

NOVEMBER 1977 \$1.00

# Popular Mechanics

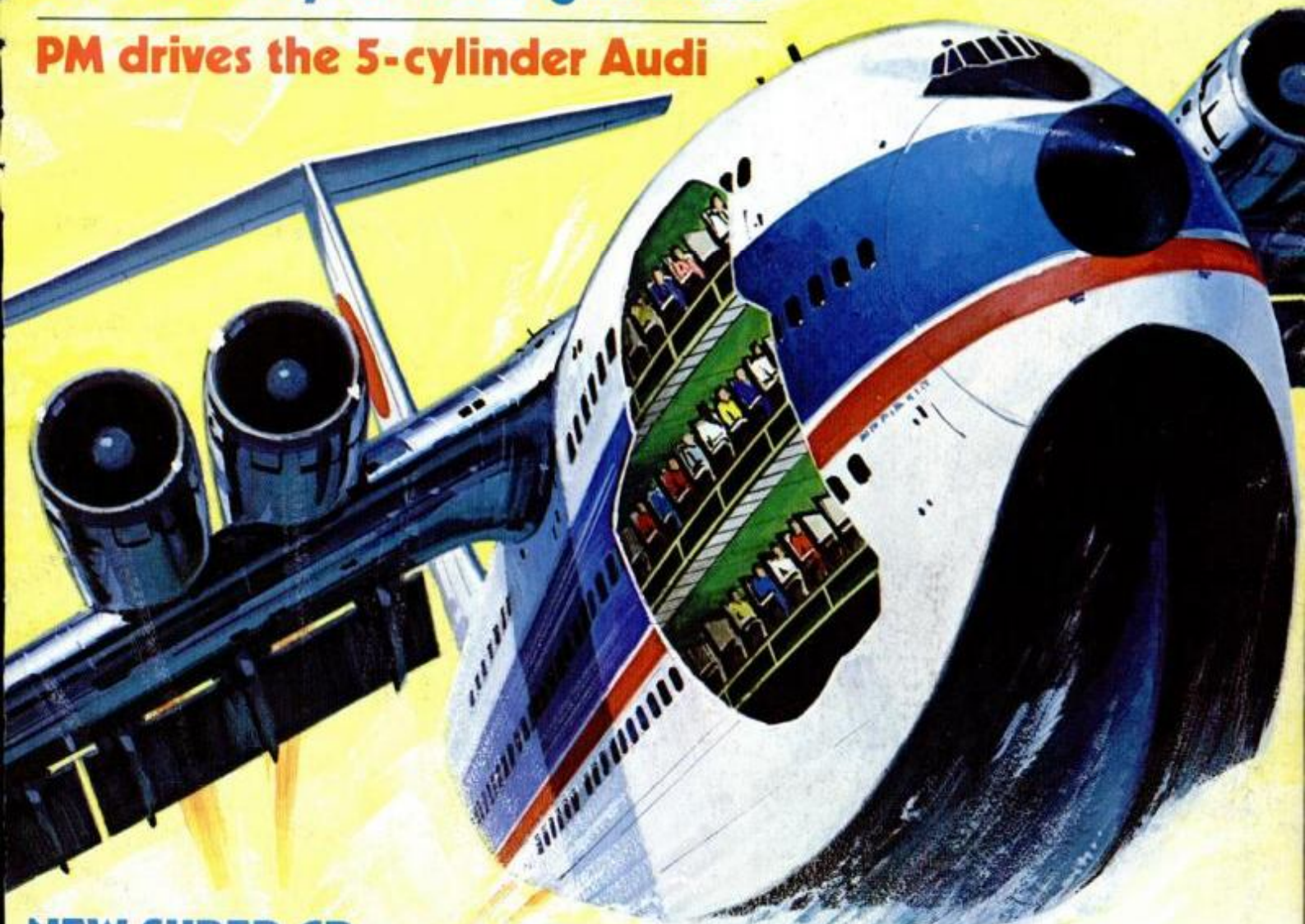
**How to drive when it's too icy to walk**

**WINTER POWER-OUTS:**  
Low-cost ways to be snug and safe

**PM drives the 5-cylinder Audi**



**SPECIAL**  
19 easy-to-make Christmas gifts  
COMPLETE PLANS



**NEW SUPER CBs:**  
13 rigs that give you  
120-channel talk-power

**PLUS: Upholstering**  
■ VW Microbus Owners  
Report ■ 3-wheel cars

**MAKING A COMEBACK?**  
**SUPER FLYING BOATS**

...with the real story behind  
Howard Hughes and his  
'Spruce Goose'



State Farm Life Agent  
Steve Johnson



State Farm Health Agent  
Steve Johnson



State Farm Homeowners Agent  
Steve Johnson



State Farm Auto Agent  
Steve Johnson

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

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

They're very pleased with their health insurance agent.

They're completely satisfied with their homeowners agent.

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

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

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



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

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

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

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

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

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



**Like a good neighbor, State Farm is there.**

STATE FARM INSURANCE COMPANIES Home Offices: Bloomington, Illinois

This One



S1ZU-44Z-WAKW

### On the cover

Imagine 1200 passengers flying overseas on a mammoth seaplane high as an eight-story building and heavier than the largest steam locomotive! Prompted by the soaring costs of airport real estate, the triple-decked GS (for giant seaplane) is now on the drawing boards of the Shin Meiwa Industry Co. of Kobe, Japan. See page 84.  
—Painting by Ed Valigursky



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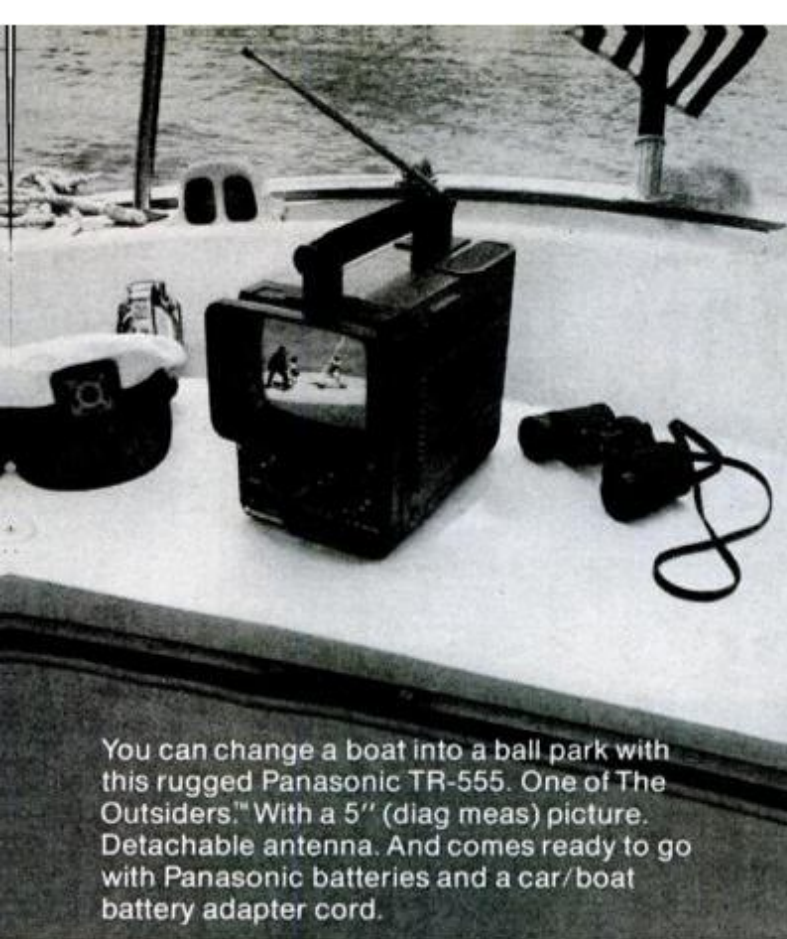
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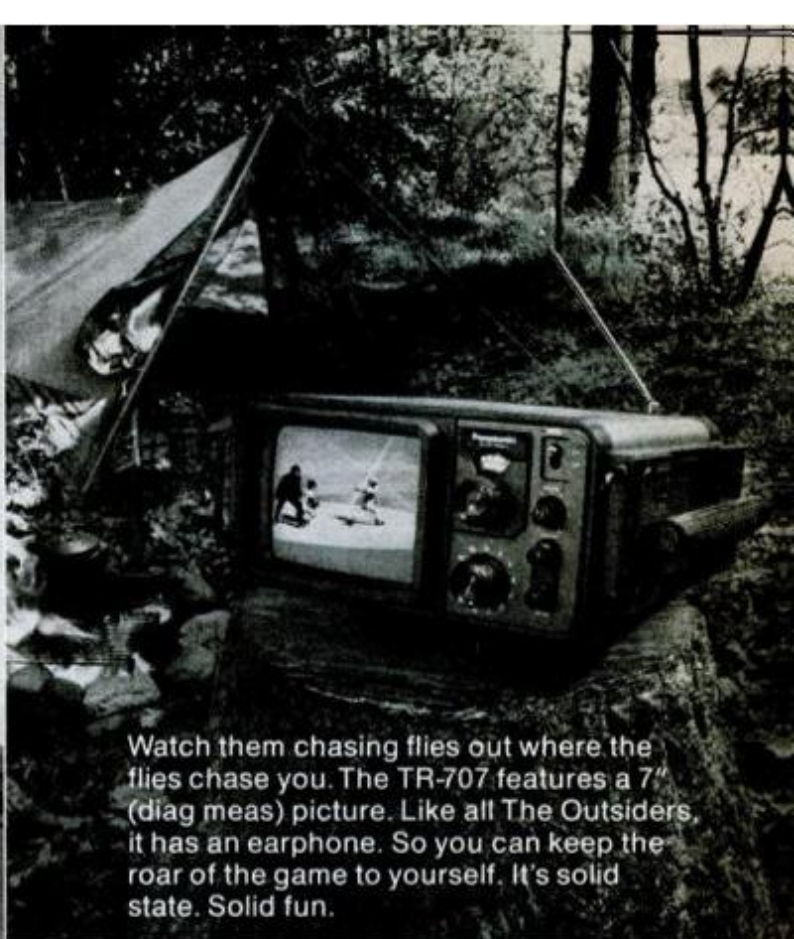
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You can change a boat into a ball park with this rugged Panasonic TR-555. One of The Outsiders™. With a 5" (diag meas) picture. Detachable antenna. And comes ready to go with Panasonic batteries and a car/boat battery adapter cord.



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



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



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

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

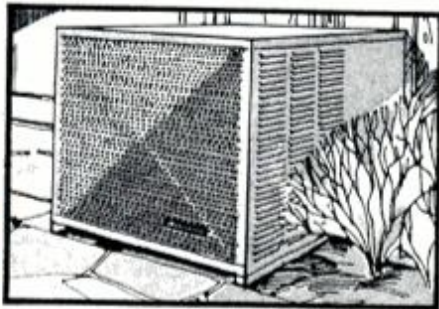
The Outsiders from Panasonic. They're rugged. They can take it. And still deliver beautiful pictures. They all come with batteries. Some with Panasonic extra-heavy-duty batteries. Some with rechargeable Panalloyd batteries. All work off car or boat batteries. And, of course, they



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

**the Outsiders**  
**Panasonic.**  
just slightly ahead of our time.

Heat with electricity?  
**Save up to \$61<sup>00</sup>**  
**out of every \$100<sup>00</sup>**  
**you spend to heat**  
**your home.**



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

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

**From 26% to 61%!**

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Conventional electric furnaces re-

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

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

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

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**energy savings now.**

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# Motorcraft Batteries.

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



Fairbanks is just 120 miles from the Arctic Circle, in the heart of pipeline country. A rugged place to test auto parts.



To avoid start-up failures Alaskans leave their engines idling for hours. That's a continuous strain on battery power.



Some roads don't even look like roads. The pounding ride tests the rugged interior construction of Motorcraft batteries.



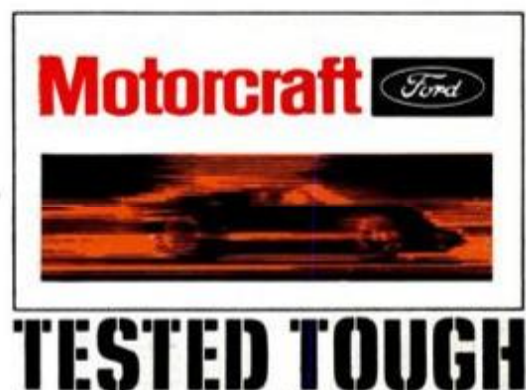
The Motorcraft Heavy-Duty Premium Battery. In the fierce cold, you need a strong and reliable battery to crank the frigid engines.

There's a word for the way Alaska treats batteries. Tough. That's why we took Motorcraft heavy-duty batteries to Alaska. And had an independent testing company test them in 50 privately owned Ford, GM and Chrysler cars and light trucks.

The batteries had to survive long periods of idling, the hard pounding on rock-strewn roads, and Alaska's astonishing temperature extremes...from way, way below zero to 90 degrees of summer.

The result? After six months of the rugged punishment Alaska dishes out, not one single Motorcraft battery failed. In fact, less than one-half of 1% of the 1674 Motorcraft parts in the test couldn't take it. That includes batteries, oil filters, shocks and tune-up parts.

No matter what you drive... wherever you drive, ask for Motorcraft auto parts. They're tested tough in Alaska.



# LETTERS TO THE EDITOR

## A better paddle wheel

Enjoyed your article on the *Mississippi Queen* (page 57, Aug. '77). In 1945 I used to ride the old *Island Queen* from "Cincy" to Coney Island, Ky., and had many unforgettable times!

In your article, you described a redesign of the paddle wheel to improve efficiency. Further improvements could be made by making the paddle wheel so the blades would "drop out" after passing through bottom dead center and would spill all those 30 tons of "carry-over" water. I plan to build a model and will incorporate this design.

DON HARRINGTON  
ARLINGTON, TEX.

*Good. Send us a photograph when you do.*

## PM's VW experts score

I just sent my check for a two-year subscription. Among the things that prompted me to do this:

■ The excellent "Firsthand Report" by Michael Lamm on the diesel Rabbit (page 82, July '77). I am driving one of these cars (averaging 47 mpg) and enjoy it more than any car in many a year.

■ The excellent *Saturday Mechanic* article (page 86, July '77) on maintaining the diesel Rabbit by Paul Weissler. I learned more from this article than I have from VW.

JAMES B. DAVIS  
SOUTH WALPOLE, MASS.

## Antique boat tows more skiers

That new record for the 20 water skiers at Seaworld, with a 175-hp Mercury (page 116, Aug. '77), is impressive, but a real "one of a kind" speedboat beat that record recently. A 35-foot, all-mahogany speedboat (the *Zephyr*), built in the late '30s by Jean Romely on Lake Minnetonka, was modified from the original 420-hp V12 Liberty engine to a Capital 750-hp V12. According to *Antique Boating* magazine, a couple of years ago she was able to tow 24 water skiers while 18 TV and newspaper reporters rode in the boat. This weight was in addition to her normal hull weight of about six tons.

Since antique boats are in the same stage as were antique cars about 10 or 15 years ago, and your magazine is cognizant of future

trends, I thought you would be interested.

CHARLES G. PHEIL  
WINSTON-SALEM, N.C.

*Records are interesting. PM's All Outdoors for Oct. '77, reports experts at Cypress Gardens, Fla., towed 26 skiers behind a Johnson 175.*

## Here's to a great crew

I was pleased to read the fine article about the F-14 and Phoenix missile recovery (page 69, June '77). I participated in that operation and look back on it as one of the most exciting periods in my life, as does Cmdr. Al Holifield whom I relieved as officer in charge of submarine NR-1. I am writing for my crew to ask if the artist's rendition of NR-1 approaching the F-14 on page 71 can be made available to us. As our ship is so small, we have our offices on the pier in a large trailer where a number of photographs and



Memento for the crew that got the F-14.

sketches are displayed for visitors.

The crew has taken a great deal of pride in this operation along with families and friends.

LT. CMDR. MICHAEL MCQUOWN, USN  
OFFICER IN CHARGE, SUBMARINE NR-1

*A copy of the painting has gone to the crew of NR-1 with our congratulations for a job well done.*

## Victorian Christmas project

You might like to see a picture we took of the PM dollhouse I built from the Victorian house plans in

*Popular Mechanics* (page 116, Dec. '76). It was a big success.

JOSEPH F. NADEAU  
ENFIELD, CONN.

*We are always glad to see pic-*



PM's Victorian dollhouse completed.

*tures of well-executed PM projects. Plans for the Victorian dollhouse still are available. Send \$7.95 by check or money order to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10019.*

## Anyone seen ZMC-2?

Your article on lighter-than-aircraft (page 64, July '77) takes me back to the days of the metal airship ZMC-2, built by the Detroit Aircraft Corp. for the U.S. Navy at Grosse Ile Airport, Mich.

The ship was finished in 1929 and flown to the U.S. Naval Air Station at Lakehurst, N.J. What became of it I do not know. I flew in it as did others at Grosse Ile. I have a sample of the "Alclad" hull covering prepared by DAC with printed matter on it giving information about the metal. I was in charge of construction of the Grosse Ile Airport.

ELROY C. CORMACK  
EL PORTAL, FLA.

## Don't brush the bristles

Kenneth Wells suggests using a solvent-soaked wire brush to remove paint from a paintbrush (page 50, June '77). That's a no-no because the wire brush will abrade the filaments. This causes curling and results in streaking and uneven distribution of paint the next time the brush is used. JOHN S. RUCH  
NEW YORK, N.Y.

*We agree. Mr. Ruch is correct. PM*





## Polaroid's SX-70 Alpha 1

Its electronics and optics make it the world's finest instant camera.

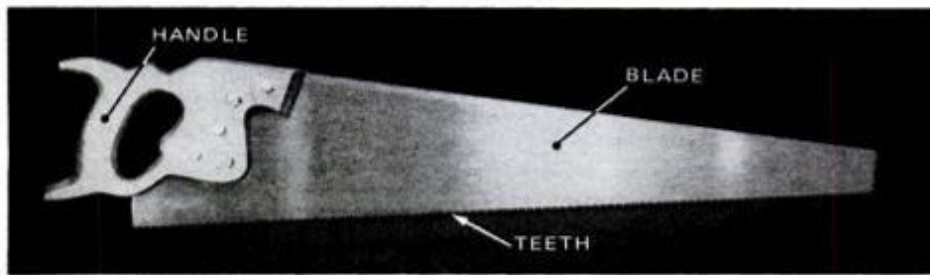
The SX-70® Alpha 1 Land camera has the most advanced optical and electronic system integrated into one camera. The SX-70 is the world's only folding single-lens reflex camera. Its four-element glass

lens offers razor-sharp focusing from infinity to 10.4 inches. You see details clearly, even in dim light, because the SX-70 has one of the brightest SLR viewfinders in photography. Its electronics auto-

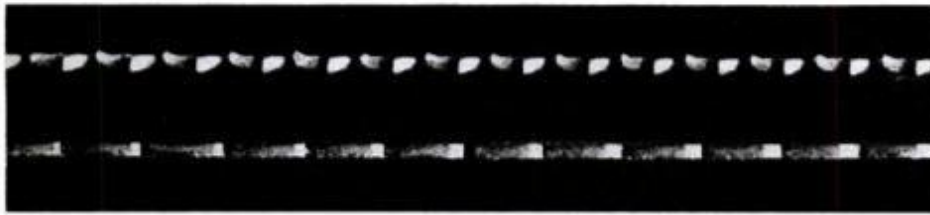
matically calculate all exposures, using a unique variable shutter and aperture combination which even makes split-second flash corrections. The SX-70 Alpha 1. So advanced, it frees you to do the creative thinking.

# WORKSHOP MINI-COURSE

## HANDSAW BASICS



Nomenclature for simple but valuable workshop tool (above). Below: Ripsaw blade has teeth that resemble chisels lined up in a row. Teeth of crosscut saw, set alternately to both sides of blade plane, cut like two rows of knife points.

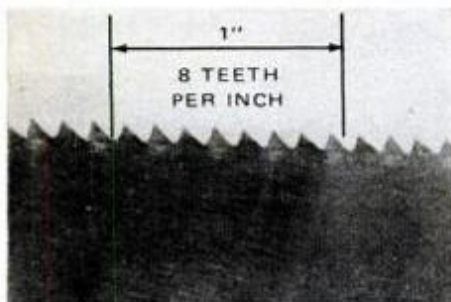


**T**here is a lot more to the hand-saw than most beginning woodworkers suspect. Did you know, for example, that a saw's blade is slightly thicker along the edge with the teeth than the rest of the blade? That's the way high-quality saws are made in order to give firmness to the cutting edge. You should know that there are two types of general carpentry saws—the crosscut saw for cutting across the grain and the rip saw for with-the-grain

cuts. You should have at least one of each in your toolbox.

Important things to know when choosing a handsaw:

- Pick a tool with a quality handle, one that feels comfortable and is securely fastened to saw blade.
- A crosscut saw has teeth much like small knives set far enough apart to keep the saw from binding. The crosscut does about 80 percent of its cutting on the downstroke and cleans the kerf on its upstroke.



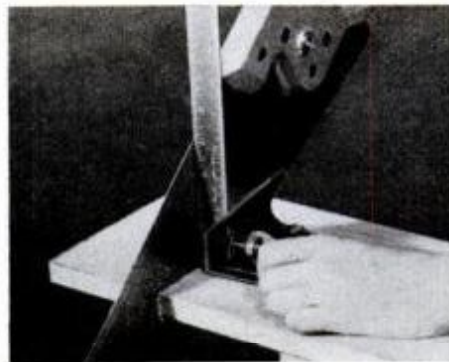
Number stamped on blade heel simply indicates the number of teeth per inch.



Basic carpentry rule: Always position saw to cut on waste side of cutting line.

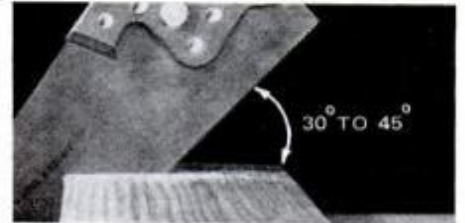


When starting cut, guide blade with thumb, form kerf by several upstrokes.

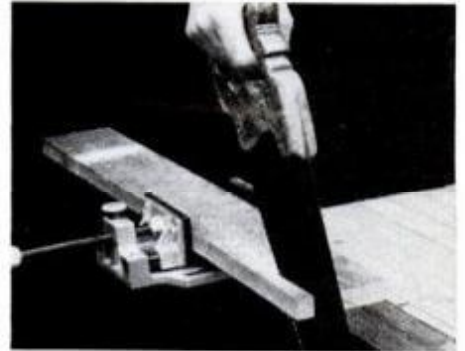


Saw must be held at 90° to the board face or you will create a bevel cut.

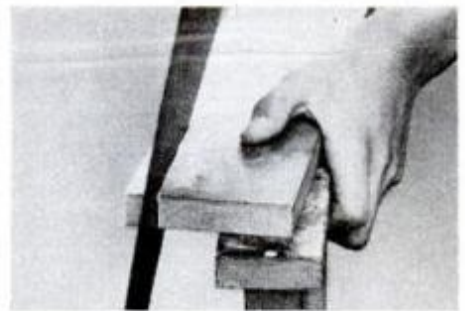
For a first crosscut saw, pick one about 26 in. long with 7 or 8 points. ■ Rip saw. Since there is less resistance when cutting with the grain, a rip saw requires fewer teeth. Here, pick a 5½ or 6-pointer. —Harry Wicks, *Home and Shop Editor*



Best cutting angle is when saw is held so teeth are within above degree range.



Greater ripping accuracy is assured if you clamp work in vise when possible.



To rip board on a sawhorse, hold work securely, using other hand like a vise.



When possible, clamp workpiece in the vise when making cross cuts as well.



# 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.

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# PM WORKBENCH

## PM EXAMINES PRODUCTS AND SERVICES

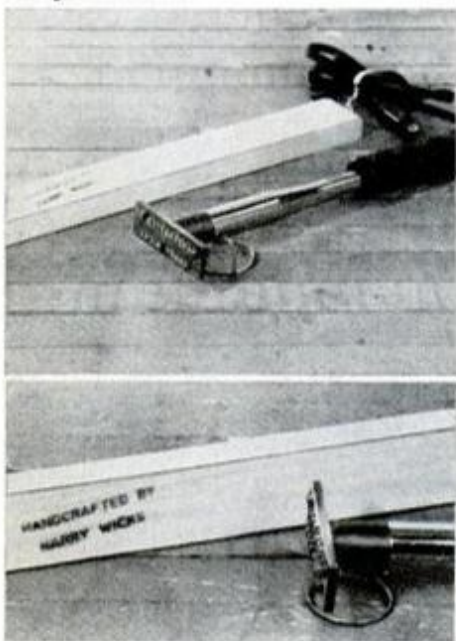
### Finding metric help

With the United States changing to the metric system, those in construction and many other fields now must adapt current measurement practices to convert to metric. To help, the Commerce Department's National Bureau of Standards has released a new publication called *Metrification and Dimensional Coordination—A Selected Bibliography*. The NBS booklet, No. 458, is 75 cents per copy and available (minimum order \$1) from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

### Scrap-wood toys

The toy truck on page 132 was designed by Andrew Cummins, who has collaborated with an automotive designer to create other handsome toy designs. He offers plans for the truck, a train-tender-caboose, tractor-trailer and racing cars for \$2 per set plus 30 cents postage (all four sets, \$8 postpaid). The drawings are suitable for framing after you've built the toys. Uncle Andy's Scrapwood Toys, Box 574, Franklin, Mich. 48025.

### On your mark

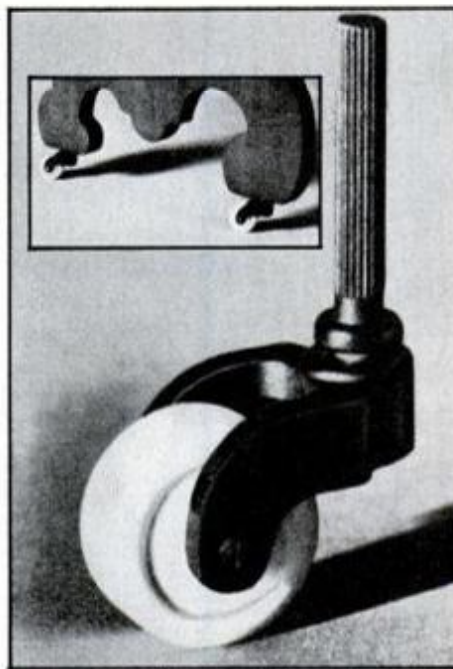


The woodworker who thinks he has everything would love to find this in his Christmas stocking. It's a low-cost 125-watt branding iron that lets a home-projects builder put his stamp on everything he

makes. The iron heats in about 15 minutes; then brands with a fury. It takes some getting used to, but clear directions come with the tool. Called Maker's Mark, it's for use on hard or soft woods and plastics. \$21.45 postpaid from Craftmark Products, Inc., Box 6308, Marietta, Ga. 30065.

### Old-time casters

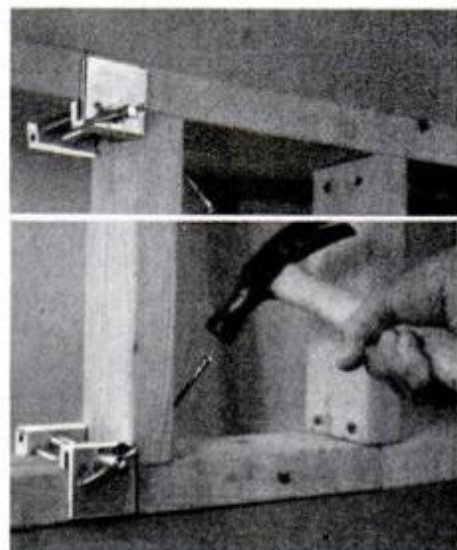
Since I have built a great deal of Early American furniture over the years, I was happy to see the new casters shown. Installation is easy: You simply bore a hole, tap in a socket and insert a caster. Those who build furniture of another era will be pleased to know these casters are especially suited for dry sinks, washstands, small tables and



carts. Wheels 1½ in. wide and 1⅝-in. dia. have black die-cast housings. Intended for carpets, a set of four porcelain casters are \$7.98 postpaid from Minnesota Woodworkers Supply, 21801 Industrial Blvd., Rogers, Minn. 55374.

### Easier toenailing

A handy carpenter's aid called Stud-Fast makes it a lot easier to drive nails at an angle, such as in fastening studs to top or sole plates. Each mini-clamp features an abrasive pad for sure gripping power plus a floating half-nut for quick changes. These are also great when you work alone with plasterboard.



Tool assures plumb studs—every time.

You just clamp a pair to studs and set the heavy sheets on them. \$16 postpaid from New Concepts Co., Inc., Box 182, Cary Rd., Algonquin, Ill. 60102.

### Save heating dollars



These insulation batts will bring an uninsulated attic up to a thermal level of R-30 in one step. (Energy experts recommend R-30 as the minimum value these days.) The one-step insulation comes in bundles with handles and step-by-step diagrams for installation. For more details, write Certain-Teed Home Institute, Dept. PM, Box 860, Valley Forge, Pa. 19482.—*Harry Wicks, Home and Shop Editor*

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.



# Real discovers the way to keep natural taste in. Artificial out.

The difference in low tar Real is 'nothing artificial added.' Real's flavor is natural. All natural.

All other major brands enhance their flavor artificially. Real does not. It doesn't need to. All that great taste and flavor in Real is natural.

That includes the menthol in Real Menthol, of course. It is fresh, natural. Not synthetic.

You get a rich, satisfying smoke. Taste you can feel. Full, natural taste. Discover the difference yourself. Taste Real...smoke natural.

**Low tar Real is the natural cigarette.**

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

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

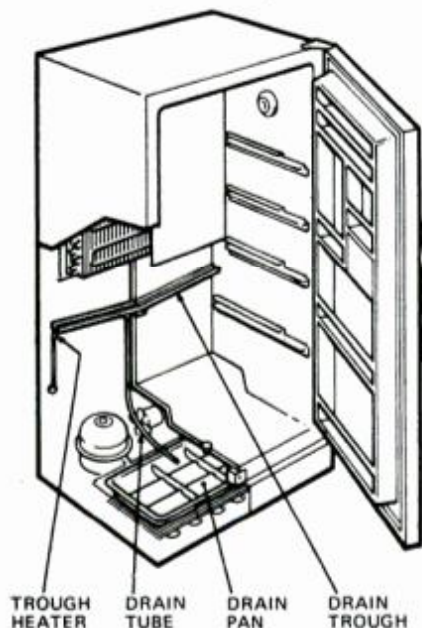
# APPLIANCE CLINIC

## QUESTIONS ANSWERED

### Flood stage

Our Frigidaire refrigerator leaks water on the floor and in the compartment. We had a serviceman replace the pink insulation between the freezer and inside compartments, but the problem hasn't been solved. We would appreciate some help.—Dr. William V. Robins, Carrollton, Mo.

If we read you right, you have two problems—not one. The first is moisture inside the unit. The second is moisture outside the refrigerator on the floor. Seldom is either



Typical refrigerator drain system.

problem caused by the insulation between the refrigerator and freezer compartments.

Investigate the following to help cure moisture buildup inside the refrigerator:

1. Critically examine how the unit is being used. Excessive opening and closing of the door, especially when humidity is high, will increase moisture inside the refrigerator.

2. Examine the door seal for damage or misalignment that allows warm air to enter the cabinet. Then test the seal's integrity by closing the door on a crisp unfolded dollar bill. Hold one end of the currency and try to snatch the dollar out. Repeat the test all around the door at intervals of 8 to 10 inches. The "bite" on the dollar should be uniform all the way around the door. If it isn't, the gasket should

either be adjusted or replaced.

3. Check the drain system, consisting of a drain tube and drain cup or trough, to see if it is clogged or kinked, causing water to overflow. The system should be removed and cleaned. Use household ammonia as the flushing agent. Replace a drain tube that is kinked.

The usual cause of water beneath a refrigerator has to do with the delivery end of the drain system. In most cases, water falls on the floor because the outlet end of the drain tube is not in position over the drain pan or the drain pan is not in position to catch water being ejected by the drain tube.

The drain system of a typical refrigerator is shown at left.

### Readers write

We've received a few letters regarding items presented in the May and June (1977) columns. They are important so let's sum them up:

1. Regarding the item *Battle of the Hexes* in the June column, an error was made in explaining how to test a GE steam iron that is leaking. The steam button must be in the "down" position to fill the iron—not in the "up" position as stated. We thank GE service representative Kathy Gonier for bringing this to our attention.

2. Regarding the item *Foreign Exchange* in the May column, Robert Ford of Carlisle, Mass., has helped us locate two companies that have step-up transformers available. The item concerns a reader who needs a transformer to operate 220/240-volt appliances purchased overseas on 110/120-volt current in the United States. The step-up transformers, rated up to 500 watts, are available at Cramer Electronics in Newton, Mass., and Newark Electronics in Oklahoma City, Okla.

3. Regarding the item *Various Variables* in the May column, Duane Pool of Redlands, Calif., and Gerald Will of Florissant, Mo., have had experience with a fourth reason for water remaining in Sears Kenmore and Whirlpool washing machines. There is a filter in the machine that is supposed to be self-cleaning by reverse flushing. Both readers found that the filter can get plugged with lint and sand, keeping water trapped in the machine. The solution is to remove and

flush the filter with a garden hose or to replace it.

### Strike up the band

Several readers have been having trouble finding belts for their bandsaws. R.A. Merritt of West Allis, Wis., supplies the answer:

"From the Yellow Pages, under rubber products, I contacted the H.L. Kuehn Co., 3747 North Booth St., Milwaukee, Wis. It will make rubber tires to your specifications. If you furnish the circumference, thickness and width of the belts, this firm can help. Three belts for 6-in. wheels and a tube of adhesive cost \$10. Cheap at twice the price."

### Dead sea

Our Hotpoint dishwasher Model GHDA653B, installed in 1972, has never filled properly. The plumber and company serviceman both said that we had inadequate water pressure. I just installed a system that has doubled the pressure to 40 to 60 pounds, but the fill is as sluggish as ever. The serviceman now suggests that we reset the dials repeatedly until water reaches the proper level. What do you suggest? —Kenneth B. Burroughs, Delmar, N.Y.

Your machine is designed to fill properly at water pressures of 20 to 120 pounds. If water isn't to the top of the heating element by the end of the fill cycle, there's a restriction somewhere.

The most likely spot is inside the water valve. In that valve is a flow washer which could be causing the trouble. The washer should sit in the valve body with its rounded side toward the water flow. If the square side is toward the flow, water intake is curtailed. We've seen machines with washers installed improperly in manufacture.

Reverse the flow washer or remove it and check water performance. If it isn't better, there could be a water-flow restriction at the shut-off valve on the line leading to the dishwasher. Perhaps this valve is partially closed. **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.

# "How a circular saw changed my life."

Believe it or not, it's the sort of thing we hear all the time.

Somebody has a job to do that's just too tough to do by hand. Or too time consuming. Or too impossible.

Like paneling to rip. Window cutouts to

make. Shelves to trim. Studs to cut.

So he turns to one of

our circular saws for help. To our Model 4511, for instance.

A lot of tool for \$32.99\*

7 1/4 in., 1 1/4 hp, 5,800 rpm, rugged.

With ball-bearing construction for longer, smoother running. A big, wraparound base for extra support. Calibrated scales for fast, accurate depth-and-angle adjustments. Telescoping bladeguard and double insulation for maximum protection.

Of course, depending on the job, he could also pick

one of our jig saws. Or sanders. Or routers. Or planes. Or drills. But the outcome would still be the same.

The enjoyment of a job well done. The satisfaction. The sense of accomplishment.

Graduating from the basics to bigger things. From a gatepost to a game room. Or even a gazebo.

And a whole new way of living.

Which leaves us with a big responsibility. The tools we make have to be equal to the job. They have to feel right in a man's hand. And they have to hold up.

That's how it ought to be with everybody's power tools. That's how it is with ours.

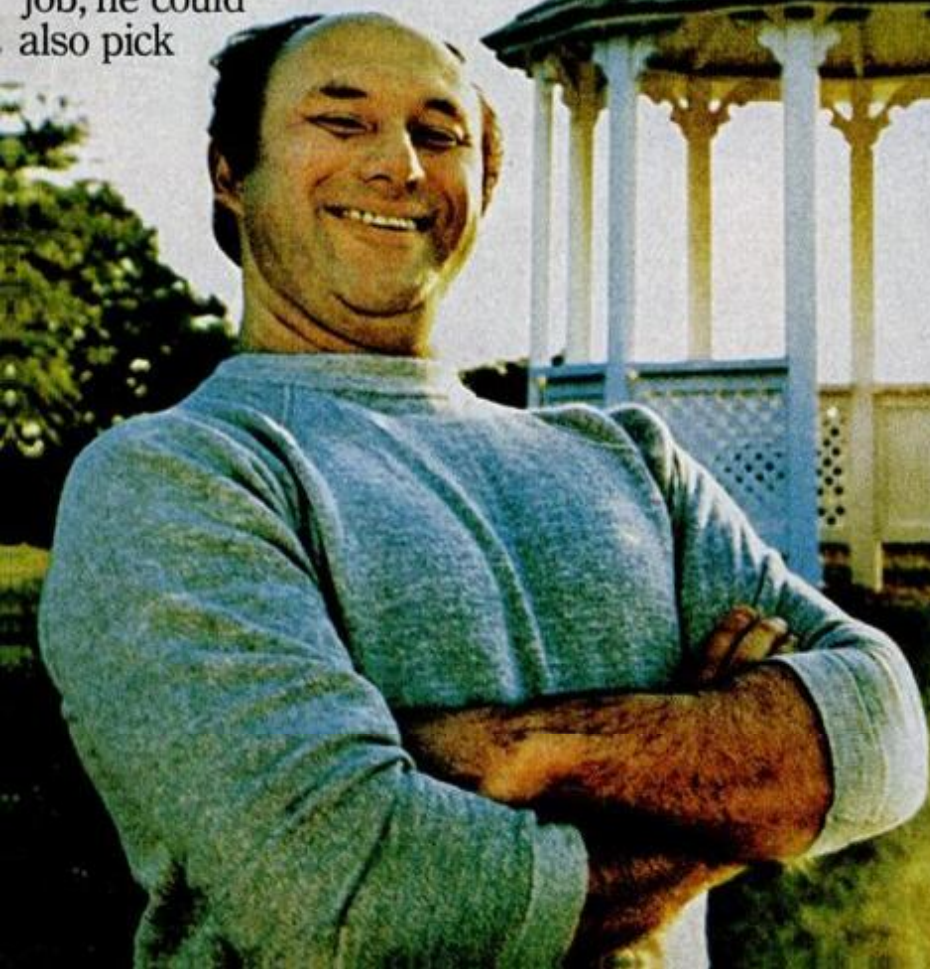
The reason is just plain good engineering. The kind that only comes with half a century of industrial experience and on-the-job performance. It goes into every Rockwell portable and stationary tool we make.

It's why they're all made tough, accurate, powerful.

When a man puts his life into something, it's the least we can do. You can depend on it.

*Rockwell.*

*It's the same name industry's been depending on for 50 years.*



**Rockwell International**

\*Manufacturer's suggested retail price.

# You're gonna love our Great

## Great little goodies. Great little



REAR WIPER/WASHER/DEFROSTER

What makes Mazda's Great Little Car great?

It's things like: A rear wiper, washer and defroster, standard on every Deluxe GLC and Sport. A choice of 4-speed, 5-speed or automatic transmission (5-speed not available on standard GLC. Sport comes with 5-speed only.) For Deluxe GLCs and Sport, a hatch you may unlatch electrically with a button below the instrument panel (or from outside, if that's handier.) And a split rear seat that allows you to fold none, one, or both seats down. For every GLC, it's things like room. Lots of it, in front and back.

It's also the fact that now, as you can see, there are four models to choose



REMOTE HATCH RELEASE



3



- 1 GLC Deluxe 5-door Hatchback
- 2 GLC Deluxe 3-door Hatchback
- 3 Standard GLC Hatchback
- 4 GLC Sport Hatchback



# Little Car. Mazda GLC.

## piston engine. Great little price.

from for 1978. (Last year, the great little Mazda success car took off like a shot. Now we happily announce more GLCs for you to love.)

The Mazda GLC is all this and much more, for not much money. Mazda's Great Little Car is a great little car. You're gonna love it.



CHOICE OF TRANSMISSIONS



SPLIT REAR SEAT



4



2



1

# mazda

\*EPA estimates based on 5-speed transmission (optional on Deluxe models, standard on Sport model). With 4-speed transmission (standard on all models except on Sport), EPA estimates are 43/34 mpg. Your mileage may vary depending on how and where you drive, your car's condition, and optional equipment. Calif. 42/33 mpg, optional 5-speed, 40/32 mpg, 4-speed.

\*\*Price for standard model shown (3). Other models higher, up to \$3849. All prices POE Seattle (slightly higher in California, and other areas). Taxes, license, freight, and optional equipment are extra.

## GLC. Now, four great little cars in all, from \$3074.\*\*

IT'S NEW  
**NOW**



**Phone/mike intercom for motorcyclists**

Tuck transducers in your ears and don helmets. Driver or passenger holds electronic package with push-to-answer switch. Conversation is possible at most speeds. About \$70. Johnson Machine Co., 3204 Street Rd., Warrington, Pa. 18976.



**Roadblock convincer**

Police in Europe and North America guarantee roadblocks with spike-studded planks or—like this one near Rome—plastic strips. Scofflaws trying to run the block wind up slithering around on rims.



**See your CB frequency**

Now keep your CB station performance on the line with a frequency counter that reads it out in LEDs when you press button. From 100 Hz to 50 MHz. \$100. Wawasee, Box 36, Syracuse, Ind. 46567.

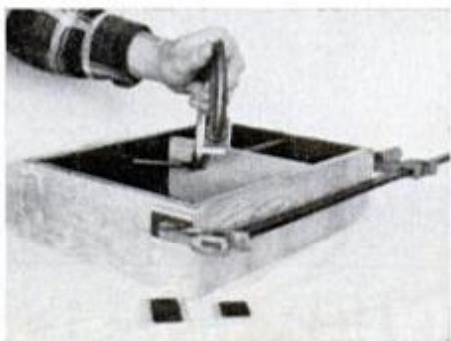
**Versatile food processor**

Chop a pound of beef or shred a cabbage in one minute. Two attachments in GE's new FP-1 food processor slice, chop, shred, grate, mix, blend and purée. About \$90 at appliance shops.



**Magnetic clamping pads**

No more holding pads on work while clamping. Magnet-backed wood pads cling to clamps. \$1.35 for four. Clampads Box 2372, Santa Maria, Calif. 93454.



**117,900 more technicians needed by 1985**

**Learn Air Conditioning, Refrigeration and Heating.**

**Learn at Home With NRI's Master Course Program In Your Spare Time**

Start a well-paid career in the field of air conditioning, refrigeration & heating with practical at-home training from NRI. The NRI program was developed with technical assistance from the York Division of the Borg-Warner Corporation and it uses bite-size texts, fine professional instruments and tools, and "hands-on" kits to make learning easy.

**Air Conditioner System comes with Course for Trouble Shooting.**

You get a Circuit Demonstrator, Control Simulator, tubing and joint-making demonstrator, leak detector, system analyzer, and a window air conditioner unit for hands-on experiments.

**Optional Resident Training at Famous York Institute**

Graduates of the Master Course may take advanced work at the world-famous York Institute Resident School at no extra charge. Working with expert instructors you will receive practical experience equal to months of on-the-job work.

**Send for your free catalog.**

Just check the card opposite. No salesman will call.

Approved for career training under GI Bill.



\*U.S. Dept. of Labor Bulletin 1824



# NRI CAN TURN YOUR CB INTEREST INTO PART-TIME INCOME OR A CAREER

## Career opportunities are opening up fast for the man trained in communications.

The field of communications is bursting out all over. In Citizens Band alone, class "D" licenses grew from 1 to over 2.6 million in 1975, and the FCC projects about 15 million U.S. CB'ers by 1979. That means a lot of service and maintenance jobs . . . and NRI can train you at home to fill one of the countless career jobs available in design, installation and maintenance of communications equipment. Start training now, the NRI way, to get your all important FCC Radiotelephone License and qualify for one of these openings.

## Learn on your own 400-channel, digitally-synthesized VHF transceiver

The NRI Complete Communications Course teaches you at home to service and adjust all types of two-way radio equipment (including CB), using the one unit that is best equipped to train you for CB, Commercial and Amateur communications: a digitally-synthesized 400-channel VHF transceiver

and AC power supply. This 2-meter transceiver gives you "Power-On" training. Then we help you get your FCC Amateur License with special instructions so that you can go on the air.

## More know-how for your dollar

The complete program includes 48 lessons, 9 special reference texts, and 10 training kits. Included are: your own electronics Discovery Lab, a new Antenna Applications Lab, an Optical Transmission System, CMOS Digital Frequency Counter, and TVOM. The course covers AM and FM Transmission Systems; Radar Principles; Marine, Aircraft, and Digital Electronics; and Mobile Communications. You must earn your first class radio-telephone FCC license or you get your money back.



## CB Specialist Course also available

NRI offers a specialized course in CB Servicing. You get 37 lessons, 8 reference texts, your own CB transceiver, AC power supply and multimeter . . . for hands-on training. Also included are 14 coaching units to make it easy to get your commercial radiotelephone FCC license, enabling you to test, install and service communications equipment.

## Widest choice of courses with Quadraphonic Audio and Color TV Servicing

NRI offers five TV-Audio servicing courses as well as career courses in Digital Computer Electronics; Marine and Aircraft Electronics; Mobile Communications, and more.

## Over a Million have enrolled with NRI

Send for the free NRI catalog and discover why more than a million people like yourself have chosen the NRI way as the right way to get ahead. Read how you learn at home from bite-size lessons, progressing at your own speed to your FCC license and then into the communications field of your choice. There's no obligation, and no salesman will call.



If card is missing, write to:

**NRI**  
NRI SCHOOLS  
McGraw-Hill Continuing  
Education Center  
3939 Wisconsin Avenue  
Washington, D.C. 20016

The Touch by Regency is the first fully synthesized, 16 channel scanner to put over 15,000 radio frequencies at the command of a fingertip.

But even with its vast range of action frequencies, The Touch never allows you to miss a call on your favorite channel.

Because The Touch lets you set up Channel 1 as priority receiver. And it samples that frequency every 1.5 seconds.

Another point: The Touch can bring you severe weather warnings. Automatically. Simply

set Channel 16 to the National Weather Service alert mode, if available in your area. The Touch will cut into any severe weather broadcast.

In other words, it can override a thrilling fire to bring you news of a frightening tomado.

What else can you do with The Touch?

You can scan for action on your 16 favorite stored frequencies by merely touching SC. Or search for the unknown by pressing SS. And let The

Touch seek out frequencies you probably never knew existed.

And when you find new action, The Touch tells you exactly what you've found in the LED display.

The Touch by Regency. No complicated programming to do. No crystals to buy. It's the new soft touch in scanning.

Your Regency dealer has the details.

**The Touch by Regency.  
The Ultimate Scanner.**



**You're never more than  
1.5 seconds away from  
your favorite frequency.**

# SCIENCE WORLDWIDE

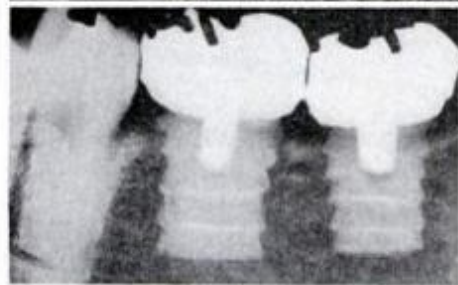
## New way to store solar energy

Collecting energy from the sun is one thing. Storing that energy in amounts large enough for commercial use is something else again. Now scientists at National University in Canberra, Australia, say they have devised a system that solves the storage problem.

They propose using solar energy to effect a heat-absorbing chemical reaction—the breaking down of ammonia into nitrogen and hydrogen. The gases would be piped to a central recovery plant where they would be recombined to release energy in the form of heat for producing electricity. They could also be stored for future energy generation or shipped to energy-hungry lands where sunshine is limited. The researchers hope that National University will be ready to build a prototype solar collecting and storage plant within five years.

## Coming: new plug-in teeth

In the not-too-distant future, dentists may replace individual teeth with ceramic jobs, according to researchers at the Battelle Memorial Institute, Columbus, Ohio. Working with baboons and rhesus monkeys,



Bone anchors tooth plug (X-ray, bottom).

the scientists have successfully implanted artificial teeth composed of a serrated ceramic root and a gold post (shown in upper photo). After the root becomes firm, a conventional crown is placed on the post.

The X-ray (bottom) shows how bone has grown around a ceramic root 18 months following implantation. "Implants have remained rigid and in full function for up to two years, with prospects for longer-



First hover flight for test aircraft. Tilttable engines pivot for horizontal flight.

term function appearing excellent," explains Battelle's Dr. Craig R. Hassler, a senior physiologist.

The objective of the research program is to develop a permanent substitute that can be used to replace a single tooth or serve as an anchor for bridgework. The implantable teeth may be ready for clinical tests by dentists in about a year. Earlier implantation methods have proved less successful because the bone did not lock in the root stem and tended to "reject" it.

## Metrics in kit form

If you've decided to join the swing to the metric system rather than fight it, you should get yourself an NBS Metric Kit. Recently updated by the National Bureau of Standards, the kit contains a copy of *What About Metric*, a consumer-oriented explanation of the system; a booklet listing references on metric information; brief history of measurement systems; color chart of the modernized metric system; wallet-sized conversion card; 15-centimeter ruler; and a metric conversion status reprint from an NBS magazine.

To get a kit, send \$2 to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Order No. SN003-003-01736-1.

## It's a copter—no, a plane

Combine the vertical flight capabilities of a helicopter with the horizontal speed of a fixed-wing plane—and what do you have? You have the XV-15, an Army-NASA experimental plane powered by two tilting props. The photo shows the XV-15

with its props in the vertical position as the plane achieves its first hover flight. Rotated 90° forward, the props permit horizontal flight. The plane is designed to provide fast point-to-point transportation.

## More in can than meets the eye

The next time you pop open a can of your favorite thirst-quencher, here's a report you might well ponder. According to U.S. Geological Survey hydrologists, it takes 66.6 quarts of water to get one 12-ounce can of beverage to the supermarket shelf. Most of that water is required by the various industries that directly or indirectly supply the can producers. Lots of water, for example, is needed for cooling in electric plants supplying the can industry with energy.

## Space Shuttle overrun

When NASA announced that 30 to 40 spots were open for Space Shuttle astronaut candidates, they were inundated by more than 8000 applications. The astronaut selection board at Johnson Space Center in Houston will pick 150 top contenders for preliminary review. Up to 40 will be chosen for two-year training, starting in 1978. **PM**





Which is the exciting new 1978 Ford Granada ESS?

**INTRODUCING THE NEW**  
**CAN YOU TELL ITS LOOKS FROM**





Check which car you think is which and compare your answers with those at the bottom of the page.

	1	2	3	4	5	6	7	8	9	10	11	12
GRANADA ESS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MERCEDES BENZ 280 SE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Which is the impressive new \$20,000 Mercedes-Benz?

**FORD GRANADA ESS.  
A \$20,000 MERCEDES-BENZ?**



**FORD GRANADA**  
FORD DIVISION

Answers: Granada ESS: 1, 4, 5, 7, 9, 12. Mercedes-Benz: 2, 3, 6, 8, 10, 11.

Материал, защищенный авторским правом

# DETROIT LISTENING POST

## New engine for Ford, Merc

Ford confirms it will have a variable-displacement engine for its cars "within the next two years." It doesn't specify which cars will get the engine. But that isn't hard to figure out. "Two years" means the cars coming in the fall of 1979. That's when the big Ford and Merc are due to get the shrink treatment, and those are the cars that will get the engine that automatically cuts down the number of working cylinders—thereby saving fuel—once the car attains a certain speed. For the full story on how this system works, see *Driving a car with 4, 5, 6, 7 or 8 cylinders* on page 106.

## Four-cylinder looms big at GM

The V6 engine, which is supposed to take over from the V8 on GM cars, could face some competition from the four-cylinder engine. GM makes no bones of the fact it expects the Eight to fade out in favor of the Six over the next five or six years, by 1982-83. GM is now looking at the cars that will come after '83. One idea the company is considering would limit the number of cars carrying V6s. The plan calls for Cadillac to go all V6 and/or diesel. The other nameplates—Buick, Chevrolet, Pontiac and Oldsmobile—would offer a V6 only in their top-of-the-line cars. All other cars would have four-cylinder engines. If the company follows this plan, something between 50 and 60 percent of all cars turned out by GM would be powered by four-cylinder engines.

GM has already started a campaign to sell car buyers the idea that a Four is a competent performer in a lightweight automobile. Three divisions—Chevrolet, Oldsmobile and Pontiac—are offering, or will offer, the "Iron Duke" L4 made by Pontiac. Buick is looking at the same engine and will likely take it on within the next year.

## Dieselizing an older car

Several guys who read my report on the Oldsmobile diesel in the July issue of PM have written to ask about installing the engine in an older car. First letter was from John H. Hanneman of Pierre, S.D. John says he buys a used Oldsmobile every other year, staying two years behind the new cars. He will

be trading his '74 Delta 88 for a '76 this fall. The car will probably need some work on it, "so my question is: Can the diesel be installed in a '76 car, where can I get the work done and what will it cost?" I passed the questions on to Paul Mutty, head diesel engineer at Olds.

Paul says sure, you can put a diesel in an older car. The Olds diesel is a modified version of GM's 350-c.i.d. V8 and the diesel doesn't take up any more space in the engine compartment than the standard engine. But changing engines is the easy part of the job. Paul says you would also have to put in some sort of electronics to warm the air before starting the diesel, find space in the engine compartment for a second battery, change from power brakes to manual (because there's no vacuum with the diesel), rework the fuel system and pad the hood of the car to hold down the noise.

Olds doesn't have any idea what all this would cost because the price would depend on the hourly rate of the mechanic making the conversion. A good mechanic will run you at least \$10 an hour, if not more. Add whatever you pay the mechanic to what you paid for the old car, plus the price of the new engine, plus the cost of add-on parts and you would be money ahead buying a new car with a factory-installed diesel.

That's the picture right now, but it's beginning to change. More and more diesels are coming on the market and the service business has begun making replacement conversions. The price is steep, but it should become more affordable.

## Cadillac going diesel, too

Speaking of the Olds diesel, GM has given Cadillac the go-ahead to offer the engine as an option after the first of the year. The car should be in showrooms by March.

## Price hikes misleading

The car companies resorted to their usually funny arithmetic to back up the claim that prices of the '78 cars are up "only" 6 percent over the '77s, as you'll discover if you shop the new jobs. On many of the new cars, equipment that used to be standard—V8 engines and automatic transmissions, for example—

has been switched to optional. You can still get the extras, but you have to pay extra. The buyer pays more money for less car. That's on top of the 6 percent price increases. This isn't a new technique. It's been going on for several years. The butcher isn't the only guy who weighs the pork chops with a thumb on the scale.

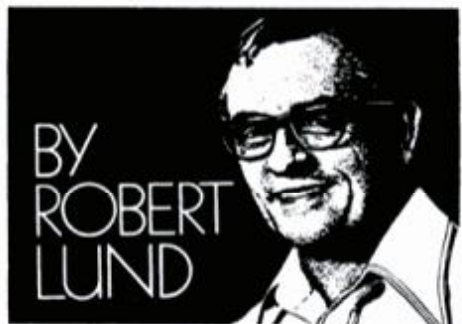
## It's only catsup, not blood

Washington says do. Detroit says can't. The script is like a classic Western movie. You know how it will end before the picture begins. The National Highway Traffic Safety Administration is now talking about requiring air bags that will protect front-seat occupants in an accident up to 50 mph. The present standard, if and when air bags are put on cars, requires protection up to 30 mph. The tougher standard is just in the talking stage, but if it gets down to serious discussion, the car companies will marshal a ton of arguments to oppose it. After the shooting and shouting are over, there will be a compromise and everybody will live happily ever after. Fade out.

I wonder if you get the same feeling I do—that both sides are cat-and-mousing each other? The government begins by asking more than it expects to get, knowing Detroit will object. And, true to the script, the carmakers say whatever the government asks is impossible to accomplish, knowing full well that they will eventually settle for something less than the original demand.

## Freebie on saving gas

The Automotive Information Council, 28333 Telegraph Rd., Southfield, Mich. 48034, will send you a list of tips on how to conserve gasoline if you send it a stamped, self-addressed envelope. **PM**





# TAKE A FREE TEST-SMOKE.

And prove to yourself  
**Sir Walter Raleigh Aromatic**  
 tastes as good as it smells.

To introduce you to the pipe tobacco that tastes as good as it smells, we're offering you a free pouch of Sir Walter Raleigh Aromatic. Fine Virginia and Burley tobaccos, blended with three fine liqueurs. For full, rich flavor as well as a pleasing aroma. Send for your free, full-size 1½-oz. pouch, and put us to the test.

**SIR WALTER  
 RALEIGH**  
*Aromatic Mixture*



NET WT. 1½ OZ.

Please send me a **FREE POUCH** of  
**SIR WALTER RALEIGH AROMATIC.**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_

Zip (required): \_\_\_\_\_

*Offer good only in U.S.A., except where prohibited, licensed or taxed. Offer expires February 15, 1978. One request per household, please—and use only this request blank. Allow up to 6 weeks for delivery.*

**MAIL TO: Aromatic Gift Pouch  
 Sir Walter Raleigh**

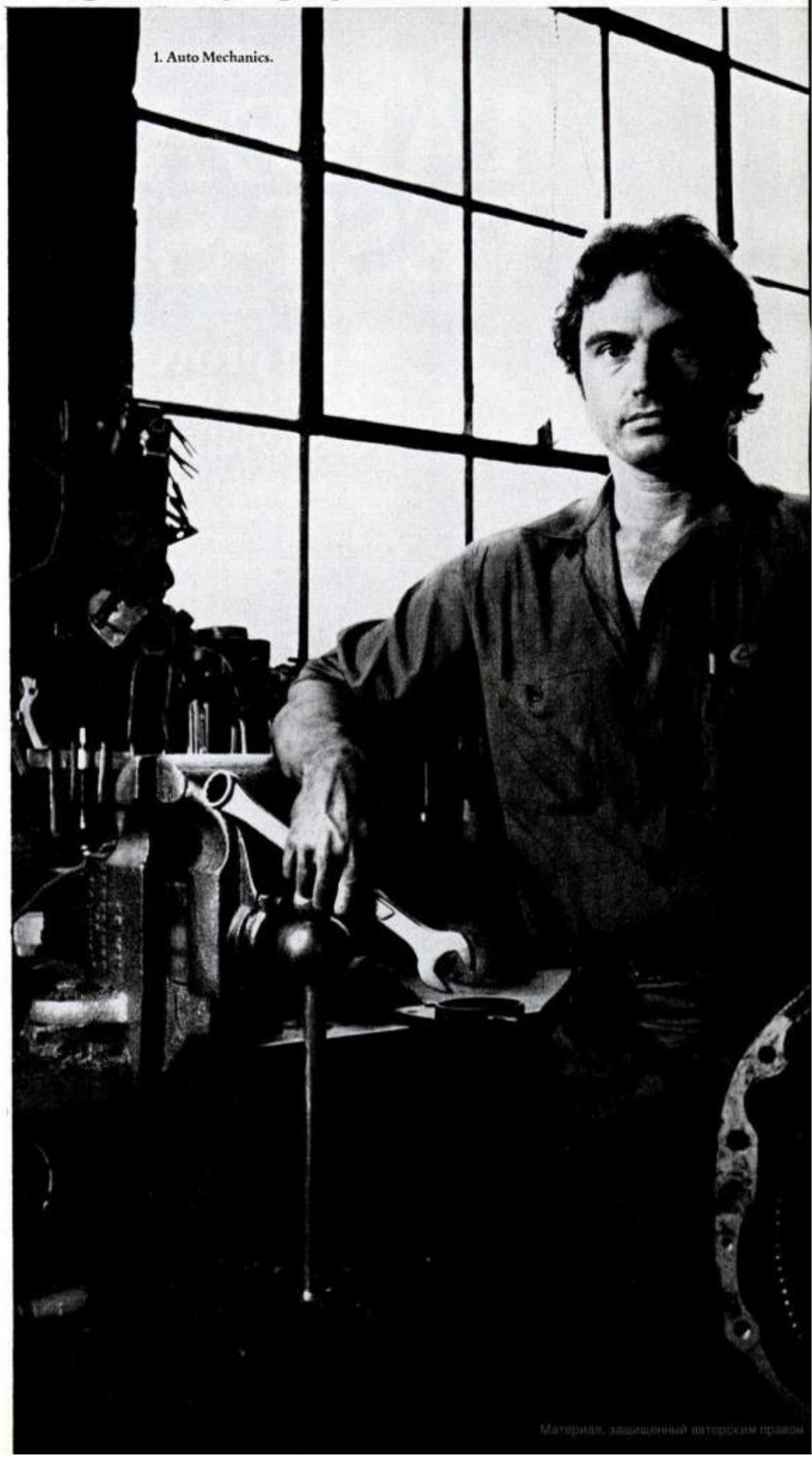
**P.O. Box 9025, St. Paul, MN 55190**

MG-69

Read what the U.S. Dept. of Labor\* says about these growing career fields:

# SIX GOOD JOBS FOR

1. Auto Mechanics.



**1. Auto Mechanics.** For entry jobs, employers look for young persons with mechanical aptitude, and knowledge of automobiles. Generally, a driver's license is required. Courses in automobile repair offered by many high schools, vocational schools, and private trade schools are helpful. Employment is expected to increase because expansion of the driving age population, and consumer purchasing power will increase the number of automobiles.

**2. Accountants.** Demand for skilled accountants will rise as managers rely more on accounting information to make business decisions. Persons planning a career in accounting should have an aptitude for mathematics. Employers seek applicants who can handle responsibility and work with little supervision. Employment is expected to increase about as fast as the average for all occupations through the mid-1980's.

**3. Engineering and Science Technicians.** Industrial expansion and increasing complexity of modern technology underlie the anticipated increase in demand for technicians. Those interested in a career as a technician should have an aptitude for mathematics and science, and enjoy technical work. An ability to do detailed work with a high degree of accuracy is necessary; for design work, creative talent also is desirable. Employment opportunities are expected to be favorable through the mid-1980's.

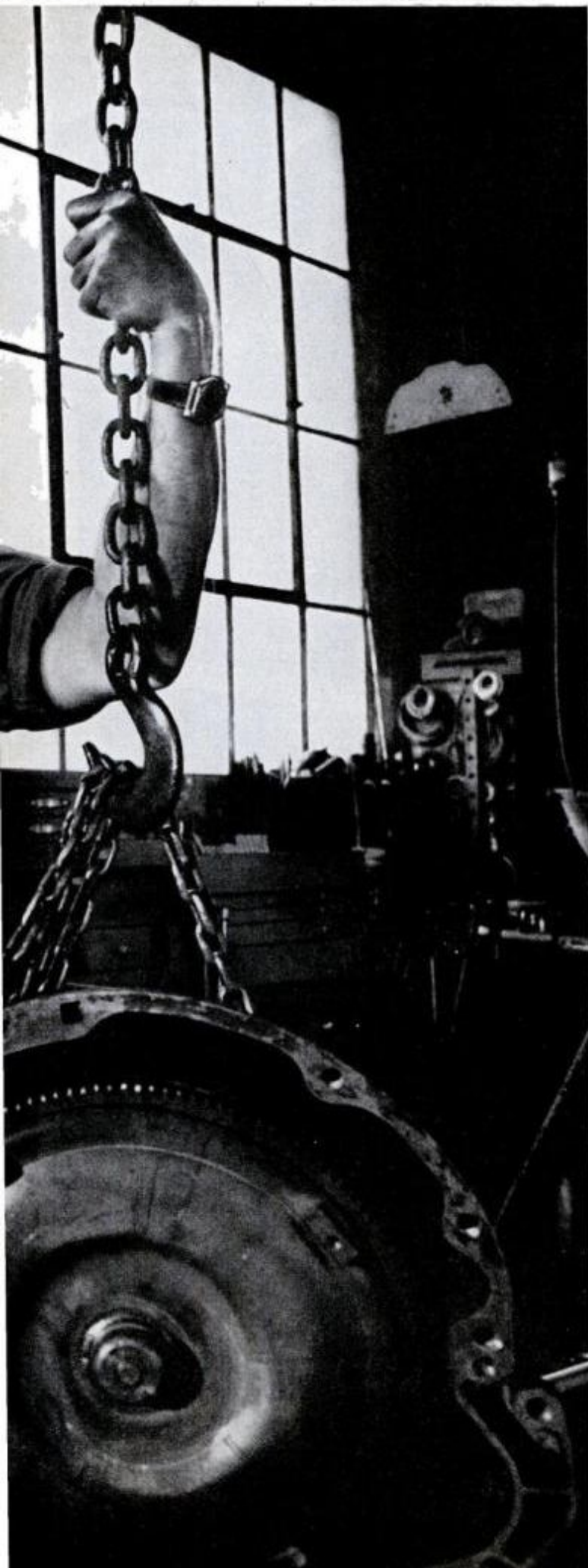
**4. Air-Conditioning, Refrigeration, and Heating Mechanics.** Increases in household formations and rising personal incomes should result in a very rapid increase in the number of air conditioned homes. Air-conditioning in schools, factories, and other buildings also is expected to increase. Employers prefer high school graduates who have had courses in mathematics, physics, electronics and blue-print reading. Employment is expected to increase faster than the average for all occupations through the mid-1980's.

**5. Draftsmen.** Those planning careers in drafting should: be able to do detailed work requiring a high degree of accuracy; have good eyesight and eye-hand coordination because most of their work is done at the drawing board; be able to function as part of a team since they work directly with engineers, architects, and skilled workers; and be able to do free-hand drawings of three dimensional objects. Employment of drafters is expected to rise rapidly as a result of the increasingly complex design problems of modern products and processes.

**6. Electricians. (Construction and Maintenance)** Most training authorities recommend the completion of a 4-year apprenticeship program as the best way to learn the trade. Many helpers gain additional knowledge through trade school or correspondence courses. Although physical strength is not essential, manual dexterity, agility, and good health are. Employment of construction electricians and maintenance electricians is expected to increase faster than the average for all occupations through the mid-1980's. This growth will stem from increased use of electrical and electronic equipment by industry.

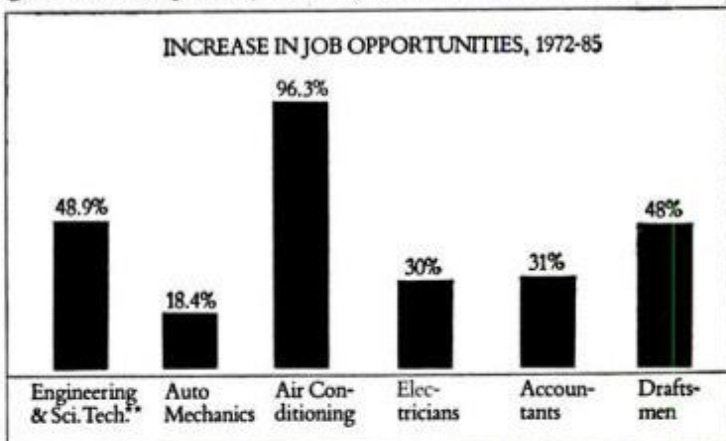
\*Bureau of Labor Statistics, Occupational Outlook Handbook, 1976-77 edition.

# THE 70's & 80's



If you're looking for a new career, you should keep in mind that some job fields will grow faster than others over the next ten years. (Some, such as barbers, railroad workers, meat-cutters, etc., will actually decline.)

Why do we tell you this? We're ICS—International Correspondence Schools—and we offer career training in fields the government experts say are likely to increase over the next decade.



Source: U.S. Dept. of Labor, Bureau of Labor Statistics, *Occupational Manpower and Training Needs*, Revised 1974.  
 \*\*This category includes electronics and a variety of engineering fields available through ICS, as well as some technical fields which ICS does not offer.

Of course, we can't guarantee you a job—no school can do that. But we can give you the first-rate training you need, especially if you're interested in one of the growing career fields where ICS concentrates its training.

You could even earn a degree without going to college. The ICS Center for Degree Studies is authorized by the Pennsylvania Department of Education to grant the Associate in Specialized Business degree in Accounting and Business Management, and the Associate in Specialized Technology degree in Civil, Mechanical, Electrical, and Chemical Engineering Technologies.

These degree programs are not mere stepping-stones to higher education nor are they primarily intended for transfer toward more advanced degrees. They are practical, career-oriented programs designed to help you reach your objectives without further academic training.

As an ICS student, you study at home, at your own pace. But you're never alone. If you ever want to talk to an instructor, you can call ICS from anywhere in the continental United States or Canada, using our toll-free Dial-a-Question® service.

Since 1890, millions of men and women around the world have turned to ICS for career training. More than 70 of America's largest 100 corporations (including Bethlehem Steel, 3M, Union Carbide, Weyerhaeuser, International Paper) use ICS training for their own employees.

No one can promise success, but if you *want* more—more money, more security, more day-to-day satisfaction and more future—our free Career Booklet and free Demonstration Lesson can help you get started in the right direction. Just check the box next to the field that interests you most and mail the card or coupon today. There's no obligation.

**ICS** International Correspondence Schools, Scranton, Pa. 18515

Please mail me the Free Career Booklet and Free Demonstration Lesson for the field I have checked below. I understand I am under no obligation.

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|---|---|--|
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| <input type="checkbox"/> Accounting               | <input type="checkbox"/> Business Management          |  |
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| <input type="checkbox"/> Electronics Technician   | <input type="checkbox"/> Interior Decorating          |  |
| <input type="checkbox"/> TV Service & Repair      | <input type="checkbox"/> Income Tax                   |  |
| <input type="checkbox"/> Surveying & Mapping      | <input type="checkbox"/> Motel/Restaurant Management  |  |
| <input type="checkbox"/> Construction Electrician | <input type="checkbox"/> Mechanical Engineering       |  |
| <input type="checkbox"/> Diesel Mechanic          | <input type="checkbox"/> Appliance Servicing & Repair |  |

Name \_\_\_\_\_ Age \_\_\_\_\_

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**Veterans:** Taken for career purposes, ICS Programs qualify for VA Benefits.

XA102K

Canadian residents use Scranton, Pa. address for service from ICS Canadian, Ltd.  
 In Hawaii: 931 University Ave., Honolulu, Hawaii 96814.

The Kodak Ektasound movie camera makes it so easy to take sound movies. Just drop in a cartridge of film, such as Kodak Ektachrome 160 sound movie film, and push the shutter release. It's that simple.

And the microphone? It's right on the handle! So, you're free to move around and shoot wherever you want without worrying about cords or microphone placement.

You don't need movie lights, either. Indoors or outdoors, in room light or sunlight, the Kodak Ektasound movie camera takes colorful sound movies without movie lights.

There's also an automatic exposure control that adjusts the amount of light reaching the film.

## Kodak's unique on-camera microphone. Sound made simple.

And, there's a sound monitor so you can hear what the camera is hearing—both before and during use.

Ask your photo dealer for a demonstration. There are several models to choose from including the new model 250 with power zoom and the new model 260 with power zoom and coupled rangefinder.

**Kodak Ektasound movie cameras**



# IMPORTS & MOTORSPORTS

## The three-wheel way to go

There's nothing new about three-wheel vehicles (as you'll see if you turn to page 102 for our feature on an extraordinary collection of these machines). The concept shown here, however, is new, and it captures the imagination of all who see it. H-M-Vehicles in Minnesota would like

to produce it because it would be an 80-mpg answer to the transportation needs of many people. The fiberglass-bodied "Free-Way" that company president Dave Edmonson visualizes would use a single-cylinder, four-cycle, OH-160 Tecumseh engine that would give the car performance enough to hit 55 mph (we'll call it a car though three-wheelers are registered as motorcycles in most places). Edmonson uses a prototype Free-Way to tool around in—the one he ran to victory in an SAE economy race earlier this year. Production is projected for mid-1978 with a sales price of \$2500. That's a lot when you consider that for \$500 more you can buy a four-wheel Subaru, Datsun, Honda or the like. What this country needs is a good \$1500 alternative to mopeds and motorcycles on the one hand, and Chevettes on the other.

## The conversion game

The guys who customize, personalize and unhomogenize look-alike production vehicles are flourishing. The more our wheels are standardized, the bigger the market for the wielders of imagination who can give a tricky twist to the commonplace. The new wrinkle for Datsun X cars is a roadster setup. Griffith Custom Coach in Fort Lauderdale, Fla., is working with participating Datsun dealers in the conversion of stock Zs to ragtops. Add \$3200 to the sticker for a Z and Griffith will hand-tailor the new top to the car.



Griffith Z Roadster is ragtop Datsun Z.



Three-wheel, mid-engine "Free-Way" is the idea of H-M-Vehicles for an 80-mpg single-seater.

The Griffith Z Roadster sales contact is Boulton Motors, 14120 N.W. Seventh Ave., Miami, Fla. 33168.

If pickups are more your style and Mazda's your marque, you may be ripe for a step-side conversion. California Step Side Manufacturing (441 Nelo St., Santa Clara, Calif. 95050) sells a slick switch on Mazda's rotary pickup: flared fiberglass fenders and 72-inch bed. The \$600 kit (which lets you legally mount larger rear wheel/tire combinations) includes a steel bed with



Rotary Step Side is Mazda in make-up.

integrally welded corrugated floor, steel tailgate, latches, steps, mounting channels, all hardware and instructions. Fancy options available are chrome steps, tonneau, lamps, bumpers and so on. California Step Side did the conversion above with Ansen Wheel Corp of Long Beach as a show car for Ansen's custom-wheel line.

## Beetle bites the dust

Mine was a '62. My first new car. White. Sunroof. Like so many of them, it got a name: Rufus (corruption of roofless). The most produced automobile in history. Almost 20 million. Five million sold to American pennypinchers. There's no Beetle in Volkswagen's 1978 model line-up—just the convertible. One last chance for a piece of history.

## The Mileage Game

It's not as much fun as slot-car racing, but it's good basic training for the next generation of drivers—who will really know how to stretch a gas-rationing stamp. Two to four players roll the dice for number of spaces and move their miniature cars over a 2000-mile course on the game board. The winner uses the least gas to get home. Hazards are "need engine tune-up, flat tire" and so on. An Amoco Oil Co. idea, it's \$8. The game is distributed nationally to department, toy and chain stores by Cadaco, 310 West Polk St., Chicago, Ill. 60607.



Feather-footed "driver" wins mpg game.

## Catalog for the commode?

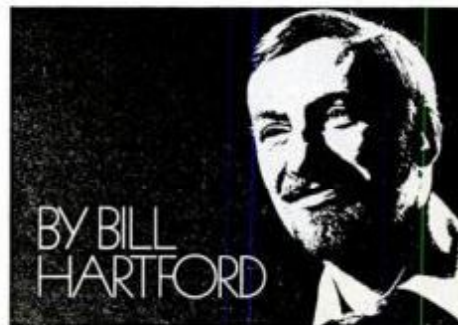
Only you know where you do your best plotting and planning. That's where you should keep handy this '77½ catalog from Auto World. I lost track of how much Oscar Kovaleski's motorsports-by-mail business has grown and was surprised to see this 196-pager. He's got all the good basic stuff up to the esoteric pieces like air-correction jets



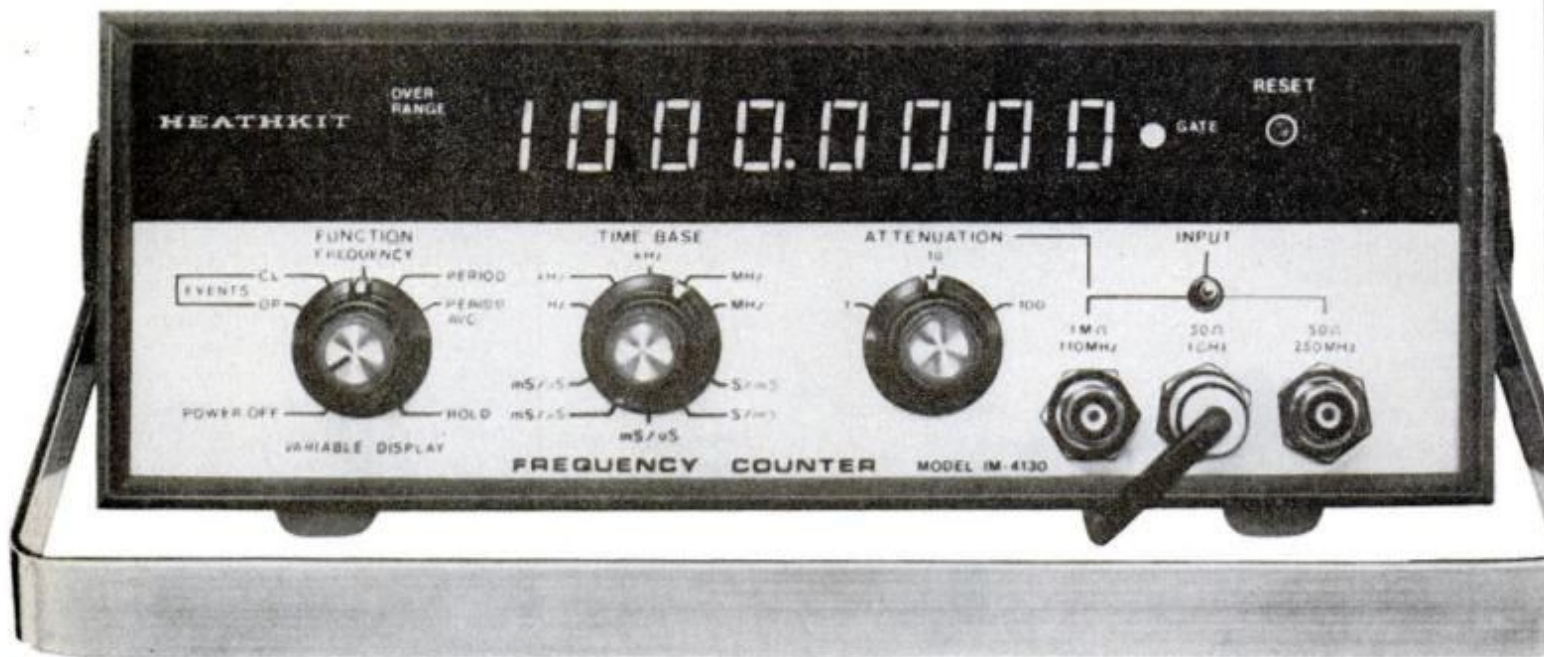
Auto World book. 18508.

for those lovely lungs from Edouardo Weber's Fabrica Italiana Carburatori. The book's a buck. Auto World, Dept. 80 PM, 701 North Keyser Ave., Scranton, Pa.

PM



BY BILL HARTFORD



One of the best frequency counters is the Heath IM-4130 (above).

# New CB add-on shows your exact frequency

by J. L. Genevickz

**Y**ou don't have to haul your CB to a radio repair shop anymore to pay a technician to use his \$2000 tester to check whether your rig is putting out signal correctly at the center of each channel.

Prices have tumbled on superaccurate digital frequency counters so you can buy your own. Just a few years ago they were in the thousands. Now they start well under \$100.

## Seven-segment readout

Here's what you get for the money:

- An extremely accurate reading of the frequency at which you are transmitting. For instance, if you are using CB Channel 1, the red LEDs in your counter will read 26.965 MHz. The frequency of the popular trucker's Channel 19 is 27.185 MHz.
- An indication that your radio is putting out power. These new coun-

ters work by sampling a tiny bit of the actual energy radiated from your transmitter.

■ An excellent shop tool if you plan to make extra income on the side repairing CBs. Get a second-class FCC ticket and you'll find that a frequency counter will be the first test gear you'll need.

Lowest priced at the moment is the \$90 kit from Digitrex, 4412 Fernlee, Royal Oak, Mich. 48073.

Popular is the wired-and-tested CT-40, \$99, from Telco, 44 Sea Cliff Ave., Glen Cove, N.Y. 11542.

Good for a lifetime is the IM-4130, \$529, from Heath Co., Benton Harbor, Mich. 49022. It will test any kind of radio or TV.

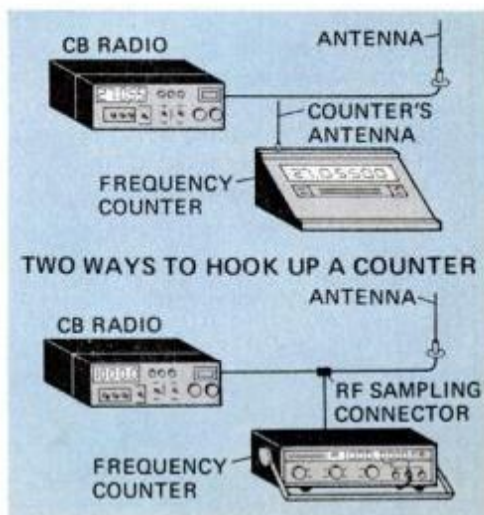
To use one of these CB add-ons, hold it near your transmitter, coax or antenna. It will pick up signals from the air and flash the frequency. Or use a special coupler to hook it into the coax line. **PM**



There are no wires to cut, no connections to make with the Telco CT-40 counter.



Model 1827, \$120 from B&K-Precision, 6460 West Cortland, Chicago, Ill. 60635.





# The Buick Wagons. Built in the belief that if all you wanted was cargo space, you'd buy a truck.

A slight overstatement, true. But all you ask of a wagon is mere hauling ability, perhaps you're not asking enough.

In which case, let us direct your attention to the new Buick Century Wagon or its slightly larger cousin, the Buick Estate Wagon.

Can they haul? The answer is a resounding yes. With nearly 72 cubic feet of cargo space in the Century, and 87 in the Estate Wagon.

But that isn't what makes a Buick Wagon special. It isn't that a Buick can haul as much as a truck. But rather the serene way it goes about its chores. That's the difference.

The ride is smooth and unruffled. Buick's computer-tuned suspension helps out greatly here.)

And how comfortable it is. Upholstery-wise, there's a choice of available fabrics that ranges from

rugged vinyl to supple velour in the Estate Wagon. And the decor is elegant enough to convince you you're riding in a fine automobile.

In motion the Century Wagon is a product of the times—trimmer, lighter on its feet, decidedly more nimble to handle in traffic than last year's counterpart. And because of that, less power is required to move it, too. In fact, the Century is powered by a new, even-firing, 231-cubic-inch, (3.8 litre), V-6, which in turn does marvelous things with a gallon of gas.

According to EPA estimates, a Century Wagon with standard 231-cubic-inch, (3.8 litre), V-6 and automatic transmission achieved 27 mpg in the highway test, and 19 mpg in the city test, for a combined figure of 22 mpg. (California estimates are lower.) Your mileage may vary depending on the condition of your car,

its equipment, and your driving habits.

Incidentally, the V-6 isn't the only powerplant that's available in the Century, either. In fact, all Buick wagons are available with a selection of GM-built engines produced by various divisions. See your dealer for details.

And while you're there, be sure to test-drive the Buick Wagon of your choice.

There is a difference in wagons, believe us.



**BUICK**  
**A little science.**  
**A little magic.**

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# CAR CLINIC

## SOLUTIONS FOR MECHANICAL HEADACHES

BY MORT SCHULTZ



### Cadillac alert

Recently the idler arm, together with the support bracket, mounting screws and a portion of the frame side rail of my 1972 Cadillac broke loose and dragged the pavement. Fortunately, the incident occurred at practically no speed, and I avoided a serious accident.

The interesting and frightening thing is that apparently the idler arm joint at the bracket had been frozen for some time, but free movement was maintained because the frame section had sheared loose. Thus, "normal" steering was possible. Probably, had my car ever received a severe road shock under high-speed conditions, this assembly would have broken loose before.

The car has been driven minimum mileage for its age (40,000) and has had regular front-end alignments and steering inspections—most notably only eight days prior to the incident. No one discovered the weak area because that portion of the frame which can shear is hidden from view by the idler-arm bracket.

I am writing this letter with the hope that you will print it as an alert to the Car Clinic audience.—Bob Wilson, Chanute, Kans.

Here's your letter, Bob, and also our thanks for what could be a life-saving tip.

### Galley slave

I have an oil leak problem with my 1976 Buick Century V6 that the dealer has tried doggedly, but unsuccessfully, to repair. He's stumped, so we're turning to you as our last resort.

The car, which has just under 12,000 miles, drips oil from the bell housing at the rear of the engine. The dealer replaced the rear seal. The second time he replaced the rear seal using an epoxy. The third time he replaced the rear seal and oil pan gasket. What do you think?—Tipton McCawley, Wheaton, Ill.

I think you're looking in the

wrong place—your trouble doesn't lie with the rear seal. Where then?

Tell your dealer to look at the camshaft galley plug, right above the rear main. If the plug is allowing oil to drip, oil will run down the rear main area, giving the impression of a bad seal.

The dealer should pull the transmission and flywheel, and seal the camshaft galley plug.

### Cops and robbers

When my 1976 Chevrolet Camaro's automatic transmission is in neutral, the six-cylinder engine idles beautifully. However, with the transmission in gear, the engine vibrates and idles very fast. I have to shift to neutral to have it idle normally.

I'd like to know if anything can be done to stop the problem. The dealer, who has tried seven times to clear up the condition, now tells me all six-cylinders are like this.—M. Coppola, Milford, Conn.

The dealer is copping out, Mr. Coppola. If all six-cylinders were like this, I would have sold the two I own long before now. I believe your unstable six-cylinder engine

can be made to run as smoothly as mine by:

1. Resetting the carburetor to specification. I have a feeling your dealer tried to clear up a vibration problem by stepping up the idle. It won't work.

2. Looking for a vacuum leak—the main cause of an erratic-running GM six-cylinder engine.

If your dealer tries again and fails, take the car to another GM dealer. Maybe the new one will have had more experience with the Six.

### Aloha, you all

I have a 1976 Datsun F-10 station wagon, equipped with front-wheel drive. There is a decided looseness in the front end. Every time the car hits a bump I hear a loud clunk and feel vibration in the wheel. The looseness seems to be in the steering column. Also, on takeoff there is a severe vibration when I disengage the clutch, but only from a dead stop.

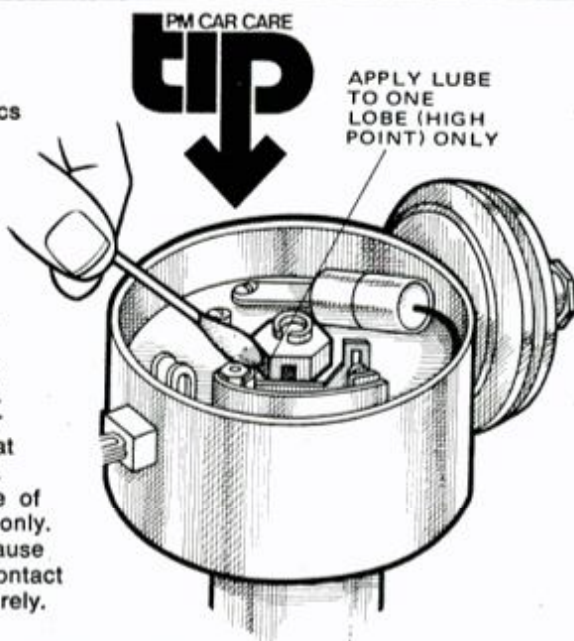
The dealer has had the car for a total of nearly two months on separate occasions, but no change has been noticed. He claims to have called in a factory representative. I am a front end mechanic, but have had no experience with front-wheel drive so hesitate to tackle it myself. Can you give me some direction on this?—Donald B. Cripe, Mililani Town, Hawaii.

Don't be too hard on the dealer. Trying to trace this kind of a problem in a front-wheel-drive vehicle is a very tough job because the weak area can be anywhere in the power or drive train and be telegraphing itself up through the steering. It could be in the engine,

(Please turn to page 40)

### Lube lobe

A little part meticulous mechanics often ignore during an engine tune-up is the cam in a non-electronic ignition distributor. Failure to lubricate it will lead to excessive wear that causes the ignition timing setting to change greatly over a few thousand miles. Lack of lube will also increase the possibility of distributor damage that needs an overhaul to repair. To lubricate cam, use distributor cam lube—no other—available at auto parts and accessory stores. Apply one drop about the size of the head of a match to one lobe only. Varying the instructions could cause the lube to melt and splash on contact points so that they burn prematurely.





# TASTE THE GOOD TIMES. RALEIGH



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



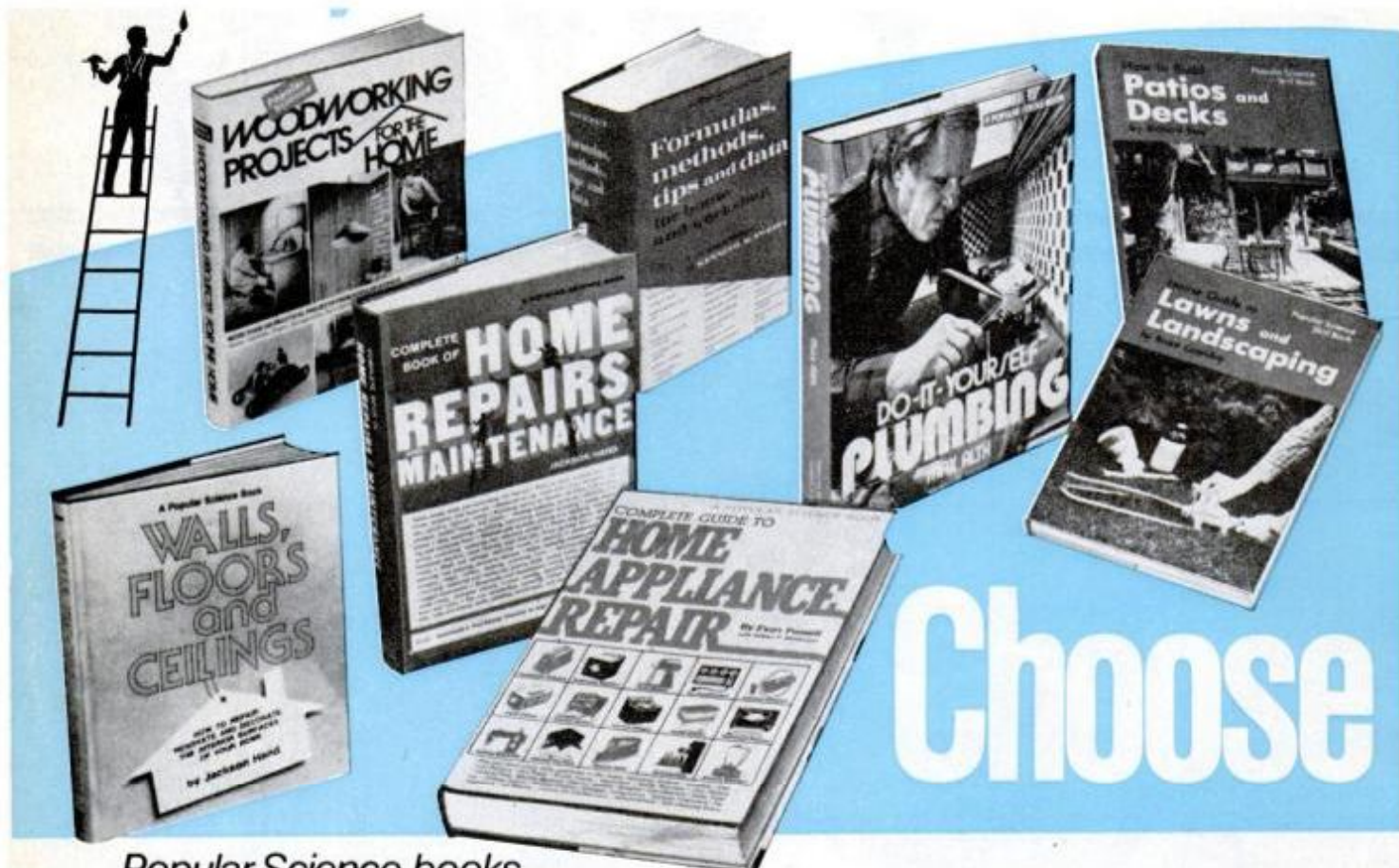
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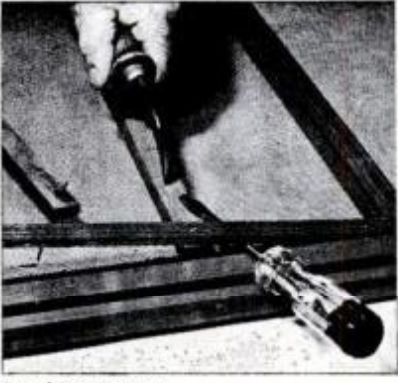


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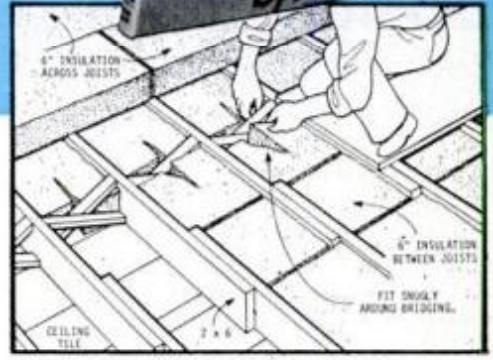
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Repairing screens.



When insulating unfinished attic without a floor, cut ends of blankets to fit snugly around bridging between joists.

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# CAN YOU OUTSMART OUR COMPUTER?

Don't be too sure. The computer built into Parker Brothers' new 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 new electronic board game from Parker Brothers. It's a game with a mind of its own.



© 1977 Parker Brothers Division of General Mills Fun Group Inc., Salem, Mass. 01970.



## CAR CLINIC

(Continued from page 34)

transmission, steering or suspension as well as in the front-drive unit. Fixing is easy—finding is tough.

But I'll tell you one place I'd start looking—the two constant-velocity (CV) joints. Either one could have a tight spot in it that's binding and then letting loose with a "jolt." One joint is toward the transmission. The other one is near the end of the strut. Pull both and test them on a bench. Replace the one that doesn't move smoothly.

If this doesn't pan out, you may want to get hold of the head of technical service at the Datsun distributorship in Hawaii. That would be Datsun of Hawaii, 711 Kapiolani Blvd., Honolulu 96813.

## Antimilk recipe

*I've noticed that the vinyl wood grain on the sides of station wagons discolors in time. Most often it takes on a white milky appearance. What can I do to this simulated wood grain on my brand-new wagon to prevent it from turning milky in a few years?*  
—J. Macher, Cranford, N.J.

We've discussed this problem in *Clinic* from a different aspect in the

## Bearing down

Truthfully, now—how long has it been since the front wheel bearings in your car were checked? Failure to lubricate bearings can cause these parts to pit or break, which will lead to erratic steering and excessive tire wear. The best place to begin is with the recommendations of the carmaker. Determine (1) if the manufacturer recommends bearing lubrication and, if so, (2) how often? When recommended, bearings should be removed from wheels, inspected and replaced if damaged, repacked with grease, reinstalled, adjusted. The procedure, simple for a Saturday mechanic, may save a car owner much grief.



past—specifically, what can be done to restore panels once they turn milky (nothing). Concerning what can be done before they turn milky—not much. All you can do is keep them washed and waxed. That, plus a little hope, may work.

## Don't draw, pardner

*I've never encountered the problem I've been having. The other day I went to set the timing on my 1972 Ford Galaxie 500 engine. After loosening the hold-down bolt, I tried*

*turning the distributor, but could not budge it. It feels like it's frozen tight. Please advise what's the best way to get it free.*—J.R. Thomas, LaMarque, Tex.

You're right. It's an oddball. I've never seen a distributor that froze itself in the engine. However, I have seen Saturday mechanics who think they have loosened hold-down bolts, when they really didn't.

Now, hold on, J.R. I'm not accusing any man from Texas of half-baked work. I'm saying that you may, in-

deed, have loosened the bolt completely, but the clamp, unbeknownst to you, may be stuck fast. So the distributor sticks fast.

Take off the bolt and clamp and see if you can't turn the distributor. If not, the distributor should come out of the engine and the shaft should be polished down, but I don't think it will come to this.

### Grand plan

*On the way home after taking delivery of my new 1976 Pontiac Grand Prix with 400-cu.-in. engine I noticed that the oil pressure was only 20 to 25 p.s.i. at 55 mph. The '72 Grand Prix I had just traded had a pressure of 55 to 60 p.s.i. I returned the new car, and returned it and returned it. The dealer checked the sending unit, installed a new gauge, installed a new oil pump and finally dropped the pan, pulled the caps off the rods and mains and plasti-gauged the bearings.*

*Verdict: "everything normal." But I still have low oil pressure and now with 13,000 miles on the vehicle, the valve lifters are making noise. Does this sound like normal oil pressure to you?—John Froese, Belleville, Ill.*

No—assuming that your dash gauge is correct. A pressure of 35 to

45 p.s.i. at 55 mph is more like it. Your dealer should follow a wiser procedure to find the problem than the helter-skelter method he's apparently used. That procedure is this:

1. Get a known-to-be-accurate gauge in the line and find out what the actual pressure is. Don't rely on a dash gauge.

2. If the pressure is low, gauge the entire oil circuit, including main bearings, cam bearings, rods. A methodical oil-pressure check helps the competent mechanic find out exactly where a leak exists. Once pinpointed, the weak area can be fixed.

### A matter of direction

*My 1970 Pontiac Catalina hesitates and runs rough only when I shift into Reverse, which is a lot different from the trouble people I've been reading about in Car Clinic have with forward hesitation. Do you have an answer for me?—Ed Wohmuth, Buffalo Grove, Ill.*

Sure do. Look for a vacuum hose leak, especially the hose from the engine to vacuum modulator on the transmission. Don't forget to examine T-fittings also. I bet a loose or damaged fitting or hose is the cause of your Reverse-only problem.

## SERVICE TIPS

■ Chrysler Corp. has recently issued a series of service bulletins to help improve the "drivability" of its 1977 models, primarily. The object, I guess (not stated as such), is to relieve surging and hesitation by rectifying problems with emissions controls. The bulletins are as follows:

1. No. 25-05-77 (2/21/77)—225-c.i.d. engine and single-barrel carburetor (federal and Canada). Applies also to 1975-76 models.

2. No. 25-06-77 (4/4/77)—225-c.i.d. engine and single-barrel carburetor and manual transmission only.

3. No. 25-07-77 (5/9/77)—318-c.i.d. engine and N-95 California emission-control system.

4. No. 25-08-77 (5/9/77)—318-c.i.d. engine and federal emission-control system.

5. No. 25-09-77 (5/16/77)—225-c.i.d. engine and Carter two-barrel carburetor (federal emission-control system).

6. No. 25-11-77 (5/31/77)—225-c.i.d. engine and Holley one-barrel carburetor (federal, high-altitude and California emission-control system). **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.

Acid indigestion  
with gas?

Get more  
complete  
relief.

Get the Di-Gel Difference.

Plain Antacid

Di-Gel



These identical mixtures of laboratory acid and gas represent the misery of acid indigestion complicated by gas. A plain antacid is added to one, Di-Gel to the other.



Di-Gel quickly neutralizes the acid and breaks up the gas. The plain antacid is not made to relieve this problem. It works only on the acid, while Di-Gel relieves both. Read and follow label directions.



Available in mint or lemon orange.

Get fast relief.  
Get the Di-Gel<sup>®</sup>  
Difference.

# ALL OUTDOORS

## New for fish (and fishermen)

Fish that could have attended the recent American Fishing Tackle Manufacturers' Assn. annual show might have found they have more to worry about. Not too much, though. There still are millions more fish than fishermen, and smart anglers today help keep it that way by releasing fish they won't be eating. But equipment makers insist their new gadgets will make catching fish easier. Now if the fish would only listen.

■ Take lures with a rattle built inside. Some are claimed to play a tom-tom tune no lunker could resist. Experiments show they sometimes bring in a big catch—other days they spook every fish away.

■ Expensive graphite rods are becoming a new tackle trend. Their sensitivity can pass along line tremors that hint a fish may be snacking on the bait. Their lighter weight and flexibility can make a few hours of rapid casting less like work. Do-it-yourself rod builders can now get graphite blanks from quality sources such as Fenwick in Westminster, Calif.

■ Often, it's found, a fish will mouth a lure, decide there could be a hook inside and promptly spit it out before the angler knows what's happened. But many fish already have tiny hooks inside their mouths that help keep a minnow from sliding out. Make a lure with micro-loop fastener fabric on it, and if the fish inhales it he may have a hard time releasing it before the fisherman can strike. The lures are now on the market and the idea sounds good. We'll see.

■ Are fish getting more fussy in selecting various colors, sizes and weights of lures? Probably not, but fishermen are. Dick Kotis, president of the Tackle Manufacturers Assn. and of Fred Arbogast Co., maker of the noted Jitterbugs, Mud-Bugs and Hula Poppers, reports a trend toward sensible basic lures. Fishermen are choosing more natural ones—unlike the rainbow selections of a year or so ago.

■ The swing toward small, light, sporty reels seems here to stay as the country's 60 million fishermen get more sophisticated. Skirted spools that don't catch and foul the line, reel bearings that can stand the wear and strain of long usage in damp atmosphere, and rod guides

of polished metals, plastics and ceramics to lessen line wear all add up to a new quality that anglers are finding to be well worth the cost, Kotis notes.

■ Added gadgets to tempt anglers: floating fillet knives; electronic depth and fish finders that are claimed to be completely waterproof by at least three makers; an Ernco Way-King landing net with a scale built into the handle so you can tell if you have a keeper (up to 18 pounds) as you lift the fish from the water. Hollow rods, like models from Stillfish and True Flite, run the line up inside and out the tip to avoid tangling. Telescopic rods for easy carrying are more popular; Trimarc has a 33-inch Concealed Rod that extends to 22 feet. You can sit on the bank and nearly reach the middle of the canal.

■ And what one fishing aid would you miss most if you were caught in an angler's Mecca without it? Recently Dick Kotis was one of the first U.S. fishermen to get into Cuba in years. In a landlocked lake he found the fishing extraordinary, even in the middle of the rainy season, but wished he'd had an electric trolling motor to ease into those shoreline holes where the big bass were. Plus bug spray.

## Snowmobile meccas

Fly-in resorts for skiers have become part of the winter scene. Now comes a similar plan for snowmobilers. Call ahead to check on snow conditions, contact your travel agent or Universal Travel in St. Paul, Minn., and you can book a week or weekend including round-trip flight, rental car and snowmobile and cold-weather clothes, plus all the social action that skiers enjoy.

Your rental snowmobile is likely to be a Ski-Doo since Warren Daoust, head of the Bombardier Div. distributing the machines, has been the sparkplug behind the plan he calls Winter Oasis. Four areas—Brainerd, Minn.; Eagle River-Rhineland, Wis.; Traverse City-Cadillac, Mich., and West Yellowstone, Mont.—were selected to test the idea, and first reports are excellent. Fly or drive to Lost Pines Lodge, Harrietta, Mich., for example, and you find 200 miles of snowmobile trails waiting in the nearby Manistee National Forest, plus

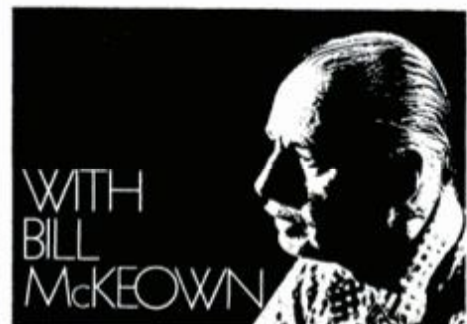
downhill and cross-country skiing facilities and all those indoor *après-snow* activities that make a little frostbite worthwhile. Winter Oasis developments are underway in other snow-belt regions, and the new \$1 booklet, *Great American Snowplaces*, available from Bombardier, Inc., Box 6106, Duluth, Minn. 55806, lists over 500 U.S. and Canadian winter-resort spots. With a good snowfall this year, snowmobiling may live up to its claim that only skiing and tennis top it as a fast-growing sport.

## Off-season homework

For outdoorsmen kept indoors by the weather, it's not too soon to plan now if you've always wanted to try a long RV trip like the drive to Alaska. A definitive guide is *The Milepost*, \$5.95 plus 75 cents postage from Alaska Northwest Publishing, 130 Second Ave. S., Edmonds, Wash. 98020. Ordering its free book catalog first is a good idea since you may want a number of publications listed. At tackle shops is the excellent new 3M guide, *Scientific Anglers Fly Fishing Handbook*, at \$2. And an impressive Christmas gift would be the new *Nautical Quarterly*. It's \$12 from Nautical Quarterly, Inc., 141 Lexington Ave., New York, N.Y. 10016, and certainly the world's most handsome boating publication.

## Pack-a-pot

It's not going to settle any arguments with environmentalists about where camping vehicles should be allowed. But Doug Toms, former president of the Recreational Vehicle Assn., now head of Holiday Rambler and a backpacker of long experience without wheels, had some pertinent thoughts recently. Never, he pointed out, had he seen a crowd of hikers camping at some beauty spot who had toted in toilets in their packs. **PM**



# Give your drinks every advantage.

Make a Mist with Seagram's 7 and give it the advantage of great taste and consistent quality. Just pour 2 oz. over crushed ice and garnish with a twist of lemon.

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The most refreshing taste you can get in any cigarette.



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

Kings, 17 mg. "tar," 1.3 mg. nicotine; Longs, 18 mg. "tar," 1.3 mg. nicotine; FOB, 18 mg. "tar," 1.3 mg. nicotine, av. per cigarette, FTC Report Dec. '76

# Set the Pace. In style!

Step inside the new Pace Arrow. You're surrounded by beautiful fabrics and the warmth of wood paneling. And space to really live! Check all the new features for 1978—including a new automotive styled dashboard.

There's also a new 32' Pace Arrow Luxury Flagship. When you see it, you'll know why Pace Arrow is a standard for the industry.

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The C35-EF has a professional quality lens. No wonder people say: "The lens alone is worth the price."

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Konica Camera, Dept 5203,  Berkey  
Woodside, New York 11377.



**Konica**

# PHOTO HINTS

## Backwoods marker



A pointed-tip felt marker, with waterproof ink, is handy in the gadget bag. On a Canadian wilderness canoe trip, I marked 37 rolls of film with sequence numbers to coordinate slides with my notes. On film shot at higher than normal ASA ratings, I noted the speeds on the cassettes so I'd know which to "push." When changing film in mid-roll, I marked the last exposure number on the cassette so I could reload later and start shooting exactly where I left off. The marker even writes on the fronts and backs of prints, including resin-coated papers, without smearing.—*Dick Harold*

## Cut chemical costs



Dry powder to make gallon bottles of stock working solutions is a cheap way to buy processing chemicals. But often the stock spoils before gallons are used. Solve the problem with an inexpensive postal scale. Divide powder into four piles. Put each in a plastic sandwich bag and that into a screw-top jelly jar. With air and moisture excluded, these packets seem to last forever. It takes only minutes to mix a fresh quart of soup from the premeasured powder.—*Robert Hertzberg*



## 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 and to continue your education. 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.



# Skill.

"A skill is the art of knowing what you're doing. I always liked to tinker with things, rebuild engines, work on my bike. When I joined the Army, I became an Automotive Repairman. Here's the first place I ever saw a Detroit diesel—or had good tools. In the Army, you have to work on all different things. You're expected to think for yourself a lot, but there's always somebody there to help you. They teach you to get your skill down pat, no doubts in your mind. Dad called the other night. He'd like me to work on his car."

*SP4 Jim Meinzer, Ft. Riley, Kansas*

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

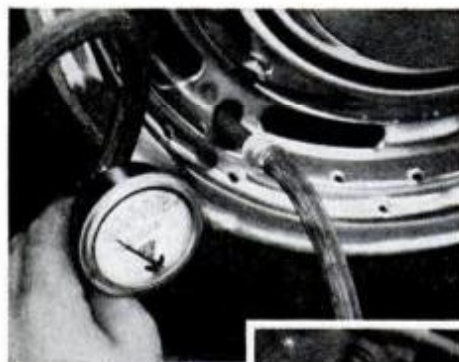
# THE PM GARAGE

## CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

### Auto-engine tire pump

This portable, compact tire pump is always ready for roadside emergencies. Called the Imperial Power Pump No. 1600, it works off your engine's compression cycle. Just unscrew one sparkplug, replace it by twisting in the pump element and connect the hose to your tire. Start your engine, let it idle and up goes your flat tire.

This pump doesn't carry exhaust fumes. Rather, a valve in the pump element (the part that replaces your sparkplug) draws in fresh air. To test the pump, I sniffed air coming from the hose. Sure enough, no gas smell.



Imperial Power Pump works off your car engine. Just screw fitting into sparkplug hole and let engine idle.

The pump inflated my car tire in about five minutes. It's also good for inflating air mattresses, rubber boats, toys and the like.

The only drawback came when I wanted to unscrew the pump element after use. It was quite hot, naturally, and hard to handle.

The pump kit, which costs \$8.95 at most auto stores, comes with a gauge on the hose that lets you check tire pressure as you inflate. Adapters for odd-sized plugs are 60 cents each. The maker is Impco, Box B, Posen, Ill. 60469.—M.L.

### Slippery stuff

One of the joys of running a clean machine is pulling out the dipstick and finding it covered, to the mark, with smooth, slippery oil, so clean and clear that you have to angle the stick to the light to see the oil. That's why there's going to be a

psychological barrier to overcome if you want to use a new, super slippery motor oil called ARCO-graphite. It comes pitch black because it's loaded with graphite. It's the graphite that gives the oil its distinctive black color and its special properties: The graphite adheres to engine parts and lessens friction between surfaces, so much so that it reduces wear and gives an average 5-percent improvement in fuel mileage, according to extensive tests made by Atlantic Richfield. ARCO-graphite oil (it's non-synthetic) comes in an SAE 10W-40 rating at \$1.55 a quart. Atlantic Richfield Co., 515 South Flower St., Los Angeles, Calif. 90071.—B.H.



ARCO-graphite oil.

### Fie on carbon buildup!

A sure way to start a hot discussion down at the garage is to bring up the subject of synthetic motor oil. You'll hear detractors who start off with "if God meant us to rearrange molecules . . ." and you'll get the other side from advocates who swear that synthetics are the greatest thing since sex. Both are unreasonable. One of the advantages of synthetics for your two-cycle applications is in the name of AMS's new oil: "100 to One." A little drop'll do ya. It mixes 100:1 in outboards, mopeds, whatever the two-cycle use. It's unaffected by extreme operating temperatures and is BIA-certified for service TC-W. It burns clean and virtually eliminates carbon buildup. You'll notice plugs won't foul as easily as with lower-priced spreads. Comes in quarts (\$4.95) and 8-oz. containers (\$1.40). AMS/OIL, Inc., 2206 Winter St., Superior, Wis. 54880.—B.H.

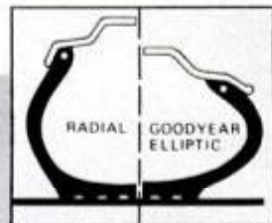


100 to One 2-cycle oil.

### More-mpg tire

Boost tire pressure and you'll get better mpg because rolling resistance is decreased. You'll get center-tread wear, too, and funny handling so you'd better not do it. You'll have to wait for this new tire, which may be on some '79 new-car models if carmakers like Goodyear's idea. With the elliptic configuration (requiring a special rim), pressure can be boosted 50 percent over conventional tires with

High-pressure inflation is the key to more mpg with Goodyear's elliptic tire. Handling and ride are good.



no sacrifice in ride or handling. Rolling resistance is decreased enough to give a 3 to 6-percent mpg increase over present radials. The squatty tire uses polyester cord for the body with steel belts. Goodyear Tire & Rubber, 1144 Market St., Akron, Ohio 44316.—B.H.

### Pinstripe with tape

Want to customize your car with tape? New tapes are fade-resistant, stick beautifully and go on easier (but I still don't like them). Trim-brite Multi-Stripes, (below), even go around curves and angles. If they're for you, get the full story in a color booklet for \$1 from Spartan Plastics, Box 67, Holt, Mich. 48842.—B.H.



Trim-brite Multi-Stripes are easy to apply.



# EUROPE'S MOST SUCCESSFUL\* NEW CAR IN HISTORY COMES TO AMERICA...

\* A CAR THAT HAS OUTSOLD EVERY NEW CAR NAMEPLATE EVER INTRODUCED IN EUROPE, BASED ON A COMPARISON OF SALES IN THE FIRST SIX MONTHS.



# Introducing Fiesta. Imported from Germany by Ford.

The remarkable sales success of the new Fiesta in Europe has surpassed even the most popular cars from Volkswagen, Renault and Fiat. Behind that success is Fiesta's dramatic level of automotive performance.

## ADVANCED EUROPEAN ENGINEERING

Fiesta is assembled by Ford in Germany, where its competition includes some of the world's finest performance sedans. It was engineered for stability on Europe's high-speed autobahns. (Its aerodynamic design minimizes wind drag, enhancing overall performance and fuel economy.) It was designed to be quick and maneuverable in city driving. Yet for all its performance, Fiesta is engineered to be a simple, easy to service car.



## FRONT-WHEEL DRIVE TRACTION

Fiesta has front-wheel drive, which helps give the car good drive wheel traction—even on snow and ice. This, in addition to Fiesta's MacPherson front suspension, rack and pinion steering, and Michelin radial tires, contributes to a solid feeling of *controlled action*.

## QUICK AND MANEUVERABLE

Fiesta *responds*. In Ford tests it did 0-50 MPH in an average of 8.8 seconds (9.1 seconds for California emissions equipped models). And its front disc brakes brought Fiesta from 50-0 MPH in an average of 3.3 seconds.



46 MPG<sup>+</sup>  
HWY  
34 MPG<sup>+</sup>  
CITY

\$3,680\*

\*EPA estimates. Your mileage may vary depending on your car's condition, optional equipment, and how and where you drive. California ratings are lower.  
\*Base Fiesta sticker price excluding taxes, title and destination charges.

And Fiesta *handles*...with a precise rack and pinion steering system that gives it excellent control in tight corners and traffic maneuvers.

## EASY TO SERVICE

Fiesta was engineered to be simple and *easy to service*—an important benefit for foreign car buyers. Owners will appreciate its highly accessible transverse mounted engine. And see-through containers that allow "sight check" of fluid levels in battery, cooling system, brake and windshield washer

reservoirs. In addition, Fiesta has self-adjusting clutch and brakes, and suspension and steering systems that require no scheduled maintenance.

## A SURPRISE INSIDE

Fiesta's 4-passenger design has created more back seat legroom than any other imported or domestic car of its kind. In addition, Fiesta has excellent



luggage space, and a fold-down back seat that creates added loading room and a convenient floor-to-roof rear hatch door. There's even an extra concealed storage compartment beneath the floor for valuables.

Fiesta is available from more than 5,000 authorized Ford Dealers across America... thousands more than any other import. A single test drive can show you why Fiesta is Europe's most successful new car in history.

*Pictured above & opposite page, upper left: Contoured bucket seats and instrumentation of the Fiesta Sport.*

*Upper right: Versatile rear hatch gate area of the Fiesta Ghia.*



# FIESTA



FORD FIESTA  
FORD DIVISION



# IT'S NEW NOW



## Nose for a supersniffer

Radome housing for a supersensitive early-warning radar juts from the front end of a British Nimrod jet like the bow of a submarine. The new Hawker Siddeley-Marconi Elliotts scanner, designed to spot missiles in time to intercept them, recently rolled out to bid for a place in the NATO 27-plane fleet of early-warning, missile-sniffing "watchbirds."

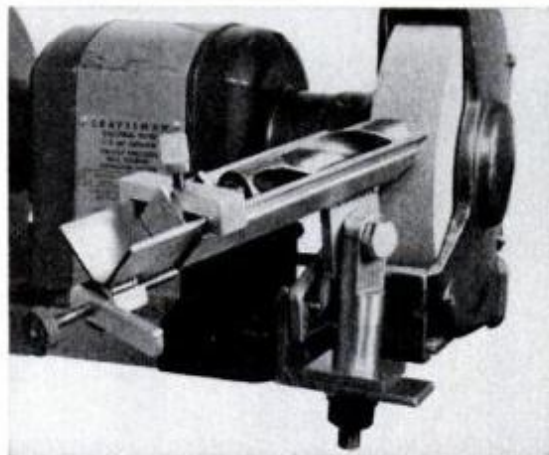
## Lithium powers a skinny digital

Wafer-thin, long-life lithium batteries form the back of new digital electronic watches only .3 inches thick. Besides providing slick look, replaceable units carry year's warranty on command display models; three on continuous. \$35 to \$60. National Semiconductor, 1177 Kern Ave., Sunnyvale, Calif. 94086.



## Put a bite back in your bits

Speedy, precise drill bit sharpening can be done on 1/32 to 1 1/4-in. bits with a device that positions and holds the tool against grinding wheel face for accurate edging. Nut under toolrest controls drill-point angles. Unit comes with manual, is \$60. J&A Machinery, 3136 Federal Ave., El Paso, Tex. 79930.



## Foil for the birds

Foil bobbles around on breezy days; crackles and pops as it moves. So RJR Archer, an aluminum products company in Winston-Salem, N.C., ran a scarecrow contest. Local 4-H clubs built 46 foil monsters including this skier.



## Pick up your car and walk

Got a parking problem? Avi Sharf of Jerusalem may have the answer. His three-wheel car steers by tiller and hits 40 mph. It's powered by a 50-cc Sachs two-stroke, one-cylinder plant, weighs 55 pounds. When you get "there," pack and carry it.



# One of a kind.

He challenges the last uncharted world.

A frontier where discovery is the greatest reward of all.

He smokes for pleasure.

He gets it from the blend of Turkish and Domestic tobaccos in Camel Filters.

Do you?



**Turkish and  
Domestic Blend**

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

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

# Beef up your snacks.



Take along Slim Jim® meat snacks. The chewy, all-meat sticks that come in six tasty flavors, fit right into your pack and keep you traveling light, but not empty. **A little less than a meal. A little more than a snack.®**



## Introducing the first professional-style welding rig for the do-it-yourselfer.

It's the new BernzOmatic OX5000 Oxygen Cutting/Welding Torch. And it's unique.

Like a professional rig, the OX5000 uses a combination of oxygen and compressed gas in separate cylinders. It's the only do-it-yourself rig that lets you control the fuel flow.

And like a professional rig, the BernzOmatic OX5000 can cut, weld, braze and solder. It even lets you do the work of a professional repairman.

The BernzOmatic OX5000 offers the added convenience of one-tip cutting and welding. It lights with one spark and can be turned off at any time. There are no hoses to crimp or break, no filters to clog plus you have a choice of either propane or Mapp® gas.

Get the professional welding rig that lets you do more yourself: the BernzOmatic OX5000. Now at your BernzOmatic dealer.

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# BERNZOMATIC®

## HINTS FROM READERS

### Appliance knob repair



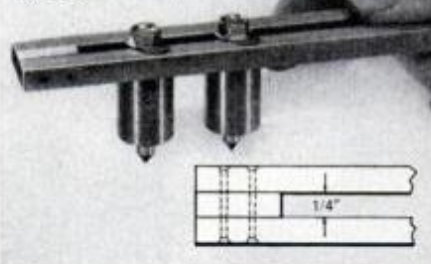
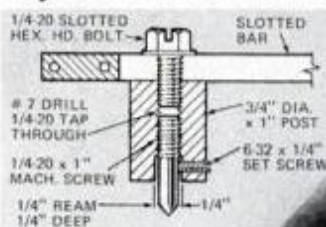
Often a loose appliance knob can be made to grip as it should by wrapping plastic tape tightly around its stem, overlapping the end to close the hole.—*M. Peacock*

### Energy-saving garage light



Replace a garage light that stays on when door is open with adapter receptacle, night-light socket and 4-watt lamp.—*M.R. Kirstein*

### Adjustable center locator



Locate and transfer center points precisely with an adjustable center locator. Align locator centers with existing centers, then tighten the posts in the slotted bar with a screwdriver. Transfer points to the work by tapping each hex-head bolt with a hammer. Set-screw-held centers are 1/4-20 machine screws with ends pointed and heads cut off. Tap No. 7 holes full length in posts and ream 1/4-in. deep with 1/4-in. drill. Hold in bar by 1/4-20 slotted hex-head bolts.—*J.R. Hickok*

# HOME AUTO BUSINESS LIFE BONDS



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When you shop at The Insurance Store, you'll find just about every kind of insurance.

And you'll find a wide selection of famous name insurance companies — including us, Continental Insurance.

Best of all, you'll also find an agent who knows each company's special capabilities and expertise. And exactly what coverages are spelled out in each policy he offers.

So whatever insurance you need, he can custom-tailor you a plan with the specific companies, policies, and prices

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That's unlike shopping at Allstate where you have to settle for only Allstate Insurance.

Or shopping at State Farm where you have to settle for only State Farm Insurance.

But it helps explain why The Insurance Store sells more property and casualty insurance than either Allstate or State Farm.

Today, there are over 6,500 Insurance Stores ready to serve you. To find your

nearest one, just check the Yellow Pages for the nearest agent listed under Continental Insurance.

And remember:

At The Insurance Store, you get more than expert custom-tailoring for today. As your needs change in the future, you're always welcome back for free alterations.



**The Insurance Store**  
featuring  
**Continental Insurance**  
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## This weekend seal your doors and windows with M-D weatherstripping

Save from 5% to 30% on home fuel cost!



Drafts around doors and windows of your home are costly. They can cause your home fuel bills to soar! And it is so easy to stop drafts with do-it-yourself M-D window and door weatherstripping. Many M-D weatherproofing products come in kits ready to install on standard doors and windows. This weekend cut your home fuel bills as much as 5% to 30% by sealing out those drafts around your doors and windows with M-D weatherstripping. You'll find a complete line of energy-saving M-D weatherproofing products at your hardware, building supply or home center dealer. And always ask for M-D products by name.



### MACKLANBURG-DUNCAN CO.

Yes I want to cut my home fuel cost. Rush me your 10 page booklet on "How to Save Money with ESP"

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Mail with 25 cents in stamps or coins to:  
 Macklanburg-Duncan Co.  
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 Oklahoma City, Oklahoma 73125

# IT'S NEW NOW



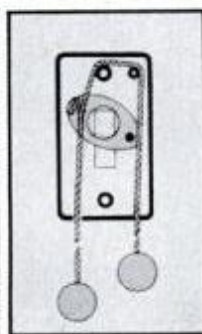
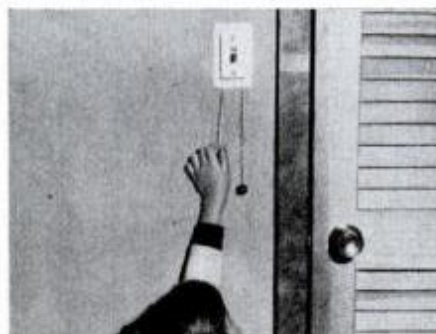
### Slalom course for swimmers

Four weighted anchors tied to a set of buoyant plastic hoops provide a new kind of underwater obstacle course for swimmers. Porpoise Underwater Slalom tethers adjust to position hoops for any degree of expertise. About \$10 in sports stores. Kransco, 501 Forbes, South San Francisco, Calif. 94080.



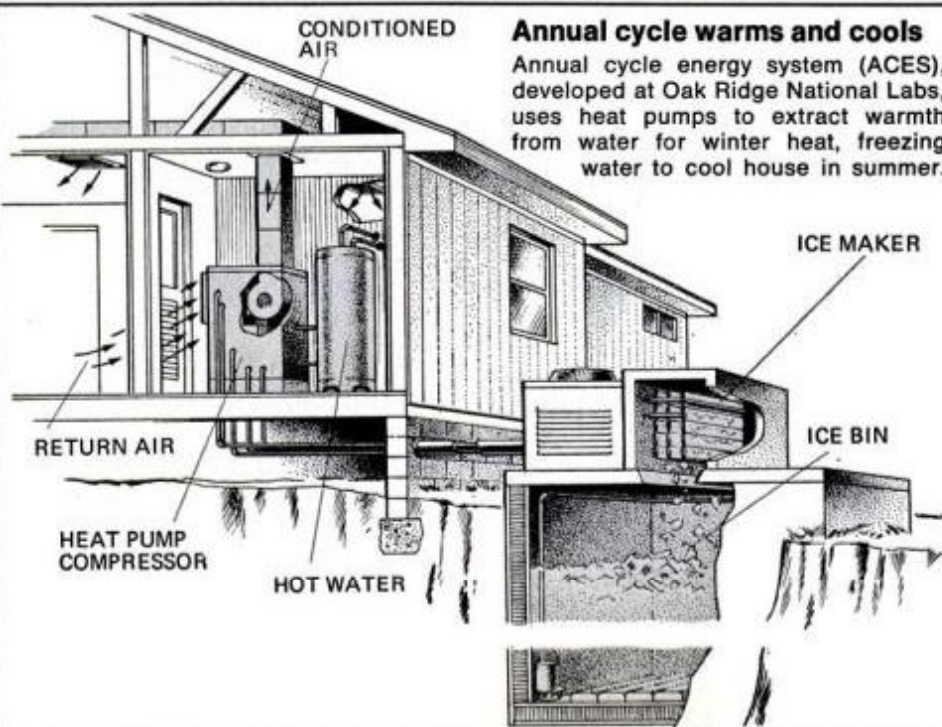
### Floating fuel cache

Undergoing tests at Fort Hueneme, Calif., a 5-ton rubber bladder 11 feet in diameter and 220 long will serve as a 126,000-gal. floating fuel tank for the Navy and Marines.



### Kiddy switch-flip

Light switch extender for short kids is fastened over standard wall toggle switch, beneath cover plate. Cam (diagram) throws toggle up or down depending on which tassel is tugged. International Inventors, 4900 Leesburg Pike, Alexandria, Va. 22302.



### Annual cycle warms and cools

Annual cycle energy system (ACES), developed at Oak Ridge National Labs, uses heat pumps to extract warmth from water for winter heat, freezing water to cool house in summer.

# DODGE IS INTO PICKUPS LIKE AMERICA'S INTO JEANS.

Both blue jeans and Dodge pickups got their start by being tough. Dependable. And therefore necessary.

Then something happened. Jeans became a whole new style of dressing. A denim philosophy that captured the mood and attitude of an entire country.

And Dodge pickups stopped being just work-horses and found themselves as at home on the town's main drag as on a dusty country road.

The plain Jane Dodge pickup has grown into pickups with Crew Cabs, Club Cabs, two- or four-wheel drive, dual rear

wheels, and a variety of carrying capacities.

You can equip them with road wheels, white letter tires, bucket seats, stereos, air conditioning, and special paint jobs.

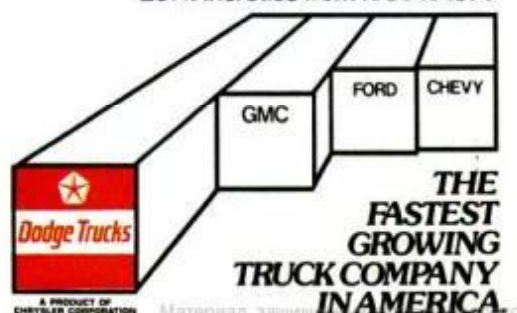
And you can take your choice of buying or leasing.



Dodge pickups have become an exciting part of America's new style. Get into it yourself... at your local Dodge Dealer's.



237% increase from 1966 to 1976

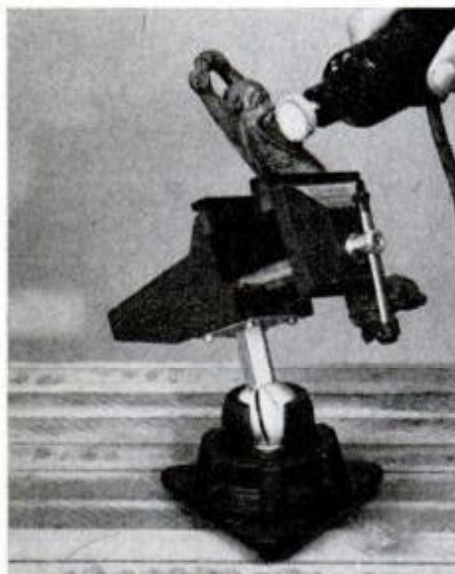


# PM's shop editors pick stocking stuffers



**H**ere's a carefully chosen selection of tools that offer 13 great solutions to your Christmas-giving quandaries. All of them are attractive gifts that are a pleasure to open and display. Especially important, one or more are certain to be just what the craftsman

(Please turn to page 64)



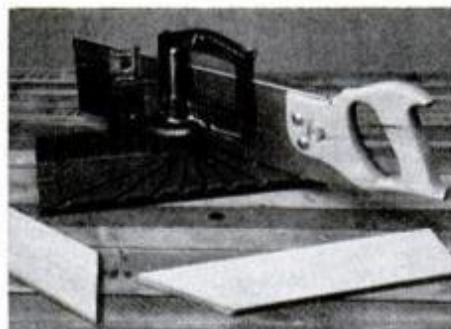
Eliminate awkwardness when working on small objects with this Dremel D-vise. It tilts up and down conveniently and swivels full circle. \$22. From Dremel Manufacturing, 4915 21st St., Racine, Wis. 53406.



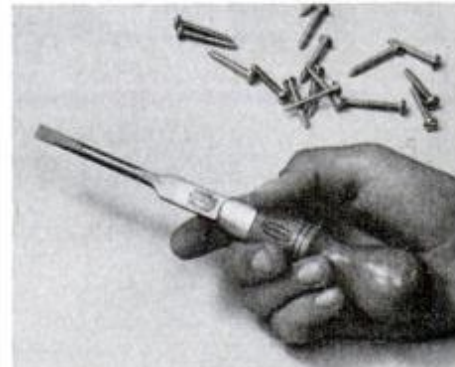
Woodturner's sizing tool makes it a snap to turn accurate diameters. Simply set parting tool to the desired diameter and lock it into position. Tool has a maximum capacity of 3½ in., \$9.15 from Woodcraft Supply Corp., 313 Montvale Ave., Woburn, Mass. 01801.



This compact electric drill helps you work on circuitry, or can be used for small bench carpentry tasks. It operates at about 9000 rpm and accommodates up to ⅛-in. drill shanks. Cost is \$27.50 from Wahl Clipper Corp., 2903 Locust St., Sterling, Ill. 61081.



Miterbox set includes a ruggedly built miterbox and 14-in., 13-point backsaw. It has quick adjustment for cutting 90°, 75°, 60°, 45° and 30° angles and a metal base with slots for bench mounting. \$18 from Stanley Tools, New Britain, Conn. 06050.



Fit the screwdriver to the job. These cabinetmaker's screwdrivers range from 3 to 10 in. and are made of Sheffield steel with beechwood handles. From \$1.85 to \$3.85 each, the set of six is \$16.55. Constantine, 2050 Eastchester Rd., Bronx, N.Y. 10461.

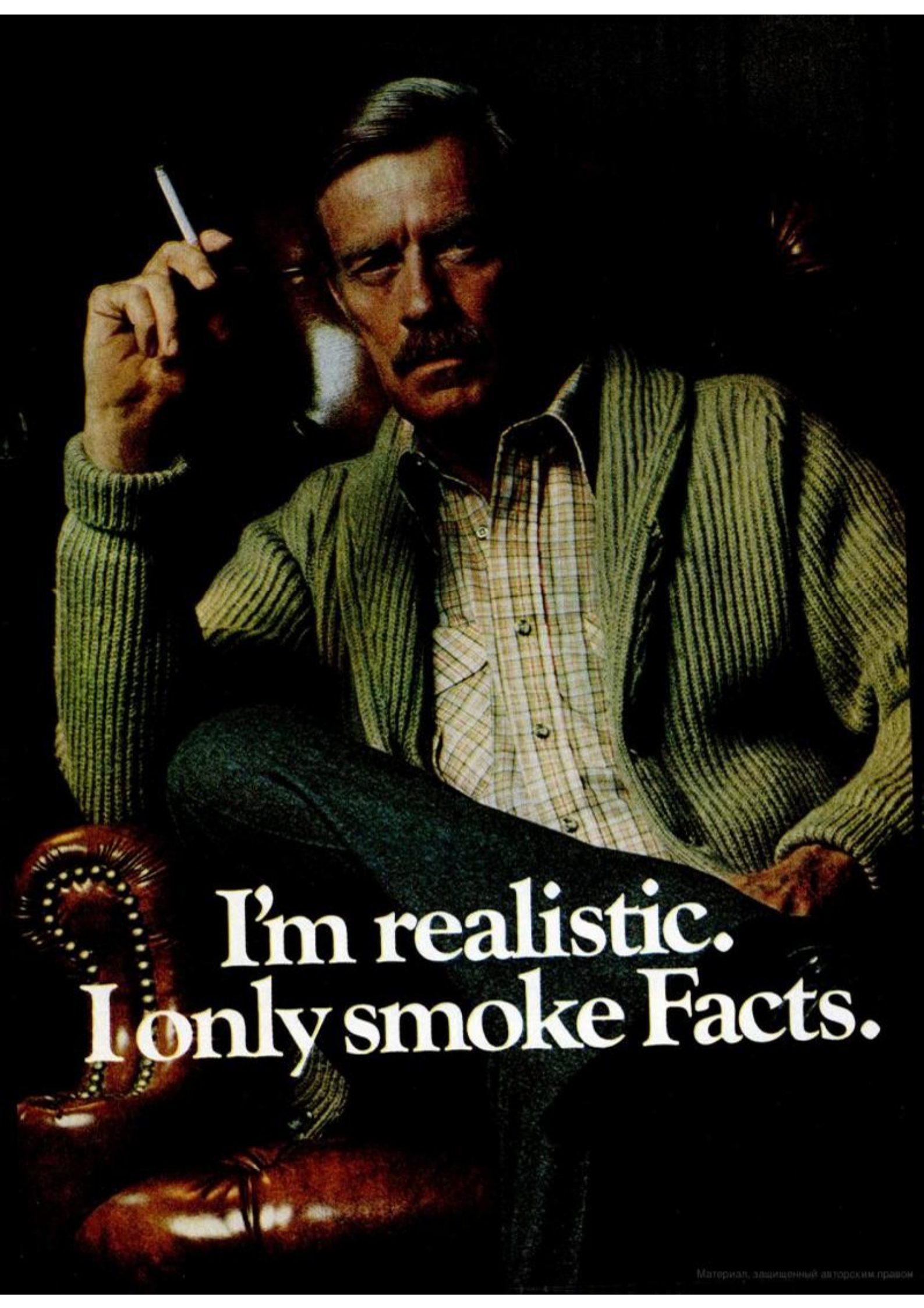


Woodcarvers will appreciate this Deluxe Whittler's set of six tools fitted into a preformed tray. The knives are great for whittling, shaping and chip carving. Tools measure 5½ in. in length. \$17 from X-Acto, 45-35 Van Dam St., Long Island City, N.Y. 11101.

The ask-for motor oil.  
Ever since America learned to drive.



Pennzoil. It's worth asking for.



I'm realistic.  
I only smoke Facts.



## FACT 1: We don't want your taste buds to go to sleep.

We believe there are elements in cigarette smoke that muddy the taste of fine tobaccos. They're called aldehydes.\* And FACT reduces these aldehydes so you can enjoy wide-awake flavor instead.

## FACT 2: We have smoke scrubbers in our filter.

We believe this is a unique way of getting at tobacco flavor. As the smoke passes through the filter, these Purite® scrubbers work like magnets to reduce these aldehydes, while letting the good tobacco flavor come through.

## FACT 3: A patent on flavor in low 'tar' cigarettes: #3828800.

Low 'tar' (8 mg.) FACT has great full flavor. And we get that flavor in a way so new we've been able to patent it. It's our Purite filter that reduces the aldehydes—those harsh-tasting gases that muddy the flavor of real tobaccos.

Add it up. Great tobacco flavor. Only 8 mg. 'tar'. A patented filter that selectively screens gases. Once you've got the facts, you'll get the FACTS.

\*Formaldehyde, Crotonaldehyde, Acrolein.



Available in regular and menthol.

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

8 mg. "tar", 0.7 mg. nicotine av. per cigarette, by FTC method.

# stocking stuffers



(Continued from page 60)

in your home has been yearning for.

These gift ideas will help the home craftsman or hobbyist build his projects or repair broken items long after Christmas has passed. Several have built-in safety features so the youngsters can enjoy them as well. The selection includes tools for both novice and experienced workers. **PM**



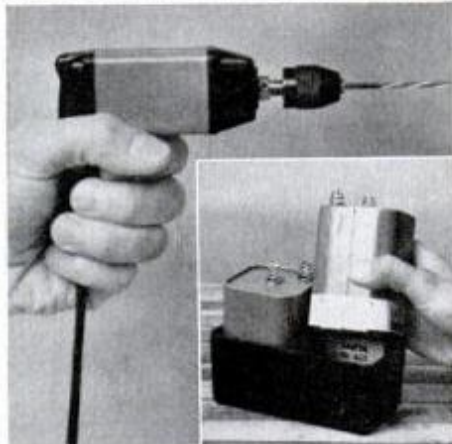
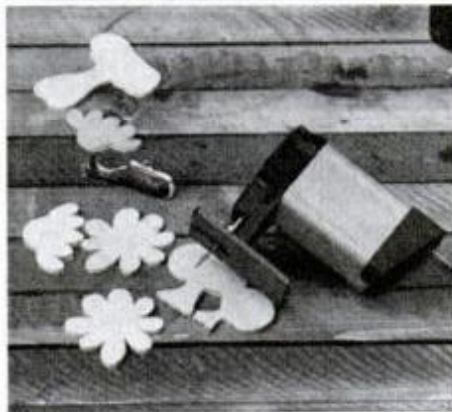
Electronics hobbyist's starter set includes a soldering iron, soldering aid tool, solder, 4-in. pliers, diagonal cutters, wire strippers, 1/4-in. nut driver and slotted and Phillips-head screwdrivers—all in one kit. \$37.90. Weller-Xcelite, Apex, N.C. 27502.



Quick and easy blade changing is possible with the Twist-n-Lock saw set. The package includes three blades for wood, metal and general cutting. \$8. Disston, 601 Grant St., Pittsburgh, Pa. 15219.



These high-leverage cutting pliers with precision-mated cutters let you make clean cuts with minimum effort. Plastic grips are optional. About \$10 from Channellock, Inc., Meadville, Pa. 16335.



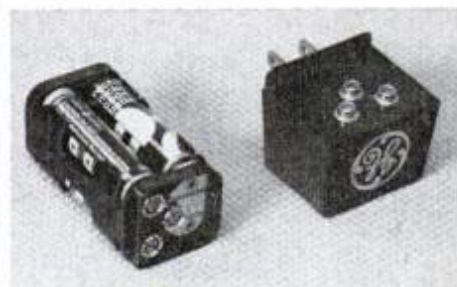
Miniature tool shop in a kit includes circular saw, sabre saw, sander, drill and battery case. Use the tools with batteries for outside work or with a converter to operate the tools on standard house current. Hobby-boy tools are lightweight so everyone can use them for repairs or hobby work. The kit is available for \$120, while the tools are also sold individually. York Crafts, Inc., 10 West 37th St., New York, N.Y. 10018.



Here's a pocket plane and square for those who like fine tools. Plane is crafted of tropical gongcalvo alves wood with 1-in. blade. Square is brass and tulipwood with 5-in. blade. \$26 and \$12.60 respectively. Garret Wade, 302 5th Ave., New York, N.Y. 10001.



This electric gun drives staples. Use it on building and repair jobs, ceiling tile, window screen, insulation and upholstery. Under \$45. Duo-Fast Corp., 3702 River Rd., Franklin Park, Ill. 60131.



Recharge worn-down batteries with help from this miniature rechargeable battery system. It's designed to fully recharge GE's AA, C, D and 9-volt nickel-cadmium batteries in 16 hours—up to 1000 times. Set includes charger, batteries and battery module. \$16 at GE outlets.

# The pay-for-itself book... try it free!

Your very first home repair job could easily save you \$20, \$30 — even more... far more than the cost of this big Reader's Digest book.



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Stop paying soaring repair maintenance costs ... join the millions of do-it-yourselfers who are already saving money by using this book. (Many users have reported savings of \$450 and more!) Voted "Best of Breed" by editors of *Washington Post*, this big Reader's Digest book is guaranteed to work hard at helping you save some of the estimated nine billion dollars that will go out this year to contractors and repairmen.

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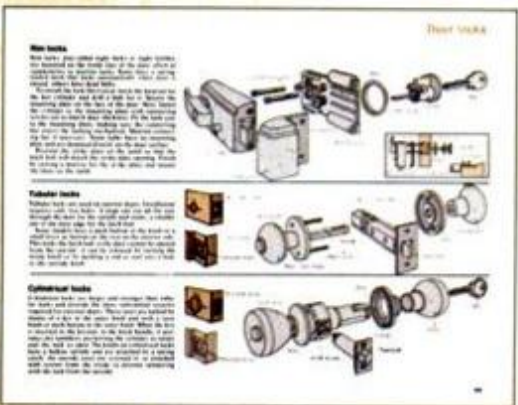
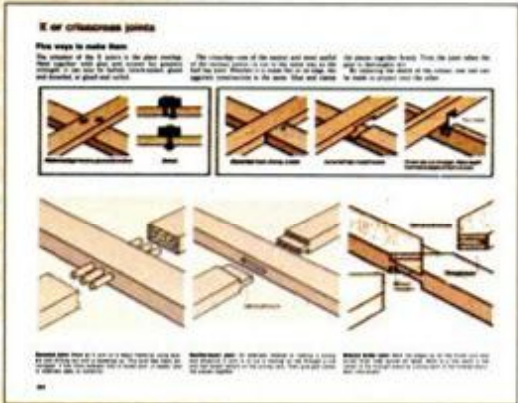
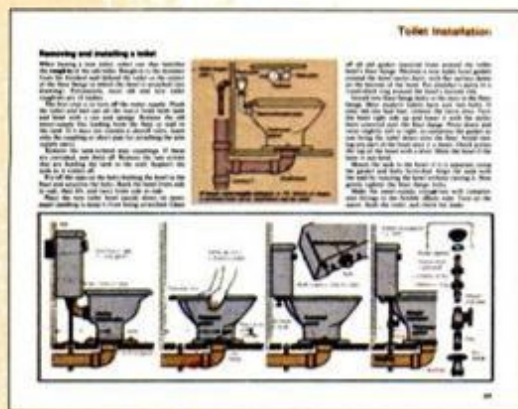
**Reader's  
Digest**

Pleasantville  
New York 10570

# "By far the best of the repair books"

—Mel Mandell, Money magazine

Reader's Digest editors scouted up the best experts in their fields, had them contribute to the *Complete Do-It-Yourself Manual*... then the editors took the experts' know-how and put it all into readable form — translated it from technical jargon into easy-to-understand pictures and language that even the beginner could put to immediate, mistake-free, good use.



**Solutions to 1001 problems — in the first "how-to" book of its kind!**

### Tools and hardware

Using hand tools, power tools  
Organizing a workshop  
Fastenings with nails, screws, bolts  
Hanging shelves, cabinets, fixtures  
Working with adhesives

### Household repairs inside and out

Repairing walls and ceilings  
Refinishing floors and stairs  
Repairing, weatherstripping, replacing windows and doors  
Waterproofing a basement  
Repairing roofs and gutters  
Building and repairing fences, gates  
Making furniture repairs  
Working with plumbing, electricity, heating, air conditioning

### Handyman's techniques

Painting, decorating, tiling  
Working with wood, metals, glass, brick, stone, cement, concrete

### A guide to better planning

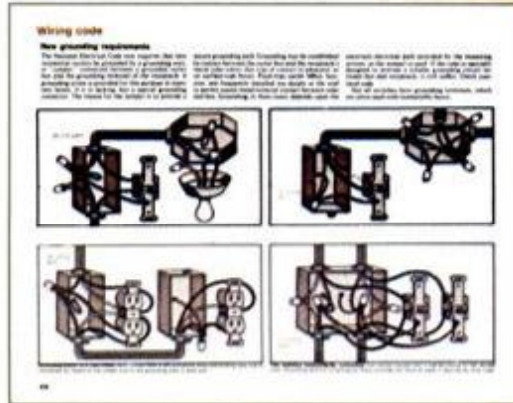
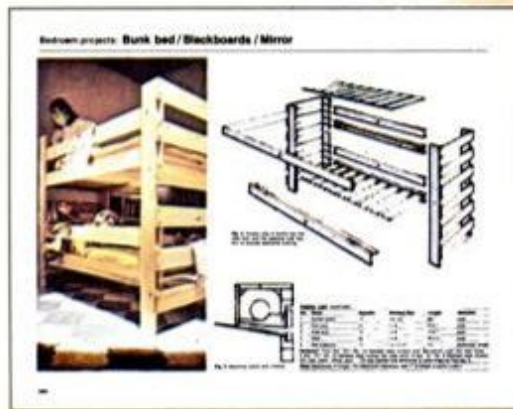
Brightening, improving, enlarging  
Making major improvements

### Projects you can build

New furnishings for living areas  
Children's toys and furniture  
Better ideas for outdoor living

**A Must for Housewives!** "That age-old advice to brides — 'if you can read, you can cook' — might be updated to 'and you can also do it yourself' (with the Reader's Digest *Complete-Do-It-Yourself Manual*." —Vivian Brown, AP Newsfeatures.

- 600 information-crammed pages
- 2,255 how-to pictures
- Special action pages for emergencies
- Projects to do
- Instant reference index
- Rugged binding, washable cover
- Opens to lie flat on working surface



How to beat the high cost of skilled labor and "house-call" fees — some typical examples:

THE JOB	THE QUOTED PRICE	BASIC MATERIALS NEEDED	COST OF MATERIALS	YOU SAVE
Fix a leaky faucet	\$ 16.95	Box of washers	\$ .35	\$16.60
Install a new wall outlet	33.90	BX cable, box, outlet, plate	6.50	27.40
Replace a 12" x 16" window pane	12.95	Glass and putty	1.65	11.30
Install a door lock	44.00	Lock mechanism	17.00	27.00
Hang a dining room light fixture	13.50	Roll of electrician's tape	.20	13.30
Paint ceilings in two rooms and hallway; paint seven doors	266.95	Two gals. ceiling paint, one gal. semi-gloss paint, sandpaper, spackling, brushes, etc.	42.65	224.30
Wallpaper 12' x 18' room	133.95*	Paper-hanging kit, paste	9.35	124.60
Tile a 12' x 15' kitchen floor	360.00	Tile and cement	158.65	201.35

\*Cost of wallpaper not included.

Prices quoted are actual estimates obtained in urban and suburban areas in the eastern United States. Cost of materials would tend to be lower in rural areas, higher in western states. However, with the step-by-step help of the *Complete Do-It-Yourself Manual*, you can "do it yourself" and save at least half the cost of a "professional" job. See table above.

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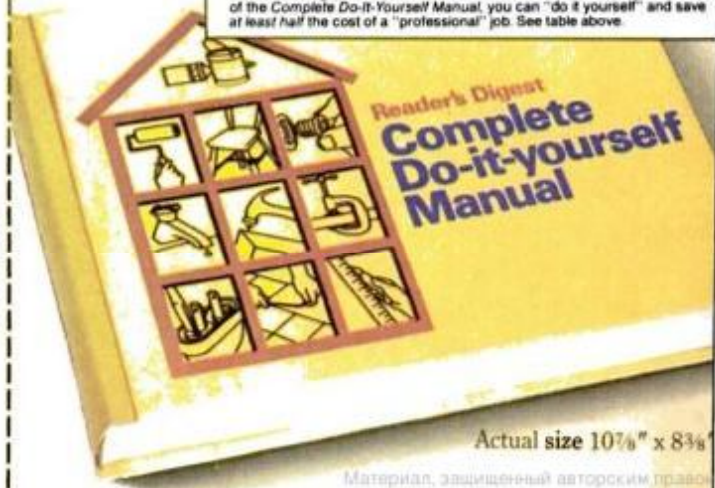
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Actual size 10 7/8" x 8 3/8"

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# Tiny portable ham radio packs 800 channels

Miniature two-way set works anywhere on car battery or built-in rechargeables.

by Anthony R. Curtis, K3RXK/W8TIZ  
RADIO EDITOR

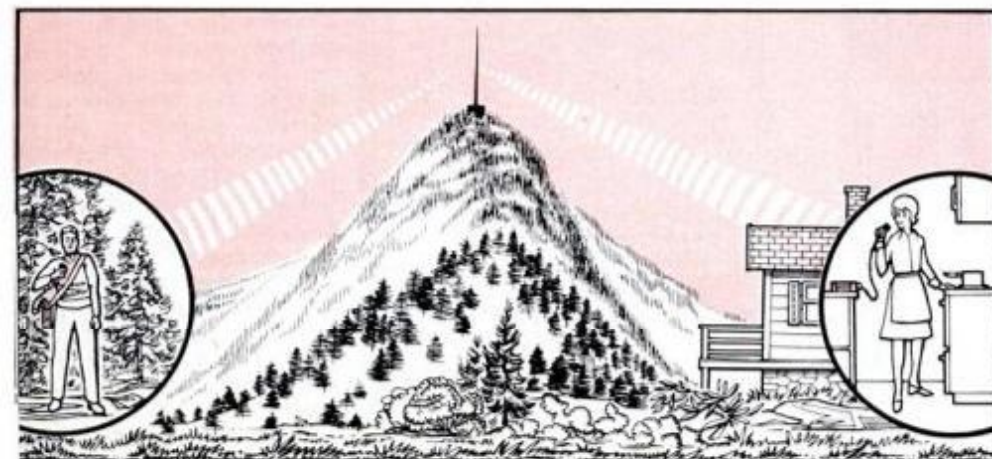
**T**ired of push and shove on the cramped 23 channels in your CB radio? Now you can have an inexpensive ham radio with 800 channels of quiet FM sound built in.

Amateur radio operators have built a network of 3000 remote, automatic repeating stations atop hills and tall buildings across America. Repeaters, which permit tiny radios to be heard over big areas, are sensitive receivers and high-power transmitters.

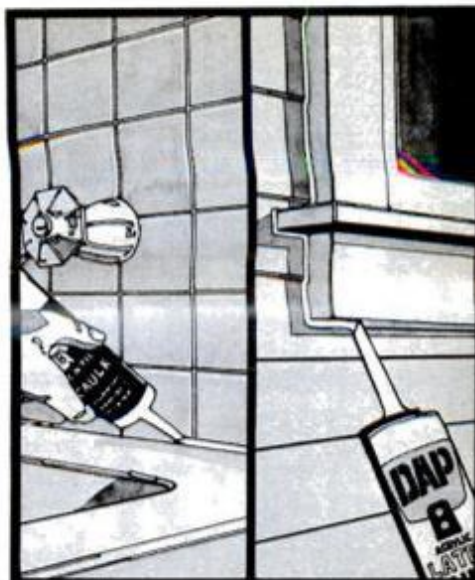
To let hams talk through repeaters, or directly from house to car, equipment manufacturers are warming up a new line of digitally synthesized 400 to 800-channel radios. One of the best of the new ones is the WE-800 (\$399) from Wilson Electronics Corp., 4288 South Polaris, Las Vegas, Nev. 89103. About paperback book size, it has 800 channels and 12-watt power. A ham license is a must for this operation. **PM**



Front-panel switches help to select 800 channels on this new Wilson WE-800 model.



A hiking ham chats with his wife using a repeater station. Weak signals from his portable set go to sensitive receiver atop hill and are retransmitted down to home radio.



## Inside and out, they're the best seals around.



DAP Kwik-Seal® Tub & Tile Caulk gives you a neat, white watertight seal around tile, tubs, sinks and showers. It's easy to apply. Stays flexible, takes paint. You can also grout tile and caulk interior window and door frames.

DAP Acrylic Latex Caulk seals cracks and joints inside or outside around windows and doors. Keeps cold air out, saves heat loss. Helps paint jobs look better, last longer. It guns on easily, dries for painting in just 2 hours.

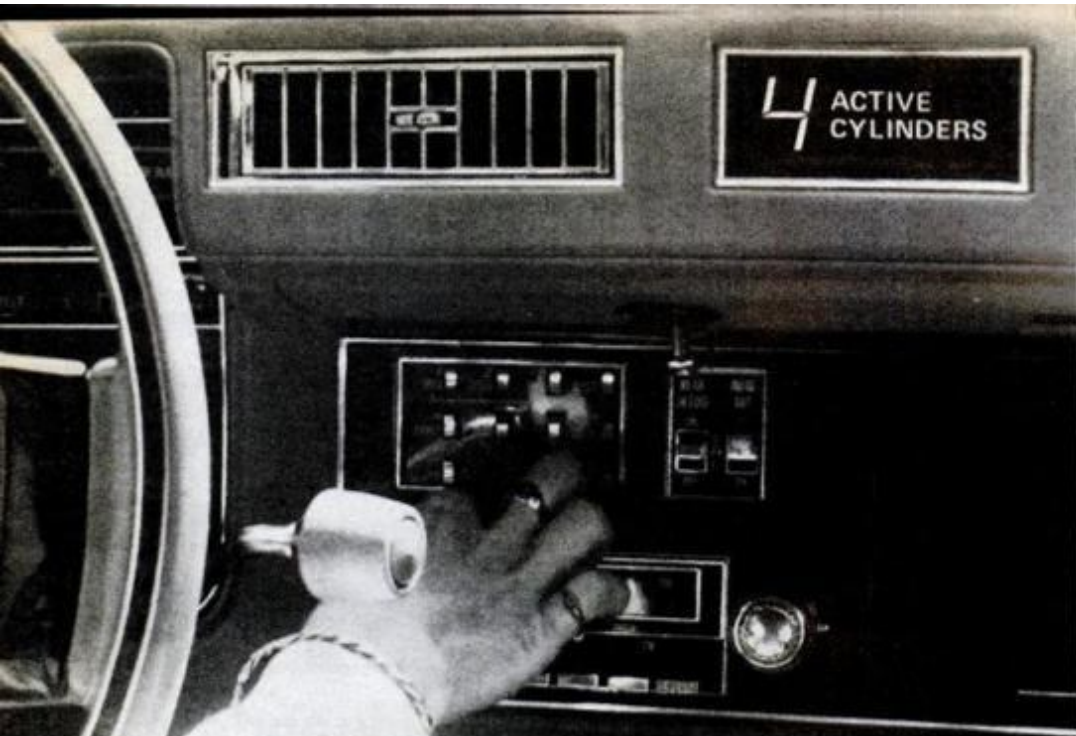


## Home fix-up's a snap with

# DAP

DAP is a trademark of DAP Inc.

DAP Inc., General Offices: Dayton, Ohio 45401  
Subsidiary of Plough, Inc.



Digital readout of cylinders in use may become a standard feature of cars in the future.

# Driving a car with 4, 5, 6, 7 or 8 cylinders

Changing your V8 to a Four while driving along is a slick way to save energy.

by Stephen F. Wilder

**H**ere's an ingenious way to achieve the penny-pinching of a four-cylinder when you are loafing along, yet retain the power potential of an Eight. Called the Valve Selector by its inventors, it yields 10 to 40-percent improvement in miles-per-gallon in every driving mode except strong acceleration.

It works this way: When any cylinder is not required to deliver much power, its intake and exhaust valves are disengaged. While the piston in the disengaged cylinder continues to pump up and down, it does not have to suck air past the closed butterfly

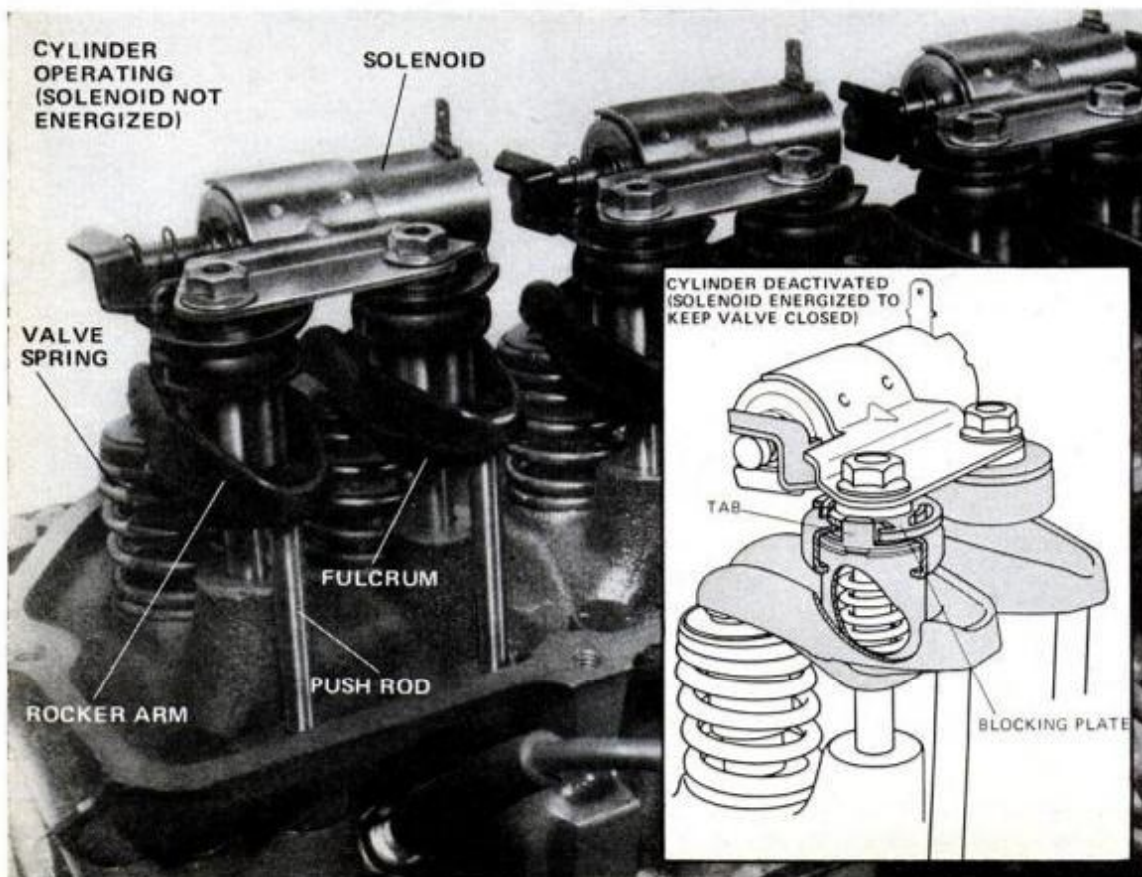
valve in the carburetor. (Ever try to breathe through a straw?) The piston is only compressing and expanding the same air over and over again, getting energy out of it on expansion equal to what it took to compress it. The eliminated pumping loss is so large that you save an impressive amount of gasoline.

The hardware involved, which may run \$100 as a factory option, can be bolted onto any engine with individually pivoted rocker arms. The only old part that needs to be changed is the rocker cover. This is replaced with a new, taller one so the Valve Selector

can be adapted without major retooling of the engine assembly line.

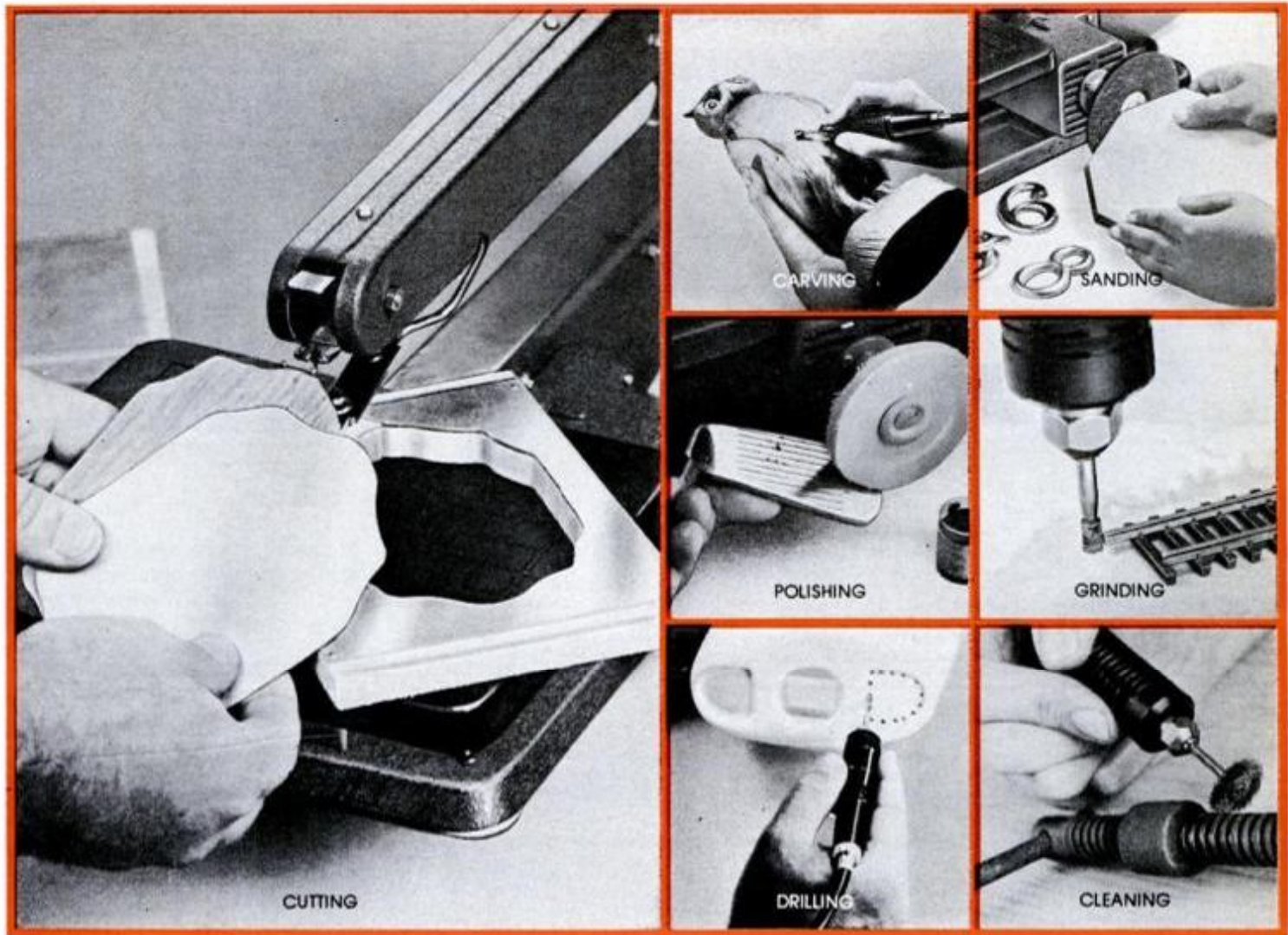
The system will be offered next year on some Ford pickups and vans. If you can't wait, you can discover what your car feels like running on half its cylinders by removing pairs of pushrods (maybe valve lifters, too). Pick cylinders that alternate in the firing order to minimize rough running. Of course, when you want to accelerate hard, you'll have to reinstall everything. With the Valve Selector (maybe they should call it the Cylinder Chooser), the technique is more elegant, and full power on all

*(Please turn to page 70)*



Valve selector system conceived by Eaton Corp. operates on conventional, overhead-valve, pushrod engine. The selector, with its blocking plate, tab and internal spring is mounted on intake and exhaust valve rocker-arm studs above the rocker-arm fulcrums. With cylinder operating (far left), the fulcrum is held down by the tab and blocking plate and the valves operate normally. To shut down a cylinder, the solenoid is energized. This rotates the blocking plate and the tab drops into the slot. The rocker arm is lifted by the pushrod, the fulcrum rides up the stud and the valve remains closed. In each of the deactivated cylinders, the piston continues to reciprocate, but the intake and exhaust valves are closed. Since the gases in the cylinder are merely compressed and expanded, no energy is consumed as pumping losses. The bottom line is more miles per gallon.

# The table top power shop.



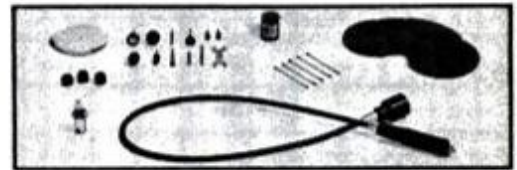
## DREMEL DELUXE MOTO-SHOP

- 15 Inch cutting throat** — Allows room for maneuvering workpiece.
- Blade guard** — Also acts as guide and holds workpiece to the cutting table.
- Direct drive, quick release blade** — Delivers 3450 cutting strokes per minute. Can be mounted in 3 positions for cutting regular or long stock.
- Adjustable table** — Moves up and down. Tilts 45°, right or left, for bevel cuts. Locks at 90° angle.



Model 572  
Deluxe Moto-Shop

- Ball bearing motor** — 115V, 60 cycle, AC, 3450 RPM Ball bearing construction for smooth, quiet running, long, dependable service.
- Power takeoff** — For sanding disc, buffing wheel and flexible shaft that lets you carve, grind, sand, polish, more.



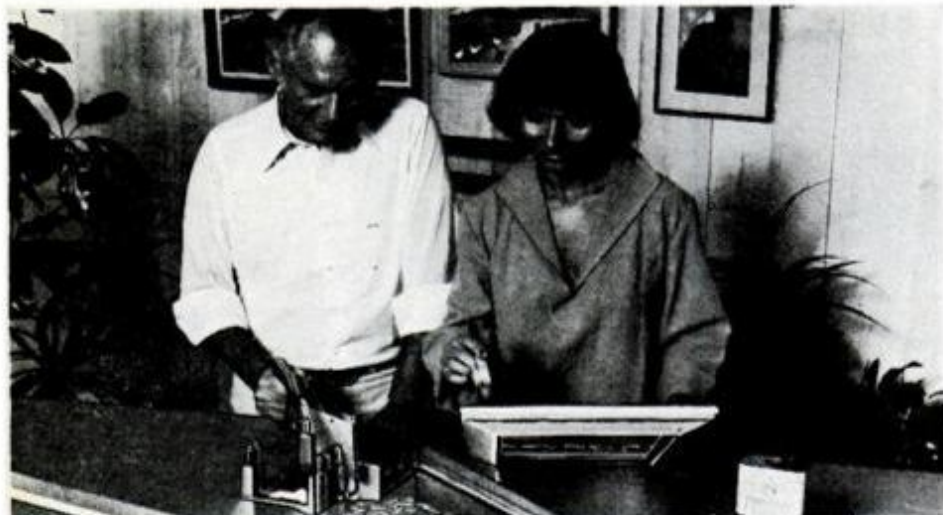
Dremel Deluxe Moto-Shop includes accessories for cutting, carving, grinding and polishing.



**DREMEL**  
Helping families to create...together.

See your hardware, hobby or craft dealer or write Dremel Mfg., Div. of Emerson Electric Co., Dept. E111, Racine, WI 53406.

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- Etchings
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- Fluorescent Art
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Have you ever tried to buy a picture frame for a valued picture, only to discover that no matter how outrageous the price, there was no way you could get a perfect fit?

The truth of the matter is that *standard* size picture frames cost an arm and a leg, no matter how cheap they may look. And, if you want the frame to fit your picture (rather than finding a picture to fit the frame), the only way you can do it is to have one custom made.

Today millions of people from coast to coast need frames—lots of them. Have you noticed, when visiting relatives or friends, how many frames they were using just to display pictures of family alone! Most families have at least a dozen framed pictures in the house, and if anyone in the family does painting . . . makes prints . . . does photography . . . has won award certificates or diplomas . . . or does needlework, etc., that number could easily double or triple! That's why custom picture framing is such a profitable opportunity. *Everyone* needs picture frames! That's why you can easily earn \$200 in your spare time!

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## CAR WITH 4 TO 8 CYLINDERS

(Continued from page 68)

cylinders is available whenever you press the accelerator.

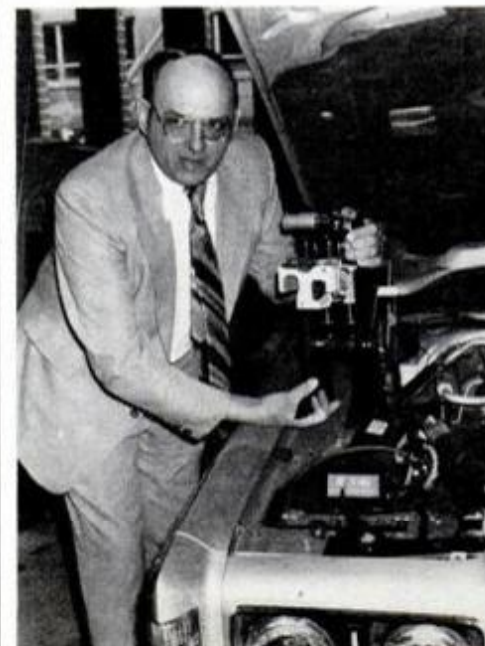
The prototype I drove, a 400-cu.-in. V8 Ford, had a bright red digital readout on the dash to tell you (and your amazed friends) how many cylinders are in use: four, five, six, seven or eight.

It was so smooth a transition, I could not tell as cylinders came in and went out of action. At idle, the vibration is stronger on four than with all eight—to be expected. To underline this, the prototype has a special switch to turn off the selector system and restore the engine to all eight. It was a strange sensation to find that when you revert to eight cylinders, the engine *drops* 100 rpm. It picks them up again when the selector is turned back on, disengaging four cylinders. That extra 100 rpm shows the effect of the pumping losses—and reminds me of those hokey oil improver demonstrations: You can also gain 100 rpm at idle by pouring a pint of kerosene into the crankcase.

### Springs do the trick

The illustration shows how the rocker arm would pivot, not on the regular spherical shoulder of the rocker stud, but on the similarly shaped lower end of a cylindrical cup. The latter is castellated at its upper end and when the engine is not using a cylinder, the castellations (or tabs) are aligned with appropriate slots in the blocking plate above. Therefore, when the pushrod rises, the cylindrical cup pushes against a "weak" spring and shifts closer to the block-

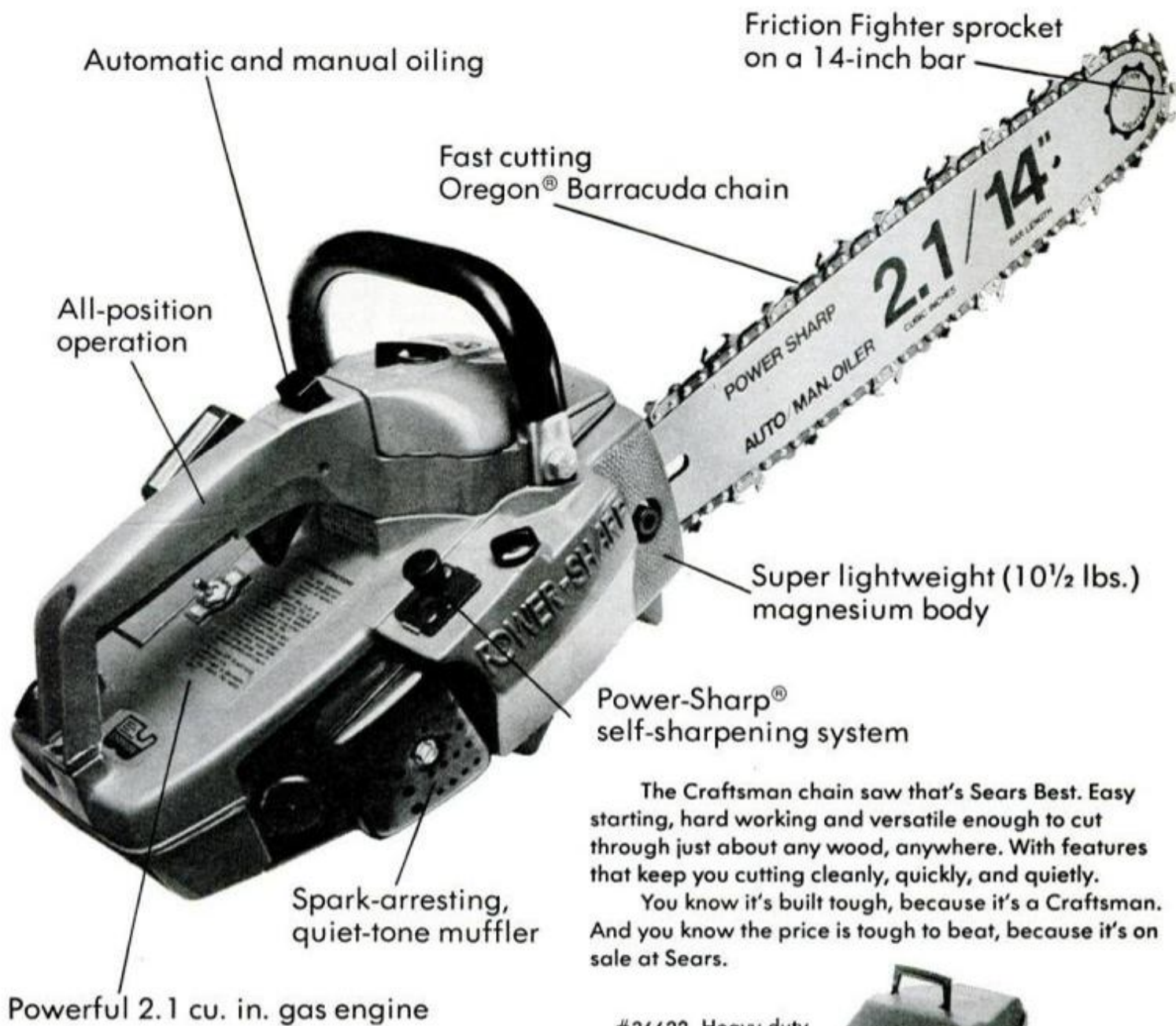
(Please turn to page 204)



Eaton engineer Ray Soeters with valve selector system and PM's test car.



# Save \$50 on the chain saw tough enough to be called Craftsman.

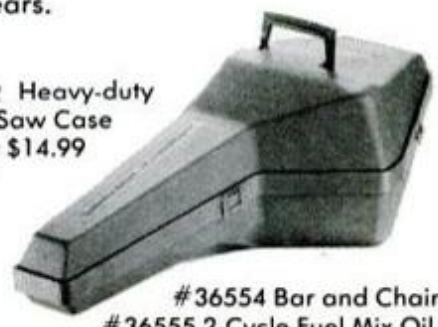


The Craftsman chain saw that's Sears Best. Easy starting, hard working and versatile enough to cut through just about any wood, anywhere. With features that keep you cutting cleanly, quickly, and quietly. You know it's built tough, because it's a Craftsman. And you know the price is tough to beat, because it's on sale at Sears.

**Save \$50<sup>00</sup>**  
**Now \$149<sup>99</sup>**

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#36622 Heavy-duty Chain Saw Case Only \$14.99



#36554 Bar and Chain Lubricant and #36555 2-Cycle Fuel Mix Oil also available.



Tools that have earned the right to wear the name.  
 © 1977 Sears, Roebuck and Co.



# Home Library Computer

*The new Bally Library Computer provides more entertainment and services than man has ever dreamed possible from a single consumer product.*

*The handsome and highly styled Bally Library Computer is made of high impact clear plastic and imitation walnut with gold trim. It measures 5" x 11" x 15" and weighs five pounds.*

This is the story of an incredible product. So incredible that we know of no future consumer product that will have such a far-reaching technological impact on society.

The Bally Library Computer is a small console unit manufactured exclusively for JS&A that resembles a programmable TV game but whose computing capabilities resemble that of a mini-computer. This calculating power and its present and future programs will provide more convenience and benefits than any recent electronic product.

## ELECTRONIC PRINTING CALCULATOR

Imagine the computer as a printing calculator with ten separate memories. You enter the data on the unit's keyboard, but instead of a paper tape, you use your TV screen to scroll out the answers similar to the credits on a movie screen. You can balance your check-book and then double check your calculations by scrolling back to your first entry. By comparison, an electronic calculator with ten memories alone would cost what this entire computer costs—but there's much more.

## A CHALLENGING TEACHING TOOL

Your child inserts a cartridge in the Bally console. Three random math table problems are then flashed on your TV screen. Depending on the speed and accuracy with which those problems are answered, the Bally automatically programs the computer with your child's math level. Problems in addition, subtraction, multiplication and division are then flashed on the screen for the next three minutes, and the computer continually adjusts to a level slightly better than the math level indicated by the previous three answers. The math tables, therefore, remain a challenge no matter how good your child becomes. Psychologists, who were consulted by Bally, helped design the cassette. They stated that the cassette should stimulate math learning and improve grades.

On the same math cartridge is a two player game called Math Bingo. It adjusts to each player's ability so a parent can play against a child or two children can compete against each other at their own math levels—both with an equal opportunity to win. You first answer a math table problem similar to the first exercise; and with a pistol-grip pointer you move a square on your TV screen to the correct answer position on your TV bingo card. The game involves both math skill and dexterity. Each game is totally different since the bingo cards have a million different possibilities. Scoring is constantly displayed, and a typical game lasts approximately three minutes. You can play as many consecutive games as you wish. However, to start the score over, you press the reset button.

## FUN AND ACTION ARCADE GAMES

Picture nine baseball players running out on your TV screen to the sounds of "Take Me Out to the Ball Game" as you step up to bat. That's the scene with Baseball, the arcade cartridge that plays two teams against each other with play so real that you hear all the music, sound effects and see all the action. There are walks, balls, and such realism that the pitcher covers first base when a ball is hit to right field—just like the real game. There are double plays, walks and errors—all part of nine innings of Baseball. On the same cartridge are several paddle ball games but with a new twist. Players can move the paddle, not only up or down like most TV games, but sideways and diagonally.



*The Bally circuit board contains 34 integrated circuits including a Z80 microprocessor. This package represents more computing power in the hands of the consumer than was thought possible this early in the history of micro electronics. The mass production of these components and circuit board has made possible a quantum leap in lowering the cost of what normally would be a very expensive system.*

Other popular arcade games include, Sea Wolf, Red Barron, Panzer Attack (similar to Tank) and dozens of games only previously available at arcades. These same games cost arcade owners up to \$2,000 each.

## MORE VALUE PER FEATURE

Let's quickly review the features—an electronic printing calculator with ten memories, a teaching machine that adjusts to your child's math level and an arcade center that replaces about \$10,000 worth of electronic arcade games with just a few cartridges. Use any one of these features and you could justify buying this unit—but there's plenty more.

With all its sophistication, the Bally Library Computer was designed to keep current with advancing computer technology no matter how sophisticated the development. Bally has provisions in its present system for expansion modules. These devices will permit you to: 1) draw directly on your TV screen with an electronic wand in 32 different colors and eight shades of each color, 2) compose, record and playback music on an electronic synthe-

sizer, 3) record your personal belongings and their value for security purposes and add or delete items while keeping the list in tact, 4) record all your phone numbers and then use the system to dial those numbers on your telephone, 5) play chess on the phone with another player and be able to see all the moves on your TV screen.

## EXCELLENT BUSINESS TOOL

With these expansion modules, businessmen will be able to do all their bookkeeping functions, payroll, inventory control and billing. There will be printers, telephone modems and a variety of peripheral computer equipment that will turn your Bally Library Computer into a significant business tool. And, when used in your business, your Bally unit is depreciable like all your other capital equipment. Even large corporations can use the Bally for specific applications to avoid tying up their larger computer systems.

The Bally Library Computer will turn these incredible add-on features into reality in a planned program starting now. Each month, a new cartridge or accessory expanding the unit's capability will be announced. If you purchase your system from JS&A, you will be alerted to these new accessories by mail on a regular basis in advance of their availability and before any national announcement. You may then order the accessories directly.

Each new cartridge or accessory will offer you a new way to use your system—a way that would justify, by itself, the purchase of the entire system.

## NOT JUST A TV GAME

Don't confuse the Bally Library Computer with the many inexpensive programmable TV games. The Bally computer is a powerful system using the Z80 microprocessor whose cost per byte (the measure of computer memory power) is even lower than a home computer. Yet it has 12,000 bytes of computer power in its most basic system and you are not just limited to teaching, music, entertainment or business applications. The Bally computer can be programmed to do anything any mini-computer can do. A programmable TV game at any price is (and will always be) just a programmable TV game. It cannot be expanded. The Bally Library Computer is actually a computer with a variety of expansion capabilities.

## A COMPUTER IN EVERY HOME

This is the first time a full-scale computer has been offered to the consumer. The home hobbyist with his home computer started the revolution a few years ago. With the specific programs, software and accessories available

from Bally, the age of affordable consumer computer ownership is here now.

### INTERNAL TASK LIBRARY

The computer you buy now has within its 34 integrated circuits an internal library of over forty tasks that it performs. With such an extensive internal library, your computing power is already in the unit you buy. This also means that the Bally unit is a smart computer. (There are such things as dumb computers.) A smart computer can complete a function faster and more efficiently because it depends less on the data it gets and more on what it can already do.

### SAFE FOR YOUR TV

The task library includes a built-in electronic timer which determines the end of a game or program by either score or elapsed time. It also times the arcade games and automatically turns off your unit and blanks out your screen if it is left on too long. Most TV set manufacturers have excluded sets that use TV games from warranty coverage because of the possible lines that appear on the screen from sets left on too long with the same picture. This is impossible with the Bally.

If you get a phone call in the middle of a game, you press the pause control which lets you freeze the action right in the middle of a play and blanks out the screen so you won't damage your picture tube.

The library has sound effects so that each arcade game is complete—from the sound of a baseball bat to that of a torpedo hitting a submarine. It has a math program capable of turning your unit into a scientific, statistical or engineering calculator with the addition of the appropriate cartridge. The library contains the capability of creating patterns on your TV screen, playing music, and accepting typewriter entries. It even has an index that displays everything in your library.



The cassette cartridges add between eight to thirty-two thousand additional bytes of computer power to the basic 12,000 byte system. The pistol grip arcade accessory can be used to play all the arcade games.

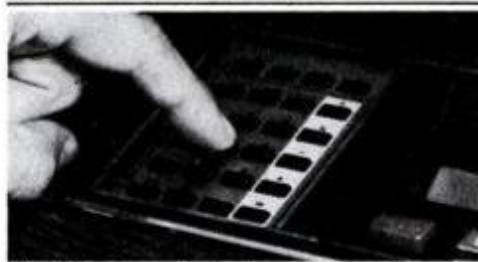
### THE MAJOR BREAKTHROUGH IN BALLY'S COMPUTER

Its extensive internal library and the tremendous power in the computer are the big breakthroughs in the Bally unit. The internal computer has over 12,000 bytes with a minimum of 8,000 bytes in its cartridges. This puts more computer power in the hands of the consumer than six typical programmable TV games or an average hobbyist home computer. It actually has the computational capabilities of a mini-computer, and each time you add a cassette cartridge you increase that capability.

Good resolution on your TV screen is one of the end effects of so much computer power. By comparison, the best programmable TV game image is projected on a screen composed of 64 dots wide by 64 dots deep or 4,096 total dots. The Bally unit is 160 by 100 or 16,000 dots—four times more—so the Bally image is sharper and has finer detail, better resolution, smoother motion, and clearer letters for math or text applications.

### SIGNIFICANT EXPANSION MODULES

The most significant expansion accessory will be the dual magnetic tape decks with an alpha numeric (typewriter) keyboard. With this accessory package, which will cost under \$500 and be introduced by JS&A next year, you can record data and software programs and do everything you can do on any main-frame computer system within the data storage capacity of the Bally unit.



The Bally console keyboard is used to select specific programs from each cassette.

The implications of this add-on module are mind-boggling. First, it adds an additional 16,000 bytes of memory to the powerful 12,000 already in the basic system. Secondly, it provides not only more power and features than are presently available in any home computer, but it contains peripherals that would normally cost thousands of dollars extra and are considered accessories on all other mini-computer systems. Thirdly, it uses the BASIC language which is easy to understand. And finally, each cassette tape in the system will contain an additional one quarter million bytes of storage capability. With the tape decks and keyboard, the consumer will now own the equivalent of an entire computer system complete with peripherals, storage and memory.

### HIGH SPEED PRINTER

A quality high-speed printer will be available soon. This will give you written records from your storage tapes. Store your most frequently called phone numbers, your income tax figures, your savings account deposits, the value of your stocks and bonds or a net worth statement. Then, when you need the information, press a button for a printed record.

### DIAL-A-BARGAIN® ORDERING SYSTEM

Our technicians have programmed JS&A's main computer so you can use the Bally to access our computer directly when Bally's dual tape decks become available. With a special module and cassette, you will be able to 1) call our computer on our toll-free number, 2) place an order, and 3) find out when it will be shipped. Since you communicate directly with our computer, your order is processed immediately and can be shipped within a few hours after receipt. To do this, JS&A engineers developed a \$100 hardware ordering package that will be sent free to those customers who order the basic unit this year.

### THE BIG DIFFERENCE

When you order the Bally computer today, you are making an investment in the future. The basic unit you receive, without a single accessory, will provide more benefits than any other product of its kind in history.

When you buy an expensive product, you must be absolutely satisfied that you get the service and a solid company standing behind your purchase for many years to come. The Bally Library Computer is backed by a substantial company, Bally—in business since 1931 and now the world's largest manufacturer of coin-operated amusement games. JS&A is America's largest single source of space-age consumer products and also a

substantial company—further assurance that your investment is well protected.

### A FRANK DISCUSSION OF SERVICE

The Bally unit is a solid-state computer with its electronics condensed on 34 integrated circuits—all hermetically sealed and all pre-tested for a lifetime of service. The Bally Computer is also self-diagnostic. We have developed a cartridge that lets the unit itself check every integrated circuit and every solid-state component and which displays any malfunction on your TV screen. Then all you do is send the circuit board or your entire unit to JS&A's service-by-mail center for prompt replacement. The cartridge will be sent free-of-charge to JS&A customers after you receive your unit.

Please don't think service requirements are common. They're not. But we wanted to assure you that service was such an important consideration in the Bally design that the unit practically repairs itself.

### COMPLETE AS IT ARRIVES

Each unit comes complete with four pistol grips for use with the arcade and teaching games, an AC adapter (batteries are not required), three free arcade games, the calculator program, its internal library of tasks, complete easy-to-understand instructions and a one year parts and 90 day labor limited warranty—all for only \$299.95.

The arcade games include 1) Gun Fight, in which two cowboys shoot at each other around cactus, covered wagons and other obstacles, 2) Checkmate, a one to four player game in which you build walls around your opponent to win and, 3) Scribbling, a one to four player game that utilizes the pistol grip to doodle different designs on your TV screen (in color with a color set).

A keyboard lets you use your printing memory calculator and a special scroll button lets you scan your entries up or down to review or check your calculations. You may also order with your unit the Baseball and Paddle Games cartridge for \$24.95 or the Math Table/Math Bingo cartridge for \$19.95. A bulletin will accompany your unit listing all the other cartridges and accessories that are available or will be available in the near future.

We feel so positive about this product that we will 1) not charge you anything for postage and handling and 2) give you a 30 day extended trial period to prove that the Bally is everything you expected after reading this article. When you receive your unit, reconcile your checkbook with the calculator, let your child practice with the math programs or have your entire family play the arcade games. After you have used the system under your own conditions and have personally experienced its fun and benefits, then decide if you want to keep it. If not, return it within our 30 day extended trial period for a prompt and courteous refund. You can't lose.

JS&A is marketing a product that will not only greatly influence the future of the computer industry, but will dramatically add consumer conveniences never before dreamed possible. Order your Bally Library Computer, at no obligation, today.

Unit pending FCC approval—allow 4 weeks delivery.  
Dial-A-Bargain is a registered trade mark of the JS&A National Sales Group.

**JS&A** NATIONAL SALES GROUP

Dept. PM One JS&A Plaza  
Northbrook, Ill. 60062 (312) 564-9000

CALL TOLL-FREE... 800 323-6400  
In Illinois call ..... (312) 498-6900

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# How to make a back-yard skating rink



Your skating rink can be as large as you like; ours, built last winter, was 60x75 ft.

**Y**ou can make a really big back-yard ice-skating rink without the bother and expense of a 2x4 frame and sheet plastic just by watering a flat piece of lawn, if you have the right weather—temperature below 20° F.

The ideal base is about a 2-in. cover of snow. You can make do with less, but the process takes longer; more than 4 in. means packing or removal. Soak the snow to slush with your hose and let it freeze, then keep adding coats to build up the surface and as needed for maintenance. With good conditions and enthusiasm, you'll have a usable rink in two days, and a fine one in five.

The only effect on next year's turf will be slightly retarded growth—but *don't* put your rink over a septic tank or leach bed. Best watering time is night, at 10° F. or less. Leave the outdoor faucet on, regulated by the indoor valve; after attaching your hose, thaw the faucet with hot water. Don't skate at 25° F. or above—it cuts the ice. My family has been making rinks this way for more than 20 years.—*Tom E. Mahl*



On a large rink, it's best to water back and forth in sections approximately 6 ft. wide across the width of the pool.



A strong rim is important. Manicuring it with a snow shovel will keep it hard; removing chips will prevent porosity.



To get a flat surface, take the nozzle off your garden hose and let the water run to cover the area evenly, find its own level.



A base of more than 4 in. of snow will have to be packed down. It's more easily done with a lawn roller than with feet.

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

Salem's why. Great taste. Fresh menthol.  
Switch to Salem for enjoyment.

**Salem King & Salem 100's.**

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

KING, 100's: 18 mg. "tar", 1.2 mg. nicotine, av. per cigarette, FTC Report DEC. '76.

Матеріал, зашифровано

# POULAN INTRODUCES A \$79.95 TRIUMPH IN AMERICAN INGENUITY.

In today's world, building a quality gas powered chain saw for less than \$80.00 was no small challenge. But Poulan did it. And did it incredibly well.

Introducing, the revolutionary Poulan Micro XXV. A beautiful, high-quality chain saw at a ridiculously low \$79.95.\*

Yet, even at that price, it's loaded with features you'll find only on more expensive saws. Automatic chain oiling. Power to breeze through an 8-inch log in less than 10 seconds. A super-quiet muffler. A virtually in-



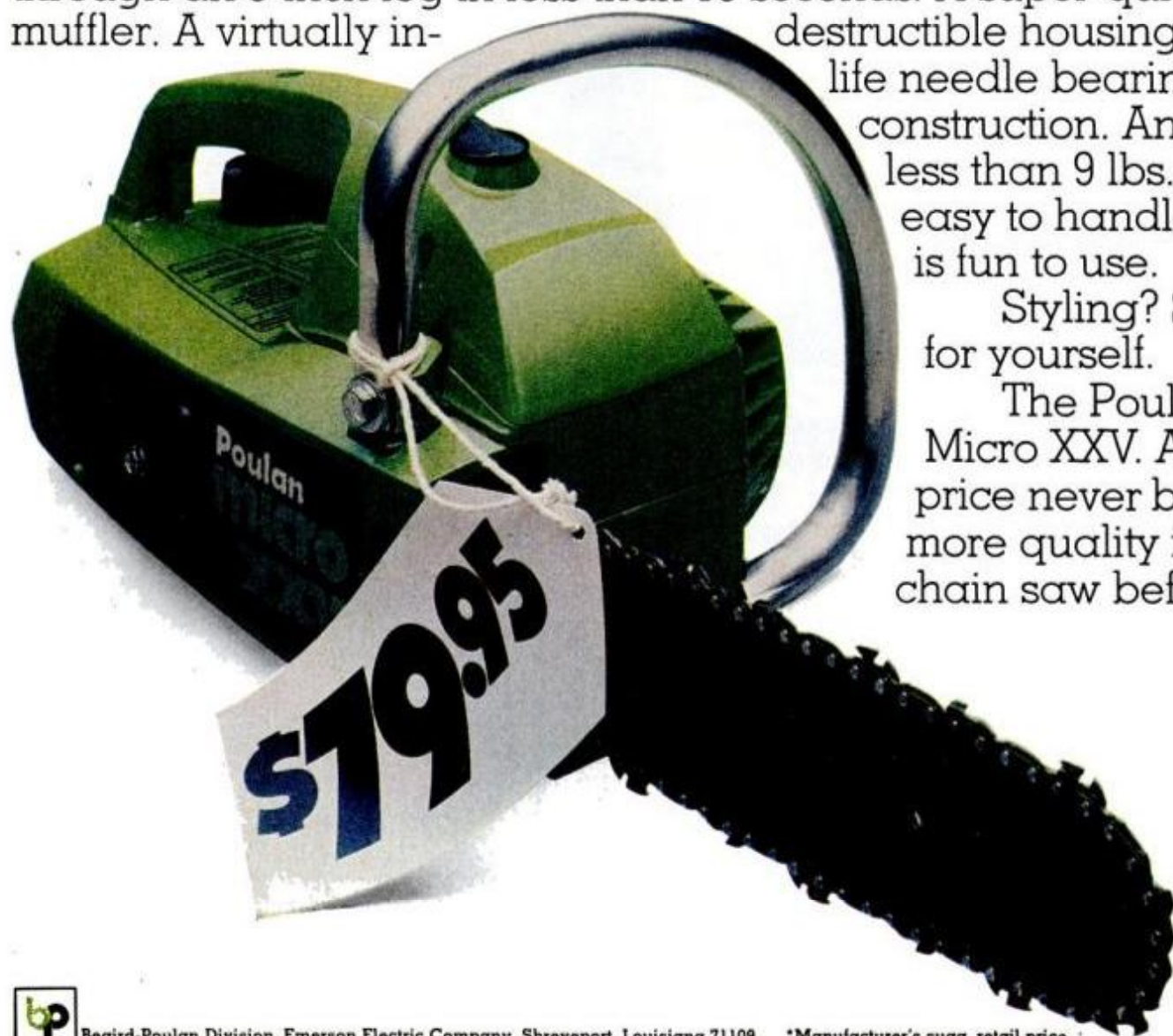
The Micro XXV has automatic chain oiling, a super quiet muffler and plenty of cutting power.

A virtually in-

destructible housing. Long-life needle bearing construction. And at less than 9 lbs., it's as easy to handle as it is fun to use.

Styling? See for yourself.

The Poulan Micro XXV. A \$79.95 price never bought more quality in a chain saw before.



Beard-Poulan Division, Emerson Electric Company, Shreveport, Louisiana 71109.

\*Manufacturer's sugg. retail price

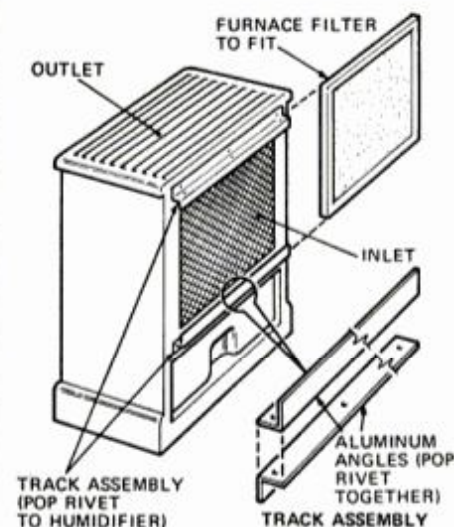
# HOMEOWNERS' CLINIC

## QUESTIONS ANSWERED

### Stagnant water in humidifier

Two PM readers offer suggestions for slowing down the process and eliminating the odor of stagnant water in humidifiers mentioned in June '77 Homeowners' Clinic (see *Stale Water*).

Marion D. Statler of Papillion, Neb., uses a small furnace filter attached to the back of her humidifier as shown in the drawing. The



### Humidifier with slip-in furnace filter.

filter catches dust and lint that otherwise go into the water and help cause stagnation. She cautions readers to take special care not to puncture the humidifier's inner tub when they are attaching the track assembly.

C. H. Donegan Jr., of Sequin, Tex., suggests using commercial additives sold for the purpose of freshening water. The additives also prevent to some measure the formation of troublesome calcium deposits that make cleaning difficult.

Thanks to both readers for sharing their helpful humidifier tips with us.

### Removing paint spatters

*I just moved into a home with dark oak trim that has been spattered with paint. How can I remove the paint without refinishing?—Cliff Turnbull, Ellsworth, Wis.*

Possibly you can rub the paint specks off with 00 steel wool. Next try scraping lightly with a razor-blade scraper, followed by a light rubbing with steel wool. Chances are that you'll damage the wood

finish in places. You should plan to clean all of the woodwork and then apply one coat of semigloss or gloss varnish.

### Heating system woes

*Water in my hot-water heating system froze and burst the tubing in the baseboard units. This was due to a furnace malfunction while I was absent. I want to use an antifreeze, but my furnace repairman says he believes the antifreeze will attack gaskets and affect operation of the controls. Is he right?—John R. Woelfel, Williston, Vt.*

Glycol antifreeze should not go into the boiler. If you can install a heat exchanger in a section of the house, in one of those zoned areas, you can put antifreeze in the exchanger.

Use equal parts of water and glycol antifreeze to make a solution for the exchanger. Again, don't put antifreeze in the boiler.

### Refinish it again, Sam

*My old upright piano needs refinishing badly. The original finish has become rough and pebbly. How do I go about refinishing it?—Glen Schmidt, Mount Hope, Kans.*

First and foremost, use extreme care in refinishing your piano. Professional refinishers would remove the inner parts of the piano before working on the finish.

Wear gloves, a long-sleeved shirt and goggles. Begin by using a commercial stripper to remove the old finish. Then use wood putty to fill any dents or scratches. Stain isn't necessary to protect the wood, but if you want to darken the surface do so. Next, use a paste wood filler to fill the wood's open pores if the piano is of mahogany. When dry, apply sanding sealer to all wood parts.

Finally, apply several coats of varnish (make certain it is compatible with your particular brand

of sealer); sand lightly between all finish coats.

### Furnace pipe wrappers?

*Is there anything with which I could wrap the exhaust (smoke) pipes on my gas furnace and water heater to increase the radiating surface area? I cringe to see all that heat going up the chimney!—K. Severns, Woodstock, Ill.*

If the vent pipes are less than 5 ft. long, you'll gain little in heat savings. Also, any wrapping that cools the pipe, no matter what length, risks accumulation of frost in the flue in severely cold weather. This can lead to further problems. This is especially true if the chimney is exposed anywhere along the length of the flue. In an outside chimney, this is along much of its height; in an inside chimney, it's that portion exposed above the roof. For this reason, I don't recommend the wrapping.

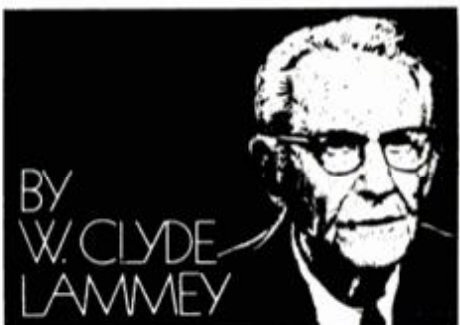
### Cold air comes blowing

*Half of our basement is a dirt-floor crawl space with one grated vent that admits a blast of cold air in winter. My husband says the cellar must be ventilated or condensation will "destroy the whole cellar." But I would like to close the vent because it's cold doing the wash in the basement. Is he right?—Mrs. Fergus Nickol, Fairfield, Ohio*

As long as the crawl space has air circulating between it and the part of the basement you use, the outside vent can be closed during cold weather. The heat given off by the furnace will keep moisture content in the air at a relatively low level. When warm weather comes, reopen the vent. Otherwise, your basement may begin to smell musty.

An alternative is to seal off the crawl space from the basement and leave its vent open. **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 orders to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.*



**T**he garage-sale price for traverse rods in perfect condition was too good to pass up: \$2 for four, with all fittings. New ones are about \$8 apiece.

When these bargain rods proved too short for the windows I meant them for, I figured out how to lengthen two of them, using splices made from one of the others. Here's the technique (remember that you'll need one extra rod for each two to be lengthened):

Start by measuring the window casement and noting the required length for the finished traverse rod. Disassemble one end of the rod by loosening the screw that clamps the slightly enlarged sleeve to the rest of the rod. The end assembly will then slip off.

### Making the splice

Completely remove one end assembly from the spare rod and strip it of rollers and clamps. Hacksaw off the enlarged portion of the spare end assembly—about 2½ in.—as in photo 1. File off sawing burr; this piece will be your splice.

Cut the extension length needed

from the spare rod and file the end smooth—photo 2. Push the splice halfway onto the main rod and push the extension section into the other half of the splice, as in photo 3.

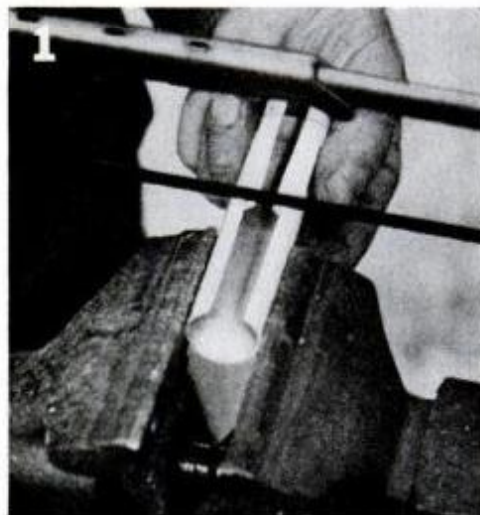
Then drill through the rod and splice, and through the extension and splice, for fasteners—photo 4. You can use small nuts and bolts, rivets or squeeze rivets. Then push the original end assembly onto the extended rod—photo 5—and tighten the clamping screw.

When you put the lengthened rod together, be sure to retain the right number of hangers on each end, add-

ing more as necessary from the spare rod. Remove the drawstrings from their hooks on the center carriers, center the carriers, adjust the drawstrings and rehook them.

### Shortening a rod

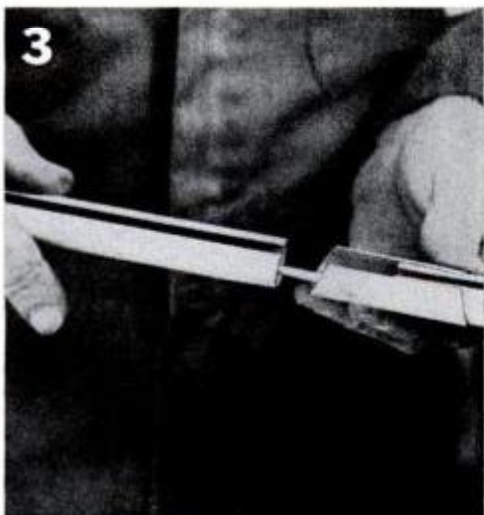
Shortening a traverse rod is an even simpler procedure: Loosen the clamping screw and slide the end assembly off. Cut the rod to the desired length, deburr the cut edge and reassemble the rod. As in lengthening a rod, take care to balance the number of hangers and to center and adjust the carriers.—*Willis Gore*



Cut off the enlarged part of the end assembly from a spare rod for your splice.



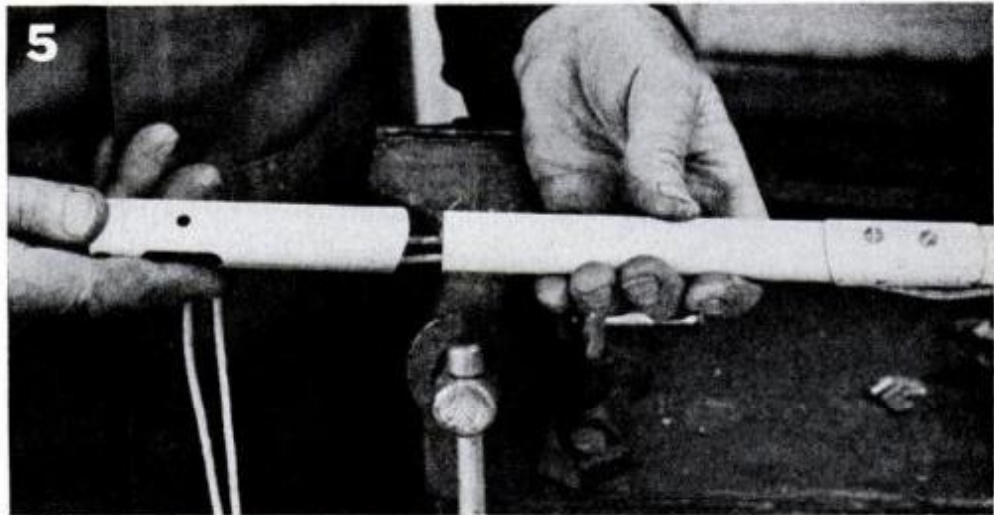
Then cut the extension length needed from the spare rod and file off burr.



Place the splice on the rod to be lengthened and push in the extension piece.



Drill through splice and rod and through splice and extension for fasteners.



Push end assembly from lengthened rod onto the extension piece and tighten screws. Add hangers, center the carriers, adjust and rehook cords, and rod is finished.



# ANNOUNCING THE ALL-NEW '78 FORD BRONCO.



The first 4-wheeler that puts it all together.

1. Big Cube 351 V-8.
2. Part-time 4WD with optional automatic.
3. Rear footwell.
4. Rear flip-fold seat option.
5. Four-speed transmission.
6. Front quad shocks option.
7. Free Wheeling package option.
8. Off-road handling package option.
9. Privacy™ Glass option.
10. Choice of bucket or optional front bench seats.
11. Front stabilizer bar.

**COMPARE IT TO ANY 4-WHEELER, ANYWHERE.**

# '78 BRONCO. THE TOTAL 4-WHEELER.



## COMPARE TOUGHNESS.

**Bronco's Tough Truck Chassis.** The all-new Bronco has a rugged steel ladder frame with extra thick frame-rails for

4-wheeling toughness.

**The Off-Road Handling Package.**

From boulder-strewn gullies to tough mountain trails, Bronco's optional off-road package can help

handle it. There are gas-filled front quad shocks, heavy-duty rear shocks and a rear stabilizer bar. 10x15 on/off road tires available. 11/1/77.

**Angles of Approach, Departure and Clearance.** The new Bronco is a highly maneuverable full-size 4-wheeler.

Minimal body "overhang" and excellent ground clearance let you get in, over, and out of tight places.

**Choice of Part-Time 4WD with Automatic.** Ford offers you part-time with locking front hubs or full-time 4WD with optional automatic. Or part-time 4WD with a standard 4-speed. Plus a variety of axle ratios.



## COMPARE COMFORT.

**Bronco's Family-Size Comfort.** Bronco does a comfortable job of seating a family of six, with front and rear bench seat options. With deep foam seats, pile carpeting and more, you've got all around family-size comfort. But don't take our word for it, compare Bronco yourself.

**Rear Flip-Fold Seat.** In seconds, you can add even more cargo-carrying capacity to Bronco's already roomy interior. The rear flip-fold seat option lets you load



extra gear or groceries from the back with virtually no effort. And for still larger loads, the seat is easily removable.



**Extra Room For Your Legs.** Bronco has a rear footwell that lets you sit with your knees and legs in a more comfortable position.



**FORD**  
FORD DIVISION



**Bucket or Bench.** You can opt for standard side-support front bucket seats that help keep you from swaying side-to-side during hard cornering. Or you can get it with an optional full-width front bench seat. Seating three comfortably up front is the whole idea.



**Total choice, too!** Bronco comes in a wide variety of two-tone color combos. Or—pick the super-sporty Free Wheeling Bronco (above) with sport steering wheel, tri-color tape treatment, black bumpers and mirrors, white spoke wheels, RWL tires.

**Make your own comparison.**

STANDARD	BRONCO	OTHERS
351 V-8 Engine	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4-speed transmission	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bucket seats (2)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power front disc brakes	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Rear footwell	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power tailgate window	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>OPTIONS</b>		
Choice of part-time 4WD with automatic	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Rear flip-fold seat with easy-release	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Off-road handling package	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Privacy™ Glass	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Free Wheeling package	<input checked="" type="checkbox"/>	<input type="checkbox"/>



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

**FORD BRONCO.  
COMPARE IT TO  
ANY 4-WHEELER,  
ANYWHERE.**



Come to where  
the flavor is.



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

18 mg. "tar," 1.1 mg. nicotine av. per cigarette, FTC Report Dec. '76

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

# SPRUCE GOOSE

## pterodactyl of World War II



Howard Hughes at the controls of H-4 prior to its only flight.

Was the flight accidental or a Hughes-planned secret? Rea Hopper, the plane's chief designer, gives us some exclusive in-flight clues. Now Howard Hughes's Hercules will go on display at a West Coast museum where all can see it.

by Capt. Charles Barton

**T**he press dubbed it the "Spruce Goose" although it's mostly birch. Howard Hughes hated the term. Senator Owen Brewster, who spearheaded a 1947 investigation of Hughes' wartime contracts, derided it as a "flying lumberyard." Many thought it would never fly. But fly it did—one time—in 1947. It's the Hughes H-4 Hercules, the world's largest airplane.

Since its maiden flight, the H-4 has languished in a special humidity-controlled hangar on Terminal Island in Long Beach, Calif., guarded 24 hours

*(Text continues on page 86. Turn overleaf for color spread of world's biggest proposed plane.)*

Known variously as a "flying lumberyard," "Spruce Goose" and the "Hughes H-4 Herc," the world's biggest flying boat had a tail surface 5 feet longer than the wingspan of a 727; wings 100 feet wider than a C-5A.



## 1200 passengers on three decks... a comeback for

by Paul Wahl

**O**n Oct. 23, 1945, an American Export Airlines Douglas DC-4 took off on the inaugural flight of commercial land-plane service between New York and London. The era of the transoceanic flying boat had ended. Now, a generation later, its comeback is planned by a Japanese firm that has a 1200-passenger, 1.04-million-pound, giant seaplane on the drawing board.

The proposed craft is called Shin Meiwa GS (for "Giant Seaplane") and will dwarf all of today's largest airplanes including the Boeing 747 and Lockheed C-5A. Only in its wingspan, 255.9 feet, is the GS smaller than Howard Hughes's famed "Spruce Goose." Overall, the 522-ton aircraft will be 293.9 feet long and 71.3 feet high; the extra-wide, rectangu-

lar hull will have a beam of 27.6 feet.

With 10-abreast seating, the 747 accommodates a maximum of 500 passengers. The triple-decked GS will carry 344 persons on its upper deck, 626 on the main deck and 230 on the lower deck, to reach the 1200 total. Payload is estimated at 120 tons.

Designed for transoceanic service, the GS will have a range of 3500 nautical miles. At an altitude of 37,000 feet, the cruising speed will be 486 knots. The plane will take off in 3084 feet at 92 knots and land in 1903 feet at 102 knots. It will operate in Sea State 3 (maximum wave height of 5 feet).

Six advanced, high-bypass-ratio turbofans of about 77,000 pounds thrust will be needed to power this mammoth flying boat. For enhanced STOL capability, the engines will jet exhaust air over the wing's upper surface in a propulsive lift

concept, similar to that of the Boeing YC-14. To that end, the engines will be mounted above and forward of the supercritical wing. An added advantage of this arrangement is that the engines are out of spray range and thus safe from danger of flameout due to excessive water ingestion.

Designers estimate that the state-of-the-art advances required by the Shin Meiwa GS—advanced turbofans, improved hull and supercritical wing designs, composite materials for weight savings and saltwater-corrosion resistance, water evacuation systems and the like—might take a half-dozen or so years to achieve. In today's yen, this flying boat would be priced at the equivalent of some \$60 million.

Impetus for bringing back the long-range flying boat is the current high price of real estate, particularly in Japan.



Flying firefighter boat Shin Meiwa PS-1 by the same company is now in production.

## flying boats?

Cost of land-bound airports has soared and this means higher landing fees and increased passenger fares. Docking and terminal facilities for flying boat operations would be significantly less expensive. A seaplane base with the same traffic capacity might cost 25 percent less than the estimated \$3-billion price of the new international airport proposed for Osaka. The lower cost of facilities and the plane's great payload accommodation are expected to make the Shin Meiwa GS economically feasible—despite the flying boat's higher unit and operating costs compared with conventional airliners.

Shin Meiwa Industry Co. of Kobe is now the world's only builder of larger seaplanes. Similar four-turboprop STOL aircraft, the Shin Meiwa SS-2 antisubmarine patrol flying boat and SS-2A amphibian are in service with the Japan

Maritime Self-Defense Force, as is the US-1 search and rescue amphibian. A firefighting water bomber, based on the same design, has been developed for the National Fire Agency.

The Giant Seaplane is one of four flying boat concepts presently under study by Shin Meiwa. Others include a Light Amphibian (LA), Medium Amphibian (MA) and Medium Seaplane (MS). All will have shoulder-mounted engines for upper surface blowing and all but the LA will have supercritical wings.

Probably the first of these to be built will be the LA, since it's within the state of the art. A twin-turboprop, 40-passenger aircraft, the LA is intended primarily for island-hopping feeder-line service. Model MA, a medium-sized amphibian, powered by four turboprops, would carry 400 people on two decks. A scaled-down four-turboprop version of the GS, called MS,

will accommodate 300 travelers. While not amphibious in take-off and landing, the latter will be equipped with beaching gear for moving in and out of the water.

Although few flying boats have been built during the past 30 years, several hundred—mostly of World War II vintage—are still in regular service worldwide, doing jobs that other aircraft cannot handle as effectively. They fly search and rescue missions, do naval patrol duty, fight fires as water bombers, haul both passengers and freight where land planes can't go. Now quite ancient, many of these flying boats are fast approaching retirement. Just replacing them should add up to a good market for Shin Meiwa.

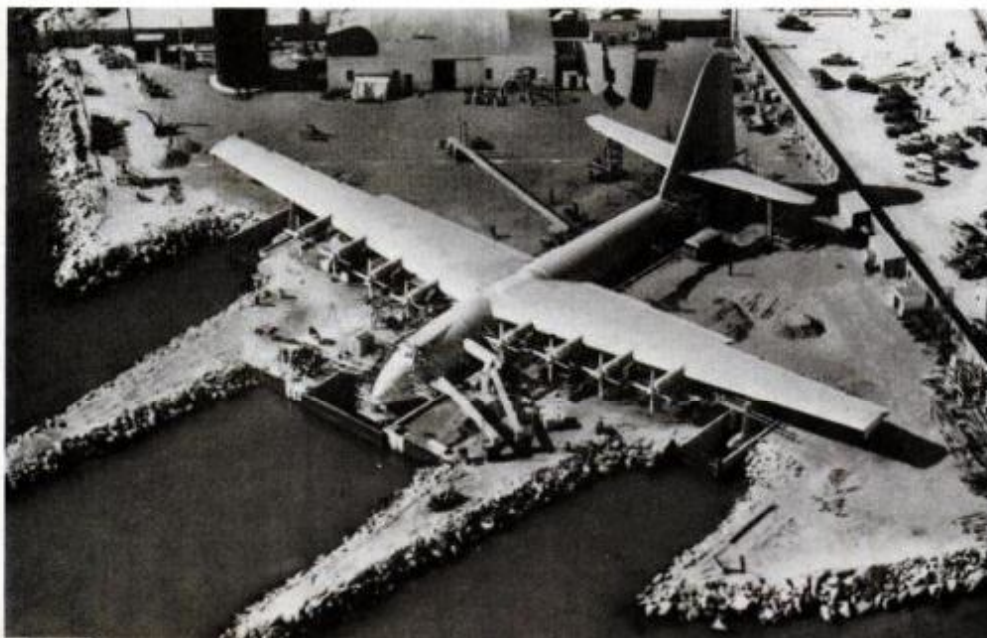
As for the Giant Seaplane: It may seem like a far-out idea, but it just might be the jumbo jet of the 1990s. If so, the spaciousness of the vast hull could permit a revival of luxury travel long gone.



H-4 interior under construction, looking aft (above). Vast deck, when completed, was designed to support 60-ton tanks and armored vehicles. Hull is 25 feet wide by 30 feet high.



Hughes and crew on flight deck of the H-4 Hercules inspect the radio section prior to "high-speed taxi run" that turned unexpectedly into a one-mile airborne flight. Below, mighty H-4 is readied for test run. Note special drydocks for wingtip pontoons.



a day. "It's in perfect condition," said the head of a government inspection team last November. "You could fly that plane."

When the proposal was made to dismantle the H-4 Hercules (parts were to go to eight different museums), protests were heard from around the country. Now there's news: If all goes well, the legendary Spruce Goose may remain intact and be placed on display at the new Long Beach Air Museum of the West, not far from its present resting place.

Some Hughes employees called it the "Jesus Christ" plane, for that was the awe-struck exclamation often breathed by visitors seeing it for the first time. Its 320-foot wing is 20 feet longer than a football field and 100 feet longer than that of the giant Lockheed C-5A Galaxy. The vertical tail fin towers eight stories—85 feet—above the keel. The horizontal tail surface is 5 feet longer than the 108-foot wingspan of a Boeing 727.

### Designed for military cargo

It all started during a fateful week in May 1942 when German submarines sank 300,000 deadweight tons of shipping. Losses were twice the projected rate of launchings—and metals to build more ships were desperately scarce.

To help solve some of the many problems, F. H. Hoge Jr. of the War Production Board suggested building a fleet of large airplanes, up to 200 tons. Landing fields big enough and landing gears strong enough to accommodate such air transports would be problems, but they could be overcome by building flying boats, he said, pointing out that it would be desirable if the use of critical materials—metals—could be curtailed.

Henry J. Kaiser thought he saw a way to get an assembly line "in production in six months or less" to build seaplanes that would carry 500 troops, or the equivalent in armor. Unable to interest the aviation industry, he sought out the late Howard Hughes, famed World War I aviator and wealthy industrial empire builder.

Here was a challenge. Hughes and a dozen other crackmen were quickly sent to the NACA Research Center at Langley Field to come up with a final design.

### Fatal crash ends early test

Hughes had a running debate with NACA experts on the proper center of gravity for seaplanes, many of which skipped and bounced dangerously on landing. Hughes wanted to move the center forward, farther ahead of the step. To prove his point, he ran tests with a ballasted Sikor-



# Yesterday's leviathans of the sky



Sikorsky S-40



Boeing Yankee Clipper



Dornier Do X



Caproni

Igor Sikorsky's flying boats, starting with his first "big" Clipper—the four-engined S-40—helped launch the world on transoceanic flights that would shrink the seas and continents. Following his far-famed series of "Winged-S" planes came the large-hulled, luxurious Vought-Sikorsky Clippers, along with the big Boeings and Martins that made Pan American Airways synonymous with transoceanic air travel all across the globe. The best of them made the transatlantic crossing from Port Washington, N.Y., to Lisbon, Portugal, in 24 hours, with a 15-minute refueling stop in the Azores.

Spectacular though they were for their time, the commercially successful flying boats of the early '30s and '40s were relatively modest in size and accommodations compared with a few giant seaplanes some of which preceded them.

As early as 1919, an Italian bomber builder named Gianni Caproni designed a huge nine-winged flying boat that looked like a one-story house on a barge, topped by three sets of triplane wings in tandem. It was supposed to carry 100 passengers, but the eight 400-hp engines evidently weren't enough to keep this ungainly craft airborne. Lord C.G. Gray, an otherwise unidentified observer of the plane's only test flight, described the 1921 event for posterity. Leaving the water, he reported, it gained a bit of altitude, then "slowly and deliberately it dove into the sea."

By 1929, the world's largest airplane was the German Dornier Do X "flying ship," accommodating 150 passengers and a crew of 10. It was powered by 12 600-hp engines in tandem pairs above the wing and cruised at 118 mph. The Do X had a 157.5-foot wingspan, was 131.4 feet long, and had a normal flying weight of 114,640 pounds. On Nov. 2, 1930, it left Friedrichshafen for New York, arriving 10 months later on Aug. 27, 1931, after a series of mishaps and delays. The Do X was not a commercial success, due in part to the fact that, during its day, German overseas air transport was dominated by airships.

sky flying boat. Unfortunately, the larger engines he had installed moved the center of gravity even farther ahead—to the point where Hughes lost control and dug in a wing landing on Lake Meade. Two passengers died. Hughes was badly injured and the plane sank.

Nevertheless, close collaboration between NACA and the Hughes group resulted in an outstanding model of the hull performed well, and the wing and nacelle design also proved excellent.

It had begun to look as though

Hughes had overcome the problems inherent in size—an overhang wingspan 50 percent greater than the 70-ton Martin Mars. This could have invited torsional wing flutter, vibration, deflection and control problems never before experienced. However, while everything seemed to go well in the early stages, delays in construction threw the whole timetable into a tailspin.

Major difficulties crept in due to Hughes's combining the giant size of the plane with wood construction—even though he was well experienced with the material. Elaborate and

costly jigs and dies had to be improvised and new glues and gluing techniques developed.

Birch was selected as a structural material because it has a superior strength-to-weight ratio, and good-quality spruce was hard to get. The wood laminating process known as Duramold was used, this on license from Fairchild.

Three different kinds of glue were ultimately used to hold the Spruce Goose together: one that cured at 300°F., a second that needed only 70°, and a medium-temperature for-

(Please turn to page 174)

# New snowmos... more style and spunk

With racing colors and clothes to match, this winter's latest go-in-the-snow machines cool with breeze or liquid for hotter, but quieter, performance.

by Bill McKeown  
OUTDOORS EDITOR



Ski-Doo's Elan and Elan Deluxe 250s repeat colors in drivers' clothes (top). Two of John Deere's five 1978 models are Cyclone and Liquifire (above, left). Scorpion has new Whip (above, right) and Scorpion machines. Yamaha's five models, including Enticers and Exciters (below), reach 50+ hp.



**S**nowmobiling is better this year because it's growing up—and settling down. Machines offer more performance (at more cost). Extensive trail systems in some northern states and provinces provide long back-country runs where snowmo groups can stay away from restricted private property. Fewer manufacturers are in the chilly field, but most survivors look like they're in business for keeps.

Mechanical upgrading involves major improvements this year, but they're not brand-new. Innovations that have been developing for years are now available on many models. While the percentage of snowmobile owners who race is comparatively small, racing has speeded up the research and testing on a number of modifications.

Liquid cooling is one such per-



Liquid cooling is reported to give snowmobiles more even temperature control, better performance, quiet operation. Polaris TX-L 340, developed from racers and top of nine-model line, has it.



For side-by-side snow sport, Ski-Doo Elite has a different look, heated handlebars, reverse gear, liquid-cooled rear-mounted engine, twin tracks. (You can even order monograms.) Price: \$3995.

formance option. "Who needs it?" was the question from the big manufacturers for several years. Now, it turns out, they were busy watching and playing with it behind the scenes. This winter a number offer it. But with all the snow and cold air around, who needs coolant to prevent engine overheating? Engineers point out that any engine performs best when it can be tuned to one set temperature. Liquid coolant allows efficient operation at air temperatures from well above freezing down to below zero.

Adjustable suspension to soften or stiffen the ride is another modification available now on some machines. Slide rails, one more bonus from the racing circuit, are a substitute for bogie wheels on many models.

Bombardier, Ltd., is introduc-

ing a series of eight snowmobiles with a variety of engines and features available. The 280-pound single-cylinder Elan is lightest and, at \$995, cheapest in a line of 16 that range through Olympique, T'NT, Everest, RV (for rotary valve), Alpine, Blizzard and Everest to the \$4000 built-to-order Elite with side-by-side seating. The last three have liquid-cooled engines. Bombardier's Moto-Ski Div. will offer Futura, Spirit, Nuvic and Sonic Machines in nine models.

Arctic Enterprises will have their little 60-cc Kitty Cat for kids, plus 12 models of the Arctic Cat Lynx, Jag, Cheetah, Panther, Pantera and new liquid-cooled El Tigre that will range from 250 to 500-cc and from 18 to 70 hp.

New from John Deere is a 275-pound lightweight Spitfire with

(Please turn to page 170)

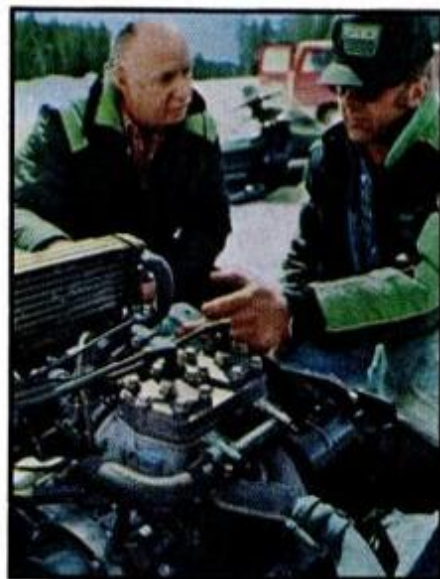
## Arctic Cat's Rocket

The performance crew called this new machine a "Crotch Rocket;" PM's test rides showed me why.

We had to go to 10,000 feet in the Rockies to preview Arctic Cat's El Tigre, a machine that



A going machine, Arctic Cat's El Tigre (above) uses liquid-cooled radiator and heat exchanger pointed out below by firm's performance chief, Marvin Ode.



may be just about the hottest snow-slider you can buy this year. At flying speed over snowdrifts, the speedometer was flickering well over 50. Down at sea level on a smooth frozen lake, this buzz bomb could certainly approach 100, and speeds over 90 have already been reported.

The machine is probably safe since those excessive speeds should scare any sane driver. I liked the low-end power as I climbed the face of steep powder-snow mountains. Conclusion: Try this liquid-cooled rocket for hot flashes in the snow.—B.M.

# New ways to camp in the cold

The latest winter challenge is overnighting outdoors. Backpackers, skiers and snowmobilers are coming up with compact gear for comfortable camping in the snow.

by Jim Elder

**D**o crowded summer campsites get you down? Biting bugs keep you in? Short summer seasons freeze you out? Many campers are finding a fine new time of year out in the snow and are taking to snowshoes, cross-country skis, backpacks and snowmobiles to try out the new sport.

Heavy old-fashioned summer gear loaded on weighty cargo sleds originally bogged us down. These "trailers" for snowmobiles increased fuel consumption, decreased mobility and radius of action, and compromised fun. One ridiculous rig might have buried snow-camping forever. It was fittingly shaped like a coffin and had skis that were too long to follow a trail turn. It would open out to sleep four—if you ever got it to your destination.

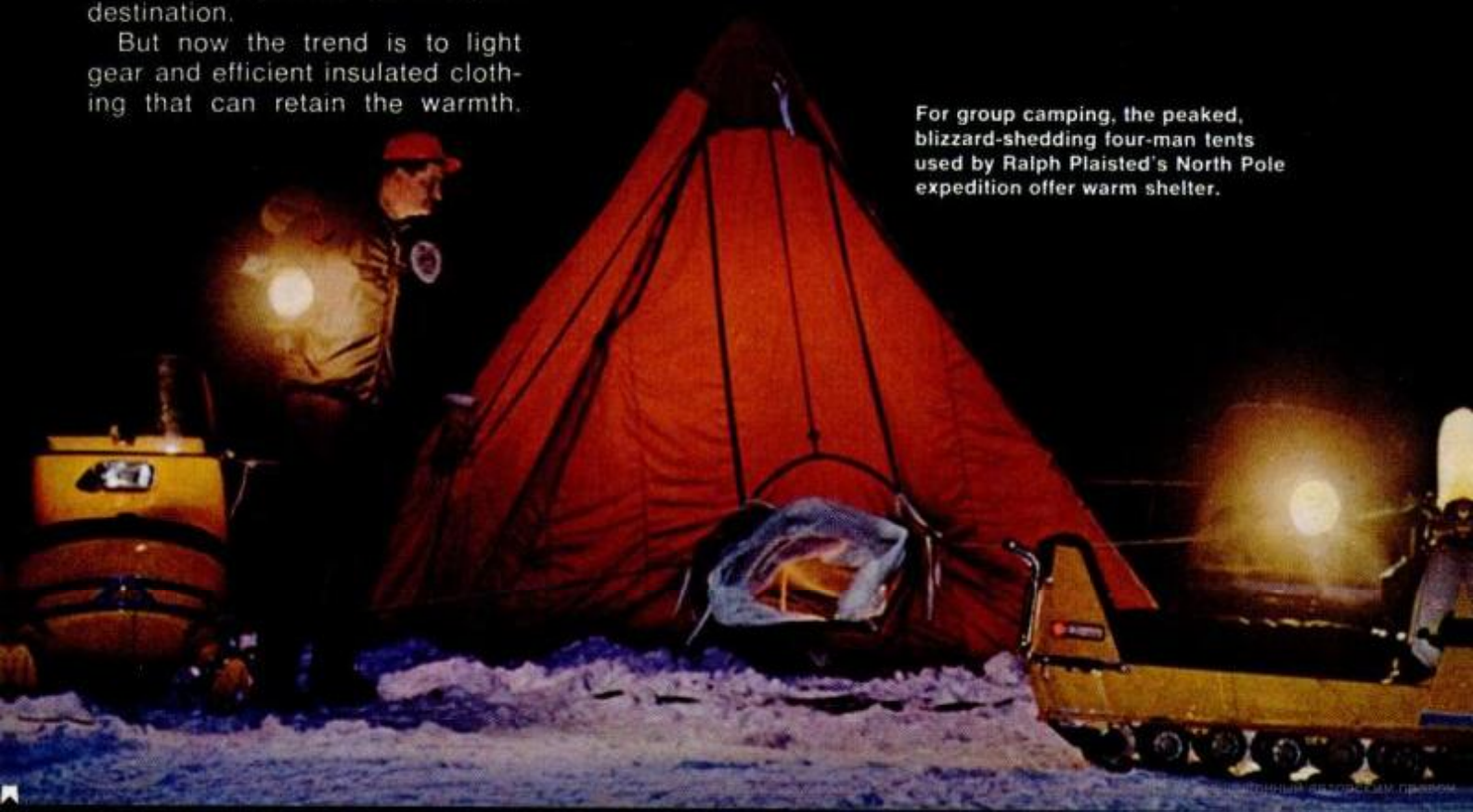
But now the trend is to light gear and efficient insulated clothing that can retain the warmth.

We've learned from backpackers that small tents are easier to pack along and keep warm in than big ones when only two are on the trail. There's no need, it has been found, to build huge melt-into-a-pit bonfires. With supplies from any backpacking or ski-touring shop and perhaps a side visit to a cycle dealer, you can outfit two snowmobilers, on two machines, for a weekend in the woods in the snow and not load them down so that a cargo sled is needed. Easier still are trips where fuel is available along the way or has been cached in advance.

What else do you need? Let's start with what you can leave behind: A big, heavy canvas tent, an ax, a big campstove, catalytic



For group camping, the peaked, blizzard-shedding four-man tents used by Ralph Plaisted's North Pole expedition offer warm shelter.





Anchoring a tent in the snow can be done by burying long snow pegs or securing guy lines to snowmobiles. Weight of campers inside helps hold tent in place.



For a camping couple, no snowmobile cargo sled is needed over a weekend. Pak Rak on rear of the machine can carry the necessary compact equipment. As shown, a backpack two-man tent with a fly, sleeping bags, small stove, freeze-dried food, cook gear for food and melting snow for water, spare clothes, parts, and tools are essentials.

heater, gas lantern, weighty air mattress, cast-iron skillets and expedition-size down sleeping bags. The big tent and lantern make sense at an extended-stay base camp, and the catalytic is a luxury there for drying and warming. But folding saws work as well as axes and are safer. By switching to these types of compact items, we've eliminated a cargo-sled load of gear.

A tent does not warm you—it simply keeps your own warmth in and the snow out, so a small backpacking tent is fine. It should be strong, have a waterproof floor, be double-roofed with a rain fly. Self-supporting designs require fewer pegs and save the time required to bury dead-man sticks. Short pegs won't hold in snow, so special stakes or branches must be buried securely to anchor guy lines. Unless you want to wake up with a frosted face

from your own breathing, moisture must escape. Rain-fly designs allow this. Pick a good "mountain" tent.

Inside, and on top of a compact closed-cell foam pad, you don't need 20 blankets or a fortune in goose down. Though down still offers best insulation, it absorbs moisture and can be difficult to air-dry on gray winter days. Many campers have switched to synthetics. Your bag should have good shoulder and head hooping, adjustable to your metabolism and the weather.

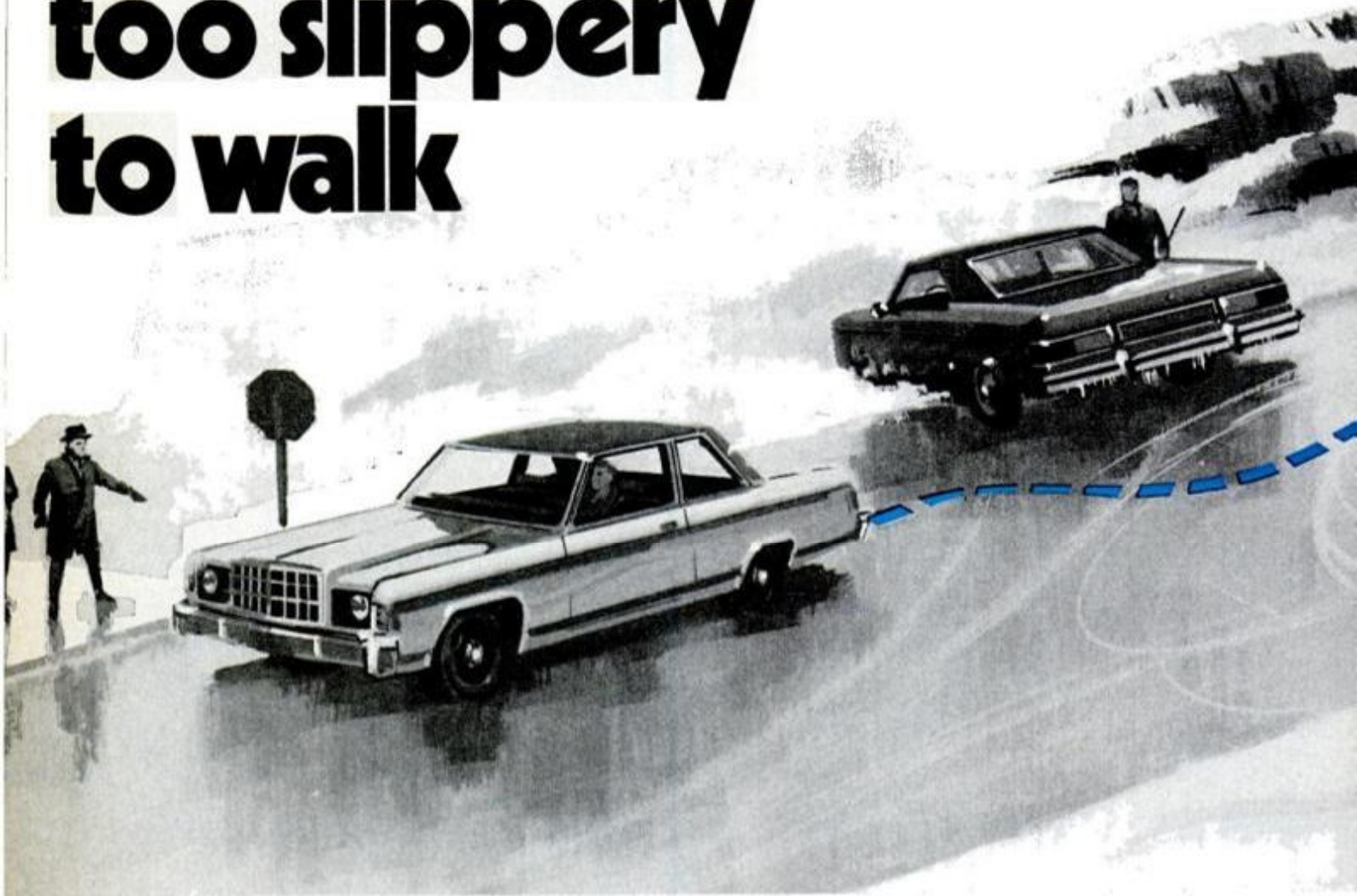
If your present bag isn't quite warm enough, consider adding an inexpensive liner or outside cover. And what do you wear inside? Ideally nothing. The best is dry underwear, dry socks and a stocking cap. Do *not* sleep in your snow-suit; you'll be colder during the night and all the next day. Dry out damp clothes on your warm snow-

mobile engine underneath the hood.

Cook with light nesting backpackers' pots rather than the familiar iron skillet. Serve in large soft plastic bowls, like those for feeding the cat. Plastic cups, too. They hold heat longer than metal plates and cups. Keep menus simple with freeze-dried items, but remember to bring enough stove fuel to melt a lot of snow for them. Small one-burner stoves cut weight and bulk; carry two of them. A Pak Rak, from Haines, Ore., will hold cargo on the back of your machine. Camera, binoculars and portable CB can get a softer ride in front of you in a motorcycle "tank bag" from Eclipse, Ann Arbor, Mich. It anchors on with riveted D-rings and Velcro straps.

Ralph Plaisted's North Pole snowmobile expedition proved you can now camp anywhere in the cold with the great new gear available. **PM**

# How to drive on ice...when it's too slippery to walk



At the Winter and Emergency Driving Workshop run by the National Safety Council, they teach you how to control your car on ice . . . it's walking that may be your problem!

by Stephen F. Wilder

**F**our men walked with care across the ice-covered parking area and got into a four-door sedan. The ice was melting slowly in a warming February sun and so was even slipperier than if it had been colder. Out of habit, they fastened their safety belts. The engine, still warm, started instantly and the driver blipped the throttle to make sure the fast-idle cam was released.

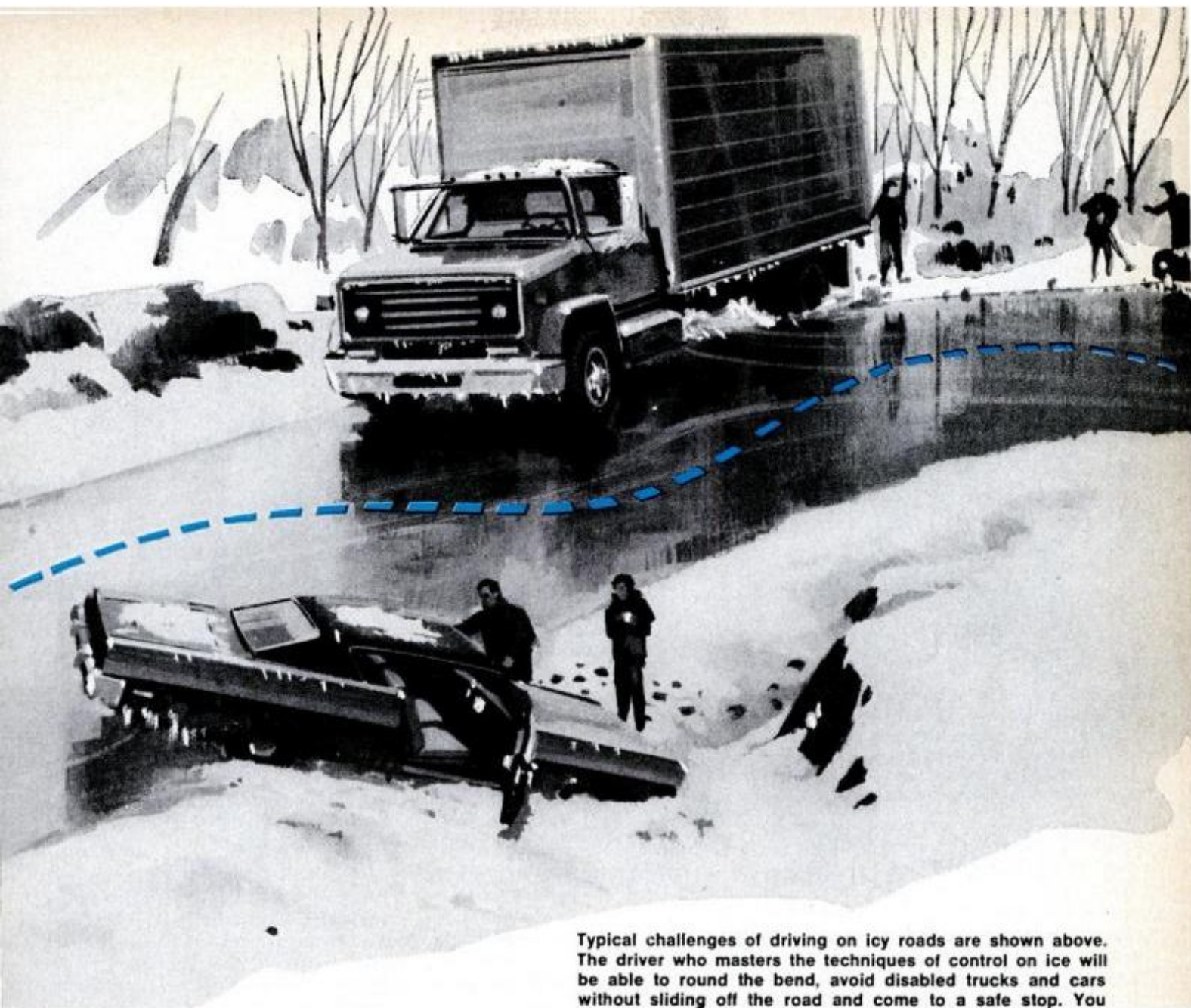
He was Bernie Pekar, on loan from Goodyear to the National Safety Council as staff instructor for its annual Winter Driving Workshop at the Stevens Point, Wis., airport.

The others in the car were also professionals in the field of driver instruction and motor vehicle safety. Dick Kraus, safety manager for Mobil's Midwestern Regional fleet, supervises nine instructors and gets some of the credit for the impressive fact that Mobil's steadily dropping

accident rate (per million miles traveled) now runs less than two percent of the average accident rate for fleets.

Charles Ed Browning is an instructor at Appalachian State University in Boone, N.C., where the Center for Safety and Driver Education teaches prospective instructors how to teach driver ed in high schools. All but two states require some level of certification of those who will teach driver ed, ranging from a three-credit basic course upward. You can even get a Ph.D. in this field.

Rounding out our group was Ed Amos from Mississauga, Ont., who actually teaches high school students, as do most of the others attending this workshop. These driver ed teachers come mostly from the northern tier of states as well as the neighboring Canadian provinces, but also



Typical challenges of driving on icy roads are shown above. The driver who masters the techniques of control on ice will be able to round the bend, avoid disabled trucks and cars without sliding off the road and come to a safe stop. You have to know how to grab and use friction that's available. See National Safety Council driving exercises on next pages.

from as far south as Louisiana. (After last winter, why not?)

For this day these passengers were students. They were here to learn a novel set of real-life exercises that they could teach to others to reduce the wintertime peak in the annual \$4½-billion toll in property-damage-only accidents.

Bernie Pekar and other experts, such as Jerry Mangas from Ford's Dearborn Proving Ground and Russ Beadle and Doc Whitworth of GM's Traffic Safety Department at Milford, Mich., were going to demonstrate a variety of techniques to teach steering and braking and, yes, even acceleration control, on extremely low-friction surfaces.

### Showing how it's done

Bernie applied the brakes while he pulled the shift lever into Drive. Easing off the brakes, he let the car

move toward the long row of traffic cones strung across the glistening ice. Gradually, he feathered in a little throttle until the speed was about 13 mph. Holding this speed, he approached the pylons so they lined up with the left side of his car.

As he came alongside the first pylon, he gently started turning the wheel to the left. Just as gently and smoothly, never lifting his hands from their original 9:00 and 3:00 o'clock positions, he turned it to the right, bringing the Impala out of its left turn and into an equally gentle sweep to the right. Smoothly and precisely, he swung the large sedan through the entire string of cones, not once breaking the rhythm of his wheel movements, not once lifting his foot from the accelerator pedal until the last marker was passed. Slowing to a crawl, he turned the car around so it faced the line of

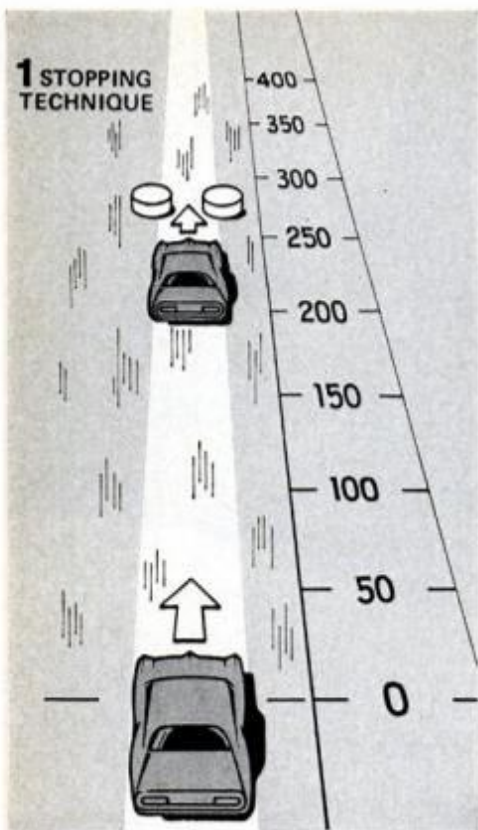
pylons and stopped it. "Gentlemen, now it's your turn. But be careful walking around the car. This stuff is treacherous."

### Too slippery to walk

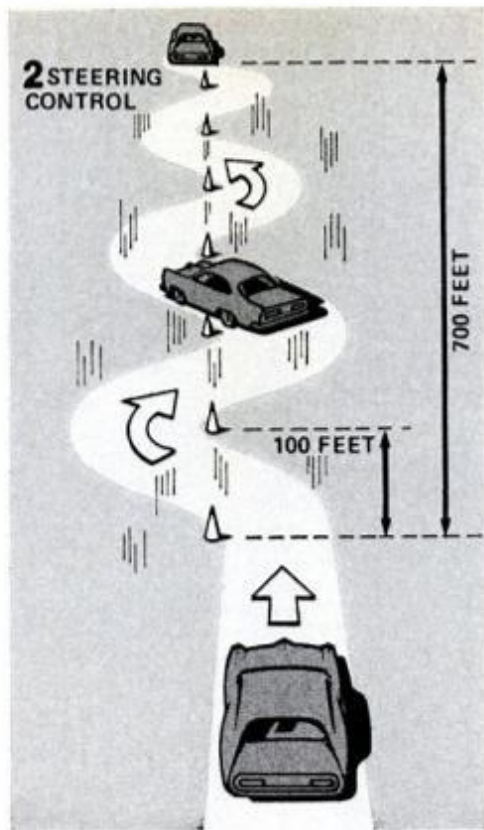
Every winter we are deluged with well-meant warnings about the hazards of winter driving, but these cautions often fall on deaf ears—as exemplified by a student who climbed out of the back seat and promptly went "splat!" on the wet ice.

Winter driving is different because the presence of ice or snow means the friction forces available to the tires can drop sharply to 10 percent or even 5 percent of normal values.

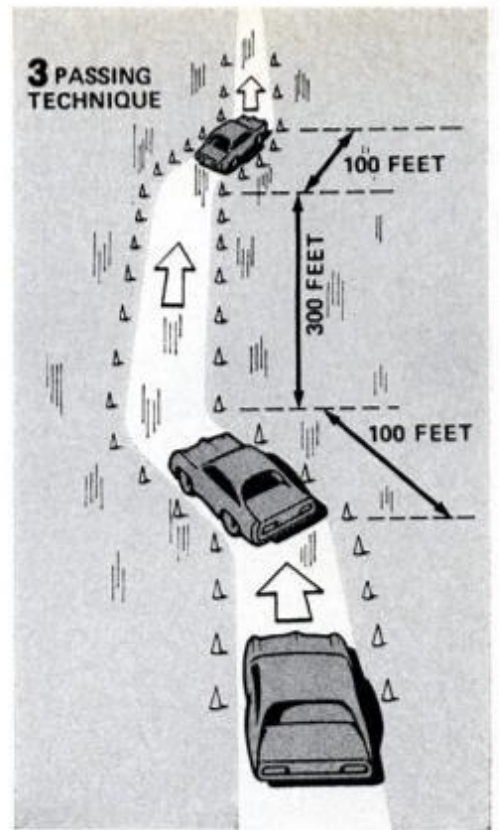
In dry conditions, the vast majority of American drivers habitually use no more than 10 percent of the available friction forces for cornering. In an emergency swerve, some use 30 percent or even 50 per-



**1 STOPPING TECHNIQUE**  
Going into skid lane at 20 mph, drivers have been taught two types of stopping techniques: the controlled stop where steering control is maintained by rapid on-off application of brakes, and shortest stop, done with the brakes locked.



**2 STEERING CONTROL**  
First run through pylons is done at 10 mph with speed increased as driver develops a feel for behavior of the car as skid begins. Early and proper correction of skid is emphasized. To avoid a power spinout, smooth acceleration is practiced.



**3 PASSING TECHNIQUE**  
Smoothness is emphasized in practicing proper passing technique, where abruptness can prove disastrous. Best speed for each student is determined by instructor. Driver experiences effects of over and understeering on control of car.

cent of it. (Most seem to specialize in locking up the brakes, and the aim of most performance driving schools is getting drivers to find and use cornering power to avoid collisions (see *How to Avoid the Accident You'd Never Forget*, page 67, Feb. '76).

It is ironic that in freezing weather when driving conditions are worst, this innate conservatism seems to evaporate. While it is obvious that snow or ice covering the road calls for lower speeds, and equally obvious that drivers do slow down a bit, the rash of accidents on snow and ice-covered streets suggests we do not slow down enough. A little arithmetic shows why.

The speed from which you can stop in a given distance, or at which you can make a turn of specific radius, varies with the square root of the available friction. Therefore, on a dry road where 55 mph is considered "safe" (not just fuel-efficient), the equally "safe" speed will be  $17\frac{1}{2}$  mph when it is covered with ice at  $0^{\circ}$  F., which offers 0.07 coefficient of friction (instead of the normal 0.7).

When the temperature is closer to the freezing point, say  $30^{\circ}$  F., the available friction is even less (0.035) and equally safe speed is  $12\frac{1}{4}$  mph.

The problem is twofold: Most of us are more impatient than we realize, and the roads are not usually

covered uniformly with ice; we just come across unexpected patches here and there. Once the snowplows and salt spreaders have done their jobs, the roads are, by and large, clear, which makes most of us quite confident. While we may keep under the nominally safe 55, we simply cannot bring ourselves to drive at less than 20 mph as if the whole road were covered with ice, because it isn't. If anyone did drive that slowly, the driver of the car behind him would honk him off the road.

Since the use of any more salt would turn our cars into rust buckets and poison our water table even faster than is now the case, and since it is fruitless to exhort everyone to drive at 17 mph until spring, we are left with the choice of either doing nothing—which means accepting the winter's toll of "lost control" smash-ups—or start training drivers to expect the unexpected in changes of road friction, and teach them how best to take advantage of what little road grip remains. After all, if ordinary mortals can race ordinary sedans on frozen lakes and reach 100 mph on ordinary tires, there obviously is *some* friction available.

#### How to grab it and use it

There is a quartet of exercises developed at the National Safety

Council for driving skillfully and safely on the slipperiest of surfaces.

Stevens Point, about 250 miles north of Chicago, offers the NSC the use of one corner of the municipal airport which the fire department sprays generously with water during freezing weather. It uses the mist-like fog setting on its nozzles and the result is a mirror-like surface of ice.

Communities where freezing is inconsistent or just unavailable can opt for coating a 50 by 300-foot corner of a parking lot with Genite, an asphalt sealer. When this is hosed down with water, a car with bald tires will act just like it's on ice. Of course, when the training program is over, it is imperative to protect unwary parkers, either by cordoning off the slippery section (at least during rain) or by adding a new surface with more gripping potential.

Driving a car on such slippery surfaces has the effect of dramatically stretching out time. If you skid at 17 instead of 55, it takes three times as long to slide into the pylons. And this gives you three times the opportunity to analyze what you've been doing and what you're going to do. Parenthetically, I'd like to see an experiment where students get their first few hours of at-the-wheel experience in such low-friction circumstances. You not only get more time,



but you have to develop very sensitive hands and buttocks to recognize the signals your car's tires are sending you. These are highly useful when dealing with emergencies on real pavement because steering feel typically gets extremely light when cornering forces are highest.

### The first exercise

But for licensed drivers, a good first lesson in ice-driving is a simple straight-line braking test. At Stevens Point, we used the packed snow bordering the ice rink to line up the car and gain some speed. The first run was pleasantly mindless: Approach the "start" line at 20 mph, apply the brakes hard as you cross it—and slide. While you're still sliding, the instructor urges you to explore what steering ability you have with the brakes locked. Of course, there is none. The point at which you finally stop is marked.

On the second pass, you again cross the start line at 20. This time you pump the brakes. You discover that your stopping distance is no shorter and you wonder what the point is. The answer, of course, is that while you are off the brakes, the front wheels can steer. In fact, you can crank in some steering (no more than a quarter-turn of the wheel—and don't move your hands lest you lose track of which way is straight ahead) while the brakes are on. Provided you didn't turn the wheels too far, when they spin up they will start steering the car. As soon as you are vectored away from

an obstacle, you can straighten the steering and hold the brakes on until the obstacle is passed.

The sequence is brake-steer-release-straighten-and-brake. Once you have no more obstacles in your path, there is no further need for modulation.

Another important lesson here is that, even though the friction available is down to 5 or 10 percent of what you are used to, there is still some there and it can be used. It may not be as much as you want; it may not even be enough to avoid an accident completely, but there is something there to reduce the severity of the accident. That's a lot better than witlessly gripping the wheel and doing nothing.

### The second exercise

The second exercise was described at the beginning of this article: The pylons are spaced 100 feet apart in a straight line. In order to learn how much cornering power is still available on ice, you make your first run dead slow and only gradually bring up your steady-state speed. Vital points here are utmost smoothness, keeping your hands at 9:00 and 3:00 o'clock, staying close to the line of cones to minimize the needed changes in direction, and leading the cones—that is, starting the turn before getting to a marker.

Should you "lose" it, the first action is to release the accelerator. Excess corrective steering won't help you if you're going too fast, but when speed is down it will.

You'll know you're doing well when you are swinging smoothly from one turn to the next with a gentle rhythm, never changing speed. But don't expect to set speed records: 12 to 14 mph on wet ice is about it when the cones are 100 feet apart.

### The third exercise

The third exercise requires markers on both sides of a 12-foot lane. After a brief straight section, the lane joggles 12 feet to the left over a transition stretch of 100 feet, then runs straight again for about 300 feet with another joggle, this time to the right before a final straight. It is a way of simulating a passing maneuver on a two-lane road. When you can do this on wet ice, you know you are ready to graduate with honors from the school of slipping and sliding.

The guidelines here are to use no more than a quarter-turn of the steering wheel at the very most, less if possible, and to "squeeze" the throttle as much as you can get away with (the less time spent in the left lane, the less you are exposed to risk). If the rear wheels slide, get off the throttle altogether and use minutely small steering corrections.

If you are pretending that you are maneuvering around a stopped vehicle in the face of oncoming traffic, then you can also use brakes in the second half of the maneuver when you return to your own lane. As in the braking exercise, squeeze and loosen them, using a rapid pace if you have drum brakes all around and a slow pace if you have discs up front.

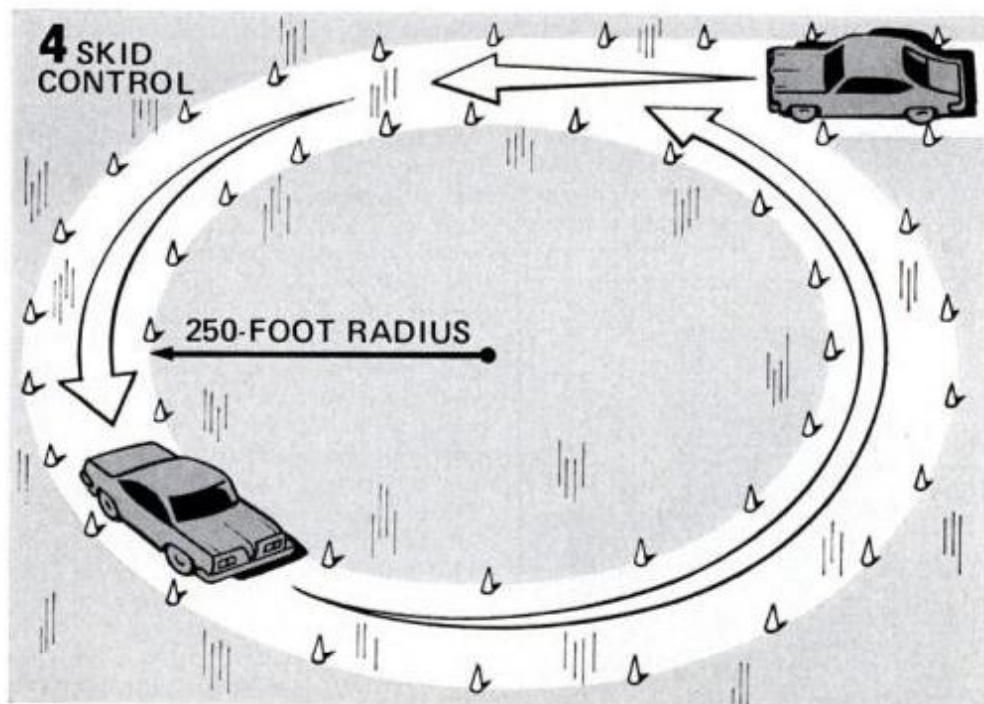
And should this incident come up when your engine is still cold and therefore operating on the fast-idle setting, it can be useful to slip the shift lever into Neutral so the engine won't overpower the brakes at the driving wheels.

### The fourth exercise

The fourth exercise needs a large circle, about 400 to 500 feet in diameter. The site may be hard to come by, but the exercise itself is super-simple: You go as fast as you can. At the Winter Driving Workshop, the staff enlivened matters considerably with a discreetly operated device that could lock up the rear wheels just long enough to make the rear end hang out. The purpose of this gadgetry is to save time, in that most of us don't rush to exceed our control limits, especially when there's an instructor riding with us.

When you find the rear end sliding out, the drill is to get off the throttle and counter-steer. (If you're making

*(Please turn to page 184)*



Treacherous ice-covered curve is simulated in this exercise. Students approach from a tangent and try to maintain control around the circle. When proper skid

recovery techniques are employed, speed can be increased gradually. Driving direction is reversed so that students can develop skills on left and right-hand curves.

# What to do when a blackout hits

New York City's recent blackout was a sample of what may happen if deliberate outages are imposed due to dwindling fuel supplies in coming years. Here's what you can do to ease the pain when lights go out.

by Gurney Williams III



Your television picture shrinks to a disappearing dot. Lights flicker out. Motors groan and die. The family huddles in the eerie quiet. It's a blackout. And despite all the myths about the simple joys of candlelit living, it's just about as romantic as drought.

Nine million New Yorkers saw little that was joyous in the power failure that struck the city and adjacent Westchester County last July. Several freak lightning strikes during a severe thunderstorm triggered a series of power shutdowns in the Consolidated Edison system that brought the country's largest metropolis to a dark standstill. For up to 24 hours, millions groped their way through darkened buildings and streets, trudged up and down high-rise apartment stairwells with candles, ate whatever cold foods they had available, and in many apartment buildings went without water and toilet facilities.

In the first hours of the blackout, the most pressing need was for light. Few people had candles and fewer still emergency lamps. As the blackout lengthened, food became the major worry of harassed housewives.

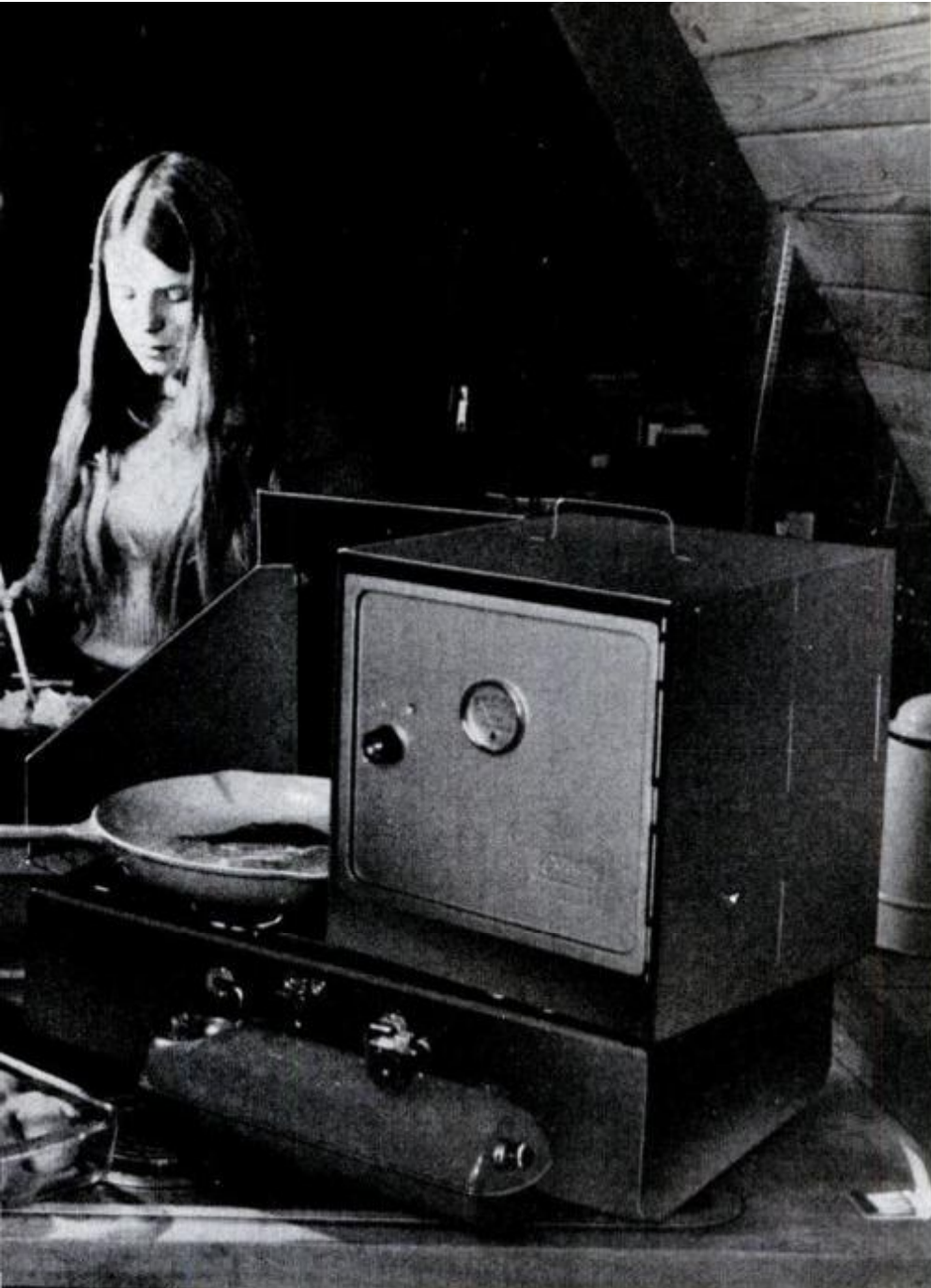


Coffee kit like L. L. Bean's Kar-N-Home provides hot drinks without public power.

Although there was plenty of food thawing in powerless freezers, there was no way to cook it. Restaurants had to close. Only in one respect was the city lucky: Had the blackout hit during the bitter cold of last winter, mass suffering would have resulted in the heatless skyscraper canyons.

But the fact is that people were caught flat-footed, unprepared. Few had taken a lesson from the earlier and more serious blackout in 1965, when most of the Northeast (and part of Canada) went without power for 12 hours. The big question is: What about power outages in the future? Utility experts think there will be even more. Heavy loads created by expanding industries and residential communities will tax utilities to their limit at critical hours. High winds, ice and lightning will always pose threats. But now there's a new ogre.

In the next few years, fuel problems may lead to blackouts that are



Liquid-fuel mantle lamps (left and above), long produced by Coleman Co., can provide light equal to a 100-watt bulb in double-mantle models. Coleman's two-burner stove and oven (left) runs full blast for two hours on three and a half pints of fuel.

planned and announced by power companies. The National Electric Reliability Council, representing utilities throughout the United States and Canada, warned late last year that such blackouts are a distinct possibility during the next decade.

"Unless the electric utility systems of this country are able to construct and operate the nuclear-fueled powerplants currently planned, the United States will face blackouts, voltage reduction or rotating outages as a result of serious shortages of electric power by or in the 1980s," said William McCollam Jr., chairman of the council.

No one is immune, not even fuel-rich Arabs. When oil experts from the Organization of Petroleum Exporting Countries met in a Qatar hotel last December to discuss oil price hikes, unexplained power failures put out the lights and stalled the elevators. There was nothing they could do.

Is there anything anyone can do? There is. Make plans while your lights are on. Join a growing number of homeowners who are enlightened about blackouts. Begin before the current goes off. Follow some



Family meals are easily cooked on campstoves like Bean's Kangaroo Kitchen.

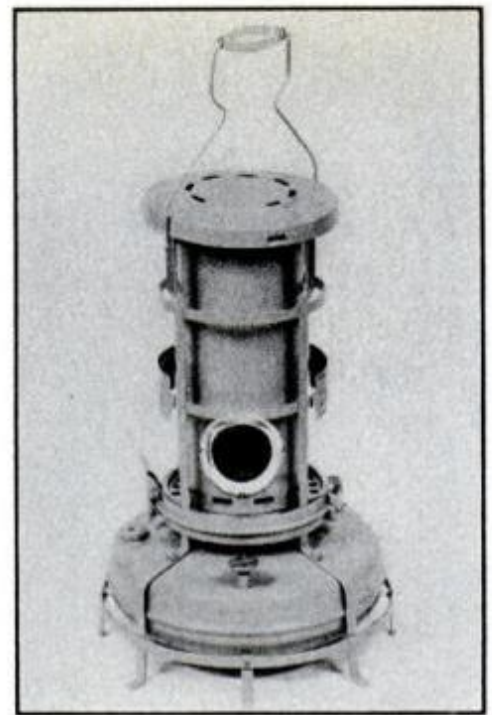
simple precautions during the outage. Here's what to do:

#### Before a blackout

Assemble a "Blackout Box"—a power-outage first-aid kit containing a small investment in self-contained lighting, cooking and heating devices costing less than \$150. (For \$1000, you can hook your house to a standby generator to see you through.) Recommended kit contents include camping equipment and canned food in a kitchen cabinet or closet—and make sure everything is in working order. Lanterns, stoves and catalytic heaters designed for camping can be used at home with proper precautions. If you haven't yet gone camping but want to try it, you might consider buying equipment that will double for both outings and outages. Whatever you buy, it's helpful to choose items that will let you use the same fuel in all your equipment. Here's what the Coleman Co. (250 North St.



Outdoor equipment in all grades lends itself to blackout situations. Coleman's deluxe two-burner takes 11-inch pans. Two-mantle lamp (rear) has 220 candlepower.



Blue Flame Aladdin heater from L. L. Bean gives 9000 B.T.U. for 16 hours on a gallon.



Francis, Wichita, Kans. 67201)—a well established manufacturer of camping gear—recommends for use in the home during blackouts:

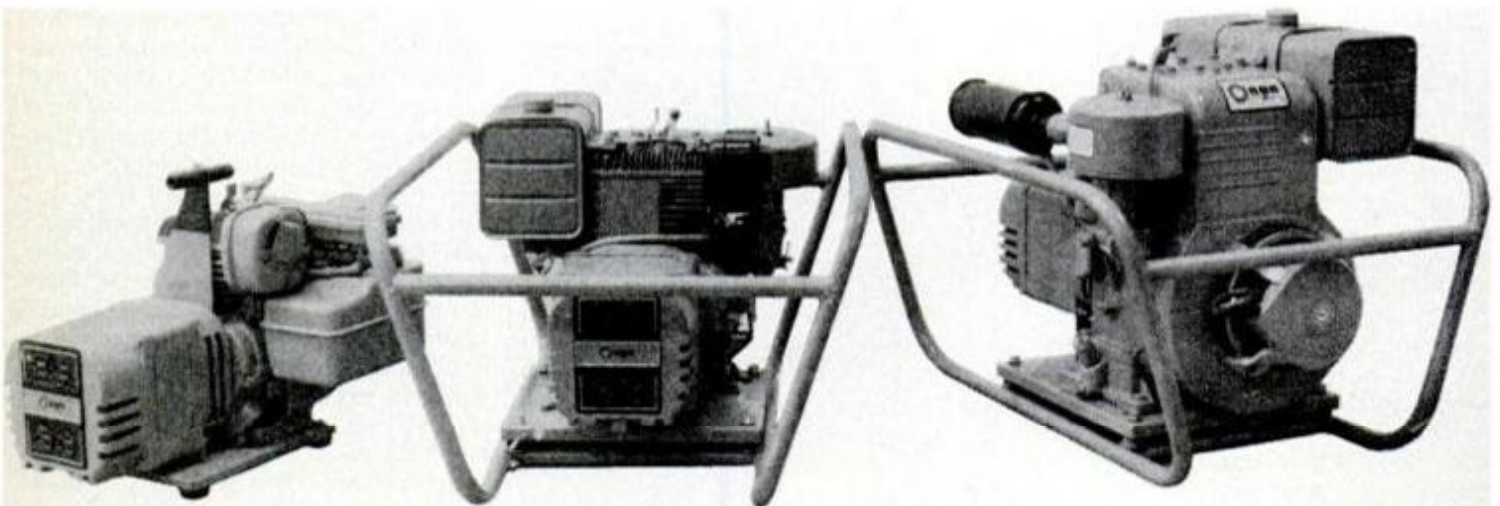
**Lamp.** A double-mantle lantern. This type of lamp has been used by campers for more than 75 years. The two mantles—the little sheaths of thread in the middle of the lamp—produce 220 candlepower, roughly equivalent to 100 and 75-watt bulbs burning next to each other at the same time. Most will hold about two pints of stove and lantern fuel, a distilled naphtha that won't clog wicks. The unit will burn eight hours on a single filling of one quart. Cost (and you should shop around for all this equipment) is under \$26.

**Stove.** Some campers try to get by with Lilliputian pots and pans. The stove you buy for a blackout—assuming your range is electric—should

be big enough to handle pots you normally use in the kitchen. Most deluxe two-burner stoves have space for 11-inch pans and will run about two hours, with both burners on full blast, on 3½ pints of fuel. Cost: about \$25 up. Coleman's is under \$36. For about \$16 you can add a stove-top oven—essentially a box with a temperature gauge—for baking.

**Don't use charcoal grills indoors.** Even a small grill will produce more carbon monoxide than a car's engine. In such concentrations, carbon monoxide—a colorless, odorless gas, heavier than air—can be hazardous.

**Heater.** A catalytic heater works by conducting fuel from a tank through a wick to a platinum burner. The platinum catalyst keeps the temperature down, leading to safe, efficient heating; clothing won't catch



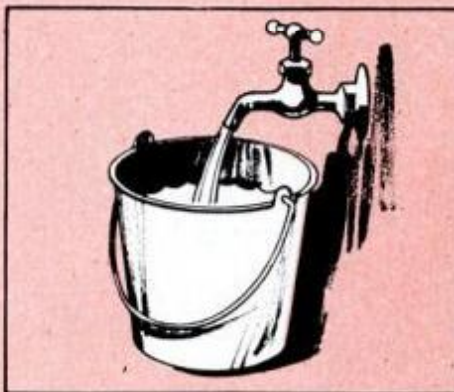
Home generators like these from Onan pump 1000 to 5500 watts into house circuits. Small units keep things going if alternated from furnace to freezer to TV, lights, other appliances. Some models come on wheels (upper left) for easy mobility and storage.

# Blackout checklist

If you know a blackout is coming, here's what you should do:



■ Turn up the refrigerator and freezer controls to maximum. Treat the refrigerator and freezer just like Pandora's Box: Don't open the door unless you have to. Food will generally stay solid for 48 hours in a fully loaded freezer if you keep the door closed. (If the freezer is less than full, food will thaw faster; a freezer full of meat generally holds its cool longer than a freezer full of baked goods.)



■ If local supplies and laws permit, fill your bathtub and/or other large containers with water in the event that your electric water pump or the local water system is affected by the blackout. Remember that toilets can be flushed after you have poured a bucketful of water in the tank.



■ If your stove is electric, make coffee, soup or a hot drink and store in a vacuum container. This will free both burners of your campstove for cooking the next meal.



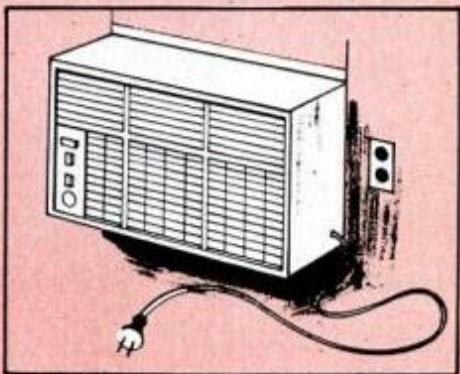
■ Review all directions on how to use camping equipment safely.



■ Fill and test all of your equipment outside the house or in a garage to forestall any spills of flammable fuel in the kitchen.



■ Bring out from storage all extra blankets, quilts, comforters or sleeping bags you'll need if your heat goes off.



■ When the blackout begins, unplug your appliances such as the refrigerator, freezer, furnace and pumps; turn off all but a few light switches. When the lights you left on come back, plug in the appliances one at a time.

fire if it should come in contact with a "cat" heater. Most, including Coleman's Fall Cat, will keep glowing in your kitchen or bedroom up to 37 hours on a tank (three quarts) of fuel. Cost: under \$43.

You'll need a small battery-powered flashlight, a supply of fuel, matches, canned foods and a manual can opener. A cooler and a hot drink container (Thermos makes a one-quart container that retails for about \$3.50) will help keep food and drink cool or piping hot all day without requiring a refrigerator or campstove.

Total cost of this Blackout Box: less than \$150. You should also have at least one battery-powered portable radio to keep you posted on the latest news during a power failure.

Manufacturers offer other useful items for blackout use. L. L. Bean, Inc. (380 Alder St., Freeport, Me. 04033) lists many products that would be handy. The Kangaroo Kitchen (Model No. 5297, \$47) can be used to boil, broil, bake, smoke, steam, toast and fry, and can pressure-cook an entire meal in 20 minutes. It's fueled by a 14-ounce propane cylinder.

Bean also offers kerosene lamps, an Aladdin Blue Flame Heater, and a handy coffeemaker. A kerosene table lamp (\$33.50) and a hanging lamp (\$34.50) operate for about 50 hours on a gallon of kerosene. They are nickel-plated and offer a light that varies in intensity from a candle glow to a 100-watt bulb.

Bean's Aladdin Blue Flame Heater (\$72) also operates on kerosene and burns without odor or smoke. It has a heat output of 9000 B.T.U. per hour, holds 1.3 gallons of fuel and will burn from 16 to 25 hours.

The firm's \$21 coffeemaker operates from a 12-volt automobile circuit or (when the current is on) from a standard household circuit. It comes with four cups and spoons and has a six-cup capacity.

New York's oldest sporting goods store, Abercrombie & Fitch (Madison Ave. and 45th St., New York, N.Y. 10017), has the Swedish-made Optimus stove for small cooking chores, the top of which doubles as a cooking pan. It runs on gas, and one-third of a pint will operate the stove for one hour and 15 minutes. With a self-cleaning burner, it costs \$40.80.

## During the blackout

Oddly enough, one of the first things to do after the lights go out is to pull the plugs on your refrigerator and freezer and turn off your electric water heater, water pump and—if summer—airconditioner. Leave

(Please turn to page 185)



Microcomputer controls all operations in Texas Instruments single-sideband CB (left, above).



# Single sideband: The high-performance CB

CB has two microcomputer chips, as on finger—one in mike, one in set.



SSB-CB triples the number of channels, adds fun, range. Here are 13 professional-type rigs you can have.

by Gerald R. Patton



With microcomputers in everything from dishwashers to microwave ovens, how long could it be before somebody shoehorned one of the tiny brains into a CB radio? Texas Instruments has done it!

The digital giant that invented the integrated circuit and brought electronics manufacturing back to American shores has slipped a micro-processor into a \$300 radio and taken a quantum jump forward in CB technology.

Imagine a 40-channel, single sideband (SSB) base or mobile citizens band radio with a microcomputer brain allowing all operating controls to be conveniently placed on a small handset. From this handset control head, complete with a light-emitting-diode display screen, you can select the channel and mode (AM or upper or lower sideband), control volume and squelch, command the radio to search for either a clear or busy channel, and read out on the digital display received signal strength and the SWR (standing wave ratio) of your antenna!



Sidebender V by SBE, Inc., 220 Airport Blvd., Watsonville, Calif. 95076, is \$419, packs 12-watt PEP (peak envelope power) transmitter punch like all SSB CBs.



Model 2705 from Hy-Gain Electronics, 8601 Northeast Highway 6, Lincoln, Neb. 68505, is priced at \$349, supplies AM modulation and both sidebands.



DB-510 from Robyn International, Inc., Box 478, Rockford, Mich. 49341, sends signals that can be copied through tough interference, as do the other SSB radios.



CP-400 SSB CB rig from Communications Power, Inc., 3407 Charleston Rd., Mountain View, Calif. 94043, features unusual cabinetry and a large meter.



CB-5470 from Sharp Electronics Corp., 10 Keystone Place, Paramus, N.J. 07652, is available for \$250, gives 120 channels: 80 SSB and 40 AM modulation.



Model ICB-2500, a \$460 SSB CB from Sony Corp., 9 West 57th St., New York, N.Y. 10016, can be turned into a base station by a \$100 adapter, Model RB-100.

SSB mode followed by five digits such as 38 UB 12345 (designating channel 38, upper sideband, unit code 12345).

The memory stores 100,000 possible combinations of five-digit numbers for any one of 40 AM or 80 SSB channels, making possible millions of different codes. For even more convenience, the five most often called codes can be programmed into a single digit code, using just one key.

One of the few *disadvantages* of using SSB with conventional CB radios is the necessity of fine-tuning the receiver until voices sound normal, rather than like Donald Duck. Even this nuisance has been solved by TI.

When two of these radios communicate, a tone-burst code is transmitted prior to voice modulation. This allows the other unit to correct any frequency deviation within a split second, thereby automatically fine-tuning the incoming signal!

In addition to TI's ultrasophisti-

(Please turn to page 168)



Cobra 132 XLR, \$399, by Dynascan Corp., 6460 West Cortland St., Chicago, Ill. 60635, has fine tuning to clarify incoming signals, remove Donald Duck sound.

## Computer talk

The radio's "brain" is made up of two microcomputers, each measuring only  $\frac{1}{50}$  of a square inch. One supervises all operations in the control head while the other, in the transceiver itself, receives and executes commands from the control head.

Each time you press the push-to-talk button, the computer checks the SWR to prevent damage that could result from a defective antenna or a break in the coax. It shuts down the transmitter and flashes a warning on the display.

## Selective calling

One outstanding feature of the TI system is an exclusive selective calling system that mutes your receiver when desired until it receives a signal from another TI radio preceded by the correct digital code number. The code is made up of the channel and

# Two's a motorcycle, three's a ... very strange car

by Michael Lamm  
WEST COAST EDITOR

Some three-wheelers in Vic Hyde's tremendous collection have a single wheel in front, others in the rear, but that doesn't matter—he loves them all.

**V**ic Hyde, genial human dynamo and one-man philharmonic from Niles, Mich., collects three-wheeled cars. He owns what is believed to be the biggest collection of three-wheelers in the world.

Policemen stop Vic on the street just to get a closer look at his cars. Pedestrians point and chuckle as he scoots past. Motorists crane and speed up to check out the odd-bodied three-wheelers.

"Anywhere I go, I always have to leave myself extra time for tech sessions," chuckles Hyde.

Vic Hyde revels in a certain amount of limelight, both onstage and off. It's part of his business as a musical entertainer. He's a one-man band; has been for 44 of his 68 years. He can play four trumpets, a drum, and a small piano all at the same time.

With 16 European tours and millions of miles of U.S. highways and byways behind him, he's played for royalty and heads of state, performed on network TV, and has done more one-night stands than anyone cares to remember. But his hobby and great love has always been cars.

Vic used to collect Rolls-Royces. At

one time, he owned as many as 15. "Everyone hates you for driving a Rolls-Royce," comments Vic, "but drive a three-wheeler and everyone gives you a smi'e and a wisecrack."

Vic spotted his first three-wheeler in Sweden while on tour with the Kuruvik Ungdom Cirkus in 1954: a shiny new Messerschmitt KR-175. (Yes, it's the same Messerschmitt that built German warplanes.) Vic fell in love with the car; went to the

Collector Vic Hyde owns two Bond Bugs. Asked if three-wheelers tip easily, Vic says, "You have to get the hang to know how many Gs you can crank into the steering wheel."

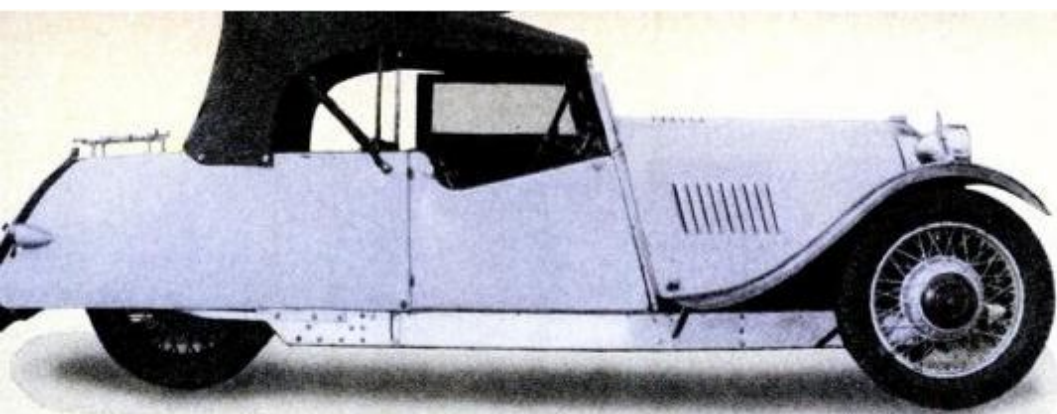
local dealer and bought one just like it.

"I traded in my 1945 Harley 74 ex-police motorcycle," muses Vic, "because here was a car that protected me from the rain, yet was small enough to fit onto the end of a circus flatcar so I could take it from city to city. It carried two people in tandem, got great gas mileage, and was easy to work on.

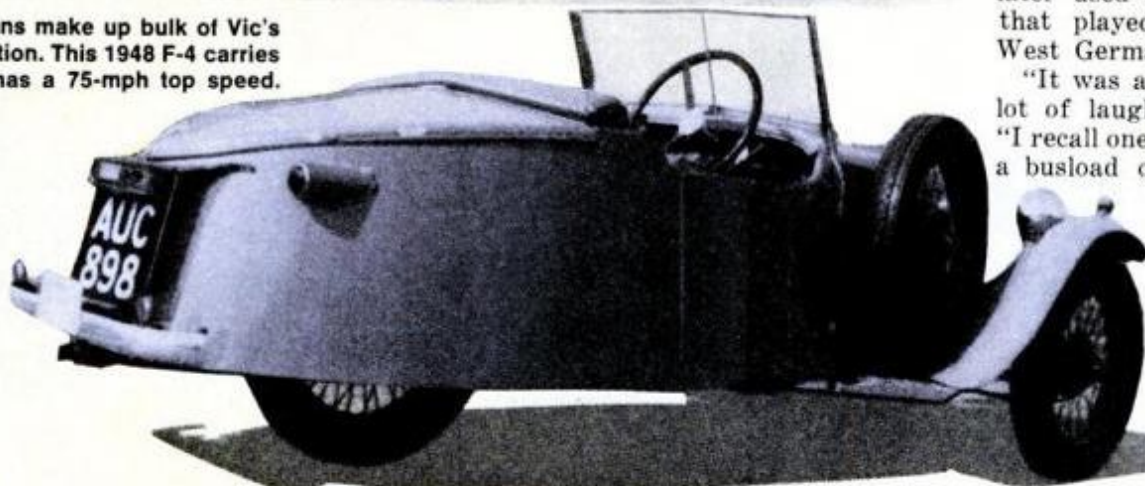
"I put thousands of miles on it all



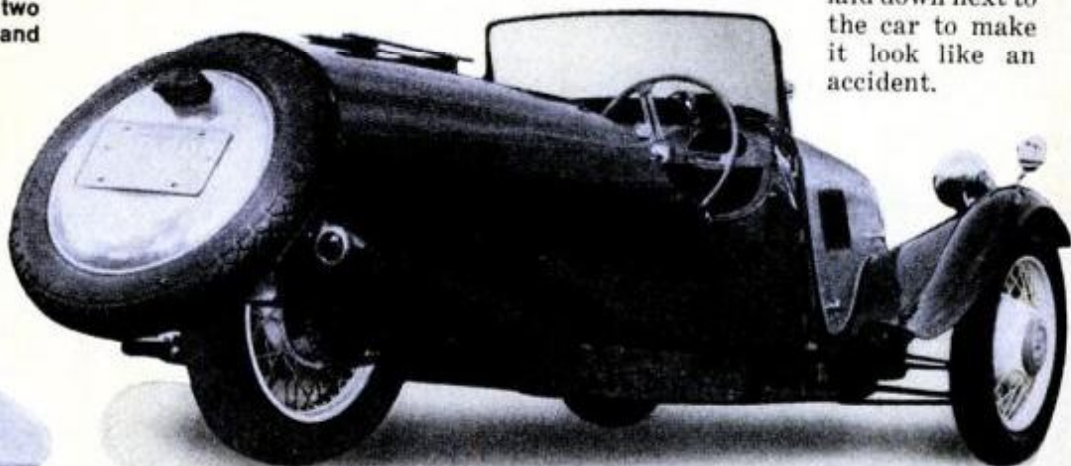




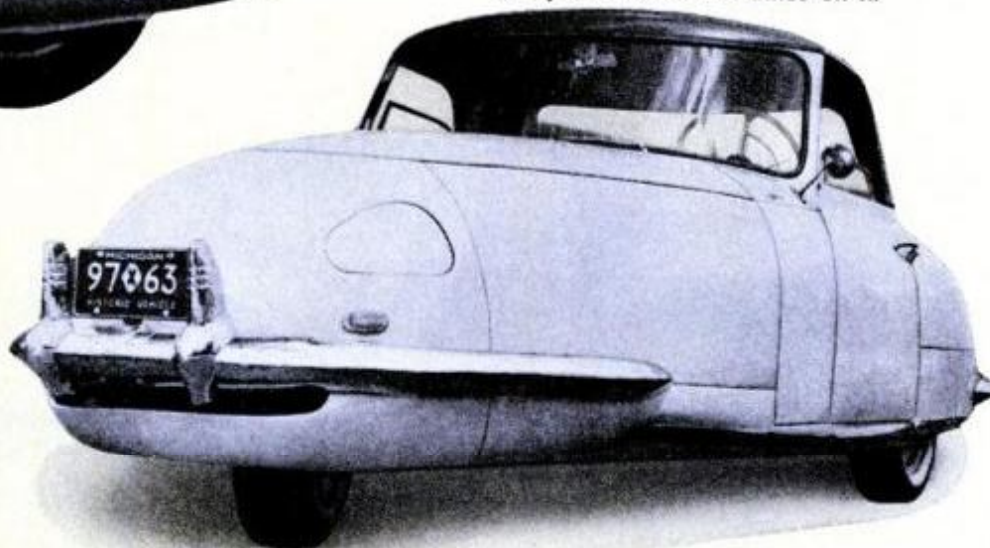
Morgans make up bulk of Vic's collection. This 1948 F-4 carries four, has a 75-mph top speed.



Vic swapped "Red" for two BSAs, this 1934 roadster and a fabric-bodied boat-tail.



1952 Morgan F-Super cost Vic \$100 in England. He had it restored there, has put thousands of miles on it.



Sole American-made three wheeler in Vic's collection is this California-built 1948 Davis, one of 17.

over Scandinavia that year. Everywhere I went, people would come running over, ogling me and the car and asking questions. So, being a showman, I learned that this Messerschmitt was giving me an image."

His second three-wheeler was another Messerschmitt, this time the slightly larger KR-200, donated by the manufacturer in exchange for German TV publicity. Vic drove it all over Europe and later used it in a U.S.O. show that played military bases in West Germany.

"It was a fun car, good for a lot of laughs," remembers Vic. "I recall one time I was following a busload of entertainers to a military installation. Pretty soon I passed the bus and got way ahead of it. About a mile separated us, so I pulled the Messerschmitt off the autobahn and pushed it over on its side, then laid down next to the car to make it look like an accident.

"The bus came along and screeched to a stop, and the cast all clambered out. 'My God,' they said, 'Vic has had an accident!' But about that time I jumped up, tipped the car back on its wheels, and said, 'Let's get this show on the road!' and off I drove."

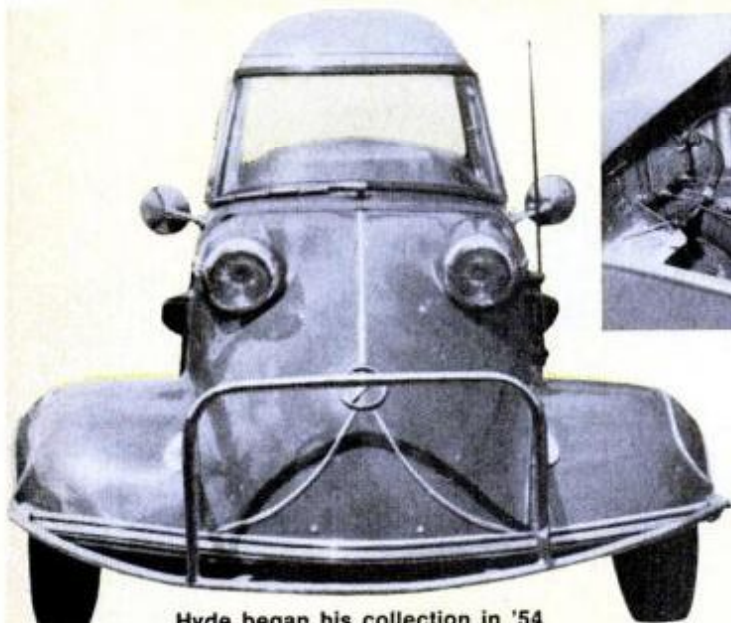
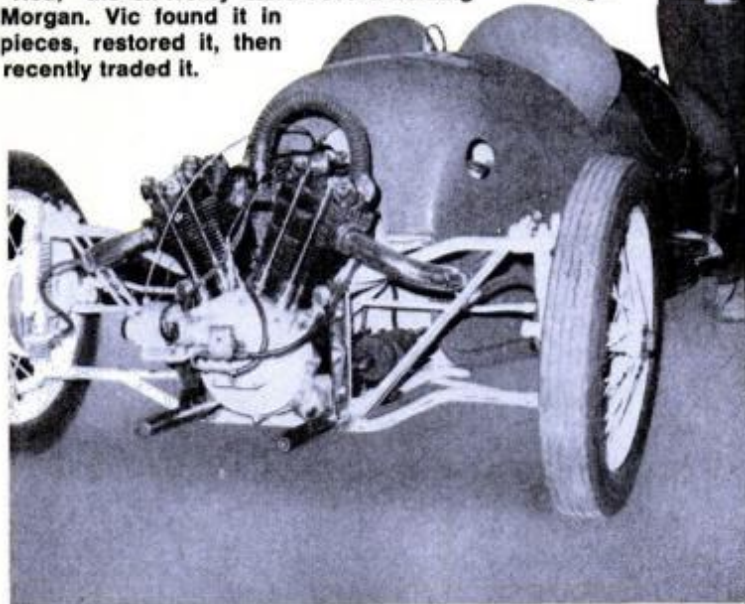
Vic's urge to collect three-wheelers didn't take a serious turn until several years later when an entertainer friend gave him a ride in a British three-wheeled Morgan. "Here was this car with its engine hanging out in the open up front—a hairy, noisy snorting beast. Before I got back to the States, I'd bought me a 'Mog.' Later I joined the Morgan Three-Wheeler Club, sold off all my Rollses and bought Morgans like crazy until I had seven.

"On one trip to England, 34 Mogs met me at the airport,

German Heinkel was taken over by Irish and British interests in 1958 and was continued as the Trojan.



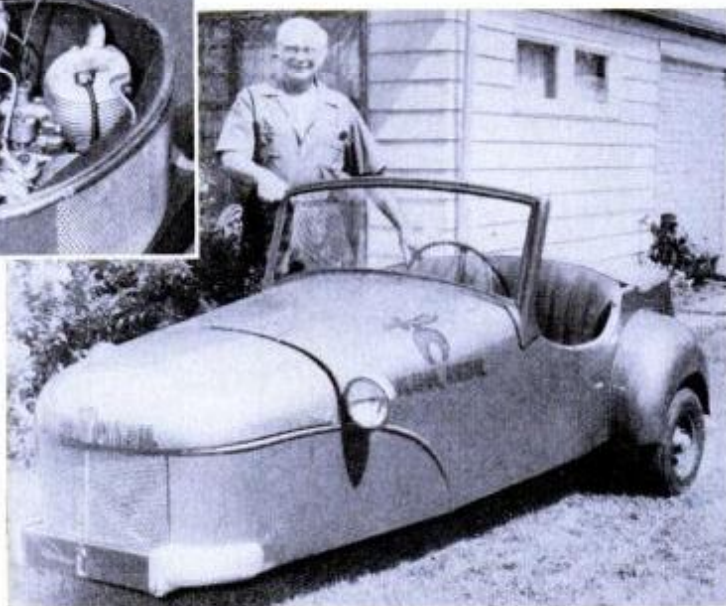
Most famous car in Vic's collection was "Red," the ex-Henry Laird record-holding Morgan. Vic found it in pieces, restored it, then recently traded it.



Hyde began his collection in '54 with this Messerschmitt KR-175.



Single-cylinder engine that powers '47 Bond Minicar pivots with the front wheel.

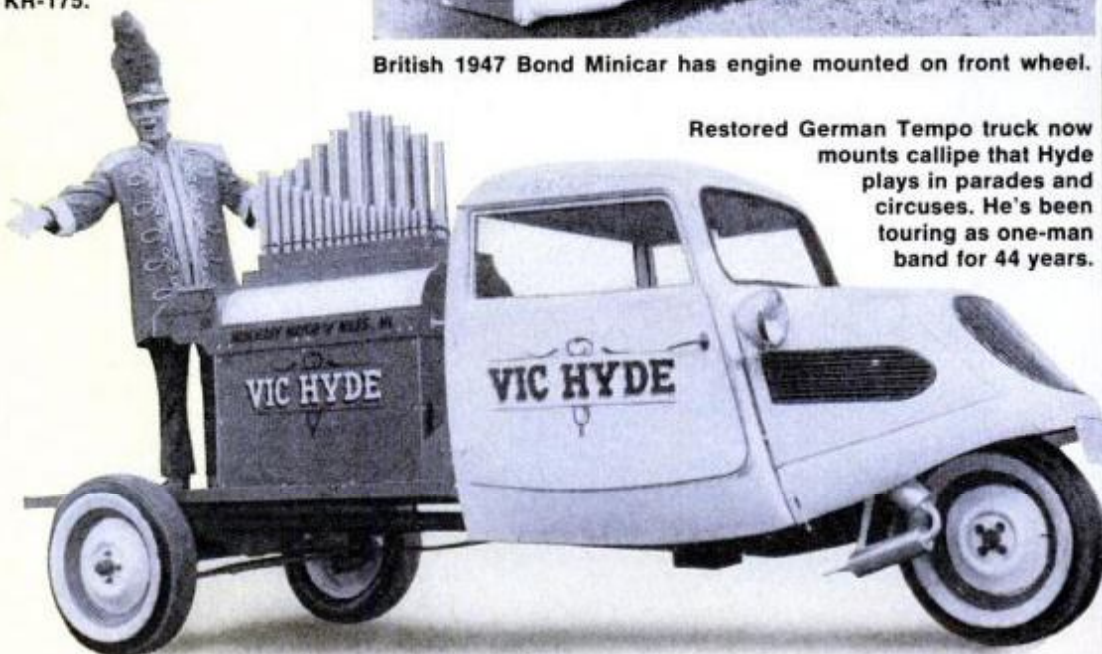


British 1947 Bond Minicar has engine mounted on front wheel.

and I bought a 1948 Morgan F with the little four-cylinder Ford motor; paid \$165. Another I picked up was a derelict 1952 F-Super for \$100; had it restored over there. Still another was a 1923 Morgan with a J.A.P. (J.A. Prestwick) outboard twin. Incidentally, the last year for Morgan three-wheelers was 1952, after which the factory switched to four-wheelers exclusively."

When he got back to the United States, Vic decided to give his restored 1952 F-Super a really good run, so

*(Please turn to page 162)*

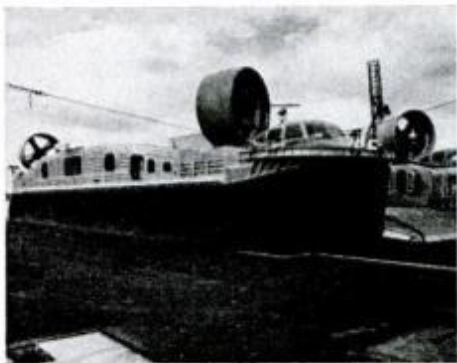


Restored German Tempo truck now mounts callipe that Hyde plays in parades and circuses. He's been touring as one-man band for 44 years.

# IT'S NEW NOW

## Air-cushion assault craft

Eight lift fans boosted this 170-ton amphibious assault craft about 5 feet above water on a cushion of air in a recent Navy test. It's designed to carry 60 tons of cargo over water or land. Four 7-foot propellers move the airborne craft—at speeds reaching 50 knots.



## Rooftop rest spot

On the unique grandstand-like tiered roof of a new San Francisco State University building, students can sit to relax or lunch. The structure houses lounges, snack bars, recreational facilities, restaurants and theaters.

## All-purpose gun oil

Spray-on gun lubricant penetrates hard-to-reach spots, protects metal parts and wood surfaces. About \$2.25 for 6-ounce aerosol can. Totally Dependable Products, Box 277, Zieglerville, Pa. 19492.



## Hand-pumped hydraulic log splitter

Split logs up to 19 inches long and 12 inches in diameter without the hassle of "wedge and sledge." The log is driven vertically into a wedge-shaped blade by a hand-pumped automotive-type hydraulic jack. Large knots are easily split. A spreader on the blade separates the log in two. About \$150; 26-inch-capacity model for about \$155. Better-Way Products, 21330 Center Ridge Rd., Rocky River, Ohio 44116.



## One man semisubmarine

It took 10 years to build this low-lying 26-foot boat, and now Douglas Price is preparing for a one-man voyage across the Atlantic. He hopes to log 150 miles daily in his yellow diesel-power semisub.

## Body mitten for cold feet

Step into insulated quilt sack and zip up to stay snug at the chilly fall games. Fits compactly into nylon case. One size for all. About \$20 from Heritage Quilts, 330 Fifth Ave., New York, N.Y. 10001.



## FIRSTHAND REPORT

by Bill Hartford  
AUTO EDITOR



# Driving the five-cylinder Audi

The 5000,  
a replacement for  
the 100LS, is a gas.



Audi 5000 is a luxurious, four-door, front-wheel-drive sedan with clean lines, many standard features and a sticker price of \$8450.

**T**he only thing odd about the new Audi is the number of cylinders. Why five? Because Audi wanted the 5000 to be front-wheel drive just as all its cars have been, but fwd with an in-line Six would be too long and heavy, and a Four would be too under-powered and rough for a luxury sedan. A V6 would be an all-new engine for Audi, requiring tons of design and development work, and an "east-west" (transverse) Six would have needed a new and expensive transaxle layout.

A sly-fox decision was made: Add a cylinder to the existing 1588-cc powerplant (used in the Fox and VWs). Result: a 2144-cc, 103-hp (at 5300 rpm) Five—the only five-cylinder gas engine in a mass-production

car. The other Five we know here, Mercedes-Benz's, is a diesel.

The Audi Five was designed with even ignition spacing of  $144^\circ$  ( $5 \times 72^\circ = 360^\circ$ ) and a firing order of 1-2-4-5-3 so the crank pattern would assist in balancing the masses, making the vibration characteristics of the engine manageable. Counterweights, vibration dampers, engine-mount placement and stiffening ribs completed the job. How Audi smoothed the running of the engine up to its 6000-plus redline (more difficult than with a slower-revving diesel Five) is detailed in a Society of Automotive Engineers (SAE) paper, No. 770112, presented in Detroit earlier this year.

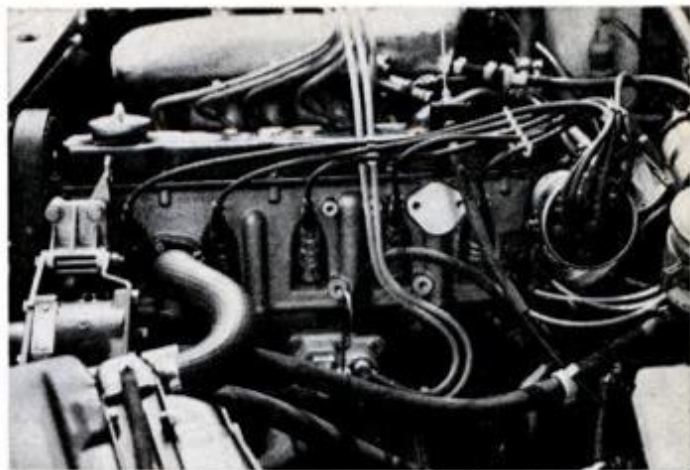
On the road, the 5000 is smooth and

feels fully the equal of the six-cylinder competition (in Europe, the 100 5E, as it's called there, has been selling nicely against the Sixes of BMW, Mercedes and others since September of 1976). We stomped on two pre-production U.S. versions—one four-speed, one automatic—and logged 12 and 14-second zero-to-60-mph times—good, but not distinguishing.

What is distinctive, however, is the engine sound—a pleasant growl when pushed hard on switch-back roads—and its sure handling in such situations. On the straight and level at 100 mph—close to top speed—the engine doesn't sound overworked and you can converse without shouting. With that little test out of the way (on the autobahn near Ingolstadt),



Wheelbase is 105.7 in., length, 189.4 in.; weight, 2700 lbs. Trunk (22.6 cu. ft.) is bigger than Caddy Seville's.



"North-south" (front-facing) V5 lays over 27° for low hood; good access for service is bonus.

we slowed to 55 mph which was—you guessed it—like standing still.

The Five runs with a compression ratio of 8.0:1 and builds up a torque of 110.3 ft.-lb. at 4000 rpm. The cast-iron block uses an aluminum-alloy cylinder head, the ohc is belt-driven, fuel injection is CIS type and ignition is transistorized. We should see fuel economy of roughly 18/25 mpg for city/highway driving, which pretty well justifies how Audi may promote the Five: "Power of a Six, economy of a Four!" Driving economy should be optimized by a cruise control unit standard on the 5000.

Indeed, standard equipment is impressive. A partial list includes power brakes (front disc/rear drum), power steering (rack and pinion), intermittent wipers, tinted glass, 185/70 HR 14 radial tires, reclining buckets, trip odometer and lots of trim, storage, carpeting and convenience features. Among the options are three-speed automatic transmission, various sound systems, alloy wheels, electric sunroof, heated front seats, power windows and door locks and airconditioning.

The airconditioning unit uses a high-output compressor built for Audi by Frigidaire, and the rotary blower circulates 165 cu. ft. of air per minute. The heater side of the integrated heating/cooling system puts out an astounding 30,000 B.T.U. and is unique in that air temperature is regulated by controlling airflow through the heater core rather than varying the volume of coolant circulating through the core. There's more space in the 5000 devoted to airflow doors, cores, outlets, blowers and ducts than allowed for the engine! An illustration of well-thought-out design is the placement of the twin sound system speakers, whose enclosures are molded into the dash (so you get them as standard equipment). The speakers are aimed to

utilize the rake of the windshield in dispersing the sound.

The most striking element, for me, is the treatment of the interiors and the way they harmonize with body colors. There's no hard black and no chrome—everything is done in quiet, nonaggressive, earthy tones and textures. Indeed, the muted interiors look and feel more like soft, sensual peach skin than the synthetic fabrics they are. When the word gets around,

interior decorators will be flocking to showrooms for a look-see.

Given the level of luxury of the 5000, it's easy to overlook the fact that the nice, unitized body sits on a chassis that incorporates sophisticated suspension and braking systems and that this is a car meant to be driven. Control in violent maneuvers and panic braking is superb. At the wheel, you may find that—oddly enough—driving is fun again. **PM**

### The crash crunch that could save your life

You won't read this in the owner's manual: "Congratulations on purchasing a new 5000. Have a safe crash!" But such a statement would be an appropriate welcome to the world of safe motoring, Audi style. The name of the game when it comes to head-on crashes is force management, and what you see below is controlled deformation acting in your behalf.

The 31-mph barrier crash I witnessed at Audi's Ingolstadt, Germany, headquarters remains in my mind as a sickening thud—more aural than visual because the eye cannot slow down what appears to be an instantaneous collapse of the entire front end. What does slow down the crash, though, is the design of the front-end structure. It uses steel members that deform in regular folds, dispersing energy more effectively than when body sections alone are designed to crumble. The predictable crumble as shown at right below is based on the ratio of the

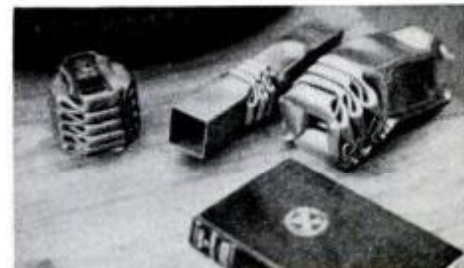
member's wall thickness to cross-sectional width, and is the first, mass-production, automotive application of an engineering principle that was published years ago by a brilliant professor, Timoshenko, whose textbook I remember with terror from my slide rule days at the Polytechnic Institute of Brooklyn.

The 31-mph barrier crash effectively totaled the 5000, but it still looked brand-new from the A-pillar back. I pulled the driver's side door open easily, remembering that in recent tests by the Washington, D.C.-based Insurance Institute for Highway Safety some new-car doors were jammed shut at speeds as low as 10 mph. For occupants that's called being trapped!

The slightest ding is enough to make a new-car owner apoplectic, but in a life-threatening head-on crash ("God forbid," as the life insurance salesman say), you wouldn't worry about dings. You'd be glad there are forces working for you—not against you.—B.H.



In 31-mph barrier crash, hood folds, and does not slice through the windshield.



Structural members crumble as designed, absorbing the force of the crash.

# Great ideas for a family hobby room

PM shows you how to duplicate the clever features of this room.

The growing interest in family-oriented hobbies and crafts has created a need for extra work space in many homes. This version more than satisfies the space needs in handsome fashion. It provides a place for working on any number of projects, yet when the work is completed or interrupted, you can store materials handily out of sight. Thus the space is transformed, ready for use in other ways.

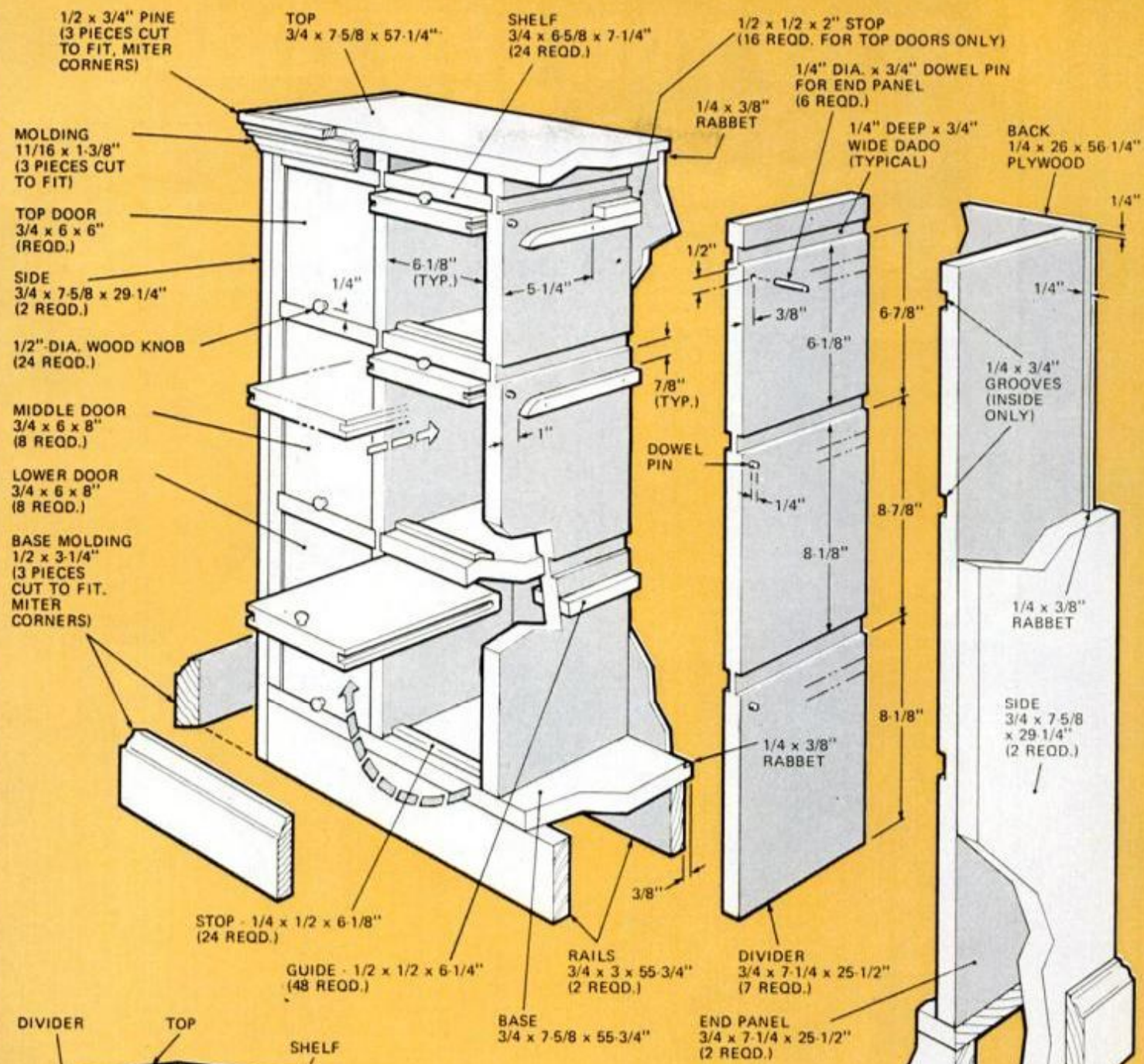
Plywood paneling applied diagonally with battens hiding the joints creates a dynamic wall pattern. For graphic interest, that pattern is picked up and repeated in bold colors on the window shades made by Joanna Western Mills. The areas to be painted on the shades are masked off with tape, then covered with acrylic paints. All the surfaces in the room are finished with hardy, easy-care materials, including the rugged indoor-outdoor carpeting by Trend.

The key elements that make this hobby center a cut above average are the colonial storage chest, the cantilevered desk and the shades that pull upward. The storage chest can hold a quantity of supplies—from model-building equipment to sewing materials—behind its clever flip-up doors. Projects in process can also be stored in the chest. The cantilevered desk is perfect for light-duty work such as assembling and gluing parts, decoupage and other craft activities. The desk is off to the side, out of the path of traffic; it's a place

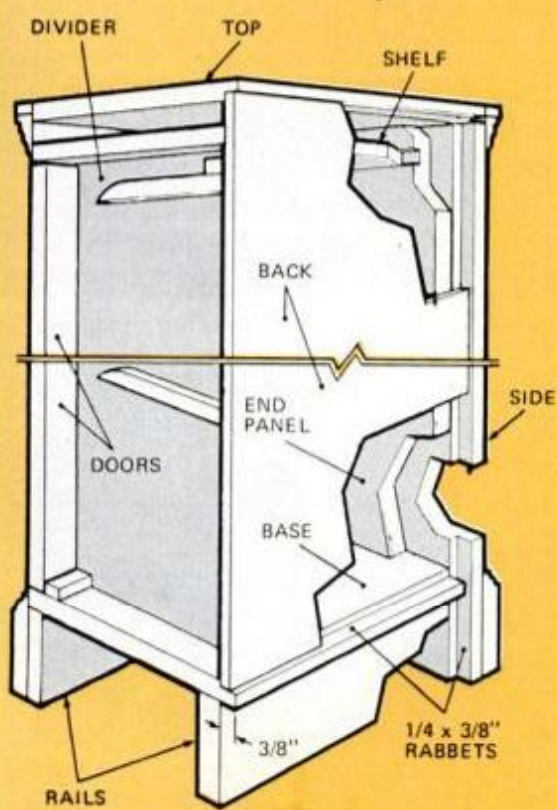
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Photo: Window Shade Manufacturers Assn.

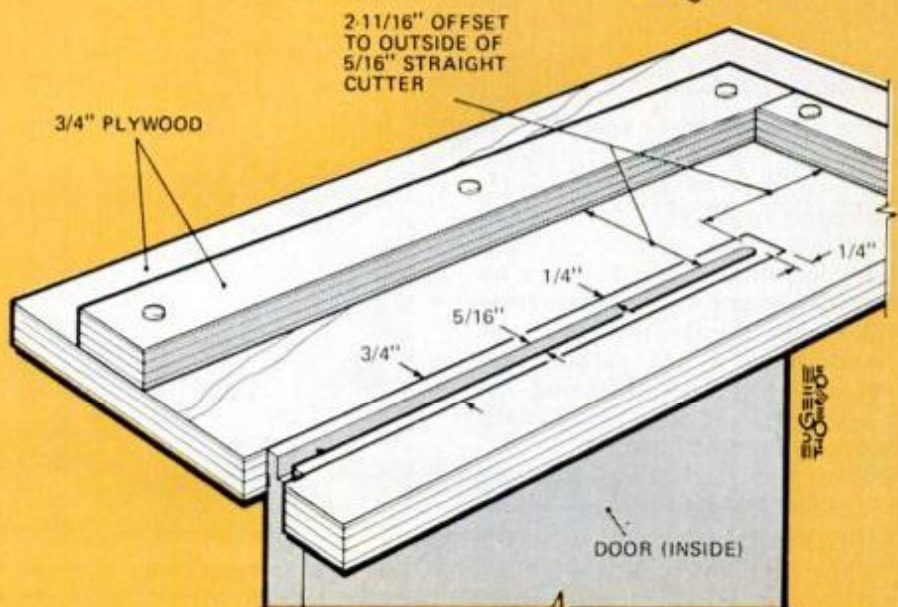




**COLONIAL STORAGE CHEST**



**REAR VIEW**



**DOOR SLOTTING JIG**

WOOD  
WORKING

# Cards you can make and send for pennies



Create PM's Christmas cards and send them at postcard rates!

## Christmas cards you make yourself

You can send a festive holiday greeting to *all* your friends this year without putting a major dent in your Christmas budget. These attractive cards are not only inexpensive to make; they're postcards you can mail using 9-cent rather than 13-cent stamps. After printing the card, you just add a personal note, address, stamp and mail it.

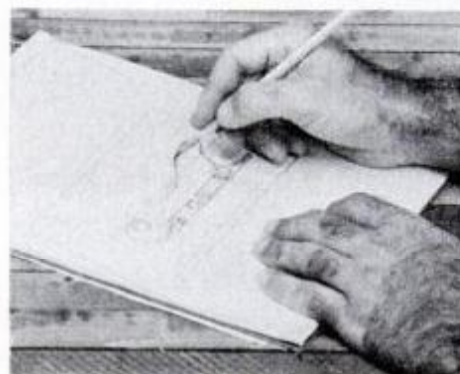
Designs are carved in linoleum blocks, then printed on postcards (or trimmed bond paper) with ink. Each ink color requires a separate

[\(Please turn to page 172\)](#)

will have special meaning for your friends. Above are examples.



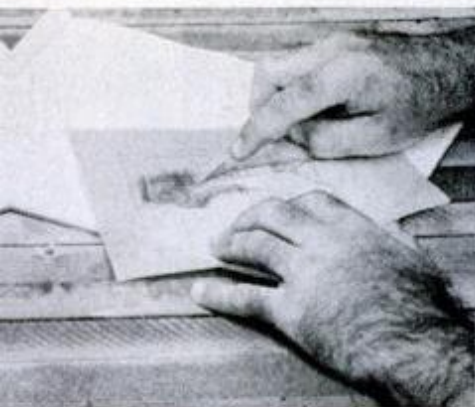
You need carving tools, linoleum block, linoleum cutter, brayer and acrylic paints.



First, use a pencil to draw your choice of pattern actual size on tracing paper.

Материал защищен авторским правом

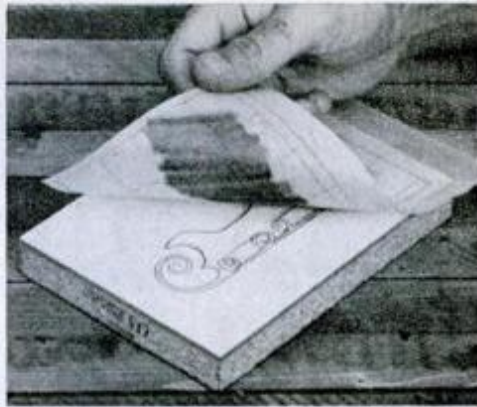




Rub a soft pencil on tissue back or use carbon paper to transfer the design.



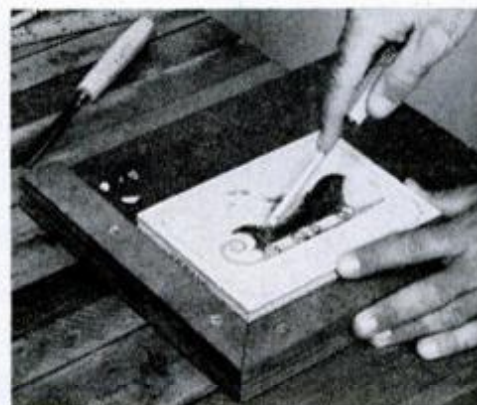
Tape the pattern on the block and go over the design lines with a hard pencil.



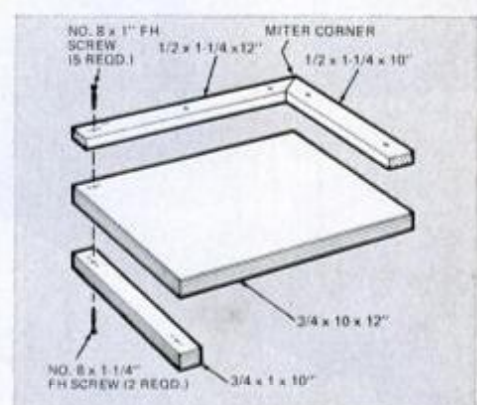
Before you fully remove the taped pattern check drawing for completeness of detail.



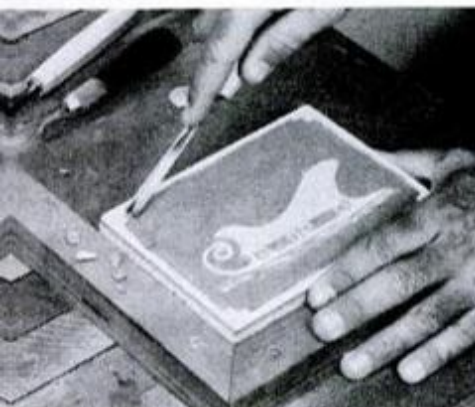
To prevent confusion, be sure to color the areas that are not to be cut out.



When carving the design, be sure to hold block with hand behind the cutting tool.



Build this simple jig to hold the linoleum block securely while you carve out design.



Carve sharp right angles at block corners to assure paper alignment when printing.



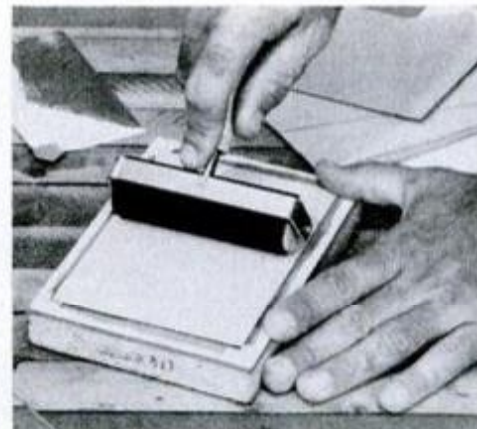
Spread ink on a glass or other nonporous smooth surface. Mix inks to create colors.



Carefully smooth the ink so that all of the soft rubber brayer surface is covered.



Place scraps of protective paper over the large areas that should not be inked.



To print, align card with notched corners; roll with a hard brayer or rolling pin.



If results are uneven, re-ink the block, replace the paper and use brayer again.

# THE NEUTRON BOMB...

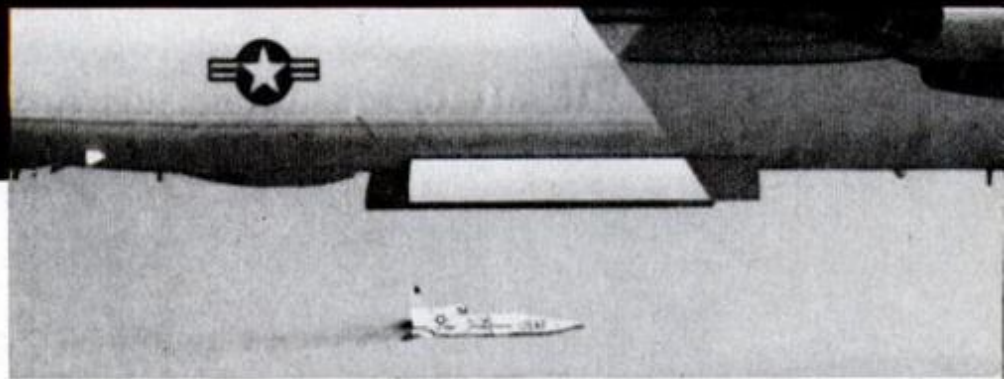
## destroy the enemy, not his camp

The first megaton H-bomb spawned an ugly mushroom over Eniwetok 25 years ago this month. It left a hot lagoon, and nuclear phenomena giving rise to a new weapon that destroys only people—not things. Here's how the military says they'll use it.

by Hugh Lucas



Cruise missile, recently announced as the strategic delivery system for neutron bomb warheads, is a bomber-launched winged craft with an 1800-mile range.



**A** quarter of a century ago this month, above the palm-fringed lagoon of a South Pacific atoll, the possible end of the world was spawned in a giant ball of fire that mushroomed in a maelstrom of sound, blinding light and billowing cloud. In minutes, the awesome phenomenon towered 25 miles into the stratosphere. An eerie thing about the blast was that few observers "heard" it well enough to describe it, but all were sure there had been a "big noise."

The event, staged over Eniwetok in the Marshall Islands on Nov. 1, 1952, was a test explosion of the world's first full-scale thermonuclear device—the hydrogen bomb. When the smoke cleared, the entire island of Elugelab in the 390-mile lagoon had been wiped off the face of the earth.

More significant was the amount of intense radiation that the megaton bomb had generated. In the lagoon area, counters registered high-

er radioactivity than in any previous nuclear test. As the 100-mile-diameter mushroom cloud dissipated in the upper layers of the stratosphere, radioactive particles distributed themselves like a blanket over the top of the earth's atmosphere. It would take a decade for the particles deposited there to return to Earth as worldwide fallout.

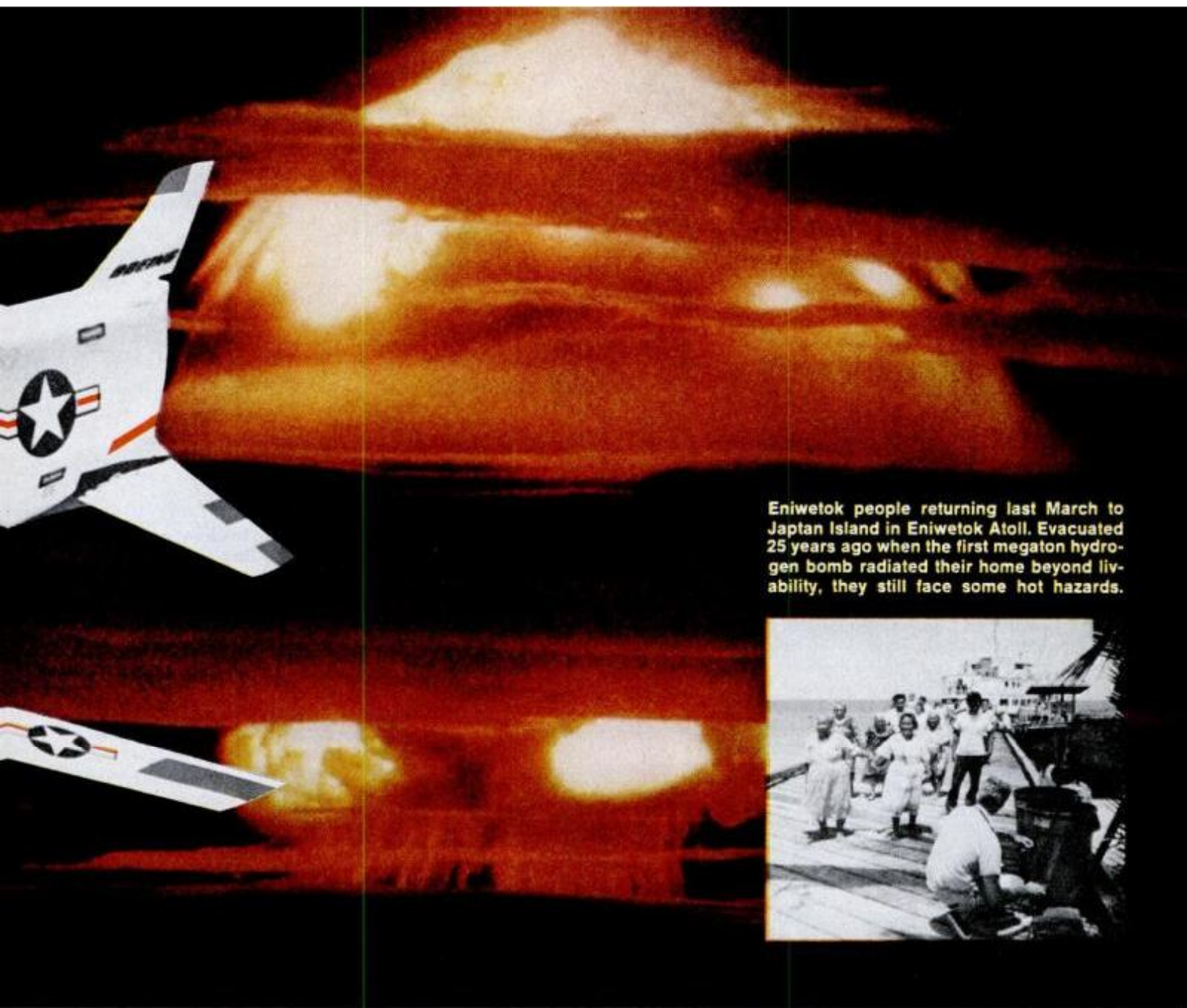
All of this had been anticipated by nuclear physicists involved in the development of the fusion super-bomb. Consequently, the native population of Eniwetok had been relocated—many of them to the Ujelang Atoll, some 125 miles to the south—presumably forever.

All that is history now. Soon after the "big bang," test-ban treaties and moratoriums were the order of the

day. And, last March, some of the Eniwetok islanders, removed 30 years ago, returned to their own atoll. Nature has all but reclaimed some of the islands in the test area, though a few are still too "hot" for humans. And recent tests of the victims of radioactive fallout, as well as victims of the A-bomb blasts in Japan, show they have not produced

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**Nuclear bombs with a force some three times as great as first A-bombs produce heat and blast that destroy everything in a five-mile-diameter circle and leave lethal radiation in a half-mile-radius area. Neutron warhead will blast-destroy about a quarter-mile-radius target area but lethally irradiate everything for  $\frac{3}{4}$  mile in every direction around detonation.**

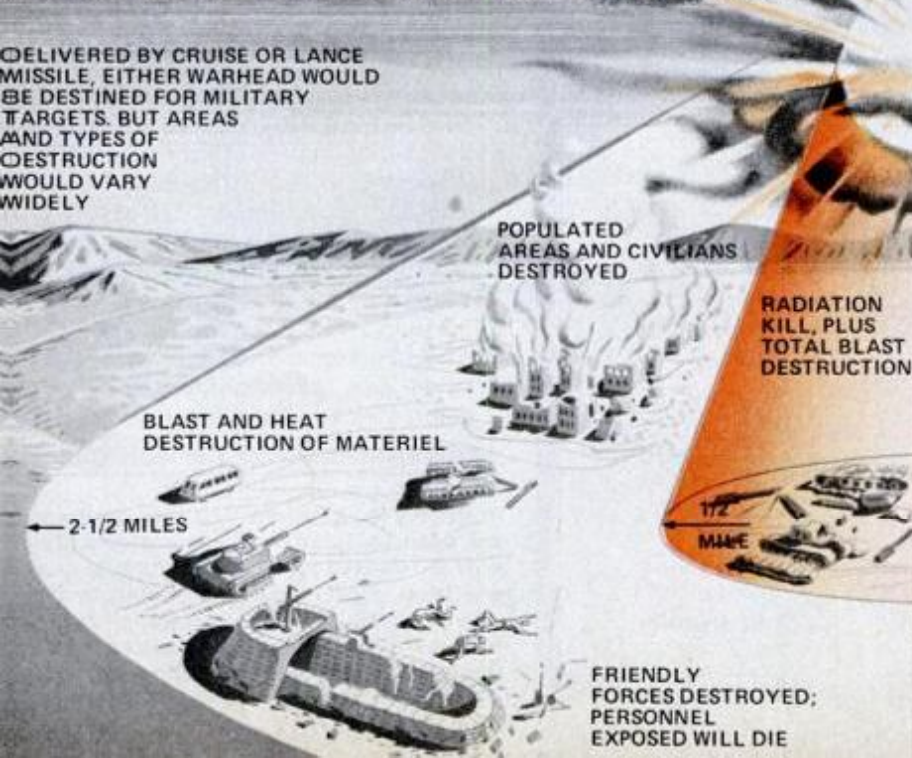


Eniwetok people returning last March to Japtan Island in Eniwetok Atoll. Evacuated 25 years ago when the first megaton hydrogen bomb radiated their home beyond livability, they still face some hot hazards.



## 150 KILOTON NUCLEAR BOMB VERSUS...

DELIVERED BY CRUISE OR LANCE MISSILE, EITHER WARHEAD WOULD BE DESTINED FOR MILITARY TARGETS. BUT AREAS AND TYPES OF DESTRUCTION WOULD VARY WIDELY



## NEUTRON BOMB



large numbers of deformed children as was feared, though cancer—also expected—is running extremely high. But the fusion phenomenon, which produced far more neutrons—and hence more radioactivity—than had the fission process of earlier A-bombs, was not ignored by military planners.

Newest actor on the quarter-century-o'd nuclear stage is the neutron warhead. Actually, far from "new," its development has been going on behind the scenes for almost 20 years.

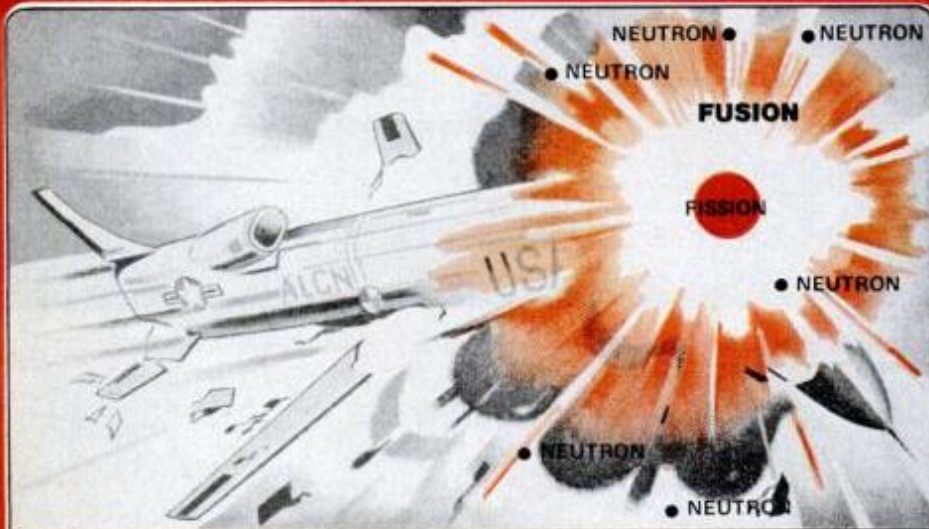
### Neutron 'bullets'

The Army was using neutron warheads as early as November 1965. That was when the Sprint missile, part of the Safeguard antiballistic missile system, was first fired. Sprint was designed to destroy incoming H-bomb-tipped Russian intercontinental missiles at low altitude over American cities.

To avoid ground destruction from fire and explosive shock waves, Sprint was equipped to give off primarily neutron "bullets." It is a fact of physics that two nuclear reactions cannot occur close in time. The phe-



Neutron warhead now being developed for the Lance missile, a long-range projectile for launching from the back of a tank (left), is smaller than the 20-year-old device used as a warhead on the early Sprint missile (above), launched from special complexes.



nomenon is called nuclear fratricide. The first blast changes the molecular makeup of the second warhead and keeps it from going off.

Thus, Sprint's explosion, triggered in the atmosphere, would prevent Russian missiles from detonating. And Sprint itself would have had minimum heat and blast effect on the city below.

### Early strategy abandoned

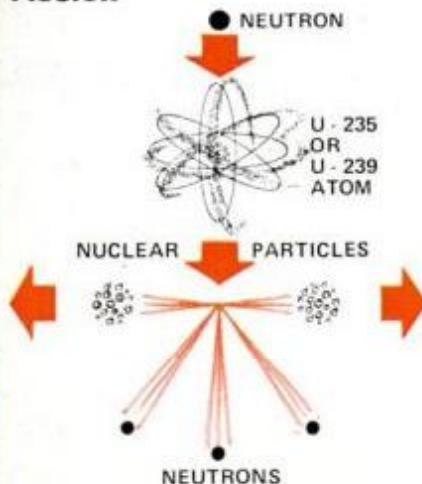
By contrast, Sprint's companion in the Safeguard system, the Spartan missile, was supposed to destroy Russian attackers outside the atmosphere with a standard H-bomb explosion because heat and blast would fade long before reaching the ground.

One Safeguard base—of 12 originally planned—was approved in 1972 and went into operation near Grand Forks Air Force Base, N.D. April 1, 1975. But within a year the program was killed because of expense. The 70 Sprints and 30 Spartans stockpiled were taken apart and are now stored in ammunition depots in Texarkana, Tex., and Anniston, Ala.

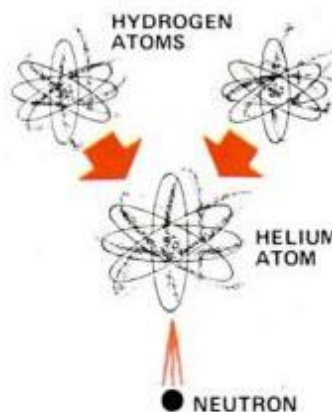
The government has been coy

In fission (bottom left), released neutrons are used up in splitting more atoms. Energy is released mostly in the form of heat and blast. Fusion (right), triggered by fission devices, releases neutrons in the form of radiation energy. Neutron bomb (top) has chemical trigger, freeing even more neutrons without heavy blast effect.

#### FISSION



#### FUSION



about details of underground neutron weapon tests. But it is known the first took place at the Las Vegas, Nev., proving ground in the spring of 1963, shortly after the atmospheric test-ban treaty. The latest was last January.

The neutron warhead now being developed is much smaller than Sprint's and has a much different role. In tactical deployment it is to be carried by the Lance missile—half the size of Sprint and essentially a long-range artillery projectile to be launched ballistically by the Army's 8-inch howitzer and 155-mm gun.

Strategically, the latest news is that the neutron bomb will be carried by the cruise missile—a small, pilotless winged airplane using a fan-jet engine to roam up to 1800 miles into enemy heartland.

### New role for cruise missile

The cruise missile, a bone of contention since the Vladivostok talks, which set the limit on numbers of ICBM carriers, is likely to arouse more controversy when it becomes generally known that it is actually in line to be outfitted with a neutron warhead. Originally designed to hit "soft" (city) or "medium hard" targets (dispersed or lightly fortified industrial complexes), the cruise missile will realize a new dimension with the advanced warhead. It will then be capable of taking out "hard" bunkers or ICBM control complexes or used as a semitactical weapon by clearing cities of defending troops with intense radiation, thus avoiding the deadly street fighting that one Pentagon source describes as "the toughest battle an infantryman has to face."

Despite its range, the cruise missile is much more accurate than the short-range, battlefield Lance. "We can fly it into a window in the Kremlin," one officer said. The Lance, on the other hand, is an "area" weapon, accurate to within 300 feet.

Neutron bombs, whether carried by the Lance or cruise missiles, would be detonated by radar 3000 feet above the ground, and would create twice the radiation of a standard nuclear bomb, with only one-tenth the heat and blast. The Lance warhead is rated at one kiloton.

Lethal radiation will reach out nearly a mile. Blast and heat, which suck up radioactive dust, will cover only one-sixth as much area, Pentagon sources say. Lance's range will be boosted about 10 miles, to 85, with a neutron warhead half as large as a standard nuclear bomb warhead producing 50 kilotons of force or three times the output of the 1945 Hiroshima bomb.

Intended targets, in case of war, would be Russian tank and armored personnel carrier crews. Soviet armor has elaborate atomic warfare protection equipment, including a water spray to wash off radioactivity, and modified MIG jet engines to blow them dry.

### NATO fear: a tank attack

Greatest fear of the NATO defensive alliance is a tank attack through the classic invasion route, the Fulda Gap in West Germany, a heavily populated area. Russian armor outnumbered the allies three or four to

one and "the only thing that can stop armor is radiation," one Pentagon officer reveals.

In this view, the neutron warhead is a defensive weapon that—the military claims—will not destroy adjacent civilians or city buildings during annihilation of an attacking force by intense radiation. In addition, it does not stir up as much radioactive dust, which caused the deadly fallout in Japan and downwind from the Pacific nuclear test sites. As a consequence, friendly troops can enter the blast area "with-

*(Please turn to page 164)*

## RADIATION VERSUS BLAST

Original 10-kiloton A-bombs exploded over Hiroshima and Nagasaki in August 1945 (Nagasaki bomb is at right) produced devastating blast and heat effect destroying entire centers of each city. Hiroshima is shown (bottom) after the dust and smoke had settled. Radiation burns affected thousands, who weren't killed outright, on the outer fringes of the blast area. Many of them later developed keloids, cancer-laden skin growths, like the Hiroshima victim shown in the photo below.



# Secrets of successful winter layup

Every boat requires tender loving care this time of year ashore as a head start for trouble-free days afloat.

by Bob Whittier

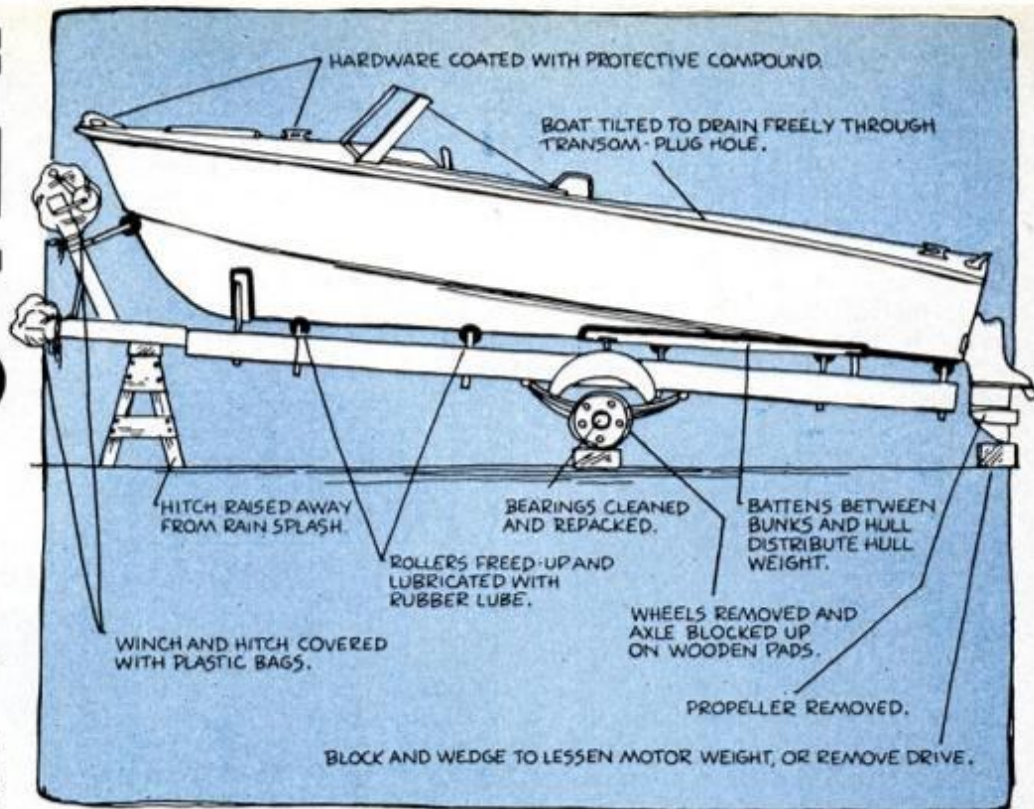
There is still no such a thing as a "maintenance-free" boat, but there are many new and easy ways to minimize the work involved this time of year. When most boats were made of wood and needed a lot of upkeep, the early fiberglass builders fighting to gain acceptance for their new material liked to claim that their revolutionary hulls required no care at all.

It's true your fiberglass or aluminum boat does not require the tedious annual caulking, sanding and painting of wooden craft, but it does need attention. Yet the "no care" notion lingers on, and it's depressingly common to see badly neglected boats sitting out in the rain and snow in back yards and marinas. Boats and their equipment rarely wear out from hard and steady service as do cars and washing machines. Instead they often suffer from long periods of idleness; a control lever or hatch hinge in constant use is less likely to corrode shut than when not in use, and a hull speeding through the water doesn't give weeds a chance to grow and harden on. But let your boat sit ashore untended for several months and you learn the value of proper layup.

## Cleaning

Before haul-out, see if your boat's bilge area is oily or scummy. If it won't pass inspection, use one of the bilge cleaners sold in marine stores. Mix it with bilge water on the season's last cruise. It will slosh around and loosen dirt film, but observe federal regulations against discharging oily waste on waterways.

With a trailered boat, add one of these cleaners to an inch or so of water in the bilge to slosh around on the last trip home. Automotive



Trailer boats have a ready-made cradle for winter storage. With additional blocking to support engine weight and hull tilt for proper drainage, your craft is well supported. Removing wheels prevents tire flat spots and lessens the chance of boat theft.

degreasing compounds in spray cans are safe to use in boats. They will not hurt wood or other structural materials since they are promptly rinsed off, but play safe and keep them off upholstery.

Boats afloat all summer often have algae or other marine growth on their bottoms. Scrub this off before it can dry! Once hardened, it is difficult to get off just by rewetting. Use a stiff-bristled brush or, before hauling out, locate a marina with a high-pressure water wand. This will do a fast, thorough job of blasting off scum without hurting the hull surface. Well-stocked marine supply stores sell bottom-cleaning preparations that help soften marine growth if this stuff does dry hard on the bottom.

Wash oil from the hull exterior with detergent and a cloth. Flush out the interior with a garden hose. Pockets of sand and silt hold moisture; they can cause wooden members to rot, metal parts to corrode. Even in fiberglass, they can cause stains that are difficult to remove when dry. Brown stains just above the waterline can be removed from fiberglass with a marine stain remover.

If your boat is aluminum, get salt and silt out of longitudinal stringers and other enclosed spaces by running water into them. Any boat that has been dashed with salt spray probably has salt specks on the steering mechanism, switches and wire termi-

nals under the dash or console. Flush there, too.

Most modern boat upholstery is vinyl so check the fine-print warnings on household or automotive cleaning products. Abrasive cleaners can dull the glossy surface. Vinyl cleaners are best. Your upholstery, ropes, cabin trim, gunwale molding may also have mildew deposits. Spray-on marine mildew removers get rid of it so quickly you'll never again use soap and water. Some household cleaners contain phosphates and may leave a nutritive coating that will stimulate mildew regrowth.

## Removing equipment

Depending on storage conditions, some gear can remain aboard while the rest should come ashore. Instruments and electronic equipment suffer from condensation that forms inside with weather changes, and they're tempting to thieves. They're better off safe and dry at home.

Cushions, bedding, curtains and a folding top also do better indoors. Mildew is inactive in cold weather, but mice and squirrels enjoy fabric nests. Sunlight darkens and stiffens synthetic ropes.

Remove and empty portable outboard gas tanks. There's so little oil in the modern 50-to-1 outboard fuel mix that a few leftover gallons can be safely used up in your car. If you see water droplets down on the tank bottom, sop them out with a piece of

cloth on the end of a stick. Permanent tanks can be doused with methanol-type gas line antifreeze to remove small water deposits.

Most owners prefer to keep permanent tanks fully filled because condensation can form inside from damp air, and the gas vapor in a partially filled tank increases the explosion hazard. Check with your insurance man and fire department when deciding which way to go.

### Hull support

The initial curing process of fiberglass resin is so rapid that a new hull is removed from a mold the day it is made. Then curing continues gradually over a period of months. A new boat that's poorly supported during this stage can take a set that may become permanent. A trailer with full and well-adjusted hull supports can make a good winter cradle. Remove outboard motors or press wooden blocks between the floor and lower unit skeg to take some of the weight of a big outboard or stern drive off the transom.

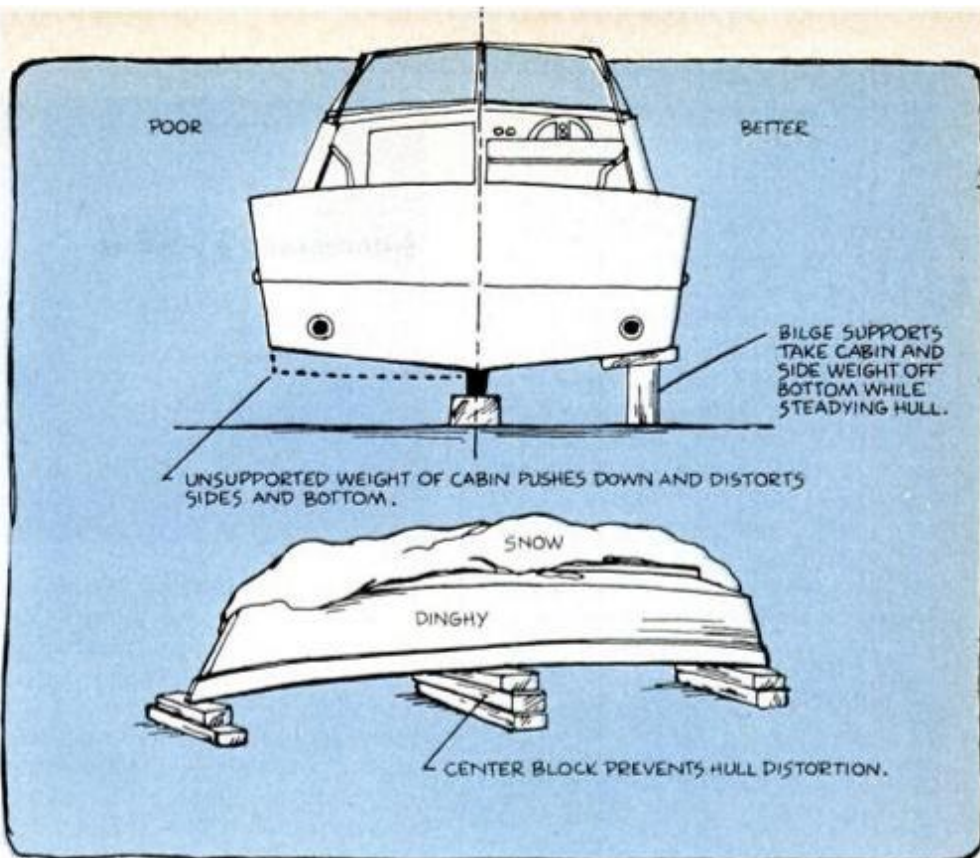
A cradle is desirable for anything larger than a small, light hull. Even on a flat floor, a hull resting on one side could develop a permanent twist. For the same reason, never leave a canoe or pram leaning against a garage wall with all the weight on one gunwale.

When making a fiberglass-hull cradle, remember the boat may not have as much internal framing as one of wood. Support blocks and chocks could press against the hull where there are no internal bulkheads and permanent depressions could be made in the hull surface. If a boat is supported only along the keel, outer sections of the bottom can be pushed down and the V-shape flattened out. To be safe, position supports under internal stringers and bulkheads, and support the chines or curve of the bilge as well.

It is common to store smaller craft like dinghies and johnboats upside down. If outdoors, remember a hull might have to support a heavy load of snow, and add supporting blocks under the gunwales amidships. Never let part of a boat rest on the ground. Wood rots quickly when kept damp; leaves can stain fiberglass and acids in them may corrode aluminum. A small boat outdoors should be on sawhorses so rain won't spatter mud in, and weighted or tied down to keep it from being blown over in a strong wind.

### Cover up

Wooden boats are traditionally fitted with covers to keep water from seeping into seams where dry rot



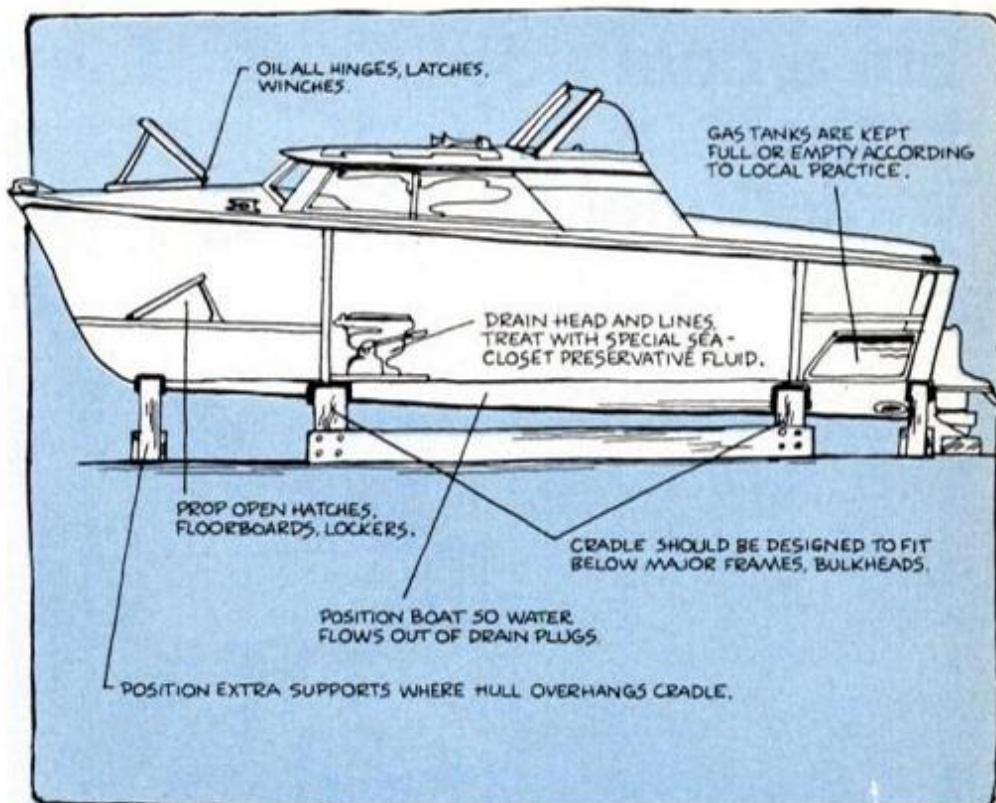
Hull distortion is prevented by positioning supports under load areas of cruiser or dinghy. Craft should be elevated off the ground to keep moisture from starting wood rot or rain and snow from splashing mud on hull. Tie-downs are sometimes needed.

breeds. Uncovered fiberglass boats will not rot, but the surface gel coat pigment can gradually fade. The more a boat is sheltered from the sun, even by storing it on the shady side of a building, the longer it retains its good looks. Point it one way one winter and the opposite way the

next if it must be stored in direct sunlight.

A good winter cover also keeps sunlight off upholstery, varnish and plastics. Marine supply stores sell general-purpose covers to fit small boats, and many frugal boatmen im-

(Please turn to page 160)



Fiberglass hulls, with fewer interior frames and stringers, may need braces that are positioned under interior bulkheads and strength members but not where supports could dimple the hull. Note all compartments and hatches are left open for ventilation.

**T**he VW bus we've all come to recognize may be on its way out. After building 4 million of the boxy bugs, Volkswagen, in cooperation with M.A.N. of West Germany, has developed a new LT series of vans and commercial vehicles based on Porsche 924 components (actually it's Porsche that borrows LT parts). VW introduced its front-wheel-drive, water-cooled LT vans and buses in Europe in 1975, but is not bringing them here yet. The reason is that the much updated and sophisti-

**VW bus is only van sold in nation with four-wheel independent suspension.**



cated version of VW's 28-year-old design is still going strong.

The box-on-wheels that began life in 1949 with 162 cubic feet of cargo space today contains 176 cubic feet. Its fuel-injected 1977 engine now carries the basic bus from zero to 50 mph in 15 seconds and provides a top speed of 79 mph, according to VW test-track figures. That's a considerable improvement over earlier models, which for years simply yawned

when the driver pressed down on the accelerator.

Question is: What do owners of the newest VW buses think of their purchases? Are they happy or ready to change? Is the van's godfather outmoded or still a leader?

To find answers, we surveyed 1000 owners of 1977 VW buses. We were actually interviewing owners of three different vehicles because Volkswagen builds the bus in three distinct configurations: the VW Station Wagon for seven or nine passengers, the VW Campmobile for campers and the VW Kombi, which doubles as a van and passenger-carrying wagon.

The overwhelming reaction—what owners like best about the VW bus—is that it pinches pennies, not people. Economy is the car's best-loved feature, with interior space a close second.

Asked what they were looking for when buying VW buses, owners gave these typical answers: "Cheaper to buy and operate

BY MICHAEL LAMM WEST COAST EDITOR

**Plenty roomy and economical, say owners, but a cool ride in the wintertime!**

High fresh-air vent doesn't pick up other cars' fumes.

Boxy shape makes it "like driving a billboard" in high winds.

Crushable front subframe affords protection in head-ons.



Photos by the author



than other, similar vehicles I looked at," says a Texas Realtor. An Oregon credit manager agrees: "I bought mine for price. No contest on space utilization and workmanship when I compared the VW with the Ford Club Wagon and Chevy Sportvan. And I get better gas mileage."

The VW bus contains 70 percent more room inside than an



Clean instrument panel is easy to read through two-spoke wheel.

average full-size American station wagon, prompting these remarks:

An Arizona nurse states: "I like

the space the bus offers. It combines the best features of trucks and cars without the cumbersome mass of a U.S. station wagon."

A California physician: "Here's a camper with plenty of room inside, and yet I can park it in my garage."

What about comfort?

"There's all kinds of room inside to be comfortable in," comments a Wisconsin trucker, "but it tends to be cold in winter." A North Carolina medical technician: "I especially like the chair-height seats, their positioning and the adjustable backrests. We own the Campmobile, and comfort becomes a function of the design's ingenuity and utilization of space and accessories, all commendable."

"Comfort and ride are extremely good for a large vehicle," opines a Kentucky teacher. But a Nebraska music professor counters, "Good seats don't mean a damn when you're freezing off what you sit on!"

Let's face it, Volkswagen—the bus heater isn't what it ought to be. Some 16.2 percent of our respondents complained specifical-



A few owners voiced their desires for swiveling captain's chairs.

ly; 18.8 percent recommended it be changed. The air-cooled rear engine makes it rough to engineer

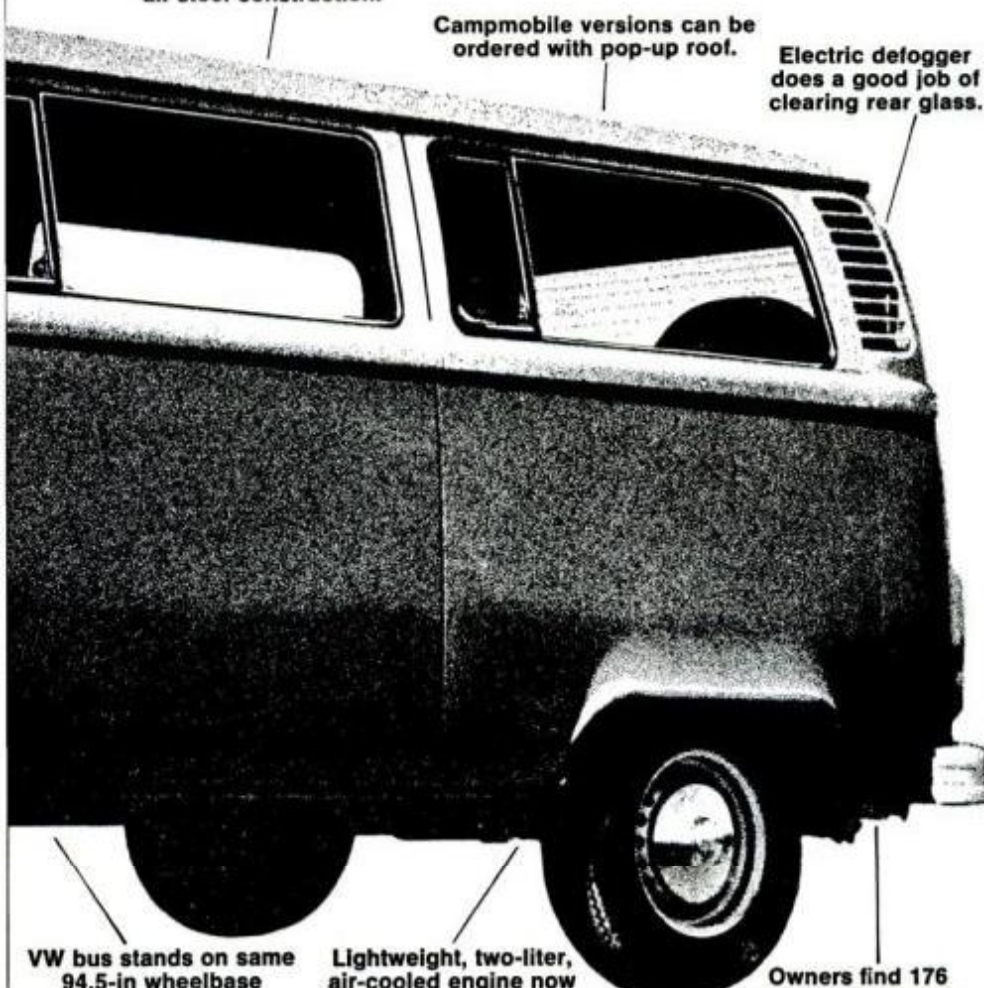
*(Please turn to page 180)*

## A NATIONWIDE SURVEY BASED ON 2,371,364 OWNER-DRIVEN MILES

Optional sliding sunroof has all-steel construction.

Campmobile versions can be ordered with pop-up roof.

Electric defogger does a good job of clearing rear glass.



VW bus stands on same 94.5-in wheelbase as Rabbit and Beetle.

Lightweight, two-liter, air-cooled engine now delivers plenty of punch.

Owners find 176 cubic feet of space inside this workhorse.

### Birth of the bus

Volkswagen's box on wheels became the original, archetypal van.

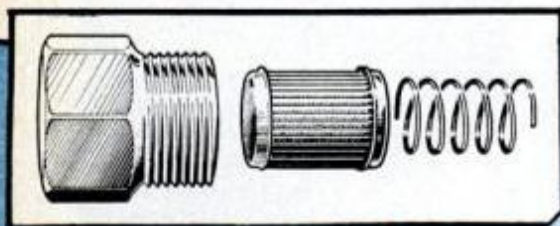
Brainstormed by VW's innovative postwar managing director, Heinz Nordhoff, the first so-called Transporter came off Wolfsburg's assembly lines in November 1949. (VW's commercial vehicle plant was later moved to Hanover.)

The VW bus's idea, then as now, was to cram as much usable space as possible into the smallest, lightest, strongest, most economical and utilitarian package possible. The all-steel, self-supporting unit body could (and can) carry as much weight as its own, with the load cradled between the axles, balanced by the engine aft and the driver up front.

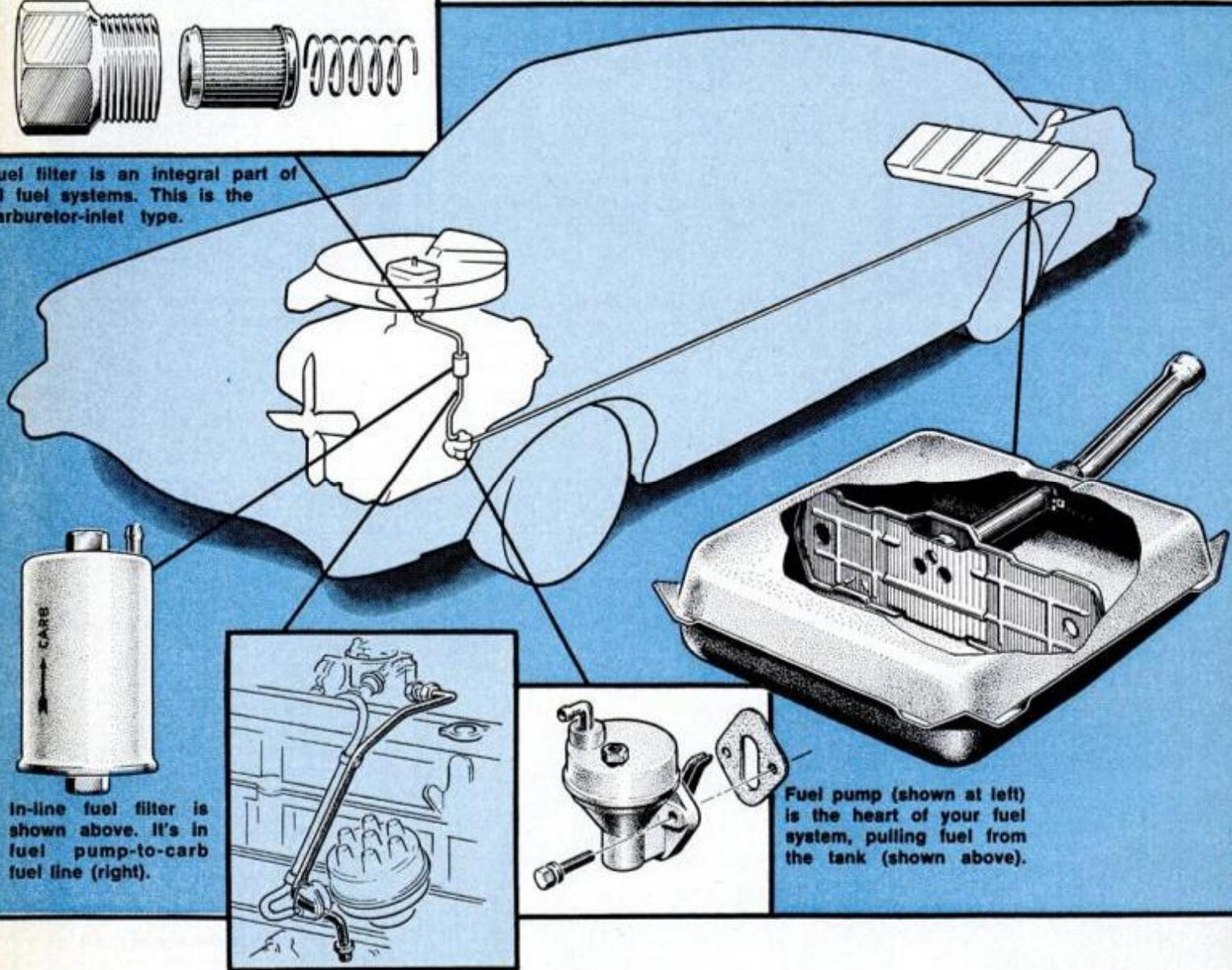
Today's VW bus comes in several distinct body combinations for different purposes. The basic station wagon still has 70 percent more interior space than the average full-sized American wagon, yet it's several feet shorter overall.

Fuel injection became standard in 1977. The engine has grown through the decades and now has a rating of 67 bhp at 4200 rpm from 102.2 c.i.d. The basic seven-place VW station wagon retails for \$5949 p.o.e., with automatic transmission costing an additional \$295. Front disc brakes are standard and so are radial tires.

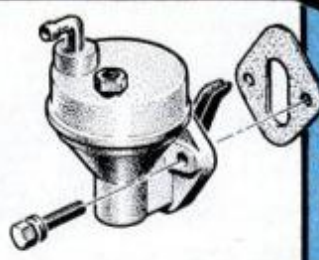
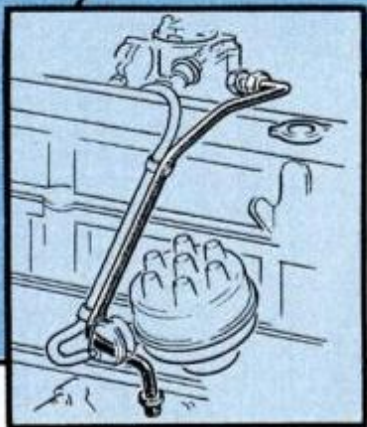
# Your fuel system: All



Fuel filter is an integral part of all fuel systems. This is the carburetor-inlet type.



In-line fuel filter is shown above. It's in fuel pump-to-carb fuel line (right).



Fuel pump (shown at left) is the heart of your fuel system, pulling fuel from the tank (shown above).

Follow us as we trace your fuel flow from tank to carburetor and you'll understand this pipeline, how to check it out, and how to repair it when it breaks down.

by Mort Schultz

**T**here's an 805-mile difference between the Alaskan pipeline and the pipeline in your car, but both do the same job—get fuel from here to there. In your car, "here" is the fuel tank and "there" is the engine.

The pipeline in your car is called the fuel system. A conventional fuel system encompasses several key components as follows ("conventional" in the sense that it is not a fuel injection or diesel system):

- The fuel tank.
- A fuel pump that pumps gasoline from fuel tank to carburetor.
- Tubes (lines) that carry gasoline from fuel tank to carburetor.
- Filters that cleanse impurities

from gasoline before it enters the carburetor.

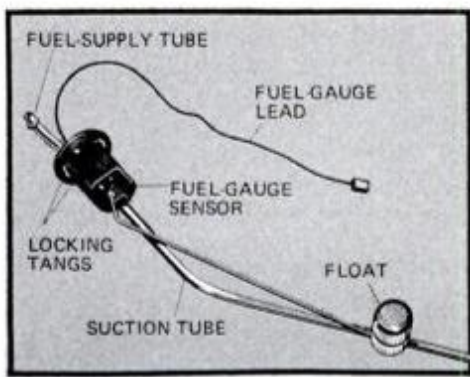
■ A carburetor that combines gasoline and air in order to make a combustible fuel mixture which enters the engine.

This article discusses roles played by each part, except the carburetor. It explains how they do what they do, how to service them and how to replace them when they fail.

### The fuel tank

The fuel tank is normally placed in the rear of the vehicle beneath the luggage compartment. In cars having the engine in the rear, such as the old Corvair and the VW Beetle, the

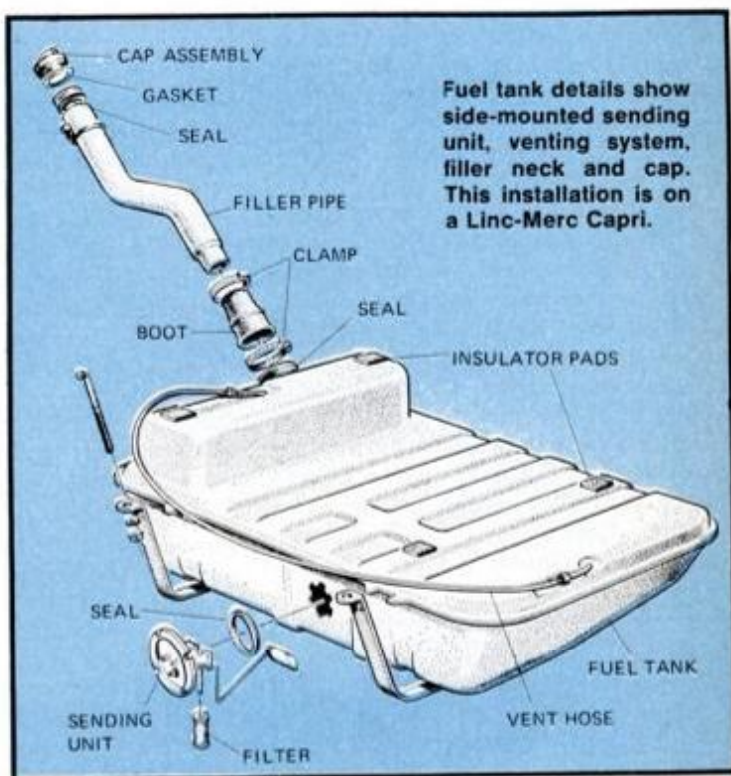
# you need to know about it



The pickup and sending unit, inside your gas tank, is detailed at left. It sends a signal to your dashboard fuel gauge.



You can remove pickup and sending unit for repair or replacement, but this may call for a special tool.



Fuel tank details show side-mounted sending unit, venting system, filler neck and cap. This installation is on a Linc-Merc Capri.

tank is placed in the forward compartment.

A tank has a filler pipe and an outlet, the latter consisting of a pickup that draws off gasoline sending it on its way to the carburetor.

Normally, a fiberglass filter having a relatively coarse mesh is positioned on the pickup. This end is usually placed about 1/2 inch off the bottom of the tank, allowing sediment that

collects in the tank to settle on the bottom rather than be drawn into the fuel line.

Rarely will a pickup filter clog. However, it could happen. Thus, if a fuel-pump delivery test (see below) reveals that fuel is not being delivered to the carburetor and all obvious points have been checked (fuel-line filter, fuel pump and fuel line), turn your attention to the pickup filter.

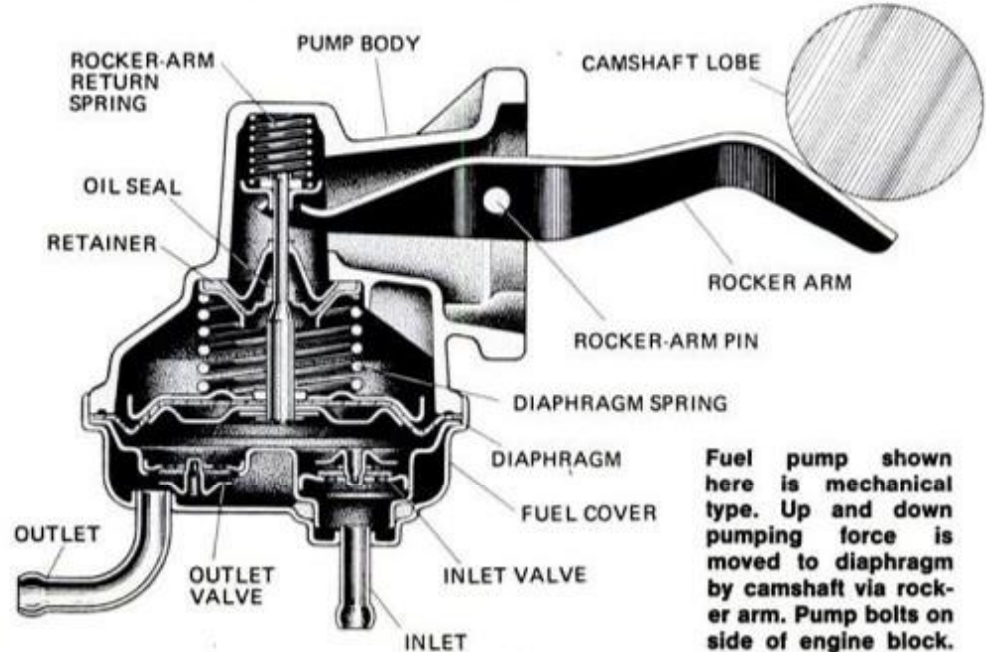
The plate on the top or side of the fuel tank should be removed and the pickup tube, normally part of the fuel-gauge sending unit assembly, withdrawn. You will probably have to drop the tank to do this.

However, in some imported cars the fuel-gauge sending unit may be disconnected from inside the trunk without dropping the tank, so check.

*Note:* A modification to 1975-76 AMC cars calls for installation of a new fuel-tank filter if a fuel delivery test shows that the engine is being starved for fuel. Check with your AMC dealer.

Other parts of a conventional fuel tank are:

- A baffle inside the tank that is welded to the sides and bottom to reinforce the tank and stop fuel from splashing and surging. A baffle has several holes in it to allow fuel to move freely.
- A fuel-gauge sending unit, possessing a float to measure fuel level, and a low-voltage sensor. The unit is connected by wire to the fuel gauge on the instrument panel.



Fuel pump shown here is mechanical type. Up and down pumping force is moved to diaphragm by camshaft via rocker arm. Pump bolts on side of engine block.

### About fuel-tank venting

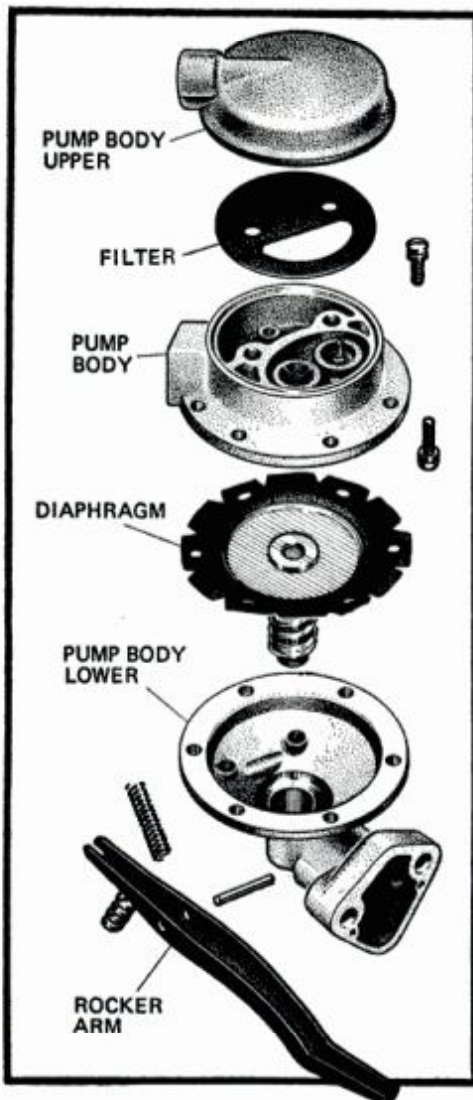
Fuel tanks are vented so air can enter the tank as gas is pumped out. Otherwise, vacuum formed in a tank

could cause the walls to collapse.

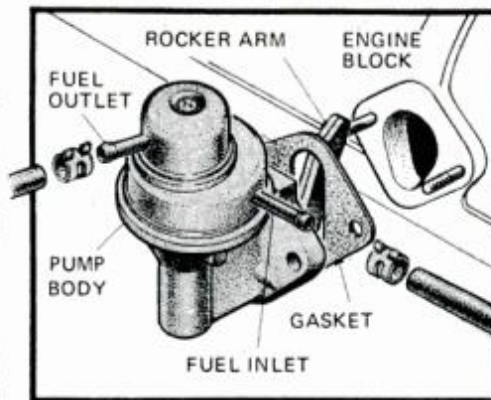
Some older cars had the vent in the gas cap. Other cars, including all present models with fuel evaporative control systems, have nonvented caps. A tube leading from inside the tank to the outside provides venting. In models with evaporative control, the vent line passes into the charcoal-filter canister in the engine compartment.

If you are in doubt about the kind of venting system your fuel tank possesses, examine the fuel tank to see if there is a vent line. Inadvertently placing a vented cap on a tank having a separate vent line will not cause an operational problem. However, it will reduce the effectiveness of the fuel-evaporation control system in controlling emission.

Conversely, putting a nonvented cap on a fuel tank that is supposed to have a vented cap could present a problem. The fuel pump, whose pumping action is assisted by air entering the tank, may not be able to deliver sufficient fuel. As we said, another danger is that the tank's walls could collapse.



Mechanical fuel pumps that aren't sealed can be taken apart as shown and restored with new parts from a rebuild kit.



Unbolt fuel pump from engine to remove. You'll have to give pump a wiggle to get rocker arm clear of opening in block.

A positive indication that a non-vented cap has been placed on a tank requiring a vented cap is an audible "whoosh" as you remove the cap. This is the sound of air rushing into the tank.

### Cleaning a fuel tank

If there is evidence of fuel tank contamination—that is, water in the fuel—the tank can be cleaned. In present domestically manufactured models, this involves dropping the tank. Some older and imported cars have a drain plug in the bottom of the tank. If you have one of these (the Triumph is one, for instance), draining the fuel and flushing the tank with alcohol while the tank remains on the car will usually decontaminate the tank.

To clean tanks without a built-in drain the general procedure is as follows:

**Caution:** Do this job in a well-ventilated area and away from everything that is likely to make a spark or flame. *No smoking.*

1. Disconnect the battery.
2. Siphon fuel tank (see below).
3. Remove fuel tank (see below).
4. Remove the fuel sending-pickup assembly. A special wrench available from a car dealer or auto-tool dealer may be needed to get the plate off.
5. Inspect the pickup filter. Replace it if it is clogged with water.
6. Complete draining by rocking the tank and allowing fuel to pour out the fuel-sending-pickup assembly plate hole.
7. Pour running *hot* water through the tank for at least five minutes. Be sure all water is removed from the tank.
8. Allow the tank to air-dry thoroughly.
9. Reassemble everything.

**Note:** If the tank shows evidence of rust, it should not be returned to service. Get another.

### Siphoning a fuel tank

The following method is totally

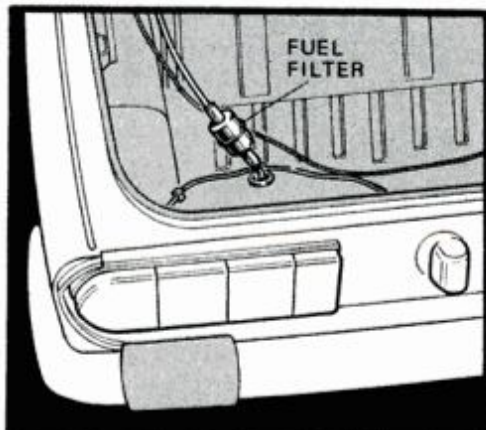
safe. It avoids your having to suck fuel out by mouth, which may lead to your swallowing gas:

1. Get a 10-foot length of  $\frac{3}{8}$ -inch i.d. hose. Cut a slit in the hose 18 inches from one end.
2. Get a 4-inch piece of  $\frac{3}{8}$ -inch copper tube. Insert this securely into the other end of the hose.
3. Insert the copper tube end of the hose into the tank through the filler neck until the hose rests on the bottom of the tank. Work the hose from side to side to clear the baffle, if necessary.
4. Insert an air hose into the silt. Only a short blast of air is needed to cause fuel to flow out of the tank.

### Removing a fuel tank

The following will apply to your car although some variation in procedure may be required:

1. Disconnect the battery.
2. Siphon fuel from the tank.
3. Raise the car.
4. Disconnect all lines and wire at the tank, such as the sending unit wire and the fuel evaporative system line.
5. Support the tank by some method, such as a jack. However, be care-



Most fuel filters are in carb or in line between fuel pump and carb. If not there, check near fuel tank, as on this Triumph.

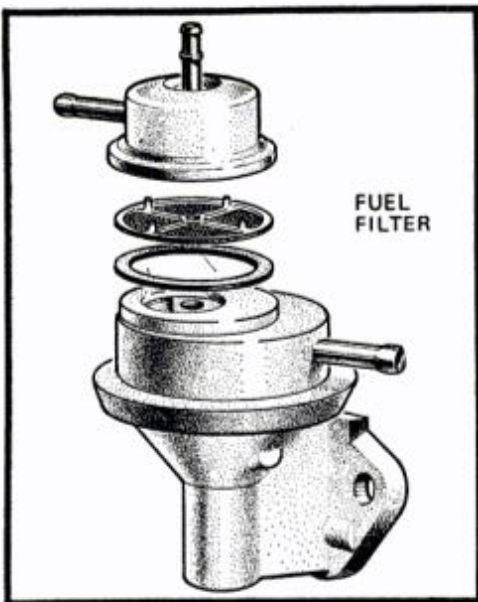
ful not to crush the tank. If you use a jack, place a block of wood between the top of the jack and the tank to serve as a pad.

6. Carefully remove the tank's supporting straps.
7. Lower the tank to the floor.

**Caution:** When installing a fuel tank, do not overtighten the support straps. Secure them until they bottom against the tank. Then torque the fasteners to about 25 ft.-lb.

### Types of fuel pumps

There are two kinds of fuel pumps: mechanical and electrical. Most American-made cars use the mechanical type, but there are exceptions. Chevrolet Vega is one.



Fuel filters are designed into the fuel pump installed on many imported cars.

The mechanical fuel pump is operated by a lobe of the camshaft. The pump's arm rests on this lobe. As the lobe revolves, pushing and relaxing the arm, suction is created inside the pump.

This suction draws gasoline from the fuel tank and pushes it to the carburetor. The critical parts of a mechanical fuel pump are:

- Inlet valve that opens to let fuel into the pump from the fuel tank.
- Outlet valve that opens to let fuel out of the pump to the carburetor.
- A flexible diaphragm that flutters alternately to draw in and push out fuel.

A spring that controls diaphragm action.

In older domestic cars (pre-1968), it was possible to disassemble and overhaul a defective mechanical fuel pump. This can't be done with present-day fuel pumps, which are sealed. A bad pump has to be replaced.

Getting an overhaul kit for an older fuel pump that can be disassembled may still be possible. Consult an auto parts dealer. If a kit is not available, which will probably be the case, you may be able to buy a rebuilt pump or get one from an auto wrecking company.

Electric fuel pumps are used in many imported cars. They are normally placed close to the fuel tank, acting as pusher pumps rather than drawing pumps. In the Vega, for example, the fuel pump is in the fuel tank.

An electric fuel pump operates as long as the ignition switch is on, so be sure the switch is turned off when the car is not in use.

An electric fuel pump can fail because a mechanical part goes bad or because of an electrical malfunction.

A mechanical defect requires that you replace the pump. Electrical failures require pinpointing the defect and repairing it.

### Testing the fuel pump

Testing is quite easy and may be done with nothing more esoteric in the way of equipment than a piece of vacuum hose and a glass graduate marked off in pints.

If you've been seeing gasoline on the ground under the fuel pump after the vehicle has been stationary, you don't even have to proceed with this test. Replace the pump. The diaphragm has gone bad.

To test fuel-pump delivery, disconnect the fuel line at the carburetor. Attach the hose, which should fit tightly. Place the end of the hose in the graduate.

Start the engine, running it for 30 to 45 seconds. The engine will run for at least this long on the fuel retained in the carburetor.

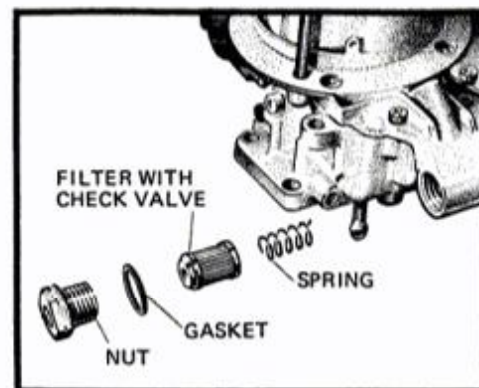
There should be at least one pint of gas in the graduate at the end of 45 seconds. If there isn't, the pump should be replaced.

*Note:* If your car is equipped with an electric fuel pump which has been giving failure signals, but the fuel delivery test proves satisfactory, the ignition-system output and fuel-pump electric circuit should be tested. A "failure signal" is engine cut-out that occurs during heavy acceleration or high speed because of fuel starvation.

### Replacing a fuel pump

*Note:* This procedure, which refers primarily to mechanical fuel pumps, may be used with variation to replace an electric fuel pump.

1. Disconnect the fuel line from the fuel tank.
2. Disconnect the fuel line going to the carburetor.
3. Remove the nuts holding the pump to the engine.
4. Turn the engine by turning the crankshaft pulley by hand until the



Removing carb-inlet-type filter requires care; don't lose spring or gasket.

pump's arm seems to be under the least pressure from the camshaft lobe.

5. Withdraw the pump slowly from the engine.

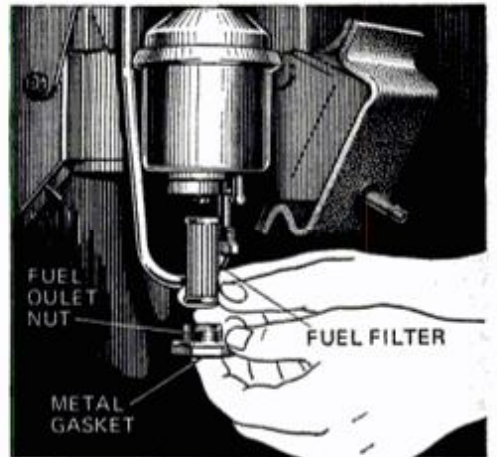
6. Scrape away old gasket material remaining on the engine.

Use a new gasket when fitting a new pump or returning the old pump to the engine. Apply a coating of gasket sealer to both sides of the gasket.

### About those fuel lines

Two troubles, both rare, may strike a fuel line: foreign particles may clog the line or the line may spout a leak.

To clean out fuel lines, disconnect them at both ends—that is, at the fuel tank and fuel pump for one line, and at the fuel pump and carburetor for the other line. Blow



The fuel filter found on a Cadillac is installed at the bottom of the fuel pump.

compressed air through the lines in the direction opposite to fuel flow. Reconnect the lines.

If it becomes necessary to replace a fuel line, keep the following points in mind:

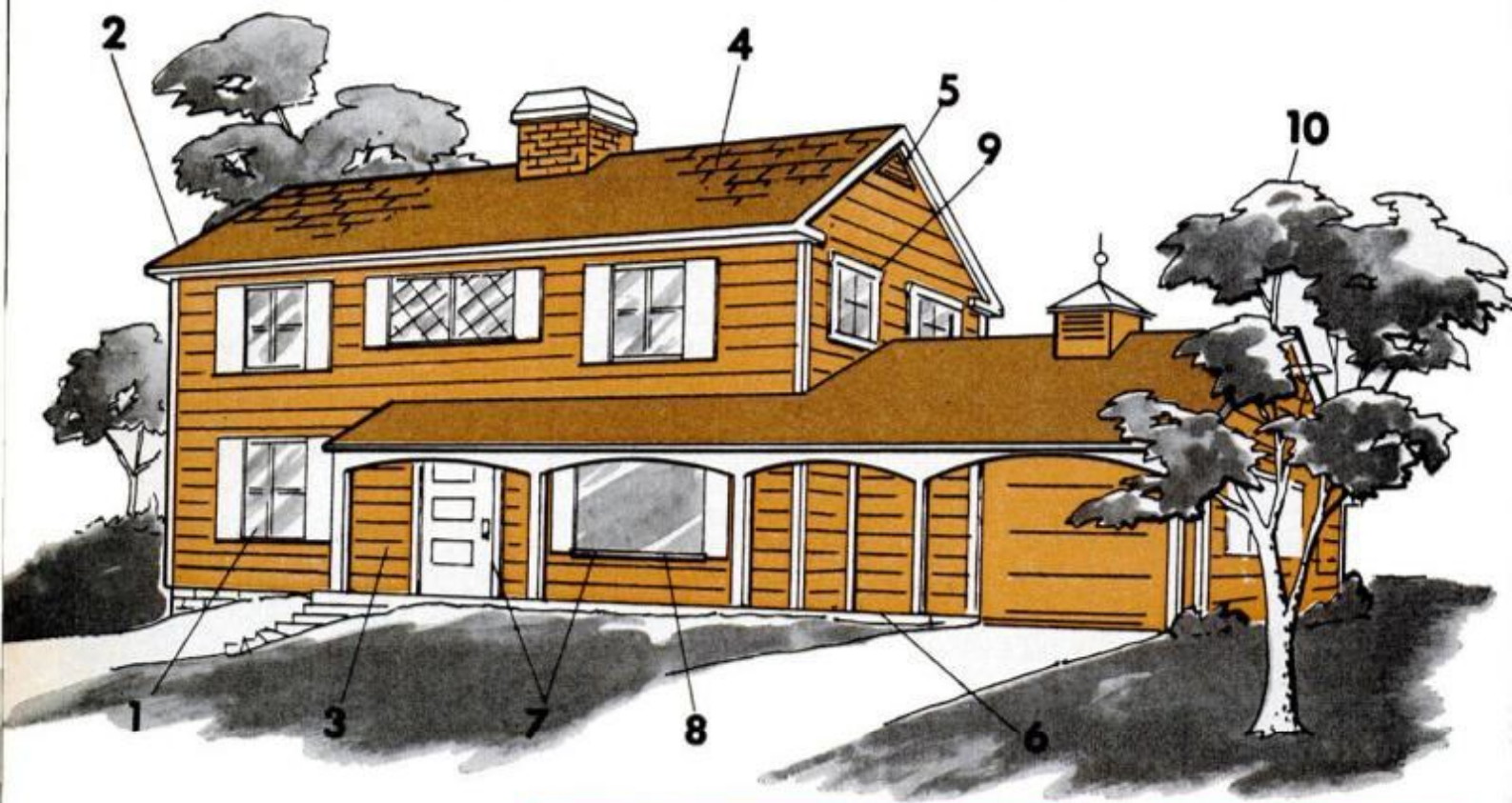
1. Use tubing that meets the manufacturer's specification, which is provided in the service manual. GM cars, for example, require tubing that will meet the GM specification 123M.
2. Do not use copper or aluminum tubing to replace steel tubing. They can't stand the stress of normal vehicle vibration.
3. Be sure to locate tubing where tubing has been placed and hose where hose has been placed. Hose that has been accidentally placed near an exhaust-system part is a safety hazard.

### Fuel filters

With some exceptions, cars today possess one of two types of fuel filters: in-line or internal. The ex-

(Please turn to page 178)

# Building an energy-saving



Position your home with care, give it a functional design, and you'll gain both efficiency and livability.

by Harry Wicks

**B**uilding a house that will conserve as much energy as possible isn't particularly difficult. Our ancestors knew how to do it, and so do we. But until recently, we did not consider it necessary to be concerned with how much energy we consumed—or how much we wasted through lack of planning. The mid-'70s energy crunch changed that outlook.

Now, as electric and fuel bills spiral steadily upward, we must find ways to reduce the amount of energy needed to maintain comfort. Like any commodity, the cost of energy is directly related to consumption: The more we use, the more we pay.

Though a new house with energy-conservation features generally costs more than one without them, your initial cash outlay—and more—will be returned in the form of savings on

## HERE ARE 10 THINGS YOU CAN DO TO HELP KEEP FUEL BILLS DOWN

1. Use double-glazed windows throughout to reduce heat transmission up to 50 percent.
2. When choosing a house style, favor multilevel designs over ranch homes. Their proportionately smaller roof areas for a given amount of space cut down heat loss.
3. Insulate exposed walls with material having an R-value at least 11 (3½-in. mineral wool batts or equivalent); ceilings with material having an R-value at least 19 (6 in. thick).
4. Use light-colored shingles on the roof to reflect sunlight and thus assist cooling equipment.
5. Adequately ventilate attic to lessen solar heat gain.

6. Use a minimum of 1-in.-thick perimeter insulation for on-grade slabs and footings.
7. Accept only tight installations of windows and doors. Cracks existing between frames and rough openings should be packed with insulation and sealed with an appropriate vapor-barrier material.
8. Caulk around all joints between windows, doors and siding with a high-quality latex or butyl caulk compound.
9. In extra-cold climates, use storm windows. When tightly fitted, they can reduce infiltration of air by 30 to 50 percent.
10. Preserve as many trees as possible for reasons explained in the text.

heating bills. For example, once the house has been closed in, you can provide insulation in exterior walls only by chopping holes in the walls around the house perimeter and blowing in the material. The job is costly, and doesn't provide thermal resistance equal to a blanket or batt installation. And your house will still lack a vapor barrier, essential to keeping moisture out of the walls. The time, therefore, to think of saving energy is in the planning stage.

In broad terms, there are five planning steps you can take to save as much energy as possible:

1. Position house on the site with regard to exposure and all the elements.
2. Design the home for efficient energy use.
3. Select materials and workmanship that will conserve energy.
4. Plan the use of insulation.
5. Get top efficiency from appliances, mechanical equipment and fireplaces.

### Position your house with care

The basic idea is to use the natural terrain to protect the house from the elements (see sketch on page 125).

Excerpted from *How to Plan, Buy or Build Your Leisure Home* by Harry Wicks, copyright 1976 by Reston Publishing Co., \$19.95. Mr. Wicks is director of the Home and Shop Dept. for *Popular Mechanics*.

# house

For example, can your house be built in a valley instead of on top of a hill? Can you locate it on the protected side of a hill or on the sunny side of a slope? Remember, you can obtain some insulation by building partly into a hillside.

And don't make the mistake of arbitrarily clearing all rocks and vegetation from the site. Look for this fault particularly if buying a contractor-built or vacation community home. Many builders and developers find it cheaper to build if just about all trees are knocked down and the land is leveled. When the land has been treated this harshly, you, the homeowner, pay in the end. Trees and protruding rock formations block cold winds in winter and provide cooling shade in summer.

If you are fortunate enough to own a site with a stream running through it, don't cover it or fill it in. What you have, in effect, is nature's airconditioning; during hot months a site with running water will be cooler than a dry one.

## Allow for sun and wind

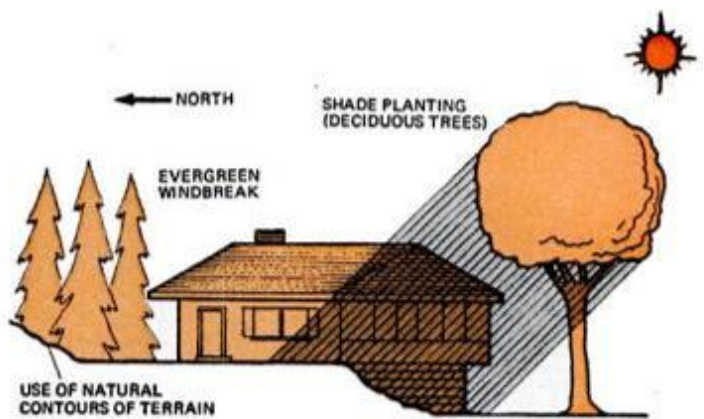
Always keep sun and wind in mind when locating your house on a site. In cold-weather areas, winter winds usually come from the North, so it makes sense to face the walls with maximum insulation and minimum glass area that way. If the house design and property layout permit, the shortest wall should face north.

In much of today's architecture, especially in leisure-home designs, large areas of glassed walls seem almost mandatory. By siting your house so the glass walls face south, the low winter sun will shine into them during most of the daylight hours and ease the load on the heating system (see sketch at right). In warmer areas, where cooling is of primary concern, the glass areas should also face south. With properly designed overhangs (often called "eyebrows"), little or no sun comes in during the summer when the sun is high. By contrast, if these windows are on the east or west sides, they pick up heat almost half the day, thus putting a burden on the house cooling system.

You can get protection as well as beauty from landscaping, too. A row of evergreens planted to the north or northwest of a house can be an effective wind barrier.

Tall deciduous trees should be retained or planted to the south, west or east of the house to provide cooling

Landscaping should protect your property as well as beautify it. A row of evergreens north of your house breaks the wind, while deciduous trees on the other sides provide shade in the summer and allow warming sunlight through in the winter when they are bare. Use of terrain is also helpful.



shade in the summer. In winter, after the leaves have fallen, these trees do not block the roof and walls from the warming rays of the sun.

## Design a functional house

Use plain common sense when picking your house—don't be guided by esthetics alone. If you question your knowledge in this area, an architect should be consulted.

First, make sure your house is designed for the climate it will be exposed to. For example, a house with a sprawling layout and large areas of glass walls might suit the climate perfectly in the southwest United States. But park the same house in the northern reaches of Maine, and it becomes an energy-guzzling monster to heat.

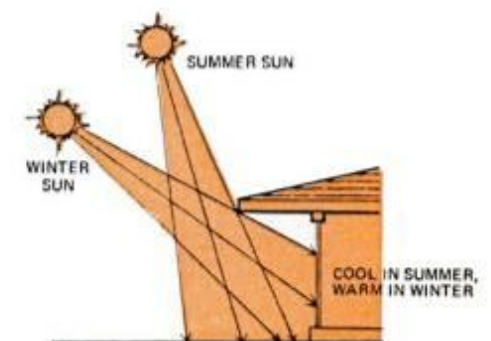
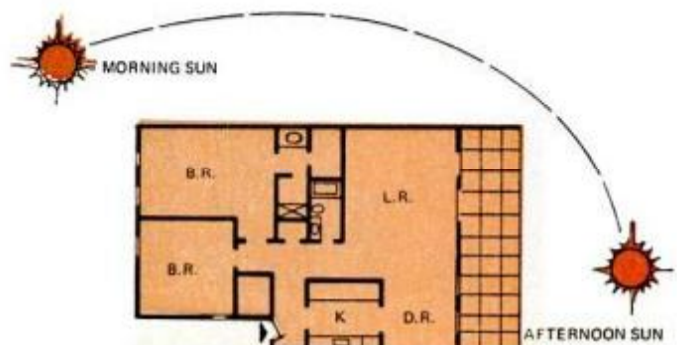
The house should be practical to heat and cool. The design feature to key in on is the ratio of roof area to floor area (see sketch): The lower the ratio, the easier it will be to heat or cool the house. Though the drawing shows that a round house is most efficient in this regard, that shape is difficult to build and live in. Next best is a square house; after that in decreasing efficiency, the rectangular, L, H and T shapes.

## Multilevel houses save money

In colder climates, a two-story house makes good sense. Since most heat is lost through the roof, a two-story house saves money because it has a lower proportion of roof to floor area. You can save as much as 15 percent in fuel consumption by having living areas on two levels

(Please turn to page 161)

**Consider your floor plan:** Keep common (or active) living space confined to one part of the house and sleeping (or inactive) rooms in another for zoned heating and cooling. Active rooms may be warmed by facing them toward the afternoon sun, and inactive rooms kept cool by facing them toward the morning sun.



Discuss the function of roof overhangs with your architect. Correctly designed ones shield walls from the high summer sun, yet expose the same walls to the winter sun which is at a lower angle. Following that same line of thinking, you can see how an attached porch, carport or patio roof also serves to protect the walls.

GOOD SHAPE, EASY CONDITIONING



ROUND

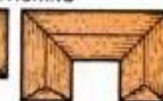
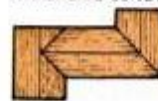


SQUARE



RECTANGULAR

IRREGULAR SHAPES, EXPENSIVE CONDITIONING



The key to efficient heating and cooling is the ratio of roof to floor areas—the less roof area, the better. Since most heat is lost through the roof and a two-level house has a lower proportion of roof to floor area, you can save up to 15 percent of fuel with a multilevel house.

# Superhot homebuilt furnace for metalworking

Replacing an expensive oxyacetylene rig, this crucible furnace will melt virtually any metal, yet costs under \$25 to make.

by Paul L. Conant

**How to use it: Place crucible in center of combustion chamber before lighting the furnace.**

The greatest obstacle for someone who wants to get started in metal sculpture or jewelry-making is usually the high cost of equipment for melting metal. An oxyacetylene torch with the necessary tips, tanks, gauges and pressure regulators is a sizable investment. But you can make a crucible furnace like this one for a fraction of the cost.

It can provide temperatures ranging from about 900° F. to over 2700° F. That's hot enough to let you work

with pewter, zinc, aluminum, bronze, brass, copper, precious metals and even iron and steel.

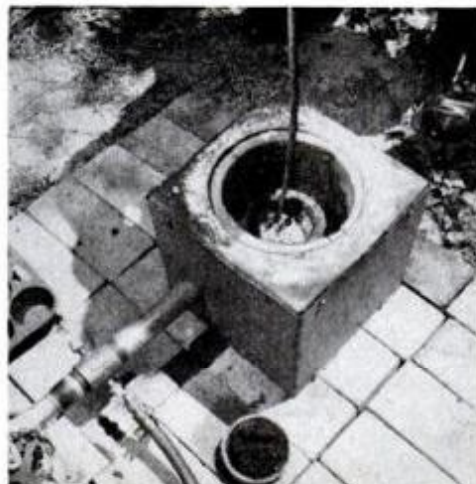
The combustion chamber is made of high-duty (about 3600° F.) insulating firebrick and, for mortar, an air-setting, high-alumina-content, refractory cement. It is assembled from eight bricks—two used as is, six cut to the shape shown. The cutting is done easily with a jigsaw, bandsaw or sabre saw. Begin assembly by soaking all the bricks in clean water

until thoroughly sodden. Premix the mortar with clean water, in a clean container, until it has a smooth and creamy consistency like that of cake batter.

Hand-dip the two uncut bricks in mortar and place them side by side to form a flat 2½ x 9 x 9-in. base. Use a small paintbrush dipped in mortar to smooth out any lumps and fill any holes. Add the other layers, two mortar-dipped bricks at a time, alternating the direction of the joints and



When the crucible is glowing brightly use tongs to put in an ingot of metal.



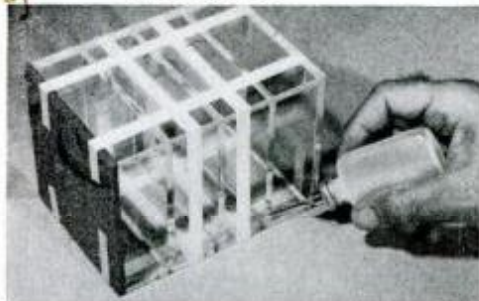
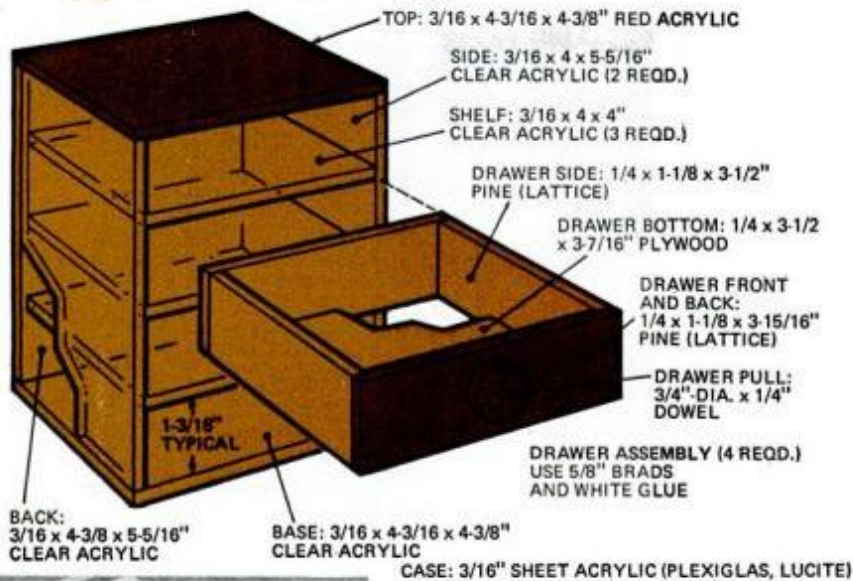
Stir molten metal with a green stick to bring dross (oxides and dirt) to surface.



Use large tongs to remove crucible full of molten metal from the furnace.



# Christmas gifts



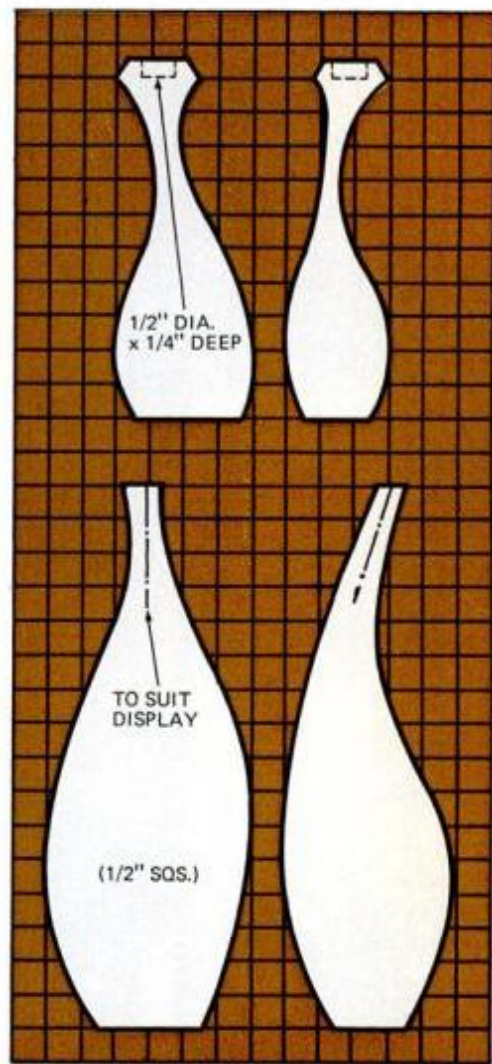
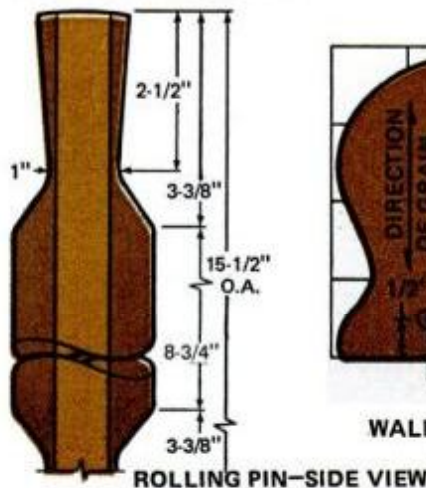
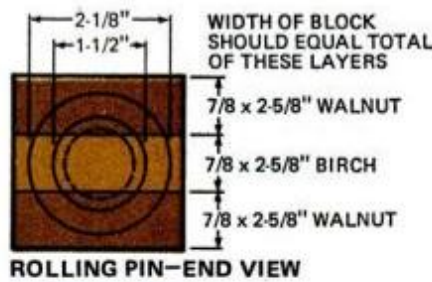
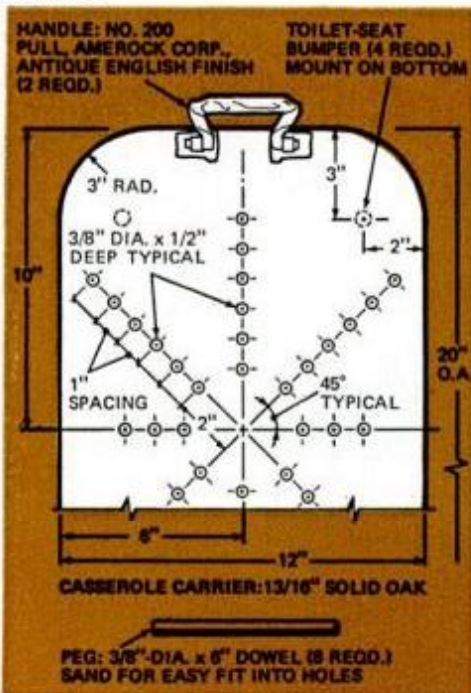
After removing protective paper, tape parts together, apply solvent as shown.

## Trinket chest

To make this little chest, you will need 3/16-in. clear sheet acrylic, plus a small opaque colored piece for the top. Cut out three 4 x 4-in. pieces with a fine-tooth blade, then tape them together to sand all edges perfectly smooth. Repeat for the two sidepieces and the top, bottom and back sections. Finish all edges with 220-320 wet-or-dry paper—but do not polish the edges at this time. Remove protective masking paper and apply solvent to each joint using the special solvent applicator (available from Plexiglas dealers). Keep joints being glued horizontal. When box is dry, polish exposed edges with DuPont auto polishing compound. Construct drawers of lattice and paint the fronts as shown. Then spray-varnish all drawer parts.

## Casserole carrier

The carrier shown is shaped from a single wide oak plank. If preferred, narrow boards can be edge-joined to achieve desired width. Round the four corners, then lay out and bore holes to receive dowels. Finish board with a polyurethane varnish. Attach handles, cut eight lengths of dowel.

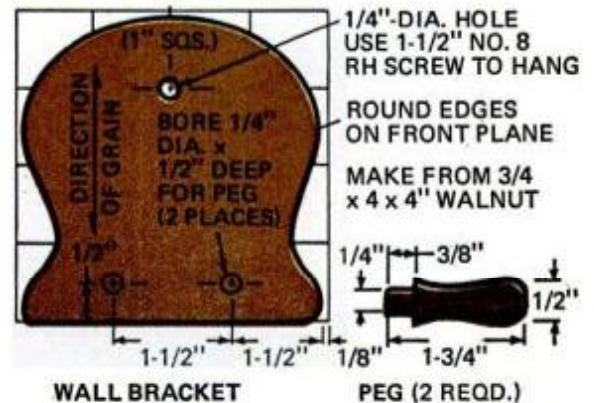


## Free-form vases

We illustrate two vase shapes, but you can create your own designs if preferred. Draw front and side views of desired shape on a suitable-size block of wood. Cut out first side on bandsaw, tack scrap back on to cut the second side. Bore hole in neck.

## Rolling pin

Start by laminating two pieces of walnut and one piece of birch. Note: 7/8 in. is actual thickness for hardwoods. Use carpenter's (yellow) glue and clamp parts securely while glue dries. Cut or plane the laminated block octagonal and mount it in your lathe in conventional manner and turn the rolling pin to diameters shown. Make bracket from walnut. Finish all parts by rubbing with mineral oil.



(Please turn to page 142)

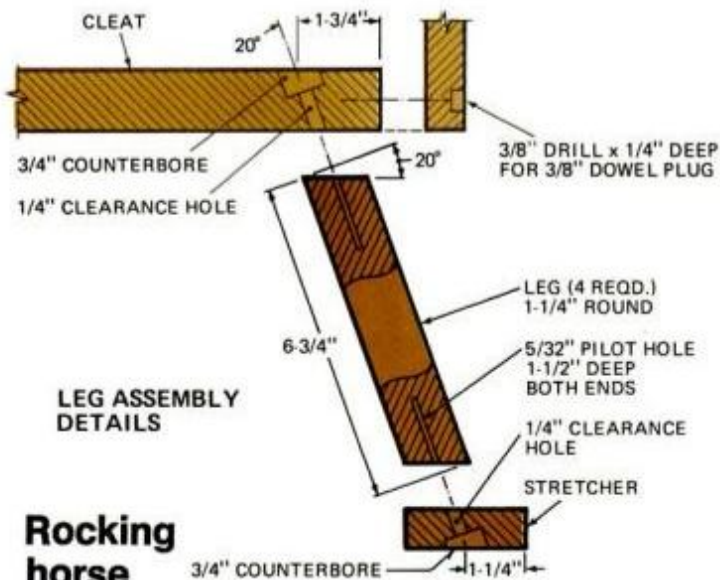
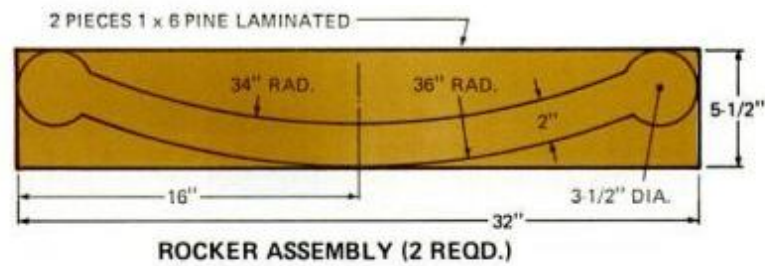
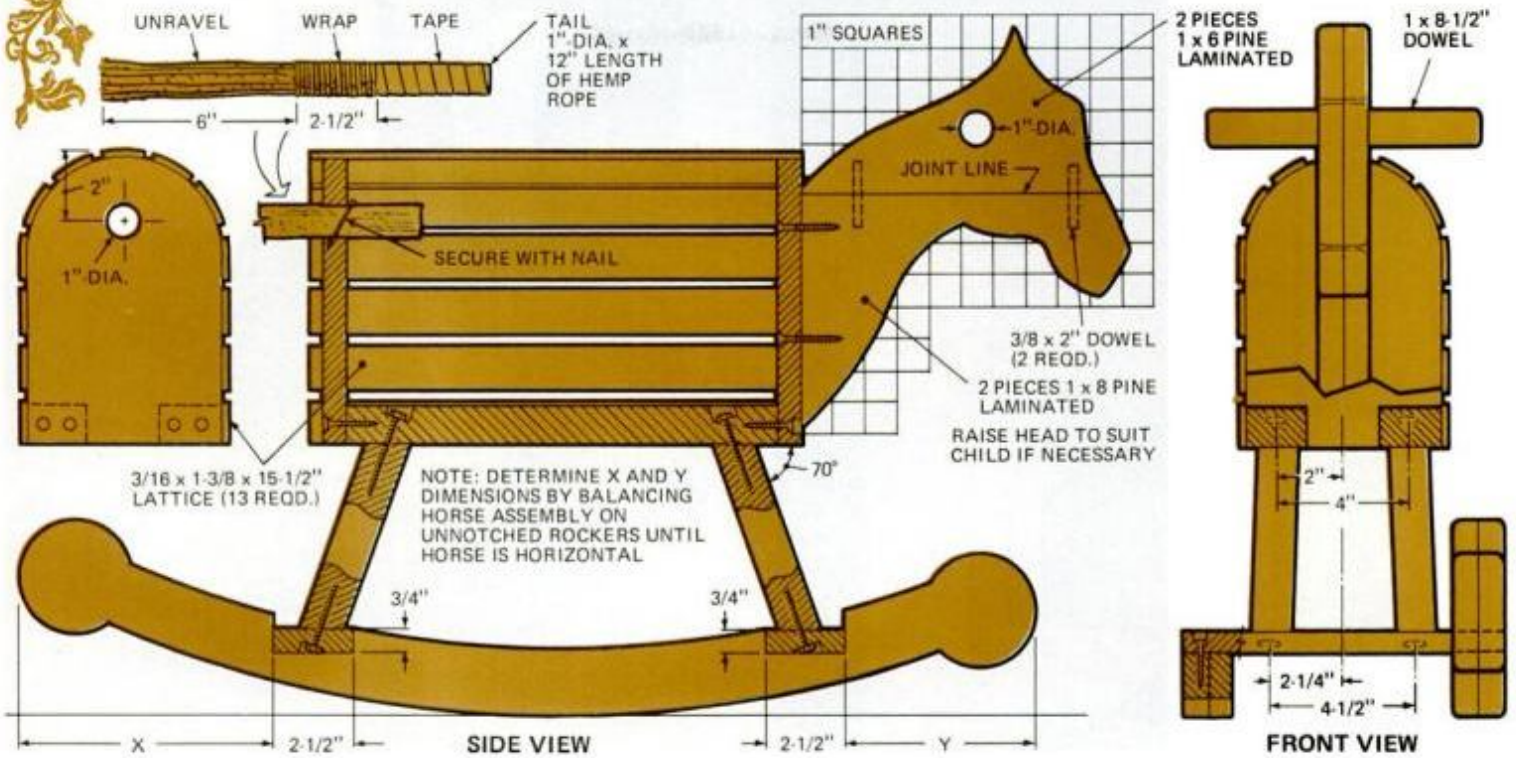
# I want low tar. But taste is a must.

I wanted less tar. But not less taste.  
I found Winston Lights. I get the low tar numbers  
I want, and the taste I like. If it wasn't for  
Winston Lights, I wouldn't smoke.

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

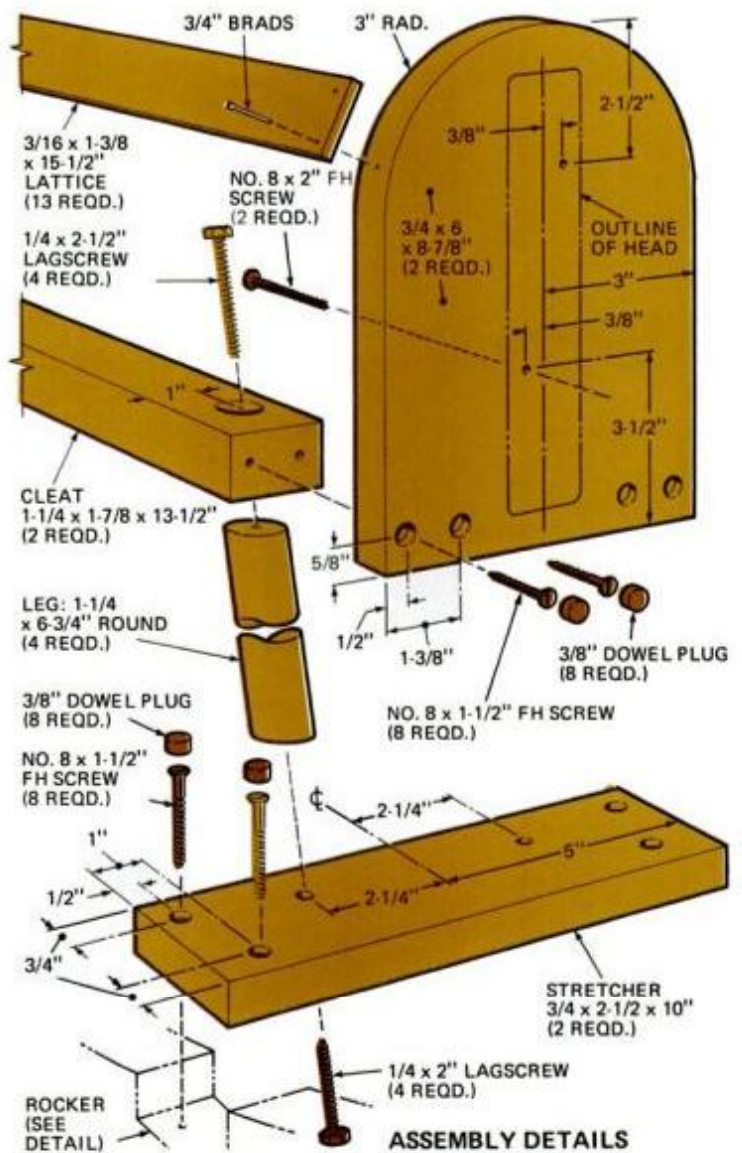
Winston Lights. Winston Light 100's.

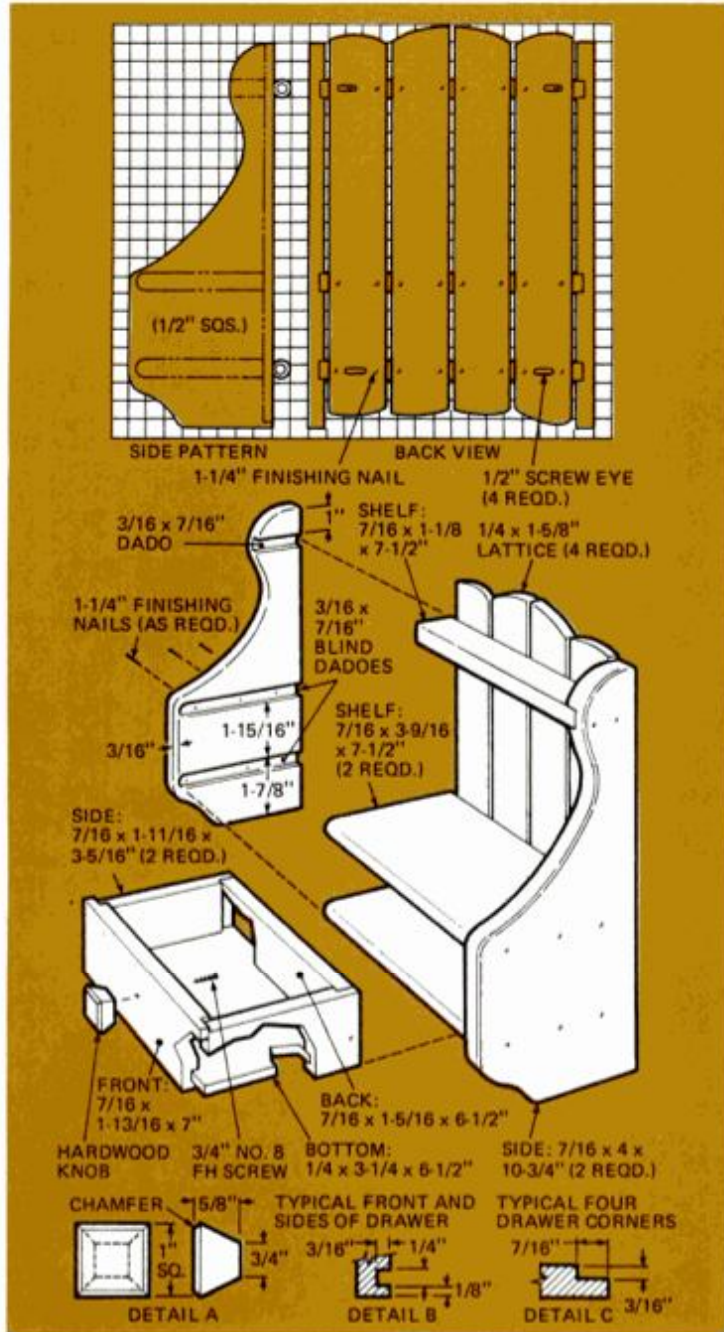
# Christmas gifts



## Rocking horse

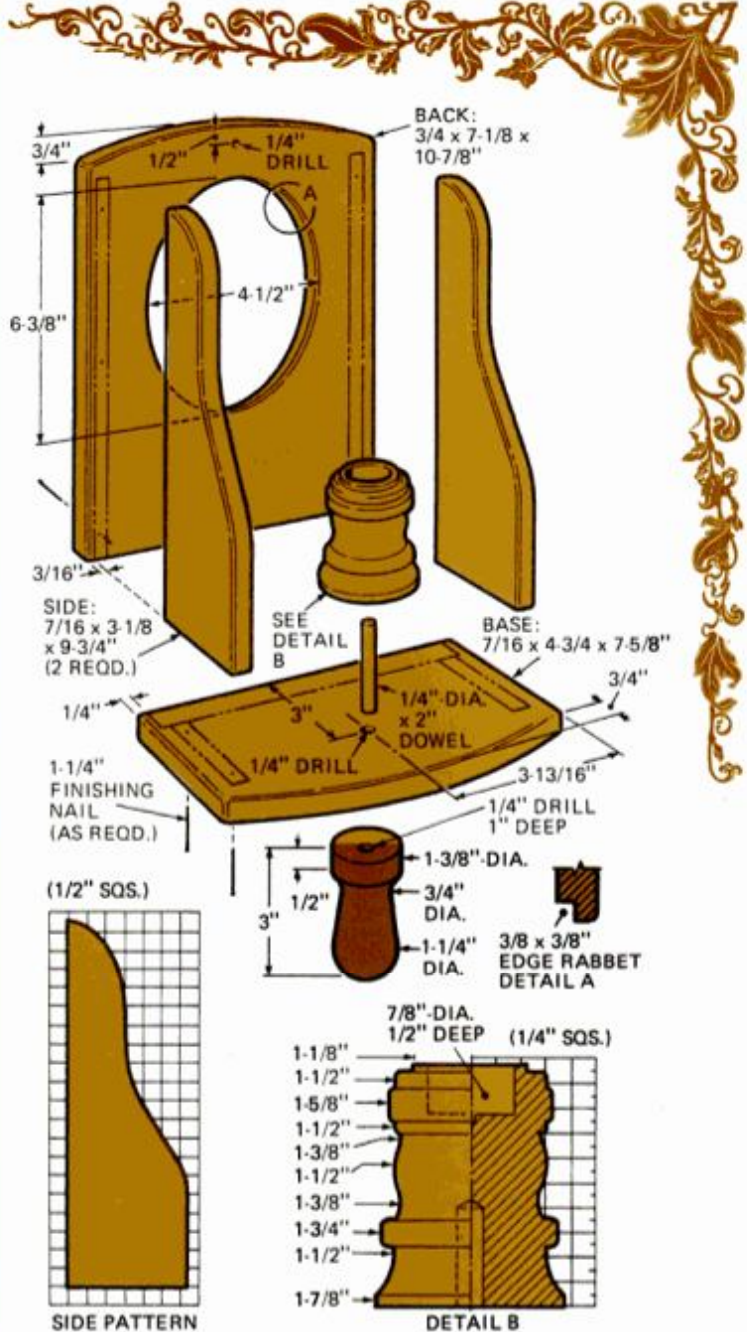
This rocking horse costs less than \$20 to build, though the finished product is comparable to those selling for \$75 or more. Cut out and label all parts. Assemble the horse's body, installing the head, tail and legs before fastening the lattice. Stain all body parts before assembly. Attach the legs to crosspieces and position the horse on rockers to locate notches; mark for notches when horse's back is horizontal. Notch rockers and finish the assembly. Sand all parts smooth; then stain, seal with thinned shellac and apply several coats of varnish. For toddlers (possible chewers), use a nontoxic finish. [\(Please turn to page 140\)](#)





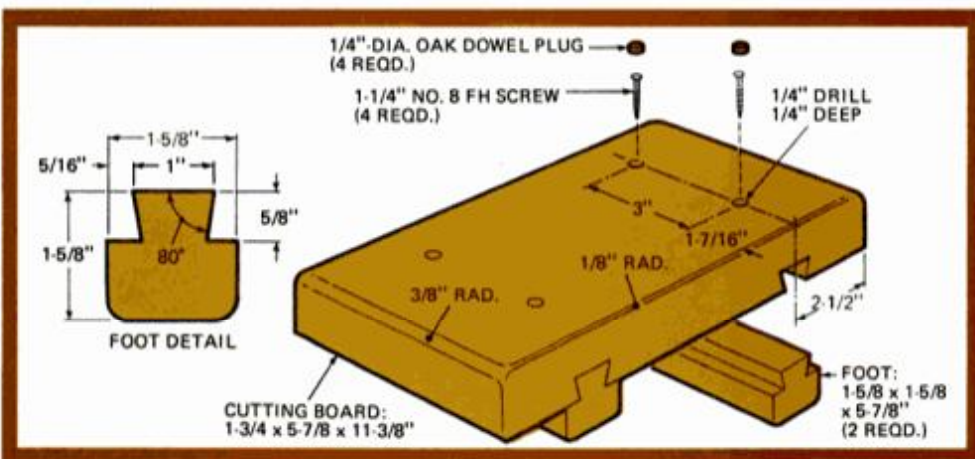
## Pine shelf

This shelf is extra-easy to build because all of the parts are made from stock lumberyard material. The case is 1/2-in. pine, the back is 1/4-in. lattice. Cut the parts as shown above, test-assemble them for fit, then do the permanent assembly using glue and brads. Check all shelves and sides for squareness, then install the back slats. Build the drawer and cut the knob on your bench saw. Stain, seal with shellac and apply varnish.



## Mirror sconce

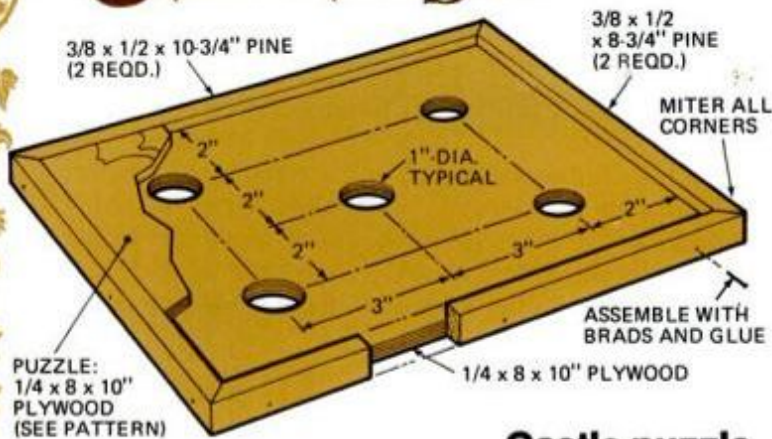
This is another project that is easier to build than it looks imply. Start by cutting out the bottom, sides and back. Lay out the oval and cut it out with your sabre saw. Sand the inner edge and, using a router, cut the mirror-holding edge rabbet. Have the mirror cut to suit by a glazier. Turn the candleholder and handle on a lathe; then fasten both to the shelf using glue and dowel. Stain and varnish.



## Cutting board

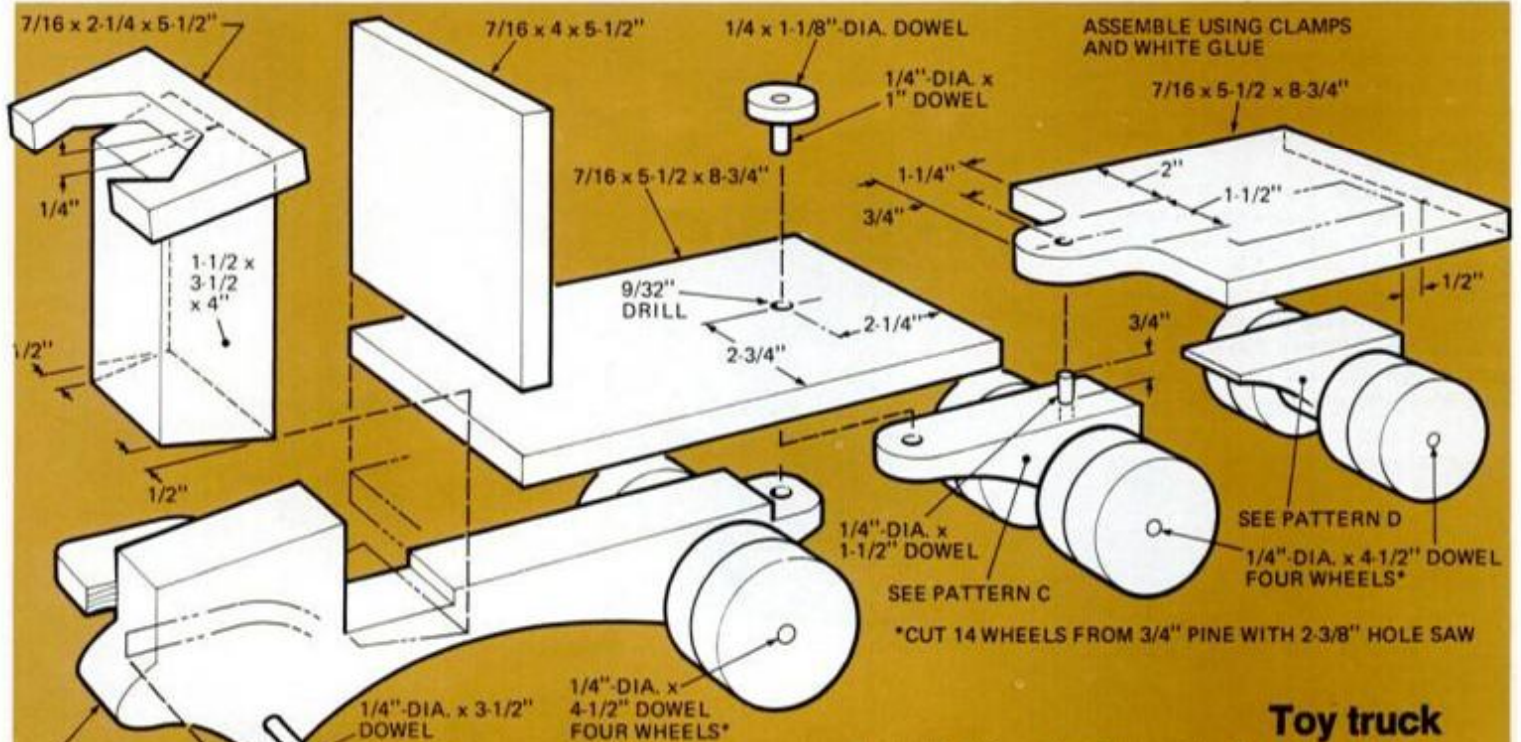
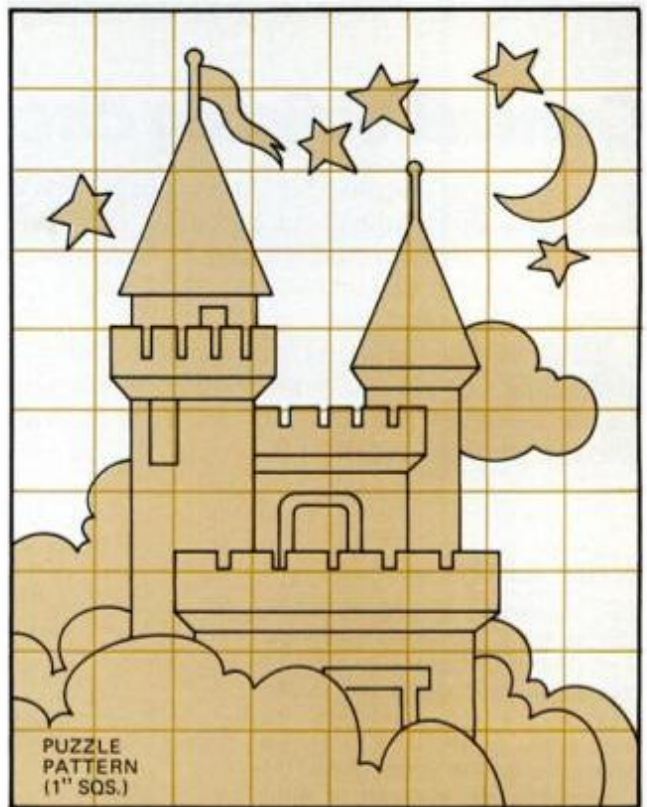
The board shown was fashioned of 1 1/4-in. thick pine laminated to form a 1 3/4 x 5 7/8 x 11 3/8-in. chopping block. After joining the pieces, adjust the bench-saw blade to a setting of 20° and a depth of 5/8-in., and use your miter gauge to make the four angled cuts on the top's underside. While the blade is still set at this angle make the four angle cuts on the feet. Return the blade to the 0° setting and remove waste from all three pieces. Join the pieces with glue, screws and dowel buttons as shown. Rub all parts with two coats of mineral oil.

# Christmas gifts



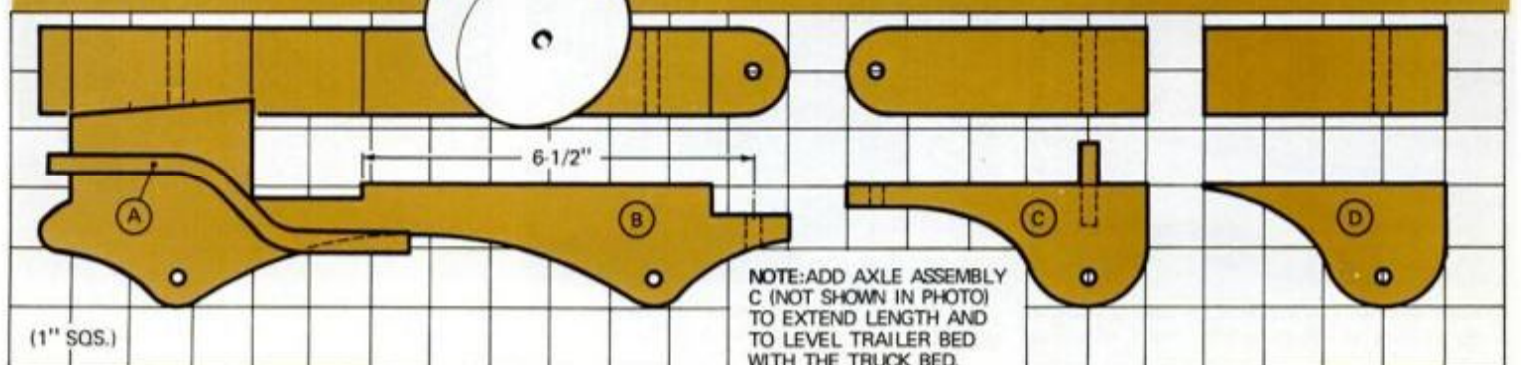
## Castle puzzle

Since this puzzle has a number of small pieces that could fit into a toddler's mouth, plan on giving it to an older child or adult puzzle buff. Draw the design on 1/4-in. birch plywood and cut the pieces out using a fine blade in a jigsaw, or use a coping saw. The stars are cut from a second piece of plywood to suit cutouts made in the puzzle. Paint the parts as shown, build the frame, and seal the parts with shellac.



## Toy truck

This well-designed trailer truck will catch and hold the interest of all youngsters from one to 10. Our model is fashioned from pine—some of which was salvaged from the shop scrap box. Cut all parts as shown, then slice the dowels in bologna fashion to create the wheels. Join the parts with glue and finish with two coats of varnish.



# General building directions

Except for a couple of lathe turnings, you can create all projects included in this year's roundup of gifts to make using hand tools only. Of course, with power tools, the building will go faster.

Most of the projects are constructed using clear pine (or carefully selected common pine). In some cases, a hardwood is called for such as in the walnut and birch rolling pin. In all cases,

carpentry and joinery have been kept relatively easy. To assure professional-looking results, give extra attention to finishing techniques. In general, the projects shown were either stained or left natural, sealed with a coat of shellac (thinned 50 percent with denatured alcohol) and then completed with a coat of varnish. For smooth finishes, rub between coats with double 0 steel wool, dust and *wipe with a tack cloth*.

## Wine cart

Start by ripping lengths of 6/4-in. pine to the thicknesses indicated, then rip the mahogany to size. To create the mortises in the underside of the top, assemble the laminations in sections as shown below. As an aid when gluing the laminations, drive a pair of small nails partly into each alternate edge, then clip off the heads to leave a small protruding point. Press each successive edge together before applying glue; the indents will prevent sliding during gluing.

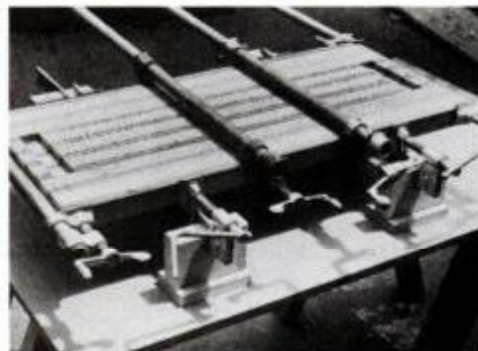
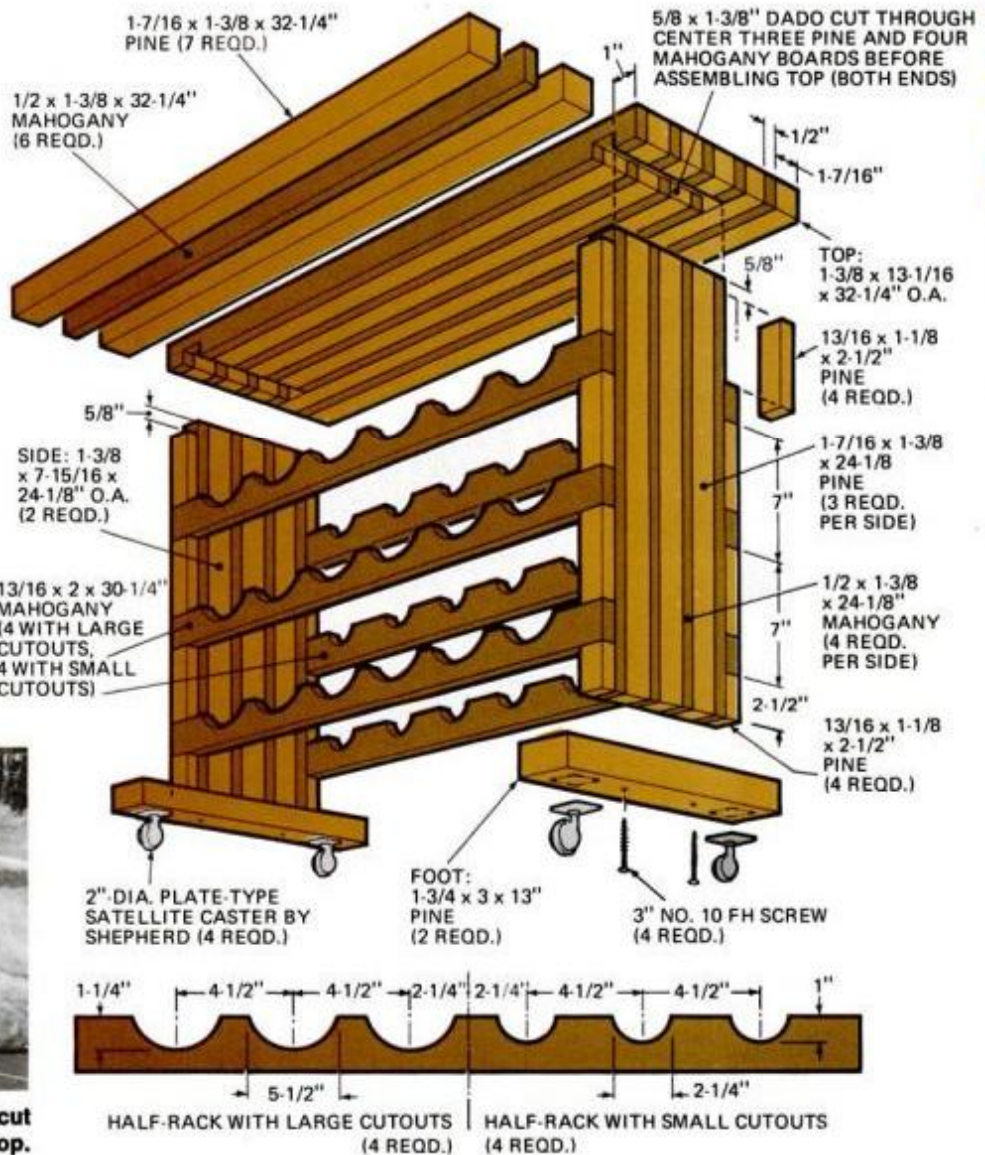
The best way to cut the notches on the uprights is on a bench saw as shown. To get clean scallops in the bottle racks, use a circle cutter in a drill press to bore holes in 5-in.-wide boards. (Clamp boards for drilling.) Then rip the boards on the bench saw. Use varnish to finish.



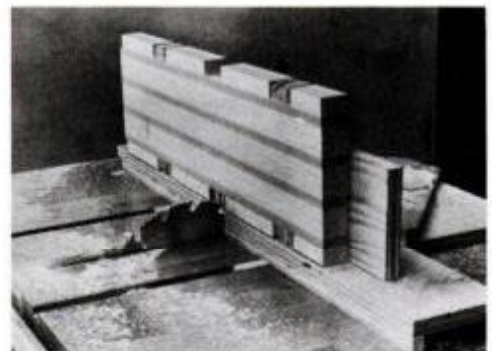
To form mortises in top's underside, cut dados across partially assembled top.



Three sections are glued up using hidden nail points to keep parts from slipping.



Use a slow-setting glue and at least four pipe (or bar) clamps for tight joints.



A makeshift high-fence miter gauge helps you make notches and tenons in uprights.

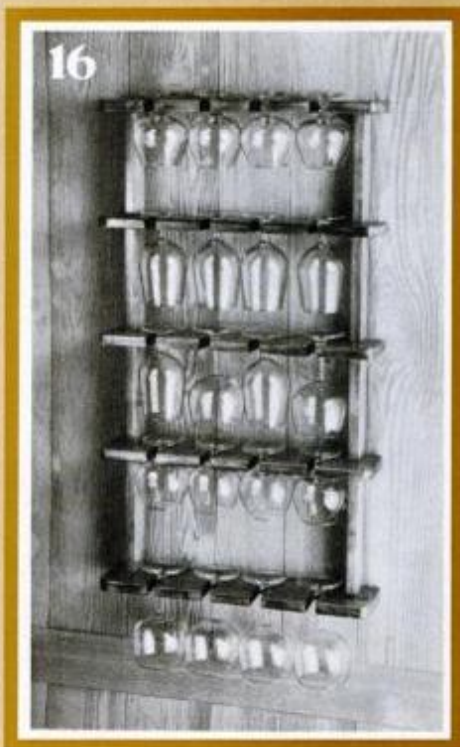
# Christmas gifts



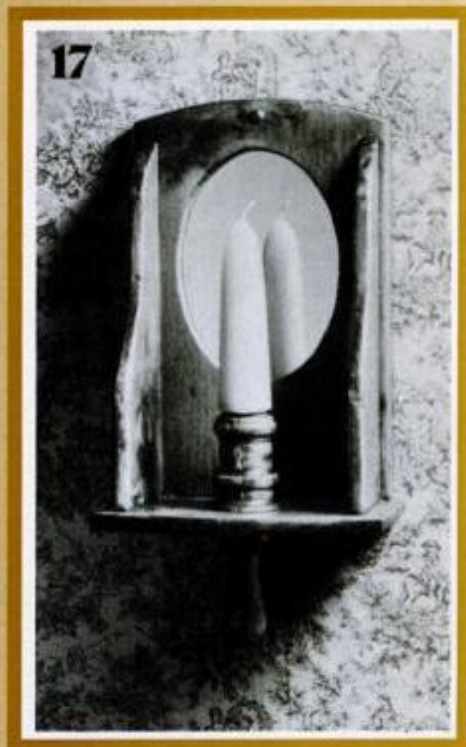
14



15



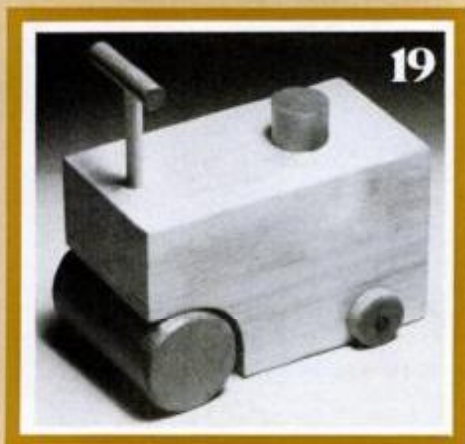
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17



18



19

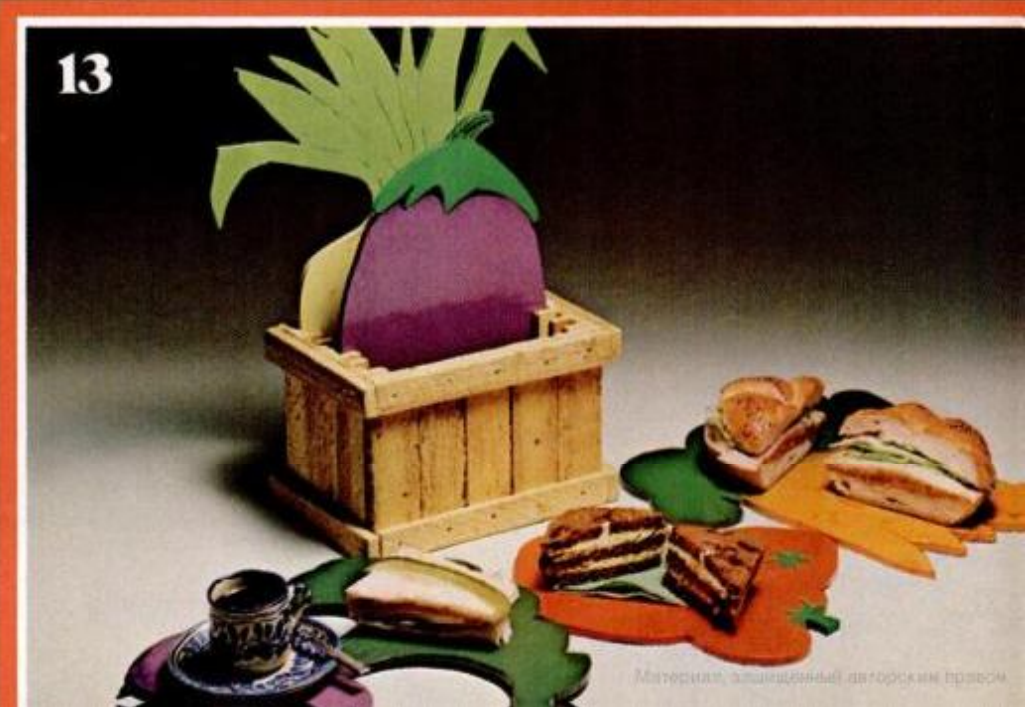
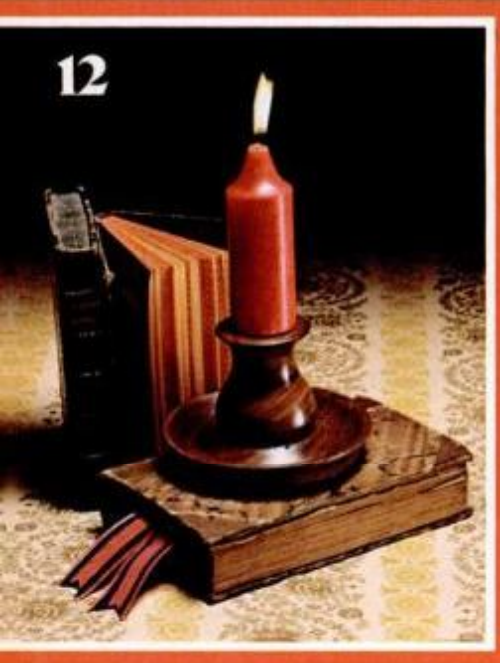
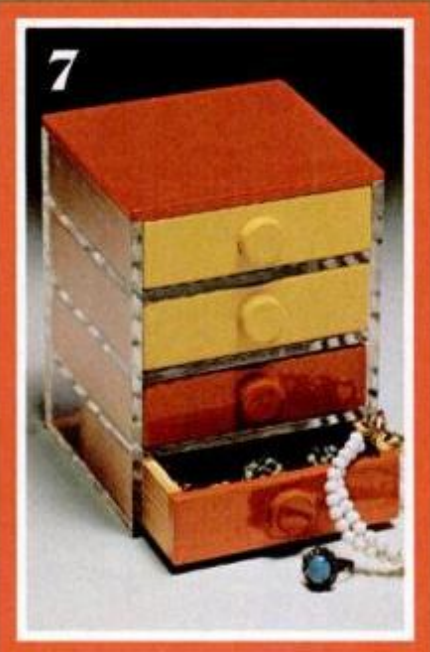
sandwich boards feature a "crate" made of textured wood lath. 14. Multicolor rolling pin is made by laminating birch and walnut layers and turning them on a lathe. Its walnut bracket has a pair of small turned pegs. 15. Simple pine cutting-serving board, like that used in Japanese restaurants to serve sashimi (raw fish), is equally good for cold cuts and cheese. 16. Stem-glass wall rack is stained a mellow honey tone, measures 4x18x32 in. and holds 20 glasses. 17. Mirror candle sconce decorates a wall, gives pleasing effect when candle is burned. 18. Castle puzzle looks easy to put together, but cuts are made at color edges rather than through colors, so the task takes

longer than you'd think. (Small parts rule out this one as a game for toddlers). 19. Pine steamroller is made by cutting a glued-up clear pine block on a bandsaw and adding slices of dowel for roller, wheels and seat. This toy, left natural, was finished with two coats of white shellac.

Instructions for building these items begin on the facing page.

## CREDITS

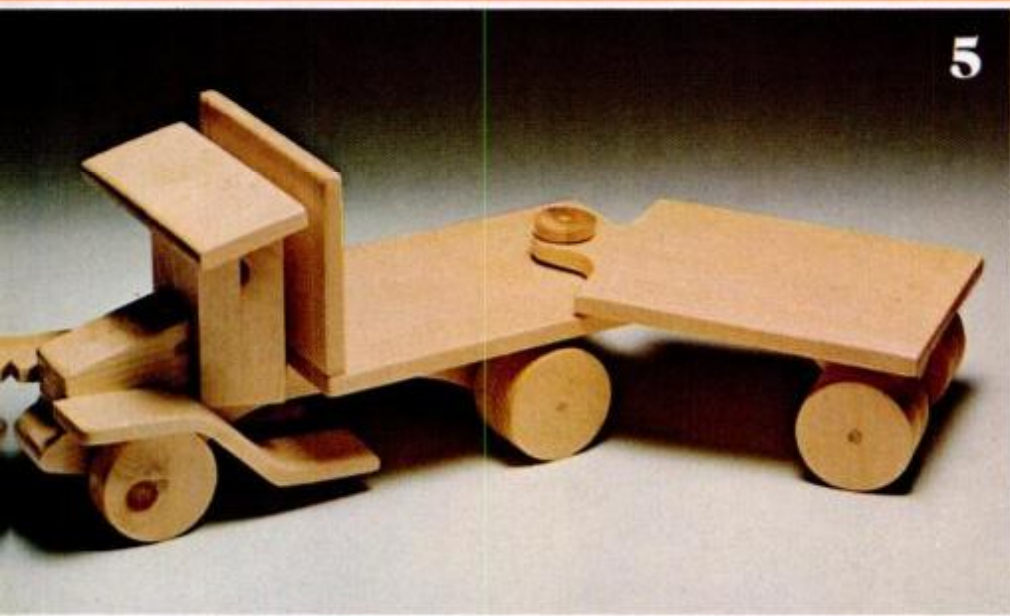
Project designs: Truck (No. 5), Andrew Cummins; Hangers (No. 6), sandwich boards (No. 13), Stanley Duna; Castle puzzle (No. 18), Kari Lonning. All other designs were constructed in the PM Workshop by Rosario Capotosto, John Wicks and Harry Wicks. PM color photos by George Ratkai; black-and-white photos, R. Capotosto; technical art, Eugene Thompson.





# Christmas gifts

worked out to assure safe rocking for your active youngsters. 3. Free-form fir and pine vases, fashioned on a bandsaw, hold dried flowers, small candles. 4. Casserole carrier lets you move hot pots safely from oven to table. 5. Toy truck can be of scrap wood or pine, left natural. 6. Children's clothes hangers of 1/4-in. plywood add whimsical, but functional, touch to nursery. 7. For young lady's jewelry, there's an acrylic plastic trinket chest with painted-pine drawer fronts. 8. The clean-cut lines of these clothes racks may help Junior to hang his clothes—at least, they'll make it easier for Mom. 9. Pine wall display shelf has rosewood knob, will hold a collection. 10. Oak knife block can be sized to suit your kitchen set; ours measures about 5x5x10 in. 11. Antique flax spools inspired these candleholders. 12. Candlestand project for lathe buffs calls for both spindle and faceplate turning. 13. Festive



# 19 great Christmas gifts you can use

by Harry Wicks HOME AND SHOP EDITOR

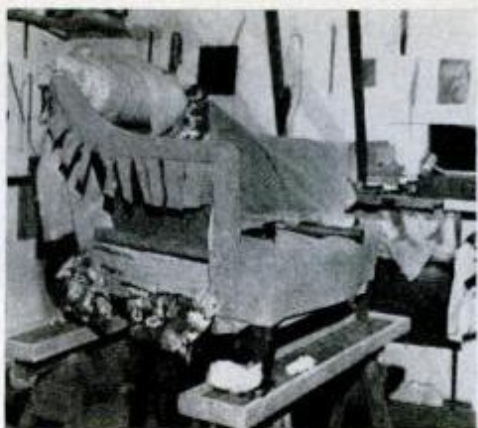
**T**here's a gift for just about everyone on your list in this year's collection of project ideas from the *Popular Mechanics* workshop. Many of them can be created for less than \$10, and even the most sophisticated project—the wine rack—costs less than \$40 to build. Complete directions for the construction of all projects shown on these pages start on page 134.

1. Our elegant wine rack holds 18 bottles, measures 29 in. high, 13 in. wide and 32 in. long. 2. Toddler's rocking horse is sized to suit age 3 or under. It's created by using sugar pine and stock lattice from the lumberyard. The rocker design is carefully





**19** Cut the arm fabric up to the frame at stress points to avoid wrinkles.



**20** Carefully tack the inside arm fabric so that no wrinkles occur in it.



**21** Position cotton padding on the inside chair back to cushion fabric.



**22** Tack the top of the fabric to the chair frame; smooth sides and bottom.



**23** Following the chair contour tack welt-ing on the outside of the arm.



**24** Position fabric for outside of arm. Chalk the contour inside the fabric.



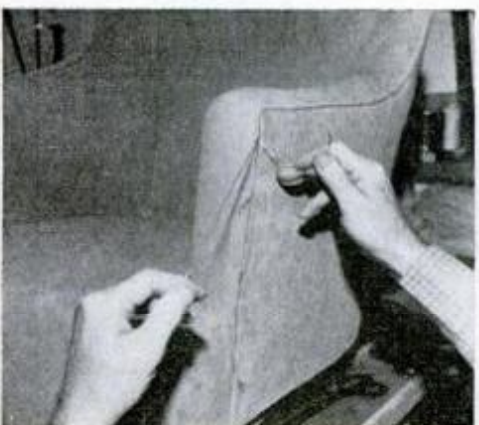
**25** Tack cotton topped with burlap to the outside of arms and chair back.



**26** Tack a cardboard strip to reverse side of arm fabric for roll effect.



**27** Stretch fabric tacked at top over back, sides; tack to frame bottom.



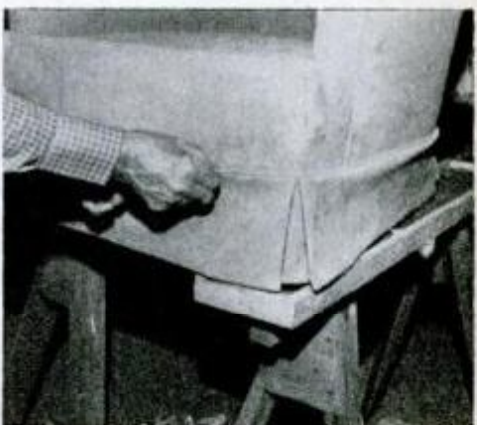
**28** Sew the outside arm fabric by hand using a curved upholstery needle.

upholster a chair. It's helpful for sewing pull strips to position the material and for sewing fabric around welt cord, but in a pinch you can hand-sew them.

Sources for specialized tools and materials are in the classified directory under "Upholsters' Supplies." Tools include a ripping chisel and mallet, pliers for removing the old upholstery, webbing stretcher, tack hammer and a curved upholstery needle.

The materials you'll need depend somewhat on the chair you reupholster. In many cases, you can use the

*(Please turn to page 184.)*



**29** If you want to add a kick pleat, sew it to bottom of chair fabric.



**4** Cut weak twine and begin rebuilding of the chair by retying the springs.



**5** Weave jute webbing on chair bottom. Pull it taut with webbing stretcher.



**6** With a tack hammer and tacks attach webbing to the bottom of the frame.



**8** Tack burlap over the seat springs, then sew it to the top of the seat.



**9** Fox edge sewed to the burlap is used to cushion and round the seat edge.



**10** If the frame needs repair, glue and clamp it to insure a strong bond.



**12** Sew inexpensive scrap material to the fabric for the pull-strip handholds.



**13** The pull strips help to position the fabric to produce a tight fit.



**14** Smooth the new fabric over the chair seat and into the proper position.



**16** Sew the back side of the new fabric to the front edge of the seat.



**17** Position the seat fabric by the pull strips at the chair back.



**18** Fit fabric over the inside of arms. Note 6 in. of extra fabric at top.

# A great cover-up

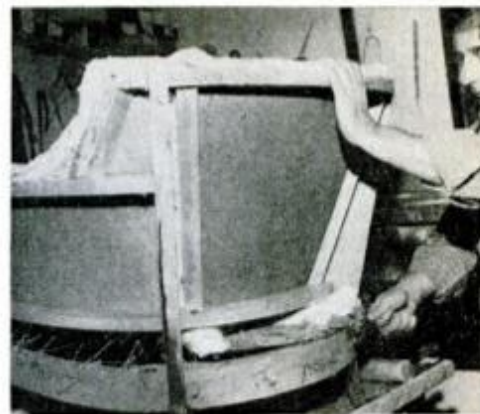


The badly worn chair (above) gets years of extra life with new upholstery. The fresh suede-look fabric in beige gives the chair a contemporary, trim look (right). Key to the appeal is tight-fitting upholstery.

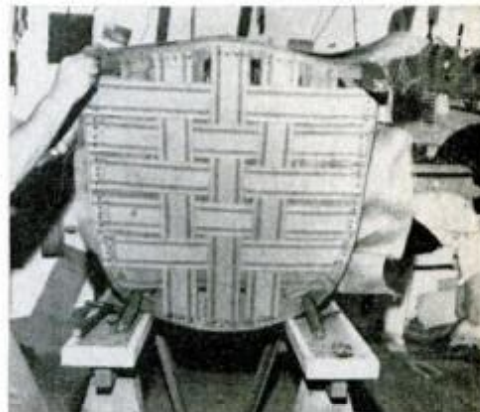
Reupholstering is easy when you learn the secrets of a real pro.



PM photos: Irv Field



**3** Pliers help remove the burlap covering the chair-seat springs and webbing.



**7** Weave the webbing from front to back and side to side for reinforcement.



**1** Start by removing the old fabric using a mallet and ripping chisel.

by Joshua Mark

**Y**ou may think reupholstering is a job that takes a professional, but with the right tools, patience and a steady hand, you can reupholster your favorite living-room chair in several weekends.

The old fabric, although stretched from use, is a good clue to the approximate amount of new fabric you'll need. If you use a print design, you'll need to purchase more material than you'll actually use since the print must be matched. The store where you buy the fabric can help determine the quantity needed. Here are some helpful tips from professional upholsterers at Carlin Decorators, Wantagh, N.Y.

Your first step is to remove the existing upholstery. Use a mallet and ripping chisel to strip away the material. Remove the burlap underneath the material with pliers.

It will help to take notes as you work, listing the materials to be replaced and the order that they are stripped. Materials will be replaced in reverse order.

## Common upholstery materials

A sewing machine is the only large piece of equipment you need to re-



**11** Measure the final fabric, then cut it somewhat larger than size needed.



**2** Strip the old fabric on the outside of arms using the mallet and a chisel.



**15** The front edge of the seat fabric attaches to the frame with tacks.

using the paintbrush and mortar to smooth and fill.

Bake the combustion chamber at 400° to 500° F. in the kitchen oven until it is completely dry. The tuyere hole is cut through the second-layer wall on a tangent to the inner surface. A scrap of 1-in. pipe, turned by hand, will quickly and neatly make this opening. Finally, add a galvanized sheet-iron case to protect the brittle firebrick.

### Making the burner

The burner consists of an air-gas mixing chamber and nozzle (tuyere) and forced-air blower with speed control. Make the orifice pipe from a 3-in. long nipple of 1/8-in. black pipe. Drill a 3/32-in. hole through one wall at the midpoint.

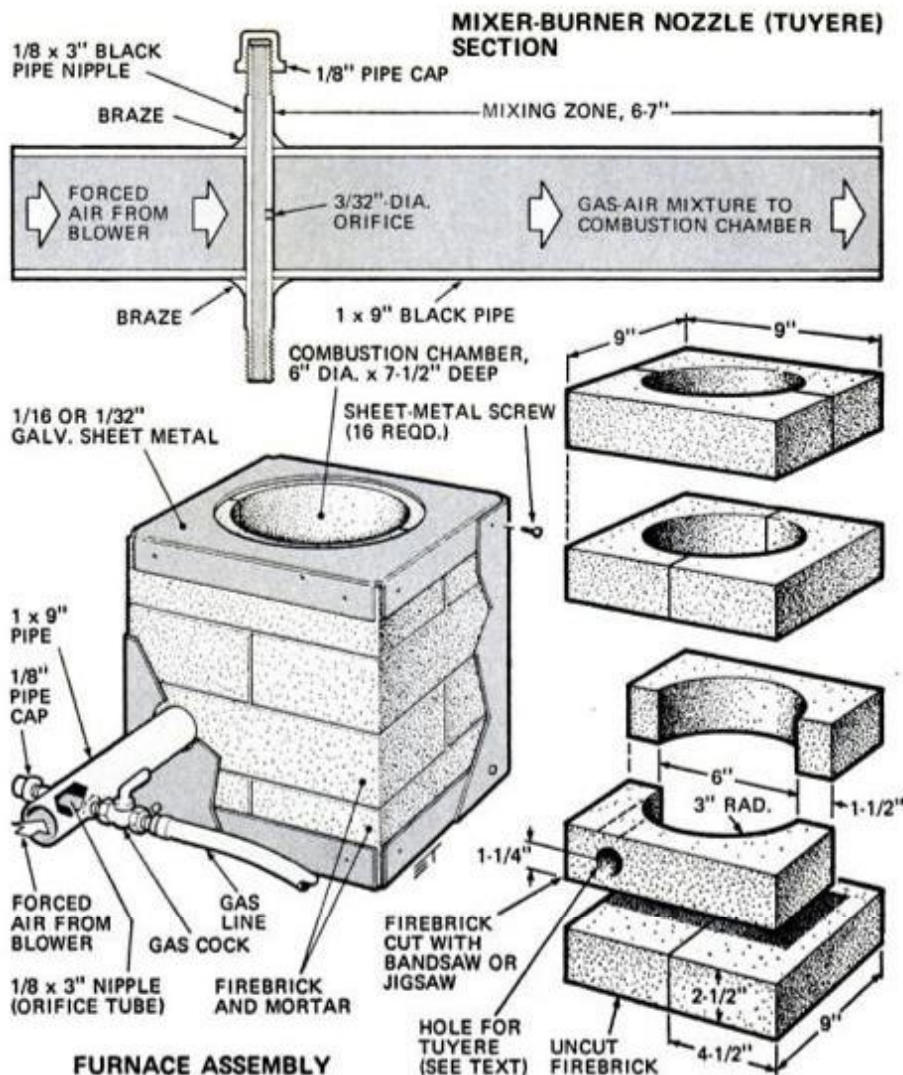
The tuyere is made from an 8 or 9-in. length of 1-in. black pipe, with holes to accommodate the orifice pipe drilled through both walls 6 or 7 in. from one end. Braze the orifice pipe in place with the orifice facing inward. Cap one end and install a gas cock on the other. The blower is taken from any hair dryer, and a solid-state light dimmer is added for a speed control.

### Installation and use

Any site that is suitable for welding will serve, assuming that it has good ventilation and that natural gas and well-grounded electrical service are available.

Set up the combustion chamber on the floor and insert the tuyere into the combustion chamber—to, but not past, the inner wall. Connect the blower and speed control. Ground the tuyere and combustion-chamber case. Connect the natural-gas line.

Prepare for operation by assembling molds, crucibles, tongs, asbestos gloves, safety goggles and the metal to be cast. Place the crucible in the center of the combustion cham-



FURNACE ASSEMBLY

ber; this aids heat circulation and makes the crucible easier to remove. Start the blower, then open the gas cock a little and ignite the burner immediately from the top of the combustion chamber. Over a 30-minute period, increase the gas flow to maximum, continually adjusting the blower speed for a pale blue flame.

When the furnace has reached its maximum temperature, the inner wall will glow a brilliant yellow. Once the crucible is glowing hot, you can put metal into it. Lower temperatures are obtained with low gas and air flow rates; for extremely high temperatures, block all but a small part of the top opening with more firebrick.

### Operating tips

When you're through casting, reduce gas and air flow to a minimum over another 30-minute period; then both can be shut off. In an emergency, shut off gas first, then air. Never turn the gas on without turning on the blower first. Before building your crucible furnace, take these points into account:

■ The furnace may constitute an "attractive nuisance," like a swim-

ming pool. Never let it run unattended. Don't leave gas or electricity connected when it's not in use. If possible, bar access to it with a lock.

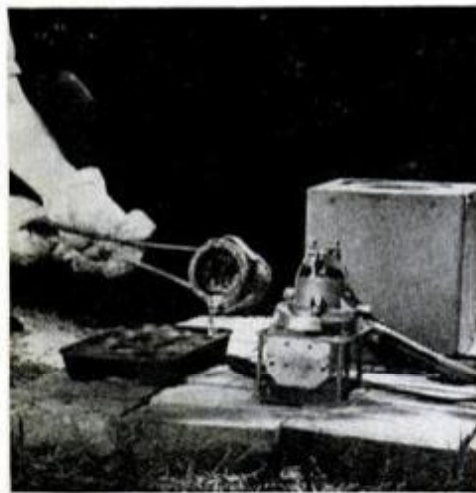
■ When on, the furnace rumbles like the sound of a jet engine. Don't operate it during hours when it could disturb neighbors.

■ Installation may require the approval of local building authorities or fire inspectors. Check with them in advance.

■ Because of the high temperatures it generates, your furnace can be hazardous to life, limb and property. Get and read the safety publications listed below. **PM**

### COMPONENTS AND INFORMATION

- Insulating firebrick, refractory cement: A.P. Green Refractories Co., Green Blvd. Mexico, Mo. 65265.
- Dimmer: Lutron Electronics, Box 154, Sutter and Jacoby Rds., Coopersburg, Pa. 18036.
- Crucibles, tongs, asbestos gloves, safety goggles: Swest, Inc., 10803 Composite Dr., Dallas, Tex. 75220.
- Publications No. 86A, *Ovens and Furnaces*, and No. 86B, *Industrial Furnaces*, National Fire Protection Assn., 470 Atlantic Ave., Boston, Mass. 02210.
- Chemical Engineers Handbook, John H. Perry, Editor-in-Chief, McGraw-Hill Book Co., 1221 Avenue of the Americas, New York, N.Y. 10020.



Pour metal into your mold, using shorter tongs. Wear proper gloves for all steps.

# ♪ Introducing the wagon that has America singing. ♪

You guessed it.

After all, you don't find people singing about ordinary wagons. Just extraordinary ones. Which, we modestly propose, is precisely the category the 1978 Plymouth Volaré wagon fits into.

Reason number one is the most obvious. That cavernous space you see below. Where those kids could lug home about 60 bushels of shells, or fish, or something else suitably exotic. (Parental guidance suggested.)

Of course, the nice thing about lugging anything around in a Volaré is that you never lug around a lot of car. Because Volaré is a trim, compact wagon. Maneuverable. Easy to park. And, a pure joy to drive. Thanks to the Isolated Transverse Suspension. An ingenious system designed to keep life's bumpy

road as far away from you as possible.

Other comforts also abound in Volaré. Like a gas pressurized liftgate that opens part way on its own. And two optional lockable storage compartments to keep "out-of-sight" valuables out of sight.

Volaré. People have been singing its praises since the day we brought it out. So much so, in fact, that last year, they helped make it the No. 1 selling wagon in America.

And if we're hearing it right (ah, what a great sound) that's exactly where it's going to remain.

Buy or Lease a Volaré at your Chrysler-Plymouth Dealer today.



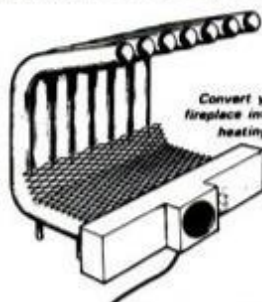
Plymouth



## New 1978 Plymouth Volaré. The car with the accent on value.

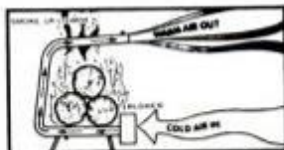
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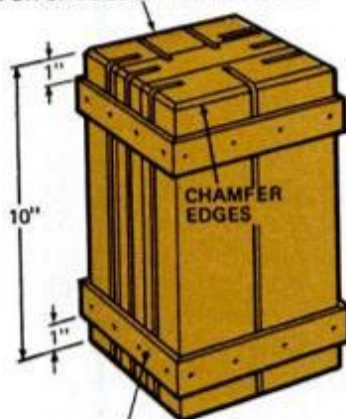
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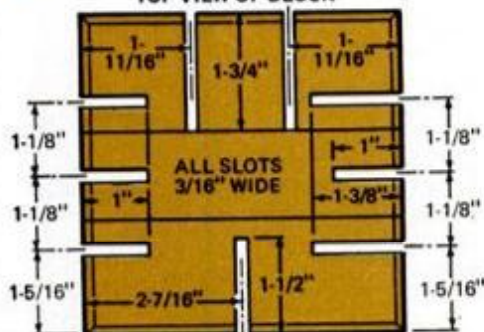
**Christmas gifts**

LAMINATE TWO PIECES 1-3/4 x 4-7/8 x 10" AND ONE PIECE 1-3/8 x 4-7/8 x 10" FOR O.A. BLOCK 4-7/8 x 4-7/8 x 10"



1/4 x 1 x 5-3/8" (8 REOD.). MITER ENDS AND FASTEN WITH BRADS AND GLUE

**TOP VIEW OF BLOCK**



**Knife block**

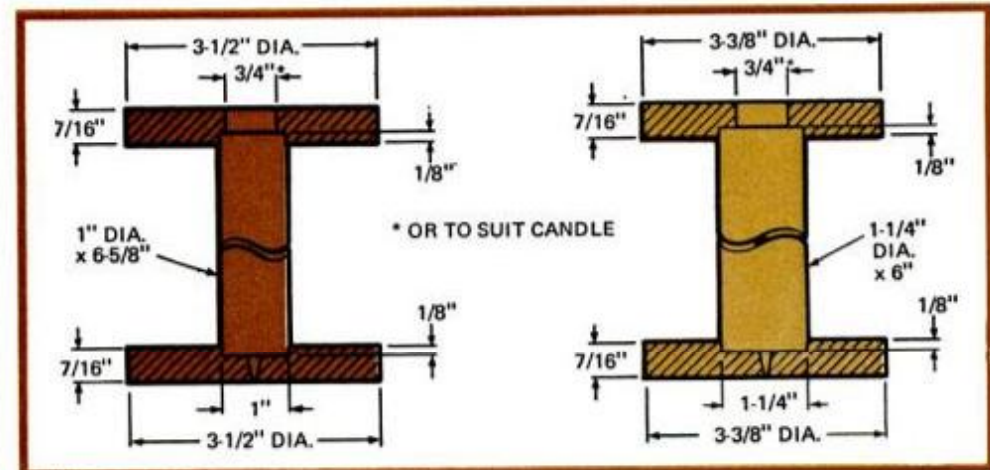
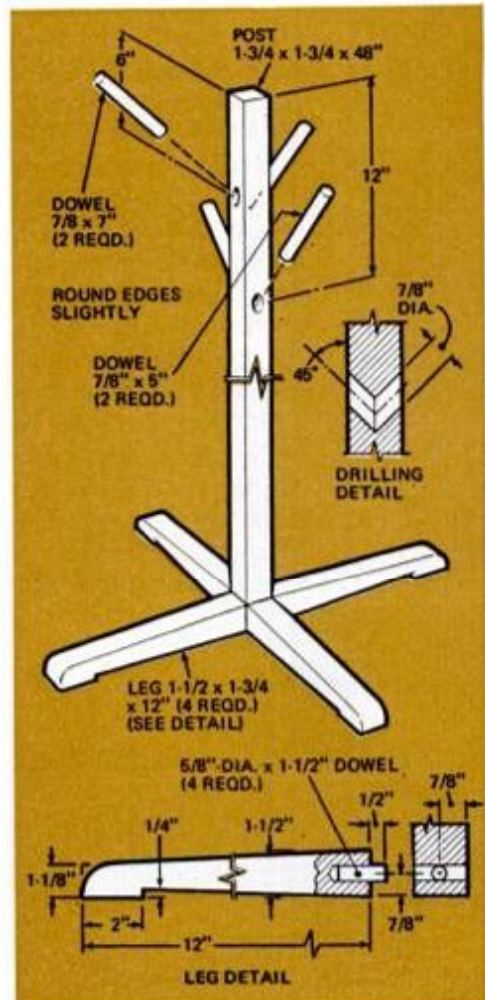
In order to create the size block needed here, it is necessary to laminate three oak boards as shown. Clamp block until glue dries. Meanwhile, cut the strips that encircle the block at top and bottom. With a dado blade mounted on bench saw, cut 3/16-in. grooves to suite your knife set. Attach strips and apply varnish.

**Flax spool candlesticks**

This is a super-easy project because the candlestand body is simply a 6-in. length of ready-made dowel. Cut the top and bottom circles from 1/2-in. clear pine; bore the mortises and attach to dowel. At top, bore a 3/4-in.-dia. hole (or size to suit) to

**Clothes rack**

Because of simplicity of design, the clothes trees shown are particularly easy to build. In fact, the toughest part of the job is boring the angled holes for the dowels. Use a guide to assure accuracy. Sand all parts before assembling the rack as shown below. Seal with shellac and finish with either varnish or enamel.

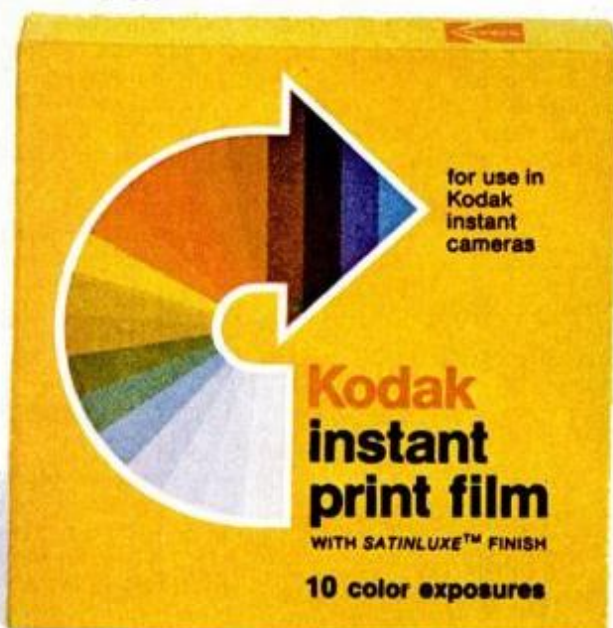


(Please turn to page 144)





# The simple instant camera with... a big difference.



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The camera's got to take simply beautiful color pictures.

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Only Kodak instant color film gives you pictures with color by Kodak. Pictures in minutes protected by an elegant Satinlux™ finish. Pictures you can take with the optional Kodak instant (electronic) flash. Pictures that can be made into beautiful color copyprints and enlargements.

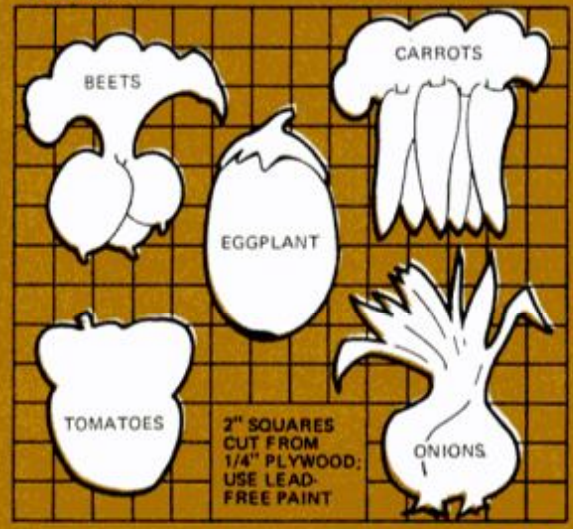
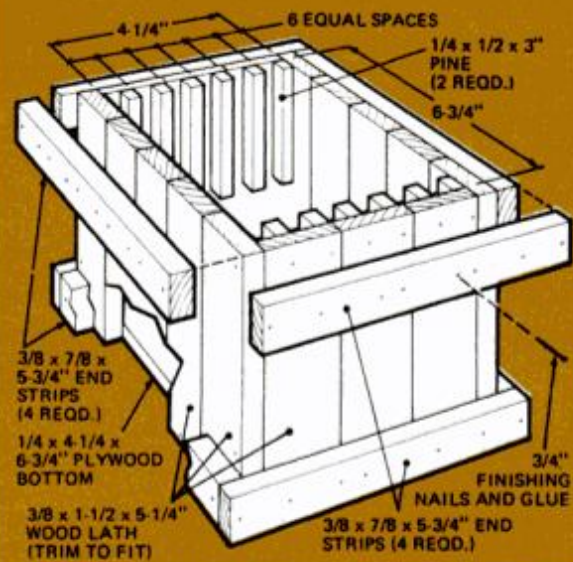
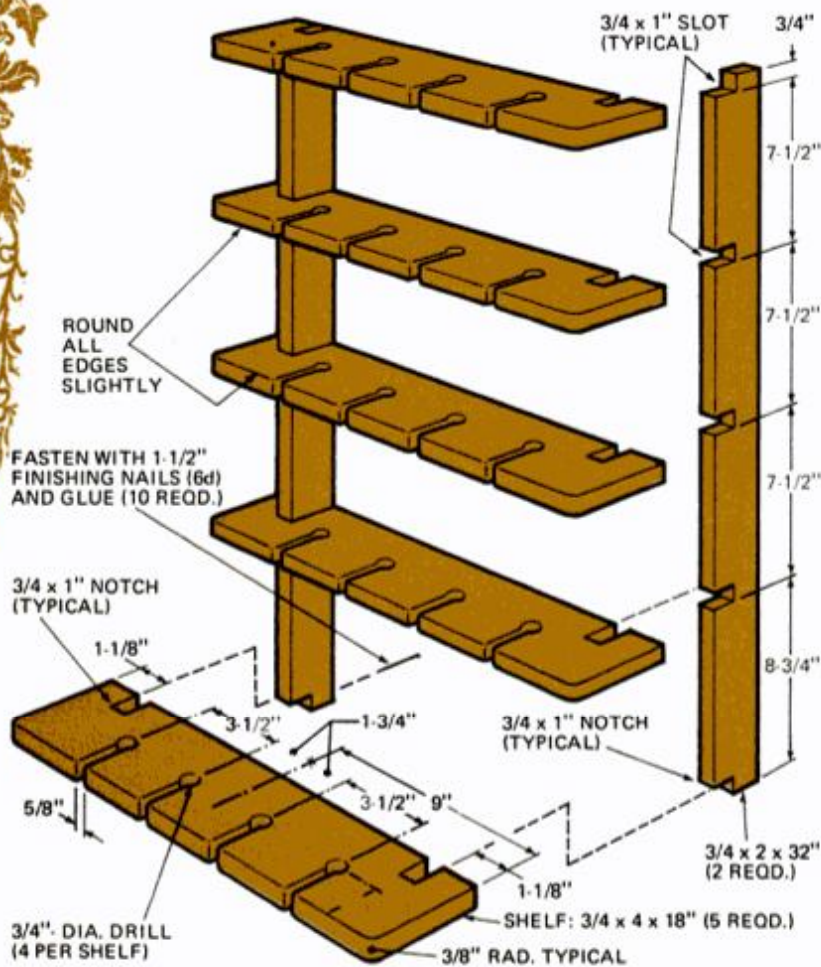
But everything starts with the film. Kodak instant color film. It's the heart of The Handle™... Kodak's lowest-priced instant camera.

**Only Kodak instant cameras use Kodak instant film.**



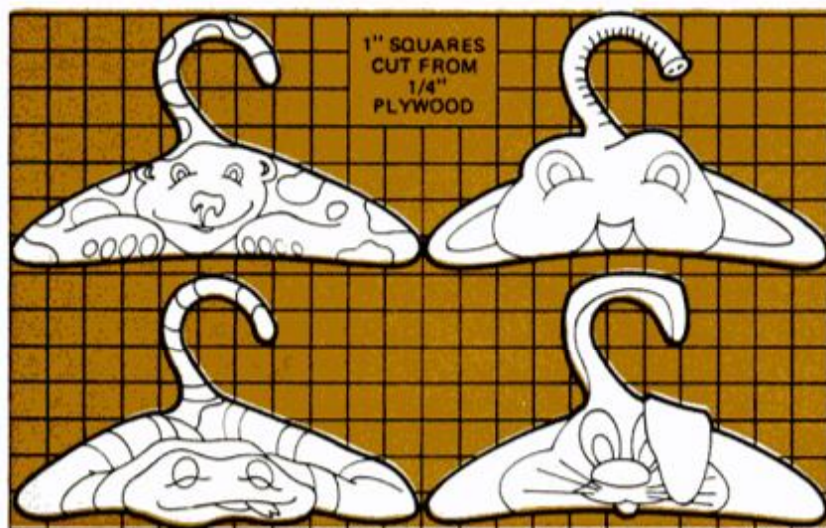
And now save up to \$10 on Kodak instant cameras and film! See your photo dealer about this limited time offer.

# Christmas gifts



## Wine glass rack

Start by cutting both sides and shelves. Then tack-nail the five shelves together to expedite cutting the notches for the cross-lap joints. Using a dado cutter set for a width equal to the thickness of the stock and a depth of 1 in., make the notch cuts. While shelves are bundled together, insert a 9/16-in. bit in your drill and bore the holes for the stems. Separate pieces and remove brads. Use either bench saw or sabre saw to cut out slots from edge to bored holes. Sand all surfaces, then assemble using glue and 6d finishing nails. Install two screw eyes, finish with several coats of semigloss varnish, rub with steel wool between coats.



## Sandwich boards

Start by building the vegetable crate of wood lath. Sand lightly so as to just remove whiskers, but do leave texture. Cut parts for the four sides, stacking pieces in four piles as you go. Then assemble the box, using glue and brads as shown above. When glue has dried, seal the porous wood with a coat of white shellac thinned 50 percent with denatured alcohol. Next day apply one nonthinned coat of semigloss varnish. Using 1-in. squares, lay out the vegetables on 1/2-in. pine or birch plywood and cut out parts with either jig or sabre saw. As you cut each vegetable, check its fit in the box and make additional cuts if needed. Next, sand all pieces smooth—rounding edges slightly as you do—and seal with a prime coat of paint. To finish, apply colors using nontoxic water-base paints.

## Kids' clothes hangers

The hangers shown were cut from 1/4-in.-thick pine plywood (because fir plywood does not take paint evenly). Start by drawing the hanger design on a piece of tracing paper. Flop drawing and rub soft pencil on back side. Tape tissue to plywood and redraw lines to transfer artwork to the wood. If necessary, go over lines on wood with felt marker to prevent smudging. Cut the hanger using sabre saw or jigsaw and, at this stage, test hanger fit on a clothes bar. When satisfied, sand hanger smooth, dust off and seal with a coat of white shellac thinned with denatured alcohol. When dry, lightly redraw designs with charcoal, then fill in with paint. Use color photo on page 133 as your color guide.

(Please turn to page 146)

# Realizing your next car should be a truck.



There you were, strolling along just minding your business, when all of a sudden there it was, all big and red and tough and shiny, practically cooing to you from the showroom floor. Buy a truck?—you? Oh well, it can't hurt to look, can it? So in you go.

What you discover first, of course, is how civilized a GMC is. Glory be, this seating's comfortable. And look at all the goodies you can order: available power steering, automatic transmission, air conditioning, stereo, cruise control. Gosh, the instrument panel's as nice as you'd find in a car. And hey—vent windows!

A test-drive? Oh, you couldn't...but then again, what's life without a little adventure, anyway? Besides, anything with such a good view of the road is bound to be a ball to drive, right? Well, okay...but just around the block.

Boy, sure is smooth up here. And all that cargo space—just imagine the stuff a guy could haul back there. Buy it? Oh, you couldn't...could you? Come to think of it, sure you could.

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The *Pro Sharpener* produces a ground edge—much sharper than a filed edge. Comes complete with three grinding wheels (enough for up to 30 sharpenings) plus a hand file adapter.

\*Patents pending

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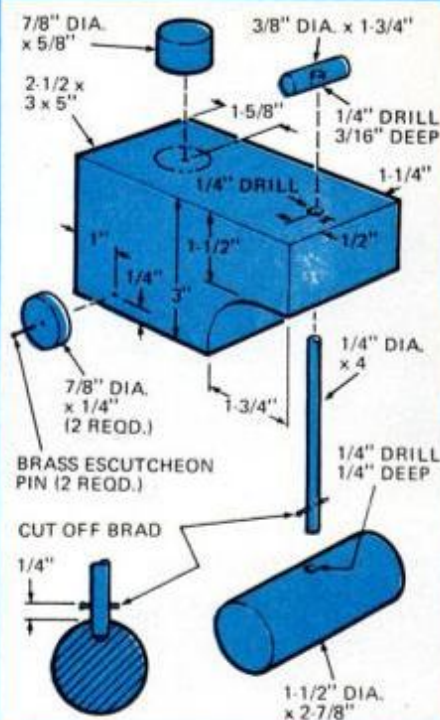
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Important: To insure correct grinding wheel size indicate your Chain Saw Mfg.  
Saw Model: \_\_\_\_\_

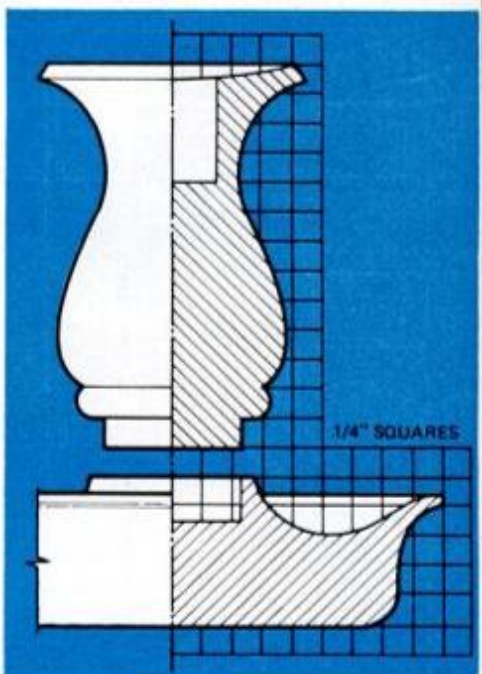
30 Day Unconditional money back guarantee.

## Christmas gifts



## Pine steamroller

The toy shown can actually be made using assorted scraps of wood and dowel salvaged from your workshop scrap box. The chassis is created by gluing up pieces of pine. The curve at front is cut with coping saw or bandsaw and should be shaped to suit the dowel roller. Note: To simplify finishing task, spray parts with clear varnish before assembly.



## Candlestand

The handsome appearance of this elegant candlestand belies the fact that it's an easy lathe-turning project. Size blocks of walnut for both spindle and faceplate turnings (turn spindle first). Mount the faceplate block and shape bottom, then reverse piece to finish top. Cut mortise on spinning plate to suit tenon. Finish parts while they're still in lathe.

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## FAMILY HOBBY ROOM

(Continued from page 108)

where glued assemblies or small pieces can be left undisturbed. The shades serve several functions: The pull-down shades hide a storage shelf niche, as well as their usual function of blocking the sun and offering privacy at the two windows. The pull-up shades are used to hide an air conditioner and a mini-storage space under the desk. Plans for the storage chest, desk and pull-up shades on these pages can start you on your way to creating a hobby center for your family and making fuller use of your living space.

### Colonial storage chest

The chest is designed to organize the small equipment and materials needed for hobby work. The 24 separate compartments will provide everyone in the family a place for his supplies.

You don't need complicated hardware to build this all-purpose chest. The doors simply pivot upward on dowels and slide back on routed grooves for access to the compartments. Shelves and vertical dividers section off the compartments so you don't have to build drawers.

Make the case of  $\frac{3}{4}$ -in. pine with a  $\frac{1}{4}$ -in. plywood back. The dividers are grooved to accept shelves and are bored for the dowel pins that hold the door fronts.

The shelves are fitted with stops for the doors when they are in the closed position. The top level of compartments also has backstops for the doors. These stops are added after the doors are in position—and before the back is installed.

The jig on page 109 makes slotting the doors fast and accurate work.

Lay it out carefully and practice routing the grooves on scrap. Work from the back of the chest to put the doors in place. Position them with dowel pins resting in the door slots and push the doors forward to the front of the chest. Attach the wood door knobs and top. Fit the back into the rabbets in the top, sides and base panels.

To give the chest a colonial look, add stock moldings at top and bottom. To finish the unit, sand thoroughly, dust off and wipe with a tack cloth. Apply the stain of your choice, following manufacturer's directions. Allow the stain to dry overnight, rub lightly with double-0 steel wool, dust and wipe with a tack cloth.

Next, apply a coat of white shellac thinned 50 percent with alcohol. Allow the shellac to dry overnight, then repeat the steel wool and dusting procedures. Finish by applying two coats of a good-quality varnish such as ZAR—following manufacturer's instructions. For an authentic look, pick the flat antique finish.

### Cantilevered desk

The light-duty desk cantilevered under a window makes use of space that's often wasted. The desk gives a work surface while the sill holds materials. During the day the shade can be raised to admit light. When not in use, the desk can display finished craft projects.

The desktop is plywood with a pine surround mitered at the joints, which gives the top a thicker more substantial appearance. The desk is anchored by a desk support and hold-down cleat. A plywood sill shelf supported by a shelf cleat and front panel finish off the top of the desk. The dimension of the sill shelf will vary, de-

(Please turn to page 148)



## Cruise Director.

Enjoy a new sense of direction and get lost less often with an Airguide auto compass. Model 1601 (shown) is self-illuminated... has adjustable compensators and adhesive mount. At retail stores. Write for Catalog A. Jobber and dealer inquiries invited.

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## Wood/Craft CATALOG

with **20**  
**WOOD**  
**SAMPLES**



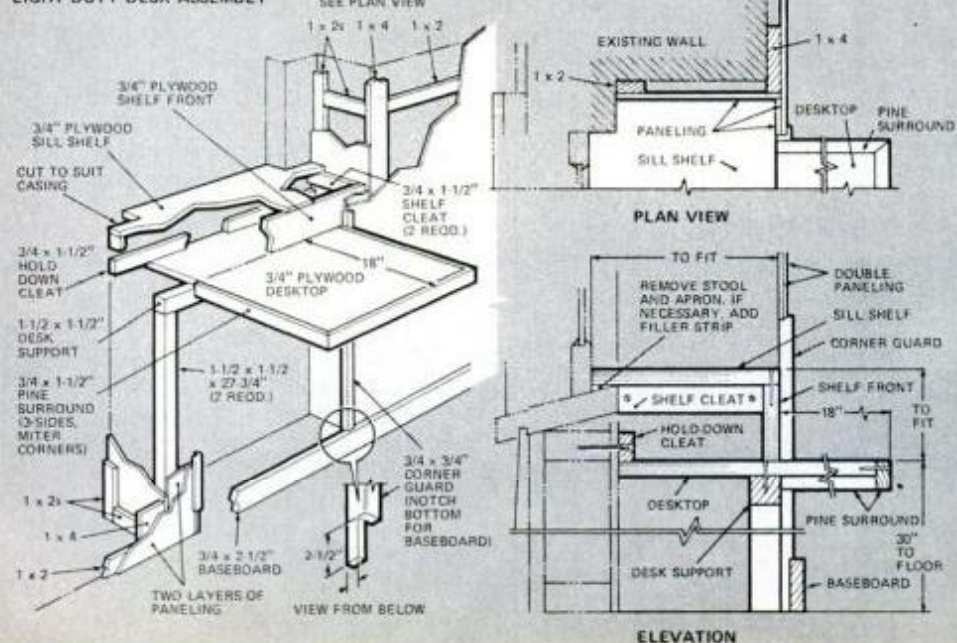
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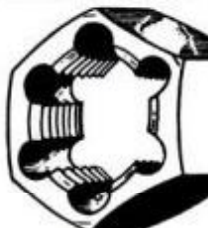
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## FAMILY HOBBY ROOM

(Continued from page 147)

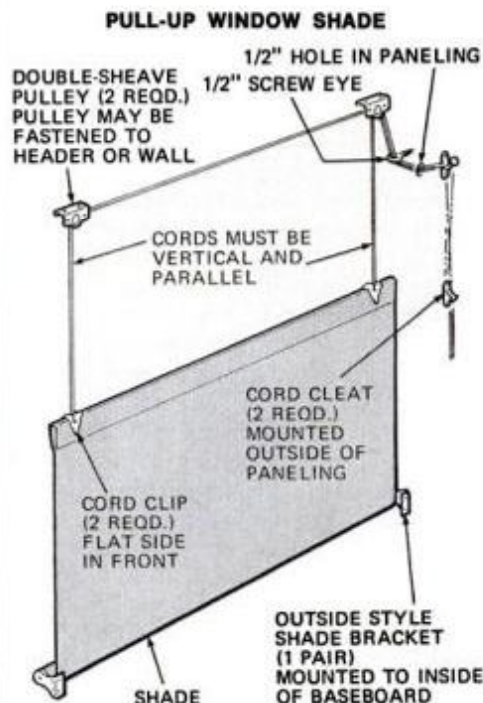
pending on the window casing, so check this dimension carefully before starting.

A corner guard notched at the bottom to fit on the baseboard covers the ends of a double thickness of paneling. The double paneling runs from the 1x4s on both sides of the window.

Finish the desk in a bright color to blend in with the room. For durability, use an enamel. A pull-up shade hides a small storage space under the desk. This niche provides extra knee room if needed.

### Shades that pull up

The pull-up shades in this family hobby center cover equipment that would otherwise give the room a cluttered look.



tered look. Installed "bottom-up" as they are, the shades offer a unique alternative to other storage units. They're also quite inexpensive. You can paint bold graphics on the shades to give color to the room. You might also experiment by laminating fabric onto the shade.

Two shade brackets mounted to the inside of the baseboard anchor the shade on both sides. Fasten two double-sheave pulleys to the wall or header at the highest point the shade will be pulled. Be sure that these pulleys are attached so the cords will be vertical and parallel for smooth shade action.

Bring the shade cord through a small hole drilled in the paneling to the room side and secure it by winding the cord around two cord cleats.

# Great saving! Easy doing!

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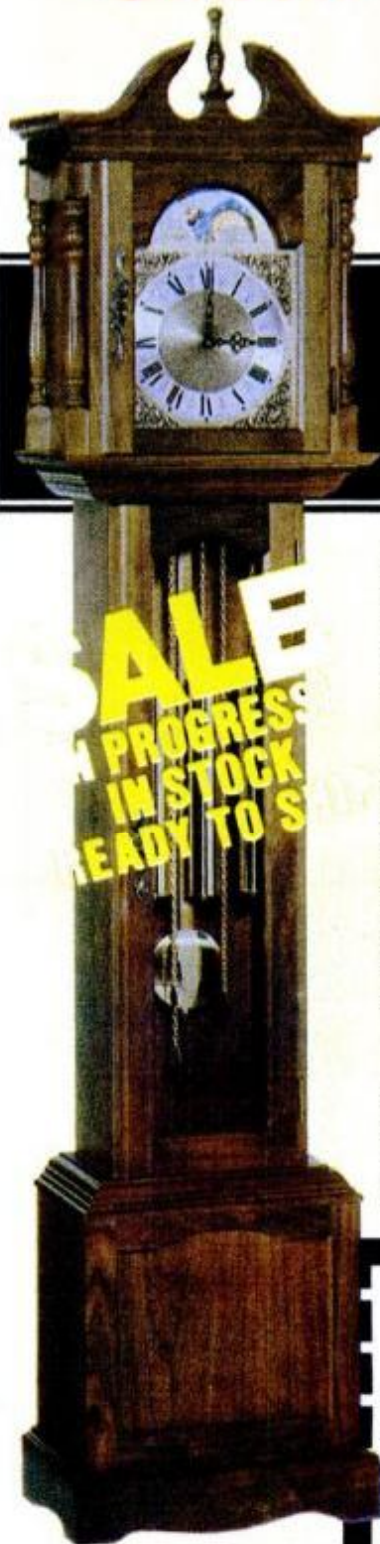
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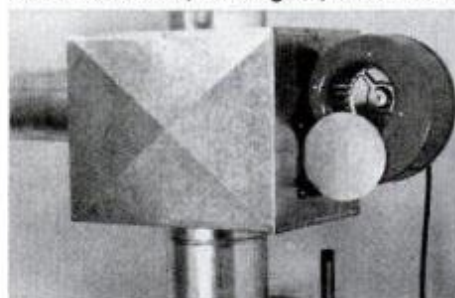


**Three-eyed projection TV**

Rooms only 12 feet long are big enough for a new Video-Beam TV projector. The console can serve as an end table. Three lenses produce a 3 by 4-foot image in a fully lighted room. The Model 10 Video Beam is \$2595. Advent Corp., 195 Albany St., Cambridge, Mass. 02139.

**Waste heat snatcher**

Intercept heat going up the flue and pipe it where needed. Fuel Miser cuts out at 200°F., keeps flue drawing. \$146 to \$200. Edmund Scientific, 101 East Gloucester Pike, Barrington, N.J. 08007.



**Key chain ruler in a tire**

Mini automobile tire key chain holds a 36-inch steel measuring tape 1/4 inch wide. The tape retracts into the "tire" case when released. It's small enough for any pocket. \$2.49 at J.C. Penney stores. Other case styles are available.

**Hushing a jet**

Roofless hangar for the Concorde at London's Heathrow Airport is rigged so that the supersonic jet's nose hangs out and engine noise soars up instead of out whenever the SST comes in for servicing. Engineers call this unique custom-built bay the "hush house."

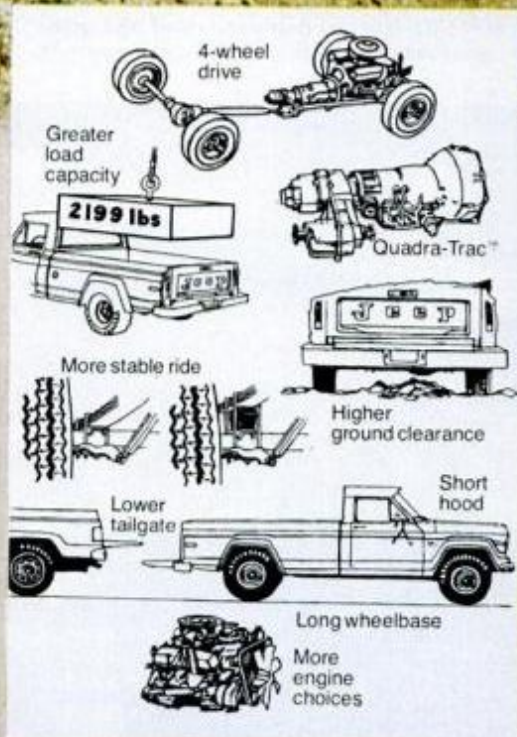




# Face the facts... and you'll buy a Jeep Pickup



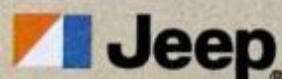
There are 4-wheel drive pickups and there is the 4-wheel drive **Jeep J-10 Pickup**. If you think they're the same, you're in for an education. Jeep Pickup has **4-wheel drive that's built-in**, not added on like an option—that's the only way we make them. Jeep Pickup is the only pickup to offer optional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



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

\*Based on available specifications, June 1977

Jeep Corporation is a subsidiary of American Motors Corp.



**Jeep wrote the book on 4-wheel drive .**

# The ultimate test for your gun



Combining sandbags and a mechanical support to bench-rest his hunting rifle, author Nonte test-fires his gun to check its sights and accuracy before the start of the fall deer season.

Bench-rest is the name of the game that can get you bull's-eyes or hunting success.

by George Nonte

**M**any a shooter takes his trusty rifle, fires a few shots at a gallon can or similar target and figures he knows just how his gun is zeroed in. If he hits the can a couple times in four or five shots at 50 yards, he figures he's ready for the range or the deer season. He does his shooting while standing, or leaning against a tree, or resting across the hood of his car or from some other haphazard position.

But shooting that way does not give a true picture of the accuracy of either gun or shooter, and doesn't really indicate whether the gun is sighted-in properly. More important, it can give a false picture of the



Heavy weight and small caliber of bench-rest rifle (above) dampen recoil and make unnecessary shooter's shoulder support.

potential accuracy of the gun, and might jeopardize an important and expensive hunt as well. There is a better way.

The absolute tops in rifle accuracy is produced by a rather small group of enthusiasts belonging to the National Bench Rest Shooters Assn. (NBRSA), 607 West Line St., Minerva, Ohio 44657. Even the most casual shooter can benefit from the methods they use to shoot five and 10-shot groups that are often indistinguishable from a single bullet hole.

These bench-resters measure their groups (from center to center of the most widely separated holes) with sophisticated optical instruments. Groups shot at 100 yards have been recorded with measurements that

*(Please turn to page 154)*



For bench-rest competition, massive reinforced-concrete benches of special design provide solid support for weighty rifles.

# Buying points where you buy aspirin is a good idea. You might need it.

Point sets from the super store are usually inexpensive, but that's where the headache starts. All point sets are not alike. An inexpensive point set is made of inexpensive parts.

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## ULTIMATE TEST FOR YOUR GUN

(Continued from page 152)

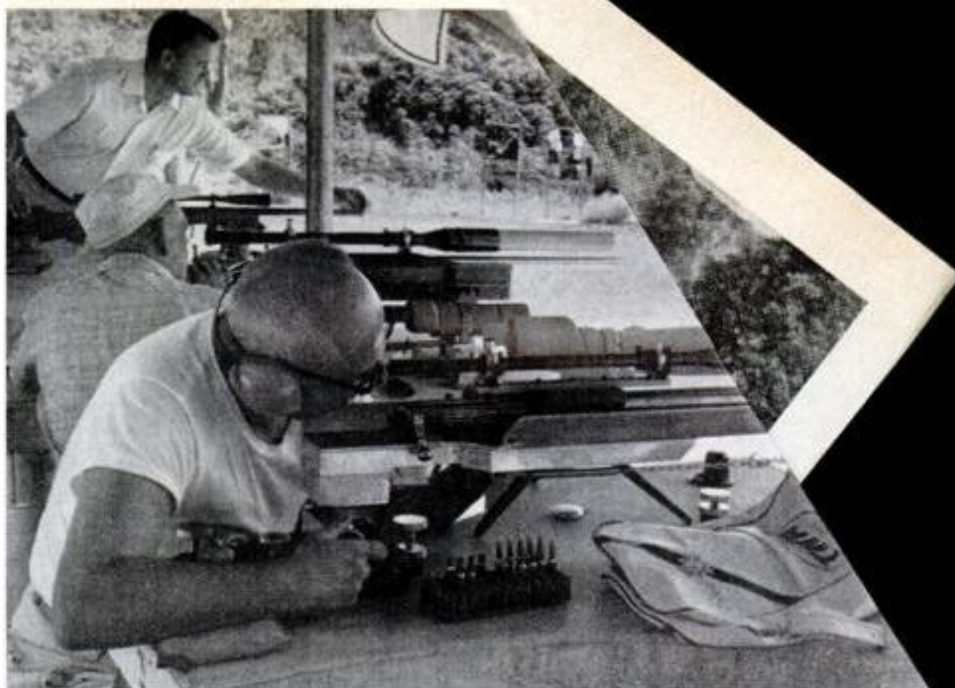
are less than  $\frac{1}{10}$  inch between centers of the widest shots. That beats legendary tack-driving by a considerable margin.

This degree of accuracy is obtained with specially built guns, very precisely hand-loaded ammunition, unusual shooting techniques, and a rigid shooting table, called a bench rest, with sandbag or mechanical supports on it.

### Accuracy for the rest of us

The special guns aren't suitable for the hunter, but bench-resters do shoot a category of "sporter" rifles that are quite suitable for hunting. The specially loaded ammunition is usually out, too, because the average hunter normally shoots only factory cartridges. He can, however, borrow bench-rest techniques to better prepare himself and his rifle for that important big-game hunt.

First comes the shooting bench, or *bench rest*. Many ranges have benches of one sort or another, but they usually aren't the massive, reinforced-concrete or timber structures of the pure bench-rest range. As long as they are solid, they'll do, and if there aren't any available you can make up a simple portable bench as shown in our drawing. It won't cost much and will last a lifetime, improving your shooting every time it's



Heavy steel channel serves as stock for this unlimited-class specialty rifle. Shooter, like many bench-resters, brings along equipment for on-the-spot reloading.

used. The splayed legs give it a firm foundation, and it is further stabilized by the weight of your torso, the rifle and sandbags.

### Those bags

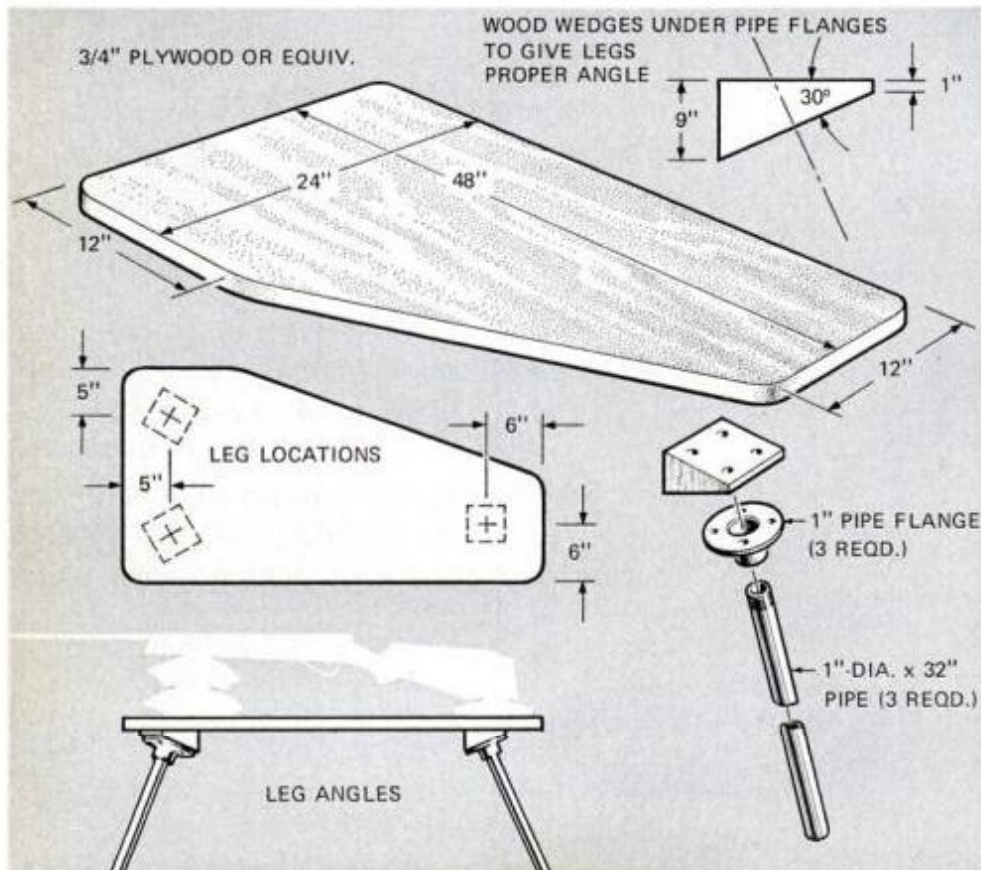
With any bench, you'll need sandbags. They can be bought in cheap or expensive models, of course, but it's also simple to make your own. Any close-woven strong cloth will serve.

Two or three rectangular bags 12 to 16 inches long and about six inches wide will serve up front. A couple of smaller bags will do back at the butt; often one is sufficient. Bags should be loosely filled so they can easily be squeezed to shape. Filled tightly, they won't work as well. Clean sand is the common filler, but lead shot is preferred by some shooters, in spite of its cost.

The large bags are stacked up near the front edge of the bench to support the fore-end of the rifle. The fore-end is bedded down into the top bag for the lateral as well as vertical support. Place the smaller bag(s) under the toe of the rifle butt, bedding the stock into it.

With malleable sandbags under the gun at both ends, the rifle's vertical angle can be changed easily to align the sights on target. Major changes are made in the front bags; minor ones by squeezing the rear bag with the left hand to raise or lower the butt slightly. In this manner, the sights are brought to bear on the target and all vertical support comes from the sandbags, eliminating the trembling and weaving present when the support comes only from your body. Lateral changes are made by moving the front bags or the rifle on them; minor shifts again by squeezing or moving the rear bag.

Hunting rifles generally recoil more forcefully than heavy bench-rest guns so the hunter must support the butt solidly with his shoulder. Alternately, a 25-pound bag of lead shot can be placed between gun butt and shoulder. This reduces recoil movement of the gun and eases the



Portable bench can be easily made, quickly assembled in the field for accuracy check.

(Please turn to page 156)

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## ULTIMATE TEST FOR YOUR GUN

(Continued from page 154)

blow on your shoulder. It also damps out shoulder movement.

### Ready, aim

With this understood, here's how the shooting goes. First, as always, make certain the rifle is *unloaded*. Seat yourself at the bench, adjusting seat height so that your left forearm and right elbow (if you shoot right-handed) can rest comfortably on the bench top. Then adjust the sandbags so the rifle points at the target when solidly bedded and you can see clearly through the sights without muscular strain. Grasp the rear sandbag with the left hand and make minor adjustments by squeezing and shifting it to bring the sights dead-on. Don't try to shift the gun by nudging it around with your shoulder. The left hand shouldn't touch the gun, just the sandbag.

With sight alignment correct, support the butt solidly with your shoulder, but don't disrupt the rifle's seat in the sandbags. Grasp the trigger grip of the stock firmly but gently with your right hand. Squeeze the trigger carefully to fire, without disturbing that solid sandbag support. At first, do this dry-fire without loading the gun. The hammer or striker should fall without any disturbance of sight/target alignment. Practice this a bit before stepping up to live shooting.

So long as you've bedded the rifle well on the sandbags and don't disturb it with your shoulder or when

pulling the trigger, the human error present in other forms of shooting is very nearly eliminated. Thus you'll be able to shoot accurately, and what shows up on your target represents the mechanical accuracy of only your rifle and ammunition.

Of course you must still control your breathing and keep your body as still as possible. By being firmly seated and resting your arms and torso solidly on the bench, such control becomes easy. *Any* movement of your arms, hands or upper body will be transmitted to the gun. If you note a very slight but regular twitch of the gun as you concentrate on the sights and target, it is most likely the effect of your pulse. This can come from the carotid artery in your neck and can be eliminated by carefully shifting your head and neck.

### Fire

When sights and target stay in rock-steady alignment while the trigger is squeezed, you're ready for live ammunition. Load with one cartridge, get everything in position, align the sights and squeeze off a shot. Jack out the empty, relax, and then repeat the process for at least three to five shots at one to two-minute intervals. This keeps the barrel from heating rapidly, which can cause it to bend slightly, affecting the bullet's strike zone. Since the first shot is the most important to the hunter, the barrel should be kept relatively cool, simulating first-shot field conditions. Take care to position both rifle and yourself back *exactly* the same for each shot. Recoil will



Massive bench-rest model can be held by sandbags, mechanical adjustable supports as shown, or elaborate return-to-battery mounts that return to aim-point after recoil.

move the gun to the rear, and it must be repositioned on the sandbags before firing again. "Exactly" means just that. Deviations in position, bedding in the bags, grip on the stock or snugness of your shoulder to the butt will reduce accuracy.

Once you have fired a group of three to five shots from the bench you'll see clearly how well your gun is targeted, as well as just how accurately it can shoot. You may be surprised to find the sights weren't zeroed as closely as you thought. If the group isn't on point of aim, now is the time to shift the sights and then shoot another group to check them. In fact, you may need to shoot several groups to get the sights set exactly, and in doing so you'll learn more about just how much accuracy your gun can deliver.

Half a dozen groups will show what normally can be expected from your gun and ammunition alone. Average group size will indicate the smallest target that can be hit consistently without usual human error. Make allowance for your error and instability under hunting conditions and you'll realize that an offhand shot at a deer 300 yards away is a waste of time unless you and the gun are both exceptionally good.

#### Bonus benefits

The use of a bench rest and related shooting methods are equally helpful regardless of the type or calibre rifle (or even handgun) that you shoot and the type of sights it carries. The light, open-sighted .22 rimfire squirrel or rabbit rifle is, in fact, less likely to be properly zeroed than a big-game rifle. Further, the usual targets of such a rifle are smaller so that one needs first-class hunt preparation.

Bench-rest enthusiasts shoot with high-magnification scope sights and use very small square black aiming points. They either quarter the square with the scope cross hairs or set the square in an angle formed by the intersecting cross hairs. Hunting scopes are usually of only 2½X to 6X power so a larger aiming point like a two-inch or four-inch square is much easier to use. With iron sights, open or peep, you may require an even larger aiming point, and a circular shape is better than a square.

While the bench experts shoot only at fixed ranges of 100, 200 and 300 yards, your bench-rest work may be done at any range that suits the space available or approximates the range you normally shoot. And bench-resting before the hunting season or any other time is bound to increase your accuracy and enjoyment of the sport.

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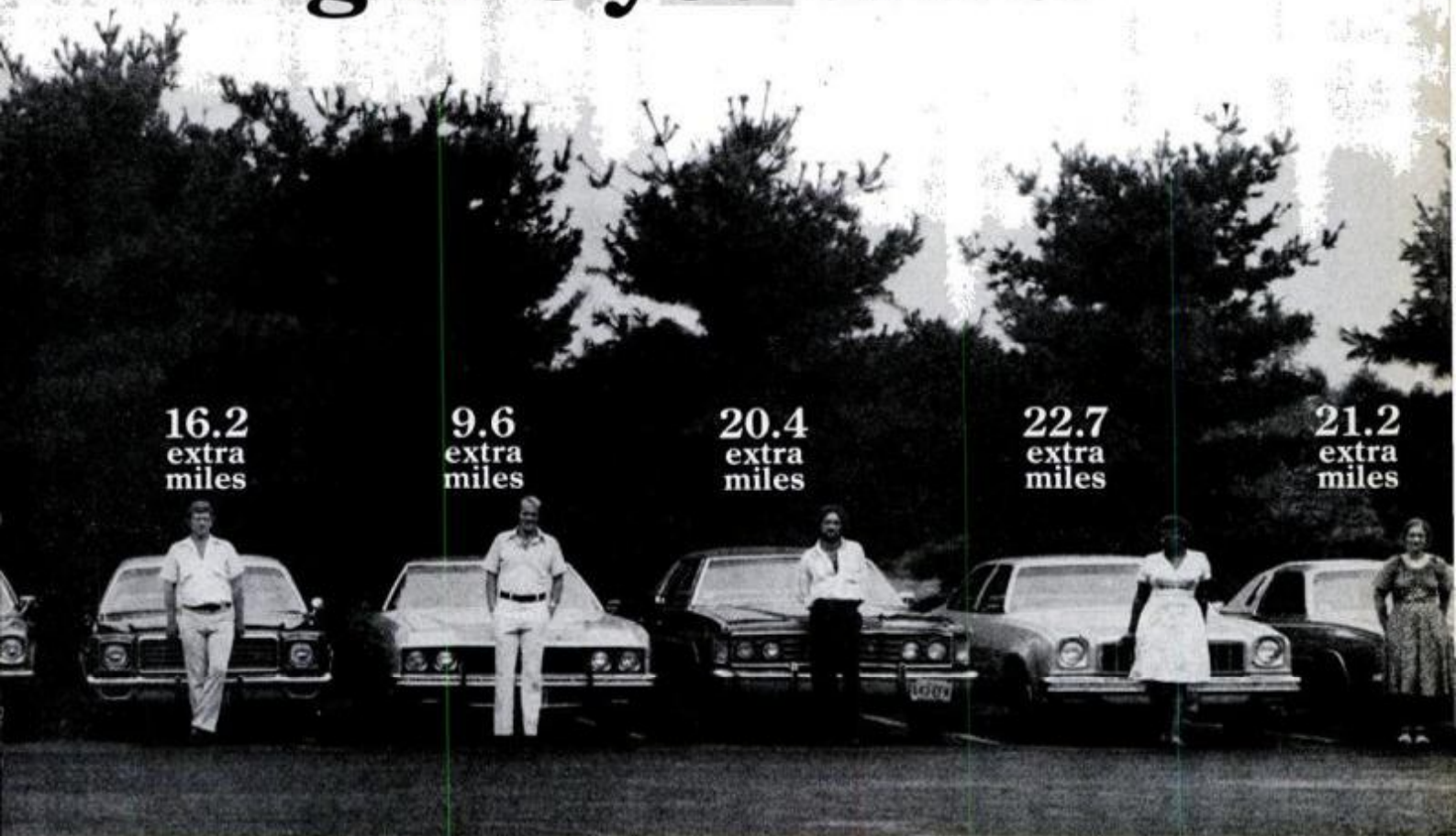
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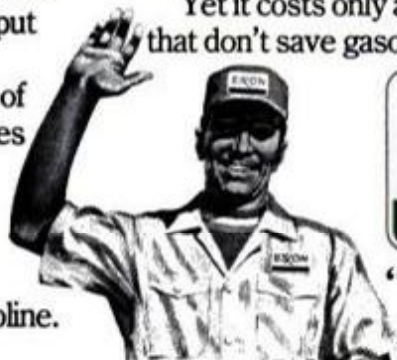
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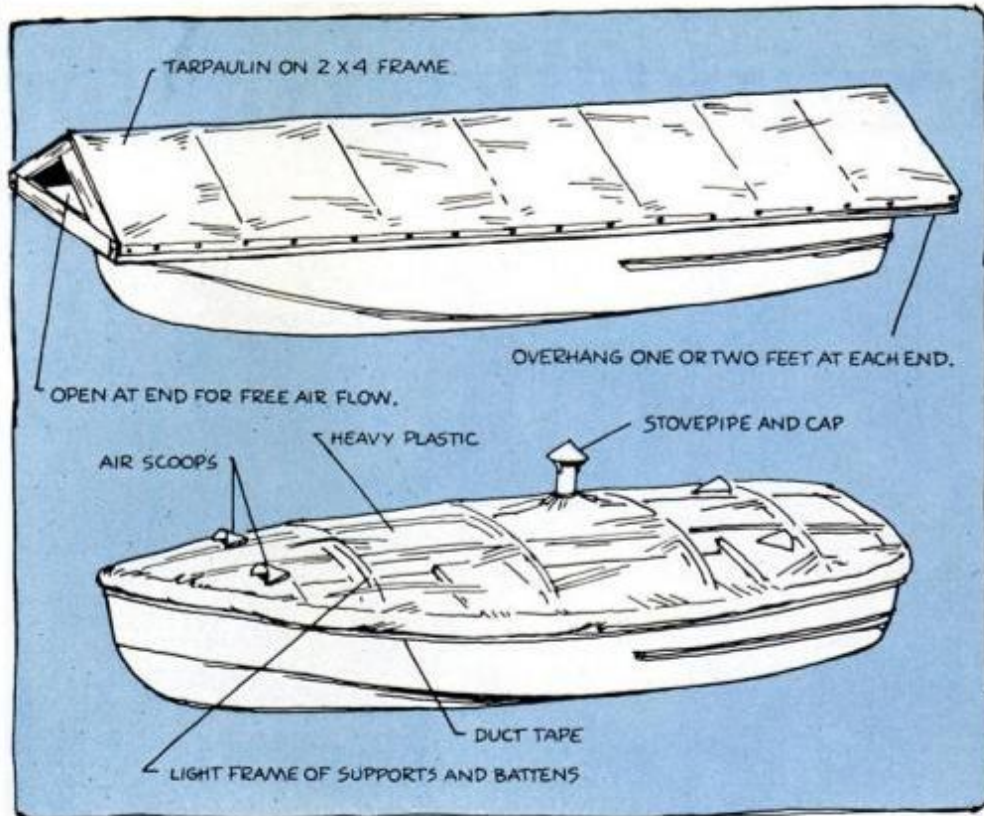
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## SECRETS OF SUCCESSFUL WINTER LAYUP (Continued from page 117)



Final cover for craft stored outdoors requires ventilation provision. If the overhanging ends (top) tend to catch storm winds, the cover can be sealed down with duct tape (bottom), but clam-shell vents and pipe should be added to exhaust damp air.

provide covers from old awnings or canvas. Don't worry if a little water comes through during a storm, as long as large quantities of water and ice don't accumulate inside. Ordinary dropcloth plastic is fine for an indoor dust cover, but rips quickly in the wind. Truck tarpaulins and heavy tear-resistant plastic sheeting are much better. Taping or battening a cover so it's airtight is a bad mistake. Lack of ventilation can permit moisture condensation to build up without escape, and mild days of late winter can make the inside like a hothouse.

A small boat cover can be supported by a 2x4 ridgepole. Larger craft require a framework of battens. Duct tape sold in hardware stores is strong, useful for holding down edges, and usually leaves less residue when removed than masking tape. A good cover should overhang the boat a foot or two at each end and be open for good ventilation. If gales try to rip it off, snug the cover down and install snap-in plastic ventilator scoops. Open all cabinets and lockers and tilt up all floorboards before the cover is secured.

### Fittings and gear

Water systems in large boats and cruisers are winterized with special antifreeze that imparts no taste to the tanks. Marine toilets should be

treated with a special sea-closet conditioner that keeps valves and packings flexible. Remove storage batteries and leave them at a boatyard or service station where they can be kept in a battery rack and hooked to a trickle charger. Don't leave loose cables dangling in the bilge; electric wires can sometimes act like candlewicks and draw water up into switches and instruments. Remove the bulbs in navigation lights so they won't corrode in their sockets.

Apply light oil to all hinges, pivots and latches. Chrome surfaces may be waxed, lightly coated with petroleum jelly or sprayed with anticorrosion liquid. Trailer wheel bearings should be regreased. Oil the hitch and wrap it in a plastic bag if the trailer will be outdoors. Blocking up the axle and removing the wheels for storage inside is good for the tires and makes the trailer much harder to steal.

### Motors

The best advice: Follow your owner's manual exactly in its section on winterizing. The delicate needle bearings of an outboard or high pressure cam-lobe areas of a four-cycle inboard may need a particular lube specified. Nonrecommended kerosine in the water jacket might damage gaskets and seals.

Careful care right now can pay off all next season. **PM**

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## ENERGY-SAVING HOUSE

(Continued from page 125)

instead of sprawled out on one level.

Give careful attention also to your floor plan. Grouping common living space in one part of the house and sleeping quarters in another facilitates zoned heating and cooling (dual thermostats, one for each area) and allows the closing off of a section when not in use. If possible, family rooms, kitchens and dining rooms should face south and west so they are warmed by the afternoon sun. Bedrooms should be oriented to the morning sun so they can be cooled easily for comfortable sleeping.

Well-planned ventilation can reduce the need for home cooling. In fact, many architects agree that in some regions, airconditioning is totally unnecessary if the house is properly ventilated. Along these lines, a courtyard or atrium (enclosed or open) can be used to create better ventilation; even though an atrium adds wall area, it may cut the cooling load. If your home is to be custom-designed by an architect, consider the inclusion of a courtyard. Be sure the house has cross ventilation.

Don't automatically opt for large expanses of glass—the major cause of heat loss. Windows should be positioned and located with more than a view in mind. Too often, they are included for esthetic reasons only and are not operable for ventilation. In my opinion, windows that can't ventilate a house don't make any sense at all. When a warm spell hits, you have no choice but to cool the house mechanically. Often, when the cooling system is spinning the meter at dizzying speed, the house could be cooled by merely opening and closing the right windows.

### High ceilings waste heat

Cathedral ceilings are dramatic and currently in vogue. But be aware that such ceilings can bring with them serious heating problems. Energy is wasted in conditioning a large volume of air in high unused spaces. And, since warm air rises, it is especially difficult to heat high-ceilinged rooms.

Old architectural standbys can still save a lot of energy. Attached porches, carports and decking can also protect windows and doors from the direct rays of the sun if they are carefully laid out. If your architectural design allows, consider using operable shutters over windows to screen out direct rays of the sun and cold wind blasts.

When you compromise function, you're almost certain to compromise good design.

PM

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## TWO'S A MOTORCYCLE, THREE'S A . . . VERY STRANGE CAR

(Continued from page 104)

he loaded it up with a tent, sleeping bag and camera and rolled west from Michigan, climbing to the top of Pikes Peak along the way and touring California plus several other western states.

### Vic drives his cars hard

That's one thing that differentiates Vic from most auto collectors: He drives his cars and drives them hard. "In my younger days I used to put 100,000 miles a year on a car. Today, though, it's more like 70,000 to 80,000."

In the 1960s, Vic began to get a reputation as a three-wheeler collector. "Once a person starts collecting something—be it coins, stamps, beer cans or barbed wire—other people put him onto things."

The centerpiece of Hyde's collection came to him via a tip. He'd been told to go to Boston and look inside a certain dirt-floored shed, under some stored furniture. He did, and what he found looked like a lot of Morgan pieces. Vic knew, though, that he'd unearthed perhaps the greatest three-wheeled Mog of all time, a supercharged factory race car fondly known as "Red."

Red set and still holds two class world speed records: 72.8 mph for the standing kilometer and 81.6 mph for the standing mile. It took Vic much pleading to convince the owner to sell Red, and even then it changed hands only because the shed had been condemned. Vic spent two years restoring the car. In June 1977, he drove Red to Cheyenne, Wyo., and swapped it for two BSA three-wheelers: a fabric-bodied 1932 boat-tail tourist and a 1934 four-cylinder roadster.

Each time he traveled overseas, Vic would bring back more motorized tricycles. He added four in 1966: a Reliant, a 1934 Raleigh Safety Seven, a nose-doored Trojan and an Irish-built Nobel. Vic bought the Nobel, which he found decaying in Wales, for \$35.

After adding another Reliant plus a Bond Minicar (both British), Vic invested in a brand-new Bond Bug, a wild-looking fiberglass wedge with a fliptop and astronaut seating. He Bond-Bugged all over England and Scotland, then made two round trips from his home in Niles, Mich., to California in the car, plus six jaunts back and forth to Florida.

### CBers get a lot of laughs

His next long-distance car became a 1964 Reliant minivan that Vic bought for \$550 in Chicago and to-

tally restored. On his first trip in it from Michigan to California, truckers along the route would tell Vic that he was "famous on the CB." On his way back home in the Reliant, Vic had his own CB installed, and he comments: "Lawdy me—everybody had something to yak about . . . lots of wisecracks like, 'Hey, look at the funny rollerskate that lost a wheel.'"

"But I had the last laugh, because the 8700-mile trip netted me an average of 62 mpg at speeds up to 90 mph!"

Vic recently restored a 1952 German Tempo three-wheeled truck, fitted it with a 4500-watt, engine-driven alternator, and mounted an electric calliope. The Tempo calliope has proved a great crowd pleaser at parades and business openings.

The only American-made three-wheeler in Vic's collection is his 1948 Davis. He heard about the car initially through an article in *Special-Interest Autos* magazine, contacted the owner in San Diego, and bought the Davis. Only 17 California-built Davises were ever produced.

Vic has finally decided to stop adding more three-wheelers to his collection, mostly because he's run out of garage space. Also, he recently acquired a huge four-manual theater organ, with 1073 pipes, that he's hot to restore.

"Collecting three-wheelers has been lots of fun," smiles Vic wryly, "but it's hell on a marriage, especially for a wife who's been trying to save money for retirement! She's a saint and an artist—Val Ri—and she deserves a big kiss for suffering through all this madness!" **PM**

### VIC HYDE'S 3-WHEELED FLEET

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- 1924 Morgan, air-cooled J.A.P., 2-speed gearbox.
- 1930 Morgan, Matchless water-cooled engine, 2-seater sports.
- 1932 BSA, air-cooled twin, fabric boat-tail body.
- 1934 BSA, water-cooled, 4-cylinder roadster.
- 1934 Raleigh Safety Seven, air-cooled twin, tourist.
- 1947 Bond Minicar, air-cooled single on front wheel.
- 1948 Davis, water-cooled 4-cylinder Continental, aluminum body.
- 1948 Morgan F, water-cooled Ford 4.
- 1952 Morgan F-Super, water-cooled Ford 4.
- 1952 Tempo truck, water-cooled Heinkel twin on front wheel.
- 1954 Messerschmitt KR-175, air-cooled Sachs twin.
- 1957 Messerschmitt KR-200, air-cooled Sachs twin.
- 1950 Berkeley T-60, air-cooled twin; Vic owns two.
- 1930 Nobel, air-cooled single, fiberglass body.
- 1960 Trojan, air-cooled single (similar to Heinkel).
- 1960 Scootacar, air-cooled Villiers single, fiberglass body.
- 1952 Reliant 3/25 minivan water-cooled 4.
- 1963 Frisky kit car, air-cooled Excelsior twin fiberglass body.
- 1966 Reliant sedan, water-cooled 4.
- 1971 Bond Bug, water-cooled Reliant 4, fliptop fiberglass body.
- 1972 Bond Bug, water-cooled Reliant 4, fliptop fiberglass body.

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## THE NEUTRON BOMB (Continued from page 115)

in minutes," according to the experts.

In A-bombs of the type that destroyed Japanese cities, a high-explosive trigger compresses uranium or plutonium into a "critical mass." Neutrons, the heaviest components of an atom, split the uranium or plutonium atoms in a "fission" process that releases more neutrons in a chain reaction. Most of the energy goes into flame and blast.

### Neutron 'cannonballs'

The neutron warhead, on the other hand, involves fusing of hydrogen atoms. The trigger of the reaction is a small fission device, producing sufficient heat and pressure to set off the "fusion" process. Each fusing of two hydrogen atoms forms a new atom of helium and releases a neutron which acts like a miniature cannonball that rips through steel, concrete—and human bodies.

The enhanced-radiation weapon reportedly will deliver a dose of 8000 rads (a measure of radiation) a half mile from the blast and 650 rads out to three-quarters of a mile. A new Army atomic-effects manual says troops exposed to 8000 rads would die immediately. The neutrons knock out the brain's nerve circuits much the same as radiation does to computers and electronic devices.

A dose of 3000 rads causes collapse in three to seven minutes. A man could recover in about 45 minutes, according to the manual, but he would die in a week from gastrointestinal breakdown. The body, from mouth to intestines, becomes an open sore, kidneys and heart weaken, and fever climbs until death occurs.

There is little effect from 650 rads for about two hours, but seeds of death from blood disease have been planted. Blood cells live 25 to 30 days, but do not divide after radiation. Bone marrow dries, and immunity to body microbes and outside disease fails before almost certain death in four to five weeks.

### Studies show grim effects

Knowledge of long-term effects is scanty. But a look at what has happened to the victims of the Hiroshima and Nagasaki atomic bomb attacks in World War II can provide some indication of the effects of enhanced-radiation devices. The \$81 million medical survey, started in 1947 by President Truman, provided 20,000 bomb victims with complete physicals every two years. The study has revealed vastly increased cancer rates.

Leukemia, a blood cancer caused by radiation, jumped by as much as

30 times the normal ratio in some groups, but cases have been declining since 1953. By contrast, breast cancers didn't start rising until 1955, but could reach the 30-times-normal level of leukemia, medical researchers say.

The Atomic Bomb Casualty Commission, a U.S. group which conducted the effort until 1975, reported that while the rate of deformed children was not much greater than normal, there was no question radiation affected children born to mothers pregnant at the time of the blasts 30 years ago. Many were born with small heads and others were mentally retarded or did not grow to normal size.

In addition, children under 10 years of age who received large doses of radiation were slightly smaller than other Japanese children. Women who were 10 to 19 years old in August 1945 appear to run a six-times-larger risk of developing breast cancer. Children who were under 9 seem to have more cancer of other types, but no breast cancer has developed.

A joint American-Japanese foundation in Hiroshima has taken over from the ABCC and plans to continue studies until possibly 1995, when the youngest survivor will be 50.

In the meantime, victims of other atomic blasts—the nuclear tests at Bikini and Eniwetok atolls in the Pacific—are trying to resume their interrupted lives.

### Contamination could last century

The picture is brighter for Eniwetok than Bikini, which may remain unsafe for up to 100 years. Both populations were removed to other islands before the United States began its series of 66 experimental explosions between 1948 and '58.

At Eniwetok, one island—Runit—is still so radioactive that it will be used as a dumping ground for the radioactive sand and atomic debris removed from most of the 40 other islands around the lagoon.

The Defense Nuclear Agency, which is doing the cleanup, will bury 7300 cubic yards of "hot" material and 79,000 cubic yards of plutonium-contaminated soil on Runit. Also, 225,000 cubic yards of nonradioactive junk will be dumped in the lagoon. Craters left by atomic blasts will be filled and covered with concrete and no one will ever be allowed to live near them.

The major portion of the work will begin this month, according to a DNA spokesman, Maj. William A. Knapp, when the Army Corps of En-

(Please turn to page 166)

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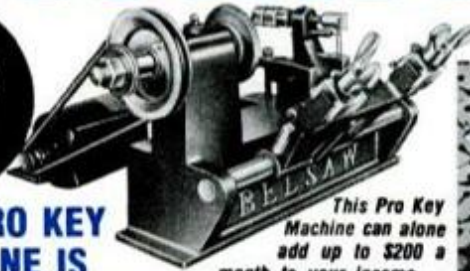
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## THE NEUTRON BOMB

(Continued from page 164)

gineers moves in to swell the force to nearly 900 men.

Energy Research and Development Agency scientists have found that radiation levels at the three main settlement areas—Japtan, Medren and Eniwetok—are actually much lower than in the United States. Coral sand does not soak up as much radiation as earth, John DeYoung, senior assistant on Pacific Affairs in the Department of the Interior's trust territories division, explains. (Japtan, however, has radiation levels equal to Germany's. German ships used home soil as ballast in copra trading before World War I and dumped it after taking aboard cargo at the island.)

## Fireball soars 20 miles high

Many of the 43 test shots at Eniwetok were on the ground. The situation at Bikini stems from only one of the atoll's 23 explosions, all of which were in the water or on barges. On March 1, 1954, a hydrogen bomb named "Bravo" went off with a force of 15 megatons. Its 3½-mile-wide fireball sent a mushroom cloud soaring 20 miles above the ocean where an unusual easterly wind carried deadly fallout over 7000 square miles.

The crew of a Japanese fishing boat ironically named *Lucky Dragon*, and people on Rongelap Island, 100 miles away, received radioactive poisoning. The cloud also sifted deadly cesium and strontium 90 dust down on Bikini.

Since Bikini was merely brushed by the atomic dragon rather than being "burned and clawed," cleaning up for return of the population was done in 1969. Thousands of coconut trees were planted on Bikini and its main sister island, Neuu. By 1974, some 40 houses were built on Bikini and 40 to 50 more planned.

## The 'Hydrogen Age'

At that time, DeYoung says, more sensitive instruments showed that scientists had "grossly underestimated" cesium and strontium 90 levels in vegetation and wells. The scheduled return was called off. In the meantime, however, some 15 families totaling about 80 people have drifted back to occupy the houses.

They may have to be moved to Neuu permanently for safety, DeYoung reports, pending results of a radiation survey that will use infrared aerial photography later this year. These islanders and their descendants thus appear likely to be the longest-standing victims of the Hydrogen Age. **PM**

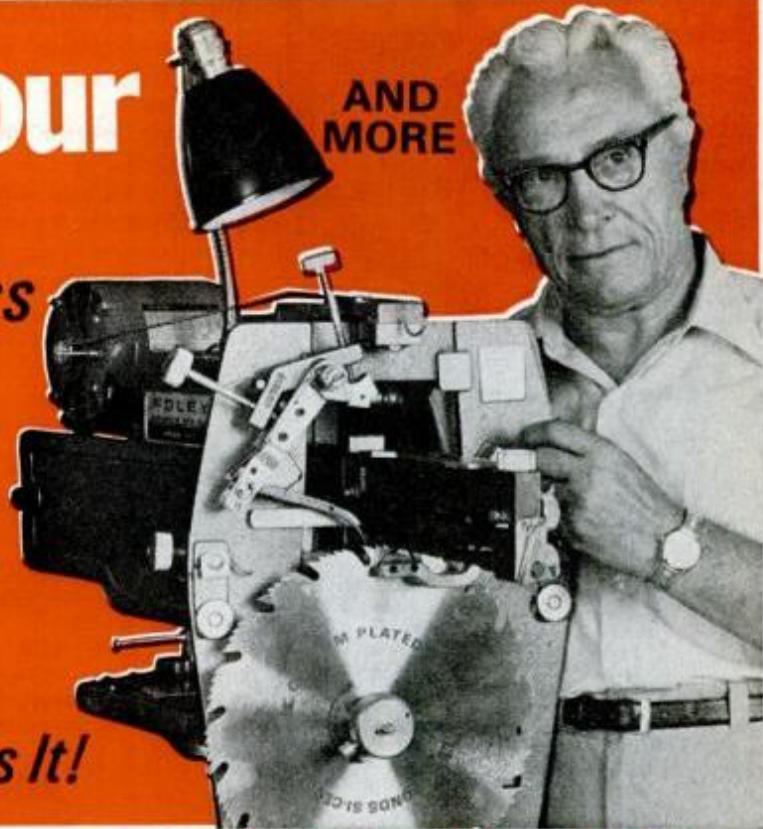


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## SINGLE SIDEBAND CB

(Continued from page 101)

cated unit, to go on sale within the next few months, there are plenty of good SSB-CB radios available today. These single-sideband CBs range from \$150 up, depending on the model and where you buy it. With some old-style 23-channel CB radios still on the market, many stores are cutting down sharply on 40-channel prices this fall.



Baron mobile SSB radio, \$430, from Browning Laboratories, Box 310, Laconia, N.H. 03246, displays channel numbers in large red light-emitting diodes (LEDs).



Big Wheeler RJ-3700, \$300, by Panasonic, Secaucus, N.J. 07094, has both wide and narrow speech clarifiers in separate controls; quick-release mount bracket.



Good SSB radios like this Model 3-5825, \$330, from General Electric, Syracuse, N.Y., have RF-gain controls to reduce sensitivity to strong signals nearby.

### Why single sideband?

A modulated AM signal consists of a carrier of RF (radio frequency) energy, plus two identical signals, like mirror images, called *sidebands*. Each of these sidebands carries the complete intelligence, or voice information, of your transmission.

SSB takes advantage of this characteristic by eliminating one sideband entirely and *suppressing* the RF carrier, which in itself carries no information. Therefore, all of the available power of the transmitter can be directed where it is most useful: to one of the sidebands.



Telesat SSB-120, \$250, from Lafayette Radio, 111 Jericho Turnpike, Syosset, N.Y. 11791, is held precisely on channel by phase-lock loop (PLL) digital synthesizer.

### Less interference

Single sideband lets you talk farther because it's immune from some types of interference that plague regular AM receivers. Some forms of interference "piggyback" on another station's RF carrier into your receiver. Since the carrier is greatly suppressed when using SSB, this effectively closes one "doorway" in which interference could enter your receiver.

Couple this with the fact that there are fewer stations operating on single sideband than AM, and you can easily see the possibilities for escaping the crowded conditions that exist on many CB channels.

Since SSB transmissions use much



Handsome Pro-40 base station, \$995, by Don Stoner, Mercer Island, Wash. 98040, may be the ultimate addition to any CB radioman's communications center.

less bandwidth than regular AM, it becomes possible to squeeze more voice channels into the same overall amount of radio spectrum. Eighty SSB channels exist in the same amount of frequency "space" required for 40 AM channels. The only problem with this is that these sideband channels are subject to interference from stations using AM on the same channels.

Because of its advantages over AM, and the increasing demands for more channels to talk on, SSB is the wave of the future for CB. Beyond its technical differences, though, SSB operation has brought about a new breed of CBer, seemingly more courteous and better disciplined on the air than some AM operators. It has revived an interest in conversation and appears to have reduced the use of "handles" and Smokey reports. Now's the time to join the latest action—and fun—on single sideband CB!

FM

# You've never tried Sebulex.<sup>®</sup> You still see dandruff. There could be a connection.

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

Try it.

You've probably tried the leading brands. But, if you haven't used Sebulex,<sup>®</sup> you may have overlooked the one shampoo that works best on your hair and scalp.

## Doctors recommend Sebulex for dandruff

When we asked over two hundred skin specialists what product they usually recommend for patients with dandruff or scaling of the scalp, the word came back—Sebulex.

Four times more than the leading dandruff shampoo.

Seven times more than the next largest selling dandruff brand.

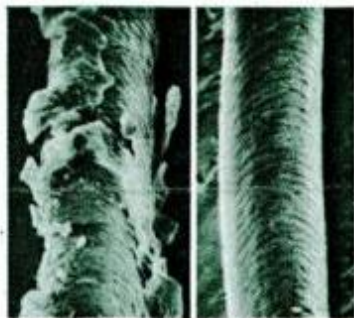
If you're out to control your dandruff, to help stop the oiliness and itching, use what more doctors recommend—Sebulex.

## Sebulex cleans away everything in sight

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

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

And with regular shampooing, it will stay that way.



Magnified hair before and after washing with Sebulex.



consistency of Sebulex right out of the bottle.

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



## Clean, fresh scent

Some people think that a hard working medication can't smell good. Well, Sebulex has a clean, fresh scent that won't advertise that you're using a medicated shampoo. Even when you're up close.

## The real proof

This Sebulex story is only proof for the inside of your head.

We'd like to prove it to you on the outside.

Buy Sebulex. Shampoo in the Sebulex medicated lather and look at your hair when it's dry.

That's where we shine.

Clean, green  
**sebulex**<sup>®</sup>  
recommended by  
specialists

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## A low pH factor

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

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

All you have to lose is your dandruff.

## Effective dandruff control, pleasant to use

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

# HENRY MORGAN SAYS:

## "Good appliance repairmen are scarcer than doctors who make house calls."

Did you know that there are over a billion appliances in use in the United States today? And three repairmen. At least that's the way it seems when one of mine goes on the blink. With more than two dozen electrical gadgets in my house going snap, crackle and pop, I finally got tired of trying to locate a guy with enough ambition to take my money and I decided to learn how to make the repairs myself.

When a well-aged comic like me decides to go back to school, you can bet the family jewels it won't be back at P.S. 93. I'm going to learn at home, or not at all. So I sent away for NRI's home study course in Appliance Repair . . . and I took the course.

With a mechanical aptitude slightly below that of King Kong, I needed a course that started at the beginning and didn't move ahead too fast. Well, NRI did just that. They started with electricity—what it is and what it does—and went from there. You proceed at your own rate of speed. Whip through it if you want to, or take your time. What counts is the fact that you learn, in a way that it sticks with you.

You learn two things: how to repair appliances—from little one cylinder gas engines to refrigeration and air conditioning equipment; and how to get started in your own appliance business. That can mean money for you either way. If NRI can turn old ten thumbs Morgan into a reasonable facsimile of a repairman, think what they could do for you!

NRI's no fly-by-night outfit. They've been training men for more than sixty years . . . and they've had over a million students. It's the oldest and largest home study school in the field of electronics and electricity, so they know it better than anyone else around.



The NRI course is really easy to understand . . . with lots of pictures to show you what they're talking about. They even send you a professional appliance tester at no extra cost.

With the tester and a few basic tools you probably have already, you're ready to service most electrical appliances. After a few months, you'll be fixing your own appliances like I do, or you can start earning spare time money fixing them for your friends and neighbors. Before you know it, you can have your own full-time business and be independent.

Take my advice and clip the coupon. Even if you don't know which end of a screwdriver is the handle, they can give you real professional training that'll help you break into the appliance repair field. It's one of the few things I've ever sent for that was even better than they said it would be . . . so why not invest a postage stamp to see if it's right for you. The NRI catalog is free and there's no obligation. No one will knock at your door or bug you at home. NRI doesn't use salesmen. They don't need them.

Take it from Henry Morgan, the appliance repair field could sure use some good men. Now.

*Henry Morgan*

Henry Morgan

## NEW SNOWMOS

(Continued from page 89)

aluminum slide rail and direct drive track. Also available will be the Cyclone 340, Cyclone 440 and Liquid-fire liquid-cooled 340 and 440.

Kawasaki will have five in the snow for this winter. The Inviter 340 is lightest at 360 pounds; the Intriguer 440 and Intruder 440 weigh in at 360 and 365 pounds with 436-cc axial fan-cooled engines. Liquid-cooled are the 339-cc Invader 340 and 440, both at 390 pounds. All will have adjustable slide-rail suspension.

Nine Polaris models will include



Moto-Ski lines from Bombardier this year will include Futura, Spirit, Nuvic and Sonic machines offered in nine different models.



Kawasaki's spirited Intruder is available in 340 and 440 models using new liquid-cooled engines for high-performance runs.

a new Cobra 340 and 440 with fan-cooled engines. Also in the line: Colt 244 and 250, the SS 340, TX 250, 340 and 440 models using free-air cooling, and the liquid-cooled TX-L 340.

Scorpion's entries start with Lil' Whip 300 and larger Whip models of 340 and 440. The Range Whip 400 claims drag-race speed, while the Whip TK has a 440 Cuyuna engine and optional rally seat. Scorpion's Sting mounts a 440 engine.

Upgrading their light 304-pound Yamaha Enticer ET205B, Yamaha Motors is introducing as well a new, larger 340 Enticer this year. The Exciter 340B and 440B are also fan-cooled, while the SRX440B, developed from racers, is Yamaha's liquid-cooled model. All use the Autolube system for automatic oil-gas mix. **FM**



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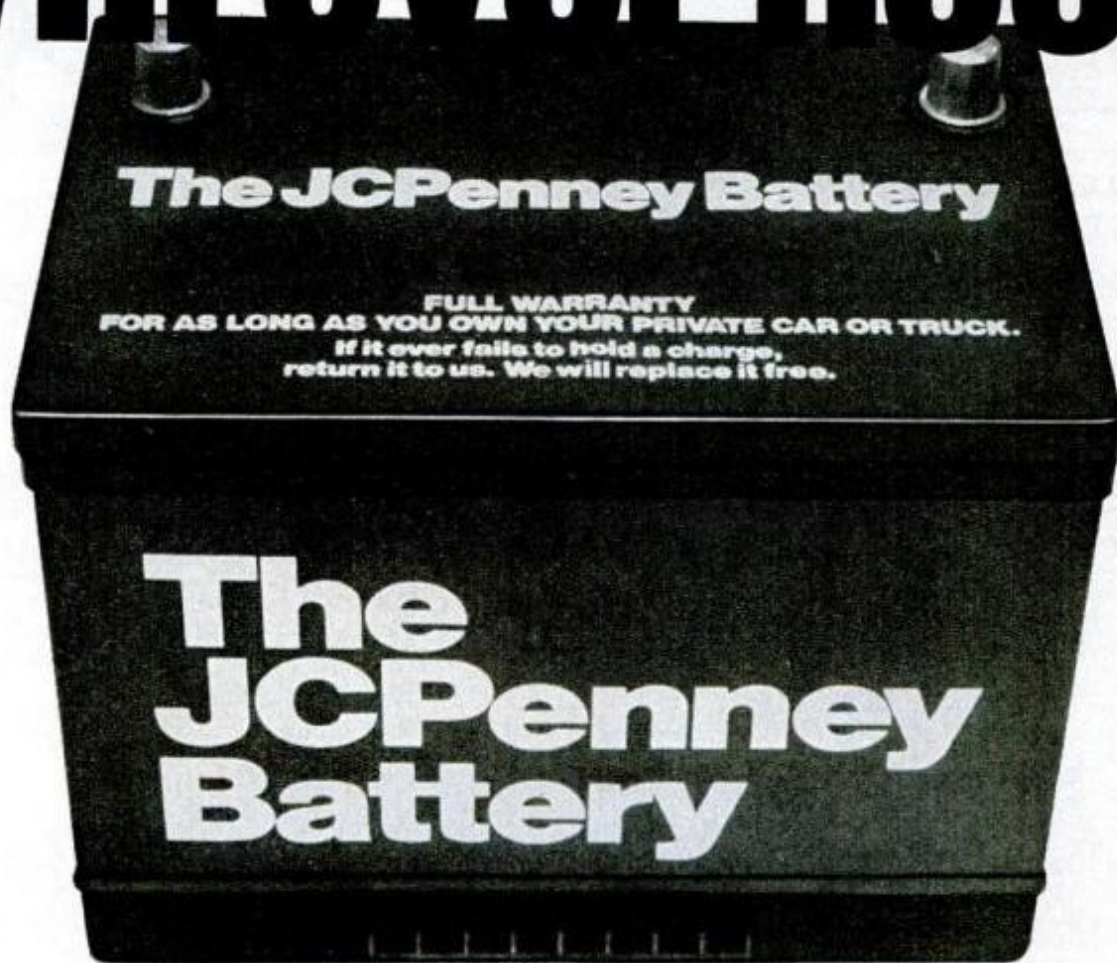
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## CARDS YOU CAN MAKE (Continued from page 110)

block. The process can be as simple as using one color and a basic design, or more complex, so everyone in the family will enjoy making cards. The simplest designs often result in the most striking cards.

Linoleum blocks are available at art-and-crafts supply stores. It's easy to carve linoleum. Since there is no grain, you can carve in any direction. It also takes color well.

PM how-to photos: Harry Wicks



Printing on the sleigh card is completed. Now re-ink the block for the next card.

And, happily, one cut will print many cards. After you've mastered the techniques of carving lines, you may want to try your hand at carving textures.

You can print on many different types of paper, but trim the paper to suit Post Office requirements and use paper similar in thickness to postcards if you intend to mail the

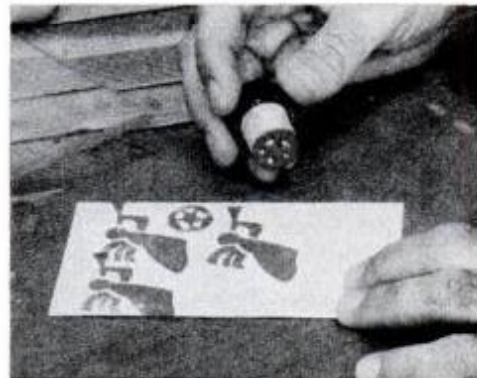
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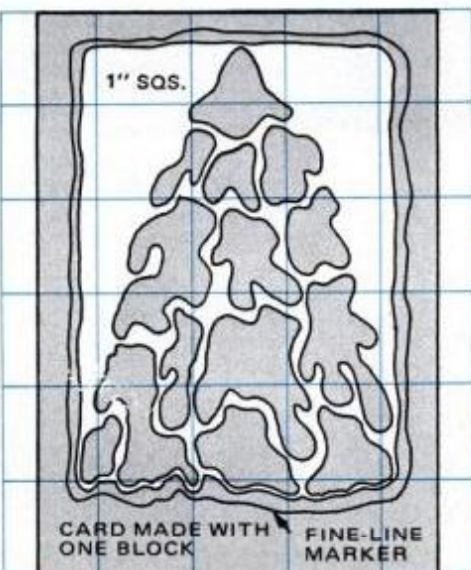
To finish, paste on Christmas wrapping-paper cutouts to simulate gift packages.



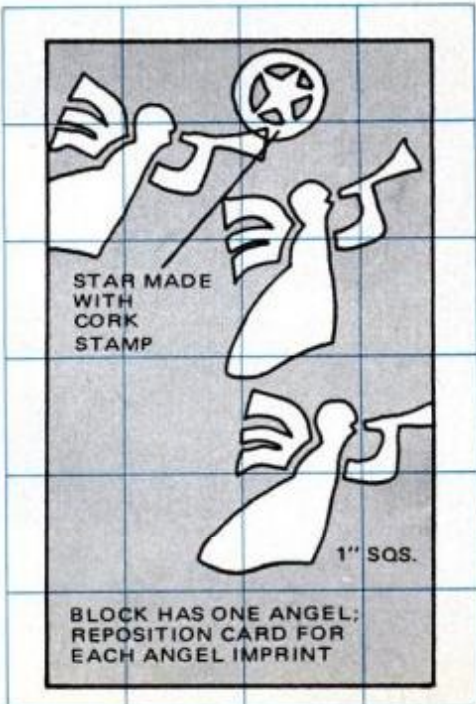
Small blocks such as the angel can be printed by merely pressing by hand.



Star design on angel card was carved on a wine-bottle cork used like a stamp.



Good designs like the tree and angel can be made with simple tools on a linoleum block. Smooth, grainless linoleum allows you to cut easily in any direction.



Executives  
love it!

# THREE

# PAIRS NO-IRON KNIT SLACKS

All 3  
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people from Paterson, N.J.,  
have been making themselves the  
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in America. For the past 52 years,  
they have supplied increasing millions

of busy top executives with exclusive  
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up a Bank President, a trucking executive, a high  
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Manager. Says one, "I don't have the time to shop.  
Besides, I get more for my money this way!"

SIX BUSINESS COLORS TO CHOOSE!

NOW THREE PAIRS for \$18.95!!!

Founded in 1925 by M. Habernickel, Jr., a tough  
no-nonsense businessman who still runs things  
today with the help of his hard-working son  
Duke, Haband emphasizes value. "We shun  
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around. This 3 for 18.95 deal is impossible  
in any normal retail channel!"

In fact, Haband's very own slacks of  
this same quality have sold at 2 pairs for  
29.95, 2 for 24.95, 2 for 19.95. Now  
comes this special offer at \$6.32 per  
pair if you can buy three pairs at a  
time. "That's the hitch!" cries  
Habernickel. "You have to  
buy the three pairs!"

YOUR REWARD  
IS:

You get  
All  
**3**  
pairs  
for

**18.95**

**500,000**  
pairs to  
sell!

We have  
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houses full of slacks,  
both domestic & imported,  
all fine brand new first quality merchandise.  
But past experience Guarantees that latecomers  
will regret their own procrastination. Some late  
orders could take the maximum limit of 30  
days to fill. But with 500,000 pairs to draw  
from, your prompt response should assure fast  
service! If you need good business dress slacks  
simply fill in the easy order form at right and  
mail it to me with your check for the \$18.95.  
You will be amazed at how much more value  
your money can buy! M. Habernickel, Jr.

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HERE IS EXACTLY WHAT YOU GET:

Your choice of Quiet, Conservative colors. Quiet, Conservative  
Tailoring ★ 100% Polyester No-Iron Non-Snag Knits ★ All  
Permanent Press NO IRON Machine Wash & Wear ★ These are all  
BETTER QUALITY made-in-U.S.A. merchandise, plus even a few  
pairs of even more deluxe imported executive slacks! All have full  
professional model detailing like inner no-roll waistband, deep  
strong no-hole front pockets. Neat set-in back pockets. Proper belt  
loops, proper businessman's straight leg model. Hook type top  
closure. Unbreakable nylon zipper. Full executive cut — THE  
WORKS! Look, clothing prices everywhere are going crazy! A  
price of 3 for \$18.95 for this excellent quality is something you  
shouldn't miss. Send in a NO RISK trial order today!

**SALE!**  
EXECUTIVE CUT  
KNIT SLACKS

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Dear Sir: Please send me  
the ..... pairs of business dress  
slacks specified hereon, for which I  
enclose \$ ..... remittance in full.

**GUARANTEE:** If upon receipt, for any  
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fire them back at us for full refund of  
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SLACKS

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FULL GENTLEMAN'S CUT  
in YOUR Exact Size!

Waist 29-30-31-32-33-34-35-36-  
37-38-39-40-41-42-43-44-45-  
46-47-48-49-50-51-52-53-54.  
Inseams: 26-27-28-29-30-  
31-32-33-34.

COLOR	How Many	What Size	What Inseam
BLUE			
GREEN			
BROWN			
GREY			
BLACK			
TAN			

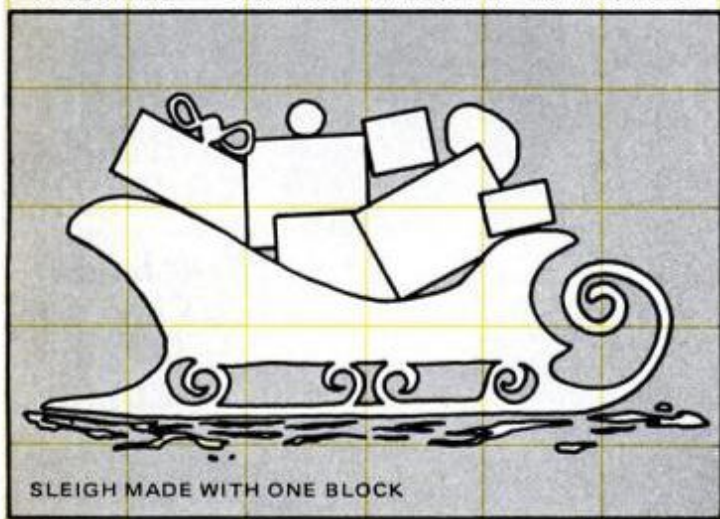
All THREE pairs for 18.95!

**CARDS YOU CAN MAKE** (Continued from page 172)

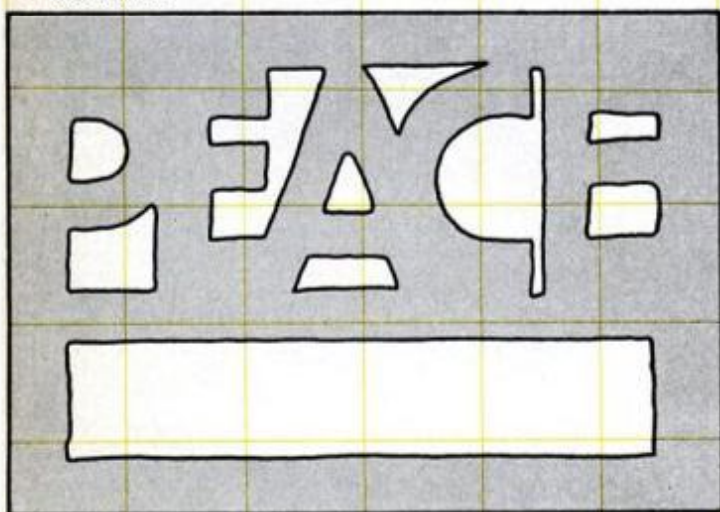
prints. Anything under 3 by 4¼ in. isn't mailable. Postcards over 4¼ by 6 in. cost the same as sending a letter. Experimenting with color and design are exciting facets of printing. An "original" card is a satisfying reward. **PM**

Card designs: Stanley Dunaj

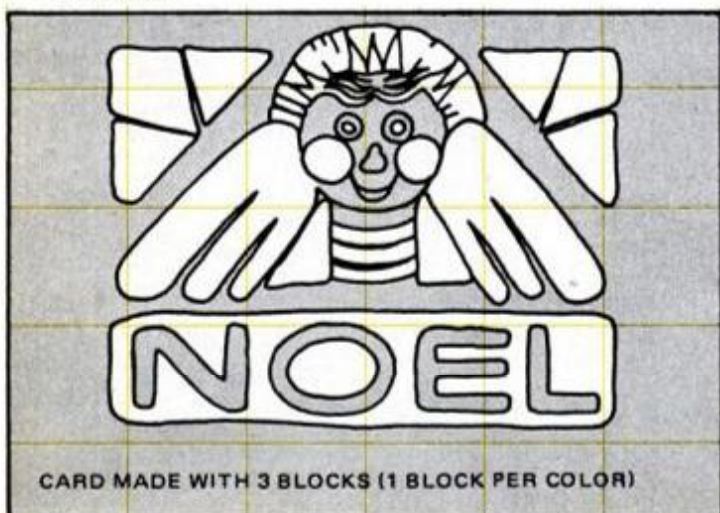
1" SQUARES FABRIC OR WALLCOVERING PACKAGES



1" SQUARES



1" SQUARES



**SPRUCE GOOSE** (Continued from page 87)

mula that became available only after the H-4 was well underway. For gluing, the plane's skin was held in place by thousands of small nails driven by special guns. After the glue cured, eight tons of nails were removed with special pullers.

**Two complete control systems**

More ingenuity went into the control system, for it was necessary to multiply the force exerted by the pilot as much as 200 times to move the Hercules' immense wing and tail surfaces against the airstream. An entire second system, its hydraulic pumps powered by separate generators, backs up the first.

The engine controls are operated by puffs of air—this through a pneumatic system that can work on bottled air should a compressor fail. Here the sending and receiving devices are "pneudynes," air-operated devices that maintain the adjustments called for despite changes in temperature and atmospheric pressure.

**Eight giant engines**

When the government inspection team viewed the Spruce Goose recently, they found that a complete set of engines plus spares were perfectly preserved in cans. They're air-cooled radial R-4360 Pratt & Whitney Wasp Majors, rated at more than 3000 hp. Each of the eight powerplants drives a four-bladed, hydromatic, full-feathering Hamilton Standard propeller, swinging an arc of 17 feet, 2 inches. The four inboard props also provide reverse thrust.

One more indication of the size of the plane is that the engines are accessible for *in-flight* inspection, even minor repairs, through a passage in front of the forward wing spar, then through the nacelles and firewall doors. The wings are 13 feet thick at the hull. Also easy to inspect are all fuel, oil, hydraulic and pneumatic lines routed along the spar. Slip joints and floating fairleads have been built into the fuel lines to allow for wing deflection.

**Fourteen 1000-gallon fuel tanks**

The engines drink from two wing service tanks supplied via transfer pumps from 14 1000-gallon tanks set in watertight hull compartments. (A separate emergency fuel system can provide pressurized fuel directly from the hull tanks to the engines.) Oil tanks in each nacelle are replenished from a central reservoir by a semiautomatic control system.

The formidable problems were solved largely by Rea Hopper, Hughes chief designer and a top-flight engineering genius.

Despite all of the design hurdles, Hughes was accused of immersing himself in detail, of tinkering, of being difficult to locate when needed and of not following accepted business practices. Cancellation of the government contract loomed in 1943 and again in 1944. Some sought to change the H-4 to an all-metal design. Hughes fought back, arguing that bigger planes were the wave of the future. "Why throw away 14 million spent on the H-4 and start from scratch?" he asked. Through the intervention of a friend with President Roosevelt, Hughes won out. Construction of the Hercules continued after the war ended, but with Hughes alone. Kaiser had dropped out.

**Colossal moving job**

By June 1946, the Terminal Island assembly and dry-dock site was completed. On the 11th, the Star House Movers loaded the 160-foot wing sections on moving

(Please turn to page 176)

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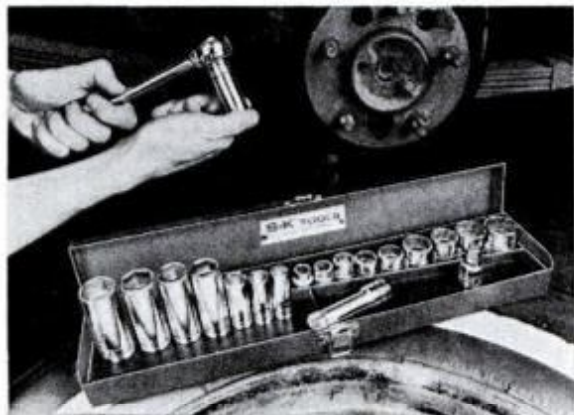


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All through their tough, exciting, victorious march to NASCAR's Grand Championship, Cale Yarborough and Great One Herb Nab counted on S-K tools.

Now you can get in on the Great Ones' act. By acting now! Because Winners' Choice Specials on S-K tools are on sale. Save big and put it together like the Great Ones!



**SAVE \$30.53 OVER 51%\***

20 pc. 3/4 in. dr. Socket Set with S-K ratchet. No. 4520-77. Great for tackling garden tractors, cars, outboard motors. Total value if purchased separately \$59.41.

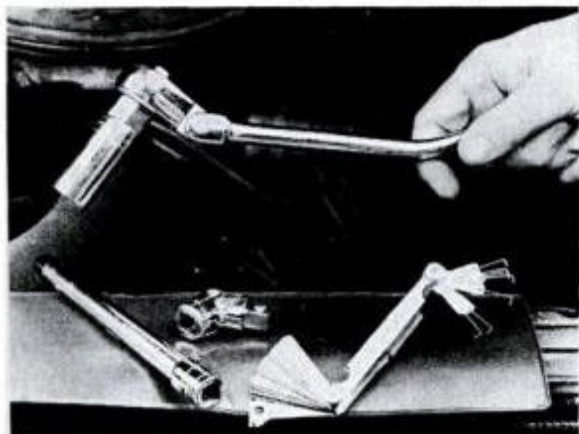
**\$28.88**  
Suggested User Price



**SAVE \$13.06 OVER 43%\***

13 pc. 1/4 in. dr. Socket Set with S-K ratchet. No. 4913-77. Fix cars, washing machines, small nuts and bolts jobs. Total value if purchased separately \$30.04.

**\$16.98**  
Suggested User Price



**SAVE \$11.29 OVER 34%\***

5 pc. 3/4 in. dr. Tune-Up Set. No. 4505-77. Handle common car chores like plugs. Special ratchet for tight spots. Total value if purchased separately \$32.88.

**\$21.59**  
Suggested User Price



**SAVE \$8.69 OVER 47%\***

5 pc. Combination Wrench Set. No. 1705-77. Take on jobs from motorcycles to power mowers, come away smiling. Total value if purchased separately \$18.28.

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\*All savings based on piece by piece purchase at suggested user prices.

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It's easy and inexpensive to have the fresh aroma of real cedar in your closets. Giles & Kendall Cedar Panels are applied with nails like any paneling, butt snugly at joints. 100% red cedar. No finishing needed. Send 25¢ for this booklet of easy plans.

Plans for 4 handsome Cedar Closets you can build



... with fragrant moth-repellent GILES & KENDALL cedar closet panels.

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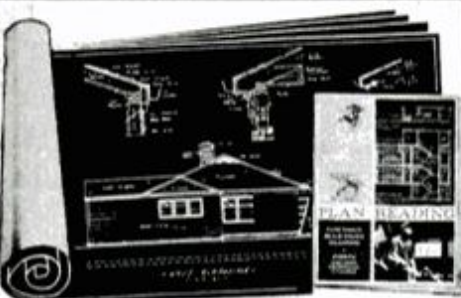
PM-5

Please send me your Cedar Closet Plans Booklet. I enclose 25¢.

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## SPRUCE GOOSE

(Continued from page 174)

dollies—high enough to clear parked cars—and started off on the 28-mile route. Police of 10 cities and towns worked in cooperation with state police to clear the way.

The big show, however, came on June 16 when an estimated 100,000 persons gathered to see the 220-foot hull inch its way along the highway. Some 23 utility companies worked to raise 2300 power and phone lines, cutting those that couldn't be moved, then putting them back after the load had passed.

At Terminal Island, the wings and other parts were maneuvered into position. Gradually the big silver boat took shape. Its finish was a coat of wood filler, a coat of sealer which acted as a cement for tissue paper, two coats of spar varnish and one of aluminum varnish. While the Hercules never filled its intended role, its appearance was convincing. Cargo space equalled that of two boxcars; the cargo deck was strong enough to take a 60-ton tank with weight distributed by planks. Such armor would roll in through huge clamshell nose doors.

Incredible delays caused by the unique size of the craft, the unusual materials used, as well as Hughes's freewheeling life style—which saw him disappear without a trace for days on end—brought down the wrath of the government. Investigations added to the delays—one conducted by Sen. Owen Brewster who called the plane a "flying lumberyard" that would never fly.

It was 1947 before the H-4 could be readied for taxi tests. Hughes insisted on piloting the ship despite the fact that he was still tender from bone breaks and cuts sustained in his near-fatal crash at the controls of his FX-11 only months before. Goaded by Senator Brewster's investigation and remarks, Hughes worked night and day.

### Taxi test turns into flight

The first test would be a media event, Hughes decided. Reporters and dignitaries were invited for Nov. 1. Because of a brisk wind and choppy sea, however, it was actually the next day before the visitors could board the big ship for a maiden "trip"—a taxi run up the bay.

Hughes and his crew wanted to complete some high-speed runs and, after putting the press ashore, they taxied back out and maneuvered into position. The eight Wasp Majors roared as the throttles were advanced and the plane nosed up, climbing on the step, with the hull spank-

ing the wave tops as the airspeed, Hopper recalls, hit 80.

On the next run, the Spruce Goose actually took off—much to the astonishment of the onlookers ashore. The Goose had tasted the air, and headlines splashed the news across the nation. Asked if he had deliberately taken off, Hughes smiled enigmatically and replied: "What do you think?"

### Accident or intentional?

Was it an accident, or was it something Hughes had decided to do without telling anyone? Hopper revealed some interesting things about that to PM.

"I'd suggested to him that, for technical reasons, we not fly that day," he recalls. "During the high-speed runs, he taxied to 80 miles an hour, then swung the plane off in a different direction—into the wind and high chop. He told me to put my hand on his shoulder and read off the speed when we hit 60 on the next try. Just before it, he told the flight engineer to crank the flaps down 15°, and we started down the bay. I saw the indicator pass 60, called it out and felt the ship leave the water.

"Hughes's immediate reaction was to cut the throttles—which was the wrong thing to do. He realized this instantly, then quickly restored power and flew the ship to a smooth landing."

What was Hopper's reaction to the takeoff? "It was slick and beautiful," he says. "I wanted to do a lot more flying in it right away."

### Was Hughes afraid of it?

How about Hughes? "He seemed eager to try it again," says Hopper. "But he was involved in many other projects by then. Nevertheless, on more than a dozen occasions after that first flight, we got the ship all ready to go on his orders. At the last minute, I'd get a call from him and he'd say: 'Rea, I'm tied up and can't make it today—let's do it next Wednesday,' and we'd postpone it again."

Did Hughes have faith in his big flying boat, or was he actually scared of it? Probably no one will ever know. A comment that he made to Hopper more than once is curious to say the least: "Rea, I'll never fly that plane unless you're in it with me. If it goes down, we go with it together." Was he kidding Hopper? Maybe.

### Never flies again

Whatever his reasons, Hughes finally returned his giant bird to the

nest to stay, never again attempting to take it up after that initial, historic flight. Still, he could not bear to part with it and paid a sizable sum to GSA to lease the plane until his accomplishment received recognition.

Eventually, the Smithsonian Institution's Air and Space Museum took title to the Spruce Goose. It, in turn, gave the big boat to Hughes's Summa Corp. for \$700,000 and the H-1 racer—a plane that would fit in an exhibit hall.

Summa agreed to preserve the Hercules for at least a year or until a museum could be found to underwrite the cost of moving and displaying it. Failing that, the ship was to be cut apart and shared among designated museums.

### Air museum may be its home

Now it appears the H-4 may survive intact. Public-spirited citizens of Long Beach, Calif., have just organized the new Air Museum of the West. The goal: to raise \$5 million to build an exhibit building not far from Terminal Island and move the H-4 Hercules to it. Once that has been accomplished, a second \$5 million fund would be sought for maintenance.

Through the years, Howard Hughes kept the aircraft in mint condition, building a \$1.75-million hangar, repairing damage caused by flooding in 1953 and making numerous modifications. Why didn't he fly the plane again?

Rea Hopper believes other interests simply took up too much of Hughes's time, but there may have been additional factors. For one thing, the anticipated need for large seaplanes didn't develop after World War II. Airfields had been constructed in every corner of the globe during the war, greatly improving access. Perhaps more important was the nearly universal switch from wood to metal construction and the coming of the jet age.

### A giant before its time

But it may be those very factors that make the H-4 Hercules worth preserving now. Those who have seen the H-4 call it a work of the cabinet-maker's art; the plastic-laminated wood by the Duramold process has a finish as smooth as glass.

Aside from the craftsmanship that went into it, however, the Spruce Goose is unique as an example of limitations and obstacles overcome—as a giant aircraft that was constructed long before giants filled the skies on routine flights from city to city. Here, surely, are enough reasons to save it.

PM

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## YOUR FUEL SYSTEM

(Continued from page 123)

ceptions are cars having the fuel filter inside the fuel pump. Cadillac is one of these. British Leyland cars (MG, Triumph, Jaguar) are among others.

The fuel filter is the only part of the fuel system we are discussing that requires periodic maintenance. That maintenance is usually just to replace the filter. In one case (discussed below) the filter can be cleaned.

**Important:** To avert the problem of a partially or totally clogged filter, maintenance should be done as often as the manufacturer suggests in the maintenance schedule—usually every 12,000 to 15,000 miles. Problems brought on by a partially or totally clogged filter are lack of power and failure of the engine to start, respectively.

### Replacing a fuel filter

To replace an in-line filter, find the filter on the fuel line between the carburetor and fuel pump. It is a small chamber.

With the engine cold, move the retaining clips out of the way and slip the chamber off. Put a rag or receptacle under the filter to catch gas. Slip a new filter in place.

**Caution:** No smoking.

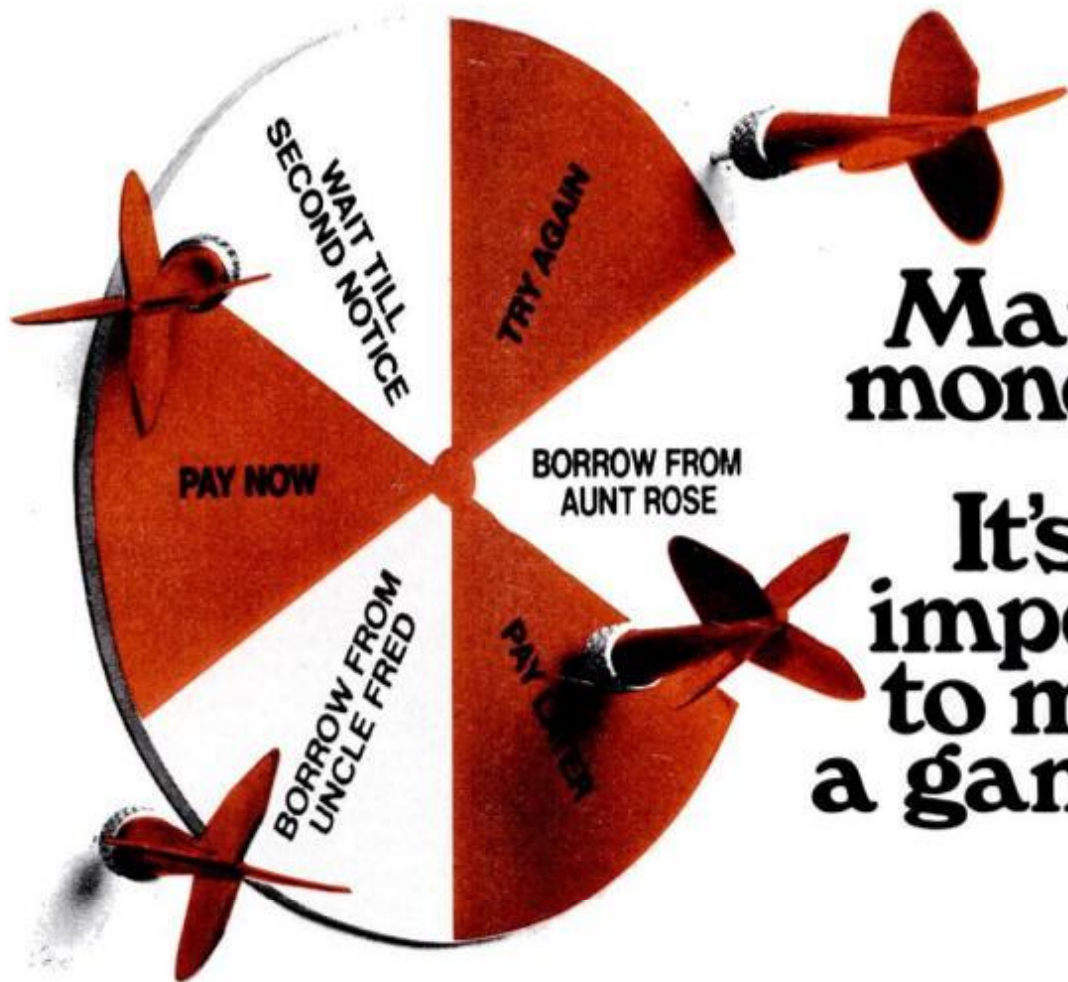
To replace an internal filter, with the engine cold:

1. Disconnect the fuel line at the carburetor inlet.
2. Remove the inlet filter nut.
3. Remove the filter and check the valve assembly. New fuel filters have a check valve to meet Motor Vehicle Safety Standards. The check valve prevents fuel discharge in case of a roll-over accident.
4. Remove the spring and examine it for damage and adequate tension. If it is okay, retain the spring for reuse.
5. Install the spring.
6. Install a new filter, making sure that the hole in the filter faces the nut.
7. Install a new gasket.
8. Install the inlet filter nut, tighten securely, and reconnect the fuel line tightly.

In the case of the Cadillac fuel filter, you will find it at the fuel pump outlet. You can reuse the metal gasket if it isn't damaged when replacing the filter.

A nylon-type filter in the fuel pump, such as those used by British Leyland, may be cleaned. To get at it, remove the fuel-pump dome retaining screw, remove the dome and sealing ring and lift out the filter. It's that easy.

PM



# Managing money.

## It's too important to make a game of it.

### With some people, it's hit or miss.

Even for the vast majority of us who take our financial obligations seriously, balancing a budget isn't easy. Just when you think you've found the answer, inflation takes another bite out of your paycheck. And everything starts costing more. Putting the kids through school. Food. Clothes. A better home. Or even new appliances. Sometimes it makes you wonder if you ever can get ahead. No matter how hard you try.

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For information, please write your state's credit union league or CUNA, P O Box 431, Madison, WI, 53701.



Despite doors top and rear, engine and battery aren't too accessible.

an efficient heater for so large an interior because by the time hot air gets ducted to the front, outside temperatures have already cooled it down. (A gas-fired after-market heater is available for about \$525 installed.)

Although handling in traffic, ease of parking, visibility, and

steering got good marks from the owners we surveyed, a number did complain of rocky handling in high crosswinds. "It's sort of like driving a billboard in the wind," muses a West Virginia dentist. Echoes an Idaho trucking safety supervisor: "Handling seems poor, even dangerous in sidewinds over 25 mph."

However, a vocal group from the snowbelt mention what a great car this is for winter traction. "Outstanding winter handling and roadability," says a Montana teacher; "fantastic ski car, handles great in the mountains." And from an Idaho bus driver: "We had a lot of snow last winter and live on a hill. Other cars couldn't make the highway up the hill; the VW bus made it without the slightest problem."

Workmanship and general quality received extremely high praise; over half our respondents marked it *excellent*. A Texas chemical sales manager says: "I feel the manufacturing people of Volkswagen may be the last group in

the world still interested in pride of workmanship and quality merchandise for the money."

We asked owners to list changes they'd like to see. The primary one, as mentioned, involves a better heater. Here's a cross section of other suggestions:

"Move the radio speaker out of the direct sunlight," recommends a California librarian. A Colorado personnel supervisor: "A few inches more rear gate width so 4-foot-wide objects will fit." "Quieter engine, better sound deadening."—California hairdresser. "Handier ignition key location."—Kentucky policeman.

A Texas investor recommends wider tires as standard for greater crosswind stability. (Radials are already standard, with steel-belted ones on Campmobiles.) Several weekend mechanics suggest making the engine and battery more accessible.

VW dealer service, long rated excellent by generations of buyers, came in for just average marks, in comparison with other

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Comes partially assembled.

cars we've reported on this year. Most owners hadn't had to take their vehicles in for service, though, and those who did (44.3 percent) reported that fuel injection gave them the most trouble. Apparently early problems with the f.i. system's airbox have been remedied and all seem to have

been repaired under warranty. Would owners buy another VW bus? An impressive 86.6 percent said yes. Some comments: "Yes, I'll buy another VW station wagon, especially if they offer the diesel engine," says a Florida IBM programmer (VW will in the LT).

"Yes, I'll probably buy another VW bus," speculates a New York researcher, "but gasoline price and availability will be a big factor." A Texas regional manager: "If the prices of cars and gasoline keep going up, I'll probably move closer to work and buy a skateboard." **PM**

## SUMMARY OF 1977 VOLKSWAGEN BUS OWNERS REPORTS\*

<b>Total miles driven</b> 2,371,364	Roominess .....32.9	Very good .....36.3	<b>Dealer service opinion:</b>
<b>Average miles per gallon:</b>	Handling .....32.6	Good .....21.7	Excellent .....23.7%
Automatic transmission	Performance .....19.2	Fair .....8.0	Good .....39.8
In town (EPA 19) .....17.2	Styling .....11.7	Poor .....1.0	Average .....16.4
Long trips (EPA 25) .....20.4	Good visibility .....11.7		Fair .....10.0
Manual transmission	<b>Specific dislikes:</b>	<b>Comfort opinion (rear seats):</b>	Poor .....10.0
In town (EPA 20) .....18.3	Heater is weak .....16.2%	Excellent .....21.9%	<b>Number of vehicles owned:</b>
Long trips (EPA 28) .....22.5	Wander in crosswinds .....12.8	Very good .....39.1	VW bus only .....34.5%
<b>Body types:</b>	Mpg lower than expected .....10.7	Good .....29.6	Two cars .....55.0
Station wagon bus .....61.0%	Poor dealer service .....10.7	Fair .....9.4	Three cars .....9.0
Campmobile .....35.7	<b>What changes would you like?</b>	Poor .....0.0	Four cars .....0.9
Kombi .....3.3	Better heater .....18.8%	<b>Had any mechanical trouble?</b>	Five or more cars .....0.6
<b>Transmission choices:</b>	Change seat shape/style .....14.0	No .....55.7%	<b>Makes of other cars owned:</b>
Manual four-speed .....87.0%	Better gas mileage .....4.8	Yes .....44.3	Volkswagen .....30.3%
Automatic .....13.0	Fewer rattles .....4.8	<b>What type of trouble?</b>	Chevrolet .....11.8
<b>Why did you choose the VW bus?</b>	<b>Workmanship opinion:</b>	Fuel injection .....14.3%	Ford .....8.1
Economy .....48.1%	Excellent .....50.3%	Oil leaks .....11.4	Dodge .....5.7
Interior spaciousness .....21.5	Good .....38.6	Heater .....10.7	<b>Age distribution of owners:</b>
Past experience .....21.2	Average .....6.0	Brakes .....10.7	15-29 years .....18.4%
For recreational use .....14.2	Fair .....3.5	Cold starts .....8.6	30-49 years .....59.0
For its performance .....11.1	Poor .....1.6	<b>Dealer repairs satisfactory?</b>	50-plus .....22.4
<b>Specific likes:</b>	<b>Comfort opinion (front seats):</b>	Yes .....60.9%	<b>Would you buy another VW bus?</b>
Economy .....54.4%	Excellent .....33.1%	No .....39.1	Yes .....86.6%
			No .....13.4

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

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\*Based on regular separate prices from 1977 Power and Hand Tool Catalog.

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To build the table, you'll need a table saw or radial saw (as at right), portable drill, sabre saw, hand tools and a staple gun.

Constructing the table is easy with PM's clear-cut plans. **PM**

The attractive pool table fits right into a casual setting such as this family room.



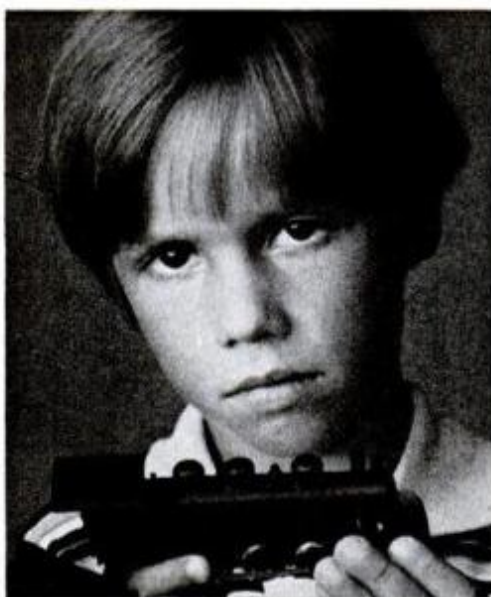
Pool table plans include detailed drawings, complete materials list, full-size pocket templates to trace and easy-to-follow building instructions. To order the plans, send \$5.95 (check or money order—no cash) to: Popular Mechanics, Dept. LP, Box 1014, Radio City Station, New York, N.Y. 10019.

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NOVEMBER 1977 103

# The DO-MORE CORNER

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## HOW TO DRIVE ON ICE

(Continued from page 95)

a left turn and the rear goes wide, steer to the right.) Unlike the serpentine maneuver, now it's all right to move the wheel a lot. If you get all the way to full lock and still haven't regained any steering control, don't panic. (Some people try desperately for full lock in the other direction, which is dead wrong.) Just wait. And remember the original braking test. You are still sliding, yes, but you *are* scrubbing off speed and after what seems an enormous time you will find the front wheels are tracking. Using your most sensitive safe-cracking fingertips, you get back on the circular course and bring your speed up to your limit and try it all again.

### Don't practice on public roads

This is as good a time as any to make a strong warning: These maneuvers are *not* to be done on roads open to the public. On ice you can slide a long, long way. And another caution: It's one thing to read about these exercises and quite another actually to do them. It's the at-the-wheel experience that teaches your fingers exactly what forces to expect. With practice, such as you get at a Winter Driving Workshop, you soon find yourself feathering in some throttle as soon as the car starts to straighten up. The emphasis is always on smoothness and gentleness. A quick twitch of the steering wheel can wipe out all your front tires' grip (the clue is that the feel goes out of the steering). In the counter-steering, what your hands are searching for in the steering wheel rim is the return of some feel.

This workshop, originally set up for driver-education instructors, is being made available to public officials, police officers and representatives from company fleets. So, if you're concerned about winter-driving skills, take this magazine to your company's nearest driving instructor or other agency and point out that motels in Stevens Point are inexpensive and that the National Safety Council (425 North Michigan Ave., Chicago, Ill. 60611) has set the registration fee at a token \$25. The usual dates are in February.

My personal view is that teaching on a low-friction surface should be mandatory. Just as every pilot has to know how to stall an airplane and recover—and demonstrate it—every driver should have successful at-the-wheel experience in dealing with the skid. Skidding is a hazard that should be respected, but total ignorance is a stupid weapon. **FM**

## A GREAT COVER-UP

(Continued from page 130)

stuffing already in the chair, particularly if it is hair or a resilient fiber that doesn't pack down. Other supplies include: Italian spring twine, webbing, burlap, cotton padding, heavy nylon sewing thread, tacks, fox edge, welting, cardboard tacking strip and the final fabric. A muslin cover may attach to the frame of your chair before the final fabric is applied.

Upholstery kits containing tools and some materials are available from Albert Constantine and Son, 2050 Eastchester Rd., Bronx, N.Y. 10461 and Craftsman Wood Service Co., 2727 South Mary St., Chicago, Ill. 60608.

Before you apply new materials, make any needed repairs on the wood finish. Also make structural repairs that can't be made later.

### Reupholstering the chair

Begin by retying the springs with twine in the same way they were tied previously. Next tack the new webbing in a pattern similar to that of the old webbing. The webbing stretcher will help you pull the webbing taut (Photo 5) before it's tacked and cut.

You can upholster the chair in sections. Work on this chair was done in seven parts: seat (Photos 8-17); inside of arms (Photos 18-20); inside of back (Photos 21-22); outside of arms (Photos 23-28); outside of back; kick pleat skirt (Photo 29); and cushions.

Allow about a 6-in. overhang when cutting material for each section except the cushions. Cut the fabric, then position it section by section. Be sure that each layer of material is securely and smoothly attached before proceeding.

After the final covering is in place, take measurements for fitted cushions such as the seat cushion on the chair shown. The covering on these cushions must fit smoothly—excess material can't be pulled under the chair frame.

Cushions are made up of a top, bottom and middle panel called boxing. Panels are joined together with welt.

It's safe to make a paper pattern of the cushion, then transfer the pattern outline to the fabric, leaving a seam allowance. Be sure to align and center the fabric grain and pattern before cutting.

Here it is also advantageous to make a trial run with a muslin case which doesn't require welt. With time, patience and care you should achieve professional results. **FM**

the pulled plugs in conspicuous positions—on the floor in front of the refrigerator, for instance, so you'll remember to reconnect appliances one by one when power returns.

There are a couple of reasons for turning off appliances. This helps the power company restore normal service. If circuits are overloaded when power returns, it may cut out again. And within the first few seconds after restoration, there's sometimes a surge of extra power. If your refrigerator or airconditioner is old, this surge can be enough to cause a breakdown.

Completely shut down, your house becomes a covered campground—except for one important difference: Cooking, heating and lighting equipment use up air. When you light them up indoors, be sure to maintain ventilation by slightly opening windows on opposite sides of the room. If there's only one window, open it several inches and leave it open as long as any fuel is burning.

Another point of safety: Catalytic heaters flare up for a few seconds when started. Flames may rise 2 or 3 feet above the heater head. So light heaters *outside* and carry the units into the house (in an upright position, held from beneath).

Hot meals and a space heater provide modest warmth; your refrigerator, meanwhile, will hold enough cold air to preserve food for two days or so if you plan ahead before you open the door. Then pull out the food you need with the speed of a thief emptying a safe. Milk, juice, sandwich meats or other foods you know you'll consume in the course of a day can be removed and kept in a cooler (outside if it's cold) so you can leave the refrigerator alone. Whatever you do, resist the temptation to open the freezer door to see how frozen food is faring. Such testing drains cold air, particularly in vertical freezers, and hastens thawing.

What if your frozen foods *do* thaw? If they're later refrozen, their quality can deteriorate. You may notice a strange odor or color when you open them. But the danger of deterioration during a two-day blackout is minimal even if partial thawing occurs, particularly if foods are tightly sealed. You may want to remove ice cream containers before they leak. Otherwise, food experts advise, leave your freezer alone and don't worry about frozen foods for the first two days without power.

After two days, move food to a working freezer if possible, and check each food item for spoilage before you cook it. Heed the old say-

ing: When in doubt, throw it out. If no working freezer is available after two days, follow directions on the side of many frozen-food packages and cook the products, if they haven't spoiled. Then keep them as cold as possible until you can eat them.

### After the blackout

Plug in the refrigerator, freezer and other appliances; reset refrigerator controls if you turned them up. Make sure all camping gear is turned off. Put the gear away according to directions (don't pack away cat heaters, for instance, until they've cooled for 20 or 30 minutes).

Camper-style living in your home is one way to ease through a blackout. The Cadillac way to go, by comparison, is to make your own electricity with a self-contained generator.

Many manufacturers produce complete standby power systems for the home that take up no more space than a lawnmower. Some models come with dollies so they can be trundled out of storage sheds when needed and hooked into your system at your electric meter.

There's a wide variety of models for home use. Onan, some of whose models are shown on page 98, makes 25 different generators between 1000 and 5500 watts. What wattage is right for you? One way to estimate is to add the approximate running wattage of all devices that might have to operate simultaneously at any point during the blackout. Then pick the generator that delivers the total you need. Here's the wattage some typical appliances require:

Lights (per bulb)	7½-300
Freezer	300-800
Refrigerator	250-750
Well or sump pump	300-600
Furnace blower	300-600
Electric range (per element)	350-1200
TV (color)	200-500
TV (black and white)	100-300
Washing machine	100-700
Clothes dryer	200-1200
Coffemaker	600-1200

The heart of the generator is a gasoline-powered engine (diesels are available, too) driving an alternator. Most generators start with a pull cord and, in seconds, an alternator turns out full power. Current feeds through heavy cable to a feed-in plug at your meter. Some generator makers provide a special switch—usually optional (Onan calls its device Power Sentry)—that disconnects the house from outside utility lines. This switch, which should be UL-approved, provides an important safety feature: It locks the house circuits into

(Please turn to page 186)

## The DO-MORE CORNER

New ideas to help you do more with the products you have around the house.



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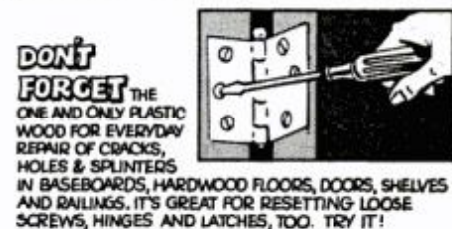


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and America's  
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NRI's Basic Professional Repair Course covers the basics of auto repair in 30 lessons. From headlight to taillight, you'll learn all you need to know, quickly. Basic home training includes eight important service items, including an Inductive Pick-Up DC Power Timing Light, Ignition and Electrical Systems Diagnostic Analysis and Tune-Up Instrument, tune-up tool kit, and more.

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Pictured is just some of the professional equipment included in NRI's Automotive training programs.



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## WHEN A BLACKOUT HITS

(Continued from page 185)

the generator, so home-produced current can't feed back into power lines and endanger linemen.

In blackouts, simply throw the special switch, crank the generator and add appliances one by one. With lower-wattage units, rotate the use of the generator's limited output for efficiency. Turn on the freezer for a few hours at midday, for instance; then turn it off in the evening when you want lights or TV. If you exceed your unit's capacity, a circuit breaker on the generator will cut you off, and the engine will stop running. If that happens, turn off some of your appliances and reset the circuit breaker.

Generators make about as much noise as a late-model lawnmower. Since they must be operated outdoors (they produce carbon monoxide like any gas engine), noise isn't likely to bother you. Your neighbors may feel otherwise. Most units transmit interference to radios and TVs, too, but generator dealers can tell you how to install a simple interference suppressor at a cost of a few dollars.

### Special generator hookups

The overall cost depends on the generator capacity and extras. Onan's 2000-watt generator lists at \$475; a 3000-watt unit about \$625. The Power Sentry switch adds about \$330; for about \$225 more, you can buy gadgetry to switch your house over to generator power automatically when the system senses a blackout.

The Power Sentry can be hooked up by experienced amateurs, but codes in some areas require that a licensed electrician do the work. Local dealers will be familiar with standards and inspection systems you'll have to follow. Part of the installation involves opening up your meter, so you'll have to call your power company, too.

If you already own a recreational vehicle with a 120/240-volt generator, Onan makes other equipment to enable you to hook your house lines to your camper in an emergency. The basic kit includes the Power Sentry and heavy twist-lock power cord, with a price tag of about \$400.

Your home-generated power will cost a lot more than electricity from a utility. The 3000-watt model, for instance, uses a gallon of gas per hour at full load to run its 8-hp engine. But during an outage, it'll seem a small price to pay to keep your furnace and freezer operating and some lights burning through the blackout.

PM

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# Royce CB conquers the paint shaker.

## Royce CB Performance Report No.1



1 All connections secured. Transmission and reception established.



2 Paint shaker is switched on. The torture begins. 335 vibrations a minute.



3 Transmission and reception continue loud and clear.



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# Royce CB. Built to take it.

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# Make this cutting board clock

This novel clock made from a wood cutting board is right at home on a kitchen wall. Cut a 5½-in. hole in the board's center, rabbet it for a



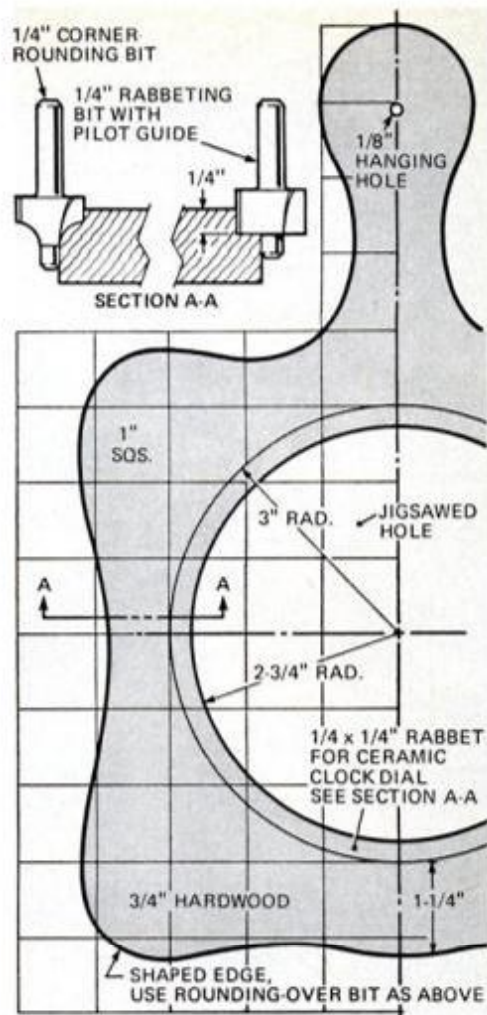
6-in.-dia. ceramic dial and add a battery movement.

You might find the right size cutting board at a housewares store. If not, it's fairly simple to cut one from a ¾-in. piece of birch or cherry. Saw it out with a sabre saw, sand the edges and shape the outer edge with a rounding-over bit in a router. Then switch to a rabbeting bit with a pilot to form a ledge around the hole face for the dial. Sand, stain and finish. Then glue the dial in place with contact cement.

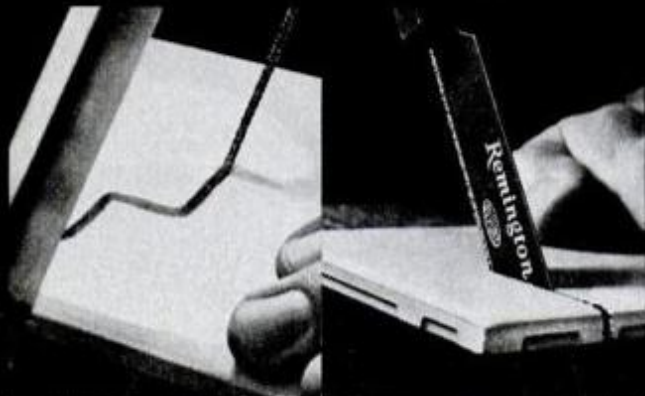
Dial and movement are \$14.45 postpaid from Gaston Wood Finishes, 3630 East 10th St., Bloomington, Ind. 47401.—Wayne C. Leckey



The rabbet where the dial rests is made with a router and a rabbeting bit.



## "Grit-Edge" blades trim tile with style.



Remington "Grit-Edge" rod saw and hacksaw blades make contour cuts in ceramic tile, snag-free cuts in high-pressure hose, cuts at any angle in hardened steel, space-age alloys and plenty of the other "unsawables".

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**Remington**

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Beryllium	X	X			X
Carbon	X	X		X	X
Cast Iron	X	X			X
Composites	X	X	X		X
Composition Board			X	X	X
Fiberglass	X	X	X	X	X
Foamed Glass	X	X			X
Friction Materials	X	X	X	X	X
Glass	X	X			X
Hardened Steel	X	X			X
Honeycomb Materials					X
Marble, Natural	X	X	X		X
Marble, Synthetic	X	X	X	X	X
Plaster			X	X	
Plastic Laminates	X	X	X	X	X
Plywood			X	X	X
Stainless Steel	X	X	X		X
Stranded Cable	X	X			X
Superalloys, Iron-base	X	X			X
Superalloys, Nickel-base	X	X			X
Tempered Hardboard			X	X	X
Tires, Steel-reinforced					X
Titanium	X	X			X
Tile, Ceramic	X	X	X		X

\*Requires coolant and variable-speed machine



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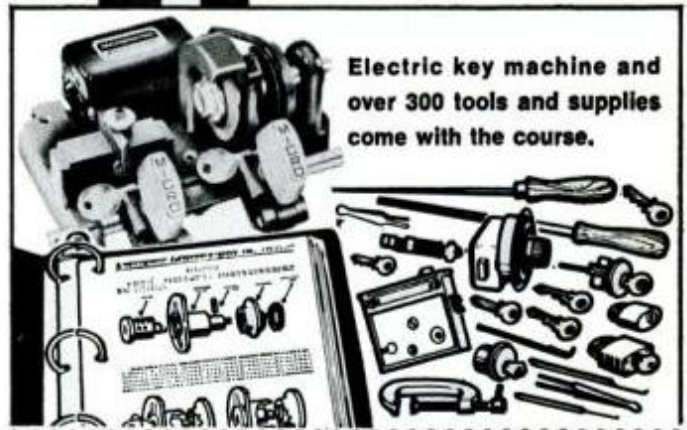
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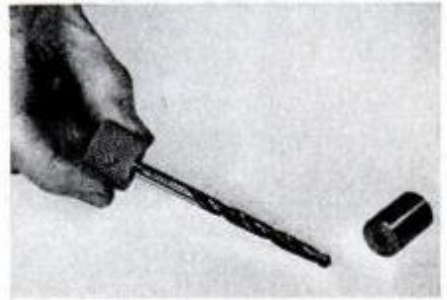
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## HINTS FROM READERS

### Cleaning tool for the shop



A radio or TV knob, preferably the setscrew type, can convert a twist bit into a tool to clean dirt from holes and to remove burrs caused by cross-boring through a hole. Most knobs fit a 1/4-in. bit. To adapt a knob to smaller size, use a sheet-metal bushing.

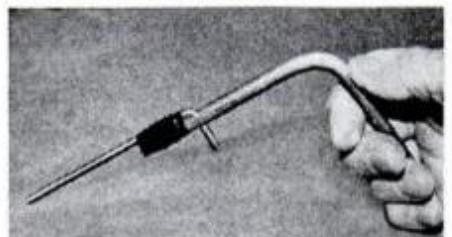
—W.E. Burton

### Inexpensive antique finish

Make an Early American wood finish for pennies. Sand the wood smooth and remove all dust. Mix a trace of burnt umber with a small amount of boiled linseed oil to get the desired tone on test wood. Rub on a thin film of the desired oil mixture and let it set for half an hour; then wipe off excess with lint-free cloth.

With an oil-dampened piece of terry cloth, lightly streak and feather out small amounts of burnt umber, working with the grain. Enhance scratches and dents by darkening them. Leave the piece for 24 hours. Then wipe off excess oil, rub with 00 steel wool and wax.—Jack Adams

### Allen wrench extension



When it's impossible to use the short end of an Allen wrench, yet it's inconvenient to get leverage by using pliers to grip the long leg, you can turn setscrews this way. Bore a cross hole in a length of steel rod to receive the wrench's short leg and countersink the hole so the wrench will lie flat against the bar. Insert short leg, hold with electrician's tape.—Dan Googins



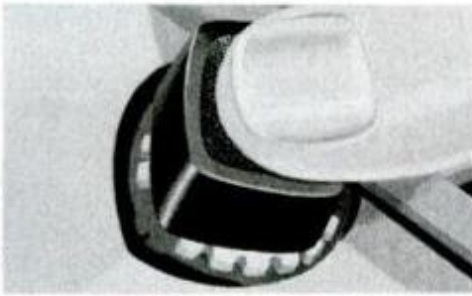
You can't buy another chain saw with all these features at any price.

Yeh, but can it swim?

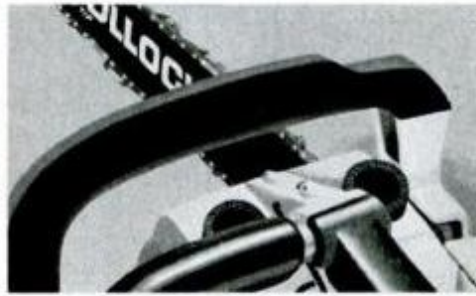


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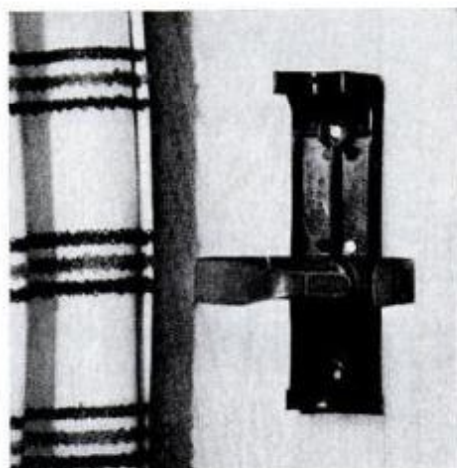
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I particularly liked the button at top for checking the charge. You just push it in (below) and it pops out if the charge is still usable. If it isn't, the button stays in and the extinguisher is discarded.—H.W.



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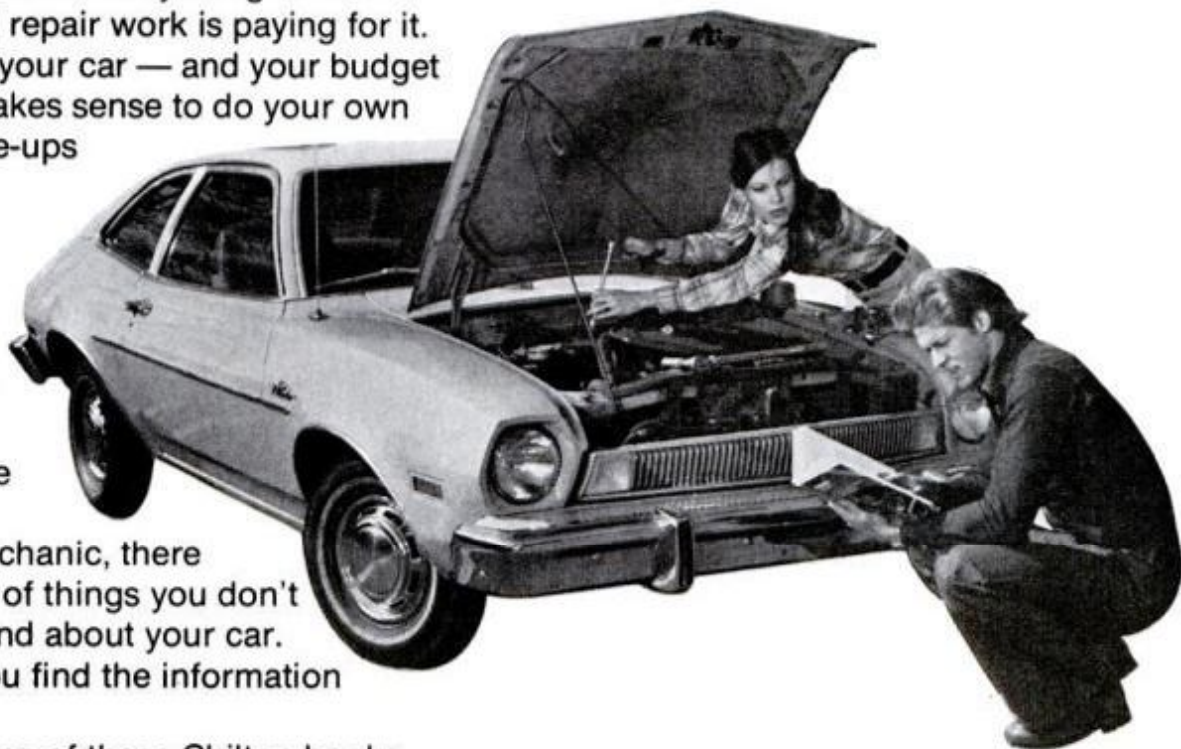
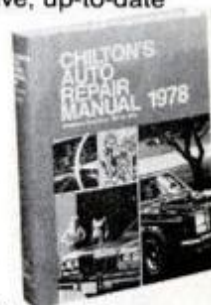
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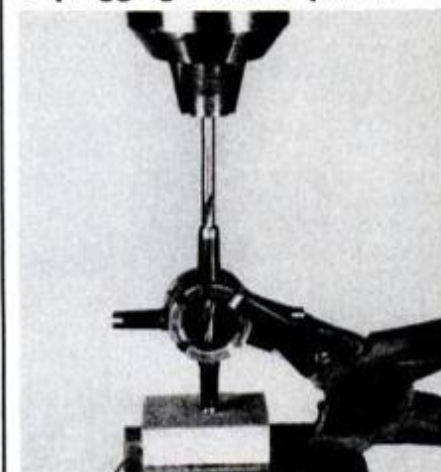
To minimize water usage in flushing your toilet, place weights on the ball stopper. Make loops of wire solder in varying lengths so they will nest neatly. Experiment to find the number needed.

—C.A. Wells

### Hide your house key

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### Unplugging a leather punch



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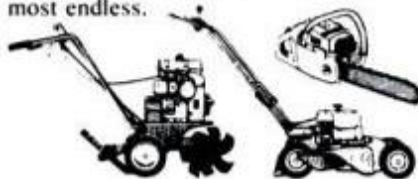
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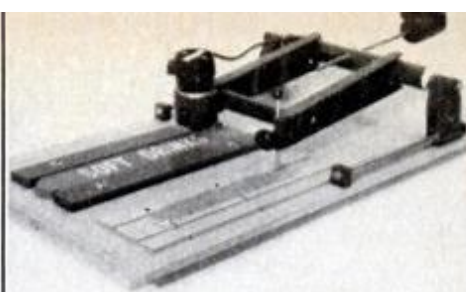
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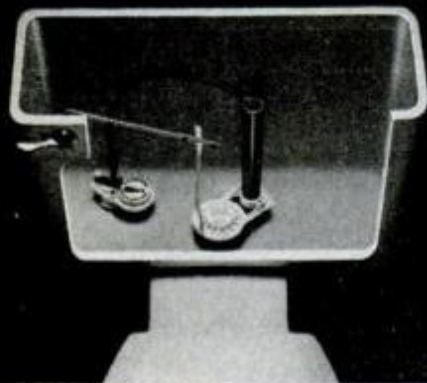
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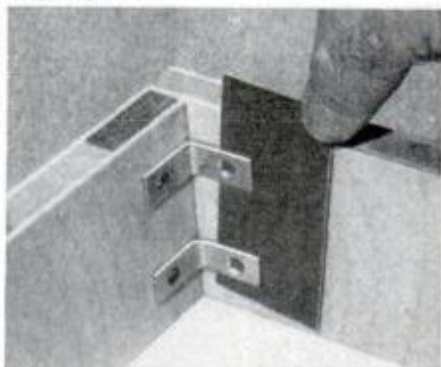
Address \_\_\_\_\_

City \_\_\_\_\_

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

## HINTS FROM READERS

### Tight joints



Make extra-tight joints with metal corner braces. Use cardboard shim to take up space under one leg while driving screw through other leg. Remove cardboard to drive second screw.

—H. Patton

### Patching basement leaks

Stubborn basement leaks that wash out the lime in cement and commercial patches before they have time to dry can be stopped. Pack a thick consistency of plaster of paris into the cavity. Immediately play a propane-torch flame on it to harden the plaster quickly. This will hold back the water long enough for you to cover the crack with cement.—C.L. Werner

### Reading paint-smear labels

When paint runs down a paint can and obscures the paint's number and other identifying marks, remove the label and look at its back while holding it up to a mirror. Numbers and directions can frequently be seen in reverse on the label's back. The mirror re-reverses the image and presents information in readable form.

—H.L. Miller

### Seam ripper for shop use



A seam ripper used in sewing is also handy in a shop or lab. Use it as a probe, scraper, cutter or knife point.—Walter E. Burton

## SAVE ON... ACCORDIONS

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Buy Direct From Importer. Over 30 models—popular colors, sizes, switches, features! Famous makes for students, teachers, professionals. Save! No middleman profit. 5 day home trial. Easy terms. Trade-ins Welcomed. Satisfaction assured. Write Today.

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(Not Available in Michigan) © 1977, Hobby Mart

# LCD Watch Breakthrough...

## MICRO-ALARM



Beep!  
Beep!

**a 6-digit 6 function LCD Alarm Watch for only \$69.95!**

At last, a constant readout (no buttons to push) precision quartz electronic watch with a built-in 24 hour alarm system.

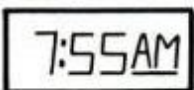
A quiet revolution has been taking place in the electronic watch industry during the last few years. Push-button LED's are being replaced with continuous-display LCD watches; 4-digit displays are being replaced by 6-digit readouts. This year there will be many such LCD watches available.

However, Winthrop-Rogers prides itself on offering not only the most technologically-perfect products available, but also on introducing the most technologically-advanced products on the electronic market before they are readily available. Therefore, we are pleased to announce the most remarkable achievement in electronic watch technology to-date.

By combining the quartz-accuracy precision of the LCD watch with miniaturized alarm technology, we proudly introduce the first CONTINUOUS DISPLAY ALARM WATCH. A watch that may not be available from other sources for years can now be yours at a price hundreds of dollars less than you would imagine.

And now consider the incredible convenience of a portable alarm clock handsomely adorning your wrist at all times !!!

- Never again missing an appointment because you lost track of time.
- Never again missing a plane or a train because you didn't realize how late it had become.
- Never again forgetting to make that all-important phone call.
- Never having to worry about forgetting to take important medication on time.
- Never worrying about waking up from that catnap, or at a hotel if your wake-up call isn't on time.
- Always being aware of when you should be coming or going or doing all that your hectic schedule demands - without devoting your valuable time to trying to remember it all.



SET TO RING  
AT 7:55 A.M.

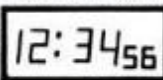
### THE ALARM

The MICRO-ALARM has a 24 hour Alarm System, allowing you to set your watch to signal at any minute of the day or night (1,440 settings per day are possible). Once set, you need not be concerned about your next appointment or train, plane or phone call. The MICRO-ALARM will remember for you and remind you when you need to be reminded.

### SNOOZE/REMIND CONTROL

For your convenience the MICRO-ALARM will give one short beep prior to its full alarm cycle, allowing you to turn it off without disturbing others. If not deactivated after the first short beep, the alarm will then beep for 15 continuous seconds. Push the deactivate button twice and the alarm is off. However, should you want a further reminder, then push the deactivate button only once and the alarm will go through its cycle again in exactly 5 minutes, allowing you to continue your current activity whether it be a snooze or phone call without fear of forgetting your next commitment.

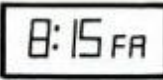
12:34 AND 56  
SECONDS



### 6-DIGIT LCD DISPLAY

The MICRO-ALARM has a 6-digit readout showing hours, minutes and seconds at a glance. Since the readout is by Liquid Crystal Display (LCD) and not by Light Emitting Diode (LED), no button has to be pushed; the time is continuously displayed! A built in night-light functions at the push of a button for reading in darkness.

AUGUST 15th  
FRIDAY



### CALENDAR DISPLAY

Just one push of the control button converts the display into a 3-function calendar; displaying the month, date of the month, and day of the week. The remarkable memory built into the module knows each month and the number of days in that month and resets automatically on the first day of the new month.

### QUARTZ ACCURACY

The MICRO-ALARM is extraordinarily accurate. Its module is manufactured by Hughes Aircraft Company, one of the world's foremost manufacturers of micro-electronics, and is guaranteed accurate to within 3 minutes a year (averaging less than 15 seconds per month). You can depend on the accuracy year after year. There are no moving parts, so there is nothing to wear out or even require servicing. The result of this accuracy is that you can set your watch to the second.

### THINK ABOUT IT!

Even if you have no consistent need for a watch with a built-in electronic alarm, the MICRO-ALARM is a valuable investment for its watch features alone:

1. It is the most up-to-date fully-functioning electronic watch available today.
2. It is accurate to +/- 15 seconds per month, and never has to be wound - put it on, and the time and date are correct even if it has been in a drawer for a month!
3. Its elegant styling will compliment any attire - and elicit compliments from your associates and friends.
4. At this price you can not find a better buy.
5. One day you will have a critical need to be reminded of a vital appointment - and then, having used the alarm function once, you will never again return to any other reminder system.
6. Why buy an ordinary watch when you can own a MICRO-ALARM?

### ELEGANT MESH BRACELET

Each MICRO-ALARM comes with a 1 year limited warranty. You may order in your choice of gold-tone or silvertone case. Each for only \$69.95 plus \$1.99 for shipping and handling. Each MICRO-ALARM comes with a matching, elegant, thin mesh bracelet, more handsome and much more practical than those "pull over-snap" type bracelets. This band adjusts comfortably and easily, eliminating cumbersome link adjustments.

### 15 DAY TRIAL

Wear the MICRO-ALARM for 15 days to assure yourself that this is no ordinary watch. If at the end of that time you are dissatisfied for any reason you may return it for a prompt refund, no questions asked.

To order by credit card please phone  
our 24-hour toll-free number:  
**800-325-6400 ask for Oper. 36**

In Missouri: 800-342-6600 ask for Operator 36

or mail the attached coupon with your payment and the MICRO-ALARM will be on its way to you.

Allow 3-4 Weeks For Delivery

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Please send \_\_\_ MICRO-ALARMS @ \$69.95 each plus \$1.99 for shipping and handling.  
\_\_\_ Silvertone MICRO-ALARM  
\_\_\_ Goldtone MICRO-ALARM

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

To expediate shipping by UPS, please provide street address rather than P.O. Box number.

# Penguin pull toy

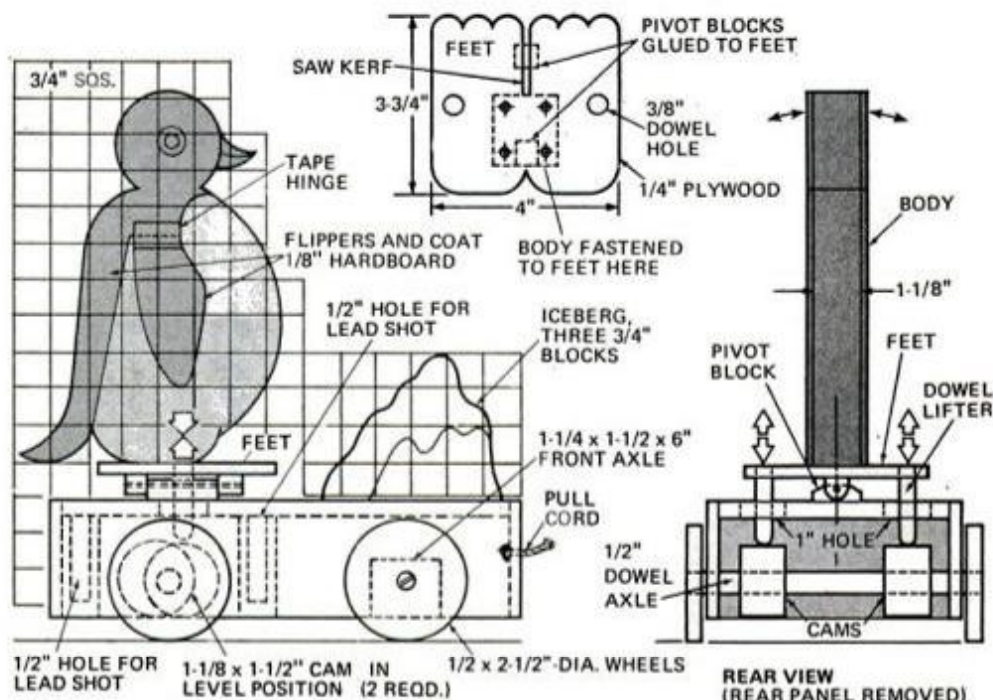


Paint wheels red, base light blue, feet and beak gold: The rest is black and white.

**W**addling along with flippers flapping, this penguin is an intriguing toy to make for your toddler this Christmas. Two wood cams, diametrically mounted on a dowel axle, give up-and-down motion to two lifters that rock the bird side to side.

The bird waddles on a hollow box fitted with wheels and weighted with

lead shot. Cut the body from 1 1/8-in. pine, then cut and glue 1/8-in. hardboard to each side for his coat. Hinge the flippers with cloth tape, and glue the body to platform feet. Cut and glue on icebergs. For full-size patterns send \$1.25 to Popular Mechanics, Box 1014, Radio City Station, New York, N.Y. 10019. **PM**



# Stripe like a Pro!

## "HOW-TO" SERIES 1

### SINGLE LINE PINSTRIPING

THE PROFESSIONAL LOOK IS EASY WITH **TRIMBRITE** QUALITY SELF-ADHESIVES... BECAUSE **TRIMBRITE** STICKS BETTER... CURVES BETTER... STAYS BETTER-LOOKING LONGER... 12 COLORS, (PLUS CHROME & GOLD)... 3 WIDTHS... AND SO INEXPENSIVE!

### PREPARATION

CLEAN DIRT AND WAX FROM AREAS TO BE STRIPED. USE EXACTO KNIFE. (OR RAZOR BLADE) FOR TRIMMING TAPE ENDS. STRIPE IN WARM WEATHER, NEVER IN SUNLIGHT.

### STRAIGHT LINE PINSTRIPING

START BY PRESSING FIRST INCH OF TAPE DOWN. REMOVE LINER MATERIAL AS YOU PULL OUT ENOUGH TAPE FOR THE LENGTH OF THE PANEL. EYEBALL TAPE LINE FOR STRAIGHTNESS... THEN GENTLY BRING TAPE TO THE BODY (TRIM DOOR OPENINGS LATER.)

### EYEBALL FOR STRAIGHTNESS... THEN LAY IT ON.

IF YOU GOOF, LIFT GENTLY & REPEAT. NEVER STRETCH.

### TAKING THE CURVES

A TWO-HAND JOB. RIGHT HAND ESTABLISHES CURVE... LEFT PRESSES TAPE... BOTH HANDS ALWAYS MOVING. **TRIMBRITE** FLEXIBILITY TAKES THE TIGHTEST CURVES... DISPENSA-PAK LETS YOU PULL OUT ONLY THE TAPE YOU NEED.

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ACCENT SIDE LIGHTS, DOOR HANDLES, NAMEPLATES. WORK IT INTO THE MAIN PINSTRIPE LINE... OR AS SEPARATE ACCENTS. FLAME-LIKE SPEAR ENDS AND CLOUD SHAPES ARE POPULAR.

### TAPE-END ACCENTS

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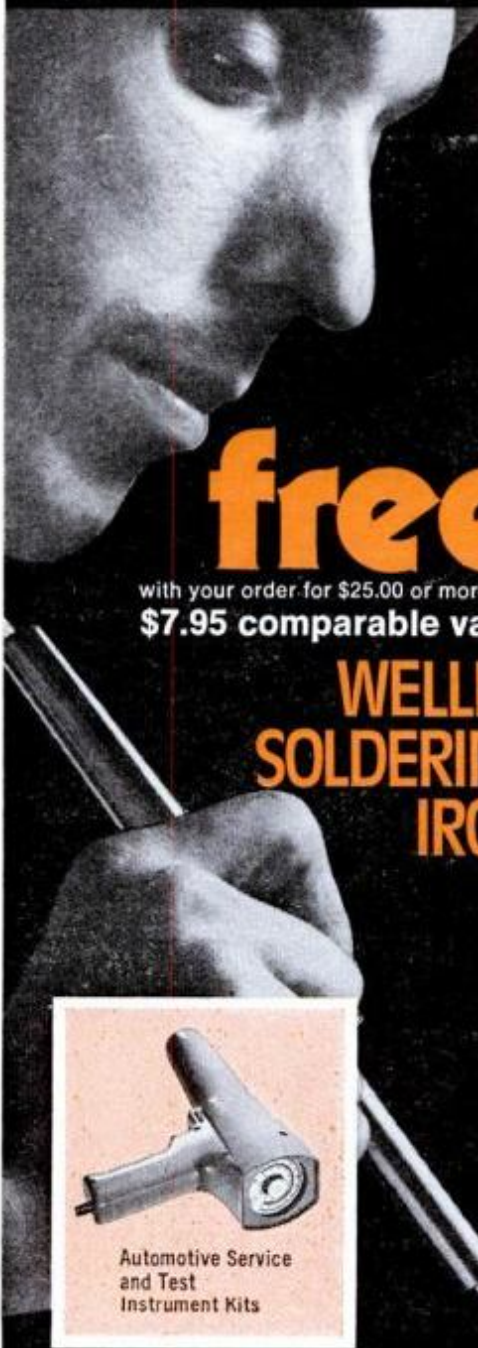
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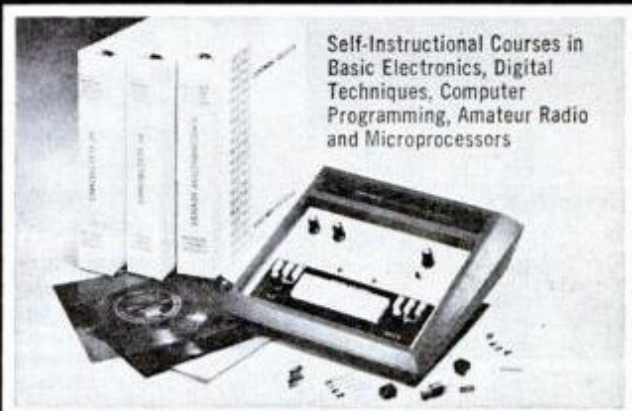
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CL-642

# "Our whole family helped assemble this wonderful Schober Organ... now we all play it!"



Talk about real family fun! We all worked together, for a few hours almost every day. Almost too soon, our Schober Organ was finished. Our keen-eyed daughter sorted resistors. Mom soldered transistor sockets, although she'd never soldered anything before. And it did our hearts good to see the care with which our son—he's only 12—installed the transistors. Me? I was the quality control inspector—they let me do the final wiring. And when it came time to finish the beautiful walnut cabinet the easy Schober way, we all worked at it!

Now, we gather around our Schober Organ every evening to play and sing together. Some of us play better than the others, but we're all learning—with the help of the easy Schober Organ playing courses. I might add that I'm especially pleased with all the money we saved. Our completed Schober Organ compares favorably with a "ready-made" one costing twice as much! (The five models range from \$650 to \$2850.) And we didn't even need to pay the whole amount all at once, because we were able

to buy Schober Kits a component at a time, to spread costs out. Or we could have had two-year time payments!

Families like ours have been building Schober Organs for 20 years. How about your family? You can have all the details, without cost or obligation. Just send the coupon for the fascinating Schober color catalog (or enclose \$1 for a 12-inch LP record that lets you hear as well as see Schober quality). Clip the coupon right now—and mail it TODAY!

The *Schober Organ Corp.*, Dept. PM-31  
43 West 61st Street, New York, N.Y. 10023

- Please send me Schober Organ Catalog.
- Enclosed please find \$1.00 for 12-inch L.P. record of Schober Organ music.

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## CAR WITH 4 TO 8 CYLINDERS

(Continued from page 70)

ing plate, letting the rocker arm pivot about the valve stem. The valve remains closed.

When the slots in the blocking plate are swung out of alignment, the castellations press directly on the plate so the rocker arm must pivot about the usual spherical surface, opening the valve normally. That "weak" spring and a down-stop preserve normal free-play settings for the hydraulic lifter.

The blocking plate is rotated by a solenoid that's too weak to overcome the plate's friction with tips of the castellations when either valve is open. Therefore, a cylinder can be disengaged only when both valves are closed. The same for re-engagement.

## No fuel burned

When the valves are disengaged, the sparkplug continues to fire, but there is no fuel to burn. The piston is simply compressing air and then letting it expand. Because there is no fresh intake of air, the cylinder stays hot so that it will not misfire when reactivated.

The solenoid that disengages the pair of valves is controlled by a microprocessor with an integrated circuit chip. The logic is simple: If certain conditions are met, the Valve Selector disengages valves. Necessarily, the manifold vacuum, engine speed and water temperature must exceed set values.

The engineers had to decide what level of manifold vacuum disengages how many pairs of valves, and what lower level of vacuum re-engages them. It is like the automatic transmission shift point problem: a suitable spread is needed to prevent "hunting" back and forth.

## Two versions of system

It seems the first Ford system—on a Six—will be a simple three-cylinder or six-cylinder switch rather than the peel-them-off, one-at-a-time system I tried. This reduces the number of manifold vacuum sensor/switches needed, and perhaps simplifies troubleshooting at the dealerships. However, it cannot offer as much fuel saving as the one-at-a-time system because you can't drop to three-cylinder operation until much later than you could have dropped to five and then to four.

It would be nice to be able to choose between two modes: economy with an accent on smoothness, and super-economy, no holds barred. The latter is for when the fuel gauge is bouncing off "Empty" and you're miles from a gas station. **PM**

## If you can use a screwdriver and drill...you can BUILD YOUR OWN HEIRLOOM GRANDFATHER CLOCK



at 50% or less of retail price

- Solid 3/4" kiln dried wood
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Astroscan lets you enjoy clear, bright, wide-angle views of stars, moon, comets, etc. Completely portable, this unique 4 1/4" f/4 Newtonian reflector houses top quality optics. Designed for ease of handling and use, Astroscan weighs only 10 lbs. and stands 17" high. What an instrument!

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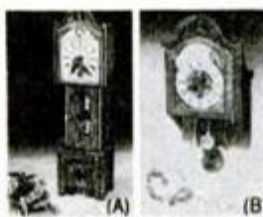
Everything you need to build these fine wooden clocks. Each contains a pre-assembled movement from Germany's Black Forest.

(A) Grandfather Clock (7x1 3/4 x 1 1/2")

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Fascinating solar rotor spins at 3,000 RPM. First-surface silvering on 1/2 dome makes hemispherical mirror. 5x3"

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This Hastings triplet is possibly the most favored pocket magnifier today. Full 10X, color-corrected, flat-field, cemented lens system. Great for jewelers, collectors, engravers, hobbyists, etc. Mtd. in aluminum case; chrome-plate case. 3/4" x 1 1/4" closed; clear lens dia. 1/2"

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Fully transistorized transmitter/receiver (TR) detector with sensitivity rivaling models twice the price. Built of rugged aluminum with a waterproof search coil. Detects a penny at 5". Wt. 2 lb. 6 oz.

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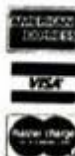
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# The Sinclair Microquartz car clock.

Time... date... seconds...

At last. An electronic digital car clock that tells you

**the date...  
the time in hours and minutes...  
and seconds...**

clearly, boldly, and more accurately than you could imagine — all at the touch of a button.

The Sinclair Microquartz. With space-age quartz control for accuracy. A big, bold digital display for clarity. And a compact anodized alloy casing for go-anywhere durability. The Microquartz measures only 1 3/4" x 3 1/2" x 1/2" — and weighs only 2 oz.

**It stays where you stick it!**

No drilling, holes or screws. Two adhesive pads (supplied) fix the car clock firmly — wherever you place it — which needn't be restricted to your car. Put it at your bedside... your work bench... on your clipboard... or on your shaving mirror in the bathroom!

Microquartz circuitry is solid state — totally immune to vibration. The display reads clearly even in total darkness. And typical accuracy is within a couple of seconds a day.



## Only \$19.95

Try it for yourself for 10 days

The Microquartz is only available direct from Sinclair. We'd like you to try one on a 10-day money-back no-questions guarantee.

Simply clip the coupon below. If you decide not to keep the Microquartz, return it in its original packing — we'll refund your money immediately. Remember — if you need to keep a close, accurate check on the time — wherever you are — the Sinclair Microquartz is just the job. Makes a perfect present, too!

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**Sinclair Radionics, Inc.**

**Galleria  
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New York, N.Y. 10022**

# sinclair

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I enclose check/money order for \$ \_\_\_\_\_ (N.Y. Residents add sales tax)

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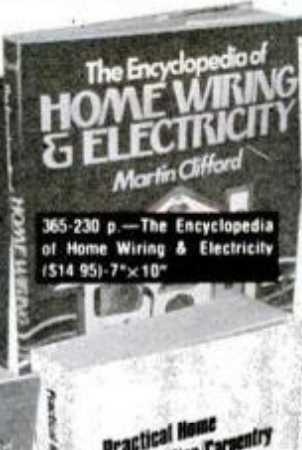


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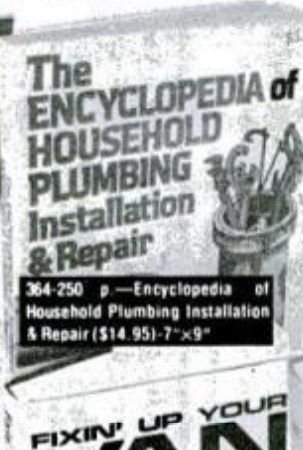
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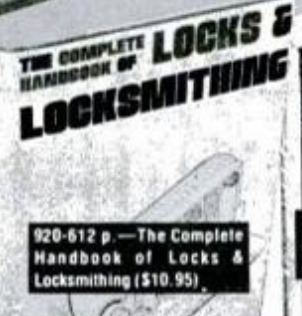
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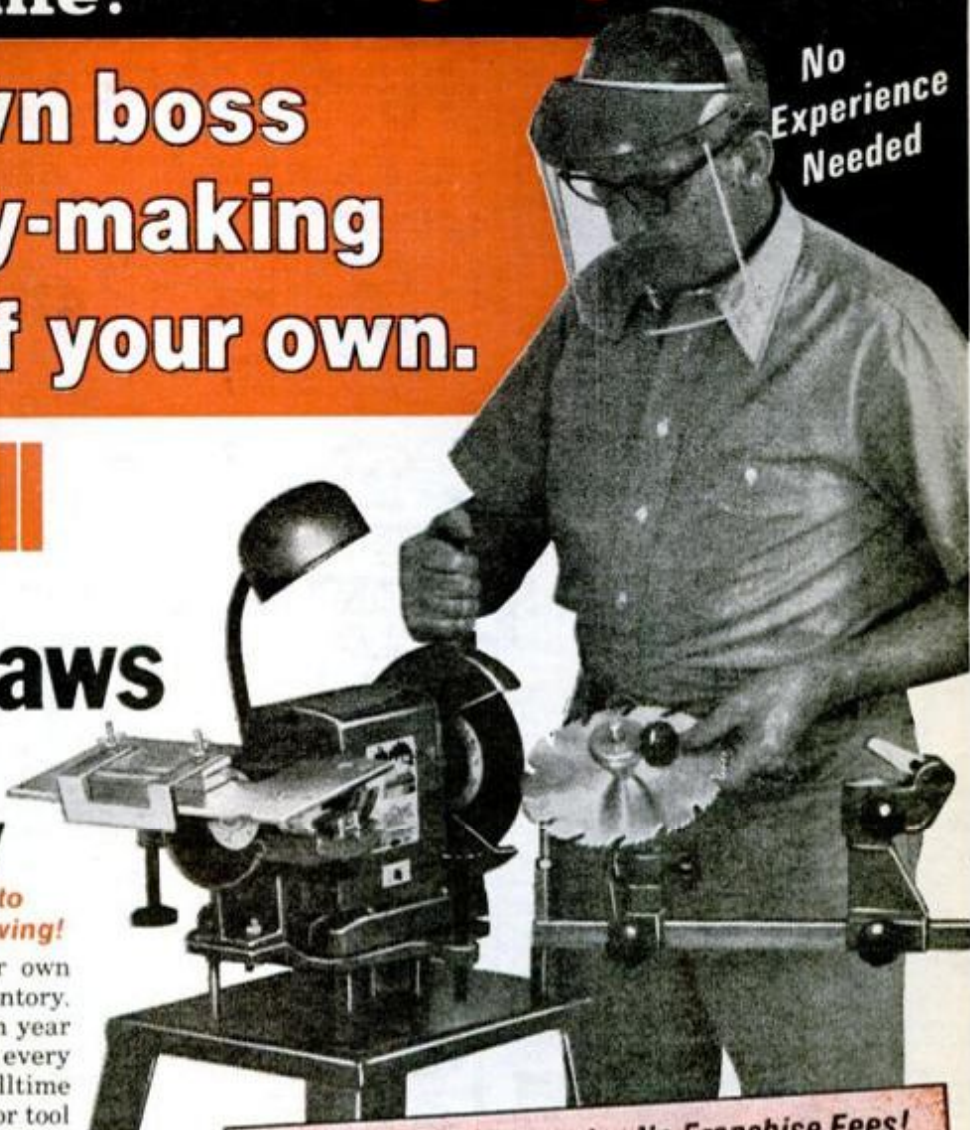
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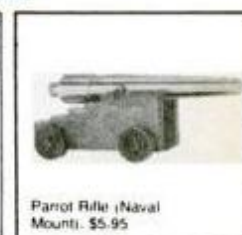
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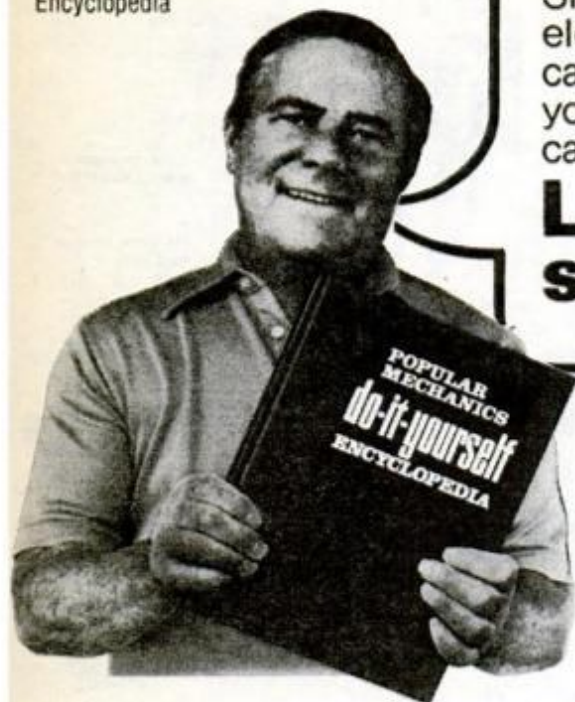
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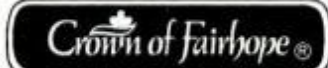


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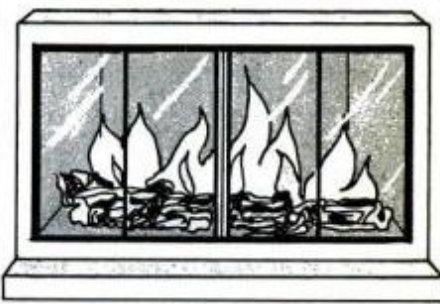
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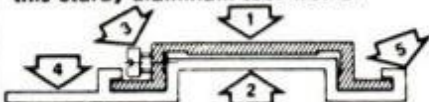
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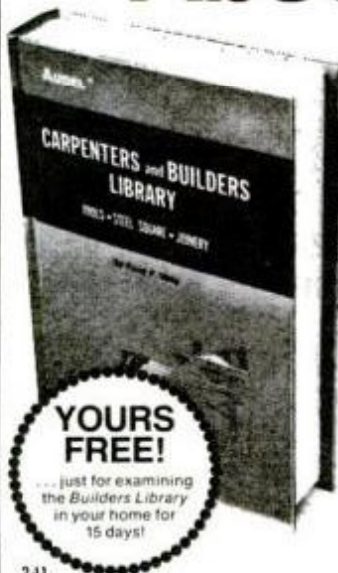
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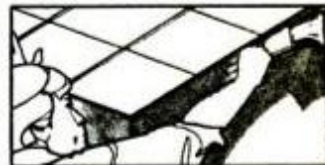
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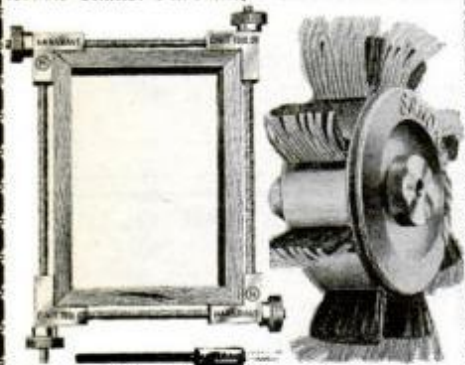
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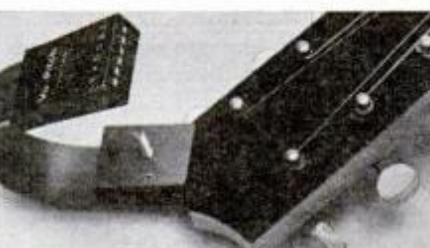
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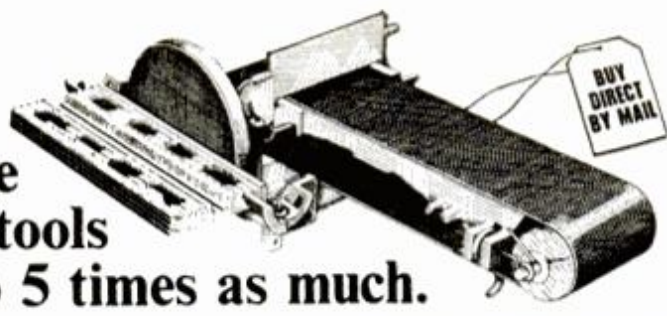
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(Continued from preceding page)

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**ENGLAND** Air Remails, FREE details. Andrew Bates, 433 Willington Street, Maidstone, Kent, ME15 8HD, England.

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**PHOTO** Identification Cards. Authentic Laminated Samples 25¢. Popcard, 2120 Paradise, Las Vegas, NV 89104.

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(Continued on next page)



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# The Cutlass Cruiser for '78.



## It's a whole wagonfull of good ideas.

### One Big Idea.

"Design a wagon that's as beautiful and comfortable as a Cutlass, but as roomy and functional as a new mid-size wagon should be."



That's no ordinary assignment. So the new Cutlass Cruiser turned out to be no ordinary wagon. It looks like a Cutlass, rides much like a Cutlass Sedan, loads and carries like a wagon — it adds up to one big beautiful idea.

### Two Easy-Loading Ideas.



This year the Cutlass Cruiser features a split tailgate. The window swings upward, out of

the way. That means you can load the Cutlass Cruiser even when you're parked in tight quarters. Swing the bottom section down and you've got a loading platform. Great for furniture, flooring, groceries, gadgets.

### Two Economical Ideas.

One for the highway, and one for the city — they're Cutlass Cruiser's EPA mileage estimates: 25 mpg highway, 18 mpg city, 21 combined, with available 260 V8 and standard automatic transmission. Your mileage, of course, depends on how you drive, your car's condition and its equipment. (Power train not available in California.) The Cutlass Cruiser is equipped with GM-built engines produced by various divisions. See your dealer for details.

<b>25</b>	MPG HIGHWAY
<b>18</b>	MPG CITY
<b>21</b>	MPG COMBINED

### Four Ride and Drive Ideas.



We know how important it is for a wagon to be maneuverable in city traffic. So we shortened the turning radius... that's the first good idea. Parking and cornering are a pleasure.

To make the ride smooth took two more ideas — a new chassis and new

suspension system. Once you feel how well they work together, you might forget you're in a wagon.

You probably won't hear the fourth idea. It's the quiet you'll experience. Quite refreshing.

### Three Comforting Ideas.

If a wagon's going to be as comfortable as a Cutlass, it's got to have room. So we increased the legroom and front headroom over last year's model. Next we added hiproom by recessing the armrests under fixed rear side windows. And, of course, the seats are full-foam and very comfortable.



Actually, the list goes on and on. But if you check out the '78 Cutlass Cruiser for yourself, you'll get the idea. A whole wagonfull, in fact.

Discover that great Cutlass Feeling.

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Pall Mall Filter King . . . 18 mg. "tar", 1.2 mg. nicotine av. per cigarette, FTC Report Dec. '76.  
Pall Mall Extra Mild . . . 7 mg. "tar", 0.6 mg. nicotine av. per cigarette by FTC method.

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