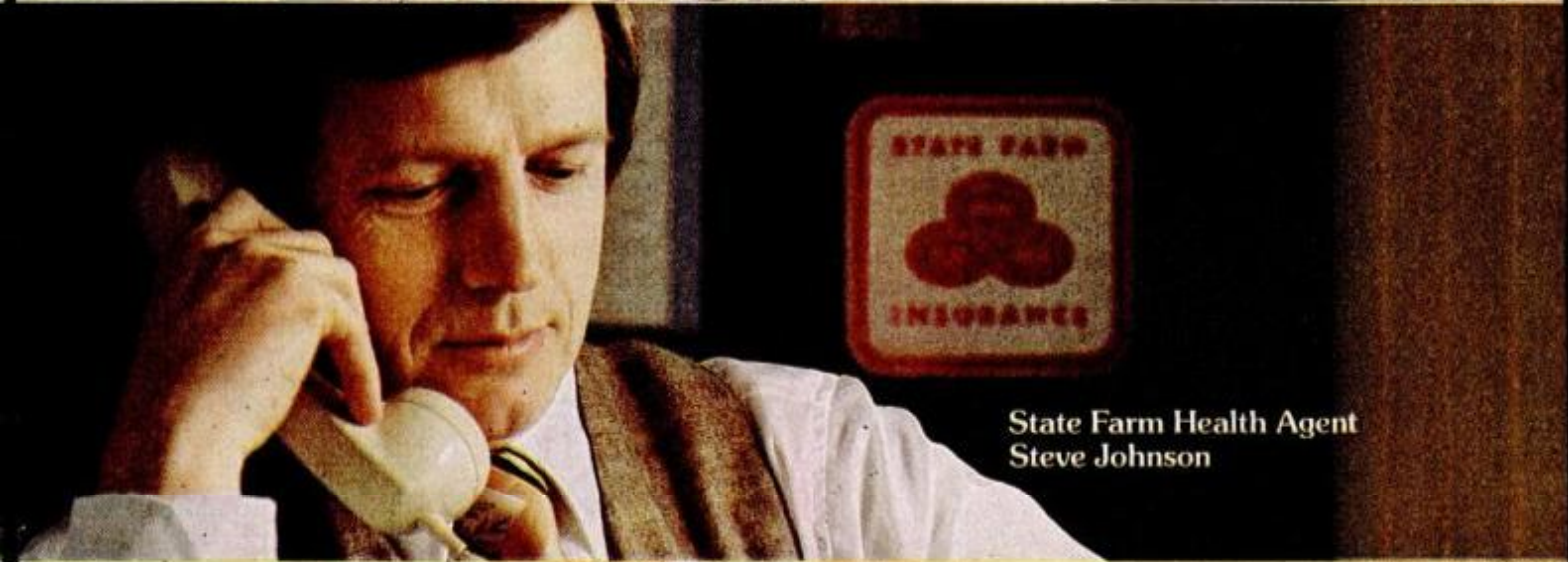
Jeep
we wrote the book
on 4-wheel drive

Only Pickup to offer Quadra-Trac®, Jeep's exclusive automatic 4-wheel drive system, considered by many to be the best system available

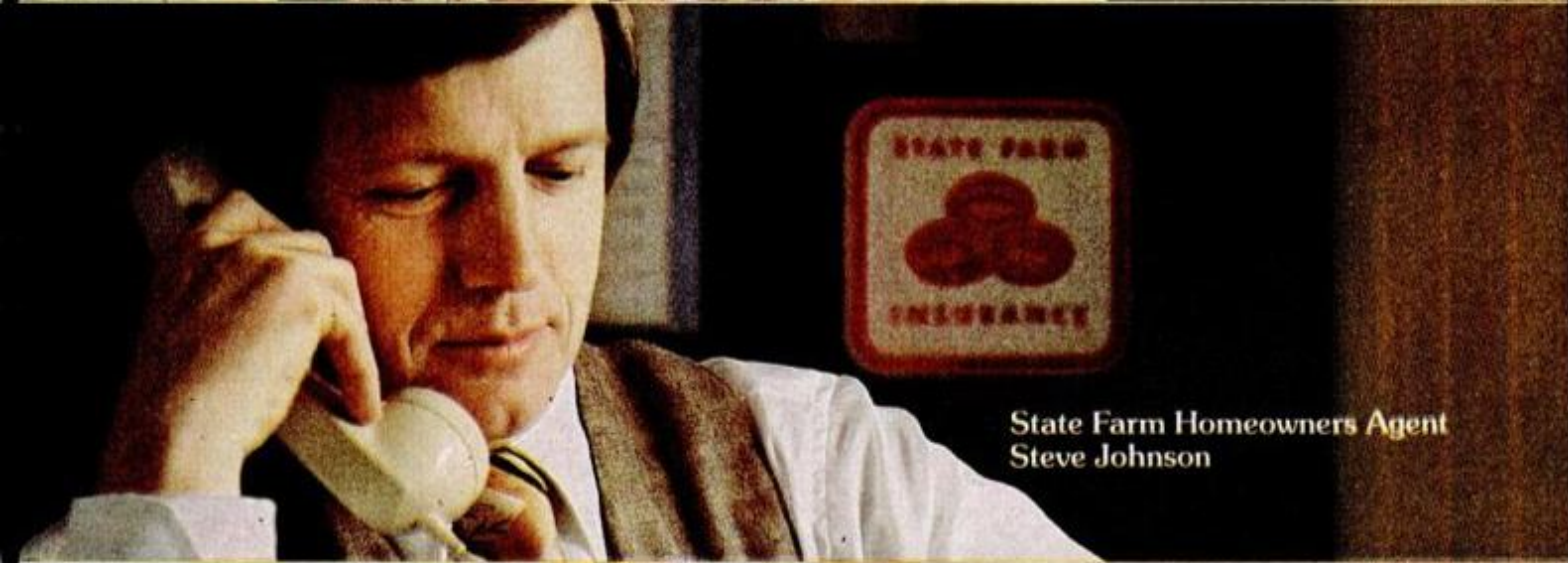
Jeep Corporation, a subsidiary of American Motors Corporation



State Farm Life Agent
Steve Johnson



State Farm Health Agent
Steve Johnson



State Farm Homeowners Agent
Steve Johnson



State Farm Auto Agent
Steve Johnson

When it comes to family insurance, Steve Johnson is one of a kind.



Jeanne and Bob Beals of Chesapeake, Virginia, are extremely happy with their life insurance agent.

They're very pleased with their health insurance agent.

They're completely satisfied with their homeowners agent.

"And we know our car insurance man is the best around," Bob says. "We feel fortunate to have him so close by."

Of course, whatever the Beals think about one agent, they're bound to think about the others.

Because all of them are State Farm agent, Steve Johnson. As a family insurance specialist, Steve can provide knowledgeable advice and person-to-

person service on all the policies they're ever likely to need.

"If we have any question about our coverages, or a claim, we don't have to wonder who to call," says Jeanne. "We just

call Steve. It's a real advantage having one agent nearby who can help us with everything."

Having a State Farm family insurance man can be a real advantage for you.

He's the one agent who's backed by America's largest homeowners and auto insurer, and one of the largest life insurance companies, too.

And there's probably one like Steve Johnson in your neighborhood. Check your Yellow Pages.



Like a good neighbor, State Farm is there.

STATE FARM INSURANCE COMPANIES Home Offices: Bloomington, Illinois

Raise the roof tonight in a Dodge Charger.

If you can't wait to see that evening sun go down, the '77 Charger is your special car. Made for people who come out to play after dark. And now you can make a night of it in a Charger that welcomes the night inside.

Just remove the transparent panels of the optional T-bar roof, and you're cruising in a Charger that's almost a convertible. Come alive in the invigorating breeze as you settle into the high-back bucket seats. For certain, you



and your Charger were born for the night.

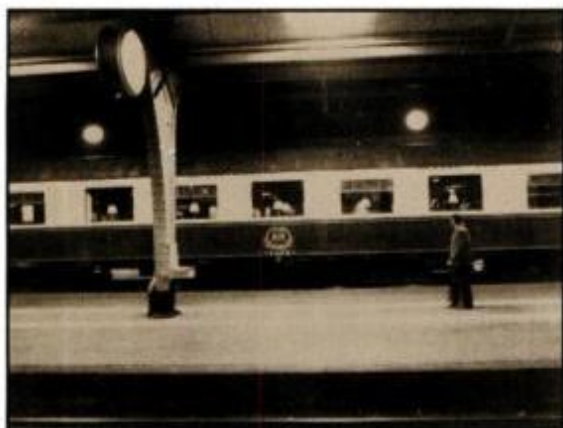
A standard 318 V8 teams up with TorqueFlite automatic transmission to give Charger a response that's anything but everyday.

When the day starts to fade and you're ready to shift into high gear, you need the car that can light up the night—Charger.

Why let another sun go down without driving one? You can buy or lease an exciting new '77 Charger from your nearby Dodge Dealer today.



THE NIGHT BELONGS TO CHARGER.



Murder of the Orient Express

In May, the world's most famous train will make its final run from Paris to Istanbul, leaving behind a legend of romance, opulence and international intrigue.

by Hans Fantel

When I lived in Vienna as a teen-ager just before World War II, I had numerous occasions to ride the world's most famous train. My home town was a main stop on the line, and whenever my family set off to visit my Uncle Ludwig in Paris, we usually took the Orient Express. Riding this incredible train was for me the best part of the whole trip.

I now think of those long-ago journeys because the train is about to make its last run. After all the fictional murders on the Orient Express, they are finally killing the train itself. But this "crime" is real. When the blue cars with their gold emblems pull out of the train shed

in Paris at 11:53 p.m. on May 22, 1977, an era will come to an end.

It began nearly a century ago, on June 5, 1883, when the first Orient Express puffed eastward from Paris. It was the first train to take passengers across the whole span of Europe, linking France with Austria and Hungary, wending its way through the wild and mountainous Balkans, to touch the edge of Asia at Istanbul three days and 1800 miles later. It set new standards of speed and comfort and, until the dark days of Adolf Hitler, represented the ultimate luxury on rails.

The Orient Express was never intended as an ordinary means of transportation. It was conceived in

Symbol of luxury travel throughout the world, the Orient Express boasted silk-shaded lamps and drapes in each compartment, visible (above, left) through windows of a car, which also bears famous golden crest on its side. Track sign at the glass-domed Gare de L'Est station in Paris (above) marks departure of the Express at 45 minutes before midnight. Champagne and compartment parties were as common at departures of the great train as bon voyage bashes at the sailings of big ocean liners.

terms of sheer splendor, a palace on wheels fit for the royalty and aristocrats who set the tone of that age. It drew its passengers from a segment of society fiercely devoted to style and elegance. It didn't matter in those days that beneath that upper crust lay a mass of misery. Ordinary citizens could not aspire to the resplendent life of their betters, and they had no political means to challenge the glossy privileges of the rich.

Anyway, polite people didn't talk about such things. Until it all blew up in two world wars and a dozen revolutions, the chief concern in the "right circles" was the pursuit of elegant pleasure. The Orient Express was a symbol of this attitude—a steam-powered self-indulgence.

Among the "regulars" on the Express was King Boris of Bulgaria,

an ardent railroad buff. Whenever the train passed through his country, he would clamber up into the engine and insist on taking over the controls. Since he was an absolute monarch in his realm, there was no way to keep him off the engineer's stand. Fortunately, His Majesty really knew the track and, by all accounts, ran the train expertly, keeping it on

schedule and managing smooth starts and stops.

Other eccentric passengers also claimed special privileges. The Marquise of Polignac always brought along her own chef—a famous Parisian kitchen master—not trusting anyone else to prepare her sumptuous dinners. Of course, the wines also came from her chateau. Travel-

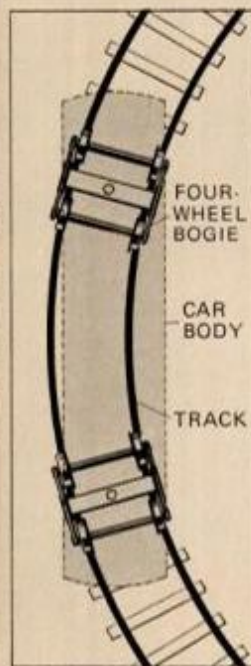
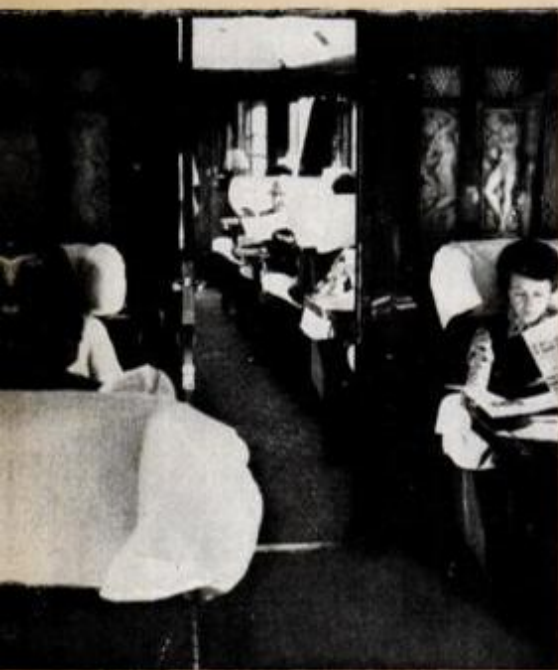
ing with a retinue of servants was not uncommon aboard the Express.

Princess Pauline Metternich of Austria scandalized the other ladies and delighted the gentlemen with her traveling costume. The princess would wear a straight skirt that showed off her trim figure rather than the fashionable crinolines that transformed women of her day into



The Alps provided spectacular scenery and severe engineering challenges. Special locomotives were required to conquer the steep grades, and braking was a problem until America's George Westinghouse invented his air brakes.





Orient Express had many routes across Europe, including those shown on map above: One to Bucharest; another went to Istanbul or to Athens.

Salon car (left) had all the luxury of a club lounge. Diagram beside it shows swiveled four-wheel trucks—first seen on Orient Express—making it possible to use long cars and still take tortuous mountain curves in comfort, safety. Below: one of first such cars built in 1800s.

walking bales of fabric that got stuck in doorways, spilled over chairs, and occasionally caught fire. The princess was unconventional in other ways, too. She smoked cigars in the privacy of her compartment. But when a gentleman in the dining car—perhaps to test her reaction—asked her if she would mind if he smoked, she answered icily: "I don't know, sir. No one has ever dared smoke in my presence."

When I first rode the train about 40 years ago, the dynasties of the Continent had already tumbled in the wake of World War I, but the Orient Express still retained something of its old aura. The interior of the cars glowed with polished mahogany artfully inlaid with walnut. The deep-blue velvet seats were trimmed with immaculate lace. Each compartment was lit with silk-shaded





Opulence of train from its earliest days was evidenced in scenes like that at left in a pre-World War I dining car. It boasted vermeil flatware on tables and silk brocade panels on walls. Service was impeccable, yet famous passengers who rode the train regularly insisted on bringing their own cooks and some even carted along retinues of servants to care for their whims and wants. The Orient Express offered every facility imaginable.

lamps, and there were fresh flowers in crystal vases. If you pulled the brocaded window curtains to shut out the passing landscape, you had the impression of sitting in the alcove of a Victorian drawing room.

The tables in the dining car were set with the finest linen and crested silver, and a small tasseled lamp lent each table an atmosphere both festive and intimate. The cuisine compared with that of the best Parisian restaurants; white-gloved waiters clicked their heels and bowed before taking your order. At night you slept on embroidered percale with a feather comforter over your feet.

Mystery and romance

Even as a teen-ager I marveled at such opulence. Yet I was even more impressed by something less tangible though just as evident. Although I had only the haziest notion about such things, I was strongly aware that during that period the train had become a place of mystery and

romance. Here you might encounter a Balkan baron en route to a rendezvous in Paris, a Bulgarian general out to buy British howitzers, speculators off to distant markets or diplomats on unspecified missions.

It took two days and three nights from Istanbul to Paris and, as time grew heavy, people would talk. That's why spies were always on the train, hoping to pick up salable information. Some—at least as depicted in fiction—were gorgeous women. Others, equally handsome, were not spies. They just came along for the ride, so to speak, to get away from home and to make new acquaintances. Train conductors were discreet, and you could lock your compartment. In an age when women had little personal freedom, a trip on the Express was a "respectable" furlough from a restricted life.

History in literature

Given this kind of social mix, it is hardly surprising that the Orient

Express became a favorite setting for novels. In the most famous of these, *Murder on the Orient Express* by Agatha Christie, foul deeds and fancy sleuthing are done while the train is stuck in a Serbian snow-drift, and a recent film based on the book admirably recaptures the sense of drama and adventure. A popular thriller of the immediate postwar period, the James Bond epic *From Russia with Love*, also takes place on the Orient Express and culminates in a shootout as the train roars through the Simplon Tunnel, deep within the towering mountains of Switzerland. Of course, James Bond—as always—finds time for pleasanter diversions along the way, notably a comely Russian spy who likes to wear a black ribbon around her neck and not much else.

The Orient Express was also technically among the most advanced trains of its time. Even on its first run, it was pulled by a locomotive with metal piston rings—the latest thing in the '80s.

Technical marvels

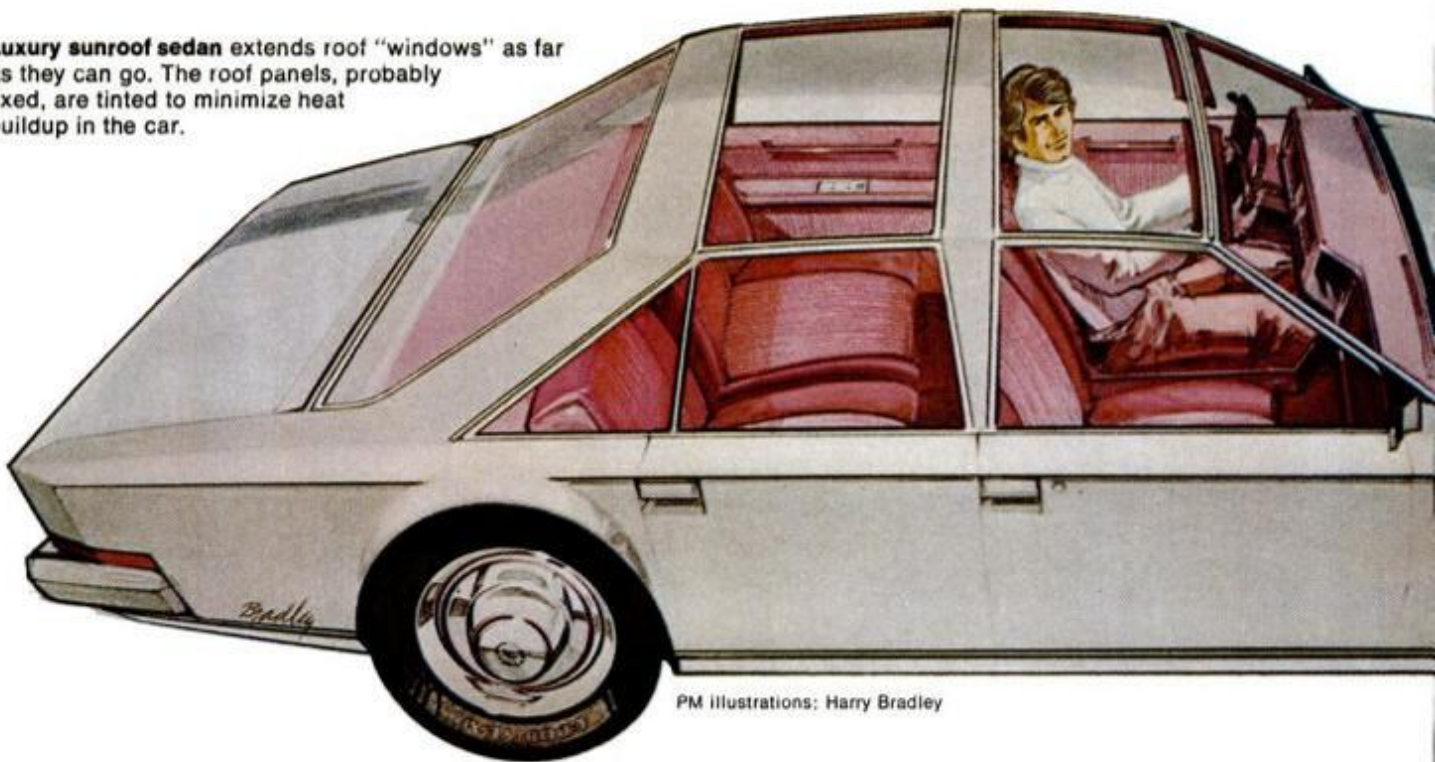
Before that, pistons were wrapped with hemp rope to provide an elastic fit against cylinders that could not yet be machined to a true round. But shortly before the inauguration of the Orient Express, tighter mechanical tolerances allowed locomotives to be fitted with metal piston rings, which could slide with less friction, withstand higher steam pressure and attain greater speed. The early Express trains astounded their passengers by going as fast as 45 mph on flat runs. Soon after, this figure had increased by another 10 mph. By the turn of the century, the Orient Express was chugging along at 60.

Passengers in the oil-lit cars of the first run also enjoyed a far smoother ride than rail travelers had known before. In earlier railroad cars, axles were fixed to the frame itself. Since the wheels could not turn independently of the frame, car lengths had to be short to allow the wheels to skew along curves without jumping the track. The Orient Express was one of the first trains with coaches supported at either end by a small, four-wheeled bogie connected to the main frame by a swivel. This permitted the wheels to align with the track curvature, made possible the long, spacious cars especially built for the Orient Express, and gave the whole train better track adhesion.

Unlike the direct-mounted wheels, the subcarriage could be isolated from the frame by soft springs to

(Please turn to page 172)

Luxury sunroof sedan extends roof "windows" as far as they can go. The roof panels, probably fixed, are tinted to minimize heat buildup in the car.



PM illustrations: Harry Bradley

April is the cruelest month—when you can't put your top down! If you're lucky, you own a convertible—one made before the dark ages settled over Detroit: 1976 saw the last production convertible, the Cadillac Eldorado. Except for a few sports cars and the VW Beetle convertible, the ragtop is gone.

In its place are half-open cars. The sliding sunroof and roof window, for example, are hot options. The semi-open design, like Porsche's Targa models and Corvette's T-top, is another popular alternative. The search continues for new designs with that wind-in-the-face feeling.

Some Detroit ideas are shown here. All four carmakers have them on their drawing boards—it remains to be seen which company will introduce one or more of the ideas, and when. Federal safety legislation requires that all variations for the open car provide roll-over protection. Thus, the designs are basically closed cars with an opening section—or at

least a window—in the roof sheet metal. They're not convertible as we recall them, but they sure beat a conventional sedan.

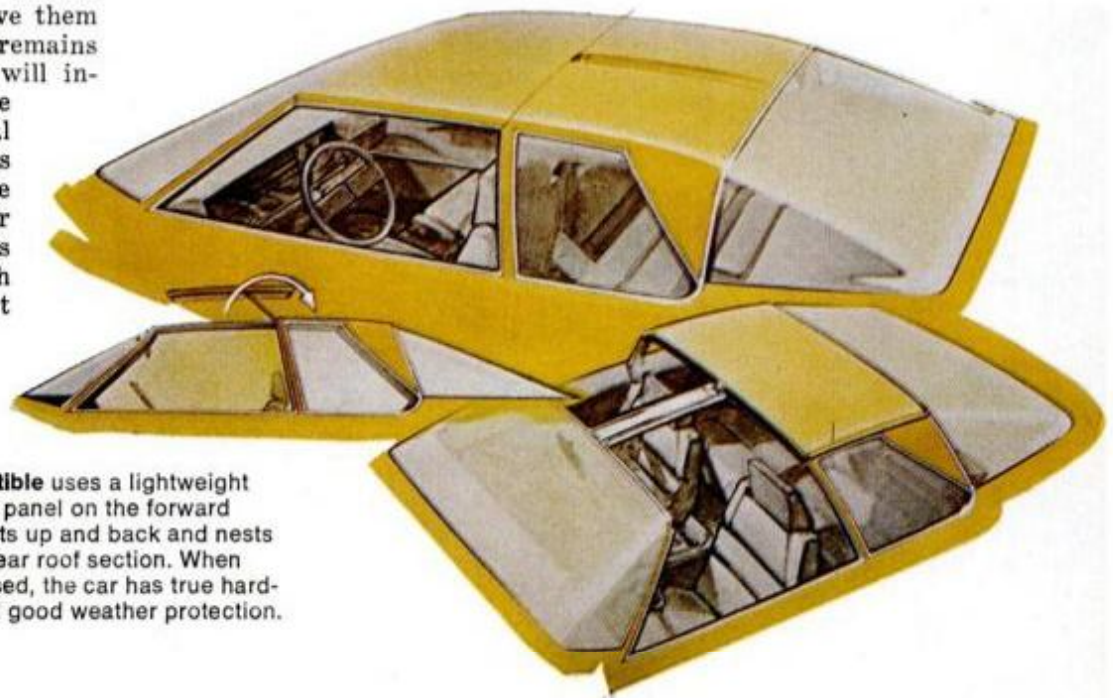
Glass roof panels

Even nonopening variations with roof-mounted glass panels are better than being cooped up in a tin top. The concept above, for example, takes the Astrorooft or Moonroof to its limits. Some prestige sedans may soon offer this dramatic glass-roof option. With special coatings used in the manufacture of the glass, sunlight enters the car in a pleasant,

modulated way and there's practically no heat buildup.

The opening roof section is more than a way to reach for the sky—it has practical uses, too. You can crank it open, attach a red flag to those 16-foot boards or other unwieldy things and take off.

Some car owners, unhappy with hardtops aren't waiting for new-style convertibles: They're having the tops of their cars lopped off! If you own a sedan and want a convertible, just turn the page and find out about a whole new business enterprise springing up. ★★★

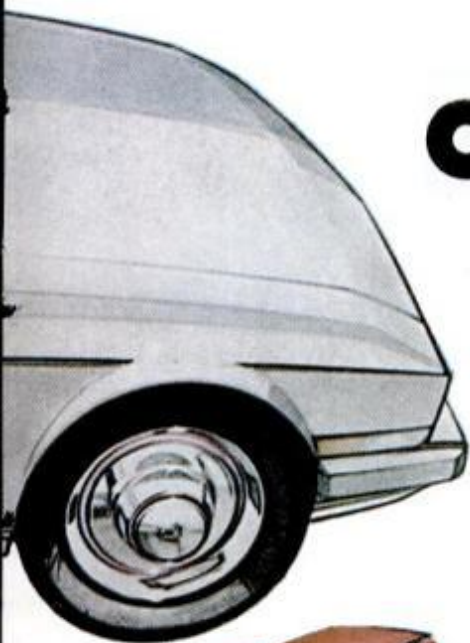


Fliptop convertible uses a lightweight fiberglass roof panel on the forward section. It pivots up and back and nests on top of the rear roof section. When the roof is closed, the car has true hardtop styling and good weather protection.

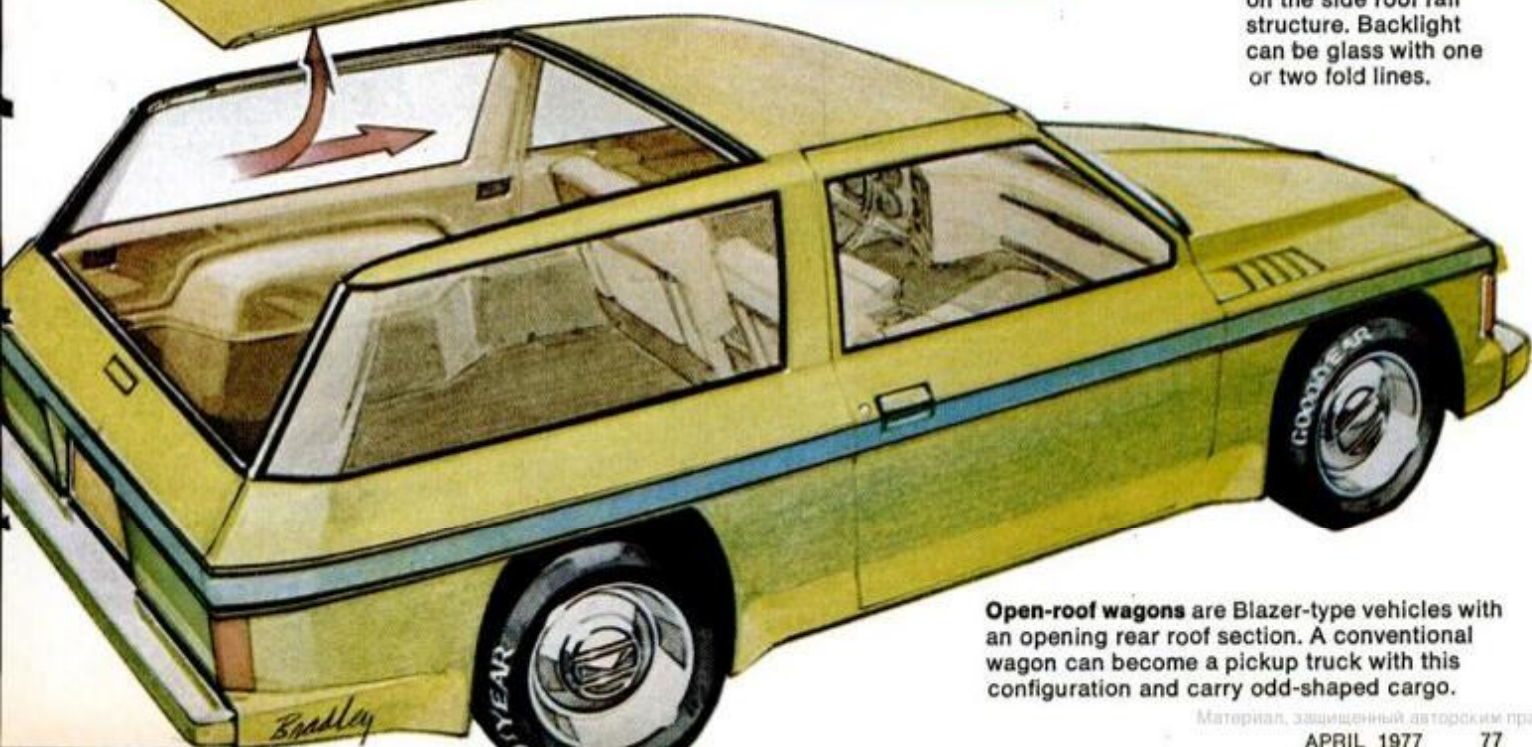
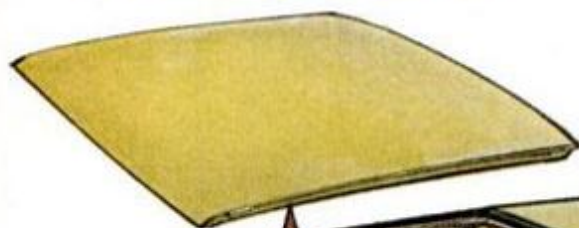
Comeback of the convertible

As sure as there's warm weather ahead,
there's hope for new forms of the open car.

by Bill Hartford AUTO EDITOR

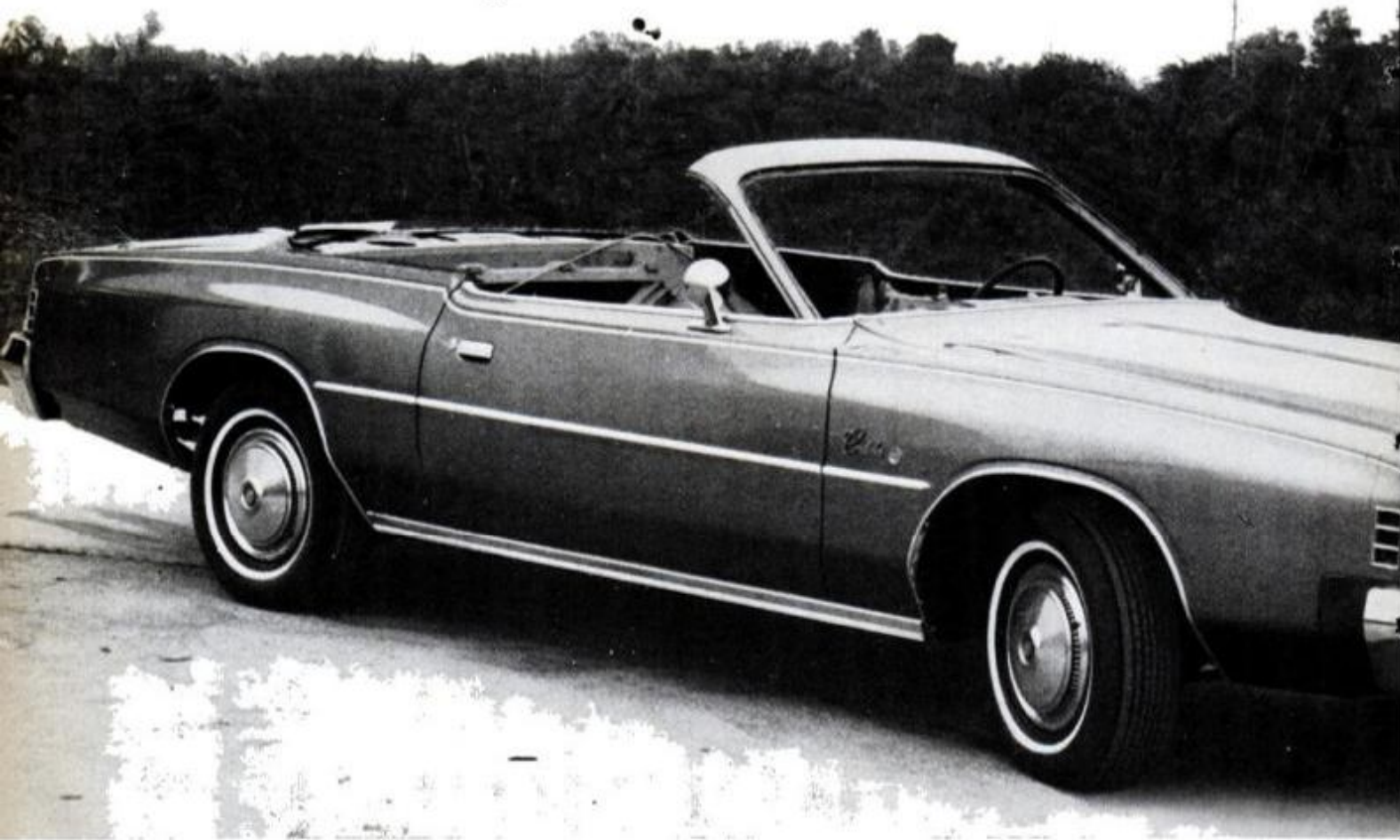


Super sunroof (above) is a fabric type that retracts on roller in fixed roof section. Landau convertible (far left) is redo of "drop head" that was so popular on European cars from '20s through '40s. Forward fabric section folds back, straps to leading edge of roof. Slide-top convertible (left) is almost identical to the '50s Nash Ramblers: Fabric top rolls up and down on the side roof rail structure. Backlight can be glass with one or two fold lines.



Open-roof wagons are Blazer-type vehicles with an opening rear roof section. A conventional wagon can become a pickup truck with this configuration and carry odd-shaped cargo.

1977 convertibles— they're for real!



by Mort Schultz

The 1977 convertibles are rolling off the production line. Here come the '77 Ford Mustang, Pontiac Grand Prix, Oldsmobile Cutlass Supreme, Buick Regal and Chevy Monte Carlo.

Following them are the 1977 Chrysler Cordoba convertible and the "creme de creme" of the entire model year—the 1977 Lincoln Continental Mark V convertible.

No, an overdose of carbon monoxide has not fogged my brain. I know as well as you that Chrysler Corp. made its last convertible in 1971, that Ford stopped producing ragtops in 1973, and that GM cut off convertible production for all except Cadillac Eldorado in 1975, with the last Eldorado convertible being made in 1976.

I also know that 1941 was the last year Lincoln produced a convertible.

But, emess, there are on the roads right now 1977 ragtops. "Emess" is a Yiddish expression which loosely translated means "it's for real." Appropriately enough, it also happens to be the name of the company that's taking brand-new 1977 hardtops and converting them into convertibles.

Mark Doyne is president of the organization, Emess Coach Builders, located in Clearwater, Fla. With a name like Doyne, can Mark be Jewish?

"No," he says.

How it got its name

So how come the company name?

"I've got a Jewish lawyer with a sense of humor," he states. "He took my wife's maiden name initials, which are 'M' and 'S' and made Emess out of it. He figured it was one way of getting people to believe that the convertible is still very much alive."

I was a skeptic who had to see for myself, so I drove down to the dream city on the Gulf. Emess was cranking up to fill 60 orders it had just received—12 of them for Mark Vs.

New-car dealers in particular have welcomed the news that the convertible has been resurrected. Keyser Ford in Madison, Wis., for example, placed an order for 10 Mustang ragtops.

However, individual car owners are not to be denied this symbol of glamor and style which graced the automotive scene for almost 40 years. In the few hours I spent with Doyne, five telephone calls were received, including one from a man in Chicago who was willing to drive a Mark V to Clearwater and lie on the beach for two weeks as the car was being transformed.

The transformation process is fascinating and expensive. Emess charges \$8850 to make over a Mark

An enterprising customizer will cut off the roof of your new hardtop—for a price.



The "can opener" is a special rotary power saw with a 14-inch tungsten-steel blade capable of cutting through ¼-inch steel plate. Here, shop engineer Dennis Violet demonstrates the saw.

1977 Mustang is ready to accept a ragtop on the frame, which is shown in the up position. Emess Coach Builders of Clearwater, Fla., charge \$4250 for the conversion job on the Mustang.



Cars are stripped down to sheet metal on the inside so that frame can be reinforced with tubular steel. Cutting off the roof without beefing up the frame would result in flexing and twisting of body. Windshield header and A-pillar reinforcements are then installed. Stripping car, a '77 Cordoba here, also keeps seats, upholstery clean.

Chrysler Cordoba convertible, a 1977 model, requires \$5000 worth of work, but result is an eye-catching open car. It's sure to appreciate in value as the years go by if kept in good condition.



Final stages of Cordoba conversion see fitting of softtop supports. Dennis Violet and Emess president Mark Doyne (standing) discuss work. After hydraulic motor, switches and so on are installed, the top is put in place. Customer has choice of black or white color for top. It's double-strength, full-folding and has a clear vinyl backlight. It folds behind back seat and a boot is provided to cover the top.

V, \$4995 to convert a Cordoba and \$4250 to put softtops on a Mustang, Monte Carlo, Grand Prix, Regal and Cutlass Supreme.

You begin with a brand-new car.

"We won't work on any other kind," Doyne explains. "If something happens, it is possible only with a new car to pin liability on a manufacturing defect and not on our process."

Car is stripped

To keep the price "reasonable," the car should be a two-door hardtop with freestanding windows. Converting other two-door models would run up the cost. More labor would be required, and windows and window regulators would have to be redesigned because pillars have to be cut off.

Okay, this brand-new car you've just paid from \$5500 to \$15,000 for is stripped. Everything that may be damaged or scratched is taken out

or off, including seats, interior panels, windshield and backlight. However, door glass is kept in place.

The most important operation of all from a safety standpoint is then done—reinforcing the frame. It is particularly critical because there is no domestic car built today which has a frame heavy enough to accommodate a convertible configuration. Cutting off a car's roof without beefing up the frame would lead to flexing or side twist.

Tubular steel rails, 1/8-inch thick, are welded to the car's frame either in crisscross fashion or longitudinally, depending on the frame's design.

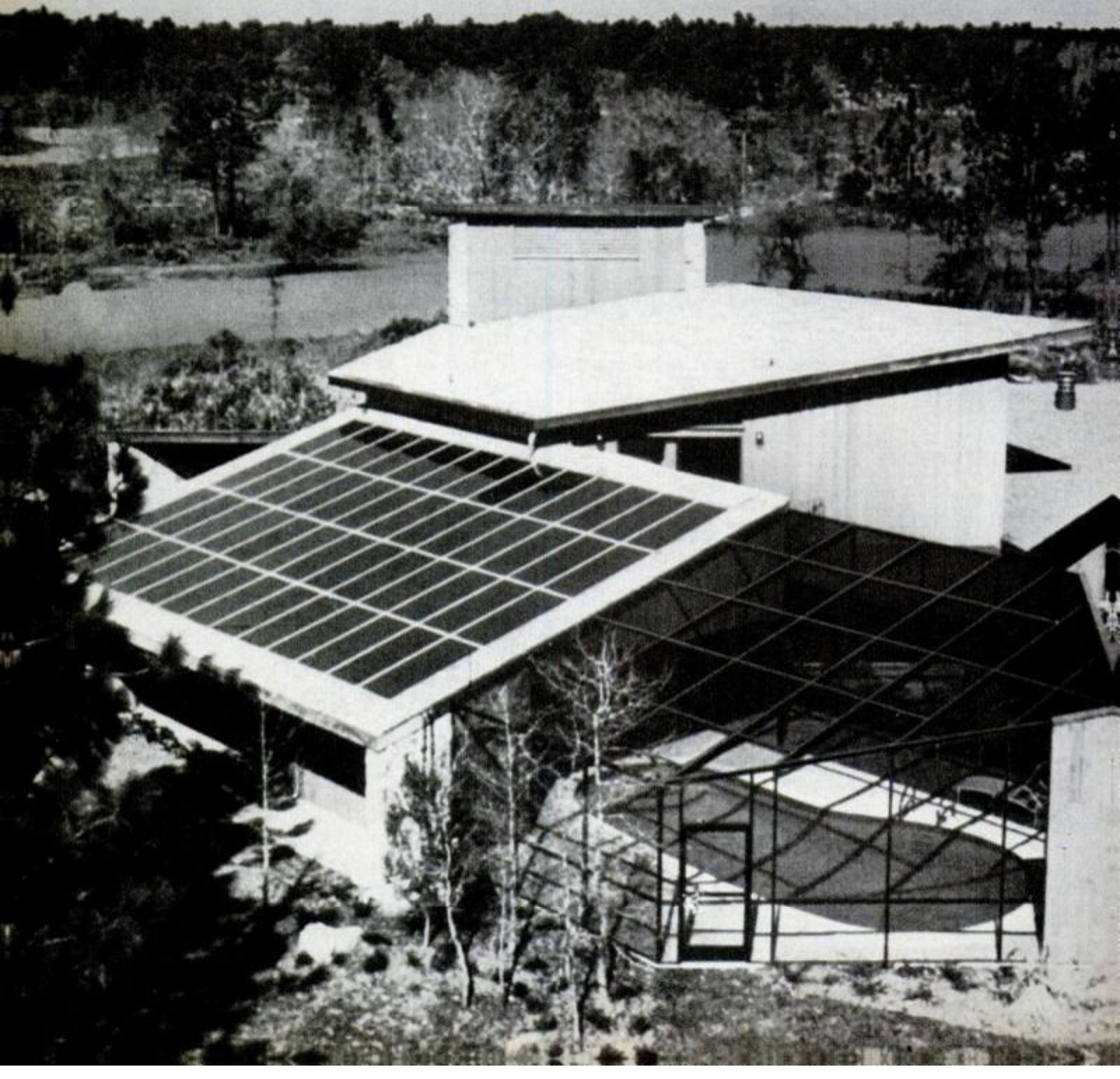
A rotary power saw made by AEG of West Germany is then used to cut off the car's roof. The operation is practically effortless since the saw's 14-inch composition steel and tungsten blade is able to cut through ¼-inch steel. No way does

(Please turn to page 175)

PM's guide to solar-energy systems

You can get collectors, evacuated tubes and concentrators for hot air or water heating. Here's what the different solar systems have to offer.

by Victor D. Chase



In many supposedly primitive societies, homes were built to take maximum advantage of the warmth of sunlight and the coolness of the night. Until recently, this common-sense approach to energy use was all but forgotten in the modern world where fuel seemed abundant and limitless.

But things are changing. As we discover that fuel is not quite as abundant as we supposed or as cheap as we have come to expect, we are also finding good reason to use nature's own thermostat.

The most obvious sign of this increased awareness is the number of solar collectors popping up on the roofs of all types of buildings in all parts of the country. This trend is here to stay and will continue until the sight of solar collectors and photovoltaic cells will be no more unusual than the ever present television antenna.

Two solar systems

Today, the state of the art of solar energy breaks down into two broad categories: active and passive. Passive solar systems use energy from the sun much as earlier societies did in their structures—by getting maximum use of the sun as it strikes a building. Passive measures include the positioning of the building on the site, materials used, design, insulation and placement of glazing.

Active solar systems, on the other hand, are the ones we usually think of when we hear the term "solar energy." They use hardware to convert and transport heat. But an active solar system does not work to capacity without support from passive techniques as well. P. Richard Rittelmann, a leading solar architect and a principal in the firm of Burt, Hill & Associates, Butler, Pa., says, "You conserve energy first, and produce energy second."

Site selection

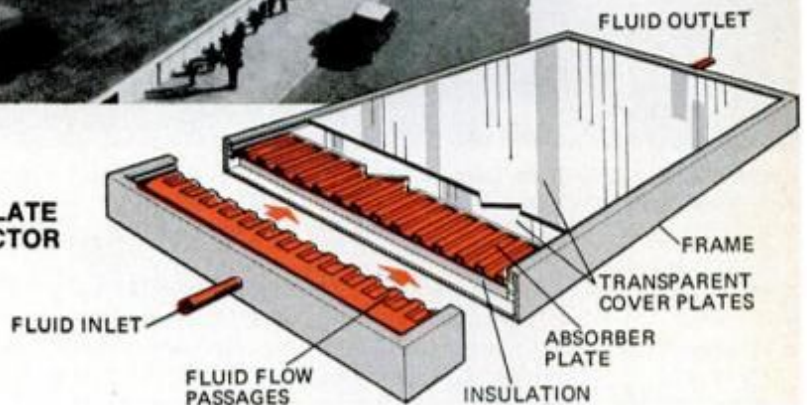
Site orientation is important. The long sides of the building should face north and south, with most of the glass toward the south. In most parts of the country, the prevailing winds are from the west, hence a shorter west wall cuts infiltration from those wintry blasts. Even more important is the effect of the sun. The west wall also picks up the greatest heat gain in the summer, so the reduction of this area has benefits the year around.

During the winter, the sun travels from east to west low in the southern sky. Windows facing south tend to act as passive solar collectors

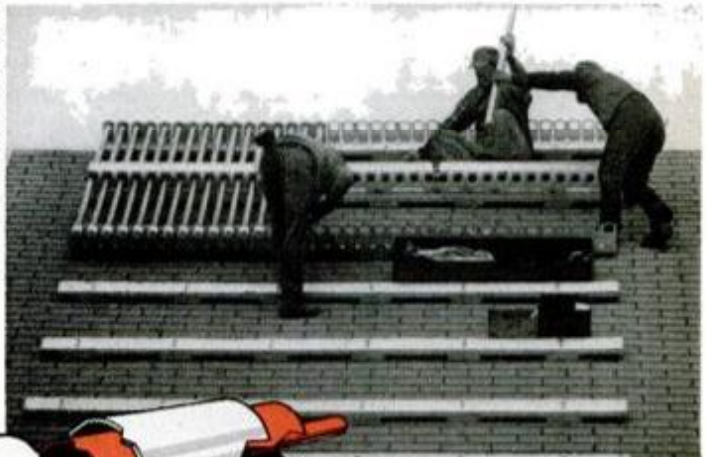


Twelve rows of collectors totaling 10,000 sq. ft. constitute one of the world's largest liquid-system installations atop elementary school in Atlanta, Ga. The 576 PPG flat-plate units handle more than 60 percent of the heating and cooling load.

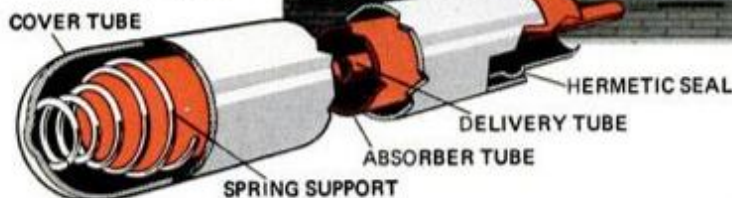
FLAT-PLATE COLLECTOR



Each unit in this townhouse group in Chicago area uses heat-pump-assisted solar energy for 60 percent of space heating and hot water. Owens-Illinois evacuated tube collectors (shown during installation) use liquid to transfer heat.

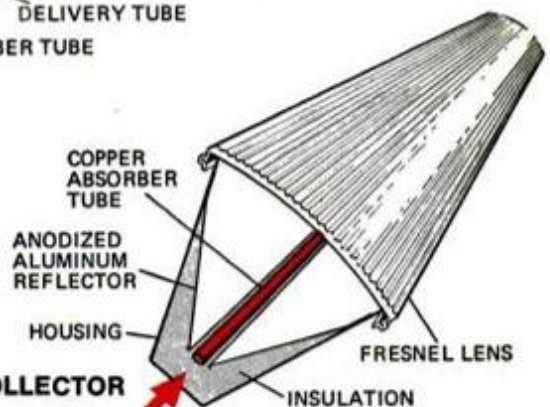


EVACUATED TUBULAR COLLECTOR



Concentrators and vacuum tubes above develop temperatures of 180° F. and up. Northrup unit at right shows prismatic Fresnel lens that focuses sunlight on the copper absorber tube. A tracking device keeps the unit toward the sun.

CONCENTRATING COLLECTOR



picking up a great deal of the sun's heat.

"If the same building is to be air-conditioned," Rittelmann notes, "the summer sun angle is extremely high so you can exclude it from those windows with overhangs." With an active system, a long south wall has the added advantage of presenting

a large roof area properly oriented for solar collectors.

Active systems

These systems are used to provide domestic hot water and space heating. Given the rapidly rising costs of fossil fuel, solar domestic water and space heating is now cost-effective.



Still think solar collectors have to be ugly? This beautiful conference center on New York State University campus at Albany uses 2300 sq. ft. of flat-plate collectors and a 25-ton heat pump. Two 8000-gallon tanks are used for storage.

tive in many parts of the country. But solar-powered airconditioning is still too expensive to be practical.

Most active solar systems in homes or large-scale commercial buildings have four basic elements:

- They use a collecting device to gather the heat from sunlight.
- They have a storage system to accumulate the heat for nighttime and cloudy-day use.
- They have a delivery system to bring the heat to the spaces to be conditioned.
- They have a backup system for days when there is not enough sunlight or stored heat to do the job.

The solar collector

The purpose of a collector is to gather sunlight (radiant energy) and convert it to heat (thermal energy). Either air or liquid is circulated through a collector to pick up the heat and carry it to its destination.

There are three general types: flat plate, evacuated tube and concentrating collector. The last two are used primarily for high-temperature systems that can include airconditioning. Flat-plate collectors are by far the most common type used, both for residential domestic hot-water and space-heating installations.

The heart of a flat-plate collector is an absorber plate made of metal (copper, aluminum, stainless steel) which has tubing that is either bonded to it or an integral part of it. Heat transfer fluid passes through this tubing. The plate is enclosed in a sealed frame and is painted flat black or covered with a material that retains heat. The back of the absorber plate rests against a layer of insulation. An air space over the surface faces the sun, covered by

one or two layers of glazing (glass or a type of plastic).

Collectors should be oriented to the south, but the fall-off in performance as you vary from due south is not that great. You can vary the collectors' angle from 20° east to 45° west of due south with only a 6 or 7-percent drop in performance, a feature that opens up many design options.

Although a good flat-plate collec-

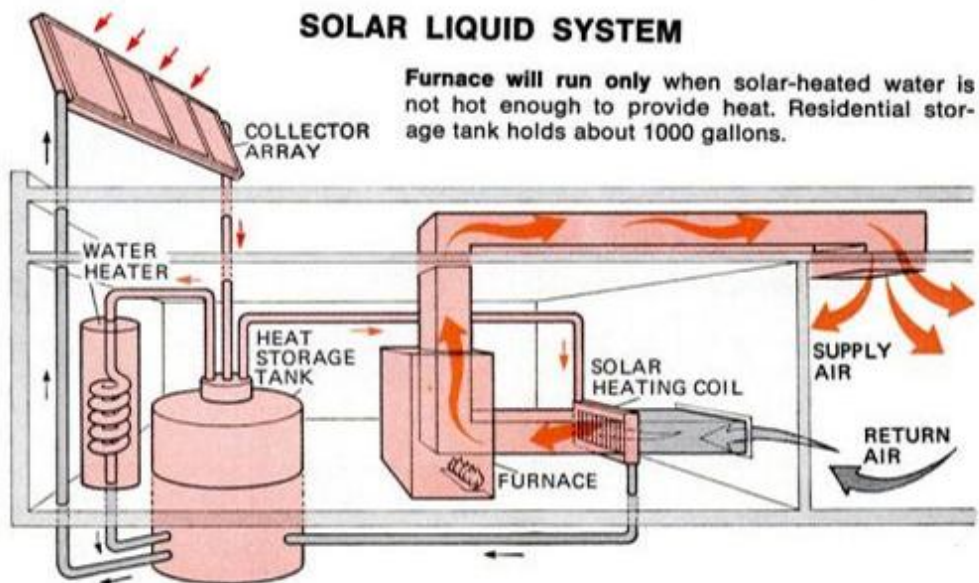
The higher the temperature of the collector, the greater the temperature difference between collector and outside air. A big temperature difference means more heat lost to the outside air. Yet the greater the heat loss to the outside air, the slower the transfer fluid must flow through the collector to absorb the same amount of heat.

"When designing a solar system, we aim for British Thermal Units (B.T.U.s) per dollar, not degrees per dollar, and the two are not synonymous," the solar architect notes. Degrees measure the level of the heat, while B.T.U.s are a measure of the quality of that heat. For example, a bathtub full of 60° F. water contains a lot more heat energy (B.T.U.s) than does a kettle of boiling water.

Freeze protection

When liquid is used, it is generally either water or an antifreeze solution. With water, the danger of freeze-ups exists in most parts of the country, and some drain-down technique must be built into the system to prevent freeze damage to the collectors. Many systems are designed to drain automatically when the circulating pump shuts off.

The antifreeze alternative presents



tor can get up to 200° F. for residential space heating and domestic hot-water systems, there is no reason to go above about 140° F. While it would seem the higher the temperature the better the performance of the solar system, in the case of flat-plate collectors the reverse is true.

Keep it cool

"We design a heating system to use the lowest temperature it reasonably can, since flat-plate collectors operate more efficiently at lower temperatures," Rittelmann explains.

its own problems. First a heat exchanger must be incorporated into the system to transfer heat from the antifreeze circulating through the collectors to the large water storage tank most frequently used. Due to the high cost of antifreeze, it is economically prohibitive to fill the storage tank (about 1000 gallons for a residential space-heating system) with this liquid. But a heat exchanger reduces the efficiency of the system because some energy is lost in the transfer process.

Another problem is that many

antifreeze solutions are toxic and some parts of the country have codes (for good reason) against using toxic substances on the heat supply side and potable water on the hot water supply side of single solar water systems. Also, be it water or antifreeze, liquid collectors can develop leaks.

A lot of hot air

Air collectors, on the other hand, tend to be simpler and less risky, with a lower initial cost.

On the negative side, air is not as good a heat transfer medium as water. As a result, the collectors are slightly less efficient, and so is the storage. While in most water systems the heat is stored in water, in most air systems rocks are commonly used for heat storage.

Unfortunately, stone has about one-fifth the heat storage capacity per pound as does water. Thus, three to five times more space is needed for air-system heat storage than for liquid. Stones used must be thoroughly cleaned and air going to the collectors must be filtered.

Distribution systems

The most basic active solar system is a domestic water heater piped to

furnace blower distributes heat throughout the building.

Fan coil units are used in larger buildings where individual room temperature control is desirable. Here, the hot water is piped directly to the rooms to be heated. Each room has a fan which blows air over a set of coils through which hot water passes.

Combined systems

In most solar space-heating installations, a domestic water heating device is also included. In some cases, a heat exchanger leading from the conventional domestic hot water tank is immersed in the solar water storage tank. In others, the heat exchanger is immersed directly in the domestic hot water tank.

With air systems, the heat exchanger is placed in the path of the hot air coming off the collectors. Sometimes, the hot-water tank itself is used as a heat exchanger and buried in the rock storage pile to absorb heat directly from it.

Combined systems can reasonably be expected to provide 50 to 60 percent of space heat and 80 to 85 percent of hot water for a family living in a typical single-family house. Initial cost for such a system can

per square foot, the collectors would run \$7000.

Technically, it is feasible to provide 100 percent of all heating needs with solar energy, but in most parts of the country the amount of collector area and storage needed for such a system would not be practical. Therefore, a backup system is almost always used, the most common being a forced-air furnace. Becoming increasingly popular is the heat pump.

Heat-pump assistance

Heat pumps are not only making themselves felt in the solar field; they're coming into their own as conventional heating-cooling devices.

Basically, a heat pump is a reversible refrigeration machine. It can pump heat from the indoors outside for cooling just as any other air-conditioner does, but by reversing the cycle during the winter, it can draw heat from the outside and deposit it indoors. Surprisingly, cold winter air does have heat in it, and the heat pump can extract that heat and make it usable.

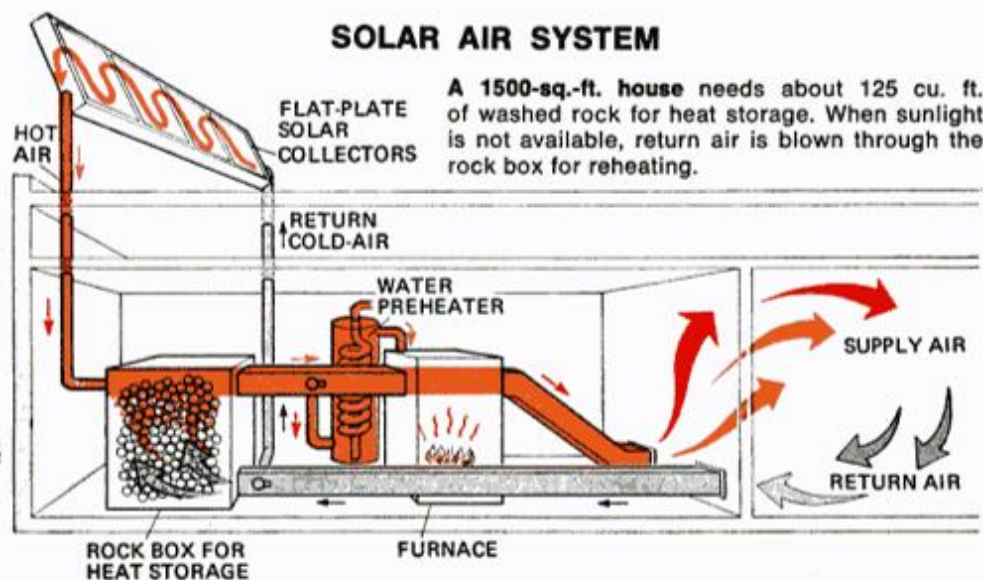
Of course, as the outside temperature goes down, the efficiency of the heat pump declines as well. Compounding the problem is the fact that as outside temperature goes down, your heating load goes up. In conventional operation, when a heat pump can't handle the load by extracting enough heat from the outside air, supplemental electric resistance-heating coils built into the pump come to the rescue.

The efficiency of a heat pump is measured in its coefficient of performance (COP). COP is the amount of energy put out by the pump divided by the amount of energy put into it. If the heat pump is pulling 12,000 B.T.U.s of electrical energy and putting out 36,000 B.T.U.s of heat, the COP is three.

That means money saved. If your heat pump averages a COP of three, your electric bill will be one-third that if you used conventional electric resistance heating only. Unfortunately, as a practical matter, today's heat pumps run an annual COP average of 1.5 to 2.

But this is where solar energy can pay off. If the heat pump can be made to draw B.T.U.s from a solar system during the cold days of winter instead of from the frigid outside air, then its COP goes up, and conventional energy consumption comes down. One method brings the outside condenser coil inside. On cold days, solar-heated water is run through a heat exchanger near the

(Please turn to page 170)



a set of collectors. But the heater should include a conventional heating mechanism to supplement the solar system.

The next step up the ladder includes solar space heating. The most direct way is to route solar-heated water from a collector array through a coil placed in the return air duct of a conventionally fired furnace. Or, in the case of an air system, warm air can be introduced directly from the collectors into the return air duct. Either way, a standard

range from \$6000 to about \$12,000.

The major portion of this cost is tied up in collectors. Flat-plate collectors can run between \$6 and \$15 per square foot. The amount needed depends on the home's location, construction and size. But as a rule of thumb you can figure that for space heating and hot water the amount of collector needed will equal one-third to one-half the floor space of your home. A 2000-square-foot home could, therefore, require some 700 square feet of collectors. At \$10

A rattle here and there isn't serious, but there are some clangs, buzzes, hums, hisses, squeals, howls, thumps, thuds, knocks, clicks, grinds and growls you'd better take care of—and fast!

You're cruising along one of the most deserted roads in the United States, Interstate 5 through mid-California. Five is, or was until recently, notorious among drivers and truckers for having almost no service facilities for several hundred miles. You're hauling a 20-foot travel trailer. You have plenty of gas and the car is equipped to haul a load with a trans cooler, an engine oil cooler, extra brakes, leveling hitch, the works.

Then it happens.

Without warning, a loud roar fills the car. Instantly you back off as your mind races over possible causes. The trailer isn't swaying, the car seems steady, the steering

is solid, you tap the brake slightly and you can feel them.

Nothing at all, yet the roar is quite evident.

Okay, you have a moment to breathe. Engine heat is within range, oil pressure is good, alternator is charging correctly, everything seems normal as you slow gradually and pull off onto a wide, safe shoulder. You switch off.

Yeah, something like this was sure to happen eventually. You step out, look for miles in both directions, and see that the road is deserted.

A nonemergency noise

Then it hits you and you sigh with relief. You are glad you learned to talk to your car and listen when it has something to say. You know

there are sounds a car can make that demand attention and others that only indicate a problem you can handle at a more convenient time.

This sound, as serious as it might appear, is one of the latter. Grinning to yourself, you walk around front, raise the hood, and reach for the fan. You're doing exactly what a shady service-station kid did some time back when your wife was driving, only he tried to sell her a new water pump because "the bearing is shot on this one . . . see, the fan turns freely even though the engine is off."

Sure it does, you explained later (after she wisely declined the water pump in favor of asking you, the expert). You told her about the fan and how it free-wheels when the engine is off because of its clutch actuated by temperature.

Out there on Interstate 5 you grab the blade and sure enough it won't turn. Maybe you can force it a bit,



PM art: Arnold Roth

but it is almost solid. The fan clutch has failed, freezing tight.

You crawl back in, start her up and drive on. The roar is still there, but you know that it is only because the fan is being driven by the engine at higher speeds. Normally the clutch would have disengaged and the fan would have coasted silently, wind-milling by the air coming through the radiator. It'll need fixing, but not until you get where you are going.

This was a car noise you could ignore. Others cannot be ignored, not for long. Here they are, the 10 car noises you should learn to identify and then be prepared to correct as quickly as possible.

One thing, in fact, can be said with absolute certainty. If you are driving down the road and your car suddenly says, "Clang . . . buzz . . . hum . . . hiss . . . squeal . . . howl . . . thump . . . thud . . . knock . . . click . . . rattle . . . grind . . . growl," you have a definite problem. The trouble is, if it says *any one* of these things, you may still have a serious situation on your hands.

1. Clang from underneath

There is no question that a universal joint can seem to go on forever, but once it begins to clang and buzz it needs attention. And attention to a U-joint ordinarily means replacement, or at least repair by replacement of the bearing units in the joint.

The U-joint is the connection at each end of the driveshaft and sometimes in the middle as well. No matter how it is bent, the universal joint transfers the torque of the transmission to the driveshaft, then to the differential (and to the rear axle).

You will normally hear the click or clang of a failing universal joint as you accelerate or as you back off. The bearing shafts are bouncing around inside the joint, first one way then the other. In operation under

these conditions, they often buzz as well.

It is possible to drive the car until the bearing fails completely, but more can happen than simply being stalled alongside the road. The driveshaft can drop free if a U-joint fails. It can whip about until the car is stopped, damaging everything in sight. Certainly the expensive driveshaft will be ruined if it breaks free.

Take the car to your own service station or garage (about 30 bucks per U-joint, installed) or, if you can raise the car, install the new ones yourself.

But before you do anything, a buzz can also be caused by a glob of road tar or undercoat on the driveshaft. Check it out.

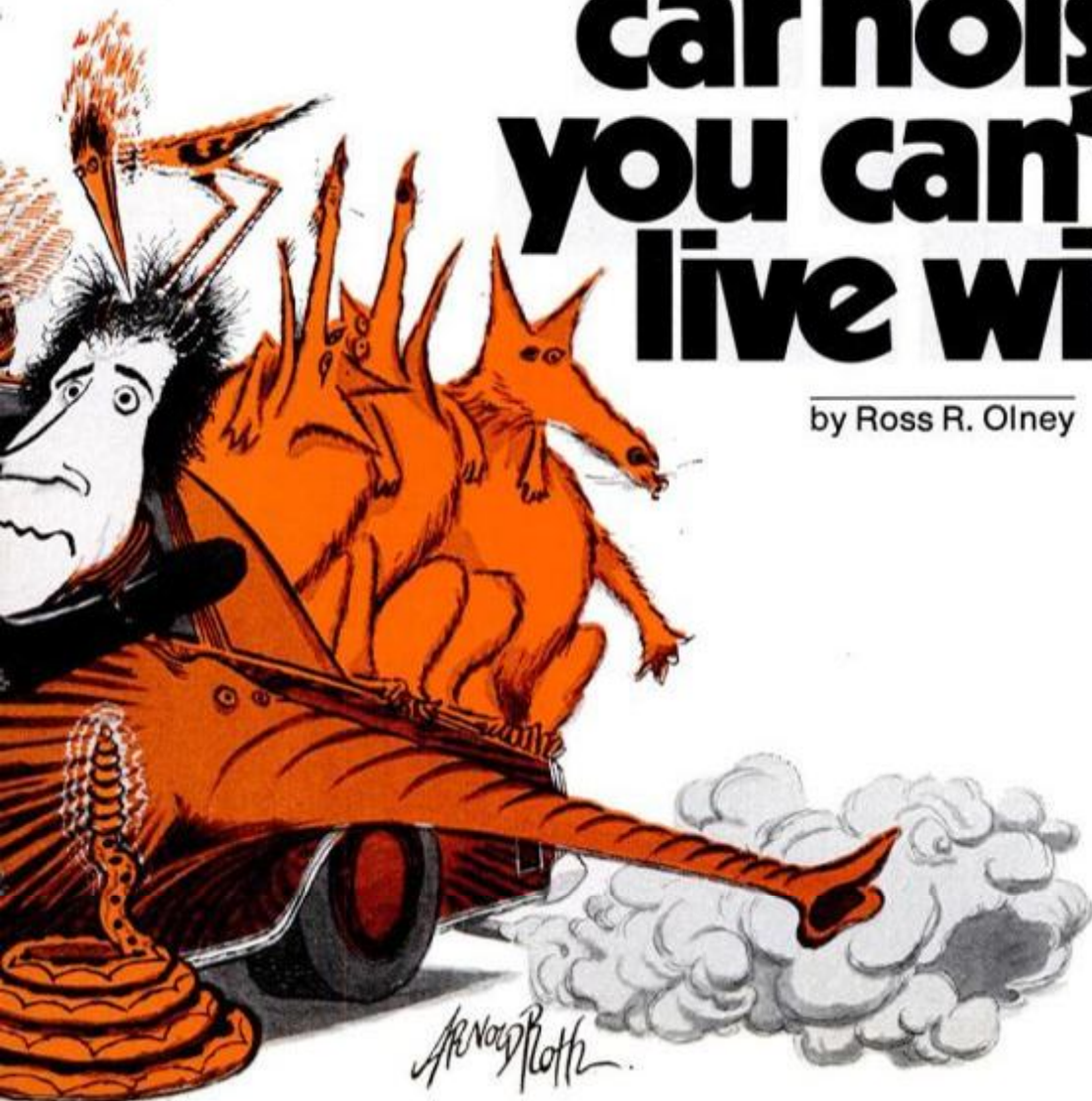
2. Hum from the rear

You've probably heard this expression: "That sound is typical of this model year."

Translation: I can't seem to find

Ten car noises you can't live with

by Ross R. Olney



the real reason for this sound from this car.

A hum from the rear *can* be a difficult sound to pin down. Still, it is one of the 10 noises you must do something about.

Let's go at it in this order, but first, you have snow tires on, right? They'll hum and there isn't much you can do about it until next spring. Go ahead and drive, and don't worry.

Check the lubricant level in the differential. If a bit of oil dribbles out when you remove the oil fill plug or even if you can reach the level of the oil inside with your finger through the hole, replace the plug. There's enough oil inside.

The wheels should be pulled next and the bearings carefully inspected. The mechanic will probably insist that the pinion in the differential is too far from the drive gear, or that the end play in the bearings is wrong (and he could be right if the hum is louder when you are coasting), or that the end play in the axles is wrong, but check the bearings first.

Bearings should show no sign of chipping, burning (a brownish cast) or scoring. Nor should they make any grinding noise when they are turned by hand. The problem here is that you will have to press off the old rear-wheel bearings and press on the new ones if you find them worn. This can be done at home (try using a socket head the same size as the bearing as a pressing tool), but a service station or garage will do it for little more than the cost of the parts.

One other advantage of their doing it: Oil seals in the rear axles can be tricky. If they install the axle, they seal the hole. They should fix it if oil later leaks out on the brakes or tires.

Finally, when all else fails, go to the complicated measurements. First, axle end play (easy to adjust), then the end play measurements in the differential (not so easy). But before you drive yourself up the wall, refer to the next section. Also remember that a hum *could* be starting out as a buzz in a U-joint that is being modified and softened as it travels through the driveshaft, differential, and out the rear axle.

Or the "hum" could really be your car's way of trying to say "whirrrr," which sometimes even precedes clang and buzz to indicate a failing U-joint.

3. Hiss from the front

A "hiss" or a "hiss-hiss-hiss" from under the hood generally indicates one of several minor, easy-to-correct problems. The sound can, however, be serious, so find its origin.

A hiss can come from a loose sparkplug (tighten), a loose or burned heat-riser tube (attach or replace), a leaking tire (repair, or change the valve if you can increase the hiss by wiggling it), a leak in the vacuum system (locate and re-attach or replace the rubber hose), a leak or broken tube in certain power systems (repair by replacing the offending tube), or from blow-by.

The last can be easily determined, but indicates a more serious prob-

CAR LANGUAGE

What it sounds like

BUZZ	A vibrating, humming sound, like bees, or many people talking.
CLANG	A metallic ringing, like the sound of a bell.
CLICK	A quick, sharp sound, like the cocking of a pistol.
GRIND	A harsh rubbing or grating sound, reducing to fine particles.
GROWL	A deep, guttural, sometimes grinding sound.
HISS	A sharp sound, like the letter "s" prolonged; like escaping steam.
HOWL	A loud, prolonged, mournful cry or wail, as in protest, pain or rage.
HUM	A low, continuous, droning sound; a murmur.
KNOCK	A pounding or rattling sound, striking against something, a collision of metal parts.
RATTLE	A rapid succession of short, sharp sounds, repeated concussions as from a collision between hard bodies.
ROAR	A loud, deep sound or din, like thunder, cannon, waves or wind.
SQUEAL	A prolonged, sharp, shrill, unpleasant sound; an extended squeak.
THUD	A dull sound like a heavy blow or fall.
THUMP	A heavy knock, a thick, dull sound, softer than a thud.
WHIR	A continuous humming or buzzing sound, as though spinning rapidly.

lem. A great deal of pressure is created in the combustion chambers of the engine. Each piston has rings to seal it in its cylinder and to aid in lubrication of the cylinder walls.

If these rings are worn or loose, too much of the pressure from the combustion chamber can leak down and around the piston into the crankcase. This is called "blow-by" and it must escape somewhere. When it escapes, you can hear it.

Blow-by generally can escape from two places, depending on the age of the engine.

Watch the oil-fill hole, the place where oil is added to the engine. Also watch the breather pipe (the crankcase vent tube) out of the bottom, if the engine is pre-1962. If smoke seems to be coming from either place, usually with a hiss, you could have worn rings and if you plan to keep the car you should get estimates on replacing them. They are costing you in mileage, oil consumption and power. On a more modern engine, blow-by gases are routed through the PCV system, fouling the PCV valve and increasing oil consumption as the gases break up oil into minute droplets to be carried by the system to the intake manifold to be burned.

A constantly fouled PCV valve is the hint here.

4. A squeal from anywhere

A squeal can mean something as unimportant as a slipping fan, alternator or airconditioner belt (dress and/or adjust, or replace), a clutch or brake pedal scraping against the floor panel (adjust), window linkages or anything else that simply needs grease (lubricate), or, if you are making a hard right or a hard left turn, a loose power-steering belt (adjust or, if worn, replace).

A squeal can indicate something a little more serious, like a low tire or a worn alternator or generator brush.

Or a squeal can indicate something very serious that needs your immediate attention, depending on where it is coming from.

Can you pin it down to the front end of the engine? Then look for water dropping or dribbling from the water-pump housing. If the bearing is failing, it will usually leak a little, and it will almost always complain with a squeal.

What if it fails? Then it will stop moving water, the engine will overheat, and finally it will stop. They'll change the water pump while you wait and it isn't a big job, but they'll charge you at least \$50 depending on your make and model car. Sometimes they have to remove the radiator and that costs more.

The other squeal you might hear demanding your attention will come from one or more of the wheels when you apply the brakes. A squeal indicates that they have already stopped working as they should and may soon fail completely.

The reason brakes squeal is that the shoes, an asbestos-based material, have worn down until metal is

(Please turn to page 207)

Americans seem to spend more time on home entertainment, and more time on the go, than any other nation. No wonder things which are self-powered portables are so popular these days.

You can get almost any kind of electronic entertainment powered by batteries: black-and-white or color television, stereo or mono cassette tape machines, and almost every radio band you can imagine—FM, AM, CB, TV sound, weather, public service, marine plus shortwave. And you can get these in almost any imaginable combination. The first choice you'll have to make in picking a portable for your summer listening is to decide just what kind of entertainment you want to take along. Radio? TV? Tape? A combination? Radio is sure to be available in any combination that you want. Radio-tape combos are common. There are a few radio-TV portables, and the only TV-tape combo due here is a JVC which includes a radio. Radio will be most people's first choice anyway. It's compact, inexpensive, drains batteries less than tape or TV, gives a wide choice of programs, works even far from stations, and usually is your best source of warnings about weather or other problems. If you have decided to get a radio, straight or in combination, you'll have to decide just what bands you want it to cover. *AM*, of course, carries great distances so you can pick up broadcasts almost anywhere you go. *FM* gives you less static and better listening, especially for music. *Weather band* broadcasts are very useful on vacation. *CB* and *public service* bands can be fun to listen to, and sometimes useful, but, since transmissions are brief,

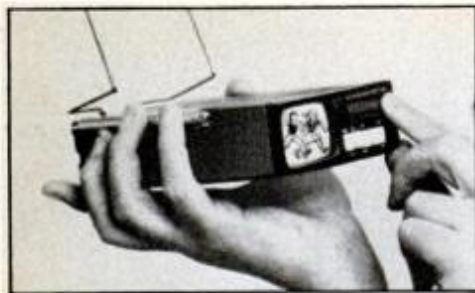
Take-along entertainment you can carry in your hand

TV, tape, radio—it's all portable, today.

by Ivan Berger



TV really is portable today. This Panasonic TR-555 weighs only 9¼ pounds, runs on D cells or your car battery and costs just \$150. The picture on the screen and those on the next two pages are real, right off the air. Today you can get most any electronic entertainment in battery-power form: TV, stereo, tape and all different sorts of radios, including FM, AM, CB, TV-sound, weather, public service, marine or shortwave. And you don't even need a long extension cord.



Pocket TV weighs 1½ pounds; is smaller than a paperback book; has a two-inch screen. Sinclair Radionics Inc., \$300.

it may be hard to catch something to hear. A scanner, such as GE's "Searcher" comes in handy if you'll be listening a lot to these bands, get a radio with a squelch control to cut out the bursts from static between transmissions. *Marine* band radio reception is handy if you're in a boat, and interesting if you're near a waterway (squelch helps here, too).

And *shortwave* is a story in itself. Shortwave broadcasts are common everywhere around the world. You can hear international SW broadcasting, plus the conversations of local and foreign "ham" operators. A lot of radios and radio/tape combinations have shortwave.

But many of the less expensive ones try to cram many of the shortwave bands into one band on the dial. That makes stations hard to tune, but still lets you pick up some stations.

If you're serious about shortwave listening, you'll want a radio that divides the SW spectrum into as many bands as possible, preferably with an added band-spread fine-tuning knob, and a BFO for tuning single-side-band and Morse (CW) broadcasts.

Music you pick yourself

Tape's advantages are somewhat different. With tape, you can take along your favorite music, rather than taking the long chance that some local station just might be playing it when the mood hits you. You can record sonic souvenirs of your vacation, possibly using them as a sound track to your movie or slide shows. And if your tape machine has a radio built in (as most do, if they're big enough for really good sound), you can also tape off the air. Sharp even has a model that lets you listen to AM while you tape FM, or vice versa.

The disadvantages of tape are only that it does deplete the batteries faster than radio, and that if you just bring a few cassettes along, you may get good and sick of them by the time you're ready to go home. That's

another advantage of combination units—greater variety in what you hear.

The major decisions in picking portable cassettes are whether to get a stereo or mono unit, and if stereo whether to get one with detachable speakers, built-in stereo speakers, or a single, monophonic speaker. Stereo gives a more spacious sound (especially indoors); and if you record someone talking in noisy surroundings, or several people talking at one time, you'll find it easier to understand what's said if it's been taped in stereo. Those built-in stereo speakers *do* work, surprisingly enough; but separate speakers work a bit better, provided you're willing to carry them along.

Superscope adds a fresh wrinkle to the speakers that attach to their CRS-152 radio/tape combination: Microphones in each speaker housing, so you can spread the mikes farther apart than single-point stereo microphones will let you (in many taping situations, though, you'll still want to keep them close together).

Still another new idea in stereo taping is JVC's HM-200E, headphones with built-in microphones for

binaural rather than stereo recording. Binaural tapes give much more realistic sound perspective when you listen to them over headphones, than stereo recordings can through speakers or headphones.

Uher, by the way, adds still another bit of versatility to its 201, the smallest stereo-recording cassette portable: An optional bracket for your car feeds it power from the car's battery and also has a built-in amplifier to boost its output enough to drive your car's speakers loud enough to be heard over the noises of the road.

If you're buying a tape portable, try swinging it as it plays, to make sure that neither motion nor any conceivable position will make the tape's speed vary. And if you'll be using it on batteries a lot, look for one with automatic shutoff, so the batteries won't keep draining when you reach the tape's end.

TV or not TV

TV—especially color TV—is the biggest battery-drainer of them all. I found that the JVC 3050, for example, would still play well and indicate full battery charge on FM or AM long after its batteries drained to the point where switching to TV



PM photo: Benn Mitchell

Материал, защищенный авторским правом

would drag the battery meter down to an indication of half-charge. TV ties you more closely to a nearby station than radios do. But it's also the most popular entertainment medium, and the one the kids are most likely to cry for—and that's often reason enough to bring it along.

Your main TV decisions are screen size and whether or not to get color. The color question will probably get solved first: Small color sets are a lot more expensive than black-and-white ones, and even a bit more than medium-sized color sets since the most popular sizes are produced in larger quantities. If the cost is no problem, remember that extra

color circuits add weight and subtract battery life. But bear in mind that color makes the details in a tiny picture easier to tell apart.

Pocket TV

One of the hottest new take-alongs is the subteeny Pocket TV by Sinclair Radionics Inc. The British company is selling its new Microvision for \$300 which brings a two-inch diagonal screen in a set weighing 26 ounces and smaller than the average paperback book. It measures 4 inches wide, 6 inches front to back and 1½ inches thick. It is powered by four AA rechargeable batteries.

As home screens grow ever larger, sets small enough to be portable look increasingly inadequate. But, in practice, they're surprisingly pleasant to watch. The small screen makes everything look sharper and crisper, just as a wallet-sized photo often hides blurs and imperfections which a big enlargement would show all too painfully. And the picture quality of the small sets themselves is fine.

Most portable TVs will run for several hours on batteries. That life usually can be extended by plugging

the a.c. power cord into a nearby socket whenever possible or using car cigaret-lighter power cords that come in many such TV sets.

Built-in batteries

In addition, some sets such as JVC and Panasonic radio-TV combos have built-in charger circuits for nickel-cadmium batteries, which can be recharged to cut the cost of truly portable operation; plug them into the power line and, while you're watching, they recharge. Detachable, rechargeable battery packs are also available for many sets, such as the Sony Trinitron color set shown.

Whatever type of portable you're looking for, you'll find some models easier to carry than others. To check balance and handle shape, you'll have to heft the set in the store. Make sure it has its batteries in when you try that. ★ ★ ★

Intriguing portables are (1) Sony KV-5100 color TV, \$460; (2) Superscope CRS-1800, \$240, with FM, tape, built-in stereo speakers; (3) Sharp GF-6000, \$170, radio and tape with automatic program search on tape; (4) Panasonic TR-535, \$200, with radio, pop-up TV; (5) JVC 3050, \$200, smaller and lighter radio-TV. Radio-with-tape combinations are common but only a few radio-TV portables are available. Look over our self-powered entertainers, select the fun you want for the beach or mountains, and toss out your extension cord.



PM OWNERS REPORT: 1977 **CHEVROLET**

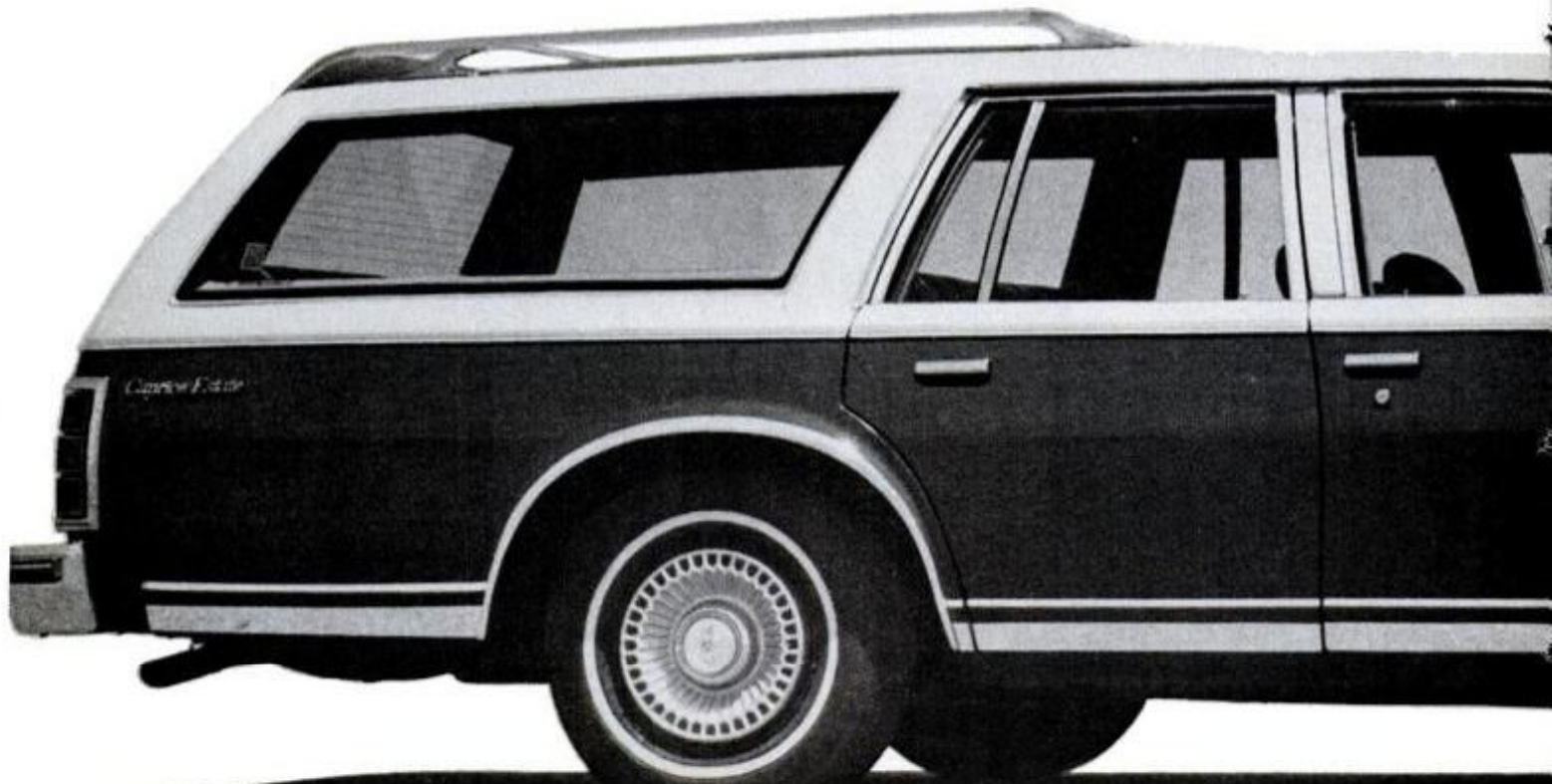
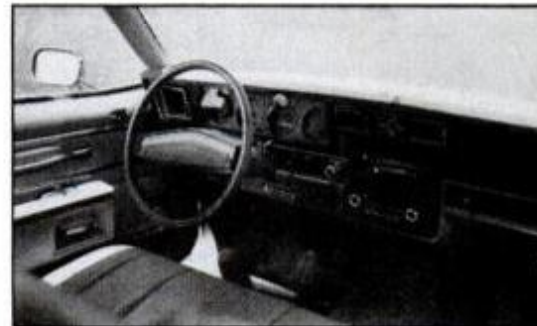
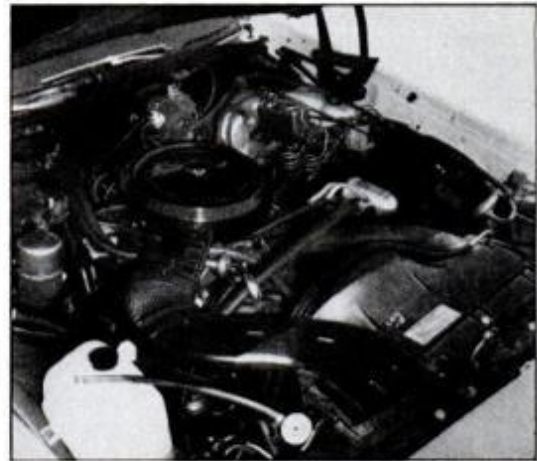
Sales say smaller size is a success, but it may just be Chevy loyalty

A nationwide survey based on 742,005 owner-driven miles

by Michael Lamm
WEST COAST EDITOR

Photos by the author

Most owners went for the 305 V8, but the 350 appears to be a better value. Fuel mileage figures are almost identical, and the 350 gives better acceleration and passing power. The wagon's rear has been squared off for more interior space; also the tailgate now works manually and swings both ways. Coupe and sedan follow styling set down by Seville, reinforcing the old saw: "If you want a Cadillac, wait two years and treat yourself to a new Chevy."



Chevrolet held its breath last October when it introduced its smaller full-sized cars. In fact, all of GM did—and the entire auto industry watched with nervous interest because GM's downsizing represented the biggest of automotive gambles. GM had a cool \$15 billion riding on the deal.

Well, the smaller big Chevy's production is now running 50 percent above last year's, and GM radiates smiles in every direction. The gamble has paid off, and it's now likely that Ford and Chrysler will bring out their own downsized big cars before 1980.

When we surveyed 1000 owners of 1977 Impalas and Caprices, we found that size **wasn't the big reason** they bought these cars—only 12.4 percent listed it. But over half (50.8 percent) of our respondents said they bought new Chevys simply because they'd owned them before—brand loyalty.

Once they got used to their new cars, though, size was one of the things owners like best. "Smaller size means better handling," said a Missouri retiree, "and the car is still comfortable and reliable." Handling, according to 38.3 percent of our owners, is the '77 Chevrolet's best-liked feature.

Let's listen now to a cross section of owners for their opinions and feelings. First, here's a Texas security guard:

"This is my fourth car from the same dealer. Chevrolet has always given me over 100,000 miles of service without any major problems. This car gets **good gas mileage** (17 to 20 mpg), handles well in traffic and on the highway, is easy to park, has a smooth ride, and contains nearly as much interior room as the older models."

A Michigan manufacturing supervisor: "Chevrolet seems to generally be one to two years ahead of the competition on new features. Quality control is excellent, not only on

All the kinks haven't been worked out of the foam seats yet—some owners say there's a hard ridge in the center.

Our survey couldn't tap those people who bypassed the smaller Chevy for reasons of size.

Several complaints on jerky shifts. Chevy uses two new, lighter automatics for 1977.

Some 15 to 18 percent said they expected better gas mileage, and the 305 and 350 V8s deliver virtually identical mpg.

Actually even the early ones seem to be well put together—69.5 percent rate workmanship "good to excellent."

this 1977 Caprice but on all Chevys I have owned. Dealer gives prompt service—is well equipped to handle large volume. Good comfort, but they ought to return to seat springs instead of **foam rubber**—the springs are better for long-distance driving. The reasons I keep coming back to Chevrolet are high resale value, reasonable price, prompt service and broad availability of parts."

A California retiree: "\$18.50 for an oil change? Can't tell if they do good work because customers aren't allowed in the service area. Elegant, simplified styling—great ride, extreme quietness. Workmanship? Quality control is a joke—this car would have been unacceptable 15 years ago—rough bumper edges, a \$2 plastic trunk mat and ill-fitting at that; a shame in a \$7000 car. But yes, of course, I'd buy another Chevy."

A Georgia industrial security man: "This is my fourth new Chevy from the same dealer. I've found this dealer completely honest and straightforward. The car is extremely quiet on the road; also smooth, and you get a comfortable ride. But Chevrolet changed to a **new automatic transmission** that doesn't shift as smoothly as the 1976 model."

An Illinois railroad foreman: "I was looking for a medium-sized car and found the 1977 Chevy exactly what I wanted. Plenty of interior room and comfort, spacious trunk, easy to drive, good looks. When I got the car, though, the windows leaked. The starter drags and the clock stops with the headlights on. I've had the car in for service three times, but some of the problems still aren't fixed. Also I'm disappointed with the gas mileage—I'd been led to expect better than 11 to 12 mpg. Workmanship rates a 'fair,' and the ventilation system tends to suck in fumes from the outside. I guess I got **one of the early ones.**"

Station wagons accounted for nearly 10 percent of the owners we surveyed. A retired Kansan, said this about his Caprice Classic wagon:

"Best Chevy I've ever owned, and I've driven no others for 40 years. The 1977 is the right size and weight for me—easy to handle, wonderful performance, clean styling, high-quality dealership."

A wagon owner in the glass business says:

(Please turn to page 218)



The 1977 Chevrolet wagon weighs 871 lbs. less than last year. Engineers put a lot more emphasis on rust protection, use galvanized steel and Zincrometal extensively. Rear suspension is four-link, coil-spring type. Diagnostic connectors give 35 checks for engine; a similar connector allows 34 tests of the air conditioner.

New import outboards join the little league

Small kickers are slicker this year as minis from overseas join the small-boat scramble.

by Ray Gill



Compact muscle is the claim for the new Mariner line produced in Japan by Yamaha and Brunswick, the parent company of Mercury Motors. Colors are black, red and white, but the silhouette of the power-head hood is similar to competitive makes. Emphasis is on workhorse rather than hotshot performance, and prices are expected to be about three percent below Mercs of similar horsepower. Some models, like the 20-pound 2-hp Mariner and the 3.5 (above and left), are smaller than the Gnat 4, the midget of the Mercury line. Though new to North America, Mariners have been sold and tested for several years in the Far East, Europe and South America. Use by commercial fishermen indicates they are rugged, require minimum maintenance. Initial sales and service are planned for Midwest states this year near the Mariner headquarters located at Fond du Lac, Wis.



The spirit moves you and your boat with a new set of Japanese outboard motors named Spirit by Arctic Enterprises of Thief River Falls, Minn. Maker of Arctic Cat snowmobiles and Silverline boats, Arctic will offer seven models made by Suzuki in Japan, one of the largest of two-cycle manufacturers in the world. Smallest Arctic Spirit weighs 23 pounds and puts out 2 hp from a 50-cc package. Other horsepowers will be 4.5, 9.9, 16, 20 (shown at right), 25 and a 50. As Suzukis, the engines have been proving themselves for several years in Japan, Australia, Europe and on the West Coast. Pricing is expected to be 5 to 10 percent below similar horsepower engines made here, and initial sales will be throughout the Midwest states.



We know how good Japanese cars, cameras and computers are. Now Nipponese outboards are moving in. Britain, Sweden, Italy and the Orient have been bidding for the American market for a number of years. But the latest entries should be big-league competitors in the mini-horsepower sweepstakes.

Mariner may be the name with the most muscle behind it. Brunswick Corp. is the parent company of Mercury Motors, as well as of divisions producing sportswear, fishing tackle, golf and bowling equipment. Teaming up with Yamaha in Japan, Brunswick has provided the Mercury engineering know-how for Sanshin Industries to produce a line of 10 motors ranging from 2 to 60 hp. A larger 85-horse Mariner that tops the line is made in the United States.

Right now the Mariners are being introduced in Midwest states, but they have already proved to be rugged performers during two years of sales and tests in Australia, South America, Southeast Asia, New Zealand and Europe. In fact, durability is expected to be the big claim of these workhorse machines, with racier performing left to the Mercury line. Last fall three boats using a 48-hp, twin 60s and an 85-hp Mariner staged a two-week 1400-mile endurance run up the Mississippi River from New Orleans to Chicago without any engine problems. The full Mariner line covers



Mariner lineup shows lookalikes to many current American motors. Horsepowers run (from left to right) 2, 3.5, 5, 8, 15, 15W, 20, 28, 48, 60 and 85. The 15W and 48 are designed particularly for heavy-duty commercial use with higher torque at low rpm on workboats and heavy craft.

2, 3.5, 5, 8, 15, 20 and 28 hp in the smaller models. A heavy-duty commercial-type 15 and 48 are also available. Currently topping the line are 60-hp and 85-hp Mariners. Prices are expected to be slightly less than Mercury models of similar power, except for the U.S.-made 85 which will probably price out the same as the 85 Merc.

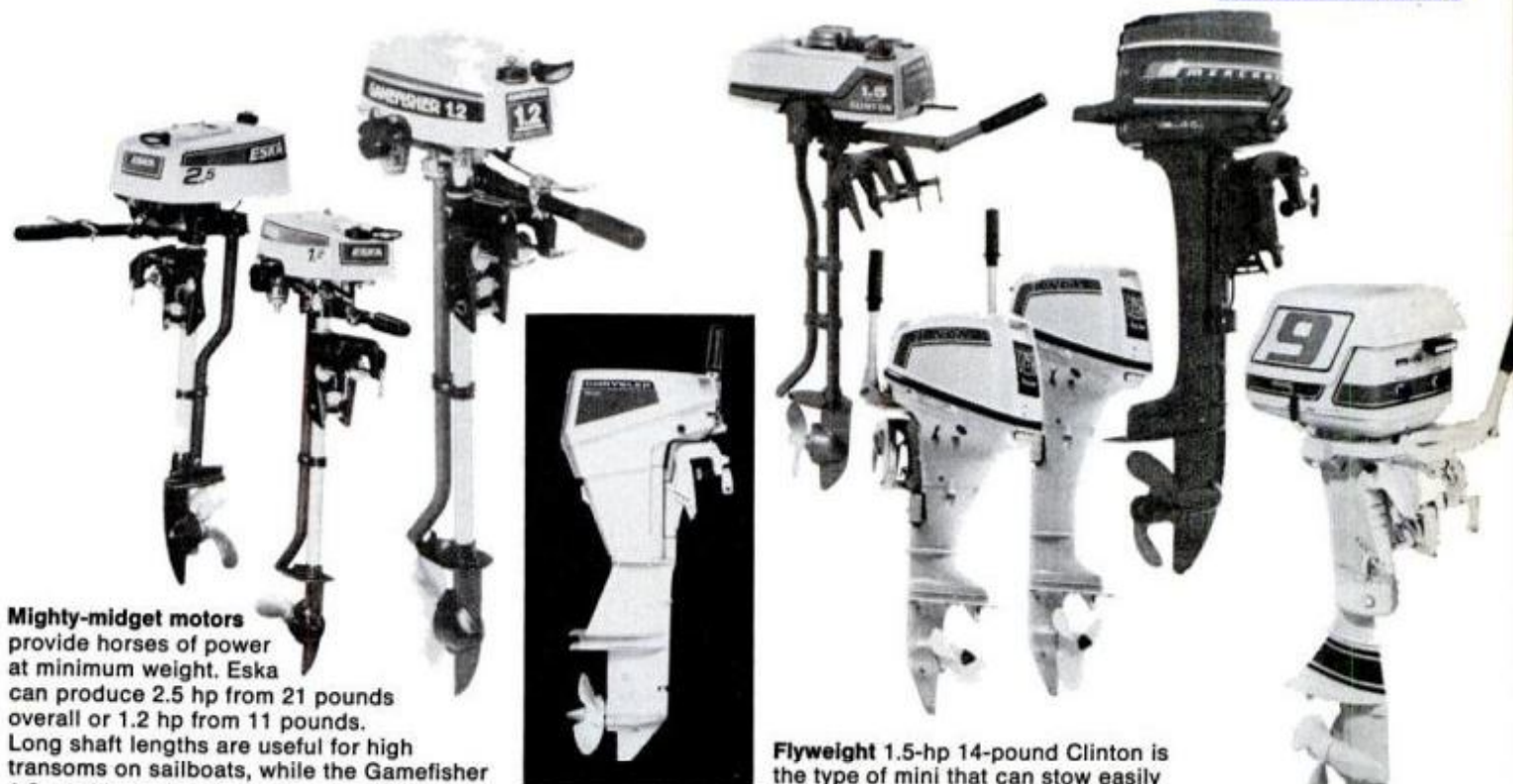
Other entries

The second full-line import entry is the Spirit from Arctic Enterprises, the snowmobile maker of Thief River Falls, Minn. These will also be mar-

keted first in the north central states; elsewhere, particularly on the West Coast and in foreign countries, they're likely to say Suzuki on the side. There are single-cylinder 2 and 4.5-hp models plus twin-cylinder 9.9, 16, 20, 25 and 50 for a total of seven in the Arctic Spirit line. These, too, are reported to cost less than American makes of comparable power.

Volvo Penta's outboards from Sweden are not new to the market, but now range from 3.6 hp up through 4.5, 8.5, 12.5 and 21.5 to a 70-hp model. The sailboat 3.9 has a 23-inch shaft and the 8.9 a 20. All

(Please turn to page 224)



Mighty-midget motors provide horses of power at minimum weight. Eska can produce 2.5 hp from 21 pounds overall or 1.2 hp from 11 pounds. Long shaft lengths are useful for high transoms on sailboats, while the Gamefisher 1.2, an 11-pounder from Sears, and Chrysler's long-shaft 10 and 6 provide power heads that can mount up out of the waves and within reach of the cockpit.

Flyweight 1.5-hp 14-pound Clinton is the type of mini that can stow easily in a car trunk. Honda 7.5 twins come in both standard and long-shaft models. Mercury 4.5 has extra-long shaft. Sea King 9 is new from Montgomery Ward.

Dwarf fruit trees: Big producers in tiny plots



The dwarf doesn't bow to the standard-size tree in growing large and tasty fruits—and maintenance is a lot easier. Here's how to get started as a back-yard orchardist.

by James Dwyer and John Albert

Many people think of dwarf fruit trees—if they think of them at all—simply as ornamental novelties. They *are* ornamental, no doubt about it. Covered with blossoms in the spring and with fruit in late summer and fall, they bring a unique beauty to any yard or garden. But they are far more than mere novelties.

Fruit is full size

For one thing, even though a dwarf fruit tree is smaller than a standard tree, its fruit is as large or larger. And because more of its nutrients go to making fruit, its proportional yield is greater. A well-cared for dwarf apple tree can produce up to 150 pounds of fruit per season. That's an attractive thought in this day of unaccountable scarcities and outlandish supermarket prices. It's one reason commercial growers are turning more and more to dwarf trees.

Another is that maintenance is so easy. All branches, fruit and leaves can be reached from the ground for spraying, pruning and harvesting. And, because the trees are smaller, they can be planted as close as 10 feet apart—except for pears, which may require slightly more separation. The benefit to a commercial grower is obvious. For the home

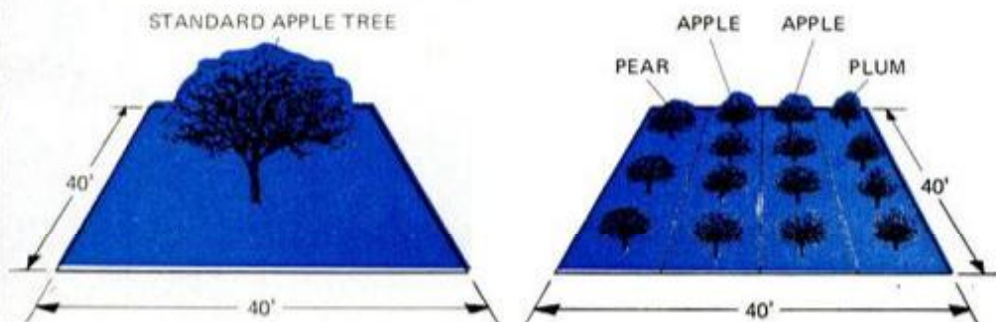
gardener, it allows planting a wide variety of fruit trees in space that normally would be taken up by a single standard-size tree.

Finally, a dwarf may start producing the first year after planting, compared to the three to 10 years required by most standard fruit trees. And don't be put off by stories that dwarfs are short-lived. With proper staking and soil care to protect their relatively shallow root systems, they will live and produce every bit as long as their larger cousins. Before you rush to buy and plant an orchard in your back yard, however, there are a few things you should know about these interesting little trees.

Most result from grafting

Some, like peaches and nectarines, are true genetic dwarfs that always grow to midget size from seed or cuttings. But most are the result of grafting. A normal-size fruit tree is grafted or budded onto the "stock" (stump and root system) of a small species of the same family. This rootstock controls the size, while the upper grafted portion, called the scion, retains all other characteristics. Finding a compatible combination isn't always easy, however.

Sometimes a third section, called a stempiece, is used to make the



In a 40 by 40-foot plot a standard apple tree would fill, 15 dwarf fruit trees can flourish and produce more fruit. Note size and crop of mature dwarf apple tree at left.

transition. For example, quince is the normal dwarfing rootstock used for pears, but some varieties of pears are not compatible with quince and refuse to "take." The problem is solved by grafting a compatible pear variety onto the quince root and then grafting the fruit-bearing variety onto this.

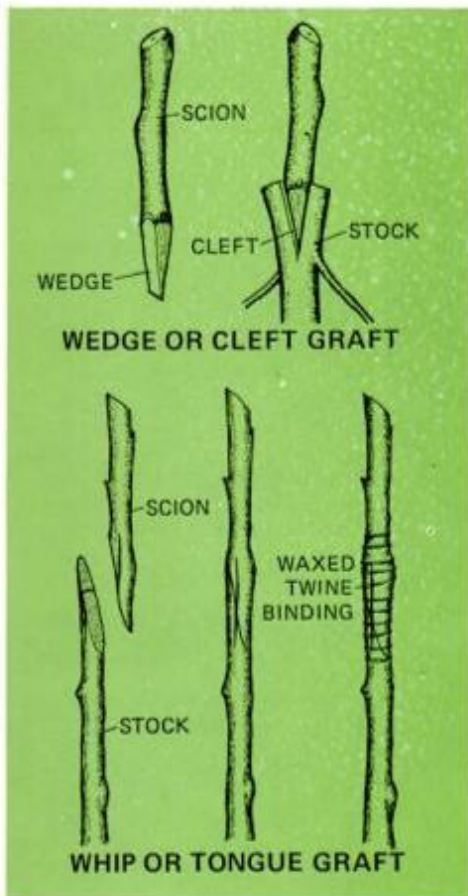
A variation of the same principle often is employed with dwarf apples. To get around the characteristically weak root support of apple dwarfing stock, a dwarfing stempiece is grafted onto a rugged crab apple root system, and the fruit-bearing scion is grafted onto this. In this case, the length of the stempiece can make a difference in the degree of dwarfing. The Clark Dwarf Apple, for in-



Size, quality and abundance of fruit that dwarf trees produce can exceed that of most standard trees bearing same variety. Stark Blushing Golden Delicious apples at left are good example of the plump fruit dwarfs can produce with minimal care. Starkrimson apples shown below provide some idea of the size of the trees, which makes them easy to prune, spray and harvest without need for ladders.



Potted peach tree (left), a Stark Starlet, is a genetic dwarf, decorative shrub for any terrace or patio garden—and will bear fruit for its owner with minimal attention. Because of their compact size, the little trees literally can permit a city dweller with tiny terrace or even a postage-stamp-size yard to have a mini orchard that will yield a startling crop of full-sized fruit with even moderate care. Abundance of the yield from potted trees is impressive.



Grafts most often used are the two shown above. Splits in stem and stock form "tongue" in the lower graft, enabling cambium layer of stock and scion to be in firm contact—a vital factor.

stance, is made from parts of four trees: The roots are quince, the lower stempiece is a strong-trunked variety of apple, the upper stempiece is a winter-hardy natural dwarf apple, and the scion is a fruit-bearing variety.

Singles or doubles

Many types of fruit trees, including some apples, pears, plums and sweet cherries, will not produce fruit unless they are pollinated by another variety of the same fruit growing nearby. Peaches, nectarines, sour cherries and apricots do not have this problem, but many other dwarf fruit trees do. So, before you buy a dwarf fruit tree, find out if it must have a mate.

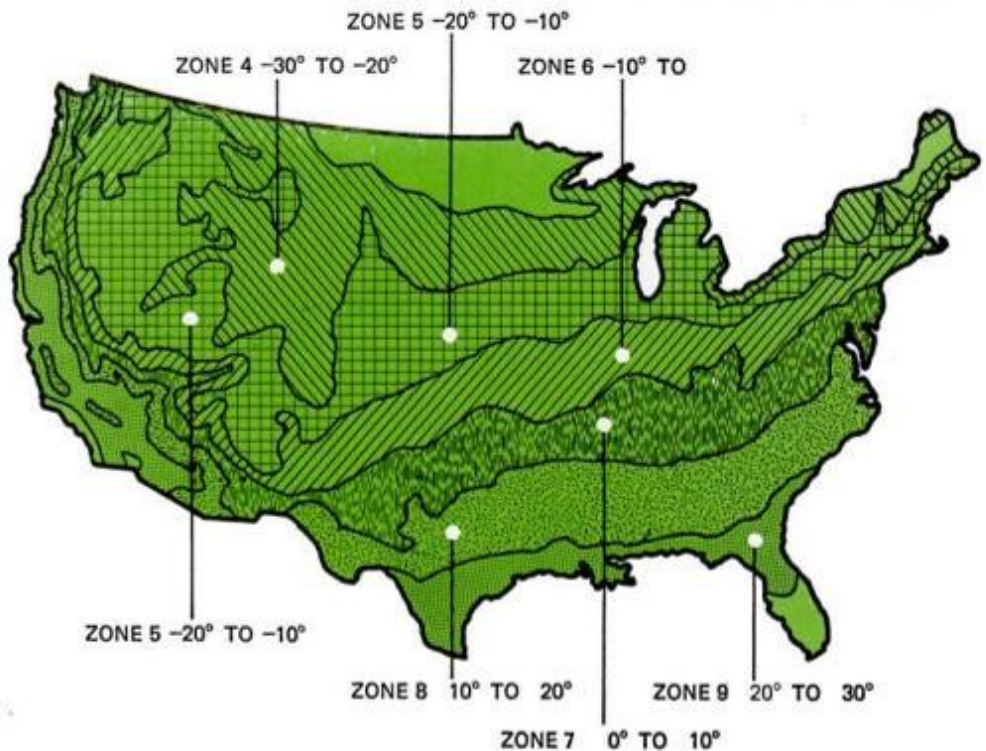
Hardiness

Another important thing to know before buying a dwarf fruit tree is whether it will survive winter where you live. All varieties need a cold period to start fruit development. Just how much cold depends on the type of fruit and the variety. The same goes for resistance to damage from cold. The U.S. Department of Agriculture has compiled a hardi-

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TEMPERATURE HARDINESS CHART

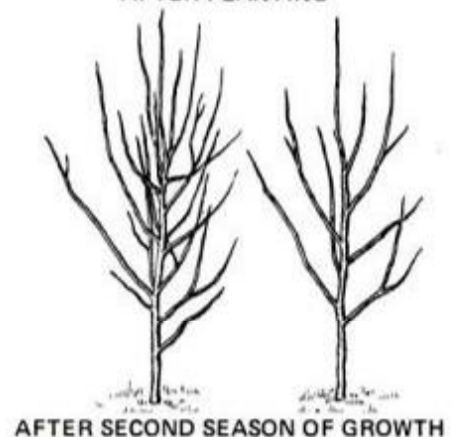
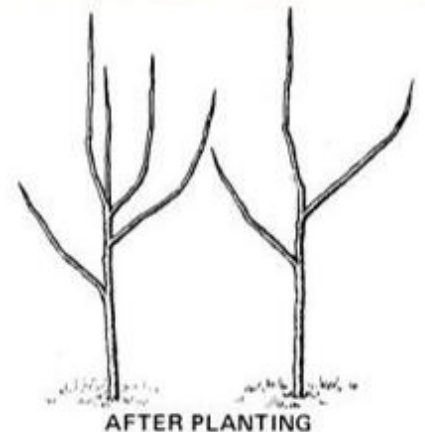
Zones 1, 2 and 3 of map are omitted since they lie almost entirely outside the United States.



Resistance to cold weather and response to temperature changes vary widely for different types of dwarf fruit trees. Care must be taken to plant the ones that do best in your temperature zone. The U.S. Department of Agriculture map above shows zones of average annual low temperatures for the Continental United States. Apples generally grow best in Zones 4 to 8. Pears, peaches, apricots and nectarines do best in Zones 5 to 8 (but Keiffer pears prefer Zones 4 to 9). European and Damson plums, and sweet cherries, do well in Zones 5 to 7, and sour cherries like Zones 4 to 7. Japanese plums need Zones 5 to 7 for best results. To be sure before you buy, check the USDA in your county.



Spurs, pictured above, develop toward summer's end on all fruit trees but peaches. They are the budding twigs that will bear next season's flowers and fruit. Trimmers look for spurs to check on next year's production, and snip them judiciously. Spurs usually appear in clusters of three buds; the outer two being fruit buds, the center one a leaf bud. Diagram at right illustrates how plant should be pruned back to the main leaders, reducing all crotches to stems. Even in second season, tree is pruned back to trunk, main branches.



The exhilaration of climbing does not come cheaply. On May 1, 1963, when I stood on top of Everest, the highest mountain on earth at 29,028 feet above the sea, it was the result of many years of mountaineering. In the 60-mph wind and minus 35°F. cold, I unfurled the American flag to mark the first ascent of Mount Everest by an American team.

I began to learn the mountains as a young boy with my parents and, at 12, with West Seattle's Boy Scout Troop 272. There were hikes and backpacking trips into the forests of western Washington where the trails wind through the dense lowland underbrush of the rain forest, and even the flanks of the Cascades themselves are heavily timbered. But many of the trails we hiked traversed high into the mountains, up through the sub-Alpine zone, where at 5000 feet the dense forest yields to meadows of heather and flowers. Late-melting snow fields beckon even higher to the

During whiteout at 19,500, climbing ace Jim Whittaker radios K2 Camp II above.

ridge tops and to their high points.

I joined the Mountaineers Club of Seattle and signed up for its basic climbing course. Graduation was a climb to the 14,410-foot summit of Mount Rainier, and by that time the lure of the mountains was in my blood. During university summers, my brothers and I operated the Mount Rainier Guide Service and led climbs to its peak. A two-year hitch in the Army with the Mountain and Cold Weather Command in Colorado kept me further involved with rock climbing in the summer and ski mountaineering in the winter. My discharge meant I could guide on Mount Rainier once again until I became employed full time at Recreational Equipment, Inc., the Seattle mountaineering co-op, where I sold—and continue to sell—the equipment I use.

New heights

Climbing adventures that followed reached new heights—Mount McKinley in 1960 and in '63, Mount Everest. In 1965 I climbed Mount Kennedy with Sen. Robert F. Kennedy. The 14,400-foot summit of the highest unclimbed peak in the Yukon was named after the late President John F. Kennedy. Robert Kennedy became the first to stand on the summit of the peak named after his brother. As leader of the 1975 American K2 Expedition to Pakistan and the second highest summit in the world, I was discouraged to see years of dreaming and preparations thwarted by the vagaries of storms, avalanches and porter strikes.

Experience shows that mountain-



K2, world's second highest, looms over Himalayan camp set up by Whittaker.

ering success requires gradual and painstaking physical conditioning, climbing skills, and the proper equipment and knowledge of how to use it the right way in the Alpine world. Of the three essentials—conditioning, skills and equipment—the novice will find getting equipment the easiest. You can now walk into most good mountain shops and be superbly outfitted for climbing (a far cry from 20 or 30 years ago).

So now you stand there with hundreds of dollars of exotic gear draped artfully over your body and pack. What next? You take your first day hike and find the \$100 Alpine climbing boots torture your feet because they are not made for trail walking. You find that \$80 down parka isn't much good either unless it's below



How to hike straight up

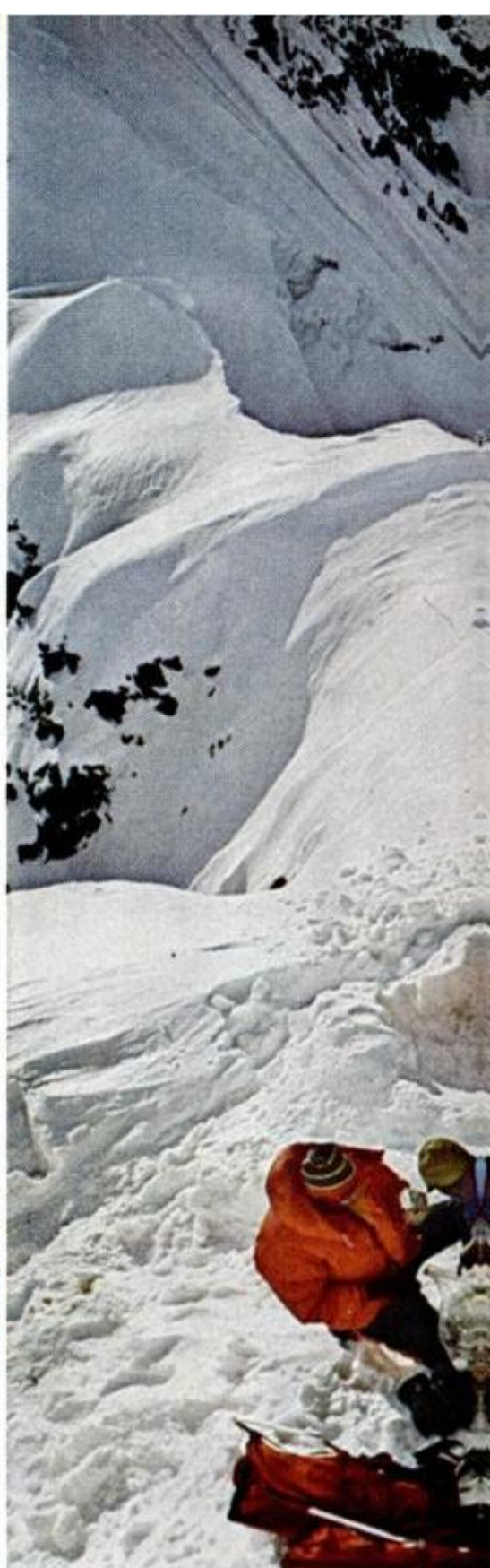
New equipment and techniques are changing the challenging sport of mountaineering.

by Jim Whittaker

Photos: Dianne Roberts




Under 100 pounds of pack at 17,500 feet up on the world's second highest mountain, leader of the expedition Jim Whittaker climbs toward the base camp on K2. Conditioning and courage, skill and equipment must combine to make a summit assault possible. In spite of modern developments, climbers today must still supply knowledge of wilderness survival, physical strength to practice it.



freezing and you're doing nothing more active than sleeping.

And what good is that superlight ice hammer and those 12-point crampons on an afternoon's mushroom hunt? Although it's possible to fit yourself out in a few days for the world's toughest summits, it's much more sensible to accumulate gear gradually. As you enter a new level of climbing ability, make each purchase while asking yourself, "Do I have the skill yet to use it; is it appropri-



Balanced on precariously narrow corniced ridge at 20,600 feet, Jim Whittaker's Camp II was dug in against continual snowstorms in hopes it could be the jump-off place for a third camp and the summit attempt. At the northern end of the Himalayan Karakoram Range, 900 miles northwest of Mount Everest, the K2 ridge shown separates Pakistan (at left) from China, dropping down and away at the right.

ate to my present climbing; will it make the trip safer and more enjoyable?"

Choosing boots

Take special care in choosing boots. Do not "over boot." If you're just starting to packpack and are sticking to the trails, select a flexible boot which makes for comfortable walking. Say you're doing a "mixed" climb which involves travel over trails, brush and scree, stepkicking in

snow and delicate footwork on steep rock. Then you'll need a boot which is a compromise between conflicting requirements—a type generally called a medium-weight climbing boot.

If you're strictly on steep snow and ice, you may require a very stiff boot. An accomplished mountaineer may even have three pairs of boots (one on his feet and two in his closet). All boots should have a sturdy Vibram lug sole of hard rubber. The Vibram grips on rock and snow and provides

excellent insulation from the cold as well as giving traction in the muddy brush-battles and on steep heather slopes.

Clothing also deserves particular care in selection. The key principle here is the "layer system." The clothing worn should preserve body heat and provide sweat-absorbent material next to the skin. Then come insulating layers which trap dead air, followed by outer shells which protect

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Popular new tackle boxes, like Magnum 1146 (above) by Plano, have adjustable compartments, see-through lids. Recommended rods (top to bottom) are:

- Zebco Pro Combo with Omega One reel, Stren line, PS10 Pro Staff 6-foot rod;
- Garcia Ambassadeur 5000 bait-casting reel, 8315-A Ambassadeur 5-foot rod;
- Daiwa GF-13 graphite 7-foot rod with Silver 1300C skirted-spool spinning reel.

New tackle that lands the lunkers

by Mark Sosin



Fitting out to start fishing—thanks to the latest in modern gear—is much easier for first-time anglers.

Getting your youngster, wife or friend started in fishing is easy if you follow two basic rules: Make sure they catch fish the first time out, and urge them to use tackle that fits the situation. Each rod and reel combination is suited for a particular phase of the sport, and there is no universal outfit that is ideal for every type of fishing. Selection must be careful—no matter how much someone wants to spend.

First, a beginner should consider his needs: the type of fishing he plans to do, weight of lures and bait that will be cast, size of the fish that might be caught, and conditions under which they will be taken. An outfit must be balanced. That is, the breaking strength of the line determines the size of the reel, and the reel must match the rod. It makes no sense to put a husky reel on a light-action rod, or a miniature reel on a rod tailored to wrestle heavyweights.

Though many people choose the rod first, it's better to decide on the breaking strength of the line you'll need. Ten-pound test is a good starting point for most freshwater fishing. If you are going to battle largemouth bass or big northern pike, you may want 12 or even 15-pound test. Should you decide to cast very light lures or fish very clear water, you might use eight or even six-pound test.

Choosing a rod

Once you select the line, you pretty well determine the lures and baits that can be cast with it and can focus on the rod. Most rods today are fiberglass; yours should be tubular with enough backbone or reserve power to handle the line of your choice without having the rod collapse. If the rod tip is too soft, you won't be able to work a lure, set a hook or even play a fish properly. If it's too stiff, you'll break lighter lines since there is no give to absorb the shock of a strike.

Spinning tackle is most popular and your choice is between closed-face and open-face reels. Closed-face hides the spool of line behind a bell-shaped projection. It is usually operated with a pushbutton on the back and fits on a rod with a recessed handle and guides facing upward. It's probably the easiest reel to use; even a 4-year-old can learn to cast with it in minutes.

Open-face spinning is better for

longer, controlled casts, and an angler can "feather" the line as it comes off the reel. Since the reel has more line capacity, it is better for bigger fish. Learning to cast is easy, but there are more operations than for pushbutton closed-face spinning. Open-face reels hang below the rod and are cranked with the left hand for right-handed casters. Most have a higher ratio of retrieve, and if a person is going to be serious about fishing, they are probably a better investment.

Match reel to line

Reels come in many sizes, and yours should match the line size you have already chosen. Tiny ultralight reels are designed for lines that break at 2 to 6 pounds of pull. Eight and 10-pound test line would be better on a reel with a spool of at least 2-inch diameter. Basically, the heavier the line, the larger the spool diameter.

The trend in open-faced spinning reels is toward fully skirted spools

(Please turn to page 192)

Beginners can land big fish right from the start with modern improved gear—and luck. Youngster with largemouth bass (below) used inexpensive closed-face spinning outfit; lady (right) lands hefty northern pike with open-face spinning gear. Fly casting (center) takes more skill and practice for graduates of easier techniques. Author Sosin (bottom) uses a spinning rig to bring in a handsome schoolie striped.

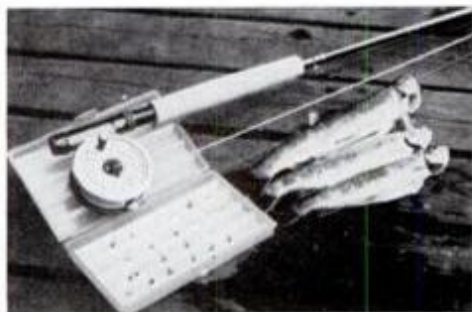


Tackle trends

■ **Rods** of fiberglass are lighter, but have the strength of the older heavier blanks. Quality ceramic guides reduce line wear, and hard chrome is returning. Graphite, a forerunner of newer and better rod materials, is gaining rapidly (it can perform well, but stay with the leading rod makers). Question the arguments about 100-percent graphite versus a composite; the proof of any rod is in its "fishability" and response to an angler's technique.

■ **Reels** of the fully-skirted-spool open-face type should be market leaders for the next few years. Skirting keeps line from slipping behind the spool, prevents dirt and sand from filtering into gears and pinions. Many new reels now have gear ratios from 4:1 to 5:1. With the trend to lighter tackle, several miniature outfits are offered in both open and closed-face. Bait-casting reels have more refinements and several are smaller with narrower spools for fresh and light saltwater use. Some makers don't realize, however, that reduced spool diameter can slow speed of line recovery and make working crank bait more tiring.

■ **Tackle boxes** now come in popular big multi-drawer models plus smaller specialty boxes with adjustable dividers that can be prepacked for a particular type of fishing. Better new ones have positive latches and see-through lids so you know where each lure is inside.



Create a classic Easter egg

Try this updated version of the traditional art of scratch-design.

Here's a time-honored way of coloring and decorating Easter eggs. Designs vary from simple to complex, making the art a good family project.

To get an egg ready for dyeing, puncture both ends (an electric drill with $\frac{1}{16}$ -in. bit works amazingly well). Insert a small wire and gently stir to break up the yolk. A bulb from a meat baster can serve as a bellows for removing the egg's insides. Then soak the shell in a pan of water and $\frac{1}{4}$ cup vinegar to help it accept the dye.

Heat the water and colorant (dye must be a natural one as in the list below) to just under boiling and add the eggs. Brew the eggs for at least two hours, stirring occasionally with a wooden spoon, then let them cool in the water.

Designs can either be drawn directly on an egg with white pencil or sketched on tracing paper and transferred with white dressmaker's carbon. Simple designs such as flowers, initials intertwined, hearts and birds are most effective.

Historically, the design was actually scratched into the egg. But you can get the same effect using a Pro Quill or other fine-point pen, dipped in white vinegar or a mixture of equal parts water and 36-percent acetic acid solution available at drugstores. Blot with tissue as you work.

Finish your egg art with a glossy lacquer spray, a pedestal and top bead found at craft shops.—*Penelope Angell, Assistant Home and Shop Editor*

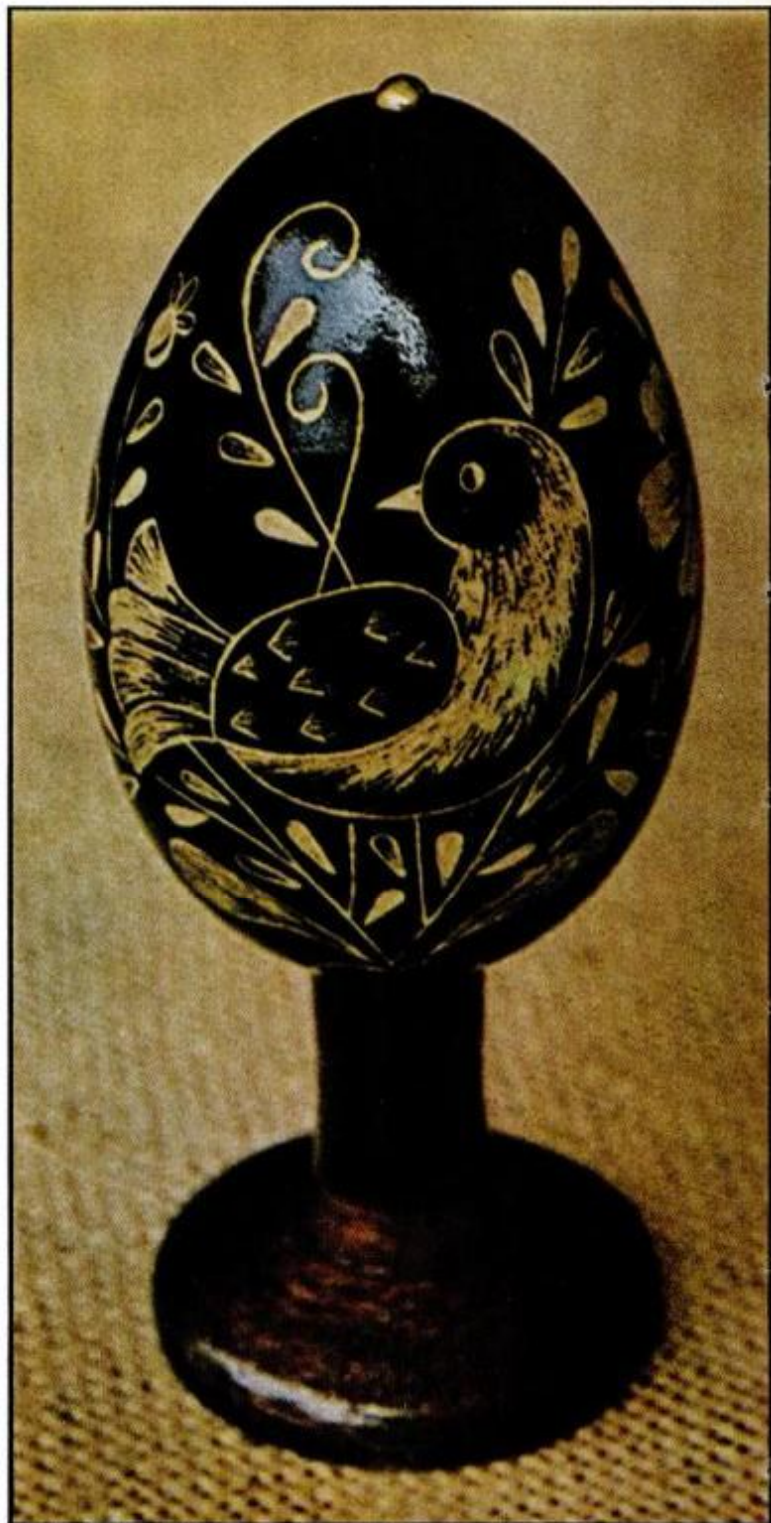
NATURAL DYE SOURCES

Yellow	Yellow onion skins; goldenrod leaves, stems, flowers; apple bark, pear leaves.
Red	Red onion skins; fresh beet juice.
Green	Birch, elderberry, rhubarb leaves; Spanish onion skins.
Pink	Sassafras roots.
Brown, Black	Walnut hulls (well aged).

Using onion skins, Arden Newsome, author of several books on egg craft, turns eggs into colorful decorations at Busch Gardens, Williamsburg, Va. Our colored egg (top) was dyed with walnut hulls.

The Pennsylvania Dutch Thistlefinch, a good luck symbol, is drawn with a white pencil on colored egg. Simple designs such as birds, flowers or abstract patterns are often the most effective.

Fine-point pen dipped in equal parts of water and 36 percent acetic acid solution etches the design. Gentle pressure is applied going over the main outline; then the details are filled in.



Photos: Thomas L. Williams



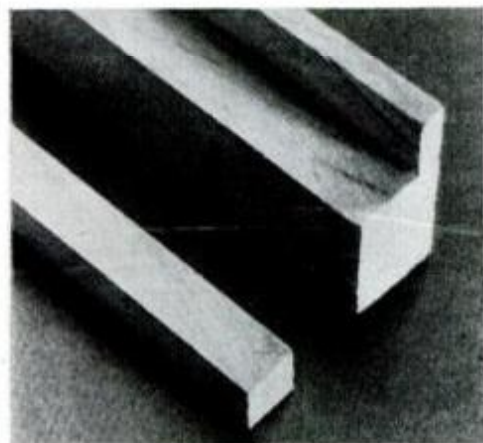
Build a floater picture frame

Your favorite art will look as if it's suspended with a frame encircling, but not touching it.

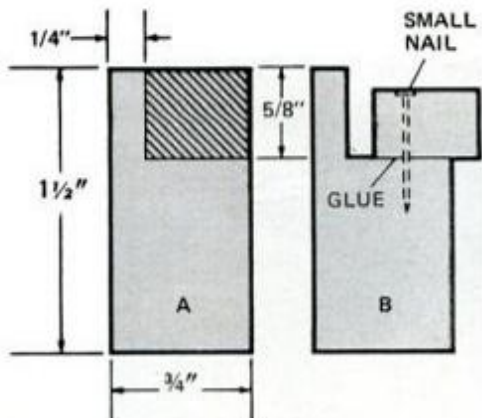
Floater frames are a popular way to display art. They're called floaters because the art appears to be suspended and accented within the frame. The illusion is created by a groove running between the outer frame and an inner frame where the art rests. Although such frames are available commercially, you can make a floater frame for a fraction of the retail cost.

Use 1 x 2 stock (actual dimensions will be about $\frac{3}{4}$ x $1\frac{1}{2}$ in.) to make your frames. Choice of wood can vary from plywood to mahogany and walnut or even more exotic varieties of woods.

First figure the size for the frame you need and cut the stock to four lengths for top, bottom and sides.



Step 1: To make a floater frame, you will need 1x2 stock. (The stock's actual dimensions will be $\frac{3}{4}$ x $1\frac{1}{2}$ in.) Using a radial saw or bench saw, cut out a strip approximately $\frac{1}{2}$ x $\frac{5}{8}$ in.

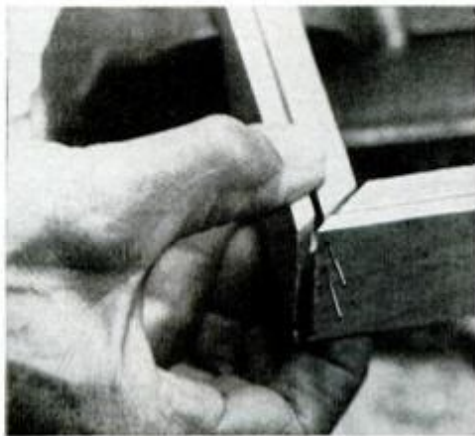


Step 2: Take removed strip (shaded area in A) and reattach it as at B, leaving a $\frac{1}{4}$ -in. gap between outer frame and floater strip. Use glue and small nails. Strip is blade thickness lower than outer rim.

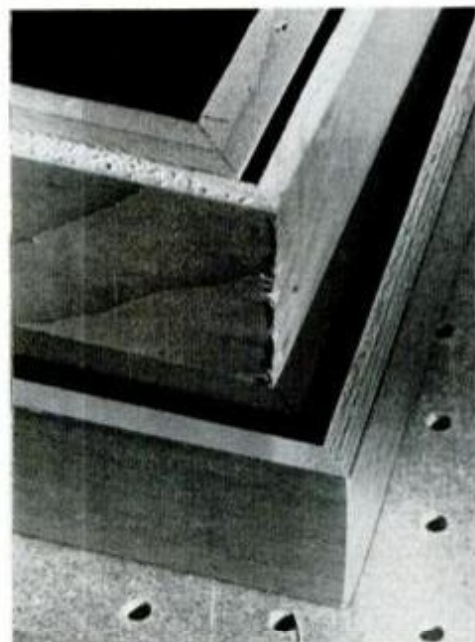
Make each member several inches longer than necessary for the finished frame.

Then remove a strip approximately $\frac{1}{2}$ x $\frac{5}{8}$ in. from each piece by making two rip cuts with a bench saw or radial saw (Step 1).

After you remove the strips, use white glue and nails to replace them, leaving a $\frac{1}{4}$ -in. gap or groove between the outer frame and the floater strip (Step 2). You might want to place a block of $\frac{1}{4}$ -in. wood between the outer frame and the strip to



Step 3: Miter frame members to size so the picture perimeter will coincide with outer edge of the replaced strip. Then assemble frame with glue and small nails.



Step 4: Two frames are assembled, ready to be sanded and finished with paint, stain or varnish. Black paint in the groove will accent the isolation of the art and help give the desired floating effect.

serve as a temporary spacer to establish the correct groove width.

Now miter each side of the frame to the exact size, keeping in mind that the picture will rest on the outer edge of the floater strip. Assemble the frame (Step 3) using white glue and 1-in. finishing nails. Pre-drill the nail holes to avoid the possibility of splitting the wood.

Once the frame is assembled (Step 4), the nail holes can be filled with wood filler and the frame sanded and finished to suit. You might want to paint, stain or varnish the frame. Regardless of your choice, black paint in the groove between the two raised surfaces will accent the isolation of the picture and give it the desired floating effect. Similarly, a silver or gold stripe applied by painting or use of Mylar tape on the outer rim will add to the effect.

You can mount the art to a piece of mat or art board using dry-mount tissue or photo cement such as Scotch Photo Mount. You can also use Ready Mount, a thin cardboard with adhesive surfaces on both sides. Next cement the mounted picture to the frame's inner rim (Step 5). Later, if you tire of that picture, you can easily unglue it and float another favorite.—Al Nunes-Vais



Step 5: Mount the picture on a mat or art board, then cement it to the inner frame surface. The picture can easily be replaced by detaching the entire mount and cementing new art in its place.

Add a sail for under \$100

Gaff-rigged for easy handling, this mini-sailer is an ideal trainer.

by Stuart James

Minimum effort and expense can quickly convert an 8-foot plywood pram from rowboat into a sailing yacht. No major modifications are necessary, and the result can be fun for a skipper of any age and particularly useful for a youngster learning the sport.

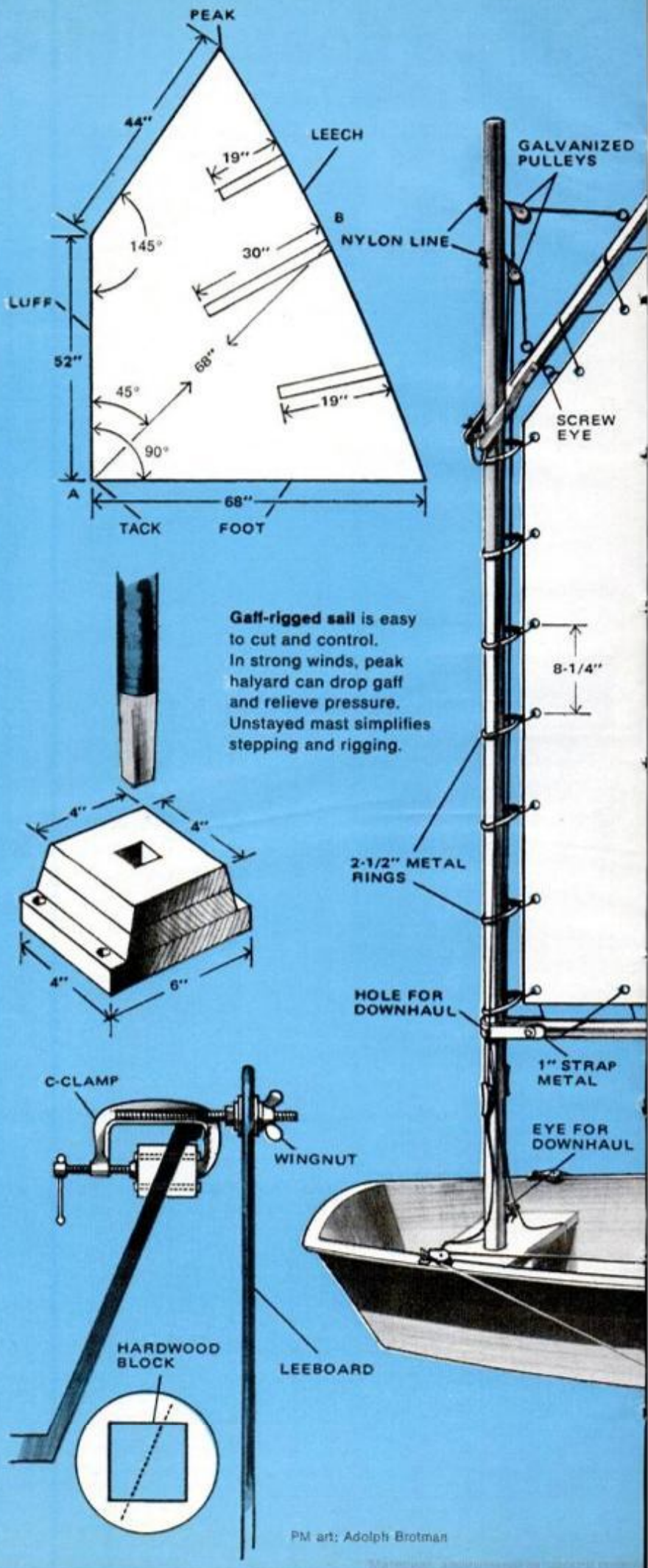
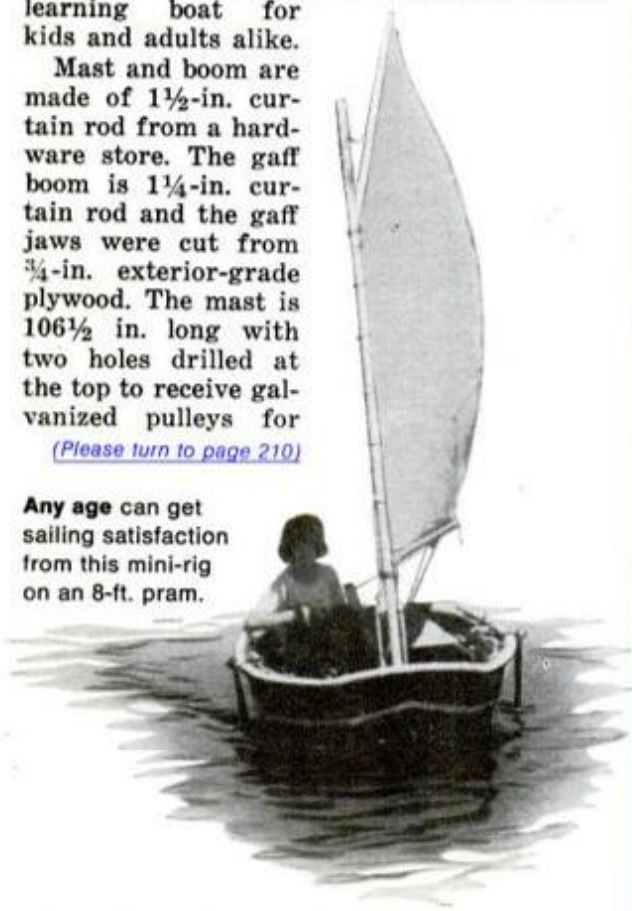
Total time required for the project was four days for gathering hardware and materials, building, assembling and painting. The Dacron sail was cut and sewn by a local awning and boat cover shop, and took one week.

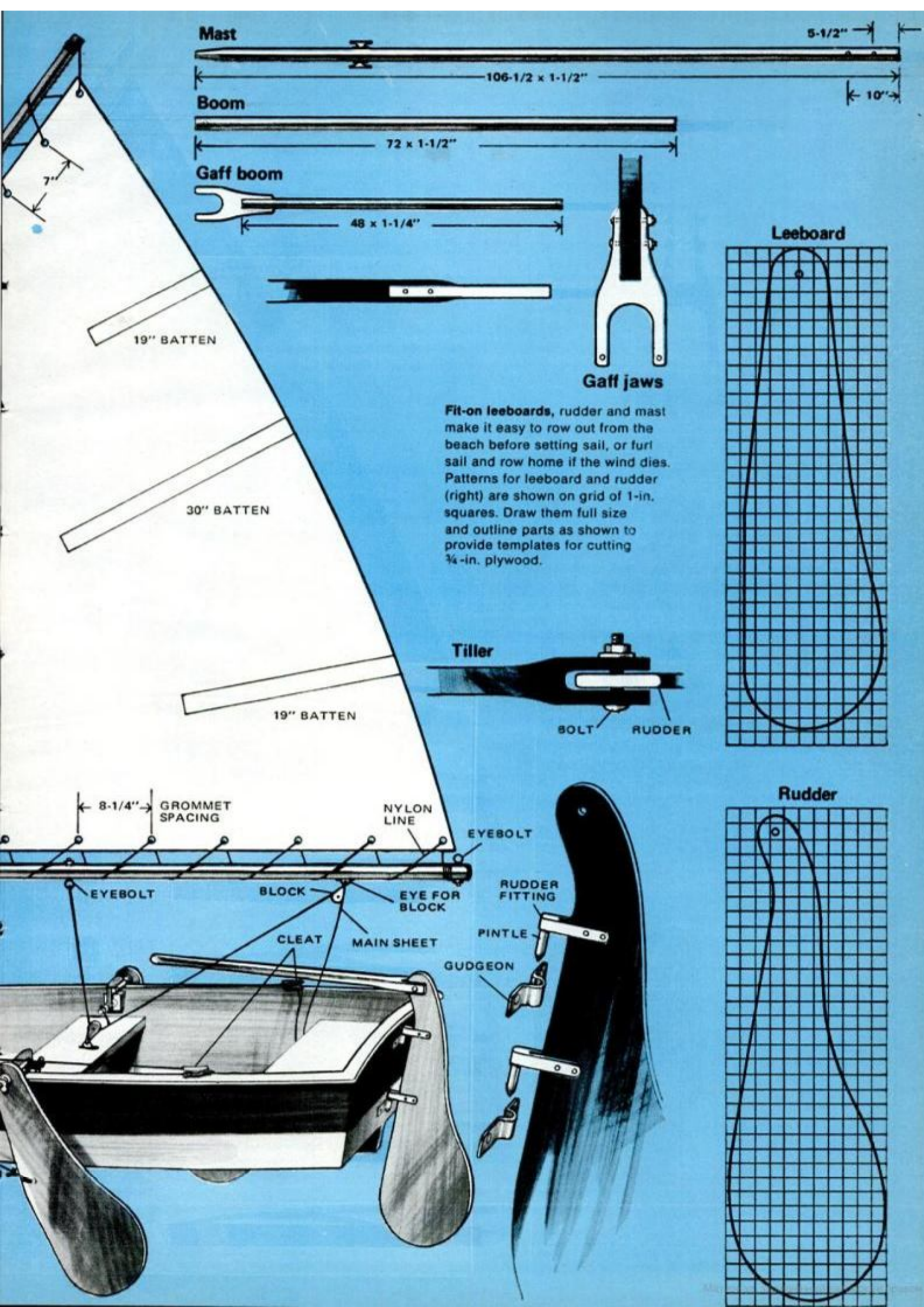
The little boat is gaff-rigged for safety, delivering a large sail area with a low profile. In a strong wind which a young sailor might be unable to handle, the sail can be collapsed in seconds by simply releasing the line that will drop the gaff boom. Tested in 15 to 20-knot winds, the pram was remarkably stable with a 10-year-old helmsman. Performance drops when the sailing pram is pinched too close to the wind, but she is stiff and forgiving with little heel, and makes an excellent learning boat for kids and adults alike.

Mast and boom are made of 1½-in. curtain rod from a hardware store. The gaff boom is 1¼-in. curtain rod and the gaff jaws were cut from ¾-in. exterior-grade plywood. The mast is 106½ in. long with two holes drilled at the top to receive galvanized pulleys for

(Please turn to page 210)

Any age can get sailing satisfaction from this mini-rig on an 8-ft. pram.





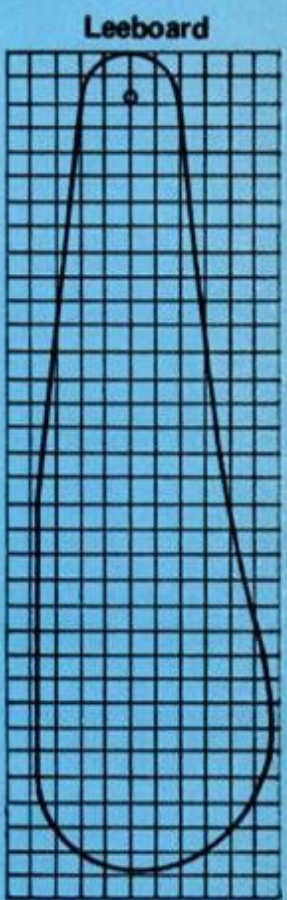
Mast
 106-1/2 x 1-1/2"
 5-1/2"

Boom
 72 x 1-1/2"
 10"

Gaff boom
 48 x 1-1/4"

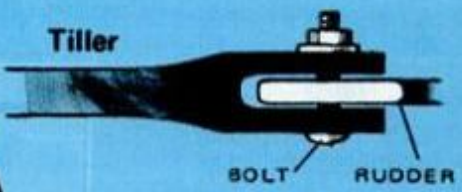


Gaff jaws



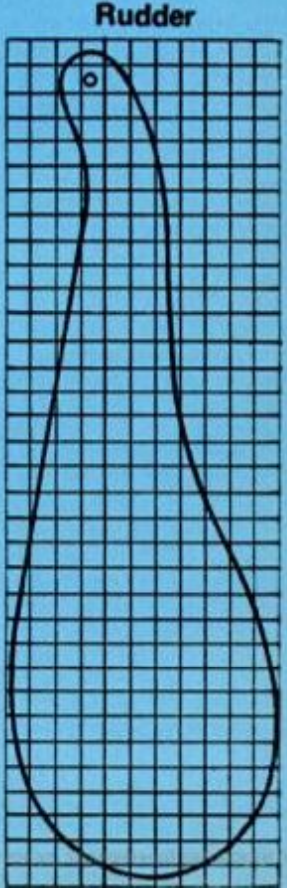
Leeboard

Fit-on leeboards, rudder and mast make it easy to row out from the beach before setting sail, or furl sail and row home if the wind dies. Patterns for leeboard and rudder (right) are shown on grid of 1-in. squares. Draw them full size and outline parts as shown to provide templates for cutting 3/4-in. plywood.

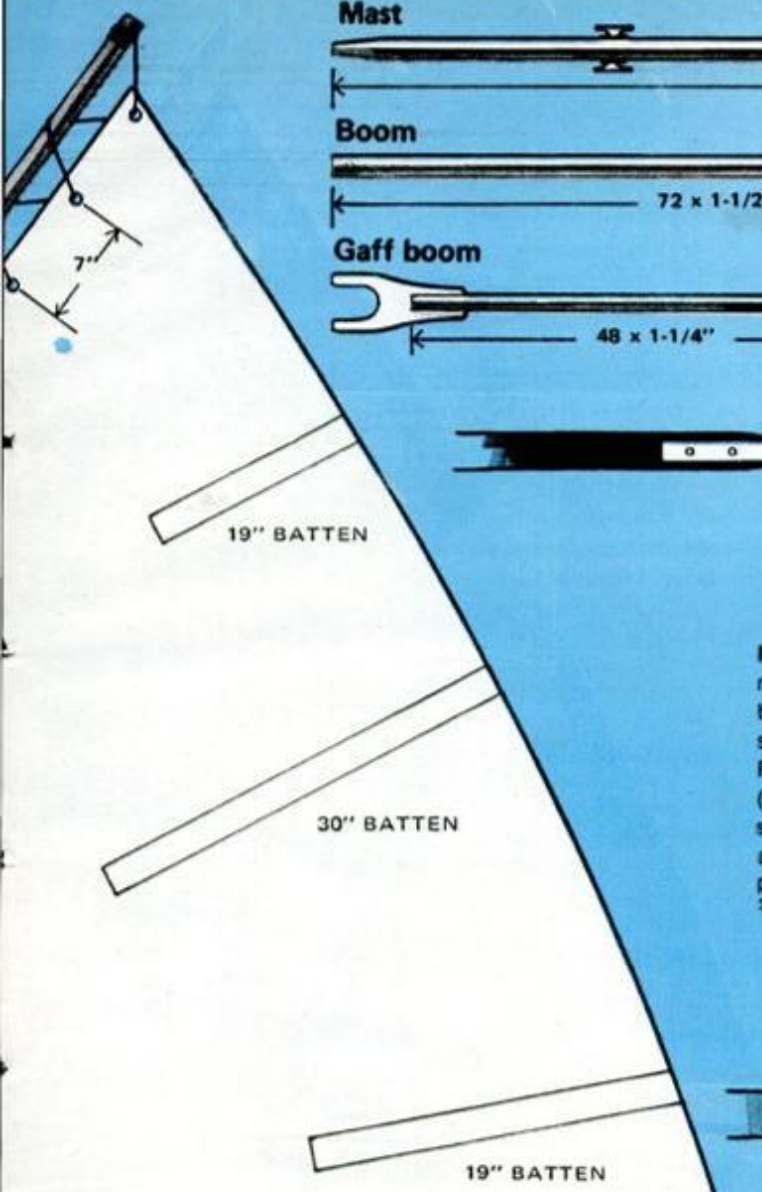


Tiller

BOLT RUDDER



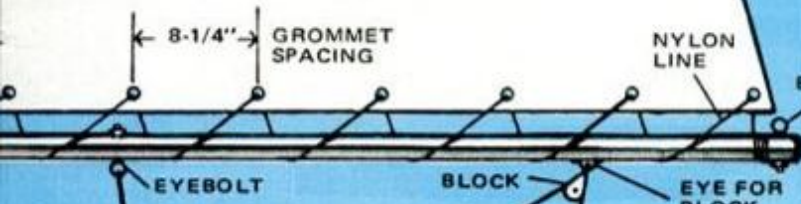
Rudder



19" BATTEN

30" BATTEN

19" BATTEN



8-1/4" GROMMET SPACING

NYLON LINE

EYEBOLT

EYEBOLT

BLOCK

EYE FOR BLOCK

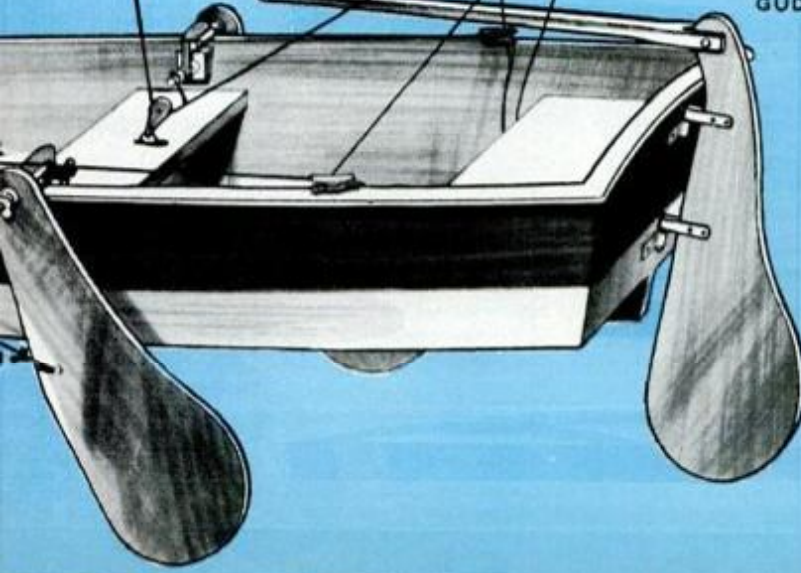
RUDDER FITTING

CLEAT

MAIN SHEET

PINTLE

GUDGEON





Get the picture? Suppose your camera normally uses a 50-mm lens. If the close-in view (right) made with a 24-48-mm lens is near normal, then you can zoom out to a wider angle shot (above left) to get exactly what you want in the frame.

Zoom lenses—now they're wide-angle, too!

by Dave Sagarin



PM photos: Benn Mitchell

Vivitar Series I
24-48 mm f/3.8



Vivitar Series I
35-85 mm Vari-Focal f/2.8

Soligor 35-105 mm
Macro-Zoom f/3.5



Vivitar 35-105 mm
Macro-Zoom f/3.5

Sigma XO
39-80 mm f/3.5





Zooming through the wide angles is like backing up to get more in the picture without moving a foot. Vivitar Series I 24-48 mm f/3.8 zoom lens (left) is one of hot new wide-angle zooms we tested. For \$125 to \$300 and careful shopping, you can zoom, wide to normal to telephoto, for perfect shots.

Lineup of exciting new zooms turns up models by Soligor, Sigma, Tamron and Vivitar. Zooming from wide angle to normal is the 24-48-mm Vivitar. From wide angle through normal to telephoto are the 35-85-mm Vivitar, 35-105-mm Soligor, 35-105-mm Vivitar and the 39-80-mm Sigma. Telephoto zooms are the 70-150-mm Vivitar and the 70-150-mm Tamron. Now you really can pop in one lens to replace three or four. You might even find one zoom now to replace all your other lenses.



Tamron 70-150 mm Zoom f/3.5

Vivitar 70-150 mm Macro-Zoom f/3.8

These new zoom lenses help you picture a wide, wide view. And we've tested an armload of the exciting new versions.

In the old days, zooms whooshed the photographer from a little telephoto to a lot of telephoto, seeming to move the camera in on the subject. The new lenses allow you to back up for a much wider view without moving a foot. And, although their list prices are higher, you can buy them for \$125 to \$300 with careful shopping.

The blessings of zooms are well known. You pop in one lens that serves in place of three or four. You save cost and weight and don't miss any shots by fumbling to change lenses. You frame and shoot exactly the image you want with no cropping or cursing later.

On the other hand, zooms usually cost more than any one lens in their range. They're heavier, bulkier and need longer exposures in dark situations. Some have produced inferior images—all those glass-to-air surfaces kick a lot of light around, causing flare and reducing contrast. Design problems result in poorer resolution, especially at the corners.

New designs solve problems

Modern design has solved these problems. We're getting zooms with shorter focal lengths, wider ranges from short to long, while the overall sharpness is better and maximum apertures are getting faster. Multi-coatings reduce flare and permit *more* pieces inside for better performance, all at reasonable prices.

But you still have to pay dollars to get a lens with durable components assembled to last and solid, well-machined focusing and zooming movements. This is the area where all the zooms tested here seem weakest, and it's a decision you and your wallet have to discuss.

The 24-48-mm f/3.8 from Vivitar is wonderfully useful, covering the range from very wide to normal focal lengths. Working close-in with a wide-angle lens involves a lot of careful juggling to keep framing and perspective where you want them. Being able to zoom after the point of view has been chosen helps a lot.

Large engraved numbers

The lens has just the few large engraved numbers that you need to indicate what focal length you're set at and the focus distance.

It's quite sharp, giving an image of good contrast, and seems to hold up well from corner to corner over its range of focal lengths. The 35-85-mm f/2.8 Vari-Focal isn't a true zoom. You have to refocus at

Big zoom for sports and wildlife



Zooming is fun, especially with this Soligor 100-300-mm f/5 macrozoom lens on your camera. Maybe it isn't the first lens to buy, but it gives wide range of focal lengths in a big, good-looking lens. It's good for zoom shots of sports. Travelers in open country and wildlife photographers also will give this lens a lot of use. It has a macro range and is easy to use.

each new focal length. This allows a design of maximum sharpness, which focuses very close. The lens has a fat collar that slides to change focal length while you twist it to focus. With practice these simultaneous operations can be done quickly. However, I find the lens bulky and nose-heavy, and the complex focus engravings aren't useful.

A lovable feature of the lens is that it will focus continuously from infinity to about the area of a large business card. But the focus twist, at one-fourth turn from extreme to extreme, is too quick. I suppose they needed it to preserve that fast twist-and-pull operation.

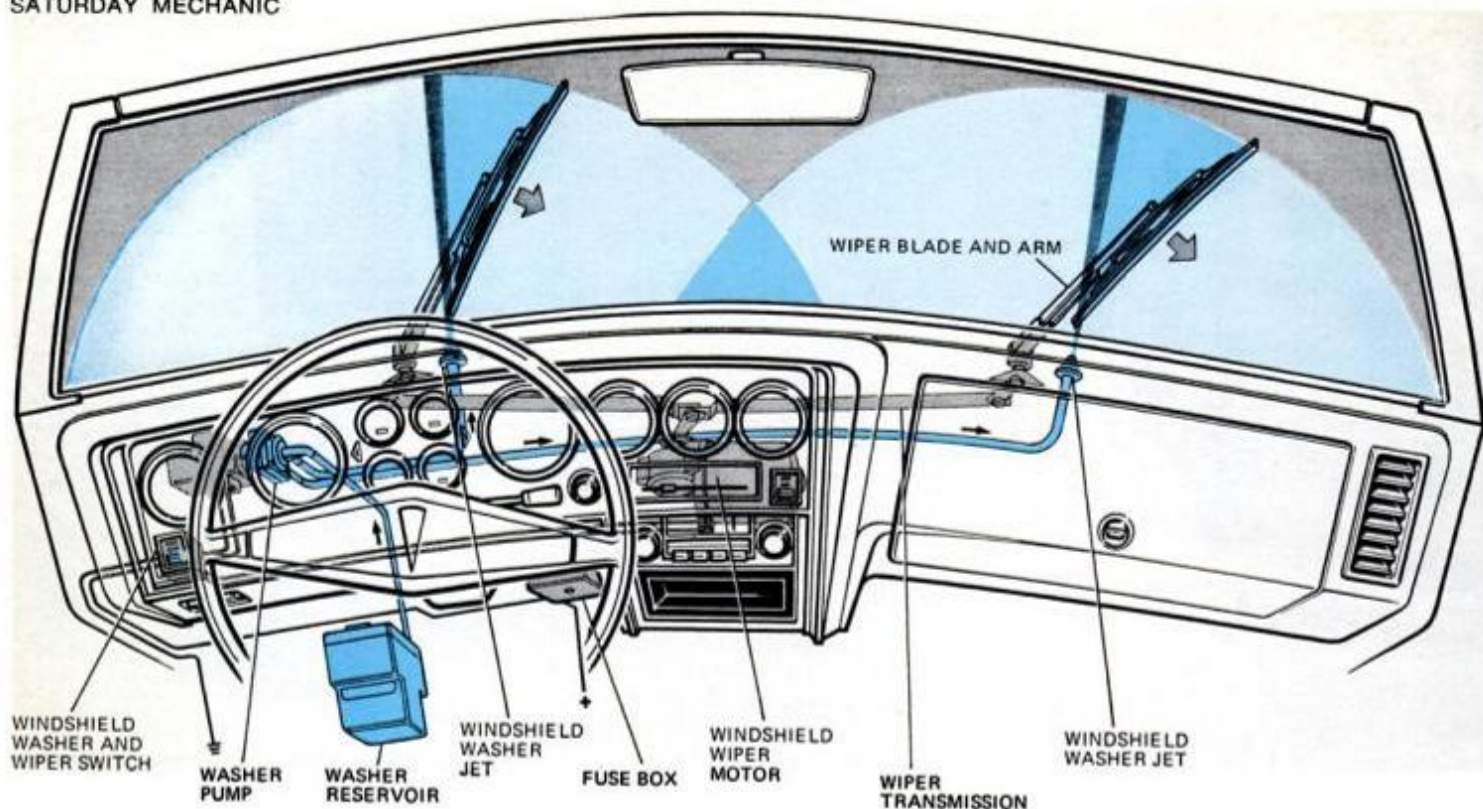
The Soligor 35-105-mm f/3.5 Macro-Zoom and the Vivitar of the same specs have many useful features. If you had to have just one lens to walk around with, this would be the range to choose. The lenses focus to 1½ meters. Set the zoom ring to 35 mm, snap it back into the "macro" position, and you can bring it down to 1:4.

Little colored lines

Sigma has covered its 39-80-mm f/3.5 mini-zoom with little colored lines and numbers. It has sets of depth of field scales for minimum and maximum focal lengths in different colors, all of which I find to be a bit much.

The focus goes from infinity to 2 meters in ½ turn, very fast. A separate macro focus brings you in to 1:3.5. The lens doesn't feel solid, a

(Please turn to page 212)



How to keep your windshield clean

Here's what you should know about forward visibility—your wipers and washer and the windshield glass itself.

by Pack Bryan

It's a safe bet that, unless your car is new or you've replaced the wiper blades within the last few months, your wipers are streaking or skipping. Wipers usually don't go bad all of a sudden, so you're not likely to notice the progressive deterioration that's going on all the time.

The quickest, easiest, safest and cheapest way to keep your wipers working effectively in all kinds of weather is to install new refills every six to 12 months. You'll want to do it more often if you live in a heavily industrialized region, and may not need so many changes if you're located in a remote rural area. Air pollution, or lack of it, is the determining factor.

Refills, not blades

Most drivers go to the needless expense of buying new blades instead of refills. The blade is the whole assembly at the end of the wiper arm,

and it rarely has to be replaced. The rubber that does the work is called the refill, costs only a fraction of the price of the blade and is usually all that has to be changed.

To convince yourself that an every-six-months timetable for replacements is more than a manufacturer's sales gimmick, make this test:

Wash your windshield thoroughly with a good detergent or window-cleaning fluid, using plenty of water to flush away accumulated dirt and grime. After lifting them carefully, give the blades a good cleaning and rinse thoroughly.

Wet down the glass one more time. Run the wipers through *one* complete cycle. If they haven't squeegeed the glass completely dry, they're shot and should be replaced. After installing a new set, try the same test. Convinced?

In between replacements, however, there's plenty that you can do to help

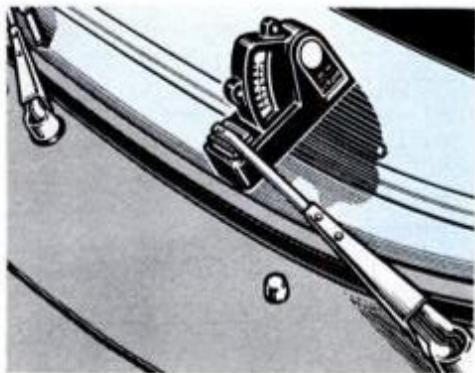
the wipers do their jobs and assure clear vision in any weather. Begin by cleaning the glass inside and out at least once a week. Even if your glass looks clean, as a result of frequent trips through an automatic carwash, the chances are you have a film of wax on the surface of the glass and on the blades. Be sure that you get it off!

Tender loving care

Glass manufacturers recommend that you treat the windshield as you would a fine mirror, so the old trick of using a dry paper towel or cloth to clean a dirty windshield on the theory that glass is "hard" just isn't valid. Use a mild detergent and water, or a solvent that has been made specifically for cleaning glass, to "float" the dirt away. Never use an abrasive or scouring powder, and don't try any car-polish compounds. All of them contain abrasives which, no matter

how fine, will scratch the glass.

Make sure that the cloths you use are grit and oil-free. If you reserve a set for car-care use, launder them frequently. An extra rinse before drying will remove any traces of oil or detergent that could leave streaks on the glass. These are usually invisible during the day, but distracting at night. Paper towels are a good way to solve the problem.



Wiper-arm tension can be checked with a professional gauge. If necessary, adjust or replace springs; don't bend wiper arm.

Removing road tar and bugs

In the summer, road tar or bugs often build up on the surface of the windshield. Use a tar remover to get rid of the tar, then follow up with a detergent to cut the residue left by the tar-and-solvent mix.

To get rid of bugs, a plastic kitchen scouring pad (not metal) works well if one of the plastic net-covered sponges made for the purpose isn't available. Another method is to let a water-soaked towel cover the windshield for half an hour or so. The moisture in the towel will soften the dead bugs.

While doing the windshield, take time to examine it for nicks and scratches. The accompanying illustration shows the types of glass damage you're most likely to discover.

Some "specialists" claim to be able to rub out hairline scratches. They may do it with a jeweler's rouge, but the result can be a lenslike indent in the glass. If you can feel a scratch with your fingernail, think seriously about replacing the windshield.

Cleaning the inside

Don't let grime accumulate on the inside of your windshield until it rivals waxed paper for transparency. The build-up usually occurs more rapidly in cooler weather, when the windows are closed and the defrosters force a greater volume of air across the inside of the windshield.

Most of the film, particularly in cars driven by smokers, is a layer of airborne dirt deposited by the condensation of moisture on the glass. Other sources in modern cars are plasticizers that evaporate from vinyl dashboard pads and seats, particularly when cars are new. Use a window-cleaning solution to remove the film.

Washer reservoir

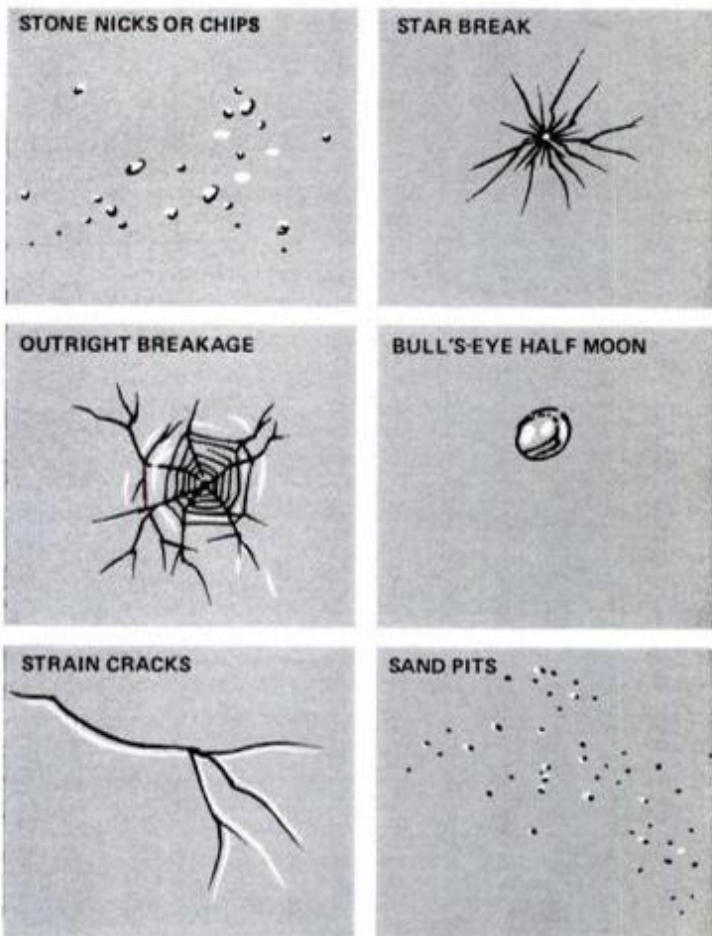
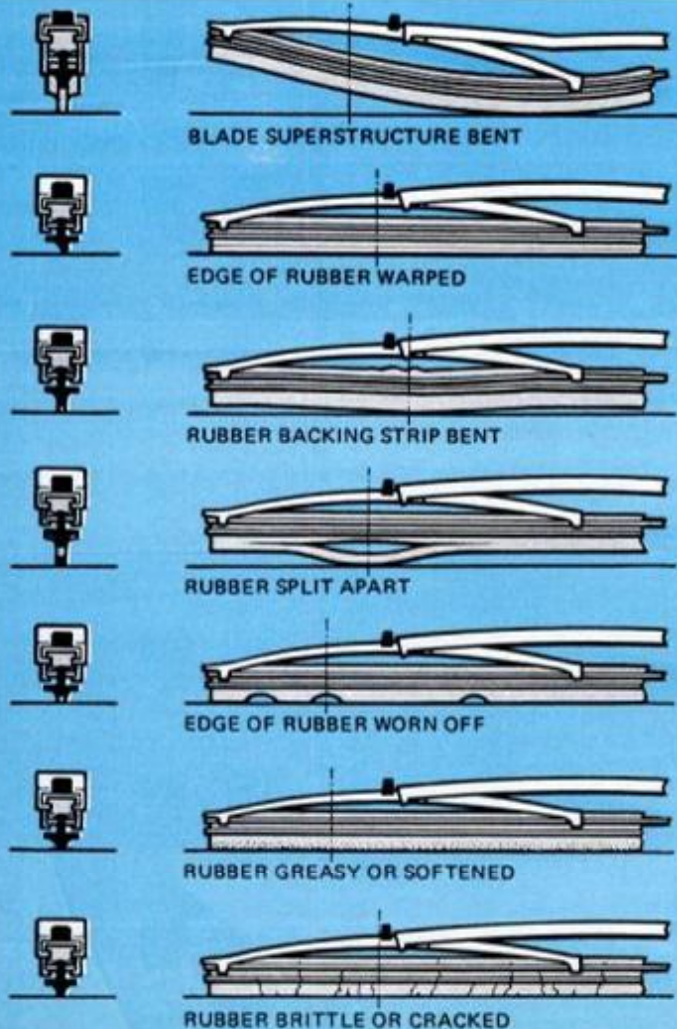
Winter or summer, be sure to keep the windshield washer reservoir filled. Use washer solvent, rather than plain water. It cuts through road grime better.

Commercial solvents are a blend of cleaning and wetting agents, to help

(Please turn to page 212)

WIPER PROBLEMS—WHAT TO LOOK FOR

Wiper-blade and wiper-arm problems are sometimes apparent, as shown in the drawings below. Often, though, rubber appears good but has lost its "life." To eliminate streaking, you'll have to install new rubber refills in the blade.



TYPES OF WINDSHIELD GLASS DAMAGE

Stone nicks or chips will not spread, but replace windshield if they're too large and directly in front of driver. Outright breakage is glass that's shattered or cracked inside or outside; replace windshield. Strain cracks will spread; replace windshield. Star break has cracks radiating from point of impact; damage will spread so replace windshield. Bull's-eye half moon is a chip that's not dislodged from glass and won't spread. Sand pits, in number, will impair vision.

The Marks have left their marks, and plenty of former Cadillac owners have come over to Lincoln because of them.

"I bought my 1977 Mark V because I wanted a change from 20 years of look-alike Cadillacs," says a New York hotel owner.

"I owned a 1972 Mark IV, then a 1975 Cadillac. Lincoln makes a much better auto," avers a California carpet dealer.

Comments a Texas housewife: "When I took delivery of the Mark V, everything was in perfect order. In comparison to my husband's Cadillac, the Continental appears to have more craftsmanship."

"I chose the Mark V," remarks a Mississippi real estate broker, "because General Motors stopped making big cars."

And a Utah investment broker: "After owning 23 new Cadillacs, my wife talked me into buying a Mark IV. I liked it so much better

than the Cads that I wanted a new Mark V."

Most Mark V owners had, in fact, owned Marks before—45.3 percent. Styling turned out to be the second strongest reason for choosing the Mark V and also the feature most owners like best (63.6 percent).

Workmanship received rave reviews from an extremely high percentage of our respondents. No fewer than 41 percent gave it a rating of *excellent*—one of the best showings by any car in recent memory.

"Workmanship seems excellent," opines a Michigan labor relations supervisor, "but the Mark's overall appointments are *slightly downgraded*—no center armrest, no separate switches for the rear compartment lights as in the past."

When we asked what might be changed in the Mark V to make it a better car, a 28-year-old corporate officer summed up the majority's

This is really a terrific compliment to the people who put Mark V's together. ▶

Lincoln took out some of last year's standard items and made them optional for 1977. ▶

◀ Eldorado's wheelbase is 6 inches longer than the Mark V's, but it's 6 inches shorter overall.

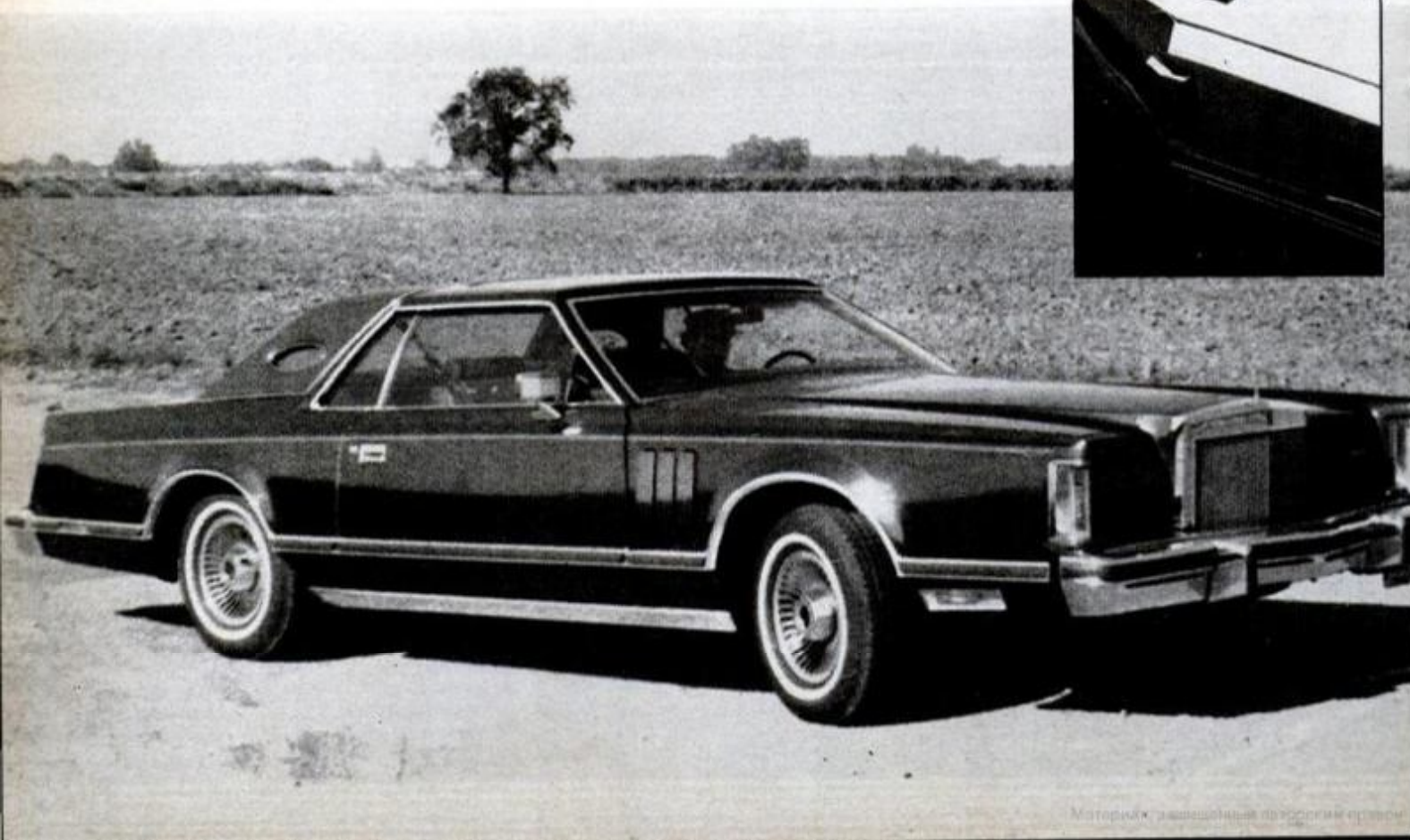
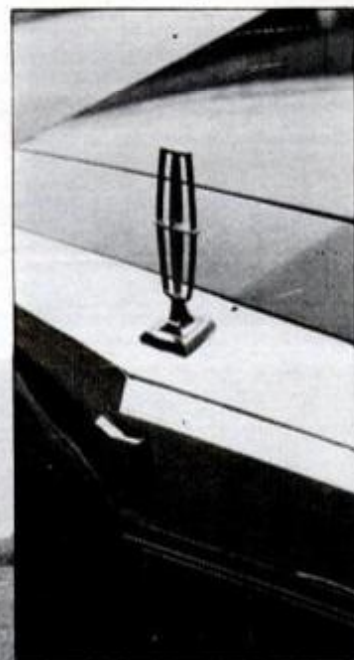
PM OWNERS REPORT: LINCOLN CONTINENTAL MARK V

Terrific workmanship, but 10 mpg in town is terrible

A nationwide survey based on
600,000 owner-driven miles

by Michael Lamm WEST COAST EDITOR

Continental Mark V for '77 is an evolution of the Mark IV introduced in 1972. Though the car is more angular than its predecessor, its styling is top among owners' likes.



feeling by scrawling "N-O-T-H-I-N-G" across his questionnaire. Some 22 percent backed him up in that opinion. Those, though, who had suggestions listed the following:

"Better gas mileage and more headroom." "More headroom and a bigger trunk and glove compartment." "Better workmanship inside the car." "Automatic airconditioning instead of the type where you have to keep resetting the temperature." "More legroom in rear seat." "The rear windows ought to open; also needs a separate set of interior lights for the rear area." "More power, like our 1972 Mark IV." "More trunk space like the Mark III; instruments; a clock you can read; better gas mileage."

Under *best-liked features*, these remarks were typical:

"Body styling, plush interior, ease of operation."—West Virginia machinist.

Lots of owners disagreed—felt the 400 pounds L-M engineers had taken out of the car should give them better mileage.

"Best-looking and riding car I've ever owned."—Michigan tool manufacturer.

"Safety in handling on the highway and fantastic steerability in town. Gas mileage is excellent, I feel, for the size and weight of the car, as are comfort and appearance."—Texas housewife.

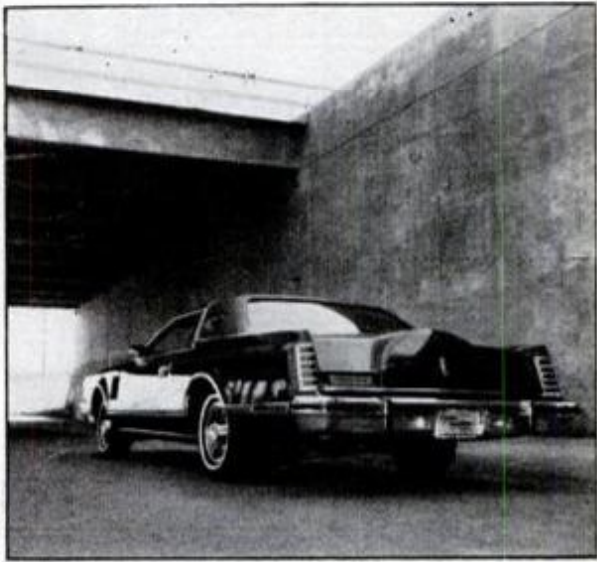
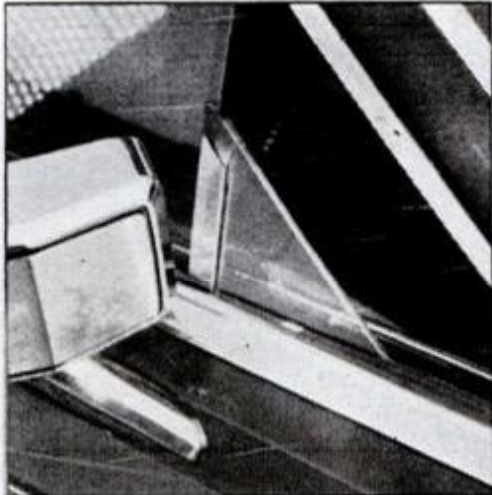
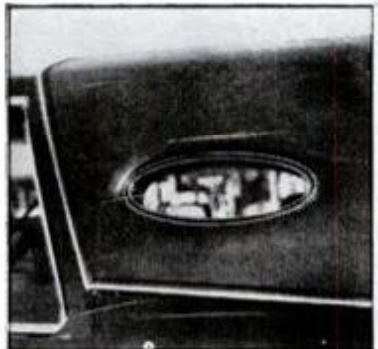
"All I can say is that it's the most perfect car I have ever seen or driven."—Alabama construction electrician.

"Easy to handle for a car of this size, and I like the size in case of an accident."—California produce dealer.

"The ride is still the best."—Michigan factory worker.

"Here are all the things I really like about this car," confides a North Carolina ornamental iron fabricator. "The styling ! ! ! It's a full-sized car ! ! ! Then there's the interval wipers, automatic lighting system,

Mark V owners expect more comfort, convenience and luxury features than owners of less costly cars and consider the tremendous overall length as still prestigious. Trunk, with pronounced spare-tire lid (below) is cited by 12.2 percent of owners who feel short-changed on space. Owners like opera window (far left), unique up/down-type vent window (left).



Summary of 1977 Continental Mark V Owners Reports*

Total miles driven 613,446	Cold starts 8.4	Very good 19.4	Average 14.5
Average miles per gallon	Trunk too small 5.4	Good 26.2	Fair 3.9
In town (EPA, 11 autom.) 10.1	What changes would you like?	Fair 15.0	Poor 11.2
Long trips (EPA, 16 autom.) 13.5	More trunk space 12.2%	Poor 12.5	Number of vehicles owned:
Engines:	Better gas mileage 9.3	Had any mechanical trouble?	Mark V only 25.5%
460-cu.-in. std. V8 94.5%	More rear-seat legroom 6.4	No 60.2%	Two cars 50.0
400-cu.-in. opt. V8 5.5	Better dash layout 6.4	Yes 39.8	Three cars 15.4
Why did you choose the Mark V?	Workmanship opinion:	What type of trouble?	Four cars 4.8
Past experience 45.3%	Excellent 41.0%	Cold starting 27.4%	Five or more cars 4.2
Styling 33.7	Good 30.9	Carburetor 16.4	Makes of other cars owned:
Riding qualities 8.8	Average 11.2	Electrical 8.2	Ford 20.0%
Size 8.3	Fair 5.9	Did you repair it yourself?	Chevrolet 17.9
Specific likes:	Poor 11.2	No 93.2%	Pontiac 15.0
Styling 63.6%	Comfort (front seats):	Yes 6.8	Cadillac 14.3
Ride 41.0	Excellent 69.7%	Dealer repairs satisfactory?	Mercury 13.6
Comfort 36.4	Very good 18.1	Yes 53.7%	Age distribution of owners:
Handling 23.1	Good 8.5	No 46.3	15-29 years 4.5%
Performance 17.3	Fair 3.2	Dealer service opinion:	30-49 years 42.3
Specific dislikes:	Poor 0.5	Excellent 40.8%	50-plus 53.2
Better gas mileage 12.0%	Comfort (rear seats):	Good 29.6	Would you buy another Mark V?
Better workmanship 9.0	Excellent 26.9%	Yes 86.1%	No 13.9

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

electric door locks, independently adjustable front seats, and warning light for low fuel."

What about complaints? Actually, 28.3 percent had none at all. Those who did put down:

"Trunk leaks, plastic piece atop front bumper blows upward at 50 mph."—New York steamfitter.

"Splash guards flap in the wind; radio interference from engine sparkplugs."—Texas optometrist.

Several owners of the 400-c.i.d.-engine version felt this way.

► "Lacks guts compared to my 1972 Mark IV."—Illinois physician.

"Somewhat hard to start after standing cold all night. Needs to crank 10-15 seconds before it catches."—New York general manager.

"They made too many standard items optional. It's the worst kind of inflation."—West Virginia executive.

"When you pay \$15,000 for a car, it ought

(Please turn to page 216)

FIRSTHAND REPORT

by Robert Lund
DETROIT AUTO EDITOR



The new Lincoln Versailles



Planned as a Seville-killer, the \$12,000 luxury Versailles goes on sale this month.

Take a Monarch/Granada body, add a Mark V grille and trunk lid, load it with just about every accessory in the book, put the pieces together with a lot of care and attention to detail and you have Ford's newest carriage-trade car, Versailles. Lincoln-Mercury dealers will have it in stock this month.

Versailles is Ford's counter-punch car to Cadillac's Seville. Ford makes no secret of the fact it used Seville as the benchmark car in working up Versailles. The idea was to build a car comparable to Seville—not superior to Seville but even-stein on quality—that could be sold at a lower price than Seville. Ford execs said they had not figured a price for Versailles at the time I drove the car, so I don't know what the retail will be versus Seville. Seville's starting price is around \$13,500. Versailles is expected to go for something around \$11,000 to \$12,000.

How close has Ford come to matching Seville in other respects, other than stiffing Seville on price?

I did a head-to-head driving test of both cars and would rate them about even. Not much to choose between them on the surface. If you did a tear-down and matched the cars piece for piece, I think the edge would go to Seville. But not by much.

Versailles has some things Seville doesn't have and vice versa.

Versailles exclusives: forged aluminum wheels, clear-coat paint finish, coach lamps and a leather-wrapped steering wheel. Ford is the first U.S. automaker to use the clear-coat paint process. This was developed in Germany and is used by Mercedes and BMW. Base coats of pigmented enamel are applied to exterior surfaces, then followed by coats of clear acrylic enamel that are sprayed on. This makes for a highly durable surface, reduces fading and gives a "just waxed" look.

Seville exclusives: automatic leveling control, electronic fuel injection, fuel monitoring system, light monitors and a tamper-resistant odometer.

The cars are neck and neck on most dimensions. Omitting figures where differences are less than an inch, here are the numbers in inches:

	Versailles	Seville
Wheelbase	109.9	114.3
Overall length	200.9	204.0
Overall width	74.0	71.8
Front track	59.0	61.3
Rear track	57.7	59.0
Front overhang	40.6	36.6
Rear overhang	49.4	53.1
Interior dimensions, front seat:		
Maximum legroom	40.6	41.7
Shoulder room	55.8	54.6
Hip room	53.4	51.4
Interior dimensions, rear seat:		
Minimum legroom	35.6	38.2
Shoulder room	55.8	54.4
Hip room	51.2	50.7
Luggage space (cu. ft.)	14.1	12.8

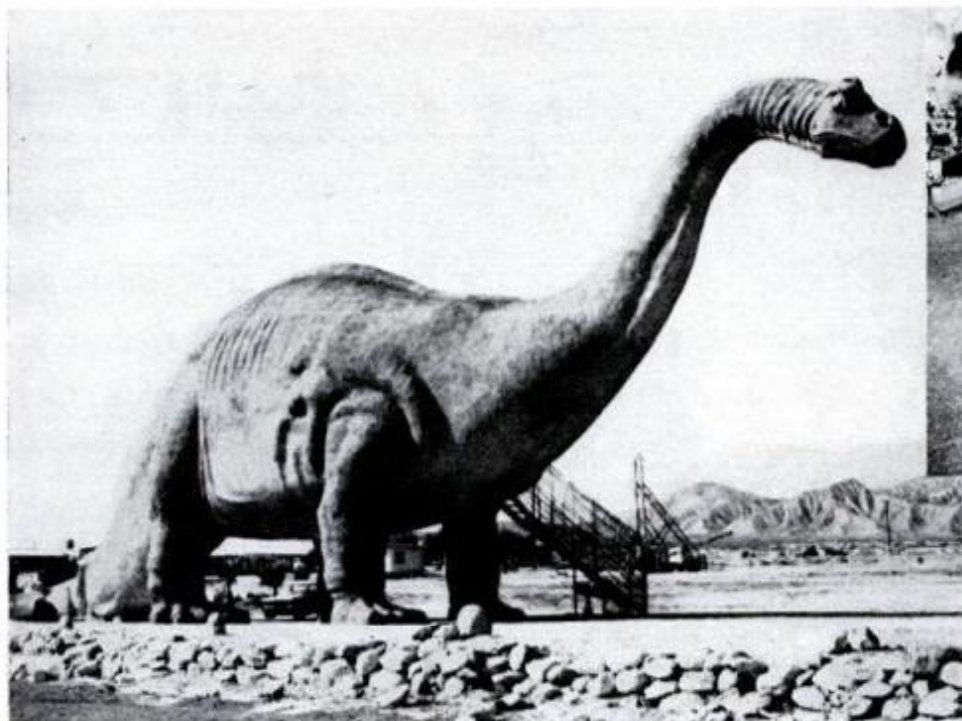
Versailles' base engine is a 351-2V (302-2V in California). Seville uses a 350-c.i.d. fuel-injected engine.

Ford has gone all out to make Versailles a smooth, quiet car and to catch and correct defects before the car is shipped. (All shipments are in enclosed vans to guard against vandalism and damage enroute.) The cars are tested for squeaks and rattles on a Burke-Porter machine. This is a rig that puts the car through a vigorous shake, rattle and roll routine to simulate travel over a rough road. If noise defects show up after completion of the test, they are corrected.

Ford says Versailles will have the best electrical reliability of any car the firm has produced. Lincoln-Mercury is using a computer program called VETS (for Vehicle Electrical Test System) that checks 90 percent of the electrical system to spot defective or potentially defective parts. If a problem—real or potential—shows up on VETS, the car is repaired and then it's retested by computer.

Along with all the testing, Versailles will be the only automobile made by Ford to undergo a 100-percent final inspection by three human fault-finders—two guys outside the car, one inside. If the machines and computers miss anything, the line inspectors are supposed to catch it and flag it for a fix. ★ ★ ★

IT'S NEW NOW



Lost world in concrete

In the desert near Cabazon, Calif., there's a brand-new prehistoric sauropod dubbed Dinny the Dinosaur. The giant reptile is made of concrete over a wire mesh frame. It houses a small museum (above) inside its cavernous belly where its creator, a painter and sculptor, displays a collection of Western artifacts.



CB 10-code reminder

For quick reference, you can fasten this national CB 10-code card to your car's sun visor. The plastic-laminated card is \$1.60 postpaid from Official CB 10 Code, Box 138, Lafayette, N. J. 07848.



Carry-all epaulets

Ski jacket shoulder straps lined with Velcro "jaws" hold gloves, goggles, headgear and other items when skiers need hands for other purposes. Units come in an E-Strap Kit including two shoulder straps and four Velcro fasteners at \$5. From K Products, 2030 Haring St., Brooklyn, N.Y. 11229.



Stowaway fuel tank

Six-gallon portable fuel tank of high-density plastic stows under 9-inch seats of small boats and can't scratch the deck. It's \$22.50. Tempo Products, 6200 Cochran Rd., Cleveland, Ohio 44139.



Your face by the numbers

People printouts are coming from British computers. They produce portraits in a "computer art" studio. To be "computer-graphed," the subject faces a scanner (above) and sees the upcoming portrait on a television screen. When the expression is right, the operator flicks a switch, freezing the image and activating the computer, which scans the picture and produces a printout in tiny characters that form an image (left). Com-Vac 230, New Place Promenade, New Brighton L45 2JX, England.

How to build in a room air conditioner

Central air is expensive to install and operate. So take the sweat out of summer—without giving up a window—by building in a room air conditioner.

by Mike McClintock
HOME AND SHOP EDITOR

If you live in a climate where the warmth of summer often goes over the edge to plain uncomfortable, you need relief with airconditioning.

There are three options: Install central air, snap in a window unit or build a healthy-sized room unit into the wall. The first choice is expensive, time-consuming and a luxury considering the costs of electricity.

A window unit will give you some relief but knocks out the use of one window and often doesn't fit very tightly or attractively.

Room air conditioners built into the wall have many advantages: Since installation is not limited to a window, you can pick a central location allowing maximum airflow. Air conditioner brackets can be easily positioned on the outside wall. You can get a tight, draft-free seal around the unit housing by filling the seams with scraps of insulation and sealing with beads of flexible caulking. You can trim and paint inside and out to match your house.

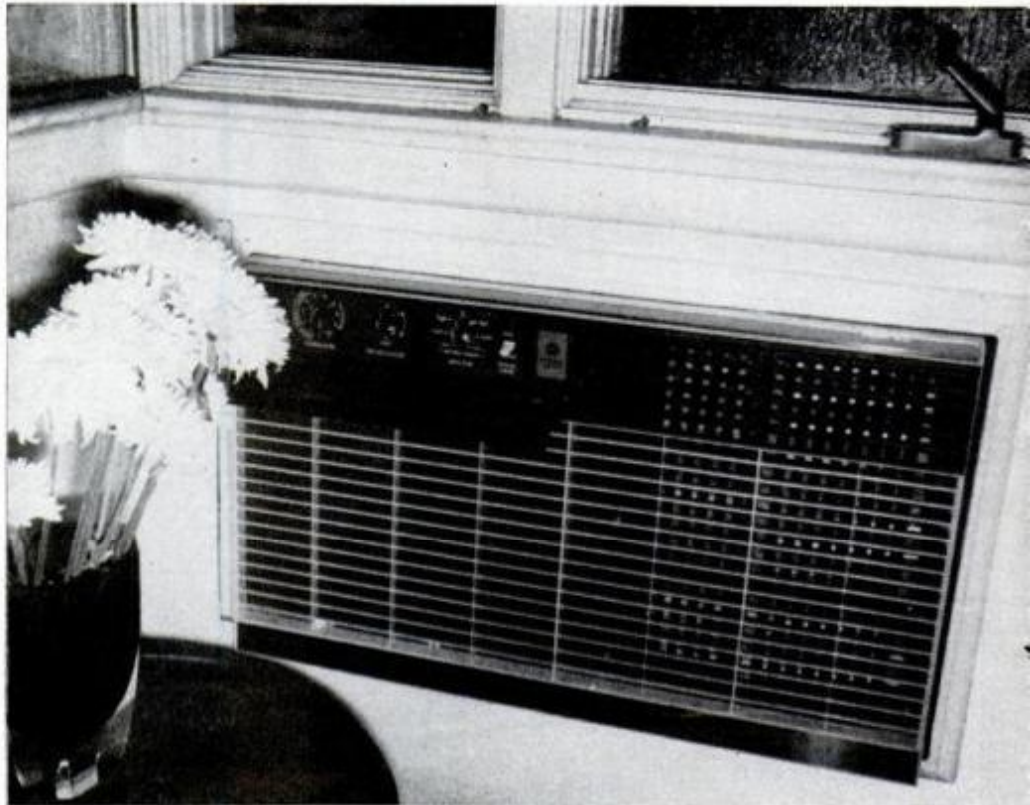
Where to locate

Try to position the unit where you'll get the most mileage from the cool air. That means facing the length, not width, of a rectangular room and avoiding obstructions like large bookcases and other furniture that can block the airflow.

Also try to locate close to a grounded circuit, and if possible avoid areas where cables in the wall will have to be moved.

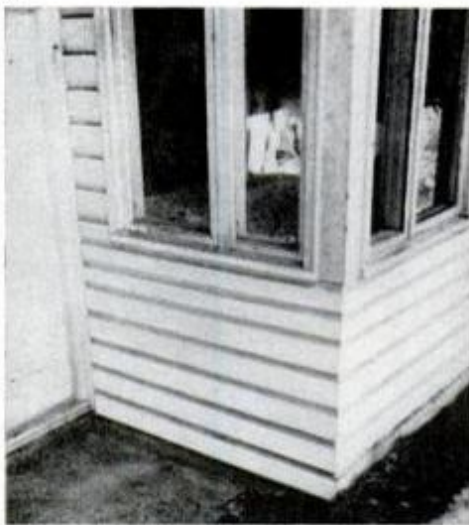
ASHRAE (the American Society of Heating, Refrigeration and Air-conditioning Engineers) recommends that you contact a reputable installer in your area to figure out how big a unit you'll need for the area you want to cool. There's no set formula because of wide differences in climate, house construction, glass area and insulation levels.

Many families are opting for a modest-sized unit located in the master bedroom. With the addition of a simple on-off clock timer, you can turn the air on before bedtime and let the timer shut it down a few hours later after you've dozed off—cool, calm and relaxed. ★ ★ ★



The compact unit from GE will beat the heat with a 6000-BTU-per-hour cooling capacity and a 1.3-pints-per-hour moisture removal rate. The 6-amp. rating is mated with a 10-position thermostat, a three-speed fan and a power-saving economy switch.

1

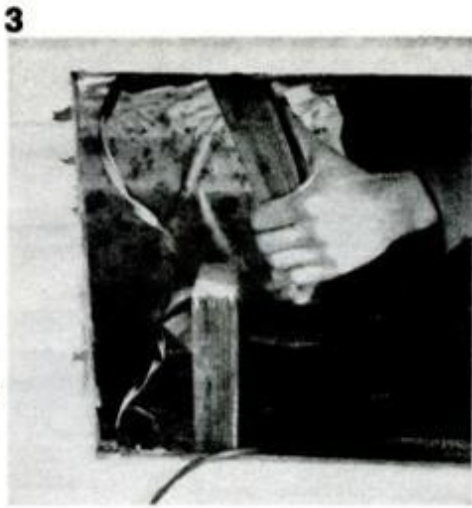


Start by laying out the opening for your unit on the inside wall. Cut 1½ in. inside a stud to allow for a 2x4 frame. Thus you should only have to cut away one stud. Drill through a corner of the opening to mark layout on the outside.

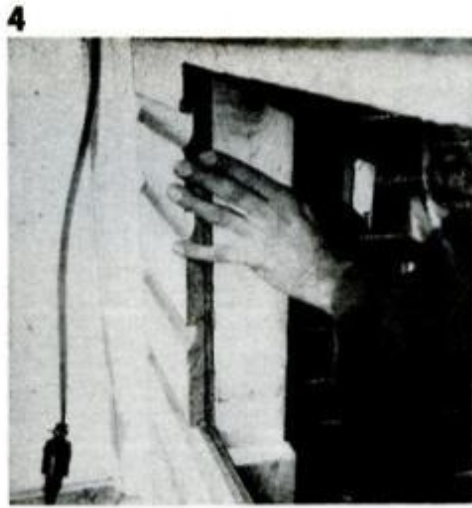
2



Check for nails before cutting opening. With a circular saw, start with a plunge cut along the layout lines and finish corner cuts with a handsaw. Peel away siding, tarpaper and sheathing and remove the insulation to reveal the studs.



Save some insulation for filling in around the airconditioning housing. To remove stud in the opening, cut it 1½ in. above and below the opening (again to allow for the 2x4 frame) and slice it in half to make removal easier. Watch out for nails.



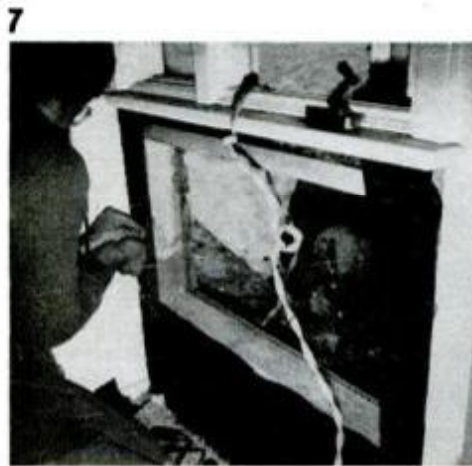
Check the unit and opening dimensions and leave 1/8-in. clearance on each side for fitting. Tack a 2x4 header between the side studs and support it at each end with a short stud down to the floor sill. Toenail all 2x4s with 8d common nails.



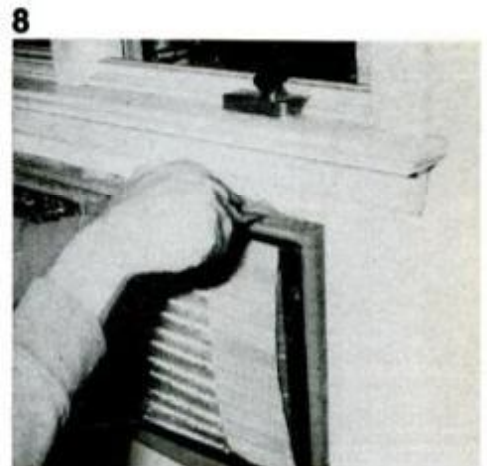
A 2x4 sill is toenailed to the side studs to support the unit. Add a short 2x4 at each end and (on some units) two in between. Drive 10d nails down through the sill and header into the center studs. Make sure that all nailheads are flush.



As you frame opening, check dimensions and be sure the sill of the frame is level. At this point, screw on air conditioner support brackets to the exterior wall. Recut your insulation and staple it back to seal off the area around the opening.



Cut down drafts by adding 15-lb. felt or polyethylene vapor barrier inside; then replace the wallboard. You should be able to reuse the original piece. Nail it on and apply tape and compound to any joints that are visible, sanding between coats.



Strip some fiberglass from the insulation scraps and force it into seams between the housing and the frame with a putty knife. Leave an even margin around the housing to the interior wall that you can caulk and cover with trim to suit.



Once unit is in place, seal the opening seams with a flexible butyl caulking. A variety of trim can be nailed around the housing. The GE unit we installed has an aluminum grille that's screwed onto the casing. For appearance, the unit can be primed and painted to match your house.



We used quarter-round molding on the interior. Miter the corners and set finishing nails. Putty the holes, sand, prime and paint. A plastic grille with adjustable vent panels clips inside the housing. Controls are clustered behind a tinted fold-down panel on the grille.

Here's a project that puts utility, organization and gadget-loaded entertainment into a trim and attractive package. PM's desk console can be the hub of your home office or a nifty and useful addition to your den or living room.

Its sleek 5-foot face is angled back for easy access to the built-in components. There's a section for books and one with adjustable shelves for papers and stationery. A small-screen TV is built into the center next to a calculator and digital clock. To the right is an intercom and a panel-mounted telephone at the end.

The birch veneer plywood case, with custom hardwood trim you can make, will turn a flush door on two file cabinets into a compact, efficient and good-looking work center.

Boxes in boxes

Console construction is basically pretty simple with a few details to add that final touch that can turn a simple piece of furniture into something special.

In this case it's the L-shaped hard-

wood trim that covers the plywood edge grain and sets off the built-in components. We've devised a six-cut method you can use to make two strips of the molding at once.

To figure out the size of your hardwood stock, make a test cut with a table saw and measure the width of the saw kerf accurately. You can see in the detail on page 118 that you'll need $\frac{3}{4}$ in. to cover each plywood edge and $\frac{3}{8}$ -in. that shows on the face of the console panel. Both legs of the molding are $\frac{1}{2}$ -in. thick.

The first four cuts remove the waste and establish the molding shape. On the fifth cut the T-pattern is ripped in half to form two strips of molding. Remember to figure in the width of your saw cut for this operation. The sixth cut trims the $\frac{3}{8}$ -in. section. You can leave a little more (or less) wood showing if you like.

Basic construction

Our plan uses specific measurements geared to the components used. If you substitute other prod-

ucts, and you can as long as they have front-mounted controls, adjust the dimensions on the front panel accordingly.

Start by cutting a 60-in. piece from a sheet of $\frac{3}{4}$ -in. birch veneer plywood to make the back, front, top and bottom. Tip: Making a cardboard pattern of the 79° angle for the face will help you set the table saw blade accurately.

Make the angled rabbet cuts, then set the blade back to 90° to finish the cuts. Make the ends and the dividers from the remaining 3x4-ft. piece of 4x8 plywood. Then make the cutouts for the equipment in the face.

After you've glued and clamped these pieces together, make your trim, clock box and calculator support block. When you glue and screw the bracing ($\frac{3}{4}$ x $\frac{3}{4}$ stock is fine) for the back access panel, leave a short section off to allow for the TV installation. It's the biggest piece of equipment and the console is built just big enough to accommodate it.

Fit the back panel in dry, then rip it into two pieces along the center-

Build the ultimate desktop

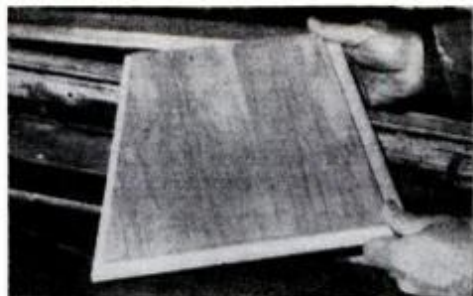
This good-looking console can be the heart of a home office that's a pleasure to work at.

by Mike McClintock HOME AND SHOP EDITOR

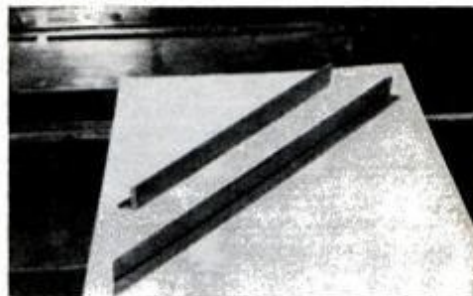




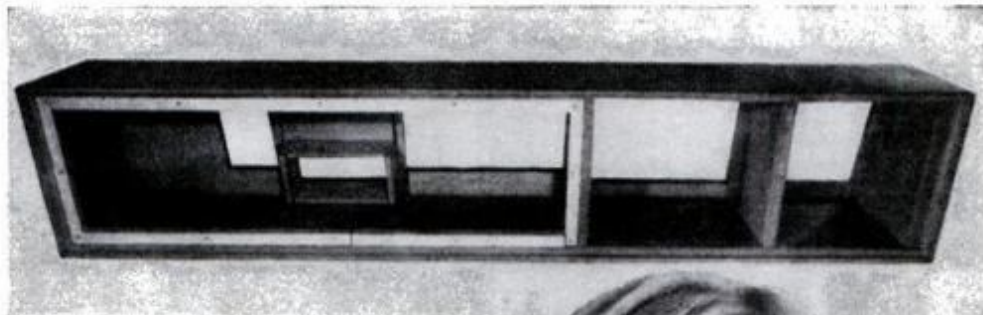
Birch veneer plywood end sections are cut at a 79° angle, the maximum slant you can get that will still accommodate the TV.



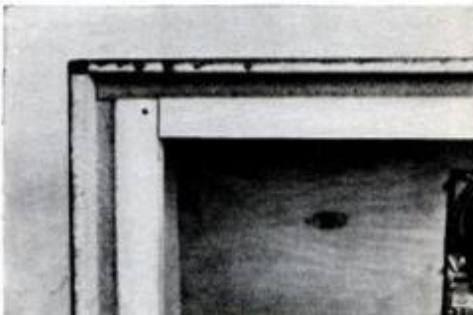
Make rabbet cuts on the frame sections. Edge margins on the plywood are covered with hardwood trim that you custom-make.



To make two trim boards at once, make a test cut, measure saw kerf and add 1 1/4 in. to get the width of your hardwood stock.



A wide-angle lens bends the image of the 59 1/4-in.-long console. Paper and book storage is separated from components.



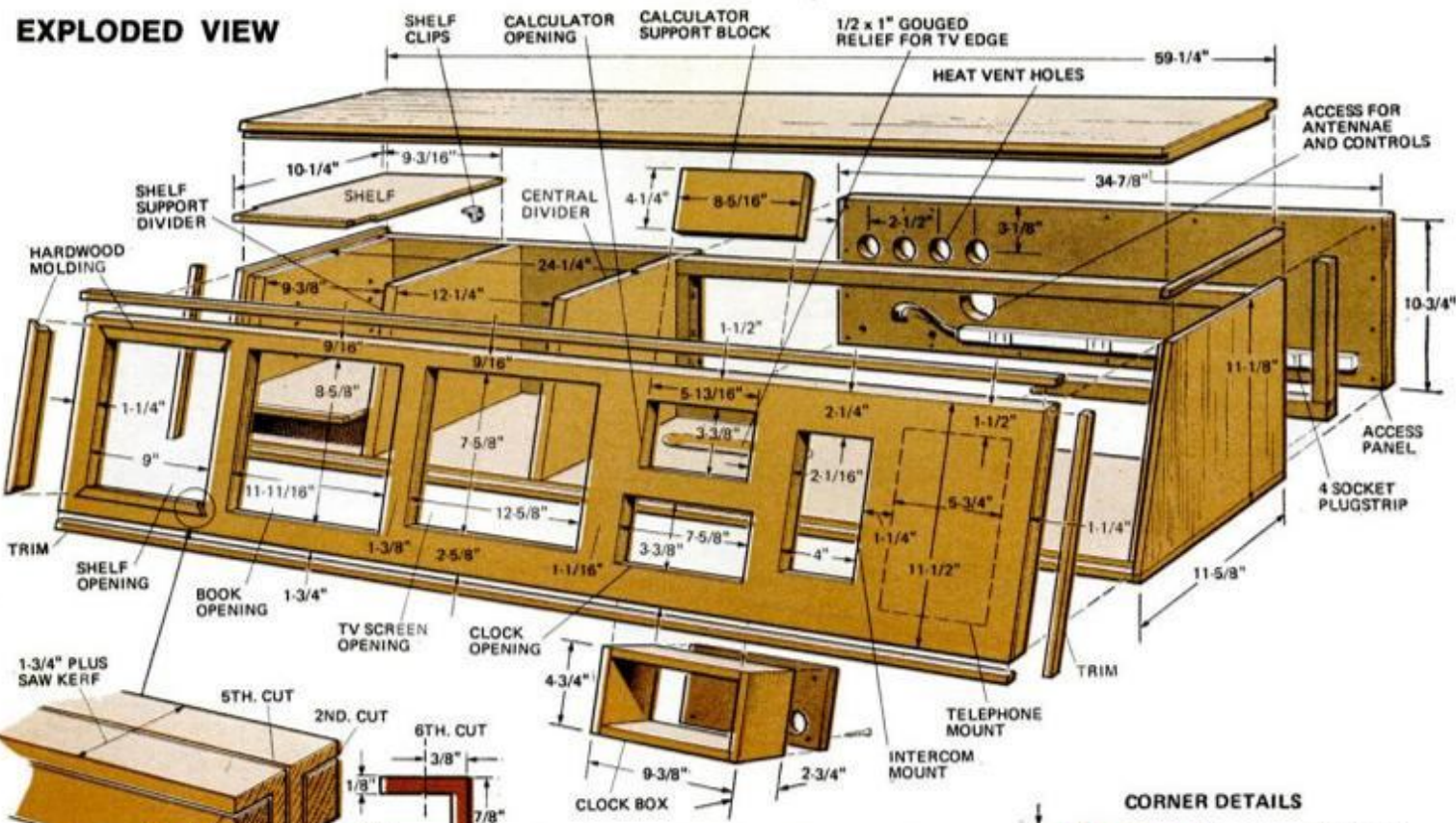
Glue and screw 3/4 x 3/4-in. bracing 3/4 in. inside the back of the frame. Six screws are used to hold the access panel to the frame.

This five-foot-long box of office organizers turn about any plain surface into an efficient work center. From the left are adjustable shelves, phone-book storage, TV, calculator above a digital clock, intercom and telephone.

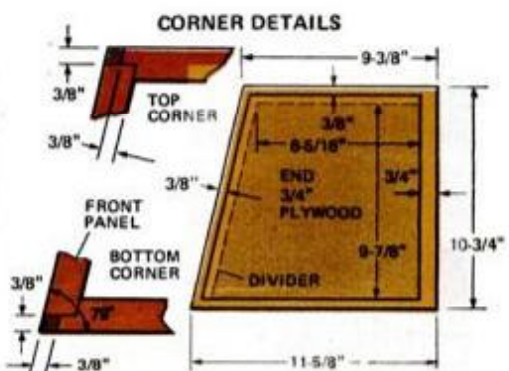
PM photo: Steve Fay



EXPLODED VIEW



Nationally distributed products with the necessary features and sizes were selected for the console. Each is of minimum size and has all front-mounted controls. Obviously, if you change products you'll have to adjust dimensions, particularly with the TV which rests in a 1/2-in.-deep recess and fits like a glove. Follow cutting sequence at left to make your own hardwood trim.



line of the middle divider. The section behind the shelves can be glued in permanently. Predrill for six screws through the other section, which must be removable.

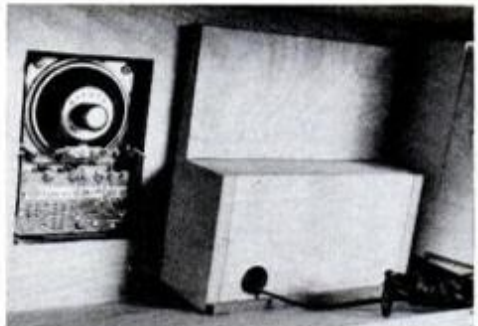
Depending on the equipment you use, an array of holes will be needed through this panel: a.c. power cord, TV antenna plate hole, four heat vent holes, telephone cable and intercom line holes as well as access for vertical and horizontal hold controls on the rear of the TV. You can use plastic nut starters, available through electronics and audio suppliers, to extend these control knobs through the back panel.

Glue in the edge trim along the 3/8-in.-deep rabbeted joints, fit in the L-trim and the shelves. Sand all surfaces with a fine No. 220-grit paper and apply several coats of penetrating oil or stain to suit.

To simplify the wiring, we mounted a 25 1/4-in. strip from a 3-ft. section of Wiremold multioutlet.

Console components

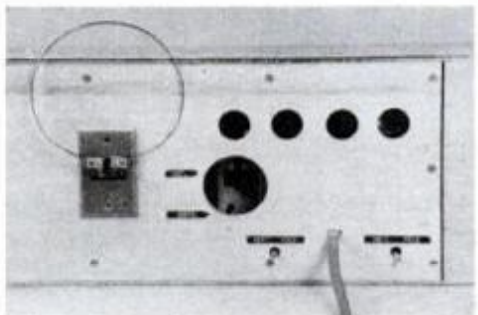
Here are the particular components we selected for the FM console: Seth Thomas digital clock; Nutone IS intercom (IR-3 mount); Casio 8R digital calculator; Philco B312H TV; Wiremold 20G306 multioutlet; Wiremold 20CSK cordset; standard TV antenna plate; standard panel-mount phone. ★★★



Clock is mounted in a separate box, secured with a molding strip screwed into the base with calculator support above.



Mount a 25 1/4 in. section of Wiremold multi-outlet to access panel and run power cord from Wiremold cordset out back.



Drill and label holes for the power cord, TV antenna, four heat vent holes, TV rear controls and the telephone cable.



Drill holes front and rear in both shelf dividers for the shelf support clips. Shelves are 1/4-in. veneered plywood.

Popular Mechanics 1977

HOME IDEAS GUIDE

A special section of
new projects and products

PM's garden shed: A three-in-one room for storage, gardening and entertaining

Outdoor furniture: Bend yourself a chair that's light as a feather

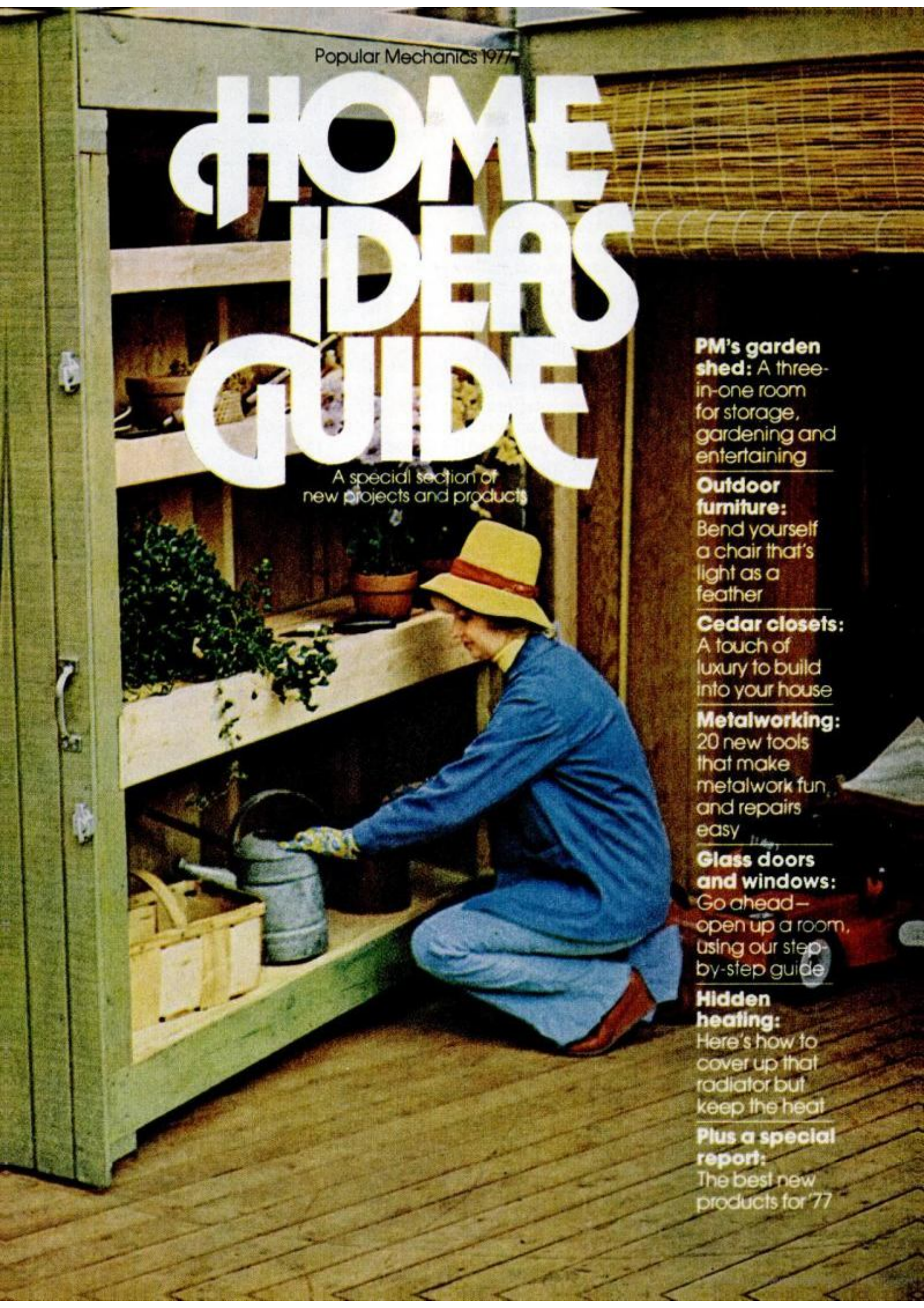
Cedar closets: A touch of luxury to build into your house

Metalworking: 20 new tools that make metalwork fun and repairs easy

Glass doors and windows: Go ahead—open up a room, using our step-by-step guide

Hidden heating: Here's how to cover up that radiator but keep the heat

Plus a special report: The best new products for '77



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APRIL 1977

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City _____ County _____

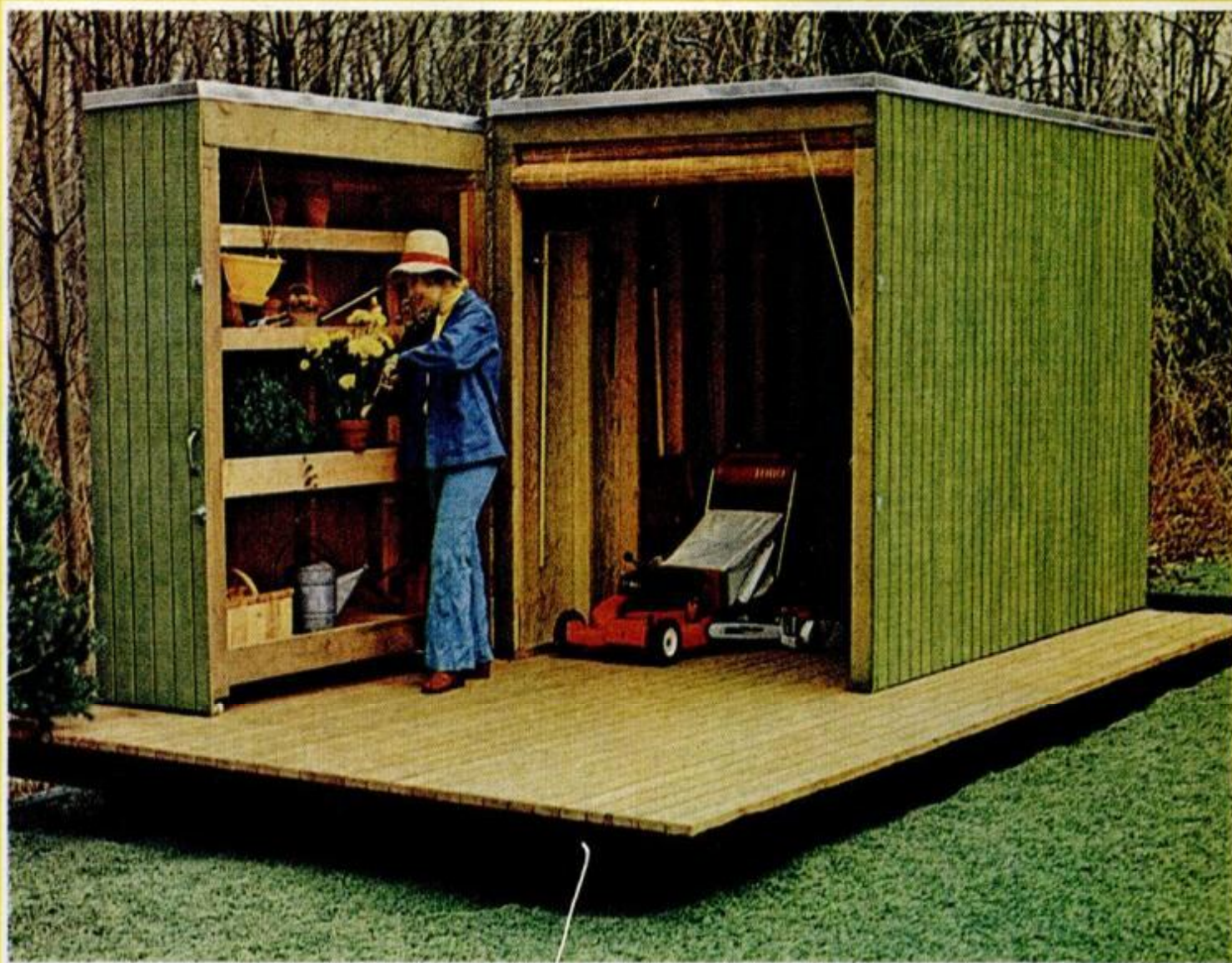
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Please include facts on: Solid vinyl siding
 Solid vinyl gutters Ornamental plastic shutters.



Protecting
the Great
American Dream.



PM photo: George Ancona

Build PM's everything shed

This easy-to-build garden shed has a roll-away door with a built-in potting bench and shelves.

by Mike McClintock
HOME AND SHOP EDITOR

The reason for it is simple—you need more storage space. The design is unique—a bulk storage section plus a swing-away, 2-ft.-deep door with a built-in potting bench and shelves, all on a raised 2x4 deck.

Looks expensive? Materials will run about \$600, a little steep for a storage box, but not bad when you add the gardening door and the deck which give you an attractive and protected area for soaking up the sun.

Turn the slatted redwood potting bench in the door into a serving bar, roll down the bamboo shade to hide storage and you have an attractive

setting for summer parties; you won't get this with many prefab sheds.

Keeping it simple

If you can handle repair and renovation jobs but haven't tackled a building from start to finish, this is your chance. If you had to pick a step-by-step project to illustrate the real basics of house construction, you'd pick a project like PM's shed.

It's small, detailing is simple, no fancy joints or special tools are needed, and the framing pattern is standard, solid and flexible. If you add another set of piers you can extend the storage section and even extend the rafters to a post and girder setup to make a small carport. Once you've got the system clear you'll see the amazing number of alterations you can make in our plan to suit your needs and building site.

Four concrete piers support the deck. Check local building codes for all construction, but in general our

12x22x36-in.-deep piers will be enough to anchor the weight of the shed. Simply dig four holes to accommodate 1/2-in.-plywood forms, check carefully to be sure they're all level with each other by laying a straight 2x4 between them and reading a level on the 2x4.

When piers are level, pack dirt around the outside of the forms to keep them in place, then fill with concrete mix. Tie the girders to the piers with anchor bolts set in the concrete while it's still wet.

Deck framing

If your local lumberyard can get pressure-treated timbers, check the price against unsealed wood. Treated wood could be best, especially if your site is damp or collects ground water. Fir timbers should be thoroughly creosoted.

Fir 2x6 joists are toenailed to the girders 16 in. on center. Buy 10-footers for the door end of the platform where you get about a 22-in. cantilever past each girder. This floating platform (close to your lawn because the girder is partially buried) is very strong when you tie the joists with the 2x4 decking. Under the main shed, 8-footers are enough for a floating platform along one side.

Coat all sides of the decking (use full 18-footers) with a preservative like Woodlife. Then make a 1/8-in. spacer and start nailing off the deck with two 10d galvanized common nails at each joist. Check actual sizes of your lumber before you begin. Frequently, long lengths like 18s are really an inch or so longer. If they are, put them on as is, allowing for a small overhang at each end.

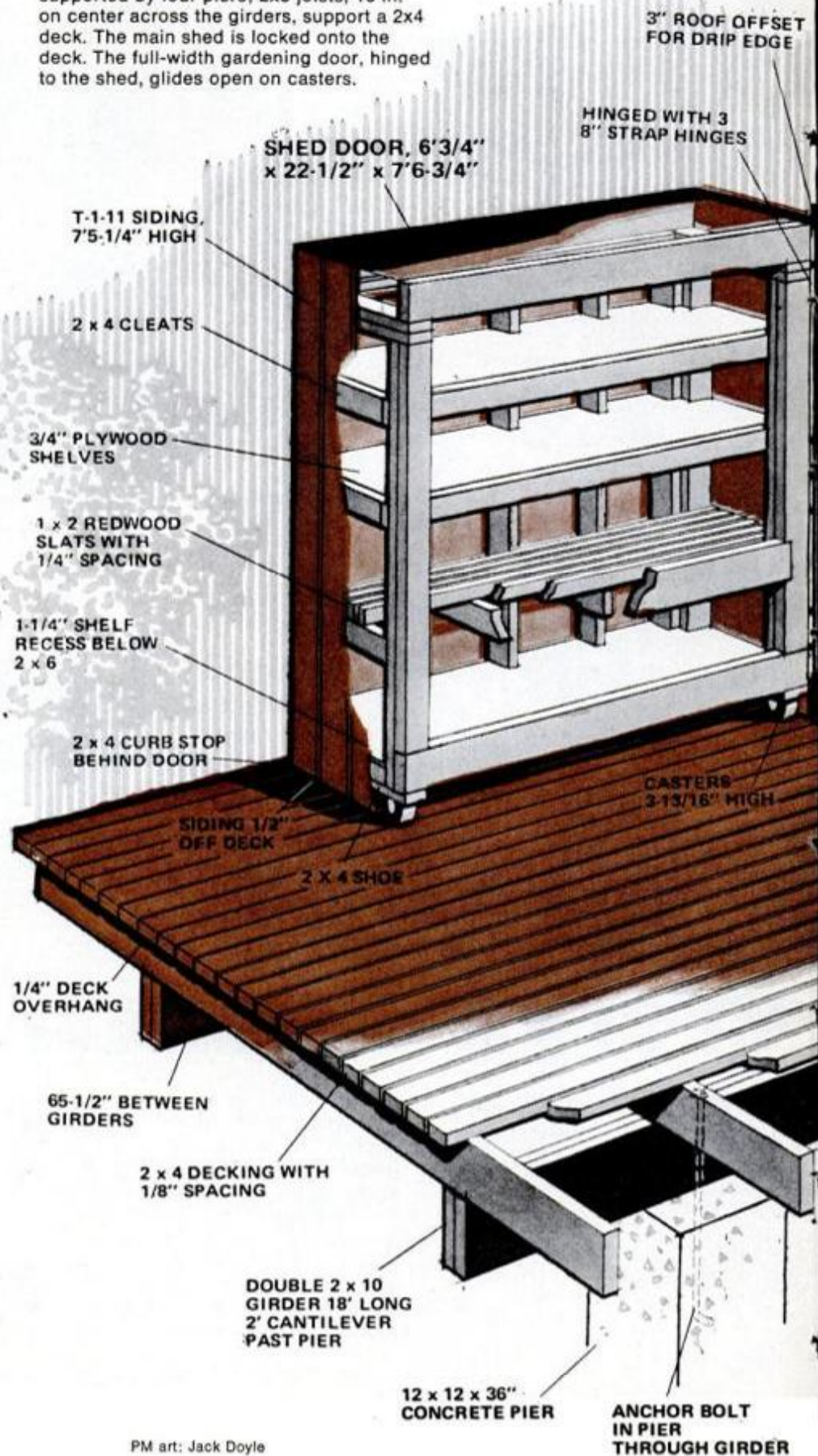
When the deck is finished, snap a chalkline at the overhang line and trim off the color-coded lumber ends with one continuous saw cut.

Main shed construction

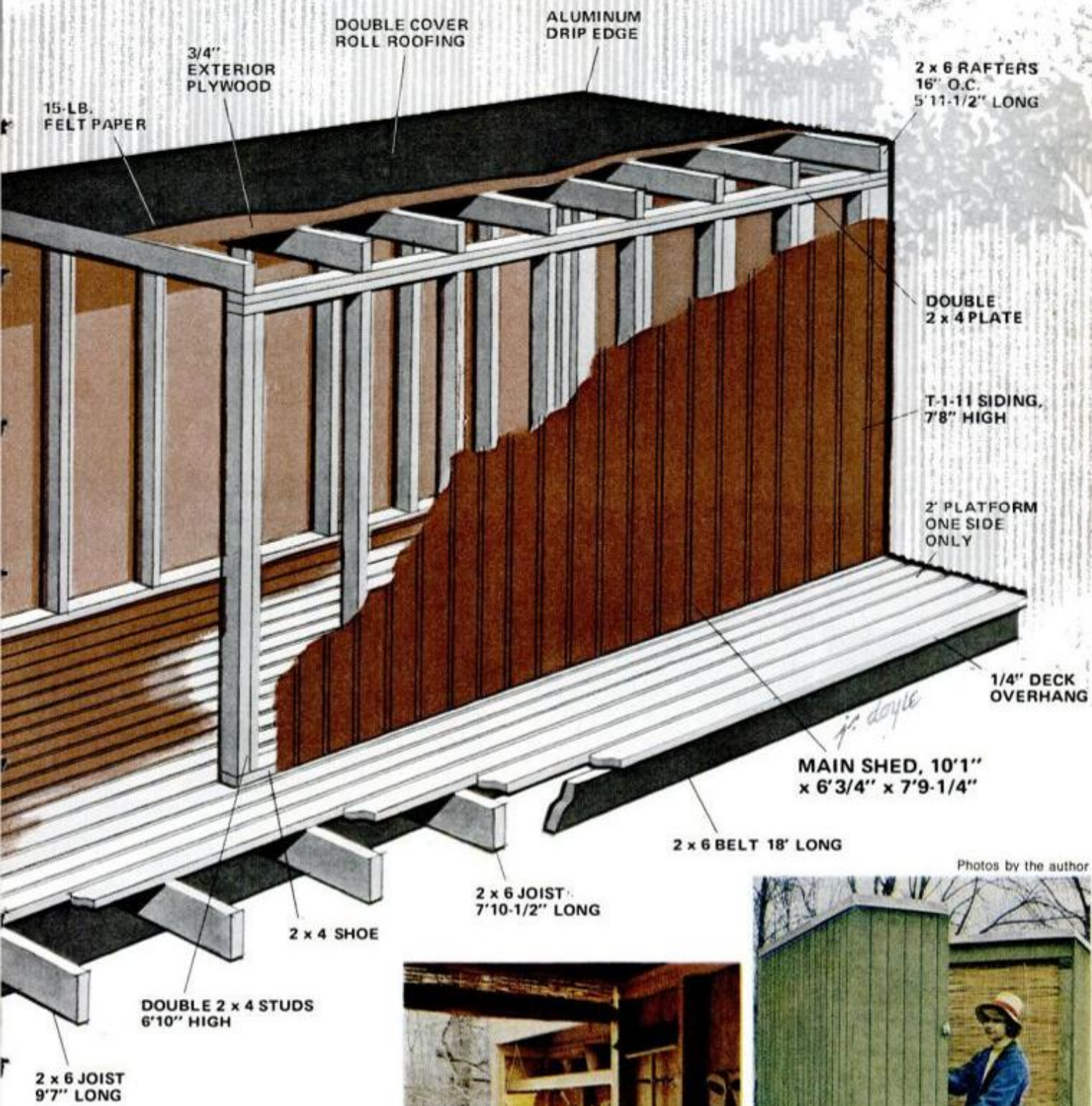
Instead of nailing one wall stud at a time, cut the 2x4 base (shoe) and one 2x4 top (plate) to length, mark them for a 16-in. center layout; nail through them into ends of the studs.

Each wall is light enough to tip up in place. Spike through the shoe into the decking, then plumb the wall carefully with a level and secure it with angled braces on the *inside* so they can stay in place while you nail the siding. Sandwich the doubled 2x4 plates at the corners and spike through them to lock up the walls. Rafters can run to the outside of the plate or 2 in. across with a 2x6 ribbon on edge to tie them together. Nail the exterior-grade plywood roofing

Here's the plan: Two full-length girders are supported by four piers; 2x6 joists, 16 in. on center across the girders, support a 2x4 deck. The main shed is locked onto the deck. The full-width gardening door, hinged to the shed, glides open on casters.



PM art: Jack Doyle



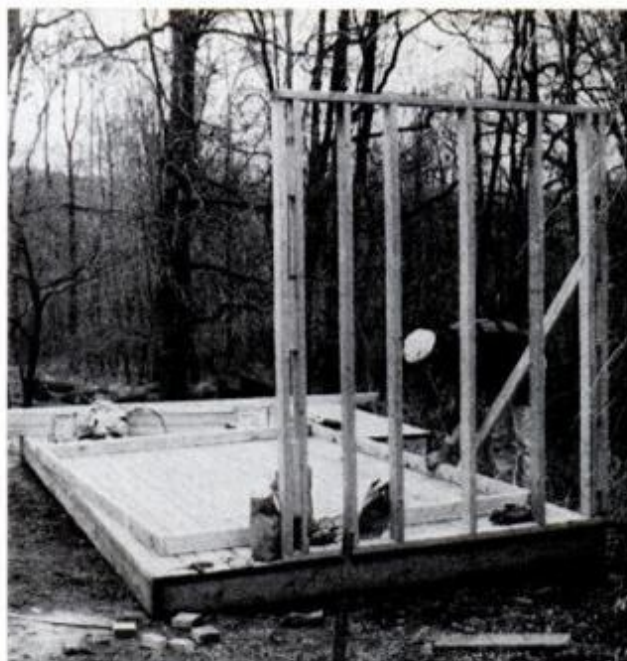
The shed has three main components: the storage shed, the gardening door and the deck. This design gets the most from all three. You can close off the main storage section by hanging a roll-up bamboo or canvas shade across the opening. With the door open, you've got an attractive and protected deck area. The slatted redwood potting bench in the door can double as a serving bar for summer parties.



Photos by the author



Lay out your site carefully, then dig girder trenches about 12 in. deep and spread a few inches of gravel in them to increase drainage. At right you can see that the full platform is built only on one side. The back of the shed is flush with the deck, but cantilevered section of joists is necessary at one end as a support for gardening door when it is fully opened.



Nail the deck (two 10d galvanized common nails at each joist) and seal it with two coats of Woodlife. Make up your walls (complete with 2x4 shoe and one plate) on deck and tip in place. Note temporary angle brace.

MAIN SHED DETAILS



You can lay rafters fully across the two 2x4 plates or 2 in. in and add a full-length 2x6 ribbon piece.



Run T-11 siding panels about 2 in. down the joist and nail to joist, deck, 2x4 shoe and stud.



Leave 1/4-in. between front panels and deck and seal end grain to prevent deterioration from water.



Cover plywood roof with double-layer tarpaper, roll roofing, drip edge. Seal seams with roof cement.



Make your walls as perfectly square and plumb as you can. When you've got the frame just right, nail 2x4 angle braces on the *inside*. A true frame means minimal trimming and generally an easier, better-looking siding job.

with the 8-ft. length running across the rafters and cover it with tarpaper, allowing a healthy overage (double-covered area).

You could make one wall higher than the other and angle-cut rafters to provide drainage. But for a roof this small you can get by with double-cover roll roofing; apply roof coating liberally to each layer and seal nail-heads and seams with roof cement.

Siding panels are run from 1/4 in. off the deck where the platform extends beyond the shed and from 2 in. below the top of the joist where the shed wall is flush with the deck. Test-fit panels before nailing and allow for the siding thickness at corners. Tack sheets with box nails and when you're sure they're right, nail along studs, shoe, plates and rafters.


Door framing

To cover the roof joint between the main shed and the door add a 1x2 nailer to the edge of the shed roof to extend the drip edge over the door. Then take about 3 in. (including the casters) off the door height. This way the aluminum drip edges will overlap the roof joint.

For a door this size you'll need

(Please turn to page 127)

Great moments in the basement.



Making a shearing cut with a skew chisel may not be everybody's idea of kicks.

But for the man with a shop in the basement, and a lathe in the shop, it's one heck of a feeling.

Probably second only to seeing his own work take shape. An intricate chess piece. A cabriole leg. Or anything else that wood and skill and imagination can turn into something beautiful.

For the man like that, we make the Rockwell 14/11" Gap Bed Wood Lathe. One heck of a tool for \$309.99* for some very good reasons.

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A 14-inch swing over the gap, 11 inches over the bed, and 36 inches between centers.

A ball-bearing headstock, and an adjustable tailstock with a graduated ram.

A built-in indexing mechanism, and a precision-ground universal tool rest.

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All of which make it possible for you to make just about anything imaginable. Symmetrical, elliptical, helical. Beaded, chamfered, tapered. Whatever.

Of course, what goes into this lathe goes into every lathe we make, including our \$169.99*

with half a century of experience and on-the-job performance.

What that buys you is as good as you could ever want, short of actually having our big industrial equipment.

Namely, some impressive features, regardless of price. And the three things there are no substitute for in any tool, regardless of who makes it.

Accuracy. Power. Durability. With us, they're not just words. They're a reputation. The

stuff that great moments are made of.

You can depend on it. *Rockwell. It's the same name industry's been depending on for 50 years.*



Rockwell International

*Manufacturer's suggested retail price.

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Whether he rides a 6- or an 8-hp John Deere Riding Mower, he enjoys unmatched mowing performance.

Because he gets features like a 5-speed shift-on-the-go transmission, an enclosed engine for quieter running, and an optional rear-bagging attachment that really works.

He appreciates the comfort, safety, and ease of operating a riding mower that's "human engineered."

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The man who rides the Deere knows the value of the John Deere reputation for delivering high-quality products and service, paying dividends in time and work saved year after year.

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Total door height (including the casters) should be approximately 3 in. less than the shed for the drip edge clearance.



Make up the door frame on the deck. Doubled 2x4s at each corner are tied together with doubled plates and 2x6s.



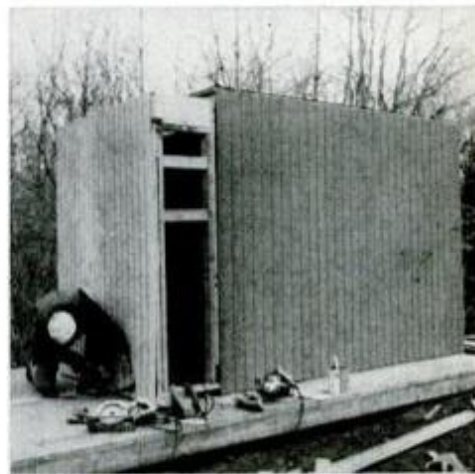
The bench support 2x6 across the door front is notched into the studs and lag-bolted through the end of the stud.



Use a clamp to hold the 2x6 flush when turning the lags. Add 2x4 nailers above for as many plywood shelves as you want.



Lighten the weight of the shed (as well as the load on the casters) by the use of 2x2 shelf nailers across the back.

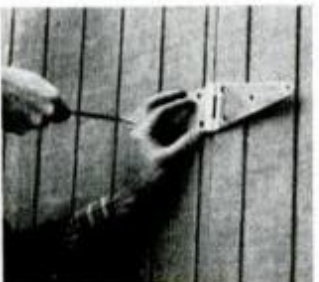


Nail the siding to all framing pieces to stiffen the unit. Match the groove patterns at the joint for a neat job.

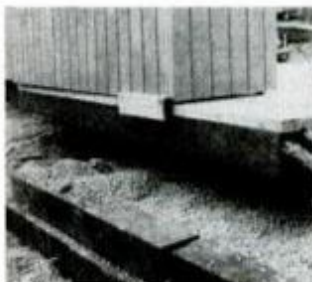
SHED DOOR DETAILS



Complete the door by running 2x4 nailers from the back wall studs to the front 2x6 to support 1x2 redwood slats (on edge



with ¼-in. spacing). Clamp door to shed on the inside and attach three 8-in. strap hinges. Lag on a 2x4 doorstep.



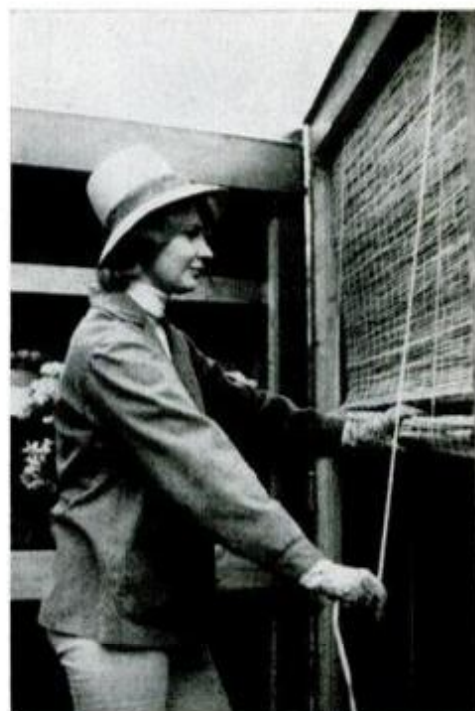
BUILD PM'S EVERYTHING SHED

(Continued from page 124)

heavy-duty casters like the Faultless rubber-wheel units. You can hide them by running the siding past the 2x4 shoe to within ¼ in. of the deck. To support the potting bench inside, notch the 2x6 flush with the front corner 2x4s. Then run 2x4s on edge from back wall studs to the 2x6, in-

cluding nailers at each end. Cut slats to length, lay them on edge and pre-drill holes for galvanized box nails down into the frame.

You can stain the siding after adding the strap hinges and handle. A hasp and padlock or sliding-door locking hardware provide security. Lag on a short length of 2x4 to back edge of the deck. Without it, you could roll the door off the deck. ★ ★ ★



Roll down bamboo shade to hide storage section and provide a good-looking backdrop for a summer afternoon on the deck.

Outdoor furniture with up-front style

Designs for 2 chairs and a footstool geared for carefree summer lounging.



PM photo:
Cosimo
PM designs:
Rosario Capotosto

by Penelope Angell

ASSISTANT HOME AND SHOP EDITOR

These aluminum-and-canvas chairs can help you get ready for summer entertaining and relaxing. You can make them from 3/4-in. Reynolds Do-It-Yourself Aluminum tubing with 90° elbow and T-butt connectors, available at hardware and building supply dealers.

Tools you need are minimal: steel tape measure, masking tape, large

square, drill, hammer, screwdriver, hacksaw or tubing cutter, parallel clamp, center punch and Pop riveter.

Cutting: A hacksaw or tubing cutter can be used to cut the tubing. The cutter makes a more accurate cut, but the tubing will need reaming afterward. The saw cut needs less reaming but must be filed smooth.

Joining: Besides using 90° elbow and T-butt connectors, 3/4-in. tubes can be joined together by fitting a piece of 7/8-in. tube over them and

securing it in place with Pop rivets.

Bending: You can make 5-in.-radius bends in the tubing with a simple jig. When making bends be sure to carefully line up the dimension marks on your tube with the index mark on the jig to insure properly fitting parts. Also clamp the tubing between the jig blocks to prevent it from sliding during bending. Pull slowly so the tubing won't buckle. To help apply pressure when you make the bends, brace yourself against the table.

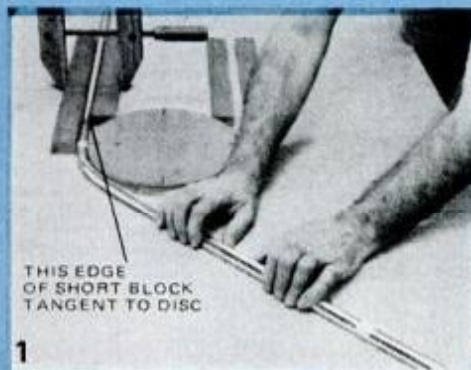
FOOTSTOOL

MATERIALS

- 6' x 3/4"-dia. tubes (2)
- 5" x 7/8"-dia. tubes (2)
- Pop rivets (4)
- 17 1/2 x 37 1/2" canvas (1)

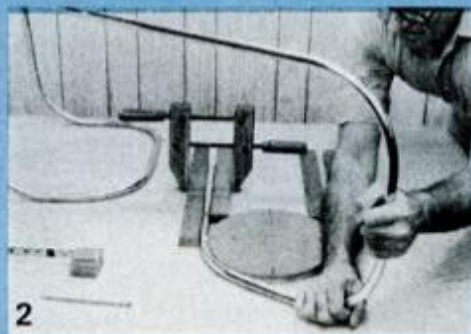
The jig for bending the tubing is a 10-in.-dia. wood disc of 3/4-in. stock (with index marks drawn through the center) and two pairs of support blocks. Each pair consists of a 3/4 x 1 3/4 x 13-in. block and a 3/4 x 1 3/4 x 17-in. block, with a 3/4-in. space between them for the tubing. A successful project depends on your bending the tubing accurately. For best visibility, it helps to make the bend dimension marks on masking tape pressed on the tubing. If you lay the jig parallel to the table edge, you can easily check right-angle bends with a large square.

Step 1: On a 6-ft. length of tubing, mark



THIS EDGE OF SHORT BLOCK TANGENT TO DISC

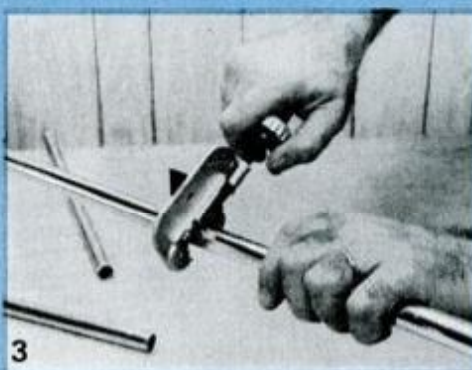
1



2

off 24 in. from each end. Place one tube end in the support blocks, carefully match the tube mark nearest that end with an index mark on the disc, clamp and make a 90° bend. Pull slowly and apply pressure. Repeat on the other end to form a U.

Step 2: Make a mark at 13 in. from each tube end. Place the tube ends into the jig so that the upright part is vertical as shown while you make the third and fourth bends. Make a 90° sideways bend



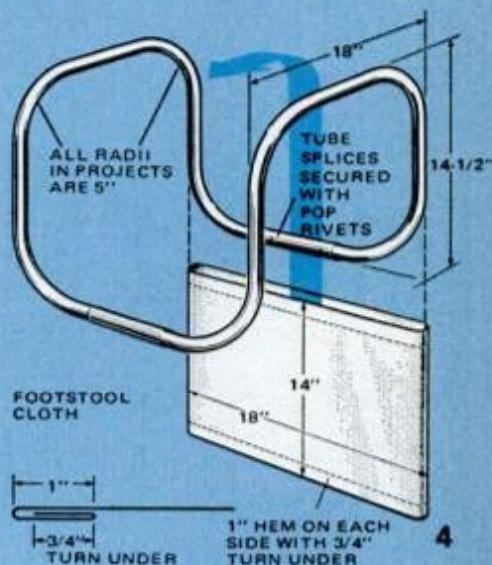
3

at both ends. Afterward mark off 10 1/2 in. from the ends, which will be cut off.

Step 3: Tubing can be cut accurately with a tubing cutter. The cutter curls the ends inward, so they must be reamed before the joints can be fitted. You might prefer using a hacksaw, then smoothing the ends after cutting.

Step 4: Repeat preceding steps to make a second unit. Then join sections with two 5-in. x 7/8-in.-dia. pieces of aluminum tubing telescoped over the 3/4-in. tubing ends. Drill two holes through one side of the tubing; secure with Pop rivets.

The covering is made from a 17 1/2 x 37 1/2-in. piece of canvas. Join the short ends with a 3/4-in. seam. Sew a 1-in. hem with a 3/4-in. turn-under on the sides.



4

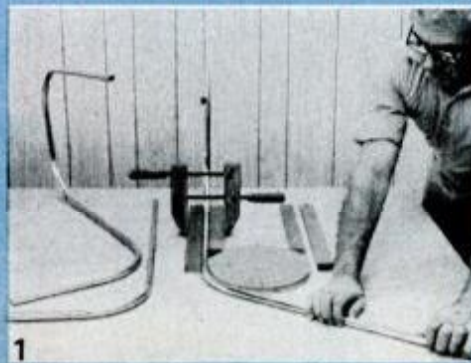
SMALL CHAIR

MATERIALS

- 6' x 3/4"-dia. tubes (3)
- 3' x 3/4"-dia. tube (1)
- 3/4" T-butt connectors (8)
- 5" x 3/4"-dia. tube (1)
- 20 1/2 x 31 1/2" canvas (1)
- 23 1/2 x 23 1/2" canvas (1)

Step 1: To make the small chair, it's best to begin by making the chair back. Start with a 6-ft. length of 3/4-in. tube and carefully mark off 23 3/4 in. from each end. Place a tube end in the bending block, match the tube mark nearest that end with the index mark on the jig and bend the tube 90°. Repeat with the other tube end to form a U.

Then give the back a slight backward



1

bend for comfort. You can do this by marking off 17 1/2 in. at both ends. Place the tube ends in the jig on edge and bend each side about 2 1/2 in. off the axis.

To make the chair sides, begin with a 6-ft. length of 3/4-in. tubing. Mark one end at 15 3/4 in. and the other at 34 1/4 in. Placing each end in the blocks, match the index marks with the tube marks nearest the end in the blocks and make 90° bends at both marks.

Now make a mark at 19 1/4 in. from the longer end and place the "U" part of the tube in the jig on edge. Grip the tube end to make a sideways bend which will be the third bend. To provide leverage to bend the short tube end, insert a 5/8-in. dowel into the tube as shown. This short length is the base of the chair.

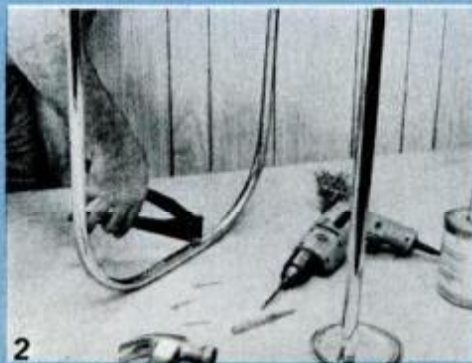
Repeat the process for the second side, but make the third (base) bend in the

opposite direction so the two sides (left and right) will join.

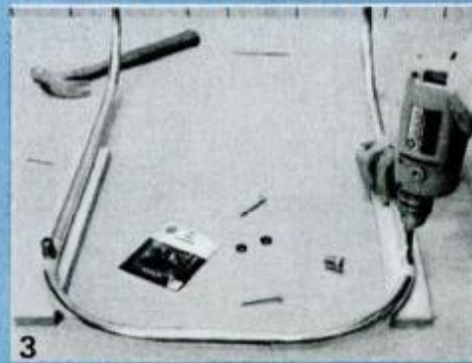
Step 2: Make a mark at 7 3/4 in. from the base end of each side and cut off that excess. Join the two sections with a 7/8 x 5-in. tube splice secured with two Pop rivets.

Step 3: T-butt connectors (8) are used to assemble the parts. Allow an extra 1/4 in. for them when you're cutting the two cross tubes on the chair front and marking the base for the holes. For example, spacing between the chair sides is 17 1/2 in., but the cross tubes are cut 17 1/4 in. to allow for the two connectors. The top cross brace is 13 1/4-in. high and the bottom cross brace is 2-in. high. The T-butt connectors consist of a locknut, connector and 1/4-20 oval-head bolt.

To install the cross tubes, use a punch to get an accurate start, then drill a 1/4-



2



3

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in. hole in the outside tube as shown. Use the oval-head bolt that comes with the connector to dimple (recess) the hole for a neat appearance. Lay the tube on a 2 x 4-in. board that has a 3/8-in. hole drilled in it to accommodate the bolt. Insert the bolt and strike its head with a hammer to make a neat dimple.

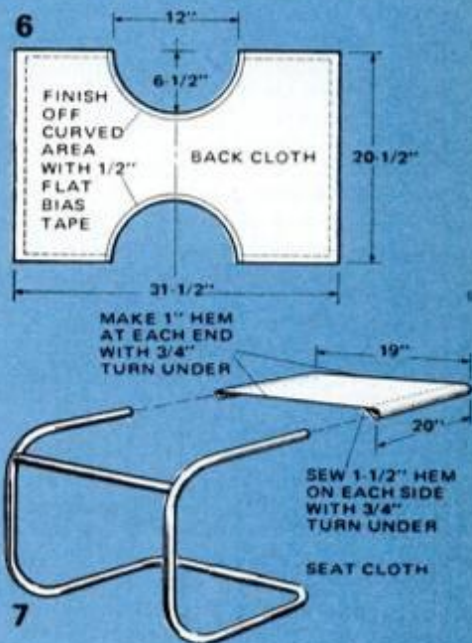
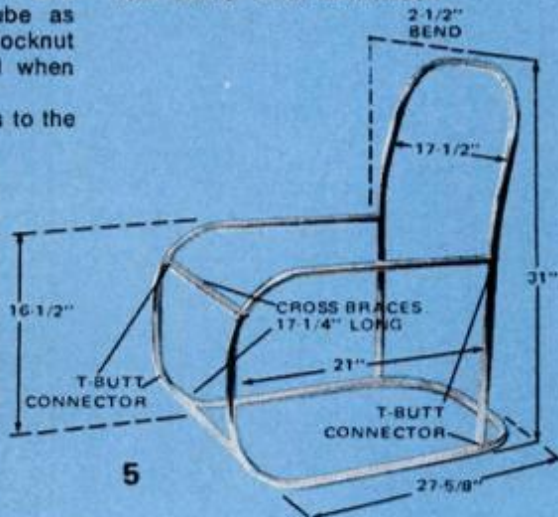
Step 4: After the bolt is inserted through the hole, place the connector over it and attach the locknut. Insert the tube as shown and tighten the bolt. The locknut spreads out against the tube wall when the bolt is tightened.

Step 5: After you attach the sides to the

two front cross tubes, insert the back into the base and then into the horizontal ends. The T-butt connectors can be removed, then reinserted. Later, the back will be loosened to insert the seat cloth.

Step 6: Cut the back cloth to the dimensions given. Finish the curved area with bias tape and fold the cloth in half. Make a 3/4-in. side seam and a 1-in. bottom hem with a 3/4-in. turn-under.

Step 7: Cut a 23 1/2-in. canvas square for the seat. Make 1-in. front and back hems with 3/4-in. turn-unders. Then sew 1 1/2-in. side hems with 3/4-in. turn-unders.



LARGE CHAIR



Step 1: To make the two sides, begin with an 8-ft. length of 3/4-in. tube. Make marks at 8 3/4-in. and 39 1/4-in. from each end. Place the tube ends in the block and make the 8 3/4-in. bends at right angles on both ends. (Since only a small piece of tube will be held in the block, join a scrap piece of tube to the short end with a dowel and clamp firmly.) Next place the long middle part of the tube in the blocks and make the 39 1/4-in. bends to close the rectangle as shown. Join ends with a 5-in.

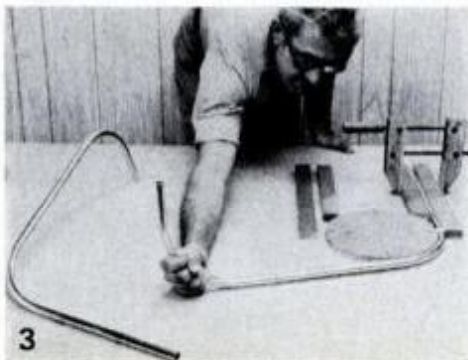
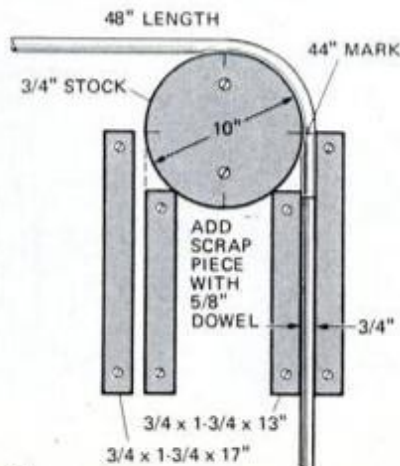
MATERIALS

- 8' x 3/4"-dia. tubes (4)
- 5" x 7/8"-dia. tubes (2)
- T-butt connectors (6)
- 90° elbow connectors (2)
- 1 1/2" x 1/4"-20 oval-head bolts with nuts (2)
- 5" x 5/8"-dia. dowel (1)
- Pop rivets (4)
- 3/8" setscrews (2)
- 23 1/2 x 58 1/4" canvas (1)

x 7/8-in.-dia. tube splice and two Pop rivets, then make the second side.

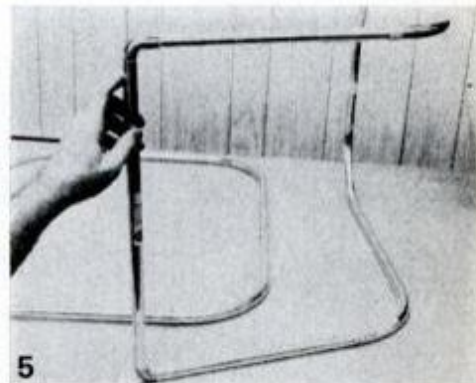
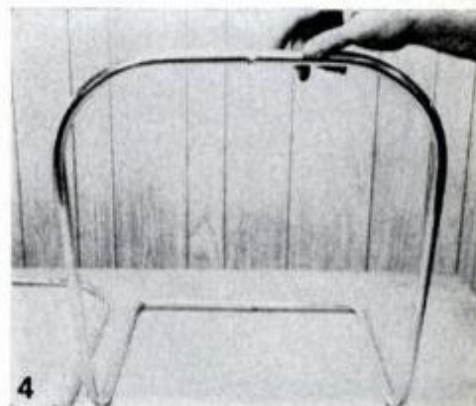
Step 2: To make the back, begin with a 48-in. length of tube (8 ft. halved) and mark one end at 44 in. Again add a temporary piece of scrap tubing with a 5/8-in. dowel as shown in the drawing so a sufficient amount of the tube can be held in the jig blocks. Bend two pieces in this way to 90° angles, then cut off 1/2 in. at their shorter, rounded ends.

Step 3: Still working with the two back pieces of tube, mark off 13 in. from their straight ends. Place the straight end of the tubing in the jig so the short bent end is held vertically in the air and make a 104° angle. This will be the angle between the back and seat. You can mark the angle on the worktable as a guide. Bend



one piece to the left, one to the right.

Step 4: You can make the upper back joint by inserting a piece of 5/8-in. hardwood dowel between the two tube ends. Two small nails will prevent the dowel



from shifting and keep the joint secure. (A 7/8-in. tube splice as used before would make a bump in the canvas cover.)

Step 5: The front cross tube that is part of the seat is attached with a pair of 90°

(Please turn to page 132)

OUTDOOR FURNITURE

(Continued from page 131)

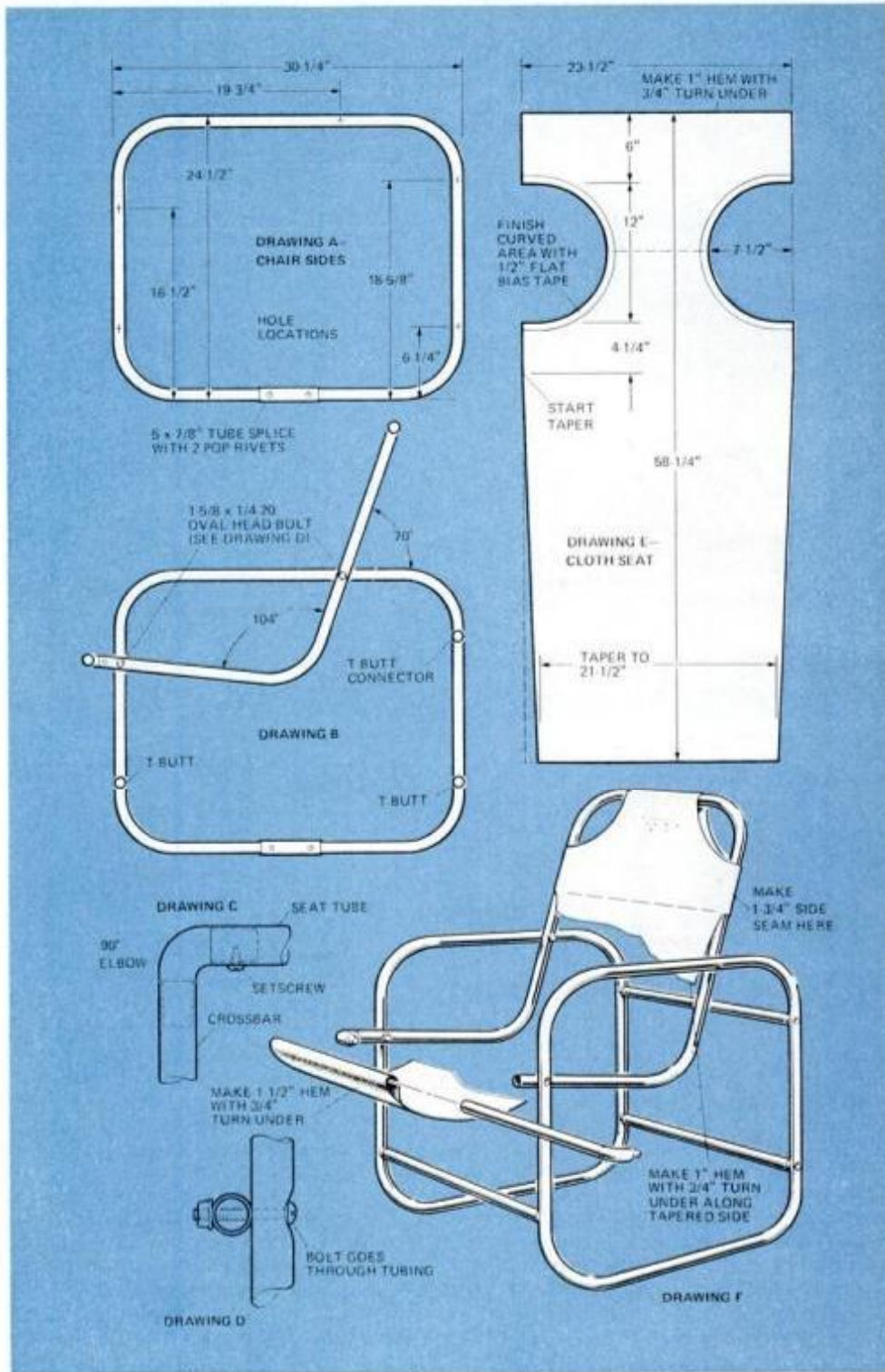
elbow fittings. Cut the cross tube to 17 1/4-in. length. (Elbow fittings have a 1 1/2-in. makeup to complete the 19 1/2-in. crossbar dimension.) Twist the fittings on either end of the tube clockw'se to tightly secure them. Insert the free end of the elbows without the locknuts in the open end of the seat tube as shown.

Step 6: The elbow ends in the seat tubes are secured with a self-tapping setscrew driven into the casting, as shown in the photo, when canvas is in place. Next cut three pieces of 19 1/4-in. tube for the lower front crossbar and two back crossbars.

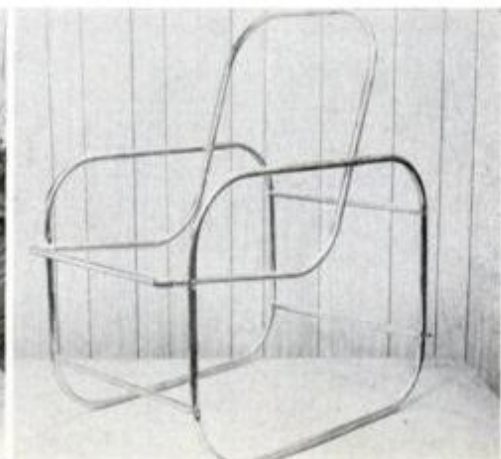
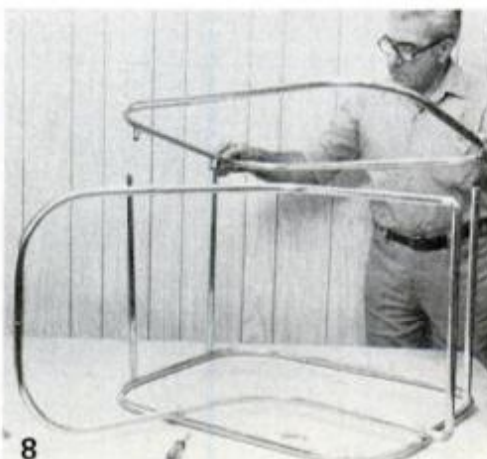
Step 7: Now you can drill the sides to receive the assembly bolts. Locate holes as shown in drawing A. Dimple the holes and insert the T-butt connectors and bolts as indicated in drawing B. Clamps and masking tape make an otherwise difficult job easy. Parts can be held together with tape to check alignment.

Step 8: Assembly should be done by first attaching the seat to one side, installing the three cross tubes with T-butt connectors, attaching the seat section with bolts as in drawing D, then adding the other side. All bolts should be tightened firmly after assembly.

Step 9: To make the cover, cut the can-



vas as shown and finish the curved area with bias tape, then taper the sides. Make a 1-in. top hem with a 3/4-in. turn-under, then fold the top part over. Sew a 1 3/4-in. side seam as shown in drawing F. Make a 1-in. side hem with a 3/4-in. turn-under along the tapered sides. Finally, sew a 1 1/2-in. bottom hem with a 3/4-in. turn-under. Then slip the canvas over the back; slide seat bar through bottom hem. ★ ★ ★





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Материал, защищенный авторским правом

Build a freestanding cedar closet

Need more storage space? Try a luxurious cedar-lined walk-in.



From home to apartment, the need for extra storage space seems to be universal. This freestanding closet holds your clothes and personal items in a luxurious, yet practical setting. It's based on a simple construction plan that's easy to assemble. The good-looking cedar panels give off a pleasant fragrance that's moth-repellent as well.

Begin construction by nailing a 2x4 frame to your dimensions. Next nail 5/8-in. plywood to the exterior of the frame; first on the floor, then sides, back and, finally, ceiling. You can finish the exterior with base molding.

The interior of this closet was then lined with Giles & Kendall cedar panels. They're made of large, thin flakes of red cedar compressed into sheets. The 1/4-in.-thick panels come in standard 4x8-ft. sheets and can be sawed and nailed like plywood. They are butted together and nailed to the frame interior with 1-1/4-in. finishing nails or attached with panel adhesive.

After the panels are installed, you can add weather stripping around the doors to insure a nearly airtight enclosure.

Shelves made from cedar panel remnants are added next. You can section off compartments. A clothes rod completes the interior.

Doors can be made from plywood, but hollow-core doors with magnetic latches are less likely to warp. Line them with the cedar panels.

Stain or paint the exterior plywood, but leave the cedar interior unfinished for its fragrance and protective qualities.

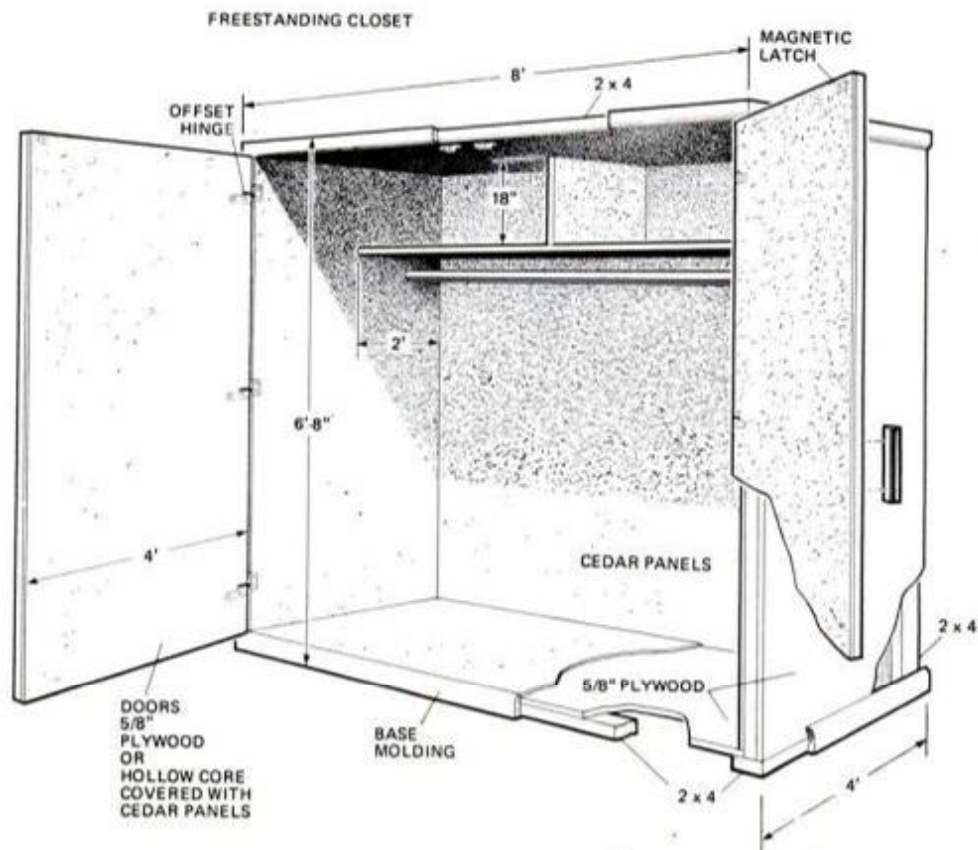
Your finished closet will provide storage space for clothes, pillows, luggage and any other items you want to protect from moths and mildew. Its fresh cedar scent will greet you every time you open the door.

You can get a plans booklet for other do-it-yourself cedar closets by sending 25 cents to Giles & Kendall, Inc., Dept. PM, Box 188, Huntsville, Ala. 35804. ★ ★ ★



The easy-to-build cedar closet (above) provides fragrant, moth-repellent storage for woollens and sports equipment.

Cedar closet panels are nailed directly to the frame of the freestanding closet (top) using 1-1/4-in. finishing nails.





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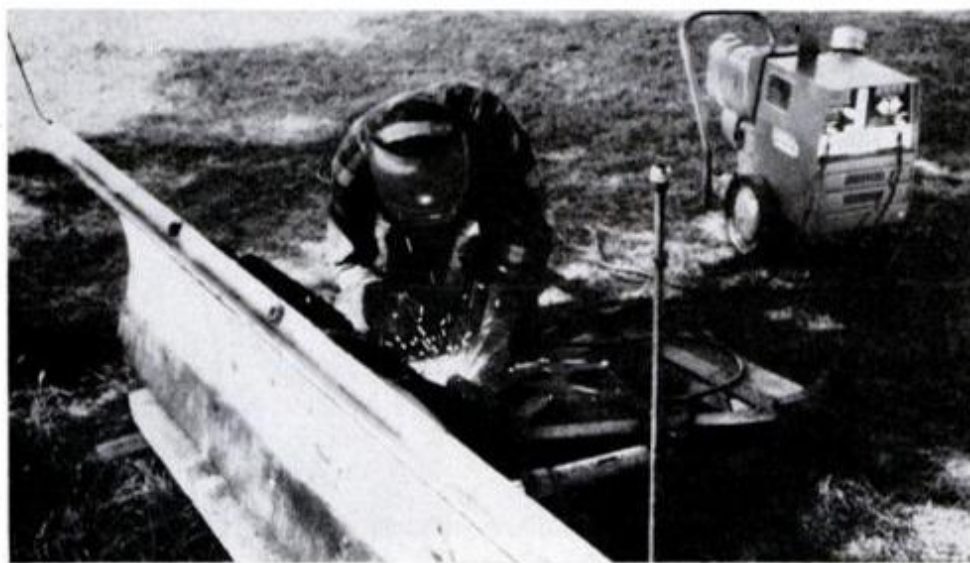
by Penelope Angell
ASSISTANT HOME AND SHOP EDITOR

Here's the basis for a modern metalworking shop.

If you've ever wanted to set up a metalworking shop, but thought the cost prohibitive—here's good news. You can buy soldering, welding and other metalworking tools designed for home use at prices in line with woodworking tools. Many power tools are under \$50 and make it possible to reclaim broken metal objects you would have thrown away.

Having metalworking tools can open up a whole new area of home repair and shop projects. You can make electrical repairs; fix fireplace equipment; repair play equipment from swings to bikes; mend boat

Six metalworking tools (right) for home repairs are (clockwise from left): Victor mini welding torch; Bernzomatic oxygen cutting and welding torch; Weller cordless soldering iron; Microflame mini torch; Black & Decker electric pencil; (center) Weller soldering gun.



The stiffener from this plow blade (left) is welded back in place with a Weldanpower 150 from Lincoln Electric, Cleveland. The arc welder has its own generator, making outside repairs easier. Cost of the welder is about \$644.



propellers and shafts, fix car mufflers and tailpipes and a lot more.

Soldering tools

Building stereo and hi-fi equipment or fixing a leaky mailbox seam are jobs where soldering tools come in handy. Use guns, irons and electric pencils to join metal wires or seam two pieces of light metal together.

Weller makes soldering guns that range from 100 to 325 watts. They have a dual-heat control for low and high temperatures, so you can use low heat on sensitive components, then switch to high heat if needed.

(Please turn to page 139)

The fan (right) is repaired with Disston's Powerpack Soldergun. Powerpack snaps into the gun to provide power. Later, it snaps out and is recharged in electric outlet. Powerpack also powers other Disston tools. Soldergun with Powerpack costs about \$24.



Free Fireplace Fun Kit

starts your new fireplace right



Purchase any Heatilator woodburning fireplace from March 1 through April 30, 1977 and we will send you a Free Fireplace Fun-Kit valued at \$38.35 retail. The Kit includes: a popcorn popper, scissors tongs, log tote, fireplace bellows, fireplace matches, Kolor coals and Kindl caps. For the name of your nearest Heatilator Fireplace dealer write: Heatilator Fireplace, A Division of Vega Industries, Inc., 3407 W. Saunders St., Mt. Pleasant, Iowa 52641, or call toll-free **800-553-8905**. * All claims must be postmarked on or before May 15th, 1977. Offer void in Canada.
*Iowa residents call collect: 319-385-3880.

heatilator[®]
AMERICA'S LEADING FIREPLACE SYSTEMS



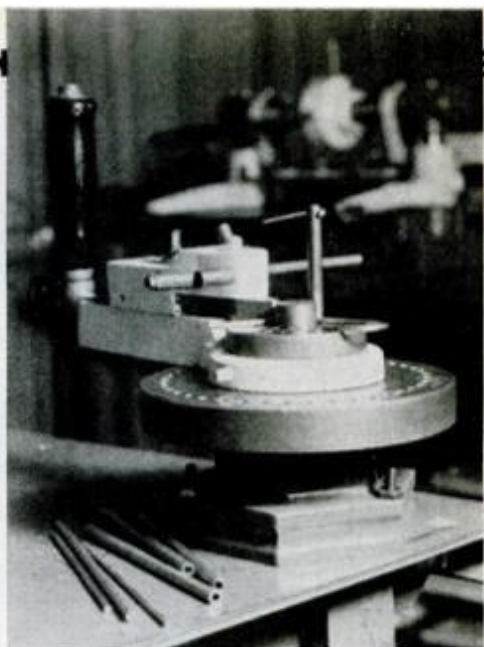
Материал, защищенный авторским правом

then switch to high heat if needed.

Disston makes a cordless soldering gun. There's no cord to get tangled in your work at the bench. It has a rechargeable power unit that also powers a screwdriver and several garden-tool attachments.

Another cordless tool, a soldering iron from Weller, makes on-site repairs possible. The handle holds a battery unit that gives enough heat for about 15 minutes of soldering before it needs recharging. You can solder wiring connections where an outlet isn't within reach or work on a yard tractor outside.

An electric pencil that heats to 700°F. comes in a Black & Decker solder and craft kit with metal tips for soldering, foil writing and wood or leather burning. Cost of the kit is about \$10.



Pinpoint oxy-acetylene flame of this Victor torch (above, left) is suited to precision work such as on this circuit board. Cost is about \$89. The Di-Acro Bender (above, right) can bend wrought iron and steel to make handsome metal furniture.

Brazing and welding tools

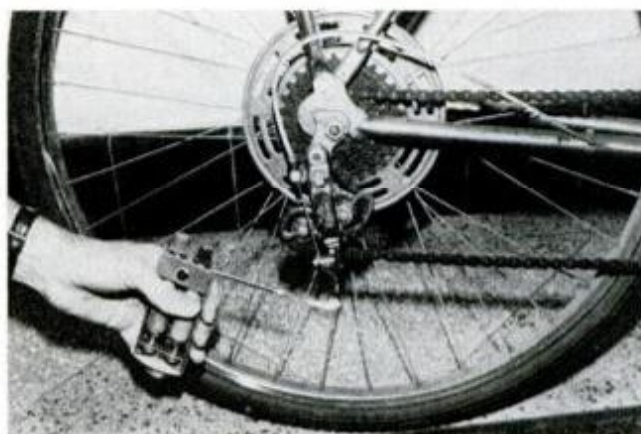
Brazing, also called silver soldering, can be done with Microflame's gas welding torch. Brazing is like soldering but done at higher temperatures (over 800° F.) and with a different solder. The Microflame torch, shown on this and the preceding page, comes with its own small gas cylinders, a butane tip for larger flames, a spark-lighter, brazing rods and flux for about \$36.

The BernzOmatic OX5000 oxygen cutting/welding torch is a compact tool combining oxygen with either propane or Mapp gas. It cuts up to 1/4-in. steel plate and 3/4-in. bolts, besides welding, brazing and soldering.

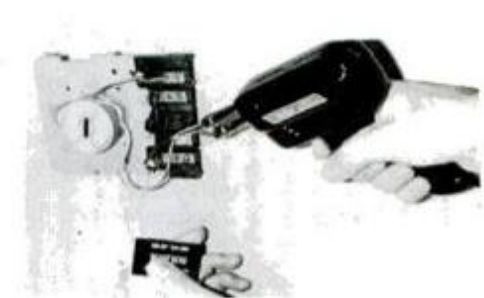
The miniature welding and brazing kit by Victor includes a torch using oxygen and acetylene to produce a 6000° F. flame. This will fuse-weld up to 16-gauge steel. It comes with oxygen and acetylene regulators, spark-lighter, goggles and instruction booklet.

The Weldanpower 150 by Lincoln has a 4500-watt a.c. generator and a 450-volt a.c. arc welder. The auxiliary generator not only makes the welder portable and able to be used for out-

(Please turn to page 140)



Useful for light repairs and craft work are the mini torch (above, left) from Microflame, Minneapolis, and Black & Decker's electric pencil (above, right).



Weller soldering gun, about \$15, has a low and high heat control. It can be used for repairing electrical parts (above) and building stereo equipment.

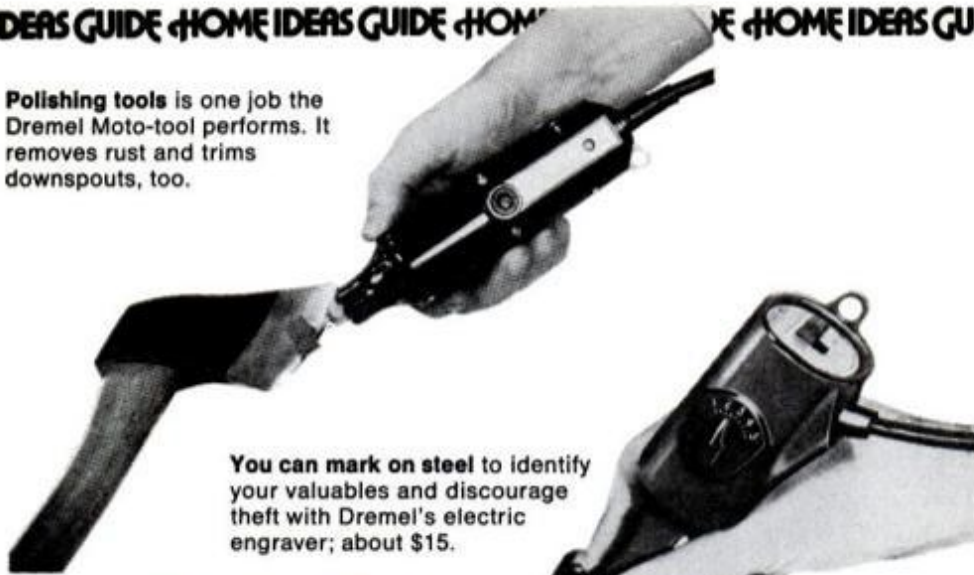


BernzOmatic torch brazes a copper pipe and fittings. Cost is about \$40.



Wiss pipe and duct snips, about \$10, cuts pipe (above, left) and sheet metal. Weller's cordless iron (above, right), about \$25, makes outdoor repairs easy.

Polishing tools is one job the Dremel Moto-tool performs. It removes rust and trims downspouts, too.



You can mark on steel to identify your valuables and discourage theft with Dremel's electric engraver; about \$15.



Riveting is a sure way to fasten light metals. The Swingline (top) and USM (right) riveters help with many repairs.



20 METALWORKING TOOLS

(Continued from page 139)

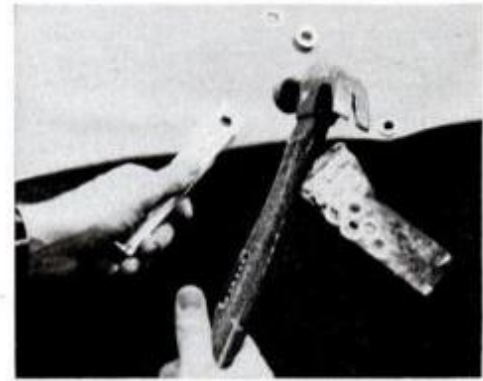
side repairs, but it can also provide output to operate other equipment.

Other metalworking tools

Mild steel bar, tubing and channels can be bent with Di-Acro hand-operated steel benders. You can make wrought-iron furniture and other shapes. The lightest model No. 1 bends up to 3/16-in. round mild steel bar and 5/16-in. 16-gauge steel tubing. Bender costs about \$200; its stand, \$130.

Rivets can join two pieces of metal together if soldering or welding aren't convenient. Rivet guns pictured on these pages are ideal for joining gutters and downspouts or securing aluminum windows.

Other metalworking tools you might need are pipe and duct snips, scriber to scratch guide lines on metal, cold



Use Ludell's grommet tool to repair canvas covers and furniture. It comes with 10 grommets for about \$2.

chisels to cut and shear metal, taps and dies for cutting threads.

Tools for wood and metal

Since many tools are used in wood and metalworking, you may already have some metalworking equipment.

You can probably use drills you have with a set of metalworking (high-speed steel) bits. Only a metal-cutting blade is needed for many electric saws.

Your pliers, wrenches, files, screwdrivers and ball-peen hammer can also be used on metal projects. A grinding wheel can sharpen the blades of your woodworking tools and can also be used to shape metal stock (but wear safety goggles).

If you enjoy woodworking, you might think of metalworking as an extension of your woodworking interest. When you're able to cut home repair bills, metalworking will be an interest that also pays off. ★★★

The Stanley tools (below) shape metal and other materials. Clockwise from left: duckbill snips, \$6.35; adjustable handle plane, \$10.20; shaver, \$2.65; round file, about \$5.35.



Introducing Ferrothane.[™] Nobody's ever seen plastic rust.



Now you can seal outdoor metal things—like this wrought-iron table—in plastic with the wrist-and-brushwork of an ordinary paint job.

It's a cinch with Ferrothane Plastic Finish—the new outdoor metal coating from Flecto, the makers of Varathane[®] Liquid Plastic. You don't even need a primer.

Just brush Ferrothane over whatever prepared metal surface you'd like to shield from the elements: wrought iron furniture, gates, grillwork, garden tools, a storage tank, toys. Thanks to Ferrothane's ingredient Rustaid you'll get



chemically formulated protection against rust and corrosion.

You'll also get a terrific-looking finish in a choice of 12 Ferrothane colors. Plus a coating that levels itself, spreads evenly, and dries in 4 to 6 hours. And gives outdoor metal things tough, long-lasting protection against rust, corrosion, mars, nicks and chipping.

How long will a coat of Ferrothane last? Well, when was the last time you saw plastic rust?

The Flecto Company, Inc.
P.O. Box 12955, Oakland, Ca 94604

To stop rust use Ferrothane:



Open up for more light

Worried about putting a hole in your wall? Use our installation guide for remodeling easily with windows and sliding glass doors.

by Mike McClintock HOME AND SHOP EDITOR



Rooms that have ample windows usually seem bigger and more pleasant than under-lighted, closed-in rooms. Adding a new window or expanding an existing one is not a hard job. Start early on a fair day and you'll be done before supper.

For a more ambitious project (and a lot more light), try opening a room by installing sliding glass doors. More framing is required, but you can still plan it for a one-day job.

Modern windows and sliding glass doors come ready to install. Some, like the Andersen Perma-Shield windows we used, have a flashing flange built into each unit. Nail it to the sheathing, cover it with siding and the exterior is finished—the wood, wrapped in vinyl, needs no painting.

Plan the opening

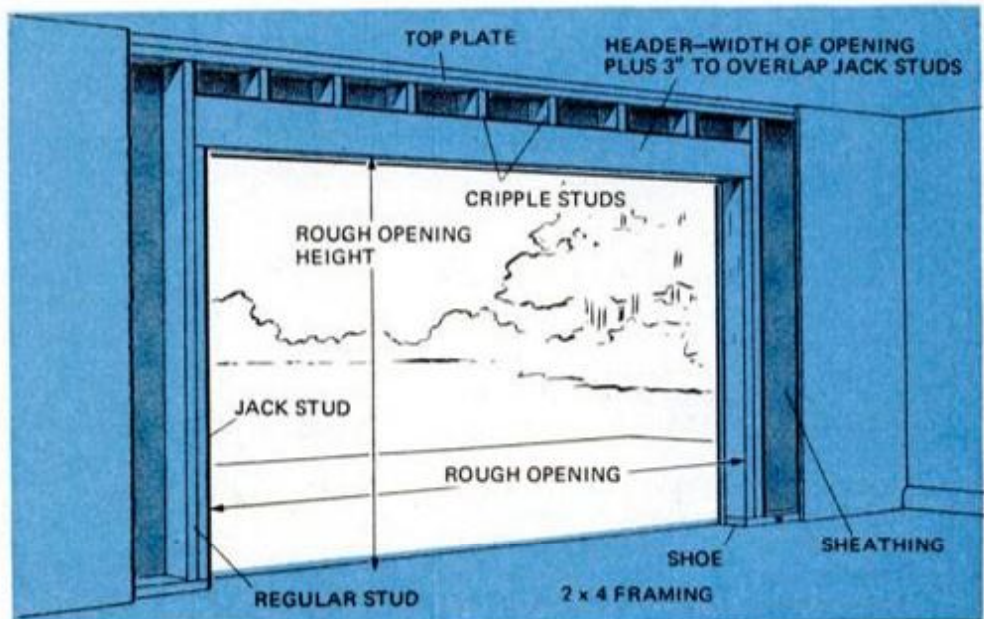
You already have at least one window in the room. Your wall is clean, solid and freshly painted. So you'd be crazy to cut a big hole in it, right? Wrong. Just make sure you cut the hole in the right place.

- Stay away from electrical outlets.

Rewiring will add time and trouble to the project.

- Don't box yourself into a corner; [\(Please turn to page 144\)](#)

Sliding glass doors provide a quick way to enclose a screen porch. You need to frame the opening, but you eliminate insulation, sheathing, siding, wallboard, taping, painting. The Andersen Perma-Shield doors above are double-glazed.



Follow rough-opening dimensions supplied with your unit for framing. The weight load from a second story or roof rafters is transferred to the double studs at each end.

Fill'er up!

Ronnie finished his tree house. And just about finished:

- 1 sweatshirt
- 2 prs. shorts
- 3 T-shirts
- 3 prs. sweatsocks
- 2 bath towels

Gndy made the softball team. Uniform on order. Meanwhile:

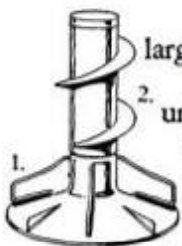
- 1 sweatshirt
- 1 pr. socks
- 3 towels
- 4 hankies
- 2 washcloths



Mom leads the fill'er up parade with:

- 1 tablecloth
- 1 apron
- 3 nighties
- 2 twin sheets
- 2 standard pillowcases
- 3 shorts
- 5 T-shirts

The exclusive Kenmore Dual-Action™ Agitator gets big loads uniformly clean from top to bottom



Ever try washing a really big load in a large-capacity washer with a standard agitator?

If so, the chances are you didn't get a uniformly clean wash. Some clothes got trapped on top, never getting down to the agitator paddles where the cleaning action is most intense.

This large-capacity Kenmore with exclusive Dual-Action™ Agitator lets you really fill'er up. The bottom half of the agitator has the familiar paddles (1.) which slosh back and forth to lift out dirt. The unique, spiral-shaped top half (2.) moves independently with a rhythmic, twisting action which *draws clothes down*

Model #26926 Also available in catalog.

to where the paddles help slosh them clean. The Dual-Action™ Agitator combines twisting and sloshing actions which work together to *circulate your entire washload*. Clothes are drawn down, sloshed clean and sent back up. Not just once, but over and over again.

Ask for a demonstration of a big-capacity Kenmore with exclusive Dual-Action™ Agitator at most larger Sears stores. See how you can fill'er up and still get a wash that's uniformly clean from top to bottom. You'll also find a great selection of hard-working standard capacity washers. Either way what you'll be getting is reliable Kenmore quality. Only at Sears.

Sears

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OPEN UP FOR MORE LIGHT

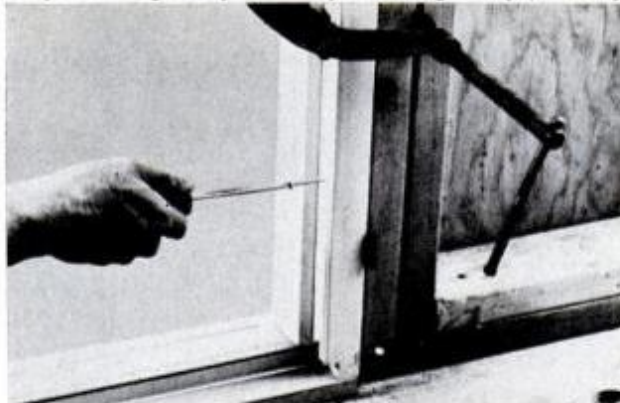
(Continued from page 142)

stay away from the extra corner studs and leave room for trim.

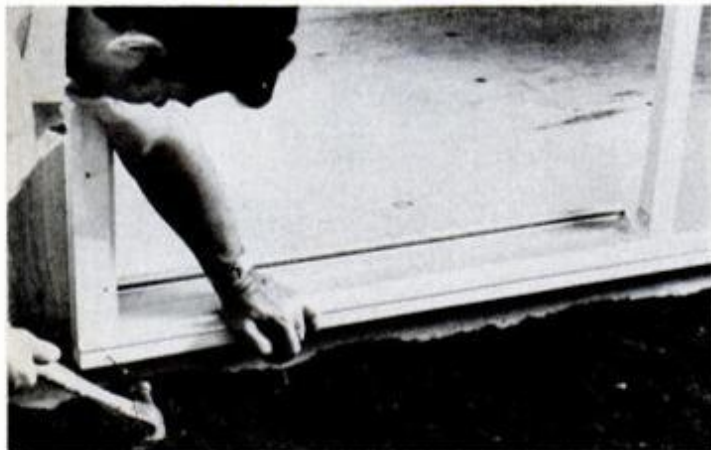
■ Try for an opening 1½ in. in from an existing stud. Add a jack stud and eliminate inside patching on one side.

■ In general, select a unit that matches the style of those already on your house. Matching the sill height and grille pattern will make

(Please turn to page 146)



C-clamps will draw the Perma Shield vinyl flashing against the sheathing. Shim between the frame and stud for a vertical alignment.



The treated sill support is attached beneath the overhanging metal sill with 10d casing nails. You can also glue the joint.



Stationary door panel is installed first. Predrilled holes for fastening of brackets assure proper alignment with the frame.

SNAPPER FAST.



There's only one way to finish your lawn Snapper fast. And that's with a Snapper mower. You can choose one of our V-Series mowers. Or the famous Snapper Comet. Or the new "High Vacuum" Riding Mower with the

optional Bag-N-Wagon that holds 30 bushels. All of them are designed to help you finish your lawn Snapper fast. So that you can spend more time doing what you want to do.

SNAPPER

McDonough Power Equipment, Inc., Dept. PM-71, McDonough, Georgia 30253. A Fuqua Industry. See your Yellow Pages or write for a free brochure. All Snapper mowers meet A.N.S.I. safety specifications.

The nicest lawns of all have a dark even color and grow at a nice even rate. And lawns like this come chiefly from seed that will grow grass like this.

Just asking for bluegrass isn't enough. There are hundreds of bluegrass strains and each has a "Personality." Some get sick easily. Some are fighters. And some come on strong and then fold up on you. It's all in getting the right seed.

Let our plump lively grass seed give you a lawn with some fight to it.

Every seed harvest brings in both the little immature seeds and the older plump fellows. The immature seeds are too weak to be worth much except for filling up the box. So what we do at Scotts is separate the big ones from the small. You get plump lively seeds and that starts you off with a lawn with some fight to it.

Now for bluegrass. The word alone doesn't guarantee you very much.

Special seed mixtures are available in the Washington, D.C. area.

We've thrown out thousands of types of bluegrass. It took us 12 years to be sure of Scotts® Victa Kentucky bluegrass. That it would all come up the same dark green. (All

Victa grass plants are identical.) And that it would resist diseases from rust to leaf spot to dollar spot so it wouldn't up and die on you.

We have a U.S. plant patent on Victa.

And you also ought to know what you don't get.

Coarse "crop" grass. Crop is a group of maverick plants that fight good grass.

They're bullies and about the only way to get them out

of your lawn is with a shovel. They grow in most grass fields, so before we have seed to sell we go out of our way to see that this problem crop is taken out. It takes a lot of digging and some other work too. But we try to put a perfect lawn in every box.

We put our Victa bluegrass in four mixtures and none of them is cheap. But the lawn you get will be the lawn you want: dark and even in color. And if you just do what it says on the box, it will get better and better.

We're the Scotts people.

We've been in the seed business here in Marysville, Ohio, for 100 years.





Metal brackets are screwed to the door and frame at the head and the sill in order to lock the stationary panel in place.



Adjustable rollers on the operating door ride on a rib in the sill. A vinyl thermal barrier runs the length of the sill.



Head stop screwed to head jamb completes track for the doors. Rollers can be adjusted for height.



Nail casing through sheathing into studs with 10d casing nails.

OPEN UP FOR MORE LIGHT

(Continued from page 144)

the window look as if it grew there. This holds true for sliding glass doors.

Headers and sills

Any time you remove a stud you weaken the wall. Where the location of your window or door is not adjustable, you may even have to remove a critical load-bearing support.

Weight carried by the studs you

(Please turn to page 148)

Rockwell faucets. So simple to install...

Right! Rockwell single control faucets for your kitchen or lavatory are so simple to install a twelve-year old can do it. And the twelve-year old young lady you see here has done just that. So have other twelve-year olds. We'll send you their names on request.

She did it using the easy-to-follow instructions that come with each Rockwell faucet, and just two crescent wrenches. You probably have both of them in your tool box.

You'll discover the simplicity of installation is matched by the beautiful simplicity of Rockwell styling. The smooth-flowing lines seem to enhance any decor, cleanly modern through comfortable colonial.

Even the mechanics of your Rockwell single control faucet will be simple. Rockwell single control faucets are washerless. Note,



too, there's a full 5-year warranty for "Drip Free" performance.

Look for Rockwell single control faucets at your hardware or plumbing supply dealer. Then do-it-yourself with confidence.

Building Components Division, Rockwell International, 400 North Lexington Ave., Pittsburgh, PA 15208.



a twelve year-old can do it.



**Walls that live up to
the way a kid lives.
That's the beauty of Masonite.**
Brand Paneling

Nobody is harder on walls than kids. That's why nothing is better on kids' walls than Masonite brand paneling. It's more than beautiful, it's tough. And it wipes clean with a damp cloth.

Look for this Earthwood design paneling and many others at your Masonite dealer. It's a practical way to make a beautiful room for your kids. Man-made finish on real Masonite brand hardboard.



*Room design by
Larry Deutsch, A.S.I.A.*

OPEN UP FOR MORE LIGHT *(Continued from page 146)*



Windows do eventually wear out. Rotting sills or warped sash may be beyond repair.



Remove window, add filler studs and sill to fit new unit. Siding stays intact.



Add sheathing over new framing, cover with tarpaper and set in the window.

Introducing Dow Corning® silicone rubber coating. The roof-to-basement brush-on maintenance/repair coating.

Get versatile silicone rubber performance with brush-on convenience with long-lasting Dow Corning silicone rubber coating. Because it's silicone rubber, it lasts five times longer than most asphalt and plastic coatings, covers twice the area, and offers lasting protection against weathering. And because it's liquid, you can brush, roll, or spray it on smoothly and easily.



See your local home center or hardware store for the full line of Dow Corning silicone rubber caulk, sealants, adhesives, and coating.

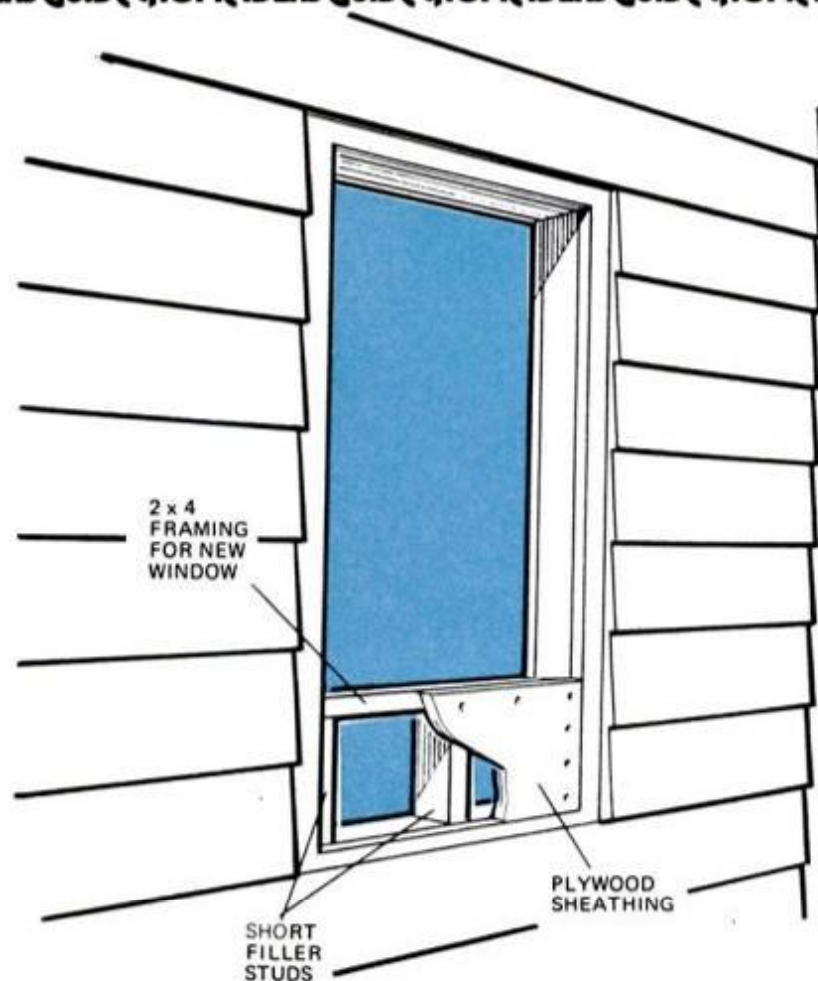
DOW CORNING



1. Seals roof, gable, and dormer additions.
2. Seals roof vents, air ducts, skylights, and eaves.
3. Seals flashings and chimney caps.
4. Seals gutters, troughs, roof valleys.

5. Seals door, casement windows.
6. Patches and repairs masonry, cement, concrete block.
7. Patches and repairs loose shingles.
8. Patches and repairs wood and aluminum siding.

9. Rustproofs drains, plumbing joints.
10. Rustproofs underside of sinks, dishwashers.
11. Weatherproofs air conditioner covers.
12. Rotproofs wood.



take out must be transferred to double studs at each side of the opening with a header. On a moderate-sized window, two 2x4s spiked together will do. Nail header between the side studs; support each end with a jack stud. The space between these jack studs is the rough-opening width. Play it safe and increase the dimension required for your unit by 1/4 in. This will give you room to shim for perfect alignment.

The header over a sliding glass door must be stronger to carry the weight of a second story wall and roof rafters. *Tip:* overbuild rather than skimp on material. In many new development houses cracks appear in the wall around openings. Insufficient headers above and beams below are often the cause.

To be safe, use double 2x6s for a 5-ft. slider, 2x8s for a 6-ft. unit, 2x10s for anything bigger. On three-panel sliders, use 2x12s. If weight from above causes your header to deflect (the engineering term for sag), your doors won't glide smoothly.

You can install a slider right on the finished floor or cut the flooring away, install it on the plywood deck-

(Please turn to page 150)

There are a number of reasons for owning a Bolens[®] Mulching Mower.

Patent #3,085,386 is one of them.



This is the mower that takes care of its own grass clippings. Saving you time and work.

The unique fully-enclosed mower housing sets up the grass with suction. Then, the exclusive multi-pitch blade cuts and re-cuts the clippings into a fine mulch that's blown down into your lawn.

So you won't have to bag or rake. But you do have to

make sure you ask for the Bolens Mulching Mower. It's one of a kind.

The housing, blade and mulching action are fully-patented.

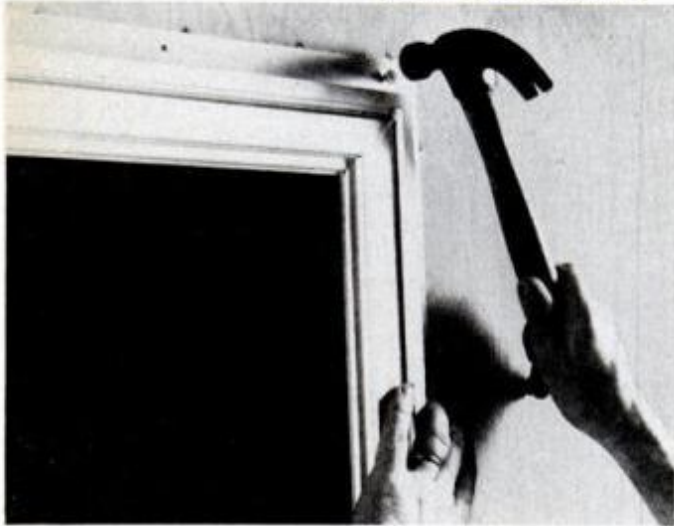
Other features include front wheel drive and Grip 'n Go safety control. You can choose manual or electric start. Or self-propelled or push models.

For the name of the Bolens dealer near you, check the Yellow Pages or write FMC Corporation, Port Washington, Wisconsin 53074.

FMC Consumer Products

Bolens Mulching Mower is a Trademark of FMC Corporation. © Copyright 1977 by FMC Corporation

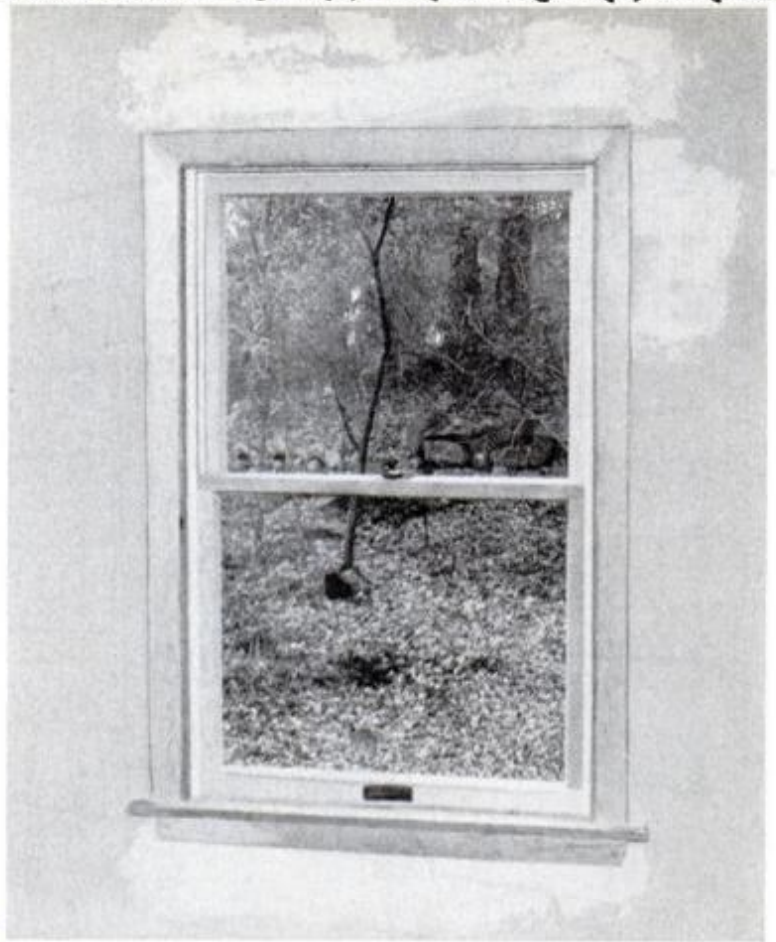
OPEN UP FOR MORE LIGHT *(Continued from page 149)*



The rigid flashing flange is part of the window and is nailed through sheathing into studs. Siding removed from around the opening is recut and replaced.

Remove interior trim carefully. When adding a new window or replacing an old one, fill in around the opening with insulation and patch the interior wall before trimming.

(Please turn to page 152)



Kwikseeze, the water rinsing brush cleaner that removes oil base paints, lacquer, varnish and shellac from hard or wet brushes and rollers. Contains special detergent that speeds-up final cleaning after soaking. Harmless to nylon and natural bristles. Available where paint is sold.

Our 102nd Year

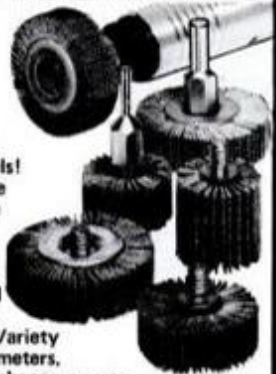
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**REMOVES
RUST
AND
PAINT**



**FLEXIBLE MINI
POLISH-GRIND WHEELS**

Nothing so slick and easy for cleaning up rust on wheels or tracks, removing paint from wood or metal, shaping and sanding models! These new durable industrial abrasive cloth flap wheels attach to 1/4" and 1/8" chucks, flexible shafts and high speed hobby electric motors. Variety of widths and diameters. Conforms to odd shapes, curves and grooves. Max RPM 15,000.



MERIT ABRASIVE PRODUCTS, INC.
Subsidiary of WHEELING (OH) STEEL COMPANY
201 W. Manville, Box 5447, Compton, CA 90224

MINI GRIND-O-FLEX KIT No. H-CRC.
Introductory Kit contains 5 wheels in 1" to 2 1/2" dia. in assorted grits, with 1/8" and 1/4" shanks. If not available from your Hobby/Craft dealer, order direct. Add \$1.00 for postage and handling. No C.O.D.'s. **\$13⁹⁵**
 FREE Abrasive Tool Brochure for the Hobbyist PM

**No plans for
the weekend?**



Then send for these.

Send us 50¢ and this coupon and we'll send you our new 16-pg. plans book. It contains 14 easy-to-build projects using Z-BRICK brand facebrick, lumber and simple hardware. Projects include plant stands, fireplaces, bookshelves and a unique toy box. Send for your copy today.

Send 50¢ to: Easy Projects PMAE
Z-Brick Co.
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Z-BRICK®

To help him go to work tomorrow, we have to go to work today.

Funny, how cute a kid can be. Trying on your hat for size. Playing that he's ready to go off to work.

But by the time he's old enough, he's going to need a lot more electrical power than is available today.

That's because some parts of the U.S. face serious electrical shortages as early as the late 1970's.

As a result, we have to continue building new power plants, as rapidly as possible—because they take 8-10 years to complete.

He'll need one of those plants. Need it so that new offices and factories can be using its

electricity by the time he's ready for a job.

He'll also need it to benefit from all the electrical things to come. The electric car he'll drive. The electric buses and trains. And all of tomorrow's miracle labor-saving devices.

To make his electric future come true, construction must go on. Your electric company has the know-how, and is ready and willing to get the job done.

So while he's playing at work, it's up to us to get to work.

**The time
to build power plants
is now.**

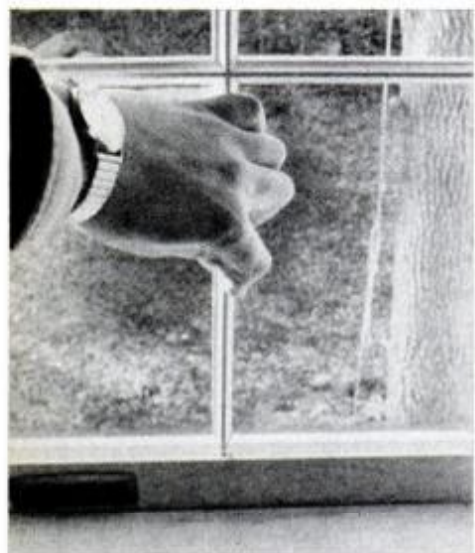


**Edison Electric Institute
for the electric companies**
90 Park Avenue, New York, N.Y. 10016

OPEN UP FOR MORE LIGHT (Continued from page 150)

ing or on top of a new sill (a redwood 2x6 is ideal). All exposed wood should be primed and painted to protect it from the weather.

Safety glass, a must for your security, is specified by building codes in many areas. Although double-paned insulated glass is expensive (a 6-ft. insulated slider runs about \$550), it will eventually pay for itself in fuel savings. ★★★



To remodel with a new window follow these steps: First, pick a window in the style you want that's slightly smaller than the existing one. This way you add to the frame and leave the siding intact. Second, add filler studs, sill, sheathing and tarpaper. Third, install the new window, caulk and replace exterior siding. Fourth, add insulation and wallboard to the interior, tape, paint and add grille clips if desired.

REMEMBER THE NAME
STAY-TITE®
THE BEST IN
REPAIR
COMPOUNDS



As in everything else there is a 1st quality in do-it-yourself materials. Stay-Tite means easiest application, tightest bond, longest life. If it's worth doing at all, it's worth doing right. Stay-Tite products are recommended by CONSUMERS GUIDE and are a POPULAR MECHANICS Product Feature. You'll find the Stay-Tite family wherever top quality home maintenance products are sold. Complete line 18 products. For **FREE GUIDE** to which compound to use to get professional results write: Stay-Tite, 14701 Industrial Avenue, Cleveland, OH 44137.



Aromatic Cedar Closets
Do-it-yourself!

This booklet shows how

It's easy and inexpensive to have the fresh aroma of real cedar in your closets. Giles & Kendall Cedar Panels are applied with nails like any paneling, butt snugly at joints. 100% red cedar. No finishing needed. Send 25¢ for this booklet of easy plans.



GILES & KENDALL, INC.
 P.O. Box 188
 Huntsville, Alabama 35804

PM-3

Please send me your Cedar Closet Plans Booklet. I enclose 25¢.

Name _____
 Address _____
 City _____ State _____ Zip _____

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Guaranteed for 20 Years

- Macco Acrylic Super Caulk will not lose adhesion, crack, bleed, stain or discolor
- Adheres to all common building materials
- May be painted within 30 minutes with oil base or latex paints
- Resists dirt pickup
- Easy to apply
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suggested user price



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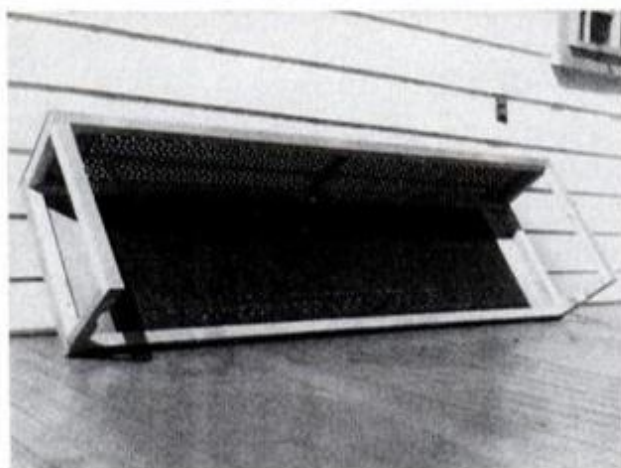
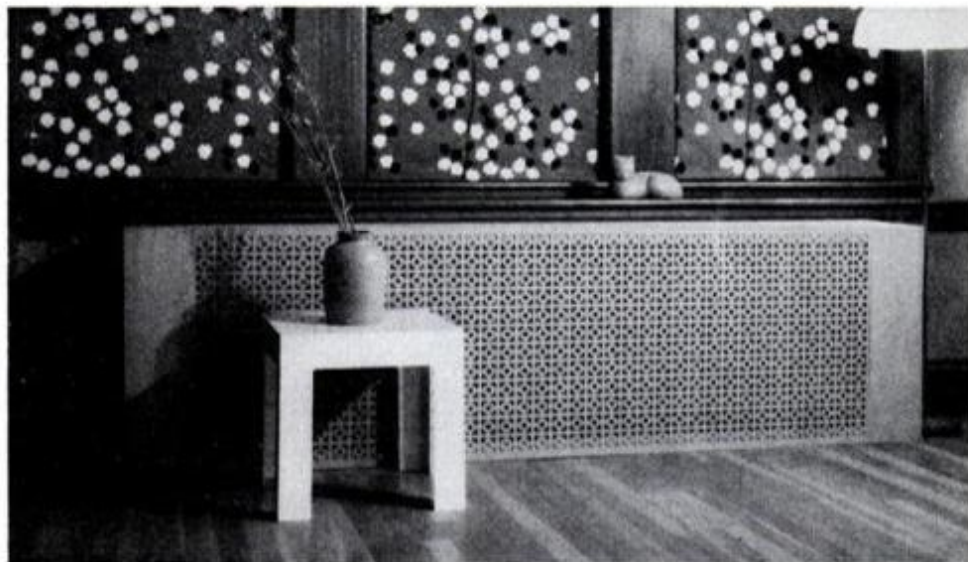
Hide your bulky radiator with this easy-to-make cover

One happily solved problem in my household was how to cover a 7-ft. radiator that doubled as an eyesore. Since it wasn't possible to buy a readymade cover for this monster, I shopped around for an inexpensive but attractive material to make one. The answer was 1/4-in. filigree hardboard, available in a number of panel sizes and patterns.

The panels I installed measure 2x6 ft. By using plywood filler at the ends,

Cut your frame members to size. The front and back are identical, except that the back has no bottom horizontal piece. Butt the boards at each joint and secure them with a dab of white glue and 2-in. finishing nails. Connect front and back with crosspieces.

When the glue is dry, cut the hardboard and attach it to the top with casing nails. The top material—hardboard or plywood if you need the



Filigree hardboard cover (above) hides a monstrous 82-in. radiator. Only two 2x6-ft. hardboard pieces are needed. Plywood filler pieces are attached at ends of cover. It is painted to blend with walls. Valve handle is reached through cutout on the end.

Back view of the radiator cover (left) shows frame construction. Use 1x1-in. stock or rip 2x4s. The top extends over the frame to form a joint with the side panels to be added.

I built the unit with only two panels. If your eyesore is 6 ft. or less pipe-to-pipe, you don't have to use plywood.

First I built the frame. Because 1x1-in. stock is so expensive, I ripped down several 2x4s. Your frame must be long enough to clear the radiator pipe at the ends. If there's a shutoff valve, allow for it. The top should be 1 1/2 to 2 in. higher than the radiator.

filler—should extend 1/4 in. beyond the frame to join with the front and side panels. Add the front and side panels, making sure not to damage the joints as you hammer. If you need access to a valve, make an appropriate cutout on the side.

You can paint the cover with a short-nap roller to make a good-looking disguise.—Robert Lasson



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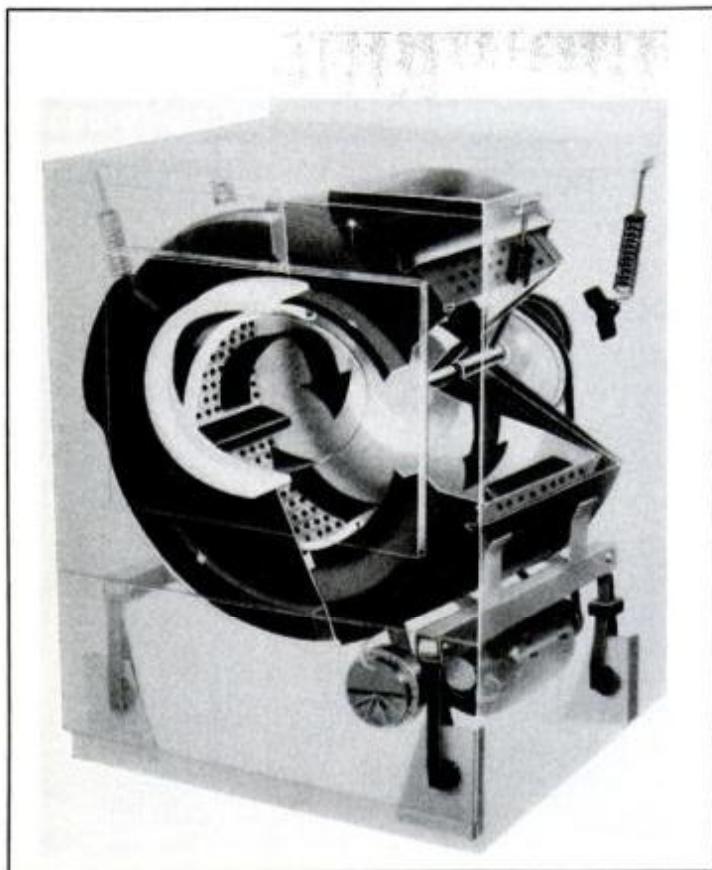
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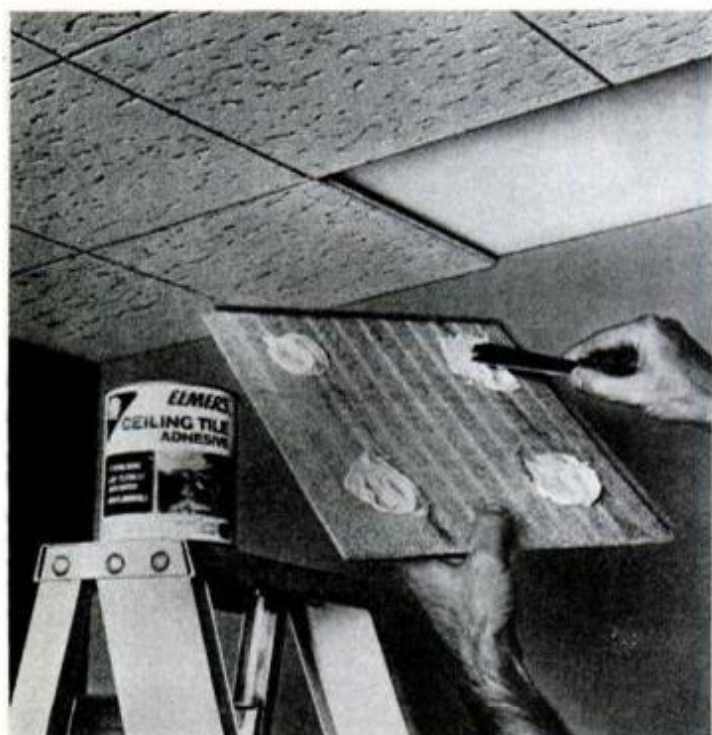
New products for spring



A washer without a center agitator (left) is the New Generation from White-Westinghouse, Pittsburgh, Pa. 15222. Two vanes on the sides of the washtub move clothes as the tub revolves, causing a tumble action like washing clothes by hand. This design eliminates the need for a transmission that drives the agitator in other washers.



This polycarbonate sheet with two walls and hollow channels is good news for the energy-conscious. Called Tuffak-Twinwal and made by Rohm and Haas, it is an excellent insulator that can be used in solar energy collectors, skylights, greenhouses, storm doors and cold-frame glazing.



Four dabs will do it when you're using Elmer's new Ceiling Tile Adhesive. Just apply the dabs to the ceiling tile and press in place for an instant and secure hold. The water-base adhesive is almost odorless, too.



Another good thing in a small package is the Moen Flow-Rator that can save you up to 25 percent of water used, compared to a single-handle faucet with conventional aerator. Water output is three gallons a minute. About \$1.49; Moen, Elyria, Ohio.

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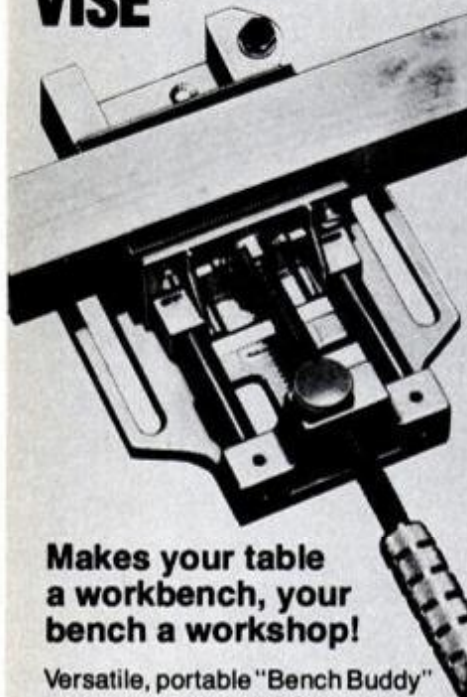
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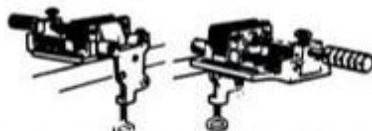
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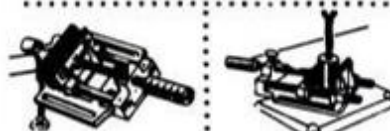


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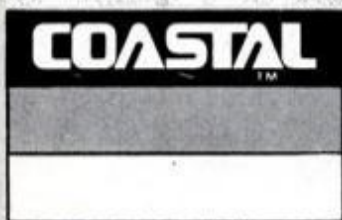


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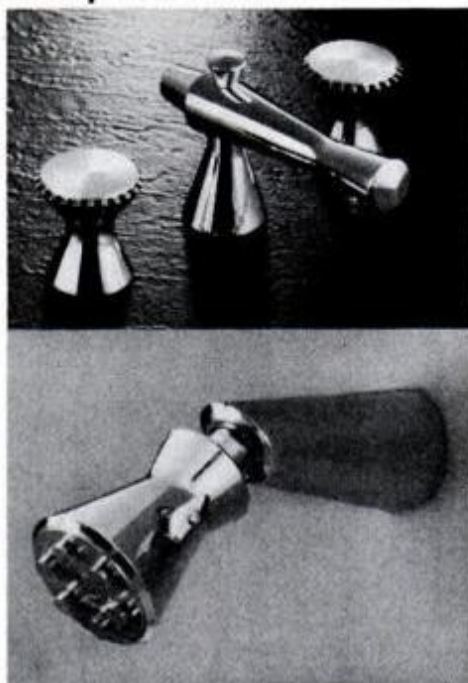


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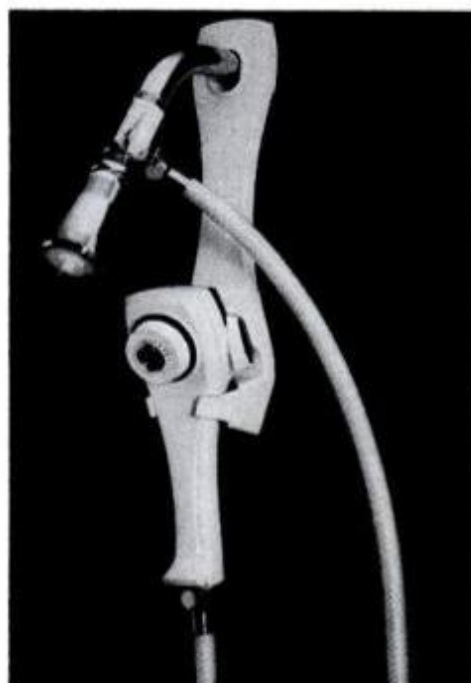


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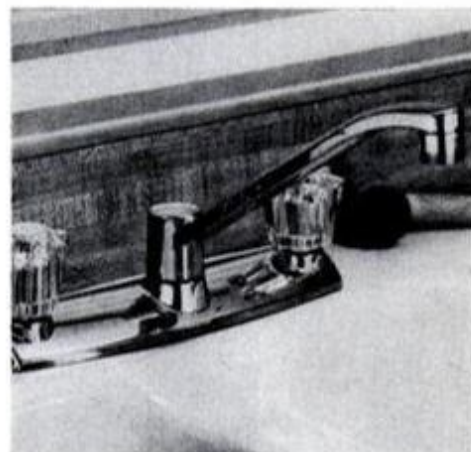


Bravura Faucets (top) are a new addition to the faucet collection of Kohler Co., Kohler, Wis. 53044. Contemporary in style, they're available in either satin or in polished finishes in gold electroplate or chromium. One model in the collection is this lavatory faucet set. Cost is from \$125 up. Also new in the Bravura line this spring is a showerhead-shower-arm combination (above). It's a departure from the traditional "bent pipe" shower arm. It has a built-in automatic flow control that limits water flow to three gallons per minute, which saves water and water-heating costs.

These Crystal-Glo two-handle faucets (right) add a little bit of glitter to the Bradley Corp. line. The decorative handles are of reflective crystal-like acrylic. Kitchen models have an optional hose and spray or swivel spray aerator. From Bradley Corp., Menomonee Falls, Wis. The price is about \$22.



This pulsator hand-shower from Moen is called the Tract Pack. It includes the hand-shower, a 59-in. length of vinyl hose, plastic-chrome diverter and an adhesive-backed hanger caddy. The shower head comes in a mirror-finish chrome. From Moen, Elyria, Ohio 44035. The price of the Tract Pack is about \$28.



The final word in relaxation is this whirlpool bath by Kohler Co., Kohler, Wis. 53044. Four adjustable whirlpool jets with dual air controls provide a pleasing water

massage. A timer and built-in safety grip handles are also included. The whirlpool bath comes in 14 Kohler colors. The price of this luxury is \$1560.

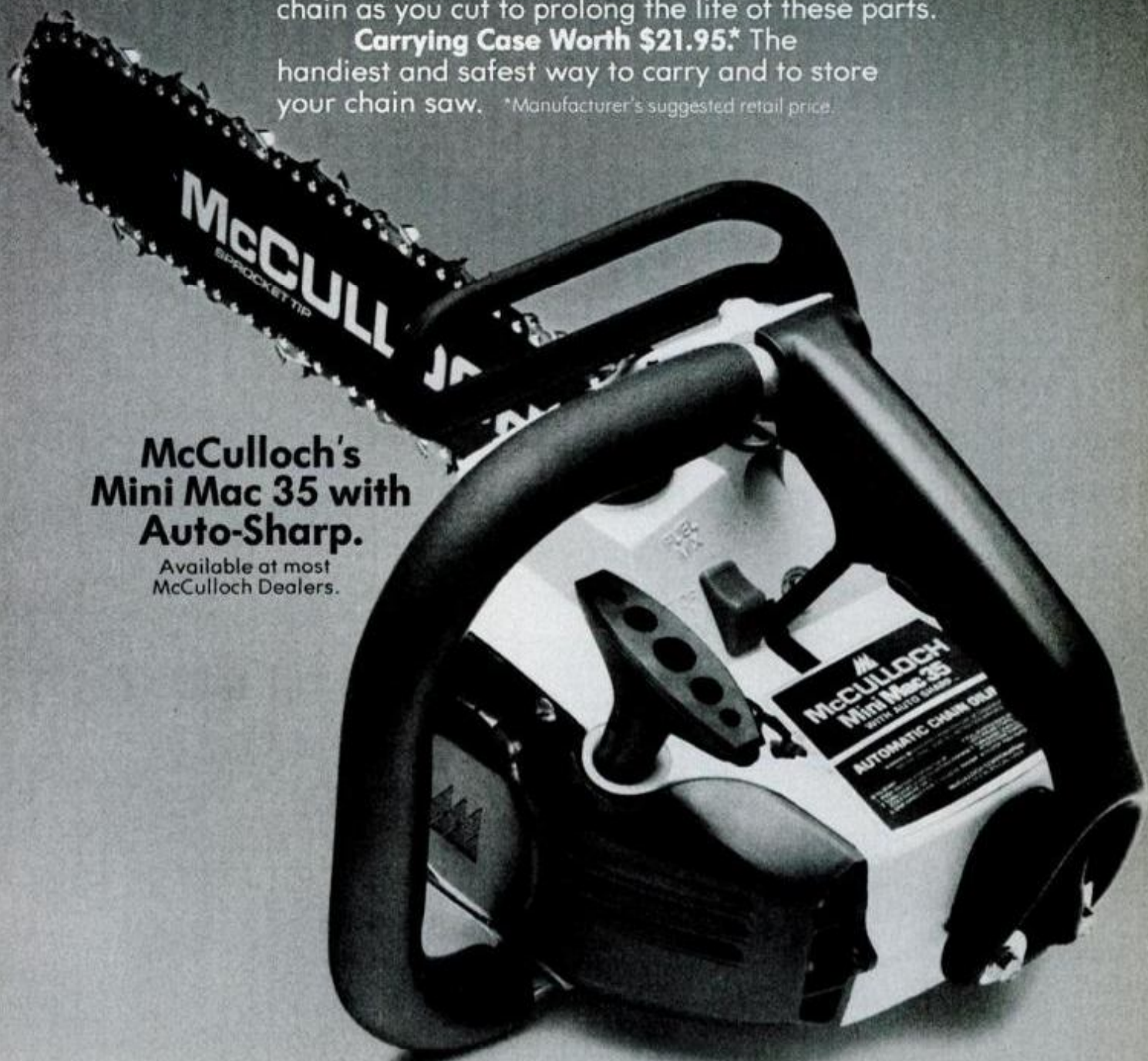
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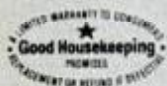
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This lightweight 23-hp hydraulic system powers a range of tools in the 10-g.p.m. class. The Kohler air-cooled gasoline engine operates quietly at low rpm. From General, Inc., Wichita, Kans. 67211.

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Cushioned vinyl flooring is becoming increasingly popular, and more designs are being made like this wood block pattern from Congoleum, Kearny, N.J. 07032. The padded vinyl is laid in a single sheet and the prefinished surface doesn't require waxing.



A new **Touch-N-Cook** computerized wall oven combines with a top-mounted built-in microwave oven to bring you speedy, energy-saving cooking from Frigidaire. The microwave oven has push-button controls. Both have black glass doors. The combination will be available in late summer.



These **Easy Mount disposers** by National are quickly installed and ready for plumbing hookup. Their mounting is said to take half as long as conventional models. Plumbing is simplified by the disposer rotating in a complete circle. Install the sink flange, snap the disposer on and tighten two screws. The disposers range from \$119.95 to \$159.95 from National, Troy, Ohio 45374.

This compact unit combines a 100-watt bathroom light with a 70-cu.-ft.-per-minute ventilating fan. An unbreakable plastic grille covers the light. Broan Mfg. Co., Hartford, Wis. 53027, also makes auxiliary bath heaters.



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Most riding mowers have a tendency to look somewhat alike. As a result, you could be easily misled into believing that they will all perform somewhat alike. You couldn't be more mistaken.

Ariens riding mowers are, first of all, comfortable and easy to operate. Controls are very responsive. The rack and pinion steering and short turning radius make the Ariens riding mower highly maneuverable. The heavy-duty, welded, steel frame and the Flex-N-Float mower

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This dynamic shape in building products is a new import from Mexico. The arched steel panels require no framing or support posts. The zinc-coated, prepainted panels come in clear span lengths of 10 to 120 ft. Each panel has an overlap flange that's sealed with a bead of caulking and simply bolted together. The system is made by Dinamics Frameless Buildings Corp., Box 5-224, Homero 425-203, Mexico 5, D.F. and is a quick way to enclose storage space, carports or farm machinery.



Thru-The-Sink, a new product from Whirlpool Corp., Benton Harbor, Mich. 49022, is a lightweight, 6¼-lb. disposer. Flanges and seals provided are said to make sink installation and plumbing hookup easy.



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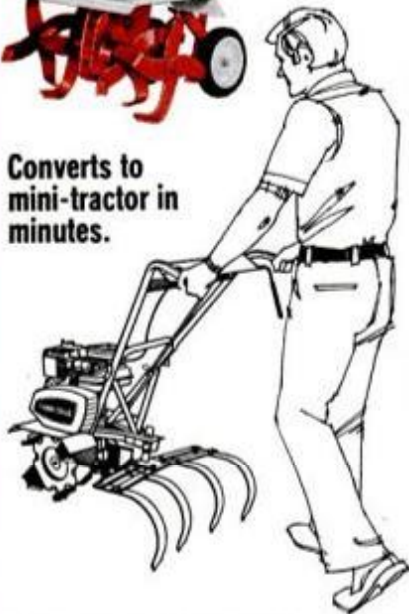
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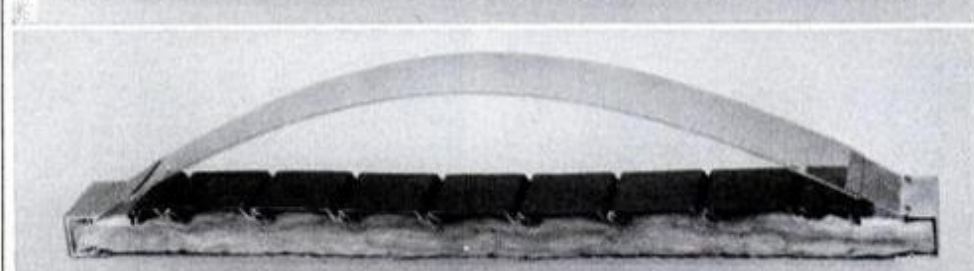
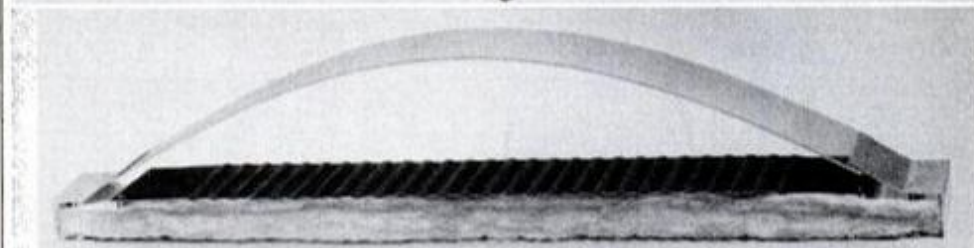
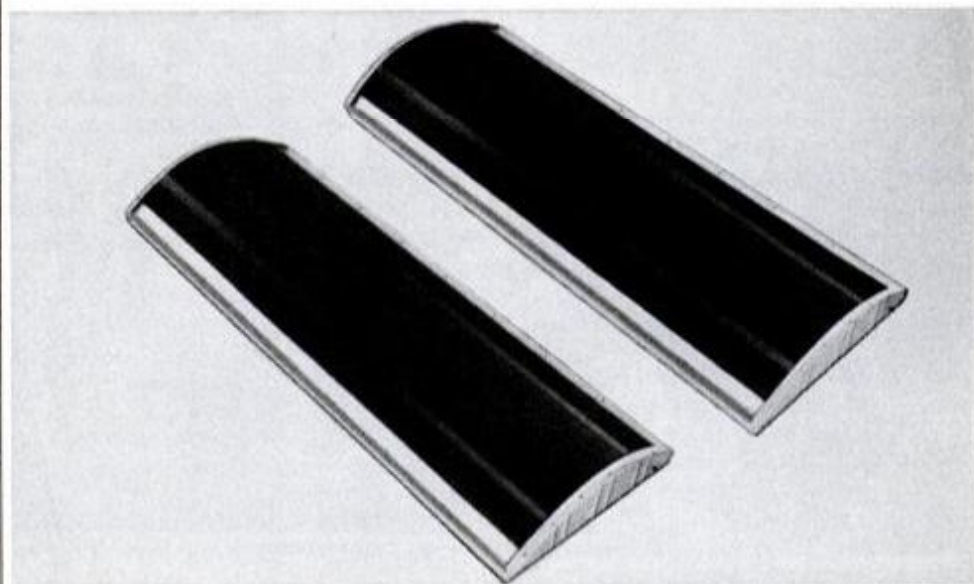
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 City _____ State _____ Plymouth, WI
 53073

HOME IDEAS GUIDE HOME IDEAS GUIDE HOME IDEAS GUIDE HOME IDEAS GUIDE
 New products continued



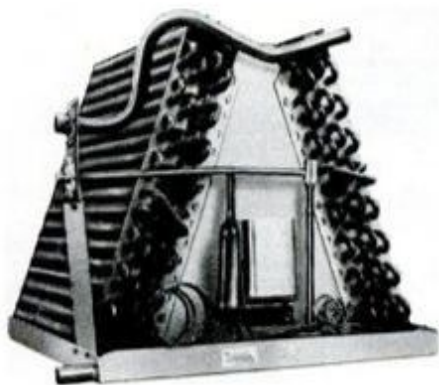
To get the look of exotic wood, in this case pecky cypress, Masonite Corp., 29 North Wacker Dr., Chicago, Ill. 60606, has introduced this new textured siding with wood characteristics reproduced in dur-

able hardboard 4x8 or 4x9-foot panels 7/16 in. thick. The panels are available unprimed or coated in two different tones ready for finishing on the job to your own taste.



Sunstream, a division of Grumman Houston Corp., Ronkonkoma, L.I., N.Y. 11779, makes solar heat collectors with the fluid passages an integral part of the flat-plate

units. The water or air systems move in an insulated plate. Some of the solar collector models are offered with double glazing for added insulation.



The evaporator coil on Climatrol's heat pump permits this system to be used in combination with a conventional forced-air furnace for what are claimed to be substantial fuel savings. The rotary, compressor-powered unit is made by Mueller Climatrol Corp., Edison, N.J. 08817.



The makers of microwave ovens continue to offer additional new features. Black glass doors, a panel with easy-reach controls, a digital clock and a fluorescent cooktop light lead the list of conveniences on Magic Chef's 24-in.-wide unit. The oven also has an electric self-cleaning system. A wide range of models are offered by Magic Chef, Cleveland, Tenn. 37311.



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FROM OUR LABORATORY:

Since 1886 Bon Ami's base mineral has been pure white feldspar. One unusual characteristic of feldspar is that, microscopically, it has far fewer jagged edges, a more rounded, smoother crystal. Other cleaners use silica as a base and this mineral retains jagged edges when crushed and has a greater tendency to scratch and mar many surfaces.

During the late 1800's and early 1900's feldspar was mixed by workers using large metal shovels. After awhile, these shovels looked nearly like silver from the constant mixing of the polishing feldspar mineral.



Unlike most products today Bon Ami Cake and Powder are still made with the same basic ingredients used in 1886. Bon Ami is a natural product that can clean many delicate hard surfaces like glass, stainless steel, porcelain, ceramic tile and chrome without scratching them.

FROM OUR CUSTOMERS:

1. A year ago we purchased a glass topped stove and since that time I have used Bon Ami bars to clean it. I have found this the

fastest, safest and best way to clean the numerous spills and boil-overs that occur in my household. K. D., Oregon

2. My husband is a photographer and uses Bon Ami Cake for cleaning chrome drums and equipment. A. Q., Michigan
3. I live in a mobile home and find it quite difficult to keep the outside windows clean because dirty water runs off the roof. I know your product would do the trick. O. R. L., Washington
4. It cleans road film from auto windows and rain spots from house windows. C. M. S., Arizona
5. I find Bon Ami good for cleaning TV picture tubes and chromium. E. O., New Jersey
6. I am an antique and classic car buff and own a 1955 Chevrolet and a 1937 Chev-



rolet Roadster, both vehicles have lots of chrome and polished aluminum and NOTHING will clean them like Bon Ami. D. W. L., Texas

7. It is the one and only scouring powder that a person with any kind of respiratory condition should use. K. B., New York
8. I found it to be very satisfactory for cleaning my white woodwork. J. L., Ohio

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Unchanged for 90 years,
because it couldn't be better.



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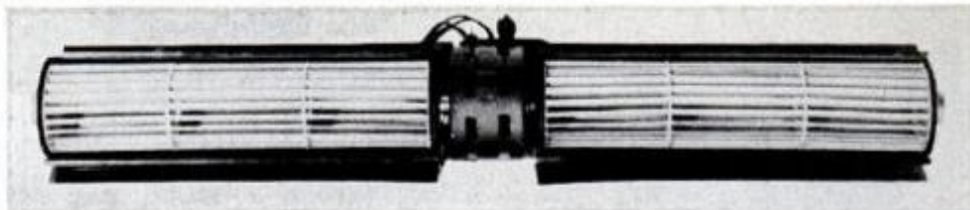
I plan to: buy build remodel

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The beautiful way to save fuel!
Andersen Windowalls



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The fireplace blower above, from Preway, is designed to raise the temperature of a room rapidly and produce more heat in a short period of time. The blower can be installed below the hearth of a Preway fireplace. It's completely concealed after installation. Cost is \$91.80. The wood-burning prefabricated fireplace at right, also by Preway, is said to conserve fuel. It uses air drawn in from the outside for combustion. Cool room air is drawn into a heating chamber that is completely sealed off from the firebox. The air is warmed and then recirculated. This simple circulation system combined with an adjustable damper has a lower burn rate designed to give more room heat per log. The 28-in. model costs about \$614.95; the 36-in. model, \$644.95. From Preway, Inc., Wisconsin Rapids, Wis. 54494.



A dramatic way to add warmth to your room is with this free-standing fireplace by Heatilator, Mt. Pleasant, Iowa. The fireplace comes in six colors. It can be installed almost anywhere there is access to the roof for a chimney and the floor has a non-combustible surface. Cost is about \$407, including an 8-ft. stack.



A trash compactor with many colorful faces is this latest model from Magic Chef. It has reversible front panels, each side a different color, for changing to match a new kitchen decor or new appliance. The price is about \$275 from Magic Chef, Cleveland, Tenn. 37311.



Your food can cook fast in a microwave oven and still have a tempting golden brown appearance with these microwave browning skillets made by Corning Glass. A special coating on the outside bottom of the dish interacts with microwave energy creating heat to brown the food.



The 18-in. wide Space Saver dishwasher from Sears fits in tight places and is an energy saver as well. The hot-dry cycle can be eliminated, saving up to one-third of the electrical energy used during the full run. Other saving features are a choice of two water levels to suit load size and insulation that holds the heat of the washing water longer than noninsulated models. Cost is under \$200.



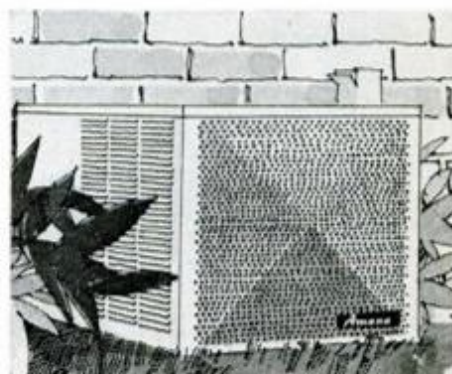
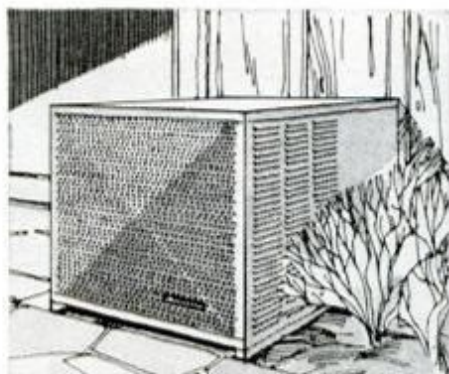
The Memorymatic Model 460 microwave oven from Litton has an automatic temperature control. The oven can be programmed to turn off automatically when food reaches the desired temperature. The model also has electronic touch controls, a solid-state memory system, a variable power control and an electronic timer. The cost is about \$569 from Litton, Minneapolis, Minn. 55441.



The automatic temperature sensor in Litton's Memorymatic microwave oven is placed in the food. Then the oven is programmed to shut off when the temperature selected has been reached.

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Amana Energy Saving Heat Pump Systems can save you 26% to 61%* in heating costs compared to an electric furnace... and give efficient summer cooling.

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The perfect system for complete cooling and heating. Amana's exclusive Heat Transfer Module (HTM™) and outdoor location provide remarkable efficiency and savings. Saves space, too. Plus you get electronic ignition that eliminates the pilot light and stops fuel waste.

**Based on Institute of Gas Technology laboratory tests and projected performance for an eastern Ohio city, compared to published performance for conventional furnaces. Savings will vary with climate and weather.

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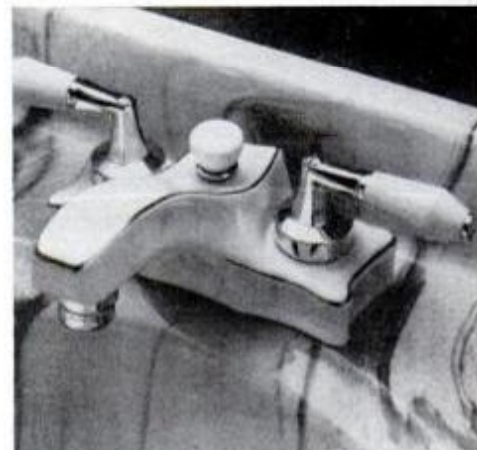
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Waukesha, Wisconsin 53186

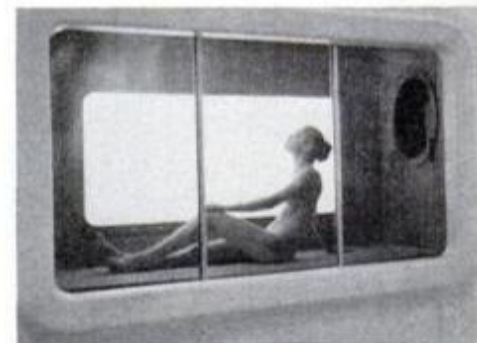
HOME IDEAS GUIDE HOME IDEAS
New products continued



Bathe in luxury inside this see-through cylinder, Bath and Shower in the Round, from Hastings, Lake Success, N.Y. 11040. Bath accessory compartments, mirror, thermostatic mixer control, hand spray and towel holders stay dry behind a panel.



This classic look is aptly named Corinthian. The understated design features a white vitreous china faucet with gold accents and handles of brushed gold with white inserts. From Bradley, Menomonee Falls, Wis. 53051.



To bring the outdoors inside, Kohler has introduced this Environment. The enclosure provides the user with outdoor-like elements such as Baja Sun, Spring Showers, Jungle Steam, Tropic Rain and Chinoak Winds. Just select the type and amount. Kohler Co., Kohler, Wis. 53044.

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HOME IDEAS GUIDE HOME IDEAS



Super-C steel joists and studs from U.S. Steel Corp. are taking the place of wood framing in some single-family homes and garden apartments across the country. According to Collins and Kronstadt, specialists in life-cycle studies, initial construction costs and related life-span maintenance costs are lower for dwelling units with floors framed in steel joists.



A spritely combination of vinyl flooring patterns from GAF is this duo: Play Stripe and Play Square. They're available in both 6 and 12-ft. widths for about \$7.95 per square yard.



It looks like brick, but it's really Masonite Corp.'s new Brick Design on hardboard. The hardboard comes in standard 4 by 8-ft. panels 1/4-in. thick. You have a choice of tan, red or white brick colors in the staggered-brick pattern. The cost ranges from \$15 to \$18 per panel.

HEAVY DUTY STAPLE GUN

No. T-50
\$16.75

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<p>1/4" STAPLE for tacking window screening, shell papers, closet linings, window shades, draperies, etc.</p>	<p>5/16" STAPLE for tacking light upholstery, leatherettes, cornices, quilting for closets, wall decorations, etc.</p>
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<p>3/8" STAPLE for fastening light insulation, roofing papers, electrical wires, weatherstripping, wire mesh, etc.</p>	<p>1/2" STAPLE for tacking underlayments for carpets, porch screening, felt stripping, canvas, fiberglass, etc.</p>
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<p>9/16" STAPLE for tacking metal lathing, cornerite, wire fencing, roof coverings, insulation board, etc.</p>	<p>CEILTILE STAPLE especially made for safe, secure installation of ceiling tile.</p>
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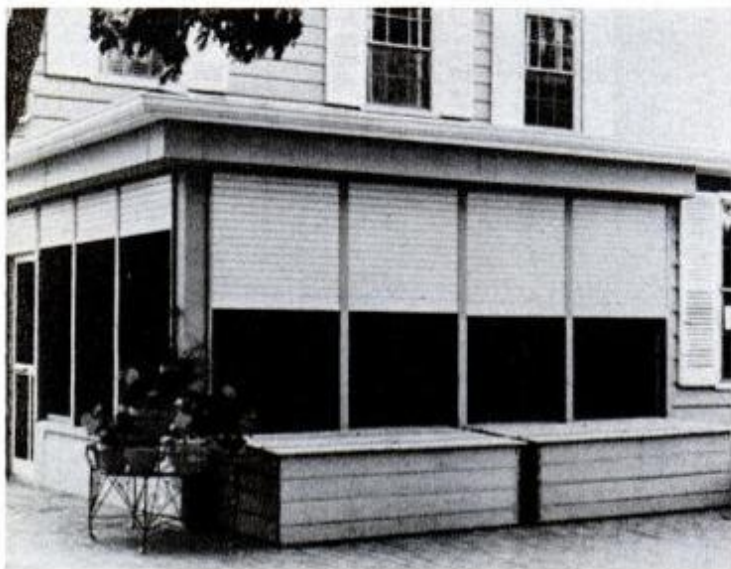
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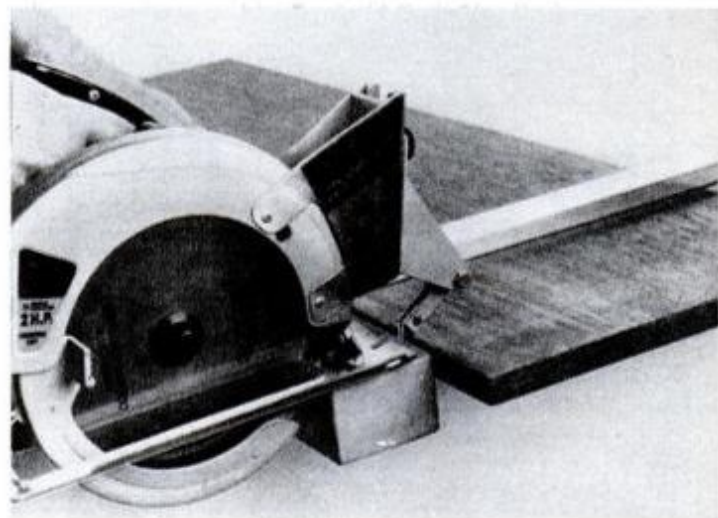
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In Canada: 6505 Metropolitan Blvd. East, Montreal H1P 1X5 Quebec

New products continued

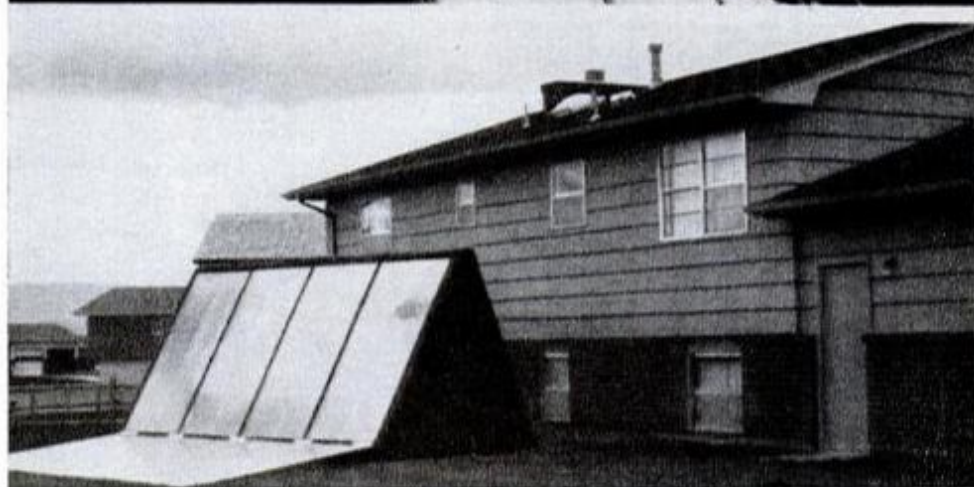
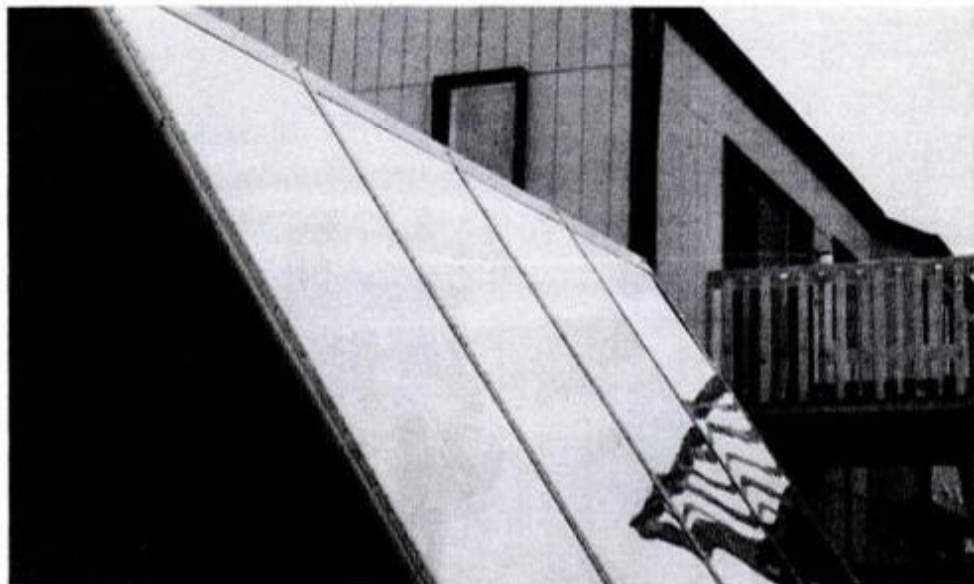


Another entry in energy-efficient products is a light control system of rolling shutters from the Pease Co., Box 510, New Castle, Ind. 47362. A standard 32x44-in. window shutter is about \$108.

This lightweight aluminum saw guide accessory can be attached to any portable circular saw. The adjustable front assembly will score plywood panels and doors prior to blade contact to minimize splintered edges. Penn/Scarf, 561 W. Covina Blvd., San Dimas, Calif. 91773, makes the attachment.






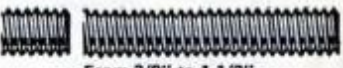

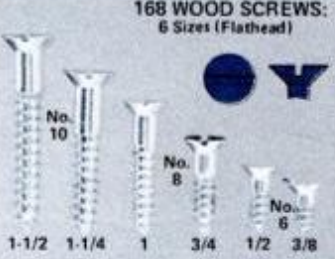
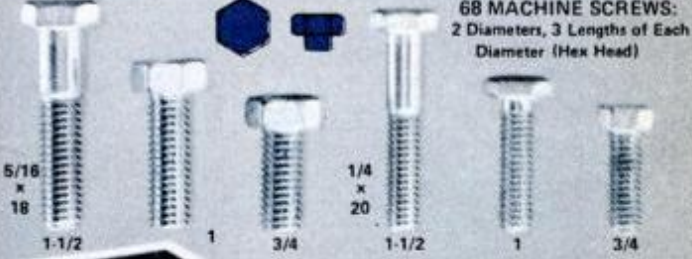
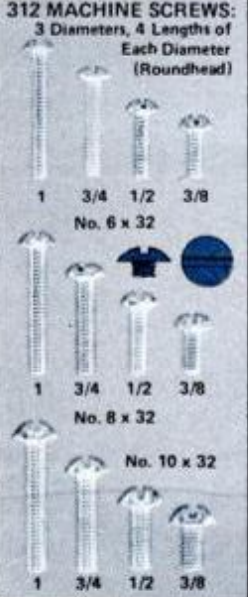




One way to save energy is to get more mileage out of the heat you already have. Broan Mfg. Co., Hartford, Wis. 53027, has introduced a heat-recycling device that pulls hot air from the ceiling down to floor level where you need it. The Heat-Recycler is 2 in. deep, 8 in. wide and 7 ft., 4 in. high. It's made of plastic that can be painted or papered to match your room, and it plugs into a standard wall outlet. Based on a rate of 4 cents per kilowatt-hour, the HeatRecycler should cost under 30 cents a month to operate by drawing only 8 watts of power. The unit is priced at about \$39.95 and should improve efficiency of the heating plant enough to enable you to turn the thermostat down several degrees to save fuel.



There are so many possibilities in the solar heating field that new products are starting to come from many new sources. Champion Home Builders, a company that builds mobile homes and RVs, has introduced an auxiliary solar furnace that's completely independent of the building it supplies and ties into an existing heating system. The building needs no structural changes to permit installation of the system. A combination reflector and collector setup made by Champion, 573 E. North St., Dryden, Mich. 48428, is built to connect to the present ductwork of a forced hot-air furnace.

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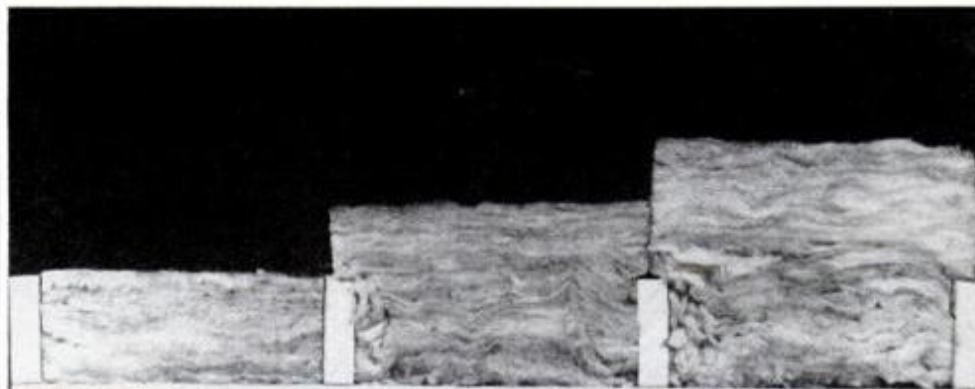
For a free booklet on wood finishing tips, write McCloskey Varnish Co., Dept. F, 7600 State Road, Philadelphia, PA. 19136.



McCloskey Stains & Varnishes

For the love of wood.

New products continued



R-19
(SIX INCHES)

R-30
(NINE INCHES)

R-38
(TWELVE INCHES)

The emphasis on saving energy means more insulation. Owens-Corning, Toledo, Ohio 43659, has made up batts of fiberglass insulation in thicknesses with high R values: 9 in. for R-30 and 12 in. for R-38, either paper or foil-faced, in 16 and

24-in. widths. These new products are being backed up by the company's Energy Efficient Home Program, a research operation that establishes design and performance guidelines in 10 major areas of home construction.

This energy-saving doorsill (right) from Pease Co., 900 Forest Ave., Hamilton, Ohio 45012, cuts drafts over the threshold and heat loss through it. The sill base has a built-in thermal break to cut heat transfer and condensation buildup. Wedges built into a sill track let you adjust the threshold for a perfect seal after the door has been hung. The sill/threshold is made of a space-age polymeric material.

ADJUSTING WEDGE

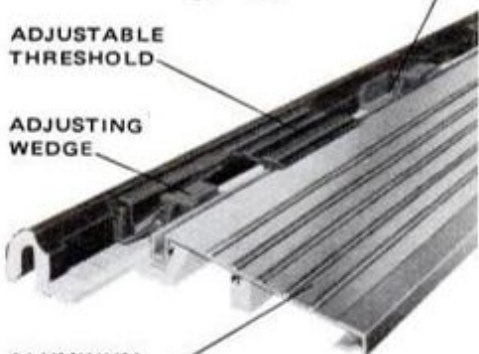


ADJUSTING WEDGE

ADJUSTABLE THRESHOLD

ADJUSTING WEDGE

ALUMINUM SILL COVER



This rigid insulating board comes in 1-in. foam panels. It's applied to framing and foundation (the panels won't deteriorate below grade) to serve as sheathing and insulation along with standard 3½-in. batts. The easy-to-handle, tongue-and-groove Styrofoam sheets are made by Dow Chemical, Midland, Mich. 48640.



Heat-pump manufacturers like the Fedders Corp., Edison, N.J. 08817, have enhanced the value of heat-pump energy systems by getting into the solar collector business. Solar energy warms water in an indoor storage tank to increase efficiency.

Handi-Glaze Latex Glaze in a Cartridge

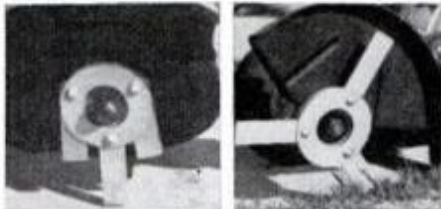


Patented
Glaz-Matic nozzle
for no-mess
perfect
everytime
glazing



the GIBSON-HOMANS company
2366 Woodhill Road • Cleveland, Ohio 44106

IT'S NEW DURAFLEX™ IT'S NEW
EDGER BLADES



Tired of Changing Blades?
Is Edging A Chore?

• Start Enjoying Your Edging For A Change with DURAFLEX™ HTW Inc. Presents A NEW Concept In Lawn Edging Blades. That Guarantees Satisfaction In Perfection Edging.

• DURAFLEX™ Ends That Changing of Rapidly Worn, Flat, Thin, Stock Unit, Giving You many times the "milage" (wear) of the stock blade.

• The NEW DURAFLEX™ Blade with it's three separate, self-sharpening, 1/8" thick cutters, anchored on bushinged axles, allowing each blade to flex back on contact with rocks, concrete etc., yet it will slice thru heavy vines and roots effortlessly.

• DURAFLEX™ insures quality results with minimum effort. Eliminates that "See-saw" or back and forth time wasting energy.

• Not Sold In Stores.

• Satisfaction Guaranteed, or return blade for refund of purchase price
In ordering, specify exact shaft size, Length of your blade, and Brand-name of edger

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HTW Inc., P.O. Box 956,
Arleta, Ca., 91331

• Limited Introductory Price: **\$5.95**
(Allow 3 to 6 Weeks Delivery.)

HOME IDEAS GUIDE HOME IDEAS



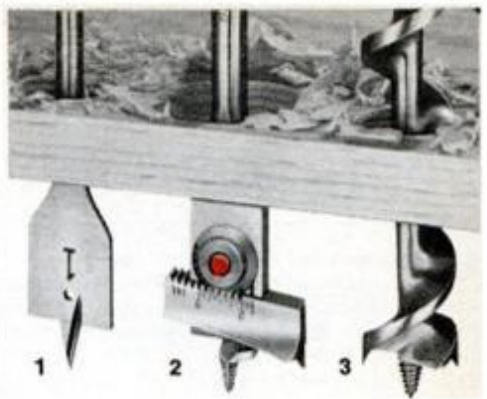
The possibility of energy shortages has increased interest in solar heating systems. The Copper Development Assn., 405 Lexington Ave., New York, N.Y. 10017, represents a number of companies that use copper tubing on copper sheeting in their collectors. The reason for the increase in the use of copper, they explain, lies in the material's high thermal conductivity and easy fabrication.



If you're really anxious to keep heat inside, you'll get help from Andersen Corp., Bayport, Minn. 55003. It is now offering double glazing on windows and doors plus a removable third grazing layer along with its Perma-Shield vinyl-sheathed units.



Ceiling tiles like those in this new style from Celotex, Box 22602, Tampa, Fla. 33622, emphasize a continuous pattern of boldly embossed designs that don't show the seams appearing between the tiles. The result is a smooth look.



Fast, accurate boring ... 3 easy ways!

1. Irwin Speedbor® "88" wood bit for all electric drills. Spade-type head, original hollow ground point starts and cuts clean and fast in any wood. 17 sizes, 1/4" to 1 1/2". Available individually or in workshop sets.

2. Irwin No. 22 "Micro-Dial"® hand brace expansive bit bores 35 standard holes 7/8" to 3". Just dial the size you need. No. 21 bores 19 standard holes, 5/8" to 1 3/4".

3. Irwin 62T Solid Center hand brace bit delivers double-cutter boring action. Medium-fast screw pitch. Balanced cutting head. 18 sizes, 1/4" to 1 1/2". Available individually or in sets.



Speedbor "88" Sets
Get 6- or 13-bit sets in metal workshop organizer racks.

New Protective Plastic Pouch!

Speedbor "88" 1/4" shank wood bits for electric drills are available individually in new easy-to-store protective pouches . . . to help you care for them as you do all your other fine, quality tools.



Strait-Line® Chalk Line Reel Box.

Every serious do-it-yourselfer should have an Irwin 50 or 100 ft. self-chalking line box. Easy action reel. Leak-proof, damage-resistant aluminum alloy box fits hand or pocket.

Irwin Screw Starter



Marks, starts and threads hole for screw to enter non-metal materials the easy way, with hardly any effort. Can also be used as a "marking tool" when drilling holes. Handiest tool in years for home and workshop. Available from your hardware or building supply dealer, and home center stores.

All items above are available in metric sizes.
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IRWIN® every bit as good
as the name
at Wilmington, Ohio 45177, since 1885

LOOKING FOR IDEAS ON HUNTING, FISHING, CAMPING, BUILDING, TOOLS, ETC.? CHECK THESE LISTINGS. THEN USE THE COUPON BELOW.

WORTH WRITING FOR

625. Rockwell 1977 Buyers' Guide

This full-color 48-page booklet is your guide to Rockwell's Power Tools and Accessories for 1977. Photos and specifications of each Rockwell Tool included along with full descriptions. See the tools that will make your home repairs simple. Just 50¢ from Rockwell.

626. Need Home Fix-Up

You can do home repairs and remodeling jobs that last—the easy way. Colorful brochure gives details on DAP products for a wide range of home fixup and paint-up needs. From DAP Inc. Free.

627. Trading Post

Here's Canadian Mist's Trading Post Catalogue—a colorful booklet which offers rugged, durable—guaranteed items not available in normal stores. For the lovers of comfort and quality, and outdoor men and women. 25¢

628. You can build your own home . . .

If you know how. These innovative kits from Identical Construction Co. will start you on the road to planning and building your own home. Included are brochure, sample working drawing and catalog sheets. 25¢

629. Do It Yourself . . . from Dow

This 16-page full-color booklet describes Dow Corning's Home Maintenance Products which include silicones, caulks, sealants, lubricants, coatings and more. See some helpful cost-cutting do-it-yourself repair ideas and tips on the best way to use silicone rubber sealant. Free.

630. Year Round Power . . .

from your garden tractor. Ariens, makers of riding mowers, lawn and garden tractors and rotary tillers—shows you their full line in these 2 large full-color brochures. You'll see how Ariens can help make your large or small gardening chores easier. Both booklets are free.

631. Nuts & Bolts To You . . .

Here's a wall-sized reference guide to the use of nuts, bolts, screws, washers and other fasteners as well as head types. Also included in this useful chart is information on diameters, lengths, threads, wrench and drilling pilot holes. Made available by DRI Industries for 75¢.

632. Why Wait For The Plumber . . .

When you can do it yourself? Rockwell International offers this 44-page Step-By-Step Plumbing Guide which includes features on how to prevent emergencies, how to use plumbing tools and how to plan new installations. The illustrated instructions are easy to follow. . . Send for this valuable book for only \$1.50.

633. Let The View Come In To You—

Here's an attractive 24-page full-color folder which provides information on different types of windows and doors. Plus,

you'll see Perma-Shield's sash and frame which come encased in a rigid vinyl sheath—so there's less maintenance for you. Free informative booklet from the Andersen Corp.

634. Plant A Redwood Shelter In Your Garden . . .

This handsome 12-page booklet features a variety of beautifully-photographed garden shelters, a guide to selecting the proper grades of redwood, plus many useful construction and finishing tips. It's from the California Redwood Association and it's only 35¢.

635. Choose the right one!

Select the tiller that is right for you. Gilson, America's largest producer of rotary tillers has nine models to choose from, 2 to 8 h.p., compact and full size; till, cultivate, edge flower beds, beautify your yard and garden, build better soil. Free colorful brochure.

636. Spring Is Fix Up Time—

and Woodhill Chemical offers these full-color leaflets to help you get a head start on all those repairs including fixing leaks in basements, plumbing and gutters. Free.

637. What caulk and sealer to use where . . . and why.

Here's an illustrated 4-page brochure from the Gibson-Homans Co. which describes a variety of household sealing and repair problems and tells how to solve them. . . Included are hi-grade acrylic sealants as well as more economical asphalt-based compounds for sealing and repairing everything from asphalt and concrete drives to caulking windows and doors. Free.

638. BE A MR. FIXIT

You can do it yourself and Stay-Tite makes it easy. See their full line of products to seal, caulk, or patch driveways, roofs, walls and window. Free from Stay-Tite Home Maintenance Products.

639. Creative Paneling Ideas

Here's a full-color 24-page booklet that features conventional as well as unusual ways to use paneling in every room in the house. The section on feature walls illustrated do-it-yourself ideas that will produce dramatic results with minimal effort. It's from the Masonite Corp. and it's just 50¢.

640. MAN-SIZE TRACTORS

Here's a 16-page 4-color booklet from Economy Brand Tractors. There's description and specifications, plus information on 21 attachments for lawn, garden, field and forest. See Economy's bigger, tougher, stronger, gear-drive tractors. Free.

641. A Beautiful Way To Prevent Rust

Ferrothane Plastic Finish with Rustaid is the prescription for rust—it protects metal surfaces by creating a smooth hard plastic coating. You can learn more about Ferrothane liquid plastic and see all the colors available in this free color booklet. Also included are full-color brochures showing other fine stains and paints.

Popular Mechanics 4/77
Box 1718, Sandusky, Ohio 44870

This Coupon Expires June 30, 1977

Please see that I receive the items checked below. I have enclosed 35¢ for the overall service charge, plus remittance for any priced items.

- | | | | | |
|----------------------------------|-------------------------------------|----------------------------------|----------------------------------|------------------------------|
| <input type="checkbox"/> 625 50¢ | <input type="checkbox"/> 629 | <input type="checkbox"/> 633 | <input type="checkbox"/> 637 | <input type="checkbox"/> 641 |
| <input type="checkbox"/> 626 | <input type="checkbox"/> 630 | <input type="checkbox"/> 634 35¢ | <input type="checkbox"/> 638 | |
| <input type="checkbox"/> 627 25¢ | <input type="checkbox"/> 631 75¢ | <input type="checkbox"/> 635 | <input type="checkbox"/> 639 50¢ | |
| <input type="checkbox"/> 628 25¢ | <input type="checkbox"/> 632 \$1.50 | <input type="checkbox"/> 636 | <input type="checkbox"/> 640 | |

Total items requested _____ Total money enclosed (including 35¢ service charge) _____

Name (Please Print) _____

Address _____

Town _____ State _____ Zip Code _____

(Please send cash, check or money order made out to POPULAR MECHANICS. No stamps, please.)

Note: Popular Mechanics processes your requests for the above information and forwards these inquiries to the organization making the offer. Each company mails the material directly. Please allow 4-6 weeks for delivery.

Survival—at bargain rates



For \$2 or less, a belt pack can be filled with gear (left), including an empty cartridge to whistle signals for help.



Bundled in a do-it-yourself tube tent made from two plastic garbage bags, a hiker is protected against exposure. Rig can be folded to fit in a pocket.



Cold conditions can be countered with candles to cook with and help start a fire of wet wood while warming bouillon.



Food and warmth from minimum supplies are available by stowing candles, lighter, waterproof matches, instant soup, coffee, small individual restaurant packets of honey, sugar, knife, string, aluminum foil and wire, garbage bags, Scotch tape.

Kit contents

Tube tent and repair tape
One or two 5-inch candles
Container of waterproof matches
Flint and steel with tinder
Sharp, rugged knife
Wire and string
Aluminum foil
Spent cartridge (whistle)
Several packets: sugar, honey
Individual servings: coffee, tea
Soup packets or bouillon cubes

by Wes Blair

Is your life worth a \$2 investment? It takes only about that much to assemble a kit that may keep you alive during an outdoor emergency. You can go 30 days without eating, three days without water, but exposure to bad weather can kill you in as little as three hours. Yet a garbage bag or a candle can save your life if you've packed it along and know how to use it.

Mountain rescue units and military survival experts agree that the most important kit item is some form of instant shelter such as a tube tent. Other necessary additions are tools, signaling devices, fire-making gear and rations. All should be light and compact enough to carry in a small box or case in a pocket, pack or belt packet.

Make your own tent

You can make a fine tube tent by

taking two full-size plastic garbage or leaf sacks, slitting the bottom open on one of them and taping the two sacks together. The 7-foot-long result can provide a water and wind-proof shelter that is remarkably warm in cold weather and can be folded into a pocket-sized pack.

Fire starters

The warmth, light and cooking abilities of a fire offer a bonus psychological boost, but often there is no dry fuel around. As a substitute, two 5-inch candles can supply enough heat to cook a cup of soup or tea and also work well as fire starters for wet fuel. In addition, carry safety matches coated with fingernail polish and stowed in a waterproof container with a sandpaper striking surface glued inside. Add a small butane lighter. They work dependably down to about 30° below. And include a

flint and steel with some shreds of charred cloth for tinder.

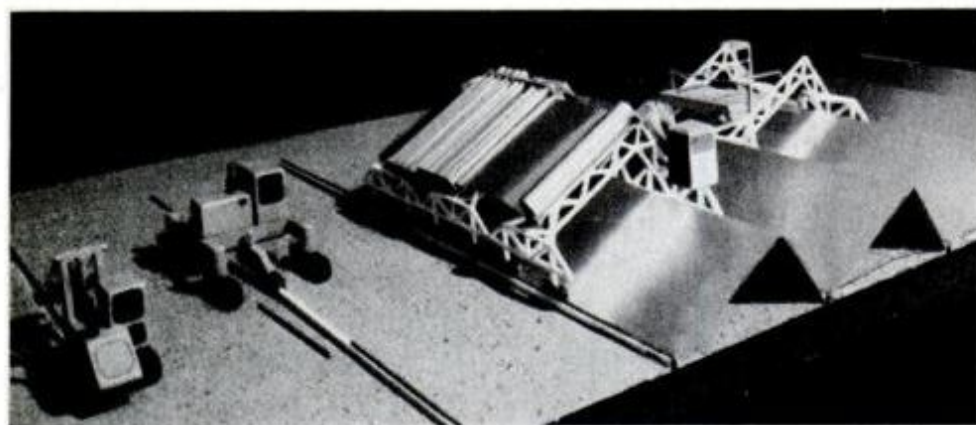
Tools and signals

First, pack a very sharp, rugged knife of good quality. A wire saw can also cut wood easily. Tape is useful for repairing tube-tent tears and a ball of twine can help pitch and rig it. A coil of wire is helpful and, with aluminum foil, can be used to make cooking utensils.

Your aluminum foil can also work as a makeshift signaling mirror. For noise, blow across an empty cartridge. This makes a signal whistle.

Rations

Most survival emergencies last only two or three days, but during cold weather you should include energy foods like small packaged honey servings from restaurants, powdered coffee, chocolate and soups. ★★★



Central photovoltaic solar power stations are under study by ERDA. Burt, Hill & Associates, Butler, Pa., built model, designed special machines to erect complex system.

coil unit causing it to operate as though it were removing heat from warm outside air. A duct system allows this coil to draw on outside air when the solar-heated water is not hot enough, as well as during the cooling season.

Other solar-assisted systems use water-to-water heat pumps. Whereas conventional heat pumps are air-to-air, this system allows the pump to draw directly from the solar storage tank.

Solar airconditioning

While solar heating is coming of age, the use of solar energy for airconditioning is still in its infancy, but growing fast. Most units are in commercial buildings.

In solar airconditioning, an absorption chiller is used to convert hot to cold by evaporation. The more rapidly it takes place, the cooler you feel—the reason alcohol, for example, feels cool on the skin as it evaporates rapidly.

To operate effectively, absorption chillers need solar-heated water about 200° F. Such installations use high-temperature evacuated tube or concentrating collectors.

Evacuated tube collectors have a vacuum inside and a center pipe through which water flows. The vacuum causes the collector to act like a Thermos bottle and retain heat up to 600° F. Because of its shape, a tubular collector does not expose much of its surface to the sun and is, therefore, not as efficient when used in low-temperature operations.

Another way to go for high levels of heat from sunlight is to use concentrating collectors. These are shaped (generally in a U-type configuration) to concentrate sunlight onto a small area with lenses over the top of the collectors. They need direct sunlight to operate effectively,

which means they must have tracking mechanisms to follow the sun across the sky. If you live where there is not much direct sunlight and therefore lower cooling loads, as in the Northeast, the use of concentrating collectors is hard to justify.

On the other hand, in the Southwest, where there is a lot of direct sunlight and a heavy cooling load, concentrating collectors reasonably can be used to drive absorption chillers.

Solar-powered airconditioning is still expensive. A residential-sized absorption chiller runs around \$3000 for the equipment alone. Couple this cost with the need for a backup system, and it's not hard to see why

MEAN DAILY SOLAR RADIATION (LANGLEY)	HEATING DEGREE DAYS		
	0-2500	2500-5000	5000-9000
350-450	1	2	3
250-350	4	5	6
175-250	7	8	9

solar airconditioning hasn't caught on yet.

Electricity from light

Two methods of converting sunlight to electricity are now being developed. One is the central power station concept where mirrors, concentrating sunlight on boilers, produce steam to drive electric generators. To date, this has been prohibitively expensive.

The second method uses on-site conversion devices called photovoltaic cells. They use one of two materials: silicon crystals, of which sand (a truly abundant fuel source) is a major component, or cadmium sulfide. While the latter is somewhat less expensive than silicon, it is also less efficient, and even with silicon cells a 10-percent efficiency is considered high.

There are promising signs, however, that researchers will soon develop an inexpensive way to make silicon, a development that could trigger widespread use of solar cells rather than collectors to produce energy.

Hot water kits

For the moment though, the largest application of solar energy is for domestic water heating. A number of kits on the market can be installed with existing conventionally fired hot-water systems. The able do-it-yourselfer can purchase such a kit for about \$1000 to \$1200, and install

Chart shows relationship of heat load (degree days) and available solar energy (mean daily solar radiation). Areas that combine highest number of degree days with most langleys (units of solar radiation) will get most economical use from a solar system.

CLIMATE AREAS FOR THE HEATING SEASON



it himself. If you call in a plumber to do the hard work, your bill will be near \$2000.

In the case of space heating, solar architect Rittelmann advises: "If there is enough sunlight and the only alternative is electricity at 5 to 6 cents a kilowatt-hour, or oil at 45 to 50 cents per gallon, some solar space-heating systems are competitive."

From the standpoint of climate, Rittelmann notes: "A space-heating system is more cost-effective in Chicago than in Miami." But even if solar heat is not competitive in your area now, it may be soon—as fuel costs go up and solar-equipment costs come down.

For this reason Rittelmann advises people now building homes to design for solar retrofitting later, if they are not going to install it now. This involves designing for minimum use of energy, providing space for thermal storage equipment (water tank or rock box), and presenting a reasonable southern roof area for collectors.

Buyer beware

If you are planning to purchase a solar system in the near future—beware! As Rittelmann warns,

"There are systems out today that are making claims that are simply not true. Some even claim they are more than 100-percent efficient."

Fortunately, there are several places for the layman to turn for help. The National Bureau of Standards has issued engineering performance criteria for residential solar installations, while NASA has developed interim standards for equipment for nonresidential buildings. A listing of systems approved under these standards for use in a Department of Housing and Urban Development demonstration program is available on request from ERDA Technical Information Center, Box 62, Oak Ridge, Tenn. 37830.

The President's Office of Consumer Affairs also has a booklet entitled *Buying Solar*, which can be obtained by writing to: Office of Consumer Affairs, Public Affairs, Department of Health, Education and Welfare, 330 Independence Ave. S.W., Washington, D.C. 20201.

Check legislation

If you are planning to go solar, check local and national legislation. As of this writing, 12 states have enacted legislation providing property, sales or income tax breaks for

MORE SOLAR INFORMATION

FLAT-PLATE COLLECTORS

Sunworks, Box 1004, New Haven, Conn. 06508.
Solaron, 4850 Olive St., Commerce City, Colo. 80022.

Revere Copper & Brass, Rome, N.Y. 13440.
PPG, 1 Gateway Center, Pittsburgh, Pa. 15143.
Ecosol, 2 West 59th St., New York, N.Y. 10019.

EVACUATED TUBE COLLECTORS

Owens-Illinois, Box 1035, Toledo, Ohio 43666.

CONCENTRATING COLLECTORS

Northrup, 302 Nichols Dr., Hutchins, Tex. 75141.

SOLAR AIRCONDITIONING

Arkla, 400 East Capital, Little Rock, Ark. 72203.

GENERAL INFORMATION

National Solar Heating & Cooling Information Center, Box 1607, Rockville, Md. 20850.
Solar Energy Industry Assn., 1001 Center Ave. N.W., Washington, D.C. 20036.

homeowners installing solar equipment.

Undoubtedly, as time goes on there will be more and more reasons to go solar, and more people will. Viewing the future, Rittelmann feels that "This idea that solar is 5, 10 or 15 years away is ridiculous. If 'being here' means that it will handle 30 percent of the nation's energy needs, I don't think solar will ever be here. By the same token, if you mean common applications that are cost-effective, that exists today." ★★

A dirty carburetor can be a real problem.



This can be a real help.

Meet STP Carburetor Cleaner. A spray. Its needlenose can get into tough places—to help clean throttle plate, choke, linkage, and the PCV valve. The varnish and gum can actually dissolve before your eyes. STP Carburetor Cleaner. Could be what you need.

Right now. **STP**
Carburetor Cleaner

MURDER OF THE ORIENT EXPRESS

(Continued from page 75)

cushion jolts as the wheels hit the gaps between adjoining rails. On Alpine slopes, passengers gained reassurance from a recent invention by an American engineer named George Westinghouse. His air brakes automatically equalized the braking force on all wheels simultaneously. This eliminated the danger of pile-ups on downgrades—a frequent occurrence when a brakeman in each car, starting in the last car, cranked "brake" wheels in sequence to slow the long train.

In later years, the Orient Express ran in alternate sections, each following a different route. One skirted Lake Geneva and cut through the Alps at the Simplon Tunnel, reaching the plains of Lombardy at Milan, and then headed eastward via Venice and Trieste. The other crossed the Alps at the spectacular Arlberg Pass in Austria, climbing high above the tree line to the very edge of the glaciers, then traversed the deep valleys of the Tyrol and followed the Danube past Vienna into the Hungarian plains.

Despite the train's name, neither section ever reached the Orient, the

eastern terminus being Turkey. But Istanbul with its minarets and Moslem flavor seemed sufficiently exotic to most Europeans to evoke images of the Far East.

Special engine

My favorite waystop on my trips to Uncle Ludwig was the Tyrolean capital of Innsbruck, a picture-postcard city of domed towers nestling under mountain peaks. I wanted to see the special mountain locomotive that would take us over the Arlberg Pass. Despite my mother's warning that I would be left behind (and presumably lost forever), I ran all the way down the platform to watch the engines being switched. The regular express engine which brought us from Vienna was tall and graceful, with two huge pairs of drive wheels whose large circumference maximized the distance covered with each piston stroke.

It was replaced by a squat engine hunching over six pairs of small wheels whose combined rail contact would increase traction. Puffing and straining through narrow valleys, its steamy breath echoing from the rocks and its busy little wheels often spinning on the incline, this powerful, low-slung locomotive reminded

me of a giant dachshund burrowing through the mountains. I regarded it with fondness and fascination, and missed it deeply when the steam locomotives were later replaced by diesels that adapted to varying terrain simply by switching gears.

Change was bad

The period after World War II was not kind to the Orient Express. Both technical and social change gradually robbed the great train of its unique character. Aviation became the preferred mode of long-distance travel, and the new governments of Eastern Europe frowned on luxury. When I rode the Orient Express for the last time two years ago, returning through Yugoslavia from a vacation on the Dalmatian coast, the train was almost unrecognizable. No flowers, no silk, no tassels, no heel-clicking.

History has entered another phase and brought the great train to its last run. The Orient Express that I remember from my boyhood marked a vanished way of life—a life of leisured elegance. But in today's world, even the rich are in a hurry and have taken to the air to form a new social category—the jet set. ★★



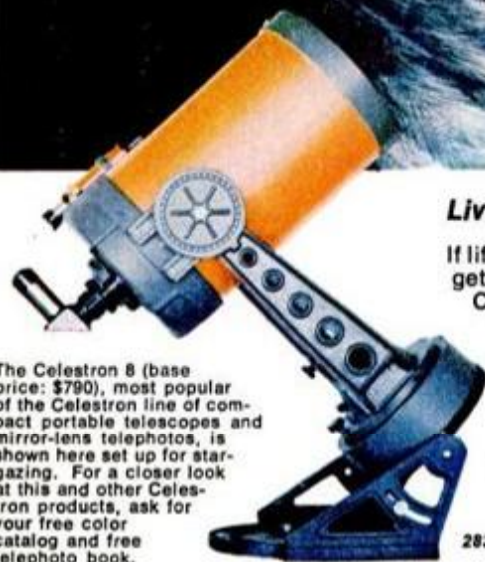
Eagle at 30 ft. Photographed by W. Beecher with the Celestron 1250mm, f/10 Multipurpose Telephoto Lens.

Saturn's Rings. Photographed with Celestron 14 Telescope.



Orion Nebula
Celestron 8

Squirrel at 75 feet
Celestron 1250mm, f/10



The Celestron 8 (base price: \$790), most popular of the Celestron line of compact portable telescopes and mirror-lens telephotos, is shown here set up for stargazing. For a closer look at this and other Celestron products, ask for your free color catalog and free telephoto book.

Live A Little.

If life is about any one single thing, it's about getting closer to the things that interest you. Celestron Telescopes help you get closer. Whether the subject is the muscular structure of an eagle's eye at 30 feet. Or the planet Saturn — one hour, 11 minutes away at the speed of light. If you want to get closer, look into the world's best-selling modern telescopes. Live a little.

Celestron International
2835 Columbia, Box 3578-EC
Torrance, Calif. 90503

Celestron

Dodge Power Wagon... lowest priced four-wheelin' pickup built in America.

The Dodge Power Wagon carries a lower base sticker price* than any other four-wheel-drive pickup built in America. Lower than Ford, lower than Chevy, and even lower than Jeep. And it's the only four-wheel-drive pickup available with

a Club Cab. The Dodge W100 base price is the lowest of all four-wheel-drive pickups built in America.

Backed by 40 years of four-wheel-drive experience, today's Power Wagon gives you four-by-four performance full time. It's the latest—full-time four-wheel drive. Designed for deep biting traction to pull you through mud, snow, or up a towering hillside. And you never have to get out of your truck to lock or unlock wheel hubs when going on or off the highway.

When you want four-wheel drive, you want it tough. You want a truck you can count on to carry the load over country that would

whip an ordinary pickup. You want a truck that can take a beating and come out of it looking good. You want a Dodge Power Wagon.

Dodge builds a full line of Power Wagons for 1977, including Club Cab and six-passenger Crew Cab models. Whether you're buying or leasing, whether it's one truck or a fleet, you can count on Dodge four-wheel-drive Power Wagons. Special tires shown not available as factory equipment.

**Price comparisons based on manufacturers' suggested retail prices, not including destination charge, taxes and options.*



Dodge trucks have got it where it counts.

IT'S NEW NOW



Ski tote can't walk off

Built-in security now is available to skiers, who can tote their boards in rubber-padded clamps with a handle (top), then lock them to a tree or post if they have to be "parked." A 4-foot vinyl-coated steel cable with combination lock is a built-in part of the high-impact plastic unit. \$20; Covell Enterprises, Box 452, Tujunga, Calif. 91042.



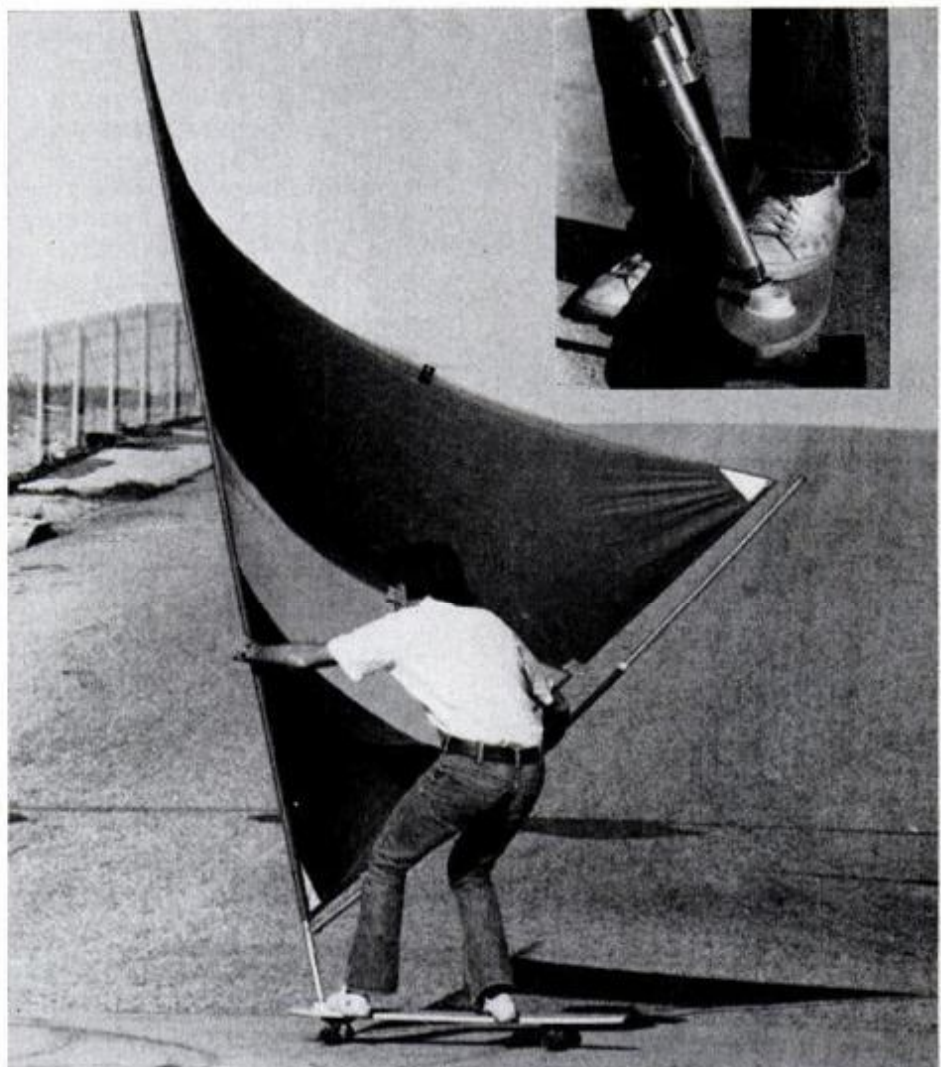
Looking backward all over

See who's creeping up from anywhere. A convex 2-foot 180° rear-view mirror clamps to yours. \$20, Universal Specialties, 15 E. 40 St., New York, N.Y. 10016.



Bathroom music

It used to be magazines and catalogs. Now it's a Rest Room Radio that delivers AM stations and paper. About \$11 plus shipping from Herst, Ltd., 14 Clifford St., London W1X 2NY, England.



Windy skateboarding

Wind-powered skateboarding is the new thing. No hills are necessary if you have a triangular sail with clear plastic window in the middle to see where you're going. Sail, created by a West Coast surfing and skateboard champ, has an 8-foot boom and 12-foot mast, fits in a socket on the skateboard (inset). It's manipulated by hand to achieve speeds up to 20 mph, tack into the wind and perform other maneuvers. Ten-pound aluminum model, \$50; wood unit, \$30 (without skateboard). They're made by Windskite, Box 3081, Santa Monica, Calif. 90403.



Kitchen select-a-filter

Filtered water for drinking or general use now can be dialed with a unit that hooks up to the kitchen faucet in seconds. The unobtrusive device, called Instant Clean, can withstand water pressures up to 400 p.s.i.—the jolt reached occasionally in homes under "water hammer" conditions. The appliance removes most harmful particles from tap water for an average family of five for more than three years. Recharge packs are available to renew the system. Water-Safe Products, 8337 Nieman Rd., Lenexa, Kans. 66214.

'77 CONVERTIBLES—FOR REAL!

(Continued from page 79)

a car's steel approach this thickness.

After beefing up windshield posts, a post to serve as a front windshield header is installed and the power assembly is put in. This assembly consists of two electric-over-hydraulic rams which can develop 600-p.s.i. pressure, a motor and a dashboard switch. The system is wired to operate off the battery.

The frame for the convertible top is installed next. In the beginning, frame members were handmade, which accounted for the 2 to 2½ weeks Emess needed to convert a hardtop to a softtop. Now things have changed. The company is housed in a brand-new 40,000-square-foot plant and has hired 18 more people to bring the total to 30. Jigs have been fashioned that allow framing to be "mass"-produced.

One-week conversion

"We'll cut the time it takes to make a convertible to one week," Doyne promised recently.

After the frame is installed, the finish work is done. A black or white ragtop (customer's preference) is put on, interior parts are reinstalled

and exterior areas are cleaned up, painted and retouched where necessary.

The canvas top isn't made by Emess. It is manufactured by a specialty firm in New York. The top is waterproof, double-strength, full-folding and has a clear vinyl rear window. The side opera windows are glass.

Top retracts into well

When folded back, the top drops into a space behind the rear seat. A top boot is provided that matches the color of the car or is a contrasting color, whichever is preferred.

If you want Emess to build you a convertible, you have to buy the car and have it shipped or drive it to Clearwater. The car should have a vinyl interior and a solid nonmetallic paint job. The car will be returned to you by truck transport unless you are willing to pay for another type of freight.

Doyne says that some people buy his convertibles as investments.

"Within 10 years, the '77 Mustang II convertible we're making now will probably be worth \$15,000 or \$20,000," Doyne states.

Not bad for an investment of about \$9500—\$5300 for the car it-

self and \$4200 to make it a soft-top.

However, if Doyne relied alone on this segment of the market he would soon have to close down operations. There aren't too many investors seeking to tie up money in a car for a decade.

On the contrary, Emess relies for its success on those who consider the convertible a status symbol and the pinnacle of automotive ownership.

A form of escape

"Driving a convertible offers one the possibility of escaping conventional norms. It reflects personal freedom and independence," says German psychologist Horst Novak.

Doyne hopes a lot of people feel that way. He's investing a bundle of money to expand his company. And other outfits, too are springing up to make convertibles almost from scratch. Custom Coach Co. in Lima, Ohio, for example, turns '77 Eldorados into convertibles for \$6500.

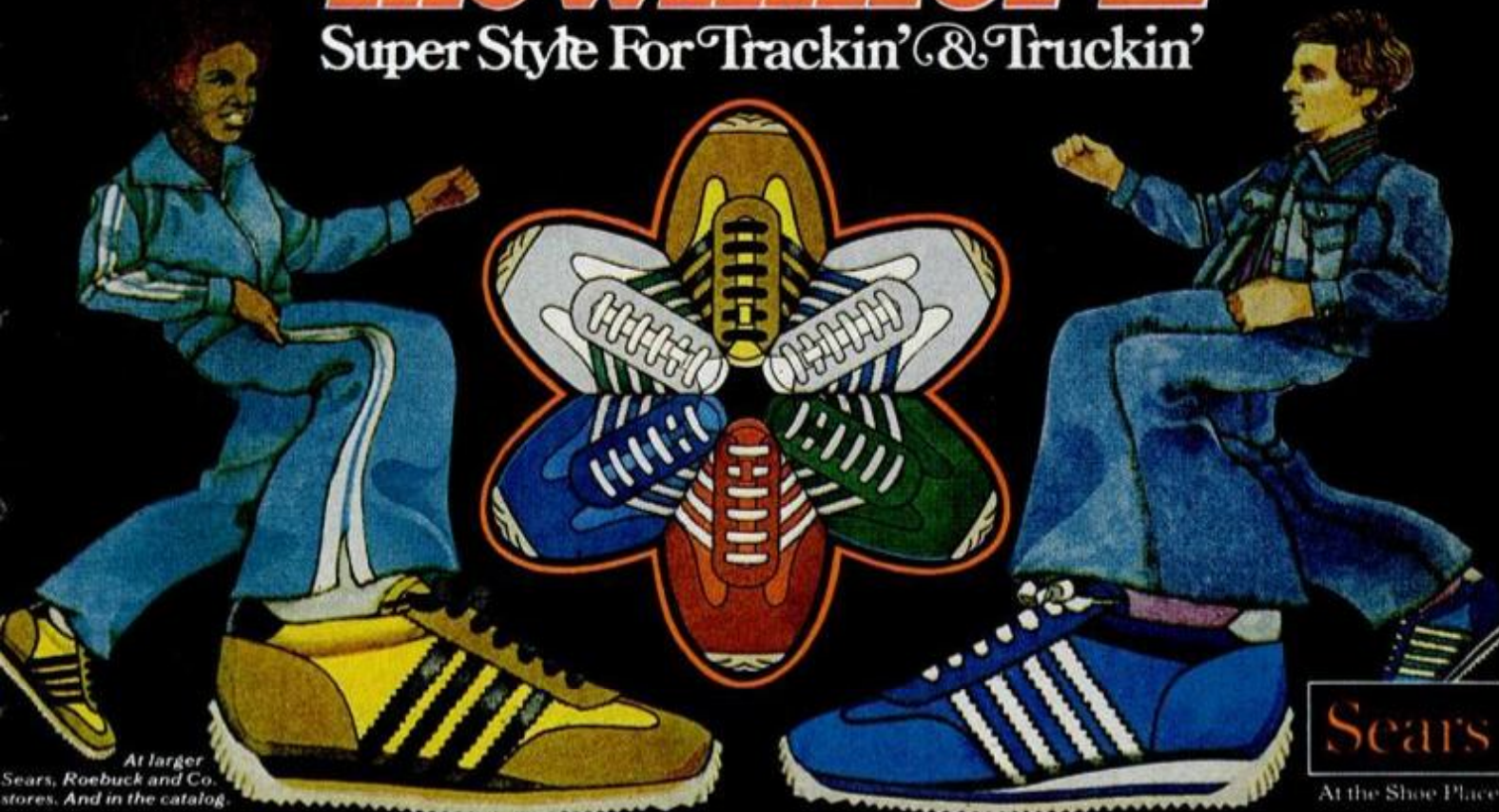
One question still bothered me after I left Clearwater, no longer skeptical. What does Emess do with the hardtops they saw off?

"If the customer wants it back, he can have it. Otherwise, we scrap it," a telephone call revealed. ★★

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DWARF FRUIT TREES

(Continued from page 96)

ness chart, in which the Continental United States is broken down into zones based on the average low temperature for each area (see map.)

Differences between fruits can be considerable, and in some cases trees have been bred for unusual hardiness. Check with a reputable nurseryman in your area, or consult the USDA county extension service before you buy.

Preparation for planting

First and most important consideration in planting is to make sure the tree is not too deeply seated. The bud union—that knotty portion near the base of the trunk where the scion or stempiece has been grafted onto the rootstock—must be several inches above the ground so that it will not develop its own roots, thus sabotaging the grafting process.

The time to plant is in early spring as soon as the ground is workable and before leaf buds have begun to open. Dig the hole a good deal wider, but not much deeper, than the root system of the tree. Put the dirt that you take out of the hole in a pile, to be mixed with organic matter—peat moss, well-rotted compost or manure—at a ratio of one part organic material to two parts soil. Do not work large amounts of organic matter into the area directly under the tree, however. To do so may cause the tree to settle too deeply. Since dwarf trees have shallow, spreading root systems, it will not benefit them anyway. If you have drainage problems, elevate the planting bed by bringing in more soil, or choose another site.

When the hole is dug, drive a stake into the center. It should be high enough to reach just above the first branches of the tree.

Preparing the tree

Dwarf fruit trees usually arrive bare rooted. Let the roots stand overnight in a pail of water before planting.

If the tree is growing in a container, remove the container and gently shake the soil away so the tree can be planted bare-rooted. In addition to pruning damaged or diseased roots, trim off those that cannot be positioned to grow outward. Any root growing around the circumference of the pot will continue to do so in the ground, producing a pot-bound effect.

Planting

Place a mound of soil at the base

DWARF FRUIT-TREE SUPPLIERS

Stark Bros., Louisiana, Mo. 63353.
W. Atlee Burpee Co., Fordhook Farms, Doylestown, Pa. 18901.
Henry Leuthardt Nursery, King St., Port Chester, N.Y. 10573.
Kelly Bros. Nurseries, Inc., Dansville, N.Y. 14437.
Jackson & Perkins Co., Medford, Ore. 97501.
Stern's Nursery, Inc., Geneva, N.Y. 14456.
Gerard Nurseries, Geneva, Ohio 44041.
Gurney's Nursery, Yankton, S.D. 57078.

of the hole and spread the roots over it, checking on planting depth. The previous soil level should be indicated on the trunk. Match it.

Hold the tree against the stake and fill the hole about halfway with the soil you took out—with no organic matter added. Make sure it is well crumbled to avoid air pockets, and shake the roots gently as you go to help the soil settle between and around them. Tread the soil down firmly. Fill the hole with water and let it all drain down.

Mix the rest of the soil with organic material and finish filling the hole to just above ground level. Again, tread firmly. Finally, make a shallow doughnut-shaped trough all around the tree, about a foot from the trunk. Fill this several times with water and let it settle. Tie the tree to the stake at two places, near the top, and about halfway up the trunk. Use padded ties sold for the purpose or strips of heavy cloth tied in a figure-8 to provide a buffer between the trunk and the stake.

Until the roots have established themselves, the greatest problem will probably come from cold, drying winds that often occur in spring. The best protection is to water regularly. The tree can be further protected by spraying with an anti-desiccant like Wilt-Pruf, and by wrapping the trunk with burlap.

Care for the tree

Since root systems of dwarf trees are shallow, mulching is important. It maintains viability of the soil surface by holding moisture. It prevents overheating, inhibits weeds and protects organisms such as bacteria and earthworms that loosen the soil. It will also break down in time and supply nutrients. So, each spring, put a ¾-inch layer of bark chips, peat moss, peanut hulls, or some similar mulch around the tree. Take care that it doesn't build up around the trunk, especially in winter. This can encourage rodents to

take up residence. They will damage the roots and gnaw the bark and vital cambium layer.

In most garden soils, dwarf fruit trees will produce reasonable yields without adding any fertilizer. Yields can be increased, however, by doing so. After fruit has begun to appear, the addition of nitrogen will increase its size. Toward the end of summer, a general-purpose fertilizer (5-10-5 or 10-10-10), worked in around the base should result in a richer spring flush the following year.

Properly cared for, your dwarf fruit trees can produce a tremendous fruit set—far more than a standard tree. Flower-bud thinning should be done to increase the size and quality of fruit and to prevent "cyclical" harvest years. With apples and pears, leave about 7 inches between fruits. Peaches, nectarines, Japanese plums, and apricots should grow at 4-inch intervals. Cherries and plum types generally need no thinning.

Pruning of dwarf fruit trees is best done in winter, while the trees are dormant. The purpose is twofold: to maintain desired height, and to encourage as much lateral growth as possible. The inner, center portion of the tree should be kept fairly clear of growth. Shoots originating there tend to be unproductive and crowd the tree.

When pruning, either remove a shoot completely, cutting close to the branch from which it originates, or cut just above a bud that faces the way you want the shoot to grow. You can tell the difference between shoots that will be productive and those that won't by the presence of "spurs"—those sharp, spikelike buds that develop in the fall. They are where fruit grows the next season.

Diseases and pests vary by climate and type of tree. Best protection is a general-purpose spray used as directed. This will contain a mixture of insecticides and a fungicide to ward off most problems. ★★

FOR FURTHER INFORMATION

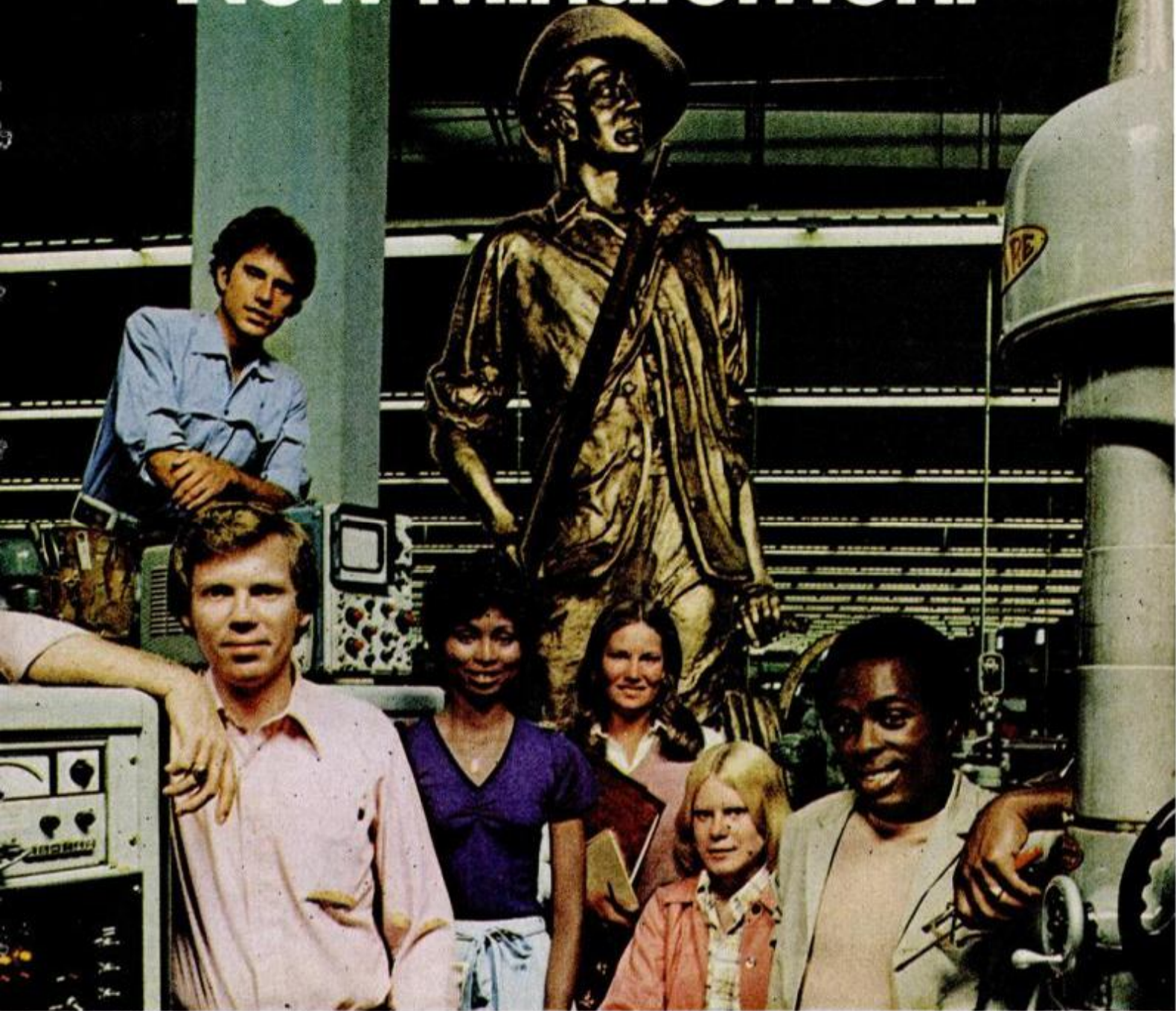
Dwarf Fruit Trees Indoors and Out, by Robert E. Atkinson. Published by Van Nostrand Reinhold Co., 450 West 33rd St., New York, N.Y. 10001.

Grow Your Own Dwarf Fruit Trees, by Ken and Pat Kraft. Published by Walker and Co., 720 Fifth Ave., New York, N.Y. 10019.

Handbook on Fruit Trees. Vol. 27, No. 3 of series on plants and gardens. Brooklyn Botanical Garden, Brooklyn, N.Y.

Grafter's Handbook, by R. J. Garner. Published by Oxford University Press, 200 Madison Ave., New York, N.Y. 10016.

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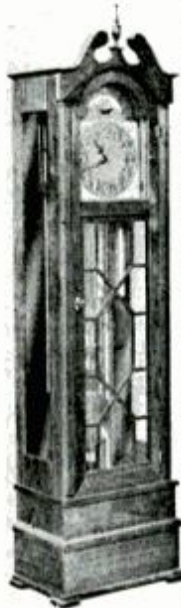
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HOW TO HIKE STRAIGHT UP

(Continued from page 99)

from wind and rain. Layers of garments must be easy to put on or take off even in difficult conditions as changes in temperature, wind and exertion dictate.

A key principle to remember is that thickness is warmth. In insulating the torso, cotton is the killer; it absorbs water and has no insulating value when wet. Wool, which is also absorbent, nonetheless retains its warmth retention properties when wet, and is a good choice for the inner layers. Down provides excellent insulation when dry, but is of no value if soaked (in wet, cold conditions).

Spun synthetic filament, like Dacron fiberfill II, is lighter for equivalent dead air thickness than wool and, unlike down, does not collapse when wet. Thus it works well in wet regions like the Pacific Northwest. Outer garments should be loose to allow movement and have windproof closures to prevent heat loss.

The following basic list is from *Freedom of the Hills* by the Mountaineers:

ANY TRIP

Ten essentials in pack

Map of area (in case)
Compass
Flashlight with extra batteries and bulb
Extra food
Extra clothing (socks, mitts, sweaters, long underwear, scarf)
Sunglasses
Pocket knife
Matches in waterproof container
Candle or fire-starter
First-aid kit

Other items in pack

Lunch
Sunburn preventive
Lip protection*
Insect repellent*
Handkerchief
Toilet paper
Canteen
Small insulation pad (to sit on)*
Whistle
Altimeter*
Camera, film*
Emergency shelter

*Optional item

Clothing: Boots, socks, gaiters, underwear, pants, warm sweater and shirt, parka, hat(s), wool (rain, sun) mittens, gloves, wind pants*, rain gear*, shorts*, hot-weather shirt*.

You can see that accumulation of gear depends on the growth of your mountain skills. Careful reading of mountaineering catalogs will help you pick equipment to fit your needs, and experienced sales people at qualified mountaineering stores are valuable.

Choose clothing for each trip depending on the type of weather you expect to encounter, but always allow for the unexpected. Notice that one of the 10 essentials already listed is extra clothing. The extra weight of rain gear and additional wool clothing is never too much to carry, even on a day trip, and will protect you from hypothermia in those sudden mountain storms.

Important hardware category

The other major equipment category is the hardware used for the climbing itself. Once again, the key is

to select appropriate gear. Snow flukes and pickets are wonderful implements on steep glacier climbs, but are virtually useless on frozen waterfalls. As you progress from backpacking to high Alpine travel to snow climbing, you can accumulate the necessary skills and equipment. In some cases, the best way for a novice to learn how to use the equipment is to go on a climb with an experienced group. For me, this occurred naturally in my Boy Scout troop. An older person can join a mountaineering club or climb with experienced friends.

Roped climbing begins at this point. Roping the climbing team together serves to reduce the length of a fall and minimize the dangers of falling. The technique which makes roping up safe is called belaying and, when properly done, the belayer can absorb the impact of a climber's fall and avoid injury to the one climbing and himself.

Along with belaying, another technique which must be mastered is placing protection against a fall. This is the leader's responsibility, and on a steep climb he inserts into the rock or ice the appropriate piece of equipment. The leader is belayed from below by his second, and as he climbs the leader will drive a piton (steel peg) or wedge a chock into an appropriate place in the rock. Next, a runner of woven nylon webbing and a carabiner (oval metal ring) are clipped into the protection. Then the rope is run through the carabiner so that if the leader falls, he will fall only to the point of his last protection. As the leader reaches the end of the available rope, he finds a belay stance and belays the second, who climbs and "cleans" the pitch of the protection. The new ethics of rock climbing demand that most protection be of the chock or nut variety. Pitons scar the route and spoil the pristine nature of the climbs for others who follow.

Conditioning program

So you've purchased your gear, taken the courses, and signed with your local climbing club for next month's climb of Mount Molehill. You're all set except for your conditioning. Mountaineering is a stressful sport; it requires sustained periods of severe exertion, and the mountain environment itself subjects the climber to considerable stress. To be a successful climber, you must condition your body to cope with various stresses before you climb.

Your proper conditioning program will be balanced between three areas: aerobic conditioning of the cardio-

(Please turn to page 182)

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HOW TO HIKE STRAIGHT UP

(Continued from page 180)

vascular system, strength training, and flexibility training. The most important is the aerobic conditioning which strengthens the heart and improves the oxygen utilization capability of the lungs and circulatory system. Efficient transport and metabolism of oxygen is the cornerstone of endurance, and is best achieved by regular participation in "huff and puff" sports like distance swimming, running, bicycling, cross-country skiing and hiking. Remember, in order to build, you must stress! Passive exercise just will not do it.

How to improve conditioning

On the 1963 American Everest Expedition we used the sustained daily exertion of the 185-mile approach march to higher and higher altitudes to sharpen the previous conditioning of the entire team. Similarly, much conditioning of the basic mountaineer occurs in a natural way as he hikes and backpacks in progressively more rugged terrain. Don't depend on hiking to do all your conditioning, though. If you're like most of us who hold five-day-a-week jobs, the weekends of exertion won't make up for the conditioning lost during the week.

If you wish to improve, you must schedule your training so you have

at least three days of aerobic activity per week. Assuming you've spent the weekend hiking and climbing, you should have two more days which must have one half-hour or more of aerobic conditioning. If these few hours per week seem too much, remember that the conditioning will not only help you to climb better but will let you enjoy the climb more. The side benefit is that you will be healthier and live longer.

The two other kinds of training are for strength and flexibility. Strength training consists of any form of resistance exercise. I am a fan of the push-up, pull-up and sit-up routine for general upper body strength, and if you desire you can also get strength improvement for specific muscles with a weight training program. Lastly, any training program should be balanced with stretching exercises to maintain flexibility and agility.

Mountaineer's creed

The proper equipment, the proper skills and the proper conditioning can make you a true mountaineer, and to fit this definition you will seek the mountains for their beauties but will also accept their demands. We are living in an age in which the crush of humanity can destroy the fragile Alpine environment. The mountaineer's creed must respect the mountains and leave no trace of his passing.

The rewards of mountain climbing are many. A sensible approach toward learning the sport will enable you to enjoy "this life that is higher than most." ★★★

Outdoor gear especially suitable for mountain sport includes Kletter rucksack in nylon with leather bottom plus 11 auxiliary patches used for attaching strap-on accessories. About \$30. R.E.I. 2½-lb. Pol-Over Sack with PolarGuard lining can zip over another sleeping bag or be used alone; \$38. Haute Route ski mountaineering boot for alpine skiing and climbing uses inner wool-lined removable boot; \$115 a pair. Down-filled ultralight Summit Parka, \$68. R.E.I. \$190 Grand Hotel expedition tent sleeps four.



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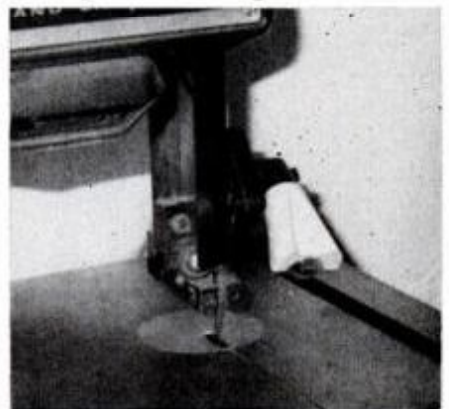
HINTS FROM READERS

Prevent splitting wood



Blunting a nail point before driving it near the end of a piece of wood helps keep the nail from splitting the wood.—*Ken Wells*

Handy bandsaw light



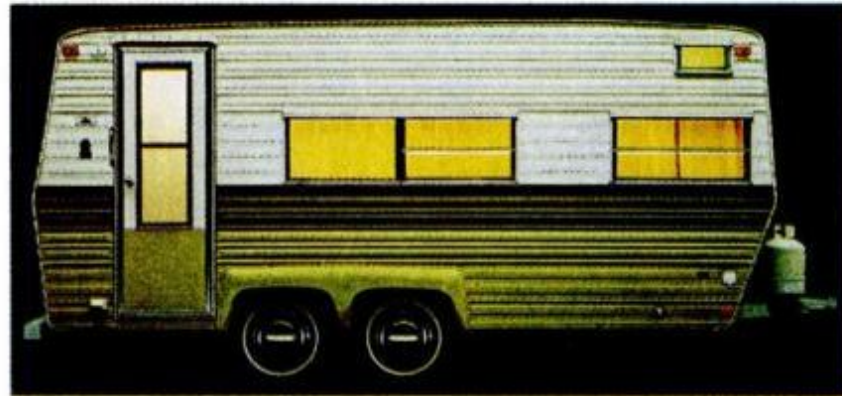
Illuminate bandsaw work with a shaded night light in a double outlet box. Fasten the box to the saw with one bolt so it can easily be removed or readjusted as needed.—*Charles A. Traub*

Bottle cap pads hammer



The plastic cap from a vitamin bottle makes a good pad to protect a surface being tapped with a hammer.—*Walter E. Burton*

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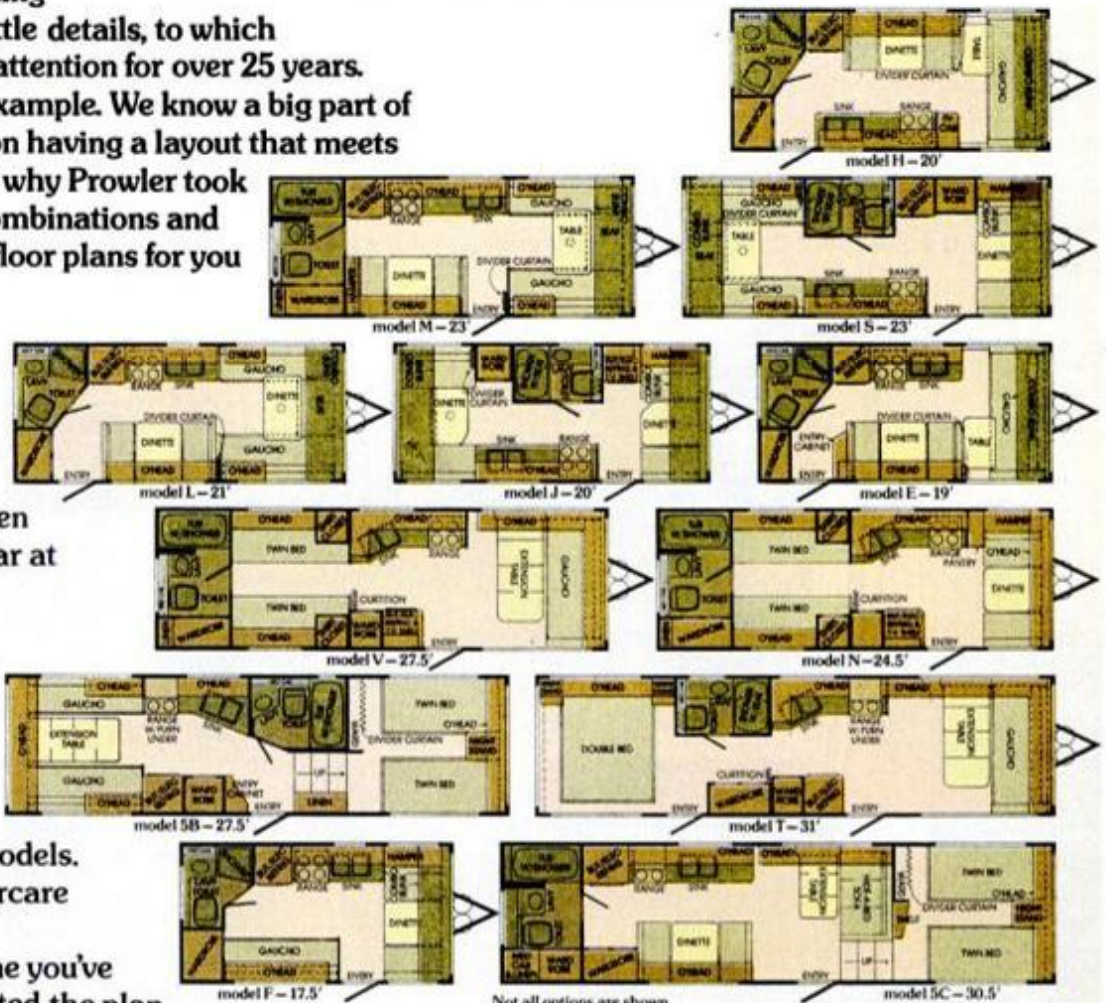
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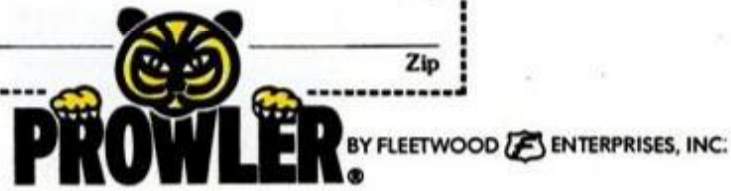


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Desktop calculators that print their results

by Hyla Clark and Larry Barandes

The latest thing in calculators is keeping a printed record of what you have computed. We've just tested four of these tiny printers and found them handy record-keepers.

Printing calculators are valuable because a paper tape provides a permanent record of calculations and results. Such record-keeping serves several purposes:

A paper tape is particularly desirable when handling large blocks of numbers. In such situations, the

possibility of operator error is higher and a tape greatly simplifies checking procedures.

A paper tape also is helpful in organizing information for personal record-keeping. For example, when preparing an accounting of expenses as required for a tax return, assorted information must be grouped and tabulated. Summations on paper tapes may be attached to each type of receipts, organizing them clearly for later use in preparing a return. Such

tapes also simplify the audit function, providing a trail of information explaining how figures were struck.

Paper is forever

In addition, paper tapes provide a worksheet of calculations. If your attention is called away from the calculator or the machine is inadvertently switched off, a record of previous computations remains on tape. But watch out: A long tape of figures

(Please turn to page 188)



PM photos: Benn Mitchell

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SHULTON

DESKTOP CALCULATOR-PRINTERS

(Continued from page 187)

with no total or subtotal is valueless.

Of course, paper tapes from mechanical adding machines do perform functions identical to those from electronic calculators. This new breed of tiny, electronic calculators, however, incorporates several important features which mechanical adding machines do not have.

Even the largest desk-model printing calculator is considerably smaller and lighter than a mechanical adding machine. The small portable printing calculators fit easily into a drawer for storage.

Portable power or plug-in

Portable calculators generally are powered either by an a.c. adapter/charger, which can be plugged into any electrical outlet, or by rechargeable batteries. Batteries retain a charge up to eight hours. Portable printing calculators, though most are not pocket-sized, are substantially more convenient to handle than mechanical adding machines. Furthermore, printing calculators multiply

and divide while mechanical adding machines do not.

Here are several basic considerations you should bear in mind when choosing a printing calculator: So models both print and read out in LED display. In such machines, the printer generally can be switched and the display mode used exclusively. An additional print key may allow selected figures to be printed during calculations. Whether or not LED display is available on a given calculator, the legibility of the printed tape is of primary importance. The availability of additional tapes is further consideration.

Whirr vs. whisper

Most printing calculators do not require a significant amount of time to print, but some machines are faster than others. Noise-level, as well as speed, is worthy of attention.

Naturally, the capacity for functions in addition to the basic addition, subtraction, multiplication and division should be examined. Some machines have a percent key; others can figure square roots.

Most machines have an automa-



More versatile printing

calculators add your choice of numbers displayed in LEDs in tiny front-panel windows or printed on paper tape. Sharp Elsimate EL-8151 (left) prints eight digits across 1 3/4-inch paper. Casio Mini-Printer C-100P (below) may be used with printer on or off while a separate print key writes intermediate answers on the paper tape. Such tapes are valuable when you handle large blocks of numbers and the possibility of error is high. Paper tapes are useful in checking your work and organizing information for your personal record-keeping files.



calculator, even if it is only a total y, but some will accumulate all ur basic functions. Others only accumulate addition and subtraction. n independent memory, of course, is most desirable. Some machines ve very limited storage capabilities. The ability to perform side calculations without affecting main-stream computations makes any machine a great deal more versatile.

Any idiosyncrasies in mode on eny also should be considered when u decide to purchase a printing calculator.

The four machines we've tested ow some similarities and some differences. They have been selected because they seem reasonably priced. hich one will cost you less than \$50.

Radio Shack EC-3000

This calculator has three-way power. It has an a.c. adapter/charger and n be powered by rechargeable or replaceable batteries. The printer es 2¼-inch thermal-sensitive pa-



Radio Shack EC-3000 calculator prints on paper tape; runs on a.c. or batteries.

r, available in three-roll packages for \$1.99.

The EC-3000 has no LED display; the calculator only prints out on paper. Eight digits are printed horizontally on a vertically fed roll. The paper also can be advanced by a manual wheel.

It has four standard math functions, as well as a percent key and a switch to set the machine for floating decimal point. The calculator comes with a convenient carrying case and three rolls of paper for \$99.95.

Casio Mini-Printer C-100P

The Mini-Printer has an a.c. adapter/charger and permanent rechargeable batteries. It has the advantage of both an LED display and a paper tape. The 5/16-inch paper is printed horizontally with an ink roller. Both tape and roller are replaceable. A paper advance key moves the tape automatically to the left.

The machine can be used with the printer on or off. A separate print key makes it possible to list subtotals without disturbing the contents of the machine. It has eight-digit capacity. The Mini-Printer has four basic functions as well as square root and memory. Its price is \$79.95.

Sharp Elimate EL-8151

The Sharp has an a.c. adapter/charger and a permanent rechargeable battery. It prints and has an LED display. The paper is electro-sensitive, 1⅜-inch wide, and can be purchased only from a Sharp dealer at \$3.95 for five rolls. It has an eight-digit capacity.

A print switch operates the EL-8151 in either print or display. When in the display mode, a print key allows subtotals to be printed. The printer is fast and quiet and the tape easily readable. There is a manual paper advance. The EL-8151 has four basic functions as well as a percent key and an independent memory. It comes with a carrying case and five rolls of paper for \$99.95.

Unlike the Mini-Printer, the EL-8151 has a true memory. Whenever the summation switch is on, a result is added to the memory. But the Mini-Printer's arrangement permits calculations to be made on the side without disturbing the contents of the memory.

Texas Instruments TI-5050M

The TI-5050M is powered by a.c. or a permanent rechargeable battery. The calculator operates only in the print mode. The printer uses 2¼-inch thermal-sensitive paper. Three rolls are \$1.99. The TI has a paper advance key. Paper automatically double-spaces whenever a calculation is completed. The characters are large and readable and the printer is quiet.

Despite the lack of LED display, the TI-5050M is the most versatile machine in this group. It has 10-digit input and output and extra features. There are subtotal and non-add keys, and an option to work in floating-point. It has a memory. The TI-5050M comes with a carrying case and three rolls of paper for \$149.95. ★★★

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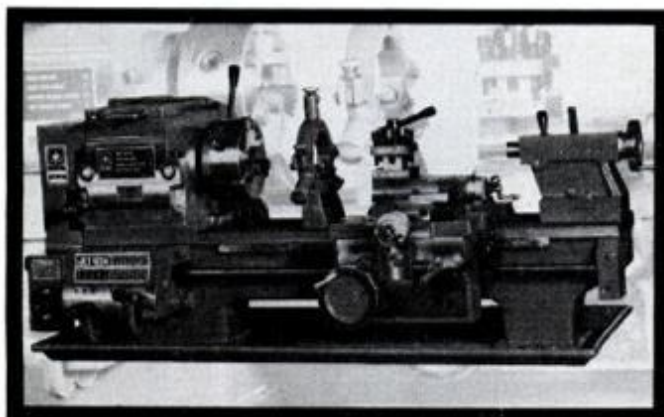
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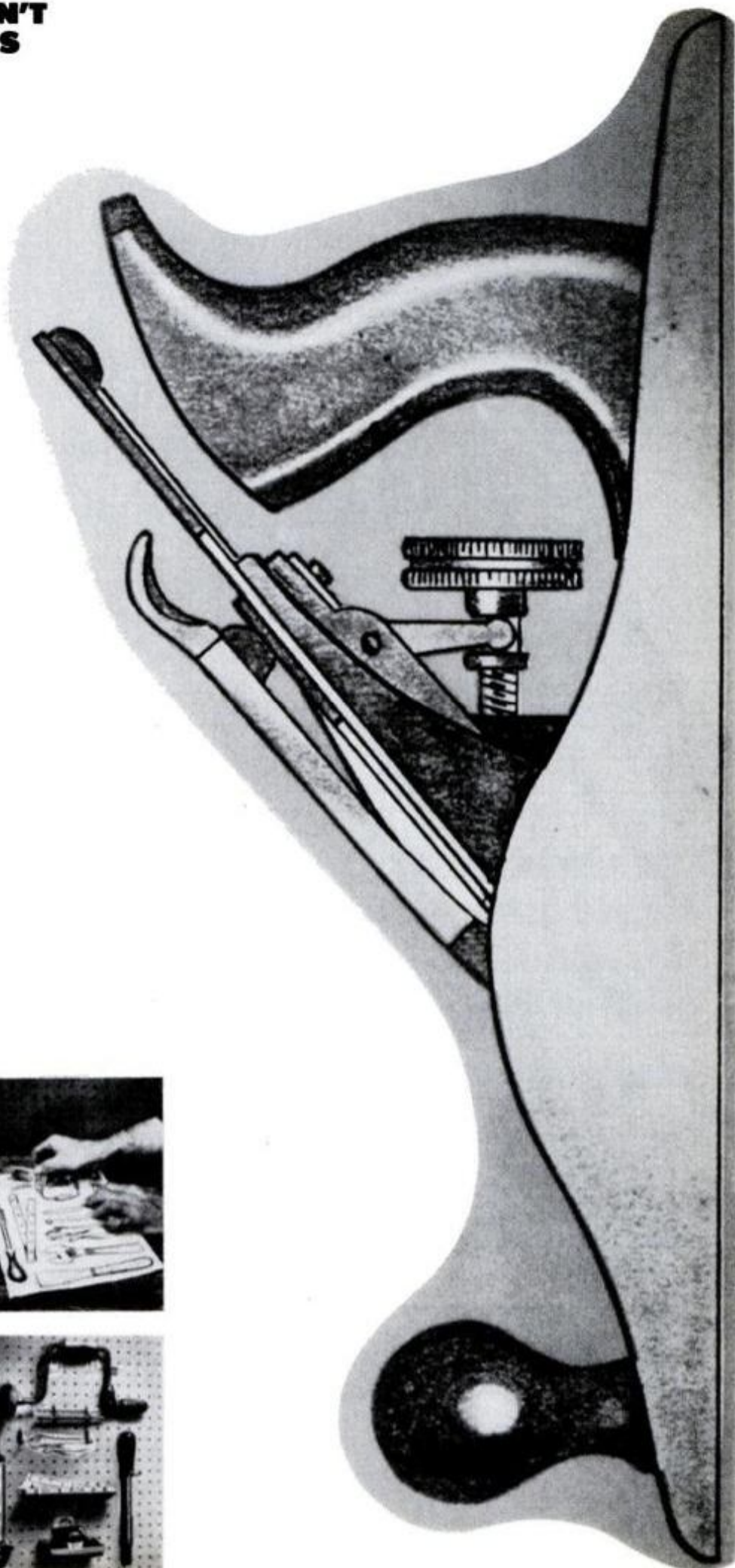
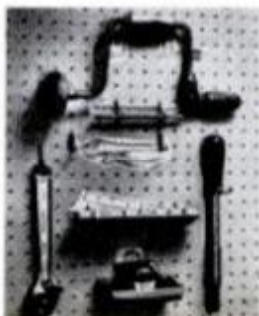
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TACKLE THAT LANDS LUNKERS

(Continued from page 101)

and high-speed retrieve of 4:1 or more. Higher ratios are also becoming standard on closed-face reels, and some are now made with longer "power" handles for easier cranking. Rod lengths vary with type of tackle, but 6 to 7 feet will handle most freshwater action for open-face spinning; closed-face rods are 5 or 5½ feet.

In the past few years, new graphite rods have begun to offer many advantages over fiberglass, but are still extremely expensive for the beginner. Graphite, more sensitive than glass, gives a much better feel of a lure working or a strike. It also makes fly casting a bit easier.

Spinning tackle is most popular, but bait casting is staging a strong comeback. It takes longer to learn to cast with revolving-spool reels, but it can be more fun, though more expensive. A good bait-casting reel runs \$30 to \$60 or more, with the average \$45 or \$50. A rod for it can run \$12 to \$60—some graphites cost over \$100. Average is about \$25.

Open-face tackle

Freshwater open-face spinning tackle is a little more expensive than closed-face. Reels range up to around \$40, with an average of \$15 to \$19. Rods are \$4.95 to \$35, with \$14 an average. Closed-face reels and rods go from \$4.95 to \$30 with a \$10 average.

Better rods usually have at least five line guides plus the tiptop. Check the reel seat, grip, guide wrappings and rod finish for quality. Rods and reels should be impervious to corrosive elements, including saltwater, even if you usually fish in fresh. Overly cheap tackle may cost you more in the long run.

Saltwater fish are generally larger and require heavier gear. Open-face spinning tackle is good as a start for casting; closed-face frequently does not have enough line capacity or a quality drag. Line of 12-pound test is a reasonable beginning for saltwater.

A conventional boat rod and revolving-spool reel is standard for the bottom fisherman; sophisticated rods are for offshore trolling.

Monofilament line may be better for most assignments, and certainly in breaking strengths under 50 pounds. There are many monofilaments, but a premium line is a better investment. You can save money by buying bulk or one-shot filler spools. Lines should be changed at least once a year and abraded sections discarded. ★★

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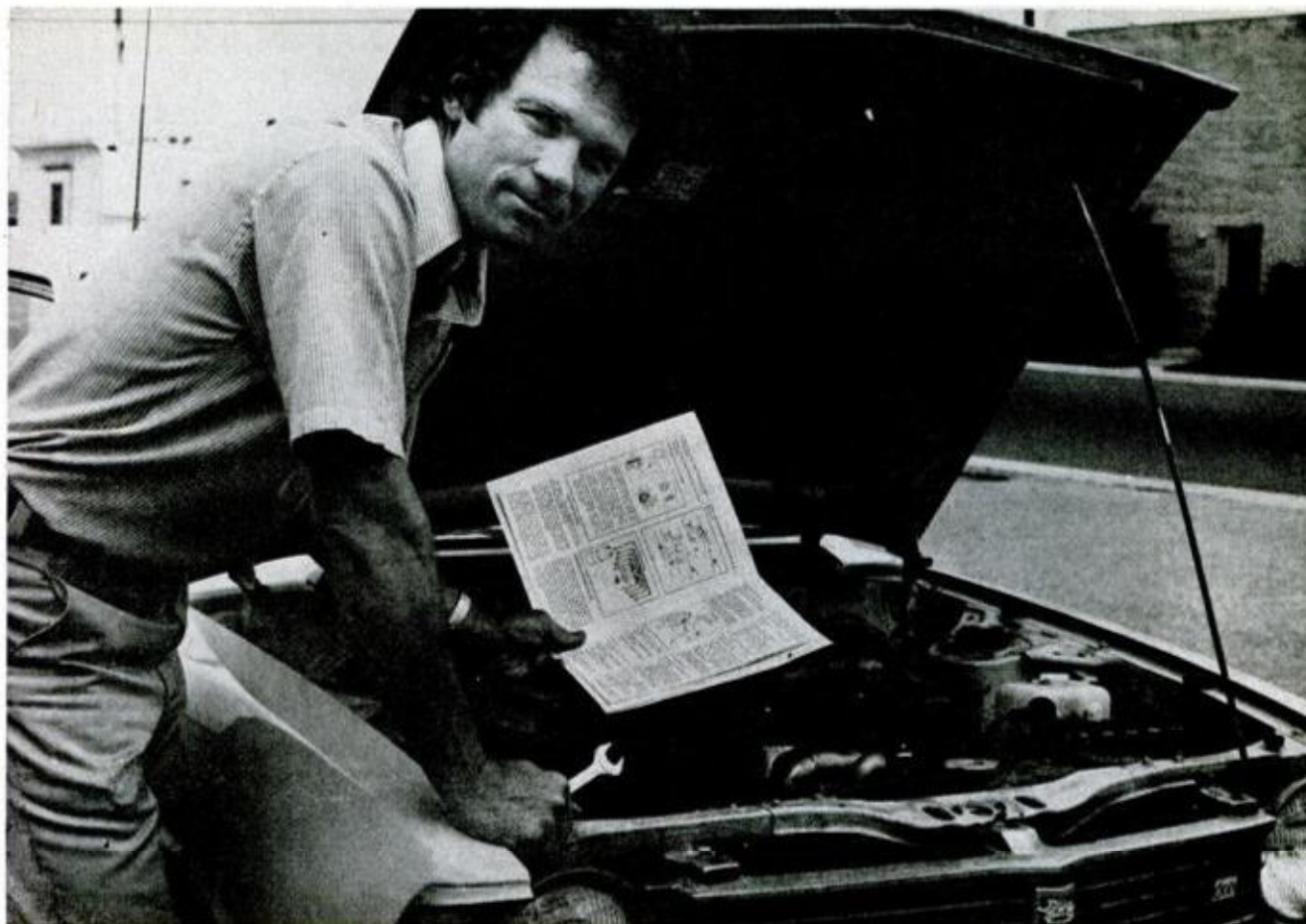
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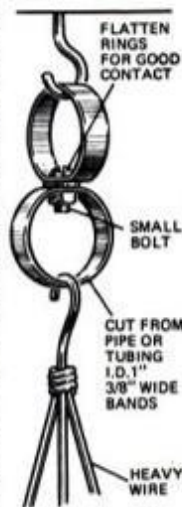
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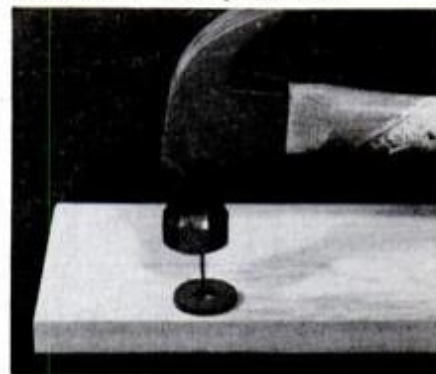
HINTS FROM READERS

Hanging plant swivel

You can give all sides of your plants some sun time with an assist from this swivel. Cut two rings from scrap piping. Flatten a spot on each ring and then drill a hole for a short stove bolt at the flattened sections. Add a washer between the rings to allow swiveling. Burr the bolt end.



Rubber washer protector



When driving a nail into exotic wood or wood furniture, slip a rubber faucet washer over the nail. The washer will protect the wood surface from marks made by the hammer.—Ken Patterson

Straight lines on round stock



To make a straight line for a sawing guide on round material such as plastic pipe or doweling, wrap heavy paper around the material with the paper's edge accurately overlapped.—Ken Wells

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This one does. What's more, because it is a kit, supplied direct from the manufacturer, it costs only a very reasonable \$19.95. And for that, you get not only a high-calibre calculator, but the fascination of building it yourself.

How to make 10 keys do the work of 27

The Sinclair Instrument wrist calculator offers the full range of arithmetic functions. It uses normal algebraic logic ('enter it as you write it'). But in addition, it offers a % key; plus the convenience functions \sqrt{x} , $1/x$, x^2 ; plus a full 5-function memory.

All this, from just 10 keys! The secret? An ingenious, simple three-position switch. It works like this.



1

1. The switch in its normal, central position. With the switch centered, numbers—which make up the vast majority of key-strokes—are tapped in the normal way.



2

2. Hold the switch to the left to use the functions to the left above the keys...

3. ...and hold it to the right to use the functions to the right above the keys.

The display uses 8 full-size red LED digits, and the calculator runs on readily-available hearing-aid batteries to give weeks of normal use.



3

Assembling the Sinclair Instrument wrist calculator

The wrist calculator kit comes to you complete and ready for assembly. All you need is a reasonable degree of skill with a fine-point soldering iron. It takes about three hours to assemble. If anything goes wrong, Sinclair Instrument will replace any damaged components free: we want you to enjoy assembling the kit, and to end up with a valuable and useful calculator.

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PHOTO HINTS FROM READERS

Developer-bottle thermometer



I hang a small thermometer around a developer bottle by a small chain or string to get an indication of the temperature of my developer. I move the bottle around my dark-room until I find the location where the temperature is near 68 degrees. I got this thermometer from a discarded wall calendar.—Ken Patterson

Flattening your prints



When my ferrotyped prints won't lie flat, this works: Dry each print without ferrotyping. Then immerse it in flattening solution until limp. Place the print, emulsion side down, on the ferrotype plate of a print dryer with a blotter laid over it. Work over the blotter with a rubber roller. Remove the blotter and roll the print some more to assure thorough contact. Then stretch the dryer apron over the print and turn on the heat. Drying time will be shorter than usual this way.

Various dilutions of flattening solution, such as GAF Flexogloss, will work well. Start weak with a ratio such as one part flattener to 60 parts water. If plain water is used, the print may be flat but have an imperfect gloss. Drying and rewetting is the secret.—Walter E. Burton

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Bounce light: The flash that flatters

It's always been good—
but new flashguns
make it easy.

by Dave Sagarin

PM photos by the author



The soft, sweet light that made upper picture came from the same flashgun that made mug-shot just above. The difference was in how the flash was pointed: Dead ahead for the shot above, but bounced off the ceiling in the top shot.

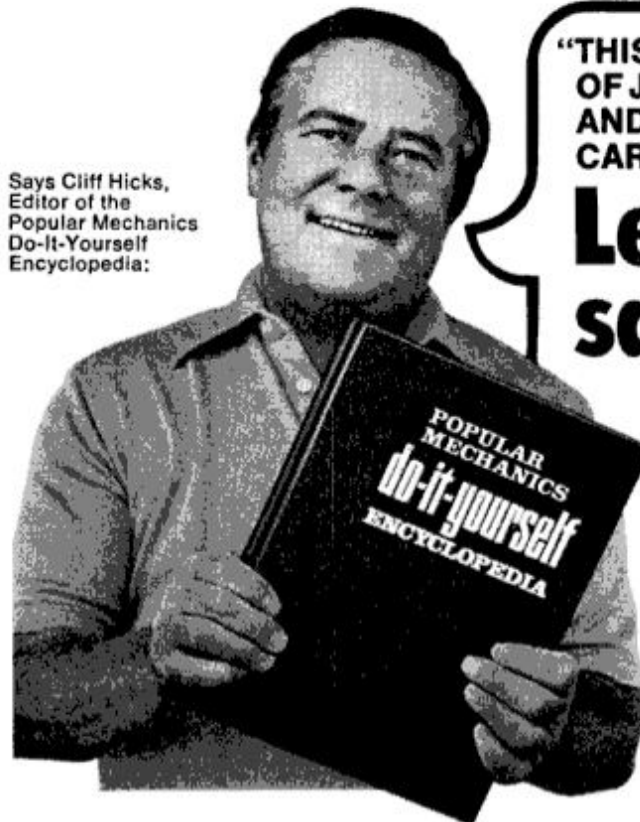
It's a far cry from the soft, glowing quality of portraits made under an overcast sky to the harsh, pasty, wanted-poster quality of shots taken with a flashgun on your camera.

It's always been possible—though difficult—to match portrait quality by bouncing the flash's light off a ceiling or wall to diffuse it and to change its angle. Now a bunch of new, moderately priced electronic flash units are making it easy.

Lighting effects depend on the size of the light source, its angle to the subject and the amount of other light available to fill in shadows. The larger the source is in relation to the subject, the softer and more rounded the quality of lighting will be. That's why the sun—far enough away to be a pinpoint source of light—casts sharp shadows on a clear day, but soft ones

(Please turn to page 200)

Says Cliff Hicks,
Editor of the
Popular Mechanics
Do-It-Yourself
Encyclopedia:



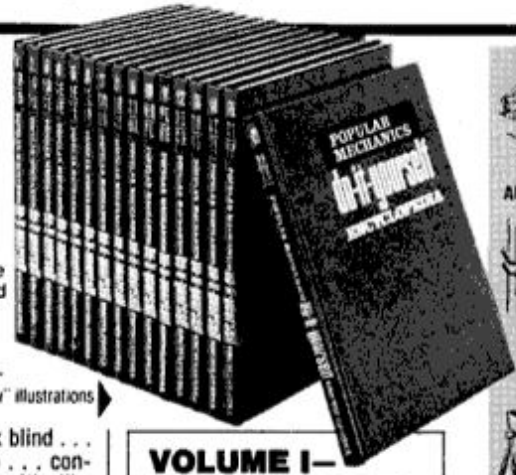
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BOUNCE LIGHT

(Continued from page 198)

when its light is diffused by a cloud layer—shadows cast by light from any point in the sky are filled and gentled by light from many other points.

The angle from which the light hits the subject makes a difference, too: Since we're used to light from above, a face lit from below looks unsettling and unnatural—that's why monsters in horror films are lighted that way. But on a subtler, more practical level, overhead light deepens eye sockets and cheek hollows; side light thins a face; front light broadens it.

Differences are surprising

The pictures on page 198 show the difference light-angle and size make. In the bounce-flash shot at top, note how the broad spot of light the flash cast on the ceiling gives a softly modeled effect, while the light's direction gives more highlights to the hair, darkens the collar (making the face stand out more) and shadows the eyes. In the direct-flash shot, the light quality is harsh—not the edge shadow behind our model on the wall, the highlight on her pendant and the sharp modeling of her skin. Because the flash is right on the camera, we get the further disadvantages of hot-spot light reflections in our model's eyes, and the loss of such small, detail-enhancing shadows as those that separate her pendant from her sweater in the upper shot.

For shooting people—the subjects of most indoor flash shots—bounce flash usually gives more pleasant results, and professionals have used it for years. What's stopped amateurs has been the difficulty of getting correct exposure with bounce.

Doing it the hard way

Before the advent of automatic-exposure flashguns, getting the right exposure for a straight bounce shot meant figuring the flash-to-subject distance (easy enough if your flash was on a rangefinder or reflex camera), dividing that distance into a guide number, then setting your lens to whatever f-stop that gave you (with a guide number of 110, for instance, a distance of 20 feet meant $f/5.6$).

For the bounce flash, though, you had to take into account the total distance from flash to ceiling to subject, figure the f-stop from the guide number, then open the lens a little more than that to compensate for light absorbed by the ceiling. Calculating the distance and how much

(Please turn to page 202)

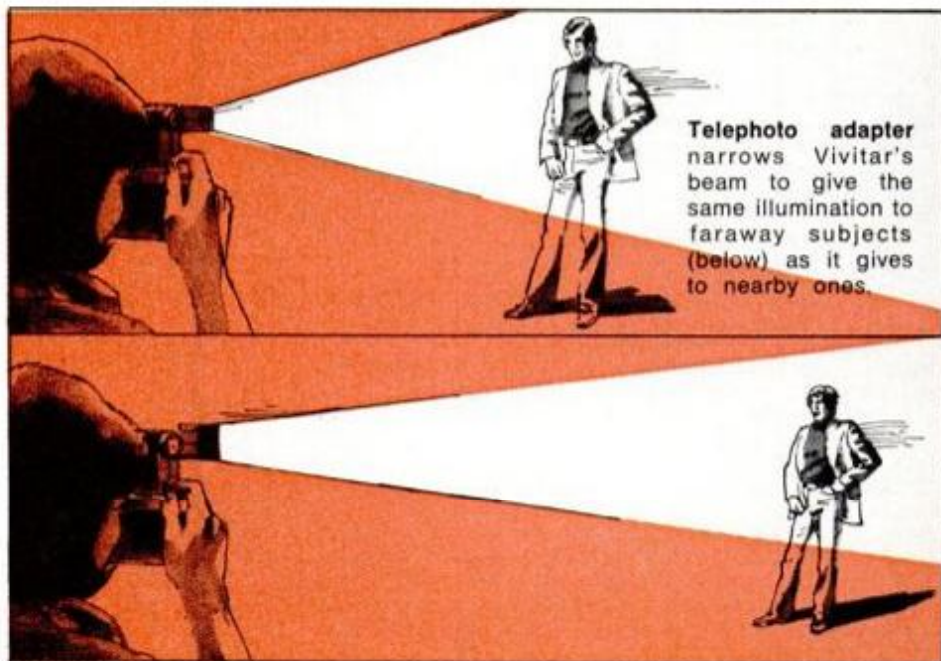


The Vivitar 283: Not just a flash, but a system

If the Vivitar 283 above seems to be dwarfed by its accessories, that's appropriate. Because what makes the 283 unique is not so much the capabilities built into it but those you can add on.

The only unique feature of the flash itself is a circuit that boosts light output up to 50 percent when the flash head is angled up for bounce to compensate for the extra distance bounce light travels. Power is from four AA alkaline batteries, but you can interchange them with a nickel-cadmium pack that recharges in 15 minutes. (The recharger, just behind the flash in the photo, shuts off when charging is complete.) For long shooting sessions or superfast recycling times, you can add the 510-volt battery pack (top left corner), which is also usable with several other Vivitar flashguns. An a.c. adapter is available, too.

The flash's beam covers the field of a 35-mm wide-angle lens, but the rectangular hood shown in front of the flash slips on to hold filters and adapters. Two wide-angle adapters spread the beam to cover a 28-mm or 24-mm lens field (or to broaden the effective light source for even softer bounce effects). Two telephoto adapters narrow it to match the fields of 70-mm or 135-mm lenses, thus allowing automatic flash at distances of up to 62 feet instead of the normal 43 feet without adapters. The filters match the light to indoor Type B color films, reduce output for close-ups, or just add color. Also shown are a sturdy grip that lets you swivel the flash to one side, a removable light-sensing cell that clips to the camera or side bounce or other odd flash angles, and the clip-on card attachment that even lets you use bounce outdoors.



Telephoto adapter narrows Vivitar's beam to give the same illumination to faraway subjects (below) as it gives to nearby ones.

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Small light-source casts sharp, strong shadows (top). Broad light-source (above) casts smaller, softer shadows; gives more rounded look to whatever it illuminates.

Two ways to bounce: Toshiba (below, left) tilts up to bounce off ceiling or swivels to bounce off nearby walls. Honeywell (below, right) converts to bounce when you snap on a Strobodome, which diffuses forward flash and re-directs undiffused light up toward ceiling; domes of different density let you choose the proportions of direct to reflected light—the darker the dome, the less direct light.



Vivitar 283 tilts up to bounce flash off ceiling; when there's no ceiling, you snap on this bounce adapter—the white card can be replaced when it gets dirty.

BOUNCE LIGHT

(Continued from page 200)

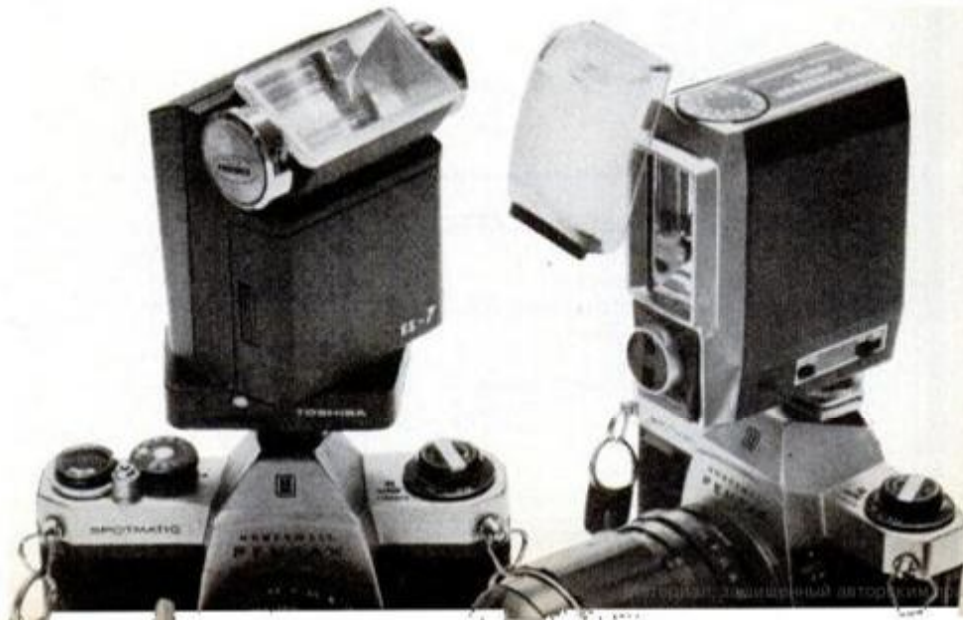
to compensate for dark ceilings took experience and judgment.

Even the early auto-flashes didn't help with bounce. Point them at your subject and their electric eyes would measure the light bouncing back, cutting off the flash as soon as you had enough exposure. But point them at the ceiling and they measured how much light bounced back from there—not how much bounced onto your subject.

Easy, automated bounce

But some of the latest units, like the Vivitar 283, Toshiba BS-7, and

(Please turn to page 206)

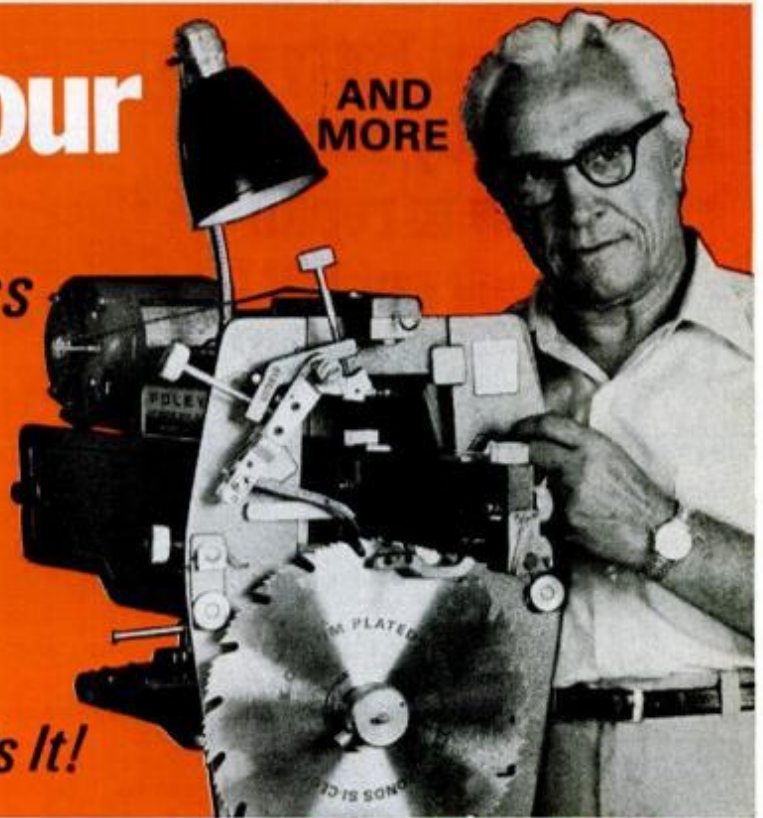


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BOUNCE LIGHT

(Continued from page 202)

the Honeywell Auto-Strobonar 480-S shown here, let you aim the light up or to one side while the electric eye cell still points straight ahead to measure the illumination of your subject. You tell these units the ASA rating of the film you're using, and about how far you think you'll be from your subject. Their calculator dials (which you can also use for non-automatic flash exposure) then tell you what f-stop to set, and whether you're likely to get enough light. When you flash, a green light signals if the subject got enough exposure.



Spiratone Spiralite Sr. BB, though not automatic, offers direct flash, bare-bulb flash for even illumination in room, or ring-light attachment for close-ups.

Since we usually bounce flash off ceilings, all three flashes are designed to bounce light upward: The Toshiba's and Vivitar's flashheads tilt up, while a plastic dome snaps onto the Honeywell to direct some light upward while aiming some diffused light forward to fill shadows in eye sockets and elsewhere. You can also swivel the Toshiba sideways to bounce off a wall or for ceiling bounce shots when you hold your camera on its side. You can do that with Vivitar, too, by using accessories (see page 200).

Points to remember

With any of these new flash units, bounce flash is as easy as straight, head-on flash. Just check the green light to be sure you're getting enough light to the subject, and don't bounce off colored ceilings or walls—they'll tint the picture as though you'd used a filter on your lens. If you find your eye-socket shadows get too deep, bounce light to fill them with a white card held below your subject (out of the lens's field of view, of course). Experiment with various combinations of direct, bounce and fill light and keep track of what you do in each shot—differences will be subtle, not startling. ★★

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EN CAR NOISES YOU CAN'T LIVE WITH

(Continued from page 86)

contacting metal inside the brake drums, or pads of the same material have worn in a disc brake system and metal is contacting the metal rotors. Either condition needs your attention. You can change the shoes and pads at home (refer to any good manual on the process and there are dozens available) or have the job done by a pro. But *not* by a bargain dealer. Brakes are important. If you're going to have the job done, pay for it and have it done correctly, with an *ironclad* guarantee.

6. Howl from the transmission

Watch it! You could have a very serious problem and almost certainly you are going to need the help of an expert. There isn't much most of us can do but look around for the best deal. But there is a *lot* we can do in that score. Beware of the quick-luck trans shops that promise free estimates, then charge you for the teardown if you don't go for the job. The truth is, most good transmission men can tell you *almost exactly* what's wrong and *what it will cost* to fix it, *without* tearing the trans part.

So get some estimates, preferably from a mechanic you know. One trick: Get your local mechanic to handle the job, to farm it out if he doesn't do that work himself. You may pay a few dollars more (you'll probably pay an arm and a leg anyhow, unless it happens to be something like a simple adjustment of bands) but he, not some guy downtown you don't know, will be responsible for the guarantee and any follow-up necessary.

7. Thump or thud anywhere

One driver bought a used car in excellent condition and he really loved it . . . but for one small problem. Every time he started out, the car said "thump" very softly. He searched for the source of the sound, his mechanic searched, the agency searched, and his friends searched. Nothing.

His first flat tire was in one way a stroke of good luck. When he went for the spare he found it loose—and the cause of the annoying noise.

His thump was inexpensive. Another thumper of no immediate consequence can be caused by a cold tire. It'll warm up and the thump will stop. Out-of-round or flat-spotted tires are more worrisome, but of no immediate concern.

A bulging or blistered tire, however, is a thumper that must be corrected now. Nor is there any way to

repair it. Shop for a new tire. Do it today. And if you must drive, do it *slowly*.

A thump or thud from the engine compartment can mean anything from a loose battery to a slipping throw-out bearing in a manual transmission . . . or worse. Check the battery first, then test by applying and releasing the clutch to see if the sound is affected. If not, the matter often comes down to excessive end play in the crankshaft, an unpleasant, rather expensive matter.

A hint: Check the motor mounts if you hear a thump or thud. A broken mount, not a very expensive repair, can possibly cause such a sound, especially at acceleration. It's worth a look.

7. Knock from the engine

Yes, this is another serious sound. Still, very rarely does a car give up on the spot, without warning. Even if it begins to knock, you probably have time to get it to a hospital. Chances are you'll need an expert, so read on if for no other reason than to learn how to talk to him.

A softer "knock" instead of a loud KNOCK! can indicate a loose piston pin, with the sound coming every time that cylinder fires. Remove the sparkplug wire from that cylinder. If the knock stops with the engine running, you've probably found the expensive problem.

A light metallic "knock" which reduces with the car coasting and out of gear often indicates a worn connecting-rod bearing. If the engine seems to struggle and emit a heavy, thudding knock, suspect the crankshaft main bearings.

Or you could be lucky. An out-of-time engine tends to knock. Start there and work toward the worst possible causes.

8. Clicking from the wheels

Wheel bearing? Wait a minute. More likely it's the hubcap. Reinstall it or hammer it on a little more firmly, then drive again. A pebble caught in the tread of a tire can cause an annoying click-click-click when you drive. They should check these things when they lube the car, but usually they don't. Flip out pebbles with a screwdriver, rolling the car a few feet so you can reach all areas.

Or the clicking could be coming from a wheel bearing and this needs your attention now. Especially if the clicking is gradually changing to a humming sound. Check the bearing,

(Please turn to page 208)

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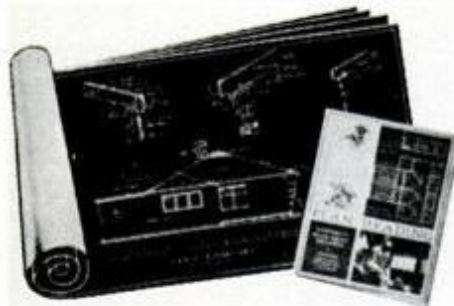
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TEN CAR NOISES

(Continued from page 207)

or have it looked at by a mechanic.

9. Rattling from anywhere

Usually nothing to worry about, rattles are a language an older car uses when it simply wants to complain about something loose here or wearing out there. A rattle can, however, be serious.

If you hear a rattling coming from up front, pull in and have the car lifted. Spin the front wheels one by one, for this is still another way a wheel bearing in the front announces its coming demise.

Another rattle for immediate attention is a shock absorber which has come adrift. It isn't uncommon for a shock to come loose at one end or the other and you can imagine what that does to the handling of the car. Yet it is an easy and inexpensive matter to correct.

10. Grind or growl anywhere

It is possible, if the grinding or growling is coming from the area of a manual transmission, to try lubricating the throw-out bearing to extend its life. Chances are that could be the problem. If you want to have it replaced (and you probably should) it will cost in the neighborhood of \$40 or \$50, unless you do it yourself. Then you'll only invest \$15 or so in the new part and a good chunk of labor.

If there is grinding or growling from the transmission itself (manual or automatic), refer to No. 5, a howl from the transmission.

Occasionally a U-joint will complain with a grind or a growl. Drive *carefully* to your home or garage.

A grind or growl can also indicate bearing problems in the wheels (see No. 2 or No. 8) or occasionally a problem in the expensive differential. Remember, always beware of the mechanic who wants to proceed directly to the big stuff without first stopping at the chicken-feed jobs.

Before you do one other thing, though, check the fluid level in the power-steering pump. A low level in the pump can cause it to grind and growl as though it were pulverizing itself (which it eventually *will* if you don't raise the fluid level, since the fluid also lubricates the interior parts of the pump).

There is no question about it—it is much easier for those who have a brother-in-law who is service manager of the dealership where they bought their car. But for most of us, learning these 10 sounds and the fixes is next best. ★★★



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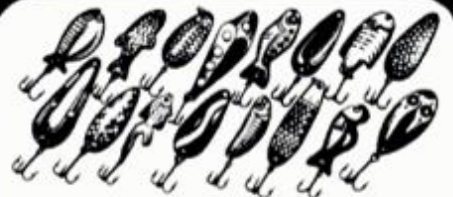
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ADD A SAIL FOR UNDER \$100

(Continued from page 104)

main and gaff halyards. The bottom is shaped square to fit into the mast step. Two small galvanized cleats are attached to the mast for the two halyards, and an eye is mounted for the downhaul.

Spars

The boom is 72 in. long with a hole drilled in one end. A piece of 1-in. strap metal is bent into a U-shape, with edges rounded and smoothed, and is attached with a bolt through the hole. This holds the boom to the mast and allows it to move up, down and sideways. A second hole is drilled through both sides of the metal U and, when the boat is rigged, a line (the downhaul) runs from the eye below on the mast up through the holes in the strap metal and back to the eye. With this, you pull the boom down and secure it after the sail has been hoisted. An eyebolt installed at the top of the other end of the boom serves to secure the outhaul for the sail. A second eyebolt, about two-thirds from the end and on the bottom, is for tying on the mainsheet. A second bottom eye, one-third from the end, holds one of the mainsheet blocks.

The 48-in. gaff boom fits into the slot cut in the jaws and is held in place with two through-bolts. A wood rasp and sandpaper shape the gaff end down to the contour of the jaws. A notch is cut in the outer end of the gaff for the peak outhaul. Two screw eyes, one at the jaws of the gaff and the other about 18 in. out, hold the main and gaff halyards. A third screw eye, near the bottom of the jaws, secures the sail lacing.

Sail

The sail itself is white Dacron, strong and weather-resistant. It's available from marine supply houses. To simplify fabrication, we drew the outline of the sail on the Dacron and then took it to an awning and boat-cover maker. To sew it yourself, you'd need an industrial sewing machine. Spread the material on the floor and mark a starting point near the lower right-hand corner. You will need excess material on all sides so that the edges can be triple-folded before they are sewn. Draw a 90° angle at the starting point (tack or bottom front corner), a 52-in. luff (leading edge) up from it and a 68-in. foot (bottom of the sail) from the tack out to the clew. From the top of the luff (throat), measure a 145° angle and draw a 44-in. line to the gaff peak for the sail head.

To get the correct curve to the



Converted pram rivals ready-builts costing nearly \$1000, is stable, sprightly sailer.

leech (trailing edge), mark a 45° angle at the tack starting point and run a line 68 in. out from the tack along this 45° angle. Bend a long, flexible batten with one end at the peak, the other at the outer clew end of the foot and the center sprung out to the midpoint mark for the leech. Then draw the leech line along the curved batten. Have one 30-in. and two 19-in. strips of material sewn on as indicated to form pockets for holding wooden or plastic battens. When having the sail sewn, indicate you want all edges triple-folded and all corners reinforced.

Installing grommets along the foot, luff and gaff head is a simple job you can do in an hour with a grommet kit from a marine store or mail-order supplier. The holes along the foot and luff are on 8¼-in. centers and at 7-in. intervals along the head.

Rudder and leeboards

Pieces of scrap ¾-in. plywood can be used for the leeboards, tiller and rudder. Template patterns can be traced on construction paper using a grid of 1-in. squares as shown. Secure the tiller to the rudder with a stainless-steel bolt with washers and nut to allow to pivot up and down freely. The pintles and gudgeons (pins and sockets that hold the rudder to the transom) are attached with bolts backed with wide washers under the nuts. Slide the pintles up and down for proper position before bolting them on the rudder. Pintles with forks to fit ¾-in. stock and matching gudgeons can be purchased at marine supply dealers.

Leeboards rather than a dagger-

board are used to avoid modifying the hull. We bought two C-clamps, a length of ½-in. threaded rod, nuts, large washers and wingnuts from a hardware store. At a welding shop we had lengths of the threaded rod welded to the backs of the C-clamps. To assemble, we roughened the threads close to the clamp with a file and then threaded a nut on until it jammed. Next comes a series of washers, the leeboards, more washers and the wingnut. The sides of the boat were angled so we cut hardwood blocks to the angle and bolted them inside and outside at the clamp position to keep the clamp level and allow each leeboard to pivot vertically down into the water.

To keep the leeboards from being pushed back by the water while underway, a line is rigged forward from each leeboard to a block (pulley) on the gunwale near the mast and back to a small cleat near the helm position. Windward leeboards can then be raised while tacking or both can be raised for launching.

Rigging

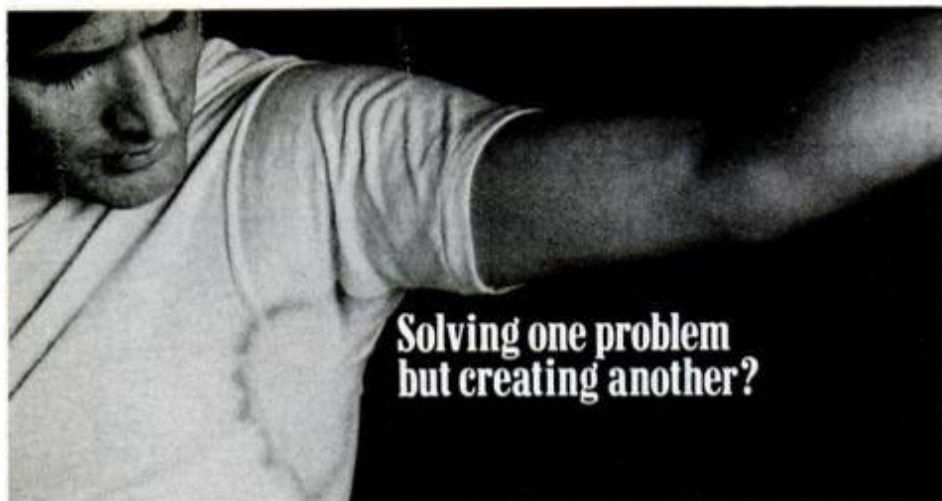
The mast is stepped by drilling a 1½-in. hole through the center of the bow seat and mounting a step below made of three pieces of 1-in. stock glued together after a square hole has been cut in the center of each. By tapering in the top two blocks, a flange is left on the bottom block through which screws can be run when the step is screwed and glued to the sole.

Mast hoops are 2½-in. galvanized rings slipped onto the mast before the gaff halyard pulleys are installed. These are attached with nylon line run through mast holes and knotted outside washers to reduce hardware weight.

By laying the mast, boom and gaff on the floor, it is easy to lace the foot of the sail to the boom and the head to the gaff using small nylon line. Using sailmakers' thread, the galvanized rings are then attached to the grommets in the luff. Drill holes near the jaw tips and thread the nylon line through these to keep the gaff jaws against the mast.

With halyards attached to the gaff and run through the pulleys, the mast can be stepped in the boat, the sail raised and the downhaul secured. The mainsheet is threaded from the boom eyebolt through seat and boom blocks to the helmsman.

For transporting, the gaff can be folded down against the mast, the boom swung up, and the sail wrapped around the spars and held with an elastic tie. Rig sail and mainsheet, mount rudder and leeboards and you're ready to go. ★ ★ ★



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ZOOM LENSES—NOW WIDE-ANGLE, TOO! (Continued from page 107)

complaint I find myself making over and over.

Flimsiest of the lot is the Tamron 70-150-mm zoom, which you must buy along with the appropriate Tamron camera adapter. This is so the dealer can stock fewer lenses. It isn't a bad idea, but I don't like extra pieces that have to fit together.

It is made to be a low-price lens, and it doesn't seem fair to compare it with, for instance, the Vivitar of the same range which sells for almost 50 percent more.

This Vivitar 70-150-mm f/3.8 macro-zoom is very good optically. It is adequately housed, compact, and has a macro range to 1:4.

The range from 70 mm to 150 mm is not very wide. It only replaces about two usual lenses. You might lay out a few more bucks for a greater range, like 70-210 mm, or 85-250.

Zoom during exposure

If you have a zoom lens, one of the nifty things you can do is zoom during exposure. You've undoubtedly seen shots made this way in ads and travel magazines. It's a technique that the pros use to indicate bold movement, or to salvage a dull

situation by making a flashy slide.

The camera must be on a tripod, since you'll be using an exposure time of $\frac{1}{4}$ second or longer. Use a slow color film like Kodachrome 25 and get a gelatin neutral density filter like a Kodak Wrattan ND 2.00, which lowers the effective film speed by almost 7 stops (conversely, it allows a shutter time seven stops longer with the same aperture). With Kodachrome 25 in bright daylight you'll be shooting around f/8 at one second, plenty long enough to work the zoom ring during the exposure. By the way, a long exposure time often gives a more saturated rich look to the colors.

Aim the center of the viewfinder at a simple, bright, bold object—a face, a leaf, the moon, an automobile's medallion—and zoom while the shutter is open. Try zooming from long toward short, short toward long, middle toward either end; and try holding still part of the exposure and then zooming.

If there's a sparkling light in the image, try using a Crostar filter. The resulting three-dimensional lights are startling and really jazz up a slide show. ★★★

KEEP YOUR WINDSHIELD CLEAN

(Continued from page 109)

the wipers clean without smearing the glass, and an antifreeze in winter to keep the solution from freezing. The antifreeze also provides some help in clearing a frozen windshield, but remember, it's just an antifreeze, not a melting agent.

Never pour boiling water on a windshield to melt ice or free the wipers. Cover the windshield at night with a blanket or a sheet of plastic to keep the ice from forming. But when ice does form, be sure to use a scraper that's made for the purpose. Glass manufacturers suggest frequent examination of these scrapers for nicks that appear in the edge of the blades. Replace any damaged scrapers before they get the chance to dig into the glass.

Checking washer and nozzles

By federal law, every car manufactured since January 1969 has been equipped with a windshield washer, and yet it is estimated that 30 percent of the washers installed in today's cars don't work.

If yours isn't functioning, it's a fairly simple task to locate the problem, the simplest being the first. Check to see if there's fluid in the reservoir. Then listen closely: If you hear the pump running, it's likely there's an obstruction somewhere in the line.

Remove the hose at the pump outlet and blow through it. If the fluid squirts out of the nozzles, then the filter is clogged and must be cleaned. Use a solvent to cut any oily residue that may have accumulated on the screen.

If the filter is clean, examine the hose line for breaks, kinks or obstructions; then check the nozzles. A straight pin or sewing needle will usually clean them out. If they've corroded closed, replacement may be necessary.

If the pump itself isn't running, check all electrical connections—the switch at the dash, the fuses, and the wiring running to the pump. If you still get no action, remove the pump or the pump-wiper combination and give it a bench test just to make sure that power has been getting to the pump. Refer to your dealer shop manual for the removal procedure to avoid damage to the wiper transmission assembly.

Replacing the washer pump

Once you decide that the washer pump must be replaced, you have several options. The easiest and least expensive to try will be to purchase a universal windshield-washer serv-

ice kit. This kit is installed as a bypass around the inoperative pump. It is not coupled to the windshield wipers, however, and thus it must be operated independently of the wipers.

Repair kits for the pulse type of wiper-mounted pumps are also available, but you should refer to the service manual for your individual make and model car for part numbers and instructions—each manufacturer has his own philosophy about how equipment should be made and serviced.

(The universal kit is also the way to go when you're installing washers on vehicles not previously equipped with them. And it's not a bad idea to install one on a boat used in salt-water.)

Adjusting the washers is simply a matter of bending the nozzles a little bit at a time until you have the stream hitting the correct spot on the windshield. That spot should be about two inches below the top of the wiper arc when the car is standing still. At expressway speeds, the stream will then hit the center of the wiped area.

All about refills

Rubber refill edges must be sharp enough to cut through water, but remain soft and flexible enough to maintain contact with the glass. The edges must also be perfectly straight to assure uniform pressure throughout their length. When the edges go bad, or the rubber begins to harden, the blade skids across the glass like a bald tire.

Although a blade may tear when it's yanked away from a frozen windshield, it is chemical action that causes most blade deterioration. In fact, there are indications that "exercise" through frequent use can help to extend the life of a wiper blade. In dry, hot desert country, wet the windshield with a hose and run the wipers for five minutes every few weeks. It will keep them limber.

Arm tension

Until the early '60s, when electric wiper motors became standard, wiper-arm pressure was critical because of the low power of the vacuum motors then in use. Too little pressure allowed the wiper blades to slip and slide over the glass, while too much pressure put too great a load on the motor. And, of course, the old vacuum-powered jobs all but stopped as the manifold vacuum dropped when you floored it under acceleration or when climbing a hill.

Today, heavy-duty electric motors permit the use of stronger springs in the arms. Average arm pressures

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have consequently more than doubled.

It isn't likely you'll need to test, but if you have to, here's how:

When the wiper arm is in a vertical position, remove the blade. Using a small pressure tester (most service stations will be able to find one in the back of the drawer), place the arm tip on the small platform and take your reading. If your car has a vacuum motor, the pressure should be about one ounce for each one-inch length of the blade. For an electrically powered system, pressure should be at least double that, and preferably be in the range of 32 to 36 ounces.

If you can't get a scale to measure the arm-spring pressure, use your own judgment. If the pressure feels strong enough, it probably is. The best test—here we go again—is to install a fresh blade refill and see how it works on a clean windshield.

Manufacturers recommend against bending the arm to adjust the pressure. With articulated arms particularly, you could throw off the geometry. Further, you take a chance of bending the motor or the transmission shaft and permanently damaging the system. It's better to install a new arm instead.

You can, however, check the arm

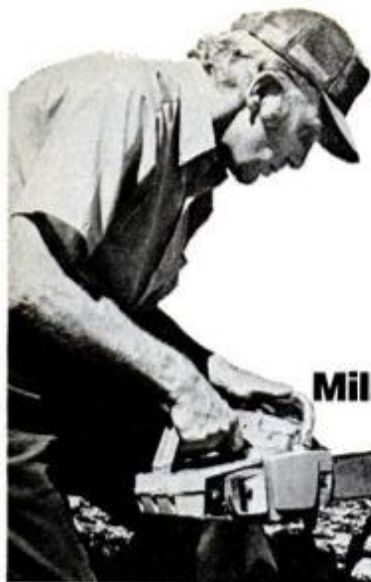
tip for parallelism with the windshield. If it isn't parallel, twist it with an adjustable wrench. If that doesn't correct the slippage or chattering, replace the arm.

Note to RV and pickup owners: chances are that the windshield on your vehicle is far larger than on any car and blade pressure requirements are different. Don't try to increase blade pressure by bending the arm or replacing it. Try antiwindlift blades. They may do the trick.

Removing wiper arms

Arms are easy to remove, if you use a puller tool. You can borrow one at your local service station, or have the dealer do the job for you. Unless you have a fleet of cars requiring constant care, there's little need to buy a tool you'll probably never need again.

Lubricating the wiper system is a matter of applying just a few drops of oil to all possible points of wear. On the wiper arm, particularly if it's a double-arm parallelogram mechanism, keep the lubrication to a minimum to avoid dripping and smearing of the glass during wiper operation. Don't forget the under-hood linkage between the motor shaft and the two arm shafts. ★★★



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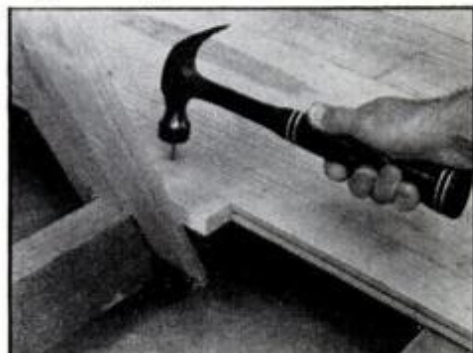
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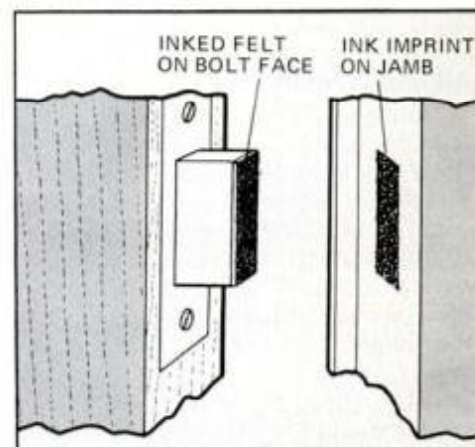
FROM READERS

Tight-fitting floorboards



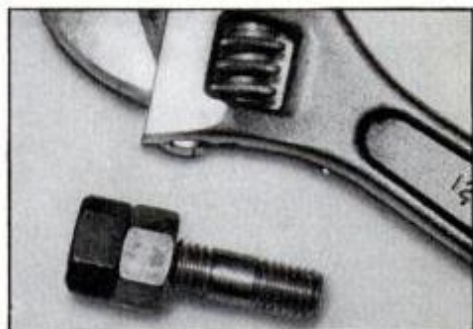
A fork-ended lever—braced between scrap wood and a rod inserted in a hole made in every third joist—pulls floorboards together.—Ken Wells

Get a dead aim on dead bolts



Inked stick-on felt applied to the face of a dead bolt will leave an imprint for the strike in the jamb when the door is closed and the bolt thrown.—Mike Lynch

Prevent thread damage to studs



Save stud threads from wrench marks by placing two nuts on the threads and tightening each in the opposite direction to lock them. Turn outer nut to drive the stud; grip inner nut with the wrench to extract the stud.—Ronald Thomas

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much because your plants absorb nutrients as they need them.

ORGANICS—A METHOD WHOSE TIME HAS COME!

The world is waking up to the importance of organics. People laughed at J.I. Rodale—the father of the organic movement—when he made his startling

revelations more than a quarter century ago. But no more.

Scientists now warn about the hazards to all life from pesticide contamination. Agronomists are now reporting the damage done to soil structure and content by chemical fertilizers. Nutritionists and the general public, more and more, are complaining about the "poor quality" of the produce found in our supermarkets. And all this talk about pollution! Why, organic farmers have always recycled their wastes through their compost piles and gardens.

All around us, we see the organic movement growing... especially in these troubled times. Where else than in your garden can you quickly get a feeling of Nature's understanding calm? And so the common sense, the practical and natural ideas advanced by ORGANIC GARDENING AND FARMING magazine have rapidly gained.

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to be inspected more carefully. I've had the car back five times for things that should have been caught at the factory."—Minnesota liquor commissioner.

"It would be difficult, after paying \$17,000 for the car, to express my feelings when I pull up to the dealership for normal service and must await my turn behind a little Cougar."—Indiana salesman.

Owners expect Continentals to be comfortable, and most aren't disappointed. Front-seat comfort got an overwhelming 69.7-percent excellent response, while the rear seat fared a good bit worse. Even at that, though, only 27.5 percent rated the rear seat's comfort fair to poor, and many owners said they used the Mark V strictly as a two-passenger car. On the topic of comfort, here are statements:

"Seat belts strangle rear passengers on entry."—Indianapolis vice president.

"Comfort is excellent front and rear—better than your favorite chair or any aircraft seat."—Retired Air Force officer from Michigan.

"Superb comfort up front, miserable in back."—Illinois public transportation manager.

"The Mark IV was more comfortable, but the Mark V's rear seat is better."—Delaware chef.

Some 60 percent of our respondents had had no mechanical problems at all. Of those who did, hard starting and carburetor ills headed the list. Dealer service received very high

This Fort Lauderdale dealer must really be something—a bunch of Mark V owners raved about him.

Maybe the Cougar owner needs and wants his car serviced just as much as the guy who drives the Mark V.

Detroit's got to do something about those hangman shoulder harnesses.

praise, with 40.8 percent ranking it excellent and another 29.6 rating it good. That's again one of the highest endorsements of dealer service in recent surveys.

"Our Lincoln-Mercury dealer has always been excellent," says a Michigan territory manager, "and has always tried to be way above satisfactory."

"The Fort Lauderdale Lincoln-Mercury dealer treats you like a human being!"—Florida airlines maintainer.

"Service is good, but there could be better coordination between the service manager and the mechanics."—Florida retiree.

"I have always received immediate attention and have also been loaned a car when mine has had to be in the shop."—New Mexico home-maker.

"Service rates average although the dealer is extremely courteous and tries his best."—Chicago commodity broker.

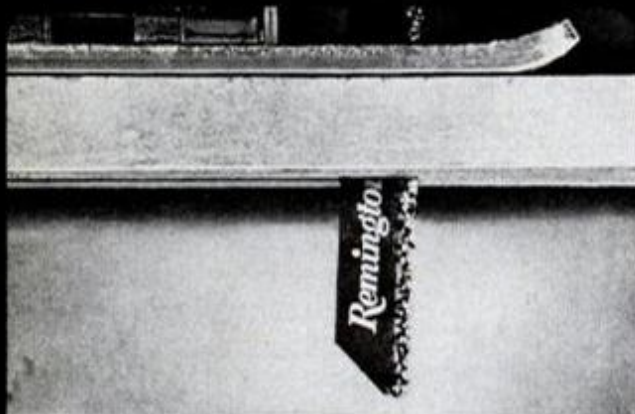
When asked whether they'd buy another Mark Continental next time, 86.1 percent said yes. "I couldn't be satisfied with any other car," remarked an Arkansas building contractor.

"Yes, if the quality holds up," asserts a Michigan manufacturer's rep.

"No—I'll probably go back to a Lincoln sedan even though I've had 1973 and 1974 Mark IVs in addition to this Mark V."—Houston physician.

"Yes, if they don't make the Mark smaller."—Self-employed North Carolinian. ★★★

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For more information, see your hardware dealer or write: Abrasive Products, Dept. 691, Remington Arms Company, Inc., Bridgeport, Conn. 06602.

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"Grit-Edge" blades can cut it.

Material	Rod Saw	Hack Saw	Saber Saw	Circ. Saw	Band Saw
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Beryllium	X	X			X
Carbon	X	X		X	X
Cast Iron	X	X			X
Composites	X	X	X		X
Composition Board			X	X	X
Fiberglass	X	X	X	X	X
Foamed Glass	X	X			X
Friction Materials	X	X	X	X	X
Glass	X	X			X
Hardened Steel	X	X			X
Honeycomb Materials					X
Marble, Natural	X	X	X		X
Marble, Synthetic	X	X	X	X	X
Plaster			X	X	
Plastic Laminates	X	X	X	X	X
Plywood			X	X	X
Stainless Steel	X	X	X		X
Stranded Cable	X	X			X
Superalloys, Iron-base	X	X			X
Superalloys, Nickel-base	X	X			X
Tempered Hardboard			X	X	X
Tires, Steel-reinforced					X
Titanium	X	X			X
Tile, Ceramic	X	X	X		X

*Requires coolant and variable-speed machine

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"We had Caprice wagons in the past and were well satisfied. This one has had the least things wrong with it of any car we've ever purchased. Our only complaint is the location of the driver's sun visor. It hits the driver on the head and messes up our hair."

A Kansas farmer: "The 350 engine gets lousy gas mileage in this square, boxy wagon—8 to 11 miles to the gallon—not nearly what the dealer told me. Also, the speedometer should go to 100 mph, not just to 80. And the dealer promises you anything, but I have to keep going back for little repairs—gearshift had to be replaced, rear seats came out and had to be rehung, gas gauge still doesn't work. But it's quiet, has good acceleration, drives well, and has more interior space than our 1972 Chevelle wagon had."

A self-employed Illinois trucker: "The seats could be a little thicker and firmer, and the sun visors should be clamped so they don't hit your forehead. Other than that, I'm very happy with my new car."

A New York marine engineer: "Transmission wouldn't shift; dealer repaired it on warranty, but I had to make three trips. Very minor paint blemishes, and the plastic ash-tray broke. No place under dash to mount a CB radio. Performance with the 305 V8 is good, and I like the car's maneuverability and styling."

A Michigan buyer: "Handles very nicely, like a Nova, but it has a lot more room. Chevys

Here's something Chevy ought to fix in a hurry—a number of owners noticed it.

Almost no one ordered the '77 Chevy with its base o.h.v. Six; some owners felt the 305 V8 ought to be standard.

Shoulder space is slightly narrower in the 1977 Chevrolet than its 1976 counterpart, but other dimensions are the same or bigger.

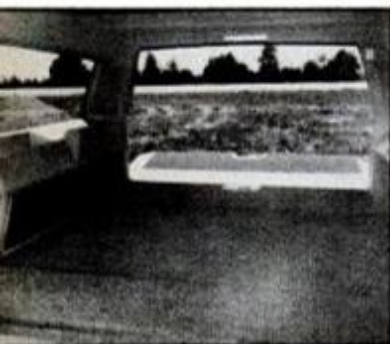
We noted a number of grumbles—people disputing the affordability of any new car.

normally have good resale value, and I consider workmanship good but not excellent. My biggest gripe is the power-window switches—they're too far away, and you have to hunt for them."

A New York lathe operator: "The transmission pauses or slips when shifting, and the clock ought to be better lighted. They've tried to adjust the transmission, but no luck so far. The front seat didn't feel right, so they added more rubber and now it's very comfortable. I like the way the car handles and rides—the engine is quiet and doesn't race or stall when cold. The car also fits in my garage nicely. I've been buying Chevrolets since 1941 and have never had a bad one."

A Michigan plant manager: "I have stereo and airconditioning, so I appreciate the Impala's silence. No wind noise, acoustical ceiling. Also excellent handling; seems to be well balanced. This is the quietest and best-built car I believe I have ever owned."

A Wisconsin agricultural economist has the final word: "It's amazing how the manufacturer lightened the car by over 700 pounds and shortened it about a foot and still provides comfort superior to that in previous years. I've owned seven Chevrolets—all were reliable and affordable. This one's absolutely quiet—no squeaks or rattles. I enjoy the comfort, styling, next-to-perfect handling, and the only complaint I have is that the seats are somewhat erect. I'd like recliners. But even so, this is the best of any Chevrolet I have ever owned!"



A few wagon owners objected to rear-facing third seat, but most appreciate the fact that the cargo floor accepts 4x8-ft. plywood sheets. A lockable 2-cu.-ft. storage compartment complements a 6-cu.-ft. underfloor pit in two-seat wagons and two open utility trays beneath the rear side windows.

Summary of 1977 Chevrolet Owners Reports*

Total miles driven	742,005
Average miles per gallon:	
305-cu.-in. V8	
In town (EPA, 16 autom.)	13.5
Long trips (EPA, 21 autom.)	17.3
350-cu.-in. V8	
In town (EPA, 15 autom.)	13.6
Long Trips (EPA, 20 autom.)	17.1
Engines:	
250-cu.-in. Six	0.9%
305-cu.-in. V8	59.9
350-cu.-in. V8	39.2
Body styles:	
Two-door coupe	28.5%
Four-door sedan	61.9
Four-door wagon	9.6
Series:	
Impala	45.8%
Caprice Classic	54.2
Why did you choose the Chevrolet?	
Past experience	50.8%
Styling	14.0
Size	12.4
Economy	9.9

Price	8.3
Specific likes:	
Handling	38.3%
Styling	29.4
Comfort	24.8
Riding qualities	24.8
Economy	19.6
Specific dislikes:	
Poor gas mileage	18.2%
Transmission shifts rough	6.5
Poor workmanship	6.5
Dealer service	5.1
Poor paint and finish	4.2
What changes would you like?	
Better gas mileage	14.5%
Seat engineering	5.3
Better workmanship	4.3
Better materials	4.3
Workmanship opinion:	
Excellent	25.1%
Good	44.4
Average	14.8
Fair	8.6
Poor	7.0

Comfort (front seats):	
Excellent	44.9%
Very good	39.7
Good	10.9
Fair	3.2
Poor	1.2
Comfort (rear seats):	
Excellent	33.2%
Very good	45.0
Good	16.2
Fair	4.4
Poor	1.3
Had any mechanical trouble?	
No	51.3%
Yes	41.7
What type of trouble?	
Transmission	25.2%
Carburetor	7.8
Car gauge	6.8
Electrical	6.8
Did you repair it yourself?	
No	96.1%
Yes	3.9

Dealer repairs satisfactory?	
Yes	53.8%
No	46.2
Dealer service opinion:	
Excellent	31.6%
Good	38.7
Average	15.6
Fair	4.4
Poor	9.8
Number of vehicles owned:	
Chevrolet only	53.2%
Two cars	37.9
Three cars	6.0
Four cars	2.0
Five or more cars	0.8
Makes of other cars owned:	
Chevrolet	69.0%
Ford	6.9
Mercury	5.2
Age distribution of owners:	
15-29 years	5.8%
30-49 years	34.8
50-plus	57.4
Would you buy another Chevrolet?	
Yes	93.7%
No	9.3

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



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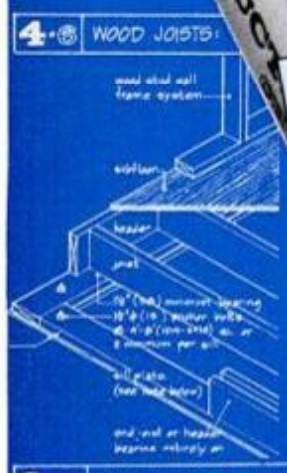
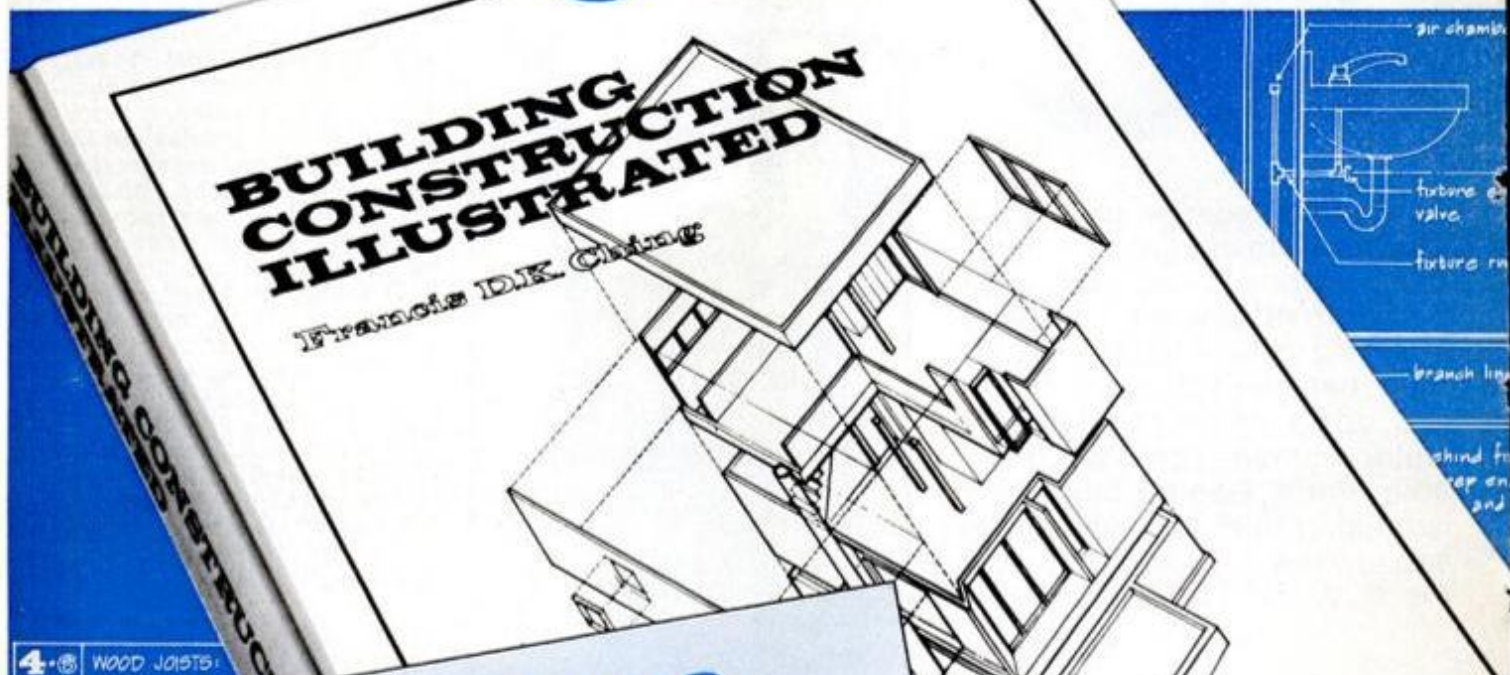
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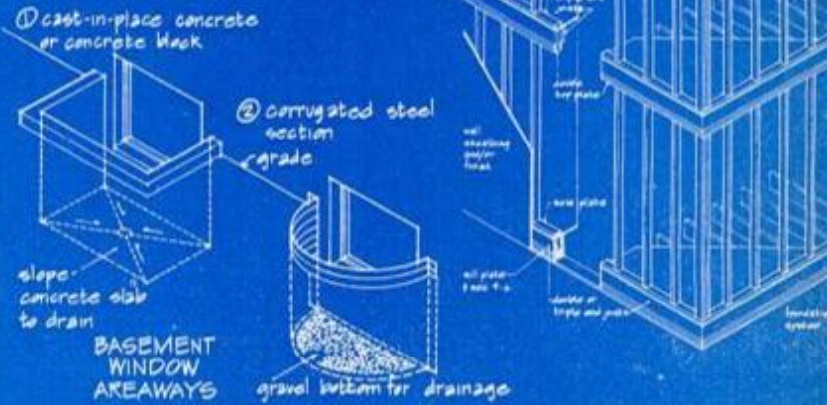
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NEW IMPORT OUTBOARDS

(Continued from page 93)



Larger inflatables have transom mounts that can carry an Evinrude 2-hp mill.

motors, from the 3.9 up, have alternators, and the 12.5 and 21.5 offer high-capacity built-in bilge pumps.

The British Seagull, in 2, 3, 4.5 and 5.5 hp, carries on a tradition as a favorite auxiliary kicker for sailboats. Honda provides the only current four-cycle outboard, imported in standard and long-shaft models delivering 7.5 hp from the B-75 K2 motor.

Tough competition

But on North American waters the imports had better be good—they're up against the toughest of competition. American-made mini-horsepower motors are providing a great variety of new lightweight marine muscle. In alphabetical order:

Chrysler has a new 4-hp single-cylinder, loop-charged midget that is water-cooled and available for 15 or 20-inch transoms. With forward and neutral shift, it has 360° pivot steering. Chrysler also has low-profile 6, 8, 10 and 15-hp units, and high-thrust "sailers" of 25, 35 and 45 hp. The 6 and 10-hp sailer models are designed for displacement hulls, provide lower power ratios with over-size propeller and double reverse thrust. The 6-horse sailer has a top-rewind starter that can be pulled from any angle. Larger Chryslers range on up to 135 hp.

Clinton Engines reports improvements for both compact and deluxe lines by adding a lightweight 2 hp to its compacts and a 9 hp to the deluxe group. The Clinton compact line now includes 1.5, 3.5, and 7.5 hp, while the deluxe 5, 7.5 and new 9 have remote tanks.

Eska's top twin-cylinder motors for 1977 are the 15 and 9.9-hp models. The 7.5 Eska comes in FNR, Deluxe and Standard, and there are two models of the 5 plus a 3.5 hp. All feature Eska's Power Loop engine design and slow troll speeds.

For the mighty midget market, Eska has the air-cooled 11-pound 1.2 hp and the 21-pound 2.5, also with Power Loop design.

Evinrude's big V6 175 and 200-hp muscle machines don't put its 36 lower horsepower engines in the shade—there are 20 to choose from that feature 35 hp or less. New this year is a compact workhorse of 25 hp, a kissin' cousin of its 35 with the same displacement and power head but with a little less speed and power. It's claimed to be faster and offer more fuel economy, however, than any other in its power class.

Evinrude's take-along twins, the 15 and 9.9, have increased fuel economy and boast a reported 300-per-



Surprising speed is possible with little mill like 15-hp Sea Horse from Johnson.

cent boost in the reverse thrust so useful for docking and sailboat handling. A 20 percent improvement in fuel savings at mid-range speeds is reported for the Evinrude 6. The 4 is available in standard or weedless drive for fishermen and the 2, still at 24 pounds, claims 18-percent less thirst for fuel.

Johnson Motor's Sea-Horse symbol is worn by 38 models from 200 and 175 hp down through 140, 115, 85, 75, 70, 55 and 35. Johnson also has a new 25 hp with notably increased speed, acceleration and low-end pulling power.

Except for the mini Sea-Horse 2, all smaller Johnsons—the 15s, 10s, 6s and the 4 hp—have MagFlash electronic ignition plus a visible cooling system to insure proper operation.

Even Mercury's new model from last year, the 4-hp Gnat, has managed a jump in fuel savings with a claim of 25-percent better performance at full throttle and 50 for cruising speeds. Neutral start is now standard on all Merc models, and all can run satisfactorily on standard automotive gasolines at a 50-to-1 gas-oil ratio. Though the 35 Mercury models range up to the 175-hp Black Max, 20 handle 40 hp or under with motors of 20, 9.8, 7.5, 4.5 and 4 horses.

Sears, Roebuck's Gamefisher outboards range from their 1.2-hp 11-pounder up to a light but powerful 15 that weighs only 63 pounds. In between are single-cylinder 3.5, 5 and three 7.5-hp motors.

Montgomery Ward is introducing new 7.5 and 9 hp air-cooled mills with the advantage of light weight but with superior silencing and vibration damping. Also in the line will be an air-cooled 23-pound 2 hp and water-cooled 6, 7.5, 10, 15 and 35-horse units.

Also offered this year for the small boat owner will be mini-mills like the 4-hp, air-cooled 4000 from Aero Marine; AquaBug's 11-pound 1.4 hp with sliding lower-unit shaft for adjustable shallow running plus Super-Bug 2 hp weighing 17.6 pounds; the unique Aquascooter 2-hp prop-jet pusher that can mount as an outboard or be used in the water to tow swimmers. Arrow Drive's 9-hp air-drive, fan-style unit can skim a shallow hull over marshes, ice or thin water. Cruise-n-Carry's single-cylinder 1.7-hp 12-pounder has an automatic reverse lock, adjustable-height lower unit and a shoulder-strap case.

Otterbine's 2, 3, 5 and 7.5-hp jet outboards are presently available as parts only. Tas Industries' TOB



Oars are optional if a dinghy or rental skiff also mounts a light Chrysler 4 hp.

12B 1.2 11-pound mini and their 2.5-hp TOB 25 feature both air-cooling and light weight. The TerMar 1.7 Mighty-Mite II now comes in two lengths to accommodate sailboat use. Triton's three new outboards, the 4, 5.5 and 7.5-hp models, all feature "depth minder" telescopic-leg lower units. With the number of little mills around, no boatman this year should have trouble trying to pick the proper kicker.

Now that the competitive forces have lined up, the fight for market share should be an interesting battle—especially for consumers. ★★



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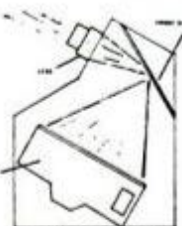
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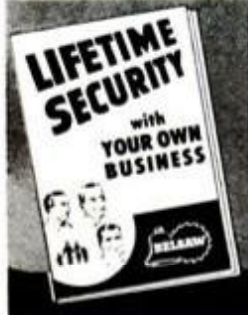
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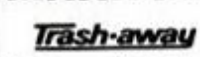
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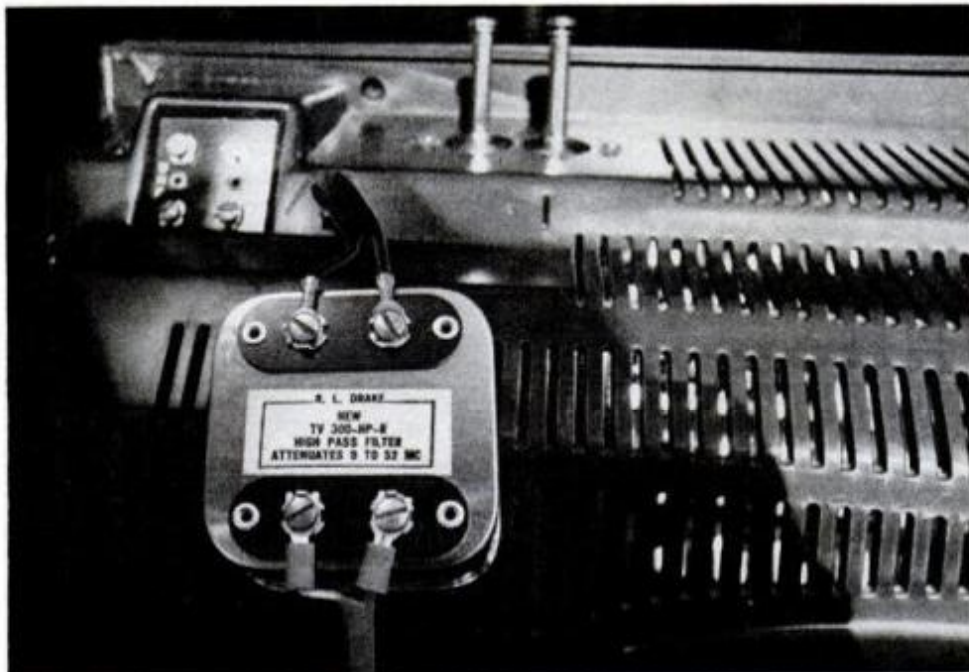
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Don't let the Good Buddies bug you

Roll your own filter to lock CB interference out of your TV and stereo.

by Anthony R. Curtis
ELECTRONICS EDITOR



High-pass filter in TV lead-in will prevent signals from nearby CB transmitter from fuzzing up your favorite show. Install the filter outside the TV cabinet to avoid shocks.

The Hardy Boys were roaring out the back end of their super van in hot pursuit of the villains when my TV picture went crunch and I heard, "Breaker, one nine. How's she look back over your shoulder, Good Buddy?" I was caught in the new national epidemic of RFI.

That's not a new flu bug from the Orient, but *radio frequency interference* from the millions of CB transmitters in use across America. If you are a CBer, or live near one, you undoubtedly have heard weird squeaks, loud squawks and irritating "ten-fours" sounding forth from your hi-fi and TV.

Filter out the noise

Luckily, it's not hard to keep such interference out of receivers. In most cases an inexpensive high-pass filter will clean TVI (television interference) from your tube.

To keep good-buddy signals from my set, I installed a TV-300-HP high-pass filter, manufactured by

R. L. Drake Co., 540 Richard St., Miamisburg, Ohio 45342, between antenna and TV. The filter, which lists at \$10.60, is designed for sets like mine which use the flat 300-ohm twin-lead kind of antenna lead-in wire. Drake's TV-75-HP, at \$13.25, does the same job but is for sets

using round 75-ohm coaxial-cable antenna lead-in.

Hooking it up

TV signals we want to receive are above 52 MHz in the radio spectrum, while CB signals are down at 27 MHz. A high-pass filter, such as the Drake, cuts off reception of all signals below 52 MHz. That permits wanted TV signals to get through, but chokes off unwanted CB transmissions.

I hooked up my high-pass filter by attaching the lead-in wire from my TV antenna to one of the two connectors on the filter. Then I ran a short length of similar cable from the filter's other connector to the terminals on the back of my TV set. I used pliers to crimp solderless connectors (Radio Shack 64-3033; 10 for 69 cents) to the stripped ends of my twin-lead so I could screw the wires onto the filter and the TV.

Don't try to mount the filter inside the TV cabinet. The shock hazard is too great. Rather, mount it on the outside back of the set close to the antenna terminals. Drake supplies peel-off-backing sticky tape so the small box will adhere to the back of the TV. Keep the run of wire from filter to TV-set terminals as short as possible.

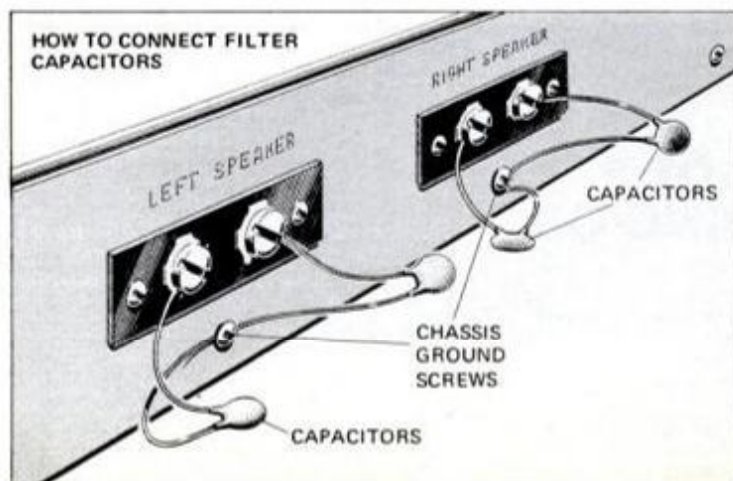
Attention, CBer

By the way, if you operate a CB transmitter which interferes with someone's TV, put a *low-pass* filter in your transmitter antenna line. A low-pass filter cuts off transmission of signals above 41 MHz, but lets 27-MHz CB signals go through.

Very bad cases of TVI may require installation of both low-pass filter on the transmitter and high-pass on the TV receiver. Drake sells its TV-3300-LP low-pass filter for \$26.60.

RFI is not new. It's been around as long as radio transmitters. Ham radio operators used to suffer with TVI back in the early days of tele-

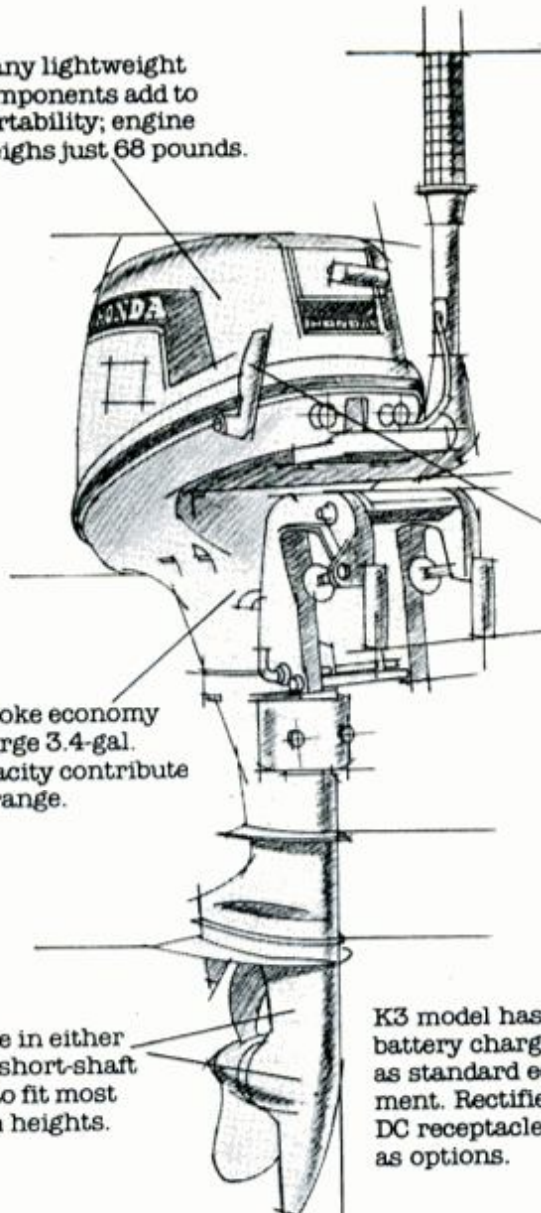
(Please turn to page 232)



Easy-to-make filter will keep most unwanted CB signals out of stereo speakers. Use four .01-mfd. disc ceramic capacitors from your local electronics shop. Wire one from each speaker terminal to chassis screw.

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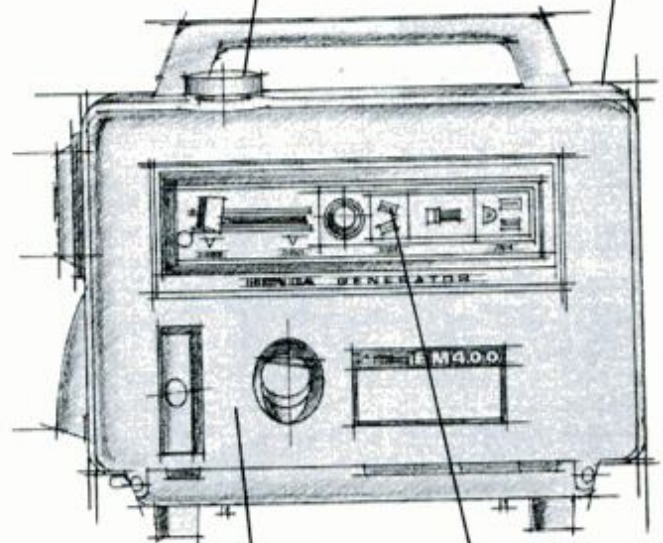
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DON'T LET THE GOOD BUDDIES BUG YOU

(Continued from page 230)

vision when TV sets were not as technologically advanced as today's. It's become a CB epidemic, all of a sudden, because millions of new transmitters have gone on the air in the last couple of years in apartments and neighborhoods where no radio-frequency signals ever were generated before. CB Smokey reports may save speeding tickets, but they can dump big frustrations on music lovers and TV addicts.

Filter your own

To keep the neighbor's ratchet-jawing out of my stereo, I made my own filter from four ceramic-disc capacitors from the local Radio Shack. I used .01-mfd. capacitors (No. 272-131) at 29 cents for two).

These bypass capacitors are hooked from the speaker terminals on your stereo set to a chassis ground. For that ground, I used a metal chassis screw near the speaker terminals on the back panel. You can use capacitors rated from .01 to .03 mfd. Try a .01. If that's not enough filtering, use a .03 mfd. Be sure to install these bypass capacitors on all speaker terminals.

cord for each component as you remove it from the system.

Those patch cords that connect components together in a system sometimes can be weak links. Sometimes cheap cables don't have good shielding. RFI problems can result. If you track your problem down to a poorly made cable, replace it with better-grade wiring.

Record-player tone-arm connections to cartridges usually are made with small clips. A loose clip, especially where oxidation may have set in around a poor connection, is a good place to find RFI. Check all connections for looseness.

Treat tape decks the same as turntables. You can bypass the pickup heads and tone-arm wires with .001-mfd. ceramic-disc capacitors. Put the capacitors as close to the pickup cartridge or tape head as possible. Keep the capacitor leads as short as possible.

Shield your set

Ear-splitting RFI may get into your stereo through an open bottom. If your receiver or amplifier has no metal base plate underneath, or is housed in a plastic box, shield it with aluminum foil. Make sure the foil doesn't short any internal components to the metal chassis. Watch out for shock hazards whenever you work inside any TV or stereo.

Home TVs and stereos are not the only devices clobbered by RFI. Many a Sunday morning has been disrupted when a church organ mutters "ten-fours." Or when a racetrack public-address system belches some Smokey reports just as the ponies break the photo-finish wire. The cure for both problems is the same as for home stereo systems. Bypass the speaker leads and shield the system.

I remember the time my friend was talking on his radio and getting into his sister's private telephone conversations. She could hear his transmitted voice through her phone as if he were on an extension. She was mighty unhappy until he got a phone company serviceman to stop by and put a .001-mfd. capacitor across the two connections on the microphone in the handset of her telephone.

Who's to blame?

When a CB transmitter interferes with your stereo or TV, you understandably get upset. But, as much as you would like it to be the citizens-band operator's fault, the Federal Communications Commission gives you the responsibility for



Drake TV-75-HP high-pass filter (left) is for use in 75-ohm coaxial-cable TV lead-in line. TV-300-HP (right) is for use in 300-ohm twin-lead TV antenna line.

Antenna pickup

If your hi-fi system includes an FM receiver, RFI may be getting into your set along the antenna line bringing FM signals into your stereo. You'll have to do something to prevent the unwanted signals from getting to the stereo just as you would with a TV receiver. FM broadcasts are from 88 to 108 MHz in the radio spectrum. Use a TV high-pass filter in the antenna lead-in line to the FM receiver.

Stereo components are hooked together by cables. When you check your system for the point where RFI is getting in, disconnect cables from one component at a time until you find where interference is eliminated. Also unplug the a.c. power

cleaning up your own home-entertainment gear. Sure, ask the CBER to install a low-pass filter on his transmitter. Hopefully, he will cooperate. But you should go ahead and install a high-pass filter on your own TV set at the same time.

If RFI ruins your Saturday afternoon stereo listening, talk with the CB radio operator. But also take it upon yourself to bypass your speaker's leads and take other necessary steps to filter out offending signals. Gripe to the manufacturer of your stereo or TV about why he didn't save you all the trouble by building filter capacitors and high-pass filters into his sets.

Many responsible manufacturers have a policy of supplying filters for use against TVI when problems are brought to their attention. A list of those manufacturers is available from the American Radio Relay League, Inc., the national amateur radio fraternity at 225 Main St., Newington, Conn. 06111. Its RFI information packet is available to all who have such troubles.

Some stereo manufacturers will supply diagrams showing how to modify audio gear with bypass capacitors. If a manufacturer can't or won't help you, write to the Director of Consumer Affairs, Electronic Industries Assn., 2001 Eye St. N.W., Washington, D.C. 20006.

Before you complain to the manufacturer and your CB neighbor, though, make sure the interference you have is from a radio transmission. No sense going to the trouble of installing filters and losing friends if your problems come from other sources.

What other sources?

Electric razors, fluorescent lights, automobile ignition, power lines, X-ray and diathermy machines, neon signs, light dimmers, thermostats and even ordinary wall switches all generate RFI to interfere with your home-entertainment gear.

Since the majority of interference will be heard only close to its source, you might waste time taking your stereo or TV to a distant service center where the interference does not exist. Fix it yourself, or have it fixed, on the spot where your receiver can hear the FRI.

Remember, it may not always be possible to cure interference completely. In extreme cases, you may be able to reduce it a great deal but not wipe it out. Even so, cutting down on the agony is better than doing nothing at all. ★ ★ ★

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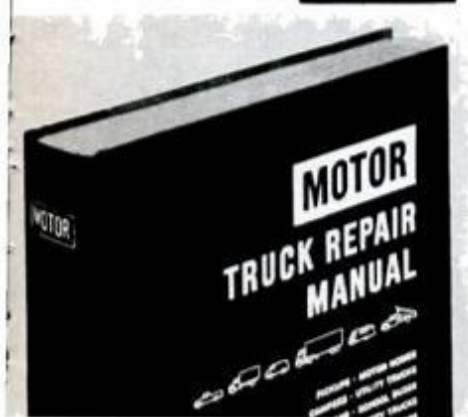
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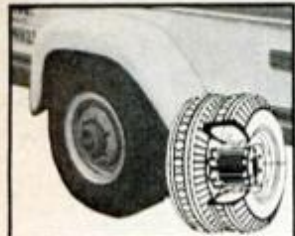
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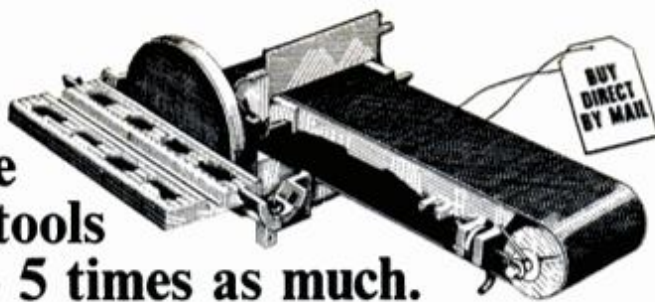
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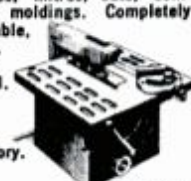
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These questions used to really stump me. That was six years ago.

My wife and I then lived in Denver, Colorado, at 2545 South High Street. We paid \$135 a month rent for a cramped, tumbled down house. My wife was expecting our second child and we were flat broke. I felt desperate and forced into a corner. I had to borrow \$150 from my father and another \$150 from my father-in-law just to buy the groceries and pay the rent. If that wasn't enough, we were several thousand dollars in debt.

Things are much different now. Last year I could have retired and lived off the income of my one million dollars in real estate holdings. (Incidentally, almost all of the income from the real estate is tax free).

Since I had worked 20 to 40 hours a week, I know that I didn't work even 10 times longer or harder than you. And with my C-average from Ames High School (located in Ames, Iowa). I'm quite certain that I'm not any smarter than you.

If hours, efforts, or brains are not what separates the rich from the average guy who is swamped with debts and very little income, then what is?

I learned the answer to that question from an old fellow in Denver. This fellow worked in a drug store stocking the shelves. Very few people knew that he had \$200,000 in the bank, all of which he had earned starting from nothing.

Within a year after meeting him, I was told and shown the same thing by a young man who had recently earned over a million dollars. By this time, I began to realize that what I was being shown was truly a remarkable and workable way to grow rich.

I began to apply the principles and me-



MARK O. HAROLDSSEN
32 Year Old Millionaire

thods I had been shown. The results were amazing. I couldn't believe how easy it was, in fact it seemed too easy.

But then I met an elderly lady (83 years old) who, although not very smart, has made \$117,000 using the same formula.

I then figured my beginning wasn't luck.

For three and one half years, I worked hard to refine and improve on the formula that I had been shown, so that it would be easy to get quicker results.

As I did this, my assets multiplied very rapidly (160% per year) to the point that I didn't have to work any longer.

I guess I am bragging now, but I did start spending alot of time in our back yard pool, traveling around the country, and doing a lot of loafing.

Then one day a friend asked me how he could do what I had done.

So I began to outline the formula that I had improved to show him really how simple it was, and how he could do the same thing.

By the next time he approached me, I had written almost a complete volume on the easy way for him to copy my results.

I wrote this in simple, straight forward language so anyone could understand it.

This time my friend's questions were very specific. (He had already begun buying properties with the formulas I had been giving him). Now he had a property he wanted to buy, but was out of cash. How could he buy it?

I not only showed him how to buy

without cash, but by the time the deal was complete, he had \$5,000 cash in his pocket to boot.

I also showed him how to buy a \$26,000 property for \$75 down.

You, or anyone, can do exactly what I did, or my close friends have done; in fact, you may well do it better. (I began doing this in my spare time only).

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- Allow you to travel one week out of every month.

When you send me a check or money order for \$10, I will send you all my formulas and methods, and you are free to use them anywhere and as often as you would like.

Now if you were a personal friend of mine, I know you would believe me and not need any kind of guarantee, but since you don't know me personally, I will guarantee that you will be completely satisfied and that my formula will work for you if you apply it. I will back up that guarantee by not cashing your check for 30 days, and if you for any reason change your mind, let me know and I will send your uncashed check back.

You may well ask, why am I willing to share my formula for wealth? Well, because many of you will probably seek further consultation and direction from me as your wealth rapidly grows and my consultation fee of \$75.00 an hour adds to my fortune.

But you shouldn't care if I profit as long as you profit. And I guarantee that you will.

By the way, if you feel a little uneasy about sending me a check or money order for \$10.00, simply postdate it by 30 days which will completely eliminate your risk.

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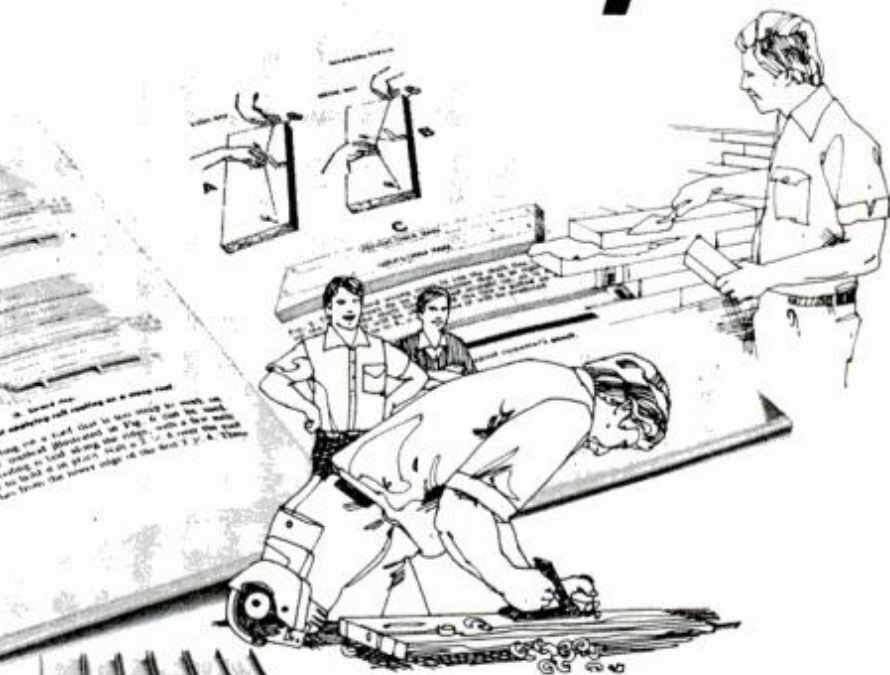
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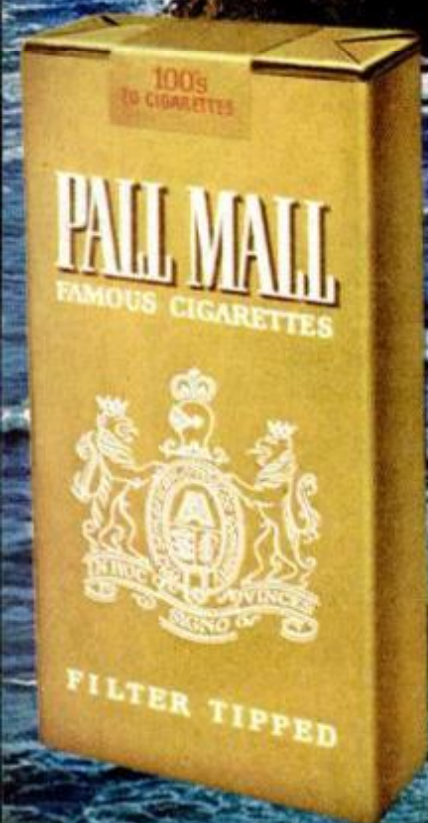


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