

DECEMBER 1980 \$1.25

# Popular Mechanics

**21 COMPLETE PLANS**

- 14 Yule decorations to make in a jiffy
- 4 silver jewelry pieces you can create
- 2 knife racks to build
- Fitted case to make for collectibles

**LAST LOOK AT THE V8 ENGINE**  
**PLUS: What you should know about converting a V8 to a V4**

**A MASTER CRAFTSMAN'S 23 BEST WAYS WITH WOODWORKING CLAMPS**

**EXCITING SOLAR GREENHOUSE ADD-ON: It stores heat in the basement**

**NOW: Dashboard navigation panel guides drivers out of danger**



**DARING RESCUE FROM OIL-RIG DISASTER**







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**Deadline**

**Christmas Eve**



This One



LUBJ-KGO-XSSF

On sale from November 30 through December 24  
This is the minimum savings nationally. Regular prices  
vary in some markets.

Prices and dates may vary in Alaska and Hawaii.  
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**Sears**

Where America shops  
for Value



# THE BIG SHIFT FOR '81



## 2WD TO 4WD WITHOUT STOPPING

A revolutionary new 4-wheel-drive system! The '81 4WD Chevy Blazer has new automatic locking front hubs and a new, lightweight transfer case. Now, for the first time ever, you can shift from freewheeling 2WD into 4WD while driving under 25 MPH. Plus you can shift out of 4WD without leaving the cab.

Plus you get Blazer's new aerodynamic styling. Trim new weight. Tough truck build. Improved Six. Optional 5.0 Liter

(305 Cu. In.) V8 with new Electronic Spark Control. And more. See your Chevy dealer for details.

### More miles per gallon for '81.

IMPROVED 4.1 LITER (250 CU. IN.) SIX

**21** EST. HWY.

**16** EPA EST. MPG

Remember: Compare the "estimated MPG" to the "estimated

MPG" of other vehicles. 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 estimated highway fuel economy. 4.1 Liter Six or 5.0 Liter V8 not available in Calif.

Chevy trucks are equipped with GM-built engines produced by various divisions. See your dealer for details. Ask about leasing, too.



NEW CHEVY  
**BLAZER**

CHEVY TRUCKS

AN IMPORTANT STEP AHEAD

4WD CHEVY BLAZER WITH OPTIONAL EXTERIOR DECOR PACKAGE





### On the cover

Heroism on the part of both Coast Guard and oil rig personnel was not enough to avert tragedy when the drilling barge *Ocean Express* went down off the Texas Gulf coast. Story on page 86 tells how equipment failures combined to cause the offshore disaster.

—PM painting by Ed Valigursky

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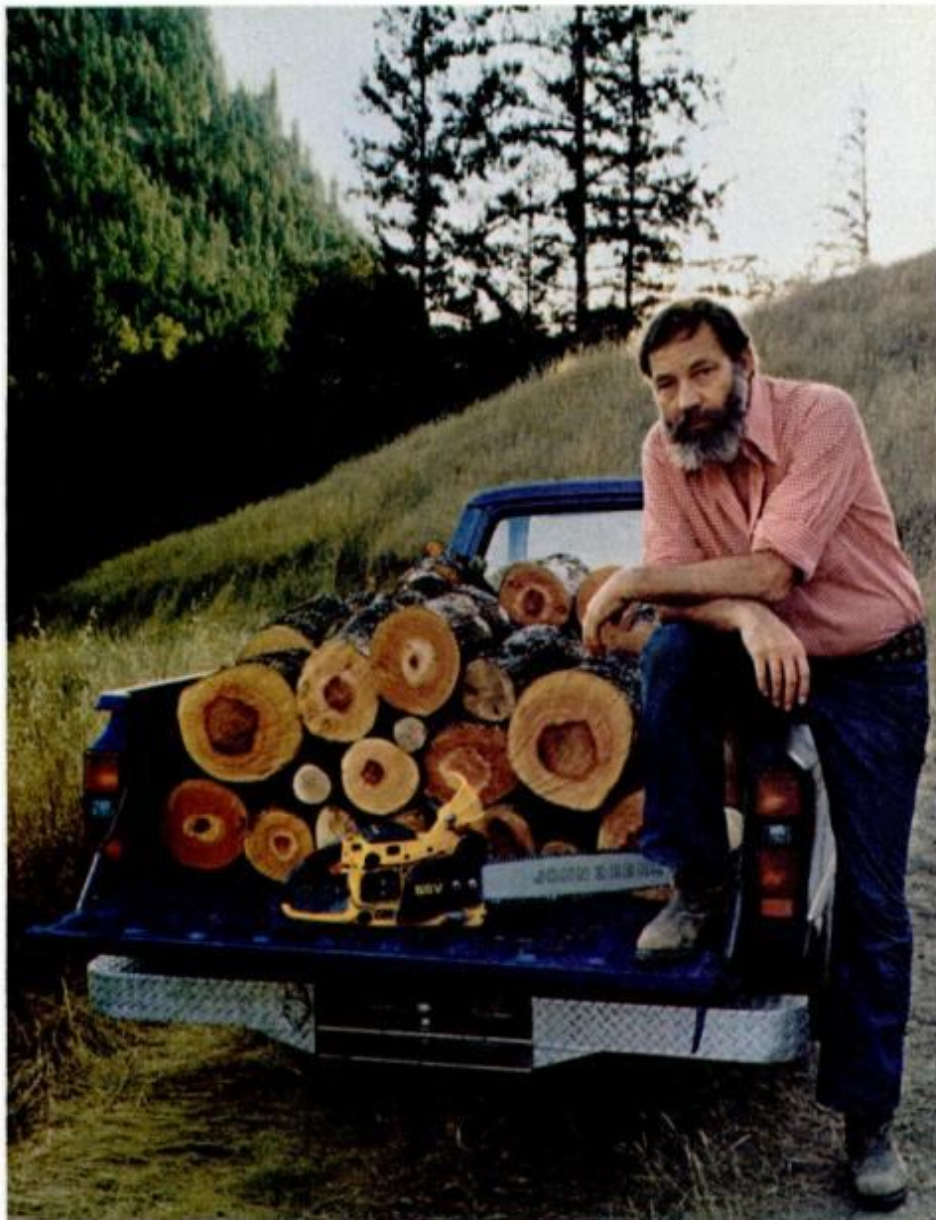
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**My fuel problem is simple.  
Either I have enough wood to get through winter,  
or I don't.**

Out here, the winters are long and the nights are cold. They measure snow by the foot, not by the inch.

I live in a cabin in the mountains. My only heat comes from a wood-burning stove. As long as I feed it wood, I keep real warm.

The problem is, there's no telling how long I'm going to be socked in there. Winter could easily last four or five months. So when it comes to my wood supply, I can't afford to take any chances. I need a chain saw I can count on. Which is why I use a John Deere Chain Saw.

And I don't plan to give it much of a rest, either.

I figure I'd rather have too much wood on hand than not quite enough.



**Nothing Runs Like a Deere®**

John Deere has seven Chain Saws, with guide bars from 10 to 27 inches. For a free folder, write John Deere, Dept. 52, Moline, IL 61265.

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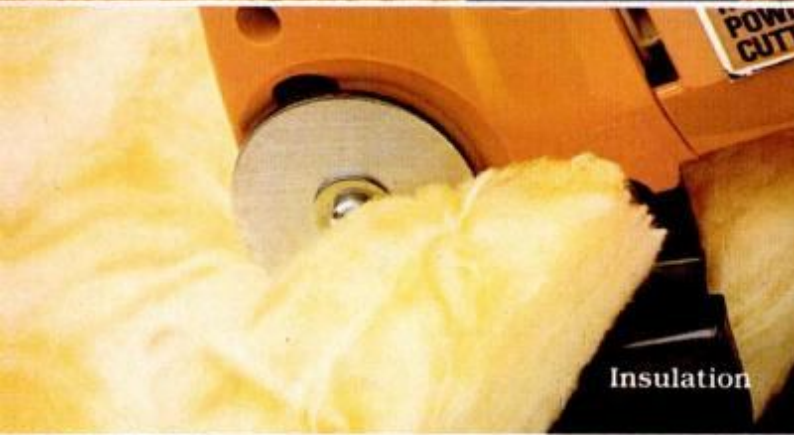




Carpet



Sheet metal



Insulation



Linoleum



Wire mesh



Canvas

# INTRODUCING AN EASY WAY TO HANDLE TOUGH CUTTING JOBS.

When you have a big, tough cutting job, you need a big, tough cutting tool. Introducing Black & Decker's new Rotary Power Cutter.

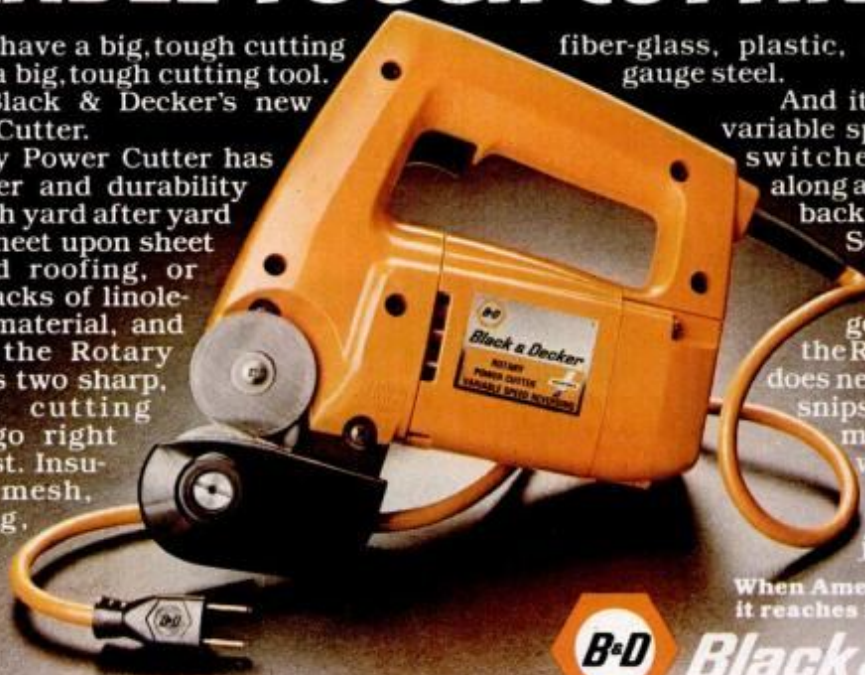
The Rotary Power Cutter has the horsepower and durability to slice through yard after yard of carpet, or sheet upon sheet of corrugated roofing, or stacks and stacks of linoleum. Name a material, and chances are the Rotary Power Cutter's two sharp, self-feeding cutting wheels can go right through it, fast. Insulation, wire mesh, asphalt roofing, heavy canvas,

fiber-glass, plastic, rubber, even 24-gauge steel.

And it's equipped with variable speed and reversing switches that let you cut along at your own pace, or back out of a tight spot.

So every cut comes out clean and precise with no jagged edges. In short, the Rotary Power Cutter does nearly everything tin snips, knives, and other manual cutting tools will do—only faster and easier and without doing a job on your hands.

When America has a job to do, it reaches for Black & Decker.



**Black & Decker**



# LETTERS TO THE EDITOR

## Sky hook's a retread

Your article in Sept. '80 on the McDonnell Douglas "Flying Catapult" (page 104) was read with enthusiasm. We congratulate Mr. McDonnell in promoting the concept. However, the idea originated with Vehicle Systems Development Corp. and was presented to the U.S. Air Force in 1977. Known as the Helicopter Lift/Launch (HELL) system, the concept was part of a program, Alternate Aircraft Takeoff System (AATS), sponsored by the U.S. Air Force.

ROBERT W. FORSYTH  
PRESIDENT  
VEHICLE SYSTEMS DEVELOPMENT  
CORP.  
UPLAND, CALIF.

Sorry, but the "Sky-Hook Takeoff" is *not* new! This system has been studied at least twice in the past 30 years by Boeing Vertol Co. at the request of the Air Force (1953 and 1963). Cables, bars and the old airship trapeze were studied.

Perhaps the concept will finally make it this time. The photo (below)



One form of sky hook: Chinook chopper airlifts a Mohawk—a portent of the future?

of a Chinook airlifting a Mohawk shows how the system could look.

JOHN J. SCHNEIDER  
BOEING VERTOL CO.  
PHILADELPHIA

If I remember correctly, about 50 years ago they thought of using gigantic dirigibles as aircraft carriers. All the farther they got in practice was a single biplane fighter, dangling beneath a dirigible, to be air-launched for warding off enemy balloon-busters.

GREG HIGGINBOTHAM  
SPRINGFIELD, MO.

Yes, the air-launch idea has been

around awhile. In presenting the McDonnell system, PM pointed out that, while offering a promising new approach, it still faces technical difficulties. Perhaps, as Boeing's John Schneider says, it—or some form of it—will make it this time.

## No snow in the face

After buying a snowblower for my tractor, I eagerly welcomed the first heavy snowfall—only to be completely covered with snow in a few minutes. Your Feb. '80 issue with plans for making a tractor cab (*Homebuilt Tractor Cab Takes the Bite Out of Snowblowing*, page 76) came at exactly the right time.



Warm and cozy in PM's homebuilt tractor cab. Note added exhaust riser on engine.

I made one for my own tractor (photo above) and have never enjoyed clearing snow as much as I do now. Thanks for the idea.

LOUIS SAIF  
WESTMONT, ILL.

Thanks for the photo; you did a great job.

Readers who wish to obtain a photocopy of the tractor-cab article may do so by sending 50 cents to *Popular Mechanics*, Box 1014, Radio City Station, New York, N.Y. 10101.

And here's an important reminder: In our June '80 issue (*Letters*, page 6), D. J. Burkhardt, a spokesman for *Simplicity Mfg. Co.*, called attention to the possible danger of carbon monoxide buildup in an enclosed tractor cab. For those contemplating such a modification, we repeat his warning. It is essential that engine exhaust be routed away from the cab, such as by a vertical exhaust stack, as shown in the photo here. Also, while the cab was not designed to be airtight, be sure there is plenty of ventilation.

## Flushed, but not with success

I am a new PM reader and it's so informative it's like having a man around the house. But I foolishly said this to the super of my apartment building and now he won't fix anything for me.

I found your suggestions for clearing a clogged toilet (*Homeowners' Clinic*, page 30, Sept. '80) more suited to the country dweller. To follow your instructions, I lugged my toilet down three flights of stairs and out onto Park Ave. There I was met with an army of disapproving glances.

As you surely must appreciate, I could not proceed to Step 2. What does one do when one does not have a back yard?

I would appreciate a hasty reply.

KATE CORRIGAN  
NEW YORK

Either you're pulling our leg or we missed a great opportunity to get a picture of you carrying your toilet down to the street. Seriously, though, we do recognize that we have many readers who are city dwellers, and we try to be as helpful as possible. Many toilet obstructions will dislodge themselves if you merely up-end the bowl and shake it. Although we haven't tried it, the water-pressure method should work if you place the bowl on a pad in a bathtub and flush it from a short hose attached to the faucet. Hope this arrives in time.

## Crosbyton revisited

The Sept. '80 issue (*Tech Front Lines*, page 106) carried a feature on the 5-megawatt Crosbyton, Tex., solar power project—and commendable coverage, I might add.

Unfortunately, there was no identification of the high-technology organizations designing, building, testing and advancing this promising development. E-Systems Inc. is the major subcontractor to Texas Tech University at Lubbock.

I would imagine that PM will receive reader inquiries. May I solicit your cooperation in directing such inquiries to: E-Systems Energy Technology Center, Box 226118, Dallas, Tex. 75266 or to Texas Tech University, Department of Electrical Engineering, Lubbock, Tex. 79409.

PRESTON F. KIRK  
MANAGER, MEDIA RELATIONS  
E-SYSTEMS INC.  
DALLAS





5 YEARS OLD. IMPORTED IN BOTTLE FROM CANADA BY HIRAM WALKER IMPORTERS INC., DETROIT, MICH. 85 & PROOF. BLENDED CANADIAN WHISKY. © 1989

# 'Tis the C.C. Season!

The Canadian Club gift package is available for holiday giving at no extra cost. And now you can send gifts of C.C. by phone. Just dial 800-528-6148.



# PM ELECTRONICS MONITOR

## Video challenges home movies

There are only a relatively few people who own videotape recorders and color cameras, and who tape family events rather than film them. Tapes are then played back on the home TV instead of the silver movie screen.

Because tape equipment has been large, bulky (compared to a super-8 camera) and quite expensive, film has continued to be the preferred at-home medium.

Thanks to Sony Corp., this situation may change. It has unveiled a very compact, combination videotape recorder and color camera. The single-unit device weighs in at less than 5 pounds. Sony maintains it can keep the cost down under \$1000 and, from what we've seen, the quality seems very good. Unfortunately, the unit shown is a prototype only, and production is not expected until the middle of the decade. By then, who knows what will happen?

However, the film industry is likely to look askance at this latest competitor. There are certain things more easily done on film (such as editing), but there are advantages to taping (such as viewing on a TV in room lighting).

Sony and other electronic manufacturers obviously hope that this new and now-miniaturized medium may succeed in replacing the home-movie industry. Whether this will happen depends, of course, on the reaction of you and me—the consumers.

## New—and sounds great

We haven't done a speaker review in this column before—but let this look at Epicure's new series 500 speaker be a first. We were able to listen to it critically for the past few weeks and have been very impressed by its sound.

The 500 is a "tower" speaker with a 10-inch woofer, 1-inch air-spring tweeter, 4-inch mid-range and two 12-inch passive radiators. Standing about 3 feet high, it belts out some of the most believable bass we have heard from any speaker.

We suspect the secret lies in the two 12-inch passive radiators, one on each side of the cabinet. These look almost like drumheads set flush with the cabinet sides. Referred to as "piston radiators," they vibrate in tune with the bass and help reinforce low frequencies without preventing any mid-range transmission, Epicure tells us.



IF CUTOUT  
MATCHES YOUR  
TRANSFORMER—  
YOUR UNIT  
IS OKAY.

## Is your telephone safe?

Cut out the template (left) to check the safety of the telephone transformers installed in your home. If you have a Princess-style phone or some others with a light-up dial, you will have a transformer. In fact, if a previous owner of your home had such a phone, the transformer may still be there. But, some transformers are now proving to be unsafe. If the template matches the transformer's shape and the words are the same as shown—call your phone company.

They are expensive—\$400 apiece—but if you are looking for the final touches to any audiophile's system, then take a listen to the EPI 500's. We think you'll like what you hear.

## Here-and-now remote control

How often have you wished you didn't have to get out of your favorite chair to change channels on the TV? Perhaps you've felt more than a twinge of envy at those who own sets with built-in remote control. But if you've priced remote-control consoles lately, you may have decided to keep on making that short, annoying walk from the TV to the chair and back.

Well, a new add-on for any TV has just been introduced by Teknika Electronics (1633 Broadway, New York, N.Y. 10019). It's Model 6301 wireless remote-control television tuner.

A box, about the size of a table radio, attaches directly to the TV with four wires. On its front are pressure-sensitive switches that can keyboard all the VHF/UHF channels—and, if you're hooked up, even some cable channels.

The main box communicates wirelessly with a hand-held remote. The remote control allows you to change channels and switch the TV on and off. It does not, however, have con-

trols for volume and picture adjustment.

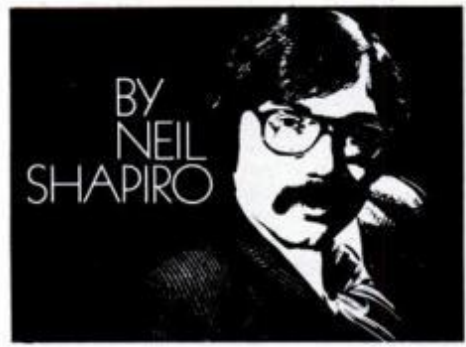
Still, for under \$100, it can save you a lot of little trips.

## Boardwalk, 2001

We just finished playing a rousing game of Monopoly with a fellow called Monty, a dapper individual with a quick smile. We found his colorful play and quick-witted trading a real challenge. In fact, Monty destroyed four other players.

Not bad for a computer program.

*Monty Plays Monopoly* will run on an Apple II home computer, and is the best program we've seen that plays a classic board game with a whole partyful of people. Graphics are great and Monty's strategy excellent. He can be yours for \$19.95 from Ritam Corp., Box 921-1, Fairfield, Iowa 52556. **FM**





# INTRODUCING DODGE MINI RAM. MORE MILEAGE, RANGE AND ROOM THAN VW VANAGON FOR ALMOST \$2000 LESS.



## Here's how Mini Ram beats Vanagon

	Dodge Mini Ram Wagon 250	VW Vanagon
Sticker Price (MSRP at base)	<b>\$7,965.00*</b>	<b>\$9,900.00*</b>
EPA EST. MPG.	18 MPG**	17 MPG**
Horsepower	95	67
Passenger Seating	8	7
Overall Length	178.9"	179.9"
Wheelbase	109.6"	95.8"
Fuel Capacity	36 gal.	15.9 gal.
Est. City Range	648 miles**	270 miles**
Side Door Width	49"	42"
Removable Rear Seat	Yes	No
Factory-Installed Air Conditioning	Option	Not Available
Power Steering	Option	Not Available
Color-Keyed Carpeting	Standard	\$375 with int. pkg.

Who moves more people than VW for less money? It's Ram Tough Dodge's new Mini Ram Wagon.

Compare Dodge Mini Ram 250 to VW Vanagon. Passenger seating, mileage, fuel capacity and range, horsepower and rear loading area. Mini Ram gives you more.

Then compare factory-installed options like power steering and your choice of 6 sound systems: all available in Mini Ram. Not in Vanagon.

Now compare price. Mini Ram costs less than Vanagon. *Almost \$2,000 less*, comparably equipped. For panel-side van buyers, there's a Dodge Van with the same performance, efficiency and interior dimensions as Mini Ram Wagon at a price VW hasn't seen in years — just \$6121.\*

Underneath it all, Mini Ram is a Ram Tough Dodge Wagon. With the best rust protection of all wagons. There's 100%

electrocoating, plus 370 sq. ft. of galvanized steel in critical areas... compared to VW's 4.

New Dodge Mini Ram Wagon. It does more than VW Vanagon and it does it for less. As a pure people mover, it just might be the best buy on the road today.

### Satisfaction guaranteed or your money back.

*If you're not satisfied with your new 1981 Dodge Mini Ram, just bring it back in good condition with no metal damage within 30 days or 1,000 miles, whichever comes first. When the dealer gets clear title, you'll get your money back, excluding finance and insurance charges. Trade-in refund may differ from trade-in allowance on retail sales contract. Ask participating dealers for details.*



Dodge Trucks



## DODGE TRUCKS ARE RAM TOUGH

\*Sticker price comparison excluding title, taxes and destination charges. Prices as of Oct. 1, 1980.

\*\*Dodge Mini Ram with standard Slant Six engine and optional auto. trans. Use these numbers for comparison. Your mileage and range may differ. Calif. est. lower. Vanagon EPA mpg is 1980 est. pending 1981 figures.



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

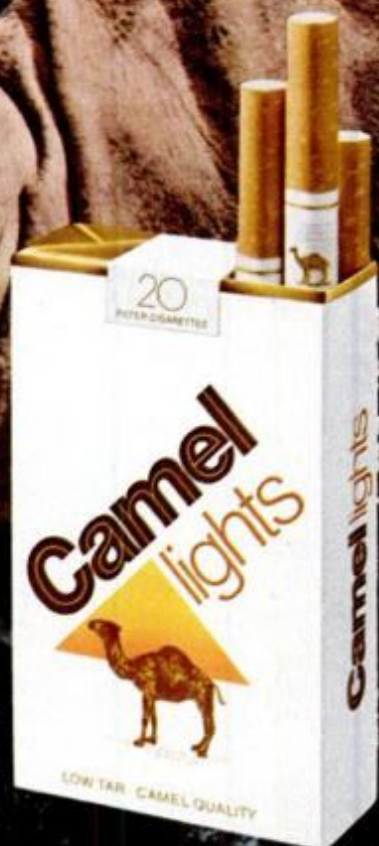
# CAMEL

Where a man belongs.

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

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**Camel Lights.**  
**Low tar. Camel taste.**

**9** mg  
tar.



# Build your own air compressor from PM's plans



Once you have an air compressor in your home shop, you'll wonder how you ever got along without it. You can spray paint with it. You can inflate swimming gear, toys, auto and garden tractor tires. More important, you can sandblast parts and rivets in metal seams. You can blow-clean fine mechanisms and, with PM's unit you can vacuum pump your car's airconditioning system prior to adding Freon—something you can't do with most ordinary air compressors. Finally, this unit features a filter/water trap—which is an optional extra on most commercial air compressors.

## PM AIR COMPRESSOR

You can do all these things with this versatile 1-hp compressor and, happily, you can build it for less than \$200. **PM**

**Compressor evacuates car's airconditioning system prior to adding new refrigerant (far left). At left, routine inflation of tires saves trip to gas station.**

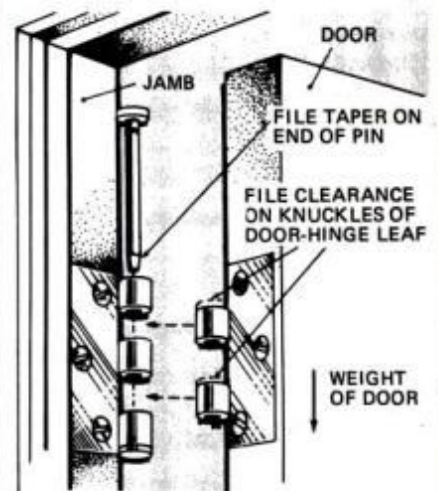
### HOW TO ORDER PLANS

Send check or money order for \$5.95 to Air Compressor, Popular Mechanics Plans Library, Box 1014, Radio City Station, New York, N.Y. 10101. Allow two to three weeks for delivery; for first-class mail send 75 cents extra.

Popular Mechanics is a publication of Hearst Magazines, a division of the Hearst Corporation.

# HINTS FROM READERS

## Improve door's swing



Before rehanging a door that has been removed for planing or some other reason, file a small amount off each of the nonweight-bearing surfaces of the knuckles on the door leaf of the hinge. This facilitates engaging and aligning the hinges to receive the pin. Clean off the pins with a file or emery cloth and lubricate the hinges.—*Andrew Vena*

## Removing frozen hardware

To remove frozen nuts on badly rusted bolts, first soak the bolts in water overnight to loosen the rust.—*Albert L. Rafanan*

## Emergency mallet

Turn a hammer into a rubber mallet. Fit it with a crutch or cane tip from a drug or medical supply store.—*Lane Olinghouse*

## Bamboo handle wedges



Bamboo (from a fishing pole or window blind) makes sturdy wedges for tightening tool handles. To glue the wedge, remove the outer bamboo cover, which is high in silica, so the glue will adhere.—*Walter E. Burton*





# Beep Free

*Doctors use them and so do many businessmen. The pocket beeper now takes a giant step forward with the introduction of the own-your-own system.*

You're away from your desk in a meeting. Suddenly your pocket beeper starts beeping. You pull it out of your pocket, press a button and you hear your secretary's voice with a message.

"Big deal," you say. "What's so special about that. There are thousands of pagers like it in use." Yes, but this one is different.

#### TOTAL CONTROL

In the first place, you own the entire system. You own the transmitter and the beepers. Secondly, the system is inexpensive. It costs less than leasing one traditional beeper for a year. And finally, it solves the problems that other pagers can't solve—but more on that later.

The new Auto Page paging system consists of a transmitter that sits on your secretary's desk. When a call comes in, she presses a button which sends out a signal to your paging device. The antenna rests on your secretary's file cabinet and plugs easily into the transmitter so there's no installation.

#### MAKES NO SENSE

But like many breakthrough products the Auto Page System has limitations. The system was designed for office, factory, farm or home use. So its range is limited to one mile with voice and two miles with tone.

For doctors who are constantly on the road, the Auto Page does not make sense. For the business person, however, who moves frequently through an office or factory, the system is ideal.

Instead of using expensive paging or loud speaker systems, you can locate and communicate with your staff in privacy no matter where they are within your premises.

#### SERIOUS THOUGHTS

You can use up to six different pagers, each on different channels, and the entire system with two beepers costs only \$395.00.

Once you own the system there are no further costs. Conventional pagers rent for up to \$25.00 per month so in eight months the Auto Page System with two pagers would pay for itself and from then on your secretary can literally 'beep free.'

Each additional beeper costs \$75.00 or the equivalent of a three month lease on the typical beeper. But you can't compare a typical beeper with the Auto Page. The Auto Page has voice transmission. The typical beeper does not. The Auto Page is a totally personal system that can be used anywhere. The typical beeper must be used near a big city. And finally, the typical system is expensive—many times the cost of the Auto Page System.

#### HERE AND THERE

We suggest that before you decide to purchase, you experience the freedom and convenience of personal paging. Order a system from JS&A on our 30-day trial. Give a beeper to each member of your staff. See how easy it is to set up a system (just plug it in). And then actively use it for a month. If personal paging is not the most convenient and efficient way to communicate, return it anytime within 30 days for a prompt and courteous refund.

We've tested our system at construction sites, in large buildings, on farms, in the country, with motel operators and several small businesses. Based on our personal observations and sales success, we are convinced that the Auto Page System of personal paging is the future of paging.

JS&A is America's largest single source of space-age products—further assurance that your modest investment is well protected. Service should not be required for many years as the Auto Page is totally solid state, but if service is ever required, just pop your receiver or transmitter in its mailing carton and mail to the Auto Page service-by-mail center which will promptly repair and return your unit.

To order your system, send your check or money order for **\$395.00** for a system with two beepers and \$75.00 for each additional beeper up to six (Illinois residents add 6% sales tax) to the address below. Please add \$4 for postage and handling. Credit card buyers may use our toll-free number below.

We'll send you a transmitter, antenna, beepers, one-year limited warranty and complete instructions.

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# MOST FUEL WAGON MADE

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give you better gas mileage ratings.

It's even rated better than the Datsun 810 and Toyota Corona Wagons. But the advantages of a Lynx Wagon go far beyond great gas mileage. You'll get excellent traction with our front-wheel drive. It's the first American-built compact wagon with four-wheel fully independent suspension for a smooth ride.

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# LYNX FROM LIN

[27] EPA EST. MPG, 42 HWY. EST. Use these numbers for comparison. Your mileage may differ depending on speed, trip. Buy or Lease at your Lincoln-Mercury dealer.

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(Based on EPA Volume Index.)

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LYNX

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**NOTES  
FROM THE  
EDITOR**

*John A. Sillerton*

**L**ong-time readers of PM are  
surely as familiar with  
the name of artist Ed Valigursky as any name associated  
with this magazine. Ed's the  
guy we call on when we want a  
dramatic illustration of men  
and machines. His work has  
appeared on our covers and  
inside pages countless times.  
This month's cover, for in-  
stance, is his 34th since we  
enlarged the magazine's size  
in January 1975.

A native of Pennsylvania  
and graduate of the Art In-  
stitute of Pittsburgh, Ed has  
lived in New Jersey for 27  
years. Besides PM illustra-  
tions, he does book covers and  
advertising art. When not  
painting, he likes to fish and  
golf. His pet subjects (are we  
ever happy) are planes and  
ships.

**PM**

At upper right, Ed Valigursky dis-  
plays the painting he did for  
this month's cover. Note that the rescue  
helicopter is positioned almost ex-  
actly as it is in the photo at right. To  
be sure he had all details correct, Ed  
went to a Coast Guard station and  
took the photo of the copter as he  
wanted to portray it on the cover.



If Santa Claus ever updates his delivery system, he'll use a snowmobile, claims  
Outdoors Editor Bill McKeown. That appears to be the point of contention in this  
confrontation between Bill and a Lapland reindeer in northern Finland. Bill was  
testing Kawasaki's new line (page 92) when the encounter took place. One thing's  
for sure, Bill concludes: Snowmobiles smell better.



# NOW! Learn to repair video cassette and disc systems with NRI's at-home training in TV and Audio Servicing.

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## Now, computerized tools for do-it-yourselfers



New drill press features digital readout.



Sabre saw also boasts electronic controls.

The latest in home-shop equipment is an exciting line of power tools controlled by microcomputers. Announced by Black & Decker (U.S.) Inc., Towson, Md. 21204, the tools include a bench drill press, sabre saw and 1/2-in. and 3/8-in. portable drills.

The drill press boasts an electronic speed control, a depth measure for checking a hole being drilled, ramp speed which shifts speed electronically when the drill is started, and an easy-to-read digital panel for conveying the information to the user.

The saw and drills have similar controls, but no readout. Since the tools appear to be a breakthrough in shop-tool technology, PM is equipping four professionals with the drill press. Their findings will be reported in a future issue.—Harry Wicks



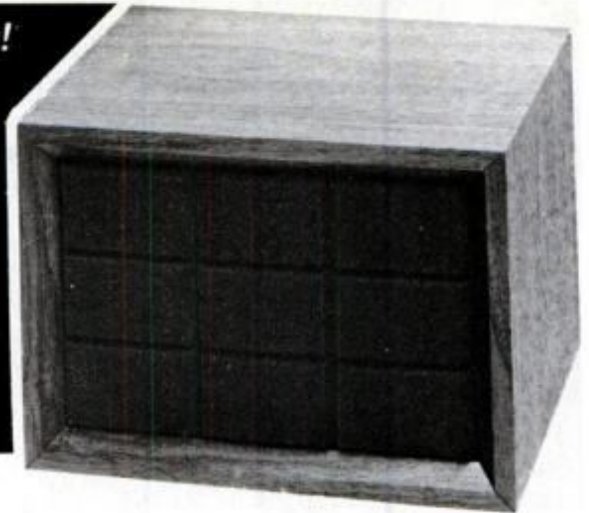
Not Just Another Limited Area Motion Detector!

# guardex™

Protects Every Square Inch Of Your Building

Turns On Lights Automatically

Powerful Electronic Siren



The Guardex 8000 Alarm System is walnut grained and disguised to look like a small stereo speaker (6 3/4" x 9 3/4" x 8") and weighs less than 6 1/2 pounds.

## Low Cost Computerized Burglar Alarm System Home - Office - Business

### NO INSTALLATION

Just plug the Guardex 8000 alarm system in, make two simple control adjustments to suit your particular building and it works! There are no other wires to run. This totally self-contained burglar alarm can completely seal off every square inch of the surface of your building. It protects doors, windows, and what most alarms miss... your roof, walls and floors.

### HOW CAN ONE SMALL COMPUTER PROTECT MY WHOLE BUILDING?

Guardex 8000 Alarm System works on the principle of audio discrimination. This, put simply, is the process of electronically separating normal everyday sounds, such as voices, telephones, etc. from break-in type noises such as breaking glass, prying metal, or forcing a door open. The Guardex 8000 protects one story homes and offices up to 2000 square feet and open commercial buildings up to 10,000 square feet. The Guardex 9300 with wireless remote sensor capability is available for multi-story homes and offices or single story with more than 2000 square feet. Call the factory for more detailed information.

### TURNS ON LIGHTS AUTOMATICALLY

When the first break-in type sound is detected, the system will instantly turn on lights, radio, or other electronic equipment that you have plugged into the back of the alarm. These lights or other equipment will remain on for a period of five minutes, then automatically turn off.

### POWERFUL ELECTRONIC SIREN

The Guardex 8000 alarm is equipped with a loud built-in siren. If during the five minute period the lights or other electronic equipment has been activated, a second break-in sound is detected, (it can be only a second or two after the first break-in sound) the built-in siren will start blasting for 90 seconds. At the end of approximately 90 seconds the siren will shut off and the alarm listens again. If another break-in sound is heard, the siren will come on for another 90 seconds. If no other break-in sound is detected, the siren will stay off and at the end of the five minute period the lights will shut off and the alarm instantly resets.

The rear control panel contains two standard AC plug receptacles for a table lamp, spot lights, radio, etc., terminals for connecting optional outside siren and back-up battery (not included); entry delay time control and sensitivity control.



### EXIT AND ENTRY DELAY

The Guardex 8000 alarm has a built-in exit delay allowing you approximately one minute to lock up and leave the building before the alarm is armed. When you enter your building you may find that just your normal entering sounds activate the siren. You may delay it from starting for up to 30 seconds by turning up the siren entry delay control.

### BATTERY BACK-UP

Burglars rarely cut power. However, to give you total protection from a burglar and possible power failure, our alarm has provisions for a battery back-up. (Batteries not included). 12 volt lantern batteries are available at most hardware stores.

### THE BURGLARY PROBLEM

The F.B.I. statistics show that at the present rate, one out of every four Americans are going to be burglarized. That is not a very pleasant fact, but it is true. You have a greater chance of being burglarized than being a victim of a fire or automobile accident. The time is now to help protect yourself and your valuables with a Guardex 8000 alarm system.

### OUTSIDE SIREN

The Guardex 8000 alarm is equipped with a loud, built-in siren, but if you desire an additional siren to mount outside or in an area away from the main alarm, they are available with 50 feet of wire for \$24.95. (Connecting terminals are provided on the back of the alarm).

### 30 DAY NO RISK TRIAL

This is your opportunity to purchase an alarm system directly from the factory for only \$199.95. Try it in your home or business for thirty days without risking one cent. Put our Guardex 8000 alarm to your own test. See for yourself! It will protect every window and door from break-in. If you are not completely satisfied, return the alarm within 30 days for a complete refund. To order your Guardex 8000 alarm, CALL TOLL FREE to charge your credit card or send your check to Guardian Electronics, Inc. in the amount of \$199.95 plus \$3.50 postage and handling. If you want the optional outside siren, add \$24.95 (California residents add 6% sales tax.)

(If you require more information, call during California business hours, Monday - Friday).



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# CAR CLINIC

## SOLUTIONS FOR MECHANICAL HEADACHES

BY  
MORT SCHULTZ



### Poly wants a mask

*Some polycoat material with which I waxed my VW Rabbit got on the rubber bumper guards and black facings that protect door handles and fenders. The wax left a white film that won't come off. I tried mineral spirits and kerosene. Any suggestions?—Earl Shank, Middletown, Md.*

According to Jerry Young of Polyglycoat World Enterprises, once this material is permitted to dry (it takes about 96 hours), it's virtually impossible to remove using conventional techniques. Jerry says your only hope is to have a body shop try stripping the discolored surfaces using mechanical methods and then repainting them.

Jerry asked me to emphasize that the material you used and Polyglycoat are not the same, but letting any polymer coating settle on areas where you don't want it will lead to the same results.

When waxing a car with a polymer material, avoid this kind of trouble by covering surfaces that should not receive a coating with masking tape. If the material gets on an area you forget to cover, remove the coating at once with mineral spirits.

### Retracing my steps

Two of my answers to questions about GM X-body cars in the Sept. '80 *Car Clinic* (page 42) evoked a considerable amount of mail that has shed new light on solutions. Since both problems appear to be fairly widespread, let's go over them again.

The first complaint is about front-end noise when making hard turns. The noise is in the form of a loud metallic clunk. According to Ralph Del Vecchio, who presented the problem to us, his dealer lubricated the area, but it didn't help. According to another of our readers, the dealer may not have lubricated the right area.

Dick Gray, who is service manager at Dow Motors Inc., in Ellsworth, Me., says, "Greasing the mechanical stops on the front and rear of both front wheels usually cures this prob-

lem. On very new vehicles, lubing the ball joints often helps." Dow Motors is a Pontiac, Oldsmobile, Cadillac, GMC and Jeep dealership. If Dick's solution doesn't work, then follow the course of action recommended in September.

The other problem concerns continuous blowing of the fuse that controls the horn, dome light and seat-belt buzzer. I suggested, apparently in error, that there is a chance of the horn wire being pinched and shorting out in the steering column.

John Endress, who is service manager at Lehman Chevrolet Inc., in Moorestown, N.J., says, "If this wire is shorted, it wouldn't blow a fuse, but would cause the horn to blow continuously. The wire in the column is a ground wire for the horn relay, and not a hot 12-volt wire. We have found the problem with these cars to be in the dome-light wiring." Dick, speaking of the same problem, concurs with John and adds that in production a screw may have been run through the dome-light wire, or the wire may have been cut by a sharp edge. In either case, a short circuit would result, causing the fuse to keep blowing.

### Buck up

*I need help badly because the warranty on my 1979 Dodge Aspen runs out*

*in six months. Although my Chrysler dealer has tried, he can't seem to uncover what's causing surging at all speeds and a rough idle in the slant Six engine. Can you arm me with the information he needs?—Monte Patterson, Hayward, Calif.*

Let's try. This car has had four problems that can cause engine surging, missing, bucking—whatever term you wish—while running and rough idling. Here's the rundown:

■ If the car has an automatic transmission and one-barrel carburetor, and surges when cold, you may need a new choke package consisting of a new choke vacuum diaphragm and choke-coil assembly. The part number is 4240063, and the service bulletin that tells all about it is 14-06-80.

■ If the car "cold bucks" on acceleration and deceleration ("cold buck" is Chrysler's term), it may need a new torque-converter lockup spring (part No. 4202672). Service bulletin 21-12-80 spells out the repair.

■ Rough idle that isn't corrected by making adjustments to the fuel and ignition systems may be caused by abnormal exhaust-gas recirculation because of a crack in the aluminum manifold. Remove the carburetor and inspect the manifold. If it's cracked, replace it according to service bulletin 09-05-80.

■ Some of these cars left the factory with the valve lash improperly adjusted. This can cause the kind of trouble you're speaking about. The solution is spelled out in service bulletin 09-07-79.

### A tool by any other name . . .

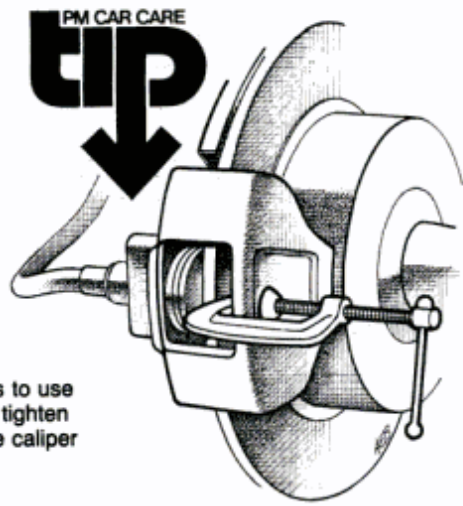
*In the Aug. '79 Car Clinic (page 56), you refer to power valve socket J-10175, which is needed to make an adjustment on a Motorcraft carburetor. This carburetor is used on Ford and AMC vehicles. Ironically, we've been trying to find another tool that*

*(Please turn to page 26)*

### Low-bucks specialty tool

When you're replacing disc-brake pads, most shop repair manuals tell you to push the pistons out of the way with an expensive specialty tool specifically designed for that make.

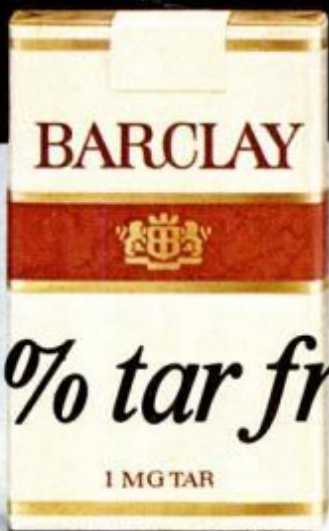
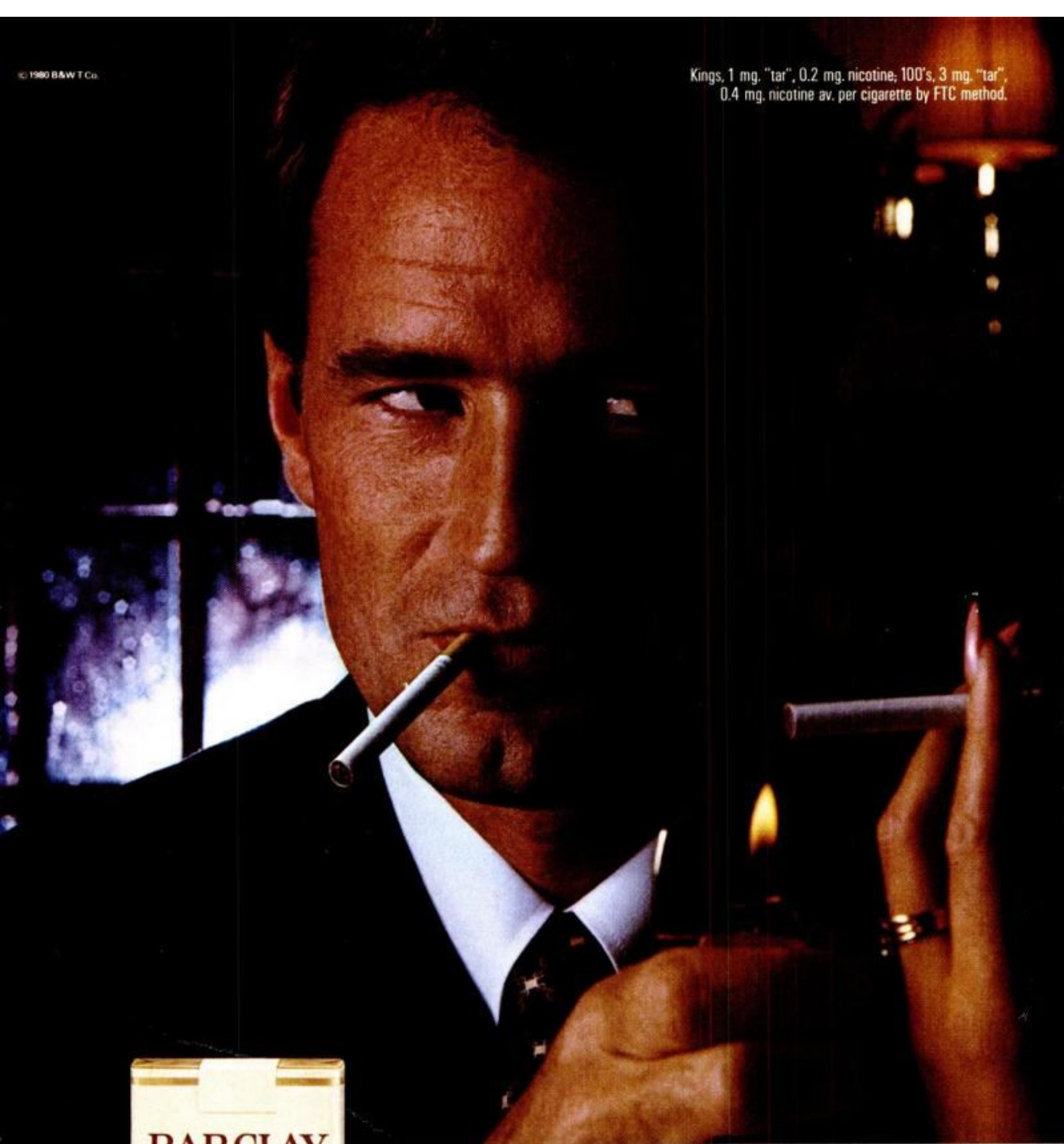
Some people, to avoid the cost of the tool, improvise by wedging a screwdriver between the calipers and using it as a lever to push the piston back. While this method works in some circumstances, it isn't always effective, and you might damage the piston face or the rubber boot. The safest and cheapest method is to use a common C-clamp. Just slip it over the piston, tighten the clamp, and the piston will slide back into the caliper without damage.





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**BARCLAY**

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





# Small Fridge. Big Deal. Save \$30 if you act now!

And we'll rush your order for Christmas or your trip south.  
AT LAST! ELECTRONIC REFRIGERATION FROM \$99.

You've nicely gotten away on your long awaited vacation, camping trip or long weekend with the family. You're comfortably cruising in your car, van or rec. vehicle along a busy interstate with few rest stops or restaurants. You guessed it...the kids want to stop for a snack. But your Koolatron P34 or P34A is full of sandwiches, cold pop, fried chicken...home made, fresh and cold. The family helps themselves and you've saved valuable vacation time and another expensive restaurant bill.

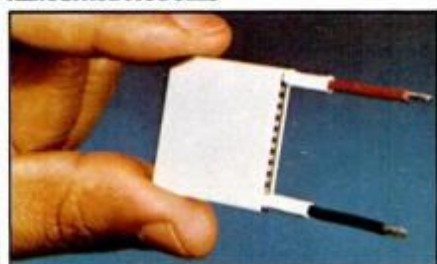
You're a commuter, a salesman or a trucker and you spend many hours in your vehicle daily. You've often longed for a fresh snack or cold beverage as the miles tick away. Now with your amazing Koolatron P10 plugged in beside you, you open the lid and instantly fresh food and drinks are at your fingertips. You're refreshed...you've saved an unnecessary stop, time and money.

## AFFORDABLE CONVENIENCE

Home refrigeration has come a long way since the days of the ice box and the block of ice. But most of us resign ourselves to doing without the same convenience once we leave our homes. Or, we revert back to the cooler and ice routine of days gone by, simply because there's never been any dependable and inexpensive alternative. But now, for the price of a good cooler and one or two seasons of buying ice, (or about 10 family restaurant meals), all the marvels of home refrigeration are available electronically. And the sloppy

ice cooler with its soggy and spoiled food can become a stone-age memory for you. An amazing space-age miracle...the thermoelectric solid state module...makes this portable refrigeration revolution possible.

### AEROSPACE MODULES



These miniaturized thermoelectric modules replace all the bulky complex piping coils, compressors and motors in conventional portable refrigerators.

Utilized by NASA scientists, as the only refrigeration system for rockets and satellites, thermo-electric cooling has been in use for almost a quarter century. These expensive modules were selected by NASA for some basic reasons...they're small (about the size of your watch)...they're light weight (they weigh less than a package of cigarettes)...they're totally reliable (these modules are completely solid state and have no moving parts)...they require little power (they use the same power as one of your car's tail-lights)...they're completely insensitive to

tilting, bumping, vibration, (which causes failures to conventional compressors, motors and piping)...they're powerful (these modules have the same cooling power as a 10 lb. block of ice)...and they never wear out or break down. And for portable refrigeration where you require 12 volt DC. power, thermoelectric modules are the most efficient. These amazing heat pumps have not only gone to the moon, but have provided the breakthrough for Koolatron's truly reliable, lightweight portable refrigerators.

## THOUSANDS IN USE

Koolatron Industries Limited now has tens of thousands of these electronic fridges in use worldwide using these same powerful solid state modules. The reliability, performance and convenience of electronic refrigeration has now been dramatically tested and proven in all kinds of temperatures, conditions and environments from Australia to Alaska. Built to take it, these electronic modules are encased in tough, plastic insulated chests that are designed to be rugged and trouble-free. Non-rusting hinges and latches prevent corrosion in salt water environments. And with only one moving part (a small 12 volt fan) Koolatron portables seldom see a service depot. Koolatron's combination of space-age heat pumps and quality engineering have now led to a whole family of electronic portable refrigerators and food warmers that eliminate costly ice and provide "home refrigeration" convenience at sane and sensible prices.



**MODEL P10-  
THE PERFECT CAR FRIDGE  
& FOOD WARMER**

**\$199. \$99.00**  
(in Canada \$199. \$109.00)



Holds approx. 17, 12 oz. pop cans—refrigerates in air temps. up to 95°F. Also keeps hot foods hot (150°F) at the flick of a switch. Tough, blue Polypro plastic case. Ext. 16" L x 11" H x 11-1/2" W. Int. 11-1/2" L x 8" H x 8" W. with 10 litre capacity (0.4 cu. ft.) weighs 10 lbs. empty. Operates from supplied 12 volt power cord in vehicles or with optional 12VDC/110VAC power adaptor.

Koolatron's P10 not only makes a great car fridge but at a flick of a switch lets you bring home your favourite fast foods "piping hot". Comes with a 9 ft. power cord that just plugs into your cigarette lighter. Amazingly easy to operate...one switch selects hot or cold. A second switch allows you to refrigerate normally or select maximum cold. With your engine off, you can operate several hours and still start your engine to recharge your battery. "A low battery" indicator warns you when it's time to recharge. With the power off, your P10 keeps everything hot or cold for many hours in its well insulated case.

As a travel fridge the P10 keeps your favourite foods and beverages fresh and cold wherever you go. If you're a salesman, your food samples will arrive perfectly hot or cold every time. If you carry insulin, medical samples, dietetic foods, your P10 will never leave your side. Great for private planes.

Photographers will find it invaluable for keeping expensive films from going bad. And mothers...now you can refrigerate baby's formula in your car then heat it with the flick of a switch. Powerboaters, just plug it into your boat's cigarette lighter, and keep a day's food and drink ice cold without running into shore for ice. You campers, hunters and fishermen will find endless uses for transporting provisions and bait...then take home your catches and game without spoiling. Terrific for golf carts.

And with our optional 110 volt adaptor you'll find endless uses wherever house current is available...At your cottage...as a bar fridge...in your motel room for a midnight snack and drink or as a small office fridge. Use as an auxiliary home fridge when you're having a party. And it's a natural at drive-in movies, auto races and at sporting events.

**MODEL P34-  
THE STANDARD  
RECREATIONAL FRIDGE**

**\$169. \$139.00**  
(in Canada \$179. \$149.00)



Holds over 40 lbs. of food and beverages or 48 pop cans. Refrigerates in air temperatures up to 95°F. Rugged ABS case in sand beige colour with dark brown non-corroding latches and handle. Large 34 litre capacity (1.2 cu. ft.) weighs 17 lbs. empty. Ext. 21" L x 16" H x 16" W. Int. 16" L x 12" H x 11-1/2" W. Operates on 12 volts DC with supplied power cord or with optional 12VDC/110VAC power adaptor.

The P34 is our standard recreational size portable refrigerator. This new, improved model has a non-adjustable solid state thermostat which keeps your food at normal refrigeration temperature even in 95°F weather. It holds more than three times as much as the P10.

Imagine dry, dependable refrigeration with the size to match your travelling and camping needs. Fits into any boat, van or camper or back seat of your car. Plugs into your cigarette lighter receptacle and refrigerates over 40 lbs. of food (no space wasted by ice), yet it draws no more power than the P10. With our optional 110 volt adaptor, you'll find endless uses as a bar fridge, cottage fridge, office fridge. Your P34 has all the advantages of the P10 without the heating cycle or low battery indicator but with all the capacity needed for serious boaters, campers, hunters, fishermen and travellers.

**MODEL P34A-  
THE DELUXE RECREATIONAL  
REFRIGERATOR &  
FOOD WARMER**

**\$169. \$159.00**  
(in Canada \$199. \$169.00)



The same size, colour, weight and capacity as the P34 but includes food warming features, fully adjustable temperature control and low battery warning indicator.

The P34A is our top of the line portable. It heats, it refrigerates and with specially designed electronic circuit control (patent pending) it allows you to dial a complete range of temperatures from very cold to very warm.

Imagine the versatility. In season, refrigerate all your hunting, camping, boating and cottage provisions. Off-season, keep foods piping hot on your ice-fishing, skiing and snowmobiling weekends. You can even dial wine-cooling temperatures. Our low battery indicator warns you when you need a recharge and the sensing circuits efficiently control your power consumption to save on battery drain. This is our best of the line, recreational fridge and food warmer with all

**READ WHAT OUR CUSTOMERS SAY:**

"We took meat from Canada and ate it ten days later after thawing it in Florida. All our produce and drinks stayed unbelievably fresh and cool." S.H., Hamilton, Canada

"The way I try to sell my refrigerator one would think I was on commission. We love our unit!" P.O.P., Houston, Texas

"The Koolatron is everything they say about it in its advertising. I personally bought one, tested it and found it so desirable that I gave it to my daughter and son-in-law who made a cross-country trek from Vermont to Oregon with their infant daughter. They told me that aside from their new Dodge van, the Koolatron was the most indispensable item of equipment they carried." K.M., New York, N.Y.

the bells and whistles for the discerning buyer who demands quality, size and complete versatility.

**SAVE \$30 IF YOU ACT NOW!**

By ordering off-season you can save a full \$30 off our regular prices. You save! We keep our plant operating at an efficient level.

**ORDER TODAY WITHOUT OBLIGATION!**

Simply complete the attached order form or phone collect and we'll rush you your portable on our no risk 21 day trial offer. Each unit comes with complete instructions and a written 1 year warranty. In the unlikely event you ever need service, we have major service centres in New York, Arizona and Canada.

When you receive your Koolatron, use it constantly for 3 full weeks without risk. If you ordered our optional 110 volt adaptor, plug it in, then use your portable immediately as a bar fridge or around the patio or pool. Next plug it into your car or RV. Take your family out for a weekend trip. Enjoy fresh home cooked food as you thumb your nose at those expensive restaurant stops. Then use it on your boat or in your office or let your son or daughter try it at their college dorm. If after you've thoroughly tested it, you don't agree that your Koolatron represents a major breakthrough that will save you time, money and bother for years to come, send it back for a full refund. You can't lose...we guarantee it.

So be among the thousands to discover that the ice age is over! Don't waste another dollar on ice...order your Koolatron with no obligation, today!

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56 Harvester Ave., Batavia, New York 14020  
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Or use this handy order coupon.

**Save \$30 with this coupon**

**Koolatron**

Dept. 1476

Industries Limited

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Canada: 230 Bayview Drive, Barrie, Ontario L4N 4Y8

Save me \$30 with these off-season prices:

- Koolatron P10 at \$99.00 (\$109.00 in Canada)
- Koolatron P34 at \$139.00 (\$149.00 in Canada)
- Koolatron P34A at \$159.00 (\$169.00 in Canada)
- Koolatron 110V adaptor at \$29.95 (\$34.95 in Canada)

Please add \$8.00 for handling and delivery per unit.

No charge for shipping adaptor if ordered with unit.

Add \$3.00 for shipping adaptor only.

(N.Y., Ont. and Quebec residents add sales tax.)

I understand that I may return any item undamaged by January 15, 1981 or a minimum of 21 days, and receive a full refund if I am not satisfied.

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DCD3



## CAR CLINIC

(Continued from page 22)

also has a "J" designation listed by Ford in service manuals. It is a disc-brake metering-valve bleeder tool (part No. J-22742). We wrote Ford, but they couldn't tell us which company makes the tools. We need them—J.N. Edmonds, Ed's Tune-Up and General Repair Service, St. Matthews, Ky.

Not only for Ed, but for other Car Clinic readers who may need a J-designated tool called for by Ford, get this: These tools are made and can be ordered from Kent-Moore, 29784 Little Mack, Roseville, Mich. 48066. Don't be fooled by literature which states that Kent-Moore makes tools only for GM, AMC/Jeep, Datsun and Fiat models. Generally, this is true, but some auto assemblies used by these manufacturers are also used by others. For example, the Motorcraft (Ford) carburetor Ed refers to is actually manufactured by Holley. Since the carburetor is used in AMC cars, tools to adjust the carburetor are made by Kent-Moore. But the same tool will obviously fit the carburetor when it's used in Fords.

Incidentally, part No. J-10175 for the carburetor tool has been super-

seded. The designation now is "socket, carburetor power valve J-10234-01." The designation of the braking tool you're looking for, Ed, is "disc-brake metering-valve retainer." The J-22742 number is still valid.

### Switcheroo

My dealer could find no reason why my VW Rabbit had experienced three radiator failures in 32,000 miles. He claimed it was the way I drove my car. Ha!

I took the car to a radiator shop and was informed that coolant was causing the radiator core, which is aluminum, to oxidize.

The mechanic suggested that I replace this abomination with a brass radiator, which I did. I've had no more trouble since that time. Maybe other Rabbit and Scirocco owners would like to know about the solution to this problem.—Tom Carara, Pueblo, Colo.

You can bet on it, Tom. Thanks.

### Give me the simple life

You can do a lot with simple tools and some know-how. Take the problem of engine rough idling caused by a possible air leak around the carburetor. How do you find out if the carburetor is, indeed, leaking without using expensive exhaust-emission detection meters you probably don't own?

Pour some heavy oil into a can. SAE 40 is okay; SAE 50 is even better. Buy a small paintbrush. Start the rough-idling engine and let it run as you spread oil around the carburetor-gasket flange area, then around the base of the carburetor. Concentrate on a small segment at a time.

If idling suddenly smoothes itself out, you have found an air leak. The oil has sealed it temporarily, cutting off the air that has been diluting the fuel mixture and causing rough idling. Tighten mounting fasteners or replace the gasket if it's shot.

PM CAR CARE

# TIP



## When you're ready to wrap it up.

- A Bostik® 'POP'® Deluxe Rivetool Kit (K106)
- B STANLEY® SurForm® Plane (296 VP)
- C EVEREADY® Economy Flashlight (3251BP)
- D EVEREADY® Floating lantern with battery (108WB)
- E WARE® 7 pc. cookware set (B-1718-43)
- F LUXON® 25 foot Mezurlock® Power Tape (Y-125)
- G Taylor® Weather Center Barometer (6431)



**SENTRY**  
Hardware

## When you're ready to do-it-yourself.

Check the Yellow Pages under Hardware for the SENTRY store nearest you.

Merchandise shown in this advertisement is available from participating dealers only. Offer expires December 27, 1980. The 4,500 Sentry dealers own their own stores. They select their merchandise and set their own prices. There may be variations in products, available quantities and prices in individual stores. Sentry Hardware Corporation, Cleveland, Ohio 44113.



# Edison introduces the reachable band saw.

A fully functional 10" band saw for less than \$175.

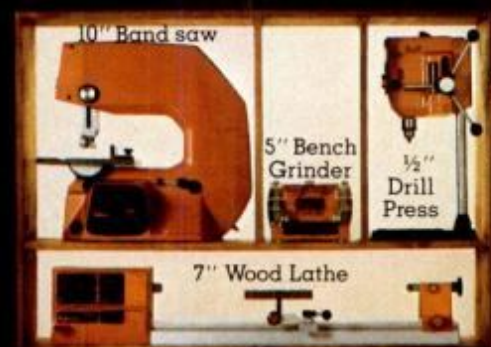
It fits right on your workbench, lifts out of the carton ready to work, and its 1/2 hp variable speed motor gives you the capacity and precision of stationary band saws that can take up twice as much room and a lot more money.

It cuts everything a good band saw should. Wood, plastics, ceramics and non-ferrous metals.

It's the new reachable band saw from Edison.

Reach for it wherever you buy tools.

And reach a new level of craftsmanship.



**From the reachable workshop.**

**Edison Bench Tools**  
Benchmark Tool Company Columbia, Mo. 65201

## Alphabet soup

*I'm confused. According to the owner's manual for my 1972 F250 pickup truck, I'm supposed to use Type F automatic-transmission and power-steering fluid (part No. C1AZ-19582-A, C or D) in the C6 transmission.*

*The owner's manual for my 1979 Ford LTD says that Type CJ automatic-transmission fluid has to be used in the C6 transmission. To make matters even more confusing, the 1979 LTD manual lists the part number for CJ fluid in this manner:*

*D7AZ-19582-A  
Dexron II  
Series D Fluid*

*Now I know one isn't supposed to use Dexron II, which is a GM fluid, in a Ford transmission, or is one?*

*Furthermore, just exactly which fluid is one supposed to use—Type F or Type CJ? And why?—James Hartmann, Kingsport, Tenn.*

You have sharp eyes and pose some good questions. The use of the wrong fluid in the C6 transmission can, indeed, lead to abnormal transmission wear and early failure, so let me spell this out clearly.

The automatic transmissions in your 1972 and 1979 vehicles are not the same, although they are both

referred to as C6 and have many similarities.

However, it is the dissimilarities that can cause problems if the wrong fluid is used. If you don't use Type F fluid in the '72 truck, but substitute Type CJ, clutches and bands, which are calibrated differently, can wear.

Type F fluid is the only fluid recommended for the C6 transmission in 1972 models. Conversely, Type CJ is the only fluid recommended for the C6 transmission in 1979 models.

The bottom line is this: Pay attention only to the recommendation that is given in the owner's manual for the particular car.

As for Dexron II, it may be used as a substitute for Type CJ fluid since their properties are the same.

However, it's vital to be aware Dexron II should *not* be used as a substitute for Type F fluid. It will cause damage to your automobile's transmission.

## GOT A PROBLEM WITH YOUR CAR?

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

## SERVICE TIPS

■ The publication of a new 432-page service manual dealing with 1977-80 VW diesel-engine Rabbits and pickup trucks has been announced by Robert Bentley Inc., 872 Massachusetts Ave., Cambridge, Mass. 02139. It is available from book stores, auto supply dealers or directly from the publisher. Price is \$18.50.

■ Spark knock in 1978-80 Chrysler Corp. cars and light trucks with 225-cu.-in. engines can be reduced or eliminated by installing a new head gasket (part No. 4201200). Refer dealers to service bulletin 08-10-80.

■ General Motors has recalled 85,000 1980 Chevrolet Camaros and Pontiac Firebirds to correct a problem in the steering system. This problem involves possible loose nuts which connect the ball joints to the steering knuckle. If they're not tightened to specification they might separate.

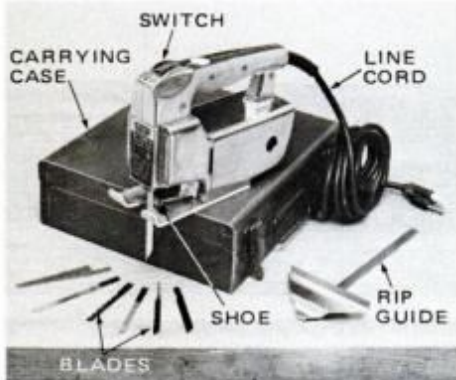
The dealer will repair this problem completely free of charge because it represents a full-fledged recall.

■ Ford recommends that if you disconnect secondary cables from the sparkplug, distributor cap or the coil, you must recoat the connection with silicone compound before the cable is reattached. If you fail to do this, the cable will not seat properly and it may lead to arcing and misfire. Ford advises you to use Motorcraft WA-10 Silicone Compound, part No. D7AZ-19A331-A. **PM**



# WORKSHOP MINICOURSE

## USING A SABRE SAW



Typical sabre saw comes in a kit. Most manufacturers include a rip guide and an assortment of blades. The box is usually built so that the saw can be put away with a blade gripped in its chuck.

**A** sabre saw is a great addition to any do-it-yourselfer's collection of power tools. Actually a portable jigsaw, the tool will make any cut your portable circular saw makes—and some that it doesn't.

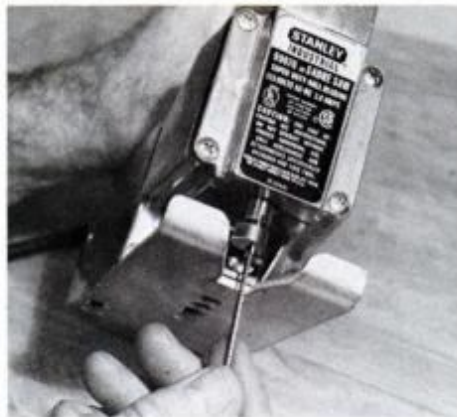
Regardless of the brand purchased, most sabre saws have sufficient power to let you take advantage of the great variety of blades offered for use with the tool. You will find blades for rough and smooth cuts in wood and metal, as well as special-purpose blades for cutting leather, plastics and the like.

There are also blades for heavy cutting and for cutting flush to a vertical or horizontal surface (we'll show you the latter next month).

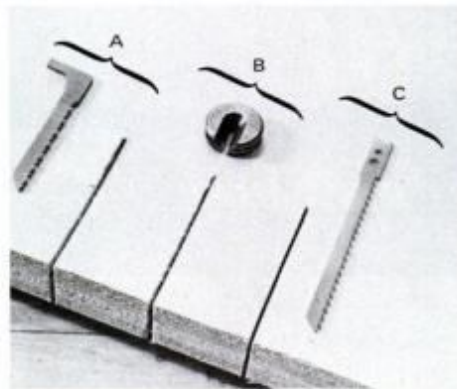
One of the most important points to learn about a sabre saw is that it cuts on the upstroke. This means that you must remember to cut material with its good face down. However, since there is often a need to produce a neat-looking cut on both sides, or a cut must be made from the good side (as when custom-fitting prefinished paneling), sabre-saw makers have sought ways to minimize the splintering effect as the blade exits from the workpiece.

Some saw manufacturers include an insert that snugs the blade as it does its cutting, as shown at right. For many tasks—cutting that prefinished paneling, for example—this works fine.

But the newest blades offered work even better. Though they are slow-cutting—you should push the saw at a comfortable feed rate—the cut on the up side is almost as



Saw shown takes a universal blade, which is inserted into chuck until it stops (can be inserted no farther). This lines up holes to receive the blade-holding screw.



Smoothness of cut varies with blade: **A**, standard plywood blade and its cut; **B**, same blade used with insert; **C**, a neat cut with a superfine blade (one shown is Sears No. 928761). Notice blade **A** has a hook instead of holes. This is the blade shape for Rockwell line of sabre saws.

smooth as the kerf on the down side.

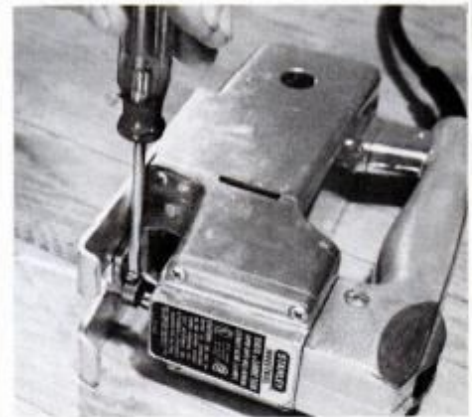
When you buy your sabre saw, take time to read the maker's manual for use and maintenance. Very little maintenance is required; I blow the sawdust from mine after each work session, and I periodically check its lube level and brushes. That's about it.

In order to minimize the chance of damage to the tool when it's not in use, I generally store it in a cabinet.

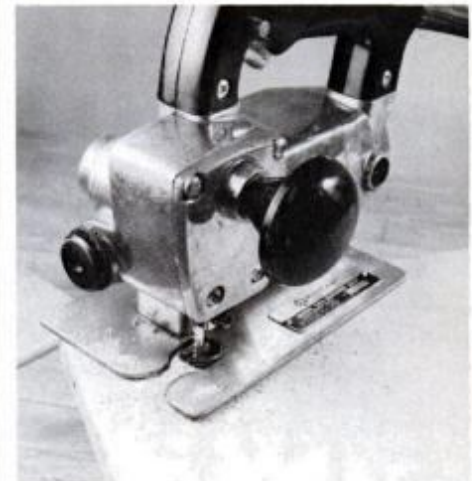
Since a sabre saw cuts with a straight up-and-down stroke, there is considerable vibration. You'll get used to the vibration quickly and the best practice to follow is to cut with a relatively slow feed rate.

*A word about safety:* Like all power tools, the sabre saw is as safe as the user.

Because the blade spits the saw-



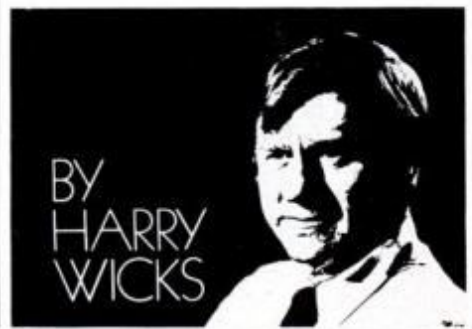
Screw—on some saws it's a setscrew—is turned fully home. For safety, the tool should always be disconnected from power when installing or removing blades.



On this saw the insert "floats" in the shoe, is held in by blade. The insert reduces splintering, as you see at left.

dust up, and you generally have to hunch over the saw to follow a cutting line, it makes sense to wear safety goggles when cutting with a sabre saw. Also, make certain the saw has come to a complete stop before setting it down. Remember, while it's running, the blade is moving.

We'll have more about this fascinating tool next month. **PM**





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# APPLIANCE CLINIC

## QUESTIONS ANSWERED

### Flighty wall heater

I have a Sears propane wall heater which keeps going out. The serviceman has installed a new thermocouple and a new pilot, but the heater still goes out all the time. Could it be the unit where the thermostat is wired?—Gerard H. Burgeault, Tyngsboro, Mass.

We think that it may indeed be the unit regulator, where the thermostat is wired. However, consider these possibilities as well:

■ Are you sure you are turning the pilot on all the way each time? Most of these units require that you hold the knob down when lighting, then rotate to normal setting.

■ Another obvious check is for low pressure in your tank.

Since you have replaced about everything else, you can be suspicious of the regulator. These gas regulators are of the simple diaphragm type and have two valves: a main and a pilot. It is conceivable that dirt or grease, possibly left during manufacturing, is plugging the orifices.

### Standing by the standby

I have a Montgomery Ward 4000-watt, 10-hp generator that won't generate unless it runs more than 10 minutes and I overspeed it. I have had it five years and start it up every week, as I was told to do if I didn't want the electromagnetic field to lose its strength. Could you tell me a trick to avoid this trouble?—Emil Loibl, New Milford, Conn.

Running standby generators once a week is good insurance; it is SOP with the armed forces and others who must have reliable generating capacity. However, we suspect it may not be loss of electromagnetic field strength that is your problem.

It may be more elementary: oxidation of the copper in the armature. Everyone knows how fast a penny tarnishes in air. The same thing happens in your generator's armature. Copper oxide (called verdigris when it reaches the green stage seen on old church roofs) is an effective insulator.

We suggest that you clean the copper contacts on your armature. Then, continuing with the once-a-week routine, spray one of the several new anticorrosion inhibitor aerosol sprays right into the generator.

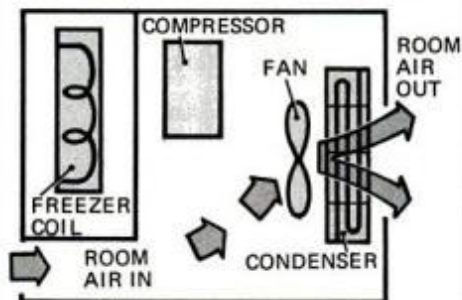
It may pay to check the brushes. In some models, these sit at a slight

angle to the armature. If not properly replaced, they won't make good contact. Also check brush springs and clips for proper tension.

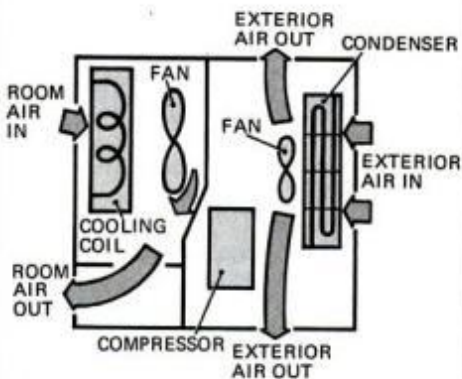
### Down to basics

The fan motor on our Carrier central air conditioner failed after less than 2400 hours. The compressor motor failed at about 3300 hours. Our refrigerator with both compressor and air-circulator fan has run at least 130,000 hours to date. Is there a fundamental difference between a refrigerator and an air conditioner?—Henry Sanguinetti, San Marino, Calif.

There is no fundamental difference between a refrigerator and an air conditioner in their heat-ex-



A refrigerator cools by conduction without a fan moving air over the freezer coil.



An air conditioner contains a fan that circulates room air over the cooling coil.

change cycles. Fans push or push-pull air through the condensers. In the air conditioner, another fan circulates room air over the cooling coil to reduce air temperature in a room. A refrigerator has less volume than a room. Cooling is mostly by conduction; there is no fan to move air over the freezer coil.

Despite their similarity, however, a direct comparison between refrigerators and air conditioners would

(Please turn to page 32)

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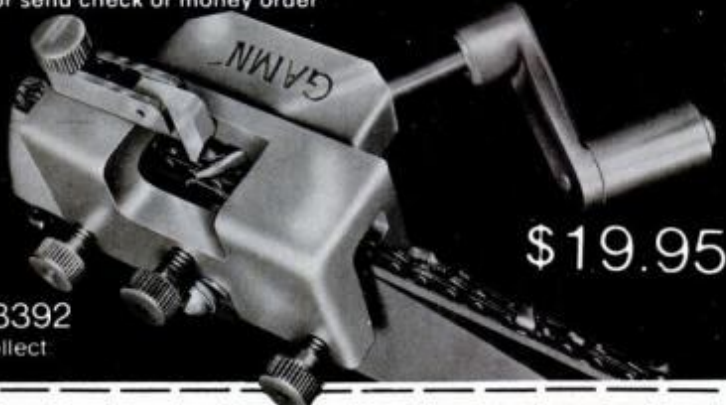
Cabinetmakers' and professional woodworkers' inquiries welcome.



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Just clamp the unit to the bar. GAMN's uniquely designed set-up mechanism securely clamps each tooth in place. Cutting is performed by a dependable carbide burr... never any grinding wheels to wear out. This simple operation assures longer-lasting chain saw life. Use anywhere — at home, shop, or in the forest. Pays for itself many times over the \$19.95 purchase price. Call our toll-free number: 1-800-457-3392 or send check or money order.



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## APPLIANCE CLINIC

(Continued from page 31)

be difficult to substantiate. In normal cases, the appliances operate on different schedules. Maintenance and peak loads are also important factors. Particularly with airconditioners, it is vital to remember that cleanliness of the unit directly affects operation and longevity. Always keep filters clean. Wipe dust and grease from fan blades, vent surfaces and coils.

Factors that can lead to compressor failure include voltage surges during lightning storms, refrigerant undercharge and dirty filters and condenser that cause highhead pressure in the compressor.

### Freezer fragrance

About two years ago, my Whirlpool freezer, Model EXV16X, developed a very disagreeable odor. The unit is now 7 years old. The manufacturer suggested placing charcoal in the freezer as he thought the odor might be caused by a spoiled product that we had spilled in there. He said the gas used, Freon, is odorless. I washed the unit, used the charcoal, and even left the door open four months while I was away. Nothing has helped. The odor has returned worse than ever.—  
*Lewis C. Cavalier, Mehoopany, Pa.*

Mystery odors in freezers and refrigerators can be very trying. A commonly overlooked culprit is a drip pan skillfully hidden by the manufacturer in the machine's bowels.

If you don't read the operating literature carefully, you may not know it is there. Check the bottom of the appliance to see if there is a drip pan for overflow that could be your problem. It may need cleaning.

If the drip pan isn't the culprit, check to see if spilled food particles might be trapped behind a loose area of the door gasket. And never fail to suspect that most common of household odor-makers: a dead mouse in the works. Try this tip from a leading ice-chest maker: Wash the inside of your unit with vanilla extract. It is said to have solved many bad odor problems.

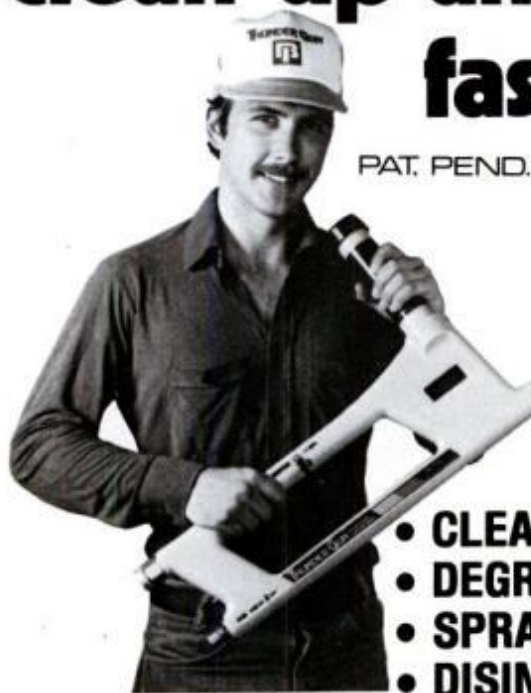
Finally, despite the maker's disclaimer, it is possible your unit has been charged with the wrong Freon. Believe us, some of these formulations will send you out for fresh air. But, after all this time, we doubt a refrigerant leak is your problem. **PM**

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



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# PHONE WIZARD



This incredible phone dialer lets you regulate outgoing phone calls using a secret lock command.

**DICTOGRAPH®** the producer of communication systems for the White House and Pentagon, introduces a space age computer phone. An amazing futuristic instrument capable of 25 functions and memory bank storage of 30 numbers — convenient compact size — all at a price that will make you smile!

No one's got it. And if they do, it's twice the size and triple the price. The Phone Wizard is lightweight (only 15 oz.) and compact, measuring only 8 1/4" x 6" x 1 1/2". The Phone Wizard was selected as the "Most Innovative Electronic Product of the Year" at the recent 1980 International Consumer Electronic Show. All American made, it is approved by the FCC (U.S. Government).

The Phone Wizard is based on a unique "Logical Language Sequence", which gives each key multiple use. This feature is activated by pressing a predetermined code onto a multiple use key (like a multi-function digital watch).

## It's an Automatic Dialer

Think of the number of people you frequently call. The Phone Wizard stores up to 30 often used phone numbers (up to sixteen digits each) in its Memory Bank.

When dialing don't pick up the phone, just push the right button and listen. The built in loud speaker lets you hear the other person answer or the busy signal.

Glance at the big bright LED display. You'll immediately know the right number is being dialed—

## More Outstanding Features

- Pressure sensitive keys, solid face (no buttons).
- Beep tones tell you that each digit is being dialed or stored correctly.
- Back-Space Erase lets you 'erase' a wrong number. Easy as pie.
- Want to confirm a stored number? Just press the storage button twice. Instantly you'll see a big read-out so you can verify.
- Automatically rings your number up to six times, then stops when your party isn't home.

## Connects to Any Phone System In Minutes

**MODULAR PLUG SYSTEMS.** Installing the Phone Wizard to any modular plug takes only minutes. Simply unplug line from phone and plug into connection labeled "line". Then plug one end of Phone Wizard cord (included) into connection marked "phone" and the other end back into telephone. Even older platforms require only an inexpensive adapter. This adapter is available at any stereo/radio store and connects in seconds. In addition, Phone Wizard automatically transforms dialer phones to

push button.

**INTERNAL PHONE SYSTEMS** sometimes require the dialing of 1 or 2 digit excess number to connect with the main system, for recording reasons. With Phone Wizard, you can still store frequently used numbers, and still press only one key for dialing. For example, the excess number is 91. Just press 91. Then press Pause, which allows enough time for internal recording. Then continue pressing the number desired, say 265-829-2112. The LED will display 91P2658292112. Now press Store/Reset and the desired storage position. Instantly, the number is stored for "one-touch" dialing.

**PRIVATE PHONE COMPANIES** such as SPRINT or MCI are easily used with Phone Wizard. The only difference is that you'll use two memory keys. The first stores the computer access number, for instance, 492-5000. The second stores your authorization number, plus the full number you want memorized. To place the call, press the first key (storing access number), wait for the computer's signal. Then rapidly press the second key TWO times. Now your call is automatically placed.

**MULTI-LINE** phone systems require an adapter, which is quickly installed. Up to 5 lines can be hooked into the adapter. Or you can connect other phone accessories. Ordering instructions follow.

## Busy Number Buster and Emergency Dialer

Suppose the number you're calling is busy, just touch the Re-Dial Key, to recall. Still busy? Just program the Phone Wizard to redial later on (up to 15 times, one per minute). A special sign on the display will indicate that the number is being redialed.

Emergency! Here's the quickest and easiest mechanism for dialing the Police or Fire Dept.

## Conference Speaker For Group Conversations

Activate the One-Way Conference Speaker by depressing a button. Conduct group meetings over the phone. Everyone on your end will hear the phone conversation through Phone Wizard's loudspeaker. You relay ideas and suggestions from the group by speaking through the telephone receiver, and everyone hears the answer. Meet by phone, you'll save time, effort, and not

to mention those high gas bills.

## Digital Clock, Stop Watch and Timer

Time of day displayed in hours, minutes and seconds.

Stop Watch Feature times all calls automatically—great for gauging long-distance calls, keeping records, cutting down on expenses by limiting calls, etc.

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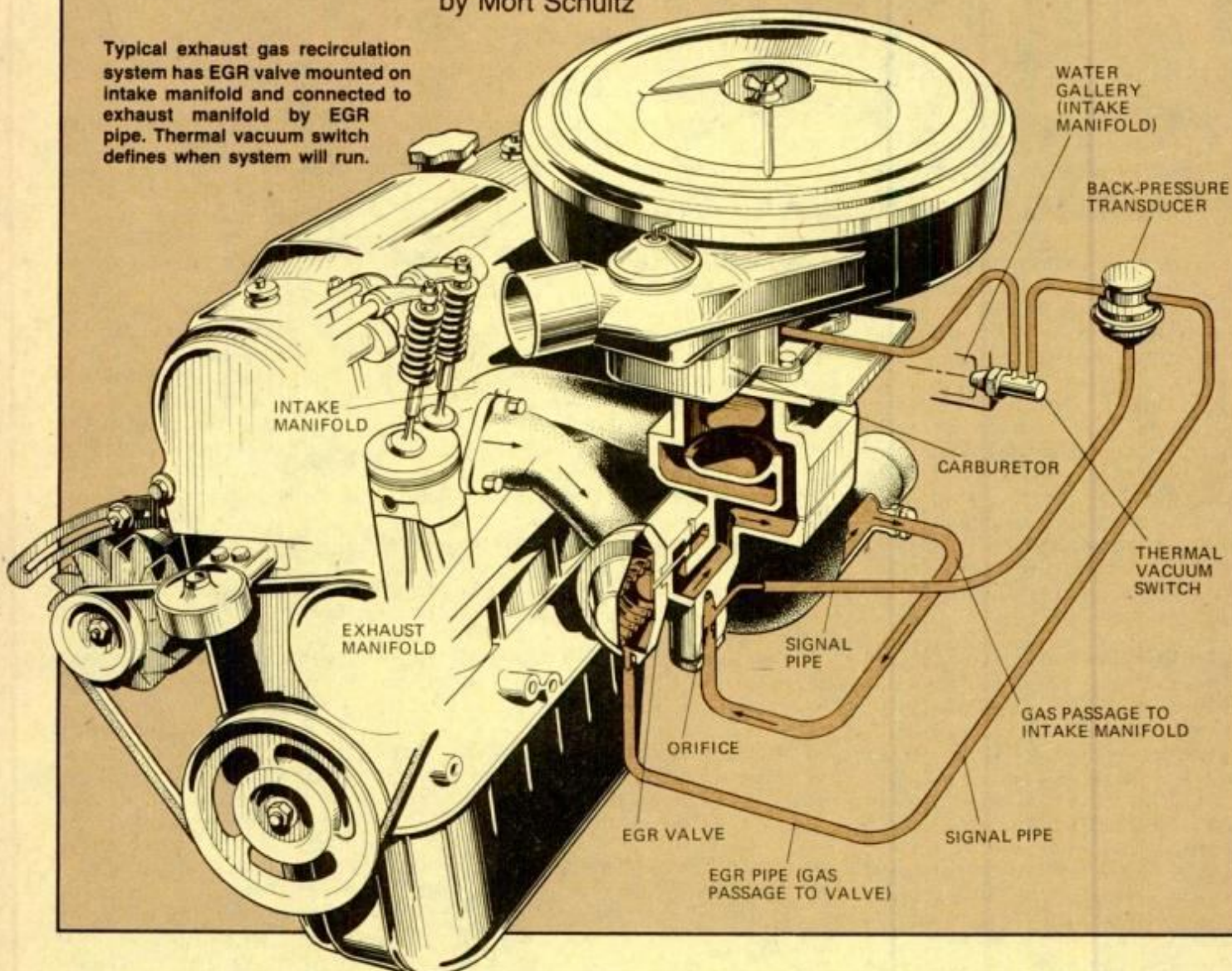
Dept. PM12, Lakewood Plaza  
Lakewood, New Jersey 08701



# Servicing the EGR systems of GM, Japanese and Volkswagen cars

by Mort Schultz

Typical exhaust gas recirculation system has EGR valve mounted on intake manifold and connected to exhaust manifold by EGR pipe. Thermal vacuum switch defines when system will run.



**A** defective exhaust-gas recirculation (EGR) system causes a variety of engine performance problems: rough engine idling, rough engine operation during light throttle acceleration, a deep sag in engine speed or stalling as the engine is accelerated and engine stalling on deceleration.

Since 1973, exhaust-gas recirculation has been a major system in the fight to curtail the polluting element, nitrogen oxide (NOx). NOx is formed when high combustion tem-

perature allows nitrogen and oxygen to combine into nitric oxide (NO).

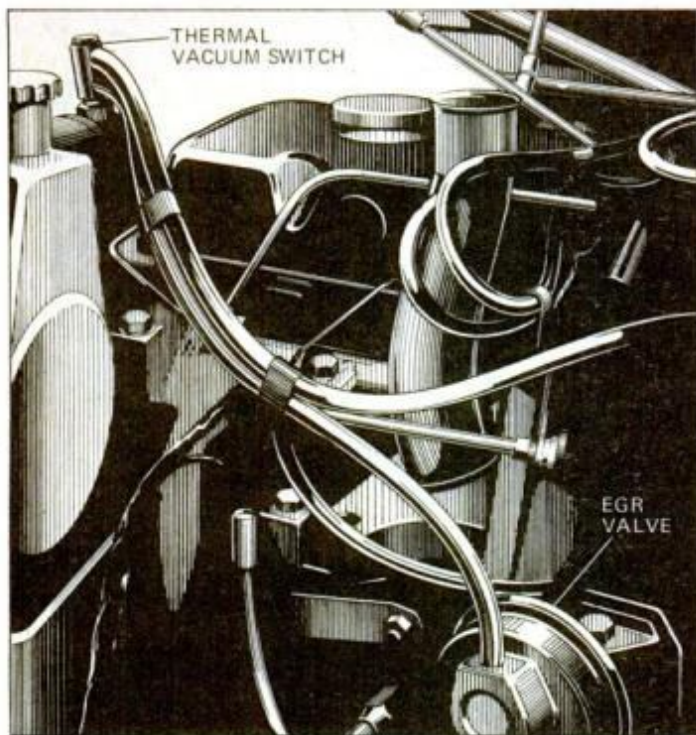
When this is expelled with engine exhaust, nitric oxide is subjected to sunlight and other atmospheric conditions, allowing NOx, or photochemical smog, to form.

The EGR system limits the formation of NOx by diluting the intake fuel with metered amounts of exhaust gas. Exhaust gas, which is inert (it won't burn), is introduced into cylinders with the air/fuel mix-

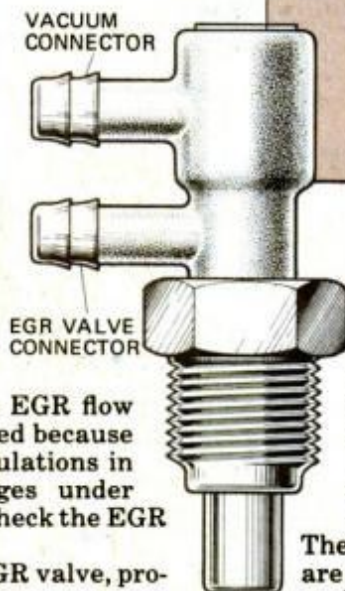
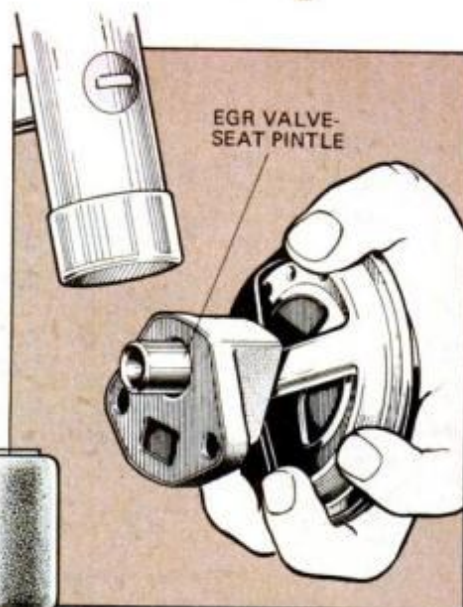
ture through the intake manifold. Exhaust gas is also much cooler than ambient combustion temperatures. Since it is cooler and won't burn, exhaust gas lowers the combustion temperature, which limits the formation of nitric oxide.

The EGR system, properly maintained, does an admirable job and should not be tampered with. Disconnecting the EGR system, in addition to causing an increase in air pollution, will cause a sharp rise in combustion temperature. This may lead





Before troubleshooting an EGR system, check that all hoses are tight and in good shape (left). Pay special attention to hose leading from Thermal Vacuum Switch to EGR valve. Below is a typical TVS. To loosen deposits on an EGR valve (right), strike the pintle with a plastic hammer.



EGR valve. Observe engine speed and EGR valve diaphragm behavior. Two things should happen:

- Engine speed should drop a minimum of 250 rpm.
- The EGR valve diaphragm should rise.

7. If only one or neither of these things occurs, remove and clean the EGR valve.

Then do the test again. If results are still not as they should be, replace the EGR valve and do the test again. Finally, remove the carburetor and clean out the EGR ports in the intake manifold.

#### Cleaning GM EGR valve

Remove the EGR control valve from the intake manifold. It is held by two fasteners. Discard the old gasket.

- Hold the valve assembly in your hand. Don't put the valve in a vise. You may damage the housing.
- Tap the sides of the valve lightly with a plastic hammer. This will knock deposits loose.
- Place a wood dowel on the valve pintle and tap the dowel with the plastic hammer. This will remove deposits from the valve seat.
- Scrape exhaust deposits from the bottom surface and from the valve opening with a wire brush. Depress the valve diaphragm and check for deposits in the valve outlet and seat. Deposits can be removed with a screwdriver.

Before you reinstall the valve, clean the mounting surface on the intake manifold. Use a new gasket.

**Caution:** Don't wash an EGR valve in solvent. The diaphragm will be damaged and an otherwise usable valve will be ruined.

#### Testing thermal vacuum switch

Remove the TVS after the engine has been warmed up. Mark the fit-

to preignition that could cause piston and cylinder-wall damage. A much better approach to a problem is to find out if the EGR is causing the trouble and if so, why, so you can fix it.

The EGR systems used by different automobile manufacturers vary from one to another. In the July issue (page 27), we described the AMC, Chrysler Corp., Datsun and Ford Motor Co. systems. This month, we complete our discussion of EGR by dealing with the General Motors, Honda, Toyota and Volkswagen systems.

#### GM's EGR system

**Note:** This discussion does not include the EGR system used with the GM Computer Controlled Catalytic Converter (C-4) System, which will be covered in a future article.

Basically, the GM EGR system consists of an EGR control valve; thermal vacuum switch (TVS), which keeps vacuum to the EGR control valve shut off until coolant temperature reaches a designated point, and vacuum hoses.

To find the EGR control valve, look near the carburetor. Trace the EGR vacuum hose to the TVS, or in some cars to a combination thermal vacuum and Early Fuel Evaporation switch (see below).

If the engine in your car is idling rough or is stalling, the trouble can be with any of these components. First, check vacuum hoses for damage, loose-fitting ends, disconnected ends or misrouting. Then check the EGR valve and TVS.

If the engine runs rough on acceleration, the EGR valve is probably

the cause, or the EGR flow may be unbalanced because of deposit accumulations in the EGR passages under the carburetor. Check the EGR valve first.

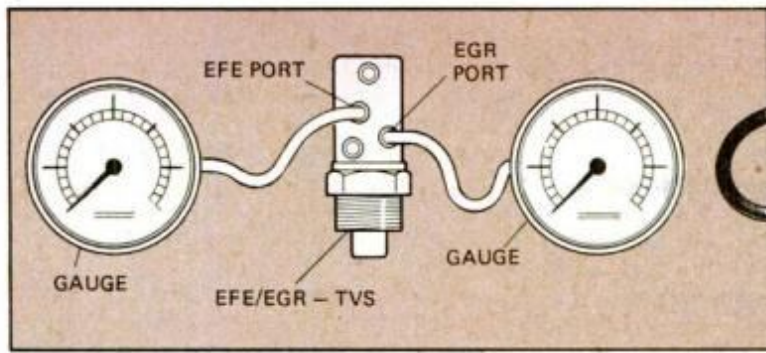
To check the EGR valve, proceed as follows:

1. Warm up the engine to normal operating temperature.
2. Remove the carburetor air cleaner so you can see the EGR valve.
3. Remove and plug the vacuum hose from the distributor vacuum-advance unit.
4. Remove and plug the EGR hose at the EGR valve.
5. Connect a tachometer and start the engine. Place the cam follower on the second step of the fast idle cam and record engine speed.
6. Attach a vacuum hose between the vacuum fitting on the intake manifold to which the air-cleaner vacuum hose was connected and the

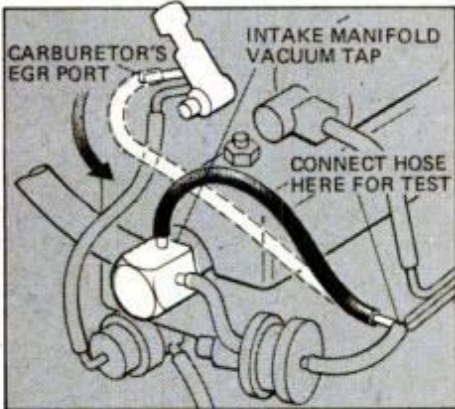
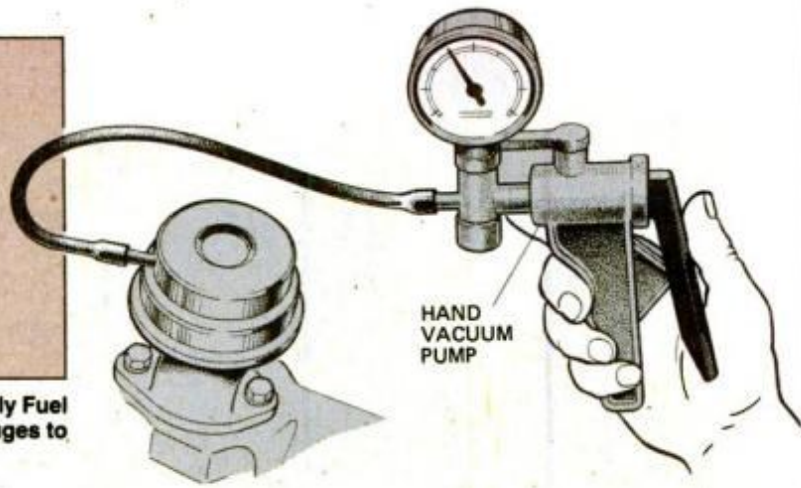


Some GM cars have Back Pressure Transducer (BPT) separate from EGR valve. To test BPT disconnect hose, check vacuum.

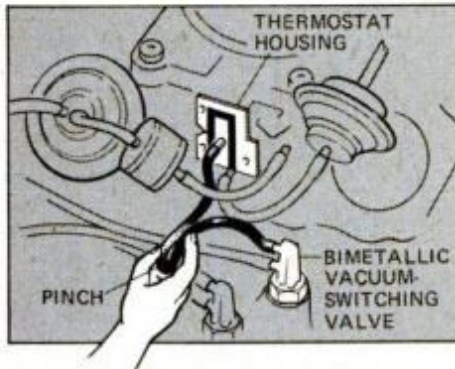




In some later-model GM cars the Thermal Vacuum Switch and Early Fuel Evaporation (EFE) are combined in one valve. It requires two gauges to test. EGR valve (right) is tested with a vacuum pump.



On Toyota, disconnect EGR hose at the carburetor and connect it to intake manifold.



ting on the TVS to which the hose going to the EGR control valve is connected, if it isn't already marked. Blow through the other fitting. Air should pass freely. If it doesn't, replace the TVS.

Put the TVS in a refrigerator, so it cools down to below 60° F. Then blow through the fitting again. Air should be blocked. If it isn't, replace the TVS.

#### Variations on GM EGR system

Some GM EGR control valves incorporate a back-pressure transducer (BPT), which is a small diaphragm control valve inside the EGR valve assembly that regulates pressure. This does not affect the method used to test the valve or what to do if it fails the test. Just make sure that if a new valve is to be used, you get the right one for your car.

Some other models (for example, those with electronic fuel injection)

To test a Toyota EGR valve, pinch closed the hose that connects the bimetallic valve with the thermostat.

have a back-pressure transducer as a separate component, independent of the EGR control valve. To test the back-pressure transducer, disconnect the vacuum hose at the EGR valve and hold your finger over the end of the hose as the engine is accelerated slowly from idle to about 3500 rpm.

There should be a gradual increase in "pull" (vacuum) on your finger. If there isn't, and assuming hoses are in good shape, replace the back-pressure transducer.

In some 1978-1980 models with 196-, 231- and 350-cu.-in. engines, the thermal vacuum switch and Early Fuel Evaporation check valve are combined into one switch having five ports. The purpose of the Early Fuel Evaporation (EFE) system is to allow a cold engine to warm up rapidly.

(Keep the EFE in mind if your car runs rough or stumbles when the engine is cold. The trouble may not be the EGR. It may be the EFE.)

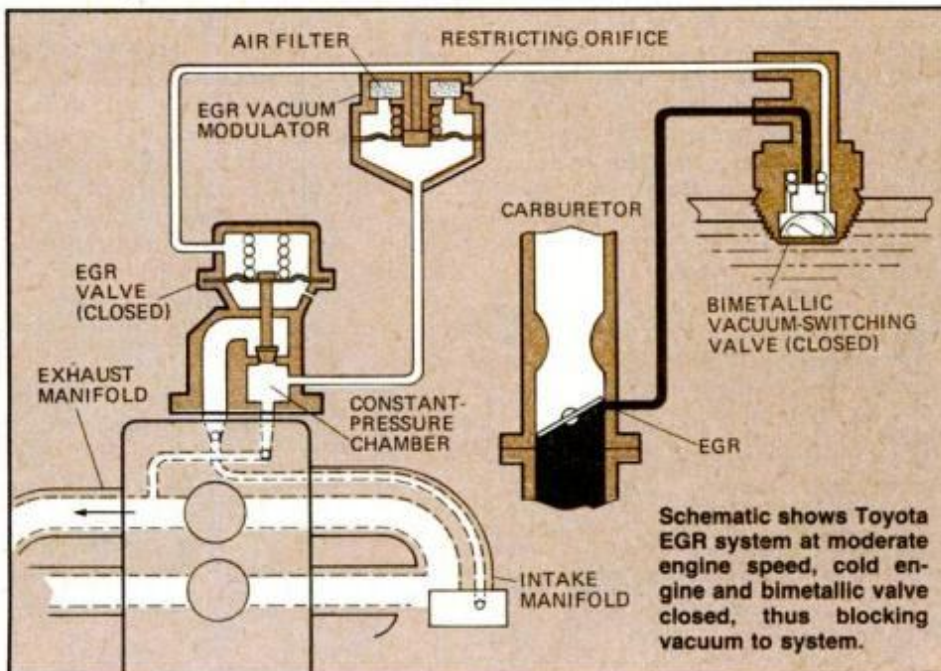
Testing the EFE/EGR switch involves using two vacuum gauges to test vacuum at the ports. The procedure, which is described in a GM service manual, is too lengthy to discuss here. If you don't have a service manual and don't know how to test this part, just replace the switch if other tests show that the rest of the EGR system is functioning properly.

#### Honda's EGR system

Honda did not adopt an EGR system until the 1980 model year, and then only on cars for sale in California and in high altitudes. However, in years to come, the EGR system will probably become as much a part of Honda as it is of other makes.

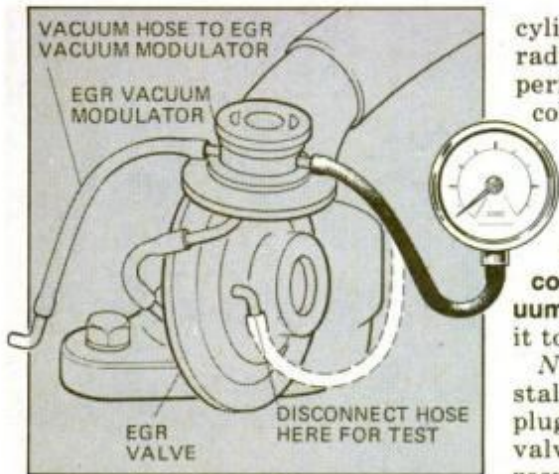
To test the Honda EGR system, the engine has to be cold. Disconnect the vacuum hose from the EGR valve and connect a vacuum gauge to the hose. Connect a tachometer, too.

Start the engine and increase speed to 4500-5000 rpm. There



Schematic shows Toyota EGR system at moderate engine speed, cold engine and bimetallic valve closed, thus blocking vacuum to system.





To test vacuum modulator of Toyota system, tap vacuum gauge on the modulator. If vacuum is present, modulator is faulty.

should be no show of vacuum on the gauge. If there is, a problem lies with the electrically operated EGR control solenoid valve or thermosensor, which is similar to the TVS described earlier.

If there is no vacuum, warm up the engine and allow it to idle. Connect a hand vacuum pump, like a Mityvac, to the EGR valve and apply 6 in. Hg of vacuum. One of these things will happen:

1. If vacuum remains steady and the engine stalls, the EGR valve is okay.
2. If vacuum won't remain steady and the engine won't stall, replace the EGR valve.
3. If vacuum remains steady, but the engine continues to run, clean deposits from the EGR valve and EGR valve passages in the manifold.

### Toyota's EGR system

Toyota adopted an EGR system beginning with 1977 models. The system in 1977 models is different from that used in 1978-1980 models.

The system in 1977 cars, except those manufactured for sale in California and high-altitude areas, consists of an EGR valve and a bimetallic switching valve. The bimetallic switching valve is a temperature sensor that prevents exhaust-gas recirculation when engine temperature is below 122° F.

The system in 1978-1980 models, and the one in 1977 models manufactured for sale in California and high-altitude areas, also uses EGR and bimetallic switching valves, but an EGR vacuum modulator has been added. This is just a back-pressure transducer (see above).

### Testing 1977 Toyota EGR

*Note:* The EGR valve in most Toyotas is located on the front of the

cylinder head, alongside the upper radiator base connections. Start performing the test with the engine cold.

1. Check all hoses first. Replace any that are cracked, kinked or loose-fitting.
2. Disconnect the EGR vacuum hose from the carburetor and connect it to the intake manifold vacuum tap. Start the engine and allow it to idle.

*Note:* If the engine doesn't start, stalls or runs rough, disconnect and plug the vacuum hose at the EGR valve. If the engine still fails to respond normally, the EGR valve is faulty (replace it) or some engine problem not related to the EGR system exists. However, if the engine starts and idles as it should, replace the bimetallic vacuum switching valve. It's defective.

3. If the engine starts okay (Step 2) and idles normally, pinch closed the hose between the bimetallic vacuum switching valve and the thermostat housing. If the engine fails to stall or to idle roughly, replace the EGR valve.

4. Allow the engine to warm up. As temperature goes above 122° F., the engine should start idling roughly. If it doesn't, replace the bimetallic vacuum switching valve.

### Testing Toyota EGR system—1978-80, California and high-altitude models

Start testing with engine cold.

1. After inspecting hoses, remove the cap from the EGR vacuum modulator. This part is located next to the EGR valve at the front of the engine, alongside the connection for the top radiator hose. If the air filter in the modulator is dirty, clean it and reassemble the unit. If the air filter is damaged, replace the EGR vacuum modulator.

2. Disconnect the EGR vacuum hose from the carburetor port and connect it to the intake-manifold vacuum tap. Disconnect the vacuum hose from the EGR valve and connect it to a vacuum gauge. Also connect a tachometer.

3. Start the engine. If it doesn't

start or stalls, replace the EGR valve. If the engine still balks, you have a problem that is not related to the EGR valve.

4. With the engine running, the vacuum gauge should not register a vacuum reading. If it does, the bimetallic vacuum switching valve is defective. Replace it.

5. Let the engine warm up. When it does, the vacuum gauge should show a vacuum reading of 15-21 in. Hg with the engine running at 2500 rpm. If there is no vacuum, disconnect the vacuum hose leading to the EGR vacuum modulator and check for vacuum at this point. If vacuum is present, the EGR vacuum modulator is defective and should be replaced. But if there is no vacuum, the bimetallic switching valve is faulty and should be replaced.

6. With the engine speed at 2500 rpm, disconnect the vacuum gauge and connect the hose to the EGR valve. Engine speed should drop to about 200 rpm. If it doesn't, the EGR valve is defective. Replace it.

### Volkswagen's EGR system

The number of VWs having an EGR system is limited to 1973 models with automatic transmissions, all 1974 models, and 1975 and 1976 Rabbits and Sciroccos. The system consists, basically, of an EGR valve, temperature valve and vacuum hoses.

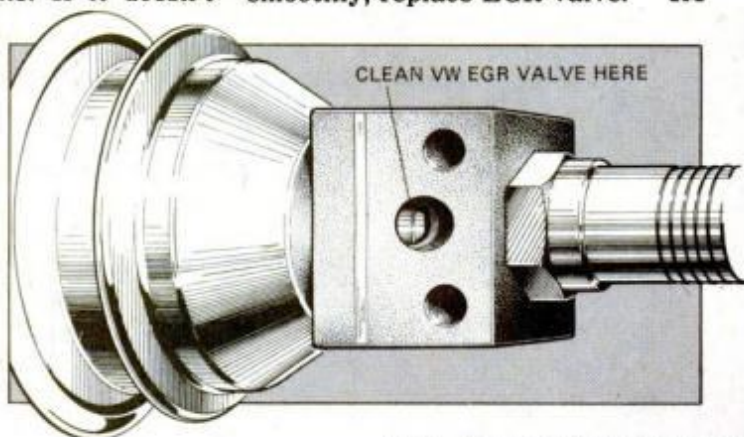
To check the EGR system, do this:

1. Check hoses. Replace those that are defective.

2. Let the engine idle.

3. Remove the EGR control hose from the connection near the throttle valve and connect it to another source of engine vacuum, such as the vacuum tank or brake-booster line. The engine should stall or run roughly. If it doesn't, disconnect the two hoses of the temperature valve and connect them together with a short length of vacuum hose. If the engine now stalls or runs roughly, replace the temperature valve. If the engine runs smoothly, clean the EGR valve and retest. If engine still runs smoothly, replace EGR valve. **FM**

The only way to clean a Volkswagen EGR valve is through a port on the side of the valve. Use a soft metal probe to remove deposits. Don't use solvents. A solvent will deteriorate the EGR valve diaphragm.





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Initial Here \_\_\_\_\_ ER 4



# IMPORTS & MOTORSPORTS

## One GLT—to go



Turbocharged for 1981, the GT is now designated the Volvo GLT.

Now we know: The GT, introduced by Volvo for the 1978 model year, was just Step No. 1. It was a chassis engineer's dream car. It ran rings around Volvo's family sedans even though it, too, had the same Four under the hood. All the tricks were in the suspension. This year, the setting up was done by the turbo trolls and the result is hotter than a sauna. Step No. 2 adds a turbocharger to the B21 (2.1-liter) fuel-injected Four, making it good for 127 hp. Now, if you wish, you can receive a special, written citation from your local constable that you achieved—and surpassed—the national speed limit in less than 10 seconds; he'll be glad to clock you. The GT was a handler; the GLT is that—and more.

BMW, too, has gone turbo—with its 733i. The German automaker added a turbocharger to its quick Six and changed the designation to 745i (because, according to its calculations, the turbo provides power output comparable to a 4.5-liter mill). Too bad it's not for export, yet.

## Tailgating a Rolls

You know that Rolls-Royce makes some of the world's best jet engines, sedans and convertibles on the other side of \$100,000, but station wagons? No, the venerable British manufacturer has not gone the way of Mercedes-Benz and added a wagon to its

Rolls-Royce wagon is California conversion.



line of luxury motor cars. Perish the thought! It's just Clyde Cassady up to his old tricks. Last time around it was a Rolls-Royce pickup that Clyde built at his Classic Coachworks in Rancho Cordova, Calif. (see *Imports & Motorsports*, page 13, Jan. '80). Classic Coachworks doesn't have anything resembling an assembly line, so the Rolls wagon is a limited-production model. That means that, so far, Clyde has the only one.

## Hatching a coupe



Audi hatchback coupe is sold in Europe.

Now that we have a Rabbit with a trunk, perhaps we'll get an Audi with a hatchback. The coupe version of the 4000 is now on sale in Europe, as the Audi 80C GT 5E.

The same coupe body is used for one of the most exciting new cars in Europe: the Audi Quattro. The 4wd sport coupe mounts the turbocharged Five and is the hot setup for hard chargers who want to get to Alpine ski country—fast. Cost? \$7000 per driven wheel.

## Profusion of Hondas

I remember when a Honda was a motorcycle. Then it was a car—a Civic. That was before Accord and Prelude. Then came Quint (see *Imports & Motorsports*, page 30, June '80), which is a five-door hatchback sold only in Japan. Now there's Ballade, Bounty and the four-door Civic. Here's how to sort them out:

We get the Civic four-door. It's 161 inches overall on a 91.3-inch wheelbase. It has joined the Honda lineup for the '81 model year.



Honda Ballade is four-door sold in Japan.

The Ballade is built on the same wheelbase and looks like the Civic from straight on, but has slightly different sheet metal from the nose back. It's sold only in Japan.

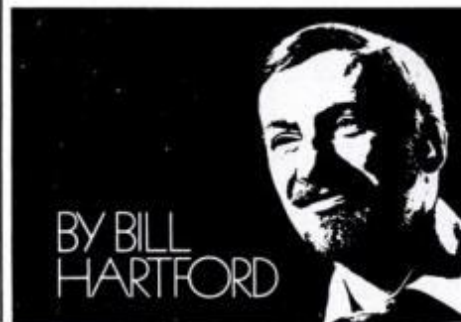
The Bounty will be made and sold in England by BL Ltd. and Honda. Production of this version of the Ballade will begin next year; it will be marketed as a Triumph Bounty.

## First facelift

The fwd Tercel/Corsa series that Toyota introduced in Japan in the fall of '78 (and here in the fall of '79) has already received some refinements. The new models (which we'll report on next month, along with the full line of '81 Toyotas and Datsuns) have a lower hood profile, new grilles, optional sunroofs and even better mileage ratings. **FM**



Corsa Avenue shows changes for Tercel.



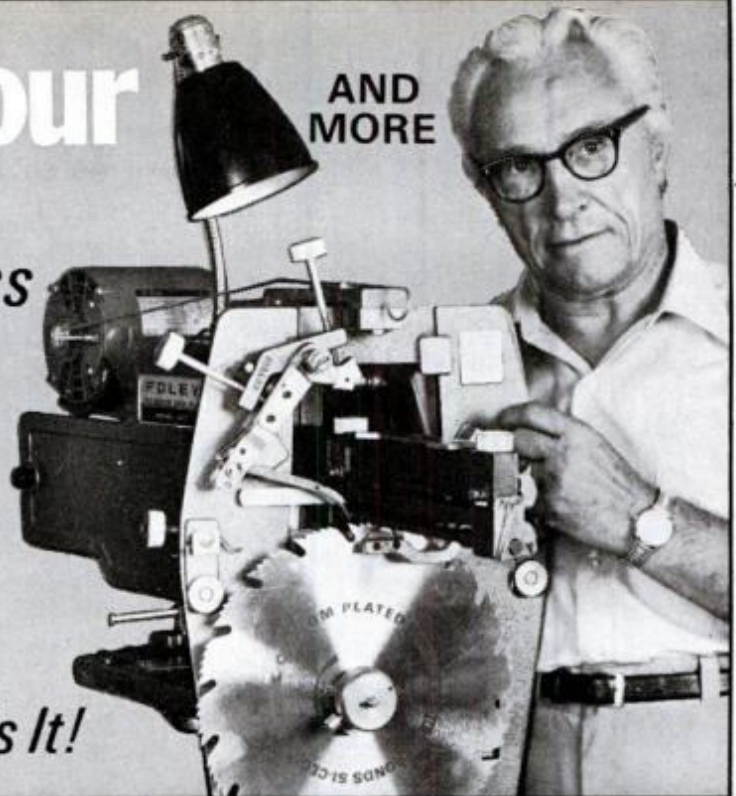


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The sharpening business allows you to get started with only a minimum investment, requiring little space and effort for a successful operation. It lets you build and expand as fast, or as slowly as you like. You pocket most of the money you take in, because there are exceptionally high profits with no investment in merchandise.

If you need only \$200 or \$400 extra income each month, a sharpening business is ideal for spare time. The additional dollars can be SPENT for more of the good things of life. Or they can be SAVED in a rainy-day fund that the family can bank on.

**More sharpening businesses are needed every year**

As original equipment continues to climb in cost, owners are becoming more concerned that the equipment be maintained so that it performs like new. This means more companies, contractors, carpenters and home owners are having their old saw blades and tools resharpened many times, where in the past, they would have replaced them with new blades or tools. This is where you can step in with the much needed service of sharpening saws and practically any kind of tool.

**Read What These Foley Shop Owners Say:**

**Shop will gross \$40,000 ... likes being independent**

*"I worked in various industrial jobs for years, and always wondered if I could make money for someone else, why I couldn't do it for myself. So after losing my regular job, I opened my Foley sharpening shop in the basement of my home. I only had a minimum of cash to start with, but Foley financed the balance. My shop will gross over \$40,000 this year, and I like the feeling of running my own shop without answering to someone else."*

**William Wescott  
Willoughby, Ohio 44094**



**Husband and wife have a going spare time shop**

*"I'm a construction foreman, and my wife is a nurse's aide. Our Foley shop fits in nicely with our regular jobs, and we earn extra money. Our sons help out too, so ours is a real family business."*

*"I'm still too young to retire, but when I do I'll have a very good business built up. Foley equipment helps us to do good work and brings customers back with more jobs on a regular basis ... we have a lot of repeat business the year around."*

**Victor Kosloski  
Sturgis, Michigan 49091**



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# THE PM GARAGE

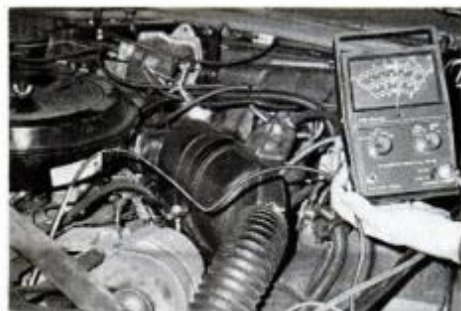
## CAPSULE REPORTS ON NEW AUTO PRODUCTS

### New tach/timing indicator

Fox Valley has just introduced a combination tach/timing indicator which has a new feature that I've found especially convenient.

Its stiff probe allows you to snake it down into the timing probe-holder that is now standard equipment on most cars.

This permits you to read the timing on the remote gauge instead of struggling to see buried marks. This system also enables you to check the



Fox Valley tach and timing indicator can be used on gasoline and diesel engines.



Stiff probe holder will give you remote timing-mark readings for timing checks.

rpm of diesel engines accurately and quickly.

The instrument is available for \$168 and is made by Fox Valley Instrument Co., 8627 North Straits Highway, Cheboygan, Mich. 49721.—*Paul Weissler*

### Spring-loaded battery clamps

Some kind of quick-disconnect system for battery cables is something which I've wanted to see for a long time.

Finally, someone has come out with a system that works.

These cables have an internal, spring-loaded clamp that holds the cable securely to the battery post. The plastic terminal cover already comes filled with petroleum jelly, which inhibits the formation of corrosive acids. Price is about \$10 from



Spring-loaded cables disconnect quickly.

All-Safe Battery Clamp Inc., 4100 East 51st St., Tulsa, Okla. 74135.

—*T.A.*

### Positive-release ratchet

We've just come across a really good positive-release ratchet handle for 3/8-inch-drive sockets. It's made by Thorsen Tool and features two prongs that are recessed on either side of the head.

When you're ready to release a socket, just press on the back of the handle with your thumb and the socket ejects.



A positive release ejects wrench sockets.

It's a much better system than the conventional ball-bearing method which is used by most other tool makers.

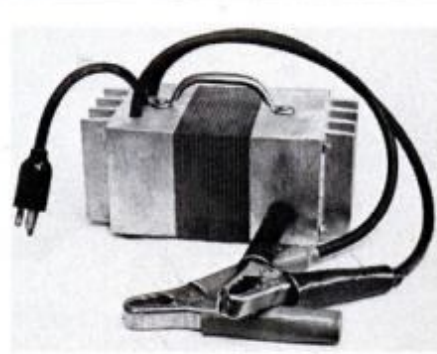
It costs \$19 from Thorsen Tool, Box 20678, Dallas, Tex. 75220.

—*T.A.*

### Boost, please

Here's a home-garage "tool" that I appreciate on those frigid mornings when my car won't start. It's essentially a transformer that converts house current into 250-amp., 12-volt d.c. to give your battery a big kick in the pants.

It isn't going to compensate for a marginal ignition system or other major problems, but if a weak battery is preventing you from start-



Quick Start will boost your battery fast.

ing, this Quick Start will get you going fast.

It sells for \$79.50 from Great Plains Products, Box 82632, Oklahoma City, Okla. 73148.—*M.L.*

### Prestone coolant tester

I learned a long time ago that you need a hydrometer in the garage both winter and summer. And Prestone's hydrometer is an especially good one to have.

For winter protection, one side reads in degrees Fahrenheit down to -45°. On the other side, there's a scale that registers the antiboil characteristics of your radiator coolant, from 255° to 268° F., with a 15-p.s.i. cap.

The Prestone tester, with its clear



Coolant tester is essential in the winter.

plastic body, also lets you see any rust or sediment that happens to be inside your radiator. Instructions are printed on the tester itself.

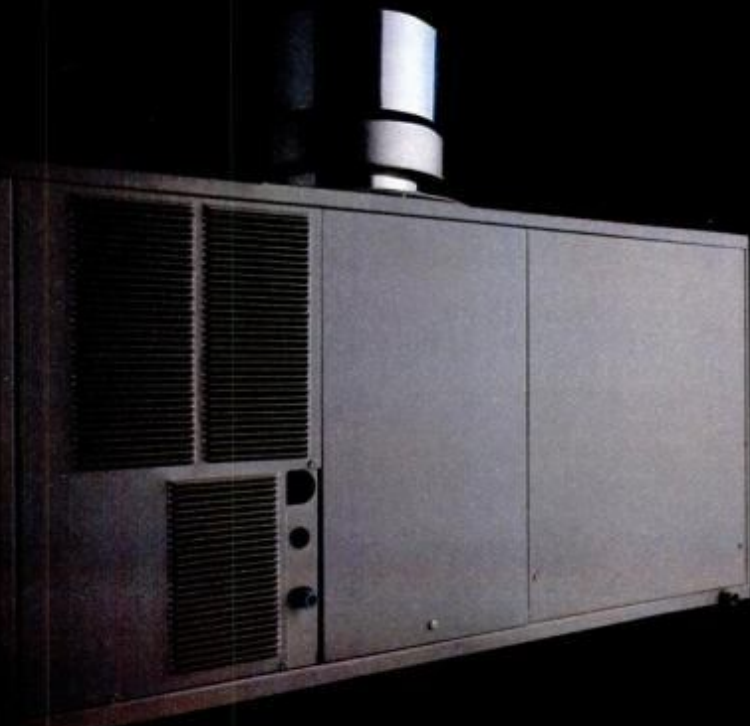
It costs \$3.79 at most auto parts counters.—*M.L.*





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Frugality. The folks who founded Amana, Iowa, considered it a virtue. Today, the folks who design Amana® products still do. Which is nice to know if you're in need of a new cooling and heating system for your home.

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The air conditioning compressor is the new high-efficiency kind. It's 14% to 34% more efficient than our standard cooling units.

The heating unit is designed around something we call the Heat Transfer Module (HTM®). Nobody else has anything like it. That's why our system is anywhere from 5% to 59% more efficient—size for size—than any gas furnace being built by our major competitors.\*

Also, our system can be installed most anywhere outdoors. So it saves space indoors.

And the way it's built, you know it's going to last. The coils are seamless copper tubing. The fins are ripple-edged aluminum to resist bending. The paint is bonded to the surface electrically. So it's almost impossible for rust and corrosion to even get started.

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### **Amana.**

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# ALL OUTDOORS

## A powerful difference

A new era of safety and performance for smaller pleasure boats may arrive this spring, when boatbuilders start installing a new outboard-type power unit. Created by Outboard Marine Corp., it's called the OMC Sea Drive and will first be made in a 2.6-liter (160-cu.-in.) V6 unit of about 235-hp and a 1.6-liter (100-cu.-in.) V4 with 140 hp.

The engines are designed to mount completely behind the boat. This means no need for a cutdown transom where the outboard used to clamp on, no motor well or inboard/sterndrive engine cover taking up the back of the cockpit. Instead, the Sea Drive bolts to a clever transom bracket which hinges at the top. Tilted, the powerhead and lower unit swing up clear of the water.

More space and less weight aboard are only two of the bonus features. Initial tests on a Bertram Flybridge 28-footer that will be on the market with the new drives in May showed that, with a pair of the 2.6-liter Sea Drives, the top speed of 46.5



Not an outboard, not an inboard, OMC's new Sea Drive is in a marine class by itself.

mph was 12 mph faster than with two 5-liter inboards. At 32-mph economy cruise, fuel consumption was less than inboards by 34 percent.

OMC estimates that the 1.6-liter Sea Drive should be suitable for hulls from 17 to 25 feet and the 2.6 for craft up to 35. The larger units are waterproofed so that even following seas won't drown them out.

## Stick 'em up

Items that puncture or break in the field often need a special kind of repair. A brittle glue job may work at home, but when it's a tent, a boat hull or a pair of waders that needs attention, a flexible repair is often necessary. Bing McClellan, of Burke Lures, now is packaging Heat 'N Fix. Tackle and sporting goods stores that carry Burke lures are now stocking it.



With a stick of adhesive and a match, this new glue drips a quick and flexible patch.

Just hold a match or lighter under a bit of the stuff and the drips can be spread to form a patch both flexible and waterproof. Called a pocket repair kit, Heat 'N Fix is claimed to work with cloth, wood, plastic, glass, metal and leather. It can be used around the house as ordinary glue, but it's for outdoor sport use that it is particularly handy.

## RVs: More miles, less weight

Winnebago calls it the Warrior—the next generation in recreational vehicles. It just may be, and just in time. Recently, motor-home sales have been spinning their wheels in a quagmire of recession, high interest rates, low fuel economy and threats of limited gas supplies.

Winnie's 1981 Warrior, 23 feet long, is a foot longer than this year's Brave. But it will weigh in at 6800 pounds (7200 for California) compared with 12,000 gross vehicle weight for the Brave. Mileage jumps to an impressive 15 to 16 mpg compared to the Brave's current 8 mpg. Interior headroom is cut from 6 feet, 5 inches for the Brave to a reasonable 6-foot-3, and the new Warrior slims 3 inches in width to 88 inches



Almost twice the mileage and half the weight are claimed for Winnebago Warrior.

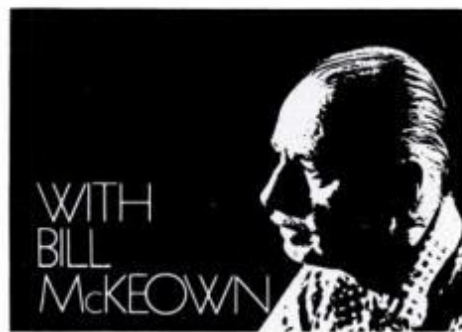
inside. Instead of the Dodge 360 engine, the Warrior is now powered by a 350 Chevy.

Shaving poundage and appetite for fuel are major challenges for designers of a vehicle that carries all the comforts of home and the kitchen sink, yet still must climb mountains and cruise at a reasonable speed. Winnebago gave us an exclusive preview of these figures, developed from the first Warrior prototype, to give PM's RV readers an advance look at what's to come. If production Warriors can live up to this standard, Winnie may have another winner.

## Raise-a-lunker

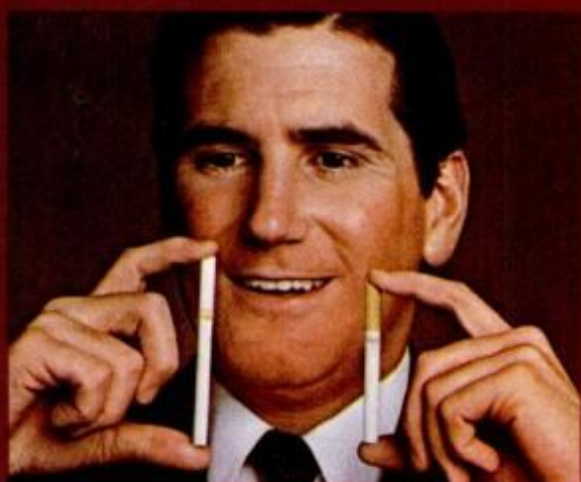
For fishermen who always feel the big ones get away, there is now a kit to keep them where you want them. All it requires is a very wet backyard—say a lake, river or bay—and an urge to grow your own. Used tires have been installed very successfully as breakwaters and underwater fish-collecting reefs. Now Topper Industries in Vancouver, Wash., is filling them with flotation material it feels should last at least 25 years. Topper calls the arrangement a Floating Fish Pen system. The tire floats support a 20x20-foot pen, framed in aluminum alloy, enclosed with nylon fish net and topped with an automatic fish feeder.

The initial unit costs about \$3000, and is designed primarily for raising fish for profit. But it may appeal to frustrated fishermen, as well. **PM**





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# PHOTO HINTS

## Keep her steady



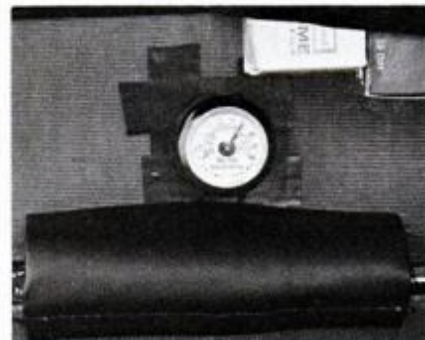
For handheld shots at slow shutter speed, sling your camera's strap over a shoulder and adjust the strap so that when you look in the viewfinder you must apply tension to keep strap taut. Bracing thus afforded is surprisingly effective.—*Bob Berger*

## Darkroom containers



Cut plastic bottles to heights that will hold exactly the right amounts of developer for various film sizes. No more measuring when you develop—just fill a container to premeasured top. Developer is saved as correct amount is always used.—*Ken Patterson*

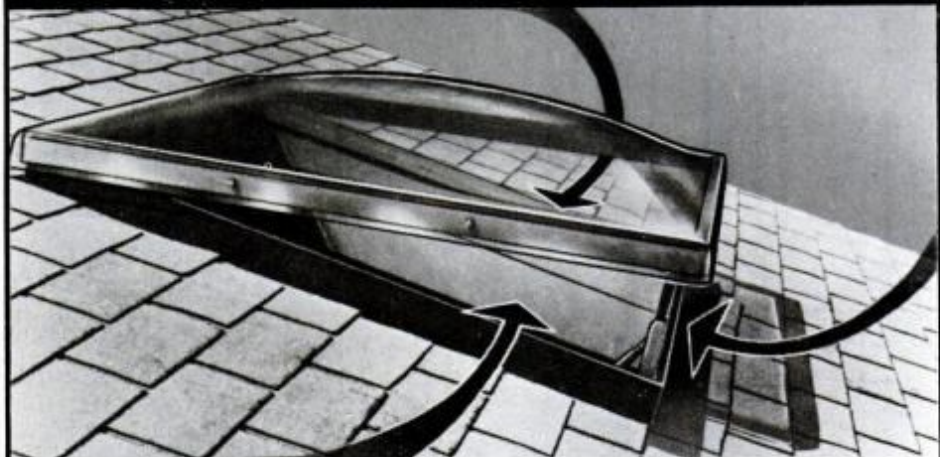
## Beat the heat



Keep a small dial thermometer in your camera bag or taped to the side. It will alert you if your film is in danger from excessive heat.—*C. Boyd Pfeiffer*



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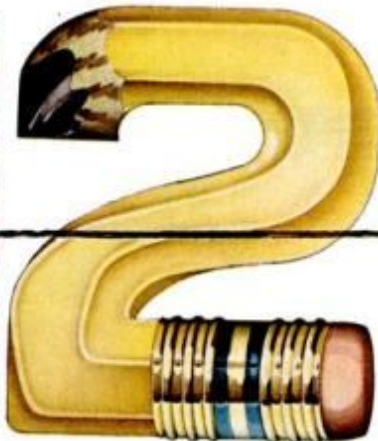
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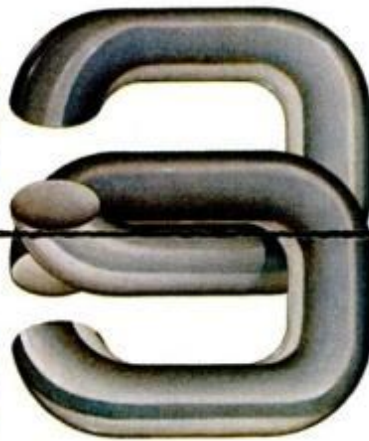
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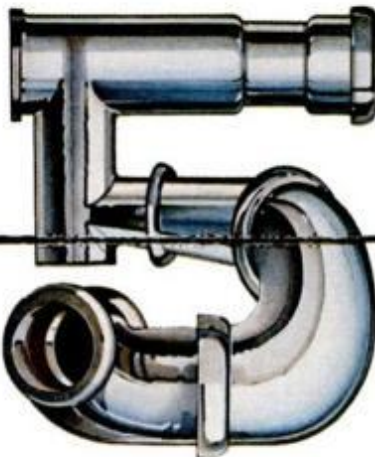
Carbon & Graphite



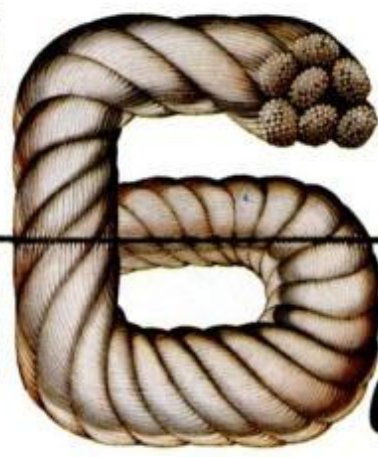
Superalloys



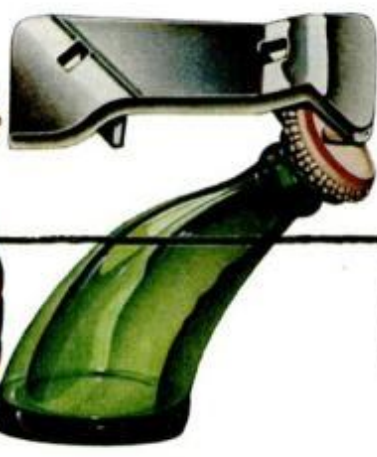
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Chrome-Plated Steel



Braided Cable/Wire Rope



Glass



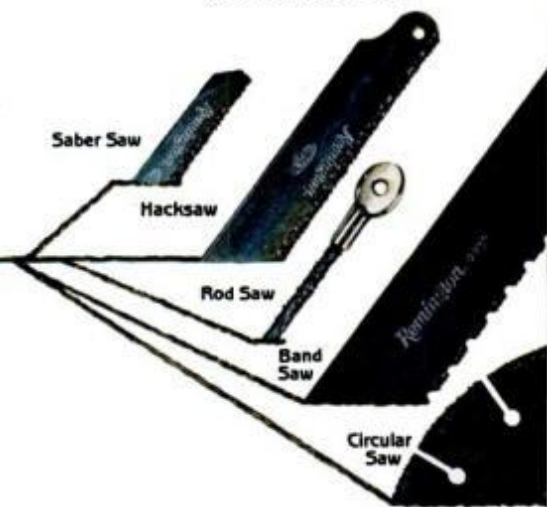
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**Sam Walker Prichard, Alabama**



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**B. A. Deberry Littleton, Colorado**

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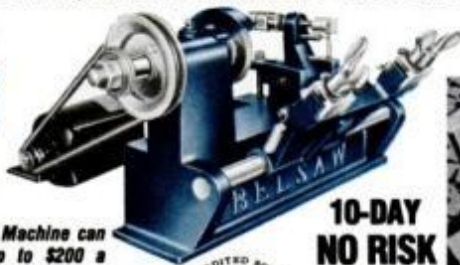
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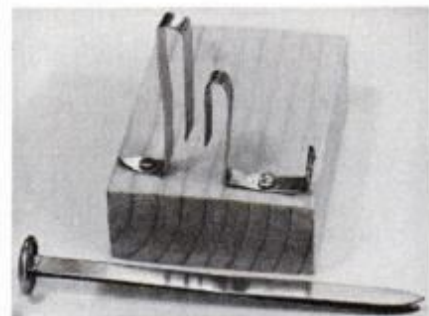
Covers all phases of Burglar, Hold-Up and Fire Alarm servicing and installation. This valuable and timely instruction

## HINTS FROM READERS

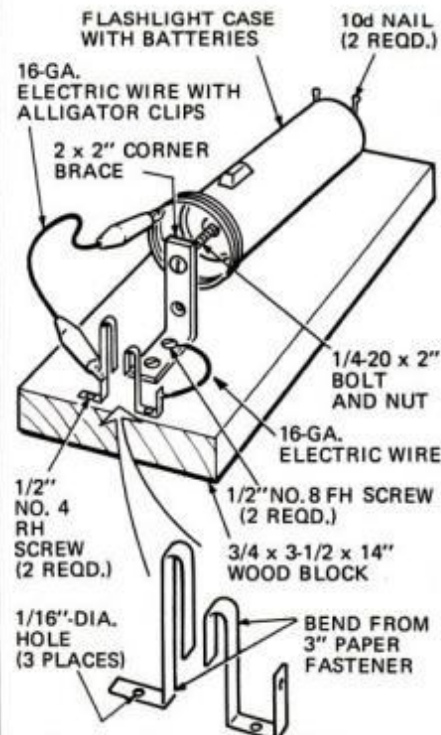
### Christmas tree bulb-tester



Test your bulb between the prongs.



Prongs are cut off a 3-in. paper fastener and attached to block with screws.



Make a timesaving Christmas-tree bulb-tester from a two-cell flashlight and shop scraps. A good bulb, properly put in tester, lights.—David W. Roberts

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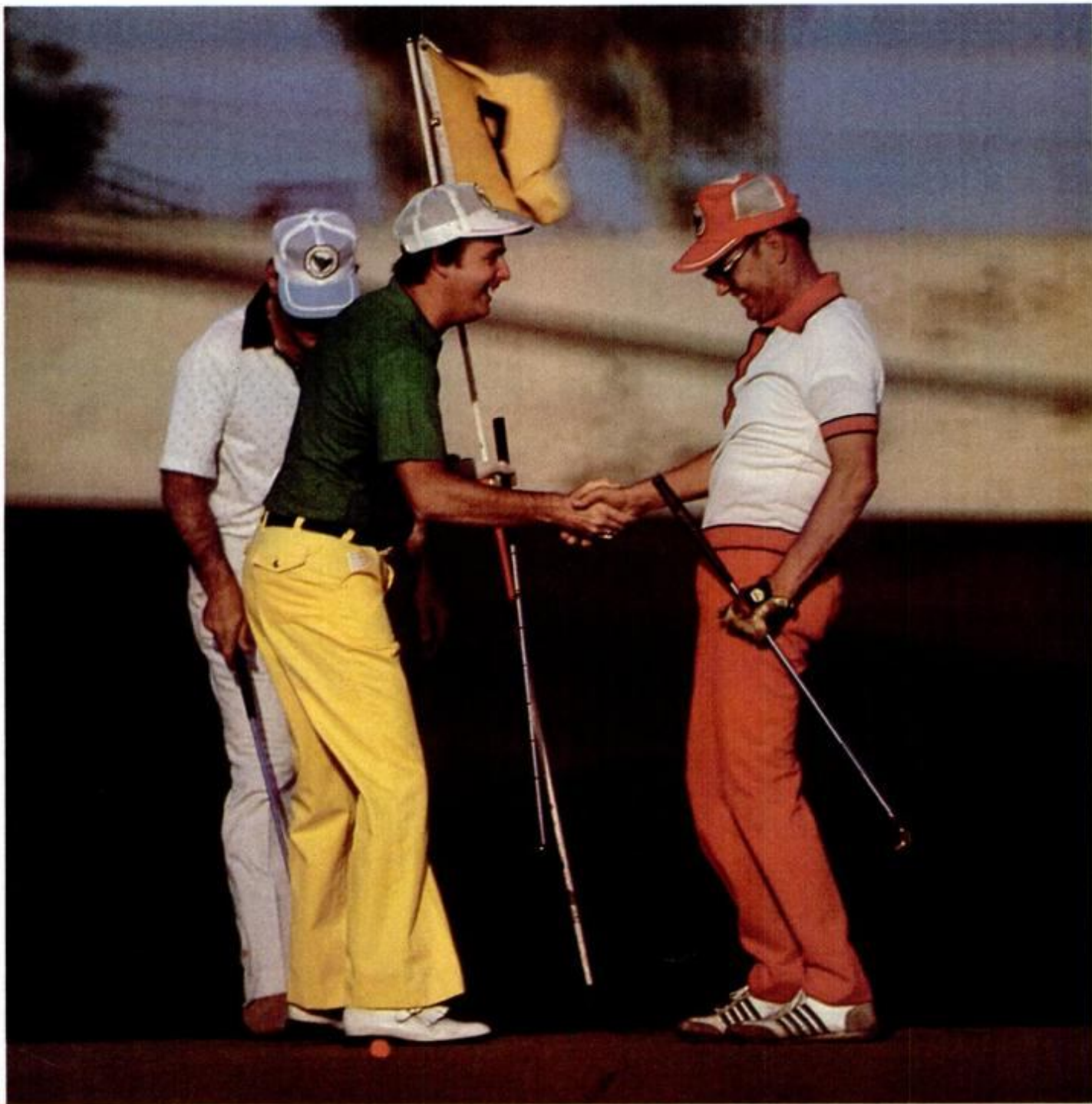
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4. After 46 years in Saudi Arabia,

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5. Jim Burchett, center, birdied the 16th to beat Mike Ehlers and "Sib" Sibley.

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### WHAT "ENGINUITY!"

Crossflow aluminum hemi-head, oversize valves, overhead cam, two sparkplugs per cylinder and 2.2 liters of displacement help this new engine rev up more torque and horsepower than last year... on less gas! You haul past the gas pumps to the highest estimated mpg in compact trucks\*.

**27** **36**  
EST. MPG EST. HWY.

\*EPA estimates for comparison, standard 5-speed manual. Four by fours: 27 est. mpg, 29 est. hwy. Actual mileage may differ depending on speed, trip length and weather. Actual highway mpg will probably be less. California mileage lower.

## SIT BACK AND ENJOY THE TRIP

in the one-and-only Datsun King Cab® GL, roomiest compact going; the only one with reclining buckets and jump seats behind them. Quartz clock, tach, AM/FM radio, overdrive 5, carpeting and new available skyroof† complete the car-like feel.

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King Cab, Li'l Hustler,™ Long Bed... all Datsun pickups are put together so well that over 84% of all those sold during the past 22 years are still on the job. Just what you'd expect from Nissan Motor Co. Ltd., the worldwide company whose name stands for quality. Put a Datsun pickup to the test-drive today.  
†Skyroof available Feb., '81.







'Ultimate' California tree house exterior and interior.

## Me Tarzan, you wipe your feet

Glen Gaviglio doesn't know for sure, but he's willing to bet he lives in America's largest tree house. His 11-room "mansion" in Fairfield, Calif., is, in fact, supported by five eucalyptus trees—plus 19 pilings. Some of the features built into the free-form dwelling by the 37-year-old sociology professor and his engineer brother, Bruce, include stained glass windows, a dumbwaiter-type freight delivery system and two indoor-outdoor hot tubs. Glen estimates that he put \$70,000 worth of materials into the house, and says he recently turned down an offer of \$250,000.



## Shopping spree



The camera pans with shopper Dudman.

It was only a trial run, but Edith Dudman, a South London pensioner, looks as if she's settled in for good. The British-made motorized shopping cart was being tested at Tesco's, a large London supermarket, and a number of volunteer shoppers thought the \$900 unit was just the ticket. On the basis of the trials, the biggest obstacle barring immediate installation of "self-drive trolleys" seems to be the tendency of customers to create their own traffic jams, including minor collisions.

## PM's Whatsit



Here we have what's obviously a jet aircraft, but—wait a minute—there's an air intake, but no place for the jet exhaust to escape. What's going on here? Have any clues? If not, turn the page.





## Cyclist with a leg up

*José Gonzalez Bonilla is a cyclist who also turns a few extra pesos in odd jobs around his native Salamanca, Spain. Most of them—tree pruning, window washing, posting bills—involve the need for a little elevation, which is where José's bicycle comes in. When used strictly as a means of conveyance, its performance is comparable to that of a normal bike, says the inventor.*

## Whatsit revealed

The unusual aircraft is an experimental jet now flying a test program at the University of Tennessee Space Institute. Developed by Ball Corp. of Muncie, Ind., the JW-1 Jetwing is a STOL-type, testing the feasibility of blowing both bypass air and jet-core exhaust from its turbofan (Cessna Citation) engine through a slot and over the upper surface of its main wing to provide added lift. An extra pair of short wings above the mainplane also creates what is called "super circulation lift." UT spokesmen say the result is a superquiet ship that takes off and lands at "Piper Cub speeds," while delivering true jet performance once aloft. Also of interest to the Navy, which is funding the flight program, is the fact that without a hot tailpipe, the aircraft doesn't have an infrared "signature" that heat-seeking missiles can home in on.

## PM follow-up: Volcanic ash

In the August issue, this column touched on the ironies revolving around the sales of small containers of Mount Saint Helens volcanic ash as a "collector's item," while the removal of tons of the stuff was the No. 1 problem in the vicinity of the mountain. Inevitably, products and systems which were to prove out mechanically in the trying local conditions that the eruptions produced were in the awkward position of profiting from general misfortune, but that's in the nature of all disasters.

One of them was the two-stage automotive air filter. Lee Filters, a Cleveland company, received glowing testimonials from drivers who kept going on Lee Maxi-Air filters, when conventional air filters were clogging with ash and choking off other vehicles. And if ash got past the filter and into the carburetor, car owners faced the nasty prospect of a complete engine overhaul. Again, the two-stage filter was a plus—and has now become standard equipment for a lot of drivers who live under the ongoing threat of heavy ash fallout.



Snap-cleaning the outer foam element on a two-stage Maxi-Air filter in Yakima, Wash., near Mt. St. Helens.



Dodge van kept going, even though two-stage filter's outer element was completely caked with volcanic ash.



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**HO! HO! HO!**



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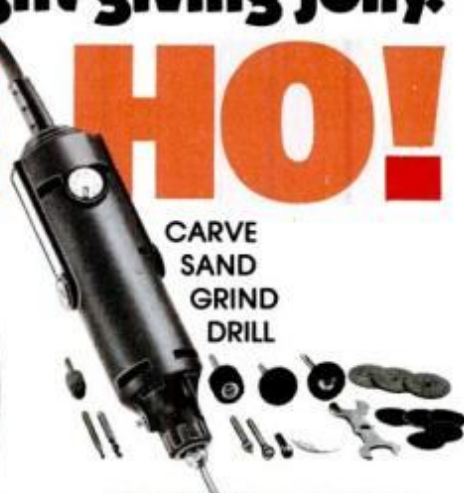
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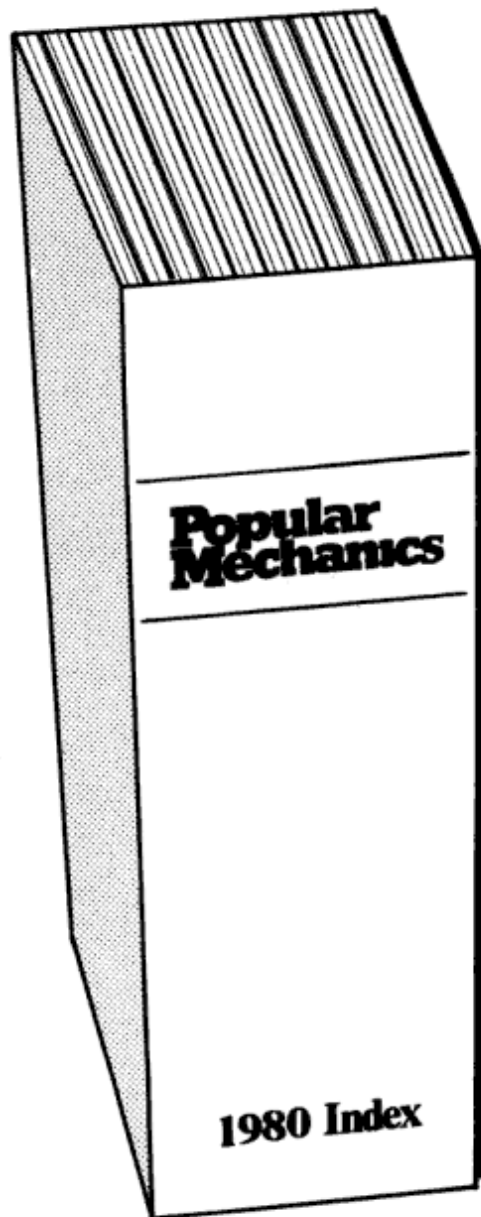
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# PM previews the Pioneer VP-1000 videodisc

This videodisc is the second on the market. It features random access for frame-by-frame selectivity.

by Neil Shapiro  
ELECTRONICS EDITOR



LASER DISC

**T**he videodisc promises to be the hottest new gadget since television. At least five manufacturers are ready to go with three different and incompatible systems. Magnavox was the first out, last year, and now Pioneer has shipped its new VP-1000, called Laserdisc.

The VP-1000 uses the Magnavox system of digitally encoded discs read by a laser. The laser light bounces off the microscopic pits and the amount of reflection is watched by a computer and translated into a video picture on your home TV (see *PM's Complete Guide to the New Videodiscs and Cassettes*, page 118, Sept. '79).

Right now there are classic movies available on disc, as well as recent films, and some self-help and home-study materials. In the next year or so, even more video entertainment on disc should become available.

Though the Pioneer machine uses much of the Magnavox technology, many features have been added and others enhanced. We found it to be beautifully engineered throughout.

## Searching the disc

At last, there's a videodisc machine that takes advantage of a disc's numbered frames. In a movie or other selection, each of the 50,000 frames on a disc is tagged with its own number. The VP-1000 offers a *random-access* or search feature that is most convenient.

If you wish to view frame No.

31,124, for example, you simply type in the number on a keyboard. Then press SEARCH. The disc automatically cycles to the frame you asked for—there is no need to fast-forward or reverse, as everything is done automatically.

Besides the search feature, there is another new scan feature. In the

SCAN mode, you can leap ahead or back (in discontinuous jumps), or move to the next selection on a multiselection disc.

The VP-1000 also offers the same fast-forward, fast-reverse, slow motion, still motion and stereo outputs that were introduced by the Magnavox machine.

## Controls and pictures tops

Not only are the controls grouped conveniently, but they are easy to use.

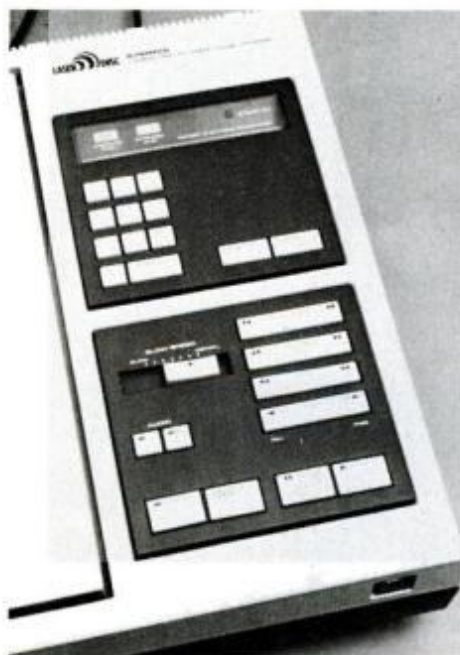
In both FAST and SLOW-MOTION modes, direction is controlled by rocker switches; these switches resemble long bars set flush with the panel. Change from FORWARD to REVERSE, and back, by touching the bar's ends. It isn't any problem to have the machine working within 10 minutes of opening the box.

Picture quality is excellent and, in fact, exceeds that of cable TV. Couple the audio to your stereo system, and the sound and picture can't be beat.

As with any videodisc, the only drawback is that you can't record—only play prerecorded discs.

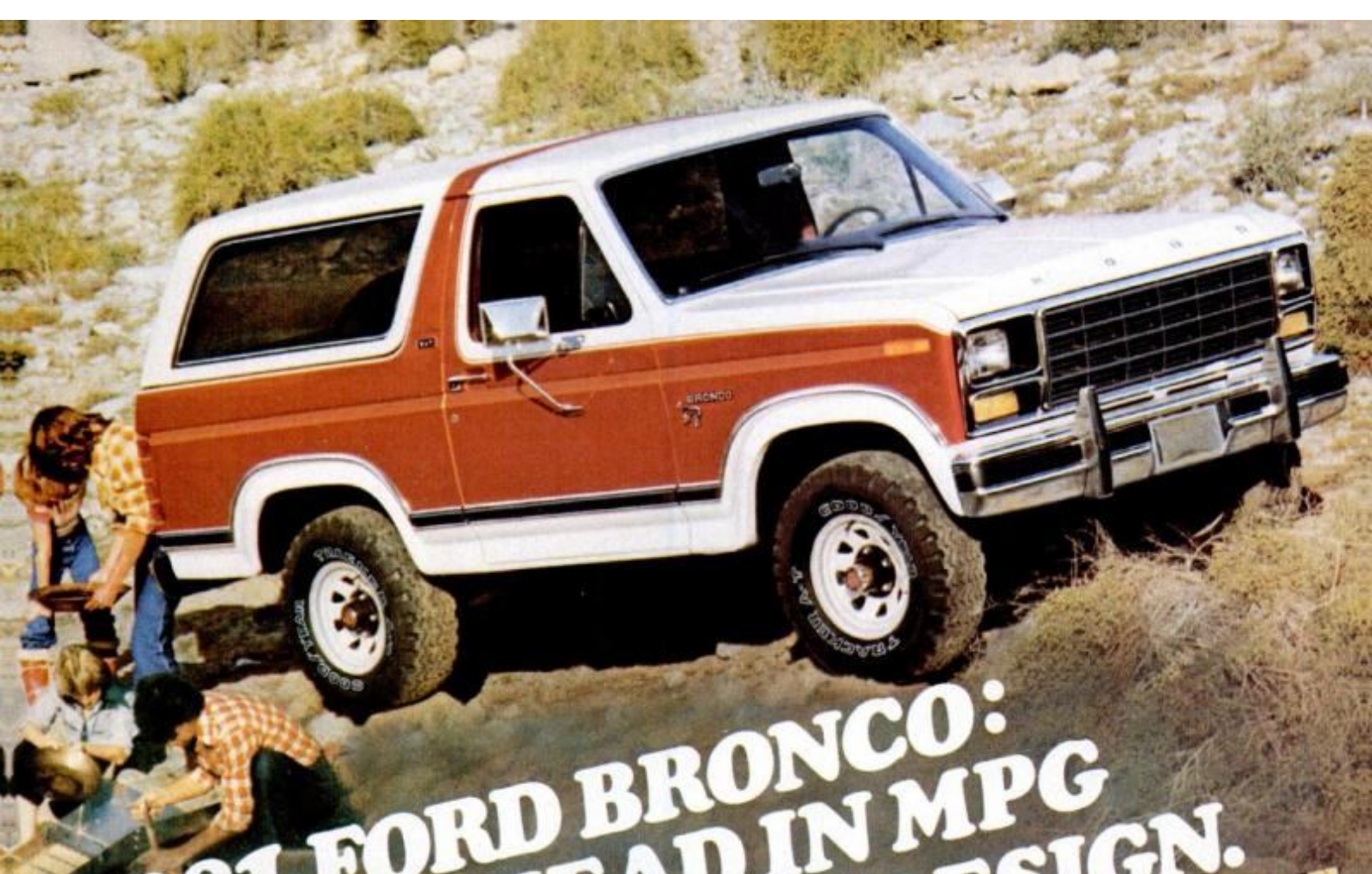
But if you're a movie freak who can spend \$25 for a full-length film, then the videodisc is for you—and the VP-1000 is a very nice videodisc.

PM



Control board of the Pioneer VP-1000 allows rapid choice and adjustment of all functions. Forward and reverse modes are controlled by large rocker-style switches.





# 1981 FORD BRONCO: MILES AHEAD IN MPG AND ADVANCED DESIGN.

Bronco, the 4-wheel utility economy champ. It's the family 4-wheeler totally redesigned last year for the needs of the 80's. The only one that can give you advanced features like tough, independent front suspension and optional 4-speed overdrive transmission to boost fuel economy, particularly at highway speeds. Any way you figure, you're ahead in a tough Bronco!



**NEW OPTION**  
**4-speed overdrive**  
For Ford Bronco. Helps improve fuel economy.

**NEW OPTION**  
**Automatic locking hubs**  
Front hubs run free on highway, lock automatically when you shift to 4WD.

**BEST SIX UTILITY MPG**

**18** EPA EST. MPG **24** EST. HWY.\*

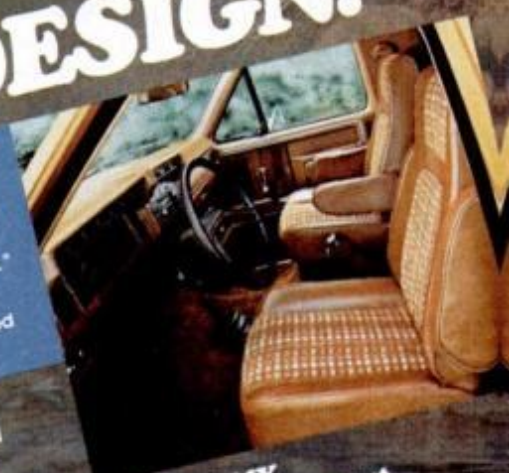
Standard 4.9L (300 CID) Six with 4-speed overdrive transmission option.

**20%**  
**Better gas mileage** for the '81 Bronco over last year's 6-cylinder estimated MPG.

**TOUGH**  
**Twin-Traction Beam**  
Independent front suspension to step over bumps for a stable ride.

**ROOMY**  
**Interior comfort.**  
Bronco can seat six with optional bench seats. Yet keeps its trim outer size.

\* Compare these estimates with others. Your mileage may differ depending on speed, distance and weather. Actual highway mileage will probably be less. California estimates lower.



**FORD**

FORD DIVISION



# DETROIT LISTENING POST

## Looking down the road

Back in April we gave you a comprehensive table showing what the car companies will produce in the next five years. So many changes in the Big Three automakers' plans have been made since then, however, with major programs accelerated, marginal ones cut, and borderline cases being reconsidered almost daily, that a revised future-product scenario seems appropriate now.

It is increasingly obvious that the size range of U.S. cars is heading quickly toward those of Europe and Japan, where "big" cars are what we used to call "compact" and truly tiny commuter cars bring up the bottom of the heap. Both the V8 engine and the traditional "family-size" auto are on the endangered-species list, and what happens this model year in terms of buyer preference is almost certain to decide their fates for the rest of this decade.

Bearing in mind that new-car programs can be substantially altered as late as two years before their introduction, and that potential losers may even be scrubbed completely at the 11th hour before reaching production, the chart at right shows how the great U.S.-market turnaround looks to us. The most recent changes are in italics.

## VW and American Motors

Few reliable spy reports seem to come out of the country's newest automaker, but we do have some information on its new-car programs for the next two years.

VW and its corporate sister Porsche-Audi will continue to introduce new models almost too quickly to keep track of them. Next to be imported here will be a slick two-door fastback version of the Audi 4000 (see *Import & Motorsports*, page 42), followed early in '81 by a redesigned VW Dasher and the 4wd Audi Quattro.

By next fall or early winter the redesigned VW Scirocco sport coupe and a two-door notchback Dasher should reach our shores. All are imports, but look for an all-new, U.S.-built Rabbit by late '82.

AMC will also make news with imported cars from its French partner, Renault. There should be a thrifty diesel version of the Renault 18 by spring and a U.S. adaptation of the slick 18-based Fuego sport coupe next fall.

## NEW CARS PLANNED FOR 1982-1985

YEAR	General Motors	Ford Motor Co.	Chrysler Corp.
1981½	Fwd J-car subcompacts for Chevy, Pontiac and (maybe) Cadillac Divisions	<i>Ford EXP and Mercury LN-7</i> Escort/Lynx-based sports cars	
1982	F-car Camaro/Firebird replacements <i>Fwd A-car intermediates based on X-cars</i> <i>Olds and Buick J-cars</i> U.S.-built minitruck	<i>Five-door hatch version of Escort/Lynx</i> Granada/Cougar-based Lincoln Versailles	Chrysler version of K-car Omni/Horizon-based minipickup
1982½		<i>Minipickup</i> Fwd Fairmont/Zephyr/ replacements (moved back from '82)	<i>Fwd 2+2 sporty coupes based on K-car</i>
1983	<i>Fwd B-cars replace current full-size models (Pontiac B-car and Olds/Buick/Cadillac slightly larger C-cars may be dropped)</i> New, smaller Corvette <i>Pontiac/Chevy two-seat mid-engine sports car</i>	<i>Downsized LTD/Marquis (depending on potential demand)</i> Redesigned Thunderbird/ XR-7 <i>Diesel version of Escort/Lynx</i>	Fwd intermediate LeBaron/ Diplomat replacements (moved up from '84) <i>Fwd K-car-based sports car (built by DeTomaso of Italy)</i>
1984	<i>Fwd A-special intermediate coupes</i> <i>New fwd E-cars (Toronado/Riviera/Eldorado) and K-car (Seville)</i> Fwd S-car minicompact (moved up from '85) <i>Fwd minivans based on X-car</i> <i>Electric commuter car and/or van</i>	<i>Downsized Lincoln Mark</i> Redesigned fwd Mustang/ Capri <i>Two-seater commuter car called Apex</i>	<i>Fwd K-car-based Cordoba/Mirada/Imperial</i> <i>Fwd minipickups and vans based on K-car</i>
1985	<i>Redesigned X-cars</i>	Fwd LTD/Marquis replacements; Fwd minicompact	<i>Fwd minicompact</i>

Styling revisions and engineering improvements to the American Spirit/Concord/Eagle and "senior" Jeep series are also likely for '82. The AMC/Renault jointly developed fwd economy car is a virtual certainty for '83—but there is also an unknown new product on tap for '82½. AMC isn't saying what it will be.

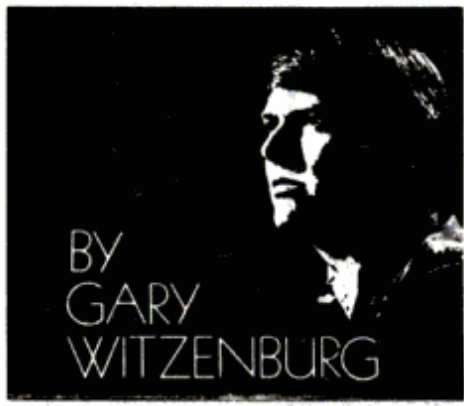
## New Ford engines

Last month we told you about the new family of GM engines scheduled for mid-'80s introduction. These included three-, four-, five- and six-cylinder powerplants for the new range of cars. It seems Ford is also planning engines along these lines.

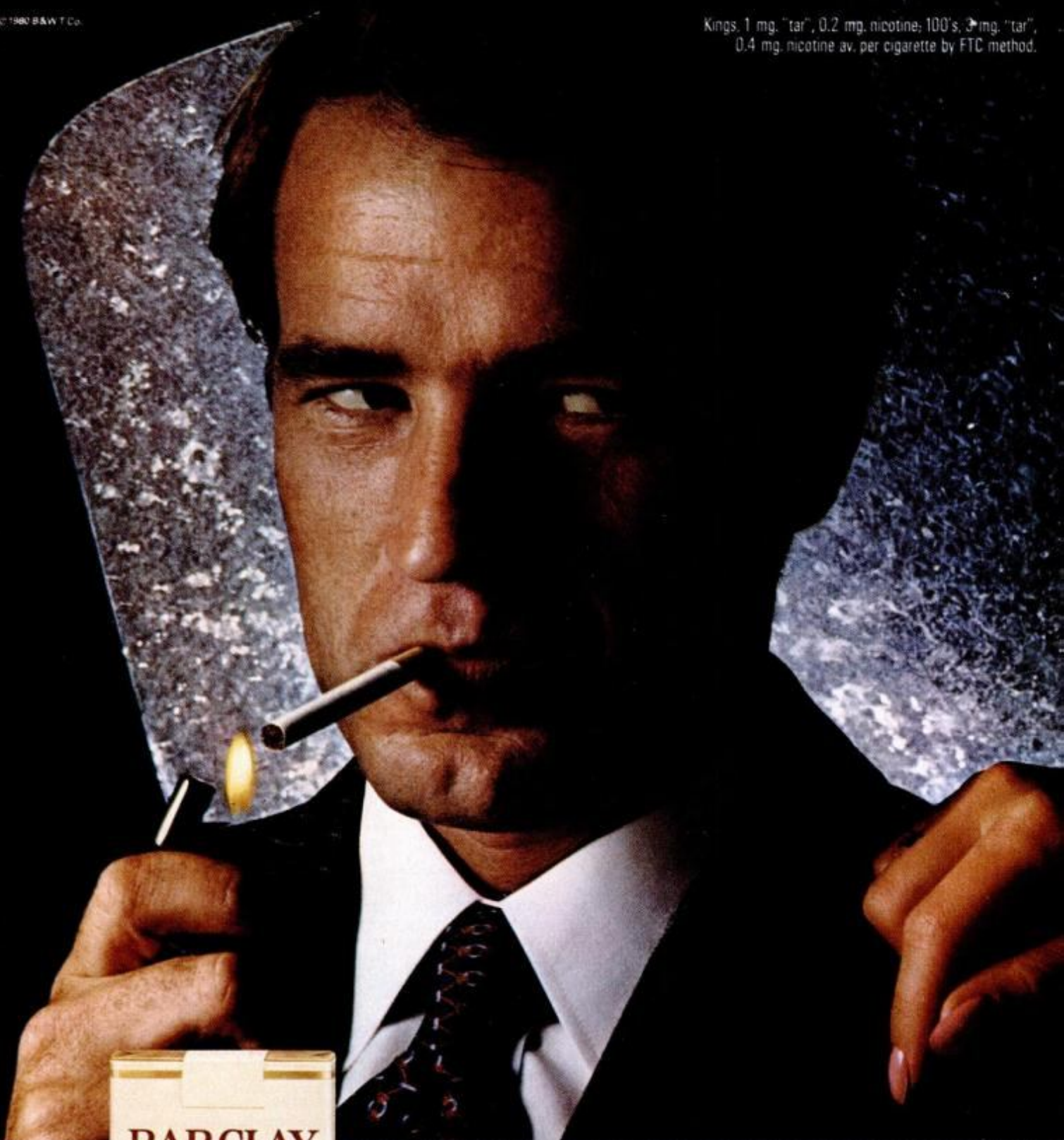
Unlike GM, which will build all its engines, Ford will have to go shopping for future powerplants. It plans to buy four-cylinder diesel engines from Toyo Kogyo, already a Ford partner in building the manual gearboxes for the Escort/Lynx. Three-cylinder gas engines will most likely come from Toyota and

Daihatsu. BMW will be supplying Ford with four- and six-cylinder diesels and turbodiesel engines.

The BMW engines will most probably make their first appearance in 1984 in the Lincoln and Mark luxury cars, while the small Japanese diesels will find a home in the 1983 Escort/Lynx cars. Three-cylinder gas engines will most likely be installed in two-seat commuter cars code-named Apex. **FM**







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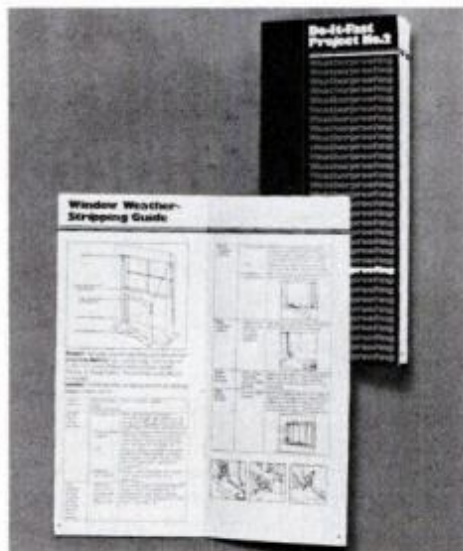
PM EXAMINES PRODUCTS AND SERVICES

## Three helpful booklets

My desk is bombarded with new pamphlets, circulars, books and the like every day. From the resulting massive pile, I've sorted out three offerings I think PM readers will be interested in. Two are available for a nominal charge and one is free.

■ **Weatherproofing.** This is a 16-page, do-it-yourself guide to help you find problem areas in your home where heat and airconditioning can be lost. Heavily illustrated, it's 75 cents postpaid from Duo-Fast Corp., CP-27, Dept. PM 1280, 121 West Franklin St., Elkhart, Ind. 46512.

■ **Teak lumber** is an informative



Duo-Fast booklet has many illustrations.



Booklet includes teak importer's address.

booklet about teak lumber and plywood. No how-to here, but the address and telephone number of the importer are in the booklet if you have been having trouble buying teak locally. It's free from Quality

Woods Ltd., Box 205-PM, Lake Hiawatha, N.J. 07034.

■ **1981 Fireplace Insert Directory**, \$2.75 from Fireplace Insert Directory, Box 800-PM, Camden, Me. 04843. This booklet describes the operation of over 50 units, giving prices and manufacturers' specifications.—H.W.

## Rugged buffer-polisher

The latest buffer-polisher from Sears is designed so that no pressure need be applied to the surface being polished; if too much is applied, the buffer stops. The tool features a 9-in.-dia., 1-in.-thick foam pad that follows contours and trim; it has two speeds—1700 rpm for laying down wax, and 1900 rpm for wax



Buffer comes with three types of bonnets.



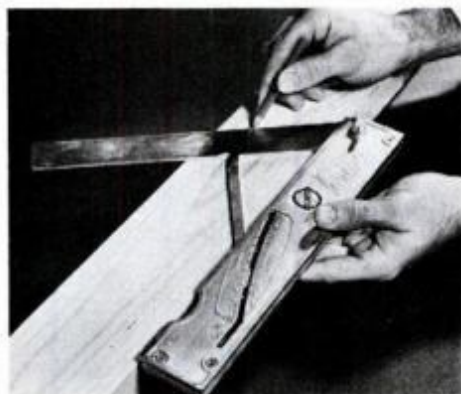
Tool can be used for autos and furniture.

removal and buffing. The ½-hp motor has sleeve bearings and double-reduction spur gearing.

It's available for about \$60 at Sears stores and through the Sears catalog.—H.W.

## A new square

The Frame-All square can be used as a T-, bevel and framing square, yet it can be folded and pocketed. Sporting a 10-in. blade and 12-in. body, the tool has adequate length. It can be used to lay out rafter pitch, and for conventional try- and combination-square functions. Manufactured with precision components,



Square adjusts to lay out rafter pitch.

the square is guaranteed against defects. It's \$13.50 postpaid from East Sales, Dept. PM 1280, 4593 Brooklyn S.E., Grand Rapids, Mich. 49508.—H.W.

## Rugged sawhorse

Sawhorses ordinarily depend on stout, bulky members to achieve rigidity. That is not the case with this sleek, trim unit. Lightweight and compact, it has folding brackets that snug the uprights firmly into grooves in the top cross member. The result is a very tight fit and exceptional stability. Handee Horse



Sawhorse disassembles for easy storage.

is offered by H.S. Wright Inc., Box 148-PM, Centerbrook, Conn. 06409.

The prices for each pair, including shipping and handling, are \$22.95 unfinished and \$24.95 finished.

—Rosario Capotosto

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



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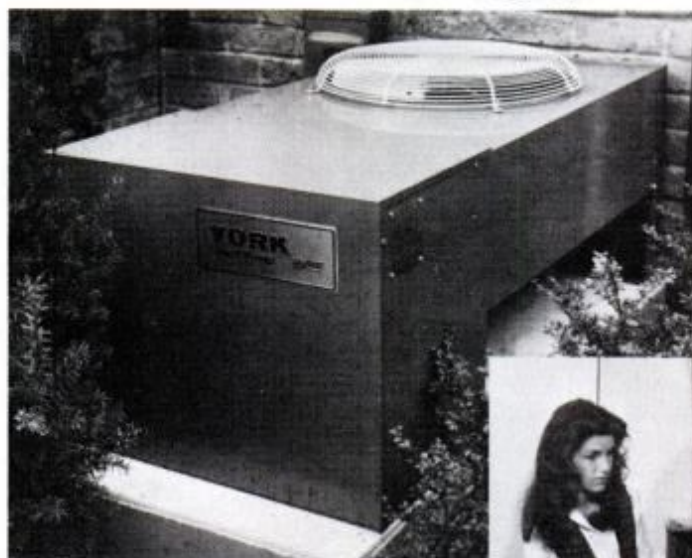
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# Heat pump with a 'brain' cuts energy usage



This outdoor heat-pump unit is part of the new heat-pump modulator system developed by York. It was installed as part of the company's field-testing program. Technicians were able to study the operation of the new system under actual home living conditions.



**A** new residential heating/cooling system composed of a heat pump and a special modulator recently has been introduced. Sold under the York Energy Saver (YES) name and called En-Mod, it cuts energy consumed by a heat pump by 17 percent, according to the maker.

This reduction is in addition to the large savings of heat pumps compared to electric-resistance, warm-air heating systems. York says its Champion heat pump saves 30 to 60 percent over an electric-resistance system.

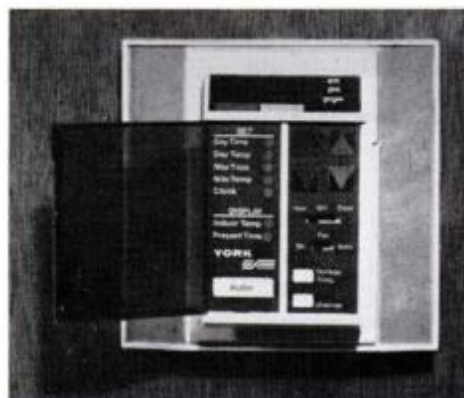
### Special system modulator

The modulator is the key new development. It's composed of two inverters and microprocessor controls. One inverter controls the compressor; the other controls the fan on the indoor unit. They vary compressor and fan speeds to control heating and cooling intensity. This eliminates most of the energy-wasteful cycling that until now was the only way to control heat. The modulator replaces a conventional furnace in the basement. It runs most of the time, at lower-than-peak capacity speeds.

The system provides lower room humidity without increased energy use. In summer, comfort level is maintained at a warmer temperature setting. There is also a programmable, night set-back control for further energy savings.

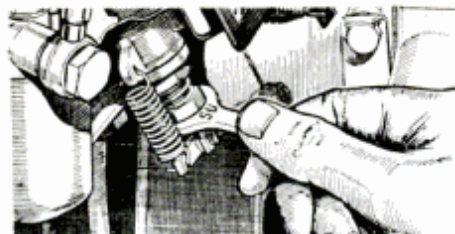
Although price of the YES system wasn't available when this was written, you can get it and other details from: Joanne Full, York Div., Borg-Warner Corp., Dept. P1180, Box 1592, York, Pa. 17405. **PM**

Two inverters with microprocessor controls shown form the modulator, the breakthrough energy-saving device that enables the heat pump to operate at variable speeds. One inverter controls a compressor; the other, the indoor-unit fan. This eliminates most energy-wasteful cycling that usually controls heat-pump output.



A wall-mounted keyboard with LED digital display takes the place of a thermostat to control the modulator. You key in the temperatures and times for automatic, day-and-night comfort control. Owner-alert feature warns of unacceptable operation. Numerical codes flash in digital display and operate as a service analyzer. You relay codes by phone to a dealer, who can arrive prepared to handle the problem.





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# SCIENCE WORLDWIDE

## Viking and friends

The Viking spacecraft that transmitted the photo of Mars (below) retired recently. But the Viking 1 mission will continue, drawing the support of an extraordinary grassroots group whose only purpose is to raise money to continue the exploration of Mars.

The Viking Fund (Box 7655, Menlo Park, Calif. 94025) accepts contributions from anyone who wants to keep the Mars mission alive. The fund has raised more than \$50,000—including one gift of \$1000—which was to be turned over to the National Aeronautics and Space Adminis-



Volcanoes (black dots at left) show up clearly in a Viking orbiter view of Mars.

tration (NASA) late this year.

A NASA spokesman said the space agency had faced some legal tangles over whether to accept the contribution.

Although NASA frequently takes in a dollar or two over the transom, mostly from young space enthusiasts, it normally cannot accept money earmarked for specific projects. But NASA lawyers have now worked out a way to accept charity for Viking, by acting as a contractor for the fund.

The support maintains hopes for a continued flow of photos and data from the Viking 1 lander on the Martian surface. The orbiting portion of the mission was closed down last Aug. 7

## Air "fossils"

Bubbles of air trapped beneath the ice of Antarctica have given physicists a clear idea of atmospheric quality many millenia ago.

The air-bubble "fossils" 3500 feet within the polar ice cap were buried some 10,000 years ago, carbon-14 dating shows. Physicists Edward Fireman and Thomas Norris of the Smithsonian Astrophysical Observatory retrieved the bubbles by melting samples of polar ice in a tightly sealed container. The two researchers also pulled up ice from 1043 feet—with 2000-year-old air—and from the surface, where bubbles match the current chemical composition of the atmosphere.

Preliminary measurements indicate that the concentration of carbon dioxide grew by 20 percent between 10,000 years ago and 2000 years ago. Since then, the increase has been startling: The researchers report carbon dioxide levels have jumped at least another 20 percent just within the past century, during a period of deforestation and rapid industrial growth.

Scientists are still debating the significance of the increase. One hypothesis is that the carbon dioxide gas might act as the glass in a global greenhouse, trapping heat. Under this unproven "greenhouse theory," the heat could eventually melt the polar ice, flooding continents.

## Coded message to scientists?

It began with an informal phone call from the National Science Foundation (NSF) to Dr. Leonard Adleman, an expert in the theory of secret codes.

The NSF officer told Adleman, of the Massachusetts Institute of Technology and the University of Southern California, that Adleman would not be receiving all of the \$30,000 in annual funding he had requested. The reason, according to *Science*, was that the National Security Agency (NSA) wanted to fund part of the work—some \$5000 of it, Adleman told us. The news (which had still not been confirmed in writing as we went to press) raised fears in Adleman and other scientists that the NSA, citing national security, would try to classify parts of Adleman's work—a possibility the NSA does not deny.

"Historically, cryptography was

used to transmit messages between generals," Adleman said. "It's been government-controlled." Today, he added, there's a need for cryptography in the public sector, to protect the content of phone calls, for instance, or the electronic transfer of funds. The flap over the grant, Adleman said, has had a chilling effect on his research.

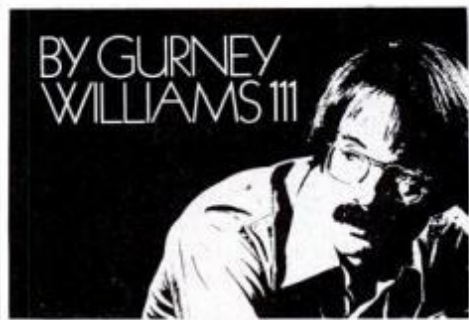
A spokesman for the NSF told PM that cryptography proposals had been sent routinely to NSA for merit review for the past three of four years. The NSF position has always been in favor of enlisting the support of other governmental agencies to support basic research "to stretch our funds," the spokesman said. But he added that the Adleman case had raised complex questions about academic freedom as opposed to national security.

Settling those questions, Adleman said, is more important than winning the full grant. "In fact," he told us, "the \$5000 would have little impact on what I would do in my research." But the NSA money might contain a secret code of its own, spelling out what Adleman couldn't publish. So if NSA comes knocking with money, Adleman says he won't accept it.

## Cancer fighter's legacy

About five years ago, chemist Morris Kupchan of the University of Virginia discovered a rare, complex compound in wood that showed promise as an anticancer agent. The problem was getting enough of it. Tons of wood yielded only a fraction of an ounce of the agent, called triptolide.

Now, four Stanford chemists, led by Prof. Eugene van Tamelen, have been able to make synthetic triptolide, making possible tests to see if the compound can be used in anti-cancer therapy for humans. Ironically, Kupchan himself died of cancer in 1976 at the age of 53. **PM**





# There are over 2 million home burglaries every year. Will your home be next?

At this time, when you can't afford not to have a burglar alarm system—space age technology has produced a system you can afford.

You know the problem. Every 15 seconds, a home is burglarized. And these crimes are no longer inner city crimes. Even the most comfortable suburbs and the most innocent small towns are not safe havens. It could be you... it could be tomorrow. And if a member of the family is home, it could be worse than burglary.

## The question isn't—"do I need a burglar alarm system?"

You already know you do. The question is "how much"? And for many millions, the answer to that question was "too much." Not any more. The First Alert Family Protection System is priced within reach of nearly every American.

## The answer to lowering prices wasn't making a cheaper burglar alarm. It took space age wireless technology to break the price barrier.

Wireless technology. That's the thing that did it. The same kind of technology that was developed for communication and control on the moon missions has now paid off for you. Because the First Alert Family Protection System is wireless, you can easily install it yourself. You save a bundle on materials and labor. And you don't sacrifice safety or convenience in the bargain.

## How First Alert wireless technology works.

Once the technology was developed—the application to home and family protection was relatively simple. Each window and door that's fitted with a First Alert transmitter can instantly send a message through the air to the Control Center when the window or door is opened. (And closing the door or window again won't interrupt the process once it's begun.) When you go out—you set the built-in delay so you can come home without setting off the alarm. When you're home, the Control Center's response is instantaneous, sounding off with a loud, clear signal, warning the occupants in your home. And scaring off the burglar. We recommend that you also employ the

optional outdoor siren—loud and shrill—to alert the neighbors so they can call the police. (Your neighbors benefit, too. Once your alarm goes off, the burglar isn't going to run across the street to try another house. He's going to head out—*fast!*)

## First Alert Family Protection System—a burglar alarm and more.

With compatible First Alert Smoke Detectors and Gas Detectors, you get an instant alarm at the console from detectors in the most remote parts of your home—giving you the maximum time to escape.

More protection. A small transmitter is available that fits comfortably in any pocket—it's a device much like a garage door opener. It will set off the alarm system at the touch of a button—to summon neighbors' help. Ideal for anyone with chronic health problems.

## All right... How much does First Alert protection cost?

You can install it in a high-rise condo with only one door for under \$170.00. Total. No installation costs—because you can easily install it yourself. Even if you're not a weekend handyman. Everything you need to know is in the instructions. Nothing is left to chance.

## What about doing the whole house?

According to a study by the U.S. Department of Justice, in 63.3% of all the burglaries, the point of entry is a door. If your home has two outside doors, it would cost very little more than the condo we described above. You know your area best—so you know how much protection is enough.

First Alert suggests you set your priorities for burglary protection as follows: 1. All exterior doors. 2. All first floor rear windows. 3. All other first floor and basement windows. 4. All 2nd and 3rd floor windows and balcony doors. You decide how much protection is enough protection.

## Are you really serious about home and family protection?

Here's your chance to find out. Because space-age wireless technology has made the First Alert Family Protection System possible—at a price that you can well afford. Easily afford. You tell us which purchase you'll put off—the First Alert Family Protection System—or a new stereo tape deck?

## The time to act is now.

To do that, call 800-323-9005 Toll Free. We'll send you all the facts—including a list of materials and optional accessories.

## Easy to install.

It's all included in the Installation Instruction Manual. So when you receive the manual from us, you can see for yourself that installing the system is within your abilities and your patience span. It's really quite easy—but a larger system does take time.

## This time, buy something you need—not something you want.

Call 800-323-9005 weekdays 8 to 5—CST. (Illinois residents call 312-851-7330, Extension 5000) and let space age technology protect your family—and your possessions.



**First Alert**® **FAMILY PROTECTION SYSTEM**™  
by PITWAY the professionals in home and family protection.



## Which do-it-yourself type are you?



Mike and Kathy B. — They've found the most affordable way to have the things they want was to do it themselves.



Bill C. — He enjoys doing home repairs and even major remodeling projects to add to the value of his home.



John M. — He's a true craftsman who has been woodworking for years. His work is so professional, he could (and often does) sell it.

We're fast becoming a nation of do-it-yourselfers — more self-sufficient and appreciative of fine craftsmanship. We've learned we can save money by doing our own home repairs and remodeling, building furniture and cabinets, and making toys and other decorative accessories.

And we're experiencing the satisfaction that comes from creating something beautiful and useful with our own hands.

No matter which do-it-yourself type you are, you've probably discovered that to do the job right, you need more than a couple of hand-held power tools.

You need things like a table saw, a drill press, a lathe and more. And you need lots of money and space for the individual tools.

But now you can enjoy a complete home workshop at substantial savings in less space than it takes to store a bicycle!

The Shopsmith MARK V multi-purpose woodworking power tool actually gives you the five most needed workshop tools — 10" table saw, 16½" vertical drill press, horizontal boring machine, 34" lathe and 12" disc sander — in one sturdy, compact and economical unit.

### Savings and Versatility

Because the MARK V has one rugged motor developing more than two horsepower... one base... and one worktable — for all five tools — it costs much less than five single purpose tools.

And quality engineering has made it more accurate than individual tools. You can even "share" features and setups from one function to another with precision not possible in single purpose tools.

It's easy to learn, easy to operate, easy to change. Before long, you'll be performing every woodworking operation with a minimum of effort and cash outlay.

### Send for FREE Information

Mail the coupon below for the FREE facts. We'll send an Information Kit and tell you how you can test-use the MARK V in your own home for 30 days without risking a penny. Send for your kit today!

The Shopsmith MARK V — the tool to start with... the system you grow with!



## Shopsmith Inc.

The Woodworking Company  
Dept. 2585  
750 Center Drive  
Vandalia, Ohio 45377

YES! Please mail me your FREE Information Kit on the Shopsmith MARK V, and facts about Shopsmith's exclusive 30-day Money Back Guarantee.

Name \_\_\_\_\_

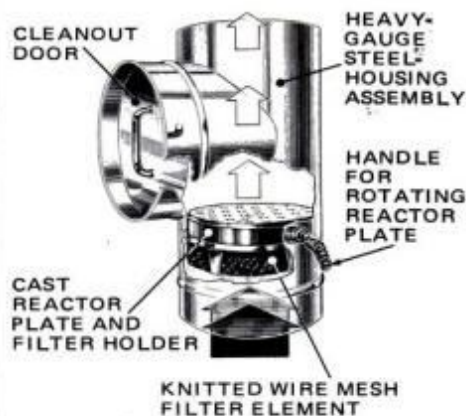
Address \_\_\_\_\_

City \_\_\_\_\_

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

NO OBLIGATION

# Install a flue filter to prevent chimney fires



Filter, which is installed inside stovepipe, traps creosote in flue gases and cleans itself at temperatures over 300° F.



Stainless-steel mesh filter and the cast-iron reactor plate need only be removed for air-blowing after excessive ash buildup.

The Smoke-Consumer, installed at the flue collar of an airtight stove, collects creosote during stove operation. Once a day the air intake on the stove is opened fully to produce a hot fire. The heat burns up creosote particles that have collected, leaving some white ash.

An independent lab found that the device not only retards creosote buildup in the flue, but also works as a spark arrester and as a traditional flue damper. Write to Lincoln Works Inc., 194 Millers Falls Rd., Turners Falls, Mass. 01376 for your nearest dealer. It retails for \$89. **PM**





# UNDISCLOSED SOURCE

©MMI 1980

*Now, the closely held secret behind many of today's quartz timepieces is revealed.*

Most major companies would rather have these facts remain secret, but one little-known company decided to show its genius to the world.

To effectively compete in necessary markets and when lacking in necessary technology, many major companies have turned to smaller more dynamic companies to build their products. Sometimes the product is built to the specs of the major company. But more often than not, the only unique parts are a label and different owner's manual. This practice is quite prevalent in the digital watch industry.

One company that has been the real source behind products introduced in the U.S. by companies like Mattel, Timex and Texas Instruments, is Olympus Electronic Co., also known as Otron.

Olympos Electronic now wants the world to know its name and genius. We feel lucky to be selected to bring this story to you.

Olympos Electronic Co. is now introducing products into this country under its own trade name—Otron. We are introducing one of the first Otron products into the U.S.

## 12 or 24 HOUR DUAL TIME, DUAL ALARM CHRONOGRAPH

The first product we selected is the Alarm Chrono X watch. It may be the most advanced Quartz timepiece in the world today for under \$200.

We know of no other watch that combines these unique features and design. It has both a 2nd time zone capability and a 2nd separate alarm. It comes in either 12 or 24 hour version. These features are just the beginning. Compare this watch feature-for-feature against any other in the world. We believe you will be convinced that there is not a better watch dollar-for-dollar anywhere.

## TESTED TO 100 FEET OF WATER

Three years ago, there were no digital water resistant alarm watches. Today they exist in some more advanced models, but cost \$100, \$200 or more. Our Alarm Chrono X is submersible to 100 feet of water. Its unique alarm emits sound right thru the stainless steel case. The O-ring construction and rock hard mineral glass lens provide a lock tight seal against water to 100 feet—it's guaranteed.

## THINNESS AND BOLD MASCULINE DESIGN

The Alarm Chrono X is a combination of bold masculine design and just the right degree of thinness. No sacrifice in function or masculinity, the Chrono X measures 8.9 mm from the top of its mineral glass lens to the back of its stainless steel case. That's 1.6 mm thinner than the popular Seiko Alarm Chronograph, 2.1 mm thinner than the Citizen and 3.1 mm thinner than Texas Instruments. Yet Alarm Chrono X has the same bold design of each. The Seiko sells for \$250; the Citizen for \$200; and the T.I. for \$125. . . What does Otron know that these other companies don't?

## UNSURPASSED QUALITY AND ACCURACY FOR UNDER \$70

Stainless steel case, and finely woven mesh bracelet, mineral glass lens, water resistant to 100 feet and quartz accuracy to  $\pm 5$  seconds per month. That's quality and accuracy found only in watches costing \$200 or more. The Alarm Chrono X sells for \$69.95 in stainless steel case and \$79.95 in gold with 3 microns of real gold over stainless. Compare features and price for yourself before you call to order.

## ORDER TOLL FREE AT NO-RISK

The Alarm Chrono X is offered with a 15 day no-risk trial period. If during 15 days, you find the Alarm Chrono X not to your liking return it for a prompt refund of your purchase price.

In the unlikely event that anything should go wrong after the trial period, your Alarm Chrono X is backed by a full year warranty thru Otron's Service by mail repair facility in this country.

To order your Alarm Chrono X fill out the order form below and send it with check or money order to us. For faster service, credit card customers call Toll Free 1-800-527-7066. Don't wait — order today to insure getting a watch of this quality, with these functions, at this price.

## MEDIA MARKETING

10155 Plano Road • Dallas, TX 75238

Please send me the following Alarm Chrono X watch(es) with a 15 day no-risk return privilege at \$69.95 each, plus \$2.50 delivery. Texas residents add 5% sales tax.

\_\_\_\_\_ Stainless Steel \_\_\_\_\_ Gold \$79.95  
 12 Hour time  24 Hour time

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

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

Check or M.O. enclosed

For even faster service, charge to:

MC/Visa Expires \_\_\_\_\_

Account # \_\_\_\_\_

Signature \_\_\_\_\_

Order Toll Free 1-800-527-7066.

In Texas call COLLECT: 214-349-3120. PM120

Normal Time	WE 19 12:56:34 T1	Continuous LCD Display of Hours, Mins., Secs., Day and Date.
Dual Time Zone	WE 19 17:56:34 T2	Dual Time in either 12 or 24 hour time; model selection (24 hr. shown).
Dual 24 Hour Alarms	6:30-1	One of two loud alarms set for 6:30 am.
Stopwatch	00:00:00	12 hr. chrono, split and lap timing, with 1/100 sec. precision.
Hourly Chime	:00	Chimes on the hour with confirmation.
Timer and Night Light for Evening Viewing	10:34:25	12 or 24 hr count down, count up timer.



# HOMEOWNERS' CLINIC

## QUESTIONS ANSWERED

### Leaky shutoff valve

To fix leaky faucets in my home, I've had to turn off the main water valve numerous times. This valve now leaks, too. Does the main valve have a washer inside? As I don't know of any secondary shutoff valve, how would I fix the leak?—Cornelius King, Croton-on-Hudson, N.Y.

There's an excellent chance that your main in-house shutoff valve is a washer type. Most builders don't spend extra money for a better type of washerless valve. To replace this washer, you'll have to turn the water off at the curb (main). To do this, lift the cover off the meter box, and you'll see a shutoff valve inside.

Turn this valve off while you replace the washer in your in-house valve. The meter-box valve may require a special wrench, but you should be able to improvise something that will work. A neighbor's strong arm may also be helpful.

### Sealing wood containers

An avid woodworker for many years, I recently made a set of wooden canisters. What can I finish the inside with so they can be used without a liner?—Roscoe Skagg, Campbellsville, Ky.

Try Quick Dry Zar, a polyurethane finish (\$4.25 per pint) that you can apply straight from the can. Brush on three coats, sanding lightly, dusting and wiping with a tack cloth between coats. It will take the first coat only one hour to dry; the following coats will take about two hours each.

Leave the canister tops off for about one week before filling the canisters to make certain that all objectionable odors from the finish are gone. If you can't locate this product locally, write to United Gilsonite Labs, Box 70, Scranton, Pa. 18501, and ask for a source near you.

### Keeping warm

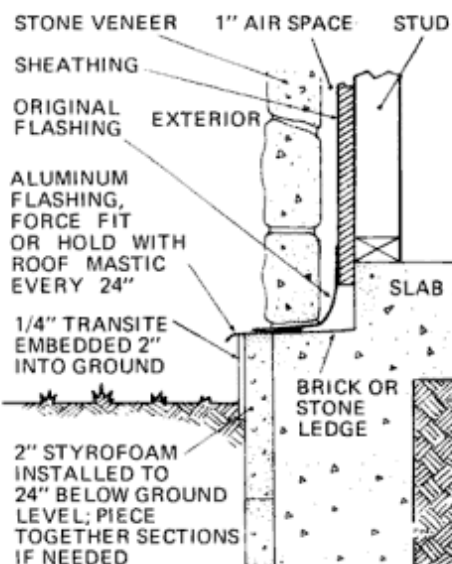
Heating our cottage that has north-wind exposure in the higher-elevation area of New Jersey is getting quite expensive. The major portion of our fieldstone house has a crawl space, but the bedrooms and bath are on a concrete slab. Can we add perimeter insulation to the outside of the footing or the foundation of the slab?

Also, as we plan to go south next

winter, is there an antifreeze type of product that we could add to the water in our hot-water baseboard heating system? We have already had one freeze-up during a power failure when we were away from home.—P.E. Dougherty, Newton, N.J.

As the greatest loss of heat in a slab is through its edges, you should by all means add insulation. In new construction, this is installed at the edge of the slab and on the inside of the foundation wall. I suggest that you use a rigid polystyrene type, such as Dow's Styrofoam SM brand. This material holds up well, even when in contact with common soil acids and water.

In your case, I would dig down at least 2 ft. and butt the insulation



**Styrofoam insulation can be retrofitted around the foundation of a house like this.**

tightly under the fieldstone. Install it with Dow's Styrofoam No. 11 insulation mastic.

Use the same adhesive to join a protective membrane (such as 1/4-in. Transite) on the outside of the Styrofoam to protect it from damage by shovels and shrubs. If your fieldstone veneer does not extend out far enough to prevent water from getting behind the insulation, you must add flashing as shown in the drawing.

Do you have a home maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.95 postpaid. Send order(s) to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.

The answer to your second question is yes—antifreeze (glycol) can be added to your closed hot-water baseboard system. However, I believe this is a job best left to professionals for the following reasons:

1. The system must first be drained.

2. Since approximately 50 percent of your system should be filled with the antifreeze, you must determine what this volume is in order to add the correct amount.

You can purchase glycol at most plumbing supply houses if you still want to do the job yourself. One more thing to remember: Even with your hot-water heat supply protected, what about your domestic hot and cold water? Based on all this, I'd consider asking a neighbor to check your system each day—it may be simpler and much cheaper than any attempt you make to freezeproof it.

### Covering a concrete slab

Our house was built on a concrete slab. The kitchen is the only uncarpeted room, making it the coldest one in the house. I'd like to insulate and cover its floor with a tear-resistant, cushioned linoleum tile, but I have severe reservations. What's a good vapor barrier? Would a 1/4-in. plywood base adhere to the slab? I don't want to go any thicker, as then I'll have a step-up kitchen.—David M. Lederman, Brick Town, N.J.

The experts at Armstrong World Industries Inc. say they know of no such floor tile. You might look into the installation of carpeting in your kitchen.

There are carpets manufactured specifically for this purpose which resist grease and excessive wear. See "Warming Cold Concrete Floors," *Homeowners' Clinic*, page 23, Mar. '79 and "Damp Concrete Floors," *Homeowners' Clinic*, page 23, July '79. **PM**





**EVERYONE  
NEEDS A LITTLE COMFORT.**



There comes a time when we all want to sit back and get comfortable. And there's no better way than with the fine, easy taste of Southern Comfort.

Inspired in the 1800's in old New Orleans, this world famous liquor is delicious straight, on the rocks, or mixed any way you like it.

It's one of the real comforts of life.

**SOUTHERN  
COMFORT**



Send gifts of Southern Comfort anywhere by phone. Call toll-free 800-528-6148 charge to major credit cards. Offer void in states where prohibited. Southern Comfort Corp., 80-100 Proof Liqueur, St. Louis, Mo. © 1980



# NEW NOW



# FISHING

## Holiday time—the happy season for fishermen

A bigger season for fishermen than fish—this is holiday time, when youngsters get their first rod and reel, and oldsters hint about tackle they think they need.

New rods—rated for less weight and more sensitivity—are being made of boron, magnesium, graphite and fiberglass compounds. Sport-light tackle and telescopic travel rods are gaining popularity. Daiwa now has reels with an ultra-high 5.4 retrieve ratio. Shimano's Fast Cast bail trips open with one finger.

Mini plastic tackle boxes from Berkley and Flambeau can clip a lure collection on a belt. And for home craftsmen, Fenwick supplies graphite rod blanks.



## Ice chest turns aerator

Fitting neatly into Coleman's Snow-Lite Model 5255 13½-gallon cooler and other similar brands, Bayou Ed's Live Well/Bait Keeper from Attwood circulates air and water to keep your catch or bait cool and healthy. For \$39.95, it adds a live well to any boat that has a 12-volt battery.

## Tones to tell the depth

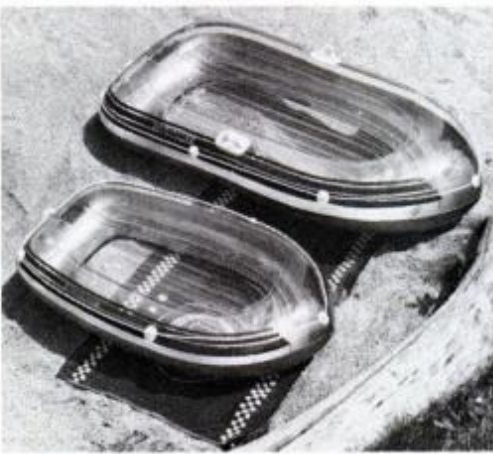
A digital-reading depthfinder with a new narrow-cone transducer, the Lowrance LDD-1800 is reported to read at speeds as high as 65 mph and depths approaching 2000 feet. High and low alarms sound warnings of top and bottom of a drop-off with the \$398 unit.



## Plastic-bottom boat

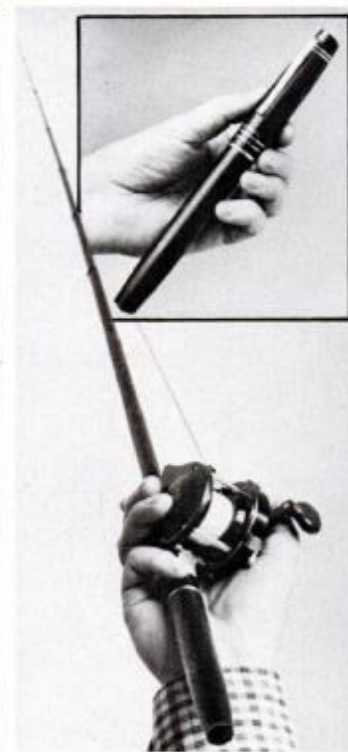
A way to watch what you want to catch is provided with two see-through PVC dinghies from the Seaway Div. of U. S. Industries, Niles, Ill.

The transparent, heavy-duty plastic gives a "glass-bottom-boat" look down from the Sea Gaze I and II inflatables. Three separate air chambers provide safe flotation, and seams are electronically welded. The smaller model is BIA-certified for one 165-pound passenger, while the larger can carry two fishermen totalling 330 pounds on sheltered waters.



## Cheese for fussy fish

Next to landing lunkers, fishermen seem to favor collecting tackle-box gadgets. A sample of this year's collection is a yellow plastic Cheese Baiter that can be loaded with the process cheddar that hatchery-spawned trout tend to prefer. Single, double or treble hooks in small sizes from 14 to 20 can be baited with a push of the plunger, and the unit fits easily into a fishing-vest pocket. It costs \$2.95 from Vanderhoff Corp., 20185 Glen Vista Rd., Bend, Ore. Other new aids include hook disgorgers, snagged-hook retrievers and assorted lures in every color.



## The write rod

Shaped like a fountain pen and only slightly larger, the 9-inch Sigma Mini Telerod from Shakespeare stretches 11 sections out to a full-sized, 6-foot rod for light-tackle angling any time a likely fishing hole appears. Latest addition to the new Sigma line, the compact travel rod is still a prototype development, but may become available next year, as Model 1110-170, for about \$30.





# “I MADE IT TO L.A. FROM UTAH IN A 1981 VOLKSWAGEN DIESEL PICKUP.

At today's fuel prices, one is thankful it's only a tankful. But, please, no applause.

Going 650 miles from a Utah ranch to a Malibu beach on a few gallons is just part of our diesel pickup's daily heroics.

Such feats of long-distance frugality have made it the best mileage truck, from the shores of California to the shores of Maine.

No other truck in America with optional 5-speed transmission gets an EPA estimated 38 mpg, 51 mpg

## ON ONE TANKFUL.”

highway. (Use “estimated mpg” for comparison. Your mileage may vary with weather, speed and trip length. Actual highway mileage will probably be less.)

Think of all the gas stations you can whiz by in your VW Pickup with its optional diesel engine.

Think of all the repair shops you can stay out of, too, with its reliable diesel engine.

Think of all the surf boards, ice chests, and diving gear you can stash back there in the spacious confines of a VW Pickup.

Without ever worrying about getting it all in. Or getting it all out. In one piece. A VW Pickup is the only truck in its class with a fully unitized body, double-wall bed construction and balanced suspension system.

In truth, a Volkswagen Diesel Pickup is not only very economical and dependable, it's also very thoughtful.

It will get you to the beach, however far, in time.

To make hay while the sun shines.

## VOLKSWAGEN DOES IT AGAIN





# Come to where the flavor is. Come to Marlboro Country.



Marlboro Bed or Longhorn 100's—  
you get a lot to like.

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

17 mg "tar," 1.1 mg nicotine av. per cigarette, FTC Report Dec:79



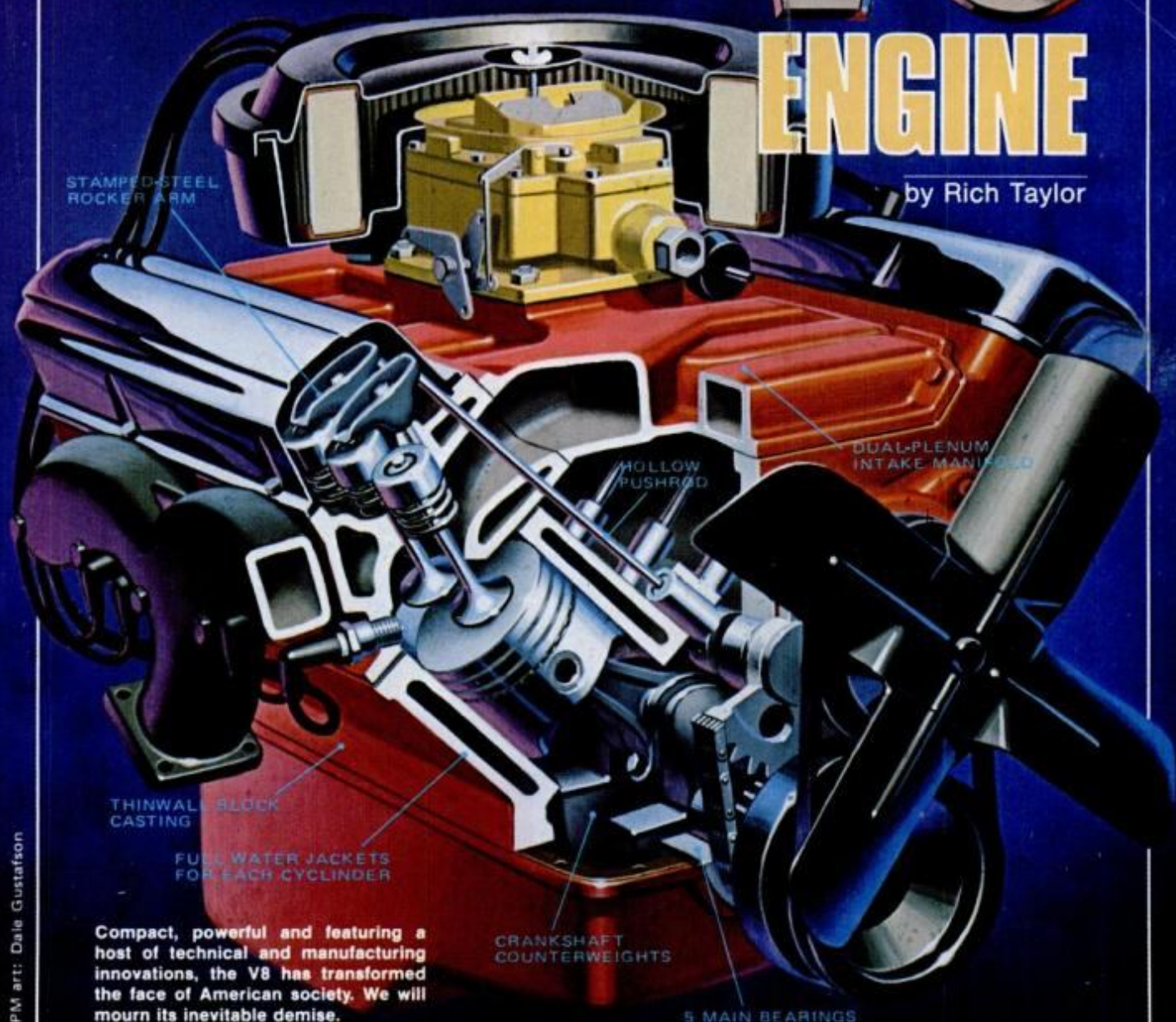
'I could see it, the ultimate vision. I could see his body stretched out and pressing down tighter and tighter upon the V8 engine until his thoracic cavity was practically bolted onto it. Its fiery combustions were his neural explosions and his neural explosions were its fiery combustions. His body and that roaring engine block were one and the same creature, sailing—at 140, 160, 180, 200 miles an hour—2000 miles an hour—sailing!—at last, the winged American centaur, the American dream, at last: soaring over God's own good green Great Plains of America bareback aboard a 300-horsepower Chevrolet V8 engine!'—Tom Wolfe, in *The Mild One*.

# THE RISE AND FALL

# OF THE V8

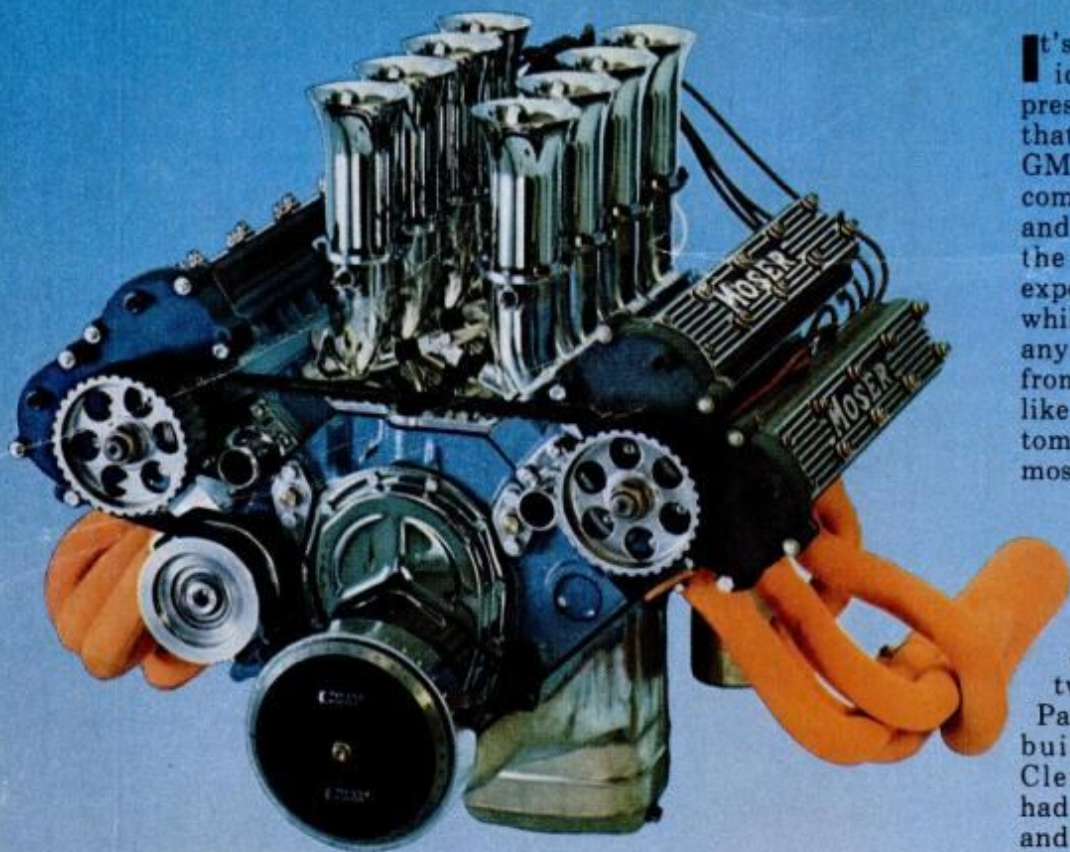
# ENGINE

by Rich Taylor



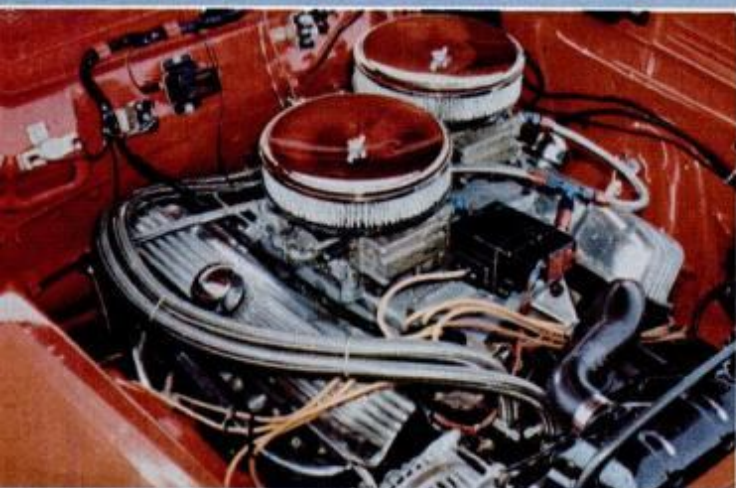
Compact, powerful and featuring a host of technical and manufacturing innovations, the V8 has transformed the face of American society. We will mourn its inevitable demise.



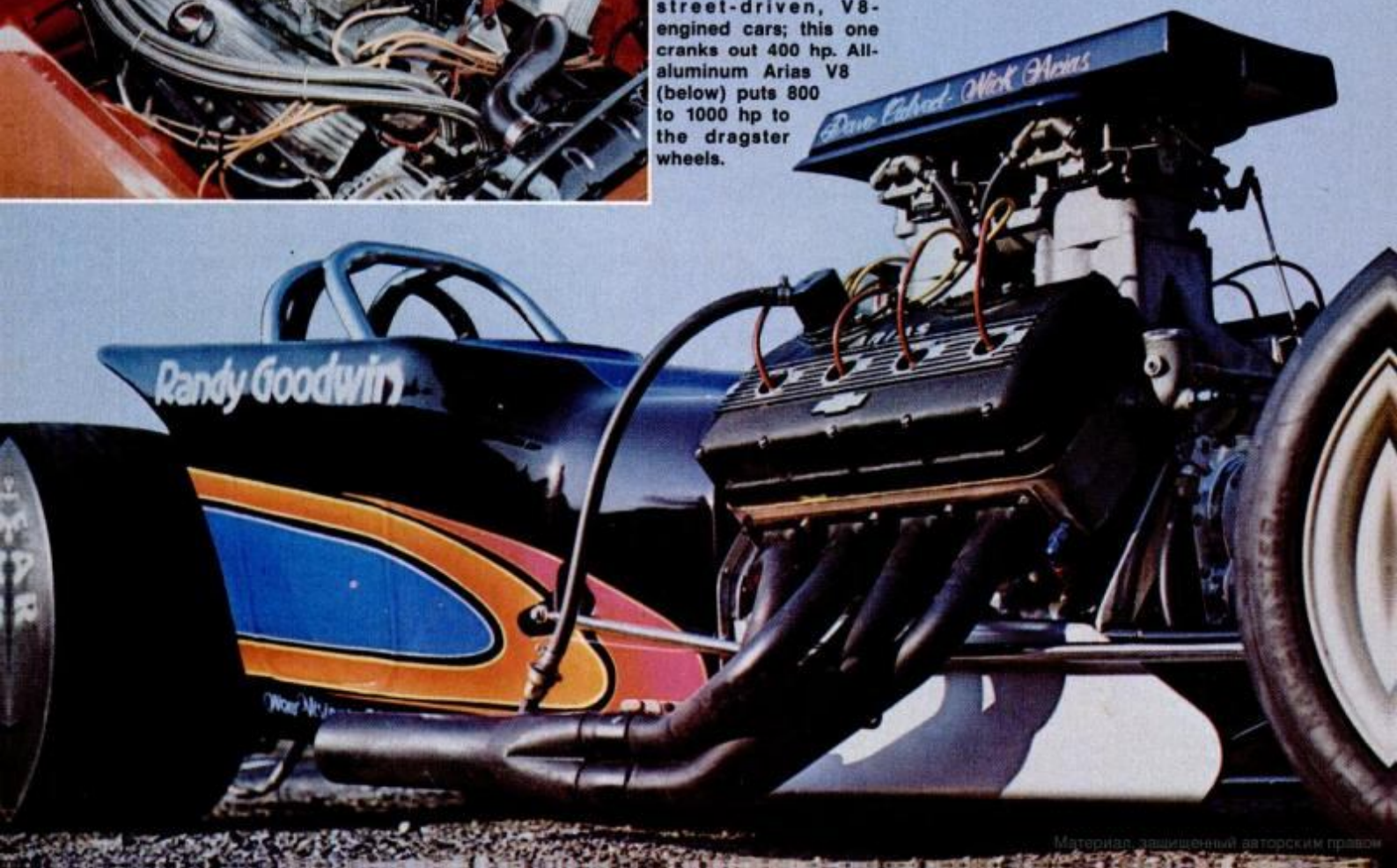


It's no secret that the American V8 is doomed. Pete Estes, president of General Motors, says that by 1985 only one percent of GM's cars will come with a V8, compared to 60 percent in 1979 and over 80 percent during most of the last two decades. Chrysler expects to stop selling V8s by 1983, while Ford and AMC won't have any past 1985. Perhaps 10 years from now a new generation of toy-like V8s will come along to replace tomorrow's Fours and Sixes, but, most likely, that distinctive V8 rumble is gone for good.

The V8 wasn't a new idea when American hot-rodders discovered it in the '50s. The first V8 appeared in a stripped-down two-seater entered in the 1903 Paris-Madrid road race. It was built by a French engineer, Clement Ader. In 1902, Ader had raced a two-liter, 16-hp V4, and his 90°, water-cooled, four-liter, 32-hp V8 was simply two V4s geared together. Three of his V8 cars were still in the running when the Paris-Madrid race was stopped at Bordeaux. Ader sold a range of V-twin, V4 and V8 passenger cars until 1906, when he replaced the whole line with conventional in-line Fours.



Moser V8 (above) was a custom-built small-block Chevy fitted with four overhead cams, hemispherical combustion chambers and fuel injection. Lots of chrome and four-barrel carbs (left) are typical of modifications made to street-driven, V8-engined cars; this one cranks out 400 hp. All-aluminum Arias V8 (below) puts 800 to 1000 hp to the dragster wheels.





He went out of business in 1907.

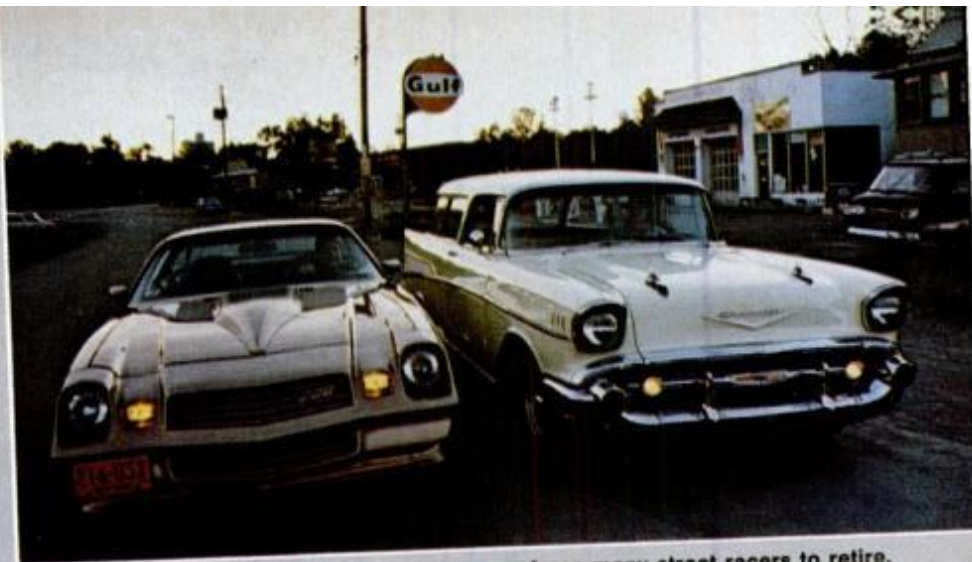
Two years before, Louis Ribeyrolles of Darracq had bolted two 11-liter, in-line, four-cylinder racing blocks onto a common crankcase to make a 200-hp, 22-liter V8, with which Victor Hemery set a land speed record of 109.65 mph. This monster eventually hit 118 mph in 1906 and presaged the definitive American V8 by half a century—90° V, water-cooling, overhead valves, a single camshaft mounted in the V above the crankshaft and dual carburetors. The Darracq was a one-off racer and had very little influence on other engines. The engineers who later ended up with similar V8s got there from a completely different starting point.

### DeDion played key role

The first production V8 appeared in 1910, also in France. This was built by DeDion, and was still available in 1923. The DeDion was a very limited production car, and DeDion's V8 would be just another footnote to automotive history, except that Cadillac bought a DeDion V8 chassis in 1912 and took it apart to see what made it tick. In 1913, Cadillac—which was then run by the legendary LeLand family, Henry M. and his son Wilfred—began work on a new V8, which was introduced in 1915. Cadillac's V8 was close enough to DeDion's design that Cadillac historians always make a special point of showing how the Cadillac engine was better.

And it was. Cadillac's 314-cu.-in., 77-hp V8 won the 1915 Dewar Trophy for engineering excellence. It stayed in production until 1927 with only minor changes, made Cadillac the "Standard of the World" and inspired a whole flock of imitators, including Pierce, Peerless and Lincoln. Even Chevrolet had a big V8 in 1917.

The 1917 Chevrolet Model D V8 was designed by Arthur Mason, one of the best engineers in Detroit. Mason's 286-cu.-in., 55-hp V8 used vertical overhead valves, similar to the ones on mid-'50s Buicks. It also had a counter-weighted crankshaft, a two-barrel carburetor and intake manifolds cast into the heads and pumps to circulate both oil and water. This was a very advanced engine when you remember that many other cars still had L-head valves, hit-or-miss splash lubrication and



Low-octane fuel and tough emissions laws may force many street racers to retire.

## The shrinking cult of the street racers

**S**treet racers are like medieval monks—ascetic, reticent, and living in an envelope of arcane language and customs. They're the ones who truly defied the V8. Ask about the motor in somebody's Camaro, and the magic words come out like mumbled incantations—"Three-twenty-seven, two-oh-two fuelle heads, Crane roller, mechanical lifters, Carter spread-bore, Weiland High-Ram, TRW twelve-to-ones."

But the street racer's religion has changed. Fifteen years ago, you could buy a Chrysler Hemi in a Plymouth Road Runner or GTX, ready to race off the dealer's floor, for less than \$4000. Chrysler rated it at 425 hp, though everybody knew the real figure was more like 550. You could buy a Cobra for \$6995 in 1967, and it came with a 427 V8 that was essentially a NASCAR race motor at least as powerful as Chrysler's Hemi. Even 10 years ago, for \$4500, Chevrolet would sell you a 370-hp, 350-cu.-in. Z-28 Camaro that would top 100 mph in the quarter-mile.

The point is, in those days any kid who could talk his dad into cosigning for the loan could drive a full-blown race car to school every morning, and he needed no more mechanical ability than shifting from P to D. But the factory high-performance V8 died 10 years ago, which means today's street racer must build his own engine.

### Build your own horsepower

With few exceptions, the Chevy small-block V8 rules the streets. General Motors has produced around 30 million small-blocks. They are bolt-in-interchangeable between every GM car of every year and model, and the billion-dollar aftermarket speed-equipment industry is primarily oriented toward these small-block Chevys. You can build a Chevy V8 into any horsepower rating you want—from 200 hp to 1000 hp—just by picking the right part numbers from a catalog of engine kits.

The demise of the V8 will have little effect on the kids on the street. The preferred small-block is either a 327- or 350-cubic-incher, sizes that GM has almost completely phased out already.

And the top-line 190-hp L48 350 that comes in the 1980 Corvette is laughably anemic compared with even the mildest street racers. No kid on a limited budget would spend \$15,000 for a new Vette that turns 15-second quarter-mile times, when he could build a 13-second '55 Bel Air or '67 Camaro for \$4000. Out there on the street, it's rare to see a hot car much newer than 1970 vintage, except for Camaros and Firebird Trans Ams.

### No more 100-octane gasoline

Worship of the V8 on the street will outlive its rejection by Detroit, but the V8 is doomed nonetheless. The biggest immediate problem is gasoline. Those old V8s crank out gobs of horsepower with high-compression ratios. They require 100-octane gasoline, which simply isn't made any more. Adding expensive octane boosters is only a temporary remedy, which means most racers will be willing to accept reduced performance from low-compression pistons as a way to drive the car at all.

Then there's the price of gas, which becomes prohibitive at \$1.50 a gallon on a 10-mpg street racer. There's also an even more serious threat, not only to racers, but to anybody who tinkers with his car. The federal government is mandating "tamperproof" engines, which extends to aftermarket parts.

The V8 cult will never die, but the true believers will become fewer in number every year as the cars get older, more expensive and more trouble to own. In the year 2000, a 427 Cobra, a Plymouth GTX or a Z-28 will be a relic worthy of veneration. Kids will laugh when an old disciple claims that there was a time, back when he was young, when you were nobody if your car wouldn't run a 12-second quarter-mile, top 130 mph and make a noise like the beating of a hundred angels' wings. Then he'll walk out to the garage, start up that 454 Chevelle he's been faithfully anointing for three decades, and the years will fall away from him. And that distinctive V8 idle, that uneven *rumpity-rump-rumpity*, will fill the air like a hymn.

—Rich Taylor



thermosiphon cooling. Unfortunately, the first Chevrolet V8 was way overpriced and, after two years of dismal sales, died unmissed and unmourned.

These early V8s all suffered the same problems. They were really just two in-line Fours on a common crankcase, and the crankshaft had the throws 180° out of phase. The "flat crank" V8 is inherently very rough, vibrating side to side and putting a terrific strain on the center main bearing.

In 1923, Cadillac introduced a V8 with a crankshaft on which the throws were 90° out of phase—which is even more inherently unbalanced, but which can be perfectly balanced through the use of crankshaft counterweights. This not only made the engine much smoother, but took some of the stress off the center main bearing. Every V8 since has used a 90° crank with four counterweights.

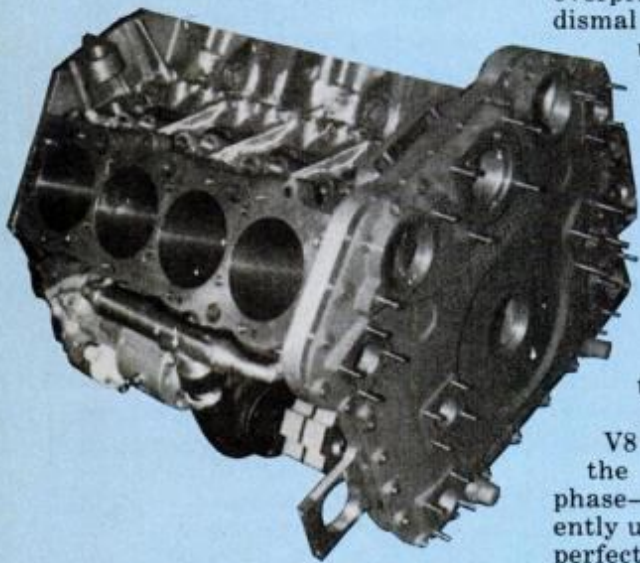
Cadillac's was definitely the most important early V8. Cadillac made the V8 smooth, powerful and reliable in an era when cars were apt to be rough, anemic and usually broken. This was not a racing engine, nor was it hot-roddable, like a Ford. But it was the perfect powerplant for a heavy limousine or touring car.

#### Flathead Ford

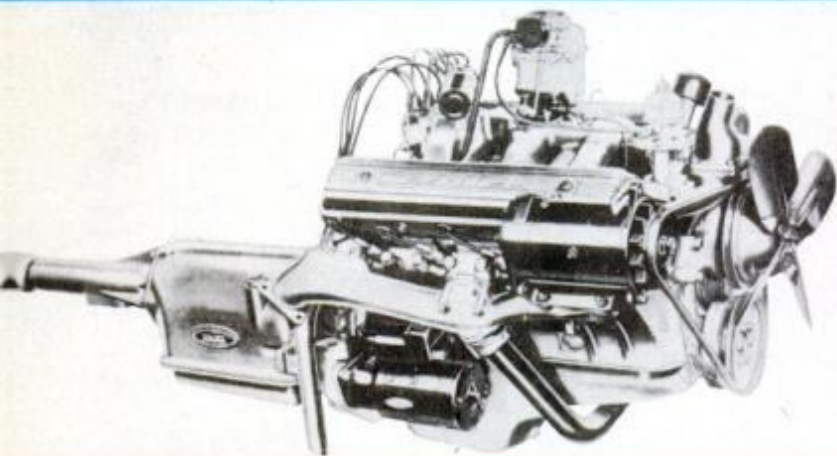
The legendary Ford flathead was the engine that really made V8 lovers out of Americans. If the truth be known, it wasn't a very good engine, but unlike the Peerless, Lincoln or Cadillac, which were built in comparatively small numbers, the Ford flathead was built by the millions. It showed every other manufacturer that a V8 could be sold in a \$500 car.

The secret of Ford's mass-market V8 was the one-piece engine block. Other V8s used one casting for the crankcase and another for each bank of cylinders.

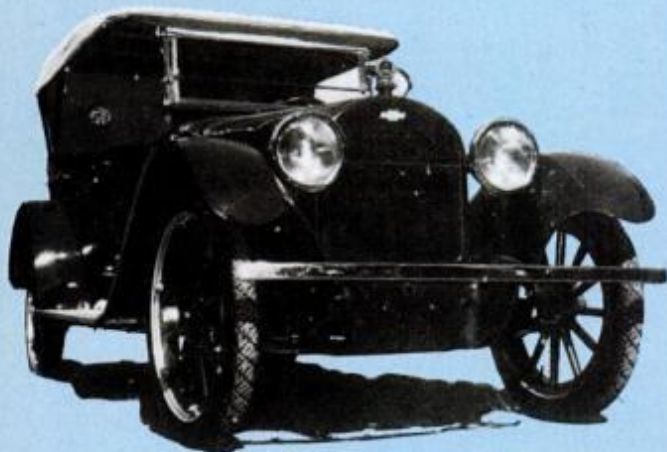
Charlie Sorensen, Ford's produc-



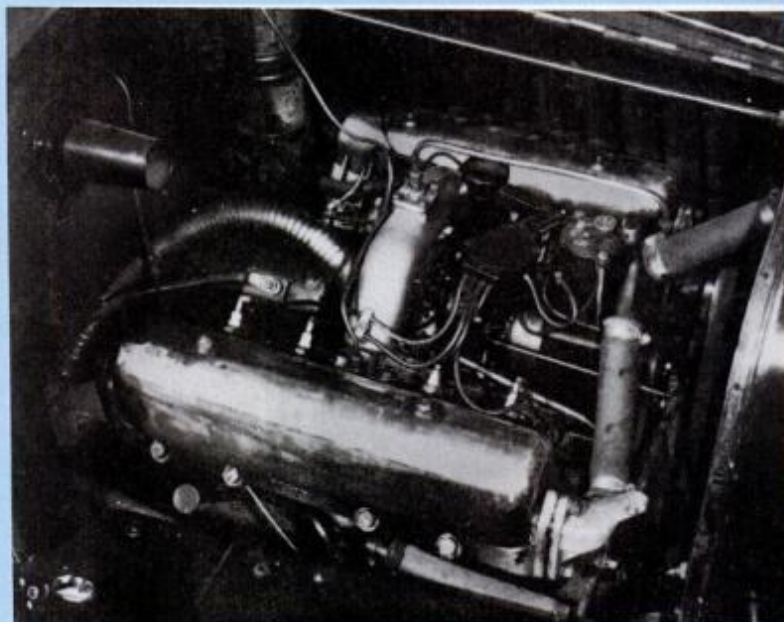
One of the many offspring of factory-built V8s is this all-aluminum block destined for duty in aircraft. It produces from 800 to 1200 hp in turbo-charged versions and also features dry-sump oiling.



The 1949 Cadillac V8 was a milestone in V8 engine technology. Designed by Ed Cole, it was lighter and more powerful than any previous V8. It was the first V8 ever built with slipper skirt pistons and five main crankshaft bearings.

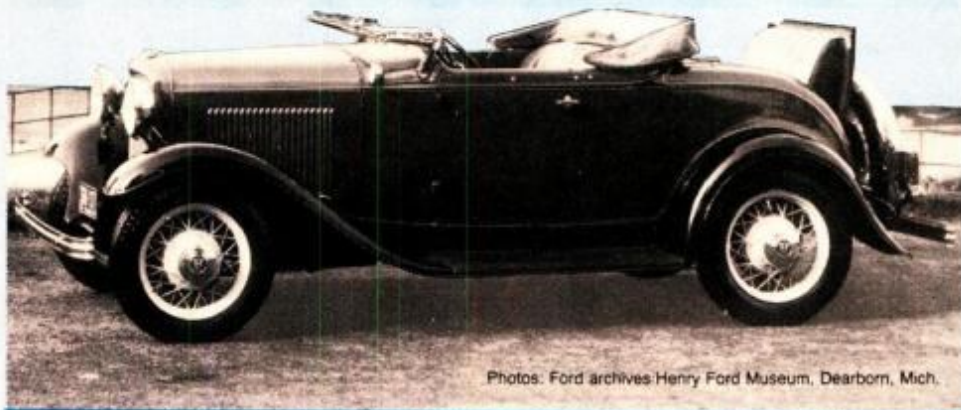


The 1917 Chevy V8, rated at 55 hp, offered a separate pump for circulating oil rather than splash oiling, and it used vertical overhead valves. Producing this engine was so expensive, however, that it lasted only two years.





In John Dillinger's line of work, speed was of the essence. "I can make any other car eat the Ford's dust," he said of his 221-cu.-in., 65-hp flathead Ford V8.



Photos: Ford archives; Henry Ford Museum, Dearborn, Mich.



tion genius, invented an automated V8 assembly line. On it, the sand for the castings was prepared by machine, the forms for casting the cores were precisely placed and the finished blocks were completely machined, automatically. The one-piece block came off the line ready to be fitted with moving parts.

The other big innovation of the Ford flathead was straightening out V8 carburetion. Most previous V8s tried to feed all eight cylinders from a single, one-barrel carburetor. The cylinders at the extreme ends, especially No. 1 on the right-hand bank, always starved and overheated. Ford devised the "over-and-under" or dual-plane intake manifold, and in 1934 fitted it with a Stromberg two-barrel carburetor. Each bank of cylinders was now fed by its own carburetor throat, through its own manifold. Every V8 since has used the over-and-under manifold and at least a two-barrel carb.

Curiously enough, almost every early V8 was designed for a huge car with a long, narrow hood that might just as well have held a straight Eight. The '32 Ford was the first car in which a compact V8—221 cu. in., 65 hp—was placed under a short hood, at the front of a small car designed around those compact V8 dimensions, which was not only inexpensive but comparatively fast. The \$500 V8 Ford could hit 80 mph in the early '30s, when it took a \$3000 Cord to hit 100. The flathead Ford was the engine for a whole generation of speed freaks, from John Dillinger to the California hot-rod kids who discovered desert dry-lake beds right before World War II.

### Ed Cole and the Caddy V8

The '49 Cadillac V8 is now considered a milestone in the history of engine design, not only because it marked such an advance over every-

thing that had gone before, but because it set the parameters for every V8 that has been designed since. Three men developed the '49 Cadillac V8: Ed Cole, Harry Barr and Jack Gordon, all of whom were rewarded with spectacular corporate careers at General Motors.

The heart of this engine was a new type of "slipper" piston invented by Byron Ellis back in the '30s. Ellis cut away the sides of the piston skirt at the bottom, so the piston could slip between the crankshaft counterweights. This was the simple secret of the modern V8.

For the same displacement, the connecting rods could be almost 2 inches shorter than before, which meant the whole engine could be shorter and narrower, the crankshaft and bearings could be lighter and, because of better heat dispersion from the lighter engine block, even the radiator and other ancillary equipment could be lighter. The 1949 Cadillac 331-cu.-in. V8 produced more horsepower and torque than the 1948 Cadillac 346-cu.-in. V8, yet it weighed 200 pounds less—just 669 pounds with all accessories.

Cole and Barr made other significant improvements for 1949, too.

Until then, every major V8 except Lincoln's 60° V8 from the '20s had used only three main bearings. The new Cadillac was given five main bearings, effectively supporting the crankshaft at every turn. The Cadillac block was also one of the first designed from the beginning to allow substantial boring and stroking—it started at 331 cu. in. and ended up at 429 cu. in.

The '49 Cadillac was the first big V8 that was light and compact enough to fit into a small car, which is why it was such a big hit with hot-rodders and road racers. Before the Cadillac came along, the most powerful racing engine generally available was the flathead Ford/Mercury 59A. It could be bored and stroked to 296 cu. in. if you crossed your fingers and held your breath, at which point it delivered 170 to 180 hp in radical racing tune.

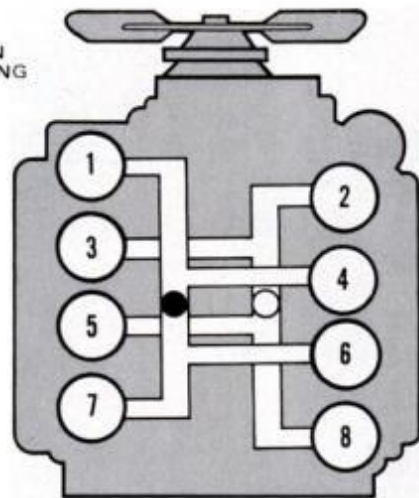
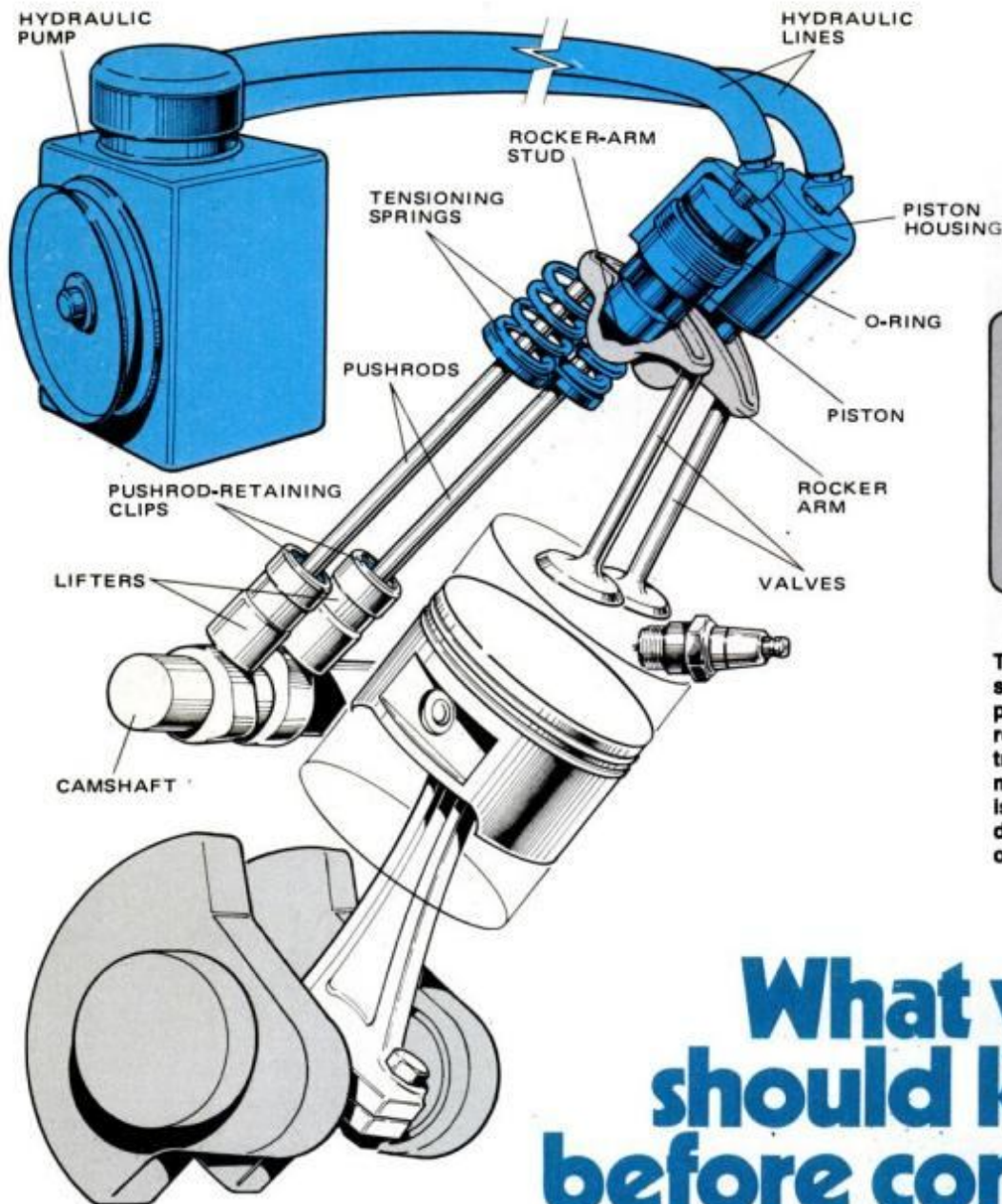
The Cadillac weighed only a bit more and fit under the same hood as the Ford, but was rated at 160 hp, stock. Road-racing Cadillac-powered Allards and Cunninghams were durable enough to last 24 hours at LeMans, yet delivered nearly 300 hp. It was cheaper to

*(Please turn to page 119)*



The Shelby Cobra was a British roadster stuffed with a 427-cu.-in., 500-hp V8 engine. For \$7000, it offered drivers performance remarkably similar to a full-blown race car.





The Automatic Cylinder Deactivator system (ACD) at left uses hydraulic pistons to engage and disengage the rocker arms from the rest of the valve train. The typical dual plenum intake manifold is shown above. When a plug is driven into the carb flange (black dot), it cuts off fuel/air mixture to four of the cylinders.

## What you should know before converting your V8 to a V4

Neutralizing cylinders in your V8 engine isn't hard or always expensive. But can you live with the result? This is what you need to know before you make the conversion.

by Tony Assenza AUTO EDITOR  
and Jerry Heasley

Long before Cadillac announced its variable-displacement V8 engine (see *Saturday Mechanic Looks Under the Hoods of the GM Models*, page 125, Oct. '80), scores of back-yard mechanics and small-scale manufacturers had devised ways of neutralizing or deactivating cylinders to improve fuel economy. While some of the ads for these devices and plans sound as if they've just invented the wheel, the technol-

ogy of cylinder deactivation isn't new and it isn't very complicated. However, no matter how simple a technique may be, there are pitfalls. We'll discuss the problems later. First, let's look at how these conversions work.

### Most common conversion

One of the most widely used methods of deactivating cylinders is to remove four of the eight exhaust valves and their lifters, pushrods and rocker arms. Then the intake valves of those cylinders are neutralized by removing the lifters, pushrods and rocker arms, but leaving the intake valves in place. Naturally, with the valve-activating mechanism removed, the intake valves will stay in a closed position.

Then a freeze plug is hammered into the intake manifold just below the carburetor.

In operation, the deactivated cylinders will draw in and expel air through the exhaust port. Some of these kitmakers will tell you to bang the electrode of the sparkplug closed, while others will tell you to remove the sparkplug and install a threaded plug. Either way seems to work fine since no fuel/air charge is being ingested by the cylinders.

What determine which pistons you deactivate are the design of the intake manifold and the location of the vacuum-operated accessories. All intake manifolds are a dual-plenum design. That is, they have two separate and independent sets of passages for delivering the fuel/air





Replacement lifters (arrow) of CVCS system allow intake valves to open .200 inch.



Freeze plug (arrow) is hammered into the intake manifold to block air/fuel flow.

mixture to the cylinders. Each set of passages will feed four cylinders, two on the left bank and two on the right bank.

When you drive a freeze plug into the intake-manifold flange below the carburetor, you effectively block any airflow to four cylinders. The passages that are not blocked will feed fuel and air into four cylinders, two on each bank, allowing the engine to work as a V4.

Maintaining that V configuration is critical because the engine must remain balanced. If you were to deactivate one whole bank of four cylinders, the vibration of the firing cycles would shake the car tremendously.

Before deactivating cylinders, you must make sure that vacuum-operated accessories, such as vacuum-assisted brake boosters and automatic-transmission modulators, will remain tapped into a source of vacuum. If all the vacuum accessories are located on the same intake-manifold plenum, the conversion will be much easier. If not, you'll have to decide which plenum to use and transfer the vacuum accessories to that one. This may require drilling the correct-sized opening and installing fittings for the hoses.

### Two- and four-barrel carbs

If your car has a two-barrel carburetor, then you'll only need one plug

to block the plenum. If you have a four-barrel carb, with a separate primary and secondary throat for each plenum, you'll need two plugs of different sizes.

But other than that, there are no major differences between converting an engine with a two- or four-barrel carburetor.

### Constant-volume system

The system that our contributor, Jerry Heasley, installed is a slight variation from the basic system described above.

In his conversion, the exhaust valves of the deactivated cylinders were left closed and different lifters were used on the intake valves. These lifters allow the intake valves to open .200 inch.

As the piston in one bank moves up, it expels air into the intake manifold. At the same time, the piston in the other bank is moving down and is sucking air into the cylinder. This system, called Constant Volume Closed System (CVCS), reduces pumping losses because the deactivated cylinders are, in essence, helping each other move air back and forth across the banks, not in and out of the engine as in the previous system.

This system also uses a freeze plug to block one of the intake-manifold plenums.

Jerry Heasley's conversion took one afternoon to complete and the system worked quite well. Our road test revealed that mileage increased about 30 percent in city driving and 15 percent on the highway. There was, however, a severe loss in power.

Heasley found that his 1970 Oldsmobile with a 350-cu.-in. engine had no reserve of power after the conversion, forcing him to plan his moves on the highway well in advance.

We found that virtually everyone



Barrel-shaped valve fits into a machined hole on top of intake-manifold plenum.

we've spoken to had the same problem—no acceleration and therefore an inability to get themselves out of a tight spot.

### Keeping it simple

The simplest system we found was developed by Charles Weissman of Valley Stream, N.Y. Charlie, who's been reading PM for more than 30 years and has all the issues to prove it, came up with a barrel-shaped valve which he installed in a machined hole in the intake manifold.

This valve is operated by a cable running to the dashboard and simply blocks the flow of air and fuel to the cylinders. No valves are deactivated and nothing is removed from the engine.

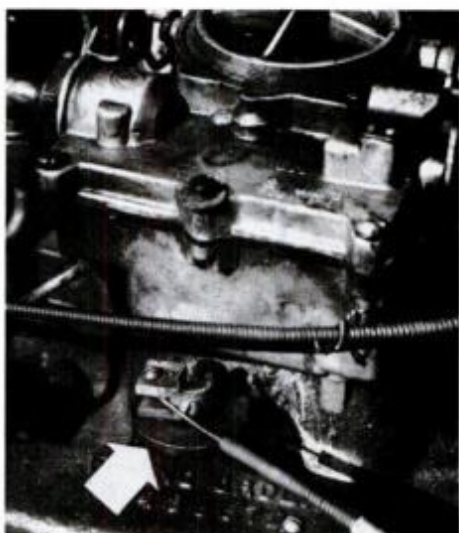
Depending on whether one or two valves are installed in the intake manifold, Charlie's engine can be switched from a V8 to a V6 to a V4. The nice thing is you can call up all eight cylinders when you need them simply by pulling a cable.

We tested Charlie Weissman's Chevy Caprice with a 350-cu.-in.

*(Please turn to page 121)*



Cable controls below the dash shut off two or four cylinders of the 350-cu.-in. V8.



Driver activates the barrel-shaped valve in the intake manifold with the cable.

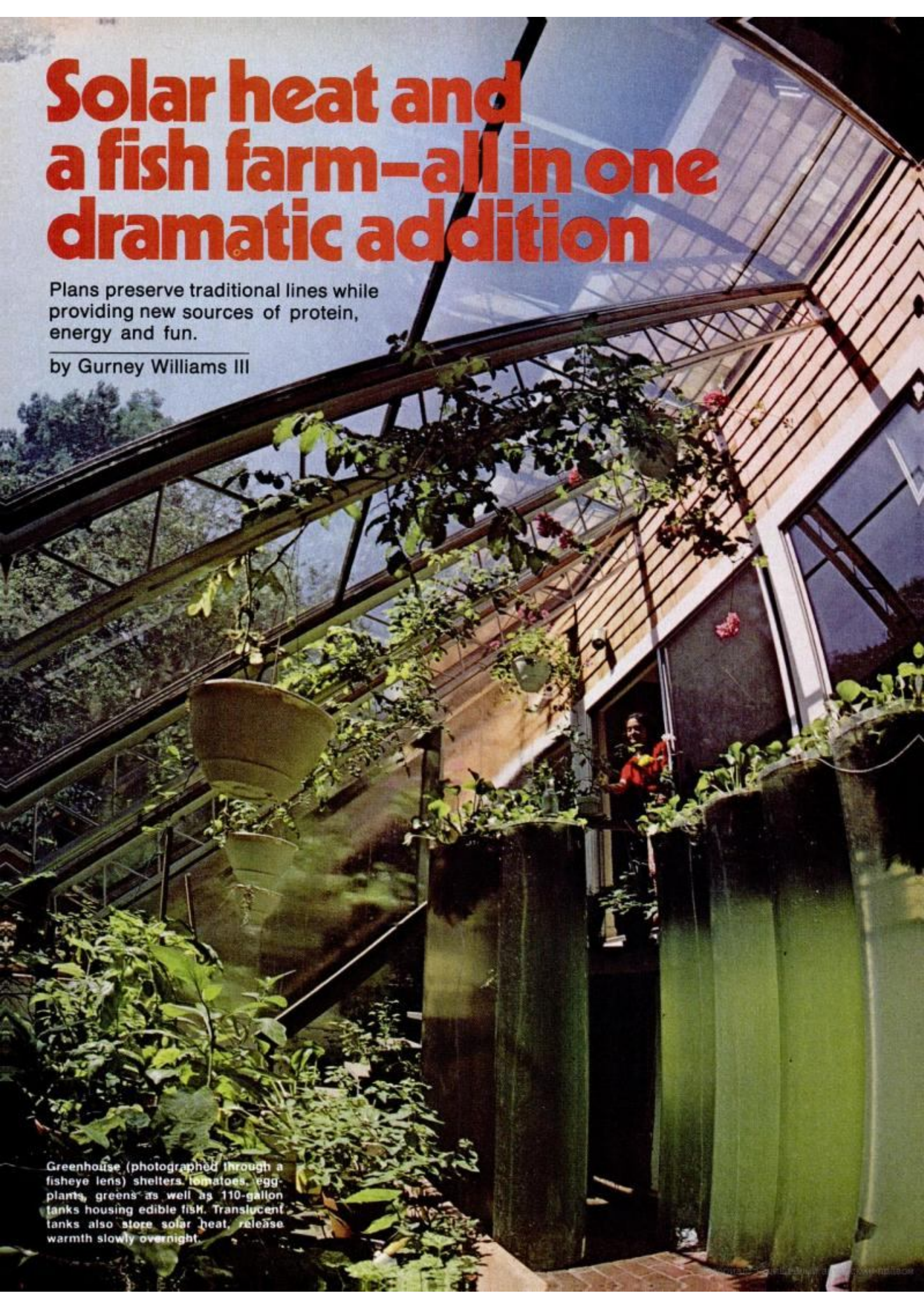


# Solar heat and a fish farm—all in one dramatic addition

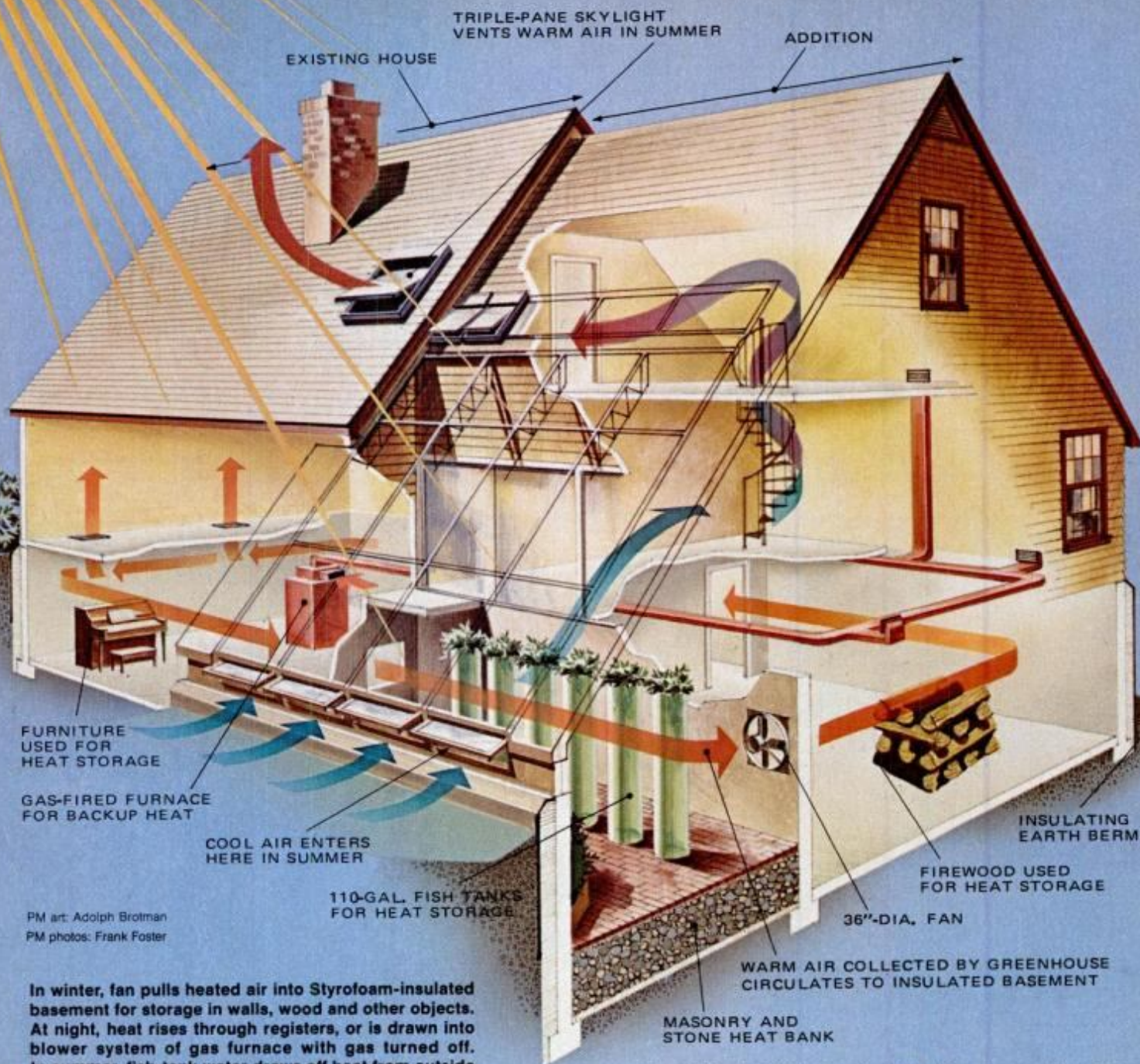
Plans preserve traditional lines while providing new sources of protein, energy and fun.

by Gurney Williams III

Greenhouse (photographed through a fisheye lens) shelters tomatoes, eggplants, greens as well as 110-gallon tanks housing edible fish. Translucent tanks also store solar heat, release warmth slowly overnight.







PM art: Adolph Brotman  
 PM photos: Frank Foster

In winter, fan pulls heated air into Styrofoam-insulated basement for storage in walls, wood and other objects. At night, heat rises through registers, or is drawn into blower system of gas furnace with gas turned off. In summer, fish-tank water draws off heat from outside breeze before it enters the house.

Architect Malcolm Wells faced a difficult assignment in raising energy efficiency of house, set in a hill sloping down to the north. His solution included adding heavy insulation on the exposed north foundation wall, and sinking south edge of greenhouse underground where temperatures remain constant. Wells' plans preserve lines and shingled look of existing house.

**B**eneath the lines of a traditional New England house, the addition you see on these pages shelters some innovative features.

An organ-pipe arrangement of 10 translucent cylinders collects solar heat in a greenhouse and accommodates hundreds of catfish, African perch and other edible fish. A fan system moves air from the greenhouse, at 3000 cu. ft. per minute, into a tightly insulated basement where heat is stored in the walls, in a woodpile and in the flotsam and jetsam—an old piano, for instance—of a family of five. A triple-pane skylight in the master bedroom upstairs opens in summer to release heat and foster breezes, partially cooled by fish-tank water, through the greenery-shaded living room.

The experimental addition, including greenhouse, basement room, living room and bedroom, adds 1000 square feet of space to the house owned by John and Nancy Jack Todd. For them, the project also liter-





ally brings home some of the tenets of the New Alchemy Institute, an 11-year-old nonprofit organization founded by the Todds and aquaculture expert William McLarney.

Despite a name conjuring images of medieval wizards, the institute (Box 432, Woods Hole, Mass. 02534) doesn't aim for miracles or magic. One of the missions of a staff sprinkled with young scientists—Todd himself holds a Ph.D in animal behavior—is to design scientifically sound "bioshelters," solar-heated structures housing crops, fish and, sometimes, people.

The most ambitious of the institute's bioshelters overlooks the sea on the green, rolling countryside of Canada's Prince Edward Island. The 6900-square-foot building con-

tains a three-bedroom residence, family greenhouse, commercial greenhouse, lab, workshop and 30 solar-collecting tanks where rainbow trout and other fish abound. The Prince Edward Island Ark, designed by the institute and now owned and run by Canada, is a typical New Alchemy conception: It models the Earth itself, supporting land crops and marine life with solar energy.



Oddly enough, it didn't occur to the Todds to incorporate bioshelter principles into their own house when they first began facing the need for renovations two winters ago. It was shortly before Christmas when problems began to multiply. The east porch needed repairs. Nancy's mother was due for a visit, and the Todds were concerned that some loose boards might trip her before she ever got in the house. Then the contractor they had called to fix the boards came down with the flu, leaving what Nancy calls a "very tacky" porch unrepaired.

The house itself was too small for the Todds and their three children. Nancy, a writer and editor, had to use the dining room for an office. "I don't think I ever turned in a manu-

John Todd (left) feeds fish in greenhouse tanks whose tops, visible through sliding windows, add color to new living room (below). Ceiling fan helps distribute warm air in winter, provides a breeze in summer.





script that didn't have sauce or squash on it," she says.

### House was a 'sieve'

No one tripped on the porch during that Christmas season, but the Todds continued to tote up dissatisfactions. "We had bought a sieve," John says. "We had only about four inches of insulation in the attic, a modest amount in the walls and nothing in the basement. The basement just acted as a radiator, cooling the whole house." As the New England winter dragged on, the Todds became aware that fixing the porch alone wasn't going to satisfy them.

When they began sketching more ambitious plans for the house, there were several other solar advocates

and researchers to help them. Among them was Malcolm Wells, a Brewster, Mass., architect, writer, cartoonist—and one of the foremost designers of underground houses in the country. Wells drew the plans and, when we interviewed him, modestly attributed many of the ideas to the Todds and others. But one feature of the final plan is vintage Wells: The south edge of the greenhouse cuts into the hillside, dropping the brick floor four feet underground. The earth at floor level stays at a constant 45° F. or so, below the frost line, even on days when exterior greenhouse glass is colder than ice cubes.

### Wood to hold heat

Another, more experimental, design feature was suggested by Joseph Seale, a staff member at New Alchemy who holds a degree in physics from Harvard. Seale's suggestion: Use firewood in the basement to store heat.

"Joe figured out we could set up a partially dried wood-storage area, which would be about 60 percent as effective as a rock-storage system," John says, "and would require one-eighth or one-twelfth the energy. Rock storage requires high horsepower to push air through the interstitial space." But, the Todds figure, air will flow easily through half a cord or so of wood, stacked log-cabin style near a 36-inch fan, driven by a 1/8-hp motor that draws heat from the greenhouse.

More than that, the Todds calculate that just about anything stored

in the basement—from tools to toys to the old piano—has some heat-storage capacity. Wells' plans were aimed at bottling up heat in the basement by day and releasing it as needed by night.

The Todds can tap the heat by opening registers. Or they can turn on the blower system in the existing heating plant: A break in the return-air duct allows the blower to suck air from the basement and push it through the house. For long stretches of sunless days and cold weather, the Todds can turn the gas back on and reconnect the interrupted air duct.

Complementing the basement-storage plan, it was John Todd's idea to install 10 8-foot-high, 110-gallon translucent tanks at the back of the greenhouse.

Water has commonly been used in buildings to store solar heat—the rough idea was familiar to Roman architects designing public baths 1800 years ago. But the tanks in the Todd house are more than a mere water wall.

For one thing, several of the tanks foster a crop of algae that would make a swimming pool owner turn pale. The deep green growth, John says, functions just the way black surfaces do in standard solar collectors. In addition to storing heat, the tanks should also provide fresh fish—up to 300 pounds per year.

### Evaporative cooling

The Todds proved to themselves last summer that the tanks provide

*(Please turn to page 122)*



Narrow stairwell connects living room to new bedroom. In summer, air passes from floor to floor through door connecting bedrooms and exits through a skylight.



Thick doors with Styrofoam core help hold heat in basement. In addition, 4-inch-thick Styrofoam plugs block off basement windows to bottle up energy from greenhouse.



It was exactly 8:10 p.m. when the call came. Outside the Coast Guard air station at Corpus Christi, Tex., a near-hurricane storm had blown up, worse than forecast. And the \$20-million modern drill barge *Ocean Express* was in trouble.

There were, according to an oil-company shore station that relayed the distress call, 50 men on board. This was the first error: There were only 35.

And the barge was said to be 20 miles at sea, the second error. It was 40 miles offshore.

At 8:14, after punching alarms, sounding sirens and ordering two choppers on line, Lt. Cmdr.

# The Ocean Express disaster—a hard lesson at sea

by E.D. Fales

DRILL DERRICK  
(AT STERN OF BARGE)



Escape capsule interior (right) is designed to keep crew members safe and snug until rescued. But when escape capsule No. 3 flipped over in 25-ft. waves and 60-mph winds, hatches were submerged, (as seen in the photo above) and the weight of 19 men provided ballast that kept the capsule upside down. Six men escaped, 13 died in the flooded capsule.



STARBOARD  
ESCAPE CAPSULES  
NOS. 1 AND 3

PM art: Dean Ellis



John Lewis and two men ran to board one of the copters, a single-engined H-52.

It was a frightening night to fly, and H-52s actually aren't built to battle offshore storms. Nevertheless, at 8:18, eight minutes after the call, Lewis and crew went up, bouncing, to buck a solid wall of wind off the Gulf. For one of the crew, it was his last mission.

Almost at once the storm cut their 100-knot air-speed to a 50-knot crawl over the ground, draining their fuel. Their first job was to keep the H-52 flying. H-52s are "marginal" in storms. If a pilot overturques the single jet turbine engine, he's in trouble. A big H-3 was called for. Unfortunately,

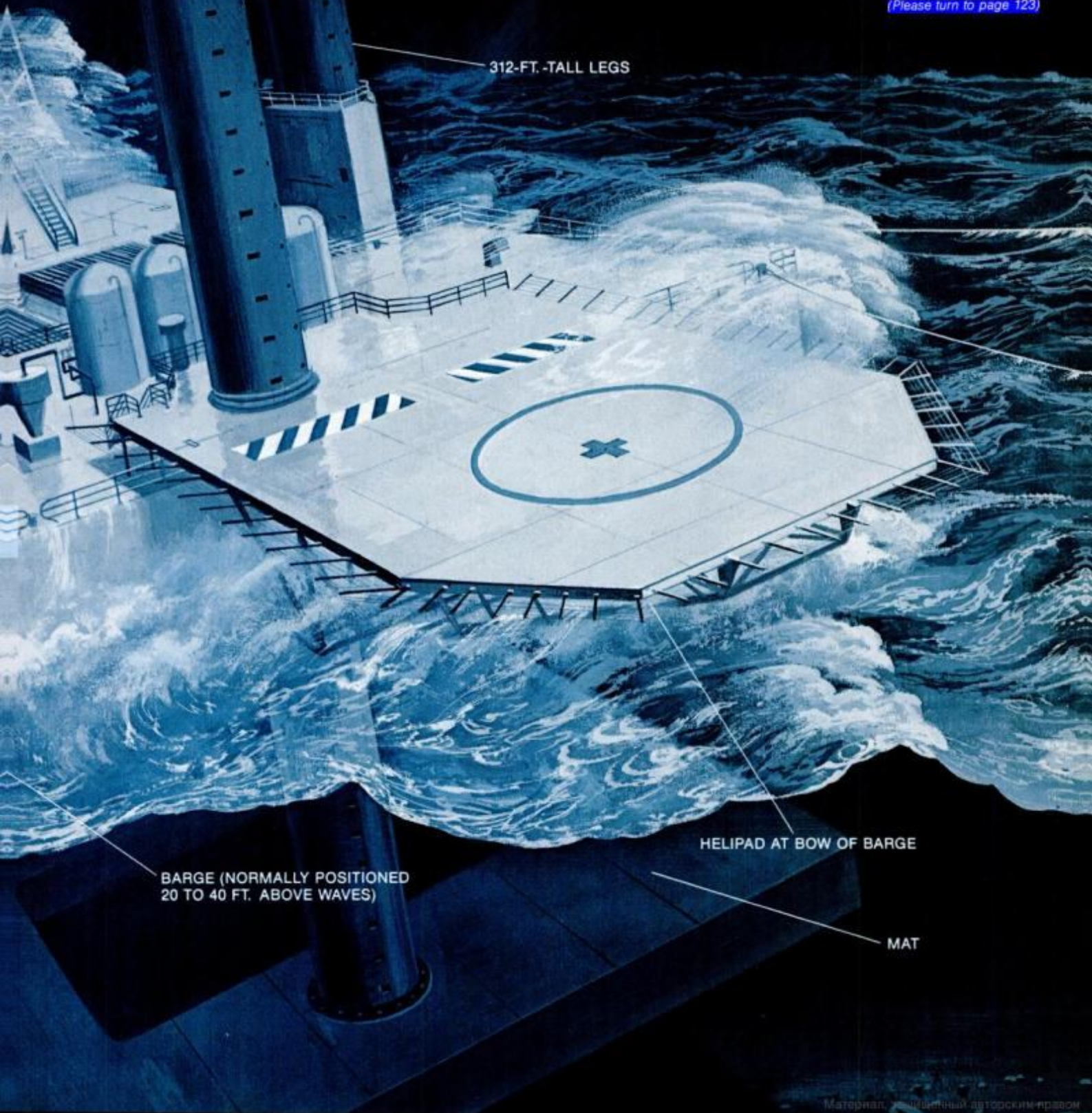
the Coast Guard does not have enough of these. The second job would be to find the barge.

Toward 8:40, Lewis raised its captain by radio and found he was 53 miles northeast of Corpus and 40 miles off the coast. The word at that time was that he would like men taken off "just in case" things got worse.

So the H-52 choppered out to lift people off—if it could. There was not time for Lewis to worry about how he would snake his way around a forest of steel towers on the barge. Three stood 16 stories tall.

What happened that night in April 1976 wrote a new chapter in offshore rescue—a chapter so

*(Please turn to page 123)*



312-FT.-TALL LEGS

HELIPAD AT BOW OF BARGE

BARGE (NORMALLY POSITIONED 20 TO 40 FT. ABOVE WAVES)

MAT



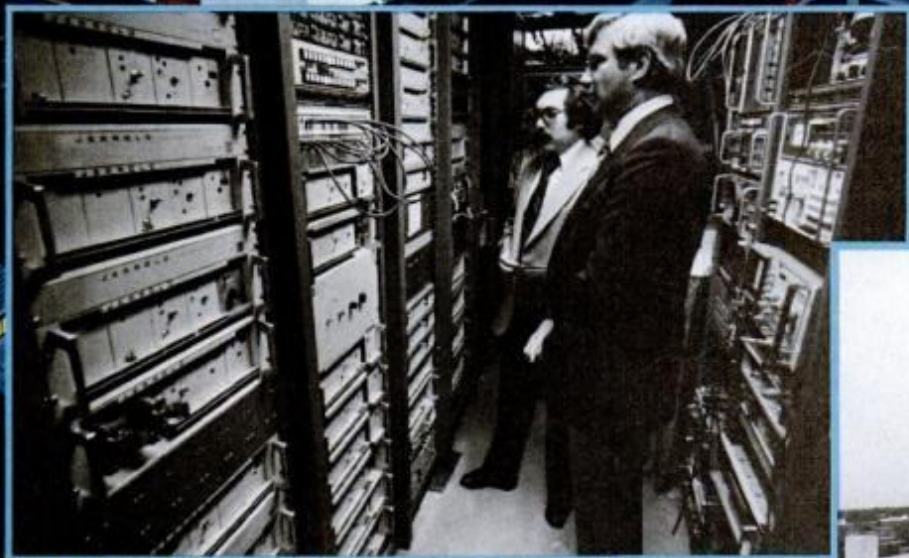
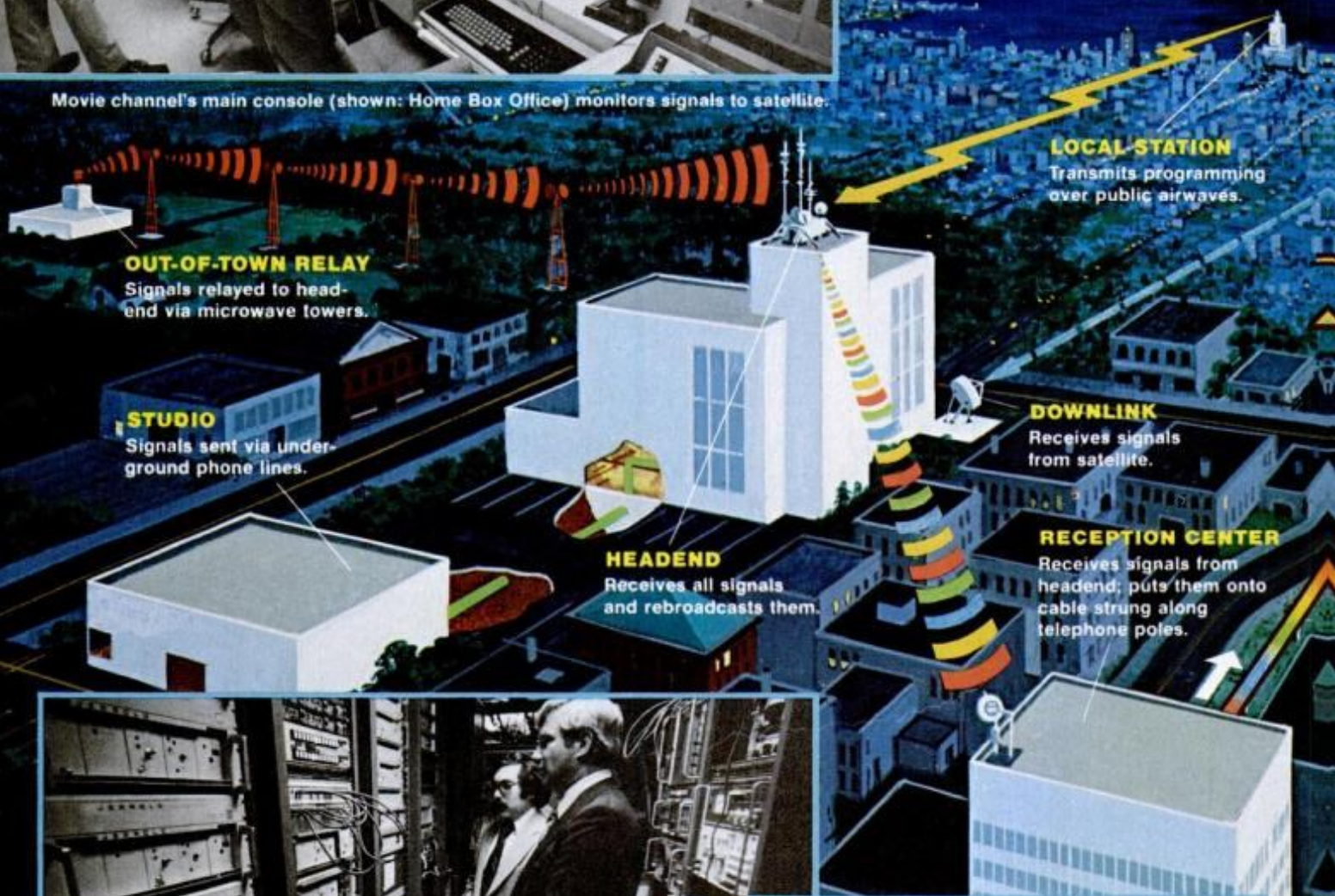
# Don't touch your dial:



Movie channel's main console (shown: Home Box Office) monitors signals to satellite.

Cable TV is one of the fastest-growing industries in the entertainment field. Here's how cable companies decide what programming to offer, how and where they get programs and how they get the signals to your TV.

by Neil Shapiro ELECTRONICS EDITOR



A cable company's headend station (above) has racks of receivers, signal enhancers and other equipment. (We show Cablevision's headend.) Enhanced signals leave headend and are received by antennas atop reception centers (right). From reception center, signals go, on cable, to your TV.





# Here comes cable TV!

If you subscribe to cable TV, you are familiar with "the box." It plugs into your television and takes the place of the VHF and UHF channel-selector switches. It has 37 channel-selecting buttons that allow you to receive all of your local channels and a few dozen other channels, too—all with crystal-clear reception.

These other channels may offer movies, news, local events, classified listings, out-of-town stations, religious news, sports, classic films, shopping hints and more. Exactly what you see depends on which cable-carrier company you

have signed up with (and often there is only one carrier in a community). The cable-carrier company decides what programming it will buy and, therefore, what you receive on your box.

There's a lot of action on your screen if you subscribe to cable TV, but there's even more action going on at the other end of the cable. Cable-TV signals fly through space, travel underground, are relayed by microwave and even come in on the public airwaves—but the only way they'll get to your TV is by a cable

## OUT-OF-TOWN UPLINK

Relays signals via communications satellite.

## CABLE

Carries all signals along telephone poles to home TV.



The box (right) is a familiar sight to cable-TV viewers. It is a control console that connects to your TV and replaces the TV's channel-selector switches. Up to 37 buttons control the selection of everything from local stations to movies, sports and even shopping hints.



(usually strung alongside telephone lines) that is controlled by your local cable-carrier company. You have to subscribe and pay the price to get connected.

Seventeen million people are inhabitants of what Ed Horowitz of Home Box Office terms "the cable universe." His figure is based on 2000 cable-carrier companies that reach into 10 million homes.

It is the cable-carrier companies that decide what will be watched in their portion of the cable universe. Their decisions on what programming to provide are based not only on the hundreds of programs offered them for rebroadcast (from such operations as Home Box Office and Ted Turner's WTBS and Cable Network News), but also on the response of their audiences.

We visited one cable-carrier company, Cablevision Inc. of Woodbury, Long Island, N.Y. Its operation is representative of some of the most state-of-the-art methods in the industry. As you read, keep in mind that other carriers may get their act together in different ways.

Cablevision, as of four months back, reached more than 112,000 homes on Long Island. In the areas they serve, that is a market penetration of about 40 percent. You can drive the streets of Woodbury and look up at row after row of delapidated TV antennas hanging broken and limp from rusted chimney mounts, forgotten by those who live in the cable universe.

Each box, on every TV, is connected by the cable which runs on telephone lines from a "reception station." Cablevision requires six wide-

**Dish antennas atop Cablevision's headend each transmit to separate reception centers. Taller, vertical antennas are used to receive microwave relays of signals from out-of-town broadcasters.**

spread stations for their coverage.

Each reception station is in constant communication with the "headend." It is at the headend that the technological magic and mystique of cable TV are most apparent.

### **Catching the light fantastic**

Situated high atop Nassau County Medical Center, Cablevision's headend looks like the ground-control station for every fleet of flying saucers ever dreamed.

Tall microwave towers pick up signals relayed to the headend by microwave networks all along the East Coast. Huge, hemispherical dish antennas stand like fixed, unmoving eyes atop insectile perches.

All of these antennas sprout from a small, silvery trailer on the expanse of the hospital roof, near the gigantic vents of the building's airconditioning system.

Many stories below, tucked away in the corner of a parking lot, is the "downlink," another large, dish-shaped antenna that points to a satellite hanging far above in outer space. The signals that it snatches

from RCA's Satcom 1 satellite are sent by wire up the side of the hospital to the headend station.

TV antennas, much like ones for sale in any electronics store, are hidden from view on a lower partial roof. These seize the more mundane, if no less entertaining, local signals from the air.

Other signals, sent by telephone connections, come from the Cablevision studios. They, too, are destined for the headend.

Within the headend, there is one tiny aisle, formed by racks of multi-million-dollar electronics on either side. These electronic receivers, enhancers and processors are the soul of the headend.

Signals, whether snatched from outer space or received from a few miles away, are changed to different frequencies. Then all the different frequencies are combined into one

main broadcast. Finally, after the colors have been enhanced and sound reconditioned—whatever it takes to get a quality signal—the dish antennas atop the headend will re-





transmit this new, improved, combined signal to Cablevision's reception stations.

Each dish antenna is pointed at a mate—another dish far off and lost on the horizon. Each receiving dish sits atop a reception station. From each reception station, the signal travels via cable to each and every home signed up to receive it.

But the signals don't arrive at the headend randomly. Nor does the headend rebroadcast anywhere near all it is capable of receiving. Each signal is one channel on the box—one button out of Cablevision's selection of 37.

### Movie madness

The biggest button on the cable box, the button that sells all the others, is the movie button. Home Box Office, Showtime and other movie "networks" are in constant competition to sell channel space on a given cable-TV carrier's schedule.

The cable-TV carrier wants to offer the movie channel he believes will bring in the most subscribers. This, after all, is showbiz—and showbiz means big bucks. In many localities competing carrier companies have been franchised by all the



Section of the East Coast microwave relay network shows signal routing from tower to tower. Before satellites, networks such as this were the only way to relay signals.

available movie people. This makes it difficult, or impossible, for another carrier to start operations. (Without movies, who would subscribe?)

The movie button that Cablevision offers its viewers is HBO—Home Box Office. HBO is carried by over 1700 cable-TV carriers and is seen by viewers in more than 4 million homes.

Recent movies are the mainstay of HBO, although they also offer specials featuring comedy, sports and news. All are shown without commercial interruption.

We took a look at HBO's main control center and studio in downtown Manhattan. From there, the nationwide entertainment network is programmed, produced and broadcast.

The studio facilities are much like those at any large TV station, at least the part concerned with filming live events. But the amount of videotape machinery is mind-staggering.

Soundtracks of various movies being edited, previewed or just looked at wash over each other in a confusing medley of interfering sounds. Curses, love calls, screams and whispers fill an immense room lit by the flickering glow of dozens of TV monitors.

In contrast, the control room is a quiet, orderly array of switches and dials along a vast console watched over by the blank eyes of small monitor screens. Entering the HBO main control room is very similar to entering NASA's mission control center. There is the same aura of cool, competent engineering and computerized efficiency.

Two movie videotapes are run simultaneously—one for broadcast and another identical one as a back-

up. The two tapes are in such close synchronization that if the main one should malfunction, technicians could switch to the backup so quickly that not one word would be lost, not one scene spoiled.

But the computer knows all. The computer knows when to cue the tape, when to dissolve to an intermission between movies—in fact, many of the humans are simply themselves backup systems, even though all are highly skilled people dedicated to making every night a night at the movies for their audience of four million.

Yet, no technology yet invented can turn a movie bomb into a smash hit.

Ed Horowitz of HBO explained that movie producers often come knocking at the HBO door in hopes of selling an unheralded product. But then again, Ed added, "If a guy

*(Please turn to page 128)*

Character generators in a studio can place just about any message onto a screen for later transmission to homes on the cable.





# New machines for the

Less weight and noise and more performance and economy are features of

**S**nowmobile manufacturers are predicting a good winter (and hoping for snow). But their new machines indicate they expect fewer sales to first-time drivers and more to experienced snowgoers who know what they want in a sled. The latest snowmos incorporate improvements and refinements that make the sport more comfortable, safer and more fun—yet were unheard of in many cases just a couple years ago.

Power, speed and noise are no longer big deals. Most top-end machines today can go fast enough

to scare an average rider, and away from the racetracks the extra power goes unused. All standard new engines have been quieted down below legal decibel levels, and the public has learned that snow-

mobiles provide an enjoyable sport that's here to stay. No manufacturers include

top speed in their specifications anymore, and few mention horsepower, though it could be a useful aid in comparing machines. Engine displacement is given, however, and the purchaser can use it as one way to guess peak performance.

The best snowmobiles for the winter of 1980-81 are likely to have shock absorbers to smooth the ride, and increased vertical travel in the suspension. Adjustments are



Atop a peak above Crested Butte in the Colorado Rockies, riders of new Ski-Doo Blizzards—5500, 9500 Plus and a 7500 Plus—pause to survey the scene. Blizzards are the leaders in the Bombardier line of 12 models for '81.

Top sled of Kawasaki high-performance line, LTD has a new liquid-cooled engine with twin-sparkplug CD ignition and self-adjusting disc brakes.



Lighter weights of new John Deere machines improve performance and economy. Sportfire totals 384 pounds.



# snowdrifts

the sleds this winter. by Bill McKeown OUTDOORS EDITOR

likely to be available to adapt the sled for rider weight, snow conditions and type of trails. Disc brakes offer more control, and slide rails to support the track are becoming standard. Liquid cooling is a feature of a number of new models, as is oil injection that mixes metered amounts into the gas so that standard, two-cycle

gas-oil premix isn't necessary. Electric starting is offered for some models, and heated handlebars below extra-

high windshields are additional options. Some sleds now come with a trailer hitch, and many use CD electronic ignition. Direct drive, rather than chain drive, to the track is another innovation.

The well-equipped machine should have full instrumentation this year, a worthwhile trend, with speedometer, odometer, tachometer and fuel and temperature gauges giving drivers better measurement of performance and engine condition. Fuel consumption can be monitored, and should be improved for the many models that have been shaved down in

*(Please turn to page 156)*



Improved front and rear shock-absorbed suspension are features of Ski-Doo 5500MX, latest addition to the line. Individual adjustment can be made to each of the shocks.



Newest from Polaris, the Cutlass SS and Cutlass both have the new direct-drive system for quiet, efficient operation.



Aerodynamic design modifies Blizzard models used for cross-country racing (left), SnoPro (right) by Ski-Doo team.



Arctic Cat Pantera with fan-cooled 500-cc engine has full instrumentation plus optional handlebar warmers, electric start.

Backed by over 50,000 test and racing miles, Yamaha's 56-hp SR-V offers added tuning parts for cross-country racers.





# 4 silver jewelry gifts to make in your shop

You can make sterling-silver jewelry at home to rival that found in fine stores—at a fraction of the cost.

by Clare Conley

PM how-to photos by the author

**S**ilver has a rich luster, even when it's not highly polished. Yet it can take a mirrorlike polish which is fairly easy to maintain. For these reasons, silver is one of the two most popular metals used in quality jewelry.

With careful attention to detail, you can make fine silver jewelry, such as the four projects shown here, for much less than the purchase price of similar-quality items. The projects are perfect for Christmas, Valentine's Day and other gift-giving occasions.

The sterling silver used is in two forms: wire and sheet. (Sterling, as

opposed to pure "fine" silver, contains a small amount of copper to make it harder and more durable.) If the metal sizes specified for these projects aren't available, you can use larger-sized metal. For best results, don't use smaller sizes.

Incidentally, copper has similar working characteristics to those of silver. You might practice by first making a project in copper to develop your skills and technique.

The melting temperature of sterling silver is 1640° F. This is important to bear in mind because certain solders for silver also melt near this point. In these projects, only medium solder, which melts at 1390° F., is used. "Medium" refers to the degree of difficulty with which solder melts.

Other grades of solder are needed in intricate jewelry having multiple joints. For example, when a silversmith makes a second joint next to a completed one, he uses a solder hav-

ing a lower melting point, so the solder on the first joint won't melt.

Keep in mind when soldering that two pieces of silver to be joined must be touching each other.

Solder doesn't have the capacity to jump across even a small gap. For best results, do your soldering on a charcoal block or a flat sheet of asbestos.

Flux is a chemical that cleans the metal so the solder flows smoothly into the joint. You can purchase it, or make your own by mixing equal parts of borax and boric acid with water into a thick paste.

Paint flux on areas to be soldered and heat it until it forms a glasslike surface. Flux holds all parts in place while you position the solder.

Solder comes in sheets, wire and small pre-cut pieces. It doesn't matter which type you use as long as it is the minimum amount required to produce a secure joint. Solder squares clipped from a sheet and

## Heart ring



1 With roundnose pliers, bend a  $\frac{1}{8}$ -in. half-heart in .060-in.-dia. silver wire.



2 Secure the excess wire in a wooden jeweler's hand vise, or a vise that has leather-padded jaws. Cut off the half-heart shape with a jeweler's saw.



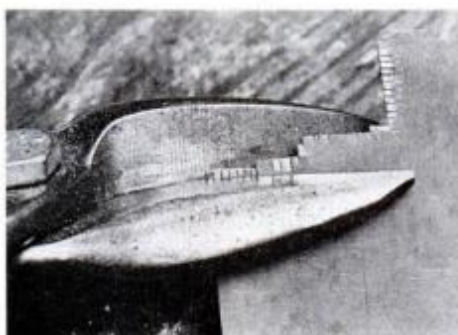
3 Bend and cut a second half-heart; then file the ends of both half-hearts flat.



4 Position both halves on a soldering block; then apply flux to the two joints.



5 Heat the silver enough to both dry out the flux and melt it to a glasslike state.



6 Clip tiny squares of silver solder from sheet solder, or use a wire solder.

PM color photos: Steve Fay



**1** Swirling S-scrolls, circles and silver beads are joined in this pendant design.

**2** Silver ring can hold a stone such as this malachite, or display an unusual coin.

**3** Lacy filigree, made by twisting wire on nails, gives this cross a delicate look.

**4** Dainty heart rings are the easiest to make of the four silver projects shown on this page.

**1**



**4**



**2**



**3**



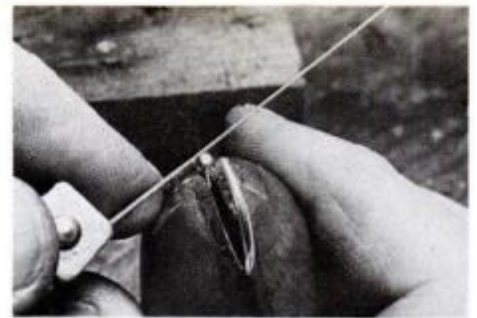




**7** Position two small pieces of solder on the joints of the heart. Then heat the silver evenly until the solder pieces turn to liquid and flow into the seams.



**8** Shape ring shank (the part that slips on a finger) around a mandrel at a point two sizes smaller than the final size.



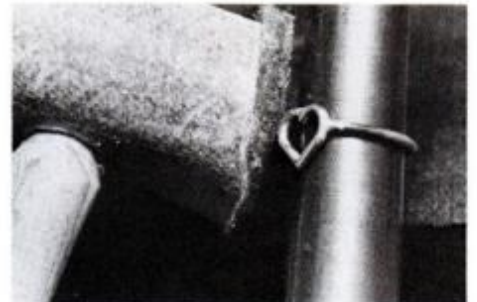
**9** Cut the shank, leaving space for the heart. Saw guide grooves in the shank ends where the heart will be positioned.



**10** With a small round file, notch the shank guide grooves to accept the heart.



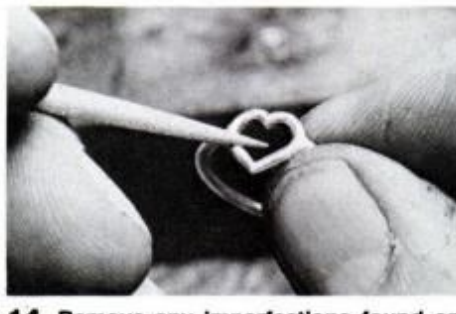
**11** The spring (return) of the shank wire will often hold the heart in place as you flux and solder the pieces with even heat.



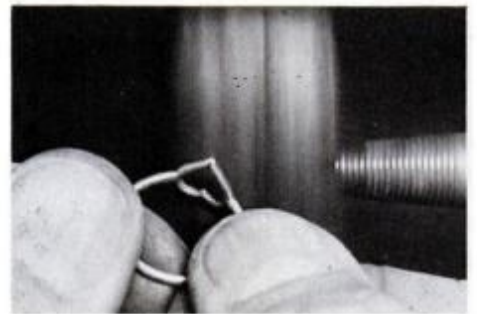
**12** Place the ring on a mandrel and round it by tapping with a leather hammer.



**13** Pound the ring's shank on a flat surface to remove any visible unevenness.



**14** Remove any imperfections found on the ring with a fine half-round file; then clean it as suggested in the text.



**15** Polish the ring first on a tripoli buff and finally on a jeweler's-rouge buff.

used in these projects were .034 to .040 in. square.

### Making a good joint

To make a good silver joint, position the tiny square of solder so it touches both pieces of silver to be connected. Next, set the torch to a flame no hotter than necessary. For these projects, the blue point should project only  $\frac{1}{4}$  to  $\frac{1}{2}$  in.

Move the torch over the silver so

the parts are heated equally to a temperature at which the solder melts. Solder will run to the heat.

If the solder collects on one side of the joint and refuses to jump across and connect the other silver part, this part didn't get hot enough to melt the solder. You can often correct this by refluxing and (usually without adding more solder) simultaneously bringing the two silver pieces to solder-melting heat.

*Note:* Never put a flame directly on solder. This will cause the solder to form balls instead of flow. The heat of the silver—not the flame—should melt the solder.

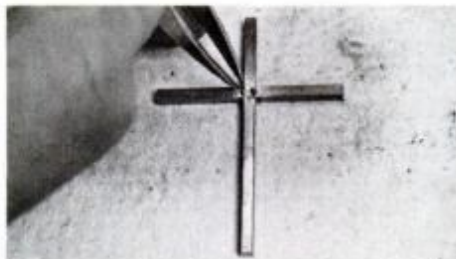
Tools common to many shops are perfectly useful in silversmithing. (See sources at the end of the story.) Just remember that the less a tool marks the silver, the less polishing you'll have to do later.

You'll need wire clippers, sheet-

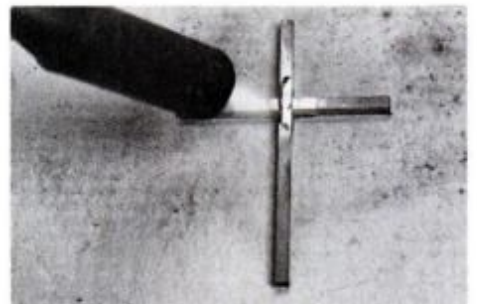
### Scroll cross



**1** Pound .128-in.-square silver wire on a hard, flat surface to remove bends/kinks.

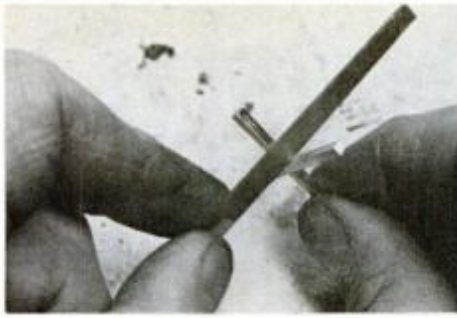


**2** Cut three pieces (see Fig. 13 on the next page) and file ends so parts butt tightly together. Apply flux, melt it; then use tweezers to place solder bits.



**3** While the silver is heated, the solder bits will melt and flow into the joints.

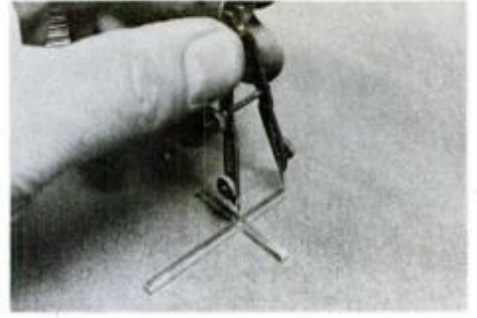




**4** Avoid using too much solder as it fills in the corners. File off any excess.



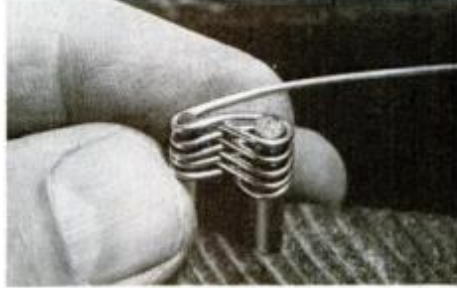
**5** To smooth cross, rub it in a circular motion on 400-grit paper on a flat surface.



**6** Use dividers to check that all the arms are equal. File the ends if necessary.



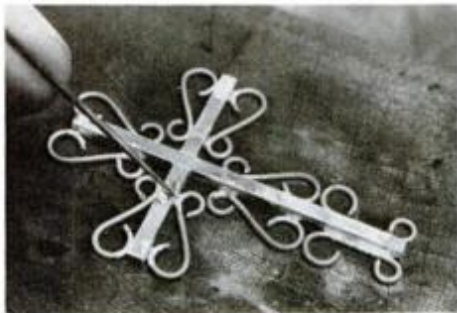
**7** Polish the cross on a wheel with tripoli then jeweler's rouge, taking care not to round the edges. Substitute polisher is a leather-covered wood scrap.



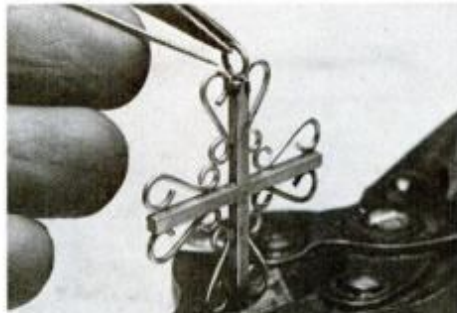
**8** To make uniform S-scrolls, wrap wire in figure eight around two nails of unequal diameter, such as 8-ga. and 4-ga. nails. First cut off heads and polish shanks.



**9** Cut the scrolls apart, making sure the cuts are aligned. Place scrolls individually on nails to make final closing bend with needle-nose pliers. If needed, tap flat before positioning scroll next to the cross.



**10** Eight S-scrolls and two C-scrolls are carefully placed in contact with cross, fluxed and soldered. To protect completed joints while heating remaining joints, apply paste mix of jeweler's rouge, water.



**11** After cleaning the piece in Sparex solution, solder a suspension ring perpendicular to the cross. Make the ring by wrapping wire around a nail. Hold the ring with self-closing tweezers; lock the cross in cushioned lever-jaw pliers.



**12** Polish the cross on the buffing wheel without rounding away its square edges.

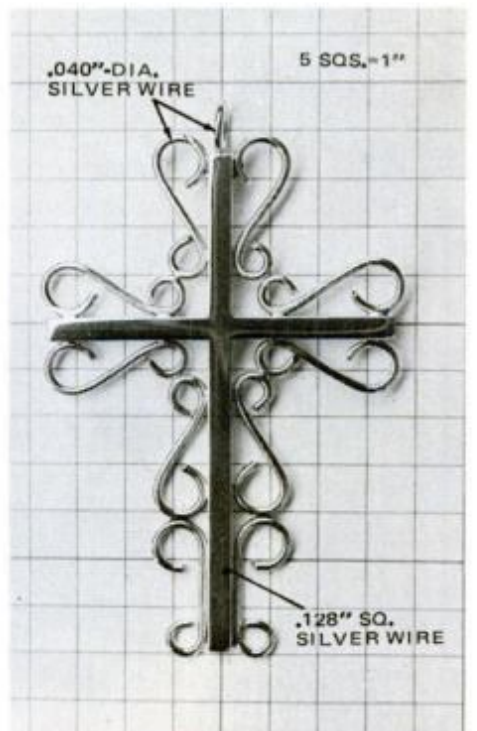
metal shears, roundnose (needle-nose) pliers, a jeweler's saw frame with No. 2 blades, tapered steel mandrels (metal rods around which rings are shaped), a propane torch with fine-point flame nozzle, tweezers, small watercolor-type brush for flux, leather hammer, several small files (flat and round), lever-jaw pliers and an electric motor with tapered spindle for two buffs: one for tripoli polish and one for jeweler's rouge. A wood mandrel that fits on the tapered motor spindle and accepts conical shells (used to grind the inside of rings) is helpful.

You can substitute hardwood mandrels turned on a shop lathe for steel ones. In place of a leather hammer, you can use a light metal hammer with leather contact-cemented onto its face. The shank of a ring, the part that slips on your finger, can be

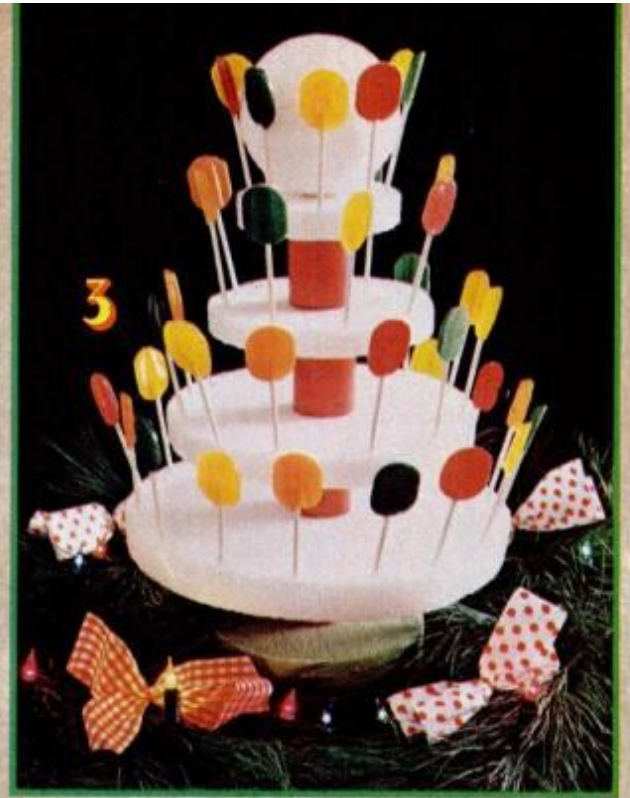
*(Please turn to page 132)*



**13** Do a final polishing with a stick faced on both sides with leather. Use one side for tripoli, the other for jeweler's rouge. Wash the cross in soapy water.







**1** Donkey-and-rider ornaments have bright detail, hang by rider's switch.

**2** Slices of round stock glued together make the

10-in. toy soldier for mantel or centerpiece.

**3** Lollipop-tree centerpiece of Styrofoam discs is sure to attract kids.

# 14 decorations you can



**4** Rocking-horse candleholders with folk art decoration add sparkle to a festive buffet setting.

**5, 6** Three-dimensional tree and angel ornaments are cut in several parts and joined by interlocking slots.

**7** Copper tubes on angel wall hanging are strips of 18-ga. sheet shaped around pencils and other cylinders.

**8** High-wheel bikes of wood drapery rings add a touch of whimsy to your Christmas tree.

**9** Wisps of aluminum screen, shaped and spray-painted, become doves that seem to float on the tree.







# make for the holidays

**T**his year we've dressed up the holidays with 14 novel Christmas decorations. They range in spirit from our lollipop-tree centerpiece—a real kid-pleaser—to the dramatic copper angel wall hanging (which isn't as hard to create as it looks).

Some of the decorations—the toy soldier, lollipop tree, doves, Santa mantel ornament and candle cubes—require only minimal construction time. Your youngsters can lend a helping hand in making these. The others will require several work periods.

Before you begin making a decoration, it helps to round up all the needed materials so you can work without interruption. Sources for materials that may not be readily available are included in the how-to directions.

Do take the time to finish the decorations properly, as suggested below, so you will be pleased with your results. A first-

*(Please turn to page 136)*



Projects' design and construction: Nos. 1 and 12, David Kirk; No. 2, C.J. Castelberry; Nos. 3 and 14, Gary Gerber; Nos. 4, 8 and 9, Stan Dunaj; Nos. 5, 6 and 13, C.J. Castelberry and Rosario Capotosto; No. 7, Doug Eisman; Nos. 10 and 11, George Sell. PM photos: Harry Hartman; technical art: Carl DeGroot; styling: Gabe Herrick.

**10, 11** Stained-glass ornaments add extra sparkle to Christmas. Star is 12 triangles of glass. Three glass colors are in the balls.

**12** A merry touch in an unexpected spot, this mouse doorstop bears a candy-cane offering to add to your holiday decorating.

**13** Our Santa is a symmetrical assemblage of wood discs glued together and painted.

**14** These candle cubes are excellent for displaying favorite Christmas cards.



With this setup, you can keep your bills, correspondence, hobby materials, whatever, all in one convenient place.

This functional work center helps you organize the many facets of an active life. It provides a place to store important papers and office supplies in one compact area. The center has a wide work surface, plus niches of various sizes to accommodate home office equipment, hobby

materials and various other items. Long shelves hold oversize objects and compartmented shelves provide upright storage of notebooks, small brochures or books while adjustable shelves give storage flexibility. Two shallow drawers and a deeper drawer complete the variety of storage

## Build this handsome home work center

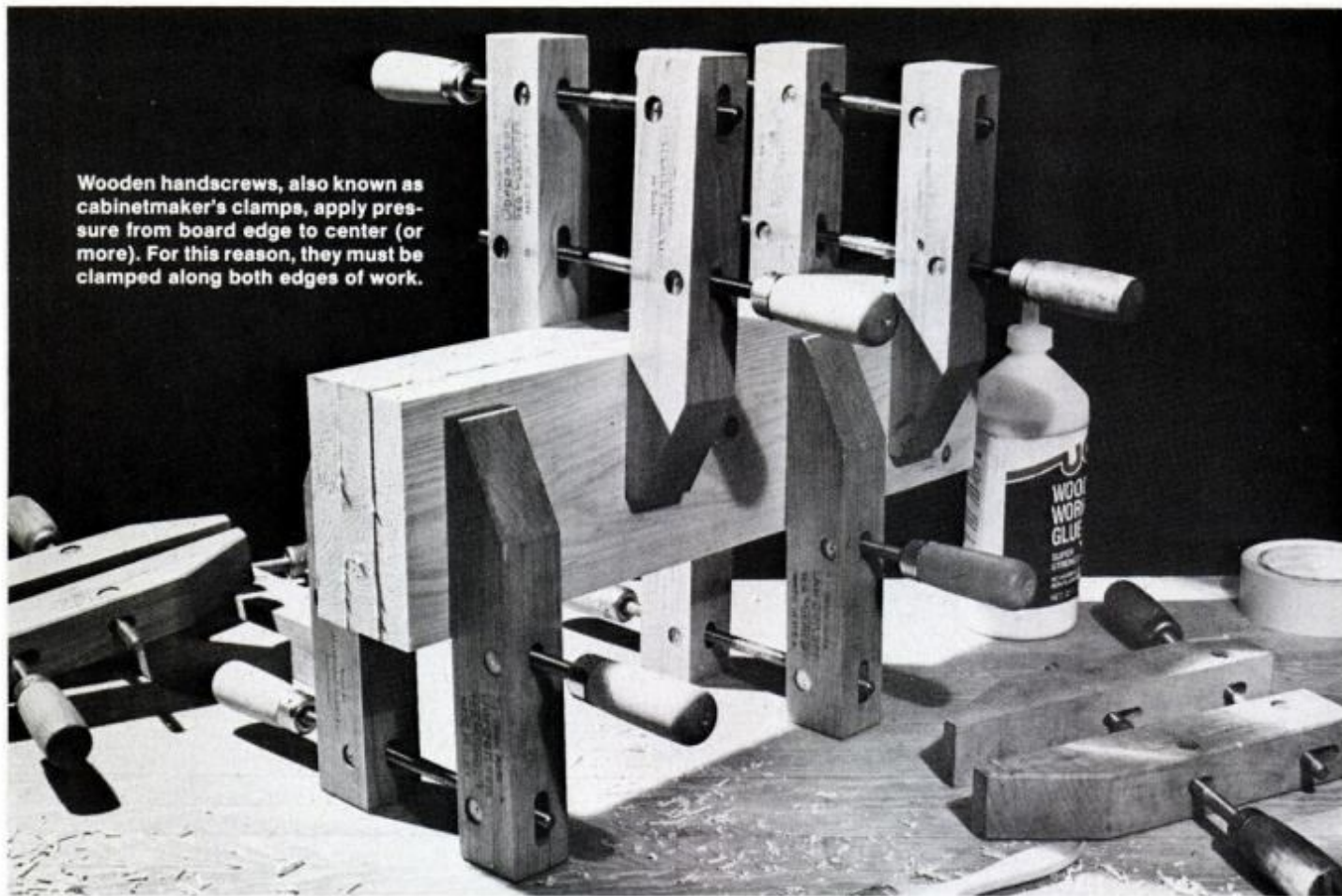








Wooden handscrews, also known as cabinetmaker's clamps, apply pressure from board edge to center (or more). For this reason, they must be clamped along both edges of work.



PM photo: Rosario Capotosto

# 23 tips for squeezing the most out of shop clamps

by Ralph S. Wilkes

**C**lamps, those indefatigable spare fingers and arms of the workshop, have three primary uses. The one most of us think of first is holding glued-up pieces of wood together—although they are also used for bonding a variety of materials. Secondly, shop clamps are used for holding workpieces in positions that make them easier to work with, as when welding or soldering metals or planing boards. Clamps are also used in conjunction with power tools. They are invaluable for tasks like holding down work on a drill press and for securing a fence for a router or a saw.

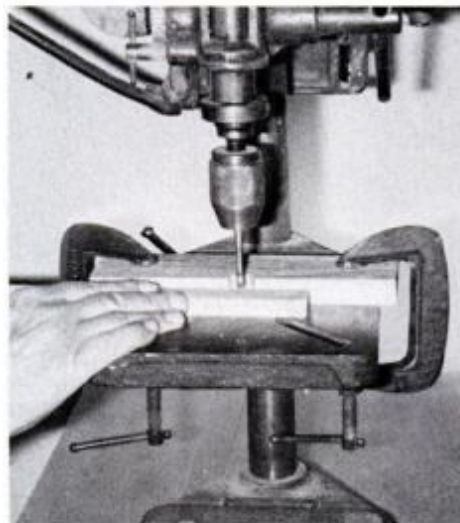
Clamps come in a multitude of sizes and styles. Many are designed for a specific task. Multipurpose clamps are extremely versatile. A well-equipped shop should have a

healthy collection of C-clamps (six to 12) in assorted shapes and sizes; at least one pair of bar or pipe clamps (preferably two); and several sizes of spring clamps. Add to this collection as the need arises.

Sooner or later you'll come across a job where no clamp will work. Solve the problem by combining various clamps or by devising your own. The hints described in the photo captions should help stimulate your imagination. **PM**

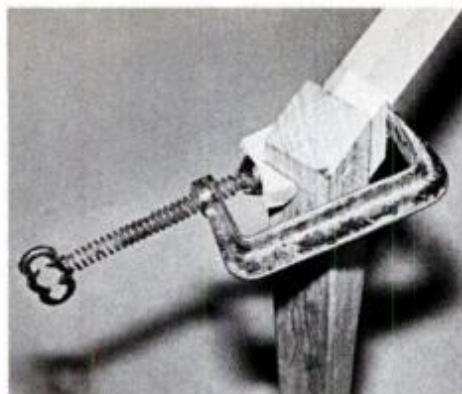
## SOURCE LIST—CLAMPS

- Brookstone Co., 127 Vose Farm Rd., Peterborough, N.H. 03458.
- Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461.
- Craftsman Wood Service Co., 1735 West Cortland Ct., Addison, Ill. 60101.
- Leichtung Inc., 701 Beta Dr., No. 17, Cleveland, Ohio, 44143.
- Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01886.

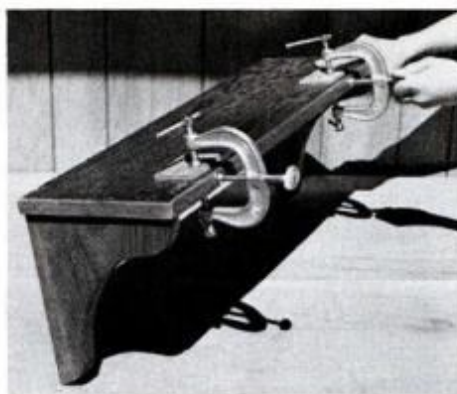


**1** Use C-clamps to hold fence for shaping on the drill press, or for many other jobs where accuracy or rigidity is important.

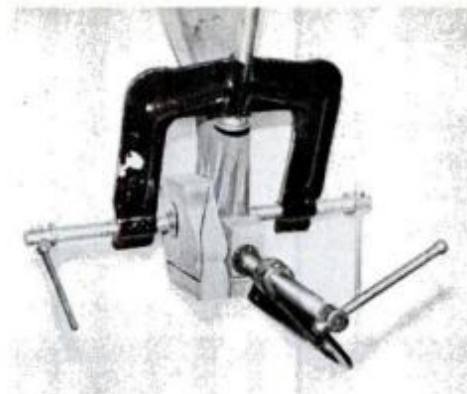




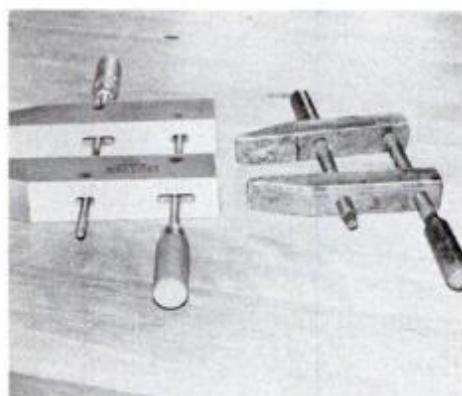
**2** To protect work from C-clamp's pads, place wood block (here, a V-block) between the swivel end of clamp screw and work.



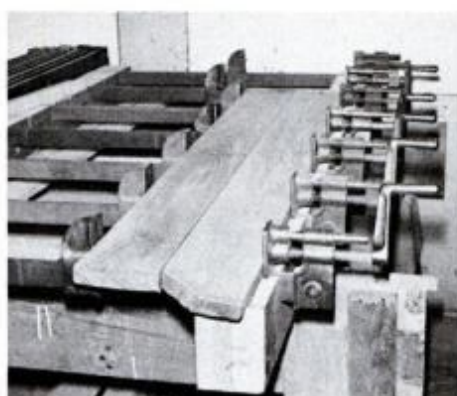
**3** Use waxed paper with three-way edge clamps to prevent accidental gluing of protective wood block to the veneer edging.



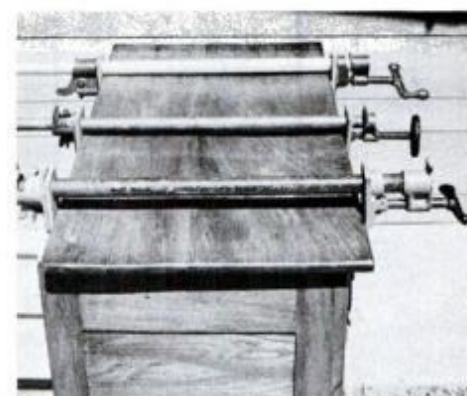
**4** For complex glue-ups, such as this restoration of a claw foot, save scraps after sawing and clamp them against the work.



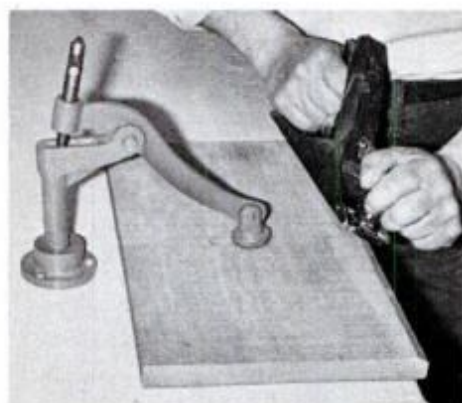
**5** Modern-day handscrew, or Jorgensen clamp, is more flexible than its predecessors; jaws can be angled to suit the job.



**6** Clamp table, found primarily in small commercial shops, lets boards lie flat, with even pressure at all of the clamp points.



**7** Make any length clamp with pipe-clamp fixtures. Have at least two sets of pipe lengths for needs. Use black pipe only.



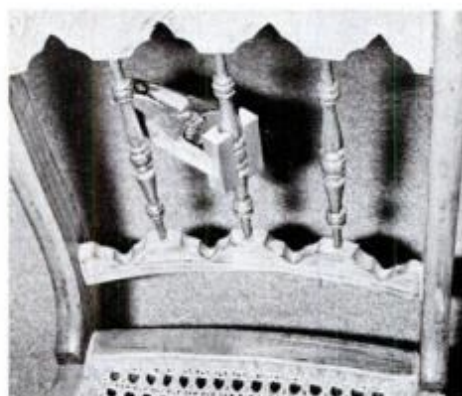
**8** Use a bench hold-down to secure work that requires planing, carving or routing. The clamp can be removed quickly.



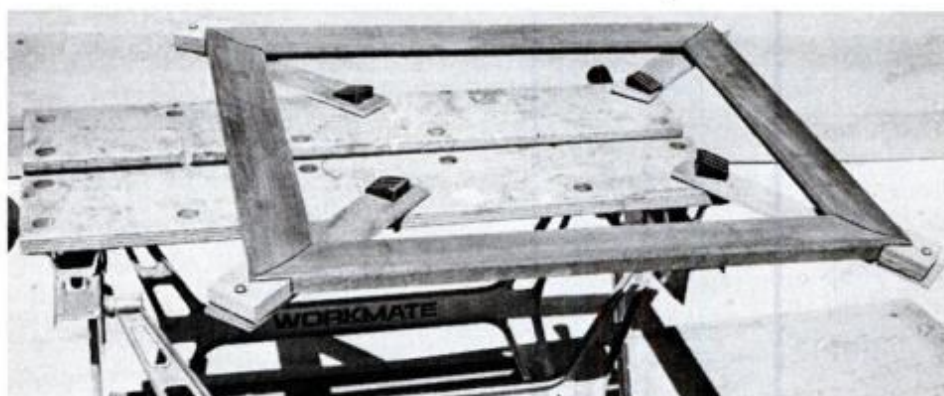
**9** In a pinch, use handy household items, such as spring-type clothespins and paper clamps, for lightweight clamping duties.



**10** Commercial spring clamps come in many styles. Model at left has pivoting jaws for irregular shapes, opens 3 1/2 in. wide.

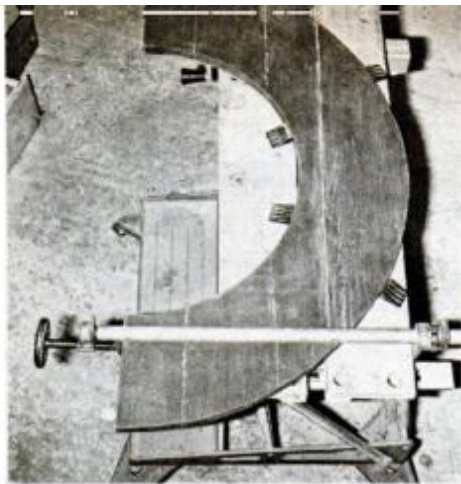


**11** When using spring clamp to repair broken chair spindle, insert V-blocks between jaws and work to spread pressure.



**12** You can adapt Black & Decker's Workmate table for use as a framing clamp by utilizing plywood arm extensions, as shown here. The table's jaws keep pressure on the work.

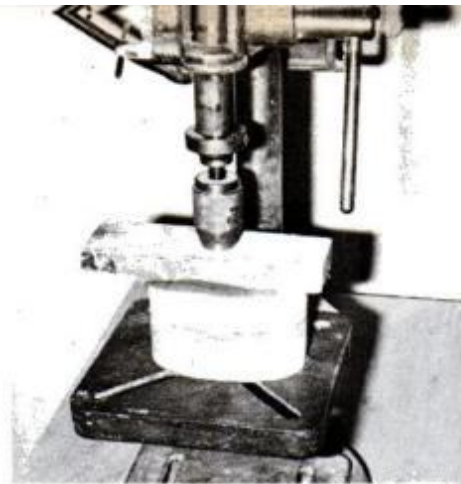




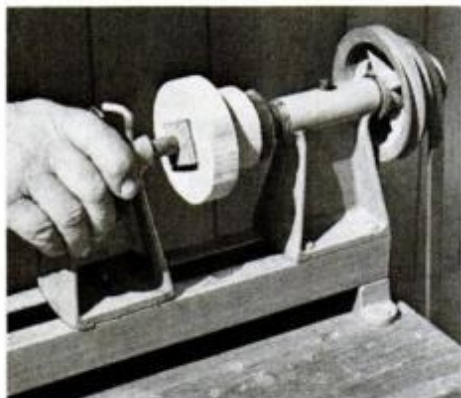
**13** A clamp-type bench used in conjunction with a bar or pipe clamp is useful for gluing up or repairing large workpieces.



**14** Even loose leg on three-legged stand is no problem: Clamp leg in table jaws and squeeze post down using twisted rope.



**15** Enlist drill press as press-type clamp. Use scrap wood over piece of sponge rubber to maintain pressure on work below.



**16** A lathe can be used in a similar manner. This is especially handy when gluing stock to scrap for a faceplate turning block.



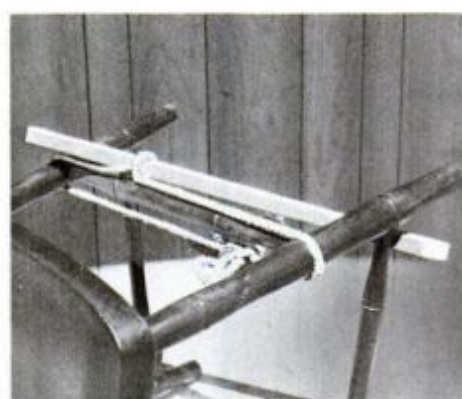
**17** Make this clamp for holding wood while planing. Provide opposite bevels on angled edges to keep wedges flat on the bench.



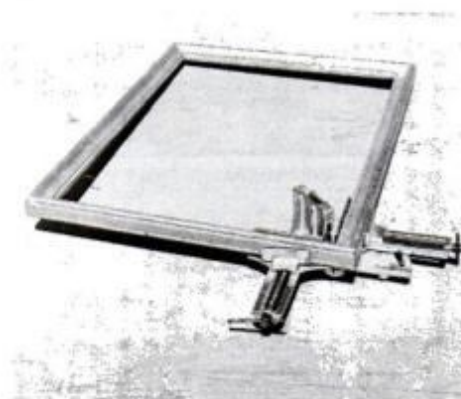
**18** Odd jobs often need a shop-made clamp. Get clamping action with this jig by pushing in long wedge with your hand.



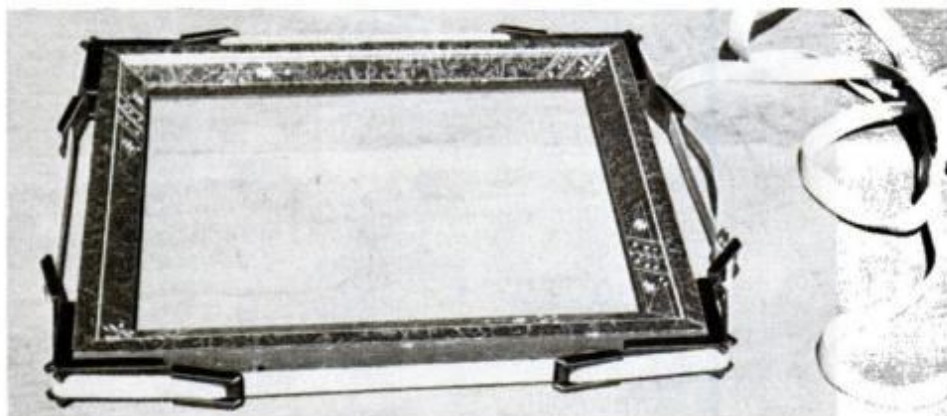
**19** Use screwdriver or wrench to tighten rugged Pony web clamp. Self-locking cam holds tight, yet permits quick release.



**20** Make a less costly web clamp from rope and twist tight with a stick, tourniquet fashion. It's handy for clamping chair legs.



**21** Use this corner clamp, which is also an adjustable miterbox, for cutting and clamping frames or odd-angled joints.



**22** Another way to clamp picture frames is to use this inexpensive clamp made of webbing and flexible plastic corners. This model can even fit very large-size frames.



**23** Use office-size rubber bands, or cut larger ones from inner tubes, for mending crockery and other miscellaneous tasks.



# NEW NOW for home and shop



**A**

**A** The 9999 units of this limited-edition Coffee-Time coffeemaker are handcrafted in black with the owner's name in gold. Each unit has an 8-cup capacity and a quiet brewing system designed to make very hot coffee. A Stop 'N Serve feature (in circle) stops the brewing cycle up to 20 seconds while you serve a cup or two. A digital clock programs automatic brewing up to 24 hours in advance. There is also a special brewing cycle for making only one to three cups of fully brewed coffee. Coffee-Time limited edition is \$200, from Robert Krups, North America, Allendale Industrial Park, 7 Pearl Ct., Allendale, N.J. 07401.

**B** You can wrap M-D duct insulation around both warm- and cold-air ducts in the attic and basement to improve heating and cooling efficiency, thereby reducing utility bills throughout the year. The duct insulation has an inner layer of 1/2-in., closed-cell insulating foam covered by a protective outer layer of thick, heat-reflective aluminum foil. This combination stops air leaks and insulates ducts from temperature extremes. The insulation is self-adhesive and easily cut with household scissors. It comes in 12-in. x 15-ft. rolls (\$11) from Macklanburg-Duncan Co., Box 25188, Oklahoma City, Okla. 73125.

**D** This simple yet clever clamp enables installers of nonmetallic sheathed cable to satisfy the strain-relief requirements of the National Electrical Code. Merely snap the clamp into place in any cable-entry knockout of a Bell nonmetallic electrical box. Use the clamp's first groove in a 1/2-in. knockout, the second groove in a 3/8-in. knockout. Push the cable through the clamp and it is automatically locked into place. If the cable entrance is ever changed, you can reuse the clamp. Cable-Lok clamps are listed by Underwriters Laboratories Inc. A card of 10 clamps is priced at \$1.60. They're made by Bell Electrical Products, Square D. Co., 2600 West 50th St., Chicago, Ill. 60632.

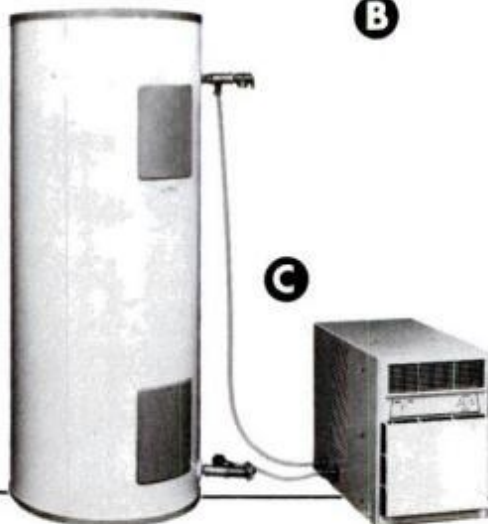
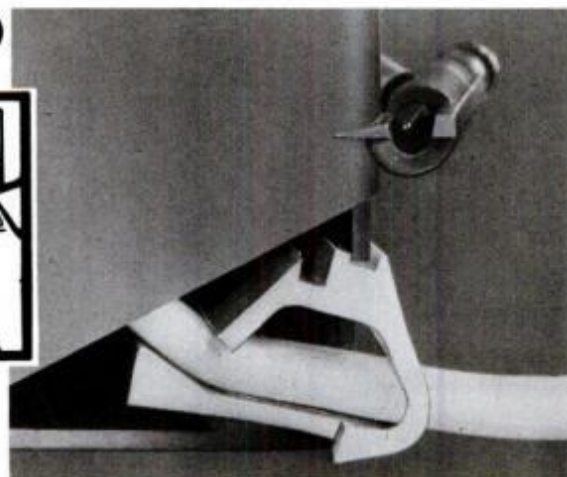
**C** This vapor-compression water heater may reduce the cost of heating water up to 60 percent, according to its maker. Similar to an air-conditioner, the water heater extracts heat from the environment. The unit then transfers this heat to the hot-water tank. The Heat Re-Cycler is a self-contained, add-on appliance that connects quickly to an existing electric hot-water system by hoses; it plugs into a 115-v. outlet. The maker is conducting a tax-credit campaign, which, if passed, would entitle users to a tax credit of up to 40 percent for the \$600 unit. Heat Re-Cycler is manufactured by Fedders Corp., Edison, N.J. 08817.



**B**

**D**

**C**





## PM HEIRLOOM PROJECT

# Make PM's presentation case

by David Warren

Skilled casemakers would be proud to say they built this box. You will be, too.

**B**uilding a French-fitted pistol presentation case was work once assigned to a master casemaker who, after constructing the wood box, spent many hours carefully cutting, shaping and covering compartments for its interior. On these pages we show you how you can build an elegant presentation case and "French-fit" the interior speedily, using today's technology.

For the project shown, we assembled a commercial, antique reproduction of a Kentucky mountain pistol. (See materials list for this kit and all other materials sources.) Our presentation case was sized for this piece. You may need to change dimensions to suit your pistol, or whatever you plan to display.

Rather than spending many hours measuring, drawing,

cutting and shaving to gain an accurate, snug fit for the firearm, we chose to go the fast and easy route, using Great Stuff Insta-Foam, a new product available at building supply

and hardware stores. Actually manufactured as an insulating material, the product is ideally suited for the do-it-yourselfer who wants to provide a perfect fit for something like our antique pistol reproduction.

To build the wood case, we used arrow-like dovetailing, which was popular in the 18th century for its beauty and strength. Since strength isn't important in a presentation case, the dovetails were actually used for their beauty.

### Building the box

Start construction by ripping the sidepieces. For the box shown, Coco Bolo was used. This is a hard, stable Central American wood with exotic color and graining that takes stain beautifully. Next, plane the sides to width.

Though the strongest dovetail joint has tails and pins of equal width, remember that the emphasis here is on beauty. Thus, the tails are  $1\frac{1}{2}$  times the width of the pins. This gives small, arrow-like wedges that assure attractive corners.

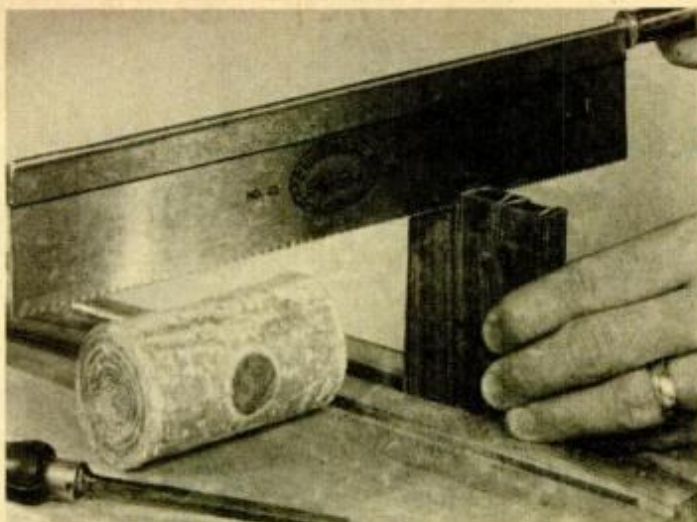
To lay out the pins, set your marking gauge  $\frac{1}{2}$  in. more than the thickness of your boards.

Then scribe a line around the ends of the front

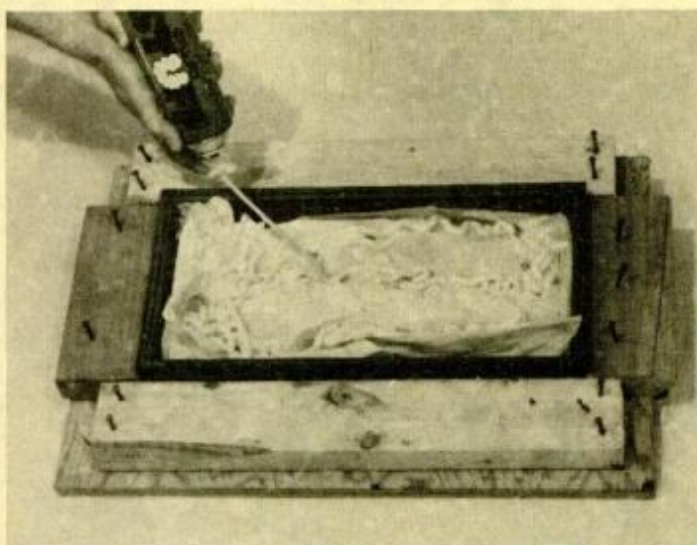
**Classy, French-fitted case is a great project for PM craftsmen. Display sections are made with foam. The lid (upper photo) features a monogram with checkered surround.**

PM photos: Matt Doherty  
Cabinetmaker: David J. Warren





When cutting dovetail pins, use a fine dovetail saw. Then clean out cuts with a sharp chisel. Use the cut pins to mark for tails.



Apply epoxy glue in rabbet and proceed to fill about 80 percent of the box with foam. Install bottom of the box and add a weight.

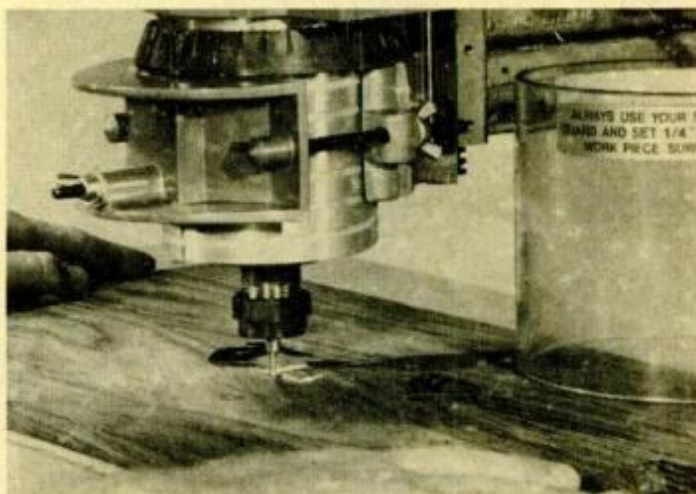


When inlaying is complete, lay out the concentric diamonds as shown. Use a sharp knife and straightedge to score lines. Form bead between lines with shop-made tool (see text) or inlay ebony veneer. Use a V-shaped veining tool to cut checkering.

and back boards. After assembly, the pin and tail protrusions— $\frac{1}{32}$  in.—can be either sanded or planed flush to produce neat-looking joints.



To form cavities for the gun and accessories, set up as described in text and tape items into position. Tape should cover them completely. Then cover tape with a piece of sheet plastic.



Cut monogram out of veneer and use letters to mark outline on box cover. Rout a recess for each letter using a small-diameter straight bit, or use a chisel. When placed, initials should be slightly higher than the surface, then sanded flush.

Lay out a centerline for half-pins at the top and bottom of each board. Half-pins are the same width as full pins, except that they are tapered only on the inner edge.

Next, lay out the full pins by dividing the remaining space on the board's end into the number of pins you wish, and mark them. Set a bevel gauge to about  $75^\circ$  or  $80^\circ$  and mark the taper of the pins on the end grain. To avoid confusion, darken all waste areas with a soft-lead pencil.

To cut the pins, clamp the workpiece in a vise so the tapered line to be sawed is vertical. Cut the pins with a fine dovetail saw. The saw kerf should be on the waste side so that it is barely grazing the mark. Do not saw into the marking-gauge line.

Now, use a hold-down to clamp the piece horizontally on the bench. With an appropriate-size firmer chisel and mallet, deepen the marking-gauge line to establish a definite edge along the mortise bottom. Alternately remove chips and deepen the line at the bottom of the mortise. Cut successively heavier chips until you remove half the waste, then flip the board and repeat the process on the other side.

Use a sharp chisel to shave the saw marks clean on each side of the pin. Cut the bottom of the socket at  $90^\circ$  by paring along the marking-gauge line so the end-grain surface is dead flat, thus assuring a tight-fitting joint.

To mark out the tails, use the mating-cut pins as patterns. Place the long board (B) against the end board (C) to be marked. Position it with outside surfaces flush and the widest



part of the pins toward the inside of the joint. Scribe a mark around and tightly against the angle of the pins. Then, with a square, scribe the lines across the end grain. Again, shade waste areas with a soft pencil. Remove the waste with saw and chisel as you did when making the pins.

Mark the corners to be mated and repeat the above steps for the other three corners.

Assemble the matched sides with plastic resin glue. Clamp sides and ends and check the box for square. The dovetails will protrude from the faces of the sides about  $\frac{1}{32}$  in.

Then cut a rabbet around the bottom, on the inside edges of all four sides, to let in the bottom (D). A router and rabbeting bit with a  $\frac{1}{4}$ -in. radius will make it easy. You may chisel the corners square or leave them round and sand the corners of the bottom to fit.

### Getting a French fit

The box is now ready to be custom-fitted. Since spray foam may create pressure, it is safest to make a simple form to hold the box sides perfectly straight (vertical). Do this by placing the box on a  $\frac{3}{4}$ -in.-thick scrap of plywood and drawing its outline. Next, nail a border of 2x4s around the outline and place the box—rabbet side up—inside the form. Cut the  $\frac{1}{8}$ -in.-thick piece of hardboard to fit square inside the case and press it into contact with the plywood. This insures that the firearm and other components will be recessed  $\frac{1}{8}$  in. below the cover.

Arrange the gun, powder horn and supply of bullets on the

### MATERIALS LIST—PM'S PRESENTATION CASE

Key	No.	Size and description
A	1	$\frac{1}{2} \times 9\frac{1}{2} \times 18$ " coco bolo* (glue up from several boards)
B	2	$\frac{1}{2} \times 2\frac{3}{8} \times 18$ " coco bolo*
C	2	$\frac{1}{2} \times 2\frac{3}{8} \times 9\frac{1}{2}$ " coco bolo*
D	1	$\frac{1}{4} \times 9 \times 17\frac{1}{2}$ " coco bolo* (glue up from several boards)
E	†	Great Stuff foam insulation
F	†	Velvet or velveteen
G	1	$\frac{1}{8} \times \frac{3}{4} \times 2$ " brass nameplate
H	†	$\frac{1}{8}$ " ebony (or see text for how to cut beaded border instead)
I	†	$\frac{1}{8}$ " ebony
J	2	Invisible hinges for $\frac{1}{2}$ " stock
K	1	$1\frac{1}{2} \times 2\frac{1}{2}$ " brass chest lock
L	1	Brass chest lock plate
M	1	$\frac{1}{8} \times 1 \times 1$ " key plate
N	12	$\frac{3}{8}$ " brass screws
O	2	Brads to suit

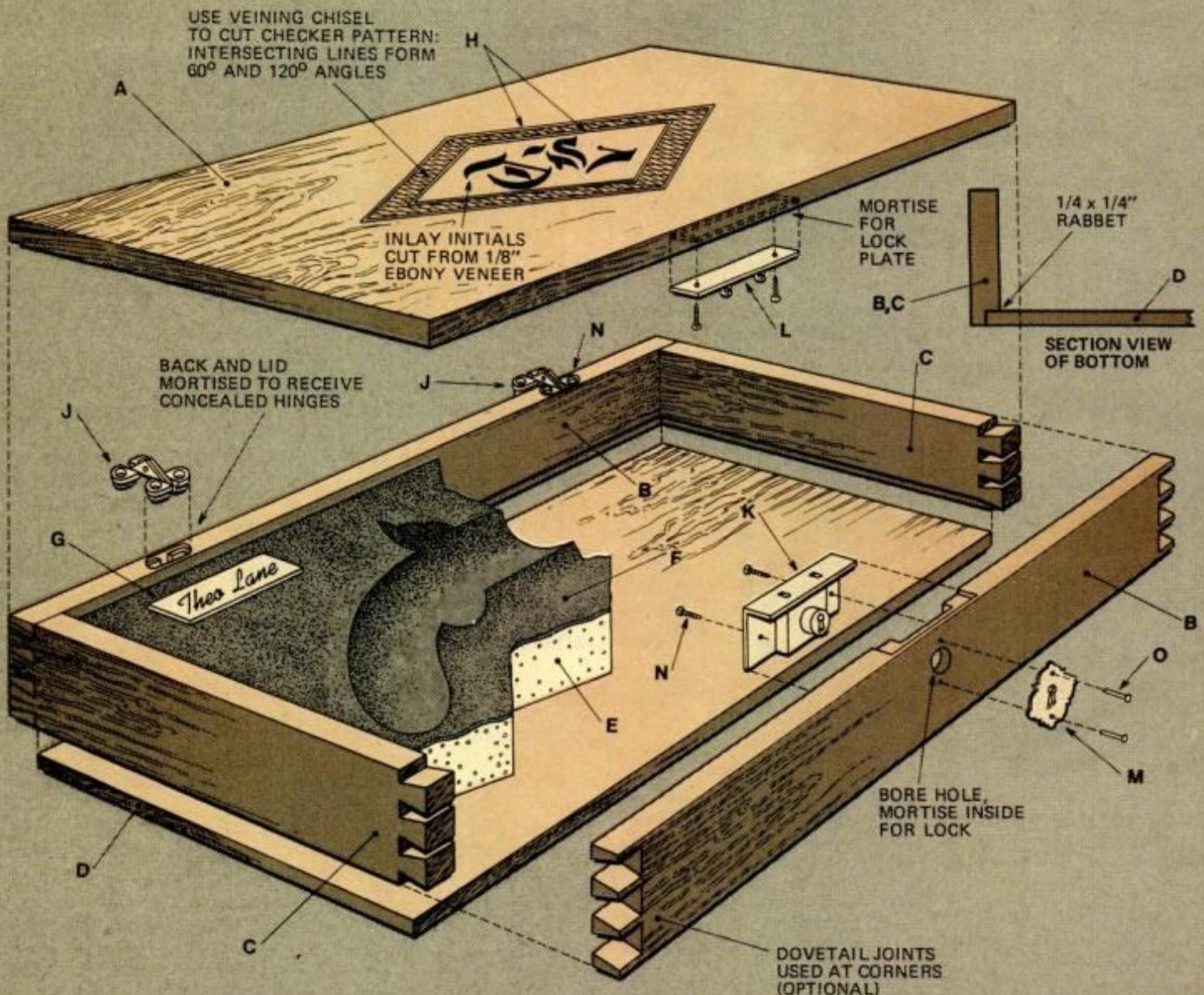
Misc.: Epoxy glue, plastic resin glue, rubber cement, finish as desired.

\*Other fine hardwoods may be substituted.

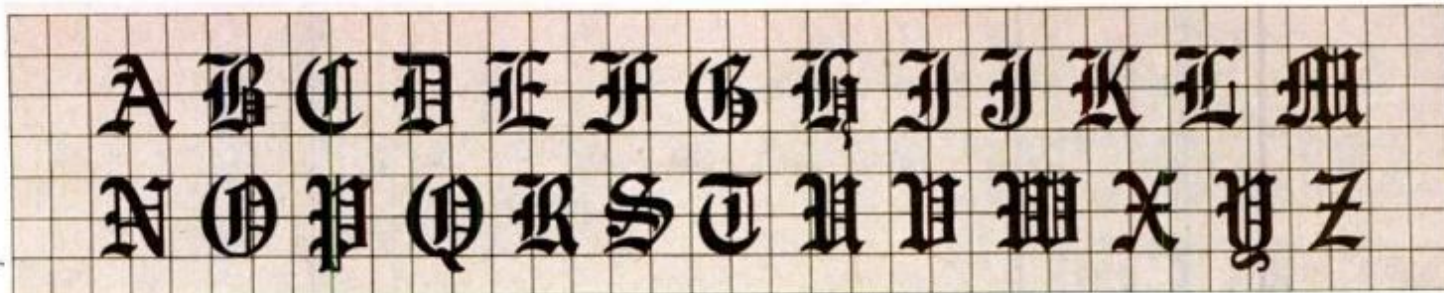
†As required.

Sources: Wood, veneer, hardware and finishing oil are available from Craftsman's Wood Service, 1735 West Cortland Ct., Addison, Ill. 60101. Brass nameplate is from Creative Awards by Lane, 32 West Randolph St., Chicago, Ill. 60601. Kentucky Mountain Pistol reproduction gun kit is from Connecticut Valley Arms, Dept. PM 1280, Saybrook Rd., Had-dam, Conn. 06438. Write to the firm for a catalog.

hardboard. Make sure that you place them in the box with the display side down and in reverse order of the manner in which you want them to appear. Cover everything; first with masking tape and then with a piece of sheet plastic cut from a garbage bag.







EACH SQUARE = 1"

Both the amount the foam expands and the time it takes to cure depend on temperature and humidity. A warm, humid day is ideal. Apply epoxy glue to the rabbet, then inject the foam into the box. The foam will expand about 20 percent so don't fill the box completely. Then set the bottom into the rabbet and weight it down to contain the foam as it expands.

The foam will become tack-free in one to three hours. When it has thoroughly cured—in 24 to 36 hours—invert the case and remove the hardboard. Remove the gun and the other components, and peel off the plastic and tape. If the foam is still soft, allow it to dry. Cover the foam with velveteen or other material you may prefer. Use rubber cement to fasten the material to the foam.

### Constructing the lid

When selecting and joining boards for the top, pay careful attention to their grain patterns. Glue up boards and, when they are dry, cut the top to size. Lay out the monogram and checkered border.

Cut the letters out of 1/8-in.-thick ebony using a fine jigsaw blade. Clean and smooth the edges of the letters with fine jeweler's files.

Use a needle to outline the location of the letters on the top of the box, then cut the outlines deeper with a razor blade or utility knife and carefully rout out the recesses with a router and 1/16-in. straight router bit. Make sure that the bit does not follow the hardwood grain by making the cuts in two passes. Depth of the final cut should be adjusted so that the initials will project a fraction above the surrounding surface. Then the initials can be sanded flush.

Now glue the ebony initials in place. After the glue has dried, sand initials flush. Carefully sand the surface as needed before you lay out the checkering.

### Chiseling border for initials

Score the outline of the diamond borders with a sharp knife or razor and steel straightedge. Then cut parallel lines about 3/32 in. apart to mark the perimeter beads. Widen and deepen these lines with a veining tool.

To form the crown of the bead, you can use a scratch tool which you make by squaring the end of a broken hacksaw blade and filing the bead shape in the end. Draw this tool repeatedly down the length of the incised parallel lines to scratch the bead round.

Use dividers, a straightedge and a soft, sharp pencil to lay out the checkering. (Fineness or coarseness of the checkering is a matter of taste.) Finally, cut the lines with a knife and straightedge and deepen with a V-shaped veining chisel. Push the chisel from the bead inward so you won't run the cutting edge into the side of the bead.

To finish the cover, we simply broke (rounded) the edges with a light sanding. Alternatively, you can mold the edge as desired.

### Installing hinges

Carefully rout or bore a series of holes to start the mortises. The center hinge pin is nearly 1/2-in. long. As a precaution, we ground off some of the end that goes into the 1/2-in. cover. Bore this hole with a Forstner bit so that you don't pierce the top.

### Off-the-shelf cases you can buy

Simple, off-the-shelf display boxes for handguns can be obtained from almost any gunshop for \$25 or less. Custom-made, finely-crafted cases sell for \$50 to \$250 or more. Six of the many companies in the United States that make and offer standard and fine custom-made cases are listed below:

Alco Carrying Case Inc., 601 West 26th St., New York, N.Y. 10001 (pistol cases).

American Display Co., 127-131 Blackstone St., Providence, R.I. 02905 (pistol cases).

Armsport, 3590 N.W. 49th St., Miami, Fla. 33142 (rifle cases only).

Kolpin Bros. Co. Inc., Box 231, Berlin, Wis. 54923 (soft rifle and pistol cases).

Pachmayr Gun Works, 1220 South Grand Ave., Los Angeles, Calif. 90015 (multiple handgun carrying cases).

Valley Forge Custom, Box 94093, Schaumburg, Ill. 60194 (pistol cases).

After you have cleaned out the mortises with a chisel, fasten hinges in place.

### Final steps

Carefully sand the entire case—except the checkering which should remain crisp from the chisel cuts. Finish with two coats of a penetrating oil, like Watco Danish oil, or with three to five coats of tung oil.

A handsome hand-rubbed look can also be obtained with boiled linseed oil mixed one-to-one with turpentine and used as a finish. Rub it into the wood with a cloth until no more is absorbed. Then wipe off the excess. Repeat every day for a week, once a week for a month, monthly for a year and then yearly to maintain the finish.

Varnish and wax also make an appropriate finish. Since coco bolo is a closed-grain wood a paste wood filler is not required. Simply complete your final sanding (220-grit paper) and remove all dust from the project.

Apply stain and allow it to dry thoroughly. Then follow with a sealer coat of 3-lb.-cut water-white shellac and methyl alcohol mixed at a one-to-one ratio. Apply it with a clean bristle brush and let it dry at least four hours. Lightly sand the dry sealer coat with 220-grit abrasive paper before applying the first coat of varnish. Three coats of varnish should be adequate; sand lightly between each coat and wipe with a tack rag.

### Guard against dust

All sealer and varnish coats should be done in as dust-free an environment as possible. If you work in a basement shop, be aware that even the dust shook free from floor joists above (due to daytime foot traffic) can spoil a finish. Try to schedule finishing sessions as the last thing to do before retiring. Also, try not to use your shop for several hours before working with finishes.

Apply a coat of quality paste wax after the varnish has cured for several weeks. A pad of very fine (4/0) steel wool saturated with the wax makes a good applicator. Buff the wax after it has set for 20 minutes or so. A polishing bonnet, chucked into a power drill will save your arm.

FM



# Sharp-looking knife racks you can make

**K**nives stored loosely in a drawer tend to lose their edges faster and cause more injuries than knives held in a rack. In addition, racks keep the knives handy and add visual interest to your kitchen.

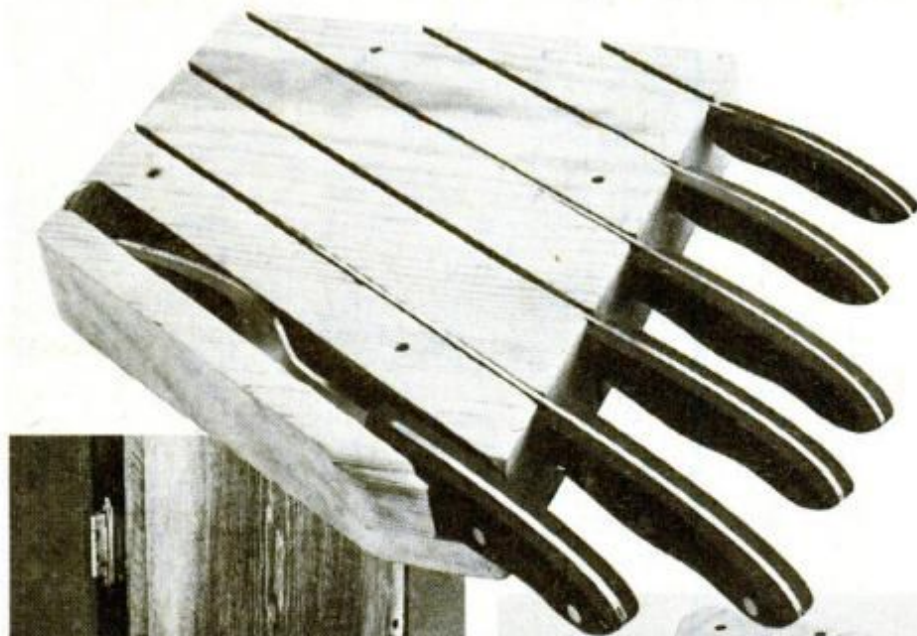
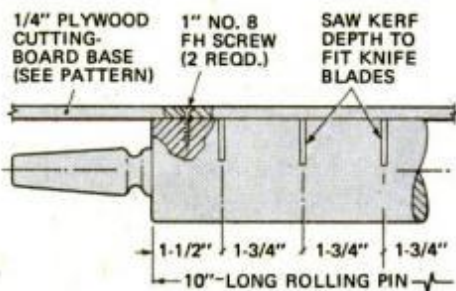
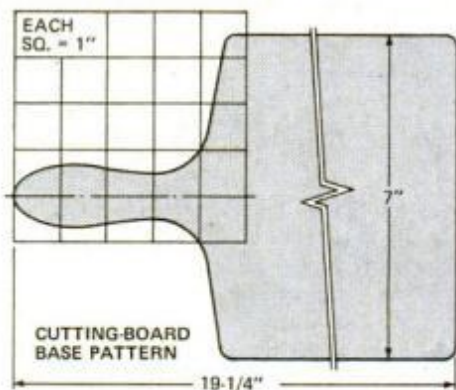
Both knife racks shown are straightforward and easy to make. The rolling-pin/cutting-board rack (right) can be assembled from ready-made items—or the rolling pin and board can be fashioned in the shop. The undercabinet rack (below) can be cut readily from a length of 2×10 or 2×12.

If you need a thicker piece for your knives, pine is usually available in larger sizes, or you can laminate three or more pieces of ¾-in. stock.

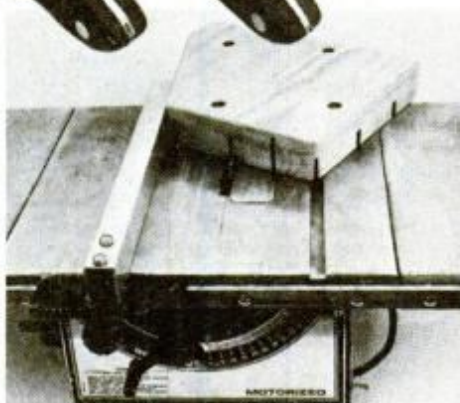
Cut the knife-holding slots using a table



Functional knife rack (above) is ornamental yet useful addition to any kitchen. It can be created with store-bought elements or completely fashioned in the shop from pieces of hardwood from your scrap box.



A good way to use wasted space: Store often-used knives beneath a hanging wall cabinet. This rack is secured with stout wood screws. For maximum holding power, use bolts (counterbore for bolt heads).



saw. Some blades will give you the right width in one pass—a ⅛-in. kerf will give the proper clearance for most knife blades. Heftier blades may require two passes in order to achieve proper clearance.

Use the miter gauge for control while making slots in the rolling pin. Take care not to rotate the pin as you slide it in position for the next cut.

Use the rip fence to guide the slot cuts in the undercabinet rack. These slots should be cut at about a 30° angle to the grain to avoid splitting. **FM**

Rolling-pin/cutting-board rack: Ken Patterson  
Undercabinet rack: Frank H. Day



# World's First and Only Solar-Powered Watch\*

## Guaranteed to outperform any watch sold today... or costs you nothing!

**The Sunwatch; acclaimed as the most accurate, most versatile, most rugged watch ever made.**

**These features make all other watches obsolete:**

- Natural side-view window simplifies reading
- 100% solar-powered, you never replace batteries
- No resetting of calendar, not even in leap years

### Space age accuracy

Now you'll never worry about accuracy again. Because the Sunwatch will keep you on time for the rest of your life. (Accurate to within 1 sec. per month.)

### Solar age efficiency

Miniature solar cells automatically convert sunlight, daylight or ordinary bulb light into useable energy for storage. The solar cells last virtually forever. So you'll never replace a watch battery again.

### Programmed for over a century

The built-in computer on a chip will always display the correct time date and month. Also, it automatically adjusts the watch calendar for long and short months, leap years and it's programmed until the year 2100!

### Easy to read

The natural side-view display lets you tell the time, day and date without twisting your arm into an uncomfortable position.

### Numbers always visible

Four varying light intensities are built into the viewing display, allowing the Sunwatch to adjust automatically to any light. This means you can always read it, even in the brightest sunlight.

### 10 Display functions

The Sunwatch is capable of displaying the following information: hours • minutes • seconds • months • date • day • leap year • speed calibration • AM/PM indicator • seconds count-off.

### Extreme accuracy

Unlike other electronic watches using tuned crystals to control timing accuracy, the Sunwatch incorporates a unique, programmable, microcircuit synthesizer to make it the first watch in history that is accurate to less than 1 second per month. That's 5 times more accurate than the latest quartz Accutron.

### The Power Source

Tiny silicon power cells, which are constantly being energized by natural sunlight, daylight or an ordinary light bulb keep the Sunwatch energy storage system charged. Should the watch not be exposed to light, it will continue to operate for months on stored power.

**The most indestructible watch in the world**  
The workings of the watch: solar panels, energy cells, quartz crystal, computer on a chip, etc., are all permanently sealed in a Lexan module. This module is so unique it's protected by U.S. and foreign patents.

### Completely waterproof

Leave the Sunwatch in salt water for months. Dive with it in depths up to 750 feet. There are no openings — magnetic slide bars activate all functions. With Sunwatch's exclusive, permanently sealed Lexan module, there are no "O" rings or seals to leak.



### Shock resistant to 25,000 G's

You can crash it into a rug-surfaced brick wall at 90 mph with no noticeable effect. Wear it while doing heavy work, exercise or any strenuous activity.

### Temperature resistant

Put the Sunwatch in boiling water for 30 minutes, freeze it in a block of ice for a year. Extreme temperatures will not damage your Sunwatch.

### Pressure resistant

There are no air spaces inside the Sunwatch. Therefore, it is not susceptible to high pressures such as might be encountered diving to great depths.

### The perfect watch for a lifetime

Imagine split-second accuracy for the rest of your life. Sunwatch is a virtually indestructible, beautifully styled, space-age timepiece, and it's available in three exciting finishes: Brushed stainless steel, Gold tone stainless steel, or a Durable black finish on stainless steel. All Sunwatches come with a matching stainless steel band with removable links and adjustable clasp.

### Made in the United States

The Sunwatch, designed by Roger Riehl, was being worn by its inventor nearly a year before the first electronic digital watch was even available to the general public. Since that time constant engineering evaluations and design improvements have been made on the Sunwatch to incorporate the latest in digital microcircuit and solar power technology. Thus the Sunwatch today represents state-of-the-art electronics technology. It is built to the same rigid standards practiced by the manufacturer in creating sophisticated computer microcircuits for the U.S. Government and other major users of these components.

### \* A word about other "Solar Watches"

Roger Riehl, designer of the Sunwatch, states that there is no other completely solar powered watch on the market today. Claims of solar power by other watch manufacturers are based on the use of a small solar cell. Due to their limited size, these cells can be proven, in technical terms, to be of virtually no significant value in extending the life of a watch battery. For this reason, all other so-called "solar watches" must have replaceable batteries. The Sunwatch's power storage system, however, need never be changed and is, in fact, permanently sealed to withstand abuse and the elements.

### Unique and memorable gift

Available in a special gift box (see order form) the Sunwatch makes an ideal gift for special holidays, birthdays, graduation, Fathers Day, etc. Perfect for business people, commuters, teachers, athletes and sportsmen, who require split second accuracy

### Free custom engraving

At your request, each Sunwatch will be hand-engraved with the name you specify.

### Limited Warranty is your protection

The Sunwatch is covered by a 2 year limited warranty issued by Riehl Time Corporation (manufacturers of the prestigious Synchronar 2100) and included with your watch. A copy of the warranty may also be obtained free of charge by writing to Riehl Time Corp., 53 S. Jefferson Rd., Whippany, NJ 07981. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

### 15 Day no risk trial offer

Order your Sunwatch today and use it for 15 days. Then, if you are not completely satisfied return it for full money back.

### CREDIT CARD ORDERS CALL

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53 S. Jefferson Rd., Dept. 4D, Whippany, NJ 07981.

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Please add \$3.95 per watch shipping and insurance.

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(N.J. Residents add appropriate sales tax)

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Quick delivery direct from the manufacturer



# TECH FRONT LINES

## TRANSPORTATION

### Dashboard navigator does everything but drive

It's the nearest thing to having your own personal traffic-watch helicopter. And the dashboard-mounted black box, which the Germans call "Ali," not only warns of traffic snarls; it can also keep watch on your driving behavior as it leads you to your destination and back home again.

"Ali" is an acronym for *auto-fahrer-lenkungs-und-informations* system, a rather daunting

and tongue-twisting Teutonic expression for a dashboard computer developed jointly by Blaupunkt Radio Co. of Hildesheim, the Volkswagen Corp. and electronics scientists at the Technical University of Aachen.

Stated in simpler words, Ali is a navigational and road-hazard warning system for the family sedan, intended to cost no more than a quality car radio or cassette deck. It will be to the automobile what VOR guidance is to the private plane. And it may revolutionize driving.

#### Replaces road maps

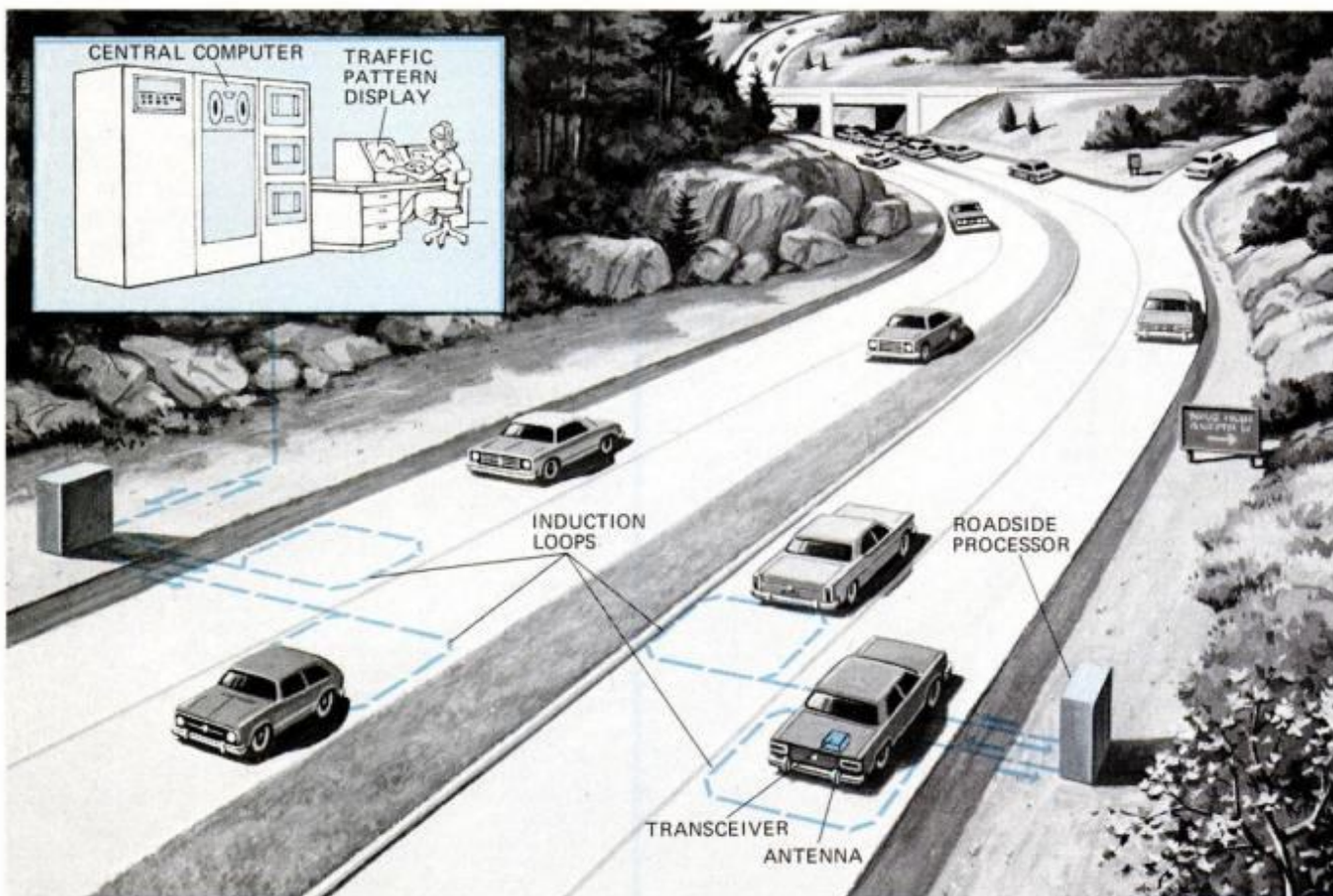
Want to go from New York to San Francisco or from Hamburg to Munich by the best route and at the lowest cost and fastest average speed? Want to avoid reading road maps, checking on local speed limits and inquiring about traffic jams, fog or patches of icy highway? Want to know exactly which exit or ramp to use at a junction or confusing jumble of overpasses to reach your destination? Perhaps you want to be told precisely how many miles or

kilometers it is to the next gas station, or be warned that you are tailgating and following the car ahead too closely for safety? Then Ali is your answer.

As futuristic as Ali sounds, it is already being tested in practice, at an \$8-million expense to the West German government. Current users are more than 400 drivers. They get driving help from Ali on a 100-kilometer network of specially equipped *autobahns* between Dortmund and Bochum in the heavily industrialized, densely populated and traffic-congested Ruhr Basin.

For all its seemingly science-fiction attributes, Ali is in fact the practical application of already existing chip electronics—an innovative system of car-based and roadside microprocessors linked to each other by ferrite-rod antennas and subpavement induction loops. These, in turn, feed information to, and receive instructions from, a central computer bank.

If the experiment proves successful—it's due to run through mid 1981—the West German



Induction coils buried in *autobahn* sense positions of cars, transmit directions and warnings about driving hazards.





On-board Ali components include transceiver and antenna in bumper (inset photos, left). Dashboard displays indicate upcoming turns.

transportation ministry will decide whether to install facilities for Ali guidance to car owners nationwide. That, according to Blaupunkt's development chief, Klaus Ottenroth, would take about five years and cost around \$200 million. Most of the money would go for installing some 6000 roadside computers and implanting induction loops in the 7000 kilometers of *autobahns* at intervals of one to two kilometers.

For the motorist who then decides to buy an Ali unit, driving on Germany's crowded roads should become a remarkably new, stress-free experience.

With Ali installed in the car, you tell it where you want to go by key-punching the seven-digit number of your destination into the dashboard unit. Each city and town in Germany reachable by *autobahn* has already been given an Ali code number, listed in a directory at the back of the owner's instruction manual. Frankfurt? Hit 1561200. For Bonn, punch in 1370910; for Munich, 2151720. Then the microprocessors and the central computer do the rest.

A kilometer or so before the car reaches a crucial junction or intersection, for example, Ali's liquid-crystal dashboard panel starts flashing the direction and precise lane and ramp you should take. If you drive past your turnoff, the panel will alert you that you're headed in the wrong direction and advise you

to turn off at the next exit and go back.

Recommended speeds and speed limits—there are few on the *autobahn*—also appear on the panel. So will little warning signs to indicate road and traffic conditions miles ahead. If there is a traffic jam, you will be advised well in advance to leave the freeway by the next available exit. And Ali will give you precise instructions for your detour.

### Ali finds detours

The computer intelligence is so sophisticated, says Ottenroth, "that it automatically calculates the fastest and most cost-efficient detour to take. For instance, if it determines there is a traffic jam ahead but not long or big enough to warrant taking a more time-consuming and gas-guzzling bypass, you will be warned of the impending tie-up and advised to continue straight ahead."

PM visited the Ali test center and computer bank in a highway maintenance building off the *autobahn* near Dortmund. Here, printouts and video screens present operators with an overview of the entire Ali network.

During the tour, a technician suddenly called out: "There's one. A jam." The video screen displayed a red-flashing symbol warning of a problem near the Dortmund-West junction. Like fighter pilots scrambling, we dashed out to the nearest Ali-equipped car, key-punched a des-

tinuation that would take us through the area, and sped off, hoping that detour instructions would soon flash on the display panel. They never came. The tie-up had disappeared by the time we arrived. But when we got back to the center, the history of the snarl was all there in printouts—an instant replay from a computer memory.

In a way, that's what Ali is all about: to consign creep-and-stop traffic jams to a memory bin. **PM**

### Big Ali is watching

Critics of Germany's Ali system contend that the computer network could turn into a kind of "Big Brother" of the highways.

Since every Ali-equipped vehicle has a code number recorded by the roadside processors and central computer, anyone with access to the data bank could determine which vehicle drove where, when and how fast. Ali-equipped cars driving too fast in areas with restricted speed could be detected readily by police. Theoretically, motorists could someday be notified of violations while in transit, receiving computer-printed traffic tickets later by mail. Theoretically, too, the system could implicate the man who happens on a crime scene in Frankfurt while claiming to be on business in Cologne.

"If we go ahead with it," says West Germany's minister of research, "there are definitely some legal details that will have to be worked out in parliament."



## AVIATION

### Biggest planes ever

Huge cargo planes with designs you've never seen before could cut shipping costs by 40 percent, move monster bulldozers from factory directly to strip mines and, adapted for people, let you ride in the same comfortable seat from center city to center city.

Years before the first of these giants takes off, aircraft designers have begun favoring some designs. The two-fuselage freighter shown below, for instance, is now considered more likely to enter production than designs calling for three bodies.

Whatever the final designs, the launching of these planes should be good news for companies with high shipping costs, and ultimately for consumers. Planes envisioned by researchers will carry payloads up to 600,000 pounds, three times that of today's largest cargo planes. Despite a gross weight sometimes exceeding a million pounds,

these planes will fly farther and burn less fuel than today's. They may even be quieter.

These advantages will surface from research to explore composite materials, reduce airstream drag on wings and fuselage, apply advanced electronics and possibly use alternate fuels, such as liquid hydrogen (see *Hydrogen: New Kick for Cargo Planes*, page 118, May '80).

Two versions shown below are on the drawing boards at Lockheed-Georgia. (At NASA's urging, Lockheed, McDonnell-Douglas and Boeing are working on "Very Large Aircraft.")

Lockheed's double-fuselage model will fly a payload of 441,000 pounds at a speed of Mach 0.80 with a range of 4000 nautical miles. Lockheed's advanced concepts department manager, Roy H. Lange, said this version of the big carriers has the best current chance of going into production.

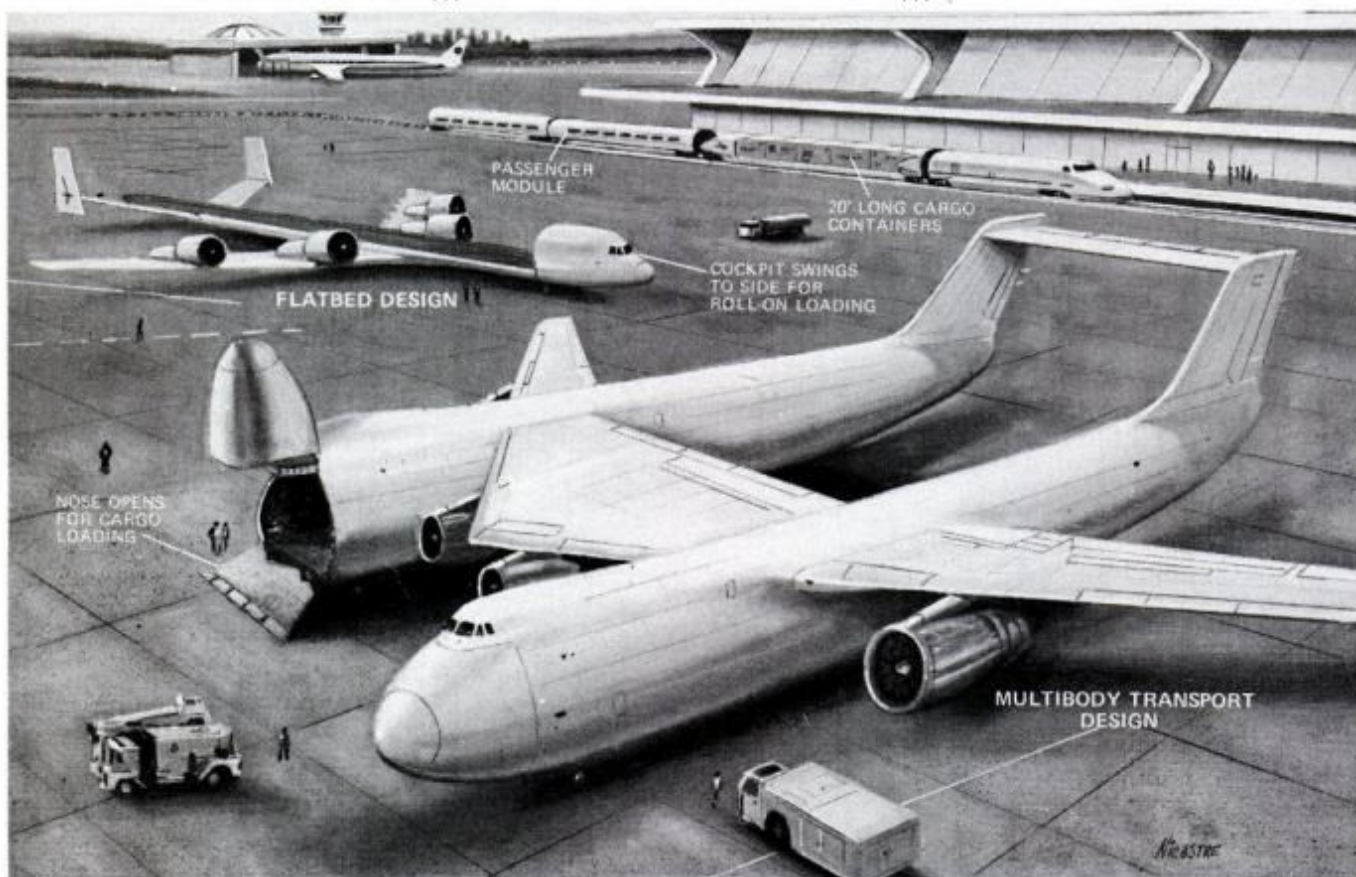
"We also have a triple-fuselage model on the boards," Lange said, but he gave it less chance of flying someday than the two-body carrier. Lange's reasons:

The three-body model would put more stress on the wing. Production would be more efficient if all fuselages were alike. And the proportion of body surface area is higher in the three-body version, creating more drag.

One of Lockheed's more innovative concepts (also below), looking like the toss-away portion of a filleted fish, is called a flatbed design. Its skeletal configuration gives the plane versatility unmatched by other carriers. Modeled after Lockheed's C-141, the flatbed model's payload is 75,000 pounds. Lockheed design engineer Rollo Smethers points out this concept is easily adaptable to much larger planes.

A passenger module that locks onto the flatbed makes the jet look as normal as today's planes. But the clincher, says Smethers, "is the fact that the module could be boarded in midcity, conveyed by rail to the airport, attached to the plane's bed, flown to its destination and sent to midcity by rail again."

How soon will these planes be airborne? "Some time between 1995 and 2000," Lange says. **PM**



Double-fuselage cargo plane will haul 441,000 pounds; flatbed plane (at rear) will adapt for boxcars or passengers.



## ENERGY

### Still race

A small Manhattan Beach, Calif., company reports brisk sales on a still, which can be powered by solar heat, to make engine-fuel alcohol from farm crops.

The \$485 still (not including tanks, from Solargas, 201 Ocean Dr., Manhattan Beach, Calif. 90266) uses some traditional technology. Corn, yeast and water ferment into a rough beer, usually 6- to 10-percent alcohol. This beer is heated, releasing a mixture of alcohol and water vapor. Alcohol, with a lower boiling point than water, is condensed by cooling. But in the Solargas unit, patent-pending equipment creates a partial vacuum within the system to lower the alcohol's boiling point—cutting heat needed to vaporize the beer. So farmers can use solar power to run the still, the company says.

The Solargas model is one of a growing number of entries in a race to produce stills for use down on the farm. Some stills cost as much as the farm. And some don't work. "A farmer is dumb to build his own still to make ethanol," says George H. Emert, director, Biomass Research Center, University of Arkansas.

"I've talked to hundreds of farmers," Emert told PM. "A typical complaint goes like this: 'I built my apparatus just the way they said, and I'm getting 30-proof alcohol when I'm supposed to be getting 160 proof.'"

On the other hand, Scott Sklar, Washington director of the non-profit National Center for Appropriate Technology, thinks stills like the Solargas device make sense for individual farmers. Other benefits: Leftover mash is good feed. And traces of alcohol make cows happy, Sklar says.

### 'No solar satellite!'

That was the emotional response of 350 people who answered a Department of Energy (DOE) survey recently. Conducted by the Citizens' Energy Project, the survey asked for detailed opin-

ions on launching giant satellites to collect solar power from the sun and beam it to Earth as microwaves.

Some 85 percent of the 412 respondents opposed the idea. Some reasons: they said they were "philosophically opposed to large-scale energy projects," or "concerned over the long-term effects of microwaves."

Despite the response, DOE intends to fight for the project. But up to now, Congress has tied up next year's funds in committee.

### Wind power quadrupled

A proposed wind-energy conversion system is expected to deliver four to five times the electrical power of a single, freestanding wind generator.

"Wind flowing past a cylindrical structure, like a silo, increases its speed as it rounds the surface, rising to twice its velocity at midpoint, right and left, of the cylinder," says Prof. Robert Duffy, Rensselaer Polytechnic Institute (RPI) Solar Center. "And doubling wind speed raises electrical production by a factor of eight."

Carving out a toroidal (doughnut-shaped) course around the cylinder jacks up wind velocity by yet another small increment. Wind generators within the scoop ride on tracks around the cylinder. Electricity generated within the rotor body is delivered through an electrified rail.

Called TARP, for Toroidal Accelerator Rotor Platform, the system was developed by Eneco, Windsor, Conn. A prototype ought to be ready by 1983, Duffy says. **PM**



Notches in tower speed wind flow.

## INVENTIONS

### Handheld forecaster

After the user supplies information by punching a keyboard, a small instrument invented by



Handheld oracle flashes forecasts.

Steven A. Root of Bountiful, Utah, will display a weather prediction for the next 12 to 24 hours.

The forecast is based on current weather, wind data, season and geographical region. (Patent 4,218,755.)

### Portable voice system

The verbally handicapped can use a portable, battery-operated voice system patented by Carl L. Ostrowski for the Federal Screw Works, Detroit. A person unable to talk normally can select any of 994 words, sounds or phrases by pressing three-digit codes on a keyboard. The desired message is spoken by a speech synthesizer. (Patent 4,215,240.) **PM**

### Stinky idea

For years, researchers have sought the perfect deodorant. Now along comes Arthur F. Isbell whose invention is aimed at making you smell like a skunk.

Isbell's kit consists of two small bottles containing chemical solutions that smell when mixed. A few drops of this released downwind of people will mask human odors with artificial skunk bouquet. Isbell's invention (patent 4,213,875) is designed to attract hunters, trappers, photographers and others who want to get close to wild animals without detection.



## ELECTRONICS

### Stereo in the round

Modern stereo is quite a step up from the monophonic "hi-fis" of 20 years ago. Now another step on the road to perfect sound has been taken. Called the Omnisonix Imager, it connects to almost any stereo and gives you the impression you can pinpoint the location of every instrument in the orchestra.

The Imager is a \$199.95 black box designed to sit on top of your stereo amplifier and hook into your tape-monitor inputs. What goes on inside the box is a guarded mystery. What goes on outside is obvious: The Imager not only gives you a feeling that your living room has turned into an acoustically beautiful concert hall—it puts you smack in the middle of that hall's music.

The company isn't saying much about how it accomplishes this sonic feat with ordinary two-speaker stereo systems, but some information is available. The human ear differentiates where a sound is coming from by a pro-

cess of comparing how much of the sound is heard by each ear—much the same principle as that of binocular vision.

The Omnisonix Imager appears to channel certain sound information back and forth between the two stereo speakers to simulate this mode of hearing. A bit of the right channel is introduced into the left and vice versa. This "fools" the listener into the feeling that the sounds heard come from more than just two point sources (the two speakers). For information, write Omnisonix Ltd., Box 430, Middletown Ave., Northford, Conn. 06472.

### Don't hang up!

We were speaking on the telephone to a friend's grandmother the other day and, rather than saying she was about to hang up, she told us she would "close" the phone. We realized later that when she was a young girl gaslights were still in use. You did not turn a gaslight off. You *closed* the light.

In not too many years, many expressions we use today will seem just as strange and outdated. For instance, if you tell your



Conversation piece: ITT's Ultra 80.

grandchildren years from now that you "hung up" a phone, all you may get are blank stares.

The era of the phone you hang up is just about over. One new phone we've seen, the Ultra 80 from ITT, is a \$69.99 handset with a telephone pushbutton dial on one side and a microphone and speaker on the other. To answer it (when it electronically beeps instead of rings), you slide open the telescoping grip.

Since it has no big bell or switching mechanisms, there is no need for a base. When you are done with your call, there is no place to hang up the telephone. You put it back on the table.

How do you break the connection? You just *close the phone*.

### 'Cartoon' games

New this year are handheld games that feature more than just a red blip moving down a blank playing field. These new games simulate moving figures for realistic action.

The way it is done is much like an animated cartoon. A film cartoon of a tennis player, for example, is made of frames, each showing a player in a different pose. Moving the frames quickly past the eye (by projecting them as a movie) simulates motion.

The new games use sets of special displays shaped like rackets, boxing gloves or players. Different parts of the display are quickly lighted to give an illusion of smooth motion. On the Tomy game, racket-shaped electronic displays, arranged on the printed-circuit board, light in sequence. The resulting stroke animation is realistic, though it's more consistent than most clay-footed players can muster. **PM**



Animated tennis players can serve and charge net in new game from Tomy.



Players control punches in Bambino action game: Knock-Em Out Boxing.



## AUTOMOTIVE

### Rubber elephants

Each year more than 500 million kilograms of rubber particles are worn off tires throughout the country. According to the General Motors Research Laboratories, that's the equivalent of 100,000 five-ton elephants wandering along the shoulders of our highways. The odd thing is that no one has ever noticed huge mounds of rubber particles accumulating along the sides of the road.

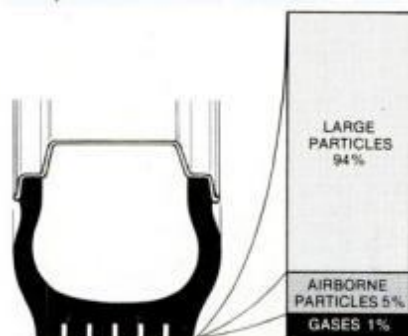
Where does your tire go? The question occurred to the Environmental Protection Agency (EPA) three years ago when it publicly proposed setting up a task force to investigate what happens to tires—specifically, whether people wind up *breathing* them. But the agency dropped the proposal when GM rushed to assure the EPA—before any laws could be passed—that the question had been under study since 1972. Now the results of the study are available.

GM researchers built a special tire-wear laboratory and discovered that the typical tire sheds 90 milligrams of matter per kilometer (360 mg/km for each vehicle).

Of that 360 mg of matter, 94 percent is comprised of large particles that fall to the ground. The rest is either airborne particles or gases.

#### On the trail of tread

Then GM went to a heavily traveled highway in California and, based on the volume of traf-



**Most tire matter is flung off as solid particles which then biodegrade.**

fic, arrived at an estimate of how much solid particulates should be in the roadside soil.

When the GM engineers examined the soil samples, they found only a five-month accumulation of tire particles. That was much less than they had anticipated.

#### Research on the roof

Rather than trying to simulate natural conditions in the lab, the GM engineers mixed tire particles into soil, put the mix in containers and left them on the roof of the research center.

After 16 months, they found the particles had virtually dissolved. Some of the particles had oxidized. Most of the tire material had been broken down by natural fungi in the soil.

The upshot of all this research is that tire pollution is one problem we won't have to worry about. In this instance, nature is cleaning up the nation's castoff tread.

#### A diesel fuel harvest

The Division of Agricultural Engineering in the Republic of South Africa has just completed testing sunflower-seed oil as a substitute for diesel fuel. The researchers report the tests were a smashing—or possibly squeezing—success.

The South Africans have shown that the oil squeezed from the seeds is only 6.5 percent lower in calorific heat than diesel fuel by volume. So the power output is only slightly lower. They've run dozens of tractors on straight sunflower oil, a blend of the oil and diesel and a blend of the oil and ethyl. The engine ran just as well with the straight oil as with the blends, but it ran the cleanest with sunflower oil and ethyl.

The researchers say that converting sunflower oil to diesel is more efficient than distilling biomass (corn stalks, wheat chaff) into alcohol. Sunflower seeds need only be gathered, squeezed in presses, filtered to remove solids, and the resulting oil is ready for use as a fuel. **PM**

Editor: Gurney Williams III

Contributors: Tony Assenza, John Dornberg, Richard Hansen, John Ingersoll, Stacy V. Jones, Neil L. Shapiro

## PRODUCTS



### Stove watcher

The Fire Fly is a solid-state stove-pipe temperature monitor that sounds an alarm when pipes get hotter than 500° F. The monitor (from Vine Valley Research, 1220 East Lake Rd., Middlesex, N.Y. 14507) costs \$29.95.



### House watcher

If home temperature falls below 50° F., the \$89.95 Tele-Sentry emits a special tone over the phone when you call. From Ma Belle's Phone Store (Box 3146, North Hollywood, Calif. 91609), system plugs into a phone jack.

### Heat-powered watch

The Thermatron watch from Bulova converts heat from the wearer's wrist into the electrical power to run the timepiece.

The new \$500 watch, with a standard appearance and size, senses body heat from the wrist, as well as cooler air around the upper part of the watch case. The temperature difference is converted into 8 to 12 microwatts of power. A company spokesman was unsure whether the watch would charge itself if worn continuously in a hot climate. But wearing the watch for a month under normal conditions would provide enough energy for it to run a year.



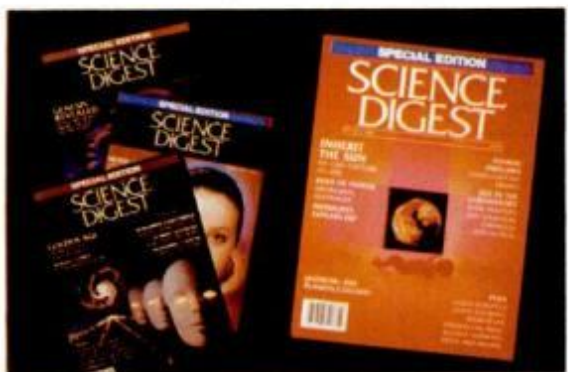




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# SCIENCE DIGEST



## RISE AND FALL OF THE V8 ENGINE

(Continued from page 79)

adapt a stock Cadillac than to modify a flathead Ford—you could buy a new Cadillac V8 in the crate for \$900—which led to such wonderful extravagances as Bill Frick's '49 Fordillac, the similar Studillac, the Cad/Allard and hundreds of Caddy-powered '32 Ford Highboys.

Briggs Cunningham raced two of the most outlandish Cadillac-powered sports cars of the early '50s—a Healey Silverstone and a Woodhill Wildfire.

### Chrysler Hemi

W.E. Drinkard and M.L. Carpentier started to engineer the "perfect" V8 in the late '30s. This was the famous Chrysler Hemi, a complex, massive and expensive pump for making horsepower. The Hemi appeared in 1951 and went away six years later, only to resurface in 1963 and die again in 1971. Unbelievably, it's still the engine of choice in the truly fast drag-racing classes. The 331-cu.-in. Hemi was rated at 180 hp in 1951, but it would easily deliver 350 hp with just modest tuning.

Today, a good supercharged 492-cu.-in. Hemi for Top Fuel will easily put out 2000 to 2500 hp for six seconds.

It's accepted as gospel by many experts that Chrysler actually lost money on the Hemi, and that it was overengineered—too good for a simple street engine.

### Small-block Chevy

The engine of the last three decades, and the definitive American V8, is the small-block Chevrolet which appeared in 1955. Ed Cole and Harry Barr were given it as their personal project in 1952, mostly because they'd made such a success of the '49 Cadillac. The Cadillac led the first generation of modern V8s; the Chevrolet was planned to inspire the second generation.

Probably the most important determinant for this new engine was that the old Blue Flame 216-cu.-in. Six was not being redesigned. The in-line Six weighed 572 pounds, which meant the new V8 couldn't weigh much over 600 pounds without upsetting the balance of the car. In order to fit into the engine compartment, it couldn't be much larger than 3 feet long, 3 feet wide and 2 feet high, and it had to produce at least 150 hp. This meant a displacement somewhere around 250 cu. in.

Of course, it would have five main bearings and overhead valves, and Cole restricted himself to an 8.0:1 compression ratio to accept regular

gas. As it turned out, a bore of 3.75 inches and stroke of 3 inches gave 265 cu. in. Engineer John Dolza figured the bore spacing with 4-inch bores, so that there'd be plenty of room for the engine to grow over the years, the way the '49 Cadillac could. Eventually, the bores were "Siamesed" in pairs, without water passages in between, in order to achieve the 400-cu.-in. small-block of the '70s, but the engine was actually designed to be a 302.

The small-block Chevy lifted engine-building technology to another plateau. Until then, engine blocks had always been cast right side up, and the forms used to shape the cores were dry sand, baked into shape. John Dolza invented a way to cast the block upside down.

Dolza's moist green-sand cores were a major manufacturing breakthrough, comparable to Charlie Sorensen's one-piece block for the '32 Ford. The old baked-sand cores tended to shift, so all measurements were  $\pm\frac{1}{16}$  inch. The green-sand cores were accurate to  $\pm\frac{1}{32}$  inch, which meant the cylinder walls could be thinner and the whole engine smaller and lighter, with better thermal efficiency. The '55 Chevy V8 was thus the first "thin-wall" engine, a type that's now standard around the world. Dolza's green-sand casting had one other economy. The '49 Cadillac required 24 separate molds to shape the block. The '55 Chevy needed only four.

Two other brilliant innovations made the Chevy small-block so important. A Pontiac engineer named Clayton Leach had invented a stamped steel rocker arm that cost almost nothing to make. Even better, each rocker arm sat on its own self-aligning ball bearing. Instead of a complicated and heavy valve train with cast rocker arms on a precision shaft, the Chevy V8 had Leach's easy-to-fix stamped steel rockers.

The only problem with Leach's system was how to lubricate the rockers. But Cole's group solved this with a hollow pushrod that pushed oil to the cup-shaped rocker, where it spread over the ball-bearing.

In 1955, you could buy a 265-cu.-in. V8 from the factory that produced 180 hp and 260 foot-pounds of torque, yet weighed only 531 pounds. More importantly, it was so efficient, the radiator for the V8 was actually smaller than that for the Six, and all the rest of the '55 Chevy was lighter than any comparable car.

It's almost impossible to list all the permutations of the small-block Chevy V8. It's been the GM corporate engine for years now, and over

(Please turn to page 120)



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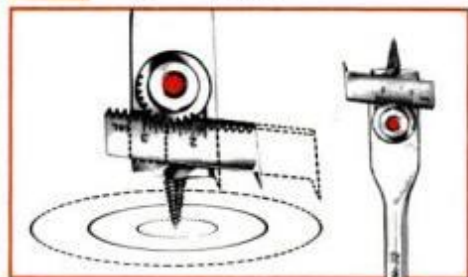
Mike Todd, School Principal and Do-It-Yourselfer

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So, like I said, I have no idea what everyone’s drinking these days. Except me and a few friends.



I.W. HARPER.  
WHEN YOU KNOW WHAT YOU LIKE.

## RISE AND FALL OF THE V8 ENGINE

(Continued from page 119)

30 million have been built. It's grown in size from 265 cu. in. to 266, 283, 302, 305, 307, 327, 350 and 400 cu. in. from the factory, and to almost every other possible size in modified form—including 209 and 255 cu. in. for unsuccessful Indy 500 contenders. It's been fuel-injected, supercharged, turbocharged, made into a diesel, cut crosswise to make a V4 and V6, and sliced lengthwise to make an in-line Four and even an in-line Three. It's had mechanical lifters, hydraulic lifters, a dozen different manifolds and heads, and from one to eight carburetors.

### The ultimate V8

Probably the ultimate Chevrolet small-block was conceived by Richard Moser and put into very limited production in 1975. Moser built a set of heads for the V8 with perfectly hemispherical combustion chambers, four valves per cylinder and double-overhead camshafts based on the Cosworth Vega. Moser claimed a redline of 10,000 rpm and 600 hp from 302 cu. in. But while a Moser V8 was a technical masterpiece, it was no more successful than the ill-fated Cosworth Vega.

The Chevrolet small-block is probably the most copied engine in the world, and after 25 years is still the most versatile engine ever built.

If the V8 engine does survive into the '90s, it may have to be something like Cadillac's "variable displacement" V8. The one just introduced is made from the 350 small-block, and during hard acceleration it hits on all eight cylinders. The ignition and fuel supplies cut out selectively at cruising speeds, however, leaving only six or four active cylinders, to gain small-engine economy without sacrificing V8 driveability.

Somehow, though, that won't be a real V8 at all. No self-respecting V8 ever ran on less than eight cylinders, nor was it ever meant for economy. From Ader's four-liter V8 of 1903 to Cosworth's three-liter V8 of 1980, the V8 has always been a way to obtain smooth, dependable power.

What sold V8s was that they were faster than Sixes and Fours, and what made them uniquely American is that we craved that power, that effortless, long-distance capability, that exhilarating shove in the gut when you stamped on the throttle. The V8 was big and wasteful, but it could handle almost anything. In a sense, the V8 represents a whole lost era of American power in many spheres. We'll sorely miss them all before we're through.

FM



## WHAT YOU SHOULD KNOW BEFORE CONVERTING YOUR V8 TO A V4

(Continued from page 81)

engine and the system worked really well on local streets, but was totally gutless on the highway. Four cylinders pushing a car that size simply can't make enough power. On the street, however, you never miss the four neutralized cylinders. The only fault we found was that, because of the different vacuum curve, the automatic transmission shifted sooner than it would with all eight pistons working.

The mileage improvement with this system was about the same as the CVCS system—15 percent on the highway; 30 percent around town.

The only other problem with the Weissman system is that it's not available to everyone right now. Charlie is just now trying to get it into mass production. He estimates that the retail price for one of his conversions will be about \$150. This includes all the parts and labor for machining a hole in the intake manifold for his valve.

### Almost the Cadillac

The most complex and expensive system around is made by ACDS Research & Development. Its system, called ACD (Automatic Cylinder Deactivator), uses a hydraulic piston mounted on the rocker-arm stud that engages and disengages the rocker arm from the rest of the valve train.

The ACD Method requires quite a bit of modification to the engine and also requires that you tap into the hydraulic steering system for the juice to make it work. But the advantage of this system is that you can switch quickly from eight cylinders to four and back again.

As for quality of materials and ease of operation, this system is on a level with the Cadillac system. The price is also in Cadillac territory. Sandy Coggan, general manager of ACDS, estimates that the total cost of the kit and local labor for installation will run to about \$1200.

So far, the ACD conversions have been installed on about a dozen different cars with results ranging from 20- to 30-percent improvement in mileage.

### Should you convert?

Whether or not you should convert really depends on your needs and your budget. If you've got a full-size car with a big V8 engine, you can easily achieve a 20- to 30-percent improvement in mileage. However, we can safely say that you will probably be unhappy with the severe reduction in performance. If you

install one of the systems that can't be switched from V4 to V8 on demand, you'll be out on the highway in a very underpowered car and, as we found out, you won't be able to power your way out of trouble. It will require a complete change in your driving style.

On the other hand, if you *do* convert a V8 to a permanent V4, you might designate it as a "street only" vehicle for local use. The severe loss of power on city and suburban streets won't make much difference.

If you go the expensive ACD route, you'll have to figure the pay-back period. That means factoring your present mileage, the \$1200 cost of the conversion and projected mileage improvement of 20 to 30 percent. You'll also have to figure out how long you will keep the car.

If you're considering a conversion, keep in mind that you will not achieve that magic 50-percent mileage improvement, no matter what the ads claim. The friction and pumping losses, and the fact that the four active cylinders will have to work very hard just to keep the car moving, make that 50 percent figure impossible to achieve. The most realistic estimates are somewhere between 20 and 30 percent.

Which kit should you buy? We really can't recommend any single kit-maker or set of plans. This field is still in its infancy and it encompasses a variety of people from Charlie Weissman, an independent inventor, to outfits like ACDS that have substantial financial backing and the ability to produce a high-quality, expensive piece of hardware.

However, all the kits and plans we've seen, tested and investigated do work. They will definitely neutralize four of your eight cylinders, and all of them allow you to convert back to a V8 if you're unhappy with the V4. As far as we could determine, none of them has caused irreversible damage to any engine.

Before you mail your money to any kitbuilder or company that provides plans for a conversion, ask them to send you literature stating exactly what the conversion entails. **PM**

### SOURCE LIST—KITS AND PLANS

ACDS Inc. (ACD system), 1945 Friendship Dr., El Cajon, Calif. 92020.  
Fuel Econosizer Corp. (econosizer kit), Box 110723, Nashville, Tenn. 37211.  
Street & Strip Speed Shop (CVCS conversion), 805 East Pembroke, Tuscola, Ill. 61953.  
Charles Weissman (information only), 125 North Montgomery St., Valley Stream, N.Y. 11580.



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## SOLAR HEAT AND FISH FARM

(Continued from page 85)

another harvest—of cool air. A breeze entering windows at the bottom of the greenhouse passes over the tops of the 18-inch-diameter tanks on the way to the living room. Warmth in the moving air evaporates the water on the surface. This increases humidity. But it also lowers the temperature of the air. A publication of the American Institute of Architects, *Research and Design* (fall 1979), reports that in such systems the temperature of the air actually drops at a rate equivalent to 1000 B.T.U.s lost for every pound of water added to the air.

Those were some of the plans. Putting them into effect took about three months of challenging work by the Todds and builders/designers Greg Wozena and Terry Eisen.

By last spring, the addition had been completed, the fish tanks had begun bubbling (with champagne-like bubbles supplied by two 40-watt air pumps), and Nancy had her office—in the former dining room.

In addition to high hopes for their champagne project, the Todds also faced some high bills. Improving the energy efficiency of the existing structure cost about \$5000. The addition cost about \$36 a square foot. So the total cost—for improving the existing home and building the new section—was more than \$40,000. That meant refinancing, at a higher interest rate. Unfortunately, many of the energy items in the project don't qualify for a tax break because they are passive: The greenhouse, for instance, is considered a structural feature—not an energy-saver—by current law. (Congress was working on changes in the law, to stimulate passive energy conservation, as we went to press.)

### Adding up enjoyment

Cost concerns aside, the Todds were pleased to have added more to their home than space. Among other pleasures, Nancy Todd looks forward to harvesting lettuce all winter. The family expects to get a good percentage of its protein from the fish tanks, and to use very little fuel for heating. And the Todds have discovered that the benefits of a solar addition extend beyond the daylight hours.

"At night," John Todd told us, "when there are just two small lights shining down in the greenhouse, and you can smell the geranium or citrus and hear the burbling of water rising in the columns, it's as close as possible to having your cake and eating it too."

PM



## THE OCEAN EXPRESS DISASTER

(Continued from page 87)

complex that only recently, after years of study, has the Coast Guard board of inquiry pieced together the story.

For days, the welded-steel barge *Ocean Express*, boring for oil, had been working 20 miles off Texas, standing on three giant steel legs and its monster "big foot."

But now it had been moved 33 miles northeast, quite an engineering operation. Its legs were 12-foot-diameter steel tubes 312 feet tall. At the bottom, these stilts fit into a rectangle 211 feet long and 170 wide that sits firmly on the sea floor. To drillers, this is "the mat"—a complex of air tanks and structural steel.

To make the tow, three tugs had steamed down from Louisiana while the mat was jacked up from sea bottom 124 feet down. This was done inch by inch by hydraulic pumps and a system of steel pins thrust into the legs through holes.

As the three legs came up, they rose 232 feet above the sea. Slowly, the mat rose with them, coming up to "towing depth"—in this case, 80 feet down. There it became a stabilizing pendulum of sorts.

When such a rig gets ready to drill, the barge in which the crew lives and works actually climbs up its own legs to a safe point 20 to 40 feet above storm waves. But for the voyage it now lay afloat, 166 feet long and 109 wide. In it were a control room, motor room, crew quarters (one deck down) and machine shop. Toward the stern, between two legs, rose the drill derrick itself, 15 stories tall.

### Bad weather a surprise

The tow had begun the day before, a Wednesday, behind three tugs, *Gulf Viking*, *Gulf Explorer* and *Gulf Knight*. For hours the curious armada smashed ahead at 3 mph, throwing spray. It was accompanied by a fifth craft, the research ship *Nicole Martin*. What no one could see was the mat, cruising 80 feet under the *Express* like a submarine.

No bad storm was forecast. Yet all day, seas grew and wind rose. On deck, or sleeping off-watch, were the barge's 29 men, captained by one of the Gulf's best barge movers, an able man named Pieter Van deGraaf. He was the barge master, called aboard for the tricky trip just as a harbor pilot boards a ship approaching port.

But there was a confusing chain of command, always a problem at sea. Another good man, the toolpusher,

actually headed the drilling crew and was directly responsible to the owners on shore.

Then there was a third boss. A ship had put six more men aboard. These were the expert drillers from Offshore Hammers Inc. And their commander was Marathon Oil Co.'s experienced drill foreman Eddie Melancon.

Right from the start, Eddie Melancon didn't like the look of the weather.

During the first evening, while approaching the new drill site, Capt. Van deGraaf had told his men to start downjacking the big legs so they would be ready for work on arrival. This was standard practice, and it reduced the weight aloft.

But when the storm grew worse, Van deGraaf ordered the downjacking stopped with the mat 148 feet down and 50 feet off bottom. This left the legs towering 164 feet above the barge, which was starting to sway.

At noon on Day 2, Thursday, the tugs *Explorer*, *Viking* and *Knight* were straining hard. Now that they had brought the *Express* to its new site, the storm was trying to blow it back.

The wind was from the south, with the tugs holding their ground, when at 3:10 p.m., the worst possible time, the *Knight* blew its starboard engine's clutch. Van deGraaf offered to send it home to safety. Crippled, with only one engine left, it stayed on loyally to do what it could.

### Chain of failure begins

It was important now not to let the south wind attack the barge from its side. Because the gale kept twisting it around, the biggest tug, *Explorer*, now dropped back to a booster position, pulling ahead from the right stern. The crippled *Knight* backed up *Viking* by taking a towline from the left stern. Up ahead, holding hard as the wind rose to 60 mph, *Viking* was surging up and down on its 1200-foot, 2½-inch steel towing cable.

Disasters grow from chains of failures. Linking *Viking's* steel cable to the barge was a 200-foot length of 11-inch nylon line. This was a shock cord of sorts that helped cushion the explosive strains of towing.

At evening, seas were as tall as two-story houses. Suddenly a sound like a cannon shot boomed through the barge. Men ran on deck shouting, "Broken towline!"

It was the second incredible failure in the chain. The nylon line had snapped.

Darkness brought bedlam and

(Please turn to page 124)

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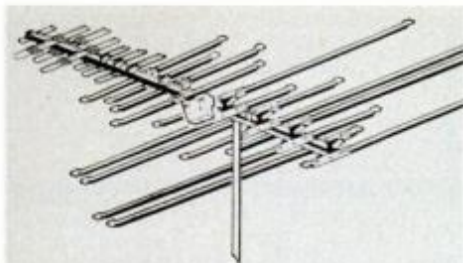
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## THE OCEAN EXPRESS DISASTER

(Continued from page 123)

hopelessness. The big barge swung sideways to the wind. Time and again *Viking* ran out a new towline. But no one on the barge could hold even the light snatch cord that would have helped lift it from the sea.

Men were hurled about. On deck, Eddie Melancon knew they had big trouble now. One man fell under a rush of water and came up laughing. Another came up with a hole in his back. Melancon grabbed him and helped stuff the injury with cloth. With no lead tug, and its left side to the wind, the barge was now swept by waves. Then it began to lean ominously toward the right. A rigger called: "Water in the motor room."

At 8:30 p.m., the chain of failures grew fast. Tons of drill pipe came adrift. Then a groan was heard, followed by a jolt. The derrick itself, 363 tons of towering steel, came unpinned and slid a few feet. One of the welders got scared. "I knew then we were going to turn over," he said.

### Barge is swamped

In the dark, the toolpusher, a big man named Dudley Boudreaux, glared at the tower. Someone heard him shout:

"Dirty, dirty brute!"

The barge, after lurching, had always come back up to normal position. But now a wave hit it and it did not straighten. "We were going down all the time," said Eddie Melancon.

Capt. Van deGraaf, however, did not think the barge would sink. He was surprised and angry when he found that someone, without his order, had radioed Marathon Oil Co. in Louisiana, and Marathon had called the Coast Guard in Texas.

Then someone else pushed the "Abandon ship" alarm. As it boomed out, men poured on deck in life vests. Someone shouted, "Run for the capsules!"

Nested just under the upper deck like three bright orange Easter eggs were the escape capsules, looking remarkably like spaceships. They were tough, smooth, round plastic shells, each with 28 seats inside and propeller and rudder protruding beneath. Inside was a small diesel engine venting up a pipe through the roof.

All but two men now scrambled toward these only to find that No. 2 capsule, on the port (left) side, had been torn away. Some 14 men now jumped into No. 1 on the starboard side, squeezing down through a

small square hatch in its roof.

No. 1's engine started even before the single-strand lowering cable let it down. In moments, the bright-colored egg was in the sea. Others saw it motor safely away, lights glowing in seven small windows.

Next, 18 men jumped into No. 3, also on the right side, 15 feet above the sea.

But now there was a delay on deck. Toolpusher Boudreaux was trying to get Capt. Van deGraaf to come, too. The barge master shook his head. "I'll stay to see you get down safely," he said. "Then maybe I can save the barge."

His faith was in the barge. If it drifted to shoal water, the big foot might take a firm bite in the ocean bottom and steady it. It seemed a reasonable hope.

But the others were ready to go. Eddie Melancon reached out, grabbed the toolpusher, and hauled him into the capsule. "Let's go," he said.

Plastic escape capsules, modern versions of the lifeboat, have been in use since 1966. Coast Guardsmen consider them better than boats or rafts. They're designed to be unsinkable. And the 19 men in No. 3 knew they were built to float right side up.

### Trouble in No. 3 capsule

No. 3's hatch was now dogged shut and the lowering cable, run from inside, let it down. It hit the sea gently. But then came trouble. The ratcheted release hook in its roof, to which the cable was attached, wouldn't release.

For 10 minutes, a man in the reopened hatch tried to open the hook. Beneath him, his companions began to get sick. "It was hot in there," one says. They waited for the barge to capsize on them and pull them under.

At last, one man, slamming the hook with a hatchet, got it open. With the motor running, they steered away.

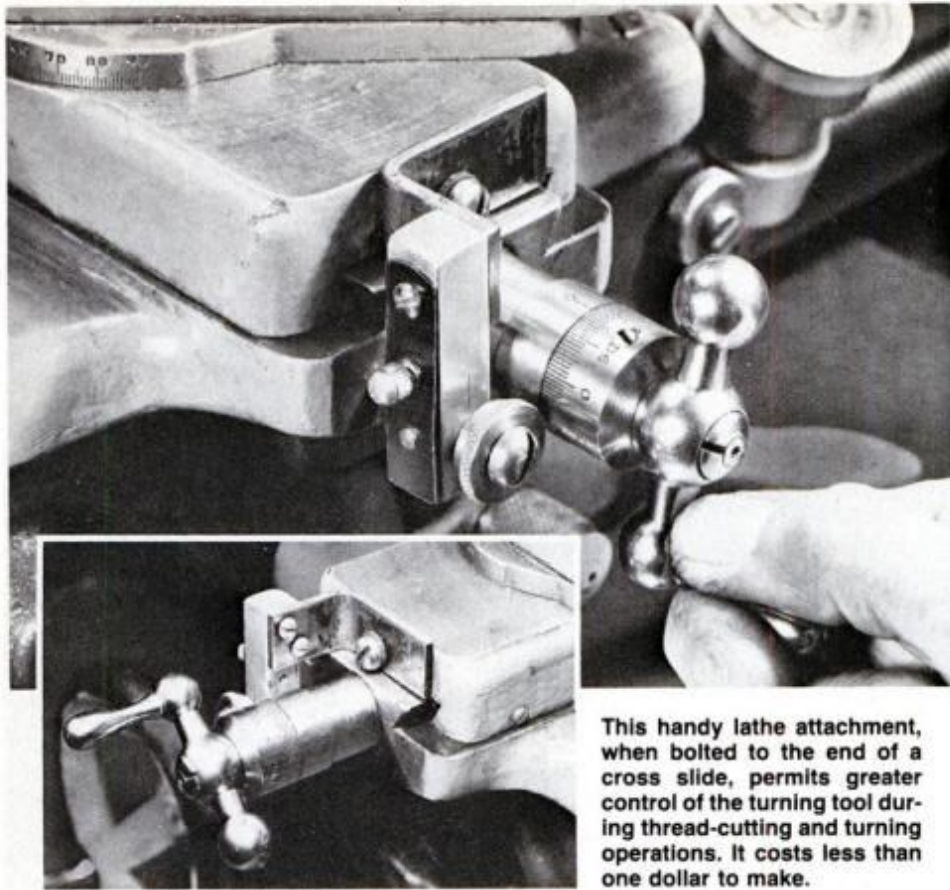
At this time, toward 9:00 p.m., two Coast Guard choppers were en route. The first, with Capt. Lewis, was not far away. Also not far away, capsule No. 1 had just reached the survey ship *Nicole Martin*. It slammed hard against its rail.

But then the 14 men inside made a discovery: Capsules are wonderful, *but how do you get out?* Wild seas banged capsule and ship together. No one could jump to the ship. Risking their lives, the ship's crew climbed down its sides on rubber tires to haul the 14 men aboard.

It was different in capsule No. 3.

(Please turn to page 150)





This handy lathe attachment, when bolted to the end of a cross slide, permits greater control of the turning tool during thread-cutting and turning operations. It costs less than one dollar to make.

## Make this cross-slide stop for easier thread cutting

A lathe cross-slide stop is often called a threading stop, but it can be useful in operations other than threading. Its purpose is to limit the inward movement of the cross slide to a predetermined point, thereby preventing the tool bit from cutting too deeply into the workpiece being machined.

The stop attachment, shown in the plans on page 126, was constructed specifically for a 9-in. South Bend lathe. It may be adapted to many other models.

A typical commercial stop, if available, clamps to the cross-slide dovetail. Our stop, however, is bolted to the end of the cross slide. It was easily constructed with available equipment and materials and did not involve the cutting of dovetail grooves. Also, it does not limit the outward movement of the cross slide as much as a dovetail-mounted stop would.

The attachment includes three main pieces that are held together by machine bolts. Cut the L-shaped bracket (A) from 1/8-in.-thick angle iron. Then drill a 1/4-in.-dia. hole in

the longer leg for fastening the attachment to the end of the cross-slide with bolt G. Next, bore two holes in the short leg for fastening part B to the bracket with bolts I.

Part B provides support for the fully threaded bolt (F) which bears against the face of the saddle when limiting the inward travel of the slide. Make B from aluminum, as was the prototype, or steel (the latter is preferable).

Equip the adjustable bolt F with a knurled knob, made as shown in the drawing detail. Then engrave 10 equally spaced lines around the smaller circumference of the knob. Smooth the end of bolt F so it will make firm contact with the lathe saddle.

The flat spring (C) and stud D prevent bolt F from turning too freely and going out of adjustment. The brass stud (D) presses through a hole, about 1/2-in. in dia., against the side of the bolt. Machine bolt K passes through the middle hole in the spring and controls the stud's pressure. Jam the knurled nut (L)

(Please turn to page 126)

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## CROSS-SLIDE STOP FOR EASIER THREAD CUTTING

(Continued from page 125)

against the bolthead to make finger adjusting easy. Rivet the brass stud to the spring as shown. Use any  $\frac{1}{2}$ -in.-wide strip of springy metal for part C.

### Using the stop

Designed to regulate the depth of threading cuts the stop will prevent the bit from biting off too much at a time and jamming or producing a rough thread.

In the act of turning a workpiece to a diameter, the stop prevents the bit from taking too deep a cut toward the finish. It can also be used in machining a number of pieces to the same diameter. In all such work, the compound slide may be set at an angle and used in making the first tool adjustments. Then the compound slide is locked in posi-

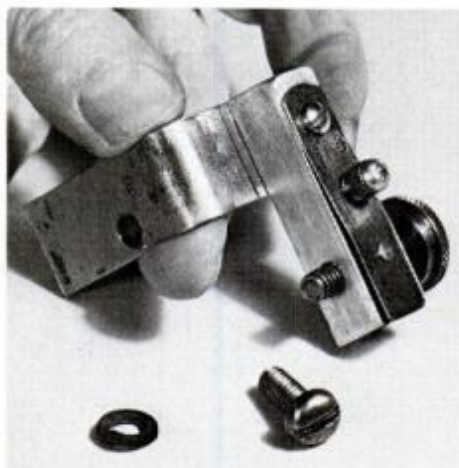
tion or, at least, care is taken so its screw is not turned while the cross-slide stop is being used.

### Making fine adjustments

Fine adjustments are possible with this stop. You can use the calibrations on knob E to change the limit of cross-slide movement. Since a 20-threads-per-inch bolt moves endwise .050 in. for every turn, the engraved lines are .005 in. apart in terms of endwise movement. Unscrewing the bolt  $\frac{1}{10}$ th turn, the distance between two calibrations, permits the bit to move inward .005 in. before the stop is once again engaged.

Provide an index mark on the front of bar B to help in adjusting the bolt.

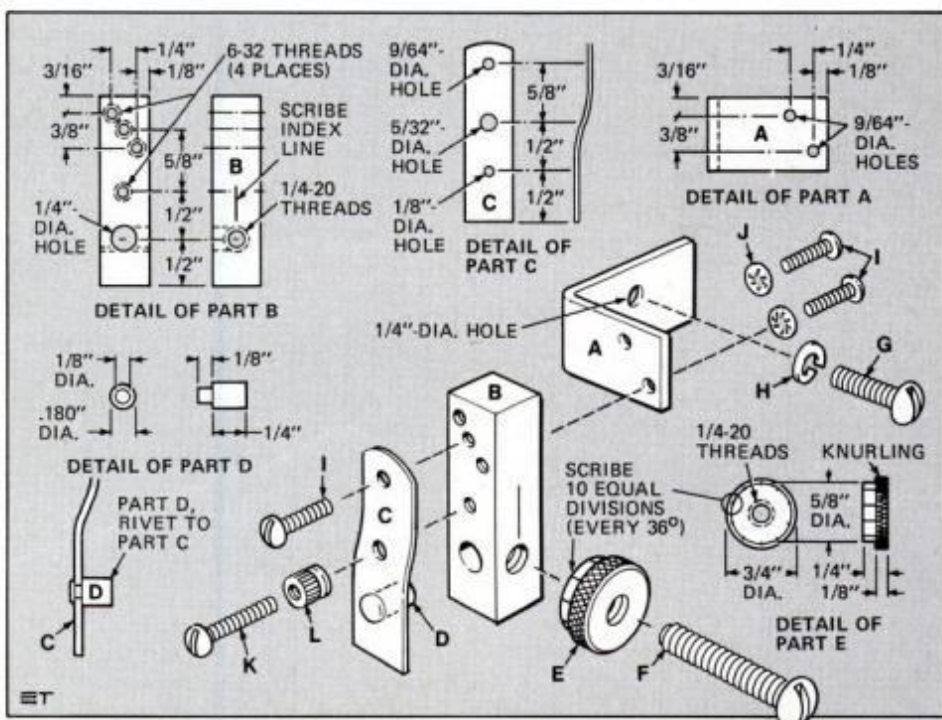
When using the stop, don't move the cross slide violently inward or else the attachment will be forced out of adjustment. Use the normal micrometer collar on the cross-feed screw, when necessary, to check the stopping position.—Walter E. Burton



Use lock washer and a  $\frac{1}{4}$ -20 bolt to fasten completed stop to end of the cross slide.

### MATERIALS LIST—CROSS-SLIDE STOP

Key	No.	Size and description
A	1	$\frac{1}{8} \times \frac{3}{4} \times 1\frac{1}{4} \times 1\frac{3}{4}$ " right angle bracket
B	1	$\frac{1}{2} \times \frac{1}{2} \times 2$ " aluminum or steel bar
C	1	$\frac{1}{2} \times 1\frac{1}{8}$ " flat spring
D	1	.180"-dia. $\times \frac{3}{8}$ " (overall) brass stud
E	1	Knurled knob for $\frac{1}{4}$ -20 bolt
F	1	$\frac{1}{4}$ -20 $\times 1\frac{1}{4}$ " rh bolt, threaded full length
G	1	$\frac{1}{4}$ -20 $\times \frac{3}{4}$ " bolt
H	1	Lock washer
I	3	No. 6-32 $\times \frac{1}{2}$ " machine screws
J	2	Lock washers for No. 6-32 screws
K	1	No. 6-32 $\times \frac{5}{8}$ " machine screw
L	1	Knurled nut for No. 6-32 screw





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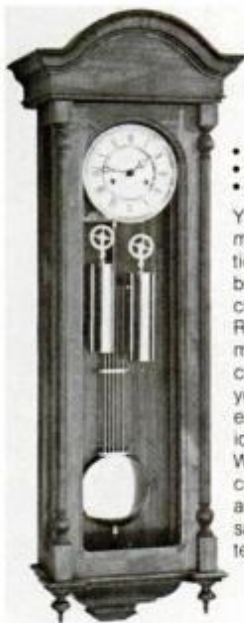
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## HERE COMES CABLE TV!

(Continued from page 91)

knows he has a *Jaws*, he knows we will come to him."

And it is not just a question of checking box-office receipts. According to Horowitz, the median age of most moviegoers is around 20. But the HBO audience averages from 25 to 49.

Besides the age-old question of generation gap, there is an accounting that must be made for local tastes. The critically acclaimed movie *Manhattan* was cited as one that might not appeal to the wide HBO audience, even though it has been very well received in metropolitan areas. On the other side of the coin, a film called *The Great Santini*, which its original producer had decided not to release due to lack of potential, got such response from cable airings that it was put into a few movie houses and became an underground hit.

To solve such dilemmas, HBO is about to launch Cinemax, which will be another movie channel. Cinemax will give movies with smaller appeal a chance. So HBO is going to go on a "button hunt," trying to bag one more position on the boxes of cable-TV carriers.

Once the movies are chosen, and are processed through that futuristic control center, they are sent by satellite across the country to the 1700 carriers. (Cablevision, being so close, receives HBO by direct microwave link.) HBO signals leave, on wire and microwave, from the Manhattan studios to "uplink" transmitters in Vernon Valley, N.Y. The dish antennas of Vernon Valley aim the signals at the RCA Satcom 1 satellite.

### The sports button

ESPN—the Entertainment and Sports Programming Network—recently began offering a full 24-hour sports show—everything from pro basketball and hockey to Mexican bullfights and Ping-Pong from China is featured.

ESPN is based in Bristol, Conn., and is the brainchild of station manager William Rasmussen. Rasmussen first thought of only supplying a local cable carrier—but then his bid for satellite space was accepted. An uplink antenna was built and ESPN was launched through space to upward of three million viewers.

ESPN is rivaled only by the movie channels in popularity. As an indicator of just how popular, Rasmussen is seriously considering bidding on rights for the 1984 Olympic Games.

Monday, Dec. 10, 1979, is a day

that RCA would rather forget. That was the afternoon that, immediately following its launch, Satcom 3 disappeared into the vastness of space. And with it went the plans of many potential new cable operations.

It was hoped that Satcom 3 would take some of the load off Satcom 1 which now broadcasts most of the cable-type TV transmissions.

### Superstations spring up

Satcom 1 and other satellites can only relay so many signals. In the past it was thought the present capacity would be more than enough. But no one (or very few) foresaw the advent of the *superstation*.

A superstation, contrary to what the slang implies, is not a giant. A superstation is simply any TV transmitter which has the capability of uplinking its signals via a dish antenna to a satellite. Strange as it might seem, there are many more stations that want to go "super" than there are expensive-to-rent satellite transponders (receiver/transmitters) to take care of them.

A station has two ways to get cross-country to a cable carrier's headend. It can relay its signals over a complex routing of microwave relay towers—or it can make the big leap through space. Over a long enough distance, it is cheaper to go by satellite.

It is the satellite technology that has turned cable TV into what it is today. Given best-case satellite availability, dozens of TV stations might go this route.

A superstation is usually not paid for programs by the cable carrier; nor is it even directly reimbursed for the expense of satellite or microwave relaying. Instead, the local station adjusts its advertising rates upward to reflect its expanded, national audience.

Many advertisers feel that, although they can't afford the networks, the superstations are a very cost-effective alternative. Lower in price, they still give national exposure. So, it is up to each superstation to arrange its programming so as to attract as many cable carriers as it can. Once again, the more buttons the merrier.

Ted Turner's WTBS in Atlanta, Ga., is the foremost of the superstations. Turner was among the first to realize the potential of that vast cable universe.

He bought a local TV station that wasn't doing all that well and turned it into a gold mine of the airwaves. He did it by scheduling a mixture of football, baseball and old-but-great movies—and then build-



ing himself an uplink to squirt it all 23,000 miles high into Satcom 1.

WTBS is now watched by more than five million people—nearly 10 percent of *all* TV viewers. Not bad for a local station in Georgia.

Now Turner is trying once again to set the cable world on its dish-shaped ear. He has launched a 24-hour news network—CNN or Cable News Network—going for his second button, like HBO, and the carriers are buying.

Watching CNN on the Cablevision box, we were astounded by the variety of the news. Not only has Turner attracted highly talented newscasters and commentators, but his format has literally changed the way a person can think about TV news shows.

There are news-variety hours, magazines, panels, news dramas and (thanks to two wacky record and audio reviewers) even news sitcoms. It is news, news, news, but unlike most 24-hour radio news formats, the Cable News Network is nonrepetitive and almost always interesting. At this writing, Turner's CNN revenues were reported at only about a third of its \$2-million monthly operating costs, but he remained convinced his "second

button" would eventually pay off.

Other stations, such as WSBK, Boston, are also carried by Cablevision and other carriers, entitling them, too, to the title of superstation. Stations from Philadelphia, Chicago, New York and all over the country are vying to be chosen as "regulars" by enough carriers so that they can also raise their ad rates and rake in the dollars.

#### Must-carries, alphanumericics

Remember those regular, rooftop-style antennas atop the headend? They are receiving all the community's local channels. Each local channel is entitled to a button on a local carrier's box. Because it is required to transmit these stations, a carrier calls them his "must-carries."

It was the must-carries who began the cable TV revolution in the early 1960s, back when there were no superstations, no movie networks. Cable TV was simply an individual's method of getting good reception when you were so far away from the TV transmitter that your snow-filled screen looked like New Year's Eve in the Yukon.

Even though the Federal Communications Commission (FCC) still requires these must-carries, many

other FCC regulations have gone by the board. The FCC is nowadays much involved in *deregulating*.

It used to be that cable carriers could simultaneously offer no more than two out-of-town commercial channels (but any number of public TV channels). Now that regulation has been dropped and the potential menu for the carriers has gotten longer.

Then there was the exclusivity clause which, until it was recently dropped, kept cable TV in regulatory chains. This required that if a local must-carry was showing, for example, *Star Trek* reruns, then the carrier could not have an out-of-towner with *Star Trek* in direct competition—button against button. Now they can, and competition should be on the increase.

Many other channels, such as ones Cablevision offers, are alphanumeric channels. These are simply words crawling across the screen. One channel might carry racetrack results; another will show and compare prices at area supermarkets.

These channels are programmed by expensive, computer-like character generators. It doesn't matter if you want italic type or little stars

*(Please turn to page 130)*

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## HERE COMES CABLE TV!

(Continued from page 129)

with eight points—a character generator can handle it.

### Where is Cable headed?

For the carrier companies, for the superstations, for the movie networks and the sports/news channels, there is no doubt the future is one of continued rapid expansion—in the short run. But how many great, or even tolerable, movies are made in one year? How many truly interesting special sports events are there? How long can expansion along the same lines continue until the cable grows stale?

While HBO is expanding into its second movie network (Cinemax), Cablevision, an HBO carrier, will be building its own uplink soon, and intends to broadcast its own *Action Plus* channel (of R-rated films) to other carriers.

These examples are not unique. Where is the promise of cable TV? Many times in our interviews we heard the term "narrowcast." A narrowcast (opposed to a broadcast) is a show specifically designed to appeal to a very limited audience. Narrowcasts would eliminate the idea of appealing to the lowest common denominator of viewers.

But where are these narrowcasts? Every so often a carrier company will do a local news documentary, or a movie channel will show a small-audience film. Yet, narrowcasts for the most part remain only a concept. They have not yet graduated to but-ton-hood.

The reason is, simply, money. Even the huge cable universe does not supply enough interest in narrowcasts to make them financially feasible.

### Up to 100 buttons?

Today's boxes have close to 40 buttons—tomorrow's may have up to 100. Does every one of those buttons have to represent a fortune in the making for someone, somewhere?

The FCC, as a regulatory body, lately has shown a tendency to roll over and play deregulation-dead. Yet without the impetus of the old and viable FCC, the broadcast public TV channels would never have been able to exist.

It appears that, until some regulatory plan is worked out, the concept of narrowcasting will never see the light of the cathode-ray tube.

Right now, cable TV is an exciting alternative to broadcast television. But its own growth, and its own inherent promise, threaten to make it mostly more of the same. **PM**

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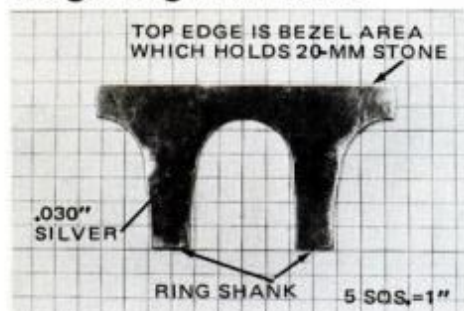
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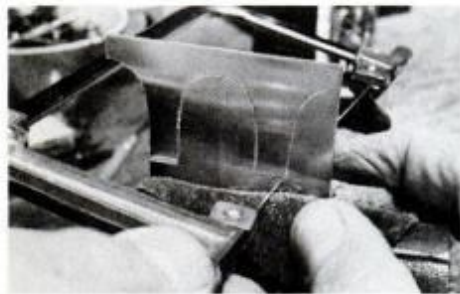
## Large ring with stone



**1** Draw pattern on cardboard or metal and cut out. Changes in the bezel size may be needed to accommodate a stone or coin.



**2** Hold pattern and silver with lever-jaw pliers. Scribe around the pattern.



**3** Cushion the silver between two pieces of leather and clamp it in a vise. Use a jeweler's saw to cut out the ring.



**4** Shape the bezel by tapping it with a leather hammer around a mandrel.

## 4 SILVER JEWELRY GIFTS

(Continued from page 97)

increased one-half size when you place it on a mandrel and pound it with a leather hammer.

To clean the finished silver projects before polishing, boil them in a pickling bath consisting of one part sulfuric acid added slowly to eight parts water. Or mix a dry compound called Sparex with water. Sparex is purchased at craft shops or jeweler's supply stores.

It is always advisable to wear eye

[Please turn to page 134](#)



**5** Test-fit the stone in the bezel; hammer the silver or file edges as needed.



**6** Hold together the two edges to be soldered. If needed, even them with a saw.



**7** After fluxing, insert solder pieces inside the bezel and heat. Return the bezel to the mandrel to check roundness. At this time, round the edges of the shank by pounding them against the mandrel.



**8** Form the shank around the mandrel to be one size smaller than the final size.



**9** Trim excess silver with jeweler's saw.



**10** After tapping the shank ends on a mandrel so they meet in a perfect match, flux and solder the ring's shank seam.



**11** Sand the top of the bezel flat and to the proper height for stone on 400-grit sandpaper. File or sand all edges smooth.



**12** Form an open ring on the mandrel. Later, it will be soldered inside the bezel under the stone to support it.



**13** Insert the support ring in the bezel; push the stone so its top is flush with the top bezel edge. Mark support placement by scribing inside the bezel. Remove the stone; solder the support, heating from the outside away from the joint.



**14** After sanding the ring with 400-grit paper, polish it on tripoli and rouge buffs. Wash the ring in soapy water and apply a cyanoacrylate adhesive inside the bezel to anchor the stone in place.



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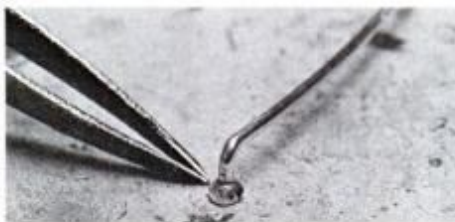
**1** To make silver rings of uniform size for the pendant, wrap silver wire around a metal rod or a bit in a hand drill.



**2** Saw across the rings to separate them. Bend the ends so they meet. To make the scrolls, see photos of the cross project.



**4** Make highlight beads by shaping balls of silver wire; melt them with a torch.



**6** Choker for the pendant is a 16-in. silver wire with one end slightly bent and a silver ball soldered onto it.



**7** Form a hook in the other end. Round the choker with your hands. Finally, clean in Sparex, polish and wash.

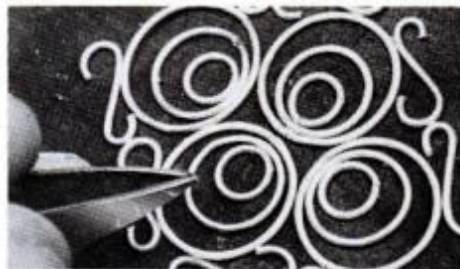
## 4 SILVER JEWELRY GIFTS

(Continued from page 132)

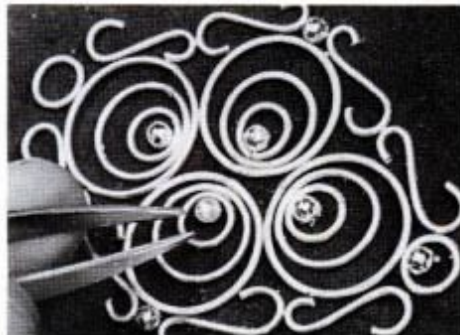
protection when working with power tools. Jewelers also wear eye coverings that magnify their work. However, I have worked successfully with reading glasses that magnify about two times. **PM**

### Sources

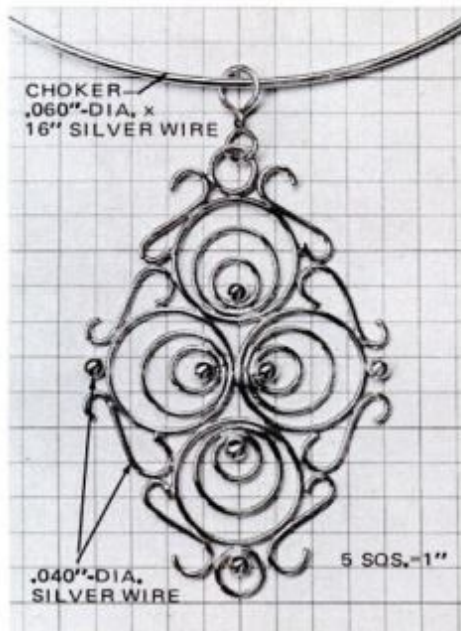
Jewelry tools, semiprecious stones and sterling silver are available in many places throughout the United States. However, the author has three favorite sources that earned such status through consistent quality and service. They are Allen Goldman, 15 West 47th St., New York, N.Y. 10036, for semiprecious stones; Gamzon Bros. Inc., 21 West 46th St., New York, N.Y. 10036, for tools and polish, and Myron Toback Inc., 23 West 47th St., New York, N.Y. 10036, for silver in all forms.



**3** There is no set pattern for this ring and scroll pendant. Experiment by making parts and shifting them. Each group of three circles here was soldered individually, then joined. Then S-scrolls were added. Later, top and bottom circles were added.



**5** Solder the silver beads in place. Then form a figure-eight suspension ring (see finished piece) and solder it in place.







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class paint job can make the difference between a so-so and a professionally crafted look.

**General finishing directions**

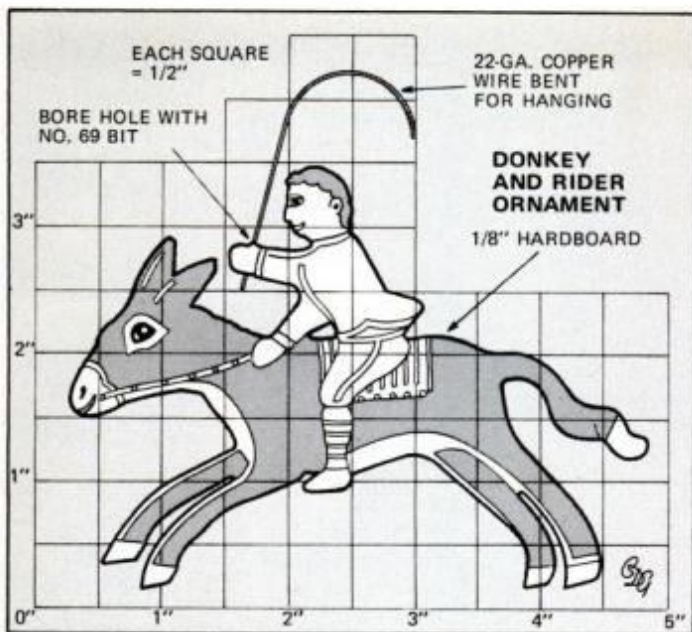
To finish your wood projects, begin sanding them smooth, using either 80- or 100-grit sandpaper. Finish raw wood sanding with 150-grit paper. Dust the piece and wipe it with a tack cloth.

To seal and prime the wood pieces in one step, apply pigmented shellac such as Bin or Enamelac. If you prefer the two-step prime-seal method you first seal, then prime the wood. A good sealer is 3-lb.-cut white shellac thinned 50 percent with denatured alcohol, and applied with a brush. Or you could use a clear acrylic spray sealer. (Test it on scrap wood to make sure the paint you use is compatible with the sealer.)

When dry, rub the work lightly with 180-grit sandpaper, dust and wipe with a tack cloth. Then treat the surface with a primer made by the same firm as the paint you plan using. Lightly sand with 180-grit paper, dust and wipe with a tack cloth.

Apply two coats of paint to the surface, using a spray or brush-on type. After the first coat dries, sand lightly with 220-grit paper, dust and wipe with a tack cloth before applying a final coat.

To protect delicate painted designs, apply satin varnish over the dried paint. For a shinier look, use high-gloss varnish.



**1 Donkey and rider ornament**

This Christmas-tree ornament hangs by the rider's switch (22-ga. copper wire). Cutting and painting details on the donkey and rider require greater skill than do most other decorations. Study the color photo and drawings carefully as you paint the decoration.

1. Draw the pattern squares full size on paper; then sketch in the pattern and trace it on 1/8-in. hardboard such as Masonite, or 1/4-in. poplar plywood.

2. Cut out the ornament using a scroll saw or coping saw. Before you cut the interior

area, bore an entry hole to accommodate the blade. (To eliminate this interior cut, paint that area charcoal gray.)

3. Sand the edges smooth with 100-grit paper.

4. Using a No. 69 bit, carefully bore a hole for the switch.

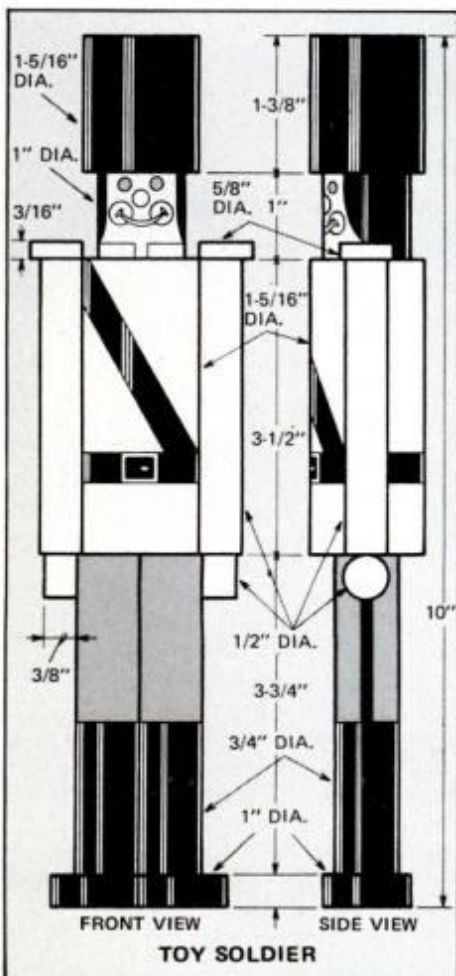
5. Sand, seal and prime as suggested in the general finishing instructions.

6. Painting the rider lets you use any bright colors you have on hand. For extra color paint cuffs on the rider's jacket and polka dots on his

britches; add fringe to the donkey's blanket. Use burnt umber to paint the donkey; mix it with white to paint the muzzle, around eyes, belly and for highlights on ears, legs, jaw and rump.

Subtle detail like this will add greatly to the overall effect.

7. Cut a 3-in. length of copper wire, insert it in hole and bend it to shape. Add a drop of white glue to anchor the wire.



**2 Toy soldier**

You can use this toy soldier as a mantel or table decoration. A good project for children, it is simply made of discs sliced from round stock, painted and glued.

1. Slice discs of 1/2, 3/8, 1/2, 1- and 1-1/2-in.-dia. round in bologna fashion. Sand cut surfaces to true parts if needed.

2. Sand, seal and paint using the color photo as a guide. Use toothpicks to elevate painted parts so they won't stick to paper or bench while drying.

3. Assemble parts with white glue.

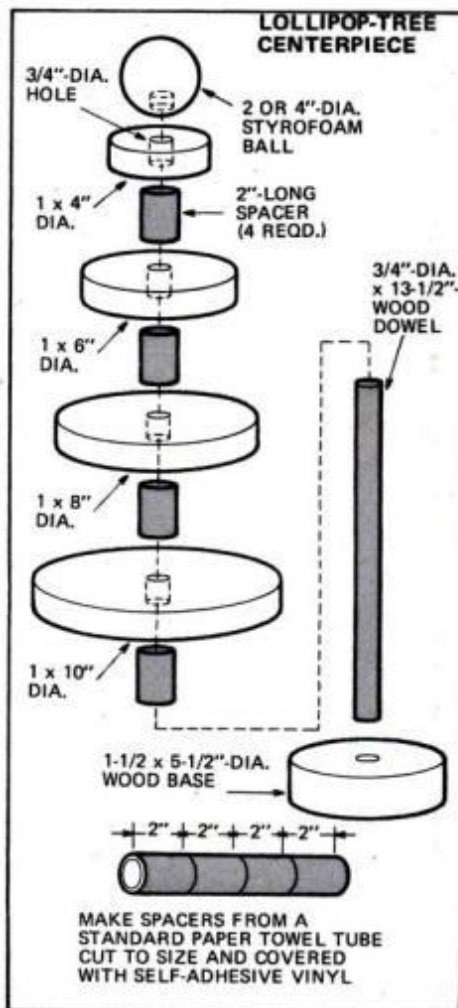
4. Spray several coats of high-gloss varnish on the soldier.

**3 Lollipop-tree centerpiece**

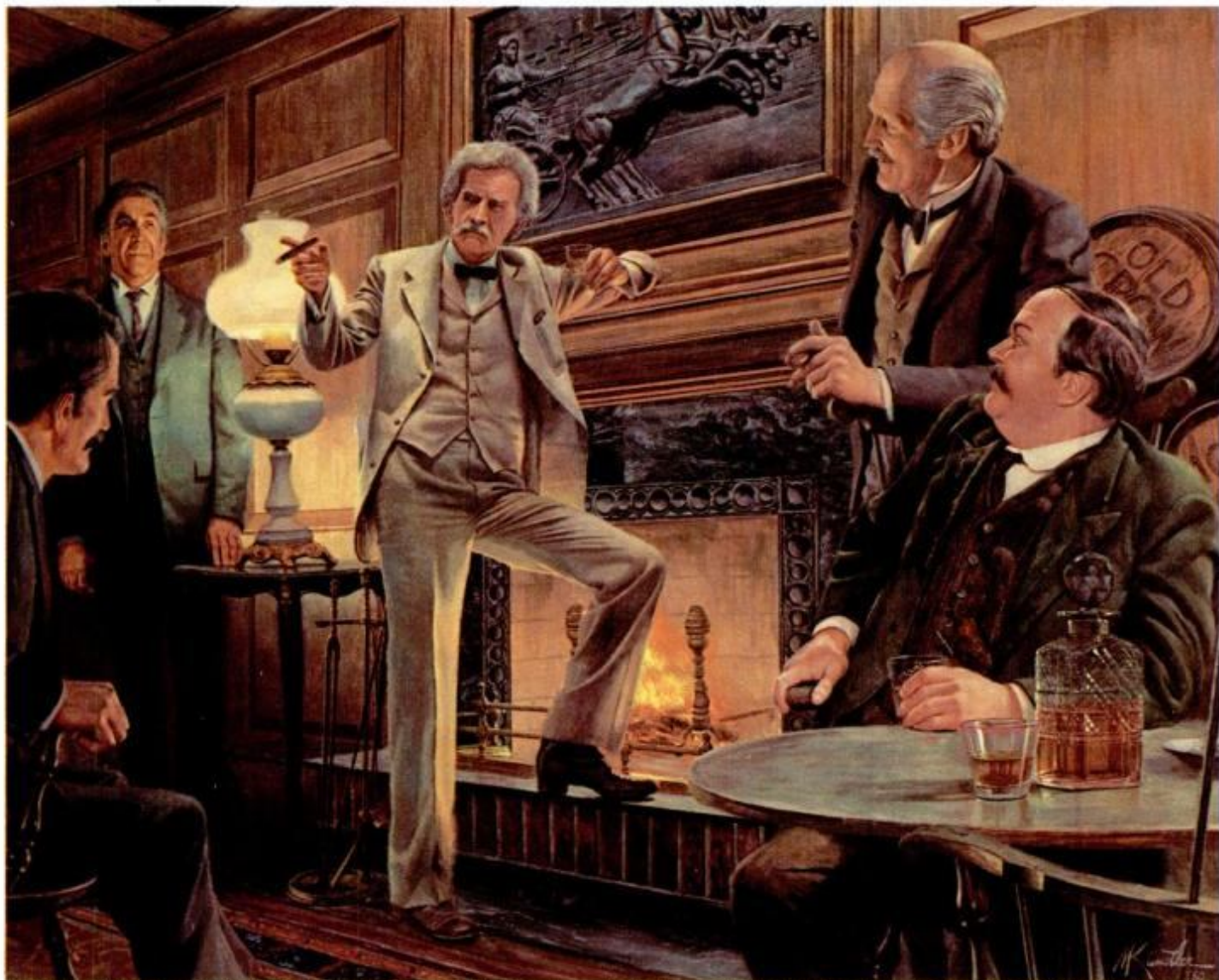
Kids will gravitate naturally to this lollipop tree. Load it with lollipops so it will maintain colorful foliage despite constant pruning. A knockdown version, it stores easily after the holidays.

1. The four tiers are 1-in.-thick Styrofoam discs 4, 6, 8 and 10 in. in diameter. You can buy precut discs or cut your own with a hacksaw blade or sharp knife. The 2- or 4-in.-dia. Styrofoam ball is available in variety and hobby stores. After you cut the foam, rub the edges with a piece of Styrofoam scrap to smooth them.

2. Cut the base, a 1-1/2 x 5-1/2-in.-dia. wood disc, and bore a 3/4-in.-dia. hole in the center







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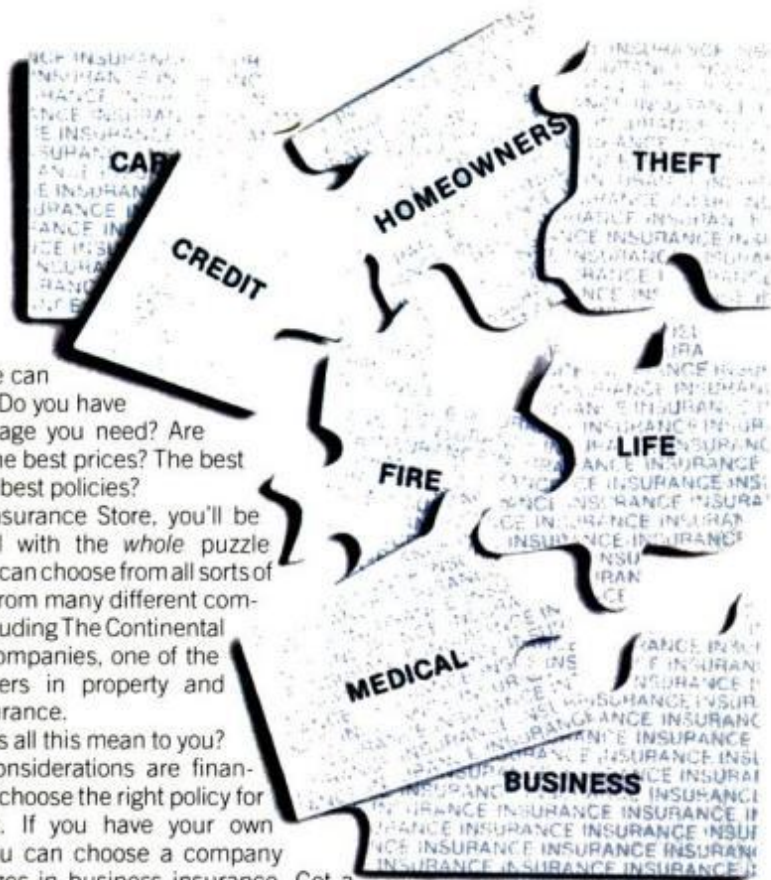
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# IT'S EASIER

## 14 HOLIDAY DECORATIONS

(Continued from page 136)

for the tree trunk. Seal the base and apply two coats of green spray paint, following preceding finishing directions.

3. Cut a 3/4-in.-dia. dowel 13 1/2 in. long.

4. Locate the center of each disc and cut a 3/4-in.-dia. hole for the tree-trunk dowel. Also cut a similar hole about 1-in. deep in the Styrofoam ball.

5. Cut an 8-in. paper-towel tube into 2-in. lengths. Wrap all pieces with red self-adhesive vinyl.

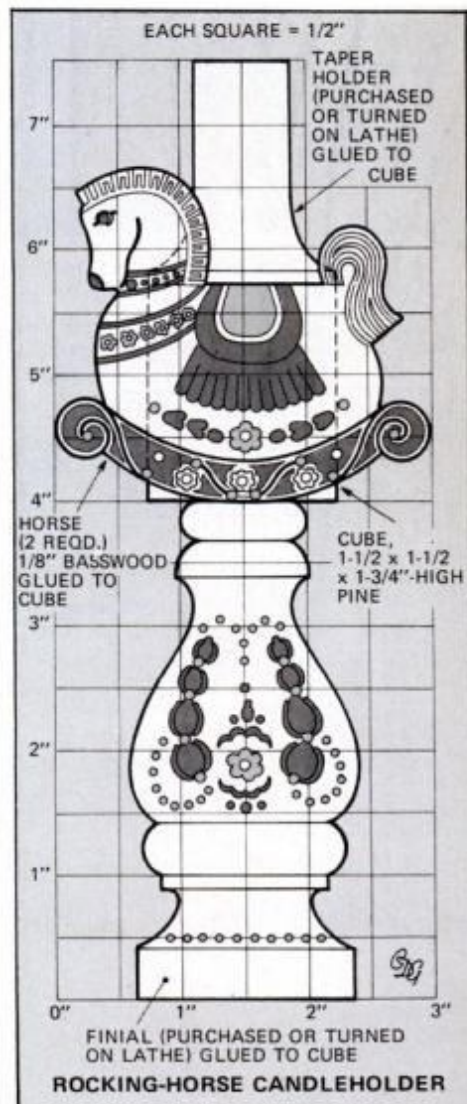
6. Begin assembly by inserting the wood dowel into the base and slipping on a Styrofoam disc followed by a spacer. Top the tree with the ball.

7. Insert the lollipops into the Styrofoam discs so the candy slants outward slightly. Be careful to space the lollipops evenly.

Also, be certain that you do not push the stems completely through the Styrofoam or, in time, they will slip down.

## 4 Rocking-horse candleholder

Rocking horses colorfully decorated in the folk-art tradition ride atop wooden finials bought at a lumberyard. You can get small holders for the narrow tapers at card shops (or turn them out on a lathe).





1. Mark off the graph squares full size on cardboard (see drawings), sketch the horse's outline and cut out.

2. Outline the pattern on 1/8-in. basswood. To save time, cut out two horses at once by clamping or tacking pieces of basswood together. Use scroll saw to cut out the ornament. Also cut out the 1 1/2 x 1 1/2 x 1 3/4-in. block.

3. It's easiest to paint and decorate the wood parts (horses, wood block, finial, taper holder) before assembly. Seal, prime and spray-paint the background according to the finishing directions. We used Krylon No. 1801 Chrome yellow spray paint—select your own color.

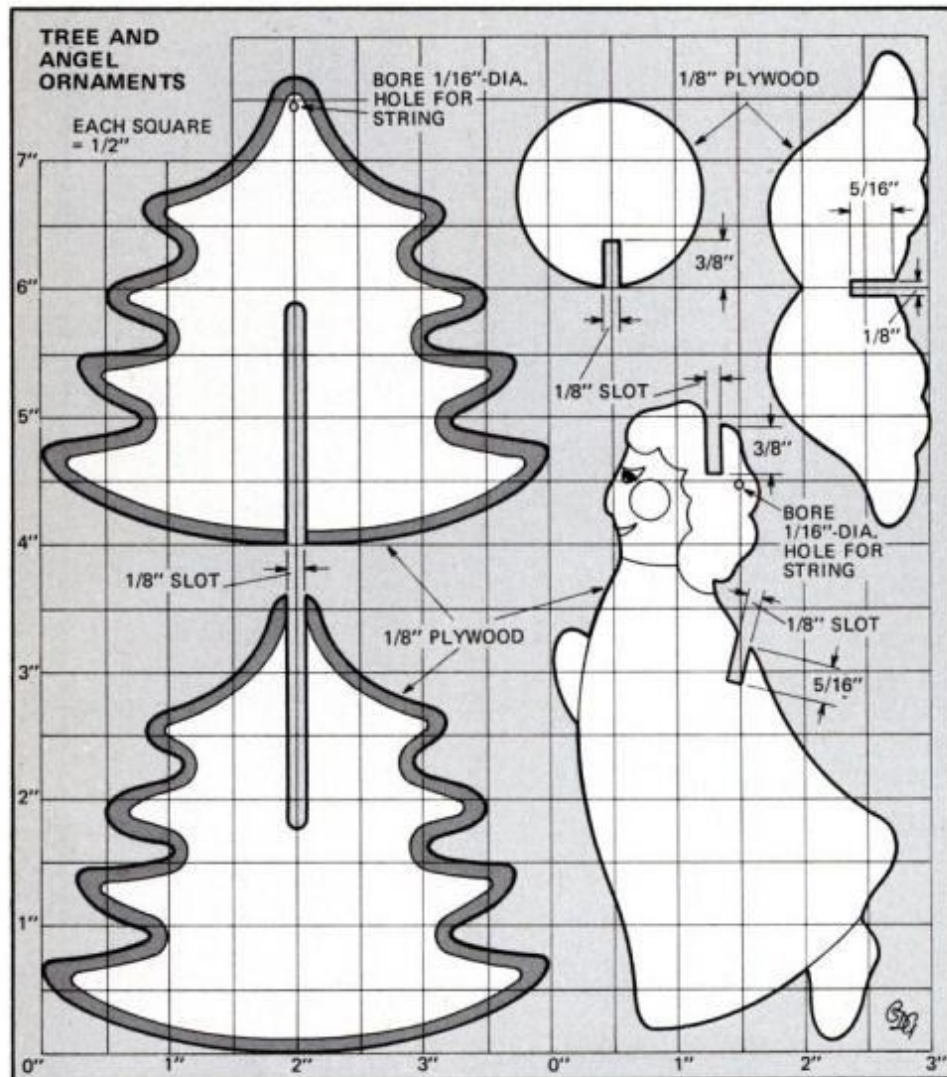
4. Before decorating the candleholders, familiarize yourself with the design by draw-

ing it in pencil on the cardboard pattern. First sketch in the saddle and the rocker; then add the flowers. We used jars of model paints in red, green, blue, black, gold and gray-green colors.

However, before you apply the colors, paint the decorative areas white to make the final colors stand out. Avoid getting paint on the surfaces to be joined, as glue will not adhere. For a fail-safe approach, lightly pencil in the pattern before you paint.

5. When the paint is dry, glue the horses to the wood block, making sure they are properly aligned. Glue the bottom finial to the wood block and glue the taper holder centered on the top of the block.

6. Protect the painted decoration with several light coats of satin finish varnish.



## 5, 6 Tree and Angel ornaments

The tree and angel ornaments, cut in several parts, are joined by interlocking slots.

1. Mark off the graph squares (see art) full size on cardboard, draw in the ornament pattern and cut out the shape.

2. Trace around the pattern on 1/8-in. poplar plywood or hardboard.

3. Use a scroll saw to cut out the ornaments. Cut the 1/8-in.-wide interlocking slots before

cutting out the shapes. The slots should be cut to give a slight amount of play to allow for paint buildup. Then, smooth the edges if needed.

4. Bore a 1/16-in.-dia. hole to accept the tree hanger.

5. Sand, seal and apply the finish. See color photo for paint suggestions.

6. Assemble parts using a small amount of white glue.

7. Apply a high-gloss varnish.

(Please turn to page 140)

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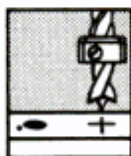
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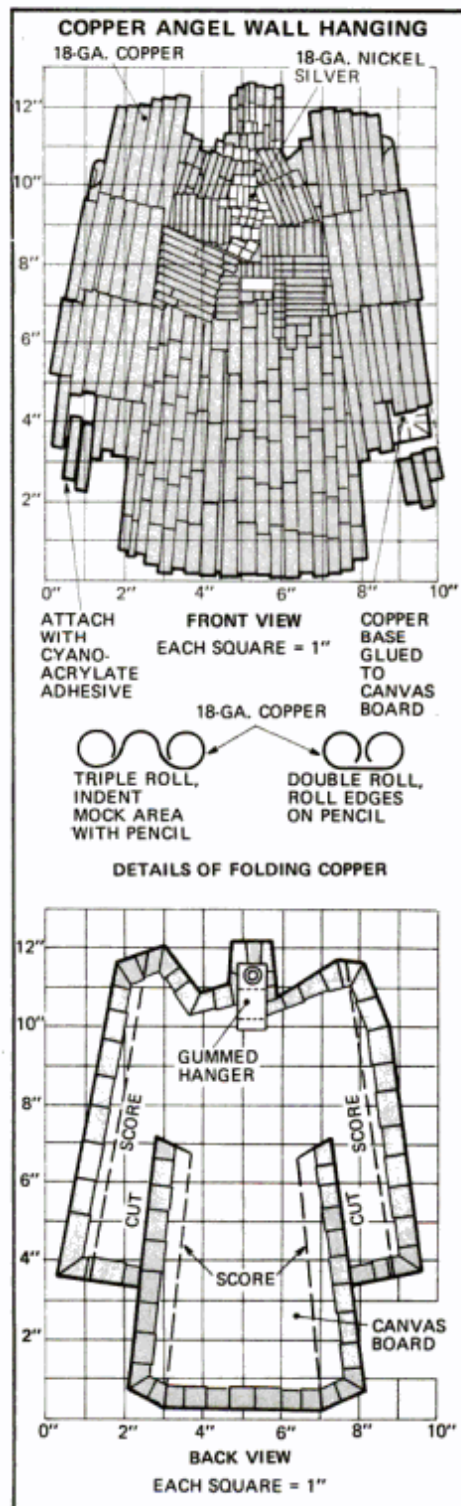
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## 14 HOLIDAY DECORATIONS

(Continued from page 139)

### 7 Copper angel wall hanging

You don't have to solder parts together to make this handsome copper wall hanging. The relatively new cyanoacrylate adhesives let you glue metal parts securely. The costliest of our Christmas decorations is made of 18-ga. sheet copper with sheet nickel-silver accents. Our designer used three 12×12-in. sheets of copper (about \$8 per sheet). The angel has a green patina. If you can't find the sheet metals or patina you can buy them by mail from All-craft Tool and Supply Co. Inc. 100 Frank Rd., Hicksville, N.Y. 11801 (516/433-1660).





1. Mark off the pattern squares full size on heavy cardboard or canvas board and draw in the angel (see art).

2. Cut out the angel with a utility knife and make the scores and cuts noted.

3. Cover the angel with sheet copper, securing it with white glue. Allow 1/2-in. tabs of copper along the edges of the angel. Cut away excess copper between tabs, bend them back and glue (see back view). Allow time for the glue to dry.

4. The copper texture covering the angel is made by cutting strips of copper sheet in various sizes from 2 1/2-in. widths in the wings to 1/4 and 1/2-in. widths in the neck and front. Roll

these strips around a pencil to form tubes (see details in art).

Vary the sizes of the rolls by using pencils, tin paintbrush handles and other small, cylindrical shapes.

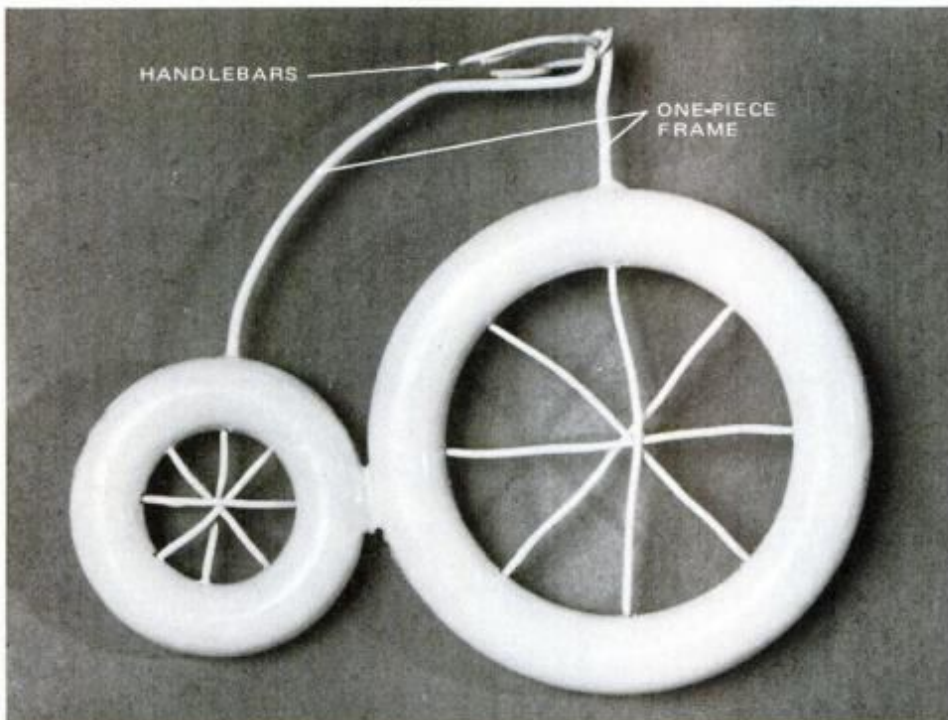
5. Glue the tubes in place with cyanoacrylate adhesive, varying the size to suit the area. Be careful not to get glue on the front of the copper; the green patina wash won't take over the adhesive.

6. Brush on green patina and let it dry.

7. Use No. 0000 (fine) steel wool to rub off the patina and to bring out the copper luster in selected areas.

8. Spray piece with satin-finish varnish.

## 8 High-wheel bike ornament



High-wheel bicycles are produced with wooden drapery-type rings and 14-gauge wire.

For a change from the traditional Christmas symbols, hang these high-wheel bikes in many colors on your Christmas tree. They're made of a smaller (1-in. i.d.) wood drapery-type ring glued to a larger (2 1/4-in. i.d.) wood drapery ring. Rings are available at Lee Wards Inc. and at other craft and housewares stores across the country.

1. Begin by sanding the rings with 150-grit sandpaper to remove body oils or any finish that may be on the rings, so paint will adhere.

2. Mark and bore four pairs of 1/8-in.-deep holes (using a No. 46 bit) for the 14-ga. wire spoke inside each wheel. Bore holes directly opposite each other. First halve, then quarter and divide the wheel into eighths to locate holes.

3. Bore hole with same bit for one-piece frame in outside, top of each wheel.

4. Cut four pieces of 1 1/4-in.-long wire for spokes, apply a small amount of white glue to the wire ends and insert each into the holes of the smaller wheel.

5. Cut four 2 1/2-in.-long pieces of wire for spokes; glue them into the larger wheel.

6. Line up the bottoms of the two wheels,

making sure that the steering holes are on top, and glue the edges together. Wipe away excess glue as paint will not easily adhere to it.

7. Cut a 5 1/2-in. length of wire for the one-piece frame (the handlebars are separate), shape it as shown in the photo and glue the ends into the holes.

8. The 4-in. wire for handlebars wraps around steering wire; ends are looped.

9. Seal and prime wood; apply two coats of spray enamel in your choice of colors as suggested in finishing directions.

## 9 Dove ornament

Lightweight, easily made doves of aluminum screening can rest on the tiniest tree branch. Yarn bows add color.

1. Mark graph squares full size on cardboard. Draw in dove pattern and cut out.

2. Fold aluminum screening in half, sandwiching cardboard pattern, and making sure the screening fold is on bottom of dove. With grease pencil, outline dove on screen and cut

(Please turn to page 142)

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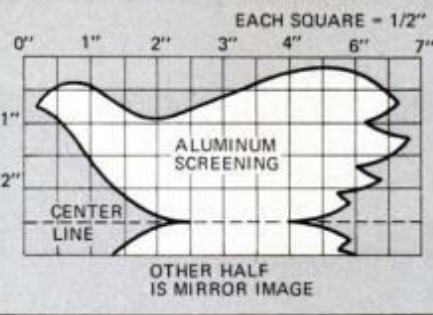
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### DOVE ORNAMENT



out shape. *Don't cut the fold.*

3. Fan out wings to shape. Apply several light coats of antique white spray paint.

4. Tie a yarn bow at the dove's neck to keep the two layers of screening together.

### 14 HOLIDAY DECORATIONS

(Continued from page 141)

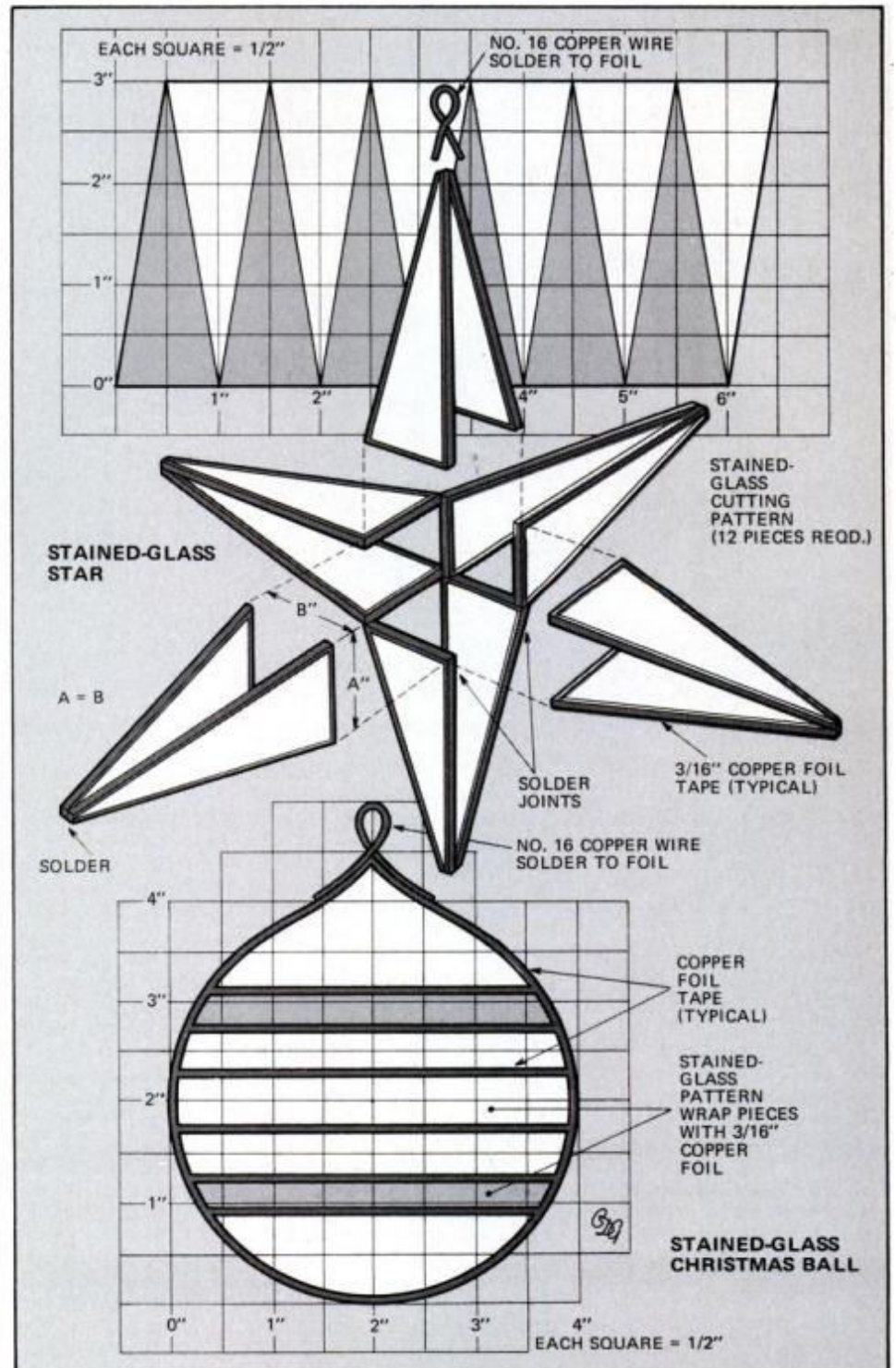
## 10 Stained-glass star

Twelve stained-glass triangles are easily formed by making straight cuts with a glass cutter.

The materials in the decoration include: colored glass, 1/16-in.-wide copper foil tape, No. 16 copper wire, 50/50 solder, liquid flux, patina (copper sulfate dissolved in water) and metal polish.

Tools that you will need are a waterproof felt-tip marker, glass cutter, parallel-jaw or glass pliers, paintbrush and 60/100 soldering iron.

(Please turn to page 146)





# "Home heating costs were eating me alive... until I got my Buck Stove!"

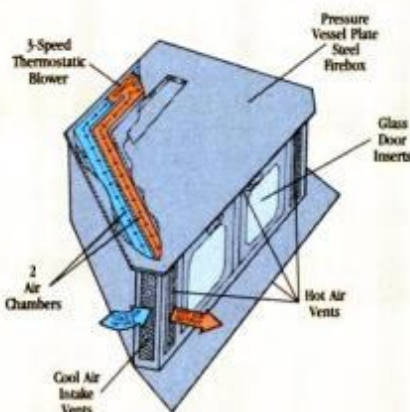
Mr. Gobel Green — Candler, N.C.

## The Buck Stove: Whole-house heating that saves you money.

The Buck Stove is *not* just another wood stove, freezing you in one room and roasting you in another. It's a low cost, high-technology alternative to your present gas, oil or electric heating system. With its own built-in thermostatic blower, the Buck Stove works effectively and efficiently, safely and quietly. And *very* inexpensively — using less wood than a conventional fireplace and no more electricity than a 100-watt bulb. Yet, unlike a Franklin-type woodstove, it can dependably heat your *entire* house — up to 3,000 square feet. And keep your family toasty warm, day and night. In fact, it's uncommon to find more than a 10°F difference between the room in which the Buck Stove is located and the far end of the house.

## How much money will you save with a Buck Stove?

While savings depend on a number of factors, current Buck Stove owners report saving up to 80% on their heating bills. What's more, those savings should increase with every passing year. Because while conventional fuels will continue to grow scarce and expensive, trees will continue to grow — period.



## Cost Of One Million Useful BTU'S



Source: Northeast Regional Agricultural Engineering Service

## There is only one Buck Stove heating system.

Buck Stove invented the forced air wood heating system and has continued perfecting it ever since. Its exclusive and patented design — for both fireplace insert and freestanding models — cannot be duplicated.

Since many Buck Stove imitations have appeared on the market, we think you should know why Buck Stove is *still* the leader.

**Quality Construction** — The Buck Stove is made with *three* steel walls. The firebox is pressure vessel plate steel — the highest quality steel available. The doors are cast grey iron, and the glass door inserts resist breaking at temperature as high as 1200°F.

**Airtight Design** — The Buck Stove heating system is engineered to burn wood or coal slowly and completely, allowing a controlled, even flow of air across the fire. This precise draft control makes it easy to build a fire and eliminates constant fire tending.

**3-Speed Thermostatic Blower** — The Buck Stove's powerful rear-mounted blower can completely recirculate the air in an 1800 square foot house once every half hour, insuring even heat distribution. And since the thermostat is regulated by the firebox temperature, very little heat is lost up your chimney when the fire is hot. And your house isn't flooded with chilly air when the fire cools down.

**Factory Certified Installation** — The Buck Stove has been rigorously tested for safety and is UL listed. But more important, every Buck Stove installer has been factory trained and certified, so

every Buck Stove installation can meet the strict specifications of Underwriters Laboratories, the National Fire Protection Association and all local fire and building codes.

## One Buck Stove owner leads to another and another and another...

If you *really* want to know how good a Buck Stove is, ask a Buck Stove owner. On an average, every Buck Stove owner sends us five new customers. Customers who are looking to save money and keep warm with the best wood heating system money can buy.

## Read this before you buy.

The Buck Stove "I Didn't Know That!" book will tell you what to look for and what to look out for when shopping for a wood stove. And give you some surprising answers to the most-asked questions about heating with wood and coal.

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## STAINED GLASS

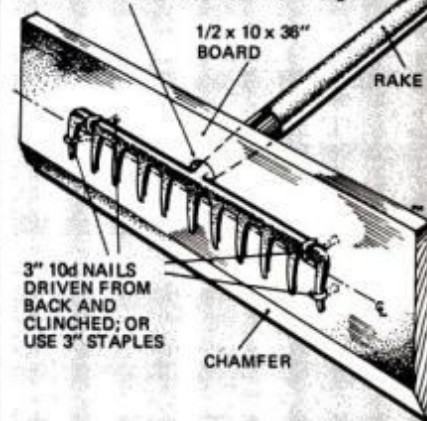
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# HINTS FROM READERS

## Snow-hoe ho

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I devised this "snow hoe" for roofs several years ago when our area in Ohio received record snowfalls. It prevents injury to me and the roof.—H.E. Schultz

## Propane-torch holder

A Christmas-tree stand can hold a top-heavy propane torch securely upright. Cradled in a stand, the torch won't fall over if it's put down hurriedly or kicked accidentally.—LeRoy J. Hebert

## Vinegar removes glue

Ordinary household vinegar removes glue from clothing. Warm vinegar loosens glued joints. Heat the vinegar to a simmer and brush several applications over a glued joint.—Lane Olinghouse

## Plastic slipsheets



Next time you need a slipsheet between pieces being bonded with contact cement, try clear plastic cut from material such as that used in grocery-store vegetable bags, instead of the usual kraft paper. The transparent material lets you see both pieces clearly for easy alignment.

—Walter E. Burton



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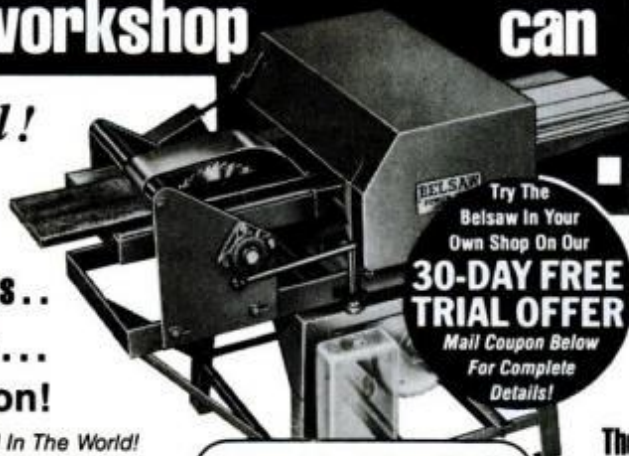
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## 14 HOLIDAY DECORATIONS

(Continued from page 142)

1. Enlarge the pattern shown to full size on a sheet of paper.
2. Place glass over the pattern and trace the lines on glass. Cut out pieces. If you can't see the pattern through glass, cut out pattern pieces, position them over the glass and trace around them. For techniques in cutting stained glass see *Flood your Home With Color Through Stained-Glass Windows* (page 110, June '76).
3. Wrap edges of each piece of glass with copper tape; carefully fold it over edges so equal tape is on each side of glass. Smooth tape down with round pencil or dowel.
4. Brush on flux and tin (coat with solder) the copper on the 12 pieces of glass.
5. Solder the tips of the triangles together in pairs so they form Vs.
6. Flux, solder six Vs together as shown.
7. Solder on a wire loop at the top.
8. Wash the piece with soap and water. Then rub the metal with a cloth dipped in patina, if desired, and apply metal polish.

## 11 Stained-glass Christmas ball

Patina applied to the metal of these Christmas-tree balls gives them an antique look. You can bring out the vibrant colors by positioning tree lights behind the balls. Materials and tools used are the same as those in directions for the stained-glass stars, page 142.

- 1 through 3. Follow steps to enlarge the pattern, cut the glass and wrap its edges with copper foil noted in stained-glass star directions.
4. Position the taped pieces of the Christmas ball on a scrap of wood and hold them in place by hammering tacks in the wood along the perimeter of the ball.
5. Brush on flux and solder the pieces together. Solder a small loop of wire to attach the decoration.
6. Wash the piece with soap and water. Then rub the metal with a cloth dipped in patina.
7. Apply metal polish to make the patina shine.

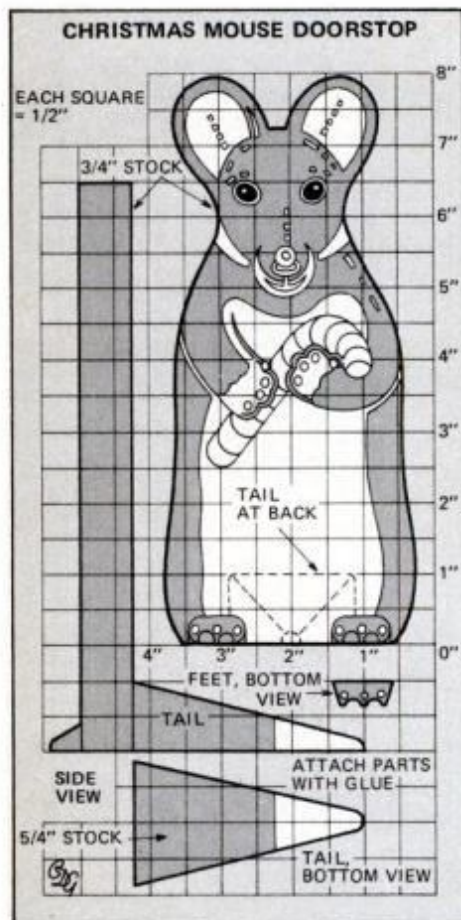
## 12 Christmas mouse doorstep

The Christmas mouse is cut of 3/4-in. (actual) stock with the tail and hind paws shaped and glued in place.

1. Draw the pattern (see art) full size and trace it onto the stock using graphite paper.
2. Cut out the mouse body.
3. Cut and shape the paws of 1/4 x 1/2 x 3/8-in. wood scraps.
4. Cut and shape the tail of a 1 x 1 1/2 x 3 1/2-in. wood block. You'll need 3/4-in. stock for this piece.
5. Assemble the parts with white glue and allow the glue to dry.
6. Seal and prime in accordance with the preceding finishing instructions. You'll use black, gray, red, rose and white paints. Mix the white, gray and a dab of rose to produce a warm gray. Mix the rose and white to make up a healthy pink. Paint the piece gray and white first. When



it's dry, you should lightly pencil in the details and paint them.



## 13 Santa mantel ornament

Our Santa design is simplicity itself. Hang it from the mantel along with the Christmas stockings.

1. Cut the discs (see art) of 1/2-in. pine (actual dimension), using 1 1/2, 2 and 2 1/2-in.-dia. hole saws. (You can also use 1-in. stock. However, in this case cut the dowel slices in Step 2 the same length as the thickness of the pine stock).

Chuck the rotary saw in a power drill. Clamp the work to the bench. If the drill is variable speed, begin at low until the blade penetrates the work, then operate at highest speed, feeding the saw slowly to produce a smooth edge.

2. Cut slices of 1/2- and 1-in. dowel the same length as disc thickness that was indicated in Step 1.

3. Bore the 1/2-in.-dia. hole for hanging the decoration.

4. Smooth all parts with 150-grit sandpaper.

5. Assemble the three discs (which will be red) using white glue. Separately, assemble the remaining discs, excluding the top white dowel slice.

6. Seal, prime and spray-paint parts as suggested in preceding finishing directions. You should first spray-paint the white assembly

(Please turn to page 148)

DECEMBER 1980 147

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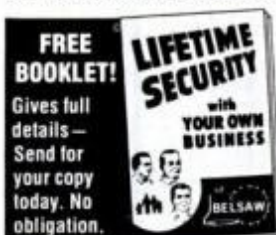


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### 14 HOLIDAY DECORATIONS

(Continued from page 147)

- and then do the same for the red assembly.
- Lightly pencil in the face features and paint them.
  - Assemble parts with white glue.
  - Apply several light coats of high-gloss varnish.

## 14 Christmas-card candle cubes

These simple candle cubes are an excellent way to display some of the favorite Christmas cards that you've been collecting over the years.

You can make the cubes of 1/2-in. scrap wall paneling or hardboard. We topped them with candleholders spray-painted white.

1. To make a pair of cubes, cut eight pieces of 1/2 x 4 1/4 x 6 1/4-in. stock for the sides; then cut the two tops, 1/2 x 3 3/4 x 3 3/4 in.

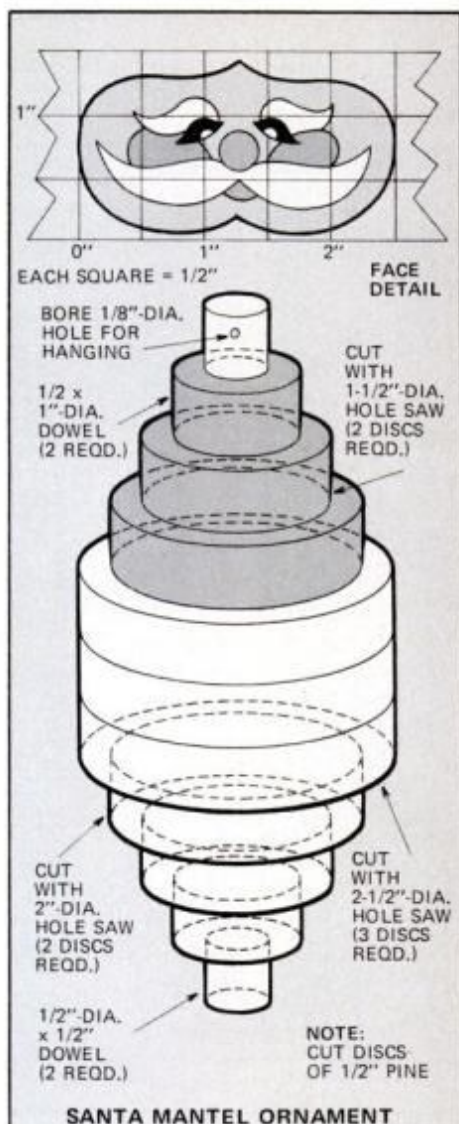
2. Assemble the cubes with white glue, setting the top inside and flush with the top edge of the sides.

Then tape the cubes together with masking tape until the glue is dry.

3. Seal, prime and spray paint the top of the cube as suggested in the preceding finishing instructions; or you may wish to leave the wall panel as is.

4. Select your favorite cards; then carefully trim them to fit the cube sides and attach them on the cube using contact cement. If you should want to use a smaller card, first back it with colored construction paper that's cut to suit the cube size.

5. Spray the cubes with a clear, protective plastic coating such as that used in decoupage work, or varnish.



Christmas-card candle cubes are pieces of paneling glued together, faced with cards.



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Heavily rusted metal panel (center). Rustoleum shows rust formation (left) while **RUST BUSTER** remains clean and rust-free! (rt.)

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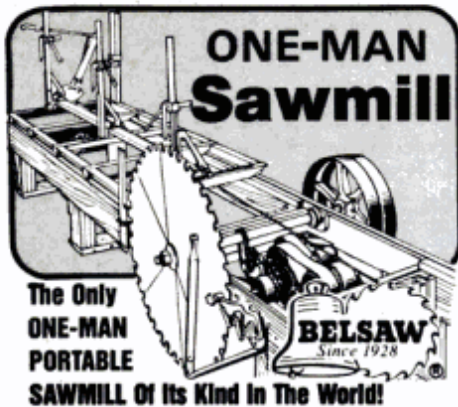
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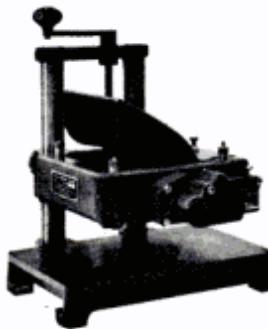


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## THE OCEAN EXPRESS DISASTER

(Continued from page 124)

Nothing in Coast Guard annals matches what ensued.

Few of the men had ever seen the inside of a capsule. Incredibly, few knew how they worked. They found themselves in a domed room 12 feet wide and 8 high. Some at once belted themselves to a long seat that circled the wall. A few took seats backed to the center support column.

About half didn't fasten the safety belts.

### Chaos reigns inside

Lights were on. The men could smell paint and diesel fumes. On one side were two large doors, but these were dogged shut for safety. There was a toilet in the room, and a good thing it was, for in the thick air more and more men grew seasick. Up in the overhead were an air purifier, its blower and a parachute flare pistol.

On one side a man steered by a stubby tiller and put the engine in drive. There was no reverse. The big egg rode very well. The men took comfort in the knowledge it was "noncapsizable."

Soon someone, through a window, spotted the lights of the tug *Viking*. In tall seas, she was going up and down like an express elevator. And suddenly No. 3 hit it a hard blow. Some wanted to cheer.

But unlike No. 1, which had come up on the sheltered lee side of the survey ship, No. 3 now found itself bouncing *astern* of the tug, tossed by the seas and with no shelter at all. As the tug maneuvered to protect it, a man in No. 3, a driller named Tommy Loftin, threw open the top hatch, struggled to stand up, and tied a light nylon line to the lowering hook. Then he tied a floating strobe distress light to the line and hurled it toward the tug.

The seas were astonishing. On the tug, a crewman found himself looking up at the capsule, poised on a crest high above him—then peering down to see it far below.

At last, someone on the tug caught the line. Relieved, the 19 men in No. 3 sat waiting to be saved.

Several times they heard cracking as No. 3 smashed against the tug. Up top in the open hatch, Tommy Loftin was taking a beating. He had already lost part of a finger. Collisions kept hurling him down. Others, waiting to escape, shouted at him, "What's the matter, man? Why don't you get out?"

But "getting out" was impossible. Loftin, finger bleeding, slammed the

hatch shut and came below. Someone said: "Hell, we're safer here. Tommy, go up and tell the tug to pull us to shallow water, then get away from us."

Wearily, Loftin climbed up top again. On the tug, a man shouted back: "Ain't no way we can tow you." Loftin fell inside and closed the hatch. Someone said water was getting in.

The biggest jolt came without warning. Suddenly, men without belts were flung against those belted in place. In a split second, No. 3 capsule had mysteriously flipped up on its side. No one is sure what did it. A steep wave? Strain on the line from the helpful tug?

Moments later "noncapsizable" No. 3 simply flipped upside down. Men tumbled into the inverted dome, fighting to get clear. Lights went out. The engine stopped. No one could find a flashlight. Aboard the tugboat the shocked crew looked in awe.

Inside No. 3, ears popped. Heads went under. Diesel fumes were sickening. Then the screaming stopped. In silence, the men heard the tug's engine throb and her propellers churn. The toolpusher, Boudreaux, thought: "She's maneuvering to pull us right side up." Several times the capsule jerked. It seemed men might be trying to tie lines to the tiny propeller. What else could they tie to?

### Weight plays a cruel trick

The relentless chain of disaster persisted. With all those men in the roof, it now became impossible to right No. 3. Most were big men. Their weight made up nearly two tons of ballast—in the wrong place.

Ladders built into one wall might have helped them climb—until their weight righted the capsule. But if there was any such way to climb one side, no one used it. The toolpusher saw a strange sight: a green light glimmering in the windows. "It's the tug's searchlight," he thought. "We're seeing it through water. They'll get us yet."

Squirming, he felt one leg go into water. His foot had gone through a window. Water poured in. He felt the capsule jerk sharply. Then came another jolt and the main side doors fell open. Boudreaux saw a chance and leaped out. So did the drill foreman, Melancon. Five others followed. On the tug, men jabbed with boathooks. One of those they fished out was the injured Tommy Loftin.

On the tug, those rescued waited for others to appear. Dead tired, Eddie Melancon threw himself on



the deck and slept. A wave broke over him. He slept on. No others appeared from No. 3.

Alone on *Ocean Express*, Capt. Van deGraaf continued to try to save his barge. By hand radio, he told the tugs, repeating it three times, to try to tow the *Express* toward shore, then cut loose and save themselves. He'd seen both capsules motoring toward ships and did not know about the trouble in No. 3.

Nor did he know that the submerged steel mat, still 148 feet down, might *already* be hitting bottom. It was, in fact, now only 19 feet off the ocean floor, which was shoaling. Was it possible the mat, dragging bottom, caused the worsening list? Van deGraaf knew only that the tilt was getting dangerous.

### Trying to rescue the captain

Coming from the west, Coast Guard pilot Lewis called and asked how things were. He was surprised and pleased to hear from the barge master that the entire crew had gotten away in capsules which could motor to safety.

When he found that the captain alone was left, he radioed: "Do you want to come off?" The captain said yes. Lewis said: "Light a flare."

Toward 9:10 he spotted a red glow. "We have you in sight," he said, reassuringly.

But from 800 feet up the sight was nightmarish. Blurred in the whirling spray were the lights of two tugs. Near the barge were two pale objects, obviously capsules. Seas were pushing the barge far over. Up in its bow, blue lights still marked the landing pad.

But how could pilot Lewis reach it? Those leaning legs and derrick blocked the upwind approach he wanted to make.

Van deGraaf's radio was getting weak. Lewis began to have doubts. ("I didn't really want to go down near that thing," he later told the inquiry.) Lashing seas could easily stall the H-52's engine.

Another problem: There was no good way to establish a hover. Finding stable air over that tilting pad would be impossible—even if he could miss the towers.

Another problem was the gale. If he came downwind, it would blow him into the towers. A third problem was visual reference. Letting down, a pilot needs to pin his eyes on something steady. The towers were moving, but they'd have to do. Watching them, he told his crew: "Here we go."

He came in from one side. He saw Van deGraaf scrambling up the pad,

waving and saying things into his radio. Timing it to split seconds, Lewis tried a pass. Turbulence made it hopeless. He made a hard instrument climb-out and went around again.

At this point, CG chopper No. 1429, another H-52, arrived, flown by Capt. Howard Thorsen. Lewis reported grimly: "I've been down there and couldn't do it. I'm going back and try again."

On his second try, the barge was listing a sharp 30°. Lewis and his two men knew there was little time left. The H-52 has no hoist bay. Peering down from the door on the right side, behind the pilot, Lewis's crewman, Harold J. Thomas, began calling: "Come right . . . come forward . . . come left." It was hard to see. Thomas was hanging halfway out, held by a gunner's belt. "Come left . . . now hold it!" Thomas called.

But in the gusts it was impossible to hold. Even worse, the barge's lights were going out. Lewis was losing his precious reference points.

### Beginning of the barge's end

Then without warning a dazzling shaft of light illuminated the whole barge. Somewhere up above, chopper 1429 had switched on a powerful floodlight known as a Night Sun. Now Lewis clearly saw the tangle of pipe on deck, the shifted derrick. The barge was rearing up backward like a horse and falling off to its right side.

Lewis pulled away and held "a little conference" with his crew. All caught their breath. When they came back next time the towers were at 45°—halfway down to the sea. Lewis thought: "It's now or never for that poor guy."

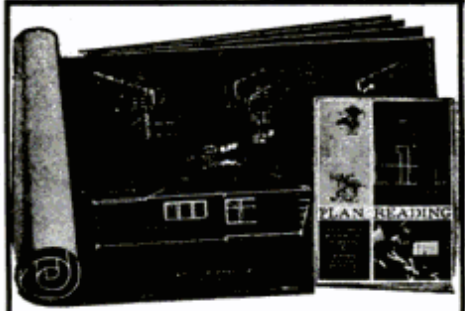
At that point, it appeared it would be never. Something went wrong on the final try—Lewis wasn't sure what. Unaccountably, he felt dizzy. And the chopper wasn't flying right.

Or so it seemed. What he didn't realize was that the barge, directly beneath him, had begun its final plunge. It was rolling over backward and sideways at the same time. The towers were falling—his reference points. And his eyes were following them into the sea.

A splash of seawater hit the windshield; another splash of salt spray came into the cabin. Then crewman Thomas was yelling: "Up! Up!" The jet engine was ingesting salt water. It was "spooling"—speeding up and slowing down. Lewis pulled the chopper up.

He should have given up then. Clearly, rescue was hopeless. But he

(Please turn to page 154)



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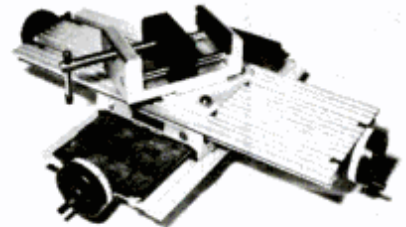
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## HANDSOME WORK CENTER

(Continued from page 101)

drawers (R through Z). Assemble the drawers with glue and 4d finishing nails. Cut the grooves in the side and front members to receive the bottom panel. On the sides only, cut dados to receive the back and rabbets to receive the drawer false fronts (V).

To assemble the drawers, glue and nail the sides to the false front and slide in the bottom without using glue. Attach the back to the bottom and sides with 1-in. nails and glue. Finally, attach the front to the false front with 1/4-in. No. 8 fh screws installed from inside the drawer. Add porcelain knobs or other hardware.

Now you're ready to screw the case to the wall cleats using 1/4-in. No. 10 fh screws.

Apply the laminate with contact cement, following the maker's directions on the can. Do all vertical surfaces first, then laminate the horizontal surfaces. Make certain all workpieces are clean, and work only in a well-ventilated room.

### Building the bookcase

Locate and secure the wall cleats (H, I), using either screws into studs or toggle bolts. Secure the bookcase to both upper and lower cleats.

Cut and attach the sides (A) and top (B) with glue and 6d nails to make butt joints. Then cut the shelves and dividers (C through F and L). Measure and cut grooves in the shelves (D) for partitions (L). Indentations in the partitions make it easier to grasp stored brochures and pamphlets. Mark and cut partitions with a band or sabre saw.

Next, attach the shelf standards (KK). Assemble parts D and L and install this section as a unit between the left side (A) and the vertical member (C), with glue and 6d finishing nails. Set all nailheads. Add shelf (E). Test-fit shelves (F) and remove.

If possible, get help to flip the bookcase onto its front. Install the back pieces with 4d finishing nails. Attach the butt block (G3) over the back seam.

Fasten the bookcase to the wall cleats using 2-in. No. 10 fh screws. Position the shelves (F). Finally, cut and attach the front trim (J,K).

### Finishing the unit

To achieve a professional finish, follow these steps:

■ Sand all surfaces smooth with 80-, then with 120-grit sandpaper; dust and wipe with a tack cloth.

■ Prime all exposed surfaces with a

pigmented shellac such as Bin or Enamelac. Sand with 150-grit sandpaper, dust and wipe with a tack cloth.

■ Apply two coats of paint, sanding, dusting and wiping with a tack cloth between coats.

After the paint is dry, prepare the surface for the cork bulletin board by sanding it lightly. Using a straightedge guide, cut entirely through the cork with a utility knife. Apply adhesive for the cork to the bookcase surface with a trowel. When the cork is in place, press firmly with rolling pin. **PM**

### MATERIALS LIST—WORK CENTER

Key	No.	Size and description (use)
A	2	3/4 x 10 1/4 x 52 1/2" plywood (bookcase sides)
B	1	3/4 x 10 1/4 x 82 1/2" plywood (bookcase top)
C	1	3/4 x 11 x 52 1/2" plywood (bookcase divider)
D	2	3/4 x 11 x 64 1/2" plywood (bookcase shelves)
E	1	3/4 x 11 x 15 3/4" plywood (bookcase shelf)
F	3	3/4 x 10 1/4 x 15 1/4" plywood (adjustable bookcase shelves)
G1	1	1/4 x 48 x 82 1/2" plywood (upper bookcase back)
G2	1	1/4 x 5 1/4 x 82 1/2" plywood (lower bookcase back); (overall back of bookcase is 53 1/4 x 82 1/2")
G3	1	3/4 x 1 1/2 x 82 1/2" pine (cleat)
H	2	3/4 x 3 1/2 x 82 1/2" pine (wall cleat)
I	4	3/4 x 3 1/2 x 11 1/4" pine (wall cleat)
J	1	3/4 x 1 1/2 x 84" pine (horizontal trim)
K	2	3/4 x 1 1/2 x 52 1/2" pine (vertical trim)
L	4	1/8 x 11 x 14 1/4" hardboard (partition dividers)
M	1	3/8 x 20 x 64 1/2" (11 sq. ft.) cork panel (see note below)
N	2	3/4 x 17 x 29 1/4" plywood (drawer-case sides)
O	1	3/4 x 15 3/4 x 29 1/4" plywood (drawer-case back)
P	1	3/4 x 3 1/2 x 17 1/4" plywood (drawer-case kick)
Q	1	3/4 x 1 1/2 x 15 3/4" plywood (drawer-case rail)
R	2	3/4 x 5 x 17 1/8" plywood (drawer fronts)
S	1	3/4 x 14 1/2 x 17 1/8" plywood (drawer fronts)
T	4	1/2 x 4 7/8 x 16" plywood (drawer sides)
U	2	1/2 x 14 3/8 x 16" plywood (drawer sides)
V	2	1/2 x 4 7/8 x 14 1/4" plywood (false drawer fronts)
W	1	1/2 x 14 3/8 x 14 1/4" plywood (false drawer front)
X	2	1/2 x 4 1/4 x 14 1/4" plywood (drawer backs)
Y	1	1/2 x 13 5/8 x 14 1/4" plywood (drawer back)
Z	3	1/4 x 14 1/4 x 15 3/4" plywood (drawer bottoms)
AA	1	3/4 x 1 1/2 x 18 1/2" pine (counter wall cleat)
BB	1	3/4 x 1 1/2 x 82 1/2" pine (counter wall cleat)
CC	1	3/4 x 1 1/2 x 17" pine (counter wall cleat)
DD	1	3/4 x 1 1/2 x 25 3/4" pine (drawer-case spacer)
EE	1	3/4 x 20 x 84" plywood (counter)
FF	1	3/4 x 1 1/2 x 84" pine (counter self-edge strip)
GG	1	1/8 x 20 x 84" plastic laminate (counter finish)
HH	1	1 1/2 x 84" plastic laminate (counter-edge finish)
II	8	1 x 1" corner braces
JJ	3	1 1/4-in.-dia. white porcelain or other knobs
KK	4	24" shelf standards and 12 shelf supports
LL	3 sets	16" full-extension drawer slides
MM	as reqd.	3" No. 12 fh screws or 3" toggle bolts to fasten cleats to wall studs or hollow walls
NN	as reqd.	6d finishing nails
OO	as reqd.	4d finishing nails
PP	as reqd.	1" wire nails
QQ	6	1/4" No. 8 fh screws

**Misc.:** White glue, plastic-laminate contact cement, adhesive for cork (or linoleum paste adhesive); 1 3/4" No. 10 rh screws; 1 1/4" ringed nails; 2" No. 10 fh screws.

**Note:** Cork in rolls and panels is available from Sears, Roebuck and Co. and J.C. Penney. See "wall coverings" in their catalog indexes.

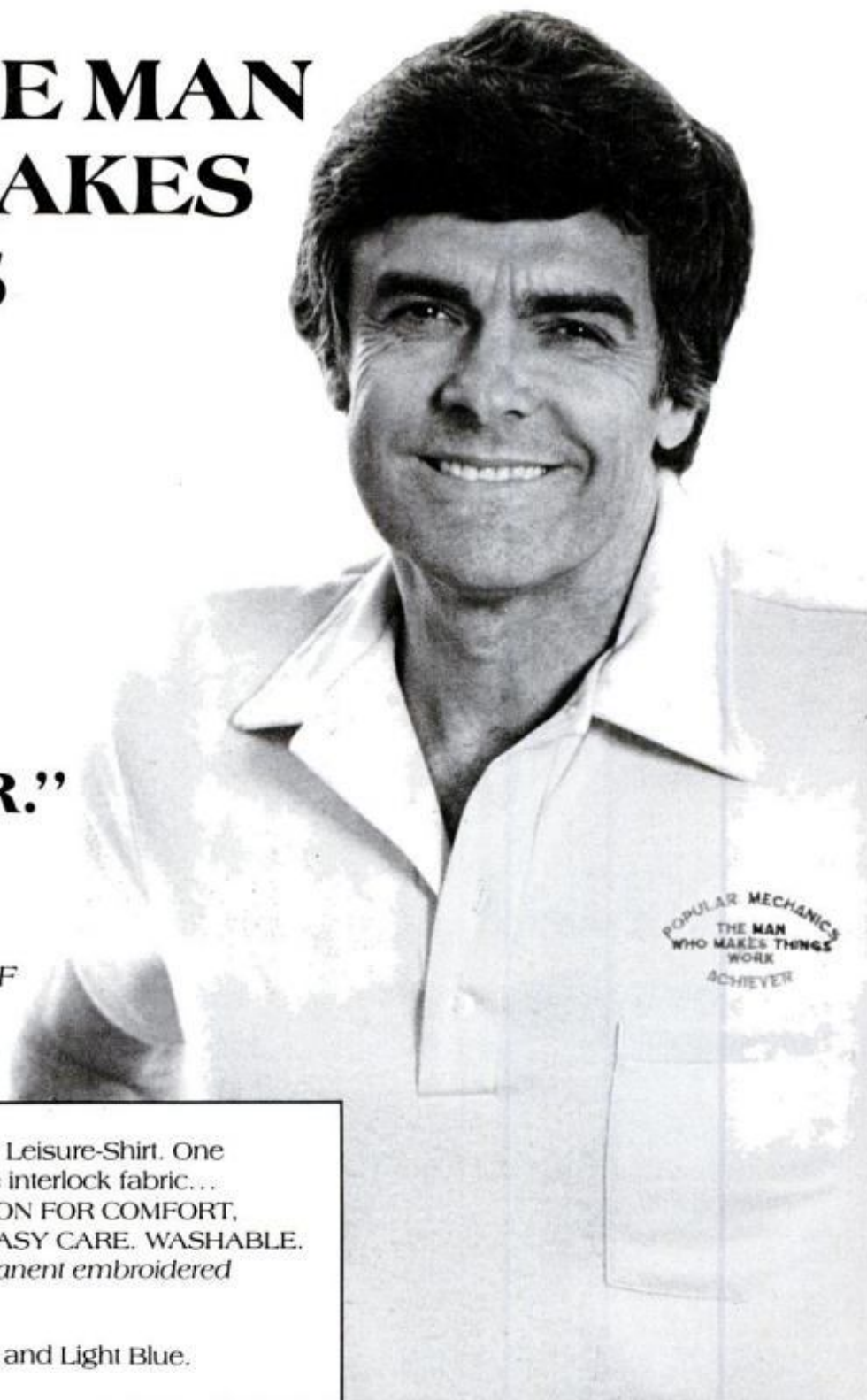


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## THE OCEAN EXPRESS DISASTER

(Continued from page 151)

persisted, in spite of the danger.

Beside him, in the left seat (a chopper pilot sits on the right) sat copilot Ensign John DiLeonardo. Lewis told DiLeonardo: "We'll try once more. See if you can monitor a 75-foot hover on the radar altimeter and keep us there."

To crewman Thomas, hanging out the door, he called: "Start the basket down. I want it right on the platform."

With the pontoons in the way, Lewis could not see down. He would have to depend on Thomas.

DiLeonardo was calling altitudes. Thomas again was shouting: "Come forward... come aft—hold it!" And at this point DiLeonardo barked: "You're losing altitude too fast. We're going down!" The barge was rolling over now and its helicopter pad, with the stranded captain on it, was coming up to smite them. Just in time, Lewis gunned a climbing escape. The rotor thundered. Down on the pad, the stranded barge master began fanning the air, grabbing for shadows. He caught one and held on.

It was the rescue basket. And up in the chopper triumphant crewman Thomas was exulting: "We got him!"

### The barge goes down

Below, in the boiling sea, the \$20-million barge sank like a stone in 167 feet of water.

And then they were climbing out toward Corpus, fuel low, but with the captain coming up in the basket to the side door and pilot Lewis thinking, "This is a pretty happy situation."

Crewman Thomas was happy, too. But suddenly he felt terribly tired. Back ashore, hours later, on the eve of retirement, he was rushed to a hospital with a heart attack. "He was real good that night," Lewis says. "Real good."

As he came up into the chopper, Capt. deGraaf's first words were: "How are my crew?" Pilot Lewis, in snatches of radio talk from the tugs, had heard only that each capsule was alongside a boat and 14 men already had come out of one. He knew nothing of the disaster in No. 3. He told Van deGraaf: "It sounds like your men are okay."

It was not until an hour later that the tugmen knew they would never right No. 3. Now they asked the Coast Guard for help—the night's second call. Again choppers came, this time with divers.

So big were the seas that nothing

could be done. Not even the U.S. Navy's veteran carrier *Lexington*, steaming up at dawn, was able to help. It was midmorning before her divers found a way to hoist the slippery round "egg." Inside, they found 13 men dead.

### What really killed them?

Pilot Lewis won a Distinguished Flying Cross for his work in that storm.

But what worries him is "a helluva lot of other pilots" out there in danger. The need for better rescue equipment for the Coast Guard is growing.

What really destroyed the *Ocean Express* was a tragic failure of modern technology. We had neglected our drill barges. If America is to take more oil from the sea, it needs to brush up on its oldest technology of all: the handling of ships. Until the disaster, no one had ever thought of drill barges as ships.

There will be more accidents, for we're rushing into a dramatic new age of ocean drilling.

But out of the Coast Guard investigation, suddenly, are coming a flood of new safeguards. Capsules now have airbags that automatically pop out and right them if they turn upside down.

And huge new supercapsules holding 54 men are more stable. They have bottom-escape hatches, just in case they *should* turn upside down. Also, capsules now in use are being retrofitted with bridles—so they can be safely towed *from the water line*, as they should.

Many new rescue studies are under way. Mobil Oil alone has begun survival training for 2000 offshore workers.

Since *Ocean Express* found it impossible to pick up a broken tow line, all rigs must now have line-throwing guns. Lines will be *shot* to tugs to pick up.

And the Coast Guard, for the first time, has gone into action to protect drill barges. Barges now must be more stable. Men who run them must be licensed. Flares and anchors must be used. Capsule-escape drills must be held.

But now, the National Transportation Board also wants shipboard computers used—to warn crews when seas get dangerous.

Finally, the Coast Guard wants better storm warnings from the National Weather Service.

It was tragic for the victims who died. But many drillers who survive future storms will owe their lives to *Ocean Express* and the 13 men who perished in capsule No. 3 that April night. **PM**



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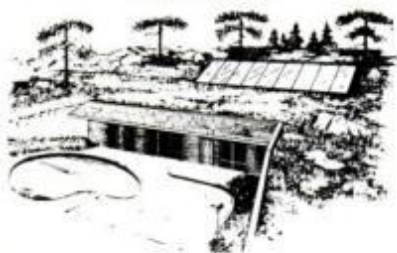
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## NEW SNOWMOBILES

(Continued from page 93)

weight and further streamlined. Styling, as always, is an important part of development, and all snowmobile makers are providing a wide variety of colorful matching helmets, suits, gloves and boots.

The world 24-hour speed and endurance records for snowmobiles are claimed by Kawasaki. Its LTD



Kawasaki Invader rears like a bronco; cowboy hat is in new line of Kawasaki apparel.

has been called a true grand touring machine. This winter it will have a completely new TC 440 D liquid-cooled engine, with oil injection and two sparkplugs per cylinder for faster firing. Invader, Intruder and Drifter models, all made at Kawasaki's Lincoln, Neb., plant, will also be in the line.

From Arctic Enterprises, the Arctic Cat line will again include the El Tigre 6000 and 5000, the Pantera, Panther, Trail Cat 4000, a new Jag 4000, and the little, kid-sized Kitty Cat. Most popular of the Cats, the Jag now has a larger, fan-cooled 431-cc Spirit engine with improved



Smallest of snowmobiles, Arctic's Kitty Cat is 8-mph junior SnoPro for youngsters.

carburetion. A limited-edition Jag 4000 normally manufactured in Sweden, with an extra-long, 150-inch track for deep snow, will also be introduced. And for the junior set, Arctic's small SnoPro racer-styled Kitty Cat has rubber-tipped skis, a single-cylinder engine with top speed of 8 mph and a range of four hours with its half-gallon tank. An

optional wheel kit is available so it can be used off-season.

Scorpion, another division of Arctic Enterprises, will introduce a new liquid-cooled Sidewinder with a 440-cc Suzuki engine, plus the Sting and Whip models, again with American Cuyuna 428-cc engines.

Machine weights have been trimmed by John Deere to improve fuel economy, speed and performance while increasing flotation over the snow. The 1981 Spitfire has a dry weight of 287 pounds with a free-air engine that requires no coolant pipes, a "direct drive" that eliminates the chain case and an estimated 40 other parts. The new Trailfire weighs in at 380 pounds and comes in 340 and 440 models. Sportfire is slightly larger at 384 pounds, while the Deere line leader is the 409-pound Liquifire, with a 436-cc, oil-injected engine with liquid cooling.

Seven models are featured in Yamaha's line: At the top is a new SRX powered by 437 liquid-cooled cubic inches. The SR-V has a 536-cc mill and also uses long-travel telescopic strut suspension in front. Then there's the Yamaha SS440, Exciter 440, Excel III and Enticer 300 and



Top of the Moto-Ski line, the new Ultra Sonic has twin carbs and tuned exhausts.

250. All have the oil injection that Yamaha pioneered.

Largest selections again come from Bombardier's Ski-Doo and Moto-Ski divisions. There are 12 in the Ski-Doo stable: four Blizzards, including the new MX5500 with "total suspension"; two Everest models; three Citations; the Elan; side-by-side-seater Elite; and the single-ski, twin-tracked Alpine; plus Blizzard SnoPro and marathon racing models. Moto-Ski used wind-tunnel testing to design Ultra Sonic, Super Sonic and Grand Prix Special styling. Other models include Futuras, Mirages and the Spirit, for a total of nine.

Seven from Polaris include the Cutlass and Cutlass SS with direct-drive transmission, TX-L Indy and Centurion Indy 500 racing winners, TX-C, TX-L and Gemini. Rumors indicate that Polaris may become a part of Bombardier.

PM



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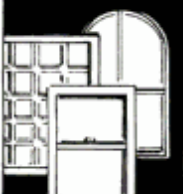
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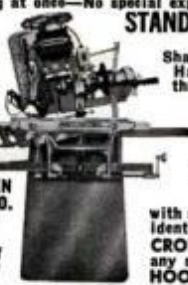


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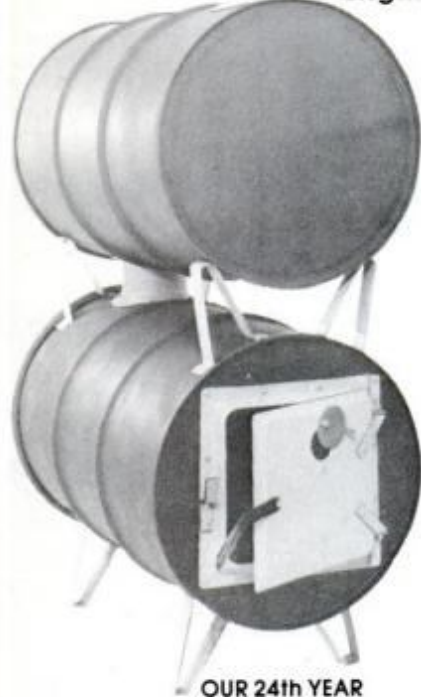


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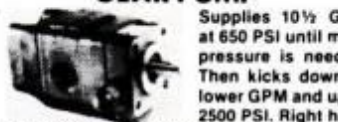
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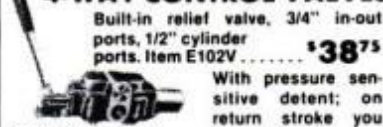
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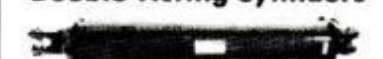


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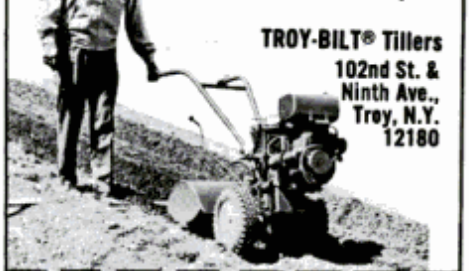


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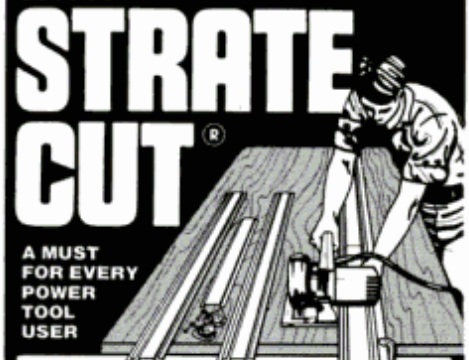
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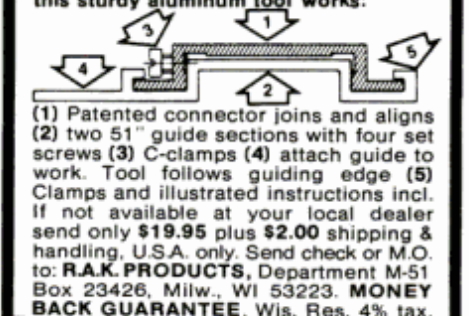
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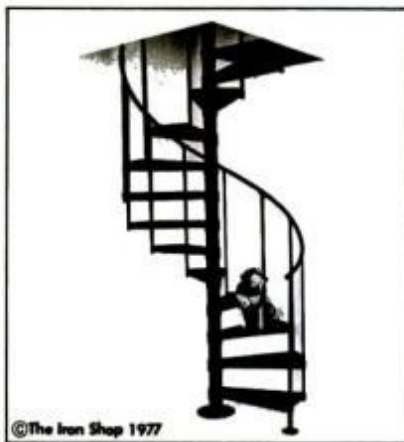
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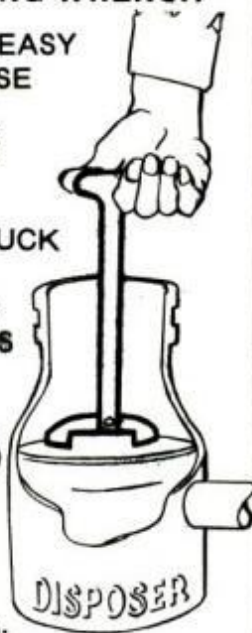
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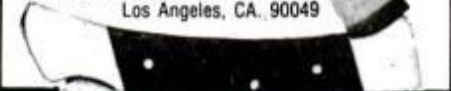
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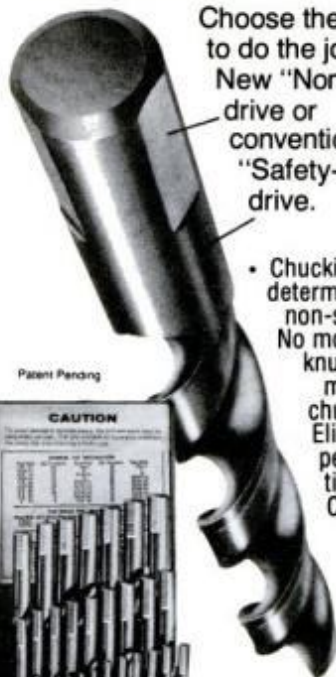
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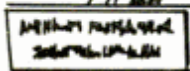


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