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NOVEMBER 1978 \$1.00

# Popular Mechanics

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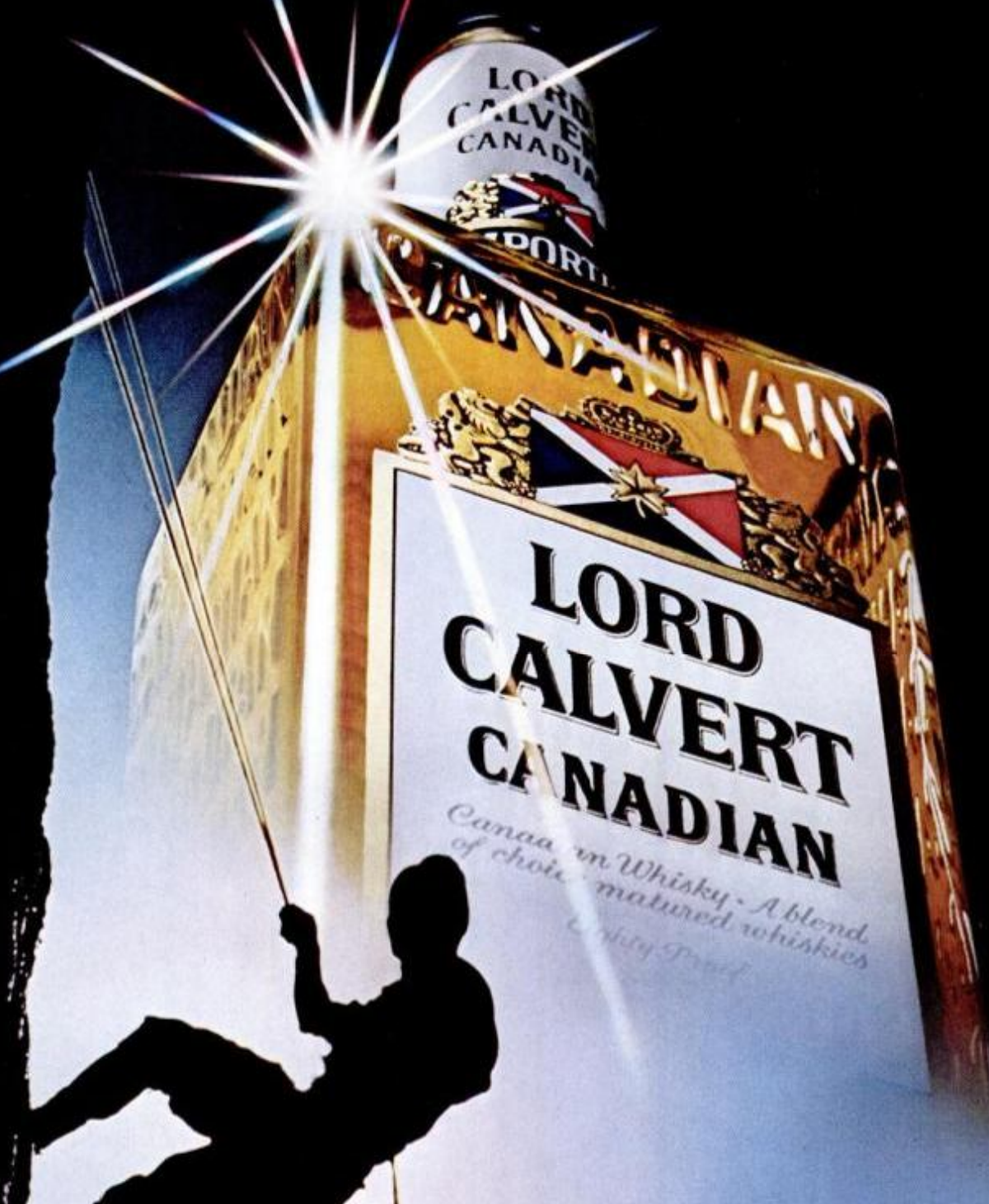
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\*Not available in Canada.



**You can't buy a better plug.**

# Popular Mechanics

## On the cover

At such great depths a camera would be virtually useless, but PM's illustration shows exactly how the latest apparatus is being tested for full-scale ocean-mining operations. After decades of development, seabed resources are primed and ready (see page 87).  
*Painting by Ed Valigursky.*



NOVEMBER 1978

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# Here's why it makes more sense to buy a Wheel Horse riding mower now than next spring.



Just when you've finished mowing the lawn for another summer, here comes the opportunity to buy one of the first lawn and garden tractors available at an exceptional deal.

## Sound crazy? Not on your life!

You probably first thought it was crazy buying an air conditioner in the dead of winter. You and a million other people.

But it turned out to be a smart move...and a great deal.

Well, your next stroke of genius will be to buy a Wheel Horse lawn and garden tractor this fall. That's right, just after you finished mowing the lawn for the last time this summer.

The secret is you can use a Wheel Horse now. Again, tomorrow. And, next week. And, for seasons to come.

Besides, right now you can get a fantastically good deal from your nearest Wheel Horse dealer.

And, yes, you'll be more than assured of having your lawn and garden needs cared for when spring rolls around.

You see, buying a Wheel Horse is not really an off-season purchase. Every season is a Wheel Horse season.

So it's an even better move than buying an air conditioner in January.

For example, this fall your Wheel Horse will till your garden.

Sweep or vacuum your lawn free of debris and leaves. And, generally, provide one fun ride for a wagon full of kids while you haul your fireplace wood.

Come winter, your

Wheel Horse can help keep your driveway and sidewalk free of snow with a snow blower or blade attachment.

In the spring, you can use your Wheel Horse to cultivate the garden. Aerate, roll or fertilize your lawn. And, of course, as summer develops, you'll continue to use your Wheel Horse for grass cutting.

The important thing is that your Wheel Horse will work for you.



You'll find out quickly just how reliable Wheel Horse is when your neighbor's snow thrower won't start early some morning. Or when his discount store special is still waiting for parts and his grass is growing up over the house.

Yes, Wheel Horse has the right tractor for you. Whether you've got a 100 foot suburban lot or a 5 acre country estate.

There are plenty of models to choose. From a snappy little rear-engine rider to a deluxe, heavy duty 19.9 HP garden tractor. Gas or battery powered. And because we offer such a wide choice, we probably have just the unit to fit your pocketbook.

Best of all, your investment in a Wheel Horse today will command a good trade-in value tomorrow. That's a fact. Because of its careful engineering. Its solid construction. And because of a dealer organization dedicated to meet your service needs.

## And here's a special offer:

Between now and December 8, you'll receive a free McCulloch chain saw or a great deal on a Polavision instant movie system with the purchase of a new Wheel Horse tractor. (Rear engine riding mower not included.) See your participating Wheel Horse dealer for details.



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# Wheel Horse



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# LETTERS TO THE EDITOR

## Older than we thought

You refer to the Pennsylvania Turnpike as the oldest superhighway (*Our Crumbling Interstates: A National Dilemma*, page 66, July '78), which is true, but it was opened nearly 40 years ago, not 30 as you stated. I took several trips, both ways, on the original highway from Carlisle to New Stanton in 1941.

ELLIS H. NORTH  
DEMAREST, N.J.

*Reader North is correct. The Carlisle-New Stanton stretch of the pike was opened in October, 1940.*

## Six cylinders are sufficient

After reading *PM's 8000-mile Safari (PM Owners Report: Pontiac LeMans*, page 70, August '78), I'll have to agree with Bill Hartford. They really are making them better than they used to. I, too, am a happy owner of a Grand LeMans Safari.

After owning more than one LeMans equipped with a 350 V8, I was a little hesitant when I ordered the Safari with a 231 V6 and automatic transmission. You advised future buyers to get a V8. But living in West Virginia, where there are a lot of ups and downs, I am very satisfied with the performance of my V6 after 5500 miles.

FRANK LEONE  
PARKERSBURG, W. VA.

## No good without testing

The article *How to Install and Use a Standby Generator* (page 18B, August '78) was fine, but I think it omitted one essential point: regular test running of the unit.

When I worked for the U.S. Air Force, we had a rule that every emergency generator was to be tested under load once a week, if it had not been used. Where this rule was followed, there was almost no trouble; where the rule was not followed, we could be sure that in a power failure some of the generators would not start automatically, and would prove to be very hard to start manually.

WARREN N. DOUBLEDAY  
ORANGE, MASS.

## Another offbeat museum

A *PM Tour of America's Offbeat Museums* (page 108, June '78) was a real service to the many people

who are unaware of the vast storehouse of historical treasures to be found in America's lesser-known museums.

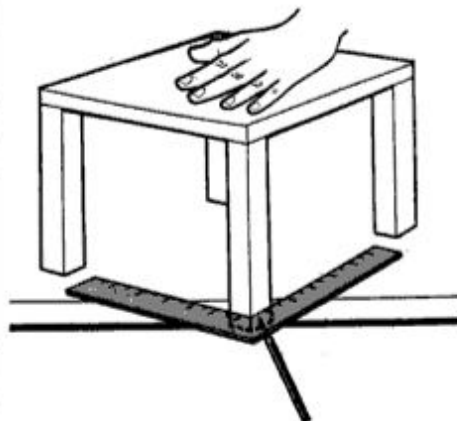
Visitors to the Air Force Museum in Dayton, Ohio, might want to consider visiting Dayton's other museum, Carillon Park. The park, which is oriented towards achievements in transportation, has the original 1905 Wright Flyer III. This craft has been described as the world's first practical powered airplane and one of the most precious aeronautical treasures in the world.

Admission is free, the park is only a few minutes from I-75 and is open May through October.

JOSEPH A. USELLIS  
EXECUTIVE DIRECTOR  
EDUCATIONAL AND MUSICAL ARTS INC.  
DAYTON, OHIO

## Wobbly on our feet

Congratulations! Instead of having one long leg, you have now created one short leg as shown in your August '78 *Hints From Readers*



**Corrected drawing. Marking should be done beneath the square.**

(page 18H) column under "Stopping table wobble." You would make the fourth leg shorter than the others by the thickness of the square. To make even legs mark the cut line of the fourth leg just under the square.

LEONARD H. KACPRZAK  
CHICAGO, ILL.

*Reader Kacprzak was one of many readers who pointed this out. Thank you, everyone.*

## More car care congrats

Your articles on car care in the May issue deserve praise for their down-to-earth simplicity. It's the

first time I thoroughly understood the basics of good maintenance without all the technical complications of certain other magazines and shop manuals.

Thanks to your article, I discovered and replaced the vapor canister filter element in the emission-control system of my car, a filter I did not know existed until reading your article.

LARRY KAY  
HANOVER, PA.

## Kit computer is capable

In the February '77 issue you discussed several possibilities of building a home computer that would be a fascinating hobby toy and perform many useful functions (*Home Computer Kits: The Hottest New Angle In America's Newest Hobby*, page 98). I strongly felt that if a magazine editor could build one, I could. I did, and my son wrote a program to totally manage and operate one of our family-owned auto parts stores.

This July 31 makes one full year that our first store has used the system without any major problems. It was so successful we have since bought three more systems, two to run our other two stores and one to do our office accounting.

You probably don't know what a great impact your fine articles make on your readers and I thought you might like to know. Keep up the good work.

ROGER A. LONG  
OVERLAND PARK, KANS.

## Sweet inspiration

Through inspiration from your marvelous magazine, I have changed from a person who knew nothing about making anything to my present true "handyman" status. I've put in plumbing, carpentry and electrical wiring. The great satisfaction derived from completing the work is as important as the money saved.

MERVYN E. FARRELL  
LONDON, ONT.

## It's a boat, not a car

In the October '77 issue you ran a *New Now* about the X-114 Airfoil Boat (page 48). The name of the boat's manufacturer is VFW-Fokker, not VW-Fokker as you printed.

KENNETH E. PAINTER  
WILLITS, CALIF.



# Save your sawbucks.

**SAVE \$90 ON SEARS BEST CRAFTSMAN 10-inch TABLE SAW.**

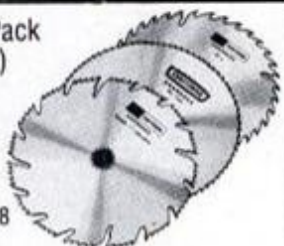


Table Saw comes partially assembled.

\*10" Blade Pack (#32407)

**Save 20%**

On Sale Oct. 29 - Dec. 2, 1978



\*Accessory Kit (#32773)

**Save 20%**

On Sale Oct. 29 - Nov. 18, 1978

8-inch Sanding Wheel  
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\*Savings on accessories based on regular separate prices from 1978-79 Power and Hand Tool Catalog.

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The saw that cuts through wood up to 3 3/8 inches thick. Has a 24 inch rip capacity and a self-aligning rip fence. Includes an aluminum miter gauge with positive stops at 45° and 90°. A steel leg set with firm footing. A see-through blade guard. A cast iron table with our exclusive Exact-I-Cut, the feature that lines the cut up ahead of the blade. A powerful 1 H.P. motor that develops 2 H.P. Plus, two 10" x 27" reinforced table extensions.

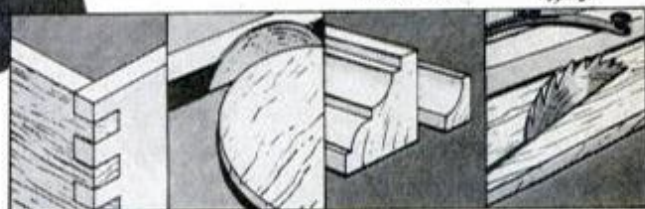
Put your sawbucks to work at savings you can build on. Visit a Sears store near you.

Make dado cuts for box joints.\*

Disc-sands.\*

Molding head for making decorative edges and surfaces.\*

Taper jig for taper ripping.\*



\*With accessory kit purchased separately.

**FULL ONE YEAR WARRANTY.**

If, within one year from date of purchase this Craftsman table saw fails due to a defect in material or workmanship, contact Sears and Sears will repair it free of charge.

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Tools that have earned the right to wear the name.

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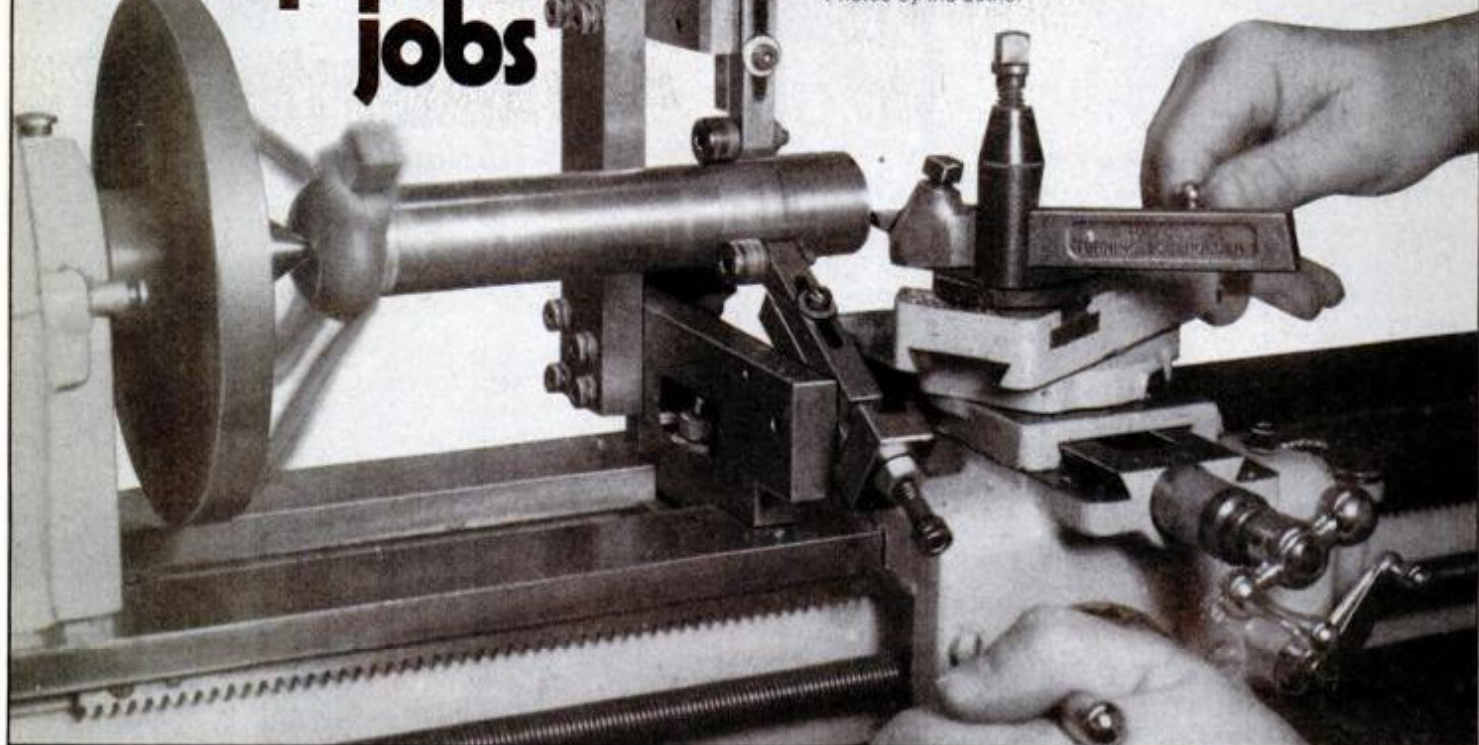
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# Shop-made steady rest for special jobs

This steady rest is designed to facilitate identical setups on repeat lathe jobs.

by Dick Sipin

Photos by the author



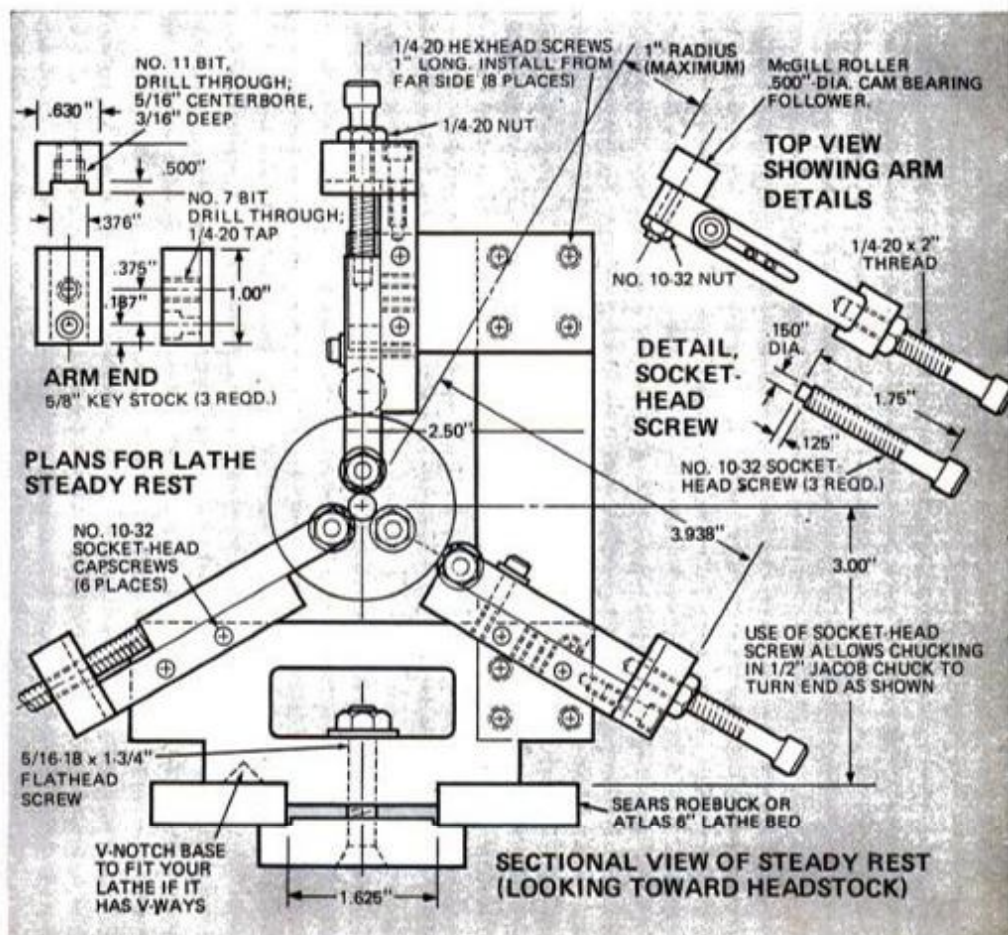
Roller bearing steady rest supports workpiece as turning tool cuts end-cone shape.

**P**M's make-it-yourself version of a lathe steady rest can well prove invaluable in many turning situations. For instance, it can be used to eliminate most of the vibration that occurs when turning long, slender rods. With the tailstock removed, it can also be used to steady work while cutting internal screw threads, boring, and while tooling conical and spherical shapes on rod ends.

When using the steady rest, work can be mounted in a chuck or, for greater accuracy, on the headstock center, attached with a lathe dog and heavy belt laces to the faceplate. See last photo in sequence on p. 10.

The contact points consist of three roller bearings that all but do away with friction. We used McGill's 1/2-in.-diameter cam followers, although Torrington, Smith or other reliable make of bearings can be substituted. They listed for \$5.39 each at a bearing distributor. Cold-rolled steel, which is available at many local steel-supply houses as well as through mail-order houses,

*(Please turn to page 10)*

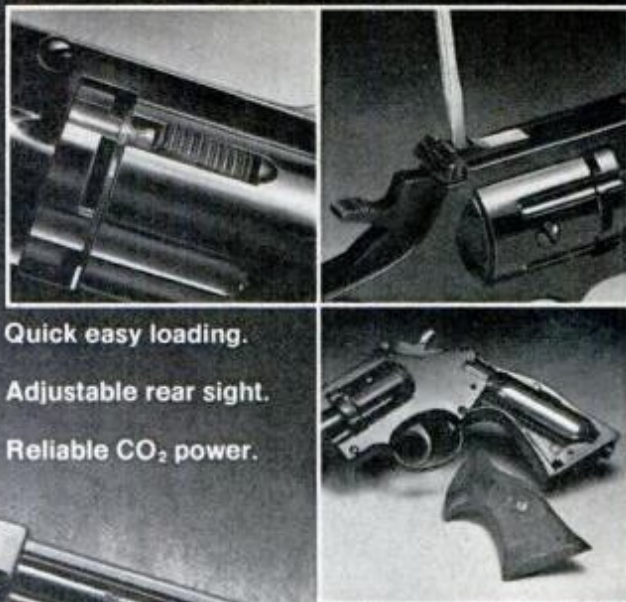


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Pick one up! The right weight. Precisely balanced. They perform as beautifully as they look. Both are double action 6-shot .177-caliber pellet revolvers.

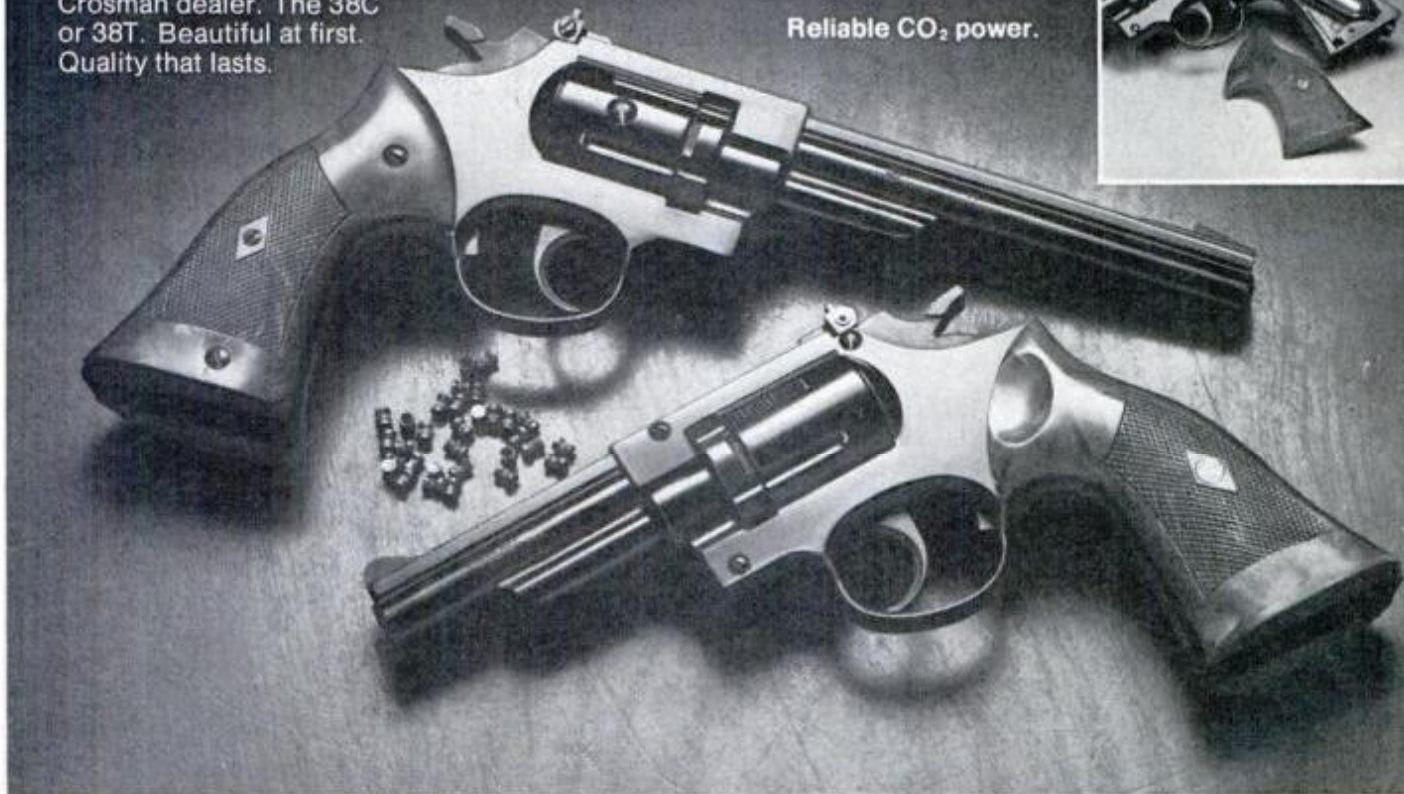
A Crosman CO<sub>2</sub> Super Powerlet<sup>®</sup> gives each of them an average of 54 powerful shots. And rifled solid steel barrels assure accuracy. See one, feel one at your Crosman dealer. The 38C or 38T. Beautiful at first. Quality that lasts.



Quick easy loading.

Adjustable rear sight.

Reliable CO<sub>2</sub> power.



**PICK UP A CROSMAN.  
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IT'S AN AIRGUN!**



Model 38C

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**STIHL®**

The world's largest selling chain saw.

For sales and service, see the Yellow Pages.

## SHOP-MADE STEADY REST

(Continued from page 8)

was used to construct the steady rest.

### Machine notes

Milling the parts for the steady rest was done on an Atlas 6-in. lathe with a compound milling vise. Because of the large amount of milling involved, tighten all your gibs to prevent chattering of the end mill cutters.

When locating holes, make light layout lines. Then, using the compound and vertical vise feeds, center-drill all holes before drilling and tapping. Always approach the holes from the same side to eliminate lead-screw backlash. All milling must be square. Check your setups with a dial indicator before machining. The .191-in.-diameter holes in the three arms are for the cam follower bearings and must be square to workpiece surfaces.

On the slide piece, make sure the threaded end is square when mounting the end piece on it. This assures that the 1/4-20 socket screw will track the arm through its full travel without binding. Three clamping screw holes are provided in each slide to cover the range of arm positions.

The rod capacity of the steady rest can be increased to 2 1/2-in. diameter by one of the following: (1) making the arms 1/4 in. shorter; (2) making the slides 1/4 in. shorter; (3) making the 1/4-20 screw 2 in. long.

### How to use, adjust steady rest

First center-drill your work and support it in the tailstock center with the steady rest bolted in place. Draw down the No. 8-32 locking screws to provide light friction clamping on the arms. Place a .012-in. feeler gage between the work and the cam roller. Advance the cam roller by turning the 1/4-20 socket screw until you feel that light contact has been made with the feeler gage. As you carefully remove the gauge, the roller should turn without slipping. Repeat the gapping procedure with the other rollers. Using an Allen wrench, turn each adjusting screw 90° (.0125-in. travel) and the rollers will contact the work. Now lock the No. 8-32 clamp screw and the 1/4-in. hex locknut.

Remove tailstock when you're finished if you intend to turn the rod end. If not, use the steady rest in optimal position for reducing vibrations while tooling long, slender rods.

FM

## 24 inch Band SAW CUTS TO CENTER OF 48 inches



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Tools	39.95
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DU-ER TOOLS, 5448 Edina Industrial Blvd., Minneapolis, Minn. 55435.



# The original, indispensable KLUGE BAG™ The "No-Waiter"

A six piece set in one easy to carry-on  
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Two time TV Emmy Award Winner Stan Hart: "The Kluge Bag is the best. The only piece of luggage I ever use."

Pennsylvania cattleman Robert Johnson: "For quality, convenience, organization, the Kluge Bag tops any set of luggage I've ever used."

DRG Record Company President Hugh Fordin: "One carry-on piece sure beats three or four check-in bags. I'm delighted."

Here's the famous original you'll see on the Concorde, the shuttle to Washington, the commuter out of O'Hare. The Kluge Bag. The only combination overnighter and fortnighter in the world.

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A "no waiter" you never check in. Never have to wait for at the baggage counter.

## Extra Comfort and Convenience

You'll use the Kluge Bag like a week-ender, too, because it's just as easy to carry on and a whole lot better. Better because nothing gets wrinkled or creased... because you have extra room for all the reports and papers you need, the tennis things you may or may not use, the sweater you'd like to be able to knock around in at night, and to bring back anything from reports to a new suit you pick up on your trip. (You can prove it yourself at our risk!)



## Beautifully Organized

The almost infinite flexibility is the result of an organization system designed by Peter Kluge, an international businessman, who travels constantly, from Chicago to Dallas, New York, Los Angeles, to Europe and the Middle East, never sure if he'll be away two days or two weeks, or of the clothing he'll need.

So, in one lightweight, compact, easy-to-carry handle or shoulder bag you get (1) a garment bag that holds two suits, (2) a pullman case, (3) a week-ender, (4) a tote-tennis bag, (5) a toilet-accessories kit, (6) a laundry-wet stuff bag...plus a full-size portfolio. Compartmentalized for easy access to your shirts, ties and belts; shoes and socks; underwear; suits, slacks and jackets; sportswear, sweater, bathrobe; business reports and papers. Anything and everything you need.



## One Vs. Two, Three or Four

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Simply, there's no other piece of luggage anything like this. Beautifully made of top-quality cellulose rayon, the material that's most often used in expensive luggage today because it's as strong as it is light, and sponges clean in an instant to retain its beauty through years of use and abuse, the Kluge Bag is available in natural canvas color with rich brown piping and in striking solid black diamond and brown trim.

Outside there are three sectional zippers, so you can get to anything in a second, with security snap locks and an over-all snap lock safety strap, plus comfortable carrying handles and the adjustable, burden-bearing shoulder strap.

Inside, a fold-up rigid bottom supports everything you can carry in the zippered main compartment. The fittings and details are equally impressive, like a tie rack, a fitted compartment for toiletries, a zippered compartment for valuables, pockets for cards, notes, keys and more. Plus a huge volume portfolio. Everything you need to make packing and traveling for days or weeks easier and faster than it's ever been before.

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Now we invite you to judge the Kluge Bag for yourself—for 30 days without risk or obligation. You must be convinced that it's the finest, most useful, convenient and versatile piece of luggage on the market today, a time and trouble saver, the perfect piece for every trip, or return it to us for a complete refund. No questions asked.

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**A**fter almost 50 years, America has discovered the vent damper. This automatic device is installed in the vent pipe of an oil or gas burner to seal the pipe when the burner shuts down, preventing heat loss up the chimney. Automatic vent dampers have been used in Europe, particularly in Germany, since 1932.

When heating fuel was inexpensive, the rate of heat loss was of little consequence to many of us. Today things are different.

In 1970, the national average price of 100 gallons of home heating oil was \$19. Last February, the national average price was up to \$49.75.



Safety standards require a fail-safe circuit which will prevent the burner from operating if the damper plate is kept from opening due to a malfunction. Check for UL approval before choosing and buying a unit for your home.

It is estimated that 25 to 50 percent of the heat output of an oil or gas burner is lost up the chimney when the burner isn't running. The automatic vent damper is designed to cut this loss. However, there is disagreement by how much.

The manufacturers contend that automatic dampers lower fuel bills by 10 to 30 percent, depending upon the size, cleanliness and adjustment of the burner, and the climatic conditions. Save Fuel Corp., pioneers in the field of fuel dampers, have test-documented savings between 20 and 30 percent for both heating and cooling systems.

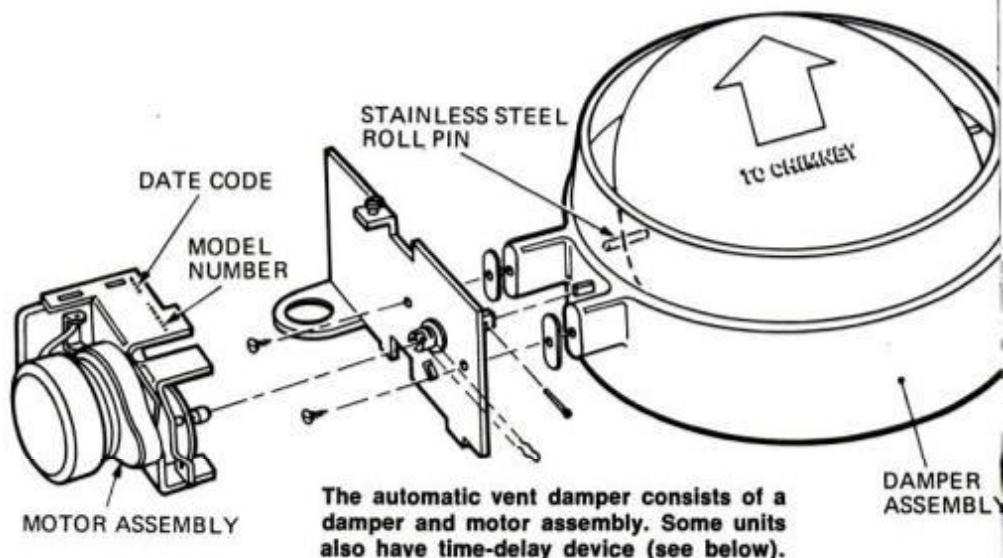
Gas and oil distributors claim otherwise. The Baltimore Gas and Electric Co. says, "At most, homeowners might get a 6 percent saving."

Last year, the Brookhaven National Laboratory in Upton, N.Y., tested two vent dampers designed for oil burners. One was the Stack Pack made by Flair Manufacturing Co. The other was the SMTI-7:7 made by Ad-Vant Industries. The Stack Pack decreased fuel usage by 10.2 percent. The SMTI-7:7 decreased fuel usage by 5 percent.

Depending on size and model, an automatic vent damper costs \$150 to \$300, installed. If you do the instal-

# Put a damper on chimney heat loss

Vent dampers conserve heat by automatically closing off the flue when the furnace shuts down.



The automatic vent damper consists of a damper and motor assembly. Some units also have time-delay device (see below).

lation, you can save \$50 to \$100, but you should *not* install an automatic vent damper yourself if your home is equipped with a gas burner.

The American Gas Assn. (AGA) warns that an automatic vent damper for a gas burner must be installed in compliance with local codes, the National Fuel Gas Code ANSI Z223.1-1974, the National Electrical Code, ANSI C1-1975, and Damper Retrofit Code ANSI Z21.66-1977.

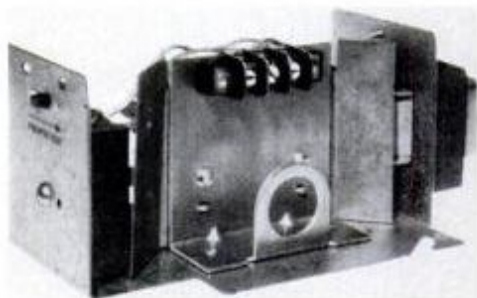
"If it isn't done right, a person could blow up his house," an AGA spokesperson warns.

There are two general types of automatic vent dampers for oil-fired burners, both characterized by the design of the post purge element. Post purge refers to the elimination of combustion products remaining in the fire box and venting system after the burner turns off.

One design has several holes in the damper plate. The plate closes almost simultaneously with burner shutdown; post purge takes place through damper plate holes.

The other post purge design provides for an electronic time delay following burner shutdown. A solid-state device (the time delay) keeps the damper plate open for three minutes to permit post purge.

The following instructions and accompanying photographs explain how to install a vent damper in an oil burner. We used a Flair Manufacturing Co. Stack Pack for our example. It has a three-minute time delay device for post purge. The installation procedure for other vent dampers is basically the same, except that some don't have the time delay device.



Systems equipped with time-delay devices for post purge (above) are more expensive, but allow greater efficiency, according to Brookhaven Laboratory tests.

1. Order the correct size vent damper by measuring the diameter of the vent pipe, or the circumference multiplied by .3183 to get diameter. The measurement you get corresponds to the damper size you need. In other words, if the vent

(Please turn to page 16)



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pipe diameter is seven inches, order a seven-inch vent damper.

*Important:* Make certain that the automatic vent damper you buy for your oil burner bears the Under-

writers Laboratories listed mark. It assures that the product complies with safety standards. The AGA symbol certifies compliance with safety standards of automatic vent

dampers made for gas burners.

2. Turn off electric power to the oil burner and allow the unit to cool.

3. Check your heating system for rusted vent pipe, oil leaks and incorrect burner adjustment. These problems should be corrected before the vent damper is installed.

4. Select a spot for installation where two pieces of vent pipe connect. To attain maximum fuel saving efficiency, this spot should be between the chimney and barometric damper. The barometric damper is a device used to avoid excess draft in the chimney when the burner is firing. Installing an automatic vent damper between the barometric damper and heating appliance is permissible, but you'll get reduced fuel saving due to the loss of heated air up the chimney through the barometric damper.

5. Separate the vent pipe and install the vent damper. If necessary to fit the damper, push the vent pipe further into the chimney or use shears to cut off half of the male, crimped end of the vent pipe. Notice the arrow on the damper plate. It must point in the direction of exhaust gas flow: that is, toward the chimney. Be sure the casting containing the damper plate is firmly seated before you reassemble the vent pipe.

6. Mount the time delay device on the burner's 4x4 main wire junction box or on a beam close to the junction box. Using wire nuts, wire the device to the wires in the junction box. The wires of the time delay are color-coded to coincide with the burner's terminals or wires to which they should be connected. A wiring diagram comes with damper.

7. Using low voltage copper wire, rated 90°C., wire the time delay device to the motor of the vent damper. Terminals that should be connected by wire are numbered 1, 2 and 3 in the device and motor.

8. With the installation complete, turn on electric power and operate the burner through several cycles to assure that the damper plate opens and closes *fully*. You can watch the plate through an inspection hole in the rear of the vent damper casting.

If the plate does not open and close *fully*, the vent pipe is blocking its movement. Shut off power and let the burner cool. Separate the vent pipe. Using tin shears, cut away one-half of the male (crimped) end of the vent pipe. This should eliminate interference. Refit the vent damper and restore power.

A successful checkout of heating system operation after installation of the damper is the only way to make sure it works properly. **FM**

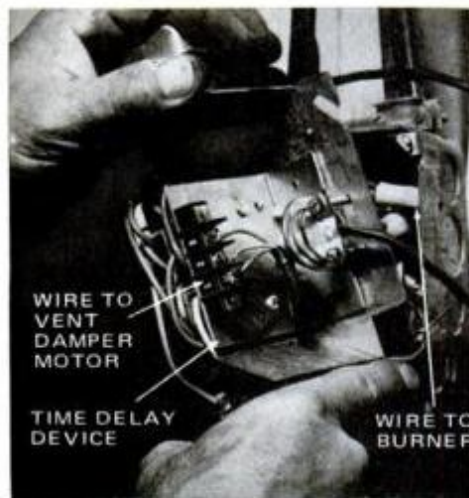
**How a damper is installed**



Photo of existing setup shows where automatic vent damper should be installed, between chimney and barometric damper.



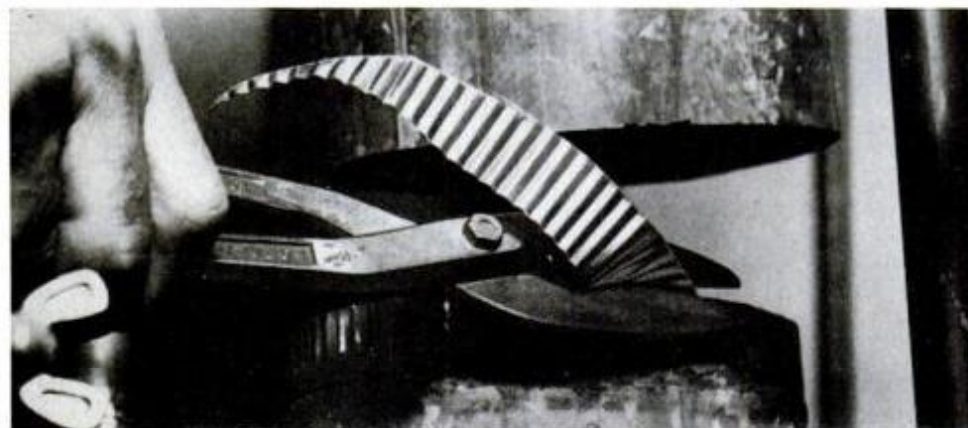
Automatic vent damper is placed between pipe sections. If necessary to fit unit, push upper pipe further into chimney.



Follow wiring diagram provided with the vent damper to connect the time-delay device to the burner and vent damper motor.



To facilitate installation, terminals on motor (above) are numbered to tally with the time delay terminals.



If movement of the damper plate is interfered with by the vent pipe, remove the damper and cut away one-half of the crimped end of the male pipe, then reinstall.

## NEW TECHNOLOGY

The JS&A Mini Travel Alarm will fit in your briefcase, pocket or purse and is no larger than four quarters.



The new JS&A Chess Computer plays six levels of chess and costs only \$99.95.

# The Winners

These two products continue to be our best sellers. Can you figure out why?

The two products shown above are our best selling new products. The Chess Computer compares with similar computers selling for up to \$400. The JS&A Mini Travel Alarm compares to the \$100 Seiko alarm but is smaller and less than half the price.

Is there more to these products than value? Let's take a closer look. The following are descriptions of these two new items with our conclusions at the end.

### THE MINI TRAVEL ALARM

It's small. And because it's small, it fits anywhere. In your briefcase or in your pocket.

The new JS&A Mini Travel Alarm measures only 3/8" x 1 1/4" x 2 1/2" and has a small easel support on the back. Just set the alarm, and the electronic beep will wake you up. The clock movement is totally solid-state, and a built-in night light lets you view the time in the dark.

But the JS&A Mini Travel Alarm does more. First, it makes a great pocket watch. The small imitation black leatherette carrying case that comes with the unit has a window so you can view the time even when the unit is in its case. Secondly, it tells accurate time—within fifteen seconds accuracy per month. And finally, it's inexpensive—only \$29.95 complete with carrying case and two readily-available hearing aid batteries. It makes a perfect gift for everyone on your gift list.

There is also a deluxe version with a built-in timer and dual time zone capability. You can now display one time while keeping the second time in memory.

The Mini Travel Alarm can be ordered by

calling our toll-free number below or sending your check for \$29.95 for the regular version or \$39.95 for the deluxe version. Please add \$2.50 postage and handling and Illinois residents add 5% sales tax.

### THE JS&A CHESS COMPUTER

It's a chess-playing robot. The new JS&A Chess Computer is not only programmed with the rules of international chess, but it has a brain that thinks for itself.

You enter your move and the computer examines all the probabilities and makes its move. There are six levels of play—from beginner to professional—so the game increases in difficulty as you become more proficient. And you can change levels right in the middle of a game if the robot starts to beat you.

The computer is small, easy to store, and is played with your own board and chess pieces. The JS&A Chess Computer has been programmed to handle all the international chess rules including castling, *en passant*, and pawn promotion. The entire unit is housed in a handsome case only 4" x 7" x 2 1/2" high, weighs 14 ounces and comes with an AC adapter.

One of the major breakthroughs has been its price. The JS&A Chess Computer is available for only \$99.95 complete with AC adapter and complete instructions. (Add \$2.50 for postage and handling and Illinois residents please add 5% sales tax.) If you play chess, you already own half of the system—your board and chess pieces. With JS&A's Chess Computer, you'll own the other half plus a very clever opponent.

### OUR CONCLUSIONS

Why are the above two products so successful? Value would seem the most obvious reason. These products easily represent 50% lower prices than popular brand name products. Or is it features? Each product has real advantages over the competition. Or is it simply our 30 day trial period? It's the most consumer-oriented way to use and experience a product before you buy.

Why do people buy these products from JS&A? Value? Certainly. Features? Yes. But most importantly, we give you the assurance that if you are not satisfied with any JS&A product, you may return it within 30 days for a prompt and courteous refund. There's no stuffy sales clerk to ask you embarrassing questions, no parking problems, and no long lines. And we'll even refund our \$2.50 postage and handling charge.

Why not join the space-age revolution with one or both of our most exciting new products. Order any one of our two winners at no obligation, today.

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# IT'S NEW NOW

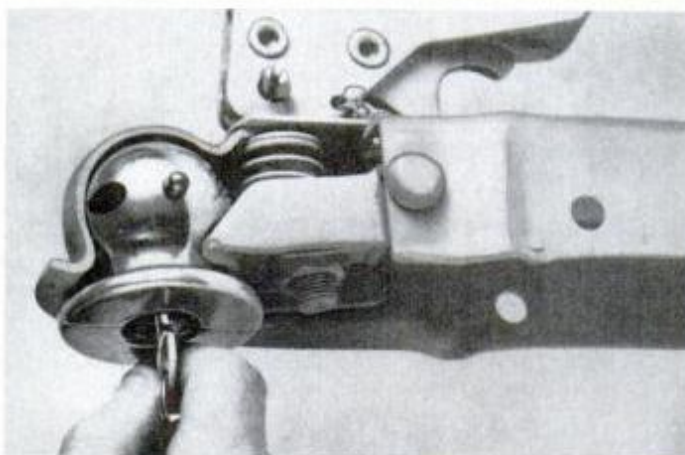


## A really big shoe

What started out as "sculpture" has become an object of utility—a bed. The jumbo sneaker is finished in red, white or blue canvas. A liner filled with polyurethane balls serves as the mattress. Four-, five- and six-foot models are \$125, \$180 and \$265 respectively. Poster Place, 32 West 53rd St., New York, N.Y. 10019.

## On the ball

Lockable Sentry Ball stymies trailer thieves with two steel pins that engage in coupler wall; enclosed ball discourages the use of boltcutter or hacksaw. Lifetime warranted unit, in two sizes, costs \$17 or \$20. Made by Recreation Creations, 210 West Oldfield St., Lancaster, Calif. 93534.



## Fault finder

No need to hunt for a special wallplate for a Sure-Gard III ground-fault circuit interrupter; it has its own. LED indicator light shows if receptacle is "hot" to assist troubleshooting. Priced at about \$50 in most hardware stores. Manufactured by Leviton, 59-25 Little Neck Pkwy., Little Neck, N.Y. 11362.



## Look but don't touch

Instatherm optical thermometer measures the temperature of any object or area visible in its viewfinder. An optional audible seeker (see top photo) indicates increasing temperature with a tone of rising frequency during scanning. Available in different temperature ranges, the battery-powered unit retails for about \$700. Barnes Engineering, 30 Commerce Rd., Stamford, Conn. 06904.



## Gum dropper

Gum Gone is said to remove chewing gum from carpets, clothing, upholstery and floors; also to remove candlewax, paraffin and pitch. An 8-ounce can is \$4. Leem Co., 1132 Southeast Salmon, Portland, Ore. 97214.



# Unfair Copy

*The watch shown here is a copy of the world famous Seiko chronograph alarm. Unfair? You be the judge.*

*All the features of the Seiko watch are duplicated in this digital watch. It is an excellent example of the fierce competition in the United States.*

It's really a shame. The watch shown above is a copy of the Seiko chronograph alarm.

Seiko is one of the world's most respected watchmakers, having literally taken over the quartz watch industry. Their quality is outstanding, and they have produced many great innovations in the digital watch industry.

The Seiko chronograph alarm sells for \$300. The watch costs jewelers \$150. And jewelers love the item, not only because of the excellent reputation of the Seiko brand, but because it's probably America's best-selling new expensive digital watch. And Seiko can't supply enough of them to their dealers.

The Mercury copy shown above looks almost exactly like the Seiko and costs dealers approximately \$50. Most dealers are selling it for \$100, and they're selling them as fast as they get them.

## LABOR EXPENSIVE IN JAPAN

Unlike the Seiko watch which is made in Japan, the Mercury is manufactured under special contract in Hong Kong by a prominent American watch manufacturer. The watch uses basically the same components as the Seiko, but the differences lie mainly in the labor. Hong Kong's labor costs are far less than in Japan. An average Japanese watch assembler makes the equivalent of \$75 per day whereas the equivalent employee in Hong Kong makes only a few dollars per day.

The value of the yen has skyrocketed while the Hong Kong dollar has changed little in comparison to the U.S. dollar. So all Seiko products have become even more expensive to export.

## BOTH BACKED BY SERVICE

The Seiko is backed by a national network of service centers. The Mercury is backed by a very efficient service-by-mail center. Since the latest crop of space-age digital LC watches require very little service other than battery replacement, which any jeweler can do, service has become less a concern.

Why then would anyone want to buy a copy of the Seiko? For several reasons:

**Savings** JS&A has obtained sufficient quantities of the Mercury to offer you the item for as low as \$69.95.

**Support** Mercury is a division of Leisurecraft Industries, a public company that specializes in obtaining the best digital watches and insuring their value with excellent service, support and quality.

**Quality** You'll be amazed at the excellent quality of the Mercury, especially compared side by side with the Seiko.

**Accuracy** The Mercury is guaranteed accurate to within 15 seconds per month, although much greater accuracy can be expected.

## THE BEST FEATURES

The alarm chronograph has an alarm that really wakes you up. Its chronograph measures time to one hundredth of a second and has three settings: **split** which continues counting the split seconds while you freeze the time for reading, **add** if you want the total time of several periods, and **lap** which starts counting from zero when you press the button.

You have hours, minutes, seconds, day of the week, the month and date. The Mercury

Quartz LC also remembers the days in a month and automatically recycles to the correct first day of the next month.

## EXAMINE THE FEATURES

Order the Mercury from JS&A on a trial basis. Compare it feature for feature with the Seiko. Compare its accuracy, its alarm, and its chronograph functions.

If after a truly side-by-side comparison, you aren't convinced that its accuracy, quality, and features make it a truly outstanding value, return it within 30 days for a prompt and courteous refund. We promise to accept the return of your watch with absolutely no questions asked and even refund the \$3.50 postage and handling.

## AMERICA'S LARGEST SOURCE

JS&A is America's largest single source of space-age products—further assurance that your modest investment is well protected.

The new crop of digital watches rarely malfunction, but if service is ever required, it is reassuring to know that there is a prompt service-by-mail facility, a one year limited warranty and two substantial companies backing your modest investment.

To order your Mercury Quartz LC, send your check for **\$69.95** for the silver-tone model or **\$79.95** for the gold-tone along with \$3.50 per order for postage and handling (Illinois residents, please add 5% sales tax) to the address shown below or credit card buyers may call our toll-free number below.

Is it unfair to copy a popular expensive watch? America's growth can be traced directly to the principle of open competition. Open competition has not only been the catalyst for innovation, but it is also responsible for bringing better value to a free marketplace. Unfair? Maybe if you were Seiko it would be. But then we're all not that lucky.

Your timing is perfect. Why not order the Mercury LC at no obligation, today.

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# They've thrown away the film-wind lever on Konica's new FS-1 SLR



With standard 40-mm f/1.8 lens, FS-1 weighs 27.5 ounces. Lens protrudes 1¼ inches.

Peering through the viewfinder of Konica's new FS-1, I focused, squeezed the shutter, and stuck my thumb up to wind the film for the next shot.

But my thumb caught only air, because on this camera, there is no film-wind lever. It's been replaced by a tiny motor powered by four AA batteries. And that innovation is accompanied by several others.

I had a brief chance to look at the camera and shoot a roll of film with it. It was announced too late to be included in this month's story on autowinders (see page 114), but the camera will definitely be of interest to autowinder fans. Unlike other such cameras, the autowind mechanism is not a separate unit, but an integral part of the body.

As a result, the FS-1 is smaller (about the size of a compact SLR) and lighter (30.1 ounces with 50-mm f/1.7 lens and batteries vs. 35 ounces for the lightest SLR-autowinder combination) than its competitors.

Not to be ignored in the fuss over the missing film-wind lever are



Align film leader with sprocket (above), close back. Camera does the rest.

some of the camera's other features. It has a shutter-priority autoexposure system (with manual override) that allows you to choose shutter speed to suit the action of your subject; the camera chooses the aperture.

## LEDs tell you what's what

A row of LEDs built into the viewfinder shows you the aperture, while also letting you know if you're over- or underexposed, or if your batteries are low.

Konica stuck a second minimotor in the FS-1 for automatic film loading. Line the film up on one of the winding sprockets, close the camera back, and the film is automatically wound to the first frame. On the preproduction model I tried, the system worked well.

The FS-1 also includes a self-timer with an LED that blinks faster as the shutter is about to trip. Viewfinder LEDs tell you when flash charging is completed.

Speaking of flash, Konica has brought out the X-24 automatic strobe for use with the FS-1. The unit ties in with the camera's metering system so that operation is virtually automatic—no adjustments need be made by the photographer. Also, the flash will fire several times in rapid succession if the shutter button is pressed for continuous shooting.

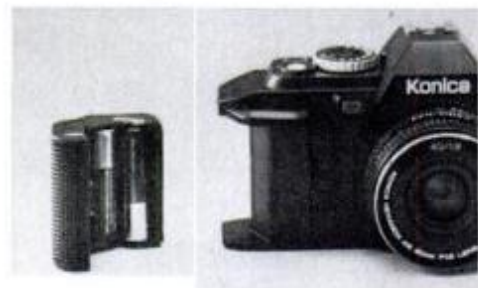
About that autowinder: In the continuous mode it shoots at 1.6 frames per second (vs. 2 to 2.5 by others). Konica says the autoexposure system is quick enough to

adjust exposure between shots. The batteries are said to be able to send 20 36-exposure rolls of film through the camera before running down. A pair of alternately blinking LEDs in the viewfinder warn when the batteries are good enough for only 100 more shots.

The FS-1 is a radical departure from traditional SLR design. In the



FS-1 with optional X-24 automatic flash.



Detachable pack holds four AA cells.

short time I had it, I liked the light weight of the camera, and the fact that a compact 40-mm f/1.8 lens is the "normal" one supplied with it. The mild wide angle allows group shots indoors with flash at reasonable distances.

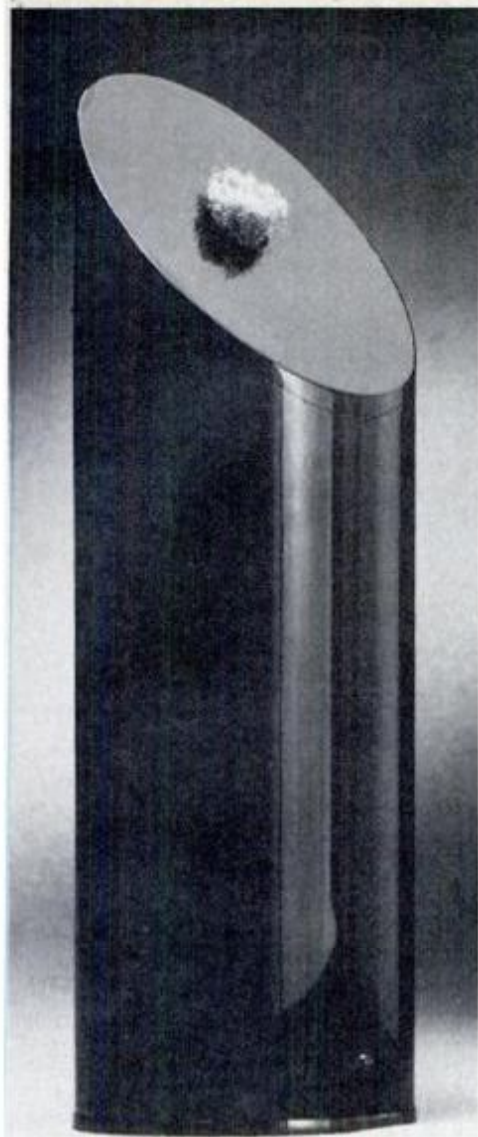
## Powered by AA batteries

One nice touch is that only AA batteries power the entire camera. Nothing is more frustrating than going to the only open drug store on Sunday morning and trying to find those silver oxide power cells.

I wasn't crazy about the way the f-stop numbers intruded into the viewfinder image. I'm not sure people will enjoy memorizing which LED in the viewfinder means what. It's not hard to do, but then again neither is loading film.

Official word at press time is that the FS-1 will list at "under \$600," but my guess is that it will run about \$475 list. It may be available by Christmas.

The obvious next step is autofocus. Konica already has it on the C35 AF (see *First Automatic-Focus Camera*, Dec. '77, page 66), but putting it on a camera with interchangeable lenses could be tough—and expensive. Give it a couple of years.—Tom Sahagian



The new Energaire ionized oxygen generator will make a handsome addition to any desk.

# Miracle Fuzz

*A new space-age invention and the same effect as lightning combine to create the world's first home oxygen regeneration system.*

Although it has no moving parts, you can actually feel a wind produced from the fuzz. This wind is ionized oxygen which spreads to fill a 1500 cubic foot room or about 15 feet square.

#### EFFECTS FELT QUICKLY

You will feel the effects immediately. The Energaire will clean your room of odor-causing bacteria and stale, musty or smoky air. Energaire will keep you alert. With a fresh supply of ionized oxygen, you will have more energy, be less fatigued, and you will sleep better.

Our polluted cities often deprive us of enough oxygen to make us feel healthy and alert. The Energaire solves this important problem by providing a personal environment—an area that surrounds your body and work location with fresh ionized oxygen.

#### NEW SCIENCE

The oxygen ion generator is a relatively new product, yet its use in the home may make it more important than any filter system.

The Energaire is a new breakthrough. Ionized oxygen generators have been under development since the early 60's. The Energaire, using the latest in microelectronics, is the first cost-efficient system that produces over 100 times the ion production of other commercial units that cost ten times the cost of the Energaire.

#### USED IN HOSPITALS

Ionized oxygen creates a germ-free environment—proven through research at several universities. Hospitals are now converting many of their operating rooms to ionized oxygen. Among the hospitals in California are Eden Hospital in Castro Valley, Chico Memorial Hospital in Chico, and the Valley Medical Hospital in Fresno.

#### TRY THIS DRAMATIC TEST

To show the dramatic effect of ionized oxygen, take the ion generator, blow cigarette smoke into a clear bowl, and hold the bowl inverted over the system. The smoke will vanish. The charged oxygen particles appear to dissolve the smoke particles, precipitating them from the air.

In a room, Energaire surrounds you with these oxygen ions and cleans and purifies the air so even in a smoke-filled room, you will be breathing clean, country-fresh air all day long.

#### DRAMATIC LIFE CHANGES

Working in an ionized oxygen environment, you think clearly, are more alert, and your brain functions better. In actual brain wave tests, there was an increase in alpha waves

when ionized oxygen was used, indicating greater alertness, deeper relaxation, less stress, and more creative brain functioning.

We are so impressed with the pleasant effect of Energaire that we urge you to personally test it yourself in your home or office.

Order one at no obligation. Put it by your desk, in your bedroom, or in any room where you spend a great deal of time. See if it doesn't keep you alert, feeling better, and more productive. See how it rids your room of unpleasant odors and freshens the air.

#### SLEEP EASIER

At home, use the Energaire to control odor-causing bacteria. Use it by your bed and see how fresh, country-like air makes you sleep easier, deeper, and more relaxed.

You should notice the difference within one day—especially in a work environment. But use it for a full month. Then, if you do not feel better and totally convinced of the positive effects of ionized oxygen, return your unit for a prompt and courteous refund.

The Energaire is manufactured by the Ion Foundation, one of America's leading ion research laboratories, and JS&A is America's largest single source of space-age products.

Service should never be required, but if it is, there's a prompt service-by-mail center as close as your mailbox—further assurance that your modest investment is well protected. The Energaire measures 9" high by 3" in diameter and weighs 24 ounces.

To order your Energaire ionized oxygen generator, send \$69.95 plus \$3.00 for postage and handling (Illinois residents, please add 5% sales tax) to the address shown below or credit card buyers may call our toll-free number below.

Let space-age technology revitalize your life with the world's first home ionized oxygen generator. Order one at no obligation, today.

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In Illinois Call ..... (312) 564-7000

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You need oxygen to live. You can live without food for 60 days, without water for seven days, but without oxygen, you won't make it past two minutes.

That small piece of fuzz located on top of the cylinder shown above emits ionized oxygen.

You are already familiar with ionized oxygen if you've smelled the air after a thunderstorm. You feel great, revitalized and alert. The lightning from the storm adds a small negatively-charged electron to each oxygen molecule in a process called ionization.

#### POSITIVE ADVANTAGES

Ionized oxygen performs several positive functions. First, it cleanses the air by attaching itself to anything floating in the air, causing it to fall to the ground.

Secondly, when inhaled, it has the same effect on the body as pure oxygen. It is absorbed quickly by the lungs and goes into the bloodstream making you feel more alert and alive.

The new space-age product shown above is an oxygen ion generator called Energaire. The copper mesh fuzz on top of the unit is one of the secrets of the system.

# WITH WHAT MINOLTA KNOWS ABOUT CAMERAS AND WHAT YOU KNOW ABOUT YOURSELF, WE CAN MAKE BEAUTIFUL PICTURES TOGETHER.

If you've considered buying a 35mm single lens reflex camera, you may have wondered how to find the right one out of the bewildering array of models and features available.

And with good reason, since the camera you choose will have a lot to do with how creative and rewarding your photography will be.

What you pay for your camera shouldn't be your only consideration, especially since there are some very expensive cameras that won't give you some of the features you really need. So ask yourself how you'll be using the camera and what kind of pictures you'll be taking. Your answers could save a lot of money.

## How automatic should your camera be?

Basically, there are two kinds of automatic 35mm SLR's. Both use advanced electronics to give you perfectly exposed pictures with point, focus and shoot simplicity. The difference is in creative control.

For landscapes, still lifes, portraits and the like, you'll want an *aperture-priority* camera. It lets you set the lens opening, while it sets the

shutter speed automatically.

This way, you control depth-of-field. That's the area of sharpness in front of and behind your subject. Many pro photographers believe that depth-of-field is the most important factor in creative photography.

At times you may want to control the motion of your subject. You can do this with an aperture-priority camera by changing the lens opening until the camera sets the shutter speed necessary to freeze or blur a moving subject. Or you can use a *shutter-priority* camera, on which you set the shutter speed first and the camera sets the lens automatically.

Minolta makes both types of automatic cameras. The Minolta XG-7 is moderately priced and offers aperture-priority automation, plus fully manual control. The Minolta XD-11 is somewhat more expensive, but it offers all the creative flexibility of both aperture and shutter-priority automation, plus full manual control. The XD-11 is so advanced that during shutter-priority

operation it will actually make exposure corrections you fail to make.

## Do you really need an automatic camera?

Automation makes fine photography easier. But if you do some of the work yourself, you can save a lot of money and get pictures every bit as good.

In this case, you might consider a Minolta SR-T. These are semi-automatic cameras. They have built-in, through-the-lens metering systems that tell you exactly how to set the lens and shutter for perfect exposure. You just align two indicators in the viewfinder.

## What to expect when you look into the camera's viewfinder.

The finder should give you a clear, bright view of your subject. Not just in the center, but even along the edges and in the corners. Minolta SLR's have bright finders, so that composing and focusing are effortless, even in dim light. And focusing aids in Minolta

*Minolta makes all kinds of 35mm SLR's, so our main concern is that you get exactly the right camera for your needs. Whether that means the advanced Minolta XD-11. Or the easy-to-use and moderately priced Minolta XG-7. Or the very economical Minolta SR-T cameras.*







(even with an auto winder). A window to show that film is advancing properly. A handy memo holder that holds the end of a film box to remind you of what film you're using. And a self-timer.

**What about the lens system?**

The SLR you buy should have a system of lenses big enough to satisfy your needs, not only today, but five years from today.

The patented Minolta bayonet mount lets you change lenses with less than a quarter turn. There are almost 40 Minolta lenses available, ranging from 7.5mm fisheye to 1600mm super-telephoto, including macro and zoom lenses and the world's smallest 500mm lens.

*Automatic sequence photography is easy when you combine a Minolta XD-11 or XG-7 with optional Auto Winder and Electroflash 200X.*

viewfinders make it easy to take critically sharp pictures.

Information is another thing you can expect to find in a well-designed finder. Everything you need to know for a perfect picture is right there in a Minolta finder.

In the Minolta XD-11 and XG-7, red light emitting diodes tell you what lens opening or shutter speed is being set automatically and warn against under or over-exposure. In Minolta SR-T cameras, two pointers come together as you adjust the lens and shutter for correct exposure.

**Do you need an auto winder?**

You do if you like the idea of sequence photography, or simply want the luxury of power assisted film advancing. Minolta auto winders will advance one picture at a time, or continuously at about two per second. With advantages not found in others, like up to 50% more pictures with a set of batteries and easy attachment to the camera without removing any caps. Optional auto winders are available for both the Minolta XD-11 and XG-7, but not for Minolta SR-T cameras.

**How about electronic flash?**

An automatic electronic flash can be added to any Minolta SLR for easy, just about foolproof indoor photography without the bother of flashbulbs. For the XD-11 and XG-7, Minolta makes the Auto Electroflash 200X. It sets itself automatically for flash exposure, and it sets the camera automatically for use with flash. An LED in the viewfinder signals when the 200X is ready to fire. Most

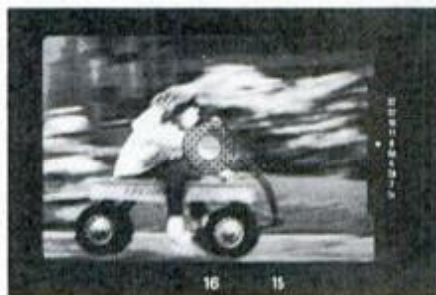
unusual: the Auto Electroflash 200X can fire continuously in perfect synchronization with Minolta auto winders. Imagine being able to take a sequence of 36 flash pictures without ever taking your finger off the button.

**You should be comfortable with your camera.**

The way a camera feels in your hands can make a big difference in the way you take pictures.

The Minolta XD-11 and XG-7, for instance, are compact, but not cramped. Lightweight, but with a solid feeling of quality. Oversized controls are positioned so that your fingers fall naturally into place. And their electronically controlled shutters are incredibly smooth and quiet.

Minolta SR-T's give you the heft and weight of a slightly larger camera, but with no sacrifice in handling convenience. As in all Minolta SLR's, "human engineering" insures smooth, effortless operation. **Are extra features important?** If you use them, there are a lot of extras that can make your photography more creative and convenient. Depending on the Minolta model you choose, you can get: multiple exposures with pushbutton ease



*The electronic viewfinder: LED's tell you what the camera is doing automatically to give you correct exposure.*



*The match-needle viewfinder: just align two indicators for correct exposure. Because you're doing some of the work, you can save some money.*

**What's next?**

Think about how you'll use your camera and ask your photo dealer to let you try a Minolta. Compare it with other cameras in its price range. You'll soon see why more Americans buy Minolta than any other brand of SLR. For literature, write Minolta Corp., 101 Williams Drive, Ramsey, New Jersey 07446. In Canada: Minolta Camera (Canada) Inc., Ontario. *Specifications subject to change without notice.*

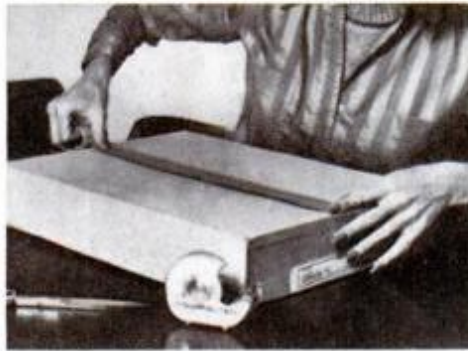
**MINOLTA**

**WE WANT YOU TO HAVE THE RIGHT CAMERA.**

# HOW TO WRAP AND MAIL YOUR CHRISTMAS GIFTS



1. Choose only sturdy cardboard boxes.



2. Seal with pressure-sensitive tape.



3. To reinforce, also use filament tape.



4. Address legibly, for reading at 30 in.

**W**hen mailing gifts this Christmas, more than ever before, be sure to "wrap it right" to avoid delays. Otherwise, due to new postal regulations, your packages could be sent back marked "unacceptable." Follow these tips:

- Use only solid, corrugated fiberboard boxes.
- Cushion items in the box with paper, plastic or Styrofoam shredding or excelsior. Fill to capacity.
- Seal all flaps and joints with a 1½-in.-wide, pressure-sensitive sealing tape, such as 3M's "Scotch" package tape. Extend at least 3 in. over

- all sides of the wrapped package.
- Reinforce with superstrong filament tape, also known as strapping tape. It comes in ½- and ¾-in. widths and holds in all climates. Encircle the box lengthwise and girthwise. Use extra tape on larger boxes.
- Don't use masking tape (too weak) or staples (too sharp for mail handlers). Also, with filament tape, brown paper and twine are no longer necessary.
- To address, use smudgeproof ink, zip code and return address—large enough to be read by postal employees at 30 in. **PM**

## Guidelines for mailing Christmas gifts

Just as important as wrapping your gifts properly is getting them in the mail in time for Christmas delivery. Almost everybody's been guilty at least once of last-minute Yuletide mailing. To avoid the late rush, follow these sure-fire guidelines for mailing suggested by postal authorities:

- Overseas packages, surface mail: Last week of October through early November. Allow at least six to seven weeks for delivery to be safe.
- Overseas packages, airmail: mid-November through early December. It's more expensive and faster than surface mail, but still requires planning.
- Domestic, long-distance packages: Day after Thanksgiving through early December. (The U.S. Postal Service

automatically sends all domestic letters and packages via air, unless otherwise indicated.)

- Local package mail: No later than Dec. 12.
- Overseas letters: At least two weeks before Christmas.
- Domestic letters: No later than Dec. 17.

These are guidelines, not deadlines. Packages and letters mailed later may arrive for the holidays, but don't count on it. The postal service offers this credo: "Mail early, the sooner the better." If your package arrives a little early, it certainly doesn't hurt. Simply mark "Don't open until Christmas" on the package to indicate that it is a holiday gift.

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Get into the well-paid field of air conditioning, refrigeration, and heating with practical at-home training from NRI. Developed with technical assistance from the York Division of the Borg-Warner Corporation, your NRI program includes the latest advances to prepare you to service home and commercial air conditioners, refrigeration units, and heating systems...even heat pumps and solar heating.

### Includes Professional Vacuum Pump and Specialist's Tools

In addition to NRI's "bite-size" lessons for faster, easier learning, you get practical, hands-on experience. Training kits include circuit demonstrator, control simulator, joint-making demonstrator, leak detector, system analyzer and more. Plus a *Lammert* vacuum pump for system purging.

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Graduates of the Master Course may take advanced training at the York Institute Resident School at no extra charge. Working with expert instructors on a wide range of equipment, you'll receive practical experience equal to months of on-the-job work.

### RUSH FOR FREE CATALOG

Just check the postage-paid card. No salesman will call.



# If it feels like somebody else is making all the money, maybe it's time you looked at NRI home training for TV and audio technicians.

No matter how hard you try, there are some jobs that just seem to go nowhere. And others so monotonous, they drive you up the wall. While all around, you see people enjoying what they do and making a good living at it.

## **NRI Can Set You Free**

There's a way out of the rut. NRI home-training in TV and audio servicing. At home, in your spare time, you can learn to become a TV electronics technician. Qualified to hold down a good paying job as a serviceman or troubleshooter. Even start your own full- or part-time business. And you learn at your own pace without quitting your present job.

## **Learn by Doing, Actual Bench Experience**

NRI is more than book learning. Sure, we give you all the fundamentals and theory. But it's reinforced with practical experience every step of the way. In our Master Course, you build actual electronic circuits and test them. You construct a 4-channel audio center, a 25" diagonal solid state



color TV, introduce and correct typical service problems. You even assemble test instruments that you use for learning and earning.

Your equipment includes a transistorized Volt-Ohm Meter, TV color pattern generator, advanced design 5" triggered sweep oscilloscope and CMOS digital frequency counter... the basic tools of the pro. In addition, you build the 4-channel audio center and 25" color TV while performing more than 35 in-set, power-on experiments that give you real bench experience while you learn.

## **Ask the Professionals**

A documented national survey confirms for the second time that almost half the professional TV servicemen have had home-training. And among them, they recommend NRI as first or only choice by more than 3 to 1! That's because NRI training works, as

it has for 63 years and more than a million students.

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# APPLIANCE CLINIC

## QUESTIONS ANSWERED

### Toaster will

In the May '78 Appliance Clinic (page 14, "Toaster Won't"), you advised William M. Hench that the latch on his General Electric toaster (Catalog No. 78T82) would not stay down because it was defective. You accurately stated that the part needed to fix the 20-year-old unit is no longer available. However, the toaster can still be repaired. I know. I was a master GE repairman for 13 years in Portland, Ore.

Follow the diagram below. The cause of the problem is excessive wear of the toaster latch (at point A). When pushed down, the latch engages the cam and holds the bread carrier down. The nub on

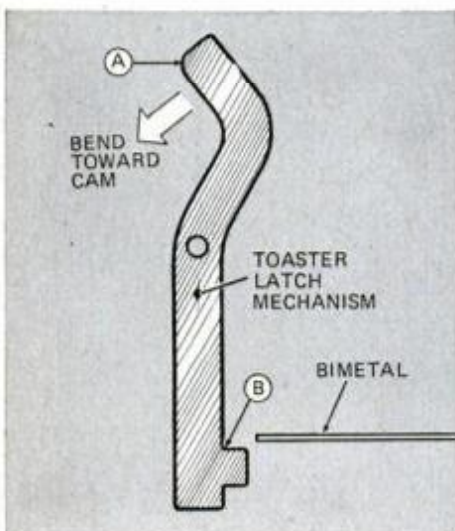


Diagram shows toaster latch, bimetal.

the bottom of the latch arm (point B) engages the bimetal. As heat causes the bimetal to "curl" and release itself from the nub, the latch disengages from the cam, releasing the bread carrier. If the latch is so worn that it can't engage the cam, the bread carrier won't stay pressed down.

The solution is simply to bend the worn latch arm toward the cam as shown. When bent enough to reach the cam, the latch can once again engage it and hold the bread carrier down.

This fix will work for GE toaster models 52T82 through 72T82 and 10T102 through 20T1025.—Jay H. Becker III, Troutdale, Okla.

Splendid. Thank you, Mr. Becker.

### Humming tools

Several stationary Rockwell/Delta tools in my workshop—bandsaw, bench saw and wood lathe—make a humming sound when they're plugged in, but not in use. Is this normal? Is there any danger of an electric shock or short?—H. Vernon, New York.

The noise is normal for Rockwell's light-industrial stationary power tools, which you have apparently purchased. They're outfitted with a low-voltage magnetic control that includes a transformer. The primary side of the transformer is energized at all times, causing it to emit an audible hum when not in use. The low-voltage magnetic unit allows 24-volt control at the push of a button and acts as a safety device to disengage the motor instantaneously if there's a loss of power.

### Odious odor

Can you explain why my Hotpoint HDA 310 dishwasher gives off an annoying odor like melted wax? The machine is five years old. The problem began only recently.—Nathan Goldstein, Brooklyn, N.Y.

One of the most common causes of dishwasher odor is a plastic utensil that gets washed from its rack and falls on the Calrod heating element. Check your unit. You can usually see it lying there, but it's possible for a utensil to get lodged under the Calrod and be hidden from view.

The source of the smell is probably external; there's no part of a dishwasher that can emit odor other than burning motor windings. The smell of burning windings is distinctive. It smells like ozone or burning insulation.

### Tube trouble

Our Kelvinator Model 176BN-R refrigerator, which has been trouble-free for 10 years, is suddenly acting up. Ice now clogs the drain tube from the freezer to the outlet in the food compartment. Air circulation to the freezer has been cut off. It's happened three times this year. I can always defrost the unit, but how can I make permanent repairs?—James Rouse, Kingston, N.C.

You probably have a leak in the drain tube, which allows moisture

to get inside and freeze. Kelvinator has informed us that you may even have food particles or other matter besides ice blocking the tube.

In any case, you have to take off the gray access panel in the rear of the unit, remove the insulation and install a new tube between the freezer drain and the food-compartment drain.

This is not an easy job. Unless you're very familiar with this refrigerator, it would be best to call a serviceman. Your biggest cost will be for the service call, not for parts or labor.

### Top down

The two top rods used for browning in our General Electric Toast-R-Oven no longer work. The bottom rods work fine. I disassembled the unit, and all wires appear secure. Why?—William Meyers, Laurel, Md.

One of three conditions, or a combination, will prevent functioning of the top Calrods in a GE Toast-R-Oven. They are: a faulty weld, malfunctioning Calrods or a burned-out anticipator heater. The anticipator heater is mounted on the bimetal (thermostat assembly) housing.

Unless you have experience repairing a Toast-R-Oven, leave it to a GE service center. There are several procedures involved which, if not adhered to carefully, could make your unit hazardous. Repairs must be made properly so the unit can withstand high current and heat.

For example, if a continuity test reveals that the upper Calrods are ineffective, they are replaced by clipping the welded bus wires off close to the Calrod terminals. The tabs retaining the upper reflector adjacent to the Calrods are straightened, and the Calrods are released. To install the new Calrods, the bus wires are silver-soldered to the Calrod terminals while adjacent components are protected from heat with asbestos paper. **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.

# Golden Lights



Only 8 mg. tar.

Taste so good you won't believe they're lower in tar than all these brands:



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MG. TAR  
1.3 MG. NIC.



13  
MG. TAR  
0.9 MG. NIC.



17  
MG. TAR  
1.0 MG. NIC.



12  
MG. TAR  
0.8 MG. NIC.



11  
MG. TAR  
0.8 MG. NIC.



17  
MG. TAR  
1.4 MG. NIC.



16  
MG. TAR  
1.1 MG. NIC.



16  
MG. TAR  
1.1 MG. NIC.

Source of all 'tar' and nicotine disclosures in this ad is either FTC Report May 1978 or FTC Method. Of All Brands Sold: Lowest tar: 0.5 mg. 'tar,' 0.05 mg. nicotine av. per cigarette, FTC Report May 1978. Golden Lights: Kings Regular and Menthol—8 mg. 'tar,' 0.7 mg. nicotine av. per cigarette by FTC Method.

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

# SCIENCE WORLDWIDE

## Papering the fields

A Swedish inventor has devised a method for collecting peat and converting it into a paper-like substance for use in raising crops. The peat is dehydrated and processed into "Agripaper," which can then be embedded with seeds and spread over semi-arid or desert land.

Tests in the United Arab Emirates have shown the Agripaper to be especially helpful in the cultivation of alfalfa, a crop of great value in feeding both livestock and people. Additionally, seeds embedded in the paper germinate with only 50 percent of the water normally needed. Commercial delivery of the material is expected to start next year.

## Crushed stone

A method of painlessly removing kidney stones from test animals will soon be tried on humans.

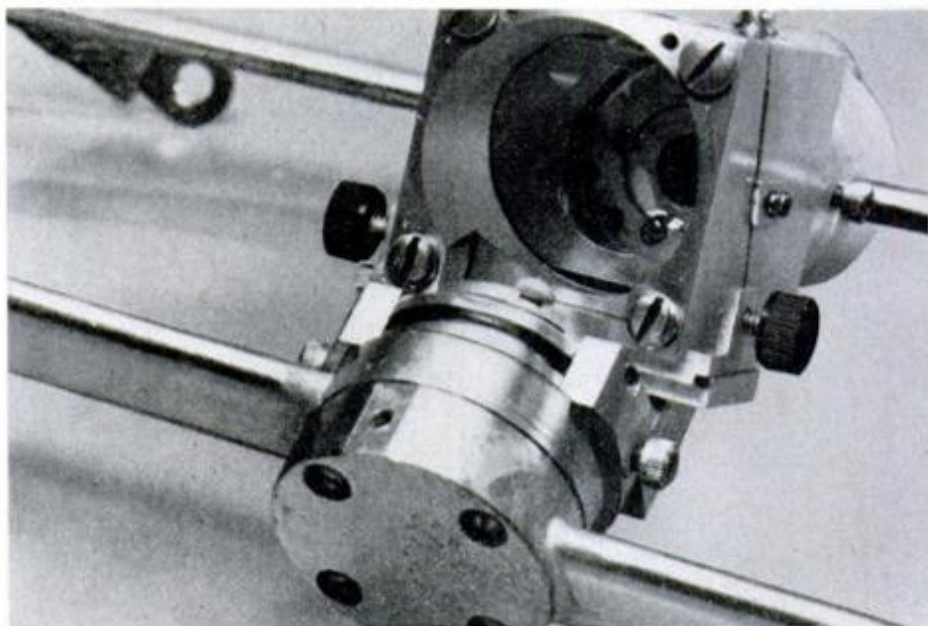
Developed by the Munich University Clinic and Dornier GmbH, the process uses intense sound waves to pulverize the stones. The sound waves are being "aimed" at the stones by a special reflector in bursts of a thousandth of a second.

Experiments so far seem to show that the stones can be crushed without damage to the soft tissue surrounding them; if so, particles still too large to be carried away by urine could be repeatedly bombarded without pain or danger to the patient. The treatment may reduce the need for kidney stone surgery by about half.

## Throwing biorhythm off base

The "science" of biorhythm has enjoyed wide vogue recently, and several energetic souls (almost none of them scientists) have made quite a lot of money writing and lecturing about it. But now several studies have all reached the same conclusion: There is absolutely no basis for believing in biorhythm.

In one study, researchers at the Johns Hopkins University School of Medicine scrutinized 205 highway crashes in which drivers were clearly at fault, to see if the accidents occurred more frequently during "critical" or "negative" parts of the biorhythm cycle. (According to the theory, three cycles



Special filter reflects some light to silicon cell (front), passes the rest to AlGaAs cell (rear). Coolant and cell-generated current flow through the tubes.

repeat from birth. The physical cycle, every 23 days; the emotional, every 28; the intellectual, every 33. Critical days are at the beginning and midpoint of each cycle). No relationship between the accidents and those parts of the cycles was found.

Similar results were reported in an analysis of the performance of professional athletes. William Bainbridge of the University of Washington showed that golfing victories and no-hit baseball games did not happen during biorhythmic "high" periods any more than would be predicted by chance. And, according to a study at Laurentian University of 400 mining accidents, the mishaps "were not more likely to occur on critical days, around critical days, or during descending portions of the various cycles."

## Two cells are better than one

When we last looked at solar cells, in this column (August '78, page 33), we reported on developments that may reduce the cost of silicon cells. But no matter how cheap they are, they're still only moderately efficient. Aluminum gallium arsenide (AlGaAs) cells can be much more efficient, but are quite expensive.

What to do? Varian Associates of Palo Alto, Calif., may have the answer: combine the two types of cells to yield high efficiency at moderate cost. They recently hooked up

a device that gave a record 28.5-percent efficiency (see photo above). The previous record was 23.4 percent.

It seems that different types of cells are sensitive to different wavelengths of light. A filter in the Varian unit reflects one group of wavelengths to a silicon cell, passes the rest to an aluminum-gallium-arsenide cell. Efficiency is further enhanced by concentrating the sun's rays 165 to 1 with a parabolic mirror.

This approach is only a precursor to a "stacked" cell, a sort of two-cell sandwich that uses the principles of the dual-cell device. According to John Heldack, one of the project leaders, a cell with a higher concentration ratio and efficiency of 30 to 35 percent is "perhaps two or three years away, with sufficient funding."

## Outsmarting mosquitoes

An alternative to pesticides has been developed at the University of Notre Dame, where scientists are trying to force mosquitoes to infect one another with a fatal disease. Male treehole mosquitoes have been infected with a protozoan that is harmful to the insects, but to nothing else. The males then are released in breeding areas where they defecate or die, leaving protozoan spores behind for young larvae to feed on. The results so far have been good.—Tom Sahagian



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

A man in sheep's clothing? Panatela wouldn't hear of it. Which is why the Panatela tradition of sound construction and exquisite styling is combined with prices just about any man can easily afford. For instance: the entire Royal Worsted (a remarkable new fabric with a soft, luxuriant wool "feel") outfit

shown above cost less than many people spend on a sportjacket alone. Panatela Separates. When you don't want to follow the flock. To get your free booklet "Guide to Dressing Well," write us at: Levi's® Sportswear, 1 Industrial Drive, Box 4547, Maple Plains, Minnesota 55348.



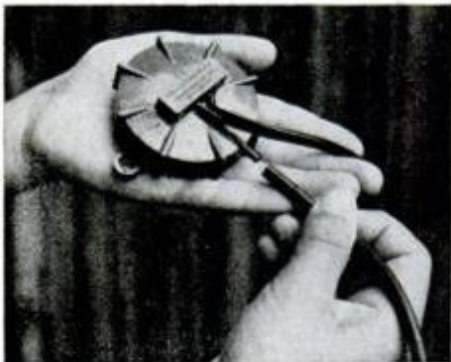
QUALITY NEVER GOES OUT OF STYLE.

# THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

## Power for passing

If you drive a car with airconditioning, you've certainly experienced poor acceleration when the air is on. That's due to the loss in available hp which is diverted to run the compressor. The power loss is especially frustrating with small-



**Vacuum switch cuts out ac compressor when accelerating. Wire goes to 12-v. clutch connection; vacuum line to carb.**

er engines and can make passing in traffic a bit dicey. Now there's help that involves 10 minutes' do-it-yourself work and \$12. Pass Master is a small, vacuum-powered switch that automatically disengages the compressor clutch during quick acceleration. Installation is simple: one electrical connection to the compressor clutch, and a vacuum connection teed into the carb vacuum line. One tip: Scratch the optional hookup (for no compressor operation at idle) if most of your summer driving is in the city, where long idling periods are common. Halem Industries, Inc., Box 1419, Cocoa, Fla. 32922.—*B.H.*

## Valve service tools

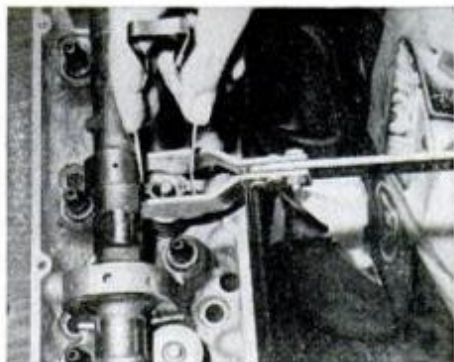
When an engine starts burning oil, defective stem seals usually are a prime cause. You can replace



**Universal valve spring compressor.**

these seals without removing the cylinder head, using air pressure into the sparkplug hole to hold up the valves and a special valve spring compressor. You used to have to pick a spring compressor specifically designed for your make of car, and anything to handle an import was either difficult or impossible to get.

But now there's a universal compressor. It's adjustable. By putting a retaining peg into the appropriate holes in the jaw and handle, you can change the relationship between the two, so it works on almost anything. You even can use it on GM overhead valve engines, with a special adapter (included) that permits bolting it to the rocker ball stud. (About \$10 from K-D Tools, Box 1767, Lancaster, Pa. 17604.)



**Tweezer tool for valve spring keepers.**

Once you've got the spring compressed, you've got the problem of handling the spring keepers. Getting them out is normally not difficult, but putting them back in can be a test of patience, particularly on some overhead cam engines where space is limited. Now there's a neat, simple answer: a \$4 tweezers-like tool with magnetic tips shaped to hold the keepers. The magnets make removal supereasy, but their real value is when it's time to put the keepers back in. Just set them up on the tweezers fingers, put the tool into position on the valve stem, then lift the tool up and away. The keepers remain in the correct position and you can release the spring. We tried this one over and over and couldn't believe how easy it was. It's available from Lisle Corp., Clarinda, Iowa 51632.—*B.H.*

## Trans temp gauge

If you tow a trailer, or have a pickup or truck with an automatic transmission, you might do well to monitor your transmission's fluid temperature. Overheating is the main cause of transmission failure.

B&M Automotive now markets a lighted dashboard gauge with a sensor that taps into your trans' radiator return line. Installing one in my Dodge wagon was like hooking up a fuel filter.



**Transmission temp gauge.**

The gauge lets me monitor heat buildup inside the tranny on a color-coded dial. Anything above 220° F. means slow down and let things cool.

The gauge and installation kit cost \$30.41, at many parts stores or from B&M Automotive Products, 9152 Independence Ave., Chatsworth, Calif. 91311.—*M.L.*

## Rust remover and sealer

Is your car rusting away? They say once rust starts, nothing can make it stop.

That might no longer be true. Noverox is a compound that removes rust and then seals the



**Rust-stopping compound.**

metal. I tried it on a rusty tailpipe, and so far the Noverox-treated spot remains uncorroded, while the untreated areas around it have rusted through.

All I did was remove the loose scale with a wire brush. Then I poured on Noverox (it can also be brushed or sprayed) and let it dry. It poured out white, but turned black as it set and reacted with the metal underneath. Noverox can be painted over, and an 8-oz. bottle lists for \$4.95. If you can't find it locally, order from: Noverox, Inc., 960 North San Antonio Rd., Los Altos, Calif. 94022.—*M.L.*





GRANDPA  
at 43mm.



GRANDPA  
at 75mm.



STEVE and LARRY  
at 43mm.



STEVE and LARRY  
at 75mm.



SNUFFY  
at 43mm.



SNUFFY  
at 75mm.



AUNT BELLA, DAD  
and MOM at 43mm.



AUNT BELLA, DAD  
and MOM at 75mm.

# GET CLOSER TO YOUR FAMILY.

With the Fujica AZ-1 Zoom Camera, you can take a beautiful wide shot of Grandpa planting his geraniums, or a close-up of

his smile without having to change lenses.

Just zoom out for the wide shot, zoom in for the close-up.

It's the only fully automatic 35mm SLR camera on the market that comes with a zoom lens. (You can also get a 50mm 1.4 or 55mm 1.8 lens.)

But this light, compact zoom isn't all the AZ-1 has to offer.

It has one of the world's most accurate and reliable automatic exposure systems,

because it comes with a built-in micro-computer. Just point the camera and you automatically get the right exposure.

You even have a choice of optional accessories like the Fujica Auto Winder and the Auto Strobe Flash.

If you're in the market for a new 35mm camera, think of all the fun you can have zooming around town with your Fujica AZ-1.

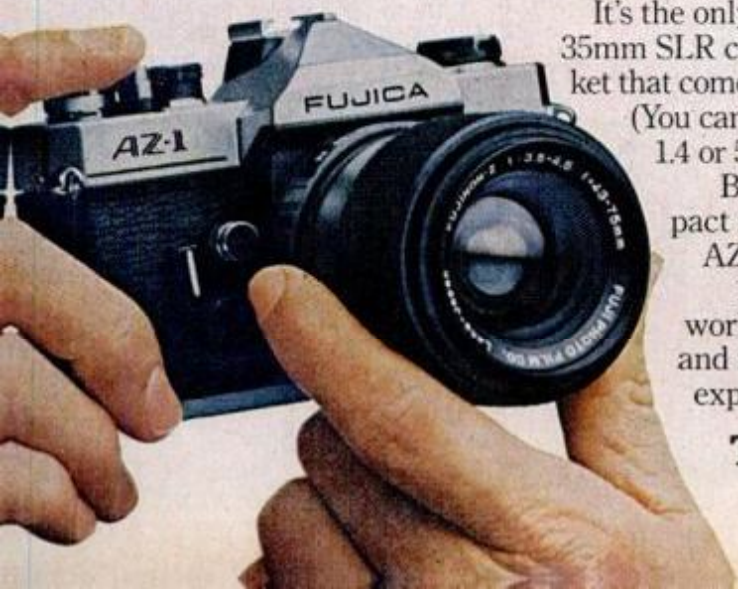
For beautiful pictures, we recommend Fuji Film.



## THE FUJICA AZ-1 ZOOM CAMERA.

FUJI PHOTO FILM U.S.A., INC. 350 FIFTH AVE., N.Y., N.Y. 10001

Материал, защищенный авторским правом



# Cult cars continued...

When we ran our 'Cult Cars' story in July little did we realize that our six pages plus cover was just the tip of an iceberg.

by Wade Hoyt

**W**e asked for it. We got it! And it wasn't a Toyota, either. In the July '78 PM cover story on cult cars, I wrote that: "The definition of a cult car is a highly personal thing. My list of favorites starts below." Like any piece of magazine journalism (as opposed to book journalism) there just isn't room to list everything you'd like to. At the end of the article, we added 16 cars "whose owners will be hopping mad if we overlooked them," and added that "we'll certainly hear from fans of TVRs, Isos, any cars with gull-wing doors..."

Well, about the only people we *didn't* hear from were the owners of TVRs, Isos and gull-wing doors. But we were swamped by the owners of almost everything else. Some of them were understanding of our space limitations. Others were hopping mad. Some of their letters are printed (in shortened form) on these pages. Of course, there just isn't room to reprint all the letters we received. So please don't send any letters about how PM didn't print the letter you sent about how PM didn't print the name of your favorite cult car.

I have two questions: (1) In the Vega, how do you tell the difference between a Cosworth engine and the standard engines. (2) Where does the '64 Chevy Bel Air stand?

David Baron  
Bronxville, N.Y.

(1) The Cosworth engine has two camshaft covers on top with the words "Cosworth Vega" cast into them. The standard engine has one cam cover and a puddle of oil underneath. (2) It doesn't stand, Dave, it just sort of slinks along near the end of the line.

The author's decision to make the Buick Regal Turbo V6 a future cult car is a big joke. All I can tell you is the Olds Cutlass outsells the Regal four to one. That's what makes a car great—public acceptance.

Joseph Krawczuk  
Troy, Mich.



Neglected: All MGs going back to this exquisite 1933 MG K3 Magnette.

See the Aug. '78 PM Owners' Report on the Regal Turbo, Joe. They seem to be an unusually satisfied bunch of owners. Hope you enjoy your Olds as well.

You missed my car, a 1977 Datsun 200-SX. Wherever I drive, I always get a honk, a hand wave or some signal of recognition from another 200-SX owner.

There are not that many on the road yet and the price is just high enough to make the car expensive enough to keep it still unique. I hope we remain a small group of owners and maintain our camaraderie.

John A. Cox  
Robesonia, Pa.

Your hope may come true, John, we heard that the 200-SX's days are numbered.

I have never seen raw motor oil sprayed on the inside of a Corvair

windshield. True, they were big oil leakers, and oil dripping on the exhaust manifold would smoke and the heater/defroster brought smoke and fumes inside the car until it was necessary to drive with the windows down. This problem can be solved by installing high temperature Viton O-rings on the pushrod tubes. The factory O-rings become brittle, crack and leak. All four Corvairs I restored were profuse oil leakers when purchased. Today, not a one leaks a drop of oil. Any curb-side mechanic can install a new set of O-rings in five hours.

Virgil Hughey  
El Dorado, Kans.

I guess you never saw my neighbor Fred's '65 Corvair. He swore that it sprayed oil all over the windshield. Now, maybe it was just fumes that recondensed on the glass, but he still had to drive around in the winter

[\(Please turn to page 30\)](#)

Datsun 200-SX.



Matched Components from Panasonic. When we first introduced them, a lot of people thought it was a good idea. Including our competitors. That's why you may find other systems that look like Matched Components.



Thrusters® For an extra thrust of bass.

But there's more to Panasonic Matched Components than just good looks. There's Panasonic sound. It's a result of our combination of power, inaudible distortion and sophisticated circuitry that separates merely good-looking compacts from

our great-sounding components.

If you're into 8-track, get on the right track with our best AM/FM stereo receiver with 8-track, the RA-6800. While cassette connoisseurs will choose the RA-6700 stereo receiver with Dolby® noise reduction system (shown below). Both receivers deliver a solid 25 watts per channel, minimum RMS into 8 ohms from 40 Hz to 20 kHz with no more

than 0.8% total harmonic distortion.

There's also the RD-3500 automatic-return servo-belt-drive turntable (shown below). It comes complete with a sensitive magnetic cartridge and the kind of performance specs that will put you in the same league with your friend the hi-fi nut.



Duo-Cone™ headphones (EAH-520).

So will the sound of our SB-1800 Thrusters speaker system. To a 10" woofer and a 10" passive radiator for an extra thrust of bass, the SB-1800 adds a parabolic short horn. It adds better sound direction and more presence to your music.

And for superb private listening, put on a pair of Panasonic Duo-Cone headphones. Think of them as accurate, full-range speakers that just happen to weigh 9.2 ounces.

So beware of imitations. Get Panasonic Matched Components. And get hi-fi without the hassle.

\*Dolby is a trademark of Dolby Laboratories, Inc. Cabinetry is simulated wood.

# When it looks this good, who cares how it sounds? Panasonic does.



Matched Components  
**Panasonic.**  
just slightly ahead of our time.

# “Minimize the cost of electricity, that’s what our research is really try

Dr. Richard Balzhiser, Director for Fossil Fuels and Advanced Systems at the Electric Power Research Institute.



Photographed at U.S. Department of Energy's Sandia Labs solar thermal test facility near Albuquerque, New Mexico.

# ing to do."

"Our principal solar research effort is to develop collectors to use solar energy concentrated by mirrors. Such systems must be in use a large part of the time to justify the large capital investment. While the sun's energy is free, it's only available part of the time, so we'll need innovative storage or hybrid systems if solar electricity costs are to compete with other alternatives.

### SOLAR CELLS

"Present solar cells are far too costly for utility use. We believe thin-film technology or very advanced cell concepts using concentrated solar energy offer the best chances for producing electricity at competitive costs. We've recently had some exciting results which could lead to the breakthrough necessary for solar cells to receive serious consideration by utilities.

### SOLAR HOMES

"To investigate and refine solar heating and cooling systems, we have built five houses on Long Island, and five in Albuquerque, equipped with various combinations of space conditioning and storage systems. We will run more than 100 experiments over the next three to four years to identify the mix of solar energy and other things a homeowner can do in combination with his utility to lower the overall cost.

### CLEAN COAL

"As coal-fired plants become more expensive and more complicated, new approaches to producing power from coal could become more attractive. We're looking for better technology to protect the environment at minimum cost. R&D on coal gasification and fluidized combustion has shown considerable promise. Unfortunately, these are not

available today, and our immediate needs must be met with better conventional plants that operate as cleanly, as reliably and as cost-effectively as we can make them."

### NUCLEAR POWER



Dr. Milton Levenson, Director for Nuclear Power at the Electric Power Research Institute.

"About 80% of our nuclear research is aimed at making nuclear power even less expensive. We're trying to improve reliability, to extend fuel life, to protect against the cost of plant shut-downs, to make plant operations go smoother.

"We're getting involved in new types of electronics, new concepts for inspection devices, and very sophisticated ways of analyzing materials. But basically it all comes back to reducing even further the cost of nuclear power."

This country will need more electricity years before resources now in research will be ready to deliver it. By 1988, our demand will increase by 40% just because of new people and their jobs. Utilities will supply that energy using whatever fuels are then available and economical. For facts on how research is keeping our energy options open, just send the coupon.

## The time to build power plants is now.

Edison Electric Institute  
P.O. Box 2491, General Post Office  
New York, N.Y. 10001

4PM-11

Please send me *free* information about research and development programs that are exploring our energy options.

Name \_\_\_\_\_

Address \_\_\_\_\_ Phone \_\_\_\_\_

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

**Edison Electric Institute**  
The association of electric companies

Edison Electric Institute is a not-for-profit organization.



Here are some more cars considered cult cars by their vociferous owners: Triumph TR-7 is at top; Saab 96, center; and the venerable MGB is at bottom.

### CULT CARS CONTINUED . . .

(Continued from page 26)

with a pile of old rags on the front seat to mop up the oil!

Thanks for the tip on Viton O-rings. If Fred had known that, he still might be driving his Corvair, but maybe not. It was also using a quart of transmission fluid a week and he had to cover up holes that rusted through the floor with plywood before someone fell out.

As a member of both the Classic AMX Club International, and the Rocky Mountain AMX Club, I was disappointed to see that . . .

Gary Born  
Denver, Colo.

I don't see how you could leave out the Triumph TR-7 or any British Leyland car for that matter.

W.R. Lyle  
Kingston, N.Y.

I feel there is a car deserving



1972 Triumph TR-6.

recognition as a definite cult car. I am referring to the Triumph TR-6.

Neil Watson  
Garner, N.C.

Surely your author might have heard of the Triumph TR-2, TR-3A, TR-3B, TR-4, TR-4A, TR-250, TR-5, TR-6, TR-7, GT-6, Spitfire, and the soon-to-be-released TR-8.

Marquis Carter Grove  
President  
Triumph Autosport Club  
Ottawa, Canada

Yeah, Neil Watson and W.R. Lyle mentioned something about them. One question: On what grounds is the TR-8 being released, and from where?

I am sending you a picture of what I truly believe will someday be a car classic—the 1973 Dodge Charger Special Edition.

Peter Frecchio  
Norway, Mich.

Thanks, Pete, I'll keep it next to Grove's letter.

A pox on that myopic churl Wade Hoyt for classifying the Volvo 1800 coupe as "pinheaded." Perhaps he should look at himself in a mirror.

Fran Stuart  
Peterborough, N.H.

Thanks, Fran. It's always nice to hear from the ladies . . .

I enjoyed your article on Cult Cars, but was surprised you did not mention the Mercury Capri. I find that other Capri owners wave, honk,

flash and jump out of sunroofs at me. I do the same back.

Robert Raye  
Glendale, Calif.

Sounds pretty dangerous to me, Bob. No one ever flashes at my Capri. Only in California, I suppose.

I really didn't expect to see my '65 Ford XL 500 convertible listed.

Charles Rettstatt  
Ringwood, N.J.

Good thing, too.

My feelings were hurt when you said that '56 Chevys were "out to lunch." I was red for hours.

Greg Nichols  
Martha Lake, Wash.

Gee, Greg, I didn't mean to hurt anyone's feelings. I didn't say the cars were out to lunch, only that collectors seem to consider them OTL—that is, not as desirable as the '55s and '57s.

I own a '70 T-Bird four-door with 76,863 miles on it and it runs fine. My problem is this: service managers at the Ford agency tell me to hold onto this baby, it's a classic. Other people tell me to get rid of it.

John Conlon  
Lawrence, Mass.

This is a problem? My feeling about any old car is that if it runs well, keep it! But if you don't really get a kick out of it anymore, sell it to someone who will. Line forms on the right . . .

You missed one of the most interesting cult cars of all—the three-cylinder, two-cycle, Saab 96.

Doug Payne  
Santa Monica, Calif.

In your article on cult cars, you left out the Citroen D series.

Leslie Denham  
Houston, Tex.

You bet I'm hopping mad. I own probably the most beautiful, economical (25 mpg), and durable (187,000 miles) cult car ever—the Mercedes 280SL.

Sandra Swanson  
Tulso, Okla.

You forgot the Nash Metropolitan. How could you?

K. Rineman  
Denver, Colo.

You forgot to include the 1969 Ford Torino.

Barbara Valicenti  
Norton Hill, N.Y.

Your article was great, except

(Please turn to page 192)

# The Preferred Taste



**Salem Lights.**  
**America's largest selling**  
**low tar menthol cigarette.**  
**More and more smokers prefer**  
**the mellow flavor,**  
**cooling menthol and**  
**total satisfaction.**

*Salem Lights*



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

10 mg. "tar", 0.8 mg. nicotine av. per cigarette, FTC Report MAY '78.

Материал, защищенный авторским правом

# ALL OUTDOORS

## Things to come

In June 1971, PM's auto editor, Bill Hartford, predicted that a strange alternate-power engine might someday appear in recreational vehicles (*A Look Under the Hoods of Tomorrow's Cars.*) There are no clouds in his crystal ball. This summer, Winnebago proved Hartford's prediction in a special motor home installation that may be a forerunner of things to come.

The new/old powerplant, known as a Stirling, has actually been around since the mid-1800s, when Scotsman Robert Stirling thought up this economical form of external combustion power. Unlike engines that burn fuel inside, Stirling's invention heats air or gas sealed inside a cylinder. Rapid expansion pushes a piston to activate the engine. The heat, however, is applied to the outside of what would normally be the combustion chamber; gases inside are reheated and recirculated. A 180-hp experimental helium model powered a bus in Holland 10 years ago.

The Winnebago installation, in a large Elandan II 32-foot motor home, uses a Stirling's special advantages for everything except motive power. A regular car en-

odorless exhaust. It is slightly larger than a standard generator but, when fitted out to provide electricity, operate appliances, supply hot-water baseboard heat and recharge batteries, the total weight is less. Entirely new and more efficient motor home heating and cooling is possible, and the life of the Stirling is estimated to be longer than that of a comparable generator, with less maintenance required.

At present the new engines are being made in Sweden and marketed here by Stirling Power Systems, jointly owned by the Swedish manufacturer and Thetford, well-known supplier of the Porta-Potti and RV sanitation systems. Winnebago chairman Harold Bragg hopes to have a limited run of Stirling-equipped motor homes in production next spring.

## Looking at waterfowl

This time of year, whether you hunt ducks and geese for food or only watch them veing overhead as they migrate south, you can enjoy them more with a new, pocket-sized \$1.80 booklet from the Fish and Wildlife Service of the Department of the Interior. It's

For shotgunners in the steel-shot zones that are saving wild-fowl lives by preventing lead ingestion, Winchester-Western has announced specially improved shells. Using a new Ball Powder, they report higher muzzle velocities while retaining denser patterns and greater energy on target because more pellets per load are possible. An energy increase of 18 percent in a 30-inch circle at 40 yards is claimed for Winchester-Western 2- $\frac{3}{4}$  inch steel loads over previous loads, and the 3-inch shell delivers 32 percent more energy.

## Save the tail

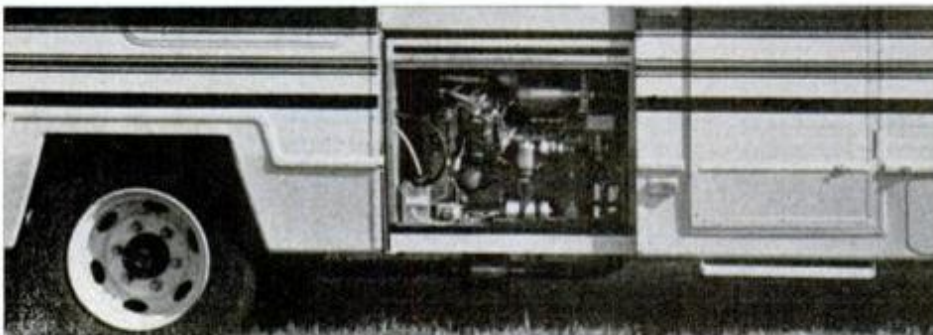
When you've eaten fine stewed squirrel right down to the tail, don't throw it away. Instead, recycle the tail by writing Mepps Lures, Box 527, Antigo, Wis. 54409, for mailing instructions.

They pay up to 10 cents for tails or up to 20 cents credit toward their spinner lures with squirrel-tail dressings.

## Emergencies

Last winter's storms and sub-freezing spells—the ones that broke power lines, put heating systems out of whack, stranded motorists and turned homeowners into campers—all deserve to be remembered again this month. Instead of putting off-season outdoor gear away, inventory it, stow some in the car trunk, more in a handy closet, and be sure everything is in working order.

In case of blackout or blizzard, equipment makers at the Coleman Co. recommend not only their own lanterns, campstoves, catalytic heaters, ice chests and sleeping bags, but also candles, portable radios, flashlights, matches, spare canned food, water and extra batteries. A Citizens Band radio in your car is worthwhile too. Prepare a checklist right now for everything you might need. **PM**

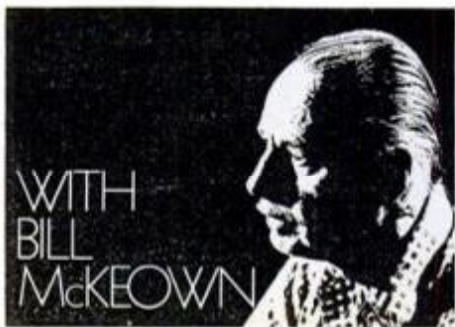


Packaged in side compartment of an experimental Winnebago Elandan, a Stirling external combustion engine may start a new trend in motor home self-containment.

gine rolls the vehicle down the road, but all heating, airconditioning, electric generating and cooking requirements are provided for by one 10.7-hp Stirling. No LP gas is necessary.

Advantages of the new system appear to be numerous for the RV outdoorsman who wants to stop anywhere and turn on all the self-contained comforts of home. The new unit can burn gasoline, kerosene, diesel oil or fuel oil. It uses less fuel than a conventional Otto-cycle generator, with lower noise level, less vibration, and clean,

called *Ducks at a Distance—A Wildfowl Identification Guide*, and can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20240. Full-color drawings of 21 species are shown, and many other wetland birds are displayed in flight for identification. Since recognizing bird colors is not only essential to the hunter, but also one of the best ways to judge range and prevent "skybusting" shots when the bird is much too far away, we recommend the booklet enthusiastically.





# Give any Manhattan the crowning touch.

Seagram's 7 Dry Manhattan.  
To 1 part dry vermouth add 3 parts  
Seagram's 7. Grace with  
a twist of lemon.  
Brilliant.



Seagram's 7 Classic Manhattan.  
To 1 part sweet vermouth add  
3 parts Seagram's 7 and a dash of  
bitters. Top off with a cherry. Tops!

Seagram's 7 Perfect Manhattan.  
To equal parts sweet and dry  
vermouth add 3 parts Seagram's 7.  
Bright idea!

Start out with the great taste of Seagram's 7 and  
you'll always end up with a great Manhattan.  
Any way you like them, enjoy our quality in moderation.

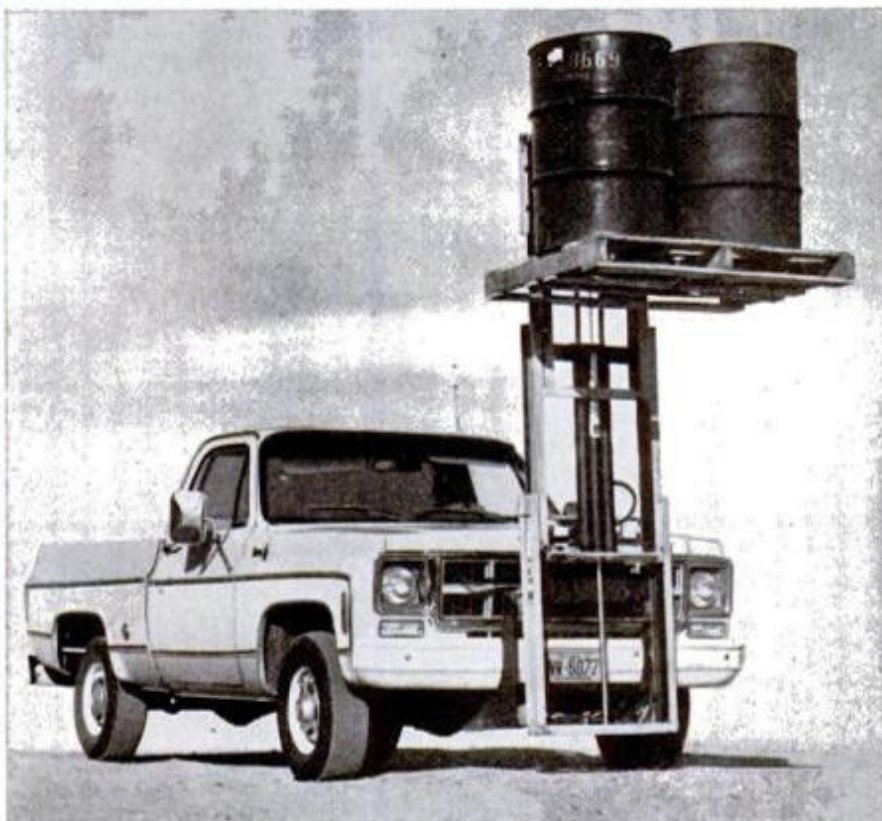
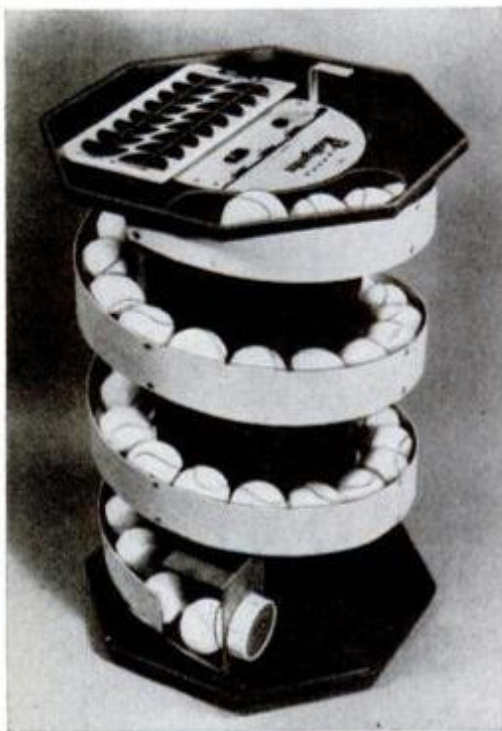
**Seagram's 7 Crown**  
Where quality drinks begin.

SEAGRAM DISTILLERS CO., N.Y.C.  
AMERICAN WHISKEY—A BLEND. 80 PROOF.

# IT'S NEW NOW

## Solar tennis, anyone?

The portable, 16-pound Rallymite model 50S is a solar-cell-assisted tennis-ball thrower. With a 50-ball capacity, it delivers shots every four or six seconds, from short lobs to 40-foot drives. It can shoot about 5000 balls after a full charge from a.c. or solar cells, the maker says; with solar assist, 7000. Available for about \$250 from Rallymaster, 2625 American Lane, Elk Grove Village, Ill. 60007.

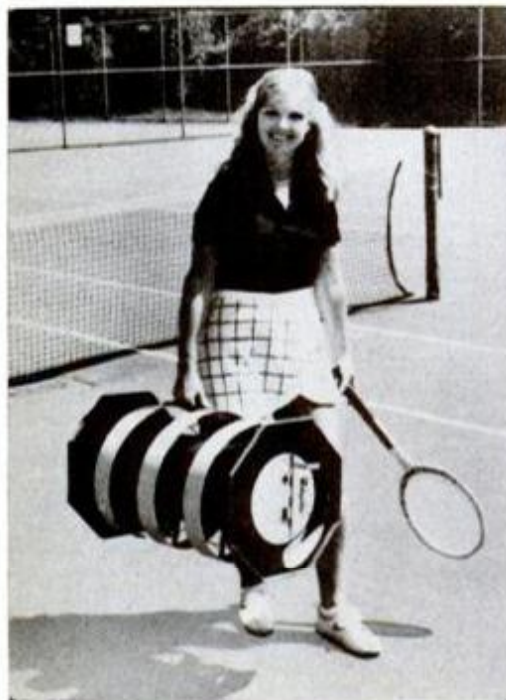


## A lift for your truck

Almost any pickup becomes a forklift with Hy-Power Forklift. Lifting unit mounts and dismounts easily from Super Bumper bolted to truck frame. Lift, powered by truck's battery, is said to stack up to 1500 pounds as high as 7½ feet. Lift is about \$2000; Super Bumper and Jack Stand for mounting of lift, \$250 each. Solex Engineering, 1811 North 25th Dr., Phoenix, Ariz. 85009.

## Surfing without waves

A motorized surfboard, Skidaddle, permits solo riding up to 25 mph. Rider steers by shifting his weight. Craft is said to be virtually unsinkable; if the rider falls off, the propeller drive declutches and engine slows to idle. Boyd Kirk, 15 Holywell Hill, St. Albans, Hertfordshire, AL1 1EZ England.



# *Come fly with me.*

In the 1979 Thunderbird T-Roof convertible.

Now when you fly your own Thunderbird, you can enjoy the open-air feeling of a convertible. It's the new Thunderbird T-Roof, the ultimate touch of sportiness in the legendary Thunderbird.

And you can add to your driving fun with a choice of over 70 options, including AM/FM stereo radio/cassette player, extended range fuel tank and new seatbelt warning chime. Test-fly the new Thunderbird T-Roof. It's a rarified experience.

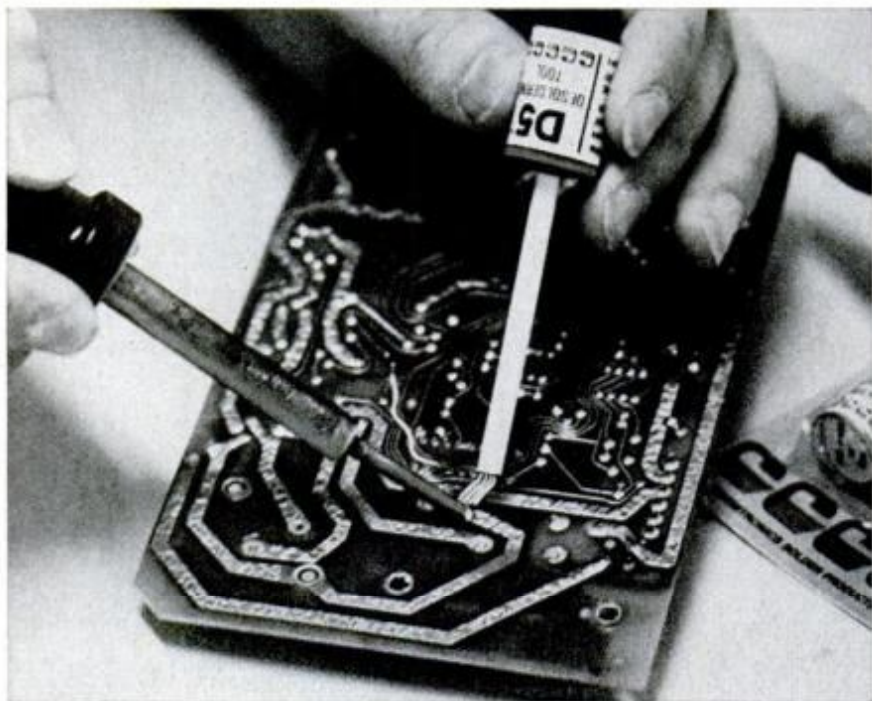


THUNDERBIRD

FORD DIVISION



# IT'S NEW NOW

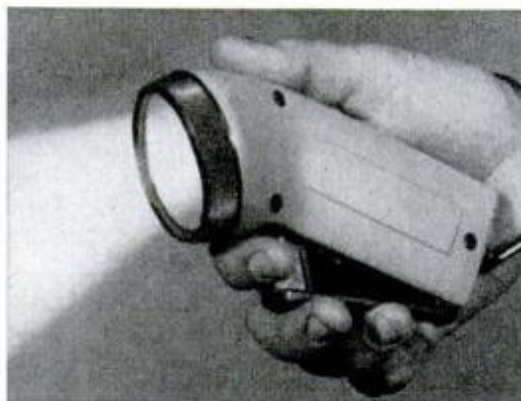


## Taking things apart

The D5 Desoldering Tool features a replaceable cylinder with 5 feet of specially-treated copper-braid wick; the wick absorbs remelted solder. Tool, with .06-inch-diameter braid, \$2.29; with .10-inch braid, \$2.45. Refills are \$1.49 and \$1.65. Chemtronics, 45 Hoffman Ave., Hauppauge, N.Y. 11787.

## Hand-powered light

Ever in desperate need of a flashlight only to find that the batteries are dead? Everlight uses a hand-powered generator instead of batteries so it's always ready when you need it. It's said to be shock and impact-proof, as well as water repellent. Costs about \$6 from Michaels, Dept. A3, Ettersburg Star Route, Whitethorn, Calif. 95489.

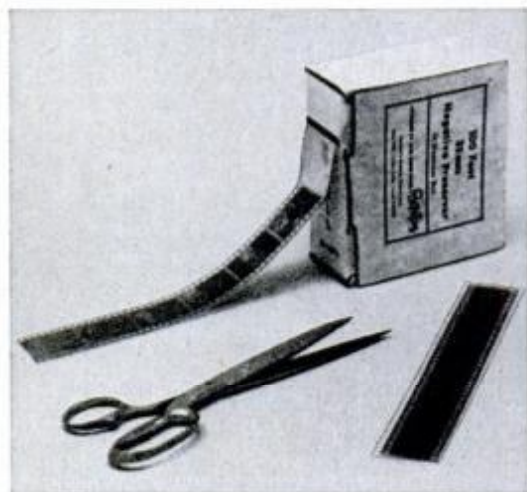


## Reduce poison hazard

Many household items pose a substantial poison hazard, especially to small children. The Poison Safeguard Kit, containing syrup of ipecac, activated charcoal and poison safety information, may be of significant help in an emergency. Sold for under \$10 from Marshall Electronics, 7440 North Long Ave., Skokie, Ill. 60076.

## Rolled-up sleeves

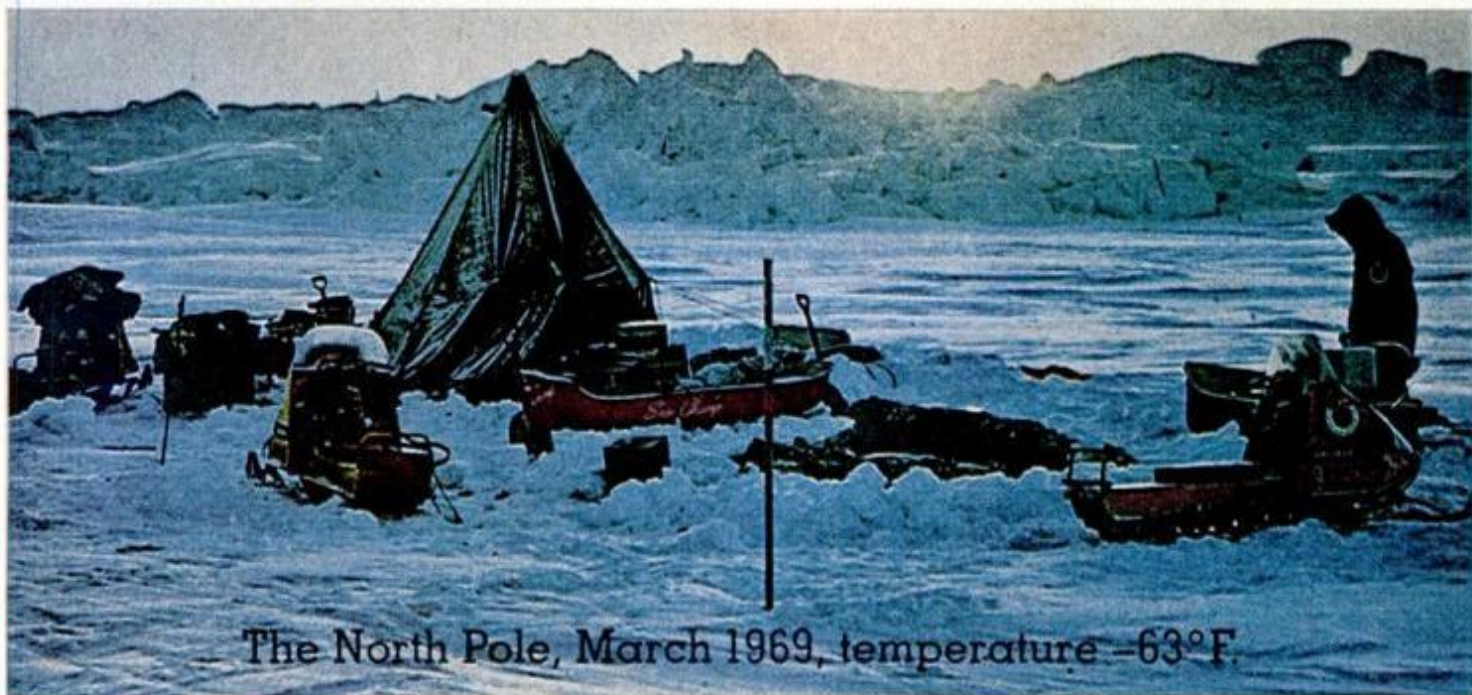
Protect your 35-mm negatives with Portertown Negative Preserver. It's a continuous 100-foot roll of clear plastic sleeving material, with a dispenser. You cut any length you want. About \$3 from Porter's Camera Store, Box 628, Cedar Falls, Iowa 50613.



## The acid test

Or base test, for that matter. The pH Tester model pH3 is a portable, self-contained instrument designed to measure the pH factor of soils, plants, tap water, swimming pools, beverages and other solutions. The unit measures from pH 3.5 to pH 9. No batteries are necessary. It's in a high-impact case and an electrode conditioner is included. About \$20 from J and M Instrument Corp., 96E Allen Blvd., Farmingdale, N.Y. 11735.





The North Pole, March 1969, temperature  $-63^{\circ}\text{F}$ .

# “Thank God for Sorels”

That was the reaction to the Canadian Sorel boot by men whose lives depended on proper foot gear.

Because at  $-63^{\circ}\text{F}$ , cold feet can kill you. Literally. So those men, members of the historic Plaisted Expedition to the North Pole, put their faith in the warmth of Sorel.

Sorel's incredible warmth is made possible by its unique



bonded leather and rubber construction, combined with our thick, boot-within-a-boot felt liner. You'll find Sorels the warmest, most rugged, most comfortable boots you're ever likely to wear.

No matter how bad the weather. Don Powellek, the Expedition's Deputy Leader, wrapped up Sorel's story best:

“At  $-63^{\circ}\text{F}$ ...quite comfortable.”

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Men's

Champion  
Men's

Premium  
Men's and  
Women's

Caribou  
Men's and  
Women's



Some styles available in genuine Vibram and Waffle soles.

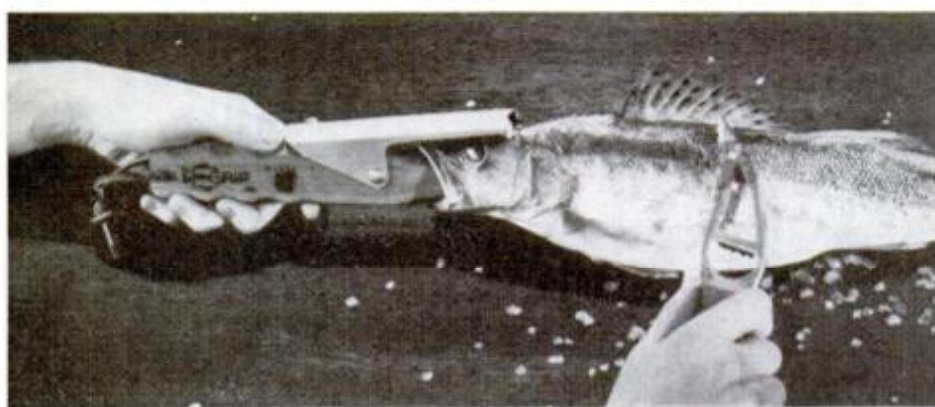


## Sorels by Kaufman

For the name of your nearest Sorel dealer write Kaufman Footwear, Dept. P, Kitchener, Ont., Canada N2G 4J8

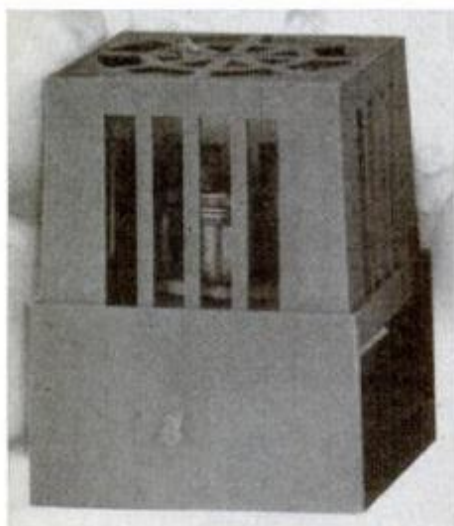
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# IT'S NEW NOW



## A gripping fish story

Your hands need never touch a fish while cleaning it, the maker of the Fish Grip claims. Insert the tool into the fish's mouth and a spring-loaded clamp grabs hold. It's said to be corrosion-resistant and will float if dropped overboard. About \$9 from Bear Paw Tackle, Inc., Box 494, Bellaire, Mich. 49615.



## A breeze in your icebox

Many small refrigerators, like those found in RVs, do not circulate cold air evenly. Fridge-Mate is a coffee-cup-size fan that can be placed on a fridge's bottom shelf to keep the cold air moving. Two D-cells are said to keep the unit running continuously for up to three months. About \$10. Fridge-Mate, Box 22697, San Diego, Calif. 92122.

## Plumbing the depths

The DS-300 depth sounder has a liquid crystal display that is said to have low power drain and furnish excellent visibility in bright light. Built-in visual depth alarm adjusts from 2 to 80 feet; audible alarm is optional. Unit shows depth down to 300 feet from surface or below keel, depending on selector switch setting. It's \$435 from Kenyon Marine, Guilford, Conn. 06437.



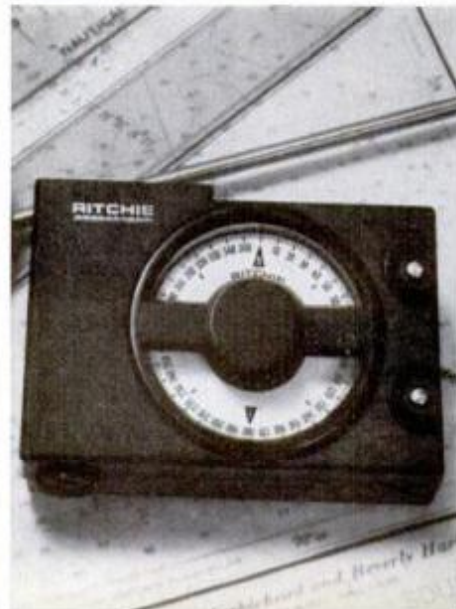
## You're hooked

If bait keeps slipping off your single fishhooks, Magic Bait Hook may solve your problem. Made of single pieces of wire in No. 2, No. 6 and No. 8 sizes, double hook holds bait with tiny barbs on the inside of each hook shank. Six are \$1.50. Grand Lake Tackle Co., Box 185, Grand Lake, Colo. 80447.



## Bearing on the matter

With most compasses, you line up a distant object in the sight and read the direction on the compass card, but the slightest movement causes the card to move around. The Hand Bearing Compass lets you lock the compass card when taking a bearing. It has a sliding light shade to reduce glare in bright light and an illuminated dial for night readings. It's about \$70, including two nonmagnetic batteries, case and lanyard. E.S. Ritchie and Sons, Oak St., Pembroke, Mass. 02359.



# Quality. Again. And again. And again.



## Quality makes them worth asking for.



# Kodak brings the convenience of built-in flash to the magic of pictures that develop in front of your eyes.

The Colorburst 300 is Kodak's first instant camera featuring a built-in flash, and your all-time favorites: ease and convenience. Convenience is topped off by Kodak's economical electronic flash built right into the camera so it's ready for use.

Easy to use because the camera and flash are fully automatic. So you can take sharp, clear pictures outdoors, and even stop-action shots indoors with the flash. All with one camera and no attachments (you can even use the flash outdoors for better portraits).

The best part comes as you watch your pictures develop, rich with color, right before your eyes. Each print is protected by a durable, textured Satinluxe™ finish, too.

Ask for the Kodak Colorburst 300 camera at your photo dealer's and see why it's everything you could want in an instant camera.

© Eastman Kodak Company, 1978



PR10 print shown 1/4 actual size.

**The Colorburst 300 instant camera. Another first from Kodak.**



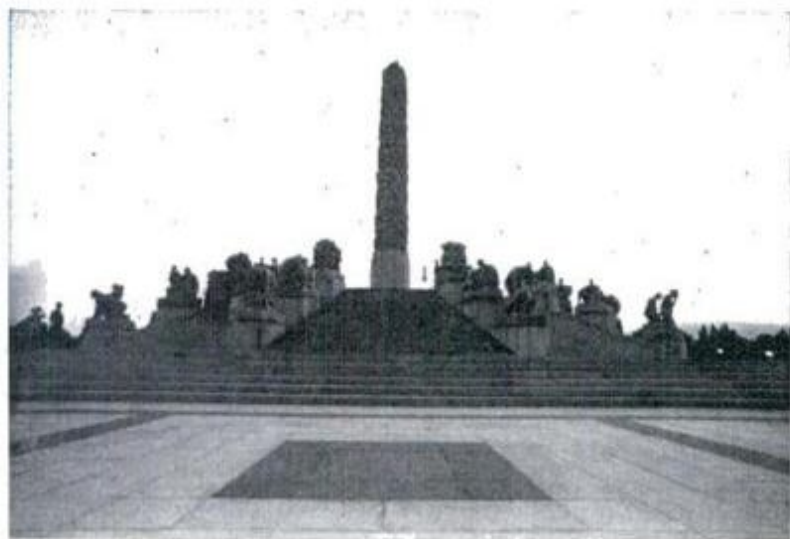
# How to choose your second lens

Analyze the way you like to shoot, then pick the lens accordingly.

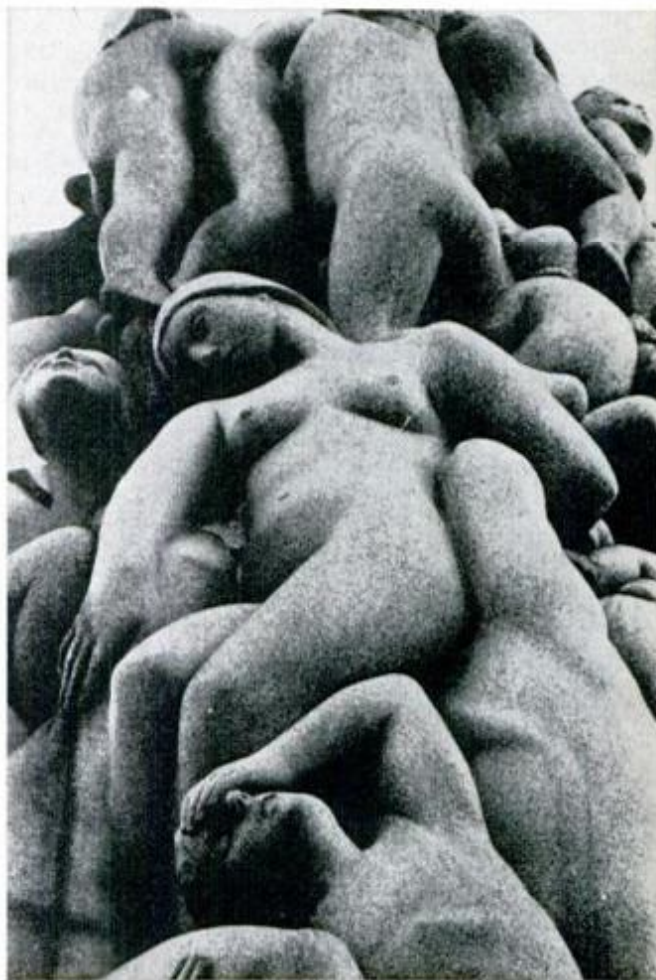
by Dave Sagarin



Author took this picture of nursery-school kids with wide-angle lens that made the two in front big but included a lot of the setting and action in the background. Normal lens would make such a group more uniform in size. Use of a telephoto lens to pick out faces would be another good approach.



Only a long lens—a 135-mm, in this case—could fill the frame with detail (right) at the very top of the monolith in Frogner Park, Oslo, Norway (above). Fifty-eight feet tall, the sculpture depicts human striving, is surrounded by other groupings.



The odds are better than four to one that when you bought your camera, you took the "normal" lens that came with it. And there's nothing wrong with that—a 50-mm or 55-mm-focal-length lens on a 35-mm camera often does beautifully. But it is not always the *right* lens.

For a portrait closeup you have to get too close to the subject for the person's features to look normal. For a nature scene you can't always relate the foreground to the background. Face it: if you're serious

about your photography, you'll eventually want another lens.

If you have an interchangeable-lens camera, there are lots of lenses you can buy. For many fixed-lens cameras, there are supplementary lenses that change the effective focal length, although not by very much. Some 110 cameras offer two focal lengths or built-in zoom lenses. There are supplementary optics that change the focal length for less money than a whole lens would cost. And cropping during printing can

often simulate the effect of a different length.

So there are many ways to get focal flexibility. The question is, how do you decide what you need. You can start answering by analyzing what *you* want to do. Don't buy equipment until you know why you want it—not just to save money, but to remain efficient. You're better off with a small collection of tools that are right for the jobs you do. Chances are, if you're already

*(Please turn to page 42)*

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See your Chevrolet, Pontiac, Oldsmobile, Buick or Cadillac dealer for model availability of Delco-GM sound systems.



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## HOW TO CHOOSE YOUR SECOND LENS *(Continued from page 41)*

thinking about adding a lens, it's because you've felt the need. Perhaps you've wished you could get more of a landscape in, or bring a distant subject closer.

Or perhaps you have an interest that requires special equipment. If you love to photograph flowers or want to document a stamp collection, you'll need macro-focus capability. Focal length is not important here, but rather the ability to get in close and fill the frame with a small subject. If your main interest, however, is architectural photography, a perspective-correcting lens will be almost a must. Or for wildlife you may want an extreme telephoto.

There is a personality factor at work. Some people naturally focus closely on a single facet of a subject, while others take in the big picture, subordinating details. Your pictures will reflect these concerns, and the equipment needs will follow.

### Expressing relationships

A wide-angle lens "gets more in," we say, but it "distorts perspective." Getting more in—seeing more of a landscape or more of the interior of a room—is certainly one reason for using a wide lens. But another, subtler reason is to present the *relationship* between the elements of a photo. Things nearer the lens become bigger, proportionately, than things in the background, and therefore more important. You can take a picture of someone that makes him dominant, yet includes supporting background—his environment.

As for the perspective business, I object to the word "distortion." If I show you a picture of a tall building, taken with the camera pointed up to get it all in, the vertical sides of the building converge; the top of the building is farther away, and is seen as smaller. If I showed you a picture of railroad tracks that *didn't* converge, would you say that was distorted perspective?

### Many lens alternatives

The people who made your camera almost certainly make other lenses for it, but a number of firms make lenses that fit many cameras. And there's widespread interchangeability. How can you decide whose lens to buy, once you've decided on a focal length or a special type?

There is not too much optical difference among lenses. Modern design techniques are available to all, and multicoating is practically universal. The real differences are in quality control, solid construction

and dealer support—warranty and availability of repairs.

If you're not going to drive nail with it, and don't expect it to work for 20 years with minimum maintenance, there's no reason not to buy less expensive Vivitar or Soligor or other nonoriginal-equipment lenses. The Vivitar Series 1 lenses, in fact, are comparable to original equipment in both quality and price.

### Zooms

A zoom lens seems to be the ideal solution to the second-lens problem. It offers a range of focal lengths, replacing two or even three standard lengths. Without shifting your ground, you can crop in or out—i.e., the camera—to include just the image you want, and modern designs have eliminated most of the traditional problems, such as focus shift, soft edges and flare. Many newer zooms also have a "macro" setting, giving close focusing as a bonus.

But all is not yet golden. For one thing, a zoom lens will cost a good deal more than any fixed lens of comparable quality. It will be bigger, heavier and slower—maximum aperture is likely to be about f/3.5. It's easier to hurt and harder to fix, and its many rings and numbers take some getting used to. However, I don't want to come down too hard on zooms; I love them, and have taken photos with them that couldn't have been done any other way.

### Between lens and camera

You can get some of the advantages of a zoom lens with a focal length extender, which mounts on your camera in the lens socket. Your lens, in turn, mounts on the extender. Extenders usually come in 2X or 3X—that is, they double or triple the focal length of your lens. But extenders cut light transmission; a 2X, with the lens set at f/5.6, gives the same amount of light you'd get through your lens alone set at f/11. They also reduce sharpness, especially at the corners—partly because you're introducing extra glass and partly because your lens was optimized to put the image directly onto the film plane.

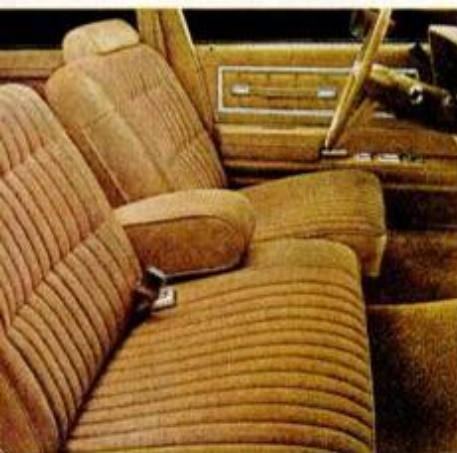
Closeup or extension tubes are inexpensive and good enough for a but the most exacting macro work. The reason to prefer a macro lens is that it is optimized for close work, giving a flat field at short distances. I'd say this is more impor-

*(Please turn to page 158)*

# PONTIAC'S NEW SAFARIS



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# HOMEOWNERS' CLINIC

## QUESTIONS ANSWERED

### Bundle up

*Our home is centrally airconditioned. Should we leave our compressor exposed to cold and snow all winter? Some people say a covering traps moisture, rusting the unit.—Mrs. Ed Mills, Kalamazoo, Mich.*

Definitely cover it in winter. To reduce the possibility of rust, lay a couple of 1x2s across the compressor top before securing the cover.

### Languishing lally

*I'm trying to eliminate rust on the concrete-filled steel columns in the basement of my mother's home. My late Dad faithfully scraped and painted them, but what seemed to be water bubbles always reappeared under the paint. The bubbles burst with a force that splatters paint on the floor. One column is now splitting. My mother cooks in the basement, but she runs a dehumidifier. The moisture appears to come from within the lally columns. None of the experts I've consulted can tell me what to do.—James Cappiello, Amherst, Mass.*

Nowadays, most builders use thicker-walled lally columns rather than thinner ones filled with concrete. The older columns were usually filled on the job. If the concrete wasn't properly cured prior to welding on the top and bottom plates, moisture would be trapped within the column, often for many years.

Try this experiment: Drill four equally spaced (90° apart) 1/8-in. holes in a rusted column as near to the floor as possible. Similarly, drill four more holes about 1 in. down from the top mounting plate. This should relieve moisture pressure in the column. Use a high-speed bit at low rpm, applying cutting oil to the bit as you drill. *Be sure your drill is properly grounded.* Stand on a dry board while drilling. Wait a month before scraping and painting. Read the June '78 *Homeowners' Clinic* (page 10, *Wrought With Rust*) for more tips on rust treatment.

### Double-door finish

*I have a beautiful set of stained double doors on the front of my house, but I can't find a varnish that withstands more than six*

*months in sun and rain.—Thomas Burdsal, Los Altos, Calif.*

United Gilsonite Labs makes a polyurethane finish, Imperial Zar, that is probably one of the best for wood exposed to weather. It's formulated to combat damage caused by ultraviolet rays from the sun.

However, you must remove all previous finish from the door's surface and edges with paint remover. Use a commercial bleach to remove any last traces of stain and varnish. Next, sand the surface and all edges with a fine-grit paper. (Edges must be properly sealed to prevent dampness from attacking the finish from within.) Stain the door to desired color with a quality oil stain. Allow to dry for 48 hours before applying at least three coats of polyurethane. Follow directions on the can.

The address for United Gilsonite Labs is Box 70, Scranton, Pa. 18501. The suggested price for Imperial Zar is \$6.50 per quart.

### Caulking quandary

*Asbestos shingle siding extends over the foundation walls of my house by about 2 in. There appears to be another layer of shingles between the siding and the foundation. Can I caulk the gap between the inner layer and the foundation wall, or will I create condensation and moisture problems? Which type of caulking would you recommend?—Joseph Lynch, Yonkers, N.Y.*

By all means, caulk. The area you mention is as important to the air tightness of your home's exterior "skin" as window and door trim. If the gap is too wide, you may want to prefill it with oakum, which is manufactured for this purpose. However, make certain the asbestos shingles still project at least 1/4 in. below the caulking, so rain that drips off the shingles doesn't follow the caulking to the

foundation wall. Although more expensive, use a caulking with a silicone base. Follow the manufacturer's instructions, and be sure to wear gloves when applying.

### Paint preservative

*Is there a way to preserve the enamel finish on a yard shed made of steel? Mine has become unsightly with mildew and rust.—James Robbins, Montgomery, Ala.*

There's a great range in price and quality among yard sheds. On even expensive models, often the inside of bolt or screw holes aren't coated with enough paint. Scratching assembly bares metal and invites rust.

A new steel structure should have all scratches and bolts touched up with a rust-deterrent paint, like Rust-Oleum. A coating of auto wax helps, too, but it's almost impossible to wax all the vulnerable areas that water reaches.

### SERVICE TIP

**If your oil burner suddenly stops, these steps may save a service call:**

Make sure your thermostat is set 5° above desired room temperature, and if you have an automatic day-night control, check that the cycle hasn't been reversed.

Check that none of your emergency switches (there are usually two) have been turned off inadvertently.

Check whether you've run out of oil. Check whether the main fuse or circuit breaker has blown or tripped.

Just once, press the overload switch on the motor. A temporary power surge to your home may have tripped it and stopped the burner.

Press the stack-control relay switch located on the junction box for electrical wiring. Also do this only once.

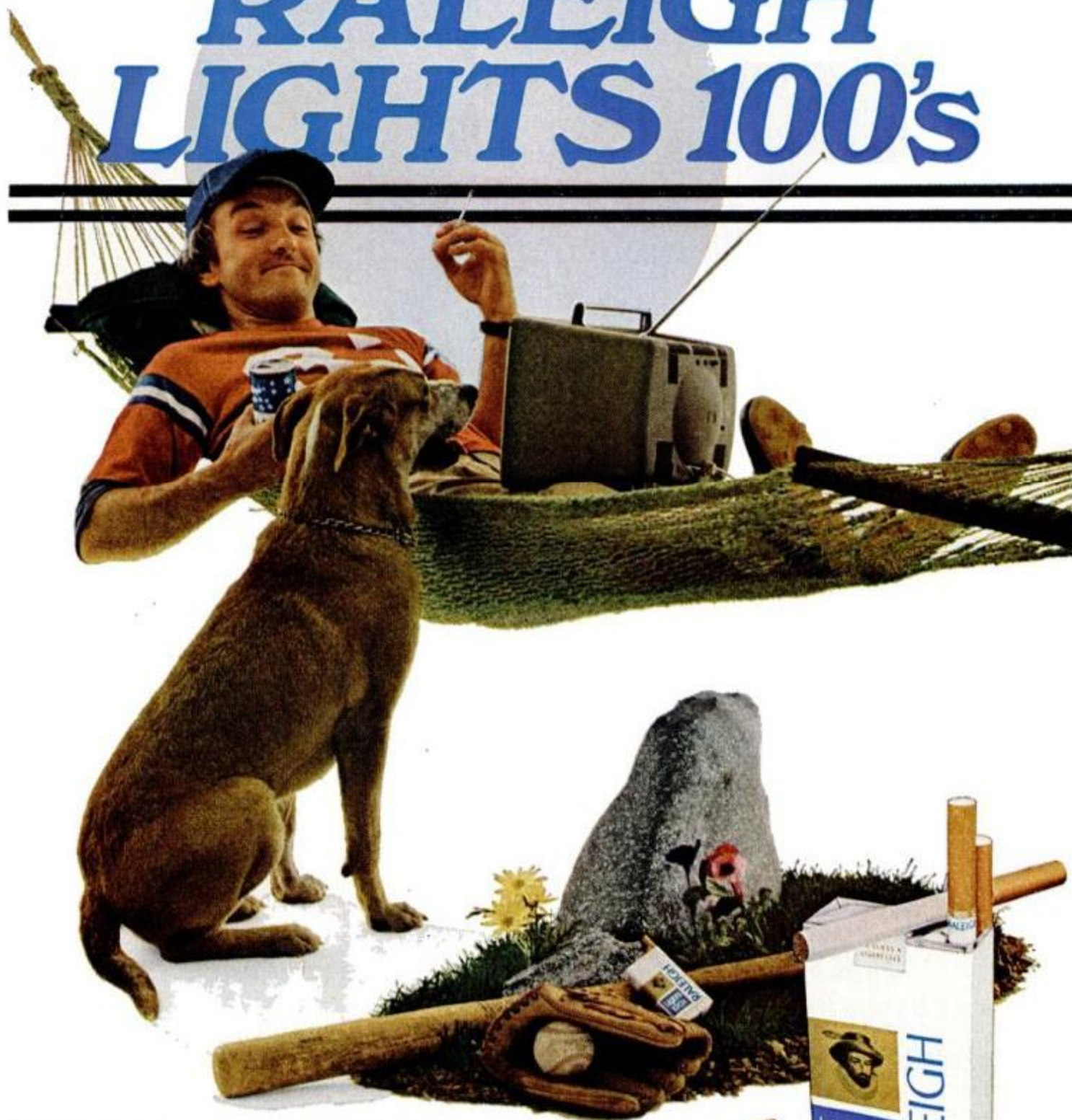
**Caution:** If the motor doesn't start after any of the above—or it starts and stops—call a serviceman. You probably have an electrical malfunction. **PM**

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



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# New for next year's fishing

Lunkers will cast a fishy eye at ingenious new gear being cast at them by '79 anglers.

by Bill McKeown OUTDOORS EDITOR

The latest look in tackle is a return to nature. Observant fish will find some of the lurid lures that have been popular are still around. But new printing and painting methods make it possible to show every scale on an imitation minnow, and colors that look life-like enough to a hungry lunker. Dick Kotis, president of the American Fishing Tackle Manufacturers Assn., predicts the new artificial baits will challenge any fishy-eyed observer with their true-to-the-original appearance. Ang'ers, he believes, will continue to be challenged by lighter and smaller rods, reels and lines that test a sportsman's skill.

And if you can't make it look natural, the trend is to make it disappear. Back lines and leaders are offered by Cortland, Berkley, Sunset and others.

■ **Rods**—were once cane or bamboo poles. Fiberglass changed that and is still the most popular, despite competition from graphite and graphite/fiberglass blends. Next year, they'll all be challenged. Browning is using boron. Shimano's Kevite is a Kev'ar/graphite mix. Shakespeare, after much success with their Ug'y Stiks, is introducing Kevlar Purdy Stik. Graftek, Zebco and Lew Childre are also



Is it the first inflatable bass boat? The 11-foot, 110-pound Sevylor Explorer has an electric trolling motor in front, up to 7½-hp aft, and can carry 650 pounds.

among the makers offering blends.

■ **Reels**—are better than ever. Daiwa has squeezed down the size of its tiny Mini-Cast and Mini-Spin sets into even smaller Mini-mini systems matching reels and rods. Skirted open-face spinning spools have gained much favor with the lip that keeps your line from tangling under the reel. Ryobi claims to have the only spinning reel with stationary spool and revolving bail so the line is not twisted. Zebco and others feature reels that convert easily for right or left-handed anglers. Garcia's ingenious Ambassador 2000 with Thum-it control allows one-handed bait casting.

■ **Line**—rates big news with the announcement by DuPont that their noted Stren nylon monofilament fluorescent lines will now have two to 15 times greater durability and abrasion resistance than their competitors. New Stren will be available in two to 80-pound test.

■ **Lures**—have added rattles, wiggles, sparkles and flavors. And now you can put little pellets of smelly chum inside Chumilures from Applied Oceanographic Technology, to stop rust and add a fish-attracting smell with Lurelube by Webco Co. Nonstop action is possible with a ball-bearing swivel from Sampro.

■ **Gear**—for fishermen gets a major bonus with tough and waterproof Royal Red Ball Flyweight waders, that fold into an 11-ounce handful to fit one corner of Plano's transparent-lid Magnum tackle box. **PM**



A powerful little aerator, Lew's L-12 Air Pump clips on any 12-volt power source, draws less than one amp to keep fish healthy. From Lew Childre's, Foley, Ala.



Lite Bite alarm from Vexilar, Minneapolis, signals with light, horn or both when a fish tugs the line. The \$20 device can also be rigged as a camp or boat alarm.



A rod that runs the line up through the middle is made by True-Flite, Macedonia, Ohio. The rod takes bait or spin casting reels, has no guides to chafe the line.

# PM WORKBENCH

## PM EXAMINES PRODUCTS AND SERVICES

### Book for home remodelers

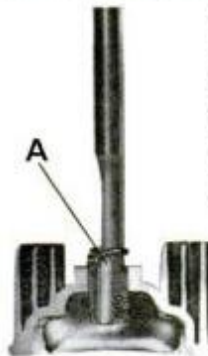
The folks at Georgia-Pacific (the plywood and building products manufacturer), recognizing the great potential that every home has for remodeling and/or improvements, have produced a home ideas book titled *Great Possibilities for Your Home*. It contains hundreds of ways to make your home more livable. The 208-page book boasts color photos and remodeling ideas for kitchens, bedrooms, attics and more. Available at your local Georgia-Pacific dealer, the \$1.95 book is now priced at 49 cents.—H.W.

### Tap restores threads

Stripping the threads in a spark-plug or other hole can cost a lot. A good alternative to rethreading is this tool that repairs damage starting from below. Rethreader costs \$12.95 for 14 x 1.25-mm tap. Rethreader Tool Corp., 610 Martha Ave., Olean, N.Y. 14760—D.O.



1. Grease the tap threads to entrap cuttings. Then insert tap in the opening. Penetrate past damaged area and match tap with remaining good threads. Align tap.



2. Grease wedge portion of tap and check markings to insure proper size. Then push wedge into opening alongside tap, forcing thread cutters outward.



3. Slowly turn tap out of opening, adjusting wedge depth as needed to insure that tap continues to cut at desired width. Remove grease and debris from the tool.

### Pressure-fed paint pad



You hand-pump the tank for pressure.

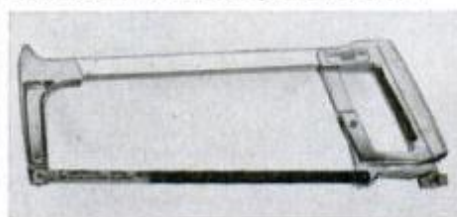
You never stop to refill your pad with this continuous-feed painting system. A portable, one-gallon, pressurized tank pumps only latex paint, and you control flow rate to the pad. It cuts painting time and eliminates messy work with



Here's what comes with the system.

trays, rollers and brushes. For both interior and exterior jobs. Pads are disposable, and the system boasts easy-to-flush features. Price: \$59.95 postpaid, Padco, Inc., 2220 Elm Street, S.E., Minneapolis, Minn. 55414.—D.O.

### Hacksaw carries spare blades



The hacksaw I've carried in my toolbox for 15 years has been retired by this Silver Streak model from Greenlee Tool Corp., 2136 12th St., Rockford, Ill. 61101. Three

features make the saw desirable: 1) Spare blades can be stored in its backbone—a real plus for on-site chores. 2) Extend the blade, lock it in place and it can be used as a jab saw for hard-to-get-at cutting tasks. 3) Thumb hook at fore-end makes two-hand sawing a snap. Price is \$7.95 at electrical and industrial supply houses.—H.W.

### Good toolbox for the home

Like most home carpenters, I keep my tools in an open toolbox that I built; thus, I've long felt the need for a closed box to protect fine tools—chisels, cutters and the like. K-32 carpenter's box from Kennedy



Well-built box has comfortable handle and carrying strap, lockable hasp.

Mfg. Co., Box 151, Van Wert, Ohio 45891, has 2300 cu. in. of storage. Inside there's a level bracket and clips for handsaws and square. It's available for \$28.40 at hardware stores.—H.W.

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





# Feelin' Velvet.



There are a lot of whiskies out there. Straights. Blends. Canadians. But none can give you the exceptional feel of Black Velvet™ Canadian Whisky. A premium import at a very reasonable price.

Try Black Velvet. And taste the Velvet difference.



## Checkpoints for shade-tree mechanics.

A good shade-tree mechanic will monitor the car's electrical system by installing one of the most basic dashboard instruments...

**The ammeter.** Normally, an ammeter shows a charge for a brief time after you start the engine, and then returns to zero. When there's less charge than normal, it usually means a loose fan belt or a bad rectifier diode. A constant discharge is most often the result of either a broken fan belt or multiple diode failure.

For accurate and reliable readings, you need an ammeter that's built for precision—the Stewart-Warner Sensor Ammeter. You can buy it as part of a pre-assembled panel of gauges, or mounted in a handsome modular housing. Two or more modules can be clipped together for a unique custom look.

The Sensor Ammeter. It's part of an entire line of Stewart-Warner equipment designed to meet the needs of the shade-tree mechanic.

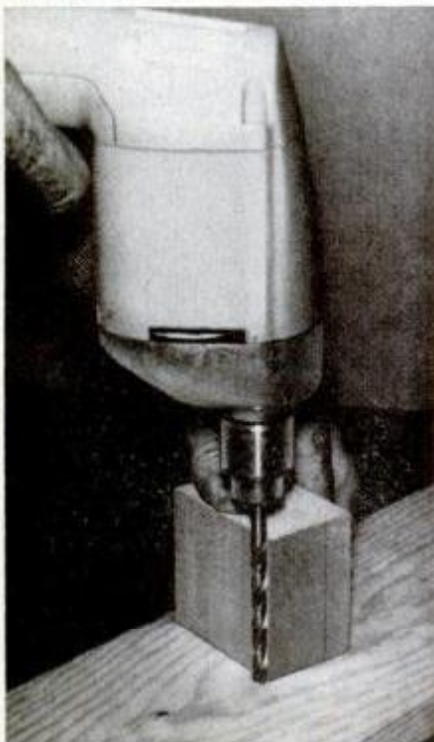
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## HINTS FROM READERS

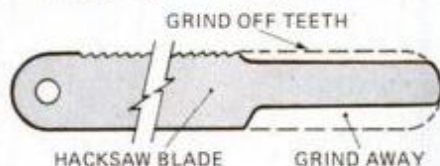
### Simple straight-hole guide for a portable drill



A small, squared-off block of wood is a useful guide for keeping a drill at right angles to the drilling surface. Simply line up the drill bit parallel to one corner.

—Frank H. Day

### Emergency blade for sabre saw



In emergencies, adapt a hacksaw blade for use in a sabre saw as shown: Carefully grind one end of the blade so it fits in the sabre-saw chuck and cuts on the upward, draw motion. At frequent intervals during grinding, cool the work in order to avoid drawing the temper from the blade.

—B. F. Borsody

### Talcum stops floor squeaks



To shush a squeaky floor, sprinkle talcum powder between boards that rub. Have someone walk around to locate bothersome boards.—Howard E. Moody

## Pay & Benefits

If you enlist in the Army, you'll start with good pay; a long list of skill-training courses to choose from; 30 days paid vacation each year; the opportunities to travel, to continue your education, and to qualify for veterans' educational benefits. For more information about all the opportunities in today's Army, send the postcard. Or call 800-431-1976 toll free. In NY call 800-243-5614.



# Responsible.

"It's like the way a baby grows. It's a child, then a teenager, then a man. It all comes with responsibility. You've got to prove yourself every step of the way. That's the way the Army is. They'll give you a piece of equipment, train you, and say, 'You are responsible'. If you're good and you know your job, you'll move up and get more. Right now I'm a senior gunner in a Chaparral Missile section. And every guy on this section is responsible for the other guy. That can make you an adult quickly. Responsibility feels like — it feels like strength."

**Join the people  
who've joined the Army.**

*SGT Calvin Jarrell, Schwabach, Germany*

# CAR CLINIC

## SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



### Jumping to a conclusion

*The 1978 Oldsmobile diesel engine is served by two batteries. Suppose I have to jump-start this engine from a battery in another car. Am I to assume that it can't be done?*  
—Jeff Benston, Louisville.

Maybe yes, maybe no. It depends a lot on atmospheric temperature. If the temperature is too low, the single battery from another car may not provide enough juice to crank the Oldsmobile's starter motor. The combined cold-cranking capacity of the batteries in the Olds is 930 amperes (465 amps per battery at 0° F). The current draw of the Oldsmobile's starter motor, which operates at 100 rpm, is greater than the current draw of a conventional engine starter, which operates at 60 rpm.

Jump-starting the Olds diesel at a low temperature, will, therefore, require that the battery or batteries being used match or nearly match the output of the Olds batteries. Batteries in another Olds diesel will do. So, probably, will a battery or batteries in a truck.

If temperature conditions aren't too bad, however, you may be able to jump-start the Olds diesel by using a single battery from another car. Connect the boosting battery to the battery in the diesel that is located closest to the starter motor. Using this battery will create a minimum of resistance during the starting procedure.

Connect the jumper cable from the positive terminal of the boosting battery to the positive terminal of the battery in the Olds. Then, connect the other cable from the negative terminal in the boosting battery to a clean ground on the Olds engine.

This ground connection should be at least 18 inches away from the Oldsmobile batteries to reduce the possibility of a spark igniting battery gases.

The bumpers of the two vehicles should not touch, and the engine

in the boosting vehicle should run at a moderate speed during the jump-start operation. When the Olds engine starts, switch off the engine in the other car, and disconnect the jumper cables in the reverse order from that in which you hooked them up.

### Spotted reputation

*Our 1977 Chevrolet Malibu Classic has 16,000 miles. It is equipped with the 305-cu.-in. engine. Each time the car is parked, an oil spot about three inches in diameter is left on the carport floor. A Sears mechanic told us the engine rear main oil seal is leaking and gave us a \$300 repair estimate. Our Chevrolet dealer was authorized by General Motors to correct the problem. The oil pan gasket was replaced, but the leak continues. Now, the service manager says all late model cars have this problem. We can't believe it, but we will if you tell us it's true.*—Fred Vyse, Bellevue, Fla.

I can't tell you it's true, because

it isn't. Neither can I understand the service manager's problem. GM has authorized him to fix the leak. If the trouble is with the rear main oil seal, all he has to do is drop the pan and pack the bearing. Since the engine or shaft needn't be removed, the Sears estimate seems exorbitant. The job takes about 1½ hours. It sounds to me like you're getting a run-around.

### Speeding up a recall

*I own a 1977 Dodge Aspen station wagon that's involved in a recall program because of engine stalling. I have not been contacted by Chrysler to bring my car to the dealer. Furthermore, the dealer hasn't received instructions. How long do these things take?—Anthony Kojeszewski, Philadelphia.*

I checked with Chrysler. Repair information has been sent to dealers, and notices are in the mail. This recall involves 1975-77 Dart, Valiant, Aspen and Volare.

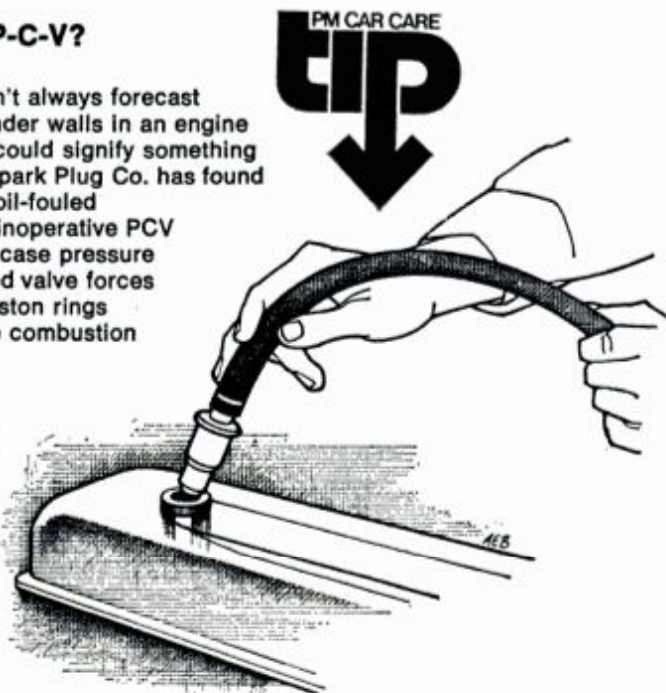
Car manufacturers have complained about owners of cars who they say are lax about informing them of changes in status. If you are the original owner of a car and change your residence, inform the company so you can be notified if there's a recall. Write the company's Recall Notification Dept. Be sure to include the vehicle identification number (VIN) along with the change of address.

If you are not the original owner of a car and learn that it's been recalled, or you want to find out if your car has been recalled, also write the Recall Notification Dept.

(Please turn to page 56)

### Ps-s-s-t: remember P-C-V?

Oil-fouled sparkplugs don't always forecast worn piston rings or cylinder walls in an engine with high mileage. They could signify something less drastic. Champion Spark Plug Co. has found that a big contributor to oil-fouled sparkplugs is a blocked inoperative PCV valve. A buildup of crankcase pressure resulting from the blocked valve forces oil and oil vapors past piston rings and valve guides into the combustion chambers, where they settle on plugs. The solution is easy. Replace the PCV valve, degrease and clean sparkplugs, and return them to service.





# INTRODUCING THE NEW BREED

Presenting a whole New Breed of Mustang for '79. Dramatic new sports car styling gives this Mustang one of the most efficient aerodynamic designs of any car now built in America. Mustang's precise handling helps it flatten corners. Choose from four engines: a standard 2.3 litre overhead cam, and options of V-6, V-8 ... even a Turbocharged Mustang. And with all this, Mustang is still sticker priced to help you bring one home, in 2- or 3-door models. Capture one at your Ford Dealer now.



**FORD MUSTANG**

FORD DIVISION



# FORD MUSTANG '79

## CAR CLINIC

(Continued from page 54)

Explain the change of ownership. Include the VIN.

### Shiftless

*I'm having a fit with the manual transmission of my 1978 Buick Skylark. After 6000 miles, it's worse than ever. The dealer says the transmission will "work in." But when? I have to smack the lever to shift from third to second and from neutral to first. The dealer says there are no adjustments, and all he can do is oil whatever it is he oils. I need help.—W.F. Mitchell, Blythe, Calif.*

You can bet you do. Has the dealer adjusted the linkage? If he doesn't know how, refer him to page 7B1-14 of the 1978 Buick service manual.

If this doesn't help matters, tell the dealer to look at page 7B1-11 in the same manual. The page is devoted to shifting difficulty diagnosis and gives recommended repairs. There is not one word about oiling.

A good mechanic would start seeking a solution by removing the shift lever and shifting the trans-

mission from the engine compartment. If shifting is now effortless, it confirms that the trouble lies with a binding problem in the shift linkage, maybe with the pivot pin. If shifting remains difficult, the trouble is located inside the transmission, maybe with the synchronizing cone.

I would get in touch with the nearest factory field service office (refer to your owner's manual)

and throw the problem in their lap. Seems as if this dealer needs help, because shifting this transmission should be as easy as putting a knife through soft butter.

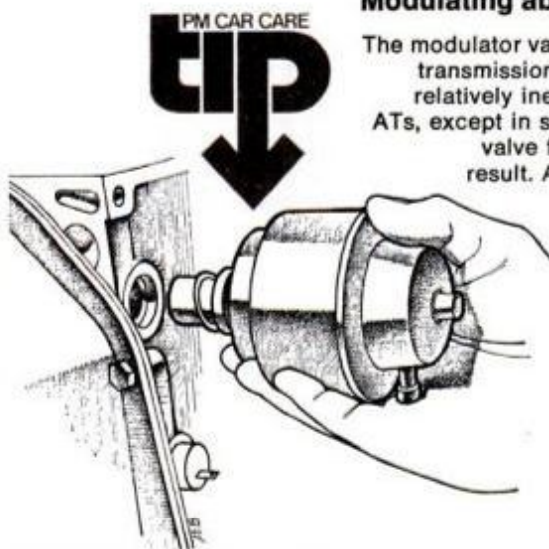
### Mind of its own

*I'll be driving my 1976 Pinto station wagon at 55 mph when it starts decelerating by itself. At times, it will stop completely. A couple of minutes later I'll be able*

### Modulating about modulators

The modulator valve probably causes more automatic transmission problems than any other part. This relatively inexpensive valve is used on nearly all ATs, except in some Chrysler Corp. units. When the valve fails, harsh, erratic or slipping shifts result. At the first sign of trouble, therefore, it's wise to replace the valve.

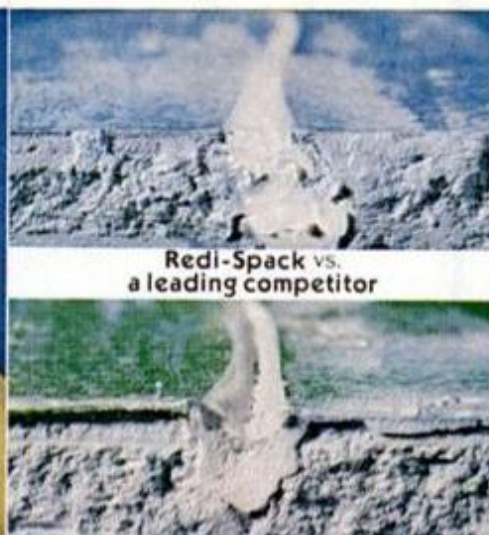
You may avoid a misdiagnosis by a transmission shop, thus major expense. The valve is screwed into the transmission housing and connected to the carburetor by a vacuum line. Raise the car, remove vacuum lines and unscrew the valve. Most modulator valves have an interior spring-and-pin assembly that should be reused with a new valve. Then replenish transmission fluid lost when you removed valve. Use fresh fluid.



## With Elmer's® Redi-Spack you don't need a pro's hands to give it the pro's touch.



Asbestos-free Redi-Spack™ acrylic latex spackling compound comes ready to use with no mixing or mess. No problems going on, either, because it's got just the right consistency.



In a first-time application test, the competitor shrinks and cracks when dry. Redi-Spack's acrylic latex formula resists shrinking, cracking and sagging.



After as little as fifteen minutes Redi-Spack is dry and ready to paint, with little or no sanding. No priming needed, because it won't wash out under paint or show through.

Elmer's. When results count.



# CAN YOU OUTSMART OUR COMPUTER?

Don't be too sure. The computer built into Parker Brothers game Code Name: Sector™ is capable of making thousands of calculations per second. It's as powerful as early computers that filled entire rooms and sold for millions of dollars. And, while it gives you clues to track down and sink a hidden electronic submarine, it also helps the sub escape and counter-attack. That's the catch that makes every game a real challenge. Whether you're playing alone or against others, your toughest opponent is the computer. Code Name: Sector™, the electronic board game from Parker Brothers. It's a game with a mind of its own.

**PARKER BROTHERS**

©1978, Parker Brothers, Beverly, MA



to restart the engine as though nothing happened. At other times, it will drop to a speed of 30 to 35 mph and maintain this speed no matter how far I press the accelerator. After a few minutes, it will pick up speed again. The Ford people have replaced the fuel filter, installed a new PCV valve, tuned up the engine, installed a new electronic module and distributor sensor, cleaned out the gas tank and put on a new fuel pump. What the hell is left?—Roy Weltner, Lancaster, Ohio.

The solution, if your Pinto qualifies: A search of service bulletin files will reveal to the dealer that 1975-76 Fords and Lincolns with 200 and 250-cu.-in. engines and YFA-1V carburetors have a problem with carburetor floats. Seems they spring pinhole leaks that cause flooding. The float, if damaged, should be replaced with the newer-type tapered float (part No.

D5TZ-9550-A). The dry float level and float drop adjustments should then be made according to shop manual instructions.

## Cold potato

In the summer of 1977, one of my sons bought a 1971 Volkswagen 412, and the other son bought a 1974 VW 412. Great cars, until the winter of '77-'78. Then, both cars' heating systems failed to work. We took them to the local VW dealer a few times and spent a good deal of money before deciding that the dealer didn't know anything about this system. Is this a warm weather car only, to be housed in winter?—Fred Robertson, York, Pa.

VW of America says that many dealers don't know how to get this tricky gasoline heater to work properly. Normally, when the heater isn't working the glow plug is to blame. It has to be replaced and/or adjusted.

The company advises that you call the customer assistance department at VW's regional office in Valley Forge. They will provide technical assistance to the dealer, so your sons won't have to freeze this winter.

## Service bulletins and DOT actions

■ "Most vehicles which surge, stumble, hesitate, or idle rough can be corrected by a simple propane idle adjustment," says Chrysler in service bulletin 14-12-78. The bulletin discusses errors made in employing the propane idle adjustment procedure. Information in the bulletin applies to 1977-78 domestically built Chrysler Corp. passenger cars and trucks.

■ The subject is coolant loss at the water-pump cover plate of the 460-cu.-in. engine used in 1978 Ford cars and trucks, Lincolns and Mercurys. The way to stop this loss is to install a new water-pump plate gasket (part No. 8513) as outlined in article 3196, service bulletin 158.

■ The National Highway Traffic Safety Administration (NHTSA), Department of Transportation, is investigating complaints of front-wheel bearing failure on 1973-77 Fiat 128 and X-1/9 cars. To date, 912 complaints have been received by the manufacturer and NHTSA.

Bearing failure can lead to loss of control. No injuries or deaths have been reported. You may be alerted to the existence of the problem by a grinding sound from the front wheels. You should also check wheels for looseness and lockup. An estimated 221,000 cars are involved in the investigation. **PM**

## GOT A PROBLEM WITH YOUR CAR?

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

# DETROIT LISTENING POST

## '80-Model GM compacts

Sharp-eyed auto writers occasionally catch brief glimpses of future prototypes when visiting the manufacturers' proving grounds for magazine new-car previews. But rarely are the cars we're not supposed to see so much in evidence as they were during GM's preview this past summer. Perhaps because development time is running too short to shut down testing for even a few days—or



Sneak look at GM's 1980 fwd compact.

maybe because GM officials actually wanted to give us a sneak preview of their '80 model front-drive compacts—there were '80 Novas, Phoenixes, Omegas and Skylarks running around all over the GM Proving Ground as we came and went and tested and photographed the '79's.

The cars have a distinct European look in both two-door notchback and four-door fastback versions, with front and rear styling varying for each division. Chevy and Pontiac were supposed to get the fastback bodies and Buick and Olds the notchbacks (just the opposite of the intermediate allocation), but there were definitely Chevy grilles spotted on notchbacks and Buick noses on fastbacks. Since we spotted no two-door fastbacks nor four-door notchbacks, and no wagons at all, it's possible that only two of the rumored five body styles are being readied for spring introduction.

## No '79 Cutlass/Century notchbacks

Rumors that GM's Oldsmobile and Buick Divs. would introduce notchback versions of their intermediate Cutlass and Century models for '79 were either unfounded or premature. The not-so-popular fastback body styles will stay, and without the rear hatch openings some critics feel they should have. Apparently the controversial European-style sloping rooflines are catching on a bit better with the

American public; but don't rule out hatchbacks for later in the year, and perhaps some Cutlass and Century notchbacks later still.

## Downsized trucks

Stand by for smaller, lighter pickups, vans and 4wds as federal fuel economy standards for light trucks take effect. Insiders say that Ford will have an all-new series of downsized pickups ready for '80 model introduction next year, and Chevy is expected to follow suit in '81. The standards (14 mpg for 4wd and 16 mpg for conventional vehicles in '80; 15.5 mpg 4wd, 18 mpg conventional in '81) will be met with smaller engines, including some diesels, more fuel-efficient components and weight and size reductions.

## Buick diesel

Although the diesel engine's future is still uncertain in light of emissions standards, both existing and proposed, that are unfavorable to it, the trade publication *Ward's Engine Update* says that Buick has developed a diesel version of its popular 231-cu.-in. V6 for GM vehicles whenever the corporation wants it. But for now, Oldsmobile remains the only domestic passenger-car diesel maker.

## World Auto Congress

The third annual World Congress, organized and hosted by the trade paper *Automotive News*, was held in Detroit again this year and, as in previous years, provided a wealth of information about the auto industry and its products, both present and future. Attendees from industry and government, plus dealers and automotive suppliers from all over the world were treated to a rare collection of speeches and presentations, including several rounds in the continuing bout between the government and the auto.

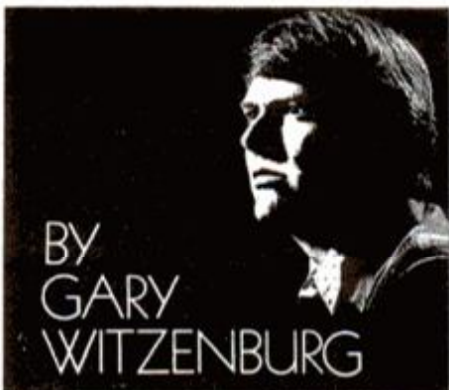
Perhaps the best glimpse into our automotive future was provided by Buick chief engineer Lloyd E. Reuss, who discussed the challenges facing auto engineers as the '70s turn into the '80s and beyond. Survival for the automakers, he said, now revolves around complying with the Federal Corporate Average Fuel Economy

(CAFE) law (which requires a fleet average of 19 mpg this year, 20 mpg in 1980, 22 in 1981 and so on up to 27.5 mpg in 1985) while still satisfying other regulations and producing attractive, affordable future vehicles.

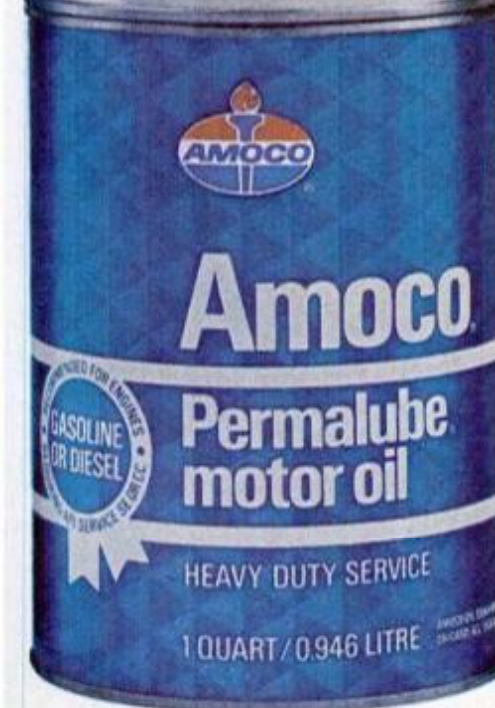
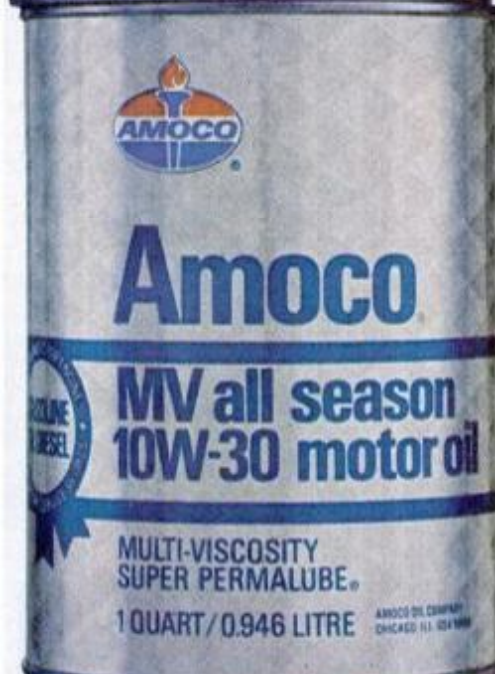
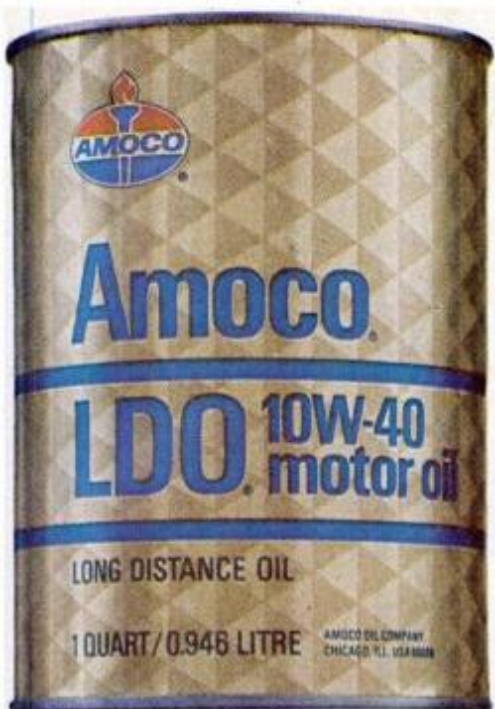
No mean feat. It requires significant "repackaging" and weight reduction of every existing car line in the next five years, plus design and development of more efficient components and accessories, substitution of materials wherever possible, adding sophisticated electronic engine controls, turbocharging small engines to make them perform like larger ones, advancing tire technology for less rolling resistance without sacrificing ride or traction, reducing aerodynamic drag on vehicle bodies, improving powertrain efficiency (lock-up torque converters and overdrive fourth-gear ratios in automatic transmissions, lower-friction lubricants) and converting many vehicles to space-efficient front-wheel drive while reducing cost and complexity.

"Engineering for the eighties," said Reuss "will not result in a radical change in the automobile. Rather I would describe it as an efficiency evolution—where we take the automobile as we know it, and refine it, using the design trends we have established over the past few years to make it lighter and more energy efficient."

All this evolution will not come cheaply: "At General Motors," the engineer pointed out, "we have estimated that it costs roughly a billion dollars to achieve a half-mile-per-gallon improvement in our average fleet fuel economy." Despite that, of course, GM continues to be very good to its shareholders. Amazing. **PM**







## The lead-free leader gives you a motor oil choice, too.

Plus straight talk on every label.



By the quart or by the case, it's easy to select the right motor oil with Amoco's new labels.

On the back of each can you'll find exactly what you want to know in plain language. No technical jargon. No longwinded sell.

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**LDO**—the original Long Distance Oil. Years of documentation prove it delivers good mileage and drain intervals of **OVER 15,000 MILES**.

**AMOCO, MV**—heavy-duty, all-season, multi-grade oil. For both gasoline and diesel engines.

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Look for the labels with the Amoco name, your assurance of proven quality. Get the lead-free gasoline leader's great oil choice now, wherever you buy motor oil.

**You expect more from a leader.**



Amoco Oil Company

# Build PM's auto cable tester

Make this ground and continuity checker from our \$1.95 kit and keep it handy.

by Jeffrey Sandler

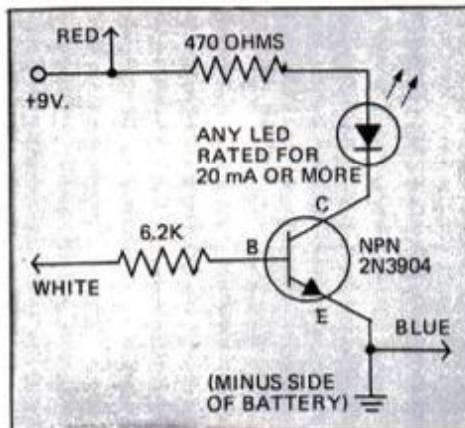
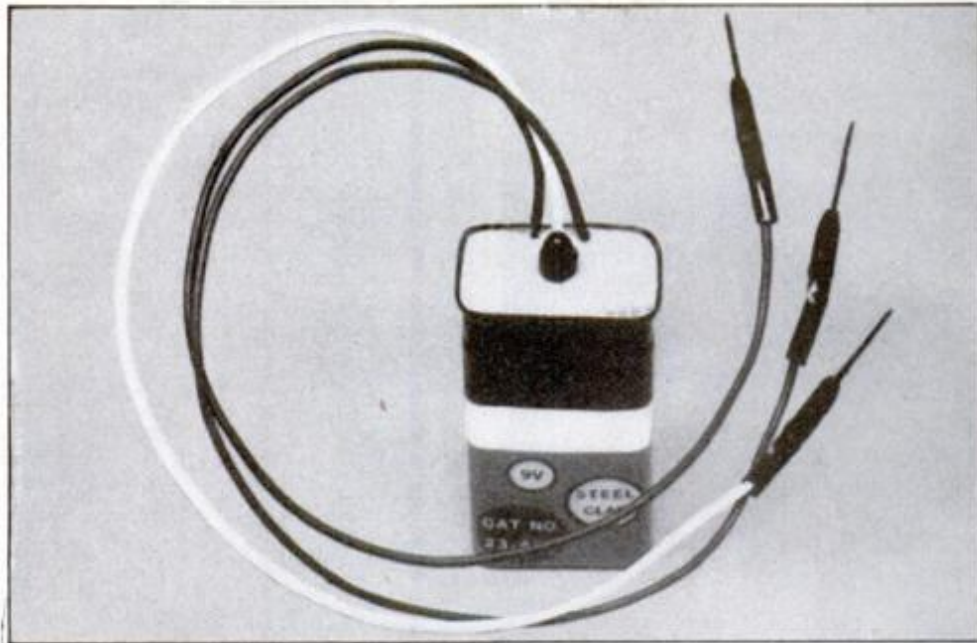
**M**any times the car battery is blamed for starting problems when the fault really lies with a loose or corroded cable terminal.

Our auto cable tester will help you pinpoint those faults, and also check for live wiring and continuity of circuits. The circuit itself is small; with a 9-v. battery it's a compact device you can always keep in the car. It will keep working for nearly the shelf-life of the battery—well over a year.

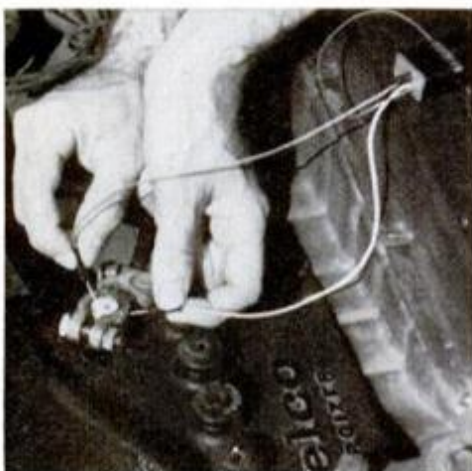
Our kit contains a printed-circuit board, resistors, transistor (2N3904 or equivalent), light-emitting diode, wire, pin probes, solder, electrical tape and complete instructions for construction and use. All you'll need to provide is the battery (preferably alkaline type for reliability), soldering iron, wire clipper and sandpaper to trim and smooth circuit-board edges. If you'd like to build the tester from your own parts, see the schematic at right.

## How it works

The transistor acts as a switch which turns on the LED when the



Complete cable tester with battery makes neat package to keep in glove compartment. Components are soldered to foil side of printed-circuit board (below). Solder connections also used at battery terminals. Add tape between board and terminals.



Pin probes on leads pierce corrosion to test battery-cable connection. A lighted LED indicates drop of .6 v. or more across junction—and a bad connection.

base voltage is more than 0.6v. positive with respect to the emitter. The two resistors, 6200 ohms and 470 ohms, limit the current in the base of the transistor and the LED to safe values.



The pin probes let you test wires that have no accessible terminals. Here we troubleshoot a taillight system, where a faulty ground can cause a malfunction.

Note that if you were to connect the 9-v. red lead to the white lead the LED would light because the 6/10 "turn-on" voltage is far exceeded. This configuration will be used later in continuity testing.



Is a wire hot or not? Here we check to see if air conditioner compressor clutch is getting 12 v. Alligator-clip lead (not in kit) is connected to ground.

All connections have some resistance, but as long as it's very small it doesn't cause any problems. Let the resistance of a connection exceed a tiny figure, say 1/500 ohm,

*(Please turn to page 62)*



## One of a kind.

The man. The cigarette. They speak for themselves.

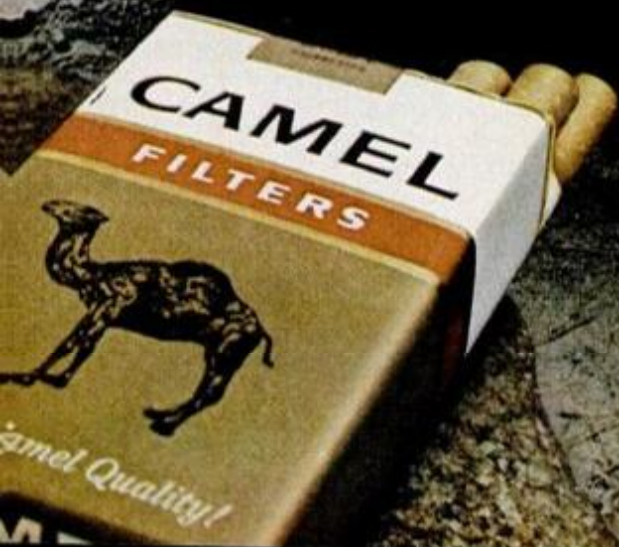
Ordinary cigarettes just don't have what Camel Filters has.

Its blend of Turkish and Domestic tobaccos gives him what he smokes for.

Pleasure. Satisfaction.

A Camel Filters Man understands why the best times are often the simplest.

Do you?



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



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

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

**DON'T GET DRESSED WITHOUT IT.**

© The Gillette Company, 1978

**BUILD PM'S AUTO CABLE TESTER**

*(Continued from page 60)*

and the voltage drop with cranking current will exceed 0.6 v., and the tester's LED will turn on. This 0.6-v. level is a good "breakpoint" for determining whether the connection is good or bad.

You must have cranking current flowing through the battery-cable connection to generate the telltale voltage drop to see if the connection is any good. This "in-circuit" testing under load has an interesting advantage. Take a battery cable connection with just 1/100 of an ohm resistance. A regular ohmmeter normally can resolve down to 1 ohm, but it never could detect a resistance that small, so you might think the connection was good.

It's another story when up to 300 amps. of cranking current flow. Using Ohm's law you get a 3-v. drop—3 v. less reaching the starter—enough to prevent the car from cranking. However, 3 v. is five times the 0.6 v. needed to turn on our tester. Because the LED is on whenever there is more than 0.6 v. between leads, it can be put to good use in finding faulty grounds. A good ground in the presence of current should be within a tiny fraction of a volt from zero; if it isn't, the LED lights up.

**Bad ground may foul lights**

Often you will run into a bad ground in the brakelight and signal system, and this makes the lights go crazy. The turn signals may go on when you step on the brakes, or you may have some other crisscross malfunction. Start probing around the wires that go to ground; you may find a connection corroded by road spray that no longer makes contact.

You can use the tester to check the end-to-end continuity of disconnected ignition cables. Do *not* attempt to test live ones.

Normally, components are inserted from the blank side and soldered on the copper foil side of a printed-circuit board. In this project, we solder the components—all except the LED—from the "wrong" side of the board, but this gives us the advantage of having a flat top on the circuit board. The components won't be damaged, or short against something, if they are on the underside of the board. (You should still make sure that leads aren't shorted together during storage).

To order our kit, send a check or money order for \$1.95 (includes postage) to PM Auto Cable Tester, Box 1014, Radio City Station, New York, N.Y. 10019. **PM**

# IT'S NEW NOW

## Projection system widens screen

A Fresnel projection system produces a 4½-inch diagonal TV picture on this portable entertainment center. Unit also has AM/FM, FM stereo and weatherband radio, stereo cassette with record and play, and twin speakers. The XP1239 is about \$400. Quasar Electronics, 9401 West Grand Ave., Franklin Park, Ill. 60131.



## Digital multimeter

Model 3400 digital VOM has automatic zeroing and polarity plus automatic over-range and low-battery indication. The 3½-digit unit has a ½-inch LCD display and six functions, including a.c. and d.c. volts and amps plus high and low-power ohms for testing sensitive ICs. It's \$140 from Triplet Corp., Dept. PR, 286 Harmon Rd., Bluffton, Ohio 45817.

## So you can time the jet lag

The Mercury model 2790 is said to be the first quartz LCD chronograph-alarm watch with dual time zone display. LCD "flags" light up next to the day of the week printed on the watch face. It's \$99. Leisurecraft Products, 28 South Terminal Drive, Plainview, N.Y. 11803.



## Cool it

The makers of Iceband claim it is useful for treating minor burns, bumps and bruises, athletic injuries, simple headaches and insect bites. Iceband can be frozen and still stay flexible, so it can remain cooler longer on any part of the body. It uses an adjustable elastic strap. About \$3.60 from Norcliff Thayer, Inc., Tuckahoe, N.Y. 10707.

## All-purpose lens?

Soligor's 35-to-140-mm f/3.5 One Touch wide angle zoom and macro lens has a range extending from moderate wide angle to moderate telephoto. In the macro (close-up) mode, maximum magnification is 1:3 and minimum focusing distance is 8.8 inches. The automatic lens is multicoated and comes in several SLR mounts. About \$590. AIC Photo, Inc., 168 Glen Cove Rd., Carle Place, N.Y. 11514.

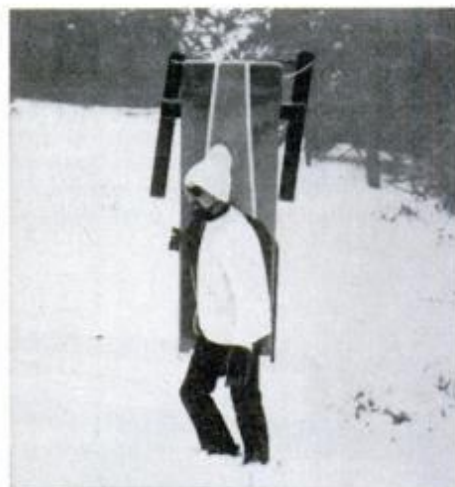




# PM PLAN OF THE MONTH

## SPORTY BOBSLED FOR YOUNG DOWNHILL RACERS

It's cartoppable and can be used by either one or two. You can build it for under \$50.



Light enough for a child to carry (above), this sleek bobsled is still sturdy and comfortable for one or two riders, even 6-foot adults. You can build your own bobsled using PM's plans, standard shop tools, wood and hardware.



Front steering skis are controlled by pull handles on the cockpit dashboard. Kids will love the "driving" sensation.

To and from the slopes, the bobsled can be secured to a car-top or placed in the back of a large station wagon or van.

**T**his easy-to-build mini-bobsled is PM's way to double fun for the kids this winter, and for many seasons to come. Light, sturdy and inexpensive, the sleek sled needs no special tracks. Dashboard-mounted controls make it safe and ideal for use on regular sledding slopes—and your kids will love it.

The bobsled rides on ski-type runners with more surface area and "bite" than a standard pair of skis. Four short runners under the seat support the bulk of the weight, while the "driver" controls the steering skis in front. When making a turn, angled kingpins slant the outside ski similar to the action of a skier's ankle. This provides the same edging action and gives an excellent grip. Four rear runners, along with double

grooves in the steering skis, maximize edge control over steep or virgin slopes.

A let-down tailgate permits a second rider to hop on the back of the sled, where he holds on to built-in grab handles on both sides of the cockpit. Four additional runners in the tailgate follow the main ski tracks and increase surface area for added control.

PM's bobsled is tough enough to carry everyone, from tots to adults. For towing back up the hill, a tow rope can be retracted from the cockpit. With the tailgate locked in the "up" position, all gear can be carried in the convenient back compartment.

There's no welding or involved steaming and bending required to build the bobsled. With PM's

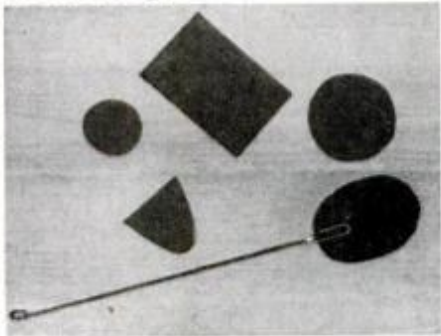
plans, only ordinary hand tools are needed, and all materials are of standard lumber and hardware stock. The body is made of a box section with 1x12-in. pine sides and stressed 3/4-in. plywood top and bottom 20x68 in. The overall track width is 30 in. The cost of construction is under \$50, including lumber, glue, paint and hardware. **PM**

### HOW TO ORDER PLANS

For complete PM plans and instructions on how to build the bobsled, send a check or money order for \$5 to Bobsled Plans, Stevenson Publications, Box 584, Del Mar, Calif. 92014. Please allow two to three weeks delivery for a third-class mailing. For first-class mail, include an additional 75 cents.

# PHOTO HINTS

## Artful dodger



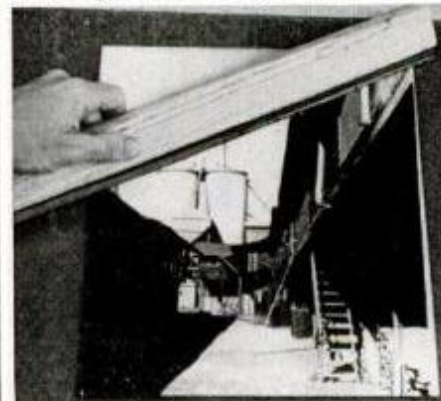
Solder or epoxy a paper clip to stiff wire to hold shapes cut from black cardboard (an enlarging-paper box) for dodging various print areas.—*Bob Berger*

## I.D. for film



Keep your name and address inside the lid of your gadget bag and shoot it on first frame of each roll that will go out for processing. You'll be more likely to get lost rolls back.—*Ted Jordan*

## Make your own squeegee



Squeegees are great for getting water off prints. Make one cheaply from a new, unused windshield-wiper blade refill epoxied to a 3/4-by-2-in. wood handle, tapered toward the blade.—*Ron Roberts*



## Now you can program a perfect meal with one incredible touch.

Our highly advanced microwave oven has just about all the features you've ever heard about and then some.

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makes cooking special again.

Quasar Electronics Company, Franklin Park, Illinois 60131

# PM's cornucopia of hard-to-find hardware

If you've ever done specialized work such as restoring or reproducing an antique, you know that tracking down some of the items you need can be the most frustrating part of the project. But this list of mail-order sources for fine woods, unusual hardware and tools can ease your way.

Keep the source list handy and use it as a reference or to shop by mail. All have free catalogs or brochures unless otherwise noted. A browse through them may reveal helpful items you didn't know existed.

## HARD-TO-FIND HARDWARE SOURCES

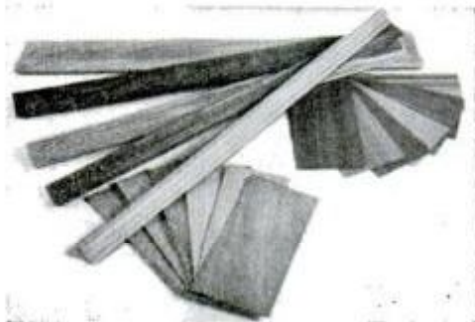
**Aaron Supply Co., Inc.**, 418 Benefit St., Pawtucket, R.I. 02861.

Miniature brass drawer pulls and butt, H, HL and T hinges.

**The Armor Co.**, Box 290, Deer Park, N.Y. 11729.

Pool table hardware, grandfather clock parts, ornamental wood carvings.

**Arrowsmith Tool and Manufacturing**



Veneers, 4x9 in. from Constantine's box of 50 (\$7.25), are shown with Craftsman's solid walnut, cherry and red oak moldings.

**Corp.**, 9700 Bellanca Ave., Los Angeles, Calif. 90045.

Virtually any ornamental wrought-steel hardware you can think of for an outdoor gate: latches, handles, hinges, springs, post caps.

**Baldwin Hardware Manufacturing Corp.**, 841 Wyomissing Blvd., Reading, Pa. 19603.

Large line of decorative period and



**Wrought-iron gate hardware from Arrowsmith:** post cap (62 cents), latch-lock gate-pull (\$5.50), tee hinge (\$4.60 a pr.).

contemporary hardware. Three current catalogs: *Quality Mortise Locks and Latches*, *18th Century Colonial Lock Makers*, *Baldwin-Kaba High Security Locks*.

**Ball and Ball**, 463 West Lincoln Hwy., Exton, Pa. 19341.

Catalog, \$4. Complete line of brass and iron hardware reproductions; custom orders for one-of-a-kind hardware in brass, wrought iron or cast iron.

**Barap Specialties**, 835 Bellows Ave., Frankfort, Mich. 49635.

Catalog, 50 cents. Swiss musical move-

ments, upholstery hardware, lamp hardware, drawer slides.

**J.D. Beardmore & Co., Ltd.**, 3-5 Percy St., London, England W1P 0EJ.

Catalogs, \$8.20 per volume: Vol 1, *Builders' Hardware*; Volume 2, *Cabinet Hardware*. Better than a trip through wonderland—hand-made grilles, bath and clock hardware, other brass and iron items in store.

**Bergen Point Brass Foundry**, 179 West 5th St., Bayonne, N.J. 07002.

Cast-brass hinges to order; brass, bronze and aluminum hinges; shelf brackets and table legs.

**Capro Craft**, Box 18, Greenlawn, N.Y. 11740.

Specialty hardware, candle cups, lamp holders, campaign hardware.



This brass lock with drop ring from Baldwin, priced at \$140, is reminiscent of those on fine Southern colonial homes.

**Faneuil Furniture Hardware**, 94-100 Peterborough St., Boston, Mass. 02215.

Catalog, \$2. Minimum order, \$5. Hardware in cast, wrought and turned brass, brass-plated steel and zinc die castings; campaign hardware, Chinese character pulls, dragon hinges, swivel glides.

**Gaston Wood Finishes, Inc.**, Box 1246,

(Please turn to page 72)

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**AN ARROW.**



We know you. You're the one who doesn't go for fancy cocktails or plain whiskey drinks.

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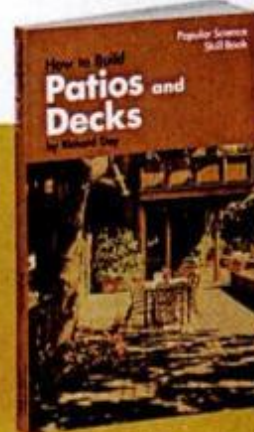
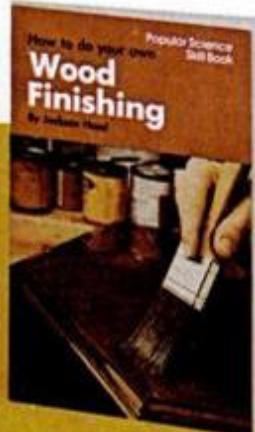
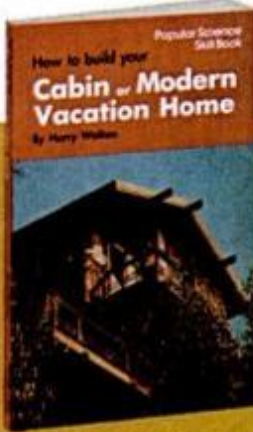


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**HOME GUIDE TO PLUMBING, HEATING, AIR CONDITIONING** by George Daniels. Step-by-step how-to for doing your own maintenance, repairs, installations. All principles, tools, techniques, instructions. Plumbing: fixtures, drainage, septic systems, more. Heating: electric, gas and oil heating, more. Air conditioning: systems, room units, more.

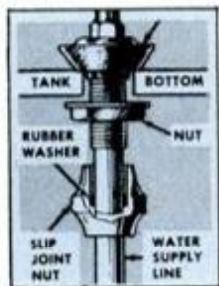
**HOW TO BUILD YOUR CABIN OR MODERN VACATION HOME** by Harry Walton. Build your own vacation home for a small fraction of regular cost. You get complete construction methods for foundations, porches, fireplaces, chimney, paneling, siding, more. Sites, plans, materials, utilities, financing.

**HOW TO DO YOUR OWN WOOD FINISHING** by Jackson Hand. How to finish new wood, apply fillers, bleaches, stains, paint, shellac, varnish, lacquer, enamel. A complete guide to restoring marred surfaces, antiques. More on novelty finishes including French polishes and glazes. Many pages in full color.

**HOW TO BUILD PATIOS AND DECKS** by Richard Day. How to design and build a patio or deck for any-size property. No previous woodworking or masonry experience needed. All the do-it-yourself how-to explains everything about construction materials, building plans, assembly techniques, tools, shortcuts, accessories. How to build footings, piers, posts, beams, tiles, more.



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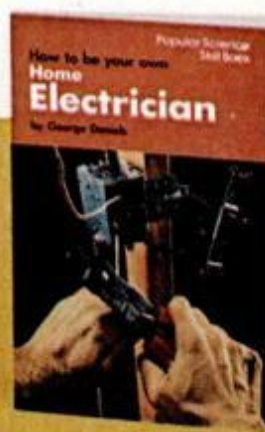
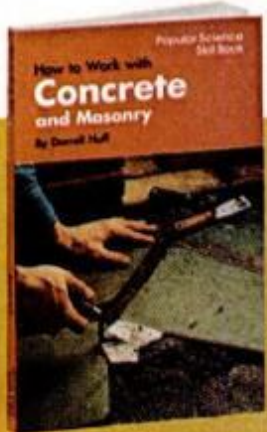
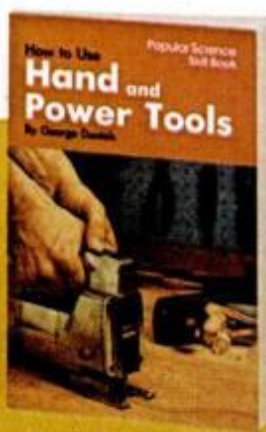
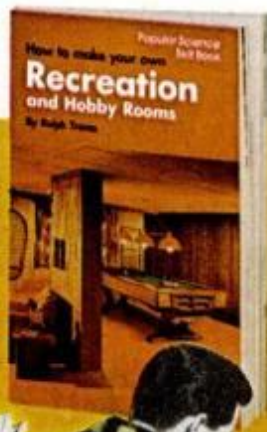
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★ **HOME GUIDE TO LAWNS AND LANDSCAPING** by Bruce Cassiday. Professional home landscaping tips and how-to on testing and grading the soil, sowing proper seed and sod, planting over 100 different deciduous and evergreen trees and more than 100 different ornamental shrubs, hedges, border plants. How to use flagstone, pebbles, slate, railroad ties, much more.

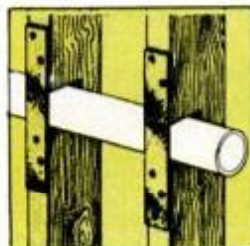
★ **HOW TO USE HAND AND POWER TOOLS** by George Daniels. How to choose, use, take care of all tools. Hand tools: hammers, saws, chisels, planes, more. Power tools: sabre saws, drills, routers, sanders, lathes, more. How to set up a power shop, safety practices, money-saving ideas, shortcuts.

★ **HOW TO WORK WITH CONCRETE AND MASONRY** by Darrell Huff. The do-it-yourself answer book on how to mix, pour, reinforce, cure, trowel, texture and color concrete. How to lay bricks, block, stone, flagstones. How to top and waterproof a wall. Step-by-step instructions for building forms for foundations, patios, barbecues. How to use transit-mix and ready-mix concrete. All finishing details.

★ **HOW TO BE YOUR OWN HOME ELECTRICIAN** by George Daniels. All the basics of electrical tools, codes, types of wire, house wiring, service wiring, outlets, plugs, switches, fixtures, doorbells, fuses, electric motors and more. Also, basic electrical theory, safety information, NEC requirements.



Tool tips...



Building details...



Finishing schedules...

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## HARD-TO-FIND HARDWARE

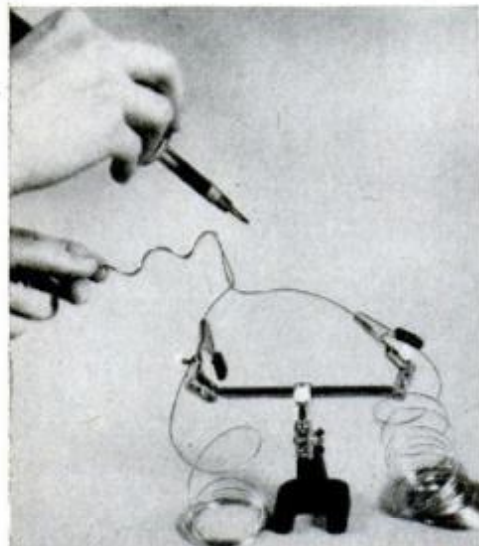
(Continued from page 66)

3630 East 10th St., Bloomington, Ind. 47401.

Catalog, \$1; Minimum order, \$4. Cupboard latches, casters, pulls, knobs, escutcheons, shelf supports and hinges.

**Steve Kayne Hand Forged Hardware**, 17 Harmon Pl., Smithtown, N.Y. 11787.

Wrought-iron fireplace equipment, hooks, brackets, military accoutrements, weathervanes, hinges.



Hold small work firmly in the spring clamps of Brookstone's Holding Jig (\$9). Pack of six extra clamps is \$1.35.

**Period Furniture Hardware Co.**, 123 Charles St., Boston, Mass. 02114.

Catalog, \$2. Custom hardware; reproduction hardware in many styles, including Victorian bathroom hardware; porcelain knobs; drapery hold-backs.

**S & S Hinge Co.**, 9465 River St., Schiller Park, Ill. 60176.

Custom, continuous and other hinges in steel, stainless and aluminum.

**Tremont Nail Co.**, Box 111, 21 Elm St., Wareham, Mass. 02571.

Minimum order, 1 lb. per size. Old-fashioned cut nails.

**Noel Wise Antiques**, 6503 St. Claude Ave., Arabi, La. 70032.

Catalog, \$1.50. Minimum order, \$4. Brass and iron hardware: claw-foot casters, roll-top desk hardware, locks, key bows, coat hooks, door knockers (such as eagle, fox head, even a medusa).

## HARD-TO-FIND TOOL SOURCES

**Allcraft Tool and Supply Co., Inc.**, 100 Frank Rd., Hicksville, N.Y. 11801.

Metalworking tools, particularly for silversmithing and jewelrymaking. Small hand tools; casting, sand-blasting, oxidizing and etching equipment; metals.

**Brookstone**, 350 Vose Farm Rd., Peterborough, N.H. 03458.

Variety of garden, gourmet and workshop implements. Some of the lesser-known items: glass cutter cuts circles and straight lines; epoxy putty that molds like clay; stainless-steel sponge.

**Campbell Tools Co.**, 1424 Barclay Rd., Springfield, Ohio 45505.

Catalog, \$1. Specializes in metalworking tools and supplies for small shops. Metalworking lathes, mills, drill presses; precision measuring tools for metal; Emco Unimat 3 (converts to 29 different machines; brochure 50 cents).

**Casting Specialties Corp.**, W51 N545 Struck Lane, Cedarburg, Wis. 53012.

Catalog, 50 cents. Metalworking hand and power tools shipped in kit form to be assembled at home. Geared to industrial arts students. Power hacksaw, lathes and vises.

**Centaur Forge, Ltd.**, Box 239, 117 North Spring St., Burlington, Wis. 53105.

Minimum order, \$10. Horseshoeing and blacksmith supplies such as horseshoe nails, farrier's hammers and shoes; tongs, anvils, forges and shop equipment.

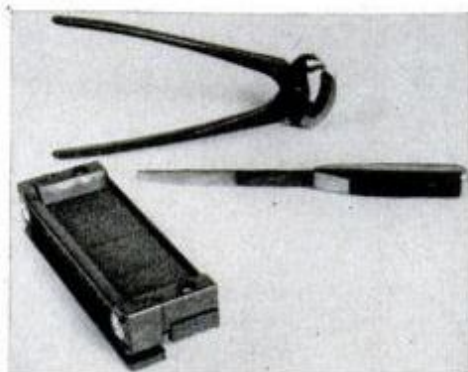
**Albert Constantine and Son, Inc.**, 2050 Eastchester Rd., Bronx, N.Y. 10461.

Catalog, 50 cents. Woodworking tools, particularly fine wood-working and carving; veneers, rare woods, decorative moldings, wood inlays.

**Craftsman Wood Service**, 2727 South Mary St., Chicago, Ill. 60608.

Catalog, 50 cents. Carving and fine woodworking tools. Small power tools, domestic and imported hardwoods.

**Edmund Scientific Co.**, Edscorp Building, Barrington, N.J. 08007.



Plastic laminate cutter (front) from Constantine (\$18) trims, bevels at once. Wade's deluxe general-purpose knife (\$11) has brass, rosewood handle. Brookstone's nail puller (\$12) also cuts wire.

Tools, meters, gauges for astronomy, optics and science; energy-crisis helpers; lab equipment.

**Frog Tool Co., Ltd.**, 541 North Franklin St., Chicago, Ill. 60610.

Catalog, 50 cents. Minimum order, \$5. A storehouse of woodworking tools: carving tools; log cabin tools such as two-

man saws, bark spuds, hatchets and axes; rasps, files, planes and books.

**Mankel Blacksmith Shop**, 7836 Cannonsburg Rd., Cannonsburg, Mich. 49317.

Catalog, \$1. Blacksmith and horseshoeing forges, furnaces, anvils, anvil bench.

**Minnesota Woodworkers Supply Co.**, 21801 Industrial Blvd., Rogers, Minn. 55374.

Catalog, \$1. Veneers, elaborate inlays, light woodworking tools, upholstery and spray equipment.

**Poor Man's Catalog** from GRW Group, Inc., 6939 Vinevale Ave., Drawer 740, Bell, Calif. 90201.

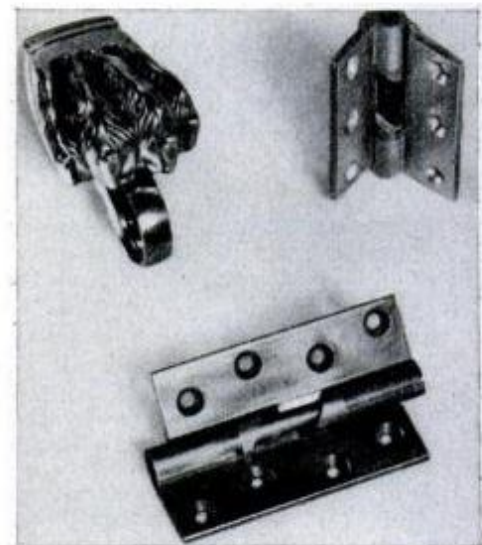
Catalog, \$1. Plans (not kits) for making very low-cost projects. Example: rotary duplicator from a gallon paint can and a standard typewriter stencil; economy sawhorse lathe, horizontal drum sander.

**Schlesinger's for Tools Ltd.**, 1257-61 Utica Ave., Brooklyn, N.Y. 11203.

Precision marking and measuring tools such as vernier calipers.

**Sculpture House**, 38 East 30th St., New York, N.Y. 10016.

Catalog, \$1. Tools and equipment for



Rising butt hinges from Ball and Ball come in brass or aluminum (from \$15 a pair) in 3 or 4-in size to clear uneven floors, thick carpets. Large brass claw-foot casters from Wise are \$52 for four.

wood and stone carving and clay and ceramic sculpting. Books, too.

**Garrett Wade Co.**, 302 Fifth Ave., New York, N.Y. 10001.

The catalog is finely detailed and a treat to read. It contains fine woodworking tools, both hand and powered.

**Woodcraft Supply Corp.**, 313 Montvale Ave., Woburn, Mass. 01801.

Catalog, 50 cents. A complete line of hand woodworking tools, sharpeners, clamps, vises, some power tools. **PM**

# Why smoke if you don't enjoy it?



Enjoyment's the name of the game. So I smoke Salem. Full, rich flavor. Smooth, fresh menthol. Can't beat 'em. Enjoyment every time.

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KING: 16 mg. "tar", 1.1 mg. nicotine, 100's: 19 mg. "tar", 1.3 mg. nicotine, av. per cigarette. FTC Report MAY '78.

# AN AUTOMATIC TELEPHONE DIALER FOR \$99

Rapidual™ works on any line with any phone. Automatically dials any of 20 numbers in its memory in one second. And you can use its super fast Touchtone® pad instead of the rotary dial on your phone.



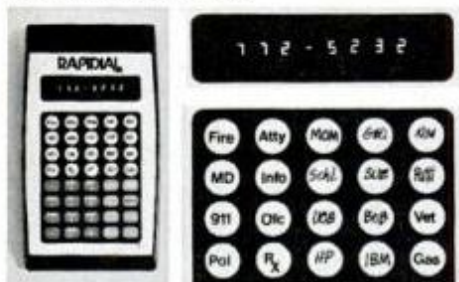
Here's the speed and convenience the industry said couldn't and wouldn't be available at this low price until sometime in the future. A highly sophisticated, full capacity, solid state microprocessor made to the most exacting standards and warranted for one full year against defects in quality and workmanship.

## Some Favorable Comparisons

The closest you can come to the Rapidual™ is the Telephone Company's Touch-a-matic®, which handles 15 numbers compared with Rapidual's 20, and must be leased for \$9.00 a month plus tax plus installation of \$105.00. (The 32 memory unit is almost \$20 a month plus \$132.00 to install.)

The next lowest price is \$130.00, for a 16 number dialer with no keyboard, so it has to be programmed through the telephone. A cumbersome technique that limits the use of the unit to numbers put in memory.

You can go up the line, from \$150 to \$400, and you won't find an easier to use, more efficient or versatile unit. Rapidual, for example, has a built-in speaker to tell you if the line's busy, and when your party's on the line. So, with Rapidual you only pick up the receiver when someone answers.



## Some Surprising Uses

**Frequently Called Numbers** We always assumed you'd put your 20 most frequently called numbers into memory — including, probably, your emergency numbers. And that's exactly the way many people use it. Delighted with the time and trouble they save with automation.

**Numbers You Always Look Up** Others find using it in exactly the opposite way even more advantageous. They store important but less frequently used numbers. Numbers they almost always had to look up before.

**Inter-Office** For many, the greatest convenience is using Rapidual primarily for inter-office calls—so they don't have to stop to look up the extensions.

**Daily Schedule Caller** Still others use Rapidual as a memo caller. Each morning they pencil in the names of the people they have to call that day, and enter their numbers into memory. When the call's completed, they just wipe off the name, erase the number. Adding new ones, if necessary, as the day progresses.

**Emergency calls** are always dialed correctly; and you save the time of looking up the number of Police, Fire Department, Doctor or anyone you need to reach immediately.

## For All Your Calls

Actually, you'll probably use Rapidual in all these ways—and more. It's so easy to program and reprogram. Can be set to pause, access WATS lines and PABX systems. What's more, calling is incredibly fast. A digit is "beeped" in a tenth of a second, so a 10-digit number is dialed in just one second!

Of course, if you don't have a Touch-Tone phone, you'll use the Rapidual keyboard for all your calls. It's so much faster and easier.

## An Important Addition To Your Home

While Rapidual has been designed for the office, it's priced for the home. Besides family, friends, the police and fire departments, you'll use it to store the number where the baby sitter can reach you in an emergency, and for the numbers you always have to look up—like the hardware, drug and local department store, the take-out restaurant, your bank, barber, the hairdresser. And you'll be amazed at how many 20 numbers seem when you go through your directory.

## Thirty Day Trial

One day will demonstrate the extraordinary convenience, unbelievable freedom you'll enjoy with Rapidual.

Still, as one of America's oldest and largest mail merchandiser, Douglas Dunhill wants you to be convinced of the flawless performance, the years of trouble-free service you'll get. Therefore, we'll send Rapidual to you on an unconditional 30-day money back guarantee.

If you can find any unit that sells for less, or a better unit at any price, if you're dissatisfied for any reason, return Rapidual to us for a complete refund.

## Installs in Seconds

Rapidual comes complete with adapters that fit either a 4-prong wall jack or the newer

modular jack. (If you have phones without jacks, your phone company will install a modular jack at a nominal one time charge.)

For multiple line office phones, there's a special optional adapter that fits the Rapidual and connects in seconds. With this Anphenol adapter Rapidual will dial on any line on your multi-line phone. Should you have any further technical questions about use or installation of the Rapidual, call toll-free 800-227-8363 (in CA, call 415-494-9402).

## Rapidual Highlights

- **LED Display** lets you verify or refer to any number in memory
- **Internal Speaker System** lets you hear busy signal or your party before you pick up receiver
- **Push Button Dialing** on any phone, even ROTARY DIAL Portable only 6½" x 3½" x 1¼" and can be moved from phone to phone in an instant
- **Plug Two Together** to increase memory capacity to 40 numbers
- **Keyboard Access** with up to 30 digit capacity for placing any call
- **Waits for Dial Tone** before dialing — easily programmed
- **One Year Warranty** with nothing to maintain or wear out.
- **Approved** for attachment to the telephone system.

**CALL 800-325-6400**  
**ASK FOR OPERATOR #11**

(Missouri residents call 800-342-6600)  
These lines are in operation 24 hours,  
7 days a week

Rapidual is just \$99.00 plus \$2.05 shipping and handling. Complete with back-up batteries in case of a power failure and the adapter to fit your present jack. The multiple line adapter is only \$19.95 extra.

To order with any credit card, call the toll free number above. Or you may send your check to Douglas Dunhill at the address below. Be sure to tell us if you want multiple line adapter. (Illinois and New York State residents add the sales tax.)

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4225 Frontage Rd. • Oak Forest, Ill. 60452

**L**ove at first sight? Not the Chevette. Until about 18 months ago, dealers thought they might have to give it away.

But as the dollar went down, down, down on foreign money markets and the prices of Japanese and German imports went up, up, up, American buyers began to take another look at the Chevette. And lots of browsers liked what they saw.

So the Chevette romance, while slow in coming, has blossomed of late. Dealers now have a hard time keeping Chevettes in stock.

And the Chevette itself has changed. It's added engine displacement and horsepower, two doors and an AM radio. The new 1.6-liter Four delivers 63 bhp in its basic form, with an H.O. (high-



Most owners got Chevettes as economical second cars and are pleased.

## PM OWNERS REPORT: CHEVROLET CHEVETTE

output) version rated at 68 bhp.

Chevettes are built in the United States with engines manufactured by General Motors of Canada. Thus, any Chevrolet dealer can work on a Chevette—an important consideration.

### Economy lured buyers

We surveyed 1000 owners of 1978 Chevettes, taking their names at random from the registration rolls of R.L. Polk, Inc., Detroit. We began our questioning by asking owners: Why did you choose this particular car?

"For the gas mileage," said a Delaware vending-machine repairman, "and the Chevette was the most car I could find for

\$3600. Also, I had a mild desire to buy American."

A Wisconsin teacher and coach: "Our Chevette replaced a 4-year-old Chevrolet wagon that was getting 10 miles to the gallon, so I guess economy was our main reason for purchase. But we also liked the Chevette's looks—it's a sharp-looking car. We investigated Honda, but were told it would take a long time to get the model we wanted."

An Alabama millwright: "I'd heard that Chevrolet put a lot of money into making the Chevette a better car. I needed something that gets good gas mileage, and I didn't want to buy anything not made in the good-old U.S. of A."

A North Carolina student: "The

*(Please turn to page 76)*



Rear hatch lifts on preloaded gas cylinder, gives good access to cargo area.

A NATIONWIDE SURVEY BASED ON 1,739,994 OWNER-DRIVEN MILES

Handy hatchback and folding rear seatback give tremendous carrying capacity.

Owners praise interior comfort, seating, and lack of noise.

# Economy and handling top owner praises, but EPA again got hopes too high.

by Michael Lamm  
WEST COAST EDITOR



Photos by the author

Chevette has 155/80-13 bias-ply whitewalls, with steel-belted radials optional.

Rack-and-pinion steering gives a quick, precise 3.6 turns lock to lock.

Toyota was my first choice, but have you priced a new Toyota lately? The Chevette turned out to be the best car for the money."

Next we asked owners what qualities and features they like best about their Chevettes. Here's a representative cross section of replies.

"It's got great handling on the



Special instrumentation is \$64 extra, includes tach, voltmeter, temp light.

road," comments a California medical records technician. "Also, the noise level at driving speeds is at a minimum—it's like being in a limousine! I think it's a nice looking little car, and the temperature controls are very good (airconditioner, vents, fan, etc.)."

"The Chevette is excellent as far as the mechanical side of it goes," says a Florida pet shop owner. "We live 2½ miles down a dirt road, and the car handles easily—just as if it were a big, heavy car."

An Iowa college instructor: "It's a nice car to drive in town. Good handling, maneuverability and pep. Plenty of room for large passengers, and the hatchback is handy."

A California engineer: "We've taken trips of 1500 and 2000 miles in our Chevette and were thrilled with the roominess, comfort, silence and economy. It's a very fine car—more comfortable than many mid-sized or full-sized models we've been in."

And a North Carolina librarian: "It's an easy car to park in a crowded lot. The hatchback and folding rear seat make a lot of sense for carrying groceries. And there's more legroom in the back seat than in most small cars."

We asked: What specifically don't you like about your Chevette?

### EPA mileage disappointing

An Illinois graphic artist: "I think the EPA gas mileage estimates add up to false advertising. I'm frankly disappointed that my car doesn't deliver the 30-40 mpg I had expected."

Some 15 percent of our respondents echoed this complaint. Realistically, owners in our survey report getting 23.7 to 29.5 mpg. However, a Maine nurse is probably right when she volunteers that, "For the first three or four months, the Chevette was delivering lousy gas mileage. The dealer said it would loosen up, and it has—I'm now getting 28 in town and 33 on the highway."

Other complaints included the following:

"It's difficult to fill the gas tank completely," says a Wisconsin clergyman. Several other owners voiced the same complaint. A Colorado man says he's solved the problem by parking the car so it tilts slightly to the right when being filled, but not everyone has access to a filling station with a sloping driveway.

"The doors are hard to shut," grumbles a Minnesota insurance underwriter. "They've been adjusted several times, but the dealer has yet to solve the problem." On that same topic, a Montana beautician reports: "The rear win-



Sedan, 3 inches longer than three-door, surprises rear riders with roominess.

dow of our hatchback burst out when my husband slammed the driver's door. The mechanic told us it happened because the car is so tightly sealed."

And a New York civil engineer has a gripe with the Chevette's shoulder harness. "What's that

(Please turn to page 78)

## SUMMARY OF 1978 CHEVROLET CHEVETTE OWNERS REPORTS\*

Total miles driven 1,739,994

### Average miles per gallon:

Base 63-bhp Four  
In town (EPA 30 manual) 23.7  
Long trips (EPA 40 manual) 29.5  
High-output 68-bhp Four  
In town 23.7  
Long trips 28.4

### Engine choices:

Base 63-bhp Four 67.3%  
High-output 68-bhp Four 32.7

### Transmission choices:

Four-speed manual 54.9%  
Automatic 45.1

### Body style choices:

Five-door hatchback 53.3%  
Three-door hatchback 46.7

### Why did you choose the Chevette?

Economy 73.1%  
Price 22.9  
Size 21.3  
Styling 17.7  
Roominess 6.0

### Specific likes:

Economy 61.1%

Handling 60.3  
Comfort 22.2  
Styling 20.9  
Size 13.2

### Specific dislikes:

No complaints 20.1  
Gas mileage 15.3  
Rattles 10.5  
Poor workmanship 10.0  
Poor dealer service 6.6

### What changes would you like?

No changes 13.2%  
Better gas mileage 9.1  
More rear legroom 8.2  
Better workmanship 6.4  
Front-wheel drive 6.4

### Workmanship opinion:

Excellent 18.0%  
Good 44.8  
Average 19.6  
Fair 10.8  
Poor 6.8

### Comfort opinion (front seats):

Excellent 25.7%

Very good 34.1  
Good 30.9  
Fair 8.0  
Poor 1.2

### Comfort opinion (rear seats):

Excellent 10.0%  
Very good 18.3  
Good 32.8  
Fair 19.7  
Poor 19.2

### Had any mechanical trouble?

Yes 58.1%  
No 41.9

### What type of trouble?

Pin drops out of shifter 17.9%  
Carburetor 12.9  
Transmission 10.0  
Brakes 10.0  
Airconditioner 10.0

### Did you repair it yourself?

No 94.4%  
Yes 5.6

### Dealer repairs satisfactory?

Yes 50.0%  
No 50.0

### Dealer service opinion:

Excellent 20.2%  
Good 28.3  
Average 23.8  
Fair 13.5  
Poor 14.3

### Number of vehicles owned:

Chevette only 33.1%  
Two cars 52.6  
Three cars 9.6  
Four or more cars 4.8

### Makes of other cars owned:

Chevrolet 46.1%  
Ford 14.4  
Oldsmobile 11.4  
Buick 9.0  
Plymouth 6.6

### Age distribution of owners:

15-29 years 31.9%  
30-49 years 42.5  
50-plus 25.5

### Would you buy another Chevette?

Yes 70.8%  
No 29.2

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



# A FRESH NEW SLICE OF APPLE PIE.



'79 Malibu Classic Coupe

Dig in, America.  
Dig in deep.

Because the deeper you dig, the more you're going to love this crisp new mid-size Malibu of ours.

A lot of folks are finding Malibu to be just the right size—with just the right room, the right look, the right feel, the right ingredients, the right name.

#### The right ingredients.

Malibu's beautiful Body by

Fisher sits on a tough full-perimeter frame, with 14 noise-absorbing body mounts, front stabilizer bar, and Full Coil suspension for a smooth and quiet ride.

Front disc brakes, fiberglass-belted radial ply tires, full carpeting, extensive corrosion-resisting treatments, High Energy Ignition system and a Delco Freedom battery that never needs refilling are all standard.

#### The right name.

The fact that Malibu is a Chevy makes it all the more appealing to a lot of people. People who've owned Chevys over the years and know the kind of value we build into all our cars.

Talk to your Chevrolet dealer soon about buying or leasing a crisp new '79 Malibu.

You're going to eat it up.

# '79 CHEVY MALIBU



windpipe strangulation contraption that passes for a seatbelt? Why can't they modernize such a simple device?"

**Like workmanship, quality**

We asked owners to rate the workmanship and quality of their Chevetttes, and 62.8 percent rated them at *good* to *excellent*.

A Michigan truck mechanic writes, "I'm well satisfied with the way my car is put together except for an improperly installed arm rest and the carpet, which fits rather poorly."

"I got what I paid for," notes a West Virginia housing specialist.

"Good fit and finish; no objectionable noises," declares a Florida Cadillac salesman!

"Good—it must be good because nothing's fallen apart yet," says a Vermont clerk.

And a New York biochemist: "Maybe I'm somebody special, but it appears that I received a car that is well made with few observable flaws."

When we asked whether Chevette owners had experienced mechanical troubles, 58.1 percent said yes. The most common problem involved a pin in the shift lever.

A Michigan housewife and part-time postal worker sums it up. "The pin that holds the shifter keeps falling out. This leaves me with no gears. The garage has to haul the car in to be repaired. This has happened twice, and I was stranded both times."

Some owners also complained of carburetor hesitation and balkiness, especially when the engine was still cold. Once it warms up, the problem seems to go away.

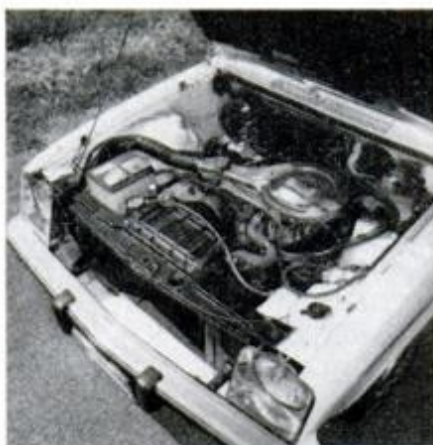
Dealer service won no awards from Chevette owners, with 51.6 percent giving it marks of *average* to *poor*.

"My car has been in the shop five times, sometimes for two or three days at a time," laments a West Virginia teacher. "No one seems to give a thought to the inconvenience of my being without a car."

A New York nurse's aide: "The service manager tends to ignore me when I stop in for service such as needed according to the manual."

A California welder: "Fast service if it's a minor repair. Anything major takes 2-3 days."

Keep in mind, though, that



**Chevette engine comes in two ratings: 63 and 68 bhp, both 98 cubic-inches.**

nearly half the owners rated dealer service *good* to *excellent*. For example, a Tennessee pastor wrote, "Quick attention to the smallest detail—he's courteous and friendly."

And a California tile setter: "Our new Chevette needed replacement of hood insulation; a dented, faulty wheel; and the turn-signal light. Everything was repaired/replaced promptly and correctly. The mechanics were very helpful and courteous."

**It's comfortable**

In rating the comfort of their cars, owners overwhelmingly voted in the *good* to *excellent* columns for both the front and rear seats. It's not unusual for subcompacts to get good marks from the front passengers, but those who sit in the rear usually groan and grumble. Not so in the Chevette. "Many friends have commented on how nice it is in the back seat," mentions a Florida lab tech, "and the air conditioner is good, too."



**With rear seatback folded flat, deck increases to over four-foot length.**

And an Iowa teacher: "Larger people find the Chevette a bit cozy. I am 5-10 and would have trouble if I were any taller. My wife, who is under five feet, thinks the car is perfect."

We then asked Chevette owners to list ideas for improving their cars. Here's a sampling.

"I think the Chevette should go to front-wheel drive (fwd), thus eliminating the driveshaft hump and allowing the accelerator and brake pedal to be spread farther apart," suggests an Illinois design engineer.

A Mississippi housewife: "The rear doors need a catch to keep them open. And I wish the car had a vent pane in the front window."

An Illinois computer programmer: "The front seat should go back three more inches for long-legged drivers."

An Oregon dentist: "Air conditioner components should be smaller, or at least the compressor should be moved from its position over the distributor."

"I discovered that you have to replace the entire air-cleaner assembly," states a California secretary, "and not just the filter. Do you realize how expensive that is? The dealer wants \$17!"

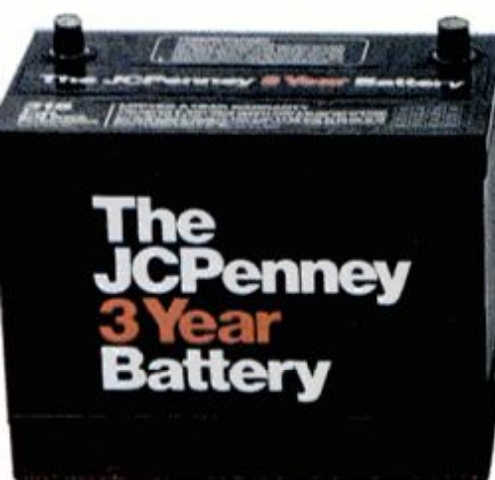
"The left rear side-marker lamp needs a better seal," opines a Minnesota technician. "If gasoline runs down the fender during refueling, it seeps inside the lamp. Not only is this very dangerous, but you breathe fumes for 10 to 15 minutes afterward."

On the whole, however, Chevette owners are very happy with their cars, 70.8 percent stating they would buy another one.

"I have given up nothing by buying a small car," volunteers a Tennessee innkeeper. "I still have the comfort in my Chevette that I used to have in a larger car. I don't have to pay a lot for gas. I can change a flat tire in 10 minutes. The ride is very smooth. A lot of my friends have said they want one—this after taking a ride in mine."

And an Illinois systems analyst wraps it up with these words: "We wanted a simple, economical car for commuting and driving around town. The Chevette is perfect for those purposes. It's a most economical American car, with a very good dealer network and reputation. And our children love the car because they can see out of it." **PM**

# "The most powerful battery you can buy for your car" presents three powerful alternatives.



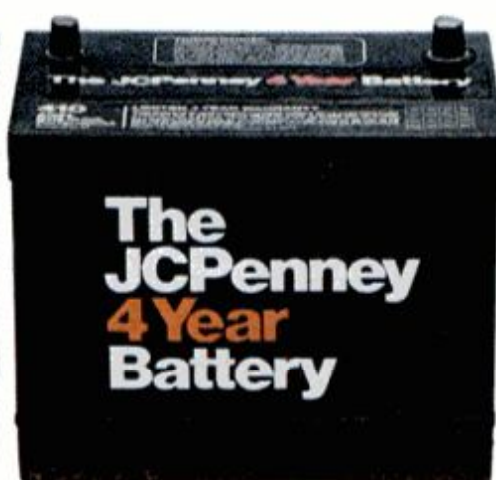
315 Amps (Group Size 24)  
Cold Cranking Power

**\$37.00\***

Limited 3 Year Warranty  
THIS BATTERY IS WARRANTED  
AGAINST FAILURE TO ACCEPT  
AND HOLD A CHARGE FOR  
3 YEARS WHEN USED IN  
YOUR PRIVATE CAR OR TRUCK.

- If it fails during the first year—we will replace it free.
- If it fails during the 2nd year, we will allow \$20.00 towards the purchase of a new battery.
- If it fails during the 3rd year, we will allow \$10.00 towards the purchase of a new battery.

Just return it with proof of purchase to the nearest JCPenney store for service.



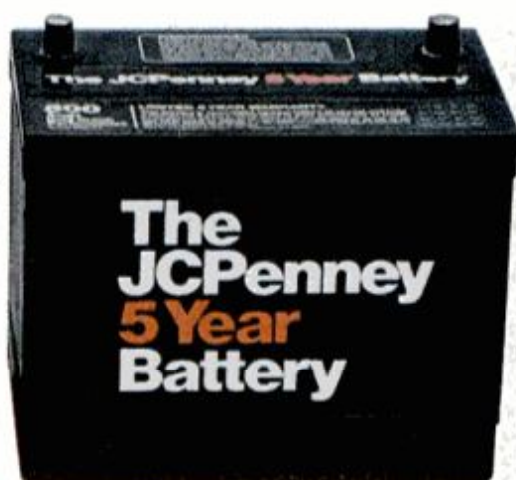
410 Amps (Group size 24)  
Cold Cranking Power

**\$47.00\***

Limited 4 Year Warranty  
THIS BATTERY IS WARRANTED  
AGAINST FAILURE TO ACCEPT  
AND HOLD A CHARGE FOR  
4 YEARS WHEN USED IN  
YOUR PRIVATE CAR OR TRUCK.

- If it fails during the first 2 years—we will replace it free.
- If it fails during the 3rd year, we will allow \$20.00 towards the purchase of a new battery.
- If it fails during the 4th year, we will allow \$10.00 towards the purchase of a new battery.

Just return it with proof of purchase to the nearest JCPenney store for service.



500 Amps (Group size 24)  
Cold Cranking Power

**\$55.00\***

Limited 5 Year Warranty  
THIS BATTERY IS WARRANTED  
AGAINST FAILURE TO ACCEPT  
AND HOLD A CHARGE FOR  
5 YEARS WHEN USED IN  
YOUR PRIVATE CAR OR TRUCK.

- If it fails during the first 3 years—we will replace it free.
- If it fails during the 4th year, we will allow \$20.00 towards the purchase of a new battery.
- If it fails during the 5th year, we will allow \$10.00 towards the purchase of a new battery.

Just return it with proof of purchase to the nearest JCPenney store for service.

## The JCPenney Batteries

The *Full* Line of Maintenance-Free Batteries.

# Ford announces its King of Clubs

Ford has the newest word in great Clubs—Captain's Club Wagon.\* Comes with quad swivel/reclining chairs, foldout snack/game table, seat-bed combo in 7-passenger model. Ideal for camp, sports weekends, vacation travel!

## THE CAPTAIN'S CLUB WAGON

Ford has out-front engine design—for easy move-around room. Also tough Ford body-on-frame construction—cushioned by rubber mounts.

Ford Clubs have more cargo space than most station wagons—and can seat up to 15 adults.



### Quad Captain's Chairs!

Living room-like comfort—Privacy™ glass, carpeting, foldout snack/game table.



### Wide seat folds into bed.

Quick and easy. Lots of roomy comfort.



### Super Wagon size, too!

Twenty inches longer. Ford Clubs are rated to tow up to 8,000 pounds! Engine choice: 4.9L (300 CID), 5.0L (302 CID), 5.8L (351 CID), 7.5L (460 CID).



\*Shown with optional sport rails, WSW tires, wheel covers, mirrors and chrome step bumper.

# FORD

FORD DIVISION



# IMPORTS & MOTORSPORTS

## Thanks a million

Okay, Mercedes, how about a new warranty for diesel owners: ten years or one million miles, whichever comes first. That idea may not be as wild as it seems: In a recent search for the highest-mileage diesel and the oldest still in use, Mercedes found Bob O'Reilly in Washington state with 1,184,000 miles on his 1957 180D and Paul Dauer in Chicago with a 1938 model 260D. Both owners were presented with new 300SD turbodiesels by Mercedes-Benz of



'57 Mercedes 180D has 1,184,000 miles.

North America.

The Great Diesel Search began at Mercedes at the same time it introduced the 300SD, the world's first turbodiesel passenger car (see page 80, Aug. '78). And the results certainly dramatized the longevity of Mercedes diesels. Runner-up in the mileage category was Ed Donaldson of Oregon who has cruised 912,000 miles in his 1968 220D. Third, fourth and fifth-place runners-up all had over 800,000 miles on their clocks. They and Donaldson will each spend a week in Europe on Mercedes.

Giving your car tender loving care for years of trouble-free driving is usually its own reward, as PM has been telling its readers for years, but to have diligent care result in the gift of a new, \$24,000 car is reward beyond all expectation. Just shows to go you, all those oil changes and wax jobs on your '71 Chevy may some day pay off in a most unexpected way!



'68 Mercedes 220D has 912,000 miles.

## Downsized BMW



BMW R65 displaces 650 cc.

Maybe the great displacement race is over and motorcycles, too, will be getting the downsizing treatment. New cars have had to meet mileage standards, hence are smaller and lighter, but bikes have been getting too monstrous to throw around easily and just plain enjoy. BMW has done an about-face and come back down to a more human scale with new, smaller additions to its model lineup. The R65, above, is 650 cc and an R45 is 450 cc. Both machines have shaft drive like all their predecessors, and both corner much tighter with their smaller engines (shorter stroke allows the horizontally opposed twins to be a couple of inches narrower and therefore able to lean over a little farther on the curves).

## New Honda



Honda 2+2 is code named Action 2.

A sporty 2+2 coupe with the code name of Action 2 will be joining Civics and Accords in the Honda model lineup sometime next year. Still under wraps, the sports model is reported to feature a new 1751-cc CVCC Four, five-speed overdrive transmission and all-independent suspension. It'll be front wheel drive, of course, and share some components with the Accord. The Action 2 will be about a half-foot shorter than the Accord, on a shorter wheelbase and is expected to cost about \$6000. Sounds like dynamite.

## V12 milestone

With three times more cylinders than the engines in most cars imported here, the Jaguar V12 is unique indeed. Ferrari and Lamborghini are the only other firms presently making V12s for road



XJ-S: Beats an engine ever so big?

cars. Ford made lots of V12s for its Lincolns, 40,000 to be exact, but that was years ago. Jaguar recently hit the 50,000-V12 mark with its 244-hp smoothie, used in XJ12, XJ12L, XJ12C and XJ-S models.

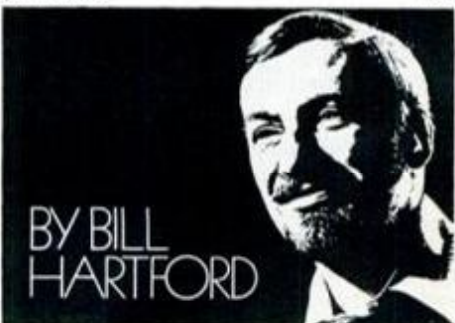
## Moped update

It's had a rough road to travel, but mopeds in the United States can now be considered a legitimate member of the vehicular family. For the past six years, moped riders have had to navigate a maze of laws that varied greatly from state to state and often lumped mopeds with motorcycles. There's no



States with moped laws number 39.

unanimity yet, but 39 states now have laws that are fairly consistent regarding minimum age, license rules, speed limits, legal definitions, registration, insurance, helmets, engine size and other regs. Not a motorcycle, not a bicycle. *Vive la difference!* **PM**



BY BILL HARTFORD

Trumpeter Mountain, British Columbia, Canada

# Canada at its best.

Enjoy the light, smooth whisky that's becoming America's favorite Canadian.  
Imported Canadian Mist®

Share some tonight.



IMPORTED BY BROWN-FORMAN DISTILLERS IMPORT COMPANY, N.Y., N.Y., CANADIAN WHISKY—A BLEND, 80 OR 86.8 PROOF, © 1977.

Материал, защищенный авторскими правами



## No silver lining for solar equipment makers

*With all the attention being given to practical applications of solar heating these days, your impression—as was ours—might be that the industry behind this idea is booming. Emphatically not so, according to the Solar Energy Research and Education Foundation (SEREF), an organization lobbying in Washington for Congressional action on solar energy tax credit legislation.*

*Says SEREF, the number of solar equipment manufacturers in the U.S. has declined by 13 percent this year compared to 1977. Production declines in most types of solar collection equipment were also noted in the organization's telephone survey of active companies. The group blames government mismanagement of solar programs, including unfair warranty requirements for products developed with government funding, for the industry's lackluster performance.*

*Only in California, where the state has enacted a substantial tax credit package, is overall solar product manufacturing on the upswing, according to the organization.*



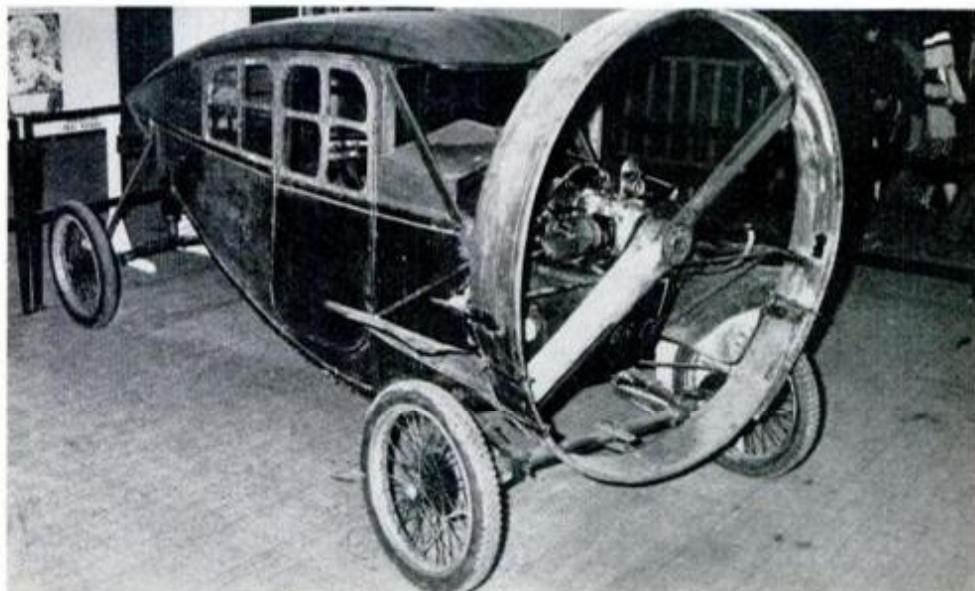
### What comes down . . .

. . . doesn't always go up again, particularly if it's been involved in that horror of horrors, a midair collision.

Six years ago, English stunt pilot Colin Goodman's de Havilland Tiger Moth tangled with a sister aircraft some 70 feet off the deck during an air show performance in Somerset (photo above). Both planes plummeted to earth in a sickening crash. Miraculously, the other pilot was only slightly injured, but Goodman had serious head injuries and was given one chance in 10 to live by doctors who initially examined him. It was certain he would never fly again. Yet today, minus the sight of one eye, Colin Goodman is back with the air show—flying. "Without the eye, it was a struggle to get my license back," he says, "but I made it."

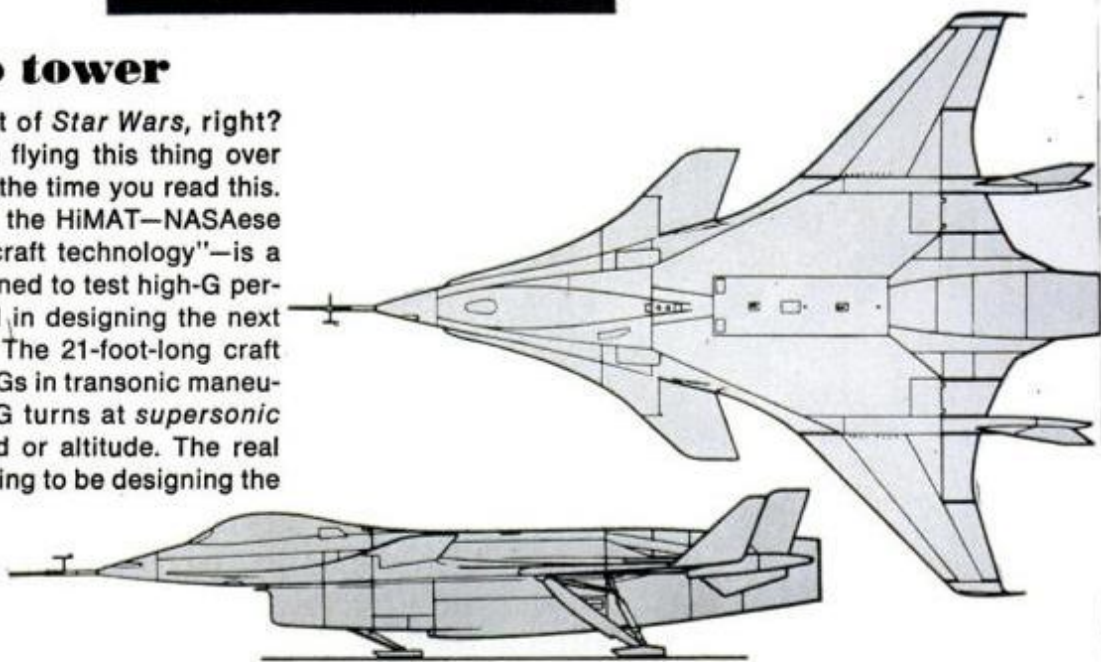
### PM'S WHATSIT

This is neither a homebuilt airplane put together in a narrow garage nor an amphibian airboat looking for a swamp. It's an automobile, a 1920 Leyet from France, which was in its time capable of speeds near 50 mph and numbered among its initial buyers—a discriminating few—auto baron Jean-Jacques Peugeot. You could stretch its credits to include front-wheel drive. Reverse? Apparently no one cared to look back in 1920.



## Darth Vader to tower

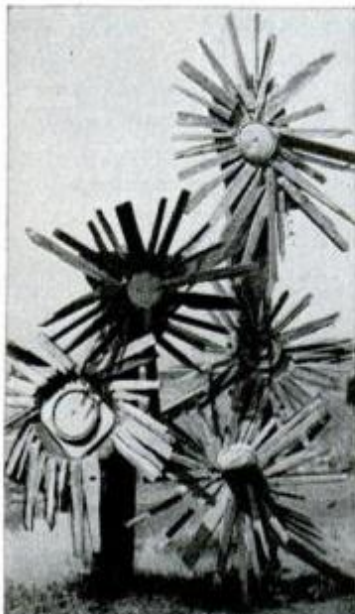
It's a rocket fighter right out of *Star Wars*, right? Wrong. In fact, NASA will be flying this thing over California's Mojave Desert by the time you read this. Nobody will be aboard, since the HiMAT—NASAese for "highly maneuverable aircraft technology"—is a remotely piloted vehicle designed to test high-G performance that will be the goal in designing the next generation of fighter aircraft. The 21-foot-long craft will pull up to 8 brain-draining Gs in transonic maneuvers, and do gut-grinding 6-G turns at *supersonic* speeds, with no loss of speed or altitude. The real challenge, confidentially, is going to be designing the next generation of pilots.



## UNTIDALED WORKS

If you haven't already caught a glimpse of the debris-and-driftwood sculpture exhibition that sprang up, apparently spontaneously, off the Eastshore Freeway in northern California, you may be seeing it here for the first and last time. Developers have targeted the mudflat museum, near the town of Emeryville, for

part of a project to include marinas and a shopping center. Which will be too bad, according to some motorists who got used to viewing the tableau on approaching San Francisco. One best feature, says a local critic, was that high tides would occasionally sweep in from San Francisco Bay and totally rearrange everything.



## FROM UNCLE'S BOOKSTORE

*The Government Printing Office is the best discount bookstore in the country—your tax dollars help make it that way. Here are some current selections you can order by writing Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Titles are followed by price and order number.*

*Japan's World War II Balloon Bomb Attacks on North America: A complete account of the bizarre plan that resulted in the only enemy-caused deaths on the American continent during the War;* \$2.75; order S/N 047-005-00009-4.

*Gambling Technology: This is a 62-page FBI manual telling local enforcement officials how illegal horse parlors, card rooms and floating crap games operate. Could be fascinating;* \$2.10; order S/N 027-001-00019-0.

*USAF Aircraft Photopak 1: Think of it! Forty-five eight-by-ten photos of current military planes and helicopters for only \$2.20;* order S/N 008-070-00405-4.

*The full State of the Union Message as delivered by President Carter: Possibly overpriced but a real curio;* \$1.50; S/N 052-071-00555-2.



# HEAD FOR A NEW HORIZON.



## 1979 PLYMOUTH HORIZON.



**HORIZON...THE EFFICIENCY-SIZED  
CAR THAT HAS CAUGHT AMERICA'S  
IMAGINATION.**

The new 1979 Horizon. A new driving experience for America. Horizon is the first American-made car its size with front-wheel drive. And that does a lot of good things for you.

### **THE STABILITY OF FRONT-WHEEL DRIVE.**

Horizon gives you outstanding handling and stability in rain, snow, and wind. So you can drive with a new feeling of confidence on highways, washboard roads, all kinds of roads.

### **ROOM YOU WOULDN'T IMAGINE**

There's more room inside the Horizon than you'd ever expect in a car this size. With the back seat folded down, Horizon becomes a mini-station wagon. With the back seat up, four full-size adults can ride in complete comfort. Even on long trips.



And long trips take less gas than you'd imagine. You get 38 miles to the gallon on the highway and 25 in the city.\*

Put all that together and you've got the new 1979 Plymouth Horizon ... the car that's caught America's imagination.

See your Chrysler-Plymouth dealer for a test drive.

\*EPA estimates based on manual transmission. Your mileage may vary, depending on your driving habits, your car's condition and its optional equipment. California mileage lower.



**THAT'S IMAGINATION. THAT'S PLYMOUTH.**

A cowboy wearing a hat and vest is riding a dark horse through a field of tall grass. He is holding a lasso aloft in his right hand. In the foreground, a longhorn with large, curved horns is partially visible. The scene is set in a rural, open landscape.

**Come to Marlboro Country.**



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

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

Kings: 17 mg "tar," 1.0 mg nicotine—  
100's: 18 mg "tar," 1.1 mg nicotine av. per cigarette, FTC Report May '78

With land reserves of key metal ores thinning out, nations are gearing up to probe the biggest mine of all—the sea.



Outsized nodule—a freak—is examined by J.L. Shaw, president of Ocean Management, Inc., during operations south of Hawaii. Drillship Sedco 445 (below) got a new hydraulic mast before she adopted her role as a deep-sea mining vessel.



# Tapping the world's deepest, wettest mine

by E. J. Lewis

**T**he world's deepest mine, according to the *Guinness Book of World Records*, is the 12,600-foot Western Deep Levels Mine at Carletonville, South Africa. But that's on dry land. Now scientists are preparing to top this feat—in ocean waters nearly *three miles* down. Last February, the *Sedco 445* left Honolulu to take up station in the Pacific

Ocean about 800 miles south of Hawaii. On this voyage, the 17,150-ton drillship would not probe for oil or gas, her usual assignment. This was a mining operation. Plans called for lowering a string of pipe with a sled-like collector at its end. Like a giant vacuum cleaner, the rig would suck up roundish lumps of mineral ore from the ocean floor 15,000 feet below.

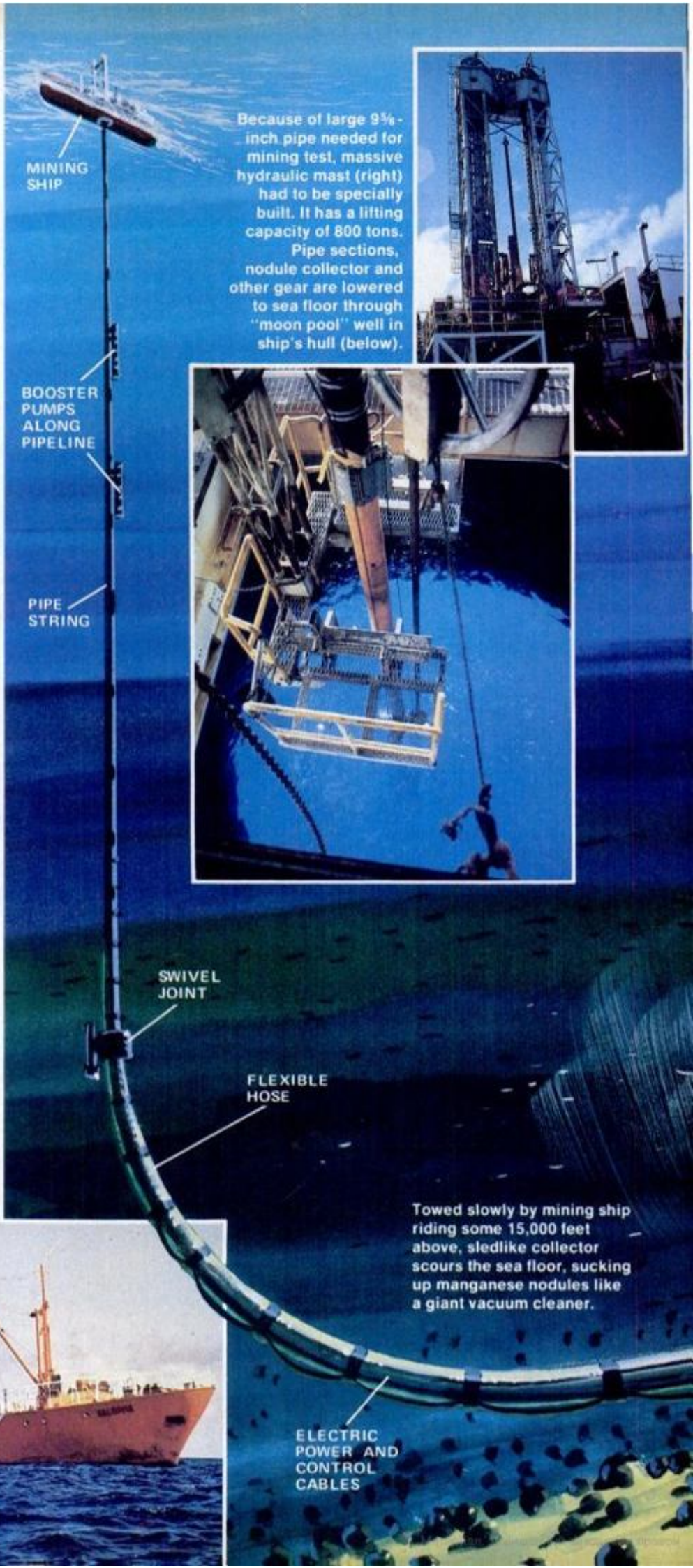
With mineral ores on land becoming ever more costly to refine because of poor quality, industrial nations are turning their eyes to the sea—to the deposits that can be dredged from the deepest, wettest mine in the world. The *Sedco 445* operation, conducted by Ocean Management, Inc., is the latest development in an international effort to perfect the techniques and hardware needed to tap the incredibly rich mineral cache strewn over the sea floor in the form of manganese nodules.

### Early discoveries

The nodules were actually discovered more than 100 years ago by scientists aboard the *Challenger*, a British ship that made a series of notable oceanographic voyages. Sea-floor samples taken during these explorations contained dark lumps of minerals, first thought to be random, scattered chunks. But after World War II, with the advent of effective deep-sea cameras, researchers could say with certainty that manganese nodules seem to exist in surprising quantities almost everywhere on the ocean bottom.

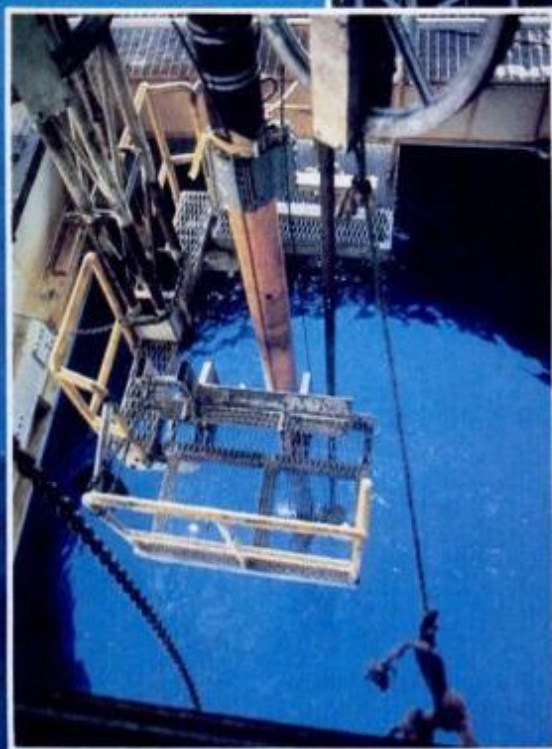
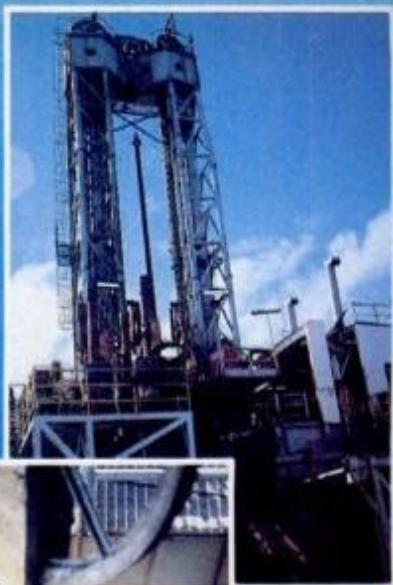
Most manganese nodules are black, shaped something like a potato and small enough to hold in the palm of the hand. Their surface tends to be rough, and they're porous, often containing as much as 35 percent water. They're spawned from the ocean itself, for the ocean is a mineral broth containing various

Using advanced electronic gear, exploration ship *Valdivia* set stage for successful sea-floor mining operations by mapping Pacific site and plotting bottom hazards.



Because of large 9½-inch pipe needed for mining test, massive hydraulic mast (right) had to be specially built. It has a lifting capacity of 800 tons.

Pipe sections, nodule collector and other gear are lowered to sea floor through "moon pool" well in ship's hull (below).

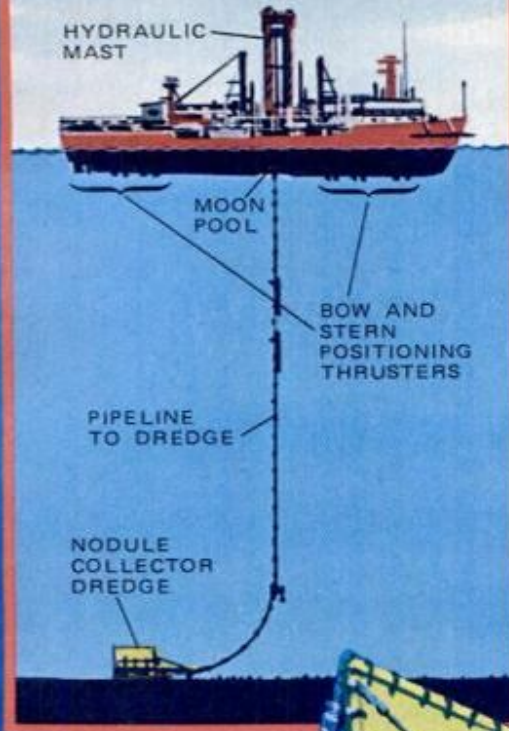


Towed slowly by mining ship riding some 15,000 feet above, sledlike collector scours the sea floor, sucking up manganese nodules like a giant vacuum cleaner.

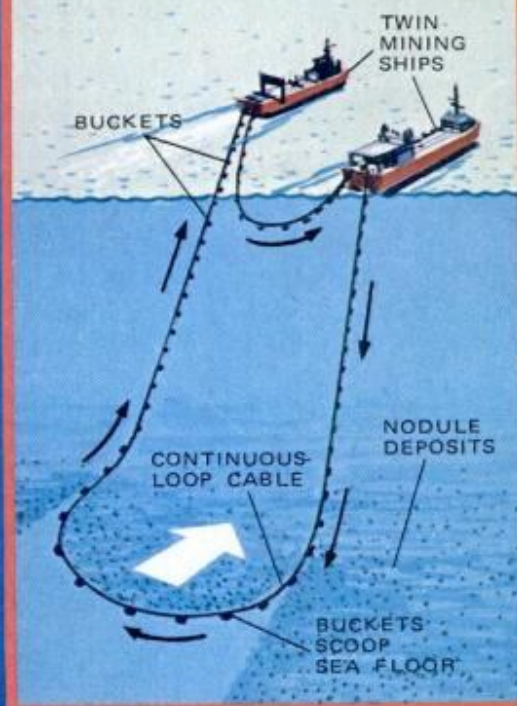


ELECTRIC POWER AND CONTROL CABLES

### HYDRAULIC DREDGE SYSTEM



### BUCKET SCOOP SYSTEM



Bottom collector connected to a long string of pipe (left) is generally favored mining system. Water and nodules can be drawn to surface by powerful pumps or lifted upward by air injected into pipe at various points. "Bucket brigade" system is being tested only on pilot scale. Buckets on long loop of cable strung between ships scrape sea floor, empty contents at surface, then return to bottom in continuous, rotating cycle.

SCANNING TV CAMERA TO SPOT NODULES

SPOTLIGHTS

SAIL-LIKE STABILIZER FIN

NODULE COLLECTOR

FLOODLIGHTS

MINERAL ORE NODULES DEPOSITED ON OCEAN BOTTOM

SUCTION ACTION DRAWS NODULES INTO COLLECTOR

SKID



TV is vital in surveying nodule deposits. Cameras (left) ride in sturdy tripod. TV screen (above) shows actual transmission from 18,000 feet. The backhoe and recovery net (right) is used to bring in bottom sampler (below, right) when weather's heavy. One way to get nodule samples is with a basket-type dredge, being dumped on deck of exploration ship (far right, opposite page).



amounts of all chemical elements. Some, such as gold, occur only in trace form, while others, like chlorine and sodium, are relatively abundant. Because of the economics involved, only two of the dissolved elements—magnesium and bromine—and one compound—sodium chloride (salt)—are now being recovered from processed seawater in appreciable quantities.

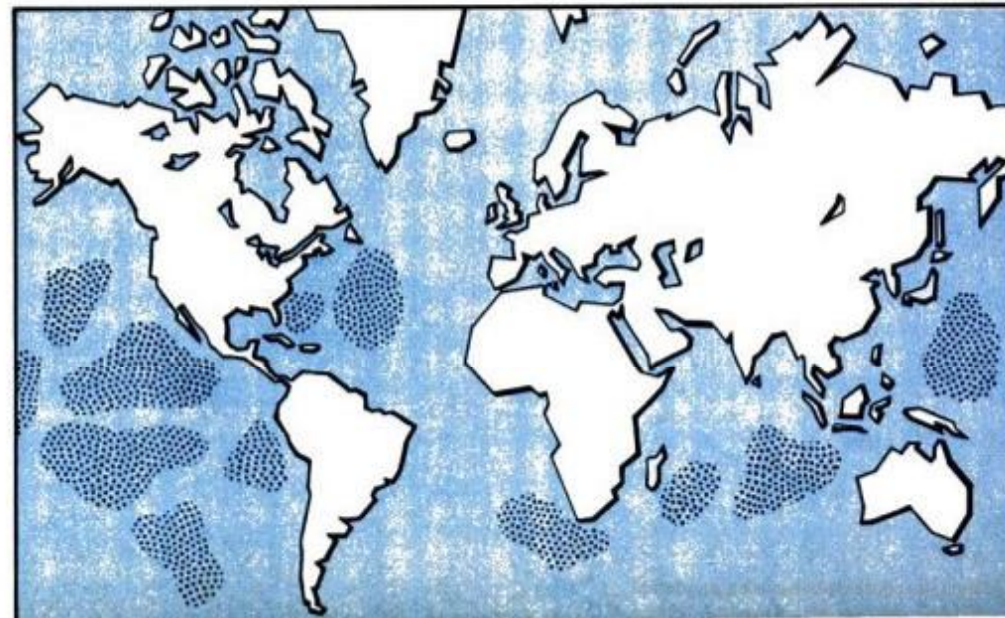
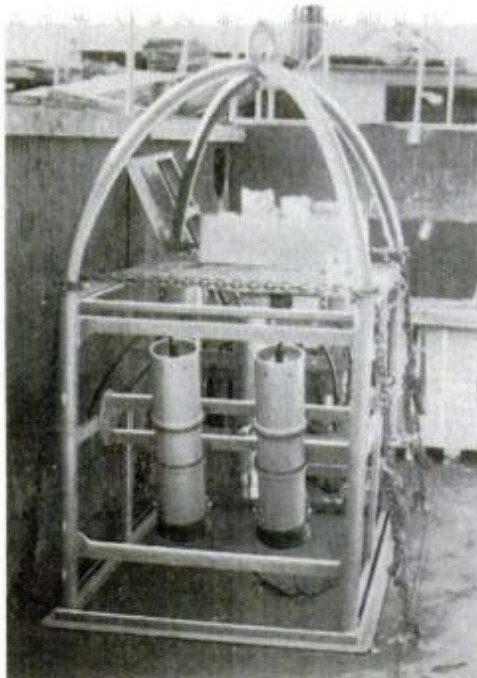
The nodules are formed by elements naturally precipitating out of the seawater. Though they may contain as many as 40 different elements, it is the presence of four minerals that has sparked today's

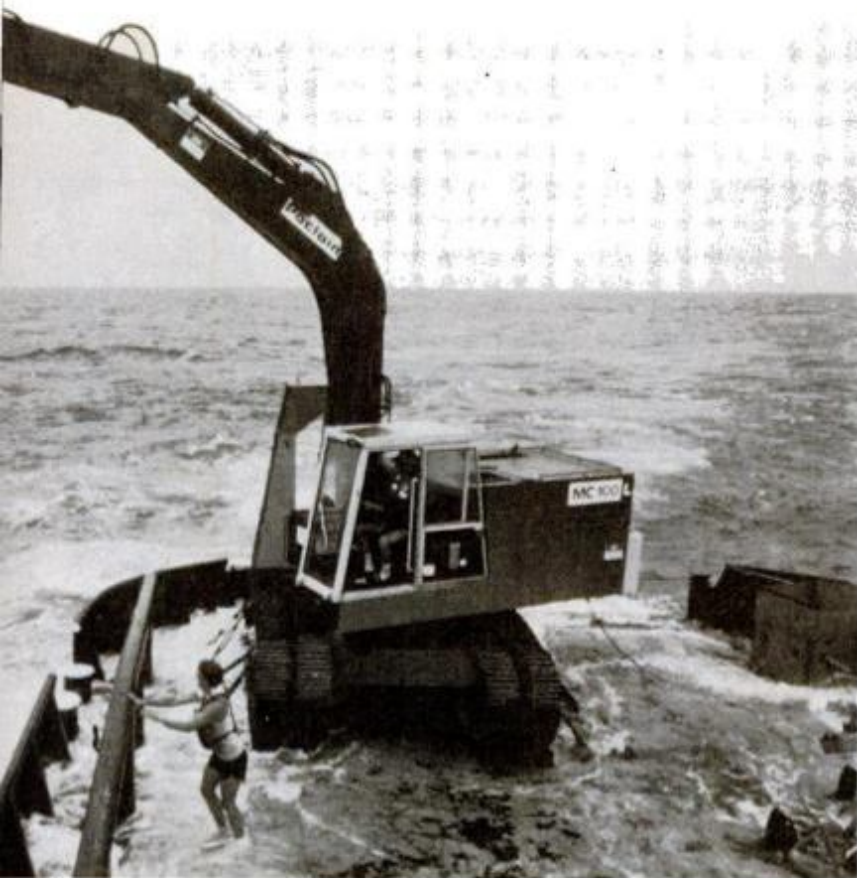
commercial interest. High-grade nodules contain 25 to 35 percent manganese, about 1.2 percent copper, 1.5 percent nickel and 0.2 percent cobalt. But content varies from area to area. Nodules with particularly high copper, nickel and cobalt content (in addition to manganese) are found south of Hawaii, accounting for the concentration of activity in that part of the Pacific.

How these nodules actually form is something scientists can't conclusively explain. It's generally agreed, however, that a "seed" acts as a nucleus around which precipitated minerals gather. Analyzed



Stereo camera (left) produces miles-long strip photos of bottom for precise topographic mapping. World map shows areas of most heavily concentrated ore deposits.





specimens show that the seed may be a bone fragment, a shark's tooth, a bit of coral or clay, a metal object or a piece of basalt, a rocklike substance of volcanic origin.

Once the basic nodule starts to form, scientists theorize, biological organisms take up residence in it, acting as a catalyst for further growth. (Specimens contain tiny tunnels that could serve as a home for some form of life.)

How long it takes for nodules to form is another unanswered question. In general, it's thought that they grow very slowly. Radioactive dating analysis of samples reveals growth rates as slow as 1 mm per million years. On the other hand, nodules of some thickness have been found growing around artillery shell fragments, sparkplugs and other recently produced objects, indicating considerably faster formation.

### Oceans hold vast reserves

Though estimates vary, it's safe to say that the oceans hold trillions of tons of manganese nodules, providing mineral reserves far greater than those on land.

While seabed mineral deposits will probably not displace existing mines on land, it's been estimated that nickel reserves recoverable from underwater nodules are approximately five times those of remaining land deposits.

Deepsea Ventures, leader in ocean mining, used unusual dome-fitted ship for deep-water tests 1200 miles off Pacific coast.

Copper, nickel, cobalt and manganese are all vital to industry. Copper is practically synonymous with electrical wiring and plumbing pipe. Nickel is a key ingredient in stainless steel and alloys for jet engines, furnishes a protective coating when plated on steel and is used in making armor plate. Cobalt is used in porcelain pigments and special alloys and is vital to the treatment of some forms of cancer. Manganese is used in making various alloys, as a pigment for dyes, as a drying agent in paints; its key role is in making steel malleable.

### American leaders concerned

What concerns some American leaders—in industry and Congress—is that the United States is heavily dependent on foreign nations for

three of these minerals. According to Dr. Jack Carlson, chief economist of the U.S. Chamber of Commerce, in 1976 the United States imported 71 percent of its nickel supply, 98 percent of its cobalt and manganese, and 15 percent of its copper. A vigorous ocean mining industry is a must, according to men like Dr. Carlson.

Today's lively interest in the harvesting of manganese nodules goes back to the late '50s and to the cobalt-rich nodules dredged up on an oceanographic expedition in the Pacific. On that venture was John L. Mero, then a mining engineering graduate student, who quickly recognized the vast potentials of ocean mining.

Some years later he wrote a text,

*(Please turn to page 204)*



# Driving the '79 VW Rabbit

When it comes to Rabbit-crafting, United Auto Workers in Pennsylvania are just as good as the Black Forest Elves.

by Bill Hartford  
AUTO EDITOR

**C**ompetition builds better mouse-traps—and better Rabbits. The competitive spirit is one of the quality control techniques being used by Volkswagen Manufacturing Corp. of America in its new Pennsylvania plant where '79 Rabbits are being assembled at the rate of 800 cars a day.

The competition in this case is not from another car maker, but from the mile-long, mother factory in Wolfsburg, Germany. Every day is a test for VW's assembly line workers, and neatness counts. Production at both the U.S. and German plants is graded by the QC people and gets an index rating. "Some days Wolfsburg wins, some days we win," says management.

Keeping the workmanship in the U.S.-built Rabbits up to or better than that of the Wolfsburg cars is the Westmoreland team's foremost priority. During a tour of the spic-and-span plant in June we watched cars going together—and going together with great care, indeed. All the '79 gasoline-engine Rabbits out of Westmoreland are machines comprised of 5400 parts, half of which are home grown (by 1980, 75 to 80 percent of the Rabbit's parts will be from North American suppliers). Sheet metal shaped into Rabbit body panels is shipped to Pennsylvania from VW's metal stamping plant in West Virginia, disc brakes arrive from Kelsey-Hayes in Michigan and so on. VW buys from 1800 vendors in Pennsylvania alone.

## One Rabbit to go

We can attest to how well Rabbit serial number 858 went together: We put 1400 hard miles on it. Like German Rabbits, it passed our rub-down test—you can caress this machine and not spill your blood on rough edges. Rabbit's reputation for moving off the line as quick as a bunny has been earned in countless neighborhood drags. And our U.S. car was every bit as fast, since it uses the same 1457-cc, ohc, fuel-injected Four. This gem of a power-



Rabbits are now made in this assembly plant in Westmoreland County, Pa. As apparent above, the '79 models are distinguished from the '78 German-made Rabbits by new rectangular headlights and different side marker lights. Interior treatment is also markedly different. All dashboards and kick panels in German-built Rabbits used to be any color as long as it was black; U.S. Rabbits are color coordinated from headliners to floor carpeting. Obvious at right is VW logo on steering wheel hub: The Wolfsburg crest is no longer appropriate now that the cars are (almost) as American as hot dogs, baseball, apple pie and Chevrolet.

plant and transmission will continue coming from Germany for the foreseeable future.

Our tender young Rabbit was properly abused during the 1400 miles. For example, traffic speed on the Pennsylvania Turnpike was absolutely *hore raising* and we couldn't resist "measuring it." For big trucks and all, 80 mph was typical on some sections. We paid for our transgressions on the pike and jack Rabbit games off the line in fuel consumption, of course, but even at that we averaged a red-white-and-blue 30.04 mpg for our mix of turnpike and town driving.

## Options on the way

While economy like this is impressive and workmanship of the Westmoreland cars is first rate, there is a good reason to pass up the first few thousand or so '79 Rabbits: lack of some very desirable options that are on the way. A five-speed transmission—for even better mpg—is one example. This option and others, like a front seat back



with rake adjustment, sunroof, even cruise control, are being brought on line as this story is being written (many early cars do have airconditioning, however). The reason: you just don't start a new car assembly plant from scratch with all the extras ready to go. All cars early off the assembly line were two-door or custom models. The basic Rabbit and L, or deluxe models, should be available now with automatic trans, four doors and various decor, convenience and rally packages.

The front end of the Rabbit always was a natural for the rectangular headlights that are new for '79—the grille is now clean as a whistle. Other exterior tipoffs to a U.S. Rabbit are the side marker lights front and rear: they're now vertical rectangles and, unlike the previous, horizontal, clean and simple German side markers, look like they came off a kid's bike.

Inside is where you really see the Americanization of the Rabbit. Rear-seat speaker ports are built in, colors are coordinated, carpet is thick





PM photos: Bill Hartford

### Rabbit on the road: PM's 1400-mile trip

We took the 858th Rabbit assembled at Westmoreland for a 1400-mile joy ride through much of the Northeast last June. In Pennsylvania Dutch country (above), the Amish turned their backs on the Rabbit machine (naturally!). But

elsewhere there was considerable interest shown in the front-wheel-drive car by those who spotted the telltale rectangular headlights on this 1979 Yankee-Doodle-Dandy Volkswagen.

On a law-abiding trip from New York City to the Berkshires, we got our best mileage, 33.75. But, overall, our aver-

age was 30.04 mpg. The zero-to-60 mph times we recorded were consistently between 11 and 12 seconds.

Economy and performance are only two of the car's strengths—there's really nothing that it does not do well. That is why the Rabbit has been the car most copied by competitors in recent years.

and, overall, the interior is comfortable, but puffy. In fact it's downright tacky if you tout the more taut teutonic touch. Another tipoff to a '79 and a most subtle one is the badge on the steering wheel hub. It's the famous VW logo, not the familiar wolf, castle and river of the Wolfsburg crest.

### Price takes a hop

The Rabbit C we ran for 1400 trouble-free miles was just being priced as we went to press. Its \$4900 sticker is \$200 over the '78 model, but does include an AM radio (that was a \$90 option in '78) as standard equipment. (By newsstand time, the base and L models and the various option packages will be priced.) Justifying this stiff sticker, VW hopes, is Rabbit's reputation as the Rolls-Royce of small cars.

The 1979 diesel-engine Rabbits will continue coming here from Wolfsburg, but they, too, will be built at Westmoreland starting during the '79 model year. Like the gas-engine Rabbits, the diesel gets optional five-speed this year—also self-adjusting rear brakes, seat-belt lock attached to seat frame, remote-control side mirror and new colors.

### The other Volkswagens

Various refinements and new options and accessories are added to the rest of the VW line for '79.

**Dasher.** A hatchback, five-door model replaces the four-door trunkback and VW's 1.5-liter diesel Four is now optional on Dasher, in addition. (Not yet available are Volkswagen's not-very-secret turbodiesel Four and diesel Six).

**Scirocco.** Also under wraps, but not a big secret are VW's plans for a turbocharged Scirocco. It'll be a rocket of a Scirocco when available, but, for now, buyers of this sporty version of the Rabbit will have to be content with only a slightly bigger engine for '79. This year's displacement is 1.6 liters for 78 hp, vs. the 1.5 for 71 of last year. Five-speed will become available in January '79 and tilt-action, lift-out sunroofs are available. Other options are the same as for Rabbits.

**Beetle Convertible.** For fresh-air fiends, this time-defying capsule in the familiar shape continues to release pure fun into the bloodstream. New for '79: steel-belted 165 SR 15 radial whitewalls, clock, intermittent wipers, leatherette covered steering wheel, seat-belt lock on seat frame, new colors including metallics (this car will soon have its golden anniversary!)

**Bus and Campmobile.** Catalyst for 49-state version, oxygen sensor for California and new paint colors. **PM**

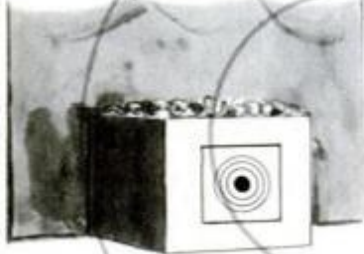


### Rabbit on the line

Work in progress is shown in these photos taken last June about two months after Job One rolled off the assembly line (and was shipped to the VW museum in Wolfsburg). Rabbit bodies (above) are on their way to meet underbody parts; drivetrain assemblies come together (top right) and dashboards are wired and tested in a special fixture (right). Limelight the new plant is receiving is enjoyed by workers. Since that will dim, there's this quality control thought on a sign I spotted in the plant: "Pride is what compels man to do his very best even though no one is watching."



# Now sharpshooters shoot BBs



An expert finds those little toys for plinkers have grown into ideal practice tools, plus precision pellet air guns that are more accurate than firearms.

by Bob Brister



"I want to be a crack shot," say the letters, "but there is no gun range in our area. How can I practice between hunting seasons?"

Or, "My son (daughter) is just starting out shooting and seems to have a problem getting the gun lined up properly. Is this gun fit or just lack of experience?"

Or, "I've discovered my left eye is my master eye, yet I've learned to shoot right-handed. How can I correct this?"

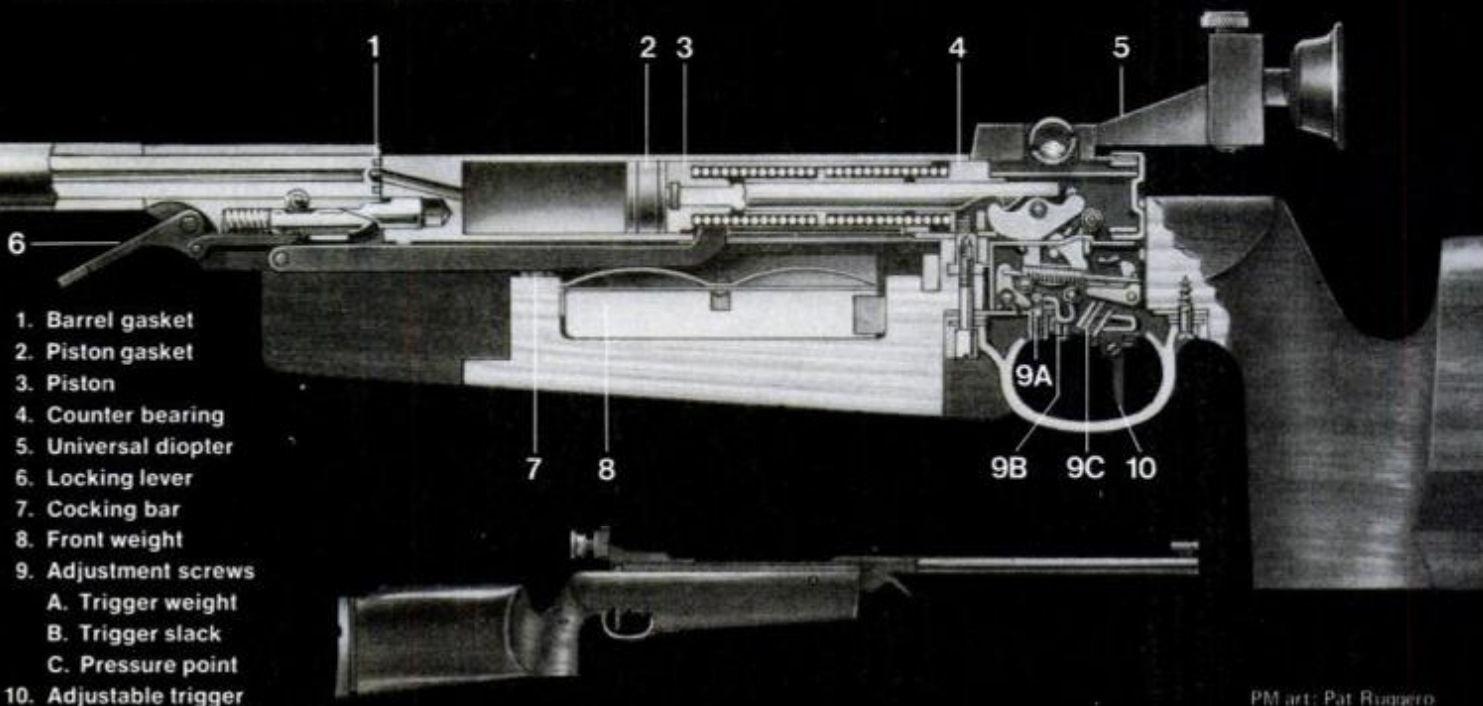
My replies to these questions and thousands like them often is one suggestion: Get an air gun.

It can be the fastest, easiest way to shoot better, and if air gun practice is good enough for Olympic champions, effective enough for the U.S. Army, and fun enough for whole families who are turning to it for recreation in the home, then there must be something special to air gun shooting.

That "something" is just being discovered by Americans, and Olympic gold medalist Gary Anderson of the National Rifle Assn. predicts there will be 3 million U.S. shooters by the year 2000, based on what happened in Germany once air guns caught on there. Today, virtually every village in Germany has its "shooting house" where people meet to compete with guns more accurate than the finest powder-propelled hunting guns.

Anderson, who won seven world championships with powder guns, comments that at 33 feet (distance of international air gun competition) the new breed of precision air rifles will shoot tighter groups

## WALTHER RECOILLESS MATCH AIR RIFLE



1. Barrel gasket
2. Piston gasket
3. Piston
4. Counter bearing
5. Universal diopter
6. Locking lever
7. Cocking bar
8. Front weight
9. Adjustment screws
  - A. Trigger weight
  - B. Trigger slack
  - C. Pressure point
10. Adjustable trigger

PM art: Pat Ruggero

than the finest .22 rimfire target rifles at 50 meters or big-bore match rifles at 100 meters. Air rifle targets are scaled down to give the same challenges at shorter indoor ranges.

### Bonus advantages

The big advantage of air guns for most shooters and hunters is that they offer the fastest, easiest, surest way to shoot better at minimal cost. The improvement can be so fast it's almost unbelievable. I coached a neighbor's daughter with a BB gun in her back yard after school, and after she'd practiced 15 minutes a day for three weeks she broke 21 out of 25 clay targets on her first trip to the skeet range with a "real" gun. Lots of shooters practice years before they shoot a better score than that.

Rifle and pistol improvement can be just as remarkable. Best practice for hunters, I believe, is with a scoped pellet rifle. This quickly improves ability to locate things in the scope and get on target smoothly, without flinching or jerking. But any air gun can help improve trigger control and gun holding. Shotgunners practice with mature stocked BB guns to speed up movements of pointing and mounting, and to be able to shoot where they look, instantly and without conscious aiming.

The U.S. Army needed that capability in Vietnam, so it trained troops with Model 2199 Daisy BB guns very similar to the simple lever cocking ones kids get for Christmas. The Army model had a larger stock and no sights—to teach troops to shoot by instinct when there is no time to aim.

Writing in the *Army Digest* in 1967, Col. James J. Ford reported: "The BB gun has a number of training advantages. It is cheap and so is the ammunition. You can see the pellet in flight, a sort of poor man's tracer. There is no recoil or muzzle blast to throw the new man off. Low velocity and short range remove some of the hazards."

### Versatile targets

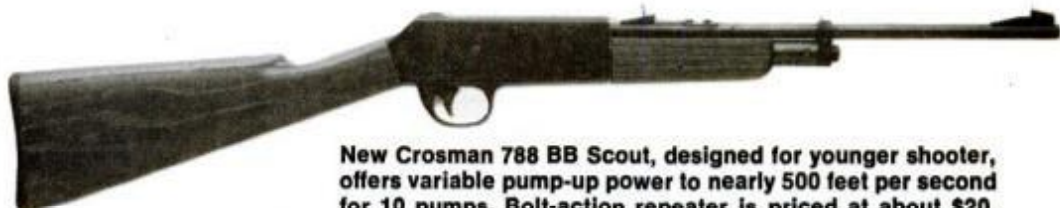
Air guns can be used safely indoors with pellet traps and target boxes, or in the back yard with a blanket draped over a clothesline and paper targets pinned to it. I've used Ping-Pong balls on the grass to teach youngsters how to mount a shotgun. (Have the shooter and instructor wear protective shooting glasses, or even sunglasses, to prevent eye damage from ricochets.) With concentration, you may be able to see the BB in flight, and



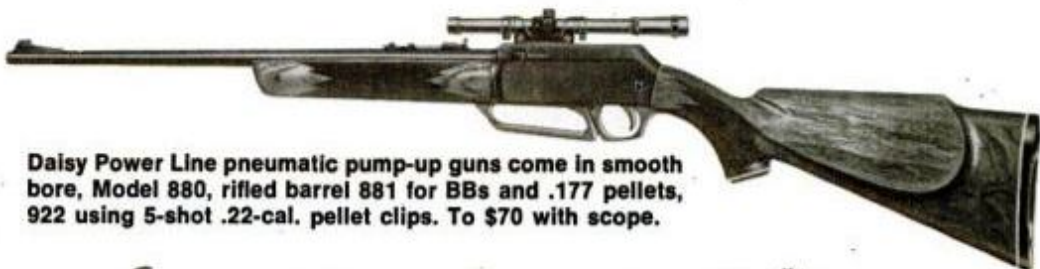
Recoilless, almost silent and adjusted for pinpoint accuracy, Beeman/Feinwerkbau 300S Universal is a .177-cal. precision German side-lever cocking airgun for up to \$700.



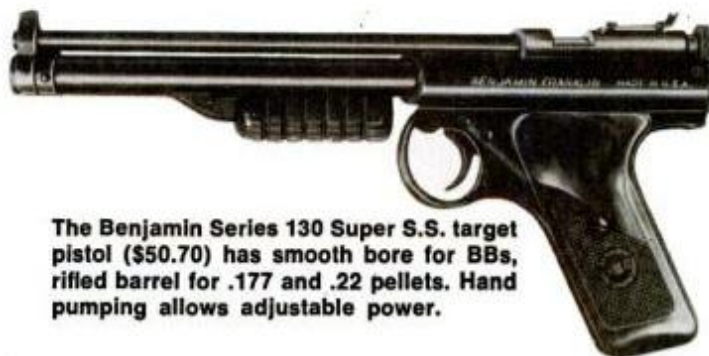
Pistols offer high accuracy. Beeman/Webley .177 or .22-cal. Hurricane has micrometer rear sight, can mount a 1.5X pistol scope, has an adjustable trigger: \$120.



New Crosman 788 BB Scout, designed for younger shooter, offers variable pump-up power to nearly 500 feet per second for 10 pumps. Bolt-action repeater is priced at about \$20.



Daisy Power Line pneumatic pump-up guns come in smooth bore, Model 880, rifled barrel 881 for BBs and .177 pellets, 922 using 5-shot .22-cal. pellet clips. To \$70 with scope.



The Benjamin Series 130 Super S.S. target pistol (\$50.70) has smooth bore for BBs, rifled barrel for .177 and .22 pellets. Hand pumping allows adjustable power.

pellets will begin hitting closer to the mark. Within a month a well coordinated shooter, old or young, should be able to hit an aspirin tablet at 15 feet without sights of any kind.

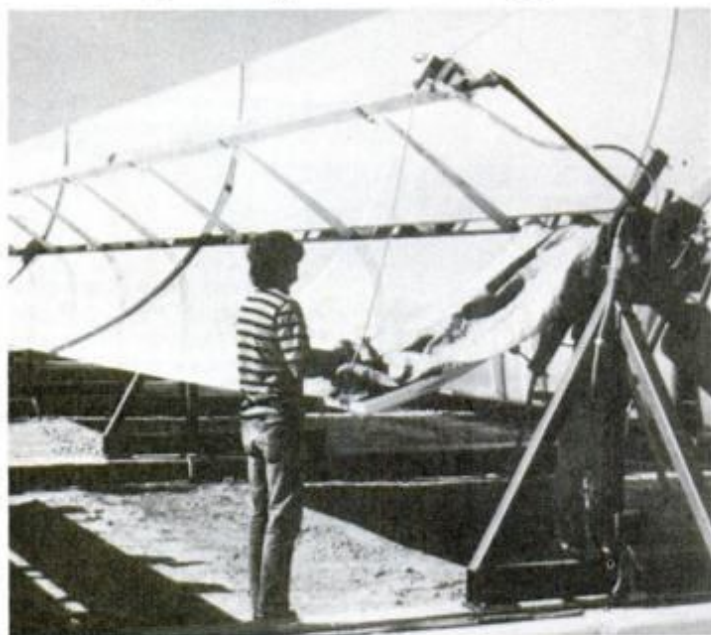
Learning to hit a moving target is easiest over water, but here ricochet problems exist and I'd recommend it only where there's no danger to some person or animal across the pond. Use a small cork bobber and cast it out with rod and reel. Let the shooter fire away at it until he's hitting consistently. Then start reeling in the cork. The shooter will

see his pellets splashing behind and instinctively start to correct. He quickly learns the whys and hows of the "forward allowance" so important to shotgunning or rifle-shooting at running game.

The slow—250 to 350 feet per second (f.p.s.)—velocity of the ordinary \$30 BB gun is excellent for this. The stocks of most are so toy-sized, however, that a youngster large enough to learn about "real guns" may have to twist his neck to sight down the barrel. But a dad handy with tools should be able to

(Please turn to page 208)

## Solar pump aids irrigation



New irrigation system is powered by solar collector.

The world's largest solar-powered irrigation system was recently installed to help grow cotton and vegetables on a 76,000-acre farm near Gila Bend, Ariz. The system could be a harbinger of wider agricultural use of solar energy, despite some less than encouraging predictions, as oil and natural gas grow scarcer and power costs climb. It was conceived, developed and put into operation within 18 months by Battelle Memorial Institute for Northwestern Mutual Life Insurance Co., the farm's owner.

The system consists of two closed loops. In the first loop, water is pumped through 5500 square feet of parabolic-mirror solar collectors. The trough-like mirrors focus the sun's rays on pipes carrying the water under pressure, heating it up to about 150°C. It flows to a boiler where its heat

converts liquid Freon into a gas and flows back to the collectors.

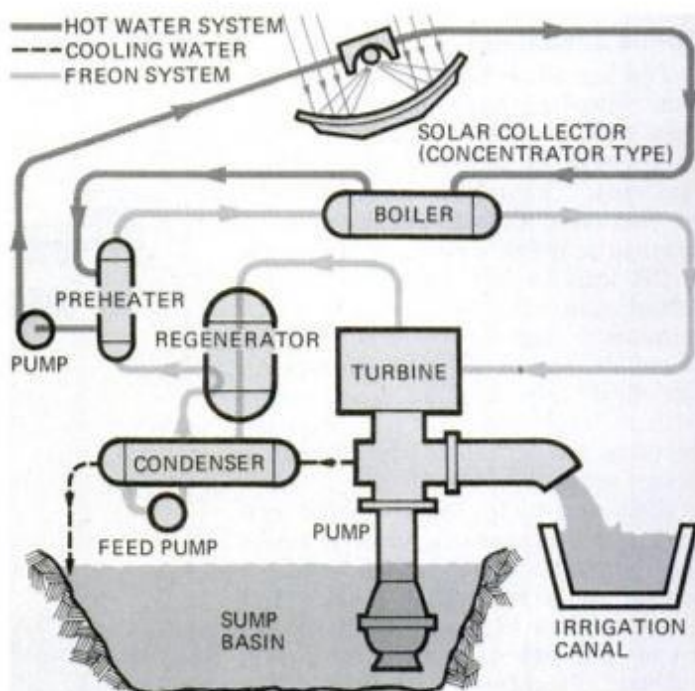
In the second loop, the expanding Freon gas drives a Rankine-cycle turbine to operate a 50-hp irrigation pump. Freon gas exhausted from the turbine is then recirculated through a regenerator/heat exchanger and a condenser to reconvert it to a liquid before it begins a new cycle. Water in the first loop slightly preheats the liquid Freon when they both pass through the heat exchanger (see diagram).

The irrigation pump draws water from a sump basin and pumps it to an irrigation canal so the water can be channeled throughout the farm. The solar collectors can pivot on their long axes so that a combination of sensors and small motors automatically aim them to track the sun in its arc across the sky. In

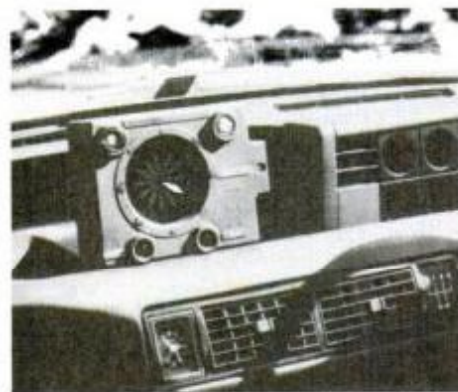
June, during the longest days of the year, the system can pump up to 5.6 million gallons of water per day over a period of 9½ hours. Peak pump capacity is 10,000 gallons per minute.

At night or during storms, the tracking system turns the collectors down into a storage position to protect the mirrors. There is also a backup control system.

No provision now exists for storage of excess energy so that the irrigation pump could be run at night or on cloudy days. The system's designers say, however, that such additions are possible if desired. The 50-hp pump size was chosen because it was large enough to operate a demonstration system of commercial size. It would also be easier to scale up to 200 or 250 hp later, to pump water from deep wells.



Schematic of two-loop irrigation system.



## Bad news for bad guys

A radar system that displays the direction from which a sniper's bullet has been fired has been developed by a Scottish electronics firm. The system, known as the MESL Radar GS 20 Hostile Fire Indicator, has been adopted by the British military for use against urban terrorists. A civilian version of the unit is available.

Although the system can be used at base stations, it is primarily vehicle-mounted and powered by lead-acid batteries. Multiple radar sensors and a computer show the direction of an incoming bullet on a simple dashboard-mounted clock face.

Low-speed projectiles like rocks and bricks are ignored, and the

## Paper money the blind can "read"



Holland helps its blind citizens identify the denominations of paper money with a system that we think every country should adopt.

Raised dots are embossed near bill's corner to allow value to be determined rapidly by feel. Different bills have different numbers of dots.

## Personal parking meters



Drivers in Copenhagen help the police catch parking violators. But they don't do it voluntarily. When parking on streets that do not have parking meters, but do have limited parking time, they must indicate arrival time by setting windshield-mounted pointers like that in the photo. All cars have these pointers, which police patrols keep tabs on to spot overtime violators.

unit allows the system to continue to show the relative direction of the sniper fire should the vehicle take evasive action or change course. The system can display the bearings of two sniper locations simultaneously.

The GS 20 is said to function day or night, regardless of weather. The system's manufacturer, Microwave and Electronic Systems Ltd., claims that operator training requires less than one day.

## Fit for a Queen



One of the many gifts bestowed upon Queen Elizabeth in honor of her Silver Jubilee, The Rolls-Royce Phantom VI Special limousine presented her by the British motor industry, is the longest Rolls built in 40 years.

The 19-foot, 10-inch auto cost about \$110,000 and is hand-built. It boasts numerous special features, as befits its royal passenger.

Interestingly, at Her Majesty's insistence, the car is not fitted with bulletproof glass. The doors, however, are said to be lined with bulletproof fabric. Other security details are secret, although a blue signal flasher can easily be seen above the windshield.

The Queen and her co-riders are ensconced in luxury, of course. Blue lambswool carpeting, cloth-upholstered seats, separate air-conditioning systems for front and rear compartments and an extra-wide folding armrest with built-in radio, cassette player and dictating machine are provided. Two forward-facing occasional seats that fold flush into the floor are fitted into the rear compartment. Side armrests contain controls for fluorescent lights, electric windows, reading lamps and a sliding glass partition between front and rear. The cocktail bar that seems to have become *de rigueur* in this sort of car is missing, with a clock and cassette storage compartment in its place.

Perhaps the most striking aspect of the new limo is the all-glass rear part of the roof, designed to afford maximum visibility of the car's occupants. The entire roof structure is four inches taller than usual, and a detachable cover, stored in the trunk, can be affixed to the roof to provide greater privacy when the car is not being used on official occasions.



Entertainment console and tape storage compartment can be seen (below) as curious subjects peer into royal auto. Transparent rear roof section (above) affords maximum visibility of occupants.



Mechanically the car is similar to production models. The engine is a 6.75-liter V8 with electronic ignition and three-speed automatic transmission. Brakes are all drums with two independent power-assisted hydraulic circuits.

A relic last seen on Rolls of the '50s, the Spirit of Ecstasy hood ornament, has been resurrected for the Royal auto. When the Queen is in her seat, the famous "Flying Lady" is replaced by the royal emblem of St. George and the Dragon.

The car joins the Queen's fleet of two Phantom IVs and two Phantom Vs, the most recent of which entered service in 1961. A car similar to the Queen's new one, but with gold plating and velvet upholstery, was recently acquired by a Dubai businessman named Bhwtia Karani for about \$146,000. Unlike the Queen, he had to pay for his.

# Time-delay stereo: How waiting pays off in concert-hall sound



Sound Concepts offers a delay system for car stereos as well as a home-use system.

**Y**ou could tell the difference blindfolded between your home listening room and a concert hall, even with no music playing. The rapid return and quick fading of sound reflections in your room at home tell you instantly that the room is small; the regularity of those reflections tells you that the room is of fairly constant dimensions from one end to the other.

Concert-hall reflections take much longer to reach you, and longer to die away. And good concert halls are full of curves and tapers, to make sure that no two surfaces are parallel, and thus prevent regular reflections that emphasize some frequencies unduly.

In music, these sound reverberations become quite important—witness the millions spent over the years to improve the acoustics of New York's Avery Fisher (formerly Philharmonic) Hall. Composers unconsciously write with them in mind, and performers play as much to each individual hall's acoustics as to each individual audience's reactions. And if you have a good sound system now, the difference between your room's reverberant qualities and a concert hall's may make the biggest difference between the sound you hear at home and what you hear at live performances.

Surprisingly, those concert-hall reverberations are already on most of your records—the trick is hearing them the way you would in the concert hall. Stereo helped recapture that sense of space a little. (If you don't believe that, try switching from stereo to mono in the middle of a good stereo recording—it will sound as if the room got slightly smaller.) Quadraphonic sound, at its best, could recreate the concert hall sense of space at home—but not too well from your existing record library.

Now there's a new class of devices that recapture it quite well:

"delay" or "reverb" devices. Like four-channel, they require extra speakers and amplifiers for the back of the room (some delay systems include these). But unlike four-channel, they're designed specifically to work with the recordings you already have; no special discs or tapes are required.

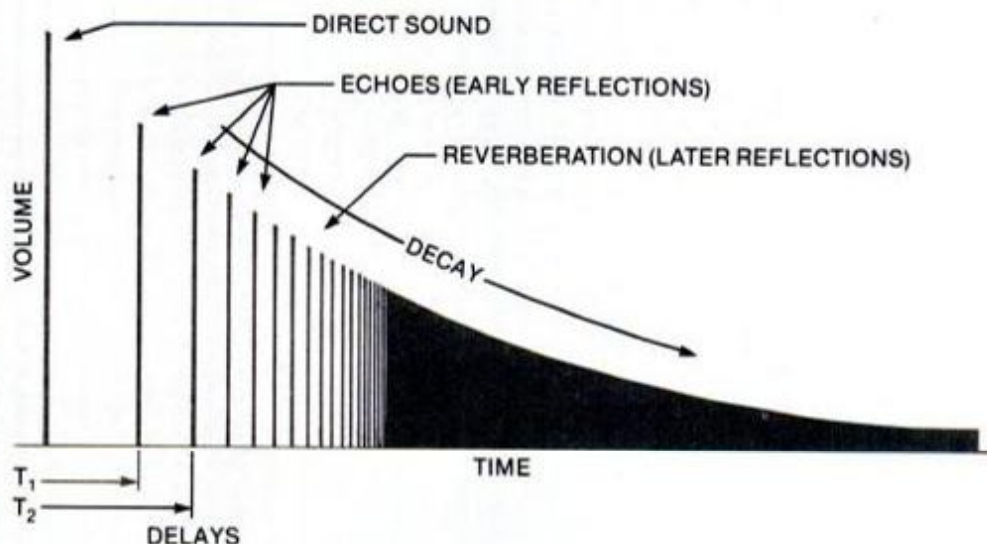
## What delay devices do

The chief differences between the sounds that reach you directly from performers in the concert hall and those that reach you by reflection from the concert hall's ceiling and walls (as much as 80 percent in some seats) are that the reflected sounds reach you later (it takes time for sound to travel) and reach you from many directions at once. There are other differences, too: reflected sound loses some of its high frequencies as it travels through the air and still more as it bounces from most surfaces. And because of re-reflections, each sound reaches you several times. But delay and directions are the main ones.

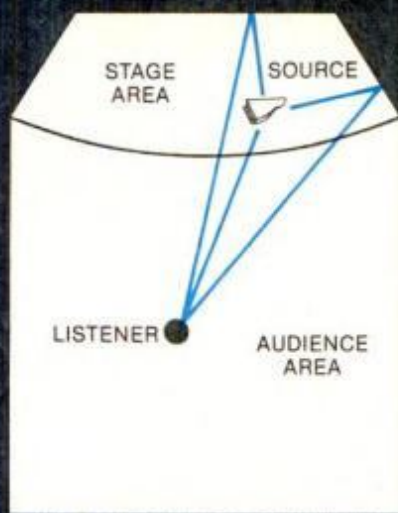
Adding just delay has been tried: a few years back there was a mild boom in "reverb" devices which delayed the sound a bit, mixed it with the undelayed sound, then fed the mix out through the regular speakers. This wasn't too successful. The spring devices used for the delay sometimes added jangly resonances to the music, and could pick up vibrations from external sources (such as footsteps, the speakers, or accidental contact with the shelf they sat on). More important, this only made the music sound as if it had been recorded in a more reverberant room, not as if it were being played back in a large one.

The new devices, though, are different. First, they're all solid-state, so there's nothing to pick up external vibrations or to add resonances. Second, they're designed to work through speakers at the back or sides of the room: some through your existing amplifiers and speakers (if you'd already invested in four-channel), others through amplifiers and (usually) speakers of their own.

The sound coming from those extra speakers is basically the same sound that's coming from your main ones, delayed by a few thousandths of a second. That alone is enough to add some sense of ambience, as long as the sound is delayed no more



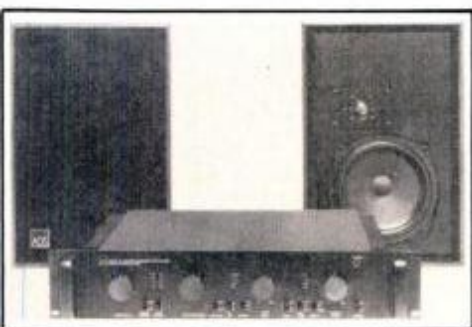
Profile of a sound as you hear it in the concert hall: direct sound of instruments is followed by early reflections, then a reverberation that gradually fades away.



Ordinary stereo is like being in a backless hall. Sound comes only from in front.

than about 50 milliseconds (longer, and you'd hear it as a separate echo) and comes from a different direction than the main sound.

There are some further differences, however, between the delayed and the direct sound—differences which, say the delay makers, correspond to differences between direct

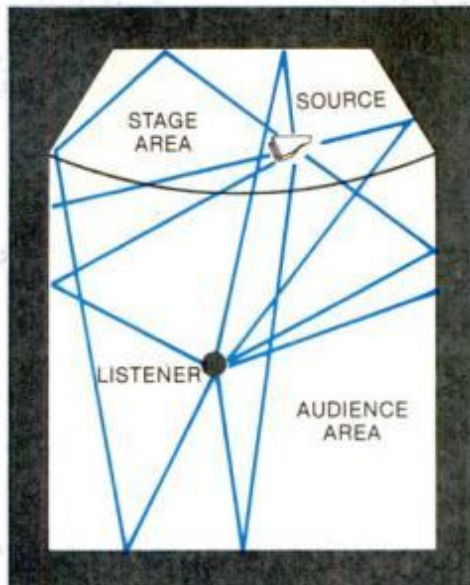


ADS 10 is a complete system having its own amplifier and rear loudspeakers.

and delayed sounds in the concert hall. Because of the high-frequency losses in sounds which travel through long paths or bounce, most delay systems roll off high frequencies above about 8000 Hz, usually increasing the rolloff as you increase the delay time. (This also helps mask any noise or distortion in the delay system, a small bonus.) And because sound takes many bounces with several consequent delay times, most of the delay systems let you send the sound through the delay loops several times, to create "reverberation."

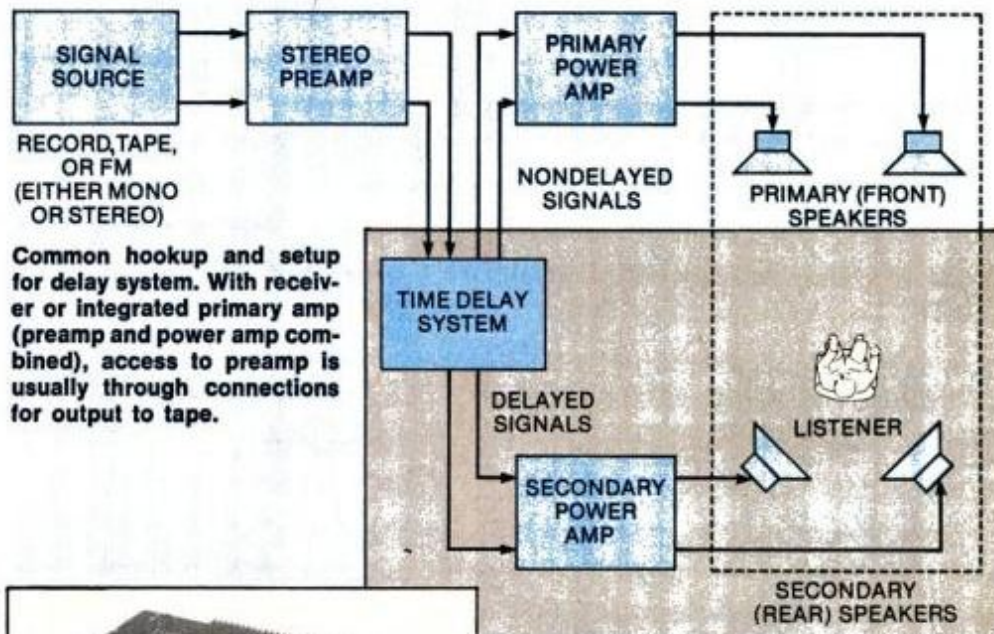
### Reverberation controls

This requires three basic controls you'll find on most of the systems shown here: an *initial-delay* control, which can be set longer to simulate a larger hall, or shorter to simulate a smaller one; a *reverberation-time* control, which governs how long

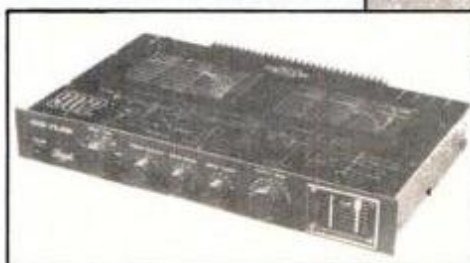


In a real hall, or with time-delay, you get a wash of sound from all directions.

reverberation takes to die out, and how "live" the simulated "hall" sounds, and a level control to balance the delayed sound against the sound of the main speakers (the balance is correct when the delay-system speakers aren't quite loud enough to be heard as separate sound sources, but loud enough to



Common hookup and setup for delay system. With receiver or integrated primary amp (preamp and power amp combined), access to preamp is usually through connections for output to tape.



Bozak 902 uses analog time-delay with integrated amplifier, speakers (not shown).

make the room seem bigger—switch them off, then, and the room seems to collapse forward toward the main speakers).

By varying the delay and reverb controls, you can create many different "spaces": a short delay and a

long reverb will simulate a small, echoey room—like a tiled bathroom, if the control settings are extreme enough. A long delay and a short reverb make the room sound large but dull, like a heavily-carpeted hotel lobby.

But you can (and should) set these controls for more natural effects, matching them to the music. The bigger the room, for instance, the longer you'll want its reverberation time to be. According to one authority, the optimum reverberation time for a studio of 10,000 cu. ft. (not as large as it sounds) is about 0.8 seconds, while that for a 100,000-cu.-ft. concert hall (a rather small one, actually) would be roughly double that.

You'll also want different reverberation times for different kinds of music. In a hall where the best reverberation time (the time it takes reflected sound to die down by 60 decibels) for organ music is about 1.7 seconds, the reverberation time should be about 1.4 seconds for symphonic music, and about 1.0 second for speech. Since a real hall has a fixed reverberation time, that will give the delay-system owner

one advantage over the live listener.

In general, the larger the recorded group, and the less artificial reverberation is on the record, the more time delay and reverb you can add. Smaller works generally take less of both, and often require a bit more treble rolloff (especially if you're trying to simulate the intimate atmosphere of a jazz club). How much reverb and delay you'll want on solo recordings depends on how closely the soloist was miked.

Many delay systems also let you add some reverberation to your main, front signals, to liven up

(Please turn to page 215)

How specialized automakers are

# Cloning the classics!

Dozens of "coachbuilders" are in full swing making reproductions of the grand, old cars of yesteryear.

by Michael Lamm  
WEST COAST EDITOR



Elegant, indeed, is this modern-day Auburn speedster from Elegant Motors, Indianapolis.

**T**here's a parallel between today's luxury-car field and that of the 1920's and early '30s.

Before you scoff, consider this. Classic coachbuilding by the likes of LeBaron, Dietrich, Brunn, Waterhouse, Brewster, Locke, Derham, Judkins, and others involved a handful of small businesses—offshoots of the main auto industry. These specialized firms built custom auto bodies for a small group of wealthy patrons.

Granted, there's the matter of

taste, but we're seeing a resurgence of coachbuilding by small companies that draw heavily on—in a sense, cloning—the products of their '20s and '30s antecedents to produce replicars and specialty vehicles.

Modern cloned classics again appeal to wealthy patrons—buyers who want something different and attention-getting. They tell the world that their tastes run beyond the mass produced.

During the Depression, the great

classic coachbuilders often turned out so-called "series customs." That meant that instead of "deep-sixing" the wooden forms over which craftsmen hammered out one custom body, they'd go ahead and make eight or a dozen very similar custom bodies. These might be trimmed differently, but they were "series"—not unique.

In that way, today's cloned classics are also series customs,

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Model A Ford clones are done by several small manufacturers; this one from Replcars, Inc., West Palm Beach, Fla.

The Gazelle is a replica of the great Mercedes-Benz of 1929. Built on either a Beetle or Pinto chassis, The Gazelle is one car from Classic Motor Carriages.



© King Features Syndicate Inc. 1927, Merely Margy comic strip.

Panther J72 Roadster (above) is a copy of the '30s-vintage Jaguar S.S. 100. Mercla Roadster (right) from Rickman Motors, uses Bentley components.

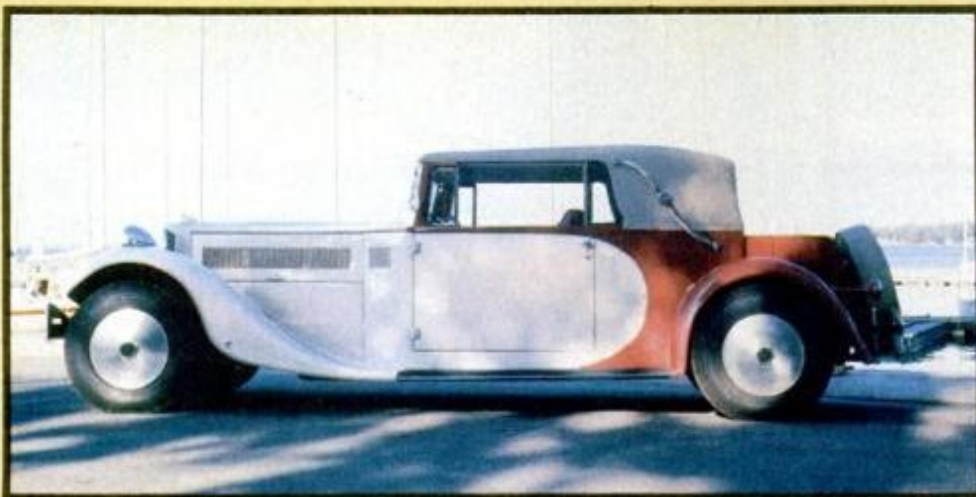
Photo: Joe Ruzs, Road & Track

each perhaps a little different from the next, but all of one series. Nowadays they're often given numbers, like lithographs.

**Three classifications**

Today's cloned classics fall into three distinct categories. First, you have those that faithfully try to duplicate actual classic cars of the Depression era—like the Auburn speedsters, the 1937 Jaguar SS from Panther and Antique & Classic Automotive, Inc.;





Renaissance from Le Vicomte Classic Coachbuilders has big Ford V8 power.

also the Model As from Florida's Replicars, Inc., and the boattail 1933 Duesenberg SSJ from Elite-Heritage Motors in Wisconsin.

Next you have those that faithfully try to reproduce *modern* classics and sports cars, like Mike Shetley's two-seater Thunderbird replica, the Intermeccanica 1958 Porsche speedster, the various Shelby Cobras, and the MIGi copy of the MG-TD roadster.



Bearcat (top) is a do-it-yourself roadster that uses four-cylinder Ford running gear. Blakely Bearcat 'S' kit is \$4995.

Daytona Bird from Old Car Reproductions is spittin' image of mid-'50s T-bird.

1958 Porsche Speedster, a dupe from Automobili Intermeccanica, is a kit on a shortened Beetle chassis.

Shelby Cobra, from Silver Classic Coachcraft, is one of the replicars that are the closest to the real thing.



Photo: John Lamm, Road & Track



Finally, you get a number of *composite* styles that borrow the flavor and perhaps the personalities of period cars, but don't actually replicate any one vehicle.

Examples might include the Excalibur, which takes off on the 1927 Mercedes SSK, but its makers disavow any intentional copying and dislike the word "replica car."

Another example of this third type is the Clenet, which seems a composite, and the Sceptre 6.6S roadster, whose maker says



he was influenced by the early Bugatti, Talbot Lago and Delage.

### Fiberglass classics

Beginning with the faithful reproductions of classic automobiles, perhaps the most popular is the 1935 Auburn speedster. Three different companies make boattail Auburns these days, with a fourth supposedly in the wings.

First among the Auburn replicators was Glenn Pray, the Oklahoma ex-schoolteacher. He orig-

inally brought out the 8/10th-scale 1937 Cord Sportsman with front-wheel drive from a turned-around Corvair drivetrain.

Since that time, several other companies have taken up making fiberglass Auburns, notably California Custom Coach Inc., in Pasadena, and Elegant Motors Inc., of Indianapolis.

Former Hollywood dancers/choreographers Ray Oja and

Cecil Gold, founders of California Custom Coach, began building their Auburn 876 in 1975 and have sold some 260 since then. In kit form, the speedster sells for \$13,500. Assembled it's \$38,000.

California Custom Coach, housed in an old Packard dealership, employs some 40 craftsmen. Their cars go together by an

[\(Please turn to page 170\)](#)

Series III Excalibur courtesy Vintage Cars, Nyack, N.Y.

Excalibur, a Brooks Stevens design, goes back to '64. It's best known of "designer" cars. Shown here is 1978 Series III.

Clenet (below) is current rage in designer cars. Roadster goes for \$49,500; with only 250 scheduled, it appreciates daily.



Swing down a slope on a Moto-Ski or camp out with Ski-Doo's latest Everest and Citation. New models are engineered with added dependability.

# New sport machines for snow

More action and performance are promised by the latest snowgoers.

by Bill McKeown  
OUTDOORS EDITOR

**N**o longer are snowmobiles America's most controversial vehicles. Both snowmos and drivers are growing up. Better engineering—including silencing—trails, safety rules, owner manners and even necessities imposed by recent winter storms deserve special credit. This year it should be easier and more comfortable to cruise the snow than ever before.

Ten years ago you might have tried to choose the best machine from 50 different makes and models. This winter there are less than a dozen major brands, though the sport continues its steady growth. The shortage that brought so many manufacturers into the business is over, and so is the alarm that the little machines were about to overrun the snow. New trails are keeping drivers away from ski slopes and private property. New powerplants turn out more speed than an average owner can handle and encourage careful driving. Snowmo tracks have been found to be helpful by cross-country skiers. And then came last year's blizzards. Suddenly some isolated communities found they could not only live with snowmobile clubs but didn't want to live without them.

**Snowmobiling and cross-country skiing are compatible; with new power, snowmos can break track and tow skijorers in to the trailhead.**





Going airborne off a snow bank, the Polaris line-leader Centurion with 500-cc displacement gets its power from a liquid-cooled three-cylinder engine.

How much speed is enough? Sitting on the snow, any speed seems like a lot. Ski-Doo and Arctic Cat claim over 100 mph with souped-up rigs, but that requires absolutely flat land conditions. Testing the machines shown here, we got the sensation that we could snap-roll them if we hit a mogul while doing 60 to 70. What you probably need is a rig that keeps up with your friends and has enough reserve to pull away when the snow is right.

For an advance look, alphabetically, at machines that can do it, here's what we'll have this winter:

- Arctic Cat's newest addition to their seven-model line is a Trail Cat, a machine designed to smooth out bumpy going. Front and rear suspension with extra-long travel, plus a specially padded seat, are said to soften rough trails. The engine is a fan-cooled 340-cc Spirit with new oil injection. Other Cat models include the Lynx, Jag, Panther, Pantera, muscular El Tigre, and the Kitty Cat for youngsters.

- John Deere will introduce the new Trailfire 440 and 340 with steel chassis and tunnel pan, but it has low weight and center of gravity. Deere's Spitfire, at 275 pounds, is reported to be one of the lightest machines currently available.

- A tapered tunnel chassis is used by Kawasaki's new Drifter 340 and 440 to handle deep powder snow. The Invader 440 makes use of fan cooling, while Invader 340 and 440S have liquid-cooled engines.

- New to the Moto-Ski line for '79 are a Grand Prix-Special, a liquid-cooled Super Sonic, and a compact Mirage,



One of the hottest of the cold weather machines, the new Arctic Cat El Tigre 6000, tops 70 hp.

Largest Scorpion is the Whip TK 440 with Cuyuna 428-cc engine. For more options: TKX Whip's widerski stance, handles, windshield, newer instruments.



Lineup of '79 Scorpions (left) shows a Sting fan-cooled 440 in the lead, followed by a Whip 440 at top, Whip 440 TK below, and the 294-cc Lil' Whip behind.



Snowmo jumping is only for experts; here John Deere's new Trailfire 340-cc does it. Larger 440 also has Kawasaki mill.



New for cold-weather wear to match your machine, John Deere Bodyguard jacket has sleeves that zip off to make a vest.

and also the Futura, Nuvik and Spirit.

■ The new Centurion from Polaris displaces 500-cc with three liquid-cooled cylinders, and the Gemini, Apollo, Cobra, TX and TX-L complete the Polaris lineup.

■ A wide-stance Scorpion Whip TK and TKX will join the Whip, Sting and Lil' Whip this winter.

■ Largest line once more will come from Ski-Doo, with new rotary-engined Blizzards, Everest, popular Olympic, Citation, light Elan, side-by-side Elite and twin-track Alpine.

■ Yamaha has a new Excel V, Enticer 340EC and 300C to round out its seven-model snowmobile line. **PM**

**The Invader, newest from Kawasaki, has liquid cooling in 440 and 340 models. New Drifters, for deep snow, use similar powerplants.**



Newer Trailfires weigh 370 pounds for the 440, 364 for the 340 model. The Splitfire 338-cc (right), however, is a full-size lightweight of only 275 pounds.

The Yamaha Excel V, newest in the seven-model line, has a 58-hp engine, tachometer, speedometer, electric starting, and Autolube injection lubrication.



# Now you'll really be able to use a home computer



Software—the essential programs that turn a toy into a tool—comes in many forms. But most convenient for home computers are tape cassettes and, for more advanced systems, minifloppies—5 1/4-in.-diameter flexible magnetic discs like the one shown.

Lack of software has limited the usefulness of personal computers; that software should arrive next year.

by Wayne Green

**W**hose imagination doesn't run at least a little wild at the thought of buying a computer for a few hundred dollars that can do more than a million-dollar computer system of just a few years ago?

It's a fantastic dream. But what is the reality, in late 1978? Well, 1979 promises to be the year when home microcomputers really learn how to do a lot of useful and interesting things.

If you want to know whether you should rush out right now and buy a system, or wait instead for prices to go down more and performance to get better, I'll skip the usual waffling answer and tell you flat out and up front: Buy a system.

Now you can follow my advice or argue with me. If you trust my

judgment to the tune of buying a thousand-dollar toy, then please drop me a line—I have a great bridge to sell you. If you're skeptical, fine—let's get at the facts.

Okay, I said \$1000 in the last paragraph. Sure, the Radio Shack TRS-80 sells for \$399. But you have to buy their video monitor and cassette player with it, bringing the tab to \$599. For this price you get what's called a Level I system, and it'll cost you a few bucks more to go to Level II—a better version that you'll soon need. The price for Level II (with extra memory) is \$988, and you won't settle for less—not for long. If you're still wondering what your thousand-dollar toy will do for you, hang on.

## Question of doings

Questions about what microcomputers can do are usually answered in generalities, like: "You can water the lawn, mind the house, con-

trol temperature in each room of your house, answer your phone, stuff like that." Sometimes the answer is even vaguer: "What do you want it to do?" But the answer always boils down to, "Sure, the microcomputer can do it."

Unfortunately, the more factual answer is that today, after three years of development, there are very few things most microcomputers can do. If that doesn't seem to square up with my recommendation to buy, stay with me—the small hitch that's been holding home computers back is being solved.

## The software gap

It's easy for electronic experimenters to underestimate the importance of programs—known as software—as opposed to the computers themselves, which are hardware. But without programs, a microcomputer is no more than an

(Please turn to page 180)

Wayne Green is publisher and editor of *Kilobaud*, a popular magazine in the microcomputer field and an offshoot of his *73 Magazine*, known to amateur radio operators for 18 years.



Dassault's Falcon 50 (above) is unique trijet design among the new-generation business aircraft. Grumman's Gulfstream III (right) employs nearly vertical "winglets" to help convert drag from tip vortex formation into useful lift.

# The jets of the Eighties take off

With fuel efficiency the watchword, new bizjets will give bigger airliners a run for the money.

by Mort Schultz

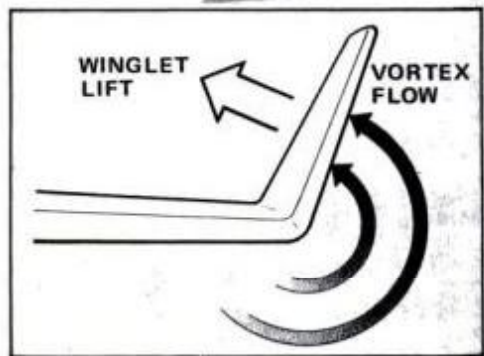
As originally conceived, the jet aircraft engine was more or less a stovepipe into which fuel was sprayed and ignited in a stream of compressed air. The resulting mass was discharged and, just as Newton predicted, gave a helluva kick to whoever was jockeying the bird. Fuel efficiency? Never mind about that.

In designing aircraft to preserve jet flight as a thing of profit and joy through the coming decade, however, aero engineers are up against the energy crunch in a big way. What they've done to keep that stovepipe in the air almost amounts to reinventing the "wheel"—which means the propeller (see illustration on following page).

Lockheed's L1011-500, Douglas's DC-9 Super 80 and Boeing's 767 have been making headlines recently as the aircraft that will compete for primacy in the nation's new commercial jet fleet. Late next year, they will start replacing the aging, fuel-inefficient and noisy Boeing 707 and Douglas DC-8.

Not making headlines, however, are a lot of other new jets that'll give these big boys a run for the money performance-wise. They will fly as high, as fast and as far, and provide their passengers with greater comfort. They are corporate jets.

True, they can't carry nearly the payload of a commercial jet. But who needs more than a toothbrush for an



Winglet—also known as a "sail"—opposes tip vortex flow, actually generates forward thrust and lift from vortex field.





Canadair's Challenger (top) and Rockwell's Sabreliner 65 will vie for corporate sales. Note that both make use of pronounced fence array on underside of wings. Performance specs are on following page.

overnighter, say, to Riyadh (that's in Saudi Arabia).

Now, don't get the idea that airplanes flown by businesses amount to zilch. According to *Business Week*, more than 50,000 business aircraft carried over 50 million passengers in 1977. In fact, U.S. corporate planes accounted for approximately three times as many total flying hours as the six million hours flown by all domestic airlines combined.

In the years ahead, the sky's the limit. The number of passengers on corporate planes will fly is expected to double by 1990. Gearing up to meet the load, U.S. companies placed orders this year for \$700 million worth

of brand new aircraft—many of which haven't been flight tested yet.

To capture as much of the market as possible, the major corporate jet manufacturers have been ballyhooing their new, next-decade models like mad. The top six are Cessna, Gates Learjet (no relation to Lear Avia Corp. which builds turboprop planes), Grumman and Rockwell International in the United States, Canadair in Canada and Avions Marcel Dassault-Breguet (hereafter referred to as Dassault) in France.

A new business jet costs \$3 to \$8 million, depending on model and accessories, which seems like a lot of loot to spend just to ferry round a handful of people at a clip. However,

corporations maintain that private jets save great amounts of time and money merely by allowing key executives to get places faster than they can by commercial aircraft.

For example, corporate jets can fly to regions not on scheduled airline routes, where many of today's manufacturing facilities and offices are located. The new business jets can all land and take off on runways which are far too short for commercial airliner operations.

Travel by company plane offers the corporation and its personnel maximum security—a growing consideration these days. Discussions can be held in private, which is difficult on a

commercial plane. And company VIPs don't become easy targets for kooks or kidnapers. Terrorism aside, the day of the sleek jet emblazoned with the company logo is over: As much as they profess a solid business rationale for their jets, executives do not want to irritate stockholders or invite any public controversy by flaunting the company planes.

However anonymous, the burgeoning corporate aircraft fleet has prompted one leading transportation economist to suggest that commercial airlines are losing more and more businessmen as customers and may, in time, become a mass transit medium for the less advantaged members of society. Prof. John R. Meyer of the Harvard Business School says that corporate planes



A relative newcomer to the ranks of corporate-type jet aircraft manufacturers, Cessna is pinning its hopes for success in the Eighties on its sleek Citation III.



Now being built in prototype, Gates Learjet's new Longhorn model uses winglets similar to those of Gulfstream III.

may eventually become as much a stigma to the airlines as private automobiles are to public ground transit. Car and corporate aircraft offer comfort, convenience and privacy.

#### Why new planes?

The business jet lineup looks like this: Cessna's Citation III, Gates Learjet's Longhorn, Grumman's Gulfstream III, Rockwell's Sabreliner 65,

Canadair's Challenger and Dassault's Falcon 50.

A comparison of characteristics can be seen in the accompanying chart. Primarily, two technological developments give these aircraft their improved flight characteristics. They are the supercritical wing (sometimes called the "high-technology wing") and the high-bypass turbofan engine. They are the same systems which characterize the new

### PERFORMANCE SPECS<sup>1</sup> OF THE NEW CORPORATE JETS

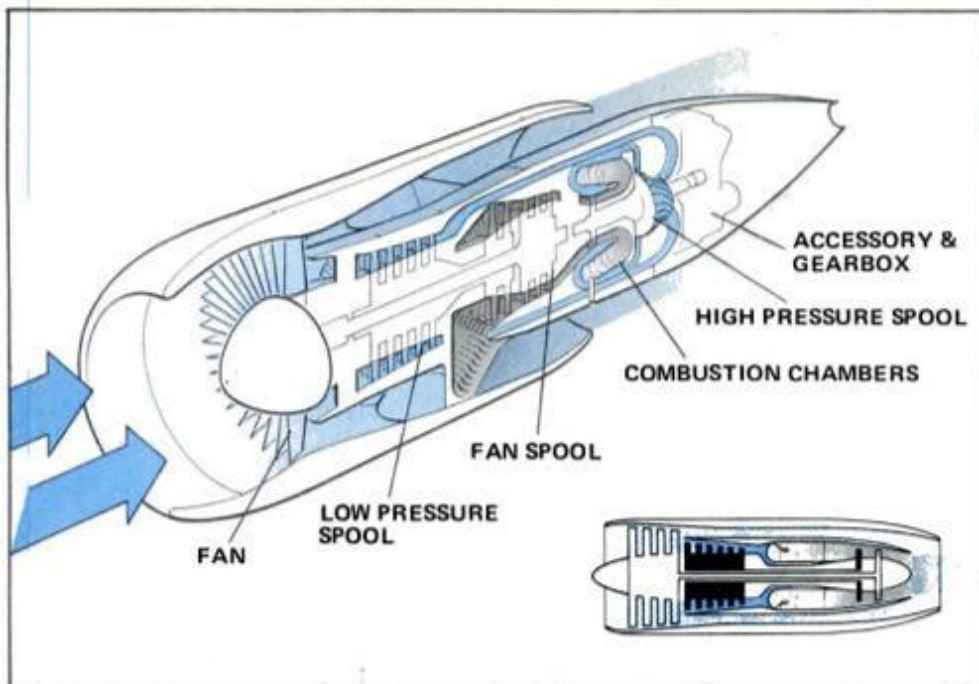
AIRCRAFT	Max. Seating Capacity	Max. Take-off Weight	Max. Certified Altitude	Take-off Distance at Gross Weight	Landing Distance at Max. Landing Weight	Max. Cruise Speed	NBAA IFR Range <sup>2</sup>
Canadair Challenger Dual Jet	11	32,500 lbs.	49,000'	4,100'	3,700'	575 mph	4,623
Cessna Citation III Dual Jet	15	17,150 lbs.	45,000'	3,990'	3,440'	540 mph	2,760
Dassault Falcon 50 Trijet	10	37,480 lbs.	45,000'	4,900'	3,400'	598 mph	3,650
Gates Learjet Model 28/29 <sup>3</sup> Dual Jet	10	15,000 lbs.	51,000'	2,680'	2,210'	583 mph	2,050 <sup>4</sup>
Grumman Gulfstream III Dual Jet	19	65,500 lbs.	45,000'	5,550'	3,400'	576 mph	4,147
Rockwell Sabreliner 65 Dual Jet	10	23,800 lbs.	45,000'	5,250'	4,270'	530 mph	2,778

<sup>1</sup>Performance data are based on sea level, International Standard Atmosphere (ISA) conditions. Take-off and landing field lengths are based on hard surface, dry runways with no wind and without the use of thrust reversers.

<sup>2</sup>NBAA IFR = National Business Aviation Agency, Instrument Flight Rules.

<sup>3</sup>Gates Learjet is currently producing this model. Models 54/55/56, which are larger, are being built in prototype.

<sup>4</sup>NBAA IFR range not available. This is aircraft's maximum range without payload.



The high-bypass jet engine employs a large fan to propel a greater volume of cool, ambient air (light blue) around the central jet combustion stream (darker area).

commercial airliners. The aim: more efficient, quieter performance.

In 1973, a gallon of jet fuel cost the airlines 12 cents; today, it costs 45 cents—more for a corporation, which doesn't usually get the same bulk rate. And the price keeps rising at 6 to 10 percent a year.

As for noise, after 20 years of lawsuits and complaints from people residing near airports, the government has set a stiff standard that has

to be met by 1985. The standard calls for a maximum noise level of 87 EPNdB (effective perceived noise level) on take-off and 98 on landing. As a point of reference, current jets have take-off noise levels of 95 to 108 EPNdB.

The supercritical wing and the quieter high-bypass engine are the major factors in making the new jets more fuel efficient. According to Boeing, "Together, the new engine

and wing technologies will constitute about a 30-percent improvement in fuel efficiency." That's some bonus factor—in the automotive market, by comparison, it would knock Detroit's sales strategies into a cocked hat.

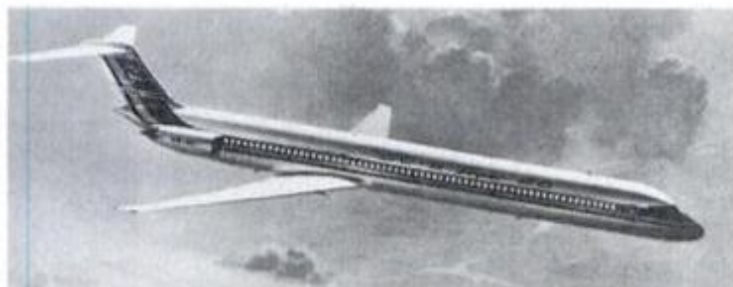
All the new corporate jets except two employ supercritical wings. The two are the Gates Learjet Longhorn models and the Grumman Gulfstream III, which have been designed with supercritical "winglets" instead.

The supercritical winglets are practically at a 90° angle to the rest of the wing. They promote fuel economy because the nearly vertical "sails" reduce the drag induced by wingtip vortex formation, which is common to high-performance aircraft. Winglets are especially effective at altitudes of about 50,000 feet where these planes will cruise. Generally, winglets are 6 square feet in area and have a height of about 45 inches.

### Supercritical wings

The supercritical wing itself is characterized by a different shape and more area than a conventional wing. Development of the supercritical wing was made possible by the use of stronger, lighter materials. The longer span allows the plane to carry more fuel, which gives it greater range. In general, the range of the new corporate jets has been

*(Please turn to page 154)*



In above perspective, Super 80 stretched version of the 13-year-old DC-9 seems to have outgrown its original wings.



McDonnell-Douglas might begrudge it, but proposed DC-X200 seems to owe at least some of its design to Europe's Airbus.



Lockheed's L1011 Dash 500, some 13 feet longer than the initial version, typifies the evolutionary airliner approach.

## FIRSTHAND REPORT

by Gary Witzenburg  
DETROIT AUTO EDITOR



**C**resting the little rise at the end of Portland International Raceway's very long front straight at about 105 mph, I simultaneously reached for the brake and heard Sam Posey, in the seat beside me, suck in his breath and give out a little "Whoops!" Nothing scares an otherwise fearless race driver more than riding at speed with someone whose capabilities he either doesn't know or doesn't trust. Sam was convinced that I had started my braking too late and would not get the new 280-ZX slowed down in time for Portland's medium-fast first turn.

But the Datsun's new four-wheel disc brakes are nothing short of superb, a fact I had discovered during several earlier circuits of the track, and they effortlessly sucked the car down to a safe cornering speed for the turn. "It's OK," I assured him, getting off the brakes and aiming for the proper line that Sam was trying to teach me. Gentleman that he is, Posey apologized and the lesson continued.

We were at the Oregon track this fine, sunny Monday to examine and test Datsun's '79 lineup, including the restyled "Z-Car", the facelifted 810, and the all-new 210 economy models. Pro drivers Posey and Don Devendorf were there, courtesy of Datsun, to help show off the new cars and generally make the day more interesting and enjoyable for the assembled magazine writers. The day before, most of us had watched Posey start his Bob Sharp Racing 240-Z from the pole position in the IMSA Camel GTU road racing event, only to fall out with mechanical troubles after an excellent race and hand second place (behind a Porsche) to the equally talented Devendorf's 240-Z.

This new Z-Car was a far cry from the very specially prepared racing "Zs" we had watched doing battle on Sunday, but it did seem

# Driving the new Datsun Z car

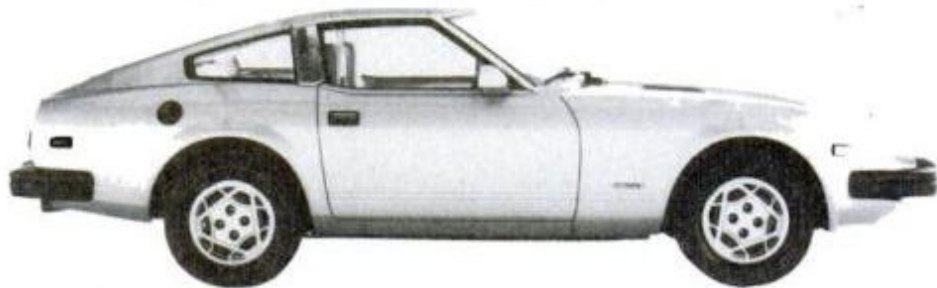


Once a sports car, the Z completes its transition and is all luxury tourer for '79.

surprisingly at home on Portland's fast and twisty road racing course. Sports car purists have been disappointed over the years to see the Z-Car grow progressively more overweight and sluggish compared to the original 240-Z that had charmed them so completely upon its introduction nine years ago. Burdened by emissions and safety regulations, the Datsun sports car has metamorphosed into much more of a luxury tourer than the very capable sports car it once was, while its price has doubled from the original's incredibly reasonable \$4000. Yet the Z-Car's sales figures have climbed

rapidly, from some 27,000 in 1971 (its first full sales year) to around 70,000 units in 1978.

Convinced, therefore, that they are on the right track, the folks at Datsun have jacked up the redesigned body for '79 and jammed a bunch more luxury and gimmickry underneath, while removing a bit more of what sports car character was left. The result is a fine GT automobile that's quiet, comfortable, plush and color-coordinated throughout, and rides far better than any previous "Z"—but don't bother entering it in the local parking lot gymkhana.



The '79 280-ZX is available in two versions, two-passenger coupe, shown here, and . . .



. . . the 2+2 which includes a rear jump seat and additional standard equipment.

One of the events of the day at Portland was a two-man pylon race, made interesting by a driver change in the middle, with prizes for the fastest times. Your faithful PM writer—and part-time race-car driver—was confident of winning. We did succeed in beating the Posey/Devendorf team by over a second, but so loose was the Datsun's suspension on the low-speed handling course that my accomplished, race-experienced co-driver nailed one large pylon (a 10-second penalty) with the flailing car's rear end, and I almost did the same on my lap.

Ironically, however, the new Z-Car showed its form in much better style once they turned us loose on the road course. In fast turns it hung in there like an Olympic acrobat. In slower corners it understeered slightly going in, but recovered nicely under power coming out. Subjectively, the 2.8-liter, fuel injected, overhead cam six-cylinder engine (same as last year) was a bit disappointing in power—the Z is no lightweight at 2787 lbs. for the two-seater and nearly 3000 lbs. for the 2+2 model, without airconditioning. But, once coaxed off the line, it performs reasonably well. Ride, as stated, has been vastly improved over previous Zs and is excellent over all but the sharpest bumps, and the brakes, a new power-assisted four-wheel disc system, are probably the car's best chassis feature. On the negative side, the soft rear suspension did tend to let the back end get loose and slide a bit, tail-out, when braking into a turn. However, it was easy to control at all times by merely countersteering into the skid in a normal manner.

### 280-ZX styling

From a styling viewpoint, the car is not greatly changed front or rear, but it does have a fresh character in its roofline. The hood retains its "power bulge" and the sunken headlamps (a Z trademark) remain, but there is now no grille opening above the bumper, and a nice air-dam has been built in underneath. Larger taillamps give the rear a pleasingly fresh look, but the wide chrome

## New 210 series for '79 replaces B210



Datsun's low-price spread includes, top to bottom, two-door sedan (standard, deluxe),



four-door sedan, three-door hatchback and five-door station wagon. Engine is 1400-cc



Four (1500-cc in wagon) with four-speed transmission. Front brakes are power-assisted



discs and steel-belted radials are standard. Optional are five-speed, auto. transmissions.

molding on the center roof pillar harks of old-style Japanese over-decoration. Larger rear-quarter windows do give improved visibility from inside, however, and both luggage room and fuel capacity have

been improved.

Inside there's more shoulder room, due to the slightly wider body and a redesigned instrument panel complete with a full set of "aircraft-style" backlit gauges. A five-speed transmission is now standard, as is AM/FM stereo with a retracting antenna. The 2+2 model also gets standard power steering and airconditioning, plus a new split fold-down rear seat. And there's an ultra-equipped Grand Luxury package available for either body style that includes alloy wheels, rear window wiper/washer, cloth upholstery, power windows, cruise control and



Two-door hardtop is added to 810 line; it, too, mounts the 2.4-liter, ohc, f.-i. Six.

(Please turn to page 190)

# What a rapid-fire camera can do for you



More than a photographic fetish, an automatic winder on a camera can be a useful tool for any 35-mm photographer.

New winders teamed with compact cameras make convenient packages for fast-action shooting, run gamut of prices.

by David Miller

**A**uto winders, the latest photographic "in" gadget, eliminate half the manual labor involved in taking pictures and are threatening to turn amateur photographers into so many R2D2s. If you use a late model electronically controlled 35-mm single-lens reflex (SLR) camera, you might turn out perfect pictures just by focusing, pushing the shutter-release and winding the film advance/shutter-cocking lever.

Today's automatic and semiautomatic (often called match-needle) cameras do most of the thinking for you, once you've made a few preliminary settings at the start of each roll of film. Now, with the new winders, you're even saved the bother of advancing that lever and are free to concentrate on the esthetic aspects of picture taking.

## Not much to look at

Basically, a winder is nothing more than a flat box with just enough room for a half-dozen small batteries and a tiny motor. On the camera, several electrical contacts on the winder's top engage matching points on the camera bottom,

David Miller is features editor of *Modern Photography*.

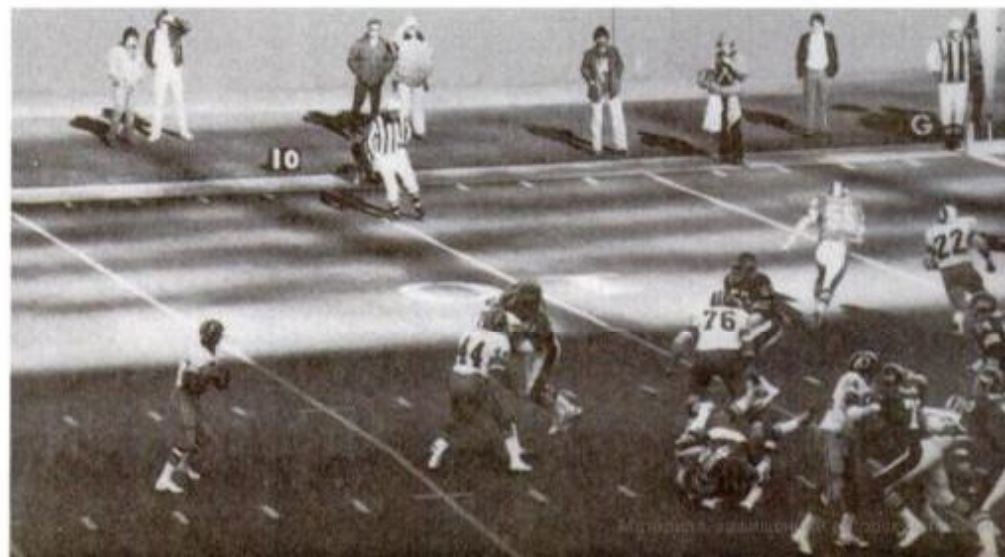
When you're after a fast-moving sequence like this pass and reception, a winder on your camera assures you of getting it.

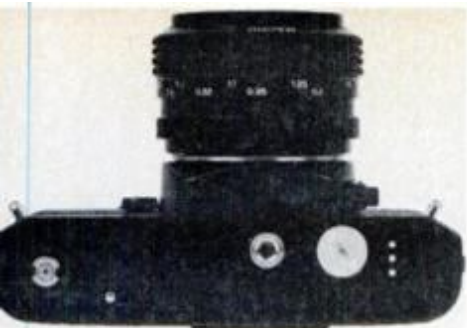
and a drive wheel couples to a similar control that turns the camera's take-up spool, thereby duplicating the wind lever's function. They are the same width and (usually) the same depth as a camera and add just about one inch and 10 to 16 ounces—little enough, considering the added convenience.

But it's not the labor-saving feature that has prompted just about every major camera manufacturer to come out with one of these items in the past year or so. Their appeal comes from their ability to fire off shots in rapid order, either one at a time or in sequences up to about three frames per second—something previously restricted to the professional photographer. As a matter of fact, winders are really a junior form of the motor drive units the pros have been using for years on their Nikons, Leicas and

latter-day Contaxes. Winders won't give you the five-frames-per-second shooting speed of the motor drives, but they are much smaller and lighter—running on just four or six AA batteries, compared to the eight or 10 needed to drive a motor—less of a strain both physically and financially. One set of batteries can get you through about 100 rolls of 36-exposure film without making you lift a finger—or flick a thumb.

Unfortunately you just can't rush out, pick a winder off the store shelves and stick it on your camera because each one is made exclusively for a specific camera of the same brand. Since only the latest model cameras are equipped to take winders, you may be out of luck unless you're willing to spring for a whole new outfit. (If you happen to be looking for a new camera now, consider all options available.)





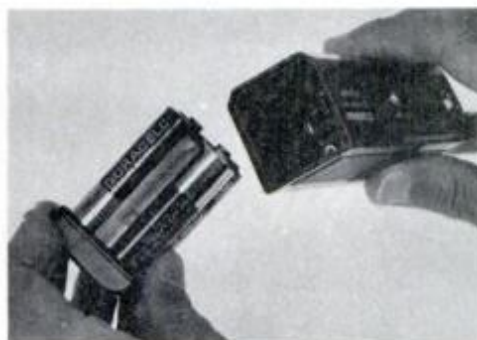
Sole plate of a winder-capable Chinon shows electrical contacts (right) and mechanical connection for drive (left).



Chinon winder's controls let you set camera to fire automatically at interval you choose or shoot preset number of frames.



Winder for Pentax MX has auxiliary shutter release on handgrip—a handy feature.



Battery clip for Minolta G winder is a good arrangement—keep a spare clip loaded and you can change batteries rapidly.

For example, if you have a Konica Autoreflex T3 or Topcon RE 200, perfectly good machines in their own right, you can't use the Konica Auto Winder AR or Topcon Auto Winder-II. But, trade in your body on the late model T4 or RE 300, nearly identical models except for those extra essential connections, and you're all set for motorized shooting. With the right combination, connect your winder by a conventional tripod-type mounting screw.

### Help in many situations

Though intended primarily for action shots—from Junior's long touchdown pass in the big high school game to the man on the flying trapeze—winders can also be a big help in other standard types of photography, such as portraiture, particularly when used in the single-frame mode (all winders have

single-frame capability, but some have both single and multiple provision). With your winder in operation, you can follow a subject in your viewfinder constantly without giving a thought to the nitty-gritty controls, waiting for the right expression—which you can then capture at the touch of that button. Remember, in single-frame shooting you have to lift your finger off the shutter release after every shot to allow the motor to move things on. You may be able to get some sort of quick sequence if you have a fast trigger finger (the single-frame-only Topcon winder can be fired at two frames per second).

But all is not click and whir with an auto winder. The motor does make a noise and while it may sound reassuring and professional to you, it won't win you any friends at a concert or golf tournament. You

may be able to squeeze off *one* candid shot of someone, but after that whirring, all your potential subjects will be on the alert for more. Despite their size, winders still add weight and bulk, robbing many of today's super-compact SLRs of their strongest selling point.

Obviously, winders can't be much of an advantage with slow shutter speeds. Likewise, they do you little good with flash, as you must wait for the flash unit to recycle before you can shoot again. (There are exceptions: some camera makers—like Minolta, Canon and Nikon—offer flash units that can keep up with their winders.) Though the Canon winder shuts off automatically when you come to the end of a roll of film (with a red signal light to warn you), most of the others leave this up to your memory. You may reach the end of the roll before you expect—thus, you could find yourself changing film at the very moment you want to be shooting.

Finally, there's the expense, not only of the winder itself, but of batteries. You should keep a spare set on hand. That can cause a space problem in your gadget bag, but it's necessary, as you never really know when you'll run out. Then, you're also bound to find your film bill rising in sync with the whirring of that motor.

### Simple controls

A big advantage, one that distinguishes auto winders from most other electromechanical devices, is their need for just a very few simple controls—on-off switch, signal light (some light up during operation to show that all is going as it should) and a button or lever to activate the rewind release button on the camera bottom. Some winders, such as those for the Pentax ME and MX and Olympus OM cameras are L-shaped, with the L part resting along the camera's right side to provide an extra hand

*(Please turn to page 218)*



# TOYS FROM SANTA'S WORKSHOP

By Harry Wicks  
HOME AND SHOP EDITOR



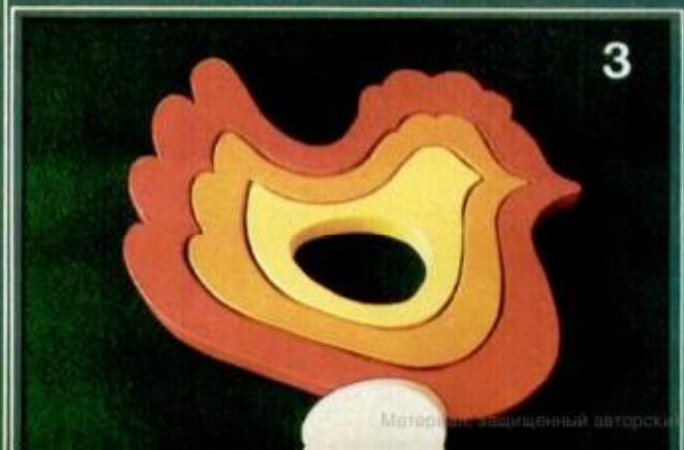
1

**P**M's second annual roundup of Christmas gifts-to-make is an impressive collection of 17 useful and handsome projects. Any or all will let you say "Merry Christmas" from your own workshop. The projects shown here were selected from scores of ideas and suggestions from readers, artists, designers and craftspeople. All items shown were built and use-tested in the PM workshop. Clear, easy-to-follow directions for all 17 projects are given on the following pages.

Happily, good-looking and practical workshop projects do not have to be time-consuming and wearying in order to be successful. In fact, the two basic criteria for

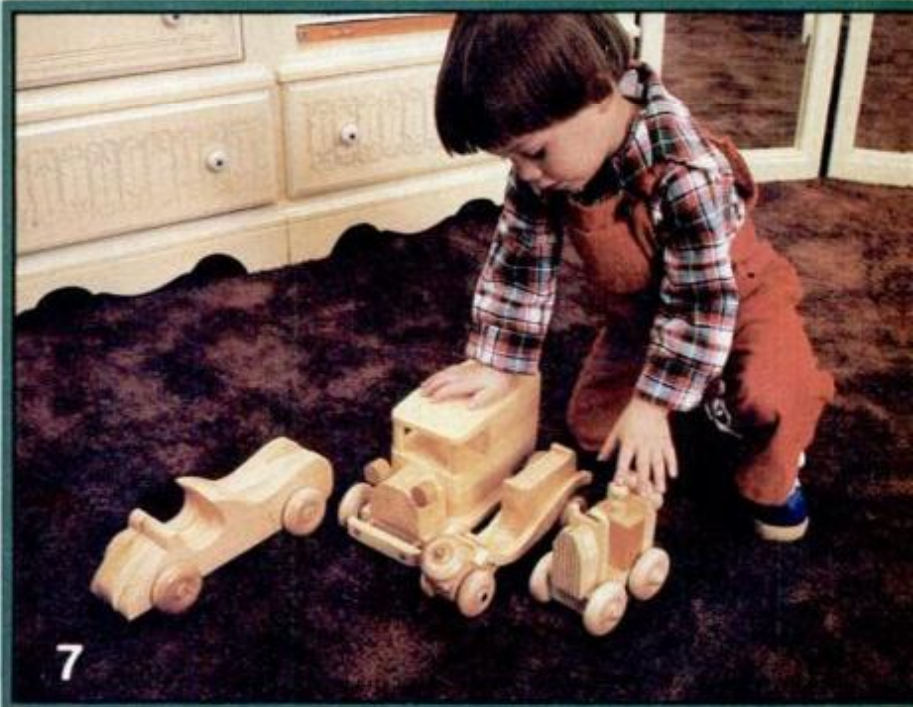


2



3





**1.** This realistic play stove will convince your princess that Santa does read his mail. Of lightweight plywood, it is durable and easy to build.

**2.** Floatable Noah's Ark is constructed from a plastic foam plank. Animals have jigsawed bodies you can mix or match to please children.

**3.** Hen puzzle, with its bright colors and bold shapes, is a visual delight for toddlers. When baby outgrows it, hang it on the wall.

**4.** Horse bench is perfect for TV viewing, yet light enough to be carried by a 4-year-old. Of pine with a stained and varnished seat.

**5.** Animal crayon holders will encourage preschoolers to keep their crayons corralled. These are simply jigsawed from glued-up pine blocks.

**6.** Amtrak ride-about rolls in a straight line so little ones can't tip it over. It's fashioned from plastic pipe, plugged both ends.

**7.** Wooden cars, truck will keep any preschooler occupied for hours on end. Our plans make them easy to build, and there's a mail-order source for wheels and "people."

**8.** Ostrich puppet has neck and legs of cording which create fascinating, lifelike movement when lines are manipulated. Fun for kids of all ages.

# GIFTS FOR ALL AROUND THE HOUSE



9



10



11

12



13

9. Eyeglass holder becomes a butterfly when specs are safely parked.
10. Coffee lovers agree that the best brews are made from freshly ground beans. Our coffee grinder, with a mechanism from a mail-order source, suits Colonial decor.
11. Put this under the tree for yourself: a stylized saw with a battery driven clock. Perfect for den or workshop.
12. Small toolbox holds a starter set of tools for young apartment dwellers, homemakers. Or, fill it with light tools for odd jobs.
13. Lathe-turned candleholders were inspired by miscellaneous turnings author spotted at a country church yard sale last summer.
14. First-class bulletin board can be fashioned in an hour or less because it is of foamboard.
15. Contemporary spice rack is created from used—and well-scrubbed—sardine cans. They're affixed to board and spray-painted.
16. Another great gift for lathe buffs to make—reproductions of the flax spools of old. Ours are of glued-up mahogany boards finished with several coats of semigloss varnish.
17. Decorative napkin holder consists of wood base and sheet acrylic sides. Candles were made from adhesive backed, prismatic film.





Main stove parts during assembly. Cleats permit using 1/4-in. plywood members.

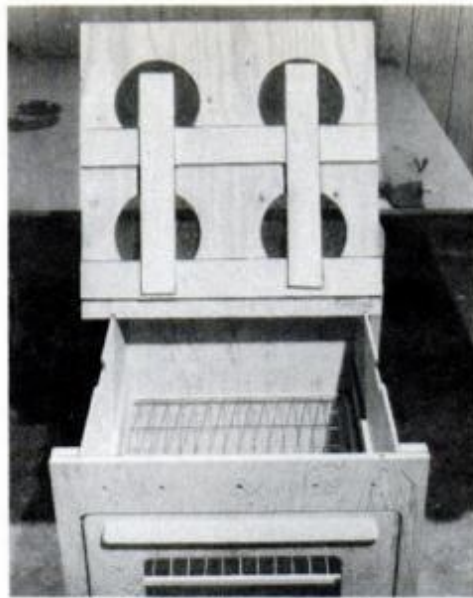
### PROJECT/DESIGNER BUILDERS

Rosario Capotosto, No. 17; R. Capotosto and Stanley Dunaj, No. 1; S. Dunaj, Nos. 2, 3, 6, 9; Doug Eisman, Nos. 11, 14, 15; Joseph Provey, No. 8; Les Walker and Harry Wicks, No. 12; H. Wicks, Nos. 4, 5, 7, 10, 13, 16; Love-Built, two funny-car designs in No. 7.

PM color photos by Harry Hartman.

### SHOPPING INFORMATION

Specialty items used in projects: Nos. 6, 7: Wheels and people for Metroliner, cars, truck from Love-Built Toys & Crafts, 2907 Lake Forest Rd., Box 5459, Tahoe City, Calif. 95730. Package of 2 1/4-in. wood wheels, \$5.50 postpaid. Package of seven "people," \$1.25. No. 10: Coffee grinder



Underside view of top. Use short cross-pieces to eliminate side-panel notches.

mechanism from Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01801; \$12.80 postpaid. No. 11: Hand-saw clock with clock movement from Capro Craft, Box 18, Greenlawn, N.Y. 11740, \$10 postpaid. No. 17: Napkin holder prismatic film kit, \$1.50 postpaid, Capro Craft, Box 18, Greenlawn, N.Y. 11740. Kit has enough film to reproduce candles as shown.



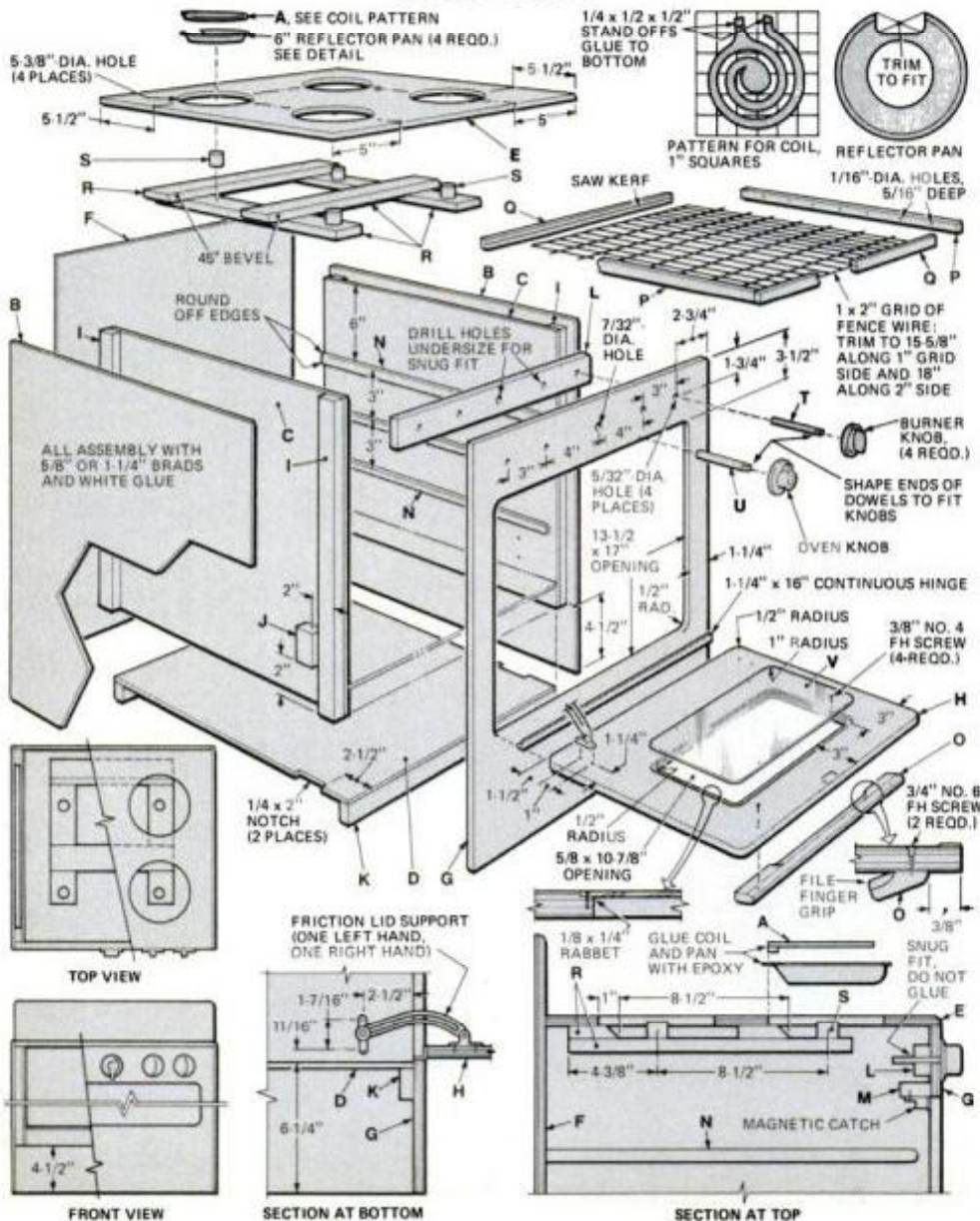
Close-up of burner assembly and knobs. Knobs are attached to snug-fit dowels.

laminated 3/4-in. mahogany. To avoid delamination later—which can be dangerous when it occurs in a spinning lathe—make certain that the laminating is done according to accepted practice as follows:

Both faces of boards to be joined should be coated with carpenter's glue spread evenly with either a glue brush or flat, clean stick. Professionals permit the glue-applied surfaces to remain exposed to the air for several minutes before bonding the pieces: This way, the pieces "grab" on contact instead of slipping and sliding about. Align boards carefully and use a sufficient number of clamps to apply equal pressure over all of the block. Set the piece aside and leave the block clamped for a minimum of 24 hours.

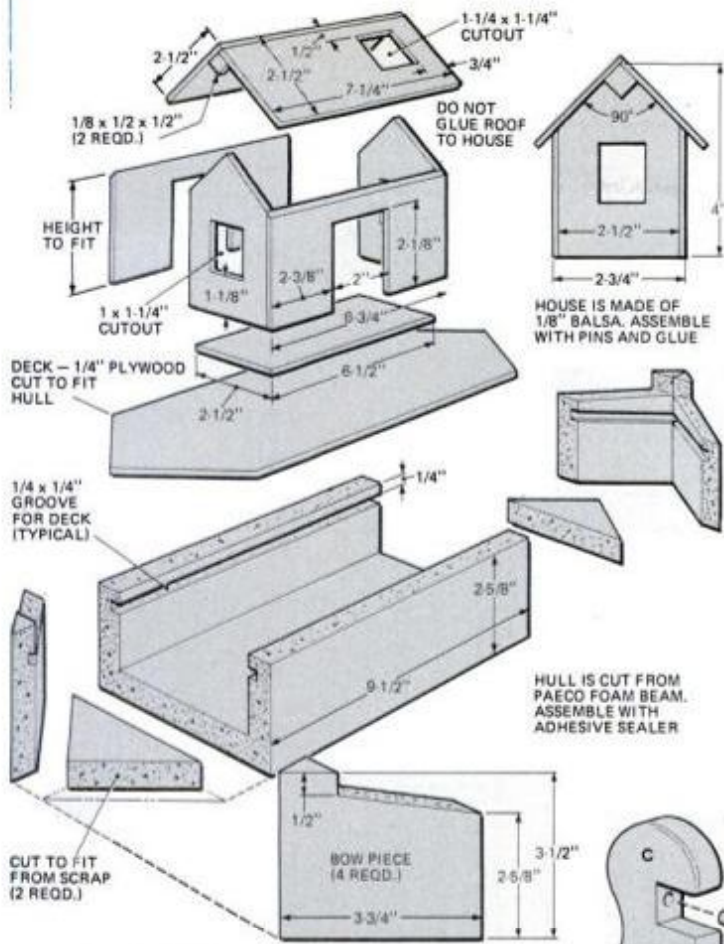
For professional-looking finishes on your gift projects, try to select finishing materials that are fast-drying. These accumulate less dust and produce a smoother finish. Painted surfaces, for example, can be quickly finished with a spray-can-type paint; just make certain you work in a well-ventilated area. For a clear

## 1. PLAY STOVE

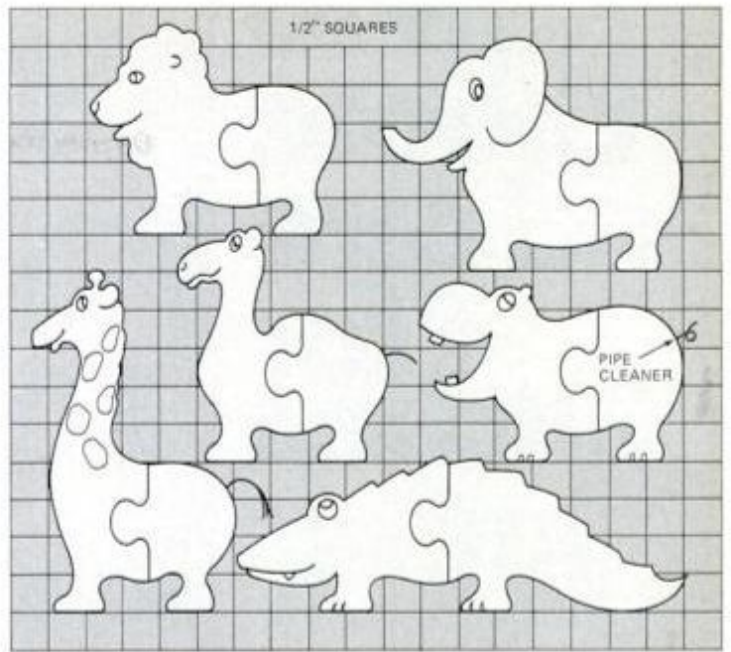


### MATERIALS LIST—PLAY STOVE

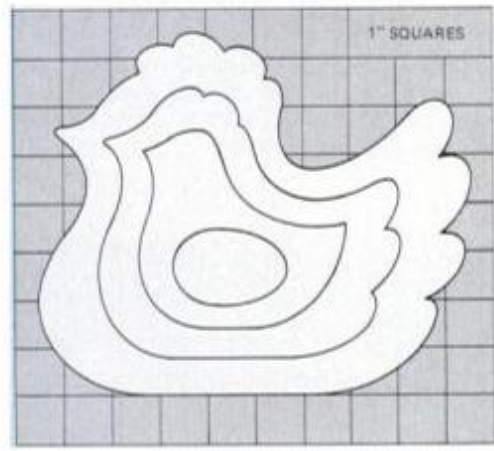
Key	Pcs.	Size and description (use)
A	4	3/4 x 6 x 6" luan plywood (heat element)
B	2	1/4 x 20 x 24" luan plywood (outer sides)
C	2	1/4 x 19 x 19" luan plywood (inner wall)
D	1	1/2 x 16 1/2 x 19" luan plywood (oven base)
E	1	1/2 x 19 1/2 x 19 1/2" plywood (top)
F	1	1/2 x 19 1/2 x 28" plywood (back)
G	1	1/2 x 19 1/2 x 23 1/2" plywood (front)
H	1	1/2 x 13 3/4 x 16 3/8" plywood (oven door)
I	4	3/4 x 1 1/2 x 19" pine (side nailers)
J	2	3/4 x 1 1/2 x 2" pine (lid support backup blocks)
K	2	3/4 x 1 1/2 x 16 1/2" pine (bare nailers)
L	1	3/4 x 1 1/2 x 16" pine (knob backup block)
M	1	3/4 x 1 1/2 x 3" pine (magnetic catch cleat)
N	6	3/8 x 5/8 x 18 1/2" pine (grill slides)
O	1	1/2 x 1 1/2 x 14 1/2" pine (oven handle)
P	2	1/2 x 3/8 x 17 1/2" plywood (grill side frame)
Q	2	1/2 x 3/8 x 16" plywood (grill front and back frame)
R	4	3/8 x 2 1/2 x 14" plywood (burner assembly)
S	4	1"-dia. x 3/4



## 2. NOAH'S ARK



## 3. HEN AND EGG PUZZLE



finish, use either a fast-dry varnish or several coats of thinned shellac. Both give durable, handsome results.

## 1. Child's play stove

1. The back, top and front are cut out of a piece of 1/2-in. fir plywood. Since these parts are all the same width, they should be cut with the same table-saw rip-fence setting.

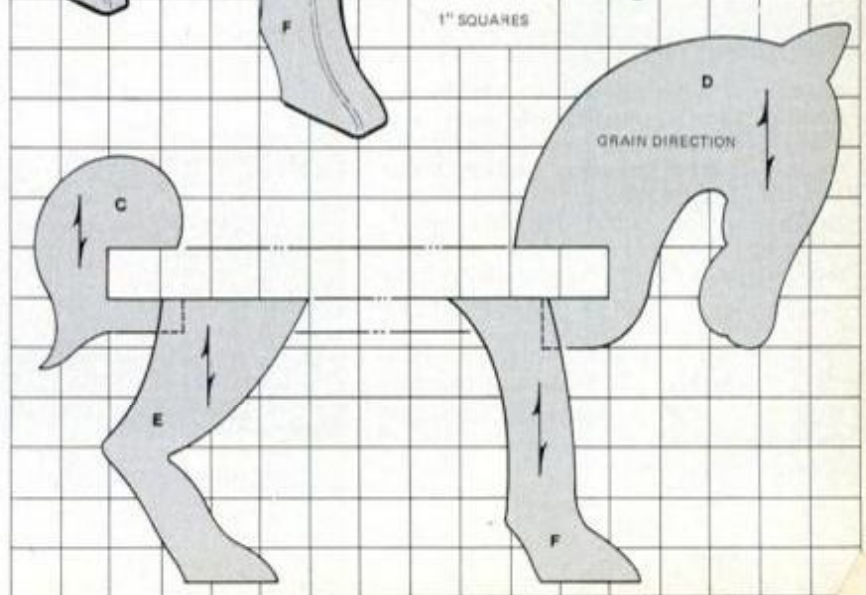
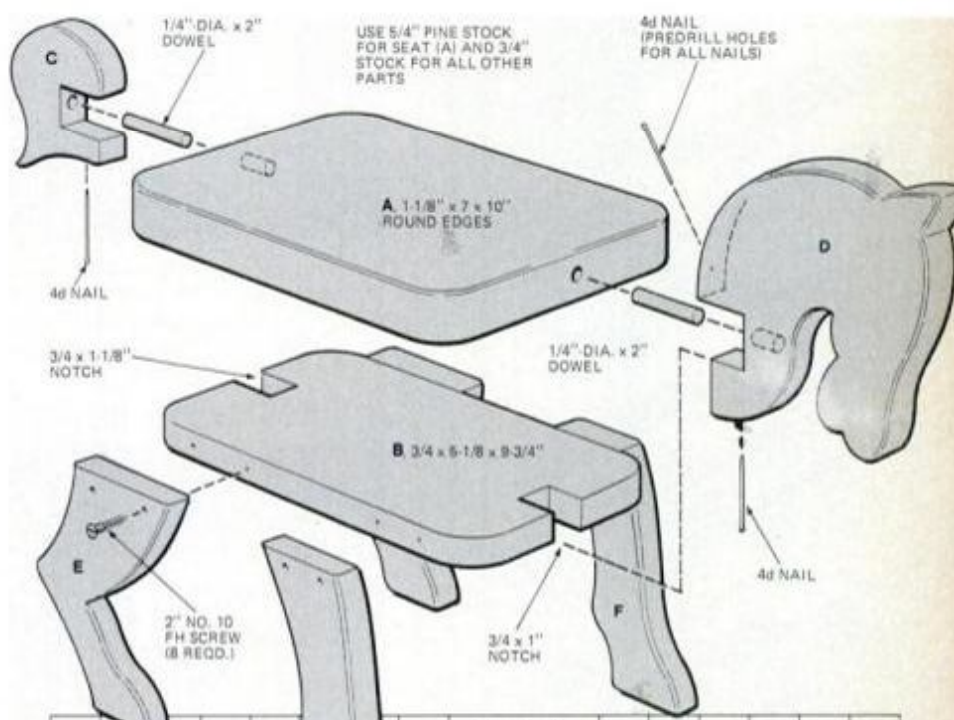
2. Cut the four large burner holes in the top with a fly cutter on a drill press or with a pivot-guided sabre saw.

3. You can economize on lumber by cutting the oven door directly out of the front panel. This way, you will have both the door and frame from the same board. To make a no-waste cut, bore five or six 1/16-in.-dia. holes in a row on the outline of the door to allow blade entry. Or make a careful plunge cut with a sabre saw.

Tack a guide strip in place to make the straight cuts. The curved corners are guided freehand. Reposition the guide to cut all four sides. The dropout piece will be a perfect-fitting door with a built-in clearance.

*(Please turn to page 194)*

## 4. HORSE BENCH



# How to choose and care for kitchen knives

Pick your cutlery with the same care as shop tools.



Some specialty cutlery: A) spatula for turning food; B) chef's knife with wide blade to protect knuckles; C) cleaver for separating meat or frozen foods by forceful blow; D) bread knife with serrated edge to rip apart light-density food; E) fork; F) trimming knife for boning or trimming meat; G) steak knife; H) grapefruit knife.

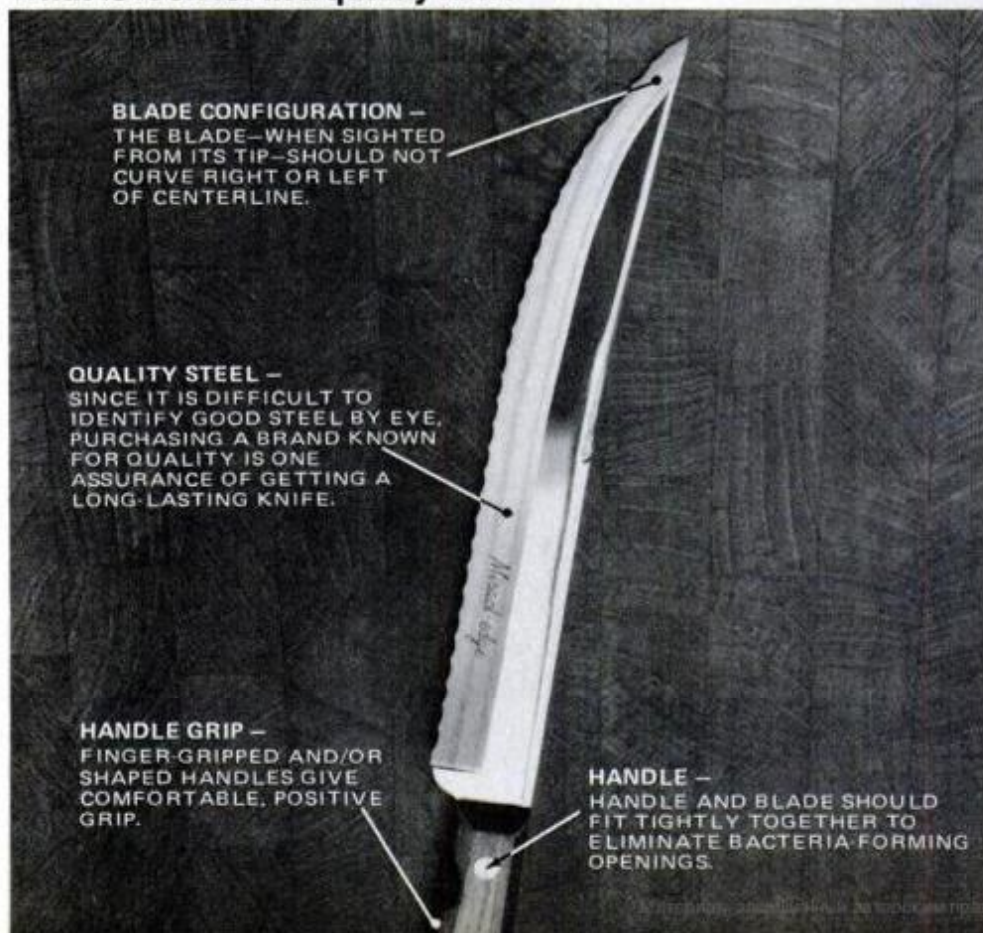
There is a proper kitchen knife for every cutting situation. However, there are also general purpose knives, designed for use in several circumstances, that are indispensable in any kitchen.

Knowing which knife to use and how to keep it sharp and in first-rate condition makes food prepara-



Widely-used knives include slicing knife with long, narrow blade for making thin slices; carving knife with pointed, slightly curved blade for carving roasts, fowl; utility knife with shorter blade than a carving knife for slicing, cutting, dicing; paring knife with short blade for peeling and dicing vegetables and fruits.

## What to look for in a quality knife



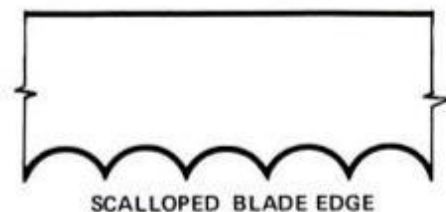
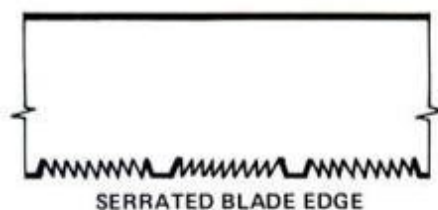
**BLADE CONFIGURATION** — THE BLADE—WHEN SIGHTED FROM ITS TIP—SHOULD NOT CURVE RIGHT OR LEFT OF CENTERLINE.

**QUALITY STEEL** — SINCE IT IS DIFFICULT TO IDENTIFY GOOD STEEL BY EYE, PURCHASING A BRAND KNOWN FOR QUALITY IS ONE ASSURANCE OF GETTING A LONG-LASTING KNIFE.

**HANDLE GRIP** — FINGER-GRIPPED AND/OR SHAPED HANDLES GIVE COMFORTABLE, POSITIVE GRIP.

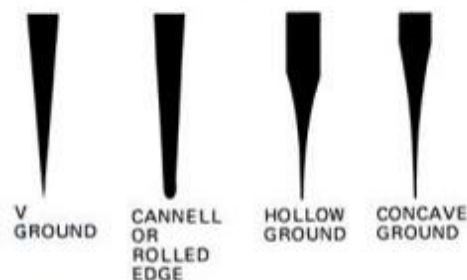
**HANDLE** — HANDLE AND BLADE SHOULD FIT TIGHTLY TOGETHER TO ELIMINATE BACTERIA-FORMING OPENINGS.

## Types of blade edges



A serrated edge as found on bread knives works like a saw to rip food apart. A scalloped edge is a series of arcs that gives more cutting surface than other edges. Generally, a kitchen knife is a piece of steel ground on a honing wheel to give it a honed edge, then polished on a felt wheel to make it extremely sharp.

## Types of blade grinds



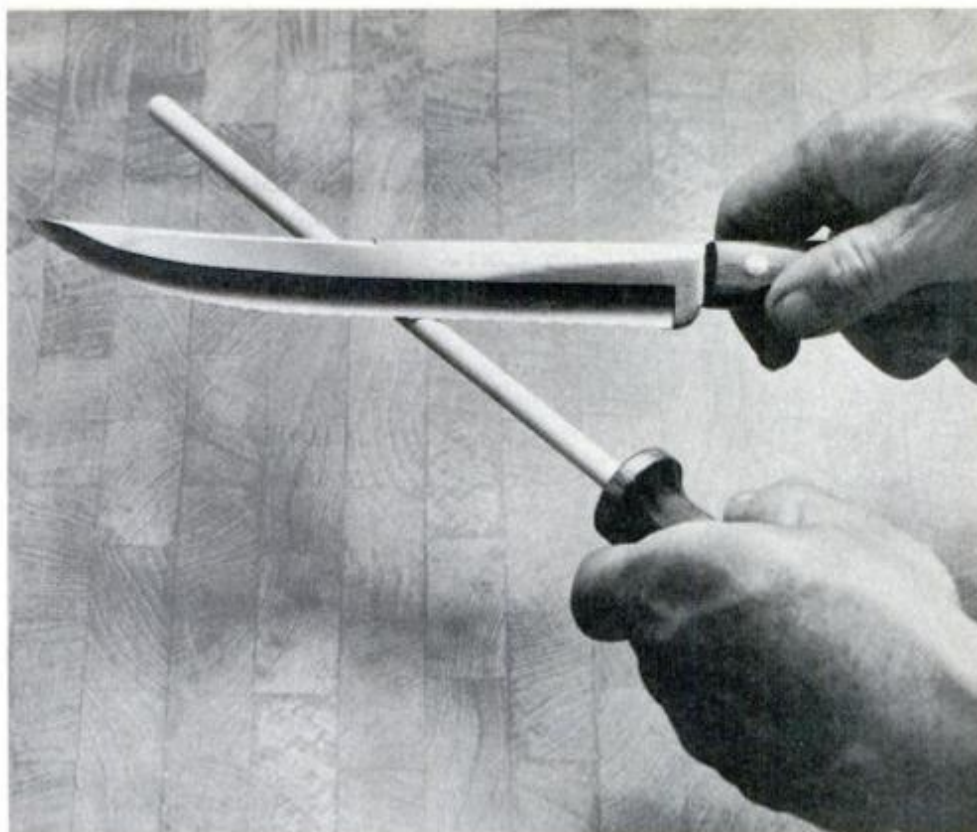
Types of grinds: The V grind extends from back to edge in a flat plane. A Cannell grind is similar to the V grind but has a heavier cross section immediately behind the cutting edge. Hollow grind has a semi-concave area on each side tapering to a thin edge. Concave grind begins nearer the back and is a thin, long-lasting edge.

## How to sharpen a knife

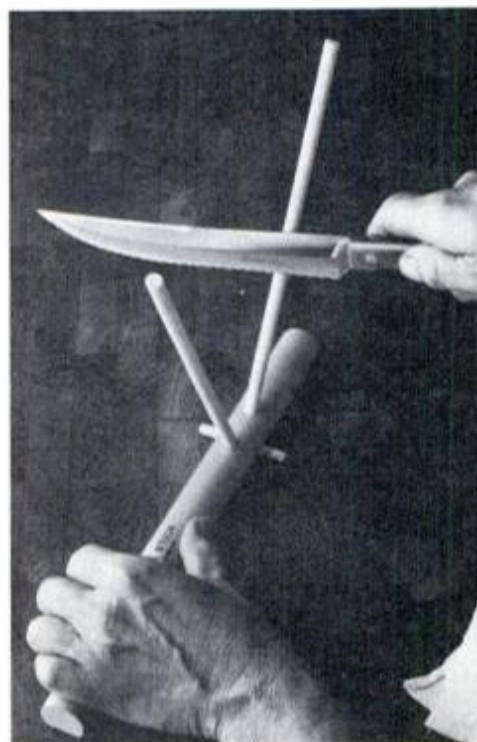


To sharpen on a stone, hold the back of the blade at a 10 to 15° angle from the stone. Stroke the cutting edge against the stone in the direction of the arrow (above) from the heel of the blade to its point. Stroke first on one side, then the other. Apply honing oil to the stone to help make smooth strokes, float particles away.

tion easier, safer and more enjoyable. The top photo on the facing page shows the most common knives which can be used in a variety of situations. To its left is shown specialty cutlery which is primarily used to prepare specific foods. Knife styling runs from the traditional, such as the W.R. Case knives



An aluminum oxide ceramic sharpening rod is an alternative to using an oil stone to sharpen a blade. This Sharp Stick by Case also sharpens electric knife blades.



Double sharpening rods on Case's Crock Stick give correct sharpening angle. User slices straight down alternating rods for most edges; sharpens scallops separately.

shown in the photos above, to sleek contemporary.

## Caring for your knives

Make no mistake about it, even a top-quality knife requires periodic sharpening and some minimum maintenance. As with any cutting tool, when the cutting edge is dull

the user must apply more muscle. Such use causes accidents.

You can sharpen a knife with either an oilstone or a sharpening rod. In between sharpening sessions, use a sharpening *steel* frequently to maintain the sharp edge. Use the steel (without oil) in exactly the same manner as the oil stone.

Don't sharpen scalloped or serrated edges on an oilstone. Sharpening serrated knives requires special equipment. You can, however, use round sharpening rods to sharpen scalloped edges. Sharpen each scallop individually rather than making one slicing motion. Some scalloped edges bevelled one side, should be sharpened only on that side.

Here are several other safeguards to insure the longest, most effective use of your kitchen knives:

- In mincing or slicing use a cutting board to prevent dulling the blade. A hard or abrasive surface dulls a knife faster than anything being cut.

- After use thoroughly wash and hand dry knives, especially if they've been used to cut fruit or salty foods that can ruin the finish.

- Knives can be washed in a dishwasher, but they'll be dulled by knocking against other items.

- Store knives in their own rack or partitioned drawer. Magnetic knife holders don't alter the effectiveness of the blade. However, take care to clean steel particles off the blade after honing it. P.A.

# Build our challenging table soccer game

Our version is regulation size and rugged enough for four to play at one time.

by Rosario Capotosto

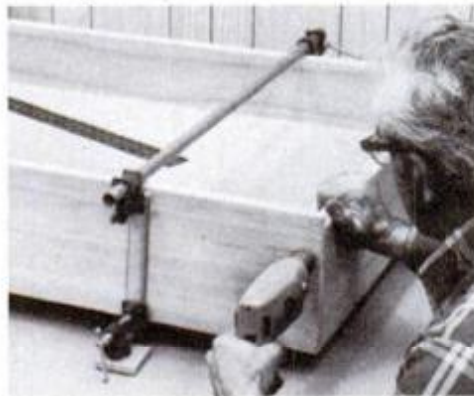
**T**able soccer is one of those games that you can't get enough of. Imported from Europe, it's catching on in this country at a phenomenal pace. Unfortunately, the price tag on factory-built models is too high for the average family to put one in the recreation room. PM's version, however, is the equivalent of ones used in the professional World Championship Tournament and costs half as much—about \$225.

The table has the markings of a soccer field and two teams of 11 soccer player figures attached to long steel rods. Each side has a rod with a row of five men in the middle, a rod with a forward line of three men, one with a defensive line

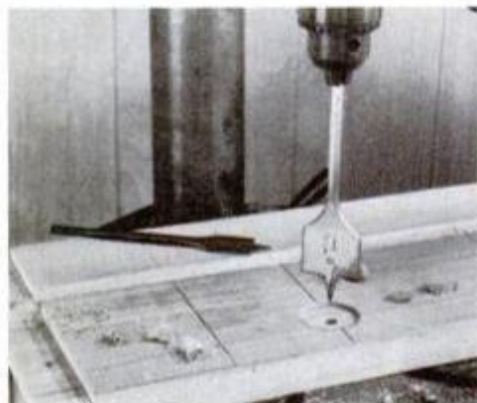
Photos by the author



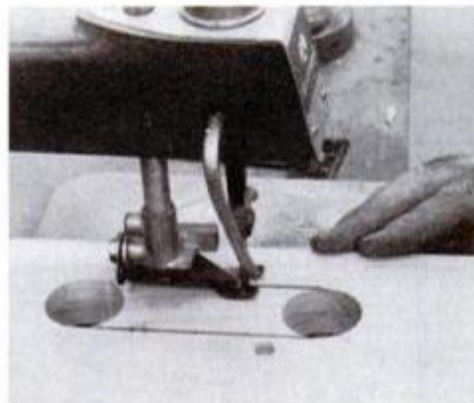
**1** Elevate table-saw blade into work-piece to make internal cut for goal-end cutouts. Let blade stop, remove work.



**2** Hold assembly together, with bar clamps for drilling screw holes at joints. Recheck for square prior to drilling.



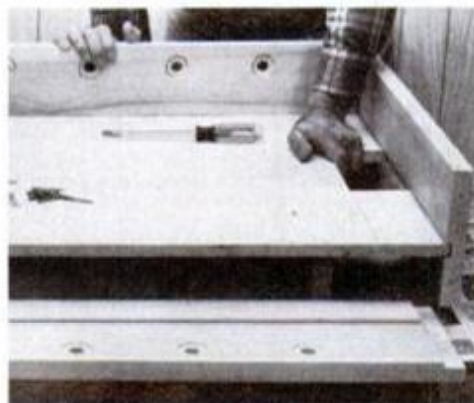
**3** Use spade bit to bore shallow recesses for plastic rod washers before drilling 1-in.-dia. holes in sides.



**4** Making parallel cuts between two holes with either jigsaw or sabre saw drops out waste from the ball return slot.



**5** Cut rabbet around the back of ball-return opening to reduce wall thickness and make reaching balls easier.



**6** Start assembly by screwing ends, then sides, to plywood. Next, insert goal enclosures and secure with screws.

of two men and one with a goalie.

The object of the game, as in real-life soccer, is to get the ball into the opposite goal—easy enough—until you try it. Actually, you have to muster a tremendous degree of skill, speed and concentration, in order to score. Two or four players can participate. The first side to score five times wins, but this is optional. Therefore, a 10-digit scoring unit is incorporated.

The plans call for the use of 5/4-in. hardwood stock in order to give the table the required rigidity and heft. A lot of power can be brought to bear during a frenzied game and a table which vibrates or creeps along the floor just won't do. We used relatively low-cost, easy-working poplar, stained to simulate cherry. Any hardwood will do. Plywood is used for the tabletop to construct the ball-return assemblies. Select only flat, dry lumber.

Start construction by ripping the sides and ends to size, then cut the wide rabbets on the ends of the two side boards. After the rabbets are cut, set up your dado head or router to cut the grooves to receive the 3/4-in. plywood top. Use the same setting to groove the ends and the sides. Next, cut the plywood top to size and make the goal cutouts at each end. The easiest and best way to get the screw holes drilled straight and in proper alignment between mating pieces is as follows: To drill pilot holes in all the outer boards, use a drill press or one of the various accessories which assure straight holes with a hand-held drill. Now assemble the top, sides and ends with bar clamps. Check for squareness, then use the hand-held drill to continue the holes into the mating pieces. Disassemble the parts after making identifying marks. Then proceed to bore and counterbore each small hole in the outer pieces for the screw-shank

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diameter and the concealing plug.

The rods ride on a plastic washer and rod bearing which fit recessed holes in the side boards. The washer seats in a  $\frac{1}{8}$ -in.-deep by  $1\frac{1}{2}$ -in.-dia. hole. The bearing is flanged and fits a 1-in.-diameter hole. Lay out the hole locations carefully and bore the shallow larger hole first, then the 1-in.-dia. hole. If you do the reverse

you'll lose the center and consequently be unable to bore the shallow hole. Sand the insides of the side boards before assembly.

After cutting ball-retrieving slots in ends you're ready to glue up the top and sides of the table. It's not complex, but there are a number of joints and over three dozen screws to drive. Since that all takes time,

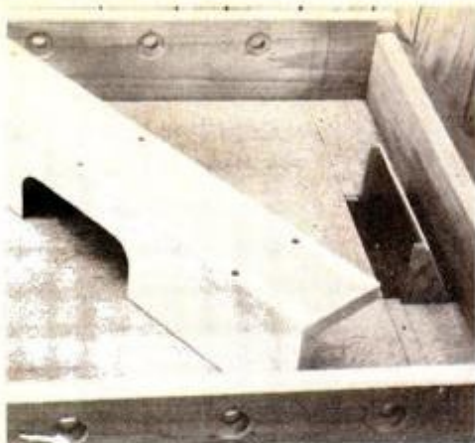
avoid using the quick-setting white or yellow glues. Instead, use a slower setting plastic resin or animal hide glue.

The goal enclosures go on next, followed by the wood filler blocks at the corners. While the glue is still handy, insert the wood plugs to conceal the screw holes.

Use a  $\frac{1}{2}$ -in. corner-rounding



PM's make-it-yourself version of table soccer challenges adults as well as children. It develops fast reflexes and provides hours of excitement.

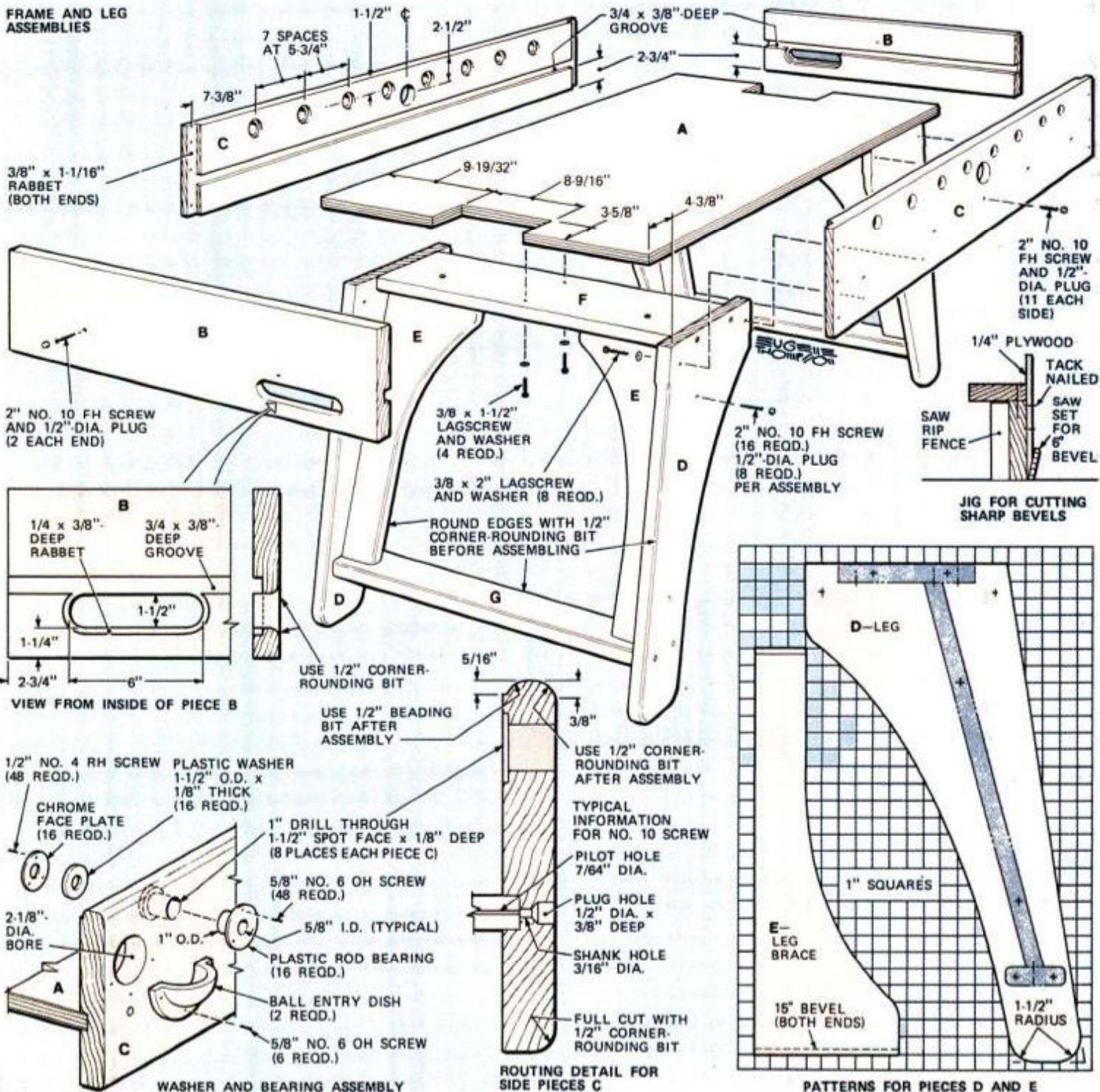


**7** Goal enclosures should be installed before tightening up side panel screws or else the fit will be difficult.

**8** Glue small wood filler blocks into the spaces at the top corners of game table; trim blocks flush later.

**9** Position patterns for the leg pieces carefully in order to minimize waste. Avoid knots and splits in the wood.

**FRAME AND LEG ASSEMBLIES**



# BUILD A TABLE SOCCER GAME

(Continued from page 125)

router bit to round outside corners, but don't take a full-depth cut along the top of the sides—otherwise the top portion of the rod bearings may show. The same precaution applies when routing the inside corners with the beading bit. The use of the bead cut is important. The resultant sharp step will help you do a professional-looking finishing job later.

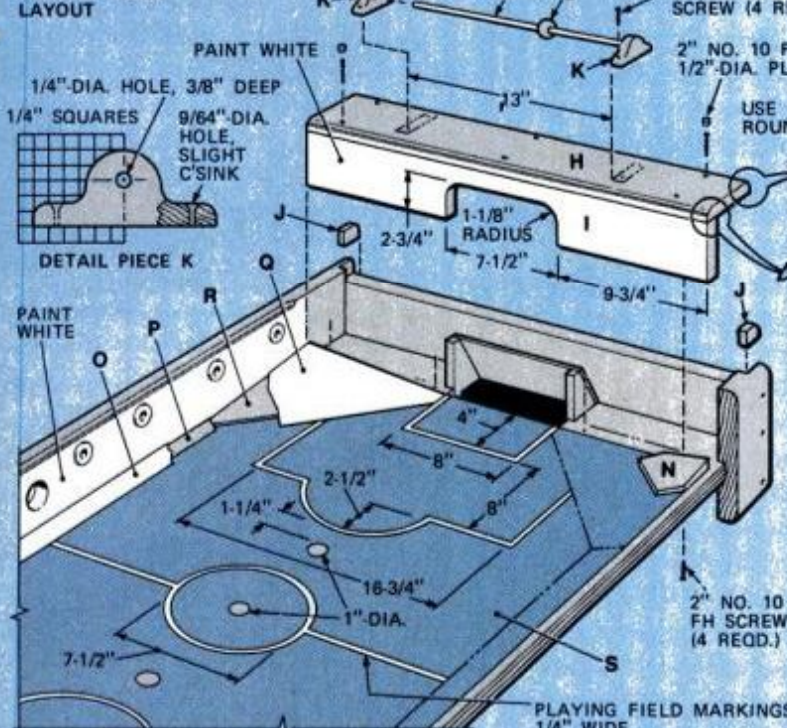
Now you're ready to try out the rods and mark the locations for the rod bearing and faceplate screws.

(Please turn to page 176)

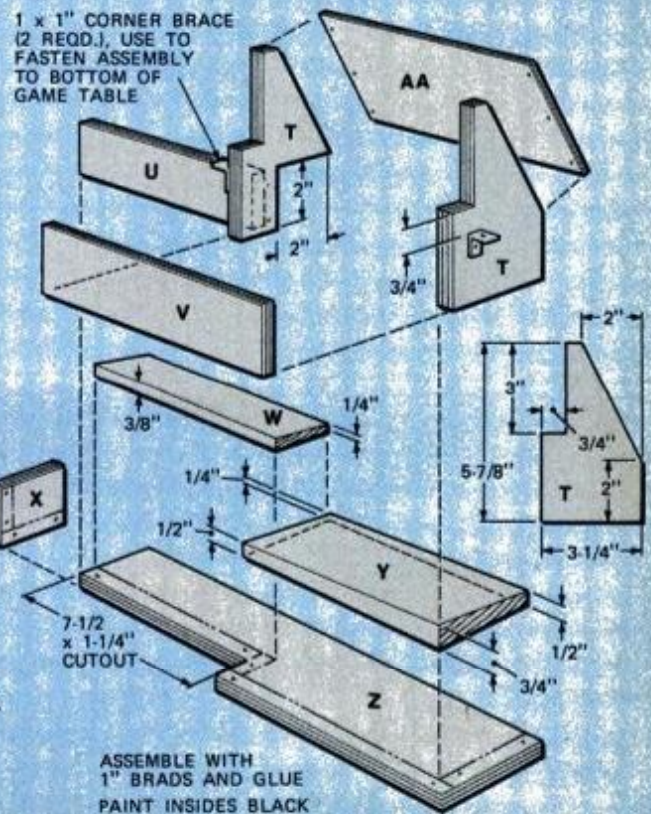
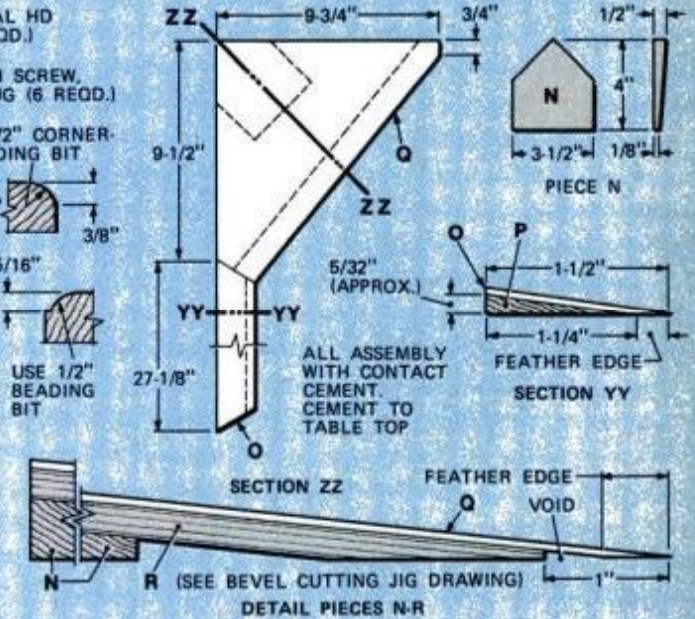
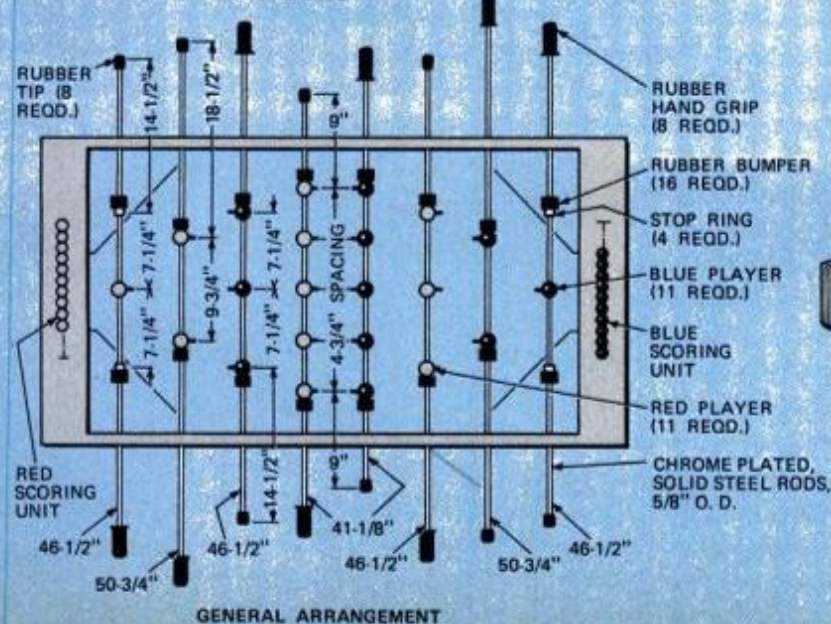
## MATERIALS LIST—TABLE SOCCER GAME

Key Amt.	Size and description (use)	Key Amt.	Size and description (use)
A 1	3/4 x 27 3/4 x 53 3/8" plywood (tabletop)	P 2	5/32 x 1 1/4 x 27 1/4" fir (wedge)
B 2	1-1/16 x 7-7/16 x 27 3/4" poplar (end)	Q 4	1/16 x 10 x 10" No. 949-60 white Formica
C 2	1-1/16 x 8 1/4 x 55" poplar (side)	R 4	1/4 x 10 x 10" plywood
D 4	1-1/16 x 16 1/2 x 29 1/2" poplar (leg, see cutting diagram)	S 1	1/16 x 26 7/8 x 46 1/4" No. 880-65 green Formica (field)
E 4	1-1/16 x 9 1/2 x 24" poplar (leg brace)	T 4	1/2 x 3 1/4 x 6" plywood (side)
F 2	1-1/16 x 8 x 24 3/8" poplar (top stretcher)	U 2	1/2 x 1 3/4 x 7 1/2" plywood (short front)
G 2	1-1/16 x 3 1/2 x 24 3/8" poplar (bottom stretcher)	V 2	1/2 x 2 1/2 x 8 1/2" plywood (long front)
H 2	13/16 x 4 3/8 x 27" poplar (goal enclosure top)	W 2	3/8 x 2 x 8" (slanted insert) cut as shown from 2x4
I 2	13/16 x 3-15/16 x 27" poplar (goal enclosure front)	X 2	1/2 x 2 1/4 x 2 1/2" plywood (end)
J 4	3/4 x 13/16 x 13/16" poplar (filler block)	Y 2	3/4 x 3 1/4 x 7 1/2" (slanted insert) cut as shown from 2x4
K 4	13/16 x 1 1/4 x 3" poplar (scoring unit blocks)	Z 2	1/2 x 3 3/4 x 16" plywood (base)
L 20	1"-dia. wood beads (score beads)	AA 2	1/4 x 4 1/4 x 8 1/2" plywood (top)
M 2	1/4"-dia. x 13 3/4" steel rod (score rod)	Misc	4, 1 x 1" corner braces; masking tape; primer; white latex enamel paint; screws and glue as required.
N 4	1/2 x 3 1/2 x 4" fir (wedge)	Note	See source box on page 177 for list of special accessories and how to obtain them.
O 2	1/16 x 1 1/2 x 28" white Formica		

### PLAYING FIELD LAYOUT



INDICATES DIRECTION PLAYER IS FACING



### BALL RETURN ASSEMBLY



1



2



3



4

# FOUR GREAT PROJECTS FROM PM'S YEAR-ROUND VACATION HOME

The second installment of PM's home carpentry series includes these four great projects from our Year-Round Vacation Home featured in last month's PM. 1. A Parsons table that is built using 3/4-in. plywood; 2. A handsome wall graphic designed by Nancy Gilbert, ASID, Armstrong Interior Design Center; 3. Hanging bookrack you can fashion in an evening and 4. An organizer for a teen-ager's bedroom.

All were featured in PM's vacation home in the September '78 issue. Now you can build them for your home.

The following project ideas were built into PM's year-round vacation home—see the cover story, September '78—but they will look good in any home. Our aim is to keep costs low and work-time short while maintaining attractive, high-quality design.

### Parsons table from plywood

The Parsons table was designed to make it easy for a do-it-yourselfer to turn out a clean-lined, contemporary table that's sturdy, durable and washable. Follow the cutting plan below to cut pieces from one sheet of 3/4-in. A-D plywood. Clamp or tack a 1x4 board to the workpiece as a guide for straight edges when you use a hand-held power saw (circular or sabre). To assemble the table, use 1 1/4-in. No. 8 fh screws and white glue. Be sure to countersink screwheads below the surface so the plastic laminate lies perfectly flat on the plywood. Fill screwhead indents, other indents and any voids in plywood edges with

plastic wood filler. When it's dry, sand filler smooth, dust.

When using plastic laminate, cut the pieces about 1/4 in. oversize with a hand hacksaw or a table saw with carbide-tip blade. Apply contact adhesive to the nondecorative side of the laminate and to the mating plywood surface to be covered. Follow maker's instructions for drying time before applying laminate, then cover plywood with two sheets of clean kraft (brown) paper, lapped 2 in. in the center.

After aligning the plastic laminate with 1/8-in. overhang on the plywood, carefully slip out the first sheet of brown paper, letting the laminate and plywood make contact at one end only. This prevents the laminate from shifting when you pull out the second sheet. Immediately tap the laminate with a hammer and a soft-wood block over the entire surface to assure a good bond.

Next, trim the laminate edges flush to the plywood edges using a

flush-trim carbide cutter in a router or a block plane. To finish, use a smooth file to get a slight bevel on trimmed edges.

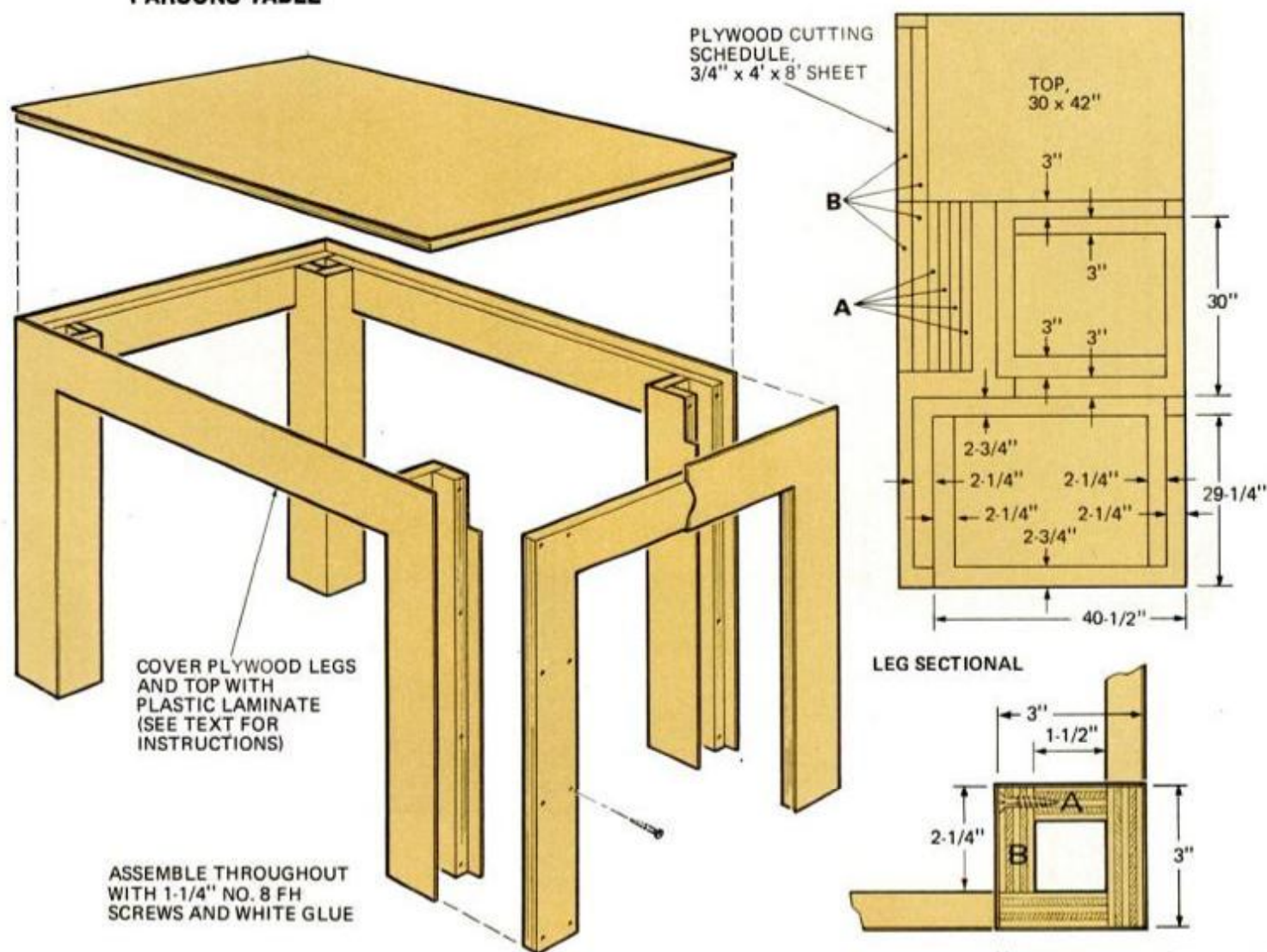
Laminate the inside faces of the table legs first, then the outside faces and, finally, the top.

### Sporty wall graphic

Plain walls in a den or bedroom can be personalized by using them to display your favorite sporting equipment. The colorful wall graphics with a fishing, hunting and skiing theme shown here, were shown on the living room wall in the PM vacation home. Letters are cut from 1/8-in. hardboard, painted and nailed to 1/4-in. paneling with 1-in. brads. Displaying equipment used regularly by family members is a practical solution to a storage problem.

The gear is attached to the wall with hooks and hangers to suit, and the shelf construction is standard. Be sure to screw shelf brackets into studs. Do not space them more than

### PARSONS TABLE



32 in. apart if you plan to store heavy items on the shelf.

### Full-height hanging shelves

From the master bedroom of the vacation home, we've selected this versatile shelf unit. It can be adapted to any room and will support a surprising amount of weight. Use heavy-weight cotton duck or canvas and hem the edges. Cut the shelves from 1/2-in. plywood and face the exposed edges with veneer tape. Glue and nail shelves to cleats and use 3/4-in., No. 8 rh brass screws to fasten through grommets in canvas stringers to cleats. The inside grommet diameter should be less than that of the screwhead.

To distribute weight where the nylon straps and canvas join, bond rectangular plywood reinforcements to "tails" of canvas panels with glue. Staples or upholstery tacks can also be used to be certain the

fabric will not tear loose. Triple-stitch canvas at the panel ends with heavy-duty carpet thread.

Finally, fasten the unit to the ceiling and anchor it to the floor with 3/8-in.-dia. screw hooks. Be certain the top hook is screwed into a ceiling joist—not simply into paneling, lath or drywall where the installation would be sure to fail.

### Canvas pocket organizers

We've made good use of the backside of a desk/divider by utilizing the space for an organizer. The canvas pockets are a good way to sort and store all the miscellany that can tend to clutter a teenager's bedroom.

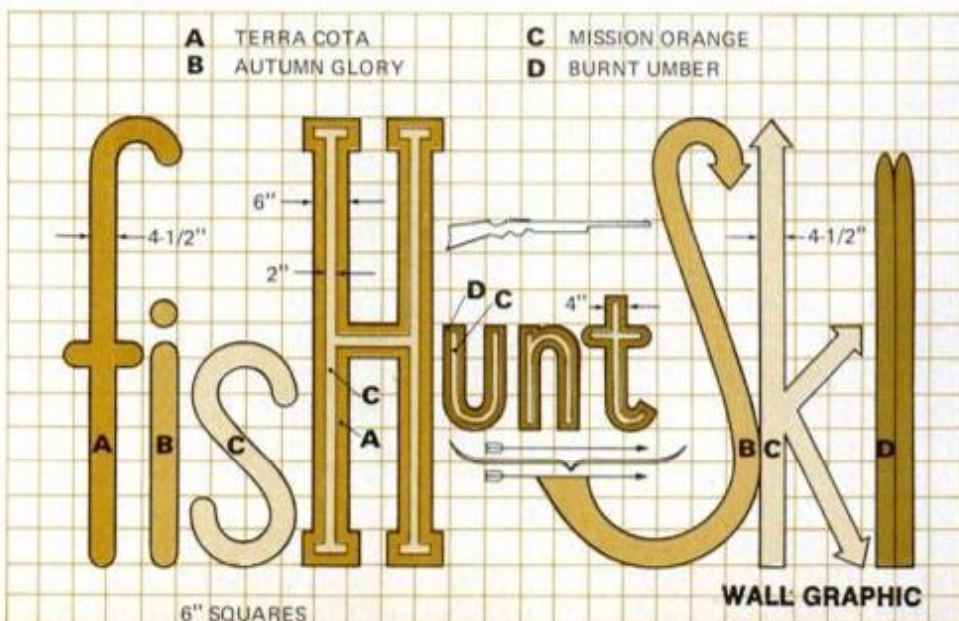
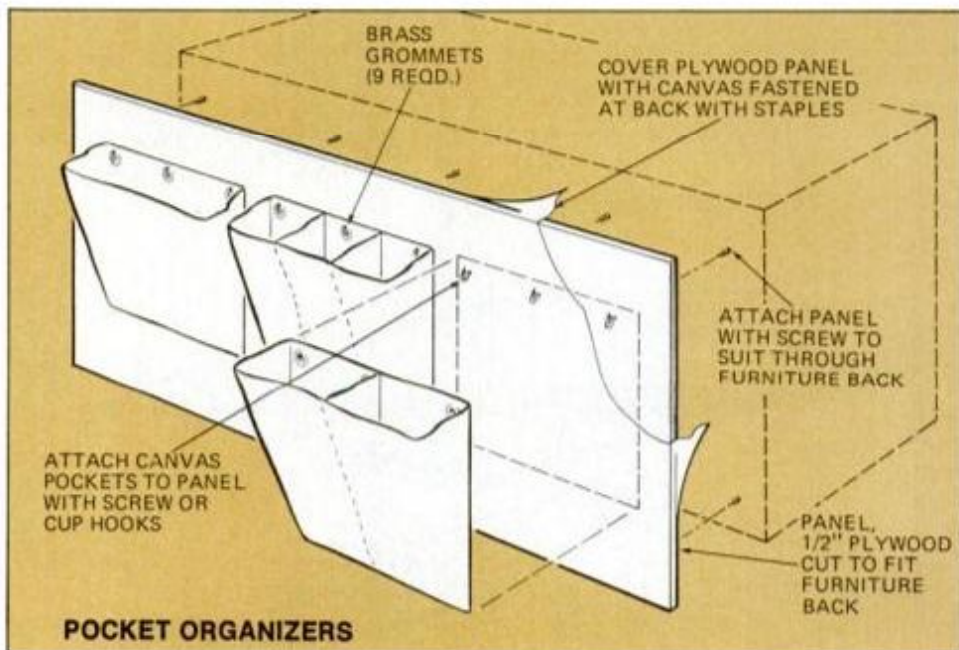
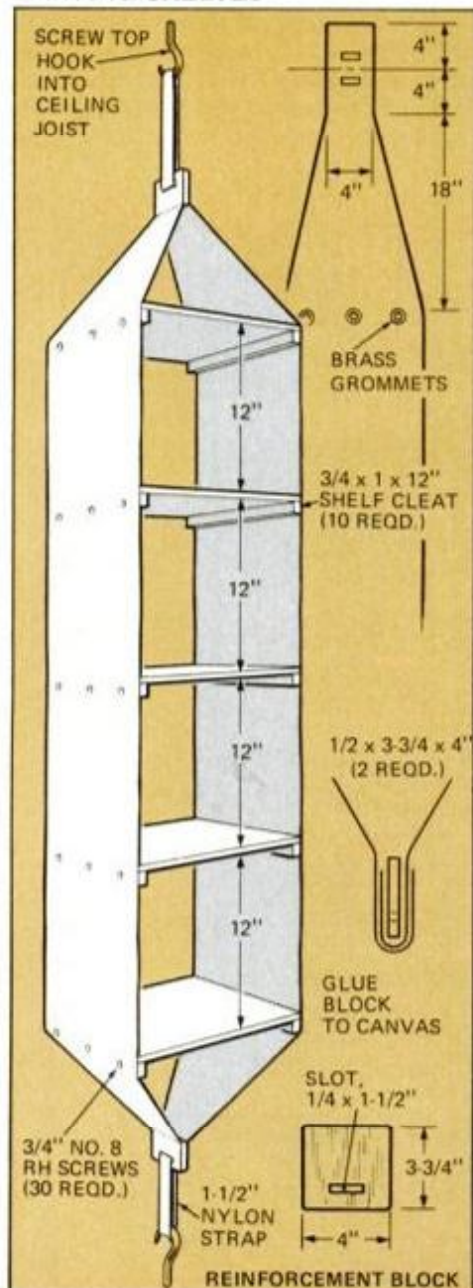
Cut a pattern size to suit your needs from brown paper first. Then cut canvas pockets and dividers. Exposed edges are hemmed and then the pockets are top-stitched to a canvas panel. If labeling is de-

sired, do it before you sew the pockets to the panel.

Cut word stencils from stencil paper using an X-acto or utility knife. Use a stencil brush with a vertical, pecking-like motion to apply textile ink through cutouts in the stencil mask. Most textile inks require five minutes ironing on the front and backside of the printed fabric to allow ink to bond permanently with the cloth. Read the instructions that are printed on the ink can's label.

Cut a backing for the pocket organizer from 1/2-in. plywood to fit the back of a desk or bookcase which is being used as a divider. Cover the plywood with canvas and fasten it to the back with staples or tacks. Screw the panel to the furniture back. Then use brass grommets and brass cup hooks to hang the organizers where they are within easy reach.

### HANGING SHELVES



# Two great ideas for your workshop

If you cut a lot of long boards and plywood, this pair of roller-equipped sawhorses will make your table-saw tasks easier and safer. Cut apart six aluminum appliance rollers (\$5.99 a pair at Sears) to get 12 pairs of casters, six for each sawhorse setup. Lay out notches in 2x4 cross members as shown below. Remove rubber padding from rollers. Measure distance between saw table and floor, and sawhorse and roller heights to determine depth notches should be cut. Height of my saw is 36½ in.; sawhorses, 36 in.; and rollers, 1¾ in. Thus, the notch depth was ⅞ in.

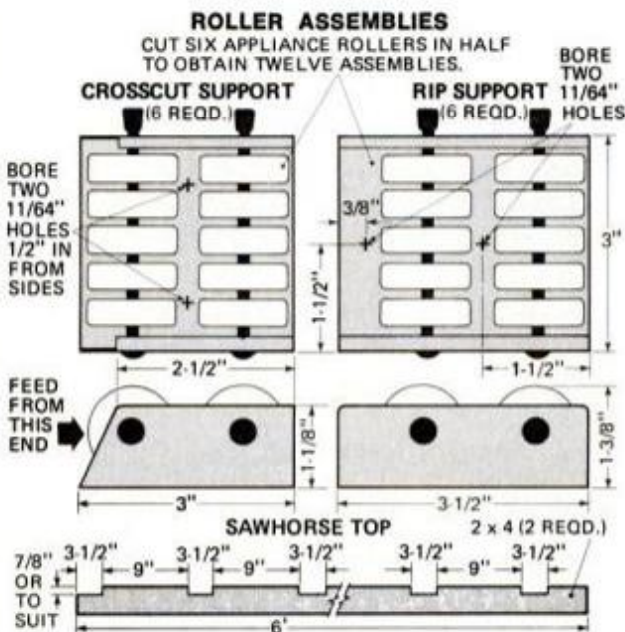
For the first sawhorse, mark a lengthwise centerline in each notch. Cut six pairs of rollers to 3½ in. and mark lengthwise centerline on each. Punch one mark between wheels on centerline and another outside the wheels ⅜ in. from end. Drill 3/16-in. holes in roller base. Place rollers in notched areas with casters positioned to rotate for rip support. Line up centerlines on notches and casters, drill 3/32-in. pilot holes and fasten half-rollers in notches with ¾-in. No. 10 screws.

For a crosscut sawhorse, cut rollers to 3 in. and cut away metal from each side at 30° angle as shown. This provides a clearance for moving a workpiece to roll on the casters without hitting aluminum sides. Mark and bore two holes on each assembly between the casters, ½ in. from the sides.

When you use a crosscut sawhorse, place it so that the rollers are parallel to the saw blade.—*Charles A. Kircher*



Install rollers on two sawhorses for easy, safe cutting of 4x8-ft. plywood.

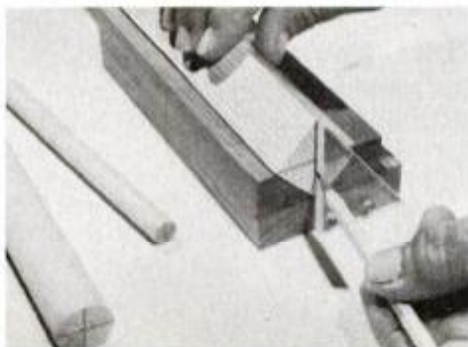


Appliance rollers are installed as shown on sawhorse that serves for rip support.



Sawhorses convert for regular use by simply flopping 2x4 cross member.

For a simple, yet precise, method of locating the centers of dowel ends, build this jig of hardwood scraps and a small piece of clear sheet acrylic. To use it, lay dowel in the 90° trough, push it flush against

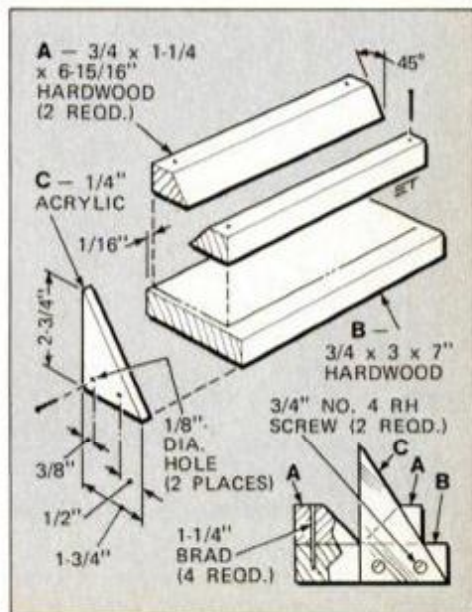


Accurate jig can be used to find centers on round (foreground) and square stock.

the acrylic triangle and draw a line on the dowel end. Rotate dowel, draw a second line and both lines will intersect at the precise center—there's no chance of slippage. You'll find that the jig will be particularly useful when you are working with small dowels that are difficult to hold in position against a combination square.

Jig takes any size dowel up to 4 in. in diameter. It can also be used to center square stock up to 2x2 in. or to draw 45° diagonals on larger pieces.

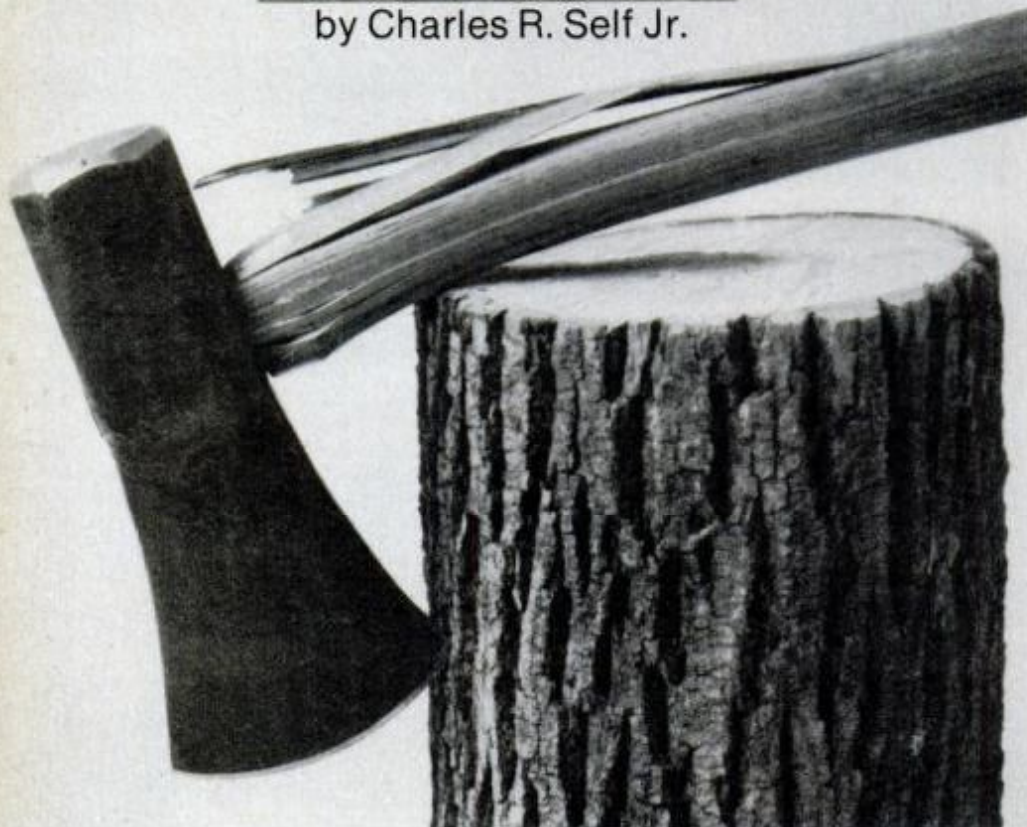
The trough is 1/16 in. shorter than jig's 7-in. base so dowels slide exactly flush against acrylic. Insert a screw eye into base for handy wall hanging.—*Rosario Capotosto and John Gaynor*



# How to replace a broken tool handle

The right handle properly installed assures safety and saves you the price of a new tool.

by Charles R. Self Jr.



Overstriking causes many broken handles—especially with long-handled tools.

With more and more homeowners using axes, woodsplitting mauls, sledges and other heavy striking tools, the need to replace broken handles is on the upswing. Overstriking, says Dennis Mosholder, at Warren Tool Div., is the primary cause of broken handles with heavy, long-handled tools. The only sure cure for overstriking, which is caused by inaccuracy, is more experience, care and concentration on the part of the tool user.

Lighter tools with shorter handles are easier to use accurately. Thus, claw and ballpeen hammers, shingling hatchets and others will usually require a handle replacement as a result of misuse, not overstriking. Everyone knows that the claw hammer isn't made for yanking out large nails, but sooner or later nearly all of us use it to pull a spike or two. Abuse of this sort, along with overstriking, will quickly snap even the best quality wooden handles.

When a handle breaks, you must select a new one of the correct size, style and quality. Size and style are simple: get the handle designed for your particular tool. A sledgehammer handle won't fit an ax eye, nor will a handle for a post maul fit a miner's pick. When shopping, take the toolhead with you. If you remove the broken handle ahead of time, it's easy to test the new handle for fit.

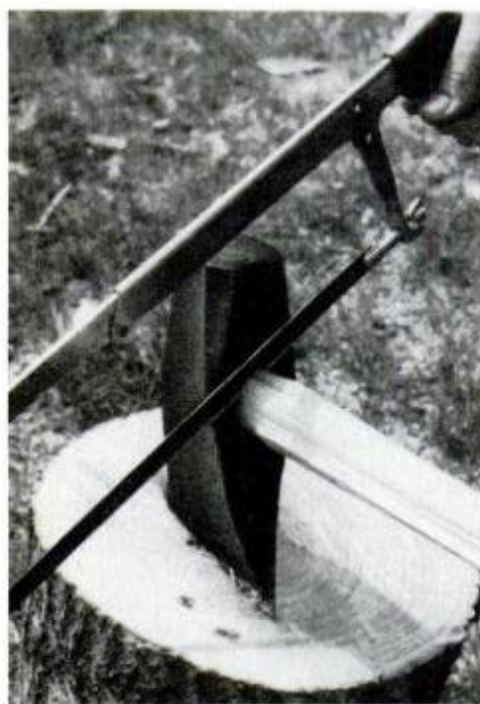
Handle quality is a bit more difficult to judge, although you can pretty much go by cost; you get what you pay for. Generally, check new handles for defects of any kind, from knots to wavy grain patterns. Select the handle with the straightest grain, and *no* knots. Look for a heavy handle. The denser the hickory is, the stronger the tool handle will be.

There are many grades of quality. Price seldom varies by more than a few dollars between the best and cheapest hickory for even the largest and longest handles. But a properly-installed, top-of-the-line handle often lasts five times longer than a cheaper model.

## Hickory versus ash

Hickory is the best wood for striking tool handles. For a time, I tried ash handles on my woodsplitting mauls. Ash has more spring and absorbs a bit more shock than hickory. But the ash just wouldn't stand up to heavy use, so I'm back to hickory.

Handle length is a matter of personal choice, although most experts recommend that axes, sledges and other larger tools stay with the



**1** Use hacksaw with coarse blade (14-18 teeth per inch) to cut away splintered handle flush with bottom of tool eye.



**2** Straddle tool head between solid surfaces or lock in a vise and use punch to remove rest of handle from eye.



original length handle, usually 32 inches. Smaller hammers, hatchets and other lighter tools usually have handles about 15 in. long, although this varies depending on head weight. Adding longer handles to large tools can add to overstrike problems since an overlong handle is harder to control.

If the original handle was suitable, there's no reason to change size. If it was too short, borrow a tool with a longer handle for a tryout before installing one on your own tool.

Hickory handles offer many advantages, including reasonable shock absorption and great strength and longevity. Proper installation, however, is vital. A poorly installed handle breaks quickly, endangering user or bystanders.

Follow the procedure in photos 1 through 10 for replacing handles on most tools with through-type heads. Step 1 shows a hacksaw being used to remove the remainder of the broken handle. The hacksaw blade won't be damaged when you come in contact with the metal at the base of the eye.

In Steps 2 and 3, a metal punch or drill may be used to remove the short segment of handle from the eye. Be certain to wear safety goggles during striking and drilling operations.

### Freeing glued handles

Some handles are glued in with epoxy. In such cases, Tom Wilkinson of Railway Handle recommends careful application of heat with a propane torch to warm the epoxy. Remove the wedges by driving or drilling them out before applying heat. Heat softens the epoxy, making removal easy, but too much heat can alter the temper of the ax or hammer. Be careful not to get the metal red hot.

Steps 4 through 9 show the proper method for fitting and securing the handle in the tool eye. Start by inserting the new handle in the eye using hand pressure. Check the fit. Tightness is essential, even in a push fit. Judge whether the wedges will expand the handle top to fill the eye. If not, the replacement handle is too small. Large-handled tools, like axes, should have the shoulder come about  $\frac{3}{4}$  to 1 in. below the bottom of the eye. Smaller tools need less shoulder length.

If material must be removed to move the shoulder up, do it carefully and slowly. Use a Surform tool or wood rasp, taking off only small amounts and checking the fit often. Touch up with medium-grit sand-

*(Please turn to page 150)*



**3** If the handle is exceptionally tight in the eye, bore several holes, then drive out the rest of the material.



**4** Fit new handle to tool eye. In some cases, excess wood will have to be removed to achieve proper fit (see text).



**5** After making initial fit, check that wedges are large enough to expand the wood to fill the eye completely.



**6** After opening up the wedge slots with a chisel, insert wood wedges (as shown) and drive in as far as possible.



**7** When tight, use the hacksaw to trim the new handle and wood wedges flush with the top of the tool eye.



**8** Drive metal wedges perpendicular to wood wedges. Small, almond-shaped ax eyes may need only one metal wedge.



**9** If job is done right, the new handle will be tight. Don't rely on wedges to correct mistakes made in fitting.



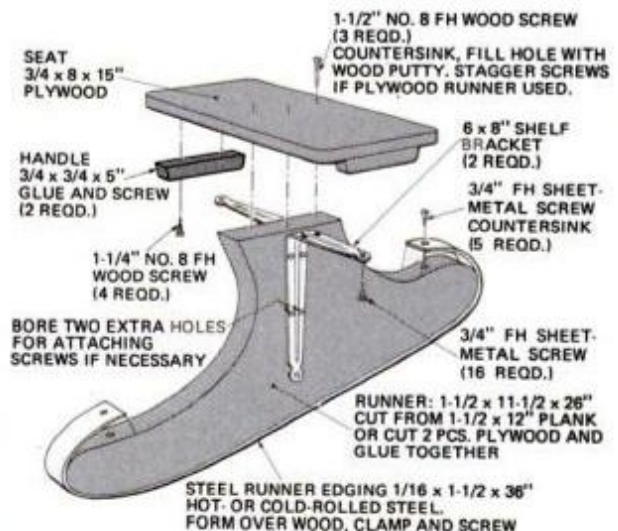
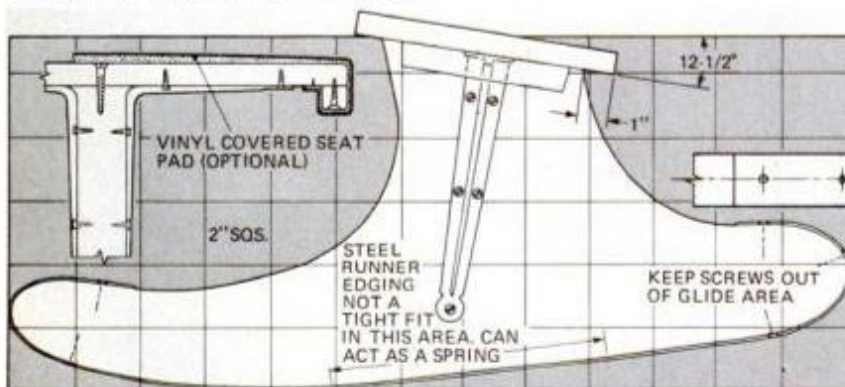
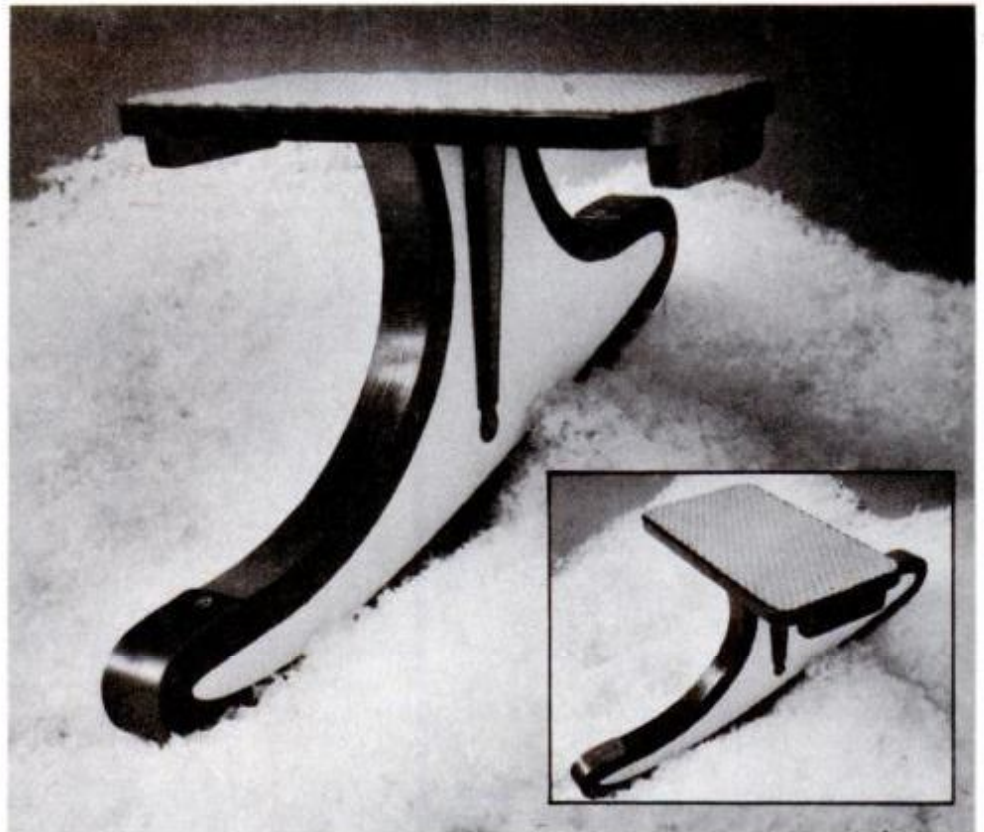
**10** Rub down handle with boiled linseed oil, taking care to coat top of the eye and spots where trimming was done.

# Single-runner sled you can build in a jiffy

A challenge to ride and race, single-runner sleds like this one are soaring in popularity. With handles and a padded seat, they're quite safe for kids. Build one for about \$10. Ours is constructed from a 1½ x 11½ x 26-in. length of fir that's free of defects. Or use two pieces of ¾-in. exterior plywood joined with resorcinol glue. Clamp this lamination for at least 24 hours and drive 1¼-in. nails in from both sides. Locate nails so they won't be hit by your saw blade later when you cut the board to shape.

Use a grid with 2-in. squares to enlarge the pattern and trace it on wood. Use coping or sabre saw to cut out. Sand wood smooth and round all edges. For the runner, use a 1/16 x 1½ x 36-in. bar of hot-rolled steel. Cold-rolled will also work, but it's more difficult to bend. To find steel, check hardware stores, steel distributors and welding shops, or order a piece for \$4.50 postpaid from Capro Craft, Box 18, Greenlawn, N.Y. 11740.

Make a pencil mark on the bottom runner portion of the sled body 13 in. from the front tip. Mark the center of the steel bar. Align the marks to position steel exactly around contour of wood.



To shape steel, drive 13 16d common nails firmly around the perimeter of the sled body, wedging steel tightly around the runner portion as shown. Wrap layers of masking tape on ends of steel to protect your hands. Later, when nails are pulled, the steel will spring back slightly. So be sure to place the two final nails about ½ in. from the ends to hold assembly rigid.

Drill pilot holes for five runner

[\(Please turn to page 214\)](#)



Use 10d common nails into bench top to hold runner for bending steel edge.



As you bend steel runner edge to shape, lock it in place with more nails.

**DOCTOR'S PROGRAM FEATURING CRASH-BURN DIET AND AMAZING CAPSULE FORCES YOUR BODY TO BURN AWAY FAT AS IT...**

# Neutralizes All The Calories In The Food You Eat!

**Meaning: After Each Time You Eat, Your Body Breaks Down Bulging Fat and Burns It Away — So You Grow Slimmer and Slimmer From Meal to Meal. (up to a full size smaller in just 5 days) . . . as you melt away both fluid and fat at the incredible rate of as much as**

**2 POUNDS GONE THE FIRST 24 HOURS  
6 POUNDS GONE THE FIRST 48 HOURS  
10 POUNDS GONE THE FIRST 7 DAYS**

**BURNS AWAY UP TO ANOTHER 30 — 40 — 50 POUNDS, OR EVEN MORE!**

**URNS EVERY LAST BIT OF FOOD YOU EAT INTO BURNED-AWAY ENERGY INSTEAD OF STORED-UP FAT!** Medical science has proven conclusively that in your body there exists a fat-burning system of natural chemical fat-destroyers so powerful they are capable of **NEUTRALIZING THE EFFECT OF ALL THE CALORIES IN THE FOOD YOU EAT.** That once you discover how to unleash these fat-destroyer chemicals against clinging pockets of fat . . . you can actually compel your body to **GROW SLIMMER, INSTEAD OF FATTER, AFTER EACH MEAL YOU EAT!**

**WORKS SO FAST — THE VERY FIRST WEEK ALONE YOU LOSE AN AVERAGE OF UP TO 1½ POUNDS OF BODY FLUID AND FAT EVERY 24 HOURS!** Now from one of America's leading obesity specialists comes a thrilling crash-burn way to slimmness . . . that does away with all the torture of rigorous diet **ONCE AND FOR ALL — ends brutal exercise FOREVER!**

What this doctor has done is simply this: Found a surefire way for you to gently raise the level of your fat-burning metabolism . . . step up the flow of your body's own natural fat-burners . . . so that every time you eat . . . your system automatically **NEUTRALIZES THE EFFECT OF ALL THE CALORIES IN THE FOOD YOU TAKE IN — AND YOUR BODY MELTS AWAY FAT LIKE HOT WATER MELTS DOWN ICE!**

Yes, with this doctor's thrilling **ANTI-CALORIE PROGRAM** and capsule, you "rev up" your inner furnace — you neutralize all the calories coming in — so not one ounce of the food you eat can possibly turn to fat:

**ACTUALLY SHRINKS YOUR BODY'S FAT CELLS STARTING IN JUST HOURS!** Yes, based on published reports from professors at leading medical schools . . . **PLUS** experimental fat-burning studies on U.S. Army officers, West Point Cadets and independent research tests . . . with the food you eat on this doctor's **CAPSULE PROGRAM** . . . your body automatically neutralizes the effect of all the calories you take in — automatically forces pounds and inches to vanish so **FAST**, that before you hardly know it, you:

- LOSE UP TO 4 TO 6 INCHES OFF YOUR WAISTLINE**
- LOSE UP TO 2 TO 5 INCHES OFF YOUR HIPS**
- LOSE UP TO 3 INCHES OFF YOUR THIGHS**
- LOSE UP TO 4 INCHES OFF YOUR BUTTOCKS**
- LOSE UP TO 4 INCHES OFF YOUR STOMACH**

. . . as you start to win the physique of a naturally skinny person . . . those types who never seem to gain an ounce!

**YOUR TUMMY FEELS LIKE YOU FEASTED, BUT YOUR WAISTLINE LOOKS LIKE YOU FASTED!** Just to give you an idea of how fast this thrilling anti-fat wonder-weapon burns away excess fat and inches . . . according to California University Medical School research on energy burn-off you can actually melt away more fat each 24 hours than if you ran 10 to 14 miles a day! — Lose more pounds each week than if you did 300 sit-ups each morning and 300 push-ups each night! **LOSE** as much as a **FULL SIZE THE FIRST 5 DAYS ALONE . . .**

**BEST OF ALL — YOU STAY SLIM FOR GOOD! BECAUSE AT LONG LAST, YOU HAVE IN YOUR HANDS A LIFETIME WEAPON TO DEFEND YOURSELF AGAINST FAT BUILD-UP!** Yes, when you arm yourself with this thrilling **ANTI-CALORIE CRASH-BURN PROGRAM** and doctor's capsule . . . you actually fortify yourself with the only thing you'll ever need for **LIFETIME PROTECTION** against excessive fat build-up. That's because, medical science now offers you a proven way to neutralize all the calories in the food you eat — gently step up your metabolism . . . stimulate

**VITAL NOTICE:** Before starting this program, consult with your physician to be sure you are in normal health and your only problem is excess weight. Individuals with high blood pressure, heart disease, diabetes, or thyroid disease should use only as directed by a family physician and see if he doesn't agree that this Lifetime Road to Slimmness including the few minutes of nightly toneup the doctor highly recommends is by far one of the most medically sound, fully sensible approaches to the problem of excess weight.



Instead of being stored as fat, it is **AUTOMATICALLY** converted to burned-away energy.

**TWO — YOU GRADUALLY ACCELERATE YOUR FAT-BURNING METABOLISM** by greater caloric burn-off than intake. Meaning: your body, without you even feeling it, unleashes a steady surge of fat-burner chemicals directly into your system to attack stored-up fat . . . automatically breaks down . . . converts it into fluid . . . that drains right out of your body!

Just like a furnace grows hotter and hotter the more you stoke it . . . so your own body burns away fat faster and faster the more you step up your fat-burning metabolism.

**THREE — YOU COMPLETELY DEFEAT THE GREATEST SINGLE CAUSE OF FAT BUILD-UP,** runaway appetite and overeating. Because the moment you take this doctor's **CAPSULE**, ravenous hunger disappears. Gnawing appetite is switched off . . . you lose your craving for food for hours at a time.

More significant . . . when you do eat on this Doctor's **CRASH-LOSS** diet and Lifetime-Slim maintenance program, since your body completely **NEUTRALIZES THE FAT-BUILDING EFFECT OF ALL THE CALORIES IN THE FOOD YOU EAT**, excess fat simply cannot form . . . stored-up body fat burned off and melted away by the hour — and you continue to grow slimmer instead of fatter after each meal you eat!

**DOCTOR ADVISES: USE THIS CRASH-BURN PROGRAM ONLY WHILE YOU'RE OVERWEIGHT . . . OTHERWISE YOU MIGHT GROW TOO THIN!** Of course, there is one thing you must keep in mind. You cannot use this **CAPSULE CRASH-BURN PROGRAM** indefinitely . . . otherwise, you might become overly thin.

Also, as long as you are on this **ANTI-CALORIE** Program you cannot stuff and gorge yourself silly on over-rich, high-fat foods. There is a reasonable limit on just how fast medical science can help you safely burn away fat. **BUT —** and here's the very heart of this wondrous development: Because this thrilling **ANTI-CALORIE** concept not only helps you neutralize the effect of the calories in all the food you eat . . . but **ALSO** puts gnawing appetite to sleep . . . you simply lose that driving urge, that maddening craze to make fattening food the very center of your existence . . . thanks to this medically proven formula that contains the most powerful reducing aid ever approved for release to the public, without a prescription, by the United States Government!

Now just think what this great **ANTI-FAT** weapon means to you, if all your life you've had to fight off excess pounds, battle away inches?

**WHY "KILL" YOURSELF WITH BRUTAL DIET OR TORTUROUS EXERCISE? NOW — YOU CAN ENJOY A LIFETIME OF SLIMNESS WITHOUT RAVENOUS HUNGER!** It means that from this day on . . . you simply start the **ALL-OUT ASSAULT ON FAT** by taking these medically proven **CAPSULES . . .** called "Thera-Thin", before eating . . . as part of this incredible **"CRASH-BURN" PROGRAM . . .** to help you **NEUTRALIZE ALL THE CALORIES IN THE FOOD YOU EAT!** You gently raise the level of your fat-burning metabolism . . . "rev up" that inner furnace . . . unlock and activate the natural chemical fat-burners nature has placed in your body . . . and **BURN AWAY FAT, MELT AWAY INCHES** as you start to grow slimmer and slimmer from meal to meal!

**REMEMBER:** You must see dramatic results in just 24 hours — results you can see on your scale with your very own eyes, the very first morning . . . yes, you must:

- LOSE up to 6 lbs. the first 48 hours**
- LOSE up to 10 lbs. the first 7 days**
- LOSE up to 7 lbs. more the next 7 days**

or "Thera-Thin" costs you nothing! Simply return within 10 days for full refund (except postage and handling, of course). Act now! Send **NO-RISK TRIAL SUPPLY** today!

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and "target" your body's "fat-burner" chemicals to attack clinging pockets of fat, so you burn away excess flab meal to meal these 3 medically proven ways:

**ONE — BECAUSE YOU CONSTANTLY NEUTRALIZE THE EFFECT OF THE CALORIES IN THE FOOD YOU EAT. YOU BURN AWAY STORED-UP FAT AND CONTINUE TO GROW SLIMMER AND SLIMMER FROM MEAL TO MEAL!** Yes, when you launch yourself on this doctor's calorie-deficit crash-burn program you gently step up your inner furnace! So when food enters your body,

**MAIL NO-RISK COUPON TODAY**

**PENN-BIO PHARMACALS, Dept. JACO-21, Caroline Road, Philadelphia, PA 19176**

Yes, I want to burn away excess weight fast and permanently with this doctor's "crash-loss" **ANTI-CALORIE CAPSULE-PROGRAM** featuring amazing "THERA-THIN". Please rush me the offer I have checked below. If not delighted, I may return it in 10 days for refund (except postage & handling), of course.

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- (#003) Full 21-day supply . . . only \$6.95 plus 50¢ postage & handling
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- 5690

Total amount enclosed \$ \_\_\_\_\_ PA residents add 6% sales tax. Check or money order, no CODs please.

**CHARGE IT:** (check one) Exp. Date \_\_\_\_\_

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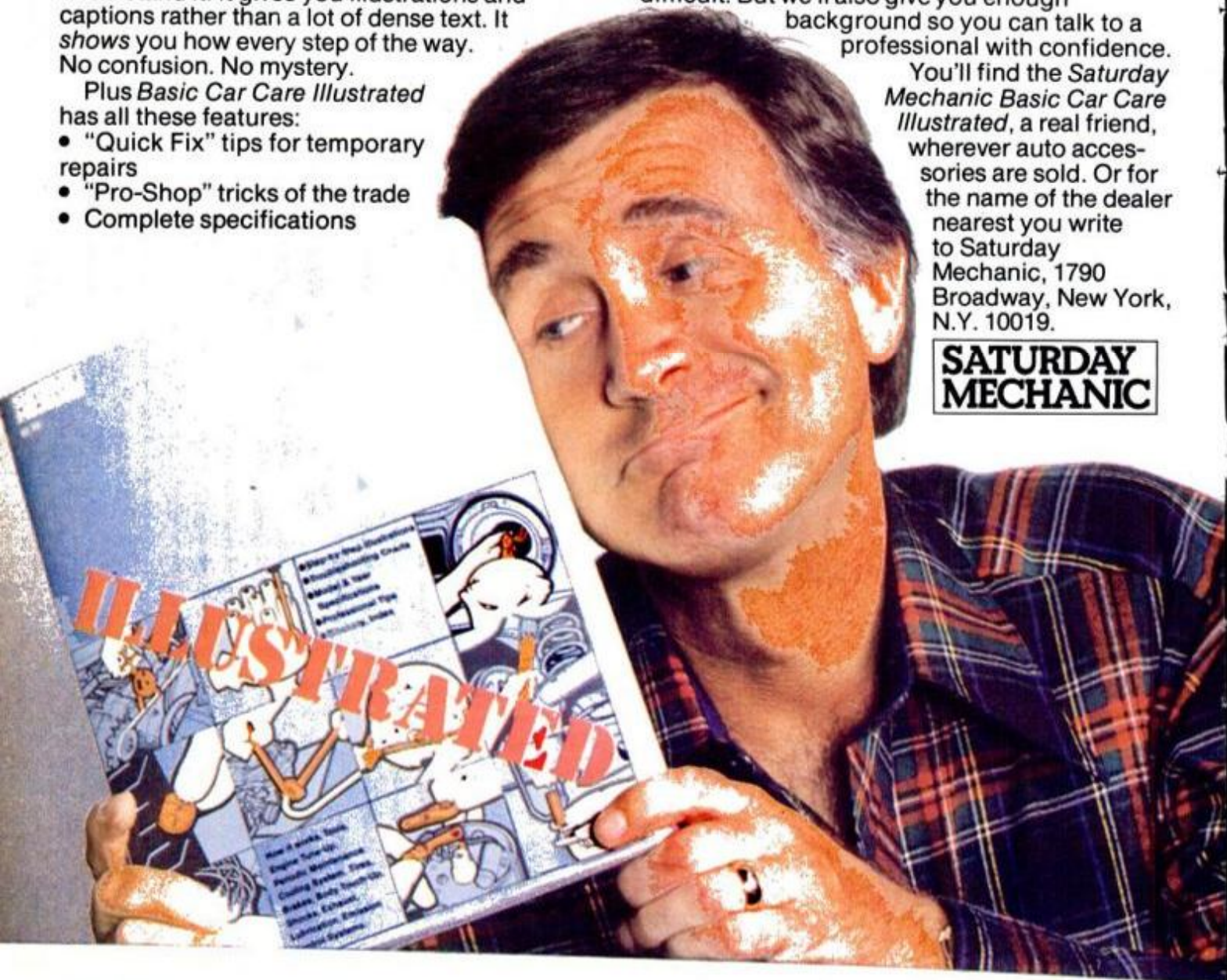
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And because we recognize the do-it-yourselfer has limited tools, time and experience,

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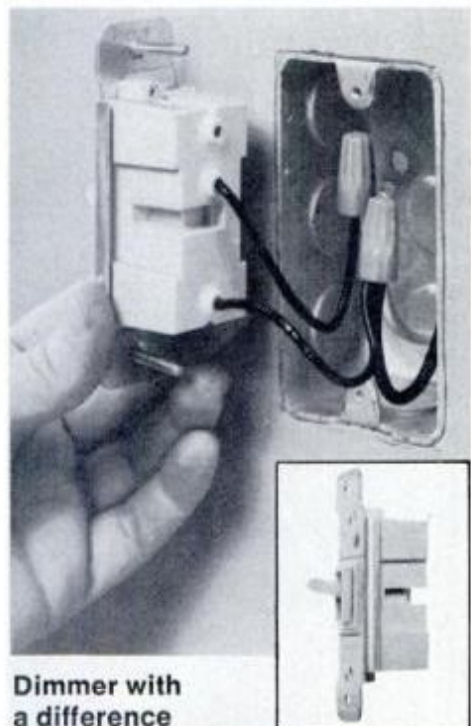
You'll find the *Saturday Mechanic Basic Car Care Illustrated*, a real friend, wherever auto accessories are sold. Or for the name of the dealer nearest you write to Saturday Mechanic, 1790 Broadway, New York, N.Y. 10019.

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# NEW NOW for home and shop



**Dimmer with  
a difference**

A dimmer control that masquerades as a standard toggle switch? It's the Light Demand, a dimmer device that you can install in an ordinary wall switch box. This unit bypasses the dimming circuit at full-on and has click stops at full-on and off positions. A 600-watt model is available for \$6.49, while the 1000-watt model costs \$29.95. Power Controls Corp., 11923 Radium Dr., Box 32969, San Antonio, Tex. 78216.



**Five-in-one machine shop**

You can tool any small part in metal, wood or plastic with the Edelstaal Machinex 5". This versatile unit combines a lathe, drill press, miller, grinder and polisher into one compact system. The headstock/motor/drive unit mounts on the lathe bed or on the vertical column (in the photo, an optional accessory drive unit is shown mounted). The pulleys allow a choice of six speeds ranging from 250 to 4000 rpm. The standard 20-inch-bed model is available for \$440 and a 24-inch model costs \$470. Distributed by American Edelstaal Inc., 1 Atwood Ave., Tenafly, N.J. 07670.



**Whole-house  
water filter**

The Clean Water System installs on any 3/4-in. copper water line in approximately 20 minutes without the use of special tools. It costs about \$50. Two types of replaceable cartridges are available. The Rust and Sediment filter (which costs \$2.49) is said to remove sludge, scale, algae and sediment, while The Taste and Odor filter, priced at \$4.99, removes those things in addition to chlorine, sulfur and other chemicals. The kit, which includes the Taste and Odor filter, is available from the Omni Corp., 900 East 162nd St., South Holland, Ill. 60473.



**Tools of the trade**

The 45-piece Super Tool Set includes interchangeable screwdriver, nutdriver and hexdriver handles and blades, along with various pliers, electrical tools and screwdrivers. All fit on a pallet for wall mounting. Set 70420 is \$160. Vaco, 1510 Skokie Blvd., Northbrook, Ill. 60062.

# How to work with plastic piping

Now flexible polybutylene piping teams up with CPVC pipe to let you do your own plumbing.

by Jim McIntosh



Some years ago, when copper tubing was the only smart choice for home water pipes, do-it-yourself plumbers enjoyed a complete system comprised of hard-temper (rigid) and soft-temper (flexible) copper. They could use the one that best suited their purpose—rigid pipe for neat-looking, exposed plumbing and flexible pipe for threading through walls and floors.

When rigid chlorinated polyvinyl chloride (CPVC) pipe was introduced, it made home plumbing a great deal easier, but didn't offer a system. Now, with the advent of flexible polybutylene (PB) pipe, plumbers again have the choice they had with copper, but at less cost and with far less effort. CPVC serves as the "hard-temper" and PB as the "soft-temper" thermoplastic pipe. Where one isn't best for a specific task, the other is.

Plastic pipe materials, usually beige in color are sold at hardware stores, home centers and wholesale plumbing outlets. Both CPVC and PB service hot and cold water and have a complete line of fittings. CPVC joins via simple solvent-welding. PB can't be solvent-welded, but joins with even greater ease using mechanical adapters, which solvent-weld to all standard CPVC fittings.

Both CPVC and PB can be cut

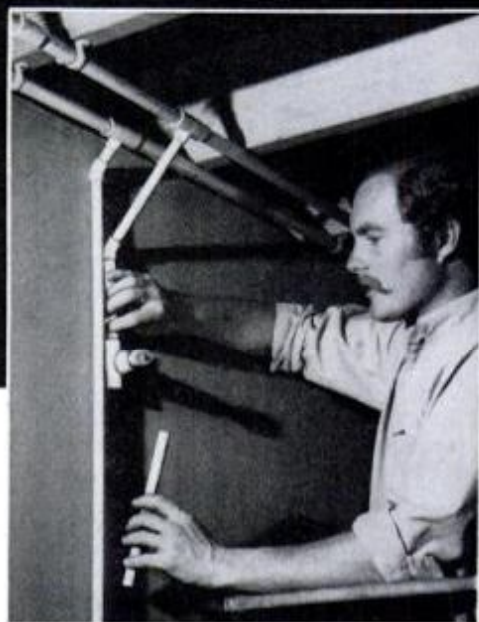
with any fine-toothed saw. CPVC is usually sold in rigid, 10-ft. lengths with  $\frac{1}{2}$  and  $\frac{3}{4}$ -in. outside diameters. PB comes in 25 and 100-ft. coils with  $\frac{3}{8}$ ,  $\frac{1}{2}$  and  $\frac{3}{4}$ -in. outside diameters. According to Genova, a large manufacturer of thermoplastic piping, CPVC and PB pipes and fittings in these sizes are common.

Neither CPVC nor PB should be compared to lesser quality black polyethylene (PE) or polyvinyl chloride (PVC) pipe. PVC and PE should never be used inside a house for water supply; they can't stand up to household hot water.

Perhaps the chief reason for do-it-yourself use of CPVC/PB piping is its ease of installation. There's no more hand-tightening of pipe ends and no more sweat-soldering flames playing around your pipes. Solvent CPVC welding requires only a clean cloth, plus cans of cleaner and solvent. Joining PB requires even less—sandpaper and a little petroleum jelly.

## Deciding which to use

CPVC, because it's rigid, runs off with the honors for appearance. It's best used where piping will be seen: in basements, unfinished utility rooms and garages. It's also useful where pipe must support a faucet, such as an outdoor hose bibb. Use CPVC for pipe sections requiring



For a neat, craftsmanlike look where plumbing shows—as it does in this basement hookup—use rigid CPVC piping.



When piping must be fitted behind walls or fished through openings, use flexible PB to save your time and effort.

Материал, защищенный авторским правом



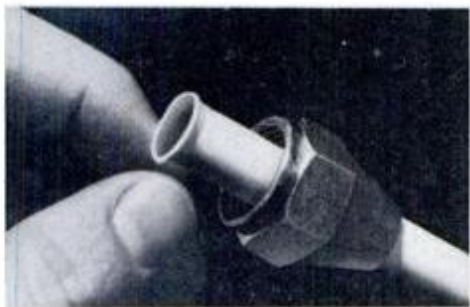
To join plastic pipe to fitting, remove burrs from cut end with knife, apply the cleaner-primer. Finally, apply solvent cement using swab that comes in the can.



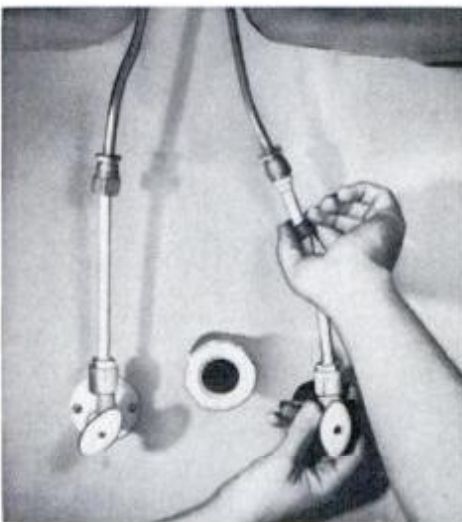
Immediately after applying the cement, join the pieces with a twisting motion. Quickly orient fitting because solvent dries rapidly. Wipe off any squeeze-out.



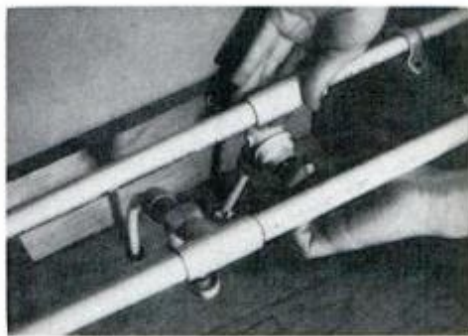
To join PB to PB, CPVC or metal pipe, use an adapter that hand-tightens. Cut tube end even (use miterbox), round corners slightly, coat with petroleum jelly.



PB and CPVC can be joined by using the same flaring tool as for copper. Fittings like this, on a flared riser tube, help join PB to uncommon fixtures.



Use superflexible PB riser tubes between all types of fixture shutoff valves and faucet tailpipes. Tubes seal the inside threaded fittings, are held by nuts.



Ideal combination: rigid CPVC pipes look tidy in basement while flexible PB riser tubes simplify runs to fixtures. Combination saves much cutting and fitting.



CPVC and PB adapt to other pipes. From top, CPVC/FIP (female thread) transition union joins CPVC to male-threaded bibb; a compression union joins copper to the PB tubing; a special adapter connects the solderless joint with copper tubing; CPVC connects to the threaded brass pipe via a flare-reducing adapter.



Transition unions connect CPVC to tub/shower mixing valve. Unions solvent-weld to CPVC or to push-in adapters, prevent leaks from thermal expansion.

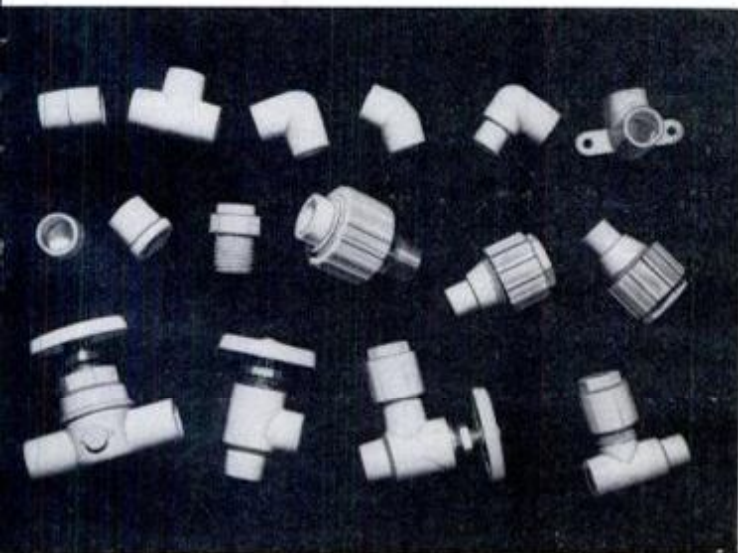
lots of fittings. CPVC fittings—like those for sweat-soldered rigid copper—are less costly than those for PB. Also, use CPVC elbows for within-wall turns in a run of PB where the PB can't bend as sharply as needed.

PB, because it's flexible, takes the cake for runs where pipe must be fed through bored holes. It's also ideal for long runs with gentle bends that are free of joints and fittings. This not only saves money, but cuts down on flow restrictions. It also reduces or eliminates measuring and cutting to fit complex runs around obstructions. A single, joint-free PB pipe can go through floors, around corners and wherever needed—in the ground, without joints. It's great beneath concrete slabs, too. Use PB to make runs you'll want to take apart easily at a later date. Adapters can be removed and reassembled as often as desired.

You can, but probably won't, use PB in exposed locations. Being flexible, it sags and doesn't look very neat. Also, for shorter runs, PB requires more fittings than are economical.

Another PB use is for flexible riser tubes. These reach from a water supply outlet on the wall or floor behind a fixture up to the faucet connections. PB riser tubes come as 3/8-in.-outside-diameter parts which you cut to length. They

(Please turn to page 151)



Fittings for CPVC and PB pipe, top row from left: coupling, tee, 90° and 45° elbows, 90° street elbow, wing elbow. Center row: cap, reducing bushing, male thread adapter, transition union, two copper adapters. Bottom: line-shutoff valve, angle-shutoff valve, fixture shutoff valve and stackable tee.

# WORKSHOP MINICOURSE

## ROUTER BASICS

**S**emester after semester the story is the same in my wood-working class. The router is the most asked about—and least understood—power tool. I believe there are two reasons why the average do-it-yourselfer avoids this tool:

1. Because you can't actually see the cutter doing its job when the router is in action, I suspect that many think there is a mystique to operating the tool.

2. It screams like a banshee; it makes a sound unlike any other power tool that I can think of. My most expensive router almost sounds like it's malfunctioning.

First you should know that operating a router is easy. Basically, there are three types of cutting:

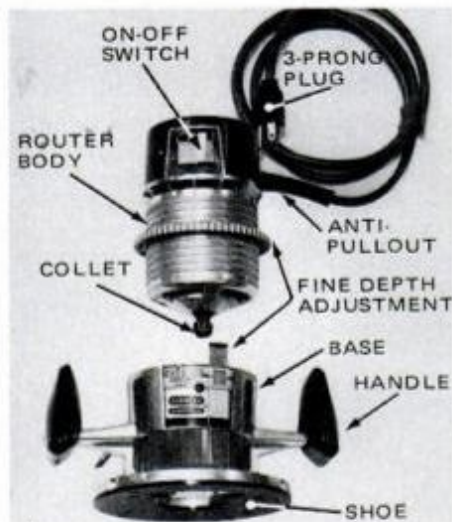
- Freehand, as in sign making.
- Using cutters with guide bearings which let you walk a decorative edge around a board.
- Using a device with cutters which do not have a bearing guide. For these tasks a clamped or tacked-on fence is positioned for the router shoe to ride against. A pivot arm is used in circular work.

For some of us wood nuts, the router's noise is music to our ears. But if you march to a different drummer, I suggest that you wear hearing-protector earmuffs.

Since the smartest move after buying a power tool, and before using it, is to get thoroughly acquainted with the tool through reading the manual, I recommend to my students that they do their power-tool buying from a dealer with demonstration models. This way you can pick up various makes, ask questions, get answers and make some trial passes with a router. Since heft—how the tool feels in hand—is particularly important with a router, it makes a lot of sense to try one out before plunking down \$60 or more.

Once you are familiar with the tool you've bought, do take the time to practice some basic cuts. Probably 90 percent of home workshop routing is decorative edge treatments or cutting grooves, dados and edge rabbets. The advanced techniques come easily with experience.

When you insert a router cutter, push it full home, then withdraw it a scant 1/16 in. to create space for expansion caused by heat. Secure



Router is comprised of two basic parts—router body and base. Body is lowered or raised to set the cutter bit to depth.



Most routers require the use of two wrenches to tighten collet, as here. Some makers offer models with built-in shaft-holding devices that permit changing cutters with only one wrench.



Use the micrometer collar—or a ruler—to set cutter depth accurately. Finally, secure body by tightening clamp screw.

the cutter in the body using the wrenches provided by the maker. Make it tight, or there is a strong chance it will spin out and could go ricocheting about like shrapnel.

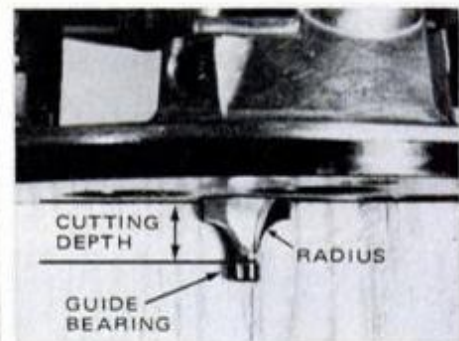
The router is fed in a counter-clockwise direction so that the cutter can do its intended job. On occasion, such as trimming the left end of a workpiece, you have to move the router from right to left. **PM**



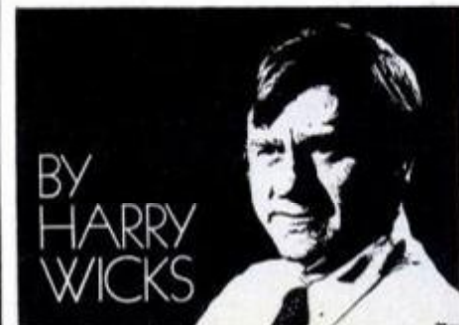
Collet is loosened and cutter is inserted fully, then withdrawn about 1/16 in.



Next, router body is inserted in base, bit is set at approximate cutting depth.



Cutters come in a wide variety of shapes. Above, a rounding-over (1/4-round) cutter is set to a depth to create a bead edge.



BY  
HARRY  
WICKS



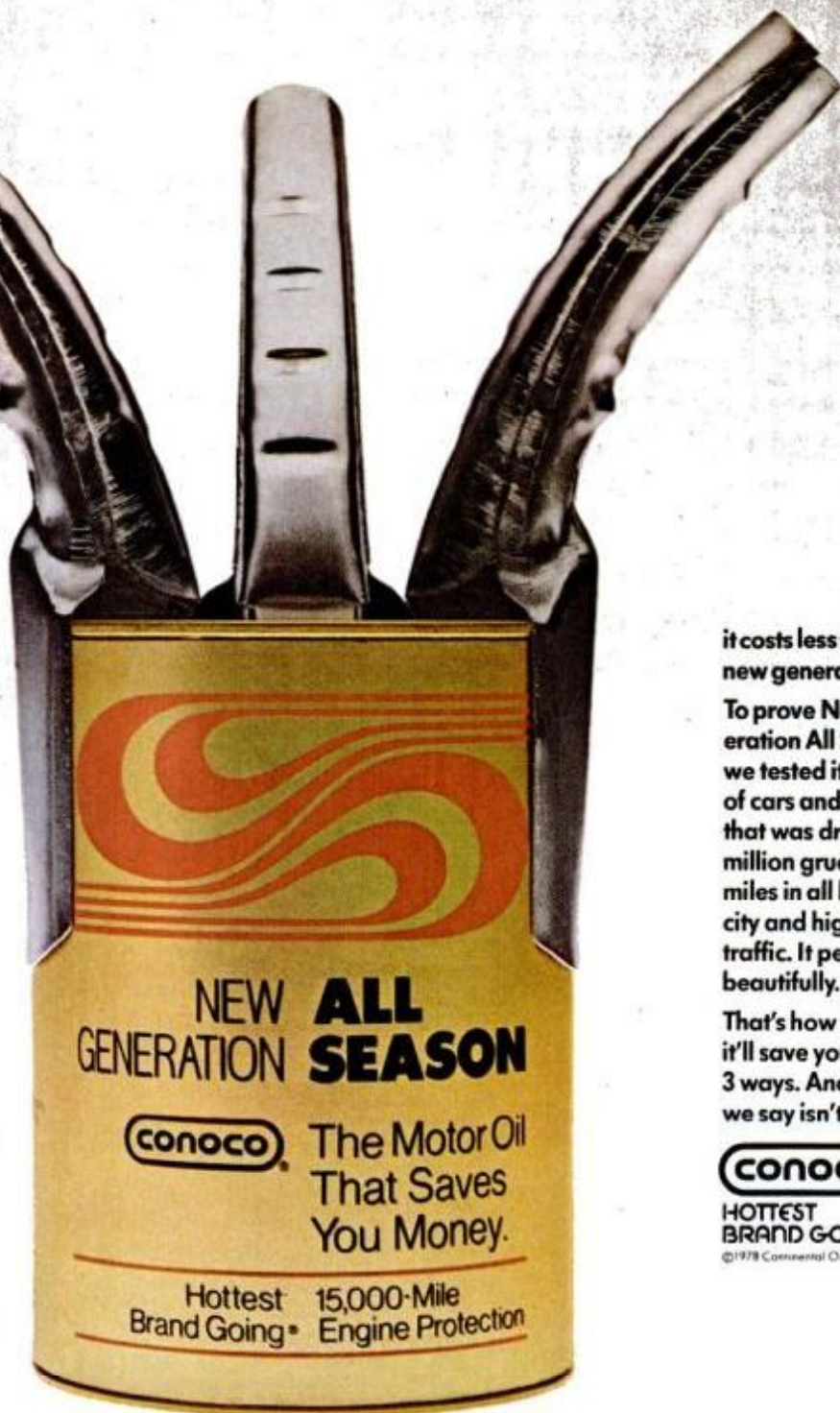
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# Squirrels in the attic?

## Here's how to get rid of them

**T**hey look cute as all get-out scampering around your back lawn or chasing each other through the trees. But let a couple of squirrels move into your home and you can bet that your attitude toward them will change. Once inside—usually in the attic—squirrels do enormous damage—not to mention their nighttime scampering, which is nerve-wracking.

Squirrels nest in late summer and early fall. In our case, we should have been alerted by the fact that cartons left on the patio were chewed to shreds. This meant that squirrels were gathering nest-building materials and were about to move in.

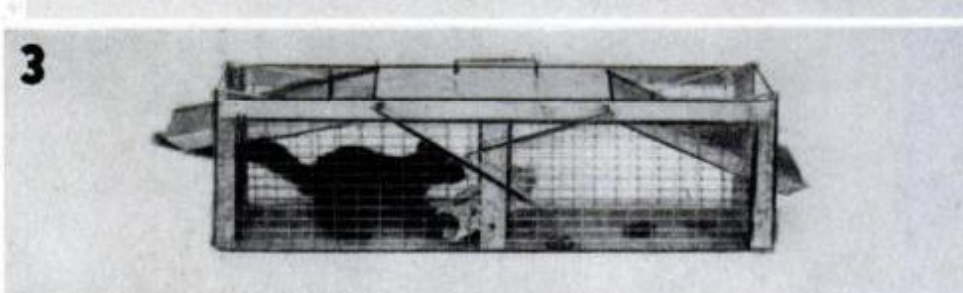
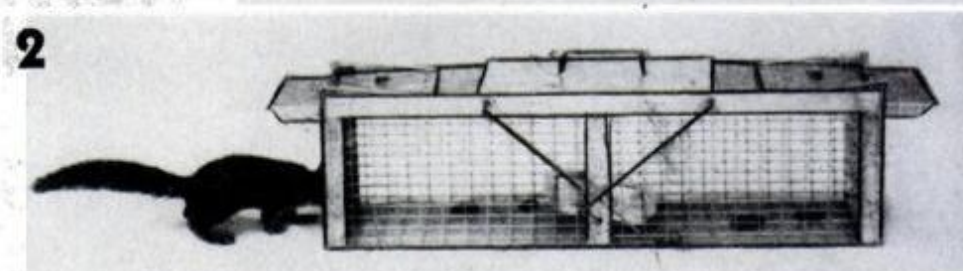
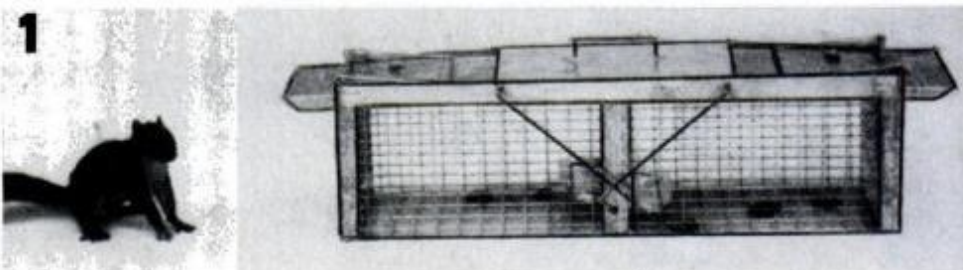
According to Steve Schwimmer of Fumex, Inc., Garden City, N.Y., "A favored method of entry for squirrels is through the fascia boards because the pests can work comfortably from the gutter. From street level," he adds, "you can't see that they are busily at work."

Begin by baiting several Havahart traps with peanuts implanted in peanut butter. Schwimmer noted that squirrels are easy to trap with these humane devices. He baited the traps with their doors tied open for a couple of days. Thus the pests became familiar with the traps, wandering in and out freely to eat. On the third day the tie-backs were removed and bang—two squirrels were caught. In some cases, the prebaiting isn't even necessary.

Because squirrels might attack when cornered, make some thumping noises or the like before moving the trap into the infested area. It is best to set the traps after 9 or 10

*(Please turn to page 145)*

Squirrels got into this house through the fascia (circle)—near the chimney.



Squirrels commonly get into attics through the fascia boards because they park in gutters and go unnoticed while chewing entry holes. Once inside, squirrels, like other pests, generally nest close to the chimney for warmth. Too often, a homeowner is unaware that he has tenants until he hears noises, running about, and so forth overhead. The noises usually occur during the early morning hours. During the day—while squirrels are out—one or more Havahart traps should be set. Here, (1) trap is baited with peanuts or other food attractive to squirrels; (2) squirrel enters cautiously; (3) and (4) when bait tray is jiggled, doors drop to trap unhurt squirrel inside.

Exterminator brought traps for catching squirrels; they required several baitings.



Captured squirrel was released in woods about 10 miles from the author's home.



# THE WORKING CLASS



You're looking at the best-selling work clothes in America.

A Dickies matched set, Dickies coveralls. Dickies new TOP HAND, the work wear with the Western touch.

Nobody makes work clothes with tougher, heavier fabric. You don't iron them. You don't pamper them. You can hardly wear them out.

We'd sell a lot more if they weren't so damned durable.

Dickies are made with Fortrel polyester. If you want the class of the field, find the lucky dealer with the horseshoe. Williamson-Dickie Apparel Mfg. Company, Fort Worth, Texas.



**IT'S FORTREL**  
That's all you need to know.

# FROM THE FOLKS WHO ARE NUMBER ONE, COME THE NEWEST VANS AND WAGONS IN AMERICA.

## 1979 DODGE.

Consider the look. Slightly bolder. With a wider hood for improved serviceability. Optional stacked rectangular head lamps and chrome grille (standard on all Royal exterior trims). Integrated corner parking lights. New front bumper, too, with optional bumper guards. And fifteen colors to choose from.

## NEW NUTS AND BOLTS.

What's under the sheet metal is impressive, too. Things like a new diagnostic plug that makes it easier to check out the voltage regulator, alternator, ignition system, and more. There's even a newly designed front suspension that further reduces noise and better isolates road shocks for a smoother ride.



(Paint and trim on van at left available through Dealer or customizing shop.)

## AN OLDIE BUT GOODIE.

Last year, we introduced the Travel Seating Package available on Royal Sportsman wagons. It not only provides comfortable seating, but a nice place to



lounge, eat, or sleep. Kind of a home away from home.

## AMERICA'S FASTEST GROWING TRUCK COMPANY.\*

Dodge is Number One (based on the industry's accepted practice of defining van sales) and offers more models than Chevy. Also greater van maneuverability, model for model, than Ford or Chevy. And makes a variety of models, ranging from our 109-inch-wheelbase B100 to the roomiest vans and wagons in the business, Maxis. They've had a big part in making Dodge America's fastest growing truck company.

\*357% increase from 1967 to 1977.

## DODGE IS INTO TRUCKIN' LIKE AMERICA'S INTO JEANS.



"HEY, THAT'S MY DODGE."

# SQUIRRELS IN THE ATTIC

(Continued from page 142)

a.m., after the squirrels have departed the nesting area. For additional safety, shine a strong flood or spotlight into the area—in case a squirrel stayed behind in the nest. The light will temporarily blind the squirrel and give you an edge.

Release captured squirrels at least five miles away or they're likely to find their way back.

According to Fox Conner of the Havahart Co., most house pests are "rats, mice, squirrels, raccoons and escaped pets such as gerbils and hamsters." This firm's traps can be used to catch all of the above—and be aware that many local municipalities offer them free or for low rental. If you have any doubt about your animal-trapping abilities—as I did—call in a pro. The charge will be somewhere around \$100.

Once you're rid of squirrels, perform corrective carpentry so they are out for good. First, carefully take down the gutters to get at the fascia board behind. If the fascia hasn't been chewed too much, metal cladding can be slid up behind loosened gutters, thus eliminating the need to remove them entirely. But you will probably have to replace the fascia board with new, solid wood. Prime-paint the board before installing and fasten it securely with 12d nails into rafter ends. Metal cladding for soffit and fascia can be bought preformed, but for a more perfect fit on older homes you may need to custom-bend sheet aluminum on a metal brake.

Finally, give the attic a thorough vacuuming. For extra insurance, I spread several boxes of camphor (moth) balls about the attic floor. Squirrels don't like the odor. Havahart Co., North Water St., Ossining, N.Y. 10562, offers a *Trapping Manual* for 50 cents postpaid. It contains good tips on trapping squirrels and other pests.—*Harry Wicks, Home and Shop Editor.*



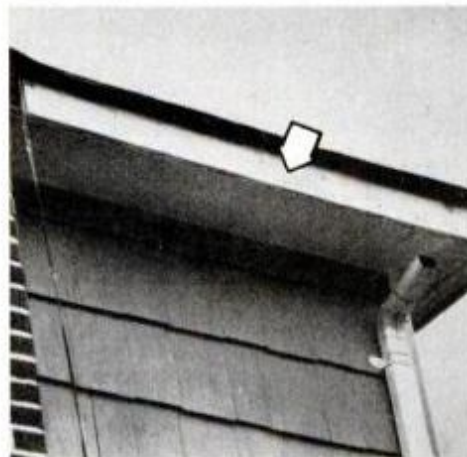
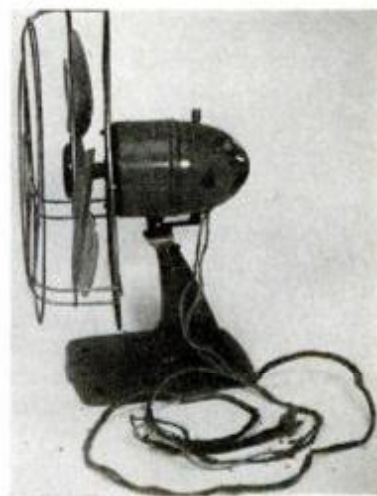
Patch job started with removal of the existing gutter and fascia board behind.



Debris, nest material squirrels hauled in is removed, then attic is vacuumed.



Using a bedspread and other materials found in attic, squirrels fashioned a super-comfortable nest (above). Wiring on fan stored in attic (right) was chewed and destroyed by squirrels.



New fascia board (arrow) is installed to provide a solid base for metal cladding.



To prevent future entries, soffit and fascia are both enclosed with metal.

Sheet aluminum is bent on sheet metal brake to suit fascia and soffit shape in piece about 2 ft. long. Metal is tucked up under shingles to bar entry there.



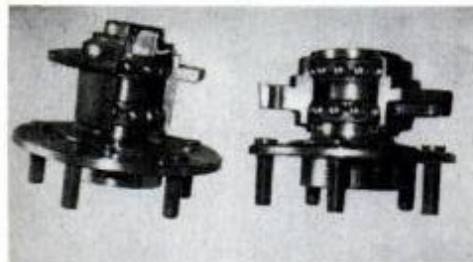
# Servicing the '79 General Motors cars

by Paul Weissler

**G**eneral Motors' new front-wheel-drive (fwd) "E" cars—Eldorado, Toronado and Riviera—may not be a wrench twirler's dream, but any Saturday mechanic who struggled with the old ones will find plenty of reason to cheer.

The No. 1 service horror—pulling the engine to change an oil pan gasket—is gone. You have to drop the right-side driveshaft, take out starter, loosen the mounts and jack up the engine on '79 models, but that's a lot easier than yanking the engine.

All three also have no-service rear and front wheel bearings—no greasing or adjusting. If a bearing is defective, you replace an entire minihub assembly containing ball bearings lubed for life with special grease.



Minihub assembly for rear wheels (left) and front (right) are lubed for life.

The cars all have a super-easy front-service dashboard, modeled after the one on the intermediates introduced last year. Instead of a bin-type glovebox, just take out the entire glovebox after removing four easy screws. This lets you at some a.c. controls.

A four-wheel-independent suspension chassis with automatic rear level control as standard equipment also is common to all three models. The automatic level—a GM option the last two years—consists of a height sensor and air-inflatable shocks at the rear, and an under-hood electric air compressor. The



Behind-dash servicing is easy with removable bezels. At top, rear defogger switch is removed from the front. Access to left side of dashboard is shown above.

## New SF oil on the way

Prescribed engine oil drain intervals will soon be going up, probably to one year or 15,000 miles, possibly late in the '79 model year, almost surely for 1980 models.

Unlike most previous stretches, however, this one results from oil company developments rather than pressure from the carmakers.

All major oil companies have engine oils for extended service, and GM engineers are completing tests for the extended interval. With the first of the 1980 line due next spring (front-wheel-drive compacts), GM obviously would like to have the new recommendation ready.

Big hangup is the list of specifications for the new standard, which must be worked out by the auto industry, oil companies, American Petroleum Institute and Society of Automotive Engineers. When the language is agreed to, the long-distance oil will be labeled SF, the step up from the current top of SE.

control components are quite open, and the rear airlift shocks are outboard of the coil springs, for easy service. If there is a failure in the sensor or compressor, you can inflate or deflate the shocks manually, through a Schrader valve at the compressor.

Rear disc brakes are standard on the Eldorado, optional on Riviera and Toronado (and Pontiac Trans-Am and Formula models, too).



Airlift shocks can be inflated or deflated manually through the Schrader valve.

They're basically similar to the optional rear discs that have been used on Cadillac and Riviera, in that the discs also do the parking brake bit, and, unlike those on Ford, you can retract the rear piston without a special tool. Just remove



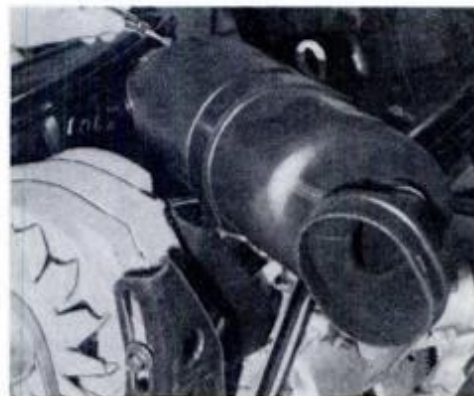
Rear disc brakes on E-bodies are new, can be serviced without use of special tools.

the parking brake lever, back off the nut on the inboard side of the caliper, and push back the piston with a C-clamp.

The transmission on all models is the 325, a modified version of the 200 Turbo used on many GM rear-

drive cars. The engine lineups, however, differ somewhat.

Cadillac uses the 350 Olds diesel V8 and its fuel-injected version of the Olds 350 gasoline engine, the same powerplants as in the Seville. Buick has the standard Olds 350 gas



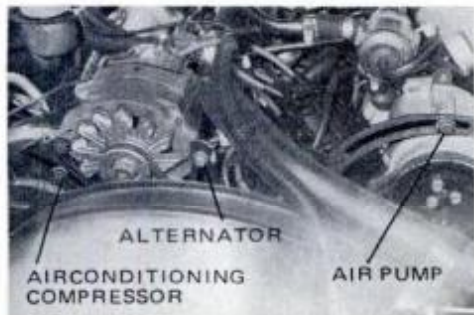
Diesel engines use a muffler-like tuning chamber that's separate from air cleaner.

V8 plus its 231 turbocharged V6. Olds offers the 350 V8 in both gas and diesel versions, replacing the 1978 403 V8. The 403 was GM's only engine with electronic spark advance (the MISAR system), so for



Controller (arrow) for fast-start glow plugs is threaded into the water jacket.

the time being GM has no engine with computer-controlled spark advance. Don't be fooled, however; MISAR was strictly a field experiment. The computers will come hot



Three drive-belt adjustments are accessible on top of Buick's V6 turbo engine.

and heavy on GM cars particularly in 1981.

In the interim, the 350 V8 in a rather spacious engine compartment is a reasonably good service package. You can get to the distributor lockbolt for timing adjustments with an ordinary wrench, without climbing into the engine

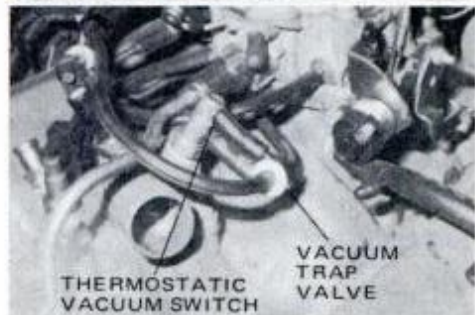
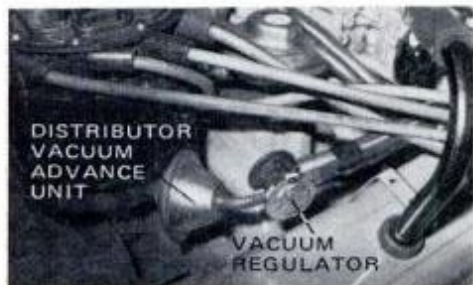


Power-steering drive belt is adjusted with breaker bar in square hole on bracket.

compartment. Sparkplug access is excellent.

### Diesel

The 350 fuel-injected gas and diesel engine compartments are a bit tighter. The diesel's air-cleaner tuning chamber (the muffler-like part built into the air cleaner snorkel) is now a separate part, connected to the air cleaner by a rubber duct. The change means you can



New spark advance system is on many GM cars for '79. Regulator maximizes fuel economy at idle and part throttle without sacrificing performance at higher rpms.

take off the air cleaner assembly without disturbing the tuning chamber, which is held to the engine by a big bracket.

The '79 diesel also has a new fast-start glow-plug system, which was supposed to be phased in during the '78 model year but didn't make it. The new glow plugs heat up very

### New fuel spritzer

General Motors is experimenting with a single-point intake manifold fuel injection system resembling Chrysler's electronic fuel management.

An in-tank pump supplies fuel under low pressure (10 p.s.i.) to a pressure regulator in a throttle body adapted from Caddy's fuel injection system. The fuel flows from the regulator to a pair of solenoid-type fuel injectors, which are mounted in the throttle body air horn, above the throttle plate.

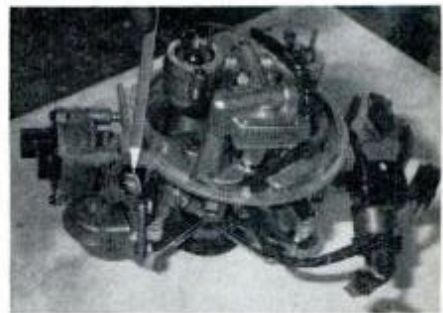
They are triggered by a computer, which receives information from sensors for intake manifold pressure and temperature, coolant temperature, engine speed and exhaust system oxygen.

There is a choke-type thermostatic coil and linkage setup, but instead of pivoting a choke plate, it opens and closes an air bleed.

The injectors also are somewhat different. They have a cone-within-a cone arrangement. Each cone has slits and when the solenoid pulls in, the inner cone is twisted and the slots in both cones line up for fuel flow.

Preliminary GM tests show that the system does not help on some engines that already are well-carbureted, but adds both driveability and fuel economy to others. A system with one injector per cylinder, located at the port, does a bit better, but the single-point system does not require careful select-fitting of a complete set of injectors for equal flow.

Although the Chrysler system is much more sophisticated (with electronic measurement of air and fuel flow) and although it's clearly further along in its development, GM engineers feel their design, with its manifold pressure sensing, has better potential for automatic altitude compensation.



In GM's single-point intake manifold fuel injection system, thermostatic coil and linkage setup opens and closes air bleed instead of pivoting choke plate.

quickly, so you can start within six seconds at 0° F. Heart of the system is a new controller threaded into the water jacket, and (surprise!) it's a mechanical bimetal control replacing an electronic sensor.

If the coolant is warm, it opens

(Please turn to page 148)

## SERVICING THE '79 GM CARS

(Continued from page 147)

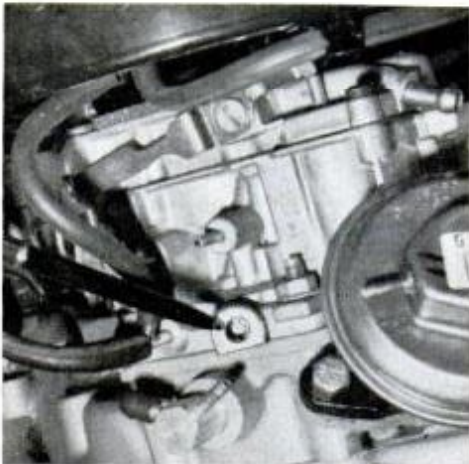
the bimetal and you get the "start" light right away. If it's cold, the bimetal remains closed until battery current opens it, up to six seconds, which is all you need.

The bimetal control has two heating elements inside, a primary for normal conditions, and a backup if the primary fails.

The new glow plugs can't take the temperatures for more than 10 seconds, so don't try to bypass the bimetal controller to assist the starting operation or you'll blow the glow plugs on the first shot. Instead, you should find out what's wrong and correct it.

You can retrofit the new glow-plug system to a previous model, but it means new glow plugs, new controller, a relay and lots of rewiring.

Olds will have a 260-cu.-in. version of the 350 diesel also available this year, as a Cutlass option. This



Idle mixture screws on most GM carburetors have been plugged at the factory.

smaller diesel also will have the fast-start glow plugs.

### Turbo V6

The turbocharged V6 in the Riv-



Fuel-tank filler neck restrictors get hardened steel washer to thwart tampering.

iera is perhaps the engine's finest application. The size of the engine compartment means the turbo and plumbing can be placed to the rear of the engine. The exhaust piping is straighter for better flow and less

### Testing one, two, three with new assembly-line tools

Three little testers that any Saturday Mechanic would like are being used to improve quality control on the Cadillac assembly line.

One is solid-state sensor for checking the integrity of the rear window defogger grid. Just run it down the rear window and each time it passes a complete line in the grid it emits a short beep. No beep means a break in the grid, so you can check the complete defogger grid in a few seconds.

Another is an ammeter with an inductive pickup. Clamp the pickup on the battery ground strap and it tells you exactly how much current is flowing. Since all late-model alternator circuits have a continuous, minuscule current flow, even with everything shut off, this tester makes it easy to tell not only if there's a real short, but how bad it is.

The third tester is a voltmeter that plugs into the cigaret lighter, and provides a digital readout with two decimal places. The Caddy has lighters all over the place, so you get a choice.



Sensor checks rear-window defogger.



Ammeter checks current with pickup.

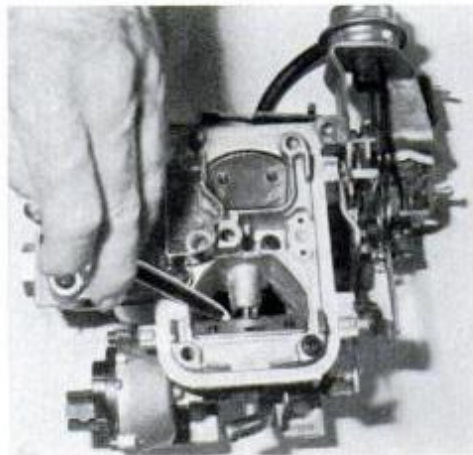


Voltmeter plugs into cigaret lighter.

restriction, which mean more power. Combined with a new, cooler route for the intake air, it gives about 10 more horses and easier service access.

All plugs are accessible and all but one drive belt adjustment is at the top of the engine. The exception, the power steering pump, is no problem; adjustment is with a breaker bar in a wide-open square in the pump bracket.

The front-mounted distributor



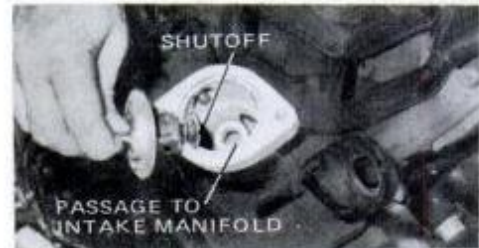
Here's a view down the throats of Vara-Jet carburetor, a new two-barrel design.

lockbolt looks buried, but you can reach it with a standard wrench from the front of the engine.

All '79 Buick V6s have been modified for freer breathing, with a new cylinder head that has larger intake and exhaust ports, plus new manifolding and exhaust systems. An exhaust that divides into a dual system after the converter is avail-



Distributor on Pontiac 151 crossflow Four is mounted low and is hard to reach.



Thermostatic shutoff closes passage to manifold and heater at high engine temp.

able. Horsepower improvements are as high as 20, depending on the carburetion, with or without turbo, and the dual exhaust.

In addition to engine options, the three fwd models have other touches to set them apart.

Buick, for example, will have a styling touch to distinguish the Riviera even when it's parked: exterior "coach" lamps at the rear sides of some models. They're unique in that the soft lighting is not provided by a bulb, but an a.c. electroluminescent sandwich. Buick could have provided a.c. cheaply via an alternator with a.c. tap. Instead, they

(Please turn page 160)



# WHY MORE AND MORE PEOPLE ARE ASKING FOR A CHAIN SAW THEY CAN'T EVEN PRONOUNCE.

Poolen. Pullen. Polann.

With a name like Poulan, getting people to say the name right may be asking a lot.

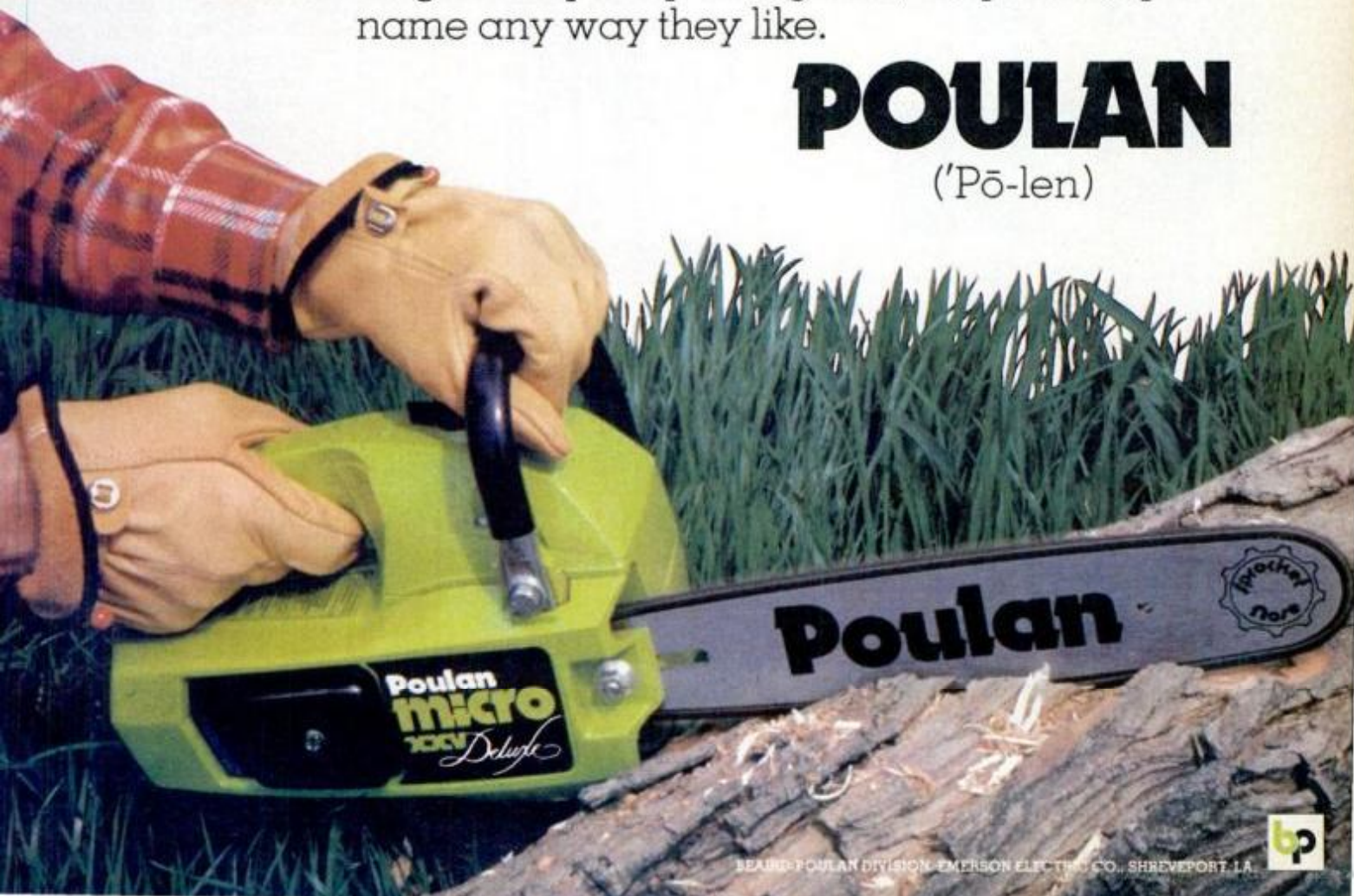
On the other hand, people ask an awful lot of our saws. Quick starting. Extra cutting power. Quiet operation. Beautiful styling. Durability. Affordability.

And we deliver all that plus a lot of other standard features, no matter which Poulan saw they buy. From the Poulan Micro XXV right on up to our pro models.

At Poulan, we figure the more we put into our saws, the less people have to put into cutting.

Maybe that's why more and more people keep asking for our saws.

And as long as they keep doing that, they can say the name any way they like.



## POULAN

('Pō-len)

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**GRAND PRIZE**  
Limited Edition  
1978 Indy Corvette.



**SECOND PRIZES**  
20 Honda Mopeds.



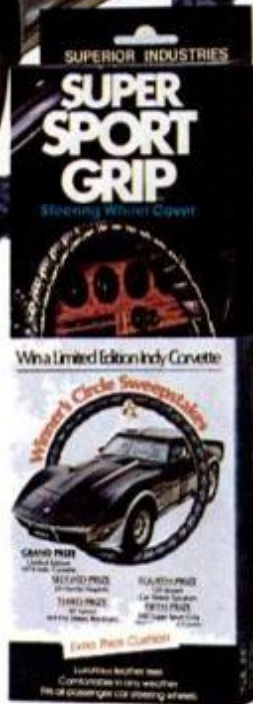
**FOURTH PRIZES**  
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**FIFTH PRIZES**  
300 Super Sport Grip  
Steering Wheel Covers.



U.S. Patent No. 3,312,124. Canadian Patent No. 801,395

The special, Limited-Edition Indy Corvette, official pace car of the 1978 Indianapolis 500, is just waiting to be won. It's truly a classic. And you could be the one to win it.

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Entering's easy. Just check out our rules. Then get on over to your Super Sport Grip Dealer for an official entry blank.

While you're there you'll see that Super Sport Grip offers exclusive double-thickness for driving comfort, quality workmanship and a selection of seven colors. All in all, it's no surprise we're the world's best selling steering wheel cover.

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**OFFICIAL RULES—NO PURCHASE NECESSARY.** 1. On an Official Entry Blank (or a plain 3"x5" paper) print your name, address and zip code. Mail it, along with the bottom flap from the Super Sport Grip box (or a reasonable facsimile drawn on the plain 3"x5" paper). 2. Send entry to Winner's Circle Sweepstakes, P.O. Box 2110C, Westbury, New York 11591. Enter as often as you wish, however, each entry must be mailed separately and received by February 1, 1979. 3. Winners will be determined in random drawings from among correct and eligible entries by National Judging Institute, Inc., an independent judging organization whose decisions are final. All prizes will be awarded and winners notified by mail. Major prize winners may be required to execute an affidavit of eligibility and release. Prizes are non-transferable and not exchangeable for cash. (Corvette winner may substitute automobile for \$14,000 cash.) Only one prize per family or household. Local, State and Federal taxes, if any, are the responsibility of the winners. For a list of major winners, send a self-addressed stamped envelope to: Winner's Circle Sweepstakes, P.O. Box 2380, Westbury, New York 11591. 4. Open to residents of U.S., Alaska and Hawaii. Employees and their families of Superior Industries, its representatives, jobbers, retailers and advertising agencies are not eligible. Offer void where prohibited or restricted by law. All Federal, State and local laws or regulations apply. Superior Industries International, Inc. © 1978. **SUPER SPORT GRIP from SUPERIOR™**

## BROKEN TOOL HANDLES

(Continued from page 133)

paper until the fit is perfect.

Lay the tool flat on a bench, insert the handle in the eye, and use a hammer to rap the bottom of the new handle. This should drive the handle well into the eye. For smaller tools, use a hammer with a head weight the same as the tool. For axes, mauls and sledges, use a 3- to 4-lb. hammer. Control is important here, as an off-angle shot could smash the base of the new handle. Protecting the handle with a block of scrapwood is also a good idea. Use moderate taps and short swings.

Steps 6 through 9 show how to insert wood and steel wedges. Be sure to place the butt end of the new handle on a firm surface while driving wedges. If the handle is large enough, use two metal wedges. Most square, oval or round eyes will be large enough, but the extended almond shape of most ax eyes won't always take a second metal wedge.

### When to use epoxy

If the handle ends up being a little bit loose, soak the top in epoxy resin before inserting it in the eye the final time. This will make up for minor mistakes, but should not be used if far too much wood was removed. In such cases, discard the handle and try again. When epoxy is used, wipe it over the exposed top of the eye to preserve the wood. If no epoxy is used, coat the top of the eye and any other spots where trimming was done with boiled linseed oil. (Coating the entire handle is a good idea.)

According to all the experts I talked with, the greatest protection for a tool handle is accuracy on the part of the user. If necessary, shorten your grip to improve your aim. For those who still feel insecure, there are several tricks to extend a tool handle's life despite mild overstriking.

### Protecting the handle

First, wrap the tool handle with about three layers of duct tape just under the eye. Then take an automobile hose clamp (worm screw type) and slip it up under the eye and tighten. You can add even more strength by wrapping the taped portion with steel wire up to an inch or two below the eye.

Remember that proper fitting of a good quality handle, combined with attention to accuracy during striking, will assure long tool life and cut down on the expense and time outlay involved with making replacements.

PM



Special pipe hangers hold CPVC snugly (left), but leave play for expansion and contraction. Use at least one hanger every 32 in. PB can be used beneath concrete slab (above). Install joint-free runs, attaching fixtures to exposed pipe ends located above the slab.

have factory-shaped ends. Riser tubes for sinks and lavatories are made with bullet-nosed ends to fit directly into most faucet tailpipes. They're held in place by a faucet nut, also called a jam nut. Riser tubes for toilets are flange-ended to connect into the toilet's inlet valve with a jam nut. PB risers are so flexible they reach from outlet to faucet easily without kinking. Cut them to length with a pocket knife.

#### Advantages of plastic pipe

Both CPVC and PB are also energy savers. Their walls pass heat much less rapidly than metal. Hot water stays hot longer and cold water pipes sweat less. The smooth walls of CPVC and PB offer less resistance to water flow, enabling smaller sizes to do the same job as larger steel pipes.

A CPVC/PB system won't corrode and won't conduct electricity, making it free from electrolysis that eats away at metal pipes. One disadvantage here is that your water system can't be used as an electrical ground. But there's no shock danger should a bad electrical ground develop.

Both CPVC and PB meet practically all building codes. CPVC conforms to ASTM Standard D-2846; PB to ASTM Standard D-3309. Both are accepted by the Federal Housing Administration and meet all requirements for potable water by the National Sanitation Foundation. They both take 100 lbs. p.s.i. continuous pressure at 180° F.

#### Tips for an expert installation

CPVC pipes and fittings join together by solvent-welding (see photos). Besides using a liberal amount, it's important to use a

high-quality solvent containing lots of tetra hydrofuran, a high-cost but effective ingredient of good solvent cements. PB pipe can't be solvent-welded, so don't try. To join PB to CPVC, solvent-weld the CPVC to one end of an adapter, and, after applying petroleum jelly, simply hand-tighten the PB to the other end.

CPVC or PB can be joined directly to threaded metal pipe and fittings or to unthreaded copper pipe. This is also a simple task, but requires special adapters, called transition unions. You'll need them for appliance outlets and inlets, at threaded faucets and when using plastic to extend an existing system of metal pipe.

Transition unions mate up metal and thermoplastic piping across an elastomeric rubber gasket. They permit differential thermal movement between the two materials without straining the parts. They also prevent the leaking associated with ordinary threaded adapters.

Transition unions come in male and female threads for metal pipes and fittings and can also be sweat-soldered to unthreaded copper. CPVC solvent-welds directly to transition unions, but a transition union and an adapter are needed to join PB to metal, because PB can't be solvent-welded.

Use transition unions at every pressurized hot water connection between threaded metal and solvent-welded plastic piping. At nonpressurized hot water and at cold water connections, use simple male thread adapters, if possible. Transition unions can be taken apart and reassembled without cutting pipes.

With all water supply piping, but

(Please turn to page 152)

# FLASHY.

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IT LIGHTS UP YOUR LIFE. AUTOMATICALLY.  
With FLASHY you get perfect color photos 24 hours a day. FLASHY has a built-in strobe and is electronically automatic. Inexpensive, ultra easy to use. FLASHY. The Chinon 35F-EE with 4-element 38mm 1/2.8 glass lens. Package includes carrying strap, case and instruction book. Light up your life with this super 35mm camera. Chinon Corporation of America, Inc., 43 Fadem Road, Springfield, New Jersey 07081 (201) 376-9260



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**“Some straight talk about**

**earning extra income.”**

Wilbur Hess  
Knapp Shoe Counselor  
Vista, CA

“Due to the higher cost of living, I found it necessary to supplement my income. I’m seventy-one years old and have retired from a steel company after twenty-two years as a machinist.

My brother, Harry Hess, who has been with Knapp Shoe for over twenty years, suggested that I try selling . . . something that I had never done before. I applied for a franchise and shortly thereafter began selling Knapp Shoes. That was in August 1975.

I work about 80 hours per month and last year grossed \$3,295.00. This leaves me plenty of time for fishing and for helping my friends and neighbors.

After wearing Knapp Shoes for 25 years and selling them for nearly three years, I am convinced that they truly are “The Most For The Money Shoe”. I have never had any reason not to be satisfied with them.

The Knapp Company and all of its employees have treated me in a fine manner. All of the people that I have dealt with seem to be well above average in every way. I am happy to be a part of the Knapp Selling Team.”

If you would like information on becoming a Knapp Counselor, please fill out and return the coupon. There is no cost or investment on your part.

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Vice President/Sales  
Knapp Shoes, 612 Knapp Center  
Brockton, MA 02401

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**KNAPP**  
The more for the money shoe.

**HOW TO WORK WITH PLASTIC PIPING** (Continued from page 151)

**WHERE TO USE CPVC AND PB**

LOCATION	CPVC	PB	SIZE OF PIPE		
			3/4"	1/2"	3/8"
Service entrance		1	•		
House mains:					
Basement	1				
Crawlspace		1			
Beneath slab		1			
Fixture branches	3	2		•	
Riser tubes		1			•
Below ground to outbuildings		1	•	•	
To outdoor hose bibbs		3		•	
Water softener	2	2	•		
Water heater	2	2	•		
T & P valve relief tube	2	3		•	
Air chambers	1		•		
Automatic washer hose bibbs	2	3		•	
Showerhead riser pipe	1			•	
Furnace humidifier		1			•
Boiler inlet connection*	2	3			
Evaporative cooler		1		•	•
Lawn sprinkler supply*	3	2	•		
Piping of manifolds		1		•	•
Behind finished walls		1	•	•	•
Sharp turns within walls	1			•	•
Gentle turns		1	•	•	•
Around obstructions		1	•	•	•
Long, joint-free runs		1		•	•
Short runs, many connections	1			•	•

\* With approved backflow preventer 1—Best 2—Better 3—Good

especially with thermoplastic, you must allow for pipe expansion and guard against overpressure or excessive temperatures. When installing CPVC pipe, always use special hangers that let the pipe slide back and forth without binding, yet hold it securely to the framing. Leave room for expansion at the ends of long runs of CPVC, generally allowing 1/4 in. for each 10 ft. of pipe. Install doglegs—offsets—in CPVC runs of more than 35-ft., and where risers reach up from water mains through the floor. Make sure offsets are at least 8 in. long to permit slight end-wise movement. With PB risers, forget this precaution. Use PB wherever possible on long runs; it's so flexible, it's not harmed by expansion or contraction.

To control high temperature in the system, install 8 to 11-in. threaded nipples atop the tank of your gas or oil-fired water heater before putting in transition unions to connect piping. Nipples keep conducted heat from the plastic piping. They aren't necessary on an electric heater.

To control excessive pressure caused by water action within the piping system, put an air chamber at each fixture. You can make one by simply adding a capped 12-in. length of 1/2-in.-outside-diameter CPVC pipe to a tee behind the wall at the fixture. If the pipe serves an automatic-shutoff appliance like a washer, use a 3/4-in.-outside-diameter pipe 18 in. long. Air chambers cushion the impact of fast-flowing water when it's stopped during a fast shutoff, thus combatting water hammer.

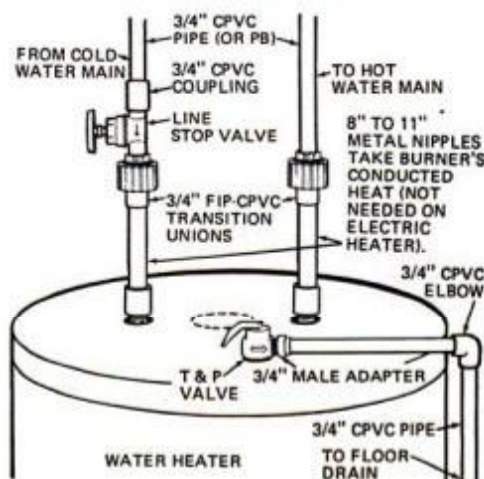
Locate a stop-and-drain valve so

the whole system can be turned off and drained to prevent freeze-up. While PB isn't damaged even by repeated freezing and CPVC can take a number of freeze-ups, their fittings cannot. Of course, the cold water inlet to the water heater should contain a valve. A line stop (shutoff) valve is handy for this. One type solvent-welds either to 1/2-in. pipe inside the hubs or to 3/4-in. pipe fittings outside the hubs. A pair of 3/4-in. couplings make it serve a run of 3/4-in. pipe.

It's also a good idea to locate shutoff valves on the wall or floor behind fixtures. The handiest valves have adapters for 3/8-in. PB riser tubes. Use angle stops at the wall, straight stops at the floor.

The next time you do plumbing work, try a CPVC/PB system. Whether you need rigid or flexible pipe, the system gives you the best of both worlds. **PM**

**THERMOPLASTIC PIPE CONNECTIONS AT WATER HEATER**



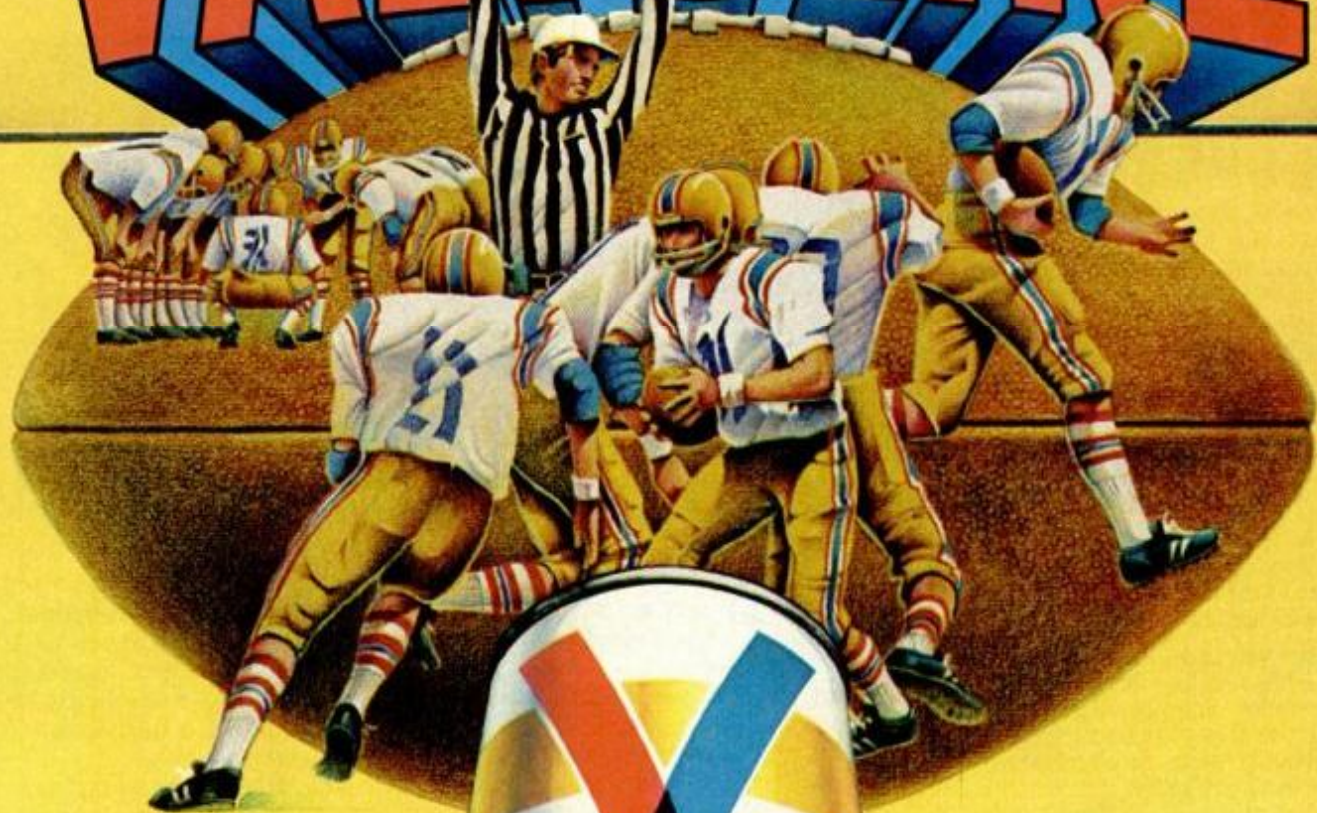
# This could be your ticket to Super Sunday!

WEEKLY

PRO FOOTBALL

SWEEPSTAKES

# VALVOLINE



## YOU'LL GET A KICK OUT OF PLAYING IT...

A Pro Football Sweepstakes where you pick weekly winners, not scores. You've got to call that fun. But consider, every week someone wins a trip-for-two to the Super Bowl. You've got to call that fantastic! Now consider the Grand Prize... "A Super Bowl Party for Ten." No way you won't call the Valvoline Weekly Pro Football Sweepstakes... a super deal!

## HOW TO ENTER...

Just stop at any participating outlet where Valvoline® Motor Oil is sold and look for the Valvoline Weekly Pro Football Sweepstakes display. Take a booklet that contains weekly entries. Then, just make your picks each week and mail them.

## A WINNER EVERY WEEK FOR 16 WEEKS...

Every week someone wins a weekend trip-for-two to the Super Bowl. But only those who can pick all the week's winners are eligible to win that week's drawing for a Super Bowl weekend trip-for-two. Valvoline flies both of you round-trip to the big game

in Miami, pays your hotel, your meals. Then takes you to the biggest football event of them all... the Super Bowl.

## GRAND PRIZE: SUPER BOWL PARTY FOR TEN...

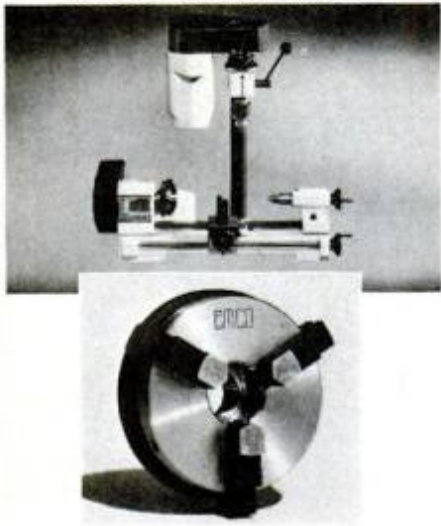
Everyone who enters the Valvoline Weekly Pro Football Sweepstakes is eligible for the Grand Prize drawing, regardless of the accuracy of selections. Just imagine... a Super Bowl weekend party for ten people. Valvoline flies all of you round trip to Miami, pays your hotel, your meals. Then takes the whole party of ten to the big Super Bowl game.

Enter the Valvoline Weekly Pro Football Sweepstakes. You'll get a kick out of playing it.

Entry booklets and complete details are available at all participating outlets. Sweepstakes closes December 14, 1978.

**Valvoline** is Valvoline Oil Company, Ashland, Ky. Division of Ashland Oil, Inc. NO PURCHASE NECESSARY. Valvoline Weekly Pro Football Sweepstakes open to residents of the United States and Canada. Void in the states of Missouri, New Mexico, Utah, Howard County, Maryland and wherever prohibited by law. All laws and regulations apply. Ohio residents only may send a self-addressed stamped #10 envelope for entry booklet to: Valvoline Sweepstakes, 29th and Mill Street, P.O. Box 391, Ashland, KY 41101. This sweepstakes is not associated with nor sanctioned by the National Football League.

As Seen On National TV



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**Special Note** to owners of the Unimat SL Series who have been looking for accessories. Emco-Lux has and will continue to have a complete line of all Unimat parts and accessories, manufactured by Maier and Company, builders of the Unimat line since the early 1950's.

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PM-N

## THE JETS OF THE EIGHTIES

*(Continued from page 111)*

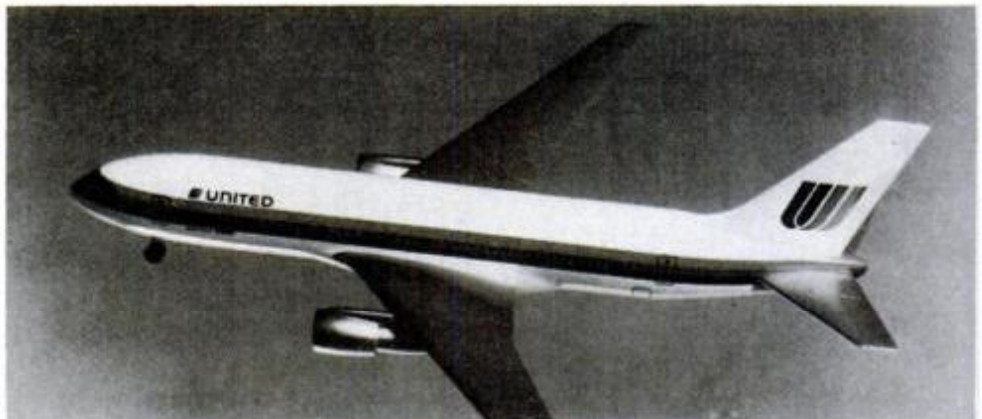
increased by about 300 nautical miles over that of current models.

The term "supercritical" refers to the relationship between the wing and air passing over it. With a conventional, more highly curved wing, air over the upper surface may reach supersonic velocity as the aircraft itself reaches a speed of Mach .78 to .80—80 percent of the speed of sound. This creates turbulence, buffeting and a sharp rise in total drag called "critical flow."

The aerodynamic characteristics of the supercritical wing delay the onset of these effects. The ability to overcome turbulence and buffeting

make noise as they are expelled from the engine.

By using a larger fan—essentially, now a mini-propeller—the high-bypass engine takes in a greater quantity of air. Instead of a 1:1 ratio between fan air and core gases, for example, the ratio may be as high as 2.79:1. More air is thus directed around the hot core of the engine to provide thrust. In addition, a sheath of slower moving air from the fan is directed by ducts so it is exhausted above and below hot, noisy core gases. This fan air serves to muffle noise. To further reduce noise, the high-bypass engine uses sound-suppressing acoustic material inside the engine and nacelle (casing that surrounds the engine).



United Airlines has placed the initial order for Boeing's all new 767, a design that resembles a scaled-down 747 with its wide-body interior but only two engines.

allows the corporate jet to cruise at a speed approaching Mach .85, putting it in the commercial airliner range. By reducing critical flow (drag), the supercritical wing improves fuel economy.

The ability to place a longer wing on corporate aircraft also improves landing and takeoff capabilities. Larger flaps are built into the wing, making for low landing speed, which shortens the distance needed for landing. Furthermore, the supercritical wing increases lift to let new corporate jets take off on shorter runways.

### High-bypass engines

High-bypass engines are about one-half quieter and 25 to 50 percent more fuel efficient than older turbo-jet engines. They have more thrust and emit lower levels of carbon dioxide, hydrocarbons and oxides.

To reduce noise, the exit velocity of the exhaust jet has to be reduced. The term "high bypass" refers to the ratio between the exhaust gases heated in the engine's combustion core and unheated fan air that also enters the engine but bypasses the core. It's the hot core gases that

All new corporate jets except one incorporate the high-bypass turbo-fan engine. The exception is the Gulfstream III, which uses a medium-bypass engine made by Rolls-Royce. This engine is a carry-over from the Gulfstream II.

One other interesting new corporate aircraft design incorporates a new jet-prop concept to challenge the high-bypass engines: Shortly before his death last May, renowned inventor Bill Lear, president of Lear Avia Corp., sent me a description of a unique corporate aircraft called the Lear Fan, supposed to fly by 1980.

The Lear Fan will have a range of 2700 statute miles and a top cruising speed of 400 mph. It will fly at 40,000 feet, on one-fifth less fuel than a jet of comparable size. This is farther, faster and higher than any other propeller-driven corporate plane—almost as fast and high as a jet.

The secret of this aircraft lies in the sleek shape of its fuselage and an aft propulsion system which combine to reduce drag. The propulsion system is mounted in the fuselage cone behind the passenger compartment and consists of two turboshaft

engines that drive a single pusher-type propeller.

At 350 mph, the Lear Fan model 2100 is expected to get 12 miles per gallon of fuel. As a point of reference, the new fuel-efficient Canadair Challenger burns about 1.6 gallons per mile.

Turboprop aircraft will have no problem meeting noise standards that could be even more rigid than those going into effect in 1985. Jet aircraft very well might.

### The new airliners

With airlines talking of buying over 2000 new planes by 1990, at a cost of \$80 billion, stakes are high in the airline derby.

Lockheed, Douglas and Boeing are pulling out the stops—especially with a new kid in town, Europe's Airbus Industrie. To date, 23 Airbus A300-B4s have been sold to Eastern Airlines in a breakthrough deal.

Airbus Industrie is a consortium consisting of aircraft manufacturers from Great Britain, West Germany and France. However, General Electric supplies the plane's U.S.-made engines.

To get their share of the market, Lockheed and Douglas are designing their new planes as evolutionary developments of the successful L1011 and DC-9 airframes, respectively. The DC-9 has been in the air since 1965; the L1011 since 1970. Appropriately, the new L1011-500 and DC-9 Super 80 are called "derivative" aircraft.

Boeing is taking a different approach. The company will produce three brand-new planes to cover virtually every spectrum of airliner need until the year 2000.

Each plane, whether derivative or totally new in design, has one characteristic in common: It is designed primarily to provide maximum efficiency.

R.H. Hopps, Lockheed's chief of advanced design and technology, says, "Speed and capacity used to be the prime reasons for building a new airplane. Now the name of the game is efficiency, with fuel saving the biggest factor."

Here is a capsule look at the new airliners:

■ **Lockheed's L1011-500.** The wide-bodied Dash 500 is designed to replace the narrow-bodied B707, DC-8 and British Aircraft Corp. VC-10 on intercontinental routes. To date, orders have been obtained from Pan American and British Airways. The plane will enter passenger service in 1979.

One unique system in this plane works just like cruise control in a

*(Please turn to page 156)*

# SAVE 20% ON SEARS GLASS DOOR FIRESCREEN NOW JUST \$59<sup>99</sup>

## SAVE \$15

... on this partially assembled black satin finish glass door firescreen. Helps you save heat, too.

Energy-efficient, shatter-resistant glass doors (3/16" thick) reduce air flow through the fireplace opening up to \*70%—



helps cut heat loss after the fire is out. Optional mesh screen (pictured) only \$12.99.

Glass doors could save more than heat—they help protect against sparks jumping from fireplace onto floors and carpeting.

\*Statistics are the average of laboratory measurements of air flow as tested with simulated brick, stone and flush fireplace fronts and calculations of the air flow based on various assumed chimney heights and assumed indoor and outdoor temperatures.



Thick (1-1/16") insulated frame comes in four sizes, is

easy to install. Measure the height and width of fireplace opening before shopping.

Antique brass finish glass door firescreen also on sale. Just \$64.99. Save \$15.

Tool sets during sale begin as low as \$16.99.

Save \$20. Dual-speed heat exchanger sale-priced at just \$79.99. Re-circulates warm air into room—not up chimney. Black enamel steel construction adjusts to fit firebox depth; right or left side blower, includes fire-grate. Partially assembled.



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At most Sears retail stores.

**Sears**

**THE FIRESIDE SHOP**

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Prices and dates may vary in Alaska and Hawaii.

## THE JETS OF THE EIGHTIES

(Continued from page 155)

car. The digital, computerized system, called Flight Management, automatically controls the throttles during climb, cruise and descent to attain the optimum air speed, thus a minimum 3 percent saving in fuel.

Pertinent specifications of the L1011-500 are: Passenger capacity—246; nonstop range—6100 statute miles; cruise speed—Mach .84.

It will be powered by three Rolls-Royce RB 211-524B engines with a takeoff thrust of 48,000 pounds, and

will be 164.2 feet long (13.5 feet less than present models).

Lockheed is also trying to sell the Dash 600 and Dash 400. The Dash 600 would be powered by two RB 211-524 engines and would be designed to carry 174 to 200 passengers nonstop 3100 statute miles.

The Dash 400 would be a three-engine aircraft, and would also have a nonstop range of 3100 statute miles—but will carry 200 to 250 passengers.

■ **Douglas DC-9 Super 80.** Bill Lawton, director of advanced design for McDonnell Douglas, describes the

company's new plane as "pretty stubby for a narrow body and far too long for a wide body."

One thing is certain; the company that Donald W. Douglas founded in the back room of a Los Angeles barbershop 58 years ago has a winner in the DC-9. The Super 80 is the fifth version of this plane, which first saw skylight in 1965. Each version has been longer than its predecessor.

For example, the original DC-9 was 104.4 feet long and carried 80 passengers. The Super 80 is 147.8 feet long and will carry 172 passengers. It is a short-to-medium-range aircraft with two new Pratt and Whitney JT80-209 turbofan engines, which McDonnell Douglas says will make the Super 80 "the quietest jetliner in major airliner service" when the plane is introduced in 1980. To date, Austrian Airlines, Swissair and Southern Airways have bought the aircraft.

Pertinent specifications are: Passenger capacity—172; nonstop range—2055 statute miles (with 137 passengers); cruise speed—Mach .75.

■ **Boeing 757, 767, 777.** As this article was being prepared, information concerning Boeing's three proposed aircraft was scanty. No specifications are available. No planes are in production. The initial order—for 767s only—had just been received from United Airlines and will be filled by mid-1982.

The twin-engine, narrow-body 757 will carry about 150 passengers a distance of 1000 to 2000 miles. The twin-engine 767, a wide-body that will have an interior similar to that of a 747, will carry 197 passengers 2000 to 3000 miles. The wide-body trijet 777 will carry more than 200 passengers 2000 to 3000 miles, while a longer range model 777 will be able to transport as many as 200 passengers 4500 miles.

### Airbus most efficient

Only a few years ago, when the Airbus people were trying—at first, with no success—to interest U.S. airlines in their plane, the rival Big Three did not hesitate to note that the European entry had only two engines, implying that three or four of them would provide a very desirable safety factor in a wide-body transport.

Today, the Airbus is acknowledged to be the most efficient transport in the air and the Boeing, Lockheed and McDonnell-Douglas interests are loaded with twin-engine design concepts.

Fewer, but bigger engines mean efficiency—and that's what's "in" today.

PM

## Prowler.

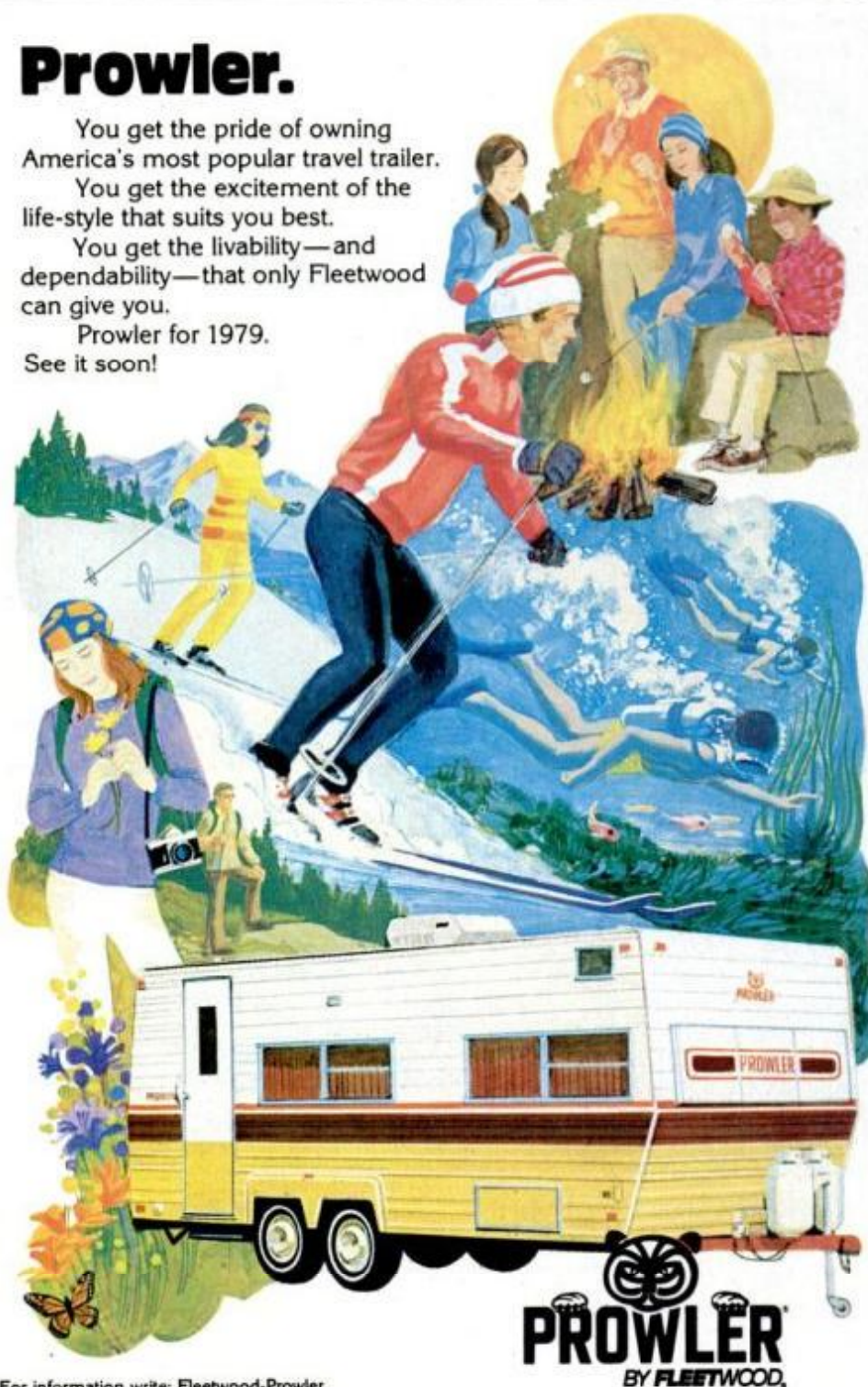
You get the pride of owning America's most popular travel trailer.

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You get the livability—and dependability—that only Fleetwood can give you.

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*Tidy instrument panel.*



*El Camino Conquista.*



*Available Strato-bucket seats.*

Here's the happy marriage of a sporty car and a practical truck. It has a 6½-foot cargo box that carries up to 800 pounds. And inside El Camino, things are downright handsome. Comfortable, too, whether you pick the standard four-inch-thick foam-cushioned bench seat or buy yourself a set of body-contoured Strato-bucket seats with available center console. And outside, you've got yourself one racy looking vehicle (which you can buy at any Chevy dealer or lease at many).



tant for stamps or coins than for flowers or jewelry, and the price is much higher.

### Your third lens

Unless your photographic interests are both very specific and very limited, purchase of your second lens also depends on plans you might have for a third.

If you're only going to get one wide-angle lens, then 35 mm may not be wide enough, while 20 mm might be too wide for much of your work. But if you think you'll be getting a third lens, then it makes sense to get two that straddle the field.

Similarly, if you want just one general-purpose long lens, an intermediate length like 105 mm makes sense. But if you know you'll add more equipment, then 85 mm and 200 mm might be better choices.

### Special mount systems

A system that hasn't achieved wide acceptance, but which has merit, is the T-mount. You buy a lens in this system and a separate mounting flange that goes between the lens and your particular camera

body. If you have two incompatible bodies, you need only the extra mounting flange. And if you know you're going to upgrade your equipment some day, all you'll need is a new flange when you finally get the camera of your dreams. Several lensmakers offer T-mount lenses, and two, Sigma and Soligor, sell lens lines with their own interchangeable flanges.

### A pro's kit

While amateurs can easily go too far in imitating professionals it may be helpful to see what lenses a working pro carries.

The first surprise is that most have *two* each of their most-used focal lengths. Thus, two bodies can mount the same length, either for duplicate coverage in color and black-and-white or so that shooting can continue without frequent reloading (this is more and more necessary with automatic film advance).

The "walking-around" lens of many a pro is likely to be a 35-mm—it zone focuses and usually is wide enough to include whatever's happening without forcing him to

back up. A "headhunter," though, a photographer whose chief interest is faces, might carry a very fast 135-mm.

A travel or industrial photographer will have a fisheye, a 17-mm or 18-mm that renders straight lines straight, a 20-mm, 24-mm, 28-mm, a perspective corrector, a fast 35-mm (much used for portraits that include some environment), a macro 50-mm, a fast 85-mm, a 105-mm, a 200-mm, and, depending on the nature of his work, a mirror 500-mm or 800-mm. He'll have at least one zoom, perhaps a 70-mm to 210-mm. Zoom lenses are used by pros more to take pictures with zoom effects than simply to replace fixed-length lenses—primarily because fixed lenses are faster.

Photojournalists, especially sports photographers, will have more long lenses, including long zooms, and wide apertures at every focal length are a must for them.

The point is, a pro must take pictures with great precision. Very small differences in the balance of elements in the frame composition, the rendering of perspective or the control of focus can be important. The only way to achieve such precision is to have the correct lens. **FM**



## With Elmer's Carpenter's Wood Glue you don't need a pro's hands to give it the pro's touch.



Elmer's® Carpenter's Wood Glue is a special wood glue for all your woodworking projects. It penetrates well in hard and soft woods and forms a heat and water resistant bond that's stronger than the wood itself.

It's also better because it "grabs" immediately and dries fast. Yet it allows realignment before it sets. So you can join surfaces as soon as it's applied.

Elmer's Carpenter's Wood Glue is also sandable, paintable and gumming resistant. Its non-toxic\*, solvent-free formula also washes off your hands and project with water. So you won't get light spots when you stain near glue joints.

\*As defined by Federal Hazardous Substances Act.

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These words to the wise are brought to you by Sunoco, where you could save money on quality gas with our 190. The gas that sells below our regular. Or 220, the gas that sells below our premium. And most cars that run on regular or premium can use them.

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Now, dial down your thermostat to save money and energy and still keep a room comfortably warm.

Just plug in the Edison Comfort Sensor portable electric whole-room heater.

It's the portable heater designed like a forced-air furnace: cold air goes in, warm air flows out.

Actually circulates heat around the whole room, so you don't have to sit in front of it to be comfortable.

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The ideal whole-room  
heater. At retailers  
everywhere.

McGRAW-EDISON

**Edison**  
Heaters

## SERVICING THE '79 GM CARS

(Continued from page 148)

installed a costly d.c.-to-a.c. inverter, so the lights could be turned on when the engine is off.

Olds also has special lighting effects. One is a fiber-optic monitoring system that lets you see if head, parking, tail and directional lamps are operating, by viewing optical outlets visible from the driver's seat. Standard is a dashboard fiber optical system, in which one bulb feeds fiber optic leads to illuminate ashtray and switches for headlamps, cruise control and rear window defogger, plus a Toronado emblem. If you suddenly lose all five lights, head for the single bulb. Remove the left side speaker grille on top of the dash and reach in.

Cadillac will have a bundle of specialty trim items, plus its Trip-master dashboard computer. For those who want metric readings, there'll be a model with a converter switch. This option also will be offered on Riviera after the middle of the model year.

### Other models

Although the fwd cars received the lion's share of the '79 changes, there were many others, particularly on Pontiac and Chevrolet, that affect service.

The nonlinear vacuum regulator with a trap valve is a new spark advance system you'll see on virtually all Chevrolets and a wide variety of other GM cars in 1979. A version also is on '79 AMC cars and it will reportedly make it on some Ford products soon. The regulator provides just enough vacuum spark advance at idle and part-throttle for best fuel economy without compromising high rpm performance.

As installed at Chevrolet, it provides 6.5 inches of vacuum to the distributor advance unit at idle and through part throttle. Other GM cars will use valves calibrated for either 6.5 or 8.7 inches of vacuum.

In the Chevy layout, manifold vacuum flows through a thermostatic vacuum switch (TVS), into a trap valve, then to the vacuum regulator and finally to the distributor. Port vacuum flows from the carburetor port above the throttle plate directly to the regulator.

At idle, cold engine, the TVS is closed and manifold vacuum must flow through the trap valve, which traps vacuum for up to eight seconds, so you don't lose spark advance on acceleration, when manifold vacuum drops sharply. Above 100° F., the TVS opens and manifold vacuum by-

(Please turn to page 162)

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In fact, if you want full protection  
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shade-tree mechanics  
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Before you take Doan's Pills for your muscular backache, remember this: Momentum Tablets are 50% stronger than Doan's Pills. That means Momentum gives you 50% more pain reliever per dose to relieve backaches.

For pain, inflammation, and stiffness of muscular backache, there's no stronger medication you can buy than Momentum Muscular Backache Formula.

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pain and soothe inflammation. It has a calmative, too, to help relax tension that can cause muscles to tighten. Doan's has none. As pain is reduced, stiffness eases, you move more freely in minutes.

If you are taking Doan's, you are not getting all the pain reliever you get in Momentum Tablets. For relief of backache pain, just 2 Momentum Tablets give you the strongest medicine possible without a prescription. Take only as directed.

## **SERVICING THE '79 GM CARS**

*(Continued from page 160)*

passes the trap valve and goes straight to the regulator.

In the regulator is an air bleed, which limits the distributor to 6.5 (or 8.7) inches of vacuum.

As the throttle is cracked open, port vacuum rises and shuts off the air bleed, and the distributor operates with whatever port vacuum exists. At most open throttle conditions it is the same as manifold vacuum; in some cases it is greater. At closed throttle it is zero.

To check the system, just disconnect the hose at the distributor, connect a vacuum gauge and start the engine when it's cold. You should read 6.5 or 8.7 inches. Open the throttle and the vacuum reading should hold for six seconds at least if there is a trap valve in the vacuum circuit.

Tee-in a second gauge at the port, warm up the engine and momentarily open the throttle all the way. The vacuum reading should change instantly, and the two gauges should finally have the same reading.

### **Fuel systems**

Three changes have been made to GM fuel systems. Not all will be popular.

The idle mixture limiters have been discarded, the needle screws recessed and plugged on virtually all GM carburetors. If an adjustment is necessary, you must take out the plug—not a fast job. This is a change that the industry agreed to make by 1980, to make carburetors tamper-resistant, but GM is trying to run ahead.

The gasoline fill neck restrictors, for unleaded gas nozzles only, will have a hardened steel washer on the tank side so you can't enlarge them easily to accept the leaded gas nozzle. This feature will be phased into all GM cars by the end of the model year.

The third change is the introduction of the Vara-Jet carburetor, a two-barrel that resembles a Quadra-Jet cut front-to-rear. It has one small barrel and one large one with an air valve connected to a metering rod for the main fuel passage. The throttle linkage is staged so only the small barrel is open for part throttle.

At wider throttle settings, the secondary throttle opens and the intruding air pushes open the air valve, which is located near the top of the barrel. As the air valve opens, it pulls the metering rod out, allowing increased fuel flow and giving the carburetor better high-speed per-

formance. It is being introduced on the Pontiac 151 Four.

That Pontiac four-cylinder is a much-changed engine in many other respects. First, it has a new cross-flow cylinder head (intake manifold on one side, exhaust on the other). This helps engine breathing, thus improves performance, with horsepower going up from 82 to 90.

This may seem insignificant, but it is a 10-percent hp increase, and required a redo of the entire engine. The only parts interchangeable with '78 are connecting rods.

The new oil pan is combined with a smaller oil filter to reduce crankcase capacity from four to three quarts. The same filter is going on most '79 GM engines and on other than the Four it will cut oil capacity by perhaps half a quart.

With the crossflow head, the location of the big HEI distributor was moved from standing up at the right front to horizontal at the right rear. The distributor sits very low and has been turned so the distributor cap flange (into which you connect a tachometer) aims downward. If you get this one and have trouble connecting your tach, buy a pair of spade connectors for the cap (available from most auto supply stores). The connector plugs into the cap flange, projects a couple of inches and can easily be bent to make tach lead attachment easier.

#### Water-heated manifold

The crossflow head eliminates the butt joint normally used, with a heat riser valve, to preheat the intake manifold when the engine is cold. Therefore, a water-heated manifold is installed in series with the heater inlet hose.

The water flow through the manifold is not shut off in normal driving or in low-ambient temperatures, because it continues through to the heater. In hot weather, however, particularly if you're crawling in heavy traffic or parked and idling, the thermostat opens completely and a projection from the valve plugs off the hose passage to the intake manifold, stopping the coolant flow to prevent overheating of the air/fuel mixture.

You must always replace the thermostat with one that has the special projection, for an overheated fuel mixture will stall the engine.

You also must understand that you cannot turn on the heater (which is an additional radiator) to prevent overheating. For when the engine is close to overheating, the heater coolant flow is stopped by

*(Please turn to page 164)*

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## SERVICING THE '79 GM CARS

(Continued from page 163)

the special thermostat. Pontiac claims the engine cooling system passes all its tests with a large safety margin, but of course, the tests were made on new cars with squeaky-clean systems.

Give your system regular maintenance to maintain its performance (a sound idea on any car).

The '78 version of the 151 Four is not completely dead. It will be used on '79 California cars, which will be equipped with three-way catalyst and electronic fuel mixture control.

## Chevette

The 1.6 Chevette engine also gets an extensive modification in '79. Horsepower has increased gradually (total about 15 percent) since '76 introduction, and for '79 there's a two-barrel carb on a standard version and a two-barrel plus new camshaft for a high-performance option.

Chevy ported and polished the cylinder head for the new two-barrel intake manifold and a tuned exhaust manifold. To handle the additional power Chevy beefed up the piston heads and their greater thickness was compensated for by an increase in the height of the block.

Therefore, the 1976-78 and 1979 blocks are interchangeable, if you're also putting in the new pistons, but the timing belts are not. And you could bolt the new manifolds and two-barrel carburetor to the old engine (after porting and polishing) for some extra power. But Chevy would tell you that it didn't do that until it beefed up the pistons, so any decision to increase performance is not its responsibility.

The Chevette 1.6 also has a new air cleaner with a replaceable element that costs a fraction of the price of the sealed canister used with the one-barrel in 1976-78, and you'll be able to inspect it visually. The sealed canister's 50,000-mile replacement interval is carried over to the element, but many of the sealed jobs got plugged long before that mileage. So a chance to see for yourself is welcome. The sealed canister didn't come with a thermostatic hot air flap system, but the '79 replacement element housing has it.

You can look for some phase-in improvements on '79 GM cars. Lock-up torque converters for automatic transmissions will be introduced on a limited basis, probably on the Chevy Caprice first, then other top-line cars, finally on everything. **PM**





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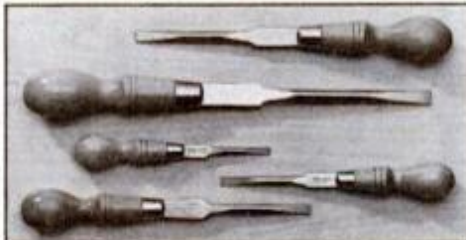
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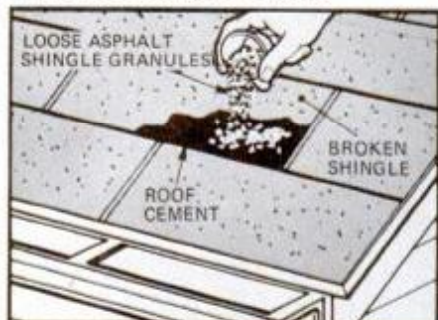
## HINTS FROM READERS

### Tubing cutter for wood dowels



Use an ordinary tubing cutter to cut wooden dowel ends. It beats a bench or jigsaw for speed and accuracy.—Howard E. Moody

### Invisible shingle repair



To fix a small damaged section of roof shingle so the repair is invisible, apply roof cement to the area, then sprinkle loose shingle granules (collected from the gutter) on top, press in.—Neil O. Juntilla

### Cleaning a lathe tool



Soft metals, such as aluminum, can leave deposits on top of lathe tool bits. Remove accumulations with a small flat or triangular file. It won't cut into high-speed steel or other hard tool bits.—Walter E. Burton

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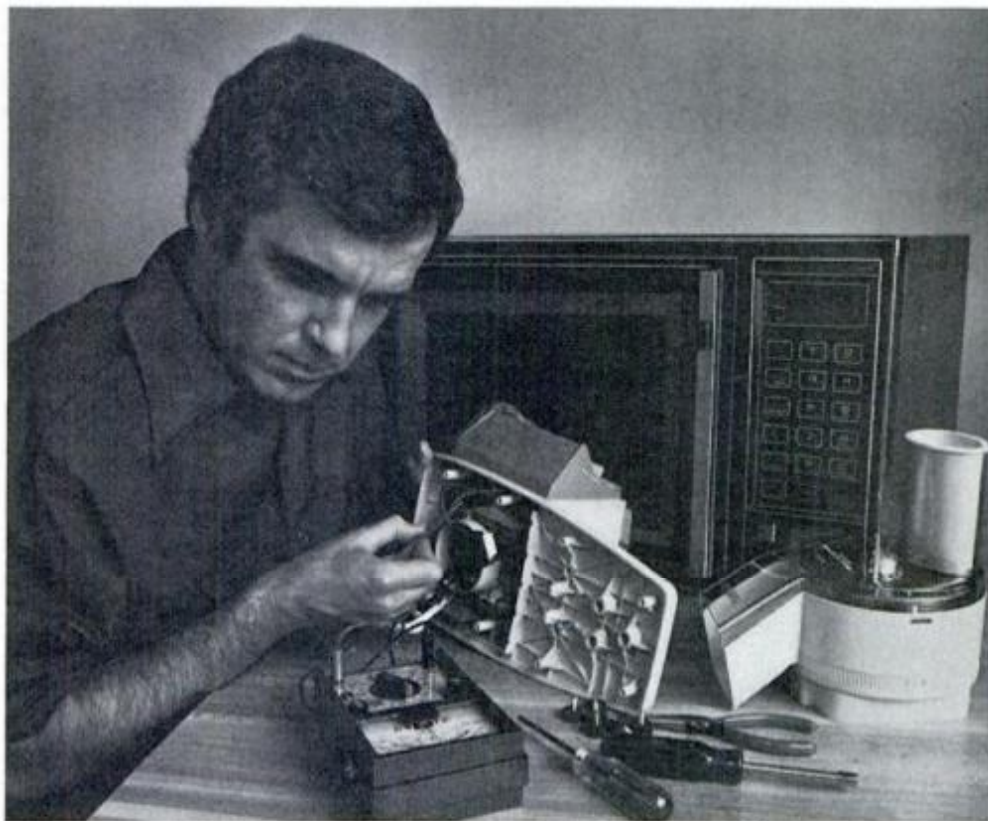
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## CLONING THE CLASSICS!

(Continued from page 103)

interlock system that's been called a giant snap-together model. The other Auburn replicars do the same. Interlocking fiberglass panels fit one into the other and are then bolted or otherwise fastened.

Another maker of Auburn speedsters, Elegant Motors in Indianapolis, occupies a former Stutz dealership. Elegant builds the two-seater version of the Auburn and a four-passenger phaeton (dubbed 856 and 898, respectively).

Two Hoosiers, Del Amy and Dick Passwater, founded Elegant, and their replicar bodies fit a number of different Ford and GM chassis, with running gear to match. The assembled Elegant 856 lists for \$26,995, the 898 for \$36,995, both minus chassis and drivetrain, which the customer has to purchase separately. Kits run \$7500-\$8995 and again use the interlock assembly system.

A newcomer on the replicar scene is Richard I. Braund, president of Elite-Heritage Motor Corp. in Elroy, Wis. He has poured much money and effort into a copy of the mighty 1933 Duesenberg SSJ boattail which he calls the Duesenberg II.

It's a full-scale design, built on a monstrous 153.5-inch-wheelbase custom chassis. The frame uses 3/16-inch steel, with extra-thick fiberglass for the body. Power comes from a 460-cu.-in. Lincoln V8, and the car uses the Ford pickup Twin-I-Beam front suspension. Says Braund: "We feel it is the finest car built in America, and we have no dreams of a high production rate that would necessitate a reduction in our quality standards."

Almost every extra comes standard with the \$55,000 Duesenberg II: airconditioning, power steering, brakes, windows and a six-way power seat.

This isn't the first nor only Duesenberg replicar. Another—a short-wheelbase roadster—was produced for a time in California.

Several Model A Ford replicars are currently available. There's one with a metal body that's made in New England (see page 82, Nov. 76.). Another, produced by Replicars Inc., in West Palm Beach, Fla., comes in a choice of three body styles: roadster, phaeton, or roadster-pickup. All list for \$14,900 and include 302 Ford V8, air, power brakes and steering, tilt wheel, AM/FM tape, and oogh horn.

There's a company in Buffalo, N.Y., called Antique & Classic Automotive Inc., that's been building fiberglass kit cars of amazing au-

thenticity—a 1930 Blower Bentley, 1931 Alfa, Bugatti Type 35, and more recently a 1937 Jag SS 100. ACA can also supply finished cars and will send prices on request.

Panther Westwinds Ltd., a British replicator, builds five different replicars, including copies of the Jaguar SS 100 and the Bugatti Royale.

Classic Motor Carriages Inc. of Hallandale, Fla., has several replica antique automobiles in its stable. The Gazelle is a 1929 Mercedes, the Bugatti is a 1927 Type 35B and, most unusual, are a group of circa 1900 horseless carriages.

## Cloned modern classics

In the second category of faithfully reproduced replicas—more modern sportsters—we have the simulated Shelby Cobras, the Porsche speedster, the two-seater Thunderbirds, and the MiGi. The Avanti II might also fit into this group. At least two companies currently make reproductions of the fabled Shelby Cobra which fetch about the same prices as the real thing.

Arntz Industries, San Francisco, builds one; so does Silver Classic Coachcraft, Lincoln, Calif.

Molds were taken directly from an actual Cobra 427, and unless you rap the fiberglass with your knuckles, you can't tell these clones from the real thing.

You can order the Stallion 429 or 351 Cobra with big-inch Ford power, or a choice of other engines. Finished cars go for \$29,200 to \$34,500.

The Automobili Intermeccanica Porsche speedster authentically reproduces the 1958 original in amazing detail. It uses VW 1600 power (90 bhp) and a shortened Beetle chassis. The body is so strong you can sit on the door while opening and closing it. And it's one of the less expensive replicars: about \$6500 complete. Intermeccanica owner Frank Reisner sells the body only for \$4500 and subcontracts it out if you want a whole car. Reisner, by the way, used to produce the Apollo GT with the little Buick Special aluminum V8 in it.

The Daytona MiGi does a convincing job of simulating the classic 1950-53 MG-TD roadster. It uses an unshortened VW Beetle floorpan and running gear. You can order a kit for \$1795 or the fully assembled and wired body (minus VW parts) for \$4995. That includes top, side curtains, wire wheel covers, gauges, everything. For another \$400, Daytona MiGi will put the body on a chassis you supply.

As for the 1955-57 Thunderbird reproductions, there are actually

(Please turn to page 172)

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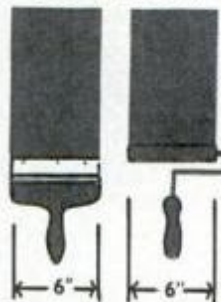
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pressure you need. The whole sprayer weighs only 2 lbs., so it's child's play to carry it right to the job. And its compact size (it's only 9" x 8" x 5") and the convenient hook makes storing it a cinch.

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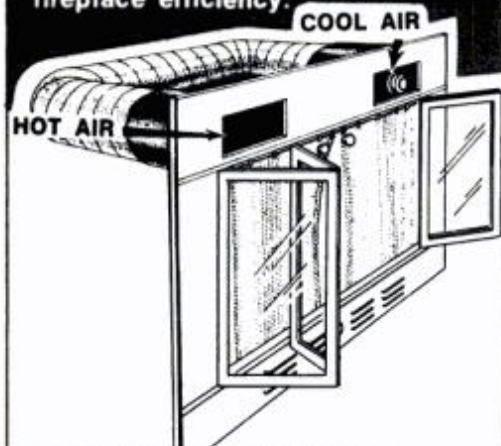
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## CLONING THE CLASSICS!

(Continued from page 170)

three different ones being built. One is a kit, the Vee-Bird, that fits the traditional VW chassis. Another is an all-metal job that's soon to be completed in England, and the third is currently produced in Florida.

This latter, called the Daytona Bird (no relation to Daytona MiGi), is built by Old Car Reproductions of New Smyrna Beach. It has a special steel-tube frame with a fiberglass body. Power comes from a 302 Ford V8 (the first car was also turbo-charged).

Among the Daytona Bird's nuances are rack-and-pinion power steering, front disc brakes, automatic, AM/FM/CB, Lincoln Versailles instrument panel, optional rumble seat, porthole removable hardtop and continental kit. The Daytona Bird lists for \$19,900. It looks very much like the original, and we hear there's a waiting list.

### The 'exoticars'

In the final group of specialty vehicles—those not copying any specific ancestor—are the Excalibur, Clenet, Sceptre, Mercia, Stutz Blackhawk, Blakely and Renaissance. Inspecting these one at a time:

The Excalibur, designed and brought into being by auto designer Brooks Stevens in 1964, remains perhaps the best known and most respected of modern exoticars. The Excalibur Automobile Corp. in Milwaukee is run by Stevens' sons, David and William.

Excaliburs are built at the rate of about one per working day, with 1400 currently on the road. The 1978 Series III uses a custom ladder frame with four-wheel independent suspension. The engine, a 454-cu.-in. GM V8, delivers 215 bhp net and drives through Turbo Hydra-Matic. Airconditioning, tilt wheel, four-wheel power disc brakes, leather upholstery, twin side mounts and a full 24/24 warranty are among the standard items. The Series III comes in two body types, phaeton and roadster, both \$25,600.

The Clenet roadster gets its inards from Lincoln-Mercury, including the frame. The body is of steel, with fiberglass fenders. Only 250 are slated to be made, with a mere 50 left to go. Price? \$49,500. Each car takes about three months to build.

The Sceptre 6.6S is another exoticar constructed on Lincoln-Mercury basics. To improve handling, the 351-cu.-in. V8 is moved back 24 inches in the frame and lowered four inches. Steel reinforcements are in-

stalled full length along the frame to support the open body, which is mostly fiberglass, but has steel doors.

The Sceptre's convertible top, doors and windshield are all standard British Leyland parts. The interior comes with Connolly leather and Wilton wool carpeting. Adjustable pedals and steering wheel, air, cruise control and other extras are included in the base price of \$39,500.

The Mercia roadster takes a different tack. Made in England, it uses thoroughly reconditioned Bentley engines and frames and places new aluminum bodywork on them. Most carry the 260-cu.-in. F-head Bentley Six. Jim Rickman Motors in Pasadena is a primary distributor, and the Mercia sells for \$37,000 and up.

The Stutz Blackhawk VI, long a favorite of movie stars and sheiks, uses a Pontiac Grand Prix chassis and GM's 403-cu.-in. V8. Its all steel body comes from Turin, Italy, where the Stutz is handbuilt in the classic tradition. All interior moldings, switches, instrument lights and screws are finished in 24-carat gold. New Zealand lamb's wool covers the floors, and no power convenience accessory is overlooked. You can order one for a mere \$64,500.

The Blakely Bearcat, based on Ford Pinto/Mustang II components, uses a box-girder steel frame and 2.3-liter ohc Four. You can get the Mustang II V6 plus four-speed gearbox and many options.

And finally, for \$50,000, the Canadian-built Renaissance by Le Vicome Classic Coachbuilders Inc., rounds out this potpourri (and we're leaving out many, we realize). Only 50 Renaissances will be built. Le Vicome uses 6.5-inch steel channel sections and tubular crossmembers for the modified Ford van chassis. A 400-c.i.d. Ford V8 powers the steel-bodied, fiberglass-fendered, 5128-pound car.

Inside, you get electric windows, power everything, flow-through ventilation, airconditioning, AM/FM stereo with eight-track and four speakers, plus an engine-turned instrument board.

### Shop before you buy

Buyers of replicars and exoticars are advised to do some shopping before they let their emotions run away with their bank accounts. Not that these cars aren't good investments—they are. Most hold their value well. But quality of manufacture varies not only from maker to maker, but from car to car.

Some manufacturers use older

(Please turn to page 174)

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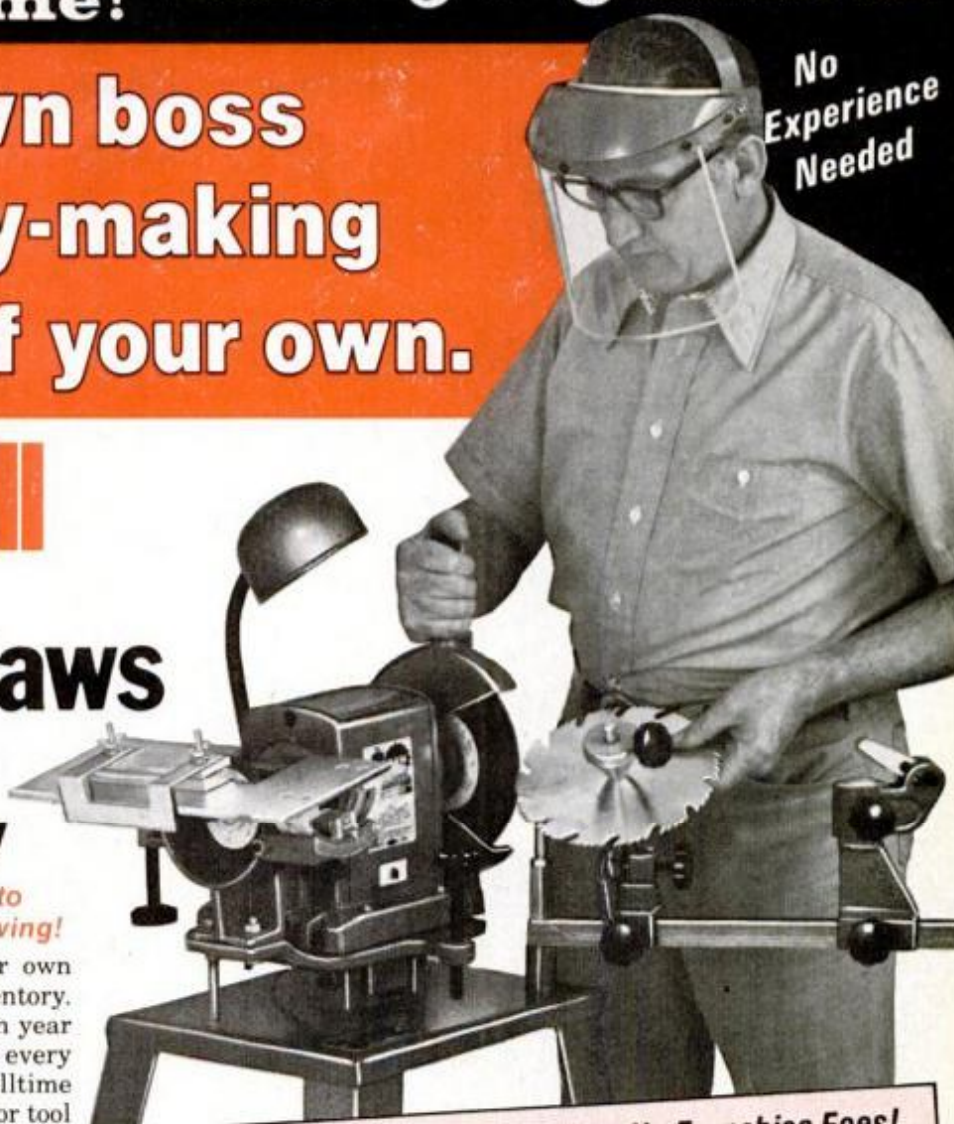
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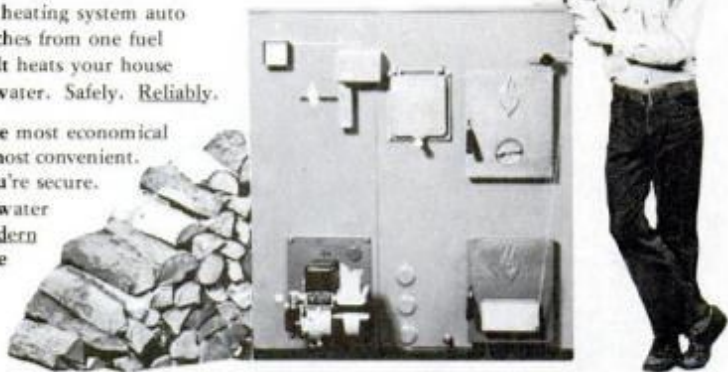
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## CLONING THE CLASSICS!

(Continued from page 172)

chassis and register their new creations under the old titles, to get around emissions and safety regs. But it might end up costing the buyer. Be sure the car is, or can be, smog and safety certified in your state.

Insurance and taxes, too, can be steep and should be considered.

There's usually no problem getting these cars worked on, or in obtaining mechanical parts. To replace a bashed fender, though, is costly.

Most dealers supply completed cars on special order only. This means putting down a deposit, usually of 10 to 20 percent of the total price. Since waits for finished cars might take six months to a year, it's best to put such deposits into jointly held savings accounts where the buyer reaps the interest.

Finally, all prices listed are f.o.b. factory and were current in July, 1978. If you have questions about individual cars, please write the manufacturer. **PM**

## How to get in touch with manufacturers

**Antique & Classic Automotive**, 100 Sonwil Industrial Park, Buffalo, N.Y. 14225 (Bugatti Type 35, 1930 Blower Bentley, 1931 Alfa, 1934 Frazer Nash, 1937 Jaguar SS-100).

**Artz Industries**, 1745 Filbert St., San Francisco Calif. 94123 (427 Cobra Replica).

**Automobili Intermeccanica**, 2421 South Susan St., Santa Ana, Calif. 92704 (1958 Porsche speedster).

**Blakely Auto Works**, 124-B Fulton St., Princeton, Wis. 54968 (Blakely Bearcat and Bantam).

**California Custom Coach Inc.**, 1285 East Colorado Blvd., Pasadena, Calif. 91106 (Auburn 876 speedster).

**Classic Motor Carriages Inc.**, 200 South Federal Hwy., Hallandale, Fla. 33009 (Gazelle, Bugatti, Gadabouts).

**Clenet Coachworks Inc.**, 495 South Fairview Ave., Santa Barbara, Calif. 93017 (Clenet roadster).

**Daytona Automotive Fiberglass**, 852 Carswell Ave., Holly Hill, Fla. 32017 (Daytona MiG1 roadster).

**Elegant Motors Inc.**, 832 North Meridian St., Indianapolis, Ind. 46204 (Auburn 856 speedster, Auburn 898 phaeton).

**Elite-Heritage Motors Corp.**, 1 Heritage Lane, Elroy, Wis. 53929 (Duesenberg II speedster).

**Excalibur Automobile Corp.**, 1735 South 106th St., Milwaukee, Wis. 53214 (Excalibur Series III phaeton and roadster).

**Le Vicomte Classic Coachbuilders Inc.**, Box 430, St. Sauveur des Monts, Que. JOR 1R0 (Renaissance).

**Mercia Automobiles**, Jim Rickman Motors, 2124 East Colorado Blvd., Pasadena, Calif. 91107 (Mercia roadster).

**Old Car Reproductions Inc.**, 1121 North Dixie Freeway, New Smyrna Beach, Fla. 32069 (Daytona Bird).

**Panther Westwinds Ltd.**, Buckingham Motor Imports Ltd., 1900 Ave. of the Stars, Los Angeles, Calif. 90067 (Panther J2, Cabriolet De Ville Saloon—Jaguar SS-100 and Bugatti Royale replicas).

**Replicars Inc.**, 3175 Belvedere Rd., West Palm Beach, Fla. 33406 (Model A Ford roadster, phaeton and roadster-pickup).

**Sceptre Motor Car Co. Inc.**, 100 Dean Arnold Pl., Goleta, Calif. 93017 (Sceptre 6.6S roadster).

**Silver Classic Coachcraft**, 643 H St., Lincoln, Calif. 95648 (Stallion 429 and 351—Shelby Cobra replicas).

**Stutz Motor Car Corp. of America**, Rockefeller Center, Time-Life Building, New York, N.Y. 10020 (Stutz Blackhawk VI).

**Veebirds Inc.**, 4941 North Park Dr., Colorado Springs, Colo. 80907 (1957 Thunderbird).

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Beryllium	•	•	•	•	•
Carbon	•	•	•	•	•
Cast Iron	•	•	•	•	•
Composites	•	•	•	•	•
Composition Board	•	•	•	•	•
Fiberglass	•	•	•	•	•
Foamed Glass	•	•	•	•	•
Friction Materials	•	•	•	•	•
Glass	•	•	•	•	•
Hardened Steel	•	•	•	•	•
Honeycomb Materials	•	•	•	•	•
Marble, Natural	•	•	•	•	•
Marble, Synthetic	•	•	•	•	•
Plaster	•	•	•	•	•
Plastic Laminates	•	•	•	•	•
Plywood	•	•	•	•	•
Stainless Steel	•	•	•	•	•
Stranded Cable	•	•	•	•	•
Superalloys, Iron-base	•	•	•	•	•
Superalloys, Nickel-base	•	•	•	•	•
Tempered Hardboard	•	•	•	•	•
Tires, Steel-Reinforced	•	•	•	•	•
Titanium	•	•	•	•	•
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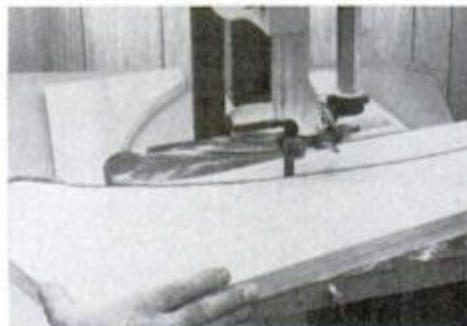
## BUILD A TABLE SOCCER GAME *(Continued from page 127)*

The rods must slide freely; if the holes are in alignment, they will. However, if you should encounter any interference you can true-up the alignment by sanding or filing the 1-in.-dia. hole slightly to allow the bearing to be shifted. The outside of the washer can also be sanded to

allow it to be shifted. Mark the holes for the screws only after all of the adjustments have been carefully made.

Saw legs according to plans and clamp the parts together to drill the screw pilot holes. Disassemble; rout

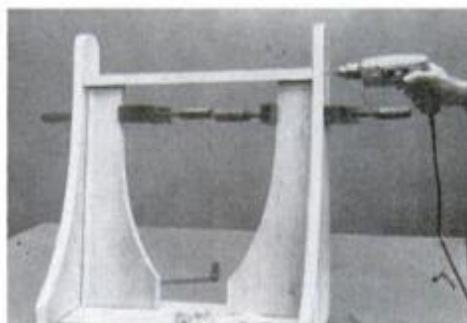
*(Please turn to page 178)*



**10** Bandsaw makes quick work of cutting out leg sections, but a sabre saw can also be used to get the job done.



**11** Spokeshave is right tool to use for smoothing saw-cut ripples. Pull tool in direction of the grain as shown.



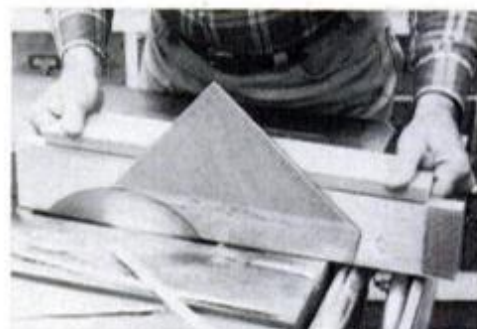
**12** Parallel clamps are used to hold the leg members together while drilling the holes for the wood screws.



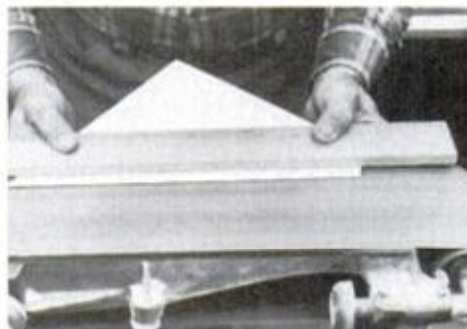
**13** Use slip sheets to position plastic laminate accurately. When aligned, pull out one sheet, then the other.



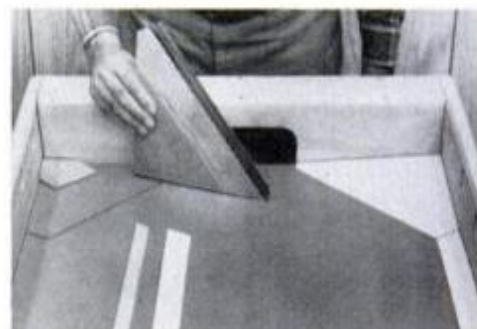
**14** To make beveled fir corner wedges, tilt the bandsaw table and clamp a guide strip to insure accuracy.



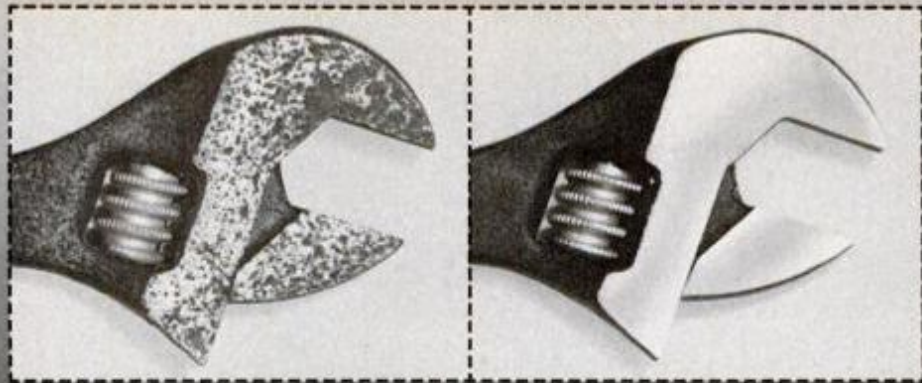
**15** Simple jig for use with table saw permits cutting wide, sharp bevel on plywood face for the corner pieces.



**16** After bonding laminate to plywood, sand front to near feather edge. Scrap wood backer prevents flexing.



**17** Test corner incline assemblies to be sure that they make positive contact along entire front edge.



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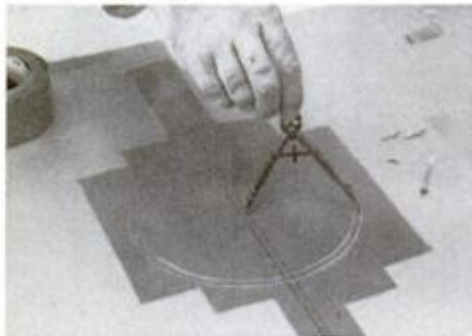
## BUILD A TABLE SOCCER GAME

(Continued from page 176)

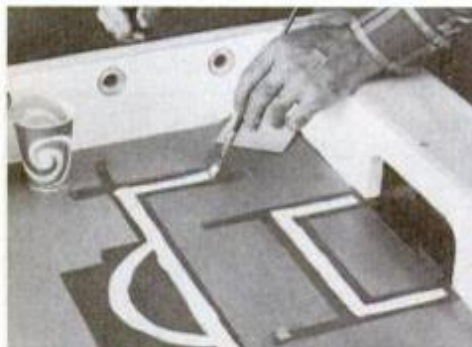
the corners round; then sand before gluing. Use glue and lagscrews to attach the legs to the top. At this time, screw in the ball return units by securing the corner braces to the underside of the table.

### Applying plastic laminate

The tabletop receives a sheet of green, satin finish plastic laminate for the play field. Cut this  $\frac{1}{8}$  in. undersize overall to assure an easy



**18** Cut PVC tape mask with compass that has knife point. For perfect circles, make concentric cuts  $\frac{1}{4}$  in. apart.

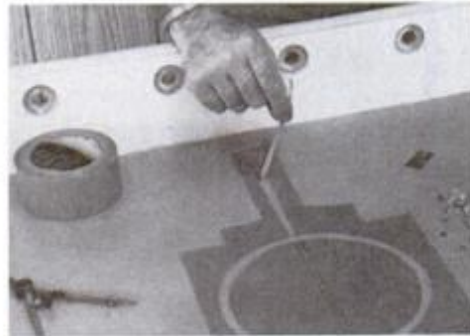


**20** Pre-coat lines with B.I.N. primer and use latex enamel top coat. Skipping primer impairs paint adhesion.

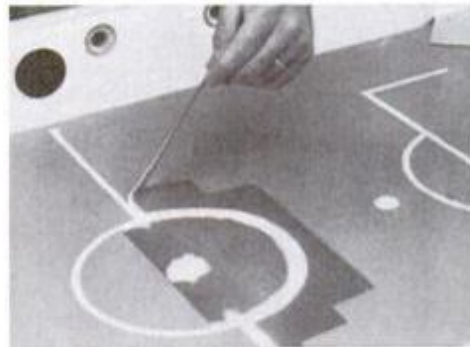
fit. Apply contact cement on both surfaces and allow to dry until no longer tacky. Then lay down two sheets of kraft paper to cover the entire cemented area. Position the laminate carefully, then pull out one of the sheets of paper to allow initial contact to be made. Then pull out the second sheet and tap over the entire surface with a mallet and block of soft wood to achieve good contact throughout.

### Making corner and side inclines

White plastic laminate is used to



**19** Peel away tape where pattern is to be painted. The PVC tape peels off easily and leaves no sticky residue.



**21** Peel off masking tape after paint has dried and apply two coats of semigloss wipe-on varnish with clean rag.

face the inclined corner segments and side strips which prevent the ball from getting hung up out of reach. The corner wedges and beveled side support strips for the laminate can be cut from a piece of kiln-dried, 2x4 fir.

To reinforce the fir corner sections, they're laminated to pieces of  $\frac{1}{4}$ -in. plywood. Cut the triangular plywood sections so they're about 1 in. shorter than the laminate at the lead edge. Nail the plywood, before attaching the laminate, to a simple jig to permit making the sharp-angled cut safely (see photo 15). The tack-nails must of course be out of the line of cut. Set the blade to make a  $6^\circ$  bevel cut.

Bond the laminate to the plywood. Then carefully sand the lead edge of the laminate to reduce the  $\frac{1}{16}$ -in. thickness to about  $\frac{1}{64}$  in. Make up the inclined side strips the same way. Put all the pieces in place and mark the area on the green which is to receive cement, but don't attach the pieces yet. It'll be easier to do the painting first.

### Taping, painting and staining

The inside walls are painted semigloss white as are the playing field markings. Ordinary masking tape can be used to do the precision painting, but you'll get the best results with PVC plastic packing tape (3M makes a good one). It's extremely thin, sticks very well, and yet is easy to remove and leaves no gummy residue.

Apply the tape along the inside corner of the routed edge; the sharp corner makes it easy to align. Coat the inner sides with white paint. When this is dry reverse the procedure: mask the painted parts and apply the stain and top-coat finish to the rest of the table. Beverlee's (UGL) cherry stain was used, followed by two coats of Zar Wipe-On semigloss varnish.

The playing field markings are done to perfection using the 2-in.-wide tape. Lay down tape in areas to be striped with  $\frac{1}{8}$ -in. overlaps at seams. Use a sharp razor blade and straightedge to cut the outlines. Use an artist's knife fitted into a compass to cut the curved portions of the tape mask.

The scoring counter is made with wood beads which are widely sold at hobby and department stores. Spray-paint one of the sets red and the other one blue before you install them.

Attach the rod bearings, washers and faceplate. Insert the rods and players and ball entry dishes. The soccer game is now complete and ready for playing. **PM**



The accessory parts for the table soccer game include: steel rods (about 32 lineal feet) or aluminum tubing; rod hand grips (8 pcs.); rubber rod tips (8 pcs.); plastic rod bearings (16 pcs.); plastic rod washers (16 pcs.); chrome faceplates (16 pcs.); goalie stop rings (4 pcs.); player

bolts and nuts (26 pcs.); ball entry dishes (2 pcs.); soccer balls (4 pcs.), and the players (22 pcs.). All of these accessories may be obtained from Capro Craft, Box 18, Greenlawn, N. Y. 11740. Write to this company for a completely itemized price list.

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## USING A HOME COMPUTER

(Continued from page 107)

interesting coffee-table curiosity.

A computer is an incredibly complex set of switching circuits that take electrical impulses from the touching of a typewriter-like keyboard and step-by-step change them into some other impulses, then turn them back into letters and numbers on a video screen or a typewriter. The programs set up the switching progressions to accomplish the programmer's goal.

With the first microcomputer, it took 20 separate steps just to get it to recognize data coming in from a cassette player or a Teletypewriter. This first small program is called a bootstrap loader. These days it's on a memory chip called a ROM (Read-Only Memory), so we don't have to go through 20 steps of manual switching.

Since each fundamental type of computer works in a different way, there is a need for a common language that can be used on all systems. The one that has become the standard in microcomputing is called Basic, and a Basic interpreter is available for almost any microcomputer sold today.

But, assuming you have Basic, you're still a long way from having a computer that will actually do anything. The next step in the process is writing programs in Basic that will make the computer do what you want. Writing programs for simple tasks like adding two numbers is easy, but a program to handle the inventory of a small business or to keep cooking recipes available on command is a more serious matter. A complex program can take days or even weeks to write, and still longer to get working without problems (bugs). Some programs take many man-years to get written and debugged.

Thus, a complex program can cost tens of thousands of dollars. This isn't serious when a large company has already invested a million dollars in a computer system, but it can paralyze things for a \$1000 home system. No one wants to buy a computer for \$1000 and then spend \$50,000 for programs. And that's why we've been getting a lot of double-talk when we ask what a home computer can do for us.

This impasse is gradually being broken as more and more small firms come up with reasonably priced programs to help make our systems useful. Since they can't charge \$50,000 for a program, their trick is to sell the same program several thousand times at a lower

price. And it's working. By the time microcomputers see their fourth birthday—next year—we should have hundreds of good programs available and our magnificent little systems should be able to do many of the things that computer salesmen have promised.

## New software of 1979

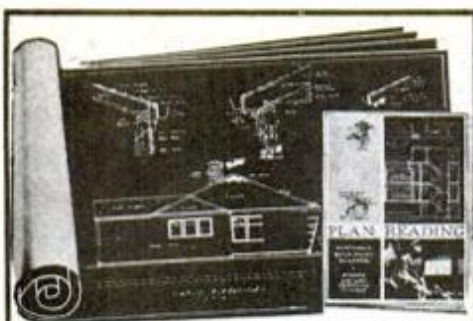
With good programs, we'll be able to keep track of our record and book collections, access recipes instantly, keep an index to magazine articles—all the things for which a file-card system is only half an answer. Double-entry personal-finance programs will tell us, to the penny, how much we should have in our pockets. Look for some really exciting games, some to be played against the computer, some against other people. More exciting still are prospects for learning via home computer. Every course taught in school will eventually be available at home; a computer has infinite patience with a student, and the top people in each field can help write the programs, so that quality of instruction can be higher than what we're accustomed to. Add just a little hardware—for which the technology already exists—and you'll see even more possibilities.

Next year should see the microcomputerists giving the post office a hard time by sending mail by telephone. Look for a little gadget that plugs onto the back of your computer and connects to the phone. It will let you call up someone else with a system and play games with him—or send letters. The one-minute late-night charge is around 20 cents within the 48 contiguous states, so we should soon be seeing computer accessories that call up any other computer in the middle of the night and leave a message. They'll call again if the line is busy, and will not ring the phone, unless you want them to. They'll also get confirmation that the message was received correctly and hang up, all within that single minute.

Connect the \$40 Vidiet-Stik light pen made by Esmark, Inc., to your system and non-typists—even preschoolers—will be able to use it with ease.

Cable-TV folk are looking with great interest at the microcomputer explosion. They're thinking in terms of a connection between cable and computer that will let you order anything you see advertised on TV, choose among contestants, even vote for political candidates.

My own concept of the next step in educational hardware is a system that uses video cassettes that also



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contain computer programs to ask the viewer-student every so often what he's seen. If he misses questions, the tape rewinds to the right spot, and he sees the material again on the TV monitor. This kind of teaching is practical with today's hardware.

### Data services

Microcomputer-based data services for home and industry will grow. Owners of the Apple computer can now tie into the Dow-Jones data bank and retrieve up-to-the-minute information on any stock that interests them. We should soon see other data services—indexes to medical-journal magazines for doctors, for example. Just about every professional man will be able to get updated indexes to literature in his field. Students will be able to access encyclopedia references. Something like having the Library of Congress in every home is not impossible.

### Business uses

With practical microcomputer systems now available in the \$15,000 price range to handle everything most small businesses need, only the lack of programs is holding up massive sales. But many small businesses have been inveigled into buying microcomputer systems without the needed programs.

Since business programs are more involved than games and simple home programs, they have not yet appeared in any numbers. We'll be seeing them, perhaps later in 1979. Since they take months and even years of programming work, they'll cost more than home programs. Computer stores will offer complete sets of programs for specific kinds of business for around \$1000. These complete packages will do everything a small firm needs in computing.

### Memory and data storage

The more memory you have in a computer the more it can do in a given time. Some programs don't use a lot of memory, but once you try to sort out a few hundred record selections and find them by composer, artist, record number, or whatever, you'll be buying more memory to plug into your computer. Business programs often require a lot of computer memory to function.

The Radio Shack TRS-80 comes with 4K or 16K of memory. This means that you have a choice of a system which can hold up to about 4000 characters or about 16,000 characters. The Commodore PET comes with 8K of memory. The

*(Please turn to page 182)*

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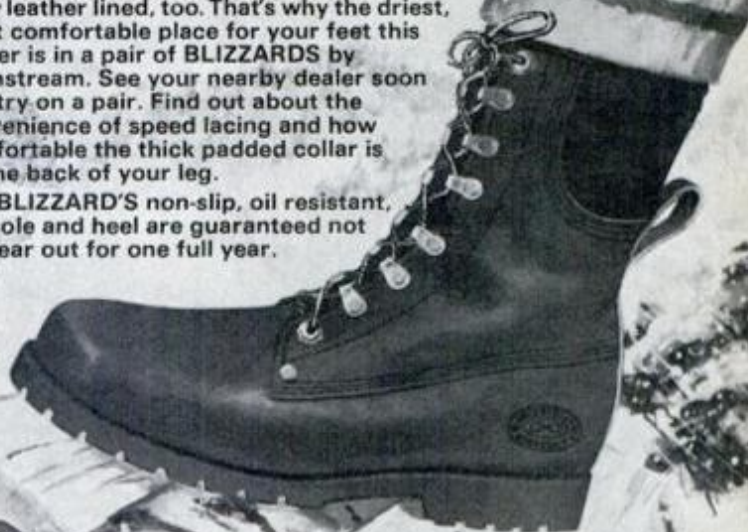


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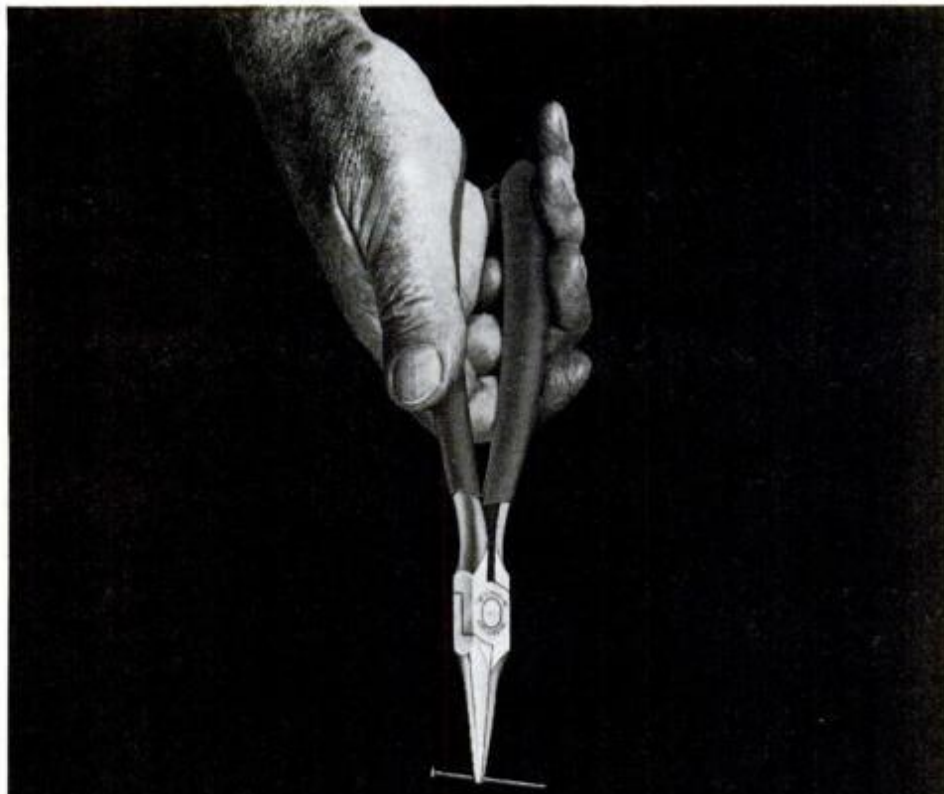
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## USING A HOME COMPUTER

(Continued from page 181)

Apple has 16K usually, though you can buy as much as you like to plug in. The microprocessors upon which all of these systems are based have the ability to handle a maximum of 64K of memory.

### Data storage

You need some way of getting programs or data (like the names of your records) into your computer. The most popular way of keeping this material on hand is on regular audio cassettes. The TRS-80 comes with a cassette recorder for entering programs and data. The PET has a recorder built right into the unit for this. The Apple has a set of jacks to plug your cassette recorder in. About 99.9 percent of the microcomputer systems sold these days have inputs for cassette recorders, and output too. So you can save any data you type in or any programs you write.

Where more data or many programs are wanted on demand, most microcomputer systems are using what are called floppy discs. These come in two sizes; one stores about 75,000 characters and the other about 250,000. Much work is being done to get these to pack twice as much on a side and use both sides. These are the types of gadgets that aficionados look for at computer shows.

### Why buy?

There are several reasons why you should immediately hie yourself to your nearest computer store and invest. You surely don't want to miss out on the fun. Prices will be coming down, but not a lot and not fast, so it is unlikely that you will be able to lose much of your investment in a system. Inflation seems to be rising faster than microelectronics can bring prices down.

There is a whole new world of microcomputer programming ahead. This means that people who can write programs that sell well will be making large sums of money, much like the royalties paid by the book publishers and record companies. Some of the people making program royalties today have been programming for just a few months. People interested in learning to write programs can now afford to buy their own computers and spend as much time as they like learning or working on programs. With program royalties now running about 20 percent of gross at the wholesale price of programs, we should see our first

(Please turn to page 184)



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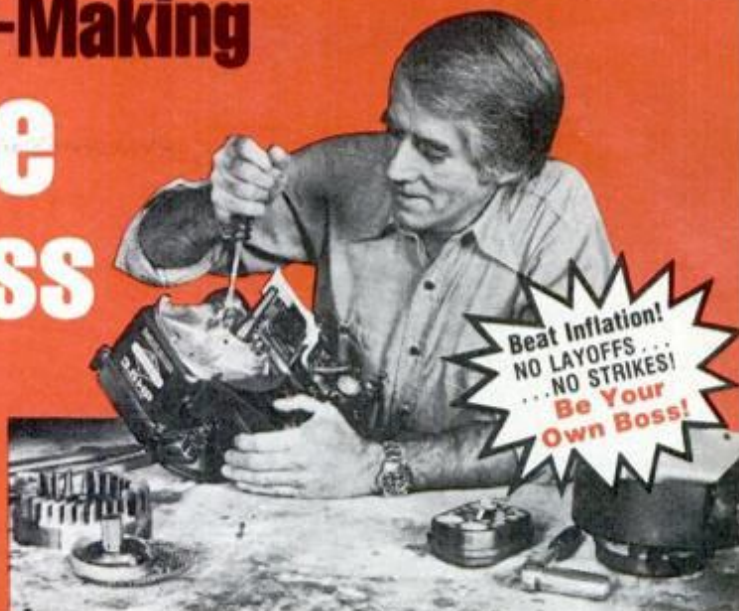
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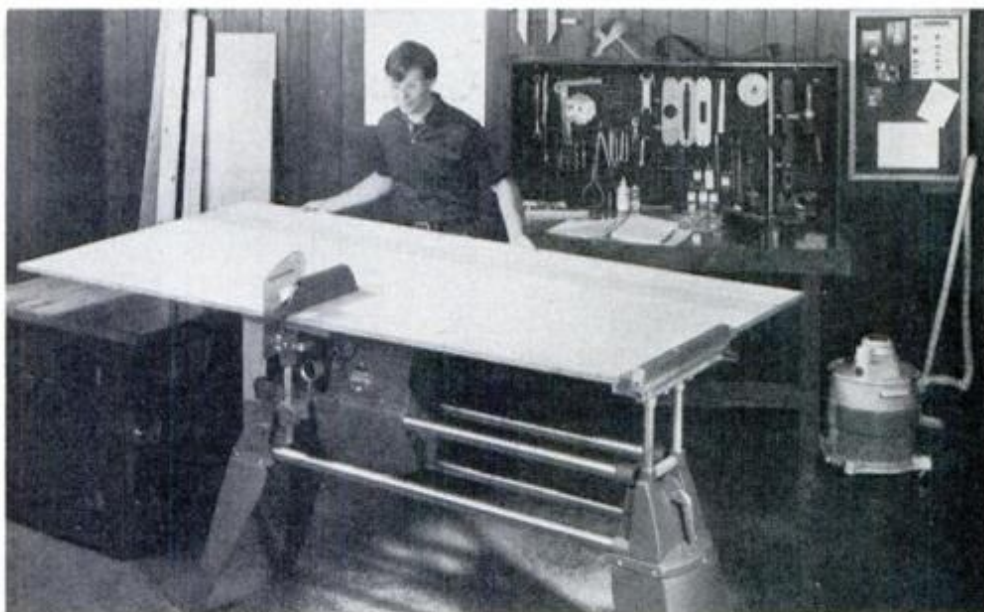
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## USING A HOME COMPUTER

(Continued from page 184)

and most computer stores can tell you when and where shows will be. Or you can find that information in the microcomputer magazines.

In addition to exhibits at these shows there are talks, lectures, workshops, symposiums, and forums. They are aimed at all levels of expertise, from the very beginner to the professional programmer or equipment designer.

### Are you a hobbyist?

Taking on computers as a hobby is a serious commitment. It means both endless fun and endless education. There are clubs everywhere, so hobbyists can help each other over the rough spots. Since it is possible to start in computing with a \$250 computer and add on to it in steps, learning as you go, it is no wonder that there are today well over 150,000 hobbyists.

Put it this way: How many hobbies can you name where you can make money and have fun at the same time? Most manufacturing firms in the field were started by hobbyists and virtually all of the programs are being written by hobbyists.

How do you get started? All it takes is the spark. Back in late 1975 when I was taking around the first issue of my brand new microcomputer magazine to show it to manufacturers I stopped off in Dallas/Fort Worth. While there I worked in a visit to two old friends who were in the ham business, one with a ham store and the other an importer of VHF equipment. I gave them a copy of my new magazine and a pep talk.

Today one of them has a firm selling disc systems of his own design and the other sold out his ham business and is now computer products manager for Radio Shack! Also, two of his programs are best sellers and he has royalties which could soon go into five figures.

I predict that there are going to be more millionaires within the next five years in microcomputing than we've had in the last hundred years. Many people who today don't know a baud from a byte will be going the route from hobbyist to small entrepreneur to magnate. Of course this means that millions of less enterprising people will be buying and enjoying computers. In various forms you'll be seeing them everywhere in the near future and I predict that this revolution will have more effect on our society than even the motor car. **PM**

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**... YOU Can Do It Too!**

## DRIVING THE NEW DATSUN Z CAR

(Continued from page 113)

remote control mirrors. It also has four of the trickiest new gimmicks we've seen: the power window system has a third button that automatically zips the driver's window all the way up or down with one touch; the stereo radio has four "surround-sound" speakers with single "joy stick" for precision balancing; the fuel gauge includes a second dial that is widely calibrated between zero and one-quarter tank; and there's a central warning system on the instrument panel that automatically checks through engine water and windshield washer fluid levels, taillights, headlights and stop-lamps each time you start the engine, or on command at the touch of a button.

No prices were announced at the press show, but the Datsun people significantly mentioned the Corvette and the Porsche 924 as the new Z's competitors, and left out Mazda's \$7000 RX-7. So stand by for a near five-figure price tag for the '79 280-ZX.

### 810 model

Datsun has perked up the fine luxury 810 sedan's lackluster lines

for '79 with a much improved grille and quad rectangular headlamps in front and larger taillamps around back, and there's a brand new two-door hardtop model as well, complete with U.S.-style rear-quarter "opera" windows and a standard five-speed transmission. The car's already impressive standard equipment level also has been enhanced significantly, examples being adjustable lumbar support for the driver's seat, "surround-sound" four-speaker stereo with an automatic power antenna, side window defrosters, backlit full instrumentation similar to that on the 280-ZX, quartz-digital LED clock, cruise control (with the optional automatic trans) and split fold-down rear seats for the wagon. The addition of a catalytic converter for '79 should enhance the fuel-injected 2.4-liter OHC six-cylinder's fuel economy and performance.

### All-new 210 models

The aging B-210 economy-series Datsun line has been replaced by a fresh-looking and much better riding, braking and handling 210 series (the "B" designation is dropped) to compete on a more equal level with Toyota's fast-selling Corolla lineup.

The styling is quite pleasing, if

not exciting, and the new cars offer better interior design and roomier accommodations front and rear. Visibility in the hatchback model is greatly improved due to its large, triangular rear-quarter window, and a nice five-door wagon has been added to the line.

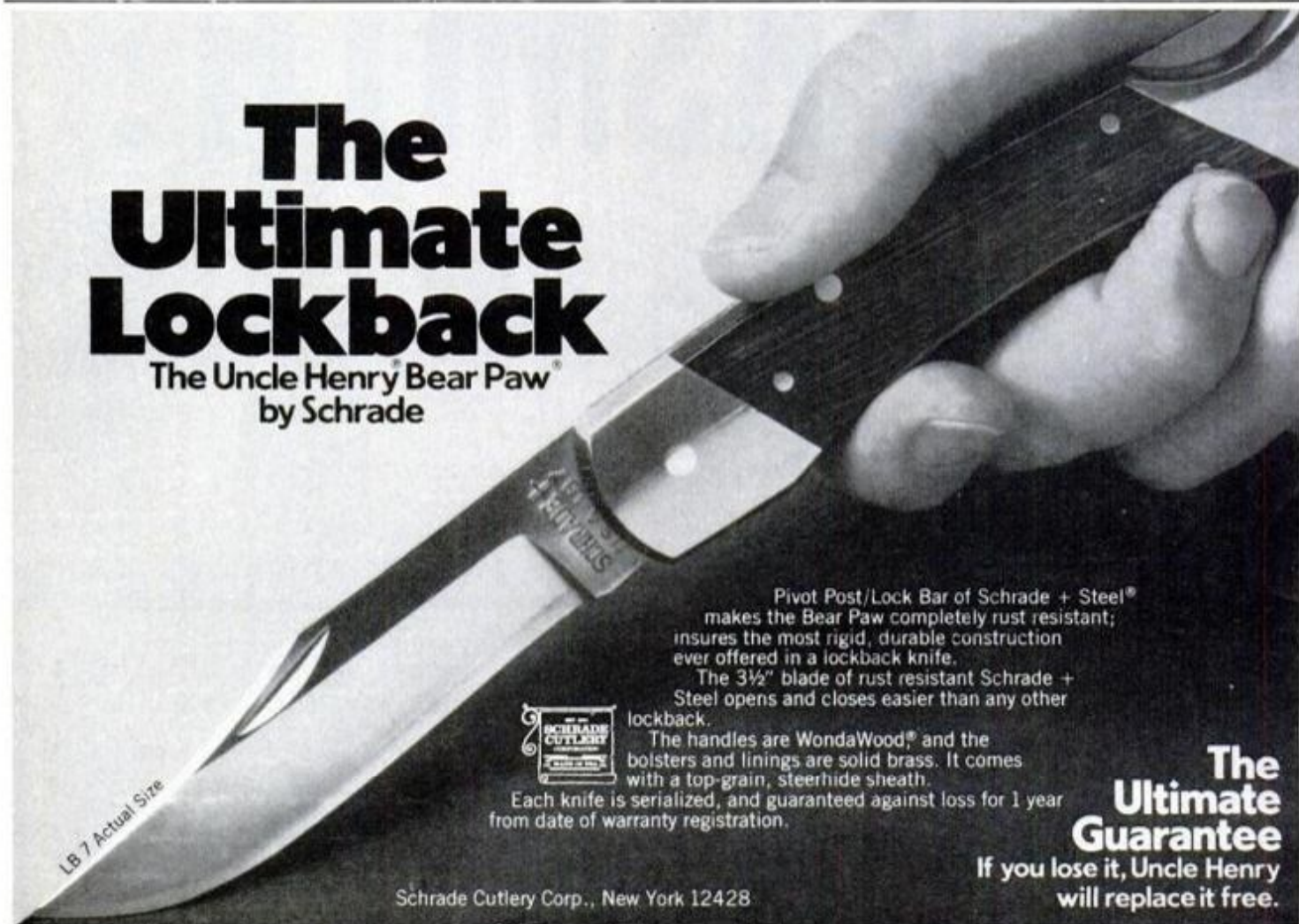
### 510 and 200-SX

The mid-range 510 series, new a year ago, and the 200-SX sporty coupe are unchanged for '79 except for evolutionary improvement here and there and some additions to the equipment list. The 510, available as a two-door or four-door sedan, two-door hatchback or five-door wagon, gets adjustable lumbar support for the driver's seat, split fold-down rear seat in the wagon and hatchback, quartz digital LED clock and a low washer-fluid warning light, while the 200-SX sports a new, much-improved standard AM/FM stereo radio, a locking fuel filler lid and blacked-out rocker panels to improve its chunky looks.

Prices can be expected to increase drastically on all these cars as the Japanese yen climbs all over our dollar on the world money market. But, at least Datsun is trying to soften the blow by building in a lot of additional equipment. **PM**

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The Uncle Henry® Bear Paw®  
by Schrade



Pivot Post/Lock Bar of Schrade + Steel® makes the Bear Paw completely rust resistant; insures the most rigid, durable construction ever offered in a lockback knife.

The 3½" blade of rust resistant Schrade + Steel opens and closes easier than any other lockback.

The handles are WondaWood® and the bolsters and linings are solid brass. It comes with a top-grain, steerhide sheath.

Each knife is serialized, and guaranteed against loss for 1 year from date of warranty registration.



LB 7 Actual Size

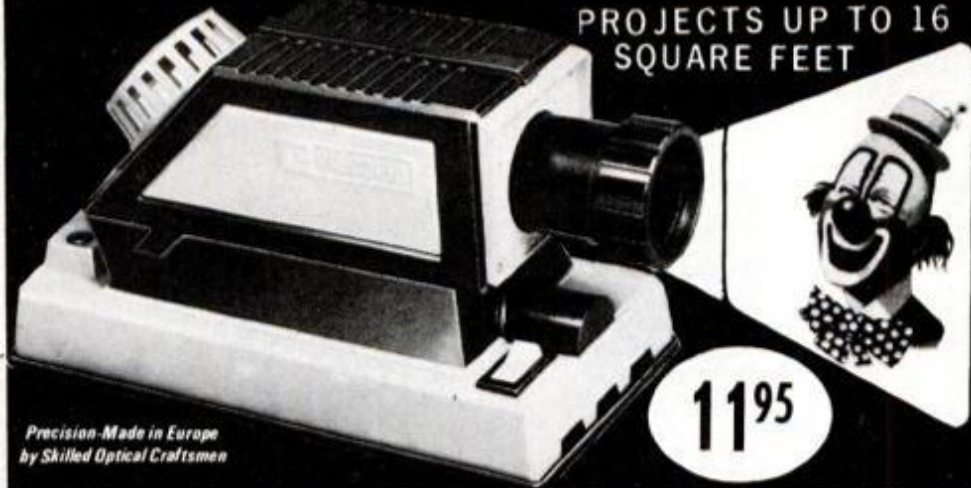
Schrade Cutlery Corp., New York 12428

## The Ultimate Guarantee

If you lose it, Uncle Henry will replace it free.

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This new Episcope Projector projects directly from snapshots, books, even objects like coins, mineral specimens, etc. Fine reflector and mirror system, hi-intensity projection bulb, and optical projection lens that enlarges images up to 16 feet square! Rugged two-tone body and base with cooling vents and "on-off" switch built in. Comes in carrying case with handle. Complete instructions included. No. 4500—Episcope Projector ..... \$11.95

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GENUINE  
GROUND CRYSTAL  
NON-PRISMATIC  
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### SUPER FEATURES

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- (5) Space Age Design
- (6) Free Shoulder Strap
- (7) Long Range Model
- (8) Deluxe Morocco Grained Zippered Carrying Case Available

**5 YEAR GUARANTEE**  
If they should fail to operate satisfactorily because of any manufacturing defect within 5 years of purchase date, they will be repaired or replaced free of charge for parts or labor and will be returned to you postpaid!

**EXCLUSIVE!** . . . Direct from an internationally known European Optical Factory: Any reader of this publication can now obtain these sensational POWERHOUSE XL BINOCULARS for a fraction of the price you would expect to pay. Only \$4.98 plus a small shipping charge brings them to your door. New Space-Age design . . . the creation of an internationally known European Optical Manufacturer. Please don't confuse this quality instrument with cheap, brittle imitations—this is a real He-Man's instrument . . . loaded with Long Range Power. Developed, engineered and proudly manufactured in Europe. The genuine optical crystal glass lenses have been precision ground by skilled European Optical Technicians. These POWERHOUSE XL BINOCULARS are the product of years of experience and optical know-how.

Perhaps never again will \$4.98 buy so much optical value . . . and downright pleasure! It's easy to understand why! After all, this new precision Binocular is just great for baseball, football, soccer, horse, auto and boat racing. Also perfect for bird-watching and nature study, theater, hunting. The knurled focusing wheel locks distant views into sharp focus—it puts you where the action is!

Due to its powerful lenses, it's ideal for checking far-away happenings. Travelers use them for breathtaking panoramas. POWERHOUSE XL BINOCULARS go where you go. They're light and rugged and can be conveniently stored away in pocket or purse. They even come with their own carrying strap for extra convenience. Four unbreakable lens covers are included—to

protect these precision lenses from dust and dirt.

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this offer is for a short time only. To avoid disappointment rush coupon today. Orders received too late will be returned promptly. This offer is not available from stores or any other source. Order direct from the importers!

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  - (2) None shipped outside U.S.A. or Canada.
  - (3) No C.O.D. or phone orders.
  - (4) None sold to dealers.
  - (5) Send 4.98 plus 95¢ for shipping & handling.
  - (6) Allow approximately 2 weeks for delivery.
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FIRES 100 SHOTS WITHOUT RELOADING!

### Quality Features

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A powerful semi-automatic CO<sub>2</sub> BB Pistol that gives you low cost target shooting. Precision-made of finest materials with quality features: 10½" long, 6" barrel, checkered target grips, positive safety catch, adjustable rear sight, velocity adjustment, handsome midnight black finish. Comes with CO<sub>2</sub> cartridge and BBs  
No. 2077—Automatic BB Pistol..... 29.95  
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solves  
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No. 5045—Slide Rule Watch .....15.95  
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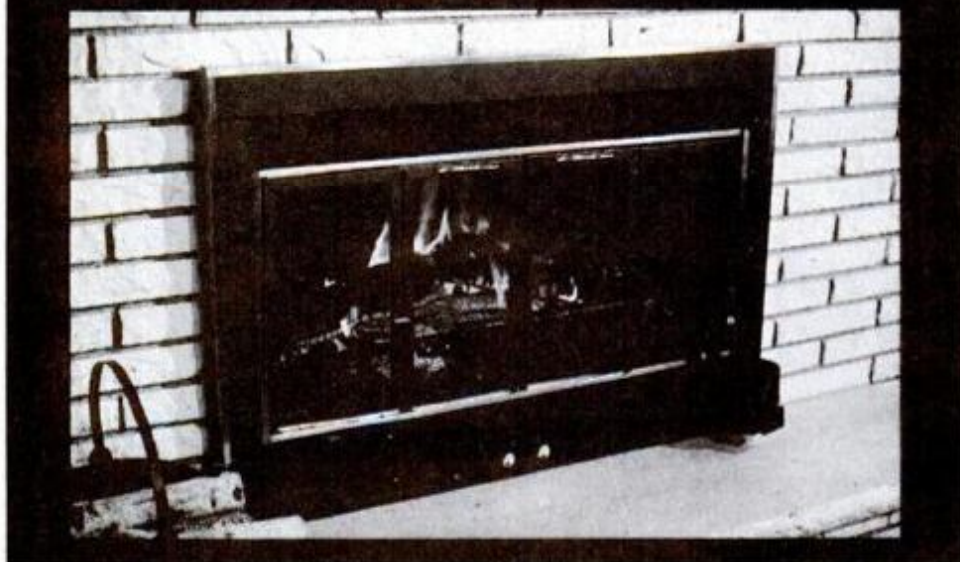
# Doctors Prove You Can Help Shrink Swelling Of Hemorrhoidal Tissues Due To Inflammation. Relieve Pain And Itch Too.

Gives prompt temporary relief from hemorrhoidal pain and itch in many cases.

Doctors have found a most effective medication that actually helps shrink painful swelling of hemorrhoidal tissues caused by inflammation. In many cases, the first applications give prompt relief for hours from such pain and burning itching.

Tests by doctors on hundreds of patients showed this to be true in many cases. The medication the doctors used was *Preparation H*<sup>®</sup>—the same Preparation H you can get without a prescription. Ointment and suppositories. Use only as directed.

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### Glass Door Thermograte<sup>®</sup> heater boosts net fireplace output 10 times!

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When it's cold outside, burning in a typical fireplace can actually result in a net heat loss. A fireplace must draw room air to prevent smoking and, with a 2 ft. x 3 ft. opening, approximately 22,000 cu. ft. of warm room air can be drawn up the chimney per hour! To replace it, cold outside air is pulled into your home through cracks.

New Glass Door THERMOGRATE Heaters dramatically reduce this heat loss and, utilizing the scientific principle of natural convection, produce a constant flow of warm air into your room . . . even without electricity!

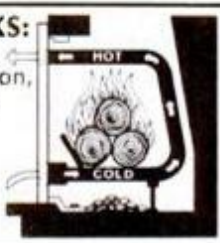
#### FREE PUBLICATION OFFERED

If you're interested in saving money and energy in your own home, write for the FREE full-color publication: "How to Burn Wood & Fight Rising Fuel Bills" which reports on heat output tests and includes complete product and ordering information.

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U.S. Pat. D247,973. Other patents pending.

#### CULT CARS CONTINUED . . .

*(Continued from page 30)*

you did miss one, the Mini Cooper.  
Brian Van Cleve  
Chatsworth, Calif.

I feel my 1968 English Rover should be included on your list.  
D. Abraham  
Old Lyme, Conn.

Wade Hoyt misses one very obvious candidate: the '66 Olds Toronado.  
R. Andrew Schaer  
New York, N.Y.

I was glad you included the Jaguar XK-120. One comment, however—you listed the Jaguar as applying to the years 1948-1953. Since I have a 1954 Jaguar XK-120, you either erroneously presumed XK-120s stopped production in 1953 or, for some unknown reason, don't believe the 1954 model qualifies. What's the story?

Robert Spinner  
San Francisco, Calif.  
*Whoops, we missed the last of the XK-120's production run which was in 1954.*

I'm an ex-1950 teenager and have to disagree with one point of the article very strongly. No one in their right mind ever can say the '55 Chev was or is a "bigger" cult car than the super looking '57.  
Joseph Krawczuk  
Troy, Mich.

My beef is that Mr. Hoyt is bad-mouthing the latest 'Vettes as "pale imitations" of the early models.  
David Pulaski  
Springfield, Mass.

*Hey, listen Joe and Dave, give me a break. I'm getting enough heat from guys whose cars weren't included. And doesn't that make two letters from you, Krawczuk? I'm afraid the limit is one cult car complaint per customer. All these gripes, and only one nice letter in the bunch:*

I found Mr. Hoyt's article on cult cars thoughtful, well-written, entertaining, and obviously the well-researched work of an expert in the field. Even though he didn't mention my favorite car (a '52 Mercury) I understand that you can't please all of the people all of the time. Bravo!, Mr. Hoyt. I am looking forward to seeing more of your work in future issues of PM.

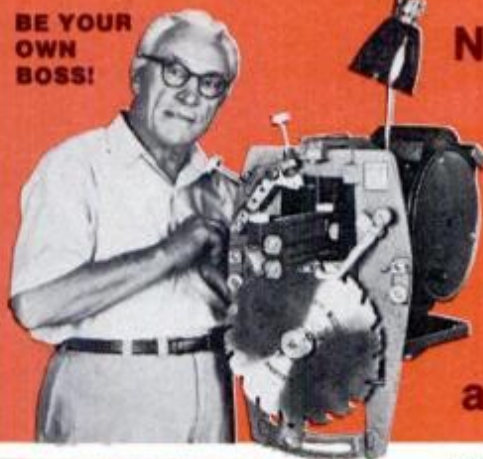
(name withheld by request)

Thanks, Mom.

PM



**BE YOUR OWN BOSS!**



Now you can cash in on the huge demand for SHARPENING SAWS and TOOLS.

**Make \$8.00 an hour...**

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**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



**Glad he chose Foley for his saw shop**

*"I worked as a carpenter all my life, but when a back injury forced me to quit I decided to go into sharpening full time. I'm very proud of my shop and glad my choice was Foley equipment... it is superb. I made over \$48,000 last year, and this year it will go more than \$50,000."*

**Victor Johnson**  
Lincoln, Nebraska 68507

**This can be one of the most important decisions you ever make**  
Going into business for yourself can be the most exciting and rewarding decision you're likely to make in your lifetime.

Owning your own business brings you a sense of independence. You're the boss, setting your own work hours. Your own effort builds the business for yourself and your family. You can achieve great satisfaction and profits, if you choose and manage your business wisely. That's why so many men, just like you, are cashing in on the big profits to be made in this fast-growing service field.

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.

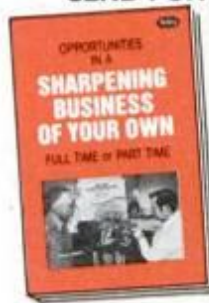
If you need only \$200 or \$400 extra income each month, a sharpening business is ideal for spare time. The additional dollars can be SPENT for more of the good things of life. Or they can be SAVED in a rainy-day fund that the family can bank on.

**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

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*It covers these important subjects...*

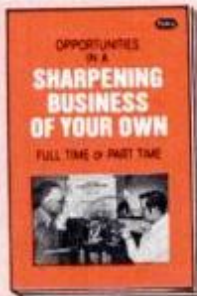
- How much money can you make
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- Sharpening business is year-round
- Sharpening opportunities in small towns and large cities
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- No experience needed, any age can succeed

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**YES**, I would like to receive complete details about how I can easily start a profitable, Foley-equipped sharpening shop. Please rush me your FREE booklet, without any cost or obligation, that gives me full details on how I can quickly start my own business.

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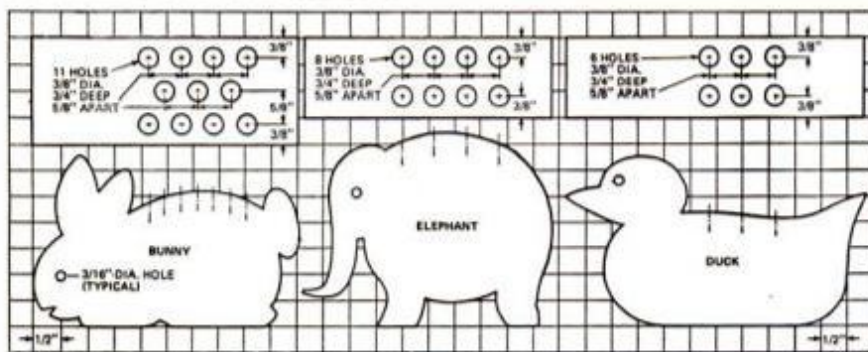
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**CITY** \_\_\_\_\_

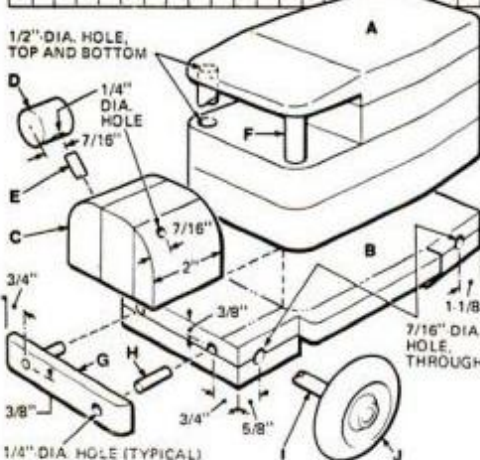
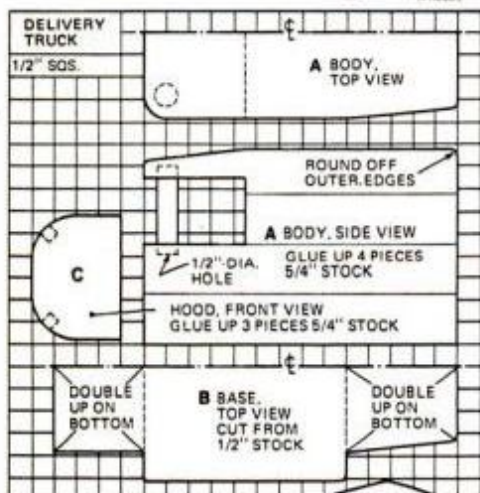
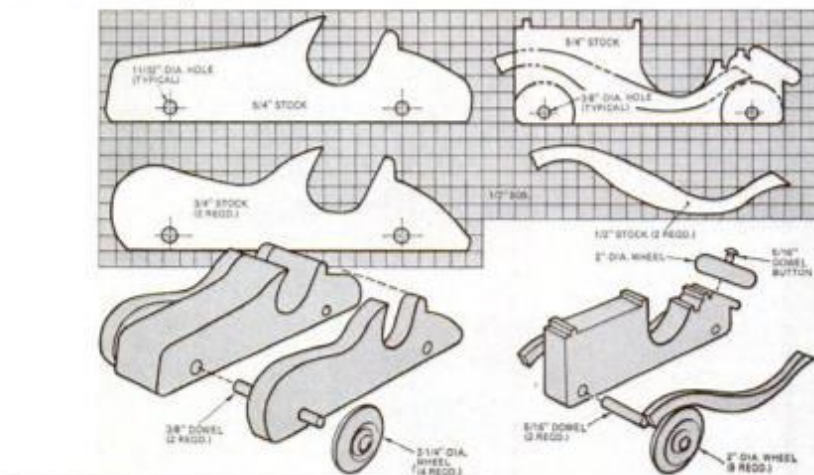
**STATE** \_\_\_\_\_ **ZIP** \_\_\_\_\_

**AREA CODE** \_\_\_\_\_ **PHONE NO.** \_\_\_\_\_

## 5. ANIMAL CRAYON HOLDERS



## 7. TOY CARS, TRUCK



## WAYS TO SAY MERRY CHRISTMAS

(Continued from page 121)

4. The window opening is cut out in the same manner, but the dropout in this case is waste. Sand the edges of the opening smooth, then use a router to cut a 1/8-in.-deep by 1/4-in.-wide rabbet to allow the clear plas-

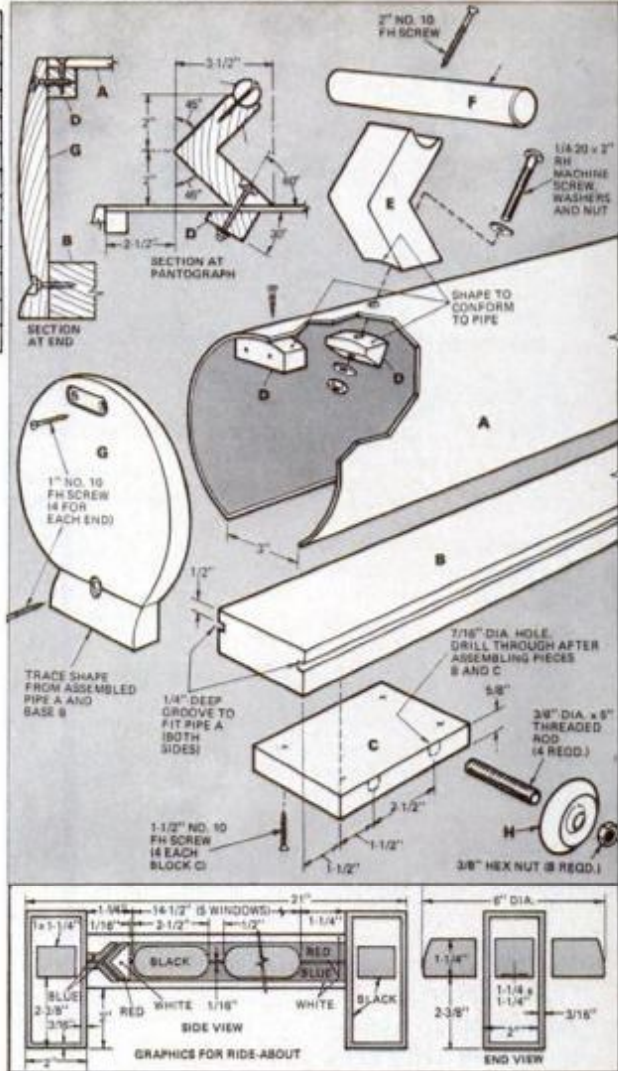
tic window to seat flush.

5. The authentic burner and oven control knobs are available at local appliance service and parts dealers. Buy these before boring the holes in the front panel; if a different brand from the one shown is used, the dowel shaft size may differ. Robertshaw is shown. The burner control knobs are RS 40-168; oven knob, RS 4590-023.

6. Attach a 1x2 backup strip, then bore the holes for the knob dowels. These holes must

(Please turn to page 196)

## 6. AMTRAK RIDE-ABOUT



### MATERIALS LIST—AMTRAK RIDE-ABOUT

Key	Pcs.	Size and description
A	1	6" dia. x 22" plastic pipe
B	1	1 1/2 x 3 1/2 x 22" fir
C	2	3/4 x 3 1/2 x 5 1/2" pine
D	3	3/4 x 3/4 x 2" pine
E	1	1 1/2 x 3 1/2 x 4" fir
F	1	1" dia. x 7 1/2" hardwood dowel
G	2	3/4 x 7 1/4 x 8" pine cut to shape
H	8	2 1/4"-dia. wheels

### MATERIALS LIST—FUNNY CAR

Key	Pcs.	Size and description (use)
A	1	1 x 2 x 4"
B	1	3/8 x 1 1/8 x 2 1/4"
C	1	3/4 x 1 1/4 x 2 1/2"
D	1	3/8 x 1 3/4 x 3"
E	1	1 x 1 1/2 x 2"
F	1	3/4 x 2 x 2 1/4"
G	1	1/4" dia. x 1" dowel
H	1	1" dia. x 1/4" dowel
I	1	3/4" dia. x 2 1/4" stock (person)
J	1	3/8" dia. x 1/2" dowel
K	2	3/8" dia. x 3" dowel
L	5	2 1/4" dia. stock (wheels)
M	5	3/8" dowel button stock

### MATERIALS LIST—DELIVERY TRUCK

Key	Pcs.	Size and description (use)
A	4	1 1/2 x 3 3/8 x 7" pine (body)
B	1	1/2 x 5 1/8 x 9" pine (base)
	1	1/2 x 3 3/4 x 3" pine (base)
	1	1/2 x 3 3/4 x 5" pine (base)
C	3	1 1/2 x 2 x 2" pine (hood)
D	2	1" dia. x 7/8" dowel (headlights)
E	2	1/4" dia. x 3/4" dowels (headlight stems)
F	2	1/2" dia. x 2" dowel (body posts)
G	1	1 1/2 x 3/4 x 3 3/8" pine (bumper)
H	2	1/4" dia. x 1 1/2" dowel (bumper stems)
I	2	3/4" dia. x 5 3/4" dowels (axles)
J	4	2 1/4" dia. stock (wheels)

**A Complete Workshop For Your Home!**

# MUST LIQUIDATE AT FAR BELOW DEALER COST! SENSATIONAL SHOPMATE SABRE-LATHES

**PERFECT CONDITION! FACTORY NEW!**

A TERRIFIC VALUE for yourself or as a wonderful gift. Made by McGraw-Edison, famous for excellent quality power equipment.

**3-Speed Control**

**ONE YEAR WARRANTY!**  
Hundreds of authorized service centers throughout U.S.

Includes complete set of attachments at no extra charge!

## SIX great power tools in ONE machine!

**It's a LATHE!**

For turning furniture legs, shelving posts, cups and bowls. Handles wood up to 16" long.



**It's a SABRE SAW!**

For scrollwork, rip cuts, bevel cuts. Can take wood up to 1" thick. Cuts plastic, metal, tubing.



**It's a DISC SANDER!**

Calibrated tilting bedrest lets you sand bevel cuts to exact angle. Fast, accurate radius sanding.



**It's a CLEANER POLISHER!**

Use wire brush to remove rust, rough edges or for "antique" texturing of wood. Use cotton buffing wheel for polishing.



**It's a DRUM SANDER!**

For fine sanding inside curves and radii, scrollwork, etc. Also for finishing edges on chisels, cutlery, etc.



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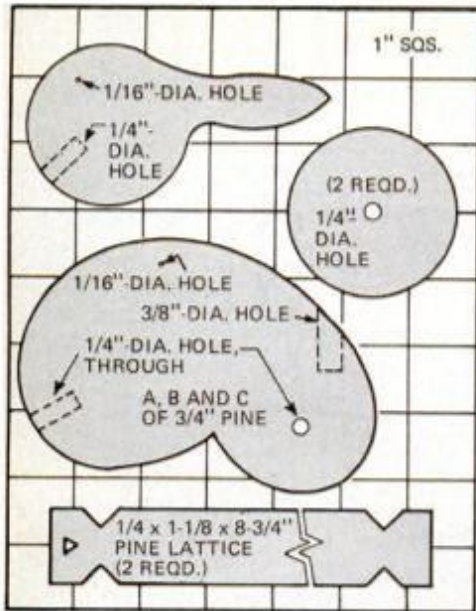
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## 8. OSTRICH PUPPET



## WAYS TO SAY MERRY CHRISTMAS

(Continued from page 194)

be straight, so use a drill press or carefully guide your portable drill. Extra thickness provides good support for the dowels.

7. Luan 1/2-in. plywood is used for the sides (inner and outer) and the base. This wood is recommended because it is readily available and reasonably priced.

8. Nail and glue 1x2 nailer strips to the inner walls and the oven base and attach the grill supports before assembling the front and back. Also make sure to notch out the space on each side of the base to allow clearance for the lid supports.

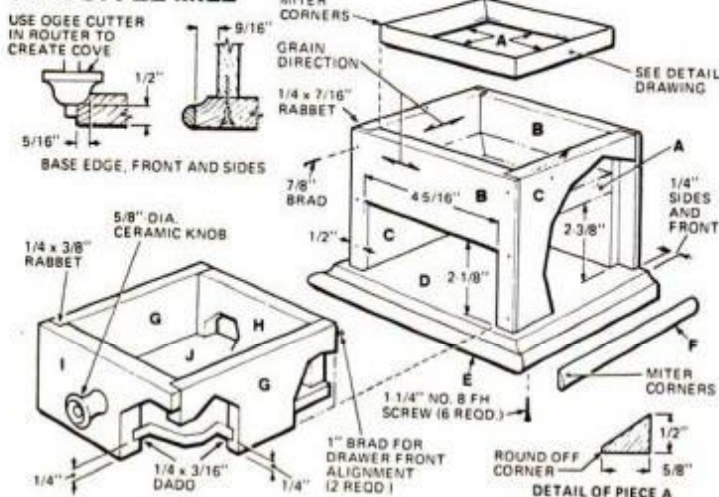
9. Burner supports are attached to the underside of the top before it is put into place. The sides go on last with glue and finishing nails.

10. "Heat elements" are cut with a jig, sabre or coping saw. If done with a power tool, four pieces of wood can be ganged to

### MATERIALS LIST—COFFEE MILL

Key	Pcs.	Size and description
A	4	1/2 x 3/8 x 4 1/4"
B	2	1/2 x 4 1/4 x 5 1/4"
C	2	1/2 x 4 1/4 x 5"
D	1	3/4 x 5-13/16 x 6 3/8"
E	1	3/4 x 1/2 x 6 7/8 half round
F	2	3/4 x 1/2 x 6-1/16 half round
G	2	3/8 x 2-1/16 x 4 1/2"
H	1	3/8 x 1-9/16 x 3 3/8"
I	1	1/2 x 2-1/16 x 4 1/4"
J	1	1/4 x 3 3/4 x 4 1/2"

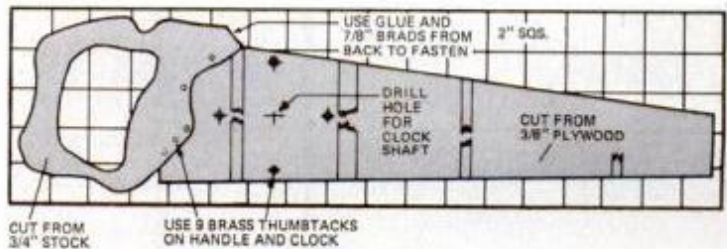
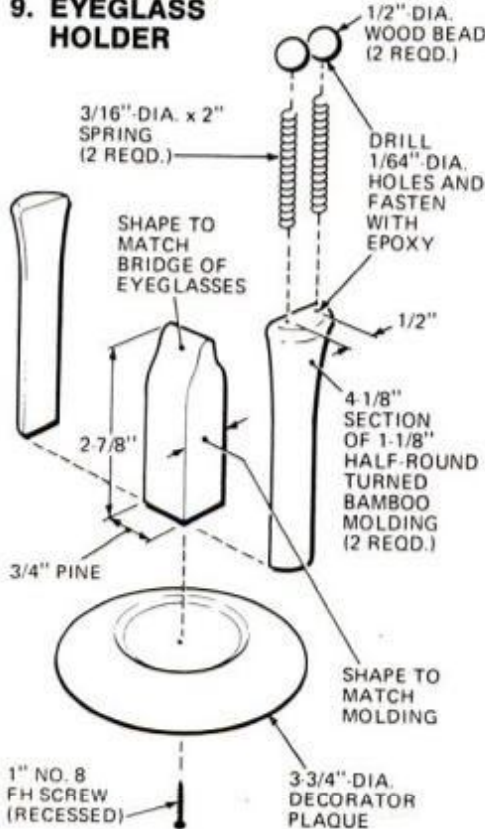
## 10. COFFEE MILL



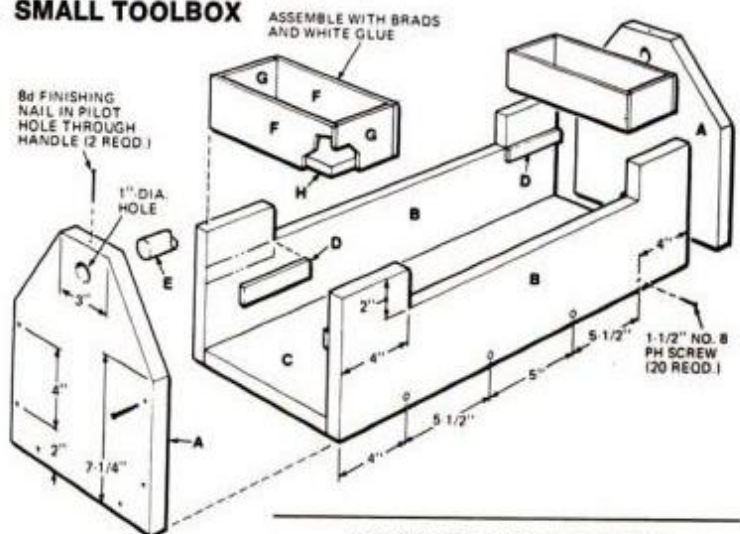
save time in cutting and sanding the spirals.

11. Reflector pans are real ones, which can be obtained at the housewares section in most department stores. Use fast-setting epoxy cement to attach the pans and

## 9. EYEGLASS HOLDER



## 12. SMALL TOOLBOX



### MATERIALS LIST—TOOLBOX

Key	Pcs.	Size and description
A	2	3/4 x 9 3/8 x 10 1/2" pine
B	2	3/4 x 7 1/4 x 24" pine
C	1	3/4 x 7 3/8 x 24" pine
D	4	1/4 x 3/4 x 4" lattice
E	1	1" dia. x 25 1/2" dowel
F	4	1/4 x 2 1/2 x 7 1/8" lattice
G	4	1/4 x 2 1/2 x 4" lattice
H	2	1/2 x 3 1/2 x 7 1/8" plywood

elements, but don't install them until after the stove has been painted.

12. The grill is made with fence wire and four strips of 3/8 x 1/2-in. stock. An aluminum foil oven liner (available at food markets and department stores) adds a final realistic touch.

13. To finish, sand all surfaces smooth and seal with a coat of shellac. Paint the stove, using the color photo (page 116) as a guide with latex paints. To protect the job, add a coat of flat varnish.

## 2. Noah's ark

1. Trace animal outlines on redwood (page 121); cut out with jig, sabre or coping saw. (The animals shown were cut out on a Dremel jigsaw.) Cut all animals in half, using a common key lock shape so the bodies will be interchangeable.

2. Using a utility knife, cut the beam to size, allowing for a 45° bow and stern. Fill in missing portions, fore and aft, with scrap pieces of plank cut as shown in the drawing. Apply adhesive/sealer; let dry. Carefully cut the 1/4 x 1/4-in. groove along the hull to receive the deck. This also forms a railing. The bottom edge of this groove should be about 1 in. from top edge; the groove circles the entire hull.

3. Measure and cut balsawood for the house floor, walls and roof. Cut a square hole in the roof; check with giraffe to make certain its head can poke through the top.

4. Attach walls to base and secure with glue and pins. Fasten roof sections as shown, but do not glue the roof permanently to the house.

5. Seal animals with primer, then paint with a nontoxic (lead-free) paint. Be careful to avoid paint buildup on the key locks or

(Please turn to page 198)



## WAYS TO SAY MERRY CHRISTMAS

(Continued from page 196)

the bodies will not be switchable.

6. Bore 1/16-in. holes in various animals and make tails of string and the like.

### 3. Hen and egg puzzle

1. The entire hen puzzle can be cut from a 12-in. length of 3/4 x 8-in. redwood or cabinet-grade plywood (page 121). For a narrow kerf, use fine-blade jigsaw such as Dremel.

2. Bore one small entry hole on each outline for getting the blade into cutting position.

3. The space (kerf width) will be diminished somewhat by paint buildup. But if a supertight fit is desired, cut the various shapes progressively by starting with the largest and using it as the pattern for the next, smaller outline on a second board. Continue in this fashion down to the final egg shape cut from a small board.

4. When all parts are cut, check fit and sand pieces smooth. Dust and apply a coat of prime paint, then finish with colors as shown. Note: If puzzle is for a baby who might put parts in mouth, make certain you use lead-free paint only. Check the label for toxicity when buying paint.

### 4. Horse bench

1. Using grid drawings as a guide, lay out horse parts on 3/4-in. pine and seat on 5/4-in. pine (see page 121).

2. Cut out parts using a jig, sabre or coping saw. Sand all edges smooth. Note: For uniformity, clamp front legs together for sanding step. Do the same with rear legs.

3. Temporarily assemble the parts—do not drive nails home. Make match marks for dowel holes for head and tail, then disassemble the bench.

4. Bore holes in seat, head and tail to receive the dowels.

5. Check fit again.

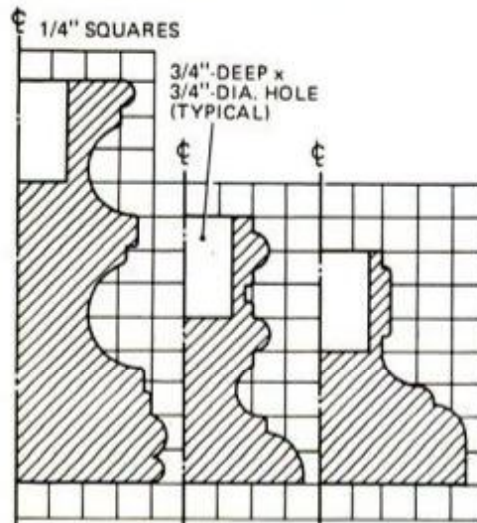
6. Sand all pieces smooth, dust and apply a coat of prime paint to legs, tail and head. Apply a coat of stain to the seat following manufacturer's instructions. Set all parts aside to dry overnight.

7. Next day apply a finish coat of paint to colored parts, and a coat of semigloss varnish to the seat. Allow to dry completely before putting the bench into use. Note: If youngster is still in the chew-anything age, make certain that the bench is painted with a lead-free, nontoxic paint.

### 5. Animal crayon holders

1. If your local lumberyard carries 1 1/2-in.-

### 13. SMALL CANDLEHOLDERS

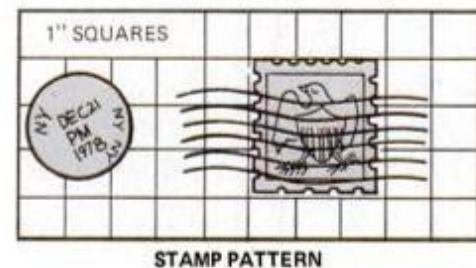
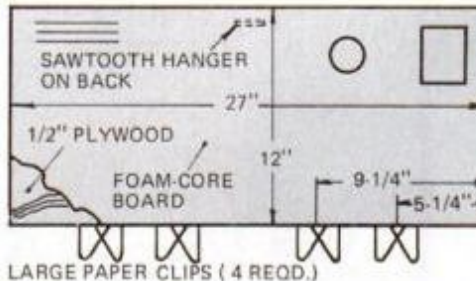


thick pine, buy a short length and you're in business. The animal crayon holders shown were created by gluing up two pieces of 3/4-in. pine to obtain the required 1 1/2-in. thickness. Use the laminating technique discussed earlier.

2. Lay out animals lightly with pencil using grid and drawings on page 194 as a guide.

3. Cut out animal shapes using a jig, coping or sabre saw. Sand all edges smooth. Bore eye holes with a 1/16-in. twist bit. Bore crayon holes.

### 14. ENVELOPE BULLETIN BOARD



4. Since these holders are intended for use by toddlers, leave the pine wood natural; do not apply any finish.

### 6. Amtrak ride-about

1. Cut pipe to length, cutting out a 3-in.-wide strip so the pipe can accept the base.

2. Using either a dado head in a table saw or repeat parallel passes on the table saw, cut grooves on sides of base as shown (page 194). Groove width should be sized to receive the pipe, so make practice cuts on scrap and check fit with pipe. Slip pipe onto base.

3. Draw an outline of pipe and base on a second piece of 5/8-in. redwood for the ends; cut to shape and sand. Apply a cleat (strip of wood) to back of "plug" so that pipe and plug can be permanently fastened together.

4. Cut two 7-in. lengths of wood for the undercarriage and drill two holes in each—evenly spaced—for axles. Install as shown.

5. The pantograph is shaped and cut from 1 1/2 x 3 1/2-in. wood, using a 45° angle. Bore holes for bolt, then contour the bottom so it fits snugly on the pipe. Use sabre or jigsaw and a Surform rasp to do the contouring.

6. Locate and install the inside support brace for the pantograph, but do not install the pantograph at this time.

7. Seal the plugs, spray with silver paint and set aside to dry.

8. Cut silver Con-Tact paper for the base, line it up evenly and remove just part of the protective paper (about 2-in. strip). Now attach the pantograph, bolting it into place. Continue to apply Con-Tact, smoothing all wrinkles as you go.

9. Cut strips for doors, windows and side design (logo).

10. Attach wheels after finishing them, like the end plugs, with silver spray paint. Lock wheels in place with capnuts.

### 7. Toy cars, trucks

1. For maximum safety with toddlers, cars can be assembled entirely without nails. If nails are used, do not eliminate glue. Set

nailheads with a nailset and fill holes with a plastic wood filler or wood putty (page 194).

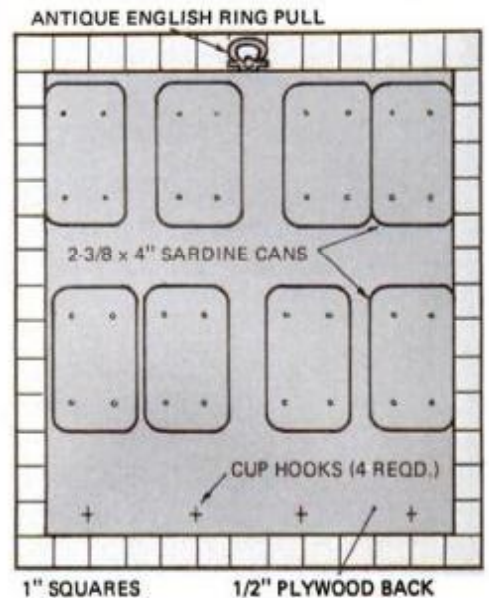
2. Lay out car parts and cut using a sabre, jig or coping saw. Sand all edges smooth before assembly. Cars can be left unfinished for toddler safety. If they're for older kids, cars can be finished with a varnish.

**Special instructions: Funny car**—A Love-Built design to which we have added dowel-button hubcaps. Cut parts carefully and test-fit before final assembly. If moving wheels are desired, bore axle holes through base using a drill press or portable drill (guided carefully). An out-of-line axle hole will result in out-of-line wheels. The figure in the car is a ready-turned form available from Love-Built (see shopping information box, page 120, for details).

**Skinny car**—Another from Love-Built. On this one, make certain that fenders match perfectly, aligning them carefully when you glue them to the body. Tack fenders temporarily so they won't shift about before the glue sets.

**Truck**—The heftiest toy of the lot. Carefully study drawing to make certain you glue

### 15. CONTEMPORARY SPICE RACK



up the right size blocks to work with. Easiest cutting for this one is on a bandsaw. On the original, the wheels are fixed and do not rotate.

**Sports car**—Perhaps the easiest of all to make, though jazzy-looking. After cutting body and fender parts, temporarily tack them together so the seat well can be checked for accuracy and alignment. Use a drum sander in a drill press or portable drill to smooth the interior circle shape.

### 8. Ostrich puppet

1. Start by laying out the body, head and feet parts on pine. Cut parts out as shown on page 196 using a sabre, jig or coping saw. Sand edges smooth.

2. Bore correct-size holes to receive cording, fishline and so forth.

3. Glue pompons to head and tail feathers to body. Use either a hot glue gun (for speed) or white glue which requires a minimum of 30 minutes to set.

4. Cut lengths of cording for legs and install them in body and feet as shown.

5. Cut length of cording for neck. Insert and glue it in body hole, then twist it once and insert and glue it into head. (The twist gives the head a jaunty cock.)

7. Using a needle, push monofilament line through leg near the foot and tie a knot. Cut off line at desired length (leaving a little extra). Repeat for a second leg, then fasten

(Please turn to page 200)

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## WAYS TO SAY MERRY CHRISTMAS

(Continued from page 198)

monofilament line to body and head in the same way.

**8. Fashion control sticks** as shown; attach with white glue and 3/8-in. brads.

**9. The easiest way** to assemble the bird is to temporarily suspend the control sticks at the desired height above the workbench. Then, starting with line from one leg, attach to control sticks. Note which control leg each line is fastened to; this is important. Repeat for second leg—but cut this line a bit shorter. Next, hold body in desired position and attach its line. Finally, hold head in position and connect line to control sticks.

To operate, move control sticks laterally—left forward, right forward and so forth. Head and body can be bounced about by moving front (head) and rear (body) sticks up and down slightly.

### 9. Eyeglass holder

**1. If you lack a wood lathe**, and/or lathe-turning abilities, you can fashion this project from a piece of ready-turned bamboo molding. Buy the shortest possible length that your lumberyard will sell.

**2. Cut the vertical piece** to length—that is, to the bamboo joint (see page 196).

**3. Select the piece of wood** that will be sandwiched between the bamboo pieces. Cut it to length and shape the upper end to receive the eyeglasses to be held. Apply glue to mating surfaces and bond the three pieces together. Use rubber-band clamps until glue dries.

**4. The base consists** of a ready-made decorator plaque. Line up the vertical member in the recess; mark for and bore the screw pilot hole. Assemble with glue and screw.

**5. Bore small holes** at the top as shown to receive the ends of springs. Bend ends of springs, apply dab of epoxy to ends and install springs in holes.

**6. Attach buttons** with small brads.

**7. Seal wood parts** using Krylon No. 1301 clear spray. When dry, spray paint, allow to dry, apply stickers.

### 10. Coffee mill

**1. This box is built** using straight-forward carpentry—no fancy joints are called for. Thus it can be built with a minimum of tools. The box is sized to suit the grinder that we used (see the shopping information box on page 120 for where-to-buy information).

**2. Study the drawing** and cut (see parts page 196). Note that there is a tapered lip around the box inside to assure that ground coffee is fully routed to the drawer below. Cut the skew materials and affix to sides before temporarily assembling box. Use miters at the corners.

**3. On our box** the decorative edging on the base was created by cutting a cove shape with a router and then adding a half-round molding. If desired, the decorative edging can be accomplished entirely with either moldings or a router alone.

**4. When the box is temporarily assembled**, check grinder fit and adjust box dimensions if necessary.

**5. When satisfied with fit**, permanently assemble box using glue (sparingly) and screws as shown.

**6. Construct the drawer** following the drawing. Make certain it fits the box before permanently assembling.

**7. To finish the box**, we used Rez latex stain, followed by two coats of McCloskey eggshell finish varnish.

### 11. Workshop clock

**1. Trace handsaw** onto plywood with a

pencil (see page 196). Add an extra inch all around if your saw seems too small.

**2. Cut out shape** using a jig, sabre or coping saw.

**3. Bore a starter hole** in center of handle opening, insert coping or sabre saw and complete the cut.

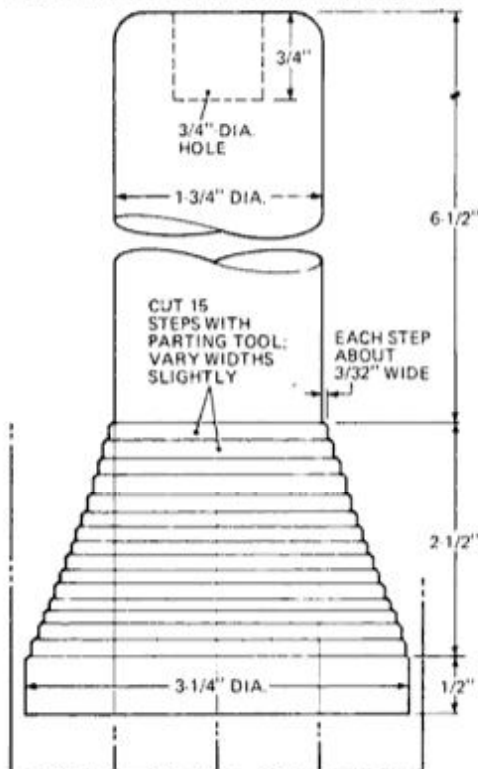
**4. File and sand** all edges smooth. Use a surface.

**5. Use either** a three-sided file or sabre fine-grit paper (150 or finer) on the front saw to form simulated saw teeth.

**6. Dust off** all surfaces and apply a coat of pigmented shellac (such as B-I-N or Enamelac). Paint areas as shown in the color picture on page 118.

**7. Bore the hole** for the clock movement

### 16. FLAX SPOOL CANDLEHOLDER



GLUE 4 PIECES 7/8 x 3-1/2 x 12" MAHOGANY TOGETHER TO MAKE TURNING BLOCK FOR ONE CANDLEHOLDER

as shown. Important: The size of this hole is determined by the size of the clock movement. The source for the clock we used is listed in the shopping information box on page 120.

**8. Check clock movement** for fit; temporarily remove the works.

**9. For maximum protection** apply a coat of varnish or shellac to all wood parts (on the original we used Marvathane).

**10. Permanently install** clock and hands, following instructions furnished.

**11. Add brass thumbtacks** for handle decoration and at the 12, 3, 6 and 9 o'clock positions. Fasten blocks on the back for handling.

### 12. Small toolbox

**1. Lay out and cut** all parts following the diagram on page 116.

**2. Fasten small box** support cleats (4) to both sides.

**3. Fasten sides** to bottom and one end.

**4. Insert handle** in the secured end and apply glue sparingly to dowel end.

**5. Insert other end** of dowel into the second end panel and secure it to box.

**6. While glue is still damp**, bore undersized pilot holes for the dowel-holding 8d finishing nails at both ends. Secure dowel with the nails and set nails with a nailset.

**7. Build the two little boxes** as shown,

gluing them up after checking them in the toolbox to make certain they fit.

**8. If desired**, the box can be finished with several coats of varnish, but it's not a must. To keep ours clean-looking, we applied two coats of ZAR urethane varnish.

### 13. Small candleholders

**1. These are straightforward** and simple lathe turnings. The holders shown were fashioned from glued-up blocks of mahogany and oak (see page 198).

**2. The holders** can be finished in the lathe if a clear finish is desired. On the models shown, we applied a shellac sealer coat while each piece was still spinning in the lathe. The holders were then removed and, for a holiday touch, sprayed with either Krylon red or semigloss white.

### 14. Envelope bulletin board

**1. Attach Foamboard** to plywood with rubber (or Con-Tact) cement, allowing a 1-in. Foamboard overhang at bottom (page 198).

**2. Place Foamboard** side down, glue large, X-type paper clips to back of Foamboard overhang using Permabond Super Glue.

**3. Flop the bulletin board** and draw a simple postage stamp (see grid drawing) using felt-tip markers. If desired, the envelope can be addressed using felt-tip markers.

**4. Make a pleasing arrangement** of pushpins that will hold your messages.

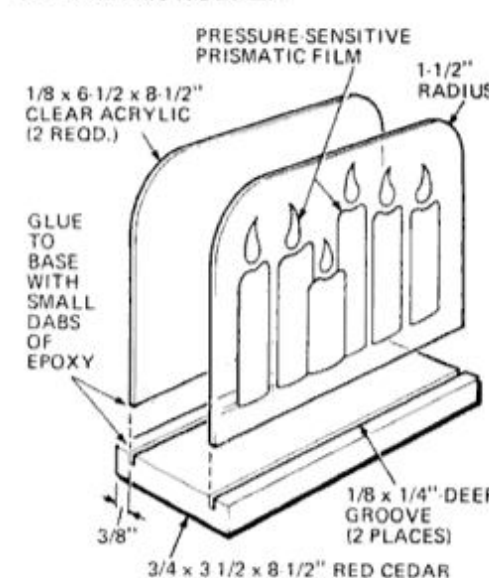
**5. Incoming mail**—for various members of the family—can be suspended from the large paper clips.

### 15. Contemporary spice rack

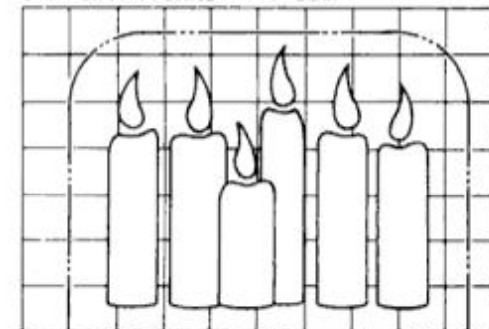
**1. On a plywood sheet**, lay out empty (and cleaned) sardine cans in an attractive arrangement (page 198).

**2. When satisfied with the arrangement**,  
(Please turn to page 202)

### 17. NAPKIN HOLDER



CANDLE PATTERNS 1" SOS.





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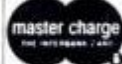
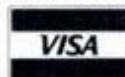
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## WAYS TO SAY MERRY CHRISTMAS

(Continued from page 200)

lightly mark the cans' positions with a pencil, then fasten them in place with a nail through the center of each.

3. To secure the cans firmly, apply a bead of fast-drying adhesive around all edges where they butt the plywood board. Use a type of glue that dries in about 10 seconds.

4. Screw cup hooks into the bottom of the rack and add a decorative hook at the top.

5. Spray the entire piece with a prime coat of flat-white paint. Allow to dry thoroughly, then apply a spray coat of glossy white paint.

6. Fill chosen containers with spices and fit the containers into the sardine-can openings. Hang the rack by suspending it from the decorative hook.

7. Applying preprinted labels (as we did) adds a professional touch to your project. But if you prefer, you can letter your own or apply small magazine pictures to identify bottle contents. A small amount of Fun-Tak, a reusable solid adhesive, helps to keep spice bottles neatly and securely in place. Hang any loose, but necessary, kitchen tools with holes in the handles from the cup hooks.

## 16. Flax spool candleholder

1. Start by gluing up the wood for the turning block. The prototype holders are turned from mahogany (page 200).

2. Rough-round the block with your deep gouge, then smooth the shape with either spindle gouge or skew.

3. Create the steps in the lower segment by using the parting tool. On the originals, we did not use calipers to size the steps; we choose to "eyeball" the increments for more authentic, antique-looking spools.

4. After turning step shoulders, sand the shape smooth while it is still spinning in the lathe.

5. Using standard lathe technique—parting tool, skew and hand-holding the free end—drop off the piece while it spins at a slow lathe speed.

6. To finish, apply several spray coats of a satin-finish urethane varnish.

## 17. Napkin holder

1. Cut a piece of ¾-in. wood 3½ x 8½ in., then run a ¼-in.-wide saw kerf near each side. The original utilizes red cedar, but any wood can be used (page 200).

2. Sand the block smooth, slightly breaking all sharp corners.

3. Apply two coats of shellac, sanding lightly between coats with 150-grit paper.

4. On a ½ x 6½ x 17-in. piece of clear sheet acrylic (such as Plexiglas) mark and cut the two sidepieces. Note: Leave the protective paper on the plastic until you are ready to install parts. Round the corners, using a sabre or jigsaw with a fine-tooth blade.

5. To remove saw marks from the plastic, pull a sharp chisel, held vertically, across the edges in a scraping motion.

6. Sand edges smooth with abrasive papers from 220 up to 600 grit. Buff edges to a high polish, using a soft cloth and rouge, or auto polishing compound. Remove the masking paper and apply a few dabs of epoxy cement into the base grooves to secure the panels.

7. Cut the candle and flame shapes out of colored prismatic film, peel away the backing and press into place. Note: Though prismatic film tends to be expensive if purchased locally, we have located a source that will supply the film in the amount needed for one holder (see shopping information, page 120).



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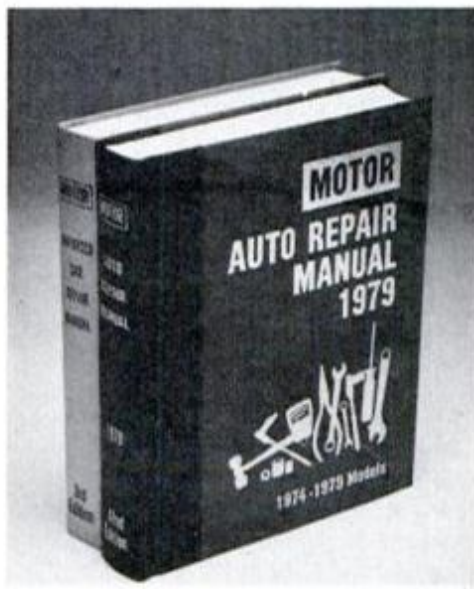
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### MOTOR AUTO REPAIR MANUAL THE BOOK THE PRO USES

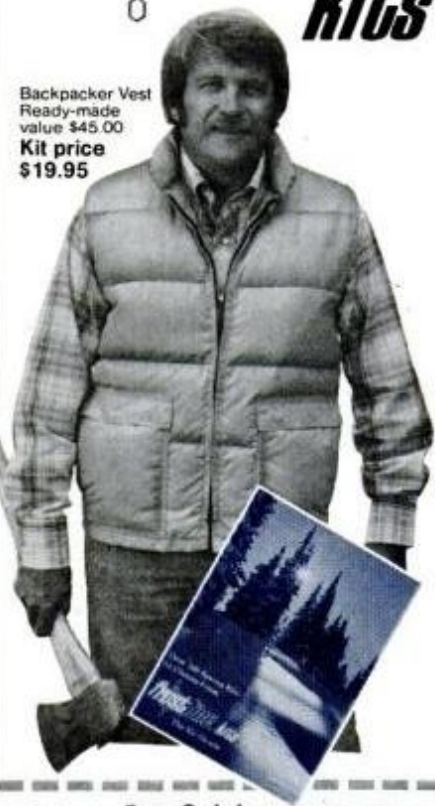
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## TAPPING THE WORLD'S DEEPEST,

(Continued from page 91)

*Mineral Resources of the Sea*, that's considered the standard work in the field. Today, Dr. Mero heads Ocean Resources, Inc., San Diego, and is known as an innovative and outspoken expert on sea-floor mining.

Because ocean-mining operations are so costly—it's estimated that \$1.5 billion would have to be invested to get commercial mining started—the effort is being pressed by a variety of international consortiums, with member companies shifting in and out of groups as development projects are pushed or put on the shelf.

### Five U.S. groups at work

At this writing, there are five ocean mining companies in the United States that work with partners or sponsors. The Ocean Minerals Co., Mountain View, Calif., for example, is backed by the Lockheed Missiles and Space Co., Sunnyvale, Calif.; Amoco Minerals Co. of Chicago; and two Dutch companies.

Ocean Management, Inc., Bellevue, Wash., is partnered by Inco, Ltd., Canada, the world's largest nickel producer; Sedco, a Dallas concern that does a lot of offshore oil work; a group of Japanese companies; and the AMR group, made up of three West German companies.

The other three companies include Deepsea Ventures, Gloucester Point, Va.; Kennecott Copper Corp., New York, N.Y.; and Dr. Mero's Ocean Resources, Inc. All work with foreign partners.

There are two major mining systems under development—mechanical and hydraulic. In the mechanical, buckets are attached to a huge closed loop of cable that's in continuous motion, pulled by traction machines aboard the mining ship. As the ship moves slowly, the bottom buckets scrape across the sea floor, scooping up nodules.

The buckets are pulled up to the stern of the ship, emptied, then lowered again for another pass. The buckets bring up nodules only; bottom sediment is washed out as they ascend. Tested so far on a pilot scale only, this method is also designed for use with two mining ships working together. In the latter case, the buckets are strung between two ships steaming side by side on parallel courses so they scoop across a wider swath along the ocean floor.

### Hydraulic system favored

The hydraulic system is currently

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## WETTEST MINE

avored by most of the groups. It employs a collector or dredgehead that is towed along the bottom by the mining ship, which moves at two or three knots. Connected to the ship by a long string of pipe, the collector functions like a powerful vacuum-cleaner nozzle, sucking in nodules as it slides forward. Nodules that would be too big for the pipeline to handle are shunted aside by a screening device.

In one version of this system, submersible pumps draw water and nodules up through the pipeline. In another, compressed air injected at several points along the pipeline, rises and expands to provide a lifting force.

### Field highly competitive

Each ocean mining group has worked out its own adaptation of the hydraulic system. Since the field is highly competitive, the groups tend to be secretive. However, John L. Shaw, president of Ocean Management, was willing to tell PM about OMI's recent big test in the Pacific, the only successful operation to be undertaken on such a large scale to date.

As described at the start of this article, the *Sedco 445* (the 445 denotes the ship's length in feet) was used as the mining vessel. But before the venture could get underway, in February, the ship had to be converted from oil drilling to ore collecting. The main changes included a new below-deck pipe transfer system and a new hydraulic mast (the midship steelwork tower that is the most prominent feature of a drillship). The hydraulic mast is ingeniously mounted in a gimbal arrangement that pivots freely, permitting the mast to remain vertical at all times regardless of the ship's pitching and rolling in rough seas. These alterations were required because the pipe was much larger—some of it as much as 9½ inches in diameter—than the one that is used in drilling for oil.

### Over three miles of pipe

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The nodule collector used was smaller than that projected for full-scale operations. A sled-like device

(Please turn to page 206)

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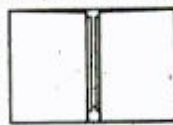
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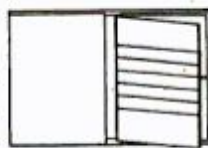
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## TAPPING THE WORLD'S DEEPEST,

*(Continued from page 205)*

equipped with TV cameras and other electronic gear, it was about 30 feet long and 10 feet wide at its "mouth," where the nodules are scooped up. The commercial version may be about 40 feet wide and capable of handling 250 tons of nodules per hour.

### Collects 800 tons

Two different lifting systems—submersible pumps and compressed air—were tested. Both reportedly worked well. The test program ended in May and resulted in recovery of 800 tons of nodules.

"It demonstrated the first successful mining of manganese nodules in large quantities," OMI's John Shaw told PM. "It was a significant technical achievement that required the invention and development of new equipment and techniques. I think the key to the success of our venture, compared to others that have failed or fallen by the wayside, was that we put together a group of companies with such a broad range of available technology.

"Another important part of the project was our exploration program that discovered the site and then thoroughly mapped out the distribution of nodules and the bathymetry (depth measurement) of the ocean bottom."

### Effects on environment

The test demonstrated that mining for manganese nodules can be relatively straightforward. The ore is not wrenched from the earth. No drilling or blasting, no shafts to be bored, no mountains moved or structures built.

Though seabed mining entails no cavalry-charge assault on the environment—at least not at this stage—the U.S. Government is watching its effects. The OMI tests were observed by scientists aboard the *Oceanographer*, an oceanographic ship operated by the National Oceanic and Atmospheric Administration (NOAA).

Monitoring included samples and measurements taken along the sea floor and around the plume of sediments discharged by the mining ship. The effect of the collector on the sea floor was observed with deep-sea cameras, and core samples were taken of the disturbed sediments to determine changes in small marine life forms.

Though preliminary findings indicate that the mining test had no serious environmental impact, it will take more studies to assure an absence of long-range effects.



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## WETTEST MINE

NOAA will continue to monitor all such mining operations.

### Who owns the seabed?

But the biggest hurdle facing the mining companies has yet to be overcome. It's a legal snag—on the question of who owns the ocean bed. The United Nations has been wrestling with the problem for a decade in a series of "Law of the Sea" conferences.

A group of developing nations—many of them landlocked—want to protect their rights to remote seabeds by having the U.N. take complete control over the mining, distribution and pricing of ocean-bottom ores. Other, advanced nations that have developed the needed ocean-mining know-how are eager for a treaty that would permit seabed exploitation by both the U.N. and private industry.

### A tricky, touchy question

A quick resolution of such conflicting interests doesn't seem likely. The snail-like pace of U.N. deliberations may not be entirely due to the complexity of the problem, according to Dr. Mero. He contends—not altogether facetiously—that many of the delegates to the U.N. "spend most of their time deciding what kind of wine they'll order for their next meal."

While this is obvious exaggeration, there's no question that the politically touchy and potentially explosive matter of seabed rights will take a long time to work out to everyone's satisfaction. Historically, the great oceans of the world beyond immediate territorial limits have long been considered "international waters" open to free use by all nations. Until now, however, little concern has been given to the use of land lying *below* these waters—there just wasn't any cause for concern.

### Ocean mining by late '80s

Meanwhile, industry leaders in America are urging Congress to pass laws authorizing long-range ocean-mining operations, pointing out that private companies cannot afford to make tremendous investments without real assurance that they will be permitted to work a given mining site a long enough time for their efforts to pay off.

Legalities aside, the ocean mining industry has come a long way in a relatively few years. The state of technology is such that full-scale commercial mining could become a reality by the late 1980s. **PM**

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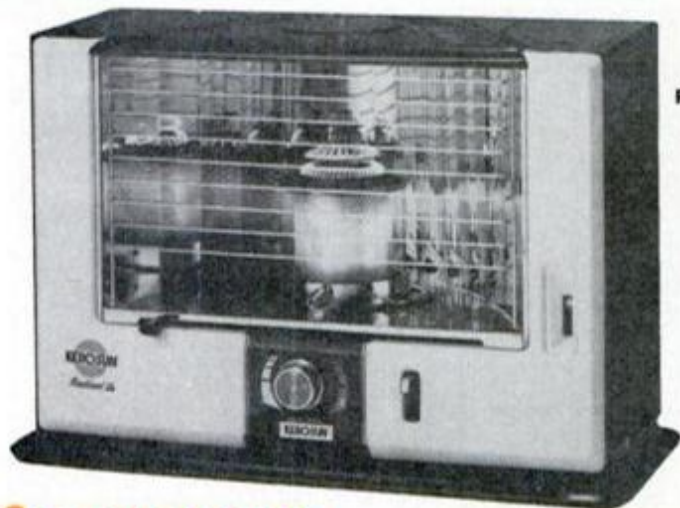
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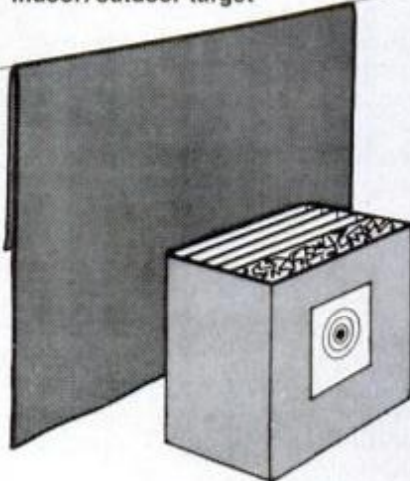
(Continued from page 95)

modify or build a new stock the right size; looks aren't as important as fit.

### Precision shooting

I've never known a hunter who practiced with a precision air rifle and did not dramatically improve his shooting. Air rifle competition is supposed to be shot offhand, with no rest for the rifle. This position also develops the skills required to make the quick, difficult, sometimes long shots in big-game hunting. Nobody can hold a gun perfectly steady offhand or from a quick

Indoor/outdoor target



Air guns can be used year around with this corrugated-carton target backstop suggested by Daisy. Crumpled newspapers and cardboard or wood dividers stop BBs or pellets, and blanket is suspended as an additional safety stop.

brace on a tree, but anyone can learn to squeeze when the sights are moving into the target and stop as the gun moves away.

It might seem that once the shooter goes back to a big-game rifle or shotgun, the flinches and jerks would return. To some extent they do, but the remarkable thing is that the repetition of air rifle practice will coordinate trigger finger and eye so that even the heaviest recoiling rifle will seem to shoot almost by itself when the sight picture is correct. And accuracy will be much improved.

### Which is best?

Each air-gun type has advantages for training. The inexpensive BB gun is fine for teaching shotgunners. Disadvantages are lack of precision accuracy, poor trigger pulls, and lack of weight and heft.

CO<sub>2</sub>-powered pellet guns require



less time and effort cocking; some have mature stocks and appearance and better accuracy than the youth BB guns. Disadvantages are variations in impact point as the CO<sub>2</sub> supply runs low, plus the cost of the CO<sub>2</sub> containers.

### The pump-ups

Perhaps the best of U.S. air guns are the pump pneumatics which obtain their compressed air by manual pumps. The Benjamin, Crosman, Daisy Powerking, Sheridan and others have the advantage of variable power, producing about 300 to 400 f.p.s. velocity with two or three pumps (plenty for indoor practice), and some get up to 700 f.p.s. with about 10 maximum pumps. Pneumatics deliver power for price, and some are quite accurate, as well. Many are not adapted for scope use, however, and they vary in impact by how hard they're pumped. The Sheridan and Crosman 766 American Classic are the most powerful with about 700 f.p.s. from 10 pumps. The Benjamin M342 gets 640, the Crosman 2200 Magnum about 620, and the Daisy Powerking or Crosman Powermaster about 500 to 600 f.p.s. These guns are not toys; at 640 f.p.s., some pellet guns will penetrate four 1/4-inch strips of pine.

The elite of air guns are the German-built "spring piston" guns. These sophisticated machines require only one cocking stroke to propel a .177 pellet 640 f.p.s.—faster than most "pump-up" guns can generate with eight to 10 pumps. A complicated cocking lever system compresses a spring which, when the trigger is pulled, instantly compresses air in a small chamber to fire the pellet. These are the air rifles and pistols used in world competition, and if the air rifle is accepted as an Olympic event for the Moscow Olympiad in 1980, that event may be won by the German Feinwerkbau 300-S.

This is the gun I use for my own practice, and it can put pellet after pellet into the same hole at 10 meters. There are a number of other precision air rifles such as the Anschutz, Diana, Beeman 75 and others which have quite comparable accuracy. Some of the most expensive models are over \$700, although there are precision German guns with even more power for under \$200.

The two basic types are the side-lever-cocking competition guns, and the barrel-break type, which open something like a double or over-

(Please turn to page 210)

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## SHARPSHOOTERS SHOOT BBs

(Continued from page 209)

under shotgun. The barrel cockers require up to about 15 pounds effort, but they also generate velocities to over 800 f.p.s. for a "tuned" model. Though extremely accurate, the most powerful models have more "jump" and generally less perfectly crisp and light trigger pulls. They are designed primarily for field use and pest control.

### Getting started

For training, practice and fun shooting indoors, consider a target rifle with around 640 f.p.s., probably the most accurate velocity for air guns. If price is important and the gun is to be used for some outside varmint hunting, my pick would probably be the Sheridan, which fires a 5-mm. (.20-cal.) pellet with good accuracy and velocity for a pneumatic gun. The Benjamin is also an excellent gun of this type and has been around for many years. My first pellet gun was a Benjamin.

For training a youngster (or yourself) for hunting with a scoped rifle, the Crosman Model 70 bolt-action CO<sub>2</sub> gun is mature sized, weighs as much as some .22s, and has an optional four-power scope. Relatively inexpensive precision guns include the Weirauch models at around \$100 to over \$250.

And though you see few in retail stores, the day of the "adult" air gun is here. Daisy, the largest air gun firm in America, reports its adult-sized Power Line series selling proportionately better than youth guns. Hundreds of fine precision air guns are available by mail. Air Rifle Headquarters Inc., Box 327, Grantsville, W. Va. 26147, has a free catalog called "Air Guns" that gives voluminous data. Even more details are covered in the Precision Airgun Guide, \$1.50 from Beeman's Precision Airguns, 47 Paul Dr., San Rafael, Calif. 94903. And a volume that covers air guns from the days when soldiers carried them up to today's tackdrivers is the Air Gun Digest, edited by Jack Lewis and written by Robert Beeman; \$6.95 from DBI Books, 540 Frontage Rd., Northfield, Ill. 60093. For an intelligent choice of a precision gun, study of these is required.

Then all you need to enjoy it, from a \$15 BB gun up to Feinwerk-bau's family model Junior at \$550, is about 25 feet of space in a hall or basement. But soon neighbors will hear about your "silent shooting gallery" and start stopping by. The fun of it is addictive. **FM**



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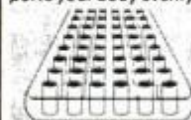
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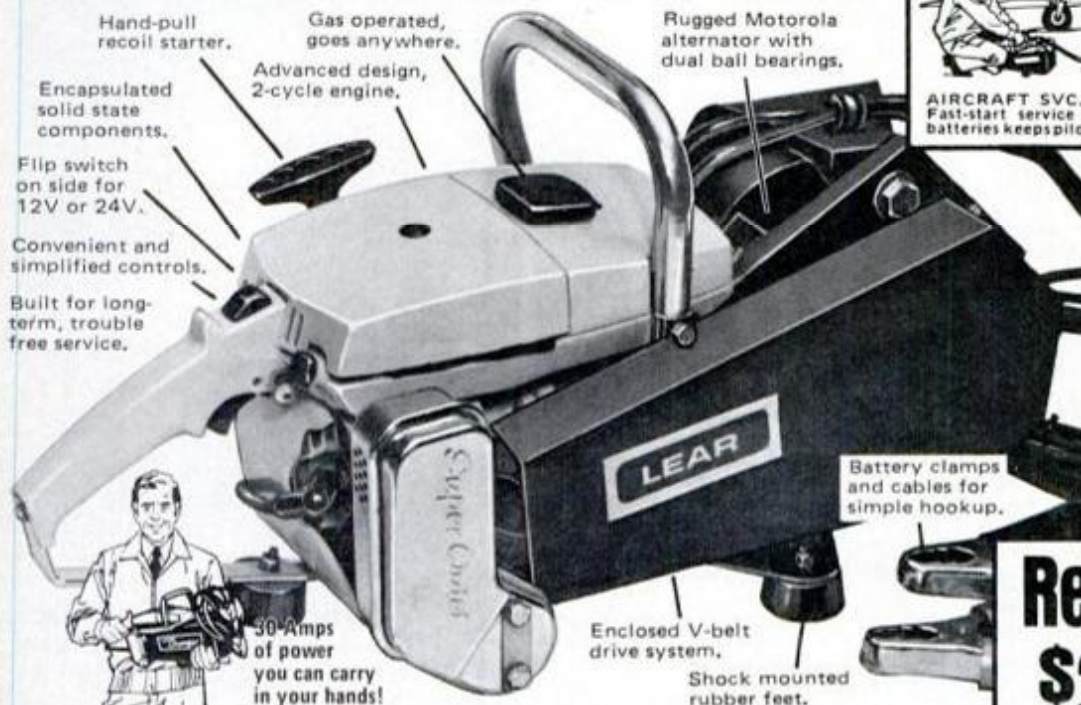
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## SINGLE-RUNNER SLED

(Continued from page 134)



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Countersink screwholes so screwheads are flush when runner is fastened to body.

screws while the assembly is still held rigid by nails. If your drill is too bulky to bore horizontally while the runner is lying on the work-bench, slip wood strips beneath to raise it and provide clearance for the drill. Enlarge holes in the bar to accommodate the screw shanks and countersink to fit the screwheads. File smooth all the sharp edges and corners.

Make the seat from exterior plywood. Sand exposed edges. Temporarily hold shelf brackets in place; mark and bore holes for bracket screws. Apply primer coat of paint first. Allow to dry. Then apply a white background. When dry, use masking tape to lay out mask for the border. Use a fine knife to cut tape parallel to the curve. Peel away waste tape and paint the decorative border. When the paint has dried, peel off the remaining tape. Paint the brackets to match and attach.

Our seat cover is made of textured vinyl, trimmed and secured with 18 No. 4 upholstery tacks 7/16 in. long. You could extend the vinyl around and under handles as shown in the drawing and tack in place. Stuff polyester fill between the vinyl and wood for extra cushioning.—Tom Wagner

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## TIME-DELAY STEREO

(Continued from page 99)

recordings made in unusually dead surroundings or miked too closely to allow much of the hall's own ambience to be picked up by the microphones.

### Other benefits

Concert-hall ambience is the main reason for buying a delay system. But there may be other benefits as well. One is that the stereo listening range becomes less critical—you no longer feel you have to sit in the one correct "stereo seat" but that you can wander anywhere in the room



**Audio Pulse Model Two is a digital-relay system with built-in integrated amplifier.**

and still enjoy the music in good spatial perspective.

Another reason is improved bass. In small rooms, bass tends to form "standing waves," areas within the room where certain frequencies are either louder than normal (a problem if your turntable happens to sit in such an area) or softer. By injecting time-delayed bass energy into the room, especially if it's injected in areas where the bass is deficient, the delay systems seem to reduce the standing-wave problem. (This effect may be noticed more at some control settings than others.)

Whether because of this bass improvement or for other reasons, delay systems can sometimes make the music seem louder than it is. You may not notice this difference directly, but your neighbors will. And there are indirect advantages, such as being able to talk over the music without shouting, and less listener fatigue due to high volume or distortion—all without any feeling that the music isn't loud enough.

If tape recording is important to you, you may find some reverberation useful in improving tape recordings, especially recordings of old, monophonic records. And if your delay system provides for headphone listening, you may find it makes the sound through them more realistic, too.

You don't need much amplifier power for a delay system, since the delayed sound should never be as loud as your main speakers anyway.

(Please turn to page 216)

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## TIME-DELAY STEREO

(Continued from page 215)

Assuming your main and delay speakers are of reasonably equal efficiency, your delay system should require no more than one-fourth to one-half as much power as your main system, according to one maker, or anywhere between 30 watts per channel and power equaling your main amp's, according to another. It's not too surprising then, that the Audio Pulse Two's power is 25 watts per channel, the Bozak 902's is 35 per—and ADS, whose system has 100 watts per channel, suggests you use its amplifiers for your main channels, if your current amplifier has less power than that.

Speakers are only a bit more critical. The speakers must have very wide dispersion to spread reverberations as wide and evenly as

### Digital or analog?

Most of the delay systems on the market (the Bozak, Phase Linear, Sound Concepts and Southwest Technical Products) use *analog* technology. The signal passes through a long chain of capacitor cells, like buckets passing along an old-fashioned firemen's bucket-brigade; this is called, in fact, "bucket-brigade" technology. (The Phase Linear also uses a spring for extra-long delays; but so do some professional reverb systems costing well over \$1000 each.)

Those whose names, coincidentally, begin with A (ADS, Advent and Audio Pulse) use *digital* technology; the signal is first converted from a continuously varying voltage that represents the original sound to a series of on-off pulses passed through a chain of computer memories before being converted back.

Analog partisans claim that there are losses and distortions in the analog-to-digital and digital-to-analog conversion stages. Digital partisans claim that cascading the bucket-brigade devices to get long delay times adds noise and limits frequency response. Analog systems allow continuous, rather than stepwise control of delay and reverberation time, and analog proponents say this helps you dial in precisely the effect you want—but digital proponents say their more limited number (but equal range) of settings is quite adequate—and that switch-selected settings are easier to repeat.

Who should you believe? That's easy—believe your ears, and trust the system that sounds good to you, no matter what technological reasons would make you expect that something else which doesn't sound as good, *should* theoretically sound better.—B.S.

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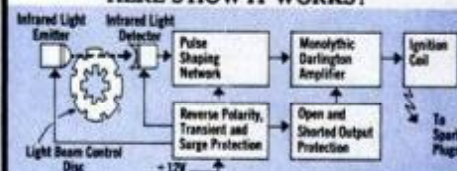
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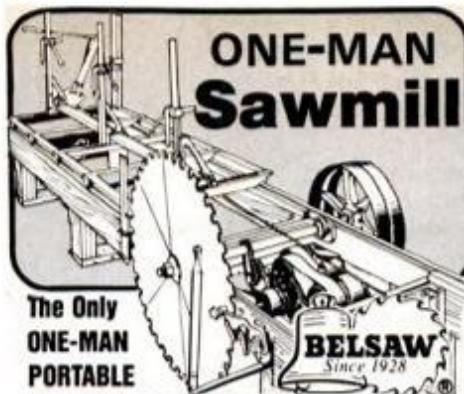


possible. (Bozak's 902 speakers are even designed to reflect all their sound from walls and ceilings, for still more sound dispersion.) Omni-directional speakers are very good for this (just as they are for rear channels of a quadraphonic setup). You should avoid speakers with any prominent frequency peaks, which may cause the sound source to shift when those frequencies occur. In the mid-range, the added speakers should sound as much as possible like your main ones. Extended bass is nice to have in your rear speakers, but is not a prime necessity. On the other hand, don't get speakers that are too bass-shy: they'll sound spacious, but not natural, and they'll do less to help your room's standing-wave problems, too.

You can set delay-channel speakers up at the rear of your room, as you would for quadraphonic sound. If you plan to use those speakers for quadraphonic listening, too, you may even prefer that. But delay-system manufacturers usually recommend setting them up along the room's side walls, facing across the room at each other. Some makers advise you to set them a bit behind you, while still others suggest a fixed distance of about 12 to 15 feet from the main speakers. If you can't mount them on the side walls, though, other recommendations are that you mount them on the back wall pointing out towards the side walls, or mount them in the corner, angling in. Try as many of these setups as your room arrangement allows, and see which suits you best. The ADS system even gives you the option of using two pairs of delay speakers.

### Do you really need it?

So far, delay systems are for perfectionists. Not because it takes a practiced ear to hear the difference (in fact, it's easy for the unpracticed ear to hear) but because it's so expensive. Systems with their own amplifiers and speakers, like the ADS 10 and Bozak 902, are about \$1000, and building your own from one of the other systems with a separate amplifier and speaker will cost you about the same. The least you can spend, if you already own rear-channel amplifiers and speakers and are willing to build the Southwest Technical Products kit (no job for the novice builder, if it's like most SWTP kits) is \$250. Still, if your system sounds good now, there may be no great improvement you could get for the money. And if you lack the money now, start saving. Delay is well worth waiting for. **PM**



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## RAPID-FIRE CAMERA

(Continued from page 115)

grip and an auxiliary shutter release button (the Topcon winder, though L-shaped, has no such release).

All battery compartments on all units are clearly marked as to proper polarity, but some (Minolta Auto Winder G for its XG-7 camera, for instance) have a convenient battery clip which is easily loaded and just as easily slipped into the winder itself. Minolta's G is typical of the units that are the same size as the camera bottom, but others, including the Topcon and Konica, have a wider base. This means added weight but, at the same time, provides a platform for steadier support on tabletops and similar supports. Of course, no camera-winder combination can stand upright if there's a long and/or heavy lens on the camera.

Among the more exotic examples is Chinon's Power Winder with its built-in, two-way interval timer. It can be set to fire the camera at regular intervals (from one to 30 seconds) for genuine time-lapse photography. Or, its counter can be set to take a given number of shots from four to 24, at those intervals. Either option gives you remote-control operation, untouched by human hands. Then there is the Contax Real Time Winder—with its battery check system and input terminal for an accessory intervalometer—intended primarily for the professional-type Contax RTS. Nearly identical is the less expensive, less-endowed Yashica Winder made for that company's FR camera series.

### For advanced photographers

Auto winders are a useful accessory for advanced 35-mm SLR fans, but they aren't necessarily for everybody. If landscapes and views of the family standing in front of the Taj Mahal or Leaning Tower of Pisa are all you're after, forget it. If you crave action, shoot-from-the-hip candids and precise-moment expressions, then you will really benefit from one of these marvels. The most comforting aspect of rapid-fire photography, however, especially if you're just about to buy a new camera, is the fact that you don't have to decide about a winder at the time you're plunking down your cash for the camera. You can always get the winder-usable camera now and use it with thumb power. Later on, if you like, get the winder. When you do, you'll make a lot of film and battery makers very happy. **PM**

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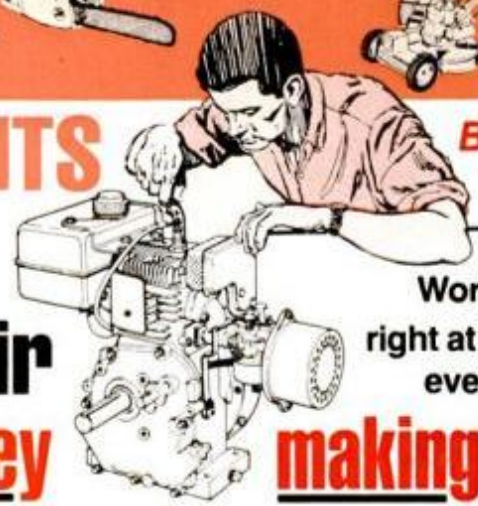
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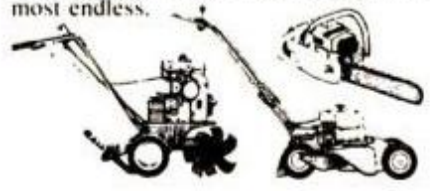
Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices—as much as \$17.50 for a simple tune-up that takes less than an hour!

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**MANUF. HAS HIGHEST SUCCESS RECORD!**

A manufacturing business started in the proper manner has always shown the greatest record of success. This is one reason why I say.... You need NO CAPITAL TO START!!! Why others will be eager to finance you regardless of who you are, or your credit rating, or where or how small you start.... But.... But you must have one or more GOOD DEPENDABLE PRODUCTS, and you must know how to go about each step of the way. THIS IS EXACTLY WHAT I AM GIVING YOU!

**WHAT I EXPECT FROM YOU FOR ALL THIS.**

Once you accept my offer, I'll expect you to study carefully the material I send you. You may accept any number of the Business Propositions for immediate or future use. You may accept or reject financing from any one of the many money sources I send you. I'll expect, that in the event you are unable to start your business immediately, or in the near future, then you will return to me the manufacturing processes together with the financing sources. You may keep all other material.

**WHAT YOU CAN EXPECT FROM ME.**

Your own manufacturing business with all sales handled for you by professional salesmen. 14 Manufacturing Propositions, many of which represent an investment on my part of thousands of dollars. You will be shown how to take a dollars worth of electronic parts and manufacture a product having a retail value of 20 times and better. Every business described here has been chosen because they can be started either full or spare time, in small space, and requires no machinery at the onset to begin manufacturing. You will be shown how and where to obtain a few cents worth of chemicals and manufacture a product selling for several dollars. Furthermore....

cont. next column

**MANUFACTURING PROPOSITION NO. 2  
A LIFE SAVING BUSINESS**

With little capital and space, you can manufacture right in your own home. Professional Quality Fire Detecting Alarms. Millions of households are now ready to buy. The field is wide open for many, many more manufacturers of Fire Alarms. I will send you the manufacturing plans for a fire detector which I designed myself. You can manufacture it for under one dollar, and will easily sell for ten times that amount. If you want something easy, that you can get rolling within a few days, and be in a profitable business literally overnight—THIS IS IT! Plus also, the plans to a highly sophisticated Fire and Burglar Alarm that offers the ultimate in home and industrial security. It is solid state, of modern technology, yet easily manufactured for a couple of dollars by anyone who knows the secret. To further assure your success, you receive the plans for an Infrared Heat Detector. It's new!

**YOUR BUSINESS WILL BE FULLY FINANCED.**

You will receive \$1000., \$5000., even \$50,000. to start your small factory just by asking for it. Even if you're starting from home. Your present credit is of no importance. You may find this hard to believe, but it's true, and it's being done every day by those who know how. YOU CAN MAKE A FORTUNE BY KNOWING THESE SECRETS! Your Only Requirement Is A Desire To Succeed!

**FURTHERMORE...** You will receive complete information on starting a mail order business. You will notice that each and every product you will be manufacturing makes a HOT M.O. item, and as everyone in the M.O. business knows,—nothing beats manufacturing your own items to sell by mail! This method alone Guarantees Your Success In Mail Order.

Further, you receive a course on Sales And Marketing. How you too can become one of the successful advertisers in this very magazine. How you can become Top Man, The Manufacturer, making products for others, which will force others to come to you to buy, and thus also serving your fellow man . . . . Then success will not only be yours—It Will Be Impossible To Avoid!

**SUCCESS WILL COST YOU \$25.00**

It is necessary that I require this small but reasonable amount, because first of all, it will eliminate most of those who are not really serious about being in business for themselves, but are just curious in 'seeing what you have'.... Secondly, people are funny in ways, if they get something for nothing, they don't think much of it....

Furthermore, you must realize, a considerable amount of time, effort and money went into each of the Business Propositions. The small charge helps offset the expense involved in getting these businesses to deserving people who will make profitable use of them. **BESIDES, YOU ARE RISKING NOTHING AT ALL — TO LOOK THINGS OVER . . . . TO THINK THINGS OVER — OBLIGATES YOU IN NO WAY. IT COSTS YOU NOTHING AT ALL. YOU CAN HAVE EVERY CENT BACK ANY TIME YOU WISH, JUST BY ASKING FOR IT.** (Please read the guarantee.)

**MANUFACTURING PROPOSITION NO. 3**

**FORTUNES IN DIVERSIFIED ALARMS**  
By manufacturing any of these items, you can be so certain of success, that it will be possible for you to start business without a penny to your name if those are your present circumstances. With the information I give you, in using other people's capital to make fortunes, I must also give you a plan to manufacture products which you will find it easy to obtain immediate outside finances regardless of who you are. Here are some of the greatest yet easiest to manufacture products ever made available to industry. An Ultrasonic Alarm working on a radar principle. It's designed to sell for hundreds of dollars yet can be built for a few dollars, giving you a free run on a highly profitable market. Plus a SOUND ACTIVATED ALARM. A LONG RANGE-WIDE ANGLE OPTICAL ALARM. MORE.

**BUSINESS PROPOSITION NO. 4**

**MANUF. SMOKE & GAS DETECTORS**  
Smoke detectors will enjoy many millions of dollars in sales in the next few years. The people who started to manufacture and sell this are rapidly expanding, and making a fortune at it. If you want an enjoyable worthwhile business — one easy to start — rapidly expandable, one that will make you a fast fortune, then go into manufacturing smoke detectors—it will make you rich. You also receive the manufacturing plans to a very Sensitive Gas Detector. This one requires a few more parts, but it's tops. Follow my advice and plans and a fortune is yours.

**BUSINESS PROPOSITION NO. 5**

**MANUF. PRODUCTS FOR HOME & INDUSTRY**  
One simple electronic part is all that's required to make this Open Circuit burglar alarm. It is manufactured for under a dollar, yet equals the performance of any professional alarm now on the market. Included are the plans for a CLOSED CIRCUIT alarm panel. It costs less than 2 dollars to manufacture and is reliable and fail-safe. Your opportunity to enter this virgin, highly profitable field, is only now made possible through my efforts in having developed these products... The manufacturing plans to these I believe are worth a fortune, for it can and will make fortunes for those who manufacture them! As bonuses you get the plans to an easy to assemble transistorized solid-state alarm system. Also the plans to a soon to become popular POOL ALARM. Get in on it!

Within a few days you will receive everything you need to start your own manufacturing business! Everything you need to start your own Small Factory . . . To grow fast, and make all the money you always hoped for.

Even though we never met, I am willing to risk a considerable amount on you. I will soon explain why I am doing this. All I ask of you in return is—Your sincere desire to own your own business! You will receive from me what literally amounts to thousands of dollars worth of processes and formulas. The same ones that made money for me, and the very same ones that made rich men of many others who began with nothing more than the shirt on their back.

You will soon have all this with....NO INVESTMENT OF YOUR OWN, other than the desire to work in rapidly building your own successful business. Financing will not be your concern—it will be done for you!

*But first I must tell you a little story.... Many years ago, I had a job paying a small salary. I couldn't take it any longer, yet I didn't know what to do. One day I began answering business opportunity ads from magazines. Believe it or not — that's how I started. I was soon making thousands of dollars a week and enjoying every moment of it!*

*Just as once someone helped me, I AM NOW GOING TO HELP YOU! I know from personal experience, if a person is ambitious enough to read ads that may lead to improving himself, then this individual is worth helping . . . . He or she has great possibilities for success, and the odds are, with proper help this person will succeed. I AM NOW GOING TO DO WHAT I ALWAYS ENJOYED DOING MOST, THAT IS — HELPING AS MANY SINCERE PEOPLE AS I POSSIBLY CAN, TO BECOME SUCCESSFUL IN THEIR OWN BUSINESS!*

cont. next column

**MANUFACTURING PROPOSITION NO. 1**

**PRE-ENTRY SECURITY DETECTORS**  
The fastest growing industry in recent years is the security field. A financial fortune awaits anyone who can produce new and improved security devices for home and industry. The greatest drawback in every alarm system presently on the market is... No alarm will sound off until AFTER the intruder has broken in. Imagine what will happen, if you offer an alarm that will detect an intruder BEFORE he has a chance to even lay a finger inside the premises.—An alarm that can just about detect an intruder's intentions of breaking in. If you can manufacture such an alarm — then this time next year, you will be a rich man! Impossible you say. It can't be done you think? I invented just such a device. The only thing I want out of it, is to see others build a profitable business from it, and benefit mankind by giving them a badly needed product at a reasonable cost... You can manufacture this device for under two dollars, using only common hand tools. Your markup and profit on this one is very high. **EXTRA BONUS—** I will also include the manufacturing plans to another pet project of mine. I call it BIG SCARE. It's an amazing little item,— when placed in the home or business, it will frighten away the most determined burglar, yet makes no sound at all. It's easily manufactured for less than a dollar even in small quantity. No one in the alarm business has this one. Be one of the first, and you will clean up on it.

**IF** you are looking for a get-rich-quick scheme, an effortless way to riches. If you want one of those plans that supposedly shows you how to use or develop that magic power within you. Or some super, vaguely described plan that promises you the ultimate secret to all the money in the world... then you are going to be disappointed. I have no effortless way to riches. I have no secret plans to offer you. When you are through reading this ad, you should have a pretty good idea of what to expect. No surprises, no disappointments... Just a Good, Solid, Manufacturing Business.

# Business for \$2500 Guaranteed!

## BUSINESS PROPOSITION NO. 6

### MANUFACTURING AUTOMOTIVE PRODUCTS

People spend hundreds of millions of dollars each year on add-on accessories for their cars... Come out with a good product that is in demand by car owners and you'll get a good share of this lucrative market. I AM GIVING YOU THE MANUFACTURING PROCESSES TO SOME OF THE BEST AUTO PRODUCTS AVAILABLE!... I suggest you start with a single auto product, and add on more products after your business gets rolling.

Once you have the proper information and process, all these products can be manufactured using simple tools, in small space, by anyone who has the desire to get rich in a small manufacturing business. These products range from very simple to highly sophisticated, yet easily produced by you or the helpers you will soon be hiring.

## MANUFACTURING PROPOSITION NO. 7

### ELECTRONIC IGNITIONS—PLUS MORE

A product rapidly becoming popular in the automotive field is Electronic Ignition Systems. With the ever increasing cost of gas, the constant demand for better economy and performance, the call for reduced emission—Electronic ignition is beginning to sell fast.

You must have seen these advertised lately in full page ads, selling for \$47.50 to \$79.95. These ads cost thousands of dollars each. The people behind these ads are making fortunes!... The field has hardly been scratched. Enter this field with a better product—selling for less—and you will soon own an established money-making business!

These plans, plus the plans to a High Precision Tachometer can be yours if you really want to make money with them. I'll send them to you!

## MANUFACTURING PROPOSITION NO. 8

### AUTO POWER GUARANTEES SUCCESS

Another item you must have seen advertised a lot lately, is a simple product which enables you to obtain 100 volt D. C. up to 3000 watts, from your car. Many people started manufacturing this product. Most of them are small one-man companies. The ones who knew how to handle it right are successful and making money.

I am going to give you something much better than this fast selling 110 VDC product. I am giving you 110 volt "A.C."!... I'll also include the plans for a product that guarantees a fully charged battery even if all the lights are left burning all night long. Unbelievable? Impossible? YET I PROMISE YOU IT'S TRUE! It consists of only 2 low cost, semiconductors, and can be assembled in a few minutes. IT'S NEW! It's a manufacturer's dream! Get your share of the profits!

## BUSINESS PROPOSITION NO. 9

### MANUFACTURING TREASURE FINDERS

Treasure and metal detectors become more popular each year. People who started manufacturing treasure finders years ago, as a small part time operation have now become giants in the electronics field. There is plenty of room for you in this money making field... Especially if you are going to make a good item selling for less than anyone else can! THIS BIG DIFFERENCE IS GOING TO MAKE YOU RICH!

NOW, you will be able to sell a treasure finder and a metal locator for under ten dollars and still make a tremendous profit!... This is not only another great mail order item, but a 'natural' seller to sportsmen, hobbyists, campers, and a mass market of millions.

As a bonus, I'll send you the plans to a highly accurate advanced unit now selling in the \$300.00 price range, yet is pretty cheap to manufacture. The plans to this one are not my own, but I obtained it from someone I know to be reliable in the field of manufacturing treasure finders.

## MANUFACTURING PROPOSITION NO. 10

### GETTING RICH IN THE SPORTSMEN TRADE

How would you like to enter a manufacturing business requiring so little capital, that you probably have that little money right now — without borrowing; yet build a business that will grow within months to give you all the money you will ever want.

There are millions of sportsmen in this country, millions more who do a little fishing occasionally. You will be manufacturing a line of products that these people need and want! I have worked out the plans for a SUCCESSFUL ELECTRONIC FISHING LURE BUSINESS. This one you really have to see to believe. Follow my directions on marketing them, and you couldn't manufacture as much as you are going to sell... Be prepared to start hiring help and expand fast with this. I'll include AS A BONUS — the manufacturing formulas to other fast selling products to the sportsmen and outdoor trade.

## MANUFACTURING PROPOSITION NO. 11

### THE LUCRATIVE AUTOMOTIVE FIELD

I'll show you — that YOUR chances of succeeding in the field of chemical manufacturing of Automotive Products on a smaller scale, are better than some of the larger established firms. Chemical product manufacturing is easy to get into, requiring very little capital and space to make commercially competitive products you will be proud of.

Like I and others have done, you can start from a small space in the kitchen of your home, and grow fast to a successful money making business, capitalizing on the success of others.

This Business Proposition No. 11, contains the processes and formulas to many products. No need to manufacture all of them. Pick the one you like best. Any one of them has a large enough market to make even the most ambitious person rich! You receive everything for just about what it cost me to get them to you. With products like these — in a short while you will be in the Manufacturing Business.

## BUSINESS PROPOSITION NO. 12

### MANUFACTURING CHEMICAL SPECIALTIES

How can you compete with Proctor & Gamble, Lever Bros., and other industrial giants like these? Think I'm crazy to even suggest such a thing? Not at all! That's what's so amazing about entering a manufacturing business. You can do it!

Just do this... manufacture a small quantity of unique products needed in millions of homes, products that are easily demonstrated, work great, and are repeat sellers. Follow my simple marketing plans—plans used by clever small businessmen who are now successful, and YOU'LL SOON FIND YOURSELF MANUFACTURING A LITTLE MORE EACH DAY... Then BINGO — one day, it'll hit you — YOU'RE IN BUSINESS FOR YOURSELF!

You will receive some of the best and unique household products suitable for small firm manufacturing. Only in this business can so many people turn pennies into dollars so easily. No special equipment is required to start manufacturing at once... no special knowledge, other than what we send you is required. But I warn you, BE PREPARED FOR RAPID GROWTH, BECAUSE YOU JUST COULDN'T AVOID IT!

## MANUFACTURING PROPOSITION NO. 13

### COMPLETE LINE OF CHEMICALLY TREATED CLOTHS

Want a line of products that are easy to manufacture, requires little starting capital, can be started without special equipment... Yet is needed and bought by home, auto owner, hobbyist, workshop, garage, factory and office... That can be sold in just about every store and bought by everyone.

Consider it for a moment — in a short while you will be in business for yourself! No complications. No worry about financing your start. No worry about selling all you can turn out... YOU WILL FINALLY HAVE ALL THE MONEY YOU WANT, AND EQUALLY IMPORTANT, TIME TO ENJOY IT.

Chemically treated cloths are time saving convenience items. They are modern products. The market for them will be growing tremendously in the years to come. You will receive the formulas and process to 8 different Chemically Treated Cloths. They cover every imaginable need in this field. Those entering this business in the near future are pretty much assured of success!

## BUSINESS PROPOSITION NO. 14

### MANUF. INDUSTRIAL & WORKSHOP PRODUCTS

If you ever dreamed of having a successful manufacturing business... NOW YOU CAN! I'll send you the processes to some of the greatest and best selling inventions I ever came across. I'll briefly describe some of them.

This one is so new, it is not on the market, and so has no name. I was going to market it right before my decision to help others start their own manufacturing business. I was going to call it "GLAR-OUT" and I know it is going to make fortunes for those who make it. The product was designed to eliminate glare from the sun when applied to windows in homes, offices, stores, etc. Think of the heating and air conditioning savings alone!

This product we will call "CHROME-TONE." It does REAL ELECTROPLATING! This valuable process cost me thousands of dollars to develop. It's worth a fortune to you.

Next, is a Rust Remover — You may have seen these around. It's a big seller. I offer you an improvement. This one will INHIBIT RERUSTING!

Next, is a product so new, I've never seen it on the market. We will call it "PAINT-NO-SKIN". After a can of paint has been opened, and then resealed for future use, a skin forms on top. THIS NUISANCE IS NOW ENDED FOREVER!

This complete set of modern manufacturing formulas are yours to get rich on and enjoy ONLY for the price of what it cost me to get them to deserving people WHO WILL MAKE GOOD USE OF THEM.

GOOD LUCK!  
MARTIN ZAHLER

## GUARANTEE

I promise to send you everything as described on these two pages, which will enable you to start your own manufacturing business without any further financing or selling on your part. The money you sent me for examining all the material carefully before you decide, will be held in trust for 30 days. If you are not fully satisfied, your money will be returned to you in full upon return of the processes and formulas together with a note simply stating that you have not copied the processes and formulas, and will not make any further use of them... All other material sent you, may be retained by you free of charge as my gift to you for your effort.

MARK — MARTIN

92 BRIGHTON 11th ST., BROOKLYN, NEW YORK 11235

PM11

Dear Mr. Zahler:

I am really serious and would very much like to have my own small MANUFACTURING BUSINESS in Electronic, Automotive and/or Chemical Manufacturing, and understand you will help me establish a Successful Profitable Factory in one or more of the fields I choose. Please send me at once, everything I need to start.

I further understand that I need invest No Money of my own in any business I enter, and that I may obtain outside financing supplied by others who will invest their capital in helping me build my factory... Furthermore, after I begin manufacturing, I need do No Selling and that all sales will be handled for me.

The cost of any one of the Manufacturing Propositions is only \$8.00 each, complete and postpaid. Or all 14 Propositions for only \$25.00 complete and postpaid.

PLEASE SEND AT ONCE THE FOLLOWING MATERIAL...

- Manufacturing Proposition NO.(s) @ \$8.00 each.
- I am not fooling about wanting MY OWN MANUFACTURING BUSINESS AND FACTORY — and at the same time I wish to SAVE \$87.00, so send me every single business proposition described on these two pages for your SPECIAL PRICE OF ONLY \$25.00 (There are 57 processes in all, actual cost is less than 45 cents each.)
- Complete plans on obtaining outside financing.
- Complete plans on marketing and having sales handled for me.
- A course on Mail Order. Including details on obtaining free advertising.
- I am enclosing \$ \_\_\_\_\_, please send everything complete and postpaid.
- I am enclosing a deposit of \$5.00, please send everything complete, C.O.D.

NAME \_\_\_\_\_ (please print)

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

### NEW PRODUCT SERVICE

Check this box and I will keep you informed of new products suitable for small firm manufacturing. You will be notified immediately of all new discoveries and inventions that you can rapidly and easily start manufacturing at once. THIS VALUABLE SERVICE WILL ENABLE YOU TO BE MANUFACTURING TOTALLY NEW PRODUCTS LONG BEFORE OTHERS BECOME AWARE OF THEM... This service is extend to you FREE OF ANY CHARGE, hoping you make the best possible use of it.

NOTE: Please do not fill out this form or order anything from me unless you have carefully read these two pages. I make this request because we have not met personally, and I wish only those seriously interested in operating a successful manufacturing business to reply.

NOTE: Due to the extensive nature of the material you will be receiving (it weighs several pounds), please do not request shipment by first class mail.

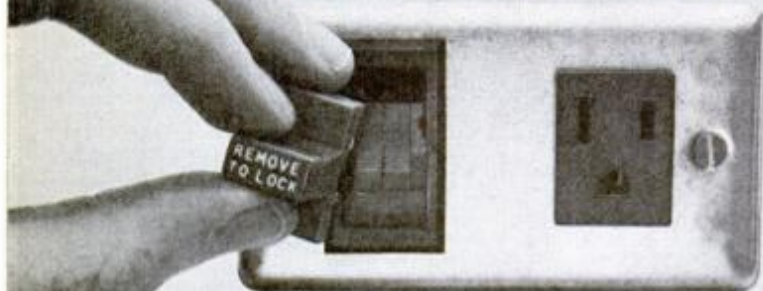
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# New locking switch helps prevent accidents and unauthorized use!



Helps protect children from shop tools such as table saws, lathes, etc.; as well as electrically operated garage door openers and potentially dangerous household appliances.

Locks OFF—just remove the snap-in switch actuator. Installs easily. Complete with instructions. Switch UL listed, 15 amp/125VAC, 10 amp/250VAC. Money back guarantee. Order several now.

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 Watch a small child fumbling with a tiny HO-gauge train. He has difficulty setting it on the track or hooking the cars together. And when the train can't take the way a child plays, it ends up in the closet. Or in the trash.

That's why Lionel makes big O-gauge trains... scaled right for a youngster's developing coordination. Because he can handle it with ease, your child will enjoy a big Lionel more than a tiny train that thwarts him at every turn.

## Built to last.

Small-scale trains are fine for hobbyists. But when it comes to children's toys, only the strong survive. That's why Lionel builds a strong,



rugged train... for the way kids play. The big Lionel shrugs off train wrecks and derailments and endures to grow into an absorbing adult hobby.

## Don't be misled by price.

A small, fragile train that spends its life in the closet is no bargain. Now, for about the price of an HO set, you can bring home the big train that delivers a childhood's worth of enjoyment.

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## The big train for small hands.



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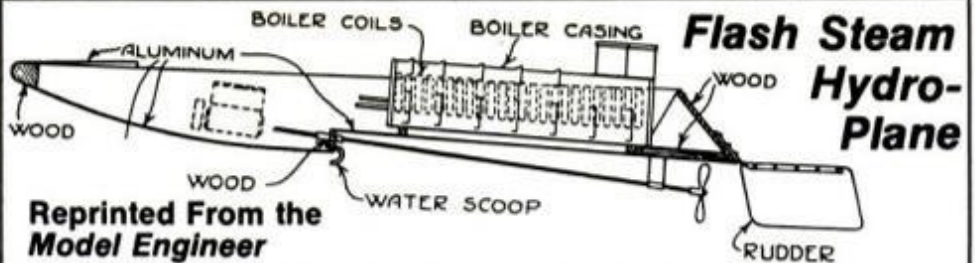
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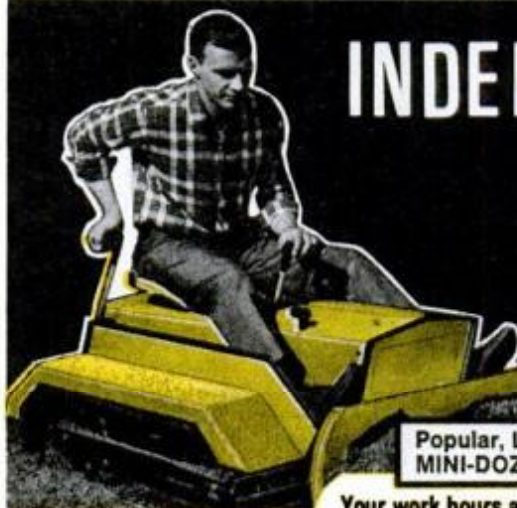
This high speed racing hydroplane is powered by a flash steam boiler and a very interesting two cylinder opposed steam engine. It's only one of the interesting projects in Volume 84 of the Model Engineer which first appeared in 1941 and was just reprinted. Other projects include hot air engines, clocks, building your own lathe from very simple parts, lathe accessories you can adapt for your lathe, live steam locomotives and much much more. Over 500 pages of the best in home shop information. Order it today and see what a treat the Model Engineer is, and if you don't think it's as exciting as we say, simply return it for a full and immediate refund.

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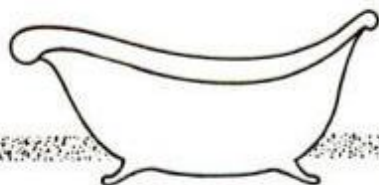
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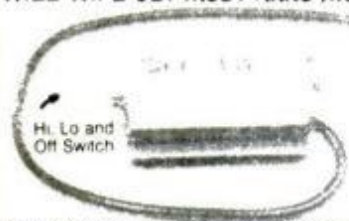
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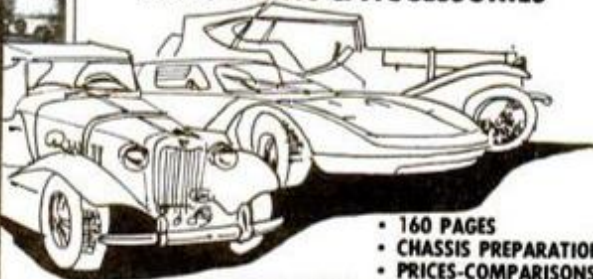
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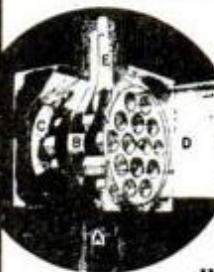
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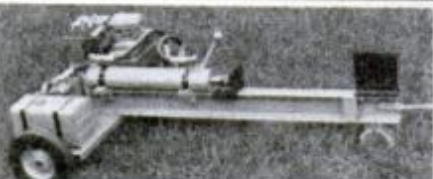
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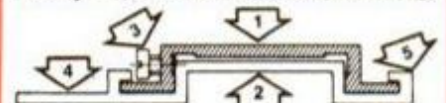
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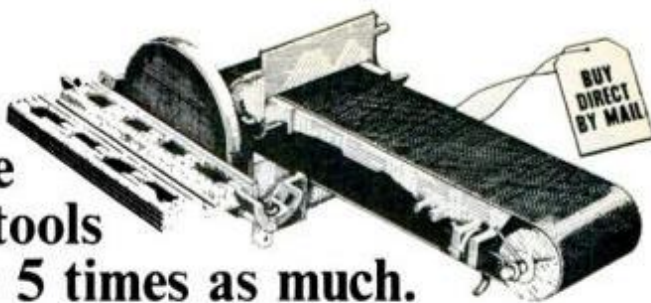


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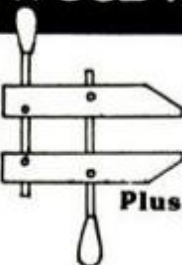
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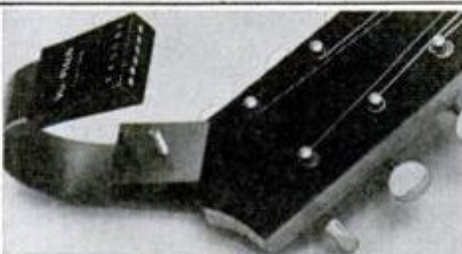
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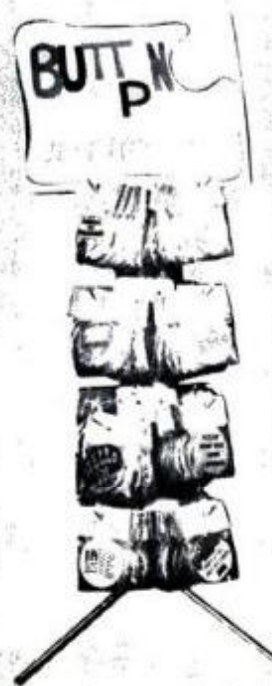
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(Continued from preceding page)

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(Continued from preceding page)

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Your ice chest is bulky, awkward to carry, messy and inefficient at keeping its contents cold. You have to buy ice every day, if you can find it, throw away the spoiled soggy food and drain off the water repeatedly.

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## USES AEROSPACE REFRIGERATION MODULES

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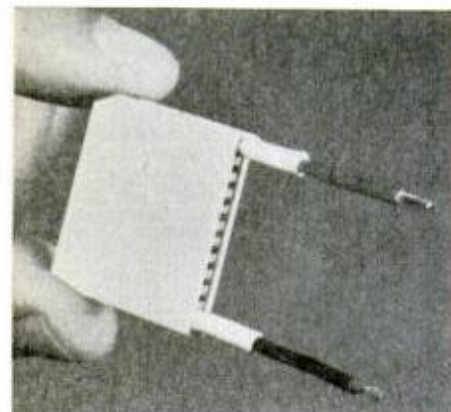
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*Two of these miniaturized thermoelectric modules replace all the bulky complex piping coils, compressors and motors in conventional portable refrigerators. The modules pump heat from your food into efficient heat sinks where it is dissipated by a quiet fan. They operate on a principle called the "Peltier Effect" - passing electricity through the junction of dissimilar metals causes heat to flow from one metal to the other.*

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