

MAY 1978 \$1.00

Popular Mechanics



INDY 500: Secrets of the winners' split-second timing
PLUS: Mini racer you can build

UNEARTHING real artifacts from Bible stories: What archaeologists have found

COMPLETE IN THIS ISSUE
100-PAGE REPAIR MANUAL FOR YOUR CAR

1948 Chrysler Town & Country



Now we're tapping the awesome power of wind

RADIO: Best of the new dash-mounted CBs

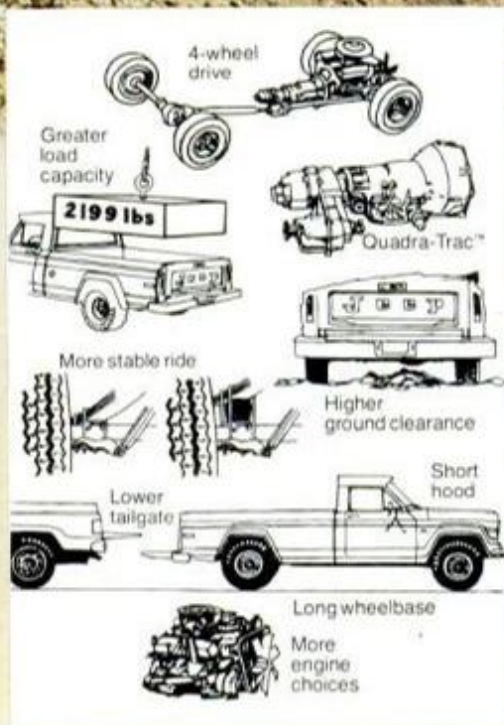
This 30-year-old, cared-for classic is more valuable now than new!

HOW TO KEEP YOUR CAR IN SHOWROOM SHAPE FOR 100,000 MILES

Face the facts... and you'll buy a Jeep Pickup



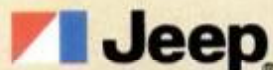
There are 4-wheel drive pickups and there is the 4-wheel drive **Jeep J-10 Pickup**. If you think they're the same, you're in for an education. Jeep Pickup has **4-wheel drive that's built-in**, not added on like an option—that's the only way we make them. Jeep Pickup is the only pickup to offer optional **Quadra-Trac™**, Jeep's exclusive automatic 4-wheel drive, the system that's unsurpassed by the competition—to give you super traction. Jeep Pickup's **load capacity** is **2199 lbs.*** That's greater than Ford, Chevy or Dodge!! Jeep Pickup has a **higher ground clearance** than all its



competitors so rocks won't stop you. Jeep Pickup does not have to recalibrate its springs like the competition to gain greater ground clearance, so you get a **more stable ride** without that "on-stilts" look. Jeep Pickup has a **long wheelbase** for a smoother ride on road or off. Jeep Pickup has a **lower tailgate loading height** for convenience and a **short hood** for better visibility. Jeep Pickup has **more engine choices** than the competition. You pick the size you need. Face the facts—the 4-wheel drive **Jeep Pickup has no competition!**

*Based on available specifications, June 1977

Jeep Corporation is a subsidiary of American Motors Corp.



Jeep wrote the book on 4-wheel drive .

Our biggest and best issue ever!

At **Popular Mechanics**, when we say we're getting bigger and better, we mean it. For the sixth consecutive year, the May **Popular Mechanics** presents the Car Care Guide, more than 100 pages of knowledgeable and comprehensive advice on keeping your car in top-notch shape.

Have you always wanted your own "dream garage"? The Car Care Guide tells you how to set one up. Confused about when to do various auto check-up jobs? You'll find a step-by-step maintenance manual to get your car smoothly through the first 100,000 miles. Still want proof that car care pays off? Take a look at the article about some classic antique autos that are still on the road—and worth quite a bit, too. No wonder the PM Car Care Guide is the largest, most successful single-subject section published by a consumer magazine!

And that's not all, either. The Car Care Guide is only a part of the total editorial package you'll find in this issue. An additional 90 pages of **Popular Mechanics'** regular, full-service editorial cover the topics that interest PM readers most—home care, boating, fishing, electronics, photography and so much more. That's why the May issue of **Popular Mechanics** will sell an estimated 430,000 copies at the newsstand for the \$1.00 full cover price.

When we serve our readers this well, we're bound to serve our advertisers well. It's simple. The **Popular Mechanics** reader responds. The Car Care Guide's Worth Writing For page alone, for example, will bring over 100,000 requests for consumer information.

The active, responsive PM reader. He's the reason why...

- **Popular Mechanics** had 1,346 pages of advertising in 1977, more than any other men's monthly magazine.
- For the first five months of 1978, **Popular Mechanics** ad pages are up again.
- This issue carries more full-color ads than any issue in 76 years.
- And why the May issue of **Popular Mechanics** has the largest advertising revenue in our history, surpassing the record set by last month's issue.

Take a close look at **Popular Mechanics**. We're sure you'll find... **There's something in it for you!**

SP1

This One



A4JS-3FH-XFR7

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Mechanics**
The Full Service
Magazine for Men

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Joseph F. Kern
Publisher

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SALES OFFICES

Frank P. Camastro
224 W. 57th Street
New York, New York 10019
212-262-4284

Alan R. Perry
520 N. Michigan Ave.
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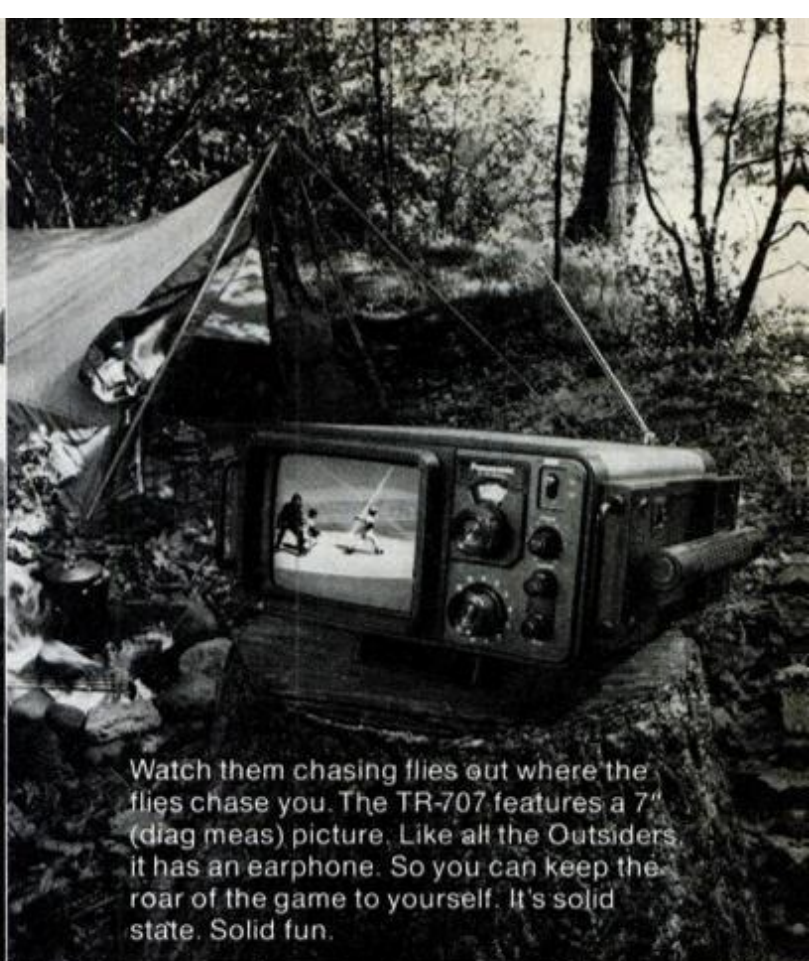
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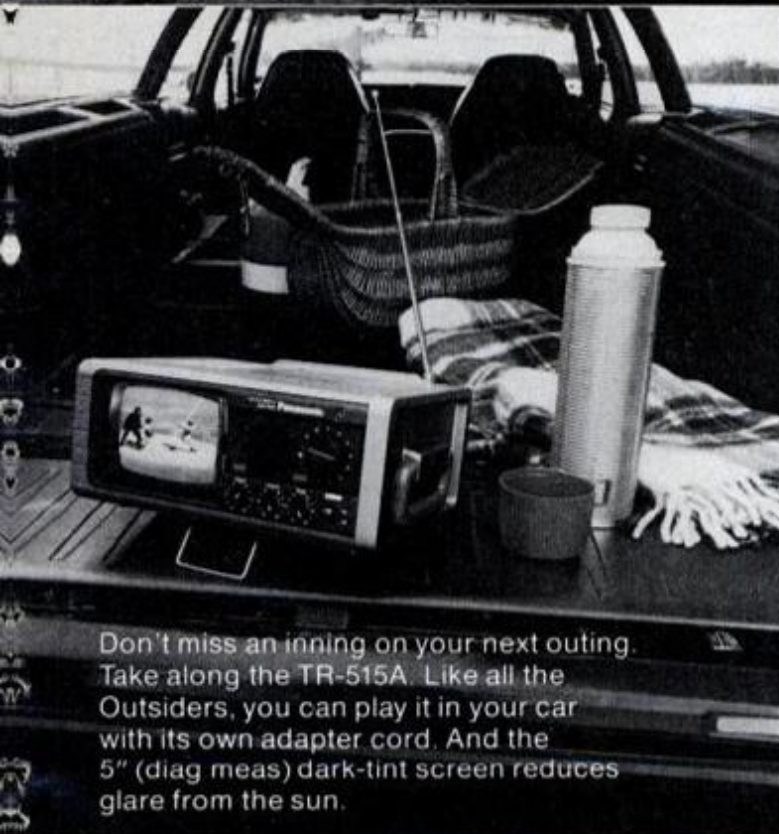
William Leavenworth
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Turn your bleacher seat into a box seat. Turn the last play into an instant replay with the TR-555. One of the Outsiders™ from Panasonic. 5" (diag meas) picture. Detachable antenna. And it comes ready to go with Panasonic batteries and a car battery adapter cord.



Watch them chasing flies out where the flies chase you. The TR-707 features a 7" (diag meas) picture. Like all the Outsiders it has an earphone. So you can keep the roar of the game to yourself. It's solid state. Solid fun.



Don't miss an inning on your next outing. Take along the TR-515A. Like all the Outsiders, you can play it in your car with its own adapter cord. And the 5" (diag meas) dark-tint screen reduces glare from the sun.



Before they start slugging homers, pop up the 5" (diag meas) TV screen on your TR-535. And when the game's over, listen to your favorite station on the built-in FM/AM radio. Solid-state IC circuitry. Complete with Panasonic rechargeable Panaloid™ batteries.

Your second TV should go places your first can't.

The Outsiders from Panasonic. They're rugged. They can take it. And still deliver beautiful pictures. They all come with batteries. Some with Panasonic extra-heavy-duty batteries. Some with rechargeable Panaloid batteries. All work off car batteries. And, of course, they



work inside on electricity. Using less current than a 40-watt bulb. The Outsiders by Panasonic. They should be your first thought for a second TV.

All TV pictures simulated.

the Outsiders
Panasonic
just slightly ahead of our time.

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Popular Mechanics®

MAY 1978

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AS A SERVICE TO READERS, *Popular Mechanics* publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, *Popular Mechanics* cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.

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CIVILIZED FOUR WHEEL DRIVE.

Subaru has brought 4 wheel drive in from the woods.

Instead of featuring a bulky body, awkward handling and a cumbersome price, Subaru 4 wheel drive vehicles are truly passenger cars. In looks, comfort and economy.

So, when you buy one of our 4 wheel drive vehicles you don't have to compromise by driving a beast of burden.

A FIRST FOR THE FAMILY CAR: FOUR WHEEL DRIVE.

For the low price of \$4,629 (In Calif., it's \$4,797.)* you get the first passenger wagon with full time front wheel drive, that becomes 4 wheel drive at the flick of a lever inside the car. And standard features like power assist front disc brakes, all purpose radial tires, rear window washer and wiper and AM push button radio.

The 4 Wheel Drive Wagon also delivers gas mileage other 4 wheel vehicles can't reach. 36 highway and 26 city miles on a gallon of lower cost regular. (In Calif., it's 29 highway and 20 city mpg.)**

Which means you can climb the steepest hills in our 4 Wheel Drive Wagon, without paying a steep price.

THE SUBARU BRAT. FUN ON WHEELS.

The Brat has the same unique front

wheel/4 wheel drive capability of our 4 Wheel Drive Wagon.

And if you enjoy the wide open spaces, you'll really like the Brat's open back, complete with carpeting and two fresh air, bucket seats with seat belts. Because now the sky's the limit to the fun you can have in a car.

A CIVILIZED PRICE.

For just \$4,329 (In Calif., it's \$4,497.)* you get features like a 4 speed transmission, push button radio, tinted glass, radial tires and a trip meter. You can also add options like camper tops, a tonneau cover, roof bars, electric winch and a sliding rear window.

What's more, a Brat won't interrupt the joy of driving with constant stops at the gas station. It delivers 36 highway and 26 city miles on a gallon of lower cost regular. (In Calif., it's 29 highway and 20 city mpg.)**

The 4 Wheel Drive Wagon and the Brat. The Civilized 4 Wheel Drive Cars from Subaru.

We think you'll go wild over them.

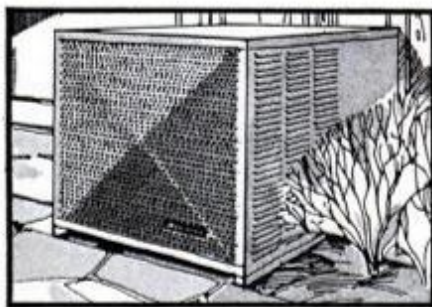
SUBARU

**INEXPENSIVE.
AND BUILT TO STAY THAT WAY.**



*Total POE — not including dealer prep, inland transportation and tax. (In Calif., it's not including tax, license and inland transportation.) Wheel trim rings are extra cost options on 4 wheel drive wagon. Price does not include special striping, tires and wheels on Brat. **These figures are 1978 EPA test estimates for Subaru 4 Wheel Drive vehicles. Your actual mileage may vary due to the way you drive, driving conditions, the condition of your car and whatever optional equipment you might have. © Subaru of America, Inc., 1978.

Heat with electricity?
Save up to \$61⁰⁰
out of every \$100⁰⁰
you spend to heat
your home.



Amana

High Efficiency All-Electric Heat Pumps
Enjoy efficient
central air conditioning, too.

It's Incredible how an Amana High Efficiency Heat Pump takes heat from cold outdoor air (even below 32°) and uses it to heat your home. Even more incredible is how much it can save you on heating costs.

From 26% to 61%!

That's compared to an electric furnace and based on design conditions and Seasonal Performance Factors for these cities: Minneapolis, MN—26.58% Savings; Kansas City, MO—44.13%; Philadelphia, PA—48.72%; Atlanta, GA—55.56%; Tampa, FL—61.09%; San Francisco, CA—61.39%. Savings will vary with climate and weather conditions.

Conventional electric furnaces re-

turn only 1 unit of heat for every unit of electricity. An Amana High Efficiency Heat Pump gives you up to 2.6 units of heat for every unit of electricity (that's at the Air Conditioning Refrigeration Institute 47°F rating point).

Amana High Efficiency Heat Pumps give you efficient central air conditioning, too.

If your heating costs are too high, it's time for an energy saving Amana Heat Pump. Quality and dependability. Backed by over 20 years of heat pump experience.

Call your Amana home comfort dealer or write Amana Refrigeration, Inc., Dept. C-259, Amana, Iowa 52204 for further information.

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 Art Director: Ira Herrick

Special Editorial Features: Sheldon M. Gal-
 lager, editor
 Automotive: Bill Hartford, editor; Robert
 Lund (Detroit), Michael Lamm (West
 Coast)
 Science and Engineering: John F. Pearson,
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 Home and Shop: Harry Wicks, editor;
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 assistants
 Boating, Outdoors and Travel: Wm. T.
 McKeown, editor
 Copy and Production: Garry Winter, chief;
 John Bostonian Jr., art; Shari Green,
 associate; Shannon K. Kelley, assistant
 Art: Don Mannes, technical art director;
 Douglas Quinn, Alan Andresen, assis-
 tants

Special Publications: Clifford B. Hicks

Editorial Offices: 224 West 57th St., New
 York, N.Y. 10019

Bureau of Information: Sophie Gronowicz,
 director; 224 West 57th St., New York,
 N.Y. 10019. (212) 262-4292

Director of Advertising
 Daniel J. Coleman

Advertising Offices: New York: 224 West
 57th St., (212) 262-4284; Chicago: 520
 North Michigan Ave., (312) 527-2400;
 Detroit: 377 Fisher Rd., Grosse Pointe,
 Mich., (313) 881-3520; Cleveland: 221
 Mercantile Center, 3659 Green Rd.,
 (216) 292-7334; Los Angeles: 601 North
 Vermont Ave., (213) 666-6263.

Advertising Production Manager: John A.
 Regina, (212) 262-4800

Classified Advertising Manager: H. E.
 Kappel, (212) 262-4825

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ANOTHER GOOD STEER FROM A TILT-WHEEL USER



Tilt-wheel steering makes me feel like I'm being treated like a lady when I get in and out of my new Grand Prix.

Barbara Taylor
Denver, Colorado

Ms. Taylor, manufacturer's representative and boutique owner, is all business when she's on the road. But Tilt-Wheel Steering lets her enter and leave her car like a lady.

Convenience and comfort are what Tilt-Wheel is all about.

First of all, Tilt-Wheel moves up out of the way to help make getting in and out easier. Then, it adjusts to drivers of all sizes—short or tall, slim or portly. You simply select the most comfortable position for you.

You can even change the position of

the wheel as you drive, to make long trips more relaxing.

Some GM cars also offer Tilt & Telescope Steering. With it, you can move the wheel toward you or away from you, as well as up and down, for even greater comfort.

Tilt-Wheel Steering is available on GM cars, light-duty trucks and vans. See your General Motors dealer for a very comfortable demonstration.



THE EQUALIZER



**Saginaw Steering Gear Division
General Motors Corporation**

Take The Pony Express! It's a compact, precision, 2-cycle gas engine that converts your bicycle to a highly efficient moped. The Pony Express is so light — only 7 pounds — you can pedal easily or turn it on for powered cruising. It's great on hills — or anytime you're too pooped to pedal!

The Pony Express attaches to your bike in minutes with just a simple wrench and a screw driver. An integral, centrifugal clutch acts as an automatic transmission. The drive wheel engages only when the engine is speeded up and disengages at idle speed.

Order now. We'll rush your Pony Express complete with instructions and list of service centers.

A motor for your bike!



So light you can power or pedal.

Please send my Pony Express auxiliary bicycle engine. Enclosed is my check for \$149.95. (Delivery free in Cont.U.S.—Calif. residents add tax.)

Please send brochure.

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3340 Emery St., Los Angeles, Calif. 90023

LETTERS TO THE EDITOR

Clearing the passages

I am allergic to many cold remedies on the market, so there was appeal for me in the idea of trying the nasal irrigator mentioned in *New Era in Health Care: Medical Devices You Can Use at Home* (Dec. '77, page 86). What's more, my 6-year-old daughter has sinus problems, and I am always afraid to give her decongestants.

We tried the nasal irrigator and found it to be a safe and sane approach for the whole family. I now know why no one came up with the idea sooner: There's no money in it for the big drug companies. It is as simple as that.

E. ROSEN

PANORAMA CITY, CALIF.

The thought of clearing my nasal passages without an endless supply of mind-fogging drugs is great. Before reading the article, I feared that science had become too sophisticated to see how simple the solution really is. Keep up the good work.

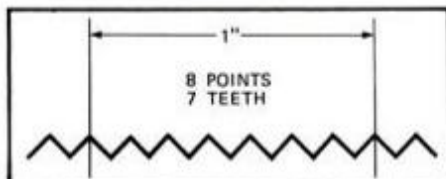
JIM BREGAN

LOS ANGELES, CALIF.

A serious tooth problem

I am confused about saw-teeth counting, more so after reading the article *Workshop Mini-course: Handsaw Basics* (Nov. '77, page 8). I learned to count teeth by starting at the first high point and then counting one *whoop* (gullet), two *whoops*, etc.

Then recently I took my backsaw



A drawing calculated to dispel confusion.

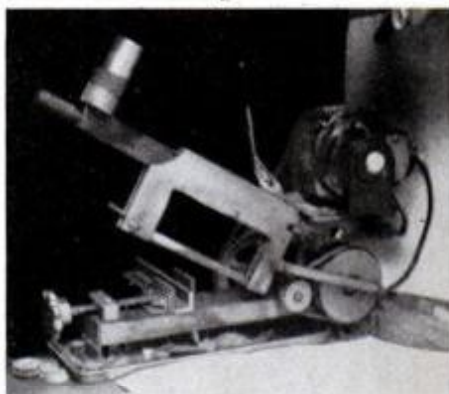
to the man who sharpens my saws. I told him the saw had 11 teeth (counting by your method) and he said it has 12.

After considerable research, I find that saw manufacturers refer to "points." I know about brownie points and bluepoints—and now know there are saw points. I think the answer to all this is to refer to "teeth per inch." I hope I haven't confused you further.

PAUL H. ROSENTHAL
WAUKESHA, WIS.

You almost succeeded. To clarify the situation, however, we must admit that the illustration with the article was incorrect. A revised drawing appears here. It is correct to say "points per inch," which will always be one more than the teeth per inch. Thus, in the saw section shown, you count eight points and seven teeth.

Best tool in shop



Here's a saw from reader Taylor's shop.

I enclose a picture of the power hacksaw that I built from plans included in the article, *Low-Cost Cutoff Saw You Can Make* (Feb. '76, page 109). Actually, I have built six of these saws, five of them as Christmas presents. I'd say that this is the most valuable tool I have in my shop.

Incidentally, I had to make a change in the plans because in Canada you can't buy 8-inch hacksaw blades. So I changed the length of the slide bar and blade holder to accommodate 10-inch blades.

I have subscribed to *PM* since 1938 and am now building a log splitter from your plans (*Split your Firewood the Easy Way*, Oct. '76, page 59). Keep up the good work.

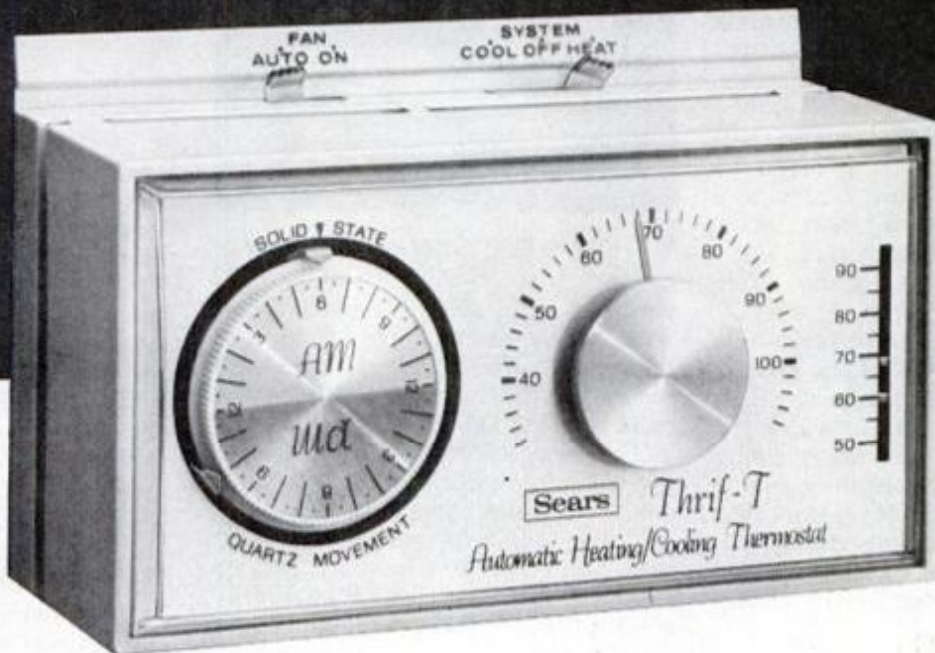
W. A. TAYLOR
ONTARIO, CANADA

Icebergs—a hot topic

A picture caption for the article, *World's Biggest Moving Job—Icebergs* (Jan. '78, page 47), states that a "2-million-ton berg has incredible momentum calculated to represent millions of horsepower." *Popular Mechanics*, I'm ashamed of you! As a university physics professor, I fight a constant battle to clarify the distinction between re-

(Please turn to page 8)

Save on Sears Thrif-T Thermostats, and they'll help you save on fuel costs automatically.



Our Thrif-T Thermostats are another group of GreenSaver products from Sears. Because these automatic thermostats help you hold down the energy dollars that go into heating or cooling your home.

There's a Sears Thrif-T Thermostat with a Single Set-Back. In winter, it can automatically turn down your heat while you sleep, then turn the heat back up before you get up. With air conditioning in summer, it automatically sets the temperature up while you are away at work. Then turns it down at a pre-set time before you get home.

There's also a Sears Thrif-T Thermostat with a Dual Set-Back. It gives you two separate timing functions that automatically raise and lower temperatures during both your sleeping hours and the hours you're away from home.

These GreenSavers work for you whether you use oil, gas or electricity. They replace most existing thermostats quickly and easily. There's no additional wiring. A screwdriver is all you need. The 24-hour quartz timer runs on a special, long-lasting NiCad battery that recharges itself.

So save now at sale prices. And start saving on fuel automatically from then on.

Here's the kind of heating/cooling savings Sears Thrif-T Thermostat can help you achieve by automatically changing the temperature twice a day.

Approximate Percent of Energy Savings

	Heating* (nighttime setback)		Cooling* (daytime setup)
	5°	10°	5°
ATLANTA	11%	15%	9%
CHICAGO	7	11	16
DALLAS	11	15	8
LOS ANGELES	12	16	20
MINNEAPOLIS	5	9	8
PITTSBURGH	7	11	10
ST. LOUIS	8	12	9
SEATTLE	8	12	9

*Above savings are based on computer study of a one-story home of 900 square feet with four people in the household. Heating savings based on daytime setting of 75° and nighttime setback from 10PM to 6AM. Cooling savings based on 75° nighttime setting and daytime setup period from 5AM to 4PM. Your savings may vary.

ON SALE

at most Sears retail stores

SAVE \$5 or \$10

HEATING/COOLING UNIT

Single Set-Back

REG. \$54⁹⁹ NOW \$44⁹⁹

Dual Set-Back

REG. \$59⁹⁹ NOW \$49⁹⁹

HEATING ONLY UNIT

Single Set-Back

REG. \$44⁹⁹ NOW \$39⁹⁹

Dual Set-Back

REG. \$49⁹⁹ NOW \$44⁹⁹

Sears

Sale starts
April 30,
ends
June 3, 1978

© Sears, Roebuck and Co. 1978

Prices and dates may vary in Alaska and Hawaii.

LETTERS

(Continued from page 6)

lated but distinctly different concepts—and you are on the side of the enemy in this skirmish.

Momentum can not be directly represented (measured) in power units. From Newton's 2nd law, the change in momentum of a body is determined by the product of the average force and the time that force acts on the body. Incidentally, a long time would be required to change the speed or direction (and thus the momentum) of an iceberg by applying the pulling force of a tow ship.

H. PETEFISH
SOUTHWEST MISSOURI
STATE UNIVERSITY
SPRINGFIELD, MO.

Instead of towing icebergs to California, I propose setting aside 50 square miles of Death Valley and digging a tunnel to the Pacific Ocean. Once the tunnel is built there is no further expense as the water would flow in by gravity.

I calculate that a 50-square-mile lake (about 10 percent of the area of Death Valley) would at peak times evaporate 1 million tons of water per day. Almost all of this water would come down as rain or snow somewhere between California and the Continental Divide, providing increased irrigation and power from the Colorado River and its tributaries.

PHIL LAREAU
PARLIN, N.J.

After reading your article with considerable interest and noting that icebergs are impervious to conventional gunfire, I have been wondering if quantities of explosives positioned at programmed depths throughout the berg and exploded in a prearranged pattern could induce premature scaling and/or tumbling; or, at best, could cause the berg to break up.

W.F. SLAGHT
QUEBEC, QUE.

How about getting water for some of the arid countries by using the heat of the sun? What I have in mind is anchoring two supertankers (or barges of comparable size) about 200 feet apart and building a greenhouse-type structure between them. The sun would evaporate water, leaving salt and impurities in the ocean. Water would condense on the glass and run down into the tankers where it could be pumped ashore. Very little treatment would be needed to make the water fit for use.

DONALD CLARK
ERIE, PA.

The Bug that became a Trol

Enclosed is a picture of my Boonie Bug, which I've dubbed the "Trol." Since the unveiling of the original Bug (*Build PM's Boonie Bug*, Mar. '74, page 94), I understand that several thousand plans have been sold.

I have been reading your magazine for years, but this PM experi-



In Syracuse, there's only one real Trol.

ence has been the most frustrating, most time-consuming, most fun and most rewarding of all. I thank you for giving me the chance to drive the most unusual vehicle in Syracuse.

The Trol was built on a '67 VW bus chassis and is powered by a '72 engine. I made some other changes, too, like side windows, Fiat bucket seats and a rear bench seat that folds out to a full-sized bed. I have only 1900 miles on my Trol, but future trips will soon change that.

GARY L. CRAWFORD
SYRACUSE, N.Y.

You're right, Gary, plans for the Boonie Bug have sold in the thousands. But we still have a supply for readers who want to try their hand at this project. They should write to Popular Mechanics, Box



Police auction and know-how produced it.

1014, New York, N.Y. 10019 and request plans PL-1406. The price is \$14.95.

Toybox safety

This is in reference to the plans

provided with the article, *These Toyboxes Please Everybody* (Jan. '78, page 101). One important detail appears to have been omitted from the designs. Air holes are a must in any toybox large enough for a child to climb into.

H.M. GLERUM
KETTERING, OHIO

You are correct. It's a good idea to add airholes to the back of any toybox. Another safety factor is that the boxes do not have any catch hardware, as refrigerators do.

Diesels call for patience

In *Detroit Listening Post* (Feb. '78, page 44), I saw a comment about the reluctance of GM dealers to give arrival dates on Oldsmobile diesels. This seems also to hold true for Volkswagen. I have had a diesel Rabbit on order for five months and have just been informed that I can wait for another six. It seems to me that demand for these higher efficiency cars is enough to warrant increased production.

REX PLUMLEE
BENTONVILLE, ARK.

Wants more solar ideas

I enjoy reading PM every month. The articles are always informative and well-written. I especially like the how-to articles on home improvements and repairs. In future issues I'd like to see more ideas on solar heating and cooling for homes.

PATRICK BLEWETT
EAST BRUNSWICK, N.J.

Thanks for the pat on the back. We have run a number of solar installations for the home, and will publish more in the future. Our goal is to keep abreast of all new developments—since solar energy is a hot topic these days.

A 10-speed for two

I want to thank author Eugene Sloane for the very complete instructions for building a bike for two (*How to Build a Bicycle Built for Two Out of Two Built for One*, June '77, page 43).

I had a pretty good 10-speed and I bought another at a police auction. Between the two I was able to make the bike at a total cost of \$50. It works very nicely and is a big hit on our camping trips.

CAREY BUSSELL
NORTH PALM BEACH, FLA.

We're about to shatter an image.

If you're one of those people who think that the sun rises and sets on Jeep, you've come to the right ad. It'll tell you that there just might be something better. Like an International Harvester Scout® II.

Big words, no doubt. But then, there are some big facts to back them.

Scout's axle ratings, for instance, are much higher than Jeep CJ-7's. 500 pounds more up front. 450 pounds more in back. Meaning Scout can really take a pounding.

Scout's got a two-foot tighter turning circle. An advantage that hardly needs elaboration.

Scout's got better seating capacity. Five big men can ride in comfort.

Scout's got a 20-inch longer cargo bed



than CJ-7. Power front disc brakes instead of drums.

A 19-gallon gas tank versus 15.5. And a removable steel roof instead of no roof at all (if you want one, Jeep makes you pay extra).

What's more, they're all differences that make a difference. A recent survey of 4-wheel drive vehicle owners showed that, on the measure of "very satisfied," Scout outscored Jeep by 25%.

So there you have it. Hard facts. And the opinion of people just like you.

Just goes to show that some images are more fragile than you think.

Scout® leads the way.

There's only so much an ad can tell you about this much machine. So we're offering you free brochures with full information telling how all Scouts lead the way. Check the one you're interested in and we'll get it to you, pronto.

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| <input type="checkbox"/> Scout® II | <input type="checkbox"/> Scout® Diesels |
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INTERNATIONAL HARVESTER



PM WORKBENCH

PM EXAMINES PRODUCTS AND SERVICES

Steel 'dumping'

Major U.S. tool manufacturers are increasingly concerned over the illegal dumping of steel products into this country. Recent Treasury Department figures concerning tools reveal that the weighted-average margin of dumping of such handtools is from 45 to 50 percent. While most of us have Japanese products, we feel that imports should compete on the same basis as products produced in the U.S.—without prices being artificially reduced by subsidies. If you agree, write your congressman.



Deluxe mechanic's 'toolbox'

Roomy unit holds tools—

This sturdy rollabout workshop cabinet consists of a base that incorporates a reasonably roomy work surface, two adjustable shelves inside and a toolbox at top; the latter boasts a tote tray, heavy duty cylinder lock and three drawers. Other pluses are its rubber wheels, for good maneuverability on concrete, and the perforated hardboard panel inside the door. Purchased together, the units are priced at \$64.98. Available from J.C. Penney through its catalog. —H.W.

Sturdy, trouble-free knives

This single-blade knife from Case Cutlery Co., Box 4000, Bradford, Pa. 16701, comes in three handle materials—Duranel (model M105-

1LSSP), smooth black plastic (21051LSSP), and laminated hardwood (6105 1LSSP). At hardware and sporting goods stores; \$16 for the Duranel, \$18 for others.—H.W.



Safety button (arrow) prevents accidental blade openings.

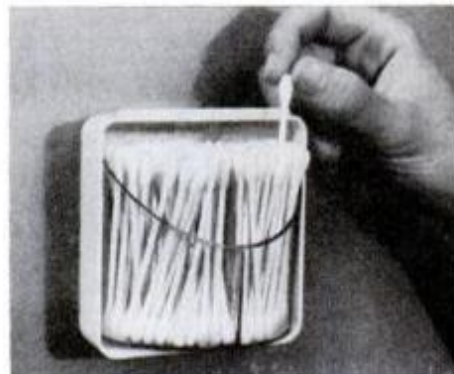
A different kind of shop tool

The newest tool in my workshop is this handy Q-Tip dispenser. The cotton swabs are great for touch-ups and those difficult shop tasks

like picking specks of dust from a varnish finish. Get the wall dispenser by sending 50 cents in coins to Q-tips Swabs Dispensers, Box 2003, Jefferson, Mo. 65101.—H.W.



In closed position, swabs are covered.



Dispenser pivots 180° to get to swabs.



Paperback book sticks to the basics.

One from a craftsman

In this era—when every would-be writer seems to have jumped on the DIY-book bandwagon—it is refreshing to come across one that is written by a real craftsman. "Cris" is such a person; his latest book is worth discovering. *Handtool Handbook for Woodworking*, R. J. DeCristoforo, \$5.45 ppd. from H.P. Books, Box 5367, Dept. HT17, Tucson, Ariz.—H.W.

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.

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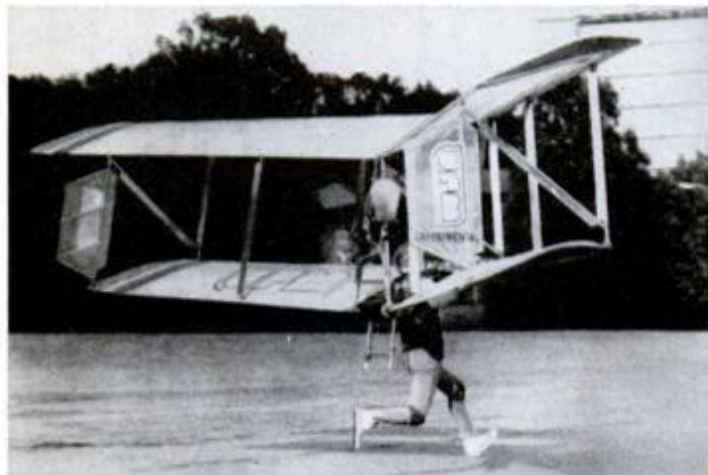


IT'S NEW NOW

Take a flying leap

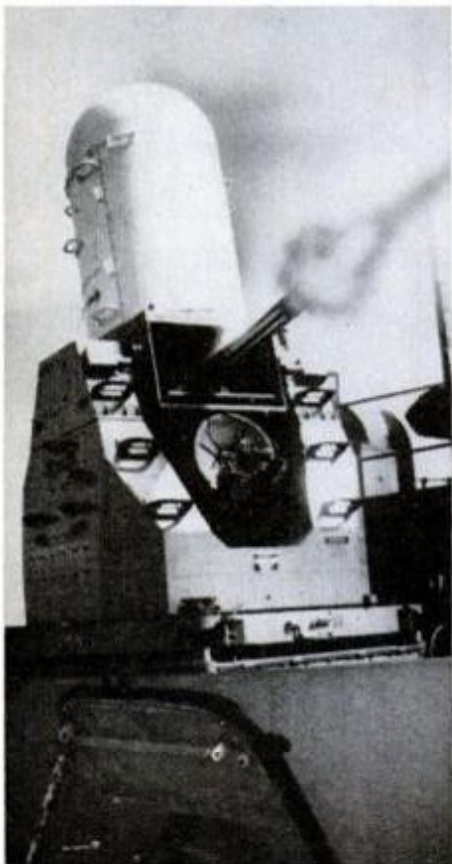
Having the pilot double as the landing gear is what keeps the Ultralight Flying Machine ultralight. Designer/pilot Larry Mauro of San Jose, Calif. here leg-launches his gasoline-

engine-assisted hang glider (below) as part of a recent public flight demonstration in San Francisco. Mauro says the airframe of his unusual craft cost about \$900 to build; the 8-hp gasoline engine and propeller cost about \$700.



Radar-controlled Gatling gun

Phalanx, the Navy's latest radar-controlled gun, has completed its tests and will soon become operational. The weapon locks onto a target and fires a 20-mm Gatling gun at up to 3000 rounds per minute. Phalanx, now being installed, will be used for ship defense.

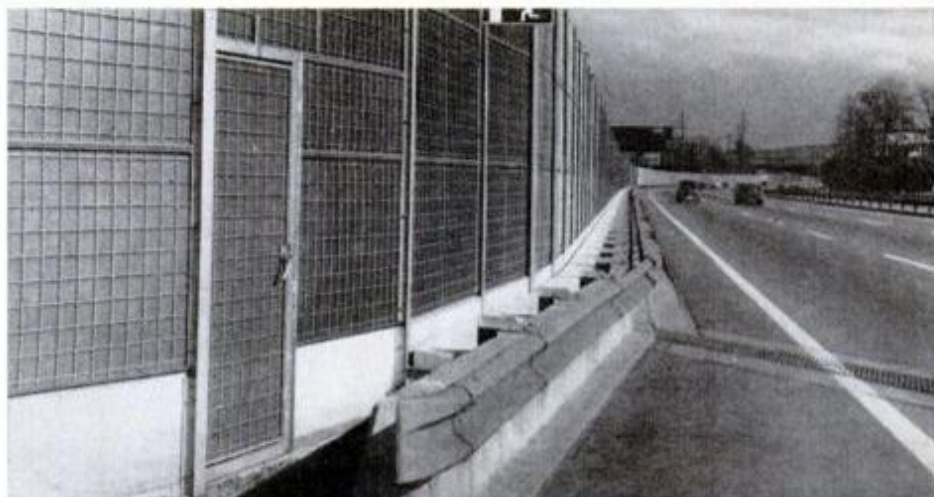


Clear reception

Tandberg received so many requests for a Lucite-encased store-display model receiver that it was made available to the public. The TR 2075 Mk II puts out 75 watts per channel, lists for \$1200.

Oak-look cabinet line debuts

The Natural Oak home cabinet line features the look of light oak—today's most popular furniture color—and solid oak doors. IXL Furniture, Route 4, Box 110, Elizabeth City, N.C. 27909.



People can go through; sound can't

These 20-foot-high sound barriers give residents near major Swiss highways some relief from road noise. But what if a motorist in trouble needs to leave the highway? A series of clearly marked doors 220 feet apart permit escape.



It'll serve Dad right.

The personalized V.O. Server holds the 1.75 liter[®] of V.O. and lets him pour elegantly. To order for Father's Day or any special day, send \$11.99 (plus \$2.00 for handling) along with your name and address and the name you want engraved (up to 20 letters) to: V.O. Server, Dept. PM, P.O. Box 5062, Smithtown, N.Y. 11787.



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APPLIANCE CLINIC

QUESTIONS ANSWERED

Drop-off point

As a refrigeration mechanic, I have found many window airconditioners damaged by mouse droppings. Mice seeking warmth find protection inside units. Droppings corrode the aluminum condenser, cutting the unit's efficiency and raising power consumption. Your readers would be wise to pry open the louvers and insert a box of mouse poison. Reposition and seal louvers with caulk or silicone rubber.—Richard M. Curwin, Freeland, Mich.

Thanks for your tip. We would like to add that poison that doesn't kill mice immediately, but which makes them crave water, should be used. This will give a mouse time to get out of the airconditioner before he dies.

Baked steak, broiled potato

I have a Frigidaire electric range model RS 35-62. The bake element won't heat. A new thermostat switch and bake element have been installed. Switch and wiring have been checked against the wiring diagram. Still, with the switch turned to any of the bake settings, the broil element heats up—not the bake. Hurry with a solution. Digestion is suffering—J.F. Neely, Dayton, Ohio

Give your range's wiring a "bromo," and straighten it out. We know you've "checked and rechecked" against the wiring diagram, but things aren't always as they seem. For example, that new switch's terminals may be labeled "A" and "B", just like the old one, leading you to attach "A" wire to "A" terminal and "B" wire to "B" terminal. But who says the switch was correctly marked to begin with? Try reversing the wires. If that doesn't do it, get another switch.

Toaster won't

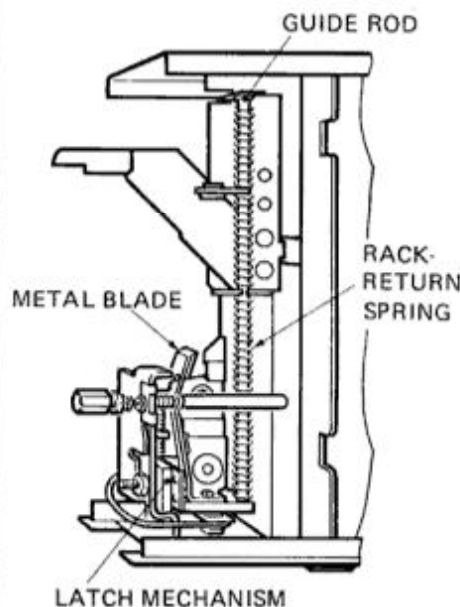
When the carrier holding the slices of bread in my toaster is pushed, it won't stay down. This is true for all three of my General Electric toasters, catalog No. 72T82. What should I do?—William M. Hench, State College, Pa.

The official word we got from several authorized GE service stations is that you should buy a new toaster. The part that goes bad—the latch mechanism—seems to be

no longer available. This model is almost 20 years old.

However, somewhere in the United States there may be an outfit that still stocks this part. There are two sources in your section of the country that you should ask. One is the Electric Repair Co., 504 N. Ninth St., Reading, Pa. 19604 (215/376-5444). The other is Quick Service Electric Co., 300 Stanwix, Pittsburgh, Pa. 15222 (412/281-0968).

Here is a schematic of this part of the toaster. If you can get this mechanism, the illustration will help you replace it.



Toaster latch diagram

Cutoff point

Our Maytag electric clothes dryer model 806 doesn't shut off when the clothes are dry. Why?—Otis Hedgpeith, Burlington, N.C.

Reasons for a dryer continuing to run include a defective timer, door switch and high limit or cycling thermostat; and a grounded motor. Check the timer, door switch and motor for open circuits with a continuity meter or test light. Assuming they check out okay, don't start replacing thermostats just yet, because your particular unit also possesses an electronic dampness system. Essentially, this system "measures" the dampness of clothing and keeps the circuit completed and the dryer running as long as dampness exists.

An electronic dampness system

consists of a series of negative and positive sensors. When wet clothes are placed in the dryer, they lie across the sensors. Moisture then completes the circuit and permits dryer operation. The dryer keeps on running as long as clothes are damp. A sure sign that a problem exists in the dampness system is when a dryer doesn't shut off after the clothes are dried. Have this system checked out.

Cold cream

The upper freezer compartment of our Frigidaire two-door model refrigerator FPCI 205 TS won't keep ice cream frozen. There is one control for both the freezer and refrigerator sections. When this control is turned colder, there is no effect on the freezer section, but the refrigerator gets too cold. The gasket is okay. Can you help?—Marshall Ross, Greenwich, Conn.

Sure can. The most common cause of this complaint is loading the freezer section with too much food. Take everything out except the ice cream. If the ice cream freezes now, you're overloading the freezer. The freezer section of a refrigerator is not a substitute for a chest or upright unit. It is intended to hold, at most, a week's supply of food.

Mechanically, two malfunctions can keep ice cream from freezing. The evaporator motor may not be operating properly and this would cut the air flow needed to freeze ice cream.

Secondarily, the heater that is supposed to remove frost from the evaporator coil may be cutting off too soon, leaving some frost on the coils. This frost will inhibit the flow of cold air through the coil. One likely cause of improper defroster-heater functioning is a bad terminator thermostat, which is a small disc in the heater that cuts the heater off when defrosting is completed. This thermostat might be throwing the switch too soon. Have the thermostat checked and, if it's faulty, replace it. **PM**

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.

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Imported Sail and Flying Dutchman

Flying Dutchman.
A legendary mixture of 18 elegant tobaccos for a smooth, rich, aromatic taste you can stay with all day.



OR **Sail Natural.**
A sophisticated, non-aromatic blend of tobaccos from Java, Cyprus and North and South America, for a full, easy-smoking taste.



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Choice tobaccos from Java to Turkey, subtly blended with mellow Virginians for rich flavor and an elegant aroma.

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Oriental and Virginian tobaccos blended with Latakia for a satisfying smoke with a gentle aroma.

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Fine Burley, Maryland and Javanese tobaccos mixed with Oriental tobaccos from Turkey and Cyprus in a smooth, easy-to-smoke Cavendish blend.



Send us an empty pouch of Sail or Flying Dutchman and we'll send you one of these full pouches-FREE.

Enclosed is one empty pouch of Sail or Flying Dutchman Pipe Tobacco.

Please send me a full pouch of (select one)

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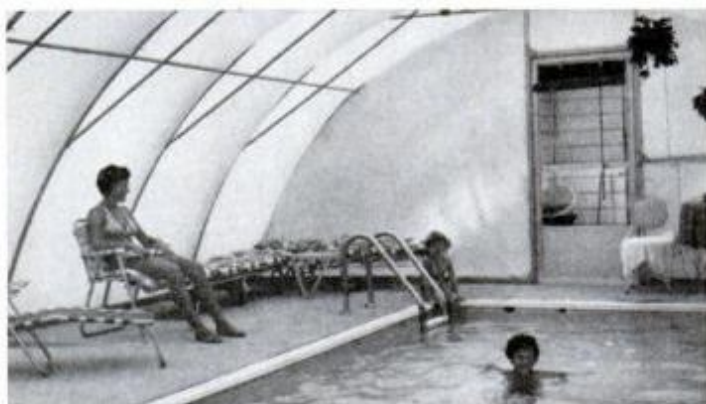
Offer good only in U.S.A. Offer void to persons under 21 years of age. Void where prohibited, licensed or taxed. Offer limited to one per household. Offer expires October 31, 1978. Please allow up to 6 weeks for delivery.

Mail to: Free Pouch Offer, Box 4130F, Westbury, New York 11590

IT'S NEW NOW

When it's cool, button up the pool

A new line of pool enclosures features a double-layered plastic film cover over a tubular steel frame. Low-pressure air between layers provides an insulating air space that keeps heat inside and cold out. Enclosures come with blower, controls and hardware. They are available in standard widths and can be custom-built; 22-by-36-foot enclosure shown costs \$2680. Porta-Green Co., 7600 Wall St., Cleveland, Ohio 44125.



Grocery bags take to the air

Kite enthusiast Ray Fahrenbruck builds and flies kites, and teaches youngsters how it's done. He's shown—in St. Petersburg, Fla.—launching an unlikely looking contraption that he calls a "monstrosity." It's constructed, for the most part, from ordinary grocery bags.

Three-wheeler built from kit

Battery-powered Sportster designed for the city, covers about 35 miles on single charge. For book on Sportster and two other electrics, send \$3 to 3E Vehicles, Box 19409-C, San Diego, Calif. 92119.



How not to cut a power cord

The retractable Save-A-Cord provides a 4-foot link between portable tool and long power cord, hooks to belt to stay out of harm's way. It lists for \$4.44.



There's opportunity for the man who can repair small engines.



NRI Can Teach You How to Service Power Mowers, Garden Tractors, Chain Saws, Outboards, Mopeds... Learn at Home in Your Spare Time

50 million small engines mean big opportunities for qualified servicemen. The man with knowhow can pick his own job or even start his own full or part-time business. And NRI can give you the training you need to cash in!

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NRI "hands-on" training gives you the professional knowledge, the professional tools, and the professional bench training you need to start in this booming business. You actually build a 3½ HP engine as you progress... use tools like inductive tachometer, torque wrench, valve spring and ring compressors, mechanics' wrenches that you get as part of your course.

Choice of Two Courses

With NRI's basic course, you concentrate on the big world of lawn and garden equipment, with 30 lessons covering ignition, lubrication, cooling, and starting systems, and overhaul. The 45-lesson master course includes additional training in other motors like generators, industrial equipment, even motorcycles. Either way, you build the engine and get your working tools to start a rewarding new career.



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25 million reasons why you should look into NRI training in CB and Communications Servicing.

The CB boom means big opportunities for qualified technicians... learn at home in your spare time.

There are more than 25 million CB radios out there, millions more two-way radios, walkie-talkies, and other communications apparatus in use by business and industry, government, police and fire departments. And all of this equipment demands qualified technicians to maintain and repair it. In addition to knowing what you're doing, you must have an FCC Radiotelephone License to service most of it. NRI can help you get both... the training and the license.

Learn on your own 400-channel, digitally synthesized VHF transceiver or 40-channel CB

With NRI, you learn by doing. You use the NRI Discovery LabTM to build and test a whole series of typical communications circuits, even assemble your own professional transistorized volt-ohm meter and a CMOS digital frequency counter. You erect and test various types of antennas to gain a firm understanding of broadcasting principles. And finally, you assemble your own 2-meter transceiver for experiments in troubleshooting and servicing. If you want to go on the air, we'll even help you get your amateur license. As an alternate choice, you may elect to receive



and experiment with a 40-channel CB to get more experience in this booming area.

You learn in your own home, in your spare time, at your convenience

NRI's bite-size lessons and carefully matched practical experiments combine theory and bench work to give you the most effective training for your money. No need to quit your job or take night classes, you move ahead at the pace that suits you best.

NRI guarantees FCC license

The law requires that technicians hold an FCC Radiotelephone License to work on broadcast equipment. NRI training in Complete Communications Electronics or our CB Radio Specialist course is carefully designed to give you the special coaching so helpful in passing FCC license exams. If you fail to pass the FCC examination for the radiotelephone license after graduating, *NRI will refund your tuition in full.* The money-back agreement is valid for six months after completion of your course.

63 years and a million students worth of experience

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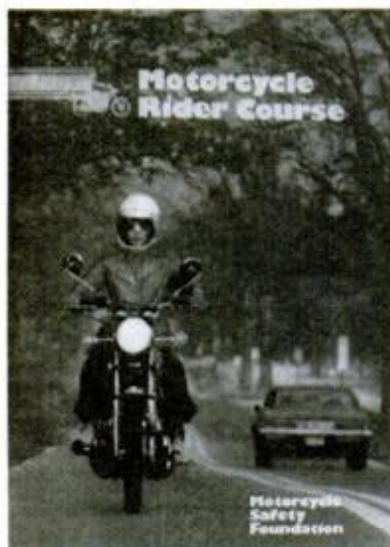
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IMPORTS & MOTORSPORTS

Feet on the pegs

Among motorcyclists, the fair days of May bring on right-wrist itch as all thoughts turn to . . . the open road. Two-cycle and four, the bikes of spring will be out in record numbers sharing the roads with cars and trucks. If you're out there on two wheels, avoid close encounters of the four-wheel kind.



Do you ride well enough to ignore this?

Among the people who fret when you're cranking it on are the folks at the Motorcycle Safety Foundation. They want you to let the good times roll, but they also want you and your shiny machine to stay intact. Taking their Motorcycle Rider Course won't make you immortal, but it'll boost your odds by improving your riding skills. The course is contained in a \$2 textbook from the foundation. There's a freebie for PM readers—reflective decal for your helmet and a riding-tips brochure. Write the foundation at 6755 Elkridge Landing Rd., Linthicum, Md. 21090.

Want some safety statistics? Here are the latest from New York State. In 1976, 2389 persons died in traffic accidents; in 1977, 2549. The increase (70 people) is mostly due to the increased number of motorcyclists in the total figure: 55 of the 70. So heads up!

From pegs to pedals

Some two-wheeler fans would just as soon not sit with their feet on the pegs, but would rather pedal—pedal furiously in the case of the competitors at this year's Human Powered Speed Championships on May 6th at Ontario Motor Speedway in California. Last year, rec-

ord speed for these streamlined bicycles was 49.93 mph, as we reported (page 104, Sept. '77). This year the muscular-legged pedalers are determined to crack the 50-mph mark and are looking longingly at the symbolic 55-mph national speed limit. In fact, there's \$2500 waiting for the first human-powered machine to hit that magic 55 mph. You may want to try, or just be a spectator at a fascinating event. International Human Powered Vehicle Assn., c/o Chester Kyle, California State University, Long Beach, Calif. 90840.

Ready to rumble

It didn't take long for someone to do a copycat on Subaru's Brat (see PM, March '78 cover and p. 118). Two rear-facing seats in the bed of a mini-pickup make it a much more versatile vehicle. The Rumble Rider rig here is an accessory from the studios of Roger Chastain, and the good news is that it fits all mini-pickups in the U.S. market. The accessory comes with two ABS plastic seats, a "quarterback" partial roof that shields passengers in the bed from wind and weather and built-in armrests. Price is \$519; Roger Chastain Associates, 2180 Temple, Long Beach, Calif. 90804.



Rumble Rider puts seats in your pickup.

Faster fastbacks

The 1978 Olds Cutlass Salon and Buick Century fastbacks can now be decked out with a sports package that works quite a change in their appearance. The Targa Band Top package includes the roof band which is brushed aluminum and flat black, a rear spoiler and a set of quarter-window louvers. It's



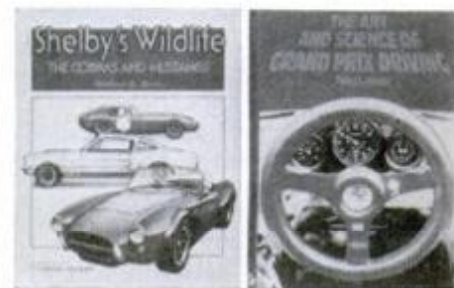
Sporty image items for Buick and Olds.

another sporty idea from Hurst Performance, the people who brought you those neat shifters and hatches. The Targa Band Top is an option available through your Buick and Olds dealers, or write Hurst Performance, Inc., Special Vehicle Div., 11760 East Grand River, Brighton, Mich. 48116.

Armchair auto racing

I've been served up some real hot chili by Carroll Shelby and I've broken bread with Niki Lauda, but I've never owned a Cobra and I've never driven a Grand Prix Ferrari. After reading two new books, however, I feel as if I've done both.

The Art and Science of Grand Prix Driving really will put you in



Vicarious thrills galore in two new books.

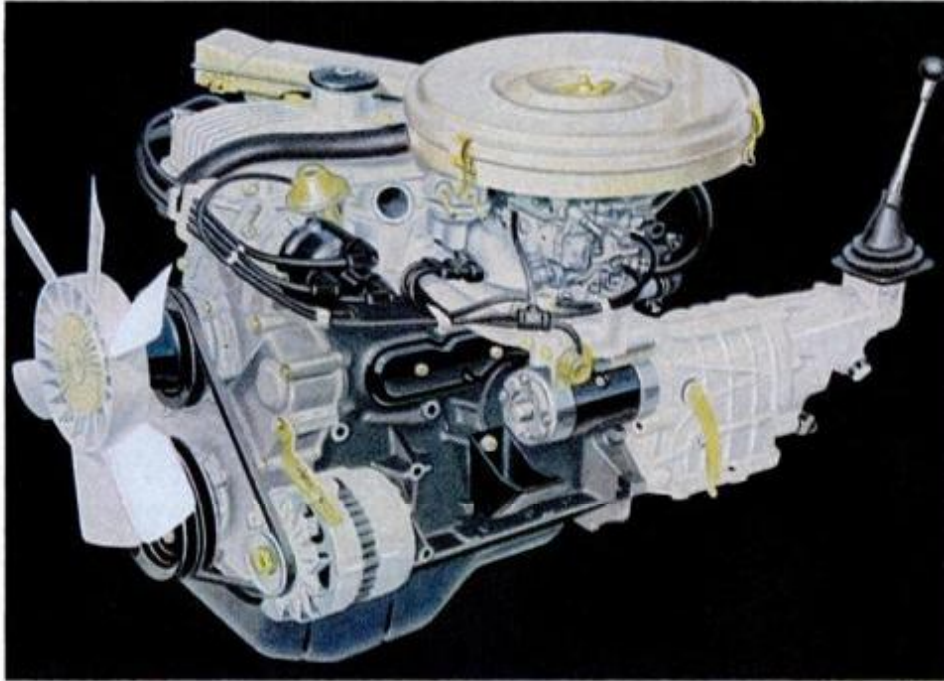
the driver's seat of a Formula I Ferrari. Niki Lauda, World Driving Champion in 1975 and 1977, is as skilled at explaining what it's like to drive one of the world's most sophisticated racing machines as he is at doing it himself. It's a handsomely illustrated book that includes lots of good color racing photography, but the best part is getting to know Niki Lauda through the text. The sections are: The Human Elements, Technical Principles, Technical Data, The Formula I Car's Components, Driving, Testing and Training, The Race, Fitness and In the Midst of Life. For \$14.95 you can be in the cockpit. Motorbooks International, Box 2, 729 Prospect Ave., Osceola, Wis. 54020.

The Shelby Mustangs and Cobras

(Please turn to page 22)



Introducing our two-barrel, four-cylinder, twelve-valve, smooth-running, low-emissions wonder.



If you're really into cars and driving, you should know more about our amazing new MCA-Jet System with Silent Shaft. We think it's one of the most significant engine developments to come down the pike since the first American high-compression V8.

First off, it offers all the advantages of a four-cylinder engine...but without the vibration usually associated with the proverbial "four-banger." Its unique Silent Shaft design (available only with the five-speed manual and automatic transmissions) is the reason. Two counterbalancing shafts rotate in opposite directions to cancel out the noticeable power pulses inherent in normal four-cylinder designs.

Now comes the MCA-Jet

part of our system. MCA stands for Mitsubishi Clean Air. The MCA-Jet System meets...even exceeds...the stringent emissions requirements now in effect in both Japan and America. Without loss in performance, too. A revolutionary new cylinder-head design that incorporates a third, or "jet," valve does the job. This valve introduces an extra swirl of air into the combustion chamber

which swirls the fuel-air mixture and promotes a faster, more even, thorough burning of the mixture at ignition.

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IMPORTS & MOTORSPORTS

(Continued from page 20)

were the cult cars of the late '60s and *Shelby's Wildlife* is a time machine that brings back that short but exciting muscle-car period. The 224-page book by Wally Wyss (a byline familiar to PM readers) is \$15.95. Classic Motorbooks, Box 1, Osceola, Wis. 54020.

New skin for 'Stangs

If you've got a beat-up heap of a Mustang convertible, vintage 1965 through 1968, here's something you might consider before it rusts out completely and blows away. If you don't want to restore it to a classic Mustang, fit this new skin to it. It won't be recognizable as a Mustang



New body transforms Mustang convertible.

anymore, but it'll be unique. The skin kit consists of reinforced plastic body panels, attachments, bumpers and other hardware. Your time and \$3000 are what's needed. Masarani Motor Car Co., Box 225, Rowayton, Conn. 06853.

Shortest car

For the shortest car on sale in the United States, it sure is long on comfort, roominess and ride. No, it's not a Honda Civic; it's Renault's LeCar. This item should set the record straight for people who want to save face in those car



1978 LeCar: shorter or longer than Civic?

quizzes down at the local barber shop. A lot of car buffs have bombed out on this question by citing the Civic as the tiniest of the minis. Civic 1200 sedans and hatchbacks are 145.5 inches overall. LeCar is 142 inches short. Try that in your garage! We'll be hearing from people who have—in an owners report on LeCar in a summer issue. **FM**

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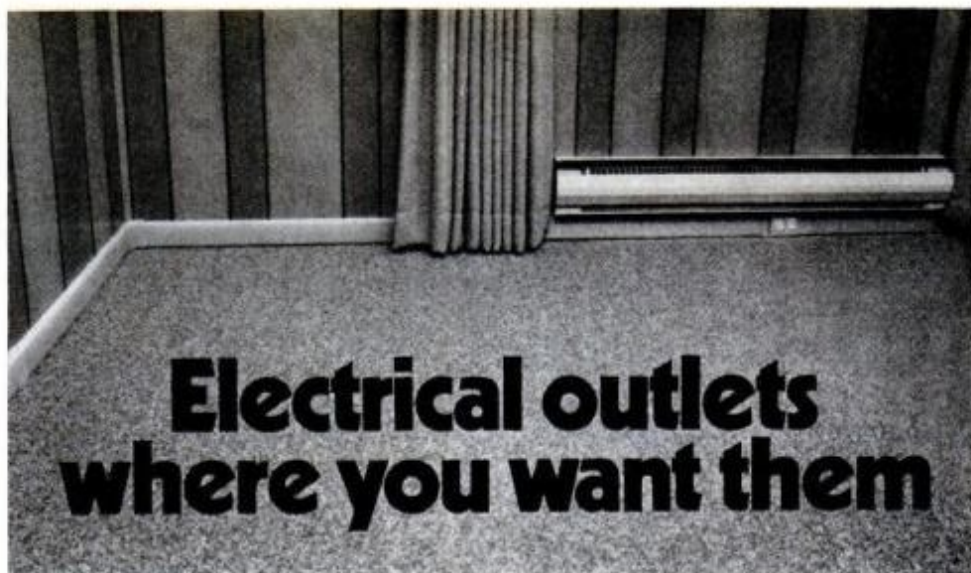
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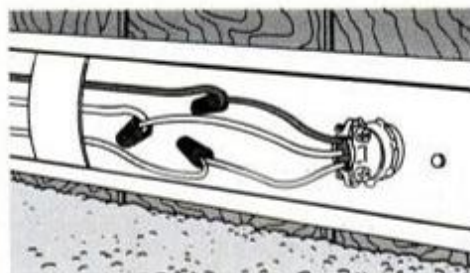
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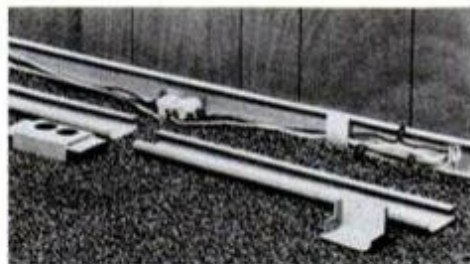
Electrical outlets where you want them



Fasten base strips to walls with nails, screws, staples or special adhesive. Miter joints are used on inside corners.



Pass branch circuit through hole in strip, using right box connector. Splice wires together with solderless connectors.



Vinyl clips retain the wires. A bracket to hold the outlet fastens to the strip. Wire outlet and mount it in bracket.



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You can buy pieces for the installation individually depending on the size and layout of your room, and number of outlets you wish. The strips and covers come in 10 and 12-ft. lengths. After system is installed, you can paint it with water-based paints to match your walls.

Cost of installing **Baseway** in an average 10 x 12-ft. room is under \$30. A door trim kit priced at about \$22 encloses wiring around a standard 7-ft. door.

For parts prices and other information contact **Carlton**, Three Commerce Park Sq., 23200 Chagrin Blvd., Cleveland, Ohio 44122. **PM**



Coat one side of each finishing cap with vinyl cement, snap it in place and apply pressure for 30 seconds to assure bond.

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So that you can journey into the worlds of macro and photomicrography, and more, the OM cameras give you a choice of no less than 13 interchangeable focusing screens. No longer are you limited by a choice of either microprism or split screen.

And while we're talking capability, here's a significant fact: the OM System is the most extensive and versatile in the world, with more compact lenses and components that add to your creativity.

In the OM-2, "OTF," Off-The-Film Light Measurement allows the camera to read the light reflected off the film and sets the exposure while the photograph is actually being taken!

Other automatic SLR's set exposure before the photograph is taken, and the camera locks it in memory. This leaves room for error, due to exposure lag.

The OM-2 also has a totally integrated flash system: the camera automatically controls the flash utilizing the same "OTF" light sensors, assuring perfect exposure with all lenses from telephoto to wide angle at any f-stop.

The OM-2 with "OTF" Light Measurement reads the light, and shuts off the flash at the precise milli-second for perfect exposure.

No wonder more people involved in photography are buying an Olympus camera than any other compact SLR.

So take the time to discuss the advancements of the OM cameras with your Olympus dealer.

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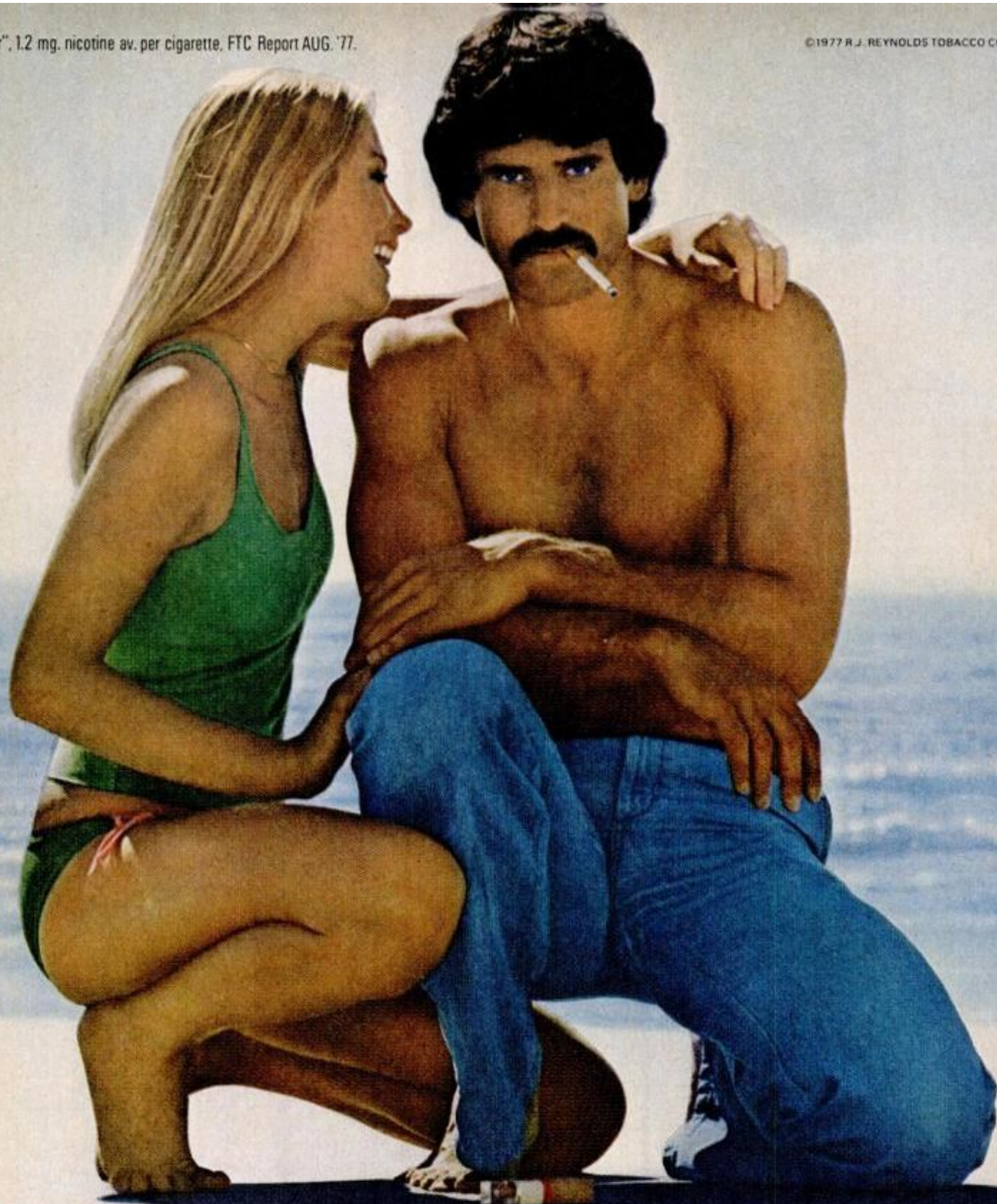
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Mania for mini-trains

Working model of the famous Flying Scotsman locomotive (left) leads a rival mini-train at Japan's exposition

At first glance, it looks like an overkill of miniaturization: mini-locomotives pulling miniature coal cars, mini-trains being assembled in a mini-marshaling yard served by a mini-roundhouse.

Yet such is the traditional Japanese reverence for the art of reproducing life in miniature—in everything from trees to steam engines—that an international fair featuring model locomotives held recently in Tokyo drew more than a million fascinated visitors during its nine-day run.

Some 30 different steam locomotives were put on exhibit, the proud possessions of dedicated model builders from as far away as Britain, Switzerland, Germany and Australia. Several, of course, had been painstakingly assembled by Japanese craftsmen. Generally, the models ranged in scale from $\frac{1}{8}$ to $\frac{1}{11}$, and, as can be seen in these photos, have an impressive power output in proportion to their size. Their ability to haul a full load of sightseeing adults and children around the fair-

(Please turn to page 30)

Serious model locomotive fanciers came from all over the world to attend the Tokyo mini-train fair. Engines were assembled and dispatched from a scaled-down roundhouse (below, right). Power of the tiny locomotives amazed the grownup riders and brought great delight to the kids. Mechanical problems (below) got plenty of attention.





Two Japanese model-builders prepare steam locomotives for a working display.



Grimly astraddle, Casey Jones may be headed for trouble on the main line . . .



. . . but in reality his Santa Fe Chief is just straining under a load of passengers.

MINI-TRAINS *(Continued from page 29)*

grounds made the little engines an instant hit with the throngs of spectators. Some may not have been model railroading buffs when they came to the fair, but they sure were by the time they left it.

Crack trains reproduced

Reproducing a famous train is one of the high points of the model railroad builder's art, and "name" engines were much in evidence at Tokyo. Included were miniatures of: the American Atlantic ES-6, the Flying Scotsman (Britain's famous express train), Santa Fe Chief, Sydney Express and the Japanese d51.

While the full-size counterparts to these trains all made their final runs years ago, visitors to the Tokyo fair were afforded the opportunity to hear one more "All aboard" to steam accompaniment—though the hissing and chuffing were admittedly the soprano equivalent of the baritone of full-scale trains.

Even riding astraddle, the sober-sided train buff could feel a catch in the throat at the nostalgia of it all. For everyone else attending—especially the many kids—it was just plain fun. **FM**

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The JS&A Jogging Computer is a total system of physical fitness and conditioning.

It's a fact. You reach your physical peak at age 25 and your mental peak at age 40. From then on it's downhill. But it needn't be. A 50 year old who exercises regularly can be healthier and in better physical shape than the average 25 year old.

When you're physically healthy, you are alert and better able to handle stress. You are better motivated and just plain happier. Jogging can keep you in good physical shape.

THE ADVANTAGES OF JOGGING

Jogging as a regular exercise has gained in popularity because it does three things for you. 1) It improves the functioning of the heart, lungs, blood vessels and lymph glands. 2) It helps control your weight without resorting to starvation diets, and 3) It is one of the few safe, strenuous exercises that creates the exertion necessary for good physical conditioning.

A NEW JOGGING COMPUTER

There is now a new, fun way to jog. The new JS&A Computer is a solid-state system that lets you jog in place in the comfort of your own home. It's fun, easy to use and convenient.

You simply set the distance and pace you wish to run and press the start button. An audible beep tone sounds and you jog in place to its rhythm. Each stride is registered on a large LED readout in the control unit so you can see how far you've run.

You jog on a large pad with sensors which register each stride. The pad is designed to feel like grass or soft earth so you can run either barefooted or with gym shoes. The idea is to gradually increase your distance and speed each day to build up your endurance.

Getting yourself to start jogging is often the hardest step. That is why the JS&A Jogging Computer is an ideal system for both the beginner and the experienced jogger.

FOR THE BEGINNER

The first time you step on the Jogging Computer, you run at a pre-selected pace and distance for approximately five minutes. (A chart will show you which speed to select based on your sex and age.) You then take your pulse rate for one minute by touching your pulse rate for one minute by touching your wrist. The pulse/rate chart determines the settings and distance you should run the next time you jog.

You could be in poor, average or good shape, and this simple five minute test will accurately tell you. Start the jogger at the distance indicated on the chart, and gradually build up a little each day. In just one week you'll notice the difference, feel great, have greater endurance, and you won't tire as easily. That is what's so nice about the system—how easily and quickly it puts you into better shape.

FOR THE EXPERIENCED

If you jog regularly, you know the many benefits of jogging. But you also know the disadvantages—all overcome by owning a Jogging Computer. For example:

Forget about the ritual You wake up early, drive to your favorite indoor track, change clothes, and you're ready to run. With the Jogging Computer, just step out of bed and start running. The time you save in preparing to jog can be substantial.

Forget about the boredom Running around a track can be quite boring. And if you count laps, how many times have you lost your count? With the Jogging Computer, you can forget about counting, as the unit does it automatically for you. You can concentrate on problems or take flights of fancy—all while you strenuously exercise.

Forget about the weather Even in summer, there are days when you can't jog outdoors. And in a daily exercise program, you must resort to the indoor track. Not so with the Jogging Computer. It's always there when you need it—portable and ready to operate.

Forget about jogger's heel If you've run on indoor tracks, you know the pain of jogger's heel caused by leaning in around those curves. Jogging in place is easier on your whole body and eliminates this common jogging problem.

BRING IT ANYWHERE

The Jogging Computer is powered by four "C" cell batteries and requires no AC power so it goes anywhere—on your patio, in the garage or basement, or at your office. The control unit can be propped up with its built-in easel or placed on a wall using the four foot expansion cord. It's portable, so after you've run a few miles, just turn it off and put it away. There's no large exercise device to take up space.

QUALITY THROUGHOUT

The JS&A Jogging Computer is all solid state, and the 17"x 22" pad was pre-tested to take years of constant, hard pounding under all conditions. Service should never be required, but if anything ever does go wrong, JS&A's service-by-mail center will have it repaired and back to you in a matter of days. Be assured that we stand solidly behind our product's quality, construction and design. JS&A is America's largest single source of space-age products. We've been in business over a decade—further assurance that your modest investment is well protected.

We suggest that you order the JS&A Jogging Computer and use it for 30 days. Jog each day when you get up in the morning or before dinner. Enjoy the thrill of feeling your endurance build. Experience the convenience and fun. See how much better you feel and how much sharper you think. Then after 30 days, measure your progress. If you don't find the JS&A indoor jogger a convenient and fun way to stay trim and healthy, then return your unit for a complete and full refund including the \$3.00 charge for postage and handling. You can't lose.

Simply send your check for **\$149.95** plus \$3.00 postage and handling (Illinois residents add 5% sales tax) to the address below or call our toll-free number. By return mail, we will send you the complete jogging computer system with instructions, charts, personal score card and a one year limited warranty.

Start today on an organized physical fitness program using the latest in solid-state, space-age technology. Order your JS&A Jogging Computer at no obligation today.

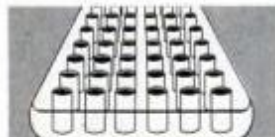
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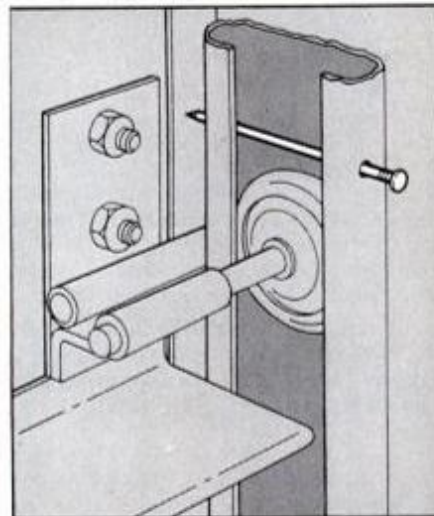
Permanent shelf liners



Scrap vinyl flooring cut to size makes permanent, easy-to-clean shelf and drawer liners. Gluing or stapling liners in place is optional.

—E.V. Reyner

Simple garage door lock



Foil burglars and stray garage-door opening signals with a no-cost lock. Bore holes through track at bottom of door just above roller and insert spike or metal rod as shown. For maximum security, do both sides of door.—Theodore A. Johnson

Vacuum finds lost parts

If you've dropped a contact lens, screw or other small item, you can find it easily without hunting for hours. Place an old nylon stocking securely over the suction end of a vacuum cleaner hose and vacuum the floor. The suction will force the lost item against the nylon.—Harvey Muller

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Liquid Carpet is available in grey, blue, green and red—in quarts and gallons wherever quality marine products are sold.

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FIRSTHAND REPORT

by John Linkletter
EDITOR



First thing you notice is that it looks something like an airplane with its hood sloping down to meet an upswept air-scoop enclosure. And the rear glass hatch completes a "greenhouse" that suggests a plane's canopy.

You begin to feel like a teen-ager as you climb into the sleek, gleaming red RX-7. You slide behind the wheel, into the bucket seat rakishly tilted aft and comfortably molded around your body. You give the key a flip, and the rotary engine hums quietly.

Ahead are the gymkhana pylons. Your hand slides to the shift lever. The shift moves smoothly, ever so smoothly. You tromp the accelerator. And the engine dies.

Of course, they're all still watching, and, as you find you've blundered into third gear, you're suddenly middle-aged again. You begin to wish somebody else were in the RX-7 at Toyo Kogyo's Miyoshi Proving Ground in Japan.

But things get better, lots better. After a successful sliding, screeching, twisting run through the gym-

Driving the Mazda RX-7



Under that sleek hood whirrs a refined rotary that'll deliver a respectable 23 mpg!

khana, a number of low and high-speed laps around the triangular course and passes over torture tracks, you're sure of one thing:

This new Mazda RX-7 is a great Japanese dream machine. It's the kind of car that becomes a love object, the center of a cult.

The RX-7 is a two-seat sports car, built by Toyo Kogyo and "exclusively developed around the rotary engine to take full advantage of the rotary." Aimed at the under-35 crowd, it's for a driver who wants a real sports car, but previously has had to settle for simply a sporty car because of price. Toyo Kogyo plans to have it in U.S. showrooms on May 1 for under \$6000 for the standard model (and about \$600 more for the GS model).

But back to driving. In the passenger seat this time, I watch the dial as a company driver zaps the RX-7 from 0 to 60 in slightly more than 9 seconds. (In other tests, company drivers have done it in 8.7 seconds, I'm told.)

The same driver takes it on a gentle downhill stretch into a high, banked curve, and the needle moves up to about 140 mph. He suddenly drops the car into the inside lane, and I think the tires will roll out of their rims. But the car barely tilts off vertical. (Later, I learn that a competition-proved Watt-linkage rear suspension plus front and rear antiroll bars on the GS model bring it so forgivingly out of a "lateral acceleration" situation.)

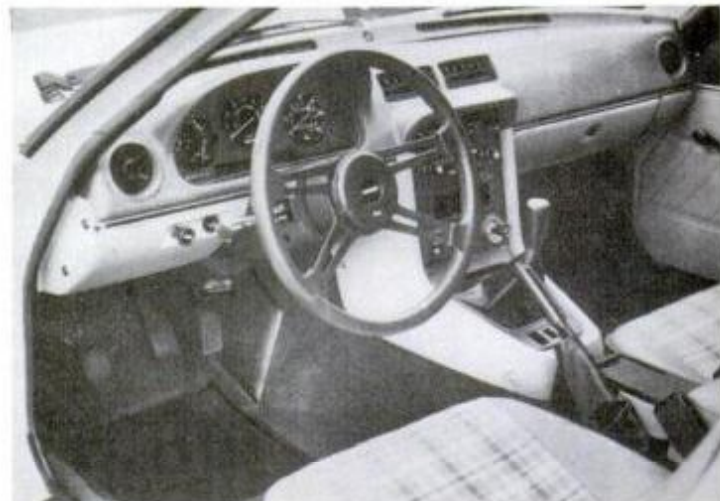
When I drive, *almost* as fast, I note the good rear visibility through the big glass hatch. The up-front view is fine over the RX-7's down-swept hood.

The dash is simple, actually a bit restrained. The principal dials are in a pod ahead of the wheel, and there are just three (photo below). Under the instruments a warning light panel monitors eight functions: rear defroster, hand brake, coolant level, generator, engine oil level, seat belt,

(Please turn to page 36)



Wide glass hatch allows good visibility to the rear; in all models it's equipped with an electric defroster. The hatch swings up for access to rear luggage deck (for which hold-down straps are available). All glass in all models is tinted.



Single pod in front of driver holds three instruments: left: fuel gauge and water temperature gauge; center: tachometer with inset voltmeter (tach needle gives voltage reading before the engine is started); right: speedometer, odometer, trip meter.

REMINGTON®
LIMB 'N TRIM 14-INCH
ELECTRIC CHAIN SAW

Cuts trees up to 28 inches in diameter. High performance 2 H.P. motor. 14-inch guide bar. Lightweight. Double insulated for your safety. U. L. listed. (75762)



\$4999

WERNER® 16-FOOT
EXTENSION LADDER

13-foot working length. Alfio-rung joints prevent twisting. Flat 1½ inch steps. 200 lb. rated load. U. L. listed. (D1116-2)

\$3799

6-FOOT ALUMINUM
STEPLADDER

Ideal for every household job. 225 lb. load rating. U. L. listed (366)

\$2544



G3 YARD GARD®

WELDED FENCE

Use it to enclose yard, garden, swimming pool... 36 inches high. 50 feet long. Double vinyl coated. Rustproof. Won't chip or peel. No rough edges. (132301-36-50)

\$2388



EVERYTHING FOR THE HOME-FIXER...
Shop at the store with the
Sentry on the door!



Want to improve your home? Beautify your lawn? Plant a garden? Do hundreds of do-it-yourself jobs quickly, easily, economically? See your neighborhood Sentry hardware dealer... One of 4,500 in the U.S., he's listed in the Yellow Pages under "hardware".



Sentry® 22-INCH CUT

POWER PROPELLED MOWER

Mowing's a cinch with this new model. Lift the handle. Front wheel power drive immediately engages. Grass discharges at side. 3½ H.P. Briggs & Stratton engine. Four adjustable wheel height settings — ¼ to 3 inches. (260-8)



\$14449

DISSTON®
RECHARGEABLE
POWERPACK™

For use with Disston Power-pack™ operated shop and garden tools. Plugs into wall outlet to recharge. Snaps into tool. (1000)



\$1444

DISSTON®
CORDLESS SHRUB
TRIMMER

Non-stick coating on double-edged 10¼ inch blade reduces friction. Prevents rust. Lightweight. Two handles for easy control. Powerpack not included. (1035)

\$1699



Crescent®

10-INCH ADJUSTABLE
WRENCH

Knurl opens, closes jaws fast. Thin head gets into tight places. Drop forged. Chrome plated. (AC110VH)

\$659



SKIL® 3/8-INCH
RECHARGEABLE
CORDLESS DRILL

Lightweight. Portable. High torque makes it easy to drill all types of material. Drives screws without pre-drilling. Reverses to remove screws. Trigger safety lock. Chuck key stores in handle. Recharging unit included. U. L. listed. (2002)



\$3488

RAND McNALLY ROAD ATLAS
1978 EDITION
UNITED STATES • CANADA • MEXICO



Includes metropolitan and state maps. Mileage charts. City, state, county index. U.S. interstate system map. Time zone data. Telephone area codes, etc. This is same Atlas that usually sells for \$3.95.

only **\$197**

STANLEY®

POWERLOCK® II
16-FOOT TAPE

Graduated in easy-to-read 16ths on both edges of long-life yellow blade. Power return. Positive blade lock. (PL316HWW)



\$749

Merchandise, in this advertisement, is available from participating Sentry dealers only. Offer expires May 27, 1978. The 4,500 Sentry dealers own their stores. They select their merchandise and set their own prices. There may be variations in products, available quantities and prices in individual stores...Sentry Hardware Corporation, Cleveland, Ohio 44113.



The RX-7 Wankel-type rotary engine, designated the 12A, has undergone many design refinements to achieve goal of better mileage and longer life for a rotary.

DRIVING THE MAZDA RX-7

(Continued from page 34)

headlights and the high beam light. I find the steering quick and responsive, without delivering much road shock to the driver, through the recirculating ball and nut steering system.

As for workmanship, nothing seems rough or undone. However, a preproduction car is no proof of quality. If the production models are

Retractable headlights pop up at touch of a switch. Retracted, headlights meld into sleek, aerodynamic design of RX-7. Note air-dam spoiler ahead of front wheels.

as good, there will be no complaint. The reintroduction of the rotary engine into the United States is not taken lightly by the company. "The future of the rotary engine in North America is dependent on the RX-7," says Kenichi Yamamoto, Toyo Kogyo's principal developer of the engine. "We will make every effort to make it succeed."

A lot of the effort has already been made. To strengthen the rotor housing, the company uses a new sheet-metal insert process. The interior chrome plating—against which the rotor spins—is now bonded to sheet metal to which the aluminum alloy housing has been die cast. Another advance is a new two-piece metallic apex seal to replace the earlier one made of a carbon material. It improves gas sealing and thermal efficiency, say engineers.

The standard RX-7 will offer, among other niceties, four-speed manual transmission, power-assisted brakes, electric rear window defroster, steel-belted radials, AM/FM radio and quartz clock.

The GS model offers such extras as five-speed transmission, intermittent wipers, body side moldings and rear antiroll bar. Its options include automatic transmission, tilt-up sun roof and airconditioning. **PM**

SPECIFICATIONS—1979 MAZDA RX-7

Engine

Type: Rotary, two rotors in line, aluminum alloy rotor housing, forced pressure feed lubrication
 Displacement: 573 cc x 2 (35.0 cu. in. x 2)
 Bhp @ rpm: 100 @ 6000
 Torque @ rpm: 105 @ 4000
 Compression ratio: 9.4:1

Transmission

Standard: Four-speed manual (5-speed manual in GS model), floor lever, all synchromesh
 Ratios: 1st, 3.674:1 Reverse, 3.542:1
 2nd, 2.217:1 Final drive ratio, 3.909:1
 3rd, 1.432:1
 4th, 1.000:1
 (5th, 0.825:1)
 Optional (GS model): Automatic three-speed, floor lever.
 Ratios: 1st, 2.458:1 Reverse, 2.181:1
 2nd, 1.458:1 Final drive ratio, 3.909:1
 3rd, 1.000:1

Brakes

Front: Power discs, 9-in. dia.
 Rear: Power drums, 8-in. dia.

Dimension and weights

Wheelbase: 95 in.
 Overall length: 169 in.
 Overall width: Base model, 65 in.
 GS model, 66 in.
 Overall height: 49 in.
 Curb weight: 4-speed, 2350 lbs.
 GS 5-speed, 2385 lbs.
 GS automatic, 2420 lbs.

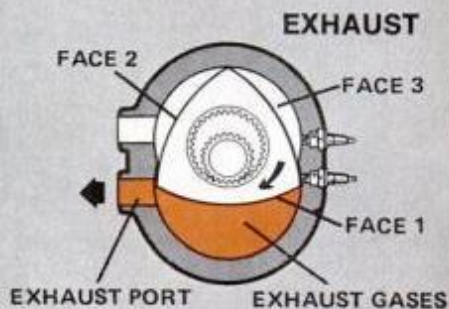
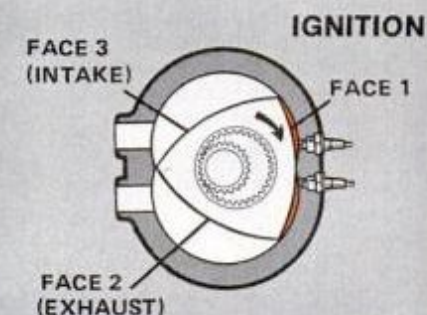
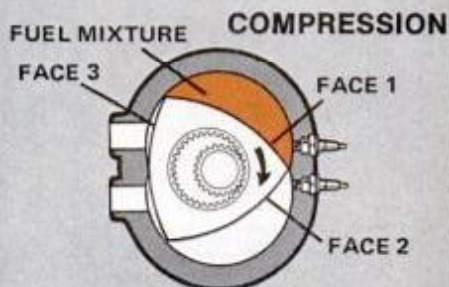
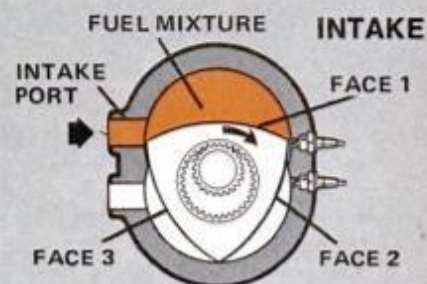
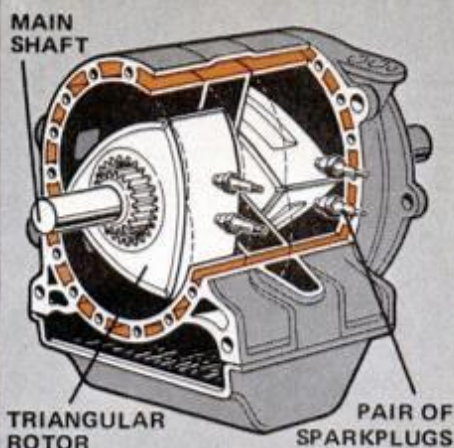
Capacities

Fuel: 14.5 gal. Cooling system: 9.5 qts.
 Oil: 5.5 qts.

Mileage figures: 5-speed manual

City: 19 mpg; highway: 29 mpg; combined: 23 mpg. (Note: EPA tests were not completed in time for this chart. Our figures are Mazda estimates.)

ROTARY ENGINE REVIEW



Mazda RX-7 version of rotary engine has two rotors arranged in-line, each going through the four combustion and exhaust phases at each turn of rotor. (Car's audio signal sounds for shifting at 6750 rpm.) Each rotor has two three-electrode sparkplugs. Water-cooled engine uses 87-octane unleaded gasoline.

'78 FORD COURIER

A tough way to go truckin'..

The '78 Courier is coming on strong with the best gas mileage ratings of the four top-selling compacts! The biggest engine option in its class! And hot options, like a 7-foot bed!

1. Great gas mileage. 38/29 MPG. That's the best gas mileage ratings of the four top-selling compacts! With standard 1.8 litre engine and manual transmission, the EPA estimates 38 mpg highway, 29 city. (Slightly lower in California.) Your mileage may vary due to how and where you drive, truck's condition, and optional equipment.

2. Biggest engine in its class. Courier's optional 2.3 litre engine is the largest engine available in any compact pickup.

3. Super interiors. For '78, Courier's XLT option offers a stylish exterior plus an outstanding level of interior comfort for a compact truck.

And in '78, Ford continues to offer the popular Free Wheeling Courier option. A tough machine that gives you everything from Accent Tape Stripes to Cast Styled Aluminum Wheels.



Free Wheeling Courier

FORD
FORD DIVISION



THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

Fanbelt pulley tensioner

If you've ever wrestled with your car's fanbelt pulleys in an effort to get the proper tension and alignment, you needn't worry about it any more.

Metrifast makes a belt tensioner that works on a screw-jack principle. Set it between two pulleys or a pulley and a hard place, twist the screw with a $\frac{3}{4}$ -inch open-end wrench, and you're in business.



Belt tensioner works like a screw jack.

Several slip-off extenders make the tool ideal for working in both tight and roomy places.

Best thing about it is that it frees both hands for positioning and tightening your alternator, airconditioner compressor, power-steering pump, or whatever.

The Instant Belt Tightener costs \$12.95 postpaid from Metrifast, 51 South Denton Ave., Hyde Park, N.Y. 11040.—M.L.

Miracle lube

Here's a new penetrating lubricant spray that goes on as a liquid, then dries onto metal, wood, or plastic surfaces. You can use it as a penetrating oil, to lubricate or to protect.

It's great for loosening rusty bolts, keeping corrosion off battery terminals, lubing sliding seat tracks and door hinges, plus hundreds of other



Versatile lube.

uses around your car and home.

The spray, called simply 707, can't stain, is non-flammable and static-free, repels lint, is dripless, and works in temperatures from 450° to minus 95° F. It contains no petroleum, silicon, or wax. It does, however, contain a solvent.

The spray is available nationwide, or directly from the 707 Co., TGN Industries, Inc., 405 Lexington Ave., New York 10017. Postpaid prices are \$3.45 for the 6-oz. aerosol can or \$6.95 for the 15-oz. pumper. Bulk amounts are available up to 55 gallons.—M.L.

Mentholatum's new Baracaide

Any mechanic who's used "waterless" hand cleaners knows they smell funny, leave an oily residue, and dry out your skin.

Mentholatum took all these handicaps (whoops) into account in developing a new hand cleaner called Baracaide. It uses no solvents, so it can't dry out your skin. Nor does it smell. And it leaves no oily feeling. Microencapsulation releases the cleaner wet or dry. Baracaide



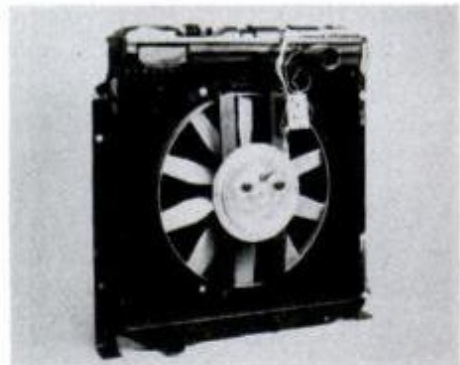
Hand cleaner that's kind to your hands.

caide also contains a skin conditioner and barrier cream. So rather than being harsh to your hands it's said to be beneficial.

The $\frac{4}{5}$ th-oz. tube costs \$1.89 at most auto stores, and other sizes are available up to 40-lb. tubs. For more information, write the Mentholatum Co., Baracaide Div., 1360 Niagara St., Buffalo, N.Y. 14213.—M.L.

Electric fan is no drag

This real cool setup is not only more efficient, but has many less-obvious advantages over traditional belt-driven automotive fans. Thermostatically activated, it controls engine temperature with much less



Flex-A-Lite fan saves engine power.

engine drag than is caused by conventional fans. We installed one in a Camaro with 305-cu.-in. engine. In our car, the fan shut off at 15 to 20 mph after which the natural air flow through the radiator gives enough cooling.

During operation, the motor draws only 1/6th hp compared to 5 to 17 for a belt-driven fan. The unit provides three added benefits: easy access for belt changes because the conventional fan is removed, prevention of costly damage to water pump bearings sometimes caused by bent fan blades, and no loss of antifreeze due to overheating when the engine is shut off—the fan keeps running until radiator temperature drops below 205 degrees.

The unit took us just an hour to install, since instructions are precise, and all parts are in the kit.

The \$70 unit is made by the Flex-A-Lite Corp., 5915 Lake Grove Ave., SW, Tacoma, Wash. 98499.—J.A.L.

Old 97 returns

If you lived through the golden age of hot rodding, or if you've ever fooled with flathead Ford V8s, you have to have a soft spot for "Old 97," the Stromberg 97 carburetor.

And now you can get this ceramic replica of the 97. It makes a great pencil holder, or perhaps a vase.

In an antique gray glaze it costs \$5, and in gold leaf it's \$10, including tax and shipping. From House of Leslie, Box 826-PM, Simi Valley, Calif. 93065.—M.L.



Old 97 carb.

Oldsmobile wagons work like wagons. With the quality ride you expect from Oldsmobile.

Custom Cruiser: full-sized for families who need room and want even more luxury.

The full-sized Olds Custom Cruiser has plenty of loading room inside, practical dimensions outside, and comfort all around plus the luxury you'd expect to find in a full-size Oldsmobile. With a ride that's all Oldsmobile, smooth, solid, serene. And you can expect good fuel efficiency, too. EPA estimates are 22 highway, 15 city and 17 combined with standard 350 V-8 and automatic transmission* (Estimates are lower in California.)

Cutlass Cruiser: for young, growing families on a budget.

Now you can discover that great Cutlass Feeling in a wagon. Cutlass Cruiser is a whole new size that looks and feels like a Cutlass, but loads and carries like a wagon. And it has a short turning radius, a new chassis and suspension and a quality Oldsmobile ride. And good gas mileage, too. EPA mileage estimates are 25 highway, 18 city, 21 combined with available 260 V-8 and automatic transmission*. The best V-8 EPA gas mileage ratings of any mid-size wagon! (Engine not available in California.)

Test drive the Custom Cruiser and the new Cutlass Cruiser at your Olds dealer's, and discover the working wagons with the quality Oldsmobile ride.

*Your mileage depends on how and where you drive, your car's condition and equipment. Cutlass Cruisers are equipped with GM engines produced by various divisions. See your dealer for details.

Oldsmobile

Can we build one for you?



Custom Cruiser



Cutlass Cruiser

There's a lot of News in Olds today.



CAR CLINIC

SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



Holding court

I took my 1971 Oldsmobile Toronado for a routine automatic transmission fluid change. The serviceman told me to use Type F fluid because of the age of the transmission. He says that older transmissions work better and require less maintenance with Type F fluid than with Dexron or Dexron II, recommended by General Motors. I wrote Oldsmobile. A representative stated unequivocally that I should continue using Dexron or Dexron II. Please arbitrate.—Don. A. Brotherson, Erie, Pa.

The difference between Type F and Dexron is in the fluids' frictional characteristics. Dexron and Dexron II allow some slippage—Type F fluid doesn't allow any.

Is the transmission serviceman saying that clutch failure has taken place? If he isn't saying this, then his advice is not logical. Using Type F fluid in a transmission that requires Dexron or Dexron II can cause clutch-plate failure.

Super snooper

I use a 1977 Ford Super Cab pickup to deliver travel trailers. The left rear brake, including the drum, showed complete wear five months after purchase. The right rear brake showed little wear. It cost \$400 for repairs.

Six months after repairs were made, wouldn't you know it—same problem. The left rear brake was badly worn, and the drum was ruined, but you could still read the printing on the right-side linings. I contend there's an inherent malfunction, but the dealer says there isn't. He insists that the only cause for this problem is a parking brake that hangs up, and this has been discounted. Please investigate.—K. W. Cole, Mason City, Iowa

I did some snooping, and it leaves me wondering what the dealer means when he says the parking brake has been "discounted." Since 1975, the parking brake adjustment

procedure for 1975-77 F-250's and F-350's has been revised several times to try and resolve premature rear brake lining wear. The currently accepted method, which you can do yourself, is as follows (an alternate method requires a special brake cable tension gauge):

- Release the parking brake.
- Lift the truck by its axle and remove the left rear brake drum.
- Measure the clearance between the cam plate and operating level on the forward side of the anchor pin, and adjust the equalizer nut until there is .015-inch clearance between the two.
- Lock the equalizer nut.

There are two other conditions that will cause premature brake lining wear. If the return springs on the left side have lost tension, the linings won't release properly. Neither will they release properly if there is a restriction in the hydraulic line serving the left rear brake.

History lesson

My problem concerns the automatic

choke system in a 1973 AMC Hornet station wagon with a six-cylinder engine. During the last cold spell, the choke failed. I removed the carburetor and disassembled the choke. I did a thorough cleaning job on both the choke and pipe that goes from the exhaust manifold to the choke housing. I found some water in the housing, but that was all. When the choke was reassembled, it worked to perfection—for a day. Help! Please!—Eric T. Ross, Rolling Meadows, Ill.

No sooner asked for than done. The "pipe" you mentioned looks innocent, doesn't it? But it's about as innocent as Benedict Arnold. The pipe (heat tube) has the job of transferring hot exhaust gases to the choke housing, where gases cause a thermostatic spring to lose tension and release its hold on the choke plate. When a hole develops in the tube (often just a pinhole you can hardly see), cold air mixes with hot exhaust to form condensation. This is a primary cause for automatic choke failure. It is also one of the least suspected reasons, so replace the tube and clean out the housing again. This should end the trouble.

Ram it

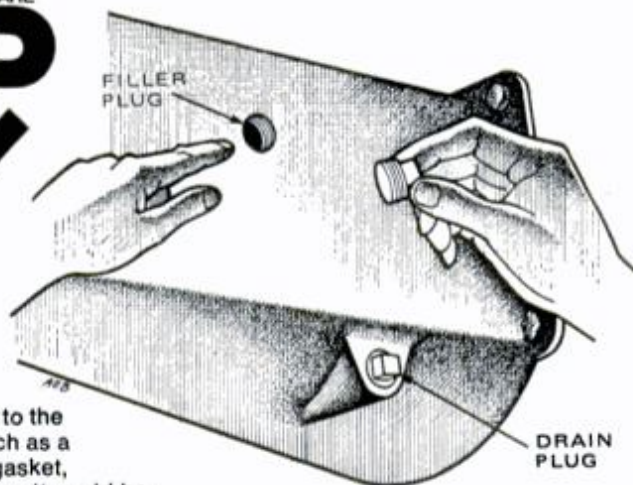
I have a 1977 Dodge 360 Ram-charger SE. How do I grease the constant velocity universal joint at the output side of the transfer case without dropping the driveshaft?—L.W. Gilpin, Newfoundland, Pa.

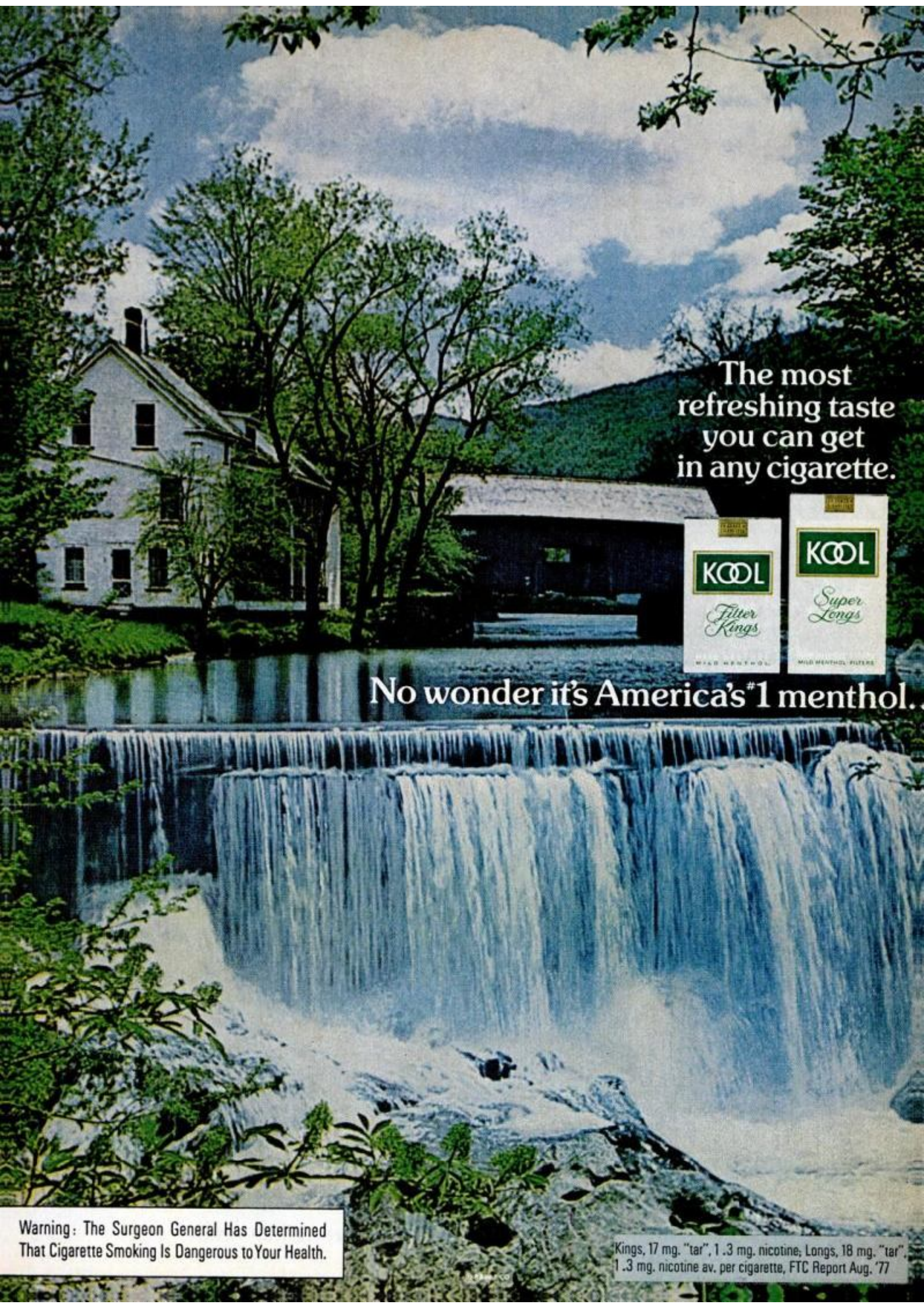
As far as I can tell, you can't . . . at least I couldn't when I tried. Quarters are too close and I couldn't get a gun on the fitting

(Please turn to page 42)

Plugging along

Out of sight is often out of mind until the trouble starts. Good examples are manual transmissions. It's often forgotten that they need a full shot of lubricant. Low lube level causes gears to stick (hard shifting) and noise. If the lube level drops from one check to the next, suspect a problem such as a loose cover or a damaged gasket, a damaged seal or retainer, or it could be a loose countershaft. The level should be to the bottom of the filler hole and it is checked by removing the filler plug on the transmission case.





The most refreshing taste you can get in any cigarette.



No wonder it's America's #1 menthol.

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

Kings, 17 mg. "tar", 1.3 mg. nicotine; Longs, 18 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report Aug. '77

CAR CLINIC

(Continued from page 40)

without dropping the shaft.

It might come as a surprise to some Ramcharger owners (even to some Dodge service people) that there is a grease fitting on this CV joint. Dodge models generally don't possess grease fittings on U-joints. In the Ramcharger, though, the CV joint at the output side of the transfer case going to the front drive axle is fitted with a rubber-tipped plug that has to be removed to uncover the fitting. Apply grease when you lube the chassis.

Lucking out

The muffler on my son's 1976 Toyota Corolla had to be replaced, so he brought the car to the dealer. The new muffler cost him \$71. Two days later my neighbor told me the muffler in her 1975 Toyota Corolla had to be replaced. I told her it would cost \$71. I ended up eating my words. She took the car to a different dealer, who replaced the muffler for nothing. I called the local Toyota consumer complaint department and explained the situation. My son got his \$71 back.

The kicker to all this happened soon after with my 1976 Toyota

Corolla. At 20,000 miles, the muffler went bad. I called Toyota and was told to take the car to the dealer (same one as my son's). The muffler was replaced without charge. Evidently, Toyota has run into a batch of defective mufflers and decided to do the right thing.—Adolph Krauz, New Hyde Park, N.Y.

You got lucky. Mr. Faherty, who works in the company's customer relations department, told me that there is no "batch of defective mufflers." He states emphatically that mufflers in Toyotas exceeding the 12-month, 12,000-mile warranty are not being replaced free of charge. He explains your situation as "probably a good will gesture" by the company.

Cover story

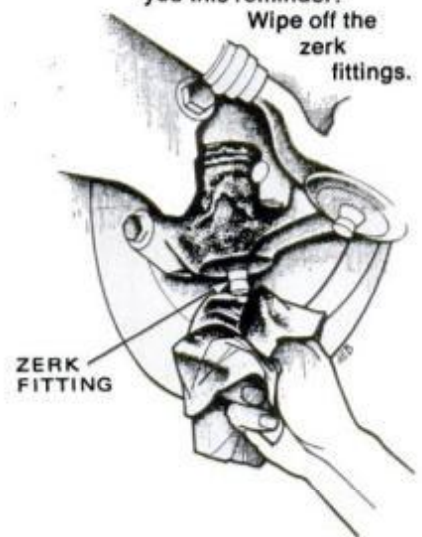
The engine cover in our new Chevrolet Versa Van leaks a large quantity of air at the seals, because the cover doesn't fit properly. The air, extremely hot, comes from the engine compartment. Other owners of 1976 and 1977 Chevy and GMC vans tell me they have the same problem. Our dealer has no solution. What's up?—W.J. Sapp Jr., Green Cove Springs, Fla.

Yoicks! Zerks

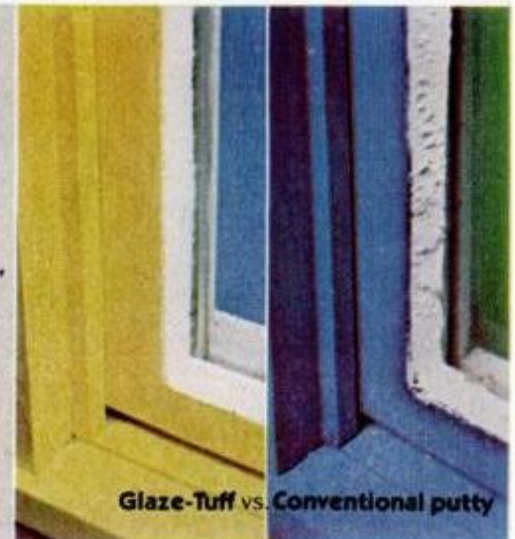
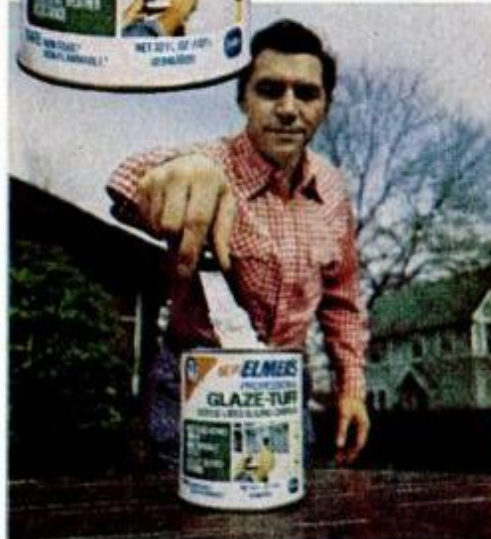
How would you like it if someone squirted dirt into your plumbing? So why do it to your car's ball joints, which depend on cleanliness for long life?

Attaching a grease gun to a dirty zerk fitting and then pumping grease into the ball joint also pumps in grit that will harm the highly polished machine parts. That's why we offer

you this reminder:
Wipe off the zerk fittings.



With Elmer's Glaze-Tuff you don't need a pro's hands to give it the pro's touch.



You'll do a faster, better glazing job with Elmer's® Glaze-Tuff™ acrylic latex glazing compound. Because its fast-drying formula goes on smooth and easy straight from the can. At temperatures as low as 40°F.

Unlike conventional putty, no "roping" or warmup is needed. And Glaze-Tuff dries to an incredibly tough, flexible finish that resists shrinking and cracking. It actually forms a chemical bond with glass, wood and metal.

The conventional putty "pulled out" during first-time application, so it required additional work. Elmer's Glaze-Tuff goes on clean, white and new looking. And stays that way, even without paint.

Elmer's. When results count.



Get The Dry Look... and don't be a stiff.



The Dry Look pump leaves hair feeling as soft and natural as it looks.

The Dry Look gives you more than a great look. It leaves your hair feeling soft and natural, too — not stiff. The Dry Look in pump spray or aerosol — with a formula that's right for your hair. Get The Dry Look... and don't be a stiff!

© The Gillette Company, 1978



At this point, nothing. Chevy shop chiefs I've spoken to are aware of the problem, but a company service bulletin has not been issued to correct it—not yet, anyway. We tried a method that seems effective. Get some 1/4-inch foam weatherstripping at a hardware store and glue it down over the joint using rubber cement. Unfortunately, the weatherstripping will be destroyed when you remove the cover, but I see no other way.

I'll be happy to pass along other corrective methods you readers may have. Please write.

Solving the 'unsolvable'

I have a 1977 Ford Granada with a 302-cu.in. engine, and only one problem. It makes a rumbling noise at a steady 40 to 45 miles per hour. Two dealers told me the problem can't be solved—"live with it," they say. Two of my friends—one with a Mercury Monarch (same engine) and the other with a Granada (same engine) have the same complaint. What's the trouble?—John A. Grau, Gibsonia, Pa.

If the car is equipped with airconditioning, the noise is probably being caused by air-conditioner compressor movement be-

cause of weak brackets. New brackets for the 302- and 351-cu.-in. engines have been released. Tell your dealer to see service bulletin 129 (2/24/77).

If the car is not equipped with airconditioning, the noise can usually be eliminated by installing two vibration dampers (part No. D3VY-4A263A) on the transmission extension housing, as outlined in the same bulletin.

Cap off your day

Here's a good tip from Stuart Cooper, Rhinebeck, N.Y. He suggests that PM readers could save some money with this simple idea just as he did recently.

"Write your name, address and telephone number on the inside of each of your hub caps or wheel covers. That way if you lose one when you hit a bump or one pops off from not being seated properly, you have a chance to get it back. I happened to be lucky and one of mine was found by a thoughtful person who took the trouble to call me. With the cost of wheel covers and hub caps these days, it can pay to take the time to put some identification on these parts."

Thanks, Stu.

SERVICE TIPS

■ According to the Automotive Parts and Accessories Assn., 10 states prohibit the operation of a vehicle in which front windshields are nontransparent, reflective or both. The fine is stiff, so check the law if you live in or plan to drive through one of these states: Colorado, Florida, Kansas (as of July 1), Maryland, Nebraska, New Mexico, Ohio, Texas, Utah and Virginia.

■ If your new Buick, Cadillac or Oldsmobile is experiencing a vibration problem, it may have excessive pinion flange wobble that can be corrected by installing a damper package kit (part No. 6263010).

■ Do you have a problem with the headlamp doors in your 1977 Ford, Mercury or Lincoln opening after the car's been parked a few hours? If so, one of the "Y" connectors (part No. 383014-S) has probably sprung a leak. The connectors are in the engine compartment on the left-hand side of the car in the outlet hoses from the left-hand headlamp cover control motor. **PM**

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.

The Chrysler 265. Enough power to free your spirit.

The facts speak for themselves.

Chrysler's 265 stern drive engine turns out more horsepower under 450 cubic inches than any stern drive engine built by Volvo, OMC or Mercury.

When that no-nonsense fact is coupled with the revolutionary Chrysler "300" drive unit, you have an

engineer's dream come true.

The "300" offers a patented self-energizing clutch that makes gear changes go practically unnoticed.

Dual hydraulic power trim/tilt cylinders provide control you may not have thought possible... until now.

All Chrysler Stern Drive engines (the

195, 240 & 265 hp. gas or 105 & 130 hp. diesel) are thoroughly dynamometer tested.

For more information on the benefits of "Chrysler Power," contact Marine Division, Chrysler Corporation, P. O. Box 1, Marysville, MI 48040.



MARINE DIVISION



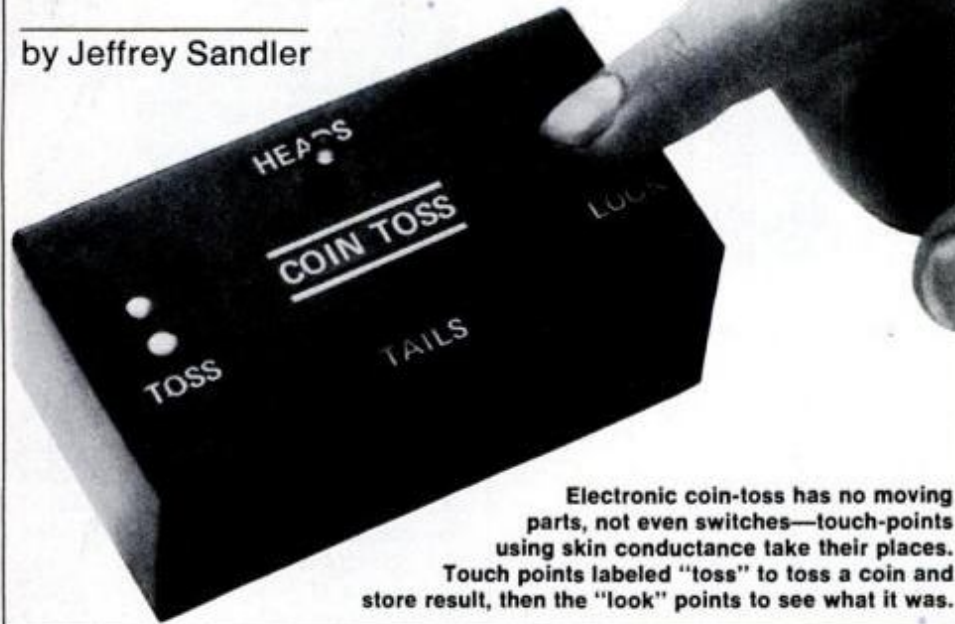
CHRYSLER CORPORATION



Toss a coin...

... make a decision or test your ESP with PM's binary box.

by Jeffrey Sandler

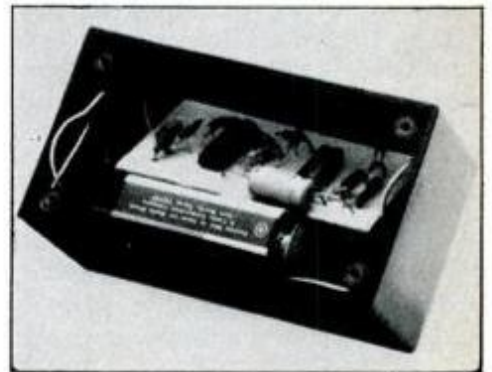


Electronic coin-toss has no moving parts, not even switches—touch-points using skin conductance take their places. Touch points labeled "toss" to toss a coin and store result, then the "look" points to see what it was.

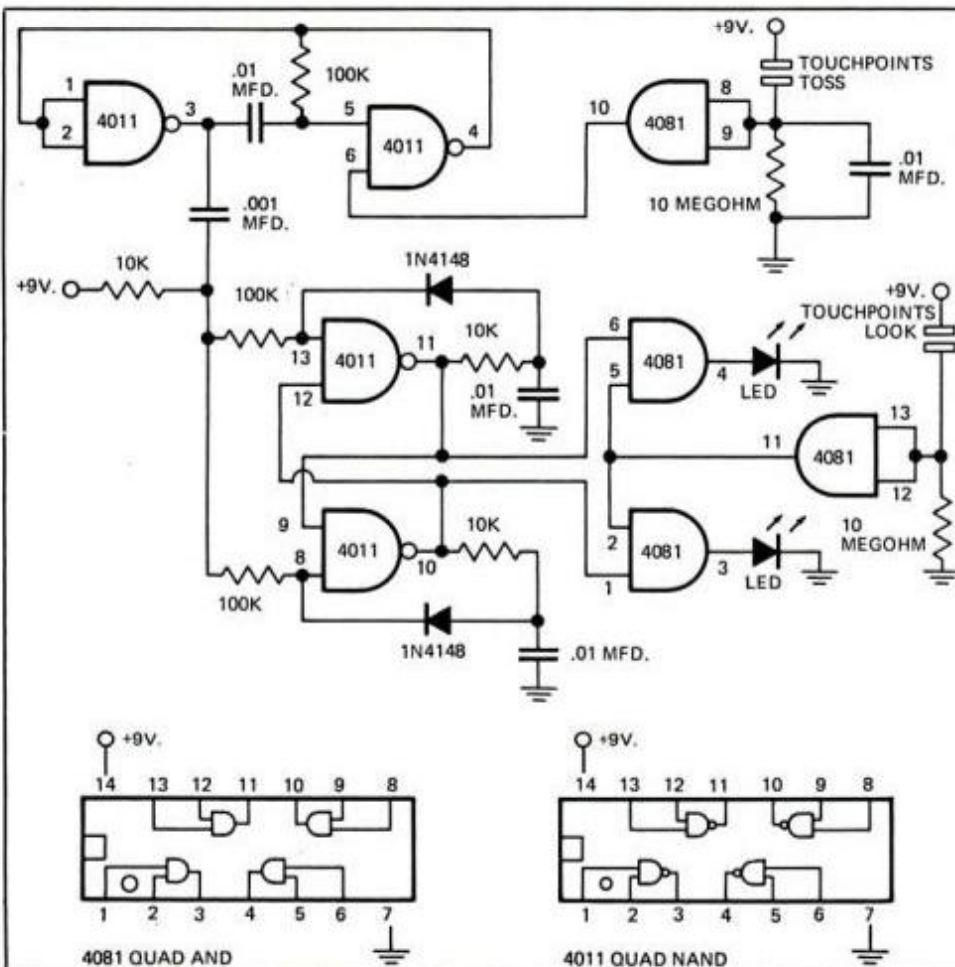
an absolutely even 50-50 chance.

If a friend claims to have ESP, let him predict which LED will light. If he's right more than half the time over 100 or more trials, he just may have some psychic powers.

If you need random numbers for a game, let the circuit generate them. They'll be binary, of course; call tails 0 and heads 1. Operate once for a 0 or 1, twice for a number from 0 to 3, three times for a number between 0 and 7, and so forth. (If you want a 1 to 10 result, operate four



Complete circuit, battery fit inside mini-box. Electrolytic capacitor has been eliminated in final design.



times and throw out 0000 or anything over 1010.)

The circuit uses an astable multivibrator (digital oscillator) to vary the heads-or-tails condition, and a flip-flop to store the condition given by the multivibrator. This alone wouldn't produce a fair toss, however, because the multivibrator's duty cycle (amounts of time spent in high and low states comparatively) is unlikely to be exactly 50-50. Consequently, the circuit is wired so that the flip-flop's state is changed once for each full cycle the multivibrator goes through, and its frequency is constant. The touch-points are pairs of exposed contacts (heads of small bolts for simplest construction). When they're touched, a tiny current is passed through the skin to turn on the multivibrator or to read out the flip-flop state to the appropriate LED.

All parts except LEDs (use any rated for 20 milliamperes or more) are specified on the schematic. Gates are CMOS quad two-input AND and NAND, four gates to a chip, as shown. Note that each chip is connected to supply and ground. The capacitors are small ceramic discs.

The binary box is available as a complete kit for \$9.95 postpaid (or \$2.50 postpaid for printed-circuit board alone) from LAT Enterprises, Box 12, Meacham Branch, Elmont, N.Y. 11003. **PM**

Next time you have one of those tough decisions to make, don't reach for a quarter to flip. Reach for our electronic coin-toss instead—it's more entertaining.

Touch a finger to the two metal

points labeled "toss." That flips the coin and determines the outcome. Then touch the "look" points to see whether the "heads" or "tails" light-emitting diode turns on. The circuit is designed so that it is

DETROIT LISTENING POST

Third edition Mustang

The sporty new Mustang III (see artist's concept) Ford will bring out this fall will come in two versions, fastback and a notchback. Wheelbase will be an even 100 inches. Mercury will offer a takeoff of the same car. The L-M version will be dubbed Capri II. Both cars will have Michelin TRX radial tires as standard on the performance models. Ford is counting on these cars, to quote a company source, "to really stick it to" Firebird (Pontiac), Starfire (Oldsmobile) and Skyhawk (Buick).

Ford developing new engines

Suppliers working with Ford on developing new engines for smaller cars say the company will rework or scrap every engine in its catalog over the next five years. If any current engines are continued, they will be used in vehicles other than automobiles. Ford isn't expected to get into anything very exotic in engines, although there could be a V8 version of the firm's dual displacement job. The new line will include a downsized V8 and, later on, at least one and possibly two V6s.

The powerplant to watch, however, is the turbocharged, 2.3-liter Four which will put out 147 hp vs. the normal 101. In the Mustang/Capri, projected mpg will be 23 combined (EPA). Projected performance will be incredible with an 8-second 0-to-60 time, which lops a full second off the 9 seconds for the 302 V8. When the cars go on sale with this engine in August, Ford will be able to check, in the field, a powerplant that's been a dream in the engine lab and on the test track.

DD engine still in running

Speaking of the dual displacement engine, don't kiss this idea off because Ford has back-burnered the six-cylinder test engine it was working on for a trial run in a '78 light truck. (The DD cuts down on the number of cylinders in use as the engine calls for less power, thereby saving on gas.) Ford hasn't kissed off the idea, although the company has switched its development work to a V8. Ford knows more about the DD than the other companies because it was in the field first and put a bundle into trying to work



1979 Mustang is an all-new car that'll be quick off the line with its turbo Four.

the bugs out. Ford just wasn't satisfied with the kind of fuel savings—little over five percent—it was getting with the experimental engines. But Ford isn't the only company working on the DD. GM and Chrysler have both lab and in-car versions of the engine under test and, given enough time, engineers believe the DD is a promising prospect for cars of the future.

Ford 'bigs' drop to 114 in.

GM was supposed to be in deep trouble when it reduced the size of its big cars two years ago. The cars were smaller and more expensive than the old intermediates. How do you convince the customer to pay more for a one-scoop ice cream cone if you offer two scoops for less money? GM did just that and the downsized cars were a smash success. Come the '79 models, Ford will be in the same position GM was in two years ago and Ford has its fingers crossed that the outcome will be the same. Ford's big machines will drop to a 114-inch wheelbase for '79, down from 121 and 124 inches this year. That's four inches shorter than some Ford mid-size cars.

At least one of the models will have single rectangular headlights, instead of the big saucer lights that have been a Ford trademark. Insiders who have seen the cars say the taillight treatment is similar to what Chrysler has on Cordoba.

Second downsizing at GM

Next downsizing of GM's big cars won't be as dramatic as the first go-round. The cars will come down another 500 to 600 pounds in weight, but they won't show it to the extent the first trimming did

compared against the previous cars. The C cars—Olds '98 and Buick Electra—will shrink only 3 inches in wheelbase, to 116. Same size as the present B bodies. The Bs—the big Chevrolets, Pontiacs, Buick LeSabre and Olds 88—will also lose 3 inches. They will drop to a 113-inch wheelbase. These cars will be out in fall of 1982, as planned. There have been reports GM might try to leapfrog the '82 cars and move them up two years, to fall of 1980. Don't believe it. Not even GM has enough money to bring out completely new cars every three years.

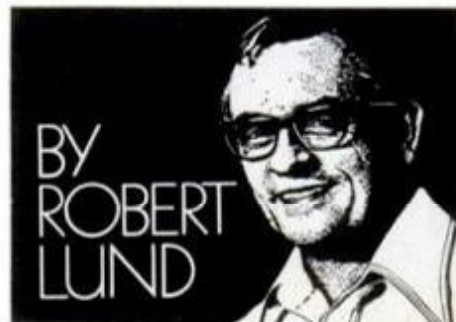
Body switch at Chrysler

Chrysler Newport and New Yorker will switch to the intermediate body for 1979, but you will need a keen eye to detect that this is the same shell used for Monaco and Fury. The big cars will have new sheet metal up front, new quarter panels and deck lids in the rear. Sedans will be on a 117-inch base, coupes 115 inches.

Pinto keeping same wheelbase

Not all cars are getting smaller. The new Pinto/Bobcat, a.k.a. Erika, that Ford will bring out in 1981 to replace Fiesta will be larger or the same size, depending on the point

(Please turn to page 48)



'78 FORD PICKUPS. TOUGH ALL OVER.

A new Ford Pickup is built tough from the ground up. Ford's exclusive forged steel Twin-I-Beam, extensive corrosion protection, big-cube V-8 options, all-welded cab, and double-wall box are just a few of the reasons.

But what makes a new Ford even tougher to beat are this year's new options like • Synchronesh 4-speed overdrive transmission for highway driving (not available on F-350 models) • Good-looking, comfortable new Lariat interior • 40-channel CB with concealed transceiver, single AM/FM/CB antenna, and all controls in the removable mike • New tilt steering wheel for your most comfortable position.

Take a look at all the new Fords. You'll find them tough all over. And *more* than just tough.



93 out of 100 of all Ford Trucks registered over the last 12 years are still on the job. (Percentage based on cumulative total registrations as of 7/1/76.)

FORD
FORD DIVISION



Look who's sitting on top of the world!

Remington Limb N'Trim 8 is the world's fastest selling electric chain saw for a lot of very good reasons. It's highly useful, easy to handle, fun to use. It's the homeowner's favorite for limbing, trimming, cutting 16" trees and a dozen other jobs around the home. And what a value! For just \$29.99 you can saw rough logs into a cord of firewood that would retail for \$90.00 or more. Saves energy, saves time, saves money.

Weighing just four perfectly balanced pounds, Limb N'Trim 8 is the lightest, most comfortable handling saw your money can buy. You can use it for hours without tiring. But don't let the size fool you. Its powerful, high speed 1 1/4 hp motor slices through wood smoothly and effortlessly.

Fast, easy to handle, fun to use... powerful, durable little workhorse... and still just \$29.99... that's Remington Limb N'Trim 8. It's backed by DESA's 40-year record of building dependable chain saws. As long as you have those jobs to do, you might as well enjoy them. For the name of the dealer nearest you, write Paul Yokubinas at the address below, or call (312) 747-1200.



Limb N'Trim 8
\$29.99

DESA INDUSTRIES

A Unit of AMCA International Corporation.
25000 South Western Avenue, Park Forest, IL 60466

DETROIT LISTENING POST

(Continued from page 46)

of reference. Larger if you measure it against Fiesta. Fiesta is on a 90-inch wheelbase and the new car will sit on 94 inches. But that's the same wheelbase as the present Pinto. Ford has pulled some technical help in from Europe to work on development of this car.

Size labels rankle Chrysler

GM will lop eight inches off the wheelbase of its X-body compacts—Nova, Omega, Phoenix and Skylark—when the front-drive versions appear next spring. They will have a 103-inch base, compared with 111 inches for the current cars. This will give GM's front-drive compacts a base four inches longer than Chrysler's front-drive cars, Omni (Dodge) and Horizon (Plymouth). So what and who cares? Well, Chrysler cares. Chrysler doesn't take kindly to Omni/ Horizon being pegged as minis, small cars, compacts, subcompacts or any other name that brackets the cars by size.

Chrysler has a point. There was a



It's nice 'n EASY (Electronic Automotive System) getting 18 digital readouts of standard functions and special information from Chrysler's experimental push-button console. In this Volare test car's computerized instrument panel, six wire connections take place of the usual 40.

time when cars could be categorized large, medium or small by dimensions. But those definitions no longer apply for two reasons: (1) the old definitions have been muddled by the downsizing of all cars, (2) every manufacturer now makes his own rules of what constitutes full-size, intermediate size, compact and all the shadings of those designations. This situation will eventually sort itself out as all cars become smaller and sizes stabilize. Until then, Chrysler is understandably vehement in saying, "Don't try to pin your size label on my car." **PM**

6 YEARS OLD. IMPORTED IN BOTTLE FROM CANADA BY HIRAM WALKER IMPORTERS, INC.
DETROIT, MICH. 46 & PROOF. BLENDED CANADIAN WHISKY. © 1978

Bonnie and Clyde led us on a wild chase to the site of their last known hideout. Nearby we hid a case of Canadian Club.

It had been 44 years since Bonnie Parker and Clyde Barrow sped through this northern Louisiana wilderness on their last run from the law. Tracking their legend even now is a wild and wooly chase over lonesome red clay roads which run deep in tangled pine forests.

We met folks who'd seen them.

Finally our search led to where an old squatter's cabin had once stood. Bonnie and Clyde were known to have holed up here in their last days, and local folks told us they'd seen the two lurking hereabout back in '34. So having found the long-lost hideout, we trekked into the brush and buried a case of Canadian Club.



Bonnie and Clyde.

Start at "the end of the trail."

To find that C.C., start your trail exactly where Bonnie and Clyde's ended. Find the road they took to their fateful rendezvous with the law—and head in the opposite direction, all the way to



the next parish. Go past the "three R's" place, and where David's lad abides, turn onto a red dirt road. At the black gold storage place, head north.

Look for a warning.

Two hard left turns and a short drive will bring you to an old sawmill. Continue till you are warned about digging and stop (if you're warned more than once, you've gone too far). On your right is an overgrown trail. Follow it to two former money-makers. From one of them, take a bearing of 160 degrees, and take a pace for each of the 120 years people have been enjoying Canadian Club. Now take 44 more in any direction but the one you've come from to where three stumps form a triangle.

We hope you brought ice and glasses, for within that triangle, just one foot down, lie 12 bottles of the world's finest tasting whisky. But if the rigors of the hunt seem too great, you can find the same great taste at your favorite tavern or package store by simply saying, "C.C., please."



Canadian Club

"The Best In The House"™ in 87 lands.

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ALL OUTDOORS

Map charts

Usually, "maps" show how to find your way on land; "charts", on the other hand, are for navigation on water. Now the National Oceanic and Atmospheric Administration, successor to the Coast and Geodetic Survey Div. of the Department of Commerce, is coming out with new kinds of maps that don't stop at the water's edge. Officially, they're called "bathymetric maps," which means data on the depth of the sea. Their contour lines suggest what it might look like if you were wandering around on the bottom, just as a topographic map shows land contours. The new maps that show both coastline and water are called

For \$2 each, the maps can be ordered from Distribution Div. C44, National Ocean Survey, 6501 Lafayette Ave., Riverdale, Md. 20840.

Beating boating's best

Every year brings new attempts at rewriting the record books. Anyone wanting to take a crack at the top spot in one of the toughest leagues—the offshore ocean powerboat tests—will be up against formidable competition. Marathon racers slamming through open seas take hours of the fiercest kind of non-stop punishment while driving skill, navigation, endurance, hull design plus mechanical performance and tuning get a final exam.

though you might not set a world straightaway record or win the championship, you'll learn a lot about what speed means on the open ocean.

Rough riding

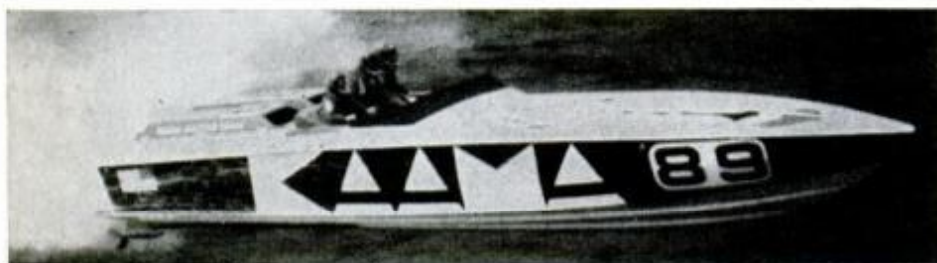
Kevlar, the remarkably strong aramid fiber from DuPont, is about to show up in another application. Schorr Strong Industries, Baldwin, N.Y., is coming out with a line of denim sportswear lined with a 50/50 blend of Kevlar 29 aramid and nylon woven by J. P. Stevens and bonded to the denim by Reeves Brothers. The result is a fabric that may take motorcycle riders out of leather and put them in denim jackets and pants. Tests indicate the denim and Kevlar 29 combination has five times the tear resistance of leather and twice the resistance to abrasion.

The sport clothes, called "Mean Street," will be showing up first at motorcycle-gear outlets in denim, and possibly later on in corduroy, which has also tested out well. Trail bike, moped and skate board riders, climbers, hikers, hunters—anyone who needs abrasion protection and gives clothes a beating—should find the material of interest. In its present state you may want to wear long johns as insulation from the mesh lining, but the potential of the fabric looks good.

Food for thought

Somehow, off camping and out in the woods, you learn the companions and equipment you like and trust—plus those that you can't stand. So has author Fred Powell, and in his new little pocket-sized book, *The Backpacker's Budget Food Book*, published at \$3.95 by David McKay Co., he lists the cooking utensils, foods and recipes he's found successful and those he really hates. His work is subtitled, "How to select and prepare

(Please turn to page 52)



For the world offshore championship, the boat to beat will be Kaama, the '77 winner driven by top racer (and grandmother) Betty Cook.

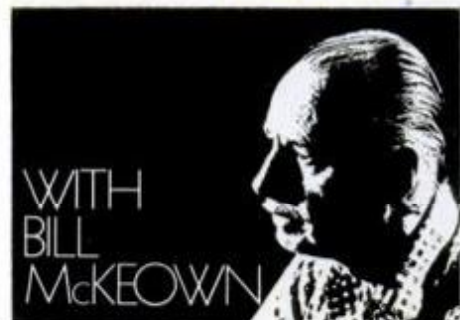


For a world offshore speed record, the new winner will have to beat the 90 mph tempo that was set in a Cigarette by a grandfather, Bob Nordskog.

"Topo/Bathy" maps.

You're not likely to hike to the water's edge and want to keep right on walking. But scuba divers will find these new maps of special value. The prime advantage, however, will be for the offshore fisherman. Now he can take sights on prominent landmarks ashore and figure out when he's right over the sunken canyon where the big fish should be waiting. Larger boats mounting the new Loran C sets should have an even easier time when fishing with a "bathy." As of now, long sections of the East, Gulf, and West Coasts have been charted offshore, in some cases as far as the outer continental shelf.

As of now, the titlists to beat are a pair of grandparents named Betty Cook, who won the World Offshore Powerboat Championship at Key West last fall, and Bob Nordskog, offshore speed-record holder at 90.555 mph. Cook and Nordskog are both from California, but to join this special fraternity you might go to Florida to talk Don Aronow of North Miami Beach into building you one of his offshore Cigarette-type racing machines. Power it with a pair of MerCruisers, Aeromarines or turbocharged 454 Chevy blocks modified for 800 hp each as Bob Nordskog did. Spend thousands of dollars and years of trying, and





**PANATELA® SEPARATES.
YOU'LL STAND OUT FROM THE HERD
WITHOUT GETTING FLEECECED.**

Obviously the herd hasn't heard. But good taste, sound construction, and individual flair *can* be combined with eminently affordable prices. For instance: the entire hopsack weave outfit shown (Panatela slacks, jacket, and vest) costs far less than many

people spend on a sportjacket alone. And everything is sized and sold separately. So you can build a wardrobe that fits both your taste and your physical dimensions. Panatela Separates. Because only a sheep dresses in sheep's clothing.

Levi's
SPORTSWEAR

Quality never goes out of style.

ALL OUTDOORS

(Continued from page 50)

your provisions from supermarket shelves," but there's much more to it than that. The first half of the book covers "The System" and "The Cook's Tools." Then he gets into basic food and recipes which are not only great for backpackers but fine



To keep outdoorsmen sharp, Worth of Stevens Point, Wis., has \$2.15 Sports-Handy Man honing-stone kit for hooks, blades.

for any outdoor cook. Powledge has dehydrated his strong opinions down into very readable pros and cons which any camper will find helpful.

Double duty

For a neat multipurpose storage and camper unit to slide into a pickup truck, there's a new plan package for \$5.95 from Popular Mechanics, Dept.



Lines of Little Rhody, smart packet from Hawkline Boats, Westport, Mass., hardly hint she's 19 feet overall, does 35 mph.

BM, Box 1014, Radio City Station, New York, N.Y. 10019. Called a Work-Play Camper, it's easy to construct, has storage boxes on each side for business tools and supplies or camping gear, or both. An open center section in the truck bed takes more supplies or a double bed with a tent top that lifts for protection and headroom. The handy unit is designed for mini-pickups like Datsun's Li'l Hustler, but adapts readily to fit a standard.

Outdoor extras

Often it's the equipment that makes or breaks an outing, and boat men, campers, hunters, fishermen and RV travelers all seem to be inventors at

heart, ready to improve their gear. Here are some items we've seen or tested recently that may be just what you've been looking for:

You're a bow hunter who always finds the best place for a stand is up some tree? The Bootmakers of Sturgeon Bay, 245 East Vine St., Sturgeon Bay, Wis. 54235, have a new hunting boot called The Stalker that has a slot in the sole to take steel climbing spikes supplied with the boots. They look something like utility pole repairmen's boots, but also have back pouches with sponges you can treat with buck-lure scent.

Have trouble with the right current for TV aboard your yacht or



E-Z Carrier, by Hellstar, Wahoo, Neb., is a new 24-cubic-foot rooftop cargo pod for extra storage space on vans and RVs.

motor home? Marine Power-House, Dytek Laboratories, Airport Plaza, Bohemia, N.Y. 11716, is a \$500 Inverter that converts 12-, 24- or 32-v.d.c. battery current into 400 watts



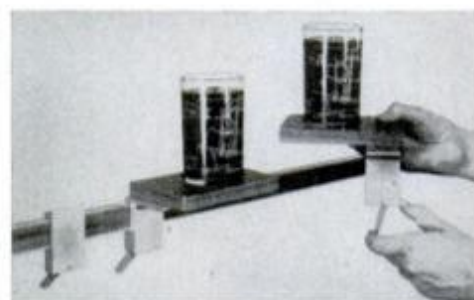
Perko Safety Strobe Light, \$60, in waterproof case gives a 1-million candlepower anticollision warning from 7-inch unit.

of sine wave output for frequency-sensitive equipment.

Or if TV just puts you to sleep, you can buy (for \$155) a Calmax Classeat, a pedestal captain's chair for your van or RV that swivels in a full circle, has retractable arm rests,

and reclines through 10 positions for lie-back comfort. T&H Van Works, 7833 Canoga Ave., Canoga Park, Calif. 91304, makes it.

Wonder what camping equipment to choose for summer pleasure and winter double duty in case of power failure? A booklet, *Standby with*



For keeping clutter off counters of boats and RVs, Raildex, by Fairfield Systems, Stamford, Conn., has clamp-on shelves.

Coleman, describes the essentials and is available from Coleman dealers or the Coleman Co., 250 North St. Francis, Wichita, Kans. 67201. Families with beginning shooters should get the 25-cent booklet, *The Crosman Safe Shooters Book*, from Crosman air gun dealers or Crosman Arms, 980 Turk Hill Rd., Fairport, N.Y. 14450. Proper handling and safety rules are the same for BB and powder guns.

With all the sew-it-yourself, as-



Campers can set up Carefree of Colorado's new Porta-Shower in two minutes. Electric pump has self-contained water.

semble-it-yourself kits coming out, there was bound to be a kit specialty store. It's called Goose Dance, 215 North Cayuga, Ithaca, N.Y. 14850. By mail you can order down parkas, leather clothing, bags, knives, caned furniture, even snowshoes you put together yourself. **PM**

PART-TIME JOBS WITH FULL-TIME PRIDE.

Serving 16 hours a month, and two full weeks a year in the Army Reserve can earn you a good extra income.

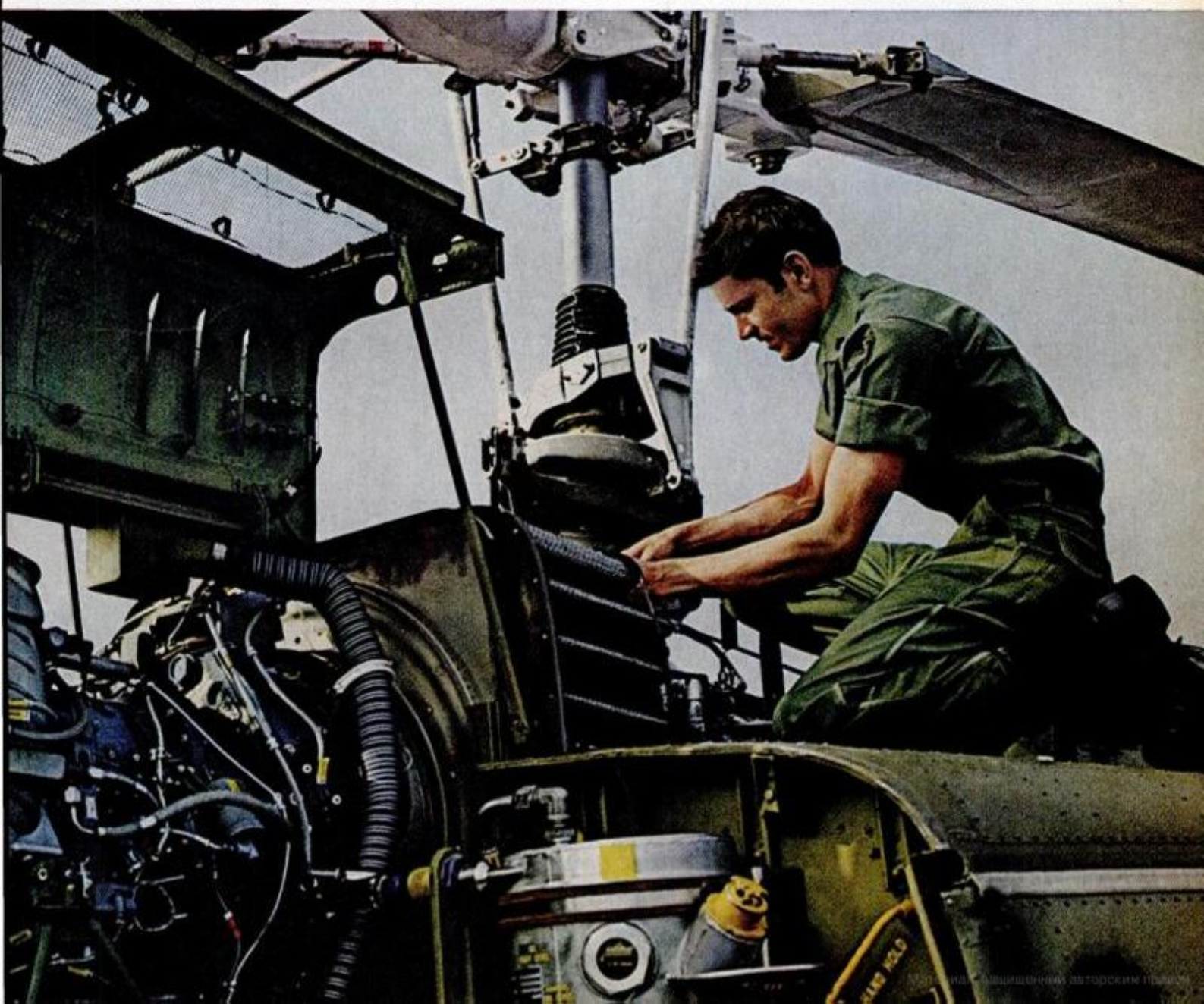
It can earn you an extra good feeling, too. Pride. Because, as an Army Reservist, you'll be working to better your country and community, as well as yourself.

And we have hundreds of jobs to choose from, in many fields. Qualify, and you can learn medical technology, surveying, or automotive mechanics, just to name a few.

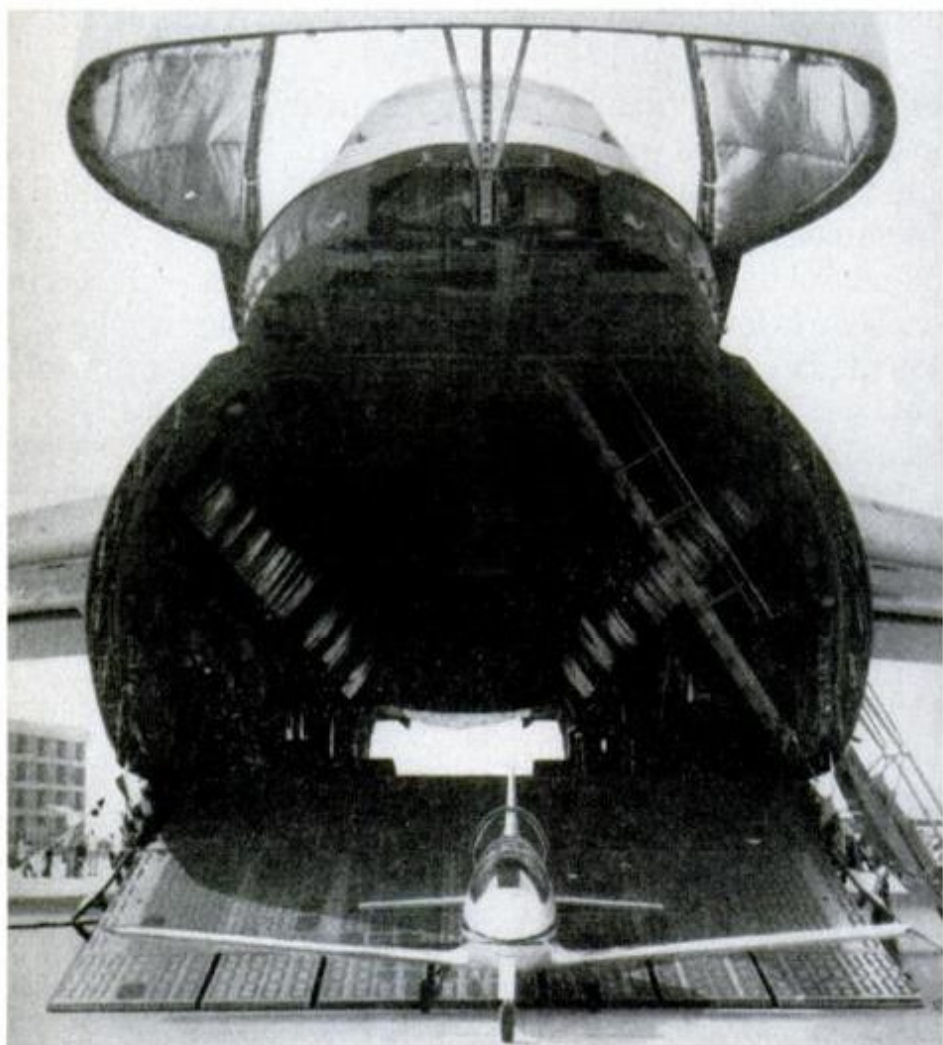
You'll have to spend some months of full-time duty away from home. First, eight weeks at basic training. Then, an average of two to four months at an Army school to learn your skill.

But you'll find it's time well spent. Because, when you come home, you'll have not only a part-time job with full-time pride, but a skill you can use in civilian life, too. For more information, send the attached postcard or call 800-431-1234 toll free. In NY call 800-243-6370.

THE ARMY RESERVE. PART OF WHAT YOU EARN IS PRIDE.



IT'S NEW **NOW**



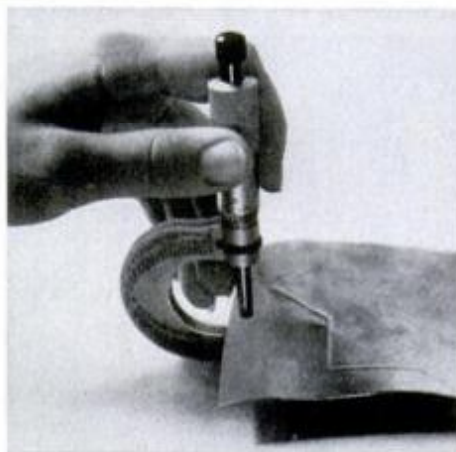
Is it a whale . . . or prefab cave?

It's a Lockheed C-5A—and the "flea" on its loading ramp is an Acrojet stunt plane. Photo was made to show the transport is a whale of a plane, at least in size.



Works in shop and kitchen

You can sand, scour or buff with the Handy Sander. Its shape fits hand well, so you can apply a lot of pressure to wood, pots and pans, even the body of your car. With scouring pad and grit belt, it has a list price of about \$3.29.



Micrometer made for lefties

Left-handers don't have to go into contortions to use this micrometer, which has its markings on the "right" side for them. It cost \$46, by Left Hand, 140 West 22nd St., New York, N.Y. 10011.



When half a ship is better than none

Using only cardboard and glue, Robert Pirrone of Monterey Park, Calif., built this 1/48 scale model of the famous *Titanic*.



He constructed it in cross-section (left), with all compartments and sections, from the engine room to bridge. It took him a year to complete the 18-foot-long model.

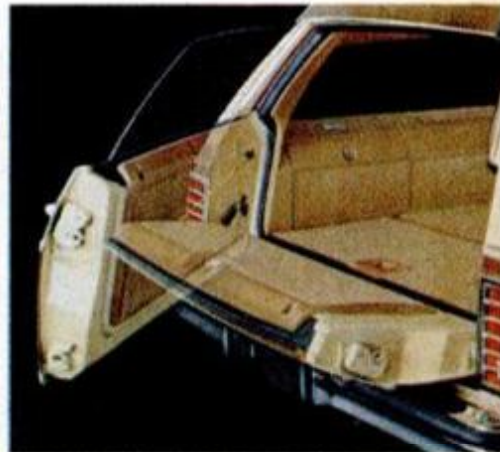
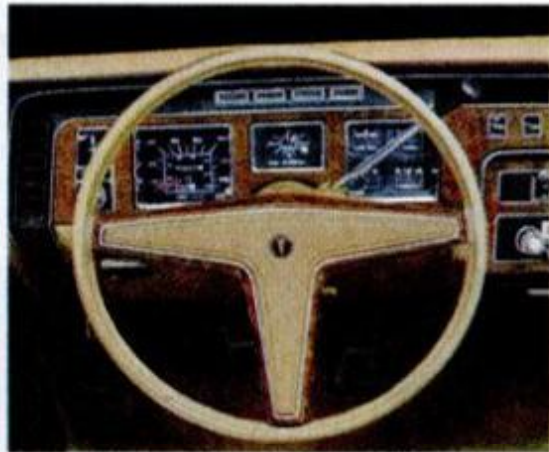
Pontiac's trim new Safari wagons.



Think of them as luxurious cars
with tremendous trunks.



Grand LeMans Safari offers available luxuries like 60/40 cloth seats. A dash designed with controls at hand. And 72.4 cu. ft.* plus hidden storage.



Our luxurious full-size Grand Safari offers available Valencia velour seats. A stylish dash. And std. 3-way gate that opens up to 87.1* cu. ft.

1978  Pontiac's best year yet!

*Load space with rear seat folded down.



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SCIENCE WORLDWIDE

Anticancer drug shows promise

Instances of complete remission in some forms of adult leukemia and acute leukemia of childhood have been achieved in early clinical trials with an experimental anticancer agent, according to a report in a recent issue of *Medicinal Chemistry*, a publication of the American Chemical Society. Called vindesine, the new drug also has improved the condition of patients with diseases such as malignant melanoma and male breast cancer. At the same time, it exhibits less serious side effects than other cancer chemotherapeutics.

Vindesine is the latest in a series of drugs derived from leaf extracts of the periwinkle plant, according to the authors, researchers at Eli Lilly and Co., Indianapolis. The reduced clinical toxicity of vindesine is a major advance, say the scientists, since other effective drugs from the periwinkle cause nervous system or bone marrow damage that precludes further treatment.

Side effects such as occasional baldness, mildly depressed levels of white blood cells and numb-fingers in some vindesine patients have not been so harmful as to interrupt therapy. Though the drug has had its early successes, it must still run a gauntlet of clinical trials to obtain government approval, caution the researchers.

The hydrogen way of life

Though it resembles many another sprawling, expensive home, the Provo, Utah, house at right above is far from ordinary. Tagged with a name more exact than homey, the "Hydrogen Homestead" is America's first house to use hydrogen for heating, cooling and cooking. It's also the first structure in a planned 38-unit subdivision (Hydrogen Village) designed to demonstrate the feasibility of using hydrogen as a residential fuel.

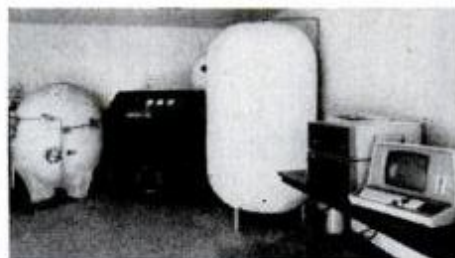
The hydrogen is generated in a small, separate "energy house" and piped into the main house. The process? Electrolysis of water, which uses electricity to split the water molecules into their oxygen and hydrogen elements. Electricity from a utility company is supplemented with that produced by solar and wind-turbine generating systems incorporated into the system. In about two years, the hydrogen



The wave of the future? Fuel used in house, car and tractor is the same—hydrogen.



Front burner has a steel mesh that glows.



Hydrogen is stored in stubby tank at left.

will be generated by a small coal gasification facility.

The house is occupied by the Roger Billings family. He is chairman of the Billings Energy Corp., a leader in hydrogen applications research and builder of the home. Acknowledging that many people are concerned about the safety of hydrogen fuel, Billings says: "What better way is there to demonstrate that hydrogen is safe than by living in the home? No fuel is safe if it is carelessly handled, and that includes natural gas, electricity, gasoline and fuel oil."

In the Provo house, the hydrogen is stored in a tank containing a rocklike compound of iron and titanium known as a hydride. Hydrogen molecules are attracted to the hydride, which soaks up the gas the way a sponge does water.

Hydrogen stored this way doesn't explode on contact with flame but burns slowly as the hydride gradually discharges gas molecules.

Before getting into housing, the Billings Corp. developed hydrogen-powered autos and buses. Vehicles recently photographed at Hydrogen Homestead were a dual-fueled gasoline/hydrogen Cadillac and a hydrogen-powered Jacobsen tractor.

Kitchen appliances and the heating and cooling systems were produced by the Tappan Co. According to Tappan, only minor modifications are needed to convert a conventional gas range to hydrogen. The air supply is closed off because the fuel is pure hydrogen, and the gas port is covered with a high-temperature catalyst composed of stainless-steel wool. Because hydrogen is colorless when ignited, the catalyst is covered with a stainless-steel mesh that glows when heated.


How to spot a young Einstein

About 3 in every 100 children are gifted learners—and they come from every racial and economic background. So states a new pamphlet from the U.S. Office of Education that explains how you can tell if your child is gifted.

There's no easy formula, accord-
(Please turn to page 60)



BY
JOHN F.
PEARSON



"I'm a Black Velvet girl
and now your girl
can be one, too."

"Enter your girl in the \$50,000 Miss Black Velvet Contest."

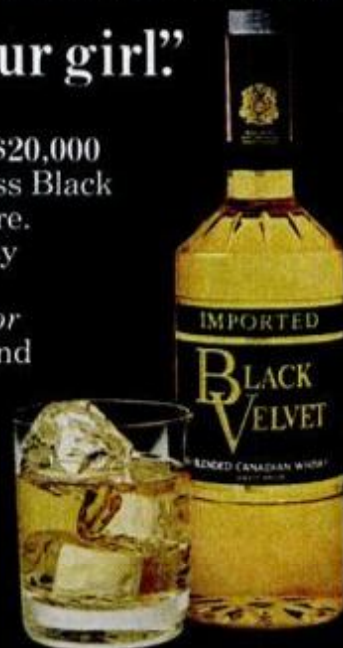
"It's as easy as sending me a picture of your girl"

You can help make your girl the next Miss Black Velvet and win \$20,000 for her and \$5,000 for yourself when you enter her picture in the Miss Black Velvet Contest. Even our 8 finalists will win \$2,000 in cash, and more.

It's easy. And almost as much fun as drinking smooth and velvety Black Velvet® Canadian Whisky.

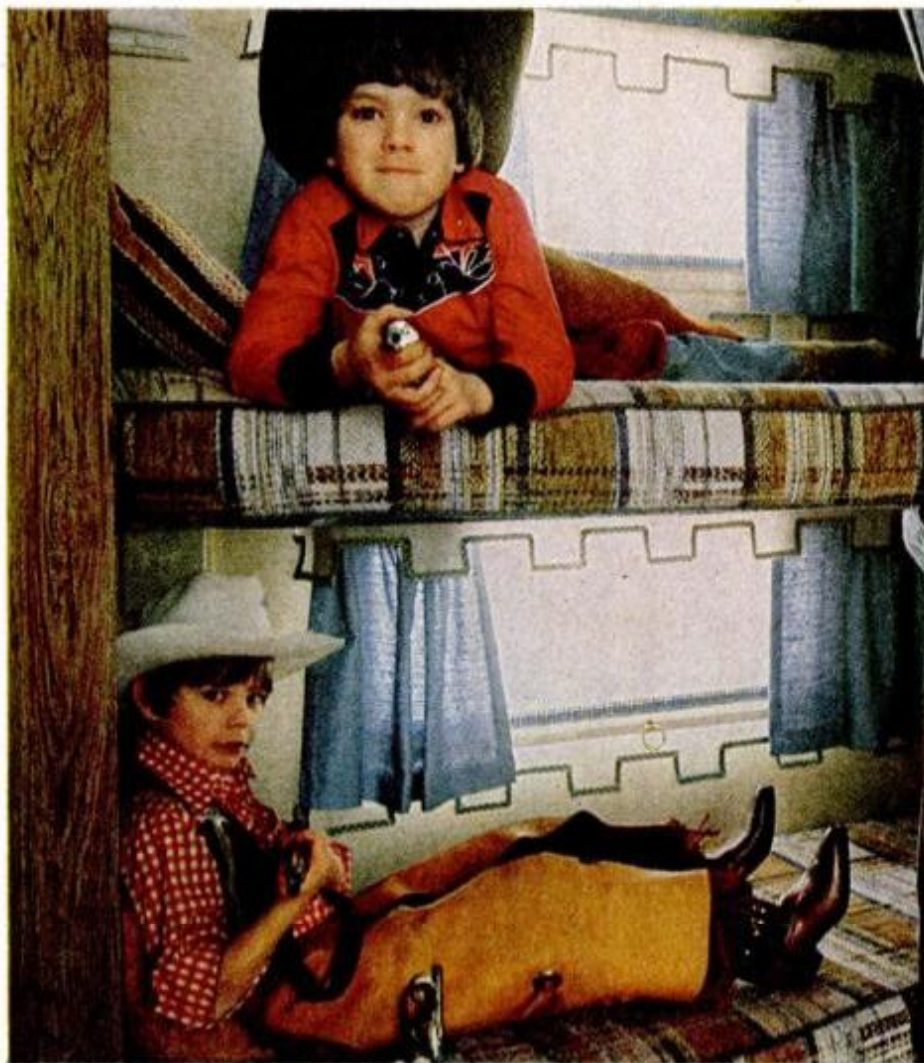
All you have to do is pick up an entry blank at your local tavern or liquor store and mail it to me with your girl's picture. If you can't find an entry blank, I'll be glad to send you one. Just mail a self-addressed, stamped envelope to: Black Velvet Contest Entry Blank, P.O. Box 255, Lodi, New Jersey 07644.

So send in your girl's picture. When she finds out she could be the next Miss Black Velvet, she'll love you for it.

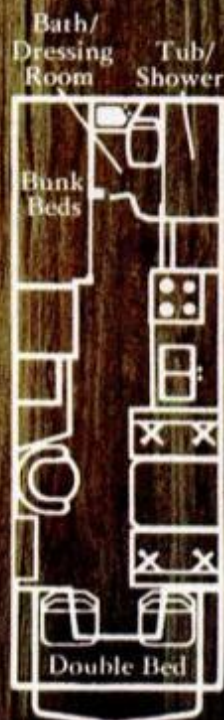


BLACK VELVET® BLENDED CANADIAN WHISKY, 80 PROOF. IMPORTED BY © 1978 HEUBLEIN, INC., HARTFORD, CONN.

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The Dunkhouse:



24-Foot
Minnie-Winnie

SCIENCE WORLDWIDE

(Continued from page 58)

ing to the pamphlet, because the gifted child may excel in areas other than the academic—in athletics, for example, or the visual or performing arts. Clues include the early use of an advanced vocabulary, keen powers of observation, and/or the ability to concentrate intensely.

If you suspect you're harboring a budding Babe Ruth or Marie Curie, you can get tips about special school and community programs from the pamphlet *What If Your Child Is Gifted?* For a free copy, write:



Seeing aid is spinoff from military device.

Consumer Information Center, Dept. 642F, Pueblo, Colo. 81009.

Aid for night blindness

A hand-held light intensifier that extends vision for patients suffering from retinitis pigmentosa—night blindness—has been developed by the ITT Corp. and Human Factors/Industrial Designs, Inc. Called Night Vision Aid, the device is said to be a refinement of a military night-vision ("sniper") 'scope.

The small unit (under 5 inches long and weighing only 12.5 ounces) gets its power from a small battery. In operation, dim light hits a photocathode, which emits electrons that travel to a glass plate full of tiny holes. The bombardment triggers chemical activity that releases more electrons. Finally, the electrons hit a small phosphorous screen where the intensified image appears.

The device has a tough Lexan housing to enable it to stand up to daily abuse over a long time. You must have a prescription from an ophthalmologist to obtain one.

New find in Antarctica

Scientists have brought to the United States what they think are the first carbon-bearing meteorites

ever found under conditions of minimum terrestrial contamination, according to officials of the National Science Foundation. The meteorites were discovered last December in an iced-over area in the Transantarctic Mountains of Victoria Land, Antarctica.

If lab tests confirm a preliminary determination that the meteorites are carbonaceous chondrites, the two specimens would be of great scientific importance because they could give researchers new information on the origin and evolution of the solar system.

The substance of carbonaceous chondrites is said to be very close to the unaltered matter from which the planets were formed. These meteorites get their name from their high proportion of carbon. Of the world's supply of about 2000 meteorites, only 25 are known to be carbonaceous chondrites, according to the Smithsonian Institution. Meteorites are masses of stony or metallic material from space that have penetrated the atmosphere and plunged to earth.

Because the Antarctic ice and cold offer protection from chemical reactions, contamination and erosion, the newly found specimens could give

Winnebago's family vacation plan.

Here's a mini motor home that makes family travel thrifty. Makes it comfortable. And makes it fun.

In Winnebago's new, 24-foot Minnie Winnie[®], bunk beds provide extra sleeping space. A separate tub/shower compartment eases bathroom traffic jams. And the rear divider curtain quickly creates a private "suite," complete with beds, bath and wardrobe.

For family meals, there's a four-burner stove and double sink in the galley. Plus a generous 66-gallon water supply.

Best of all, the Bunkhouse is affordable. With price and terms that can fit a family budget. Look up your nearest Winnebago dealer in the Yellow Pages. Look over the Bunkhouse and the whole, new, value-priced line of Winnebago's.

If you need a family motor home, you can drive a bargain with us.



There are a lot of reasons why you'll sleep better in a Winnebago.

WINNEBAGO
FOREST CITY, IOWA 50438

Want to try before you buy? Call Rent-A-Way Winnebago, 800-447-4700 for information (In Ill. call 800-322-4400)

scientists new clues that would not be found in typical specimens.

Soft touch for truckers

Fatigue is one of the most serious problems faced by the long-haul trucker—and much of it is due to poor circulation in the lower body after hours of driving. Now there's relief for the driver who suffers from tingling or swollen feet, leg

cramps and sore buttocks.

The Koch Komfort cushion is a sheepskin-covered inflatable polyester bladder. Air from the truck's own air lines runs through the cushion's interior channels, causing the cushion to inflate and deflate in a rippling wave motion. This action results in a "massage" that significantly aids blood circulation, according to the results of laboratory tests.

More comfort with zip-on cast

Itching and skin irritations are par for the course if you're unlucky enough to have to wear a conventional plaster of Paris cast over a broken bone. Those annoyances reportedly are eliminated with a German-made urethane cast that has a zipper. If you develop a skin irritation, just zip the cast open and dab on medicine. The urethane cast also is much lighter than its plaster predecessor, is easier to put on, and is said to offer less resistance to X-rays.

Thinks quake gave warning

Nature gave several months' warning before a major earthquake struck Hawaii in 1975. So says Arch C. Johnston of the Cooperative Institute for Research in Environmental



Model shows how to unzip new cast.

Sciences, Boulder, Colo. He has found that vibrations from other earthquakes far from Hawaii slowed as they passed through the area where the big Hawaiian quake later occurred. Johnston believes the velocity decrease was due to a stress buildup that finally was released in the Hawaii quake, which registered 7.2 on the Richter scale. **PM**



Cushion turns driver's seat into massager.

PEAK PERFORMANCE.



Honda portable generator scales Mt. Everest without skipping a beat.

When you set out to climb a 30,000-foot mountain, you can't take a lot of stuff with you. Food, clothing—and a few necessary tools to get the job done.

One thing the American Bicentennial Everest Expedition had along was a Honda EM-400 portable generator. At the 18,000-foot base camp, the little Honda put out dependable power for charging batteries, running a soldering iron—even powering the radio to keep up vital communications.

The EM-400 puts out 400 watts (max. rating) of AC power; it'll power

small tools and accessories around the home or campsite. It also puts out 12 volts of DC power, so it will charge your car battery as well. It's simple to use; the quiet Honda engine is a four-stroke design so you never have to pre-mix fuel. And at a mere 39 pounds, it's easy to store and move.

Check out the Honda EM-400 at your Honda generator dealer today. It's a nice companion to have, whether you're climbing a mountain or just getting the odd jobs done at home.

HONDA GENERATORS

For optimum performance and safety we recommend that you read the owner's manual before operating the unit. For the Honda dealer nearest you, call collect (213) 381-2201. Honda also makes a line of tillers, outboard engines, general purpose engines and water pumps.
©1978 American Honda Motor Co., Inc.

PHOTO HINTS

Easy-to-make viewing box



Make a serviceable retouching stand and transparency viewer in minutes from a cardboard box, a piece of opal glass, strong tape and a light-bulb socket and cord. Assemble as shown and paint the inside white to increase reflectance; paint outside improves appearance. Ventilation holes help dissipate heat. I've found that a 25-w. bulb provides adequate illumination.—*David W. Roberts*

Clean solutions fast



Reduce your darkroom preparation work by using a simple scrapwood stand to filter two solutions at a time. Construction with waterproof glue and nails or screws makes a sturdy stand in next to no time.—*Robert Hertzberg*

Free Racing Jacket

When you buy any four Gabriel heavy-duty shocks*



Al Unser, Gabriel Shock Test Team member with Jim Hall and his new First National City Travelers Checks Chaparral Lola.

Owner: Jim Hall. Driver: Al Unser. Shock Absorbers: Gabriel



This may be the most exciting new Indycar on the USAC circuit this year. Jim Hall of Chaparral fame prepared it. Two-time Indy 500 winner Al Unser will drive it. Gabriel engineered the racing shocks.

Jim Hall's Gabriel shocks, of course, are built especially for his car. Each one is made by hand and costs \$1,000.

More control

At Gabriel we don't just race for the publicity. We race to improve the shocks we make for you.

*Includes Road Star,® Red Ryder,® Striders,® Hi Jackers,® Adjustable E,® Load Carriers,® Pro Shocker® and MacPherson strut cartridge. Send in dealer coupon with proof of purchase for free jacket. Redeemable through July 15, 1978.

And the lessons learned from racing help us make your car an easier—more controllable—one to drive.

Free racing jacket

As still another reason to find out what a set of Gabriel shocks can do for your driving, we'll give you—free—a racing jacket like the ones Jim and Al are wearing.

It's a handsome nylon jacket with a zipper front. It comes in blue or white, in children's and adult sizes. It's yours when you buy any four Gabriel heavy-duty shocks.

So come down to your participating Gabriel dealer, and join the Gabriel team.



Gabriel®

SHOCK ABSORBERS

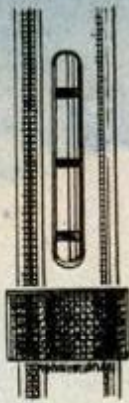
**UNIQUE
DESIGN**

The Coleman® Classic: It goes up like a breeze, stays up in a gale.

Before you buy any tent, compare the Coleman Classic against the crowd. (At a campground, it'll be the one that goes up so fast.)

Because this is one tent that's *really* easy to erect. There are just two poles and a crossbar. Color coded to help you fit 'em together. With Coleman's exclusive Lock-O-Matic system, you adjust the poles with a quick twist. And after you get it up—it *stays* up.

Then compare *usable* space, not



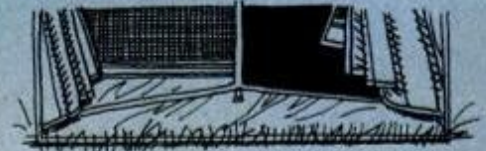
just "floor space." (Sloping walls can reduce it.) See how the Classic gives lots of headroom, clear out to the wall.

Next, grab a handful of the rugged sidewall fabric. It's spun polyester for added strength and less weight. And like all Coleman tents, it's flame resistant. Give those double lap-felled seams a healthy tug. That's the feel of *quality!*

Check the Classic's triangular windows. They'll catch every breeze and assure cross-ventilation.

Notice that the weather flaps zip-up tight from inside. That's a difference you'll appreciate in a drizzle.

The Classic even has a threshold that helps keep out leaves and dirt.



A tent is one of the biggest investments a camper makes. So invest in one that'll go with you for years! Go with a Classic or one of our six other Coleman designs.

Remember: Coleman equipment can come in handy in storms, blizzards and power losses too.

The great outdoors
is too good to miss.

Coleman

The Coleman Company, Inc. • Wichita, Kansas

IT'S NEW
NOW



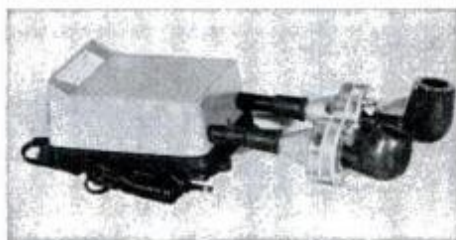
Tiny camper made for couples

The Romahome has at least three things going for it: good design, fuel economy and a price of about \$5500. It's made by a British firm—Evans Developments, Ltd.—and is a conversion of a Honda pickup. The 8-by-5-foot fiberglass camper shell sports two 6-foot bunks and a tiny galley. Head-room in galley is 6 feet, a luxury made possible by a 2-foot overhang at rear. Romahome isn't speedy but its frugal two-cylinder, 350-cc engine, rated at 27 hp, gets about 45 mpg.



Our house and the sun

Using the Solarcator, a compass-equipped cardboard device, you can determine how the orientation of your house lends itself to various solar energy installations. Solarcator and booklet with information on solar energy systems is \$1.95. Solar Homes, Inc., 2707 South County Trail, East Greenwich, R.I. 02818.



Banishing bite from briars

The Pipe Dryer "sweetens" pipes by pumping warm air through them. It operates on 115-volt house current, costs \$28.60. Maker is Athens Fabricating Co., 282 South View Dr., Athens, Ga. 30601.



For quick, neat slicing

Even frozen food can be sliced with the Braun Universal Slicer, which has a safety switch and comes apart for easy cleaning. Suggested retail price is \$80.

MACHINE WASHABLE

Coleman® Bags:

Shop for details like these and rest easy.

Every Coleman '78 catalog model bag is *machine washable*. Liner and cover are color-fast and pre-shrunk.

You can literally *feel* the quality in the materials.

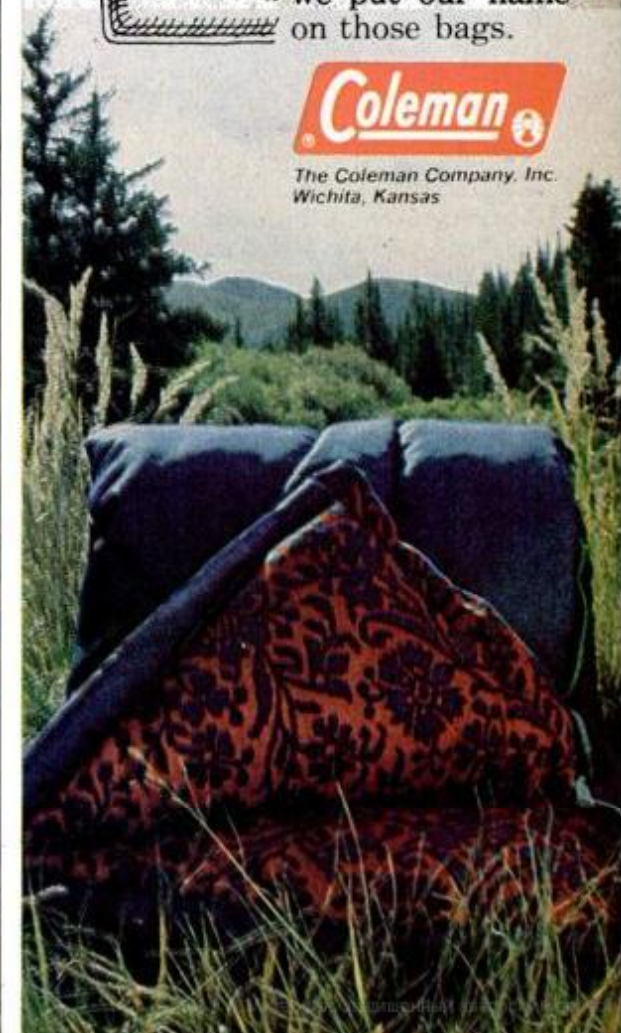
And see the workmanship in stitches that are close and tight.

Then there's the insulation. Selected to keep its warmth and comfort trip after trip.

The quality is right. And so is the price. After all, we put our name on those bags.



The Coleman Company, Inc.
Wichita, Kansas



Make this jewel-like "birdhouse" terrarium and fill it with your favorite ferns, mosses, African violets or other suitable house plants.

To begin, cut full-size paper patterns of the front and back sections. Secure them to glass using double-faced tape. Next, score the glass along the patterns' edges. The square sections can be marked on the glass with a grease pencil and scored with the aid of a straightedge.

For best results, hold the cutter as shown on the opposite page. The cutter's tip should be dipped in fine lubricating oil prior to making each cut. Draw the cutter toward you in one smooth and even stroke. Retrace only spots that the cutter skips. Avoid excessive pressure; it will leave small chips on the scored line and may cause erratic breaks. Curved sections of glass may be parted by tapping with the knob end of the cutter *under* the score. Pliers are also useful in forming the breaks (wear safety goggles).

Next, cut lengths of $\frac{3}{8}$ -in. copper foil tape long enough to encircle each cut piece, plus $\frac{1}{4}$ in. for overlap. Peel only a few inches of paper backing at a time. Center and apply the foil tape to the perimeters of the glass sections as shown. Rub tape on edges and sides with a burnishing stick to remove air bubbles.

To tin the foil, brush a thin coat of tinner's flux on the copper. (Try not to get flux on the glass because it may stain.) Then touch a small amount of 50/50 solid-core solder to a hot iron and quickly draw the molten solder along the foil.

Assemble the terrarium by arranging the front pieces on a flat surface and tacking them together. Center the front and back walls on the floor section and tack in place. Set each sidepiece on the same foundation and tack at the corners. Then tack roof sections in position.

Making beaded joints

To obtain beaded joints, touch the solder wire to the hot iron and move them along the seams without touching the foil. After soldering, wash the terrarium thoroughly with detergent to remove any acid.

For a bronzed, antique finish on the beading, brush a solution of copper sulfate and water onto the soldered edges. *Caution:* Copper sulfate is toxic, so wear rubber gloves. Give the terrarium a final scrubbing. Before planting, run a bead of silicone sealer around the lower seams.

After you've mastered Tiffany's technique, you may want to experiment with colored glass or mirror for other creations. **PM**

(For pictures and details, see page 68)



PM photo:
Bob Goldin

Make this Tiffany-style terrarium

Create this miniature oasis using the same method Lewis C. Tiffany used for his famous lampshades.

by Phil and Loretta Hermann

SAVE YOUR BACK AND SAVE SOME MONEY, TOO...

as you split firewood the easy way with POPULAR MECHANICS great new log splitter. You build it yourself and then sit back to reap the rewards of a roaring fire. The rig on this hydraulically operated log splitter exerts some 10,000 lbs. of pressure and will easily split 2 ft lengths of maple and ash logs 12 to 14 inches in diameter. With an I-beam backbone, double acting hydraulic cylinder, control valve oil filter, 3 hp gasoline engine and more features, you'll find this log splitter a delight to build and a pleasure to use. And, you'll save your back from aching as well as saving money by splitting that wood yourself. So, have some more time to enjoy the warmth from your fireplace. Send for complete plans and step by step instructions now. Just \$8.95



PM Plans Library **Log Splitter**

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Please send complete plans and instructions. I enclose a check or m.o. for \$8.95. Make check payable to Popular Mechanics.

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Address _____

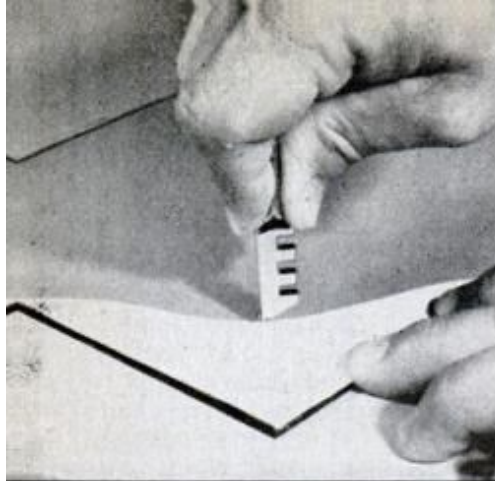
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State _____

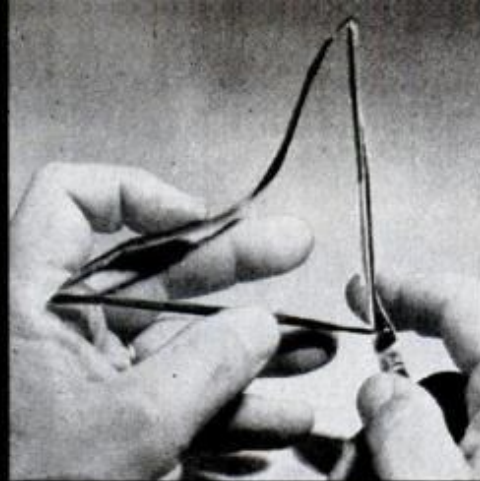
Zip _____

Please allow 3-4 weeks for delivery.

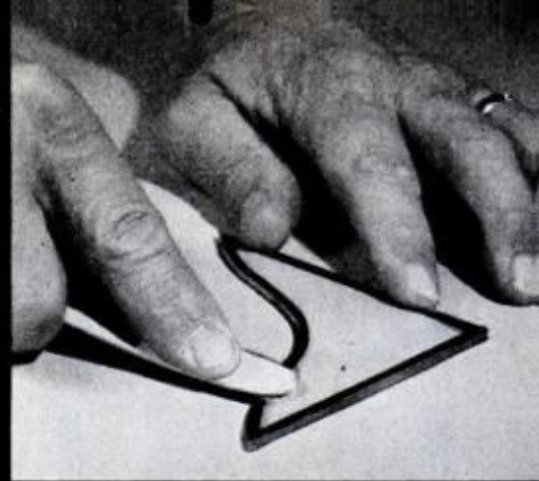
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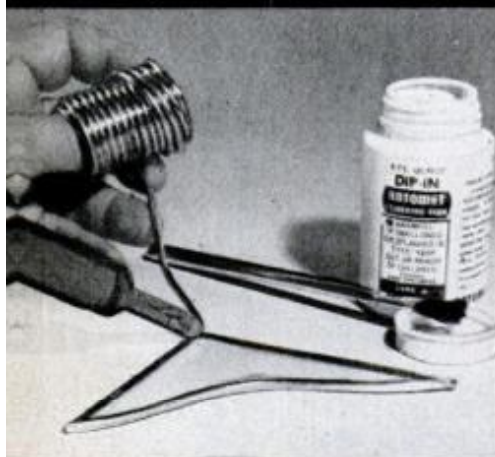
Full-size stencil paper cutouts give visual guide for scoring nonsquare sections.



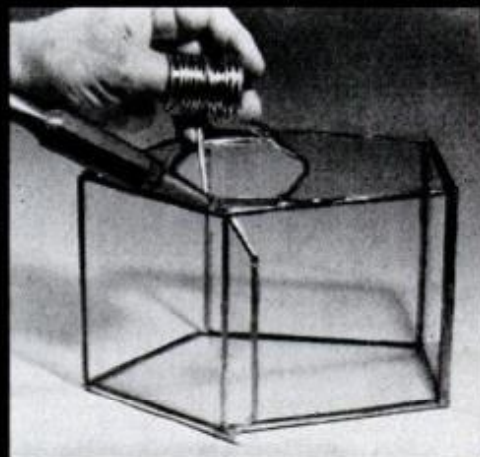
Cut copper foil strips long enough to wrap glass edges, adding 1/4 in. for overlap.



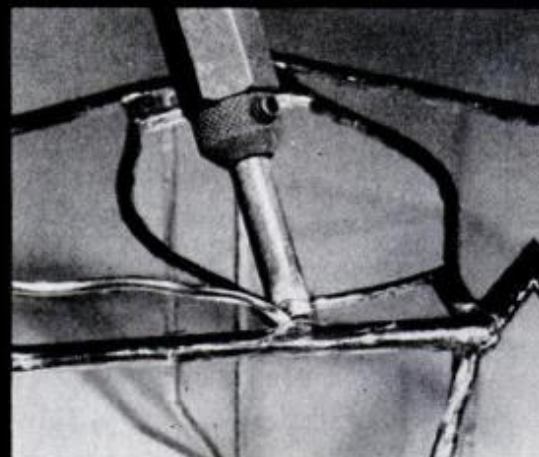
Rub all surfaces of the foil edging with burnishing stick to remove air pockets.



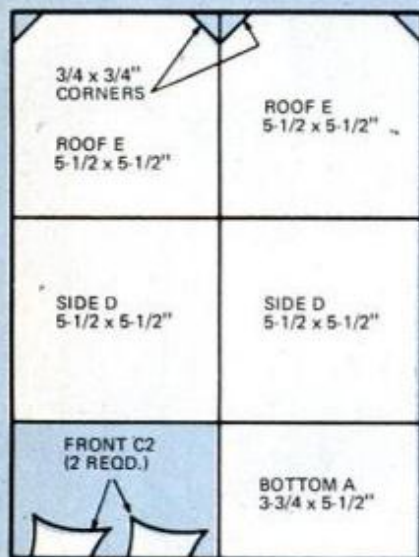
Apply thin coat of flux with acid brush. Then draw molten solder quickly along foil.



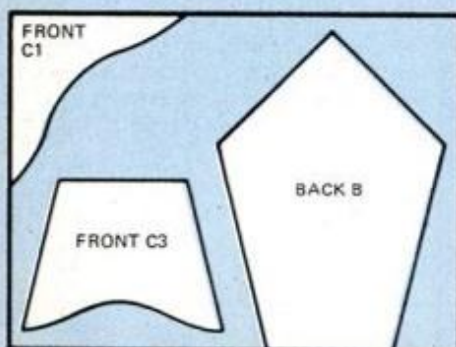
Lightly tack corners until all pieces are in place. See text for order of assembly.



Hold iron's tip with solder 1/8 in. above horizontal joint to form rounded edge bead.

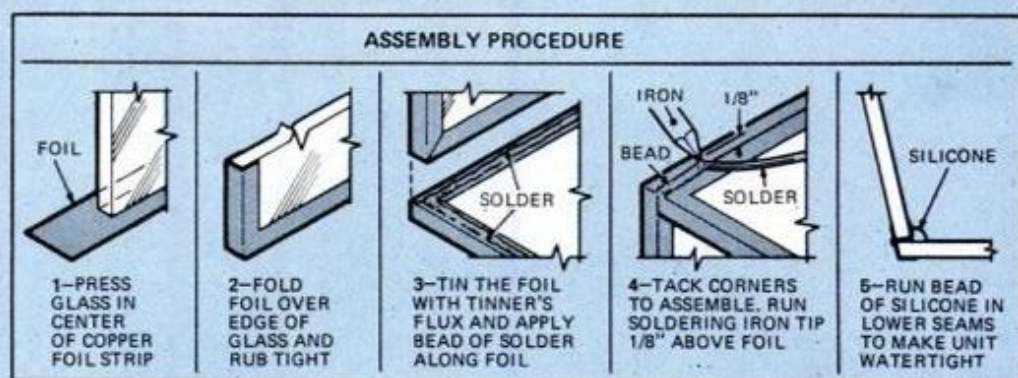


1 PIECE 11 x 14-3/4" DOUBLE-STRENGTH GLASS

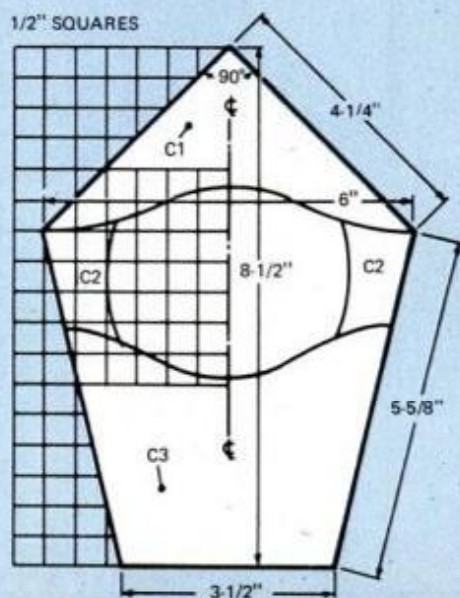


1 PIECE 9 x 12" DOUBLE-STRENGTH GLASS

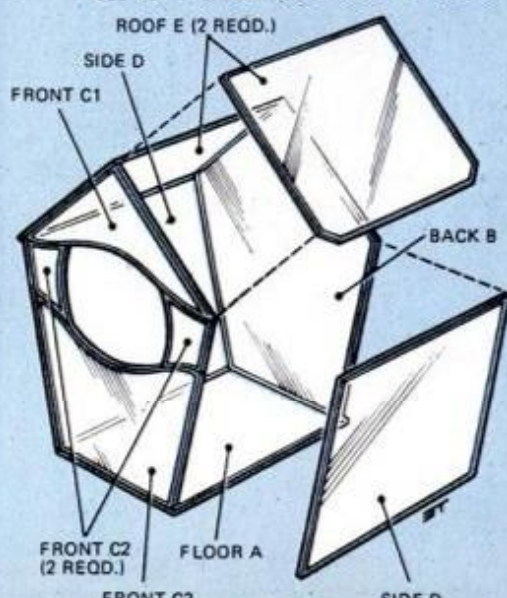
GLASS CUTTING PATTERN



SEE TEXT FOR ANTIQUE FINISH FOR SOLDER



FRONT AND BACK PATTERNS



TERRARIUM ASSEMBLY



**Thank goodness
the best things never change.**

Like the feeling you get every time
you share the sounds and the smells of
a misty morning.

Like the feeling you get every time
you taste Smooth as Silk Kessler.

Consistently smooth. Sip after sip.
Year after year. Money just can't buy
a smoother whiskey.

**SMOOTH AS SILK
KESSLER**



HOMEOWNERS' CLINIC

QUESTIONS ANSWERED BY JOHN GAYNOR

Choosing a roof color

When I reroof my house this spring should I choose a white roof to reflect the sun's rays and lower air-conditioning costs or a black roof to help melt the snow?—Dave Lindman, Minneapolis.

Actually with today's drive on energy conservation, which includes venting the attic space and adding up to 12 in. of insulation in the ceiling, the emphasis on color is not too important. A layer of snow will act as an additional insulator against cold.

In summer, white will certainly reflect the sun's rays. I would choose a color compatible with the color scheme of your home. Keep in mind, though, that the light colors tend to stain from the acids in leaves and pine needles.

Rust stains on concrete

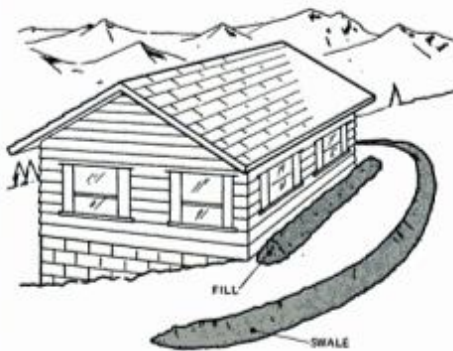
The weep hole in the tailpipe of my 1977 car is causing quite a rust stain on my garage and driveway concrete. Any ideas?—J.W. Meyers, Weleetka, Okla.

Many contemporary buildings are built of steel such as "Corten" that has a controlled-rust characteristic. This steel rusts over a period of 3 to 5 years until it reaches a handsome patina. During the process, some rust stains appear in unwanted areas. The larger building suppliers carry an agent that removes these stains: Iron and Manganese Stain Remover, from Price Research Ltd., Kansas City, Mo. This can solve your problem. Cost is about \$10 per gallon. Follow instructions on the can. Briefly, you'll be directed to apply remover to the stain and wash it off after 3 to 5 minutes. Reapply if necessary.

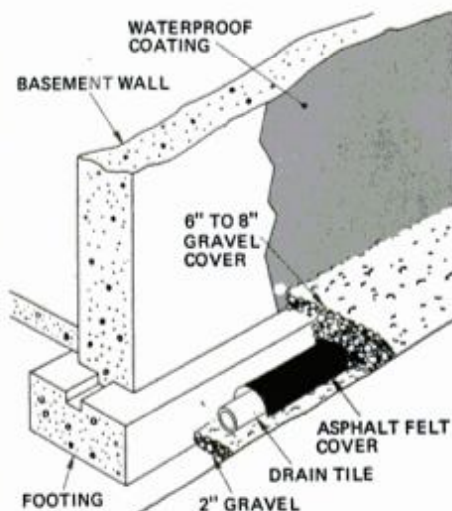
Musty basement

We have installed a modern heating and cooling system in our older home. Some part of the musty odor in the basement is being picked up by the fan, located in the basement. I have tried the obvious, checking and sealing all my plenums, but the odor persists. I might add that the basement is a partial one. About half the crawl space is open. I know that venting is important to reduce the odor, but if we do this in the winter, our pipes will freeze. Any suggestions?—Bill Lewis, Noble, Okla.

Musty odors are sometimes the result of invisible moisture. Chances are good that there is excess moisture in your basement, whether half the ground area is basement and the other half crawl space, or whether the basement/crawl space



Swale diverts water from the house. Earth fill shouldn't touch the house.



Drain tile next to the footing helps soil drainage at the outer wall.

is only partly in the ground as with an English basement.

To track down the musty odor first look at the outside of your home to see if any of the adjacent ground slopes toward the foundation. If so, cut a swale (ditch) in the ground to divert the surface water away from your house as

shown in the house illustration. Earth fill at the foundation must be higher than, and slope away from, the adjacent ground.

Also, check your downspouts to make certain that they discharge onto splashblocks and wash away from the house. If your crawl space has an earthen floor, it is your most likely culprit. Cover your crawl space with a 4-mil polyethylene vapor barrier. Lap the joints at least 6 in. and seal them with roofing cement. Extend the plastic at least 1 ft. up the foundation walls and fasten the plastic to the walls with roof mastic.

If none of the proposed solutions applies to you, a more costly method, for coping with ground water (which affects many areas in Oklahoma) is shown in the drain tile illustration. As this means digging down to the footings and laying drain tile, it would be wise to have test borings made to be sure ground-water dampness is the problem.

Cracked concrete foundation

The outside of the foundation wall of my older home is stuccoed. The inside is treated with what I think is a moisture-proofing material. The mortar between some of the blocks on all four walls has loosened, leaving small cracks inside and outside. Cracks occur all around some of the blocks, others zigzag. The mortar seems soft and crumbly. How can I correct this?—E.H. Dustman, Everett, La.

Without seeing the problem, it's difficult to evaluate. The zigzag crack is most likely due to settlement in your footings, but if the crack hasn't grown or changed for some time, your settlement has probably reached its final position. The joints should be raked out (cleaned) a minimum of 1/2-in. deep, and pointed up with a mix of one part mortar cement to three parts of fine, clean mortar sand. Work the mortar in with a pointing tool (a 6-in. length of 3/8-in. dowel works equally well). If it is not practical to remove the stucco on the outside, fasten wire lath to the existing wall and add 3/4-in. stucco over this. If you have any doubt as to the structural adequacy of the walls, you would be wise to consult a licensed structural engineer. **PM**

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, \$4.95 postpaid. Send order(s) to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.

TASTE THE GOOD TIMES. RALEIGH



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



Super Longs
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And now
Low "Tar"
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Get genuine
tobacco flavor
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You'll remember Raleigh. The genuine tobacco flavor. Now with Double Coupons!

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Lights, 14 mg. "tar", 1.0 mg. nicotine; Filter Kings, 16 mg. "tar", 1.1 mg. nicotine; Longs, 17 mg. "tar", 1.2 mg. nicotine av. per cigarette, FTC Report Aug. '77

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IT'S NEW NOW

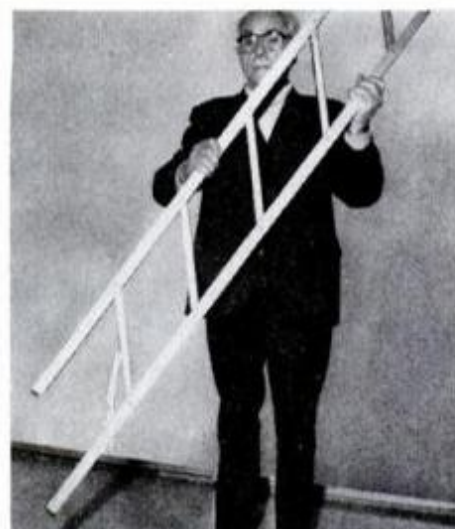
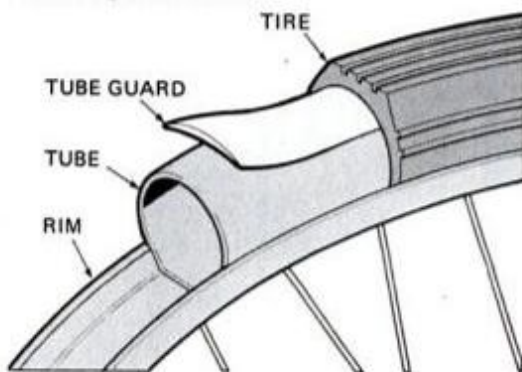
Cruise missile wins—and loses

The Navy's Tomahawk cruise missile battered .500 in recent tests near the California coast. The craft successfully completed its first undersea launch from a submarine, flew a guided land-attack test flight and parachuted to earth. During an anti-ship test, however, the launch went well, but missile crashed when its turbofan engine did not develop sufficient power. The General Dynamics-built craft has now flown 25 times for a total of 19 hours.



Flat denial

Tube Guard inner tube protector is a solid plastic strip that fits between a bicycle tire and inner tube, and can be installed without removing the tire or the tube from the wheel. It is said to protect against thorns, glass and tacks and to outlast the tire itself. \$2.99 a pair from Marlin Industries, 1055-C Melrose St., Placentia, Calif. 92670.

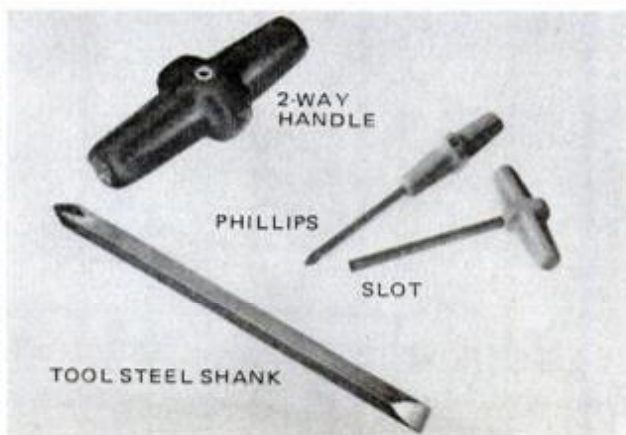


Fold, but don't spindle or mutilate

A Belgian manufacturer has introduced a space-saving folding ladder. Made of aluminum, the ladder becomes rigid when a slotted bar is notched into place (bottom photo). Ladder's steps are nonslip.

Two-way driver times two

Not only does the Super-Tee screwdriver have two blades (slotted and Phillips), but its handle can be used two ways. One way, the handle is like that of a normal screwdriver. At a 90° angle, it gives greater torque. The shank can also drive 1/4-in. sockets. It's \$5.95, from Fischer Tool Co., 4516 East Pleasant Valley Rd., Independence, Ohio 44131.



OMNI'S ARMY.

The new Dodge Omni. People just seem to like it. Because Omni tries so hard to please. With a 99.2-inch wheelbase. A 1.7 litre overhead cam engine. And a likeable base sticker price of only \$3706* including standard features like an AM radio, vinyl body side moldings, and white sidewall tires.

The Omni shown below with a number of stylish additions has a sticker price of just \$3981*.

\$3981* (PRICE OF CAR AS SHOWN)
\$3706* (BASE STICKER PRICE)



**MOTOR TREND
CAR OF THE YEAR**

Even big people like Omni. For example, the four weekend hackers you see here. All four of their golf bags fit in a covered compartment behind the rear seat. If this were a twosome, that rear seat could be folded down giving 35.8 cubic feet of space. Enough to handle their bags



*Excluding taxes and destination charges.

and a couple of carts. Omni's built here in America with American-sized people very much in mind.

Lots of room. That's one advantage of Omni's front-wheel drive. The size of the tunnel you find in the middle of most conventional rear-wheel-drive cars is reduced. So there's more room for legs and stuff.

Then there's ride. It's stable. Comfortable. Because the right kind of

attention was paid to things like spring rates and jounce travel. Front-wheel drive with rack-and-pinion steering does its part, too.

Another thing, with four good-sized suburbanites like you see here, Omni's gritty four-cylinder engine can make this car move with plenty of authority. No sweat

at expressway speeds.

Remarkable, when you consider the EPA estimated mileage ratings achieved by that engine and Omni's standard four-speed manual transmission and a 3.3 transaxle ratio:

**EPA ESTIMATES:
30 MPG HIGHWAY/25 MPG CITY.**

Now, your mileage may vary according to your car's condition, equipment, and your driving habits. And California mileage is lower. But these are noteworthy ratings for a car that can do all the Omni can do.

Here's a suggestion. Visit your Dodge Dealer. Have him wheel out an Omni. Take it out on the freeway. Over a bumpy road. We have a feeling when you're through, you'll be ready to buy, or lease. Omni's like that. It attracts fans.

**DODGE
OMNI.
IT DOES IT ALL.**

Photo-totes: Choose the bag for your needs

1. Pick a ready-made to suit your style

Camera cases, like photographers, differ in their shapes, sizes and virtues. Picking the one that's right for you depends on where and how you take pictures, as well as on your tastes and budget.

If you combine photography with scrambling up mountains, or skiing down them, a photographer's backpack may be the best way to tote your cameras.

If you're a pro, or just sling your gear around the way many pros do, a rigid bag will give your equipment maximum shock protection.

If you're prone to dropping things into bodies of water—and it can happen even if you think you're careful—look at the Sima pouch.

Although not shown in our photos, two other rigs are worth consideration by outdoor photographers. One is a waterproof nylon zippered belt

(Please turn to page 76)



Short on looks but long on function, the Domke bag was originally designed for street photographers on the *Philadelphia Inquirer*. J. G. Domke, 4310 Pine St., Philadelphia, Pa. 19104, will send you one for \$45.



System Bag will hold all the gear you'll want to carry, offers good working access to a multitude of compartments. It's \$89.95 from The System Bag, 63 Hillside Ave., Pleasantville, N.Y. 10570.



Vivitar Enduro case has a contoured, rigid outer shell, padded interior, adjustable waist and shoulder straps and room for SLR camera and two extra lenses. Its suggested list price is \$31.95; at photo shops.



Windago Shutterpack is largest of three from Ultimate Experience. Made of waterproof nylon padded with 1/2-in. foam, it costs \$69.95, carries a 30-lb. load. Side pouches let you reach film, gadgets.



Sima Sports Pouch is a novel departure bag design. It inflates to provide an cushion that protects equipment from shock. Boatmen-photographers take note. It floats, too. Price is \$19.95.

DODGE, NO. 1 IN VANS AND WAGONS, PRESENTS SPORTSMAN WAGON FOR 1978.

AND THE NEWEST, MOST VERSATILE, MOST MANEUVERABLE WAGON YOU CAN BUY.

THINK OF IT AS AN UP-SIZE STATION WAGON FROM AMERICA'S NO. 1 SELLER OF VANS-WAGONS.

We've been the industry leader in domestic wagon* sales for many years running. Here's to the years ahead.

1. ALL-NEW SEATS.

The bucket seats are more comfortable, more colorful. And now you can order them in fun-to-touch fabrics. Mounted on curved tracks, the new seats allow a higher position for the shorter driver and more headroom for the taller driver. And you can order bench seating for up to 15 people.



2. MORE ROOM, MORE QUIET.

We've made the engine cover smaller to make the people compartment bigger and increase the footroom. And on Custom and Royal models we've put in more sound insulation and made suspension improvements to make the ride quieter.



3. EXCLUSIVE TRAVEL SEATING PACKAGE. This new factory-installed option on B200 and B300 Royal Sportsman lets you easily convert from two three-passenger bench seats to a dinette set to a double bed. The wood-grained-finish tabletop stows out of the way when not in use. The package makes your Sportsman into a home away from home.

4. 23MPG HWY / 17MPG CITY.

EPA estimates for Dodge Sportsman B100 wagon, with standard 225-cubic-inch six-cylinder engine and manual transmission. Pretty good for a wagon that does this much work. Your mileage may vary according to vehicle condition, equipment, and how it is driven. California mileage is lower.

5. NEW OPTIONS.

Sky Lite sun roofs, air conditioning, and more. Trailer-towing packages for up to 7000 pounds gross trailer weight. Six different kinds of radios including units with 40-channel CB.

6. MORE ROOMINESS.

Maxiwagon has eight inches more loadspace length this year.

Room for more cargo and more fun. And its rear quarter windows wrap right around the corners to make backing up a snap.



Put our new features together with Dodge dependability and value, and you'll see why we keep on selling more wagons than anyone. Buy or lease one or a fleet . . . at your Dodge Dealer's.



NO. 1 IN VANS AND WAGONS.*

* Passenger van-type vehicles known in the industry as wagons.





The classic, rigid Halliburton cases are made of seamless aluminum, have foam inserts and combination locks. Model shown measures 6x13x18 in., costs \$105.



Pop art cooler bag is made of vinyl insulated with fiberglass. Practical and fun, it'll set you back \$6.95 by mail. Porter's Camera, Cedar Falls, Iowa 50613.



Burleigh Brooks Blue Sky photo backpack is made of Cordura nylon and accommodates even 4x5 view cameras and much other gear. You cut out the foam insert to custom-fit your equipment. Price is \$89.95.



Kalimar's Camera/Cabin bag has soft-luggage styling and lots of zippered compartments to keep filters, film and small accessories handy. Made in brown or black polyurethane, it's priced at \$32.50.

PHOTO-TOTES *(Continued from page 74)*

pouch, roomy enough for camera, film and filters. The other, a belt pack like those worn by Ski Patrol members, offers greater capacity. Pouch is \$4.75 and pack is \$25.50 from L.L. Bean, Freeport, Me. 04033.

Popular among photographers is the Danish shoulder bag sold by The Chocolate Soup, 249 East 77th St., New York, N.Y. 10021. It holds an extraordinary amount of gear. Cost is \$29.50.—*Bob Berger*

2. Try something fishy

You can get serviceable camera-toting equipment for rock-bottom prices at your sporting-goods store. Sound fishy? Right! It's fisherman's gear. A reel case for a small camera and film, or a tackle bag for a fuller selection of equipment. My tackle bag—\$2.29 on sale—holds an SLR, two extra lenses and a small flash in its main compartment, which snaps open and shut by spring tension for fast access. Side pockets hold film, filters, meter and more. I usually have a camera handy in the car, and these little bags stow neatly out of sight under the front seat.—*Ric Clark*



A vinyl reel case affords good protection for a compact 35-mm camera, will also hold a couple of rolls of film. Several sizes are available; this one cost about \$2.50.



A fisherman's tackle bag, with lots of accessible compartments, may be all the camera bag you need. For \$4 or less, you'll have room for all the equipment shown.

3. Build a custom case for lenses, accessories

How about a compact case that protects your expensive equipment yet keeps it ready for instant use? You can make one to fit your needs exactly for about \$16. It's made of wood strips covered with fiberglass and uses a rear cap and foam strips to hold each lens. Design yours around the equipment you'll use.

Lay the objects on a flat surface

and experiment to find the most compact arrangement. If your normal lens is wider than your wide-angle, use it in the layout; each lens should have both caps on. Allow $\frac{1}{4}$ in. between sides of lenses (or between a lens and other object) and $\frac{3}{8}$ in. at each end. Measure overall dimensions of the collection. Interior depth of the case will be diame-

ter of the largest lens plus $\frac{3}{8}$ in.

Draw the shape of the end of the case on heavy paper and cut it out. Give it a curved shape for strength and comfort. You need two pieces of wood for the ends, one $\frac{1}{8}$ in. thick, the other $\frac{3}{8}$ in. I glued up layers of veneer, alternating grain direction, to make custom plywood. Solid wood and edge-glued strips are also okay. Mahogany is recommended, but most

(Please turn to page 78)

“What fuel could supply America’s electricity for about 250 years?”

David G. Roberts, Scientist

“Coal. America has one trillion tons of coal reserves in the ground. Enough energy to equal the oil reserves of the whole world.”



“Wherever feasible, electric companies are converting plants that run on oil and natural gas to coal. In this way, these precious fuels will last as long as possible—for transportation, farming, medicine, heating, and other useful applications.”



“For many sections of the country, nuclear power is still the best and most economical answer. Coal can’t do it everywhere.”

The time to build power plants is now.

By 1988 America will need 40% more electricity just to supply all the new people and their jobs. New power plants—both coal and nuclear—are urgently needed and must be started at once to be ready in time. For facts on your energy options, just send in the coupon.

**Edison Electric Institute
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New York, N.Y. 10001

Please send me *free* information about coal and the energy crisis.

Name _____

Address _____ Phone _____

City _____ State _____ Zip _____

PHOTO-TOTES

(Continued from page 74)

easily worked woods can be used. Cut out both ends at once to make them identical.

From the same wood, cut strips for the curved part of the case— $\frac{1}{8}$ x $\frac{1}{2}$ in. x overall length. Find the number needed by measuring around an end and multiplying by two, and make 25 percent extra to allow for mistakes.

Tape the ends to a scrap of 2x4 cut to the inside length of the case; it will hold them square while the first strips are glued on.

Glue strips edge-to-edge across and to the top and bottom of the ends, using white glue. Leave room at the sides to remove the 2x4. Strip edges may need to be beveled to fit tightly together. Remove the 2x4 and fit and glue strips—about $\frac{3}{8}$ in. wide—around the sides. When glue is dry, smooth the case and round all corners.

Now cut two pieces of 10-oz. fiberglass cloth about $\frac{1}{4}$ in. oversize for the ends. Mix an ounce of resin according to maker's directions and coat one end. When the resin is tacky, smooth cloth on and around the sides. Soak the cloth with a new batch of resin, avoiding bubbles, and let it dry. Then repeat the process on the other end. File edges smooth when resin has hardened.

Caution: These materials can be hazardous. Wear skin and eye protection, ensure adequate ventilation, and follow manufacturers' directions carefully.

Cloth for the rest of the case is $\frac{3}{8}$ in. oversize in width and long enough to wrap around and overlap $\frac{1}{2}$ in. Application is as for the ends. Smooth edges and feather the overlap after hardening.

Using a wood block and pencil as a marking gauge, draw a cutting line around the case. Make an opening cut across a corner with a hacksaw, then cut the case in half with a sabre saw. Sand both halves inside and out, and give the outsides and edges of both a final coat of resin.

Adding metal trim

Metal trim is made from about 3 ft. of aluminum divider bar used between sheets of $\frac{1}{8}$ -in. wall paneling. With a hacksaw (or sheet-metal squaring shear, if available) trim one of the wide flanges flush with the narrow one. Align the bar with the inside bottom of the case and mark it $\frac{1}{16}$ in. short of the inside top. Mark a point $\frac{3}{8}$ in. farther and remove the wide flange between marks entirely to allow for bending; then bend the bar to fit the

corner. Repeat for the next corner. After making the second bend, cut the bar at the outside edge of the back of the case, and remove the wide flange from the last $\frac{3}{8}$ in. Cut away part of the wide flange at front center to leave space for the latch, then attach the bar with epoxy. Bend the inside flange slightly inward with pliers so the case will close.

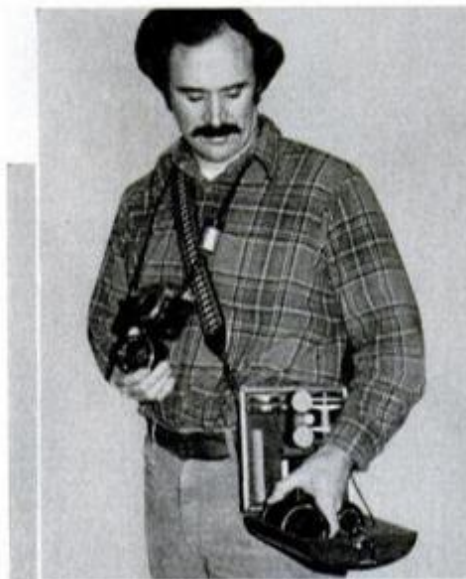
Screw hinges into place. Use split rivets and washers to attach the latch and shoulder-strap D-rings. An anchor for the bead chain should be riveted into place. The flip-up spacer for extension tubes and tele extender is cut from scrap left from the case's thick end. Two holes in the spacer which meet at right angles but whose center lines are offset from each other, secure one end of the bead chain. The chain passes through one hole; a screw driven into the other locks it in place. The spacer is fastened with screws from outside the case, after lining is put in.

The lining can be velvet or artificial suede or any other soft material

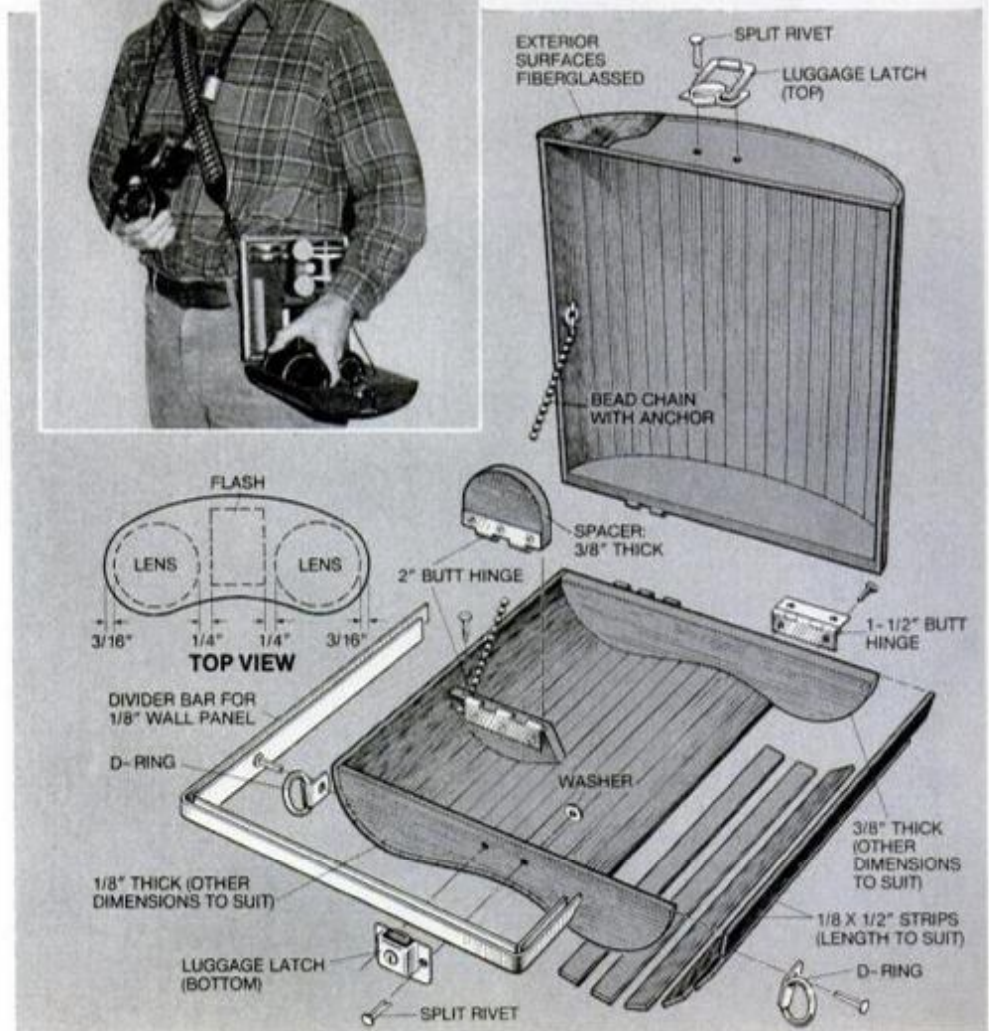
that glue won't soak through. It's held with white glue or contact cement; epoxy or silicone glue may be needed where it is to adhere to metal flanges. Use the paper end pattern you made earlier to cut the lining for the ends.

Lenses are held in place by rear caps fastened to the case. Metal caps are sturdier, but plastic ones work as long as they fasten securely to the lens. Don't use the friction-fit type. I attached my caps to flattened parts of ornamental hinges with silicone glue, using greased nails to provide a $\frac{1}{16}$ -in. separation (removing them after the assembly dried for 24 hours in a warm place), then attached the hinge parts to the case with $\frac{3}{8}$ -in. No. 8 sheet-metal screws.

Pieces of adhesive-backed foam weatherstripping can be placed inside the case to hold lenses steady. Holders for film cans and small accessories can be made by gluing wide strips of sewing elastic to wood blocks which are then glued or screwed into place in the case.—Ron Roberts



Custom accessory case is body-contoured, rigidly built to protect equipment, holds two lenses, flash, film, filters, tele converter and extension tubes. Drop front gives convenient access to gear.



4

3

2

1

Test read the ultimate riding mower.

Even at Toro, we've never engineered a precision mowing instrument quite like this.

For...

The Cut.

Each blade of grass four blades of grass will be sliced. For a cleaner cut.



FOUR CHANCES TO CUT PER PASS

Cutting blade tips lift and fling clippings to the optional grass catcher.

Cutting speed won't slow, because blade drive's independent of the five forward speeds you match to mowing conditions.

The cutting deck floats. Front to back. Side to side. Anticipates



UNIQUE, FULL-FLOATING DECK

your lawn's ups and downs. So there's less chance of scalping.

The cut is smooth, even. At any height from 1.6 to 4 inches.

The Comfort.

Floor's flat. No hump to bang an ankle.

Seat's deep cushioned. Controls are close at hand.

The engine is counter-balanced to cut down vibration. And it's hooded to help hold down noise.

The clutch is like a car's. For smooth starts.

Steering? High helix through inclined spindles. For precise handling, straight tracking.

Pivoted front axle moves up, down. Absorbs bumps, so you don't.

To unload, stay in your seat, pull one lever and drop 5½ bushels of clippings. Or choose the catcher that puts 5½ bushels into two disposable plastic bags for you.

The Life.

We engineered durability into this mower. And low maintenance.

From the lifetime-lubricated transmission to the unique Toro two-clutch system.

One clutch for the transmission. One for the blade. Both extend belt life. What's more, they make it easier to

A one-year limited warranty backs this mower just like our two medium-capacity rear-engine riders.

Your test ride's next. On any of five front-engine models. Examine these precision mowing

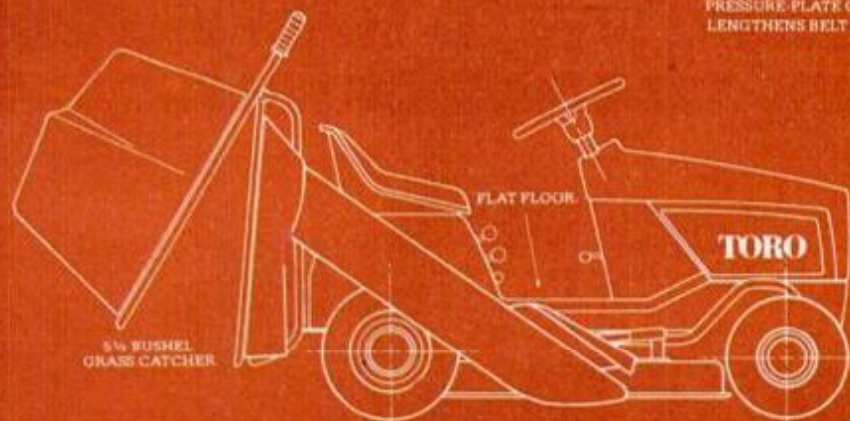


What's significant too, with two clutches, there are no troublesome idler pulleys to adjust.

And by all means, do compare them to any other riding mower. See if we haven't engineered the ultimate.



PRESSURE-PLATE CLUTCH LENGTHENS BELT LIFE



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Haven't you done without a Toro long enough?[™]

PM LOOKS AT BEAM BOX FM ANTENNA

by Hans Fantel

If you live in an apartment building and have no chance of erecting an antenna on the roof, a new type of indoor antenna may clear up your FM reception problems. It is intended especially for listeners in or near large cities where FM signals are often plagued by what is known as multipath distortion.

Multipath distortion is exactly the same thing as "ghosts" on TV, and it's caused the same way. The signal from the transmitter bounces off tall buildings (or off a mountain, or a bridge) so that your FM tuner actually receives two separate signals, one directly from the station, the other a ghost reflected from somewhere else. The ghost signal arrives a fraction of a second later than the direct signal because the reflected path is longer than the direct straight line from the transmitter. On TV, the result



Component-styled Beam Box is intended to fit in attractively with the rest of your hi-fi equipment.

is a double image. On FM, it's fuzzy sound and loss of separation between left and right stereo channels.

The best way to solve this problem is to put up a directional roof antenna pointed at the station you want to hear. This cuts off the multipath reflections from other directions. But the idea of a directional roof antenna offers little comfort to apartment dwellers who do not

have roof access. For the most part, they've been out of luck—at least so far.

Now B.I.C. (British Industries Co.) has come to their rescue with a gadget called the Beam Box, a compact device that measures about 14½ inches square and 4½ inches high and can be kept on the shelf right beside the tuner or receiver. It contains an antenna that can be aimed in different directions simply by turning a knob (a matter of switching in different combinations of antenna elements, not physical movement).

What's more, it can also be tuned to different frequencies across the FM band to increase signal strength from the particular station you want to hear. This gives it measurably greater pulling power for difficult stations than either an ordinary wire dipole or a rabbit-ear indoor antenna can provide.

Our midtown-Manhattan test, using a receiver with a multipath-

(Please turn to page 82)

We put B.I.C.'s Beam Box through its paces

To test the Beam Box, PM chose the most difficult location imaginable—right in the middle of Manhattan, surrounded by steel-frame skyscrapers that produce a real jumble of multipath FM signal reflections.

For a test receiver, we selected Yamaha's CR-2020 for two reasons: First, its excellent fidelity reveals changes in signal quality directly to the ear (we listened with a pair of top-quality AKG earphones). Second, the Yamaha receiver has a special multipath meter that indicates the amount of reflected (out of phase) signal being received. With the aid of such a meter, it's possible to orient an antenna for minimum multipath pickup.

We found that tuning the Beam Box to the frequency of the station we wanted to hear helped in several cases of marginal reception. On out-of-town stations coming in very weakly, we could increase that signal level by 20 to 30 units over the signal provided by an ordinary wire dipole. As a result, the background noise level dropped perceptibly, while the highs in the music lost their fuzzy distortion and came through quite clearly.

This advantage was shown most definitely with stations at either end of the dial—where ordinary antennas are least sensitive. For frequencies at the center

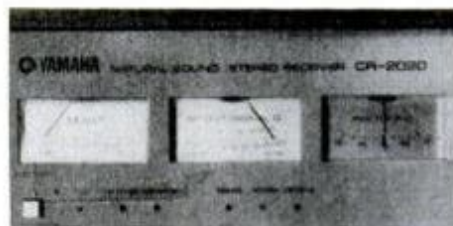
of the band, and for adequately strong stations, both the regular dipole and the Beam Box seemed about equal.

Surprisingly, the multipath meter on the receiver did not register much reduction of reflected signals with the Beam Box. Of course, the performance of any

antenna depends on the particular location and its surrounding terrain.

With tall buildings casting reflections from all directions, it was evidently impossible for the Beam Box to separate the direct signal from its echoes.—H.F.

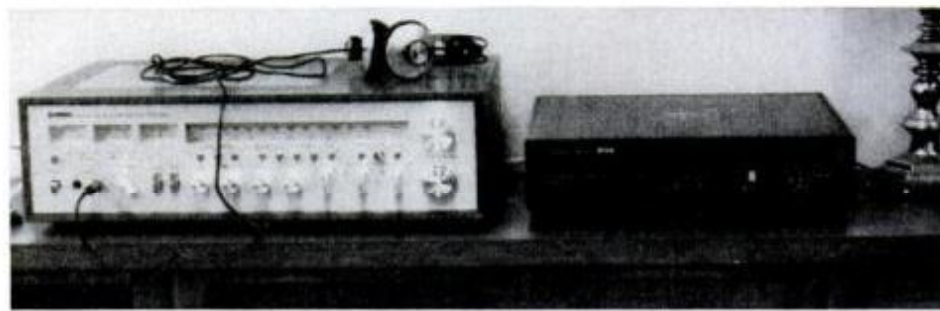
PM photos: Stephen Walton



Here center meter on receiver is indicating total signal strength of station.



Same meter is also used to show percentage of signal that is not multipath.



Test setup with Beam Box antenna, Yamaha CR-2020 receiver, AKG headphones.



Marlboro



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

7 mg tar, 1.0 mg nicotine av. per cigarette, FTC Report Aug. 77



**A DO-IT-YOURSELFER NAMED RAY
BUILT A MODEL OF ROME IN A DAY.
AT SUNDOWN, ROME FELL,
BUT RAY TOOK IT QUITE WELL,
'CAUSE HIS RIGHT GUARD KEPT WORKING ALL DAY.**

With Right Guard Deodorant, stick or spray protects all day. Right Guard helps stop odor before it starts. All day long.

DON'T GET DRESSED WITHOUT IT.

© The Gillette Company, 1978

BEAM BOX FM ANTENNA

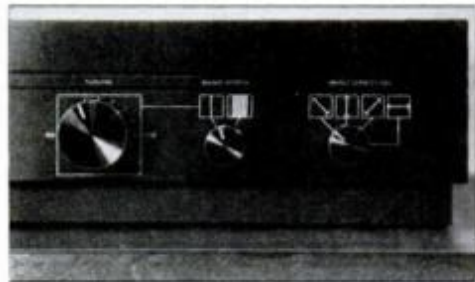
(Continued from page 80)

distortion meter (see below), showed that when multipath interference comes from all directions, the Beam Box can't reduce it very much.

We also tried the Beam Box in other locations with less sophisticated receiving equipment.

In a different Manhattan situation—fewer tall buildings nearby—reception with Beam Box and dipole seemed about the same.

In a suburb about 35 miles from transmitters, the Beam Box provided noticeably improved reception of some stations, but did not pull any greater number of stations than the conventional dipole. Here it was



Beam Box has three controls: right, a selector switch for phase-shift network that electrically alters antenna orientation; center, bandwidth switch; left, tuning knob, used with the bandwidth switch in narrow position. Rear of the device has connections for both 300-ohm and 75-ohm leads to tuner or receiver.

found that leaving the bandwidth switch on narrow while tuning the receiver made it easier to separate adjacent stations and to pull a weaker station normally blanked by a stronger one.

Kingston, R.I., is a deep-fringe location for Boston stations and medium fringe for those in Worcester, Mass., and Hartford, Conn. Here, with the wire dipole reoriented for each station, it provided better reception of about half of them; but most listeners can't or won't move a dipole antenna with each retuning. With the remaining stations, the Beam Box was better than the dipole for one, equal to it for the others.

Our findings indicate that the Beam Box is no real substitute for a directional roof antenna, either in signal gain or multipath suppression. But where such an antenna is impractical and there are just one or two sources of multipath, the Beam Box should be superior to other indoor antennas.

Before investing \$89.95 (suggested retail), ask your dealer to lend you a Beam Box for a trial where it counts—in your particular receiving location. **FM**

Where to take your garden for help

Professional assistance is available —if you know where to find it.

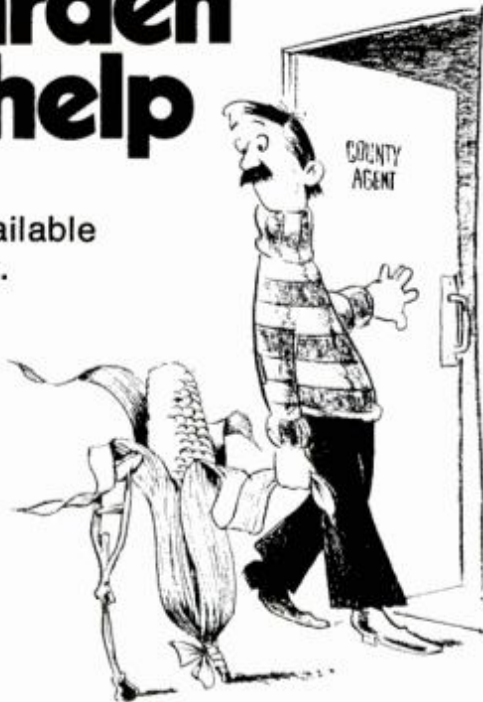
Suppose you're having a problem—weevils in the peas, or melons that won't grow to anything like the ones shown on the seed packet.

Maybe you can get help from the local garden center. Maybe you can find a more experienced gardener in the neighborhood who knows what to do. Maybe you can get a book from the public library that contains an answer that isn't too technical. But maybe you can't.

Fortunately, there are other resources available to you—primarily, your county agent. You may have always thought of him as someone who talks only to farmers, but the fact is almost every county in the United States (many cities, too) has one, and he's there to help with agricultural problems, no matter how small your garden may be.

Often the only problem is finding him. The county agent works for the Cooperative Extension Service, a joint operation of the Dept. of Agriculture and your state's land-grant university. It's the university that decides how local offices are designated and listed in the phone book. Possible listings (usually under your county government) include: County Extension Office, County Agent, County Agricultural Agent and Farm Adviser. If you see nothing that looks likely, call your county government switchboard operator for help.

Once you've found the county agent, what can he do for you? He can answer questions, as an impartial expert with specific knowledge of your geographic area. He can identify insect pests from samples (but get instructions before collecting or sending them) and tell you how to combat them. In most cases, he can provide analysis of your soil (get sampling and shipping instructions before digging up chunks of topsoil) and make specific recommendations as to the kinds of plants that will thrive in it. Finally, your county agent can apply his local expertise in guiding you to other information sources that can help



you resolve your special problems.

Some of that information comes from the USDA, and you can get it directly. The Department's 432-page 1977 Yearbook of Agriculture, *Gardening for Food and Fun*, offers a wealth of information on climates, growing techniques for specific fruits and vegetables and even storing and preserving your produce. It's available for \$6.50 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (mention stock No. 001-000-03679-3). The Department also has helpful free pamphlets. Write to U.S. Department of Agriculture, Office of Communication, Publications Div., Washington, D.C. 20250. Ask for the Popular Publications list.

Gardening clubs are a valuable resource for both the advice of more seasoned gardeners and all-around camaraderie. Your county agent can help you contact such groups.

A national organization with 250 local chapters is Men's Garden Clubs of America, 5560 Merle Hay Rd., Des Moines, Iowa 50323. They publish a magazine for members and sponsor youth programs in gardening. More specialized are the North American Fruit Explorers (c/o Robert Kurle, 10 South 55 Madison St., Hinsdale, Ill. 60521) and the Indoor Light Gardening Society of America (c/o Horticultural Society of New York, 128 West 58th St., New York, N.Y. 10019). If fruit-growing or experimental gardening under fluorescent is your ticket, get in touch with one of these two groups.

—Stephen Walton



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UNDER EVERY TOUGH CHEVY FLEETSIDE PICKUP THERE'S ANOTHER TOUGH CHEVY PICKUP.

When we say Chevy trucks are built to stay tough, we mean it. There are two tough steel walls in the Fleetside tailgate, pickup box sides, front fenders and hood. That's toughness where it's needed most. And that's one more good reason Chevy Fleetside pickups make such an impressive investment for your job.

Corrosion resistance to match.

Chevy pickups are given extensive corrosion resistance treatments. For example, up front, inner and outer fender and hood panels are sprayed with an anti-corrosion compound before assembly. In the back, Fleetside pickup box steel floor, sidewalls, front panel and tailgate are electrically

charged and immersed in primer for corrosion resistance in those hard to get at places.

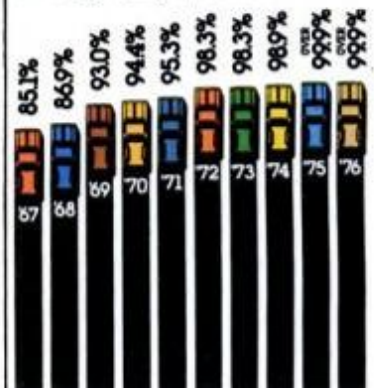
A word about engines.

Chevrolet pickup trucks are equipped with GM-built engines produced by various divisions. See your dealer for details.

Built to last. Look at the record.

95.7% of all Chevy trucks, in the ten most recent model years recorded, were still on the job. This is

based on the latest available industry model year registration statistics through July 1, 1976.



R. L. Polk & Co., July 1, 1976, 1977 statistics not available.

Double-wall tailgate.

Fleetside tailgate is double walled, with deep, embossed surfaces on the inside for rigidity.

Double-wall pickup box.

Sidewalls are double walled from top to bottom to provide structural rigidity. Also, inner wall prevents shifting cargo from marring exterior wall.

Double-wall cab.

Upper cab back panel, windshield pillars and front cowl are two steel walls thick.

Double-wall hood.

Two pieces of steel welded together to form one solid unit. Helps eliminate hood flutter.

Double-wall front fenders.

Front fenders have an embossed steel inner wall. Also, a self-washing inner fender skirt to help protect engine from salt spray, flying stones.

Double-wall doors.

Pickup doors have inner panels with embossed areas for added rigidity.



BUILT TO STAY TOUGH.

FIRSTHAND REPORT

by Michael Lamm
WEST COAST EDITOR



Some of the nicest sedans on the road today are engineered by BMW. This latest 733i turns out to be one of the sweetest cars I've driven lately.

It's just a shame it has to be so expensive. At \$22,000, the 733i—great as it is—would be pretty hard to justify to your accountant.

Sure, all that engineering and all those gadgets do cost money. So does BMW's superb detailing and finish. I found no jagged sheet metal under the doors, rockers, bumpers or anywhere else; no orange peel in the paint; no glue runs; no bad seams in the upholstery, trunk, or carpeting. This car is put together!

But I came away thinking it's too bad BMW doesn't offer an economy version of the 733i for just plain folk. All that marvelous handling, braking, safety and comfort would still suit me fine even without the power door locks, the electric sunroof, AM/FM radio, cast alloy wheels, decklid-mounted toolkit, electric speedo and tach, pushbutton monitor panel, and electrically powered outside rear-view mirror.

I could live without the standard airconditioning and rear defroster, too, but it's really hard not to lust after the styling and engineering that make this largest BMW truly outstanding.

What I especially wouldn't want to do without is the 733i's handling. Automotive writers have been saying for years that "...here's a sedan that handles like a sports car." Well, here's one that really does. It handles *better* than most sports cars.

BMW's new front suspension has double-jointed lower pivots and a modified MacPherson-strut setup that makes the car track and corner like it's built into the roadway. Turn the steering wheel and that's where the car goes.

The front suspension also allows more space inside the front wheels

Driving the BMW 733i



The Bavarian Motor Works' \$22,000 flagship is a sedan that handles like a sports car.



Standard features include sunroof, cast-alloy wheels, AM/FM, airconditioner and more.



Instrumentation includes readout panel for levels of most fluids under the hood.

for the disc brakes, so the rotors can be larger. BMW uses four-wheel discs all around, with small drums at the rear for the parking brake.

Brakes are *hydraulically* assisted from the same power pump and reservoir that serves the power steering. BMW went this route because fuel-injected engines (in this case, the Bosch L-Jetronic) have an unsteady vacuum supply. Also, the hydro assist gives a dozen or so stops with the engine off—some-

thing you don't get with vacuum.

Steering assist gets progressively weaker as engine rpm increases. This lends more road feel at higher speeds. BMW has shied away from the now-traditional rack-and-pinion steering for the 733i and goes with a ZF recirculating ball type. It works well and precisely, but I found it a little stiff at lower speeds.

Rear suspension uses fully independent axles with semitrailing arms and high-mounted coil springs wrapped around tube shocks. The rear suspension assembly stands on its own isolated subframe, as does the entire front body structure. The idea is to keep the unitized passenger compartment as quiet and smooth-riding as possible.

And it's a very silent, gentle car on the road. With all windows rolled up, you hardly hear any noise at all. There's a bit of whoosh from the Michelin steel-belted radial tires, but good insulation and sound deadening cancel out engine, drive-train and wind sounds very effectively.

(Please turn to page 86)



Fuel injection hardware is apparent on the 733i's in-line, overhead-cam Six.

On smoothly paved roads, this car glides along without a burble. However, you do feel rough surfaces, as you might expect from a suspension that counters body roll and corners so well. Thus there's a slight trade-off, but I'd rather feel a bit of jiggling in the rough than wallow on too-soft springs for the hypnotic comfort of a boulevard ride.

And one pleasant feature of this BMW is that it's extremely tight, so it moves over bumps and corduroy stretches in amazing silence.

Power comes from BMW's proven overhead-cam Six—the same engine used previously in the 3.0S and 3.0Si, which the 733i replaces. Slightly oversquare, this powerplant is potent but not temperamental and not lumpy at idle. BMW lists 177 hp at 5500 rpm. That's just a tad less than one horse per cubic inch.

Torque, on the other hand, tends to be slightly weak when compared with U.S. V8s of similar horsepower rating, especially at lower rpm.

What this translates to is this: The 733i with its standard manual four-speed gearbox accelerates right alongside the best performers on the road: 0-60 mph in less than 9 seconds and the standing quarter mile in less than 17.

But with the optional automatic



BMW traditions are trunk-lid-mounted tool kit and independent rear suspension.

transmission, the 733i sprints less like a springbok and more like a llama. Which isn't to say it's bad, but the automatic does tend to put a damper on brisk acceleration.

The four-speed makes this car a delight to drive. It nips into gear with just the gentlest nudge. It's also very accurate, with short throws and a cooperative shift mechanism. The clutch feels positive, too, but not grabby, and its hydraulic actuation means it doesn't take much muscle to operate.

There's everything inside this BMW that even the pickiest driver can hope for, plus quite a bit more. Seat bottoms adjust up, down, back, forth, and tilt for knee support. Seat-backs recline. If you can't get comfortable, go see a doctor. The steering column adjusts for length and height. And there's ample knee and toe room in the rear seat, even with the front buckets shoved all the way rearward.

Gauges read well but aren't totally complete. Instead, there's a Las Vegas strip of lights that blink when anything goes wrong. In addition, BMW interior designers put a monitoring panel to the left of the instrument cluster. When you press the main monitor button, it checks levels

of water, oil, washer fluid, brake fluid, brake pressure, and whether the backup lights work.

Here's a car with a tall greenhouse, big windows, thin pillars, and short hood and deck. Potentially, the 733i is designed for full vision in every direction. Problem is, all four seats have big, bulky headrests, and the rear rests stick up into the driver's view.

BMW puts great emphasis on safety, and they prove once again that a shoulder harness doesn't have to saw into your neck. Their belts, in fact, have been a pleasure to use for years.

The 733i incorporates crash-crush sheet metal front and rear, and BMW makes a big point of the fact that the front structure deforms in a controlled way when bashed. The hood, too, is designed so it can't fly back through the windshield.

Rear sheet metal likewise gives in a rear-ender, and the gas tank can move downward in a crash so it doesn't blow up in your hip pocket. The gas filler is protected against side impact.

Meanwhile, the roof and passenger compartment make up what amounts to a roll cage, with built-in roll bar in the B-pillar and a beefed-up top structure.

All of which leads me back to my original thinking. Here we have one of the world's greatest-handling, most sensible, desirable, practical, efficient, and cooperative 4/5-passenger sedans. But only a handful of buyers can afford them.

I like gadgets as much as the next fellow. More than the next fellow. But if BMW could delete a lot of its standard equipment, perhaps making it optional, then if they could bring a car like the 733i to the masses at a mass-production price, they'd have a world-beater. What a car that would be!

FM



Rear-passenger accommodations are superb; armrest hides storage compartment.

SPECIFICATIONS—BMW 733i

Vehicle type—Front engine, rear-drive four-door sedan.

Price, p.o.e. East—\$22,000 approx.

Engine-Type: Ohc in-line Six, hemi combustion chambers.
Bore and stroke: 89x86 mm (3.50 x 3.39 in.).
Displacement: 3210 cc (196 cu. in.).
Max. bhp @ rpm: 177 @ 5500 SAE net.
Max torque @ rpm: 196 @ 4000.
Induction system: Bosch L-Jetronic fuel injection.

Power train—Standard transmission: Getrag 4-speed, all synchro.
Optional transmission: ZF 3-speed automatic.
Final drive ratios: 3.45:1, each transmission.

Suspension—Front: Double-link MacPherson strut, small positive kingpin offset, negative caster offset at axle, progressive antiroll bar.

Rear: Independent axles, semitrailing arms and coil springs around tubular shocks; full antilift action.

Tires—Michelin 205/70 VR-14 steel-belted tubeless radials.

Steering—Recirculating ball, hydraulic power assist, 15.2:1 ratio; adjustable steering col.

Brakes—Four-wheel outboard discs, 11-in. dia., vented in front, nonvented rear; power assist from steering hydraulic booster.

Body and dimensions—Construction: All-steel, unitized body with front and rear suspension carriers; 4-door, 5-passenger sedan.
Wheelbase: 2795 mm (110.0 in.).
Overall length: 5013 mm (197.4 in.).
Overall width: 1800 mm (70.9 in.).
Trunk capacity: 22.6 cu. ft.
Fuel capacity: 22.5 gal.
Curb weight: 3845 lbs. (automatic).

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circuitry, Panasonic's RF-4800 gives you all these sophisticated controls. Like an all-gear-drive tuning control to prevent "backlash." Separate wide/narrow bandwidth selectors for optimum reception even in crowded conditions. Adjustable calibration for easy tuning to exact frequencies. A BFO pitch control. RF-gain control for increased selectivity in busy signal areas. An ANL switch. Even separate bass and treble controls.

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Answers that make the difference.



Trick on the new Skater-Cross courses is to come as close as you can to the top edge of concrete chute without losing the board over the side. This one is working.

Skateboard wring-out

If you're jaded for want of thrills, don't despair. Try one of a burgeoning breed of concrete chutes for skateboarders known as "Skater Crosses." The complexes—mostly in California so far—boast hair-raising courses 620 feet long, with bobsled-type 15-foot walls installed along the curves.

Experienced skateboarders push their expertise by skimming the top of the wall with only rear wheels bearing on the surface. If things get too hairy, they simply drop off the board and let it sail over the side. They then scramble down the verti-

(Please turn to page 90)



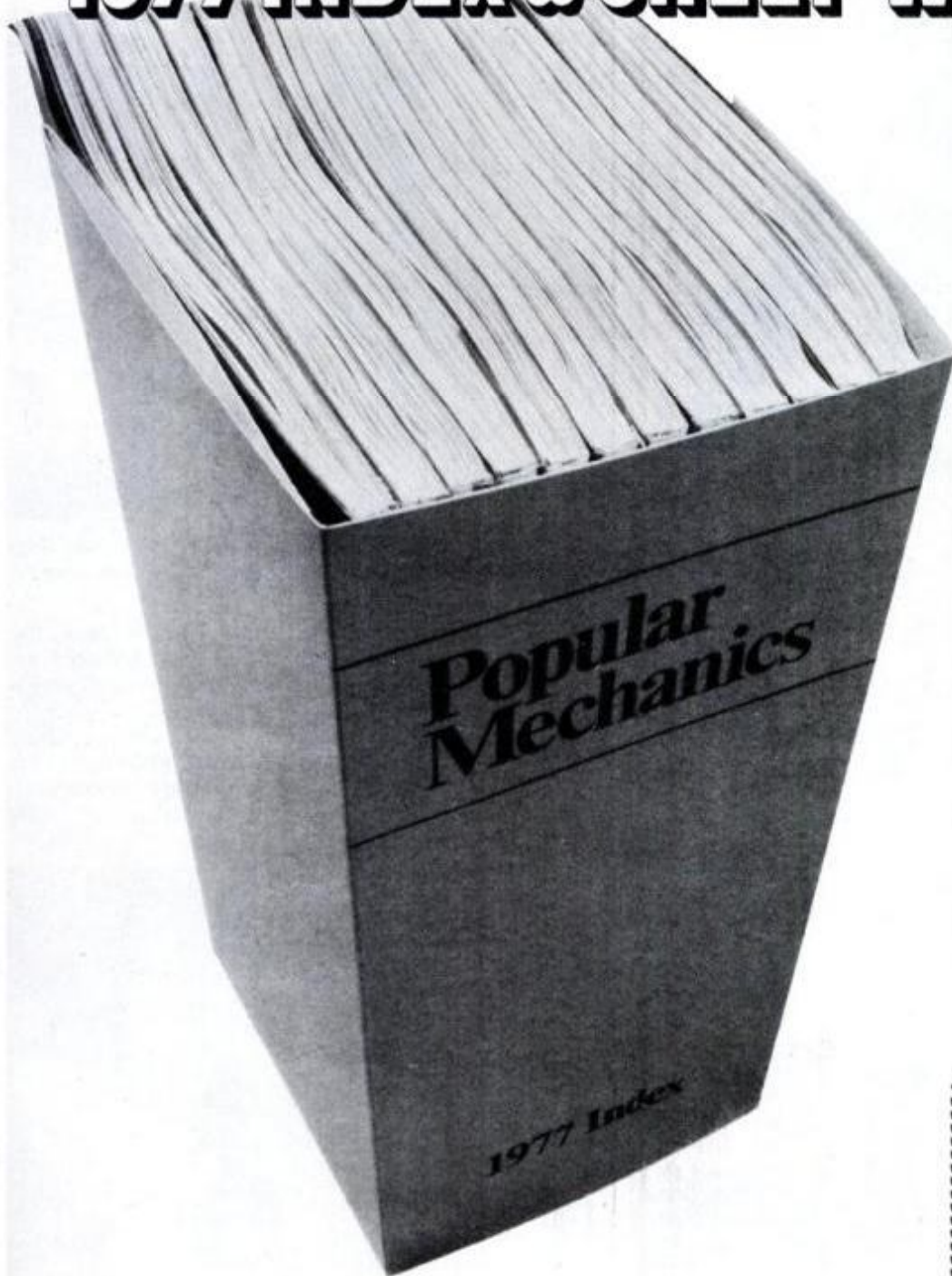
How to live dangerously is demonstrated by a young skateboarder at the top edge.



Skater-Cross in southern California boasts a 620-foot course of free-form concrete, offering curves with high walls for skimmers, and flag man to control the traffic.

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SKATEBOARD

(Continued from page 88)



Experts skim the rims within inches (top), but near-misses kick board over edge . . .

cal wall on foot, into the track, and usually fall. Bruises and burns are at a minimum, thanks to helmets, knee and elbow pads.

All Skater-Crosses have supervisors on the track guiding traffic with flags. Dangerous performers are waved off the course. **PM**



. . . and drop rider down into the trough where helmet and pads do their job.

Maybe you thought catching smugglers, stopping poachers and saving lives only happens in the movies.

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provide an allowance for housing and meals. So most of your pay is yours to keep—or save towards a new car, stereo equipment, even college.

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We protect our national resources, keeping our new 200-mile fishery conservation zone safe from "poachers" who illegally fish our waters.

These are big jobs, important jobs to our country and to the men and women who perform them. So are the other things we do. Working to pre-

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PM photos by Harry Wicks

Using checklist in factory manual, Jim makes routine check.

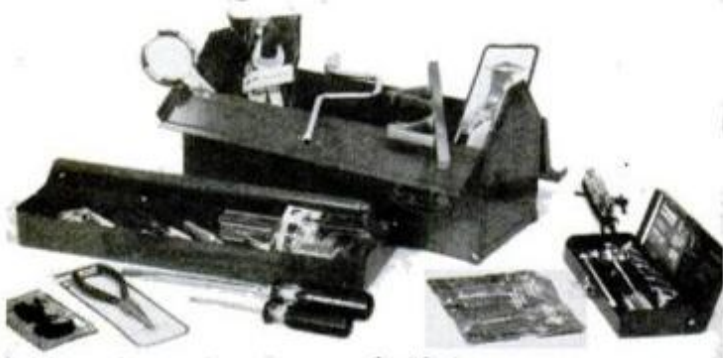
PM's Home and Shop Editor and his teen-age son check out new learn-at-home plan.

by Jim and Harry Wicks

Since there are an estimated 50 million gasoline-powered lawnmowers in use in the United States, the latest earn-at-home offer from the Foley Manufacturing Co. triggered our curiosity. Actually, the teen-age half of this testing team spied the offer and felt that fixing lawnmowers could, in fact, be a rather pleasant way to earn income in his after-school hours. His interest spurred the other half of the team into action.

The first step was to learn more about the program, so we contacted the folks at Foley. We knew that this firm has been in the business of helping individuals to establish small businesses for better than 50 years. Their major reason for developing a Lawn Mower Repair Program, according to Allen Jacobson, consumer

Learn to fix that lawnmower engine



1 Quality tools that get you started include S-K open-end and 3/8-in. socket wrench set, ignition set, flywheel puller.



2 Package that comes in kit includes well-written manuals for different makes of mower engines—both two- and four-cycle.



3 The master instruction manual by Foley comes in this sturdy three-ring binder with grease-resistant cover.

4 PM's teenage tester found instructions particularly easy to follow with clear drawings with lots of information.

education supervisor, "was to expand the markets of opportunity for our associates." Thus the firm set guidelines to develop a program for the repair of small engines that could make it possible for an individual to earn from \$8 to \$15 an hour. Next, details were worked out so program users would realize a parts markup of from 20 to 35 percent on the parts used.

For \$398, you can enroll in the program, and the fee can be split up and paid in up to 12 monthly installments. For those who want to see more firsthand before investing that amount, there is also a \$25 "Free Trial" offer. You send the firm \$25 for the Foley In-Depth Manual. You will be billed for the postage and that will be your only cost. After you

(Please turn to page 94)

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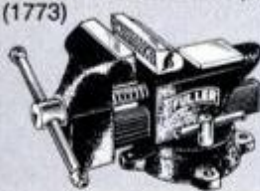
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\$5.88

LAWNMOWER SCHOOL

(Continued from page 92)

have looked over the manual you can do one of two things:

- Keep it and enroll in the program; the \$25 becomes your down payment.
- Return the manual for a \$25 refund.

One of the first things we liked about this program is that it is complete upon arrival. There is no waiting around for weeks and months for the next step. And all material is presented in a clear step-by-step manner; the instruction manual is easy to understand.



6 Foley recommends building an engine stand, offers one version in manual.

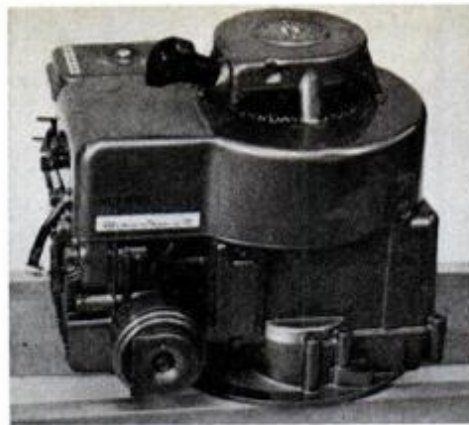


8 To gap points, follow book sequence. Start by removing cover.

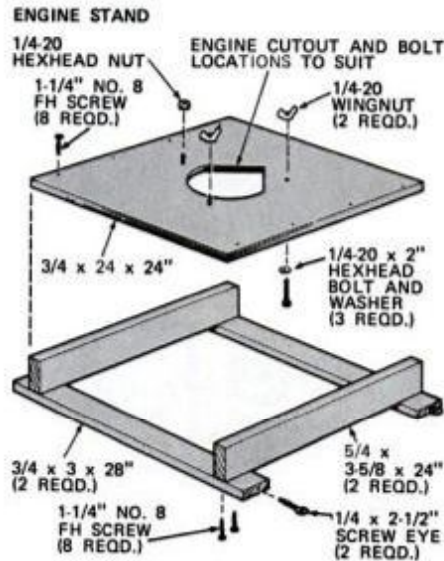
What comes with the course

The package, as it comes, is impressive. For openers, it includes a spanking new Briggs & Stratton engine—this is the make used on 60 percent of the lawnmowers today to practice your new skills on.

All tools in the package are of top quality. In fact, we feel that the toolbox is a dandy starter set that will probably last a lifetime. We were also impressed with the special tools that were included to make the job easier. Among other items, for example, the kit has a flywheel puller and ignition wrench set—must-have tools for lawnmower repairmen.



5 A brand new Briggs & Stratton four-cycle engine is sent to practice skills.



7 This version was designed, built by authors; C-clamps hold it on workbench.



9 Next, mesh screening comes off so that the flywheel is exposed.

A program bonus

Once you are enrolled as a member of the Lawn Mower Repair Program your name goes on a parts referral list. As a member you are entitled to trade discounts on parts, and you will receive guidance and information from the Central Service Distributor. Additionally, if you have any mechanical problems or difficulty finding parts, or need help in developing the business aspect of your fix-it service, help is available from Foley by means of a toll-free phone number.

After working with the manuals, tools and engine provided for the past six months, we can report



10 Book illustrates technique for using tools to remove the flywheel clutch.



11 Flywheel is lifted off to expose the points in B&S engine.



12 Points are gapped following instructions. Parts are then reinstalled.



13 PM's tester is checked out by his Pop, PM's home and shop editor.

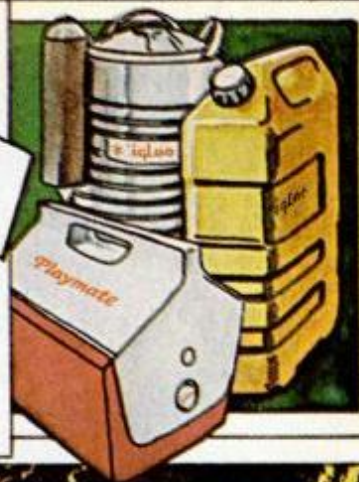
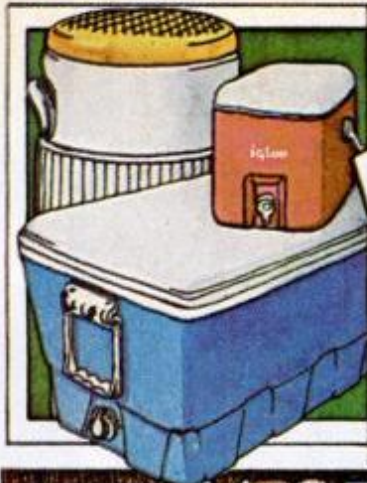
favorably on the program. Instructions are well written and easy to follow and we found all materials to be of top quality—including the tools.

For details on the Lawn Mower Repair Program, write Allen Jacobson, Consumer Education Supervisor, Foley Mfg. Co., 3300 Fifth St. N.E., Minneapolis, Minn. 55418. **PM**

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1. THE BROTHERS OF MOOSE LODGE #1628 IN MERIDIAN, MISSISSIPPI, HAD ALWAYS STORED THEIR ICE IN IGLOO ICE CHESTS BEHIND THE BAR.



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2. 'TIL ONE NIGHT...
THE LODGE WAS ON FIRE!



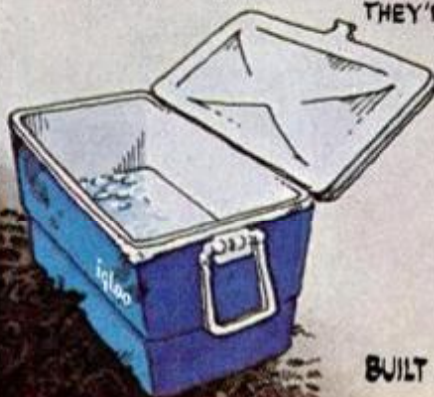
4. NEXT DAY, THE LODGE BROTHERS WERE BACK ON THE SCENE, PICKING THROUGH THE RUBBLE OF THE BUILDING...NOT MUCH WAS LEFT.

5. THEN THEY SPIED THE IGLOOS.

6. THEY WERE PARTIALLY MELTED, BUT... THERE WAS STILL ICE INSIDE!



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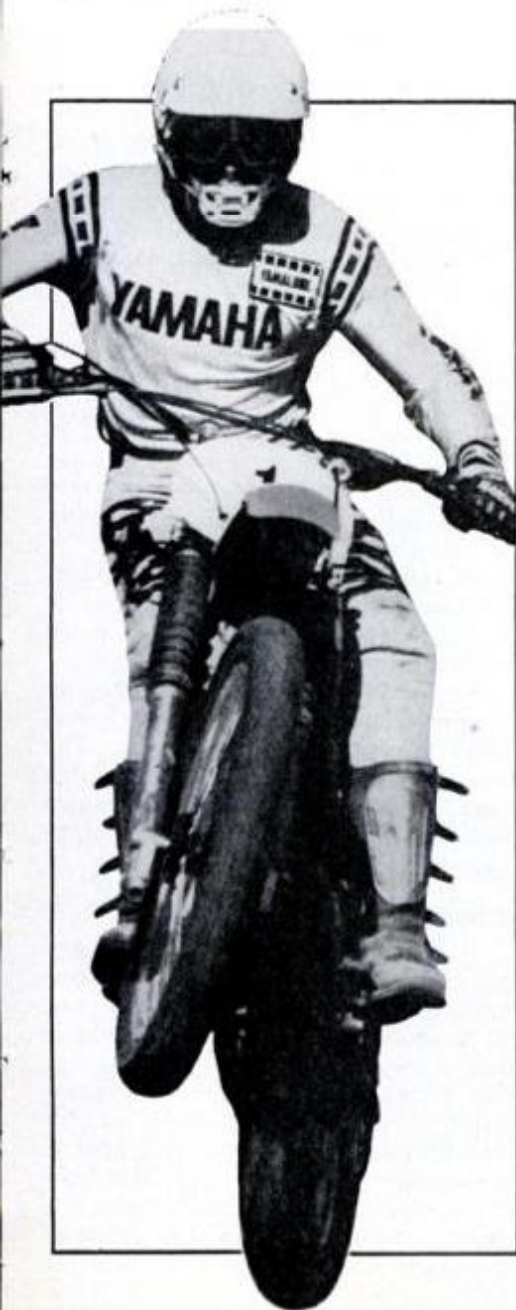


IT'S MORE FUN TO TAKE THE BUS.

Материал, защищенный авторским правом

How to make it handle better

by Bill Hampton



Good handling is especially important if you want to compete on your two wheeler.

Does your motorcycle wander and wobble? It shouldn't! That two-wheeler should track straight as an arrow and take the corners as though it were on a rail.

Whether you're a street jockey or an off-road buff, you need a motorcycle that has good handling. But if your machine doesn't have it, don't despair; there are several things you can do to improve or fine tune that bike.

Start with the tires

First, make sure your tires have the right air pressure. If they are underinflated, they'll make the steering mushy, especially in the turns. Because soft tires flex more, they generate excess heat that causes breakdown of the plies inside; tread wears faster, too. When the shoulder areas of the tread wear away, there's nothing to hold you up in the turns.

Overinflation can be bad, too. Excessive air pressure makes the bike skittery by reducing the tires' flexibility and by shrinking the size of their "footprints." With less rubber in contact with the road, it takes longer to stop. And the center areas of the tread will wear faster than the rest of the tread.

A hard front tire also makes the steering light and causes the bike to wander. Don't run oddball-size tires, either. Stay within the manufacturer's recommendations for your bike.

Don't get the wobbles

Tires that are too small or too big, or are irregularly worn, can bring about a spine-tingling phenomenon known as *speed wobble*. Although not as common as it was years ago when tires and suspension systems were poor, speed wobble can still occur under certain conditions. What happens is that the front wheel and fork assembly shakes or wobbles violently from side to side. If it becomes bad enough, speed wobble may shake the front end so violently that the handlebar is wrenched from your grasp.

Most times, though, speed wobble may be of such low frequency and short duration as to go unnoticed. What happens is that the tires may strike a bump in the road or the rider may overcontrol in such a way as to set up speed wobble. But if the bike has good steering geometry, it'll shake its head a few times and then settle down.

Tires can cause wobble and poor handling in different ways. If a tire isn't true on its wheel rim, it can give a bike the shakes. A manufacturing defect where tread is askew on the tire carcass or asymmetry in construction could bring about wob-



Squirting in a charge of tire-balancing fluid is a quick way to improve balance.

bling as well as poor bike handling.

A major cause of wobble can be an out-of-balance tire and wheel assembly, especially up front. The front tire and wheel are particularly sensitive to imbalance, because they do the steering and are "hinged" to the rest of the bike by the steering head. The rear tire and wheel aren't as sensitive to imbalance, since they're held in place by the rear swing arm.

Balancing your tires

A simple way to balance a tire and wheel is to inject the contents of a can of tire balancing fluid (TBF) into the inner tube. As the tire rotates, centrifugal force distributes the TBF throughout the tube in such a way as to smooth out any imbalance, or "heavy" spots in the tire. Many riders swear by this method.

An approximate method is to elevate a wheel and give it a little spin. After the wheel stops, mark an X with chalk or crayon on the sidewall of the lowermost portion of the tire. Rotate the wheel a couple of more times. Note where the X mark comes to rest. If the tire/wheel are in balance, the X area of the tire will come to a stop at different locations. But if the X area always stops at the bottom, you'll need to place an estimated weight diametrically opposite the X mark, on the opposite side of the wheel. Usually the heaviest spot will be in the area of the tube air valve and your weights will go opposite it.

If your bike is equipped with the

(Please turn to page 98)

YOUR MOTORCYCLE

(Continued from page 97)

modern, cast-alloy, "spokeless" wheels, you can balance them with Tape-A-Weights. They come in flat strip form with an adhesive backing that allows them to stick securely to the rim of the wheel.

To balance the rear wheel, you'll have to disconnect the rear chain so the wheel turns freely.

Check your spokes

And don't overlook loose or improperly tensioned spokes as possible causes of wheel wobble.

One way to check for loose spokes is to strike each one with a wrench or screwdriver. A tight spoke will emit a ringing sound, while a loose spoke will sound dull. When you tighten loose spokes, be careful not to overtighten or you may distort the wheel.

To check a wheel for distortion, or runout, elevate it so it can rotate freely. Then carefully eyeball the rim as the wheel turns. The most accurate way, however, is to put the wheel—minus tire—on a truing jig where it can be checked for both sideways and radial runout. You may have to use the services of your local bike shop.

How about replacing your spoked wheels with the modern, cast-alloy type? They cost more but they're lightweight, and they won't distort like conventional spoked wheels. Cast wheels will also accept tubeless tires, which helps to keep the unsprung weight low.

In your quest of wobble-free steering, don't overlook simple things like loose axle-securing nuts or worn wheel bearings.

As for the wheel bearings, prop up a wheel and grasp it with both hands 180° apart. Shake or rock it. The bearings should have no perceptible play. Rocking the rear wheel can also detect play or wear in the swing-arm bushings.

Check the steering head

How about that other "hinge" point of the motorcycle—the steering head? There shouldn't be any play or wear in the steering-head bearings, either. Here's how to find out if there's any slop in the bearings: Squat down in front of the front wheel (with it elevated, preferably) and grasp the lower fork legs. Now rock them vigorously back and forth. Any play in the steering-head bearings and fork-leg bushings will be apparent.

If you can't determine whether it's the head bearings or the fork bush-

(Please turn to page 100)



Balance weights with adhesive backing make tire and wheel balancing easier than ever. These Tape-A-Weights are especially easy to use on cast-alloy wheels (left).



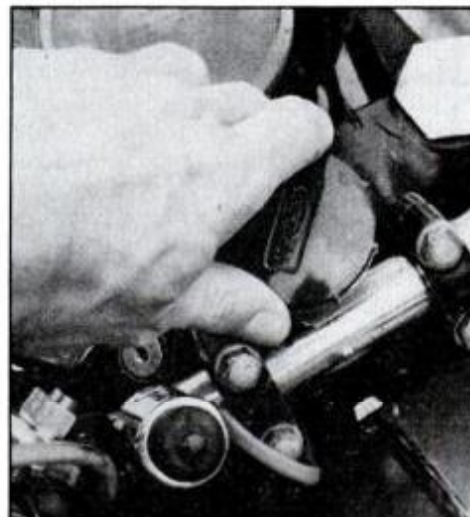
Steering-head bearings and fork-leg bushings should be checked for looseness.



Another method for checking head bearings is with front brake on (see text).



Wheel bearings are checked by rocking wheel and determining amount of play.



Friction-type steering damper on some motorcycles is used to tune out wobble.

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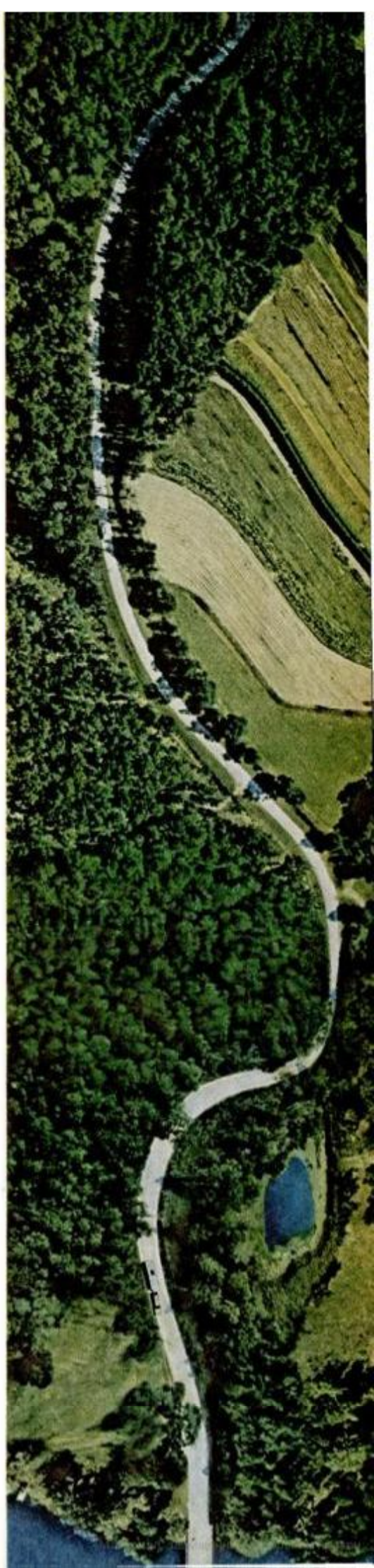
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Wheel alignment can be checked with any one of several methods including boards.

ings that are sloppy, you can try another method to isolate the head bearings: Straddle the bike and apply the front brake. Then place the finger tips of your left hand over the gap between the bearing retainer and the steering head. Rock the bike forward and backward. You'll feel any play in the bearings.

Loose bearings can be snugged down by tightening the upper bearing retainer (if it's threaded) and/or the stem nut. Check your owner's manual for specific adjustment on your specific bike.

By swinging the fork from side to side, with the front wheel off the ground, you can determine just how much to tighten the bearings. There shouldn't be any binding in the fork as it moves.

Front fork and rear shocks

The front-fork assembly can be troublesome in various ways. For example, a bent or kinked fork leg can cause all kinds of steering problems. And if the motorcycle has ever been "dropped" hard enough, the fork legs may be out of parallel.

Too much oil in one fork leg and/or not enough in the other can make the fork behave peculiarly too. Just changing the viscosity of the oil in the legs can make a difference in their damping characteristics. If the fork is too soft, you may want to try heavier springs and a heavier oil. Conversely, if the fork action is too firm, opt for lighter springs and/or lighter oil.

Complementing the front fork's suspension components are the rear shocks. Don't overlook them. They have an important role in keeping the rear tire in contact with the ground. For hot-dog handling, you may want to replace your bike's



Fine control of rear suspension is achieved with air-adjustable shocks.

stock units with some of the components made by the accessory manufacturers.

About the steering damper

Your bike may have a device known as a steering damper, which either prevents or controls fork wobble. Older English and American-made motorcycles have a friction-type damper that's contained in the steering stem. By tightening the knob on top of the stem, the side-to-side movement of the fork can be reduced should a front-end wobble occur. It's also effective when carrying a passenger or when traveling over a rough road: if you snug down the damper, the front end doesn't wander as much.

The other type of steering damper is hydraulically actuated and is mounted between the frame and fork-leg triple clamp. It's similar to the damper found on storm doors, but more refined. The hydraulic damper automatically varies the degree of damping in proportion to the amount or intensity of fork movement. When the fork is turned sideways slowly, little or no resistance is offered by the damper. But should the fork be turned suddenly to one side, as during a speed wobble, the damper would provide resistance. If your bike is a wobbler by nature, you may want to mount a hydraulic damper on it.

A word on wheel alignment

Wheel misalignment is something else that can turn your motorcycle into a wobbling wanderer. Wheel misalignment usually involves the rear wheel and is caused by careless rear-chain adjustment. If one wheel adjuster is turned more than the other one, it cocks the wheel out of

plane with the front wheel. To see if the rear wheel is centered in the swing arm, measure the distance between the swing-arm-pivot center and the center of the axle, both sides. Use either adjuster to center the wheel. Then turn both wheel adjusters to properly tension the chain ($\frac{3}{4}$ -inch play midway between sprockets, with rider weight on seat).

Even with the rear wheel centered in the swing arm, however, the two wheels could still be out of plane with each other. You can check for that possibility in three different ways. First, if you have a critical eye, get down on all fours behind the rear wheel and sight along both tires. The front wheel must be pointing dead ahead.

A second, more accurate method is to use a straightedge. Place an accurately cut board on supports so that it touches the lower portions of both tires. Again, make sure the front wheel is pointing dead ahead. Since most motorcycles have wider rear tires than front tires, make sure the board contacts both sides of the rear tire. Then carefully measure the gaps between the board and both sidewall areas of the front tire.

Align the rear wheel with the front wheel with the adjuster(s). Obviously if the frame, swing arm, or fork is badly bent to cause misalignment, it can't be corrected by trying to realign the rear wheel.

A third way to check for wheel alignment is to use a string or cord. Tie one end of it around a spoke on the rear wheel and pass it around the back of the rear wheel. Then pull it taut from the front-wheel position. As with the straightedge, make sure the string touches both sides of the rear tire. Keeping the string as straight as possible, note the size of the gaps between it and both sides of the front tire.

Check windshield or fairing

Radical modifications to the motorcycle, such as extending the front end, can create handling problems. If you must modify your bike, do it intelligently. If your bike has a windshield or fairing, make sure it's properly mounted. It's not unusual to have a loose or improperly attached fairing or windshield, especially if it's handlebar-mounted, cause wobble. The same goes for touring gear, if it's not distributed right or tied down tightly on the bike.

As you can see, there are many things that can affect a motorcycle's handling. So keep it "trackin' true". Your life could depend on it. **PM**

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Pall Mall Extra Light . . . 7 mg. "tar", 0.6 mg. nicotine av. per cigarette by FTC method.
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Only smooth, consistent Seagram's 7 can make a real 7 & 7. Start with 1½ oz. Seagram's 7 and add 7 Up. Over ice in a tall glass, it's unbeatable.

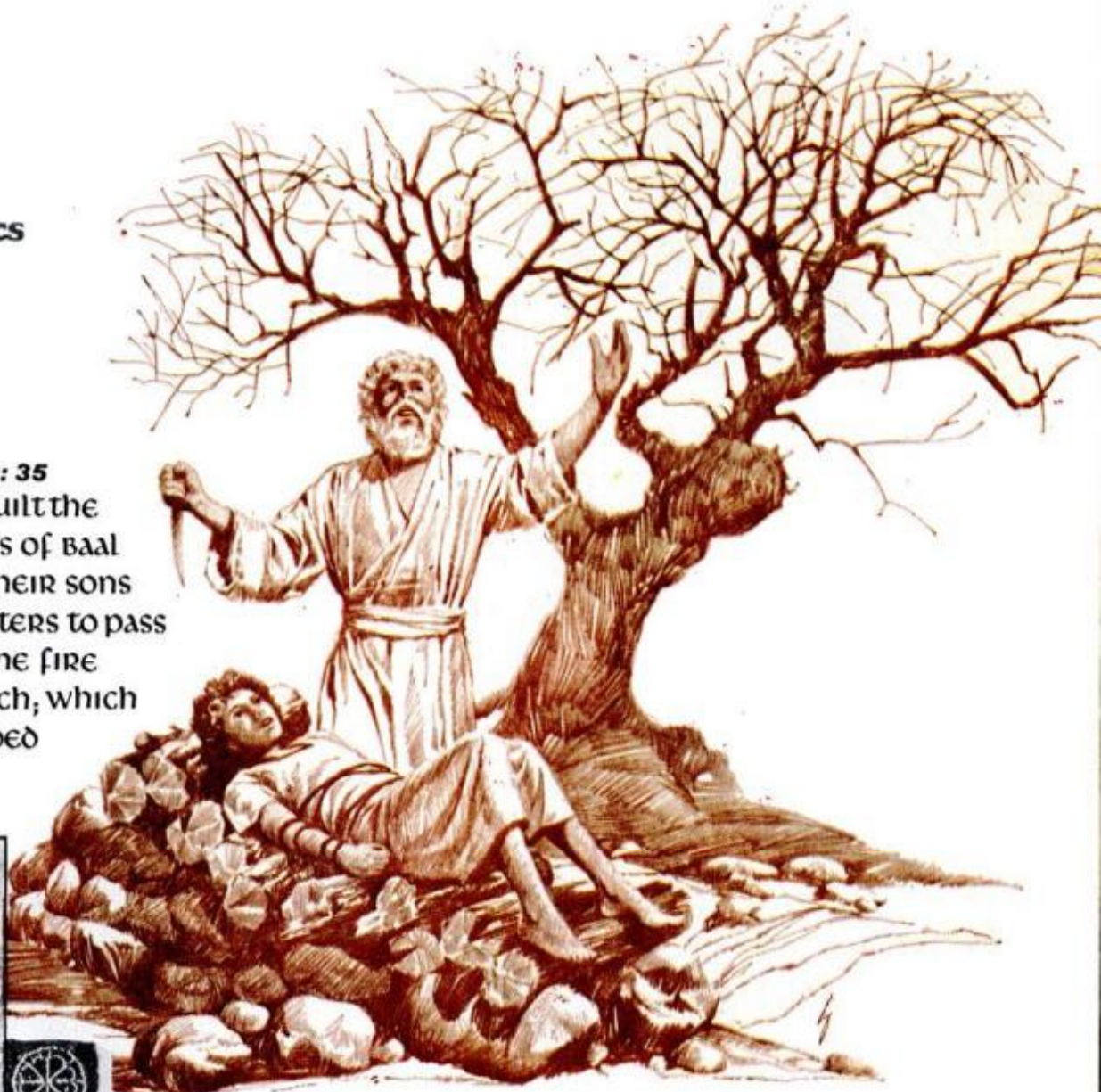
Seagram's 7 Crown

Where quality drinks begin.



SEAGRAM DISTILLERS CO., N.Y.C. AMERICAN WHISKEY—A BLEND, 60 PROOF.

Jeremiah 32: 35
and they built the
high places of Baal
to cause their sons
and daughters to pass
through the fire
unto molech, which
I commanded
them not.



American Institute of Oriental Research



Stone depicting Phoenician priest carrying infant to sacrifice confirms Biblical references. Jars in Carthage cemetery contained charred infants' remains. Jews sometimes reverted to forbidden custom (as God tempted Abraham to do) and were reprimanded.

Putting Biblical pieces together

With the latest "finds" in Holy Land excavations archaeologists are proving the Bible's parables.

by Richard F. Dempewolf

Archaeologists, investigating an ancient tomb accidentally exposed by bulldozers north of Jerusalem, recently made a startling discovery. Among the remains of a young man were two heel bones pierced by an iron spike with a bent tip to which bits of olive wood still clung.

Thus was unearthed the first material evidence ever found of an actual crucifixion in the Holy Land.

Condition of the bones indicated that the execution was performed on

a T-shaped cross with a short post—more common than the type on which Jesus is always depicted. The victim's legs were bent upward, his buttocks resting on a block nailed to the post. In this case, according to Professor Yigael Yadin, Hebrew University's famed army-general-turned-archaeologist, the heels probably were secured between two boards fastened to the sides of the post. The nail tip would have been bent over to prevent its removal. It also prevented its re-



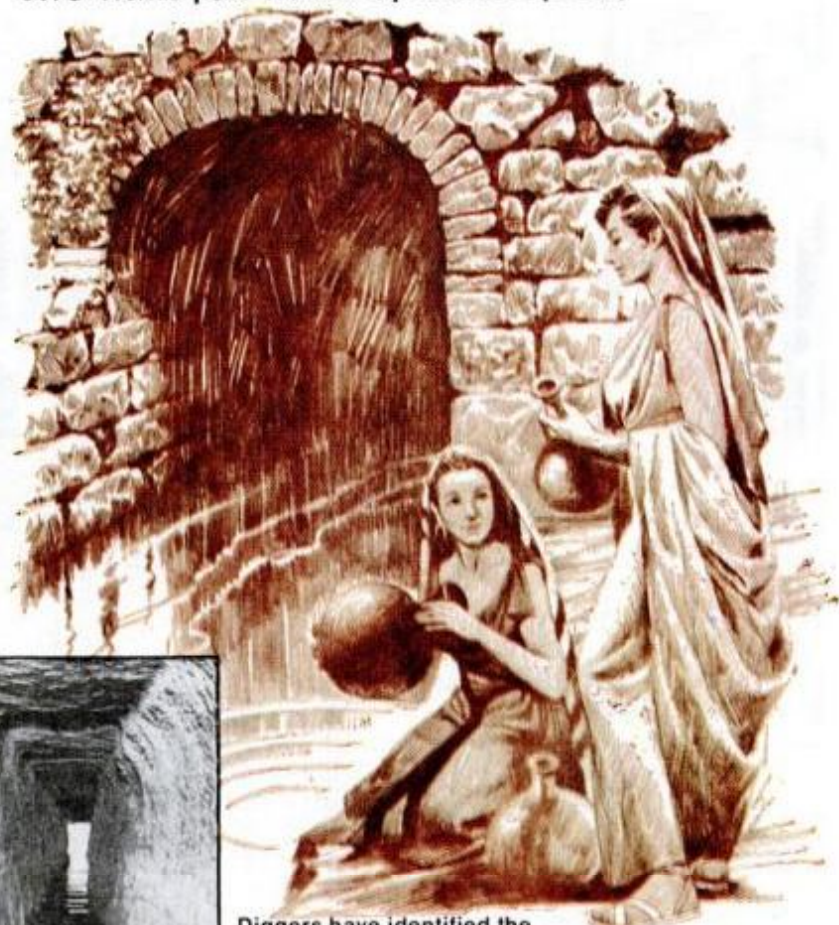
Genesis 30: 31; 26: 25
 and he (Abraham)...dugged this well, wherefor
 he called that place BEERSHEBA. and he (Isaac)
 builded an altar there,
 and called upon the
 name of the lord.

Archaeologists unearthed a well near Beersheba's gate—
 dating to time of patriarchs.
 Later it was confirmed as
 Abraham's by finding Isaac's
 altar as part of nearby wall.



Isaiah 22: 11

ye made also a channel between the
 two walls for water of the old pool.



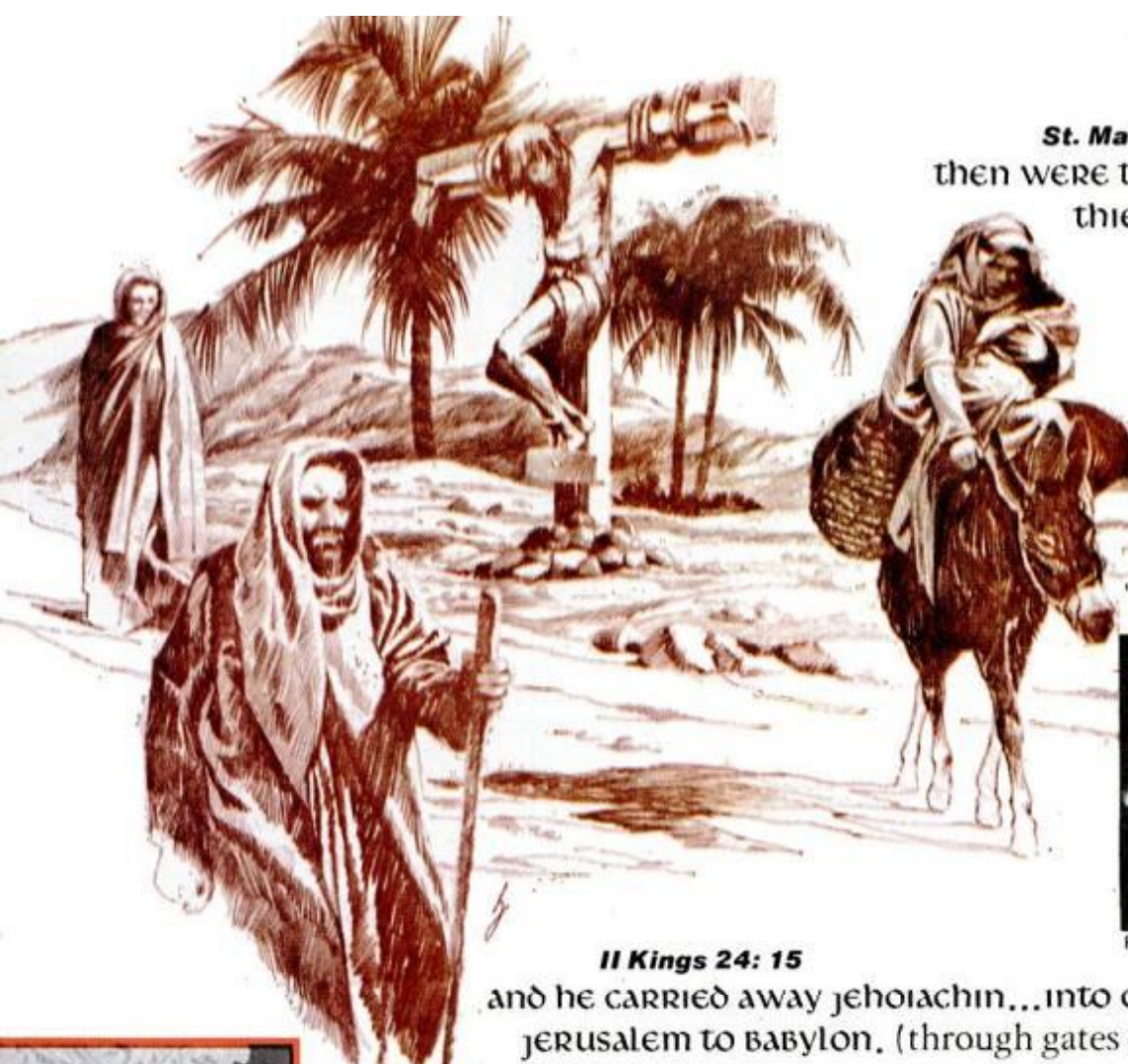
Diggers have identified the
 1760-foot water tunnel carved through rock by
 Hezekiah's engineers to funnel water to the
 Pool of Siloam inside Jerusalem and
 frustrate Sennacherib's invading armies.



removal from the bones when the body
 was taken down. Otherwise, the bones
 might have gone unnoticed.

The unique find is only one of many
 surprising discoveries now being made
 by archaeologists in the Holy Lands,
 throwing new light on Biblical history.
 The fact is that no archaeologist
 digger in the Middle East goes into
 the field without a Bible.

St. Matthew 27: 38
 then were there two
 thieves crucified....



Bent spike through heel bones found in a tomb near Jerusalem, dating to Herod's time, is first evidence of a crucifixion.



Photo: Hebrew University

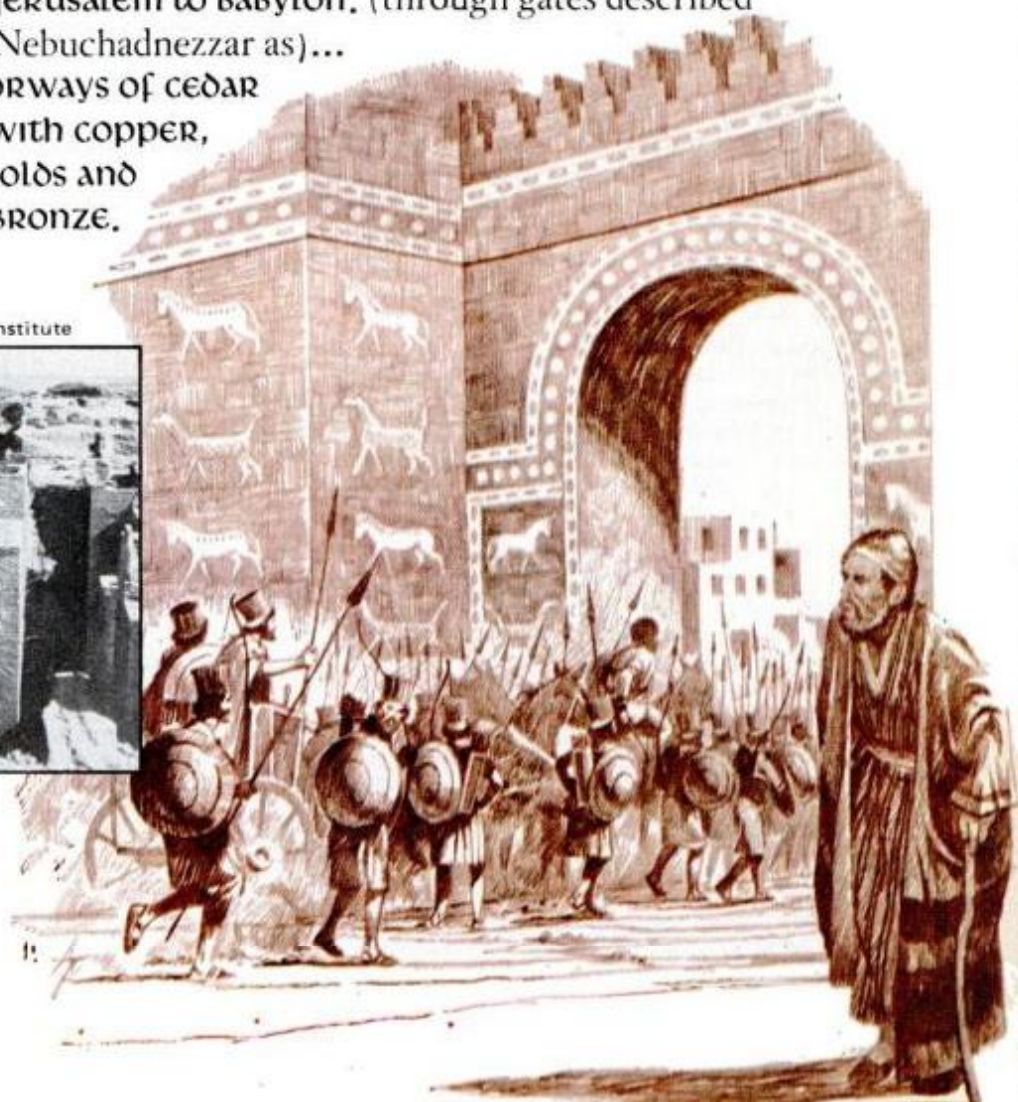
II Kings 24: 15
 and he carried away Jehoiachin... into captivity from
 Jerusalem to Babylon. (through gates described
 by Nebuchadnezzar as)...
 doorways of cedar
 covered with copper,
 thresholds and
 hinges of bronze.



Photo: Oriental Institute



Most outstanding archaeological find in Babylon was Nebuchadnezzar's double gate of Ishtar, boasting bulls and dragons in glazed brick on outer walls.



Many of their finds during the past 30 years have dramatically confirmed familiar Bible stories; others have proven some accounts in error. In a few cases, the evidence has served only to deepen mysteries.

Excavators have dreamed, for instance, of one day turning up solid evidence of Noah's Flood. In the late '40s, an aerial photo turned up show-



Ruins of gate discovered in Gezer's wall are identical to those attributed to Solomon in Jerusalem, Hazor and Meggido, confirming biblical accounts.

1 Kings 9: 15

and this is the reason of the levy which king solomon raised, for to build the house of the lord...and the wall of jerusalem, and hazor, and meggido, and gezer.

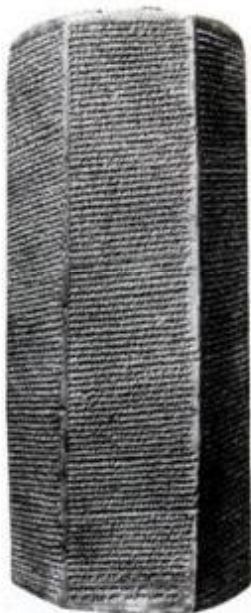
Job 38: 25-26

who built a sluice gate for the floodwaters, a path for the thunderstorm, to bring rain to no man's land, to the unpopulated desert?

II Kings 18: 14

return from me: that which thou puttest on me will I bear...and then hezekiah gave him all the silver that was found in the house of the lord, and all the treasures of the king's house...

Biblical account of Hezekiah's payoff to Sennacherib is borne out in identical detail on huge clay hexagon of 689 B.C., recording the Sennacherib campaigns. It was found in palace ruins at Nineveh.



Photos: L. Stager, (Oriental Institute).



In the northeastern Judean desert, irrigation systems for 7th century B.C. farms have been found. One of these systems could be the sluice that Job saw.

ing a shiplike outline on an inaccessible slope of Mount Ararat in Turkey. Archaeologists were excited for awhile, but no one ever seems able to probe the actual site. Political barriers have posed problems.

"People come back from the area with bits of ancient wood," says Dr. Lawrence Stager, associate professor of Syro-Palestinian archaeology at the University of Chicago's Oriental Institute. "But the chunks always date medieval—probably remains of old monasteries."

Deep in the ruins of Ur, in Mesopotamia some years ago, an expedi-

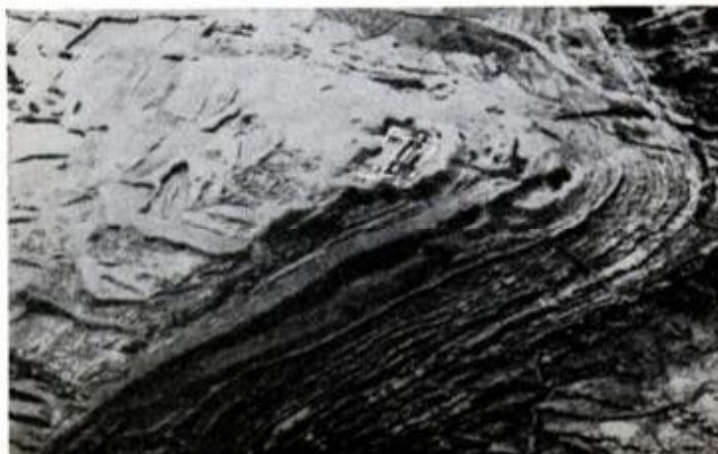
tion led by England's Sir Leonard Woolley hit an 8-foot layer of clay between two layers of ruins. Woolley sent an electrifying telegram to London: "We have found the flood!"

Since then, unhappily, no other such deposits have turned up in the same time frame. "Woolley probably hit a pothole," says Dr. Stager.

But many digs have indicated that there were scores of floods in ancient times throughout the Middle East. Moreover, texts on clay tablets, dat-

ing to 700 B.C., unearthed at Nineveh, retell an older Assyrian flood story that has a familiar ring. In it, a Babylonian named Utnapishtim describes how he built a ship, when the gods told him of a coming flood, and "... all that I had I loaded, of the seed of all living things, I brought into the ship my whole family and kinfolk; the cattle of the field, the beasts of the field, all craftsmen..." During a lull in the storm, Utnapishtim released birds—first a dove, which returned; later a raven, which did not. Soon after, the vessel grounded on Mount Nasir in Kurdistan.

Was Utnapishtim Noah? They may be related. Experts believe that, among the many floods in those times, probably one was so big it provided the basis for a story that



Recent digs in Ai, at Et Tell north of Jericho, reveal a small village settlement in Joshua's time, established on the ruins of a much older city 10 times as large.

Joshua 8: 1

and the lord said unto joshua...go up to ai: I have given unto thy hand the king of ai, and his people, and his city, and his land...



Among the newest tools used by archaeologists to isolate light artifacts like seeds is froth flotation. Seeds float to tank top, reveal economy and life style of the people.



Today the spade has given way to coring in order to probe the layers of time that a mound or a tell may have to offer.

found its way into the folklore of many cultures.

Among the great puzzles are the walls of Jericho. The Bible states that Joshua and his 40,000 followers circled the city six days while priests blew rams' horns. On the seventh:

The people shouted with a great shout . . . the wall fell down flat so that the people went up into the city, every man straight before him, and they took the city. Joshua 6: 20

According to archaeological evidence, it probably didn't happen. Excavations have disclosed that by Joshua's time (thought to be about 13th century B.C.) no walls were standing, and Jericho had been a ruin for a hundred years or more. No pottery or other sign of habitation appears in layers corresponding to Joshua's day.

Another mystery shrouds the Bible's account of Joshua's devastating attack on the newly rediscovered city of Ai, a dozen miles west of Jericho.

All the Israelites returned to Ai, and smote it with the edge of the sword. And so it was that all that fell that day, both of men and women, were twelve thousand, even all the men of Ai . . . and Joshua burnt Ai and made it an heap forever, even a desolation unto this day. Joshua 8: 24-28

The new excavations at Ai have turned up a rubble of ruins indicating that Egyptians totally destroyed it in 2400 B.C. Ai, the name used in the Bible story, means "The Ruin" in Hebrew. It remained a ruin until about 1220 B.C. when, says Professor Joseph Callaway of Southern Baptist Theological Seminary, "a settlement was founded on about 2.75 acres of the original 27-acre acropolis. This group," he says, "was part of an influx of newcomers who infiltrated the area and apparently met little or no resistance."

Does all this make the Bible a

collection of tall tales? No, say most archaeologists. Dr. Stager points out that it must be considered a theological book first, and a literary source rather than scientific. "It needs an outside check," he says.

In most cases, archives of kings of the time describe events that parallel the Bible closely. Such "checks," along with excavation, make the difference. "You have to remember,

Stager warns, "that the writers of the Bible had a religious purpose. You have to know what they were trying to say in a given passage at a given time."

In Joshua's case, many of his exploits described in the Bible are confirmed by archaeological evidence. Both Ai and Jericho fell, the Bible says, when Joshua and his people

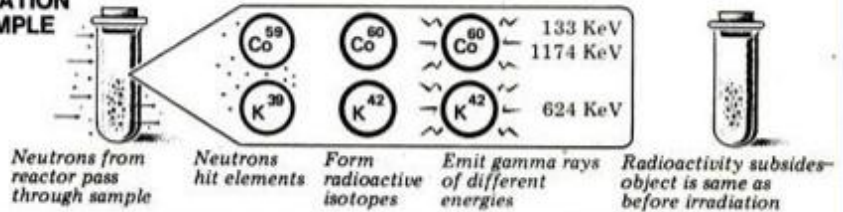
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NEUTRON ACTIVATION ANALYSIS

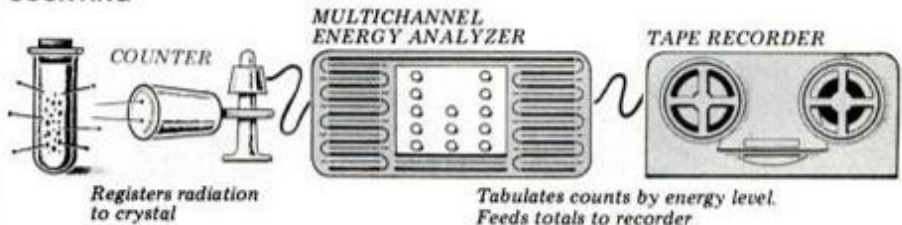
PREPARATION OF SAMPLE



IRRADIATION OF SAMPLE



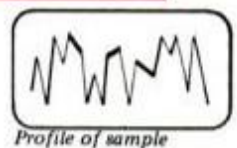
COUNTING



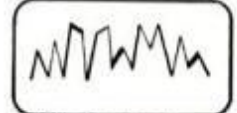
COMPUTING



Computer produces chemical profile of each sample and of related groups of samples



Profile of sample



Profile of related groups of samples

The seats closest to pit row are the best seats of all, and here's why.

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How to watch the pit-stop



A.J. Foyt whistles into pits as crew begins attack on car...

... car gets fresh tires, fuel ...



... as 25 gallons gush in, Foyt downs a drink ...

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ballet

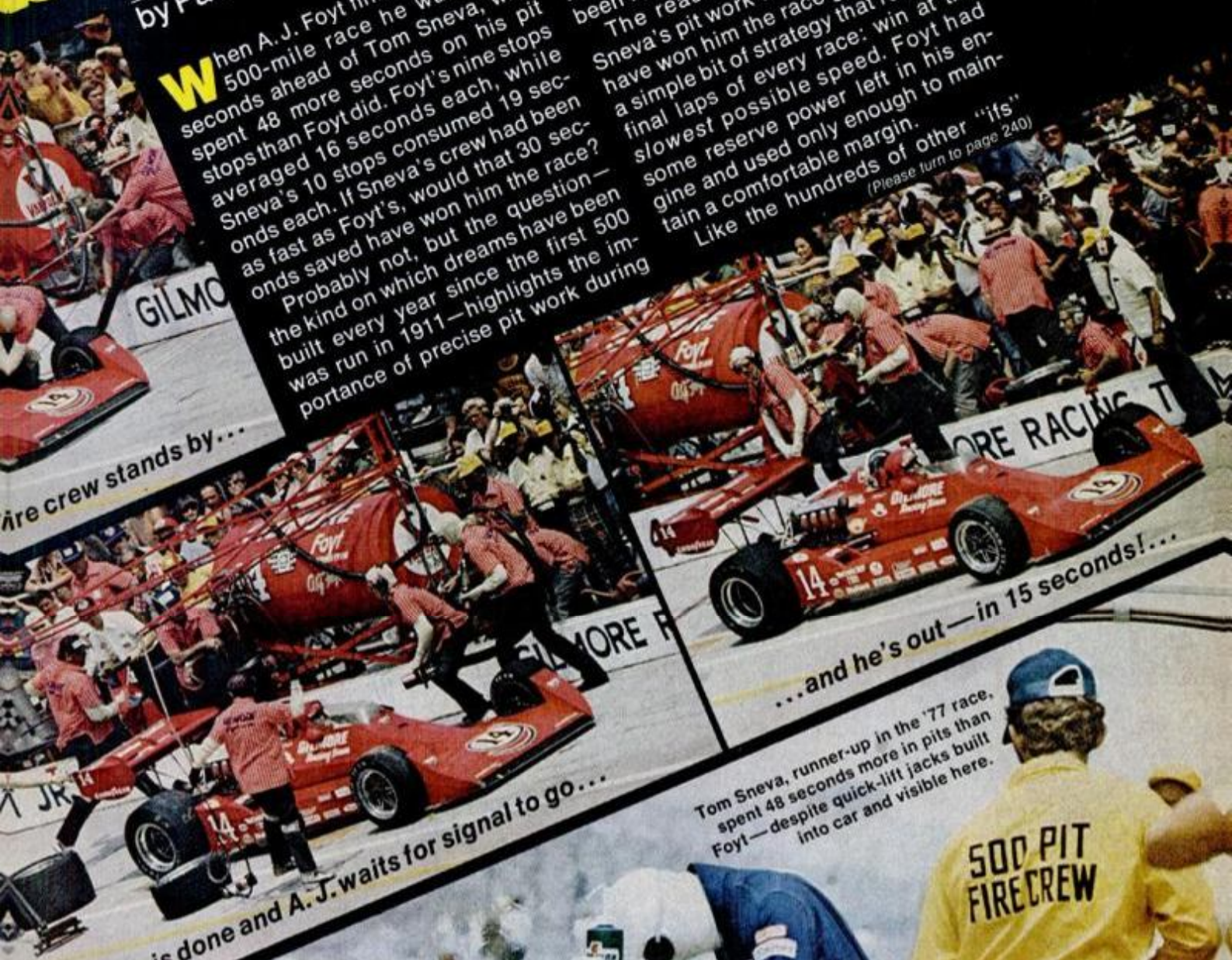
by Pack Bryan

When A. J. Foyt finished the 1977 500-mile race he was 28.63 seconds ahead of Tom Sneva, who spent 48 more seconds on his pit stops than Foyt did. Foyt's nine stops averaged 16 seconds each, while Sneva's 10 stops consumed 19 seconds each. If Sneva's crew had been as fast as Foyt's, would that 30 seconds saved have won him the race? Probably not, but the question—the kind on which dreams have been built every year since the first 500 was run in 1911—highlights the importance of precise pit work during the race. It is doubtful that many races are won in the pits but plenty have been lost there.

The reason an improvement in Sneva's pit work would probably not have won him the race goes back to a simple bit of strategy that rules the final laps of every race: win at the slowest possible speed. Foyt had some reserve power left in his engine and used only enough to maintain a comfortable margin. Like the hundreds of other "ifs"

(Please turn to page 240)

...fire crew stands by...



...and he's out—in 15 seconds!...

Tom Sneva, runner-up in the '77 race, spent 48 seconds more in pits than Foyt—despite quick-lift jacks built into car and visible here.

...the job is done and A. J. waits for signal to go...





After painting, polishing and tuning the pair of Mini-Indy II prototypes, designer Peter Stevenson trundled them to the Briggs Cunningham Automotive Museum in Costa Mesa, Calif., for trial runs. He had no trouble getting extra drivers from museum crew.



PM Art: Don Mannes

HOW TO ORDER PLANS

Complete plans are \$5; plans update alone, for modifying Mini-Indy I, \$7. Send check or money order to Mini-Indy II, Stevenson Publications, Box 584, Del Mar, Calif. 92014. Allow two to four weeks for third-class mail: add 75 cents for faster first class.

At the track, our new version got the same kind of reactions that the original did three years ago: Before driving it, "Gee, that's cute!" After driving it "Wow!" Performance is just about identical so you can race the old model against the new one, and you can carry two Indys in most station wagons.

Build PM's Mini-Indy II

Using ideas and suggestions that were sent in by builders of the popular Mini-Indy I, designer Peter Stevenson created this sleek updated version for 1978.

Since *Popular Mechanics* first introduced the Mini-Indy I back in August 1975, the little racers have been popping up coast to coast; from a parade down New York's Fifth Avenue to tracks in California. There are three solid reasons why more than 7000 PM readers joined the fun and built Mini-Indys of their own:

- It looks good. Trim lines with no clutter make this a downright handsome racer.
- It's simple. No welding is required

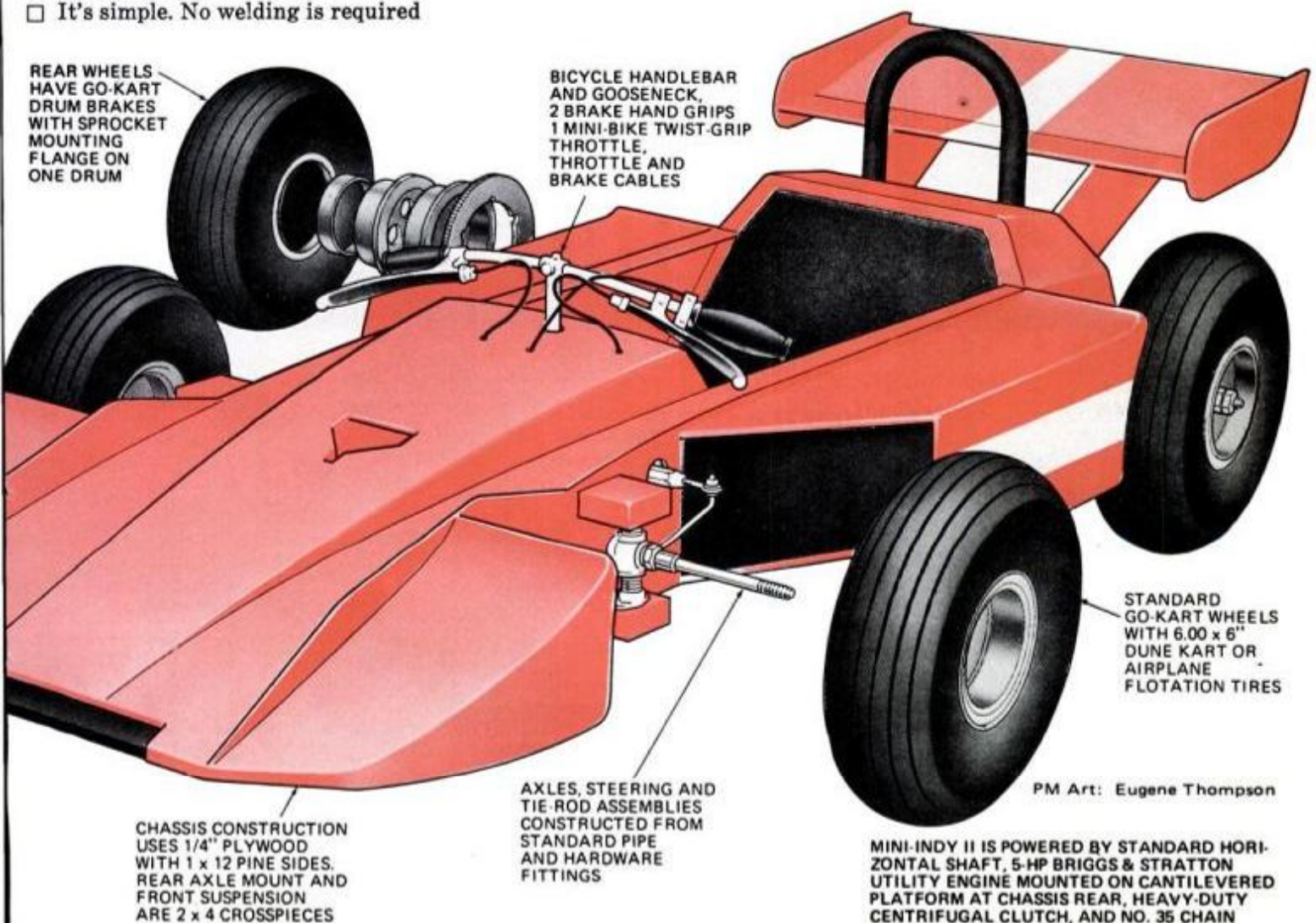
so construction is relatively easy.

□ It gives an honest-to-gosh racing performance.

Now, after several seasons of reader feedback, we're announcing the Mini-Indy II. This version incorporates many features developed by Mini-Indy I builders. A roll-bar adds to safe competition, along with the styling updates of sidetanks, and front wings (which double as nerfing

guards) to keep wheels from hopping in close competition.

The new features can be added to the original model—or you can build from scratch. Power still comes from the reliable Briggs & Stratton 5-hp lawnmower engine with speeds up to 40 mph (at 90 mpg). All controls are on the handlebar to give drivers of all sizes the fun of handling a racer. **PM**



REAR WHEELS HAVE GO-KART DRUM BRAKES WITH SPROCKET MOUNTING FLANGE ON ONE DRUM

BICYCLE HANDLEBAR AND GOOSENECK, 2 BRAKE HAND GRIPS 1 MINI-BIKE TWIST-GRIP THROTTLE, THROTTLE AND BRAKE CABLES

STANDARD GO-KART WHEELS WITH 6.00 x 6" DUNE KART OR AIRPLANE FLOTATION TIRES

CHASSIS CONSTRUCTION USES 1/4" PLYWOOD WITH 1 x 12 PINE SIDES. REAR AXLE MOUNT AND FRONT SUSPENSION ARE 2 x 4 CROSSPIECES

AXLES, STEERING AND TIE ROD ASSEMBLIES CONSTRUCTED FROM STANDARD PIPE AND HARDWARE FITTINGS

PM Art: Eugene Thompson

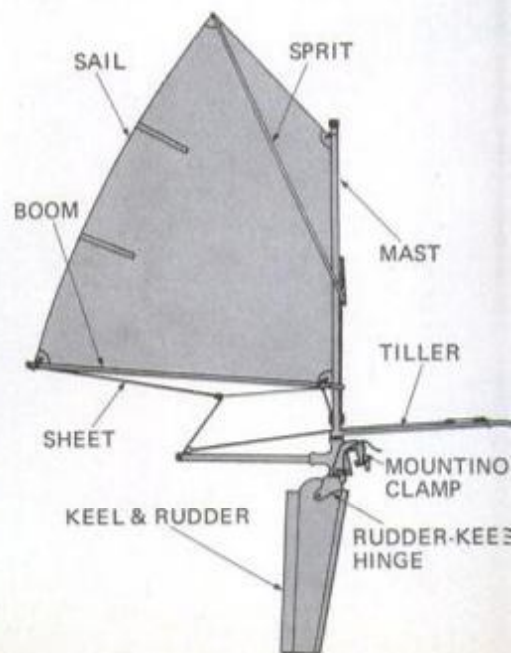
MINI-INDY II IS POWERED BY STANDARD HORIZONTAL SHAFT, 5-HP BRIGGS & STRATTON UTILITY ENGINE MOUNTED ON CANTILEVERED PLATFORM AT CHASSIS REAR, HEAVY-DUTY CENTRIFUGAL CLUTCH, AND NO. 35 CHAIN

A mini runabout of only 11½ feet overall, the Family Fun-A-Bout from Grayling Boats claims 36 mph using a 35-hp outboard motor.



New fun machines for

Skiffs, dinghies, even inflatables can be powered with this clamp-on sail outboard from Finnish Imports of Stamford, Conn.





spring

Design innovations in new leisure vehicles will get you there with more kicks and more comfort this year.

by Bill McKeown
OUTDOORS EDITOR

When you're heading for where the outdoor action is this year, the latest in vehicular innovations can add to the enjoyment. Some rigs change with the seasons to handle snow or sod. Others provide more speed or sport for your money, or cost less because you assemble them yourself. Smaller fun machines use less gas; some none at all.

Wind power

Take a new invention from Finland called the Outboard Sail.

For action afloat

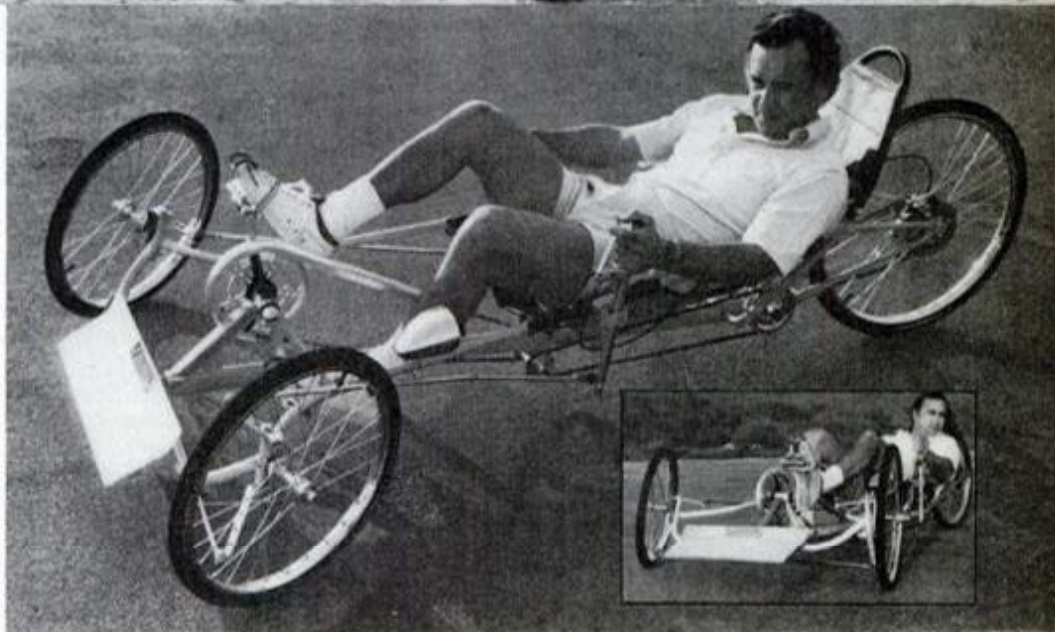


Comfort plus performance of 49 mph combine in the new Hammond deep-V El Dorado Elite V-1950 with an OMC 235 stern drive, a 19-footer designed for sporty style.

For action ashore



Comfortable four-wheel-drive ride is the claim by Pathfinder Equipment for its stubby Dodge Van Charger.



Lying down on the job is just one feature of the MASA Slingshot, an 8-foot, 55-pound trike with five-speed derailleur shifting and disc brakes.

For action ashore



Carry-Boose, a snowmobile trailer from Bombardier, maker of Ski-Doo and Moto-Ski, can change with weather by adding a set of wheels for towing behind a garden tractor or removing them to become rooftop luggage carrier. It's black or yellow.

Clamped on your boat's transom like a kicker, rather than forward where a sail would seem to belong, the contrivance combines keel and rudder in one stabilizing dagger board that hinges up for shallow going. About 39 square feet of sprit sail top it, and the whole 25-pound rig can be fastened on any small boat that can handle a five-horse outboard. First cost of \$395 is also the last, since you'll never need to buy fuel for it. Finnish Imports, 168 High Line Trail, Stamford, Conn. 06902, is the source.

Water speed

Runabouts are being set up for more miles per hour, style and comfort. Twin forward windscreens are a feature of the compact Family Fun-a-Bout, an 11-foot 4-inch model from Grayline Boats, 1030 River Terrace Drive, Bloomington, Minn. 55431. It can handle up to 35 hp for speeds up to 36 mph.

Stern-drive push of 235 hp aboard a new Hammond 19-foot El Dorado Elite produces a sporty average speed of 49 mph as checked by radar speed gun (48), calibrated racing speedometer (49), and stock speedometer (50). Upholstered bow-rider designs cushioned for forward cockpit com-

Off-season snowmobiling is possible with \$800 Scranton Mfg. SK-365 for conversion to year-round use.



fort are available in I/O and outboard styles from the Austin, Tex., builder.

And the flashy swift look of a custom West Coast skiboat (no photo) is now available in a stock production model, the Firestar 17 from Starcraft, Goshen, Ind. It comes with a rating for up to 150 outboard horses, or with a 330 Hardin inboard, chrome stacks and all, spinning a Jacuzzi or Berkeley water jet pump.

Pedal power

You can't call it a bicycle. Maybe it's a tricycle going backward. But the new Slingshot, from MASA, 20100 Plummer St., Chatsworth, Calif. 91311, is a lot of fun to crawl aboard, lie down on and drive, according to our test pedaler, Bruno Michetti. Getting set to steer, he found, was like strapping into a drag racer.

It weighs just under 55 pounds, has an overall length of eight feet, width of three and a half feet and height of two, so you may need more than a narrow, winding bicycle path for safe transit. But disc brakes, five-speed derailleur shifting and three-phase chain drive provide good performance on paved roads or other suitable surfaces. Don't spend \$595 on one for the kids, however, until they've grown to be five-foot-five. Since the reclining seat position is not adjustable, they'll need at least that height to take full leg strokes.

What would the designer Dr. Porsche have come up with if he had created a bicycle instead of the Volkswagen beetle and Porsche cars? A hint is available from his great-grandson with the Austrian Porsche

Design Group. They have worked out and wind-tunnel tested a new approach that may be produced shortly by Austro-Daimler Bicycles and imported by Steyr Daimler Puch of America, moped distributors.

The modular frame of the bike (not shown) is of synthetic honeycomb construction, has all cables encased in an exterior shell of high-tensile plastic, and should weigh about 20 pounds. You push down on your saddle seat to inflate your tires, that's the kind of creative thinking involved. Speed—and price—are expected to equal those of other high-performance bikes once this new model is available.

Special vehicles

Instead of putting the snowmobile away in storage for the summer, you can now use it 365 days a year. So say the makers of the SK-365 four-wheel conversion kit. Initial installation is reported to take a back-yard mechanic a few hours, but once that is done you can switch back and forth between skis and wheels in less than one hour. Wide wheelbase, coil-spring suspension and rear stabilizer smooth out the ride, and the adjustable-length chassis provides a fit for almost all makes of snowmos. Quick or slow steering can be adjusted. Name of the nearest dealer handling the \$800 kit is available from Scranton Manufacturing, Box 336, Scranton, Iowa 51462.

For a snowmobile luggage-tow trailer that can be converted from skis to wheels, there is the Carry-Boose, from Bombardier, for its Ski-Doo and Moto-Ski machines. Hitch it to a lawn or garden tractor in warm weather, using the wheels available,

For overnight camping



Canvas camper enclosures this year can completely shut in Harris Flote-Bote pontoon open-deck craft for privacy, weather protection.



Outboard motor or stern drive push Steury's 23-foot T523 five-sleeper afloat; 8-foot beam allows trailering ashore.



With a roll-out rear double bed for additional accommodations, the new lightweight Apache-Lite 16 sleeps six.

or take them off and you have an enclosable cartop carrier. The \$140 Carry-Boose weighs 55 pounds and has 10 cubic feet of capacity. Dealer names can be provided by Bombardier Corp., Duluth, Minn., or Valcourt, Quebec, Canada.

Camp rigs

For off-road and van fans, Pathfinder Equipment, of Lake St. Louis, Mo., and San Gabriel, Calif., is supplying its dealers with a new four-wheel-drive Dodge B-300 Van Charger, claimed to be shorter overall, at 176 inches, than the Blazer, Ram Charger or new Bronco. With a 109-inch wheel base, it is said to deliver a more comfortable ride than other utility vehicles in its field.

Smaller cars are likely to start a

trend to smaller and lighter trailers, and already several RV builders have figured ways to bulge the walls and get more accommodations into a small space. Vesely Co. of Lapeer, Mich., maker of Apache and Empire units, has engineered a roll-out double bed and swing-up side wall for the new Apache-Lite 16-foot travel trailer. Sandwich paneling holds the weight down to 1850 pounds. Vanguard Industries, Colon, Mich., combines soft and hardwall construction called "Fold-A-Wall" for its camping trailer, Palomino Stallion XL, with fabric extensions at each end to sleep seven.

Boat builders, also, are making small hulls hold more. Open deck models from Harris Flote-Bote, Fort Wayne, Ind., can add Camper Enclo-

tures this year that zip up a pontoon craft into a cabin cruiser with walls of marine vinyl fabric. Bugs and rain are kept out, and bunks, galley and head can be set up inside.

Steury Boats, Goshen, Ind., has a compact 23-foot T523 five-sleeper houseboat that takes outboard or stern-drive power. Most convenient dimension of the compact packet, however, is its eight-foot beam. This means the boat tows along highways without a special permit, and can even become a travel trailer for use in campgrounds.

Any similar trailerable boat, in fact, can do double duty as a land-based RV, particularly if it can be enclosed for privacy and has bunks and a holding tank. You can sleep afloat or ashore.

FM

It stands seven stories tall and looks like an upside-down eggbeater. It's a windmill—more technically, a wind turbine—but it bears little resemblance to the old-fashioned fan-like affairs you can still see rusting in some rural farmyards. This modern giant (see photos below) is one of a number of experimental designs being developed for the U.S. Department of Energy

(formerly ERDA) in an attempt to harness windpower as a large-scale, practical energy source in the face of rapidly dwindling fossil fuels.

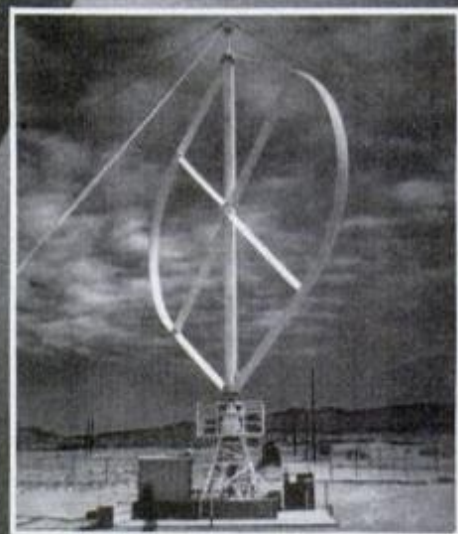
Unlike traditional windmills, the eggbeater type, currently under test by Sandia Laboratories in Albuquerque, N.M., uses a vertical-axis shaft with curved rotor blades attached at the top and bottom. The blades spin in the wind, acting as a turbine to

drive a generator that produces electricity. Another giant wind machine is NASA's Mod-O (for Model O) shown in the photo and diagram on the facing page. Towering 100 feet high, it follows the more conventional horizontal-axis approach, but has a single, propeller-like rotor spanning a colossal 125 feet. Like Sandia's eggbeater, it turns a generator to produce electricity. Both machines

Coming: Super windmills for super power

Harnessing windpower looks promising but hasn't been a breeze. Here's the good news—and bad—about this vast new energy source.

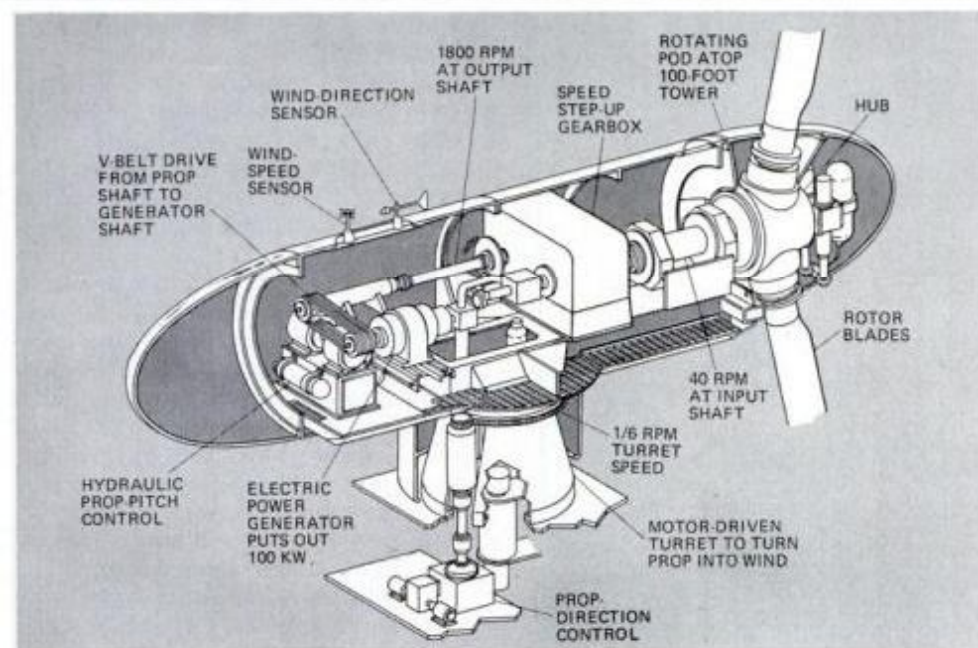
by Victor D. Chase



One of newest windmill designs is vertical-axis "eggbeater" turbine. Its big advantage: It requires no device to keep it facing into the wind. Seven stories tall, this experimental giant is being tested by Sandia Labs for U.S. Department of Energy. Coupled to a generator, it can produce up to 60 kilowatts of electric power.



Simple tail-aimed Dunlite windmill is made in Australia and sold here by several U.S. companies. It has electrical output of 2 kilowatts in 25-mph wind.



ergy Projects Office in Cleveland, "It doesn't pay to try to catch the energy in wind speeds of 5 to 7 miles per hour. By the same token, in 40-mile-per-hour winds, there's enormous power, but it occurs so infrequently that there is little there. It doesn't make sense to add the cost of having to stand that additional stress."

And speaking of stress, consider that a wind-turbine generator operates on an average of twice the number of hours in a single year as an automobile generator does in a 100,000-mile lifetime. Building a machine to withstand such punishment is costly, and high cost in relation to relatively meager electrical output is the big bugaboo of modern windmills.

Big blow but little show

When you realize that it takes a windmill rotor some 16 feet in diameter to extract a mere 2 kilowatts of electrical energy from a 20-mph wind—which doesn't occur too often—you begin to get an idea of what must be done to produce electrical power on a realistic basis. NASA's mighty Mod-O, built at a cost approaching \$1 million, puts out 100 kilowatts (100,000 watts)—which sounds impressive until you learn that this is just about enough to satisfy the electrical needs of 30 typical residential homes. It obviously wouldn't pay to build a million-dollar powerplant for one street of 30 houses.

Electrical rates to the consumer would also be prohibitively high under current WECS technology. One study puts the average price of wind-generated electricity at a staggering 15.4 cents per kilowatt-hour (kwh), compared to the present national average of 4 cents per kwh. Nobody is

Resembling a great-winged bird poised for flight, rotor on NASA's Mod-O wind turbine spans on incredible 125 feet (photo above). The test installation, near Sandusky, Ohio, is one of world's largest,

has electrical output of 100 kilowatts. A 200-kilowatt version, the Mod-OA, is now operating at Clayton, N.M. Drawing shows streamlined pod on motorized turret that keeps blades facing wind.

spin out healthy amounts of power, though not enough as yet to be commercially practical.

The woes of windmills

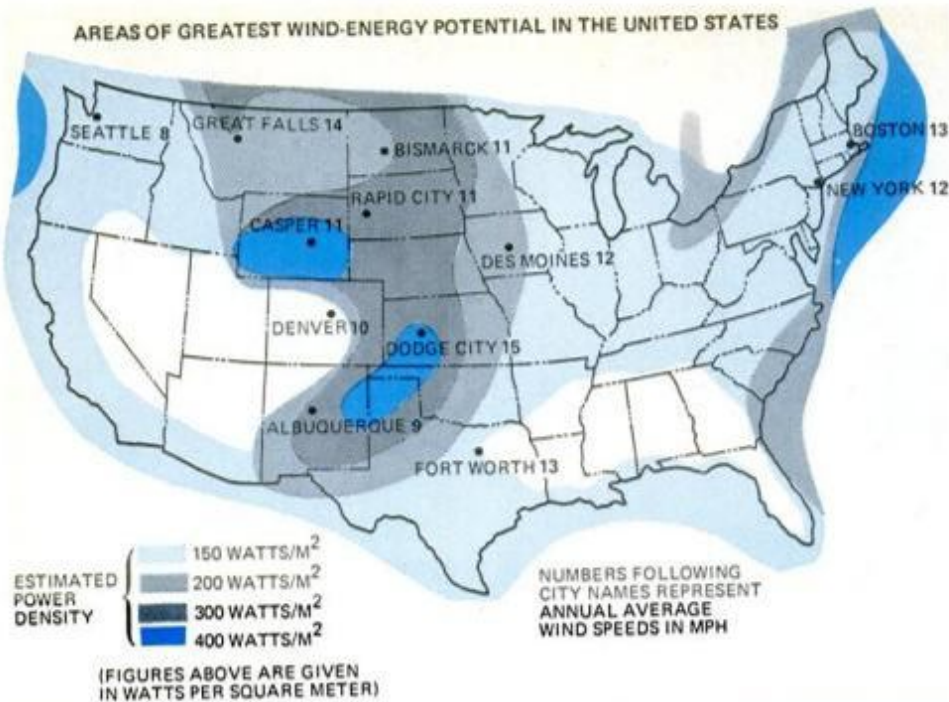
Windmills were used for centuries to grind grain, pump water, saw wood and even produce small amounts of electricity until the advent of the steam engine and rural electrification turned them into abandoned hulks. Now, scientists striving to revive the use of windpower are finding their job is no breeze. Windmills—known in laboratory lingo as WECS for "Wind Energy Conversion Systems"—pose special problems and requirements. First they need wind, which doesn't always blow when and where you want it to. A

glance at the map on the following page shows that the areas of greatest wind-energy potential in the United States are somewhat limited, lying mainly in the west-central Great Plains and the coastal regions of the Northeast and Northwest.

Not just any wind will do either. For efficiency, prevailing winds must be steady and moderate, neither too weak nor too strong. Ironically, high winds can be as bad as no wind simply because a wind machine can be damaged or destroyed by the very force that makes it work—a powerful gust can shear off a rotor blade or blow down the whole structure, as has happened in a number of cases.

According to Ronald Thomas, deputy manager of NASA's Wind En-

AREAS OF GREATEST WIND-ENERGY POTENTIAL IN THE UNITED STATES



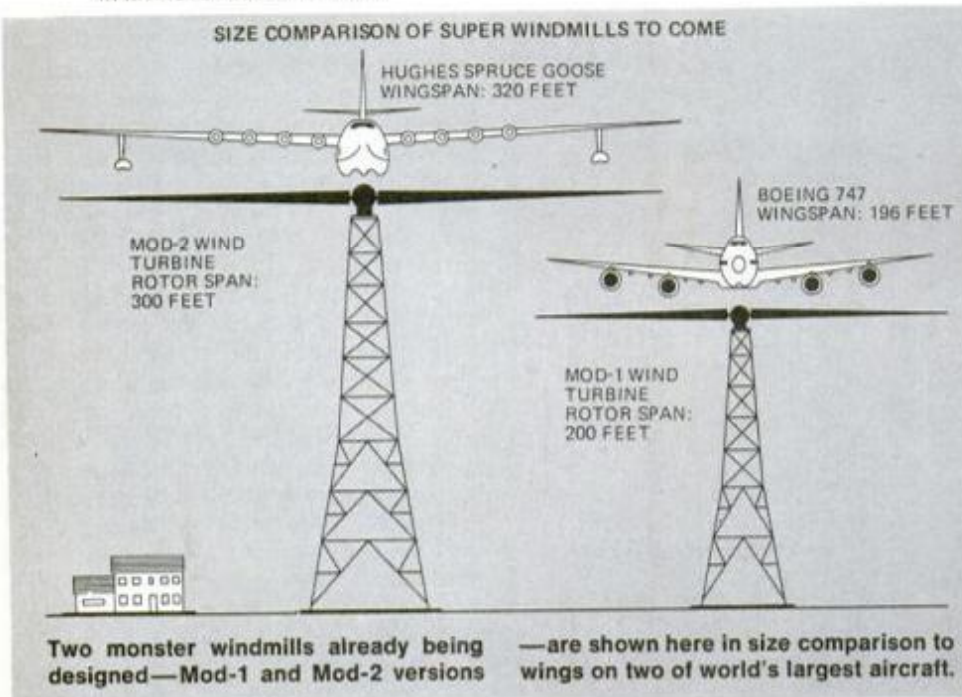
going to be happy about paying that kind of money.

On the brighter side

Despite these gloomy prospects, windpower does hold promise. Like solar energy, it is pollution-free and plentiful—at least plentiful enough at certain times and places to make it worth reaping. It has been estimated that there is an available wind-energy supply of 1070 billion kwh per year in the continental United States, or about 14 percent of the projected power demand by the year 2000. The catch is that it would take some 313,500 powerful wind turbines to capture this energy, and no one believes anything like this number could be operating even by the turn of the century.

A more realistic estimate is that windpower might be able to provide up to about 7 percent of the projected demand. While this may not seem like much, it, along with other forms of alternate energy such as solar power, could make a substantial contribution when the crunch hits.

One advantage windpower has over solar power is that it is not restricted to daytime operation or sunny weather. Winds blow night and day, around the clock, in good weather or bad. Another intriguing feature of windpower lies in the peculiarity of its mathematics. Extractable energy is proportional to wind velocity *cubed* (multiplied by itself twice). This means that a small increase in wind speed can result in a very large increase in wind energy. It is possible, for example, to capture eight times more power at a wind velocity of 16 mph than at 8 mph. The significance of this is that a seemingly mild breeze—if sure and steady—could be highly productive.



Superstars of windpower

There is no doubt that windmills can be made to work. The big questions today are how much power can you get in how much wind for how much money? In other words, at what point does a wind machine make economic sense?

The name of the game has been to develop machines that are cheap enough, efficient enough and durable enough to compete with conventionally produced electrical power. So far, this hasn't been easy, but scientists are taking giant steps—literally—toward developing what may eventually prove to be the game-winning superstars of windpower technology.

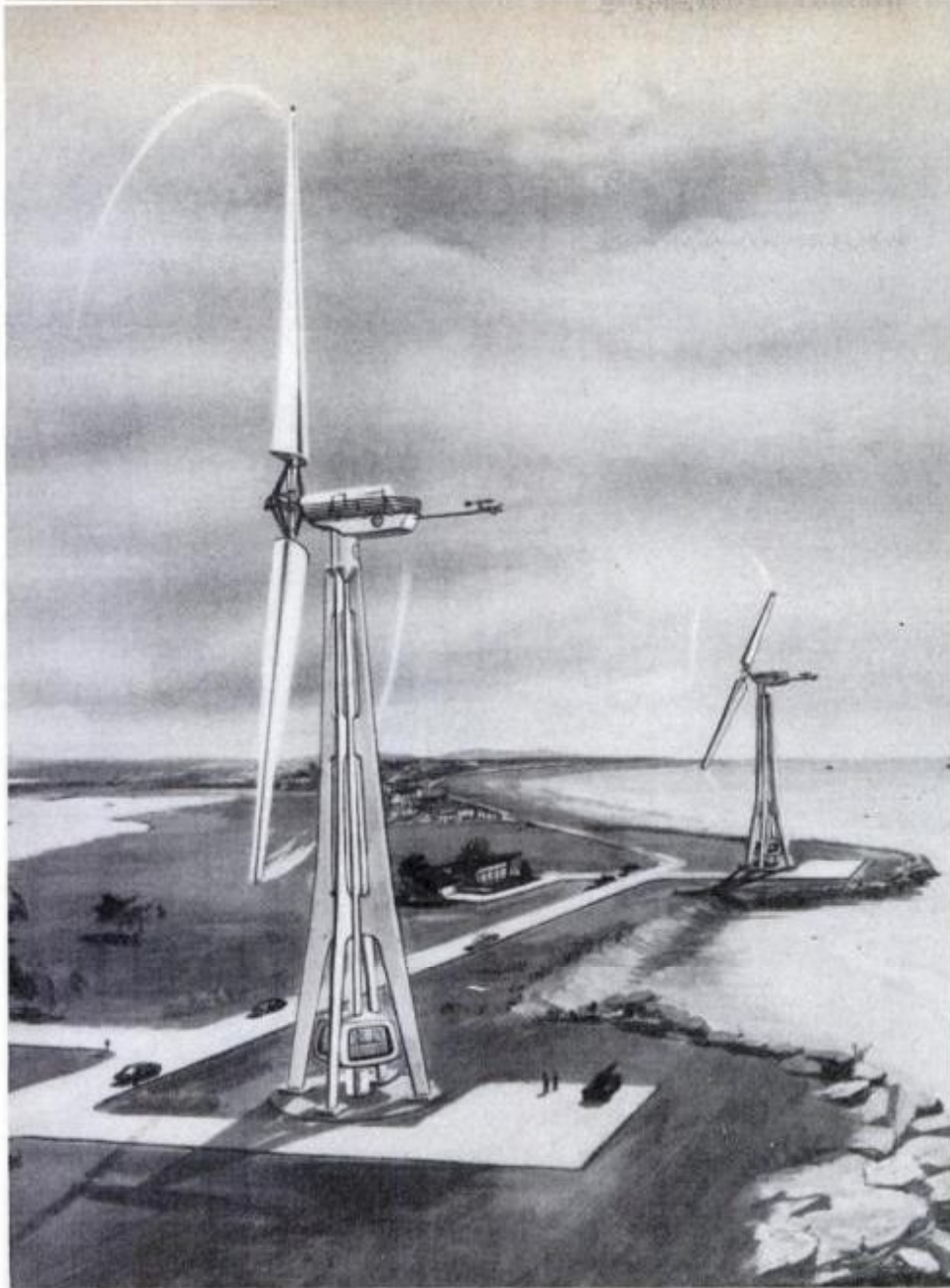
While the emphasis has been on larger and larger windmills, the Department of Energy is by no means neglecting small machines. It maintains a special test site at Golden



Grumman's Windstream-25 is one of several commercially available windmills designed for private use. It has a rated output of 15 kilowatts in 26-mph wind.



Built in 1940s, Smith-Putnam giant near Rutland, Vt., still holds record as largest windmill in world. It had 175-foot rotor, was damaged in storm and abandoned.



Art concept shows how windmills may dot barren, wind-swept shores where energy

potential is high. Such "windmill farms" could feed substantial power to utilities.

Colo., to study small-scale windmills that could supply supplementary power to individual homes (see listing at the end of this article for sources of further information on commercially available windmill generators for home or small-business use).

The bigger, the better

It works out, however, that—within reasonable limits—the bigger you make a windmill, the more efficient it is. This is due to another quirk in the mathematics of windpower: Available wind energy increases in proportion to the *square* of the rotor diameter. Thus a 100-foot rotor puts out *four times* as much power as a 50-foot rotor. Or, to turn it around, it would take four 50-foot windmills to turn out the same amount of power as one 100-footer.

The implication of this is obvious: If you're going to build a windmill,

you might just as well make it big—it will cost you much less in the long run, kilowatt for kilowatt, than building a lot of little windmills. This is why windmills of the future will almost certainly be super giants like NASA's 100-foot-tall Mod-O and Sandia's seven-story "eggbeater."

Already, NASA has improved the efficiency of its Mod-O in an updated version called the Mod-OA, recently installed on the wind-swept flatlands near Clayton, N.M. Although of the same general size and design as the Mod-O, the newer Mod-OA puts out 200 kilowatts of electricity—twice as much as its predecessor.

While still short of providing total community power, the Mod-OA is expected to share a sizable portion of Clayton's energy load. A small, isolated town of 3000, Clayton has previously had to rely solely on scarce and costly gas and oil. Two more Mod-OAs are scheduled to go up



Rim-driven generator is feature of "bi-cycle windmill" under study at Oklahoma State University. Rotor is shaped like a bicycle wheel with rim connecting blade tips. Advantage: Rim travels much faster than hub, drives generator at high speed.

later this year, one on Block Island, R.I., and one on Culebra Island, Puerto Rico—both remote, windy locations ideally suited to the use of wind-generated electric power.

World's biggest windmill

Mod-O and Mod-OA are currently the world's largest operating windmills—but there was one even bigger. This was the gigantic Smith-Putnam machine built just prior to World War II on a hill known as Grandpa's Knob near Rutland, Vt. It swung a mammoth 175-foot-long rotor and managed to crank out an incredible 1250 kilowatts of power—proving that windmills *can* produce useful amounts of electrical energy.

Unfortunately, a rotor blade broke off in a storm and, because of wartime conditions, was never replaced. After the war, fossil fuels were abundant, electricity was cheap, and the Smith-Putnam project was abandoned.

Sophisticated engineering

Early windmills consisted, for the most part, of small, multibladed, pivoted rotors that required a tail fin to keep them "weathervaning" into the wind. They also faced the wind with the rotor on the "upwind" side of the supporting tower.

Today's wind turbines of the Mod-O and Mod-OA type incorporate vastly more sophisticated engineering. They require no tail and face "downwind"—that is, their rotor is located behind the tower instead of in front of it. This keeps the long, thin, highly flexible rotor blades from being blown into the tower structure, as might occur if the traditional upwind arrangement were used.

The rotor is mounted on a revolving
(Please turn to page 286)

In-dash CB: Lots of new choices and a chance for a bargain

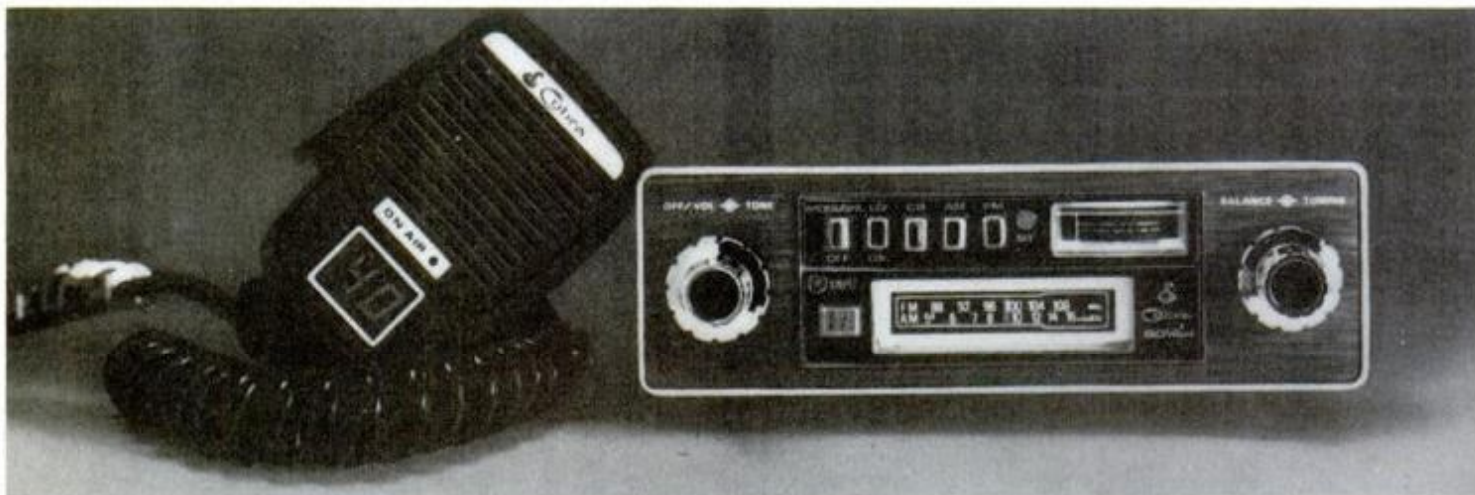
You can get CB or CB-plus-entertainment in a neat package that looks like original equipment, helps to discourage thieves.

by Meredith Schultz

If you've been thinking of getting into CB, or contemplating an equipment upgrade, this may be a good time for you to act. As CB becomes more and more a utility, the telephone of the highways, it's getting easier to get what you want in a CB transceiver without cluttering your car or risking instant ripoff.

There's been a decline in CB thefts, which should continue as transceivers approach the one-in-every-car level. Part of the reason for fewer thefts is better mountings, which hold transceivers in the dash or completely concealed, combined with hidden antennas.

The new in-dash units, especially, offer attractive combinations of 40-



Cobra 50XLR combines CB with AM/FM stereo, cassette tape. Channel selector, readout, squelch are on mike for easy operation.



Kraco KCB-4095 is designed for in-dash or under-dash mounting, also includes AM/FM stereo and cassette in one unit.



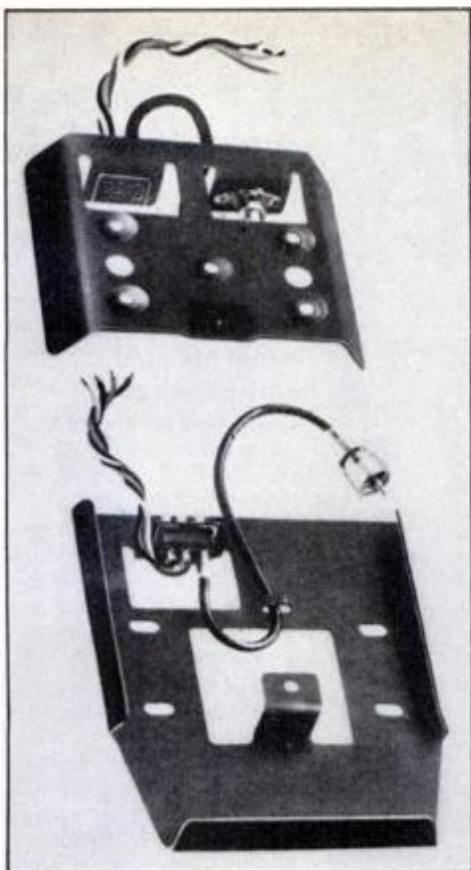
It's CB only, but SBE's Sidebander V is a sophisticated SSB unit that has channel scanning and Channel-9 access.



Monitor feature on Panasonic CR-B4700 interrupts AM or FM stereo radio whenever there's a signal on channel you've chosen.



Motorola CT950AX has pushbutton AM/FM stereo tuning, 8-track player, standby switch for monitoring CB with radio or tape on.



Snap-in, snap-out slide mount, \$15.95 from GTE Sylvania, lets you take your CB set indoors or lock it in the trunk—but you must not forget to do so.

channel CB capability with good looks. You can also get CB with radio, or CB with radio and tape for a compact communications-music center—or go to single-sideband CB, with the equivalent of 120 channels.

Some combo units also offer special features like an automatic interruption of music for calls on Channel 9 (the national emergency channel) or your local traffic channel.

The new in-dash transceivers or transceiver combos look a lot like original-equipment car radios and are difficult for thieves to spot. Also they take time to remove. A pro might take the time, but the grab-and-run artists—by far the bigger threat—will look for much easier targets.

In addition to the units shown opposite, there are classy in-dash CB-only rigs from Tram/Diamond, and more music combos, like Teaberry's TBR-640 CB/AM/FM-stereo set and Craig's L630, which combines CB with AM/FM-stereo and eight-track tape. The Craig unit matches the virtues of other in-dash combos with those of concealable transceivers—it puts CB controls on the microphone, leaving a relatively plain-looking panel in the dash.

Despite their advantages, in-dash rigs are not selling well in all parts of the country. For this reason, you may be able to find a good buy on a

Concealed transceivers like Kraco KCB-4060, at right, Radio Shack One-Hander and Cobra 62XLR are another approach to CB security. All controls and indicators are on the microphone, which you can pocket or stash in the glove compartment when you leave your car unattended.



Tunable receiver lets you concentrate on your area's traffic channel.



Less expensive receiver gets all 40 channels at once, clips to windshield visor.

set that offers the communications and entertainment functions you want.

Prices for in-dash units range from about \$100 for AM/CB only to \$400 and more for combos that do practically everything but drive the car for you.

If you're shopping for a new car, you'll find that auto dealers are offering a variety of in-dash CB's and CB-entertainment combos. Shop judiciously; it may be possible to get what you want for less by adding it after you buy the car.

Other ways to go

If you have reason to be concerned about the places you and your car are likely to visit, you may want still more security for your CB. There are several alternatives.

You can keep the rig in a slide-mount bracket under your dash. When you park the car, disconnect the CB and its antenna lead, slide it out and either take it with you or lock it in your trunk. Some users don't even bother with the bracket—they leave the transceiver on the seat beside them. The thing is, the set *must* be removed every time you leave the car, even if just for a moment or two.

Another approach to high security is a concealed transceiver, mounted up under the dash, under the seat or

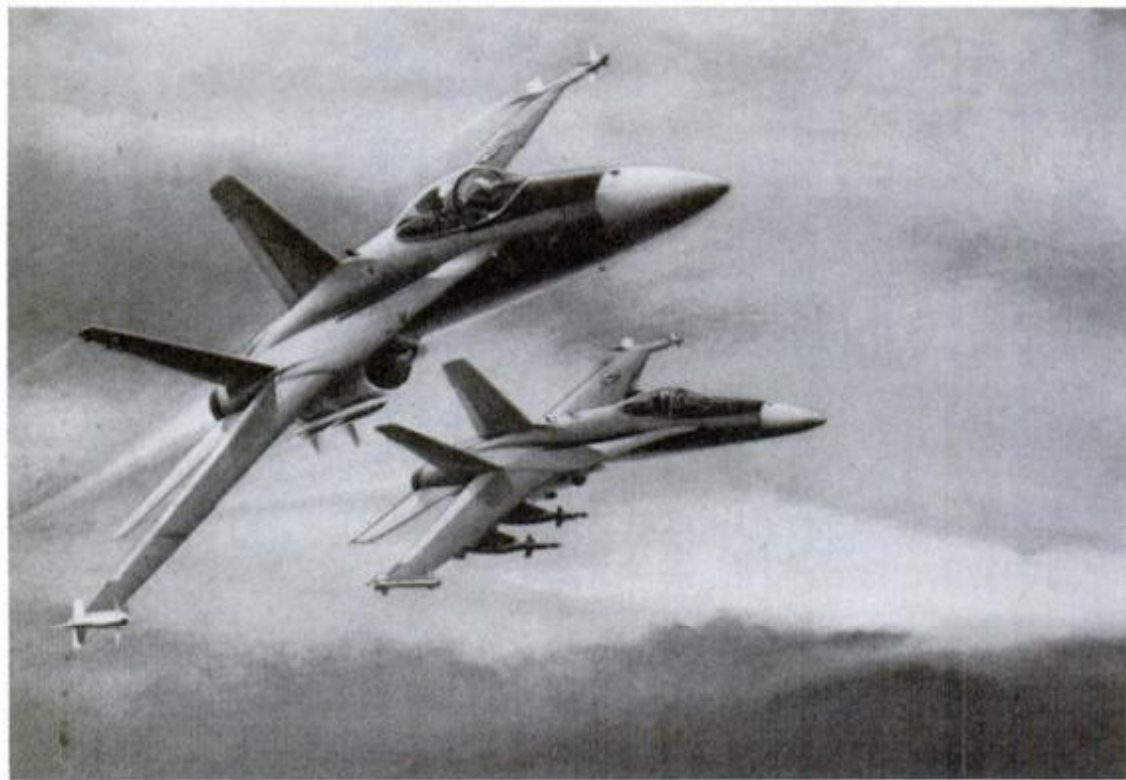
even in the trunk, with all controls right on the microphone. One-hand operation may also be less distracting—and thus help keep your driving safer—than reaching down or over to controls.

Do you really want to talk on CB, or is it enough just to monitor Channel 9 or the channel that carries the traffic-and-Smokies calls in the area? Then you don't need a transceiver at all, and needn't worry about a license or about installation as such. You can just get a receiver and save some cash.

The two CB receivers shown above, made by Randix Industries Ltd., both clip to the sun visor, and each comes with a foil antenna you can put up across the inside of the windshield. The nontunable model, which gives you the strongest signal on any of the 40 channels, sells for \$8.95; the tunable version, which allows selective monitoring and cuts out idle chatter, is \$12.88; with a gutter-clip antenna included, respective prices of the receivers are \$16.95 and \$19.95.

The CB industry has been going through financial turmoil. For the consumer, it can mean real buys on closeouts or excess inventory. But since some manufacturers have been in real trouble, you should try to pick one who will be there when your rig needs service. **FM**

IT'S NEW NOW



Hornet for dual flight-attack role

Designed to replace the F-4 Phantom and A-7 Corsair, the F-18 Hornet is slated for duty with the Navy and Marine Corps through the '80s. It will have a dual role of fighter escort and attack plane. The single-seat, twin-jet Hornet will have a top speed of better than Mach 1.8, a combat radius of over 400 miles and a ceiling of 50,000 feet. It reportedly will be easier to maintain than its predecessors, with only 20 minutes required to change an engine. For close combat, the F-18 will be armed with Sidewinder missiles and a cannon; for beyond visual range, it will wield the Sparrow radar-guided missile. The first Hornet is slated to be test flown later this year.

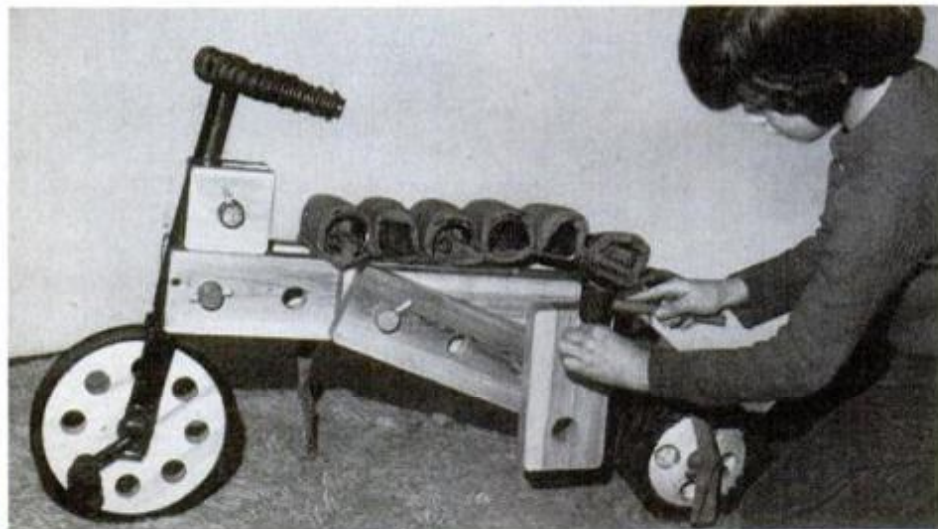
This set lets child build his own toys

The Nico System is a wooden toy construction set from Belgium that uses peg and hole connectors. Each set contains 20 structural pieces, three wooden wheels and a metal bar. The tricycle shown is one of 10 possible configurations that can be made with the basic kit. Additional pieces can be purchased to expand the number of toys that can be built. The set is considered safe because of the lack of nails and screws; a small wooden mallet is used to drive in the pegs. Toy may be available here soon.



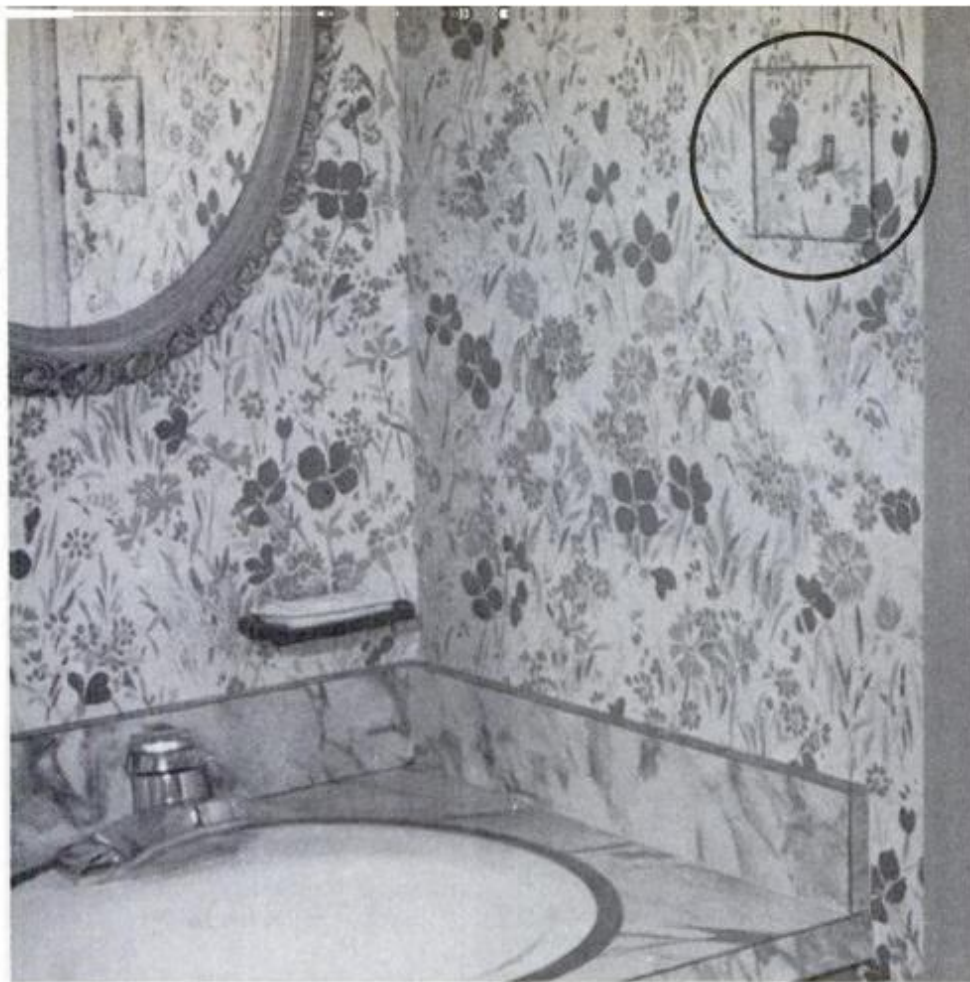
The sun does the cooking

Boaters and campers can use solar energy to heat two gallons of water for beverages in compact Solar Wunder. It is \$49.95 and made by Solar Works, 4817 First Ave. South, Birmingham, Ala. 35222.



No coin needed in emergency

Push a button on this Swedish pay phone, dial a certain number, and a central office will dispatch emergency aid. Unable to speak? Keep pressing button.



The wall covering on the switch plate becomes part of the overall design.

How to hide unsightly wall plates

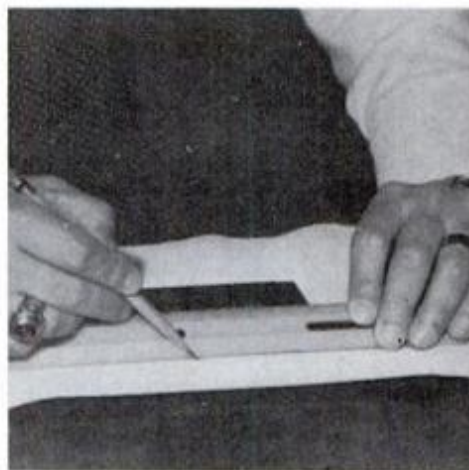
In just a few minutes you can enhance a new wallpapering job by covering electrical wall plates to match. Results are particularly pleasing in the case of light and airy wall covering patterns that are inappropriate with ornate metal or wood plates, or with dark patterns next to which off-white plates are distracting, and with traditional patterns over which clear plastic is out of place.

By following the steps shown you can cover wall plates at virtually no expense. If your wall covering isn't washable, you may want to apply a coat of dull varnish for protection—test the varnish on scrap first.

To remount the covered plate, first puncture the screw holes with an ice pick or other sharp tool, piercing the paper from front to back. Carefully line up the plate and fasten it to the electric receptacle with screws.—*Jack Bridges*



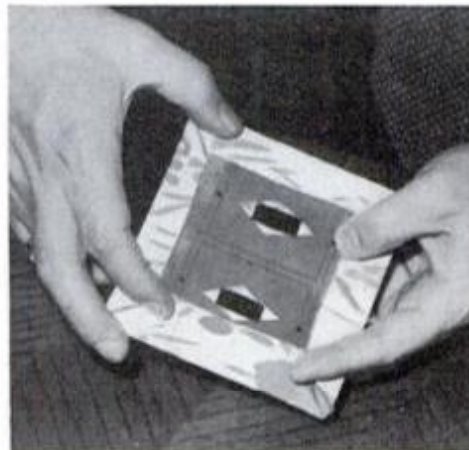
Loosen the switch plate. Place a 5x7-in. wallpaper piece so its design matches that on the wall. Fold edges under plate.



Place the switch plate on a table face down. Then draw a line around the plate $\frac{3}{4}$ in. from the fold lines.



Cut along the drawn line, then fold over all sides and secure them with tape. Recheck that wall and plate pattern match.



Mark the switch openings with diagonal lines from the corners. Cut along the lines, fold pieces back and tape them.



Similarly cover outlet plates. Find the center of the outlet opening, cut pie-shaped wedges as needed, fold and tape.

When we invited AMC owners to list their complaints about the 1978 Concord, a resounding 30 percent put down *none*. That's an amazingly high percentage and sets the Concord above all 14 cars we surveyed in 1977, including the Honda Accord (18.9 percent), Thunderbird (29.1 percent), Grand Prix (21.5 percent) and Diplomat/LeBaron (21.2/18.0 percent).

"This is a top-quality car," states a New York retiree, "and no other automobile—foreign or domestic—can beat it."



Concord styling was big reason for buying and the best-liked feature.

This owner is by no means unique. A Texas insurance agent notes, "It's a good-quality car, but more than that it's a joy to drive. Steering is light, making it easy to park and turn. It has adequate pickup with the 258-inch Six and

PM OWNERS REPORT: AMERICAN MOTORS CONCORD

automatic. I like the looks, and it's perfect in town, especially for my wife, who has trouble parking and driving in heavy traffic. We traded in a Chrysler New Yorker and find we miss the convenience of a big car somewhat, but the Concord is much better for my use."

An Illinois machinist: "This car is put together neater and truer than others I looked at; also quality of materials and workmanship looked better; also AMC gave me a better trade-in."

A Michigan management consultant: "For the money, I find the Concord luxurious and suited to my needs for a smaller car. I have

owned several American Motors products and have always been pleased."

A Maine serviceman: "It's the roominess in a compact car, the cloth seats, ride and silence, and response of the engine that make this a really sharp little car."

Each time we survey AMC owners, we can count on a great deal of brand loyalty. Previous ownership came up third among reasons for buying the Concord. Confessed a Michigan Salesman, "I've owned 38 AMC cars over the years," and an Ohio minister ad-



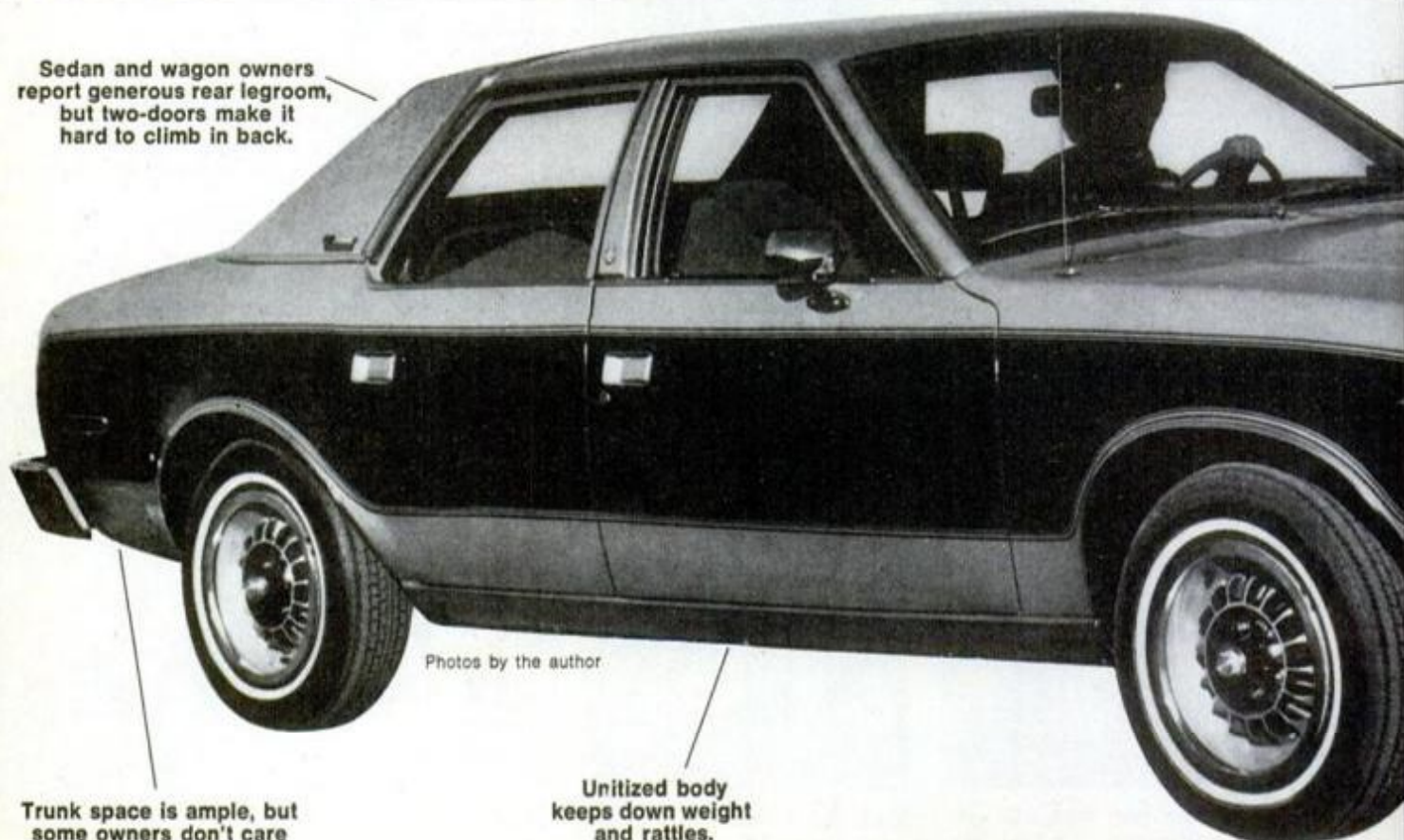
Automatic shift was ordered by 95.1 percent of owners. Half are over 50.

ded, "I've had four AMC cars with the 232-inch Six. All of them have given me at least 100,000 miles without trouble."

Dealer service came in for ano-

BY MICHAEL LAMM WEST COAST EDITOR

Sedan and wagon owners report generous rear legroom, but two-doors make it hard to climb in back.



Photos by the author

Trunk space is ample, but some owners don't care for Space-Savr spare.

Unitized body keeps down weight and rattles.



In engine compartment, 258-cu.-in. Six is the most popular choice.

ther high ranking in our owner survey, with 67.5 percent rating it *good to excellent*. Said an Illinois music teacher, "My dealer will even come to my house if I'm really upset. The service people fix things correctly but not always within the allotted time. They do allow me a loan car if they know they'll have to keep mine overnight."

The loaner, of course, is part of AMC's Buyer Protection Plan. Quite a number of owners cited the BPP as one of their reasons for choosing the Concord. A retired Floridian interjected, "AMC's warranty plus the courtesy of everyone at the dealership (sales,

service and clerical) plus the cleanliness of the shop area were all factors that helped me decide on the Concord."

Owner praise for the car far outweighed the minor dissatisfactions, but on the minus side, gas mileage became the No. 1 gripe. Some 13 percent mentioned it as lower than expected. Actual mileage came closer to the EPA figure than most, but a New York typesetter wrote, "Gas mileage is killing me. I figure my overall average at 10 mpg, whereas the EPA says 18 mpg overall. Gas mileage was my main reason

(Please turn to page 266)



More trunk space was asked for by some owners; most found it adequate.

What's a Concord?

AMC's 1978 Concord replaces the previous Hornet line. Basically similar to the Hornet, the Concord represents an upgraded, more luxurious, more comfortable, more silent, more opulent automobile.

For \$200 extra the Concord D/L package includes reclining front bucket seats, full gauges, digital clock, extra insulation plus more interior lighting and trim.

A Concord Sport package (\$289) includes much of the D/L equipment plus radial tires on slotted wheels, a four-speed gearbox and added ornamentation inside and out. The AMX coupe represents the performance expression of the Concord line.

The Concord's unitized body keeps down rattles and weight. Engines include the 304 V8 and the long-lived, reliable ohv Six in two sizes. The four-speed is available with the Sixes only, but relatively few buyers opt for it, perhaps because it costs \$111 extra and doesn't have an overdrive ratio.

A well-established Buyer Protection Plan covers AMC's new cars for 12 months or 12,000 miles and guarantees a loaner if repairs can't be finished in one day. It also reimburses owners for food and lodging should the car break down out of range of a dealer. It can be extended another year for \$75.

A NATIONWIDE SURVEY BASED ON 1,127,000 OWNER-DRIVEN MILES

Driver and passenger enjoy Concord's luxury and comfort.

Very few owners opted for V8. Small-Six gets about 1 mpg better mileage than larger one.



Sport option group includes steel-belted radials; front discs are standard.

Bumper nerf strips come with D/L package or can be ordered separately.

Mature, feather-footed drivers can't get enough mpg to be 100-percent happy

What today's compleat angler will



PM photo: Mike Walker

More fun and more fish, twin goals of the all-seasons angler, are brought closer by some new tackle and gear designs.

What you put on and fit out with for fishing depends on where and how you go plus your personal preference in outdoor apparel. But now there are far more materials, designs and styles to choose from, many that help you catch more fish and keep you comfortable while you're doing it.

Where the fish are waiting makes a difference. Southern bassin' men outfit themselves in bright jumpsuits with decals, baseball caps, high-powered outboards and bait boxes overflowing with assorted lures for the latest in pistol gripped bass rods. A Florida fisherman may fight a marlin offshore in a sportsfishing cruiser while attired in a T-shirt, shorts and a pair of scuffed deck shoes, but cranking a lathe-turned 12/0 aluminum-and-stainless reel holding braided 130-pound-test line. Sunshine is a factor when fitting out for angling, as are temperature, rainfall and sometimes insects.

First let's point out that quality still pays off. My Tapatco fishing vest is fine after five years' hard use, and a favorite 10-year-old, \$30 Royal Stetson fishing hat has outlived a dozen others. But my \$14.95 "discount-bargain" stocking-foot waders leaked the moment I stepped in a frigid Alaskan stream.

Price, brand names and source are often good indications of quality today in both gear and tackle. Modern fabrics of 100 percent wool for

Observant fish will be seeing better outfitted fishermen rigging more efficient tackle in higher performance boats.

by E. L. (Buck) Rogers

warmth, cotton for coolness and the blends for lightness, durability and washability are all good choices. Combinations like 65 percent polyester/35 percent cotton are popular for rugged parkas. New treatments for rain gear and waders are producing materials that are stronger and lighter and in some cases both waterproof and porous so sweat doesn't build up into a sauna bath inside. Newer synthetic lines, rods of fiberglass and graphite and rust-resistant low-friction reels are superior performers if well made.

Fishing shirt

You'll need several. Three of mine are wool Pendletons for fishing in Canada and Alaska. Others are tropical-weight cotton and wash-and-wear blends. All have long sleeves to ward off mid-day sun as well as insects at dawn and dusk. But when fishing from a cruiser, with a canopy for shade, a short sleeved shirt makes sense. Epaulets make a creel, camera or binoculars easier to carry.

Fishing trousers

Here I standardize: two pairs of white ducks for salt water trolling, four pairs of khakis for all-purpose angling. All have elastic waist bands (hard to find), are roomy enough for sitting comfort, and the legs are short enough to keep them from dragging through bilge water in a skiff. They are cool in the summer, yet warm enough with thermal knit or quilted long-johns for cold-weather comfort. Look for wash-and-wear shirts and slacks with permanent press for easier air-travel angling.

Jumpsuit

Astronauts wear 'em, so do repairmen, but I find them impractical. Unless they're one size too large they pull in the crotch when I'm seated on a boat cushion—and then they look like I'm wearing a sack tied in the middle. Furthermore, to get some sun, you have to take off the whole suit and fish in your drawers. But the fisherman who plunks down \$5000 for a glittering bass boat seems to need matching sets of red, yellow and purple jumpsuits with sewn-on patches advertis-

ing everything from plastic worms to depth finders. Tastes differ.

Footwear

I fished with a Canadian Indian last summer who wore cowboy boots in the boat, and I know a minister who wears last year's "preachin' shoes" on the creek bank. Many fishermen settle for modern sneakers, however. They're cool, non-skid and light enough to swim with if you slip in. Get a good pair. Royal/Red Ball now makes a stylish, special fishing-wading sneaker called the Lunker. Keds, Sperry, Adidas and Converse also make excellent non-slip shoes.

Fly fishermen need the felt, cleated, or stud soles now available on both waders and shoes. Kits for do-it-yourself installation, using new traction materials and adhesives, are also made.

Headgear

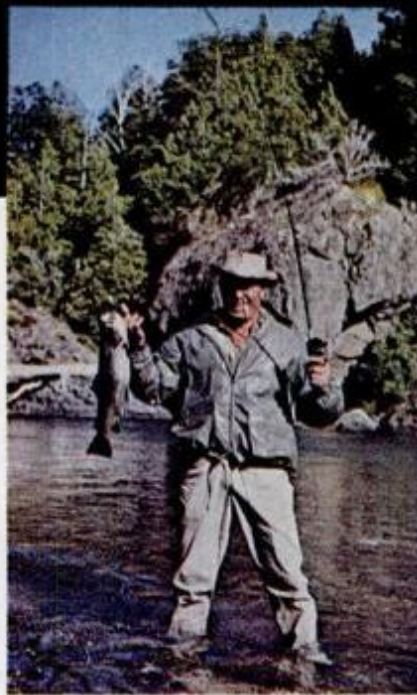
Where I grew up, a man's fishing hat was as treasured as his Tonkin cane fly rod—like my beat-up old Stetson with its broad brim for sun and rain protection. For the tropics, I switch to a light poplin hat with a long visor and a flap to keep the sun off my neck. Bass fishermen wear baseball caps for good reason—it's the only headgear you can keep on in a bass boat at 40 mph. You see a lot of these guys with sunburned ears, but the new synthetic weaves are light and do let cooling air through. In black fly country, wear one of the new hats with a mosquito net hidden in the crown, or stow a net inside an old favorite.

Raingear

Keeping warm and dry is important when it's wet outside but the fish are hitting. Regrettably, too many products don't do the job. Look for the new treated garments fabricated without stitches, and brands like Sperry, Converse, Royal/Red Ball, Peter Storm and Stearns. Mail order outfits such as L.L. Bean, Orvis, Eddie Bauer, Cabela's, Thompson and Sears can supply quality gear. A light coated-nylon poncho is good in a boat; you can spread it

(Please turn to page 256)

wear and use



For fishing Argentine trout waters, author Buck Rogers selects light tackle, beat-up broad-brim Stetson, khaki shirt and pants, wading shoes, nylon windbreaker. The jacket can be rolled to fit bottom of a tackle box, is wind and rain resistant, and dries quickly. Stream fishermen should pick jackets and vests with extra pockets for gear. New models offer a built-in flotation.



For surf or stream fishing, Rogers picks waders or Lunkers, Topsider jacket, khaki hat, polarized floater glasses.



Modern system for controlled warmth uses layers; wool shirt topped with foul weather jacket, insures comfort.



Famous angler "Uncle Homer" Circle finds jumpsuit comfortable and handy when designed with extra pockets for equipment.

Champions choice

World's champ Rick Clunn, with BASS head Ray Scott at the final weigh-in, tells PM's McKeown how he won, for second year in a row, the BASS Masters Classic, on Lake Tohopekaliga, a fishing hot spot near Kissimmee, Fla. Water and weather conditions determine tackle choice.



All-time top money fisherman Rick Clunn, of Montgomery, Tex., banked \$71,564 by the end of last year—using Floyd Buzzer and Johnson Spoon lures to win the last two annual BASS Masters Classics, the world series of tournament fishing. The runner-up high scorer on the catch-and-release contest trail was Roland Martin, of Broken Arrow, Okla., with \$70,750. Both select casual fishing clothes carefully so they can be comfortable from a frosty dawn start on



Pro champions Rick Clunn and Roland Martin select lures, tackle from large assortment carried for special conditions.

through a blazing afternoon or, should the weather change, a windy, rainy one.

In a big tackle box, each carries a very large assortment of crank baits, spinners, spoons and plastic worms. They test each in various colors and conditions to learn which the bass like best. While fishing, lures are changed quickly if fish do not seem interested. Each man uses both bait-casting and spinning reels. Monofilament line is replaced before there are signs of wear. Usually two or more rods are rigged for quick switching when the action gets hot. For boat equipment they pick outboard hp to match the hull rating, electric troller, live well, depth finder, CB, water temperature gauge. These winners back up fishermen's luck with top tackle and precise techniques —Bill McKeown

PM photos Jerry Imber

Build PM's porch swing: Just like the good old days— only better

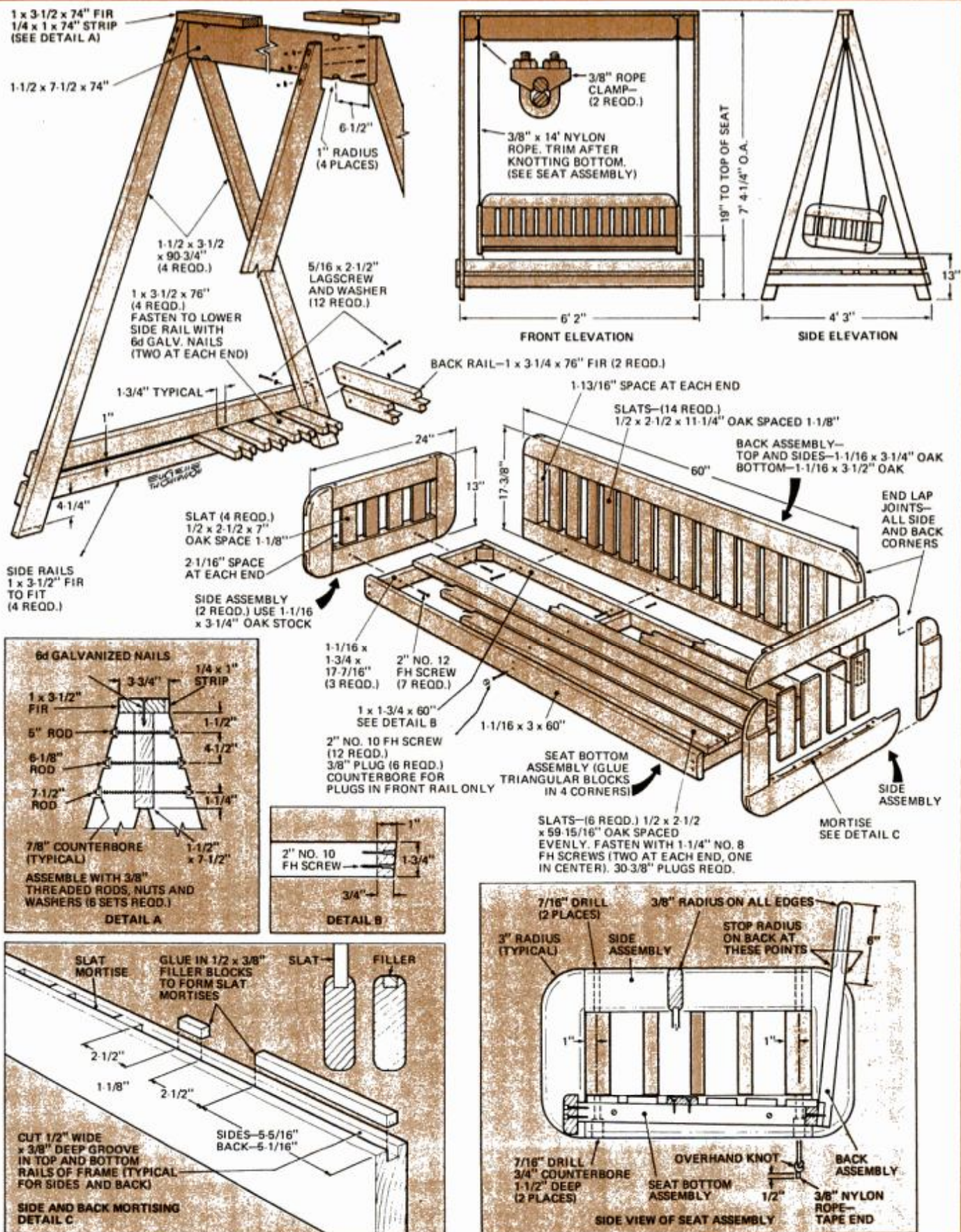
We've updated the porch swing of yesteryear to create our own handsome, easy-to-make version. Here's how you can build it, too.

by Harry Wicks
HOME AND SHOP EDITOR

Though your memories may not include spooning in a porch swing, your entire family from grandparents to toddlers are sure to enjoy sitting and relaxing in our version of the old-fashioned, front-porch swing.

Of contemporary design, simple construction details for readers to follow

were worked out by Rosario Capotosto and the author, based upon an original sketch by designer Tom Fung. If you own a porch you can suspend the swing from stout hardware anchored in the porch rafters or joists. Happily, those who live in today's modern porchless houses can enjoy this swing too



because we've created an alternate suspension system—a sturdy A-frame whose design blends beautifully with that of the swing.

Starting construction

The seat section of the swing has been designed and constructed like a

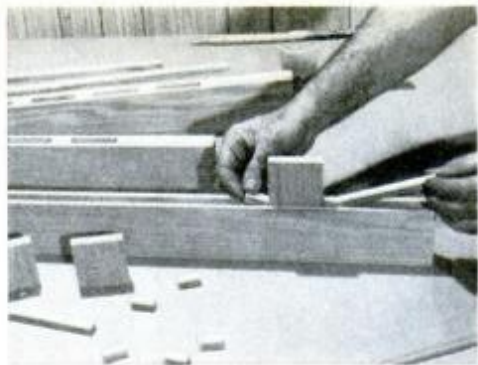
fine piece of furniture—quality joinery, weatherproof glue joints and plugged-over screwheads are used throughout. The seat is built of 5/4 and 1/2-in. oak while the A-frame is built of lower-cost 2x4 and 2x8 construction-grade fir. We selected clear 1x4 flooring for all horizontal frame

members because it measures a full 3 1/2 in. wide and its thickness gives more rigidity than does 3/4-in. stock.

More often than not, you will find that hardwood comes from the lumberyard surfaced on two sides only (S2S). When the lumber comes this way, you must use either a plane



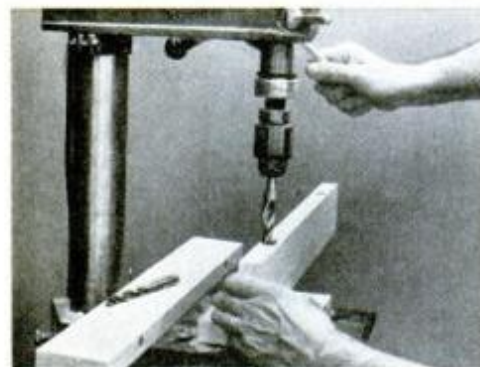
1 Top and bottom rails for back and sides are grooved to receive slats.



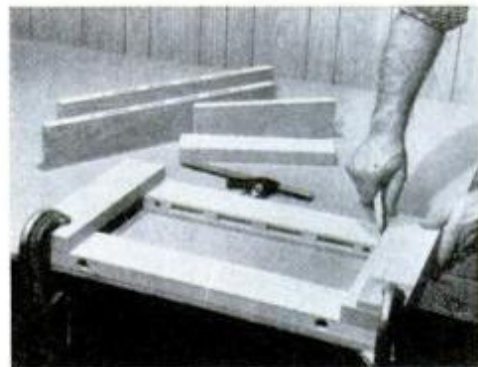
2 Use dummy slats to locate filler blocks; next, mark glue border lines.



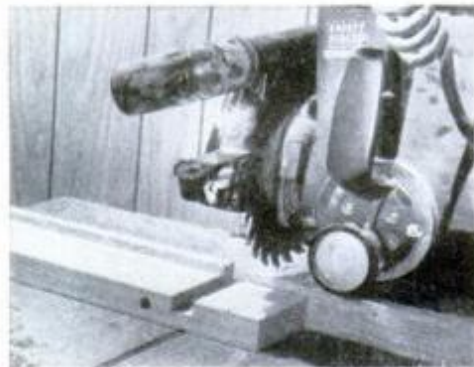
3 After glue dries, trim the rails slightly using a smooth-cutting blade.



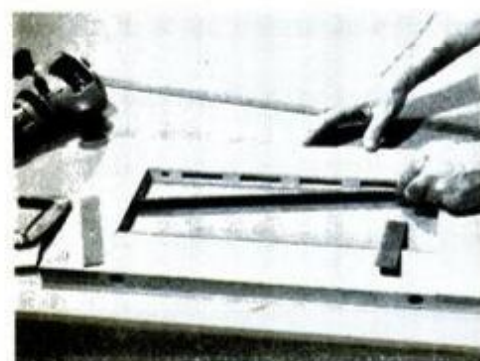
4 Next, bore holes for rope. In bottom rail, drill large-diameter holes first.



5 Clamp parts together to establish the exact dimensions for end lap joints.



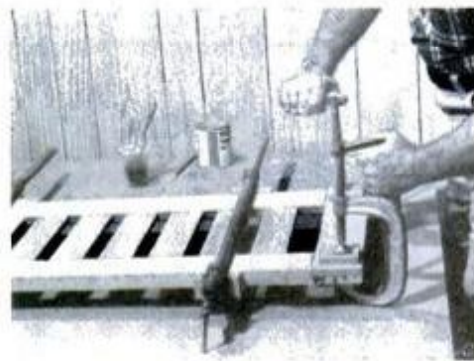
6 Cut laps with dado head in radial (or table) saw; set dado for widest cut.



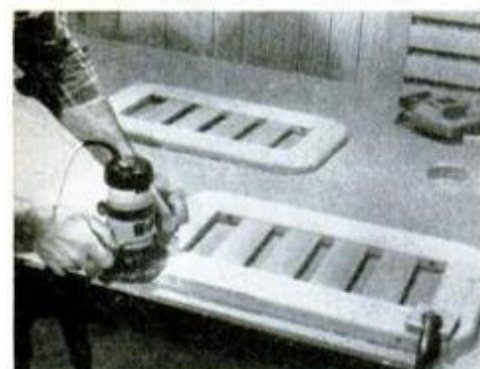
7 Tack frame together, insert 1/8-in. strips in mortises for router guide.



8 Round the corners using 3/8-in. bit set so cut does not reach mortises.



9 Put slats in grooves using glue; apply glue to lap joints, clamp parts.



10 Use a sabre saw to cut 3-in. radius on corners; round over with router.



11 Clamp seat frame to side and back while you bore screw pilot holes.

or jointer to joint one edge perfectly smooth and straight. You can then rip the boards (using either a radial-arm or table saw) to the widths required for the seat back and side sections. We used red oak for the seat—5/4-in. stock for all parts except the slats, which are of 1/2-in. stock.

Caution: when you go to buy your lumber, be selective; it is almost impossible to perform accurate grooving and lap-jointing on stock that is warped.

Use your saw and a dado cutter-head to cut the grooves in the back and side section rails to receive the slats. Notice that we installed filler

blocks in the grooves to get accurate and neat mortises for the slats. Cut several scrap slats to act as guides to mark the spacing for the actual slats. Cut the filler blocks out of 1/2-in.-sq. stock—which will project a hair above the surface after installation to permit flush trimming later, after gluing. Set the blocks in place with dummy slats and mark the glue border-lines (Photo 2). Mix some resorcinol (waterproof) glue and apply it sparingly to mating surfaces—don't make it too watery or it will ooze into the grooves and require difficult cleanup later.

If the blocks are snug fitting as they should be, clamping will not be necessary. Proceed down the rail installing blocks, with the aid of dummy spacers, as you go. Next day when the glue is dry, trim off the 1/8-in. projection by ripping with a smooth blade in the table saw.

At this stage you should bore the

Building the A-frame



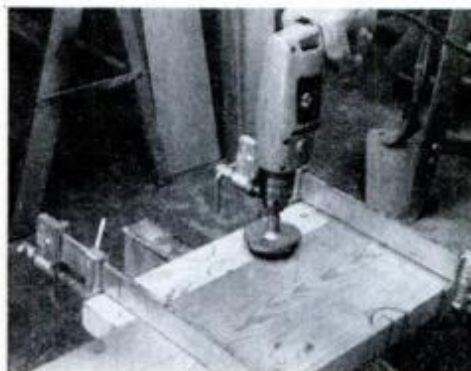
12 Lay frame members on floor. Mark for miter cuts. Set T-bevel for 105°.



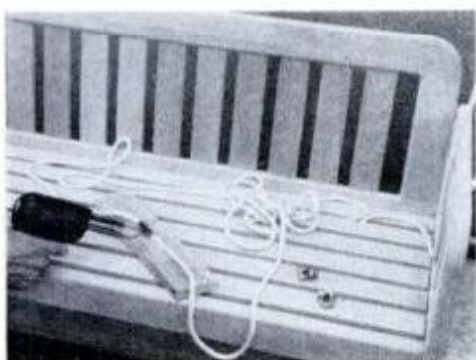
13 Cut mitered ends with radial-arm or table-saw miter gauge at 15°.



14 To cut the long notch at top, clamp 2x4 to table, support outboard end.



15 Use a holesaw in drill, clamped scrap block, to bore rope notches.



16 To prevent unraveling, cut rope with soldering gun (or heated knife).



17 Prop seat on horses to install rope, push knots in counter-bores.

holes for the nylon rope. The top racks get 7/16-in.-dia. holes while the lower members are counter bored to receive the knots. Make certain that you bore the larger, 3/4-in.-dia. hole first and then the 7/16-in. hole. If you reverse this order you will have great difficulty centering the holes.

To mark the frame members for end lap joints, clamp the sections together. Then use either a knife or a very sharp pencil to mark the cutting lines. Set the saw's dado head for a wide cut and its elevation so that the cutters will penetrate half the thickness of the stock. It's a good idea to check a test joint in scrap stock so that you are certain to produce perfectly mated end lap joints. For greatest accuracy when you're making an end lap joint, cut the first one completely and then use it as the marking guide for its mating cut.

Next, you should assemble the



18 Weatherproof rope clamps keep rope in place. See text for source.

units temporarily to check the distance between the mortise bottoms and cut the slats to suit. Make it a point to cut the slats about 1/16 in. shorter than the actual distance to allow for the glue. Cut the slats, and then break all sharp corners on them using a Surform plane and fine sandpaper. Set the slats aside.

Before you can glue the slats in place you must round the inside edges of the frame sections with a router; this cannot be done once the slats are installed. Since the mortised inside edges will not give the router cutter's pilot guide a true surface to ride against, a simple woodworking trick is called for. Temporarily assemble the sections without slats (using tacks only at corners in the waste area, where the outside corner radius will be cut). Then cut strips of 1/8-in. hardboard equal in width to the thickness of the stock and place them around the frame inside to provide a smooth, flat surface for the router bit (Photo 7). You would be wise to set up a test strip and make a trial cut using a 3/8-in. rounding-over bit. Adjust the depth-of-cut so that it doesn't reach the mortise.

While sections are still temporarily assembled, sand the insides as well as all of the rounded edges. It's easier to do this before the slats are in place. Make light match marks on the mating parts and then disassemble the units.

To install slats, apply glue sparingly in recesses and to the end surfaces of the slats. Insert all slats into one rail, apply glue to the second rail and push it onto the slats. Apply glue to the lap joints and complete the frame assembly. Hold the sections secure and square with bar clamps until the glue dries.

The seat frame is made separately. Cut the parts to size and assemble them with glue and screws as shown. Counterbore the screwholes at the front so that the screwheads can be concealed with plugs cut from the oak stock. If you don't own a plug cutter, you can use maple dowels. Before you glue the seat slats in place, clamp the seat frame to the back and sides and bore the required screw holes. Two screws go into the sides from the end of the seat frame, three from the back and two from the outside of the side panel into the side of the seat back. These are sunk and plugged.

Making the A-frame

Start with the 2x4 verticals. Lay them out as shown in the photos and mark the miter cuts. Cut the miters using a radial or portable circular saw. Next, cut the 2x8 to length and cut the half-circles for the rope near each end. For perfectly accurate notches, use a hole saw as we did

(Please turn to page 162)

CREDITS

Swing design: Rosario Capotosto and Tom Fung.
PM photos: Harry Hartman (color) and Rosario Capotosto (black and white).
Set styling: Gabe Herrick.

12 great planters you can build

Build any or several of these beauties for use indoors or out—our plans make building them easy and your plants will like the results.

by Harry Wicks
Home and Shop Editor

Despite the extra good looks of the planters shown on these pages, all 12 (actually 13 because there are two versions of one style) are easy do-it-yourself projects. Some are built of exterior-grade plywood while others utilize clear all-heart redwood and softwoods such as pine, fir and cedar.

To keep construction simple, we used dimensioned lumber and plywood throughout; the planters are sized so you can use lumber as it comes from the lumberyard.

General directions

For maximum planter life, assemble your planter using resorcinol

Plant stand for two pots



Planter tower



Flowerpot box



Wall-mount redwood planter



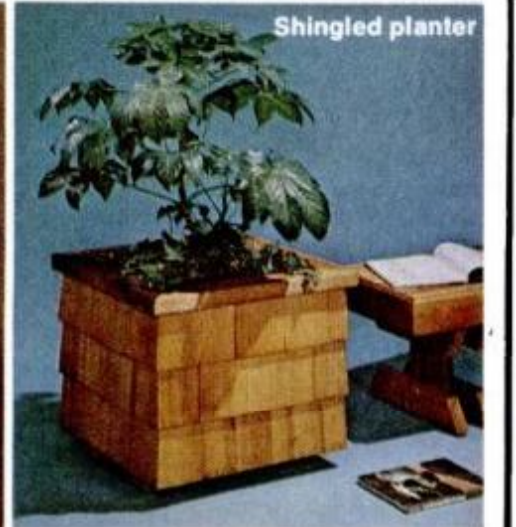
Mirror plant stand



Planter tree



Shingled planter





Wood lath planter box with pots



hanger



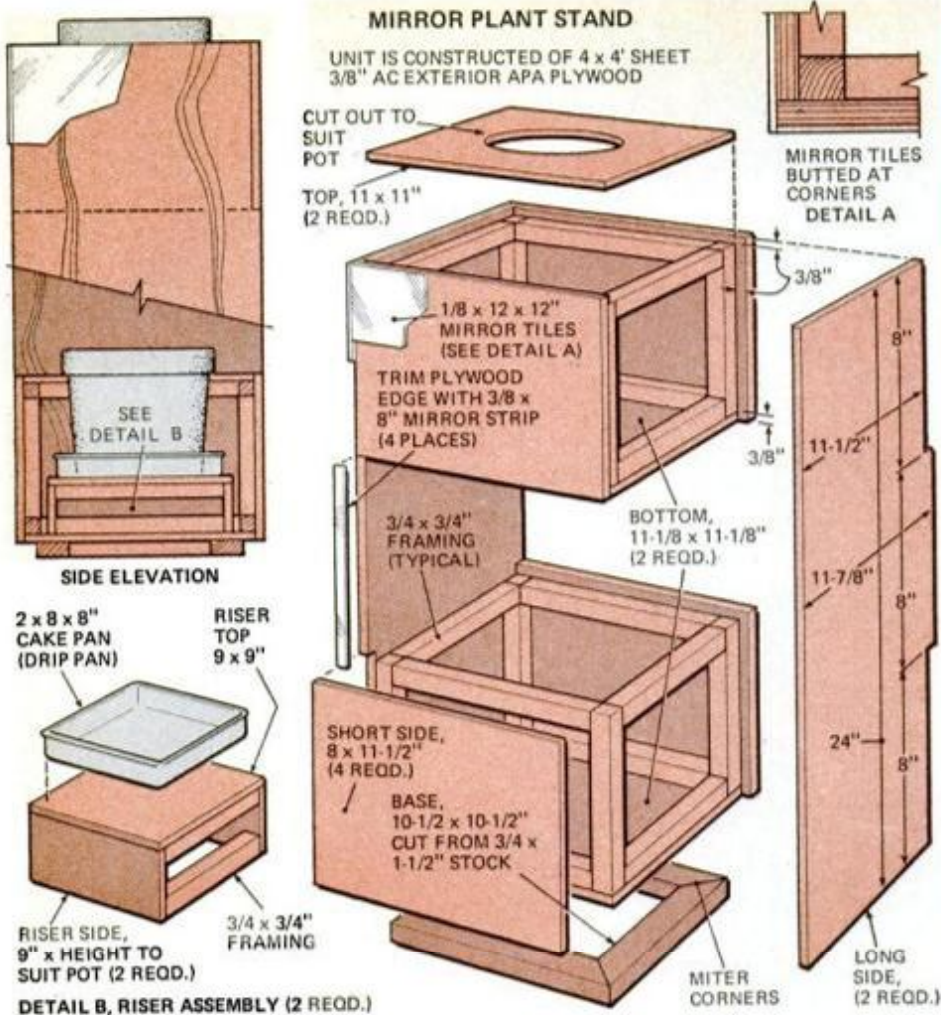
Redwood planters



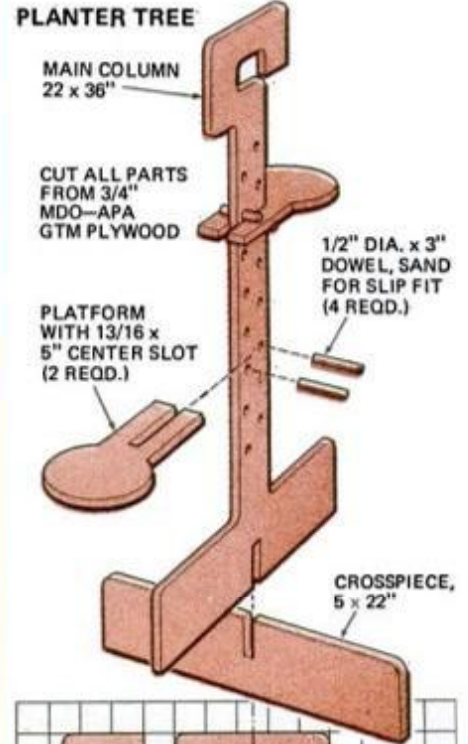
Dual planter

Redwood and cedar



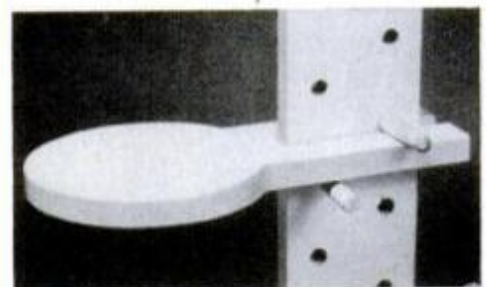
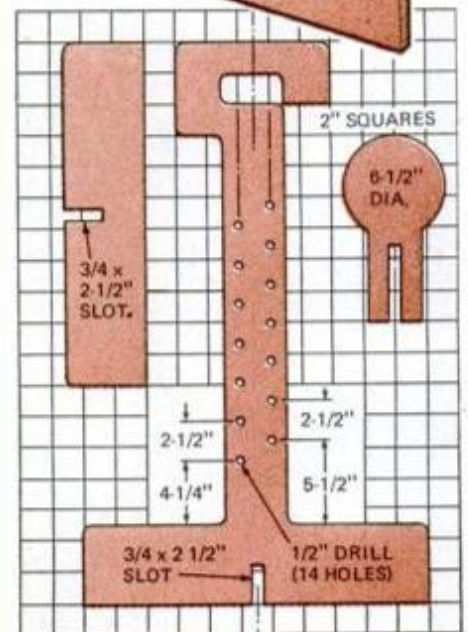
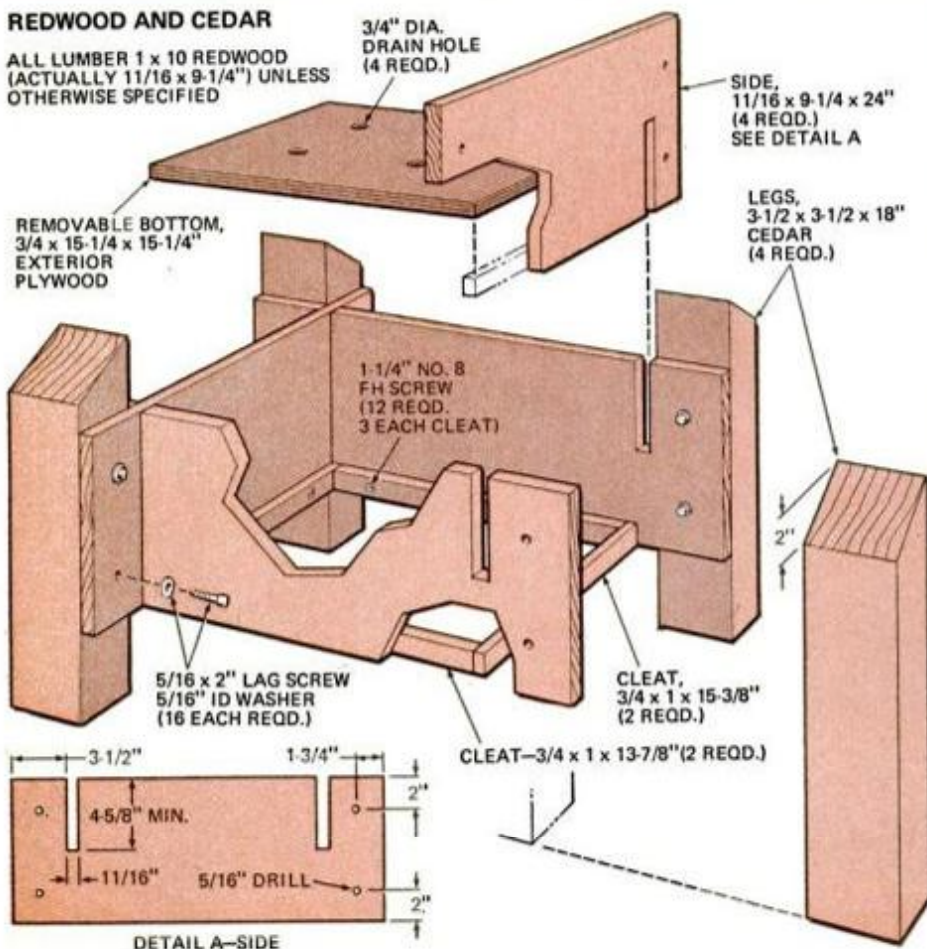


formaldehyde glue which is waterproof; do not pick a "water-resistant" glue. To prevent ugly rust stains from marring the wood surfaces, use only noncorrosive hot-dipped galvanized, stainless steel or aluminum nails and galvanized screws, nuts and bolts (where they are called for). To prevent splitting the wood members, particularly



REDWOOD AND CEDAR

ALL LUMBER 1 x 10 REDWOOD (ACTUALLY 11/16 x 9-1/4") UNLESS OTHERWISE SPECIFIED



Strategically placed holes in main column receive pegs that hold shelf securely.

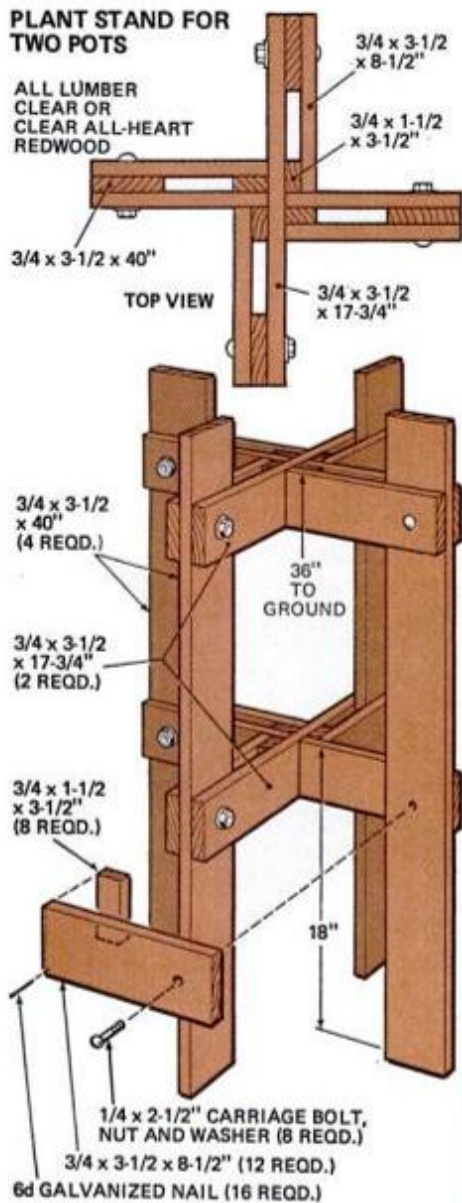
when the fastening is near the end of a board, do take the time to predrill pilot holes for all nails. The drill-bit diameter should be approximately three-quarters the diameter of the nails being used.

If you prefer a natural look, you can simply coat your planter with a clear wood preservative following directions on the label. If you want a particular color for a patio or yard accent, consider using one of the exterior latex stains. But, for maximum protection, your planter should then be coated with a quality exterior-grade urethane varnish. Be sure that the stain you choose is compat-

(Please turn to page 268)

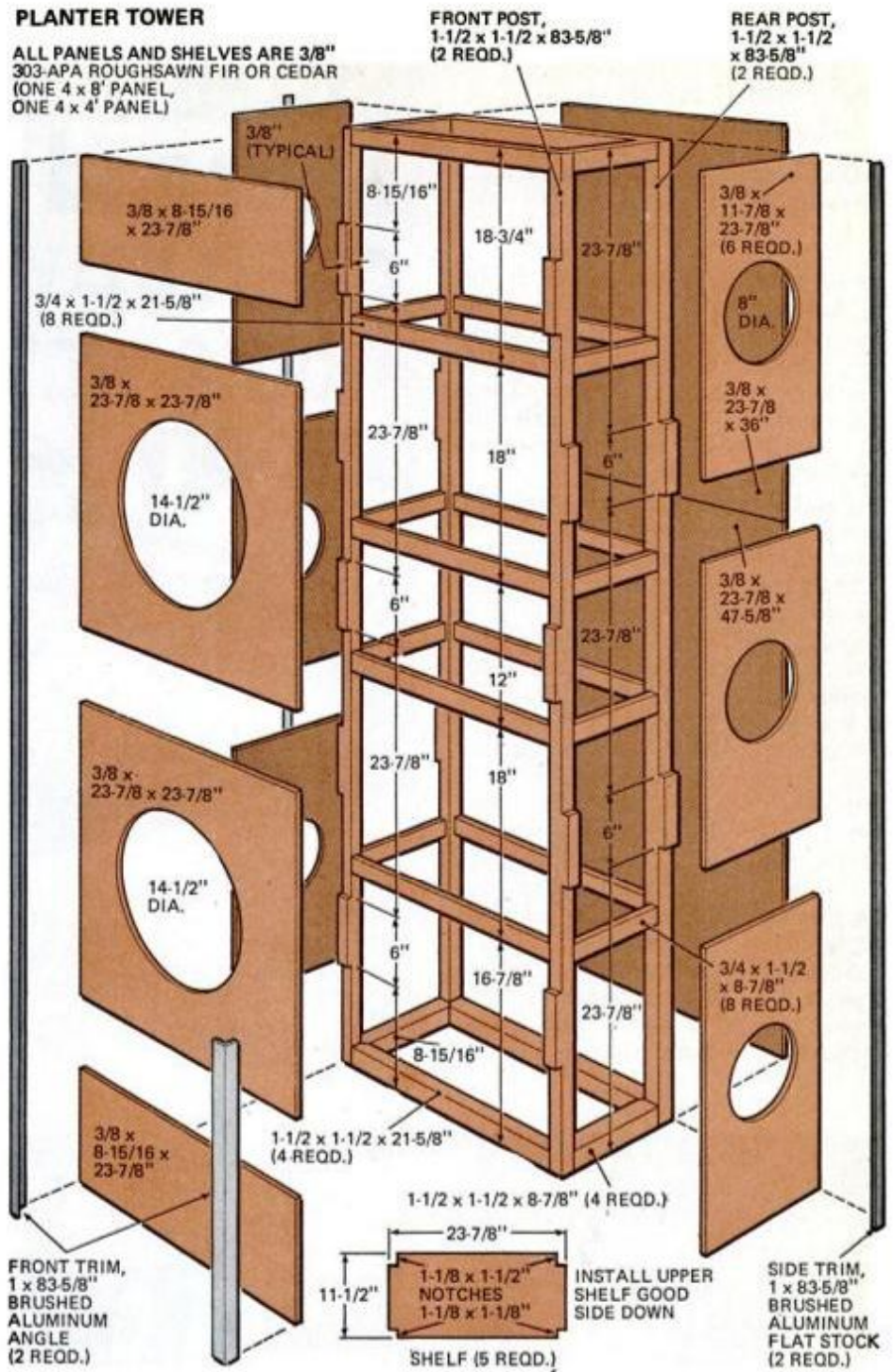
PLANT STAND FOR TWO POTS

ALL LUMBER CLEAR OR CLEAR ALL-HEART REDWOOD



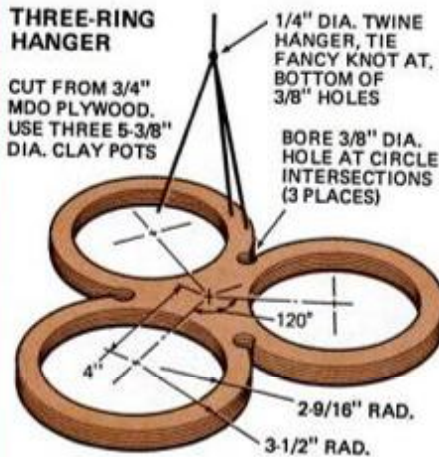
PLANTER TOWER

ALL PANELS AND SHELVES ARE 3/8" 303-APA ROUGHSAWN FIR OR CEDAR (ONE 4 x 8' PANEL, ONE 4 x 4' PANEL)



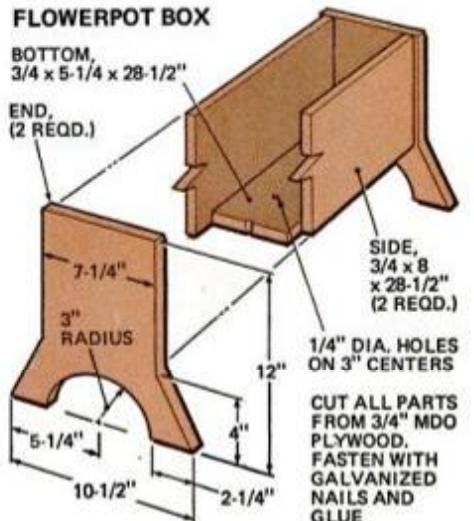
THREE-RING HANGER

CUT FROM 3/4" MDO PLYWOOD. USE THREE 5-3/8" DIA. CLAY POTS



FLOWERPOT BOX

BOTTOM, 3/4 x 5-1/4 x 28-1/2" (2 REQ.)



CREDITS: American Plywood Assn., Tom Tavernor, planter tower, planter tree, mirrored and dual planters; California Redwood Assn., plant stand for two pots; Gary Gerber, IDSA, wall-mount, redwood and redwood-and-cedar planters; Lester Walker, AIA, flowerpot box, three-ring hanger; Western Wood Products Assn., Julia L. Sturdevant, shingled and wood-lath planters. PM color photos, American Plywood Assn. (Strode photographers), Harry Hartman and Western Wood Products Assn.; carpentry in PM Workshop by John Capotosto and the author.

Here's the quick way to improve the look, smell and taste of your drinking water.

by August B. Russo

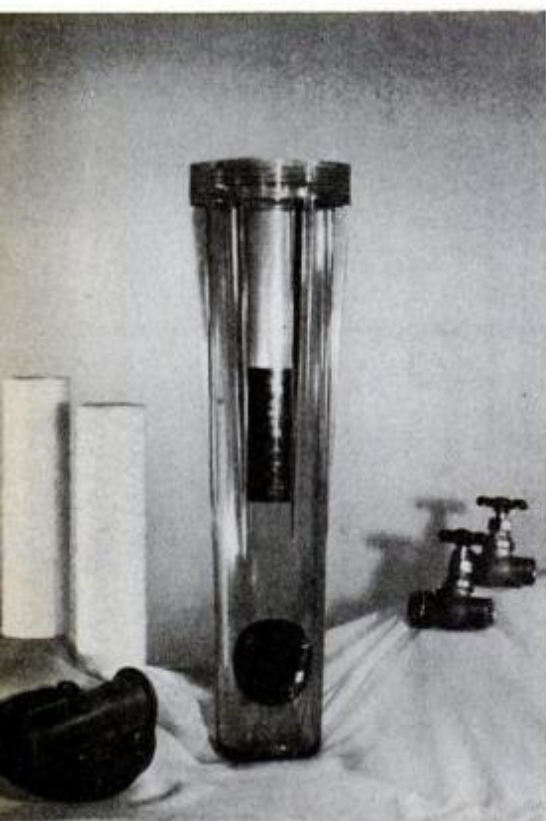
Everyone expects clean, fresh-tasting water to flow from the faucets in his home. But the water we get often is cloudy and has unpleasant tastes and odors. These are caused by dirt, pipe scale and rust particles, as well as by chemicals used for purification.

Besides these noticeable contaminants, other impurities, often unseen and untasted, cause concern. Chlorine combines readily with other substances to form organic compounds, including chloroform and carbon tetrachloride. These compounds can accumulate in the body to toxic levels.

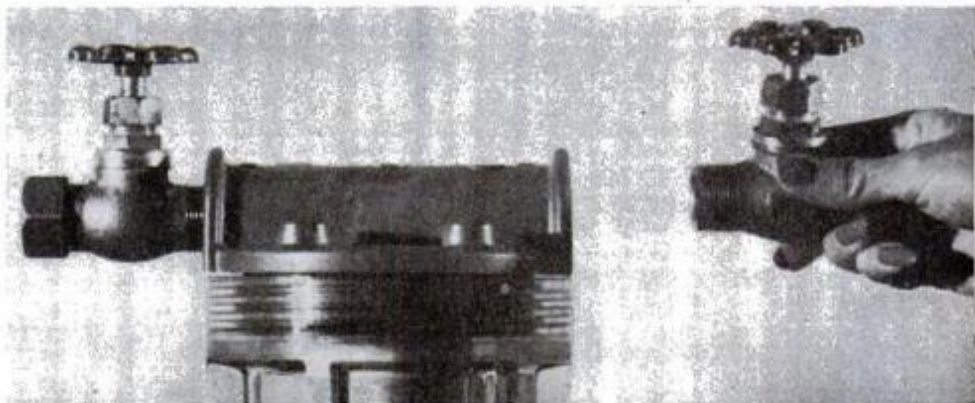
You can contend with health hazards in your drinking water—and eliminate unappealing odors and tastes as well. Activated-charcoal filters, easily installed in the home, can help. They afford fresher tasting, better looking water—and an extra measure of security.

Activated charcoal in cartridge-type filters absorbs organic compounds. It also filters out hydrogen sulfide and chlorine to improve

Install a filter and clean up your home water supply



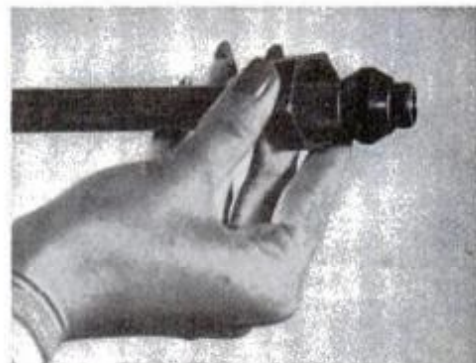
Filter has tubular sump, one or two cartridges, head; requires two gate valves.



Screw the gate valves into the filter head until they are tight and handles upright.



Shut off water, drain pipes, then remove length of pipe specified by filter maker.



Slip locknut and ferrule onto pipe. Mark location in case ferrule is moved.



not only the taste of the water, but of food cooked in it, too. It will not remove bacteria, heavy metals or radioactive elements. These need other types of filters—see chart.

Charcoal filters will remove dirt and rust. This helps to reduce wear on valves in clothes washers and dishwashers. It also prolongs the life of faucet washers and eliminates the dulling effect dirty water can have on laundry.

Activated-charcoal filters for the home do not have monitoring devices to tell you when the charcoal has become saturated. Replace the cartridge when water pressure and water flow drop below an acceptable level. Depending on how much water your family uses, 60 to 90 days is a likely figure for cartridge life.

Although there are several styles and sizes of cartridge filters for the home, most models have a tubular plastic or metal sump, which accepts one or two 9¾-in.-long filter cartridges. There are countertop filters that screw directly onto a kitchen faucet and units that go under the main water line to clean the entire home supply. They cost from \$40 to \$125, with all materials for installation.

Tools and plumbing accessories needed to attach a filter to the main water line are two gate valves with locknut and ferrule assemblies, a tube cutter and an adjustable wrench.

To begin the job, turn off the

main water supply valve and drain the pipes by opening the faucets. Thread the gate valves into the inlet and outlet of the filter. Measure the amount of copper pipe to be removed from the line; the filter manufacturer will provide a template or give the exact length. Be sure to select a location where there will be adequate clearance for the filter and for operating the valves.

With the tube cutter, remove the called-for length of pipe. Slip the locknuts onto the pipe ends and place the ferrules about ¼ in. from each end. Scribe a line on the pipe next to the ferrule in case it is moved accidentally.

Position the filter with the inlet on the water-meter side of the pipe. Tighten the locknuts, first on the meter side and then on the other.

The filter is now ready for use, but first you should attach a heavy copper jumper wire to the pipe or valves on either side of the filter head to keep electrical outlets and telephone lines grounded. *It's a safety must.*

Now open the main water supply valve, then open filter valves slowly, first the one nearest the meter and then the other, and enjoy better, safer water.

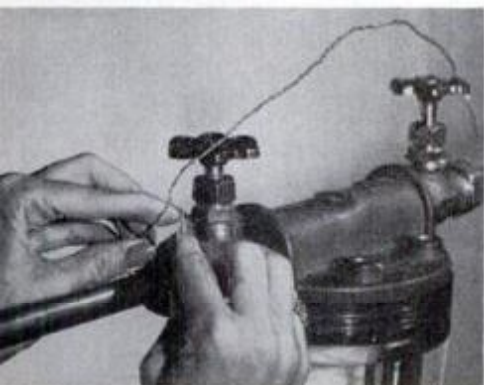
The filter shown is model 2PC made by Filterite Corp., Consumer Products Div., 2033 Greenspring Dr., Timonium, Md. 21093; retail price is \$69.95. **PM**



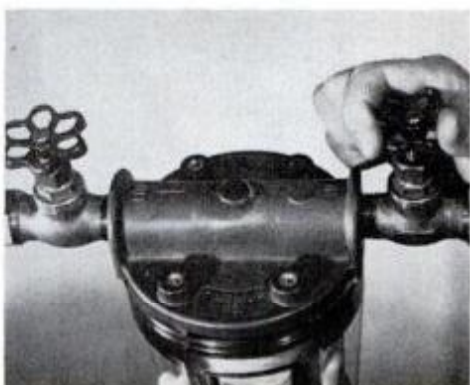
Place the filter in position, with the inlet on the water-meter side of the line.



Now tighten locknuts. Both gate valves should be closed at this point.



Install a copper jumper wire from valve to valve to maintain electrical ground.



Turn water supply on, open the meter-side valve first, then the outlet valve.

Cartridge home water filters

Will remove:

Algae
Carbon
 tetra-
 chloride
Chlorine
Chloroform
Dirt
 particles
Hydrogen
 sulfide
Iron in
 suspension
 (rust)
Sulfur

Will not remove*:

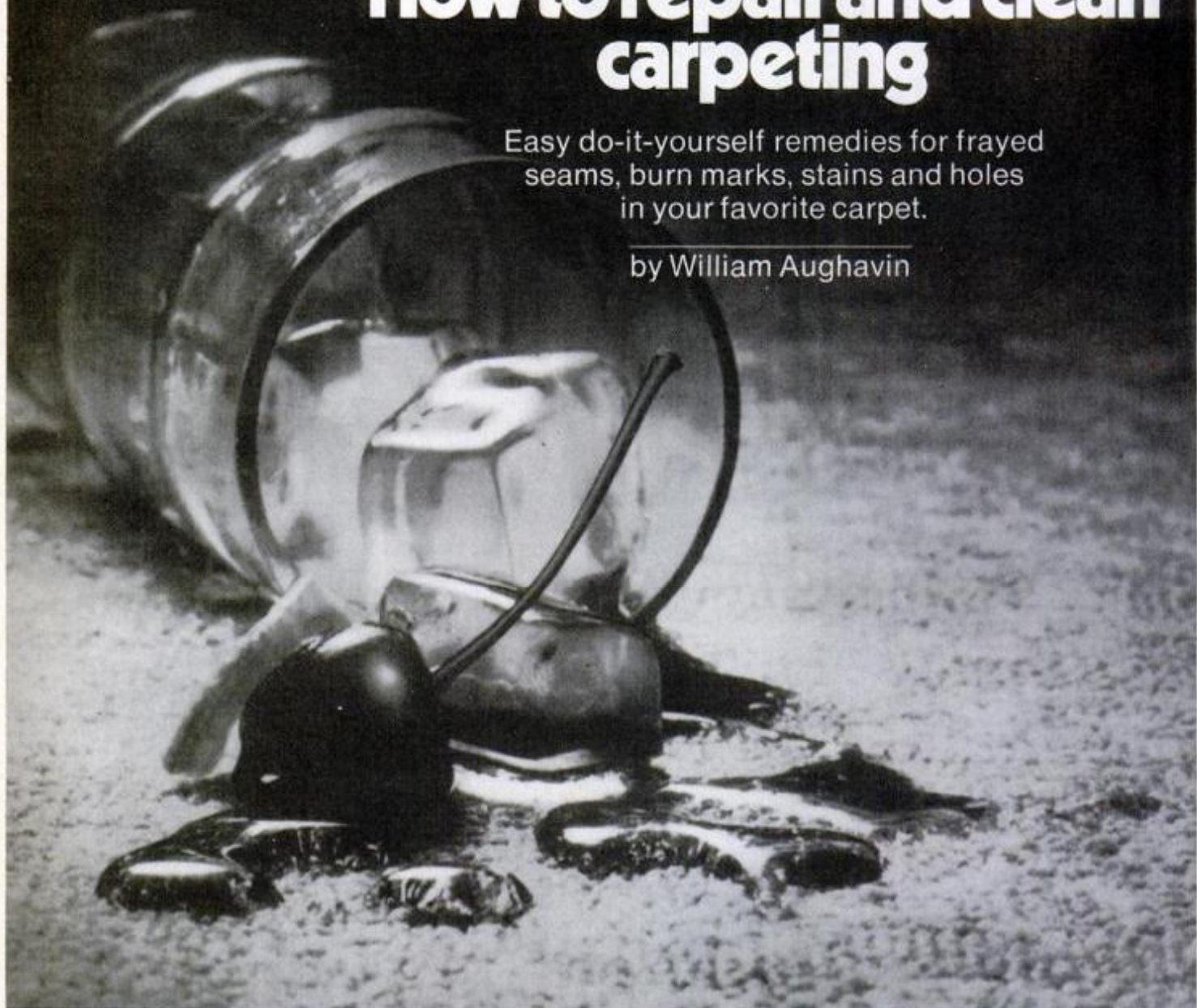
Arsenic
Asbestos
Barium
Cadmium
Chromium
Coliform
 bacteria
Cyanide
Iodine
Iron in
 solution
Lead
Mercury
Selenium
Silver
Other heavy
 metals and
 radioactive
 elements

*These substances can be removed by complex, expensive membrane or reverse-osmosis filters, all of which require a cartridge filter to pre-clean the water and prevent clogging.

Tips from an expert: How to repair and clean carpeting

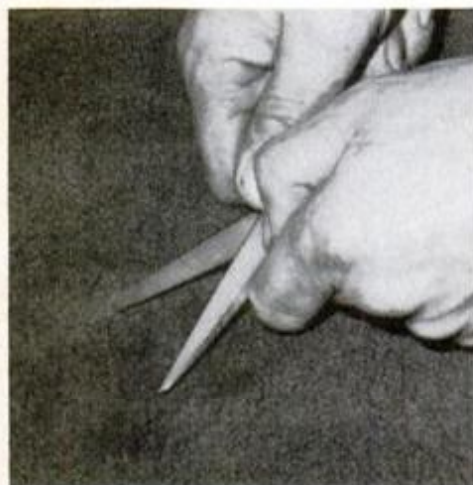
Easy do-it-yourself remedies for frayed seams, burn marks, stains and holes in your favorite carpet.

by William Aughavin

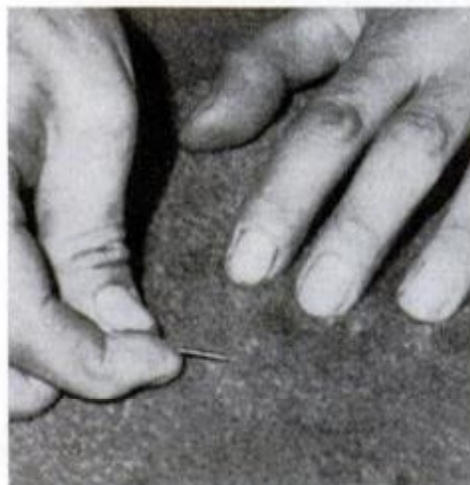


PM photos: Irv Field

Fixing surface burns



1. Surface burns on synthetics melt fibers. Scrape black ends with scissors.



2. Use a needle to pick yarn and further clean charred ends, then clip smooth.

With a little know-how you can easily repair holes, burns, frayed seams or seemingly unremovable stains in your favorite old carpet. These tips can help you rejuvenate any carpet that has suffered from years of use and abuse.

Repairing surface burns

A superficial burn mark on wool carpet is easy to remove. Since the wool doesn't melt, the ash will fall away quickly when it is scraped with a butter knife or brush. Then carefully clip the nearby edges of yarn to even them.

Slight burns in the surface of synthetic carpets call for the repair technique shown at left.

Burns that go deeply into the pile or extend to the carpet backing must be cut out and replaced with a patch. For a repair that can't be detected, cut patch from matching carpet scrap so that its pile runs in the same direction as that of the laid carpet. Make patch three inches larger on all sides than the burn.

To remove the burned area, cut a hole the same dimensions as the patch. Since carpeting is composed of straight needle rows, you can mark a straight line by using a screwdriver to open a bead in the carpet along

a needle row. Line up patch you cut with bead opened in carpet and cut along the bead to remove the burn area. Cut backing support for patch, tuck through hole and fit patch in place as in photo directions below. To make sure adhesive grips firmly, rest a heavy object on the completed patch for several hours. Then intertwine yarns along seams with a needle and trim off carpet fuzz around patch with scissors.

ones, you need professional tools that can usually be rented. A carpet kicking tool removes excess carpet stretch. A special iron melts seaming tape to make a permanent seam.

Begin by picking up the old seam or carpeting to be seamed with a screwdriver or ice pick. Be sure there is excess stretch in carpet so seam edges can come together, then seam as shown on page 140.

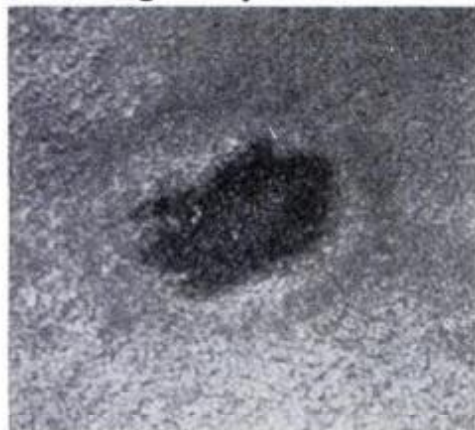
After you've hammered tacks 3 in.

Seaming a carpet

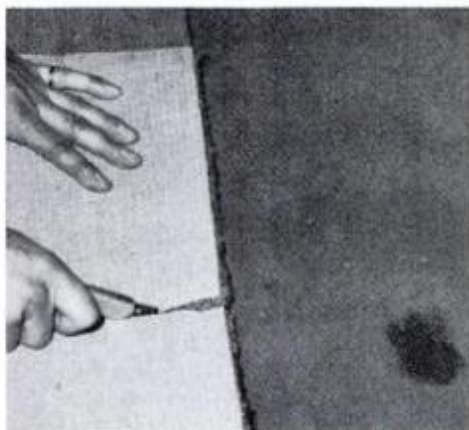
To repair frayed seams or make new

The author, a professional carpet cleaner, is with Lasher Carpet Co., New York.

Patching a carpet



1. Burns that scorch or alter pile height must be patched with scrap carpeting.



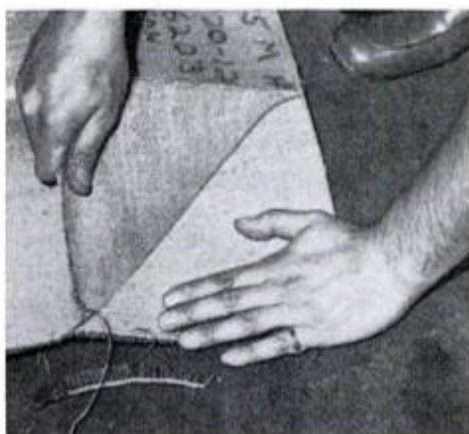
2. Sharp razor knife cuts a patch that is 3 in. larger on all sides than burn.



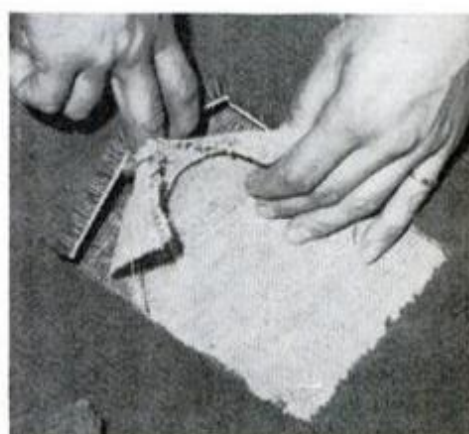
3. Align patch on bead already made as described in text; cut at 90° angle.



4. Cut along bead, grasp the old carpet and finish cutting to remove burn area.



5. Jute, burlap or backing from another carpet scrap provides support for patch.



6. Cut the support about 4-in. larger than hole and tuck it through opening.



7. Squeeze carpet latex adhesive evenly on the support; avoid the surface carpet.



8. Make sure pile direction is correct and carefully place the patch into the hole.



9. Use a long needle to intertwine yarns at seams; clip carpet fuzz near the patch.

Seaming a carpet



1. Trim old seam tape with razor knife. Remove pins in seams with screwdriver.



3. Tack both sides of carpet seam 3 in. from edge at 3-in. intervals.



5. Staple or tack both sides of the tape. Secure seams with a special hot iron.

from the seam border, trim away any overlap using a sharp razor knife and metal straightedge. When the seam has been completed, quickly tap the carpet edges with a hammer to assure adhesion to the tape before the tape cools.

Maintaining a carpet

To give your carpet the long life it deserves, once-a-week vacuuming is generally a must. If your carpet becomes stained, consult the care

(Please turn to page 262)

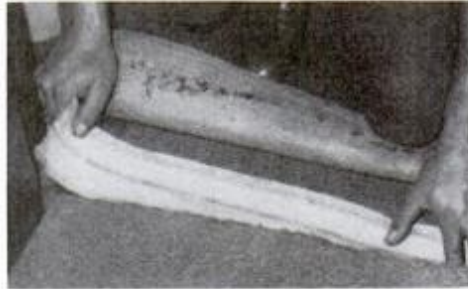
Cleaning a carpet



A rented steamer cleans the carpet thoroughly, then removes excess water.



2. You can rent carpet kicking tool that removes excess stretch in the carpeting.



4. Place electric-melt seaming tape (or use latex or pin tape) beneath seam.



6. Light will go on when tape is melted. As you work, press seam edges closed.



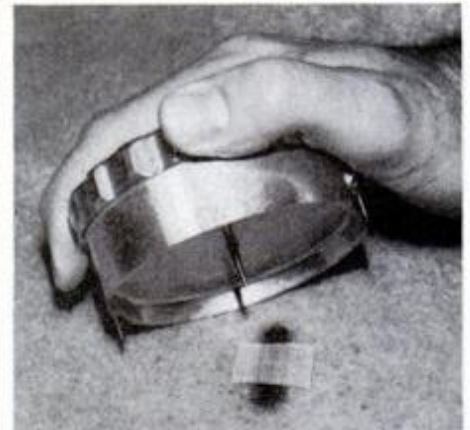
7. The end result is a smooth seam that separates rooms having different carpets.



Place aluminum foil under furniture so wood stain won't bleed to moist carpet.

EDITOR'S REPORT: CARPET REPAIR KIT

Materials and tools you need to fix damaged carpets are contained in this easy-to-use Blue Lustre Carpet Repair Kit. The cutting tool works like a cookie cutter to remove the damaged area and make a replacement plug. On small stains and cigaret burns, the kit helps you to make invisible repairs fast and easy. Cost is \$12.95, including postage; Earl Grissmer Co., Inc., 7950 Castleway Dr., Indianapolis, Ind. 46250—P.A.



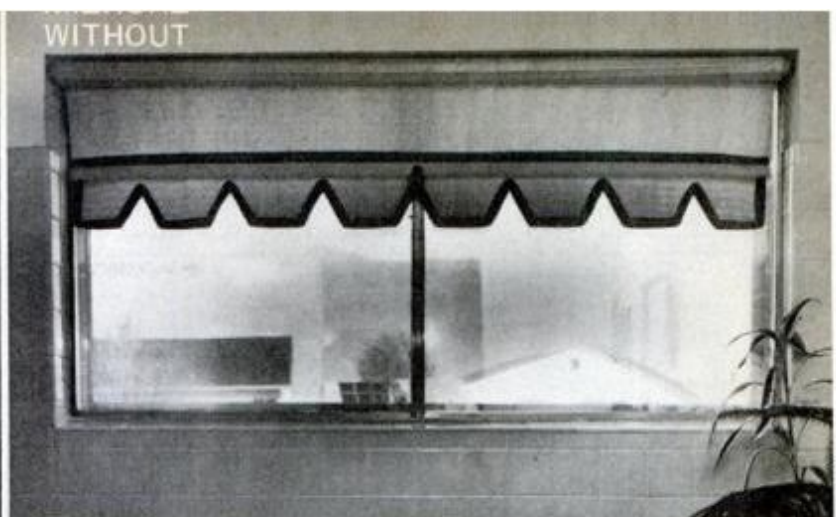
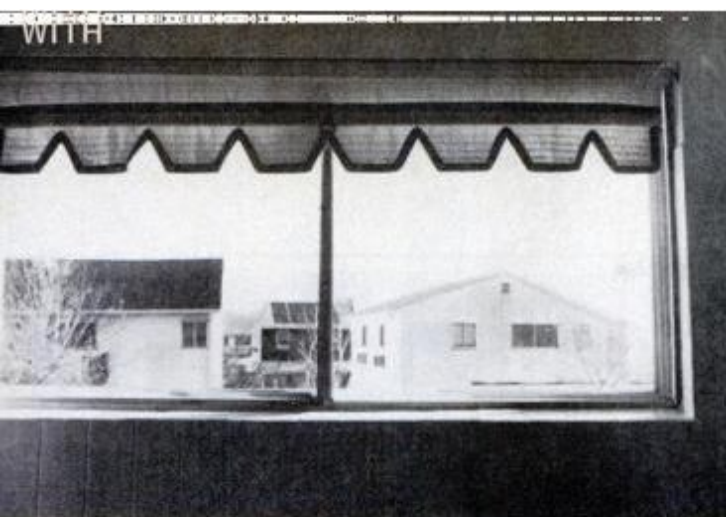
Anchor the spike on the cutter to a piece of tape placed over damaged area.



Position an adhesive disc underneath the carpet where the patch will be.



Press the carpet round down firmly to adhere. It will accurately plug the hole.



Put sunglasses on your windows and keep down cooling costs

Savvy homeowners know that energy consciousness doesn't apply only to heating, that airconditioning can bloat your electric bills alarmingly. Now 3M Co. has a product that promises to cut energy use.

Scotchtint Sun Control film is transparent plastic material with a vaporized metal coating. 3M claims it reflects up to 75 percent of the sun's radiant heat and cuts glare up to 82 percent. It also helps prevent interior heat from leaving in winter. They say an average room with Scotchtint-treated windows can be 10° to 20° F. cooler than one without. Protection from the sun also reduces fading of wood finishes, paint and fabrics.

Scotchtint is a *permanent* installation. Applying it requires a few sim-

PM photos: Irv Field



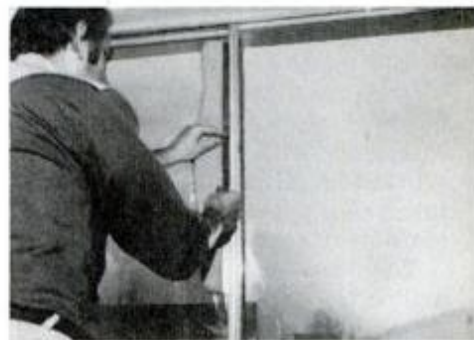
3. Cut the film to size with a blade. To save time, do all the cutting at once.



6. Add two drops of detergent to water and wet nonsticky side; position film.



4. Wet down the window with a water spray bottle: use plenty of water.



7. Squeegee water, then trim film with 1/16-in. margin for moisture escape.



1. Scrape paint and dirt off the inside of window with a blade.



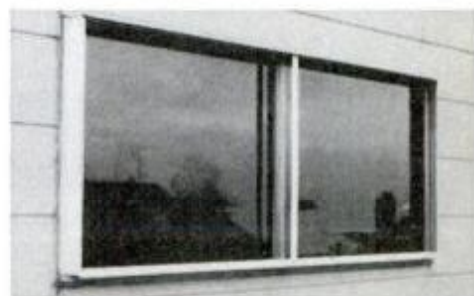
5. Wet adhesive side of film. Static electricity holds it to tile for spraying.

ple tools: Single-edge razor blades, squeegee, straightedge and water-spray bottle. Two drops of detergent will aid final squeegeeing.

Scotchtint is found at hardware and houseware stores in rolls of silver and bronze color; a 30x48-in. roll costs about \$10 to \$16; 36x78, \$20 to \$26; 48x78, \$26 to \$32. **PM**



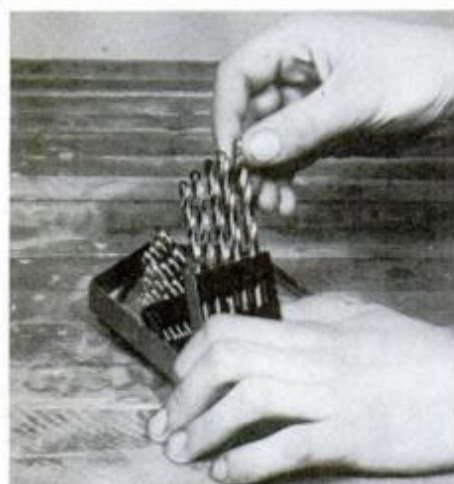
2. Thoroughly clean window with clear water. Squeegee away excess moisture.



8. Mirror-like finish gives you privacy: You can see out, others can't see in.

WORKSHOP MINI-COURSE

ELECTRIC DRILL BASICS

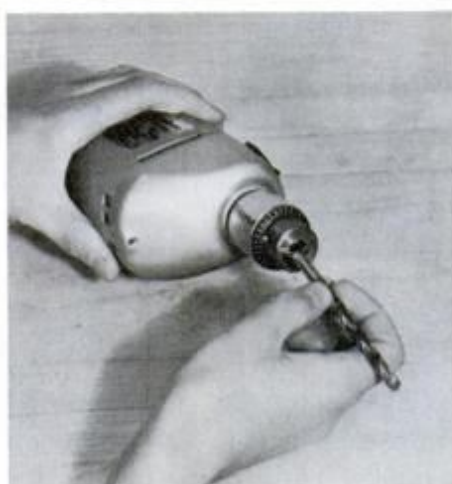


Protect bits by storing them in a metal case. This one holds 13 twist drills.

Though some woodworkers may disagree, a portable electric drill is generally the first power tool a fledgling craftsman should buy. Besides giving the immediate ability to bore accurate holes in a wide variety of diameters, a drill can be used to countersink, counterbore, sand rough surfaces smooth, stir paint—and a lot more, thanks to the many accessories you'll find in your hardware store. For now, however, we will stick to the basics of electric drill usage; in a future Workshop Minicourse we will get into the pluses and minuses of the various attachments.

The most-commonly purchased drill is the 1/4-incher; that is, a drill whose chuck will accept bits up to 1/4 in. in diameter. But before plunking down your cash, give some thought to buying a 3/8-in. drill instead. It will handle all tasks that a 1/4-in. drill will while giving you greater bit, thus boring, capacity. Because of this increased capacity, the 3/8-in. drills come with motors that provide greater torque; you will find that most of them have speeds in the 300-to-1200-rpm range. Lower speeds are desirable when you bore into tough materials like concrete, metals and hardwoods. Softwoods, on the other hand, call for speeds in the 1600-rpm-and-higher-range.

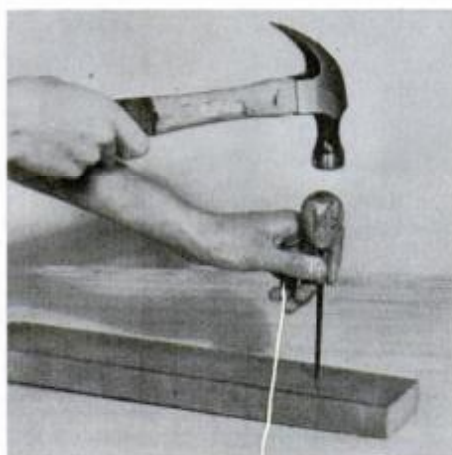
Since various types of material call for different drill speeds, take a look at the variable-speed models that most makers offer. With one of these you can drill safely in most materials; all manufacturers include a chart of speeds to use when



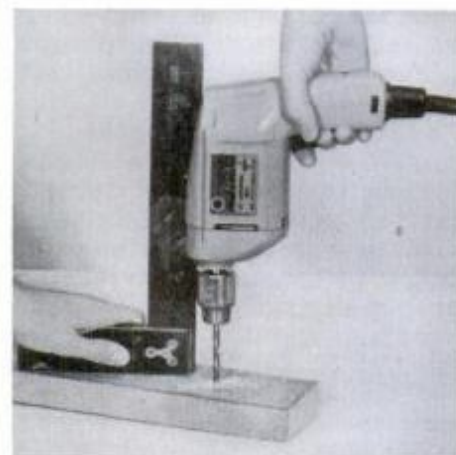
Bit is fully inserted into Jacobs chuck, aligned so all three jaws will hold it.



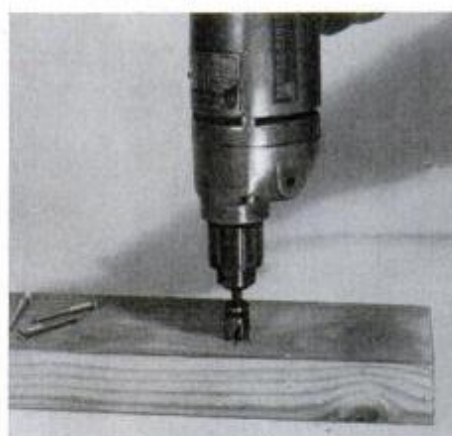
Next, use chuck key that comes with the tool to tighten bit securely in chuck.



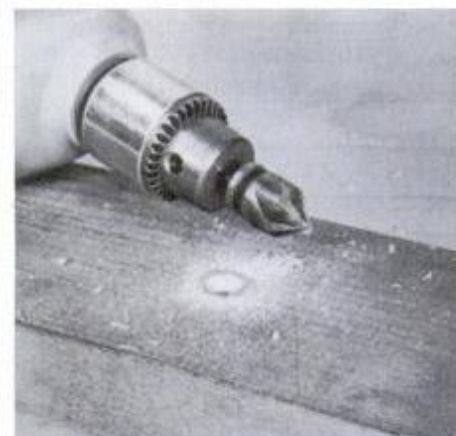
Keep bit from drifting as drill is started by making slight indent with an awl.



To make sure drill is perpendicular to work, use square on front and side.



Use a countersink when installing flat-head screws so that heads will be flush.



Rosette sinks are available in a variety of diameters, cost about \$1.50 each.

you are drilling various materials.

A desirable feature is the ability to reverse chuck rotation. A drill with this feature quickly becomes a power screwdriver when fitted with a screwdriver accessory. And it can be a real wristsaver when turning in or backing out screws.

A portable drill usually requires no maintenance other than blowing dust out of air ports, and a brushes check, periodically. Most do not even call for lubrication because necessary lubricants are sealed in at the factory.—*Harry Wicks, Home and Shop Editor*

In this sixth annual special section, PM's Auto Editors take you step-by-step through the service and maintenance jobs you'll be doing during your first 100,000 miles of car ownership.

Popular Mechanics

1978 CAR CARE GUIDE



Bonus: PM shows you how to set up a neat and clean Dream Garage. Does yours look like this? Well, it can!

PM Photo: George Ancóna



You can fix dents, holes and scratches in your car's body. Everything you need is in the 11-piece kit. Follow the FREE Auto Body Repair Manual. You can't go wrong. And you'll save money! A lot of money! When you do it with DURO, you do it right.



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1978 Popular Mechanics CAR CARE GUIDE

Contents

POPULAR MECHANICS' 1978 CAR CARE GUIDE SHOWS YOU HOW TO SET UP A DREAM GARAGE AND HOW TO USE IT!

YES, CAR CARE REALLY DOES PAY OFF!

PM SHOWS YOU HOW TO GET ORGANIZED FOR TOP-NOTCH CAR CARE ... TURN A MESS INTO A DREAM GARAGE!

SECTION 1. 0 TO 10,000 MILES

The early miles

SECTION 2. 10 TO 20,000 MILES

The growth miles

SECTION 3. 20 TO 30,000 MILES

The adolescent miles

SECTION 4. 30 TO 40,000 MILES

The carefree miles

SECTION 5. 40 TO 50,000 MILES

The transition miles

SECTION 6. 50 TO 60,000 MILES

The resisting trade-in miles

SECTION 7. 60 TO 70,000 MILES

The ongoing miles

SECTION 8. 70 TO 80,000 MILES

The payoff miles

SECTION 9. 80 TO 90,000 MILES

The golden miles

SECTION 10. 90 TO 100,000 MILES

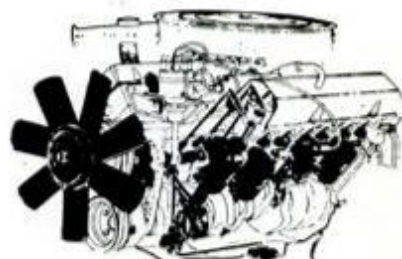
The begin-again miles

SECTION 11. TAKING INVENTORY

Prepared by the editors of Popular Mechanics with technical art by Hank Iken (Walken Graphics), Fred Wolff and Ed Lipinsky. Photography by George Ancona, Irv Field, Strother MacMinn and David Best.

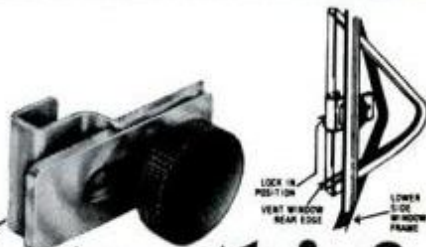
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Credit Card No. _____ Expires _____

Name _____

Address _____

City _____

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1902



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The first men to use a Bosch plug were the pioneers of the automobile.

Carl Benz and Gottlieb Daimler are generally recognized as the inventors of the gasoline-powered automobile. Both men developed automobile engine prototypes as early as 1885. But they remained frustrated in their efforts to build more power into their engines.

Benz put the problem in a nutshell when he said: "Without the spark all is in vain."

He was referring to the one glaring deficiency of the ignition systems of his time—an inability to consistently achieve the rapid-fire delivery of the vital spark needed to ignite the fuel-air mixture.

The solution came two years after Daimler's death. On September 24, 1902, Daimler Motorworks received the first Bosch high-tension magneto and spark plug. Bosch had supplied the spark.

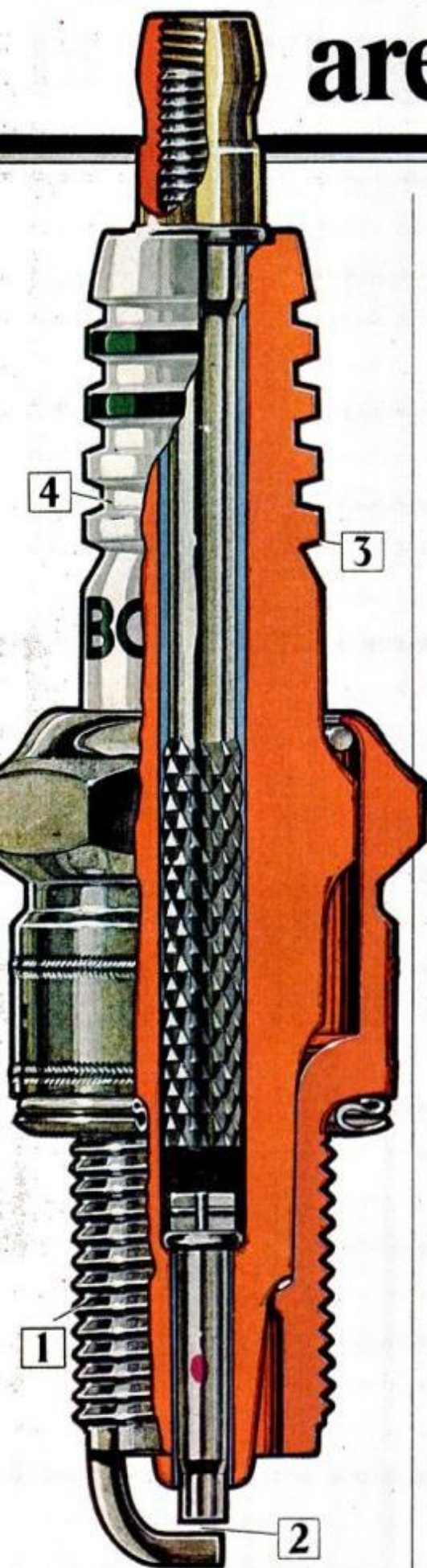
Since 1902, Bosch has developed over 20,000 different plugs. The four refinements described here are only the latest in a long line of Bosch innovations.

Bosch improvements such as nickel plating are being copied by competitive plug makers. But no U.S. plug incorporates all four refinements. Taken together, they set the Bosch spark plug apart.

1 Nickel-Plating

When it's time to install new plugs, you might find that the old ones have "seized," or gotten stuck, so that they're almost impossible to remove.

Plugs can stick fast in some engines due to an electro-



refinements that spark plugs are made

chemical reaction between the alloy cylinder head and the metal plating on the plug threads. Engine heat speeds up this reaction.

The harder the metal used to plate the plug, the better it resists this chemical change. Bosch plates their plugs with nickel, which is much harder than the galvanized zinc used on the leading U.S. plug.

Bosch nickel plating virtually eliminates the possibility of seizing.

2 Gapped at Factory

The gap between the center and ground electrodes of a spark plug is crucial to smooth performance of an engine. A variance of only 4/1000ths of an inch can cause irregular firing of the plug.

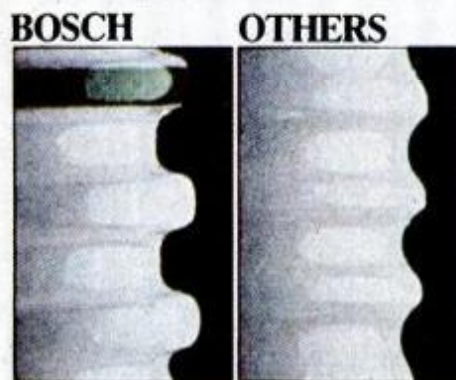
Only Bosch pre-gaps its full line of plugs to the *exact* engine specifications determined by the car manufacturer. No need

Each Bosch plug is pre-gapped to car maker's specifications.

to waste time or risk mistakes with hand gapping. Bosch plugs come ready for immediate installation.

3 Angular Rib Design

A spark plug insulator must be able to handle extremely high voltage without allowing current to "flash over," or leak.



to the outside of the plug. The irregular configuration of insulator ribs restricts the flow of leaking current.

Bosch engineers devised a rib design that substitutes corners for the usual curves. This angular configuration reduces leakage even further by lengthening the uneven path over which leaking current would have to travel.

4 Crack Resistant

An insulator should not crack under prolonged compression and temperatures as high as 1,500°F. Aluminum oxide, the major component of insulator ceramic, reduces its brittleness. This makes cracking less likely. Bosch insists on

an industry-high proportion of 95% aluminum oxide, vs. 91% for the leading U.S. plug.

When it comes to trying to build a better spark plug, Bosch has been at it—and kept at it—for over three quarters of a century. Which may explain why, if you want all four of these refinements in a single plug, you'll have to ask for Bosch.

Bosch spark plugs are available only in professional automotive outlets.

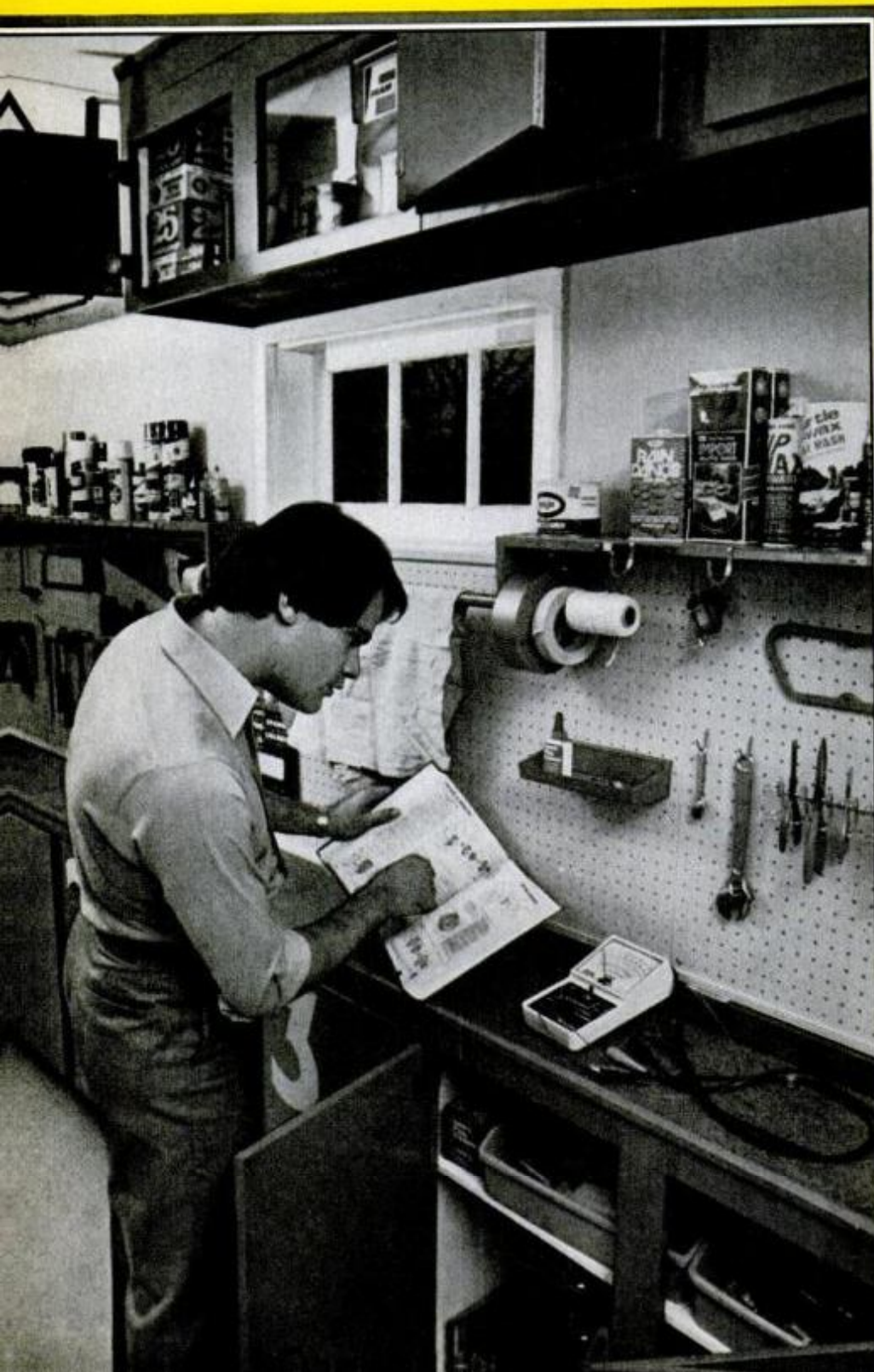


ROBERT BOSCH CORPORATION

Popular Mechanics 1978

CAR CARE GUIDE

shows you how to set up a dream garage and how to use it!



With this Car Care Guide you will be able to get organized at last! It'll help you plan an efficient new garage layout and systematically stock it with tools, test equipment and supplies.

Best of all, expert PM how-to will guide you through a money-saving maintenance program for your car's first 100,000 miles.

The first section of the Guide describes car care jobs from Mile One to 10,000 miles, the second section goes from 10 to 20,000 miles and so on up to 100,000 miles. The final section summarizes the things you'll need in your garage. Use this section as a shopping list.

The Guide is based on maintenance schedules for 1978 vehicles from Detroit automakers. Manufacturers don't always agree on maintenance intervals. For example, Ford recommends replacing a fuel filter at 10,000 miles while GM says 15,000. We believe in frequent preventive maintenance, so in the case of the fuel filter, you'll find it in our 0 to 10,000 mile section.

If you have an older model car, the manufacturer may call for more frequent maintenance than is necessary for '78 models, so follow your owner's manual to establish your own maintenance schedules.

And what do you do after your car reaches that milestone, the 100,000-mile plateau? Why, you start all over again and go for 200,000. Why not?

—The Editors

Your garage can be as organized as the PM setup here, making car care easier than you've ever imagined. And, yes, car care really does pay off—as you'll see when you turn this page . . .

WHY OUR OIL SHOULD BE STANDARD EQUIPMENT ON ALL SMALLER CARS.

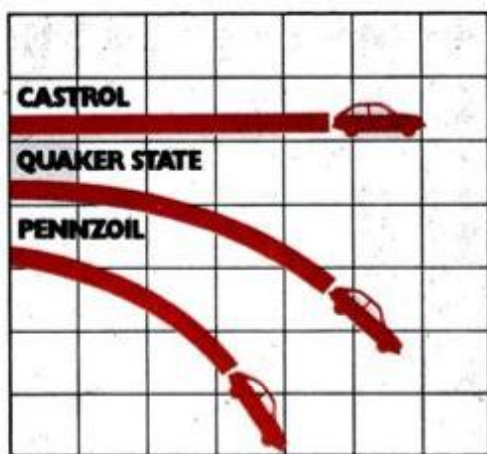
Smaller cars demand even more of a motor oil than big cars do. Their 4 and 6 cylinder engines run at considerably higher revs throughout their entire performance range. So there's more heat and friction in the engine.

All this can cause extra wear, tear, and 'shear' (thinning out of the oil)—what engineers refer to as "viscosity breakdown." As the viscosity of the oil breaks down it loses more and more of its ability to protect a smaller car's engine from its own self-destructive tendencies.

That's why Castrol is so essential for smaller cars.

Unlike ordinary oils Castrol doesn't break down. After an incredible expenditure of time and money Castrol engineers developed a unique motor oil formulation using a special viscosity modifier that prevents Castrol from thinning out under intense heats and pressures.

Then they added additives and detergents that keep sludge from forming as the oil cools down. Additives that give



To prove that Castrol is better suited for smaller, hotter, higher-revving engines we tested Castrol against Quaker State and Pennzoil. As the graph above plainly shows, only Castrol didn't break down.

Castrol the strength it needs to keep cleaning and lubricating the narrow passages in smaller engines. (And if Castrol can do all this for smaller engines, imagine what it can do for bigger, less demanding ones.)

To prove how good our oil really is, we tested Castrol against the two leading brands: Quaker State and Pennzoil.

The test was conducted in a laboratory by an independent testing firm. Each one of the oils was an SAE-approved 10W-40. After the equivalent of roughly 2,000 miles they found that while Quaker State and Pennzoil had both shown significant breakdown, Castrol hadn't broken down at all.

So while there are lots of oils to choose from, only one should be standard equipment on smaller cars. Castrol—the oil that doesn't break down.

After all, if your motor oil breaks down, who knows what could break down next?



Castrol
THE OIL ENGINEERED FOR
SMALLER CARS.

Mint 1933 Auburn convertible sedan brings over \$100,000; basket case about \$5000.



Can you drive your car for years and wind up making money on it?

It's a lot more likely today than ever before, especially if you know what you're doing. Half the secret is maintenance, the other half, demand for the particular model of car you have.

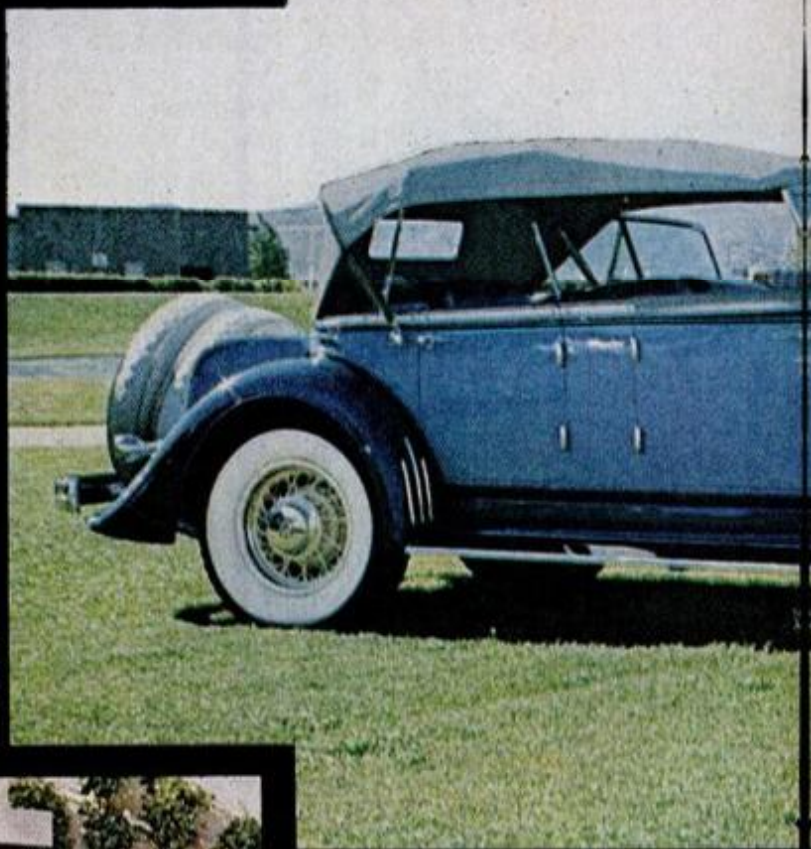
Our West Coast editor, Michael Lamm, bought a two-year-old Camaro convertible in 1969 for \$2500. The car's odometer showed 25,000 miles. Today, nine years and 79,000 miles later, Mike's been offered more than he paid for the car—by people who stop him on the street!

"My Camaro looks practically new," says editor Lamm. "Even the top is original. I've never had the heads nor

CAR CARE GUIDE

Yes, car care really does pay off!

1933 Chrysler Imperial LeBaron was made in limited numbers. If you bought this one new (for less than \$4000) you'd be a rich man today.



Auctioneers predict that some Duesenbergs will go for more than \$1 million soon.

pan off. The engine burns no oil between changes.

"I admit I baby this car. Most owners don't. Most, in fact, haven't tried to get off the depreciation treadmill. They trade in every couple of years, put a minimum into maintenance and may lose thousands of dollars each time they get into another car without even realizing it. If they do realize it, they don't seem to care.

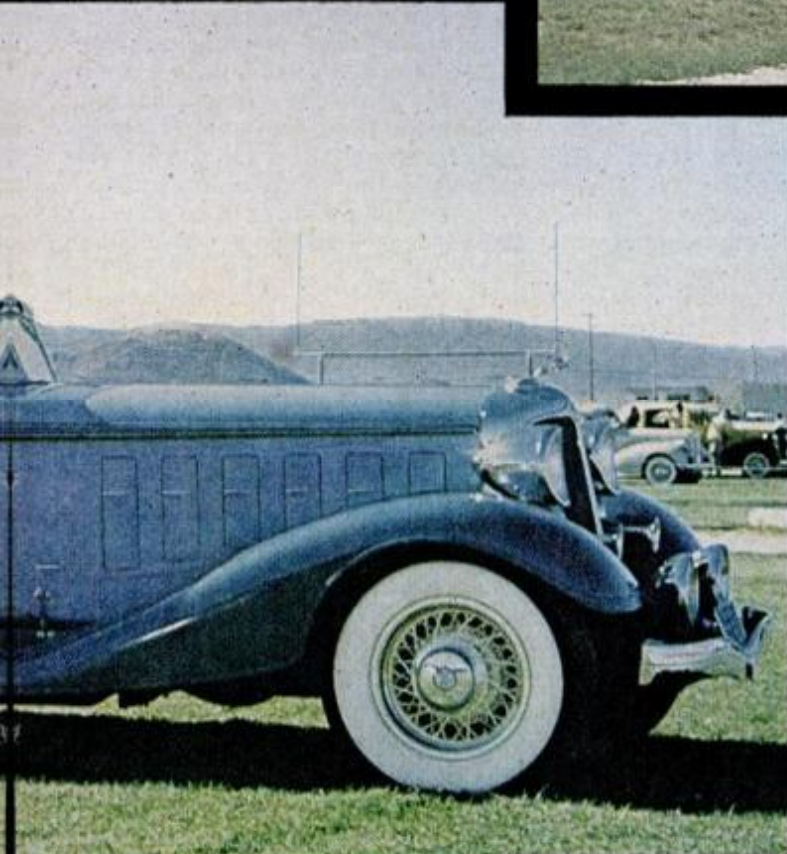
"Well, I care," continues Lamm. "I decided a long time ago that I'd try to sidestep depreciation by buying a car I really like. I decided to take good care of it, and keep it as long as possible." Mike concedes that living in California helps. Body rust is not the

problem there that it is in other parts of the country.

You, too, can make money by keeping and maintaining your car. First, ask yourself if your car has "collector appeal" to begin with. Eventually even a mint Maverick might become a collector's item, but you'll have to wait an awfully long time for that to happen. If you own a more desirable car—say a Trans-Am or Corvette—it can become a collectible model almost immediately.

Thus if you take care of a car that's desirable to begin with, you stand a much better chance of recouping your investment when the time comes to sell. And if you pick the *right* car,

Sporty, 1918 Buick roadster is more in demand than 1918 sedans and touring cars.



Classic prow of Packard—a marque that has remained strong among collectors.

maintain it faithfully, and keep it a reasonable length of time, you'll probably end up making money in the end.

The true classic cars you see on these pages—the Auburn, Duesenberg and Imperial LeBaron—are worth up to 100 times more today than they cost new. Most of their appreciation has occurred within the past 10 to 15 years. These cars and many more like them have been appreciating more quickly recently than ever.

We don't hold up these classics as typical, but the fact remains that much newer automobiles—the so-called "milestones" and special-interest makes—are becoming collectible faster than the antique classics of the



1932 Studebaker Regency coupe is more in demand than plain four-door sedans.

Photos: Shurtler MacMinn and David Best

CAR CARE GUIDE

cars anyway, especially since the word "restored" means different things to different people.

A full-scale, ground-up restoration—one that nets 98 to 100 points at a concours—can cost \$10,000 and more often runs nearer \$20,000. So you can see that if you take good care of a desirable car in the first place, you'll come out better than you would if you let it run down and restore it (even recondition it) before resale.

Back in 1948, a young machinist named Gar Button bought a brand-new, nine-passenger DeSoto Suburban long-wheelbase sedan. Button, of Los Gatos, Calif., still owns the car, having put 172,000 miles on it. He's kept it in showroom condition and continually gets offers from prospective buyers. Button paid one year's salary—\$3000—for the car in 1948 and now values it at \$15,000.

The predicament boils down to two essentials. First, what constitutes a desirable car? Second, what constitutes reasonable (or even compulsive) maintenance? You'll get answers to the second question throughout this Car Care Guide. The first one warrants more going into.

First, let's establish some working definitions. Collectors and old-car hobbyists talk basically about four different categories of cars: antiques, classics, milestones and special-interest.

You'll find no dictionary definitions for them. It's impossible to arrive at precise definitions. Various car clubs and state motor-vehicle departments define them differently.

But for practical purposes, "antiques" are cars built between the beginning of the automobile—say 1896—and about 1925. And no, a 1953 Plymouth is *not* an "antique," though many states will license it so.

The term "classic," at least in the vocabulary of the purist, covers only cars designated by the Classic Car Club of America. The club's roster of classics includes depression-built marques like Duesenberg, Pierce-Arrow, Packard, big Cadillacs, Lin-



1967 Chevrolet Camaro convertible is car that some would pay \$3500 to own.

colns and Imperials that cost a lot to begin with. Today, classics are out of sight pricewise.

Like "antique," "classic" becomes a common label for various cars that aren't. For example, despite what the Classic Chevy Club says, 1955-57 Chevrolets are *not* classics.

"Milestone" is a term of recent coinage. Cars designated "milestones" are again determined by a vote of a club, in this case the Milestone Car Society. The club currently certifies some 125 makes and models of 1945-64 vintage. A few examples of milestones are 1955-57



1973 Lincoln-Mercury Panteras, built in Italy with 351 Ford V8s, are rare.

Thunderbirds, the original Olds 88 (1949-50), certain stepdown Hudsons, the 1957-59 Ford retractable hardtop, the 1953-56 Packard Caribbean and the 1953-54 Studebaker Starliner coupe.

So-called "special-interest" cars take in everything else collectable, from Model T Fords through Model As, early V8s, Chrysler Airflows, vintage Stovebolt Chevs, orphan Gramms, Kaisers, Hupmobiles and so forth. Broadness of the special-interest category lets it encompass all milestones, but it goes much farther—into such cars as 1965-73 Mus-

tangs, all Corvettes, Avantis, Tornados—anything of interest or coming of interest to car collectors.

If you're driving a 1964 Riviera, it's a milestone; if it's in good shape it's a special-interest car too—definitely collectable and commanding a respectable price.

Generally, values of classics, milestones and special-interest cars are going up, but prices of antiques have mostly stabilized. That could change. Not many antiques go for much over \$10,000 now, and you can still buy a nice Model T for half that. But all styles of Model As and flat-head Ford V8s, are in great demand, especially the open V8 jobs of 1932, 1934, 1936 and 1940.

Here are basic qualities that separate collectable and future collectable cars from the ho-hum majority. If you own a car with some of these traits, it's worth hanging onto and keeping in tip-top condition.

1. Was it a good car to begin with?

One reason traditional collectables like Model A Fords, 1941 Cadillacs and 1955-57 Chevys remain in such solid demand is that they were well designed and well engineered.

2. Is there something special, un-



1978 Volkswagen Beetle convertible is destined to appreciate in coming years.

usual or outstanding about your car?

If it's a convertible, great—ragtops are currently the rage and will probably remain so. T-tops and some sunroof jobs do or will fit the special-interest category, also turbocharged models like the 1962-63 Olds F-85, Corvair Spydys and likely the new Buick Regals.

3. Is it sporty and chock full of performance or personality?

Corvettes, Firebirds, Camaros, GTOs, Olds 4-4-2s, early AMXs, Superbirds, Daytona Chargers, Bricklins, Panteras, Ferraris, senior Porsches, Lotuses and similar examples will never



1957 Ford retractable hardtop convertible possesses a uniqueness that puts it in demand among automobile enthusiasts.



1976 Cadillac Fleetwood Eldorado convertible, last of Detroit ragtops, appreciated instantly due to financial speculation.

let you down if you keep them up. Eventually, marques like Javelin, the original Barracudas, Challengers and most sporty, exotic, expensive imports like Jaguars, BMWs and Alfas will return their investments.

4. Is it particularly good-looking? Styling standouts are always in demand. Consider the Jaguar XK-120, XKE, Studebaker's Starliner coupes and Avantis, and Corvettes. Good lines make up part of the appeal of the aforementioned cars and categories.

5. Was it expensive to begin with? There's some debate as to future collectability of such models as Sevilles and Versailles, but a lot less headshaking about Eldorados, Cad convertibles, most Mark Lincolns, all Rolls, many larger Mercedes and perhaps the last of the late, great Imperials.

However, you *can* still go wrong if you use price-when-new as your only guide. Citroen-Maseratis, for instance, haven't been in nearly the demand expected a few years ago, and the Bicentennial Cadillac convertibles (the "last" ones) have plunged from about \$35,000 to more like their original list of \$15,000 recently. The \$35,000 was due to financial speculation when it was announced that the production run was about to end.

6. Did it enjoy great popularity when new? Rarity is one thing, and many people believe that the rarer a car, the more valuable it is. That, though, isn't always true. Often the more popular it was when new, the more popular it will be as a used car and the more in demand it becomes when it's collectable. Examples: Model A Fords, flathead V8s, Stovebolts, 1955-57 Chevys, Mustangs—all very popular new, all popular today. On the other hand, Powell Sport Wagons, of which perhaps 100 were built during 1955-56, aren't in the slightest demand today.

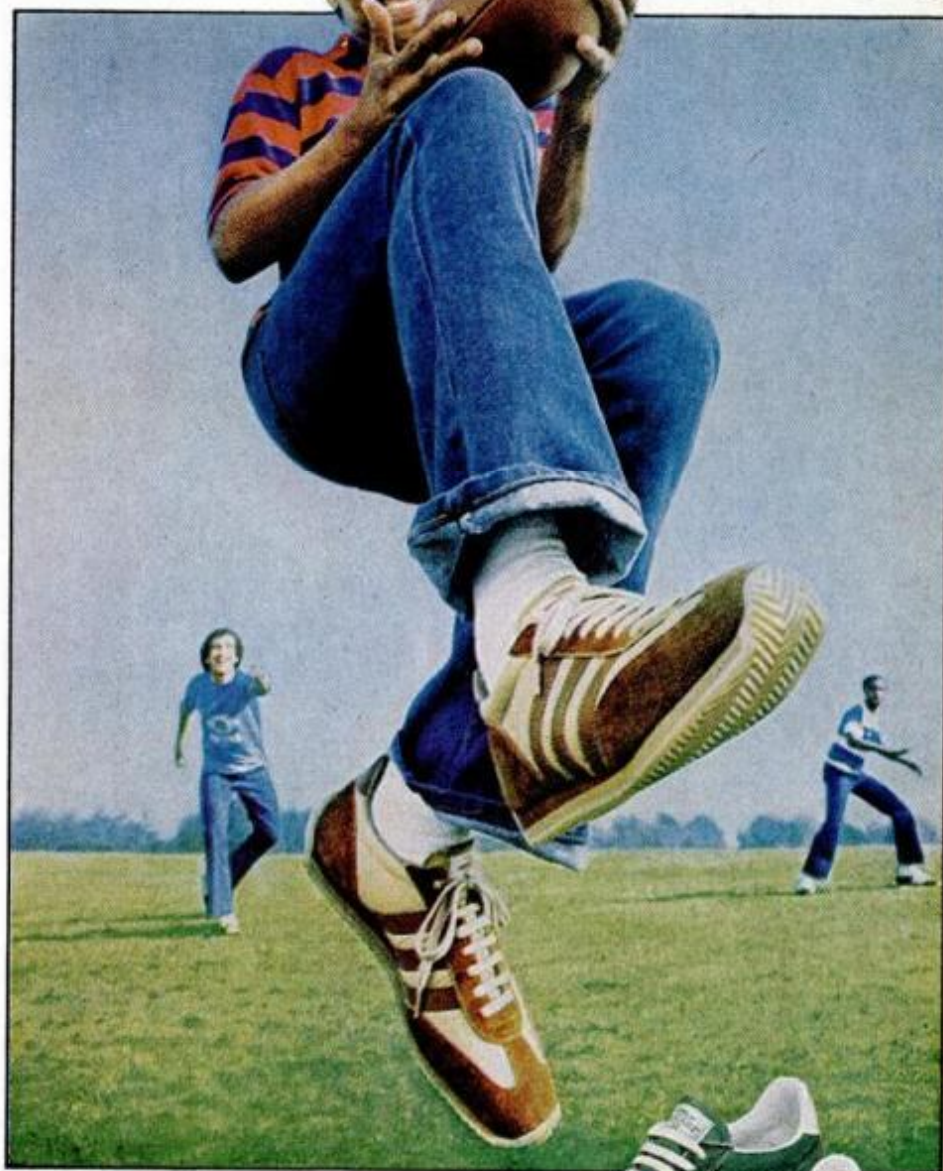
Rarity becomes interesting only when the car is unique or unusual by virtue of custom body work or some outstanding feature: a limousine when nearly all its cousins were sedans; a handcrafted convertible; a station wagon tailored from a conventional body type.

Caution. Buying and selling enthusiasts' cars (any type) has become big business. If you're tempted to invest in a "collectable," be sure you know what you're doing. Just as you wouldn't jump lightly into land speculation or the bond market or farm futures, be careful before plunging into the wild world of automotive speculation.

You'll never go wrong *maintaining*

(Please turn to page 288)

Get the feel of a **WINNER.**



The Winner II Sportshoe

Nylon with split-suede trim upper. Padded tongue and collar. In blue, beige, red and green. See the entire line of Winner II Imported Sportshoes at The Shoe Place.

Sears

©Sears, Roebuck and Co., 1978



Exxon's gasoline-saving Uniflo[®] motor oil

**14.0
extra
miles**



**22.4
extra
miles**



**14.5
extra
miles**



**13.6
extra
miles**



**16.1
extra
miles**



**Every day you
wait to change
to Uniflo could
cost you money:**

gave an average 16 extra miles per tankful.

16.2
extra
miles



9.6
extra
miles



20.4
extra
miles



22.7
extra
miles



Some individual car savings in one of our driving tests. Your results may vary, depending on your car and driving habits.

If you get just the average savings of our test fleet, you could save about \$20 a year on gasoline by changing to Uniflo motor oil.

That would give you a tidy profit of nearly \$17. Maybe more.

Here's how to figure it.

Uniflo costs only about 25¢ a quart more than multi-grade oils that don't save gasoline.

But after conditioning with Uniflo, 18 of the 19 cars in our test fleet demonstrated measurable gasoline savings—savings as great as 26 extra miles per tankful. And the whole fleet averaged 16 extra miles per tankful.

Want to know how much money that average 16 extra miles per tankful could save? You can get a good idea from the chart below.

How to estimate the savings.

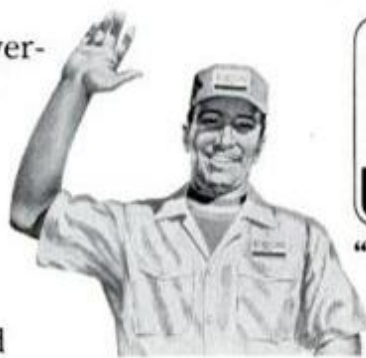
Just go across from the price you pay for gasoline until you are directly under the miles per gallon your car gets.

In the example below, the driver would

be ahead \$16.96—even after paying the small difference in cost between Uniflo and typical multi-grade oils that don't save gasoline.

If you get just the average savings, you'll see that Uniflo can save you a lot more than its slight extra cost. And if there's more than one car in your family, don't forget to add the extra savings.

The Spring oil-change offer at participating Exxon dealers gives you a chance to save even more money. Why not try Uniflo now. Every day you wait could be costing you money.



"Thanks for coming by."

Annual savings you could get by changing to Uniflo.

GASOLINE PRICE PER GALLON	MILES PER GALLON YOUR CAR NOW GETS				
	10	12	14	16	18
74.9¢	\$29.25	\$23.87	\$20.03	\$17.15	\$14.92
69.9¢	\$27.10	\$22.08	\$18.49	\$15.81	\$13.72
64.9¢	\$24.94	\$20.29	\$16.96	\$14.46	\$12.52
59.9¢	\$22.79	\$18.49	\$15.42	\$13.12	\$11.33
54.9¢	\$20.64	\$16.70	\$13.88	\$11.77	\$10.13

The gasoline-savings examples above are based on a 417,000-mile fleet test. After conditioning with Uniflo, the fleet averaged 4.5% better mileage than with a typical multi-grade oil like most people use. Annual savings are calculated on the basis of 10,000 miles of driving per year (the national average) with two 5-quart oil changes.



PM
shows you
how to get organized
for top-notch
car care

Turn a mess into a dream garage!



Yes, you can transform a single-car garage that looks like this into a dream garage if you want to!

Corner storage is necessary part of design; wall cabinets are only 12 inches deep, but hold a mountain of supplies and tools.



Ten-drawer tool cabinet rolls out of corner for access to drawers, can be moved anywhere in garage or driveway. Spare-parts storage is in cabinets on the side wall.





Cabinets over workbench are perfect place for shop manuals, road maps, other gear.

Whatever the job — gapping sparkplugs or cleaning and waxing — car care is a pleasure in a neat, clean garage!



Go ahead, attack that mess, because the end result will make your months of work worthwhile. You'll *never* have a dream garage if you don't first roll up your sleeves, dig in and . . .

Strip the garage bare

This is the hardest part. You'll have to find temporary resting places for years of accumulated bits and pieces (unless you're lucky enough to start in a brand new garage).

The glorious garage in these photos is single-car, attached to the house. As you can see, we

devoted only one side and the back end to car-care use. The other side you can lay out for storage or leave bare. Your decision might be based on the size of your car and how much room you want for getting in and out and moving around. After all your garage gear is temporarily tucked in nooks and crannies all over the house, you can proceed.

Spackle and paint

Start fresh by repairing any damage to wallboard and then apply a flat-white coat of latex on walls and ceiling. You'll have an

extra step of applying wallboard if your garage is not already finished.

Paint the floor

Cement is the devil to keep clean, and spilled lubricants or an oil leak from your car will make a sticky mess and leave stains. We chose epoxy concrete enamel as our floor covering. Epoxy paint is exceptionally durable and has a porcelainlike finish for easy wipe-up. Proper preparation of your floor is important, so make sure you follow instructions to the letter. New concrete must age 60 days before you start work, for example.

With epoxy, the second coat should go on as soon as possible after the first has dried (for good adhesion). An epoxy floor is dazzling (and slippery at first so be careful), and well worth the work.

Check your dimensions

You have to do a lot of work on paper before you go any further. Check all garage dimensions carefully and don't forget the dimensions of your present car, or those of the biggest car you anticipate keeping in the garage. We allowed 13 inches along the side of the garage and 2 feet at the end. That's all the space you need to do what you see in the accompanying photos! With dimensions noted, you're ready to plan the new layout.

Plan your layout

As you design your dream garage from the floor up, try to keep everything off the floor. The clearer the floor the easier it will be to sweep and hose out the garage. Another requirement is the need for work surfaces, hooks and shelves—the more the better. Give attention to your lighting. Our garage is adequately lighted by a ceiling fluorescent fixture and a second one over the workbench. This is the time, too, for selecting locations for fire extinguishers and considering installation of smoke alarms, electronic garage door opener, intercom, telephone and other equipment.

An area for vertical storage is a must, also. The front corner of our garage is set aside for cartop luggage carriers, mechanic's creeper, tire pump, CB antennas

and other tall gear. We decided on a ready-made workbench and rolling tool cabinet for the end of the garage. For storage cabinets we got some kitchen cabinets.

Pick your cabinets

You can build your own cabinets to order, or have them built, but we decided the best way was to use the standard, prefab kitchen units that are widely available. The four 30x36x12-in. cabinets along the wall are a popular size and lined up they provide a 12-foot-long work surface. The three cabinets overhead are for spare parts. Prefab cabinet kits are reasonably priced and available by



Concrete floor of your garage must be covered with two coats of an epoxy paint for quick and easy cleanups. You will need special cleaner, acid, wire brush and scraper to prepare floor. With the garage stripped bare and walls and floor painted, you can check dimensions and plan the layout.



mail. They go together easily and are quickly hung.

Shelves and hardboard

With cabinets secured to your garage-wall studs, cut shelving and perforated hardboard to fit. Trim moldings also can be cut now. While laying out your shelves, consider where you might install dowels to serve as towel, rag and chamois racks. We built a chamois rack under the garage window as seen in the photos. The dowels protrude beyond the end caps on the

shelves to serve as holders for rolls of tape. With sawing, sanding and nailing done, you face a difficult task: color selection.

Picking your paint colors

Since you're working in a garage, it's tempting to take the easy, battleship-gray route at the local paint store. Don't do it! If you need convincing to treat your dream garage like another room in the house, look at our color photos. The brown, brick and putty colors couldn't be more perfect. They create an uplifting atmosphere to work in. Copy our color scheme or plan an exciting one of your own. After you paint, you can lay protective covering on your work surfaces. We chose grease-resistant toolbox drawer liner for ours. Now you're ready for the big day.

Move in your tools

Getting organized means having a regular place for all your tools and supplies. Place your tools in the workbench and cabinet drawers with some kind of logic—all metric tools together, for example. Lay out your perforated hardboard to keep fre-

quently used tools and supplies handy. And everything should be in its place. The only way to keep it that way is to . . .

Set up a maintenance schedule

To keep your dream garage from turning back into a nightmare, be disciplined about keeping tools clean and put away, and keeping the garage shipshape. As impressive as your dream garage may appear, it's never really finished, is it? Let's see, if I only had a diagnostic oscilloscope and . . .

FM

CAR CARE GUIDE 0 TO 10,000 MILES

SECTION 1

The early miles

Sometime during the first 10,000 miles of a car's life, and then during each additional 10,000 miles, you should perform the following automobile services in your dream garage:

- a. Change engine oil.
- b. Change the oil filter.
- c. Check fluid levels in the cooling system, power-steering pump, brake master cylinder, transmission, rear axle, battery, and windshield-washer reservoir.
- d. Inspect suspension and steering ball-joint seals and universal-joint seals.
- e. Lubricate chassis, body and other points.

- f. Clean the battery.
- g. Check and adjust ignition timing, curb idle speed and fast idle speed; check the performance of the automatic choke, throttle solenoid and thermostatically-controlled carburetor air cleaner.
- h. Replace the fuel system filter.
- i. Torque carburetor mounting bolts.
- j. Inspect engine-compartment rubber and plastic components for deterioration. (Rubber components include drive belts.)
- k. Adjust tension, after inspecting the drive belts.
- l. Drain and flush cooling system.
- m. Inspect the exhaust system for

leaks, and missing or damaged parts.

- n. Inspect brake hoses for deterioration and looseness.

- o. Check clutch-pedal free play, and adjust the clutch.

- p. Inspect and rotate tires.

- q. Check the operation of airconditioning controls and the system's performance, after inspecting airconditioning belts.

- r. Conduct a thorough safety check. In addition to safety-oriented items mentioned above, check the ignition and steering lock; parking brake; transmission "Park" gear; starter safety switch; transmission shift indicator; seatback latches; lap and shoulder belts; head restraints; defrosters; windshield washers and wipers; lights; direction signals; horn; rear-view mirrors; sun visors; door latches; hood latch; suspension system; steering system; and brakes.

- s. Care for the car's body.

Tool lineup

To perform services, the following tools, instruments and supplies are generally needed. The list does not mention conventional tools, such as common wrenches, screwdrivers and the like. Each item begins with the same letter that precedes the task above for which the item is needed, making it easy for you to match the particular tool, instrument or supply to the job.

- a. Engine oil pan drain-plug wrench, drain pan, and engine oil of the correct viscosity.

- b. Oil-filter wrench and oil filter.

- c. Ethylene glycol antifreeze, power-steering fluid, brake fluid, transmission fluid, rear axle lubricant, distilled water for the battery, and windshield washer fluid. Funnels are helpful for pouring fluids. A syringe to fill the battery with water comes in handy. You may also need a special wrench to remove the rear axle drain plug, and a special suction-filler gun to replenish the fluid in the rear axle.

- d. If an inspection shows that a ball joint or universal joint seal is leaking, the damaged part should be replaced. Special tools are needed. However, this problem usually doesn't occur until the car has accumulated many miles, so information relative to these tasks is presented in Section 7 (60,000 to 70,000 miles) of this *Car Care Guide*.

- e. A hand grease-gun capable of developing a maximum of 10,000 pounds per square inch (p.s.i.) A gun that accepts cartridges of chassis grease is the

(Please turn to page 160)

Basic "baby foods" for your new car are lubricants—grease, engine oil and others.



CAR CARE GUIDE 1

easiest to use. You may also need a grease-gun extension and zerk fittings. An oil can with a long spout and finger-trigger is useful. You should have white grease, lubricating oil, powdered graphite and silicone spray in your inventory.

f. Battery-terminal puller, post and terminal-brush cleaner, hex-nut pliers and terminal spreader. You also need baking soda or ammonia, garden hose and battery carrier to safely transport the battery to and from the car.

Note: This list of battery tools assumes the presence of a conventional battery having cell caps and top-mounted posts. Adjust your tool requirements accordingly if your car possesses a sealed nonrefill-



Check and set sparkplug gap. A gauge in your garage and your car is a good idea.

able battery and/or one that has cable terminals attached to the side of the battery.

g. A stroboscopic timing light having a magnetic pickup. If a timing light that doesn't have a magnetic pickup is used, you need an adapter to avoid piercing ignition cables. A distributor wrench may also be required to adjust timing. Don't forget sparkplug gapping and cleaning tools.

A tachometer is needed to check carburetor settings accurately and to make adjustments. The tachometer may be part of another instrument, such as a complete engine analyzer or a tach/dwellmeter. Carburetor solvent and an old toothbrush help in keeping carburetor linkage and the choke valve clean and bindproof.

h. A fuel filter designed for your engine. There are two general types: (1) the in-line filter, which is positioned externally in the fuel-pump-to-carburetor fuel line; (2) the internal filter, which sits in the carburetor inlet.

i. A torque wrench. Buy one wrench that provides both foot-pounds and inch-pounds calibrations. However, two individual wrenches, one for foot-pounds and one for inch-pounds, are just as effective.

j. A variety of hoses (cooling system, heater, power steering and vacuum); clamps for hoses that require clamping; drive belts. Plastic components that go bad may be replaced on an as-needed basis if they cannot be repaired.

k. Drive-belt tension gauge. A bar for

bringing pressure against the alternator or another part may also be needed to achieve correct belt tension.

l. Flushing tee, rust preventive and a garden hose.

m. In time, you will have to replace exhaust-system parts. Although exhaust-system components should be inspected during every 10,000-mile period, repairs aren't normally required until the car reaches 40,000 to 50,000 miles. See Section 5 for information and a list of tools and equipment needed to make repairs.

n. A brake hose may have to be replaced during the first 10,000 miles, but this is unlikely. However, keep replacement hoses handy. We discuss how to do brake work in Section 5, 40,000 to 50,000 miles.

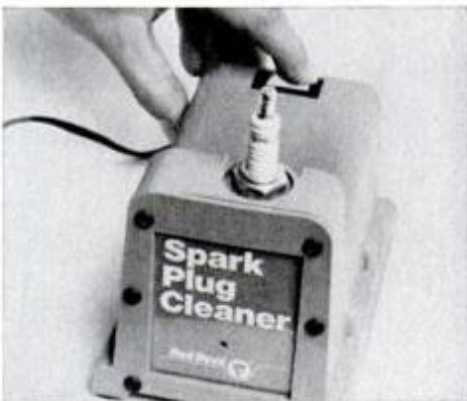
o. No special tools are needed to adjust the clutch.

p. A tire-pressure gauge, tread-depth gauge, a good lug nut wrench and jack (a hydraulic garage jack is the easiest and safest type to use).

g. Normally, airconditioning service isn't required until 20,000- to 30,000-miles. Refer to Section 3 for information on special equipment.

r. A set of windshield wiper blades, and an inventory of bulbs, sealed headlight beams and fuses.

s. Hopefully, the car won't experience any bumps, scrapes or raps during the first 100,000 miles (see Section 10 for

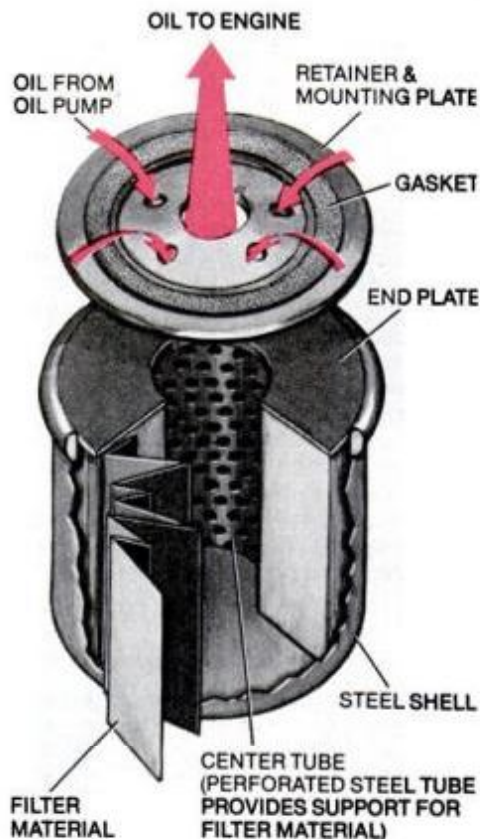


Cleaning sparkplugs at home is convenient with a do-it-yourselfer's sandblaster.

body repairs). However, you will need supplies to keep the body bright and rust-free. The lineup should include cleaners, wax, tar and bug remover, vinyl-top dressing, car-wash detergent, tire dressing, chamois, rags and a bucket.

To keep the interior as sharp-looking as the exterior, have a vacuum cleaner and whiskbroom in the garage. Don't forget the engine compartment. Commercially available engine degreasers used every few thousand miles do wonders.

Note: Several parts mentioned in the above list require ordering by use of a part number. Filters fall into this category. You must get the correct part for your car. If the old part does not bear a number, provide the parts salesman



Oil filter replacement at every oil change will help you get long engine life.

with the make and model of your car, and a description of the engine; or take the old part with you when you go to buy the new part.

The remainder of this chapter offers tips on employing your dream garage to care for your car during the 0-to-10,000-mile time frame. "How to" sections discuss services that we feel require emphasis or clarification.

Engine bliss?

Oil, oil, oil!

No other single service will help your car attain its 100,000-mile birthday, and beyond, more than frequent oil changes.

How frequent? Never exceed the mileage suggested by the manufacturer in the car owner's manual. However, if you read this recommendation carefully, you will find that the manufacturer's suggestion is only a guide. The oil-change interval should be adjusted to the type of driving you do, and the area in which it is done. *Engine longevity is directly related to how often oil is changed.*

Use an oil made by a reputable company and designated on the can as meeting "SE" requirements. If you decide to add a synthetic oil to the engine, you could probably extend the drain period. Most synthetics are advertised as able to provide proper lubrication for 15,000 miles under "normal" conditions. However, never exceed the car manufacturer's mileage recommendation if the

(Please turn to page 162)

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The POPULAR MECHANICS Car Care Guide, beginning on the following page, is jam-packed with valuable car maintenance hints to get your car smoothly through the first 100,000 miles. The convenient "magazine-within-a-magazine" format allows you to remove the section easily. Simply bend the magazine pages away from the front and back of the Guide. Pull the Car Care Guide out and you'll have a handy automotive reference manual always at your fingertips.

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SECTION 1 CAR CARE GUIDE

vehicle is under warranty. You will void the warranty.

To verify that services have been performed on a car as stipulated by the warranty agreement, keep a log of services and mileages when services are done and keep receipts for products you buy.

The section in the car owners manual dealing with oil is important. Read it carefully. It will explain mileage requirements and what oil to use in your car for the weather prevailing in your area.

How to: Changing oil

1. **Warm up engine** so the oil is hot.
2. **With the engine turned off**, raise the front of the car. Make sure it's held firmly. Engage the parking brake, place the transmission in Park or in gear and chock the rear wheels.

3. **Crawl beneath the car** (use your creeper), and place a drain pan (minimum six-quart capacity) under the crankcase.

4. **Remove the oilpan drain plug.** Use an open-end, adjustable socket or box-end wrench if the drain plug has a hex head. If the drain plug is countersunk, you need a special drain-plug wrench. Don't try any offbeat techniques. You could butcher the plug.

5. **If the plug is frozen** and tough to loosen, smack the handle of the wrench with a mallet.

6. **After breaking the plug loose**, remove it by hand, but be ready to pull away fast, so you don't get bathed with hot, dirty oil.

7. **Let the oil drain.** Be patient. With every drop of oil that drains, the engine is ridding itself of more contamination.

8. **After draining is done**, thread the drain plug carefully back into the oil pan. If the plug has a washer, be sure to use it. Don't force the plug if it binds. Back the plug out, and start over.

9. **Tighten the drain plug fingertight.** Then, use your torque wrench to tighten the plug to the specification in the service manual. Generally, oil drain plugs are tightened to 20 foot-pounds. After you fill the crankcase with oil (following oil filter replacement), check around the drain plug for a leak. If oil is leaking, tighten the plug a little more.

10. **If you accidentally strip the threads** of the drain plug, the plug won't tighten as you turn it. Don't rush to replace the oilpan. First try a rubber oilpan drain plug sold by auto part and accessory dealers. It costs about \$2, and may stop the leak, saving you \$50 for a new oilpan.

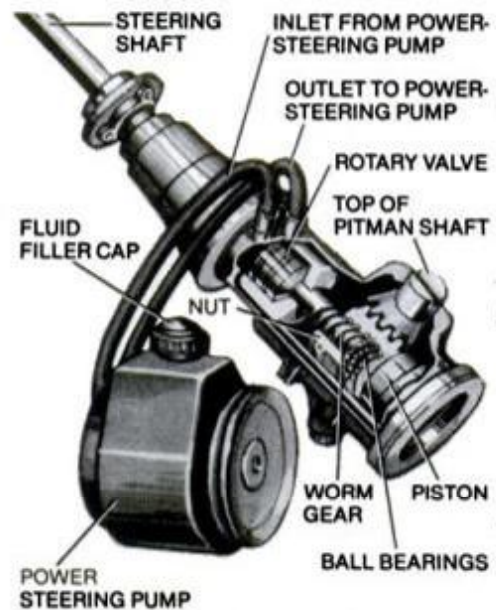
Don't forget the filter

Should an oil filter be replaced every other oil change, as car manufacturers suggest, or every oil change? The fact is that one quart of old, dirty oil is contained in the old filter, and four quarts of clean oil plus one quart of dirty oil equals five quarts of dirty oil.

Whether or not you go along with man-

ufacturer recommendations, you will have to replace an oil filter sooner or later. An oil filter is a blind item. You can't look inside to judge quality, so buy a filter made by a reputable company.

Replacing an oil filter is such an easy job that many people become complacent and make serious mistakes. The first mistake is buying an oil-filter wrench that doesn't fit the filter. The second one is



Power-steering unit is on your list of components to check for proper fluid level.

not following acceptable procedure. To make sure there won't be errors which can have serious consequences, here is an outline of the right way to do this job.

How to: Replacing the oil filter

1. **Place the oil-filter wrench** around the filter and loosen the filter by turning it counterclockwise.

2. **If the filter holds fast**, pound a large chisel through the oil filter canister. Spread rags around the area to contain the oil that will spill. With the chisel set, give the chisel a whack or two with a mallet. This will loosen the filter.

3. **Put a drain pan under the filter** to catch dripping oil, and unscrew the filter by hand. Discard the old filter.

4. **Wipe the filter's seat** on the engine clean, making sure the threaded extension to which the new filter will attach is also clean.

5. **Coat the gasket** on the base of the new filter with clean engine oil. Also apply oil to the filter's threads.

6. **Carefully thread the filter** into place on the engine. *Tighten by hand only.*

7. **With the filter in place**, add oil to the crankcase through the oil filler tube or port on the engine. Do not overfill the crankcase. If your manual calls for five quarts of oil, put in five quarts of oil. Check the oil level on the dipstick to see it's at the FULL mark.

8. Start the engine, and let it run a few minutes. Turn it off. Check for leaks at the oil drain plug and oil filter.

As essential as blood

The various fluid-using systems in your car need fluid that is specifically designated for them—not "any old stuff." It must be the specific fluids recommended by the manufacturer "or equivalent."

It's this "or equivalent" designation that often causes confusion. There are two ways to make sure you are getting the correct fluids for your car.

The first way is to buy fluids from the parts department of a dealer selling your make of car. Use the specifications we outline below. The second way is to buy fluids that carry the name of a reputable manufacturer. Read the package. It must state that the fluid meets the specification of the particular car manufacturer.

The following is a rundown of American manufacturers' fluid recommendation for late model cars:

American Motors (AM)

Cooling system—AM all-season coolant.

Power steering—AM automatic transmission fluid (labeled Dexron or Dexron II).

Master cylinder—AM heavy-duty brake fluid (450°F. minimum boiling point).

Automatic transmission—AM automatic transmission fluid (labeled Dexron or Dexron II).

Manual transmission—SAE 80 gear lubricant conforming to API GL-1 (API: American Petroleum Institute).



Torque wrench is necessary for tightening to spec many fasteners on your car.

Overdrive—SAE gear lubricant conforming to API GL-1.

Rear axle, conventional—AM rear axle lubricant SAE 80 conforming to API GL-4.

Rear axle, limited-slip type—AM limited-slip gear lubricant conforming to API GL-5.

Battery—distilled water.

Windshield washers—AM windshield washer solvent.

Chrysler Corp.

Cooling system—Ethylene glycol.

(Please turn to page 164)

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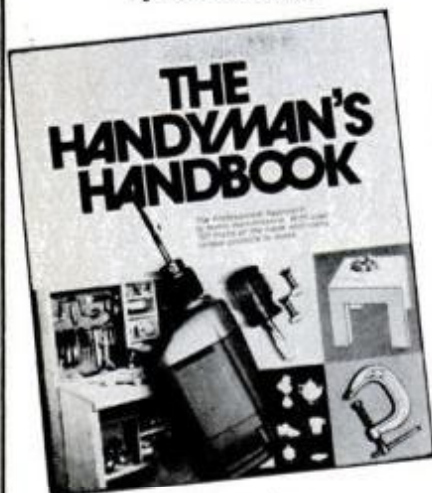
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SECTION 1

CAR CARE GUIDE 1

Power steering—Mopar power-steering fluid (part No. 2084329)

Master cylinder—Mopar brake fluid or fluid conforming to DOT 3.

Automatic and manual transmissions—Mopar automatic transmission fluid (part No. 3549660) or Dexron or Dexron II.

Rear axle, conventional—multipurpose gear lubricant conforming to API GL-5 or Mopar hypoid lubricant (part No. 3744994).

Rear axle, limited-slip type—Mopar hypoid lubricant (part No. 3744995).

Battery—mineral-free water.

Windshield washers—Mopar all-weather windshield washer solution.

Ford Motor Co.

Cooling system—Cooling-system fluid (part No. 8A-19549A or B).

Power steering—power-steering fluid (part No. C1AZ-19582-A).

Steering gear (rack and pinion)—hypoid gear lubricant (part No. D2AZ-19580-B).

Master cylinder—heavy-duty brake fluid (part No. C6AZ-1942-A).

Automatic transmission—automatic transmission fluid (C1AZ-19582-A).

Manual transmission—manual transmission lubricant (part No. C3AZ-19C547-B).

Rear axle, conventional—hypoid gear lubricant (part No. D2AZ-19580-B).

Rear axle, limited-slip type—hypoid

Master cylinder—Delco Suprame II fluid.

Automatic transmission — Dexron or Dexron II automatic transmission fluid.

Manual transmission—SAE 80W or 90W



Oil filter gasket should be coated with oil before installing hand-tight on engine.

gear lubricant conforming to API GL-5 (SAE 80W in Canada).

Five-speed transmission—Dexron or Dexron II automatic transmission fluid.

Rear axle, conventional—SAE 80W or 90W gear lubricant conforming to API GL-5 (SAE 80W in Canada).

Rear axle, limited-slip type—GM rear axle lubricant 1052271.

Battery—colorless, odorless, drinking water.

Windshield washers—GM Optikleen washer solvent 1051515.

How to: Checking fluids

Here are several tips that will be helpful:

1. If a coolant recovery system is present, check coolant level by the markings on the coolant recovery tank when the engine is warmed up to operating temperature. If the level is below the ADD mark on the tank, add coolant.

The emulsible oil in a cooling system may coat the coolant recovery tank, making it difficult to see the level through the plastic. Remove the tank's cap and check the level by looking into it.

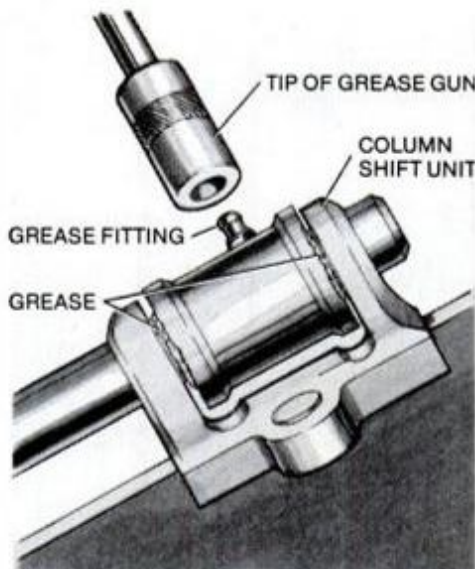
If a coolant recovery system is not present, check coolant level by removing the radiator pressure cap with the engine cold.

2. Keep brake fluid level from ¼ to ½ inch below the top of the master cylinder.

3. Instructions for checking the automatic transmissions of various models are as follows:

■ American Motors—The engine and transmission have to be at normal operating temperature (about 175° F). The engine should be running, and the transmission selector should be in N.

■ Chrysler — The engine temperature gauge should indicate a normal warmed-up condition. Move the shift lever slowly through all of the gear positions, pausing momentarily in each and finally end-



Clean fittings before lube job and completely fill cavities with clean grease.

gear lubricant (part No. D9AZ-19580-A).

Battery—Refill with commercially available distilled water.

Windshield washer—Ford Ultra-Clear windshield washer solution.

General Motors

Cooling system—ethylene glycol-base antifreeze conforming to GM Specification 1899-M.

Power steering—GM power-steering fluid No. 1050017.

ing up in N. The engine has to be idling.

■ **Ford**—Warm up the engine and transmission to normal range (150°-170° F.). Start with the transmission in PARK and the engine idling. Move the transmission selector lever through each range, allowing time in each range to engage the transmission. Return to the PARK position, keep the engine idling and check the level.

■ **GM**—With the engine running and the shift lever in PARK, remove the dipstick and touch the end of the stick to determine if the fluid is cool, warm or hot. Wipe off the stick, reinsert, withdraw and take a reading.

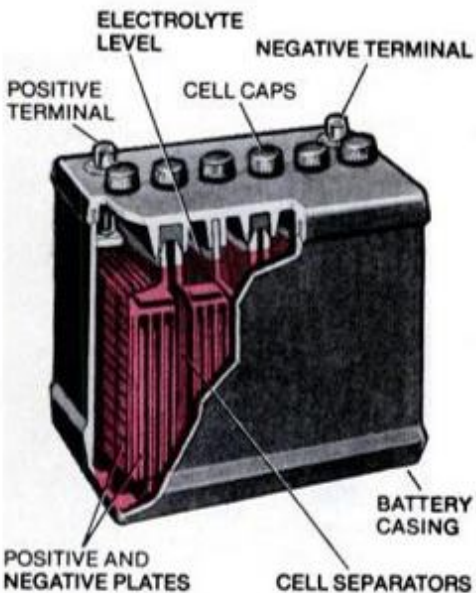
If the fluid felt cool, the level should be $\frac{1}{8}$ - to $\frac{3}{8}$ -inch below the ADD mark.

If the fluid felt warm, the level should be close to the ADD mark.

If the fluid felt hot (can't be held comfortably), the level should be between the ADD and FULL marks.

4. To check the lubricant level in a manual transmission, warm the car up to normal operating temperature and remove the filler plug on the transmission housing. Lubricant should be level with the bottom of the filler plug hole.

5. Although the lubricant in the rear axle should be checked periodically and brought up to level, in most cases it is not necessary to drain and replace fluid. (The same holds true for lubricant in the power-steering pump, manual-steering gear and brake master cylinder.)



Storage batteries with cell caps must be checked and water added periodically.

However, if rear axle lubricant is contaminated by water—for example, if the rear of the car is accidentally submerged when launching a boat—the lubricant should be replaced immediately. (The same is true if other types of lubricant are contaminated.)

Furthermore, GM recommends that the

(Please turn to page 166)



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rear axle lubricant be replaced every 15,000 miles if the car is used for pulling a trailer. Chrysler advises draining every 35,000 miles under this condition.

The rear-axle-lubricant level is checked by having the car level and removing the drain plug. Lubricant should be at the bottom of the filler hole.

You can add lubricant by using a paper cup. However, a suction gun makes the chore easier. You will need this tool if you have to drain the axle.

Key body points should not be disregarded. Body points to lubricate and lubricants to use are as follows:

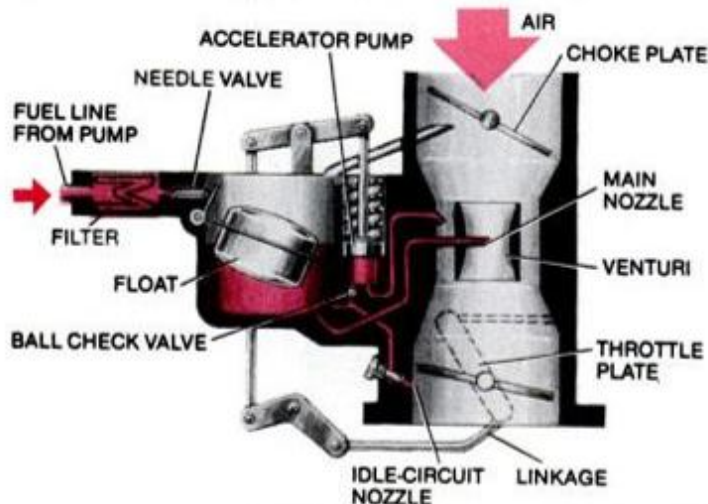
- Hood latch mechanism and hinges—light oil.
- Door hinge pins—light engine oil.
- Door lock rotor and striker plate—light engine oil or stainless stick lubricant.
- Lock cylinders—powdered graphite.
- Weather strips—rubber lubricant.

6. Only American Motors and Ford specifically recommend distilled water for the battery. Chrysler stipulates "mineral-free water" and GM calls for "colorless, odorless, drinking water." *Interpretation:* distilled water or rainwater caught in a clean glass container.

Lubrication points

You should get a copy of the lubrication chart for your car. It is found in the front of practically every service manual. The chart points out the locations of lubrication points and specifies how often lubricant should be applied. It also specifies the manufacturer's recommendations concerning lubricants to use.

Carburetor should receive attention to insure that the choke plate and all linkages are kept clean and move freely. Fuel filter requires periodic replacement. Find it either in the fuel line or in carburetor body as shown here.



How to: Lubricating the chassis

1. Find the grease fittings by referring to the lube chart.

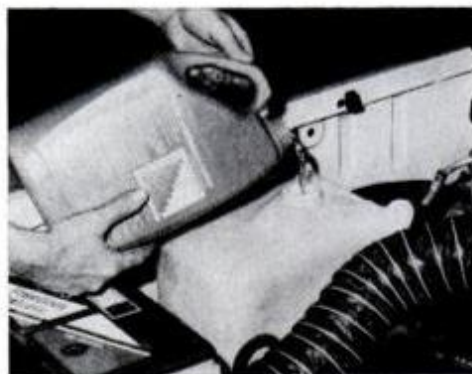
Important: Remove plugs that have been placed in grease ports. Permanently replace them with grease (zerk) fittings.

2. Wipe grease fittings clean.

3. Intercept the nipple of the grease fitting with the tip of the grease gun.

4. With an American Motors or Ford

model, pump the handle of the grease gun slowly until the rubber boot swells slightly. Swelling may be felt or observed.



Coolant overflow reservoirs make it easy to add coolant without opening radiator.

5. With a Chrysler or General Motors model, pump the handle of the grease gun slowly until grease oozes from the bleed hole in the base of the seal, or until the seal swells.

Important: A joint will fail to accept grease if a grease fitting is plugged. A little oozing is normal. However, if grease continues to come out between the grease fitting and the tip of the grease gun, replace the grease fitting.

6. Each car manufacturer suggests that certain areas receive grease in addition to those we've just mentioned. There are no grease fittings at these points. Therefore, smear each with grease when you are doing a lubricating service. The points we are referring to are:

■ American Motors models—(1) shift linkage pivot points (both manual and automatic transmissions); (2) steering stop plate; (3) clutch release idler lever (disassemble and pack with grease).

■ Chrysler Corp. models—(1) clutch linkage pivot points; (2) parking brake linkage pivot points; (3) shift linkage pivot points (both manual and automatic transmissions); (4) gear-shift control mechanism.

■ Ford models—(1) kickdown linkage

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pivot points from the accelerator pedal linkage to the automatic transmission; (2) clutch lever and rod connections; (3) steering stop pad surfaces; (4) shift linkage (both manual and automatic transmissions); (5) parking brake cable guides, levers and linkage.

■ General Motors models—(1) clutch fork joint and cross shaft; (2) parking brake cable guides, joints of links and levers; (3) shift linkage lever contact faces and pivot points of manual or automatic transmission shift linkage (do not lubricate the control cable on the console floor shift of an automatic transmission).

How to: Cleaning a battery

Note: These instructions do not apply to a so-called maintenance-free battery, which is sealed and has no vent caps.

Caution: The battery is potentially lethal. It emits explosive hydrogen gas. Never strike a match or smoke when performing this service. Never place a metal tool on top of the battery. Remove jewelry when you work around the battery, because metal that touches a battery post can cause a short circuit, which may cause a spark that can ignite hydrogen gas. Wear goggles to protect your eyes if electrolyte accidentally splashes. Flush electrolyte from the skin with a flood of water. Electrolyte will ruin clothing, so you may want to wear a protective garment such as the rubberized apron worn by photographers in dark-



Transmission fluid level should be kept up to the full mark on the dipstick.

rooms.

1. With the ignition off, remove the battery cables—*negative cable first*. Use a battery-cable puller if you can't remove a terminal by hand. Don't pry the terminal with a screwdriver or rap it with a hammer. You will damage the battery.

2. Use your battery carrier to lift the

(Please turn to page 169)



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Your new car needs protection against rust. That's for sure. And when you consider the investment you have in that car, you can't afford to settle for second best. There are those who say they will do it for less, and there are those who will tell you they can do it faster. But your Ziebart Dealer will do it right... the first time. He's an expert in rust protection. He takes pride in his work and understands the importance of quality workmanship as the real measure of protecting your car from rust. Your Ziebart Dealer really wants your car to be free of damaging rust. And he has the tools, the training, and the experience to deliver what you need... positive protection against rust. Call him today. He's in the White Pages.

IT'S US. OR RUST.



Ziebart
Auto · Truck Rustproofing



CAR CARE GUIDE

battery out of the car. Transport it to the "cleaning area."

3. Polish battery posts with your battery cleaning tool.

4. Cover battery vent caps with masking tape, and scrub all sides of the battery with a 50:50 mixture of baking soda or ammonia and water. The mixture must not get inside cells where it will neutralize electrolyte.

5. Flush the battery with water, and repeat the procedure until a fresh application of cleaning mixture doesn't fizz when it's applied.

6. As the battery is drying, clean cable terminals with your battery cleaning tool and wash down the battery tray in the engine compartment with cleaning mixture and water.

7. Return the battery to the car.

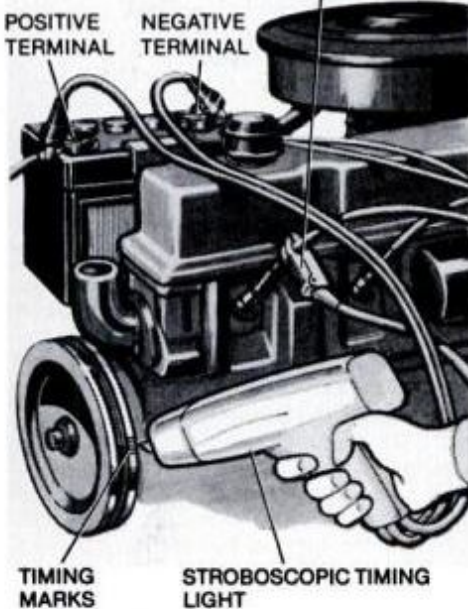
8. Reattach the battery cables tightly—positive cable first. Spread a light coat of petroleum jelly over terminals and posts. This helps retard corrosion.

Precise: Like a fine clock

One good thing about having your own garage is that you can use it as often as you like to check important things. Under this category are carburetor and ignition timing settings.

These settings change as mileage accumulates. There is no guarantee they are going to stay precise until you do an engine tuneup, which is when most car owners verify settings. As long as your

INDUCTIVE PICKUP ON
NO. 1 SPARKPLUG CABLE



Ignition timing should be checked—even on a new car just home from your dealer.

dream garage is open, you can check carburetor and timing adjustments every day if you wish, but once every 5000 miles will be sufficient.

To check the carburetor, use a tachometer. To check ignition timing, use a stroboscopic timing light. While doing this, check operation of the automatic

(Please turn to page 170)



ORIGINAL SIMONIZ.



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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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COLEMAN® INFLATE-ALL™ 150

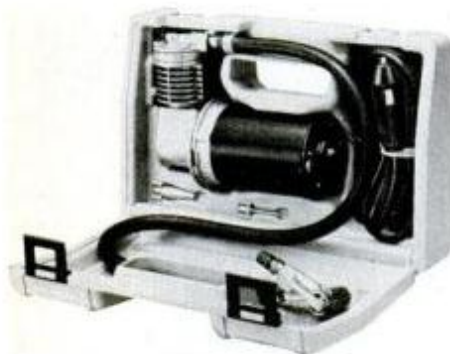


No air? No sweat!

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NOW IN LEADING AUTOMOTIVE DEPARTMENTS

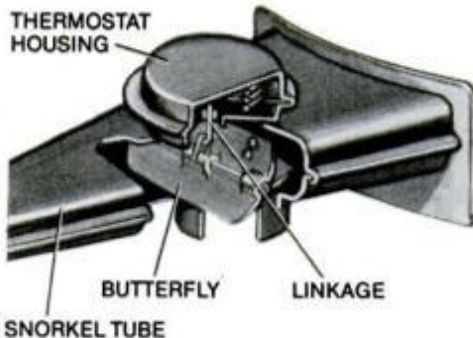
SECTION 1 CAR CARE GUIDE

choke, thermostatically-controlled carburetor air cleaner and throttle solenoid.

How to:

Checking, adjusting carburetor

Important: Manufacturer's adjustment specifications are required. These can



Air cleaner snorkel has butterfly that shuts off outside air until engine warms.

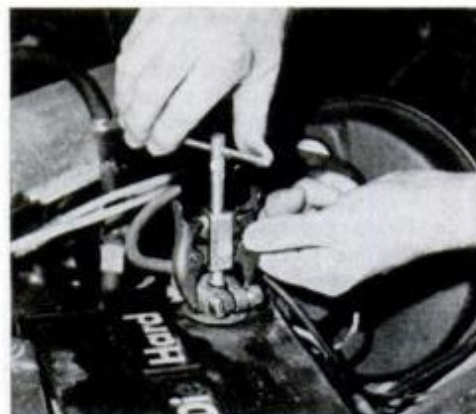
be obtained from the service manual, emissions control tuneup decal in the car's engine compartment and most owner's manuals. You must also determine which accessories, such as headlights or airconditioning, are to be turned on, if any, while making adjustments.

1. Remove the carburetor air cleaner.
2. Check the operation of the automatic electric choke by starting the engine (cold). The choke plate should be closed. As the engine warms up, the choke plate should open within 1½ minutes. Clean the choke plate's pivot points with carburetor solvent. (If the choke doesn't function properly, isolate the cause as described below under "How To: Troubleshooting an Electric Choke.")
3. Warm up the engine.
4. Replace the carburetor air cleaner.
5. Connect a tachometer—one lead to the positive terminal of the ignition coil and the other to ground.
6. Set the curb (slow) idle speed to specification. Depending on which one the carburetor possesses, turn either the idle speed screw or the adjuster of the idle stop solenoid.

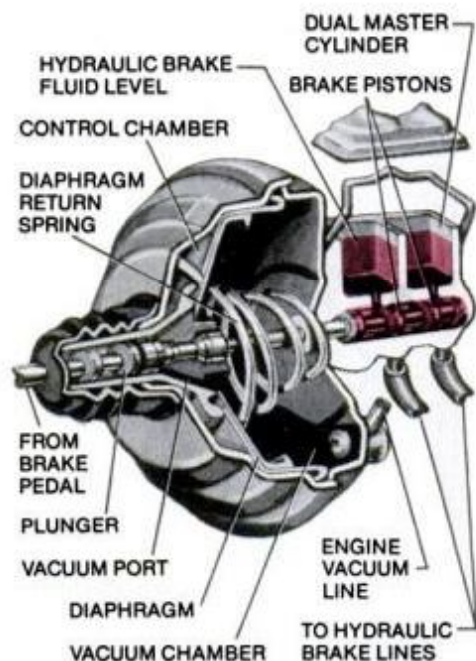
If the carburetor has both an idle-speed screw and an idle-stop solenoid, adjust for the higher specified rpm by means of the idle-stop solenoid. Then, disconnect the solenoid by pulling apart the quick-disconnect plug. Set the lower specified rpm with the idle speed screw.

7. If an idle-mixture screw (or screws) covered by a slotted cap is present, turn it (them) until the engine is idling smoothly. A one-barrel carburetor is equipped with one idle-mixture screw. Two- and four-barrel carburetors are equipped with two idle-mixture screws.

8. Find the fast-idle mechanism. It consists of an adjusting screw that rests against a stepped cam. Set the screw against the first or second step of the cam by rotating the cam. Turn the screw until the tachometer records the specified



Battery terminal puller makes job easy with no danger of damaging posts or case.



Power-assist brake unit is in line with master cylinder; check brake fluid level.

fast idle speed. Open the throttle slightly by turning the throttle lever to release the fast-idle mechanism, allowing the engine to return to slow idle speed.

9. Check the performance of the dashpot (if your carburetor has one). The dashpot helps to prevent stalling which can occur when the throttle is released suddenly.

Open the throttle by rotating the throttle lever. Release it quickly. If the engine stalls or seems to want to stall, loosen the dashpot locknut. Turn the dashpot with your hand until the plunger tip rests against the throttle lever without causing an increase in engine speed. Tighten the locknut.

10. Check the performance of the idle-stop solenoid (if your carburetor has one). Turn off the engine. The plunger in contact with the throttle lever should retract immediately, allowing the throttle to close. This prevents engine dieseling

(Please turn to page 172)

Riding High/Riding Free

Escape from the commonplace with E-T

Whether you're taking it off for the beach or putting it on for town, you'll turn heads when you're wearing E-T's. They're the wheels that tell the world what you want to say. C'mon, get away from the everyday. Start riding high, riding free with E-T.



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Shown below. The new ALL-ALUMINUM E-T VIII Spoke. A knockout because of the clean-sweep, deep dish, long spoke effect that only an aluminum casting can provide.



1st prize
Chevy Sports Pick-Up with Gerring custom interior



2nd prize
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3rd prize
10 Negrini Mopeds. And 1000 E-T Beach Towels, 5000 E-T Belt Buckles. 6013 Winners!

E-T's Riding High Riding Free Sweepstakes

To get entered, get down to your E-T dealer. If you can count, you can win. . .
Count the number of spokes on an E-T Radial Spoke. . .

Fill out an official entry blank or just put your name, address, zip code on a 3 x 5" paper with your guess. One entry per envelope. Send to E-T Mags Sweepstakes, P.O. Box 17149, Cleveland, Ohio 44117. All prizes will be awarded by random drawing among entries with correct answers, on September 16, 1978. All entries must be postmarked no later than September 1, 1978. 6013 chances to win. One prize per family; no substitutions. Decisions of judges final. If winner does not meet licensing requirements, prize may be transferred to another member of the family. Taxes, if any, are sole responsibility of winners. E-T Sweepstakes open to all, except employees and families of FDI, Inc., its advertising and judging agencies. Void in Missouri, Wisconsin and wherever prohibited or restricted by law. Odds of winning determined by number of correct entries received. For a list of winners send separate stamped, self-addressed envelope to Winners, E-T Industries, 1000 Hill Road, Benicia, CA 94510





Inductive-pickup type timing light makes checking ignition timing quick and easy.

(run-on). If the idle stop solenoid does not perform satisfactorily, replace it.

11. Turn off the engine. Reinstall the thermostatically controlled air cleaner. Let the engine get cold and test air cleaner performance.

Start the engine and allow it to run for about one minute. Look inside the snorkel. The flapper valve should be open. If the snorkel is covered by a duct, remove the duct to check the flapper valve. If this valve is not open, replace the vacuum motor and sensor. This repair is discussed in Section 6, 50,000 to 60,000 miles.

How to: Troubleshooting electric choke

1. **Disconnect the choke lead wire** from the choke cap.
2. **Connect a jumper wire** between the choke cap terminal and the wire terminal.
3. **Connect a test light** between the connector of the choke lead wire and ground. Start the engine.
4. **If the light glows**, then current is getting to the choke cap, which is causing the problem. Replace the choke cap.
5. **If the light doesn't glow**, verify that the problem is being caused by the lead wire. Connect the test light between the alternator stator and lead wire. The light should glow. Replace the lead wire.

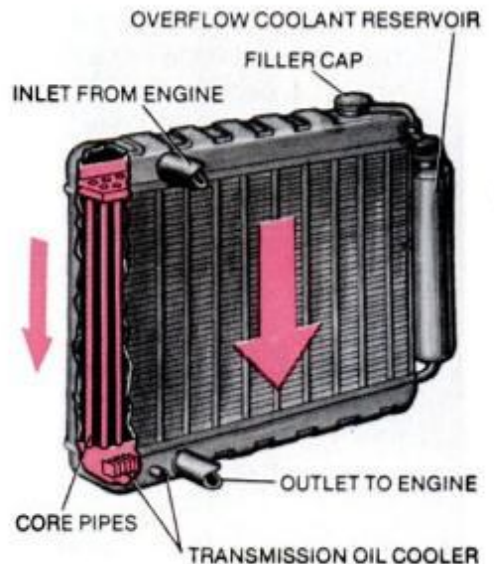
How to: Setting ignition timing

The following is the advisable way to make this critical adjustment. First, make sure sparkplugs are clean and gapped to specification. Then:

1. **Locate the timing marks.** In American-made cars, the marks consist of a stationary pointer, usually on the timing case cover at the front of the engine, and a movable indicator mark, usually on the vibration damper or pulley.

Some imported models have timing marks on the flywheel. These are visible through a port at the rear of the engine.

2. **Determine the timing specification** from the service manual, tuneup decal or owners manual.



Check coolant level and hoses connecting radiator to engine regularly.

FROM 5,000,000 TEST MILES COMES FIRESTONE'S FINEST STEEL BELTED RADIAL

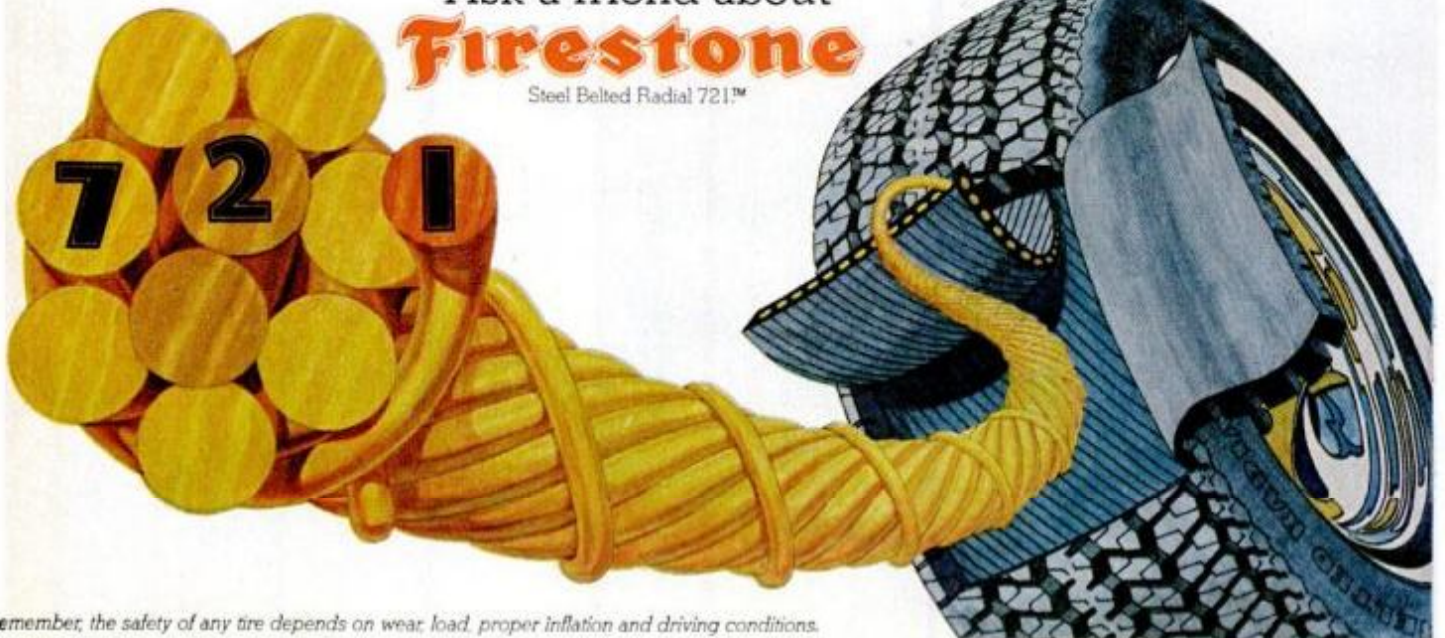
We tortured out the secrets. From day in, day out speeds up to 90 mph, from slamming into turns and diving into water, from millions of miles that tear at tires came our finest steel belted radial tire ever, the Firestone 721.

Inside, an improved steel cord. It uses ten strands of steel, where we used five before. Seven strands around two strands, and one other wrapping up the pack...our new twist that gave the tire its name.

Ask a friend about

Firestone

Steel Belted Radial 721™



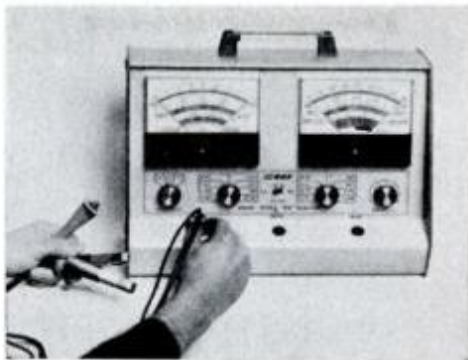
Remember, the safety of any tire depends on wear, load, proper inflation and driving conditions.

3. Wipe the marks clean and emphasize the mark denoting the correct adjustment by painting it with white paint.

4. If you have a timing light that is equipped with a magnetic pickup, attach the pickup to the ignition cable serving No. 1 sparkplug. If the timing light is not equipped with a pickup, disconnect the ignition cable at the sparkplug and attach an adapter between the plug and cable. Connect the timing light to the adapter.

Note: If No. 1 sparkplug is not accessible, disconnect the cable at the sparkplug that is compatible with No. 1 plug in the firing order. In a four-cylinder engine, this will be the third number in the firing order. In a six-cylinder engine, this will be the fourth number in the firing order. In an eight-cylinder engine, this will be the fifth number in the firing order. Here are examples: 1-3-4-2; 1-4-2-5-3-6; 1-5-4-2-6-3-7-8. Compatible plugs are indicated by the bold figures.

5. Connect a d.c. timing light by attaching the thick lead to the adapter. Connect the red lead to the battery's positive terminal, and connect the other lead to the battery's negative terminal. If you have an a.c. timing light, connect one lead to the adapter and plug the a.c.



Test equipment, including dwell and tach meters, is necessary for complete tuneup.

wire into an outlet.

6. Unless instructions on the tune-up decal state otherwise, disconnect the vacuum hose from the vacuum advance mechanism on the distributor. Seal the end of the hose by sticking a golf tee or pencil in the opening.

7. With the engine idling at specified slow idle speed, aim the timing light at the timing marks. If timing is correctly adjusted, the stationary pointer and specified timing mark will be aligned and appear stationary.

8. To make an adjustment, loosen the distributor hold-down bolt with a distributor wrench. As you point the timing light, turn the distributor until the timing mark pointer aligns with the correct timing mark. Tighten the distributor hold-down bolt, and then double check the setting.

9. Check the performance of the centrifugal-advance and vacuum advance mechanism while you're at it. Aim the timing light at the marks and open the throttle until the engine is running at 1500 rpm. The timing mark should advance as the engine speeds up. It should return to its original position when the engine is allowed to return to idle. If this doesn't happen, the distributor has to be repaired.

10. Reattach the hose to the vacuum advance chamber. Repeat the procedure outlined in Step 9. The timing mark should show that the spark has advanced further than in Step 9. If it does not, the vacuum chamber will have to be replaced.

How to:

Replacing fuel filters

A fuel filter is located at the carburetor inlet of most Rochester and some

(Please turn to page 175)

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

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Great little piston engine. Great little goodies. Great little price.

The 1978 Mazda GLC is a phenomenal automobile. It's not often a car of special merit comes along that doesn't cost a small fortune. It's not often a car comes along with this kind of equipment, this kind of styling, for this kind of money: \$3695** for the GLC Deluxe 3-door Hatchback.

An electric remote control button under the instrument panel allows you to unlatch the hatch from the driver's seat. Or, you may open the hatch from the outside, when that's more convenient.



REAR WIPER/WASHER/DEFROSTER

Every Deluxe GLC has a rear wiper, washer, and defroster as standard equipment. A choice of 4-speed, 5-speed, or automatic transmission. And a rear seat that splits in half, so you can carry people and stuff, or just stuff.

There's a lot more to a GLC than this of course. Yet it doesn't cost a lot of money — whether



CHOICE OF TRANSMISSIONS

it's the GLC Deluxe 3-door Hatchback, or the GLC 5-door Hatchback, or the GLC Sport, or the GLC Standard model.

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REMOTE HATCH RELEASE



*EPA estimates based on optional 5-speed transmission. Your mileage may vary depending on how and where you drive, your car's condition, and optional equipment. 42/33 mpg Calif.

**POE Los Angeles prices (slightly higher in California, and other areas). Taxes, license, freight, and optional equipment are extra. GLC prices for models not shown range from \$3245 to \$3920.



mazda

GLC. Now, four great little cars in all, from \$3245.**

CAR CARE GUIDE 1

SECTION 1

Holley carburetors. (The fuel filter on Cadillac's is located in the fuel pump.) To replace this internal fuel filter (Cadillac's, too), do this:

1. Place a rag under the inlet.
2. Loosen the inlet fitting by turning the fitting with one wrench and the nut with another.
3. Remove the fitting and fuel filter.
4. Retrieve the spring and reinsert it into the inlet.
5. Install a new fuel filter. Face the open end of a pleated-paper filter toward the fuel line. Face the larger opening of a sintered bronze filter toward the fuel line.

6. See that the washer is in position on the fuel inlet nut and screw the nut into the carburetor (or fuel pump). Tighten the nut, but do not overtighten.

7. Screw the fuel inlet fitting into the nut. Tighten securely, but do not overtighten.

8. Start the engine and check for leaks. If there is a leak, tighten the fitting a little more.

An external filter in the fuel pump-to-carburetor fuel line is used primarily by Chrysler and AMC. To replace this filter, do this:

■ Place a rag under the filter. See that the engine is cold.

■ If the filter is held by flat metal clamps, cut through them. If the filter is held by round wire clamps, squeeze them with pliers and slide clamps onto the fuel line.

■ Remove and discard the fuel filter and clamps.

■ Install the new fuel filter. External filters are stamped with arrows to indicate direction. The arrow has to point toward the carburetor.

■ Start the engine and check for leaks. If a leak is present, reset hoses more securely onto the fuel line.

Ford uses a combination external-internal fuel filter. The front of the filter

is attached to the fuel line, while the aft section is screwed into the carburetor inlet. To replace this kind, do this:

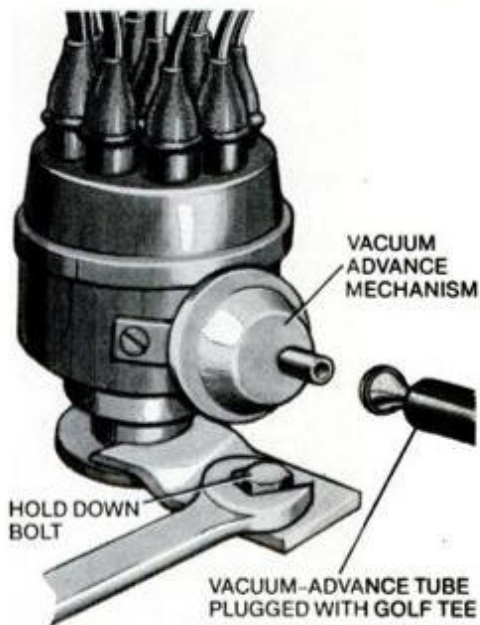
1. Place a rag under the filter.
2. Remove the clamp from the fore end.
3. Unscrew the aft end from the carburetor.
4. Screw the threaded end of a new filter into the carburetor securely, but do not overtighten.
5. Connect the hose between the fore end of the filter and the fuel line.
6. Start the engine; check for leaks.

How to:

Cooling system care

The following method, which uses a tool called a flushing tee, eliminates the need to remove engine drain plugs. The tee is spliced into the heater inlet hose and becomes a permanent part of the cooling system. When flushing is done, the tee is sealed with a cap. The flushing tee is an amateur mechanic's way to give a cooling system an effective reverse flush. Water going through the engine and radiator flows in a direction that is opposite normal circulation. The following explanation assumes a new car with crossflow radiator:

1. With the engine cold, install the flushing tee per kit instructions.
2. Remove the radiator pressure cap.
3. Open the radiator drain cock at the base of the radiator. Let coolant drain.
4. Close the drain cock and install the pressure cap.
5. Disconnect the upper radiator hose from the thermostat housing, and bend the hose so its opening faces away from the fan.
6. Attach a garden hose to the flushing tee.
7. Start the engine, run it at fast idle, turn the heater control to maximum heat and turn on the garden hose.
8. Turn off the water and engine after



Vacuum advance mechanism on distributor must be plugged for timing checks.

the water flows clean from the radiator hose for two minutes. Reconnect the upper radiator hose.

9. Install a good quality ethylene glycol antifreeze in a 50:50 proportion with water. Add rust inhibitor if you wish.

How to:

Adjusting the clutch

Note: The following is only an example. (It applies to most Ford Motor Co. cars.) It is presented to emphasize the importance of clutch adjustment. Failure to make adjustment will result in premature clutch failure. Determine the method the manufacturer of your car wants you to use.

1. Measure clutch pedal free travel with the transmission in Neutral and the engine running at about 3000 rpm.

Clutch pedal free travel should be a minimum of 1/2 inch. If not, adjust it.

2. Disconnect the clutch return spring from the release lever.

3. Back off the release lever rod locknut and adjusting nut.

4. Move the clutch release lever toward the rear until an increase in resistance is felt. Hold it in that position.

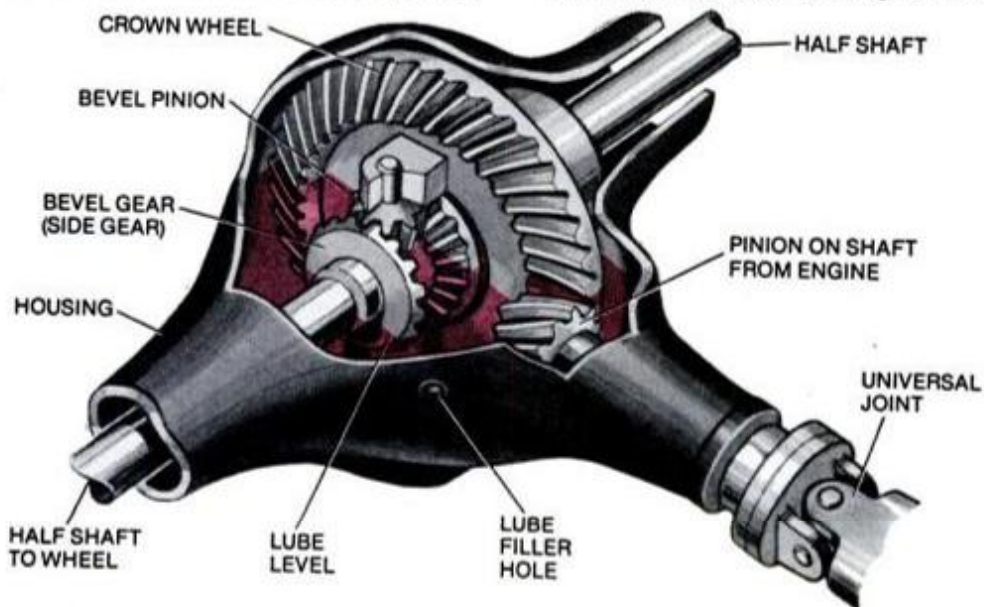
5. Push the release rod into the pocket of the release lever until it just contacts the lever. Hold it in that position.

6. Insert a feeler gauge between the adjusting nut and bullet-shaped end of the release rod. Some models require a 0.194-in. clearance; others a 0.136-in. clearance.

7. Tighten the adjusting nut against the feeler gauge.

8. Tighten the locknut against the adjusting nut. Do not disturb the adjustment. Remove the feeler gauge and install the clutch return spring.

9. Recheck clutch pedal free travel and readjust if necessary.



Level of lubricant in differential must be checked by feel at lube filler hole.

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We found New Generation All Season protected the engines up to *twice* the time span and *double* the mileage. However, in cars under warranty, change according to manufacturers' requirements.

Today's engines are complex machines. And, many things, such as dirty spark plugs, faulty carburetor, dirty air filter can affect their over-all perform-

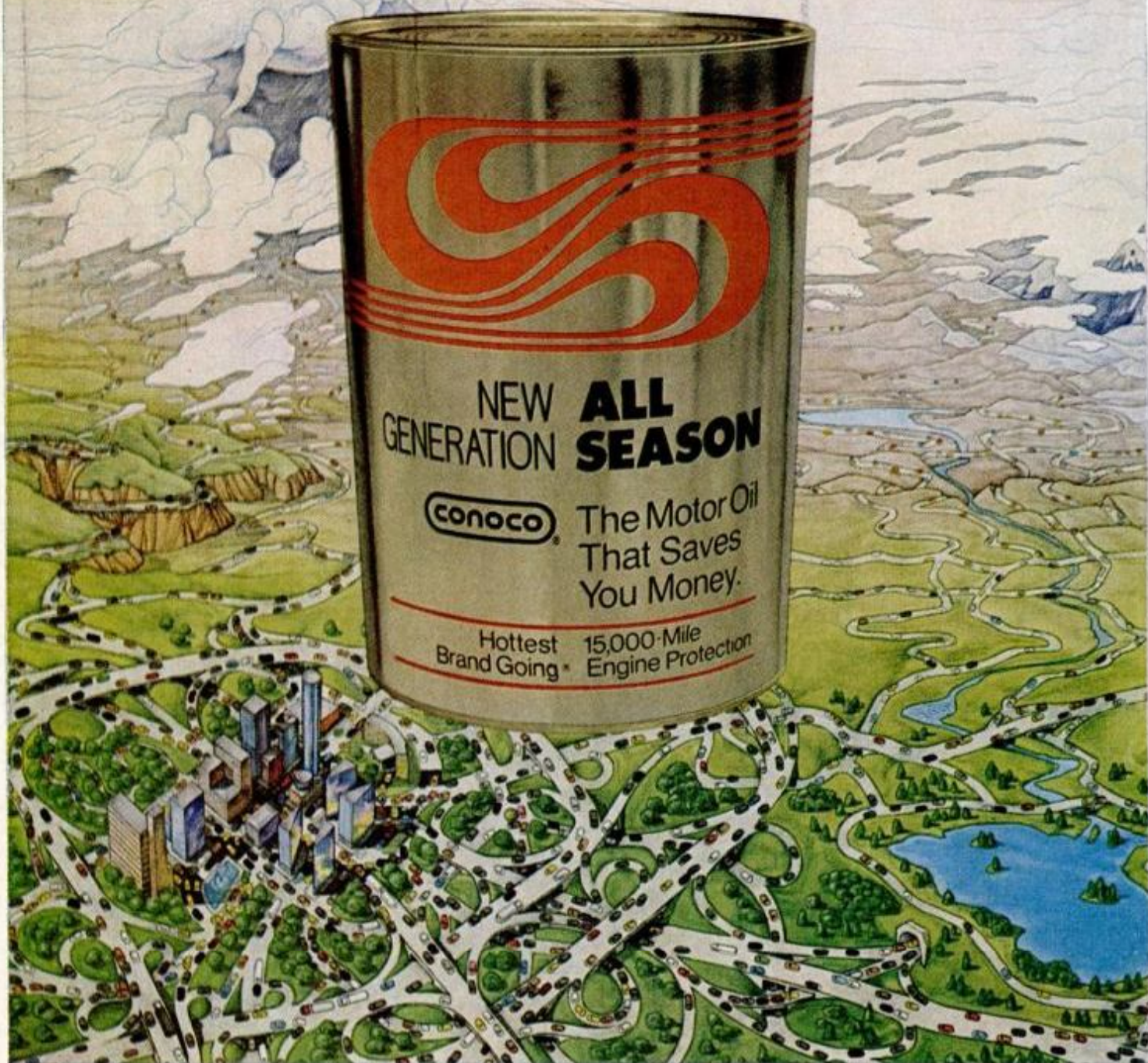
ance. But with proper car maintenance and this superb new oil from Conoco, engines can perform more efficiently and improve gas mileage.

And best of all, this new oil is priced competitively with other new generation oils.

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CAR CARE GUIDE 10 TO 20,000 MILES

SECTION 2

The growth miles

The following are the services you should give a car in your dream garage during the second 10,000 miles, and every second 10,000 miles thereafter:

- Servicing emission control systems.
- Tuning up the engine.
- Inspecting brakes.

Emission control systems

We concentrate on systems widely used on most late-model domestically built cars. These are the positive crankcase ventilation (PCV) system; fuel evaporation control system; exhaust gas recirculation (EGR) system; and catalytic converter.

Note: Not all emission control systems require servicing in the 10,000-to-20,000 mile period. We point out where servicing is required by manufacturers at other than 10,000-to-20,000 miles.

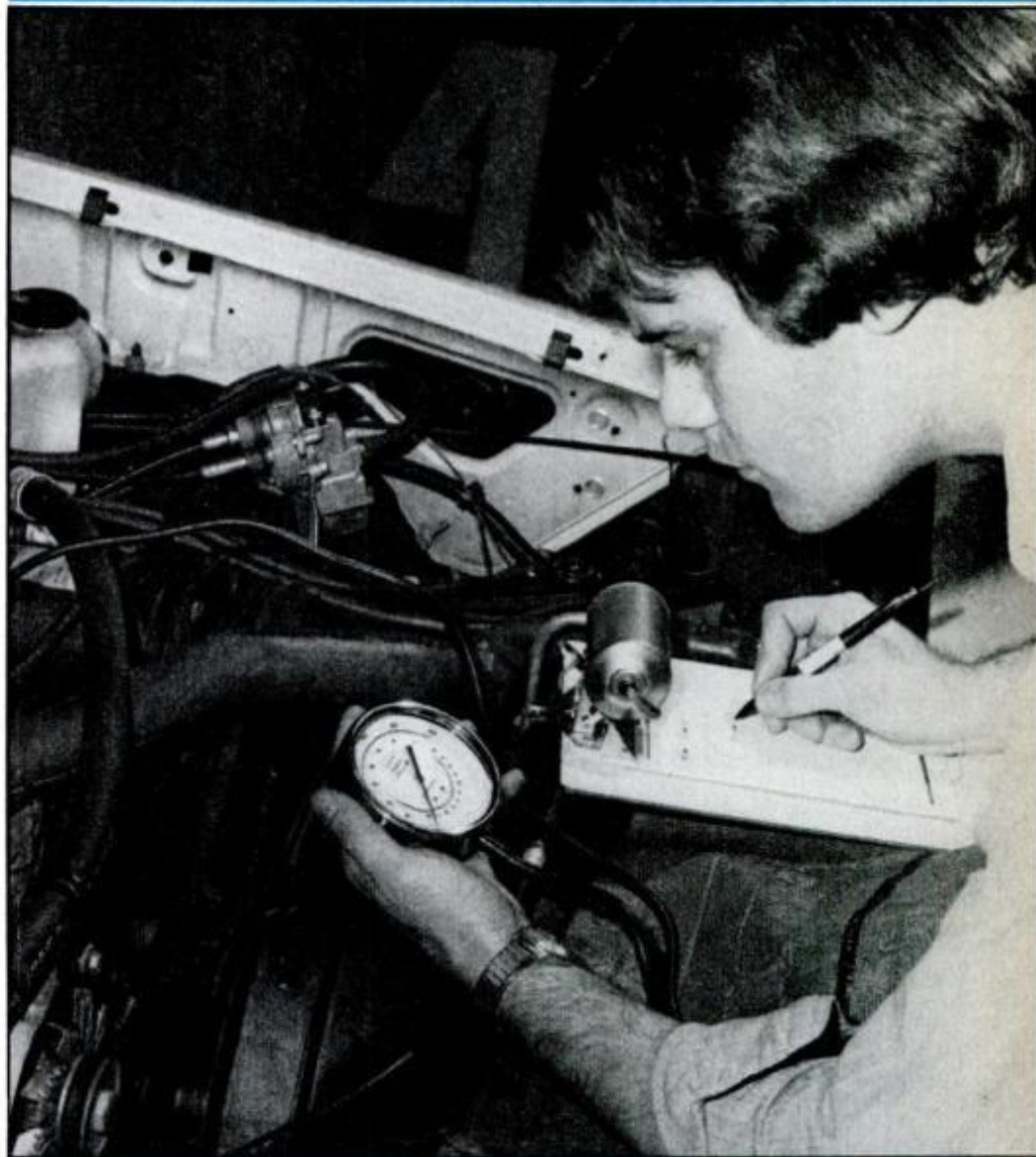
The PCV system

The job of the PCV system is to circulate fresh air through the engine crankcase to draw off crankcase vapors. Vapors are pulled into the intake manifold for distribution to the cylinders, where they are burned with the fuel mixture.

A malfunction in the PCV system will have an adverse effect on the calibration of the fuel mixture. For this reason, PCV parts should be maintained in good working order.

These parts generally consist of hoses, an air intake filter and a regulating (PCV) valve. The PCV valve controls the flow of crankcase gases to the intake manifold.

Note: The PCV system dates back to the early 1960s, and its character has changed through the years. The one in your car may not be exactly like the one described here. However, it will be close



Vacuum-gauge readings can give you a great deal of information about your engine.

enough to permit you to service the system by following these instructions.

The PCV system test described here, though suggested by General Motors, may be used for all models:

1. Remove the PCV valve from the intake manifold or rocker-arm cover.

2. Run the engine at idle.

3. Place your thumb over the end of the valve. You should feel vacuum, and engine speed should drop about 50 rpm.

If these conditions are not met, a

clogged system is indicated. To isolate the problem area, remove the PCV valve from the hose. If hoses and carburetor passages are clear, strong vacuum will be felt, and there will be a significant change in engine idle. The engine may even stall. Replace the PCV valve.

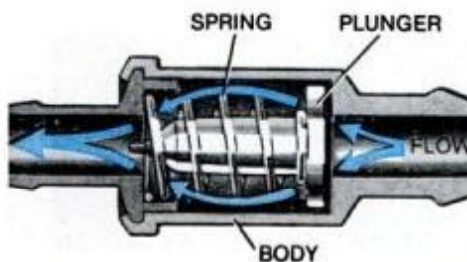
If the engine doesn't run this way, a hose, carburetor passage or air intake filter is blocked. Remove and clean the hoses. Unplug the carburetor passage by cleaning with a drill bit smaller in diameter than the passage. Replace or clean the air intake filter.

Note: In some cars, the air intake filter is a small cotton or mesh-type element that is inside the carburetor air cleaner housing. In other cars, the filter is part of the crankcase oil filler port cover.

The fuel evaporation control system

This system employs a vapor separator to collect fuel-tank fumes. Some fumes

(Please turn to page 178)



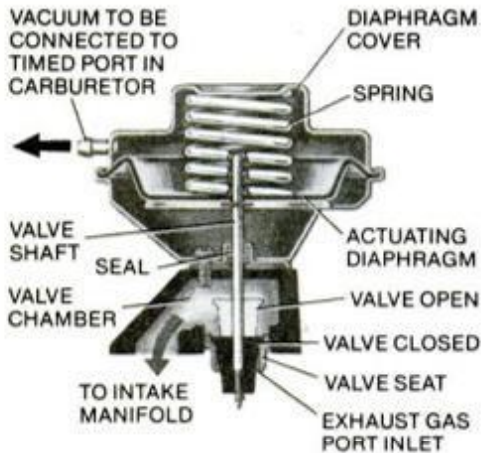
Positive crankcase ventilation (PCV) valve must be operating correctly.

SECTION 2 CAR CARE GUIDE

are condensed to liquid and returned to the fuel tank. The remainder are transferred to the intake manifold through a charcoal canister.

There are three precautions that apply to this system:

■ Never use a vented fuel-tank filler cap on a car having a fuel evaporation control system. Gas fumes will leak into the



Exhaust gas recirculation (EGR) valve is key component in this emissions system.

air, which is exactly what this system is trying to prevent. The fuel evaporation control system makes use of a nonvented filler cap.

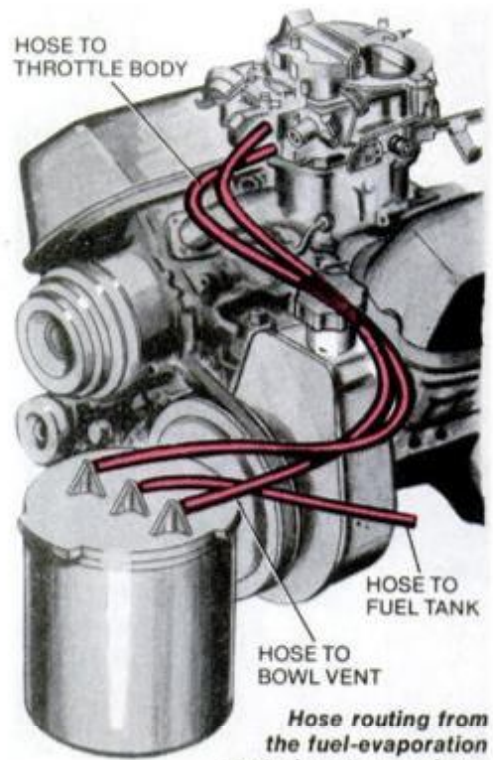
Conversely, if a nonvented fuel-tank filler cap is installed on a car not having a fuel evaporation control system, suction that builds up in the fuel tank will cause the tank to deform or collapse.

■ Never substitute ordinary hoses for fuel evaporation control system hoses. These hoses are made of special material that won't deteriorate when subjected to fuel fumes. They will be marked in some way to indicate their purpose, such as with the initials *EVAP*.

■ Never smoke or use an acetylene torch near fuel evaporation control system components. The reason is obvious.

In American-made cars, the only scheduled service required by the fuel evaporation control system is to replace the filter in the charcoal canister every 12,000 miles.

With the engine turned off, identify each hose to its connection on the charcoal canister so it can be reconnected correctly. Loosen the bracket, remove the canister, invert the canister and replace the filter. Reinstall the canister and connect hoses tightly.



Hose routing from the fuel-evaporation control system canister. Don't forget to replace the filter.



Introducing the Purolator 15,000-Mile Dual Oil Filter.

Now's the time to take the next step in protecting your car's engine. And, as you might imagine, the next step in oil-filtration technology comes from Purolator, the company that invented the first oil filter in 1923.

The new 15,000 Dual Oil Filter is and does exactly what its name implies.

It puts Purolator technology to work in a sophisticated, reinforced series filter which uses two distinct but complimentary filtration systems. There is nothing like it on the market. The primary medium is an improved paper, and the secondary is a nonwoven synthetic. In combination, they increase the filter's overall heat resistance, contributing to longer filter life and improved filtration.

So take the next step in protecting your car's engine with Purolator's new 15,000-mile Dual Oil Filter.

For more facts on the 15,000-Mile Dual Oil Filter, write for our technical bulletin: TB 9374-A, c/o Marketing Service Department, Purolator Inc., 970 New Brunswick Avenue, Rahway, New Jersey 07065.

Purolator

when you can't afford to take a chance.

Exhaust gas recirculation system (EGR)

The EGR system limits the formation of oxides of nitrogen by diluting the intake charge, which reduces peak combustion temperature. Oxides of nitrogen will be formed only where high heat is present.

A metered amount of exhaust gas is injected into the combustion chamber with the intake charge through an EGR valve. The exhaust gas entering the combustion chamber is inert and is cooler than combustion temperature. Since the gas won't burn, the peak temperatures of the gases in the combustion chambers are lowered.

Although basic EGR systems from manufacturer to manufacturer are similar, there are differences in servicing procedures. Therefore, the following is a discussion, manufacturer by manufacturer, of EGR valves.

Note: EGR systems are more complicated than we imply in this discussion, consisting of a number of parts in addition to the EGR valve. However, space limits our discussion to the valve, which is the most critical component. If the EGR valve loses calibration, a number

of engine problems can occur, notably stalling and poor acceleration.

American Motors—The EGR valve in AM cars is serviced by removing it from the engine and scraping deposits from its base. Manually compress the valve's diaphragm to see if the pintle (poppet valve) operates smoothly. If it doesn't, replace the valve.

According to American Motors, the EGR system should be serviced every time the car records another 30,000 miles.

Chrysler Corp.—Chrysler suggests you service its EGR system every 15,000 miles. Remove the EGR valve and inspect the poppet valve (pintle) and seat for deposits.

Apply a liberal amount of manifold heat-control solvent to the poppet valve and seat area. Let deposits soften. Apply vacuum using a vacuum pump to the valve's vacuum nipple. This opens the valve. Scrape deposits from the seat and poppet with a knife.

Caution: Do not spill solvent on the valve diaphragm. Solvent will damage the diaphragm.

Ford—Clean Ford's EGR valve by inserting a short length of speedometer cable at the end of an electric drill into the valve's cavity and between the pop-

pet and seat. Turn on the drill. Use a circular motion to loosen deposits.

Caution: Do not strike or pry the valve.

General Motors—To inspect and clean GM's EGR valve, proceed as follows:

1. Remove the carburetor air cleaner and disconnect the EGR valve from the intake manifold.

2. Depress the valve's diaphragm, hold it, plug the vacuum tube and release the diaphragm. The pintle should *not* close within 20 seconds. If it does, replace the EGR valve.

3. If there are deposits around the pintle and seat, hold the valve in your hand and tap on the end of the pintle with a plastic hammer. Shake deposits free.

4. If there are deposits in outlet holes, scrape them out with a knife or screwdriver.

5. Clean mounting surfaces of the valve and engine with a wire brush.

Caution: Do not use solvent.

Ford and General Motors don't specify EGR valve maintenance in their maintenance schedules for late-model cars. The valve should be inspected when one of the following problems associated with malfunctioning EGR systems suddenly occurs:

(Please turn to page 180)

DRIVE A SOFT BARGAIN

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Send bottom panel of Super Sport Grip box with name and address to Superior Refund Offer, P.O. Box NB101 El Paso, Texas 79977 for your \$1.00 refund. Offer limited to one per individual. Offer expires Nov. 30, 1978.

Here's the only steering wheel cover that's double-thick for double comfort, better grip. Luxurious looking deep grained texture, miracle designed pores let steering wheel "breathe" to keep it cool in summer, warm in winter. Easy to install. Seven beautiful colors to dress up any car.

SUPER SPORT GRIP
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- Rough idling and/or stalling.
- Engine roughness on light throttle acceleration.
- Abnormally high fuel consumption.
- Stalling when the engine decelerates.
- Detonation on throttle application.

Catalytic converter

The catalytic converter converts hydrocarbon and carbon monoxide exhausted by the engine to water vapor and carbon dioxide.

Important: Leaded gasoline must not be used in a car equipped with a catalytic converter. It will make the catalyst ineffective in a short time. Using leaded gasoline is against the law.

There is no periodic maintenance for a catalytic converter. The catalytic element or converter should be replaced when the catalyst is no longer effective. This occurs at about 50,000 miles.

With catalytic converters used by Chrysler Corp. and Ford Motor Co., the entire converter must be replaced. The job is similar to replacing a muffler.

The catalyst in the converters of American Motors and General Motors cars can be replaced without replacing the chambers. A large drain plug is removed from the converter and a vibrating effect is applied to purge used-up catalyst pellets. New pellets are then injected into the chamber. Expensive equipment is required so you'll have to see your dealer.

Tuning up an engine

The following is a tune-up procedure for cars with electronic ignition. It should be done during the second 10,000 miles of a car's life, and every second 10,000 miles thereafter.

Note: The exact mileage when a tune-up should be performed varies from manufacturer to manufacturer. For 1978 models, it is around 20,000 miles, give or take a few thousand miles.

Tune-up Step 1: Test engine vacuum

As an engine runs, a partial vacuum is created. A reading of 12 to 21 inches Hg. (inches of mercury) on a vacuum gauge, depending on the engine, is normal. Manufacturer's specifications should be checked for the exact requirement. If the vacuum gauge reads other than the specification, or if it shows an erratic pressure, a problem exists that should be corrected before continuing.

Procedure:

1. **Examine vacuum hoses** to see that they are connected securely. Vacuum will leak if a hose is loose. A hissing sound as the engine runs tips you off to a loose hose.
2. **Warm up the engine.**
3. **Connect the vacuum gauge** to an engine vacuum port. If necessary, remove a vacuum hose from a vacuum port, attach the gauge to the port and plug the end of the hose.

NEEDLE REACTION	PROBLEM INDICATED	PROCEDURE
Steady but below normal, and swings to 0 in. Hg. when accelerator is jabbed.	Leaking piston rings.	Overhaul engine.
Steady but below normal.	Late ignition timing, sticky throttle or leaking intake manifold-carburetor gasket.	Track down and repair problem.
Drops intermittently about 4 in. Hg. at idle.	Sticking valve(s).	Inject penetrating oil into engine through carburetor air horn. If the needle fluctuation should cease temporarily, recondition the valves.
Drops intermittently to a very low reading at idle.	Insufficient valve clearance or burned valve.	Adjust or repair.
Floats slowly over a 4- or 5-in. Hg. range.	Carburetor is out of adjustment.	Continue the tune-up. Problem should be rectified when the carburetor is adjusted.
Floats over a wide range.	Leaky head gasket.	Replace.
Floats over a range of about 2 in. Hg.	Incorrect sparkplug gap.	Continue the tune-up. Problem should be rectified when the sparkplugs are serviced.
Slowly drops as engine is revved to 2000 rpm.	Restricted exhaust system.	Correct the condition.

4. **Run the engine at idle.** Record the gauge's reading. Jab the accelerator pedal and release it. Record the reading.

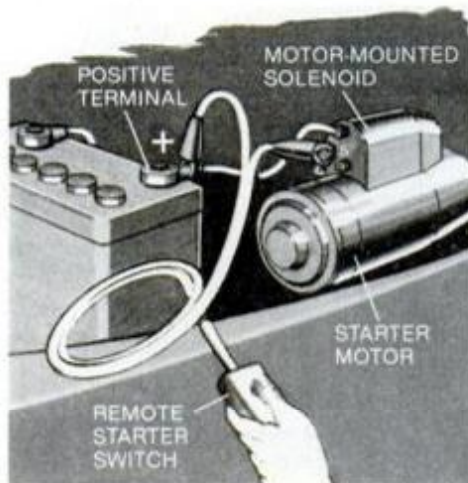
The gauge needle at idle should record the manufacturers specified vacuum reading. It should hold steady.

The gauge's needle when the accelerator is jabbed and released should swing from about 5 inches Hg. to about 22 inches Hg.

If the needle reacts in a manner other than that suggested above, it will indicate the malfunctions shown in the chart above.

Tune-up Step 2: Remove sparkplugs

1. **Identify sparkplug cables** to the cylinders they serve. Write numbers corre-



Remote starter switch connected as shown lets you crank engine under hood.

sponding to the number of each cylinder on strips of masking tape. Wrap a strip around the respective cable.

2. **Loosen sparkplugs** one turn.

3. **Remove the coil-to-distributor cable** so the engine doesn't start.

4. **Crank the engine** two or three strokes to establish a compression leak around sparkplugs, which will blow away particles that broke loose and may fall into cylinders when plugs are removed. Particles can damage cylinder walls and pistons.

5. **Remove sparkplugs.** Stick strips of numbered masking tape on them to coincide with the numbers of the tapes on the respective cables. Plug identification permits you to localize a cylinder problem revealed by examining plugs.

6. **Sparkplugs should be replaced.** Be sure the new plugs are of the correct heat range for your engine. However, before you discard old plugs, examine them to determine if a malfunction exists.

Tune-up Step 3: Test compression

Compression refers to the action by pistons of compressing the combustible fuel mixture into a smaller volume inside the cylinders. Maximum power and fuel economy are obtained when maximum specified compression exists.

However, an engine will run efficiently on less than maximum specified compression. It ceases to run efficiently when compression drops below a minimum standard, or when there is an appreciable difference in compression from one cylinder to another.

(Please turn to page 182)

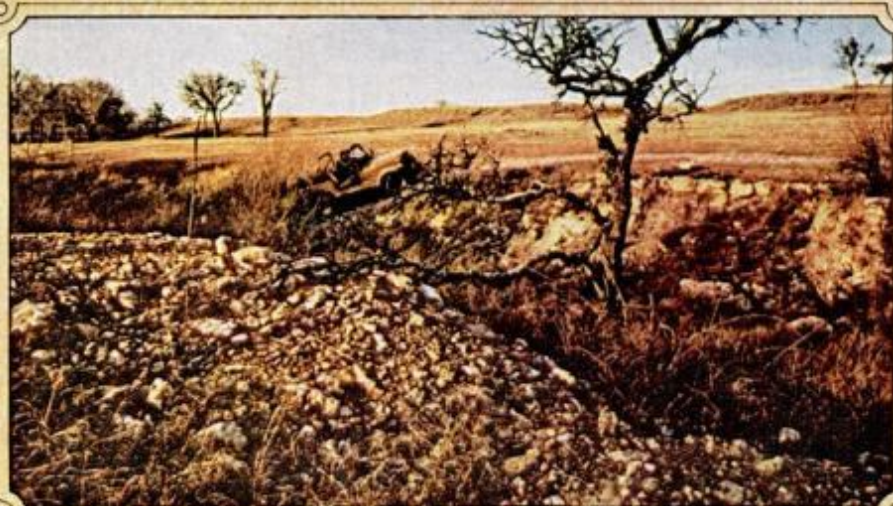
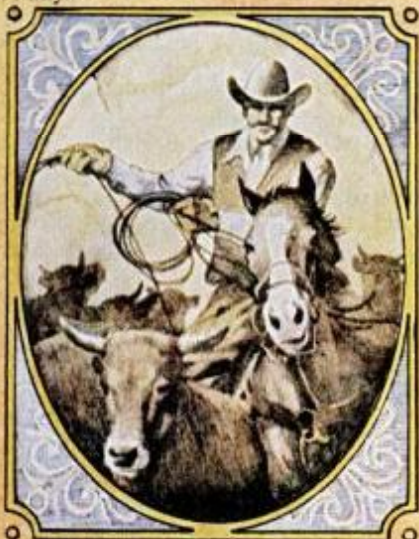
CHAPTER 1

TRACKER A-T

ROUNDUP ON THE CHISHOLM TRAIL

LONGHORNS TO ABILENE

In the late 1860s Texas cattlemen needed a quick, safe way to move beef to market. So, they followed a trail blazed by old Jesse Chisholm. It started in the blistering heat of the Texas heartland, ran through Oklahoma and finally to the railhead at Abilene, Kansas. Over a million head of longhorn carved this trail into American history. And part of it is still here today.



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Using *Tracker A-T* tires we set out to find part of the old Chisholm Trail. The trip covered everything from paved highway to rutted desert trails. And *Tracker A-Ts* did it all. *Tracker's* aggressive tread ran smoothly and quietly over the pavement, yet they were tough enough to dig in and keep us rolling over potholes, boulders and pulling through powder-soft sand. Like the drovers ninety years ago, *Tracker A-T* tires helped us keep moving.

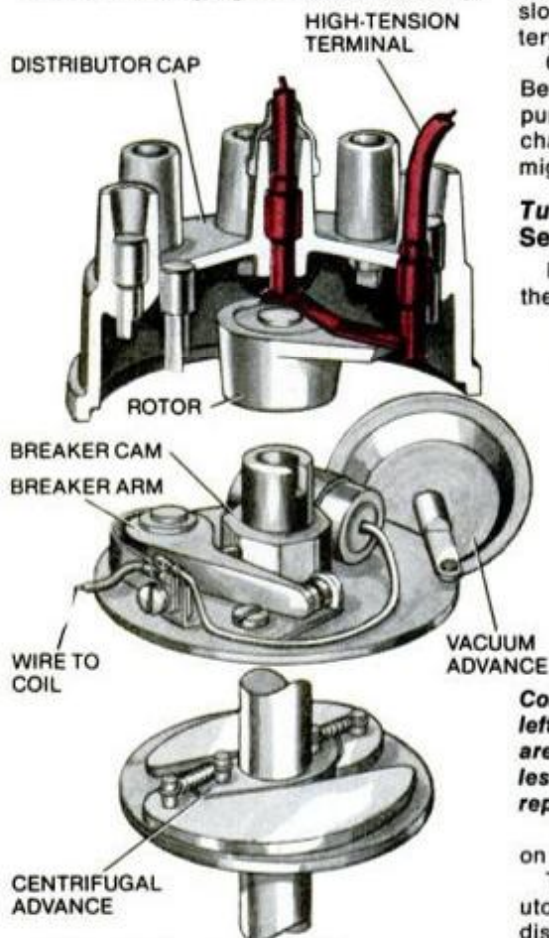
GOODYEAR

Tuning up an engine having low or uneven compression wastes time and money. Tune-up may hide poor compression for a while, but it won't cure it, and the problems poor compression causes will return. They include poor starting and running performance, and less than maximum fuel combustion.

Procedure

1. Insert the compression gauge into the first sparkplug port.

Important: To get a good, tight seal between the gauge and sparkplug port, make sure the gauge is seated securely.



2. Crank the engine until the highest reading you can get is shown on the compression gauge.

3. Record the reading.

Follow this procedure to obtain compression readings for each cylinder.

Interpretation:

Find out manufacturer's specifications for the engine's minimum allowable compression and allowable cylinder variation. Generally, an overall average compression of 100 p.s.i. (pounds per square inch) or less is unacceptable. American Motors, Chrysler Corp. and General Motors permit an 80-percent variation between the lowest and highest-reading cylinders. Ford allows 75 percent.

To pinpoint the reason for low or uneven compression, inject SAE 30 engine oil into the affected cylinder(s) through

the sparkplug port(s) and take another reading.

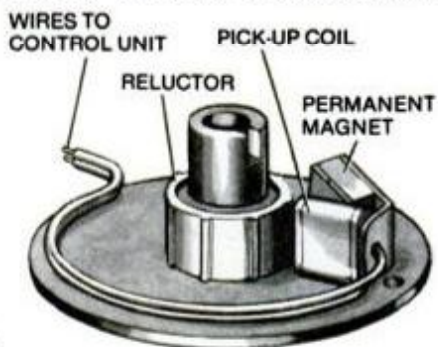
If compression rises, the engine probably needs new piston rings. If there is no appreciable increase in compression, the fault probably lies with valves. If the first reading you took showed low compression of two adjacent cylinders, and injection of oil causes compression to rise, the head gasket may be damaged.

As your engine gets older, it may show compression readings that are higher than specification. You may also have starting problems when the engine is warm. This starting problem is characterized by a slow whirring, reminiscent of a weak battery or high starter-circuit resistance.

Carbon has built up in the cylinders. Before removing the head to physically purge carbon, try one of the combustion chamber cleaners on the market. You might get lucky and save a big job.

Tune-up Step 4: Service the distributor

First install new sparkplugs. (Refer to the January '78 PM for recommendations



Conventional distributor is exploded at left to show components. Breaker points are on arm activated by cam. In breakerless electronic system reluctor and coil replace breaker points as shown above.

on the correct way to install plugs.)

The modern electronic ignition distributor is easy to take care of. Only the distributor cap and rotor require servicing. You no longer have to fuss with distributor points.

Procedure:

1. Remove a sparkplug wire from a distributor cap tower by grasping and pulling on the boot.

2. Identify the wire and tower, so the wire can be reconnected properly.

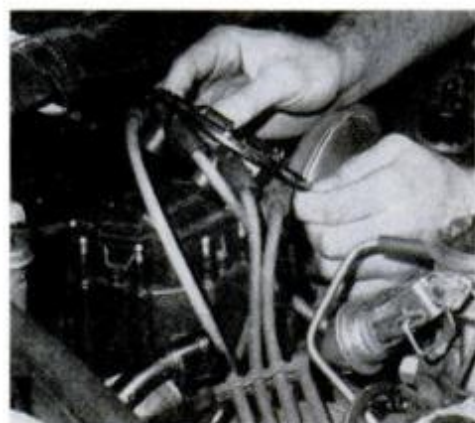
3. Inspect the tower for erosion. If the tower is eroded, remove all wires and replace the cap.

4. Insert a distributor-cap cleaning tool and clean out the tower.

5. Follow the same procedure for the other towers.

6. Remove the distributor cap, which is held either by screw-head latches or clip-fasteners.

Caution: Handle all distributor caps with respect, but especially one from a



high energy ignition (HEI) system distributor is used on current GM cars.

GM car having high energy ignition. This cap contains the coil. Carelessness may lead to damage that will necessitate replacing this expensive component.

7. Wipe the cap clean inside and out.

8. Examine the cap inside and out for wide, obvious cracks and for carbon tracks that indicate hairline cracks. Replace a cracked cap.

9. Use compressed air to blow out the inside of the cap. Inspect terminals. If terminals are badly burned, replace the cap. If terminals are a little burned (slightly black), polish them with fine emery cloth.

10. If you have to replace a distributor cap, lay the new and old caps side by side so the significant features of each are aligned. Connect the cables to the new cap. They must go into the correct towers.

Insert each cable's terminal firmly into its tower as you squeeze the cable's boot to allow air to expel itself. If the terminal is not seated all the way, electricity will have to jump a gap between the cable's terminal and the terminal in the tower. This arcing will cause "terminal" terminal damage.

11. Remove the rotor. One type is pulled from the distributor shaft. Another type is held by screws that have to be removed.

12. Examine the rotor for cracks, carbon tracks, and a corroded or partly missing terminal. Replace a damaged rotor.

13. Examine the coil. Look for an eroded tower and housing cracks. Replace a damaged coil. Clean out the coil tower with the distributor tool.

Tune-up Step 5: Check sparkplug cables

1. Disconnect a cable at a sparkplug by pulling and twisting the boot.

2. Point the end of the cable into the air—not toward the engine.

3. Connect one end of a jumper wire to a clean ground on the engine. Connect the other end to the shank of a screwdriver that has an insulated handle.

(Please turn to page 185)



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push it, pull it,
sit on it, or leave it
out in the rain,
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Standardizd. We make tune-up kits, distributor caps, spark plug wires, coils, voltage regulators, and electronic ignition components.

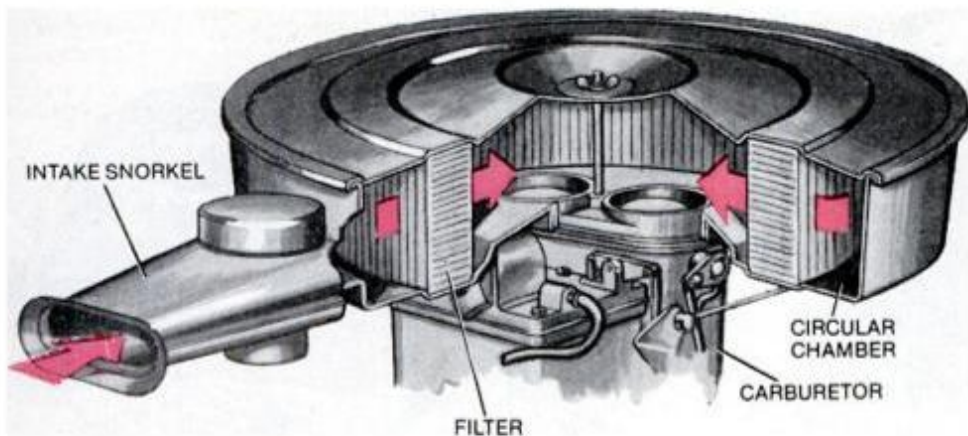
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Carb air-cleaner filter replacement is easiest job on your car: Unscrew wingnut, remove cover, replace filter. When replacing cover don't overtighten wingnut.

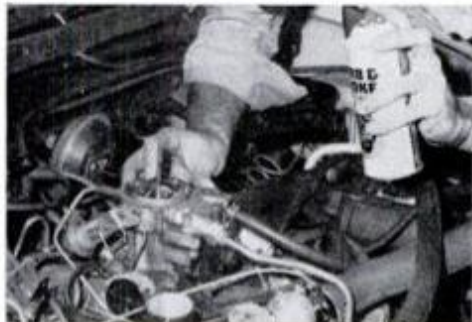
4. Start the engine and let it idle.

5. Hold the tip of the screwdriver a fraction of an inch from the cable, and move the screwdriver up and down the cable, probing every inch, including the sparkplug boot. If a spark jumps the gap between the cable and the screwdriver, replace the cable.

Note: A set of ignition cables for an engine with conventional ignition costs about \$8 to \$10. If several cables are weak, you may want to replace all, although you don't have to. Cables for electronic ignition are very expensive.

One cable costs almost what nine cost in a car with conventional ignition. You can replace only the bad cable.

6. Test the distributor-to-coil cable. However, it can't be disconnected since the engine will stop running. Leave one of the sparkplug cables disconnected as you probe the distributor-to-coil cable



Carb and choke cleaner is used on the choke plate to keep it working smoothly.

with your screwdriver. The disconnected cable establishes a resistance that lets current leak through any cracks in the distributor-to-coil cable.

Tune-up Step 6: Service the carburetor air cleaner

Generally, the manufacturers recommend that you clean the carburetor air cleaner element at 15,000 miles and replace it at 30,000 miles. This assumes that the element isn't excessively dirty at 15,000 miles. If it is, it should be replaced.

A dirt-clogged air cleaner element can reduce the flow of air to the carburetor, forcing the engine to run on a fuel mixture that is richer than necessary. An increase in fuel consumption can be expected.

Most U.S. models use a paper air cleaner element. Take out the element and hold a droplight inside it. Examine the element for deformed fins and a heavy concentration of dirt. Install a new one if needed. If the old element can be kept in service, tap the element's flat side on a hard surface to remove loose dust. Turn the element and do the same thing to its other flat side and replace.

Tune-up Step 7: Pre-instrument service

Some cleaning and lubrication in the carburetor-manifold area may be called for, as follows:

- See if the manifold heat-control valve moves freely by activating the counterweight you will find under the exhaust manifold if the car is equipped with this valve. If the valve sticks, tap it with a plastic-headed hammer.

Apply manifold heat-control valve lubricant or graphite to the valve shaft.

Caution: The engine should be cold when you service the manifold heat-control valve to avoid burning your hand on the hot manifold.

- Remove the air cleaner housing (or leave it off following Tune-up Step 6). Using an old toothbrush and carburetor cleaner, scrub carburetor linkage clean. Activate the linkage to see that it moves freely.

Important: Plastic covers over the ends of some carburetor linkages can work loose and catch. This may interfere with the linkage's movement. Worse yet, the covers may cause the throttle to stick. Check this out.

- Open the choke plate and scrub down the inside of the carburetor barrel(s).

Important: Use a carburetor cleaner that is compatible with catalytic converters. Some aren't and may damage the converter if the cleaner gets into the engine and is burned. The label should

specify that it can be used in cars having catalytic converters.

- Do not lubricate carburetor linkage. Leave it dry after you apply cleaner and wipe it off.

Apply choke (carburetor) cleaner to the choke plate.

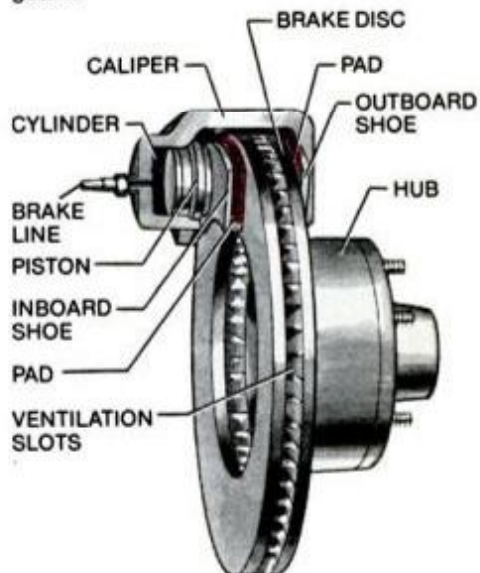
If you have had a problem starting the engine, the choke may need adjusting. Turn to Section 6 where choke overhaul and adjustment are discussed.

Tune-up Step 8: Adjustments

To complete this super tune-up, adjust the carburetor and ignition timing. Procedures were explained in Section 1.

Inspecting brakes

To be safe, inspect brakes between 10,000 and 20,000 miles and then between 20,000 and 30,000 miles. Ordinarily, brakes should not require overhauling until 30,000 miles or beyond, but a brake inspection is a necessary safeguard.



Disc-brake pad thickness is easy to check after you remove wheel from hub.

For one thing, an inspection will reveal a defect that may have developed. For another, an inspection can help forestall a major expense.

Brake linings that wear down to bare metal score brake discs or drums, which makes brake overhaul an expensive proposition. Brake inspection allows you to determine if lining wear has reached this critical point.

A brake inspection involves two tests. One test checks the hydraulic system. The second test is visually inspecting brake linings.

Testing the hydraulic system

If the car has power brakes, let the engine idle. If the car doesn't have power brakes, leave the engine off:

Apply pressure to the brake pedal for

(Please turn to page 186)

DYNAMITE SHINE.



IT'S SO EASY.

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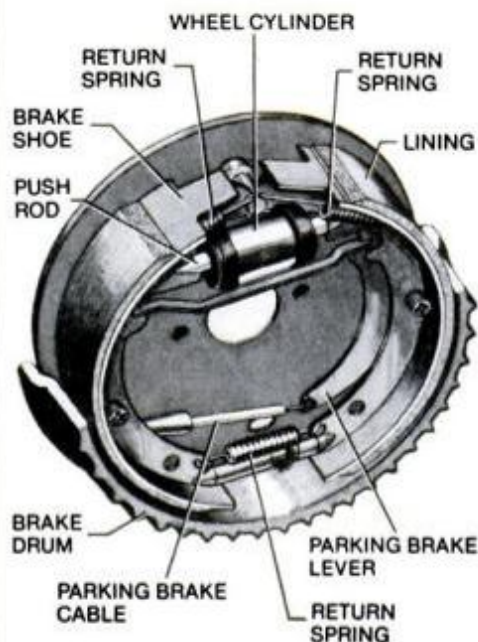
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CAR CARE GUIDE



Check drum brakes, still used on rear wheels of most cars, for lining wear.

about 15 seconds. If the pedal falls away, you probably have a leak in the hydraulic system.

If the pedal feels springy rather than firm, air is probably trapped in the hydraulic system. This should be purged (bled). Check the fluid level in the master cylinder to see if fluid has been lost.

If the brake pedal is firm and steady, but low ("low" is defined as below the level of the accelerator pedal), adjust brakes by moving the car forward and then in reverse—about 200 feet in each direction. Bring the car to a full stop each time.

Brake pedal height should become adequate after a number of cycles. If it doesn't, self-adjusting mechanisms require service.

Inspecting brake linings

Remove one of the front wheels. We will assume front wheels are equipped with disc brakes.

Loosen and remove the guide pins holding the pads, and slide one pad from the caliper. Measure lining thickness with a gauge at several locations along the pad. If thickness at any location is less than 3/16 inch, replace linings.

Reinstall pad and check the other one.

Important: If you have to replace pads in one wheel, replace pads in both wheels on the same axle to maintain equal braking action.

Remove one of the rear wheels. We will assume rear wheels are equipped with drum brakes. Measure the thickness of both brake linings with a gauge at several locations along the shoe. If thickness at any location is less than 3/16 inch, replace linings.

Important: If you have to replace linings in one wheel, replace linings in both wheels on the same axle to maintain equal braking action.

CAR CARE GUIDE

SECTION 3 20 TO 30,000 MILES

3

The adolescent miles

During the 10,000-mile period from 20,000 to 30,000, some of the specialized equipment you've purchased for your dream garage will be pressed into service for the first time—specifically, airconditioning servicing equipment.

In addition to inspecting and, if necessary, repairing the airconditioner, other tasks you should do at this time are:

- The automatic transmission—draining; changing the filter; adjusting bands, if called for; filling with new fluid.
- Shock absorbers—inspecting and replacing weak components.
- Steering linkage—testing for linkage wear and replacing worn parts.
- Wheel alignment—checking alignment and realigning those (settings) that are out of adjustment.
- Wheel bearings—inspecting bearings; installing new bearings, if necessary; lubricating.

Airconditioning system: Tools you will need

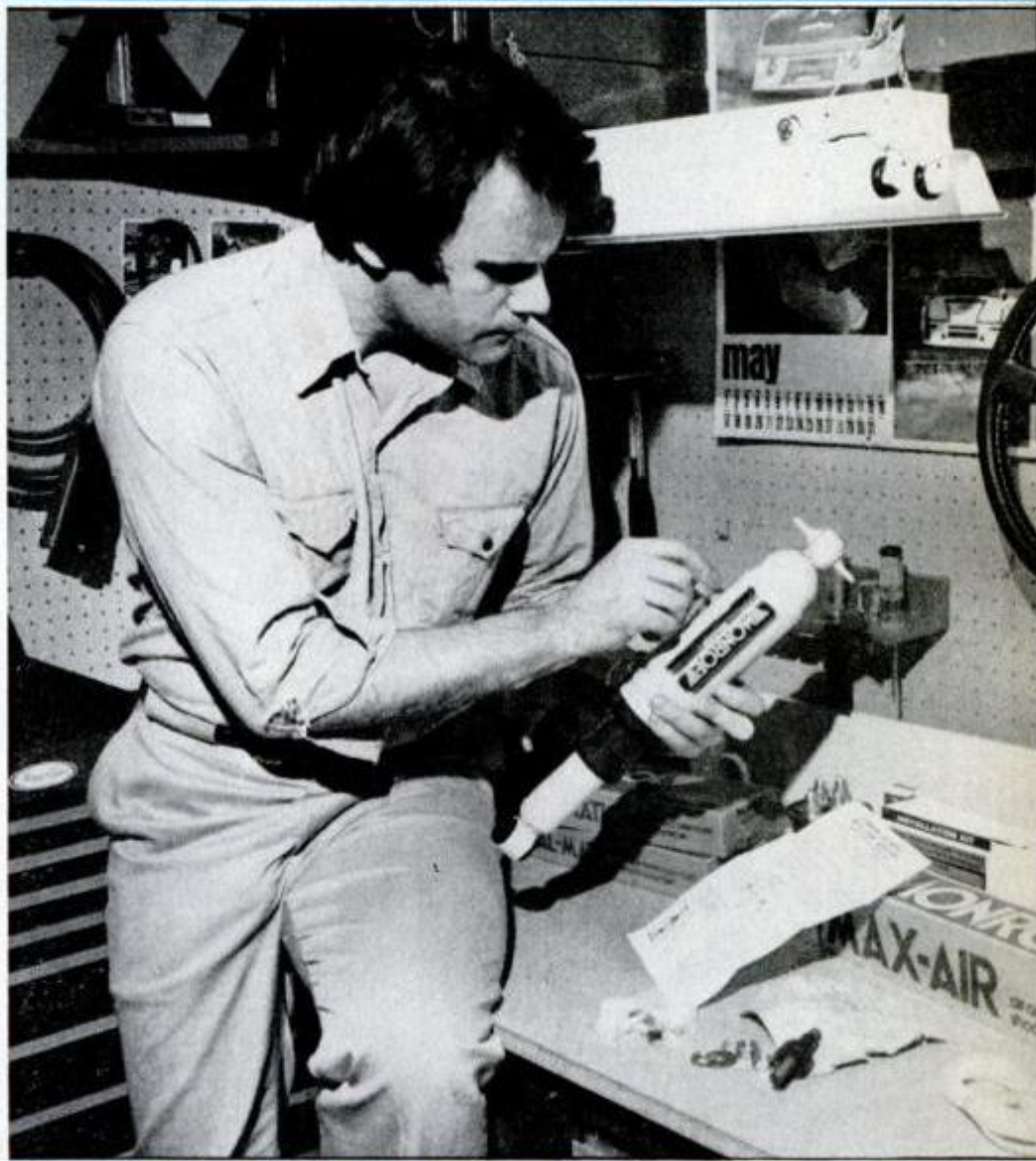
The tools needed to service a car's airconditioning system effectively are:

- An accurate thermometer for obtaining temperature readings at outlet ducts. The gauge-type thermometer sold in photo supply stores is one of the more accurate ones you can buy.
- Refrigerant leak detector. The type most widely used by professional shops is a propane torch detector, which consists of a propane canister outfitted with a tube and open nozzle assembly.
- Airconditioning manifold gauge set, which is necessary for discharging and recharging the system.
- Vacuum pump to clean moisture and air from the system before it's recharged.
- A supply of refrigerant, available in 15-ounce and larger sizes. We suggest you use the more convenient small cans.

Airconditioning system: Checking coolness

Note: The procedure outlined here is designed for quick and easy diagnosis and repair of the most common airconditioning problem: failure to cool. If extensive repairs are needed, such as rebuilding the compressor, consult the car's service manual or one devoted exclusively to the automotive airconditioning system. Airconditioning service manuals are sold by auto parts and accessories dealers.

A number of conditions inside a car will affect "coolness." The number of passengers, for example, may make it seem warm although the airconditioner



Replacement shocks should be best you can afford if you plan to keep car a long time.

is working efficiently. And a vehicle's interior will feel warmer in the afternoon than in the morning.

An airconditioner that is working at peak efficiency cannot be made to work any more efficiently.

1. To test an airconditioner's output, start the car's engine, set controls for maximum cooling and turn on the unit. See that windows and doors are closed.

2. Insert a thermometer in an outlet and allow the reading to reach the lowest temperature it can. Maximum allowable low temperature is generally

about 45° F. If the thermometer reads appreciably higher than this, the airconditioner probably requires recharging.

3. Take a reading at each outlet. If one reading shows a temperature higher than the others, it indicates the particular duct is blocked, or has a hole drawing warm air into the cool air flow.

Airconditioning system: Preliminary service procedures

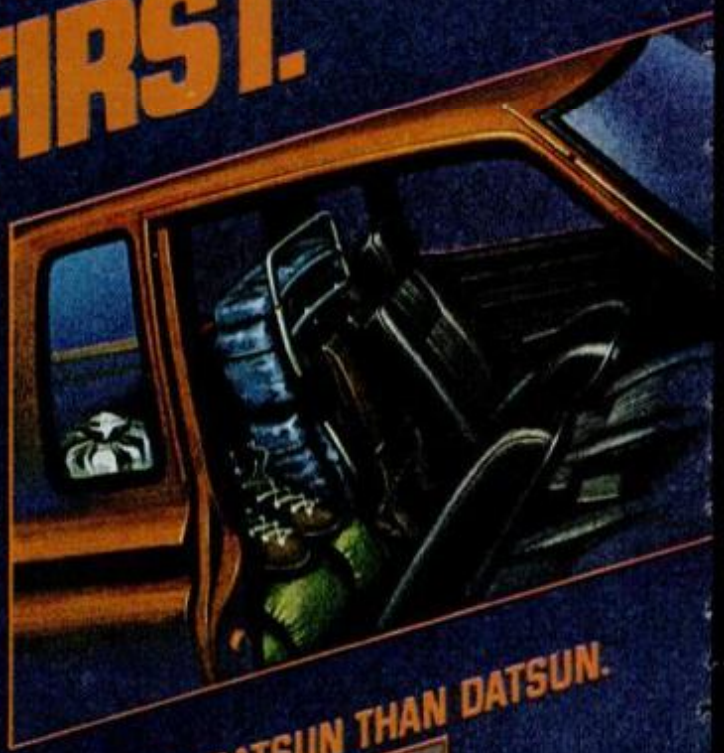
Before recharging an airconditioning system that isn't providing maximum

(Please turn to page 189)



IT'S A CAR. IT'S A TRUCK. IT'S A FIRST.

KING CAB.™ The most unique personality in small pickups. Only from Datsun. Inside the cab, all the features of a car — carpeting, console, more leg room than any other small truck and the only reclining bucket seats in any size pickup. But Datsun didn't stop there. Behind those bucket seats — up to 11.3 cubic feet of lockable storage space. Try finding that in any other small pickup. Not available. Yet the King Cab is pure truck tough. Even a 1400 pound payload of passengers and cargo can't hurt its performance. It's built to very demanding specifications: Datsun's! Come see the complete line of America's No. 1 small pickups and test drive the King Cab. It's Datsun — dedicated to the different — *driven* to the exclusive.



NOBODY DEMANDS MORE FROM A DATSUN THAN DATSUN.
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"Keep thinking big, Datsun."

CAR CARE GUIDE 3

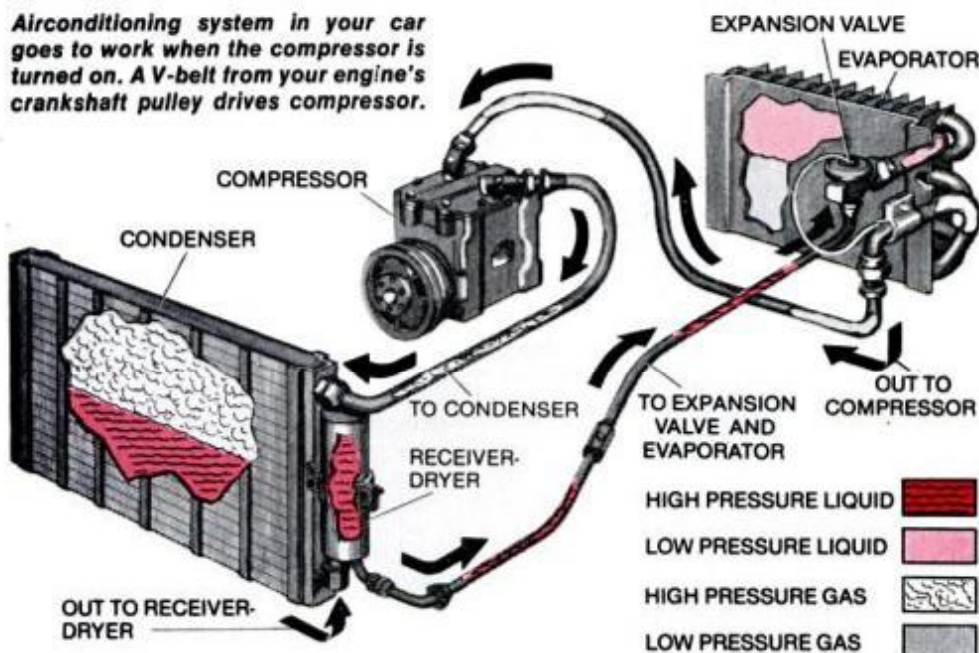
SECTION

cooling, there are certain external inspections you should make:

■ Examine the drive belt that runs the compressor. The compressor is a pump that circulates refrigerant. If the belt is broken, loose or glazed, the compressor won't work at top efficiency. Neither will the air conditioner.

■ Set controls for maximum cooling (consult the car owner's manual) and turn on the unit. Look at the center of the pulley section of the compressor. This is a clutch that couples together parts of the compressor when the compressor is

Airconditioning system in your car goes to work when the compressor is turned on. A V-belt from your engine's crankshaft pulley drives compressor.



Recharging air conditioner can be done with small refrigerant cans. Use goggles.

called on to circulate refrigerant. This clutch should be rotating.

If it isn't, look for fuses in the wiring circuit to the compressor. Replace fuses and test again. If the clutch still fails, the compressor requires an overhaul.

■ See that the condenser is not blocked. The condenser receives vaporized (heat-laden) refrigerant from the compressor and converts it to liquid form. Thus, the condenser has to be exposed to cooling air and will be found at the front of the car adjacent to the radiator.

Foreign material (leaves, insects and so on) blocking the condenser causes a reduction in cooling. Use a soft-bristle brush and compressed air to clean the condenser.

■ Check the receiver-dryer unit. This cylindrical component filters moisture from liquefied refrigerant as it flows from the condenser to the evaporator. It also "stores" refrigerant until called for by the evaporator.

The receiver-dryer can become clogged, which will impede the flow of liquefied refrigerant to the evaporator where

for a leak by passing the hose slowly along the undersides of the system's hoses and fittings. Refrigerant is heavier than air and will drop if it's leaking, so keep the hose low.

If the refrigerant is leaking, the color of the leak detector's flame will change to green or blue-green. Tighten connections if the leak is at a connector.

Caution: Fumes given off by a leak detector may be toxic. Don't inhale them. Wear a respirator.

You will have to discharge the system if a connector or hose, receiver-dryer, expansion valve or any major component has to be removed. The expansion valve is a regulating device which controls the amount of refrigerant that goes to the evaporator.

It isn't necessary to discharge a system if refrigerant needs replenishing. However, our discussion assumes that you have to do the full job.

Ideally, you should consult an air-conditioning service manual that outlines the procedure for discharging the particular system in your car. This manual should locate your low-pressure and high-pressure servicing valves.

You shouldn't have any problem removing a faulty component. It's generally a matter of unbolting fasteners.

The more critical parts of the job are discharging, vacuuming and recharging the unit. Here are several points to remember:

■ The main tool you need is the manifold gauge set. This consists of an inlet suction side, which is attached to the system's low-pressure service valve, and an outlet side, which is attached to the high-pressure service valve.

The low-pressure service valve is positioned on the line between the evaporator and compressor; the high-pressure service valve is between the condenser (actually the receiver-dryer) and evaporator.

■ Notice that the manifold gauge set possesses an exhaust line. Pay it out so its end is as far from the car as possible. If you are doing this job inside the garage, the line should extend outside. Don't evacuate the system in a closed garage.

As the system is being discharged, don't go near (or let anyone else near) the output end of the exhaust line. Refrigerant can cause blindness. Wear goggles.

■ The system is discharged by opening one valve and then the other valve of the manifold-gauge set. Open valves slowly. A rush of refrigerant leaving the system could draw oil from the compressor. The system is discharged when needles of both gauges of the manifold-gauge set point to zero.

■ After replacing the damaged part, vacuum the system to remove moisture and air which will harm refrigerant. Close valves of the manifold-gauge set, con-

(Please turn to page 190)

it is needed to cool the car's interior. In the case of a factory-installed unit, the evaporator is placed in the firewall, so it faces the inside of the car. Some after-market air conditioners have the evaporator under the dash inside the car.

To check the receiver-dryer, allow the air conditioner to run at maximum cooling for several minutes. Feel the entire cylinder with your hand. If there is a variance in temperature between the top and bottom parts of the cylinder, replace the receiver-dryer.

■ If the temperature test has proven that the air conditioning system is operating efficiently, but the atmosphere inside the vehicle is warmer than you think it should be, inspect the exterior of the car for air leaks. Warm air coming into the vehicle through windows that don't close fully, and through openings in the engine firewall and floor pan, will reduce air conditioner effectiveness.

Replace damaged window regulators. Readjust or replace window weatherstripping. Seal holes with auto body sealer.

Airconditioning system: Discharging and recharging

Light the refrigerant-leak detector and adjust the valve for a small flame. Check

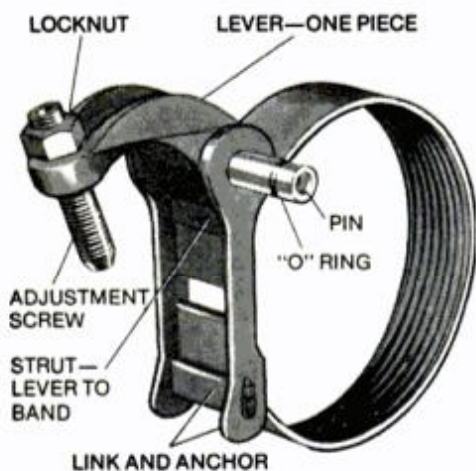
SECTION 3 CAR CARE GUIDE

nect the set's exhaust line to the vacuum pump, open both valves and start the pump.

Vacuumping should be thorough. It takes at least 30 minutes for complete vacuumping to take place. You can tell when enough time is taken by looking at the gauge serving the inlet suction side of the manifold-gauge set. When the needle drops below zero, an almost perfect vacuum exists. Recharge the system.

Place a can of refrigerant in a tub of water which has been heated to 125° F. This converts refrigerant into a vapor.

Connect the valve on the can of refrigerant to the charging hose of the mani-



Automatic transmission work includes adjusting bands; rear band is shown here.

fold-gauge set (see that the valves are closed). Start the car's engine and turn on the air conditioner. Open the inlet suction valve only.

The system is properly recharged when the gauge serving the inlet suction side of the manifold gauge set reads to a specified pressure reading. The specified reading is usually embossed on a nomenclature plate that is attached to the compressor. When the specified pressure is obtained, add an additional 8 ounces (½ pound) of refrigerant.

Automatic transmission: Preliminary discussion

Requirements for servicing automatic transmissions vary from manufacturer to manufacturer, and in some cases from model to model of the same manufacturer. Some models don't call for servicing, while others require servicing before, at or after 25,000 miles. Follow the manufacturer's recommendations.

Generally, one automatic transmission is serviced much the same as any other automatic, with the exception of adjusting transmission bands. With some transmissions, several bands (front, kickdown and rear, for example) are adjusted. With other transmissions, only one band requires adjustment. With still other transmissions, no band adjustment is made.

Consult the service manual to see what has to be done and to obtain band adjustment specifications. The specifications are given in inch-pounds or foot-pounds, so you need a torque wrench.

Automatic transmission: Servicing procedure

Note: Some cars have fluid drain plugs on the transmission. Place a receptacle under the plug to catch fluid when the plug is removed. With other transmissions, the pan must be loose so fluid will drain. It is practically impossible to keep fluid off the floor even though you place a large receptacle under the pan. Therefore, you might drain fluid outside the garage, then hose down the driveway.

1. Remove the drain plug and let fluid drain. If the transmission pan doesn't have a drain plug, remove bolts from the pan, except two that are opposite one another. Loosen these.

2. Insert a putty knife between the pan and the case, and pry the pan loose. Be ready to hop out of the way, so you aren't splattered with fluid.

3. After fluid drains, remove the transmission pan. It is customary to examine the interior of the pan and the drained fluid for particles, which would indicate that some part of the transmission is failing.

4. Scrape the old gasket from the pan and/or transmission case. Surfaces should be free of gasket material and dirt.

5. If possible, drain fluid from the converter. Remove the converter cover. Some converters have one drain plug, while others have two. You may need someone to crank the engine (disconnect the coil-to-distributor cable) to get the drain plug(s) into position. Don't forget to put back the converter cover after you reinsert the drain plug(s).

6. Adjust the front and/or rear bands. In many cars, the front band adjustment is made by attaching the torque wrench to an adjustment fitting on the outside of the transmission case and tightening until the specified reading is recorded by the torque wrench. The rear band adjustment is made by attaching the torque wrench to an adjusting fitting which is usually inside the transmission case.

7. Clean the transmission pan in kerosene. Let the pan dry before introducing new fluid.

8. Remove the transmission fluid filter, which you will see when you remove the pan. Replace it with a new one.

9. Install the transmission pan. Use a new gasket. Make sure the gasket isn't torn or wrinkled as you tighten the transmission pan bolts.

10. Lower the car, open the hood and remove the automatic transmission fluid dipstick. Insert a clean funnel in the dipstick tube and add transmission fluid.

Use the fluid called for by the car's manufacturer, which is either Dexron II

(or Dexron) or Type E. Do not use Dexron as a substitute for Type F, or vice versa. It won't be compatible with your transmission, and damage can result.

Add enough fluid to bring the fluid level on the dipstick between the ADD and FULL marks.

Caution: Be careful that you don't introduce dirt into the transmission with the fluid. Dirt means damage.

Examine the pan for leaks caused by bolts that haven't been tightened enough, or by a gasket that was damaged as it was being installed.

When everything is in order, check the fluid level (see Section 1 for instructions). The fluid level should be between the ADD and FULL marks.

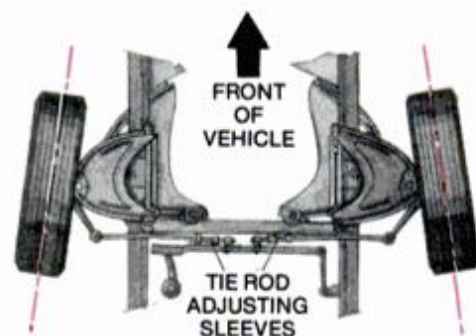
Caution: Do not overfill the transmission. Excessive fluid causes erratic functioning (slipping).

Shock absorbers: Facts about failure

A shock absorber's job is to damp the oscillations of the car's springs, which do the actual job of absorbing road shock. A car with bad shocks bounces up and down abnormally, especially after it goes over a bump.

Although manufacturers of shock absorbers contend that shocks usually fail between 20,000 and 30,000 miles, shocks can fail before or after that.

A driver who is supercritical may be able to tell "by feel" if he has a shock problem. He may be aware of that unusual bobbing, a slight shimmy in the steering wheel when the car hits a bump,



Toe-in adjustment refers to amount front wheels are angled toward one another.

or a bit of sway when the car turns a corner.

Generally, though, a driver can't tell when shocks have gone bad since failure is gradual, and the driver is accustomed to the way the car is handling. Stability seems no different than it was the day, month or year before.

Every abnormal condition that bad shocks create can also be caused by a number of other conditions, such as worn steering linkage, loose wheel bearings, low or uneven tire pressure, or faulty front-wheel alignment. What it comes down to, therefore, is that the

(Please turn to page 193)

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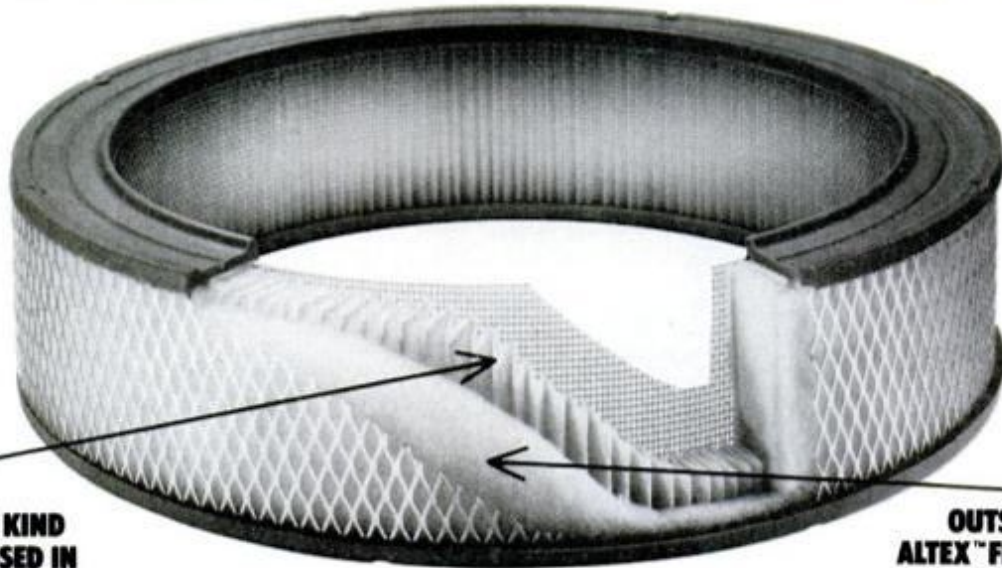
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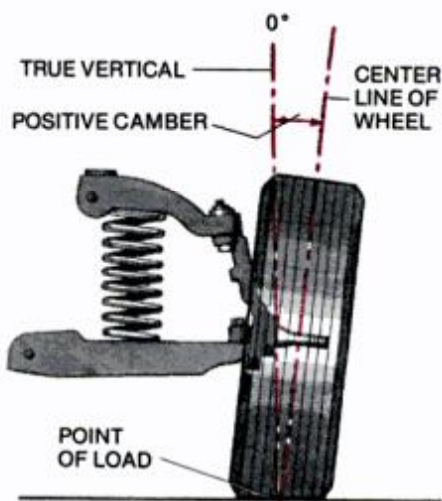
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SECTION ENGINE 3

CAR CARE

is one on the car. The car's body will limit the upswing of the body in that check each corner. An indication of condition is to drive the car to 10 mph. Apply the brake lightly. If the front dips while the rear rises, front shocks are weak. Normally, front shocks fail before rear shocks.



Positive camber is amount front wheels are angled out from the vertical position.

A final test is to get under the car to examine the shocks. If hydraulic fluid is leaking, the shock is bad.

Grasp each shock and try shaking it. If it wobbles, tighten the mounting and shake again. If movement is still present, replace the shock.

Shock absorbers: Which to use when

There are several different types of shock absorbers. This section outlines what they are. We use generic terms. Your auto parts and accessories dealer can help you match our term to the manufacturer's trade term. The following explanations also suggest which shock to use for different conditions:

■ **Standard shocks**—unless you specify "heavy-duty" suspension when you order a new car, standard shock absorbers are usually the ones you get. They are designed to provide the softest ride and are suitable for driving on smooth roads with the car carrying less than a full load most of the time.

■ **Heavy-duty shocks**—The body of a heavy-duty shock absorber has a larger diameter than the body of a standard

shock (normally 1½ inch versus 1 inch, respectively). Heavy-duty shocks provide a firmer ride and will support a car that is used to carry a full load of passengers and/or cargo most of the time.

Another difference between heavy-duty and standard shocks is the warranty. Heavy-duty shocks of major manufacturers are generally guaranteed against defects in material and workmanship for the time you own the car. Standard shocks aren't. This means that if a heavy-duty shock goes bad, it's replaced free.

■ **Overload shocks**—This is a heavy-duty shock absorber encased by a coil spring. This auxiliary spring helps the car's regular springs support heavy loads. They assist in preventing vehicle sag caused by excessive weight.

Cars that haul trailers benefit from overload shocks. So do station wagons that carry a full load.

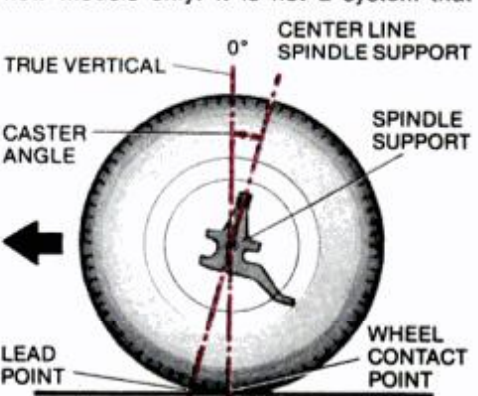
However, putting overload shocks on a vehicle that doesn't need them is of no advantage. They are more expensive than standard and heavy-duty shocks, and they give a harsher ride. They also cause the vehicle to sit higher than do heavy-duty or standard units.

■ **Air shocks**—Air shocks are heavy-duty units that have air chambers, allowing you to add and bleed air as you do with tires. You add air for more support, bleed air when you want less.

Air is added, bled and checked by means of an ordinary tire-type air valve. The valve is positioned in the rear since air shocks are used only in the rear. The valve may extend through the bumper or trunk floor. An air line runs from the valve to the shocks.

Air shocks are designed for cars that haul very heavy loads, particularly trailers. Replacing air shocks is done as described below, except that the air must first be purged and the air line disconnected.

The so-called automatic load leveler is an air shock system that is automatically filled or emptied according to load. The car is equipped with an air compressor and a sensor-type system. The automatic load-leveler system is available in some new models only. It is not a system that



Caster is amount center line of spindle support is angled back from vertical. Compare to the front fork of a bicycle.

is added to a car as an aftermarket piece of equipment.

Shock absorbers: How to replace them

Front and rear shock absorbers are held at the top and bottom by fasteners which you have to remove before taking off the shock. This poses several questions. Let's run them down:

■ **Should you replace all shocks if only one is bad?** Certainly not. If a front shock is bad, let's say, you don't have to replace the rear ones.

■ **But what about the other front shock?** Do what you want, but we suggest replacing it, too. As a rule, if one shock goes bad, the other shock on the same axle will soon follow.

■ **Can you make it easier to reach top fasteners that you unscrew from under the car?** Use a socket extension. Also, you may be able to reach retainers better by taking off wheel and tire assemblies and going in through wheel wells.

■ **How do you free frozen fasteners?** Use lots of penetrating oil and patience. Let oil penetrate for several minutes before trying to unscrew retainers. If still frozen, use your impact driver.

■ **Where do you place jacks?** At the place where they best support the car and also relieve pressure on the shock. Up front, use a hydraulic garage jack under the suspension arm on the side you're working. In the rear, place the jack under the rear axle as close to the shock as possible. If necessary, use two jacks—one to support the car and another to take pressure off the shock.

■ **Suppose top retainers aren't visible from below. How do you get at them?** From above. Up front, there are access holes in the inner fender panels. In the rear, look for access holes in the trunk floor.

■ **Anything else?** Before you install a new shock, it's a good idea to mount it upright in a vise and activate it several times to purge trapped air. Also be sure the shock is firmly attached to its top and bottom seats which you have wiped clean.

Steering linkage: What to do

Raise the front of the car. Grasp each steering-linkage rod leading from both wheels to the steering gearbox. Try to shake the rod.

If you feel any play, try to tighten the rod. Check for play again. Play? You have no choice. Replace the worn part.

Wheel alignment: What's the angle?

The term "wheel alignment" generally encompasses three wheel conditions called "toe-in," "camber" and "caster." In most American-made cars, each is an adjustable angle. In many foreign cars, camber and/or caster are not adjustable;

(Please turn to page 194)



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CAR CARE GUN

however, toe-in can always be adjusted.

In many cars, maximum steering stability and minimum tire wear are obtained when front wheels are set slightly out of parallel to each other—usually from a minimum of 1/16 inch to a maximum of 3/16 inch, depending on the car. This is toe-in, and it compensates for the fact that there is no perfect steering or suspension system—that is, one that can maintain itself so front wheels run absolutely parallel.

If you have sharp eyes, you may be able to see that the front wheels of your car lean slightly in or out. This tilt is called camber. When tilted out—that is, set farther apart at the top than at the bottom—the wheels have positive camber. When tilted in—farther apart at the bottom than at the top—wheels have negative camber.

The purpose of applying camber is to offset the adverse effects of stress on steering when a car is rolling. In other words, a car that has a specified mount of positive or negative camber will offer better steering response than if it had no camber. The amount of camber specified by the manufacturer provides the optimum condition.

Technically put, caster is the angle between the line extending the steering-pivot axis and a vertical line through the center of the wheel. Simply put, it means that a wheel should roll straight and return to a straight position after a turn. Caster is compensatory angle to assure that this happens.

Wheel alignment: Should you do it yourself?

Physically altering each wheel alignment angle to bring wheels back to specification is not difficult. Toe-in is normally adjusted by loosening and turning tie-rod ends. Camber and caster are generally adjusted by adding or subtracting shims to the control arms or by turning an eccentric adjusting bolt.

It's really a snap to do until you bring up the subject of the instruments needed for making adjustments. You need two gauges—one to measure toe-in and one to measure caster and camber. The question is whether you can get by with inexpensive gauges, costing from \$20 to \$50.

To get an idea of the accuracy of these gauges, PM used them to adjust toe-in, caster and camber. Then, we took the car to a front-end garage for a recheck with very expensive front-end equipment.

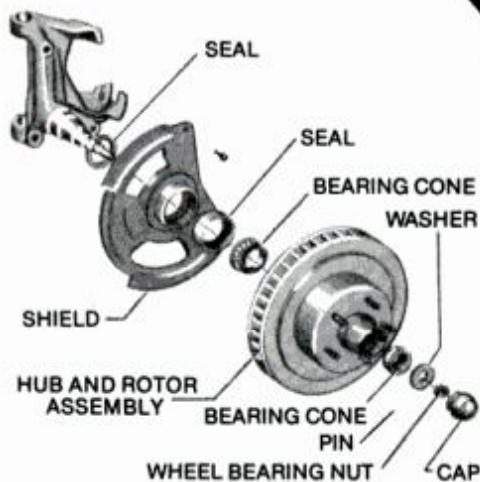
We found that the toe-in gauge we used provided a reading that was almost identical to the reading in the professional garage.

The caster-camber gauge was less satisfactory, giving an error of about 1/8°. However, the gauge was the least expensive (\$21) and was not used with a turntable to obtain the necessary 20° wheel rotation that is called for. More expen-

sive gauges racks are sold

Wheel bearings Importance of se.

Bearings of driven front wheels of one of the most neglected was the last time you serviced. Wheels roll because of bearings. When bearings require they get hot. If matters become the bearing's needles (rollers) with themselves to stationary part of the ing on which needles rotate (race).



On cars with disc brakes, remove front wheel bearings for lube as shown here.

When heat welds needles to the race, the bearings become solid metal. Forced to turn on the wheel's spindle, the solid mass begins to cut through and weaken the spindle. If this continues long enough, the spindle can snap, which will cause the wheel to collapse. The outcome of this can be a serious accident.

We aren't saying that this *will* happen if you never service wheel bearings. We *are* saying that it *could* happen. Thus, the wise course of action is to lubricate and adjust wheel bearings during the 20,000 to 30,000-mile period, and every 20,000 to 30,000 miles thereafter.

Wheel Bearings: How to Service

Note: We discuss servicing wheel bearings in a disc brake. Servicing wheel bearings in a drum brake is done similarly. Only bearings of driven wheels require service. Wheel bearings of drive wheels are lubricated by the differential or front drive unit.

Proceed as follows:

1. Jack up and support the car. Remove the wheel cover.
2. Using chalk, draw a line from the wheel onto the hub. When you put the wheel back on, align the two marks. This will allow you to maintain wheel balance.
3. Loosen caliper retaining bolts and lift the caliper off the rotor.
4. Fashion a hanger from a piece of

metal. Slip it onto the caliper and hang the caliper on a suspension member, so no stress will be on the brake line.

5. Remove the grease cap.
6. Straighten the cotter pin, pull it out and throw it away.
7. Remove the wheel bearing nut and washer. Lay them on a clean sheet of paper. Do not use newspaper. Newsprint may be transferred to parts.

8. Grab the rotor. Pull it forward, then push it back. The outer wheel bearing will pop out. Lay it on the paper.

9. Remove the rotor and place it on a clean sheet of paper or cloth.

10. Using a soft brass drift and hammer, tap the inner bearing and seal from the hub. Discard the seal.

11. Wash bearings in clean kerosene. Use a clean, soft-bristle brush to work kerosene between needles. Handle bearings by the race. Don't wrap your hand around bearing so dirt and perspiration on your hand can get on the bearing.

13. Examine the bearing. If it is damaged or has turned black, discard it.

14. Spin the bearing slowly. If it doesn't rotate smoothly, but binds or feels gritty, discard it.

15. The ideal way to grease bearings is with a grease packing tool. With one type of tool, the bearing is placed inside the tool, and the tool is closed. A grease gun is attached to the grease fitting on top of the tool. Wheel bearing grease is forced between the needles as the grease gun is pumped.

If you grease bearings without using a tool, wear clean rubber gloves. Place a glob of grease in the palm of your hand. Work the bearing into the grease, making sure grease gets between all needles.

Use plenty of grease. There is no such thing as too much with wheel bearings.

16. After bearings are lubricated, use a clean rag that is saturated with kerosene to clean the inside of the hub. Let it dry. Apply a thin coat of wheel bearing grease to the hub.

17. Put the inner wheel bearing back in the hub.

18. Lay a new grease seal over the bearing; tap it in place with a grease seal installing tool or a soft, brass drift.

19. Place the disc back on the spindle, which should be cleaned and greased.

20. Seat the outer wheel bearing into the hub.

21. Install the washer and run up the wheel bearing nut.

22. To seat bearings, find the manufacturer's wheel bearing torque specification in the service manual. Spin the wheel as you tighten the wheel bearing nut to this specification. After tightening, see that the wheel revolves freely. If it doesn't, back off the nut one-half turn.

23. Install a new cotter pin and wrap its legs around the wheel bearing nut. If necessary, snip the legs to shorten them.

24. Install the caliper, wheel and wheel cover.

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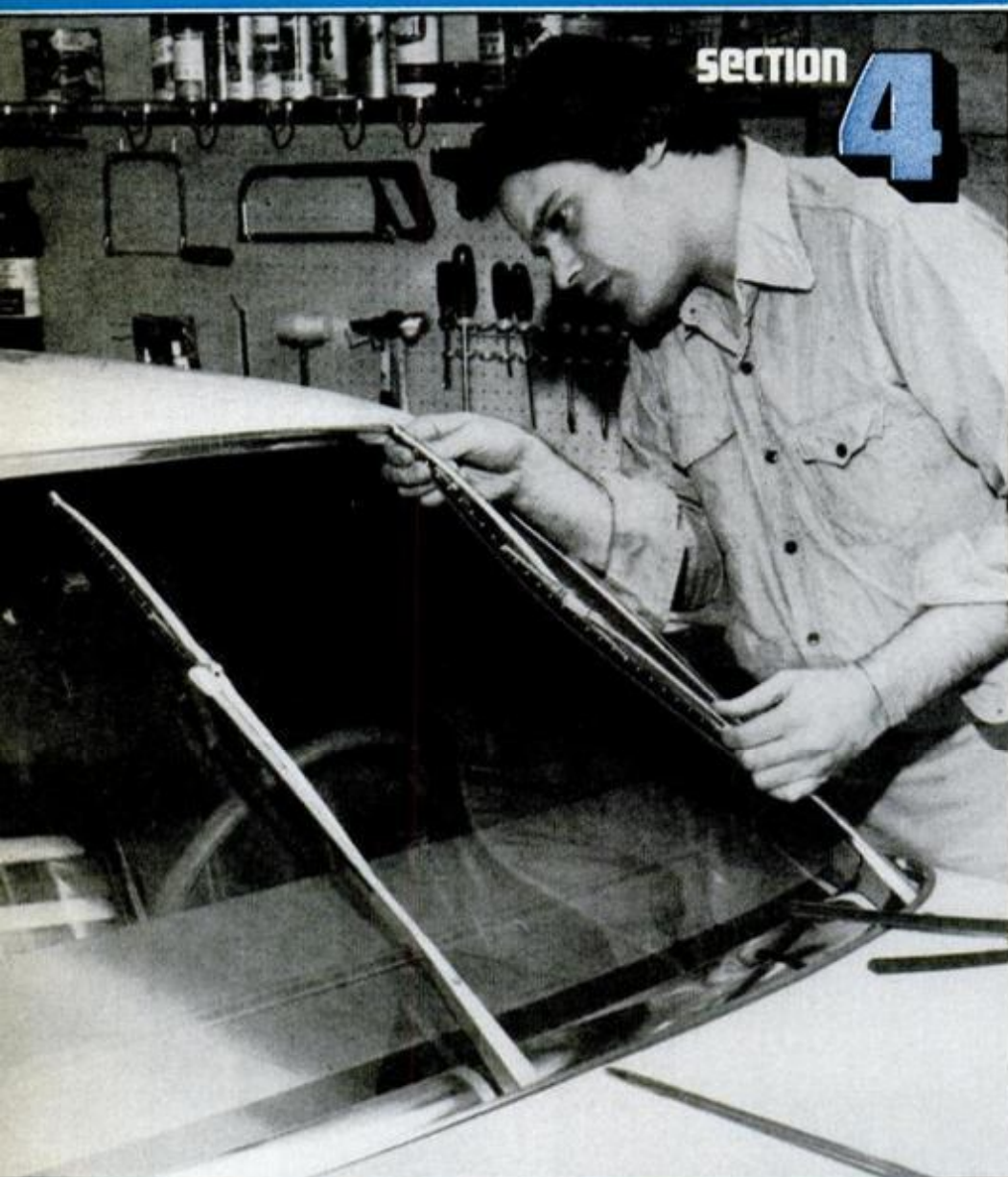
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CAR CARE GUIDE 30 TO 40,000 MILES



SECTION 4

Replace rubber refills on your wiper arms at the first sign of windshield streaking.

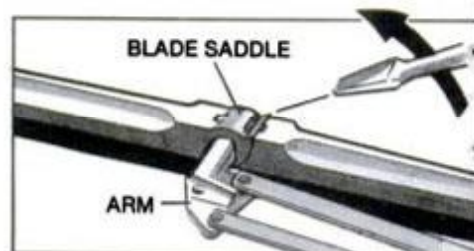
The carefree miles

Why do we refer to the period between 30,000 and 40,000 miles as the "carefree miles?" Because by this time, most of the bugs that a car may have had in its earlier miles should be ironed out. Thus, this period is usually free of major problems. Only ordinary periodic maintenance is required.

However, there usually is some "nuisance" work that has to be done. This section deals with such work, which includes the replacing and aiming of headlights, replacing of other bulbs,

renewing of windshield wipers, replacing of wiper arms, changing of fuses and replacing the battery.

Before we get to this task, let's stress a point that many car owners seem to overlook. Any problem that afflicts a car may be an inherent condition that the manufacturer has recognized and taken steps to correct. Therefore, discuss any problem you have with the service manager at a new-car dealership. Ask whether a service bulletin has been issued covering the malfunction.



Wiper blade removal procedure varies; here screwdriver is a necessary tool.

Keep in mind that service bulletins and such don't apply only to current-year models. Bulletins frequently are produced a year or two after the production run has been completed. In fact, under the safety recall program, Cadillac recently recalled its 1960 models for a steering defect.

Speaking about safety recalls, if you want to find out whether a new or used car you would like to buy has been involved, contact the National Highway Traffic Safety Administration (NHTSA). You can call it toll-free at 800-424-9393. (The number to call if you live in the District of Columbia is 426-0123.) Tell the operator the car's make, model and vehicle number (VIN). In most vehicles, you will find that the VIN is embossed on a plate that's in the top left-hand (driver's side) corner of the dash, practically butting the windshield.

If you learn that the model has been recalled, you can find out if a particular car already has been serviced by mailing a postcard to the manufacturer's customer relations department.

Headlights: How to replace

Do the following if one of the headlights goes out:

1. **Turn on the headlights** to open concealing covers, if your car happens to be so equipped.

(Please turn to page 198.)

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DieHard



CAR CARE GUIDE 4

SECTION



When windshield cleaning-fluid reservoirs crack, try patching before replacing.

2. Remove the trim around the headlight.
 3. Remove the headlight retaining ring. With some types, you will have to remove the screws and turn the ring before it will come off. With others, you will have to unhook a spring.
 4. Pull the headlight out from the connector and install a new bulb.
- Important:* In cars that are equipped with two rather than four lights, install a No. 2 bulb. In cars that have four headlights, install a No. 2 bulb in the outside lights and a No. 1 bulb in inside lights.

Headlights: How to adjust

Suppose the officer at the state inspection station flunks you because of misadjusted headlights. Or you see for yourself that beams point up, down or to the side. You have three options:

1. Take the car to a shop and have the lights adjusted.
2. Buy a headlight aimer, which is pretty expensive.
3. Devise a headlight aimer for your dream garage, which costs nothing, but requires a blank wall. Draw a pattern on the wall using the illustration appearing above right as a guide.

To adjust headlights, park your car on a level surface so that the lights are 25 feet from the wall. Test the low beams first—then the high beams. If an adjustment should be needed, reach the adjustment screws through the headlight trim, or by opening the car's hood and reaching behind the headlights.

Light up your life

As you know, headlights aren't the only bulbs a car has. There are also front parking lights, which incorporate the front turn signals and hazard flashers; front side marker lights; rear side marker lights; and taillights which incorporate stoplights, rear turn signals and rear flashers. A car also has a license-plate light.

Parking-light bulbs can be replaced by removing the lenses (if the lenses are

equipped with screws) or by reaching up underneath the bumper. Front side marker bulbs can be changed by reaching under the fender or removing screws from the lens.

Rear side marker bulbs are reached from inside the trunk or by removing screws from the lens. And taillight bulbs are usually changed from inside the trunk or by removing the lens (screws.)

If replacing a bulb doesn't restore a turn signal to operation, then the flasher is probably shot. To replace it, find the flasher, which is usually under the dashboard, and pull it from the connector. Install a new one.

Note: Hazard signal flashers normally are operated by a different flasher.

Windshield wipers: How to replace blades

To replace a windshield wiper blade, determine how the wiper is attached to the wiper arm. The following rundown will help you locate the "mystery" link:

American Motors—Blades can be detached either by the pressing of a spring clip located in the center of the blade or by pressing a tab on the underside of the blade.

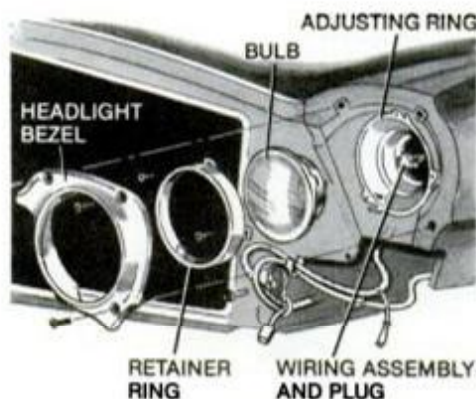
Chrysler Corp.—Blades can be released by pressing a lever in the center of the blade. The rubber wiping element is then removed by pressing a release (button or lever) on the end of the bridge.

Ford Motor Co.—One type can be replaced by pressing a tab on the bottom side of the blade. Another type can be changed by pressing the arm to unlock a stud as you press a tab. With still a third type, press a spring clip in the center of the blade.

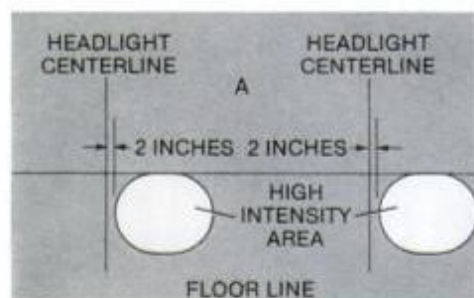
Where rubber elements have to be released from the blade, squeeze the latch lock or press the latch pin and pull the element out.

General Motors—Two types are used. With one type, you press a release tab and slide the blade off the wiper-arm pin. With the other, push the lock spring down and slide the blade off the wiper arm.

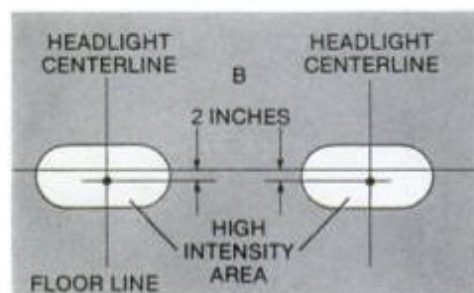
To remove the rubber element, press



Headlight replacement is easiest when done from front as shown in this view.



Keep check on headlight aim with wall sketch; low beam is above, hi-beam below.



the release button or squeeze the spring-type retaining clip.

Windshield wipers: How to replace arms

If renewing of the windshield wiper blades doesn't result in a more effective wiping action, the arm that holds the blade may not be providing sufficient tension against the windshield. The arm itself may be damaged.

Get an indication of the arm's effectiveness by pulling it in away from the windshield and then releasing it. The unit should snap back authoritatively. If it doesn't, it's time to replace the arm.

As is true with wiper blades, the wiper arms are held in place in a variety of ways. The following list sums up these methods:

- By a slide latch that connects the arm to the pivot shaft.
- By a slide cap that connects the arm to the pivot shaft.
- By a pressed fitting on the pivot shaft. Exercise caution with this setup, which predominates with GM and Chrysler models. Using a screwdriver to pry the arm loose may damage the pivot shaft and could lead to paint or glass damage. A special windshield-wiper arm remover and installer is available from auto parts and accessory dealers. Kent-Moore Tools is one company that makes the instrument (part No. J 8966).
- By a spring-loaded clip that is released by swinging the assembly away from the windshield, inserting a 3/32-inch pin through the pinhole in the underside, and shimmying the arm off the pivot shaft.

Note: Some arms that are held by spring-loaded clips do not have pinholes. The arm is swung away from the glass

(Please turn to page 201)

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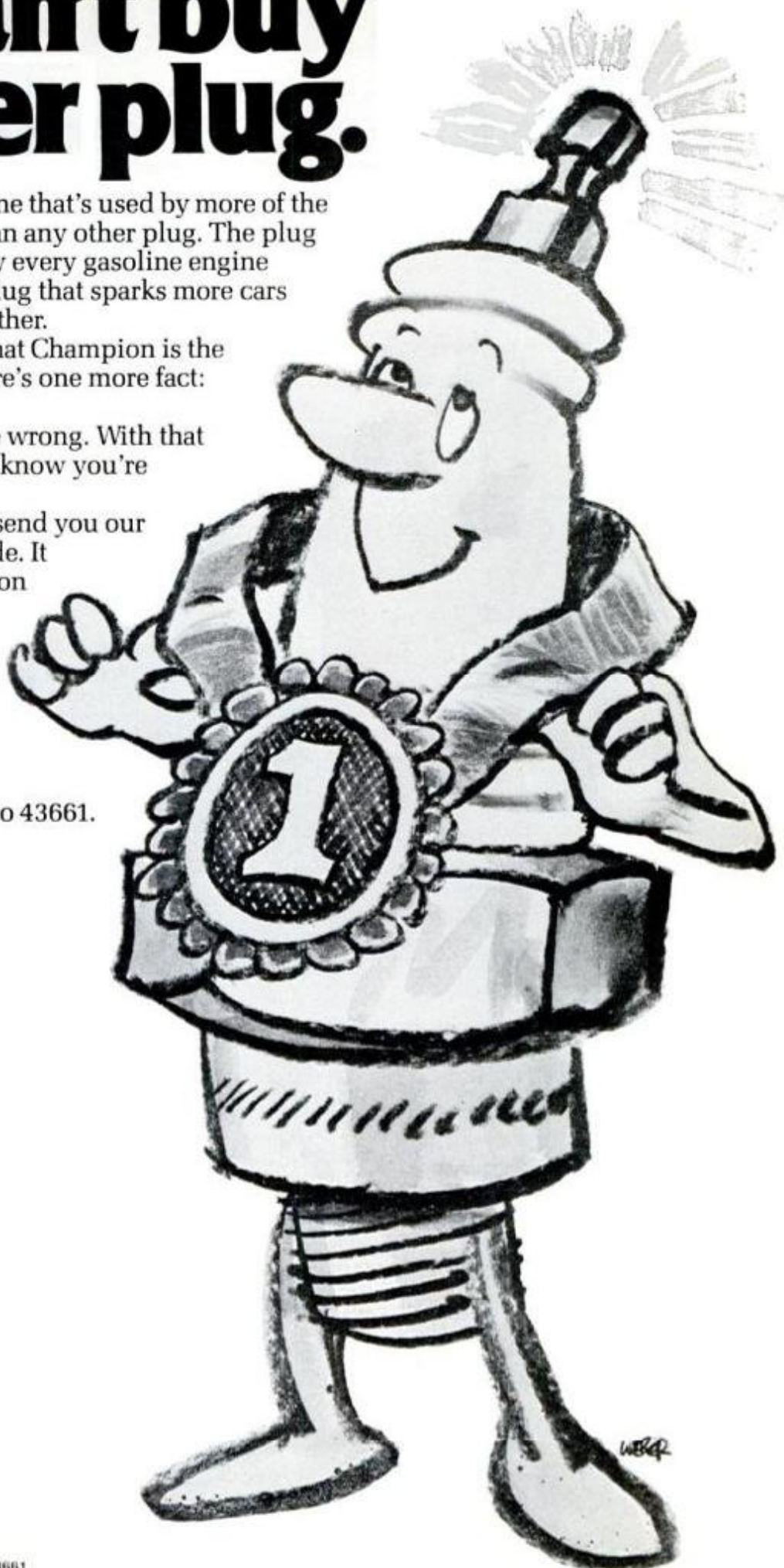
If you're still not convinced that Champion is the plug you should be using, here's one more fact: It's the world's No. 1 seller.

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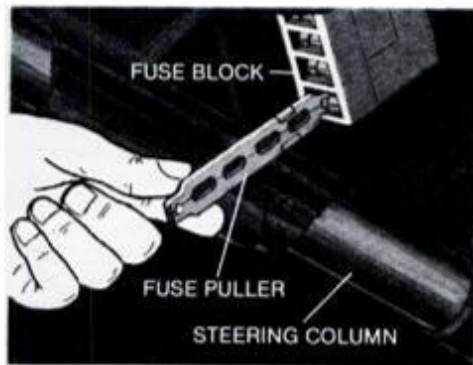
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CAR CARE GUIDE

and rocked back and forth to get it to release from the pivot shaft.

A short-short about fuses

You may save yourself a lot of work by remembering that when an electrical component fails to function, the problem may just be a fuse that has loosened or gone bad. Fuses in a car perform the same function as fuses in a home—that of protecting electrical equipment that



Fuses are easily replaced with appropriate removal tool. Keep spare fuses in car.

could be damaged if there's a sudden surge or a short circuit.

When an electrical component fails to function, replace its fuse and see what happens. The cause of the problem may be only an old fuse whose element has weakened.

However, if the component works, but the fuse then blows again, check the circuit. There is a more serious problem indicated.

Manufacturers place fuse panels in various places. Look under the dash on the firewall, in the glove compartment, in the engine compartment and under the instrument panel.

Replacing fuses will be easier with a fuse puller.

Caution: Before pulling a fuse, make sure the ignition is off.

Changing a battery

The key word is *safety*. Take steps to prevent sparks that may ignite battery gases and cause an explosion. Do this by being careful not to drop tools on battery terminals. Also, remove wristwatch, rings and any other jewelry before beginning work.

In disconnecting a battery, remove the negative (ground) cable first. Then remove the positive cable.

When installing a battery, connect the positive cable first. Then connect the negative cable.

Don't overlook the battery cables as a possible cause of hard starting. Cables don't last forever. If you find that the insulation is damaged, replace the cables.

In a majority of cars, the negative cable is attached to the engine. The positive cable normally goes to a starter relay, then from the relay to the starter switch.

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SECTION 5



Replacing brake pads is easy; complete overhaul takes more effort but saves big money.

The transition miles

As a car heads toward the midway point in its first 100,000 miles, it enters a transition period. Up to 40,000 miles, a car requires mainly maintenance; that is, lubrication, tune-up, adjustment and inspection. Minor repairs may be needed, but the emphasis is on providing a car with the services that lay the foundation for long life.

Between 40,000 and 50,000 miles, the emphasis begins to change. Some critical parts start wearing out and need to be replaced or overhauled. This poses no problem for the owner of a dream garage. It is during this transition period that the garage really begins to pay for itself.

Among the jobs you will probably encounter in the 40,000-50,000 time frame

are overhauling the brake system, replacing tires and balancing tire-wheel assemblies, and replacing all or part of the exhaust system.

Brake overhaul: Some considerations

The extent of overhaul depends on the extent of wear or damage. Between 40,000 and 50,000 miles, new disc-brake pads and drum-brake linings will probably be needed.

However, the periodic brake inspections you have been making (see Section 2) should prevent damage to discs and drums. One purpose of inspections is to prevent extreme lining wear that will cause metal shoes to score discs and drums.

If scoring has taken place, you may be able to salvage discs or drums by having them resurfaced. Consult a professional brake shop that has a reputation for doing good-quality work. The turning machine needed to cut discs and drums is not on the dream garage "buy" list.

With the exception of disc and drum resurfacing, all brake work can be done in your garage. For example, if there is evidence of a brake fluid leak, you can make repairs. One indication of a fluid leak is a fading brake pedal. Another is visual evidence of fluid on the back of a wheel, on a brake hose or on brake linings.

In the case of disc brakes, repairing a fluid leak frequently involves overhauling the caliper. Follow these guidelines to do the job:

1. Remove the caliper from the disc.
2. Remove pads from the caliper.
3. Remove the piston or pistons and seal(s) by applying an air hose against the brake line port.
4. Remove and discard the dust cover and retainer.
5. Remove and discard the O-ring seal from the cylinder wall, if one is used.
6. Apply clean brake fluid to the piston and cylinder wall, and polish them both with crocus cloth.
- 7 Reassemble the caliper using new parts from a brake rebuilding kit that is compatible with the brake system in your car.

In the case of a drum brake, a damaged wheel cylinder may be causing a brake fluid leak. You can usually verify this by pulling back both boots that cover the ends of the cylinder. If fluid leaks out, the cylinder should be repaired or replaced.

Try to overhaul a bad cylinder by removing the cylinder from the brake backing plate and disassembling the component into its parts—two boots, two pistons, two cups, one expander and one cylinder bore.

Spread fresh brake fluid over the cylinder bore and polish the bore with crocus cloth. If the bore is badly scratched, replace the cylinder with a new one.

Reassemble a still-usable wheel cylinder with new parts from a wheel cylinder rebuilding kit.

What should you do if the master cylinder is leaking? If you can buy a master cylinder kit for your particular unit, you can rebuild the cylinder. Follow these guidelines:

1. Remove and drain the cylinder.
2. Remove the retaining clip and withdraw the primary piston, secondary piston, return spring and associated components.
3. Hone the cylinder bore, if necessary. Honing should be superficial to remove surface glaze. Excessive honing will increase the cylinder bore size and make the part unusable.
4. Rinse the cylinder in alcohol. The alcohol should pour freely through all passages, showing that passages are

clear. If passages are blocked, try blowing them free with high-pressure air. High-pressure air should also be used to dry passages.

5. Rebuild the cylinder using parts from an overhaul kit that is designed for your particular master cylinder.

Replacing tires: Don't forget balancing

Dream garage notwithstanding, buying tires and mounting them yourself doesn't pay. The price for tires will be the same whether you mount tires yourself or you have the dealer mount them for you.

New tires should be balanced, which is a job that's not within the realm of a home garage. Tire balancing equipment is too expensive.

Tires should be balanced both dynamically and statically to insure perfect tire and wheel assembly performance.

Dynamic balancing, which is done with the wheel and tire rotating, eliminates heavy spots that create horizontal vibration. A metal weight is placed directly opposite the heavy spot on the inside of the wheel to counterbalance the spot which is on the outside of the wheel.

Static balancing equalizes heavy spots that force tires against the pavement on each revolution. This produces vertical vibration. To counterbalance the effect, a weight equal in mass to the spot is placed on the same side of the wheel directly opposite the offending mass.

Exhausting the possibilities

Replacing an exhaust system is a relatively easy task although the question is often asked: "What do you do with the catalytic converter?"

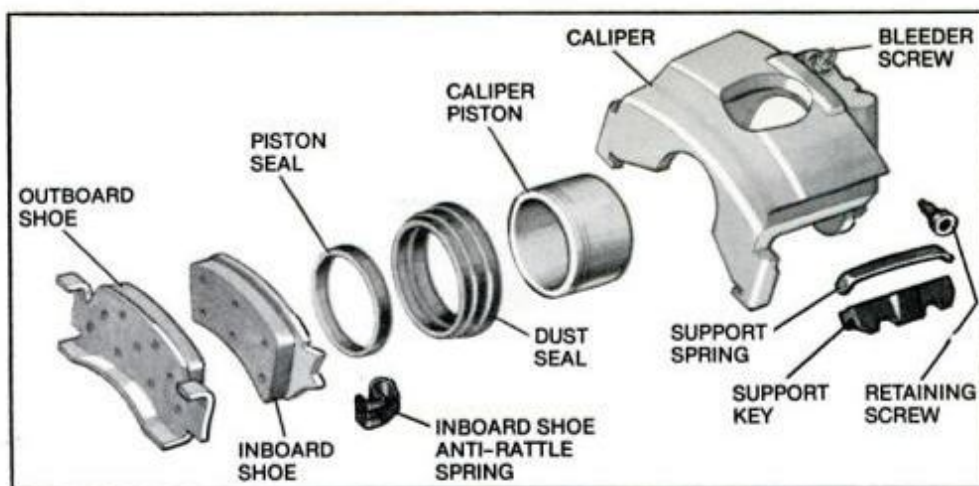
You do nothing if the catalytic converter is performing properly. Even if your exhaust system fails an emissions inspection, you should first check other emissions equipment and tune up the engine. You don't want to discard a good converter until you're sure it has reached its end.

The life expectancy of a catalytic converter is 50,000 miles. If other exhaust system components have to be replaced before the catalytic converter goes bad, treat the converter like an ordinary muffler that's going to be kept in use. Simply work around it by disconnecting the clamps that attach it to the exhaust system's pipes.

When a catalytic converter fails and has to be replaced, consider the converter you have. All are not treated the same. For example, a catalytic converter that fails in a Chrysler or Ford car has to be cut out, just like a bad muffler, and replaced.

The converters on American Motors and General Motors cars are different. They can be serviced with special tools that drain exhausted catalytic pellets and replace them with fresh ones. Even if the bottom of the converter is physically damaged, it is usually possible to save the housing by replacing only the bottom cover, as follows:

1. Use a chisel and a ball-peen hammer to cut off the bottom cover. Cut close to the bottom edge. Do *not* cut through the fill plug, but cut around it. Make the depth of the cut as shallow as possible to



Typical disc brake caliper showing the components you'll encounter in doing overhaul.

prevent damaging the inner shell. Wear goggles while cutting.

2. When the bottom cover has been cut free, remove the insulation. Inspect the inner shell. If the shell is torn, crushed or dented, replace the converter.

3. Fill the new bottom cover with fresh insulation. Apply sealing compound all around the cover. The sealing compound sold by GM parts departments bears part No. 8998245.

4. Install the cover.

In the case of GM and AMC converters, we became curious whether it would be less expensive to replace the entire converter yourself or have a mechanic replace the pellets, assuming you don't have the special tools. We learned that a new converter costs about \$200. Having the pellets replaced costs about \$90—\$16 for labor and \$75 for the pellets.

Exhaust system repair: Points to remember

■ Never work on an exhaust system

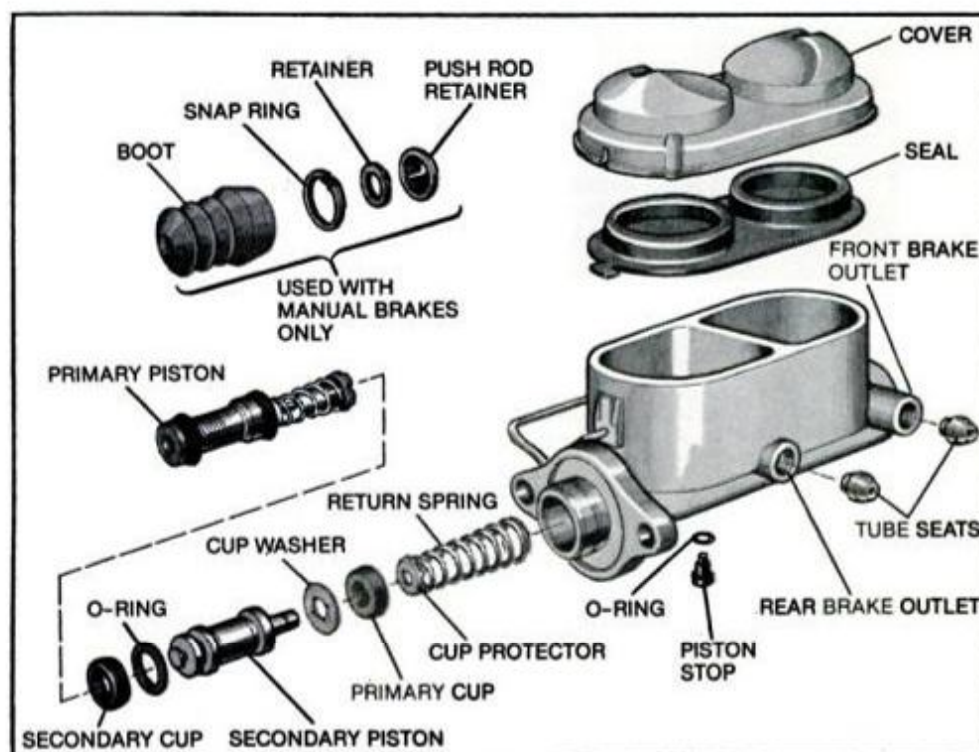
when the engine is hot. You may get burned.

■ If some parts are salvageable, you have to loosen fasteners that are probably frozen hard. Use plenty of penetrating oil, and give oil ample time to do its work before you try busting fasteners loose.

■ In removing one exhaust system part and keeping another in place, wrap wire around the "other" and tie the wire to the chassis so it is supported. If the component hangs down, it can break loose and end up in the garbage.

■ When joining parts together, apply a liberal quantity of exhaust system joint sealer to joints before installing clamps. The sealer helps prevent exhaust leaks.

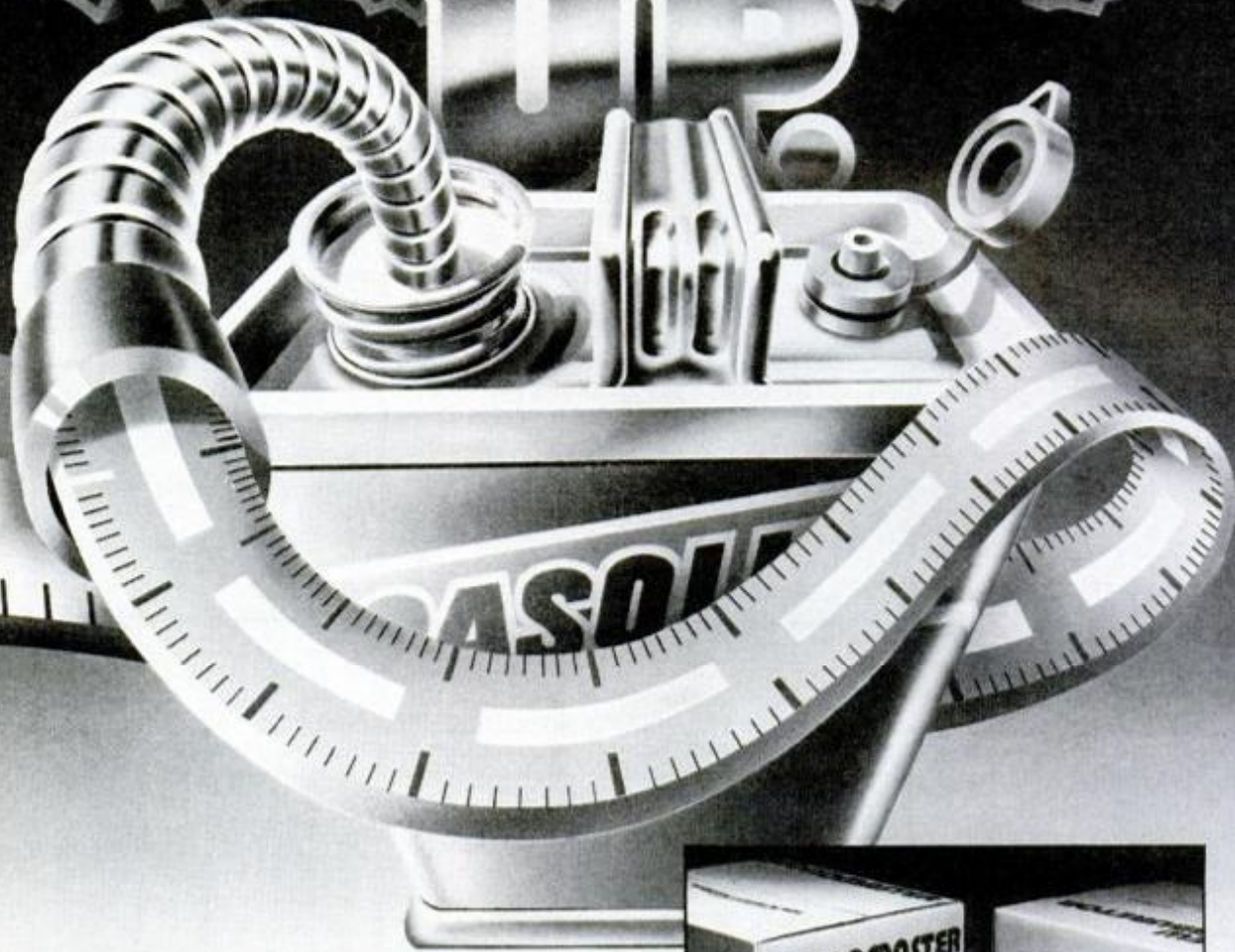
■ Do not overtighten fasteners that hold exhaust system components. You may crush them. However, fasteners can't be too loose, because parts will hit against the chassis and be damaged. To be 100-percent safe, tighten fasteners to the specifications given in the service manual using your torque wrench.



Rebuilding brake master cylinder will be cheaper than new cylinder if you do work.

MEASURES

TIP



With Holley Economaster carburetors, it's not a matter of inches, but miles. Extra miles to make a tank of gas last longer. Recent tests at the Holley emissions laboratories using Federal economy test procedures on typical vehicles showed fuel economy gains ranging from 3.2% city - 6.4% highway for a 1974 Ford Torino V8, to 14.1% city - 10.2% highway for a 1973 Dodge Dart 6 cylinder.

In all, 11 different Holley Economaster models were tested in everything from Chevys to AMCs, equipped with a variety of engines, 4, 6 and 8 cylinder, and automatic transmissions. Economaster carburetors: solid mileage improvement for your car you can easily bolt on yourself. See your local auto parts dealer or write for a where-to-buy list. Also available at NAPA stores as Holley Fuel Savers.

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CAR CARE GUIDE 50 TO 60,000 MILES

SECTION

G

The resisting-trade-in miles

According to the Automobile Manufacturer's Association, the average American who buys a new car trades it for another one at between 50,000 and 60,000 miles. One reason often given is that when "things" (meaning parts) begin going bad, it's best to get rid of a car before it costs big money for repairs.

But the excuse isn't valid. The average price of a new car, reasonably equipped, was quoted recently by General Motors as \$7000. How many repairs can you make for \$7000?

Two of the repairs your car is likely to

be ready for at 50,000 miles are carburetor overhaul, and, for cars with manual transmission, a new clutch. Doing a carburetor overhaul yourself costs little. A new clutch? You can buy one for less than \$50. I won't kid you. Putting in a new clutch isn't easy. But even if a mechanic does it for you, it should only cost about \$125.

True enough—it is difficult to resist the temptation of buying a new car after the old car has attained 50,000 miles. But the longer you keep your old car, the less per mile the car is going to cost you.

As we said before, keep the car in gem condition long enough and its value may eventually exceed its original cost. Look what's happened to the values of cars like the Cord, Stutz, Model A and 1965 Thunderbird convertible. But even if you own a more run-of-the-mill car, and merely keep it looking and running well, there is still a payoff to come—in dollars saved.

To help you realize that payoff, here's information on carburetor overhaul and clutch replacement.

The argument for carburetor overhaul

A new carburetor costs \$30 to \$75. A repair kit that permits you to overhaul your old carburetor costs \$4 to \$6.

A typical overhaul kit contains new needle and seat, accelerator pump, gaskets, float-level gauge and instructions. You will also need a container of carburetor cleaning agent to soak parts that you will retain.

The instructions that come with the repair kit are explicit and complete, so there's no need to repeat them here. However, we wish to emphasize points which will make the job safer and easier.

Carburetor overhaul practical procedures

■ Before removing the carburetor from the engine, disconnect the battery to prevent an accidental spark from igniting fuel that will be spilled. The engine should be cold.

■ Make a diagram of lines and hoses attached to the carburetor so they can be reconnected correctly.

■ Plug the disconnected fuel line and cover the intake manifold inlet after the carburetor has been removed to keep dirt out of the system.

■ Set the carburetor on a stand, which costs about \$7, and not directly on a workbench. The stand prevents throttle plate damage that would occur if the plates hit against a hard surface.

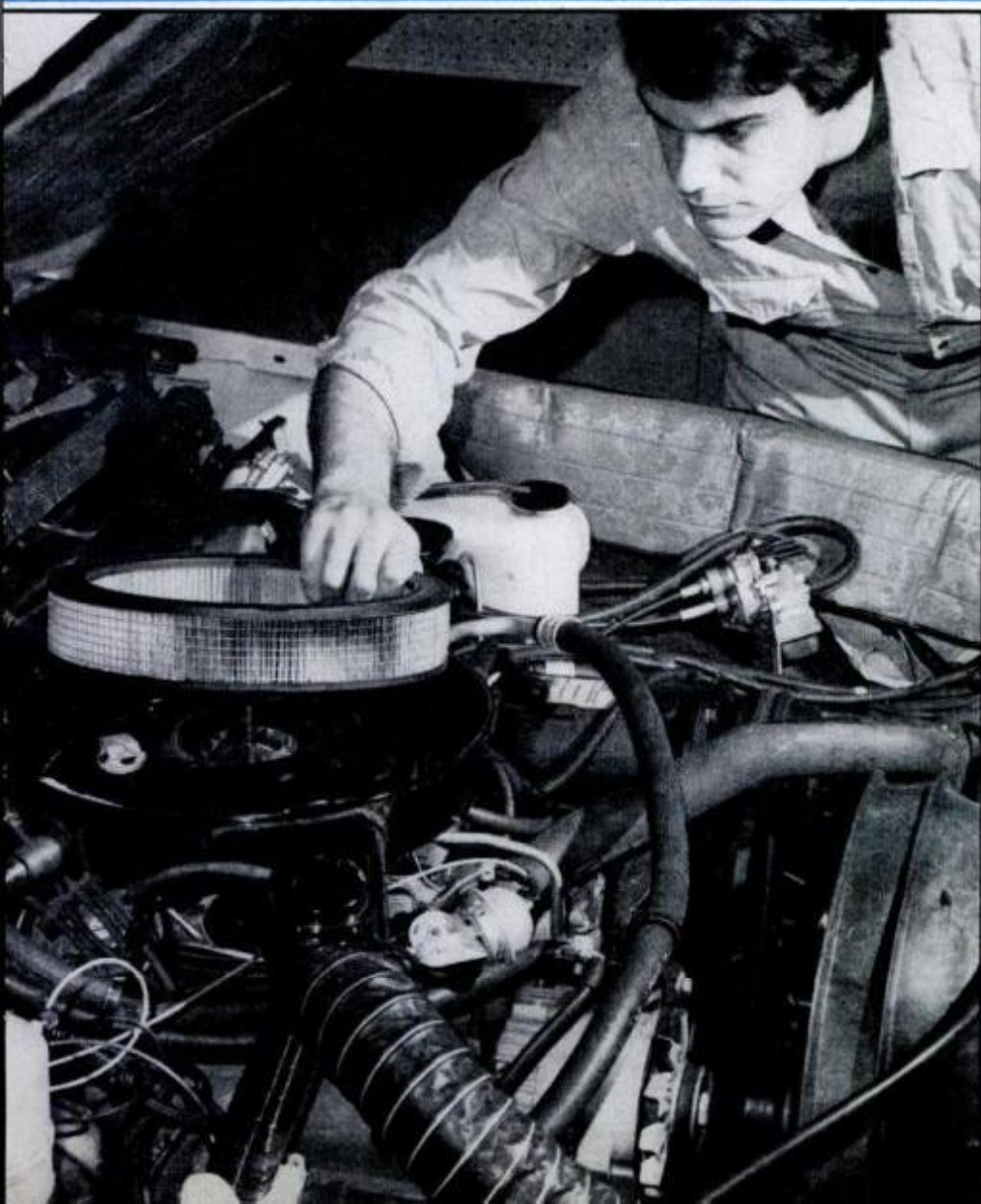
■ Do not put rubber and plastic parts in carburetor cleaner. Just wipe them clean. However, rubber and plastic parts are generally replaced by new parts contained in the rebuild kit.

Carburetors may possess large and small valve check balls. Do not interchange them during reassembly.

■ Do not reinstall questionable floats. If a float has sprung a leak (it will slosh when you shake it), replace it. Floats may not be contained in your overhaul

(Please turn to page 206)

Carburetor overhaul is quick work when you use instructions supplied with a rebuild kit.



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OAK FOREST, ILL.—a Director of a Nationally renowned research institute in this Chicago Suburb has announced that most people spend 25% of their income on automobiles in one way or another.

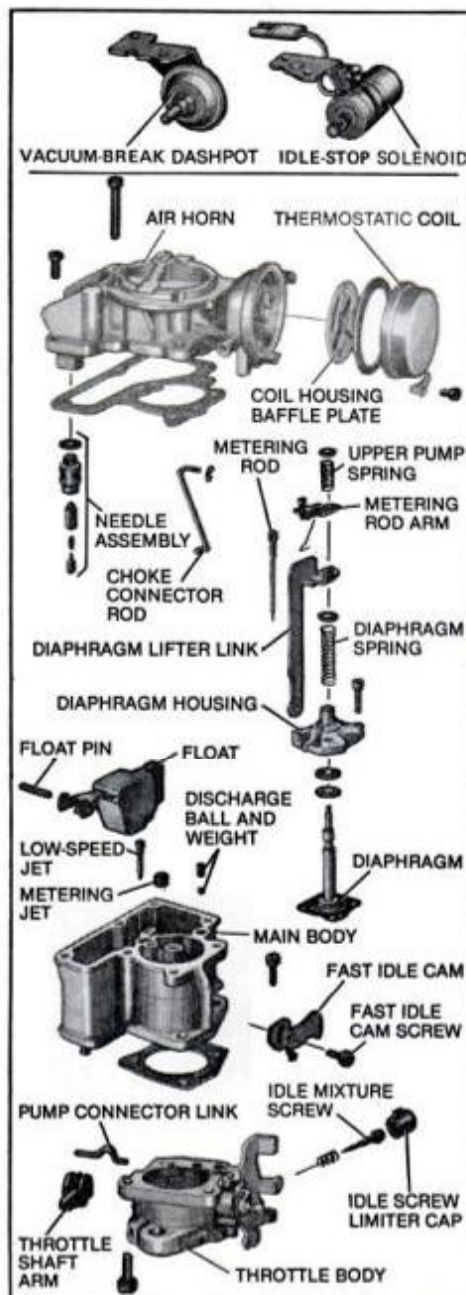
According to Edward Howe, marketing director of Automobile Research Institute, "Because we are so dependent on our cars" Consumers are often taken advantage of or are forced to make fast decisions without being prepared; From the gas station all the way to buying or selling or leasing a car.

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When disassembling carb (typical single barrel shown here) keep a key to parts.

kit, and may have to be purchased separately.

■ Metal parts that will be retained should be soaked in carburetor cleaner for several hours. Then they should be treated with compressed air, which will remove remaining dirt and dry the parts. Concentrate particularly on ports and jets.

■ Before you reassemble parts that accept gaskets, run your finger lightly over mating surfaces. Make sure these aren't scratches or burrs in the metal. If you find one, carefully try to remove it with a fine-tooth file. If the scar remains, it may tear the gasket and cause a leak.

■ Put the bowl cover back into position slowly. Do not jam or shimmy it into place. You may cause damage.

Repairing a thermostatic carburetor air cleaner

If the valve in the snorkel of a thermostatically controlled air cleaner isn't working right, an engine will stall or hesitate. A valve won't work right if the vacuum control (motor) or temperature sensor has gone bad.

Check valve function as explained in Section 1. If the valve isn't working properly, replace the vacuum control first since it is most often to blame.

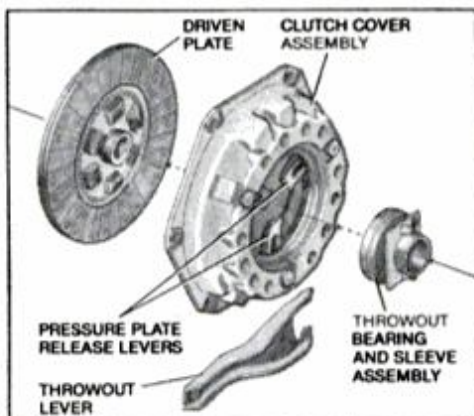
Remove the air cleaner from the engine. Tip the vacuum control slightly, which disengages the lock, and turn the vacuum control counterclockwise.

Slide the vacuum control to one side to disengage the operating rod from the snorkel valve. Remove the vacuum control.

Before installing a new vacuum control, make sure the valve in the snorkel is free. Lift the valve. Let it fall. It should move without binding.

If not, aim compressed air at the valve pivots. Test again. If the valve doesn't function smoothly, it is probably damaged and the air cleaner will have to be replaced.

To install a new vacuum control, hook



Manual transmission clutch overhaul is a difficult job; adjustment, however, is easy.

the operating rod to the valve in the snorkel. Place the vacuum control's locking tangs in the housing openings. Turn the control clockwise to engage the lock.

Test to see that the job has been done properly by installing a vacuum hose on the vacuum control and applying 9 inches of vacuum to the control through the hose with a vacuum pump. The valve in the snorkel should move.

If you find that replacing the vacuum control has no effect on air cleaner performance, replace the temperature sensor by prying off the retaining clips. Remove the sensor and gasket.

Install a new sensor and gasket by holding the sensor firmly against the housing as you push on new retaining clips. Make sure the gasket is compressed so that an airtight seal will be formed.

A word about clutches

As was mentioned, replacing a clutch is a job you may not want to do. It takes a great deal of time and special equipment to handle the weight of the transmission, which has to be removed.

However, don't avoid the simple job of adjusting the clutch, as we outlined in Section 1. Adjusting a clutch periodically is the surest way of postponing clutch repairs for many thousands of miles.

Another way is to use the clutch properly. In particular, depress the clutch pedal fully when you shift and let it out all the way after shifting. Never ride the clutch (rest your foot on the pedal). This is one sure way to send this expensive part to the grave prematurely.

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SECTION 7

Safety comes first when you're ready for those jobs that'll take you under your car: Use good jacks, jack stands and ramps.

The ongoing miles

If averages hold true, by now you will have been driving and caring for your car for about five years, and a question may dawn: "How many more miles can I get?"

Surely, 100,000 miles are reachable. Given the care the car has been getting in the dream garage, 200,000 miles, and even more, are conceivable.

However, as mileage continues to climb, some problems we've not discussed can crop up. Two in particular that may appear at this time concern suspension ball joints and universal joints. This section contains information that will help you cope with both.

Suspension ball joints: Makeup and importance

A car has four front suspension ball joints. There is one on each of the lower control arms, and one on each of the upper control arms. Much of the vehicle's weight is borne by ball joints.

A ball joint consists of two main parts:

a *ball* and the *socket* it fits into. They are precisely machined, so the ball fits in the socket snugly and the socket is sealed to keep out water and dirt, since water and dirt will damage ball joints.

In time, though, wear takes place, and water manages to intrude. This hastens wear. Water dilutes grease, and rust gains a foothold. Rust causes greater erosion of machined surfaces, which in turn, leads to more play.

As play increases, the chance of the ball busting through the socket increases. This is the reason why it is important to periodically check ball joints for play. If play goes undetected, there will come a time when a ball will smash through the socket, and when this happens, you may well lose control of the car.

Suspension ball joints: Testing play

Either the lower ball joints or upper ball joints in a car assume the majority

of the load. This differs from car to car. In determining whether play is excessive, it is necessary to test the primary load-carrying ball joints in particular.

In General Motors cars, the lower ball joints assume the greater part of the load and are the ones to check. They have wear indicators, which make the job easy since inspection is a visual rather than by instrument.

The degree of wear is indicated by a nipple in the joint that protrudes .050 inch beyond the surface when the joint is new. Wear is "recorded" by the nipple retreating into the joint.

To check for ball-joint wear in General Motors cars, keep the car on the ground and crawl beneath it on a creeper. The car has to be supported on its wheels (rather than on a jack) so lower ball joints are kept loaded.

Wipe the grease fitting clean and run your fingernail over the surface. If the nipple is flush with or inside the cover,

(Please turn to page 210)

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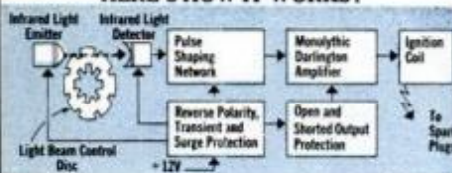
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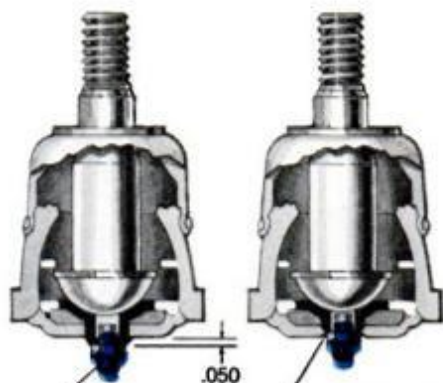
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SECTION 7 CAR CARE GUIDE



NEW JOINT: NIPPLE EXTENDS PAST COVER
WORN JOINT: NIPPLE IS FLUSH OR BELOW COVER

Ball joints on newer GM cars have built-in indicators to show condition at a glance.

replace the ball joints. Check ball joints on both sides of the axle.

Checking ball-joint wear in Ford Motor Co. cars involves a more extensive procedure. In the Maverick, Comet, Granada and Monarch, the upper ball joint is the primary load-carrying member. Test for excessive play as follows:

1. Place jacks beneath the underbody and raise the car until the wheels fall to the full-down position. This unloads the upper ball joints.

2. Make sure wheel bearings are adjusted (see Section 3).

3. Place a wear gauge (dial indicator) in position so it rests against the inner side of the wheel rim, adjacent to one of the upper ball joints.

4. Grab the tire at top and bottom, and move it slowly in and out, noticing the reading on the dial indicator. It should be zero for the Granada and Monarch (no play) and should not exceed .250 inch for a Maverick or Comet. If this specification is not met, replace the ball joint.

5. Test the ball joint on the other side of the axle.

Ball joints in all other Ford Motor Co. cars are checked the same way we've just described, except that lower ball joints are the primary load-carrying members. This means that jacks are placed under the lower suspension arms to unload lower ball joints, and the wear gauge is positioned against the inner side of the wheel rim, adjacent to the lower joint.

In these cars, ball joint wear should not exceed .250 inch.

To test ball joints for excessive wear in Chrysler Corp. cars, do the following:

1. Raise the car and place safety stands under both lower control arms, as far to the outside of the lower control arms as possible. Make sure the upper control arms are not in contact with the rebound bumpers.

2. Clamp a wear gauge to the lower control arm so the gauge's plunger tip is against the housing assembly of one of the ball joints.

3. Raise and lower the wheel by placing a pry bar under the center of the tire. If the wear gauge indicates excessive play, replace the lower ball joint. In general, excessive play in Chrysler Corp. cars is .020 inch or more, but check the specs for your car.

4. Test the ball joint on the other side of the axle.

The upper ball joints in American Motors cars carry the load. Raise the front of the car and place support stands under the frame side sills.

Remove the grease fitting plug of one of the upper ball joints and install ball joint clearance (AM part No. J-21240) by threading the knurled nut into the grease fitting plug hole. If this gauge is not available, place a wear gauge (dial indicator) in position so it rests against the inner side of the wheel rim, adjacent to the upper ball joint. Raise and lower the wheel several times by moving the tire up and down with a pry bar.

The indicated play should not exceed .080 inch.

If one of the load-carrying ball joints has to be replaced, you may want to replace the other also, so the job won't have to be repeated soon. You won't normally have to replace the nonprimary load-carrying ball joints since they experience little wear.

However, if you wish to check them, raise and support the car, grasp the tire on the top and bottom, and move the wheel and tire in and out. Watch the suspension arm of the nonprimary load-carrying ball joint. If there is appreciable movement, abnormal wear may be indicated, but beware of the fact that play like this is also caused by loose wheel bearings. Don't indiscriminately replace ball joints.

Original-equipment ball joints are either riveted, bolted, screwed or pressed into place. For the most part, replacement ball joints are bolt-on units.

Complete details about replacing ball joints in your car are outlined in the service manual. Each model is handled differently.

Universal joints: Listening tells you

You won't mistake a universal joint that is about to go bad. You will usually hear a constant "clunking" sound as you drive the car at about 10 mph.

As you know, universal joints connect the propeller shaft to the transmission's output shaft and the differential flange yoke (input). In the case of a split propeller shaft, there will be more than two U-joints.

Test to determine which U-joint has seen better days by raising the car and grasping the prop shaft near one of the joints. Try rocking the shaft back and forth; that is, in and out. There should be no play. Test other joints the same way.

If there is play, the U-joint should be re-

(Please turn to page 212)

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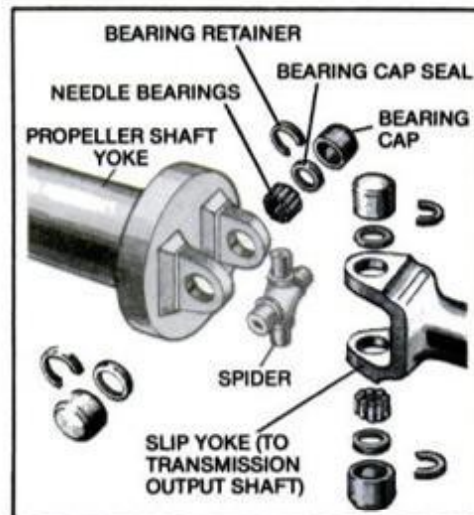
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CAR CARE GUIDE

placed as soon as possible. If the problem is allowed to continue, the universal joint will get weaker and weaker. Eventually, it will break apart, and the propeller shaft will drop. If this should happen while the car is being driven, an accident could be the result.

Consult your service manual for specific information on how to replace a U-joint in your car. Generally, the job is done in the following way:

1. Using a file, scribe a mark across



Universal joint components are shown in view of a typical front U-joint assembly.

the rear U-joint and differential flange yoke. Use this mark to reinstall the propeller shaft so shaft balance will be maintained. If the shaft balance should be upset, a vibration will be created as the car is being driven.

2. Remove the U-joint bolts and drop the rear of the prop until it clears the differential.

3. Draw the shaft toward the rear of the car to pull it off the transmission's output shaft.

4. Be careful not to drop the propeller shaft. If the shaft is dented or bent, it will have to be replaced.

5. Prop the shaft on a workbench and clamp the bad U-joint in a vise. The shaft should be supported so that it will be held level.

6. If bearing caps have snap-ring retainers, pull them out with long-nose pliers. Tap around the circumference of the cap with a hammer until the cap pops loose. Remove the other cap in the same way. You can now slide the bad U-joint out of the yoke.

7. If bearing caps have no snap-ring retainers, encircle the cap with a piece of pipe of suitable diameter. Smack the pipe with a hammer to break the bearing cap retainer loose. Do the same thing to the other bearing cap. The U-joint can now be removed.

8. Slide a new U-joint into the yoke. Press on the bearing caps, and seat them by tapping them with a soft-faced hammer.

9. Wipe the propeller shaft down with alcohol and reinstall it.



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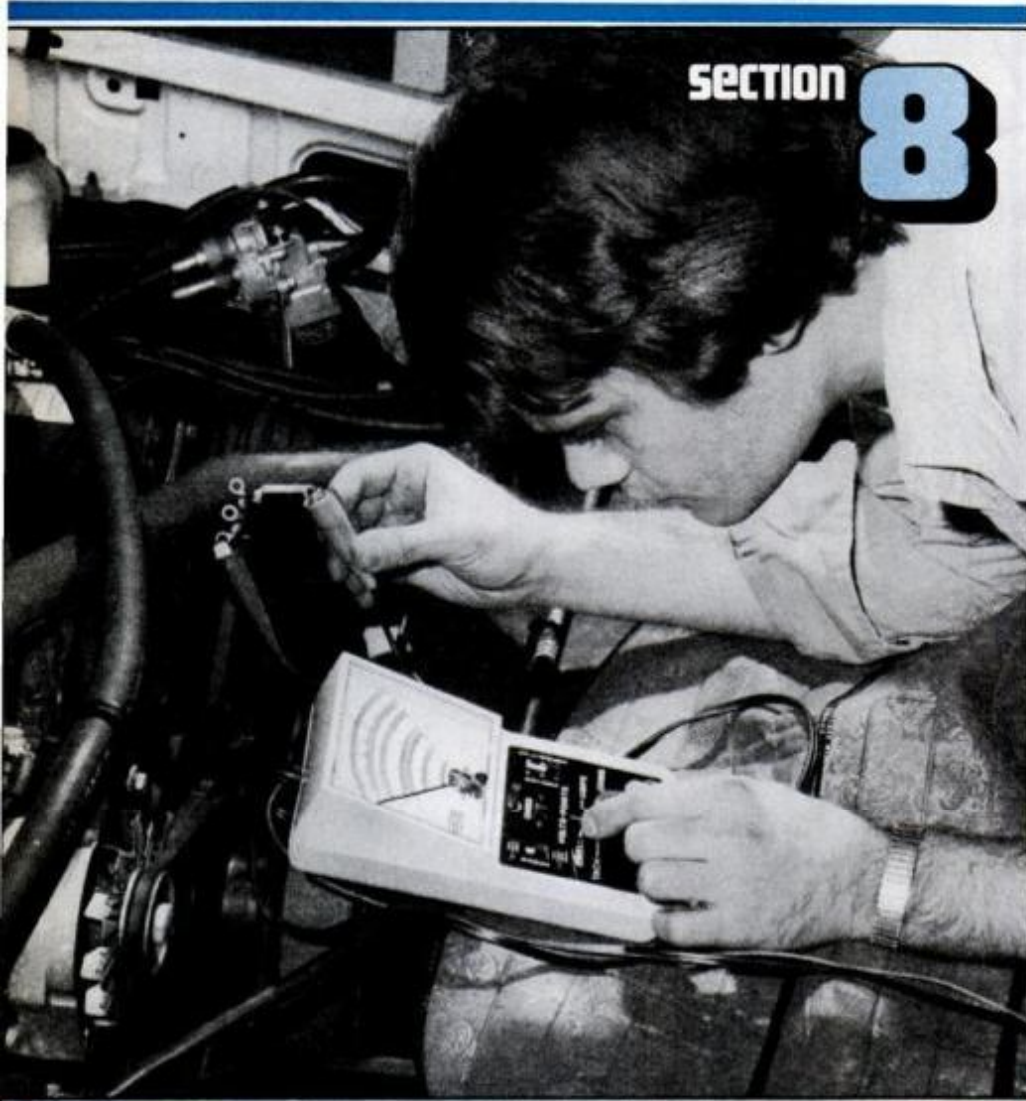


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SECTION 8



Troubleshooting alternator components, like diode trio shown here, requires ohmmeter.

The payoff miles

The stretch from 70,000 to 80,000 miles presents a rewarding lull to the owner of a car who is also the proprietor of a dream garage. Just as during the Care-free Miles (Section 4), the car requires little maintenance work.

"How about electrical components?" someone may ask. "You've not touched on the electronic ignition distributor, alternator or starter motor."

Right, and this is probably as good a section as any to discuss them. However, the electronic ignition distributor, alternator and starter motor don't require maintenance, and they are probably three of the most reliable components in an automobile.

We don't think you will have trouble

with them during the 70,000-80,000-mile period. In fact, the alternator and starter motor may not give trouble for many more miles beyond 80,000.

Note: No discussion will be presented here about the electronic ignition distributor because of a detailed two-part article on the subject currently being published in PM. Part 1 appeared in the April issue, and Part 2 will appear in next month's (June) issue.

The alternator: What's to know

The alternator, not the storage battery, generates current for a car's electrical components. The battery, which stores energy to be used by the starter motor in

cranking the engine, gets its juice from the alternator. If it didn't get recharged, the battery would soon end up lifeless.

The main components of an alternator are the stator, rotor and diodes (rectifiers). Each component, when damaged, can be removed from the main body of the alternator and replaced or refurbished by a professional alternator overhaul shop (see the yellow pages of the phone book under, "Alternator and Generator—Automotive Repairing").

The alternator's electrical generating windings are encircled by a ring of soft iron. This is a stationary component, or stator.

The rotor, which is an armature, is mounted on bearings and rotates in the inner diameter of the stator. The rotor is driven by the alternator drive belt.

As the rotor turns inside the stator, alternating current is generated. However, a car's electrical components require direct current. Converting a.c. to d.c. falls to the diodes, which are one-way electronic valves. There are diodes which pass only negative current to the battery and other electricity-using units, and an equal number which pass only positive current.

Unlike an old-fashioned automobile direct-current generating system, which doesn't possess one-way rectifiers, an alternator does not need a regulating device to prevent current from reversing itself and damaging the alternator. Rectifiers do this job.

However, a device that controls the output of voltage is needed. You see, an alternator that is permitted to run without a control that limits output will generate too much voltage. Thus, the car's electrical components will literally burn up.

Therefore, a voltage regulator is an integral part of a car's a.c.-generating system. In earlier models, the voltage regulator is an external unit mounted near and wired to the alternator. In late models, the voltage regulator is a fully transistorized unit that is inside the alternator. Whether external or internal, a faulty voltage regulator can be replaced without replacing the entire alternator.

The alternator: First things first

An electrical problem that is being caused by a damaged alternator won't escape you for long. The generating system light or gauge on the dash will either light up or point to discharge. Or the engine won't start, because the battery, which you know is in good physical condition, is undercharged.

Voltage regulators fail more often than alternators, with opposite results. A mal-

(Please turn to page 216)

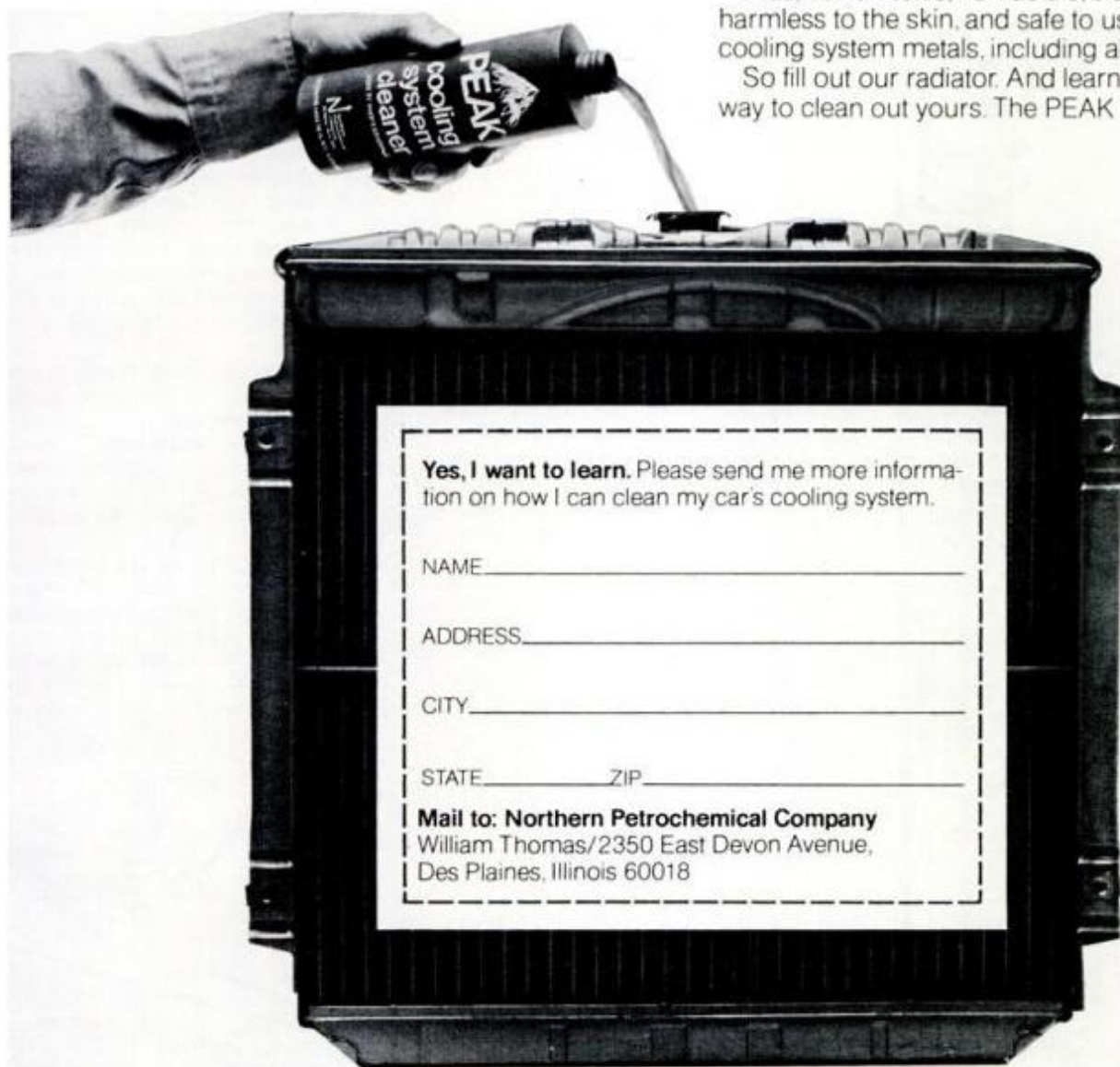
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functioning alternator leads to undercharging, while a malfunctioning voltage regulator usually results in overcharging.

In most cars, overcharging is easily detected. The battery will require water too often. Furthermore, you will probably get an odor resembling rotten eggs or sulfur when you remove battery caps to check the water level.

Detecting overcharging isn't this easy with a sealed battery. Fortunately, sealed batteries are protected somewhat from overcharging. The battery grids, which are composed of a lead-calcium alloy rather than lead-antimony as in a conventional battery, won't accept as much current and are less susceptible to overcharging.

However, if there is complete loss of voltage control, in time the battery will be ruined if you don't watch for other clues. One of the main indications of voltage regulator failure is a lot of burned-out bulbs. In this case, test the performance of the voltage regulator.

Alternator "problems" are caused most often by a loose, worn or slipping (glazed) drive belt. If the rotor can't turn at a specified rpm, the alternator can't produce its rated current.

Make sure battery-starter motor cables are tight, free of corrosion at terminals and in good shape. High resistance causes a reduction in current delivery. Also see to it that wires at the alternator are tightly connected.

For in-depth alternator troubleshooting you need an alternator test instrument. This instrument is a volt/ammeter and rheostat that measures current output. You also need a diode tester, which is an ohmmeter. Furthermore, you need specific information concerning how to test

your particular alternator. Each model is different.

Starter motor circuit: Quick, easy checks

Suppose the engine cranks too slowly and won't start, or it doesn't crank at all. To determine if the cause is in the starter motor circuit, proceed as follows:

Turn on the car's headlights. If they don't burn brilliantly, the starting trouble likely is caused by a run down battery.

If lights burn brightly, turn the ignition switch, watching the lights as you do. One of three things is liable to happen—

- Lights will go out.
- Lights will dim considerably.
- Lights will stay bright.

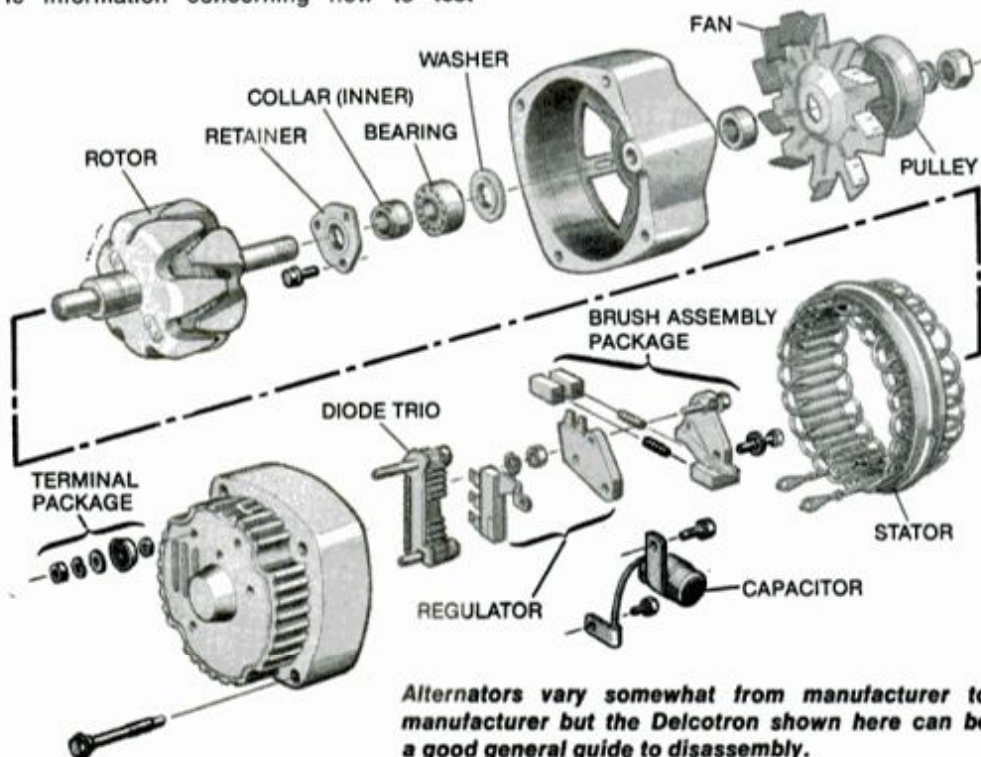
If lights go out, there is probably a weak connection between the starter motor and battery. Remove cables at the battery, and clean posts and terminals. Do the same at the starter relay and/or starter switch, and also where the battery ground cable connects to the engine or frame.

If this doesn't solve the problem, test each cable for high resistance to find the faulty one. Replace it.

If lights dim considerably, the battery may be run down, or there may be a mechanical problem in the starter motor or in the engine. Check the battery electrolyte specific gravity. If it's changed, ask yourself, "What in the engine may be causing a heavy enough burden on the starter motor to impede starting action?"

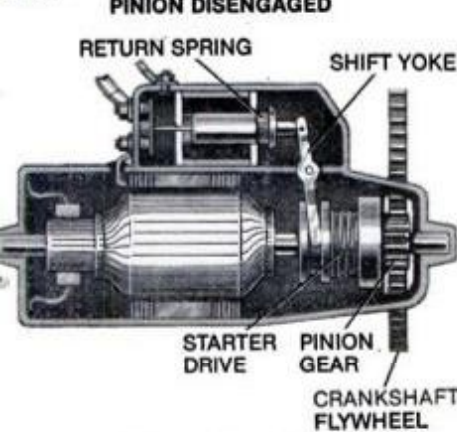
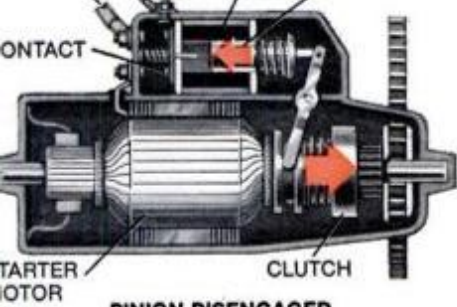
First of all, could it be a combination of heavy motor oil and low atmospheric temperature? Cold causes oil to thicken.

Another possibility is tight pistons and



Alternators vary somewhat from manufacturer to manufacturer but the Delcotron shown here can be a good general guide to disassembly.

TO IGNITION SWITCH
FROM BATTERY SOLENOID
SOLENOID PLUNGER



Starter motor operation and action of the solenoid is shown in these two views.

bearings. Have you done any engine work recently?

If you discount the battery and engine, then the starter motor comes next. Mechanical problems in the starter motor which impose a heavy drag that prevents starting are a bent armature shaft, worn bearings, loose pole-shoe screws, and thrown armature windings or commutator bars.

Starter motor failure is verified by disassembling the starter for visual examination, and testing commutator run-out and armature circuitry.

If lights stay bright, but the engine doesn't crank, there is a circuitry problem in the starter motor or starter solenoid. You can quickly check the starter solenoid by placing a heavy jumper lead across the solenoid's main terminals.

If the starter operates, the solenoid is at fault.

If there is no cranking, the starter motor should be removed from the engine, disassembled and tested with a starter bench tester.

As with alternators, starter motors can be rebuilt, usually by the same professional shops that rebuild alternators. When alternator or starter motor repair becomes necessary, get an estimate of what the overhaul procedure will cost. Then, compare it with the cost of a replacement unit that may be purchased at an auto wrecking yard.



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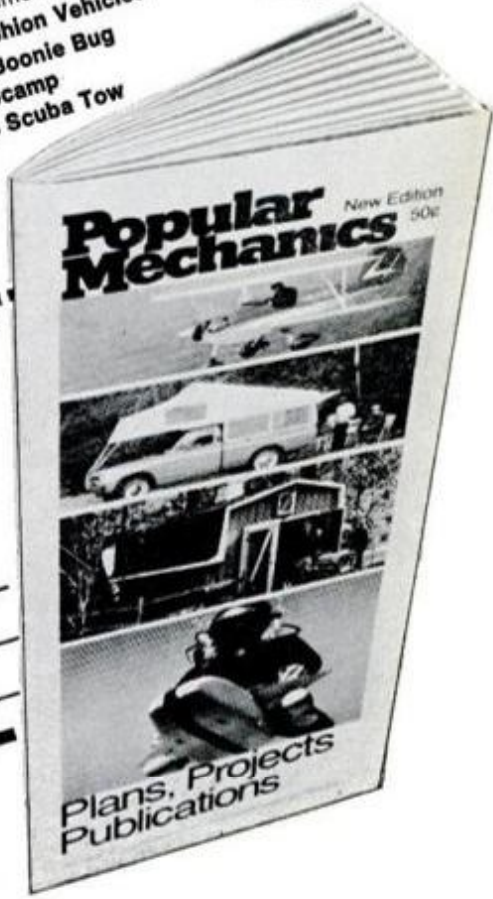
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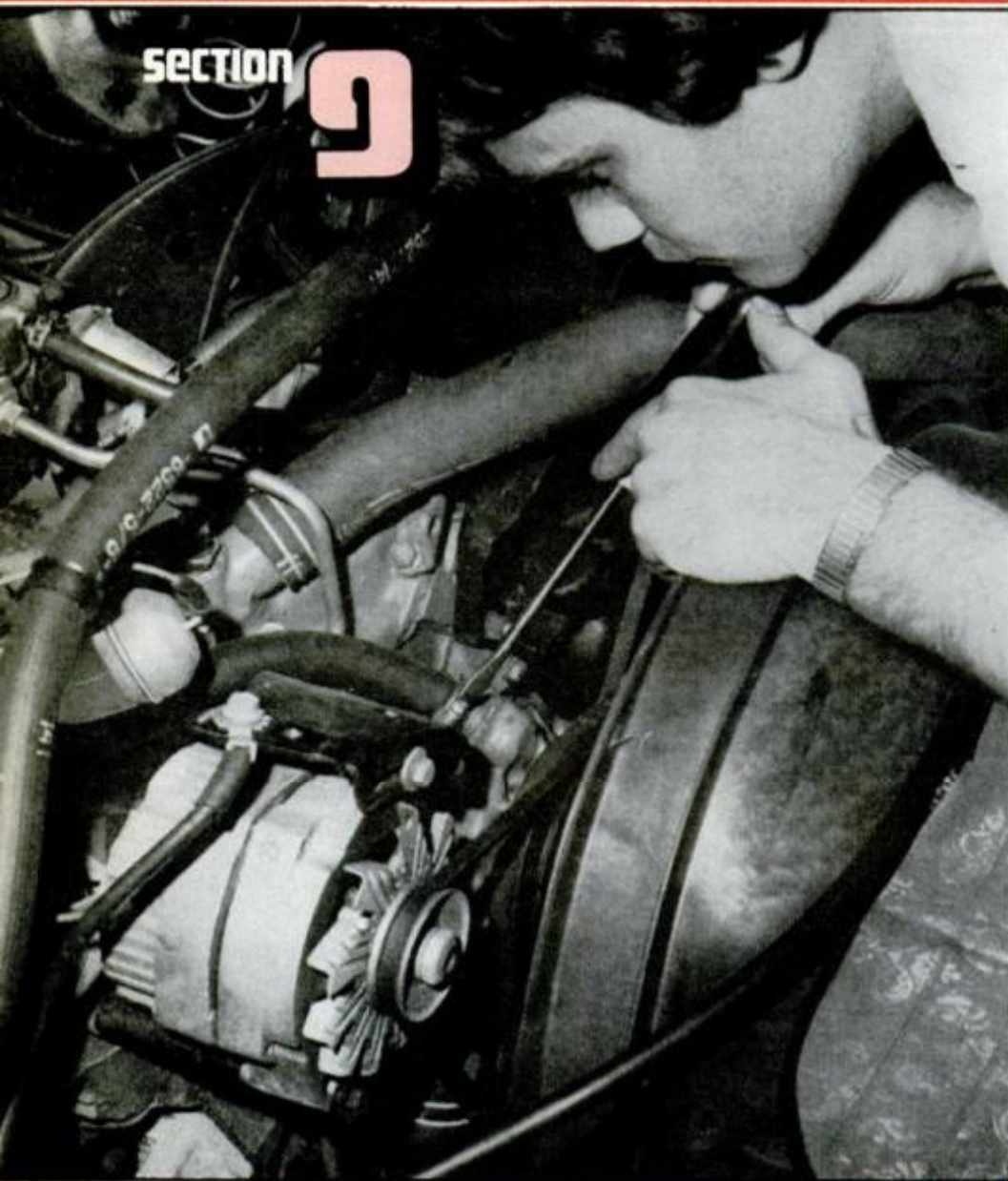
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CAR CARE GUIDE 80 TO 90,000 MILES

SECTION 9



After completing a cooling system job, replace all hoses and make sure clamps are tight.

The golden miles

The designation, "Golden Age Miles," may prompt a raised eyebrow. What's so "golden" about a car piling up 80,000 or 90,000 miles?

By applying the designation "Golden Age" to this time of your car's life, we mean that the 80,000-to-90,000 period is a prelude to the 100,000 milestone. It's a period when you begin to admire your vehicle's strength and what you have done to keep it in excellent condition.

However, car service is a continuous

process. The vehicle has to continue getting the maintenance and repair services which have allowed it to reach 90,000 miles, and which may allow it to double that figure in the years ahead. Using this Car Care Guide as your basis and your dream garage as the "tool," attaining 180,000 miles is a realistic goal.

In the 80,000 to 90,000 mile stretch, then, your car should continue to receive the care it has gotten from mile one. In addition, you may be faced with repairs

we have not discussed before; specifically, overhauling major cooling system components and power booster units.

But there's no problem. All the tools you need are in the dream garage.

Cooling system repairs: What's involved

If you follow the schedule presented in Section 1, you will drain and flush the cooling system once during every 10,000 mile period. At the same time, you will check hoses for wear and replace any that are damaged. Hoses are the weak link in a cooling system. They fail faster than other components.

The lineup of hoses includes top and bottom radiator hoses, inlet and outlet heater hoses, and water pump bypass hose (if present). A hose that shows cracks as it is squeezed, or bulges under pressure (when the engine is hot) should be replaced.

When a car reaches 80,000-90,000 miles, other parts of the cooling system may have weakened and require repairing or replacing. Most likely to need servicing are the thermostat and radiator pressure cap, which will probably have to be replaced before 80,000 miles. Next, in order of repair likelihood, are the water pump, radiator and thermostatic fan clutch.

Cooling system repairs: Replacing a thermostat

An engine that overheats or one that doesn't warm up to normal operating temperature is an engine that may have a bad thermostat. Remove the thermostat by following this procedure:

1. Be sure the engine is cold.
2. Remove the radiator pressure cap, open the radiator drain plug and allow coolant level to fall below the thermostat housing. (You don't have to drain the entire cooling system.) If you use a clean receptacle to catch coolant, you'll be able to reuse it.
3. Remove the top radiator hose from either the radiator or thermostat housing.
4. Remove the thermostat housing bolts. There are usually two.
5. If necessary, slip a putty knife into the joint formed by the thermostat housing and engine block, and pry the housing off. Don't worry about the gasket. You'll be installing a new one.
6. Notice the position of the thermostat. Make a mental note, if you have a good memory, or draw a sketch so you can reinstall the thermostat properly.

GM's method of checking a thermostat is as good as any other. Heat a solution of 33-percent ethylene glycol and 67-percent water to 25° above the temperature stamped on the thermostat valve. Submerge the thermostat valve completely in the solution and agitate the solution thoroughly. The valve should open fully. If not, replace the thermostat.

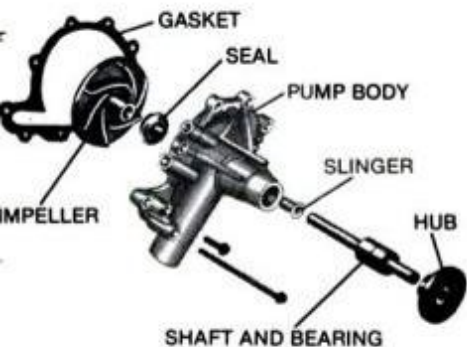
Submerge the thermostat in a second solution of ethylene glycol and water (same percentages) that is 10° below the temperature stamped on the thermostat

valve. Agitate. The valve should close completely. If not, replace thermostat.

To reinstall a thermostat (new or old), first clean the thermostat housing and engine block surfaces with a putty knife. Surfaces must be clean to have a seal that won't leak.

Insert the thermostat in the correct position. Install a new gasket. Replace and bolt the housing down. Be careful not to damage the gasket. After you hook up the radiator hose and replenish coolant, start the engine and check around the housing for leaks.

You should also test the radiator pres-



Water pump overhaul is still done, but a professionally rebuilt pump is a good buy.

sure cap with a pressure tester to make sure the cap is holding the pressure at which it's rated. Replace a bad cap.

Cooling system repairs: Replacing the water pump

Replacing a bad water pump is a time-consuming job, but you can do the job yourself and save a lot of money. The tools you need are in your dream garage.

You can't mistake a bad water pump. Usually, it begins failing by making noise. Then, coolant begins leaking. One way to find the problem is to run your hand around the pump (engine off). If your hand gets wet, take out your tools and get to work.

Generally, the procedure you follow to replace a bad pump is to drain the cooling system, disconnect hoses, remove drive belts, take off the fan shroud, remove the fan and hub assembly, and remove the water pump and gasket. You may have to remove the radiator (see below).

Before you install a new pump, clean gasket sealing surfaces. Install a new gasket and water pump. Tighten bolts to the specification in the manual. Rotate the pump shaft by hand to make sure it's turning freely. Then, complete the repair by installing parts in reverse order of the disassembly procedure.

Cooling system repairs: Replacing the radiator

Radiators can get plugged or develop leaks. So can heater cores. Repairs may be attempted by a professional radiator shop, but there is no guarantee of success. The part may be so badly shot that it can't be salvaged. The jobs of removing and installing a radiator and heater core can be done in the dream garage.

A leak in the radiator or heater core is

(Please turn to page 220)



**"The grip is basic
for proper control"**

Roger Staubach,
Dallas Cowboys

**"The grip is basic
for proper control"**

Tom Watson,
1977 Masters and
British Open Champion

**"The grip is basic
for proper control"**

Armstrong Tires

The way a tire is designed and built determines how well it grips the road. And that is a factor which determines the kind of driving control you get behind the wheel. Why do Roger Staubach and Tom Watson prefer the Armstrong Coronet steel belted radial? They like the way Coronet's road-hugging design gives them a combination of driving control and passenger comfort. Ask your independent Armstrong dealer to show you the full line of Armstrong tires. You'll like the way they perform. And you'll love the values.

ARMSTRONG TIRES
GRIP THE ROAD



VHT



WE'RE TOUGH TO BEAT!

FLAMEPROOF COATING

The #1 coating for headers, pistons, stoves, boilers, and numerous other applications. Reduces engine compartment temperatures. Available in 16 colors that beat the heat. Often copied — never equalled.



ENGINE ENAMEL

Heat resistant urethane formulation withstands engine temperature while providing a durable coating resistant to gasoline spillovers. Available in 14 Gloss and Flat finishes.

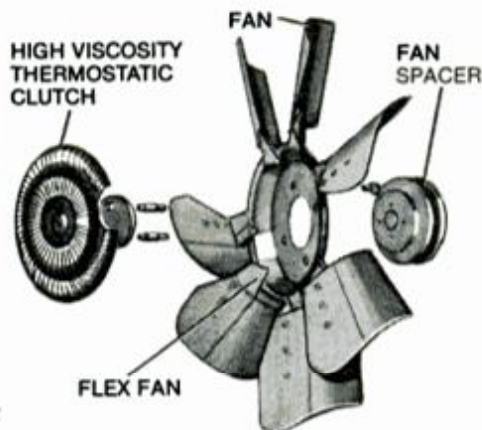


SPEREX CORPORATION

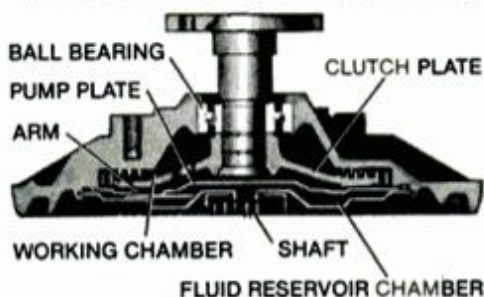
16131 SO. MAPLE AVE., GARDENA, CA. 90248
213/323-6162

easy enough to detect. You can see it by putting the cooling system under pressure with a cooling system pressure tester. If overheating occurs and you want to know if the radiator is plugged, warm up the engine and turn it off. Feel the radiator. It should be hot along the left side and warm along the right side, and there should be an even temperature rise from right to left. Cold spots in the radiator suggest clogged sections.

To remove a radiator for the purpose of bringing it to a professional shop for restoration or replacing it yourself, proceed as follows:



Thermostatic fan robs less power from your engine than a constantly running type. Check clutch operation periodically.



1. With the engine cold, disconnect the battery.
2. Drain the cooling system, and disconnect radiator hoses. If there are automatic transmission oil cooler lines attached to the radiator, disconnect them, too.
3. Loosen the radiator shroud and move it to the rear to gain maximum clearance. If necessary, remove the shroud.
4. Remove the radiator attaching bolts.
5. Lift the radiator out of the engine compartment, but be careful that you don't bang the radiator cooling fins. You will damage them.

Cooling system repairs: The thermostatic fan clutch

Although intermittent noise is normal when the fan clutch is engaged, continuous noise or a loud roar at engine speeds of 2500 rpm and up indicate that

the clutch assembly is locked up. If you can't turn the fan by hand (engine turned off, of course) or you get a rough feeling as you turn the fan, replace the clutch.

Power brake unit: Insight into service

If you are lucky, you'll be able to get a rebuild kit for your car's brake booster (power brake unit). This will save you the cost of a new or rebuilt unit when the old unit goes bad.

How can you tell if power brake repairs are needed? The first indication, obviously enough, is when effort is required to bring the car to a halt. But to positively point the finger at a power brake unit, let the engine idle for a few seconds. Then shut it off.

Press and release the brake pedal a few times, and note whether there is an increase needed in the amount of pressure. If you notice that an increase is needed in pressure to engage the brake, then there is nothing wrong with the power brake unit. If no increase is needed, there is a problem.

Idle the engine and disconnect the vacuum hose from the check valve on the booster. Put your thumb over the hose. You should feel strong suction. If not, inspect the hose and replace it if damaged. Be sure the hose is connected to the vacuum source.

Remove the vacuum check valve and blow into the end to which the hose attaches. Air should not pass through the valve. Now, draw out. You should not have to exert any force. Replace the valve if it is defective.

If the cause of the problem hasn't been found, you have to remove the unit for overhaul or replacing. If you are going to overhaul the booster, separate it into its two halves and replace each with its comparable part in the overhaul kit.

To remove a brake booster unit for overhaul or replacing take off the master cylinder, disconnect the vacuum hose, and withdraw the bolts holding the booster to the brake pedal linkage and firewall.

Power steering unit: Not much to do

Repairing a power steering gear is not something the owner of a dream garage would get involved with unless he has special tools and detailed information. However, when a problem develops, such as noise, hard steering or shimmy, there are several possible causes other than a malfunctioning power steering unit. They are as follows:

- Incorrect tire pressure.
- Worn tires.
- Loose or worn drive belt.
- Wheel and tire imbalance.
- Loose wheel bearings.
- Worn shock absorbers.
- Faulty front-end alignment.
- Steering shaft and coupling misalignment.

SECTION 10

The begin-again miles



Bodywork will be a large part of car-care chores at this stage of your car's life.

Ask someone in the business how long a car can last if it's treated right. The answer you get will range from 150,000 to 300,000 miles. Maybe more.

An increasing number of car owners must agree. More and more of them are taking better care of their property, with the result that they're able to keep their cars in use for longer periods. Several facts reveal this.

For one, the average age of passenger cars on the road today is 5.7 years, up from 4.1 years in 1971. Over 93 million cars now are three years old or older.

According to TRW, Inc., a leading manufacturer of automotive replacement parts, the replacement parts (aftermarket)

business is currently selling \$26.3 billion worth of parts a year. This industry has shown a 12-percent-per-year growth over the past four years.

Surprisingly, this \$26.3-billion figure does *not* include tires, batteries, accessories and chemicals, such as antifreeze. It only includes "hard core" mechanical parts, such as ignition and fuel system components, exhaust systems, shock absorbers, ball joints, wiper blades and motors, cooling system and engine parts, and paint and body supplies.

We've discussed most of these things in this Car Care Guide for 1978. Now, let's get to "paint and body." Why? Because in 100,000 miles your car just

isn't going to be that lucky. Its body is going to sustain some damage.

However, your dream garage can be used as a dream body shop to repair minor damage. Special tools needed to fix dents or a water leak aren't expensive.

The information that follows outlines ways of using these tools to repair body damage, so your car can begin its second 100,000 miles looking as classy as at the start of its first 100,000 miles.

Repairing dents

A slide hammer makes the task easy. This tool will straighten a dent without fuss and bother. Here's what to do:

(Please turn to page 222)

**Products
That
Stand on
Over
50 Years
of
Tradition!**



GUNK

- **ENGINE BRITE** — America's No. 1 engine cleaner. Just spray it on and hose it off.
- **GXT XTRA TEMP ENGINE ENAMEL** — Produces a fast-drying, durable, high gloss, heat resistant finish.
- **CAR WASH** — Our own biodegradable phosphate-free powder.
- **TAR & BUG REMOVER** — Especially formulated to dissolve tar spots and loosen bug deposits.
- **GARAGE FLOOR, BAR-B-Q AND MOWER CLEANER** — Removes the grease and oil from floors and machinery before it reaches the house!

RADIATOR SPECIALTY COMPANY
Charlotte, N.C. 28237

1. **Punch holes in the dent** with an awl. If the dent is large, place holes 1 inch apart.

2. **Screw the slide hammer** into the center hole, and slam the arm back against the handle. Keep inserting the hammer into one hole after another until the dent is straightened.

3. **Press the work area down** to bare metal, using a grinding wheel and sanding disc. Extend the bared surface a little beyond the original damage.

4. **Mix plastic filler and hardener** in the proportions suggested by package instructions. Your auto parts and accessories dealer can acquaint you with this body repair material, and can provide you with sanding supplies, paint and wax.

5. **Apply the filler and hardener** quickly before it hardens. You have 5 to 15 minutes, depending on ambient tempera-

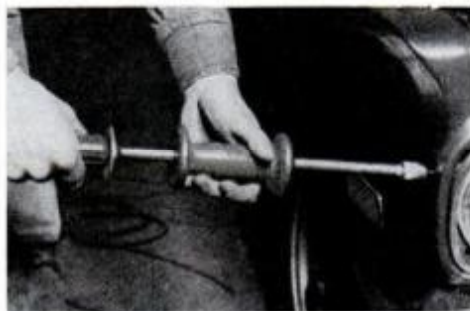
ture. Do not apply filler and hardener if ambient temperature is below 60° F. or above 80° F., or if the car's body is damp.

Lay on light applications until the material builds up to a height of 1/8 to 1/4 inch above the surface. Apply the material to bare metal only. It won't adhere to paint.

6. **Wait 15 minutes**; then scratch the material with your fingernail. If it crumbles, wait longer. The material should harden sufficiently in 15 to 30 minutes, depending on ambient temperature, to allow you to continue working on the repair.

7. **Use a Surform** to mold the material. The Surform will also remove excess filler. Shave off about 90 percent of the built-up filler. Now, let the repair alone for about 30 minutes to let the filler get rock hard.

HOW TO IRON OUT THE WRINKLES IN YOUR BODYWORK



Slide hammer is essential tool for pulling out dents in your sheet metal.



Sand the repaired area as smooth as possible with a fine grade of sandpaper.



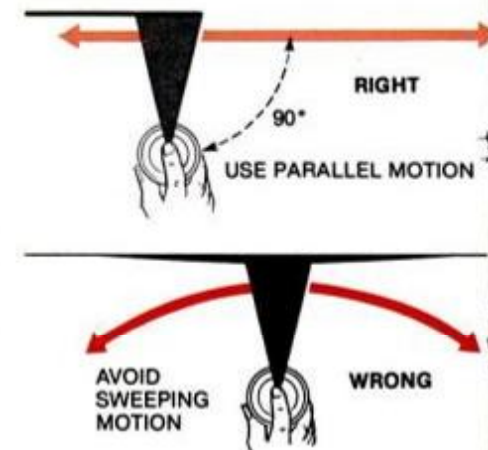
Fill in wrinkles with a body filler after preparing the surface thoroughly.



Spray the paint and let it harden thoroughly before compounding and waxing.



Shape the hardened filler as close to the original contours of the body as possible.



8. Sand the repair with 40-grit sandpaper. Follow this with another sanding using 100-grit sandpaper. Get the surface as smooth as possible.

Now, use 220-grit wet-or-dry sandpaper. Keep the paper wet and sand from the edge of the paint into the work area. When you're done, the work area should feel as smooth as the adjacent areas.

Use a sanding block. Don't try to sand the area without one. You won't do a good job.

9. Mask off nearby body trim and lights, and apply a light coat of primer. If any overspray gets on adjacent paint, wipe it off at once.

Let the primer dry 15 minutes and apply a light coat of auto-body glazing putty, which will fill scratch marks left by sandpaper. Now, let the repair set for a minimum of one hour.

10. Sand the surface lightly with 320-grit wet-or-dry sandpaper, kept wet. Apply another coat of primer. When the primer dries, apply paint.

To get the correct color, find the paint color code on the vehicle identification plate, which is probably attached to the car's door pillar or firewall. Take the color code to an auto parts and accessories store. The salesman will see that you get the right paint.

You will probably have paint left over. You can use it to touch up minor body scratches. Cut a hole in a piece of cardboard, lay the hole over a scratch and aim the spray to hit the scratch. The cardboard will protect adjacent areas from overspray.

Apply paint in light applications, using a parallel motion (see drawing). If the spray is too heavy, paint will run. If you spray in an arc, the coat will be uneven.

No body preparation is necessary if scratches are minor. However, deep scratches should be treated with sandpaper, primer and paint. Sand the surface as we described above, and apply primer and paint.

Repairing a water leak

Finding the area that's leaking is the tough job. The repair itself is easy.

First, determine the area that's getting wet. No problem. It's either up front or in the back.

If water is showing up in the front, test the front windshield. If water is showing up in the rear of the passenger compartment or trunk, test the rear windshield.

Test the front or rear windshield by taping a garden hose to the car's roof. The hose should be without a nozzle, and its spout should point toward the glass area being tested. Place the spout about 30 inches from the glass.

Put something heavy in front of the spout to disperse the water so it will spread and flow over all the glass area.

Remember: water flow must cover the entire glass, from one end to the other. If not, it will be just your luck that the area missed by the water is the spot where the leak is occurring.

Turn on the water. Allow it to flow for

(Please turn to page 227)



PICTURE TOOLS AREN'T TOYS FOR YOUR KIDS

THEY'RE NOT EVEN TOYS FOR YOU.

BUT THEY ARE A GREAT IDEA FOR ANYONE WITH A WORKSHOP!

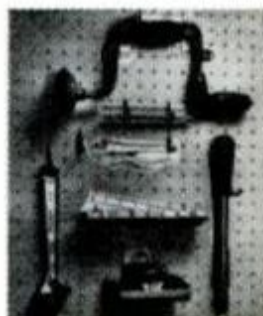
Don't get angry at your family for misplacing your tools . . . Get PM PICTURE TOOLS . . . they take the guesswork out of what goes where on your home shop panel.

Here are 74 realistic drawings of hand and portable power tools . . . with a pressure sensitized backing. Just peel off the back, and apply the picture tools to any area at all. Then, you'll know

immediately what's missing, and what's out of place.

It's easy and very inexpensive to have your home workshop well organized. Send for your PICTURE TOOLS today . . . and let your family know where to place your tools.

Send today. Only \$4.95 plus 50¢ to cover postage and handling.



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 Please send ___ set(s) at \$4.95 plus 50¢ each for your PM Picture Tools. Enclosed is my check or money order for the amount \$ _____
 Make checks payable to Popular Mechanics.

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Drive a Happy Car this Year!



In 1978, the Automotive Parts & Accessories Association, representing over 50,000 retail outlets and manufacturers, and POPULAR MECHANICS want you to "Drive a Happy Car"! We're aiming to make your car safer, more economical and more fun to drive during this sixth annual "May is Car Care Month" program. To deliver the car care message, we've enlisted "Happy Car," the new Car Care Month symbol.

"May is Car Care Month" continues to expand. More manufacturers with many more quality automotive products are participating this year than ever before—they're listed

here along with the products they'll be featuring in May. And, you'll find more participating APAA retailers bringing these automotive products to you. Be sure to check the directory on the facing page for your Car Care Month Headquarters. In addition, hundreds of newspapers are complementing the Car Care Month effort with information-packed Car Care sections, produced in cooperation with APAA/POPULAR MECHANICS.

With all the great car care information and product specials available this month, right now is the time to start getting your car in top-notch shape!

CAR CARE MONTH MANUFACTURERS

Airguide AUTOMOTIVE INSTRUMENTS	Airguide Auto Compasses		Rally Car Wax Rain Dance Car Wax		3000 lb. Scissors Jack		Petersen's Big Book of Auto Repair, 1978 Edition, Basic Bodywork and Painting Basic Automotive Troubleshooting How to Tune Your Car Basic Ignition and Electrical Systems
	V Belts for Auto and Home Radiator Hoses Heater Hoses		Jumbo Autobody Repair Pack		Hull Compass-Thermometer Gift Pack	PLASTIC TECHNOLOGY PROMAR DIV.	Road Hugger Gyrobalancer
	Calibrated Adjustable Fil-T-O-Reg Fuel Pressure Regulator View-All Inline Gas Filters	Motorcraft	Spark Plugs Batteries Shock Absorbers Tune-Up Kits Filters Ignition Wire Sets		Trimline Mufflers		Automotive Diagnostic Analyzer Digital Analyzer Precision Master Test Tune Kit Dwell-Tach-Points Tester D.C. Power Timing Light with Inductive Clamp-On Pick-Up Astro Tiro Gauge (water temperature, oil and amp.)
ALONDRA, INC.			Extra Life Air Filters Oil Filters PCV Valves Transmission Filters Windshield Wiper Blades & Refills Autolite Spark Plugs		Side Irons Light Truck Running Boards		
Rainyday	Windshield Wiper Blades Washer Pumps		Headlamps Heavy Duty Signal and Park Lamps		The Original Jet-X Pressure Washer		
	Hi-Low Current Sensing Electronic Alarm System E-Z Power Converter Anes New Van/RV Burglar Alarm System		Snowrite Lite 'N' Easy Autobody Repair Kits Snowrite Lite 'N' Easy Autobody Fillers Go-Jo Dispenser, Cartridge Unit (hand cleaner) Go-Jo in Plastic Container		J Wax Kit Pre-Softened Paste Wax Car Plate Rust Resistant Auto Wax	ROBERTSHAW CONTROLS CO.	Thermostats Caps Clamps
	ARMOR ALL Protectant		Kendall Superb SAE 10-W40 Dispo-s-a-Jug	MESA CORP.	Mesa Transmission Oil Cooler Mesa Engine Oil Cooler	SATURDAY MECHANIC	Saturday Mechanic Books
BERNZOMATIC	Oxygen Cutting Welding Torch		Fiberglass Autobody Repair Kit for Rusted-Out Metal Six Piece Autobody Repair Kit for Dents and Deep Scratches		Rislone		TMT (Teflon Motor Treatment)
BERRYMAN PRODUCTS INC.	Auto Tire Sealer Transmission Cleaner Carburetor Cleaning Chemical Aerosol Carburetor Cleaning Chemical Transmission Sealer and Conditioner Crankcase Cleaner		Five Minute Motor Flush	MISSOURI HICKORY CORP.	The Tannery-Leather Vinyl Cleaner Conditioner Glazon-Acrylic Glaze for Leather and Vinyl	Star brite	Star Brite Auto Polish Star Brite Vinyl Shampoo Star Brite Vinyl-Brite Star Brite Car Wash in a Bottle
BURNWORTH TESTER CO.	Burnworth Tester V12	HAYDEN	Transmission Oil Cooler		Three-Way Adjustable Shock Absorbers Van and Truck Extra Heavy Duty Shock Absorber		Sun Inductive Timing Light Sun Dwell Tachometer Sun Complete Tune-Up Kit Sun Engine Analyzer Sun Emission Analyzer Sun Super Tach II
	Spark Plugs	HEADLIGHT PROTECTOR PLASTICS CO.	Sure-Lite Headlight Protectors	MUSKEGON	Muskegon Re-Ring Kit MPR-Performance Ring Set		Turtle
	Classic Soft Wax Fuel System Tune-Up		Splash Guards Luggage Carrier Rally Side Rails		PEAK Antifreeze & Coolant PEAK Cooling System Cleaner		Prestone Super Flush
	DL Blue Label Hand Cleaner	Holley	Economaster Carburetors Performance Carburetors Street Dominator Intake Manifold		Bond-Tite Autobody Repair Kit Bond-Tite Super Glas (fiberglass in gel form)		All Climate Motor Oil Oil Filter Tiffany Wax
DIXCO	Magnum Chrome Diecast Inductive Timing Light Dixon Protester 10 Analyzer		Micro-Adjusting Torque Wrench	page alert Systems, Inc.	Page Alert Vehicle Theft Warning System by Pocket Pager & Coded Radio Signal		WD-40
Dowgard summer/winter coolant/antifreeze	Dowgard Coolant/Antifreeze	Holts	Fill-In-One Autobody Repair Kit HOLT'S 3000' Muffler Bandage Kit	autotune	Auto-tune Mini Inductive Analyzer		Duro Body Shop Kit Pizazz Duro Super Glue-3



CAR CARE MONTH

These APAA member retailers provide you with quality automotive products, and many are offering money-saving specials on some of the excellent products featured

in the CAR CARE GUIDE. Watch your newspaper for "Car Care" sections containing announcements from your local Car Care Month Headquarters.

HEADQUARTERS

Automotive Parts & Accessories Assn. member retail outlets

AA AUTO PARTS	WA	Crown/Auto	MN		GA	TEDDY AUTO PARTS	VA
ADVANCE/AUTO	NC. SC. TN. VA	Frank's AUTO SUPPLY	PA	Murphy's MART	AL. IL. IN. KY. MD. MI. MS. OH. PA. VA. WV	THRIFTY AUTO PARTS	CA
Aid	CT. FL. NY. NJ	Fred Meyer	AK. WA	Nationwide	FL. IN. KY. NC. OH. TN. VA. WV	ThriftyAuto Parts, Inc.	ID. WA
Allied AUTO SUPPLY, INC.	TX	GIANT DISCOUNT AUTO STORES	MI	OTASCO	AL. AK. FL. GA. KS. KY. LA. MS. MO. OK. SC. TN. TX	THRIFTY AUTO STORE	LA
APCO AUTO PARTS & MACHINE	AZ	GLOBE DISCOUNT CITY	LA. TX	PAN AMERICAN	FL. VA	TOM BARLAGE AUTO PARTS	OH
APPY'S	CA	GRAND/AUTO	CA. NV	Parts World	NV	TOP AUTO	WA
ARROW AUTO PARTS & SUPPLY CO. INC.	MO	Guarantee Auto	IN	Pay Less	WA	TRUCKS & STUFF	IL. IA. MN. MO. NE. SD. WI
AUTO BARN STORES	NY	Goodmax	IN	Penn-Jersey	DE. MD. NJ. PA. VA	True Value HARDWARE STORES	AL. AK. AZ. AR. CA. CO. CT. DE. FL. GA. HI. ID. IL. IN. IA. KS. KY. LA. ME. MD. MA. MI. MN. MS. MO. MT. NE. NV. NH. NJ. NM. NY. NC. ND. OH. OK. OR. PA. RI. SC. SD. TN. TX. UT. VA. WA. WV. WI. VT. WY
AUTO GIANT STORES	PA	Harts FAMILY CENTER	OH	PEP BOYS	CA	UNIROYAL	AL. AR. CO. CT. DE. FL. GA. HI. IL. KS. LA. MD. MA. MI. MS. MO. NE. NJ. NY. OH. PA. SC. PR
Big Don AUTO SUPPLY	MI	Holiday Village	MN	PLAYTOGS DISCOUNT CENTER	NY		NJ
B & I AUTOMOTIVE	WA	JACKS AUTO SUPPLY	TX	Prange-way DISCOUNT STORES	WI	WESTERN AUTO	AL. AK. AZ. AR. CA. CO. CT. DE. FL. GA. HI. ID. IL. IN. IA. KS. KY. LA. ME. MD. MA. MI. MN. MS. MO. MT. NE. NV. NH. NJ. NM. NY. NC. ND. OH. OK. OR. PA. RI. SC. TN. TX. UT. VA. WA. WV. WI. VT. WY
BLUE STAR AUTO STORES	IL. IN	KRAGEN AUTO SUPPLY	TX	Protecto	OH	QUALITY FARM & FLEET INC.	IN. OH. MI
Boscov's	PA	MAPLE AUTO SUPPLY	MA	R&S AUTO	NJ. PA	ROSE AUTO STORES	FL
GAP	ME. NH	MIDWAY AUTO SUPPLY	TX	SCHUCK'S	OR. WA	STATEWIDE AUTO	ID. OR
cap	MA	MONTEGOMERY WARD	AL. AK. AZ. AR. CA. CO. FL. ID. IL. IN. IA. KS. KY. LA. MD. MI. MN. MO. MT. NE. NV. NH. NM. NY. NC. ND. OH. OK. OR. PA. SC. SD. TN. TX. VA. WA. WV. WI. VT. WY	Zayre shoppers' city	MN		
CHAMPION AUTO STORES	IA. MN. MT. NE. ND. SD. WI	MR. AUTO	PA				
DAY & NITE	NC						

THE HIGH PERFORMANCE DIET



It happened again this year. Detroit found a way to squeeze more power out of a small engine. Which is great for a car's fuel economy and pollution level. But hard on its stomach.

That's why many new cars could use some copper in their diets—the copper core in NGK plugs.

Ordinary plugs have iron cores. But copper dissipates heat as much as five times faster than iron. At high speeds the copper works to prevent pre-ignition, detonation and burning. Thanks to the copper core we're also able to fight fouling at low speeds by using a longer-nosed insulator than that found on other plugs. The final result is a plug with a wider heat

range. And wider heat range means better performance at any speed, in any weather. And longer life.

NGKs can put any car on the road to good health. Foreign or domestic. Four, six or eight cylinders.

Stock NGK copper core plugs. For cars that have to watch what they eat.



The Copper Core gives you more.



NGK SPARK PLUGS (U.S.A.), INC. 1652-56 West 240th Street Harbor City, California 90710

CAR CARE GUIDE

at least 30 minutes. Now comes a very important point:

Every 10 minutes, rock the car from side to side for 30 seconds to one minute. Water may accumulate in a seam along the front or rear windshield, but may not drip into the car until it's disrupted as the car turns a corner. Rocking the vehicle simulates turns.

Examine the inside of the car. If water has appeared, you should be able to confirm that the leaking area is the front or rear windshield. What do you do?

What you *don't* want to do is lay windshield sealing compound over the windshield moldings. This won't stop the leak. All it will do is make it tougher to remove the moldings so the windshield can be sealed properly.

Do the job right. Use a windshield clip tool, which is a professional body shop tool that isn't expensive. Slip the tool under a strip of molding and slide it along until it hits a molding retaining clip. Twist the tool. This will pop the molding loose from the clip. Continue until all four moldings have been removed.

Do not use a screwdriver or putty knife in place of a windshield clip tool. There's a good chance of cracking the glass.

When moldings have been removed, take off and discard all old retaining clips. Put a new retaining clip at each point where an old one was positioned. Retaining clips may be obtained from an auto parts and accessories dealer or an auto body shop.

Apply a liberal quantity of windshield sealer. Be sure the bead covers the entire circumference. Don't leave any gaps. Attach the molding strips by pressing them onto retaining clips.

Suppose the water test doesn't uncover the leak. Close all side windows tightly and aim the hose at them.

Be sure the entire area is covered with water. Train the hose at each spot for a couple of minutes. Have patience and be meticulous.

It would help to have an assistant sitting in the car who can alert you if water begins leaking. If a leak becomes apparent, the sealing rubber gaskets around window reveals and/or doors should be replaced, if they are dried out, or reattached if loose. Use rubber cement to do the job.

If an up-front leak has not been uncovered, hose down each conceivable opening into the car for several minutes. This includes every seam and bolt along the firewall, drip railings and "A" posts. The "A" post is the structural part of the body on each side of the windshield.

Once the leaking area is found, it can be sealed with silicone rubber caulking.

If water appears inside the trunk, chances are the gasket has dried out. You can replace it by pulling off the old gasket, cleaning the surface with a wire brush and alcohol, and installing a new gasket with cement.

You will probably have to do this job again—when the car reaches 200,000 miles. But, what the heck. By then you'll own a gem of a classic car.

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Silent Vehicle Alarm



**An Immediate
Warning System That
Alerts You (And Only You)
The Instant Your Vehicle
is Victimized!**

Crime Is On The Increase!

According to the FBI, 1,000,500 vehicles were stolen last year—that's one every 32 seconds! In addition; there were 995,287 reports of personal property taken from vehicles and 1,216,462 cases of vehicle accessories (CB radios, stereo equipment, etc.) being stolen. This enormous total of 3,212,249 cases of vehicle-related theft victimized one out of every 78 people in the United States. At this very moment someone could be breaking into your car!

Do You Carry Valuables In Your Car?

From time to time, nearly everybody leaves important or expensive property in his car unattended. Salesmen may leave samples for a few minutes, a few hours—even overnight. Businessmen leave irreplaceable papers. Families leave luggage, camping gear photography equipment, CB radios, car stereos—even cash. Guard your valuables, samples and your car with the all new PAGE ALERT 101. Once installed, you will be alerted the instant a door, hood or trunk lid is opened. It cannot be disconnected from outside and there are no embarrassing noises.

Ease of Operation

Should your vehicle be entered by a thief, the powerful transmitter sends an individually coded radio signal to a small pocket pager which "beeps" its warning so that you may protect your property or call police. It punches its warning signal through buildings and other obstacles and has a range of more than ½ mile! The sophisticated coding system provides an infinite number of individual codes.

A MUST For Delivery Truck & Tractor Trailers

If your business involves deliveries of any kind—a PAGE ALERT installed in every vehicle in your fleet can provide important protection against expensive losses. Big tractors and trailers and their contents represent enormous investment. Even if the truck or cargo itself is not stolen, the cab may be severely damaged when a thief rips out the tape deck or CB radio.

Campers, Trailers, Vans, Motor Homes, Boats, Planes

Recreation vehicles are often unattended while their owners go hiking, fishing and sailing. Their locks are little deterrent to determined thieves. But the PAGE ALERT can notify you the instant your RV is broken into. For RV owners the PAGE ALERT can double as a one-way communications device to alert family members in case of emergencies or simply when meals are ready.

Inventory and Industrial Security

The PAGE ALERT 101, Theft Warning System by Coded Radio Signal & Pocket Pager, is ideally suited for after-hours security of manufacturing plants and large warehouses where guards are posted. A single transmitter and receiver combination, with several closure switches, can alert the guard to any intrusion into sensitive areas. As a result of the PAGE ALERT 101's 2 tone sequential coding, several systems may be installed, enabling the guard to pinpoint the break-in. Because the PAGE ALERT requires no time-consuming and expensive hardwiring, its security applications are almost limitless.

Commercial Communication Applications

When an important call is received, a construction boss can be beeped at the top of a skyscraper by a pocket pager. A car salesman can be called in from the lot. The PAGE ALERT 101 is perfect for hotels and motels and in-plant paging. When important personnel are needed they can be reached almost anywhere on the premises.

Unique!

The PAGE ALERT 101, Theft Warning System is truly unique in the security industry. A wireless transmitter pocket pager system that can be anything from a vehicle alarm to a building security system. Use your imagination and remember — PAGE ALERT MEANS PROTECTION!

Simple to Install

Complete, Easy-to-follow instructions come with each unit. No special skills needed.

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Order yours in the next 30 days and instead of the regular list price of \$189.95, we will ship yours at the special price of \$149.95. WA residents add \$7.65 sales tax.



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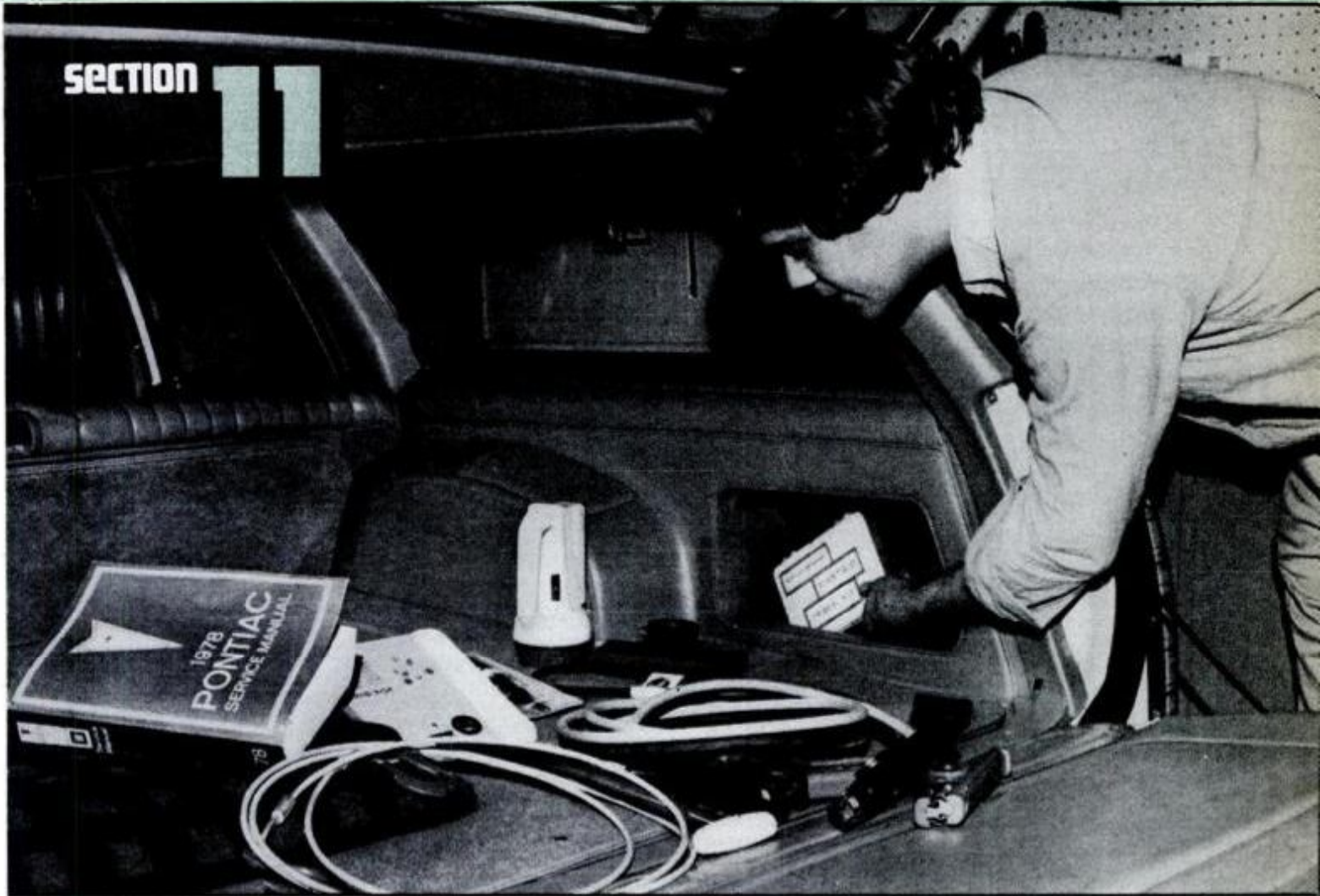
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CAR CARE GUIDE

SECTION 11



Carry in your car all the equipment you will need if faced with a medical emergency or mechanical breakdown on the road.

Taking inventory

The following list may be used to gather equipment for your dream garage. Most of these items may be purchased as needed, so are placed into categories which coincide, in general, with the service-by-mileage sections in this Car Care Guide.

Your inventory will depend on how much work you want to do yourself, and on the car that's being serviced.

General in-garage equipment

Adhesives, assorted
Air compressor
Allen wrenches
Awl
Bucket(s)
Can opener
Clamps
Cleaners for auto parts, tools, hands
Common hand tools, assorted (screwdrivers, pliers, open-end wrenches, box

wrenches, etc.)
Coveralls
Creepers
Door and window security locks
Droplight
Dust mask
Fasteners assorted (nuts, bolts, washers, screws, cotter pins, etc.)
File cabinet (for warranties, owner's manual, product folders, etc.)
Fire extinguishers
First-aid kit
Flashlight (and spare batteries)
Funnels
Garage heater (kerosene)
Gear and bearing pullers
Gloves
Grinder, benchtop
Hacksaw
Hooks (to hang equipment)
Impact driver
Intercom

Jack stands
Jumper wires
Nut drivers
Oil cans
Overhead hoist
Penetrating oil
Petroleum jelly
Pipe cleaners
PM Car Care Guides
Power drill, bits and buffing pads
Propane torch
Pry bar
Punches
Putty knives
Rolling tool cabinet
Safety goggles
Sealants, assorted
Seal puller
Service literature
Scissors
Shop cleanup vacuum

(Please turn to page 230)

Multi-Stripe like a Pro

"HOW-TO" AD #2

MULTI-STRIPE PINSTRIPING

TRIMBRITE MULTI-STRIPE GO ON EASY AND SLICK. STICK TIGHTER, CURVE BETTER, STAY LONGER. SPECIAL REMOVABLE TRANS-PARENT CARRIER FILM KEEPS 'EM PARALLEL DURING APPLICATION. 10 COLORS... 3 WIDTHS, COMPLETE WITH SPEAR ENDS, AND VERY AFFORDABLE.

PREPARATION

CLEAN DIRT AND WAX FROM AREAS TO BE STRIPED. USE EXACTO KNIFE (OR RAZOR BLADE) FOR TRIMMING TAPE ENDS. STRIPE IN WARM WEATHER, NEVER IN SUNLIGHT.

PULL OUT ENOUGH TAPE FOR LENGTH OF PANEL. REMOVE PAPER BACKING & APPLY FIRST INCH OF TAPE. EYEBALL FOR STRAIGHTNESS... BRING TAPE GENTLY TO SURFACE. IF YOU GOOF, JUST LIFT GENTLY & REPLACE. BURNISH WITH SOFT CLOTH TO INSURE BONDING.

STRAIGHT IS GREAT!

REMOVE TRANSPARENT CARRIER FILM... PULLING STRAIGHT BACK, NOT UP.

COMBO CURVES & CORNERS

IN PLANNING CURVES — THE NARROWER THE STRIPE, THE TIGHTER RADIUS YOU CAN TURN. CUT ENOUGH TAPE FOR STRAIGHTS OF PANEL. WORK ENDS INTO TRICK CORNER DESIGNS. ONE HAND TO GUIDE, THE OTHER TO PRESS. CUT... OVERLAP... BLENDING INTO STRAIGHTS.

PLAN AHEAD FOR ACCENTS!

SPECIAL ACCENTS ON DOOR HANDLES OR NAMEPLATES REQUIRE ADVANCE PLANNING... EVEN TO SKETCHING OUT THE DESIGN. ONCE YOU'VE GOT THE PLAN, CUT ENOUGH MULTI-STRIPE TO COMPLETE THE JOB... AND DO YOUR THING! "TRIAL-&-ERROR" CAN BE THE WAY TO GO, TOO... BECAUSE WITH **TRIMBRITE** IT'S AS EASY TO CHANGE THE DESIGN AS TO CHANGE YOUR MIND!

TIPS ON TIPS

OUR MULTI-STRIPE COME COMPLETE WITH TIPS... OR YOU CAN DREAM UP YOUR OWN. **TRIMBRITE'S** FLEXIBLE ENOUGH TO TAKE THE TIGHT CURVES... THIN ENOUGH TO OVERLAP. SO THE SKY'S THE LIMIT.

IT'S A TAPE DECK!

WITH MULTI-STRIPE, FAR-OUT HOOD & DECK DESIGNS ARE A BREEZE. ONE POPULAR CHOICE IS THE "SQUARED" LOOK. TRY IT... YOU'LL REALLY DIG IT. AND **TRIMBRITE** SHRUGS OFF SUMMER SUN, WINTER SNOW... EVEN CAR WASH TORTURE!

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PRODUCTS
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HOLT, MICHIGAN 48842

CAR CARE GUIDE

- Smoke alarm
- Socket sets (standard and metric)
- Stapler
- Step stool
- Stethoscope (to pinpoint engine noises)
- Spare maintenance parts such as wiper blades, oil and air filters, drive belts, PVC valve, ignition cable set, thermostat, etc.)

- Vise
- Wire brush
- Wire cutters
- Workbench
- Work clothes

Section 1: The early miles

- Airconditioning service equipment
- Automatic transmission fluid
- Axle lubricant
- Battery charger
- Battery cleaner (baking soda)
- Battery hydrometer and load tester, terminal and post cleaning tool, terminal puller
- Battery water syringe, distilled water
- Belt tension gauge
- Body care products (chamois, sponges, cleaning compounds, tar and bug remover, glass cleaner, vinyl cleaner, touch-up paint, wax, etc.)
- Brake fluid, hoses
- Chassis lubricant
- Coolant (antifreeze)
- Cooling system and heater hoses, flushing equipment, hydrometer, pressure gauge, thermometer
- Distilled water
- Drive belts
- Engine degreaser
- Fuel filter
- Grease gun
- Greases and oils, assorted
- Lubriplate



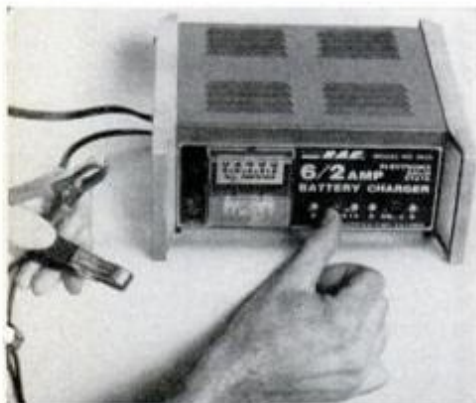
Vacuum gauge is an essential diagnostic tool. Large dial face is easy to read.

- Motor oil
- Oil draining and disposal equipment
- Oil filter, filter wrench
- Power drill and buffing pads
- Power steering fluid
- Spark gap gauge and sandblaster
- Steering gear lubricant
- Suction gun
- Tire air pump, pressure gauge, valve cores and caps
- Windshield washer fluid

Section 2: The growth miles

- Automatic choke cleaner
- Breaker points and condenser (conventional ignition)

(Please turn to page 232)



Battery charger for your garage should feature high and low charging rates.

- Support ramps
- Tapes, assorted (electric, duct, etc.)
- Tool caddies
- Torque wrenches
- Trash can

DO YOUR OWN 60 SECOND AUTO LAMP INSPECTION.

Non-functioning lamps are one of the leading reasons for safety inspection failure. But it's easy to make your own safety check. Just turn on your headlamps and four-way flashers. Take a quick stroll around your car and check your headlamps, stoplights, tail, side-marker, parking and license plate lights for burnouts. It could prevent an accident or even save a life.

Your best replacement — General Electric Plus 25 headlamps.

If your headlamps are burned out, replace with General Electric Plus 25 headlamps. They generate 30% more light than our previous standard headlamps, which helps you see 25 feet further down the road. In fact, you should replace both headlamps with GE Plus 25's to get the full benefit of more light. The easy way to know if you have Plus 25's in your car is to check the number on the back of the light. If it's #4002 or #6012, it's our old model. If it's #4000 or #6014, it's a Plus 25. You can do-it-yourself, or have your service dealer install them. General Electric, Miniature Lamp Products Department #3382, Nela Park, Cleveland, Ohio 44112.



GENERAL  ELECTRIC

If You're Into Automotive Investment, Here's a Statement About Profit and Loss: Buy The Mark Ten B Electronic Ignition And Sonic Sentry Anti-Theft Alarm Now!



The profitable part about the Mark Ten B capacitive discharge system is that it actually eliminates 3 out of 4 tune-ups and deals with rough idling, slow starting, hesitation during acceleration and poor gas mileage—on the spot! To prevent loss, the *Sonic Sentry* protects your vehicle and contents from theft by literally blowing the horn on anyone who intrudes into the harmless, ultrasonic field it emits throughout the interior of your car, truck, van, camper, bus, boat or airplane. To learn more about these quality, protective accessories from Delta, invest a minute of your time by filling out and mailing the attached coupon today!

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Compression gauge pinpoints conditions inside your engine—and it's easy to use.

- Cam lubricant (conventional ignition)
- Carburetor air cleaner
- Compression gauge
- Distributor cap and rotor
- EGR valve
- Engine diagnostic equipment (select from the following): Dwellmeter/tachometer, engine analyzer, exhaust gas analyzer, oscilloscope, stethoscope, stroboscopic timing light
- Fuel evaporation control system filter
- Head gasket
- Ignition coil and ignition point feeler gauge and wrench for conventional ignition
- Manifold heat-control valve lubricant
- PVC filter and valve
- Remote start switch

- Sparkplug cables
- Sparkplug holder tap set (for cleaning and retapping plug ports)
- Vacuum gauge

Section 3: The adolescent miles

- Automatic transmission filter
- Shock absorbers
- Wheel bearing packer, seals, bearings

Section 4: The carefree miles

- Battery cable puller and cables
- Bulbs



Exhaust gas analyzer checks emissions and is excellent tool for carb tune-up.

- Directional and hazard signal flasher
- Fuses
- Headlights
- Windshield wiper arms and blades

Section 5: The transition miles

- Brake caliper repair kit
- Brake cylinder hone, linings (pads), and overhaul tools
- Exhaust system pipes and joint sealer
- Muffler and muffler clamps
- Wheel cylinder repair kit

Section 6: Resisting temptation miles

- Carburetor cleaner and float
- Carburetor overhaul repair kit

Section 7: The ongoing miles

- Suspension ball joints and gauge
- Universal joints

Section 8: The payoff miles

- Alternator repair parts or new alternator
- Battery and starter cables
- Ohmmeter
- Starter relay and solenoid
- Volt/ammeter and rheostat

Section 9: The golden age miles

- Cooling system and heater hoses
- Cooling system thermometer
- Radiator hoses and pressure cap

(Please turn to page 234)

LOOK FOR THIS LABEL



The Popular Mechanics Product Feature Mark. You'll find it on tools, home and car care supplies, workshop accessories and much more. Products displaying the Mark let you know they've been featured in the pages of Popular Mechanics.

And for over 75 years, readers have been turning to Popular Mechanics' pages to find reliable, authoritative information on a vast array of topics ranging from home maintenance to outdoor leisure activities to automotive care. The reason—a solid reputation built on a tradition of dependable reader service.

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380 HEX NUTS: 5 Sizes 	<div style="border: 2px solid black; padding: 10px; transform: rotate(-15deg);"> <p>WORKSHOPS</p> <p>NEW IMPROVED MODEL! OVER 1/3 MORE FASTENERS!!</p> <p>THE ORIGINAL NUT & BOLT SHOP™ NOW BETTER THAN EVER! STILL ONLY \$19.95 <small>plus \$3.90 shipping & handling</small></p> <p>THE FASTENERS ALONE ARE WORTH WELL OVER \$50!!</p> </div>		105 COTTER PINS: 4 Sizes
WASHERS: 3 Styles, 4 Sizes of Each Style 			

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Now you can have just the right nut, bolt, screw, washer, or cotter pin at your fingertips... whatever the job! And for an almost unbelievable low price!!

With the NUT & BOLT SHOP — a complete size range of just about every kind of hardware you'll ever need. All organized in one 25-tray, 75-bin cabinet. Perfect for auto repair. Home projects and hobbies. Office maintenance. And industrial shop use. Great as a gift, too!

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CAR CARE GUIDE

Thermostat
Water pump repair kit

Section 10: The begin-again miles

Auto body glazing compound
Body hammers
Body molding
Brake booster check valve
Fiberglass repair materials
Grinding wheel
Paint and primer
Plastic filler and hardener
Sandpaper (various grits)
Slide hammer
Surform
Windshield clip tool, molding, retaining clips, sealer

In-car equipment

Air pump
Battery terminal cleaning tool



Engine analyzer, this one a digital type, offers many functions in one instrument.

Bulbs
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Flashlight
Fuses
Gas siphon hose
General tools (screwdrivers, wrenches, pliers)
Headlight
Ice scraper
Ignition coil, points file and gauge
Jack and support pad
Jumper cables
Lock de-icer
Logbook
Muffler clamps
Penetrating oil
Radiator pressure cap
Rags
Road emergency kit (flares, reflectors, "help" sign)
Spark plug and wrench
Tire pressure gauge, valve cores and caps
Tow rope
Wheel chocks
Wheel lug nuts (spare), and nut wrench
Windshield de-icer
Work gloves

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Use Gumout in your gas tank four times a year and Jet Spray on the carburetor linkage.

Our products are the answer when troubles are caused by a dirty carburetor.



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Slash auto repair bills by handling most maintenance and repair jobs yourself. This big 328-page book gives step-by-step "how-to" instructions supplemented with detailed drawings and photos. Only \$9.95.

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Here's a 28-page, full-color manual on ignition service from Fram Corp. There's a special feature on high energy ignition systems, including comprehensive trouble shooting instructions. Plus you'll find features on selecting the right spark plug, setting ignition timing and more. Just \$1.00.

846. Your oil questions answered

Shaler Rislone offers information answering common questions about motor oil. Covers viscosity, additives, sludge and multi-grade oils. Free.

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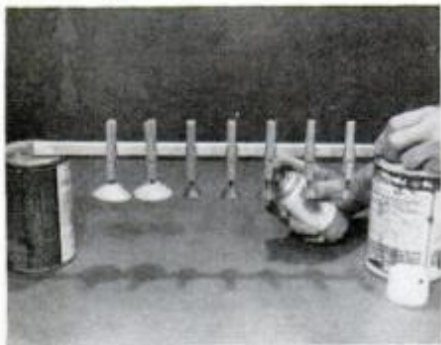
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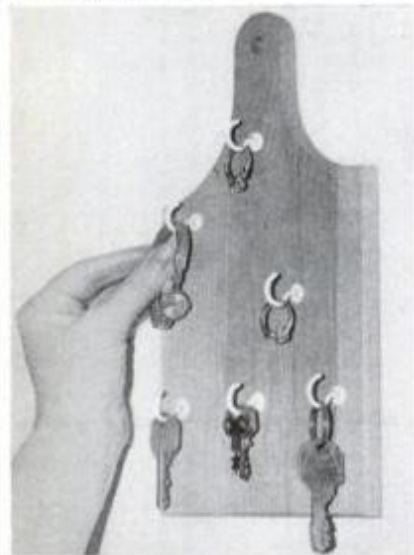


Glue clothespins to a horizontal wood strip to make a handy painting rack. When elevated at both ends it holds wooden knobs or other small objects for a no-mess spray painting job.—*Ken Patterson*

Paint-stripping tool

When you're refinishing furniture, a good tool for removing old paint or varnish from hard-to-get-at places is an old fine-tooth hacksaw blade. It scrapes better than a knife and reaches where sandpaper can't.—*J. Millus*

Handy hold-all



Hang keys and jewelry from this handy hold-all. Mount several screw hooks on an inexpensive cutting board or scrap wood cut to shape.—*John Hosack*

New use for old tape

After replacing the tape in my Stanley tape measure, I used two magnets to fix part of the old tape containing nail lengths and other data to a fluorescent light over my bench.—*William R. Postman, Jr.*

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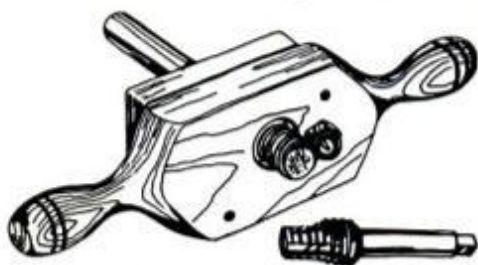
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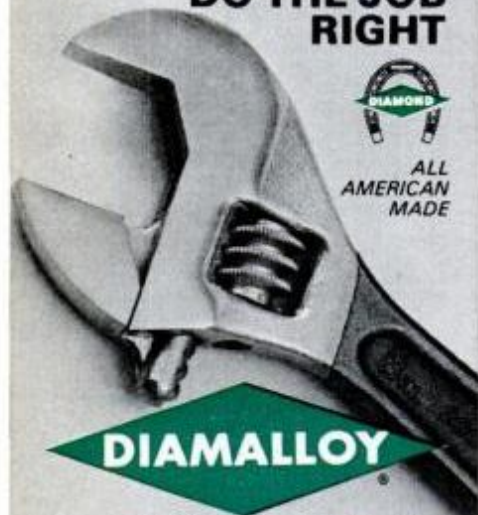
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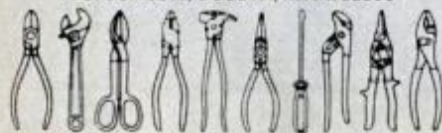
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INDY 500

(Continued from page 109)

after a race, there are always some "what-ifs" about the pit stops and how they affected the outcome. You'll be able to Monday-morning-quarter-back, too, if you've got a good sightline on the pits at this year's 500.

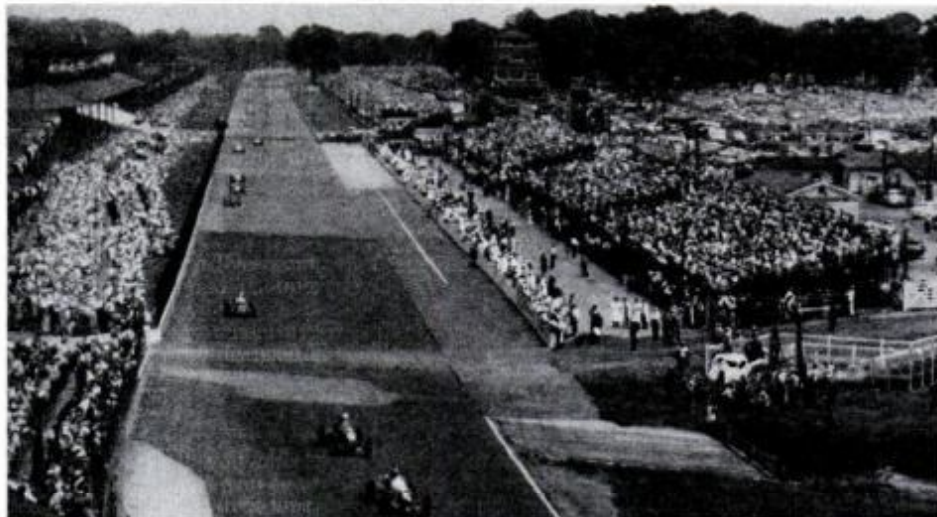
Quarter mile of pits

Until 1957, the pits at Indianapolis

The better known teams and more popular drivers are usually assigned positions in the middle area of the pits, opposite the best grandstand seats. (Paddock Penthouse—\$55 each). Multicar teams are usually assigned side-by-side pits.

Each pit is defined by a pair of vertical lines spaced 30 feet apart along the inside wall. Each car's driver, sponsor and number are also painted on the wall. The pits extend

LONGER PIT ROW FOR HIGHER SPEEDS



The pits at Indy have seen many changes since the first race in 1911. Compare pit row in 1950, top, with the pits as they'll look May 28th at the start of the '78 500.


were on a wide apron along the front stretch, with no barrier separating them from the brick-paved running surface of the track. Before World War II, pit crews and their equipment were in dirt-floored stalls that edged the pit area.

Today, the 1,322-foot-long pit area is separated from the now-paved front stretch by a 30-inch-high concrete wall and a wide strip of grass. A wide runway begins on the inside of the fourth turn and leads down on the inside of the track to the pit entrance, about halfway down the main straightaway. Drivers cut left to enter the pits, and run down to their assigned spots along the wall.

out about 8 feet to a white line that runs the length of the pit lane. Regulations state that each car's pit area must remain clear at all times except immediately preceding, during and immediately following a pit stop.

All parts, supplies, materials and equipment must be kept on the inside of the pit wall in an area of equal length, but limited in width by a milling crowd of crew members, firemen, officials, photographers and reporters, sponsors, owners, former participants, friends and anyone else important or lucky enough to manage the right credentials. Everything that's needed must be passed

(Please turn to page 242)



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First in Dependability
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OUTBOARDS



INDY 500

(Continued from page 240)

over the wall during the pit stop.

Within this storage area stands the high fuel tank, brightly painted with the car name and number. In many instances, the tank also is the mounting point for cantilever arms which are swung out over the stopped car to carry pneumatic lines for the air impact wrenches used to remove and replace wheels on the right side of the car. (See photos of Foyt's pit stop.)

Compressed air (actually nitrogen

because it is lightweight and dry) for the wrenches and also for the built-in jacks used to lift some cars (see photo of Tom Sneva's pit stop) is stored in steel bottles under these tanks.

Fueling is by gravity feed through a large 5-inch hose which has a dry-disconnect nozzle to mate with a spring-loaded closure on the car's fuel tank. A second hose, smaller but with the same type of nozzle, plugs into the tank near the filler and catches any overflow, which is returned to the storage tank. Not a drop can be wasted. One man han-

dles the fuel line, another the overflow. When operated properly, the system can consistently put 30 gallons into a car in under 15 seconds, although slightly less is added during a typical pit stop in an actual race.

Wheels on the Indy cars are held in place by large hex nuts, in turn secured by a large spring clip resembling a safety pin. An air wrench equipped with a large socket spins off the nut after the pin has been removed, and spins it back tight after the wheel has been changed. Replacement tires are usually laid on the track immediately adjacent to the stopping point of the pitting car (note first photo in A. J. Foyt's pit stop sequence). This is done to save precious seconds during the stop and to serve as a locating point for the driver as he brakes down from near-racing speeds.

Pit-stop speeds a real hazard

(An accepted but nevertheless very real hazard of working in the crew of an Indianapolis race car is

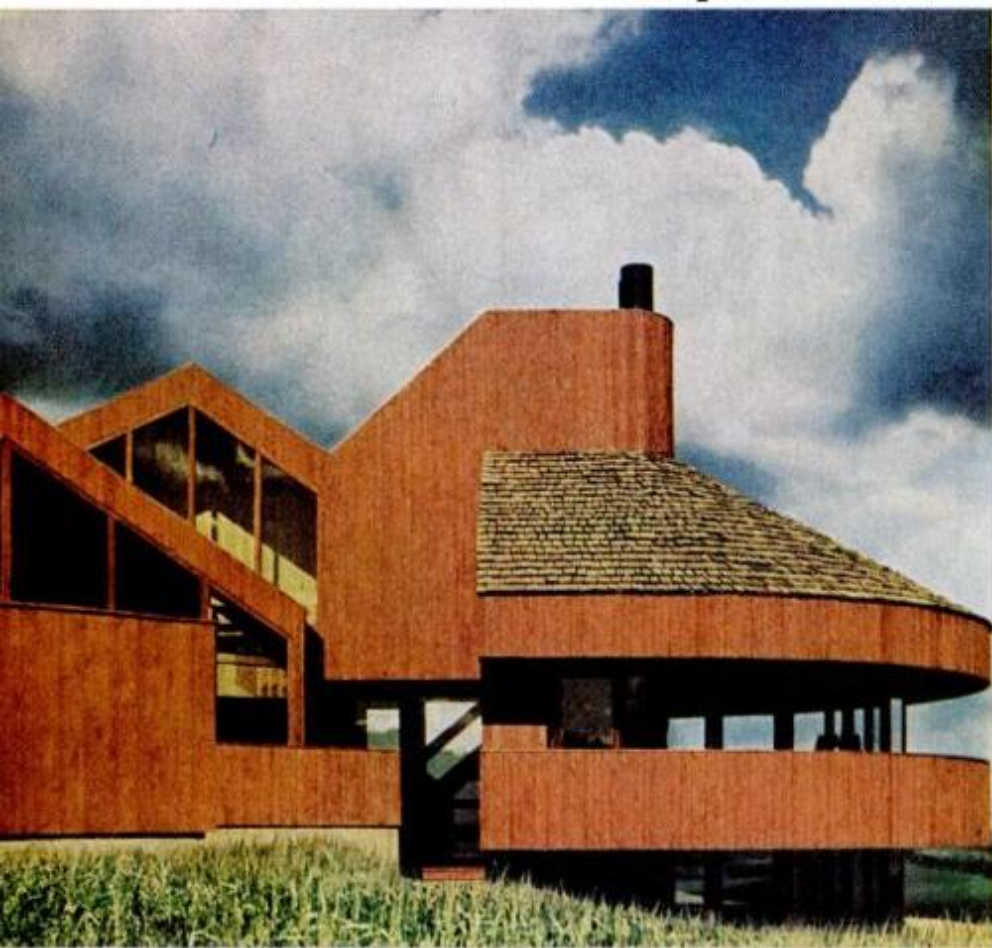


Pit row in 1945 was overgrown due to non-use during war years. In races prior to World War II, pit crews were confined to the dirt-floored stalls along pit area.

the speeds at which the drivers come into the pits. Despite the jouncing and swerving they withstand on every lap, the drivers get so acclimated to top track speeds that anything less than 150 mph seems like a crawl to them. As a result, particularly when running at or near the front, they often rush into the pits well above the "reasonable" speeds prescribed by the regulations.)

United States Auto Club (USAC) regulations limit those in the pits to five crewmen and the driver. In the past, crews have tried to get around this by having other crewmen with extra-long-handled tools work on the cars from the other side of the pit wall. One of A. J. Foyt's crewmen couldn't disconnect his before the car pulled out during the 1976 race and Foyt had to return to the pits on the next lap. The practice is now of-

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ficially disallowed, although a crewman may use a boom to pass refreshments to the driver.

Typically, when a car comes into the pits, the two crewmen assigned to the refueling operation are standing along the pit wall, to the driver's left. To his right, at the outside edge of the pit, are three crewmen ready to spring into action as soon as the car stops—sometimes even before that. One man fits his wrench to the right rear wheel hub, another does the same to the right front, while the third man in the middle positions the jack and lifts the right side of the car. After lifting the car, he springs to his left to grab the fresh right rear wheel and exchange it for the used one his partner has pulled off the car. The man at the front works alone because of the lighter weight of the front wheels and tires.

As the right rear wheel is shoved into place, the wrench man replaces the nut. The jack man moves to lower the car and pull the jack from under it. By this time, the fuel men are pulling their lines and giving the car a final "eyeball." The front tire man jumps back, the jack man and the rear wrench man move to the back of the car to give it an assisting shove, the driver is given the "GO!" sign and the pit stop is finished—in less time than it took you to read this description, literally.

Here's a list of Foyt's pit stops last year, their time and what was accomplished:

Lap	Time (sec.)	Purpose
24	14	Fuel
40	14	Fuel, 2 right tires
68	14	Fuel
92	20	Fuel, restart engine
115	18	Fuel
137	17	Fuel, 2 right tires
156	16	Fuel, 2 right tires
163	17	Fuel, 2 left tires
183	15	Fuel, 2 right tires

It is easy to fall into the trap of thinking that the clocked time-in-the-pits is actually the total cost in time of a pit stop. It isn't, for it takes the driver some time to slow down for the stop—regardless of how fast he roars down the pit lane—and still more time to regain racing speed after he re-enters the track. This throws a heavy variable into any calculations of who-might-have-won-with-fewer-pit-stops (or shorter ones), because there's no official comparison of the times registered by cars on laps that include a stop in the pits.

Best time for pit stops

This is also the reason for the rush of pit stops every time a yellow light (reduce speed, maintain posi-

tion) is turned on during the race. At the electronically-paced 85 mph lap speeds, a pit stop during a yellow light period is far less costly than it is at twice that speed. Although no passing is permitted (another regulation not always equitably administered), a driver can dart into the pits, make a quick stop, and get back out without losing too much ground to the man he's chasing or the one who's chasing him. (In NASCAR, where a pace car on the track slows down the field and permits it to bunch up behind the leader, drivers will make one quick stop

for a pair of right side tires, dart out again to catch up with the field and thus not lose a position on the lap, and then pull into the pits again next time around for left side tires and pull out.) Yellow-light pit stops also offer the hair-raising spectacle of a 100-mile-an-hour traffic jam.

When two close-running drivers are assigned adjacent pits, spectators in the nearby stands really get their money's worth, for the lead can change as the cars sit in the pits. The pressure on crews mounts even higher at times like this—but that's

(Please turn to page 244)

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INDY 500

(Continued from page 243)

the name of the game today. In a three-hour race, a driver will average a stop every 20 minutes. That's not much of a break for the crew after the all-out effort of a 15-second, two-tires-and-fuel stop, particularly when an accident to someone else on the track just a few laps after one stop may bring the driver charging in again for more fuel.

Gone are the days when landing a berth on the crew of an Indianapolis race car for the 500 was like winning a two-week cruise to the Bahamas—fun and games, a little work and not much money. Back when the race was run in about four hours, cars made only one or two pit stops, and those were often leisurely. A much seen photo of the period shows that Mauri Rose actually had time to get out of his car and stretch his legs during a pit stop before hopping back in and going on to victory. There was some pressure on the crews, of course, but not the kind that will exist on May 28th this year. The purse they're shooting for is different, too. In 1948, the total for all 33 cars was \$171,075—less than the winner alone will take home this year.

Strategy used to play a key role in pre-race planning as crews tried to balance such variables as race speeds, fuel consumption, tire wear, what-the-other-guys-will-do and a dozen other factors. Special emphasis was placed on what signals pit crewmen would use to tell the driver his position in the race and when to come in for tires and fuel. Signals took the form of chalked numbers and letters on a hand-held blackboard. More than one driver, running with a new crew, plowed into the first turn trying to remember whether "P-1" meant "You are in first position" or "Come into the pits after 1 more lap."

Today, with most crews linked with their drivers by two-way radio, drivers are kept posted on race progress and told exactly when to come into the pits. The driver, too, can tell the crew about happenings elsewhere along the 2½-mile course. Spotting an accident on the second turn, for example, he'll know that the yellow light will be on for several laps and can alert the crew to be ready for a stop on the next lap.

Most crews prepare for the pit stops well in advance. Once they've qualified the car—for the hot cars and drivers that's usually two weeks before the race—they begin practicing pit-stop procedures. When

(Please turn to page 246)

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INDY 500

(Continued from page 244)

the Lotus team was first competing at Indianapolis with Jimmy Clark driving, they learned the hard way that fast pit work was essential for success. For the 1965 race, which Clark won after two previous attempts, they hired the Wood Brothers, leading pit crew from the rival NASCAR circuit. At first disdained by the Indy establishment, the Woods' professional approach in practice before the race, and speed and precision during the race, made many converts. Their performance at their first 500 touched off the current era of superfast, high-pressure pit stops.

As if there weren't enough pressure to get the car into the pits, get the work done, and get it out again quickly, the crews face another burden in the increasingly more stringent enforcement of pit rules by USAC. Designed to insure safe procedure during the race, most rules make sense, but have been applied capriciously on occasion.

There are still arguments about the penalty given to Jerry Grant at the end of the 1972 race. His teammate, Bobby Unser, had dropped out early. Because his own pit seemed blocked, Grant zipped into Unser's pit for a fast tire change. That in itself was not illegal, but because a crewman inadvertently gave him some fuel from Unser's designated supply, Grant was later penalized a lap. This penalty dropped him from second place and cost him a \$72,000 bundle.

A \$192,863 pit stop

The best and worst of what can happen during pit stops are best illustrated by the experiences of Lloyd Ruby, who led the 500 for four years in a row. Ahead on the 175th lap in 1968, he was forced into the pits by a faulty ignition coil. It was replaced in six minutes and he went out again to finish fifth. The winning share, \$177,523, went to Bobby Unser, but Ruby did earn \$30,248 for fifth spot instead of \$13,138 for 15th that he'd have earned had he quit when the coil did.

Ruby was in the lead again in the 1969 race, with more than a lap over eventual winner Mario Andretti, when he made his second pit stop on the 106th lap. Then, as Ruby tried to pull out of the pits before the fuel hose was disconnected, he tore out the side of his car. He was awarded 20th spot and earned \$13,864, instead of \$206,727 in top money—a \$192,863 difference. So keep your eyes on the pits this year!

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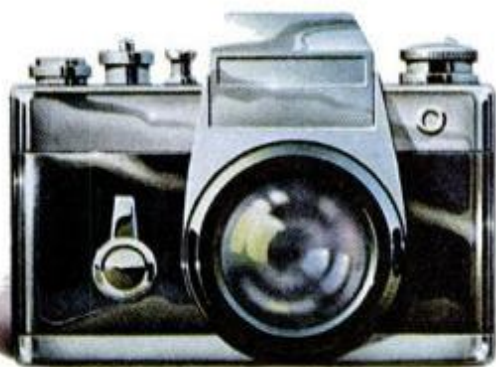
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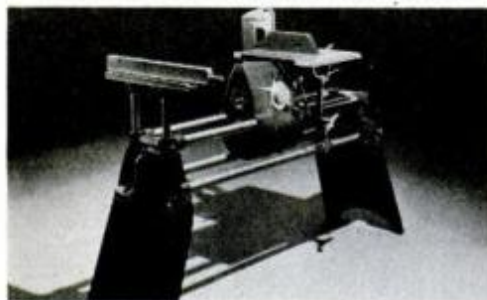
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Stunt-flying fender-benders



Britain's RAF Red Arrows can perform high-precision maneuvers in the sky . . .

Britain's Royal Air Force aerobatic team, the Red Arrows, famed for their 600-mph daredevil stunt-flying in England's hottest military jets, have turned out to be a disaster on wheels. The top-drawer pilots are counterparts of the U.S. Air Force's Thunderbirds and the Navy's Blue Angels—in the air, at any rate.

Recently, the 12-man squad of RAF aces made arrangements to race each other in stock cars at the internationally famous Brands Hatch

track outside London. On the appointed day, the team turned out 12 strong, taxied their vehicles to the starting line, and that's when the fun began.

Within the first half dozen laps, one of the cars spun out, ran head-on into a barrier in a spectacular display of uncontrolled driving maneuvers, and had to be pushed off the tarmac by the RAF "afterguard." That wreck wasn't even off the track before there was another. Two more

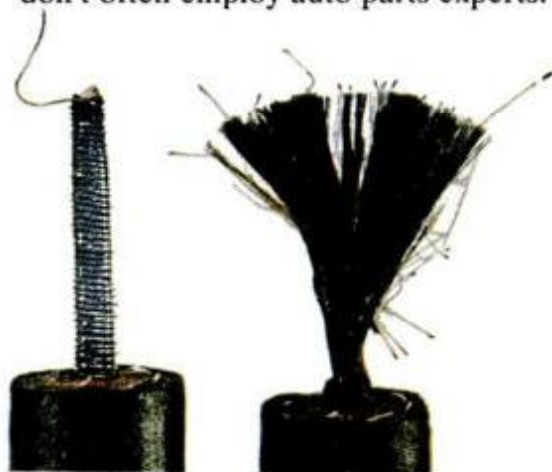
(Please turn to page 250)



. . . but when racing stock cars on the ground, they cracked up all over the track.

Would you buy plug wires from a lady who sells wired bras?

When she runs over from Lingerie to help you in the Automotive Department, she wants to be helpful. But does she know that the "wire" in those plug wires is probably carbon and fiberglass? not "wire" at all. Has she ever heard of Sorensen Mono-Mag, the real WIRE wire? Probably not. Super stores don't often employ auto parts experts.



The wire on the right has a core of hundreds of fiberglass strands impregnated with graphite particles. It's OK, but it does break down eventually from heat and vibration until the voltage can no longer reach the plugs. Sorensen Mono-Mag lasts and lasts and always delivers full voltage because it is "Real" Monel steel wire. There's no radio static, so — you enjoy living room quiet stereo, tape deck and CB radio.

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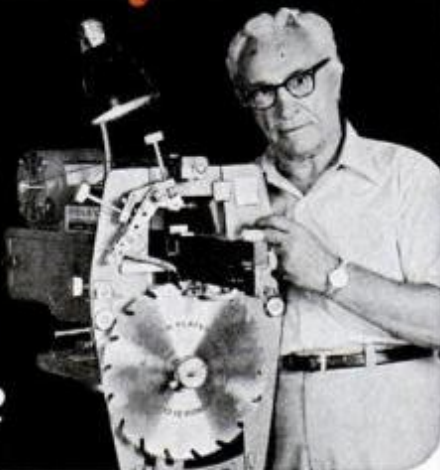
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STUNT-FLYING FENDER-BENDERS

(Continued from page 248)

hot pilots creamed each other while dicing in the corners and went hurtling all over the road in a variety of fascinating figure eights.

The race finally had to be black-flagged because wreckage on the track had littered practically all the lanes. The embarrassed air aces downshifted to a "landing" and taxied the cars from the track, to the cheers and jeers of more than 2000 spectators. Not quite the form that saved England from Hitler's Luftwaffe in the earlier stages of World War II.

"Those laddies jumped at the chance to race here," observed a Brands Hatch official. "But now they're jolly well red-faced. There's a bit more space up there where they do their usual tricks."

Most spectators agreed. Said one: "They're really the greatest in the sky, but they were on the wrong track today. You can't do loops and barrel rolls on pavement without making a little contact here and there." **FM**



Car No. 1, piloted by the Red Arrows' leader, seems a bit the worse for wear.



Oh, bad luck! In first car to crack up, an RAF ace spun head-on into a barrier.



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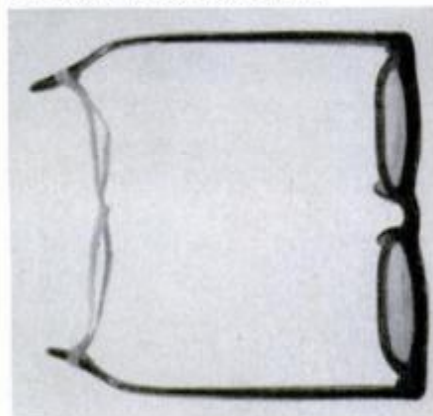
Freezeproof nuts and bolts



Coat washers and exposed ends of nuts and bolts on new outdoor equipment with grease or special rust-inhibiting oil and you'll have less trouble loosening parts later.

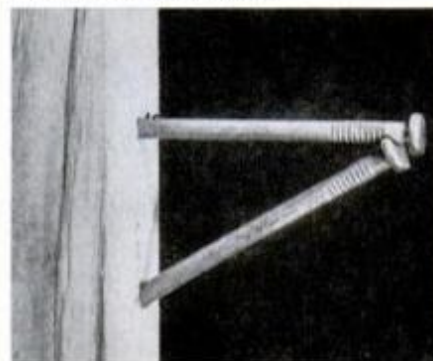
—Walter E. Burton

Bifocal-wearers' assist



Close work on ceilings is hard for bifocal wearers who must look through the lower parts of their glasses. Make a headband of rubber bands and invert the glasses to look through the reading part comfortably.—Jorma Hyypia

Braced-nail bracket



Two nails, one driven horizontally and one driven at an angle to brace the other, act as a support for heavy loads. File a notch in the angled nailhead to fit the upper nail's shank.—I.T. Bank

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That can't happen when you use Scotts® Turf Builder Plus 2®. It gets rid of dandelions and forty other broad-leaved and vine-type weeds.

(That's a lot of weeds, but unfortunately there are grassy weeds that need a different treatment. Crabgrass, for instance. For crabgrass and its ugly relatives, we make Turf Builder Plus Halts®. Apply it in early Spring, and it prevents annual grassy weeds from taking over your lawn.)

We'll get these dandelions out of your lawn, roots and all.

When Plus 2 gets onto a dandelion's leaves, the weed is doomed. Plus 2 penetrates the weed's sapstream and reaches every part. In a few days, you can see the stems and leaves twist and curl. When the weed dies in about a month, you don't even have to rake it out. It will soon fall apart and disappear. And it won't grow back, because Plus 2 took care of every bit of the root. At the same time the Turf Builder® is hard at work. The slow-release nitrogen in this fertilizer

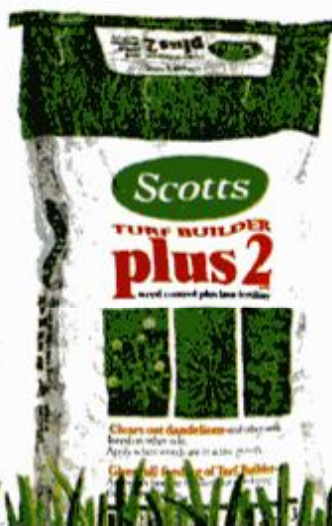
stimulates the nearby grass to grow into the thin spots left by the weeds. It thickens the lawn by helping new grass plants grow. It feeds your lawn at just the right rate for healthy growth and keeps on feeding it for up to two full months.

And you can get all this done in one shot. Just spend about half an hour with your spreader and our Turf Builder Plus 2. Those dandelions will be on the way out, and with them will go other intruders such as plantain and chickweed.

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Soldering nylon



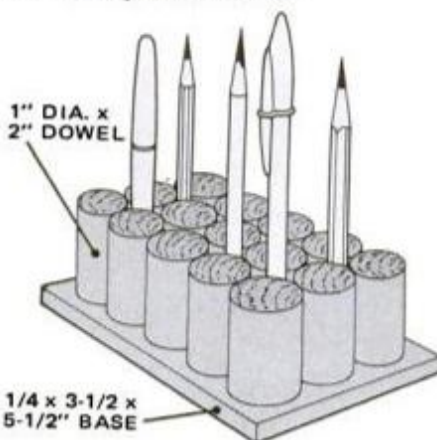
You can keep ends of nylon rope from fraying by simply touching them with a soldering gun and fusing strand tips. Same stunt keeps knots from slipping.—*B. Ervin*

Tape trap temporarily



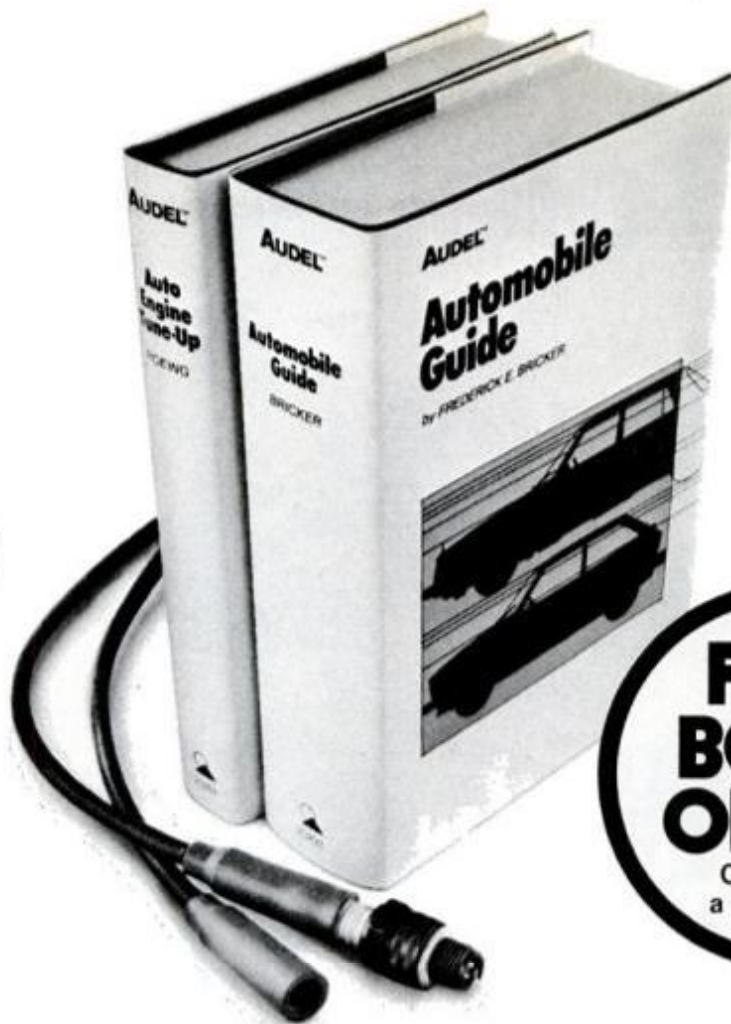
Self-adhering, stretchable, waterproof garden hose repair tape wrapped in two layers around a leaking sink trap will keep it in service until the corroded pipe can be replaced.—*I.S. Haggerty*

Pen and pencil holder



Make this unusual desk accessory of 1-in.-dia. dowels cut 2 in. long, glued to a 3 1/2 x 5 1/2-in. base. Glue the outside dowels, leaving a 1/4-in. border around the base, then glue on the middle row of dowels.—*Robert Tom*

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Automobile Guide

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COMPLEAT ANGLER

(Continued from page 126)

over the seat and your feet. Stream anglers need a parka or windbreaker and, of course, waders.

Jackets

Cold weather usually calls for an insulated jacket or parka, but often a quality nylon windbreaker will do. I put a light one in my tackle box to supplement my light top-quality rainsuit. The fly or light-spin fisherman should pick a jacket or vest loaded with pockets. Check out the ones



Assorted protective headgear, tackle box, Lunker waders, wet gear, vest are basics.

with inflatable linings or foam flotation that will come in handy in case of a dunking.

Waders

Chest waders are preferable since hip boots always seem to ship water, but many tend to puncture and leak. Toughest, probably, are Uniroyal's Industrial Waders, priced at more than \$100. But there is word that Royal/Red Ball has in development some remarkably tough lightweights, maybe for next year, that weigh only a pound with stocking feet bottoms. Waders now come in women's sizes, too. Belts are available that conceal a pop-out inflatable life preserver inside.

Accessories

In addition to the recent great refinements in fiberglass and graphite tackle, don't overlook the small items that add so much. Polarized sunglasses not only see beneath the surface but some float if dropped. Tuck away one of the new Swiss Army knives for fishermen, long-nose pliers, fillet knife, fishing thermometer, clip and compass, plus your personal equipment favorites, and you will then be all set to wet a line in comfort and style.

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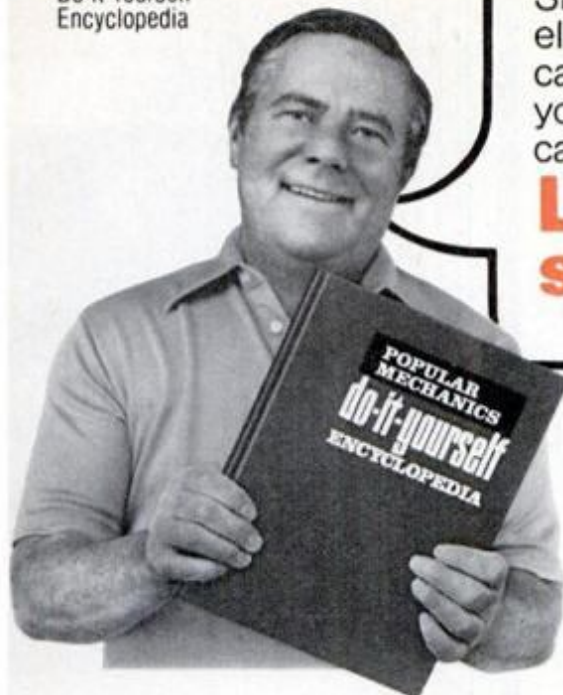
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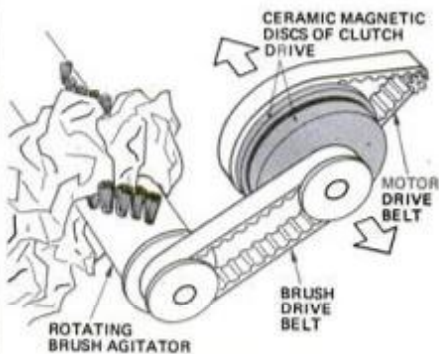
PM LOOKS AT ELECTROLUX'S NEW UPRIGHT VACUUM



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- Dirt doesn't pass through the fan on its way to the filter bag as with other systems. This eliminates damage to the fan and motor by stray objects.—P.A.



Magnetic discs part to stop rotating brush if something causes it to jam.

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Quite simply, because a Gravelly is built to last.

It is not uncommon to find 25-year-old Gravelly lawn and garden tractors still going strong today.

Not necessarily because the folks who bought them are such mechanical geniuses. But because the folks who build them are.

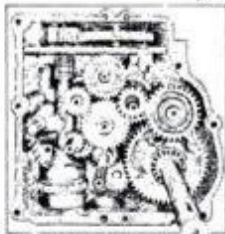
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Beneath a Gravelly's impressive exterior, lies an even more impressive interior. Designed to give each and every Gravelly a long and lively life.

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Gravelly offers both 2 and 4-wheel tractors which operate 10 different mowing attachments. Other attachments are available for plowing, tilling, cultivating, and snow removal. A Gravelly also powers a seeder, sprayer, compost shredder, thatcher, aerator and even a log splitter.



How to keep your tractor from going into hibernation for the winter.

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BUILD PM'S PORCH SWING

(Continued from page 131)

(Photo 15). Since the standard hole saw only penetrates to about $\frac{3}{4}$ in., you will have to drill from both sides and then complete the cut with a sabre saw. Use a drum sander to smooth the cut. Mark locations for the $\frac{3}{8}$ -in. bolt holes, then use a 1-in. bit to bore a partial hole parallel to the flat surface of the notch, just deep enough to seat the washer. Then bore $7/16$ -in.-dia. holes through the assembly. This is best accomplished with a helper. Lay the 2x4s on the side with the 2x8 held vertically in place between the notches. Do this on 2x4 scraps on edge to permit access with your electric drill. But, if you mark the bolt holes carefully and then support each member in proper position on the drill press, you can bore the holes individually on the separate pieces.

Since lagbolts are not available in the size required, you will have to use threaded rod cut to size, with nuts and washers at both ends. (Oversize lagbolts will not have sufficient thread to allow cutting to length.)

Assemble the frame by bolting the tops, then attach the three lower outer rails. Before you add the second rails, nail in the four horizontals using two hot-dipped galvanized nails at both ends.

To hang the seat, set it in place on high sawhorses or other support. Pass the nylon rope through the 2x8 half hole, then through the chair sides. Make an overhand knot at each end, then wrap a piece of plastic tape tightly around the rope just below the knots. Do not cut off the waste with a knife or scissors or it will unravel. Instead cut by burning it through with a soldering gun or heat knife. The heat will melt the end and prevent unraveling. Melted nylon will mess up the gun tip a bit, but can be cleaned off with a light sanding after the gun cools.

The knot will seem too big to fit the $\frac{3}{4}$ -in. hole, but can be forced in if you pull hard enough. The fit will be good and snug so you won't need a washer. Remove the supports and let the seat hang, then attach the special rope clamps at the top. The seat can be adjusted to any comfortable angle you want and locked in position by tightening the clamps.

Very little work is required for finishing the swing; we simply applied three coats of Flecto Varathane Liquid Plastic (Exterior) to the new wood following the manufacturer's instructions on the can. Since the

(Please turn to page 264)

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BUILD PM'S PORCH SWING

(Continued from page 262)

swing itself is of oak, however, its parts must first be rubbed with natural paste wood filler to fill the wood's open pores. Using turpentine, thin the filler to a creamlike consistency and brush it on—first against and then with the grain. Let the filler set until it turns flat, then rub off all excess filler with burlap or other coarse-textured cloth. Wait 24 hours before applying the first coat of Varathane. (Note: You do not need to use the filler on the close grain fir used in the A-frame).

Alternate suspension method

Those who have a porch will want to hang the swing from its ceiling rather than build the A-frame. You can suspend the swing from two $\frac{3}{8}$ x $4\frac{1}{2}$ -in. screw eyes turned into one or two ceiling joists. (If the ceiling joists run parallel to the swing's length, both screw eyes will be in one joist. If joists run perpendicular to the swing, each screw eye will be in its own joist.) Locate joists using a small nail. When a joist is located, bore several small holes to make certain that the screw eye will go into the center of the joist.

Some additional hardware is necessary for a ceiling installation to prevent undue wear and tear on the nylon rope. You should install an open-end wire rope thimble between each rope clamp and the screw eye above it.

The clamps and rope are generally available at marine supply houses. If you have difficulty obtaining them locally, you can order them from Capro Craft, Box 18, Greenlawn, N.Y. 11740. For A-frame mounting, order the kit that contains 28 ft. of $\frac{3}{8}$ -in. nylon rope and two clamps; it's \$7.50 postpaid.

The ceiling-mount kit is priced at \$9. It includes the rope clamps, 30 ft. of $\frac{3}{8}$ -in. nylon rope and the pair of thimbles noted above. **PM**



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CARPET REPAIR AND CLEANING

(Continued from page 140)

becomes stained, consult the care manual received at time of purchase, contact your carpet dealer, or write to the manufacturer for information on your type carpeting.

For general, overall cleaning, you can rent a steam cleaner. Be sure the dealer shows you how to use it properly—over-wetting the carpet is a common error. For professional results and a clean, long-wearing carpet, follow the instructions on the cleanser package. **PM**



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INTERNATIONAL HARVESTER

for choosing the Concord, so you can understand it when I tell you I think I got ripped off."

A persistent complaint centered on the driver-side defroster, which apparently does not deliver enough heat or air.

Another 5.3 percent of owners queried said the digital clock didn't run or didn't keep time. This clock is standard in D/L models and optional at \$25 extra in other Concorde.

These complaints paled, though, alongside the enthusiastic reactions of most owners. Here's a sampling of specific praises:

"The instrument panel is easy to read and well lighted."—Texas military retiree.

"It has a quiet, comfortable ride," says a New York agriculturist, "with excellent seats for lumbar support. The engine can't be heard inside the car and gives plenty of get-up-and-go [this is with the 304 V8, which only 1.8 percent of our respondents had]. The Concord handles like a charm, and quality is good."

A retired Arizonan: "The performance is very good. I was surprised at how well the car performs in the mountains with the 258-c.i.d. Six. It's very stable in high crosswinds and when turning sharp curves."



Four-door models are convenient for passengers; most popular is 2-door.

Riding comfort drew good marks, with only 2.4 percent rating the front seats *fair to poor* and 11.5 percent giving that score to the rear. "I like the way it rides," says a Wisconsin carpenter, "and the front seats are a lot better than in my 1976 Hornet."

"When the front seat is all the way forward, there's not enough space beneath the steering wheel," observes an Illinois housewife.

As we traditionally do, we asked owners to suggest improvements. A big 26.1 percent put down, "No changes—leave it the way it is." Of those who offered suggestions, 7.1 percent wanted better gas mileage, 5.9 percent craved more trunk space, and 5.0 percent suggested improving front-seat comfort and visibility.

Luxury marks one of the big changes between the Concord and its Hornet ancestors. What do the owners say about this new-found luxury?

A Michigan engineer observes, "All of the Concord's luxury features are good enough to com-

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Elmer's® Carpenter's Wood Glue is a special wood glue for all your woodworking projects. It penetrates well in hard and soft woods and forms a heat and water resistant bond that's stronger than the wood itself.

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Elmer's Carpenter's Wood Glue is also sandable, paintable and gumming resistant. Its non-toxic*, solvent-free formula also washes off your hands and project with water. So you won't get light spots when you stain near glue joints.

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pare to our 1976 Olds Toronado, and some are better."

"It's an expensive-looking car that's not expensive," opines a North Carolina accountant. And commenting on the Concord's design, an Iowa milkman observes,

"It's the only car in its class that doesn't look like a crackerbox."

In short, Concord buyers like their cars, with few and rather minor gripes. A New York dry cleaner spoke for most. "I've been driving Nash, Rambler and

AMC cars since 1946 and think I am safe in saying that, without a doubt, my 1978 Concord is an entirely different car—in quality, comfort, ride, quietness and appointments. It's the best car I've ever owned." **FM**

SUMMARY OF 1978 AMC CONCORD OWNERS REPORTS*

Total miles driven1,127,061
Average miles per gallon
232-cu.-in. Six
In town (EPA, 18 auto)..17.4
Long trips (EPA, 23 auto.).....21.3
258-cu.-in. Six
In town (EPA, 16 auto)..16.3
Long trips (EPA, 21 auto.).....20.6
Body style choices:
Two-door sedan48.0%
Four-door sedan28.1
Four-door wagon21.9
Two-door hatchback coupe 2.0
Engine choices:
232-cu.in. Six17.4%
258-cu.-in. Six80.8
304-cu.-in. V8 1.8
Transmission choices:
Automatic95.1%
Four-speed manual 2.6
Three-speed manual 2.3
Why did you choose the Concord?
Styling47.2%

Size23.7
Past AMC experience18.2
Economy17.9
Price13.1
Specific likes:
Styling52.4%
Handling46.1
Comfort35.2
Ride28.0
Economy26.2
Specific dislikes:
No complaints30.0%
Gas mileage13.1
Poor workmanship 7.8
Ineffectual defroster 6.3
Clock doesn't keep time .. 5.3
What changes would you like?
No changes26.1%
Better gas mileage 7.1
More trunk space 5.9
Changed styling 5.6
Change seat shape, comfort 5.0
Workmanship opinion:
Excellent31.0%
Good42.2
Average16.7

Fair 6.8
Poor 3.3
Comfort opinion (front seats):
Excellent51.1%
Very good33.0
Good13.5
Fair 1.9
Poor 0.5
Comfort opinion (rear seats):
Excellent24.9%
Very good39.3
Good24.3
Fair 8.1
Poor 3.4
Had any mechanical trouble?
No58.8%
Yes41.2
What type of trouble?
Defroster11.6%
Electrical10.2
Heater 8.8
Carburetor 8.2
Oil leaks 8.2
Did you repair it yourself?
No96.6%
Yes 3.4

Dealer repairs satisfactory?
Yes64.9%
No35.1
Dealer service opinion:
Excellent30.3%
Good37.2
Average13.8
Fair 6.9
Poor11.7
Number of vehicles owned:
Concord only52.2%
Two cars38.8
Three cars 6.8
Four or more cars 2.2
Makes of other cars owned:
American Motors16.0%
Chevrolet14.3
Ford14.3
Oldsmobile11.4
Buick 8.6
Age distribution of owners:
15-29 years16.0%
30-49 years29.9
50-plus54.2
Would you buy another Concord?
Yes81.4%
No18.6

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

Save twice on cooling costs with Cool Attic® Total Comfort Home Ventilator.

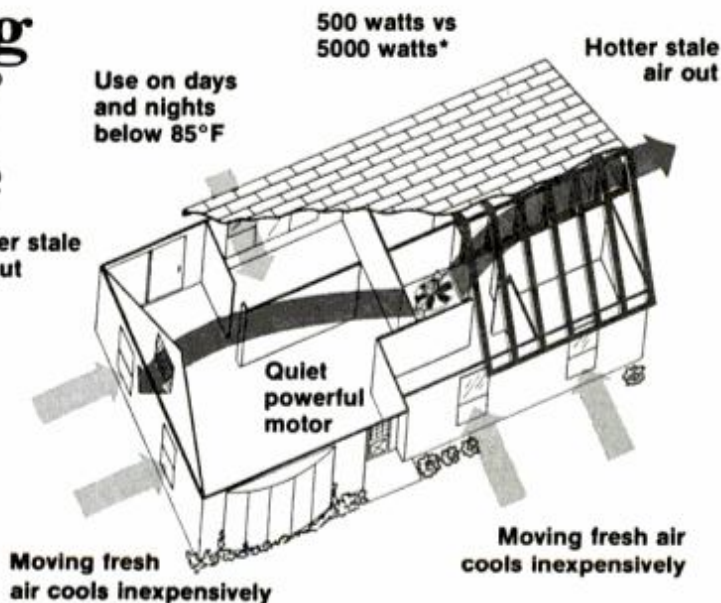
Sure there are days you want air conditioning. But there are lots of days and nights when the temperature is below 85°F and all you really need is a comfortable breeze being pulled through the house.

If you had the Cool Attic Total Home Comfort Ventilator on those days, you could save twice. You could save first because the ventilator uses about 1/10 as much energy as an air conditioner.* You'd save a second time by reducing wear and tear on your air conditioner because it runs fewer days. And in some instances, it eliminates the need of expensive air conditioning completely.

How does the Total Comfort Home Ventilator work? Very simple. When mounted in a central hallway ceiling, the ventilator pulls air into the house through open windows, and exhausts it through the attic. This moving air cools naturally, inexpensively.

The Total Comfort Home Ventilator is also a do-it-yourself dream. It's easy to install with a few household tools. Our easy-to-follow instructions give you the step-by-step details.

Install a Total Comfort Home Ventilator and enjoy its low-cost cooling benefits for years to come. Visit your do-it-yourself center that features the complete Cool Attic line.



*Based on power consumption of selected air cooled, condensing units, 36000 BTU, various manufacturers. Source—1977 Directory, Air-Conditioning and Refrigeration Institute.



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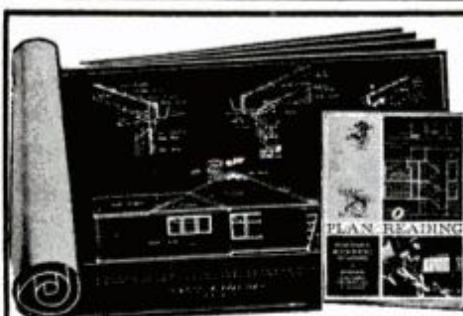
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12 GREAT PLANTERS YOU CAN BUILD

(Continued from page 135)

ible with the varnish that will follow it.

Here's a quick planter-by-planter rundown as they appear on pages 132 and 133:

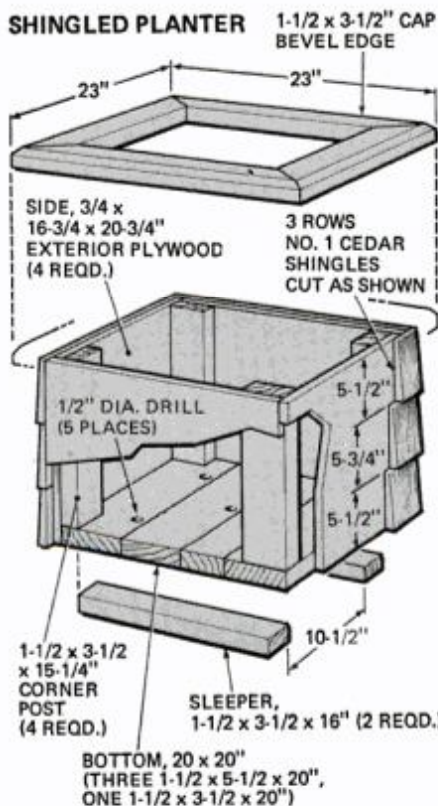
Plant stand for two pots: Our version is 40 in. high and is of nominal 1x4s and 1x2s. Assemble each cross section with a 1x4 that is 17 3/4 in. long and six 1x4s 8 1/2 in. long. Use glue and nails on cross sections and attach the legs with bolts and nuts.

Planter tower: To build the 7-ft. x 24-in. planter tower you will need one and one-half sheets of 3/8-in. APA grade-trademarked 303 rough-

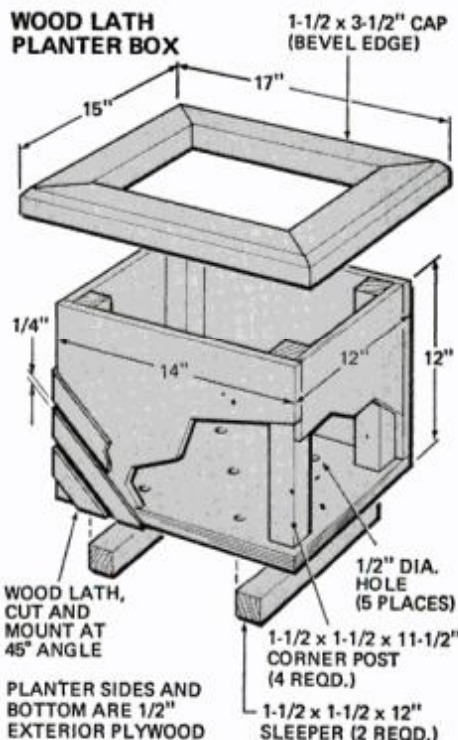
Flowerpot box: This simple little container can be assembled in a matter of hours. For a smooth finish we built ours of MDO medium density overlaid plywood—the same material that is used for billboards. If your lumberyard doesn't stock MDO plywood, make certain you pick an exterior grade of plywood. The box consists of five parts—two ends, a bottom and two side pieces. After cutting parts, sand them smooth and assemble as discussed in General Directions. Because of its interesting contemporary shape, we finished

(Please turn to page 270)

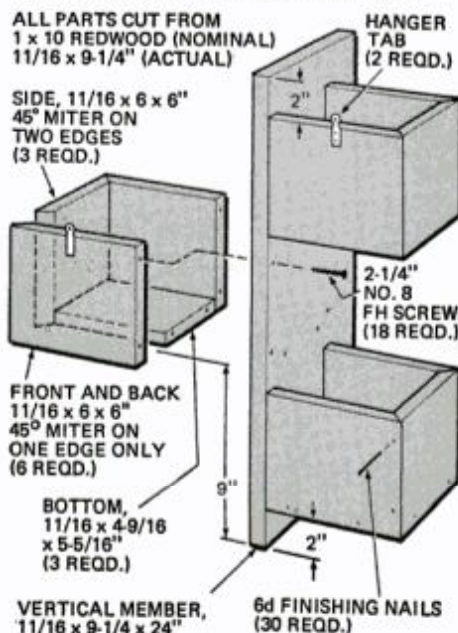
SHINGLED PLANTER



WOOD LATH PLANTER BOX



WALL-MOUNT REDWOOD PLANTER



sawn siding. The tower's attractive accent comes from the siding's grain direction and from the two different semitransparent stains used in the finishing. The framework consists of five 8-ft. 2x2s and three 8-ft. 1x2s. Brushed aluminum flat and angle stock is used for trim (if you want to keep costs down, trim corners with 3/8-in. quarter-round molding). But, even using the aluminum accent trim, the tower can be built for around \$45.

Stain the unit after assembly using the accent colors of your choice. Follow the instructions on the can's label and protect all wood parts with several coats of compatible exterior-grade varnish.

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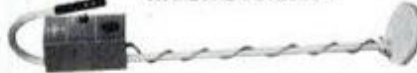
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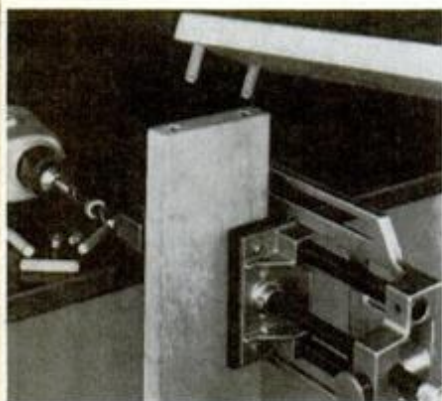
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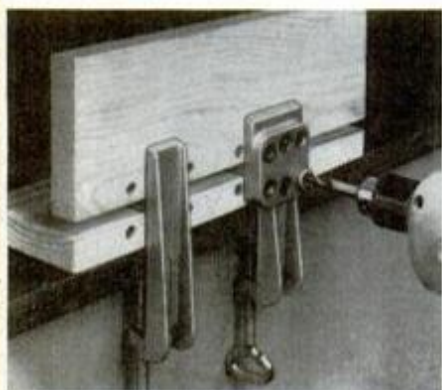
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12 GREAT PLANTERS YOU CAN BUILD

(Continued from page 268)

ours with a coat of exterior primer, followed by a coat of exterior semi-gloss paint.

The wall-mount redwood planter is built of standard redwood. Cut parts as shown in the drawing and assembled with glue and nails. To finish, apply two coats of clear wood preservative.

Mirrored planter: Construction of the frames for the 12 x 12 x 24 3/4-in. double-cube mirrored planter takes a half sheet of 3/8-in. exterior grade plywood plus a little lumber for finishing. Mirror tiles are used to finish. With the latter there is a chance of slight discrepancy in size so, frequently, a bit of cutting will be required to finish the planter in

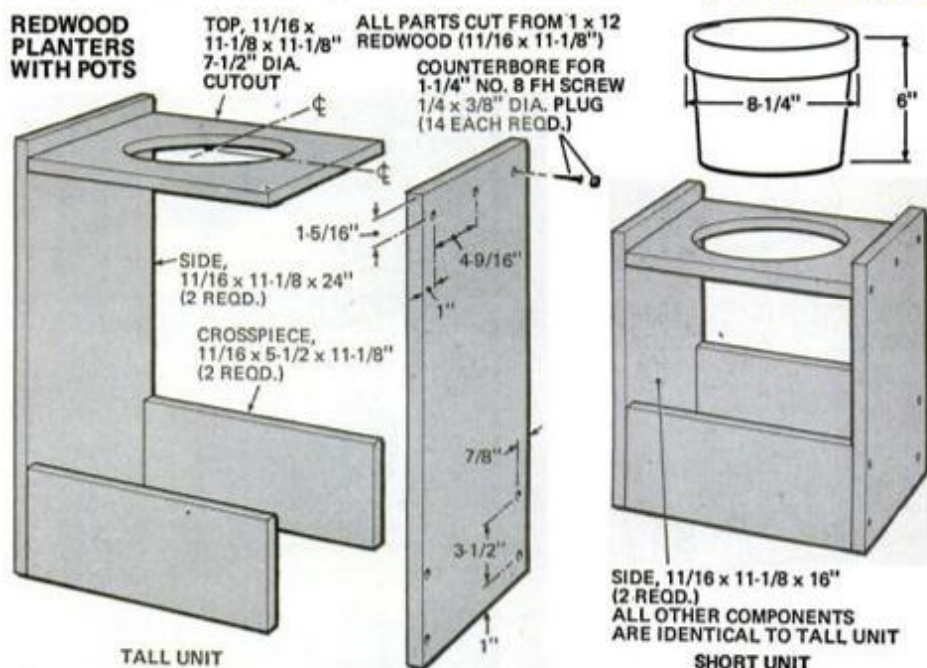
craftsmanlike fashion. If you find it difficult to cut glass, you might consider choosing an optional finish such as floor tile, cork, or carpeting.

Planter tree: The adjustable planter is built from a quarter sheet of 3/4-in. A-C exterior plywood. Here's a tip: if you buy a ready-cut 2x4-ft. handy panel, make sure the grain of the panel runs with the 4-ft. dimension. Buy the plywood, plus a foot or so of 1/2-in. dowel and you're ready to go to work. Total cost of this one is about \$10 (unless you add casters for easy mobility).

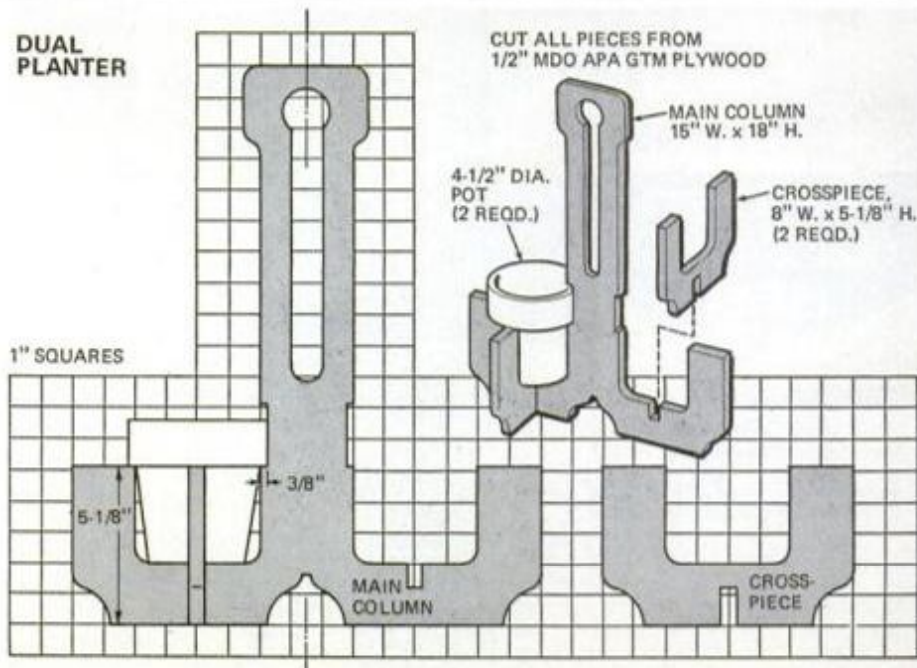
Shingled planter: Use kiln-dried western red cedar for planter bottom and corner posts and 1/2-in. exterior

(Please turn to page 272)

REDWOOD PLANTERS WITH POTS



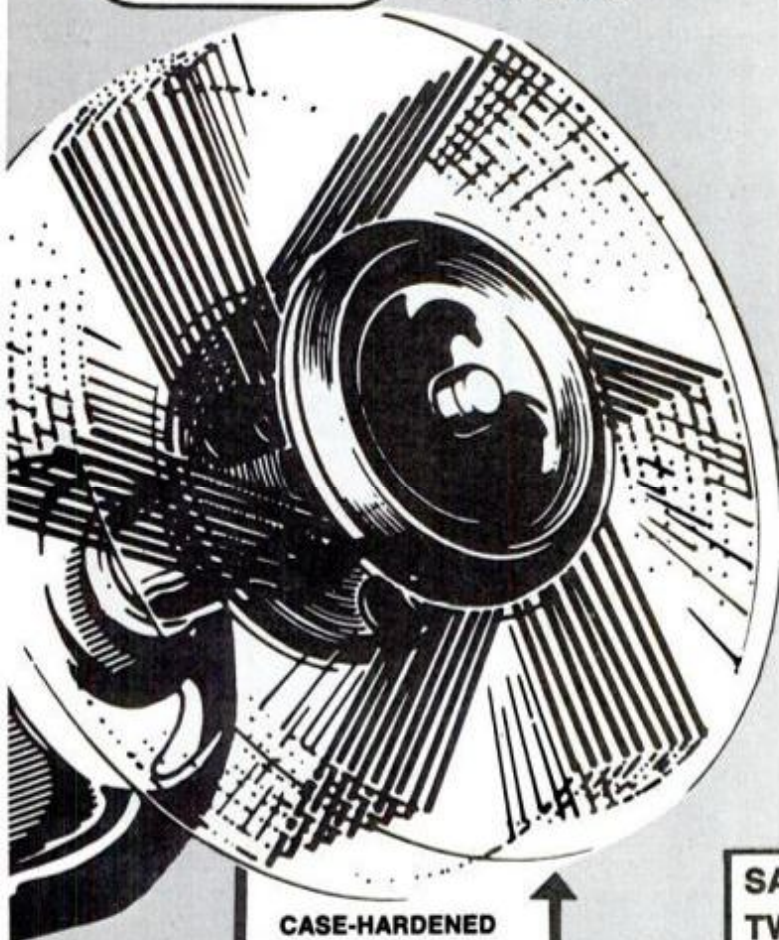
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12 GREAT PLANTERS

(Continued from page 270)

plywood for the box. Install the cap rail using miter joints at the corners and then fasten the wood shingles to the box. Lay out shingles to determine just how much to trim their lengths. Cut all shingles and then affix them to the box using 1/2-in. galvanized roofer's nails. Shingles can be left natural or treated with clear wood preservative. If box will be filled with earth, rather than a pot, seal all inside seams with emulsified asphalt. Bore drain holes in the bottom to obtain a positive runoff.

Wood-lath planter: Construction for this planter is identical to that for the preceding planter. The only variation, of course, is in finish treatment. This one is clad with inexpensive wood lath applied on the diagonal. Because of the laths' thinness, you are well advised to use waterproof glue as well as galvanized 3d nails to attach the wood lath to planter sides.

Three-ring hanger: This whimsical planter can actually be made in minutes. To make it, simply lay out and cut the circles using a sabre saw. Bore for twine holes as indicated, sand smooth, and then paint with exterior latex paint.

Redwood planter: All parts for both versions of this planter are cut from nominal 1x12 clear all-heart redwood. Notice that there is no fancy joinery called for here—just straightforward cutting and assembling. Do these steps following the suggestions outlined under General Directions.

Dual planter: To make this 8x15x18-in. planter you will need a 2x2-ft. sheet of MDO or A-C plywood. A sabre saw isn't a must, but surely can make this project go faster. Build it in the morning, paint it in the afternoon, use it the next day. Cost, about \$5.

Redwood and cedar: This rugged planter, propped with your favorite small tree or the like, will quickly become the focal center on your patio. Cut all parts to size and sand them before assembly. Make angle cuts on cedar post tops and sand. Next, carefully lay out and cut the notches in the planter sides. (Note: Since notches aren't visible, they can extend for a slightly greater length than shown).

Start assembly by interlocking the four sides. Bore holes in the sides for lagbolts, hold legs in position and mark lagbolt locations. Bore pilot holes in legs, then attach legs. Finally, glue and nail bottom supports in place and drop in the bottom. **FM**



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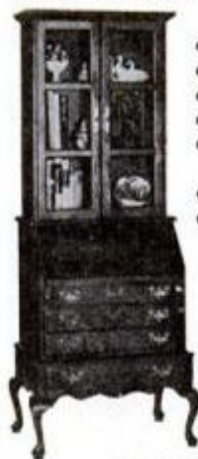
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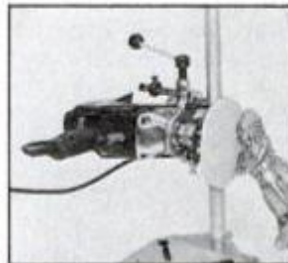


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What you should know about your new homeowners insurance

There are important changes in the latest policy provisions that can benefit you—if you're aware of them.

by George T. Frazier

On Jan. 1, 1976, a new type of home insurance policy was introduced on a trial basis in six states—Colorado, Georgia, Illinois, Nevada, Ohio and Vermont. By the end of 1978, this new policy, known as "Homeowners '76," will be *standard* in all 50 states.

There are both major and minor changes in the new policy. Some of them will benefit homeowners if they are aware of them. Other changes remove coverages that existed in older policies. Again, homeowners must be careful. They may no longer have protection in areas they have been taking for granted. Let's take a guided tour through Homeowners '76 and see what the significant changes are.

The most noticeable change in Homeowners '76 is in the language. There isn't a single "party of the first part" in the entire document. Instead, you see words like "we" (meaning the insurance company) and "you" (meaning the policyholder). There are 40 percent fewer words in the new policy and the type is 25 percent larger. The language is easier to understand. While you won't prefer your policy to a novel, you will understand what you're reading and the wording isn't so stilted and dull that you'll be bored to death.

The good news

Besides the verbal facelift, there are definite pluses and minuses. In the plus column are expansions of existing protection and coverage of other items that were not included before.

■ Coverage on trees, shrubs, plants and lawn has been increased from \$250 maximum to \$500.

■ In the past, the homeowner's policy provided no protection for losses incurred through credit card theft,

forgery and counterfeit money. If you wanted protection in these areas, you could only obtain it in the past at extra cost. Homeowners '76 has this protection added—up to \$500 in losses, without charge.

■ Personal property is covered, worldwide, for up to the face value of the insurance policy. This covers luggage or other possessions lost or stolen while vacationing or away on business. Previously, there was a restriction on this coverage. Older policies were limited to 10 percent of the policy value for such losses.

The 10-percent lift is still in effect in Homeowners '76 for possessions lost in a second home owned by the insured. But if you own a vacation home, you probably have that insured separately, so there is no problem on that score.

■ You will be able to replace broken glass with more expensive safety glass, if the law requires it, and the tab will be picked up by Homeowners '76. Previous policies covered only broken glass costs based on the type lost. If you had to replace your broken glass with safety glass, you paid the difference.

■ Tape decks, CB radios and other sound equipment *not* permanently installed in your car are now covered by Homeowners '76. This is an important addition, since most auto insurance policies specifically exclude coverage on such equipment if it is not permanently installed. So your slide-out electronic units are covered, but the tapes themselves are not.

If you're planning to have a CB installed, send the information to your insurance agent. He should receive a copy of the sales invoice with the serial number, cost and model number. If it is to be permanently mounted (bolted securely to the car), your auto insurance agent should receive the data. If you already have this equipment in your car, check with your agent to find out what insurance company practices are regarding coverage of the gear. This coverage can vary from company to company.

■ Homeowners '76 covers the property of a student living away from home, provided the loss occurs at least 45 days after he or she has moved to the temporary quarters. Older policies didn't spell out what

protection existed for students in dormitories.

■ If there are fire department charges connected with nonfire occurrences, such as windstorm or lightning damage, Homeowners '76 will pay the bills.

■ There's been an expansion in coverage for debris removal in Homeowners '76. Older policies lumped property loss and debris removal together and you were covered up to the face value of the policy. Now, if the cost of debris removal boosts the amount of loss beyond the policy limit, another five percent over the limit is added to cover the cost of removal of this debris.

■ Another gray area that has been cleared up has to do with grave markers. Homeowners '76 covers them up to a limit of \$500. This wasn't spelled out clearly in older policies and, often enough, if there was damage to a grave marker, it was your loss.

■ In connection with injuries that are covered by your homeowner's policy, the time limit for rendering bills for resulting medical expenses (medication, surgery, braces and so forth) has been extended from one year to three years from the date of the accident.

■ If you are required to spend time in court in defense of a claim, Homeowners '76 will reimburse you for loss of earnings of up to \$50 per day. This is an expansion of the \$25 per day reimbursement limit in previous policies.

■ There is a new endorsement that you can add to the "personal injury" coverage of Homeowners '76. You can now have protection against liability claims from libel, false arrest and invasion of privacy. Let's say, for example, you mistakenly accuse someone of a crime and, as a result, he or she is arrested. If the person is cleared and then files suit against you, you have some protection if you have added this endorsement.

The bad news

So far, I've spelled out all of the coverage added or expanded by Homeowners '76. Now let's look at those areas where protection has been reduced.

■ The theft coverage on silverware, guns and gold objects—not jewelry

or pure metal—is now limited to \$1000 in Homeowners '76. Previously, these items were protected up to the full policy limit on contents. If you want additional coverage beyond what is now offered by Homeowners '76, you can get an "all risk" endorsement added to the policy. Cost for this added coverage will be about \$2 per \$1000 of insurance for silverware, with a minimum value which, though it varies from state to state, will amount to approximately \$5 a year.

Other items can be considerably more. A gun collection can be protected for about \$20 per \$1000 of insurance—about 2 percent—per year.

■ There's some bad news for authors: Coverage against the loss of manuscripts has been reduced from \$1000 to \$500.

■ Rowboats and canoes are no longer covered for damage by wind if they are left out in the open. Wind-storm coverage does apply if they are located in a fully enclosed building or shed. If you have room in your garage, you would be well advised to keep your small boat there.

■ If you rent some of your property and something is stolen from those premises, you're not protected. If you rent a room or shed to someone on an occasional basis, you can get coverage through a separate endorsement—for an additional premium. Contents of such rented quarters would have to be insured specifically for fire and theft.

All told, we're better off

There's been no change in certain areas. Homeowners '76, like older policies, maintains a \$100 limit on loss of money. This limit also applies to gold, silver and platinum. The \$500 limit on jewelry, including items made of gold, silver and platinum, is the same as before. The \$500 limit on coverage also applies to watches, furs and gems. As mentioned earlier, this coverage can be bolstered by obtaining "riders" or endorsements. The cost is relatively small for the additional protection involved.

By and large, Homeowners '76 represents an improvement and, no matter how we feel about it, it is, or will soon be, "the law of the land." The language is simpler and more things are covered—distinct pluses. A few items that were insured before are now eliminated or have reduced coverage. At relatively low cost, you can cover the few gaps that have been created. Overall, in terms of insurance protection, we're a lot better off. **PM**

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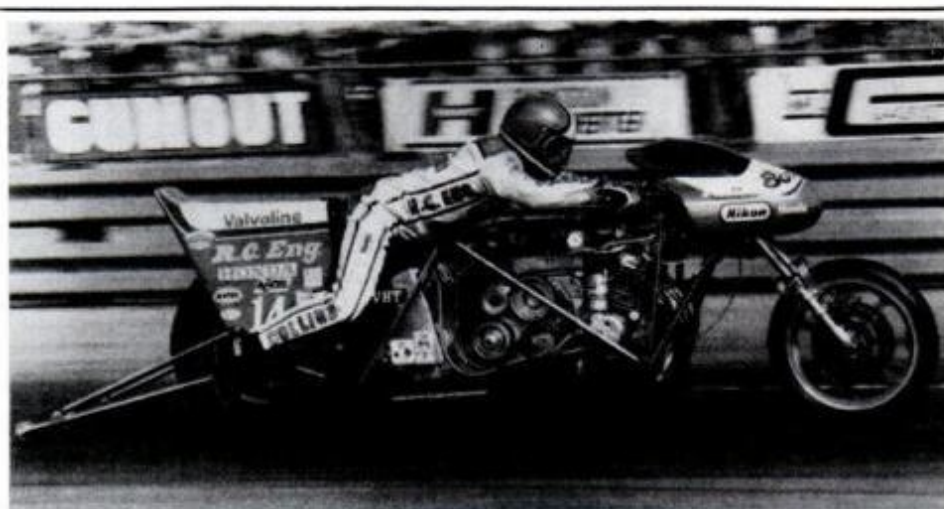
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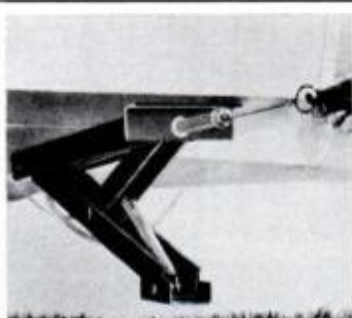


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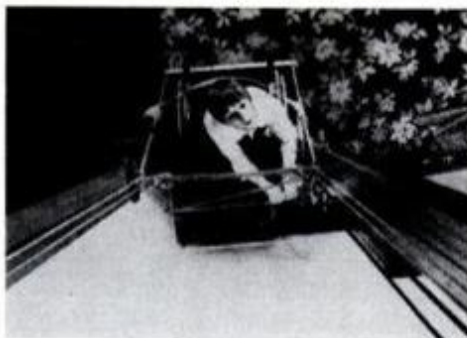
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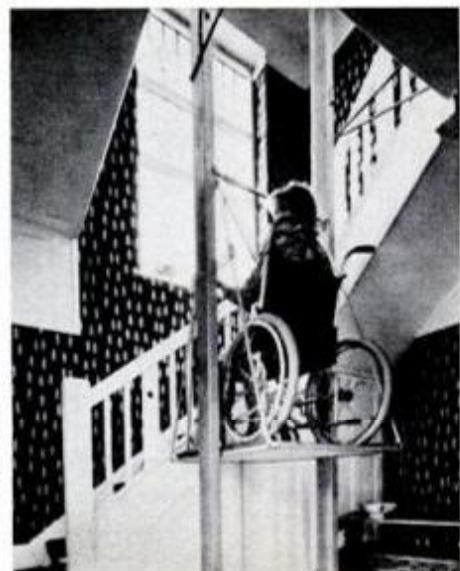
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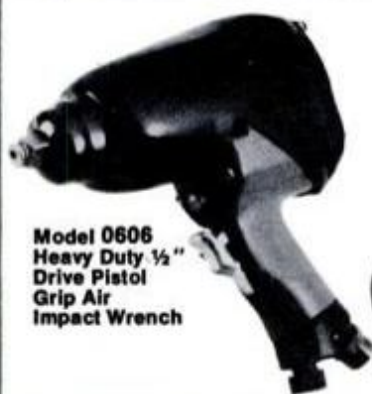
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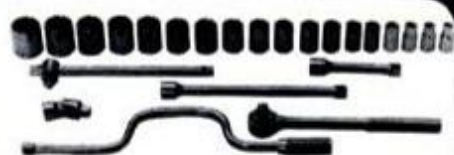


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(Continued from page 107)

were attacking cities throughout Canaan, slaughtering men, women and children and putting the torch to cities, in pursuit of the land God had promised them. After Jericho and Ai, they moved on to subdue a string of Canaanite towns. Nearby Bethel probably was next. Hazor, north of the Sea of Galilee, probably would have been among the last. Both have been excavated and Biblical accounts confirmed. Deep in the ruins of Bethel, in layers dating to Joshua's exploits, excavators exposed evidence of a great holocaust. Adobe was baked lobster red, stones were calcined and ash lay 5 feet thick.

As for Hazor, the Bible states that Joshua—

... took Hazor, and smote the king thereof with the sword . . . and smote all the souls that were therein with the edge of the sword, utterly destroying them . . . and he burnt Hazor with fire. Joshua 10: 10, 11

Excavations made in the last decade by Yigael Yadin, on a tell, north-east of Nazareth, uncovered ruins of a large city that proved to be Hazor. In layers dating to the 13th century B.C., diggers again found evidence of devastation and fire.

A curious recent find possibly relating to Joshua's conquests is a collection of broken plaster bits with script dating to about 600 B.C. that turned up in Jordan. Pieced together, jigsaw puzzle fashion, the inscription appeared to document the curses and prophecies of a non-Israelite prophet named Balaam. The occasion of the uttered curse was readily identified in the biblical book of Joshua.

Then Balak the son of Zippor, King of Moab, arose and warred against Israel, and sent and called Balaam the son of Beor to curse you. But I would not harken unto Balaam. Therefore he blessed you. Joshua 24: 9, 10

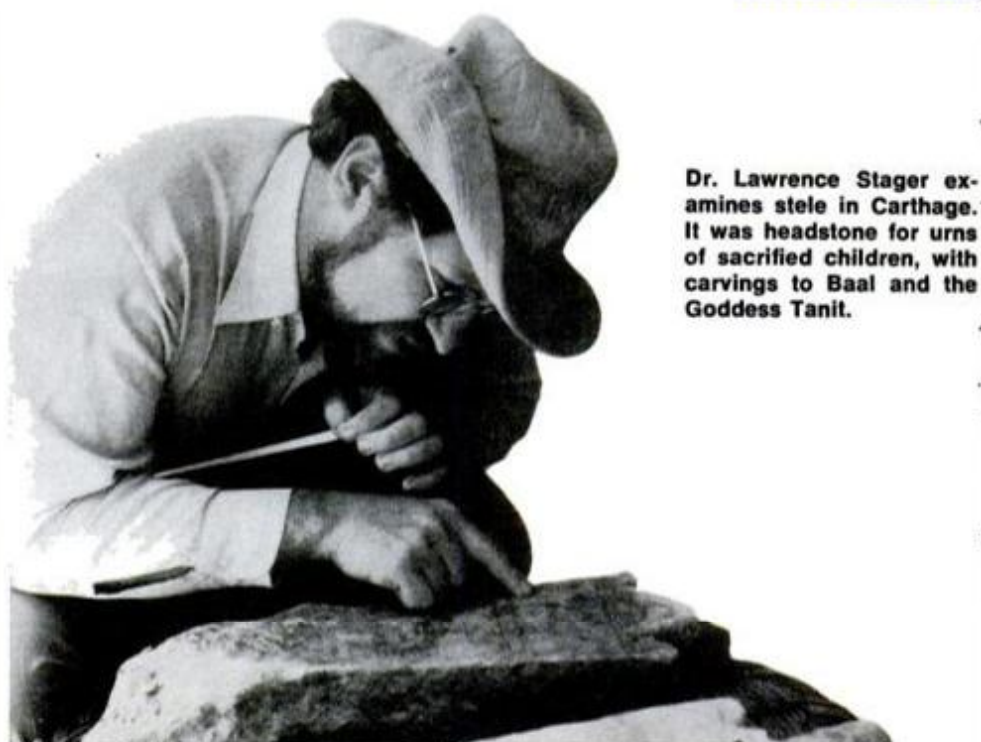
The newly discovered inscription records Balaam's curse, along with the response of his listeners (in red) and the prophet's blessing, just as reported.

Eventually, many enigmas posed by some Biblical accounts may be answered, thanks to sophisticated modern archaeological techniques. Today, before mining through successive layers of a likely mound, aerial infrared photography may be used to reveal otherwise invisible contours, indicating subsurface aberrations. Modern diggers may also use coring drills to sample the centuries layered beneath their feet before excavating. At any stage of a dig they can pinpoint "where they are" in history, within a handful of years.

Pottery dating, an old technique, still is used to determine not only the age of a layer, by the vessel's shape and decoration, but texture and colors of clay can indicate where it was made. For more accuracy in locating the source, small samples of an object can be bombarded with neutrons in a nuclear reactor. The isotopes formed for each element in the sample—even the rarest—give off their own energy profile of gamma rays. Then chemical fingerprints can be used to group pottery from objects that may look nothing alike, but come from a common clay source."

For older dating, samples are sub-

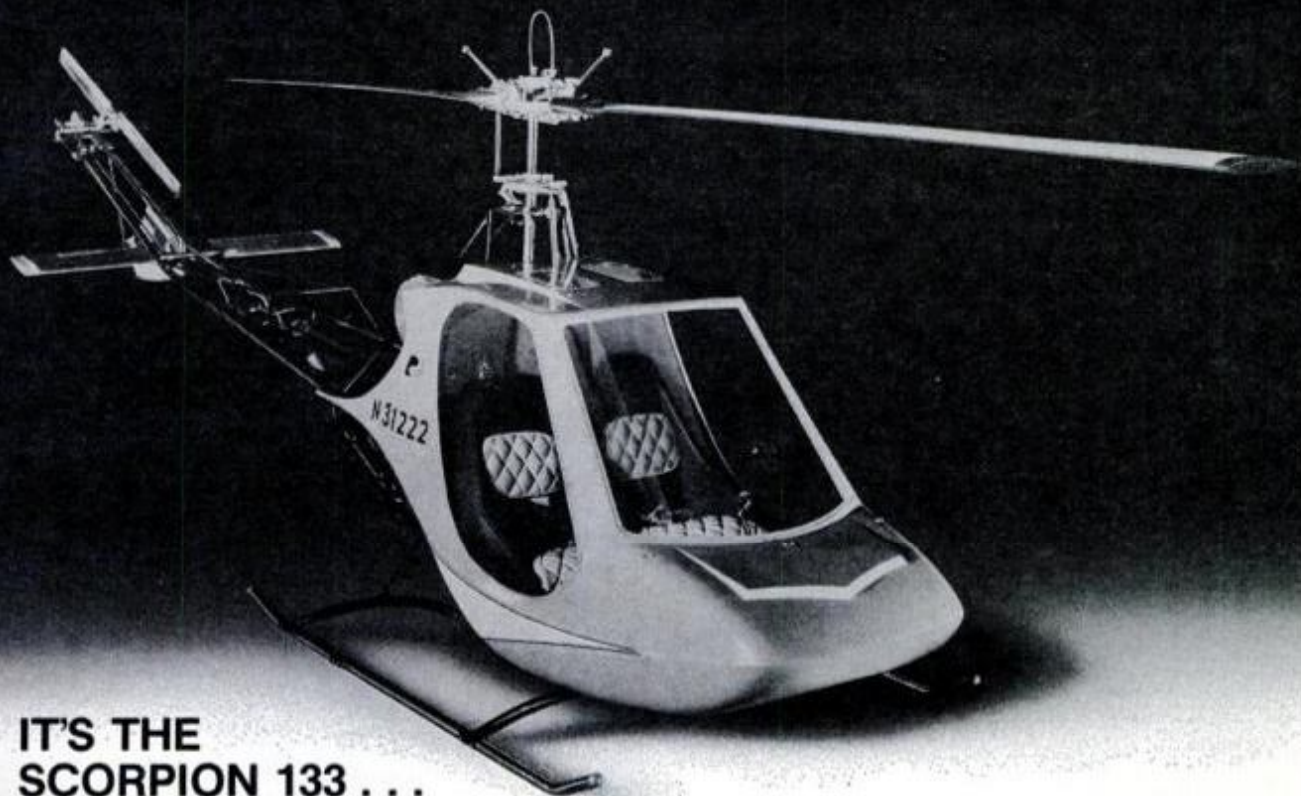
(Please turn to page 280)



Dr. Lawrence Stager examines stele in Carthage. It was headstone for urns of sacrificed children, with carvings to Baal and the Goddess Tanit.

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(Continued from page 278)

jected to carbon 14 tests. "Nowadays," says Dr. Stager, "we find that we can get even more precision by taking carbon 14 dates from old bristlecone pines, and use those to correct the calibrations for our carbon samples. This way, we go back 7000 years, accurate to within a century.

Wherever archaeologists pursue their dusty endeavors today, you're apt to see them dumping shovels of earth into odd-looking tanks afoam with suds that float what Dr. Stager calls "the light carbon fraction—such as seeds, grains and food remnants. These reflect the economy and life style of an ancient people—a help in determining who was living in a given place at a given time.

In his cramped office at the Oriental Institute, cluttered with journals and boxes of sherds, Dr. Stager thumbs through thousands of color slides to illustrate points in a fascinating narrative of more than a dozen years of Holy Land expeditions he has led or accompanied.

"Most people," he observes, "think that the emergence of the people who became Israelites began with the group that followed Moses out

of Egypt. Archaeological evidence indicates that they included many more tribes, scattered throughout all of ancient Canaan. The Exodus tribes may have provided the nucleus that drew them together, but it was only a small fraction of this unique people."

Stager-supervised expeditions explored more than 100 settlements founded for the first time in the period of Judges in the desolate hills north of Jerusalem, established by the same people, he says, who later became Israelites. "They developed agricultural terraces on hills formerly and sparsely occupied by Canaanites, and farmed with expertise," he points out.

"These were not simple sheep herders or camel-riding nomads. Their architecture was like that in the coastal cities—dwellings with a roofed area supported by pillars, and open courts."

A sidelight the archaeologist likes to emphasize is that the script of Israelites and Canaanites was the same. "Their differences," he says, "were primarily religious and social. The Israelites believed in one God—Yahweh. And they were hill groups, who may have been breaking away from centralized urban politics and strife."

Where the original Hebrew patriarchs came from was pretty well established as Mesopotamia for a while, due in part to many references in the Bible connecting the names of some ancients with the Mesopotamian city of Ur, plus the discovery in ancient Mari of a reference to a lost city of Haran in Mesopotamia. The Bible says:

And Terah took Abram, and Lot . . . and Sarai . . . and they went forth with them from Ur of the Chaldees, to go to the land of Canaan; and they came unto Haran, and dwelt there . . ." Genesis 12: 31, 32

More recently, however, on a large mound known as Tell Mardikh on the North Syrian plateau, a University of Rome team under Professor Paolo Matthiae, is still at work on their discovery in the city of Ebla. The fabled capitol of a



Modern archaeologists use aerial photography to reveal possible sites of long-buried ruins, which will mark surface.

2500-B.C. state commanded trade with every major center in the ancient world. In 1975, the expedition uncovered an archive of 15,000 complete tablets. This library in clay holds many keys to Biblical enigmas and is now being assembled and translated.

"The real surprise," says Dr. Stager, "is that the language is a new one, containing root words and names appearing much later in Biblical Hebrew; a new civilization dating to 2500 B.C.—the oldest ancestor of Hebrew we know. These finds will revolutionize everything."

"The texts mention names like Abraham, David, Saul, Israel and possibly Yahweh. There was a king named Eber—a name mentioned in the Bible:"

Unto Shem also, the father of all the children of Eber, the brother of Japheth the elder, even to him were children born. Genesis 10: 21

Their gods were Dagan and Baal; The tablets mention Dagan of the Canaanites, and later the Philistines, whose temples Samson pulled down.

The implication, of course, is that the patriarchs may well have stemmed from Syria, not Mesopotamia, and spread south and east through the Fertile Crescent—a sickle-shaped arc of land sweeping up from southern Palestine, through Syria to the Tigris and Euphrates Rivers, then swinging down through Mesopotamia to the Persian Gulf.

Wherever their beginnings, evidence of their appearance in central Palestine was unearthed 20 years ago by a team from Harvard University, Drew University and McCormick Seminary, under the late Dr. Ernest Wright, curator of Harvard's Semitic Museum.

Excavating the ruins of Shechem, a city state of great importance on a trade route north of Jerusalem, the group found artifacts and coins indicating that a large courtyard there had been used as a shrine by the wandering believers in Yahweh, between 1800 and 1700 B.C. The discovery confirmed a Biblical reference:

And Abraham passed through the land into the place called Shechem . . . and the Canaanite was in the land. And the Lord appeared unto Abraham and said, unto thy seed will I give this land: and there



Ebla's archive of 15,000 tablets, filled with Hebrew root words and names, may place the origins of the patriarchs in Syria.

he built an altar unto the Lord. Genesis 12: 6, 7

Some of the wandering tribes pushed on into Egypt, where they were held in bondage to provide a pool of forced labor for Rameses II. Artisans in colorful Semetic attire appear in Egyptian wall paintings prior to that period.

That bondage ended with Moses and the Exodus through the desert of the Sinai, where survival was touch-and-go. Skeptics had thought the Bible leaned a little heavily on miracles to get the Jews across the wilderness. A passage dismissed as "a little much":

"And when the dew that lay was gone up, behold upon the face of

the wilderness there lay a small round thing, as small as the hoar frost on the ground. And when the children of Israel saw it, they said one to another, it is manna: for they wist not what it was. And Moses said unto them, this is the bread which the Lord hath given thee to eat." Exodus 16: 14, 15

As it turns out, it could have been true. A zoologist discovered in 1927 that a minute insect living on the shrubs of the desert exudes droplets of a sweet solution that solidifies into sticky white globules rich in carbohydrates. A pound of the substance can be gathered with ease by one person in a day.

It was after the Exodus, when the Israelites came out of the desert and began spreading through Canaan under Joshua's leadership that archaeologists find evidence of their movement northward, through the western horn of the Fertile Crescent. The discovery in Shechem of a monolithic stone by Dr. Wright provides an interesting sidelight to the Hebrew migration, and carries a specific Biblical reference.

So Joshua made a covenant with the people that day, and set them a statue and an ordinance in Shechem, and Joshua wrote the words in

the book of the Law of God, and took a great stone and set it up there under a great oak, that was there in the sanctuary of the Lord. Joshua 24: 25, 26

The stone is there today, re-erected on Shechem's temple mount.

The subsequent trail of migrating tribes from this point is the one of carnage and burned-out acropolises blazed by Joshua, according to Biblical record, with some archaeological backup. But in those days the Israelites were not the only aggressors on the march. The Philistines with their new iron weapons had sailed down from Aegean islands to attack Egypt. Defeated by Rameses' armies, they moved up the Mediterranean coast, laying waste to some cities, occupying others, and creating a time of terror that still reverberates in history. The bronze swords and spears of their Canaanite opponents were butter knives by comparison.

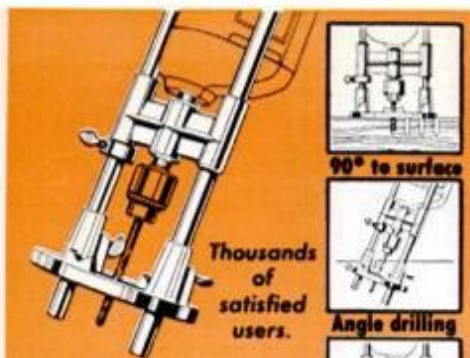
During those strife-ridden years, according to the Bible, not all the faithful were necessarily convinced that Yahweh, the one God, was really enough when the going got rough. Moses had his golden idol worshipers to contend with. There was

(Please turn to page 282)

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(Continued from page 281)

backsliding here and there to sneak in a sacrifice to Baal, or set up altars to Asera (a Canaanite goddess associated with Baal).

Unique 'other gods'

Dr. Stager noted an inscription during recent excavations at an important site near Kadesh-Barnea—southernmost outpost of the Levites—which says: "Blessed be Yahweh and his Asera."

"Here we have an icon," he observes with a chuckle, "of a famed female deity on a throne—and worshippers—in a southern settlement of Levite priests who are in charge of the outposts of Judah! A female deity in the Israelite religion!"

"It's why," Dr. Stager adds, "they had reformers like Hezekiah and Josiah."

Not as amusing are the Herodian finds of archaeologists, near the West Wall of Jerusalem—the lidded stoneware jars that were inscribed with a single word: "quorban" (sacrifice).

According to Jeremiah, Topheth, in a valley near Jerusalem, was where some Judean kings were regularly practicing child sacrifice—until they were brought up short by the prophets.

This was a Phoenician custom, Dr. Stager emphasizes. During re-

evil again in the sight of the Lord; and the Lord delivered them into the hands of the Philistines forty years. Judges 13: 1

Throughout the Holy Lands, layers of this period in the ruins of Israelite cities contain many Philistine artifacts—again confirming the Biblical record.

It was a good 30 years before the Israelites were able to reorganize under King Saul, a warrior who helped re-establish them in their Palestinian walled cities.

Later, with the arrival of David on the scene, another era of Israelite conquest was under way. He shattered the Philistines and extended Judean power from Beersheba to Dan. He laid siege to Jerusalem and conquered it from its Jebusite inhabitants.

Rebuilding of Jerusalem

This marked the start of the Israelites' real growth, and Jerusalem became the seat of Hebrew life. The Biblical record describing how David's armies rebuilt a lost kingdom is established in written records found in archives of Egypt and Mesopotamia. Some of his rebuilding of "the city of David" is chronicled in the Bible. Remains of his "House of the Mighty Men" (Nehemiah 3: 16), "David's Home of Cedars" and "David's Tower" (Song of Songs 4: 4) have been found in excavations by Dr. Kathleen Kenyon, director of



An Arab boy who fell in the Pool of Siloam discovered the tunnel feeding it. Investigators later found this inscribed stone far up tunnel. Legend states that, at this point, King Hezekiah's engineers heard each other mining the rock and broke through.

cent excavations in Carthage, he and his team unearthed 200 urns containing charred bones of infants one to three years old.

"They put a lid on it," he says, "then dug a hole and erected a monument saying, 'to Baal,' or 'to Tanit,' the goddess, and gave the name of the parent who sacrificed the child."

That the practice cropped up occasionally in Judea is acknowledged at several places in the Bible.

And he defiled Topheth, which is in the valley of the children of Hinnom, that no man might make his son or his daughter to pass through the fire to Molech. II Kings 23: 10

Such infractions of the law could not be tolerated. The Bible reports:

And the children of Israel did

the British School of Archaeology in Jerusalem.

Under Solomon, more building was accomplished, and Judah reached its zenith as a power in international trade. Evidence of Solomon's rebuilding throughout the kingdom was uncovered recently by excavations in Hazor, under Gen. Yadin, in Gezer, by the Oriental Institute under Dr. William Dever with Dr. Stager as supervisor, and in Megiddo (previously explored by the Institute). All three have identical city gates, which are also identical to Solomon's gate in Jerusalem (see photo). The rebuilding of these town walls and their unusual gates is described in the Bible:

And this is the reason of the levy

which King Solomon raised; for to build the house of the Lord, and his own house, and Millo, and the wall of Jerusalem, and Hazor, and Megiddo, and Gezer."

Ancient archives and cuneiform inscriptions found in excavations throughout Egypt, Mesopotamia and Assyria, bear out much Biblical history from the reign of Solomon onward. The campaigns of Sennacherib, out of Babylon, against Jerusalem, found recorded on stelae at Nineveh, read almost like those of Hezekiah, recorded in the Bible. So do the records of Nebuchadnezzar.

For Hezekiah, the Biblical accounts are particularly well documented by archaeological finds in Jerusalem. For years there was controversy among archaeologists about when Jerusalem expanded to include within its walls the suburbs of Mishne on the western hill. Recent excavations have revealed a huge wall, seven meters wide, built in Hezekiah's time. Teams under N. Avigad have uncovered 40 meters of it, extending southward, then turning to encompass the western hill settlements, and swinging again to bring the Pool of Siloam—Jerusalem's water supply—inside the city for the first time. Another Bible story is confirmed.

Hezekiah . . . who built up all the wall that was broken, and raised it up to the towers, and built another wall without. II Chronicles 32: 5

Hezekiah's vast tunnels, designed to bring water from the Spring of Gihon into the city (see photo) are extensively chronicled in the Biblical accounts.

And when Hezekiah saw that Sennacherib was come, he took council with his princes . . . to stop the waters of the fountain which were without the city. So there was gathered much people together, who stopped all the fountains, and the brook that ran through the midst of the land, saying, why should the kings of Assyria come and find much water? II Chronicles 32: 2-4

Site of Solomon's mines?

While a lot of Biblical history has been verified archaeologically in the past half century, work still goes on. Recently, U.S. Geological Survey scientists aiding Saudi Arabian development surveyed the Mahd adh Dhab (Cradle of Gold) area between Mecca and Medina. They found enough ore to suggest that it would qualify as Solomon's fabled Ophir. The site lies on a trade route not far from the Biblical port of Ezion-Geber, that would have been used by Solomon's ships. Thousands of stone hammers and grindstones were

found, dating back to a time when, the scientists believe, abundant surface deposits of nuggets and gold-bearing ore would have been accessible to such tools, and in quantities that seem to finally confirm the Biblical account.

And they came to Ophir, and fetched from thence gold, 420 talents, and brought it to King Solomon. Kings 9: 28

Recent discoveries

"A lot has happened in the last two years," says Dr. Stager, "and we've barely scratched the surface. Our froth flotation machines are telling us more about the people who lived in the ruins we probe, which changes the whole archaeological picture.

"Fragile plant remains reflect prehistoric life. We've found that wheat and barley were used from 7000 to 3000 B.C. alternately with legumes. There were no fruit trees. After 3000, you find grapes, so we know there was wine. We've floated up olive seeds from the third millennium, so there was olive oil. There were dates and pomegranates. The Mediterranean had developed a grain and fruit economy. We found things attributed to the Romans we now know were Phoenician. No one ever knew they were so advanced horticulturally.

Ancient pot smokers

"At Carthage we recovered poppy seeds, suggesting opium use. That got us looking for more evidence. We soon found that drugs were used in temple rites. In Lebanon, a big jar of marijuana was found in a temple ruin. In Crete a terra-cotta goddess was found with three big opium bulbs sprouting from her head, so the practice of using opium was widespread."

Dr. Stager foresees more dramatic advances in techniques, using a combination of NASA satellites and laser beams.

"By scanning a satellite picture of a known trail or ruin with laser light and getting a certain light pattern, you scan the rest of the photo," he explains. "Wherever there's a similar light pattern, you may have another trail or ruin that's invisible to the naked eye."

Will all these things help to validate the Biblical record? In some cases, yes. In others, probably not. But any Biblical archaeologist will tell you that, whether or not Bible stories are verified, The Book already has proven itself a useful touchstone to the archaeological jigsaw puzzle of the Middle East, as well as a document of faith for the faithful. **PM**

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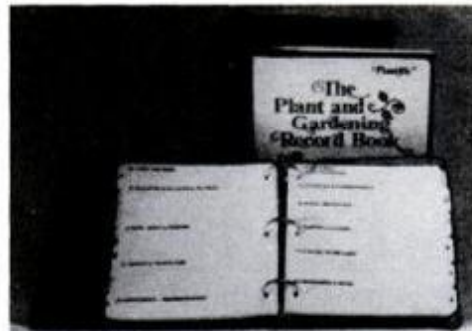
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Keep a track record of your plants' progress and basic cultivating information at hand in the Plant and Gardening Record Book. The \$8.95 volume has an alphabetical index and record sheets with space for plant descriptions, planting and care details, harvesting and results data, conclusions and recommendations. From La Crosse Associates, Golden, Colo. 80401.



The 4-speed, rear-mount tiller by Roto-Hoe tills a 16-in. wide strip. It's chain-driven with a 5-hp Tecumseh engine. Furrowing, snow-throwing and shredding attachments afford year 'round use. Model 910-CD, \$428. Roto-Hoe Co., 100 Auburn Rd., Newbury, Ohio 44065.

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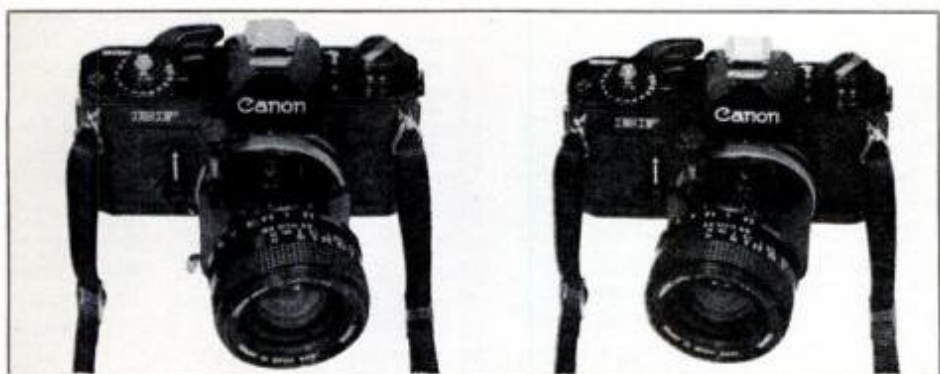
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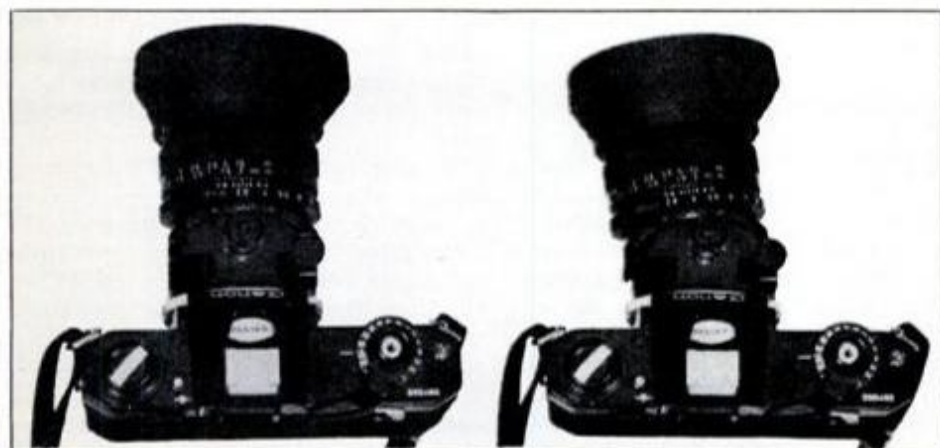
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PM LOOKS AT CANON'S TILT AND SHIFT 35-MM LENS



Turn knob to shift lens off optical axis. Scale on top gives an accurate guide.



Lens can be rotated 90° as shown here. Views from above show the lens being tilted in the horizontal plane. This versatile lens almost shoots around corners.



For arty or unusual shots, tilt, shift and rotation can all be brought into play.

I found out about this fascinating lens during a routine trip to my camera shop. Since the lens does at least some of the things that I could accomplish only with a 4x5 view camera, up to now, I checked it out.

Basically, what the lens brings to your shooting is the capability to shift off the optical axis for correction of perspective distortion. Additionally, it can be tilted, on or off axis, to increase depth-of-field at *any* aperture—which previously could only be accomplished with a view camera.

Though this lens is used most in large-scale architectural photog-

raphy to avoid distorted structural lines, I found it especially good for tabletop shooting, the kind that I do most often when photographing home workshop articles. The series of three photos shown on page 286 illustrates what you see when you shift the lens.

To shoot this series I set up several shop items on seamless paper and affixed the TS 35 lens to my tripod-mounted Canon EF. The three exposures were made with the lens shifted maximum right,



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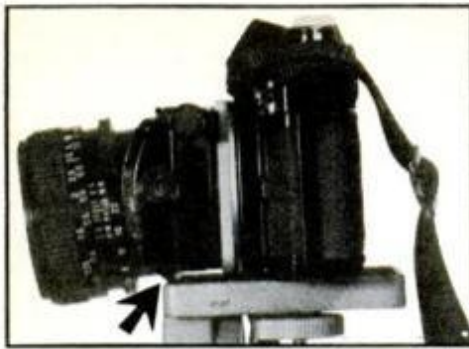
It's the ultimate torch! Like a professional rig, the new Bernzomatic Oxygen Cutting/Welding Torch can cut, weld, braze and solder, yet is much handier and easier to use. It's totally portable and fits easily into tight spots not easily accessible with a professional rig. It's even styled like a professional rig and uses real oxygen and either propane or Mapp gas (Reg. trademark Airco, Inc.) supplied in separate cylinders.

What's more, you can use it for all types of indoor and outdoor household repairs, from plumbing to jewelry-making, and for auto body work and van conversion.

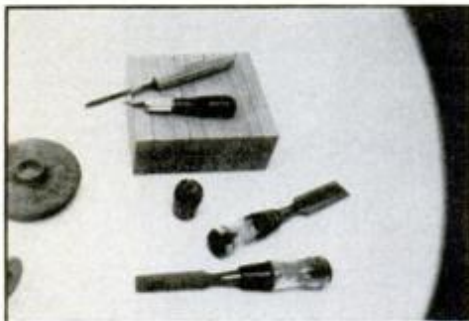
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Fault: Full tilt-down was impossible on author's tripod, mandates using a spacer.



Through-the-lens look at the TS 35's shift range: At top, the lens is shifted fully to the left (improper lens hood was mounted on camera to illustrate point); center, on target; above, with lens shifted to the right of axis. Reasonably fast lens— $f/2.8$ —has an $f/22$ minimum aperture which can be focused as close as 12 in. The lens's angle of view is $64^\circ/79^\circ$.

the lens shifted maximum right, left and dead center.

Conclusion: This is a fine piece of equipment for serious amateurs and professionals who shoot a lot of architectural or other photography calling for distortion correction and increased depth of field.

The recommended list price for this luxury is \$695, but if you shop around a bit, you may find dealers offering it for less.—*Harry Wicks, Home and Shop Editor*

SUPER WINDMILLS

(Continued from page 119)

ing turret but does not swivel freely. The turret is motor-driven at a slow rate through elaborate computerized controls programmed to respond to gradual, long-range changes in wind direction rather than short-lived, sudden gusts. Thus the rotor is prevented from whipping wildly back and forth in rapid, random wind shifts that reduce efficiency and impose heavy structural loads on the rotor blade.

In the Mod-O and Mod-OA machines, the rotor is designed to kick in automatically at a wind speed of 8 mph. The rotor blades have variable-pitch control like the propellers on piston-engined aircraft. At start-up and in low wind speeds, the blades are steeply pitched to take huge bites of air. As wind speeds increase, the blades gradually feather to keep the rotor turning at a constant 40 rpm. Through step-up gearing, this is increased to 1800 rpm to drive a generator—actually, a synchronous alternator—to produce a steady electrical output.

At wind speeds above 40 mph, the rotor blades feather completely and sit dead in the air. This eliminates dangerous stresses on the delicate blades and saves the cost of having to build rotors strong enough to withstand higher-than-useful wind forces that might break the rotor blades.

Eliminating tower shadow

There is one slight drawback to the downwind configuration of modern windmills. This is known as "tower shadow." As each rotor blade sweeps down behind the tower, the wind-blocking effect of the structure subjects the blade to a sudden loss of wind force, then an equally abrupt impact as the blade swings out of the "shadow." This fluctuating stress gave early rotors fits, but is now being remedied by making tower structures as thin and open as possible to offer minimum wind resistance. All operating equipment is located either on the ground or within a streamlined pod atop the tower that houses the rotor mechanism, power generator and turret controls. Even the stairways originally on the Mod-O prototype have been removed, and technicians reach the top by cable lift when repairs or adjustments are necessary.

Selling power to utilities

The ability to produce a constant electrical output regardless of variations in wind speed is one of the key features of a successful wind turbine. Windmills produce power only

when the wind blows. What do you do when yours is becalmed? Storing electricity in batteries for use during windless periods is costly and impractical on a large scale. Resorting to a conventionally fueled backup generator is also expensive and tends to defeat the whole purpose of using windpower to ease the demand for fossil fuels.

The answer that wind-energy experts have come up with seems ingeniously simple: Hook your windmill to an existing utility power grid. You feed power *into* the grid when you have it and draw power *from* the grid when you need it. This can be done because of the steady electrical output now made possible by modern windmills using variable-pitch, constant-speed rotors. All that's needed is a synchronous inverter to match the windmill's output to the standard 60-cycle current flowing through the power grid.

A can of worms?

While the scheme sounds simple enough, it does open up a whole new can of worms. Predictably, power companies have not been exactly thrilled by the prospect of having to buy electricity from independent producers, especially in indefinite, intermittent amounts. Among other considerations, such a system would require a dual metering arrangement to monitor the two-way power flow to and from the utility grid, plus a certain amount of complicated bookkeeping to keep track of who owes whom how much—a process that, even in an age of computerized automation, could become a headache.

In the few areas of the country where utilities have agreed to go along with the idea, they have levied substantial surcharges on windmill operators for the privilege of hooking into their grids. Whether they will be allowed to continue this practice is being debated in Congress. Ultimately, however, as power shortages become more and more severe, there is little doubt that utilities will be less reluctant to join the program—they may, in fact, come to welcome it.

The same holds true for solar energy where power production is at best periodic and unpredictable. The power-sharing grid concept could be the ideal answer here, too.

The most immediate use of windmills will probably be by isolated utility companies that are too small to have huge coal or nuclear generating plants and too remote to hook up to a large grid system. Because their only alternatives are expensive diesel-powered generators or oil or gas turbines, the economic potential

of windpower will look better to these utilities before it does to big-city companies that don't need the supplemental output that windpower can provide.

The nonpolluting aspect of windpower is also expected to provide an incentive for its use despite its currently higher cost. Many people, it is believed, would be willing to pay somewhat higher rates for the benefits of pollution-free power.

Meanwhile, windpower technology is proceeding at an increasingly rapid pace. When the federal wind-energy program was first established in 1973, it had a total budget of \$1.7 million. This figure has leaped dramatically to more than \$36 million allocated for wind-energy research and development during this year alone.

Bigger monsters to come

If NASA's Mod-O and Mod-OA machines with their 125-foot rotors seem immense, just wait until you see what's coming. Already underway is a Mod-1 version that will swing a 200-foot rotor—nearly 5 feet longer than the wingspan of a 747 jumbo jet. It will have an electrical output of 2000 kilowatts—10 times greater than that of the Mod-OA—an encouraging sign that windpower is starting to blow really big.

And this is just the beginning. Also being planned is an even larger colossus—the Mod-2—that will use a 300-foot rotor to churn out 2500 kilowatts. While construction sites for these newest behemoths have not yet been selected, officials hope to have both the Mod-1 and Mod-2 windmills operating some time within the next two years.

Also in the running is Sandia's vertical-axis eggbeater, based on a design originally conceived by G.J.M. Darrieus of France in the 1920s. While the present experimental model puts out a modest 30 to 60 kilowatts, depending on wind speed, its vertical-axis configuration does possess some advantages. Unlike horizontal-axis machines, it requires no mechanism to keep it aimed into the wind. Its blades catch the wind from any direction, like the spinning cups on a wind-speed indicator. The blades are also anchored securely at both the top and bottom of the vertical driveshaft, thus making them less prone to wind damage. A disadvantage is that rotor speed varies with wind speed, producing a fluctuating output that requires some means of power regulation before it can be fed into a conventional utility grid.

Even large windmills have a limited power potential—a fact of phys-

ics and economics that scientists must wrestle with. Many wind-energy experts believe that turbines with rotors up in the 300-foot range—the length of a football field—are straining the outer limits of technological practicality. Beyond a certain point, it simply may not be possible—or desirable—to build bigger and bigger monsters.

'Farming' the wind

For this reason, most experts now feel that windpower, to be truly practical, must be "harvested" like crops on huge "windmill farms." Here, not one, but dozens—perhaps hundreds—of whirling wind turbines would sprout like cornstalks in vast clusters stretching for miles over windy plains, blustery mountain ridges and breezy shores. Together, they would gather in enormous amounts of wind energy and feed it into utility grids that, in turn, would distribute electricity to areas where power is needed but winds aren't plentiful enough to keep a giant windmill operating profitably.

With large-scale windpower production, electrical rates would presumably come down to more reasonable levels. This is the grand dream. It won't come true quickly or easily. But, like Don Quixote's seemingly senseless jousting at windmills, it just might not be an impossible dream. **PM**

SOURCES OF INFORMATION ON WIND-ENERGY SYSTEMS

Aero-Power, 432 Natoma St., San Francisco, Calif. 94103; **American Energy Alternatives**, Box 905, Boulder, Colo. 80302; **American Wind Energy Assn.**, 54468 CR 31, Bristol, Ind. 46507; **American Wind Turbine**, 1016 East Airport Rd., Stillwater, Okla. 74074; **Automatic Power, Inc.**, Pennwalt Corp., 213 Hutcheson St., Houston, Tex. 77023; **Dominion Aluminum Fabrication, Ltd.**, 3570 Hawkestone Rd., Mississauga, Ont., Canada; **Dyna Technology, Inc.**, Box 3263, Sioux City, Iowa 51102; **Edmund Scientific Co.**, 380 Edscorp Bldg., Barrington, N.J. 08007; **Energy Alternatives, Inc.**, Box 233, Leverett, Mass. 01054; **EnerTech, Inc.**, Box 420, Norwich, Vt. 05055; **Environmental Energies, Inc.**, Box 73, Front St., Copemish, Mich. 49625; **Grumman Aerospace Corp.**, 4175 Veterans Memorial Hwy., Ronkonkoma, N.Y. 11779; **Independent Energy Systems**, 6043 Sterrettania Rd., Fairview, Pa. 16415; **Independent Power Developer**, Box 1467, Noxon, Mont. 59853; **Kedco, Inc.**, 9016 Aviation Blvd., Englewood, Calif. 90301; **Natural Power, Inc.**, Frankestown Turnpike, New Boston, N.H. 03070; **Northwind Power Co.**, Box 315, Warren, Vt. 05674; **Pinson Energy Corp.**, Box 7, Marstons Mill, Mass. 02648; **Real Gas and Electric Co.**, Box A, Guerneville, Calif. 95466; **Rede Corp.**, Box 212, Providence, R.I. 02901; **Sencenbaugh Wind Electric**, Box 11174, Palo Alto, Calif. 94306; **WTG Energy Systems**, Box 87, 1 LaSalle St., Angola, N.Y. 14006; **Windlite Alaska**, Box 43, Anchorage 99510; **Windworks**, Box 392, Rt. 3, Mukwonago, Wis. 53149; **Zephyr Wind Dynamo Co.**, Box 241, Brunswick, Me. 04011.

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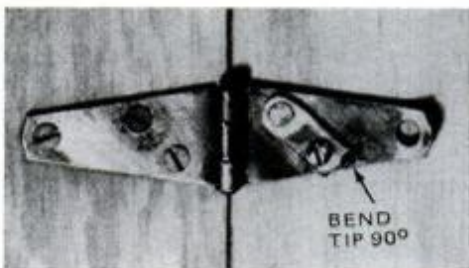
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Make a hasp from a hinge

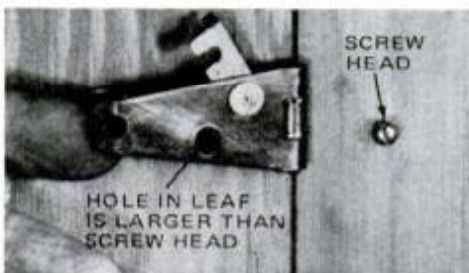
Turn a small hinge into a novel hasp-type latch suitable for cabinet doors. Instead of closing over a staple as hasp fastenings usually do, this latch engages the round head of a wood screw or bolt.

The hasp shown is made of a strap hinge with 1x2-in. leaves. You can use a butt or other type hinge, provided there is room on one of its leaves for the hook.

The hook is 1/16 x 3/8 x 1-5/16-in.



Steel hook engages wood screw to close.



Enlarge leaf hole to clear screw head.

steel. It pivots around a rivet installed in an existing screw hole on the hinge leaf. The hook notch centers over another hole (an original screw hole enlarged to accommodate the screw head). In the closed position, hook notch fastens under the screw head to anchor the hinge. The hook tip bends outward for easy lifting. A little play in the hinge joint makes it easier to disengage the leaf and the pivoting hook from the screw head.—Walter E. Burton

CAR CARE REALLY PAYS OFF!

(Continued from page 153)

your car. Maintenance pays, even if you trade every couple of years.

If you've decided to keep your cars longer, maintenance will let you do it. And if you own any body style that's a cut above the rest—unusual, desirable, charismatic—then rigorous maintenance will help it become collectable.

Remember: Keep it original, keep it looking good inside and out, keep it running as the engineers intended. You'll reward not just the next owner but yourself as well. **PM**

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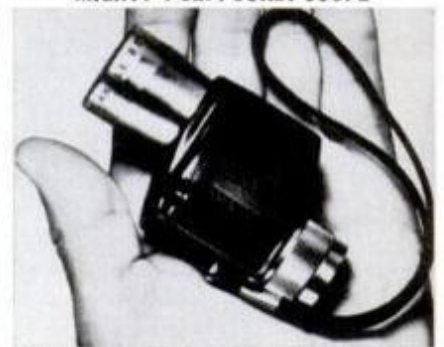
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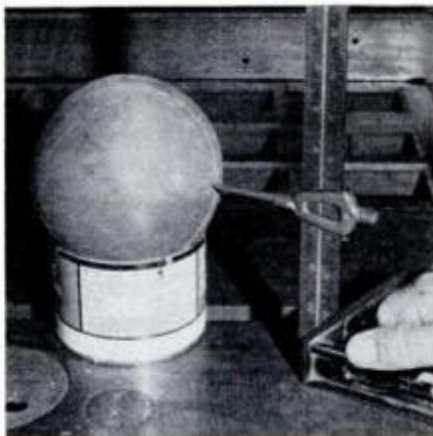
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—Emery J. Loisel

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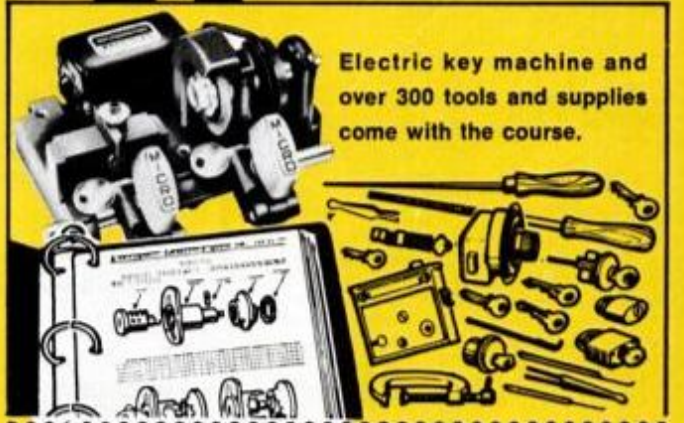
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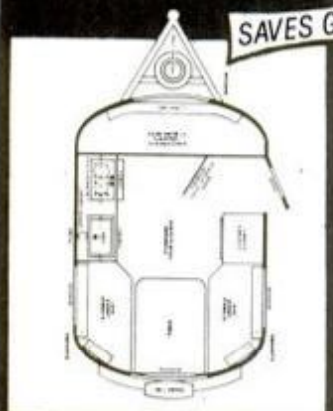
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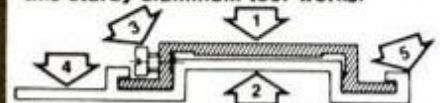
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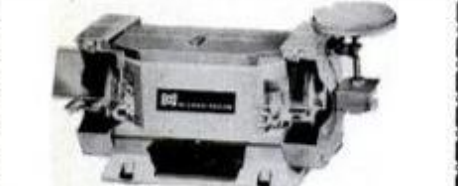


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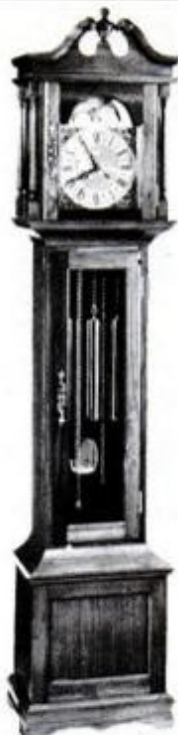
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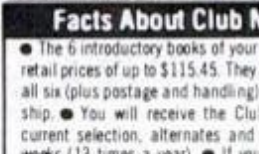
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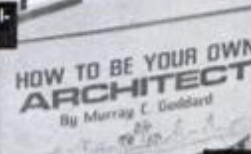
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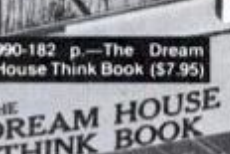
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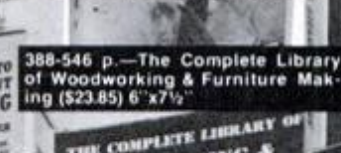
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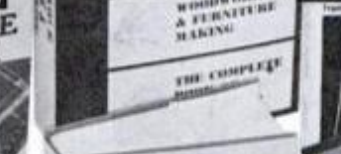
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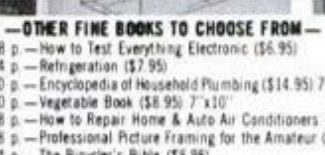
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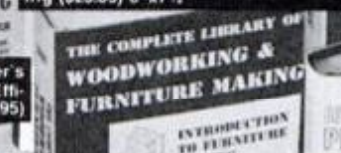
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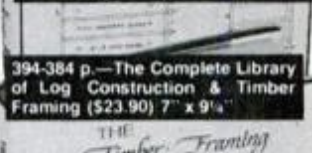


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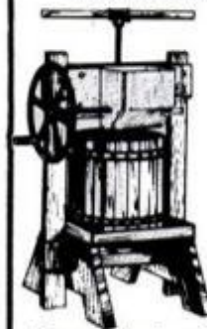
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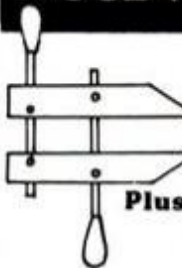
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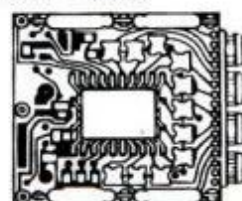
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