

JULY 1983 \$1.50

# Popular Mechanics

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SMALL PACKAGE**



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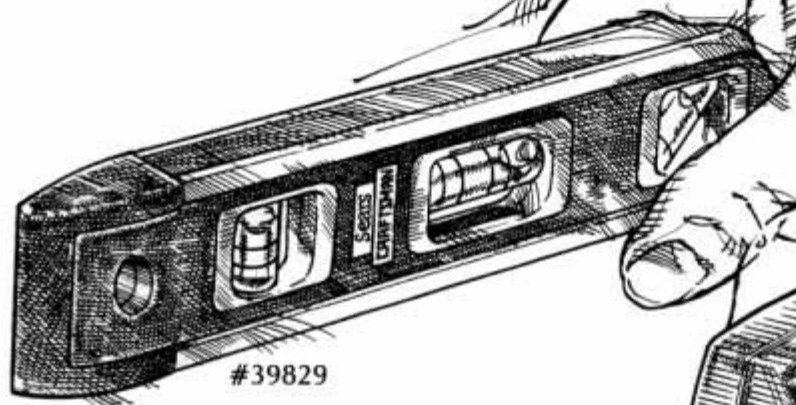
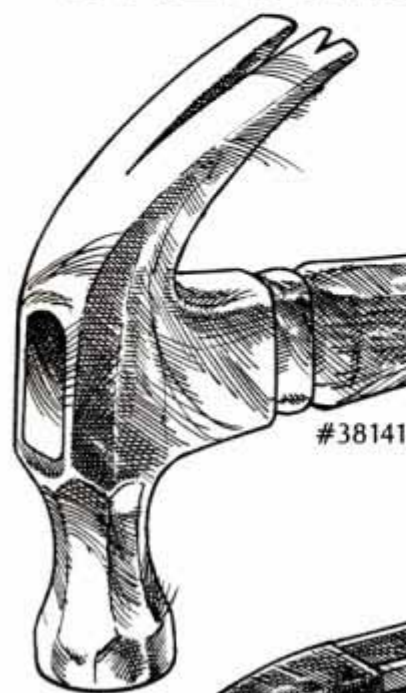
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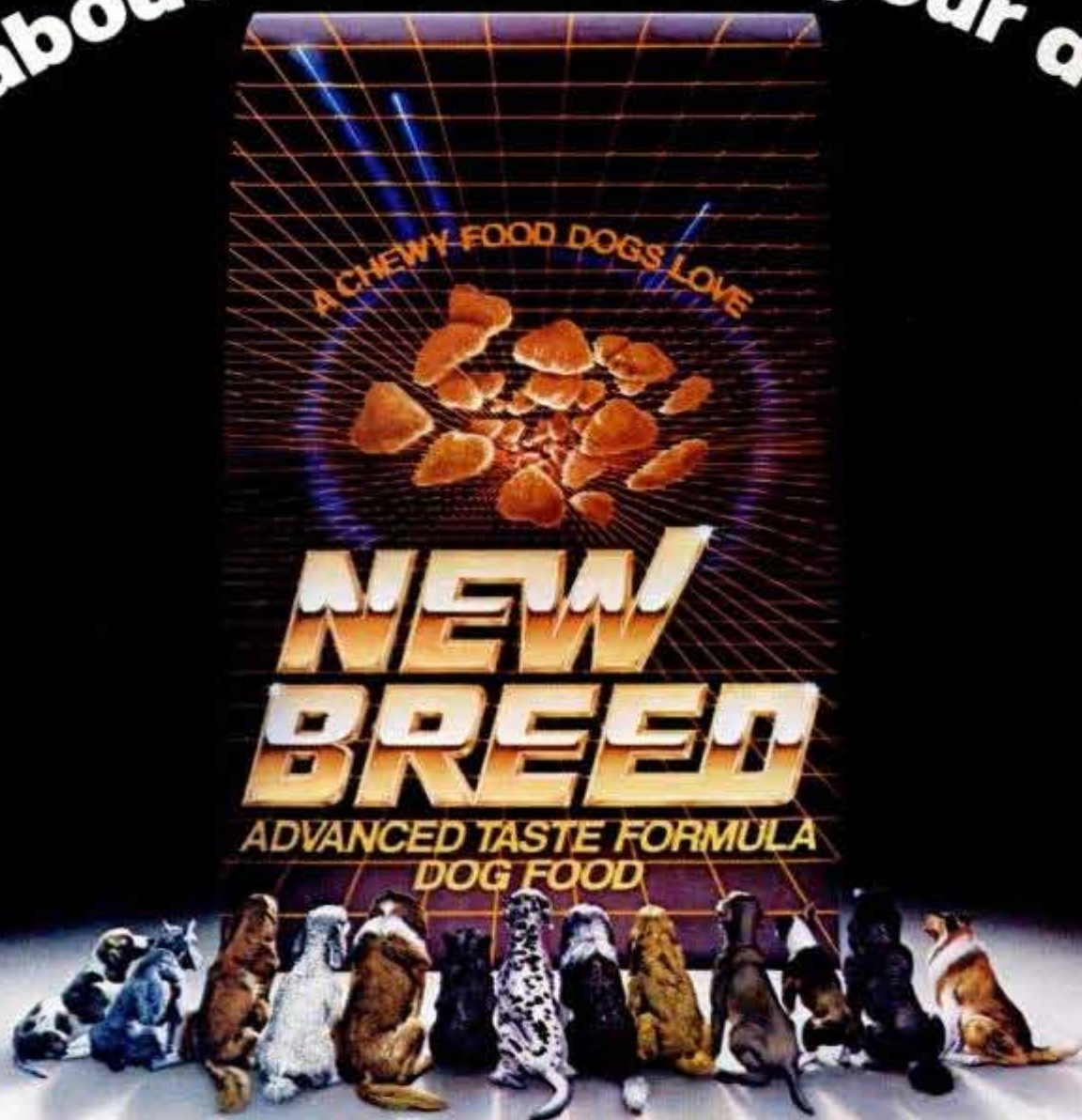
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# Popular Mechanics®

VOLUME 160 NUMBER 1



**ON THE COVER**  
Mitsubishi's Montero romps over sand in PM's rugged driving test of three gutsy little 4x4 off-roaders. Read how it compares with Chevy's S-10 Blazer and Ford's Bronco II in the story beginning on page 80.  
—PM photo by Vic Huber

JULY 1983

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# EDITOR'S NOTES

John A. Littleton

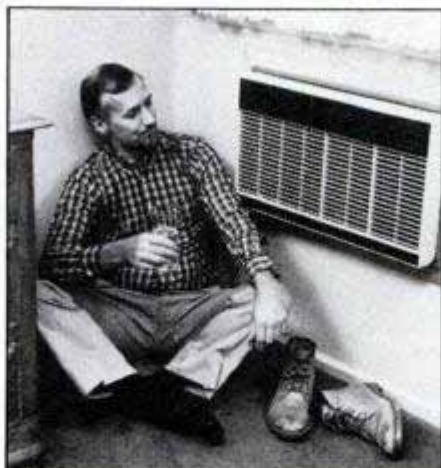
**R**eaders really wrote at least one of our features this month. You submitted so many good ideas for a home bike shop that we put the best seven together into *PM's Bike Shop—As Good As A Pro's* (page 96). If you have family wheels to take care of, you'll find lots of ideas you can use. . . . **Woodworkers will be as pleased as we are** with this month's Master Craftsman's Shop, the 14th in our continuing Great Shop series. Staffer Michael Chotiner trekked up to Westwood, Mass., to visit the shop that owner Harold Ionson characterizes as "comfortable." That's an understatement, reports Michael: Any woodworker will find it's the kind of shop he fantasizes about. You'll find it on page 90.

*Even the best of the off-roaders needs a little help on a bottomless river bed.*



*Photo models find there's more to do than just sit in a swing for a PM photo.*

**Do-it-yourselfing** comes in a variety of forms around here. And sometimes quite unexpectedly. Take the case of the stuck 4x4. When editors Tony Assenza and Mike Lamm were charging a trio of four-wheel-drive vehicles through the boondocks of California to do *Little Off-Roaders With Lots Of Guts!* (page 80), they rated the Mitsubishi Montero the best dirt machine of the lot. So how could they expect it to get hung up, axle-deep, in river mud? It did—and they huffed and puffed it out themselves. . . . **Then when camera models** Cindy Guyer and Chris O'Connell arrived



*Ah-h-h, the job's done and everything works: Hartford savors the moment.*

on site to pose for our porch swing story (page 94) . . . well, same old story. They got to hang the swing themselves. . . . **But Managing Editor Bill Hartford** did the *expected*. He cut through his wall to install an air conditioner (page 138) and got a perfect fit first time! **PM**



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# LETTERS TO THE EDITOR

## Don't count the jeep out yet

Your obituary on the demise of the jeep (*The Jeep Is Dead, Long Live The HMMWV*, page 89, Apr. '83) was good reading, but a bit premature. The jeep is still going strong in armies all over the world and will undoubtedly continue in service long after the last of the new HMMWVs has been declared useless surplus. The jeep is *not* dead!

BILL KISH  
NEW YORK CITY

A timely story, but it contained a glaring error. The World War II jeep was not known as the M151. The original Willys version was the Model MB and the Ford version the Model GPW. These were followed by the M38, M38A1 and M38A2 series, all different from the earlier models. The M151 designation was first used in 1959.

BERNARD M. SIEVERS  
MAJ., U.S. ARMY (RET.)  
WILLIAMSTOWN, N.J.



*Picking a winner: PM's April cover correctly depicted the Hummer as the Army's choice to replace the jeep.*

In your fine history of the jeep, I'm glad you were thoughtful enough to mention poor Bantam, which originated the jeep concept, then lost out in the competition to build it. They deserve far more credit than they ever got.

LARRY L. RUTH  
WALWORTH, N.Y.

We agree that the jeep will still be around for a long time, but its phase-out has already begun. Just one week after our story on the new HMMWV appeared, the Army announced the winner of its competition for a jeep replacement. It's AM General's Hummer, the vehicle pictured on our April '83 cover (left). Over 54,000 will be built during the next five years.

Early-model jeeps were known by many names, but since the M151 designation has been in use for more than 20 years, we felt it would be the most familiar. Also used was MUTT (for Military Utility Tactical Truck)—a name some jokesters said was apt.

## That's why it was a 'doozy'

I greatly enjoyed Mike Lamm's article *Automakers Who Dared—And Lost* (page 79, Mar. '83). As he said, Duesenberg had it all over Rolls, Mercedes and the rest of the foreign competition. Europe had absolutely nothing to offer in those days—and probably still doesn't—that could average 135 mph for 24 hours straight, the world endurance record that Ab Jenkins set in a stock-engined Duesy in 1935.

J.T. HORSTMEIER  
PASADENA, CALIF.

It was one of the best features I've ever read in PM, and the pictures were superb. My compliments to you.

ROBERT LAMMERS  
RIVERSIDE, CALIF.

## They're both fine chests

I certainly was surprised to see construction plans in your magazine for a tool chest that our firm has been making since the early 1920s (*Build Our Master Craftsman's Toolbox*, page 108, Apr. '83). It was, indeed, a compliment to my grandfather, Harry H. Gerstner,

who designed this and many other chests dating back to 1906.

We still make this design, and the quality of our current product far exceeds that of the old chests you mentioned. If any of your readers would like the real thing, we would be happy to send them our free catalog.

JOHN H. CAMPBELL  
PRESIDENT  
H. GERSTNER & SONS  
BOX 517  
DAYTON, OHIO 45402

*Thank you for your kind comments. Although our chest follows traditional lines, we did not knowingly pattern it after any particular Gerstner model. It was a composite design based on two homemade toolboxes dating back to the '30s that our author, Walter E. Burton, studied some years ago.*

## PM's Phoenix for phun

You sure had the right idea in offering plans for your clever expandable camper (*PM's Phoenix—An Expandable Van You Can Build For \$2,000*, page 48, Mar. '79). I recently completed my ver-



*Expandable Phoenix camper built by reader Zimmerman. Added door is in rear.*

sion (photo above), adding a hatchback door for the extra convenience of rear outside access. I look forward to many happy times in this fun machine.

CHARLES M. ZIMMERMAN  
HANOVER, MD.

Thanks for letting us know. For others who may be interested, plans for building the Phoenix are available for \$15.75 postpaid from Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101. (Note: Because of inflationary rises in materials prices, estimated construction cost is now \$3,000 to \$4,000.)

PM



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# IMPORTS & MOTORSPORTS



## Lotus is back

Stop! Before you drop \$63,000 for a Ferrari 308GTSi or another exoticar, you should know that Lotus is back in town.



The mid-engine Esprit is available in two models. Turbo and normally aspirated S3, with marketing in the United States now being handled by Performance Associates.

On the outside, the Esprit is the familiar, hard-edged, beautiful wedge that Giugiaro designed in the mid-'70s (not the custom convertible model we show here).

But beneath the Esprit's sheet metal, there is a lot more happening. Displacement of the inline Four is now 2.2 liters. In the Turbo model, horsepower is 190 at 6,500 rpm (redline is 7,300 rpm), which should get you to 60 mph in 7 seconds. You'll also find structural

*Lotus Esprit Turbo convertible is a custom job from Kollinger in Europe. Production-model Esprits are available here.*

and suspension redesigns, a new interior, better rustproofing, better engine cooling and ventilation system and all the necessary touches to make the S3 model worth \$35,000 and the Turbo \$50,000.

That's right, Lotus is not synonymous with kit cars anymore, if you remember that wonderful, do-it-yourself Lotus 7. And these are not the days of the Lotus Europa which, when we featured it on PM's cover in October 1972, was \$5,500.

## Super bikes

We're too timid to want a 190-mph street-legal motorcycle, but it's good to know where you can get one. Motorcycles from the Swiss builder Fritz Egli come into North America at, of all places, Calgary, Alberta: Herb's Quality Sales is the place and Herb Jahn is the man (at Box 83, Station J, Calgary, Alta. T2A 4X4, Canada). Former Swiss motorcycle champion Egli works with Honda and Kawasaki engines and makes racing machines that can also be set up street-legal. The racer shown below can take 750- to 1,200-cc engines.



*Red Hunter is Honda-based racer made by Egli, available from Herb's in Canada.*

## Bells and whistles

All comfort and convenience features started out as "bells and whistles." That's how innovative designs are put down by auto manufacturers who didn't happen to think of them first.

Electrically adjustable side-view mir-



*Vanes in Mazda 626 center vent oscillate.*

rors, for example, have gone from being a "great gimmick" to a standard item. Even the individual left- and right-side control switches have been refined into a single switch with left and right positions.

And let's not overlook the safety aspect: Heated side-views—and rear defoggers and wipers—are a blessing in freezing and wet weather.

We recently put some U.S. miles on Mazda's new touring sedan, our first

drive since testing the car in Japan last year (see *Driving The '83 Mazda 626*, page 66, Dec. '82). We were dazzled by the bells and whistles on this auto.

The car's motor-driven, oscillating vanes in the center vent are no gimmick when they're used with the air conditioner. They're a sensible refinement of the vent system and I would



*The speaker balance is set using a joystick-type control.*

welcome a similar type of arrangement on my room air conditioner at home.

A neat application of the joystick control can be found on the Mazda's sound system. The balance between the front and rear speakers and left and right sides is set with a single stalk that can be rotated 360°. Zap! Those hard-to-use knobs on concentric shafts now have been made obsolete.

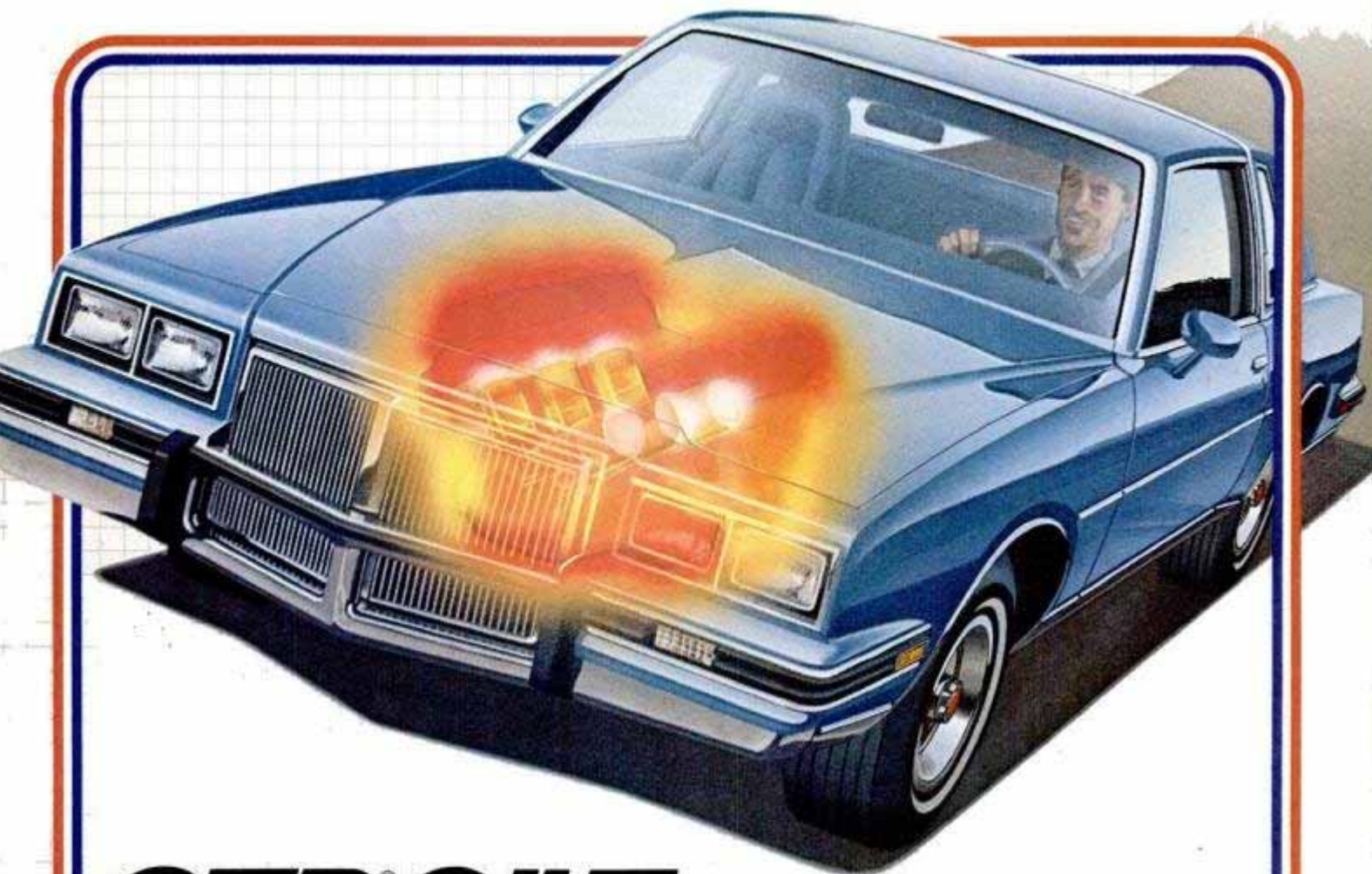
Some other 626 features that we fell in love with are the instrument panel design with its built-in shelf running almost the width of the automobile and the front armrests which also serve as storage compartments. Because of the way the forward half is designed, the armrests serve neatly as racks for PM-sized magazines.

Of course, all of the touches that make it a pleasure just to sit in the 626 have to be piled on top of a well-designed chassis, drive train and other stop-and-go systems to make driving the Mazda a special experience. And they are.

You guessed it: The Mazda 626 is a car that rings our chimes. **PM**



*Armrests have compartment with a cover, plus a slot big enough for magazines.*



# **STP<sup>®</sup> Oil Treatment fights motor oil breakdown.**

Parts of your car's engine can reach 450 degrees Fahrenheit after only 10 miles of driving. This kind of intense engine heat weakens your oil's vital protective properties. That's motor oil breakdown. STP Oil Treatment fights motor oil breakdown. Here's how:

STP scientists specially formulated STP Oil Treatment to strengthen your oil's high



temperature performance properties. To put extra lubricants and antiwear agents to work... just where they're needed. STP contains a special chemical additive, ZDDP, that helps reduce engine wear, oil oxidation, bearing corrosion and engine sludge. Whenever you change or add oil, get STP Oil Treatment and fight motor oil breakdown.

**Depend on STP proven performance.** 

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0.7 mg. nicotine, av. per cigarette by FTC method.

# Winston. America's

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

# s Best.



Join the first team.  
Reach for Winston.



# THE PM GARAGE



## High-density juice

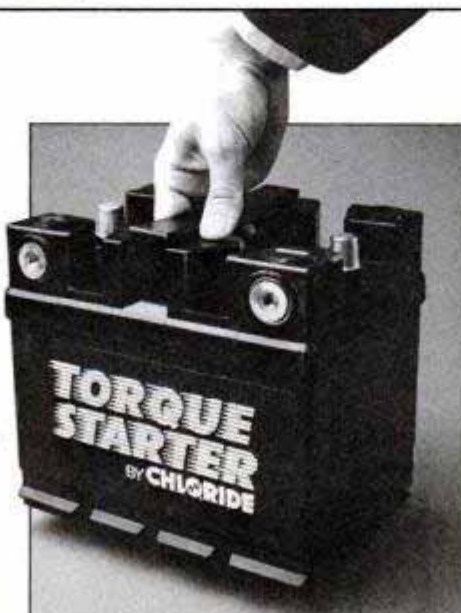
A maintenance-free battery guaranteed for six years and designed for the Saturday mechanic has been introduced by Chloride Inc. of Tampa, Fla.

The battery is designed to hold all the acid in the plates. So in theory, even if it cracks, it won't leak. It uses a new calcium-lead design that is really sealed (a pressure-relief, but no vent).

Called the Torque Starter, it has a rating of 650 starting amp. The battery has both top posts and side terminals. If you use the side terminals, the top posts are available for recharging and boost-starting.

The battery has a carrying handle for easy removal and installation. List price is about \$90. From Chloride Battery Div., Box 1124, Tampa, Fla.

—Paul Weissler



*New battery has six-year guarantee and comes with two sets of cable terminals.*

## Oil pumper



*Portable oil changer will pump out most crankcases in less than three minutes.*

If you need to be begged to change your motor oil, you might be interested in the Power Max Oil Changer. The 12-volt d.c. pump has an inlet and outlet line plus clips that attach to your car's battery.

To change the oil, push the inlet line down the dipstick tube far enough for it to touch the bottom of the oilpan. You can approximate the length you'll need by measuring the length of the dipstick and adding a few inches.

It will pump the oil at a rate of two quarts per minute. We've used it on several test cars and the unit delivers what it promises and seems well made.

Cost is \$49.95 plus \$3 shipping from I.D. Ratherby, 18480 Bandilier Circle, Fountain Valley, Calif. 92708.—T.A.

## Cheap flashers

Many imported car flashers are extremely expensive—\$20 to over \$60 (a popular Toyota application costs \$61). An American aftermarket flasher manufacturer, Ideal, is now making a flasher line at prices you are more accustomed to paying—\$5.25 and up list, with a top of \$9.05.



*Inexpensive, domestic flashers replace costly, foreign-made units. That's news.*

Ideal dissected all the expensive imported car flashers, found nothing special about them and came up with a line of eight to cover about 100 different numbers.

The Ideal catalog contains a chart showing flasher locations, so if you don't know where to find yours, the parts store counterperson can look it up. Ideal Div., Parker Hannafin Corp., 1000 Pennsylvania Ave., Brooklyn, N.Y. 11207.—Paul Weissler

## Sparkplug tool

Cleaning and gapping sparkplugs can be a real pain without the proper tools. Kaster's new five-way ignition maintenance tool can be a real plus in your toolbox.

Kaster's Sparkplug Tool has provisions for checking six different plug gap widths, a gap adjusting tool, a carbon scraper, a brush and an ignition/sparkplug tester. And, all the tools fold into a pocket knife-sized plastic handle.



*Ignition maintenance tool can even check for electrical leaks in spark system.*

The six wire-type gap gauges range in size from .035 to .080. The brush works well removing deposits on the plug, after using the scraper.

The ignition tester allows you to check for spark leaks at the distributor cap, along the length of each sparkplug wire and at the plug itself.

The tool costs \$3.95 at auto parts stores or from Kaster Inc., Station Road at Sunrise Highway, Bellport, N.Y. 11713.—Joel Breault

# NUMBER ONE AND STILL CLIMBING!



## **TOUGH FORD FULL-SIZE 4x4**

Ford toughness and innovation drove our F-Series 4-wheelers to the top. Now two trim sizes join America's best-selling\* full-size 4x4 pickup—Bronco II and Ranger.

\*Based on registration data for 1983 model year through December, 1982.



### **NEW FORD BRONCO II.**

The perfect size for 4-wheeling! Turns in less space than Chevy S-10 Blazer, seats 4 in comfort. V-6 engine is standard, with power S-10 can't match... the power you need for 4-wheeling fun!



### **FORD RANGER 4x4.**

The best-selling† American 4-cylinder pickup now offers the most powerful V-6, too! Beats Chevy S-10 in horsepower, torque. It's OFF-ROAD Magazine's "4x4 Truck of the Year" †Based on calendar year registrations through December, 1982.

Get it together—Buckle up!

# AMERICA'S TRUCK

# BUILT FORD TOUGH

# Wagner® revolutionizes

## Introducing the Wagner® Power Twin™ airless sprayer/roller.

Imagine painting an entire wall and never once coating your roller in a paint tray.

Or tackling some intricate staining chore like shake shingles without the endless tedium of dabbing and poking with a brush.

Think about how nice it would be to never again have to pour paint from a can to a tray.

Now you're beginning to see the beauty of a versatile, new tool that stands to revolutionize painting around the house.

The Wagner® Power Twin™ airless spray/roller.

### A Choice of Rolling or Spraying.

Created especially for home owners, the Wagner Power Twin is the first and only product of its kind.

It gives you the flexibility of an interchangeable spray gun and roller, both on a twenty-five foot hose.

The roller looks like the usual kind, but that's where the similarity ends. With this roller, a squeeze of the trigger pumps paint from the can, straight to the inside of the roller cover. Specially designed perforations distribute the paint evenly to the outside. So you can paint wall after wall nonstop, in smooth, even strokes. But

that's only half the story.

For covering large areas of hard-to-paint surfaces, you can attach the spray gun.

You'll be amazed how fast you can paint siding, shutters, decks, furniture, and more—all with a smooth, even finish and no brush marks.

The spray gun comes with a tough, tungsten carbide tip that lets you adjust the fan width of the spray for added precision.

And because it's powered by a piston pump, there's no bulky air compressor.

### Applies Virtually All Kinds of Paint.

The Wagner Power Twin will spray oil-based paints and even heavy latex paints.

You can also apply stains, varnishes and lacquers. Or almost any other liquid, including sprayable pesticides.

### Helpful Accessories.

A variety of accessories can help make painting with a Wagner Power Roller®

even more convenient



**2 hrs. 10 mins.**

We painted this house, excluding trim, in 2 hrs. 10 minutes with the Wagner Power Twin. It took us 6 hours, 32 minutes with a brush.



**24 mins.**

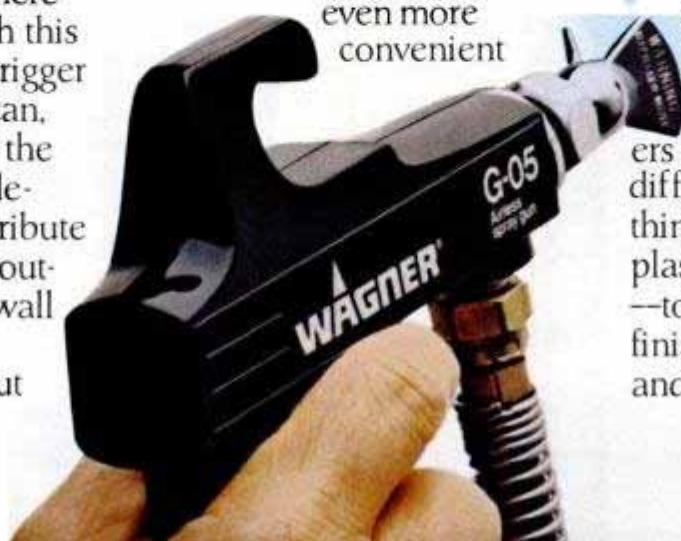
We painted this porch floor and adjoining outside deck in just 24 minutes with the Power Twin. It took us 34 minutes (and 32 dunks) with a conventional roller.

and efficient.

For painting the ceiling or for reaching the top of a wall, you can avoid using a ladder by adding an eighteen inch extension to the roller.

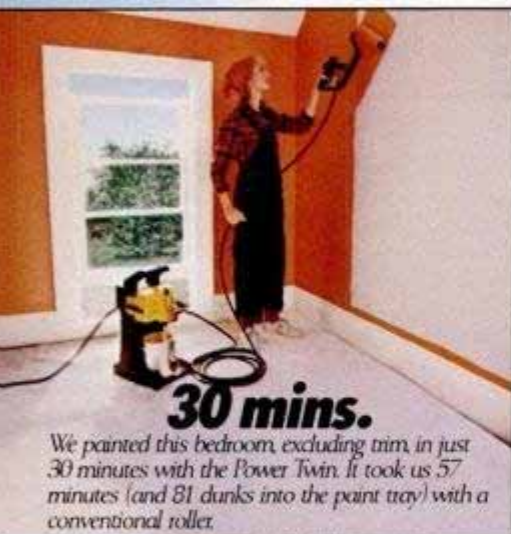
An optional spatter shield will make the job all but speckle free.

Power Twin roller covers are also available in four different naps to give you everything from a very fine finish on plaster, drywall and woodwork—to a more heavily textured finish on stucco, rough plaster and cinder blocks.





# painting. Again.



next painting project, whether it's the new baby room or the old shed out back, consider the incredible Wagner Power Twin.

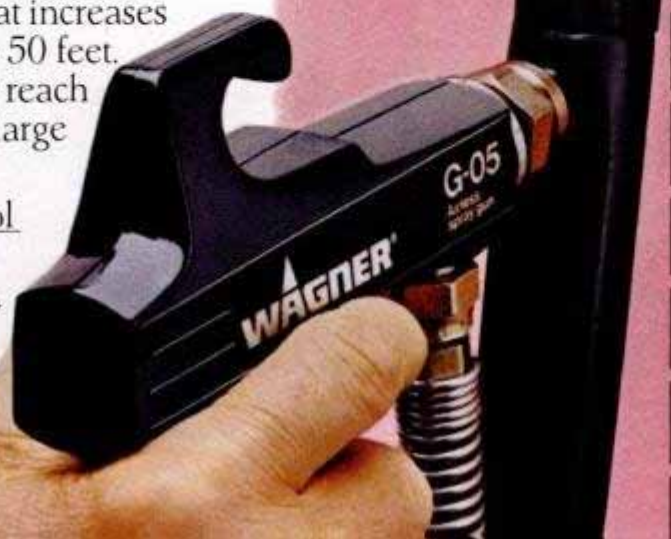
It's the kind of blue chip investment that'll pay for itself over and over again in time savings, ease and professional-looking results.



For working outside, 12 and 24 inch spray tip extensions will let you paint overhangs without having to climb on scaffolding or up a ladder.

There's also a 25 foot hose extension that increases the total length to 50 feet. So you can easily reach the top of even a large two story house.

The Right Tool  
for Painting™  
Inside or Outside.  
When you consider your



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1770 Fernbrook Lane  
Minneapolis, MN  
55441

Please send your "How to..." brochures to help me learn more about painting with a Wagner® Power Twin™ and Wagner® Power Painter® airless paint sprayers. 06-07-02

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**WAGNER®**  
The Right Tool for Painting™



# PM ELECTRONICS MONITOR



## Latest round in the disk wars

Laser videodisk systems have not caught on in the living room as some industry observers once predicted they would. But, videodisk systems may just set the board room—and the computer room—on fire.

The main drawback to the videodisk system has been that it is a playback-only device. You can't record on it beyond the first manufacturing process. For this reason, the videotape deck has remained top dog in the entertainment field.

But Matsushita recently showed a videodisk system that uses a laser and can erase old program material and record new. The laser beam records

information on the disk by making some microscopic pits shinier than others. When reading the disk, the laser interprets the reflectivity of these pits as a video image.

But wait. Before you begin planning to record *The Dukes Of Hazzard* on disk for posterity, you should know that Matsushita doesn't feel this new process can be cost effective enough to make it attractive to the consumer.

Instead, the new erasable videodisk will see its first application as a medium for computer storage. Each disk can store up to 15,000 full pages of documents, including pictures.

This beats existing computer storage

on two fronts—cost and versatility. A typical videodisk system, under this method, would be able to store almost 10 times as much information as a 10-mb (megabyte) computer hard disk. Hard-disk systems are expensive—disks alone cost hundreds of dollars.

Other companies, such as Sony, are reportedly racing to catch up to this latest spin in technology. As these erasable videodisks come on line at large corporations and businesses, it seems reasonable to assume that the manufacturers will be able to streamline and enhance their production lines. And while costs of this erasable disk are high today, I predict this latest revolution will be available for the at-home videophile in two to three years.

## Light a video torch

The 1984 Olympics will flow from Los Angeles to the world as brief pulses of light on thin glass fibers. This new system of digital television broadcasting was first shown at the recent annual meeting of the National Assn. of Broadcasters and will be the primary system used to link the dozens of sports arenas to the main TV transmission site.

Bell Labs, which pioneered this technology, has achieved not only the two-way transmission of voice and data, but of full-color and broadcast-quality TV. All three national TV networks have proclaimed that the signal meets or exceeds all of their specifications for use on the air.

Even now, plans are being made to link all of the Olympic sites with an invisible spider web of thin, glassy fibers hidden in underground conduits and within walls yet to be built. When the system is completed, it will be the largest lightwave network in the world.

Technology like this holds great promise not only for the TV networks, but for colleges, hospitals, businesses or anyplace that has a number of buildings that could be linked by one- or two-way television. Colleges might use it to transmit a lecture from one lecture hall to another, or even to a different campus in a distant part of the state. Hospitals could send pictures of operations and procedures to other institu-

tions throughout the country. As this digital technology becomes more developed, it will truly become a dance of the light fantastic.

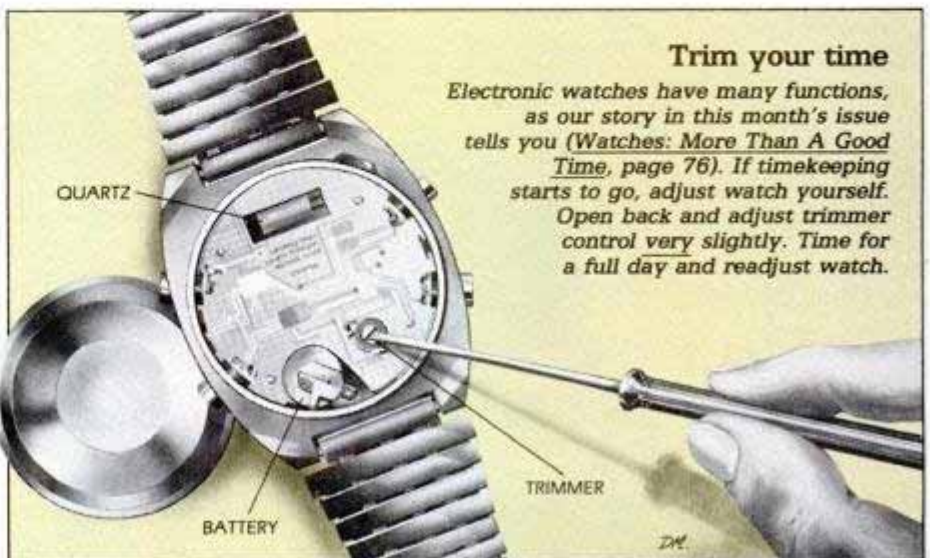
## Equalman

Those ubiquitous Walkman-style radios have become popular with people in just about every walk of life. For carry-along sound and portable music, they just can't be beat. But place them in a living room and their limitations become obvious.

One company, AudioSource of Fos-

ter City, Calif., has had much success with add-on speakers for these units. I've heard AudioSource's LS-Six speakers and can tell you that they make the small sound of the portables more respectable.

The latest add-on is a five-band equalizer. This miniature-size but full-feature audio equalizer for your Walkman is called the EQ Three, and it sells for \$39.95. Just plug it into your portable's headphone jack, plug the headphones into the equalizer and adjust the unit's five slide controls to bring a whole new dimension to smallness. **PM**



### Trim your time

Electronic watches have many functions, as our story in this month's issue tells you (*Watches: More Than A Good Time*, page 76). If timekeeping starts to go, adjust watch yourself. Open back and adjust trimmer control very slightly. Time for a full day and readjust watch.


You're not just moving in,  
you're moving up.



*Canadian Club*  
"The Best In The House"®

6 Years Old. Imported in Bottle from Canada by Hiram Walker Importers Inc., Detroit, Mich. 86.8 Proof. Blended Canadian Whisky. © 1982

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# The Man in the Plain Pockets Jeans

He likes jeans made of tough, cotton denim. Jeans that fit right and look good, without frills or fancy stitching. He's the man who knows there's more to quality than an inflated price tag. The man in the **Plain Pockets™ Jeans** only at **JCPenney 15<sup>00</sup>**

Prices higher in Alaska, Hawaii, and Puerto Rico.  
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Матеріал розроблений за авторством дизайнера

# APPLIANCE CLINIC



## Converting to a refrigerator

*I own a Frigidaire upright freezer, model No. UDF-1564. Can I change this freezer to a regular refrigerator with temperatures of 38° to 42° F.? Can this be accomplished by installing a new refrigerator thermostat in the freezer?—A.L. Towson, Smithsburg, Md.*

Your model number indicates that your freezer is an upright, nonfrost-proof type and probably has refrigerator shelves. If you change the thermostat to the refrigerator type, this is what will happen: During the run time (compressor-on time), frost will accu-

mulate on the shelves and the tubing. When the thermostat is satisfied, the compressor will shut off.

Now what happens to the frost? It will melt and turn to water. The water will drop down and land on articles on the shelves as well as the freezer bottom. When the compressor comes back on, this water will turn to a sheet of ice.

As you can see, it's not practical to change a freezer into a refrigerator because of built-in design characteristics.

## Gas flow

*I own a Magic Chef gas range with an electric ignition, model No. 22AA-2KLW, serial No. 6X024-44327. After turning off the eye-level oven, gas continues to flow to the pilot. Any suggestions?—Yosi Weiss, Brooklyn, N.Y.*

It sounds as if the problem is in the gas pilot circuit. The switch on the thermostat, which supplies power to the pilot valve, may be faulty. Or, the gas pilot valve may be stuck open.

Unplug the range and have your local service company repair it. Call Brooklyn Union Gas at (212)643-4050 or Long Island Stove at (516)248-8261.

## Confused washer

*I own a Maytag portable washer model No. A50, serial No. 391682KS. When I fill the washer, the water backs up into the spin tube. In addition, when I turn on the spin, the washer drains, whether it's set on washer drain or spin drain. I would appreciate any advice you could give me on how to retain the water and how to drain it as needed.—Mrs. Alice Brown, Mineralwells, W.Va.*

Chances are your problem is in the diverter valve. The flapper inside the valve may be broken or not sealing properly. Or, the drain cable which

controls the diverter valve may be broken or possibly out of adjustment.

If you have decided that you don't want to call a Maytag repairman and you want to tackle the repair job yourself, I suggest that you order Maytag service manual part No. 56150 directly from Maytag Co., Newton, Iowa 50208. The approximate cost is \$2 plus postage.

Pages 4-5 and 4-6 of the service manual explain exactly how to remove and disassemble the diverter valve and describe the correct procedure to follow for adjusting the drain cable on your washer.

## Appliance interference

*We have a 1972 RCA color television set, model No. JP972W, serial No. 205-370579, with a 300-ohm antenna wire to a Model 7280 Channel Master matching transformer. This is a commercial set with a 72-ohm coaxial antenna jack. We get interference on the lower channels (2-6) from appliances with motors.*

*We installed a filter from Radio Shack that plugs into the television set, but it didn't help. Channels 10 and up are fine. Can we eliminate this interference from our appliances?—John A. Yates, Chesapeake City, Md.*

I contacted RCA concerning the interference on your television set. RCA spokesmen said they know of no problem with your model TV or any modification that would help. They suggest that you try hooking up a master-type matching transformer at the antenna. Then run a 75-ohm shielded coaxial cable lead to the back of the television set and hook it up to the 72-ohm jack.

Radio Shack sells an indoor/outdoor matching transformer, part No. 15-1140, for approximately \$3. They also sell 75-ohm wire in 25-, 50- and 100-ft. lengths with the F-connector already attached. I hope this will help clear up the interference on your set. **PM**

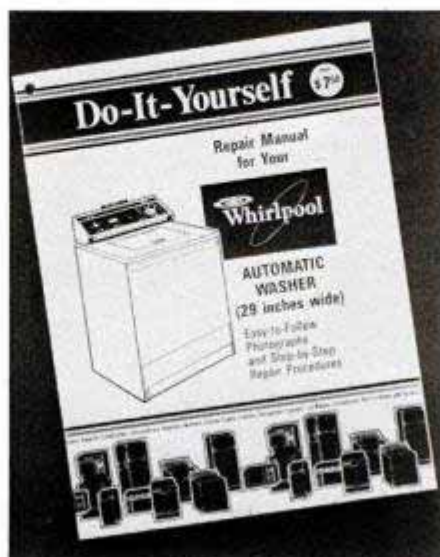
## SERVICE TIP

Whirlpool recently has come out with a do-it-yourself repair manual for automatic washers that's aimed specifically at consumers.

The new manual gives the reader detailed, step-by-step procedures in non-technical terms for 53 separate repairs on most Whirlpool automatic washers that were built within the last 10 years.

The service manual is the first of a planned series of do-it-yourself repair guides. With the manual and the availability of replacement parts through Whirlpool distributors, it is thought that more consumers will begin to make repairs on their appliances themselves.

The repair guide costs \$7.50 and is available through Whirlpool appliance dealers or parts distributors. You can also receive a copy by sending \$8.25 to: Literature Dept., Whirlpool Parts Distribution Center, La Porte, Ind. 46350.



**New Whirlpool automatic washer manual covers 53 detailed repair procedures.**

*If you have a problem with any appliance, send your question, along with the model and serial numbers, 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.*

# HOMEOWNERS' CLINIC



## Condensation in Florida room

*Last year, I added a Florida room to my home. The condensation is so bad that the inside of the roof drips and the walls and storm windows are always wet. The roof and walls are metal. I need help combating this moisture problem.*—Stanley Chepinkas, Riverhead, N.Y.

Your room in Riverhead, constructed as you describe it, would sweat even in Florida. The metal becomes hot during the day, and the moisture in the cooler evening air quickly condenses out on it.

Most warehouses have metal roofs. But they have rigid insulation, such as Styrofoam, on top of the decking, then a built-up roof applied over the insulation. This, of course, keeps the metal from getting hot.

This corrective measure may not be practical for you. If not, you must provide through ventilation as close as possible to your roof to draw out all the superheated air from the ceiling area. You will also find it necessary to place screened, louvered vents on the opposite wall to allow fresh air inside.

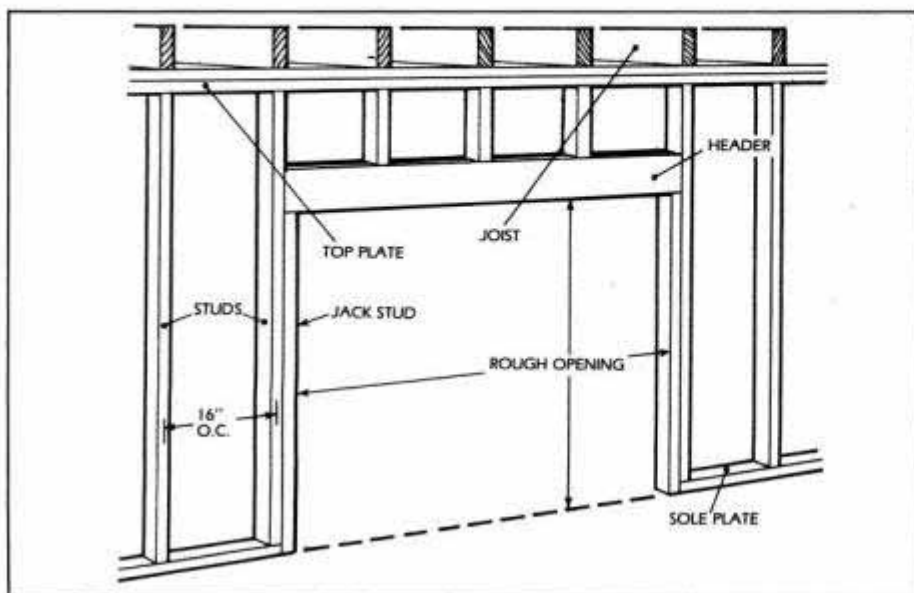
## Sliding doors for closet

*I live in a 55-year-old house which is in excellent condition. I have two closets that have a door on one end. The closets are so deep that I can't get to the back without moving stored items. I'd like to cut out each wall and put in sliding doors. But before I cut out the wall, I'd like to know what size opening I'd need for an 80-in. door, and how much I should allow for the header and track?*—Albert J. Ontolchik, Cleveland

I'm afraid the explanation is too detailed for the limited space of this column. However, hardware stores,

lumberyards and do-it-yourself shops carry the hardware, which will have accurate drawings showing the required clearances.

First, determine if the wall to be cut is a bearing wall. If it supports a floor or ceiling above it, it is bearing and must be supported by a header on jack studs at each end. The ceiling framing must be temporarily supported during work. Your building department or an engineer can tell you the size header for the span you want. If you haven't done this work before, have a contractor frame a rough opening for the sliding doors. You can do the finish work.



Framing a door on a bearing wall involves adding a header supported on jack studs.

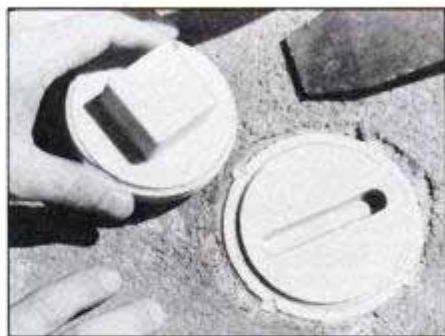
## Consumed by mildew

*Please help. We're being consumed by mildew. Our ranch-style home is built on a slab, has aluminum siding and is heated by electric ceiling cables.*—Larry J. Dawson, Waynesboro, Pa.

You can waterproof concrete, but vapor still will pass through. If moisture is under the slab and the slab wasn't poured over a vapor barrier, moisture will rise through the slab forever. I would remove the baseboard, carpet and pad, and install a vapor barrier (minimum 4-mil.-thick polyethylene) over the entire floor, stapling it a few inches up the wall. Carefully fold it at the corners. Reinstall the baseboard and carpet. Trim the vapor barrier at the baseboard top.

## SERVICE TIP

Aptly called Toe-Saver, the Genova plug closes off a cleanout opening level with the floor. There is no lug to trip over. Priced from \$2.50 to \$5, it's made in 3- and 4-in. diameters to replace plastic and metal cleanout plugs that are set flush in concrete

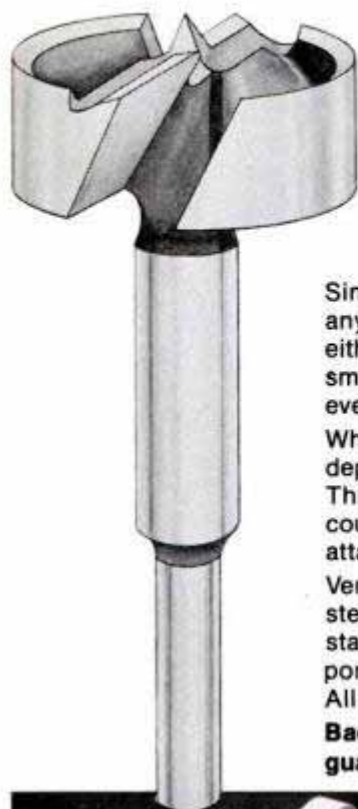


A Toe-Saver cleanout plug (right) is used in place of standard raised-head plug.

floors. A flat metal bar or piece of wood up to  $\frac{3}{8}$  x 2 $\frac{3}{8}$  in. can be used to tighten or loosen the plug. For further information, write to Genova Inc., 7034 East Court St., Box 309, Davison, Mich. 48423-0309. **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 the column. For more home-repair and maintenance help, get PM's Home Care Guide, \$4.95 postpaid. Send your order(s) to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10101.

# Forstner Bits - A Good "Bit" Better!



Almost unknown in America, Forstner bits are the most accurate and versatile of all woodbits.

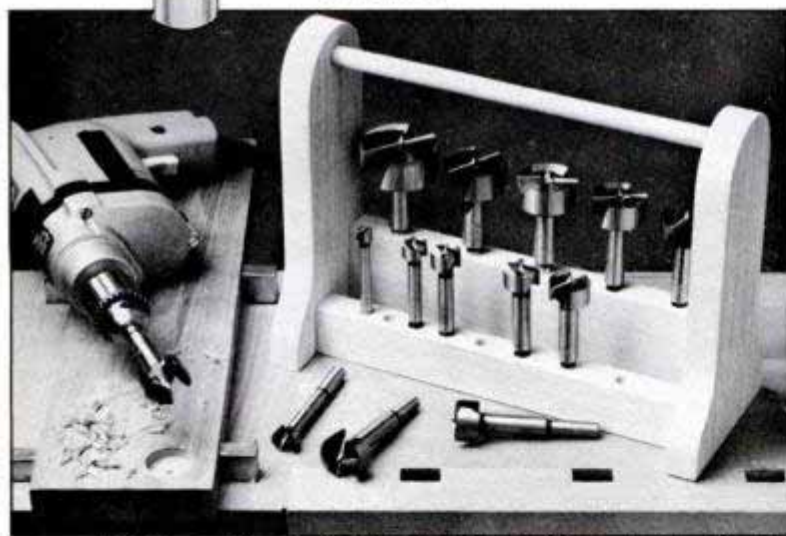
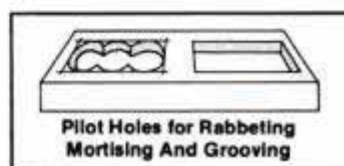
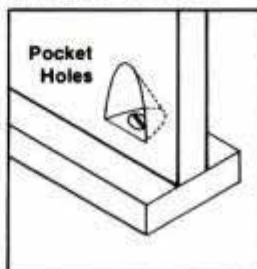
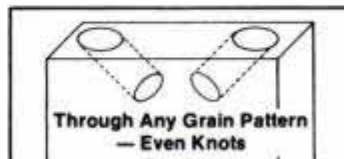
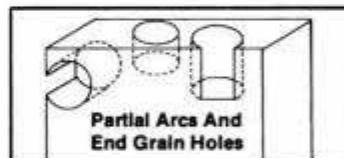
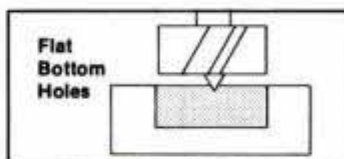
With your Forstners you can drill flat bottom holes, or bore **clean** holes in thin stock or veneers... and even end grain. They easily enlarge existing holes.

Since Forstners are guided by their outer edges, you can bore any arc of a circle; hence even ovals or curved openings... either flat bottom or thru... and the hole sides are glass smooth! Because of their design, they won't move off center even through irregular grain or knots.

When rabbeting or grooving, drill holes of exact width and depth first, to cut down on chisel work and prevent splitting. Thru-holes for door locks or blind holes for plugs above countersunk screws are a breeze. Great for pocket holes to attach rails to tops.

Very high Austrian quality; carbon tool steel. Primarily used in drill presses or stands, they can be used in any portable drill with a  $\frac{3}{8}$ " or larger chuck. All bits are  $3\frac{1}{2}$ " long.

**Backed by our 90 day money back guarantee.**



Yes Ric Leichtung, please send me:

How Many	Item Number And Description	Price Each	Total Price

Net Amount of Order \_\_\_\_\_  
 Shipping, Handling, and Insurance **\$2.00**  
 Ohio Residents Add 6 1/2% Tax \_\_\_\_\_  
**TOTAL** \_\_\_\_\_

**Method of Payment**

Check Enclosed  VISA  MasterCard

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State \_\_\_\_\_ Zip \_\_\_\_\_

**LEICHTUNG'S 1983 Fine Tool Catalog**

Here's my order for Forstner bits. As my BONUS please send your 98 page, 1983 color catalog of hard-to-find woodworking tools, PLUS all catalogs and bulletins... **FREE**... FOR THE NEXT TWO YEARS!

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## Swinging like a metronome

*My problem concerns the alternator gauge in my 1971 Dodge Charger. Without rhyme or reason, the needle suddenly swings way over to discharge. Dashboard lights dim and turn signals barely blink. Then, just as quickly, the needle swings back to normal or well into the charge region.*

*I've had the alternator tested. The voltage regulator, battery and drive belts are new. No one can explain this strange behavior, which never happens when the car is in the hands of a mechanic. Do you have any thoughts on this problem?—Tom Bissonette, Waterloo, N.Y.*

In 20 years of writing *Car Clinic*, I've

rarely been without thoughts about any problem. My thought on this one is that there's a short in the electrical system. Something carrying current is grounding out momentarily. With conditions right, vehicle movement can activate the forces that cause the short. Further movement can restore things to normal just as quickly. Frequently, this type of short results when an engine mount breaks. The resulting engine movement causes a wire to ground.

The object that's shorting out has to be large enough to handle a heavy load. It can't be any piddling No. 14 or No. 16 gauge wire. If it were, it would

not be able to handle the electrical load caused by shorting and would melt. Therefore, inspect heavy wiring and connectors, especially the connector carrying alternator current to the battery. It's at the rear of the engine on the firewall. The wire it supports is No. 10 gauge, which is heavy enough not to burn out when the short circuit occurs. If memory serves me correctly, this connector has a tendency to corrode. Pull it apart and check its terminals. If they're corroded, clean them or replace the connector. Also inspect that No. 10 gauge wire for damage. If this fails to uncover the trouble, make an inch-by-inch inspection of all wiring harnesses, including the starter motor cable and terminal.

## Pint-size solution

*My 1981 Chevrolet Caprice station wagon (5.7-liter diesel engine) has a lockup-type automatic transmission that's giving me fits. It doesn't engage after I make a sudden stop in traffic until the engine is revved up quite a bit. Then, it engages with a rough thump. I'm afraid I'm facing a bill I cannot afford. Is there some sort of additive I can try?—Don Clark, Wichita, Kan.*

Not an additive—just ordinary Dexron II automatic transmission fluid. If the problem is being caused by a sticking Teflon sealing ring in the delivery sleeve, which is a fairly common condition with your 350C automatic transmission, overfilling the unit by one pint may straighten it out. It's worth a try, because if the trouble isn't being caused by this Teflon ring, you could be up against an internal transmission problem. A competent transmission shop should be able to diagnose the problem by pressure-testing the trans on a dyno or on the road.

## Isolated epidemic?

*The four-speed manual transmission in my 1979 Mercury Zephyr jumps out of first gear. The transmission was repaired twice, without success. The car has been driven only 22,000 miles. The dealer says mine is an isolated case. Yet, my brother owns the same model and has the same problem. What's the*

*truth about this?—Richard Schreuder, Reading, Pa.*

The truth is I'll have to guess, because your description of the car leaves much to the imagination. You could have one of three four-speed transmissions in this car—a single rail overdrive (SROD), Hummer 79ET (manufactured in Germany) or the SR4. Hummer and SR4 units are used in cars equipped with 2.3-liter (140-cu.-in.), naturally-aspirated or 2.3-liter, four-cylinder turbocharged engines,

respectively. The SROD is installed in cars having the 3.3-liter (200-cu.-in.), six-cylinder engine.

I'll guess that your Zephyr and your brother's have 3.3-liter engines and SROD four-speeds. I'm probably on safe ground, because there has been a problem with the SROD transmission jumping out of first gear. One or more of the following conditions cause this:

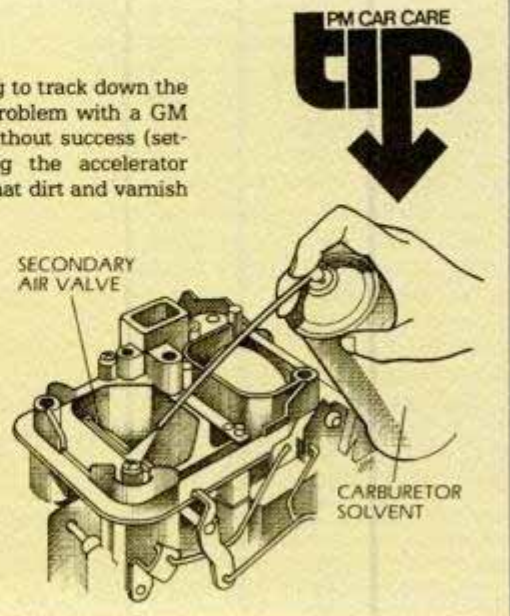
1. The floor pan wasn't cut out properly in production, and it's blocking the

*(Please turn to page 24)*

## Air logged

I was going nuts the other day trying to track down the reason for a flat-spot acceleration problem with a GM V8 engine. After doing the usual without success (setting ignition timing and replacing the accelerator pump), it suddenly dawned on me that dirt and varnish coating the secondary barrel of the Quadrajet carburetor could keep the secondary air valve hung up. This allows too much air to enter the cylinders on acceleration when a greater concentration of gas is needed.

I flicked the air valve a couple of times to see its response. Sure enough, it acted like it couldn't get out of its own way. A spritz of carburetor cleaner down around the valve eased the problem. If it hadn't, I would have had to remove the carb for a thorough cleaning.



shift lever before first gear is fully engaged. Hopefully this is the trouble, because it's easiest to repair. If shift lever movement is restricted by the floor pan before first gear engages fully, enlarge the hole in the floor pan.

2. The turret assembly through which the shifter shaft extends is worn, causing shifter shaft movement that pops first gear out of engagement. If this is the reason, replace the turret which is bolted to the transmission extension housing.

3. The third-and-fourth or reverse gear shift rail is sloppy. The rails are probably okay, but they each work in conjunction with a poppet valve. If the valve is damaged or isn't the correct one, the rail will move and cause first gear disengagement. If this is the case, the transmission has to be disassembled to replace the valve.

4. First-and-second synchronizer assembly or the leading edge of first gear is worn or damaged. Again, transmission disassembly is necessary.

**A hitch in time**

*I really don't have a problem, but I do have a question. It concerns 1981 and 1982 Honda Accords equipped with automatic transmissions. The ignition timing specification for my 1981 Accord calls for a setting of 0° ± 2° with the transmission in gear and the engine running at 800 rpm. The ignition timing specification for my friend's 1982 Accord, which is identical to mine, is 16° before top dead center (BTDC) with the transmission in gear and the engine running at 700 rpm. How come there's this much variation?—Carl Lawrence, Manhattan Beach, Calif.*

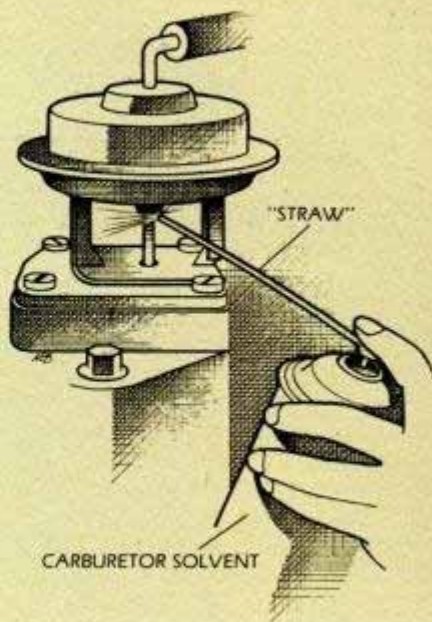
Identical? In respect to timing they're not, because each uses a different timing system. The timing of your '81 Accord is controlled by centrifugal force, manifold vacuum and ported vacuum. The timing of your friend's '82 is controlled only by centrifugal force and manifold vacuum. I don't want to get involved in a long discussion about this, so let me just say that according to Honda, "The two systems operate differently to achieve approximately the same result, and the reason Honda selected the ignition timing control for the '82 was simplicity." Maybe so, but it's also a fact that the 16° BTDC setting at idle speed gives the '82 Accord

**DO YOU HAVE A CAR PROBLEM?**

*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 discussed in the column.*

**Championship advice**

Our friends at Champion Spark Plug Co. offer this good tip about engines that idle roughly because of a vacuum leak. One area of leakage frequently overlooked is the diaphragm of the exhaust gas recirculation (EGR) valve. An EGR valve can leak from a hole that's large enough to cause rough idling, but too small to prevent diaphragm movement. Therefore, the normal troubleshooting method of touching the diaphragm to see whether it moves may fail to reveal the existence of a damaged diaphragm. But there's another way—with carburetor solvent. Aim the flexible "straw," which usually accompanies a spray can of solvent, at the underside of the valve, especially around the actuator shaft (engine running, of course). If the idle smooths out (the solvent is sealing it temporarily), you've got a leaker. Replace the valve.



excellent pullaway torque. In any event, don't fool with the setting. Stick to the one for your '81 engine and let your friend stick to the one for the '82 engine.

**Head master**

*You're my last hope, because no Oldsmobile or Pontiac dealer in this area has been able to uncover what ails my 1980 Olds Omega. Its Pontiac-made, 2.5-liter (151-cu.-in.), four-cylinder engine carbons up and starts knocking. It matters not which gas I use. I've tried different brands and all octanes from 87 to 92. Mechanics just keep pouring GM Top Engine Cleaner into the cylinders. I'll chuck the car if you can't help.—Max Wolfe, Speedway, Ind.*

A new head gasket may be the answer to your prayers, Max. The gasket now in the engine is 40-thousandths of an inch thick. The new gasket (part No. 10022914), which is 60-thousandths of an inch thick, lowers the compression pressure enough to prevent knock.

I suggest you return the car to your dealer and advise him of this new gasket. Ask him to contact the GM regional office which is listed in your owner's manual. Your case is documented, so even if your car is no longer covered by warranty, this repair should be free.

However, your dealer should explore all possible causes of spark knock before he replaces the head gasket. Most spark knock problems are the result of a faulty EGR valve. Make sure the dealer bench-tests your valve and

checks the EGR passages in the manifold for clogging. One other unusual cause of spark knock is sticking centrifugal advance weights. Ask your dealer to check them for corrosion and binding. **PM**

**SERVICE TIPS**

- If you use part No. GF478 as indicated on page 7-2 of the 1982 Chevrolet Corvette owner's manual or in Fig. 6C-3 of the 1982 shop manual to get a fuel filter, you'll get the wrong one. The correct part number is GF482.
- Here's how to handle a spark knock in a 1983 Ford/Mercury 2.3-liter engine: Be sure timing is set according to the engine emissions decal. Inspect vacuum lines for correct routing and tight connections. Check the EGR valve. If nothing shows up, retard timing in 2° increments to a maximum of 6°, readjusting curb and fast idle speeds each time.
- Does your 1983 GM 125C automatic transmission start out in second gear? If so, you may have a fluky "CB" or "HY" early production unit. No problem—just have your dealer remove the governor assembly from the transmission and take out the primary spring.
- Hesitation on medium acceleration from idle with a Chrysler Corp. 1983 225-cu.-in. engine and one-barrel carburetor may be corrected by installing a driveability package (part No. 4293788), but only if the engine carries hose routing label 4227725. The vacuum delay valve in the package won't work on engines that have hose routing label 4139816. This is in bulletin 14-07-83.

# Save Gas, Save Engine with 'POLY'

The following introduces one of the most fully tested and credentialed gas-saving, friction-reducing engine treatments ever to reach the market!

**WHAT IS POLY?** "Poly" is short for polytetrafluoroethylene (TFE). It is the slipperiest substance known to man (1981 Guinness Book of World Records, p. 188). The Petrolon Corporation, makers of Slick 50, has invented a way to permanently bind this slippery chemical to your engine with one treatment. All you do is add one quart of Slick 50 to your oil during oil and filter change. By reducing engine friction, Slick 50 increases gas mileage and horsepower and reduces engine operating temperature, thus causing your oil and engine to last longer. Just as important, it reduces metal wear, defraying costly overhauls.

**HOW DO I KNOW THIS ISN'T A FRAUD?** Slick 50 has some very impressive credentials. The "Consumers Digest" magazine (March/April, 1982, p. 35) states "Slick 50 does reduce engine heat and ordinary wear, and our informal tests indicate that it will improve gas mileage by about 2 or 3 miles per gallon." Researchers at the Franklin Institute Research Laboratory, after applying a powerful ultrasonic cleaning process to a Slick 50 treated engine, were surprised at its permanence. They stated, "We actually expected the Petrolon Slick-50 TFE Resin coating to also be removed, but later found it was still there."

The FAA (Federal Aviation Administration) has fully accepted Slick 50 Aircraft Piston Engine Treatment (F.A.R. #33.49). An FAA test simulating 1400 hours of engine use (equivalent to about 70,000 miles on a car) showed almost zero engine wear!

2500 miles after removing Slick 50 from the crankcase, tests done at the University of Utah Engineering Experiment Station showed that the benefits of Slick 50 were still there. They reported a horsepower increase of 16.9% and 9.9% for light and heavy loading respectively. The senior engineering researcher at the University of Southern California in San Diego stated this, "Slick 50 does increase horsepower and decreases fuel consumption in tests done at the university." The Space Shuttle Columbia uses the chemical "poly" in its gears and bearings because it is the only chemical lubricant which can withstand the heat and corrosive elements of space.

Perhaps most dramatic of all is a tor-



ture test overseen by the Automotive Services Council for Pennsylvania and shown on television station WTVE. Three cars with between 75,000 and 129,000 miles on them were treated with Slick 50. Six months later the oil was drained from each vehicle, and the cars were driven without the oil plugs for about a half hour. The water temperature never rose, and the engines sustained no apparent damage. There are many more tests available. If you are still skeptical, send \$2.00 to defray printing and postage costs, and we will send you additional, more detailed test information, etc.

**HOW DO YOU TREAT AN ENGINE?** Very simply. A few minutes before oil and filter change, add engine flush (sent free with each order) to clean out the engine. Let the engine idle for 10 minutes. Then drain the oil, change the filter, and add the proper amount of oil less one quart. Add one quart Slick 50, drive for 30 minutes, and leave it in the crankcase for 3,000 miles. As the engine operates, the oil carries the polytetrafluoroethylene between the parts where it is burnished into the pores of the metal. Once impregnated, it is permanent, so you do it only once, not each time you change oil. One quart of Slick 50 will treat all standard 4-, 6-, and 8-cylinder gasoline and diesel engines.

**WILL IT WORK WITH MOST OILS?** Yes, Slick 50 will work with all petroleum-based oils and all synthetics that are compatible with petroleum-based

oils. An exception is graphite oils. However, once an engine is treated, you can go back to a graphite type if desired.

**WHAT ARE THE BENEFITS OF SLICK 50?** Your actual benefits in percentages may vary, depending on the kind of driving you do, vehicle condition, weather, and geographic area. By reducing friction, Slick 50 does all of the following: It increases gas mileage. It increases horsepower—small economy cars and large RV's really need this! It reduces operating temperatures, thus increasing the lubrication and life of the oil and the engine. Last but not least, the drastic reduction in engine wear defrays or eliminates costly overhauls which could save you up to \$1,000. Slick 50 eliminates the "lubrication starvation" that all cars experience when first started before the oil has a chance to circulate. Up to 90% of the engine wear on a car can be caused by this lubrication starvation. You receive all of these benefits for \$33.95, less than the cost of two tanks of gas.

**WILL SLICK 50 HARM MY ENGINE OR AFFECT MY WARRANTY?** No! Slick 50 is suspended in an excellent grade of petroleum oil which meets or exceeds every manufacturer's engine warranty requirements. In addition, Slick 50 is the only product of its kind to have both an API (American Petroleum Institute) and an SAE (Society of Automotive Engineers) rating imprinted on the package. It also has a SF-CC-CD service classification.

**ARE DEALERSHIPS AVAILABLE?** Yes. Here's an opportunity to make handsome profits. Having such solid test results from major institutions makes Slick 50 easier to sell than many other products. Free dealership information is sent upon request.

**Free engine flush sent with each order. Free shipping with orders of 2 or more.**

**For purchase or further information, call toll-free 1-800-525-8624 (in Colorado call 1-303-762-1385) or send to SLICK 50, 3148 S. York St., Englewood, CO 80110.**

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# DETROIT LISTENING POST

## \$100,000 Cadillac?

Cadillac Div. General Manager Robert D. Burger disclosed recently that he would like to take a shot at the hyper-status market with a future model in the \$100,000 stratosphere. Obviously, he added, such a car would have to be done just right to have the kind of value and snob appeal required at that price. There's no word on what sort of car that might be. But Burger said his division was taking a serious look at the idea.

Meanwhile, Cadillac's '84 fwd C-body DeVille should reach production sometime this month for a fall intro. The compact Cimarron is being readied for a V6 engine injection for '85, and the next-generation fwd E-body Eldorado and K-body Seville are under development for '86 introduction.

Still, Burger says he intends to keep a rear-drive Cadillac in the lineup as long as there's demand for it. Unless he's talking limousines, that means a version of the current top-of-the-line C-car Fleetwood will likely be kept in production after the new C-cars debut.

## Chrysler going it alone

In case you haven't heard, Chrysler's deal with Peugeot to share a U.S.-built Omni/Horizon replacement (beginning next fall) is off. The two companies reportedly couldn't agree on the size, with Peugeot wanting something smaller than what Chrysler had in mind. Chrysler now says it'll build its own new subcompact automobile, with introduction pegged for the '86 model year.

One '85 program that is still in place is a mid-sized, 103-in.-wheelbase, fwd K-based, H-body, five-door hatchback sedan. The car will slide into the growing Dodge/Plymouth/Chrysler lineups somewhere among the current LeBaron/400 and E-Class/600 models. With the new G-24 sport coupes and T-115 minivans bowing this fall, and the rear-drive, M-body Cordoba and Mirada coupes remaining in production at least through '85, there's going to be a real smorgasbord of model choices at Dodge and Chrysler-Plymouth dealerships.



*Cadillac is getting back into the convertible business, as this photo of an '84 indicates. Caddy General Manager Bob Burger says 3,000 will be built by American Sunroof, the same people who do the Riviera ragtops, and they'll be available soon after the start of '84 model year production. Base price is around \$29,000.*

## High-performance Fords

Once the hot SVO (Special Vehicle Operations) Mustang makes it to market this fall, the next SVO factory street rod may well be a rumored ultra version of the new fwd Tempo. It would feature a very special wheel/tires/suspension package plus aero aids, Euro-sport trim and accommodations and a turbocharged, injected version of the Tempo/Topaz 2.3-liter HSC engine.

On the V8 front, Ford says it could easily get another 20 horses out of the current 175-hp, 5.0-liter HO V8 by adding fuel injection, state-of-the-art electronic control (EEC IV) and a few other tweaks if pressure from the competition warrants the expense. If Camaro/Firebird engineers have their way, it will.

Then there's the next (11th) generation Thunderbird already being planned in Dearborn, Mich., for a probable '88 debut. Word is it will be an ultralow, ultraswoopy, land-bound missile with aerodynamic body concepts straight off the recent Probe IV (Cd=0.15), air-sprung suspension, fwd and injected V6 power.

## AMC revamping models

American Motors plans to drop two slow-selling Renault models as well as its own aged Concord and Spirit this fall when the new three-door and five-door Alliance-based hatchbacks are introduced. Renault's LeCar and the 18i station wagon for now stays with a new nameplate—Renault Sport Wagon.

The full-size Jeep Cherokee also gets laid to rest when the new, smaller

Cherokee and Wagoneer arrive for '84. But the big, top-line Wagoneer remains. Word is the new fwd hatchbacks will be called something other than Alliance. Given the '83 Alliance sedan's excellent reputation and phenomenal first-year success, I sure don't understand why.

## Air-sprung Lincoln

Seems the '84 Lincoln Mark VII will be the first modern American car to ride on air springs. The pressurized rubber bladders, supplied by Goodyear, are designed to work with any type of suspension and conventional tubular shocks. Their pressures can be computer-adjusted with an on-board air compressor to compensate for changing loads. They can also be driver-adjustable to taste and conditions.

## Ford for '84

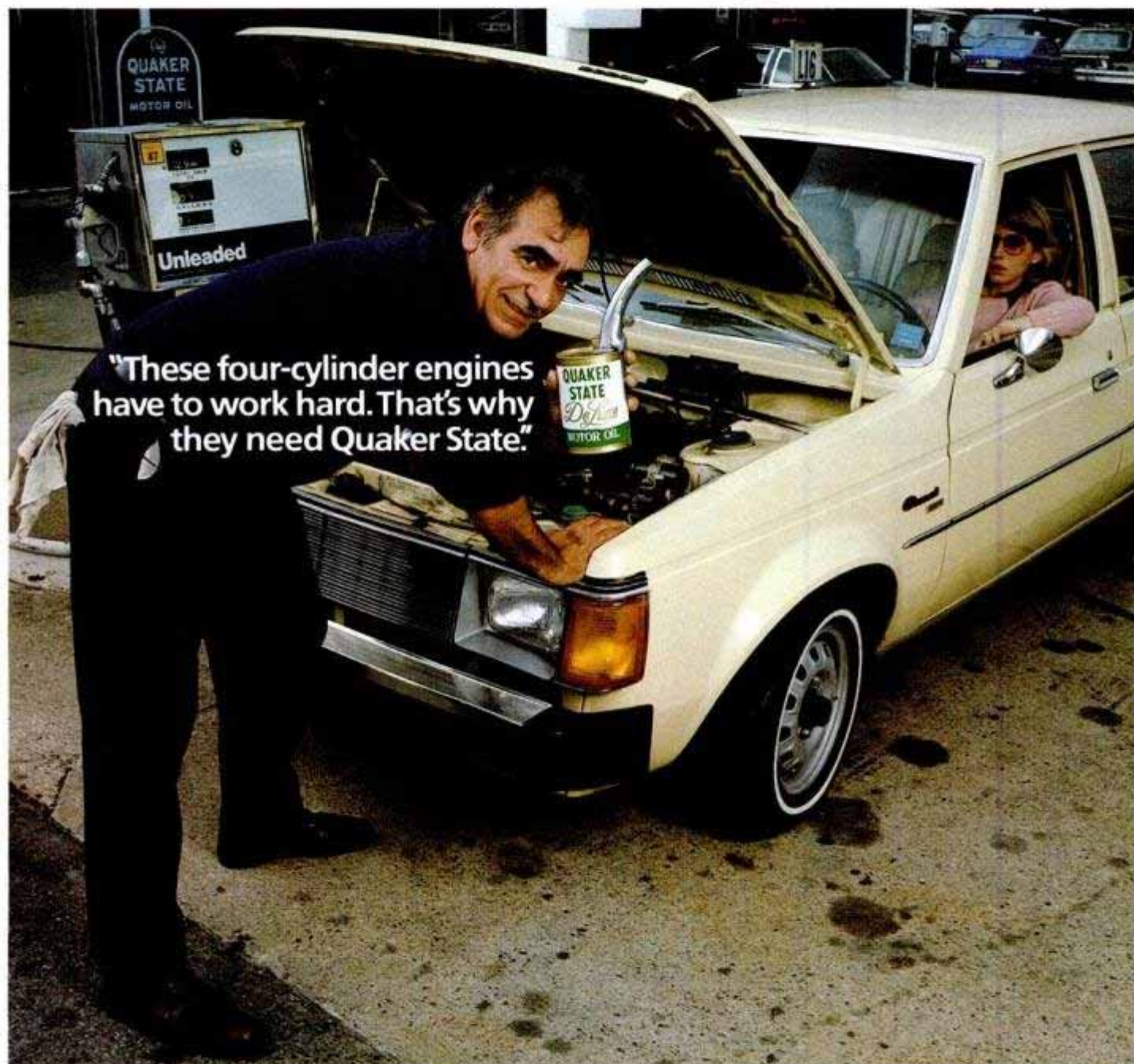
At a recent preview, Ford unveiled a number of '84 cars and engines.

Interestingly enough, the preview was held at the Briggs Cunningham Museum in Costa Mesa, Calif., to provide a suitable racing/high-performance backdrop for Ford's tweaked-up cars. This look-only-and-forget-everything-you-see preview was revealing in more ways than one.

Ford is going all out in its efforts to build not just the European image, but the European substance into its domestic vehicles. For instance, the 1.6-liter Four found in the EXP/LN7 and Escort/Lynx will get a megadose of horsepower.

*(Please turn to page 28)*

# "Today, you need an oil this good."



"These four-cylinder engines have to work hard. That's why they need Quaker State."

Small engines deliver good gas mileage. But to give you the kind of performance you want, they have to work extra hard. They need Quaker State quality. These Quaker State motor oils are made exclusively from Pennsylvania Grade Crude Oil. They offer quality protection for any kind of car—old or new, big or small. Quaker State. It's so good, it's America's best selling motor oil.

## Quaker State



## DETROIT LISTENING POST

(Continued from page 26)

er next year with the addition of a turbocharger and multipoint fuel-injection. This will boost power output to 124 hp and, according to Ford, will propel the cars to 60 mph in eight seconds. While Ford didn't disclose specifics on how the suspension and chassis would be modified to accept all this power, they felt confident the cars could handle the added load and get the power to the ground—and keep it there. These engines won't be available until after the start of the '84 model year.

For economy fans, the Escort/Lynx also will be available with a 2.0-liter turbocharged diesel engine. In other words, you'll be able to order up your '84 Escort or Lynx in slow, medium or fast versions. The base, normally aspirated 1.6-liter engine will still be available.

The interiors of both those cars will be vastly improved and the Euro influence will be very much evident. Rather than the schizoid look of the old interior, the new one is harmonious, looks all-of-a-piece and is tastefully executed.

And speaking of executions, the lum-

py EXP/LN7 twins will not be cut loose from production but will carry on with the addition of dams and spoilers to improve the looks. The modified cars actually look much better than you might expect. Tacked on swoopies usually look dumb. In this case, they don't look so bad. With the addition of the turbomotor and aero aids, the EXP/LN7 might just give Chrysler's Daytona/Laser sportsters a run for their money.

### More Buick HiPo catalogs

John Thawley of Hawk Engineering (a Buick-contracted prototype shop in Santa Paula, Calif.) writes to correct an error in the March '83 *Detroit Listening Post*. We said that the Buick V6 Performance Guide by Jim Ruggles was available from Buick dealers. It's not. It's available (free) from Special Products Engineering, Buick Motor Div., 902 East Hamilton, Flint, Mich. 48550.

Thawley's own *Buick Free Spirit Power Manual* can be found at some dealerships, or (for \$8.45) from its publishers, Steve Smith Autosports, Box 11631, Santa Ana, Calif. 92711. And Thawley tips us that a third high-performance Buick book, carrying an official GM part number, should be in dealer inventories by the end of this year.

### Camaro/Firebird futures

Rumors already are flying about GM's fourth-generation F-car (Camaro/Firebird), due about 1987. It will probably be fwd, considerably smaller than today's models, some 800 pounds lighter and equipped with a port-injected, four-cylinder engine. The hot Z28 and Trans-Am models will get a version of the turbocharged, injected 2.9-liter aluminum V6 now under development at Pontiac Div. This same killer V6, putting out a reputed 210 hp, should be available by '85 in Camaros and Firebirds and as part of a super-high-performance Pontiac Fiero option.

### GM goes west

General Motors recently announced its plan for a styling and design center in California. The goal is to create products and advanced concepts and try to figure out why over half of all Californians buy Japanese cars.

GM sees those wacky left-coasters as styling leaders and trend setters for the rest of the country and wants to be close to those trends. The center will also put them close to the Art Center College and engineering schools whose graduates don't want to leave sunny California for snowbound Detroit. **PM**



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# Shoulda Had-a HAYDEN



## This Family's Transmission Failed!

The same scene is repeated thousands of times every day.

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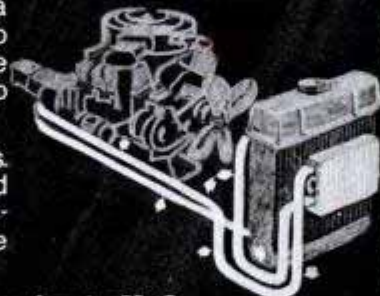
**Could My Transmission Fail?** Yes. Over 12 million transmissions failed last year\*. Nine out of ten transmissions and engine failures can be traced to overheating.

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perature doubles oil and equipment life. Transmission repairs run \$400 to \$1200.

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Send today for free product brochure to discover What's-A-Hayden.

\*Courtesy ATRA (Automatic Transmission Rebuilders Association).

 **HAYDEN INC.**

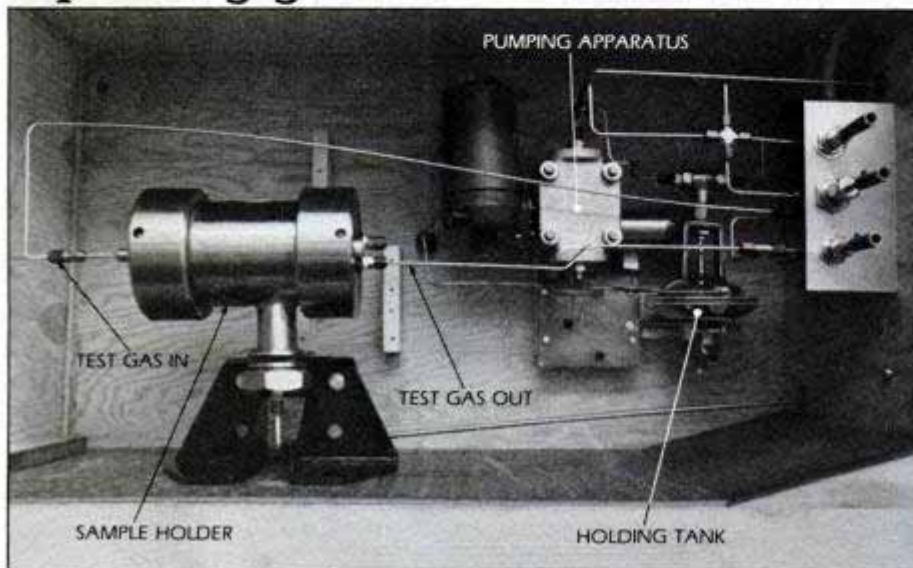
1531 Pomona Road, P.O. Box 848, Corona, CA 91720

Hayden Trans-Cooler prices start as low as \$29.95. To receive direct ordering information call toll free outside CA 1-800-854-4757 or (714) 735-4900.

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**Squeezing gas from a rock**



*To find out whether a rock deposit is worth mining for natural gas, geologists can use the CORAL. Test gas goes into the sample holder, passing through a rock sample and out to computerized sensors. The rate of flow indicates the natural gas content.*

Some natural gas deposits are found inside rock. Others are found in underground wells covered by rock. Currently, geologists have to do a lot of expensive drilling before they can judge the potential of a natural gas field. But in the future, the job may be cheaper and quicker with the help of the Institute of Gas Technology's new Computer-Operated Rock Analysis Lab (CORAL).

The portable lab uses just a tiny piece of rock from the potential gas field to analyze the chances of finding gas in or under it.

The sample is placed in the CORAL's stainless-steel cylinder. Test gas is fed into the cylinder and can pass out only

through the rock. Outgoing gas is piped to computer sensors which can analyze the flow.

Rock containing natural gas will produce more test gas than was introduced into the CORAL apparatus. Rock dense enough to cap a natural gas well won't allow test gas to pass through. In a CORAL experiment, test gas also goes into a holding tank to monitor the pressure of the test gas itself against that which passes through the sample.

All this is designed to give an on-the-spot estimate of the value of a natural gas dig. It will lead to more gas finds, and may drastically cut the cost of exploring for natural gas.

**There's more to the sun**

A team of American and British scientists aboard NASA's Kuiper Airborne Observatory (KAO) has found an infrared region that extends 1,250 miles beyond the sun's outer edge. The team photographed the region during last summer's solar eclipse over the Pacific. As the moon came between Earth and the sun, blocking out the disc, KAO's 36-inch telescope picked up the infrared region.

Most infrared radiation from the sun never reaches the earth because clouds absorb the rays. But KAO, a C-141 aircraft, shoots photos perched at 40,000 feet, where infrared radiation is more detectable.

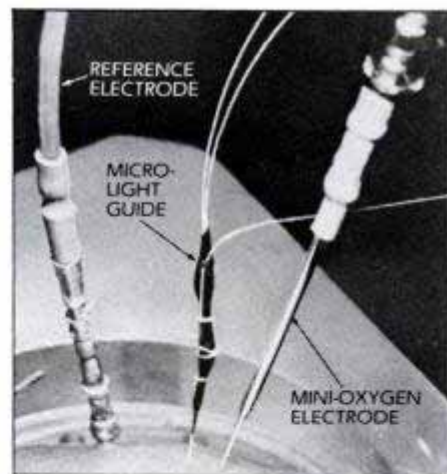
Initial analysis of the photos indicates the newly discovered solar region is made of densely packed gas. The photos also suggest that the sun may actually be quite a bit larger than scientists thought.

**Space Shuttle contest**

Have you heard about PM's Space Shuttle contest for readers? We've reserved space in the Space Shuttle cargo bay where we'll load up an experiment designed by a reader. You design the experiment, we build it and send it up. Winner gets an expenses-paid trip for two to the launch and there are other great prizes. For details, see page 102, April '83.

**Fleshlight for cell study**

To study an individual cell, a scientist has to get it onto a microscopic slide, a process which kills the cell. Scientists who want to study single living cells have searched for ways to do it while the cells are still alive. Now that method may be on the way. Rutgers researcher Sungchul Ji has observed the flow of alcohol through three living rat liver cells with a new system he has



*The Rutgers microlight guide, working with reference electrodes, can form an enhanced image of a single living cell.*

developed. Two fiberoptic strands are taped together, one to bring light to the tissue being studied and the other to transmit light reflected from a couple of cells back to a computer. A reference electrode helps enhance the fiberoptic image and a mini-oxygen electrode confirms the flow of oxygen.

With the new setup, doctors may one day examine single cells in a patient's body, allowing early and accurate diagnosis of diseases such as cancer and diabetes. **FM**



When it's summer and bumper to bumper on the freeway, wouldn't it be fun to drive beyond the pavement's end?\* Or on a winter morning, to beat even the snowplows to your favorite ski mountain after it snows all night?

If it's all-season fun you're after, Tercel 4WD Wagon can take you there. It lets you shift from front-wheel drive to four-wheel drive — **on command** — without stopping. It gives you six speeds forward — including an overdrive

for extra efficiency, and a unique "Extra Low" for maximum 4WD pulling power. Plus, it'll carry 7 sleeping bags, 4 pup tents, 2 camp stoves, and a guitar with room to spare!

The Tercel 4WD Wagon: tough as a hiking boot, practical as a backpack. It's not only the roomiest of all small 4WD wagons, it delivers the best mileage of any four-wheel drive you can buy — 42 Estimated Highway MPG, <sup>(32)</sup>EPA Estimated MPG!\*\* (Not to mention Tercel 4WD Wagon was named "Car of

# OH WHAT A FEELING! TOYOTA

the Year" by *Off Road Magazine*.)

Is it fun to head for your destination in a new Tercel 4WD Wagon? Fun? It's a blast!

\* For rough-road use, installation of the optional Chassis Gravel Shields is recommended.  
\*\* Remember, compare this estimate to the EPA Estimated MPG of other 4WD vehicles with manual transmission. You may get different mileage depending on how fast you drive, weather conditions, and trip length. Actual highway mileage will probably be less than the "Highway Estimate."

BUCKLE UP—IT'S A GOOD FEELING!

## THE NEW TOYOTA TERCEL 4WD WAGON. "DESTINATION FUN!"



# FOUR!

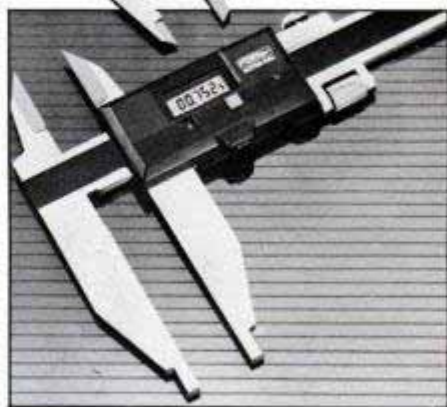
WHEEL  
DRIVE

## Triple sink for kitchen connoisseurs



American-Standard's self-rimming, triple-bowl sink is part of the new Connoisseur sink line. A double-bowl sink is also available. Prices for the triple-bowl sink range from \$326 for white to \$422 for color. The double-bowl sink's

prices range from \$166 for white to \$252 for color. Optional hardwood cutting boards are available for both sink models. For details, contact American-Standard, U.S. Plumbing Products, Box 2003, New Brunswick, N.J. 08903.



## Electronic calipers

Fowler's Ultra-Cal electronic calipers read out inside and outside measurements (in inch or metric) on a high-contrast LCD display. Available in 6-in. (\$199.50) and 12-in. (\$365) sizes from Fred V. Fowler Co. Inc., 66 Rowe St., Box 48, Newton, Mass. 02166.

## Quick corner cache



Closet Maid's easy-to-install shelves turn unused corners into valuable storage. Measuring 19 x 19 x 26½ in., the vinyl-coated shelves are held in wall-mounted clips.

The shelves are

\$7.99 each at home centers. From Clairson International, 720 Southwest 17th St., Ocala, Fla. 32674.

## Carry-about gas grill

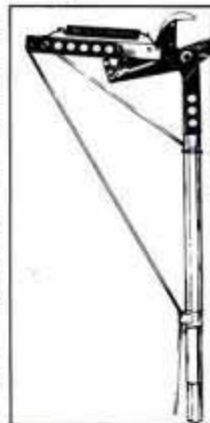
The Happy Cooker portable gas grill (\$69.95) features a locking lid that allows you to carry the grill by the handle—even while



you cook. The grill's 165-sq.-in. cooking surface is fired by a 14-oz. disposable propane cylinder (not included). Available at home centers and discount outlets. From UNR Inc., Box 429, Paris, Ill. 61944.

## Ratchet-action pruner

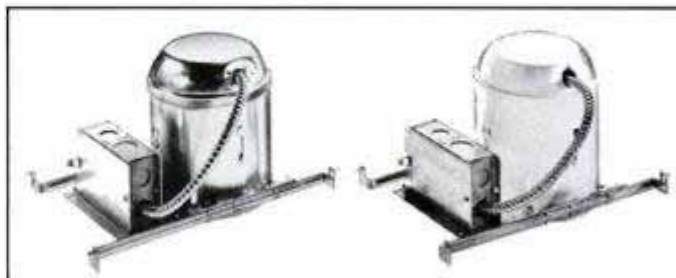
Make tree trimming easier with this ratchet-action pole pruner from American Standard Co., 1 West St., Dept. PM, Plantsville, Conn. 06479. The Teflon-coated steel cutting head is sold by itself (\$98), with two 6-ft. wood poles (\$155), or two 6-ft. fiberglass poles (\$199).



## Heavy-duty brushcutter



Solo's Model 109 brushcutter is powered by a 1½-hp, two-cycle gasoline engine that can be switched quickly to power any of Solo's outdoor equipment. The brushcutter (\$189.95) and engine (\$149.95) are sold separately. Options include a heavy-duty monofilament head (\$19.95), a three-knife mowing blade (\$34.95) and a circular saw blade (\$12.95). By Solo Inc., 5100 Chestnut Ave., Box 5030, Newport News, Va. 23605.

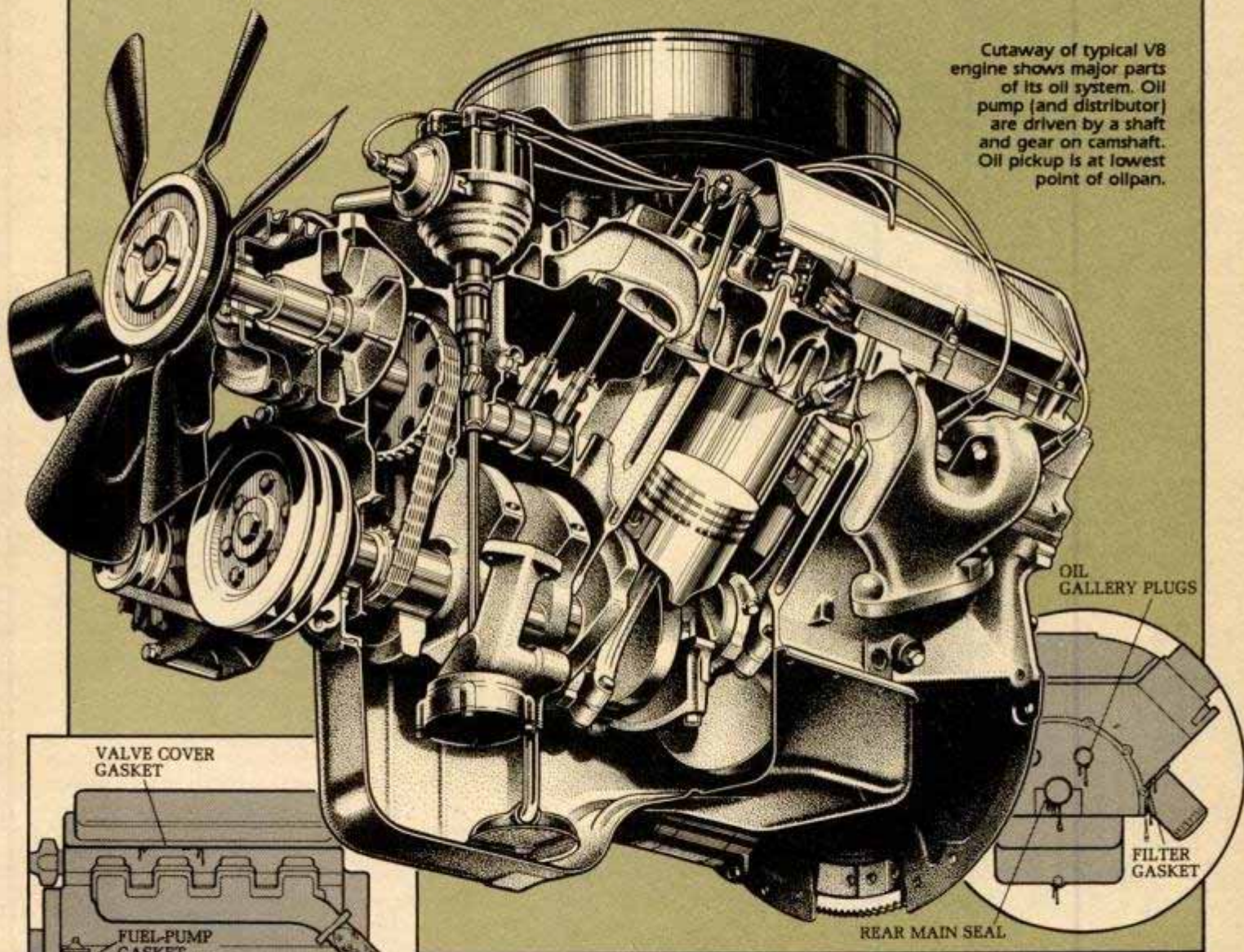


## Ceiling lights with safety sensors

The Halo Lighting Div., 400 Busse Rd., Elk Grove Village, Ill. 60007, presents the H7-ICT light (\$20) with sensors that detect dangerously high temperatures. The aluminum-finished unit (left) is used where ceiling insulation covers the housing. The white-finished unit (right) is used where insulation does not come in contact with the housing. **PM**

# Troubleshooting Oil Consumption Problems

Cutaway of typical V8 engine shows major parts of its oil system. Oil pump (and distributor) are driven by a shaft and gear on camshaft. Oil pickup is at lowest point of oilpan.



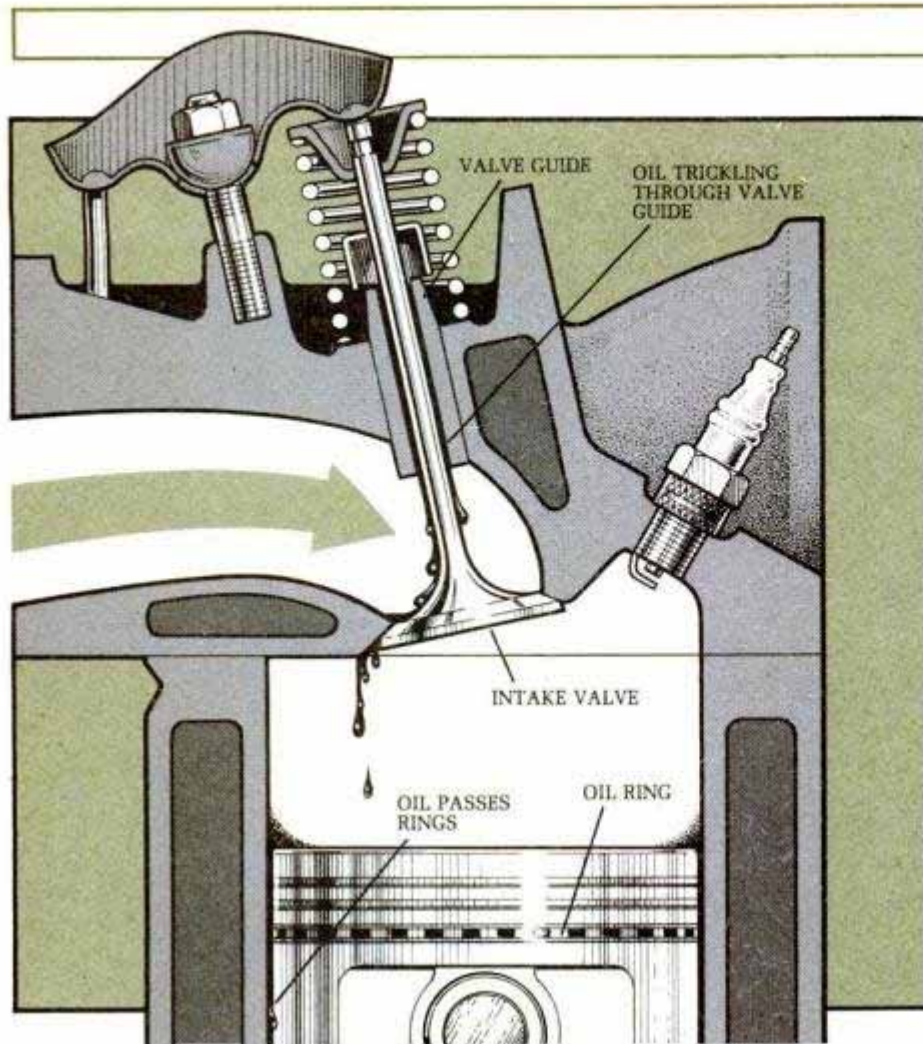
External oil leaks (insets) can occur at any of the many gaskets on an engine: valve cover, oilpan, fuel pump, filter and so on.

**H**as your vehicle's thirst for motor oil forced you to join the ranks of those poor unfortunates who carry a substantial part of the nation's petroleum reserve in cans in their trunks? Are you serenaded by the rolling and clunking of errant oil cans every time you accelerate or come to a stop? Do you occasionally find yourself at the side of a dark highway, flashlight gripped between your teeth, trying to direct a wind-whipped stream of oil

into that little opening in your car's engine?

Maybe it's time to solve your engine's oil-consumption problem. A lot of vehicle owners assume that the solution to an oil-use problem will be expensive. And while it's true that repairing some of these can be costly, a great number of oil-consumption problems can be fixed quite inexpensively.

The first step toward the solution is to determine whether the loss results from internal or



**Internal leaks occur when oil is sucked into the combustion chamber by one of two routes: either up past the piston rings or down past the valve guides and the valve.**

external leakage or both. Your parking space should provide a good clue. If a puddle of lubricant always is left behind, your vehicle is obviously leaking something. But remember, it could be transmission or differential oil.

An engine that leaks oil internally, into the combustion chamber, will produce blue exhaust smoke under one or more conditions. The list includes idling, accelerating, decelerating, after prolonged idling, or after fire-up. The conditions that provoke exhaust smoke can help you determine the source of the oil.

### External leakage

External leaks are difficult to pinpoint because there are many locations from which lubricant can leak, and because the vehicle uses more than one type of lubricant.

You can identify the area of leakage and the type of lubricant by leaving white paper under your parked car. Engine oil leaks will leave dirty spots, while transmission fluid leaks will leave pink spots. By tracing the point of leakage to the vehicle, the source can sometimes be determined.

However, if the entire underside of the engine is covered with wind-swept oil, the drip method of locating a leak may only reveal the spot where the lubricant is collecting before dripping to the ground. Sometimes, the

tracks of oil can be traced to the source. Remember that since the oil is blown to the rear as the car moves, the source will be a point farther forward.

In some cases, it may be necessary to clean the engine before attempting to find the leak. Use one of the commonly available engine cleaning solutions. Cleaning agents come in aerosol cans. You simply spray the cleaner on the dirty engine, allow it to soak in for a while and then hose it off. Several applications may be necessary to clean a filthy engine. You should do a particularly good job on the underside.

Once the engine is clean, repeat the drip test without driving. Let it idle for 20 minutes over the paper. Race the engine occasionally while it's idling to prevent overheating. Shut the engine off. If there are no spots on the paper, leave the car in place for a few hours.

The point of leakage should now be fairly easy to trace. If the leak is near the top of the engine, it may not drip down to the paper. But you should be able to spot the dripping lube on the clean engine.

In either case, if you still can't find the leak, you can try one of the black light kits available for tracing oil leaks. These kits include a fluorescent substance that's added to the oil.

When the black light is aimed at the leaking lube, it glows brightly.

Most engines have rocker cover, timing cover, oilpan and fuel pump gaskets. Some engines have valley or pushrod cover gaskets. On some V-type engines, the intake manifold seals the valley, and intake manifold end-seals are used. These are all common sources of leakage, and the leak can sometimes be difficult to spot. If the rear end-seal leaks, oil may collect on the block behind the manifold or it may leak down between the bellhousing and the engine block. In the latter case, it may lead you to believe that the source of the leak is in the oilpan gasket or rear main seal.

In some cases, a considerable amount of disassembly work may precede the installation of a gasket. This is particularly true of oilpan and timing cover gaskets. You'll want to consult a repair manual before attempting either of these repairs.

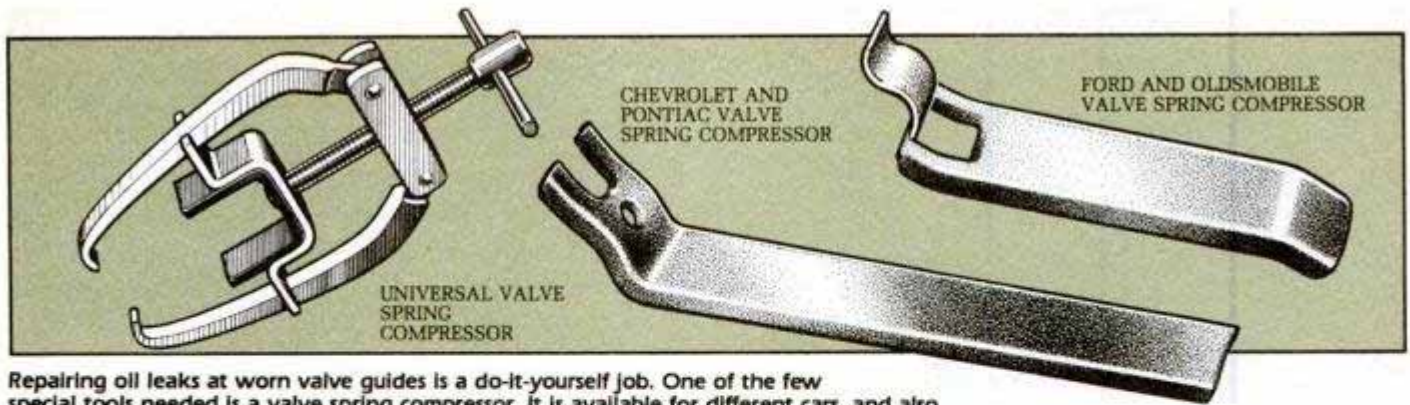
### Tighten bolts carefully

Occasionally, a gasket leak can be repaired by tightening a few bolts. However, don't tighten bolts excessively in an effort to stem the flow. Use a torque wrench and tighten only to the manufacturer's specification.

Modern gaskets are generally installed without adhesives. But in many cases, a fast-drying adhesive must be used to hold the gasket in place for installation. We have found that, when installing oilpan, rocker cover, fuel pump or timing cover gaskets, it's advisable to secure the gasket to the respective component first with a fast-drying adhesive and then allow it to dry before installation is attempted. Check the instructions that come with the new gaskets for any additional information concerning adhesives. When reinstalling components, torque all fasteners to the correct specification in gradual steps.

Some of the new powerplants are assembled with RTV (room temperature vulcanizing). RTV adhesive is used *in place of* conventional gaskets. On other engines, an anaerobic form-in-place chemical sealant is used in a similar manner. Your parts store counterperson should be able to tell you if either compound is necessary for repair. All he has to do is look in the gasket catalog. For some applications where chemical sealant was used at the factory, gaskets are provided for repair.

Most powerplants have a flexible seal surrounding each end of the crankshaft. These are usually known as the timing cover seal (front) and the rear main seal (rear). Timing cover seal leaks come from behind the front pulley of the engine and are easily misdiagnosed as timing cover gasket leaks. Repair of a timing cover seal involves disassembling the front of the engine. In most cases, the radiator must be removed. Consult a repair manual before attempting such a task. If the old seal wore a groove in the collar of the crank damper, the damper assembly will have to be replaced along with the seal.



Repairing oil leaks at worn valve guides is a do-it-yourself job. One of the few special tools needed is a valve spring compressor. It is available for different cars, and also comes in a universal model. Spring compressors can often be rented by the day.

Rear main seal leaks come trickling down from between the oilpan and the flywheel. To repair a rear main seal leak you must remove the oilpan. The rear main seal is located in the last of the main bearing caps or in a seal holder behind the last main bearing cap. On some engines, the oil pump must be removed so that you can gain access to the rear main bearing cap.

The main seal has both upper and lower halves. Once the cap or seal retainer has been removed, the ends of the upper half will be visible. On some engines, the upper half can be "walked out" by holding it against the crankshaft with a punch while an assistant slowly rotates the crank. Once the seal has been dragged around to the lower position, it can be pulled out. Again, consult a repair manual before attempting a rear main seal job.

Most engines have a camshaft expansion plug in the back of the block above the crankshaft. If this plug leaks, it can mimic a leaking rear main seal. On some engines, you can see above the crank using a flexible light probe. On other engines, you may not discover a

leaking cam plug until the rear main seal job fails to stop the dripping lube. In any case, the repair of the cam plug calls for removal of the engine or transmission.

### Internal leakage

If lubricating oil leaks into an engine's combustion chamber in significant amounts, it can produce several undesirable results, not the least of which is that large cloud of blue smoke that forms at the rear of the tailpipe. But smoke isn't the only negative effect of oil consumption. The presence of oil in the combustion chamber sometimes causes detonation. Furthermore, the fact that the engine operates without sufficient lubricant much of the time can also lead to friction damage.

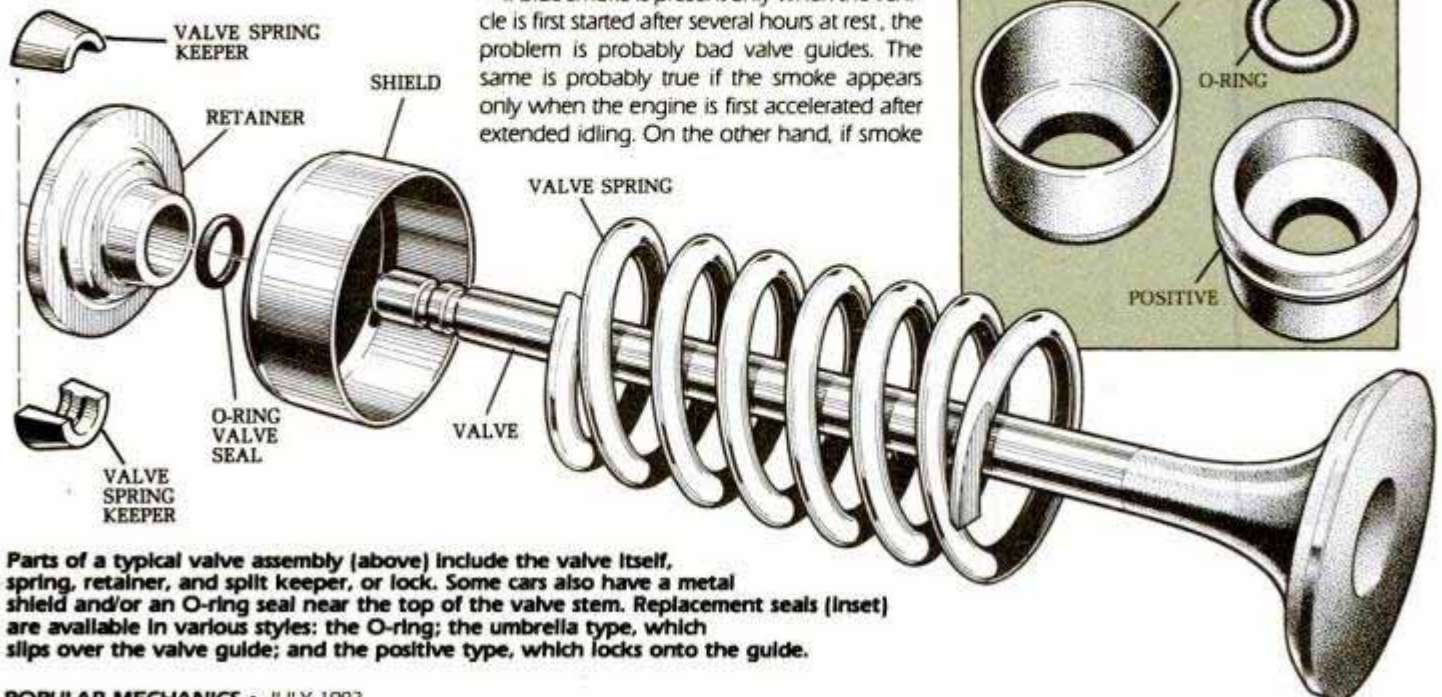
There are two principal ways that oil can enter the combustion chamber—through the valve guides or past the piston rings. But oil can also reach the chambers through the PCV system fresh air hose or, on some engines, past the intake manifold gaskets. There are several clues that can help you distinguish between the various causes of internal oil consumption.

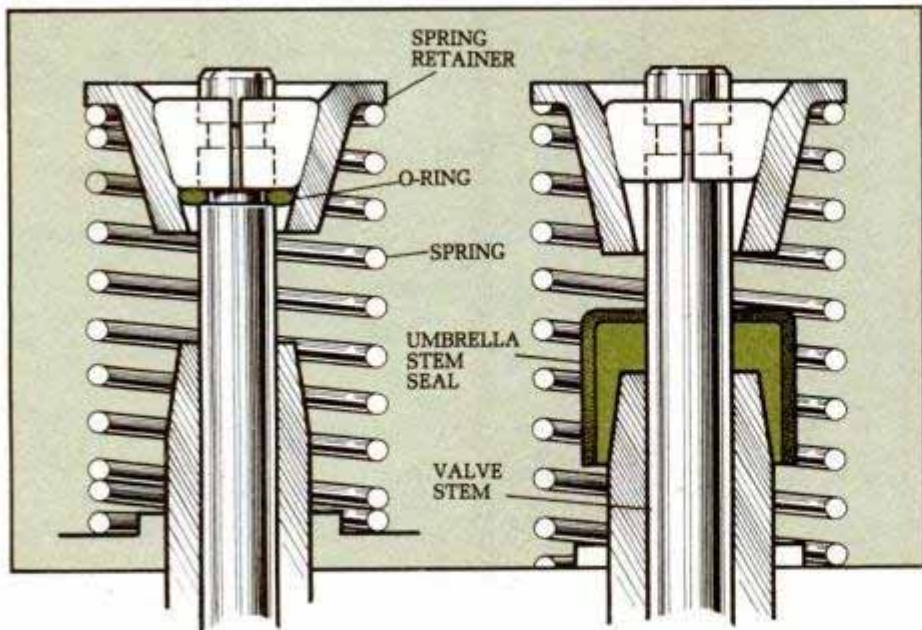
If blue smoke is present only when the vehicle is first started after several hours at rest, the problem is probably bad valve guides. The same is probably true if the smoke appears only when the engine is first accelerated after extended idling. On the other hand, if smoke

appears only when the engine is under load and continues throughout the rpm range, the oil rings probably are worn out or stuck in their grooves. However, as valve guides continue to wear, they can produce oil smoke under most operating conditions.

Before attempting a diagnosis, remove all the sparkplugs. If only some of the plugs exhibit the caked-on, oily black deposits that indicate oil consumption, you will be able to limit your troubleshooting to those cylinders.

Valve guide wear is a very common problem on today's high-temperature engines, and is certainly the principal cause of oil consumption. The valve guides are the bushings that hold the intake and exhaust valves. They are fitted to within a couple thousandths of an inch of the valve stem diameter and are sometimes capped at the top with a seal. You can check the valve guides for wear by pressurizing each cylinder with an air leak tester or a plug-hole air-hose adapter. An air-leak tester consists of an air compressor, a regulator, a





Two typical valve seal arrangements are shown above. Both have a funnel-shaped spring retainer and a split keeper, or lock, that fits into a groove on the valve stem. The setup on the left has an O-ring in another groove; the one on the right has an umbrella seal.

hose and an adapter that screws into the sparkplug hole.

To check valve guides, remove the valve cover, attach the air fitting to the first sparkplug hole, or the sparkplug hole of the first cylinder that shows evidence of oil fouling. Then turn the engine until that cylinder is at top dead center, and pressurize the cylinder.

Remove the jam nut, ball and rocker assembly for the intake valve. If all of the rockers are mounted on a shaft, remove the shaft assembly. (You'll need a manual which shows torque specifications to reinstall the rocker assemblies.)

Obtain an on-the-engine valve spring compressor. There are several types available, and they can be rented from most tool rental outlets. Tap the retainer of the intake valve for that cylinder with a worn socket and hammer. Then compress the valve spring and remove the spring, retainer and keepers.

Note the condition of the valve stem seal. If it's not on top of the guide, you'll find it in the form of a rubber O-ring in the valve stem's lower groove. If you have a mid-'70s car that was equipped with neoprene seals rather than the newer, more durable Viton seals, they may be cracked or broken. If they are, the replacement of the seals may be all that is necessary. However, you should also check the guides. New seals on worn guides will do little to stop oil consumption.

To check the condition of the guide, release the air from the cylinder while holding the top of the valve stem. *Don't let go or you may end up disassembling the engine!* Move the valve down 1/4 inch in its guide. Then attempt to wiggle the stem back and forth. If it moves a visible amount, the guides are worn excessively, and the head will have to be removed for

professional guide and valve seat service. Once the guides are renewed, the valve seats must be reground.

If the intake guide for the particular cylinder is okay, check the exhaust guide, as well. Exhaust guides generally have more clearance than intakes, but you should be able to produce only a barely perceptible lateral movement.

Reassemble the valve, retainer, spring and split valve keeper units carefully. If O-ring type seals are used, they should be pushed into the proper groove before the split valve keepers are installed.

If you find that only the valve seals are damaged, continue compressing springs and replacing seals, one valve at a time. We once solved a serious oil-consumption problem on a mid-'70s AMC V8 by replacing all of the seals, which had disintegrated.

Engines that use the intake manifold as a pushrod cover, like the small Chevy V8s, can sometimes draw oil through a leaking intake manifold gasket. This will mimic bad guides to some extent. However, the idle will be very rough and if the sparkplugs are removed, you'll find that only one or two are oil-fouled. A vacuum gauge can help confirm a leaking manifold gasket since idle vacuum will be low and unsteady.

Some engines can draw oil through the PCV system's fresh air tube if the filter is missing. You should always make sure that the PCV system is functional before attempting to diagnose an oiling problem.

If the oil-return holes that allow oil to drain back to the pan become clogged, an engine may begin to consume oil through the valve guides even if they're not excessively worn.

If you find that oil is unable to drain to the

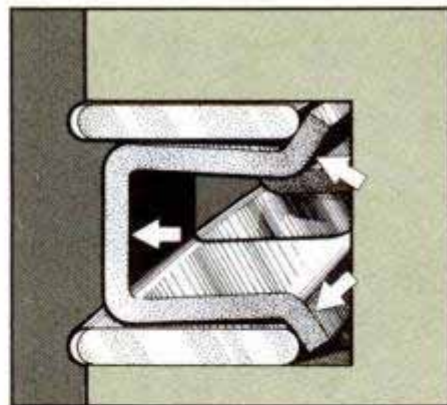
bottom of the engine, try to clear the drain holes before any additional diagnosis is attempted. Clogged drain holes can also aggravate a PCV oiling condition.

Some technicians have told us that using certain types of aftermarket rocker covers can lead to oil consumption through the PCV system if the internal baffling of these covers differs from the original equipment.

If all other potential causes of oil consumption have been ruled out, consider the oil rings. Bad oil rings are usually accompanied by bad compression rings, but not always. Generally, if the oil rings are worn, you'll find that the cranking compression of the cylinders is below the minimum. However, the presence of the oil can sometimes mask the compression problem.

If the engine pushes a substantial amount of smoke and hot air through the oil filler cap when it is removed with the engine running, the compression rings are probably worn. If air comes rushing out through the fresh air tube or oil filler cap when you pressurize a cylinder to check the valve guides, the compression ring seal is bad, and the oil rings are probably worn as well.

However, remember that oil rings can leak without the compression rings leaking. If the oil rings stick in their grooves, the engine will burn oil. Sometimes they can be loosened by driving the car for a short period of time with a



Oil rings should be forced out against the cylinder walls to make a tight seal. Leaking rings may be worn or just stuck.

crankcase full of light viscosity oil, such as SAE 10W, and a thin oil additive designed to free sticking lifters and oil rings. *Don't use one of the heavy, sticky oil additives for this purpose.* Run the engine until it is extremely warm. Place a piece of paper over the radiator if necessary, but don't overheat the engine. Then change the oil, using your normal fill.

Of course, the ultimate solution for oil rings that cannot seal the combustion area is a complete teardown and rebuild. Before you agree to this expensive job, make sure you have eliminated all other possible sources of oil leakage. **PM**

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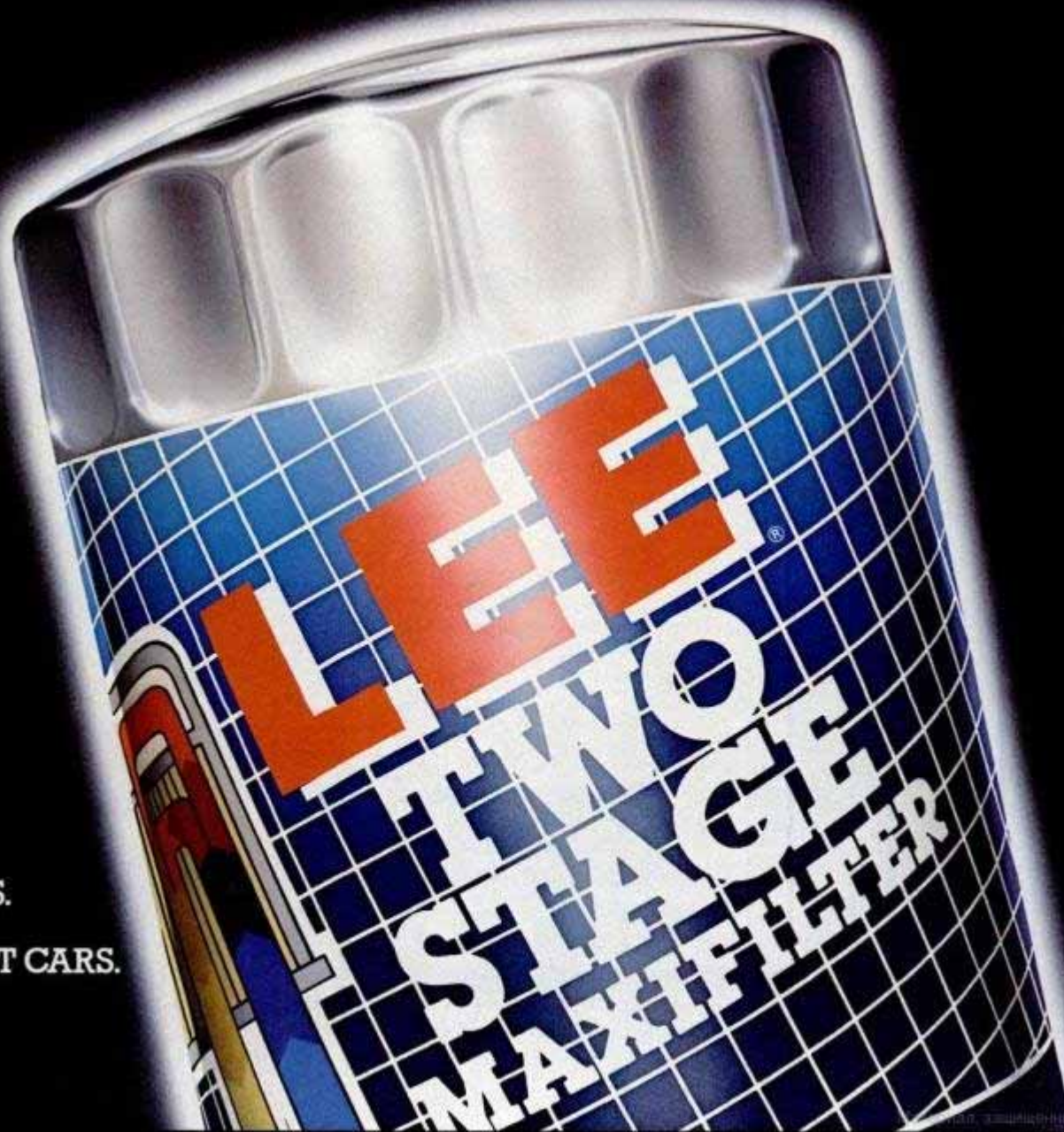
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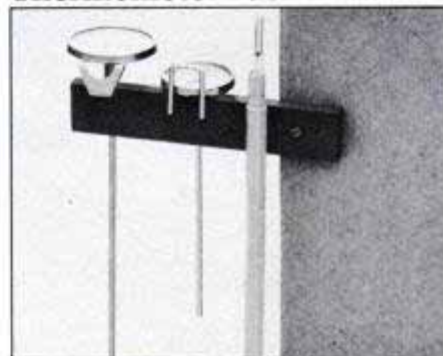
## PM PHOTO HINTS

### Hand dryer



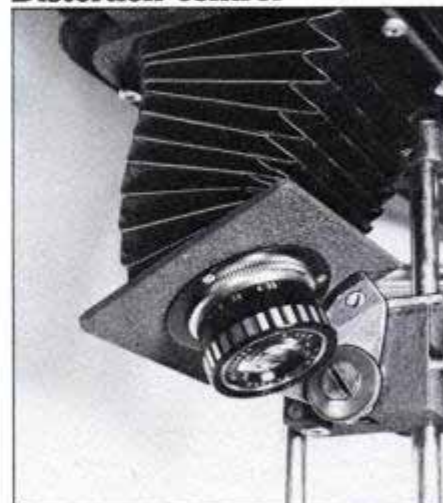
Wet photographic processes can often leave your fingers in condition to smudge prints. A portable hair dryer in the dark room will help.—A. Weber

### Thermometer rack



Losing a thermometer can ruin your prints and annoy you. It's easy to build a rack like the one shown and stop such losses.—William J. Frazier

### Distortion control



An enlarger can be modified by cutting lensboard from the focusing stage and installing a lensboard tilt arm. This lets you distort enlargements for special effects.—Ron Jeagerings





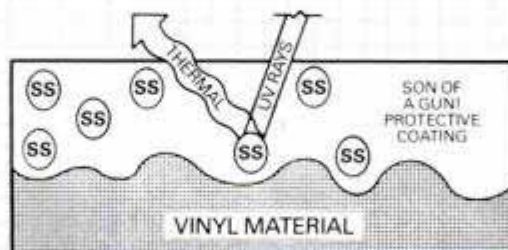
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That's why new STP Son Of A Gun!® Protector is specially formulated to give you more than just a beautiful, long-lasting shine.

STP's exclusive sunscreen formula is activated by the sun itself, to give you long-lasting protection against harmful ultraviolet rays. Used regularly, STP's sunscreen molecules absorb potentially damaging UV rays—changing them to thermal energy

and dispersing them before they can penetrate the surface.



SS - Sunscreen Molecules

Today, a beautiful shine isn't good enough. You need the beautiful protection of new, improved STP Son Of A Gun! Protector.



**Depend on STP proven performance.**



# ALL OUTDOORS



## This boat does everything

Wouldn't it be nice to have one boat that could fill all your boating needs? The Carib Dory comes the closest to being able to do that of any small craft I've seen. It can be a runabout, sailboat, rowboat, fishboat, or yacht tender.

The 12-foot fiberglass dory is



*Carib Dory with outboard and steering console in place (above) is a fun runabout. With its 100-sq.-ft., rainbow-colored sail installed (left), it's a stable sailboat.*



\$1,795. A sailing kit is \$618. And a steering console is \$595. Attaching or removing the sail or console can be done fairly quickly, without the use of any tools.

Another nice thing about this little craft is its 5½-foot beam. This allows a 200-pound person to stand on the gunwale with the boat tipping only slightly—a nice feature for divers who want to roll over the side without shipping water.

An optional transparent polycarbonate bottom (\$175) can be added at the factory if you want to watch fish or other underwater scenery. The boat can carry five people or 1,100 pounds.

For information about the dealer nearest you, write: Carib Dory, 1640 Pomona, Costa Mesa, Calif. 92627.

## Casting against a stopwatch



*Think that casting into this hoop from 50 feet away would be fun? Try Speedcast.*

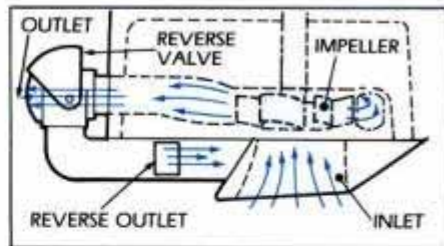
So your casting skills are pretty good, eh? If so, you may want to give this new sport a try. It's called Speedcast, and the rules are simple. Each competitor has 60 seconds. During that time, he tries to cast a 5/8-ounce plug as many times as possible into a two-foot hoop resting in the water 50 feet away.

It's not as easy as it sounds. Veteran anglers have sometimes buckled under the stress. But it's fun—and profitable. Winner of the World Speedcast championship in Las Vegas, to be held in August in tandem with the prestigious Western Bass U.S. Open, pockets \$2,500. For information about Speedcast events to be held near you, write Paul Johnson, Trilene University, Spirit Lake, Iowa 51360.

## Shallow-water outboard

If you're like me, at one time or another you've probably gotten your outboard's prop tangled up in a shallow, weed-infested marsh. We wouldn't have done that if we had been using Surf-Jet's new Jet Stream outboard. It's a 15-hp, water-cooled, Subaru two-stroke that uses a special centrifugal pump for propulsion.

Water is drawn into the pump through an intake grille by an impeller driven by the engine crankshaft. It is then forced out at high pressure and volume, driving the boat forward. Jet

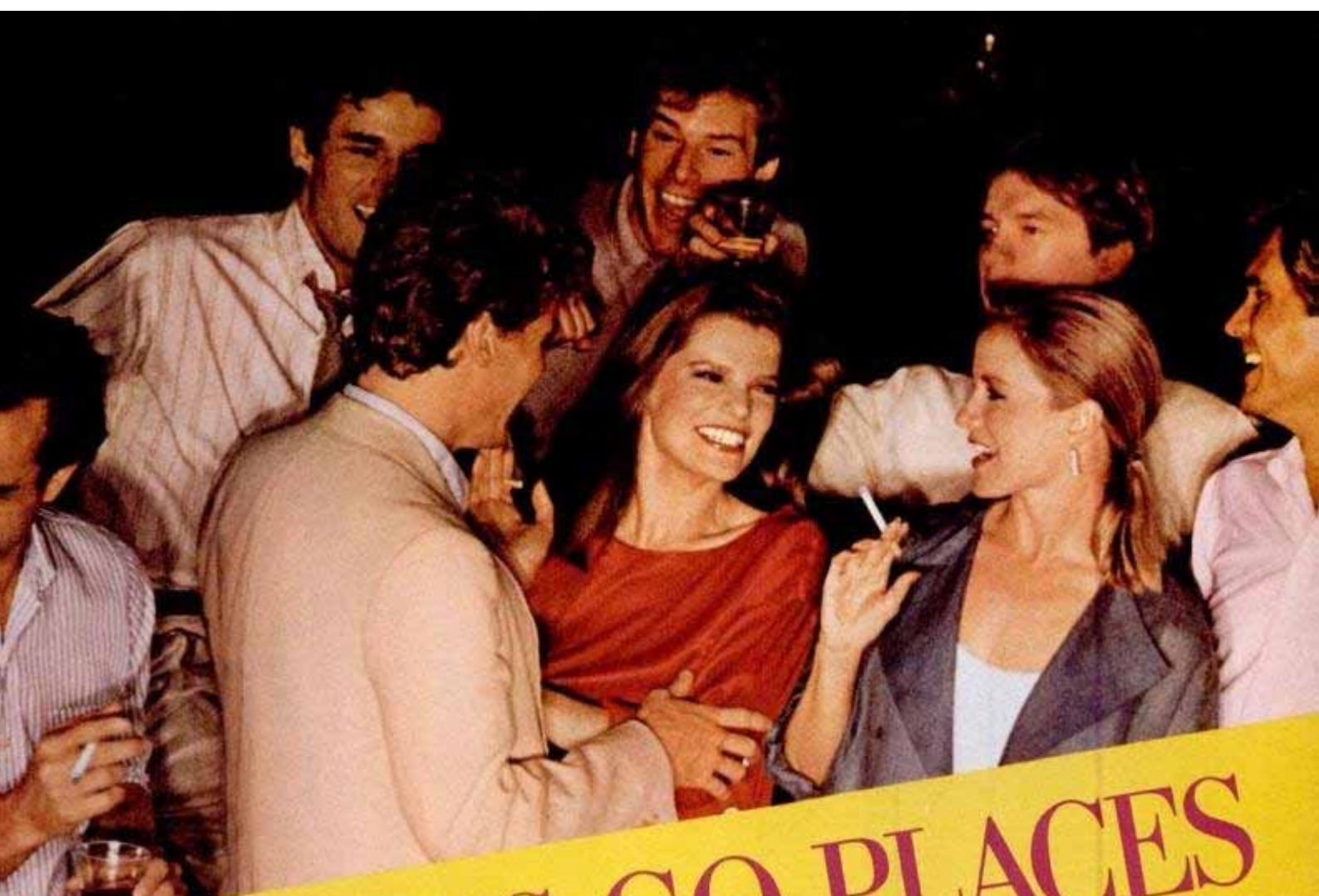


*Grille beneath impeller inlet stops weeds from clogging the inlet. Impeller works very much like a car's water pump.*

Stream weighs 94 pounds. It can attain speeds about 65 percent as fast as those of a comparable outboard.

The bottom of the intake grille is never lower than the bottom of the boat, thus allowing operation in virtually any water the boat can float in. I've seen this thing run in water so shallow the bottom of the boat was scraping. You'll get the best performance out of this little baby using a light, shallow-draft hull with a relatively flat bottom. If running in shallow, weed-infested waters is your bag, check out this outboard.

Jet Stream costs \$1,795. It's made by Surf Jet in St. Paul, Minn., and is available at marine dealers. **PM**



PLAYERS GO PLACES

New  
**Players Kings.**  
Regular and Menthol



12 mg "tar," 1.0 mg nicotine av. per cigarette, by FTC method.

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

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# Special-Purpose Hammers You Can Make

BY WALTER E. BURTON

PM photos: Black and white by the author  
Color photo: Steve Fay

The average home workshop usually is equipped with a wide variety of saws, screwdrivers and wrenches. Each is selected carefully for use in a specific situation. But most of you probably have only one or two different types of hammers in your shop. The result is that you're often forced to use the wrong hammer for the job at hand.

Certain craft, hobby and repair jobs require special hammers—hammers that you can make yourself in your workshop.

The seven hammers shown are made from cold-rolled steel or drill rod and are intended for light to moderate hammering. Heavy pounding should always be done with a commercial hammer designed for that purpose. *Caution:* Always wear safety goggles when

hammering. And never use a brittle metal, such as cast iron, to make a hammer.

## Cold-chisel hammer

A cold-chisel hammer is used for chipping away welding scales and slag. Make the hammer's head from an old cold chisel that's become too short to be useful. First, grind away any mushrooming on the chisel's head to expose

a sound steel surface. Then, grind a new cutting edge on the chisel's blade end. Locate the chisel's center by balancing it on a small rod. On this point, drill a  $\frac{3}{16}$ -in.-dia. hole for the steel handle rod. Drive the handle rod into the hole and secure it with a  $\frac{1}{8}$ -in.-dia. iron rivet placed in the hammer's head.

Make the handle from a  $\frac{3}{4}$ -in.-dia. tension spring. First, use a propane or acetylene torch to heat the spring to a bright red. Then, stretch it to about 4 in. long. After it has cooled, slip the spring over the handle rod and crimp one end tightly in a vise. Braze the spring's other end to the handle rod.

## Brass-head hammer

Used for light, non-marring sheet-metal work, this simple brass-head

*(Please turn to page 48)*



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## DODGE RAM 50

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\$5,665... That's the only thing you can call "small" about the '83 Dodge Ram 50. And this low price offers you all the big things that make this hard-working pickup a value standout in its class.

### BIG 1630 LB. PAYLOAD.

■ The Ram 50 has a larger standard payload than any of the top-selling small pickups. Over 33% more than the base Ford Ranger ... 63% more than the base Chevy S-10!

### BIG 2.0L ENGINE PERFORMANCE.

■ Ram 50's standard 2.0L powerplant has more horsepower than the base Ford Ranger and Chevy S-10. And neither the base Ranger nor S-10 can beat Ram 50's 27 EPA estimated MPG.†

### BIG ON PROTECTION.

■ Dodge uses galvanized steel in critical areas to help protect your Ram 50 from corrosion. And loaded or empty, you can count on standard power front disc brakes to help make your stops smooth and sure.

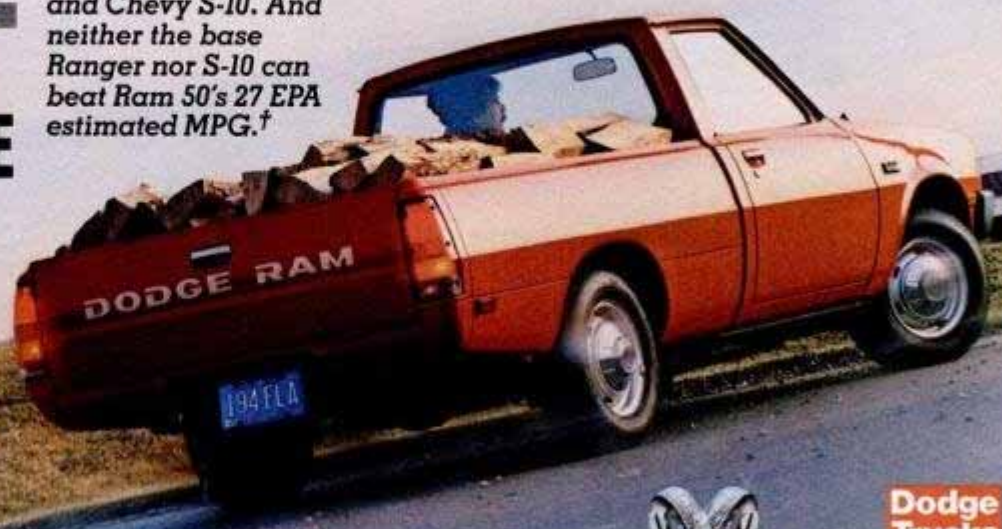
### BIG ON INTERIORS.

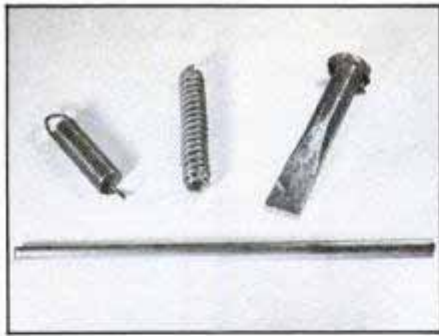
■ You'll like the room and common-sense layout of Ram 50 interiors and instrument panels. Adjustable steering column is a standard benefit—helps you get in and out easier and adjusts to suit your driving comfort.

Adjustable steering column is a standard benefit—helps you get in and out easier and adjusts to suit your driving comfort.

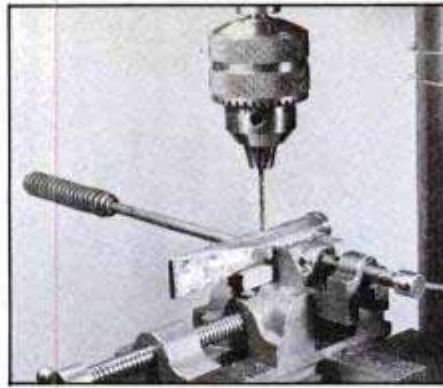
\*Base list price. Title, taxes, and destination charges extra. Based on a comparison of base list prices. LEVELS OF STANDARD EQUIPMENT MAY VARY.

†Use for comparison. Your mileage may vary depending on speed, weather and trip length. Calif. est. lower.

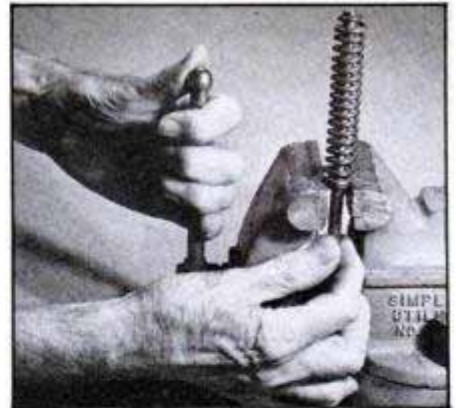




Cold-chisel hammer's components: a 1/4-in.-dia. spring shown before and after heating and stretching, an old cold chisel and a 5/16-in.-dia. steel rod.



Bore a 1/8-in.-dia. hole for the rivet that will secure the head to the handle.



Use a vise to crimp the spring to the rod.

## SPECIAL-PURPOSE HAMMERS

(Continued from page 46)

hammer consists of a 1/2-in.-dia. x 2-in. brass rod fitted with a hardwood handle.

To form the elongated eye in the hammer's head, centerbore a 1/4-in.-dia. hole through the brass rod. Elongate the hole on a milling machine. Place the hammer's head onto the handle and secure it with a metal wedge.

### Arc-type hammer

The arc-type hammer is related to the tools used in coppersmithing and silversmithing. Make the hammer's

curved head from 1/4-in.-dia. drill rod. The head's radius is equal to the handle's overall length. Before bending the drill rod, heat both ends to a bright red. Then, hammer each end to form the striking faces. Bend the rod in a vise.

Cut the handle from 5/8-in.-dia. brass tubing. Hacksaw a notch in one end of the tubing and flatten it around the curved head. Braze the flattened tubing to the head. Turn a brass plug on a lathe to fit into the handle's end.

### Question-mark hammer

Despite its odd appearance, the question-mark hammer strikes a surprisingly strong blow. It's handy for

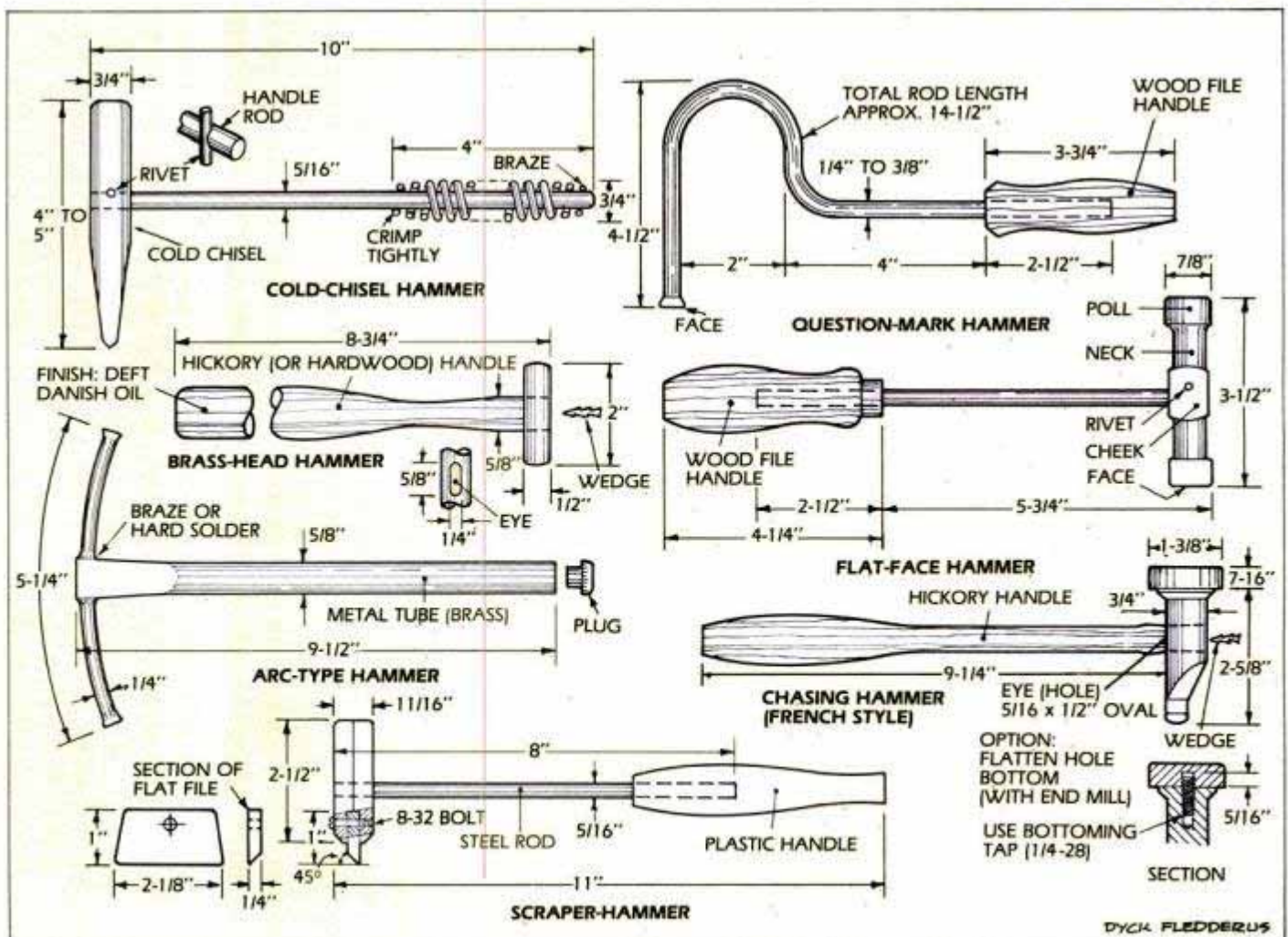
working on internal machine parts or for driving small nails where other hammers can't reach.

Form the hammer from 1/4- or 3/8-in.-dia. drill rod. Before bending the rod, heat one end until it's red-hot. Then, hammer the end until it mushrooms slightly, forming the hammer's face. To bend the rod, install two steel pins or lagbolts into a workbench. Slide the rod between the pins and bend it to shape. Glue on a wood file handle.

### Flat-face hammer

Related to the hammers used in auto-body repair shops, the flat-faced ham-

(Please turn to page 50)



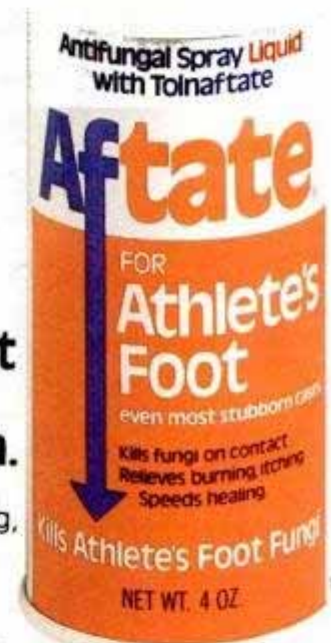
# Walk Away From Athlete's Foot.

**Use Aftate  
to kill athlete's foot  
fungus fast  
and prevent its return.**

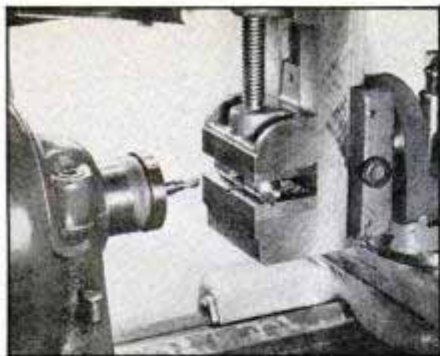
Just think, no more itching, burning or painful cracking. Because Aftate not only kills athlete's foot fungus on contact ... with daily use it keeps the torment from coming back. Aftate, with the only medication recognized in a report to the FDA as safe and effective in preventing athlete's foot.

Aftate is odorless ... available in aerosol liquid, gel, and powder forms. Whichever you use, with Aftate you can walk away from athlete's foot.

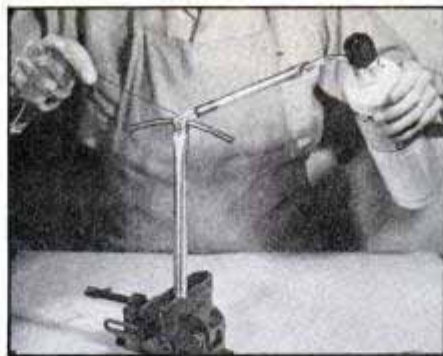
And to cure jock itch fast, use Aftate for Jock Itch in the green package.



Read and follow directions.  
© 1983 Plough, Inc.



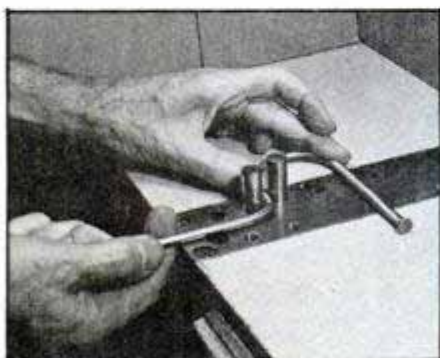
Milling machine cuts brass tool's eye.



Braze head of arc hammer to the handle.



Use torch, ball-peen hammer to form question-mark hammer's striking end.



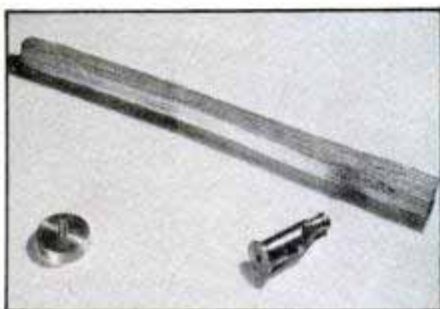
Bend question-mark shape between pins.



Use the question-mark hammer in spots where other hammers can't fit or reach.



Flat-face hammer is turned on a lathe.



Chasing hammer with its face removed. The two-part head is joined by a threaded pin. Epoxy glue strengthens the joint. Hickory stock is shown before it was turned into the hammer's handle.



Shape chasing hammer's hardwood handle on a lathe. Outer end is steadied by live ball bearing center in tailstock.



File the beveled edge onto the scraper using a flat file. Be sure to anneal the section of file used as the scraper.

## SPECIAL-PURPOSE HAMMERS

(Continued from page 48)

mer is useful for hammering in corners and smoothing sheet metal.

Machine the hammer's head on a lathe from a  $\frac{7}{8}$ -in.-dia. cold-rolled steel rod. Then, square the hammer head's ends on a milling machine or grinder. Install a  $\frac{1}{8}$ -in.-dia. rivet into the hammer's head to lock the head to the handle rod. Glue on a wood file handle.

### Chasing hammer (French style)

Lightweight chasing hammers are used in jewelry making and craft work. But our shop version is made somewhat heavier.

The hammer's head consists of two sections, both machined on a lathe. Fasten the  $1\frac{1}{8}$ -in.-dia. replaceable face to the head with a  $\frac{1}{4}$ -28 threaded pin. Then, form the hammer head's elongated eye on a milling machine. Secure the

head by driving a metal wedge into the handle's top end.

### Scraper hammer

Primarily designed for removing blistered paint from wood siding, this scraper hammer also is useful for scraping paint and rust from metal surfaces. Cut the hammer's head from an  $1\frac{1}{16}$ -in.-dia. hexagon-shaped steel rod. Then, mill a  $\frac{1}{4}$ -in.  $\times$  1-in.-deep groove in one end of the head for accepting a section of flat file. The flat file section serves as the scraper, but must first be annealed (heated and slowly cooled to prevent brittleness).

File a beveled scraping edge onto the file section using a sharp flat file. Now, place the scraper into the hammer head's milled groove and, using a No. 29 drill bit, bore a hole through the head and scraper for an 8-32 bolt.

Next, heat the scraper to a bright red and then quench it in water. Reheat



Scraper hammer's beveled file section is used for smoothing rough hardwoods.

carefully until the scraper's beveled edge shows a yellow color. Then cool the piece in water again.

Tap 8-32 threads into the head, position the scraper into the head's groove and then screw in an 8-32 bolt. Bore the head for accepting a  $\frac{1}{16}$ -in.-dia. steel rod handle. Secure the head to the handle by installing a  $\frac{1}{8}$ -in.-dia. rivet through the head. To finish, glue on a multipurpose plastic tool handle. **PM**



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on outside protection.***



*Inside every can of Olympic Stain with WEATHER SCREEN™ are specially treated oils and additives that actually repel water and preserve the beauty of wood.*

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*Olympic Stain. We've got the inside on outside protection.*

**OLYMPIC**



# 3 Antique Mirrors You Can Copy

Using our plans, you can reproduce these three classic mirrors.



Attractive, three-drawer pine mirror (above) is a simplified version of popular Early American piece. Old-time flavor of Chippendale Looking Glass, currently a favorite at antique shows, is captured in our reproduction (above, right). Mirror shown below (right) frequently is listed in antique furniture guides under "dressing mirror" or "dressing glass."

The mirrors shown here were popular in the late 18th century and throughout the 19th. All three are in great demand at antique shops these days. However, they are becoming more difficult to obtain. PM's mirrors duplicate the original antiques.

The three-drawer pine dressing mirror and the cherry dressing mirror were created by Ralph Wilkes, a former antique dealer and a master craftsman. The Chippendale Looking Glass is a faithful copy of an original found in the New England attic of a friend of builder George Allen. (Mr. Allen, a retired high school principal, taught at Sewanhaka High School on Long Island when PM Home and Shop Editor Harry Wicks was a student there.)

## Pine dressing mirror

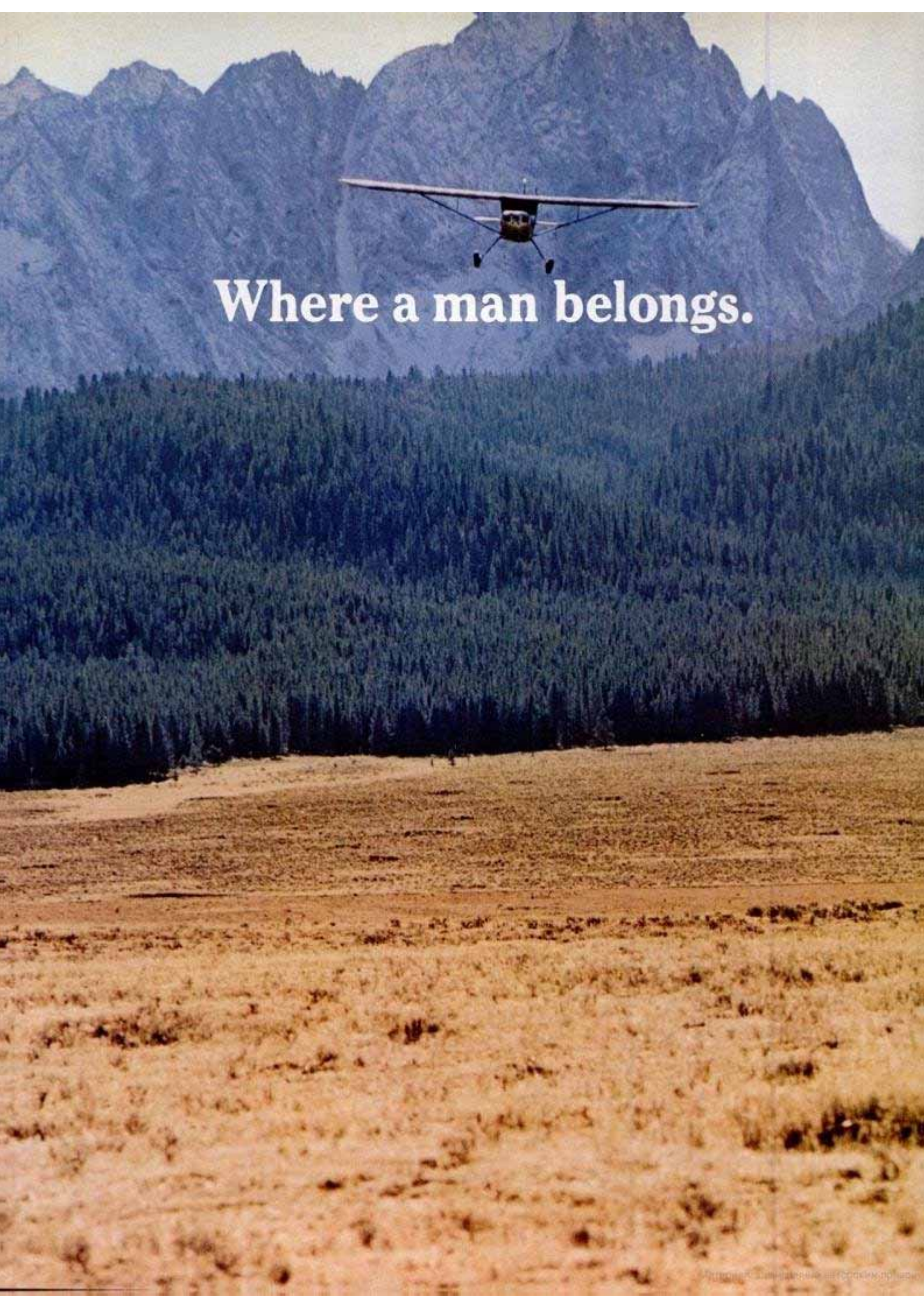
Designed for use on a table or chest of drawers, this attractive dressing mirror is mounted atop a three-drawer cabinet. It's made entirely of pine to look authentic.

Start by cutting the base cabinet pieces as shown.

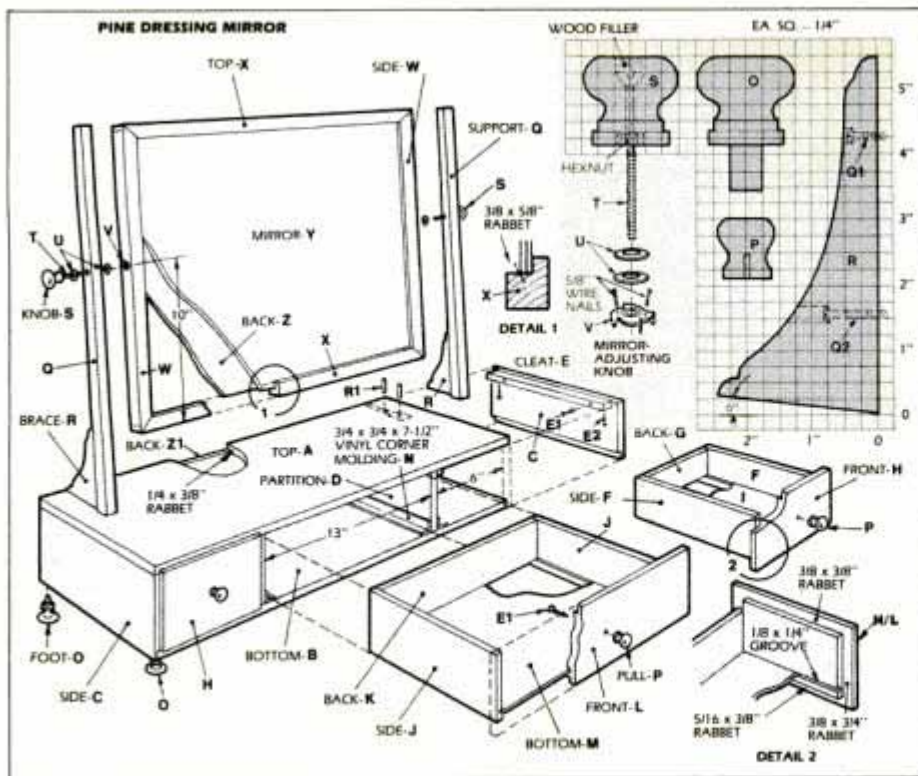
[\(Please turn to page 54\)](#)



PM photos: Three-drawer pine mirror and cherry dressing mirror, George Ancona; Chippendale Looking Glass, Harry Wicks



**Where a man belongs.**



## ANTIQUE MIRRORS

(Continued from page 52)

Notice that the cabinet's sides receive rabbets along the back and bottom edges. The cabinet's top and bottom pieces are rabbeted along the back edge. Take the time to sand all pieces thoroughly before assembly. This way, the cabinet will require only light sanding after assembly.

The cabinet's construction is designed so that nailing through the top or sides is avoided. All visible nailing is done through the cabinet's bottom and back surfaces. First, glue and screw the cleats to the cabinet's sides and partitions. Be sure to keep the cleats 1/2 in. back from the front edge to allow the drawers to close. Next, attach the partitions and the sides to the cabinet top's underside by screwing through the cleats. Finally, glue and nail the cabinet's bottom in place.

Cut lengths of 3/4 x 3/4-in. vinyl corner molding for use as drawer slides. If you can only find rounded corner molding, plane the two outside surfaces flat before using it. Secure the slides in the cabinet with one 5/8-in. brad at each end. Next, cut all the drawer pieces according to the materials list. Notice that in order to avoid the cleats, the two smaller drawers' sides are narrower than the center drawer's.

Dry assemble the drawers to be sure they fit smoothly into the cabinet. Make any adjustments before gluing and final assembly. With the cabinet assembled and the drawers fitting properly, glue and nail the cabinet's back in place using 5/8-in. brads.

Now, cut the pieces needed for the mirror frame, supports and braces. Before assembling the frame, cut rabbets into the frame's pieces to hold the mirror and hardboard back. Also, shape the front edges of the frame and all four corners of the two support pieces with a 1/4-in. rounding-over bit.

Next, cut the bottom edges of the supports and braces at a 6° angle. Mount the braces to the supports using No. 8 roundhead screws as shown. Use a doweling jig to bore each brace's bottom for accepting two 3/8-in.-dia. dowels. Also, bore a 1/4-in.-dia. hole through each support for installing the mirror adjusting knobs.

Before assembling the mirror's frame, bore a 5/16-in.-dia. hole in each side piece for installing Teenuts. Since the Teenuts are installed backward from their designed use, bore two 1/16-in.-dia. holes in each Teenut as shown. Tap the Teenuts into the frame's sides and then drive in two 5/8-in. wire nails to secure each one. Now, glue and nail the frame together with 1 3/4-in., 17-gauge wire nails at the corners. Clamp the frame square until the glue dries.

Before proceeding any further, turn the mirror adjusting knobs, drawer pulls and the cabinet feet on a lathe. After turning the adjusting knobs, counterbore both ends of each knob as shown. Then, bore a 1/4-in.-dia. through hole in each knob for installing a 1/4-in.-dia. x 2 1/2-in. stovebolt. Place a hexnut on the inside of each knob and tighten the bolt to draw the nut flush with the knob. Fill the outside counterbores with wood filler to conceal the bolt heads. Assemble the support members and

the frame by screwing the mirror adjusting knobs through the supports and into the Teenuts in the frame's sides.

Now you're ready to join the mirror frame and supports with the base cabinet. Stand the frame and support members centered on the base cabinet's top. Position the braces 1/4 in. from the cabinet's back edge. Outline the two brace locations lightly with a pencil on the cabinet top.

Remove the frame and insert dowel centers into the holes previously bored in the braces' bottoms. Then, reposition the frame according to the pencil lines on the cabinet. Now, push down on the braces so the dowel centers transfer the dowel locations onto the cabinet's top. Bore 3/8-in.-dia. x 1/2-in.-deep holes into the top at these locations. Glue and insert the dowels into the braces and then glue the frame and support assembly to the cabinet's top. Clamp and let dry. Attach the feet and drawer knobs to complete the assembly.

Finish the project with a coat of Minwax Early American stain (No. 230). After the stain has dried for 24 hours, apply three coats of satin polyurethane varnish. Sand lightly between varnish coats with 220-grit abrasive paper.

After the surface has dried thoroughly, install the mirror. Then, carefully nail the hardboard back in place with 5/8-in. brads.

(Please turn to page 56)

## MATERIALS LIST— PINE DRESSING MIRROR

Key	No.	Size and description (use)
A	1	3/4 x 8 x 28" pine (cabinet top)
B	1	3/4 x 8 x 27 1/4" pine (cabinet bottom)
C	2	3/4 x 8 x 4 1/4" pine (cabinet side)
D	2	3/4 x 3 1/2 x 7 7/8" pine (partition)
E	4	1/2 x 3/4 x 7 3/8" pine (cleat)
E1	11	1 1/4" No. 8 fh screws
E2	8	1" No. 8 fh screws
F	4	3/8 x 2 3/4 x 7 1/2" pine (drawer side)
G	2	3/8 x 2 1/2 x 5" pine (drawer back)
H	2	3/4 x 4 x 6 1/2" pine (drawer front)
I	2	1/8 x 5 1/4 x 7 3/8" hardboard (drawer bottom)
J	2	3/8 x 3 1/4 x 7 1/2" pine (drawer side)
K	1	3/8 x 2 3/4 x 11 3/4" pine (drawer back)
L	1	3/4 x 4 x 13 1/2" pine (drawer front)
M	1	1/8 x 7 3/8 x 12" hardboard (drawer bottom)
N	6	3/4 x 3/4 x 7 1/2" vinyl corner molding (drawer slide)
O	4	1 3/4"-dia. x 2 1/8" pine (feet)
P	3	1"-dia. x 1" pine (drawer pull)
Q	2	1 x 1 3/16 x 20 1/2" pine (support)
Q1	2	1" No. 8 rh screw
Q2	2	1 1/2" No. 8 rh screws
R	2	3/4 x 2 1/2 x 5 1/2" pine (brace)
R1	4	3/8"-dia. x 1 1/2" pine dowel
S	2	1 3/8 x 1 1/2"-dia. pine (mirror adjusting knob)
T	2	1/4"-dia. x 2 1/2" fh stove bolt with nut
U	4	1/4"-dia. flat washer
V	2	1/4"-dia. Teenut
W	2	1 x 1 3/16 x 17 3/4" pine (frame side)
X	2	1 x 1 3/16 x 21 3/4" pine (frame top and bottom)
Y	1	1/8 x 16 x 20" mirror
Z	1	1/8 x 16 x 20" hardboard (mirror back)
Z1	1	1/8 x 4 3/4 x 27 3/8" hardboard (cabinet back)

Misc.: Carpenter's glue, 8d finishing nails, 1 3/4" 17-gauge wire brads, 220-grit sandpaper, 5/8" 16-gauge wire nails, polyurethane varnish, Minwax Early American stain (No. 230).

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Where a man belongs.



9 mg  
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Camel Lights.  
Low tar.  
Camel taste.

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

9 mg. "tar", 0.8 mg. nicotine av. per cigarette by FTC method.

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## ANTIQUE MIRRORS

(Continued from page 54)

### Chippendale Looking Glass

This wall-mounted mirror is made entirely of rich, ribbon-stripe mahogany; 3/4-in. stock is used for the frame, 1/4-in. mahogany-veneer plywood for the decorative scrolls.

Begin by cutting the mitered frame pieces to size. The frame's corners are joined using spline-reinforced miter joints. Splines produce tight, strong joints and ensure flush surface alignment. Use a table saw tenoning jig to cut 1/8-in.-wide spline grooves in the frame's miters. If you don't own a tenoning jig accessory, you can build one yourself (see *Build a Tenoning Attachment For Your Table Saw*, page 146, July 1971).

Next, cut 1/8-in.-thick solid mahogany splines to fit the spline grooves. Be sure the grain runs across the spline's width to prevent splitting. Notice that each spline has an inside corner cutout. Install the splines so that this cutout will fit flush with the frame's inside corners.

Assemble the frame by first gluing the splines into the grooves and then clamping the frame square. Let the frame dry, then sand it.

Turn the frame face down on the workbench and route a 1/4-in.-deep x 3/8-in. rabbet into the back inside edge. This recess holds the mirror and the hardboard back.

Next, using a 1/2-in.-dia. straight bit, route the eight circular notches into the frame's back for holding the hardboard back's tabs.

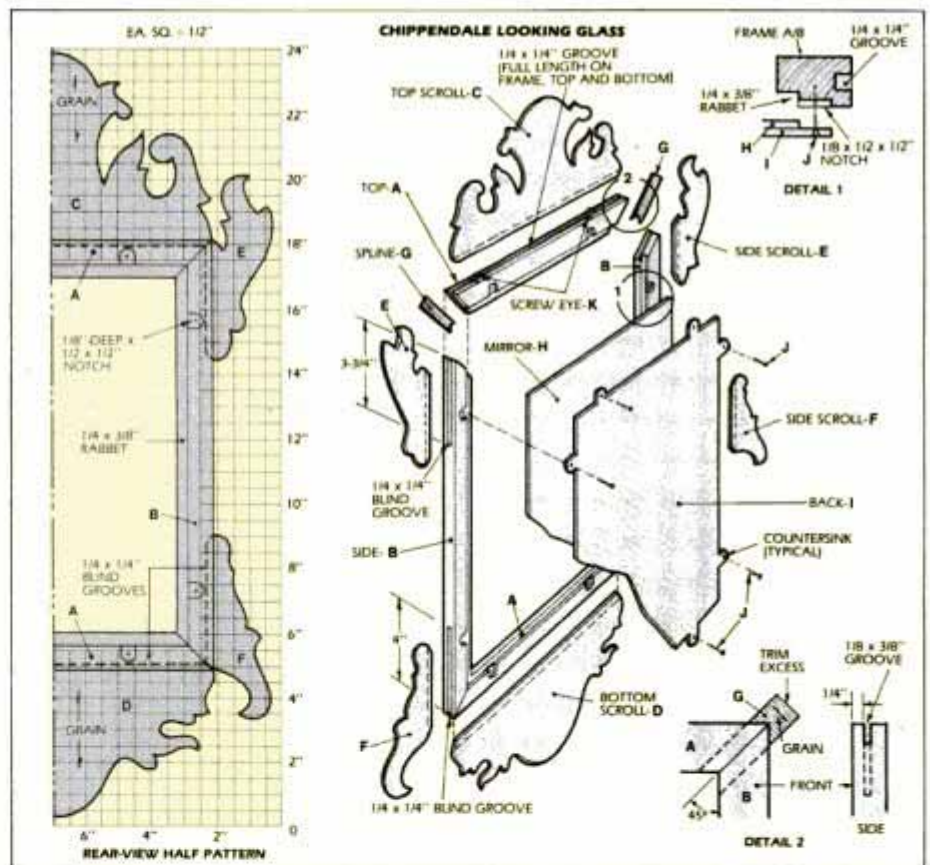
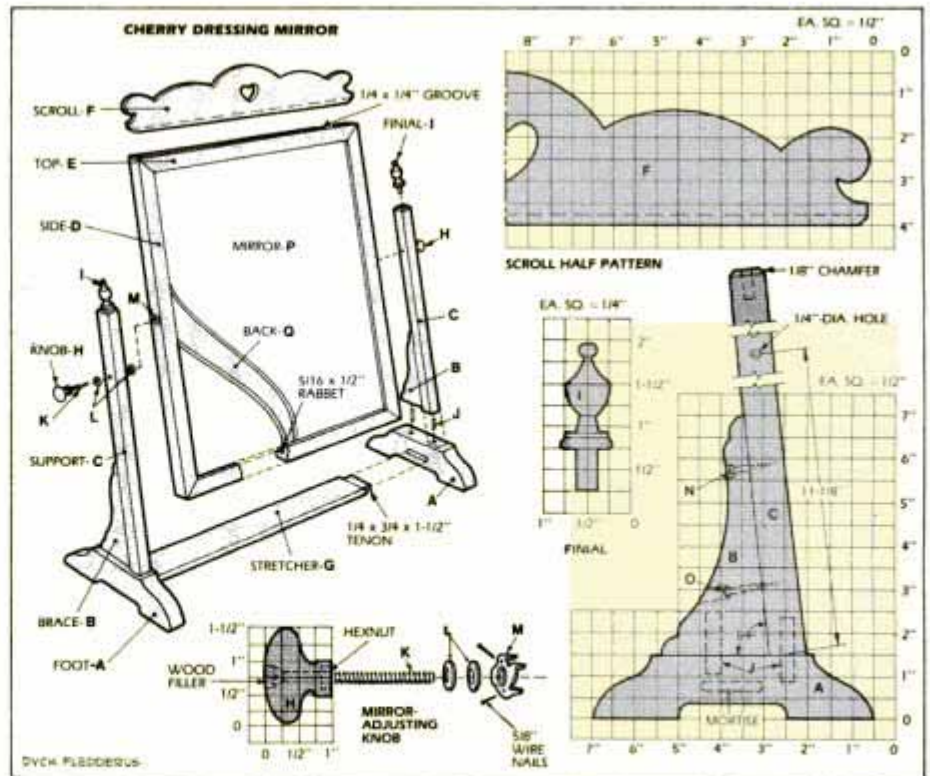
Set up the table saw with a 1/4-in.-wide dado head to groove the frame's edges to hold the decorative scrolls. Cut the grooves 1/4-in.-deep along the length of the frame's top and bottom and partially up the frame's sides, as shown. Next, cut the 1/4-in. mahogany-veneer plywood scrolls using a band saw, jigsaw or sabre saw. Use a

(Please turn to page 58)

### MATERIALS LIST—CHERRY DRESSING MIRROR

Key	No.	Size and description (use)
A	2	1 3/4 x 1 1/2 x 6 1/2" cherry (base)
B	2	5/8 x 2 3/8 x 5 1/2" cherry (brace)
C	2	7/8 x 1 1/8 x 14 1/2" cherry (support)
D	2	7/8 x 1 1/8 x 20" cherry (frame side)
E	2	7/8 x 1 1/8 x 16 3/4" cherry (frame top and bottom)
F	1	1/4 x 3 1/2 x 16 3/4" cherry (top scroll)
G	1	3/8 x 2 x 18 1/4" cherry (stretcher)
H	2	1 x 1 1/2"-dia. cherry (knob)
I	2	5/8"-dia. x 1 1/2" cherry (finial)
J	4	3/8"-dia. x 1 1/2" dowels
K	2	1/4"-dia. x 2 1/2" fh stove bolt with nuts
L	4	1/4"-dia. flat washer
M	2	1/4"-dia. Teenut
N	2	1" No. 8 rh screws
O	2	1 1/2" No. 8 rh screws
P	1	1/8 x 15 x 18" mirror
Q	1	1/8 x 15 x 18" hardboard (back)

Misc.: Carpenter's glue, 1 3/4" 17-gauge wire brads, 5/8" 16-gauge wire nails, wood filler, polyurethane varnish, Minwax cherry stain (No. 235).



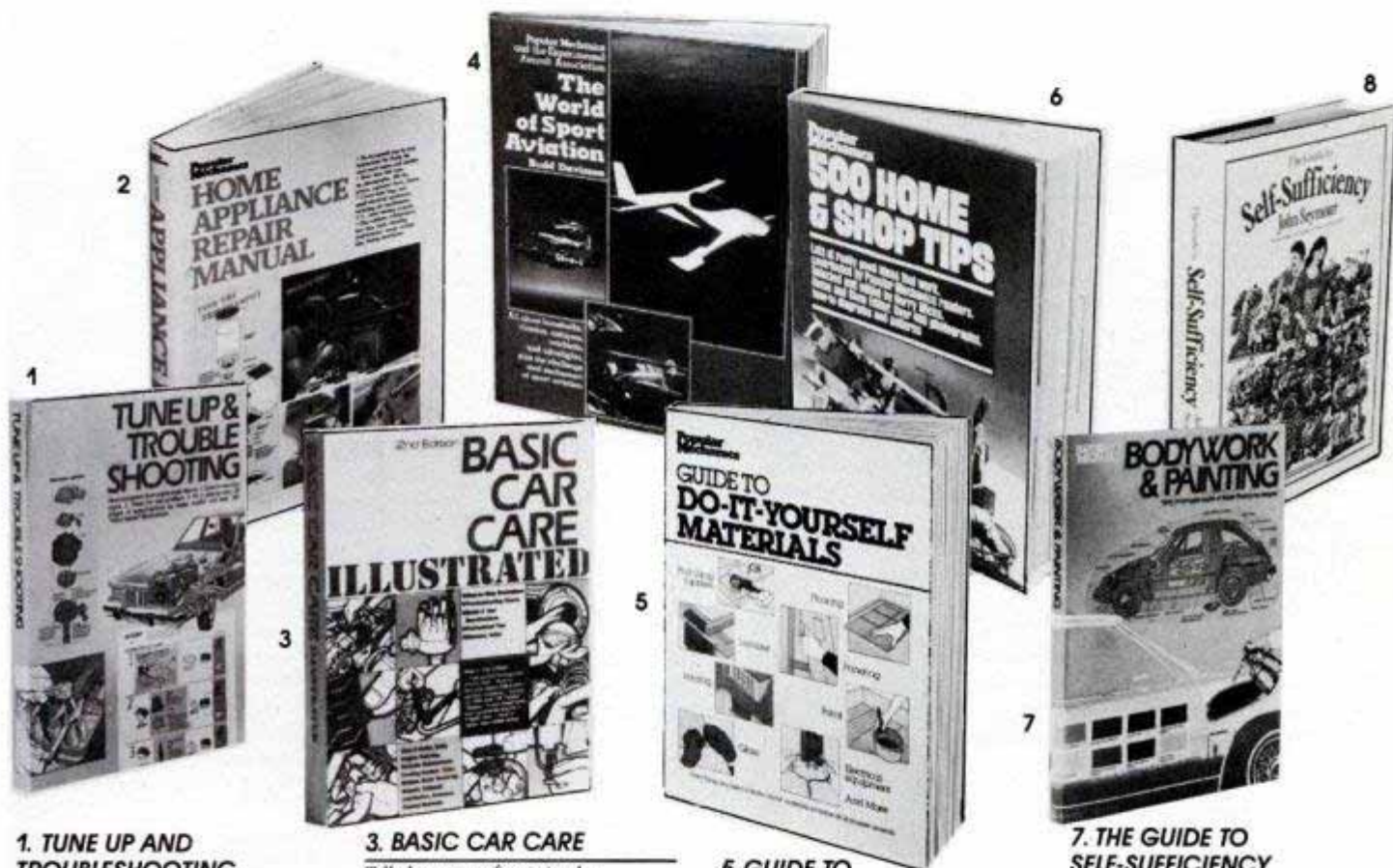
### MATERIALS LIST—CHIPPENDALE MIRROR

Key	No.	Size and description (use)	G	4	1/8 x 3/4 x 2 1/4" hardwood mahogany (splines)
A	2	3/4 x 1 1/8 x 9 3/4" mahogany (frame top and bottom)	H	1	1/8 x 8 1/8 x 11 1/2" mirror
B	2	3/4 x 1 1/8 x 13 1/8" mahogany (frame side)	I	1	1/8 x 9 1/4 x 12 5/8" hardboard (back panel)
C	1	1/4 x 6 1/8 x 9 7/8" mahogany plywood (top scroll)	J	4	1/2" No. 6 fh screws
D	1	1/4 x 4 7/8 x 9 7/8" mahogany plywood (bottom scroll)	K	2	No. 16 screw eyes
E	2	1/4 x 2 x 5 3/4" mahogany plywood (side scroll)	Misc.:		Carpenter's glue, picture-hanging wire, wood filler, 220-grit sandpaper, red mahogany stain, clear finish.
F	2	1/4 x 2 x 5 3/4" mahogany plywood (side scroll)	Note:		Lumber and Wood-Glo clear finish from Constantine's, 2050 Eastchester Rd., Bronx, N.Y. 10451.

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This is the first book whose table of contents was designed to match the needs of rapidly growing do-it-yourself market. It shows how to save time and money by doing your own work. Step-by-step illustrations, 16 pages of photographs, including color matching, pinstripping techniques and custom designs. (B-1758, \$19.95 - B-1758A, paper \$12.95)

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## ANTIQUE MIRRORS

(Continued from page 56)

smooth-cutting 24-tpi saw blade for a cut that requires little or no sanding. Notice that the scroll's corners are mitered to allow the scrolls to abut tightly. Dry fit all scrolls before final positioning and gluing. (If you're unable to find a small amount of 1/4-in. mahogany plywood in your area, you can buy it from Constantine's Inc. See materials list for address. Minimum order: 12 x 24-in. for \$6.75.)

Since mahogany is an open-grain wood, you must fill the grain before applying the finish. To save a finishing step, mix the red mahogany stain with a natural wood filler. Now, you can stain and fill the wood's grain in one step.

Brush the stain/filler mix liberally into the wood's grain. Allow the filler to dull over (about 20 minutes), then wipe off the excess with a coarse rag, such as burlap or terry cloth. Wipe against the grain, rubbing the filler into the wood's pores. Be sure to remove all excess filler from the wood's surface before it dries or you'll have a lot of sanding to do. Allow the filler to dry overnight, then sand lightly with 220-grit abrasive paper. Brush off the sanding dust, wipe with a tack cloth and follow with two coats of clear finish. We used Constantine's Wood-Glo clear finish.

Complete the project by installing the mirror after the finish has dried. Mount the hardboard back to the frame with one 1/2-in. No. 6 fh screw in each of the back's eight circular tabs. Then, insert two No. 16 screw eyes in the frame's top as shown to anchor the picture-hanging wire.

### Cherry dressing mirror

The cherry dressing mirror is similar in design and construction to the three-drawer pine mirror. Often listed in antique books as a dressing glass, this late 19th-century piece is designed for use on a table or chest of drawers.

Start by cutting all the pieces to the sizes shown. Notice that solid cherry hardwood is used throughout. Before assembling the mirror's frame, rabbet the frame's pieces to hold the mirror and hardboard back. Also, shape the frame's two front edges and all four sides of both vertical supports with a 1/4-in. rounding-over bit. The decorative scroll, feet and brace pieces are all shaped on a band saw, jigsaw or sabre saw. Use a lathe to turn the finials and the mirror adjusting knobs.

Next, cut the mortises in the feet using a router or shaper fitted with a 1/4-in.-dia. straight bit. Make several passes, increasing the cutter's depth on each pass, until you reach a 3/4-in.-deep mortise. You could also form the mor-

tises by boring a series of 1/4-in.-dia. holes and then chiseling out the waste.

Form the 1/8-in. chamfer on each support's top edge with a disc sander or block plane. Then, bore a 1/4-in.-dia. hole in each support's top for installing the finials. Also, bore a 1/4-in.-dia. hole through each support's side for installing the mirror adjusting knobs as shown.

Cut the bottoms of the supports and braces at a 6° angle (84° angle along the vertical plane). Then, attach the braces to the supports with glue and No. 8 rh screws as shown. Use a doweling jig to bore each brace's bottom edge for two 3/8-in.-dia. wood dowels. Notice that the rear-positioned dowels are bored slightly deeper than the front dowels.

Now, transfer the braces' dowel hole locations to the two foot pieces using dowel centers. Bore 3/8-in.-dia. holes into the feet on these points. In this case, the rear-positioned dowels are bored into each foot shallower than the front dowels. This is to avoid boring into the foot pieces' mortises.

Glue and insert the dowels into the braces and then glue the braces onto the feet. The vertical support members are now completed, but they're not joined by the stretcher until after the mirror's frame is assembled and installed.

Before assembling the mirror's frame, bore a 5/16-in.-dia. hole in each frame's side for installing Teenuts. See the instructions for the pine dressing mirror for installing the Teenuts and the mirror adjusting knobs.

Glue and nail the frame together with 1 1/4-in., 17-gauge wire nails at the corners. Clamp the frame square until the glue dries. Then, glue the decorative scroll into the frame's top groove. Assemble the support members to the frame by screwing the mirror adjusting knobs through the supports and into the frame's Teenuts. Tighten the mirror adjusting knobs to hold the supports parallel to the frame's sides. Now, cut the stretcher to equal the exact distance between the two feet. Dry-fit the stretcher to be sure that its length and tenons fit properly. Make any necessary adjustments before gluing and final assembly.

Finish the project with a coat of Minwax cherry stain (No. 235). After the stain has dried 24 hours, apply three coats of satin polyurethane varnish. Sand lightly between varnish coats with 220-grit abrasive paper. After the surface has dried thoroughly, install the mirror. Carefully nail the hardboard back in place with 5/8-in. brads. **PM**



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*"The Escort looks so comfortable, contented, and familiar at the top of the heap that it's hard to see that something new and special has been added... live with a new Escort for a while and you'll realize it has advanced new circuitry that should go down as a genuine breakthrough."*

### ESCORT WINS

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### ESCORT WINS

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*"The Escort is a highly sophisticated and sensitive detector that has been steadily improved over the years... In terms of what all it does, nothing else comes close."*

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*"Ranked according to performance, the Escort is first choice... The Escort boasts the most careful and clever planning, the most pleasing packaging, and the most solid construction of the lot."*

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*"Only one model, the Escort, truly stood out from the rest... once you try the Escort, all the rest seem a bit primitive. In no test did any of the other detectors even come close."*

### FOR ESCORT OWNERS ONLY:

As our ad above states, we've made another improvement. The new ST/O/P circuitry is a standard part of every ESCORT starting with serial number 400,000.

Is ST/O/P adaptable to your present ESCORT? Well, yes and no. At S.N. 200,000, there was an internal redesign of ESCORT



**ST/O/P:  
THE  
FIRST  
RADAR  
DETECTION  
ADVANCE  
SINCE  
SUPERHETERODYNE**

# ESCORT: "A GENUINE BREAKTHROUGH"

—CAR and DRIVER

If you keep up with magazine tests, you know that ESCORT does more than just outperform other radar detectors. In its most recent evaluation, Car and Driver concluded: "The Escort radar detector is clearly the leader in the field in value, customer service, and performance..." But performance, as measured by warning distance, is *not* the new breakthrough. After all, ESCORT has been beating all comers since its introduction in 1978.

## Now There's More To It

While long detection range is obviously essential it does *nothing* to solve a problem that has cropped up in the last year. In fact, increasing range by itself just makes the problem worse. If you already have a good superheterodyne unit, you know what we mean. A new generation of imported detector *transmits* radar signals, and can set off your unit as far as a mile away. The longer the range of your unit, the farther away you find them. As Car and Driver pointed out last November: "Since there are far more detectors on the road than police radar units, interference...could become a genuine nuisance."

## Low Level Contamination

At first it was just an irritation. At least ESCORT owners had a way of distinguishing the polluters from the real thing. Our unique audio warning differentiates between the two police radar bands: it "beeps" for X band and "braps" for K band. The polluters' trashy signals triggered both warnings at once, and made a new sound—different than the sounds for police radar. (The rest of the industry didn't even know there was a new problem. Their detectors were making the same sounds as always, just more often.)

## Radar Epidemic

As more and more of the "polluting detectors" hit the streets, the problem became more serious. If one of the "polluters" is approaching in an oncoming lane, the alarm from your detector is brief. But if it's traveling the same direction as you, your alarm can go on for *miles*. And the offending detector doesn't have to be in the car right next to yours. It can be ahead or behind, and up to a mile away. A very serious problem indeed.

incorporating custom integrated circuitry, a precision quartz timebase, and a new integrated microwave mixer/antenna/Gunn oscillator. The new ST/O/P technology builds on this by significantly expanding the digital logic and adding memory. As a result, older units (serial numbers less than 200,000) cannot be modified to incorporate ST/O/P technology.

## Pollution Clean-Up

The problem required an entirely new approach. Examining the interference from these imports, our engineers discovered a subtle difference between their signals and those of police radar, even though they were on the same frequency. The solution, then, was to design new circuitry that would reject the pollution while—and this was the hard part—maintaining ESCORT's industry-leading response to pulsed and instant-on radar. We named it ST/O/P™ (Statistical Operations Processor), and it consists of a CMOS digital processor with built-in memory. ST/O/P is not simple, and it's not cheap. But it is, in our opinion, the most important breakthrough in radar detection since superheterodyne. Car and Driver would seem to agree: "Now, all the world's Radio Shack detectors can hum right by your car in full microwave broadcast mode and your Escort will sit on your dash as politely and silently as a canary-fed cat."



## THE RADAR DEFENSE KIT

## Peace of Mind

With ST/O/P, we've put the complications necessary to cope with today's radar problems inside—where they work automatically. Just install ESCORT, plug it into your cigar lighter, and turn it on. ESCORT does the rest. If you encounter a signal from a "polluting detector," ESCORT keeps quiet while maintaining its lookout for police radar. If the signal is the real thing, ESCORT immediately alerts you both audibly and visually. And, unlike other detectors that keep you guessing about the radar's location, ESCORT's signal-strength meter moves upscale as you approach and its variable-rate beeper/brapper pulses faster. You get the full story.

For those of you with ESCORTs from S.N. 200,000 to 399,999 we are presently developing procedures and facilities to make adding the ST/O/P circuitry to your unit possible. The cost will be \$75, and details and special shipping instructions will be in our advertisement in the August '83 issue of this magazine. Sorry, but we won't be able to convert your unit until that announcement.

## It's Simple

If you want the best, there's no reason to look anywhere else. But don't take our word for it. Try ESCORT at *no risk*. Open the box, install ESCORT on your dash or visor, and take 30 days to test it. If you're not absolutely satisfied, we'll refund your purchase *and* pay for the postage costs to return it. You can't lose. ESCORT is sold factory direct, so knowledgeable support and professional service are only a phone call or parcel delivery away. And we back ESCORT with a full one year limited warranty. Order today and let ESCORT change radar for you forever.

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# Firestone

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# PM SOFTWARE MONITOR

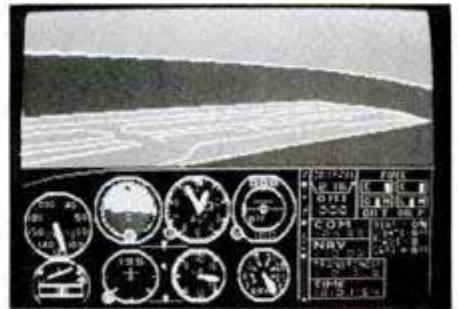


## Magnificent men in their flying computers

We dove down to buzz the antenna tower high atop Boston's John Hancock building—probably not the smartest decision we've ever made. But the sheer exhilaration of powered flight was making us a daredevil.

As we approached, the building grew larger and clearer, and details in the tower became apparent. Its complex, girdered structure stood out in bold relief against the bright blue sky glimmering behind a layer of white clouds. The only thing that spoiled the view was when we crashed into the tower and our Cessna crumbled to pieces around us.

Luckily, especially for those with offices in the Hancock building, we were not in a real plane. But we were in the next best thing—Microsoft's *Flight Simulator* for the IBM PC personal computer.



*Boston's John Hancock building makes a tempting target (left) in Microsoft's Flight Simulator for the IBM PC. Landing (right) requires the most practice of any maneuver.*

This new program simulates all the variables of flying a small aircraft. And, it does so using the best graphics we have seen on the IBM computer. The animation is topnotch, with no annoying flickering, the colors are crisp and believable and the controls all respond as they should.

Little touches like being able to look out the side or back windows make this flight simulator the most realistic of all. But its realism is its only drawback. Learning to fly your computer is just about as difficult as learning to fly a plane. But it's also just as much fun.

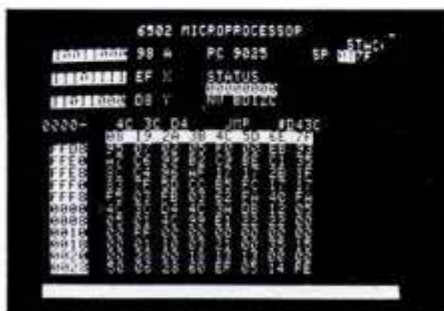
—Neil Shapiro

## Better programming

A language such as BASIC is fine for many applications. But when you need speed for such things as animation or number crunching, you must get closer to the way your computer thinks by programming at the machine level.

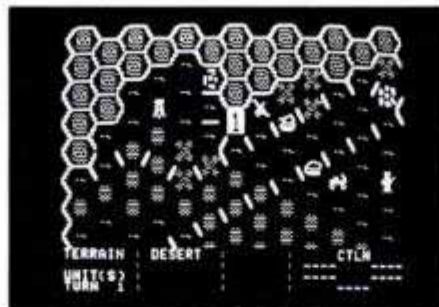
Machine language can be difficult to learn. Now, Prentice-Hall has released *Machine Language 6502 Programming*, a combination of book and Apple II computer disk.

The book is a detailed guide to learning machine language. On the disk, the program *Tutor* enables you to manipulate your computer's memory directly and see the results. It's a fine package for learning.—N.S.



*Tutor helps you learn machine language.*

## Oil's well that ends well



*Invade Persian Gulf with tactical (left), strategic (right) displays in RDF-1985.*

The U.S. Rapid Deployment Force has landed on the Saudi Arabian shores of the Persian Gulf. The year is 1985. There already is a conventional war in Europe and this bold stroke by the United States will, it is hoped, stop the U.S.S.R. from cutting off the flow of oil to the American war machine.

Part of a series of computer simulations titled "When Superpowers Collide," this latest game from Strategic Simulations Inc. (SSI) uses the graphic and computing potential of the Apple II to the fullest. Either two players may go head to head, or you can play either side against a cagy and aggressive computer opponent.

Movement is shown on a series of 12 tactical maps displaying all terrain and unit types. For an overall view of the desert and salt flats, the commander can switch to a less detailed, but helpful, strategic display.

Results of combat and firing are governed by the outcome of a number of complex and realistic variables. The computer calculates such things as how many units are supporting another unit's attack or defense and how far a unit is from its headquarters. The results are on-screen in seconds.

*RDF-1985* is a most realistic simulation of what we all hope will never be.—N.S.

# THE PM WORKBENCH



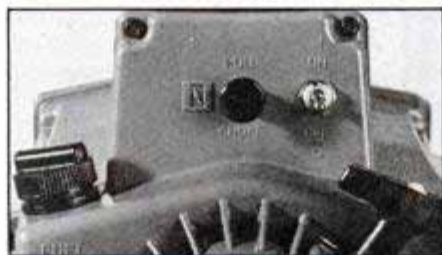
## Portable, powerful pumping

Here's good news for anyone who has to get rid of lots of water, say, after a basement flood. It's the Waterbug, a new portable, gas-powered pump from Homelite.

The Waterbug is a powerful, little two-cycle, centrifugal pump capable of moving 1,350 gal. per hour. In addition to making easy work of flooded basements, the Waterbug can also irrigate your lawn or garden from a nearby lake or stream; spray-clean boats and docks or maintain the water level in swimming pools. It costs \$184.95. Homelite Div. of Textron Inc., Marketing Services, Box 7047, Charlotte, N.C. 28217 makes it.—J.T.



*The Waterbug (above) comes with 12 ft. of 1-in.-dia. hose, couplings and a garden hose adapter. All of the pump controls are conveniently located at one end of the 1.6-cu.-in. engine (right).*



## Wallpaper trimmer

This handy, little knife, designed for wallpaper hangers, is perfect for trimming along moldings, in corners and around other obstructions. The curved blades are available at hardware stores. The Wallpaper Tool is \$7.95 postpaid from Selfridge Industries, Box 494, Warrenton, Ore. 97146.—H.W.



*Plastic tool is light and comfortable. Its secret lies in the use of a curved blade.*

## Write what you read



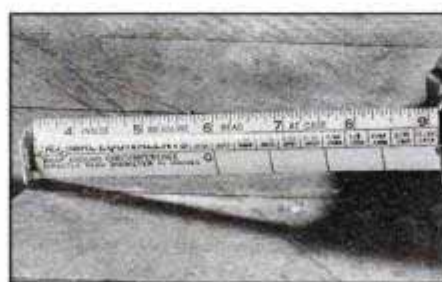
*Textured Lexan disc allows you to record measurements with a graphite pencil.*

This 25-ft. tape has a face disc that lets you write on it. As every professional and home carpenter knows, this can be a valuable asset when you measure a wall for paneling or plasterboard, then must run outside to do the cutting. The tape also has inside measurements on the reverse side. This eliminates the necessity of adding the width of the tape's case to the measurement.

It's available for \$14.95 from Rite-way Tool Co., Box 4019, Lantana, Fla. 33462.—H.W.



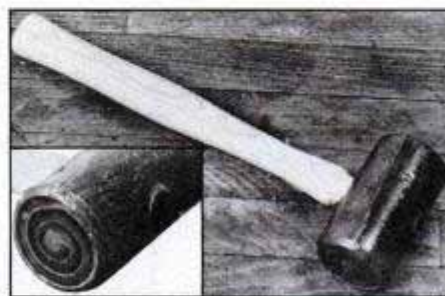
*The recorded figures can be erased easily and the Lexan disc is ready for reuse.*



*Tape's backside rule eliminates the nuisance of having to add the tape's case width to inside measurement's reading.*

## Rawhide mallet

After splitting a few wooden mallets over the years—driving lathe centers into hardwood stock—I treated myself to a 10-oz. rawhide mallet. The head of this quality tool is made of tightly rolled, glued and screwed leather. It's then mounted to a 10-in.-long hardwood handle. It now hangs by my wood lathe, but I also use it for rapping chisels or jobs where I don't want to mar the work, such as driving dowels. The mallet (No. BA-0271) is \$15 plus postage from Shopsmith Inc., 750 Center Dr., Vandalia, Ohio 45377.—H.W.



*This top-quality rawhide mallet features a tightly rolled leather head (inset) on a hardwood handle. The mallet's head has a 2-in.-dia. and is 4 in. long.*

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Complete statement included with product. For you fill write for advance FREE copy to:

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**Tool Organizing System**

A heavy-duty portable tool chest plus roll-about cabinet—both for a price you'd expect to pay for one piece alone!

**FANTASTIC!! BOTH PIECES JUST**

**\$59.99**

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**\*Double-slide Safety Drawers.**  
Support more weight and prevent spills. Drawers lock automatically when cover is closed.

**\*Bolt latches and center padlock hasp on chest. Padlock hasp on cabinet door.**  
Total security and safety.

**\*3 large capacity drawers**  
(Inside dimensions: 16 3/4" W x 21 1/4" H x 8 3/4" D) and **a big top storage tray** (Inside dimensions: 18 3/4" W x 24" H x 9 1/4" D).

**\*Soft-foam Drawer Liners.**  
Protects tools and tool chest.

**\*Cabinet top has 1/4" lip on sides and back.** Keeps tool box in its place.

**\*Side-handle cord holder...** for neat storage of electrical cords.



**\*Adjustable, sturdy shelf in cabinet.** Handy hanger holes and hooks on inside of door.

**\*Large Capacity.**  
Tool Chest: 19" W x 12-5/8" H x 9-1/2" D.  
Cabinet: 19-5/8" W x 24-1/2" H x 11" D. Over 3.5 cubic feet of combined inside storage space.

\*Height of combined units over 3 feet: 37-1/8 inches.

**\*Four steel ball bearing swivel casters...** smooth-rolling, solid rubber wheels.

Tools and supplies not included. Imported from Taiwan and Korea  
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**Similar units sell for well over \$100!!**

**How do we do it?** Volume Purchasing...plus direct shipping. Both add up to big, never-before-heard-of savings!

You don't have to be a professional to know how important it is to keep your tools clean, safe and dry...to have them organized, right with you.

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Then you'll know why this Tool-Locker comes complete with a **FULL 5-YEAR WARRANTY**. Why D.R.I. backs it even further with a **100% Guarantee of Satisfaction**. If you're anything less than 100% satisfied, just send your Tool-Locker back for a full refund, including shipping and handling charges.

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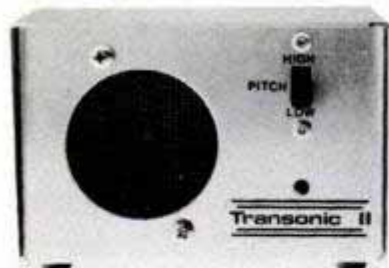
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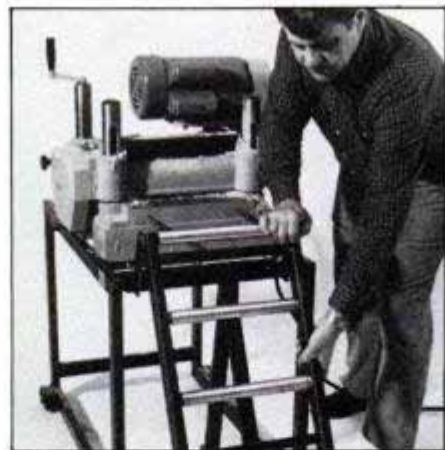
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*Infeed support is via a single roller held  
at the same elevation as RC-33's bed.*

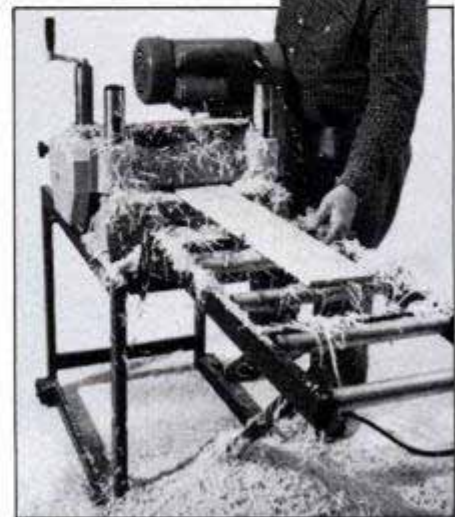
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Using a quality planer by itself is a joy  
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unit even better. We decided  
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have seen in anyone's home workshop.  
The primary tool is a beauty and the  
stand it now sits on has an excellent  
infeed-outfeed roller setup. Of the  
three models available, I chose the ver-  
sion with a single infeed roller. Model  
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ping included). The stand places the  
planer bed at the correct working  
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setup was particularly helpful when I  
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IF YOU WANT CLEAN FRESH AIR OR YOU'VE UNPLUGGED YOUR POPULAR FILTER-FAN UNIT BECAUSE IT DOESN'T WORK THEN READ THIS...

Is your indoor air fresh, clean, and alive? Indoor air pollution is becoming a national health hazard. Energy efficient, airtight buildings are stifled with stale, polluted air which contains tobacco smoke, smoke and soot from fireplaces, heating systems, and cooking appliances; as well as dust, pollen, viruses, and bacteria. Most of these pollutants are so small (under 5 microns) that they are not effectively removed by common, small filter-fan units. Scientific tests show that these noisy, toy-like devices which emit chemical "citrus" odors are no match for high-powered ionizers in thoroughly cleaning indoor air.

### ANOTHER IMPORTANT DIFFERENCE

You know how fresh and vibrant the air feels right after a rainstorm, in the mountains, or near a waterfall. That clean, alive, fresh air is rich in something important that is greatly depleted in our urban and indoor air. That missing element is negative ions, nature's own air cleaners. Many users experience great benefit from these amazing active ions, including feelings of aliveness, alertness and vitality similar to that experienced in the fresh mountain air. In addition, even hospitals use ionizers in some units.

Filter-fan units do not emit negative ions. The COLLECTOR, by Zestron, creates trillions of these beneficial ions every second, while giving you the best performance, value, and technology in air cleaning.

### THE ZESTRON BREAKTHROUGH!

Most ionizers clean your air but leave an untidy deposit of pollutants on room and furniture surfaces near the ionizer. The COLLECTOR, by Zestron, takes ion technology a giant step forward by giving you superpowered ion output while depositing pollutants from your air on The COLLECTOR panel. This easy to clean panel features a scientifically formulated surface that electrostatically attracts the vast majority of airborne pollutants to it rather than to the floor or walls near the ionizer. Other bipolar ionizers with porous collecting surfaces that absorb odors and unsightly grime are almost impossible to clean.

### AMAZING DEMONSTRATION!

Unplug your COLLECTOR, place the ionizer unit and an ashtray on top of the panel. Place a lit cigarette in the ashtray and watch the smoke rise into the air. Now plug it in, and amaze yourself and friends as the smoke barely rises above the ashtray and then nose-dives onto The COLLECTOR panel before it can enter the room air. This is accomplished entirely electronically with no moving parts. The COLLECTOR, by Zestron, is the only ionizer on the market that cleans the air powerfully enough to accomplish this test.

### ADJUSTABLE OUTPUT

Some people prefer fewer ions at night. The COLLECTOR is the only adjustable bipolar ionizer that allows you to set the ion level to your personal preference.

### THOUSANDS OF SATISFIED USERS

Don't you, your family and friends deserve the healthy, clean, fresh air that Zestron ionizers have brought to thousands of satisfied users? Users write: "I simply cannot believe how much better I feel." Dr. E.K., D.D.S.—MA; "I smoke heavily and it has cleared the air as advertised." G.P.—WA; "I haven't taken the top off my nasal decongestant spray since using your product. I was previously a chronic user." G.S.—S.D.

When you use your COLLECTOR, you'll quickly feel the difference it makes and smell the freshness in your air. You'll actually see the elimination of smoke and dust in your air!

### SILICON VALLEY TECHNOLOGY

The COLLECTOR, incorporating years of high reliability design experience, is built with quality parts in the heart of Silicon Valley, USA, to give you years of trouble free service.

The COLLECTOR operates anywhere in your home or office for pennies a month and has nothing to wear out or replace.

### SUPERPOWER OUTPUT

The COLLECTOR, by Zestron, is the only bipolar collecting ionizer with superpower output. The thoroughness and speed of air cleaning increases with more ion output, and Zestron ionizers give you the highest output (without detectable ozone). Don't be misled by low cost, low output units stating output at the emitter. Check the comparison chart below. Don't buy any ionizer not stating output using the industry standard of ions/cc/sec. at one meter.

IONIZER	ADVERTISED OUTPUT (1 m.) ions/cc/sec.	BIPOLARIZED
The COLLECTOR by Zestron	1,200,000	YES
JSA Bubble	not stated	YES
Aspen	not stated	YES
Orbit	not stated	YES
AirEase	not stated	YES
AirCarell	236,000	YES
Ion Fountain	540,000	NO
Ion Cloud	350,000	NO
Ionosphere	350,000	NO
Modulian	75,000	NO
Ion Breeze	not stated	NO

### FREE ION DETECTOR

A FREE remote ion detector comes with each COLLECTOR to verify and compare output. When you place the detector next to The COLLECTOR and a competitive unit, you will see greatly reduced or no output from the competitive unit!

### SATISFACTION GUARANTEED

Order a COLLECTOR now and try it in your home or office risk free for 30 days. If for any reason you are not satisfied, return the unit for a full refund including return postage. The COLLECTOR has a full one year warranty on both parts and labor excluding abuse.

### ADDITIONAL DEALERSHIPS AVAILABLE

Reorders are pouring in. Customers write: "We are enjoying the results of the first one and are ordering two more." Dr. J.B., M.C.—CA; "I'm a distributor for three other ion companies, and have to say I am extremely, extremely impressed." T.N.—CA. ZESTRON, the leader in ion technology, has created a unique DEALERSHIP PROGRAM. Call or write for details on this RISK FREE OPPORTUNITY.

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In Calif. 800-392-1200 or (408) 371-1200. Use your credit card or send check or money order to Zestron, Inc., Dept. PM7, 1901 S. Bascom Ave., Campbell, CA 95008. Add \$4.00 shipping and handling per unit. (Calif. residents add 6.5% tax.) Orders outside U.S. add 15% to unit cost. Order one at \$119.95 or two at \$109.95 each. For additional quantity discounts, call Zestron, Inc.

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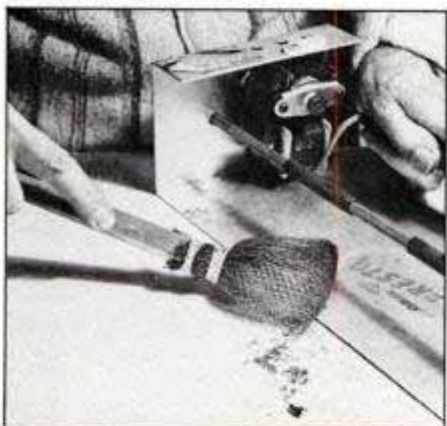
# HINTS FROM READERS

## Workshop spatulas



Paint, varnish, oil and adhesives can cling to the inside of containers. A rubber spatula can scrape the container sides clean and help remove the contents. Bore a hole in the handle for easy wall hanging.—*Kenn Oberrecht*

## Plastic-net brush



You can convert plastic-net bags (the kind that hold onions) into a useful, brushlike tool. Fold the netting to a suitable shape and, with rubber bands, secure it to a round or flat stick used as a handle. The netting has no bristles to flare back when you're cleaning confined spaces. It traps sawdust, chips and other dirt for removal from hard-to-reach areas. It's especially handy when you're working around a lathe, drill press and other power tools.

—*Walter E. Burton*



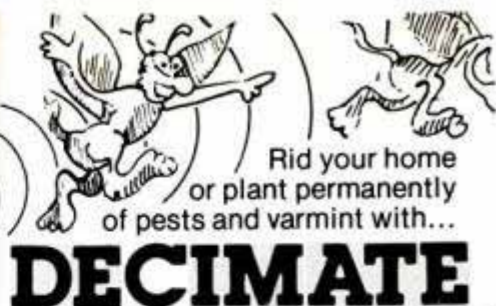
just  
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**Important Notice:** Please do not confuse Decimate with similar looking units of low intensity and only one output level. Decimate "sweeps" from 25,000 to 65,000 Hz. in each cycle -- other units have constant frequency. They may cost a few dollars less, but they cannot possibly do the job.



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# DECIMATE

It's not a pretty topic, but let's face it, mice, rats, roaches, bats, fleas, spiders and other pests and varmint make life miserable at home or at the plant. Sure, there are all kinds of poisons that get rid of them -- temporarily. Trouble is that those poisons usually contain carcinogens that endanger you and your household pets. And, unfortunately, in just a few generations (and that can take as little as a few months) the "little visitors" usually develop immunity against them.

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Boasting a 100-hp Four and totally redone suspension and sheet metal, new Prelude satisfies itch the original couldn't scratch.

## Driving The '83 Honda Prelude

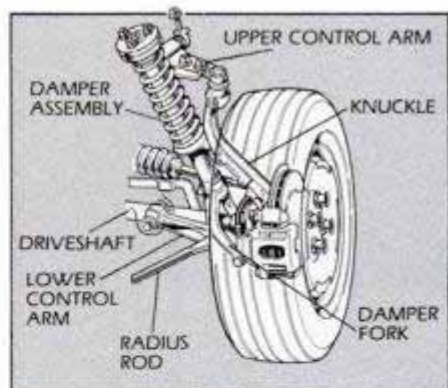
Daring technology under an all-new skin.

BY TONY ASSENZA AUTO EDITOR

If there's one thing that can be said about the people of Honda, it's their ability and willingness to experiment. They can't seem to resist a challenge. Whether it's entering a new market (snow blowers, lawnmowers, portable generators and roto-tillers are among their products), or wading hip-deep into some unconventional realm of technology, they do it with an enviable single-mindedness and sense of purpose. Guts would be a shorter word for it. It seems to be part and parcel of the Honda work ethic, and it finds its origin in Nobuhiko Kawamoto, Honda's head

of research and development. The best and brightest of his young engineers are funneled through Honda's various motorsports activities, such as the motorcycle racing program, Formula 1 (yes, they're doing that, too) or production sports car racing.

In the compression of time and space that's organic to motorsports, you adapt or die. You think on your feet, create, test and develop with a racetrack as your lab and a motel room, or worse, as your office. And you do it fast because the meter's ticking and the competition never stands still. If you're successful, or at least show the ability to keep your head, you're rewarded with the task of



*Unconventional front suspension is necessary for Prelude's low, sloping nose.*

solving bigger problems with even bigger stakes: market penetration instead of checkered flags.

The results of this intense, on-the-job training can sometimes be remarkable (the Honda City's torque motor, the racy Civic S) or sometimes simply unworkable because of a too radical approach, as with the racing 500-cc motorcycle engine with its V4, oval-piston and dual-connecting-rodded configuration (see *New Motorcycles*, page 71, Jan. '81). But the scars of battle aren't collected in vain at Honda. From

the failure of the V4 racing motor came the successful 1,100-cc V4 motor of the Honda Magna motorcycle. It is the quickest and fastest street-production motorcycle on the market, able to squeeze 105 smooth, tractable horses from a mere 1.1-liter.

### The new flagship

The motorcycle and racing influences are clearly evident in the new Prelude. As its new flagship, replacing the older car of the same name, the Prelude is the showcase for the best that Honda can produce in design and engineering. The design targets were ambitious. For instance, the target car for the Prelude's handling, road feel, ride quality and steering input to the driver was no less than the Porsche 924 Turbo. Ambitious indeed, considering they were trying to make a front-drive car handle like a rear-drive. Yet the task seems to have been accomplished successfully.

There's no hint of torque steer, dreaded bump steer or funny off-throttle dart and weave. Steering input, for most of the steering wheel sweep from lock to lock, is quite good, but at the extremes the wheel tends to go limp and stop transmitting information. This probably has more to do with the choice of tires fitted on the test car than with any design fault. Original equipment



The .36 drag coefficient results in low wind noise and wind resistance at speed.

tires on most Japanese cars—even the high performance—aren't always what you'd call terrific. With a tire like the Eagle GT, or top-of-the-line Goodrich TA, the handling and feedback would probably be crisper.

Some drivers of manual transmission cars without power-assist steering might find the steering hard at low speeds. Getting in and out of parking spaces might require more muscle than you're willing to supply, but I found it tolerable.

Cars with automatic come with standard power assist and are easier to park, but they also lose some feel in the twisties. Due to the very low front end design, necessary for a good aero num-

ber (0.36), Honda engineers found that a conventional MacPherson strut arrangement wouldn't fit. So they designed an upper and lower control-arm suspension with a radius rod attached to the lower arm. The rod runs forward and locates the suspension longitudinally. The spring and shock absorber are contained in one unit. At the bottom, this damper assembly has a fork arrangement which bolts up to either side of the lower control arm. The fork is necessary to allow the driveshaft clearance to get to the front hub.

This complex arrangement solves the packaging problem, although it must have given the assembly and produc-

*(Please turn to page 70)*

## Tonight, instead of watching the stars...



## watch the stars!

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## DRIVING HONDA PRELUDE

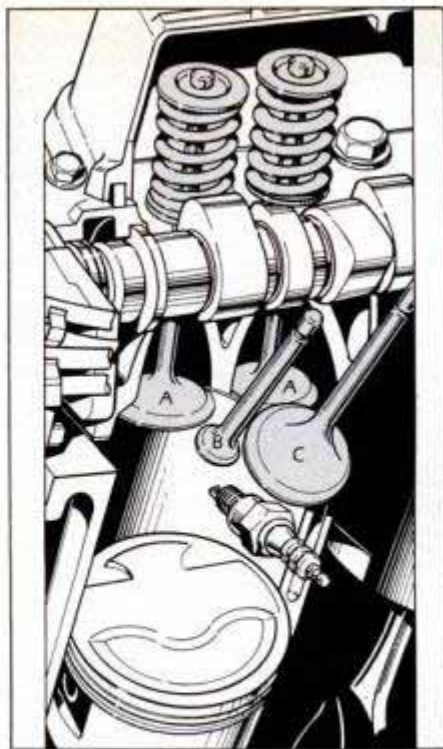
(Continued from page 69)

tion people fits. But it does work. The car has excellent on-center feel and transmits a solidness that belies the car's low weight of 2,200 pounds.

In the flatlands and mountains around Palm Springs, Calif., where we tested the car, the Prelude exhibited outstanding road manners. On tight, decreasing-radius turns, taken too fast, lifting off the throttle creates a mild oversteer. This is easily controlled with either opposite lock or gentle reapplication of the throttle. The need for better

tires also becomes evident. Under all driving conditions, even over rough pavement, the Prelude has excellent directional stability. Driver and passengers will be pleased by minimal body roll and very low noise intrusion.

The centerpiece of the new Prelude is the engine. It displaces 1,829 cc, has a single overhead camshaft and, like all Honda engines in the United States, has the Stratified Charge prechamber with a tiny intake valve feeding the prechamber. (For some reason, these engines always have been called eight-valve heads when in fact they have 12 valves: four intakes, four exhausts and



Prelude's cylinder head has two intake valves (A), the stratified charge valve (B) and a single exhaust valve (C). All operate from a single overhead camshaft.

four small intakes for the prechamber.) The Prelude engine has an additional intake valve situated in the main combustion chamber alongside the existing valve. This makes the motor technically a 16-valve job, but Honda calls it a 12-valve motor.

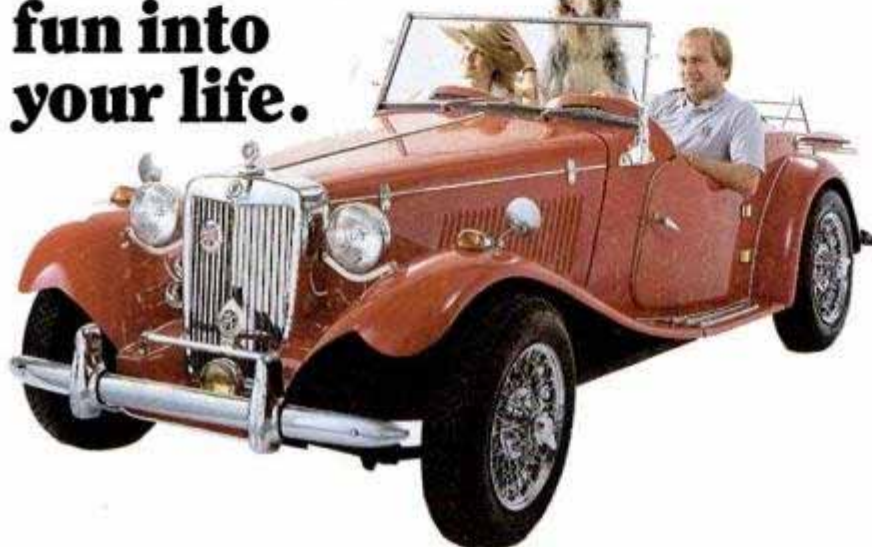
Whatever you call it, the engine is a technological *tour de force*. The single overhead cam operates all four valves, prechamber, dual intakes and single exhaust through a conventional rocker-



The interior is done up well. Even plastic manages to look good in the Prelude.

arm arrangement. All three intake valves, however, have different opening times. The CVCC valve opens first, filling up the prechamber with a very rich fuel/air mixture. The intake valve farthest from the exhaust valve opens next, filling the main combustion chamber with a leaner mixture. Ten camshaft degrees after the first intake valve opens, the second one opens. According to Honda, this creates a ram-charge

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effect, causing complete cylinder fill and creating a high-speed swirl, which is conducive to better combustion, higher efficiencies and better performance. It's a complex system.

Staggering the opening of the intake valves creates a desirable valve overlap at high engine rpm, producing more power. At low speeds, this overlap creates idle instability.

In theory, this seems to work fine, but in practice, the motor somehow doesn't live up to expectations. For all its complexity and daring, it doesn't seem to make any more horsepower than competitive engines on the basis of displacement to power ratio. The Prelude motor produces 100 hp at 5,500 rpm, but its torque curve doesn't peak until 4,000 rpm, delivering 104 ft.-lb. at that speed. Most four-cylinder motors deliver peak torque at 3,500.

The valve arrangement pays off in the top end. Where most small Fours being to flag, the Prelude's motor continues to pull well into the 100-mph range, and with a lot less noise and rattle than most of the competition. This lack of bottom-end torque may be caused in part by the twin 34-mm, constant-velocity carburetors. Two fairly large throats like that work well in the upper rpm band, but create too much volume to be moved for proper gas velocities at low engine speeds.

This problem is partially alleviated by the use of a close-ratio, five-speed gearbox and a very high (numerically) final drive ratio of 4.075:1. The automatic gearbox has a numerically lower final drive of 3.875:1.

Essentially, this combination of engine and power train forces you to drive the Prelude like a race car. Most race motors make all their power at the top end and only feel right in the upper rpm range. The Prelude loves it on the high side of the rev counter. With the closely spaced ratios, a very good clutch, brake and throttle pedal arrangement, and an excellent shifter, heel and toe shifting is a joy. It's like a Formula Ford with a passenger seat.

#### First-class interior

Prelude shoppers will have a very short list of options to choose from because the car is extremely well equipped right off the assembly line. The only option worth mentioning is air conditioning. Everything from the power-operated moonroof to remote-controlled, outside rear-view mirrors is standard.

Interior dimensions are larger in almost every respect than the previous model, making the cockpit a more livable place. The assembly, quality of materials and ergonomics are close to perfect. The one exception is a steering wheel that some might find too low.

There's no tilt adjustment, either. While there's a lot of plastic, Honda has done a terrific job of making it look good. I didn't even mind the molded-in fake stitching on the dash.

The suggested retail price is a very attractive \$9,645 for the five-speed version and \$9,995 for the automatic with standard power steering. The EPA numbers are 26 and 38 city/highway for the five-speed and 26/33 for the automatic. Not a bad set of numbers all around.

If there is one criticism that can be leveled at the new Prelude it is that it's not the car we were led to expect. As

the new flagship, and with so much new technological ground broken in its gestation, it lacks the ferocity of purpose that the specification sheet promises. A multivalve head, 9.4:1 compression ratio, exotic suspension, 2,200-pound weight and 100-hp motor would lead you to expect a bloodthirsty warrior of a car. While it's agile, and capable enough, it's perhaps a bit too docile. For a company that takes so many chances and flaunts as many conventions as Honda, it's a pity it couldn't have taken one more chance and produced a Prelude that was more samurai and less of a gentleman. **FM**

# SOUTHERN COMFORT

Southern Comfort Corp., 90-000 Pines Road, St. Louis, Mo. © 1983

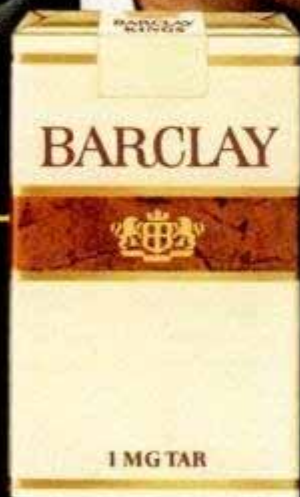


*"My Plantation consists of exactly six tomato plants out behind the garage. But with a cool evening breeze rustling through the leaves and a couple of O J Comforts up here on the deck, I know what good old Southern Hospitality is all about. That's Comfort."*



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# AROUND THE WORLD BY HELICOPTER



*The Spirit of Texas made a scheduled North Pacific landing on a makeshift flight deck aboard the container ship McKinley halfway around the world.*



*Ross Perot Jr. (left), 24, and Jay Coburn, 36, covered 26,000 miles in 30 days.*

They talked their way out of three countries and landed on the heaving deck of a cargo ship while making the first 'round-the-world copter trip.

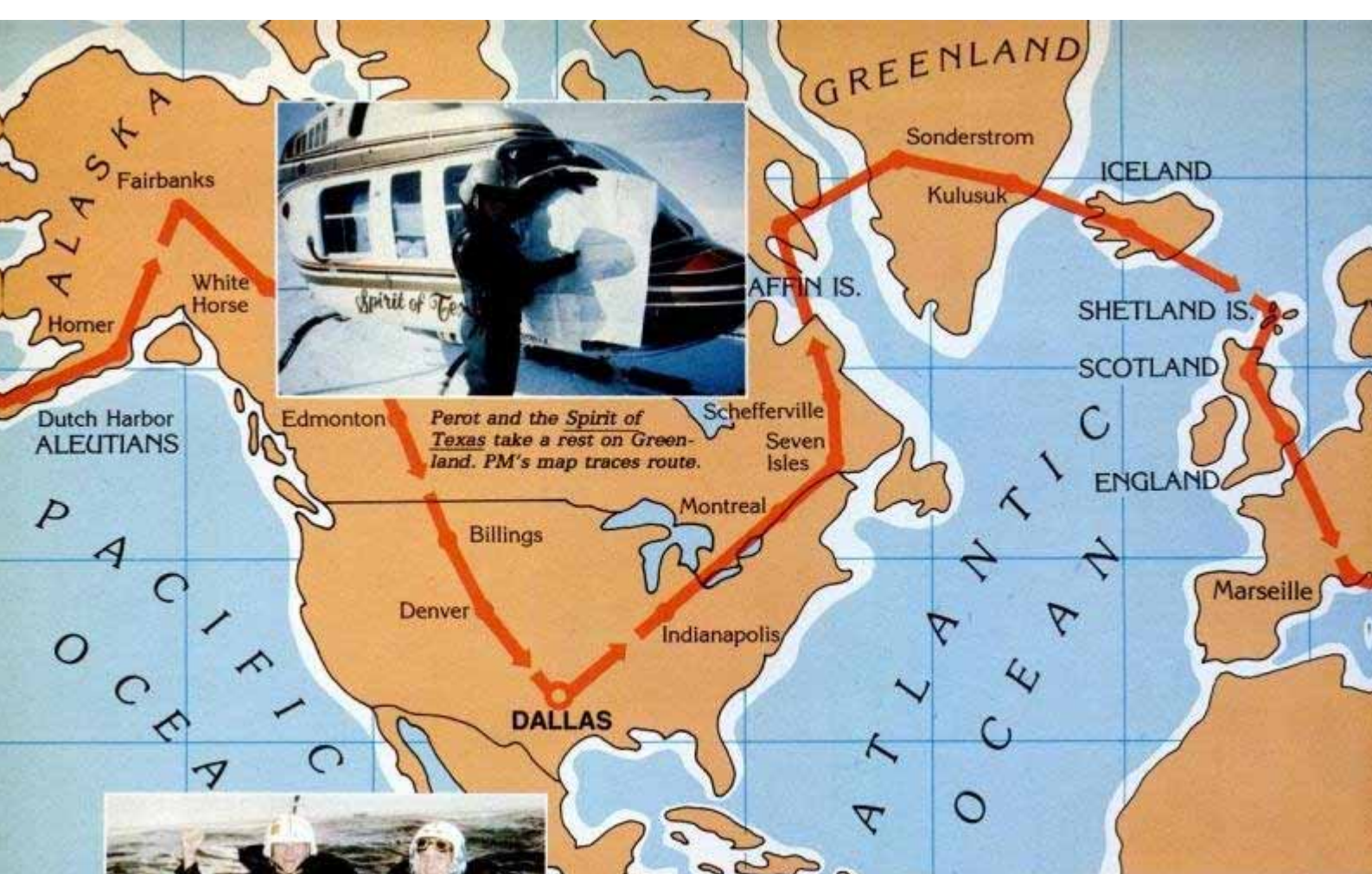
BY ROSS PEROT JR.

**F**lying a helicopter around the world. It sounded absurd. The oceans are too wide. There's too much hostile territory. The odds are against it. And, until Australian adventurer Dick Smith left Dallas last August 6, no one had tried it before. (Smith departed from Dallas, where he picked up his Bell helicopter.)

As he announced his plans to start from the United States, I began to get the fever. An American should

be first. So I asked Jay Coburn to take the trip with me. He had flown a helicopter in Vietnam and later served as deputy commander in the daring rescue of two Electronic Data Systems executives from a revolutionary jail in Iran. He was a winner.

Once we decided to make the trip, it took just three weeks to equip a Bell Long Ranger for long-distance travel. To make room for a 151-gallon auxiliary fuel tank, the helicopter was gutted of all nonessential



Perot and the Spirit of Texas take a rest on Greenland. PM's map traces route.



Prepared for the worst, Perot and Coburn practiced sea survival (above) and carried thermal suits (right) in case of an oceanic ditch. Their cockpit (below) was equipped with special avionics. Loral extended radar system was installed on the instrument board between pilot and copilot seats.



Rear seat of the Bell chopper was removed to make room for an auxiliary fuel tank (above). Some of the advanced electronics gear was also stowed in the rear section.



equipment. This also made room for long-range navigation and communication gear, a special heater/defroster unit and pop-out floats for emergency water landings. The paint scheme was modified to include high-visibility colors.

We chose a route that crisscrossed the Northern Hemisphere from equator to Arctic Circle, flying over mountains, deserts and jungles. The weather was so foggy in places, we sometimes had

to fly 10 feet off the ground, following rivers and railroad tracks. In India and Burma we were almost arrested for landing without permission. But in each case it was life and death: We needed fuel.

It was for refueling that we faced our biggest piloting challenge: landing on a cargo ship in the North Pacific 150 miles off the coast of the Soviet Union. The Soviets wouldn't allow us to land in their territory for fuel.





The Spirit of Texas is shown flying over Greenland on the first leg of her 30-day trip around the world.



After the record flight, the Bell Long Ranger helicopter was given to the Smithsonian Institution. It's now on display at the National Air and Space Museum in Washington.



At Koartac, an Eskimo village, Perot and Coburn were surprised to find fuel for chopper. The villagers even took an oil company credit card.

So the success of our trip depended on landing atop a 40 by 40-foot makeshift pad strapped to the bow of the container ship *McKinley*. Normally, that would not be a problem, but I had never landed on a ship before. With 40-knot winds and 15-foot seas, the landing would be rough.

From takeoff on September 1 until the end of the trip on September 30, the *Spirit of Texas* performed like no other helicopter in history. During the month,

our standard production Bell helicopter logged 250 hours, covered 26,000 miles, made 56 stops, burned 56,000 pounds of jet fuel and averaged speeds of 100 knots and altitudes of 1,000 feet.

The helicopter had only 30 hours of flight time before we took off, so there was not enough time to work the bugs out. Fifteen minutes after takeoff from Dallas, we ran into our first problem. We forgot the maps to Montreal, but we

weren't about to go back. Fortunately, we were able to buy the maps at our first fuel stop.

Maps were not necessary to fly to Seven Isles, Canada. The weather was so bad we had to fly the St. Lawrence River, just a few feet above the shipping channel. Fighting 40-knot head winds, Jay and I were forced to navigate from buoy and buoy. Occasionally, we had to fly under bridges and power

*(Please turn to page 127)*

# WATCHES

## More Than A Good Time!

Today's marvelous watches let you watch TV, win sports car rallies and translate foreign languages. They even keep great time.

BY NEIL SHAPIRO ELECTRONICS EDITOR

**R**emember when watches had a big hand and a little hand and all they did was tell you the time? Well, today's electronic watches, with their sleek, liquid crystal displays and computerized innards, go much further than that. Telling the time is a sidelight now—sort of icing on the programmed cake.

Today's watches can do a lot more than tell you the right time. If you're an active person, they can do quite a bit to enhance your lifestyle. Now, we don't know anybody who actually owns *all* of these types of watches. But, if you will permit us a bit of whimsy,

**SEIKO TV WATCH**  
(And FM Receiver)

PM photos: Bill Ashe

*A wristwatch you can watch on your wrist may be in the near future. Seiko has unveiled its revolutionary new TV watch with a liquid crystal screen. The picture is clear and easy to see.*

**MARCEL 757**  
(FM Stereo)

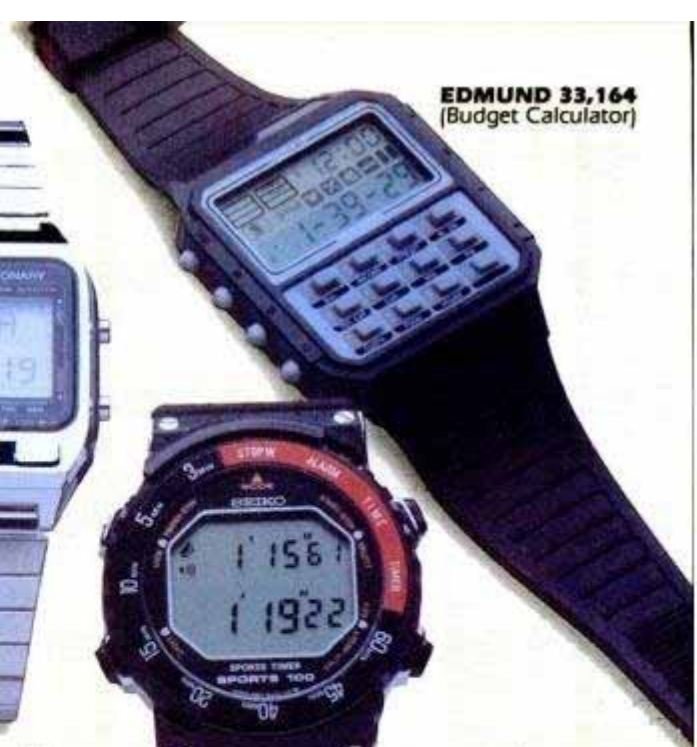


**CASIO TE-2500**  
(Dictionary)

"Get down" with a stereo watch and headphones (above), or get the word with an English-foreign language dictionary watch (right).



**EDMUND 33,164**  
(Budget Calculator)



follow us while we detail an evening in the life of the mythical Thomas Tock, man about town and watch owner extraordinaire.

### Stepping out

Tock, both his arms covered from wrists to biceps with the latest in programmed technology, is alerted to the evening's revels by the first of many insistent alarm beepings. Practiced eyes glance down the row of watches on his left arm.

Dexterously resetting the Marcel (Model 750) multi-alarm, dual-time

zone watch, Tock sets out for a night on the town.

Sensing that he's making good time driving through the late-night traffic, Tock glances at his Seiko Tachymeter Sports 100 (Model MGL03) to check his average speed and estimated time of arrival.

Barreling through a sharp lefthander, Tock notices that the Seiko's tilted face allows him to keep both hands firmly on his silver Porsche's steering wheel. Finally, Tock pulls up in front of his favorite disco.

At the bar, he's amazed to find that



**SEIKO MGL03**  
(Sports Timer)

Be a sport and wear a watch like this Sports Timer (above), which will time all of your favorite sporting events. Or be a stay-at-home and calculate all of your household finances on this aptly named Budget Watch (top).



Now you can have entertainment on your wrist. In the roulette game watch, the wheel spins and realistically slows. Kopy Kat game watch is a rendition of the match-the-musical-note games. You can take on aliens in Star Trek's Wrath Of Khan. Or get closer to Earth and maneuver your tank away from attacking airplanes.



Casio's touch-sensitive face will make you wonder where the buttons went. Other calculator watches, such as the Armitron and Marcel, feature tiny but easily pressed buttons. Some calculator watches, such as Armitron and NSC models, include countdown timing functions.

the bartender doesn't know how to make a Martian Wallbanger. Luckily, Tock's Edmund memo watch (catalog No. 33,217) saves the day. The watch's one-line display scrolls the list of ingredients in a manner reminiscent of the old Times Square marquee.

As the drink arrives, our hero cannot help but notice the dark-haired, sultry beauty who seats herself next to him. They turn to each other and she smiles and says something to Tock. After a moment of puzzlement, he realizes that she is speaking a different language.

The Casio Dictionary watch (TE-2500), worn high on his right arm, comes to Tock's rescue. Its Spanish-English and English-Spanish functions soon have Tommy and Estralita chatting—via his watch face—like old friends. Both, they find, are electronic game players.

With a flourish, Tommy unveils his Mercury Plane/Tank electronic game watch (3655) and it isn't long before the two together have saved well over a platoon of heavy tanks from being ravaged by dive-bombing enemies.

Near closing, the bartender presents Tock with the tab. Tommy nonchalantly picks up the itemized bill and clicks on the calculator display of his Casio touch-sensitive calculator watch (TC-500). The face clears to a flat display of calculator buttons. The heat-sensitive sections of the watch's face respond to his darting fingertips as he calculates the bill. He sighs. There's been no error and he reaches for his wallet.

His monetary problems fade as he enters the lovely Estralita's phone num-

**ARMITRON 40/6351** (FM Stereo)

*This FM stereo watch features an on-the-face tuning control, in addition to a power supply and headphones (not shown).*



ber and address into the two-line display of his Seiko memory watch (MGJ07M).

His pulse pounding (he checks this with his Edmund pulse watch, catalog No. 33,160), he offers Estralita the chance to accompany him home to see his etchings of rare old timepieces.

She smiles sadly. No, she sighs, and tells our man of the hour that she fears she has come down with a cold.

A quick check with the Casio temperature watch (TS-1000) confirms this fear. Not even Tommy's exciting presence could generate that high bargraphed reading.

Before leaving, alone, he checks his blood alcohol level on the disco's wall-mounted breath analyzer (that one's not yet built into a wristwatch). It's okay. He pulls out his car keys

*(Please turn to page 126)*



**TIMEX 67731**  
(Sports Timer)

*You can time individual laps with this sports timer watch (also available in men's version).*

**SEIKO MGM05M**  
(Rallye Timer)

*Drivers will get super-charged performance and function out of this special timer watch.*

**EDMUND 33,218**  
(Jogger's Watch)

*Joggers can set the pace with this watch and keep track of how far they run.*



**EDMUND 33,217**  
(Memo)

*Keep a phone number handy with this watch and its one-line scrolling display.*

**SEIKO MGJ07M**  
(Memo)

*A two-line display and calculator functions make this a real thanks-for-the-memory watch.*

**MARCEL 731**  
(Memo)

*Scrolling memory display keeps track of events. Shoot-'em-up game helps pass time.*



**MARCEL 750**  
(Multi-Alarm)

*Many watches feature multiple alarms. With a watch like this, you can beep day and night.*

**EDMUND 33,160**  
(Pulse Watch)

*Ever want to take your pulse on the spur of the moment? This watch will do it for you.*

**CASIO TS-1000**  
(Temperature Watch)

*This watch will keep track of your body temperature as well as your appointments.*

# New Speakers Use Foam Panels— Not Cones

Foam diaphragms, polymer plastics and piezoelectricity all add up to some of the best sound you can find without going to a concert hall.

BY NEIL SHAPIRO ELECTRONICS EDITOR

**L**ook inside the cabinet of just about any speaker and you'll find the usual speaker technology—a cone-shaped, paper or paper-like material which moves in and out to produce sound. But if you look inside one of the new speakers from BES you'll look in vain for any evidence of a cone. These speakers make music using a large, flat panel made out of a polymer plastic, which is similar to Styrofoam. And yet, they deliver a rich, commanding sound, as if you were in a concert hall.

But to call the BES diaphragm simply a flat piece of Styrofoam would be similar to calling a Stradivarius a fiddle. This contoured, cut and shaped material—the heart of the BES system—is a musical instrument in its own right. It's as tuned and as lovingly engineered as any antique instrument, but it's within the framework of today's newest technology.

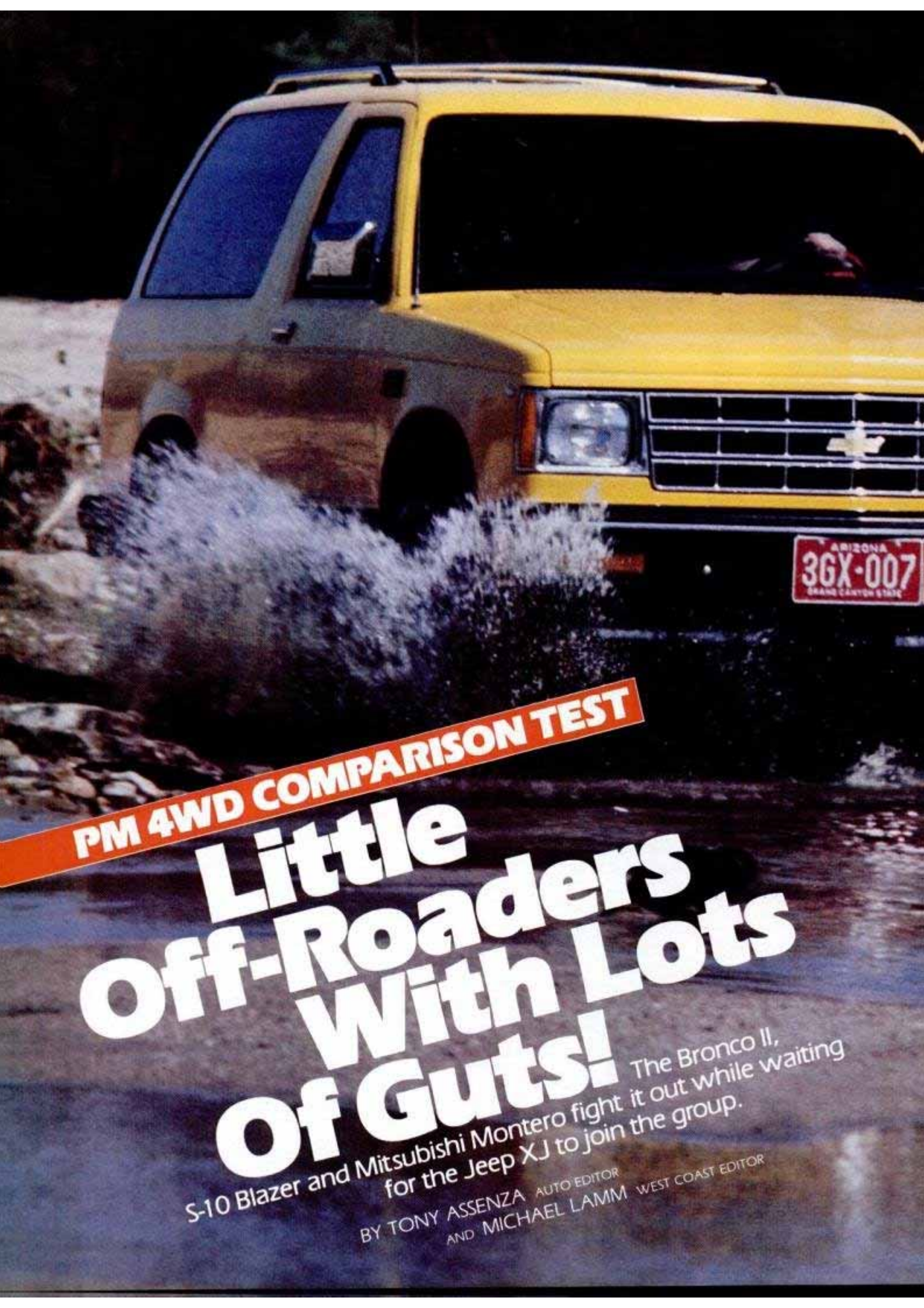
We tested a pair of the SM 280 model speakers from BES and were impressed by the quality of sound and the ingenuity of the engineering. While this new technology does appear farfetched or even gimmicky, the sounds produced by the hardware in your listening room are second to none.

These speakers don't have enclosures. Instead of a cabinet, the flat speaker is framed within a wooden, all-around hanger. This is in keeping with BES's theory of delivering music free of coloration from either the material of the speaker or the cabinet around it. This coloration effect often minutely changes a musical score's tone and sound from speaker to speaker. According to BES, the foam material, called Soniflex, does not color the music. The Soniflex panel hung within the frame is said to

*(Please turn to page 120)*



*Foam diaphragm (above) replaces speaker cone technology. The drivers vibrate the panel and produce sound, which then is enhanced by the panel's special shape and mechanical crossovers.*



**PM 4WD COMPARISON TEST**

# Little Off-Roaders With Lots of Guts!

The Bronco II, S-10 Blazer and Mitsubishi Montero fight it out while waiting for the Jeep XJ to join the group.

BY TONY ASSENZA AUTO EDITOR  
AND MICHAEL LAMM WEST COAST EDITOR

## CHEVY S-10 BLAZER



*Chevy S-10 Blazer carries the same name as its full-size brother. It's available with a V6 engine and automatic transmission. Bronco II also comes with V6 and has Ford's unique, split-beam front suspension. Mitsubishi Montero is set up for serious bashing, with a skid plate, generous ground clearance and a unique, independently suspended driver's seat.*

PM photos: Vic Fluber

## FORD BRONCO II



## MITSUBISHI MONTERO



**T**here was a time when the ultimate definition of 4x4 power came in the form of a Dodge Ramcharger pickup with 318 V8, a four-speed and no options.

It was a masculine vehicle that had all the right noises and earned the undying admiration of drivers who really used it primarily to haul seed sacks, fertilizer and lumber.

But the 4x4 ethic has been redefined. Brute strength has been replaced with efficiency, and the object these days isn't to go crashing through an obstacle, but rather to sidestep it with some nimble handling.

The three vehicles assembled for this off-road bash are the latest in 4x4 newthink. While they may not have the Genghis Khan charm of a Dodge Ramcharger, they certainly aren't your quiche and salad eaters, either.

Of these three 4wd vehicles, the one that rates best depends on how you plan to use it. If you're bent on serious off-roading,

we say buy the Mitsubishi Montero. But be sure you order it with limited-slip differentials. Limited-slip, in fact, makes a good investment with any of these 4x4s, and it's optional on all three.

If you're using the vehicle mostly for family transportation with an eye to slogging through snowbanks and over muddy roads, we found Chevrolet's S-10 Blazer to be the best choice. It's by far the most comfortable and carlike of the trio, with silence and sophisti-

cation that the others just don't have.

In the Ford Bronco II's favor is its space utilization, especially with the optional external spare mount. That, plus the Bronco II's split, folding rear seats, gives this vehicle more cargo versatility than the others. Then, too, while the Bronco tends to be a little noisier, it's not all that much different from the Blazer.

### Mitsubishi Montero

Japanese automakers usually remove most of the oriental touches from their cars before bringing them to the United States. Mitsubishi, though, excises less of its Japanese-ness than, say, Datsun or Toyota or Honda. The Starion is one example of a very Japanese-looking—and feeling—import, and the new Montero counts as another. To us, it not only

looks Japanese, it has a certain imported feel, too.

Sturdy and rugged though it may be, the boxy Montero is not particularly attractive. It's got more headroom than it needs (about 8 in. of dead space above the head of an average American male). But the tall greenhouse leaves it susceptible to strong winds and the backwash of passing trucks.

Although hardly a ball of fire, the Montero responds pretty well to the throttle. It cruises along nicely on smooth pavement, but in overdrive FIFTH, it lacks power for hills. Even shifting down to FOURTH doesn't inspire confidence for passing.

The Montero uses torsion bars up front and leaf springs aft. Its ride tends to feel somewhat jiggly on pavement, but that's because its sus-



*Chevy's interior (above) is as plush and comfy as any Chevy car, right down to its power windows. Most of the rear cargo space, however, is taken up by the full-sized spare tire. The Mitsubishi's interior (left) is a bit barren, but it's all business. There's even a huge grab handle for front-seat passengers to use when the going gets rough.*



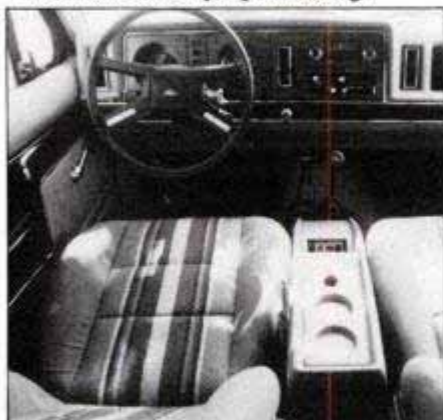
*All three acquitted themselves well in the boonies, but Ford and Chevy were most at home on the open road.*



## 4x4 SPECIFICATIONS

	Montero	Bronco II	S-10 Blazer
Engine	Ohc 4	Ohv V6	Ohv V6
Displacement (cc/cu. in.)	2,555/156	2,786/170	2,837/173
Horsepower @ rpm	105 @ 5,000	115 @ 4,600	112 @ 4,800
Torque @ rpm	139 @ 2,500	150 @ 2,600	145 @ 2,100
Transmission	5-speed man.	4-speed man.	4-speed auto
Ratios:			
1st	3.740	3.96	3.06
2nd	2.136	2.08	1.63
3rd	1.360	1.39	1.00
4th	1.000	1.00	0.70
5th	0.856	—	—
Reverse	3.578	3.39	2.29
Transfer case (low)	1.944	2.48	2.61
Final drive	4.625	3.08	3.73
Wheelbase (in.)	92.5	94.0	100.5
Overall length (in.)	157.3	158.4	170.3
Overall width (in.)	66.1	65.0	64.7
Overall height (in.)	74.0	69.0	64.2
Ground clearance (in.)	9.3	6.5	8.8
Curb weight (lbs.)	3,160	3,155	3,106
Payload rating (lbs.)	1,050	760	1,000
Fuel capacity (gal.)	15.9	23.0	13.2
Tire size	215/SR15	215/75R15	235/75R15
Base price	\$9,229	\$9,998	\$9,433

Ford's interior is as well done as the Chevy's, but provides lots of useful little bins and storage areas. Two of the three rear storage boxes are lockable and the spare is stored outside on a theft-proof, swing-away fitting. Large rear glass area gives the Bronco an airy, open feeling.



pension is really set up for much rougher surfaces. The Montero is most at home negotiating washouts, sand, mud, rocks, water and snow.

In our two days of flogging these three vehicles, the Montero was the only one that never bottomed out. It also showed the best handling traits in deep sand, although we did feel that the optional, limited-slip axles would have helped the one time we managed to get stuck in axle-deep mud and water. The automatic lock-

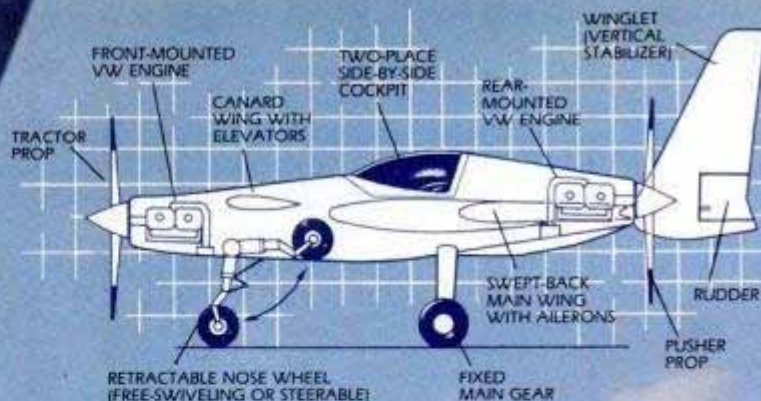
ing hubs helped get us out, and we found the Montero's two-speed transfer case to be the least noisy of the three in low range.

The Montero's standard power steering tends to be relatively imprecise. The steering gives plenty of road feel, but it's not especially quick or accurate. The Blazer's steering has less feedback, but much greater precision and quickness.

Standard equipment in the Montero  
(Please turn to page 134)



It's a twin-engine sports plane but you have to look closely to tell. The second engine is in the tail, driving a pusher prop. Called Gemini, the unusual craft is a spinoff of Burt Rutan's popular single-engine Long-EZ. It takes VW engines from 64 to 75 hp, has a top speed of 185 mph, also features a roomy, two-place cockpit with side-by-side seating (the Long-EZ is a tandem two-seater). Canard wing, a familiar Rutan trademark, adds lift, helps prevent stalls and spins.



Greater safety is the rationale behind push-pull power. If either engine fails, the plane will continue to fly straight due to the inline arrangement. In conventional twins, off-center thrust can throw a craft out of control.

**GEMINI**

GEMINI



**SONERAI II-LT**

Two former taildraggers now get a training wheel up front for pilots leery of tail-wheelers. Sonerai II-LT (above) is a fixed tri-gear version of Monnett's sleek, racer-style tandem two-seater. It does 170 mph on 60 hp. Kit price is \$6,500. Glasair RG (right) has retractable tri-gear, seats two side by side, does 241 mph on 160 hp. Kit is \$16,100. Tri-gear retrofit kits for both earlier tail-wheel models are also available.



**GLASAIR RG**

# 15 Handsome Homebuilts

## YOU CAN MAKE AND FLY

From nostalgic old-timers to exotic shapes of the future, here are the latest in exciting sports planes you can build from plans and kits.

BY SHELDON M. GALLAGER

**E**arly next month, half a million aviation enthusiasts and some 20,000 recreational aircraft will descend on Oshkosh, Wis., for the world's biggest air show—the Experimental Aircraft Assn.'s annual, week-long Oshkosh Fly-in. Some of the latest and most exciting creations in the world of sport aviation make their debut at Oshkosh. But not all of you can get

there in August. So here's a preview of what's hot in homebuilts.

All have one thing in common. They're made and flown by backyard builders with ordinary home-shop skills and pasture strips for airfields. While sales of factory-built sports planes have been grounded over the past few recession years, the homebuilt market is flying high, largely for one reason. Most of the designs can be built from plans or kits for less than what you probably spent on your last family car.

Not surprisingly, several of the new shapes reflect the growing influence of homebuilt wizard Burt Rutan. Two, the Gemini and Cozy, are derivatives of Rutan's unconventional, canard-



CHRISTAVIA MK. 1



KELLY-D

Reminiscent of the classic J-3 Cub, new Christavia Mk. 1 (above) is a low-cost, two-place tandem monoplane you can build from plans for as little as \$6,000. It does 120 mph on 65 hp, can land and take off in less than 700 feet and is aerobatic.



WHATLEY SPECIAL

From out of the past come two nostalgic bipes, the two-place Kelly-D (above) and single-seat Whatley Special (left), both designed for barnstorming on a budget. Kelly-D cruises at 95 mph on 125 hp, costs about \$8,000. Whatley Special does 80 mph on 55 hp, is under \$3,000.



*Tiny 20-hp engine in one-man, twin-tailed Zia motor glider permits self-launch takeoffs and lets you chase thermals at 80 mph. Wings span 46 feet, give power-off glide ratio of 28 to 1. Craft is \$11,880 as kit, \$16,500 assembled.*

winged Long-EZ. A third, the Solitaire, is a Rutan original—a mini motor glider that represents Burt's first excursion into the field of auxiliary-powered sailplanes.

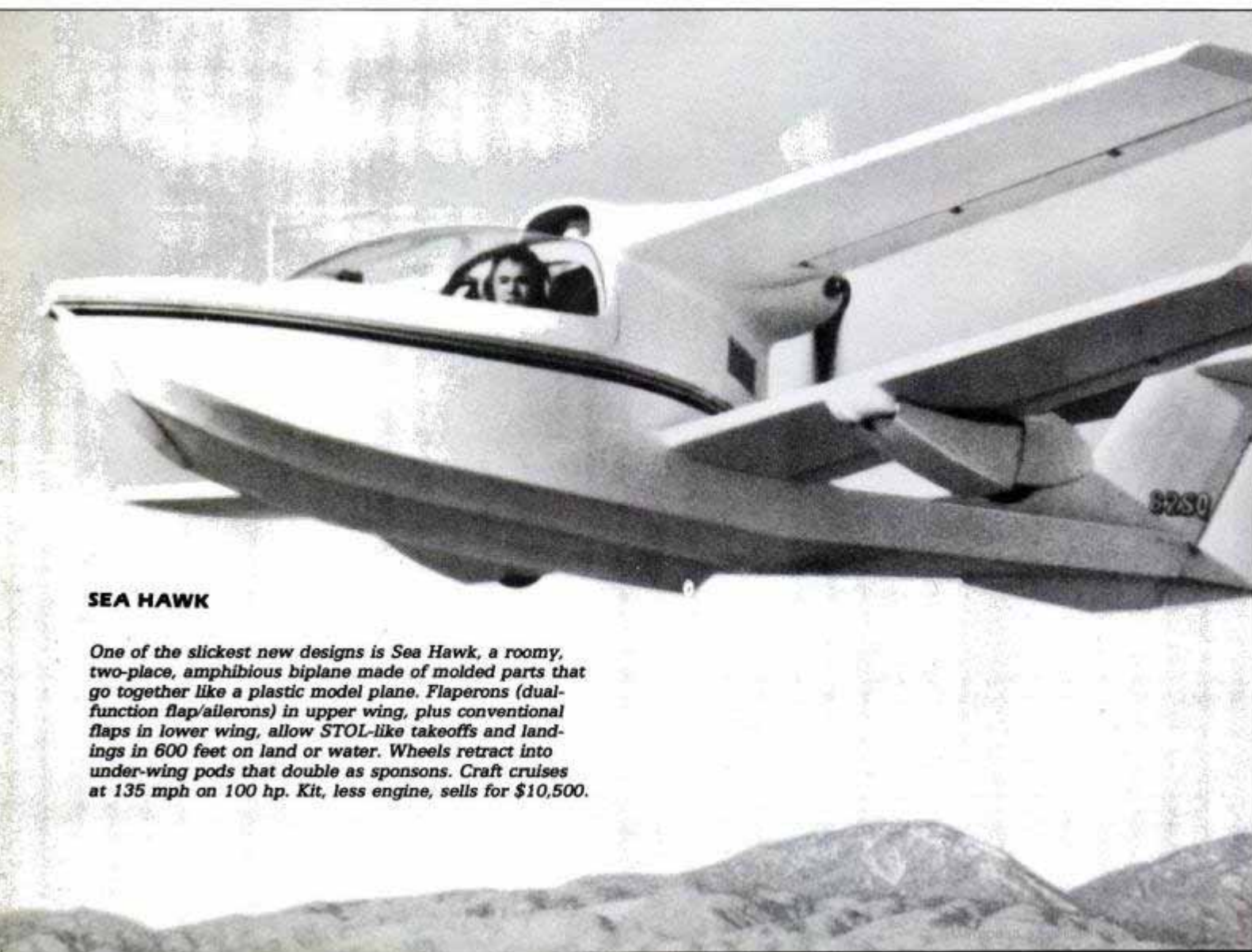
Gemini and Cozy are both wide-bodied versions of the Long-EZ, providing spacious, side-by-side seating for pilot and passenger in place of the EZ's tandem-seat arrangement. Advantages claimed are more companionable flying, greater cockpit comfort, easier student instruction, added room for instrumentation and increased cargo area in back.

The Gemini also differs in its use of two separate powerplants—but not where you'd expect to find



*For tops in economy, it's hard to beat this trim little high-wing, single-seat Cracker Jack. It cruises at 75 mph on a 25-hp engine, burns less than 2 gal./hr., can be built from plans for \$4,000 to \$6,000. Kits to come later.*

them. One is in the nose pulling, the other in the tail pushing—an intriguing concept borrowed from another Rutan innovation, an inline corporate twin called the Defiant. The novel push-pull arrangement provides the safety of twin-engine power without its drawbacks. If either engine fails, the plane will continue to fly straight and level because the thrust is always on the centerline of the aircraft. In a conventional side-by-side twin, a dead engine produces an abrupt off-center thrust that can cause serious control problems, in some cases with disastrous results. In the Gemini, this can't happen.



## SEA HAWK

*One of the slickest new designs is Sea Hawk, a roomy, two-place, amphibious biplane made of molded parts that go together like a plastic model plane. Flaperons (dual-function flap/ailerons) in upper wing, plus conventional flaps in lower wing, allow STOL-like takeoffs and landings in 600 feet on land or water. Wheels retract into under-wing pods that double as sponsons. Craft cruises at 135 mph on 100 hp. Kit, less engine, sells for \$10,500.*



COZY

Cozier side-by-side seating is goal of this aptly named Cozy, a wide-bodied version of Rutan's tandem-seat, pusher-prop Long-EZ. It cruises at 185 mph on 118 hp, can be built from plans and prefab parts for \$6,000 to \$14,000.

The Gemini is designed for small VW engines of 64 to 75 hp, cruises at 160 mph and can be built for about \$18,000. Plans will sell for \$250 to \$300. The Cozy cruises at 185 mph on a 118-hp Lycoming engine and costs \$6,000 to \$14,000, depending on how much work you do yourself. Plans are \$198.50. Both craft are of all-composite construction and, like the original Long-EZ, follow Rutan's familiar canard configuration—a tandem-wing arrangement designed to increase lift, distribute load and minimize the chance of stalls and spins.

Rutan's Solitaire is one of two new motor gliders fitted with just enough power to get you aloft with-

(Please turn to page 114)

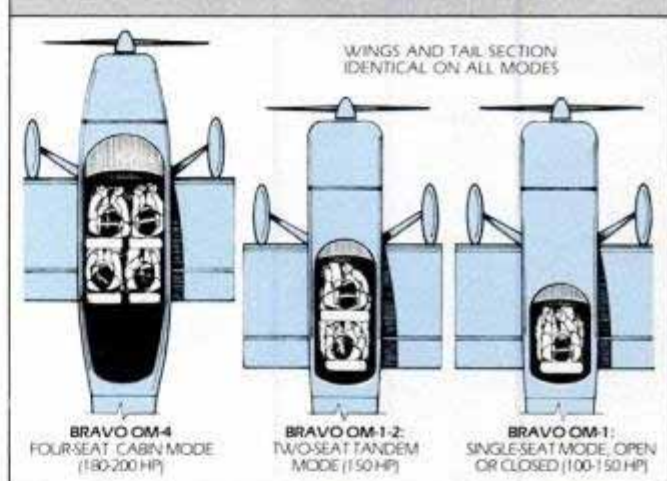


TM-5

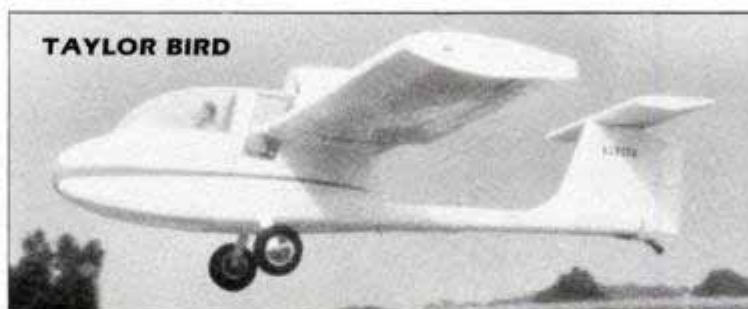
Large bubble canopy gives this sporty, two-seat tandem TM-5 superb visibility. It takes 65- to 100-hp mills, does up to 150 mph, is aerobatic, has removable wings and can be constructed for as little as \$6,500.



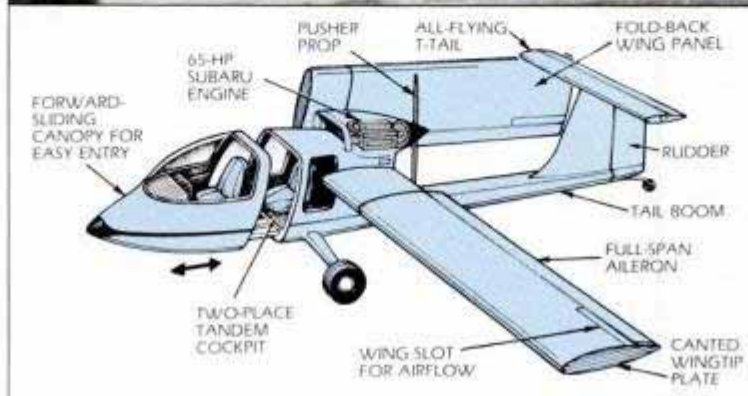
BRAVO



**Kits with a choice:** You can build this ingenious new Bravo in four ways—as an open or closed single-seater, a tandem two-seater or a four-place cabin job. Wings and tail are identical for all, with interchangeable forward sections available separately. Two-seat version shown tops 155 mph on 150 hp. Four-seater takes 180 to 200 hp. Kits, less engine, range from \$6,500 to \$12,500.



TAYLOR BIRD



**New look in an old name:** From the designer of the classic Taylor Cub (later the Piper Cub) comes modern Taylor Bird, a tandem two-seater with a forward-mounted cabin for good visibility, simple tail boom for ease of construction. The wing slots channel airflow up and over the ailerons for positive roll control even at low stall speeds. The nose section slides forward for easy entry. Wings fold back for trailering. Top speed is 125 mph on 65-hp Subaru mill. Using plans and preformed parts, it's under \$10,000.

# PM FIRSTHAND REPORT: **DODGE DAYTONA**

BY MICHAEL LAMM WEST COAST EDITOR

PM photos: Chan Bush



*With its 142-hp turbo Four and an aggressive suspension, the Daytona offers performance and handling to match its swoopy looks.*

## Chrysler's sporty new coupe takes the K-car platform to the limit in looks and performance.

**I**t's one thing to drive an engineering development car, a mule, as they're called. It's sometimes quite another to drive a preproduction car. They're often two different vehicles, since changes are made constantly as the car goes through its engineering development process.

We had driven an engineering development mule car last winter (see *Chrysler's G-24 Super Sports Car*, page 65, Feb. '83). But this was our first shot at an actual version of Chrysler's new sporty car. The car has a name now, and some minor revisions have been made since our last report. The Chrysler version is called the Laser, the Dodge version, the Daytona.

We drove the two prototypes hard—as hard as we could around the Laguna Seca race course in Monterey, Calif. We've also driven the car that Chrysler used for its performance target—Porsche's 924 (the 944 hadn't been introduced yet). Our opinion? The Laser/Daytona is a remarkably fine handling GT coupe. It's right up there in the 944 ballpark at about half the price, which

means between \$8,000 and \$11,000, depending on model. Both versions of the car use MoPar's ohc 2.2-liter engine in two states of tune. In standard form, the Laser and Daytona use the throttle-body-injected 2.2 Four delivering 98 hp at 5,200 rpm and 119 ft.-lb. of torque at 2,800 rpm. That's nine fewer horses than the Shelby Charger 2.2, but it's a [\(Please turn to page 118\)](#)



*Turbocharged versions have vent in low-pressure area of hood to expel hot gases.*

# PM OWNERS REPORT: DODGE 600

BY MICHAEL LAMM WEST COAST EDITOR

*"Fuel mileage could be improved with 4-speed automatic."*

MONTANA CATERER

*"JERKY ENGINE PERFORMANCE BEFORE IT WARMS UP."*

WISCONSIN RETIREE

*"Excellent workmanship inside and out."*

NORTH DAKOTA RANCHER



*"Good-looking. I feel very proud driving in the 600."*

NEW YORK BOOKKEEPER

*"Fantastic legroom in the rear seat."*

CALIFORNIA VETERINARIAN

PM photos: Bill Ashe

This European-styled car pleases owners with its style and handling.

**B**asically, what Lee Iacocca did was stretch the company's K-cars to create the new E-series sedans—the Dodge 600/600-ES and the Chrysler E-Class/New Yorker.

Stretches represent common practice nowadays: normal chassis and badge engineering. All major American car-makers do it. GM expanded its X-cars to make the A-series, Ford conjured the Tempo/Topaz from the Escort, VW pulled the Jetta out of the Rabbit.

In Chrysler's case, the E makes a logical extension of the K. Both use the same engines, fwd transaxles, chassis platforms and basic bodies. Yet the E-cars are changed enough to satisfy a different set of buyers.

In all, the E-series expands the K's 99.6-in. wheelbase to 103.1. The E stands 11.2 in. longer overall and has 2.1 cu. ft. more trunk space. There's also nearly 2 in. of additional rear legroom.

The Dodge E-car comes only as a four-door sedan, but in two series: the basic 600 and the 600-ES. The up-market ES competes more directly with



The sportier Dodge ES version comes with a leather-wrapped steering wheel.

## A NATIONWIDE SURVEY BASED ON 1,027,062 OWNER-DRIVEN MILES

European and Japanese sport sedans like Audi and the Datsun Maxima. The

*(Please turn to page 109)*



Owners were almost evenly split in their choice of the 2.2-liter or 2.6-liter Four.

# No Tool Is Too Good For

To most folks, Harold Ionson's shop would be a fantasy. To him, it's just a cozy place to pursue a hobby.

BY MICHAEL CHOTINER  
ASSISTANT HOME AND SHOP EDITOR

**H**arold Ionson, an otherwise youthful 62-year-old woodworker who lives in Westwood, Mass., likes to play the old codger when he talks about his shop and his work. Asked to state the organizing principle for his vast workspace, he responded (in a voice and speech pattern disconcertingly like Walter Cronkite's) "Well, young man, you've gotta be comfortable."

To call this amiable and patient

master craftsman a hobbyist is a little misleading, but truthful. He was graduated from the Boston Trade School after four years of training in furniture and cabinetmaking. He worked as an apprentice and journeyman in several large custom shops for about 10 years after graduation. Ionson then switched to another career (designing forms for architectural concrete), and was able to retire early. For the past eight years, he



*Harold Ionson's spacious shop is set up in a remodeled garage (facing page, lower left) behind his Westwood, Mass., home. Many of his tools were acquired from custom shops where he worked as a young man. Pigtaills with outlets are suspended conveniently around the shop. Hatch in ceiling leads to storage space above joists.*

PM photos:  
Frank Foster



# This Master Craftsman's Shop

has devoted himself to building reproductions of antique furniture and clocks.

To make himself a roomy, "comfortable" shop, Ionson added a 40-ft. extension to his garage. He says he wouldn't consider setting up a woodworking shop in his basement because of the effect of dampness on lumber. Ionson's basement isn't wasted, however, since he's set up a metalworking

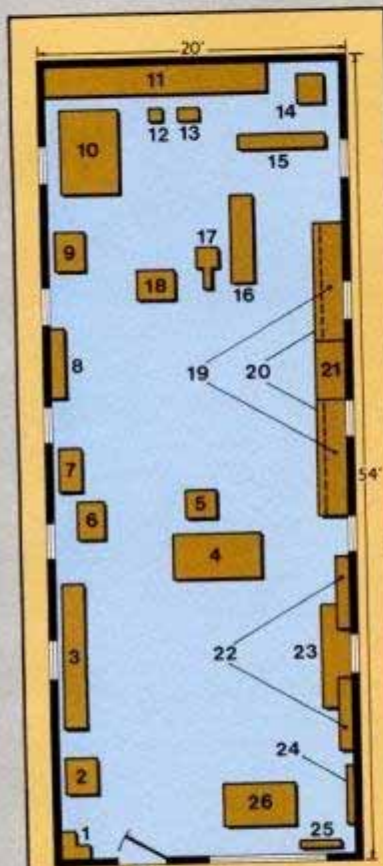
shop there equipped with a collet lathe, screw-cutting lathe, watchmaker's lathe and a bench shaper.

Ionson considers the heart of his woodworking shop to be the handwork area. It's the most pleasant corner of the shop because of the abundant natural light streaming in through the windows.

Ionson made the 7-ft.-long workbench himself, with a top 3½ in. thick,

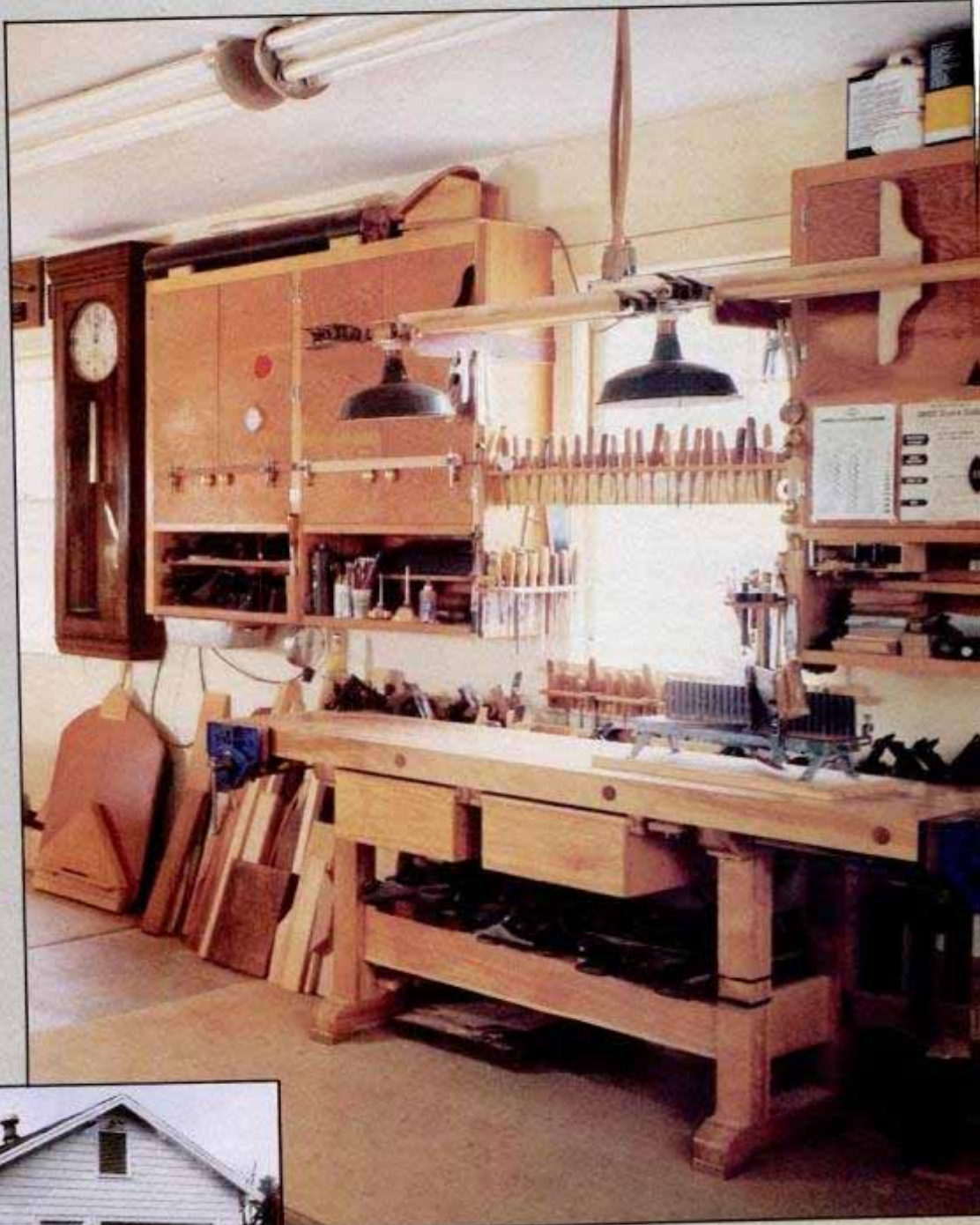
24 in. deep, laminated from 1-in. strips of red birch. The massive legs and leg braces are, in Ionson's old-codger parlance, "fox-wedged" at the joints. He smiles faintly when he throws out such a term, waiting to see if you'll bite. The term refers to the practice of sawing a kerf at the end of a tenon and driving a wedge into it to tighten the tenon in the mortise.

On racks and wall hooks, in drawers



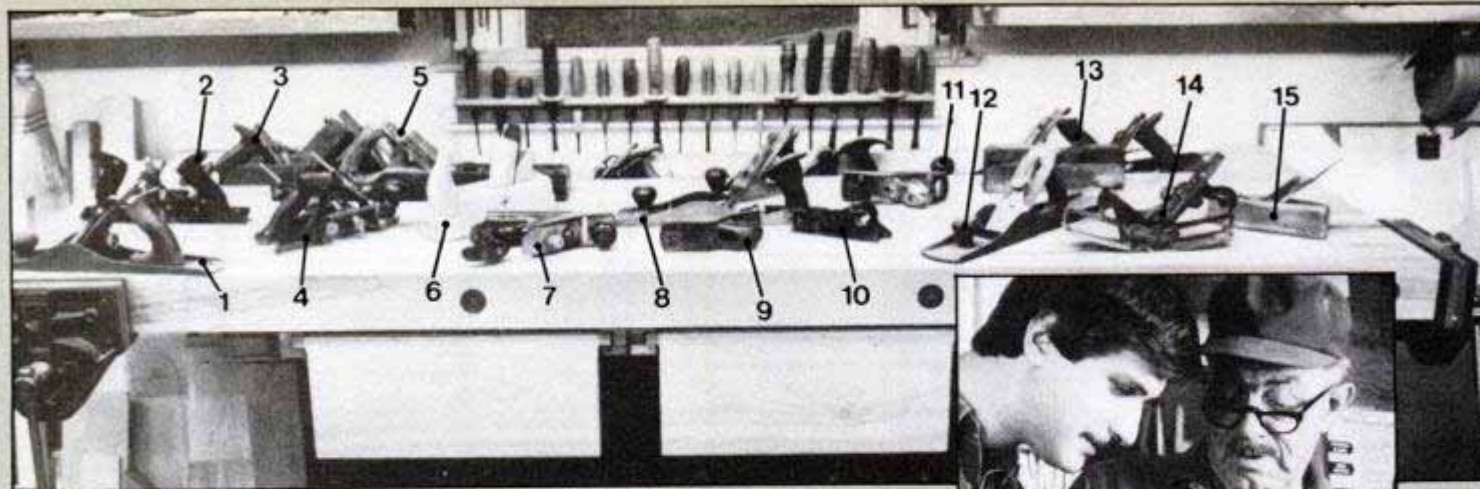
SHOP FLOOR PLAN

- |                         |                          |
|-------------------------|--------------------------|
| 1 Book/paper storage    | 14 Mortising machine     |
| 2 Band saw              | 15 Lathe                 |
| 3 Patternmaker's lathe  | 16 Jointer               |
| 4 Table saw             | 17 Scroll saw            |
| 5 Rolling stand         | 18 Planer                |
| 6 Shaper                | 19 Hanging cabinets      |
| 7 Shaper                | 20 Under-counter storage |
| 8 Open shelves          | 21 Radial-arm saw        |
| 9 Drill press           | 22 Hanging cabinets      |
| 10 Veneer press         | 23 Workbench             |
| 11 Lumber rack          | 24 Small-drawer cabinet  |
| 12 Drum sander          | 25 Compressor            |
| 13 Vertical belt sander | 26 Assembly table        |



*Ionson made his red birch workbench with a tool-storage well at the rear. Several sets of chisels are nearby. The pan mounted beneath the cabinet (left side) contains a kerosene bath for storing oilstones. A retractable power cord reel was salvaged from a broken vacuum cleaner.*





At right, Ionson points out the special features of a Stanley No. 45 molding plane, vintage 1888, to the author. Other samples from his large collection are shown above: 1. Stanley No. 5 jack plane (circa 1900); 2. No. 171 door trim and router plane; 3. No. 5 jack plane (modern-day); 4. No. 45 molding plane; 5. Ebony-body smoothing plane (18th century); 6. Modern German toothing plane; 7. Stanley No. 72 chamfering plane; 8. No. 62 low-angle block plane; 9. No. 203 block plane; 10. No. 95 90°-angle edge plane; 11. No. 140 block plane with skew blade and removable side for rabbeting; 12. Chapin's patent fore plane (circa 1890); 13. Stanley No. 90 rabbet plane (only combination wood and metal-bodied plane ever made by Stanley, 1880-1890); 14. No. 20 compass plane; 15. Scrub plane handmade by a working mate from Ionson's early days.



Do you know a shop that we should consider for the Popular Mechanics Great Shop Series? If so, send snapshots plus a description of shop and owner to: Home and Shop Editor, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. If we agree, we'll visit the shop, photograph it and share it with PM readers.

and cabinets in the handwork area, Ionson keeps hundreds of hand tools. He says, "Power tools are great for taking the grunt out of the work. But there are hand tools to do every job that power tools can do and, in most cases, I prefer working by hand."

His appreciation of fine hand tools goes beyond their practical attributes.

Ionson has become a collector. He searched through some of the more than 40 hand saws he has hanging six-deep on wall pegs and selected one—a Disston crosscut saw more than 40 years old.

"The steel of the blade," he pointed out, "is harder and thinner than what's available today. And it has an apple-

## Build This Master Craftsman's Miter Gauge

Master craftsman Harold Ionson won't take credit for the design of his miter gauge. He claims that it's merely a refined version of the type that can be found in most commercial woodworking shops that produce fine furniture on a large scale.

For assured accuracy, the miter gauge has two precisely sized slides that ride in both grooves in the table saw top, completely eliminating side-to-side play.

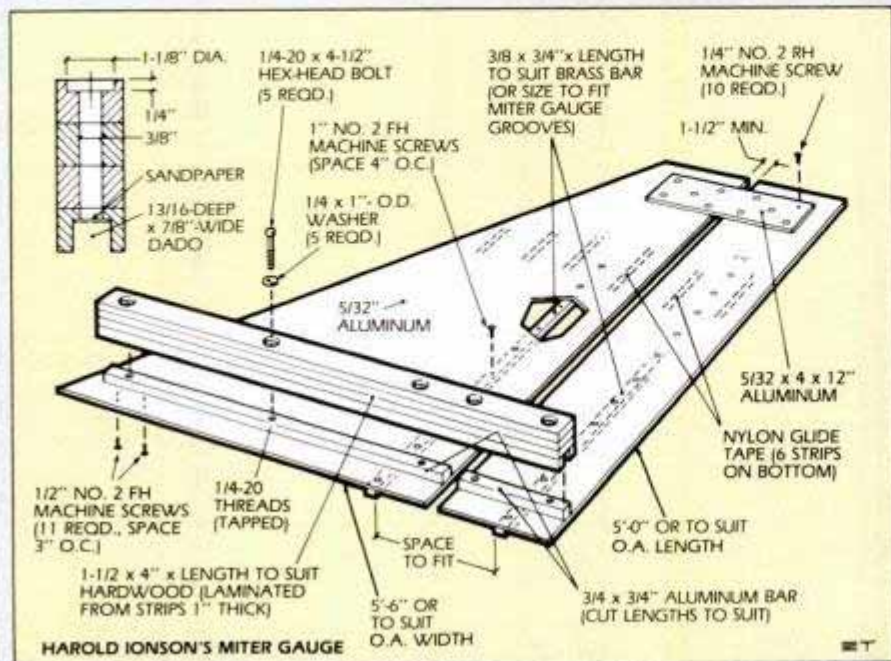
To enable the backstop to be adjusted square to the saw blade, Ionson bored holes slightly larger than the diameter of

the hold-down bolts. The dado in the bottom of the backstop is also cut slightly larger than the aluminum bar over which it seats to allow  $\frac{1}{8}$  in. of play for adjustments.

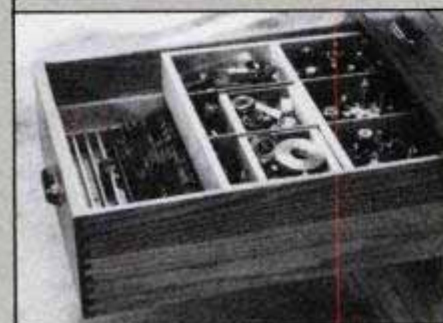
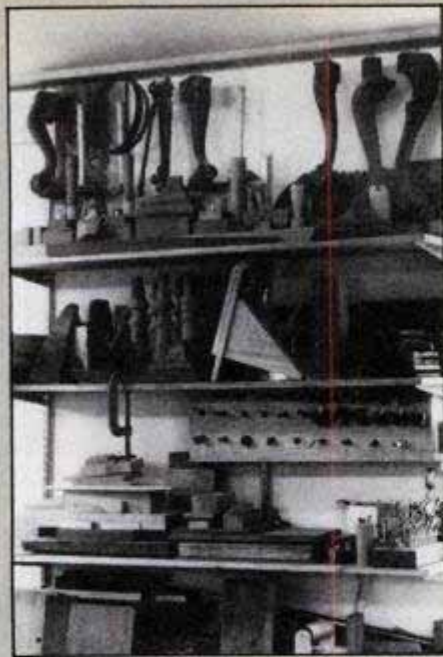
In addition to adjusting the backstop when necessary, Ionson takes it off twice a year and straightens it by running it through the jointer.

Ionson says he selected  $\frac{5}{32}$ -in. aluminum for the base because its thinness allows it to lie perfectly flat. The blade slot is wide enough to allow clearance for dado heads.

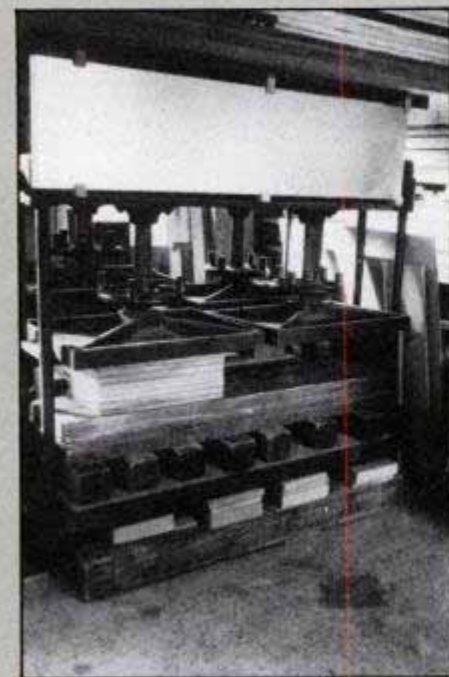
Alter dimensions as needed for a miter gauge that is compatible with your table saw.—M.C.



Ionson's miter gauge features two slides that ride in tabletop grooves to eliminate play when making crosscuts.



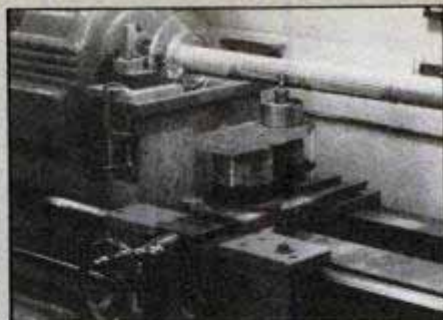
Drawers for small objects (above) were compartmentalized with bi-level sliding trays. Storage on the open shelving (top) is somewhat more casual. Note the apparently random assortment of leg patterns, handles and other turnings which are alongside jigs, clamps and drill bits.



This press, once used for veneering desk tops in a shop where Ionson worked, now serves mostly for storage. Each hand screw develops a half-ton of pressure.



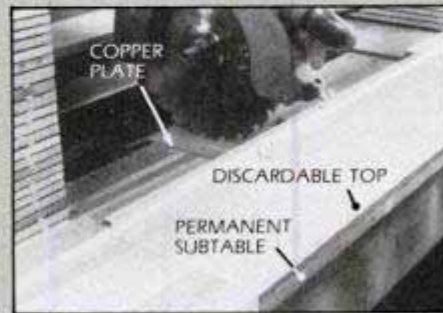
Ionson added a 20-in. extension to the bed of his Milwaukee-Delta lathe and a ball-bearing steady rest. He improved the profiling accessory by making a finer tipped, more sensitive guide pin.



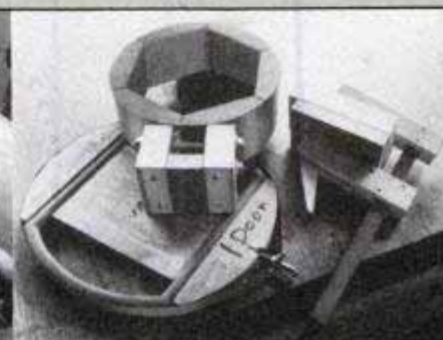
A homemade plastic disc index for Oliver patternmaker's lathe locks turnings at precise rotational settings. A carriage-mounted toolrest was replaced with a router. The setup is used for beading.



The tools on the bed of this 10-in. Northfield jointer were built to hold down stock while pushing it over cutters.



Radial-arm saw table has thin, discardable top over permanent subtable. Copper plate prevents sawdust abrasion.



Among the hundreds of clamps in Ionson's shop are several he created for special jobs. The segmented jaws on one (foreground, above left) were designed for laminating veneers on tapered legs. Another (background, above left) holds legs for carving and inlaying. Shown above at the right are two variations of band clamps for gluing unusually shaped frames, and a friction clamp that is activated by a cam.

wood handle, nicely carved, that actually fits the human hand."

Then he stuck four fingers of his right hand through the handle so the front part rested in his palm, seized the blade tip with the fingertips of his left and bent the blade into an S. Striking the heel of the blade with his right thumb, he produced the tinniest, twangiest sound you can imagine. The grin that formed slowly on his face erupted into a chuckle.

As we moved on, Ionson showed me another saw he really likes—a modern version of a Japanese dozuki, which he feels is unequalled for precision.

In a storage well at the back of his workbench, underneath it and on shelves nearby, Ionson keeps his vast collection of planes. He reeled off their

names, catalog numbers and the dates they were made, explaining their special features and uses.

Some of the planes were acquired for their value as collector's items, notably an 18th-century, ebony-bodied jack plane with a raze (a decorative narrowing of the body) and a Stanley No. 90 rabbit plane dating from 1877. It's the only combination wood and metal-bodied plane Stanley ever made. He also has many modern planes which he uses constantly, among them a tothing plane.

It has a serrated iron set almost vertically to the sole, used for cutting V-shaped grooves in the gluing surface of veneers to help them lay flat, and for planing highly figured stock as

(Please turn to page 112)



# Build PM's Old-Fashioned Porch Swing

Your grandparents probably spooned in a swing like this, patterned after one in the 1927 Sears catalog.

BY ROSARIO CAPOTOSTO

*Our replica oak swing (left) lets you get more use from your front porch. If you prefer, suspend the swing from a beam installed between two back-yard trees.*

The design for this charming two-seater swing was developed from a sketch we found in the 1927 Sears Roebuck catalog. We followed the catalog description in selecting the materials—it's made from oak with a golden gloss finish. Our version differs only in the matter of cost. Back then, the swing sold for \$5.95. Cash only, mind you. No time payments. At today's prices, you

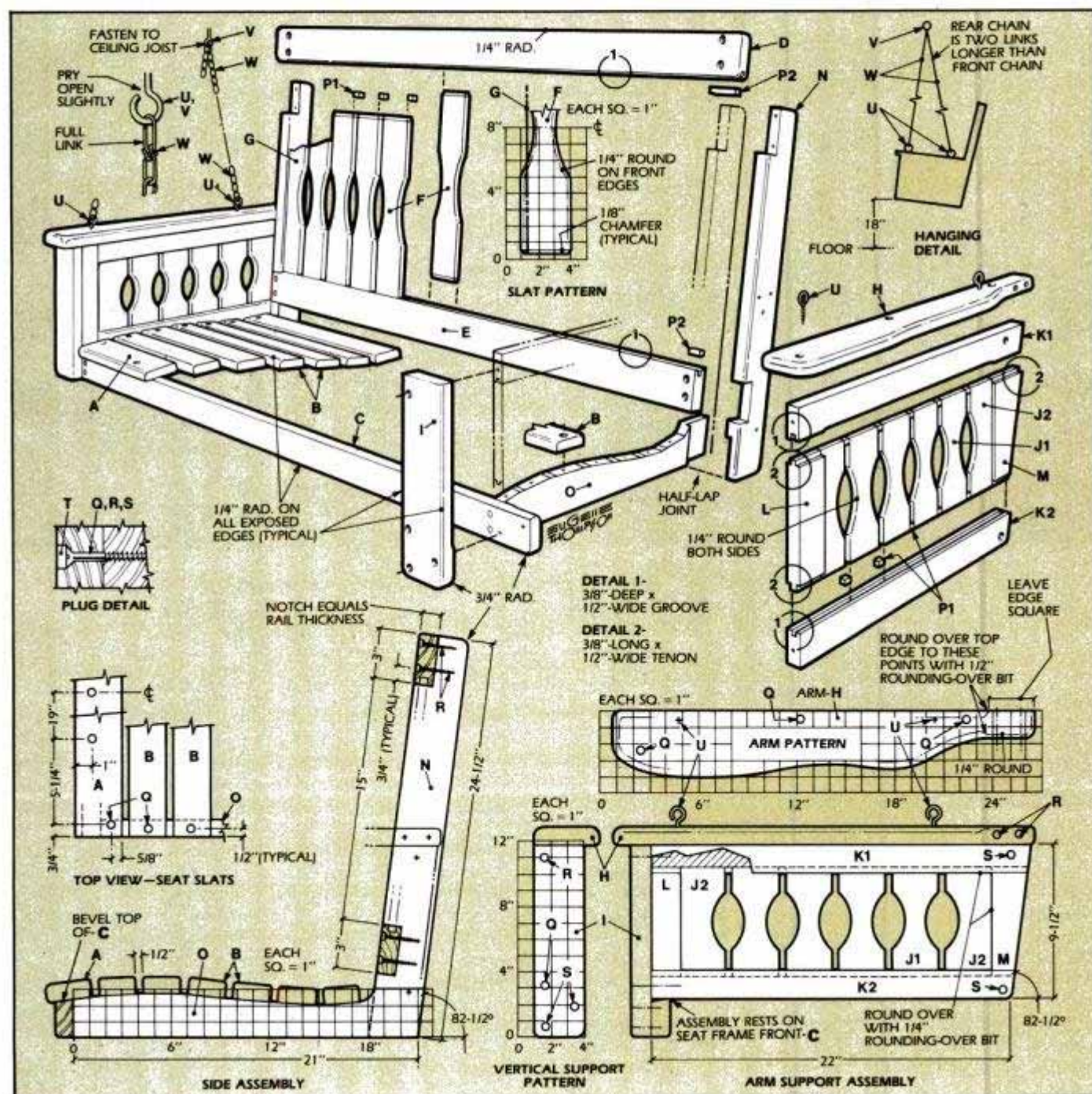
can build it for approximately \$100.

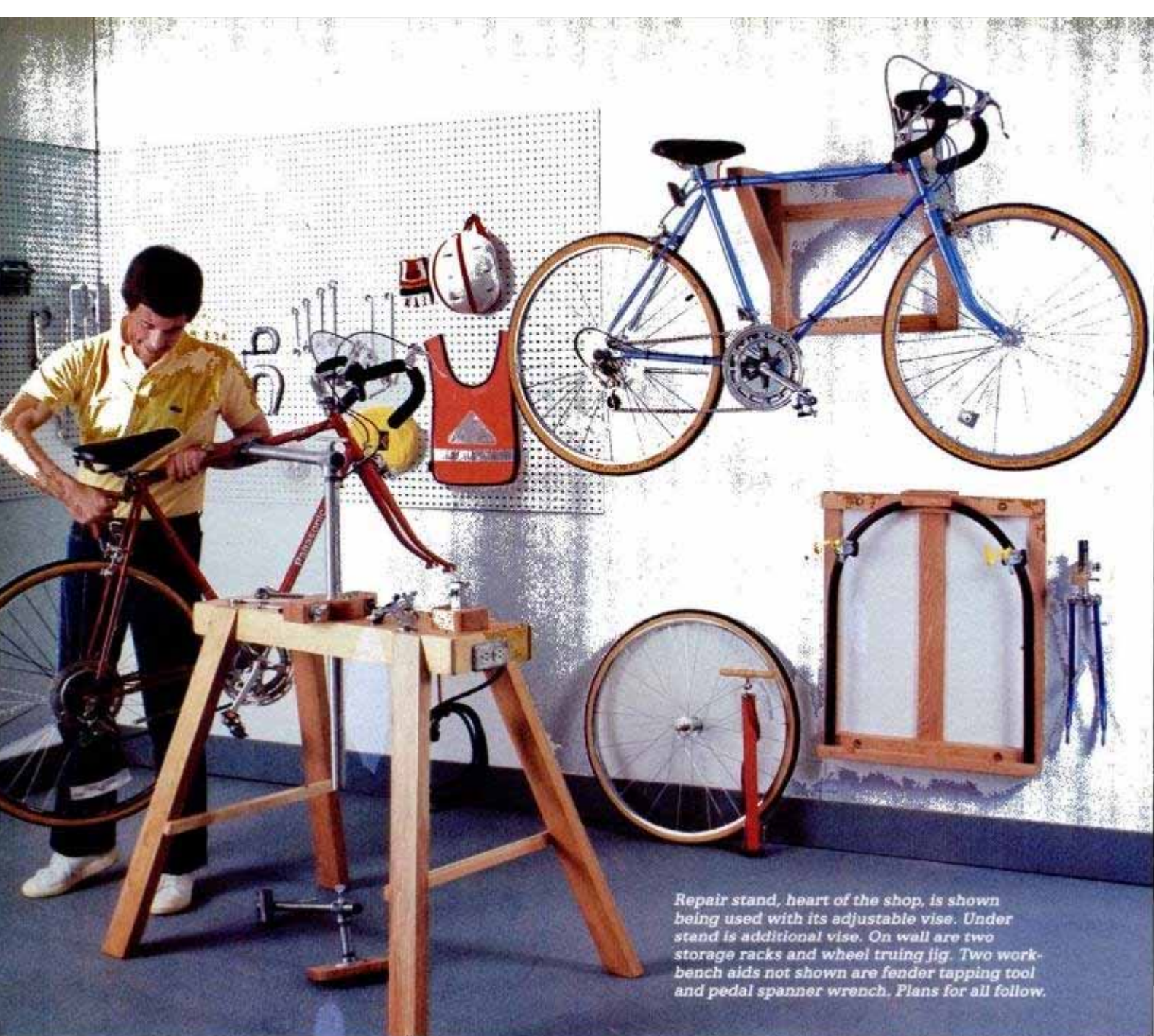
Begin construction with the L-shaped sides. Cut four pieces of stock to width and about 2 in. longer than necessary for parts N and O. Use a dado head or make a series of passes on your table or radial-arm saw to form the end half-laps for joining the back frame sides to the seat frame nailers. Make both a left and a right layout so the joint lines will be vertical on both sides of the seat.

Note that the contoured seat frame

*(Please turn to page 129)*

PM how-to photos by the author  
PM color photo: George Ancona





Repair stand, heart of the shop, is shown being used with its adjustable vise. Under stand is additional vise. On wall are two storage racks and wheel truing jig. Two workbench aids not shown are fender tapping tool and pedal spanner wrench. Plans for all follow.

# PM's Bike Shop— As Good As A Pro's

Great jigs, fixtures and shortcuts let you create a bike repair center at home.

**M**any PM readers share with us the tools and equipment they've developed in their shop work. The seven designs that follow were created by readers to care for and repair the family bikes.

We built and tested them ourselves, in some cases making what we thought were minor improvements. As you're duplicating them, you, too, may discover

er that modifications better suit your requirements.

## 1. Bike Repair Stand

This stand holds a bike in position while you make repairs. It has an electrical receptacle to power hand tools and a surface to hold equipment and hardware.

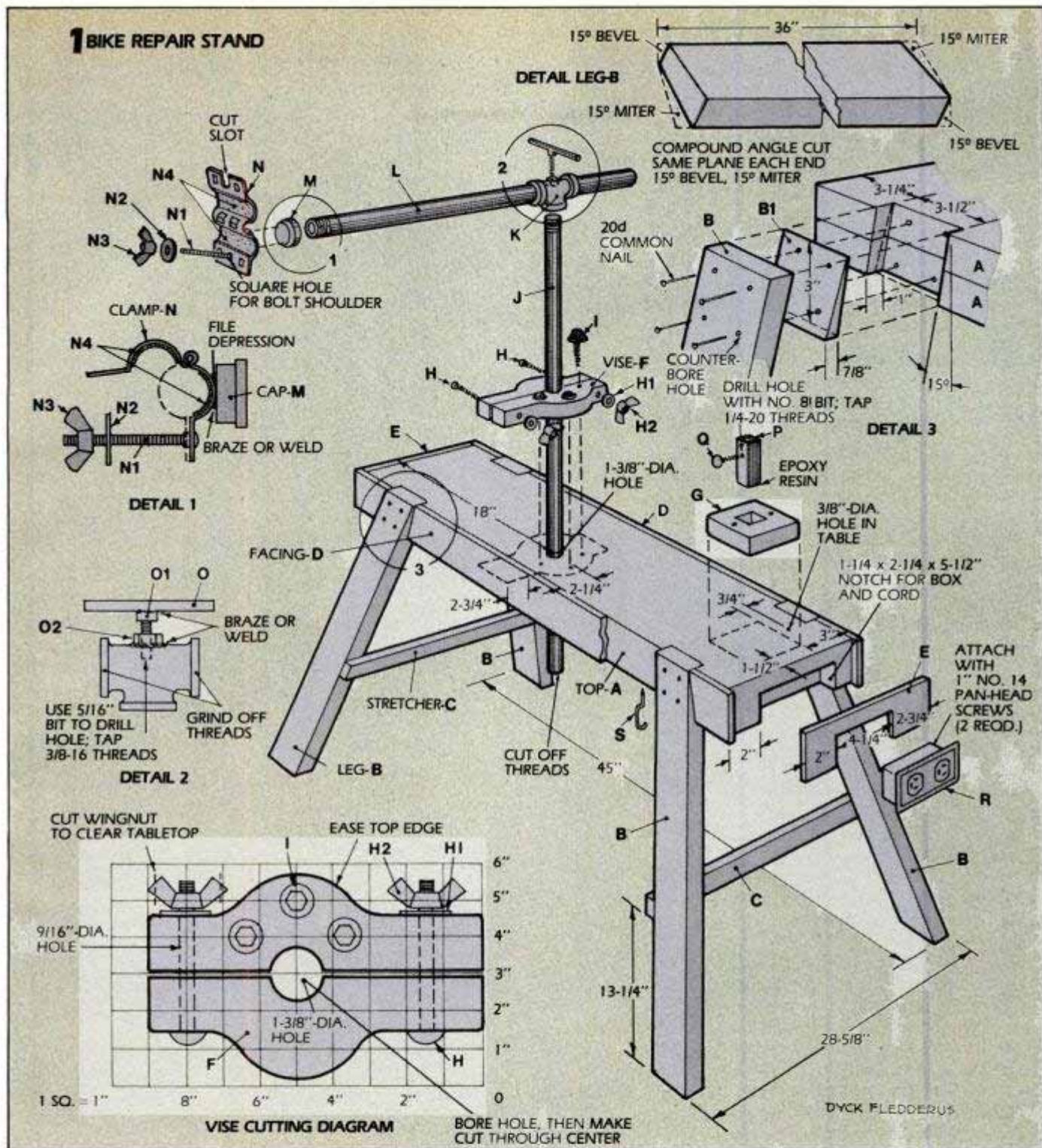
Begin work by cutting two 2×10s to size for the benchtop (A, see materials list). Cut out the notch in the lower piece and partially notch the upper piece to receive the outlet box (R). Glue and nail the two pieces together using 8d (2½-in.) common nails driven

through the bottom member. Apply clamps if necessary.

To manage the heavy benchtop, attach a 24-in. length of 2×4 to the table saw miter gauge. Set the gauge to make 15° miter cuts in the top for the leg sockets—first left, then right (see detail 3 in the drawing). Make repeated kerf cuts with the blade projecting 1 in. to notch out the leg sockets.

Project designs: Nos. 1, 3, 4 and 5, Ray E. Starnes; No. 2, Steve Pence; Nos. 6 and 7, Edw. J. Collier Jr. Construction, black and white photos: Rosario Capotosto, except No. 6, Edward J. Collier Jr. Technical art: Dyck Fledderus PM color photo: Harry Hartman Studio

# BIKE REPAIR STAND

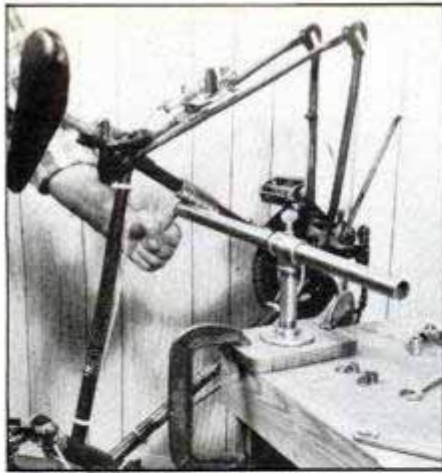


To make the compound angled socket shapes that support the legs in two outward angles, cut filler wedges (B1) of 2x4 stock. Glue and use 1-in. brads to secure the wedges in the sockets. Both ends of the legs (B) are cut in compound angles. Set the blade for a 15° bevel and set the miter gauge for a 15° miter to make each cut.

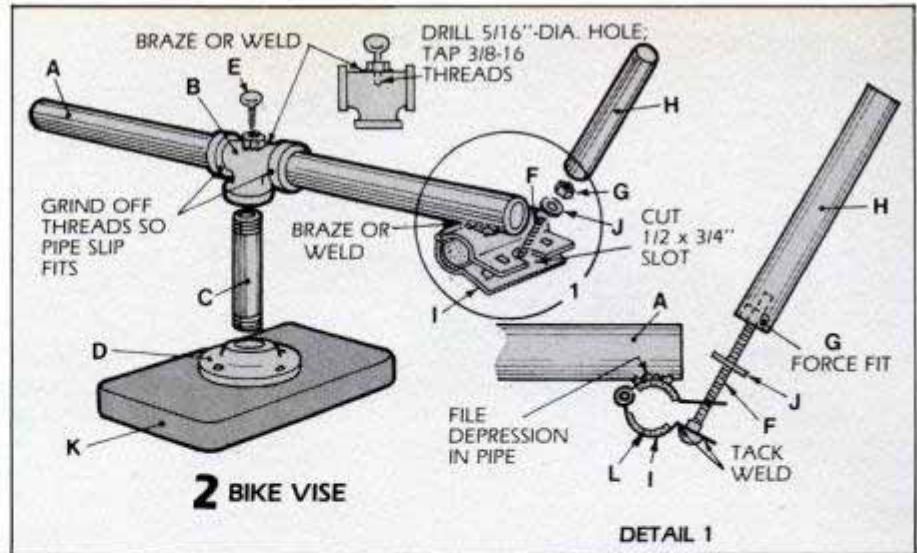
Bore pilot holes in the legs to prevent splitting and attach them with 20d (4-in.) common nails and glue. For a neat job, first counterbore the holes, then set the nails and fill the holes with wood filler. Attach the pine facing (D and E) with glue and 4d (1½-in.) finishing

## 1 MATERIALS LIST—BIKE REPAIR STAND

Key	No.	Size and description (use)	N	1	¾" × water pipe repair clamp (bike holder)
A	2	1½ × 9 × 35" pine (benchtop)	N1	1	¾"-dia. × 2½" carriage bolt
B	4	1½ × 3½ × 36" pine (legs)	N2	1	7/16"-i.d. washer
B1	4	7/8 × 3 × 3½" pine (leg wedges)	N3	1	Wingnut for N
C	2	¾ × 1½ × 21" pine (stretchers)	N4	2	¾ × 1¼ × 3¼" rubber pads
D	2	½ × 3 × 36½" pine (facing; trim to fit)	O	1	¾"-dia. × 4½" steel rod (handle)
E	2	½ × 3 × 9" pine (facing; trim to fit)	O1	1	¾"-dia. × 1" bolt
F	1	1¾ × 6 × 9½" oak (vise)	O2	1	Nut for O1
G	1	1¾ × 4 × 4" oak (wheel-truing holding block)	P	1	1¾"-o.d. × 4" square steel tube (jig holder)
H	2	½"-dia. × 4" carriage bolts (vise fastener)	Q	1	1" × 1¼-20 thumbscrew
H1	2	9/16"-i.d. washers	R	1	Surface-mount duplex outlet box and cover; duplex receptacle
H2	2	Wingnuts for H	S	1	Plastic-coated electrical wire hook
I	3	¾"-dia. × 3½" lagbolts, washers	Misc.		1" brads for wedges; 20d common nails, 8d common nails; 4d finishing nails; 6d finishing nails; carpenter's glue; wood filler rubber cement; heavy-duty, three-wire grounded extension cord; strain relief for cord; polyurethane varnish.
J	1	1"-i.d. × 29" galvanized pipe (vertical member)	Note:		Ground outlet according to NEC.
K	1	1" tee-fitting			
L	1	1"-i.d. × 23" galvanized pipe (horizontal member)			
M	1	1" pipe cap			

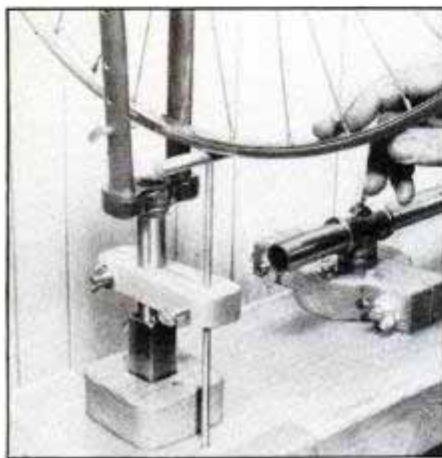


**2** Bike vise, temporarily secured to bench with C-clamps, has padded clamp with handle for easy movement.



**2** BIKE VISE

DETAIL 1

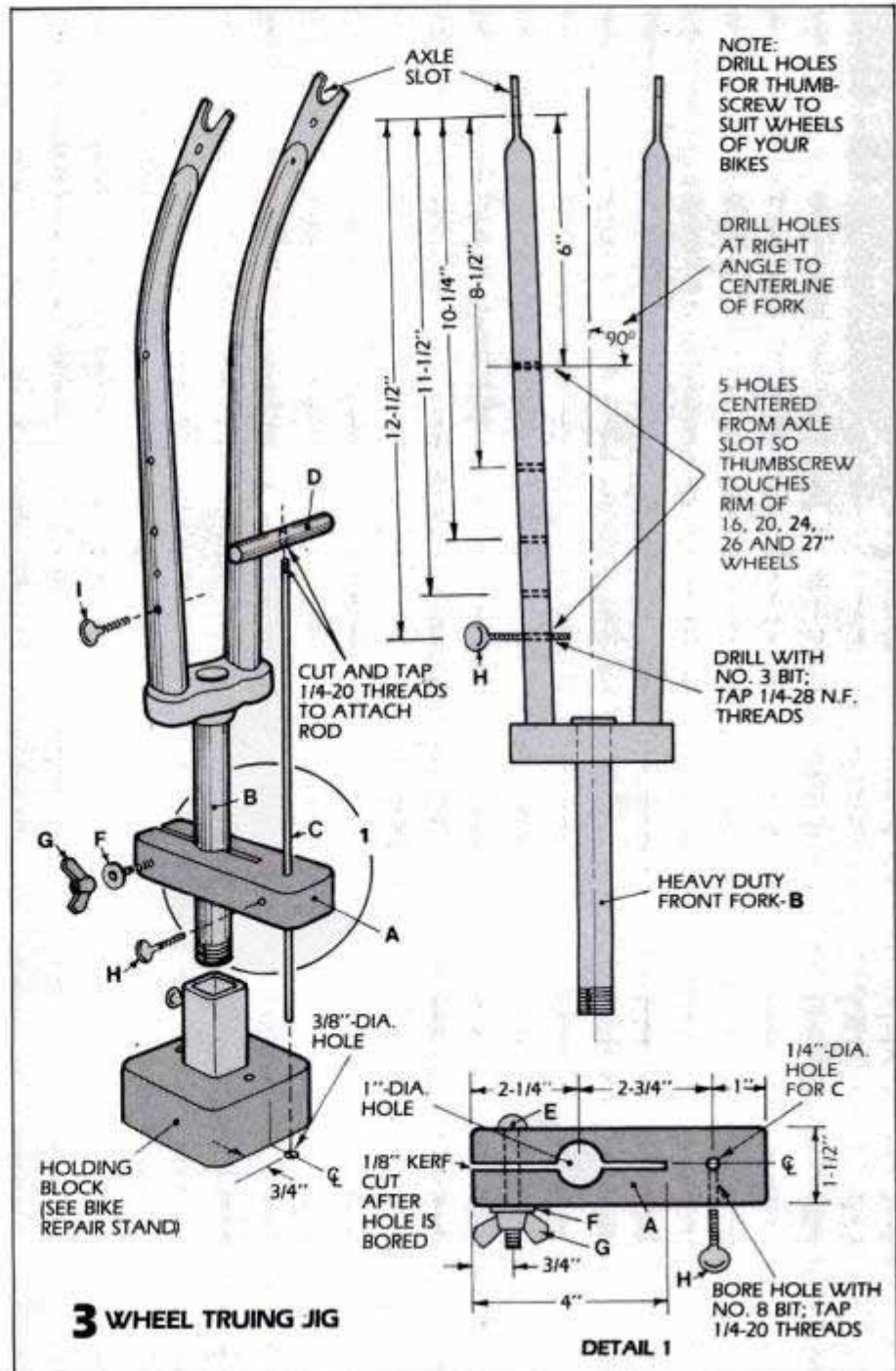


**3** Metal rod with crossbar of wheel truing jig checks perimeter run-out. Fork thumbscrew checks the side run-out.

nails. Attach stretchers with 6d (2-in.) finishing nails. Fill the holes with some wood filler.

Lightly draw a 1-in. grid on a  $1\frac{3}{4} \times 6 \times 9\frac{1}{2}$ " piece of hardwood for the vise (F). Bore the hole for the vertical pipe (J) and bore holes for the carriage bolts (H) and lagbolts (I). Then cut through the center of the pipe hole to separate the vise pieces. Use a band saw to cut the contours. Round the top edges with a router and a  $\frac{1}{4}$ -in.-radius corner-rounding bit. Do the same with the bench edges.

If you plan to make a wheel truing jig (project No. 3), cut the jig-holding block (G). Locate its center and draw a  $1\frac{3}{8} \times$



**3** WHEEL TRUING JIG

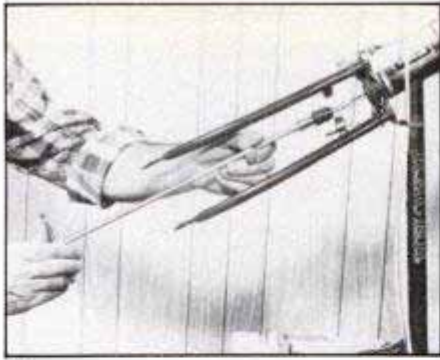
DETAIL 1

## 2 MATERIALS LIST—BIKE VISE

Key	No.	Size and description (use)
A	1	$\frac{3}{4}$ "-i.d. $\times$ 22" galvanized water pipe
B	1	$\frac{3}{4}$ " tee
C	1	$\frac{3}{4}$ " $\times$ 6" pipe nipple
D	1	$\frac{3}{4}$ " floor flange with screws
E	1	$\frac{3}{8}$ "-dia. $\times$ 1" thumbscrew
F	1	$\frac{3}{8}$ "-dia. $\times$ 2 $\frac{1}{2}$ " carriage bolt
G	1	$\frac{3}{8}$ "-i.d. hexnut
H	1	$\frac{3}{4}$ "-o.d. thin-wall conduit
I	1	$\frac{3}{4}$ " water pipe repair clamp
J	1	$\frac{7}{16}$ "-i.d. washer
K	1	$\frac{5}{8} \times 4\frac{1}{2} \times 7\frac{1}{2}$ " oak (base)
L	2	$\frac{1}{8} \times 1\frac{1}{4} \times 3\frac{1}{4}$ " sheet rubber (pads)

Misc.: Rubber cement, polyurethane varnish.





**4** Long extension of fender tapping tool puts handle below fork legs. You can turn the handle easily to cut threads.

1 3/8-in. square to be cut out for the steel jig holder (P). (Square steel tube is available at welding and metalworking shops.)

Bore holes tangent to each of the corners inside the square, then cut out the remaining wood. Use a No. 8 bit to drill a hole in the jig holder. Tap 1/4-20 threads for the thumbscrew (Q). Position the holding block centered on the width of the bench and 2 in. from one end. Bore a 3/8-in.-dia. hole for the wheel-truing jig rod centered 3/4 in. from the edge of the holding block. Secure the holding block and holder in place.

File or grind the threads in the top of the clamp assembly tee (K) so the horizontal pipe (L) will slip fit. This is a tedious job with a file, but much easier with a 1-in.-dia. drum grinding stone mounted in a drill press. Wear goggles for this operation. File a flat centered on the top of the tee to seat a nut (O2). Weld or braze it in place. Then drill a through hole with a 5/16-in.-dia. bit and tap threads for a 3/8-in.-dia. bolt (O1) into the tee.

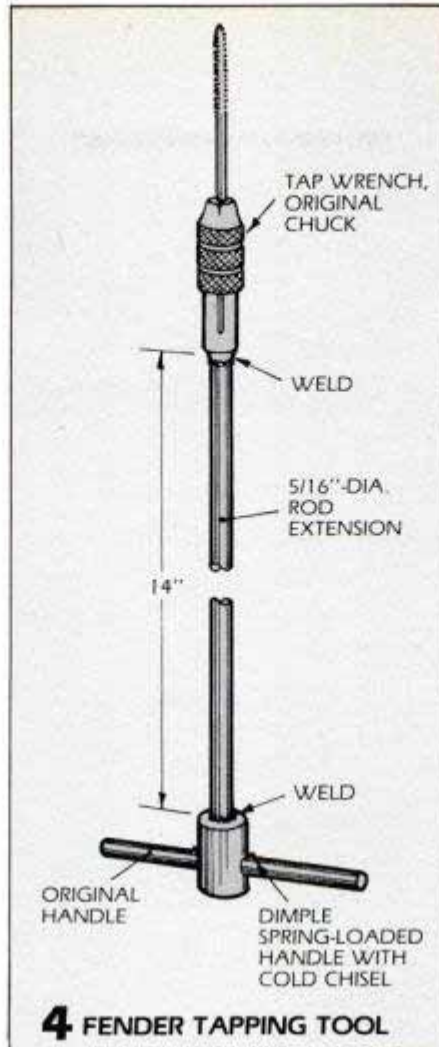
A 3/4-in. water pipe repair clamp (N) holds a bike while you work on it. Bore, then file to shape, a square cutout in the clamp for the shoulder of the carriage bolt (N1). Also, cut a slot in the clamp leaf. Weld the clamp to a pipe cap fitting (M). Use a half-round file to form a depression on the cap to match the clamp contour. Use rubber cement to attach sheet rubber pads, available at hardware and plumbing supply stores, inside the clamp leaves.

Wire the electrical receptacle to a

### 3 MATERIALS LIST— WHEEL TRUING JIG

Key	No.	Size and description (use)
A	1	1 1/16 x 2 x 6" oak (clamp)
B	1	Heavy-duty front fork
C	1	1/4"-dia. x 12" steel rod (perimeter run-out gauge)
D	1	1/4"-dia. x 4" steel rod (crossbar)
E	1	5/16"-dia. x 2 1/2" carriage bolt
F	1	Washer for E
G	1	Wingnut for E
H	1	1/4-20 x 2" thumbscrew
I	1	1/4-28 x 1 1/2" thumbscrew (side run-out gauge)

Misc.: Polyurethane varnish.



**4 FENDER TAPPING TOOL**

heavy-duty, grounded extension cord. Run the cord to nearby power for use. Finish all wood with a satin-finish polyurethane varnish.

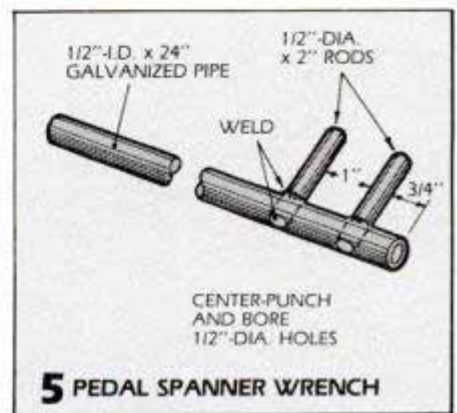
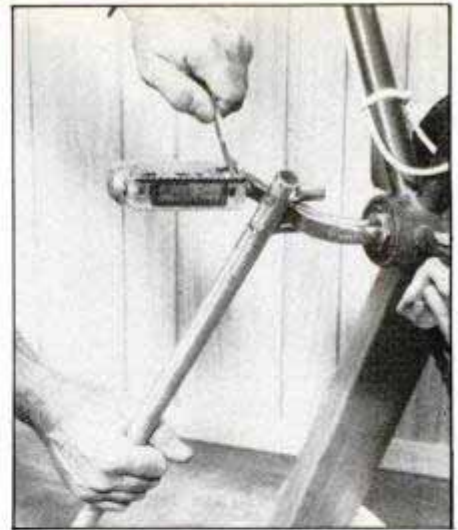
## 2. Bike Vise

For those who prefer a readily portable bike holder to help make repairs, or if space doesn't permit an entire bike repair stand, or you work on more than one bike at a time, this handy bike-holding jig is invaluable. You can temporarily install it with C-clamps, or permanently bolt it to your workbench.

Begin construction by filing or grinding the internal threads of a T-fitting (B) until a 3/4-in. water pipe (A) slides through freely. (For pointers on completing this operation and for other work tips, read the preceding section on building the clamp assembly in project No. 1.)

Drill a 5/16-in.-dia. hole through the top of the T-fitting and tap threads for a thumbscrew (E) using a 3/8-16 tap. Thread together the tee, pipe nipple (C) and floor flange (D). Cut the base (K) of hardwood and apply polyurethane varnish or other finish. Secure the floor flange to the base.

A water pipe repair clamp (I), welded or brazed to the horizontal pipe, holds a bike for repair. Cut a shallow



**5 PEDAL SPANNER WRENCH**

V-groove in one end of the pipe with a hacksaw. Then, with a half-round file, round the groove to accept the clamp. Before attaching the clamp to the pipe, bore a 3/8-in.-dia. hole through the outer lips of the clamp. Use a three-corner file to form a square of one hole to accept the shoulder of a 3/8-in.-dia. carriage bolt (F). Cut the hole in the other lip to form a slot. Carefully weld or braze the bolt to the clamp and the clamp to the pipe.

To make the speed handle, slip a washer (J) and a hexnut (G) onto the clamp bolt. Force a length of thin wall conduit (H) over the nut. Use rubber cement to glue sheet-rubber pads (L) inside the clamp jaws to protect the paint finish on the bike. Slip the pipe into the T-fitting and you're ready for work.

## 3. Wheel Truing Jig

The main part of this wheel truing jig is a heavy-duty front wheel fork (B) of a bike in which a wheel is placed temporarily while its shape is checked. A thumbscrew (I), inserted through holes carefully drilled and tapped in the fork, gauges the side (right-left) run-out of the wheel rim. A rod (C) with a crossbar (D) checks the perimeter run-out. A

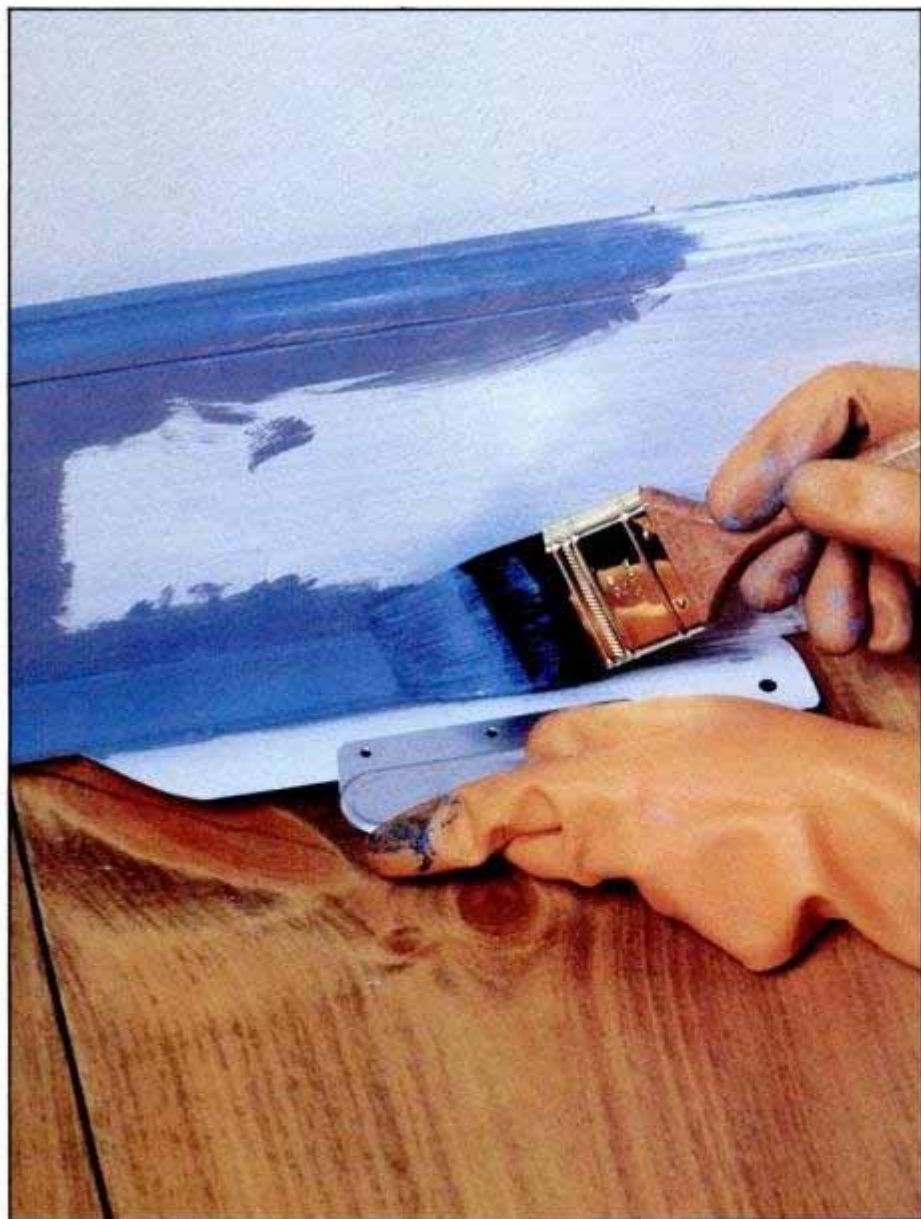
(Please turn to page 106)

# INTERIOR PAINT PROBLEMS

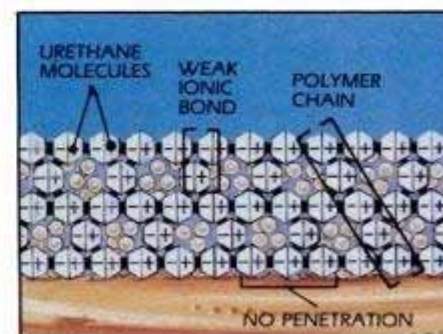
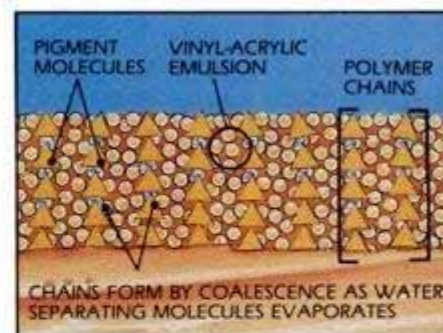
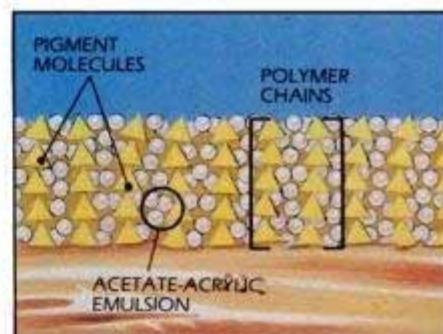
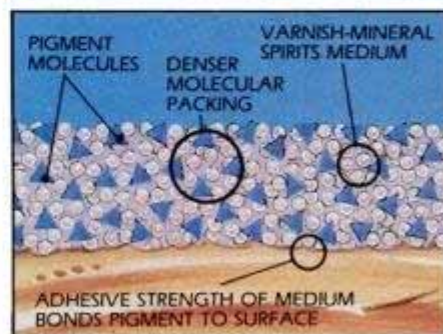
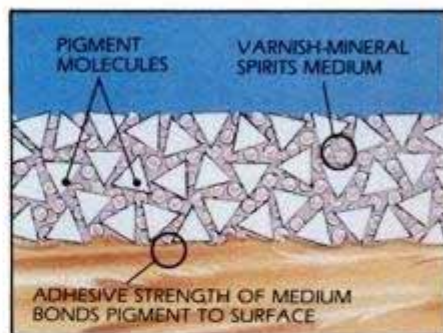
## PM Answers The **15** **Toughest Questions**

Interior paints are formulated more for appearance than for adhesion. Here's how to prepare surfaces and apply paint so it will keep on looking great.

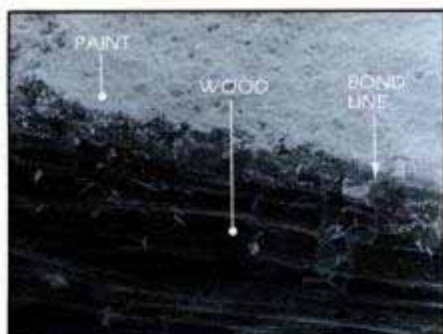
BY JOHN H. INGERSOLL



To protect the floor and produce an even contrast line when painting a baseboard, use only the tip of your trim brush for maximum control. A handheld shield keeps floor clean, provided that paint isn't allowed to leak underneath the shield.



## FLAT ALKYD WALL PAINT



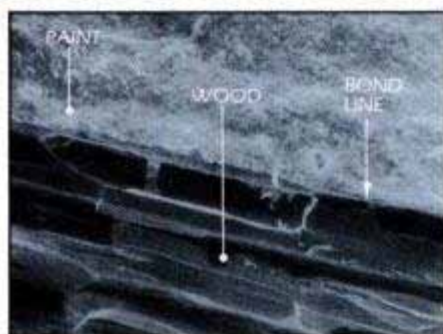
Flat white interior alkyd (oil-base) paint on wood is shown at left magnified 200 times. Illustration at far left clarifies the chemistry. In flat paints, molecules are loosely packed, accounting for flaky appearance in photo. By percentage, flat finishes are composed of more pigment than medium. Paint doesn't penetrate the wood, except at pores. It's bound together by weak mechanical interaction between molecules of the medium—varnish and mineral spirits—which binds the pigment to the surface.

## HIGH GLOSS ALKYD ENAMEL



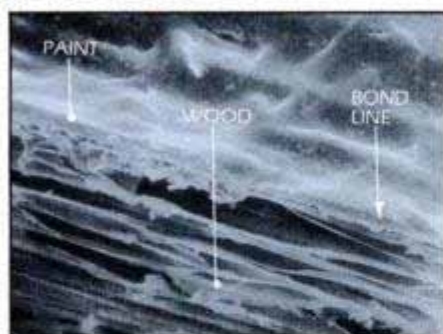
We selected a bright blue for our sample of a high gloss alkyd enamel and found it hardly showed up at 200x, the best illustrative magnification for other paints. The pigment content is lower in high gloss paints, about 10 percent by volume. The higher presence of medium makes the paint more reflective. Here, medium molecules are smaller. They completely envelop the pigment molecules, packing together densely for a harder, smoother surface. Gloss paints penetrate deeper and adhere better than flat alkyds.

## FLAT LATEX WALL PAINT



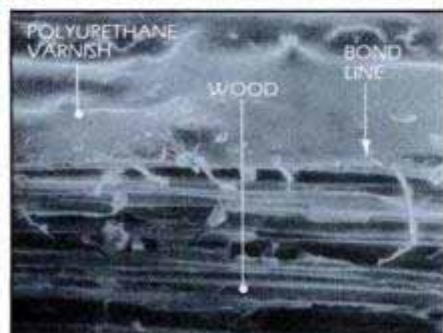
Like flat oil paint, flat latex finishes contain a higher percentage of pigment relative to the amount of medium. The yellow latex we selected for our sample is an acetate-acrylic emulsion with a thermoplastic property—it can be exposed to high levels of heat without fading or changing in nature. Molecules of the medium repel each other, but bind pigment molecules in polymer chains. This accounts for the thermoplasticity. Penetration is slight, but the polymer bonds strongly with surface.

## SEMIGLOSS LATEX ENAMEL



The orange latex semigloss we chose for microphotography is formulated with about 18 percent pigments borne in a medium of vinyl-acrylic emulsion. This paint is a polymer immersed in water—the molecules are held together in chains. The chains form by coalescence: As the water evaporates, the molecules are drawn together by a weak force similar to magnetism. Paint is bonded to the surface by forces that are quite similar to the ones that form polymer chains. Packing of the molecules isn't very dense.

## HIGH GLOSS POLYURETHANE VARNISH



Polyurethane varnish penetrates wood only slightly. When urethane is exposed to oxygen, this modified alkyd gains molecular weight and cures to a densely packed coating formed of fairly large molecules. This accounts for its wear resistance. The forces involved in the formation of polyurethane polymers differ from those present in latex polymers. Charged particles within molecules make a slight ionic bond with each other and with the surface. Opposite charges attract to balance chemical forces.

To find out more about interior paints, we took five finishes into the lab to look at their binding patterns. For the most part, interior paints are engineered for appearance rather than for bonding.

The overriding concern with appearance in the formulation of these paints accounts for different problems than those with exterior paint. Here, we address 15 of the toughest, most frequently asked questions about painting indoors.

**Q.** I've repainted the plaster walls of my living room several times, filling a large, long crack that starts at the corner of a finished opening with joint compound. Shortly after each paint job, the crack reappears. How can I repair it permanently?

**A.** The position of that crack is a sign that the framing is inadequate. The best solution would be to beef up the header or top plate of the bearing wall, the sooner the better.

If you're not prepared for such an extensive repair presently, chip out all loose plaster and clean the crack out thoroughly. Lay an ample bed of compound about 3 in. wide over the crack. Place wallboard tape over the compound bed and press the tape down with a 4-in. taping knife, squeezing out the excess compound and making sure there are no air bubbles underneath the tape. When the compound dries (in a day or so), apply a second coat over the tape, feathering the edges flush with the wall surface.

**Q.** We have a rather large hole, about 4x4 in., in the plasterboard wall of our home. I want to repair it before repainting. Can I do it without replacing the entire panel?

**A.** Cut a couple of 1x2s about 6 in. long. Insert them through the hole and position them to create a fastening cleat against the back of the existing plasterboard. Use 1/4-in. dry wall screws applied to the face of the plasterboard to mount the 1x2s parallel on opposite sides of the hole, leaving a 3/4-in.-wide flat showing for each. Then, cut a piece of dry wall to fill the hole. Fasten it to the 1x2s with dry wall screws. Tape and compound the seams to conceal the patch.

**Q.** The wallpaper in our home is peeling in some areas. I'd like to reglue the bad spots and simply repaint the room. Do you see anything wrong with that?

**A.** Painting over wallpaper is not recommended for several reasons:

Lead photo: Harry Wicks  
Microphotos: Monroe Yoder, New York University  
Other photos: Benjamin Moore Paints,  
John H. Ingersoll  
Technical drawings: Fred Wolff, Ed Lipinski  
Finishes for microphotography manufactured  
by Benjamin Moore Paints.

Paint solvents can loosen paint in areas that are now sound and cause dyes in wallpaper to bleed through paint. Also, wallpaper seams will show through paint.

The rule that it's best to remove wallpaper before painting has two exceptions: when the plaster beneath is suspected to be in bad condition, and when wallpaper has been applied over dry wall. In these cases, resurfacing walls with  $\frac{3}{8}$ -in. plasterboard provides the best simple solution.

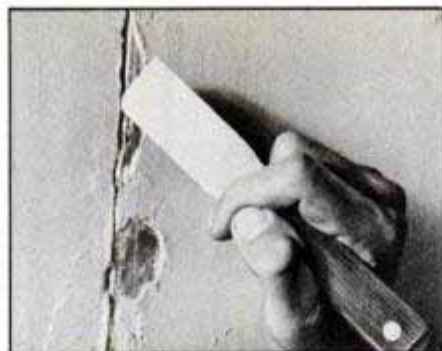
If you ultimately decide to paint over wall covering, first paint a small area to see if colors bleed through or if the paper lifts. Apply alkyd or latex primer coat to wallpaper. Prime vinyl fabric wall coverings with alkyd and smooth vinyl coverings with printed designs with a latex primer.

**Q.** I'd like to paint over simulated wood-grain hardboard paneling that has V-grooves in the surface. How can I best prepare the panels for painting and ensure that the grooves won't show?

**A.** The surest way to create a smooth, paint-receptive surface would be to apply  $\frac{3}{8}$ -in. dry wall over the paneling, but this may involve other alterations you're not prepared for.

A second alternative would be to sand the paneling lightly to remove any gloss, then tape and compound over the grooves and seams. Lay a bed of wallboard compound over each groove with a 3-in. putty knife, apply tape while the compound is still wet, and smooth the tape with a 4-in. taping knife. When the first application is dry, apply a thin second coat of compound with a 6-in. taping knife. A third coat applied with an 8- or 10-in. knife may be required. Sand lightly between coats with medium (120-grit) paper.

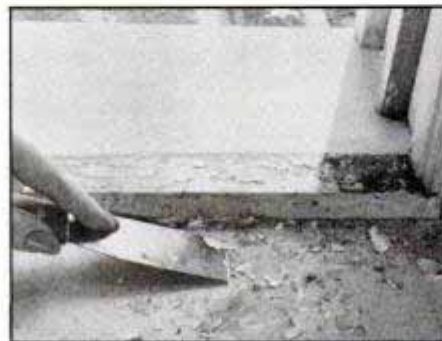
**Q.** I have a chronic problem with cracking and peeling paint on the inside of windows and sills. How



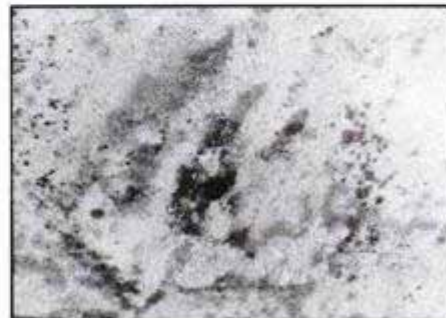
Cracks as large as the one above should be cleaned thoroughly of all loose material, then covered with compound and wallboard tape to prevent reoccurrence.



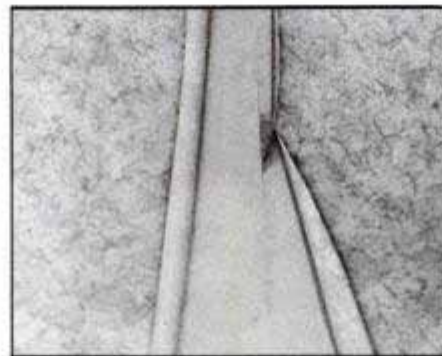
Above shows how not to apply joint compound over cracks—unless you want to do a lot of sanding. Don't dab it on; apply a smooth coat with wide-blade knife.



This windowsill needs to be scraped thoroughly, then primed before topcoating.



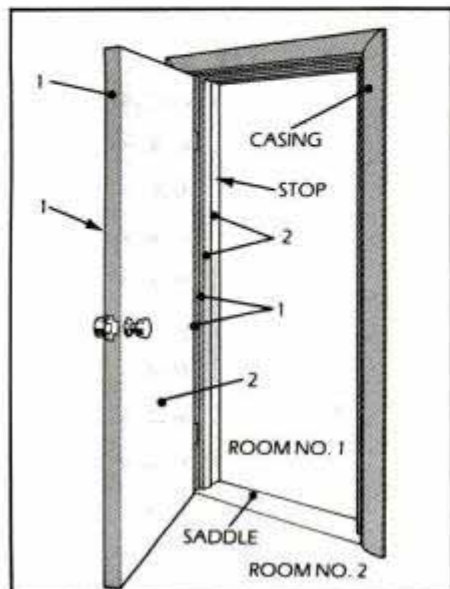
Mildew stains, caused by excessive moisture, are removed with bleach. Add mildewcide to paint to prevent stains.



Wallpaper should be steamed off and paste washed off walls before painting. Then seal plaster with alkyd primer.



For a perfect finish, remove all paint from peeling baseboard heater housing, then apply the primer and finish coats.



can I reduce the need to paint so frequently?

**A.** There are many factors that can contribute to paint failure on interior surfaces around windows. When windows are leaky, paint is subjected to damage from moisture. The tendency of moisture inside the house to evaporate through points of least resistance like windows causes extreme dryness on the surfaces. And, sills have higher exposure to the sun's rays than other surfaces. Installing storm windows, caulking windows

tightly and installing window shades can reduce such weathering.

Paint can also fail when it's applied to a surface that's too glossy or dirty. It's wise to knock off the sheen on existing paint before repainting. High infiltration of dirt and dust makes it a must to pay careful attention to cleaning surfaces during preparation. Lab data indicate that latex polymers bond better than oil-base paints and that latex is chemically more stable when dry.

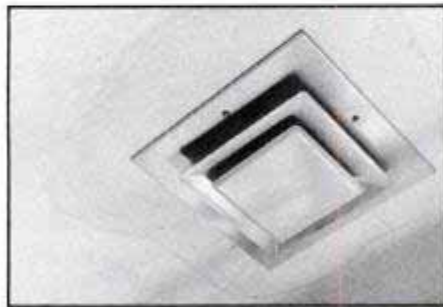
**Q.** I have a problem with a water stain on my ceiling that keeps bleeding through every time I repaint. How can I seal that stain for good?

**A.** First, you have to be sure that you correct the problem that causes the staining. After stopping the flow of water, apply a coat of pigmented shellac over the stain. Wait a couple of

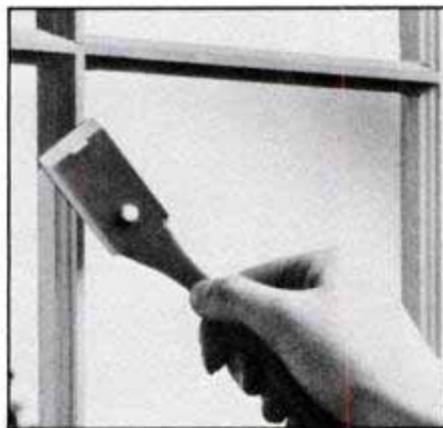
When there is a color change from one room to the next, treat the door and jamb correctly. No. 1 in the drawing indicates members that could be painted to match Room 1, while 2 indicates the specific areas that should match Room 2.



Even a texture paint can't hide ceiling defects like this—plasterboard is coming loose at seams. It can be pulled flush against nailer with nails or screws.



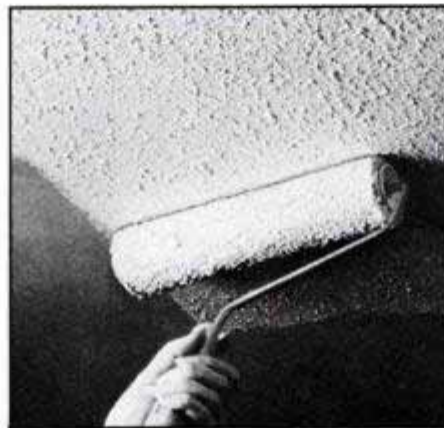
When water staining occurs, look for the source and stop it. Condensation from air conditioner duct is the cause here.



A small pad applicator offers more control for a hand unsteady with brush.



Liquid deglosser creates a good bonding texture for repainting over enamels.



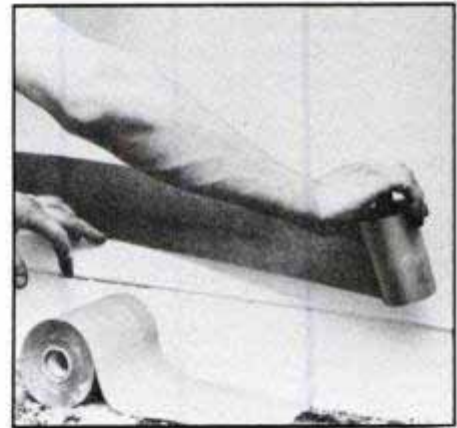
Textured paint will hide small defects. Here, sand paint is applied with a roller.



Emery sponge is as effective as sandpaper around a block for deglossing trim.



Roller with splatter shield protects painter and work area for easier cleanups.



While useful, masking tape shouldn't be used over paint that's not completely dry.

weeks before applying the finish coat to be sure the problem has been solved.

**Q.** I'm finding it hard to make paint jobs last on the radiators in my home. Is there some kind of special paint I should use?

**A.** With radiators, as with all paint jobs, preparation is the key to a lasting job. If paint is generally sound, remove only loose paint by wire brushing. Paint edges around chipped areas can be feathered smooth with medium, then fine, emery cloth. If peeling is extensive, it's best if you remove all old paint using a chemical stripper. Make sure the room is properly ventilated and wear rubber gloves when working with stripping chemicals. When you are through, wash all traces of the chemical from surfaces using soap and water.

Let the radiator cool and apply prim-

er to bare spots. Do not use aluminum or other metal-base paints (they insulate the radiator). Use either oil or latex for the top coat. Be careful not to plug up the air-release valve with paint, and do not paint the shutoff valve stem. Before turning the radiator back on, wait several days to allow the paint to cure.

**Q.** When painting a room, I start by applying paint in corners and at the base and top of the wall with a brush, then I knock off the large wall surfaces with a roller. When it's dry, the paint I brushed on looks different from the rest of the wall. Is there any way to overcome this?

**A.** The problem is caused by the different textures that brushes and rollers create. Also, the overlapping of the two textures often results in a

somewhat darker or lighter lap mark.

To avoid this when painting with latex, apply the paint in heavy coats with both brush and roller. Work the roller as close into the corners as you can in order to create a uniform texture. Apply your roller coat while the brushed-on paint is still wet. In general, to avoid lap marks when painting with latex, work from dry areas and feather them into wet. Two full coats will create a more uniform color than one.

While the two-coat rule holds true for alkyds and other oil-base paints, the method for working with them is opposite from that used for latex. Apply thin coats, brushing or rolling them out. Work from wet areas to dry ones.

**Q.** My old metal kitchen cabinets look shabby. They're scratched,  
*(Please turn to page 133)*

# WORKSHOP MINICOURSE



## Working with glue

In my many hours in the workshop, I've seen some fine woodworking efforts spoiled because the craftsman simply did not know how to work with glue. Make no mistake about it. The subject of glues and adhesives can be, and is, one fit for a book. However, here we have just enough space to review the basics of working with glue in your shop.

For some reason, purists tend to reject white or carpenter's glue and opt for hide glue. The truth is that professionals working in today's mills and shops use carpenter's glue by the ton. I suspect old world craftsmen, if they were here to make a choice, would do the same.

There's no need to back away from either white or carpenter's aliphatic resin glues. Both have superb holding power. White glue gives you a bit more working time than the carpenter's. That's important for a beginning woodworker. Once you've mastered your gluing techniques, you will want to move up to faster-setting professional glue.

The single biggest error made by neophyte woodworkers is to use too much of the stuff. In addition to making sloppy joints, excessive glue will produce a weaker joint.

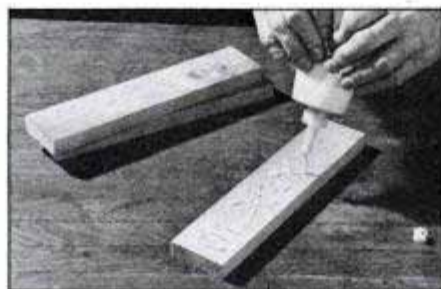
The correct way to use glue is to spread a thin layer on both surfaces to be joined. Wait a few minutes to let the glue get tacky. This minimizes sliding action. Then press the pieces together. Except for contact cement, you should apply clamp pressure immediately after bonding two glued surfaces. Let the piece rest 24 hours.



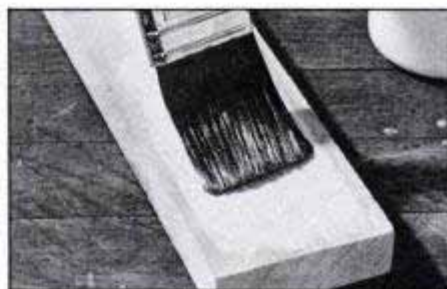
To keep down the cost of glue, purchase one-gallon containers and transfer job-size quantities to smaller vessels.



Glue pot was purchased in a housewares store. It's actually a mustard dispenser. Small funnel guides the glue in.



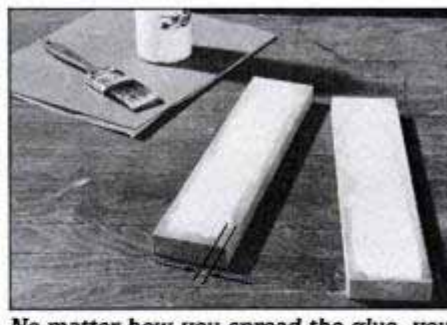
When applying glue to the surfaces to be joined, keep the liquid away from edges.



One way to spread glue is with a low-cost brush, which can be washed with water.



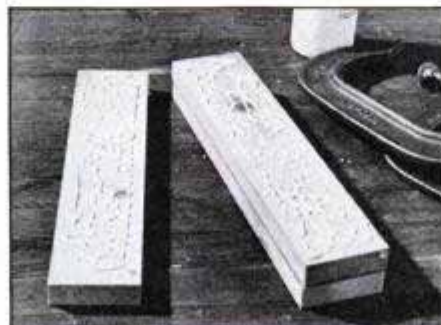
Small serrated knives, dispensed at fast food restaurants, are excellent spreaders.



No matter how you spread the glue, you must keep it away from the board edges (arrows) if you want a neat joint.



Clamp boards immediately and keep the joint under pressure for at least 24 hours. If workpiece surfaces will show, scraps of wood (pads) should be inserted between the clamp pads and workpiece (arrows).



The biggest error made by beginning woodworkers is to use far too much glue.



When pressure is applied to overglued pieces, squeeze-out will occur. This has ruined the appearance of many projects.

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

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Competitive tar levels reflect either the Dec. '81 FTC Report or FTC method

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7 mg



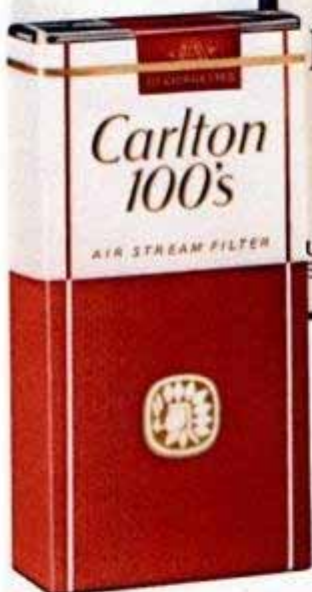
6 mg



5 mg



4 mg



5 mg



2 mg

**They're all after us.**



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## Your legacy: A way of life.

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Obtain the Property Report required by Federal law and read it before signing anything.  
No Federal agency has judged the merits or value, if any, of this property. Equal Credit and Housing Opportunity.



## HANDSOME HOMEBUILTS

(Continued from page 114)

wing monoplanes of the type popular in the '30s. The other two, the Whatley Special and Kelly-D, are patterned after the biplanes of World War I. All four are of traditional fabric-covered, metal and/or wood construction.

The Christavia Mk. 1 is a tandem, dual-control two-seater with an enclosed cabin like the classic J-3 Cub. It does 120 mph on 65 hp, is aerobatic, and can be built from stock, off-the-shelf materials for as little as \$6,000, including engine. Plans are \$125.

For carefree, wind-in-your-face flying, the Cracker Jack is an open-cockpit single-seater designed around a tiny, 25-hp DAF engine that gives it a cruise speed of 75 mph. Plans and kits, including the powerplant, will be available soon. Estimated construction cost with engine: a modest \$4,000 to \$6,000. (Incidentally, the Cracker Jack Sailor Boy insignia shown on the plane's tail is a registered trademark of Borden Inc. It was used by special permission from Borden and cannot be copied by other builders.)

The two biplanes are also breezy, open-cockpit affairs, just as they were in the old days. The Kelly-D is a tandem two-seater, cruises at 95 mph on 125 hp and can be built for about \$8,000 with a used engine. Plans are \$150. The Whatley Special is a single-seater, does 80 mph on only 55 hp and is said to cost less than \$3,000, complete with engine and instruments—a bargain even today's ultralights would be hard pressed to beat. Plans are \$25.

Who says sport flying has to be a rich man's hobby? **PM**

### HOMEBUILT SOURCES

- **Bravo:** Morrissy Aircraft, Box 4129, Oceanside, Calif. 92054 (brochure \$1, full info pack \$15.50).
- **Christavia Mk. 1:** Elmwood Aviation, Route 4, Elmwood Dr., Belleville, Ont. K8N 4Z4 (info pack \$10).
- **Cosy:** Co-Z Development Corp., 2182 North Payne Ave., St. Paul, Minn. 55117 (info pack \$8).
- **Cracker Jack:** Wood Wing Specialty, Box 1258, Tehachapi, Calif. 93561 (airframe info pack \$5, engine info pack \$5, both for \$8).
- **Gemini:** David W. Ganzer, 3420 Oak Creek Rd., No. 3, Mojave, Calif. 93501 (info pack \$7.50).
- **Glasair RG:** Stoddard-Hamilton Aircraft Inc., 18701 58th Ave. N.E., Arlington, Wash. 98223 (info pack \$10).
- **Kelly-D:** Dudley R. Kelly, Route 4, Versailles, Ky. 40383.
- **Sea Hawk:** Aero Gare, Bldg. 105, Mojave Airport, Mojave, Calif. 93501 (info pack \$8).
- **Solitaire:** Rutan Aircraft Factory, Bldg. 13, Mojave Airport, Mojave, Calif. 93501.
- **Sonerai II-LT:** Monnett Experimental Aircraft, Box 2984, Oshkosh, Wis. 54903 (info pack \$5).
- **Taylor Bird:** Taylor Aero Industries, 5855 State Route 40, Tipp City, Ohio 45371 (info pack \$5).
- **TM-5:** T.M. Aircraft, Box 570, Route 1, Furlong, Pa. 18925 (info pack \$10).
- **Wag-Aero 2+2 Sportsman:** Wag-Aero Inc., Box 181, 1216 North Rd., Lyons, Wis. 53148 (info pack free).
- **Whatley Special:** Vascoe Whatley Jr., Box 474, Allendale, S.C. 29810 (info pack free with SASE).
- **Zia:** Zia Applebay Inc., 2111 Commercial N.E., Albuquerque, N.M. 87102 (info pack free).

## MARINE SURPLUS SALE

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## SEA & FIELD BINOCULARS

— (all in original cases) —

## 50 MILE RANGE-

# Only \$9 a pair

## will be offered to the public

### FEATURE SUPER 50mm LENSES—IDEAL FOR NIGHT VIEWING SO POWERFUL YOU CAN ACTUALLY TELL TIME ON A CLOCK A FULL MILE AWAY!

**M**arine Surplus Depot will accept orders directly from the public for 50-MILE-RANGE SEA & FIELD BINOCULARS! Each of these precision ground non-prismatic LONG RANGE BINOCULARS are so powerful you can actually sit in the grandstands and 'lip-read' a quarterback calling signals a whole football field away! Precision engineered with haze-resistant lenses, these rugged, lightweight Sea & Field Binoculars withstand rough

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### TECHNICAL SPECIFICATIONS:

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**LENS AND SCOPE DIVISION**  
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QUANTITY	MODEL #	GOLD	SILVER	PRICE
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	30A	X		
	30D	X		

Add Postage, Handling, and Insurance \$1.00 per pair

Total \_\_\_\_\_

Credit card orders may call 1-404-252-0703.

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**FREE case with each pair.**

## FIRSTHAND REPORT: DODGE DAYTONA (Continued from page 88)

fuel injection system plus a Garrett AiResearch TO-3 turbo-charger that raises horsepower to 142 at 5,600 rpm and torque to 160 at 3,200. The turbo's center bearing is water-cooled to help prevent bearing seizure—long a turbo weak point. Dished pistons in the turbocharged engine lower compression from 9.1:1 to 8.0:1, which means the turbo will burn unleaded regular, while the TBI 2.2 needs premium. A knock sensor retards timing to prevent engine damage.

Turbo boost comes in at a low 1,200 rpm and jumps to 7.2 p.s.i. at just over 2,000 rpm. A wastegate holds pressure to 7.5 p.s.i. right up to the 6,000 rpm red-line.

The system works very well. There's virtually no turbo lag, and power comes on like turning a tap—smooth and lots of it, very much like a small V8.

### Speedy 0-to-60 times

With this much power on tap, it's no wonder that 0-to-60 times are consistently in the 8- to 9-second range, which puts the Laser/Daytona right up there with the Porsche 944, Camaro Z28 and others in that league.

Despite the power, we could barely feel any torque steer. One thing that keeps torque steer in check is the use of equal-length axle shafts—a trick accomplished by shortening the jointed right axle via an extension from the differential. This extension rides in a car-



Chrysler has gone the complete electronics route with dashboard and most instruments. Synthesized voice has 15-second delay.

rier bearing and only then drives the right axle.

The suspension and structural engineers have done a fine job of taming the 61/39 weight distribution, and that's no easy trick.

We drove these cars to their limits. It would take a very careless driver to get in trouble with the Laser/Daytona. They're very forgiving, very communicative in the way they tell you where they are and what they're going to do in hard cornering. They're extremely responsive to steering inputs and, in short, you don't have to go through a Bondurant course to have fun with these automobiles. Of course, it can't hurt.

An optional handling package in-

### SPECIFICATIONS—DAYTONA AND LASER

#### ENGINE

TRANSVERSELY MOUNTED, 2.2-LITER, SOHC, IN-LINE FOUR, ELECTRONICALLY FUEL INJECTED, DRIVING FRONT WHEELS

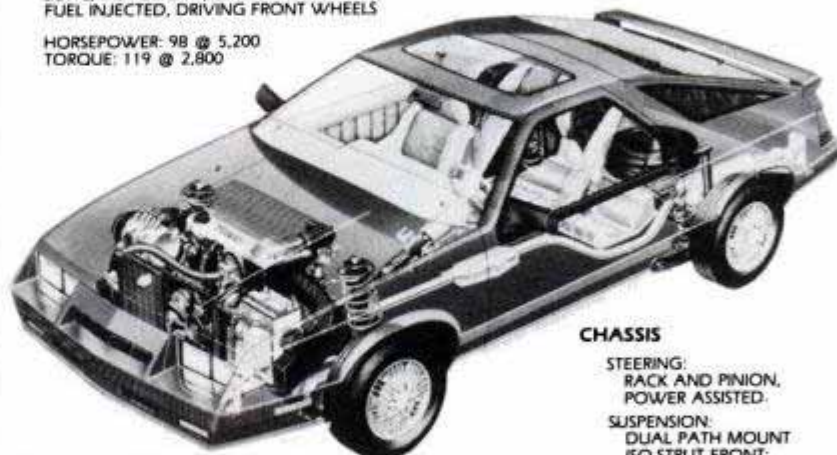
HORSEPOWER: 98 @ 5,200  
TORQUE: 119 @ 2,800

#### WEIGHT

2,651 POUNDS

#### TRANSMISSIONS

MANUAL FIVE-SPEED OR AUTOMATIC THREE-SPEED



#### DIMENSIONS (IN.)

WHEELBASE: 97.1  
OVERALL LENGTH: 175.0  
HEIGHT: 52.0  
WIDTH: 69.3

#### TIRES

185/70 R14 STEEL-BELTED RADIALS STANDARD; 195/60 R15 GOODYEAR EAGLE GT's OPTIONAL

#### CHASSIS

STEERING: RACK AND PINION, POWER ASSISTED.

SUSPENSION: DUAL PATH MOUNT ISO-STRUT FRONT; COIL SPRING REAR; GAS-PRESSURIZED SHOCKS

BRAKES: VENTED FRONT DISCS, SELF-ADJUSTING REAR DRUMS

Basic K-car platform has been improved to accommodate added horsepower and upgraded suspension. The 195 tires are biggest Chrysler has put on a front-drive car.

cludes Goodyear Eagle GT P195/60R15 tires on Western's Swiss-cheese 15x6 alloy wheels. The tires alone make a big difference over the standard P185/70R14s. Other suspension goodies include considerably higher spring rates than the K-cars, stiffer stabilizer bars and bushings, gas-filled struts and shocks, plus progressive jounce bumpers.

Power steering is basically the K's rack and pinion, but cut from a 22:1 manual ratio to 14:1 with power assist. A high-output pump along with better valving give the G-cars faster back-and-forth response—great for slaloming. There's also enough road feel and precision to make driving in traffic a safe pleasure.

Braking is another of the G's strong points. We made several smoking panic stops, but had no trouble keeping the



*Despite a severe front-weight bias, the Laser/Daytona handles quite well and can generate considerable cornering force.*

tires from locking up. Twin proportioning valves in the brake system make it nearly impossible to lock up only the rear wheels. Stops were short, straight and fade-free.

We did find the Laser/Daytona's shift mechanism lacking a bit in precision. The shifter takes some getting used to, and we sometimes found ourself going into FIFTH when we meant to hit THIRD.

### Space Shuttle electronics

The standard Laser and Daytona come with conventional instruments: round tach and speedo plus four working gauges. The XE goes the digital electronics route, and if you enjoy Space Shuttle gadgetry, you're going to love the Laser XE. You can order the XE electronic panel optionally in any G-car, along with Chrysler's other monitors, voice synthesizer, graphic message center and electronic navigator.

In Chrysler E-cars and others, we used to be annoyed by the synthesized voice, which would tell us to buckle up or close the door even as we were doing those things. This newer version of the voice waits 15 seconds, and if you've already slammed the door or buckled up, it stays quiet.

Being derivatives of the K-car family, the Laser/Daytona are front-wheel-drive, unit-bodied, four-place sport coupés that Chrysler Corp. will offer in several different forms when they go on

sale October 1. Chrysler's Laser version comes in two equipment levels—the standard Laser and up-option Laser XE. Dodge offers the Daytona in three different equipment levels—the base Daytona, Daytona Turbo and Daytona Turbo Z.

The car abounds with well thought out little details. Somebody deserves a big bonus for fighting to keep those all-important little things—the air horns, backlight sunvisors, split folding rear seats, the tennis net ahead of the cargo deck, tie-down straps, clutch-foot rest (or brace for hard cornering) and the

low brake pedal for heel/toe driving.

Actually, we could find only a couple of tiny things wrong with the G-cars, and we're nit-picking. One is veiling glare in the windshield. The other is the analog tachometer on the digital instrument panel. It's too small.

### What they've done

Chrysler's two new G-cars take the K-car about as far as it'll go in terms of performance, handling and looks. The transformation wasn't easy. But if the cars we drove are any indication, the effort was well worth it. **PM**



**The measure of lasting quality.**

When you buy a tape rule, you can be sure it will read inches and feet. But in many cases, that's all you can be sure of. Unless it's a Stanley Powerlock® tape rule.

Powerlock tapes are built with quality that lasts. They offer you features you can't find in ordinary locking tapes. A DuPont

Mylar® coated blade, for durability. A Tru-zero hook, for precision measuring. Easy-to-read blade graphics. And on some models, patented speed control brake cams, for decreased whiplash and longer tape life.

Stanley Powerlock tape rules are available in a wide range of lengths and widths.

For inside measurements, there's even a top-reading Powerlock rule—the only tape rule of its kind.

For twenty years, Powerlock tapes have been the *Badge of the Professional*,™ and with good reason. They don't just measure. They measure up.

**STANLEY**  
helps you do things right

## NEW SPEAKERS

(Continued from page 79)

deliver exact musical reproduction. The panel is far from a simple, rectangular block. Instead, it is carefully shaped and designed to reproduce a range of sound frequencies as good as or better than most paper-cone speakers.

The SM 280 is a two-section speaker. The bottom part delivers the bass and midrange frequencies. The top section sounds the high notes. The voice coils are placed at strategic spots on the shaped diaphragm. Their magnet/pole piece arrangements, just as in common speaker technology, convert the incoming electrical voltages to mechanical movement. In this case, they move built-in bobbins or acoustic hammers. These hammers, rather than driving a paper cone, transfer sound impulses to the Soniflex diaphragm. Other areas are vibrated by piezoelectric drivers.

The sound travels through the diaphragm, causing it to pulsate and make sound waves. At this point, it is the shaping of the diaphragm that determines the way these sound waves are reproduced as frequency. Round cut-outs on the diaphragm serve as mechanical crossovers and cause different areas of the panel to vibrate the different notes.

Because it is a two-sided panel, sound flows from the front and back of the speaker. This omnipolar dispersion results in excellent stereo imaging. We heard superb stereo sound in every area of an average-sized living room.

Of course, speakers with cones are here to stay. Or are they? We asked one of the many companies which makes driver/cone speakers—Epicure Inc. The firm told us it will continue using conventional materials and technology. Epicure pointed out that the latest, most respected British and Japanese

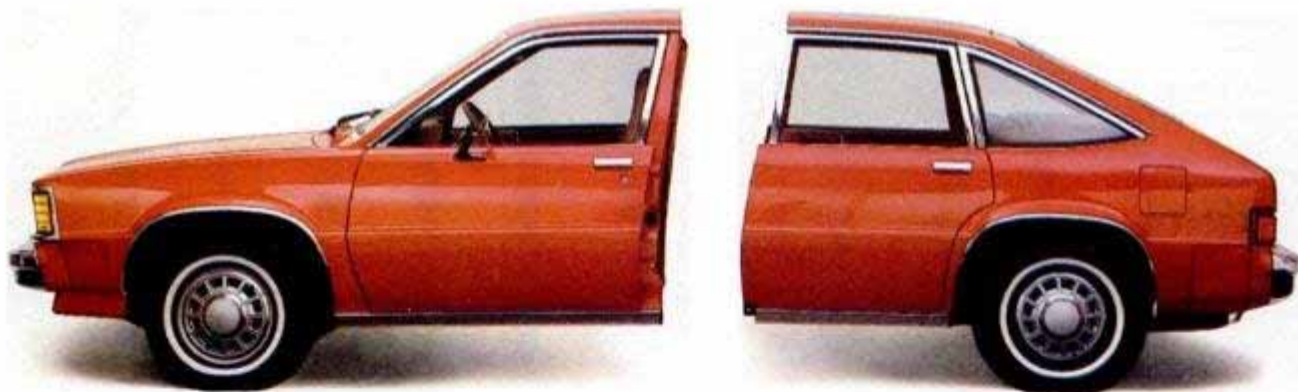
research on speaker design focuses solely on driver/cone technology.

While Epicure agreed that the surround effect of the BES speakers allows the listener freedom to move about the room, it maintains that placement of the BES speakers is far more critical than with normal speakers.

As usual, the final analysis of a speaker's worth is in the listener's ear. The BES speakers (at \$550 apiece) deliver the most impressive stereo sound that we have ever heard outside of a live concert. While positioning of the speakers in relation to draperies and doorways did affect the sound, once in place, the SM 280s had a purity of sound that an audiophile could enjoy from many points within the listening room.

If you are thinking of adding ultra-high-class speakers to your audio system, audition these. They could be your speaker of choice. **FM**

## How Havoline Supreme's 9 additives help you get the most out of your car.



### Proven protection up front.

Havoline Supreme with Texaco-developed additives, including a built-in friction fighter, protects engines against wear, rust, and bearing corrosion—and helps prevent acid, sludge, and varnish deposits.

What's more, Havoline's multigrade rating offers wide-temperature range convenience for year-round protection.

### Havoline's protection is proven.

The final test of a motor oil comes under actual driving

conditions. Havoline Supreme has proven it delivers the kind of protection needed in tough, high-speed state trooper cars and severe stop-and-go driving in New York City taxis.

### Havoline helps save gasoline.

Fuel economy tests proved it. Compared to a conventional motor oil, Havoline Supreme, with its special friction-fighting additive, helps save gasoline.



### Backed by improved mileage.

### Havoline is diesel tested.

If you own a diesel, we have good news. Havoline 10W-30 has the API-SF/CC rating required by most engines like yours. And it's been

proven in punishing diesel-powered taxis.

Engine protection and improved mileage. They come together. Thanks to Havoline Supreme.



# TECHNOLOGY UPDATE

## ROBOTICS

### A bomb squad cop on wheels

On the day we visited New York's bomb squad, the team's newest member had just wrapped up a hair-raising case by removing a suspected bomb from a street corner. As the rest of the bomb squad members walked back to their cars, the new guy rolled back to his truck, folded himself up, and waited patiently for his next assignment. Antisocial? No. This squad member is a remote-controlled machine with a robot arm.

The Canadian-built Pedesco Mark-3 unit, which costs about \$20,000, plugs into any wall outlet or works off its own 12-volt batteries. It's a simply constructed device that New York City is now using to help answer an estimated 9,000 bomb scares per year.

A human cop, working controls on a remote dolly and seeing on a TV screen what the Mark-3 "sees" through its 360-degree-pan video camera, can lower the arm on its pneumatic boom and remotely close the hand on any suspect package. The package is carried to a specially equipped bomb truck. The Mark-3—New York now owns four—will also be used by the Emergency Service Div., which answers calls for everything from burning cars to hostage situations.



PM photo: Steve Eskow  
Pedesco Mark-3 unit can pick up bombs with its robot arm or handle a hose to put out auto fires. The \$20,000 remote-controlled device has television eyes and a searchlight.

## ENERGY

### Fusion power goes compact

America's first full-scale fusion reactor, Tokamak, began operating last December at Princeton University. This year, with Tokamak still in operation, Princeton began running a downsized version. The compact model—Spheromak—with its diameter of 7 feet, is about one-fifth the size of Tokamak. In fusion, atoms are driven together to form heavier elements and energy—more energy than needed to start the process. Compact models will cut the cost of producing fusion energy.



Spheromak, the economy fusion reactor, has smaller magnets, fusion chamber, vacuum system.

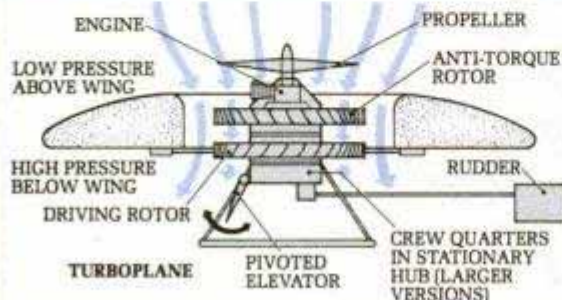
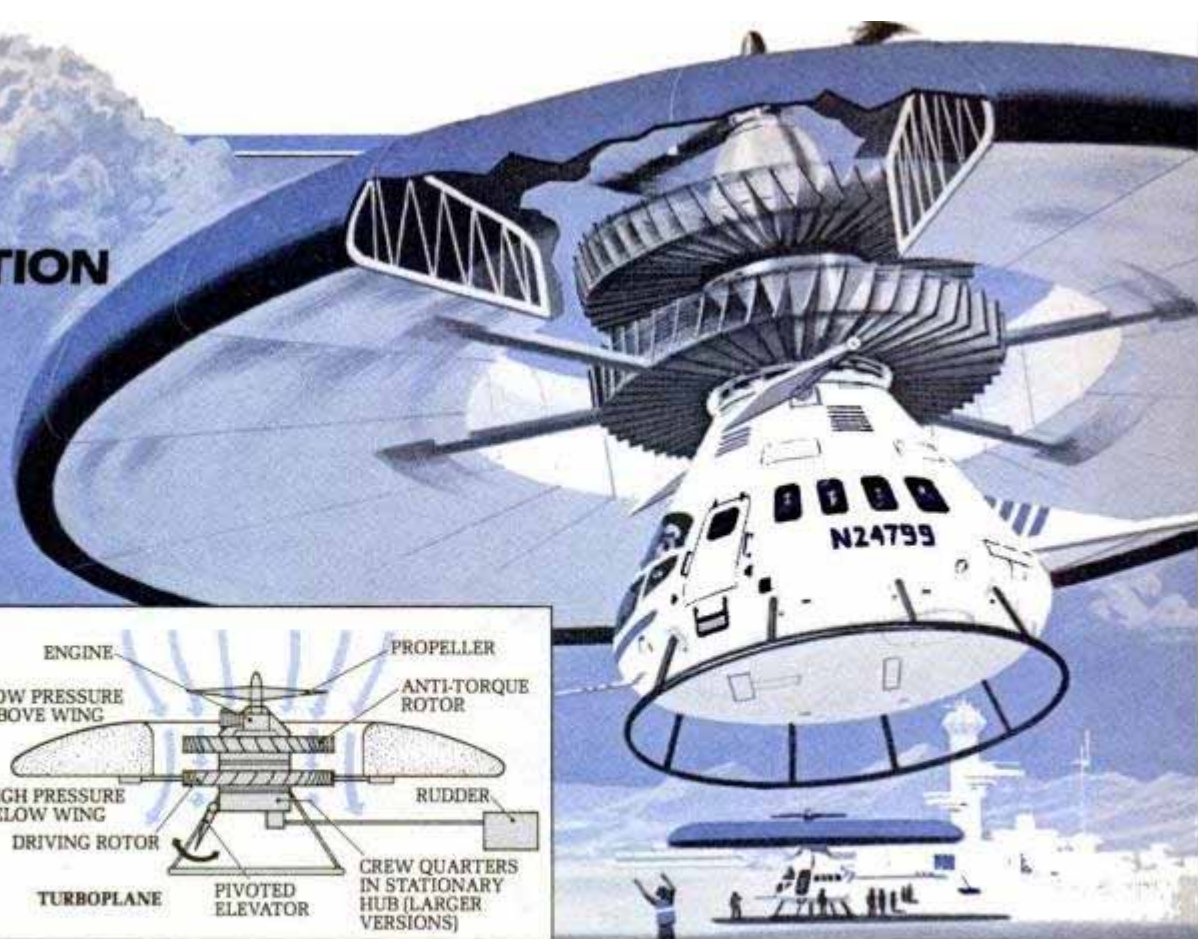
### People mover needs a name

University of Minnesota engineer J. Edward Anderson is seeking a patent and a name for his new people-mover system. Lightweight composite, three-passenger people-movers would be computer operated along a narrow-gauge rail. The cars, parked on rail cul-de-sacs, would be passenger-activated with a magnetic card. If you have a name for this system, submit it to Anderson at the University of Minnesota, Minneapolis, Minn. 55455. Anderson says his system would cost about \$8 million per mile to build, which is somewhat cheaper than a streetcar system and only about 14 percent of the cost of Houston's elevated train system now under construction.



J. Edward Anderson with his composite car for people moving.

## AVIATION



### New flying saucers: Freaky and far out, but maybe for real

The next time you look up in the sky and think you see a flying saucer, it just might be the real thing—though not filled with little green men from Mars. Two serious flying saucer concepts under development here on our own planet may point the way to exciting new shapes in commercial and recreational aviation. Both are VTOL-type aircraft, permitting vertical takeoffs and landings right in your own back yard. Unlike helicopters, however, they use small, ducted-fan props for lift and propulsion, saving the cost and complexity of huge, ungainly rotor blades.

The Turboplane (above, left) is the creation of Austrian inventor Heinz Jordan. In its present form, it's a whirling, doughnut-shaped wing, about 3 feet in diameter, that looks like an overgrown, motorized Frisbee. Though only a radio-controlled model, it's a prototype for much larger, man-carrying versions. A small, horizontal propeller draws air down through an opening in the center, creating a high-speed, low-pressure flow over the wing and a low-speed, high-

pressure flow under it. At the same time, a controllable-pitch rotor attached to the rim spins the circular wing like a toy pinwheel. A second, fixed rotor, with reverse-pitch vanes, exerts a counterrotating force on the central hub to keep it from turning, thus eliminating the need for an anti-torque tail rotor such as the ones helicopters require.

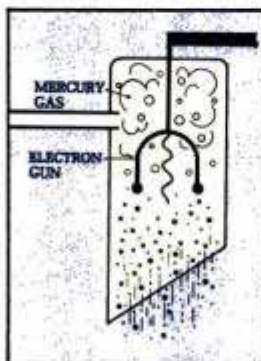
The upward force of high-pressure air below the wing, the downward force of the ducted airstream, and the gyroscopic effect of the spinning ring all combine to produce tremendous lift, thrust and directional stability.

Like a helicopter, the saucer is tipped slightly downward for forward flight, but requires no complicated cyclic or collective pitch controls. A tail rudder steers the craft, while a pivoted forward vane acts as an elevator for pitch control. For fast maneuvers, the spinning ring can be slowed down through the adjustable-pitch rotor to lessen its gyroscopic resistance to turns. If the engine fails, the prop continues to

## AEROSPACE

### Thrustworthy ions

Later this year, a Titan-rocket-launched satellite, on an earth resources mission, will use an engine never tried outside a lab. The Hughes Ion Thruster Engine will be used to make slight changes in the satellite's attitude once in orbit. The thruster uses a solar battery to build up a charge in an electron gun that fires a stream of electrons through mercury gas, knocking free other electrons. As electrons fly out the conical thruster, the satellite moves in the opposite direction. Ion thrusters may someday make space travel as cheap as solar energy.



Ion thruster has been used only in the lab.

### New jet engines are fuel sippers

Pratt & Whitney's two newest jet engines, the PW4000 and the PW2037, promise to cut the cost of running an airline. Both have fewer moving parts than their predecessors, cutting maintenance costs. And both deliver up to 7 percent better mileage than P&W engines of similar size. The 2037 was certified for the Boeing 757 last December. The 4000 will be ready for certification in 1986.



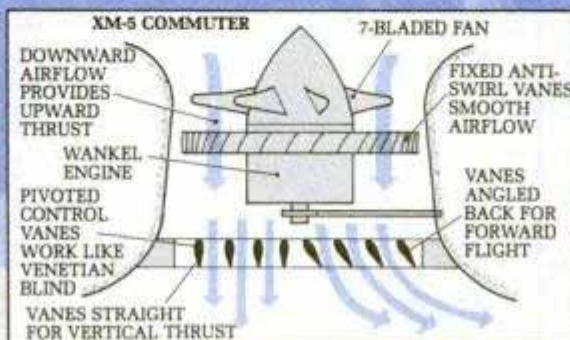
Pratt & Whitney's PW2037 sips fuel, has fewer moving parts.

Editor: Dennis Eskow  
Contributors: Sheldon Gallager, Alcestis R. Oberg, Allan Lundell, Geneen Marie Haugen, Frank A. Tinker, Franklyn Peterson

# TECHNOLOGY UPDATE



Prototype of XM-5 (far right) is a one-man, tailless saucer, but production version (artist's concept at upper right) will be sporty four-seater with a triple-finned stabilizer using two-way elevator/aileron for control. Cutaway (near right) shows how air can be ducted downward for vertical lift or rearward for forward thrust. On facing page (far left) is 3-foot-diameter R/C test model of revolving-wing Turboplane. Cutaway shows how one rotor spins wing, while a second, counterrotating rotor keeps hub stationary. Artist's concept (upper left) depicts what a full-size passenger liner or cargo freighter might look like.



PM art: Dean Ellis

autorotate, providing sufficient lift to make a safe, emergency landing like an autogyro.

The unusual Turboplane configuration is said to have a potential payload capacity of more than twice that of current heavy-lift helicopters of comparable power. In full-scale production versions, crew quarters, passenger accommodations and cargo space will be located in the central, stationary hub. In the meantime, the prototype Turboplane will be sold as an R/C model for hobbyists. The price is about \$200, less engine and radio control, from Ferdinand Kristoff, Austrian Investment Counsel, 1126 North Swan Rd., Tucson, Ariz. 85712.

Another saucer-like design is the XM-5 Commuter (above, right), a futuristic, four-seat aerial runabout that could be a moviemaker's prop for a film like *Star Wars*. Conceived by Dr. Paul Moller, a California professor of aeronautical engineering, it's capable of making vertical takeoffs and landings, but once aloft, flies much like a conventional sports plane. Unlike the rotary-wing Turboplane, it does not spin like a top, but has a fixed, airfoil-shaped fuselage fitted with a bubble canopy and a rakish-looking, triple-finned tail. Eight 36-hp Wankel-type

engines, driving small, ducted-fan props around the rim, provide a total of 288 hp for speeds up to 215 mph.

Advantages claimed for the multiprop array are highly sensitive control response, self-canceling torque, simplified engine maintenance and the security of redundant power. The craft will continue to fly with any four of its eight engines disabled and can even land safely on two.

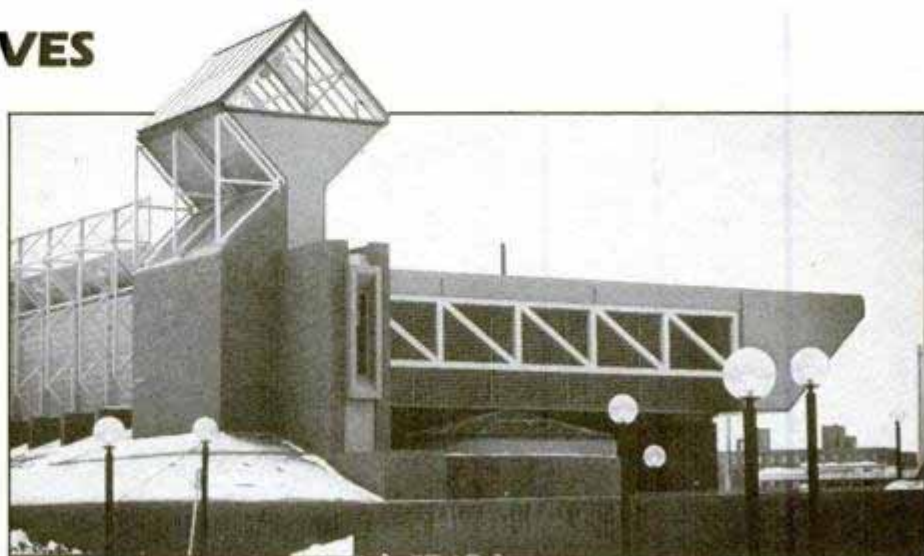
Rows of computer-controlled louvers in each duct, which work like Venetian blinds, can be angled to direct the airstream downward for vertical thrust or rearward for forward thrust. Used differentially on opposite sides, they also steer the craft at low hover speeds when there is little or no airflow over the control surfaces. At high speeds, dual-function elevons in the tail operate collectively as elevators for pitch control and differentially as ailerons for roll control.

Approximately 15 feet in diameter and made of molded fiberglass parts, the exotic XM-5 will be available in kit form later this year. The anticipated price is around \$25,000 from Moller Corp., 1222 Research Park Dr., Davis, Calif. 95616.

## ALTERNATIVES

### Underground courses

Engineering has gone underground at the University of Minnesota. The school's engineering lab just completed its first semester in a six-story underground building that houses classrooms and studios for drawing and modelmaking. The building's roof and cooling system stick up out of the ground. The builders say it cost 10 percent less to complete the structure than it would have for the same space above ground. It'll also cost far less to heat and cool since the surrounding glacial rock and limestone maintain local temperature at a constant 55°F. Solar panels provide the little heat needed to give the building some hot water. Light is all electric.



Only roof and cooling system are above ground on Minnesota's six-story engineering lab.

## INVENTIONS

### Artificial gill will help divers

**M**an's ability to work and live beneath the sea has always been severely limited by his lungs. But Houston heart surgeon Arnold Lande has invented equipment that could change the situation drastically.

The diver has a tiny hole put in his throat in a simple medical procedure to allow a tracheal catheter to be inserted. Other holes in the groin area allow for tubes to run from a vein and an artery to a backpack gill. These holes carry out used, or deoxygenated, blood and bring in oxygen-rich blood. The diver's nose is plugged and his lungs and sinuses filled with oxygen-rich fluorocarbon.

The fluorocarbon flows in and out of the lungs with help from a liquid respirator. Used fluorocarbon is shunted to a sea scooter equipped with a chemical scrubber to remove carbon-dioxide and to add oxygen. Extra oxygen comes through the groin tubes, which carry used blood into the gill for scrubbing and send renewed blood back into the body. The dual supplies give a human all his oxygen needs for a full day's work, which will cut the cost of undersea labor.



With the artificial gill system, oxygen-rich fluorocarbon is pumped into the lungs by a liquid respirator. Extra oxygen is supplied to the blood through tubes in the diver's groin.

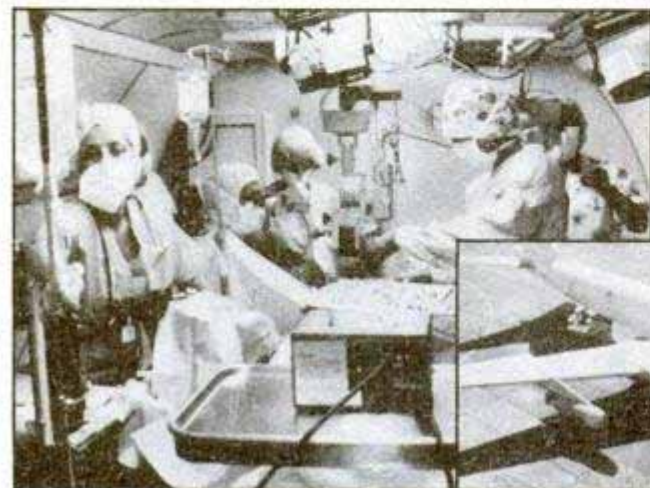
## MEDICINE

### Sight flight takes off

**W**hen Project Orbis's DC-8 jet takes off, the hopes of thousands of people around the world go soaring. The jetliner turned eye hospital was donated by United Airlines to Project Orbis last year. After a year in operation, the flying eye hospital has landed in 27 cities in Latin America, Africa, Asia and Europe. With a small but sophisticated operating room, X-ray facilities and classroom, Orbis has a dual mission—to bring advanced eye

surgery techniques to people in remote locations and to train ophthalmologists in new surgical techniques.

The surgical area includes scores of tools for delicate microsurgery, permitting Orbis's head surgeon and two residents to perform operations to remove cataracts and repair damaged nerve tissue. Orbis expects to make a substantial dent in the number of people worldwide with sight-threatening illnesses.




Using microsurgical tools, doctors can bring advanced eye surgery techniques to remote parts of the world aboard the Project Orbis flying eye hospital, a DC-8 jet (inset). In its first year, Orbis landed in 27 cities.

## MILITARY

### Super jumper

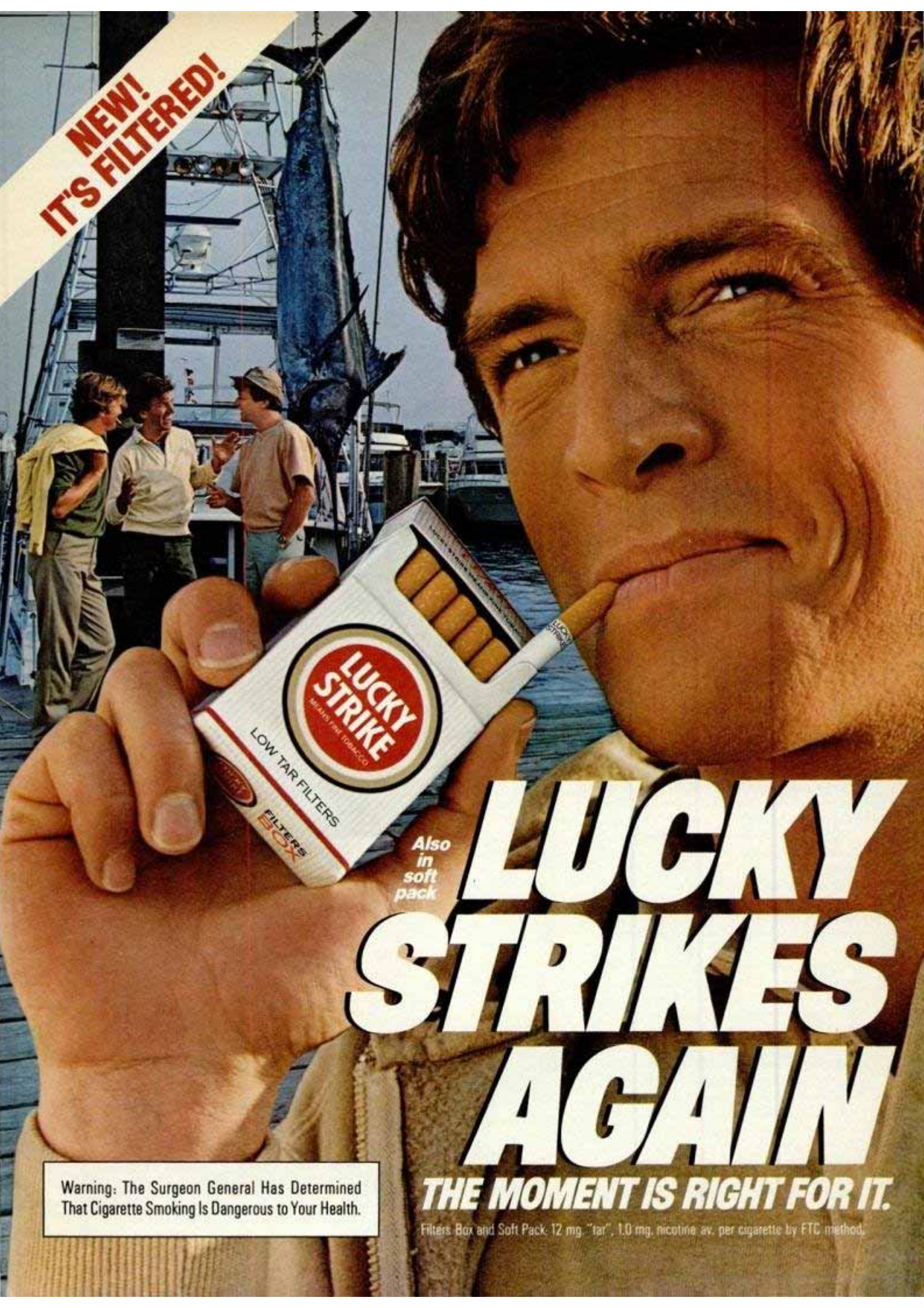


McDonnell Douglas Model 279-3 flies twice as fast as Harrier and can take off vertically.

**M**cDonnell Douglas, which makes the AV-8 V/STOL Harrier jets, is testing a new kind of jump jet this summer. Designated Model 279-3, the craft flies twice the speed of sound, about double the Harrier's top speed of 692 miles per hour. A high-thrust plenum chamber engine has a maneuverable nozzle, capable of giving the jet vertical lift. First test flights are being run at NASA's Ames research center in Palo Alto, Calif. The Navy and Air Force have shown an interest in the craft. 



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## WATCHES

(Continued from page 78)

and infrawave door unlocking transmitter, slides in, buckles up and takes off.

Reaching his home, Tock pulls morosely into his garage, enters his living room and checks the time on his Edmund Jogger watch (33,218). He drifts off to sleep watching a rerun of *60 Minutes* on his Seiko TV watch.

Okay, so that was a little farfetched. No one would own and wear all those watches. The point we're making, though, is very real. All those watches with all those functions exist today.

### Imagination takes over

This explosion in watch technology is, of course, due to the advent of the microchip and of integrated circuitry much like you would find inside an expensive computer. Now that it is possible to fit literally thousands of transistors within a watch case, designers are able to give imagination full rein.

We were particularly impressed by the memory watches. While you can indeed use these to enter a phone number, they have many other uses. How many times has someone given you a quick address or name and you wished you had just one sheet of paper handy? With a memory watch, you're always ready to "write" something down. These watches range in cost from about \$20 for Marcel's No. 731 to approximately \$45 for the Edmund 33,217.

The FM stereo watches all deliver amazingly good sound. The power supplies are light and no bigger than an old-style hearing aid, so they fit invisibly in a pocket. The headphones, of the kind made popular by Walkman-style radio, are light and comfortable. The Marcel watch (757) has the best on-face tuning dial—easy to grasp and smooth to turn. These FM stereo watches cost from \$20 to \$30.

Sports-minded people should find many of these watches useful. The watches that time sporting events, like Seiko's Rallye Timer and Sports Timer, also keep track of your jogging pace.

Sports watches can be found in all price ranges, from Timex's \$27.95 timer to Seiko's \$124 Sports Timer. Price depends mostly on such factors as material used in the case and band.

Of course, the calculator watches are the most versatile for most people. The ability to have a complete calculator within reach at all times is quite handy. While most feature a face full of buttons, we were quite impressed by Casio's touch-sensitive, flat display.

Calculator watches are all available for approximately \$25 list. The list prices, however, are only suggested.

The question arises—particularly when you consider watches that take

your pulse, measure your temperature or even show you a TV program—are these just gimmicks?

We called a number of well-known companies in the watch manufacturing field. We found that many of the companies that made watches in the most expensive jewelry store categories went far out of their way to avoid manufacturing watches such as these.

"We make watches," one representative of a high-end watch company told us, "not toys." He seemed miffed that we had even thought to call him.

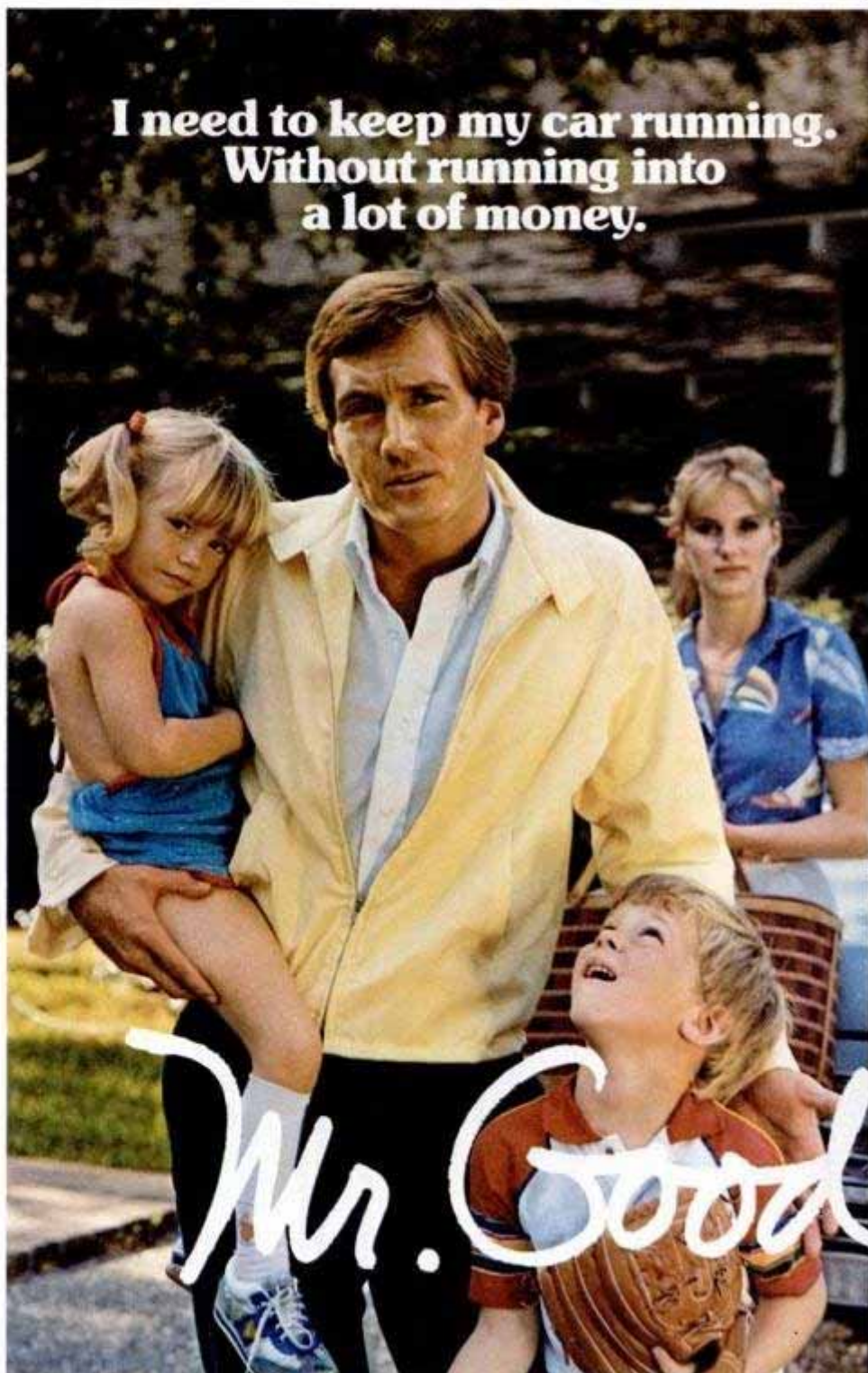
This, we think, is snobbery. For if there is any one thing that all of these

watches seem to have in common, it is that they keep almost perfect time even if their bands are made of alloy and they have no diamonds.

With solid-state electronics, even the least expensive watches can give you amazingly accurate timepiece performance—as accurate as that achieved by more expensive watches before they miniaturized the transistor.

So if you need a watch or two, give some thought to the less mundane models shown here. They're fun, they're accurate and they're amazing in their own right. By the way, do you have the right time? **FM**

I need to keep my car running.  
Without running into  
a lot of money.



## HELICOPTER

(Continued from page 75)

lines and alter course to let ships pass.

On the third day, we made an emergency landing at Koartac, a remote Eskimo village. The fuel transfer pump had malfunctioned, jettisoning most of our fuel. Surprisingly, the Eskimo chief had two barrels of fuel in his back yard. After pumping the fuel on board by hand, we paid him with a Shell credit card. (The chief was convinced the oil company would accept Perot's make-shift bill.—Ed.)

While heading to Greenland, we flew over our first stretch of open water, the Labrador Sea. I began to wonder what it would be like if our fuel pump malfunctioned again. A man can only survive for a few minutes in these freezing waters. Fortunately, we were wearing Air Force survival suits designed to keep us alive for 24 hours.

Crossing the Greenland icecap was spectacular. There was nothing but flat, smooth ice from horizon to horizon. While landing on the icecap, the temperature, wind and lack of scenery made me feel like I was on another planet.

We made it across the North Atlantic to Sumburgh in the Shetland Islands. That night, sleeping was difficult. An arm-wrestling championship was being conducted in the town's only bar right below.

### Taking the lead

The next day we chased sheep over the Scottish countryside while en route to London, where we overtook Dick Smith in his Bell Jet Ranger (he had scheduled too many stopovers). Now we knew we would be the first men to circle the globe in a helicopter. We quickly flew to France, then south over the Mediterranean into Egypt, where both the scenery and political climate began to change. The army greeted us in Luxor when we were forced to make an unscheduled stop for fuel.

Soldiers surrounded the helicopter. I began to relax when I realized all they wanted were cigarets and candy bars. But their superiors were not as easy to please. Our stay in Egypt ended only when we paid several "surcharges" to the appropriate officials. If we landed in Iran, it would take more than money, cigarets and candy bars to get us out. Jay wanted to land to get his picture taken, but I convinced him it wasn't a good idea, since he's still a wanted man in that country.

We arrived in India to another military welcome. The Indian Air Force was upset because we didn't follow their assigned air route. They wanted us to fly 850 miles to Delhi without stopping. Our range was only 750 miles.

Fake position and altitude reports didn't fool the Indian air traffic controllers. Realizing that the controllers were getting suspicious of our position, we threw all our maps out the window. Our story was simple—we got lost. Pleas of ignorance, three letters of apology and a promise never to return got us back into the air.

### Guns and interrogations

We ran into thunderstorms over Burma and had to make an unscheduled stop in Mergui. The tower refused to let us land, but we had no choice—we needed fuel. The Burmese army greeted us with automatic weapons and conducted individual interrogations. Amazingly, our stories matched. I was taken downtown by armed escorts to exchange enough money to buy fuel. I wondered if I would see Jay and the *Spirit of Texas* again. Forty-five minutes later, I returned and found a Burmese colonel sitting in the helicopter with Jay. The colonel was wearing a *Spirit of Texas* baseball cap and smoking cigarets.

On the 19th day, we landed at Clark

(Please turn to page 128)

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## HELICOPTER

(Continued from page 127)

Air Base in the Philippines. We enjoyed all the comforts of home: football games, steaks and country music. We had only one problem—Typhoon Ken. The typhoon was threatening to delay our trip. If we stayed too long at Clark, the *Spirit of Texas* would be grounded. We gambled on flying ahead of this menace. Our helicopter passed through the western edge of the storm. Battling 50-knot head winds, it was a slow trip to Taiwan. To stay ahead of the typhoon, we arrived in Japan one day early.

The next big challenge was crossing the North Pacific. For three days, we waited in Kushiro, Japan, for the *McKinley* to reach the rendezvous point (48-04N, 159-12E). During that time, we discussed the techniques for landing on ships, practiced emergency procedures and privately wondered if we could find the *McKinley* in the middle of the Pacific.

On September 26 at 2 a.m., we started east in pursuit of the *McKinley*, 750 miles away. Typhoon Ken had caught us again. We took off with 500-foot ceilings and rain. Every 30 minutes, we made radio contact with the ship. We started receiving the non-directional beacon from the *McKinley*, 230 nautical miles from our rendezvous point.

### Minor damage

The luck of the *Spirit of Texas* held. At 0014 Greenwich Mean Time on September 26, we landed on the heaving deck of the *McKinley* with only minor damage to the helicopter—a few rivets were jarred loose. Refueling took 30 minutes. Jay and I didn't want to get seasick so we took off quickly. Head winds caused by the typhoon slowed our ground speed on the second leg of the Pacific crossing, and confused our fuel calculations. Again, our luck prevailed and the winds changed. After flying 1,400 miles in 14 hours and 30 minutes, we landed on the island of Shemya, Alaska. Only 15 minutes of fuel remained.

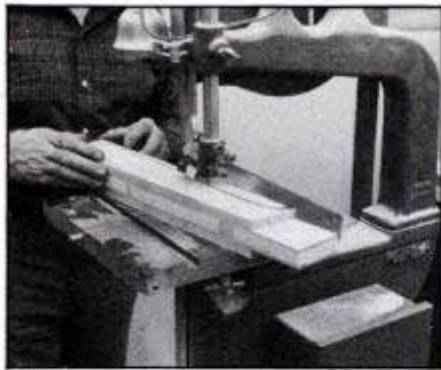
Leaving Shemya, we fought fog, rain and icing as we rushed back to Dallas, determined to complete our trip within 30 days. We arrived home safely on September 30—29 days, three hours and eight minutes after takeoff. We had flown 22 of the last 24 hours to reach our goal. (Dick Smith finished his voyage as expected in the first week of October.—Ed.)

The trip was an all-American undertaking: American helicopter, American avionics and an American crew. It once again proved this country is the world leader in aviation.

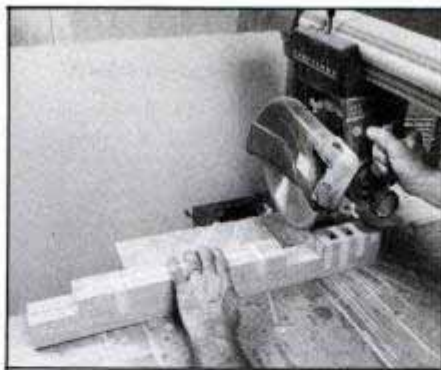
PM

## OLD-FASHIONED PORCH SWING

(Continued from page 95)



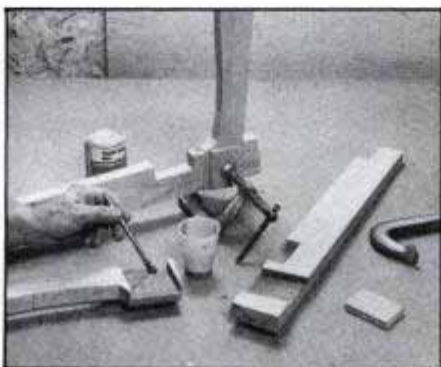
After cutting half-laps in seat-frame nailers (O), tape them back-to-back for uniform contour cuts with a band saw.



Tape together stock for back frame sides (N) to cut matching joints for the back frame top and bottom (D and E).



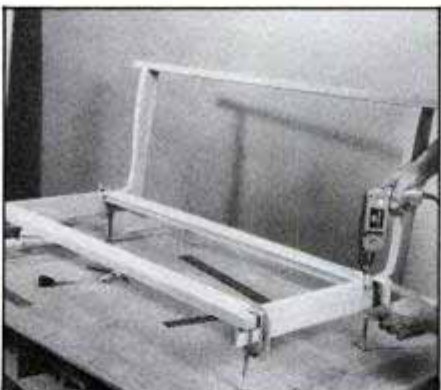
Wide belt sander flattens concave curves on seat nailers (O) where slats will join. Use narrower sander in convex areas.



Half-lap joints, glued and clamped while curing, require no screws. Ragged ends are cut off after joints strengthen.



Feather board clamped to saw table is used to hold stock against fence while cutting dadoes in frame members.



After spotting and boring plug recesses in frame members, assemble temporarily and bore screw pilot holes as shown.

nailers (O) actually have a series of flats in their top surfaces that will enable the seat slats (B) to lay flat when in position. Use either a band or scroll saw to cut the contours into the seat frame nailers. Lay out the positions for the slats on the nailers, then create flat surfaces for each slat by sanding. A belt sander can be used on the convex sections, but a narrow belt sander or hand sanding will be necessary on the concave sections.

Rip the stock for the back frame top and bottom (D and E) and the seat frame front (C), and cut the pieces to length. Note that the top of the seat

front frame (C) should be beveled as shown in the side assembly view on page 95.

Next, cut dadoes in the back frame top and bottom (D and E) for the back slats. Since it'll be extremely difficult to install the slats if any of the pieces have a slight bow or twist, it's advisable to cut the dadoes a hair wide so the slats will fit with a slight amount of play.

Mark the screw hole centers in the top and bottom pieces for the back frame (D and E) and in the seat frame front (C). Then bore 1/2-in.-dia. holes 1/4 in. deep for plug recesses (see plug

(Please turn to page 130)

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## PORCH SWING

(Continued from page 129)

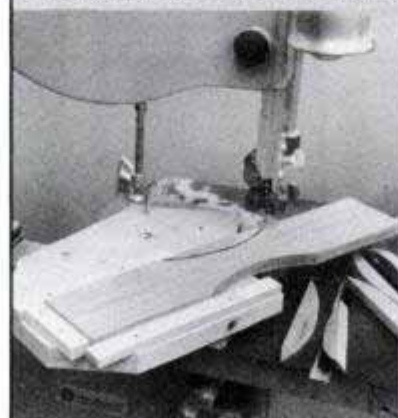
detail, page 95). Use a brad point bit for this if you have one in order to bore clean-edged holes. Follow up by boring the screw body holes in these pieces.

Clamp parts of the back and seat frame together. Then use a portable drill to bore the screw body holes into the side members. While the parts are assembled temporarily, you should

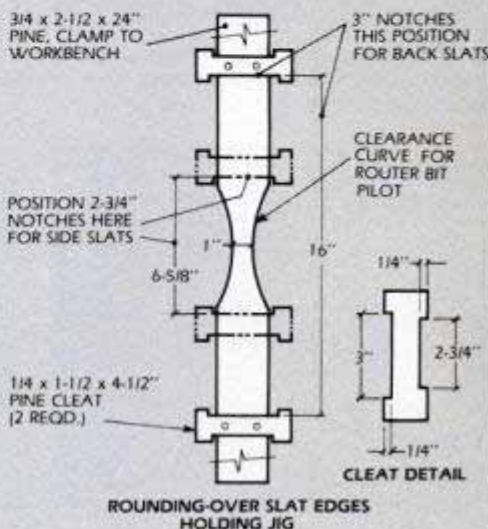
mark the intersections for the stopped corner-rounding cuts (at the ends of C). Disassemble and rebore the holes in parts C, D and E for the screw shank diameter.

Small blocks (P1) are inserted to fill the gaps in the rails between the back slats (F). Longer blocks (P2) are used to fill the gaps at the ends of the bottom and top back frame. Glue the blocks in place, making sure those in the top are aligned with the ones in the bottom.

## 2 HANDY JIGS FOR THIS PROJECT

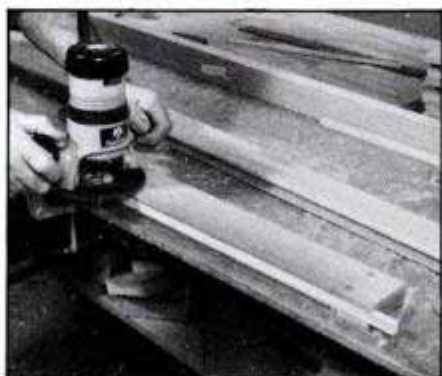
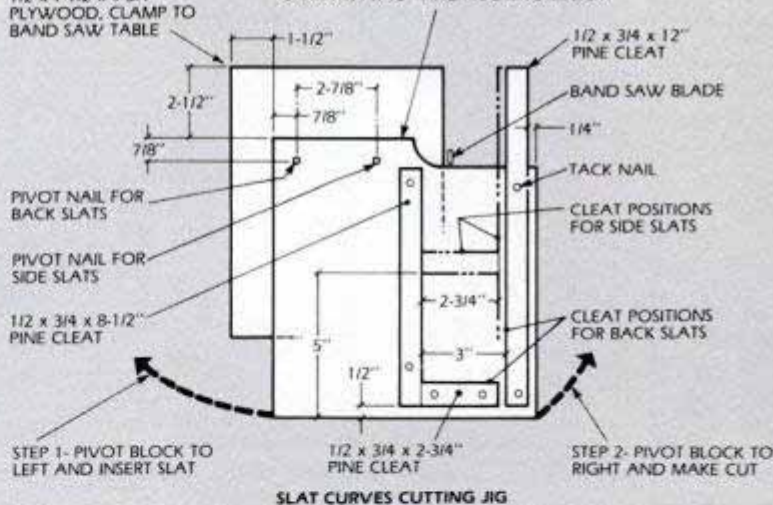


Use slat curves cutting jig (above) with band saw and holding jig to round corners with router.

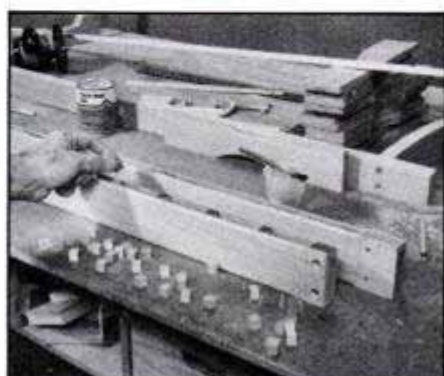


1/2 x 7-1/2 x 9-3/4" PLYWOOD, CLAMP TO BAND SAW TABLE

3/4 x 9-1/4 x 10" PINE PIVOTING BLOCK



Insert temporary filler strip in dadoes of frame members to guide the router bit when rounding over corners.



Spacer blocks glued into dadoes create mortises for slats. Blocks in opposing members must align perfectly.

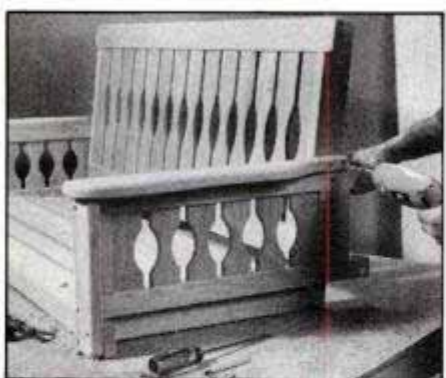
Cut 1/2-in. stock to size for the back slats (F). The simple jig shown in the drawing (page 130) will make it easy to cut smooth, uniform curves in the slats. Set up the holding jig (page 130), and use a router to round over only the front corners of the back slats (F). The corners of the end slats (L) are rounded over on both sides. Finish-sand all the parts before assembly.



Slats are first glued only at the bottom. The top is screwed in place dry. Use masking tape to nurse slat tops into place.



When glue on slat bottoms has set, flip swing over, remove unglued top, glue up mortises and remount top with screws.



The armrests are fastened last. Note that all the rounding-over cuts have been made before the final assembly.

Glue and screw the seat frame front (C) to the seat frame nailers (O), then the back frame bottom (E) to the back frame sides (H). Attach the partly assembled back frame to the seat frame, gluing up the half-lap joints on parts N and O.

Glue the back slats into the back  
(Please turn to page 132)

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Sign here \_\_\_\_\_

## PORCH SWING

(Continued from page 131)

frame bottom (E), then slip the unglued back frame top (D) over the top of the slats, screwing it into place temporarily. When the glue at the bottom of the slats has set (about 2 hours), turn the piece over, remove the frame top (D), glue up the mortises and screw it back in place permanently.

Cut four pieces for each arm support assembly (K1, K2, L and M). After cutting dadoes in parts K1 and K2, cut the tenons on L and M to fit the dadoes. Glue the lower tenons on parts L and M

into the lower side frame (K2) only. When the glue has set, add the upper side frame member (K1) without gluing it.

Round over all the inside corners on each side. Glue in the slat spacer blocks (P1), and follow the same procedure for gluing in the slats as used for the back assembly.

### Final assembly and finish

Cut the seat slats (B) to size, bore the plug recesses and screw pilots, then round over the top corners and sand. The front edge of the front slat is rounded over with a 1/2-in.-radius router bit.

Cut plugs of contrasting wood, such as poplar, and glue them into the recesses to conceal the screwheads. Sand the plugs flush before attaching the sides to the seat in order to have full access with a belt sander.

Cut out the armrests (H) and vertical supports (I) and round their corners. Then counterbore and bore the screw pilots. Mark the backs of the arm support assemblies for the angled cutoff. Make the cuts, sand and then assemble the remaining pieces. Conceal all screws with flush-sanded plugs.

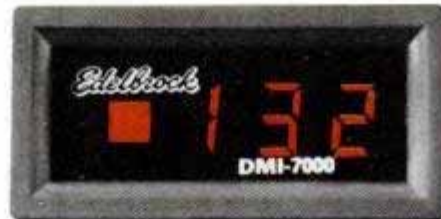
Although we call this project a "porch" swing, it can be suspended in many places around the home and yard. For example, if your home doesn't have a suitable porch, you can run a beam between two trees and hang the swing from it. Or, you may wish to build a free-standing frame for mounting the swing.

Be sure that the structural members and fasteners are strong enough to hold the load. Check with your local building department for minimum requirements for the beam size considered safe for the span. Also check the shear strength for the fasteners you want to use.

Bore holes for the screw eyes in the swing armrests. Use a cold chisel to force the screw eyes open just enough to permit entry of a chain link. Install screw eyes in porch ceiling joists (or an overhead beam) and open them slightly. Hang the swing with chain as specified in the drawing and finish the oak to suit your own tastes. We used two coats of gloss polyurethane varnish on our swing. **PM**



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### MATERIALS LIST— OLD-FASHIONED PORCH SWING

Key	No.	Size and description (use)
A	1	3/4 x 2 3/4 x 50" oak (front seat slat)
B	6	3/4 x 2 3/4 x 50" oak (seat slat)
C	1	3/4 x 2 3/4 x 56" oak (seat frame front)
D	1	3/4 x 3 x 52" oak (back frame top)
E	1	3/4 x 3 x 50" oak (back frame bottom)
F	12	1/2 x 3 x 15 3/8" oak (back end slat)
G	2	1/2 x 2 3/8 x 15 3/8" oak (back end slat)
H	2	3/4 x 4 x 25 3/4" oak (armrest)
I	2	3/4 x 3 x 12" oak (vertical arm support)
J1	8	1/2 x 2 3/4 x 6 3/4" oak (side slat)
J2	4	1/2 x 2 3/4 x 6 3/4" oak (side end slat)
K1	2	3/4 x 1 3/4 x 24" oak (upper side frame)
K2	2	3/4 x 1 3/4 x 24" oak (lower side frame)
L	2	3/4 x 1 3/4 x 6 3/4" oak (side front)
M	2	3/4 x 6" x 6 3/4" oak (side rear)
N	2	3/4 x 3 x 28" oak (back frame side)
O	2	3/4 x 3 x 24" oak (seat frame nailer)
P1	46	3/8 x 1/2 x 1/2" oak (spacer block)
P2	4	3/8 x 1/2" x length to fit, oak (spacer block)
Q		3" No. 14 fh screw
R		2" No. 14 fh screw
S		1 3/4" No. 14 fh screw
T		1/2"-dia. wood plug
U	4	3/16 x 4" screw eye
V	2	3/8 x 4 1/2" screw eye
W		3/8" swing chain

\*Rough dimension, trim to fit.

Misc.: Plastic resin glue, gloss polyurethane varnish.



## PAINT PROBLEMS

(Continued from 103)

and rust is forming on the inside of the sink cabinet. Is it possible for me to refinish them?

**A.** Yes. Start with a clean surface. Remove rust with steel wool and prime the bare spots with metal primer. Rub down the cabinet surfaces with 00 steel wool to remove gloss.

You can use any interior paint, oil or latex, for the topcoat, but for best results, use a paint formulated for metal. Auto finishes are superb, especially when sprayed on. When spraying, mask areas not to be painted. Extinguish any pilot lights in the room and wear a respirator. Apply thin, even coats, rubbing between coats with 000 steel wool. Make certain the room is well ventilated.

**Q.** When painting a room in which the ceiling color contrasts with the wall color, I have a hard time making the contrast line neat. Often, the plaster corner is not exactly straight, and if I follow it, the line looks wavy. What do you recommend?

**A.** The Shur-Line Tool Co. markets a paint pad equipped with guide rollers designed to solve just such a problem. Paint the ceiling color and let it dry. Load the Shur-Line tool in a paint tray, being careful not to get paint on the guide wheels. Start at a corner and press the pad against the wall firmly, with the wheels riding on the ceiling. Work your way around the room.

The Shur-Line tool is also excellent for painting contrasting colors around casings and at the floor, or anywhere there's an adjacent perpendicular surface. If you paint a straight line rather than trying to follow the exact corner, the corner will look straight.

**Q.** I've heard that a freshly scraped wood floor should be finished with four coats of polyurethane varnish. That's pretty expensive, not to mention time-consuming. Is there any way to seal the floor before applying the varnish to reduce the number of coats necessary?

**A.** Yes, you can use a sealer. But be sure it is compatible with the polyurethane varnish. Dura Seal 500 made by Minwax is one such product. It's fast-drying—the first coat of varnish can be applied over it after 30 minutes. At least two coats of varnish should be applied over sealer.

**Q.** We're about to remodel and redecorate our kitchen. We'd like to change the color of our appliances. Is there some paint we can use in order to avoid buying a new stove, refrigerator and dishwasher?

**A.** You cannot change the color of your range easily. To withstand high heat levels, ranges are hot-dipped

into porcelain. The finish is so hard that no other coating will adhere well when exposed to heat. You would have to remove the porcelain finish and refinish with a silicone-base paint, the only type of paint that can withstand the heat.

While dishwashers, washing machines and clothes dryers are also porcelainized to resist rust, refrigerators and freezers are usually finished with enamel. Enamel finishes should be rubbed with No. 1 steel wool to produce a suitable bonding texture and sprayed with a paint formulated for metal. Auto finishes can be used to recreate the luster of the original finish.

**Q.** We're planning to repaint a room a color that's incompatible with the color of the housings on our electric baseboard heaters. What's the best way to refinish them?

**A.** Spray metal baseboard heaters with an enamel made for metals. The heaters should be cleaned thoroughly and rubbed with fine steel wool before spraying.

If you don't particularly care about producing a factorylike finish, a thermoplastic latex may either be brushed or sprayed on heater housing.

**Q.** We moved into an old house with wooden countertops that had been painted. We want to strip off the old paint and use a natural finish on the tops. What type of finish is suitable for surfaces where food will be prepared?

**A.** Constant Quality Wood Bowl Seal, a lacquer-base finish available from Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461, can be used to finish your countertops. It seals wood pores and is stain-resistant, colorless, odorless, tasteless and nontoxic. Wood Bowl Seal should be applied in several coats to seal effectively and bring out the richness of the wood grain. It is not suitable for previously oiled surfaces, but may be applied over lacquer if the surface is sanded lightly first.

**Q.** During my last paint job, I covered the floor of the room I was painting thoroughly, but when I finished, I found I had tracked latex paint throughout the rest of the house. How can I get out stains on the carpet and varnished wood floors?

**A.** To avoid tracking paint into unprotected areas, many pros wear galoshes that they step out of when leaving the work area. Getting dried paint out of carpeting is difficult. You might try scraping the carpet fibers with a razor. If you have a high-pile carpet, you might be able to get away with carefully cutting out some of the stained fiber.

Do not use solvent on the varnished wood floor. Try washing the paint spots gently with a steel wool soap pad. If that doesn't work, try scraping the paint off with a razor blade. **PM**

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## OFF-ROADERS WITH GUTS

(Continued from page 83)

includes a lot of thoughtful extras: skid plates, tach, digital clock, console, rear-window defroster, adjustable-speed wipers, spoke-steel wheels, radial tires and a whole lot more. The driver's bucket seat has an adjustment that compensates for weight and has three height positions. It's a tricky addition to this vehicle that we consider unnecessary. Other drivers disagreed on this one. The seats themselves feel the best of the lot.

Mitsubishi uses the same 2.6-liter, sohc Four as in its pickup and Starion, but turbocharged. It delivers 105 hp. EPA estimates put fuel mileage at 19/24 mpg.

### Ford Bronco II

This new Bronco is an outgrowth of the Ranger pickup. Basically, it offers the same engines, transmissions and equipment as the Ranger. Currently, you can get only the 2.6-liter V6, but the 2.3-liter Four is slated for 1984. A four-speed gearbox is standard, with a five-speed and automatic optional. Our V6/four-speed test Bronco II had a lot of options, including cruise control, tach, tilt wheel and overhead LED clock with map light.

All three vehicles were well crafted, with good workmanship, but Ford doesn't pay quite the attention to detail that it might. For instance, the Bronco's plastic door trim quits and starts again above the windows, so the mating edge looks ragged. The dash tries to simulate wood veneer, but fools no one. The S-10 Blazer's instrument panel, on the other hand, simulates brushed stainless steel and succeeds in that illusion.

The Bronco seats feel comfortable at first, but offer relatively little lateral or lumbar support. Steering tends to be imprecise, with little road feel. The V6 has no reserve power, but it's peppy enough if you learn to live within its limitations. The EPA says 20/30 mpg for the V6 with four-speed.

The Bronco II has the easiest-to-use transfer-case stick, although shifting while moving isn't recommended. Driving in 4wd on dry pavement isn't recommended, either. Manual locking hubs are standard. Automatic locking hubs are optional on '84 models. The Bronco II uses an adaptation of Ford's Twin I-Beam front suspension. Four-wheel drive makes the Twin I-Beam setup look complicated and hard to get at, but the book says it rarely needs servicing.

In 4wd, we found the Bronco II's off-road power and handling marginal and wouldn't suggest trying to run the Baja in stock trim. For road driving in winter and bad weather, however, it's a fine

vehicle, and the Bronco II even comes fairly close to a small station wagon in space utilization.

### Chevrolet S-10 Blazer

Like the Bronco, the new Blazer springs from a pickup—in this case the Chevy S-10. The S-10 Blazer we drove had the 2.6-liter V6 with four-speed overdrive automatic. A 2.0-liter Four (1.9 in California) is standard, and a four-cylinder diesel is in the offing.

The Turbo Hydramatic 700-R4 automatic in our test vehicle was one of its least appealing features. The V6 with four- or five-speed would perform a lot better. While the 700-R4 is a good transmission, the torque converter saps too much power, and in both THIRD and high range there's just not enough oomph for comfortable passing.

Then, too, the Blazer's shift quadrant doesn't really tell you which range the automatic transmission is in. It's hard even to find REVERSE. We drove perhaps 30 miles before discovering that the automatic would upshift to FOURTH (overdrive) range if only the shift selector were placed so it read NEUTRAL.

Although the owner's manual says it's all right to shift back and forth between 2wd and high-range 4wd with the vehicle moving, the transfer lever is balky to shift, and the gearcase is noisy in low range. Ultimate shifting comes via vacuum, so theoretically the lever shouldn't bind, but it did in our test vehicle. Once shifted, however, the Blazer has good pulling power in sand, mud and deep water.

On city streets, the Blazer is the most comfortable and most quiet of the group. It feels like any compact GM sedan. Good seats and ample insulation help make it so. Steering response on dry pavement is quick and positive. In deep sand and on slippery surfaces, the Blazer understeers badly.

Because of the Blazer's big, 235/75R15 off-road tires and wheels, the spare takes up the major part of the cargo deck and leaves too little space, even for a couple of grocery bags. This is perhaps the Blazer's greatest flaw. It's possible to order two smaller sizes of tires (195 and 205), each with spares that stand upright inside the vehicle. The Blazer offers no external mount at all—a regrettable oversight in our opinion.

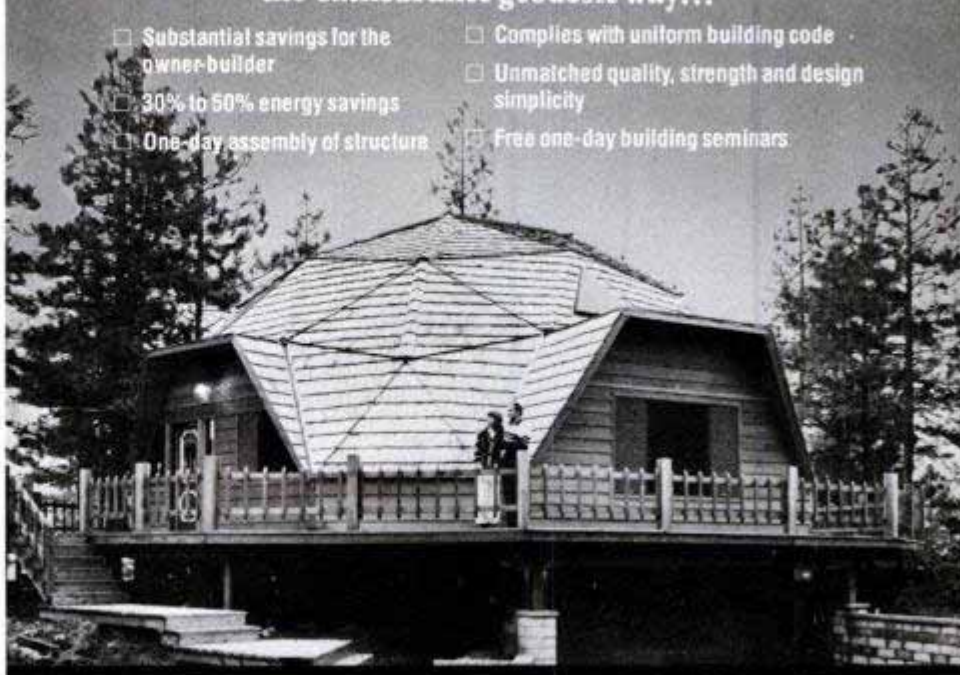
Sportsmen and families interested in four-wheeling—either off-road or on—have never had a greater choice of vehicles than they do now. And the upcoming Jeep XJ wagon, due this fall, will add to the selection.

The first decision to make, though, is how you plan to use your 4x4. After that, it's just a matter of checking out the light-duty types or scrutinizing those meant for the high country. Then, select options to match your needs. **PM**

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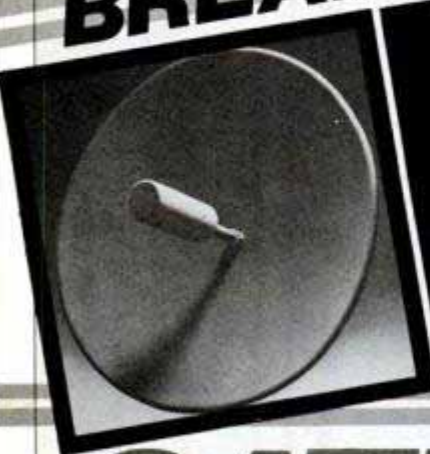
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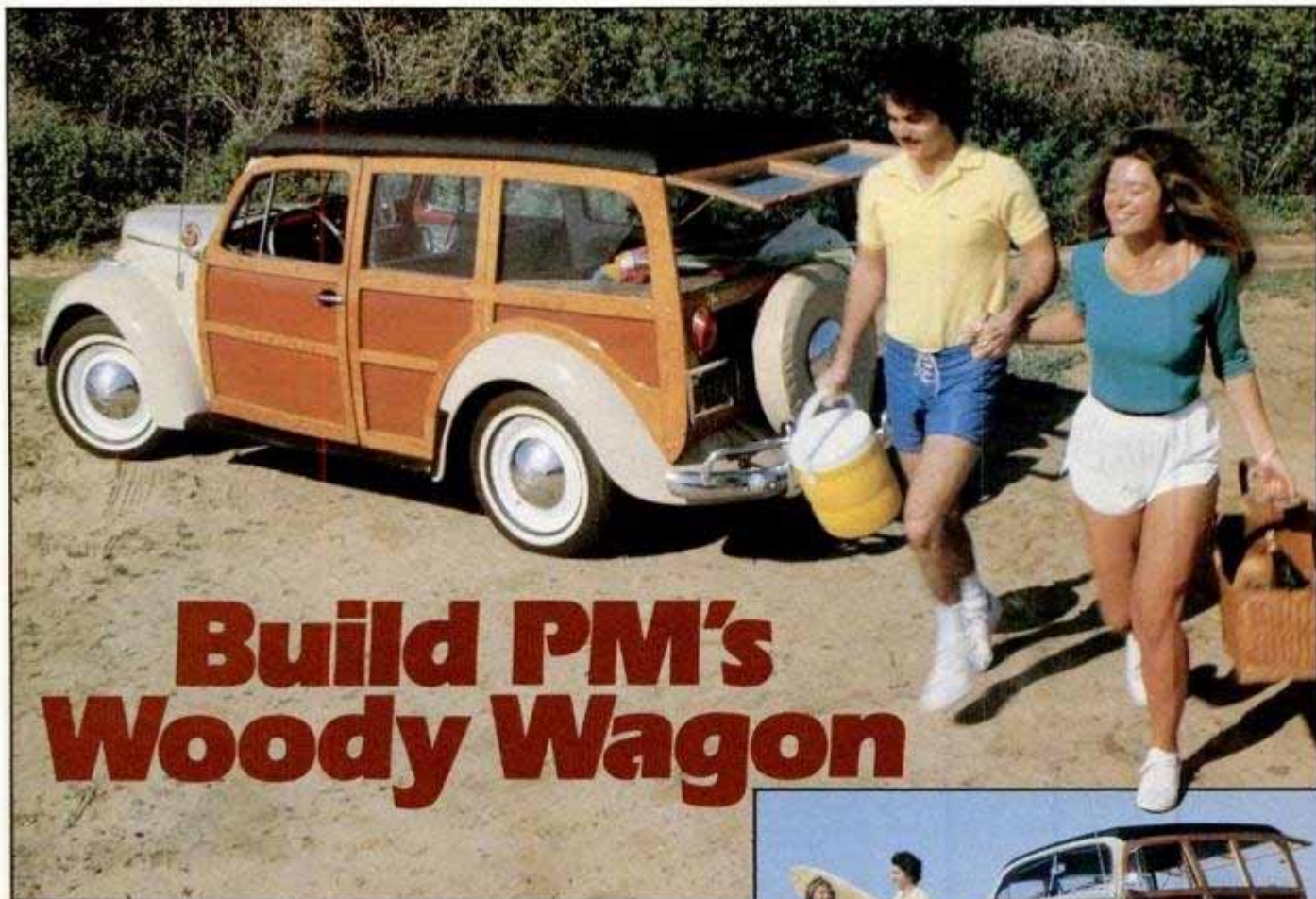
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# Build PM's Woody Wagon

**T**his little Woody didn't take all that much cash, or hours, to build but the minute it hit the freeway it started getting waves, yells and thumbs-up signs. The Woody project had a special meaning for me: I was almost born in a 1940 Ford Woody, learned to drive in one, blew my first engine in one and used one for some fun surf safaris in my younger days.

For the prototype we used an older '67 VW Beetle because its wheels closely resemble the '40 Ford wheels. Later-year front fenders are bolted on because they, too, closely resemble the '40 Ford. It took one morning with hacksaw and sabre saw to trim off the rear of the roof down to the windowsill lines. The side wood frame is cut from one 4x8 sheet of 3/4-in. ACX plywood, on each side.

## Cut panels in one piece

The entire door and rear panels should be cut out in one piece if possible. This eliminates any fancy joinery. The panels are strong by themselves. Next, one panel of 1/4-in. mahogany was cut to fit behind each 3/4-in. panel and the assembly was attached to the side with countersunk bolts and sheet-metal screws. Finally, a heavy wooden framing was bolted around the top and the lath and beam roof screwed together exactly as was done on the woodies of the '30s and '40s.

The increased headroom and better

*The Woody Wagon, a nostalgia trip for many PM readers, is constructed on a VW Beetle chassis. Picnic gear (above) and a surfboard (right) fit inside.*



visibility give the passenger in the rear a more comfortable ride than does a standard Beetle rear seat. This seat also folds down for added carrying space.

The PM Plans provide a simple, full-scale pattern for the side panels. Thus, you will spend a minimal amount of time on the fitting. And the project is a fast one. All told, once work starts, you should be able to complete the project in four weekends—at a cost of about \$600. The '40 Ford fiberglass hood is available from Sears or J.C. Whitney, and it can be easily modified to fit older Beetles.

This project is a fun one from start to finish. The end product is a happy-looking, useful little car that seems to attract friends wherever it goes.

—Peter Stevenson

## HOW TO ORDER PLANS

Plans for the PM Woody, including how-to-build instructions, materials list and full-size pattern for side panels, are available for \$14.95 postpaid. Send check or money order to PM Woody, Stevenson Projects, Box 584, Del Mar, Calif. 92014. Canadian residents please remit in U.S. funds.



*Pieces are cut, ready to install. Door and side frames are ACX plywood with contrasting mahogany plywood panels. Roof and rear window members are in back.*



*Rear roof has been trimmed to windowsill line and side panels are positioned in place. Later, wood framing is bolted around top and roof members added.*

# Install Your Room Air Conditioner In The Wall

You don't have to give up a window to have air conditioning this summer.

BY BILL HARTFORD  
MANAGING EDITOR

**T**he trouble with a window air conditioner is that it's an eyesore and a block to summer breezes. That's why a through-the-wall installation is the perfect solution. Cutting through a wall is not difficult in a framed house.

Our installation, in an average-size bedroom of an asbestos shingle-sided Cape Cod, is under one of the windows. A mounting at about eye level allows the most efficient operation of a room air conditioner, but our bedroom layout and a desire for the least obtrusive visual break on the outside wall dictated this location.

To find out the size of the unit needed for our 12 x 13-ft. bedroom, we called GE's Answer Center at 1-800-626-2000. The Center confirmed the fact that a 4,000- to 5,000-B.T.U. air conditioner would be big enough. For its features and heavy-duty case design—perfect for an in-wall installation—we decided to use a GE Thinline rated at 5,800 B.T.U.

The chassis of this unit slides out while you use the case itself as your "sleeve" that goes in the wall. This model comes shipped with a frame and accordion insert for window installations, so your first step is to remove it by taking out four screws.

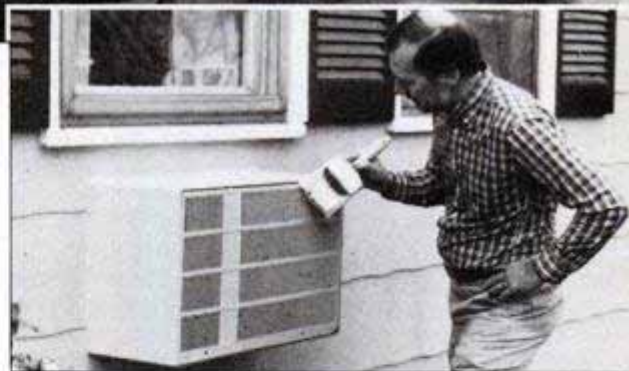
Decide whether to start the job inside the house or outside. Because of our ground-floor installation and desire to keep down the plaster mess indoors, we opened the outside first. We marked the dimensions of the case on the outside, centered under the window, and started removing shingles. If the shingles are not heavily coated with paint, it's easy to get under them with a jab saw (simply a hacksaw blade with a handle) and cut off the nailheads. If you can remove the shingles without cracking, you can reuse them.

After removing shingles, cut and fold back the felt (tarpaper) and determine how much sheathing will have to be removed to install a 2x4-in. header and sill for the case. The width of our case is 26 in. and we had to cut sections out of

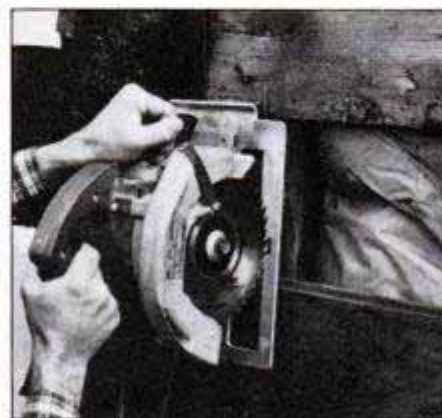
*(Please turn to page 140)*



*Final touch on in-the-wall installation is preparing molding for paint or stain. Above, we sand wood filler used to cover nailheads that were set. Outside (right), while painting replacement shingles, we painted case and outside grille to match shingle color.*



*When starting job from outside on a shingled house, first step is removing shingles without breaking them. Heavy paint made ours difficult to remove. We found it easier and faster to replace with matching shingles after job was complete.*



*Use circular saw to cut out siding between studs (make sure you wear safety glasses). Remove nails holding siding to cut down centerline of stud.*



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## AIR CONDITIONER

(Continued from page 138)

two cripple studs that ran from the window's sill to the sole plate. It was easiest to locate our header right below the windowsill framing, nailing directly to it after checking for level.

Cut out siding with a circular saw fitted with a carbide blade after removing nails at the stud where you're cutting. Set blade depth to the thickness of the siding and cut down the stud centerline so that you can renail the remaining siding in place.

Mark off the height of the case (15½ in. in this instance) on the two cripple stud sections to be removed. Add 1½ in. to allow for the 2×4-in. header and another 1½ in. for the sill. In addition, we added ½ in. on top, bottom and

sides to avoid having to force-fit the case. Take up any slack with a layer of felt. Check for level and mark with a square before sawing out the cripple stud sections. After cutting 2×4s to length for the header and sill and checking for level, nail in place. Then cut two lengths of 2×4s for the vertical frame members and toenail them in place.

Slide the air conditioner case into the completed frame to double-check the fit before closing up the wall. When you're satisfied with the fit, cut off excess insulation and repack it around the frame. Cut sheathing to suit the case opening and, finally, apply 15-pound saturated felt, using ½-in. staples and a 12-in. overlap to keep water from leaking inside.

Now you're ready to cut out the wall-



On studs under window, mark position for header and sill. Dimension is height of air conditioner case plus two 2×4s.



Section of cripple stud is removed after sawing out. Pull away from plasterboard.



Toenail sill, here, and header into place.



Use utility knife to cut back insulation.



Check framing dimensions for the case.



Check fit of case, then finish nailing.



board. Locate the four corners for the case opening by drilling through the wallboard from the outside with a 1/4-in. bit.

Then, moving inside the house, pencil-connect the holes and cut out the section of wallboard with a sabre saw. Slide in the case, noting whether its walls were predrilled for an in-wall installation. The GE we used had the holes; if yours doesn't, drill them. They're positioned to allow securing to the frame with about 1 in. of cantilever inside the house and the remainder of the case outside.

The case should be secured in the frame with a slight tilt (pitch) to the outside for drainage. Weep holes, one on each side, should be drilled in the bottom of the case if none exist. We gave the case the slight pitch needed by securing it with a 1 1/4-in. protrusion into the room at its top edge and 1 1/2 in. at

the bottom. Hold the case in place while you mark hole location and then secure it with screws through the case and into the framing.

Finish your job outside by cutting the old shingles (or replacements) to fit snugly around the air conditioner case. Run a bead of uninterrupted caulk between the shingles and case, on all four sides.

Inside the house, caulk around the case between it and the wallboard. Then cut a molding of your choice, using a miter box, to frame the unit. After trimming, set all nails and fill over them with wood filler.

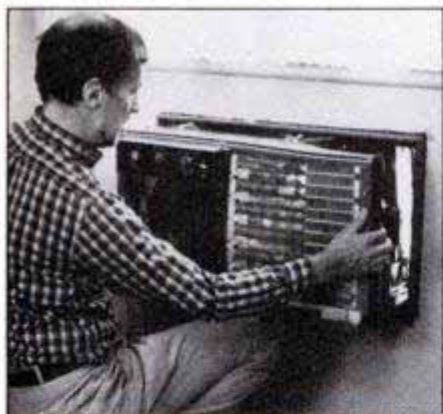
Before installing the front grille on the GE unit, we made sure to replace the chassis-securing screw. After connecting your custom air conditioner to a three-prong (grounded) outlet, you're ready to beat back summer heat and humidity—with window intact. **PM**



Cut out wallboard flush with the frame.



Screw case to frame after positioning with slight pitch to outside for drainage.



Slide air conditioner chassis into case.



Replace chassis-securing screws that were removed so case could be installed.



Replace old shingles, or install new ones, after cutting to fit around the case.



Before installing the molding, caulk between wallboard and case to cut drafts.

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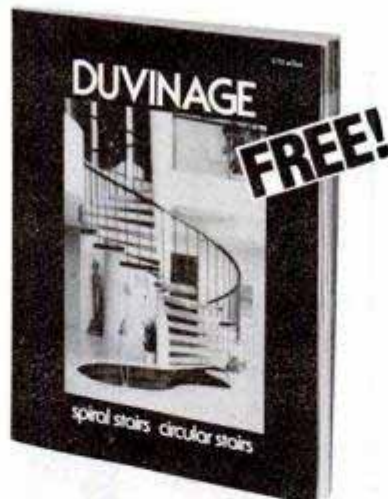
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Only \$57.00 for 10 word minimum  
\$5.70 each additional word  
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**CHICKEN** - 25 Master Chef Recipes \$3.00. Tooley, Box 9364, Atlanta, GA 30331

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**BARBECUE SECRETS**. 5 Great Basting Recipes and Cookout Tips. \$3. Chef Bob, P.O. Box 2357, Oak Park, IL 60303.

**RAVING REVIEWS** Meat Loaf. \$2.00. E.E. Edwards, P.O. Box 602-A, Amawalk, NY 10501.

**QUICK** Fudge. Minutes to make. \$2.00. Jean, 7530 Ironwood, Dublin, CA 94568

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**FREE BEERMAKING CATALOG**. Lowest prices. Homebrew, Box 158M, Haslett, Michigan 48840

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**HOME PROTECTION!** Burglar Alarm Warning Stickers . . . FREE Information . . . Write: Oakton Distributors - P.O. Box 7232, Westchester, Illinois 60153

# 1 Million Famous LCD Quartz Travel Alarm Clocks To Be Sold For Only \$5 Apiece In Mammoth Publicity Drive

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*All who wish to  
apply for one should  
write to the company before  
Midnight, Sept. 30, 1983*

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NEW YORK—One million famous LCD Quartz Travel Alarm Clocks will be sold as part of a publicity campaign for only \$5 apiece to the first one million persons who apply in writing to the company before Midnight, September 30, 1983.

These are the same nationally publicized LCD Quartz Travel Alarm Clocks advertised in *The New York Times*, *TV Guide*, *Parade* and other leading publications, with a built-in computer so powerful it never needs winding and which is accurate to within seconds a month.

The smallest travel alarm ever made, it is only 2½-inches long, 1¼-inches high, and less than ½-inch thick. Smaller than a credit card, it slips easily into pocket or purse and weighs less than one ounce.

Time and date are displayed in full Quartz digital mode, and its pleasant "beep" alarm will sound for 20 seconds or until shut off. A unique "backlight" permits viewing even in total darkness.

These famous LCD Quartz Travel Alarm Clocks will not be sold at this price by the



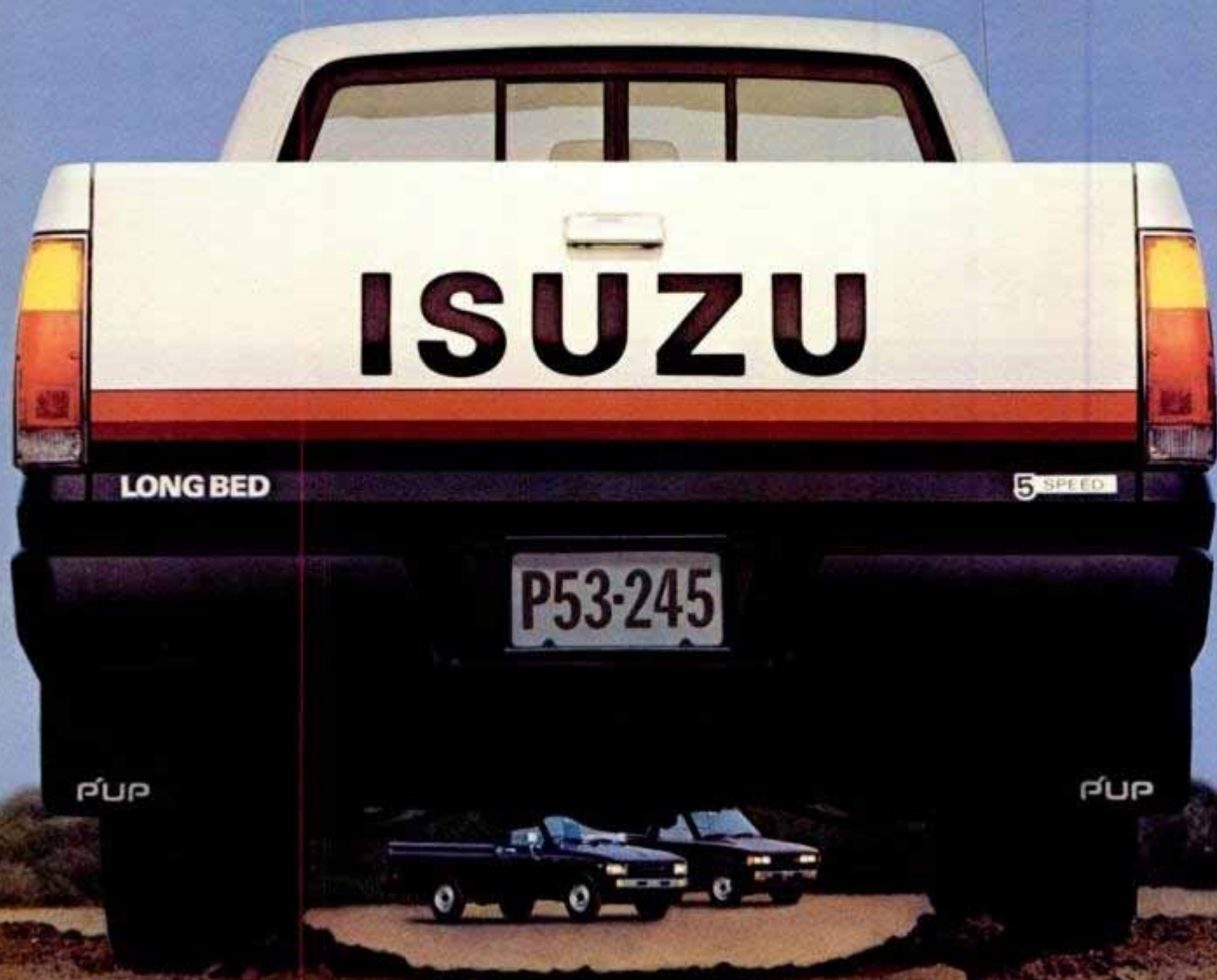
company in any store. To obtain one at this price you must apply in writing to the company address (below) no later than Midnight, Sept. 30, 1983.

Each clock carries a full one-year money back guarantee and will be replaced by the company, free of charge, if it ever fails to function.

There is a limit of two (2) clocks per address at this price, but requests which are mailed early enough (before Sept. 25) are permitted to order up to 5 clocks.

To apply for an LCD Quartz Travel Alarm Clock, mail your name and address *and this original printed notice* together with \$5 for each clock desired. Add only \$2 shipping and handling no matter how many clocks you are requesting. Mail to: **Carter & Van Peel, Travel Alarm, Dept. 114-7, Box 1723, Hicksville, New York 11802.**





# The world's toughest truck is about to take its gloves off.

No pussy footin'.  
No holding back punches.  
It's bare knuckles time.

That's what it's come down to. In today's economy, people in the market for pick-up trucks are driving a very hard bargain. They want to know the truck that delivers the best price and value for their money. And, pound for pound, nobody does that better than the Isuzu long-bed.

For instance, in the all-important area of fuel economy, we beat Toyota and Nissan with our 28 mpg city and 40 highway. We also have a range of over 764 miles between fill-ups. Which is about 40 more than either Toyota or Nissan.



Not only that. In terms of payload we carry 250 pounds more than either of our two competitors.

And just as importantly, this extraordinary fuel economy has not led us to economize in creature comforts. On the contrary. Because while the Isuzu is incredibly tough on the outside, it is unbelievably soft on the inside—with deep pile carpeting, a roomy bench or optional bucket seats.

So if you're in the market for a pick-up truck, remember that old adage—"When the going gets tough, the tough get going." And as three quarters of the world has learned over the last 40 years—nobody's tougher than Isuzu.

Tougher than the world's toughest roads.  
**Isuzu. Driving into your future.**

ISUZU GAS LONG-BED TRUCK 40 MPG HIGHWAY (28) EST. MPG. USE EPA ESTIMATES FOR COMPARISONS ONLY YOUR MILEAGE MAY VARY DUE TO SPEED, WEATHER, AND TRIP LENGTH. ACTUAL HIGHWAY MILEAGE MAY VARY. CALIFORNIA GAS MPG WILL BE LESS.

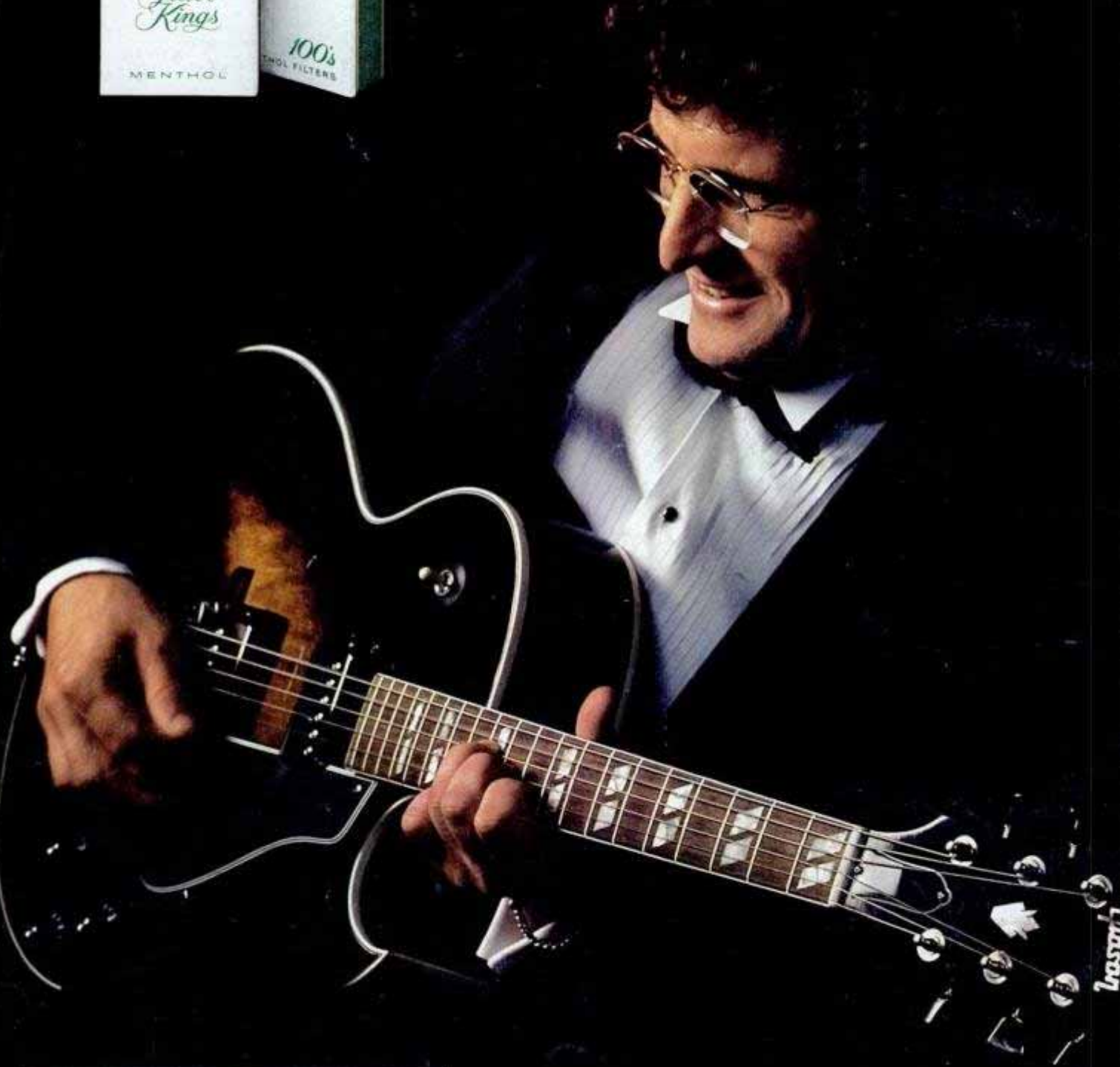
"Sponsor of the USA Hockey Team to play in the 1984 Winter Olympics."

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is hot, the taste is Kool.  
Because there's only one  
sensation this refreshing.



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

Kings, 17 mg. "tar", 1.1 mg. nicotine; Longs, 14 mg. "tar",  
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