

# Popular Mechanics

## CHRISTMAS GIFTS YOU CAN MAKE

21 pages Starts page 89

**BEDE 5J:**  
First homebuilt jet  
for private pilots  
Page 192

**CLIP-AND-SAVE  
KNOW-HOW:**  
Starts page 92

- How to fix a clothes dryer
- How to unclog drains
- How to cut heat loss
- How to fix furniture mars



PIPE RACK

BOOK ENDS



DESK ORNAMENTS



CARVED JEWELRY



PULL-TOYS



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17 mg. "tar," 1.4 mg. nicotine; av. per cigarette, FTC Report Feb. 73.

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# How to beat the odds on the long shots.

Here's why many of the people who know rifles best put their money on the Remington Model 700.

When you finally get a bead on the big one—a trophy ram, or goat, or pronghorn—you know how many shots you're going to get.

One. Making that kind of long shot takes a lot of practice. It also takes a lot of rifle.

The Remington Model 700 bolt action is a lot of rifle. That's why so many people with gun savvy recommend it for long-range shooting.

Ask a veteran hunter—a guy who's bagged the big ones time and time again. The Model 700 is so accurate we used its design as the basis for our classic 40XB Bench Rest competition model. Before we ship a 700, we test it carefully for accuracy. If it doesn't measure up, it never leaves the factory.

Ask a gunsmith. He knows gun design inside and out. He can tell you that our Model 700 has one of the strongest center fire bolt actions ever made. The cartridge head is surrounded by three rings of solid steel. And there are no extractor cut-aways to weaken this critical area. The bolt lugs are machined from steel every bit as strong as the steel around the cartridge head.

Ask a dealer. He probably sells hundreds of rifles a year. You might find out from him that the variety of

the Model 700's caliber selection sets it apart from any other bolt action rifle. It comes in 17 different calibers, for every kind of hunting, every kind of game.

Beyond accuracy. Accuracy and versatility are only a part of the 700 story. Because we know a sportsman

takes special pride in owning a finely crafted firearm.

The Model 700 BDL "Custom Deluxe" is a finely crafted firearm. And it looks it.

Its classic Monte Carlo stock is made of select American walnut. We bring out the rich grain with Du Pont RK-W, a high-lustre finish that's also scratch- and water-resistant.

We've given it deep, traditional checkering to accent the natural beauty of the wood. And added white line spacers and a black fore-end tip to set it all off.

The BDL also has a hinged floor plate, "jeweled" bolt, and a sling strap with quick-release swivels. A real buy with prices starting at \$174.95\*.

The Model 700 ADL "Deluxe" offers, among other features, a Monte Carlo stock, skip-line checkering, and Du Pont RK-W wood finish. It's priced from \$154.95\*.

**One more thing you ought to know:** Once you've picked the right rifle, pick the right ammunition to go with it.

Remington ballistics know-how and top-quality components make Remington "Core-Lokt" center fire cartridges the logical choice. They're made for your Model 700. In fact, each 700 is tested with them before it leaves the factory.

The Remington Model 700 and "Core-Lokt" cartridges. Put them together and you've got a shooting system that's hard to beat for reliability and accuracy.

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MODEL 700 CALIBERS
17 Rem.
22-250 Rem.
222 Rem.
223 Rem.
25-06 Rem.
6 mm Rem.
243 Win.
270 Win.
30-06
308 Win.
7 mm Rem. Mag.
264 Win. Mag.
6.5 Rem. Mag.
350 Rem. Mag.
300 Win. Mag.
375 H & H Mag.
458 Win. Mag.
Left Hand Version
270 Win.
30-06
7 mm Rem. Mag.

This One



RQ4S-0S9-W11Z

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Great guns deserve great ammunition. ↘

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# Sub-compact. Full size. Which demands more from its motor oil?

At today's expressway speeds, little car engines strain to keep up with the big guys. That raises the oil temperature. Today's big cars are usually loaded with power options that also raise the oil temperature. And heat is the main reason oil deteriorates. Today you have to name your oil. By type. By S.A.E. grade. By brand.



Ten years ago, you rarely had to think about oil temperatures. Today you do. Thinking about it may help prevent an unnecessary repair bill.

It doesn't matter what size car you're driving. Even with a modest number of power extras, your new little car can generate some severe crankcase temperatures. Emission controls are one reason. Also the strain of high speeds on little engines, especially on a hill. The harder an engine works, the hotter the oil gets.

**Full-size cars run hotter, too.** They're loaded with heat-raising options. Some examples: Automatic transmission ups oil temperatures by 10-15° F. Air conditioning adds about 10° F. Power steering, about 10° F. Plus, in new cars, a 15-20° F. boost from emissions systems. And if you're hauling a trailer, change the oil even more often.

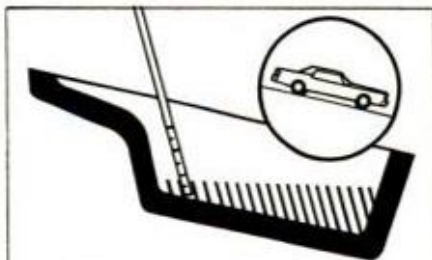
What all this means is that your engine oil temperature may be running close to or over 300° F., compared to about 180° F. 10 years ago.

In short, heat is now an oil's worst enemy. So what should you do?

**First, read your owner's manual.** And change oil just as

frequently as it says to. Also note the cautions about severe operating conditions such as dusty areas and short trips in extreme cold.

**Second, have your oil level checked more often.** Every time you fill up with gas, in fact. Some oil burn-off is normal—but the amount



### When you check and add oil yourself:

1. Choose a level spot—not a sloping driveway.
2. Turn the engine off. Wait a few minutes.
3. Fill to the full dipstick mark, but not beyond.

varies from car to car, even when they're the same size and the same year. And keeping the crankcase full helps keep the oil cool.

**Quaker State your car to keep it running young.**

**Third, watch your oil warning light.** At start-up, it flickers on for a moment or so, until the oil flow is normal throughout the engine. If the light stays on, switch your ignition off immediately and get help. If the light goes on when you're driving, pull over as soon as it's safe. Maybe it's just your oil that's low. Or there may be a more serious problem. Answer: Wait for a professional to get you going again.

**Fourth, be sure to use a premium oil.** An oil that's fortified to handle this severe heat. For your peace of mind, ask for Quaker State Motor Oil. Quaker State is refined only from 100% Pure Pennsylvania Grade Crude Oil, the world's choicest. And Quaker State is fortified with a blend of additives, scientifically selected to retard oxidation, clean and disperse harmful deposits and to neutralize harmful acids.

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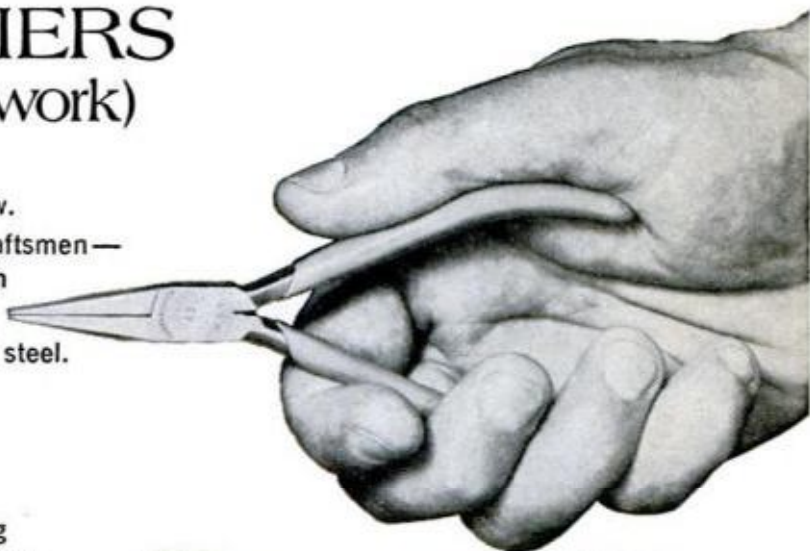
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## AUTOMOBILES, DRIVING

- [28 Drive to South America? How to go by family car](#)
- [40 Detroit Listening Post](#)
- [62 Imports and Motorsports](#)
- [109 Motor homes built the way they ought to be](#)
- [114 When we really had a mini-car!](#)
- [117 '74 Snowmobiles: New styling, new power](#)
- [128 PM owners report: Buick Apollo](#)
- [146 Saturday Mechanic: Get set for a cold-weather starting emergency!](#)
- [154 Up periscope? Your next car may have one](#)

## SHOP AND CRAFTS

- [89 Christmas gifts you can make](#)
  - [89 Jewelry you can carve in a jiffy](#)
  - [161 Initial bookends](#)
  - [162 One-piece plastic beauties](#)
  - [166 Animal pull toys](#)
  - [169 Blockmobiles](#)
  - [172 Kitchen play appliances](#)
  - [175 Teaching box](#)
- [176 Belt sander becomes edge sander with new quick-change attachment](#)
- [178 Rapid travel for drill-press attachment](#)
- [179 Hints from readers](#)
- [180 Jaw stretchers give your lathe chuck a bigger bite](#)

## HOME AND YARD

- [92 How to fix an electric dryer](#)
- [98 How to unclog drains](#)
- [100 How to minimize heat loss](#)
- [102 How to repair scratches in furniture](#)
- [182 Outdoor greeting card with a new twist](#)

## AVIATION

- [122 World's hottest homebuilt: The famous Pitts Special](#)
- [192 Bede 5J: First build-it-yourself jet](#)

## BOATING, OUTDOORS

- [109 Motor homes built the way they ought to be](#)
- [117 '74 Snowmobiles: New styling, new power](#)

## SCIENCE, INVENTIONS

- [104 Who's ahead in the superstadium game?](#)
- [196 From wood to paper—now it's back again to wood](#)

## ELECTRONICS, RADIO, TV

- [150 Four-channel headphones: Here's how they sound on two ears](#)

## PHOTOGRAPHY

- [84B Photo hints](#)
- [198 Compact 300-mm tele at a comfortable price](#)

## EVERY MONTH

- [8 Letters](#)
- [20 All Outdoors](#)
- [49 Car Clinic](#)
- [70B Science Worldwide](#)
- [70F Appliance Clinic](#)
- [74 The Bicycle Shop](#)
- [86 Homeowners' Clinic](#)
- [132 It's New NOW: Latest products and developments \(A 14-page roundup\)](#)

# Popular Mechanics

NOVEMBER 1973 • Vol. 140 No. 5

### INTERNATIONAL EDITIONS

Australia, Caribbean, Denmark, Mexico, Southern Hemisphere, Sweden



[Four-channel headphones . . . 150](#)



[Rapid travel for drill-press table . . . . . 178](#)



[Christmas gifts you can make 89-91, 158-175](#)



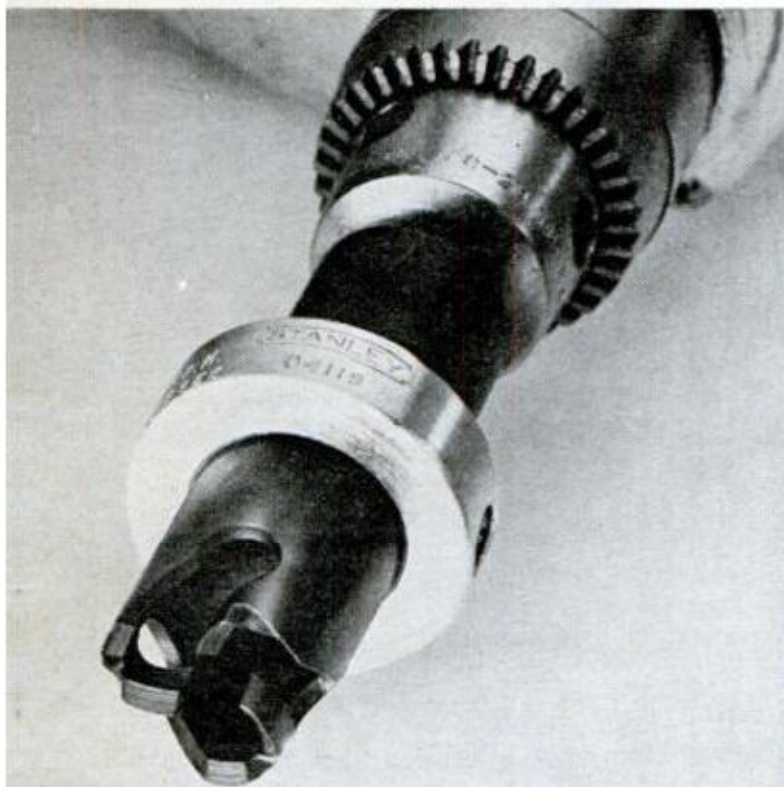
[Cold-weather starting tips 146](#)

ON THE COVER: A generous sampling from [21 pages of fascinating Christmas gifts](#)—jewelry, pull toys, household accessories—you can make from wood and sheet plastic. Photo by George Ratkai

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# Make your own furniture with Stanley's Electrichisel.™



Stanley's remarkable new Electrichisel™ tool works with any electric drill. Makes dado, rabbet and mortise cuts in wood.

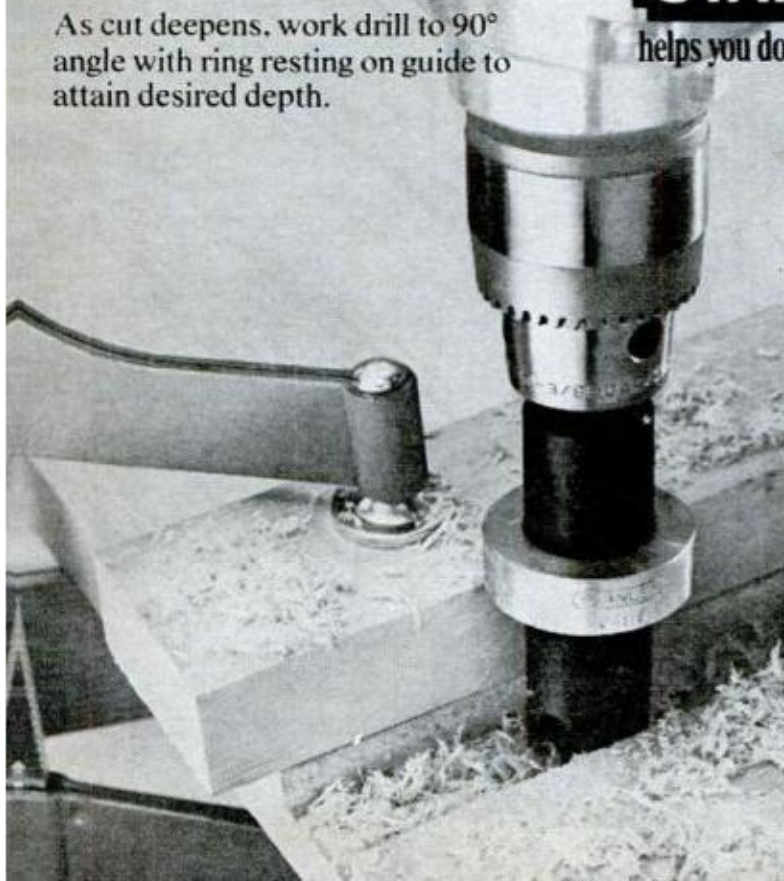
As cut deepens, work drill to 90° angle with ring resting on guide to attain desired depth.



Just clamp a guide to the wood. Set depth ring. Start cut at 45° angle and work Electrichisel back and forth along guide.

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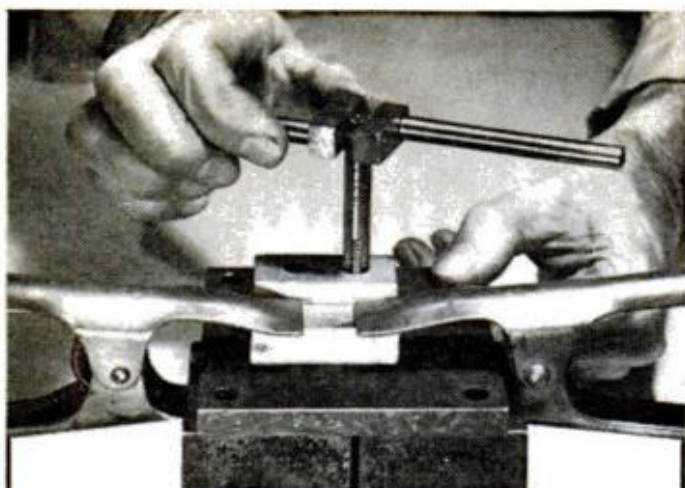
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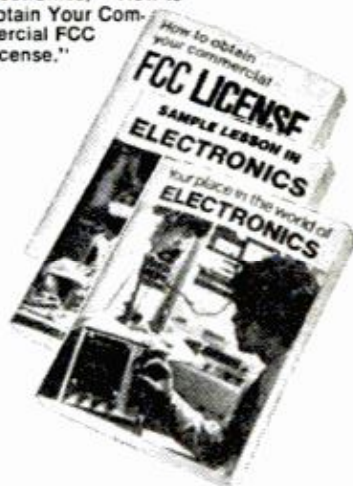
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NOVEMBER 1973

7



# LETTERS

## TO THE EDITOR

### Train has right-of-way

*Grade Crossings Take a Deadly Toll* (page 138, Sept. PM) by Jack Harrison Pollack is well-written and timely. He could have let the last line say: "Remember, the train has the right-of-way and can always prove it." I read this somewhere years ago and have never forgotten it. Make school bus drivers memorize it.

BELLAIRE, TEX.

JACK BARKER

### Carbon copy in the Bahamas

In the August *Detroit Listening Post* (page 32) you stated that General Motors in 1975 will be introducing "Vega carbons" bearing the Pontiac and Olds nameplate.

On a recent trip to the Bahamas I saw what appeared to be a Vega with a different grille and taillight treatment. On closer

examination of one of these cars, I noticed the Pontiac nameplate. Is this the same car mentioned in the column? If so, why will it not be available here until 1975?

TAMPA, FLA.

ALAN SOLOWITZ

*Yep, same car. Pontiac's already producing a derivative of Vega in Canada. It's called the Astre. It's sold in the Bahamas, but not in the United States. GM doesn't have the manufacturing capacity to produce the car here yet, but that problem should be solved by next summer.*

### Woodchopper's maul

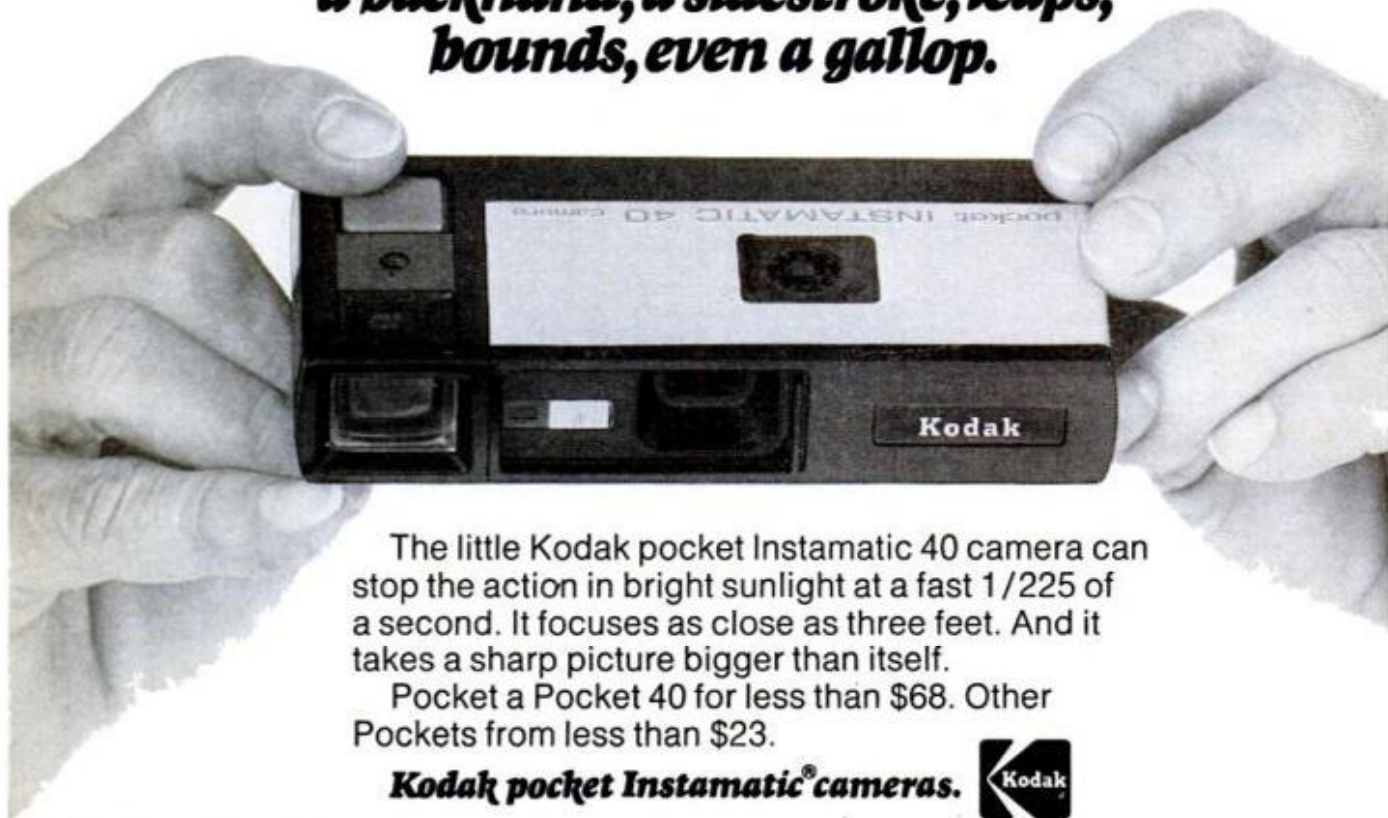
I disagree in part with *How to Fell, Buck and Limb a Tree* (page 90, Sept. PM). I have had many years' experience in tree harvesting, so I believe I can make the following comments as an expert.

When you're splitting a large-diameter log for fireplace use, it should be done when the log is green—not after it has dried out. Hickory, for instance, cannot be split when dry.

Second, when you're splitting with a steel

*(Please turn to page 10)*

***This little Pocket can stop  
a backhand, a sidestroke, leaps,  
bounds, even a gallop.***



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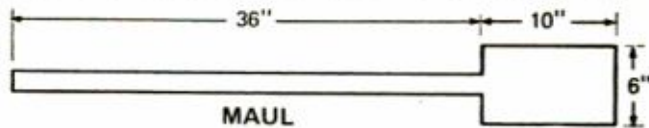
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## LETTERS

(Continued from page 8)

wedge, never use a steel sledge; the sledge steel, being softer than the wedge, will splinter and fly off in all directions. A maul should be used for this purpose. Make it from a six or eight-inch-diameter hickory tree cut close to the ground in the fall and



shaped as shown. It should dry out in the summer and be used the following fall.

COLUMBUS, GA. LESLIE W. BLOOMFIELD

### Oil, too, heats water

*How to Troubleshoot a Water Heater* (page 84, Sept. PM) failed to mention the fact that water heaters are also oil-fired.

As a matter of fact, we in the business feel that an oil-fired water heater represents the best value because of its low operating cost and better recovery rate.

CENTRAL ISLIP, N.Y. GENE GIFFORD

On page 89 you state that a water-heater tank is made of copper or glass. Copper, maybe, but glass, never! Surely you meant glass-lined. An all-glass tank would probably burst from water pressure or crack from the heat of the burner flame.

SWISHER, IOWA

ROBERT D. SMITH

### Still good after 40 years

Congratulations on your consistently concise, informative articles on practical home-built planes.

I should say, also, that I enjoy your magazine as much as, or more than, I did 40 years ago.

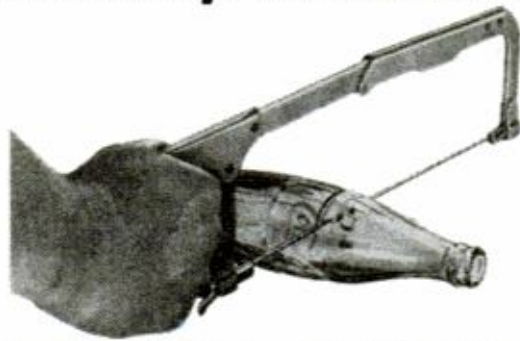
ASHLAND, VA.

D. WALTER McDOUGALL

### Rx for red eye

I was surprised by your report that the new Keystone Everflash camera does not help solve the red-eye problem (*Pocket Cameras Become Big Business*, page 128, Sept. PM). According to Keystone, the

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For more information, see your hardware dealer or write: Grit-Edge Products, Dept. 400, Remington Arms Company, Inc., Bridgeport, Connecticut 06602.

**Remington.** 

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### RECOMMENDED CUTTING APPLICATIONS FOR "GRIT-EDGE" BLADES

Material	Rod Saw	Hack-saw	Saber Saw	Circ. Saw
Ceramic Tile	X	X	X	
Slate	X	X	X	
Marble	X	X	X	
Flagstone	X	X		
Brick	X	X		
Glass	X	X		
Fiberglass	X	X	X	X
Tempered Hardboard			X	X
Asbestos Cement	X	X	X	X
Composition Board			X	X
Synthetic Marble	X	X	X	X
Plywood			X	X
Plaster			X	X
Counter Top Material	X	X	X	X
Hardwood Flooring			X	X
Stranded Cable	X	X		
Spring Steel	X	X		
Hardened Chain	X	X		
Stainless Steel	X	X	X*	
Tailpipe Bolts	X	X		
Cast Iron	X	X		

\*requires coolant and variable speed machine.

(Please turn to page 13)





# What it didn't have... held it all together...



We ran this Kawasaki 900Z 200 miles at 130.423 mph. The bike was perfectly stock, except it was missing all nine gaskets and 355 lock washers? How did our driver, champion Tom Rockwood react? Like you will. With amazement.

Permatex Gel Gasket replaced those conventional soft gaskets, and Permatex Lock-Nut the lock washers; two revolutionary products that do a better job than the parts you use now.

Permatex Gel Gasket was used

instead of gaskets on the Crankcase Split, Oil Pan, Cylinder Base, Valve Cover, Cam Chain Tensioner Housing, Kickstart Cover, Breaker Housing, Clutch Cover, and Transmission Cover—all with predicted success. We just squeezed it on, bolted it tight, and drove away.

We applied Permatex Lock-Nut instead of lock washers on 165 engine parts and 190 frame locations with equally remarkable success: a smooth steady ride,

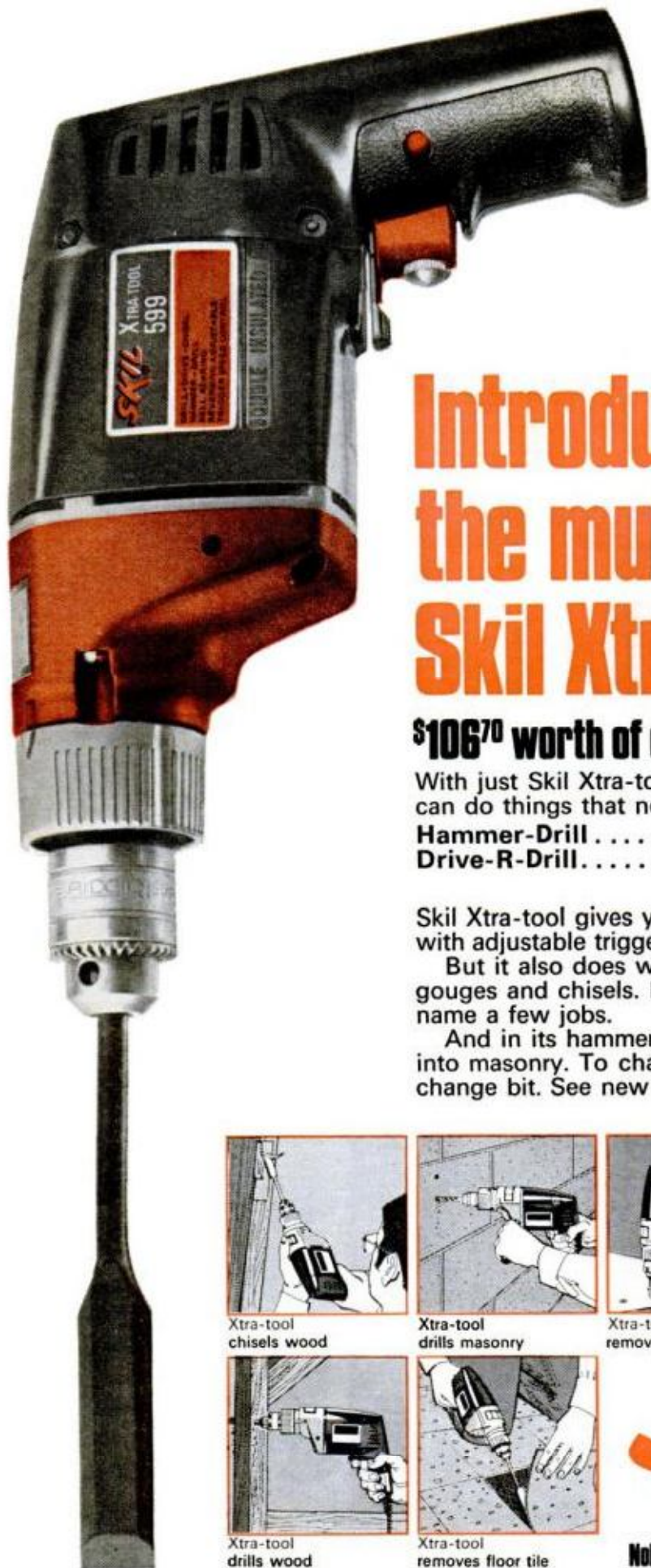
safe, sound, sure. One drop of Permatex Lock-Nut will keep any threaded connection together, and even works in the presence of grease and oil—so you don't have to worry about any special cleaning. And with over 800 applications in one handy bottle, that's a lot of extra room in your tool box.

Permatex Gel Gasket and Permatex Lock-Nut. Performance you can depend on. Our name is our bond.



PERMATEX COMPANY, INC., P.O. Box 1350, West Palm Beach, Florida 33402 • 305/686-0880 • Telex 513-417





# Introducing the multi-purpose Skil Xtra-tool.

**\$106<sup>70</sup> worth of capabilities for just \$49<sup>99</sup>.**

With just Skil Xtra-tool and available accessories you can do things that normally require two different tools.

Hammer-Drill .....	\$ 66.75 *
Drive-R-Drill .....	39.95 **
	<u>\$106.70</u>

Skil Xtra-tool gives you all the capabilities of a  $\frac{3}{8}$ " drill with adjustable trigger speed control, forward and reverse.

But it also does what no drill can do. It scrapes, gouges and chisels. Removes paint, putty, rust. Just to name a few jobs.

And in its hammer-drill mode, Xtra-tool drills quickly into masonry. To change mode, just rotate collar and change bit. See new Skil Xtra-tool. A drill. A hammer-drill.

All for just \$49.99.

\*Price based on averaging of retail prices for suggested competitive products.

\*\*Price based on Skil suggested retail price. Details available on request.



Xtra-tool  
chisels wood



Xtra-tool  
drills masonry



Xtra-tool drives,  
removes screws



Xtra-tool  
drills wood



Xtra-tool  
removes floor tile

# SKIL

**Nobody was ever sorry he bought the best there is.**



## LETTERS

*(Continued from page 10)*

distance between lens and flash unit is sufficient to reduce the red-eye problem substantially. This is one of the camera's big advantages.

On the other hand, you might have tested a Pocket Everflash and come up with different results. Was this the case?

NEW YORK

SAUL BENNETT

*You're right, we were talking about the Pocket Everflash—as we thought was made clear in the context.*

### Now Olds is quiet as a graveyard

I can't tell you how grateful I was to find the solution to an annoying rattle in my 1972 Olds Delta 88 in your July *Car Clinic* ("Nesting Birds," page 32). This noise had been driving me up a wall for nearly three months, and once I had the parking brake cables lubricated it stopped entirely.

Now my Olds is quiet as a graveyard.

JOHN B. HASTINGS

GROSSE POINTE WOODS, MICH.

### Likes Teenie better

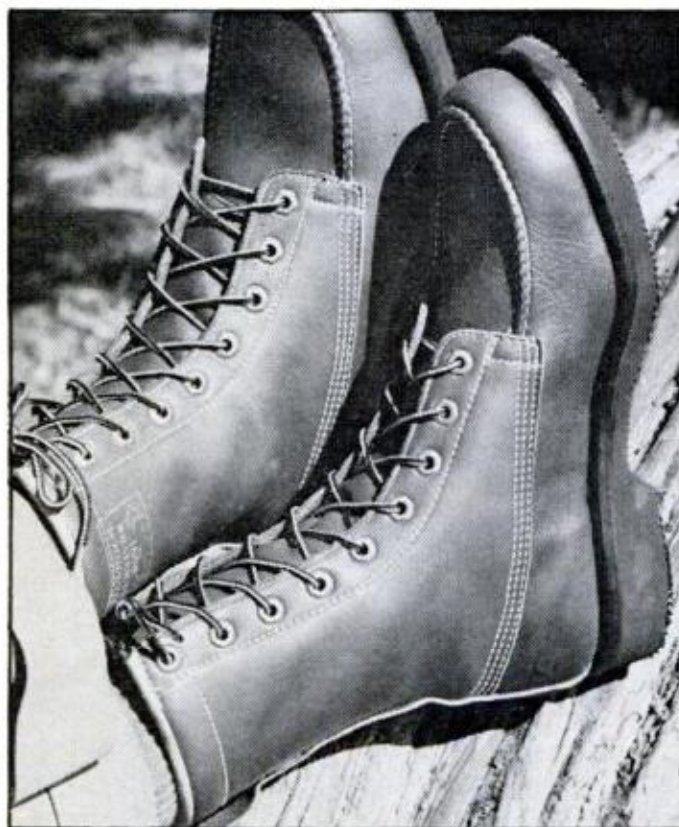
There is a homebuilt design which years ago met and exceeded most of the design and flight criteria outlined in your article on the Pazmany PL-4A (*Breezy Little Homebuilt: A Beginner's Dream Plane*, page 127, June PM).

The Teenie Two was designed by Calvin Parker for the first-time builder. It requires only the most basic tools. It is all metal, pop-riveted, has a single seat and tricycle landing gear and is direct-drive Volkswagen powered. The original Teenie Two has been flying since 1969. There are several Teenie Twos flying or under construction. My own is 50 percent complete.

On several occasions I've had the pleasure of flying the Teenie Two. It offers the first-time builder a safe, easy-to-fly airplane

*(Please turn to page 14)*

# HERMAN SURVIVORS®



We build Herman Survivors® to do two things well: Cover a lot of territory in great comfort. And stand up to the kind of punishment outdoorsmen give them. In any kind of weather. That's why we build the uppers of soft, durable burgundy full-grain glove leather, line them with Ensolite® for warm feet right down to  $-20^{\circ}$ , then line the whole upper and soft padded cushion insole with saddle tan full-grain cowhide for even greater comfort. After that we stitch the boot down to resilient, oil-resistant Neoprene® crepe soles and heels. These Hermans come in two styles: 8" insulated boot, #7192, and 6" insulated shoe, #7192-6. They're tough. And they're comfortable. Like all our boots. When you're looking for quality in an outdoor shoe, hunt up a pair of Hermans.



FREE CATALOG

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_

ZIP \_\_\_\_\_

J. M. HERMAN SHOE COMPANY,  
DEPT. 34, MILLIS, MASS. 02054

That sounds like my kind of boot.  
Send me your catalog and the name  
of my nearest Herman dealer.

PM-BGL-3-11



# SUPER CAULK™

## Guaranteed for 20 Years

- Macco Acrylic Super Caulk will not lose adhesion, crack, bleed, stain or discolor
- Adheres to all common building materials
- May be painted within 30 minutes with oil base or latex paints
- Resists dirt pickup
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- For use inside or outside the home



**Guarantee:** Macco Adhesives guarantees that if Macco Acrylic Super Caulk is used as directed and fails within 20 years after application, Macco will replace an equal amount of material at no cost after inspection, and upon submission of proof of purchase to Macco. This guarantee applies to residential use only.

**MACCO ACRYLIC SUPER CAULK.**  
IT'S CALLED SUPER FOR A REASON.

**SCM MACCO ADHESIVES**  
SCM CORPORATION, WICKLIFFE, OHIO 44092

## SHIP MODELS



From our own workshop: finest quality wood ship kits—clippers, schooners, frigates, tankers, freighters—39 in all. Beautiful fittings; no lead or plastic. Also plans, books, whales, marine prints and decoration. At better dealers or send 50¢ for big illustrated catalog.

**BLUEJACKET**  
SHIP CRAFTERS

145-D Water St. S. Norwalk, Ct. 06854

## Mini-Kites

Mini-kites are only 6 inches high. These small box kites done in bright colors are remarkable fliers. Interesting and attractive conversation pieces too; and because of their small size, high angle of flight and ease of flying, they are especially suitable for children and congested areas. Excellent gifts and for year round flying. Come sturdily packaged and ready to fly on 125 yards of string, included.

Each prepaid in U.S.A.—\$3.00  
Two for \$5.00

MINI-KITE COMPANY

Satellite Beach, Florida 32937

Box 2067

14 POPULAR MECHANICS

## LETTERS

(Continued from page 13)

with a minimum of work, in a minimum of time and with a minimum expenditure.  
EL CAJON, CALIF. RICHARD W. SEVERSON

*We were pretty sure that Teenie Two is a good airplane, too, back when we printed an article about it (Now: Teenie Two, page 94, May '71 PM) and offered plans. They are still available for \$35. Order plan No B1270 from Popular Mechanics, Dept. CO, Box 1014, Radio City, N.Y. 10019.*

## Prizewinner

Following plans in *This Christmas Wish the World Peace* (page 152, Nov. '71 PM) I built the poster with some minor modifications. I attached a small rubber-tired wheel to each leg of the frame for rolling it in and out of the garage and suspended the whole thing from the overhead beam across the front of my garage.



The poster won third prize in the 1972 Newport Christmas decorating contest with hardly any additional decoration—only a few strings of colored lights around the garage door and front windows. I hope to shoot for another prize next Christmas!  
NEWPORT, ORE. CLYDE SLOAN

## Car Care Guide again available

I would like to know if I can obtain a copy of the May 1973 issue of *PM* containing the *Car Care Guide*. Or is a reprint available?  
READING, PA. VINCENT GRUPI

*The Car Care Guide is included in the 1974 Car Repair Annual, which went on sale recently. If you can't find the annual on your newsstand, order it for \$1 from Popular Mechanics, Dept. JL, Box 1014, Radio City, New York, N.Y. 10019. ★★★*



# SIX REASONS WHY YOU SHOULD PUT FIRESTONE STEEL RADIAL 500 TIRES ON YOUR CAR VERY SOON.

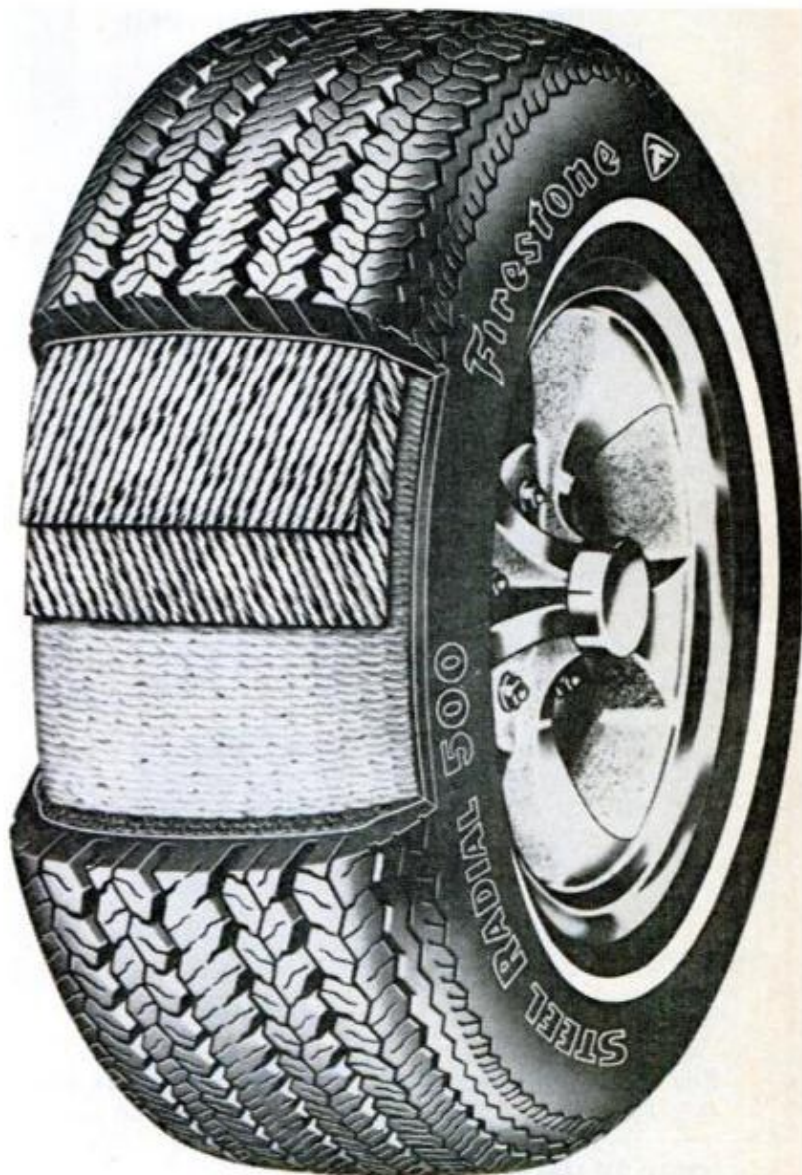
- 1 They will put steel between you and tire trouble.** Two strong belts of brass plated high tensile steel cord are under the tread to stand up to chuckholes, curbs and roadjunk.
- 2 They are guaranteed for 40,000 miles.** When you think most people drive about 12,000 miles a year, imagine how long these tires should last.
- 3 They will give you better handling, more precise steering than any conventional tire we've ever made.** The steel belts stabilize the tread, help hold it to the road to deliver better handling and better cornering.
- 4 They are the quiet radials.** Compare the radials — you'll find Firestone has a computer designed, logarithmic tread pattern specially designed for quiet running and quiet cornering.
- 5 Firestone gives you 7 days to test the ride.** If you're looking for a smooth-riding radial, read our offer below.
- 6 We'll help you out when it comes to paying for them.** Your Firestone Revolving Charge, Master Charge, BankAmericard, Carte Blanche, Diners Club and American Express Card are good at most Firestone Dealers and stores.

#### OUR 40,000 MILE GUARANTEE

The Steel Radial 500 by Firestone is guaranteed to give you 40,000 miles of treadwear in normal passenger use on the same car. If it doesn't, take your guarantee to any Firestone Store or participating Dealer. He'll replace the tire with a new one and give you credit for the mileage not received based on the then current adjustment price (approximate national average selling price) plus Federal Excise Tax. A small service charge may be added.

#### OUR 7 DAY TEST RIDE

Trade in your old tires on a set of Firestone Steel Radial 500's at any Firestone Store or participating Dealer. Drive on them for seven days. If you don't like the way they handle—or ride—return them within seven days and they'll put your old tires on again and refund your money in full.



## Firestone

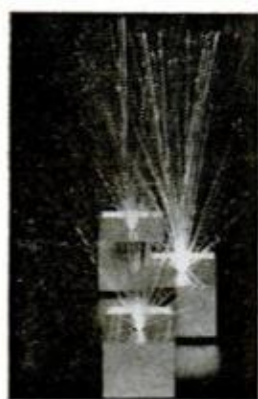
The people tire people



# DECEMBER PREVIEW

## OF POPULAR MECHANICS

What's new and different in Christmas decorations: Best of what's new is what *you* create with your hands and ingenuity,



so we suggest: **Optical fibers** made of flexible hollow plastic transmit light and let it spill out of the end like water. These are now available in kits and PM shows you how to use them to make handsome Yuletide and year-round gifts. . . .

**Snow candles** are made by pouring molten wax into snow. The technique is simple; the results simply beautiful. . . . **Outdoor decorations** include a tree you can make from painted cans which are illuminated from within by miniature bulbs. The tree appears to be made of large colored spheres.

Two new VW-powered planes that can be built from plans and kits are shown



for the first time. The Scamp, a biplane, and the Quail, a monoplane, are single-seaters that are designed for easy construction by the home-builder and for flying out of pasture strips. The Scamp can be built within six months—you can get started now and be flying it next summer.

What's new under the sun? A **solar-powered watch** that's a spin-off from space research. . . . **New winter gear and snow glasses** that evolved from snowmobiling.



. . . **New winter driving techniques** for four-wheel drive vehicles. . . . **New meters** that help fishermen find fish. . . . **New guns, new boats, new radios, new digital clock kits, new hobby kits, new light on the energy crisis and a new way you can go into business for yourself.**



Plus the know-how that will make your around-the-house jobs easier: **How to repair a gas clothes dryer • How to sharpen almost anything • The choice and care of paint rollers • What you should know about fuses.**

**Buy it on your newsstand. Better yet, make sure you'll keep getting this kind of exciting fare. Send this coupon with your check to:**

**POPULAR MECHANICS**  
250 West 55th Street  
New York, New York 10019

Please enter my subscription for  1 yr. \$5.97 or  2 yrs. \$10.97

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Payment of \$ \_\_\_\_\_ is enclosed.  New  Renewal

On new subscriptions, first copy will arrive in about 8 weeks.

(Above prices apply in U.S. and Possessions only. Canada, add \$2 per year. All other countries, add \$4 per year.)

WPM3K1



New square-cornered Sylvania picture tube

Handsome woodgrain cabinet, at no extra cost. (Offered only by NRI)

6-position detented UHF channel selector

Modular construction with plug-in circuit boards

Automatic color control

Automatic degaussing

Automatic tint control

100% solid state chassis

Automatic fine tuning



## NOW... learn color TV servicing while building this NEW 25" DIAGONAL SOLID STATE SET created by NRI for home training

NRI wanted more than a hobby kit TV . . . so we built one from the circuits up, specifically for teaching advanced electronics. You can only get this superb set from NRI . . . it's exclusive with NRI Color TV Servicing Course.

NRI was first to supply home study students with custom-designed training kits to give practical hands-on experience as you learn. Now NRI scores another first . . . with the exclusive 25" diagonal picture tube, solid chassis, color TV set designed-for-learning. You build it yourself with NRI's TV-Radio Servicing Course.



*Kit for kit, dollar for dollar, you get more for your money from NRI.*

The TV-Radio Servicing Course includes a wide-band service type oscilloscope and a color bar cross-hatch generator . . . along with

other valuable equipment you will use to perform experiments and make repairs on your own and other sets.



You'll soon find yourself earning \$5 to \$7 an hour, in your spare time . . . even before the course is completed.

Learning at home is easy . . . the simplified NRI way. Texts are "bite-size" and fully-illustrated, leading you step by step, stage by stage, to a thorough

knowledge of electronics. You can introduce defects into circuits, perform experiments, and discover the how and why of circuitry and equipment operation.



### Train with the Leader—NRI.

The same training innovations which have made NRI the leader in career training at home are now available to you. Mail the insert card for a free full-color catalog which spells out the NRI "discovery" method of learning. There's no obligation. NO SALESMAN WILL CALL.

**APPROVED UNDER NEW GI BILL.** If you have served since January 31, 1965, or are in service, check GI line on reply card.



**NRI TRAINING**  
3939 Wisconsin Avenue, N.W.  
Washington, D.C. 20016





## ALL OUTDOORS

### Endangered

Animals threatened with extinction receive a great deal of their protection from our leading conservationists: the hunters, target marksmen, arms and ammunition companies. An excellent 28x43-inch poster in color illustrating 26 species on the endangered list is offered for \$1 by Crosman Arms, the maker of BB and pellet rifles. Write Endangered Species Poster, Crosman Arms Co., Box 355P, Newark, N.Y. 14513.

Snowmobilers endangered by weather, lack of maintenance, handling techniques or their own carelessness can now get good instruction from many safety education programs. Arctic Cat has prepared a new student manual for drivers taking Snowmobile Operator Responsibility Training, a course that provides basic instruction for owners. Groups may obtain information about the program from local dealers and Arctic Enterprises, Thief River Falls, Minn. Scorpion, Polaris and Bombardier Ski-Doo also offer training aids.

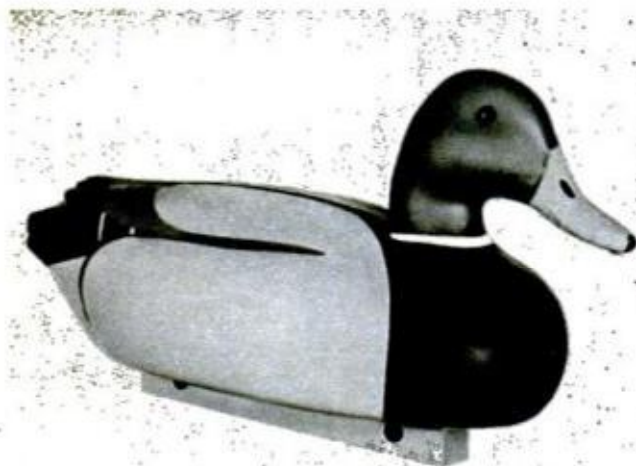
### Preserved

With urban sprawl encroaching on hunting areas, a handy answer for many sportsmen this time of year is the shooting preserves in the United States, Canada and Mexico. A listing of hundreds of public daily-fee preserves, giving season dates and cost of non-

*(Please turn to page 24)*



**Chevrolet's recreational lineup for '74 has 14 station wagons and trucks. K-20 pickup (top) has full-time four-wheel drive. Center is dual-rear-wheel pickup crew-cab model. New Cutaway Van (above) offers either dual or single rear wheels for popular mini-motor home "chopped van" vehicle conversions.**



**Decoys of a dozen mallards or black ducks (six drakes, six hens) can be made from finish-it-yourself kit for \$26.95. Included are 12 solid foam-plastic bodies, hand-blown glass eyes, mahogany keels, epoxy, sandpaper, paint kit (10 colors for mallards). Keyser Decoys, Industrial Hwy, Southampton, Pa. 18966.**





There's a lot of good  
between "Winston..."



and should."

Winston tastes good **GOOD**, like a cigarette should.

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

© 1973 R.J. REYNOLDS TOBACCO CO.  
20 mg. "tar", 1.4 mg. nicotine av. per cigarette, FTC Report FEB. '73.

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# EMPEROR GRANDFATHER CLOCK

## DO-IT-YOURSELF CASE KIT

MODEL 120 IN SOLID 3/4 INCH CHERRY

SALE  
PRICED **89.50**  
REGULARLY  
\$129.50

Finished Model 120 in cherry shown

All pieces pre-cut and pre-sanded at the factory. Breakfront swan neck crown and finial, waist and dial doors, dial frame and sculptured base-front factory assembled by skilled cabinetmakers. Complete hardware and assembly instructions furnished. Each piece may be re-ordered separately. No woodworking experience necessary.

## NOW A FIRST FROM EMPEROR

### FOR THE VERY FIRST TIME . . . IN CHERRY

Since colonial days cabinetmakers and woodworkers have chosen cherry for its distinctive natural color and beautiful, close grain. Now you can share in this American heritage of craftsmanship. Emperor's stately Model 120 (America's most popular grandfather clock) is now available in lustrous cherry. The rich look and resonant quality of this fine hardwood enhances the desirability of this elegant timepiece. Build it yourself, and enjoy that rare feeling of self-accomplishment that comes from one's own workmanship. The Model 120 Do-It-Yourself Case Kit is easy to assemble and contains all the wood parts you need. The movement is ordered separately from Emperor.

### ENJOY DOUBLE SAVINGS

You save on this beautiful cherry grandfather clock because you build it yourself. And you save even more now, because the Model 120 solid cherry case kit is sale priced at just \$89.50. Save \$40.00 from the regular price of \$129.50. Install the movement and save hundreds from the price of comparable grandfather clocks retailing up to \$600. There is no better reason to order this beautiful clock now, adding "the final touch of elegance" to your home, while creating an heirloom for generations to come.

#### MONEY BACK GUARANTEE

If not completely satisfied, return in original shipping carton within thirty days for complete refund. No questions, no excuses.

**ORDER NOW . . . IN TIME FOR CHRISTMAS**— Emperor Grandfather Clocks are a pleasure to give . . . a joy to receive. By ordering now, your kit will arrive in time to build for yuletide enjoyment.

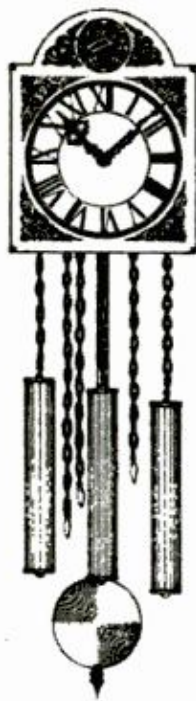
SEND FOR FREE COLOR BROCHURE  
OF COMPLETE EMPEROR LINE

OFFER GOOD THROUGH DEC. 31, 1973



Model 120, Solid 3/4" Cherry  
74"x16 3/4"x10"





100-M Movement  
with Tempus Fugit  
Dial  
**\$89.50**

# EMPEROR MOVEMENT FOR MODEL 120

**WEIGHT-DRIVEN—EIGHT-DAY—WESTMINSTER CHIMES**

Emperor's 100-M grandfather clock movement is produced in West Germany by proud clocksmiths who, for over a century, have been manufacturing the world's finest movements.

Embossed overlays surround the solid brass dial. The face has a high, permanent polish and serpentine hands. In the arch above the dial is a shaped aluminum world with the words "Tempus Fugit" (Time Flies) inscribed in black enamel. Or, if you prefer, the classic moving moon with lunar calendar.

The completely weight-driven movement strikes the famous, melodious Westminster chimes on four musically-tuned rods; four notes on the quarter-hour, eight on the half-hour, twelve on the three-quarter hour, and sixteen on the hour. The hour is struck on four additional tuned rods. The Emperor movement includes weights, solid brass weight shells, brass bob, pendulum and chimes. All plates are solid brass, and pinions are hardened steel. Installation and adjustment of the movement is simple, following the step-by-step instructions.



100-M Movement  
with Moving Moon  
Dial  
**\$99.50**

**ONE YEAR UNCONDITIONAL GUARANTEE**

## MERRY CHERRY AT CHRISTMAS SAVINGS!

**ORDER NOW!... DIRECT WITH THIS FORM!**  
**OFFER GOOD THROUGH DEC. 31, 1973**

CLOCKS, KITS, MOVEMENTS SHIPPED 2 TO 3 WEEKS, SHIPPING CHARGES COLLECT  
WORLD'S LARGEST MANUFACTURER OF GRANDFATHER CLOCKS

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Emperor Industrial Park, Fairhope, Alabama 36532

Please Check:  
New Customer   
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QUANTITY	DESCRIPTION	WEIGHT	REG. PRICE	SALE	EXTENSION
	Model 120-K Do-It-Yourself Case Kit, Cherry, w/o movement	53	\$129.50	<b>\$89.50</b>	
	Model 100-M movement complete with Tempus Fugit dial, Westminster Chimes for Model 120	32	\$89.50		
	Model 100-M movement complete with moving moon dial, Westminster Chimes for Model 120	32	\$99.50		

We accept personal checks.

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TOTAL \$ \_\_\_\_\_

Alabama Residents

ONLY Add 4% \$ \_\_\_\_\_

GRAND TOTAL \$ \_\_\_\_\_



Please send FREE color brochure on complete Emperor line

VISIT OUR FACTORY SHOWROOMS MON.-FRI., 8 AM to 5 PM, EMPEROR INDUSTRIAL PARK, FAIRHOPE, ALA.

NOVEMBER 1973

23



## ALL OUTDOORS

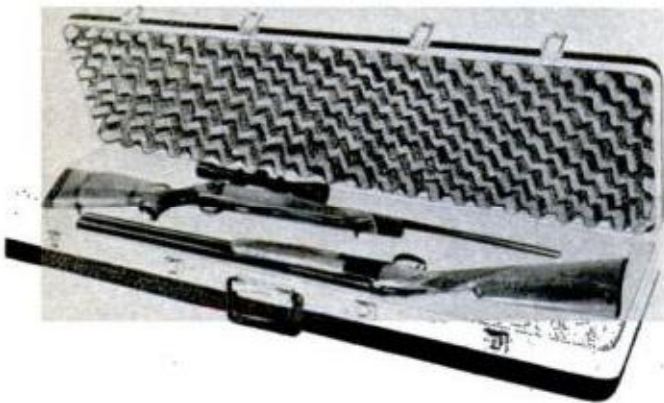
(Continued from page 20)

resident hunting licenses as well, is found in the *1973-74 North American Shooting Preserve Directory*, 25 cents from the National Shooting Sports Foundation, 1075 Post Rd., Riverside, Conn. 06878.

### Coming events

Nov. 9-18, Southern California Boat Show, Los Angeles Convention Center; Nov. 10, Hennessy Key West Offshore Race, Key West, Fla.; Nov. 10-11, Regional Pistol Championships, Tampa, Fla.; Nov. 12-23,

(Please turn to page 26)



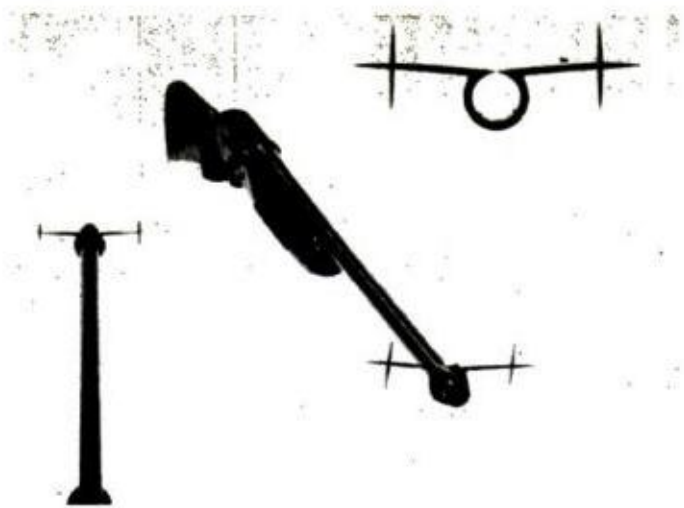
### Polyfoam protection

Grand National gun case, 54x12x5½ inches, is large enough for scoped rifles or shotguns on bed of foam for full protection. Brown or black case is \$45 from Olympic Luggage, Box 161, Kane, Pa. Pistol case is \$20.



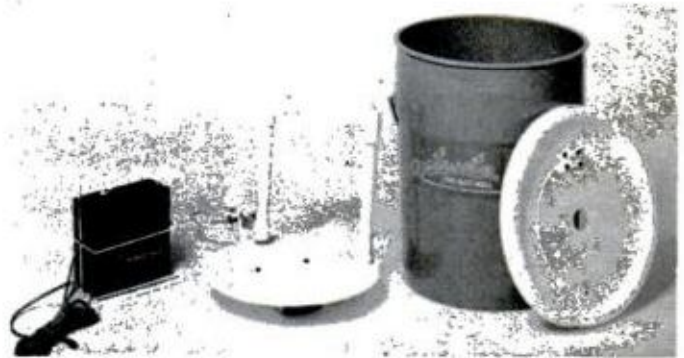
### Hunting stand

Apache Port-A-Stand rides into the woods on hunter's back and assembles quickly for lookout set 10½ feet high. Stand can even be used as game litter to carry out trophy. Weighing less than 17 pounds, it's available for \$65 from Sporting Products, West Monroe, La.



### Shotgun sight

Duk Hit, a new shot-shooter accessory, slips on 12 and 16-gauge single-barrel guns without tools and is claimed to give 80 percent improvement in figuring lead. D.D. Ritter, 22244 Archwood, Canoga Park, Calif., \$5.



### Live bait well

Water-ator, operating from 12-volt d.c. car or boat battery or rechargeable power pack, also comes as ice chest aerator. Sportsraft, Chelsea Place, Houston.



### Lantern reflector

Generations of outdoorsmen have suspected the Coleman lantern couldn't be improved, but now a heat-resistant plastic and aluminum reflector aims the light while protecting hands. Fits 220 and 228 model lanterns.



## THE '74 VEGA GT. EVERYBODY LOVES A WINNER.

In three short years Vega has won more automotive honors than any other American-built economy car, and has become one of the best selling cars made.

So what do we do? We change it.

But not without darn good reasons.

We reshaped the front end with the intention of making Vega stronger, not prettier. With tougher bumpers. And cooling slots in place of a grille.

Instead of grasshopper legs to support the hatch, you get hydropneumatic arms for easier opening.

On the lighter side, you also get nicer carpeting, and a bigger selection of available fabrics and colors and vinyl

roofs and stripes and that sort of thing.

But, more than ever you want economy, of course. So we've improved the Vega overhead cam engine with modifications in the carburetor linkage, the inlet manifold and so on. And we've even increased the size of the fuel tank—so you can go farther between stops.

Vega honors include: *Car & Driver* Readers' Choice, Best Economy Sedan, '71, '72, '73. *Motor Trend*, Car of the Year, '71. Economy Car of the Year, '73 Vega GT. *Motor Service & Service Station Management* mechanic survey, Easiest Subcompact to Service, '72.





## ALL OUTDOORS

*(Continued from page 24)*

World Moving Target Championships, Melbourne, Australia; Nov. 21-25, St. Petersburg Sailboat Show, Bayfront Yacht Basin, St. Petersburg, Fla.

---

### Ready to tow

Dodges for '74 can be ordered fully factory equipped with hitch or hitch platform, dual battery charging system circuitry, electric wiring harness and connector, trailer brake provision—all set for trailer hookup. ★★★



### Convertible chest

On its side this new oversize ice chest can serve as a 2.7-cu.-ft. vertical refrigerator. Back down as top opener, Covey Convertible is heavy-duty 80-quart chest, seat, live-bait tank. From Covey Corp., Houston.

---



### Underwater detector

Keys, valuables dropped overboard can be located by diver with new Goldmaster Amphibian from White's Electronics, Sweet Home, Ore. Optional headphone and hood, shown, is used instead of built-in speaker.



### '74 outboard

Expanded line of outboard motors from Sears has been announced with introduction of this 15-hp unit. Others include twin-cylinder 9.9 hp, 7.5-hp water and air-cooled motors, plus new air-cooled 5 and 3-hp sizes.

---

### Hunting coat

New with full back covering of blaze fabric for high visibility, Sears jacket is about \$18 from catalog and stores. Also available is special Winter Sports Catalog offering skis, skates, cold-weather clothing.





# Switch from what you're used to.



Would you like to become less dependent on cigarettes? Would you like to smoke less? Or inhale less?

Then you ought to think about switching to new Dutch Treats. The filtered little cigar with a taste that's different from cigarettes but very satisfying.

**Dutch Treats**  
could change the way you smoke.





# Drive to South America?

Here's how to go  
all the way by family car.

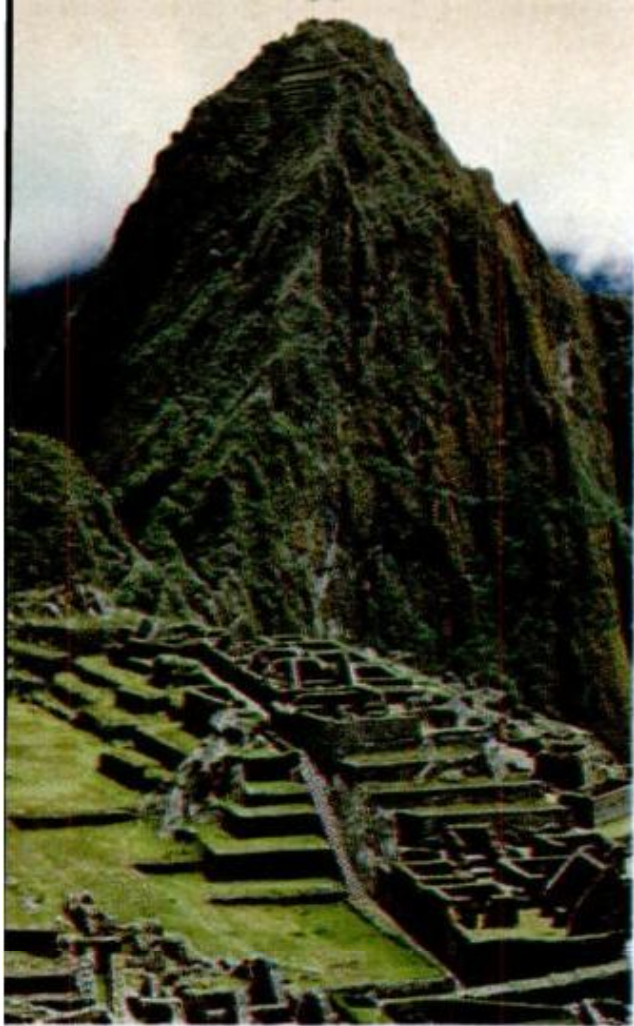
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by Ernst Jahn

**Recreational vehicle** owners who follow the Pan American Highway will find photo subjects like this Andean girl, plus mountain villages and ancient ruins.







**High above Sugarloaf and Copacabana beach** of Rio de Janeiro, a trip can begin or end if you drive halfway and then trade off with friends who have flown down to complete the trip by land while you return by air.

**Machu Picchu**, ruins of the lost city of the Incan civilization, is a side trip when you leave the Pan American Highway at Lima, Peru, and drive high into the Andes. The city is reached by 3000 hand-hewn steps.

**T**he Pan American Highway is no longer a dream. Today 92 percent of it is paved and South American border procedures are much easier than a few years ago. On a recent return tour of this vast, amazing continent, my wife and I had to open the doors of our camper only once for customs inspection during 26 border crossings.

Living costs are still remarkably low. A filet mignon dinner with a bottle of wine in Rio de Janeiro was just one dollar, and two pounds of well-aged steak at a butcher store in Argentina cost 80 cents. Gasoline in Colombia averaged 15 cents a gallon for standard and 21 cents for premium. It was even less in Venezuela.

Jungle animals are no problem: The jaguars, poisonous snakes, anacondas, crocodiles and man-eating piranha you hear about keep their distance if you keep yours. You have to go far off main routes to find them. But along the highway we saw llama, vicuna, deer, sea lion, fox, ostrich, rhea, penguin and a lot of wild fowl.

On our latest trip we flew to Rio to pick up the camper of stateside friends who had driven it down. Most people on their first excursion begin in Mexico and head south. From the United States, the Pan American Highway crosses Mexico to Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama. Through Central America it winds along, below, around and through the mountains that are the backbone of the Americas.

Beyond Panama is the only break in the highway. Here the road is under construc-



**Native market shopping** keeps costs low for the RV tourist. In Cuzco, the ancient capital of Peru, poncho-clad Indians display their wares. Beyond, the road leads up to Lake Titicaca, at a 12,600-foot elevation, and Bolivia.



## One-fifth of highway is above 10,000 feet



High suspension bridges swing Pan American Highway across Peruvian valleys between passes through Andes, make easy grades for camper driving. Approaching a narrow bridge, first car to blink headlights has the right-of-way.



Car ferry across the Straits of Tiquina on Lake Titicaca, elevation 12,600 feet, uses an outboard motor for power. Route is a side-trip to Cuzco, Peru, and La Paz, Bolivia.

tion and will require 130 bridges before it is completed through the Darien jungle several years from now. At present, your car goes by boat to Cartagena, Barranquilla, or Buenaventura in Colombia, or La Guaira, Venezuela. Shipping cost for an average camper plus two passengers is \$200.

From these ports the Pan Am Highway heads south through spectacular Ecuador and Peru. A side trip from Lima, up into the Andes, leads to Cuzco, ancient capital of Peru. Beyond, on the road to La Paz, Bolivia, you can cross the world's highest navigable lake, Titicaca, at 12,600 feet. An outboard-powered ferry takes you and your car across the Strait of Tiquina for \$2.

A branch of the highway goes east from Bolivia across Paraguay, through Asunción to Argentina. An alternate route south through Chile first crosses hundreds of miles of the Atacama Desert, then goes through valleys of the mountains surrounding Santiago. From here the route east swings upward through the Bermejo Pass over the Andes; during heavy winter snows you can drive through the international rail-

*(Please turn page for map of Pan American highways; text continues on page 34)*



# CHEVY

Our Cheyenne Camper Special

# CAMPER TAMER



## Pickups engineered with campers in mind

Underneath, there's an improved brake system because front disc/rear drum brakes are computer-matched to truck GVW rating. A massive Girder Beam front suspension and Load Control rear leaf springs to help smooth the ride. Tough double-wall construction in the cab and body.

Inside, there's a foam-padded seat cushion almost 7 inches thick. Insulation in the cowl, floor and roof. You can order power steering and Turbo Hydra-matic transmission. And Chevy's remarkable Elimipitch camper stabilizer system that dramatically reduces camper body surge and chucking.

Another result of all this built-in toughness and comfort is built-in value. Value you can appreciate day in, day out, day off.



## Camper Special Package

On  $\frac{3}{4}$ - and 1-ton Chevy pickups equipped with a 350 or 454 V8, larger tires, and Turbo Hydra-matic or 4-speed manual transmission, you can order the Camper Special equipment package that includes heavy-duty suspension, a camper wiring harness and front stabilizer.

## Deluxe Camper Special Package

In addition to the Camper Special equipment, this package includes camper Elimipitch shock absorbers, camper tie-downs and a rear stabilizer bar.

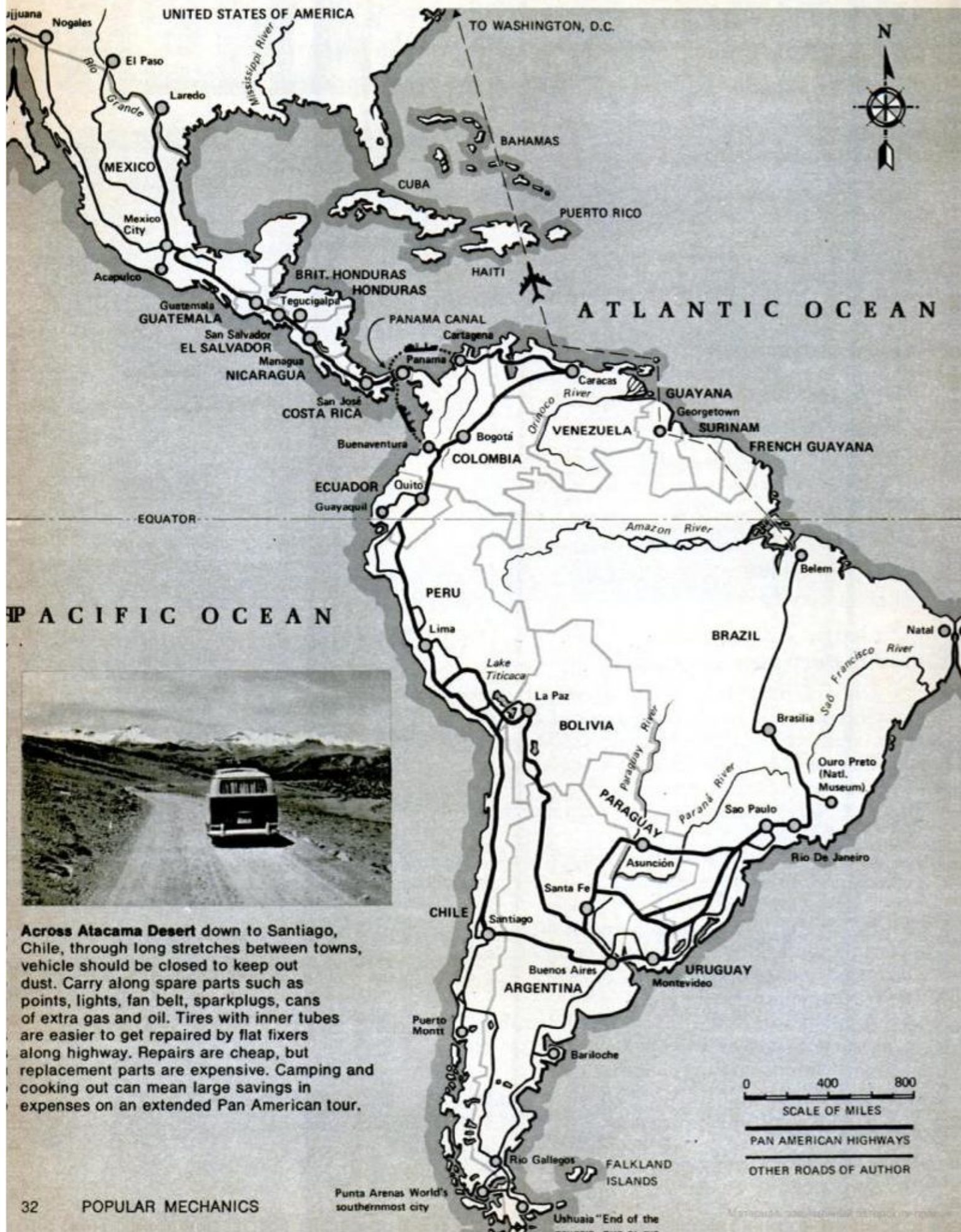
Building a better way

**Chevrolet**

to see the U.S.A.



# Colorful weeks or months can be spent on route



Across Atacama Desert down to Santiago, Chile, through long stretches between towns, vehicle should be closed to keep out dust. Carry along spare parts such as points, lights, fan belt, sparkplugs, cans of extra gas and oil. Tires with inner tubes are easier to get repaired by flat fixers along highway. Repairs are cheap, but replacement parts are expensive. Camping and cooking out can mean large savings in expenses on an extended Pan American tour.

Punta Arenas World's southernmost city

Ushuaia "End of the world"



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Get hold of  
honest taste..

Have an  
Old Gold.



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

20 mg. "tar," 1.3 mg. nicotine  
av. per cigarette, FTC Report Feb. '73



## Cheap repairs, expensive parts, are available

way tunnel instead. A two-day run through the Pampas brings you to Buenos Aires.

The highway turns north through Uruguay to Brazil and Rio de Janeiro, the "marvelous city" as it's called in Portuguese by Brazilians. Mountains and jungle slope steeply down to the beaches of Copacabana and Ipanema. Inland several hundred miles, Brasilia, the new capital city, marks the end of the Pan American with ultramodern skyscrapers and architecture.

To complete a circuit of South America the Brasilia-Belém Highway stretches 1300 miles north through the Mato Grosso region and Amazon Valley jungles. It is gravel surfaced but continually maintained for the never-ending flow of truck traffic. Pavement is scheduled for 1974 completion, and there is twice-a-week bus service. Overnight accommodations at local inns on the way are 15 cents for a hammock, 25 cents for a bed. To keep costs down, the secret is travel by camper, motor home or trailer, eliminating hotel and restaurant expense. Campgrounds are becoming increasingly available, (one Brazilian chain now has 42), but on our most recent trip from Rio de Janeiro to La Guaira, Venezuela, we parked instead at picturesque shoreside or mountain spots off the highway. In large cities, for a few cents a night, we parked at truckers overnight filling stations or in hotel parking lots with the permission of the manager. Meals averaged \$1.35 per day for food bought in local markets. Total gasoline bill was \$250; car repairs including flats were \$68. Expenses for four months along the highway came to \$480, and \$380 more shipped the

camper from La Guaira back to New York.

Before starting, you'll need a passport for every country except Mexico. A tourist card can be obtained from the consulate of the country you are about to enter. Required Inter-American Registration and Driving Permits are \$5.50 from the American Automobile Assn. (AAA) and a Carnet de Passage en Douanes is \$35.

Most cities and towns have servicing facilities for any car. Repair shops are efficient and cheap; spare parts are generally available, but expensive. It's well to carry sparkplugs, points, condensers, fan belt, wire, headlights, several feet of garden hose, spare cans of gas and oil, and inner tubes. Tires with tubes are easier to patch and there are plenty of "vulcanizadores" (flat fixers) along the way. If your engine is a high-octane, high-compression job have it tuned down for the low-test you're more likely to find. Try to seal your vehicle from inside; in some remote areas, dust may become unbearable.

Best months for driving the highway are January through April (South American autumn) to avoid the rainy season, and the best hours are during daylight. At night pedestrians may be walking the roadway or cattle sleeping on the warm pavement. But the highway is well built and wide with gradual inclines, and any recreational vehicle can travel its entire length successfully. Complete details are given in the author's *Latin American Travel & Pan American Highway Guide*, \$7.35 postpaid from Compsco Publishing, 663 Fifth Ave., New York, N.Y. 10022. ★★★

**Brasilia**, supermodern capital of Brazil, marks the end of the present highway after it turns inland at Rio de Janeiro. From Brasilia, gravel road extends north 1300 miles through Mato Grosso and Amazon Valley jungles to Belém. Paving of this stretch is scheduled for 1974.





**“Buy 12 Craftsman panels,  
get this jig saw free.**

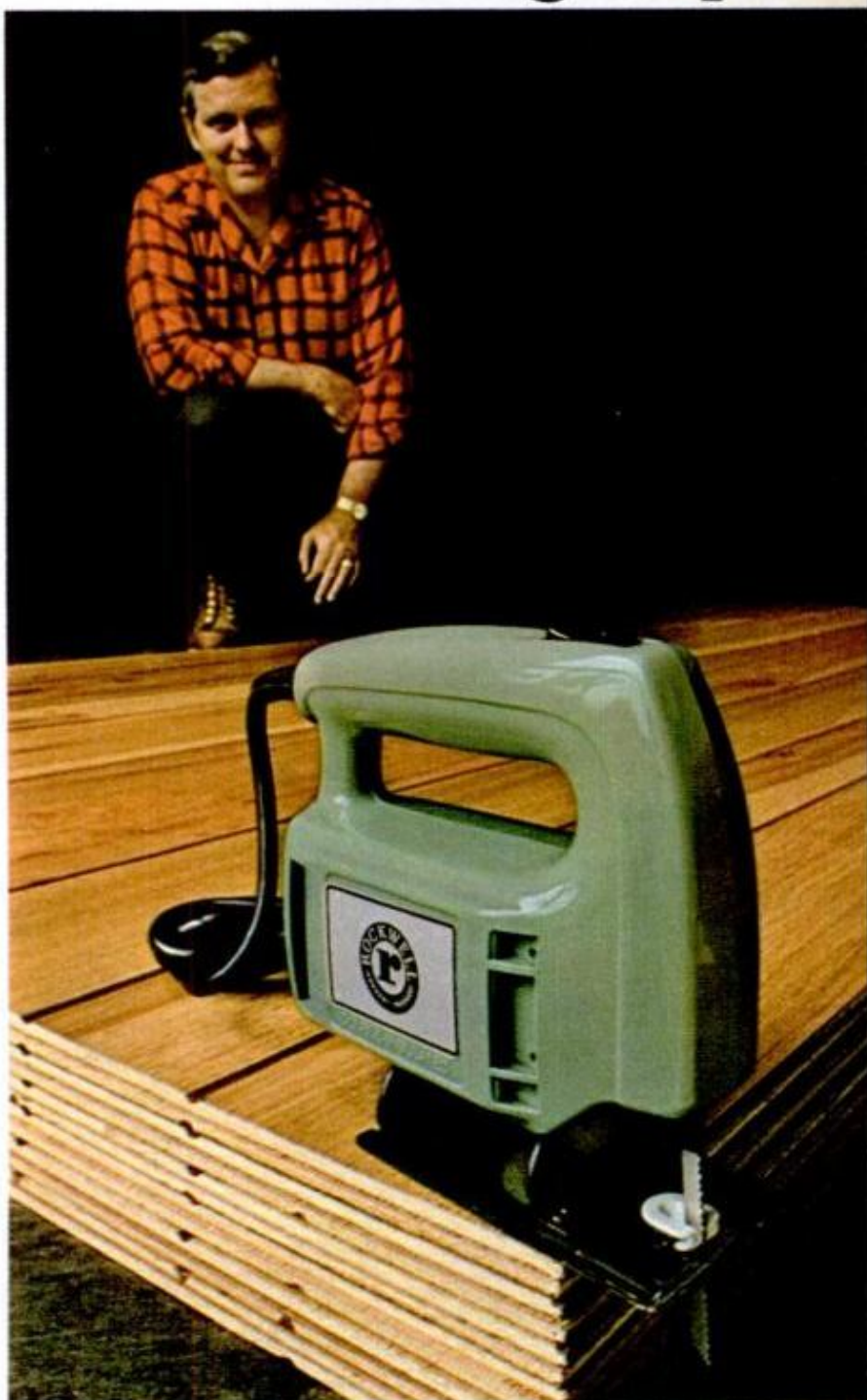
**That’s some deal from The Paneling People.”**

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Call toll-free 800-447-4700 (in Illinois, 800-322-4400) for the name of your nearest participating dealer. Offer ends December 31, 1973. (Or such earlier date as supply is exhausted.)



**The Paneling People.**

**U.S. Plywood**

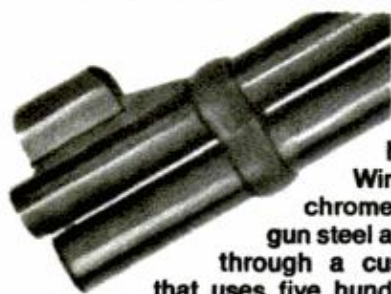


Today's Winchester Model 94 brings you real walnut, a cold-forged chrome molybdenum steel barrel, deep rich blueing, a steel finger lever with smoother, easier action, and a rugged steel carrier... all at a price you want to pay.

More than 3,500,000 Model 94s in the hands of hunters for the last 79 years have earned for it the well-deserved title: "The Deer Rifle."



**Cold-forged chrome molybdenum steel barrel:** Twenty inches of tough, accurate barrel come on the business end of every Winchester Model 94 we make. The size gives you a gun that snaps to your shoulder perfectly, in any cover, and then lays the Super-X right where you



put your sights. But the way we make these barrels today would make old-timers scratch their heads in admiration.

Winchester takes a blank of chrome-moly steel . . . the best gun steel around . . . and then puts it through a custom-designed machine that uses five hundred tons of pressure to cold forge Winchester Proof Steel barrels of excellent strength and accuracy. Time-tested design, with the modern precision of chrome-moly steel. The best combination you can have come buck season.

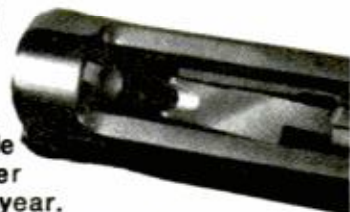
**Walnut stock and forend:** The quality of Winchester chrome-molybdenum steel calls for the traditional finishing touch of solid American walnut, made with Winchester craftsmanship for a fine wood-to-metal fit.

The handsome, dark wood tones of the finish give the experienced hunter an unobtrusive brush-buster of a deer gun that's all business as it waits for the big ones. The weather-resistant satin finish shrugs off snow and rain . . . and then shines up to give you a fine looking Winchester you'll show proudly alongside your trophies.



**Steel carrier:** One important thing that hunters have found about the Model 94 is its safety. Exterior hammer. And

if you open the action a crack, you can tell at a glance if there's a round in the chamber. However when you re-close the action, you place a lot of pressure on the carrier. The Model 94 has a heavy, all-steel carrier that's made to keep your repeater in business year after year.



That's Winchester the way you want it.



**Smoother lever linkage:** Hunters who appreciate a well-made rifle will do themselves a favor by opening up the new Model 94's lever action, and taking a good look at how it goes together. If you know your 94s, you'll notice a brand-new, re-designed camming slot in the lever. It's curved. The result is an action that opens more easily and smoothly than ever before . . . and a Model 94 that lets you reload in a flash if you have to, without taking your attention from your target. The lever is steel, rugged enough to take all the manhandling you can dish out . . . but polished and blued for a sharp appearance that says "pure Winchester."

**New rich blueing:** The Model 94 receiver is another tough customer. Its one-piece construction is 20% stronger today than previously. But on the outside, the receiver is a real smooth operator, finished with a unique, rich blueing process newly developed by Winchester. Men who know guns can tell with one look whether a blueing job is right or not. Take a look at our new 94.

**New loading port cover:** Designed to make loading a snap, the new Model 94 loading port cover is a one-piece unit that works better, and looks better. We blue it on the regular 94, but if you're the kind of hunter who wants a little more, take a look at the Winchester Model 94 Antique. Marbled, case-hardened receiver, and a brass-plated loading gate. Works just like the regular Model 94, though. Very accurately.



**Most popular deer cartridge . . . 30-30.** Over the years, we've chambered this old buck-buster for a lot of different loads. And even today we'll read where some hunter who understood quality when he bought it has bagged a good-sized White Tail or Muley with his 32-40 or 38-55 Winchester Model 94. Today we've settled on just one caliber for the Model 94. The famed 30-30 holds 6 rounds in the

tube magazine under the barrel. You can find 30-30 Winchesters everywhere you find deer as legal center fire game . . . and where there are men who like prime venison. Always ask for Winchester Super-Speed or Western Super-X, in your choice of Silvertip or Power-Point bullets.

**Biggest-selling deer rifle ever made.** A deer hunter is a no-nonsense kind of guy who goes into the woods for just one reason: to bring home the venison. For success, he relies on doing the basics just a little bit better than the buck he's after. When it comes to selling this deer hunter a sporting arm, you can forget all about the frills and fancy stuff. He knows what he wants and goes after a fast-aiming repeater that can do the fundamentals just as well as he can. And for more than three quarters of a century his consistent first choice has been the Winchester Model 94. To prove that, we've sold more than 3,500,000 over the last three-quarters-of-a-century-plus. There's got to be a reason why. Find out what it is for yourself, today, at your Winchester dealer's. **WINCHESTER.**, 275 Winchester Avenue, New Haven, Connecticut 06504.

**MADE IN U.S.A.**



**Proven design:** hunters that the best way to improve the Model 94's appearance was to

**Winchester** Since 1894, have agreed

leave it alone. We have. And today the Model 94 still has all the crisp, lean Western styling it had when we shipped the first ones out of the factory. It's a style that's been imitated often. But even the sincerest form of flattery from our good competitors can't match Model 94 performance that's given the name "Winchester" a definition all its own in Webster's dictionary. First of all the 94 is a carbine. That means it's a compact design . . . less than seven pounds that you can carry all day in one hand. It comes to your shoulder quickly and naturally in brush or open country . . . anywhere, anytime you have to make snap shots count. The straight-grip, high-comb stock is a pleasure to look at, and fits you like a glove. The slim carbine-style fore-arm gives a feel of accuracy and precision. Top ejection means the Model 94 works equally well with either left- or right-handed shooters. The hooded front sight and sporting rear sight are made to line up in a big hurry. But the option of a side scope mounting lets you have pinpoint longer-range accuracy too. Put it all together and you'll know why "Model 94" means "Winchester" . . . and why "Winchester" means "Rifle" to sportsmen and peace officers all over the world.

 **winchester**  
the way you  
want it



# The nice little things you



An interior in Custom Cruiser that's a lot like a luxurious sedan.



A tailgate on the Custom Cruiser that disappears into the floor.



Lots of room to haul lots of things.



A front center armrest in Cutlass Supreme Cruiser and Vista-Cruiser.



A Vista Vent on the Vista-Cruiser to let smoke out and sun in.



Tailgates that swing up and out of the way on Cutlass Supreme Cruiser and Vista-Cruiser.

You get some nice things because our wagons are Oldsmobiles: things like thick cut-pile carpeting, woodgrain vinyl inlays, and beautiful upholstery. Seats with up to six inches of foam. The equipment to make your wagon drive like an Olds: power steering, power front disc brakes, Turbo Hydra-matic transmission, and a Rocket V8.

You get other nice things because our wagons are wagons: things like cargo space—Custom Cruiser has up to 106 cu. ft., Cutlass Supreme Cruisers and Vista-Cruisers each have up to 85 cu. ft. Each wagon is available in 2-seat and 3-seat models.

Finally, you get other nice things because you order them extra: like GM steel-belted radial tires, power windows, luggage rack, stereo radio, and many other features to make your wagon all the Oldsmobile you want it to be.

**1974 Oldsmobile station wagons.**  
*Many nice things make a difference.*



# can have with an Olds wagon.

Cutlass Supreme Cruiser



Vista-Cruiser

Custom Cruiser





## DETROIT LISTENING POST

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### Ford readying new mini

Ford has still another new car in the works, but you may never see it unless you're a world traveler. It's Ford's version of the ultimate small car. Ultimate if you want a rear seat, which the car has, but not the smallest car the company could put out if it decided to dispense with the back seat and build a two-passenger one-seater. While solid information is hard to come by at this early stage, indications are the car is intended for markets outside the United States. But if the trend to small, smaller, smallest cars continues in this country, a domestic version could be in the offing. When? Two years from now at the earliest, but more likely late 1976.

---

### Chrysler thinking small

Is Chrysler thinking small car again? It's either that or the company is on a miniaturization kick. Engineers assigned to component development projects for '74-and-beyond cars who thought they had their work all locked up have been given new orders: redo it on a smaller scale. Design engineers are really sweating on some parts—shrinking the steering column, for example, while still allowing enough room for stowing an air bag behind the center of the horn ring.

---

### Better idea for boosting belts

Engineers are looking at an idea that may overcome Detroit's main objections to the ignition interlock system. This is the device that requires the driver and right front passenger to buckle the combination seat belt-shoulder strap before the car can be driven. The auto companies are very much in favor of force feeding people to wear belts and shoulder straps. But they don't like the idea of making the car undrivable until the belts are buckled.

There may be a way around this. If the government would allow it—which seems

unlikely at this point—the belts could be hooked up to the speedometer, rather than the ignition, so it would be possible to start and drive the car at very low speeds, say up to 10 mph, without buckling the belts. To kick the car above 10 mph, the belts would have to be fastened.

This would overcome the nuisance objections to the ignition interlock—situations where a stalled car has to be moved or when a parking lot attendant wants to shuttle a car a short distance. The idea is feasible, but Detroit isn't very hopeful about selling it to the government unless there are massive failures of the ignition interlock.

---

### Ghia to be Ford trend car

Mustang Ghia, highest priced version of the new Mustang II, will apparently become the try-it-on-for-size car at Ford, taking over that role from T-bird and Continental. When a new idea comes along, the big, expensive cars get first crack at it. Then, after a year or two, a whittled-down version is developed for the smaller, less expensive cars. This is true at all the companies.

Ford has reportedly sent word to suppliers that if they have any promising ideas for comfort and convenience add-ons, the company is interested in looking at the items for future editions of Mustang Ghia. This makes sense if Detroit is really going to smaller cars. Try it on the small cars first, rather than on the low-volume big jobs.

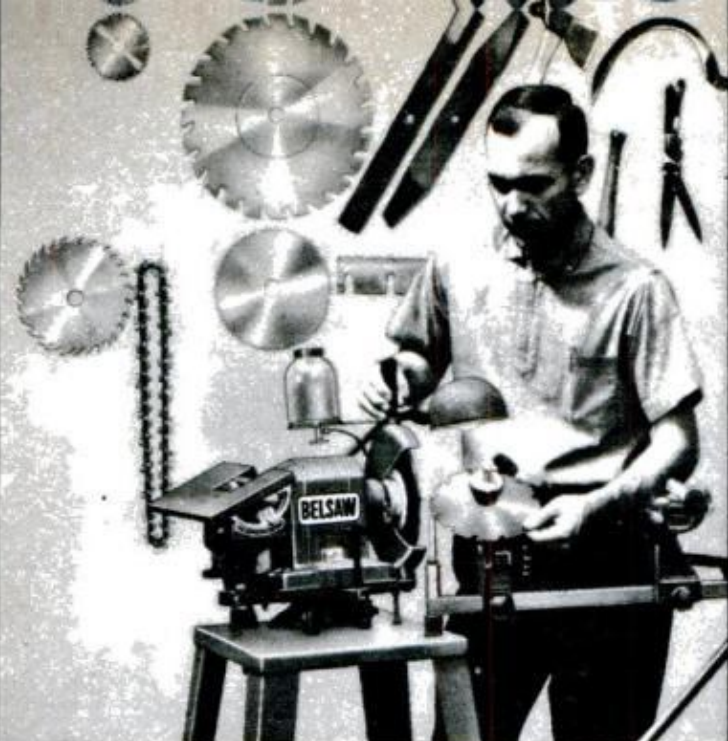
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### No more oil changes?

Automakers are weighing the advantages versus disadvantages of using more sophisticated oil filters as a means of reducing oil changes, thereby conserving oil. Both auto engineers and petroleum engineers say the usable life of oil could be extended thousands of miles by going to a more advanced filtration/purification system. Car-

*(Please turn to page 46)*





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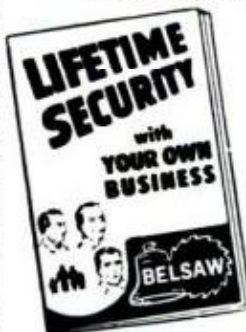
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# I'd like to give this to my fellow men... while I am still able to help!

I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

## I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

## A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

## Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

## Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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# "How I rewired my taillights with a plastic straw and Dow Corning Bathtub Caulk."



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"When my taillights started getting dimmer and dimmer, I took them apart and found that the sockets, wires, everything, were all corroded.

"So I cleaned everything up, bought two new sockets, and decided this time that they weren't going to corrode.

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I cut two small pieces off a plastic drinking straw, slid one over each set of wires to keep them from getting stuck together, tied the wires together, and then pumped them full of caulk.

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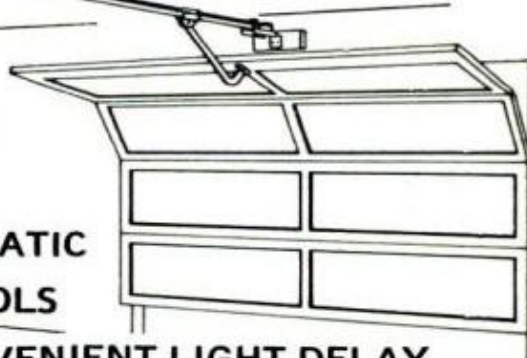
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## DETROIT LISTENING POST

(Continued from page 40)

makers are weighing the pros and cons—cost, availability and reserves of oil measured against a much more complicated and costlier filtering system.

### AMC to get GM Wankel

Although no contract has been signed, GM has agreed to sell American Motors rotary engines "as available." This means AMC has an understanding to obtain Wankels from GM, but the deal doesn't specify how many or when they will be delivered.

### Bad news for car strippers

During the past four or five years, Detroit has made a real effort to build cars easy to service—so you can do your own servicing, so parts are easy to get at, remove and install. That trend may stop, at least on the prime targets for thieves—tape players, for example. A plan being discussed would fasten certain accessories down so they can't be removed with anything less than a blowtorch, stethoscope and sledge hammer.

The car companies are looking for ways to thwart thieves, not only those who make off with the whole car, but also strippers who peel off parts and fence them through bootleggers. If your car is pinched, you have a fair chance to get it back. About four out of five stolen cars are recovered. But if a heister takes your tape player, mag wheels or radial tires, you can just about kiss them goodbye.

There's a way of discouraging the strippers, if not outwitting them completely, and automakers are examining the idea. It consists of locking in parts so you have to go through a long, involved procedure to remove them. There's no easy way to get the gear off—you have to know the exact removal sequence—in the same way you must know the order of numbers to open a combination lock—to pull the parts out. A stripper could still take your tape player, but he would need time to disassemble it. He couldn't grab-and-run, as he can now.

But there's a drawback for the car owner. If Detroit goes to "nailed in" parts, the owner will have to pay the mechanic for the extra time it will take to remove parts when an item needs service. ★★★



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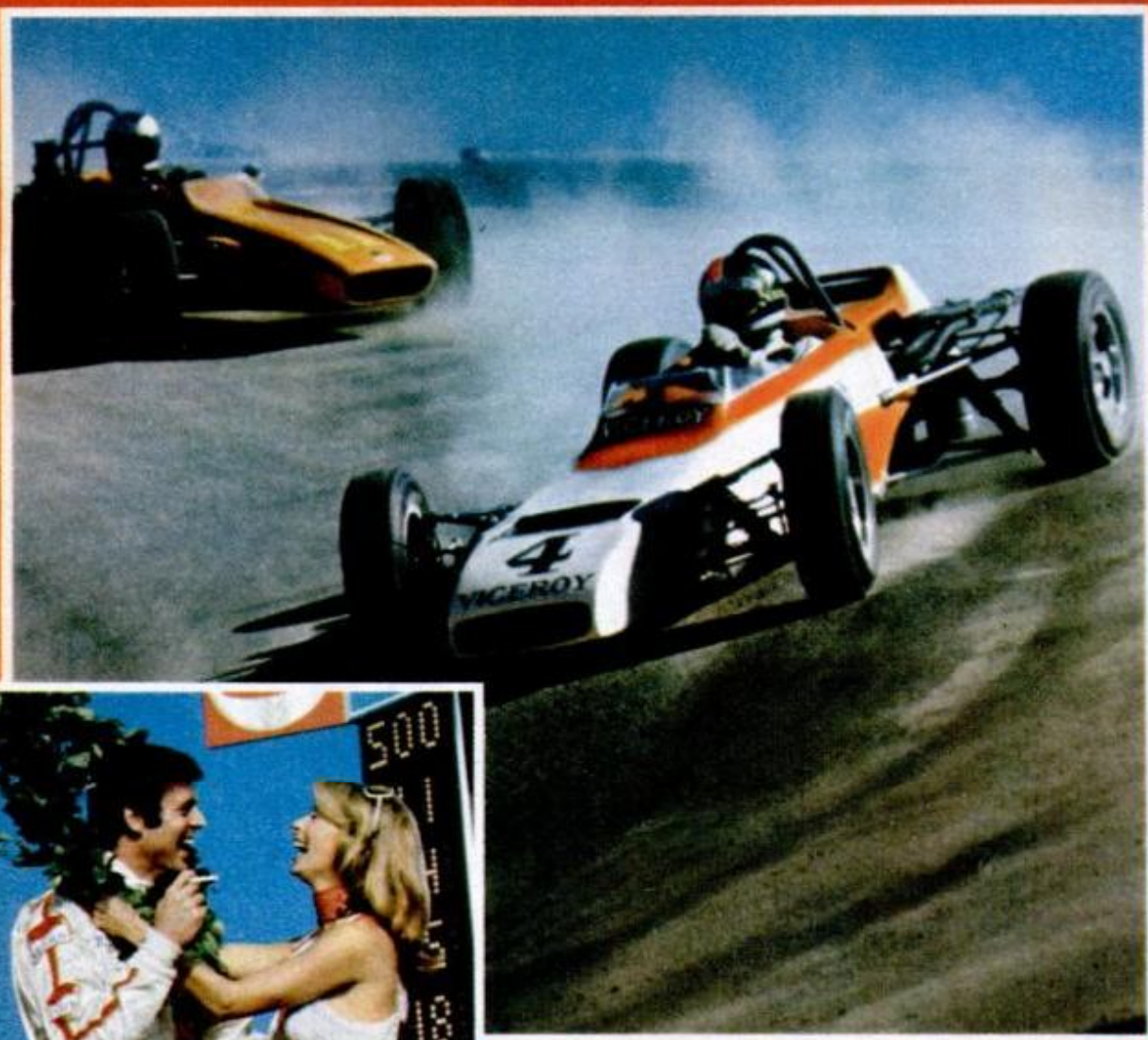
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## CAR CLINIC

BY MORT SCHULTZ

### The horn blows at midnight

*Recently, the horn of my parked 1971 Ford LTD started blowing in the middle of the night. It is now disconnected, awaiting your diagnosis. Whats wrong?—Harold C. Kopp, Nashville, Tenn.*

The horn contact in the steering wheel of several Ford models has plastic inserts beneath the contact pads. These inserts have expanded, forcing the contacts to close. The problem has been recognized, and a new type of horn contact has been issued. Consult a Ford dealer. Replacing the horn contact should solve the problem.

### Obstinate Opel

*I have a problem that is common among Opel owners. My particular car is a 1971 1900 station wagon. Because of a poor carburetor, the car is hard starting, has poor power, and pings when most brands of gasoline are used. These conditions are getting more pronounced as the car logs more mileage. I would like to replace this carburetor, which I have already rebuilt once, for another. What make do you suggest?—Melvin O. Brown Jr., Rome, N.Y.*

Sorry, Mr. Brown, but if there is another make of carburetor which you can use in place of this two-barrel Solex, I don't know what it is. The problems that you and others have experienced are real enough, but there have been several modifications and advisories issued by the factory to Buick-Opel dealers that have helped iron out some of the difficulties. Rebuilding the carburetor without applying these modifications is akin to doing half a job. One advisory, for example, warns of the harm that loose manifold bolts will cause and the necessity of tightening them often. One modification calls for installation of a heat shield between carburetor and manifold to offset percolation. There are others, and you should check with a Buick-Opel dealer or write the technical publications department of Buick Motor Div., General Motors, 902 East Hamilton

Ave., Flint, Mich. 48550, for an explanation of what they are.

### How to get Subaru parts

*I own a 1972 Subaru 1300G EFI sedan and am experiencing difficulty getting parts. Most parts stores don't stock supplies for Subaru. What should I do?—L. Rubin, Washington, D.C.*

Parts should pose no problem if you request them from a Subaru dealer. According to Subaru of America, master parts depots in California and New Jersey supply western and eastern distributors. There are 14 distributors in the country, and they in turn supply Subaru dealers. If you cannot obtain parts from a local Subaru dealer, contact the distributor for your region: Mid-Atlantic Subaru Star, Ltd., 17450 Indian Head Hwy., Accokeek, Md. 20607. Any other Subaru owner reading this who needs help in locating a place to get parts may call a toll-free number, 800-447-4700, in every state other than Illinois. In Illinois, call toll-free 800-332-4400.

### Needs a break

*I service a 1972 Chevelle Malibu with a six-cylinder engine. The engine starts immediately, but stops after a few revolutions and requires restarting four or five times before it finally catches. I found that the choke plate closes fully when the throttle is depressed prior to cranking, but that it flies open halfway when the engine starts. This is causing the trouble, I'm sure, but the Chevrolet service shop tells me this is the way it's supposed to be because of anti-pollution measures and that I'd be subject to a \$10,000 fine if I tampered with the setup. What do you have to say?—Stamm's Garage, Middletown, Pa.*

It isn't printable. Undoubtedly, that Chevy shop hasn't heard of a choke vacuum-

*(Please turn to page 52)*



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## CAR CLINIC

(Continued from page 49)

break adjustment, so let me give you the procedure and you can pass it on. It calls for proper adjustment of the vacuum-break diaphragm to insure correct initial choke-plate opening after the engine starts.

First, remove the air cleaner and plug the "Therm AC" sensor vacuum-takeoff port if the car is equipped with a "Therm AC" air cleaner. Apply vacuum to the vacuum-break diaphragm with an external vacuum source until the plunger is fully seated. Now, push the choke plate closed and place a gauge between the lower edge of the plate and the air-horn wall. If the car is equipped with automatic transmission, the size of the gauge should be .225 inch. Bend the vacuum-break rod at the elbow to adjust to the correct specification.

By the way, at present, according to federal law, only franchised dealers and manufacturers are subject to the \$10,000 fine for tampering with emission controls. State laws on emissions vary. As an independent garage owner, you might contact the motor vehicle department in Harrisburg to determine the nature of Pennsylvania law.

### Cranky speedometer

*My 1968 Chevrolet Nova makes a whining noise that is accompanied by the speedometer needle jumping. The manual is rather vague on how to lubricate the cable, and it seems to me that the radio has to be removed, steering post dropped and instrument cluster pulled out. Is there an easier way?—Harry Simmons, Brooklyn.*

I agree that space is kind of tight, but you can work on this speedometer without taking any of the vehicle apart.

I doubt, though, if lubrication alone will solve your problem. Experience has shown that oscillation of the speedometer needle and/or a whining noise is caused most often by a kinked or sharply bent cable. The problem can usually be corrected by following this procedure:

1. Examine the speedometer cable for kinks and sharp bends at the speedometer

head, firewall and transmission. If the cable is kinked or bent, it should be removed and straightened out or replaced.

2. Disconnect the cable from the speedometer by unscrewing the coupling nut. About 1000 Novas in 1969 were built with a push-on connector that held the cable to the head. To remove the cable, pull it away from the head as you depress the connector.

3. Pull the shaft part of the cable from the casing and straighten or replace it. Reinsert shaft in casing and reconnect cable.

### More light on 'blackout'

*Your answer to Hugh Lewis of Coshocton, Ohio, regarding headlight dimming with his 1968 Oldsmobile ("Blackout," Car Clinic page 22, June PM) overlooked one probable cause. I had the same problem with a 1967 Pontiac LeMans. In addition to what you suggested to check (drive belt, carburetor idle adjustment, grounding of the regulator and condition of regulator and alternator), I think he should check the BATT wire going to the regulator. In my car, the wire comes off the starter solenoid and is difficult to reach, but when it was replaced and contacts cleaned, the problem cleared up.—Kenneth K. Rosenthal, Austin, Minn.*

Thanks for the valuable addition, Mr. Rosenthal.

## SERVICE TIPS

**The U.S. Department of Transportation** warns car buyers to beware of dealers who substitute undersized tires for those supplied by the vehicle's manufacturer. The department's National Traffic Safety Administration says it has received "numerous reports" of undersized tires being installed by new-car dealers. The department suggests that you check the designation on tires against manufacturer's specification in the owner's manual and on the placard that is usually put into the glove compartment to make sure they match. Don't fail to check, especially if you have the dealer substitute an optional tire for original equipment. Substituting inadequate tires is a violation of federal safety law.

**Sparkplugs fouling** at low speeds with a 1973 Chrysler Corp. car having a 340-cu.-in. engine? Switch from an N9Y to an N12Y sparkplug. ★★

**GOT A PROBLEM WITH YOUR CAR?** Ask Mort about it. Send your question to Car Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.



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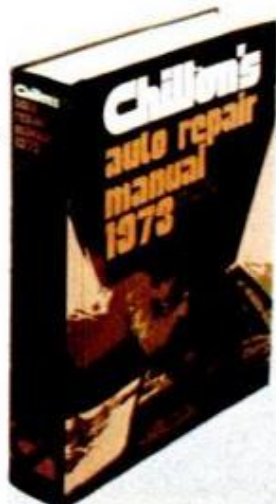
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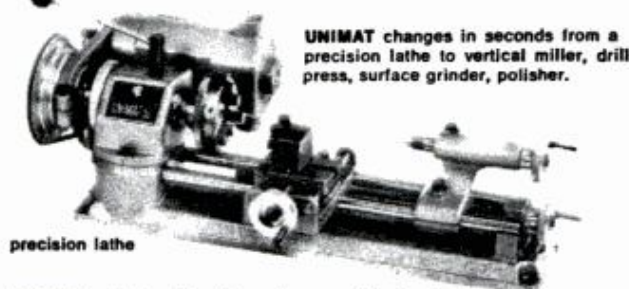
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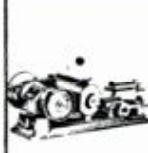
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1974 Gran Torino Brougham shown with optional deluxe bumper group, electric rear window defroster and convenience group.



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## IMPORTS AND MOTORSPORTS

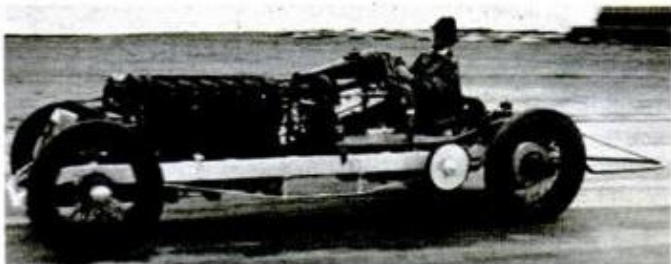
### Spridget kit



Pack up your troubles with your old kit car and try this brand-new one from England. We found out about it too late for last month's kit car story (See *Drop a New Body on the Old Buggy*, page 110, Oct. '73 PM). Most kit conversions use a VW chassis, but this kit turns any Spridget (Sprite or Midget model) made since 1958 into a very British sports car. The fiberglass front and rear sections give Spridgets the appearance of a combination of the Morgan, Triumph TR series and Lotus Seven. The photo below shows before and after views of a converted MG Midget. The kit car is called the Arkley SS after the village in Hertfordshire where the kits are made. Designer is John Britten, a British club-racing driver, who wanted to market a "typically English sports car" at an affordable price. His solution is this modification of the Spridgets which retain their twin-carb, 1275-cc engine and drive-line components. For more kit information, write to John Britten at Arkley Engineering, John Britten Garages, Ltd., Barnet Road, Arkley, Hertfordshire, England.

### Superstar car

Buried for 42 years in the sand on the coast of Wales, a famous land-speed record car runs again! It was in 1927 that driver Parry Thomas cranked over the 500-hp machine, nicknamed Babs, and ran it up to speed—almost 170 mph—in an attempt to shatter the land speed record of 174 mph, which was then held by Sir Malcolm Campbell. When the drive chain snapped, the car somersaulted, killing Thomas. The crashed car was left behind and was soon covered by the drifting sands. It was resurrected by a mechanical engineer, Owen Wyn Owen, who found it with the help of old maps and photos (and shovels). With the 27-liter Liberty aero engine roaring, he drove it for all to see last summer, following a four-year task of restoration.



### Adam's apple

The General Motors subsidiary in West Germany, Adam Opel A.G., has a smart-looking new car that was just introduced at the

*(Please turn to page 64)*







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## IMPORTS AND MOTORSPORTS

(Continued from page 62)

Frankfurt International Auto Show. The new model is still called the Kadett, a name that has dropped from our vocabulary here since Opel has gone to the 1900 and Manta logos. It's a small, practical car, but GM Overseas Operations says there are no plans to bring it in at U.S. ports of entry.



### Citroen hum-m-ms a pas de deux

If you're a Wankel fan, the new Citroen GS Birotor will double your pleasure and double your hum-m-m. The new GS, introduced at the Paris Auto Show, mounts a two-rotor Wankel from the European Comotor engine works. Comotor is a joint venture of NSU and Citroen that was formed in the late '60s to develop and produce Wankels for passenger-car use. The GS Birotor displaces 1900 cc and goes on sale in France early next year.



### Shoehorned V8

The MGB GT V8 sounds impossible, but it's been done. In England, British Leyland Motors markets the GT with two heads under one bonnet: They've stuffed the Rover 3.5-liter V8 in the engine compartment and performance is incredible. You can't buy the V8 version here, but now that you know it's possible you can do it yourself. ★★★



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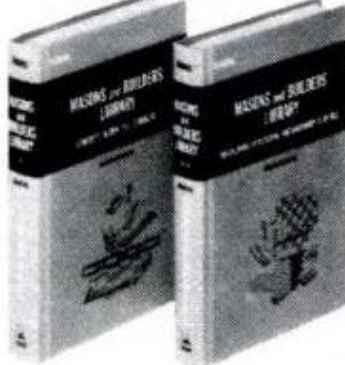
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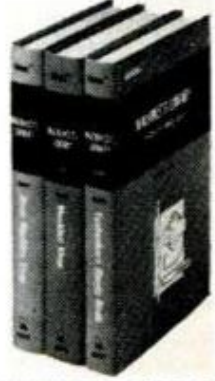
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## SCIENCE WORLDWIDE



### Lab hailstones test windshields

Some crashes that defy explanation may be caused by hailstones smashing an airplane's windshield or penetrating its skin. That's the thinking of British researchers who use a helium-powered gun to fire man-made hailstones at airplane windshields of different types of composition. Projectiles of frozen distilled water are fired at speeds up to 1700 mph. In size, they match hailstones encountered between 10,000 and 30,000 feet, and are as large as two inches in diameter.

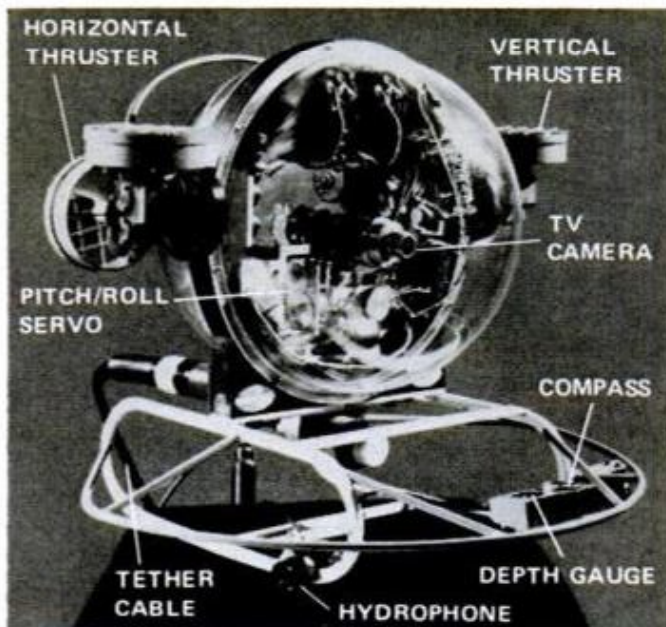
Object of the tests is to find airplane components that will stand up to the icy projectiles in the sky.

### No mums for mom if she's allergic

If you give your wife a bouquet of fall flowers and she breaks out in a rash, chances are she's allergic to chrysanthemums. This popular flower is one of the most common causes of skin rash, according to a recent report in *Archives of Dermatology*, a professional journal. The potency of mums was established in tests with human subjects known to be allergic to certain substances. Researchers gave the offensive ingredient in mums the forbidding name "sesquiterpene lactones"—a substance that is also found in tulip bulbs.

### How do green plants do it?

The ability of green plants to convert sunlight into chemical energy is under study by University of Michigan scientists. Their goal: to find a new approach in the design of a device that will collect sunlight and convert the energy to electricity. "Ideally, we would like our device to be both small enough and economical enough for the home," say the scientists.



### TV eye for underwater work

A new device for underwater inspection work is Anthro, a remotely controlled submersible with a 20-inch-diameter plastic bubble for a hull. A television display and propulsion controls—on board ship or on dry land—are connected to the vehicle by an umbilical. Anthro's TV camera is electronically "slaved" to the operator's head. As he moves his head, the scene he views is moving in exact synchronization. Headphones provide binaural sound—transmitted from hydrophones aboard Anthro—as an additional aid in orienting the vehicle. (If Anthro bumps into anything, the bump

(Please turn to page 70D)



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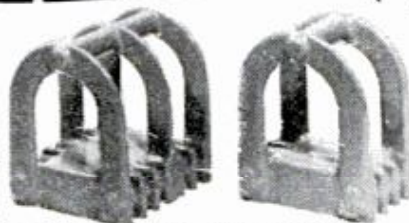


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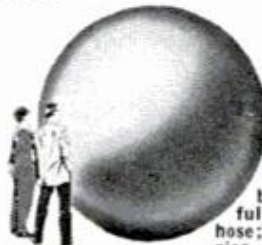
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## SCIENCE WORLDWIDE

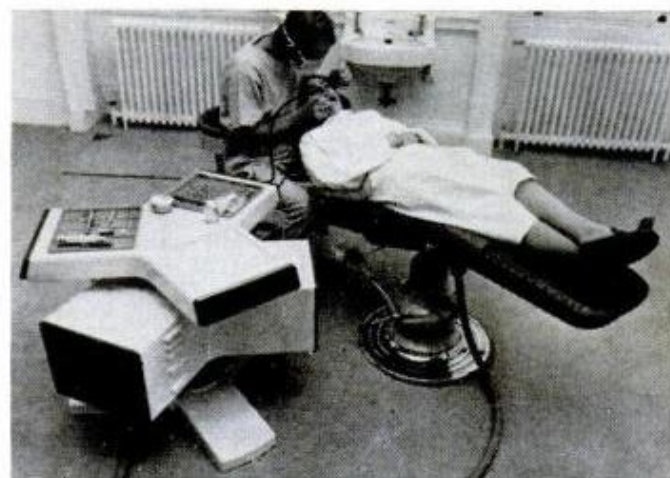
(Continued from page 70B)

is heard topside.) Movement of Anthro—forward, reverse, up and down—is by hand controls. Device was developed by Hydro Products, San Diego.

## A real wet spot in sunny Hawaii

Though a number of areas in the Hawaiian Islands suffer from drought, Mount Waialeale, a 5148-foot peak, is the wettest known spot on Earth, according to the U.S. Geological Survey. Located near the center of the island of Kauai, Mount Waialeale is oriented in such a way that its sheer walls tend to pull in prevailing trade winds and “wring” moisture from them.

The peak is a unique laboratory, say Geological Survey scientists, allowing them to study the complexities of the hydrology of Pacific Island environments. Hydrologists have been measuring rainfall on Mount Waialeale for the past 62 years.



## Dental equipment goes modern

There's little resemblance between the conventional dental chair and a new dental system created by a British designer. The main component is a service module containing just about everything a dentist needs—instrument trays, X-ray unit, high-speed drill, and air, water and suction lines. A hydraulic umbilical connects the service module with the patient's chair; any adjustment in chair height is relayed to the module, which automatically moves up or down so that it remains at a comfortable working height. The system is not yet on the market.

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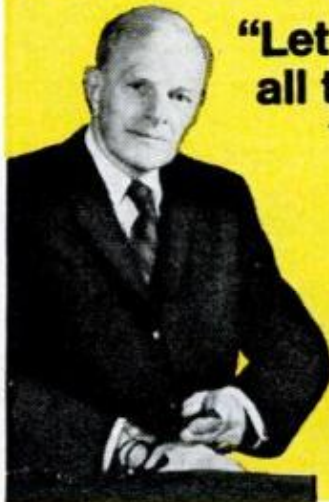
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\$450 mark in five days."—*T. E. Baylor*. Wall: "I work just 2 or 3 days a week. Best month was \$1200."—*J. R. Johnson*.

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# APPLIANCE CLINIC

BY PAUL MANN

## Selecting the right refrigerator size

I have received a number of letters from readers asking for guidelines to use in determining what size they need when purchasing a new refrigerator. The chart below provides average figures that should prove helpful. It is based on information supplied by the General Public Utilities Corp.

Size of Family	Shopping Frequency	Refrigerator Space Needed (cu. ft.)	Freezer Space Needed (cu. ft.)
1	Once or more a week	8	3
	Twice a month	9	4
	Once a month	9	5
2	Once or more a week	10	4
	Twice a month	10	4
	Once a month	10	6
3	Once or more a week	11	4
	Twice a month	12	5
	Once a month	12	6
4	Once or more a week	11	4
	Twice a month	12	6
	Once a month	12	8
5	Once or more a week	12	4
	Twice a month	12	6
	Once a month	14	10
6	Once or more a week	13	6
	Twice a month	13	6
	Once a month	14	11
7	Once or more a week	15	6
	Twice a month	15	7
	Once a month	16	12

## Dispenser replacement

*I have a Whirlpool front-loading portable dishwasher that needs a new detergent dispenser. Can I replace it myself?—Vincent Cellucci, Philadelphia.*

I don't see why not. Your first task is to get new parts. These come in a detergent-dispenser replacement kit, which can be obtained from a Whirlpool dealer. The part number of the kit for your portable machine is 569383. It costs \$3.08. If you can't get the kit from a dealer in your area, write the Customer Assurance Dept., Whirlpool Corp., St. Joseph, Mich. 49085, and you'll get assistance.

To remove the old detergent dispenser and replace it with the new one, disconnect the dishwasher from its power source and remove the front panel. Disconnect the wiring harness lead to the dispenser coil at the molded connector. Now, simply remove the four screws holding the dispenser assembly to the interior door panel, open the door and lift the dispenser out.

Reverse the procedure to install the new dispenser, making certain that the detergent-dispenser gasket is seating squarely when you secure the dispenser to the interior door panel.

## No-defrost warning

*Our Frigidaire refrigerator-freezer, about 15 years old, is supposed to be self-defrosting. However, the freezer compartment no longer self-defrosts. The unit has served us well, and we hate to part with it if it can be repaired. Please advise.—E. T. Dahlin, Fort Wayne, Ind.*

It can be repaired, but this will be expensive. What probably happened is common in machines that have seen long service. The freezer compartment is supposed to begin self-defrost at about minus 5° F. If the inside of the compartment doesn't reach this temperature, the unit will continue to freeze food satisfactorily, but won't kick into self-

(Please turn to page 70H)





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## APPLIANCE CLINIC

(Continued from page 70F)

defrost. The reason for the problem in a unit this old is a weakened compressor that isn't operating at full capacity. You'll have to replace the compressor, and this will cost about \$150. The job should be done by a qualified refrigerator serviceman. If not replaced, the compressor will get progressively worse and ultimately fail completely—possibly causing a freezer-load of food to spoil.

### What happened to combinations?

*For years I was more than satisfied with a washer-dryer combination. Now I am ready for another such unit, but have been told that no company manufactures them any more. Is this true? If so, why?—Ms. Roberta Bobba, San Francisco.*

Yes, it is true. I haven't been able to find a company that presently manufactures washer-dryer combinations. But I have found retail outlets that still have some in stock, so I suggest you shop more appliance stores in your area.

Why have washer-dryer combinations been discontinued? I've gotten several stories. The one that some appliance manufacturers would like you to believe is that the market has been saturated, but this is not really the case. There are consumers like you who would buy a combination. The story that sounds more plausible is that some major problems with these units—such as leakage of water into the dryer fan and motor—could not be solved. For most small-space installations, stacked washer-dryer pairs are now the rule. You might consider one.

### Trucking

*I have to truck a refrigerator several miles, but have been told that damage could occur if I lay the unit on its side. Is this correct?*

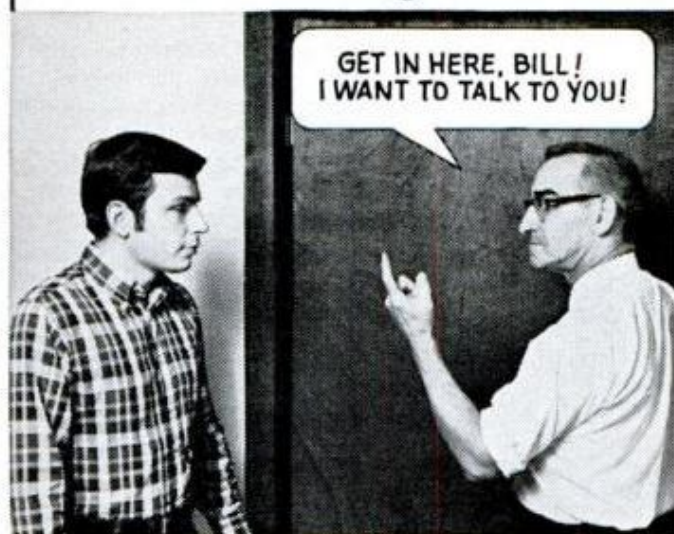
—Peter W. Busch, Phoenix, Ariz.

No, it's not correct. Truck away. ★★★

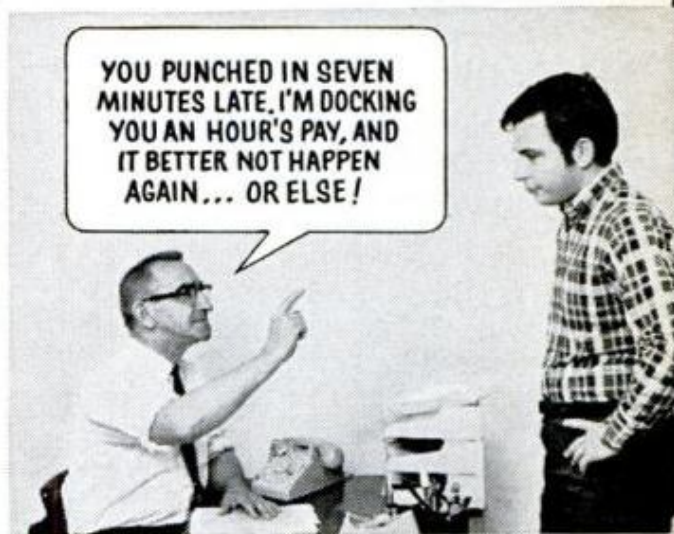
*If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be answered in this column.*



# The day Bill told off his boss



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PM-85



## THE BICYCLE SHOP

BY EUGENE A. SLOANE

You can ride your bicycle for exercise or commuting all winter. Here are tips for preparing your bike, and yourself, for the cold.

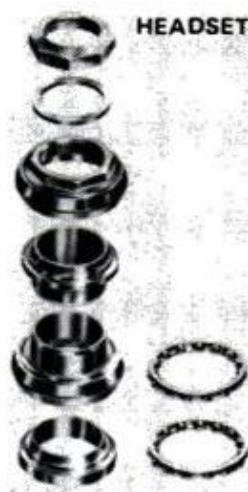
**I** ride my bicycle all year round, and so can you. All you need to know is how to prepare your bike for winter, how to ride safely (even in two or three inches of snow) and how to keep warm.

First, the bicycle. Fall is a good time to do your annual overhaul, because if you ride much in winter, it's easy to get water in bearings that will wash grease out. And in the North, a lot of slush that gets into bearings has corrosion-causing road salt along with it. The last thing you want to happen to your good bike is to have rust in your bearings, which could mean expensive bearing replacement (balls and cups, for example). So take apart all bearing parts, including headset, bottom bracket, pedals and hubs (see illustrations, right).

For lubrication, I like the new Phil Woods grease which has excellent low-temperature rolling characteristics and water repellency. As the temperature drops, ordinary grease gets stiffer, makes pedaling harder and can be washed out of bearings by water. The Phil Woods grease costs about \$1.25 for a three-ounce tube. Another good product is Lubriplate Low Temp grease, also sold as Lubriplate Snowmobile grease. It gives excellent running characteristics down to minus 60°. It's \$1.55 for a pound can.

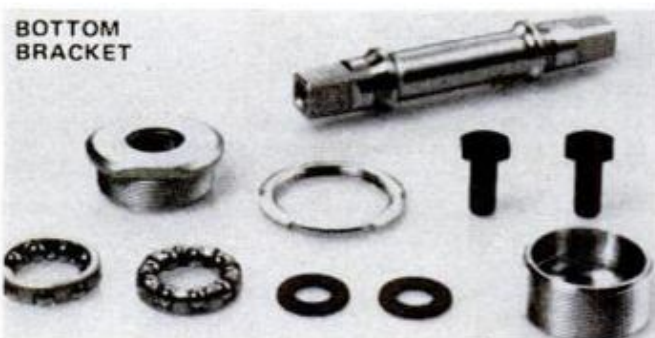
If you ride a fine bike through slushy streets that have been salted, you'll find the fine polish of aluminum cranks, chainwheels, hubs, rims and even handlebars will be pitted or seriously marred by the salt. You can protect these parts by removing all grease with a solvent (such as any dry-cleaning fluid), then spraying the parts with a clear acrylic coating. I use Rustoleum No. 2500 water white clear acrylic lacquer that comes in a spray can for \$1.25. If the

*(Please turn to page 76)*

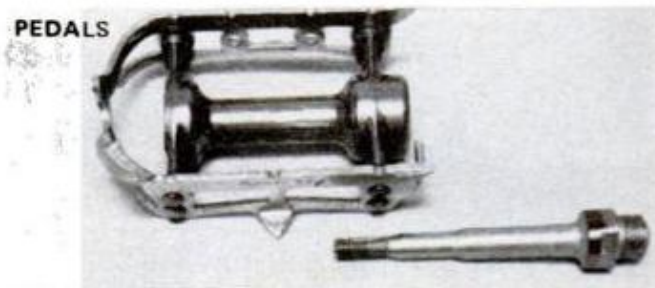


HEADSET

Take apart and relube all bearing surfaces for winter cycling. These include headset (left), bottom bracket, pedals and hub (below). You will find instructions for these jobs in past *Bicycle Shop* columns. For headsets, see page 38, Sept. '72; bottom brackets, see page 67, May '72; pedals, see page 34, July '72; and hubs, see page 31, April '72.



BOTTOM BRACKET



PEDALS



COMPLETE REAR HUB



COMPLETE QUICK-RELEASE UNIT



COMPLETE AXLE UNIT



# AC goes to great length to protect your car's engine

AC Oil Filters provide up to 12 feet of filtering surface to help keep your car's oil and engine running clean.

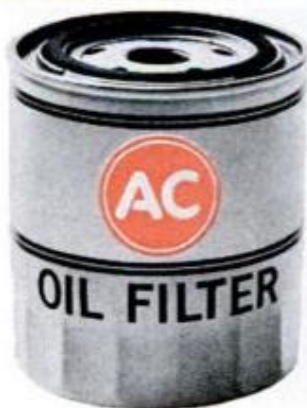
That's 12 feet of tough, polyester-reinforced filter material. A lot of material. A lot of protection.

How does AC pack it all in? With a unique "W-Fold" in the filter material. (The additional folds provide the additional filtering surface area.)

There is a difference in oil filters. Go to any length necessary to get a new AC Oil Filter with your next oil change.

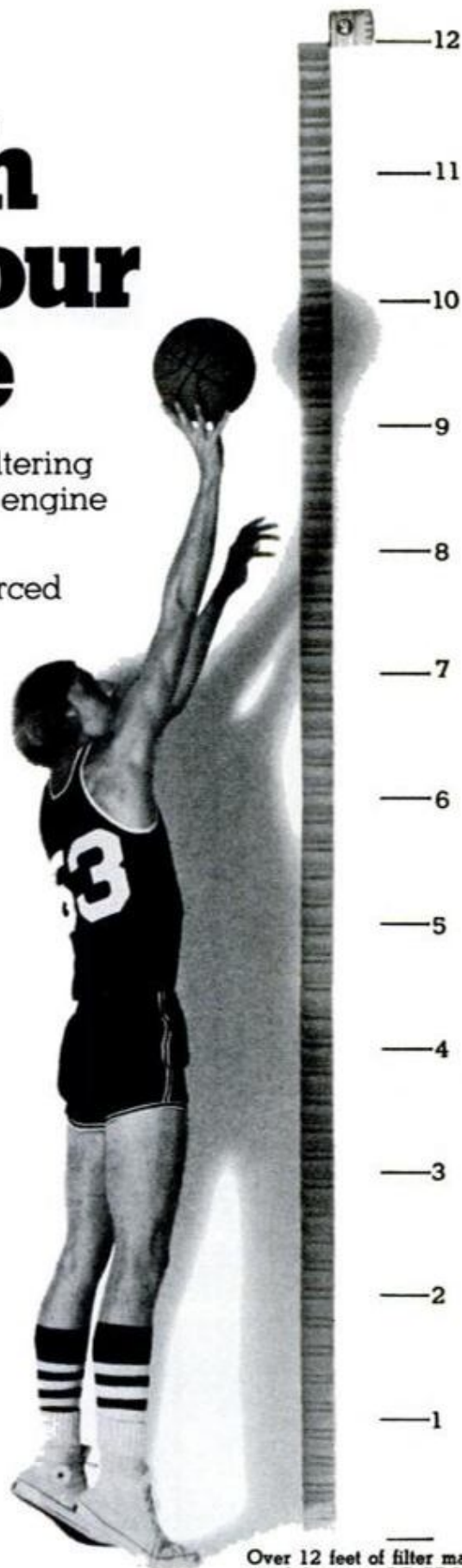


AC's unique "W-Fold" construction. More folds provide more filter surface.



AC SPARK PLUG DIVISION

AC helps keep your engine running clean



Over 12 feet of filter material from an AC PF-30 Oil Filter stretched full length.



## THE BICYCLE SHOP

(Continued from page 74)

lacquer won't adhere, remove it with methyl ethyl ketone (MEK), available in hardware stores. Then brush on one coat of Rustoleum clear blue (*very* light blue transparent coating) undercoating paint. Allow it to dry for at least 30 minutes, then spray on the lacquer. When winter is over, these coatings can be removed easily with MEK.

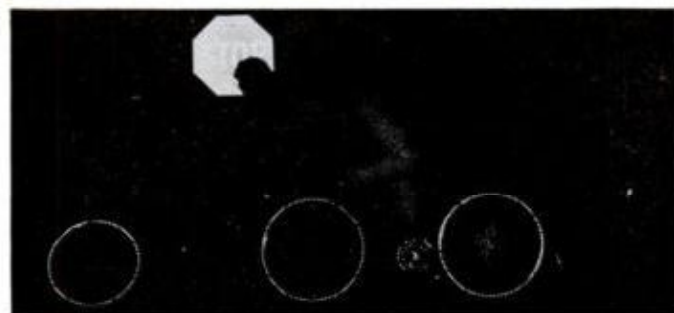
You might also dab or spray a few drops of graphite oil into your bike lock to keep it from "freezing" in cold weather.

You can successfully ride in snow up to about three inches deep. However, if you have fenders, you'll probably have to stop occasionally to unclog the snow packed between fenders and tires. For slippery conditions, when roads are snow-covered, try cyclo-cross tires (drawing) if you use tubular tires; otherwise try the knobbyest wired-on tires you can buy.



New Goodyear and Firestone wired-on tires have a highly visible reflective ring on each side which makes the tires glow like neon hoops when auto headlights reach them—a vital addition to safety for nighttime riding.

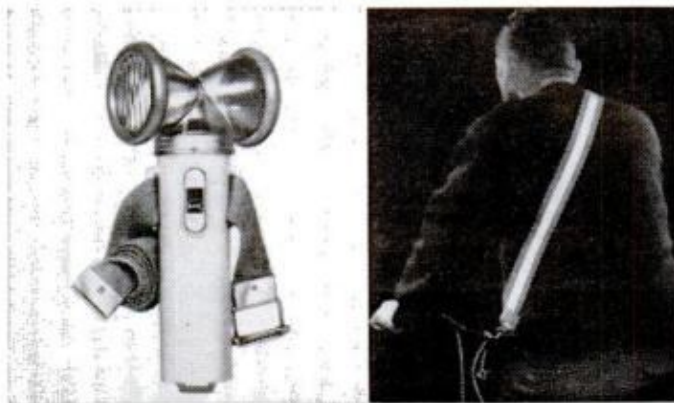
Speaking of night riding, I never go out without some kind of light so motorists can



All six bicycle tires visible in top photo look alike—until night. Then even a distant light reflects from three Goodyear Glowall tires (bottom photo).

see me—not so I can see where I'm going. Streetlights, or the light of the moon on snow, give me all the light I need. A good light is one you can strap on your left leg, with amber or red beam facing rear, white beam facing front. Most bike shops sell them for around \$3, with batteries. The light makes you quite visible as your leg moves up and down.

I'd also add a set of reflectors visible



from all sides, such as red facing rear, amber both sides and white facing front. A reflective belt, like this Gladd model (around \$1.75), adds nighttime visibility.

A hard hat of some sort is very important at any time—and especially needed in win-



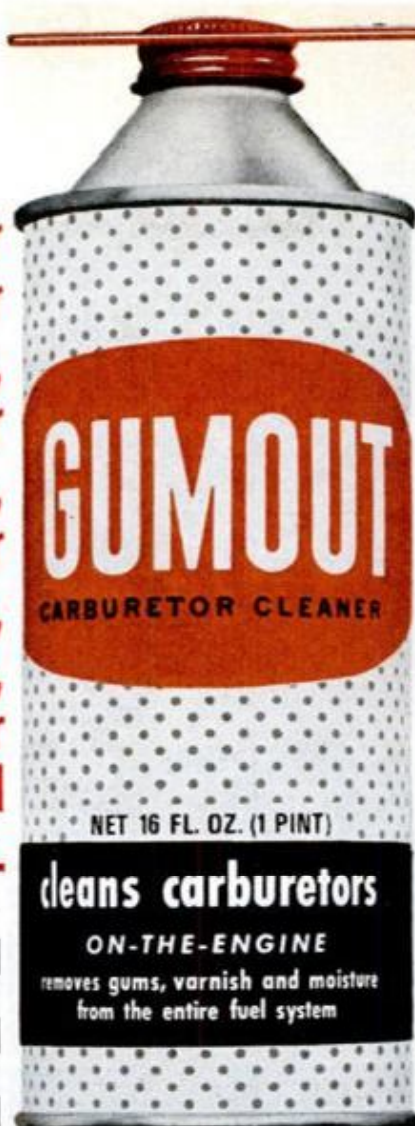
ter when roads may be slippery. I've had two bike accidents recently (both my own fault) which resulted in two totally wrecked bike frames and a dislocated shoulder in one instance and a sprained wrist in the other. Either one could have easily resulted in a fatal head injury; I was very, very lucky. I now have religion, and in summer I wear a hockey helmet, and in winter, a trooper cap (actually a hard hat in disguise). My hockey helmet is the Cooper SK16 for about \$10; the trooper cap is made by G&R Distributors, 3015 California Ave., Chicago 60618, for around \$15.

In general, you should be able to ride until the air temperature drops to about 15°F. To keep warm, I suggest wearing layers of clothing. Start with thermal under-

(Please turn to page 78)



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# THE CARBURETOR CLEANER.



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**GUMOUT** Division, Pennsylvania Refining Company, Cleveland, Ohio 44104



## THE BICYCLE SHOP

(Continued from page 76)

wear, slacks, a sweater and windbreaker. As the temperature falls, replace slacks with goose down-filled or heavy lined pants, keep the sweater, but add a heavy jacket, preferably down filled. Forget electrically heated socks and gloves; they just don't work. Use a good grade of double ski sock. For shoes, I like fleece-lined winter booties made for bicycling. If your bike shop doesn't carry them, you can order them directly from W. F. Holdsworth Ltd., 132 Lower Richmond Rd., Putney, SW15, England, for about \$15. Be sure to send your U.S. shoe size, which is the same as British size. Bike shoes are important because they have a steel plate in the sole which distributes pedaling pressure evenly over the foot, instead of letting it concentrate in one spot.

As for winter-cycling gloves, the only ones that keep my hands warm in below-freezing temperatures are ski mittens with a wool liner. Buy them big enough to add your own liner if they don't come that way.

Remember, if you have layers of clothes instead of one thick set of pants or slacks

or one heavy jacket, you can peel off a layer as you warm up.

There's really nothing like getting out in the crisp, cold air on a bike to make you really feel alive. But be careful. In late fall, when roads are leaf-covered, remember that wet leaves are as slippery as ice.

If you ride over snow, be sure you know there's no ice under the snow that can cause you to skid and perhaps fall under a passing car. Snow itself is surprisingly unslippery if you don't try to take corners too sharply or too fast. Don't ride on ice or snow over ice. And stay on flat ground; it's almost impossible to climb steep, snow-covered hills, and it's downright dangerous to come down them at anything like high speed. You may not make fast time in winter, but you can get a lot of healthful outdoor exercise on your bike, yet remain warm and comfortable while others are shivering. ★★★

*Gene answers letters of general reader interest in every third or fourth Bicycle Shop column. However, it is impossible for him to give individual responses to your letters, so please do not enclose a stamped envelope for a reply. Letters should be addressed to The Bicycle Shop, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.*

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It took a champion athlete to develop the WAIST-AWAY Belt. Athletes in training have used rubber "sweat suits" to lose bulk fast. All that was needed was to find a way to concentrate the body's heating effect on the area bulging with fat.

### ALL BELTS ARE NOT THE SAME

ALL "reducing belts" are not made with the same materials and design as the WAIST-AWAY. Some imitate, but none can duplicate the original WAIST-AWAY design. Note these important differences:

WAIST-AWAY is made of the same soft, rubber-like composition that the athletes use. This is the most effective material to make your body heat sweat away the excess moisture that adds to bulky fat. And it's the most comfortable to wear next to your body. Not a cheap elastic or cloth.

### REDUCES—DOESN'T JUST HOLD IN

Some belts just hold you in like a corset while you wear them. Waist-Away Belt plus our exercise program actually trims down the bulge; doesn't just squeeze it in.

WAIST-AWAY's special construction creates a soothing massage effect that relieves back and waist tensions. The heating effect developed by WAIST-AWAY helps ease backache and stiffness.

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# I LIVED LIKE A KING ... AFTER I LEARNED HOW TO MAKE \$2,000 A DAY ... YOU CAN TOO!



My Castle high atop my own mountain

## IF YOU WANT TO BE RICH!



My dream came true by Copying Success

## I WILL TEACH YOU MY SECRET OF COPYING SUCCESS!

**THERE ARE 3 WAYS TO BECOME RICH.** One is to be born rich, two is to have wealth thrust upon you and three is to achieve wealth. If you were not born rich, forget it, wishful thinking won't help. Some hope for a rich uncle to remember them in a will. There is also the Lottery Ticket Type who reads travel folders while waiting for his number to be called. Waiting for wealth to fall on you is one of the most popular yet least successful ways of becoming rich. If this is your present system, forget it. **STOP DREAMING, WAKE UP, YOU MUST MAKE IT HAPPEN!**

### YOU MUST COPY SUCCESS!

I have proven that a fortune can be made in a brief period if a person knows how. I can show you how to do it too. Why would I share my secret to success? Simply because it gives me a great feeling of satisfaction helping others to find their fortunes as I did. I will also probably make another fortune myself from these ads that are appearing all over this great country.

### STOP USING EXCUSES NOW

Age, education, capital are unimportant in this system of making money. There are no degrees needed to be rich. I was going nowhere for years, then the opportunity to copy success came and I grabbed it, then my success story unfolded. I had problems too. I was born poor, quit school, washed dishes for 3 months and daydreamed about how to make a better life. I got married and had children and worked selling everything from garbage cans to correspondence courses. I even worked on the side as a mechanic and painter. I worked 60 hrs. a week but ended up with so many debts and loans it seemed hopeless. We even took in boarders to make ends meet. I'm not talking about the depression years, I'm talking about just twelve years ago. I'm sure there are many going through the same thing, right now.

### OPPORTUNITY UNFOLDED

right before me, just as this page is unfolded before you, not by plan but by chance. I was out selling and stopped into a man's office just at a moment when he was

counting what looked like thousands of dollars right there in front of my eyes. I just stood there in awe for a couple of minutes just looking at all that money. It wasn't bundled like from a bank, just loose bills crumbled on a desk in a pile about a foot high. The longer I stared the bigger that pile looked. I'll never forget that day because it was the beginning of the change I needed and wanted in my life. That man was making thousands of dollars a day and he had been doing it for years. He was a millionaire. I had to find out how he was doing it. I made up my mind to copy his secret or method or whatever it was that made him rich. I went to work for that man the next day. For 6 months I watched, listened and studied everything that man did. I learned the secrets this man developed in ten years of success. I put these methods to work on a limited basis at first because I had only limited money.

### THEN IT STARTED WORKING FOR ME

I got out of debt and before I knew it I had made a fortune, more money than I imagined even in my day dreams.

Almost overnight people were calling me a genius. I was written about on the front page of the Wall St. Journal. People were coming to me for advice. I had a mansion in town. I owned buildings with rents coming in. I even bought a 55 room castle atop my own mountain with swimming pool, tennis court and gardeners. I owned Lincolns and Cadillacs. My family and I traveled. We were suddenly financially successful and we did it by our secret of copying success.

### I OFFER YOU OPPORTUNITY

even greater than my own. I offer to share with you my secrets for success that I have proven can work. Now I am going to ask you to send me ten dollars for sharing this way to wealth. The information I mail will cost me less than ten dollars and I hope to make a profit (less the cost of this ad). I am sure you will not begrudge me making a profit, after all, it might make you rich. I would gladly have paid a thousand dollars 12 years ago for the key to success. You should never expect something for nothing. If you are not satisfied I will return your payment. Never give away ideas, they may be worth millions. Start thinking right now about making money and stop worrying about losing ten dollars. Ten dollars won't even pay for a parking ticket in some cities. By the way, you can examine the information I send you for ten days and return it for a full refund if you are not completely satisfied. All your risk is really an eight cent stamp.

### NOT A BOOK OR FRANCHISE

I'm not offering you a stock scheme, merchandise or equipment. You won't have to leave your job, knock on doors or get your friends to do it for you. No working in a cellar either. This is excellent for women too. It's possible to make more money at home than their husbands make at work.

**I will not just tell you about my success story, but rather ... I will introduce you to your own!**

You can have cash coming in every day even when you're sick or on vacation. Even holidays can't stop the cash flow of my system. Sound exciting? You bet it is. You will need lots of confidence in my system and very little money to get started. People with little capital

must have daring and be willing to take a chance if they want to make lots of money. If you have ten dollars worth of daring after reading this offer, I strongly urge you to put it in an envelope and I promise to show you how to change your life.

**OTHERS GOT BACK THOUSANDS BECAUSE THEY BELIEVE IN ME AND MY SYSTEM NOT ONE LOST.**

One man made \$30,000 in just six months using my secrets. I taught him what I will teach you and now he is independent. People from all walks of life have used my idea: A teacher, janitor, lawyer, housewife, chemist, salesman, secretary and even a policeman. **NOT ONE EVER LOST A PENNY.** I cannot promise you will make as much money as I but then again you may make more.

**OPPORTUNITY IS NOT JUST KNOCKING AT YOUR DOOR ... IT'S ALMOST KNOCKING YOUR DOOR DOWN!!!**

This is the chance you have been dreaming about ... **NOW TAKE IT!** Your risk is only a stamp, your money is refunded if you find I'm wrong. **BUT, . . . . .**

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The complete PM PICTURE-TOOL KIT consists of seven big sheets (9¾ x 11¾ in.) of a special heavy-weight paper with a pressure-sensitive adhesive on the back. On each sheet are beautiful drawings of hand tools and portable power tools—all you're likely to have in your shop (74 in total). Most are full size; the others nearly so.

Also enclosed in the kit is a blank sheet of the same special paper, printed in an overall color to match the tools. This sheet enables you to design your own drawings of special tools.

Each of the PM PICTURE-TOOLS is carefully die-cut. You simply peel off the backing paper and apply it to the proper spot: on painted or unpainted wood, plywood, hardboard and even perforated-hardboard surface.

Later, if you want to move a few tools or rearrange the entire panel, you can peel off the PM PICTURE-TOOLS and reuse them in new locations!

Once your PICTURE-TOOLS are in place, you'll know at a glance exactly where each tool belongs.



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The Black & Decker 1/2" reversing drill. A big, tough drill that's at its best where the jobs are toughest. In masonry. *Heavy* masonry. Like cement blocks. Or concrete slabs. Or fire-hardened brick.

It's got a strong, burnout-protected 1/3 HP motor. With a high-torque gearing system that'll drive through just about anything. And since it's *reversing*, you can get out of the work as easily as you got in.

It's got a two-position end handle that'll give you extra control and leverage for tough jobs. And it's removable, for

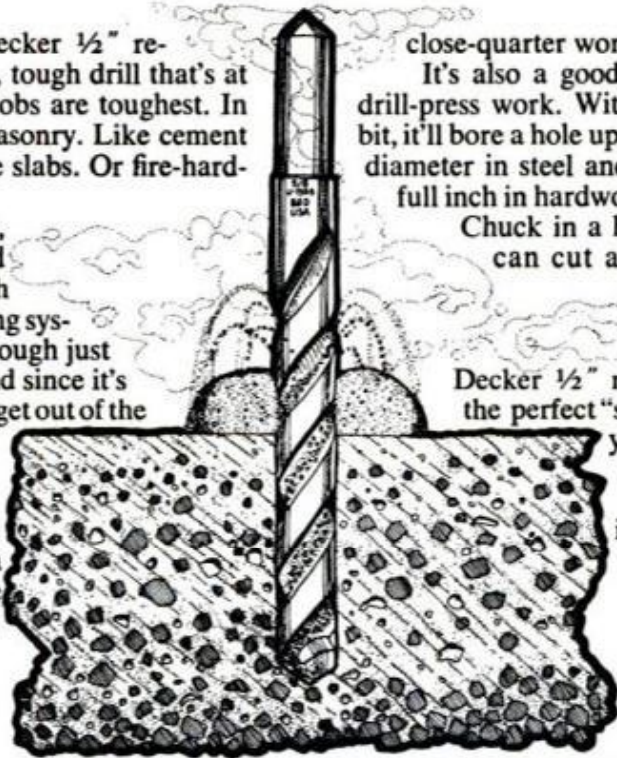
close-quarter work.

It's also a good choice for home drill-press work. With the proper bit, it'll bore a hole up to 1/2" in diameter in steel and a full inch in hardwood.

Chuck in a hole saw and you can cut a clean hole up to 2 1/2".

No doubt about it. This Black & Decker 1/2" reversing model is the perfect "second drill" for your workshop.

Because when the job gets tough, it gets the job done.



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If you don't agree that it's worth at least a hundred times what you invested, send it back. Your uncashed check or money order will be returned.

The only reason we won't send it to you and bill you or send it C.O.D. is because both these methods involve more time and money. We're already going to give you the biggest bargain of your life.

We are going to show you how to do something that cost us tens-of-thousands of dollars to learn, and more tens-of-thousands of dollars to put into practice.

We are offering to show you how you can have an account established for the wholesale supply of the best known names in guns, ammo, fishing tackle, sporting goods, watersports equipment and marine products.

We'll show you how your supplier will package, label, insure and drop-ship your customers orders. . . orders that were pre-paid so you don't tie up your money.

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It doesn't require education.

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It doesn't require luck.

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It doesn't require experience.

Your age makes no difference.

What does it require? BELIEF! Enough to take a chance. Enough to absorb what we send you. Enough to put into action, a plan that could put you on the road to riches.

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Imagine being able to afford the things you've always wanted. . . Being able to "take off" and go fishing, hunting or anything you desired whenever you wanted to. And, be secure in the knowledge that your business would keep running in your absence.

Just imagine what it would be like to be your own boss. Set your own hours. Work as little — or as much — as you please, realizing that the more you worked, the richer you'd become.

Sound like the impossible dream? It's not. . . We guarantee it!

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THERE HAS NEVER BEEN SUCH AN OPPORTUNITY!

Remember. . . you don't have to give up your present job. You don't need any special permits or licenses. And, you can work out of your home.

Now, the rest is up to you. Make us prove every statement we have made here. Send us the attached coupon now. We are not asking you to blindly believe us. JUST TRY IT. You have only an eight cent stamp to lose. But. . . what if we are right. Look what you could gain.

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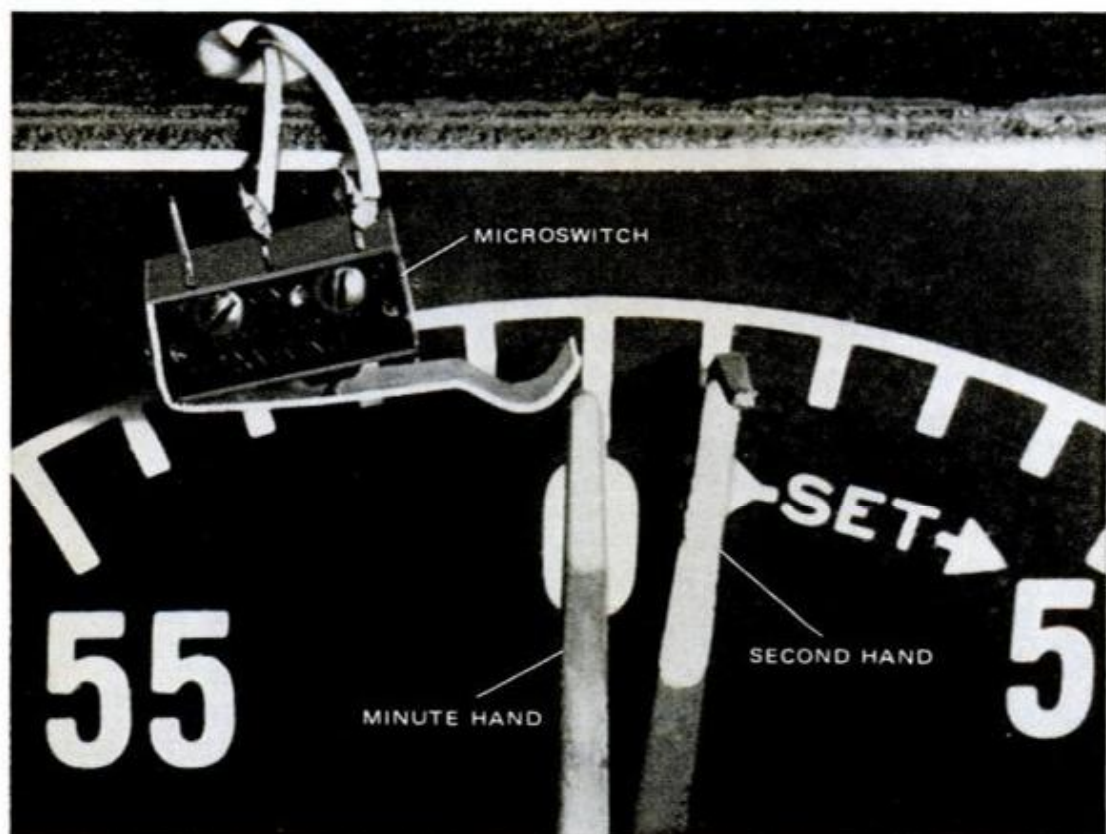
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# PHOTO HINTS

## FROM READERS

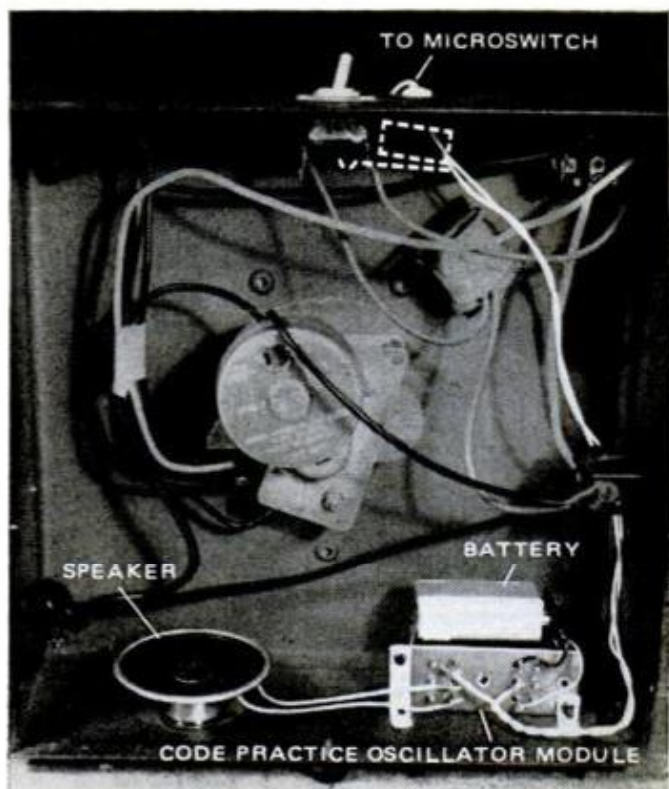


Microswitch contacts second hand once per minute, to activate "beep" oscillator and speaker added inside case.

### Beeper improves darkroom timer

I use my Gra-Lab timer for both printing and film developing. Since I can't always look up to see when I should agitate the film or paper, I added a "beeper" to sound off once per minute while the timer hands are moving. Parts I used were a lever-type microswitch, mounted to contact the second hand as it passed the 60-second mark, a small speaker, and a Radio Shack code oscillator module with its battery taped on; but any equivalent parts should do. The oscillator is mounted inside the timer case with aluminum brackets, and the speaker is epoxied directly to the case (I get adequate sound without baffle holes). The microswitch is mounted on a small wood spacer, so it won't interfere with the minute hand's operation.

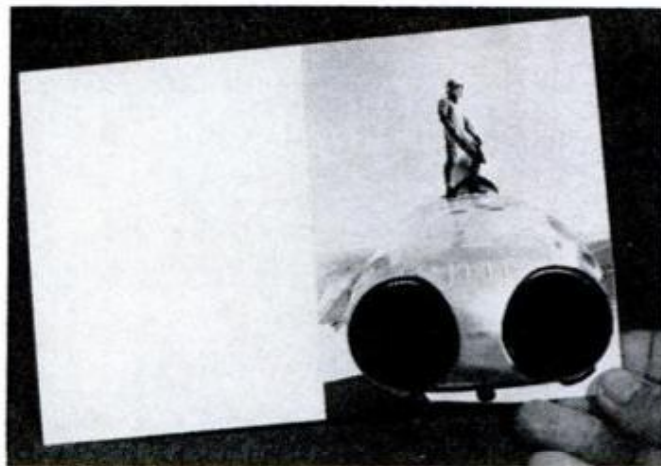
—Douglas Blodgett, St. Charles, Mo.





### Photos make personalized note cards

Turn your favorite photos into photo notes, and you'll get a lot more mileage from them. Cut 8x10 single-weight, matte paper into 5x8-inch halves (double-weight or glossy papers are more likely to crack), and print your picture as a vertical or horizontal on the right half of the sheet, so that it makes the front of the note when folded; mask off the unexposed half of the paper during exposure, to avoid fogging it. If it's a shot



Print on the right half, leave the left half blank, and fold the paper on the centerline.

you're especially proud of, you can print it across the entire sheet and fold the picture in the middle; the recipient can fold it out again.

Since unmounted, single-weight paper has a tendency to curl, use print-flattening solution (or print on Kodak's "RC" resin-finished papers) and keep your finished note cards flattened between blotters until you use them.—Arthur L. Schoeni, Dallas.



Emulsion on the outside carries the picture, while paper's back surface, inside, is easy to write on.

## Minolta helps you get close to nature.

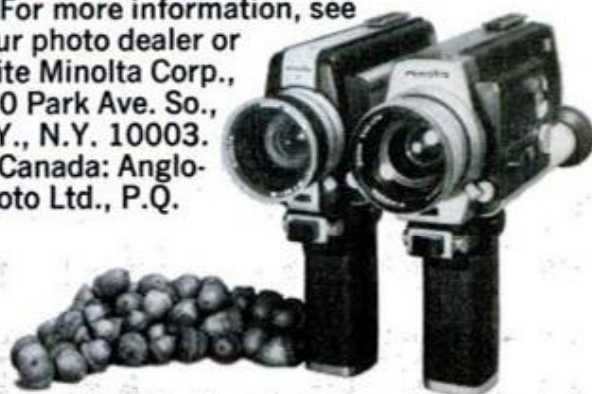


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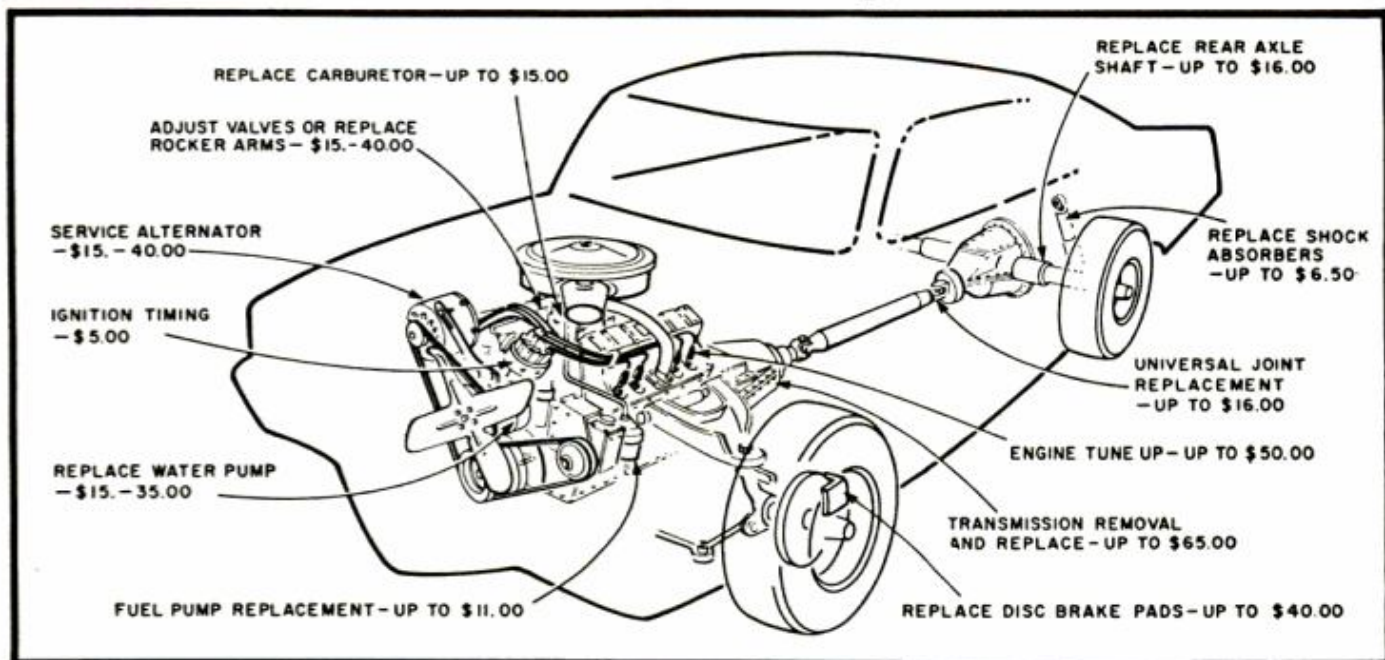
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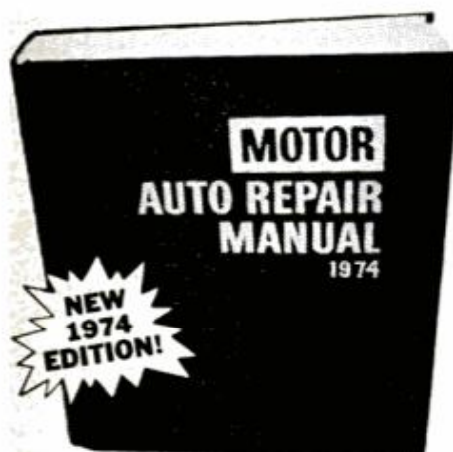
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**This year, we're out to win you over.**



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Maybe it'll be the fact that our wagon is big enough to carry 4' x 8' paneling on the rear floor even with the tailgate closed. (Compare that to other

mid-size wagons.)

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Or maybe it'll be the way we engineered this wagon. With a torsion-bar front suspension. A body made strong by more than 4,000 welds and quieted by more than 95 individual components to reduce noise.

Maybe it'll be the Electronic Ignition System with no points or

condenser to replace. It virtually eliminates ignition tune-ups. And helps spark plugs last as much as 18,000 miles.

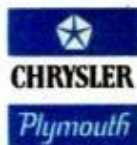
Or maybe we'll win you over with the fact that all our engines run on regular gas.

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**Mid-size Plymouth Satellite.**  
Extra care in engineering...it makes a difference.





## HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

### Balky garage door

*It's getting almost impossible to raise and lower my sectional garage door. It even binds and sticks at several points coming down. What could be wrong and how do I fix it?—Howard Weist, Gary, Ind.*

Sounds to me as though the parts need oil badly, or the torsion spring is out of adjustment, or both. I'm assuming that no parts have been damaged or are out of original alignment. The ball-bearing rollers at each end of such a garage door will run dry of lubricant in time, sometimes to the point where they will not be able to rotate. This alone could cause the trouble you describe. Clean each roller with a solvent and stiff brush, then apply a few drops of light oil.

The torsion spring on the support shaft at the top of the door is designed to provide part of the "lift." This spring is adjustable. Tighten it a little at a time until the door raises easily and requires a slight pull to lower. Clean and oil this spring in the same manner as the rollers.

### Clock origin

*I acquired an old clock that caught my eye because of its unusual ornamentation. It has a long door veneered in a beautiful curly wood and a door panel consisting of nine pieces of beveled glass set in brass framing. It strikes on a long chime rod, has Arabic numerals, a brass and silvered dial and is driven by two brass weights. It's a hanging clock, about 35 in. tall and 12 in. wide. The question is, who made it and where? No one I've contacted seems to know.—George Hyde, Atlanta.*

It's not possible to give you a positive answer without seeing it, but I'm guessing—and this is strictly a guess—that the clock was made in either Germany or Austria. The strike on a single chime rod and the multipaneled glass door in brass framing would seem to indicate this origin.

### Refinishing benchtop

*I've just bought a nice cabinet workbench for my basement shop. It's used, of course, and the top has chisel marks, digs and gouges—none very deep—and several small holes. How do I go about smoothing it up?—Bill Fredricks, Baltimore.*

With some doing you can make it look almost, but not quite, like new. Use a wire brush first to remove dirt and any other debris. Then buy a cabinet scraper (if you don't already have one) and scrape the top until you get down to clean wood. Drive short lengths of dowels into the holes, cut them off flush and sand the entire top smooth. If some of the gouges are too deep to reach bottom with the scraper, or a hand plane, chisel a diamond-shaped recess and fit a patch of the same wood. Glue this in place and sand flush. Then give the top several coats of boiled—not raw—linseed oil, or any prepared oil finish.

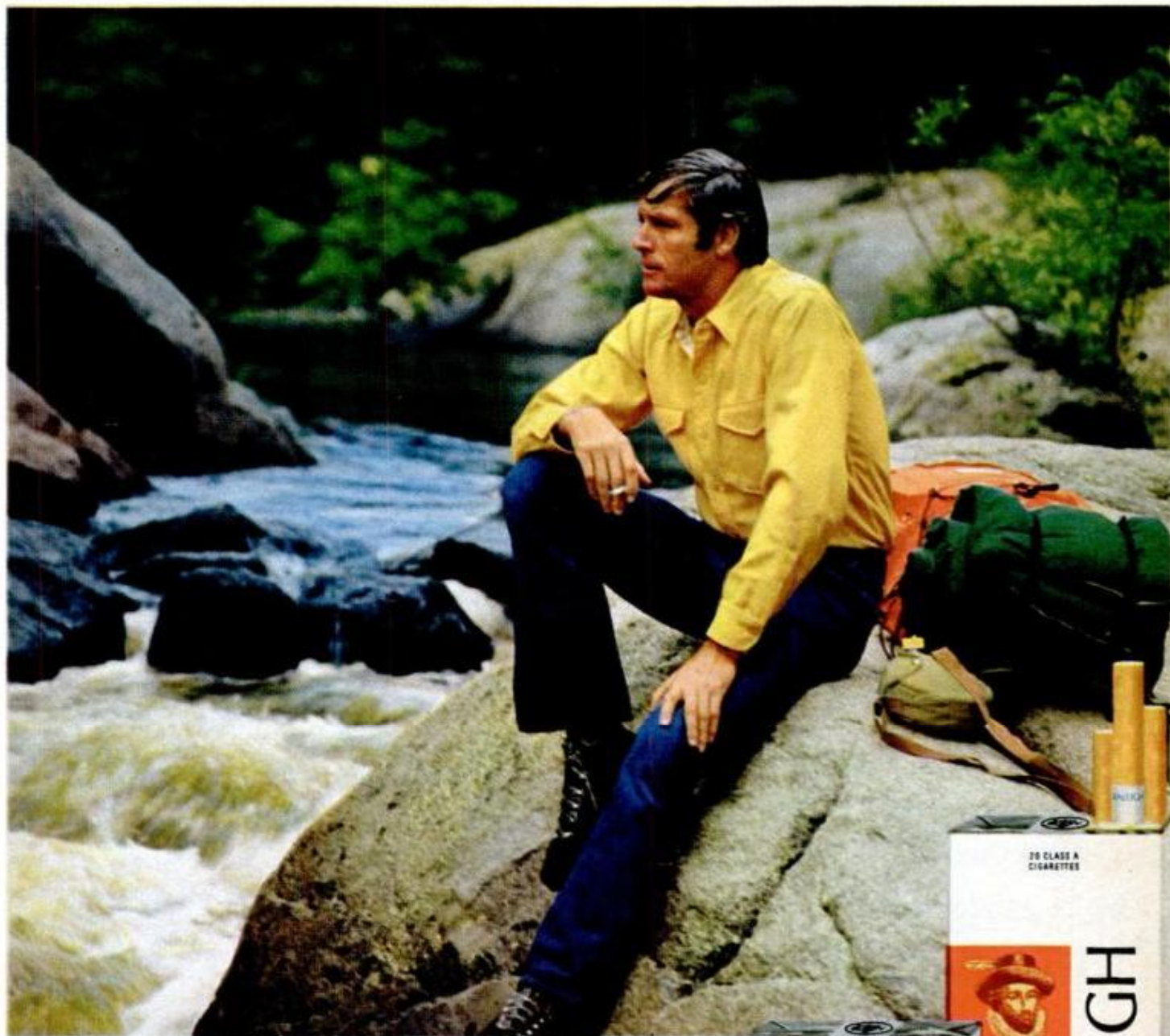
### Skin on paint leftovers

*I buy a quart of paint, use a part of it, put the cover back on tightly. Yet when I open it again there's a thick coating or "skin" over what's left. How does one prevent this?—Ralf Mayer, El Paso, Tex.*

The best way I know of salvaging paint leftovers is to pour what remains after use into a glass jar with a screw top that can be closed tightly. The trick is to select a jar of a size just large enough to hold the leftover paint with little space remaining between the paint and the underside of the lid. As a rule, paint leftovers will keep in such a container for long periods of time without "skinning." But make sure that lid is turned down tightly. ★★★

*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. While letters cannot be answered individually, problems of wide interest will be discussed in this column.*





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# Christmas gifts you can make

**Popular  
Mechanics**

## Jewelry you can carve in a jiffy

You can create these personalized, easy-to-make gifts in time for them to be found under the Christmas tree

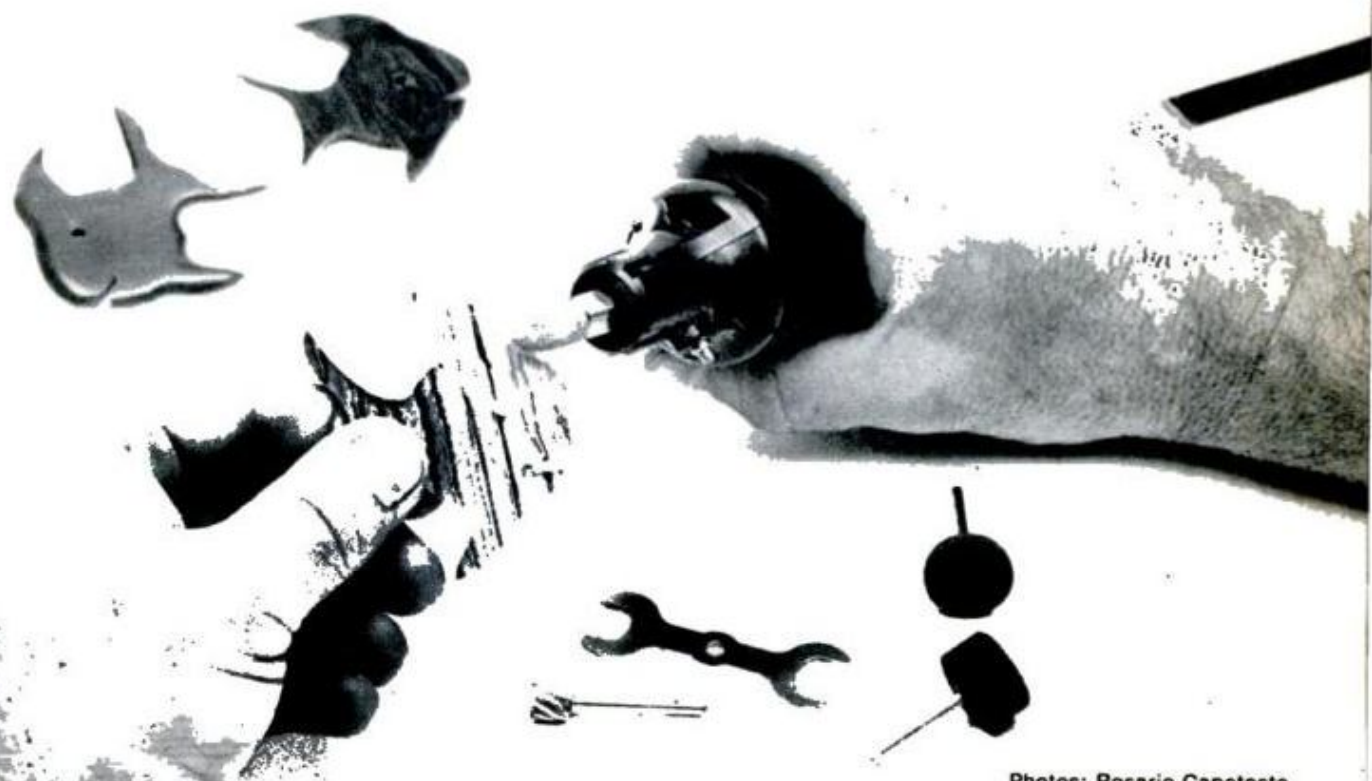
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by John Gaynor and Harry Wicks

**T**hese miniatures can be carved, from start to finish, on a kitchen table, so you won't need a king-sized workshop for the project. And the nature of the job requires just a small amount of material—even scraps which you probably have on hand can be used. Further, the tools that

make it all possible are available at reasonable cost.

Mini carving is a wise choice for beginners. Unlike sculpture, you needn't be either an artist or an advanced craftsman to try your hand at it. As can be seen in the step-by-step photos showing the crea-



Photos: Rosario Capotosto

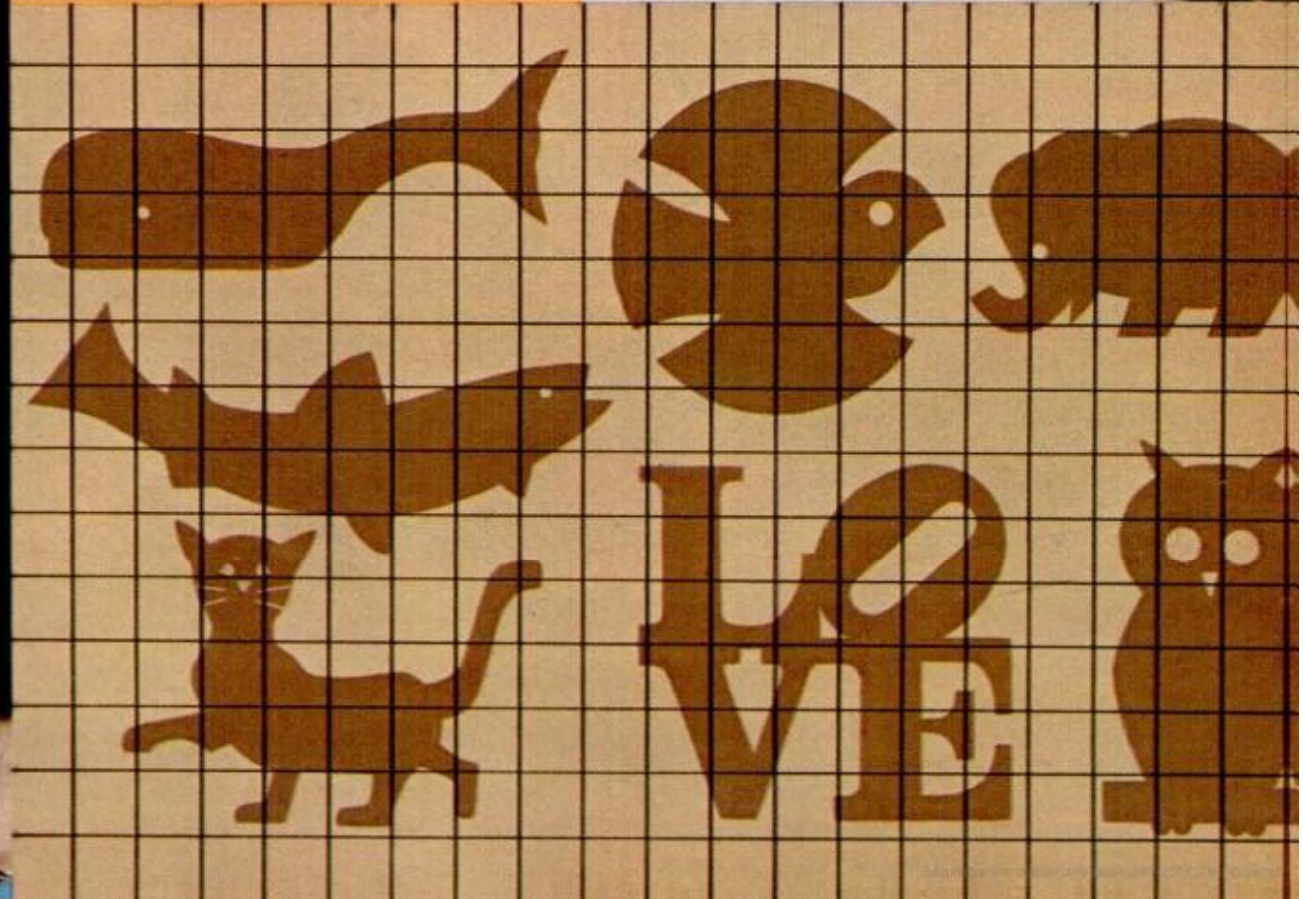
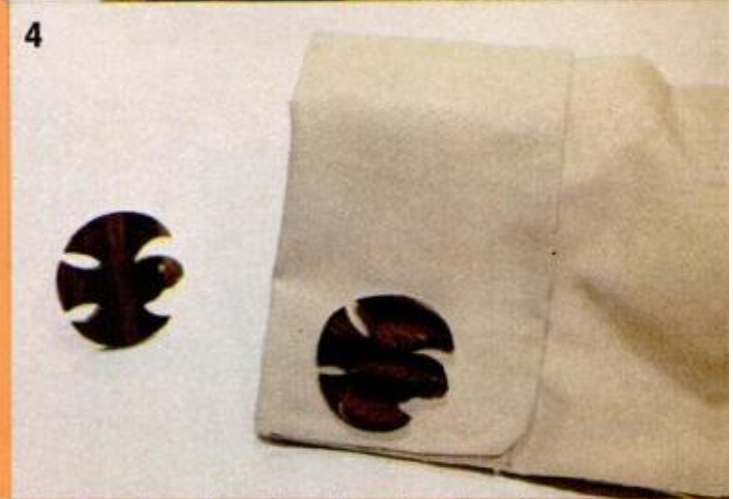








- 1 Peace dove pendant is of white plexiglass on tinted plastic suspended from a rawhide thong.
- 2 Whale tie tack was created using two woods. The rounded-off edges reveal lighter backup piece.
- 3 Same carving of the whale in red plexiglass is particularly well suited for teen-ager's earrings.
- 4 Masculine cuff links were "carved" on a jigsaw, sanded smooth, then glued to jewelry hardware.





# How to fix an electric dryer

Data: Ed Franzese

An automatic clothes dryer is probably the simplest of major appliances: Basically, its function is to pass hot air across and through wet clothes to evaporate moisture from them.

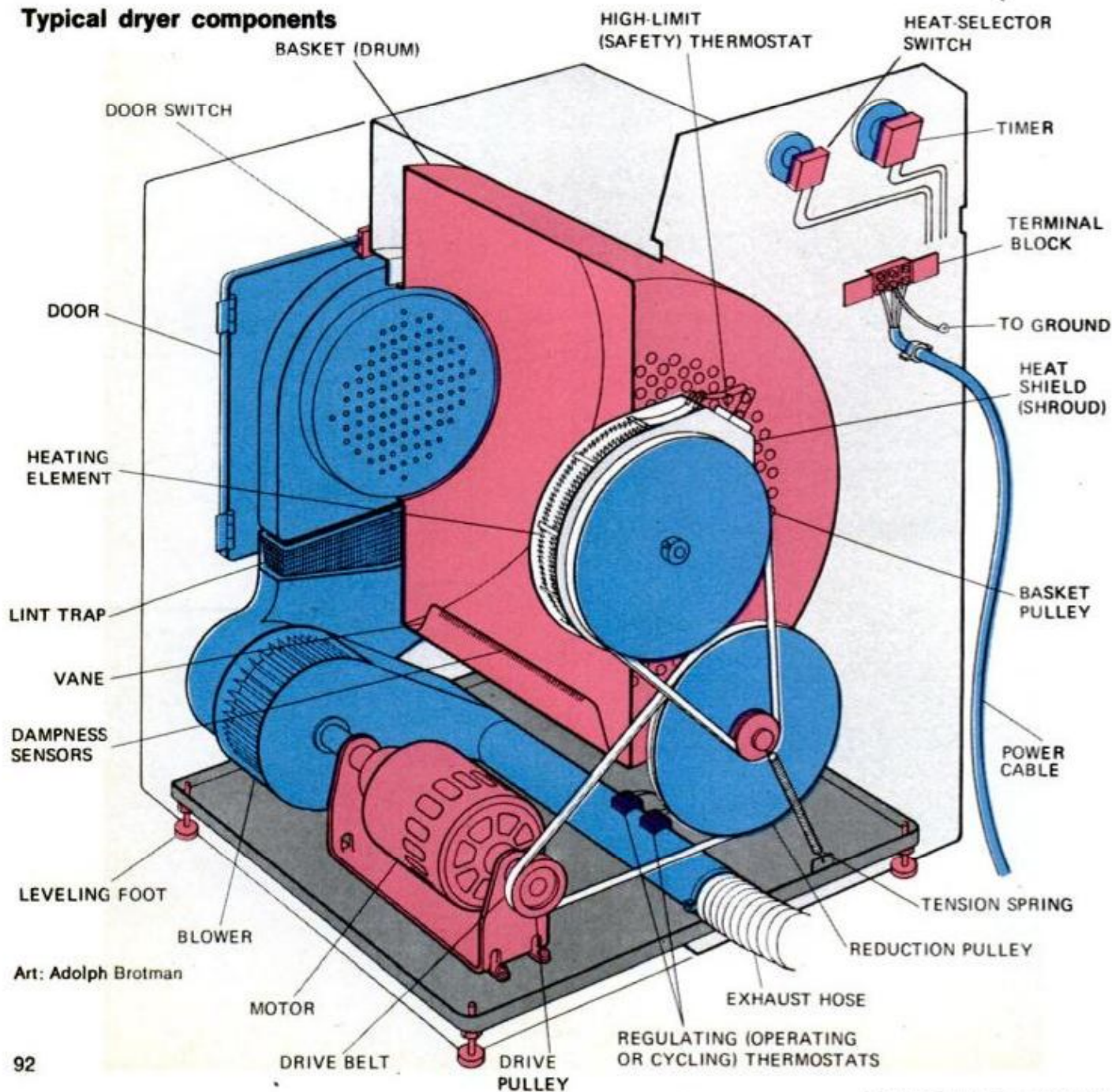
The major components of an electric dryer are a basket to hold the clothes, fan or blower to move the air, motor to turn both basket and fan, resistance-wire heating element to heat the air, and controls for motor and heating element.

An electric dryer is normally run on a

30-amp., 220-v. circuit, with the heating element operating on a full 220 v. and the motor on 110 v. Some dryers are designed to run on 110-v. circuits as well. But, while this is perfectly safe, the heating element is less efficient at the lower voltage and drying time is considerably longer.

Nearly all electric dryers work like this: Air at room temperature is drawn into the appliance at the bottom or through front or rear openings. It is passed to the heating element, heated and drawn into the clothes

## Typical dryer components



Art: Adolph Brotman



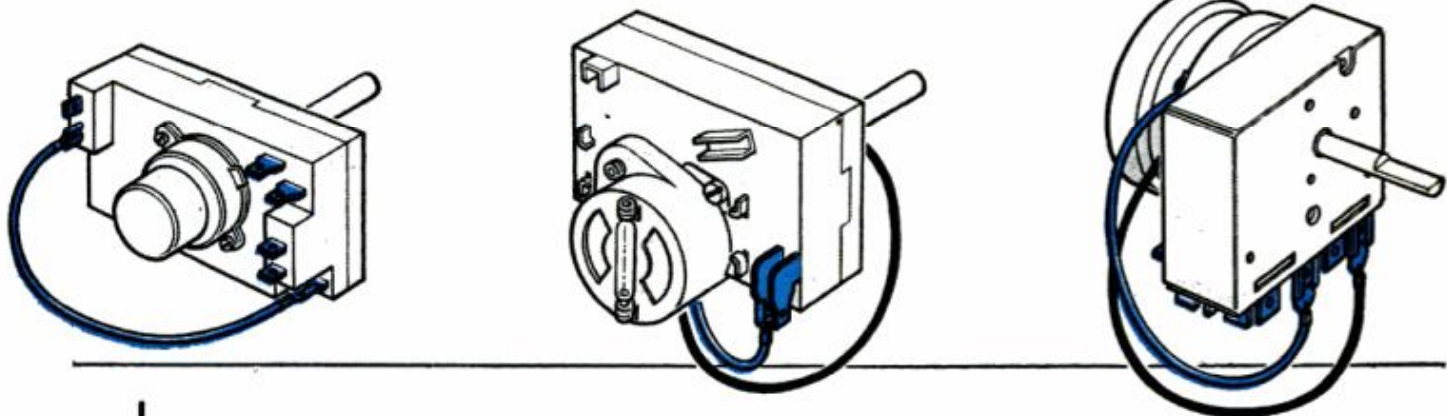
basket. In dryers with unshrouded baskets, hot air enters through holes at the rear of the basket; in dryers in which the basket is shrouded, hot air is drawn into the shroud and enters the basket through holes around its side. Passing over and through tumbling clothes in the basket, the hot air picks up moisture and lint (a result of normal wear) from them. When it leaves the basket at the front through ducting built into the door assembly, the air passes through a screen lint trap, usually just below the door.

The air then is sucked into the blower, and forced through a duct to an exhaust hose that leads outdoors.

Motor and heating element are controlled by a timer, a heat-selector switch, two or more thermostats, a door switch, and, in newer machines, an electronic dampness sensor. The thermostat located near the heating element, called a high-limit thermostat, is a safety device and will not trip if the machine is operating normally. One or more regulating thermostats govern the

*(Text continues on page 96)*

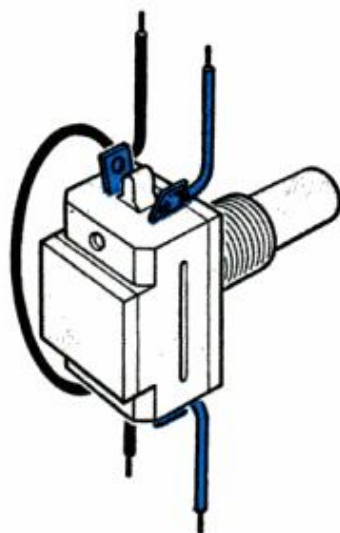
## TIMERS



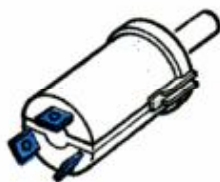
Art: Peter Trojan

## Motor does not start

POSSIBLE CAUSES	WHAT TO TRY
1. Line fuse blown.	Replace fuse (or reset circuit breaker).
2. Door open.	Close door tightly.
3. Timer defective.	Check the line voltage at timer. Turn timer on and place 115-v. test lamp across its terminals. If you get a reading, it indicates open contacts. Replace contacts or timer.
4. Door switch defective.	Remove wires from door switch, place continuity tester across terminals and press button. No reading indicates a defective switch. Replace.
5. Motor wiring loose or disconnected.	Tighten or reconnect loose or disconnected wires.
6. Centrifugal switch defective.	Refer to the manufacturer's schematic diagram for switch terminals on the motor; place continuity tester across terminals. If you get no reading, replace switch or motor.
7. Motor defective.	Direct-test motor with test jumper. If motor still fails to run, replace.



## DOOR SWITCHES

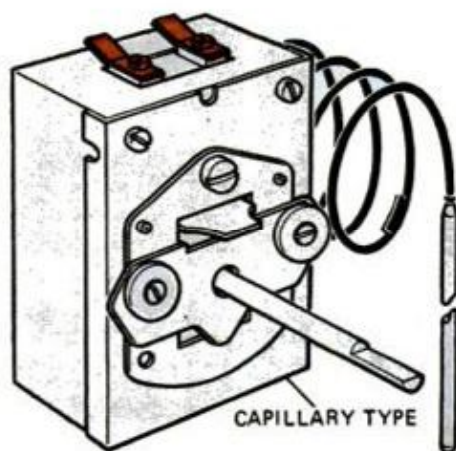
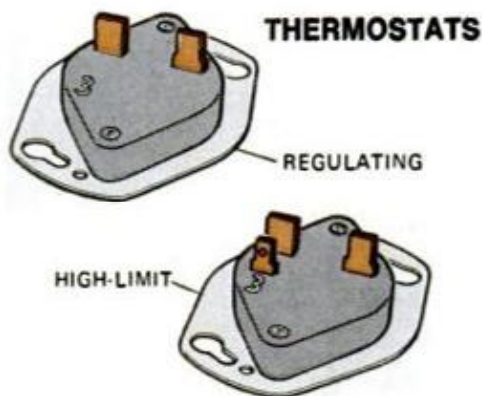
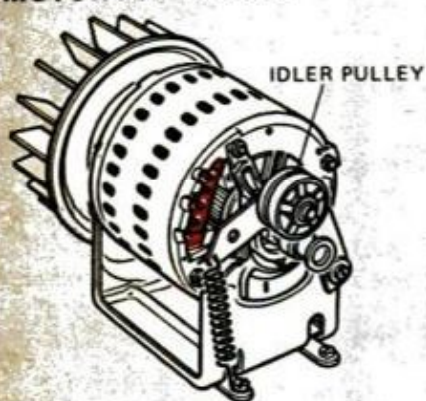




## Motor hums

POSSIBLE CAUSES	WHAT TO TRY
1. Voltage too high or too low.	Check panel fuses or circuit breakers. Check voltage at dryer line or terminals. Any variation greater than 15 percent from normal can cause hum. Notify power company.
2. Centrifugal switch in motor stuck.	Remove both motor and switch. Grease shaft, clean the contacts and reassemble. If the switch still sticks, replace it.
3. Basket binding or idler wheel broken.	Check the basket while turning it by hand. Replace any worn or broken idler wheels. Check leveling of machine.
4. Motor defective.	Direct-test motor with test jumper. Replace it if it fails to operate properly.

### MOTOR AND MOUNT

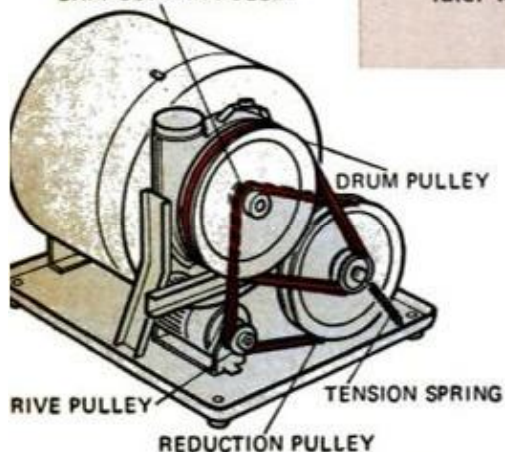


## Motor hums; basket does not rotate

POSSIBLE CAUSES	WHAT TO TRY
1. Broken belt.	Remove back of dryer and replace any broken belts you find.
2. Loose pulley.	Check setscrews in all pulleys. If pulleys are slipping on their shafts, realign them first and then tighten setscrews.
3. Tension spring broken.	Replace broken tension spring.
4. Basket binding or idler wheel broken.	Check the basket while turning it by hand. Replace any worn or broken idler wheels. Check leveling of machine.

### BASKET DRIVE WITH REDUCTION PULLEY

EXHAUST FAN PULLEY





## Noisy operation

POSSIBLE CAUSES	WHAT TO TRY
1. Loose fan.	Retighten fan-blade setscrew on motor shaft.
2. Loose objects caught in basket.	Remove all loose objects from basket.
3. Loose motor pulley.	Retighten motor-pulley setscrew.
4. Worn belt.	Replace any worn or frayed belts.
5. Basket binding.	Turn basket by hand to locate the point of binding. Check felt gaskets, wire harnesses and leveling of the unit.
6. Vibration.	Check for a loose fan blade, an out-of-balance fan blade, also for worn basket bearings and motor mounts. Tighten any loosened parts and replace worn parts.

Quick, corrective action—when dryer runs noisily—is the best insurance against more serious damage to the dryer later.

## Clothes dry slowly or not at all

POSSIBLE CAUSES	WHAT TO TRY
1. Drum overloaded.	Check size of load. Refer to the manufacturer's minimum and maximum standards.
2. Operating thermostat defective.	Place a thermometer in an exhaust duct, then record the temperatures at which the dryer heat is turned on and off. Check these figures against the manufacturer's specifications. If they should be out of the suggested range, replace the thermostat.
3. Lint trap clogged.	Clean lint trap thoroughly.
4. Heating element open.	Place a continuity tester across the heating-element terminals. If there is no reading, an open coil is indicated. Replace.
5. Exhaust hose clogged.	Clear exhaust hose.
6. Timer set too low.	Check your owner's operating manual; then increase the timer setting.
7. Blown panel fuse or tripped circuit breaker.	Check fuse or circuit breaker at the panel; then replace or reset it. If fuse or breaker should blow or trip again, then check for a short circuit in the heating element.
8. 110-v. operation.	If possible, change to 220-v. operation. Clothes take 2½ to 3 times longer to dry on 110-v. line.
9. Clothes excessively wet when placed in the dryer.	See that clothes are spun-dry or wrung out—not dripping wet—before they are placed in dryer.

Too often, slow drying will occur because the maker's instructions are not followed to the letter. First step is to reread operating instructions, make certain that they are followed.

MOI



heating element in normal operation. In old dryers, these may be of the adjustable, capillary type (you should *not* attempt to adjust one of these). Simple bimetal thermostats are more common. Regulating thermostats are usually located in the door assembly or on the exhaust duct, one for each heat setting for which the dryer is designed.

A dryer with a permanent-press cycle may have a "cool-off" regulating thermostat to run the motor with heat off until clothes cool to about 115°F.

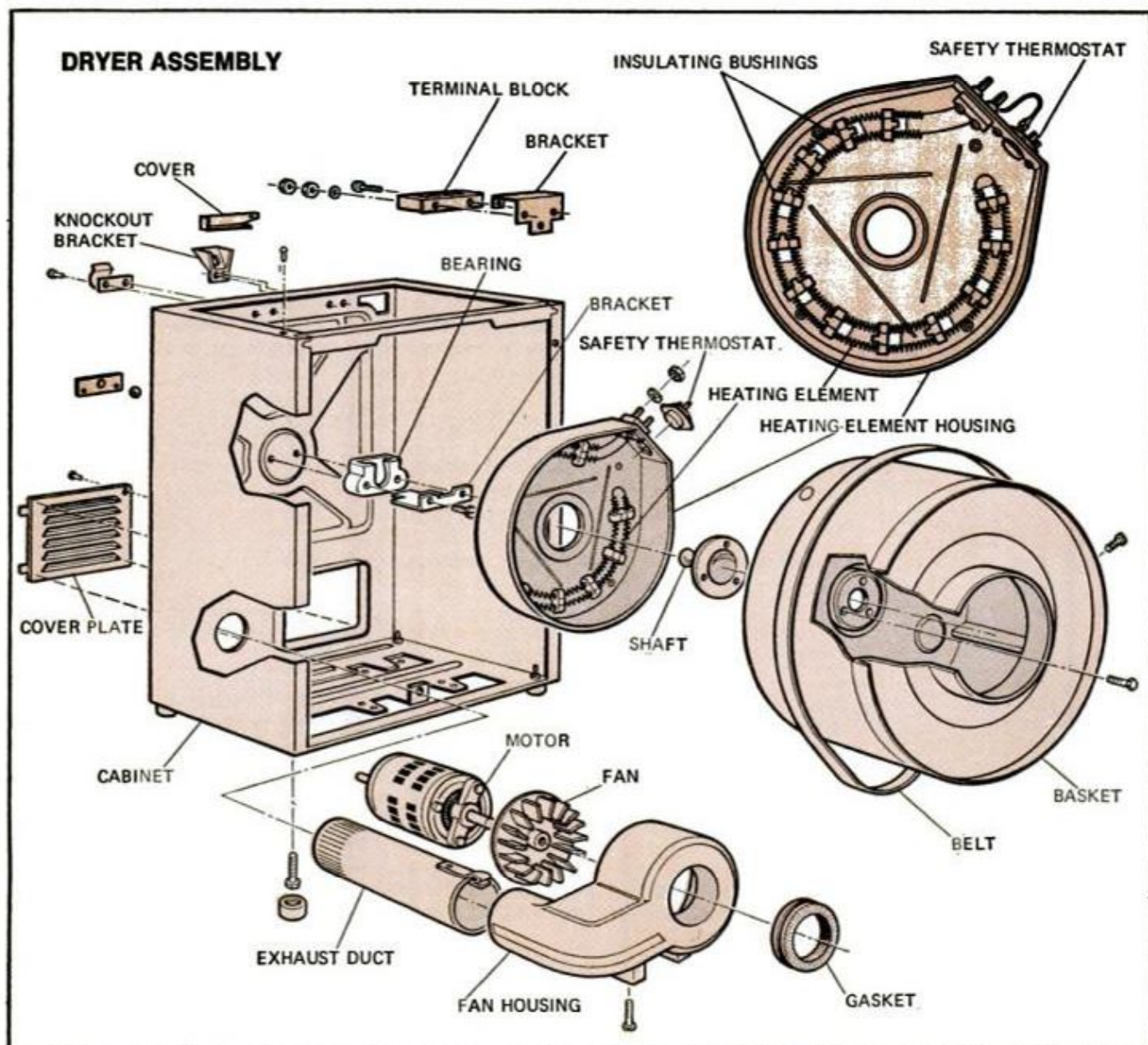
Operation of electronic dampness sensors is based on the fact that the electrical resistance of clothing increases as it dries. Damp clothes complete a circuit across sensor elements located on or near the basket vanes. By measuring their resistance in this circuit, the sensor determines whether or not a desired dryness has been reached, and shuts off the dryer when it has. Repair

of these sophisticated electronic controls should also be turned over to a qualified serviceman.

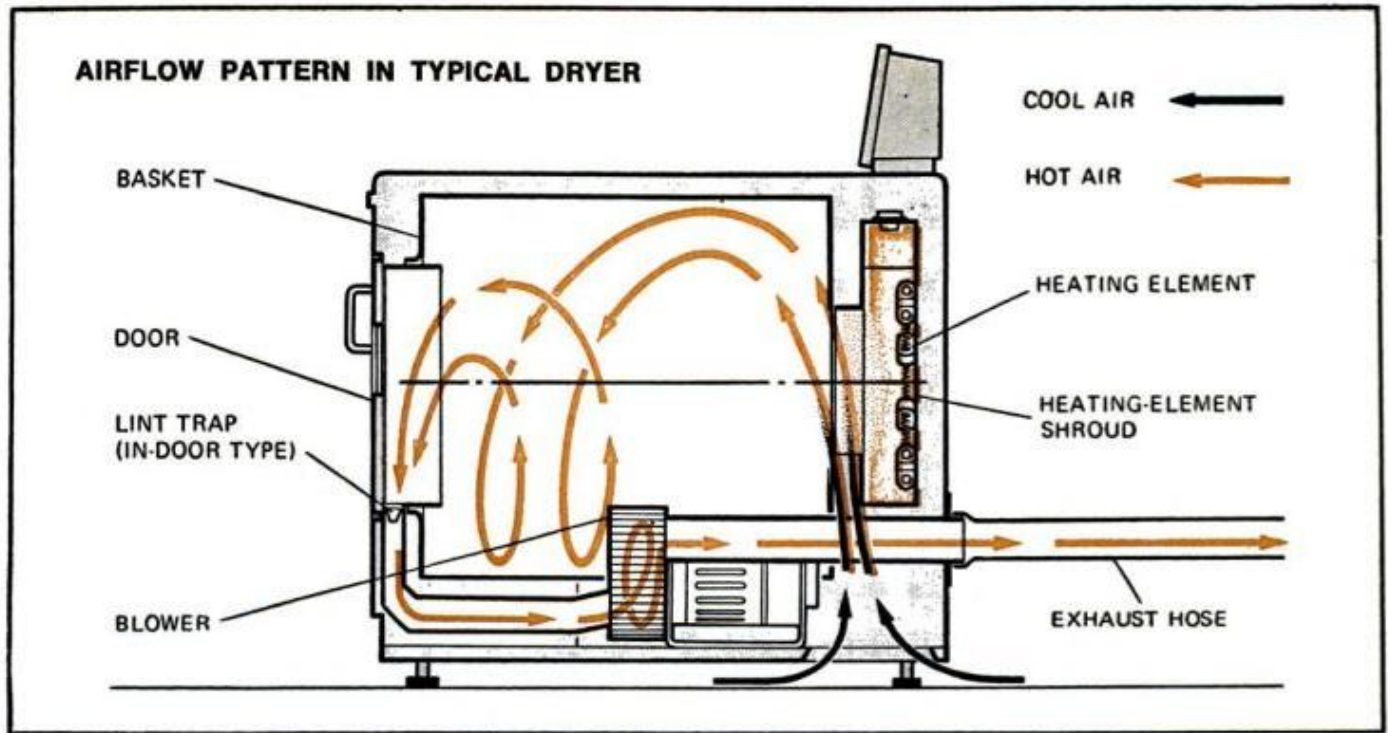
A dryer basket may be driven by a belt that passes around it and also passes over a pulley on the motor shaft. Where the dryer is equipped with a shrouded basket, that basket is usually driven through two belts and a reduction pulley.

A dryer motor has two windings—one for starting and one for running. It is shifted from the former to the latter winding by a centrifugal switch. The motor terminals and their corresponding wires are usually coded with matching colors. Refer to the manufacturer's schematic diagram for correct terminals when you test your equipment.

The troubleshooting charts on these pages should help you correct most common electric dryer problems. Gas dryers will be the







subject of a **CLIP-AND-SAVE KNOW-HOW** article in next month's *PM*. When working on your electric dryer, or any other appliance, follow these safety precautions:

- Refer to your manufacturer's manual to locate components.
- Be sure that power is *turned off* before you handle components.
- Make all of your continuity tests with *power off*.
- When making tests with a 115-v. lamp, turn power off first, connect the lamp, turn power on again, observe the result, then turn power off again and disconnect the lamp.

- Make sure that the appliance is properly grounded, in accordance with your local electrical code.

- Use replacement parts that meet factory specifications; those that are made by the manufacturer of the appliance are your best bet.

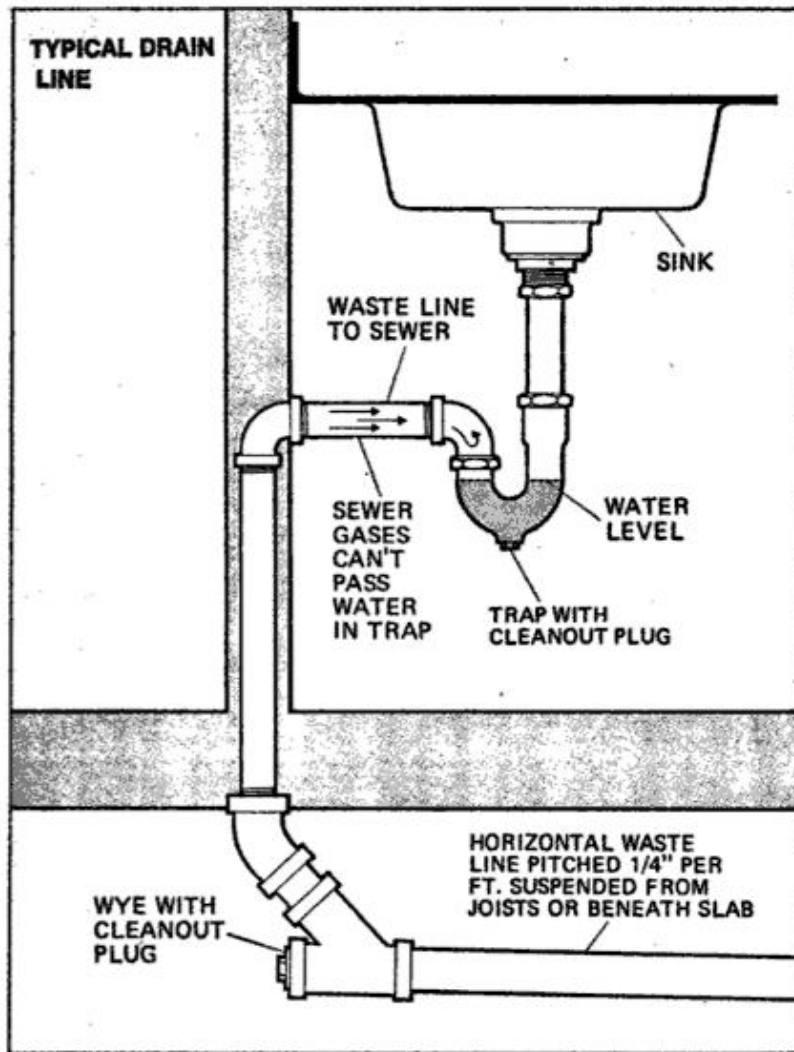
*Extra tips:* Before replacing an electrical part you believe to be faulty, make sure that the problem isn't caused by a loose connection. Tighten all connections after replacing an electrical part. Use new parts, not rebuilt ones, unless your appliance is so old that you can expect little further service from it. ★★★

### Dryer does not shut off

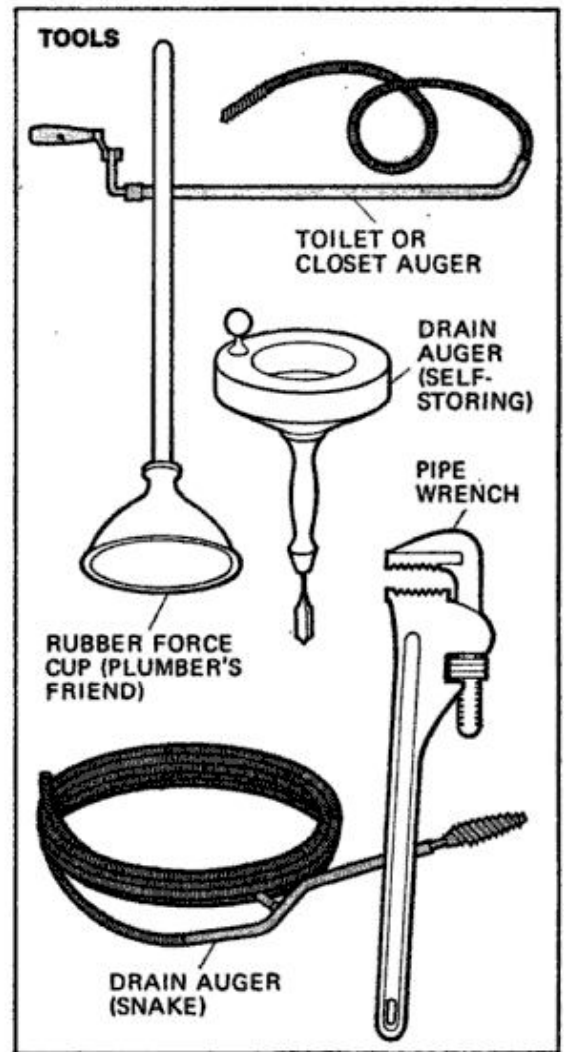
POSSIBLE CAUSES	WHAT TO TRY
1. Timer defective.	Check for a stuck timer or welded contact points. Replace.
2. Door switch defective.	Remove wires from the door-switch terminals; then place continuity tester across terminals. If there is a reading before the switch button is pressed, replace switch.
3. Operating thermostat defective.	Check thermostat against the manufacturer's specifications with a thermometer in the exhaust duct. If defective, replace.
4. Motor grounded.	Remove wires from motor terminals. Touch one lead of the continuity tester to a terminal and the other lead to the motor housing. If you get a reading on the tester, the motor is grounded. Replace.



# How to unclog drains

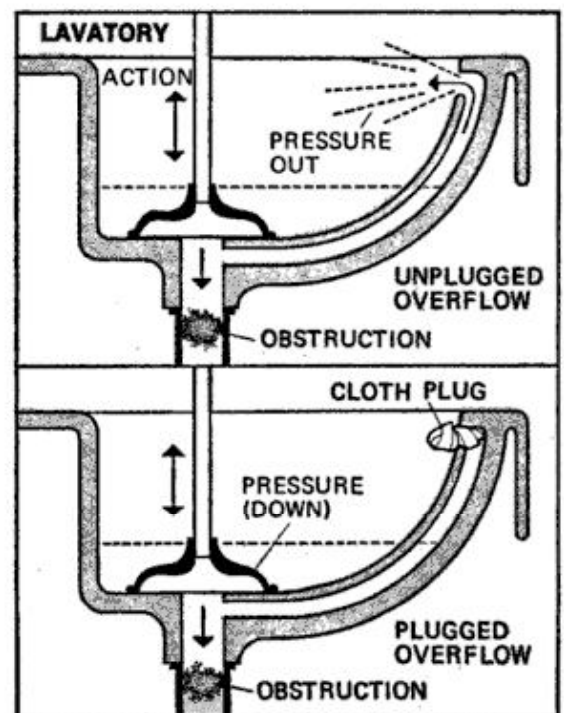


Art: Adolph Brotman



## Blocked drains—a common problem

Drain blockage (after dripping faucets) is probably the most frequently encountered home-plumbing problem. The first step to take when a drain has clogged is to check other drains in the house to determine whether the main waste line itself is blocked. A typical drain is shown above. Notice that between the sink basin and waste line horizontal run, there are two places where the line can be cleaned out—at the trap and at the wye. There should also be a cleanout at every angle (turn) in the waste line. The five tools shown at right above will let you handle most emergencies when the obstruction is in the fixture or reachable area of the waste line. If blockage is caused by tree roots outside, your best bet is to call in a pro with his equipment for clearing the line. To free a stopped-up sink (right), plug fixture's overflow vent and use a force cup. Remove stopper, cover force cup with water and stroke with up-and-down motion. Particles drawn up into sink should be removed and operation continued until line is running freely. If this doesn't work, try chemical cleaners; first scoop out all water in sink.

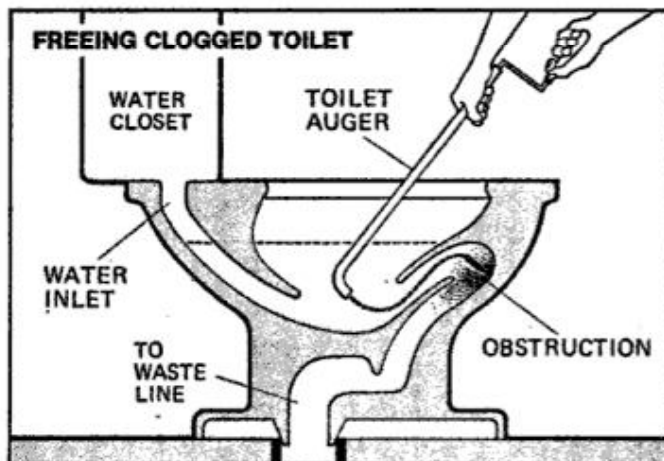




## Clogged toilet

If just one toilet is clogged, it means that the problem is in the toilet itself and not in the drain line. Generally, a number of energetic thrusts with the force cup will free the obstruction. If this fails, try removing the obstruction using a bent wire coat-hanger or toilet auger. (Removal of the obstruction is better than pushing it along where it may clog further along the line.)

The toilet auger is a flexible wire encased in a metal tube. When the handle is cranked, the flexible wire is forced out of the tube and into the trap. Though a good tool for clearing toilet obstructions, its effectiveness is limited by length—usually 3 to 4 ft. If the auger won't reach the obstruction, try using a drain and trap auger. If this fails, the toilet will have to be removed so clearing of line can be accomplished.

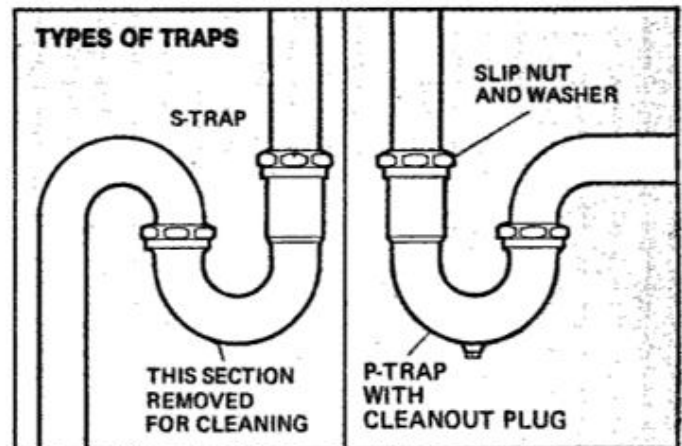


## When all else fails

If you've tried all methods without success, the obstruction is in the main sewer line. In this event, a professional is required; he has the tools and the specialized know-how for clearing clogged lines (usually tree roots) with a minimum of fuss and inconvenience for the family.

## Chemical cleaners

To avoid clogged drains, chemical cleaners should be used at the first sign that water drainage is slowing down in fixtures. Make certain you read and follow the manufacturer's instructions on the container, paying particular attention to the safety precautions (and antidotes). When using chemical cleaners, wear rubber gloves, protect your eyes and make certain you *never use a force cup immediately after using chemicals*; your skin can be severely burned by liquids that may splash back. Give cleaner time to do its job (following maker's instructions), then flush out drain with cold water.



## Cleaning out the trap

The primary function of the trap in a waste line is to prevent the odor of sewer gases from entering the house via the fixture. Water, which is always in the trap, prevents this from happening. If the force cup or chemicals won't clear the line, the third step is to clean out the trap. S-traps must be removed entirely for cleaning by loosening two slip nuts. However, most traps have a cleanout plug at the bottom. Here, simply place a pail beneath the trap and back out the cleanout plug. Then the obstruction usually can be washed out with tap water or snaked out with a drain auger. When line is clear, *carefully* replace the plug or slip nuts. They have very fine threads that are easily stripped if not started right. At this time, check washers on the slip nuts for resiliency. If they show signs of wear, they should be replaced.

## General facts about clogged drains

By conscientiously performing a few maintenance chores every few months, you can probably avoid clogged drains to begin with (except for root problems in the main sewer line). Periodically back out the clean-out plug (or remove S-trap) and flush out all sludge, hair and the like. Make certain you have a pail handy as you remove the plug—remember it is always filled with water. Second, periodically use a chemical cleaner. One type of "clogging" occurs in winter only: Freezing. Here, you must first locate the frozen section of pipe—usually in an unheated attic or crawl space. If water lines are in an outside wall, in some cases the freezing will be where you can't directly reach it. Here, heat applied lower on the line will eventually reach and thaw out the frozen section. Apply heat to pipes using flameless heater, hair dryer, or warm air from the exhaust outlet of a vacuum cleaner. If you use a propane torch, keep flame moving and remove flame from pipe every few minutes or steam might develop to explosive pressure.

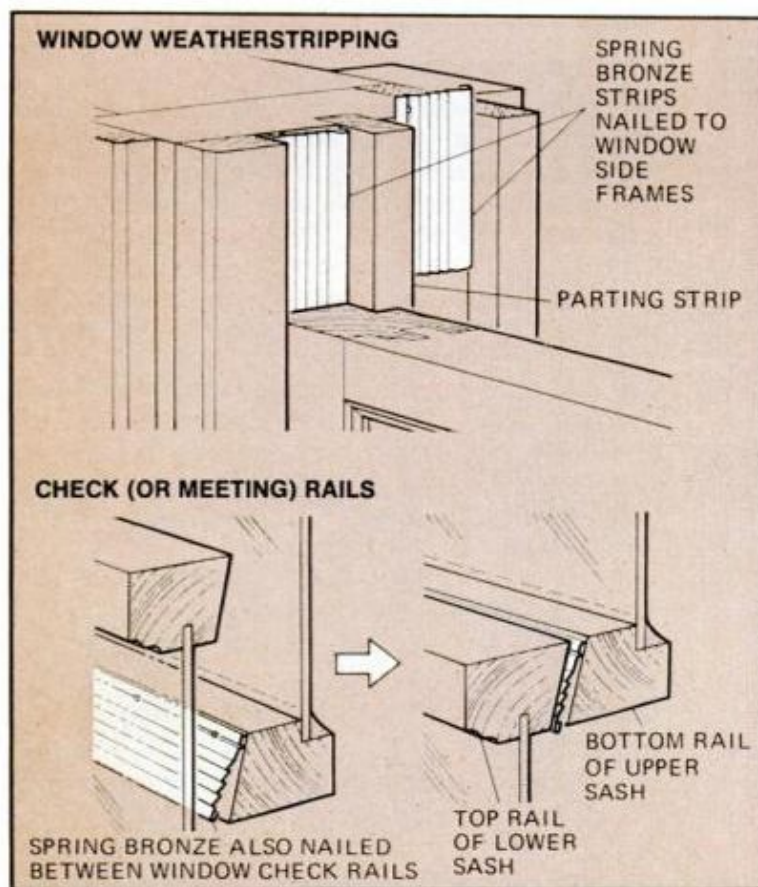


# How to minimize heat loss

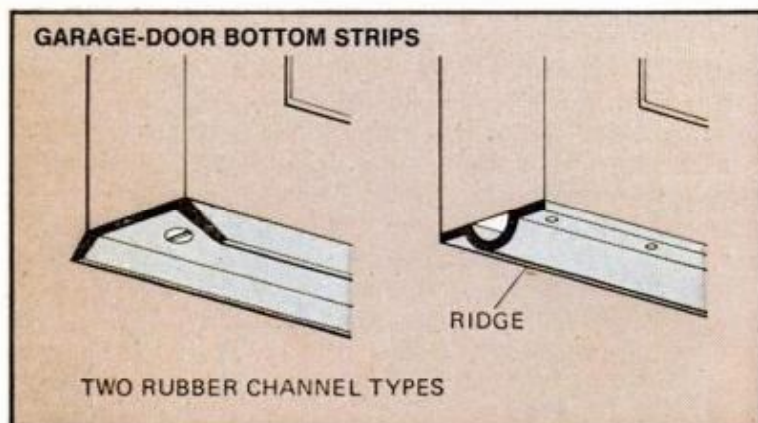
For months, there has been growing concern over the amount of heating fuel that will be on hand for the cold months ahead. Because of probable limited availability and increasing cost, it makes good sense for every homeowner to cut down fuel consumption wherever possible. After the basics (see *How to Cut Fuel Bills*, page 70, Jan. '73 PM), the best way to do this is by reducing the amount of heat lost through

cracks around windows and doors. Whether your home is new or old, chances are a careful inspection of these areas will reveal places where you can reduce or completely eliminate drafts to save fuel and money.

Storm windows should be used in *all* cold climates. In particularly cold areas, it even makes sense to use them over double-glazed (insulated) windows to create, in effect, triple glazing.



Art: Peter Trojan



## Drafty windows

If you have neither the desire nor cash to replace a drafty window, you should consider installing spring-type weatherstripping as shown in the drawing at left. Minor drafts can be corrected with such weatherstrip, but for very poor-fitting windows, your best bet is to call in a pro for an estimate on what it would cost to replace the window with a factory-weatherstripped and double-glazed new one.

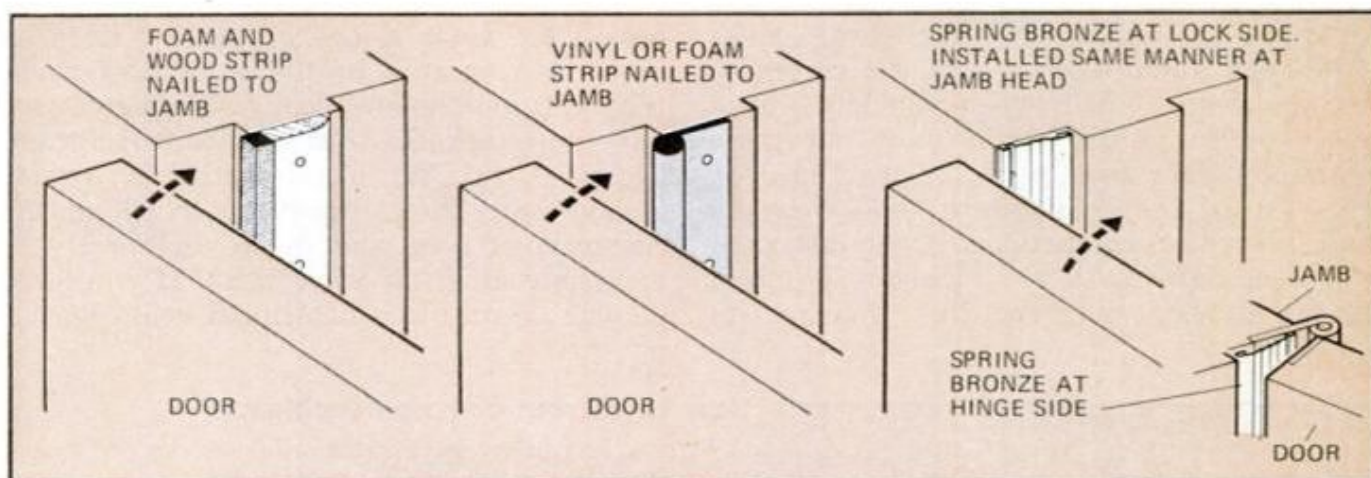
To weatherstrip a double-hung sash, raise the bottom sash all the way and nail the stripping to the channels (track) where the sash runs, on both sides. Next, lower the bottom and top sashes and install the stripping in the top-sash tracks. Also apply the stripping to the top rail of the upper sash and the bottom rail of the lower one. (This way, it is less conspicuous than if nailed to the head and sill.) Finally, where top and bottom sash meet—the check rails—install stripping.

On steel casement windows, several coats of paint will eventually produce mating shapes on the frame and sash that will form an almost airtight joint.

## Treating garage doors

The chief source of garage-door drafts is at the bottom. Several types of rubber or vinyl channels (drawing, left) available for sealing this joint are simply nailed to the door bottom. If drafts exist around side and head, typical weatherstrip stop cannot be used; friction created by the sliding door will soon wear it out. There is, however, a product available for draftproofing these areas which is nailed on—instead of replacing—existing stop. Made of white vinyl, it comes packaged to suit the opening.





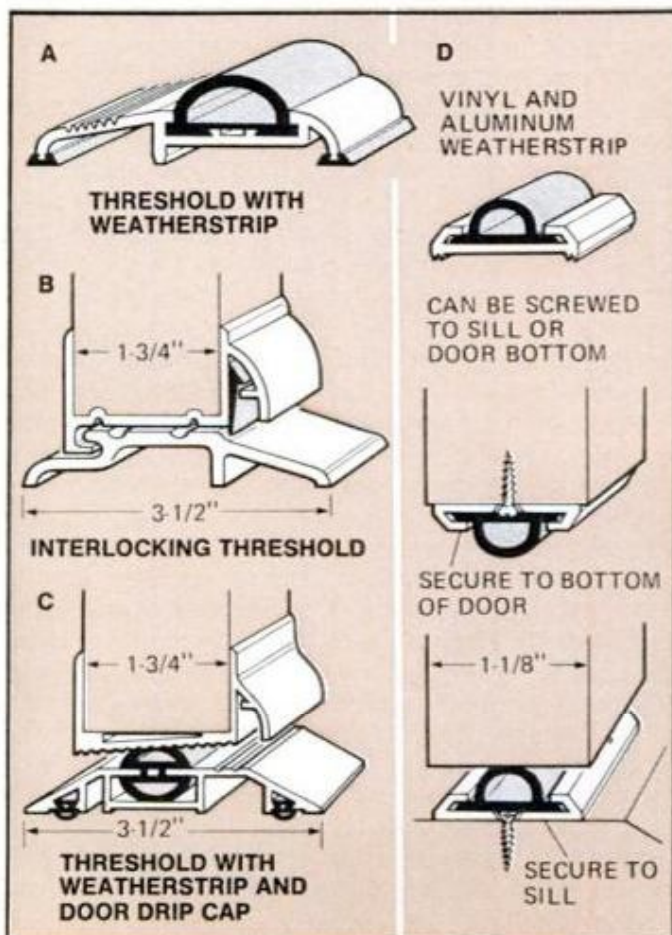
### Exterior doors

Wide gaps around an exterior door can usually be corrected using one of the three types of weatherstripping shown above. One of the best methods for doors is the spring-metal type discussed for windows. Here the strips are nailed to the door jamb close to, but not touching, the door stop. (If the metal touches the stop, the spring action will

not function efficiently, and there is good chance the door will not open and close properly.) The two other types are applied to the stop (rabbeted jamb shown). If the jamb is nonrabbeted, the old stops can be replaced entirely with clamshell or colonial stop which comes with the weatherstripping applied to its edge (foam and wood strip). These stops come in packages of two 7 and one 3-ft. lengths of stop and the necessary nails.

To install stop, close the door and position the stop so it exerts a slight force against the door—so it won't rattle in stiff breezes—and nail it in place. Do the two verticals first, and the head stop last using coped cuts on both ends for neat, tight joints.

Since most exterior doors must be trimmed on the bottom to clear carpeting inside, the largest draft-producing gap is usually at the bottom. Thus, all exterior doors should be fitted with a weatherstrip threshold. These are commonly used in new construction, but if your door has a wood saddle beneath it, consider replacing this saddle with a method shown at left. To install any of these thresholds, door must be taken down and refitted.



### Don't overlook exterior cracks

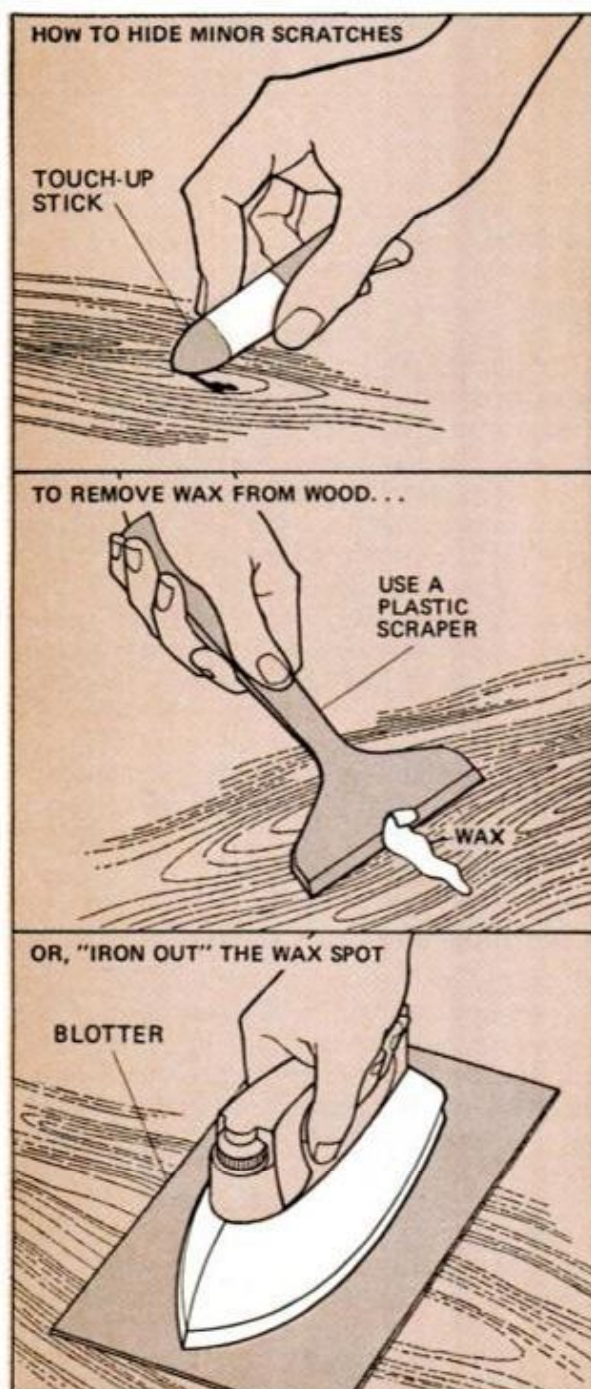
Instead of minimizing the importance of "those two or three windows that need a caulk job," think of the size crack or opening around each window or door. Multiply it by the number of windows and exterior doors in your house and you might well end up with the equivalent of a 2x2-ft. opening in your wall. Also, bear in mind that caulking can become useless with age due to exposure to sun and house settling. Check all openings where siding meets casings, scrape out any loose caulk and replace with new. And, though a cheap compound may spell a saving initially, in the long run you will come out ahead with high-quality latex or butyl caulks because they will last longer.



# How to repair scratches in furniture

Mars in furniture—scratches, nicks and dents—often can be corrected by the owner. First, when you buy a new piece of furniture, you'll find that most manufacturers give specific instructions for the care of the finish. Save these booklets and follow the instructions. If you lack such aids, the information on these pages will help you keep your furniture looking its

best, allowing it to age gracefully. Keep in mind that because of the variety of ways that different finishes can be damaged, you have no guarantee that results will always be successful. When attempting a repair, always test the planned repair on an inconspicuous area and make certain treatment is compatible with finish. If you have doubts, consult a professional refinisher.



## How to correct common problems

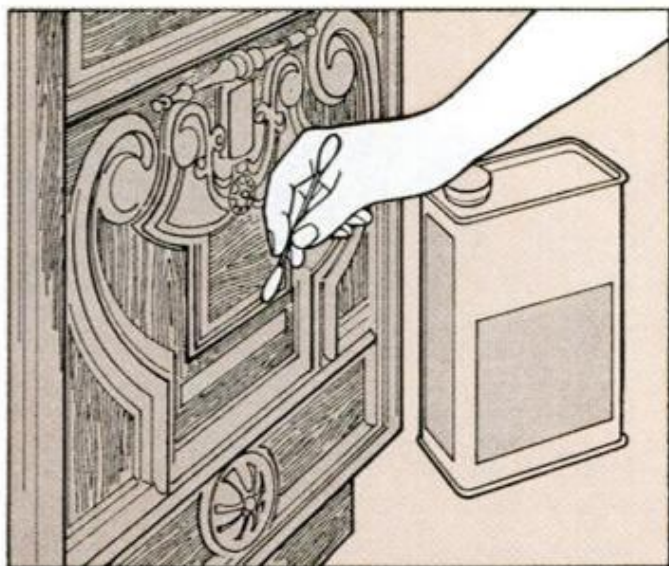
□ *Alcohol and other liquids* such as perfumes and medicines should be wiped up immediately. If the liquid remains on for a period of time, the finish may soften. Allow spot to dry, then use a staining polish of a shade close to the finish. If this doesn't do the job, try rubbing liquid or paste wax into the wood, using your fingers. For oil finishes, make a paste of finely powdered rottenstone and boiled linseed oil and apply it to the damaged area, using a piece of felt or cotton swabs and rubbing lightly with grain. Then wipe the area dry with a clean cloth and polish the surface.

□ *Minor nicks and scratches* that have not penetrated the surface are called blemishes by professionals. These are more easily repaired. Your first try should be with a scratch-concealing (tinted) polish. If unsuccessful, apply a touch-up stick to the area (see top drawing). These are available in a variety of colors; if you cannot find a stick that comes close to the furniture color, try using a combination of two or more sticks to mix desired shade. Fill the scratch with this and rub well. Finally, polish with wax and a soft cloth. A couple of "home remedies" that work: shoe polish applied with a cotton swab and buffed dry. On cherry or mahogany pieces, iodine will sometimes conceal scratches.

□ *Minor burns* are a little more difficult to repair. Sometimes these can be hidden by rubbing with a poultice (paste) consisting of lemon juice and cigaret ashes. Apply with a gentle, circular rubbing motion and wipe clean. When dry, apply scratch-concealing polish. For major burns call in an expert.

□ *Candle wax* can be removed by carefully chipping off as much as possible with a plastic scraper (center drawing). Follow by wiping with a cloth dampened with mineral spirits. On stubborn wax spots, place an ice cube over the spot for a few seconds to harden the wax, and repeat scraping step. Frequently, a spot of wax can be ironed off. Place a heavy blotter on the spot and press with an iron set on "warm." The blotter absorbs the wax. Finish with liquid polish and a brisk rubbing. Water spots can usually be removed using same technique. To remove white rings, rub with a thin paste consisting of wax and mineral spirits. When dry, apply a thin coat of cleaning polish or paste wax.





### Care of plastic-laminate furniture

There are now available easy-to-use commercial plastic-laminate cleaners. Sold in a pressurized can, the cleaner is simply sprayed on the laminate and wiped with a clean, soft cloth. Before applying the cleaner/polish, first wash the surface using a mild soap or detergent and water solution to remove spots. Allow surface to dry before applying the polish. Although many homeowners mistakenly believe that plastic laminates are virtually indestructible, remember that they are not. Take precautions. Protect surface from hot vessels with trivets; do not use a kitchen countertop for slicing vegetables. Do your cutting on a cutting board.

### Routine furniture care

Routine care means frequent dusting, occasional washing, periodic cleaning and waxing, and making minor repairs. *Dusting.* Should be done several times a week using a clean, lint-free absorbent cloth. *Washing.* At least annually use a mild, sudsy soap-and-water mix. Dip rag and wring out well. Take care so you do not overwet joints or glued parts will loosen. Work fast. Wash, rinse and dry a small area at a time; make certain you overlap washed areas. *Complete cleaning.* At least once a year, before applying a new coat of wax, give the wood finish a thorough cleaning. First remove old wax film with a clean cloth dampened with mineral spirits or, even better, a *synthetic turpentine* with an oily base. (Turpentine can leave a sticky residue.) Mineral spirits and synthetic turpentine are available at most paint stores. If many layers of wax have accumulated, use a cleanser-conditioner to completely remove dirt buildup. Do a small area at a time, drying worked areas as you go. To clean out crevices, such as in carvings, wrap absorbent cotton around a pointed stick (drawing, above left). Dampen cotton with mineral spirits and clean out desired areas. Wipe and dry the crevices as you proceed. Finish with a thin coat of liquid wax; rub thoroughly with piece of flannel.

### Some furniture dos and don'ts

*Do* immediately remove spilled liquids using a blotting rather than wiping action.

*Do* lift objects to move them. Lamps and ashtrays should not be dragged across a surface.

*Do* use trivets or pads to avoid burns.

*Do* use only polishes recommended for furniture. A self-polishing floor wax, for example, could soften and damage a wood finish.

*Do* use only soft, lintfree cloths for polishing. If using old shirts, remove all buttons and seams. Since some contain an abrasive starch, *do not* use cheesecloth to polish.

*Do* work *with* the grain of the wood whether washing, cleaning, polishing or waxing.

*Don't* use a new polish or cleaning agent without first testing on an inconspicuous area.

*Don't* use nail-polish remover on furniture.

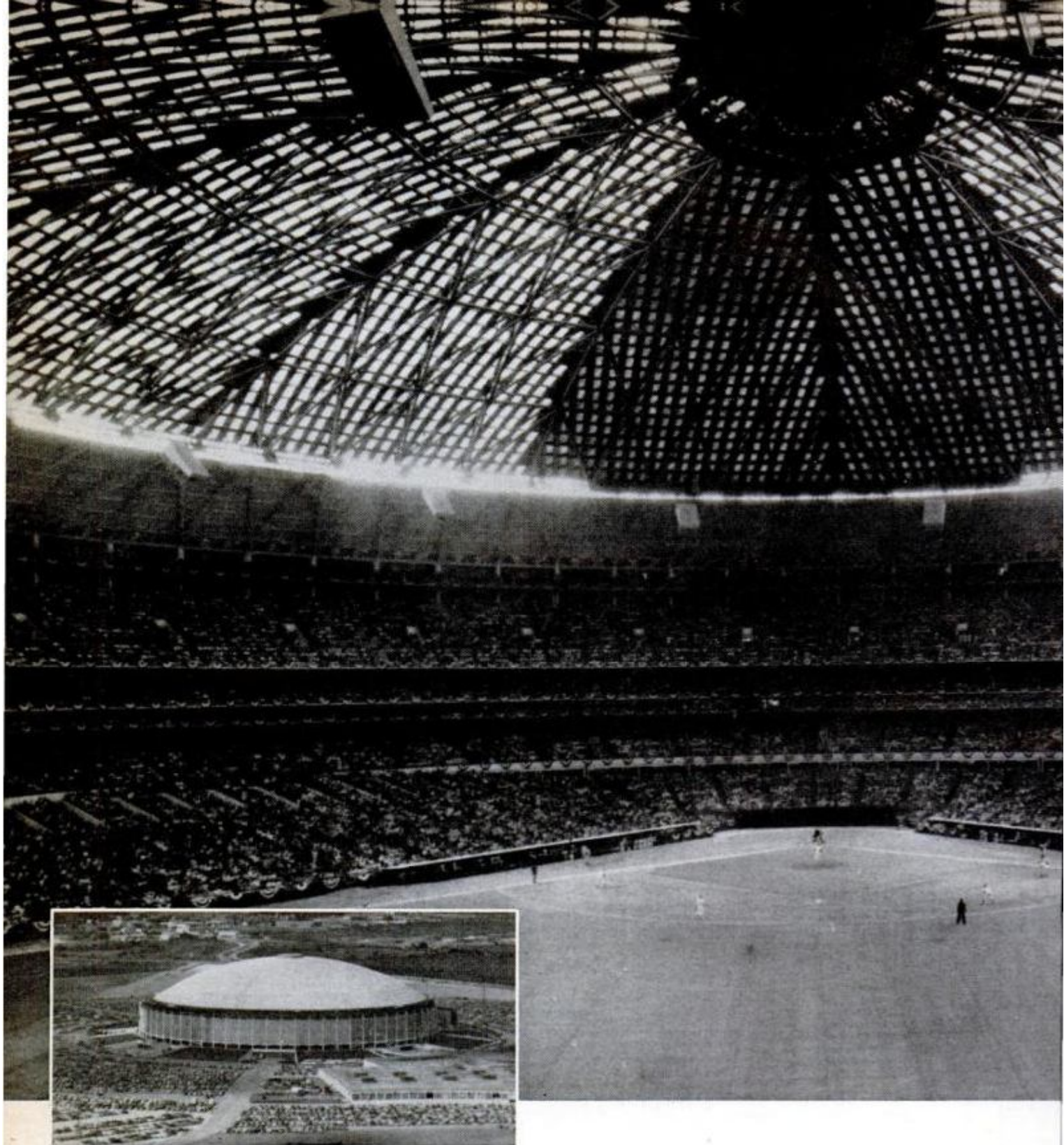
*Don't* attempt the repair of badly damaged surfaces yourself. If you create a large damaged area, the inevitable calling-in of a pro will just up the cost of repair.

*Don't* place rubber and vinyl products (mats and coasters) on furniture surfaces unless the manufacturer states that they are intended for such purpose. Lacking this assurance, place a piece of felt under each lamp, ashtray and the like to serve as a protective pad for the furniture.

*Don't* wash painted furniture too frequently. Repeated washings or heavy scrubbing will eventually change the color.

*Don't* wax or polish a painted piece of furniture unless the product you plan to use is guaranteed not to discolor paint finishes.





## Who's ahead in the superstadium game?

by Ed Nelson

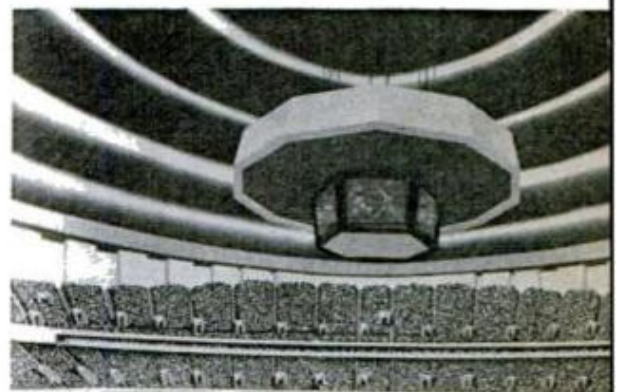
The downtown skyscraper is no longer the proudest structure of the American city. Today, the chamber of commerce is more apt to roll out the superlatives for the new stadium, especially if it's topped with a dome.

New stadiums—some more “super” than others—have sprouted in or near cities like Houston, San Diego, Dallas, Buffalo and Kansas City. Late starters, but coming up fast in this newest of competitions, are Seattle, New Orleans and an area in New





## Louisiana superstadium



Jersey known as the Hackensack Meadows.

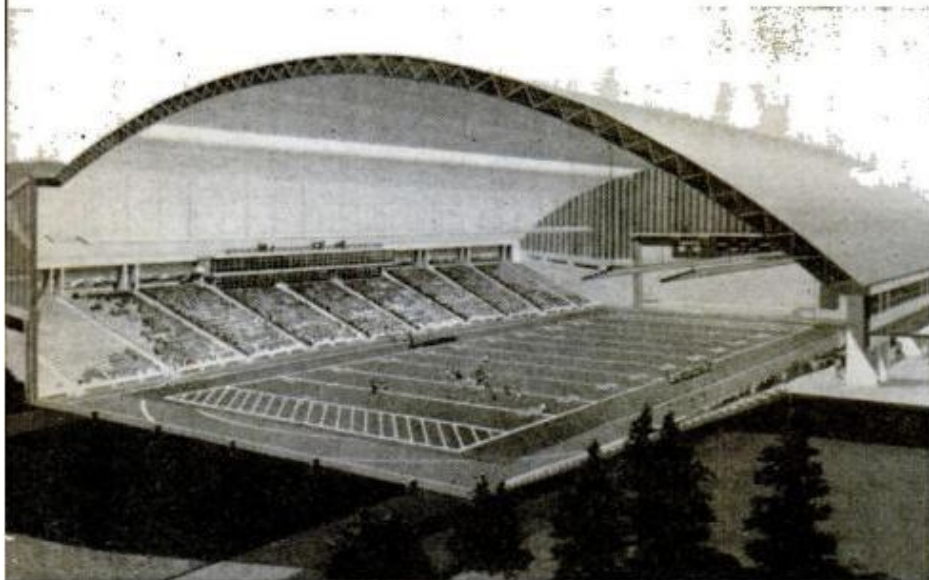
Rivalry is keen. In a brochure, publicists proclaim the Houston Astrodome as the "eighth wonder of the world," an assessment they attribute to evangelist Billy Graham. Not to be outdone, the builders of the Louisiana Superdome in New Orleans created a drawing showing how the entire Astrodome could fit inside their stadium—and with room to spare.

Scheduled to open in the fall of 1974, the Superdome bids to become the new

The "age" of the domed sports arena got its start with the Houston Astrodome (left), completed in 1965. Artificial turf was another first. Now the Louisiana Superdome (above) bids to take over the top spot among superstadiums. Located in downtown New Orleans, it will be bigger than the Astrodome and will boast a TV gondola suspended from its huge dome. Six screens, each measuring 26 by 22 feet, will provide spectators with instant replays. The stadium will cost \$154 million.



## A university stadium designed for versatility



champ—the largest enclosed stadium in the world. It will have a dome 680 feet in diameter and 273 feet high, and a seating capacity of 75,000 for football. By contrast, Astrodome sports a 642-foot-diameter roof, is 208 feet high and seats 52,000 football fans.

Superdome will be equipped with a system of motorized stands to allow ground-level seats to be moved for different seating configurations for various types of events. The wheeled stands will roll on recessed tracks. Thus, Superdome will have 18,886 seats for basketball, 60,543 for baseball and 97,465 when used as an auditorium.

Versatility is not unique to Superdome. Like other modern stadiums, it will owe a debt to Rome's Colosseum, a multipurpose arena that even had a system for flooding the field for minor "naval battles." It seated 50,000, putting it in the same league with many of today's stadiums.

But Superdome's TV array, a "gondola" of six screens suspended from the dome, will be a feature no Caesar could watch. Hanging high in the center of the stadium, the TV screens will provide the crowd with instant replays and close-ups of the action on the field. All this suggests that you'll be able to see as good a show at the game as you would have by staying home in front of the tube. This may be a crowd pleaser, but one wonders how baseball umpires and football officials, who must make many split second judgment calls, view this bit of technological legerdemain.

Superdome beats out the Astrodome in another way, too. The Houston facility cost a mere \$38 million. Superdome had an initial price tag of \$35 million, a total that since has mushroomed to \$154 million.

The inflated price didn't faze at least one state official. "We're not gonna let a couple of million dollars stop us," he said. Needless to say, the state government is backing the project to the hilt.

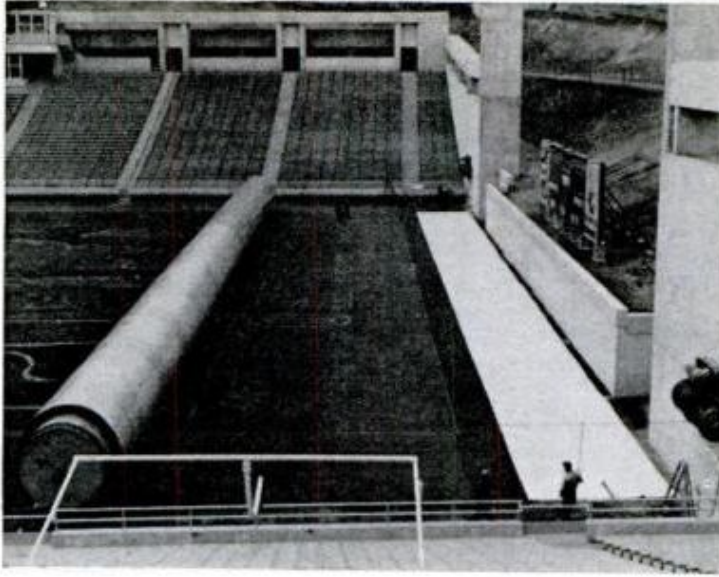
The daddy of the superstadiums is the Astrodome, the "world's first airconditioned domed stadium." The guiding genius behind it is Judge Roy Hofheinz, a portly, cigar-smoking Houston businessman who claims Rome's Colosseum gave him his inspiration. But the ground-breaking ceremony, in January, 1962, was strictly Texas-style. In addition to wielding shovels, public officials and chamber of commerce people fired .45 Colts into the ground.

Today, the Astrodome is the major structure of what has become known as the Astrodomain. Other facilities include Astrohall, a huge exhibition hall; Astroworld, an amusement park; four Astroworld hotels and motels.

It's Judge Hofheinz's habit to think big and do things with a flourish, prompting one admirer to comment: "I fully expect to read some morning that Roy Hofheinz has booked World War III."

You might think that Seattle, located in the cool, sober precincts of the Northwest, would handle its project—the King County Multipurpose Stadium—with a minimum of





**University of Idaho's** new 21,000-seat stadium was not designed as competition for the domed palaces. But it's an innovative facility that will—after a second phase of construction—sport an arched roof. When the Tartan Turf gridiron (extreme left) is rolled up, other sports (center) can be played on the permanent floor. Photo shows the system of cables and winches used to roll up the synthetic gridiron.

fuss and confusion. Not so. Seattle voters twice rejected stadium proposals. When they finally okayed a revised proposition, location became a problem.

Professional consultants told a commission—composed of political and business leaders—that the three best available sites were in the suburbs. Each would be cheaper than a downtown site under consideration, and each would be readily accessible to cars.

But the commission wanted a downtown site. A local paper joined in the flap with an editorial calling for the firing of all the consultants.

When the dust finally settled, the site chosen was 37 acres of abandoned rail yards at the edge of town. A 65,000-seat stadium, as is planned, would normally require 10,000 parking spaces, perhaps more. But only 2400 are planned. Officials say that other downtown space will take up the slack—and many fans will come by bus, they hope.

Necessary ramps from a nearby freeway and other highway improvements could cost an extra \$6.5 million. The stadium itself is tabbed at \$43 million.

And the sad part is that the stadium can't lay claim to a major-league football or baseball team, a caliber of tenant that stadium builders dote on. What may have been Seattle's best chance for big-league football vanished when the Buffalo Bills announced they were staying put. The Bills had threatened to call a moving van when



**Texas-style opulence and comfort** are seen in these two private boxes at Texas Stadium, outside Dallas. To obtain a 40-year lease on a box, you have to purchase \$50,000 worth of stadium bonds and buy a dozen \$120 season tickets. Box shown at top, leased by an oil and gas company, features blue velvet chairs and a crystal chandelier. Gridiron, where Dallas Cowboys do their stuff, is behind and to left of camera. Bottom photo shows modern decor favored by a cement company.





New home for the Buffalo Bills is a relatively modest, no-dome structure. Like other stadiums, it did not come into being without controversy about location.



Instead of a single, multipurpose facility, the new Harry S. Truman Sports Complex in Kansas City, Mo., boasts separate football and baseball stadiums.

Buffalo, too, came down with a fairly serious case of stadiumitis.

Local folks had generally agreed that a new stadium would be nice. But sharp disagreement developed over location: city or suburbs. For a while there also was talk of building a domed stadium.

Finally, conflicts were resolved and the Erie County Football Stadium became reality—in a suburban location. The community had sold \$23.5 million bonds for financing but—wonder of wonders—the stadium was completed at a cost of only \$21.5 million. One reason for the low price tag: no dome. The Bills are playing in the new stadium this season.

Buffalo's modest approach was patterned, to some degree, on Schaeffer Stadium, a no-

frills structure erected in Foxboro, Mass., outside Boston, at a cost of but \$6.2 million.

The stadium was opened in 1971. A crowd of 60,423 watched the New England Patriots beat the New York Giants. But this artistic success was somewhat dimmed by a traffic jam that the *Boston Globe* termed historic. More embarrassment came from Foxboro's sewer system, which simply wasn't up to opening-day demands. Before the end of the game, washrooms were awash.

The visiting team that day—a New York fixture for decades—will not be based in the nation's largest metropolis much longer. Soon they'll be playing out of New Haven, Conn. (location of the Yale Bowl) while waiting for their new home to be built in the Hackensack Meadows, near Rutherford, N.J., and across the Hudson River from New York.

The Giants were lured into the Meadows by a gentleman who could easily give Judge Hofheinz a run for his money. Though less flamboyant than the judge, David A. (Sonny) Werblin is his match when it comes to big thinking and doing.

After years as a leading show-biz executive, Sonny became president of the New York Jets. He quickly turned them into a top attraction by signing on Joe Namath—for a princely sum—as quarterback.

Sonny left the Jets in '68. He is now the chairman of the New Jersey Sports & Exposition Authority and the driving force behind the development of a sports and exposition center in what is now a rubble-strewn marshland.

The main facility will be Giants Stadium, an open, three-tiered structure that will accommodate "more than 75,000 persons in self-rising, armchair seats," according to publicity literature. The stadium will be ready by August, 1975, says Sonny.

The complex will also include a track for horse racing, an exposition "arena," hotel and other impressive facilities.

At groundbreaking ceremonies on a snowy November day, Sonny Werblin spoke in the true spirit of the stadium builder as he surveyed the expanse of garbage-littered marsh: "We will stand here again someday and marvel together at what men of determination, good will and strong faith can achieve. The Good Lord willing, we will transform what is before you today into an area of beauty, excitement and pleasure for you, your children and generations still to come." ★★★



# Motor homes built the way they ought to be

by Jim Liston

EDITOR

Picture this: You're at the wheel of a motor home rolling at 70 mph. It's so quiet you can easily talk with people seated at the dinette behind you without raising your voice; so quiet you need to check the tachometer against the speedometer. You hear the whiz of the tires and the swish of the wind. But engine noise is more than 20 feet away, sealed off in a rear compartment.

The coach is eager on the hills, never slows to less than 50—in second—on the steepest; it glides down the highway, smoothing out the dips and rough stretches with a pleasant, easy stride. The accelerator is responsive; the power steering has a good, positive feel. A truck pulls onto the highway and you hit the brakes at 70 and there's no sweat, no squeal, no fade. When your freeway exit takes you by surprise, you zip into the tight curve of the off ramp faster than you think you should with a vehicle of this type. There's no lean, no sway; the coach tracks like a sports car.

There's a wonderfully secure, solid feeling to the vehicle, and the more you drive it the more aware you become of the complete control you have. This is the way motor homes *should* handle; this is the way they'll have to perform and handle if they're to come up to this pace-setter recently introduced by the FMC Corp.

FMC is a worldwide manufacturer of diversified machinery, chemical, fiber and film products. It had been known for some time that General Motors' GMC Truck and Coach division was planning to enter the motor-home field as a producer. But FMC's 2900 R (29 feet; R for rear engine) entry came as a surprise. The prototype first appeared at the Family Motor Coach Assn. convention at Burlington, Vt., July, 1972, and all but stole the show.

It was the kind of vehicle coach fans knew from experience would be an ideal highway cruiser. And with its price of about \$30,000, which included *everything*, it was considered a real bargain by coach



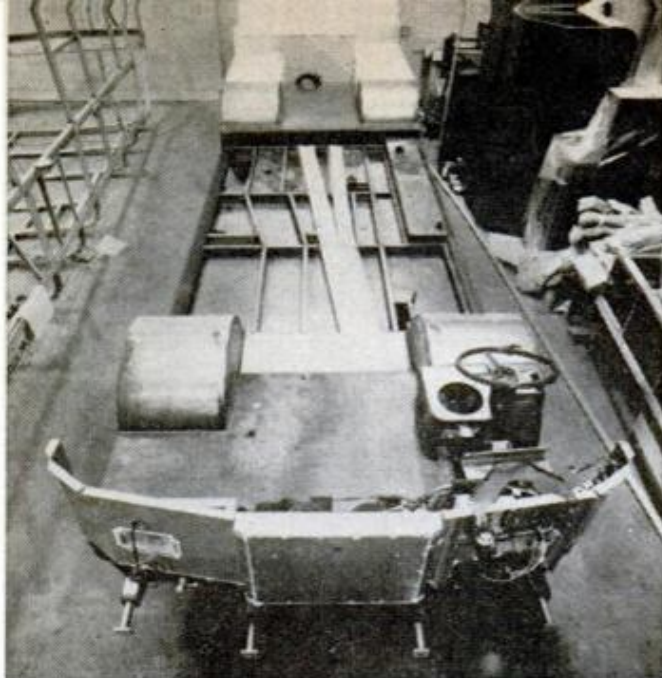
**FMC 2900R** (top) is 29 feet long, 8 wide, with 81-inch track, built-in airconditioner, TV antenna on roof. GMC's 26-footer has sleek, aerodynamic styling.

buyers accustomed to prices that start at \$35,000. A short distance away the GMC was attracting big crowds with its front-wheel drive, low roofline and floor, and air springs mounted between tandem rear wheels.

As two different engineering approaches to a design problem the FMC and the GMC offer an interesting comparison.

From their beginning, 15 years ago,





**FMC starts by welding** its own steel chassis, to which aluminum frame (left) is welded. Plastic conduits in center carry accelerator, brake and gear selector cables and heater hose. All joints on underbelly are sealed to prevent corrosion. Cockpit of FMC has good instrument array with panel at right supplying a digital readout on the coach's domestic equipment.

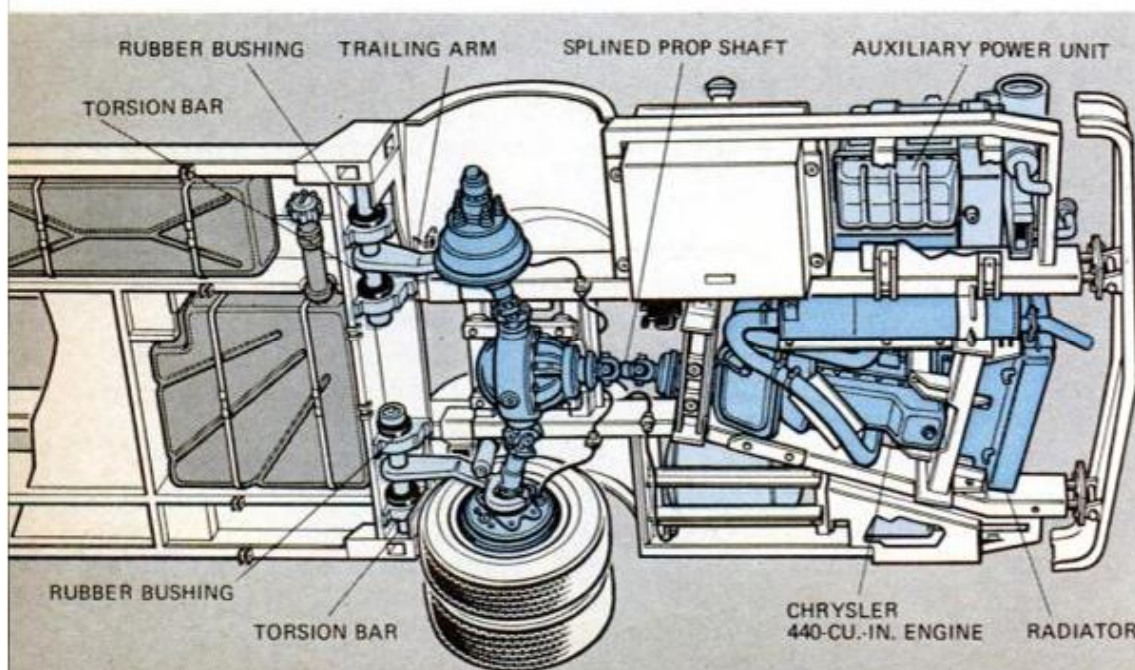
most motor homes have been built on truck chassis. The adaptation results in several things that are less than ideal—a high center of gravity with poor lateral stability (sway on turns and in crosswinds), hard-riding truck suspension, poor acoustical and thermal insulation—and, in many instances, insufficient power.

Truck manufacturers whose chassis are used by motor-home builders have lately improved suspension systems and braking power and lowered the high center of gravity. But engineers have long contended that the right way to build a motor home is from the ground up, with body and chassis engineered as a unit.

The engine of the FMC is in the rear to eliminate a long drivetrain and to make possible a radically lower center of gravity. Noise and heat are behind, and mechanics never have to enter the living quarters to tune the engine. A Chrysler 440-cu.-in. engine is coupled to a heavy-duty, three-speed transmission, and oil pan capacity has been increased to insure adequate cooling without adding transmission coolers.

FMC uses four-wheel independent-suspension-type chassis. Front suspension is an 11-leaf transverse spring with "A" arms; the rear suspension is a torsion-bar system.

On the rear wheels a trailing arm is welded to a tube held in rubber bushings and clamped in brackets. In the middle of this assembly, which is bolted to the frame, is a torsion bar. This is the same torsion bar FMC developed for military personnel carriers which have been torture-tested from the Arctic to Panama.



**Torsion-bar suspension** accounts for coach's remarkably quiet, smooth ride. The tube to which the trailing arms are welded passes through heavy rubber bushings that eliminate lubrication, noise and vibration. Engine compartment affords good access and is vented on three sides.



The differential is mounted on the chassis frame with a sliding spline shaft so the drive wheels can bounce and the shaft merely gets longer or shorter. This substantially reduces the unsprung mass.

Motor homes built on truck chassis have Ackerman steering. Alec Turner, chief engineer, maintains that FMC's three-piece automotive-type track rod is superior to the one-piece track rod used on trucks. The turning radius is a remarkable 31 feet. A 14 $\frac{1}{8}$  x 3 $\frac{1}{2}$ -inch brake lining is used on all four wheels.

The exterior of the coach is gold and white, colors molded into the fiberglass shell. A clean roof (one-piece molded fiberglass with no joints) with vent stacks, auto airconditioning condenser and TV antenna concealed, reduces air drag and wind noise. Two 115-volt off-road airconditioners, that get power from a land line or the 6500-watt Onan generator, are concealed beneath the closet of the vehicle and are exhausted under the coach.

The combination of a steel frame and welded aluminum upper cage gives the FMC full roll-over strength. Legislation requiring this and other safety features was anticipated by FMC to avoid costly design changes later.

It's easy to step aboard the FMC; there are no steps to climb. The flat floor extends all across the interior width in front, so in addition to the driver, two passengers can share the view and they can stand erect

when getting in or out of the seat. In addition to the passenger door, there's a driver's door—something *every* motor home could use.

The instrument panel gives the driver solid information with calibrated water temperature, oil pressure and amperage gauges and a tachometer. A "domestic panel" gives a readout on the amount of water in the water tank, the amount of fluid in each of two holding tanks; battery condition, waste destruct system and vehicle leveling indicator. The latter is a camping convenience; it shows which wheels are low; when the coach is leveled within two degrees, panel lamps go off. This system is soon to be coupled to an automatic self-leveling device.

The FMC's interior closely resembles a well-appointed commercial jetliner. Vinyl-clad aluminum walls, wood-grained Formica cabinets, and molded fiberglass bathroom fixtures make it a beautiful, easily-maintained vehicle. The galley, bath and bedroom/living room are well planned and—there's only one word for it—"restful" after a day behind the wheel.

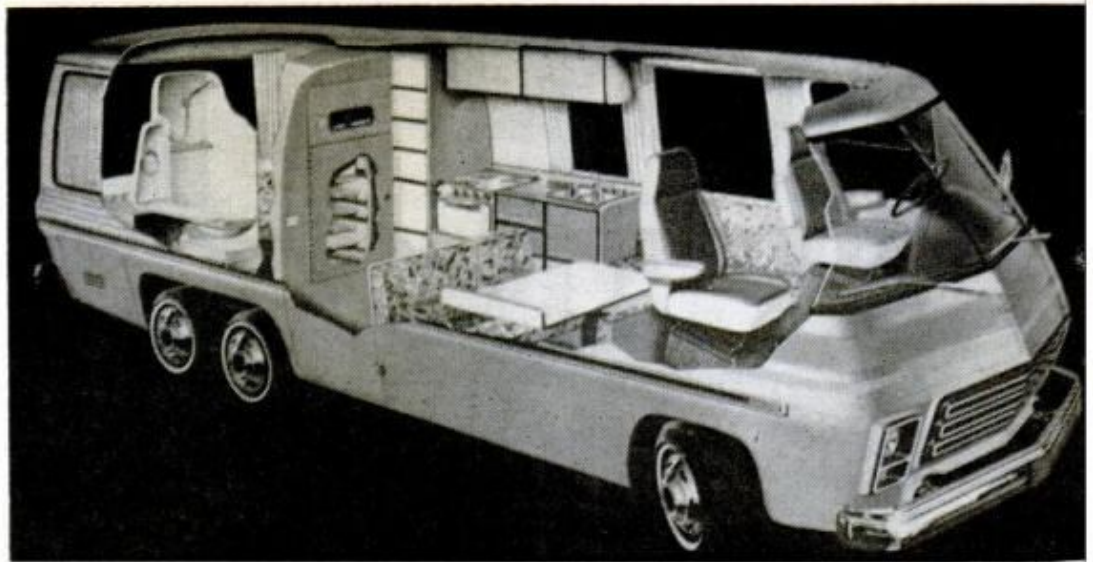
Originally, the 2900 R had a base price of \$22,958 with optional features available. But it soon became clear that those who were interested in this coach—third and fourth-time purchasers of motor homes—wanted everything. The present price of about \$30,000 is for a single design with everything "standard." To list only a few: 60-gallon fuel tank; 60-gallon fresh water tank; 65-gallon dual waste holding tanks: AM-FM radio, stereo tape deck, front and rear 28,000-B.T.U. auto airconditioning,

**Well-lighted bath** has skylight and window, molded plastic vanity sink, tub-shower, marine toilet. Galley's wide window, eye-level oven, 8-cu.-ft. refrigerator, ample cabinet space make cook happy.



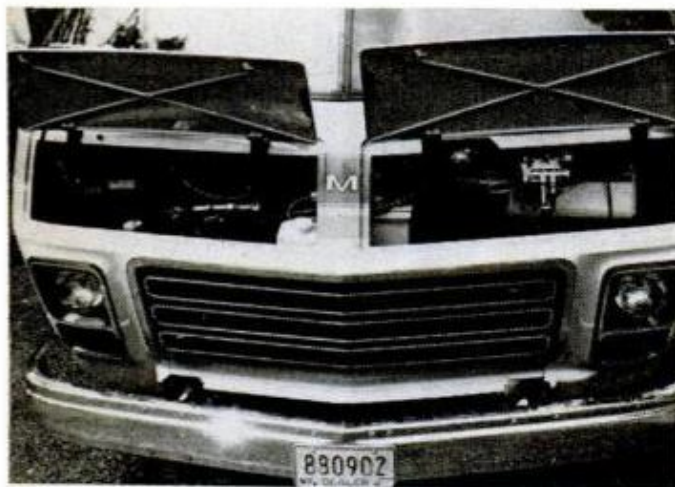


**GMC's 26-foot model** sleeps six; 23-footer sleeps two less for about \$1000 less. When open, bath and closet doors divide vehicle into two private compartments. Coach is only one step off ground but the driver sits above the engine with an excellent view of the road.



22,000-B.T.U. household airconditioning, 6.5-kilowatt auxiliary generator, Thermasan waste destructor, Michelin tires, TV antenna.

We drove the FMC from San Diego to San Jose, Calif., a distance of 468 miles in



**Doors on front of GMC** give access to cooling system, brake master cylinder, battery, oil dipstick.

**Dinette converts** to double bed; couch back raises to make double berth. Main bedroom/lounge is at rear.



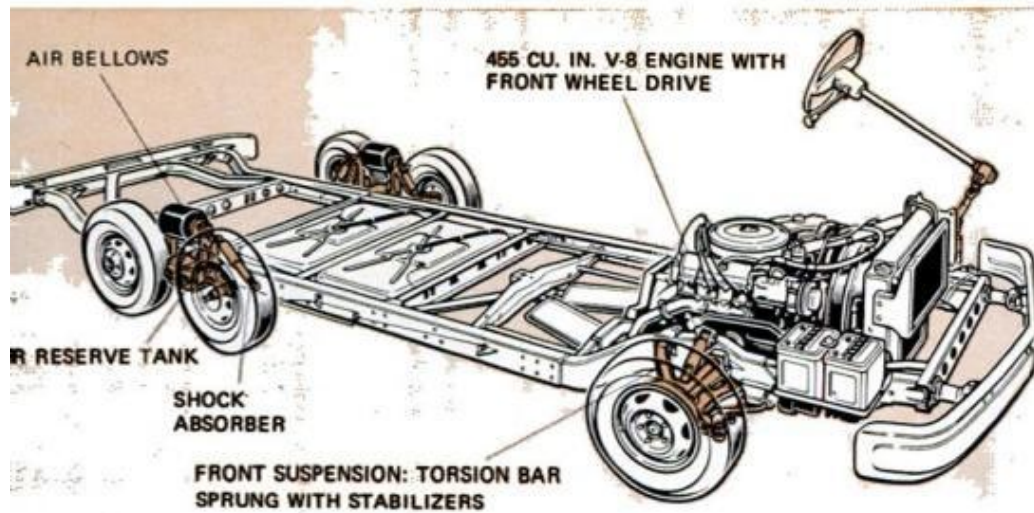
eight hours. We chose U.S. 5 through the San Joaquin Valley because it's notorious for its strong crosswinds. We knifed through them without effort, cruising steadily at a legal 70 mph. Despite the winds, L.A. freeway traffic, and 100° temperatures which required full airconditioning all day, we got 6.9 miles per gallon at an average speed of 58 mph. At the end of the day we knew FMC had here a whole new dimension in motor homing—an express cruiser (60-gallon fuel tank) capable of biting off at least 360 miles without a gas stop and with very little wear and tear on the driver. That comes pretty close to low-level aviation.

With all the good features in the 2900 R there are a few faults that are surprising oversights. The owner of a \$30,000 rig will want a better bed for his guests than is provided by converting the dinette. Likewise, the driver's seat and front passenger seat will, we're sure, have to be redesigned. The brake pedal is not directly across from the accelerator; you have to draw your foot *back* about four inches and raise it to land on the brake. Too slow in an emergency.

**I**f you've ever wondered what it would be like to boss a big transcontinental bus on the highway or slip into the pilot's seat of a commercial airliner—you'll get a pretty authentic answer when you climb into the "cockpit" (that's what they call it) of the GMC.

GMC gets rid of the long drivetrain and lowers the center of gravity by using an Oldsmobile front-wheel-drive unit with 455 cu.-in. engine, four-barrel carburetor and three-speed automatic transmission. The floor of the vehicle is only 15 inches off the





**Low-slung chassis** puts floor of GMC only 15 inches above ground. Low center of gravity gives the vehicle its stability. Rear wheels, cushioned by air springs, are in tandem and mounted outboard of the body for wider stance. Rear track of GMC is 82 inches. Wheel bases available are 140 in. and 160 in.

ground; the "flight deck" over the engine is 21½ inches above that so the view is high, wide and handsome. No motor home offers a more unobstructed view. The windshield wraps completely around to the pillar behind the driver's seat. (The big windshield wipers have the washers built into the arms so the fluid hits where it should.)

GMC licks the ride problem with "air springs," air-inflated rubber bags, mounted between independently suspended wheels in tandem. The air-cushion unit includes an automatic leveling valve that maintains a constant ride height at the rear tandem suspension. An optional Power Level System that overrides the automatic leveler lets you trim the rig at a campsite; it raises or lowers the vehicle as much as four inches.

The front wheels are independently suspended with torsion bars and stabilizers. GMC uses tandem rear wheels instead of duals, claiming that: (1) placed outboard, they provide a wider stance, hence greater stability (the GMC rear track is 82 inches) and, (2) the wheel wells do not intrude on passenger space.

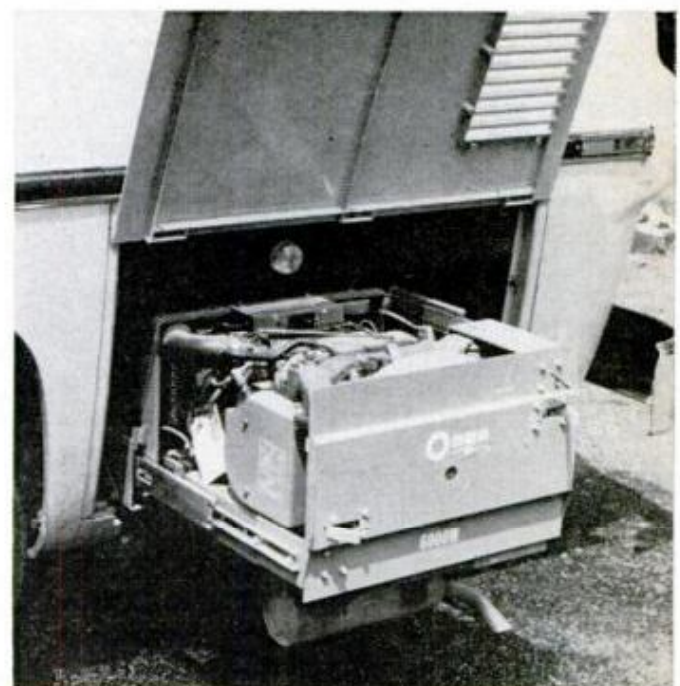
The body of the vehicle is shaped like an aircraft fuselage—and built like one, with a cage of aluminum ribs and stringers. The roof and upper side panels are aluminum; the nose and rear and lower panels are molded fiberglass to resist corrosion.

The glass areas are generous; windows in the living area are each 32 x 57 inches; the rear window is 32 x 66. Overhead cabinets in the galley are kept to a minimum to lend spaciousness. But there is plenty of storage under the sink and adjoining the

*(Please turn to page 208)*

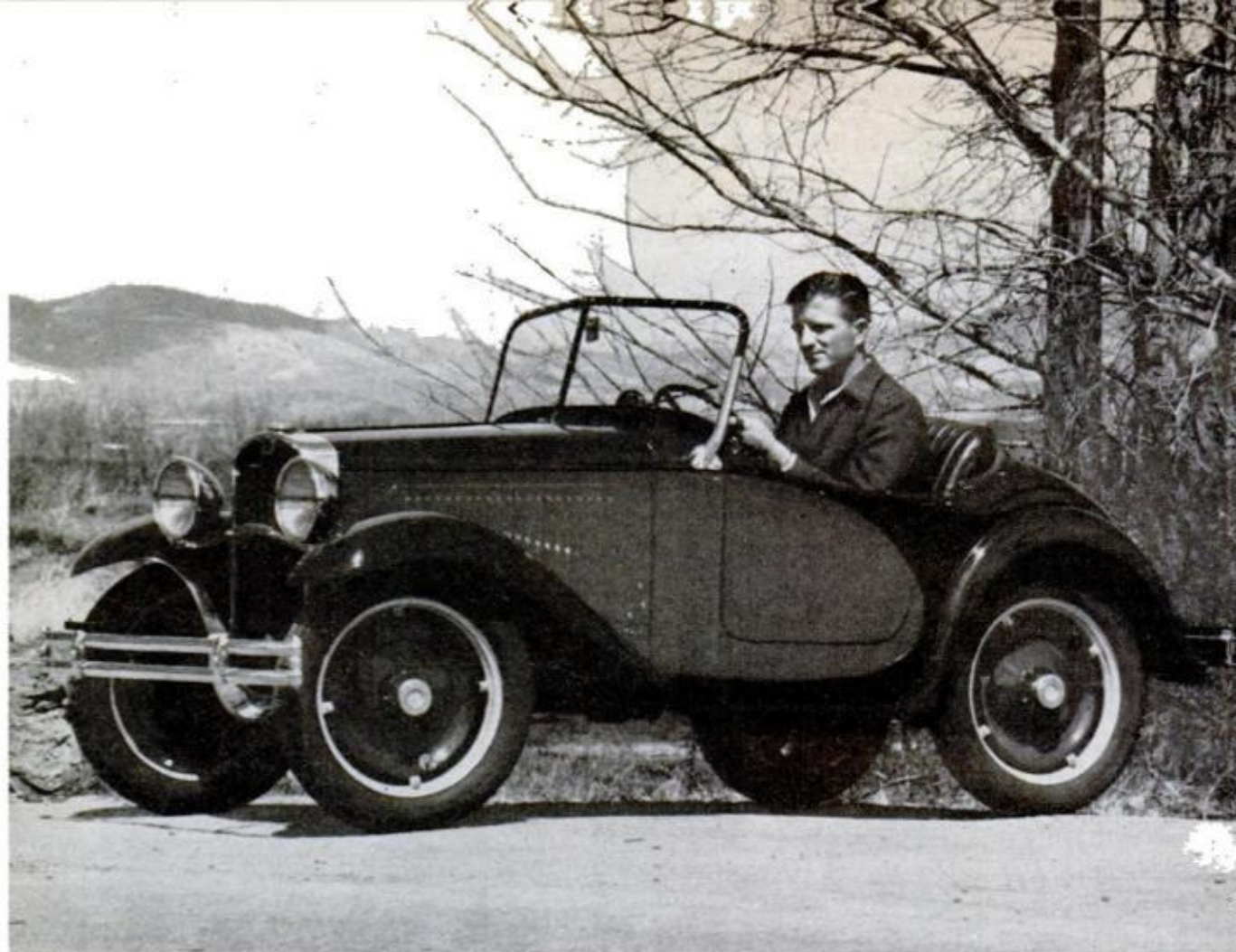


**Air bellows is not concealed,** is displayed as distinctive feature. Rear adjusts automatically to load under way, can be leveled at your campsite.



**Motor generator, in left rear compartment,** glides out on ball-bearing tracks for easy servicing.





Photos taken at Harrah's Automobile Collection, Reno, Nev.

**1933 Austin roadster**, the "American Austin," is built on wheelbase of 75 inches and has overall length of 122.5 inches! This perfectly restored example is from Harrah's in Reno, Nev.

# When we really had a mini-car!

Dozens of makes of small cars once scooted around towns in the United States and were regarded as just whimsical—but now we need 'em!

by Michael Lamm  
WEST COAST EDITOR

**W**hat ever happened to Baby Austin? For that matter, what ever became of all those little roller skates—the Crosley, Bantam, Metropolitan, Davis, Playboy and similar wee ones, their names dim now or forgotten completely?

With consumer pressure—and conceivably even future legislative pressure on Detroit—the automakers are spawning a whole new crop of small cars. As the small-car boom gets in full swing, a brief look at some subcompacts of the past might prove interesting. Because every one of them failed!

Before World War I, a craze for so-called cyclecars swept this country. Cyclecars were one and two-passenger jobs, usually powered by motorcycle engines, many with belt drive and flimsy wooden or wicker bodies. They sold for around \$350 at a time when normal motor cars were rich men's toys. The craze lasted until 1914, when Henry Ford undercut cyclecar prices with his Model T. Before that, though, some 300 manufacturers





**"Perpendicular parking only!"** Ten-foot-long cars, 49 inches wide like the American Austin, would easily triple the number of parking places available along Main Street, U.S.A.

**No cosmetic continental kit,** the rear-mounted spare tire is a real one and is easily accessible for changing. Tires are 3.75x18, and the wheels are disc type with demountable rims.

**Not up to current safety standards,** the Austin has a three-speed stick and is fun to drive. The automobile of the future will also be small and a joy to drive, agrees automotive researcher Dr. Nathaniel H. Pulling, who is auto safety project director for Liberty Mutual. He sees the trend definitely heading toward smaller cars again, "like we had in this country in the 1920s and '30s and still are predominant in Europe. I have little doubt that cars will be a joy to drive by the 1980s." But the most important changes will be in safety improvements, and therefore any update of the Austin would have a far different interior than that shown here!



of cyclecars had jumped right into the fray.

No significant small-car developments happened again until the late 1920s, when a group of U.S. businessmen took out a license to build an American version of the highly successful British Austin Seven. This became the American Austin. Production began in Butler, Pa., in 1930—just in time for the Depression. It looked like perfect timing—a cheap, economical midget for an impoverished people. But do you think Americans were sensible enough to actually buy the little Austins? Not on your life. And why not? Opinions vary, but most of the reasons were considered to be emotional.

The American Austin came in cute roadster, coupe and commercial body styles. It was powered by a two-main-bearing, four-cylinder engine about the size of a six-pack of soda pop. The whole car was supersimple to work on. Power was rated 13 bhp at 3200 rpm, giving a cruising speed of about 45 mph and 45 mpg. Not bad, especially considering the f.o.b. price of only \$395 in 1930, dropped to \$315 by 1933.

Photos are of Harrah's wonderfully restored 1933 American Austin roadster, a car I had occasion to drive not long ago. It's sheer delight—highly maneuverable, responsive, comfortable, and a bigger crowd-gatherer than any brand-new Lamborghini. The Austin is shorter than a VW Beetle by exactly three feet, so it'll park in the maneuvering space between two standard-sized cars that are parallel-parked. Its major drawback proved to be a congenital lack of power. Thirteen horses just aren't enough to





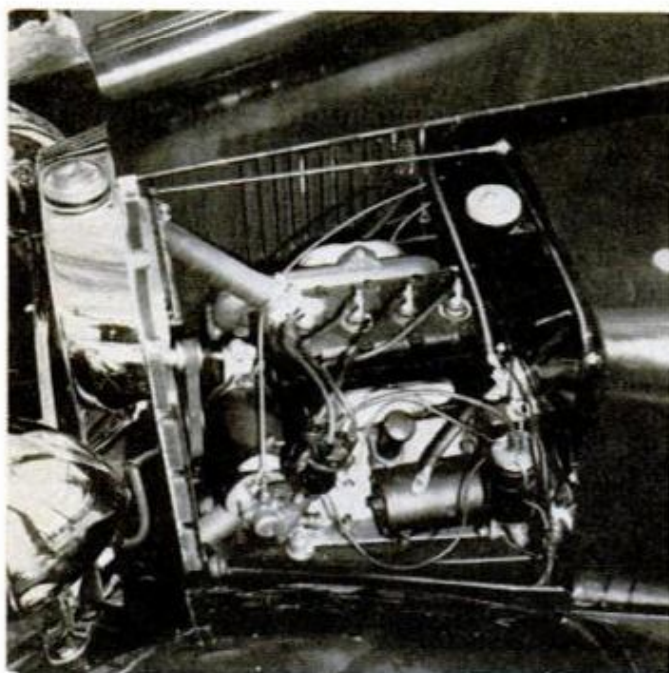
to keep up with traffic as it exists today.

Austin's slogan, "... not too small, others too large," convinced too few Depression buyers. Then, too, for another \$150 (lots of money in those days), you could buy a new Ford, Chevrolet, or Willys 77. So in 1934, the American Austin Car Co. went into receivership, emerging again the next year as the American Bantam Car Co. (same factory, same British patents, essentially the same engine and running gear). Bantams were restyled in 1938 and lasted through 1941. With a dying gasp, Bantam engineers designed the first acceptable military Jeep in 1940, but the company was too weak to build Jeeps, so the contract fell to Willys.

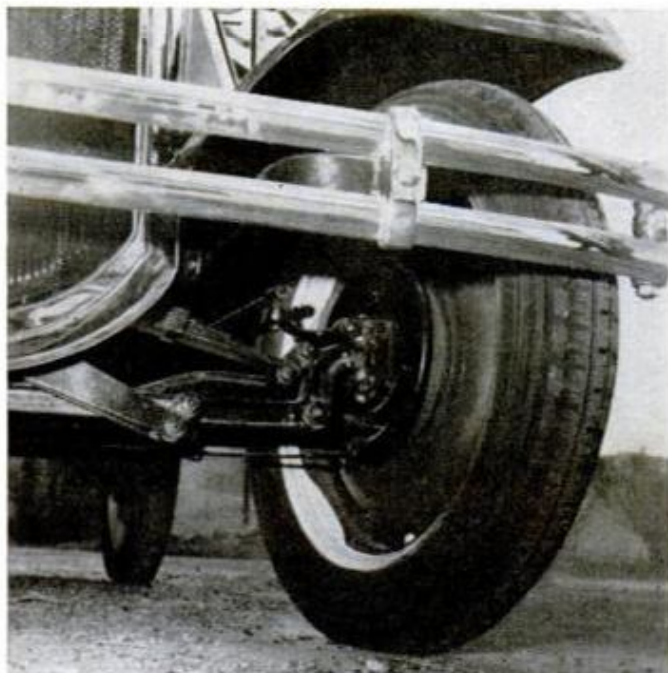
Another small-car adventurer, Powel Crosley, began building midgets in 1939, which again seemed a fortuitous time because war was coming, with tire and gas rationing right behind. These factors would



Front track of the roadster is 42.5 inches, and rear is 44.0 inches. The car sold for \$315 in 1933.



The four-cylinder engine has a cast-iron block and displacement of 45.6 cu. in.; hp is 13 at 3200 rpm.



The 1020-pound car has 8 $\frac{3}{4}$ -inch ground clearance, drum brakes, transverse leaf-spring front suspension.

put Austins, Bantams and Crosleys in great demand during WW II. I remember people swearing by their Austins during the war, because they'd run forever on the same tires—and the same tank of gas, some of them said.

After the war, these dutiful cars inevitably ended up on some wrecking yard roof as sort of a symbol, like the pawnbroker's three globes.

Anyway, just after war's end, another rash of little cars with names like Bobbi, Keller, Del Mar, Gregory, Airway and Pup

popped up briefly. The thinking was that America needed new cars—any new cars—preferably cheap and quickly made. What these builders didn't realize is what all small-car makers before them had also miscalculated: the fact that most Americans simply didn't like little cars. It's an emotional business.

This time around, though, there's no room for emotion. There are pressing reasons for cars to get smaller. They'll be getting smaller, still. Maybe as small as an American Austin. ★★★



# '74 snowmobiles: new styling, new power

Cold-weather customers may call this the winter of the hot bargains.

by Bill McKeown  
OUTDOORS EDITOR

After last year's scant snow supply, Skiroule drivers and all others are hoping for white hillsides once again.



**T**his winter's bigger and better snowmobiles will come from an industry that's smaller and better. More models are being offered by fewer companies, with 30 or so builders turning out machines that are stronger and safer, more durable and easier to service—plus some that are lighter, quieter and faster.

Three years ago more than 100 companies were in the snowmo business, but over-estimated markets and under-average snowfall have settled things down, and 95 per-

**Mirage II** is Ski-Doo's name for its experimental version of side-by-side seater for four, enclosed and heated. Prototype mounts rear 1600-cc water-cooled engine, reports speeds to 50 mph.

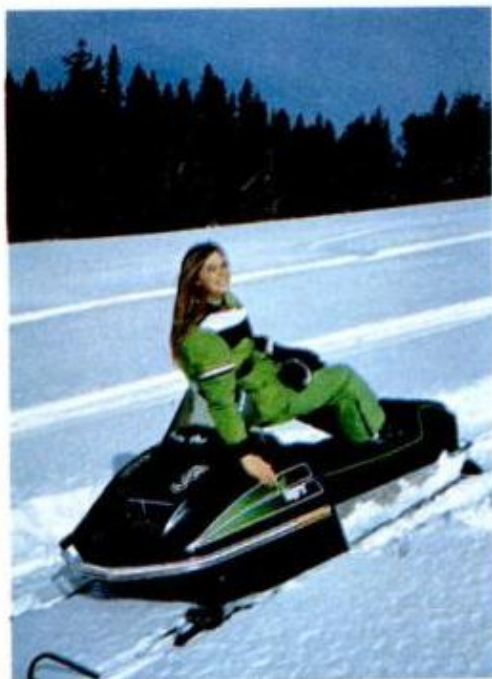
More new snowmobiles on following pages:  
[text continues on page 120](#)



## More color and less noise for '74 snow trails



**Ski-Doo will offer** (from left) Elan 294 SS, Elan 250 Deluxe, Elan 250 E, Olympique 340, Olympique 300, T'NT Free Air, T'NT, T'NT Everest and (at back) Elite, Nordic and Alpine.



**Arctic Cat's hot El Tigre** with 440 cc tops line that includes Puma, Cheetah, Panther and Lynx.



**John Deere** offers an expanded line of seven models including 600 (at right) and matching clothing.





**Polaris lineup** (front to rear) features new Electra, Custom II, women's champ Dorothy Mercer with Colt, and Colt S/S.

**Evinrude's** (below) will come in wide-track Trailblazers using 35 and 45-hp rotary engines plus narrow-track Skimmers to 50 hp.



**Mercury Trail Boss models**, the Mark II, 440 Max and 440 S/R, will have bogies and slide rails, torsion-bar ski suspension.



**Johnson JX 650** (left) will supply 50 hp, with other options of 400 cc/35 hp and 440 cc/40 hp plus wide-track, quiet, rotary models.



**Skiroule's RTW** has a rotary Wankel engine and a new orange look for the noted green line. Kohler powers a new 50-hp Laser 440.



MORE  
→





**Massey-Ferguson** will offer seven Ski Whiz models this winter from 21.5 to 40 hp in Sport Track and wide track, optional electric start, shocks.



**Chaparral Firebird**, from Armco, has 22, 28 and 32-hp engine options. Liquid-cooled engines will be feature of new SSX 40 and 50-hp models.



**Suzuki XR 440** tops five-model line with 432-cc, 37-hp engine, disc brake, slide rail, hydraulic shocks, dual rear mirrors.



**Deere JDJ models** are "blitz-black" with 340-cc displacement for JDJ4 Special, 400 for JDJ6, 440 in JDJ8, slide rails, "grouser-bar" track.

cent of machines now produced come from the 19 members of the International Snowmobile Industry Assn. Sleds left over from last year should provide bargains for buyers and make the market more competitive.

Engine noise, chronic complaint of the nonrider, has been reduced 75 percent in the last five years. Since 1970, sound levels are down from 88 decibels on the A scale to 82 dBA, a 50-percent reduction using the dB logarithmic measurement. Goals for April 1975 are 78 dBA ratings and 73 after April 1978. Evinrude and Johnson already have machines at this level. Rapid development of snowmobile trails away from settled areas should also help quiet critics.

Power trends continue to go up, with displacement nearing 800 cc for some free-air racing rigs. Liquid cooling, so well established with four-cycle automotive engines, may bring its stable temperatures and easy silencing possibilities to snow-time travel:





**Raider, from Leisure Vehicles, has rear-mounted Canadian Curtiss-Wright engine, twin tracks, Double Eagle, Eagle and Hawk bucket-seat models.**



**Moto-Ski Grand Sport has 399-cc and 436-cc models with slide rails, speedo and tach. Other machines include Cadet, Capri, Chimo, 295, 340, 440 Futuras.**



**Boa-Ski 440 SS has hydraulic disc brakes, pop-up headlamp, automotive instrument panel, front shocks, Kohler 440-cc engine.**



**Rupp Nitro II provides 336-cc or 438-cc engines, twin carbs, CD ignition, aluminum rails.**

Chaparral will have a new liquid-cooled SSX of 40 and 50 hp, Brut introduced one last winter, and Kiekhaefer Aeromarine's new high-performance snowmobile mill, possibly for some Ski-Doo models, is reported to have liquid cooling as well. Both Evinrude and Johnson offer optional U.S.-made rotary combustion engines up to 10 hp to 45 this year. Their new narrow (15-inch) track Evinrude Skimmer and Johnson JX will mount up to 650-cc 50-hp engines.

The top 25 machines of 1973-74 could include Alouette, Arctic Cat, Auto-Ski, Boa-Ski, Chaparral, Columbia, John Deere, Evinrude, Harley-Davidson, Herter's Husky, Johnson, Mercury, Moto-Ski, Northway, Polaris, Raider, Rupp, Scorpion, Ski-Doo, Skiroule, Massey-Ferguson Ski Whiz, Sno-Jet, Speedway, Suzuki, Viking and Yamaha. Many models have color-matched clothing.

Snow-season shoppers should have a lot to select from this year. ★★★



**Scorpion Super Stinger 440 has Rockwell Twin 434-cc power, front shocks, speedometer, tach, flecked red styling, Para-Rail suspension, Power-Bite track.**



# World's hottest homebuilt

The famous Pitts Special is considered the finest aerobatic plane around, yet oddly enough is a home-grown creation. You can build one like it yourself from plans or from a new kit of parts soon to be available.

by Harvey Shaman

Go to any air show, stunt-flying exhibition or competition event and you're likely to see more Pitts Specials performing than any other aerobatic aircraft. The U.S. team that took top honors in last year's International Aerobatic Championship did it in—guess what?—yes, the Pitts. Over the years, this tough, lovable little biplane has become a favorite of crack pilots the world over and is generally considered the finest aerobatic performer around.

What's so astonishing about the Pitts is





that it's basically a homebuilt—not mass-produced on assembly lines, not costing hundreds of thousands of dollars, not reserved for the wealthy few—but lovingly handmade from plans in back-yard barns and garages all over the country. Until recently, the plane was not even certificated by the FAA, but had to be licensed in the experimental category. So popular has the Special become that well over 3000 sets of plans have already been sold to prospective builders. More than 300 completed Pitts are flying; another 400 are under construction.

While the Pitts does require some special skills to fly it aerobatically, it is by no means limited to professionals. Any reason-

**Peeling off in a smart bank** (far left) is colorfully striped Pitts, its sunburst design a trademark of world-famous stunt pilot Bill Thomas who flew plane exclusively for PM pictures. Below, Thomas and PM Outdoors Editor Bill McKeown (left in photo) roll out a two-place version of the Pitts for an exciting test ride. McKeown, a World War II fighter pilot, reports his experiences with the Pitts on page 125. At bottom, Curtis Pitts, designer of the vaunted Special, stands by one of his creations.



Photos by the author



ably well experienced sport pilot can handle it successfully—and have a ball in the process. More than anything else, the Pitts is a fun plane to build and fly. It is small, light, extremely sensitive on the controls and incredibly strong. While its designer, Curtis Pitts, only claims it meets minimum FAA aerobatic stress specifications of 9 Gs positive and 4 Gs negative, competition pilots regularly pull much more than this—and miraculously the wings stay on. The twin wings give the ship a high degree of lift, good stability and a relatively low, safe stall speed of 62 mph. This combination of sure-footed stability, easy handling and quick responsiveness makes the Pitts a strange cross between a Sunday pilot's dream and a wild man's adventure. You can fly it with conservative care or all-out abandon—either way, the thrills and excitement it offers are hard to beat. The Special is, indeed, something *really* special.

In its classic form, the Pitts is a single-place, open-cockpit biplane reminiscent of the helmet-and-goggles, scarf-flying, wind-in-the-face early days of aviation. For those preferring companionship and/or instruction while flying, a two-place version—the S-2A—is also available. Both have remarkable performance characteristics. The single-place Special—three decades in development and refinement—is powered by a 180-hp

Lycoming engine. It has a top speed of 176 mph and a phenomenal rate of climb of 2600 feet a minute. Its power loading is so low—only six pounds per horsepower—it can fly straight up, performing intricate antics as it goes, without stalling.

What makes the Pitts so maneuverable are its small size, dual ailerons and symmetrical wing shape. Overall length is only 15 feet, 4 inches, and the wings span less than 17½ feet. The dual ailerons—two on each side—are ganged together to provide large control surfaces for quick turns and rolls. These, combined with the short wing-span, give the ship a tremendously fast roll rate of 180° per second. The symmetrical wings—having the same curvature on both top and bottom—enable the plane to fly equally well upside down as right side up

**Rolling a Pitts** is simple because the ship is so responsive and easy to control. In series of photos at right, aerobatic champion Bill Thomas demonstrates this graceful and spectacular maneuver. Main trick is to keep tail straight as plane rolls on its axis.







**At midpoint in roll** (above), plane is upside down, showing vivid checkerboard markings on underside of wings. Wings have symmetrical airfoil shape, enabling them to fly equally well inverted as right side up—important in aerobatic flying. Note very slight aileron deflection due to ship's sensitivity.



**Report from the cockpit:** PM Outdoors Editor test-flies the two-place Pitts S-2A.

Some people go to Mecca, dive through underwater canyons or climb mountains for an ultimate adventure. I found mine about 3000 feet above Miami Everglades in the front cockpit of a Pitts S-2A—two-holer model of the world's most responsive airplane.

Bill Thomas, perhaps the greatest of aerobatic instructors, was in the back seat, following me through on stick and rudder. The controls had the clean, crisp feel that showed no hint of mush or vicious reaction, just as Thomas had described back in his Fly for Fun office at New Tamiami Airport. The Pitts is a plane you have to fly to believe.

Through stalls, straight and inverted tailspins, loops, Cuban eights on to hammerhead stalls, slow rolls and snaps, Immelmans, Olympic routines, lomcováks—I tried to remember any plane like it I had flown during my test pilot days or in fighter combat. None compare in feel or could have completed all the maneuvers. If I had the time, I'd buy the plans and parts today from Pitts and build one. If I had \$20,000, I'd buy a completed Pitts from Thomas. That's not much to pay these days for perfection.

—Bill McKeown



**Featherlike wing section** is all wood with open-truss rib construction for maximum strength, minimum weight.

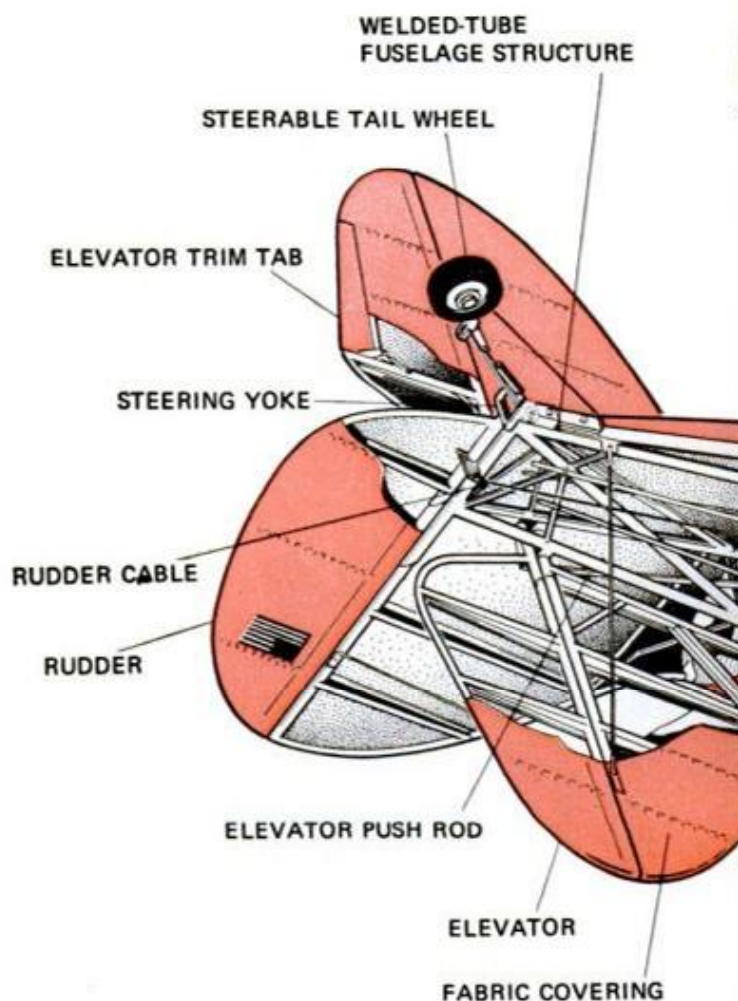


—particularly important in aerobatic flying where many of the most exotic maneuvers are performed in an inverted position.

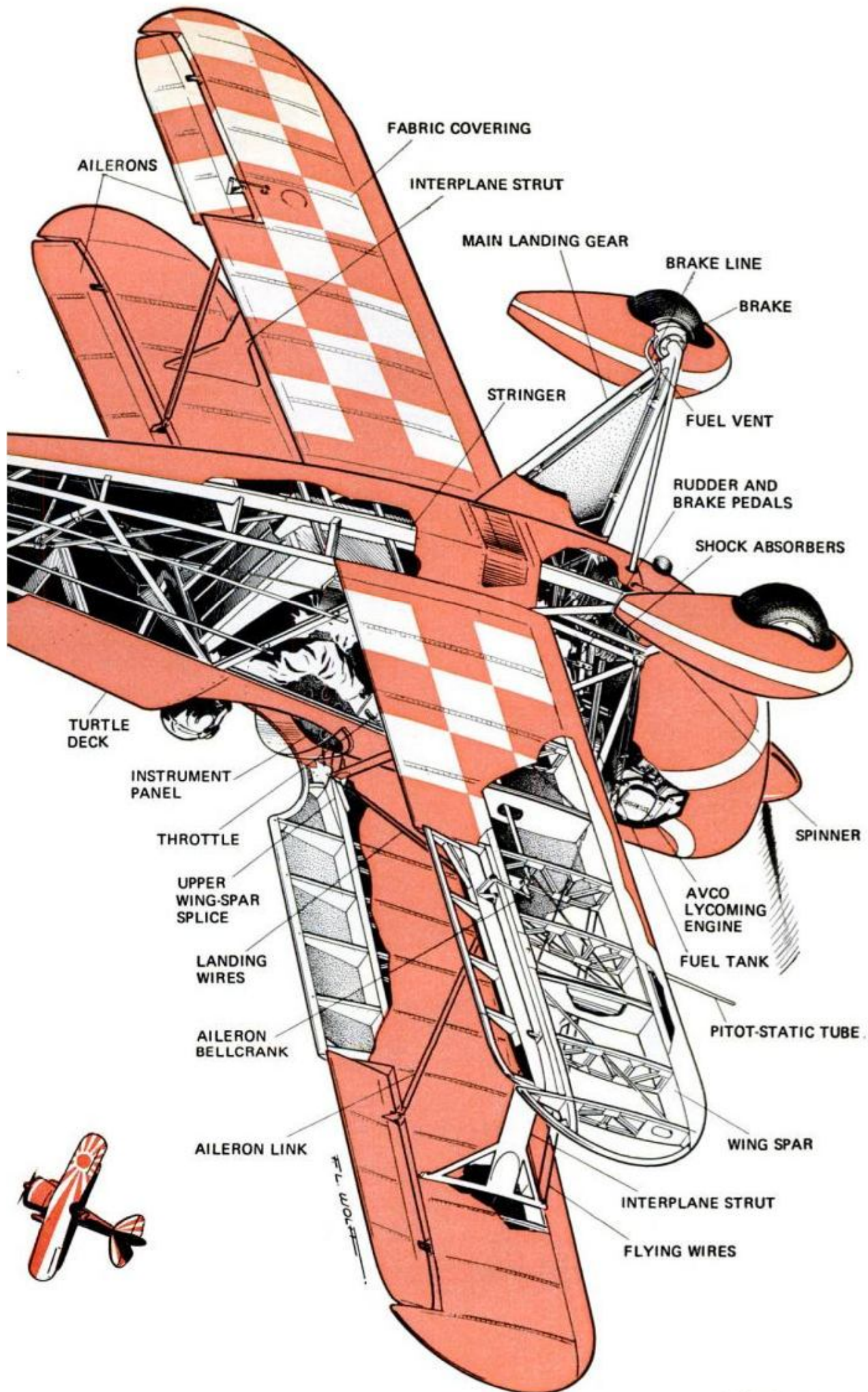
Basic construction is fabric over a welded-tube fuselage and all-wood wing sections. Pitts believes the wood wings provide high strength without the danger of fatigue that metal might be subjected to under the constant flexing of aerobatic stress. Empty weight is 720 pounds, gross 1150. Fuel capacity is 20 gallons. Landing gear is fixed to save weight and simplify construction. Wheels, wing struts and engine cowling are all smoothly faired to minimize drag.

Plans for the Pitts Special, including detailed instructions and many full-size patterns, are \$150 a set. As an additional aid to home builders, Pitts will supply many of the parts ready-made. He is also preparing a complete kit of parts, which, when properly assembled and FAA-approved, will result in a fully certificated aircraft. The plans-built version will remain an experimental-class ship. And if you have about \$20,000 to spare, you can buy the plane ready to fly. So there are many ways to have a Pitts if you want it. For more information, write Pitts Aviation Enterprises, Box 548, Homestead, Fla. 33030. ★★★

**Smiling from cockpit,** aerobatic ace Bill Thomas (left, below) prepares to put Pitts through its paces for PM. Dual ailerons in upper and lower wings (center photo)—rare in biplanes—are one reason why Pitts is so maneuverable. Lower ones are controlled by stick, while upper ones are "slaves" operated by connecting rods. At right is cockpit—unusually roomy for such a small plane.











PM OWNERS REPORT: **BUICK APOLLO**

# Easy rider, good handler;



Apollo uses GM's X-body, same as Nova, Ventura and Omega, but Buick-ish grille and portholes give it the Flint look.



Owners report good roadholding, cornering and ride. Rattles, wind roar in hatchback were noted by a few.



# but rough on gas!



A nationwide survey based on 700,000 owner-driven miles.

by Michael Lamm  
WEST COAST EDITOR



Photos by the author

**I**t's a great road car, corners better than other makes I have driven, and doesn't creep sideways going around curves." That's the way a Minneapolis food-store manager sums up his new Apollo.

"It's built on GM's small body, but the Apollo drives and handles like a much larger car," says a Texas lab technician.

Handling came in as the Apollo's best liked feature. Fully 52.8 percent of our respondents listed handling as their primary "specific like." Yet handling didn't emerge as a major reason for buying the car initially. Size and styling led that parade, and it wasn't until after most of the owners had lived with their Buick compacts that they discovered just how well they handled. The good handling came as an unexpected bonus.

Among other reasons for buying the Apollo: "Since we already have a 1965 Skylark with 155,000 miles that's still going strong, we were glad when Buick came out with a smaller car—but not *too* small"—



**Drastic body tuck** lets tires kick mud and stones onto rockers. Size and styling played major roles in buying decisions.



**'I'm short . . . Apollo was the one I could see out of best.'**



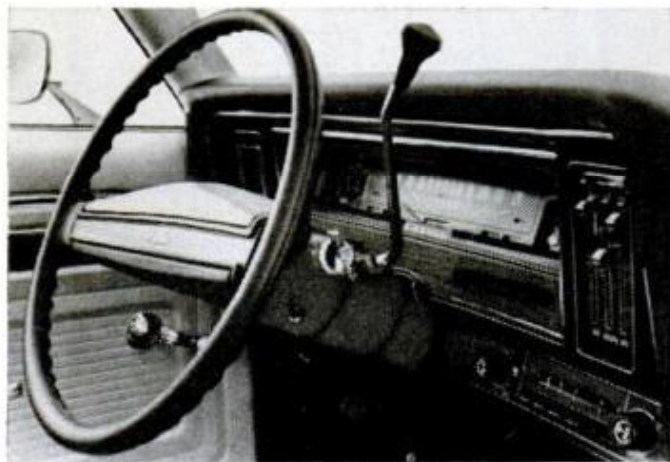
Give us back our quarter windows, say many owners. Apollo's gas mileage with the V8 is only two mpg better than big Electra's. A Six is available, but so few people buy it we couldn't tabulate it in our sampling. Hatchback owners praise space and convenience, but would like a regular spare and a method of holding the hatch up in any given position.

tribute from a New Jersey department-store manager.

An Ohio laborer confessed, "I was driving past the Buick dealership when I saw this car. I said to myself, 'That's a sharp car,' and I bought it right then and there." An Indiana teacher gave this reason for choosing the Apollo: "I'm short-statured. After checking out several imports and small cars, the Apollo was the one I could see out of best."

Buick's Apollo is the latest in a series of GM compacts built on the X-body shell. It shares basics with Chevrolet's Nova, Pontiac's Ventura and the Olds Omega. The Apollo's engine is by Buick, and so are quality control and identifying trim (such as the grille). A few owners noted that the car looked too much like other GM compacts and should be altered to make it more definitely Buick.

Nearly 20 percent of our owners selected the hatchback coupe over the two other body styles available—four-door sedan and a regular pillared coupe. Most liked the hatchback's easy access and ample storage. A 62-year-old retiree wrote, "I even slept in the back once and found it perfectly comfortable in my sleeping bag in the hatch." Noted an Indiana housewife, "The hatchback trunk is deep enough to carry grocery bags upright."



Apollo's dashboard looks much like all other X-bodied GM compacts. Airconditioning/heater controls take figuring out, but otherwise it's an easy car to drive. Most owners optionalized to the hilt, with sunroofs cropping up as one of the most popular extras.

However there were a few complaints. A Wisconsin welder: "The rear seatback isn't held down firmly enough, so it rattles. And the rear glass fogs easily." An Ohio printer: "The hatchback leaks." Several owners also mentioned short legroom in the rear seat of the hatchback, and a New York contractor sighed, "I wish they'd given me a real spare instead of this deflated eraser. Also there ought to be a way to hold the hatch up in any given position."

Now what about that famous Buick workmanship? "All good except the inside trim, which fell off when I brushed against it," said a Colorado tool and diemaker. "Seems to be very good," commented a Texas retiree. A New Hampshire accountant with tiny handwriting: "Generally good, but some minor spots of glue and blemished paint on close



inspection." Over half of our owners rated workmanship "good to excellent."

Apollo buyers tend to be middle-aged or beyond, and many had owned Buicks before. For instance, "I've bought Buicks since 1934 and have always been satisfied—sure didn't want to switch after 39 years."

And about their dealers, nearly 80 percent rated them "good to excellent" on sales and general policies, but when we asked for a service rating, the percentage dropped to 50/50. "I call their service manager a mental incompetent," growled one testy Apollo owner.

The biggest gripe, though, as usual, was poor gas mileage. Our sampling averaged between 12 and 15 mpg, which is only two mpg better than we reported for the 1973 Buick Electra (page 130, June *PM*). A Muskegon Mich., day-care director speculated: "Antipollution controls make for added fuel consumption and cause rough running when cold." His point about surging when cold was echoed by a number of respondents.

What changes would Apollo owners suggest, given free license? "Move shoulder harness hook at roof so belts don't strangle people getting in and out of rear area." "Too much body tuck lets mud and rocks mar fender areas." "I'd like a small vent window up front," suggested a North Carolina bank clerk, and she had plenty of company. "More room in the rear seat of my

sedan." "Better gas mileage [over and over]." "Fewer gaps in body sheet-metal to cut wind noises at speed."

This last came from an Ohio real estate broker, and on the same point a Massachusetts lab assistant mused, "The Buick dealer should have charged me more for my Apollo because I have a perpetual hurricane outside the window. With all windows closed, this noise starts at about 40 mph and gets louder as I go faster." Wind roar bothered quite a number of people.

Apollo owners generally find their cars comfortable to drive and ride in. Most are pleased and even impressed with the 350 V8's power, although a handful note an initial sluggishness just above idle. This they blame on smog equipment.

Among minor complaints, the horn ring seems a bit touchy, and not everyone has mastered the airconditioning/heater system. "I've read the instructions at least a dozen times, but I still don't think a Philadelphia lawyer could figure them out."—Virginia supervisor.

Mostly, though, owners feel the same way as this Indiana telephone operator: "I looked at a lot of cars before the Buick. The minute I spotted the Apollo and sat in it, I knew this was my car. I didn't even have to drive it, and I bought it before the official show date. I wouldn't want any other car. I really do enjoy it. It's great." ★★★

## Summary of 1973 Buick Apollo Owners Reports\*

Total miles driven .....732,675

### Body styles:

Two-door coupe .....50.0%  
Four-door sedan .....30.1  
Hatchback coupe .....19.9

### Engines:

350-cu.-in. V8 .....97.5%  
250-cu.-in. Six .....2.5

### Transmissions:

Automatic .....99.3%  
Manual ......7

### Average miles per gallon:

Local driving .....12.0  
Long trips .....14.8

### Why the Apollo?

Size .....38.6%  
Styling .....36.5  
Economy .....11.6  
Good price .....10.5  
Previous Buick ownership .....4.6

### Specific likes:

Handling .....52.8%  
Styling .....35.7  
Comfort .....24.5  
Ride .....21.9  
Size .....16.0

### Specific dislikes:

Poor gas mileage .....26.5%  
Poor workmanship .....10.4  
Rattles .....5.6  
Harsh ride .....4.5

### What changes would you like?

Better gas mileage .....14.0%  
More legroom .....9.3  
Different styling .....7.0  
Bigger trunk .....5.6  
Better workmanship .....5.6

### Had any mechanical trouble?

No .....52.6%  
Yes .....47.4

### What type of trouble?

Transmission .....15.4%  
Electrical .....14.0  
Airconditioner .....10.3  
Carburetor .....8.1  
Alternator .....6.6  
Brakes .....5.9

### Did you repair it yourself?

No .....97.7%  
Yes .....2.3

### Dealer repairs satisfactory?

Yes .....61.5%  
No .....38.5

### Dealer service opinion:

Good to excellent .....50.0%  
Average to poor .....50.0

### Workmanship opinion:

Good to excellent .....55.6%  
Average to poor .....44.4

### Is the Apollo your only car?

Yes .....52.8%  
No .....47.2

### Other cars owned:

Other Buicks .....34.6%  
Chevrolet .....20.6  
Ford .....10.3  
Pontiac .....7.4  
Oldsmobile .....4.4

### Age distribution of owners:

15-29 years .....19.3%  
30-49 years .....29.1  
50-plus .....51.7

### Would you buy another Apollo?

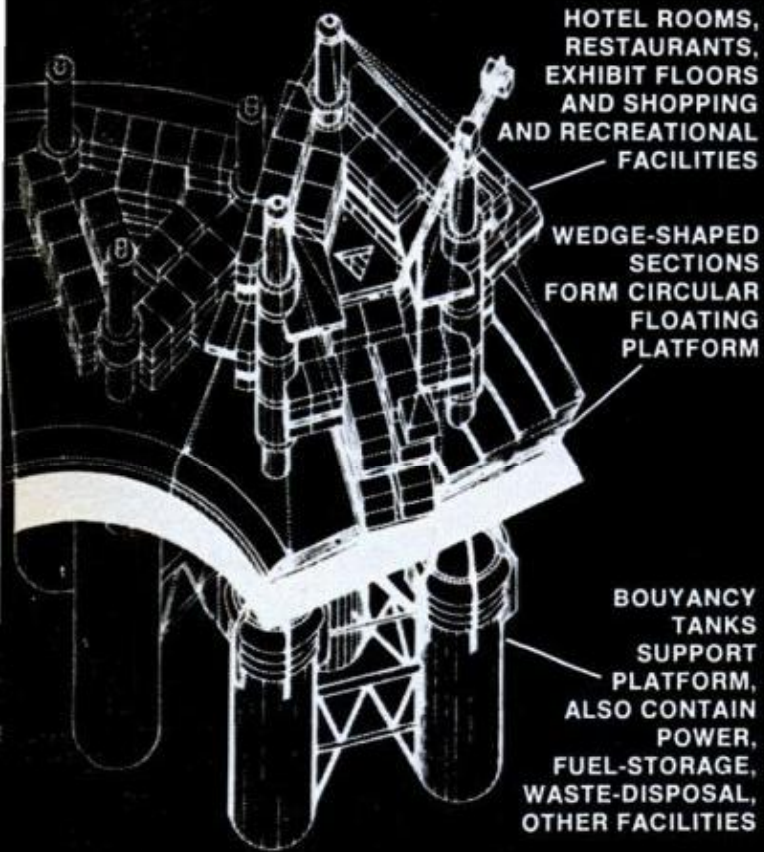
Yes .....72.7%  
No .....27.3

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

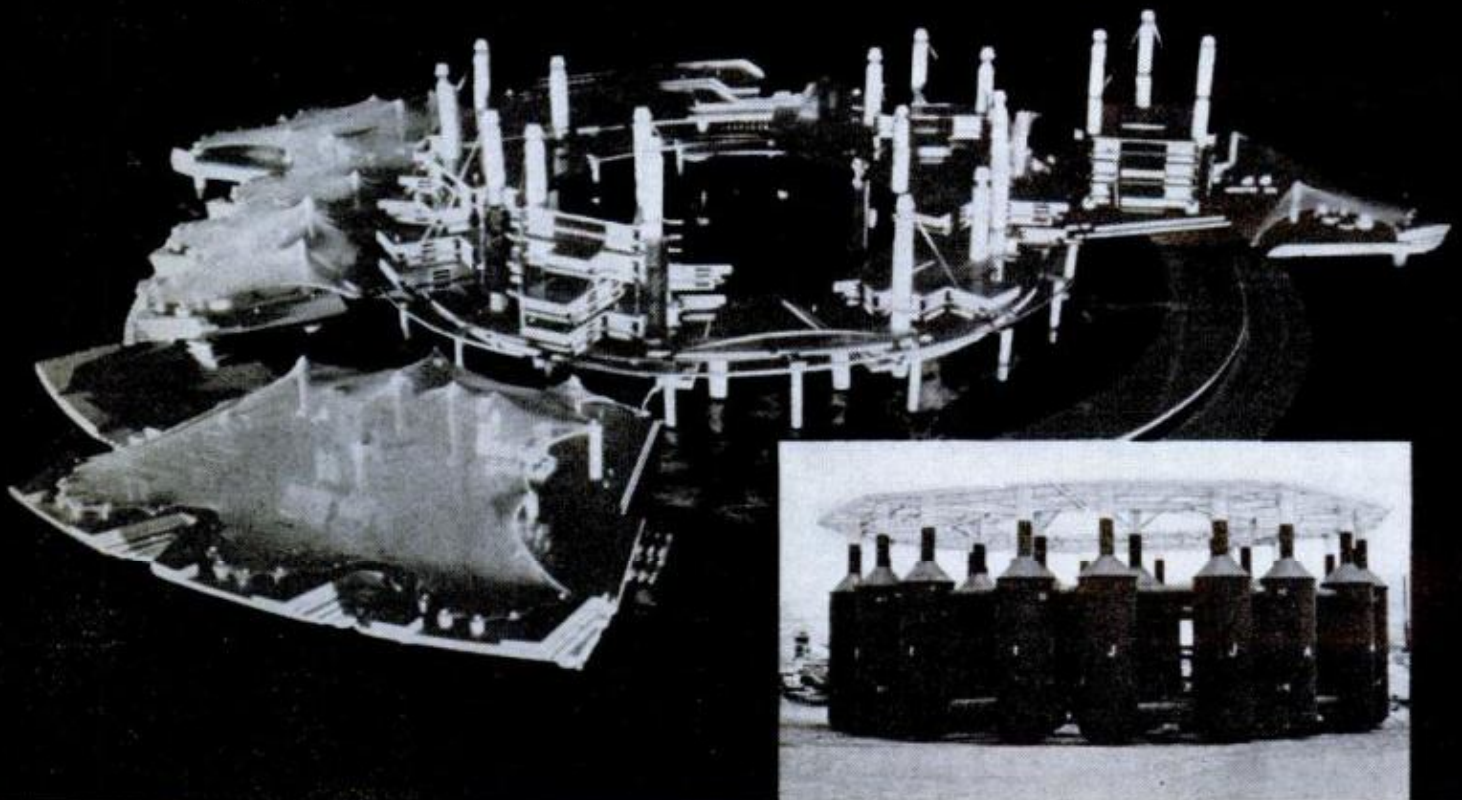


# IT'S NEW NOW

## A strange new sight: Floating cities looming out of the sea



The answer to our overcrowded land may be man-made islands—huge floating cities in the sea to create more living space. To find out, scientists at the University of Hawaii are planning a pilot project, a mini city on sea legs to be stationed off Honolulu. The novel structure is expected to be completed in time to serve as an exposition center to commemorate two bicentennial anniversaries—the American Revolution in 1976 and the discovery of the Hawaiian Islands in 1978. The floating city will consist of wedge-shaped platform sections joined together to form a ring 1000 feet in diameter. The ring will be supported on bottle-like buoyancy tanks extending 370 feet deep. A 1/20th-scale model of these columns is shown in photo below. The tanks narrow at the neck to minimize the force of wave action. Towering buildings on top of the circular platform will house exhibit areas, living quarters, restaurants and shopping facilities. With water covering 70 percent of the Earth's surface, expanding into the sea may well be man's solution to the problem of finding space for a growing population.







**Corral for trash cans**

Clean-Way shelter for trash cans is mobile, animalproof, prevents rusting. Sells for \$29.95 (stationary model \$24.95) plus collect shipping charges. Environmental Products, Inc., Box 672, Alexandria, Minn. 56308.



**Emergency compressor for road use**

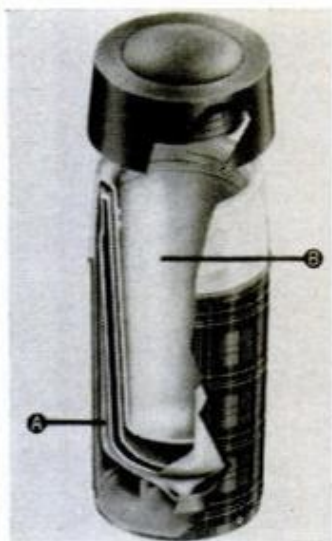
Thomas First Air Kit is based on a small but powerful compressor that plugs into your car's cigaret lighter, pressurizes up to 60 pounds per square inch, and can inflate a flat tire so you can drive on it to permanent repair facilities. The outfit weighs 4 pounds, includes 10 feet of power cord and 3 feet of air hose, nozzles for tire valves, toys and sporting goods and air cleaning. It's \$24.95 from Thomas Power Air Div., Thomas Industries, 1419 Illinois Ave., Sheboygan, Wis. 53082.



**Suspended ceilings with hidden support**

Ceilings with no visible means of support—and without visible bevels between tiles—are the result with Armstrong Cork Co.'s Integrid Ceiling System. Metal grid runners are hidden above 1x4-foot acoustical tiles, available in three patterns. Ceilings can also be installed directly under exposed wood joists or they can be attached to existing suspended-ceiling grids. A special recessed lighting fixture can be obtained as part of the system.





## Safety vacuum bottle for youngsters

Safety-Sealed vacuum bottle from Aladdin has glass vacuum-insulated filler (A) sealed between walls of plastic case (B) so that even if the filler breaks, no glass comes out. Reduced bulk of glass filler makes bottle easy for child's hand to hold; wide mouth makes it easy to drink or spoon from. It's made by Aladdin Industries, Inc., 703 Murfreesboro Rd., Nashville, Tenn. 37210.



## Genuine fake antiques custom-made



## Squadron of Messerschmitts—cars, that is

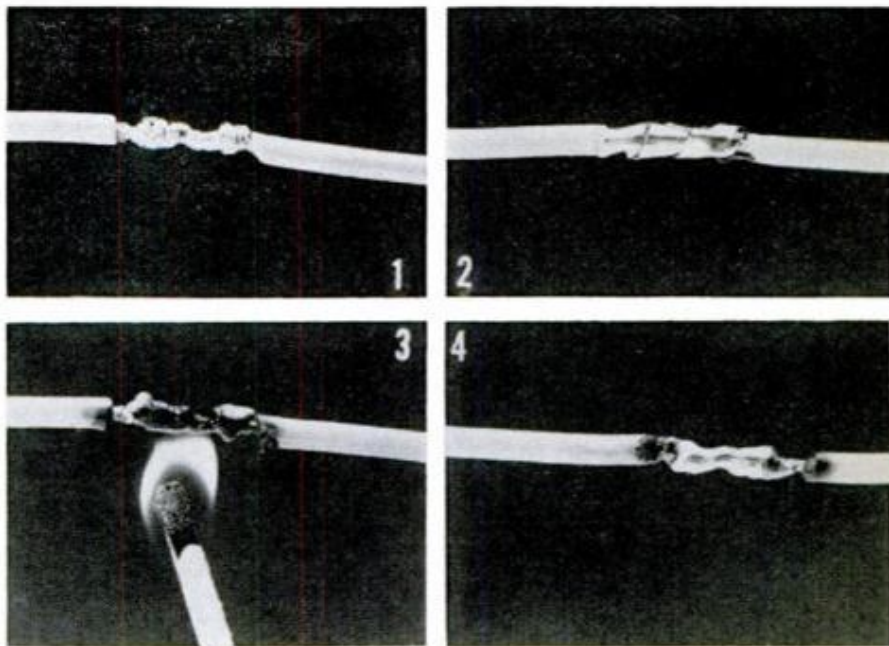
Gathered together for their annual outing are these old-time Messerschmitt cars produced by the same German firm that turned out the famous World War II Messerschmitt fighter. The nine shown here at Rickmansworth, England, are believed to be the only still-operating models remaining from the many that were imported by Britain up to 1964, the last year the midget side-hinged, hatch-door cars were made.

The nearest thing to a real antique is one made by British silversmiths Eric Pollard and Frederick Neale of Southwick. Their reproductions are so authentic—right down to scratches in the original—that only chemical analysis can tell the difference. A genuine antique is first disassembled and a mold made for each part. Duplicate parts are then cast in the molds and assembled into replicas selling for up to \$1000.



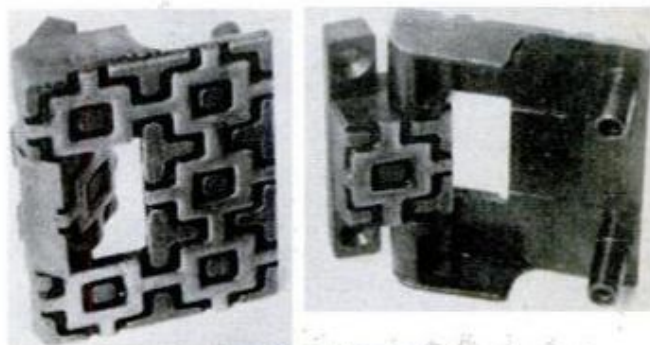
## Soldering with a match

Want to solder a couple of wires together but don't have a soldering gun handy or a place to plug one in? With this Archer tape solder, you don't need a gun. You just twist the wires together (photo 1 at left), wrap the tape around the splice (2) and hold a match underneath (3). The flame melts the solder and out comes a perfect joint (4). Handy for emergency use when traveling, boating or camping, the solder comes in 100 pre-cut pieces for 89 cents. At Allied and Radio Shack stores.



## Quartz-lamp sauna heater

Compact Vega Sauna Heater has high-intensity quartz-lamp heating that gives fast warm-up and produces a soft light. Three safety devices are incorporated in the heater and controls. Heaters are \$450 and \$550 f.o.b. Denver; prefab sauna rooms start at \$550. Write Vega Sauna Co., 2301 South Delaware St., Denver, Colo. 80223.

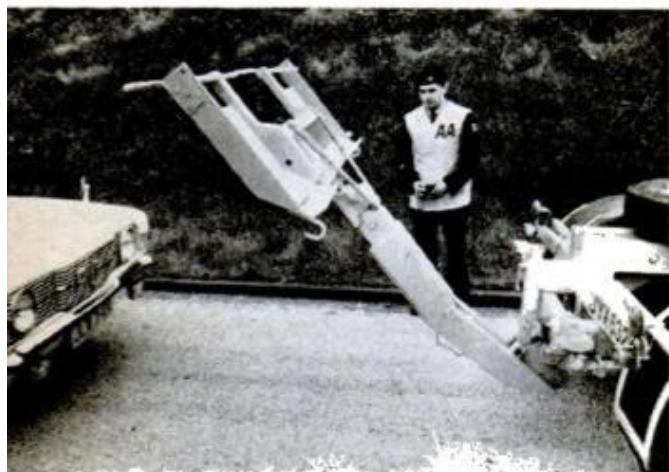


## Handsome hinge hides its works

New decorator hinge is unusual because it has no visible screws, barrel or pin. Designed for use on  $\frac{3}{8}$ -inch offset (lipped) cabinet doors, the deeply carved hinges are called Sculptura V, come in five different patterns, each available in antiqued brass and antiqued silver. For nearest supplier, write to Gries Reproducer Co., Dept. PM, 400 Beechwood Ave., New Rochelle, N.Y. 10802.



# NOW



## Quick lift for stranded motorists

The hydraulic lift on this new British tow truck can pick up a disabled vehicle and have it on its way to a repair shop in less than a minute. The lift arm is rolled under the stranded car's front wheels, then raised. The wheels hook into pockets, locking the car to the tow truck without other fastening. Much faster and safer than conventional methods, the system is under study by the British Automobile Assn.

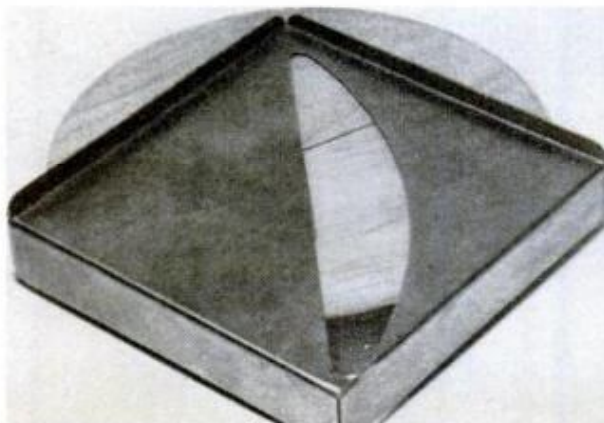


## Mini airliner to go where only copters dare

Designed for quick takeoff (top photo) and short landings on rough terrain (bottom), this new Australian "bush" transport can venture into rugged jungle and mountain areas where formerly only helicopters could operate. The twin-engine, turboprop Nomad can take off in 400 feet and land in 200—without a paved runway. Seating 12, it's being considered for use both as a military troop carrier and small civilian airliner. A special wing-flap system gives the ship its unusual slow-flying STOL capabilities.

## Center-finding tool

Locating the center of a length of dowel or of a piece of any round, square, octagonal or rectangular stock is a snap with the Rewco Center Finder. The device is placed over edge or end of workpiece and a line drawn along the diagonal. Tool is then rotated and second line drawn. Center is at intersection. Made of a stainless steel, the tool is \$2 postpaid from Rewco, Box 567, Rogers, Ark. 72756.







### Instant tire-pressure indicators

You can check your tire pressure at a glance with these screw-on indicators, one for each wheel. Each gauge attaches to the tire valve and registers pressure on a pop-out stem as you press a sleeve. Releasing the sleeve retracts the stem. The gauges do not interfere with tire filling and can be left on permanently. Set of four, \$2.98 postpaid. Schmuckle's, Box 2278, Encinitas, Calif. 92024.



### Chair back adjusts to you instead of you to it

You can tailor this backrest to suit your own personal comfort merely by turning a small wheel at the side. The cushion clamps to most home or office chairs. Turning the wheel varies curvature to desired contour for maximum seating ease. Not yet marketed, the device was invented by Dr. Muller-Limmroth, Munich, Germany.

### Flameless flying model rockets

Convertible Cold Power line of flying model rockets from Estes uses freon gas propellant for flameless operation, with provision for conversion to standard model-rocket engines. Each kit includes model, launcher, launch-control system, propellant and converter. Rockets are from 17 to 19½ inches in length. All feature parachute recovery. Kits are \$6.95 each at hobby, toy and department stores, discount centers, or by mail directly from Estes Industries, Inc., Box 227, Penrose, Colo. 81240.

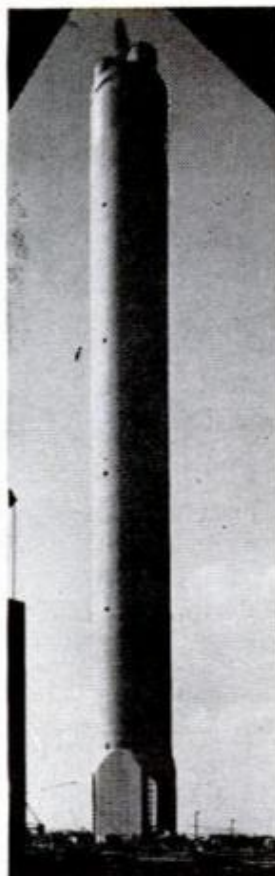
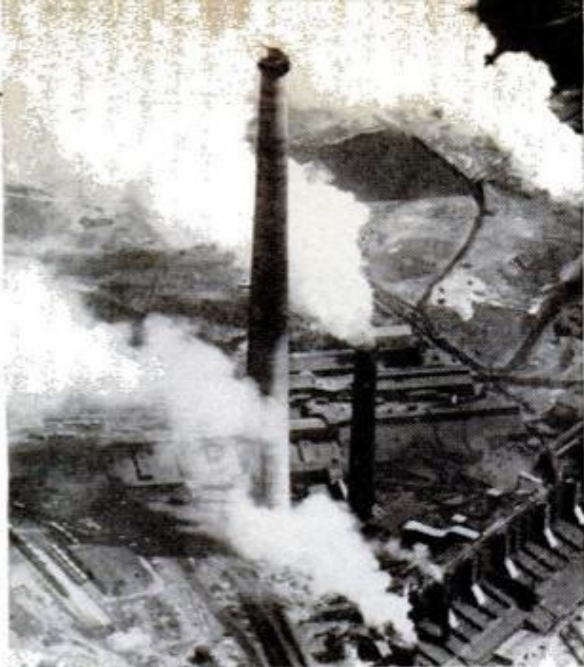




## Paper bricks



Recycled paper may soon be used to make building blocks for homes. The process, developed by chemical engineer Robert Matteson (left), is currently being put to the test by elementary school children in Orinda, Calif. Old paper is shredded and mixed with chemicals, then compacted in a hand press (bottom) to form "bricks." The method was used to erect a 6x10-foot toolshed (center photo).



## World's tallest chimneys

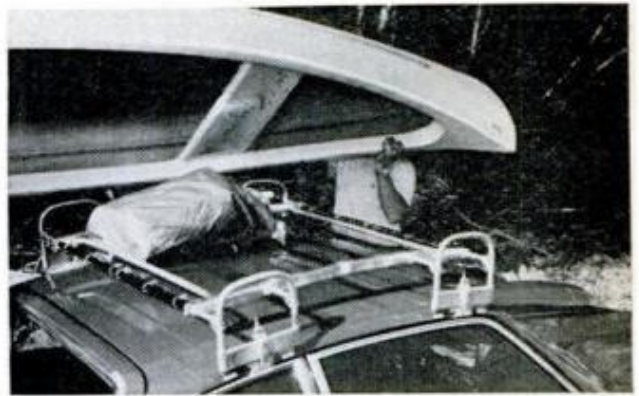
Industrial chimneys are getting taller every day in an effort to spew polluting fumes higher into the atmosphere. International Nickel's at Sudbury, Ont. (top) is said to take the record at 1250 feet. At Drax, England, Britain's Central Electricity Generation Control Board boasts the biggest. While shorter at 850 feet, the mammoth tower (lower left) is 87 feet in diameter. In Japan, Mitsubishi's unusual four-legged stacks (lower right) top out at 722 feet. The design is said to withstand wind stress better than a single straight chimney.





### Space trackers—junior style

For several years now, students at Kettering Grammar School in Northamptonshire, England, have been scooping the world in reporting Russian space launches. Their tracking station, part of a physics course, has proved so successful they often beat Tass and NASA to the news.



### Convertible cartop carrier

All-purpose cartop carrier has a system of adjustable crossbars and tiedowns that permit it to tote a variety of loads from luggage, camp gear and canoes (top photo) to small items like skis, oars and fishpoles (bottom). The Hema rack telescopes to fit all cars from compacts to full-size wagons and can carry up to 440 pounds. Easily attached, it quickly fastens to a car's rain gutters with clamps. \$39.95 from ICM Marine Products, Ltd., 1140 West 15th St., North Vancouver, B. C., Canada.



### Hot-glue gun puts the heat on repairs

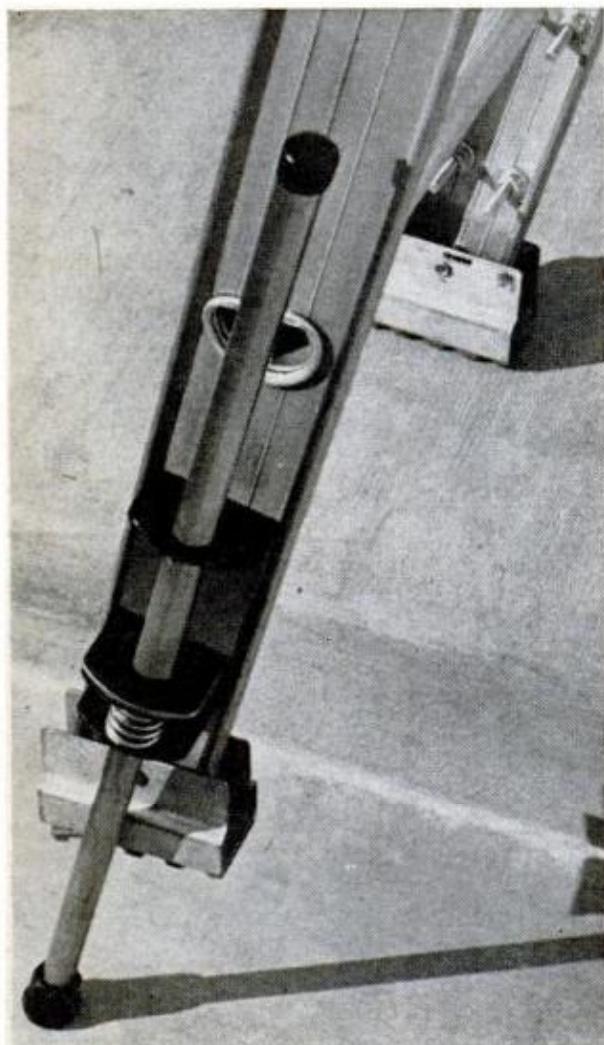
Bond, caulk and seal wood, tile, leathers, plastic with The Little Red Fixer, Swingline's automatic-feed electric glue gun kit. FixStix adhesive bonds in 60 seconds. UL-listed gun has contour grip, thermostatic control, long nozzle for tight spots, automatic trigger for one-hand operation—glue feeds as you squeeze. Kit includes gun, 29 glue and caulk sticks, instructions, molded plastic carrying case. Suggested retail price is \$11.98.





## Automated bartender

Slip in a programmed punch card (top photo) and this automated bar will turn out any drink you want, premixed and ready for use. Up to 50 selections of ingredients are possible from which hundreds of drinks can be made. Liquors and mixes, kept in pressurized containers (left), are fed in precise amounts to a mixing spout. \$700 to \$1400. Leisure Products Corp., 1717 Dallas N. Parkway, Plano, Tex. 75074.



## Leg lengtheners for safer ladders

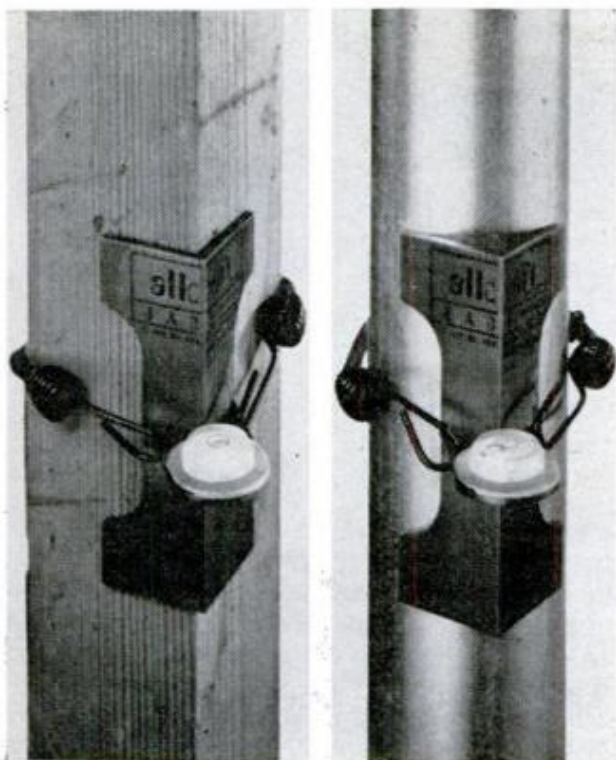
For working more safely on a ladder on uneven ground, Xtenda-Leg adds up to 16 inches of length to a ladder leg. The infinitely adjustable steel extenders mount on both wood and metal ladders. They're \$9.95 per pair, including freight, from K. O. Industries, 12968 Greenleaf St., Studio City, Calif. 91604.

## Big-job portable drill

McCulloch's new Mini Mac All Purpose Drill weighs 23 pounds, is powered by a 1.8-cubic-inch two-cycle engine, has two-speed-plus-neutral gearbox. Supplied with a 1-inch wood auger, it accepts augers and drill bits up to 8 inches in diameter. Suggested retail price is \$269.95. For more information, write McCulloch Corp., 6101 West Century Blvd., Los Angeles, Calif. 90045.

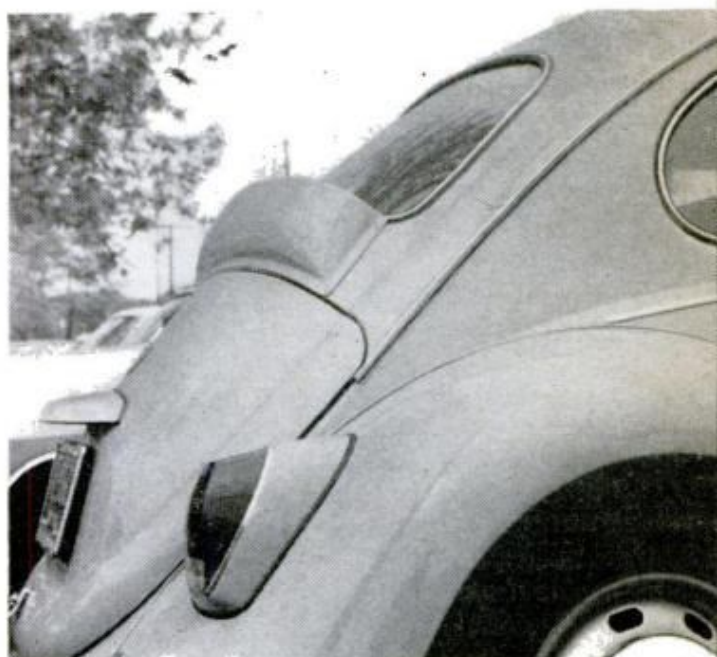






### Strap-on vertical level

Lev-All is a vertical level that leaves hands free. It straps to any round, square or rectangular pole, post or rod, has bull's-eye bubble level that allows leveling in all directions at once, using both hands for adjustments. Maker suggests using it on fenceposts, television antennas and wall studs. The tool is available for \$8.95 postpaid from Cedar Hill Service, Dept. PM, Foristell, Mo. 63348.



### Better breathing for the VW Beetle is said to improve engine performance

Made especially for the Volkswagen Beetle, this trim-looking molded-plastic air scoop is said to improve engine breathing and cooling, resulting in better performance, increased gas mileage and lower oil temperatures. The accessory fastens to the rear deck, channeling ram air to the engine compartment, and can be spray-painted to match existing body color. For additional information on price and local sources, write the maker, Amroc Co., Box 242, Smithtown, N. Y. 11780.

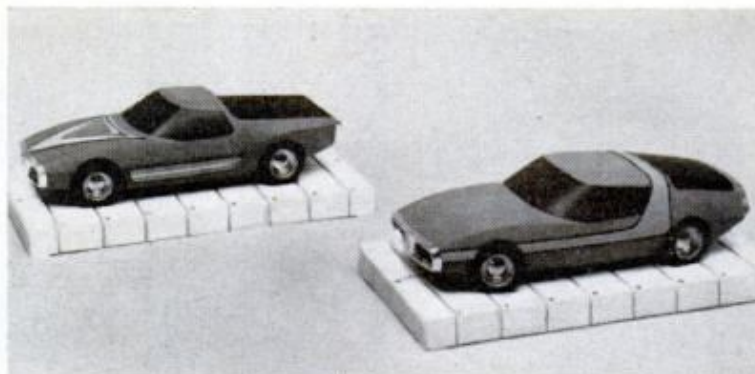
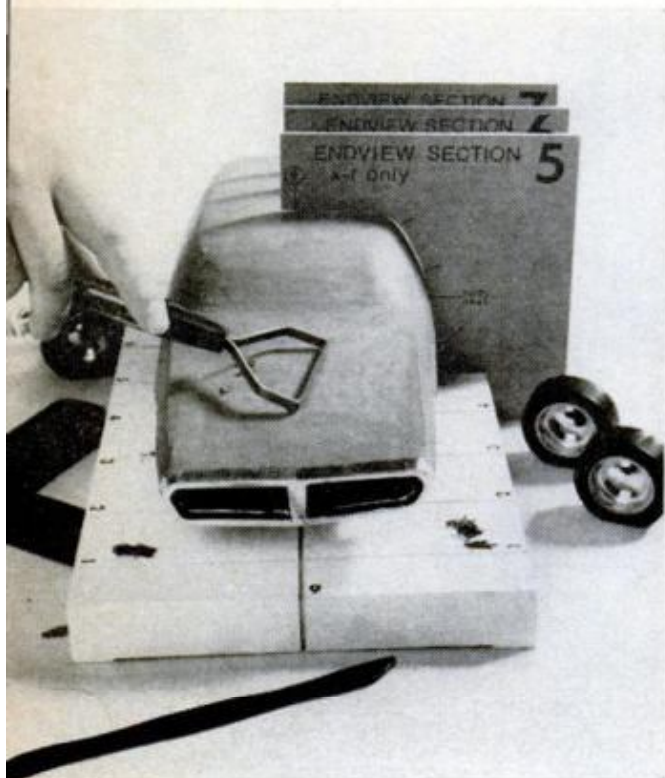
### Piggyback house trailer

This new experimental British house trailer isn't really a trailer at all but is coupled rigidly to the car so both operate as a single unit. Called the "Caraboot," it's said to be easier and safer to handle than conventional trailers because turning, backing and jackknifing problems are eliminated. Also, the trailer's wheels connect to the car's brakes to give added stopping traction. The fiberglass body, housing the kitchen, bath and sleeping quarters for four persons, is waffle-ribbed for strength.





# NOW



## Model-car styling kit

Use the same materials, tools and techniques the pros do with the Detroit Car Styling Kit. Apply clay to a foam-plastic buck and shape it using templates provided to make a sleek fastback or pickup—or a model of your own design. Each kit includes wheels, bumper-grilles and decals for finishing. Made by Whiting, a division of Milton Bradley Co., Springfield, Mass., the kit sells for about \$9 in hobby and department stores.



## Pocket calculator travels anywhere

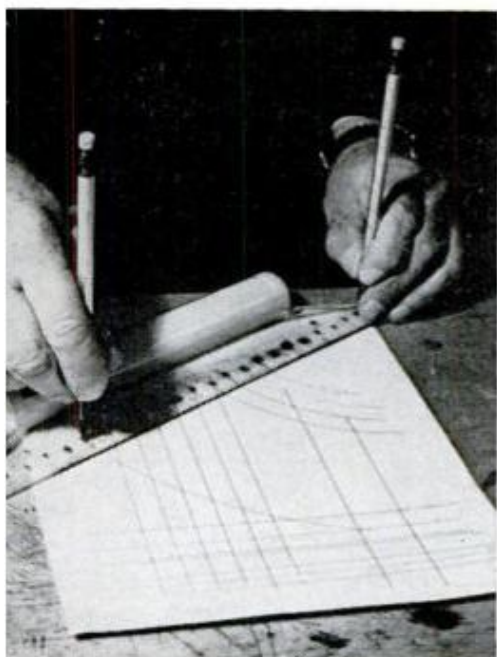
This kit-built pocket calculator runs on rechargeable batteries and comes with a charger that can be wired for either 120 or 240-volt operation so you can use it virtually anywhere in the world. A special "battery-saver" circuit turns off the display after 15 seconds, but stores the information so you can reactivate it any time later. The IC-2009 kit has 8-digit display, floating decimal, constant key, can be built in two or three evenings. \$92.50, Heath Co., Benton Harbor, Mich. 49022.

## A paint job that 'sparkles'

Glitter is sprayed on right along with the paint using Glitter Brite Flake Finish. The initial coat is then followed with a clear coat of a shiny, weather-resistant finish. Available in many colors, the paint is about \$3.28 for a 16-ounce can. Order from Growco, Inc. Box 3285, Tampa, Fla. 33601.







**Rolling ruler does tricks**

Drawing parallel lines is easy with this novel ruler. One edge is fitted with a roller that permits the ruler to slide smoothly over the paper. The opposite edge has a series of spaced holes. You just place two pencil points in the holes the desired distance apart and roll the ruler along to get two perfectly spaced lines. By pivoting the ruler at one end and swinging the other, you can also draw arcs and circles. \$6.95, Rol-Ruler Co., Riegelsville, Pa. 18077.



**Finger saver**

This handy nail starter makes it easy to work in hard-to-reach places and will keep you from rapping fingers. The nail or tack is snapped into slotted jaws at the tip, and the tool is pulled free after starting. Made of tough Cyclocac plastic, the starter features a 4-inch ruler, a nail penny (d) gauge and a hole for hanging on a tool-board. Made by The Raylar Co., Box 8366, Long Beach, Calif. 90808. Available by mail for \$1 plus 10 cents for postage and handling.



**His roof's growing fine**

No, you're not seeing things. The man above is actually mowing grass on a rooftop. He's John Campbell, caretaker of a home for handicapped children in Symington, Scotland. The idea for the turf-covered roof came from the home's founder, Isabel Murdoch, who felt it would give the structure a natural, pleasing appearance. It provides a tough and weather-proof covering and never wears out or blows off like shingles.



**Quick-check anti-skyjacking system**

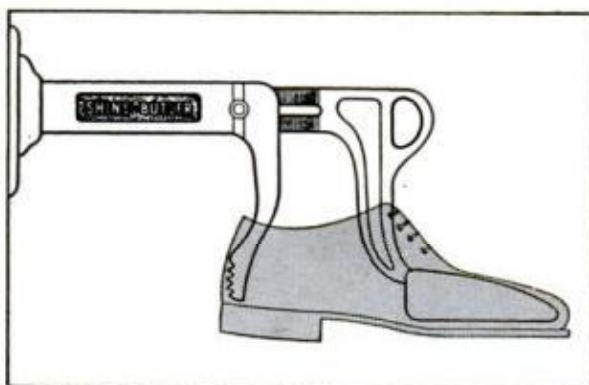
Passengers and luggage are screened simultaneously in this two-in-one airport security system designed to speed up anti-skyjacking measures. As passengers walk through a tunnel-like magnetometer to detect metal, their baggage rides along beside them on a conveyor for checking by X-ray inspection. Side-by-side system, used by TWA at LaGuardia and other major U.S. air terminals, can process 720 passengers and pieces of luggage an hour.





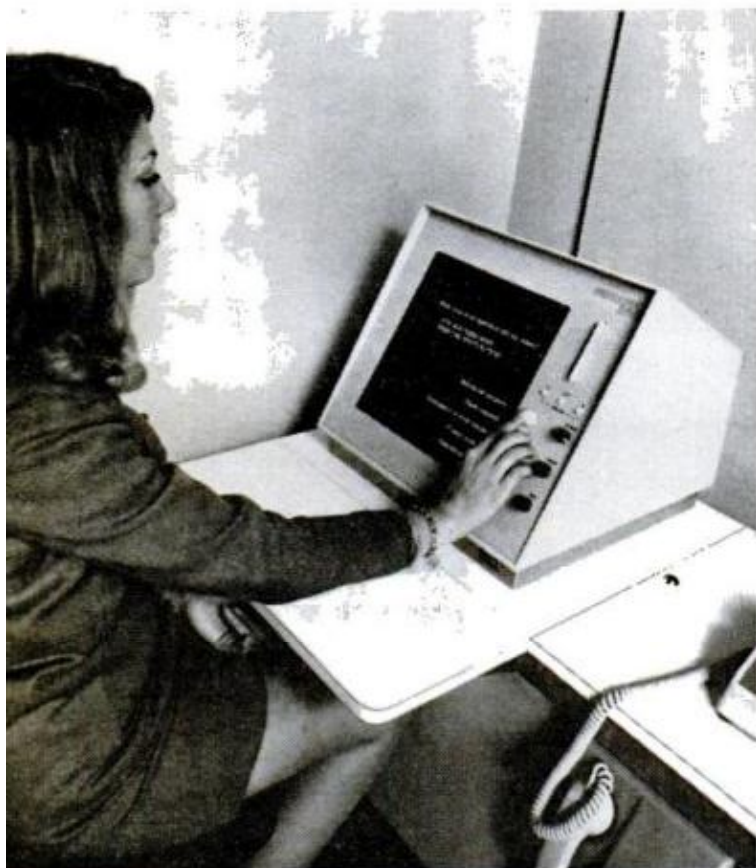
## At last, a move to standardize slide trays

First non-Kodak slide projector to take circular Kodak Carousel slide trays is this Keystone made by Berkey Photo. It features rangefinder focusing, also accepts other Kodak accessories such as supplementary lenses and stack loaders. Three models range from \$114.95 to \$179.95. Keystone Div., Berkey Photo, Inc., Keystone Pl., Paramus, N.J. 07652.



## Shoeshine parlor on the wall

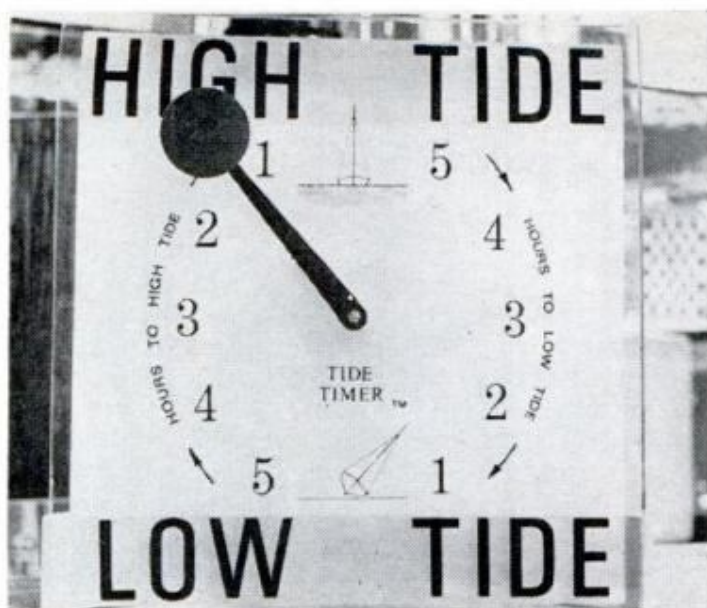
No-stoop shoeshines are possible when the shoe is held at a convenient height on the wall by Shine Butler. The device saves wasted motion and leaves both hands free to use polishing cloth the way a professional does. Shakeproof and self-storing, the bracket mounts on any solid vertical surface and holds shoes of all sizes—men's, women's and children's. Shine Butler sells for \$4.95 postpaid from David Lash, Dept. PM, Box 464, South Norwalk, Conn. 06856.



## Electronic 'doctor'

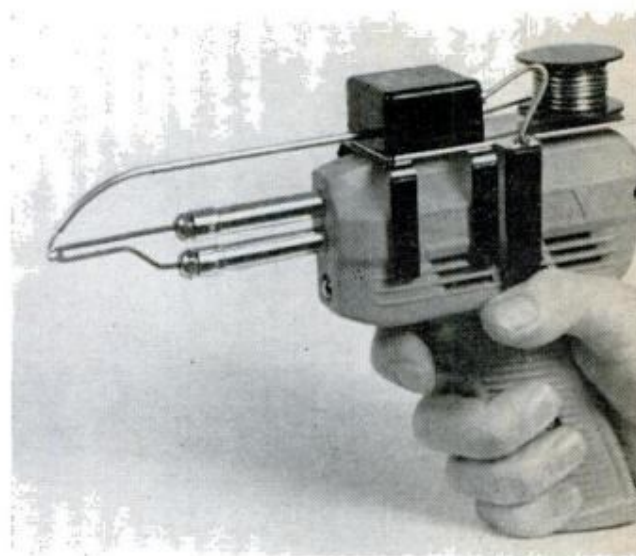
Busy doctors can now interview patients electronically to save time. Questions flash on a TV-like screen, and the patient replies by pressing buttons. The answers then appear on a printed readout that gives a doctor a medical "profile" of the patient's general condition and symptoms to aid diagnosis. The Searle Medi-data Profile 320 can be linked by phone to a central computer so physicians in different locations can simultaneously study the results.





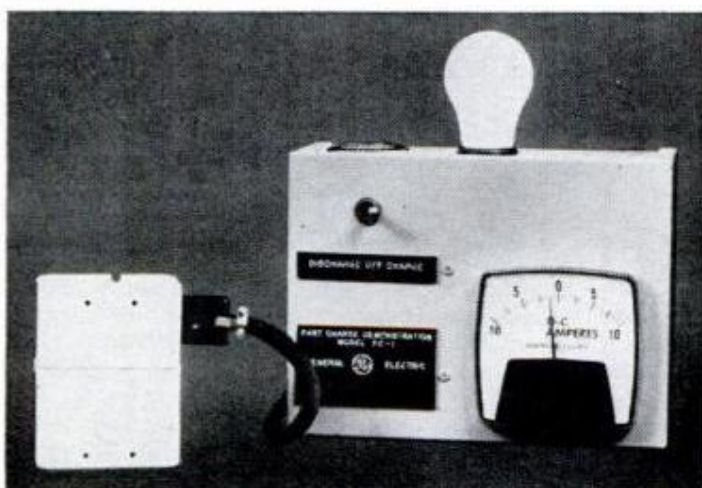
**Automatic tide timer**

Swimmers and boaters can tell tide time at a glance with this clock. Unlike indicators that must be manually adjusted, it revolves once every 12 hours and 25 minutes, automatically compensating for daily variations. Two models are \$30 and \$60 from Hammacher Schlemmer, 147 East 57th St., New York, N.Y. 10022.



**Feeder for one-hand soldering**

Thumb trigger of "Freehand" solder feeder gives  $\frac{1}{4}$  inch of solder with each squeeze and can be positioned on gun for either right or left-hand use. Feeder holds 20 feet of solder, weighs 5 ounces loaded. Upside down it's a solder-gun stand. Available for most popular guns (specify make and model) for \$8.95 postpaid (plus applicable tax) from Schurman Products, Dept. G-PM, Box 13, Weymouth, Mass. 02188.



**New 'instant charge' reusable batteries**

New line of GE nickel cadmium batteries can be recharged in as little as 15 minutes. What's more, they can be left on charge indefinitely without harm as a sensing circuit automatically cuts off power as capacity is restored. Called Powerup 15, the new cells are available in all popular household sizes.



**Pruner has blunt nose for safety**

Pocket pruner stays handy while blunt nose protects pockets and user. Highly polished stainless-steel pruner is  $4\frac{1}{4}$  inches long, has serrations on one jaw to prevent slipping; \$3.85 plus shipping from Brookstone Co., Peterborough, N.H. 03458.



# Get set for a cold-weather starting emergency!

by Mort Schultz

Suppose you find yourself stranded late one night in the middle of winter, because your car won't start. Help is miles away, and the thought of trudging through ankle-deep snow in near-zero weather is chilling. But what choice do you have?

Just this: By considering the facts and using everything at your disposal, your chances of getting the car started and keeping it running long enough to reach help are pretty good.

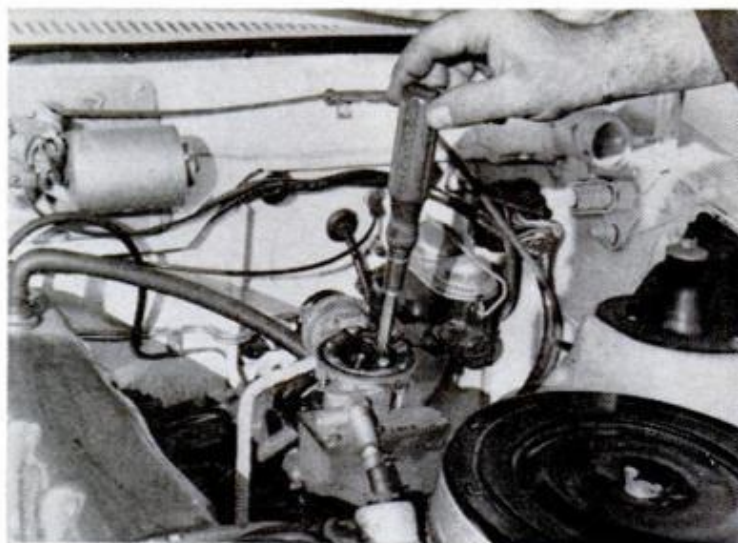
Think a moment. Does the engine crank normally? Does it start but fail to keep running? Does it crank sluggishly or not at all?

Each condition reflects a different set of circumstances. For example, if the engine turns briskly but doesn't fire or starts but fails to keep running, a careless starting procedure could be causing fuel flooding or starvation.

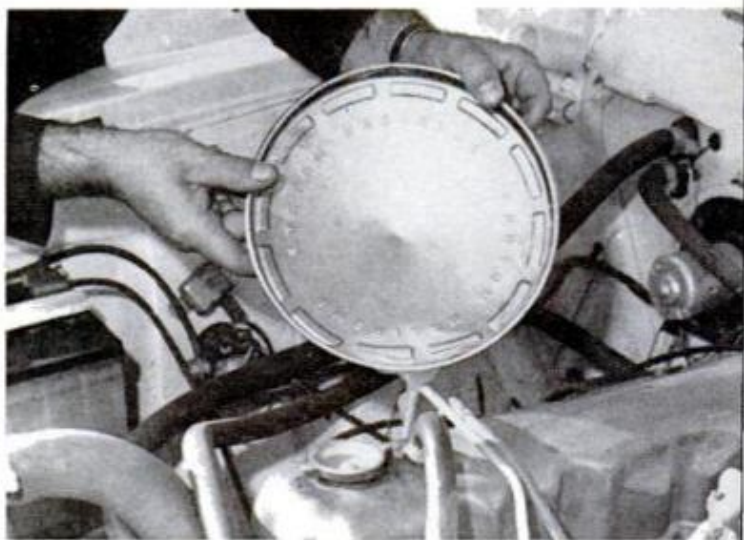
Place the selector lever of an automatic transmission in P or N. If the car has a manual transmission, press the clutch pedal to the floor. Late-model cars with manual transmissions are equipped with a starter interlock which prevents cranking if the clutch isn't fully depressed.

If the engine is still warm, keep the gas pedal depressed one-third to one-half as you crank, but don't pump the pedal.

If the engine is cold, depress the gas pedal to the floor once only and release it



**Choke-plate operation** affects proper starting and running. Plate should be closed starting a cold engine, but should open gradually as engine warms. If it is stuck in closed position try to free it or prop it open.



**Water in your gas** can freeze in winter and block fuel lines, especially at bends. Hot liquid poured over the lines will get fuel flowing again so you can start. If you need a pail or container, a hubcap makes a good one.

slowly. With your foot *off* the pedal, crank the engine. If it starts but fails to keep running, repeat the procedure.

In very cold weather (0° or below) with a cold engine, fully depress and release the gas pedal slowly two or three times before cranking. Keep your foot off the pedal as you crank.

If the engine won't start, it may be flooded. Press the gas pedal right to the floor and keep it there as you crank. When



the engine fires, keep holding the pedal to the floor until engine speed increases.

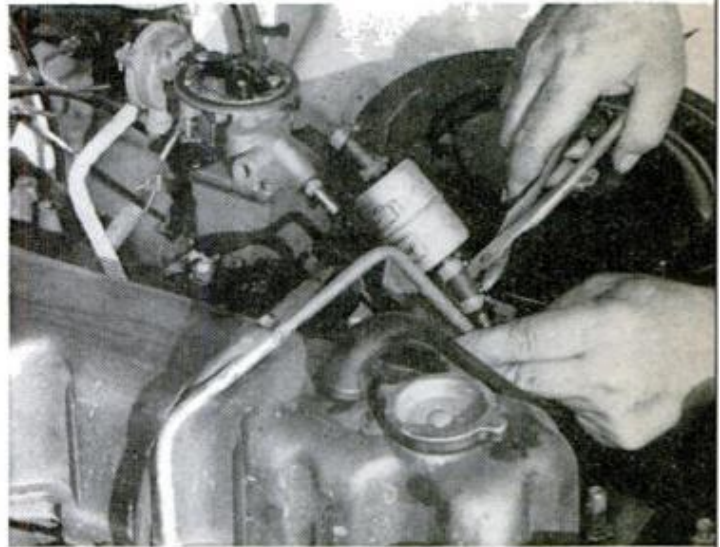
If correct starting procedure doesn't produce results after a couple of attempts, don't keep at it. You'll just kill the battery. Instead, remove the carburetor air cleaner and look at the choke plate. If the engine is cold, the choke plate should be closed so an enriched fuel mixture will be available for easy starting.

Close a choke plate that is stuck in the open position by pushing it closed with your finger. If it fails to stay in place, prop it closed by wedging a screwdriver between the carburetor air cleaner holding bracket and the carburetor.

If the choke plate sticks in the closed position and won't open as the engine warms up, flooding will occur, causing the engine to stall. Release the choke arm from the fast idle cam, which opens the plate, and keep it open by wedging it with a scrap of wood or anything else that will fit snugly between the plate and carburetor.

Suppose starting procedure and choke plate operation are okay, but the engine still won't start although it cranks briskly—what then? As long as the carburetor air cleaner has been removed for examination of the choke plate, determine if fuel is getting to the carburetor.

Operate the throttle once or twice by hand. A strong spray of fuel should squirt



**A fuel filter that's clogged with ice or dirt will cut off fuel. Remove it from the fuel line.**

into the venturi. If not, maybe a sliver of ice is blocking the flow of fuel.

If you have a thermos of coffee, slowly pour it over the fuel pump, fuel line, fuel filter and carburetor fuel bowl. Or if the engine is still warm, open the radiator drain plug slightly and drain some coolant from the radiator. Use a hubcap to catch it if no other receptacle is available.

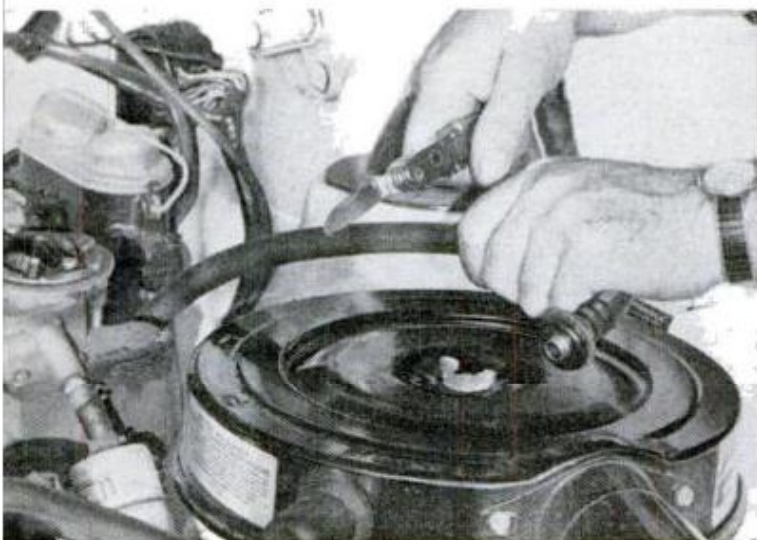
What can you do if the engine is ice cold? Gather snow in a receptacle or hubcap and start a fire with paper and other flammable material. This is an emergency. Use whatever is available.

Melt the snow and get water as hot as you can. Pour it over the fuel pump, fuel line, fuel filter and carburetor bowl.

The fuel filter can be troublesome, and it might prove fruitful to take it off to see if the engine will start without it.

Some cars have an external filter, while others have filters inside the carburetor intake port. Check the fuel line. If the filter is external, slip clamps off the line and pull the filter off.

The only drawback to having an external fuel filter during an emergency is that you must replace it with a piece of hose when you remove it. If you have spare hose of suitable size in the trunk, you're in good shape. If not, look beneath the hood for a piece of hose of suitable size that won't prevent the engine from starting and running



**Length of hose from your PCV system will serve as an emergency bypass for fuel filter that's been removed.**





**Check inside of distributor cap** for moisture, and wipe thoroughly. Make sure cables are tightly in place.

if it is removed. One such piece may be the windshield washer hose.

You can also cut off a piece of PCV hose. Although there will be a tremendous loss of vacuum, the engine will start and keep running until you reach help. Connect the hose, but drive slowly so it won't slip off.

If the fuel filter is internal, you have to unscrew the fuel line at the carburetor. Remove the filter from the intake port and reconnect the fuel line at the carburetor. You can run the engine without the filter or a substitute.

One more thing in the fuel system should be checked: a piece of ice or dirt may be keeping the needle valve off its seat. Tapping the fuel inlet of the carburetor with a tire wrench or any other suitable tool will often cause the obstacle to dislodge itself.

If fuel is getting to the carburetor, but the engine won't start although it cranks freely, an ignition failure is indicated. Perhaps snow has blown onto ignition parts, dampening out the spark. This is a good possibility if dirt has built up on ignition parts. Dirt retains moisture.

Wipe off each sparkplug. Wipe out the distributor cap and coil towers, and wipe off each high tension cable and its terminal.

Be sure terminals are firmly replaced into towers and onto sparkplugs.

Suppose that instead of cranking freely, the engine emits disheartening grunts. Chances are that the battery has failed suddenly or a combination of cold weather and dirty battery cable terminals has increased resistance in the starter circuit.

To verify this possibility, switch on the headlights and operate the starter. Battery failure or troublesome cables cause the lights to go out or dim considerably.

Remove the cables from the battery posts; scrape the insides of the terminals with a knife, screwdriver or piece of sandpaper; scrape off the battery posts; and tighten terminals firmly to the posts.

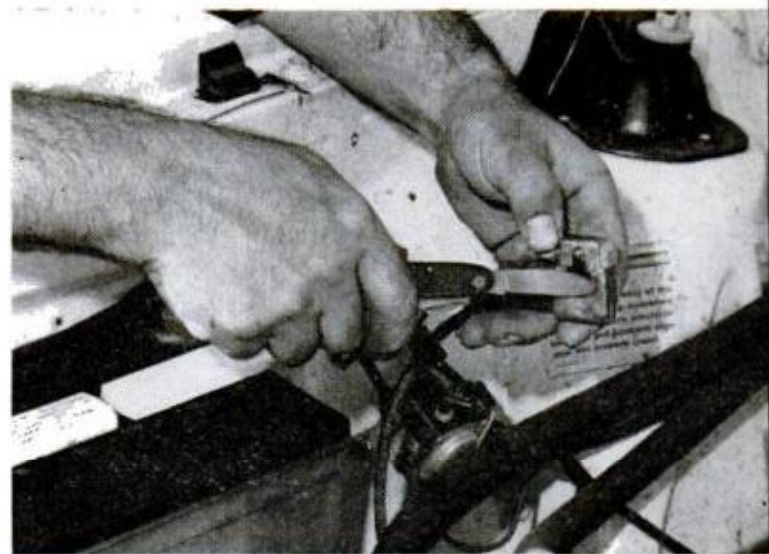
Disconnect the ground cable first and reconnect it last to avert a short.

No luck? Maybe one of the cables has failed. If you have battery jumper cables in the trunk, use them as a substitute by hooking them to the battery posts, and connecting the ground cable to ground and the "hot" cable to the starter switch. If the engine starts, drive slowly—jumper cable clamps may slip off from vibration.

Many jumpers sold today have soft aluminum wiring that will overheat to the point of failure if used for any length of time. A sturdy set of cables with strong copper wiring that can withstand emergency service is better. It costs about \$10.

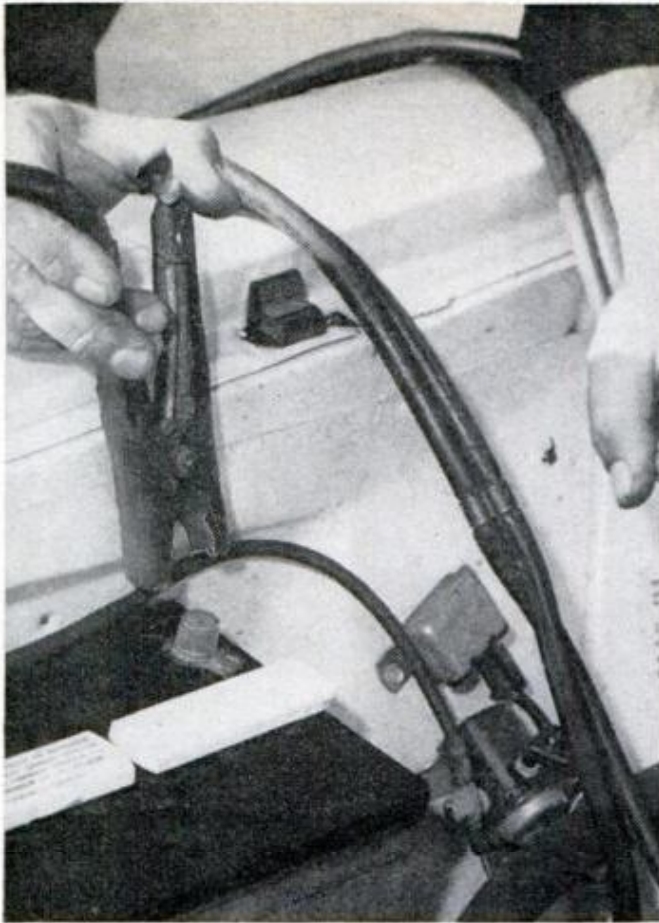
To be safe, stop frequently and check cables for overheating. If they are hot, stop the engine and let them cool.

If your problem is a dead battery and you have a manual transmission you can be



**Corrosion on battery terminals** and posts will boost circuit resistance and could cause a cranking problem. In emergency, scrape both with knife if your wire-brush cleaning tool is home in the garage.





**Ingenious emergency trick:** If your battery cables have failed, use your jumper cables to make the circuit.

push-started. Switch on the ignition key, shift into second gear and depress clutch. When the car is rolling at about 10 mph, let out the clutch.

Your chances of starting a car having an automatic transmission by pushing are slim. The oil circuits in most are such that the engine can't be driven through the transmission. If you can push start, place the transmission selector lever at N and turn on the ignition key. When the car is rolling at the speed specified for your car, shift to the specified gear range.

Since battery failure causes more winter emergencies than anything else, carry a set of jumper cables so you can jump your battery with that from another car.

If you want to be 100 percent equipped for winter driving—in remote areas, especially—keep a booster battery in the trunk, too, but make sure it is charged.

It is very important to connect a booster battery properly to avoid damaging diodes in the alternator. Connect the positive post of the booster battery to the positive of your car battery using the red jumper cable. Connect the negative posts of the two batteries with the negative (black) jumper cable. ★★★

## New for road emergencies



### Portable charger gets you started

You'd never be stranded with a dead car battery with this portable charger along. The 28-pound gas-powered generator recharges 6 or 12-volt batteries in 10 minutes, was developed by William Lear, designer of the Lear Jet. \$279 from Lear Avia Corp., Box 10825, Reno, Nev. 89510.



### Gasoline substitute keeps you going

Out of gas? Just pour in a can of this nonflammable substitute and you're on your way. Eliminating the hazards of carrying spare gasoline in a trunk, Rescue mixes with the gas remaining in an "empty" tank and raises the level enough to get you to a gas station. Cristy Chemical Corp., 405 Grove St., Worcester, Mass. 01605.



# Four-channel headphones: Here's how they sound on two ears

by Robert Angus



“If God had meant us to have four-channel headphones,” quipped an audiophile friend of mine the other day, “He would have given us four ears.” But since we have just two, do four-channel headphones (which have been with us almost since the first four-channel amplifier appeared) do any good? Or are they merely a gimmick to part us from \$50 or so of our hard-earned cash?

One acoustical engineer, at least, thinks they're a gimmick. Peter Tappan, of Bolt, Beranek and Newman (acoustical consultants for New York's Philharmonic Hall), after lengthy experiments with quadraphonic headphones, told last year's Audio Engineering Society convention: “Most of the clues necessary for four-channel perception—those provided by involuntary head movements and others—are missing in four-channel earphone listening, because the phones are directly coupled to the ear. The



**Fixler headphones**—the only ones we've found that really reproduce the four-channel speaker experience—will be coming soon from Teledyne and other manufacturers. These are preproduction prototypes; final versions may look slightly different, as each manufacturer has his own ideas on styling.





**Inside a quadraphonic** headphone like this Superex model, you'll usually find two small speakers angled slightly toward each other and facing the head: angles and the distance between speakers control sound perspective, construction of speakers; earcup controls sound quality. Fixler phones (facing page) are designed differently, have speakers aimed along axis parallel to the head's.

result is a narrow band of four-channel perception inside the head between the ears."

If that's the case, why have thousands of audiophiles listened, then laid down hard cash for quadraphones? To find out, *PM* tried several of the more popular four-channel models, including Koss's 2+2, Lafayette Radio Electronics's F-4400, David Clark's CH4/A, the Superex QT-4B and the Mura four-channel phones. We tried them with different types of music, on different types of four-channel recordings, and tried some of Tappan's test procedures, too. In addition, we took apart the Superex to see how a four-channel phone is constructed.

Our listening tests showed Tappan's observation that most of the quadraphonic activity takes place along a narrow band between your ears to be essentially correct, particularly with SQ or QS matrixed four-channel records. The newer phones—the David Clark and Lafayette models—seemed to provide a greater spread between front and rear than did models like the Koss and Superex which have been available on the market for some time. But that "spread"—at least with the test records that we used—often made pianos and violins sound larger than life.

The piano in Philippe Entremont's recent Columbia SQ recording of the Khatchaturian Piano Concerto, for instance, seemed 50 yards wide when heard through quadra-

phonic headphones. Yet when heard through speakers, the piano was of normal size. A Khachaturian violin concerto recorded by JVC on a CD-4 discrete disc positioned the violin to the listener's left, with speakers, but squarely in the middle of the headphone listener's head. (Nonetheless, CD-4 discs do let the listener place instruments more precisely than he can with either SQ or QS matrix discs—and CD-4's stereo spread is greater, regardless of which phones you choose).

The paradox is that stereo listening has conditioned us to expect more drama and dimension from headphone than from speaker listening, while four-channel phones so far have given us a little less. But four-channel phones do add *something*—shifting the switches on my Koss and Clark units from four-channel to stereo did cause a definite collapse of the acoustic "space" I heard, and reduced presence and brilliance a bit, too (but doubling up the speakers on each channel also gave stereo listening better bass response and less distortion). The Lafayette's "two-channel" position switches in a simple matrix, adding quadraphonic ambience to stereo material.

To understand what four-channel phones do, it helps to have some understanding of how they're put together. Usually, both front-channel and rear-channel reproducers are mounted at equal angles to the head; but because of the ear's shape, the front-



## Sampling of four-channel phones 1



Four-channel phones vary in shapes, features. Rectangular David Clark phones (1) come with plug-in matrix box to add ambience to stereo material; Koss KO-747Q (2) and PRO-5Q (3) have quad/stereo switches, volume-balance controls.



Lafayette F-4400 phones (4) have switch-selected matrix for quad listening to stereo; Stanton 65/4C (5) has external switch.





channel reproducer feeds directly into the ear, while the rear-channel reproducer fires across the bumps and ridges of the outer ear. As a consequence, you will hear less treble from the rear channels—but then, you also hear less treble from the rear in real life.

Obviously, the outer ear is much more than just a simple sound funnel into the eardrum. Acoustical engineers are only now becoming aware of the significance of the ear's whorls, ridges and valleys, and their influence on directional hearing. Scientists at the Massachusetts Institute of Technology several years ago made a synthetic ear which could be slipped over a microphone.

When the bare microphone was placed in the midst of a group of students who were all talking at once, it was impossible to distinguish what any one voice was saying in the babble. But when the "ear" was slipped over the mike, the voices became more distinct, and it was possible to pick out a single speaker and follow what he said. This phenomenon forms part of the four-channel headphone experience.

But it's obvious that quadraphonic earphone listening is not an attempt to recreate reality, or even to reproduce inside headphones what takes place acoustically in your living room. Quadraphones seem to be designed for a totally different kind of listening effect than either that of loudspeaker four-channel or two-channel headphone listening—an effect which, though unreal, is rather pleasurable and quite exciting in itself.

Does it have to be unreal? One man who says no is Philadelphia inventor John Fixler, who's come up with a four-channel headphone that really seems to work. The Fixler phone resembles conventional quadraphones in most respects—look-alikes, with two drivers in each earpiece. But the

*(Please turn to page 209)*



**Teledyne PH-220 (6)** comes with stereo adapter plug. **Superex QT-4B (7)** and **Realistic Nova 44 (8)** have stereo/quadraphonic selector switches.



In the first Indy 500 a rear-view mirror was used by the winner to keep an eye on all the cars behind. "Sitting alone in the narrow cockpit of the Wasp and trusting to an adjustable mirror placed just in front of his eyes to warn him of the approach of any of his rivals from the rear, Harroun drove a masterly race." That's how the periodical, *The Automobile*, described the event in 1911.

Since then we've trusted to the rear-view mirror to warn of other "rivals from the rear"—cars racing for the same hole in traffic that we're heading for!

Relying on the rear-view mirror standard, with its limited angle of rear vision, too many drivers have missed cars in the "blind spots" and the accident statistics have climbed: A recent estimate lays the cause of at least six million vehicle accidents last year to inadequate rear vision. Average drivers are oriented toward vision in the front hemisphere of the vision arc and even the best of us have some difficulty, for example, backing a small tandem trailer into a driveway.

At best, the current system of rear-view mirrors, inside and out, have provided only a 30 percent rear-view arc. This isn't much better than it was back in 1911. Attempts to improve the viewing arc with rear view mirrors since then have been many. Outside mirrors have expanded the rear-viewing angle, but have always been subject to the elements, of course, not to mention the carstrippers' art. Aftermarket manufacturers have devised mirrors of all sorts, some of them adding a couple of degrees of view to give the average motorist a fair break in his attempts to negotiate today's 100-million-car traffic on high-speed roads with multilane challenges from sideswiping lane changers.

Some motorists have bought larger mirrors that mount in place of the original-equipment mirror, but many became disenchanted and discarded them after a period of straining their necks to see over or under them in order to catch changing traffic signals.

Convex mirrors, popular on some European sports models, have had their own disadvantages in mass usage. The convex curve of the mirrors, while it expands the field of rear viewing, does so at the expense of clarity of the image reflected. And the danger of misjudging the distance and speed of the car coming up behind can

## Up periscope?

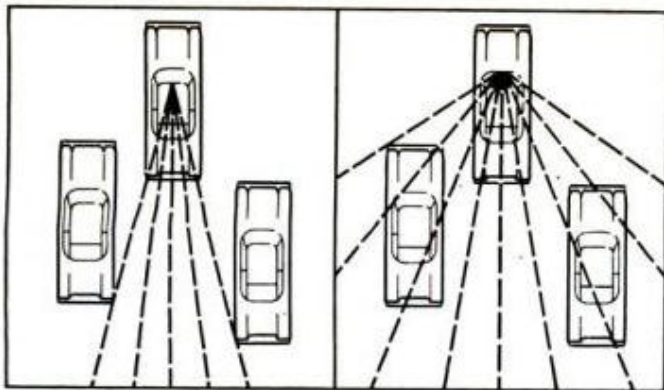
The trick of seeing behind you has always been done with simple mirrors, but if they can't measure up to stricter rear-visibility standards, your next car will have a periscope.

by Ed Janicki

Among experimental periscopes being tested in real-life driving situations are several that have been installed in auto-racing pace cars. This Javelin pace car at Michigan International Speedway mounts a Parascope designed by Para-Vue. Another system designed by Donnelly Mirror Co. makes use of electric defrosting and has been installed in a fleet of General Services Administration cars for purposes of testing and evaluation.







**Wide-angle mirror** systems may be able to meet future standards for rear visibility. New systems are being researched by auto companies as a more cost-effective approach to indirect rear visibility than periscopes. Shown here is the view afforded by one of the aftermarket wide-angle mirrors that are available. This one, called WINK, greatly expands rear viewing angle as shown in drawings and photos. Costing about \$15, this system mounts five mirrors in one frame to provide the panorama. Each separate mirror is set at a precise angle to provide the distortion-free view. Another wide-angle mirror available is approximately 30 inches wide and is of single-piece construction. Disadvantage of these systems, of course, is the extent to which they intrude on forward visibility.



make this alternative to the flat image mirror a very dangerous one.

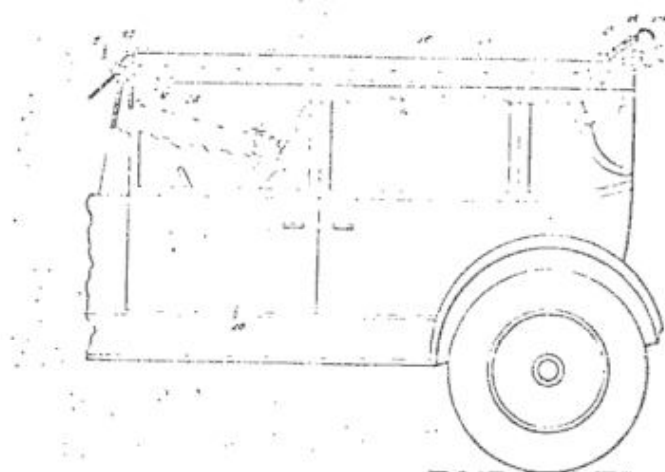
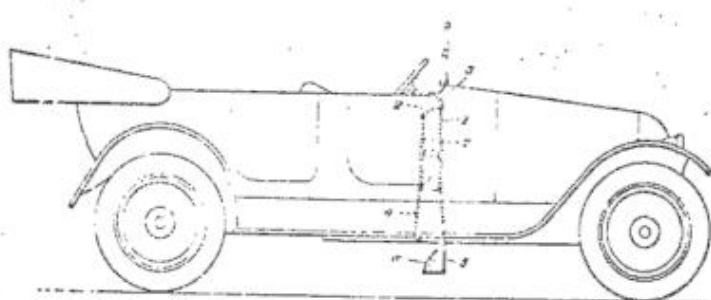
While the problem of providing simple and effective rear-viewing systems would seem anything but insurmountable at first glance, designers who have tried to do so have the problems of cost and car designs to reckon with. Fastbacks, for example, practically, shut out the whole world behind the car, and the huge fins of the 1950s were nightmares all their own.

The rear-visibility problem, being one of safety, drew the attention of the Department of Transportation. A few years ago, the DOT underwrote a study by the California firm of Dunlap and Associates. The Dunlap report on motor vehicles rear vision was completed in August 1969 and it told the government and the industry what everyone knew. But it did so in convincing language and with convincing evidence, including a survey of driver views on rear vision. Not surprisingly, a high percentage of those surveyed felt the system could stand some improvement.

Results of the Dunlap study called for an



## Early inventors saw a need for a better rear vision



**Automotive periscopes** are not a new idea! Shown here are patent drawings from early in the century. At top is an idea from 1919 for a "vehicle reflector." Filed by F. Schmid and F.E. Thomas, the idea was to pick up the image of traffic behind in a mirror under the car and reflect the image up to the dashboard. Another idea, as shown above, was to enclose the "automobile mirror system" in a tunnel in the roof of the car. Filed in 1926 by C.W. Paul, the drawing's plan view showed the rear opening running the entire width of the car. The deflector at the rear appears to be the first rear spoiler on an automobile—unintentional, of course!

over-the-roof system as the best for rear view. This, to many in the field, means the periscope.

The federal government has equipped a group of cars with improved mirrors, hoping to arrive at standards for increased "indirect vision." The ultimate goal of the project is a system that uses a single device to provide five-lane rear vision. It's still not known whether any system of mirrors, inside or outside, or in combination, will be able to meet this requirement and that is why new systems such as the periscope are being looked at and checked out by the manufacturers.

To provide a single display point within the automobile, either the periscope or some

other more sophisticated system will be needed. Television scanning and even fiber optics—bands of optic material that can bend light around corners—are not to be ruled out entirely, except that the costs of such systems would be prohibitive, and there's a limit to what the motorist can afford to get a "safe" car. The periscope may be the most cost-effective solution providing the greatest safety for the least dollars.

The automobile periscope has been a traditional area of tinkering for American inventors, with a file of patent art alone gathering dust a foot thick in patent offices. Some of the early attempts are curious tinkering with the basic problems of bending light.

A pair of inventors named Schmid and Thomas came up with one of the earliest attempts, a system of periscopes that gave a rear view from under the chassis (shown in the drawing, top left). That happened in 1919.

By 1923, a W.A. Doble devised a double periscope system, with one scope for the driver and one for the back-seat driver. C.W. Paul designed a periscope in 1926 that involved a tunnel running the length of the car just under the roofline (drawing at bottom, left).

The trouble with most of such attempts was that, while some looked good in theory, application involved a grappling with cumbersome boxes. The three-mirror approach of the time created a problem in the bending of light and ended with requirements for very awkward systems.

In 1960 Karl E. Smith began working on a panoramic three-mirror system and after three years of experimenting came up with a scope which he mounted onto the roof of a Chevrolet Corvette. It consisted of one mirror as wide as the car and mounted on the roof. This mirror projected an unobstructed view of the rear and sides and transmitted it via two mirrors to the driver's front line of sight.

The Dunlap report was high in praise of the Smith system.

There are about a dozen firms trying to get there first with the most flexible and adaptable periscope system. Among them is Para-Vue, a small company headquartered in Roseville, Mich.



Its periscope system operates with only two mirrors, a trick made possible by use of a see-through mirror. Previously three mirrors were required simply because a conventional two-mirror system left the driver with a useless, inverted image in front of him.

Para-Vue calls its system the Parascope and its claim for it a doubling of viewing arc over present mirror systems.

The Parascope has a 22-inch-wide mirror encased in a hermetically sealed covering that protrudes four inches above the roofline on the driver's side. The display mirror inside is located just above the front windshield header.

Para-Vue says its unit will be available through retail outlets it is starting to franchise around the country. The cost, which includes the installation, will be less than \$100, according to the company. In assembly-line mass production the Para-Vue unit would cost out at less than \$25, it is claimed.

And there are still some unanswered questions in the whole field of car-mounted periscopes. Para-Vue has the devices mounted on company-owned Camaros and has installed them on pace cars at two of Michigan's speedways.

The differential in vibrations between cars and from the outside mirror and the inside mirror can raise problems and even though hermetically sealed, such mirrors

might become encrusted with freezing rain just as any mirror will. For this reason, Donnelly Mirror Co. in Holland, Mich., has built an electrical defrosting system into its periscope.

Would the old adjustable interior window in tandem with a rear window defrosting system, despite its inherently narrow viewing arcs, be as acceptable the best of all possible systems? It may be.

Carmakers have greatly improved rear visibility in recent years. Greenhouses are bigger, there's more glass area and the wide C pillars have been narrowed to block as little of the traditional blind spot as possible, and rear-window defrosters are proliferating.

If Detroit can meet stringent indirect visibility standards for the late '70s with \$5 worth of mirrors they'll be home free. They'll beat the problems of cost, styling—even car washing—associated with periscopes. That's why they are researching advanced applications of conventional mirrors with top priority.

GM is rumored to have received favorable results with a two-mirror system for the left side of the car. One mirror is wider than the other to obtain a greater viewing angle.

If there's a more economical way to see as much behind without the problems and cost of a periscope, they'll find it. Otherwise it's . . . up periscope! ★★★



**Experimental Safety Vehicle (ESV)** from Fairchild prepared for the Department of Transportation includes a periscope installation that is aerodynamically integral with the roofline of the sedan.



**ESV from AMF** uses a periscopic rear-viewing system that protrudes several inches from the roof. Its height enables it to provide the driver with a better viewing angle for objects close behind the car.



Christmas gifts  
you can make  
(Starts on page 89)

## How to carve the mini jewelry

*(Continued from page 90)*

Cement worked best. Apply cement liberally to surfaces to be joined and clamp the piece overnight between two pieces of wood. Make certain the wood is separated from workpiece with wax paper because glue oozes out as clamp pressure is increased.

Next day, remove hardened excess glue using a sharp knife. The flat is now ready to saw to shape. After sawing, sand and

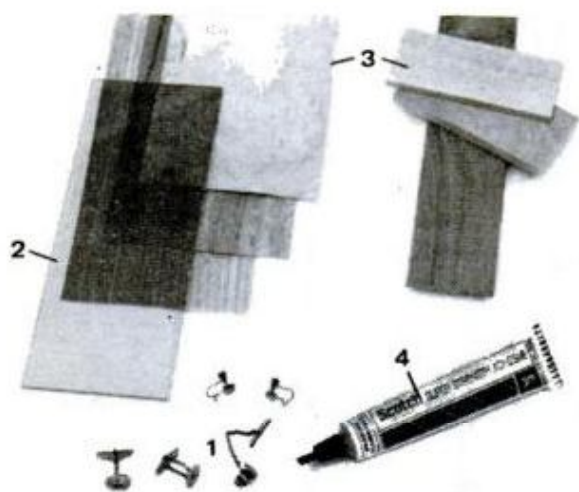
buff edges smooth. Drill the hole for the hanger if the carving is to be a necklace or simply glue the carving to the appropriate jewelry finding with Super Strength Adhesive. For a hand-rubbed look, we found that a clear plastic coating, the type which comes in an aerosol container, works best. Three light coats are better than one thick one. It is also best to spray flat pieces with them lying down rather than suspended—



**Basic tool used for carvings** is Dremel Moto-Tool which comes in 34-piece kit including wrench. Tungsten carbide bits are extras, but well worth the investment.



**Other tools which will speed work:** 1. variable-speed control; 2. drill-press accessory; 3. Moto-Shop jigsaw and 4. flexible shaft (used with jigsaw).

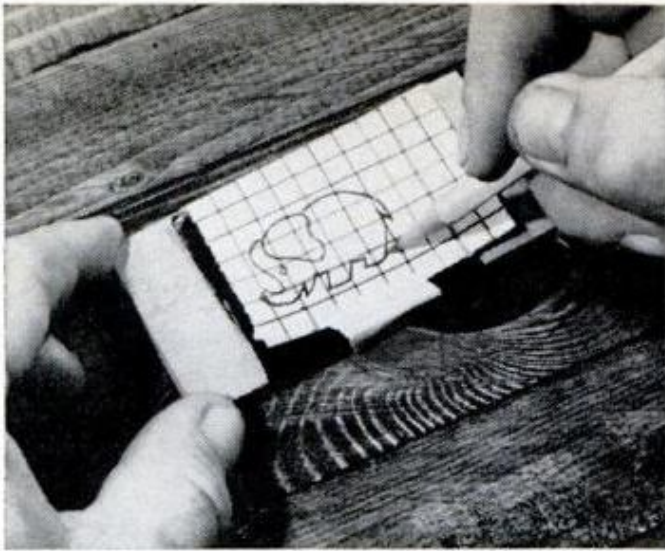


**Materials used:** 1. jewelry findings (cuff links, earrings, tie tack shown); 2. plexiglass; 3. veneers, solid wood and 4. glue to affix carvings to hardware. For sources of the materials, see page 160.

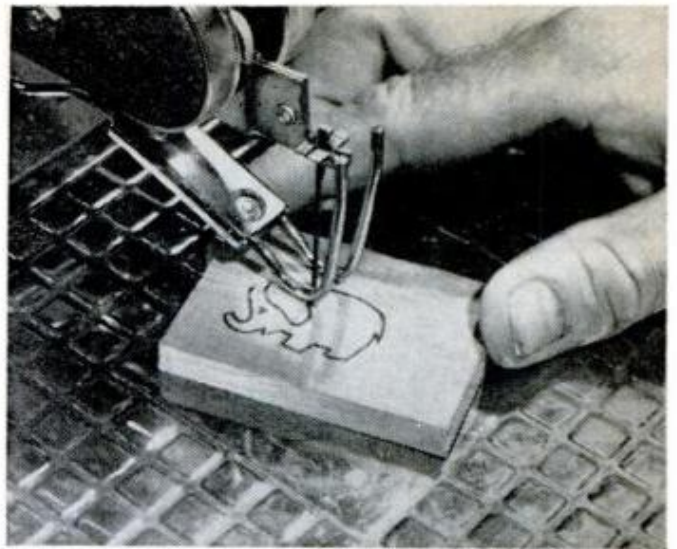


**Carvings shown above** are examples of plastic glued to plastic (top), wood to plastic and plastic glued over veneer. Daybond Thickened Cement (Rohm and Haas) works best for these applications.

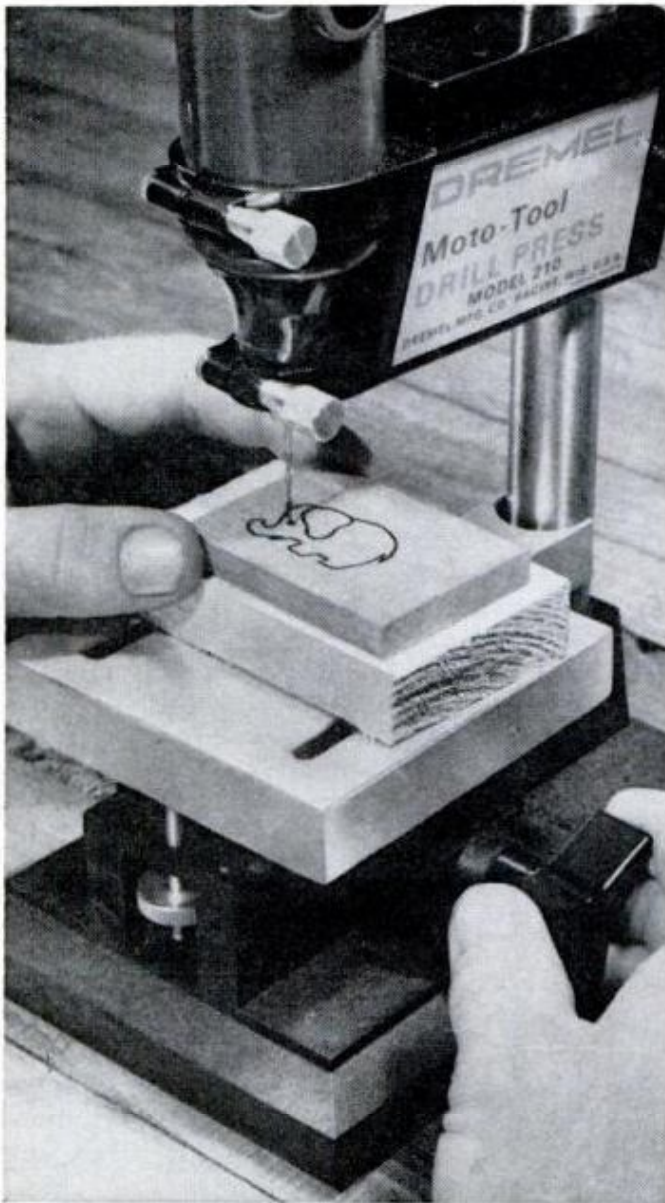




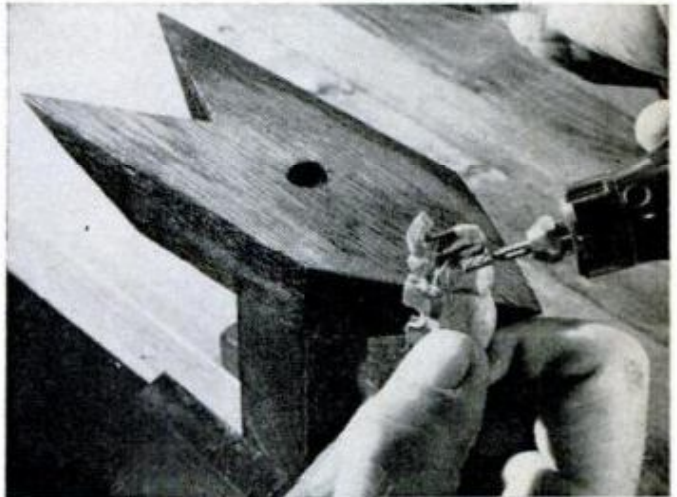
1. Design is transferred from grid paper to wood block using carbon paper beneath drawing. Tape carbon and drawing so they can't shift while you trace.



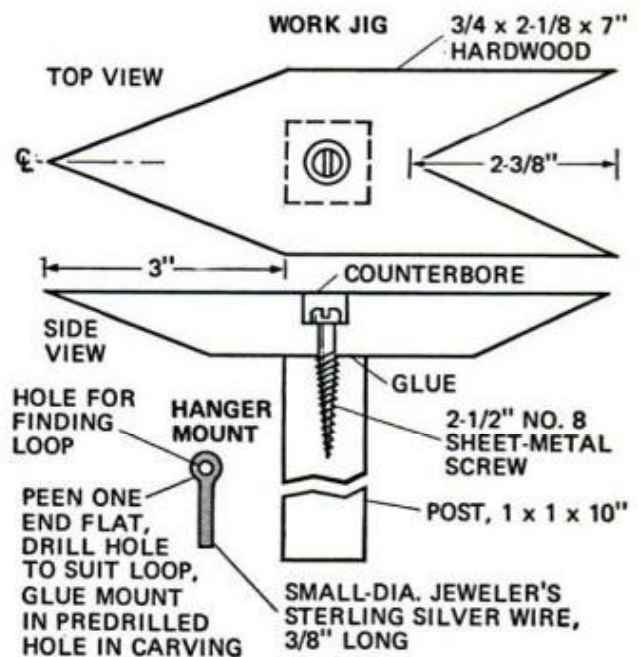
3. Figure is then cut out using the jigsaw. Stock used to create elephant shown is  $\frac{3}{16}$ -in.-thick cherry. Blade guard minimizes chatter and protects fingers.



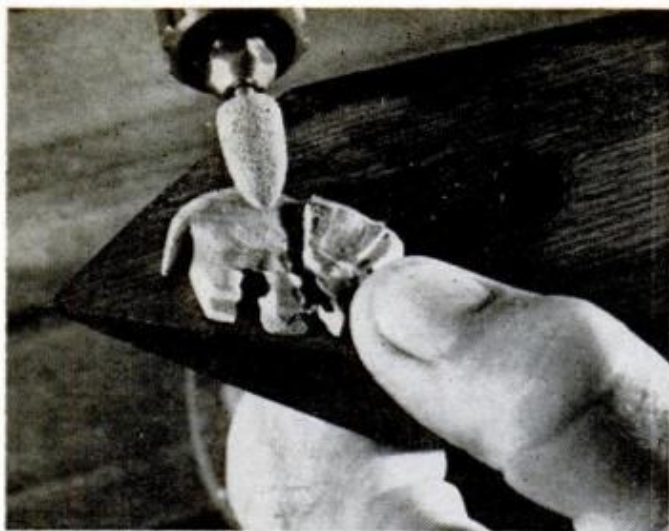
2. Carving tool is mounted in drill-press accessory and eyehole is drilled. Unlike large presses, this head remains stationary; worktable is raised to drill by turning knob to right of and below platform.



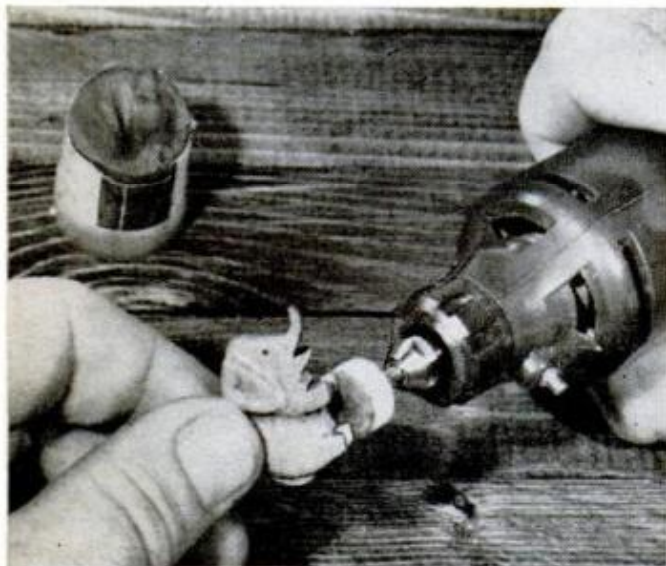
4. Carving starts with knurled cutter (No. 194 shown). Shop-built work jig facilitates maneuvering and handling small piece. Jig (below) is gripped in bench vise.







5. After rough shaping, carving is ground smooth with emery-point dressing wheel. Since tiny form is finger-held, carving with power calls for extra care.



6. To finish, carving is polished with buffing rouge and cloth pad chucked in tool. Pad is recharged by periodically dipping spinning pad in the rouge.



7. Finished gift from the workbench is ready to be wrapped and placed under tree. For looks, box can be lined with black velvet around tissue as shown.

## Manufacturers of Materials

**Tools:** Moto-Tool kit No. 281 (\$49.95), Moto Shop No. 571 (\$39.95), and accessories, Dremel Mfg. Co., Dept. PM, Box 518, Racine, Wis. 53401.

**Jewelry findings:** American Handicrafts Co., Dept. PM, 1011 Foch St., Fort Worth, Tex. 76107.

**Wood and veneers (by mail order):** Albert Constantine and Sons, 2050 Eastchester Rd., Bronx, N. Y. 10461. Also, Craftsman's Wood Service, 2727 South Mary St., Chicago, Ill. 60608.

**Plexiglas and Daybond Cement:** Rohm and Haas Co., Dept. PM, Philadelphia, Pa. 19105.

**Super Strength Adhesive:** Adhesives Div., 3M Center, St. Paul, Minn. 55101.

**Clear plastic coating:** No. 1301, Krylon Div. of Borden, 50 West Broad St., Columbus, Ohio 43216.

**Note:** All items listed above, except for woods and veneers, are available at hobby, hardware and department stores. If you have difficulty obtaining a product, to locate nearest source write direct to the manufacturer at address given above.

when the first side is dry, flop the piece and spray the second side.

*Carving in the round.* Though three-dimensional carving is slightly more difficult than flat carving, it is also more satisfying. For these carvings, use thicker stock— $\frac{5}{16}$  to  $\frac{3}{8}$  in. Steps for carving in the round are shown in the photos. After cutting out the shape, use the powered carver and various cutters to begin rough shaping to give the piece form in the third dimension. Although cutter No. 194 is not included in the kit, we found it best for this stage of carving.

Keep in mind that the Moto-Tool's cutter rotates at 30,000 rpm. And since the carving is small, thus fingertip held, care should be taken to keep fingers clear of the cutter's path. Never start a cut from the end and work toward the middle; always start a cut in a "meat" portion of the wood and progress shaping toward an end. If you start a cut at the end grain, the tool may jump in the opposite direction. Also, don't try to cut away too much wood in one pass. A series of light passes is easier to control and permits more graceful shaping.

With the piece roughed out, start smoothing using a grinder such as No. 992 or 997. For this step, using the variable-speed control, adjust the tool speed to lower rpm. High rpm will leave burn marks on wood and plexiglass. To sand hard-to-get-at spots, trim an emery board to a point. When satisfied with smoothness, spray the piece with a clear plastic coating. When completely dry, polish the piece with the buffing wheel and polishing rouge as shown in Step 6. ★★★



Christmas gifts  
you can make

# Initial bookends

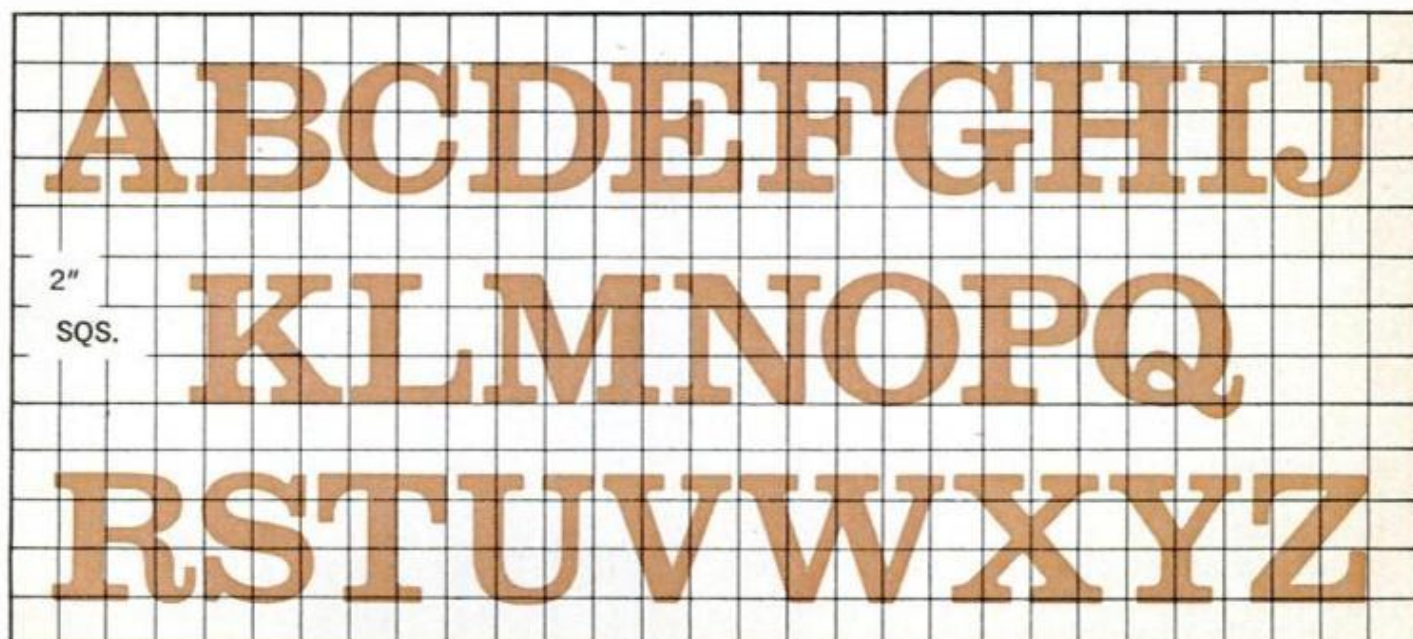
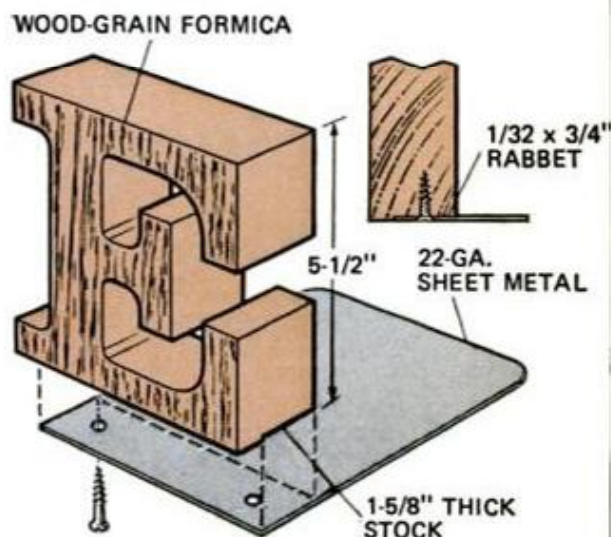
by U. R. Ittman

Here's a gift that is as personal as it can be—bookends of a friend's first and last initials. Letters C, O, U, J and V must be altered a bit to provide flat bottoms for attaching sheet-metal bases. The project provides a good way to use up scrap wood and pieces of plastic laminate.

Formica's English Oak was used on the face of the letters shown and the rest was painted (see cover). Cement the laminate to the wood and tape a paper pattern of the initial (enlarged from the drawing below) to the laminate before bandsawing. ★★★



**Sanding** the bandsawed edges of the letters goes a lot faster with a band sander, of course, but it can be done by hand with the sandpaper wrapped around a dowel and narrow wood block.





## Christmas gifts you can make



### King-size book rack

This handsome book rack is made from a sheet of  $\frac{1}{8}$ -in. black plastic measuring 14 x 18 in. When cut out and the edges polished, four 90° bends complete it.

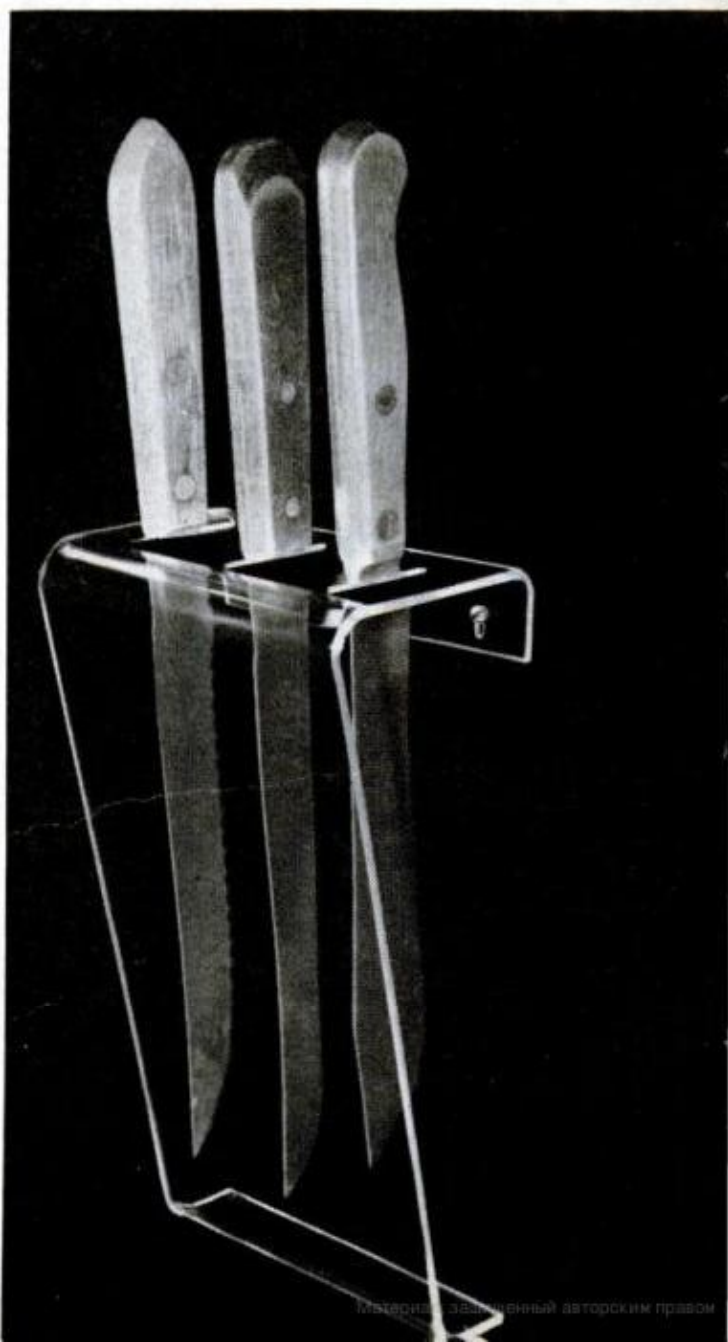
## One-piece plastic beauties

by Michael Shook

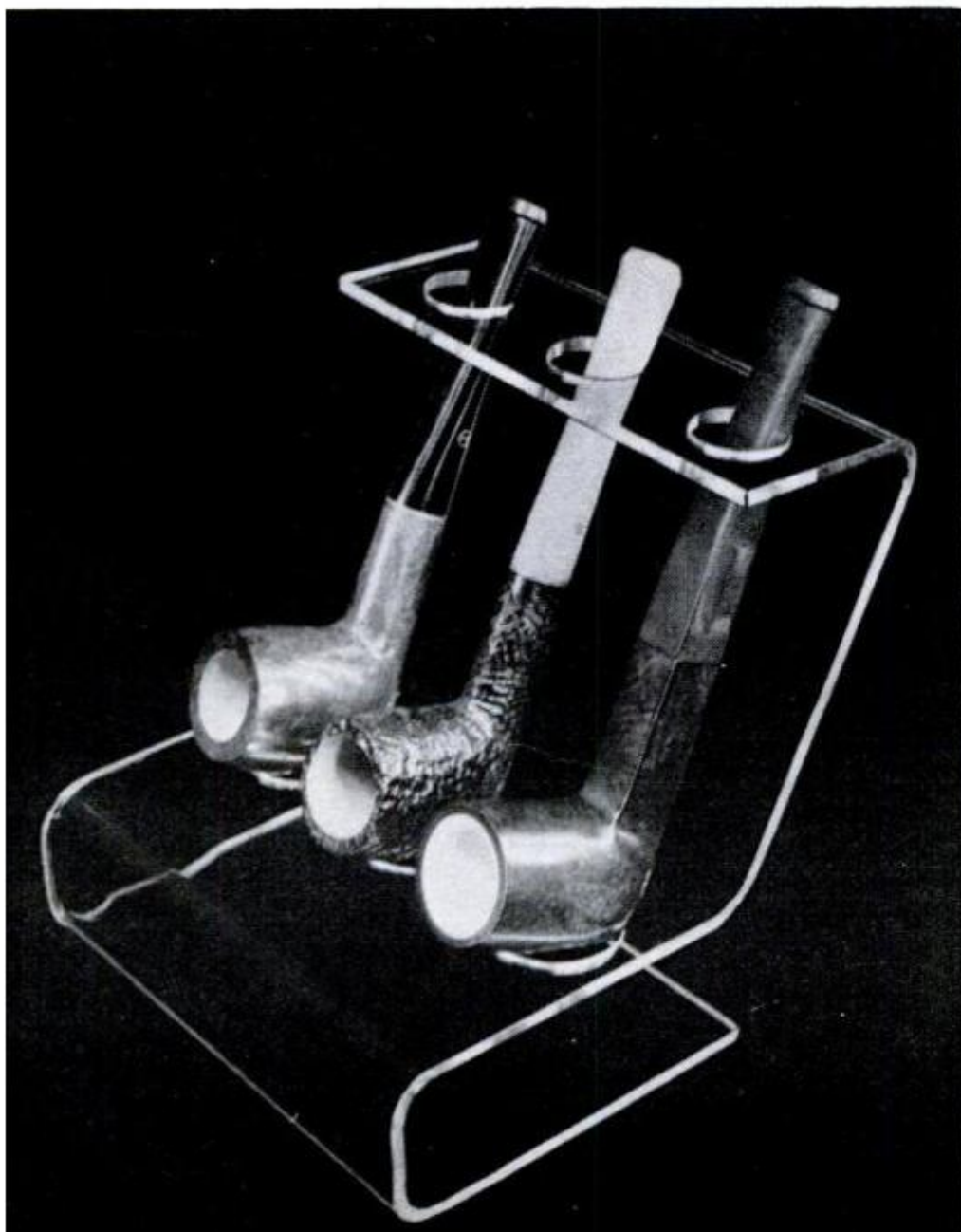
Any time you can make a project from a single piece of wood, the simpler it is. That holds true with sheet plastic when messy cements are not required. One advantage of rigid acrylic plastic like plexiglass over wood is that it can be bent like butter merely by heating it. Consequently, corners and joints are integral and exceptionally strong.

There are any number of handsome and useful glasslike projects you can make from a single piece of translucent, opaque or transparent plastic as you can see from the five examples shown here. Aside from needing a saw or pointed tool to cut the material and a drill to drill it, bending is most easily done with a strip heater. This can be a homemade affair as shown on page 165 which makes use of a heating-tape element sold at most stores that sell sheet plastic.

Normally, the protective paper covering







### Magazine rack

Shaped like a huge "W," this modern, roomy magazine holder (left, above) lets you see each periodical at a glance.

### Letter/stamp holder

Serving to hold both letters and a roll of stamps, this simple-to-make gift (right, above) makes an unusual desk accessory.

### Knife rack

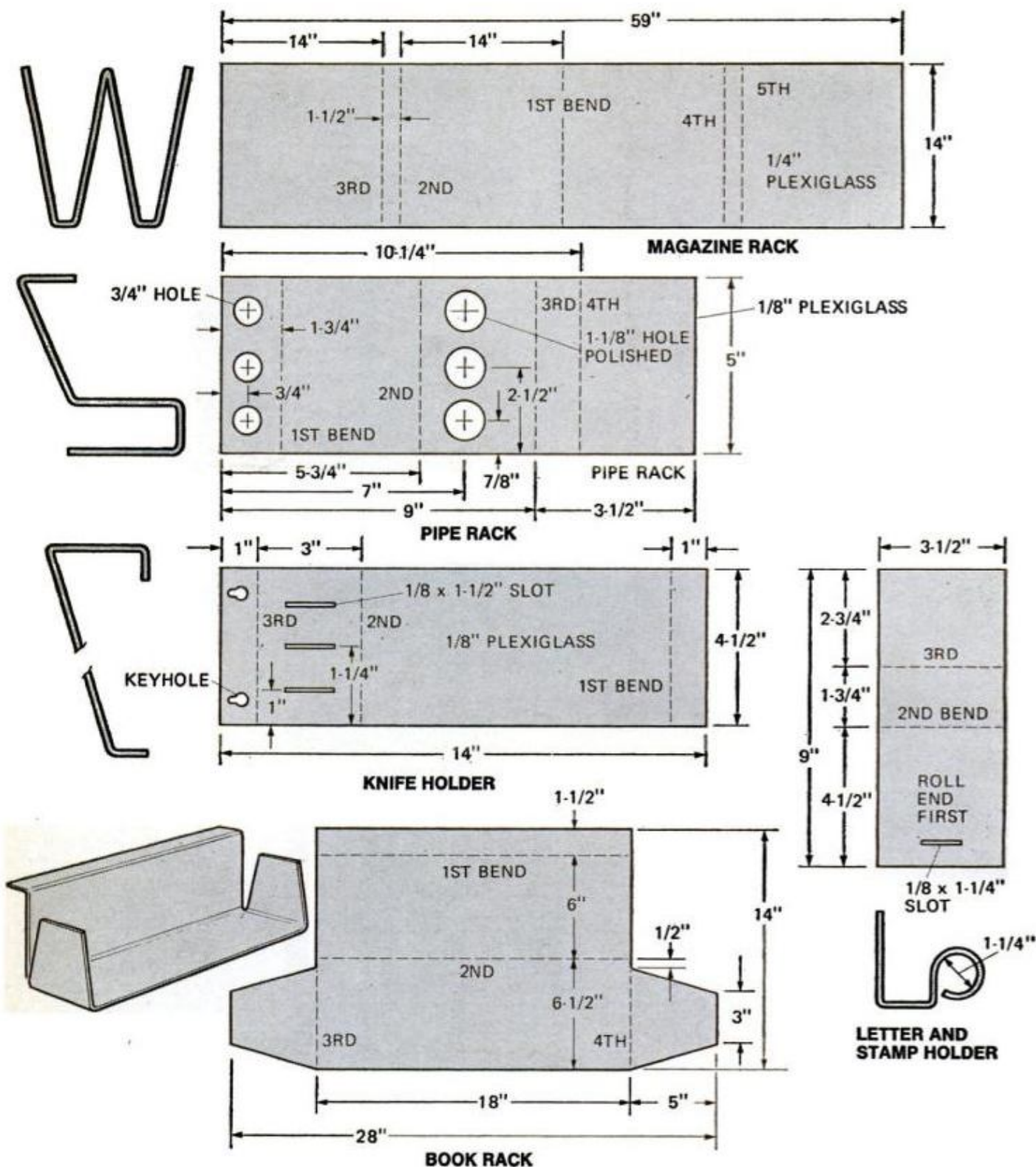
Looking like glass, this three-knife holder (far left) is formed from  $\frac{1}{8}$ -in. clear plastic and hangs on wall by two keyhole slots.

### Pipe holder

A relief from the common wood pipe rack, this beauty (left) holds three pipes, with their bowls cradled in polished holes.



## Bends and holes required for five projects



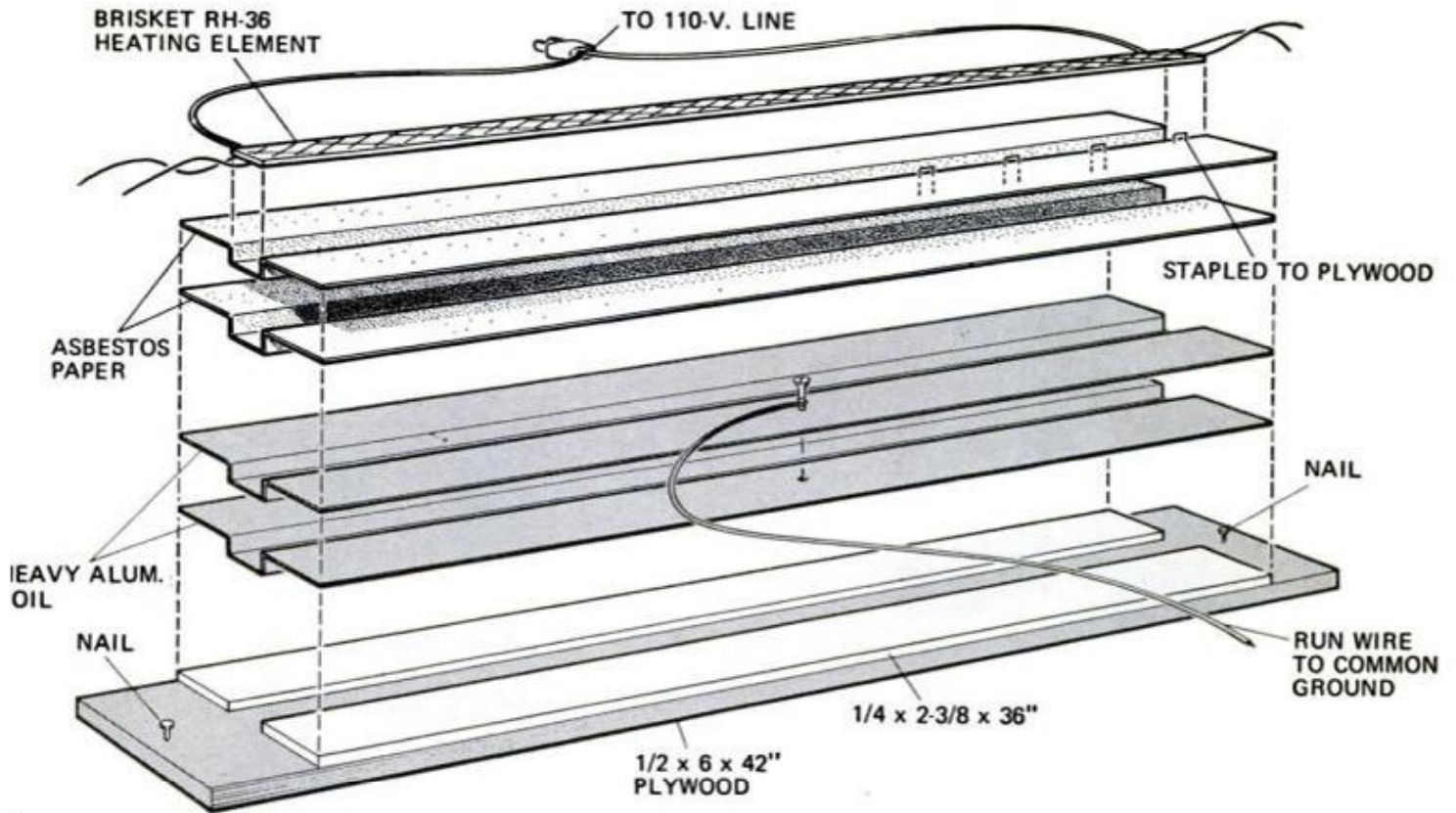
on plastic is left intact while you're working it, but when you're ready to bend it, the paper must be peeled off. A grease pencil is used to mark the line of bend.

To use the heater, plug it in about 15 minutes to get the tape hot (about 290° F.) Place the plastic across the heater so the line of bend is over the tape and leave it for another 15 minutes or until the plastic has

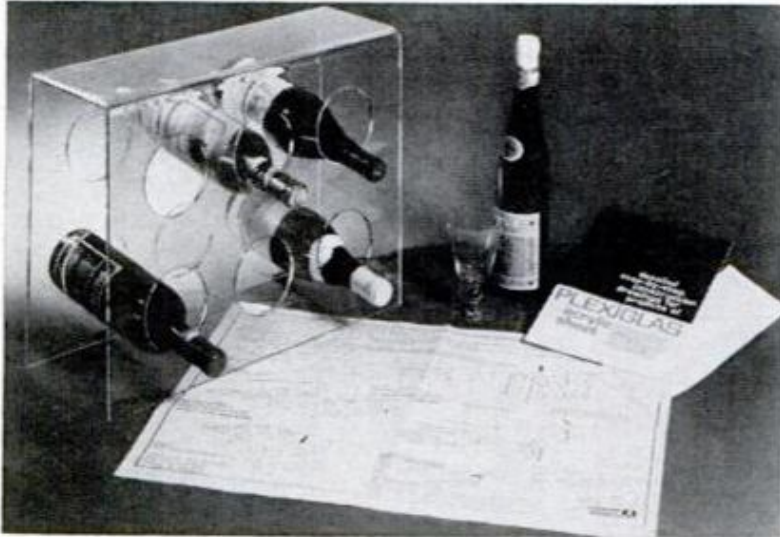
softened sufficiently. Now gently bend it along the pencil line while the sheet is still on the heater to the angle of bend you want. Then lift it off to cool. Since the bend has a tendency to spring back slightly upon cooling, make the bend a bit greater than you want and continue to hold it until the softened plastic cools and hardens. It will harden in a minute or two.



## Details for making strip heater



## Plans available for additional projects



How-to plans for this handsome one-piece wine rack, plus some 20 others such as coffee tables, tic-tac-toe game and lamp are now available to PM readers from Plexiglas dealers or by mail from Rohm and Haas Co., Box 9730, Philadelphia, Pa. 19140. Measuring 17 x 22½ in., each plan provides step-by-step instructions and sells for 50 cents. Readers also can get from dealers for 25 cents a colorful 16-page booklet, *Do It Yourself With Acrylic Sheet*, with photos of 40 project ideas, fabrication information and lists of project plans available.



Christmas gifts  
you can make

# Animal pull toys



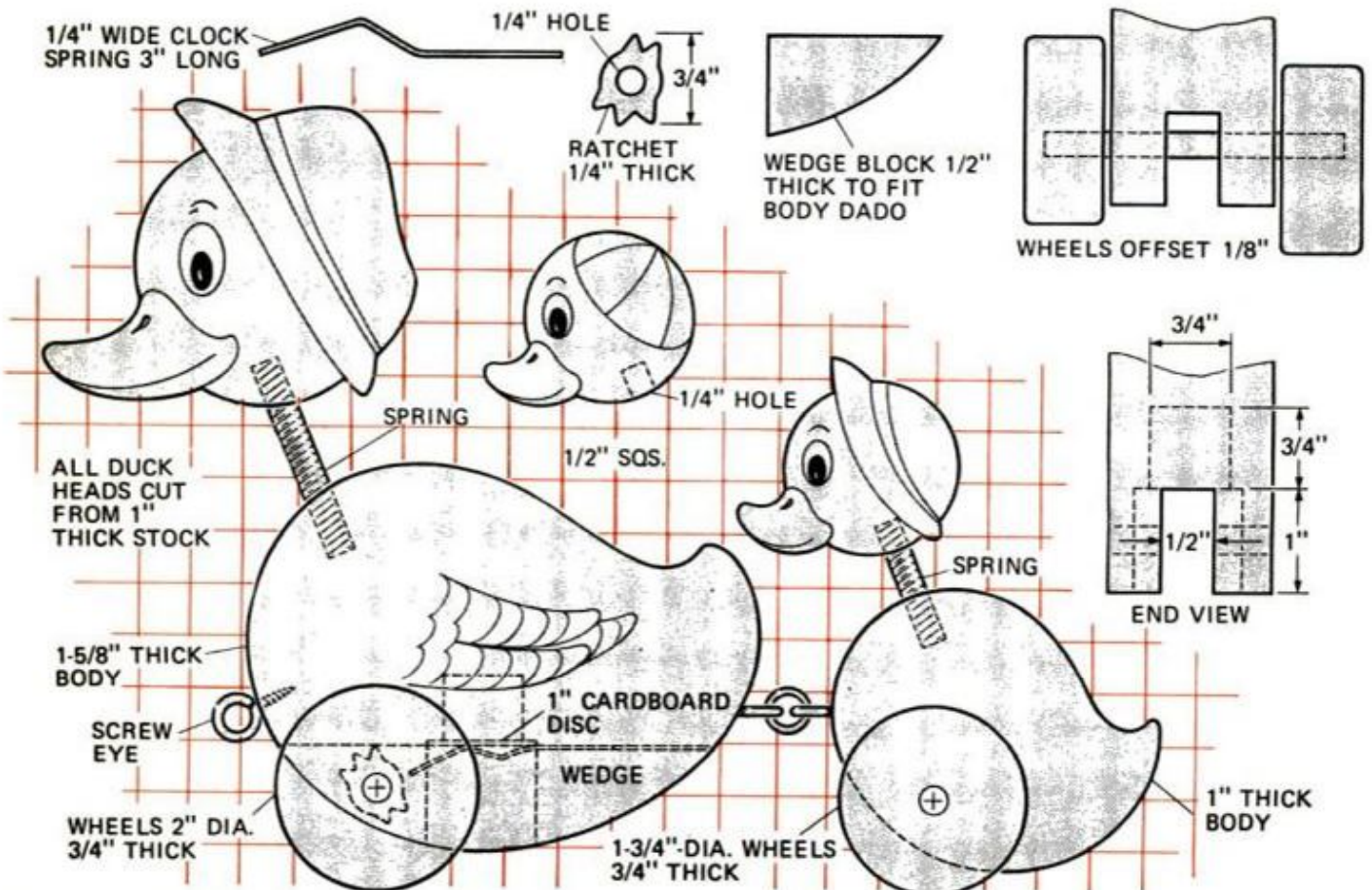
Mom Duck and kids

by Elma Waltner

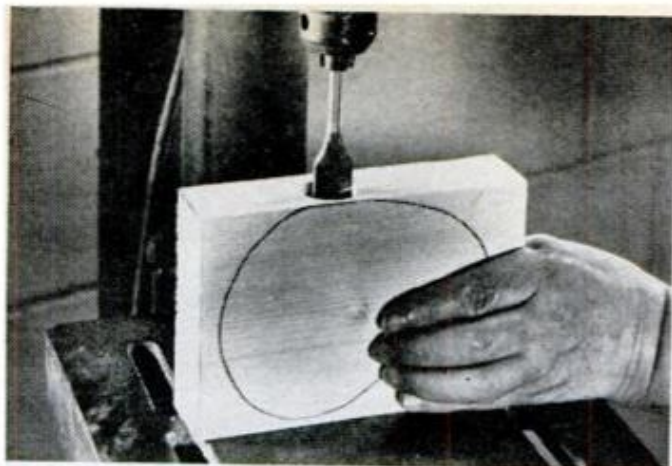
Toddlers like toys they can pull, and if they are noisy, so much the better. Mom Duck and her kids waddle along quacking merrily, and Danny Dachshund makes himself heard as he is pulled. Off-center wheels provide the waddle, and compression-spring necks make the heads bob.

Both ducks and dog have the same voices, produced by pieces of clock spring being snapped against sounding boxes by hardwood ratchets.

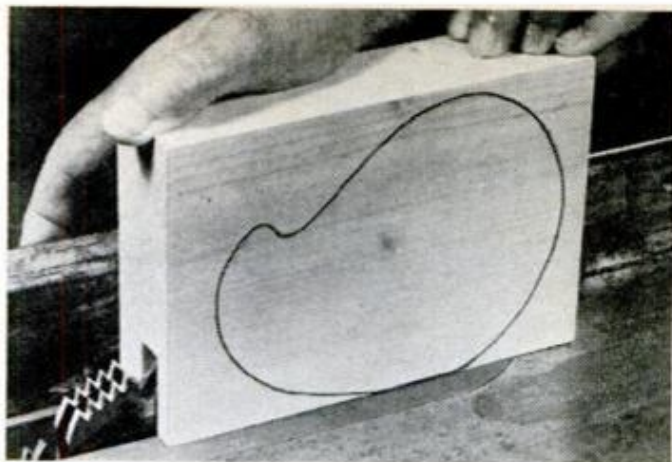
The series of photos on the opposite page shows how the ducks are made. In each case, the voice-box holes are bored before



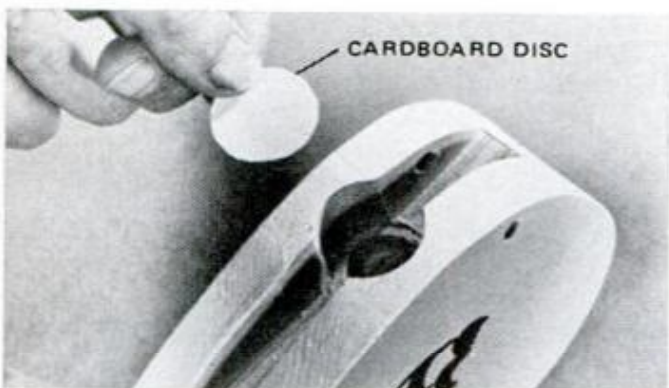




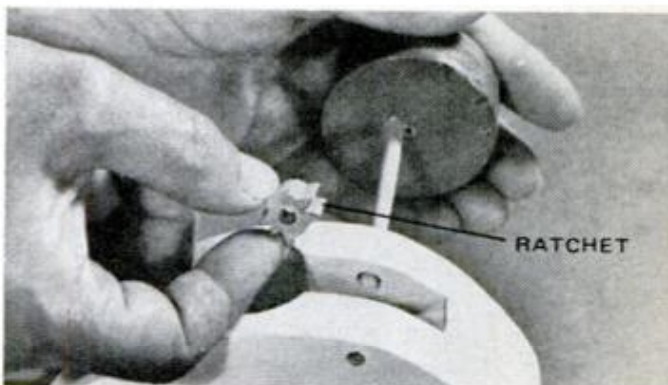
Sounding-box holes are bored in block before body is cut out. Drill 1-in. hole first, then  $\frac{3}{4}$  in.



Block is passed over dado saw to form  $\frac{1}{2}$ -inch.-wide slot in bottom edge, drilled for axles, then sawed.

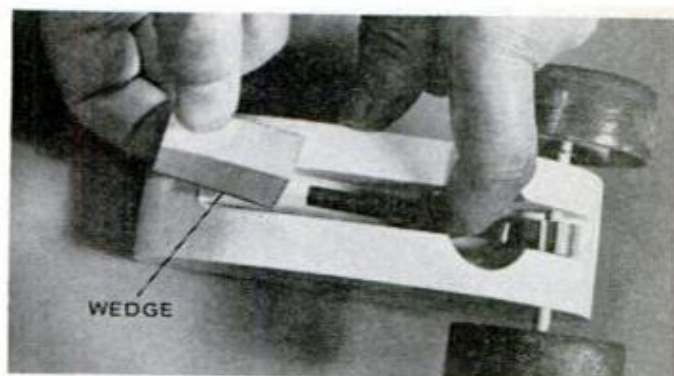
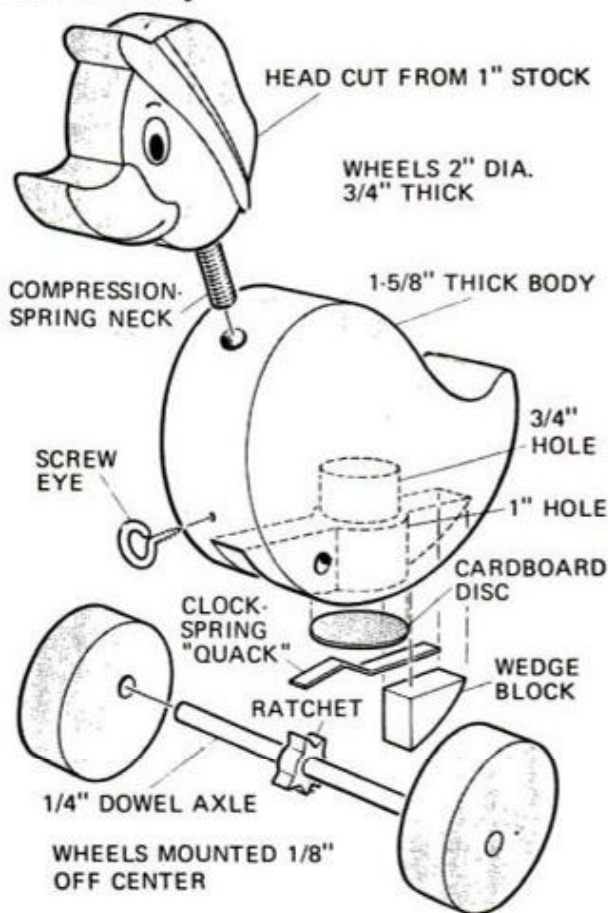


Thin cardboard disc is glued to ledge formed by large hole to cover the  $\frac{3}{4}$ -in. sounding-box hole.

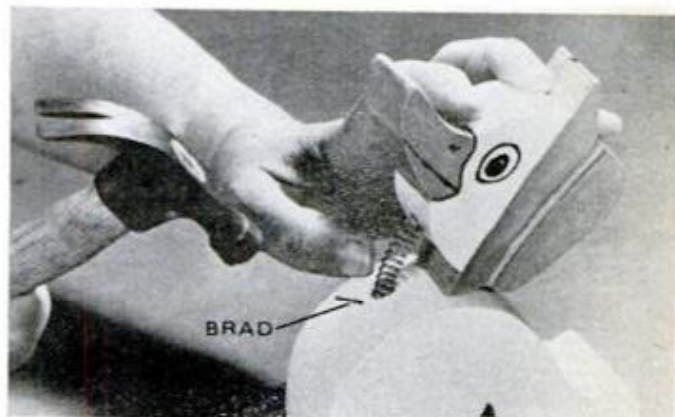


Ratchet is slipped over axle as it's passed through slot. Glue on each side holds ratchet on axle.

## Duck assembly



Apply glue to wedge block, then insert block in slot to hold spring against cardboard and ratchet.



Small finishing nails, plus glue, are used to anchor neck springs in holes. Nails are driven crosswise.





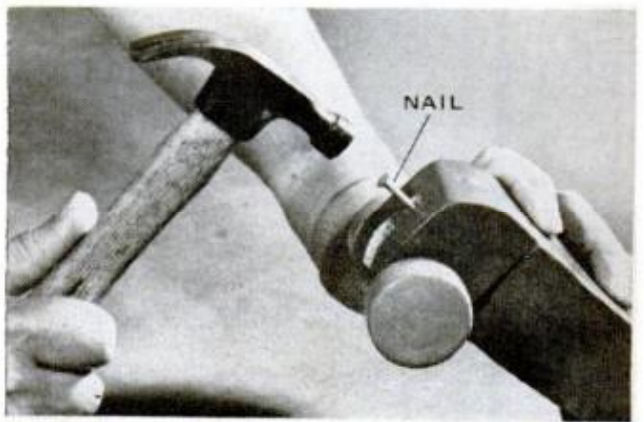
Danny Dachshund

the blocks are slotted and sawed out. Postcard stock is just right for the cardboard sounding-box discs; a dab of glue holds the ratchet (clacker) on the axle and in center of the slot.

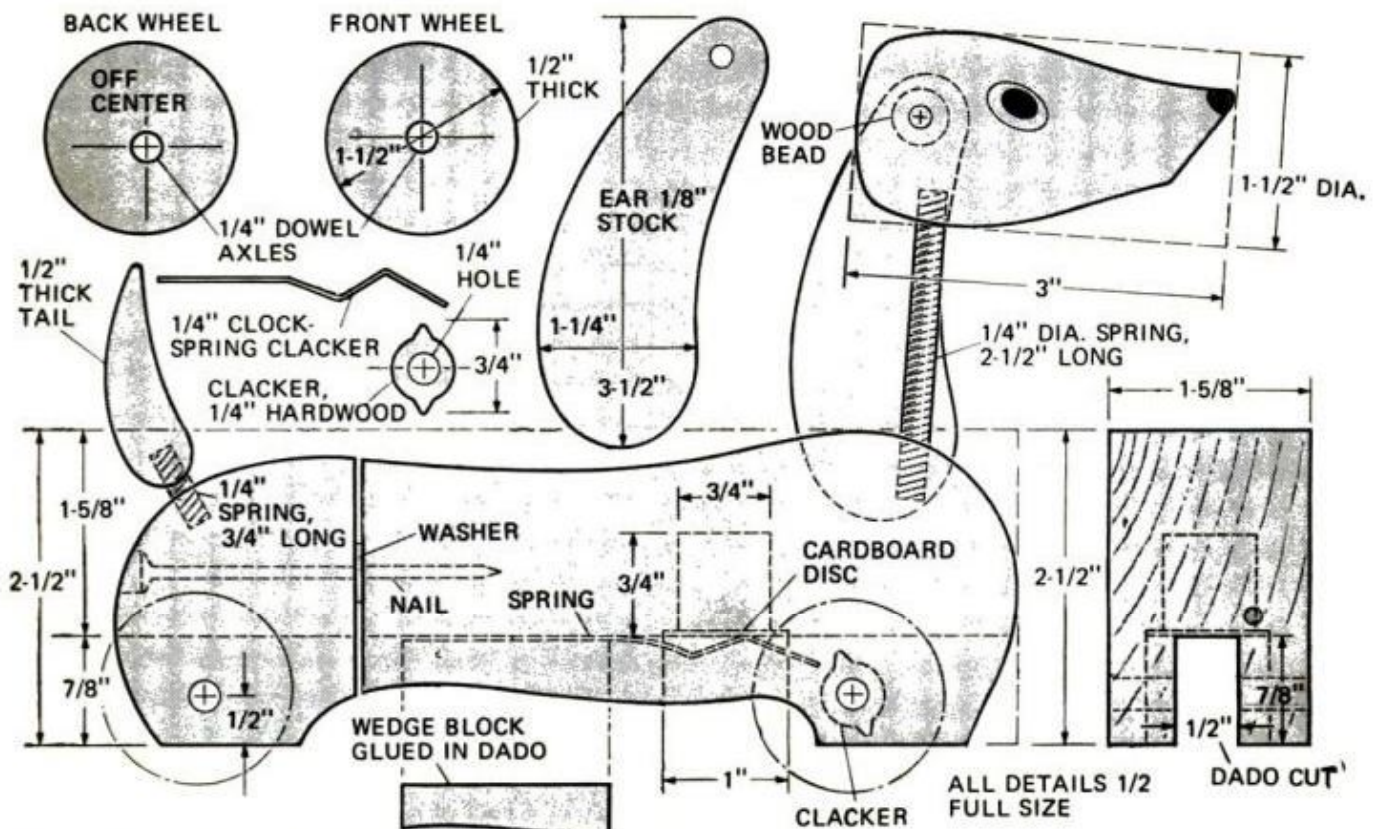
Basically, Danny is made the same way, the exception being that only his rear wheels are placed off center. Waddle is produced by attaching his hind quarters with a nail in an oversize hole. His head is lathe-turned and then cut off at an angle to form nose and mouth. Wheels can be cut quickly with a hole cutter. Sand all parts smooth and paint with a nontoxic enamel. ★★★



Attach ears to head by driving nails through oversize holes in ears, then through wooden beads.



Attach hind quarters to front section with washer between by driving nail through loose-fitting hole.





# Blockmobiles

Christmas gifts  
you can make

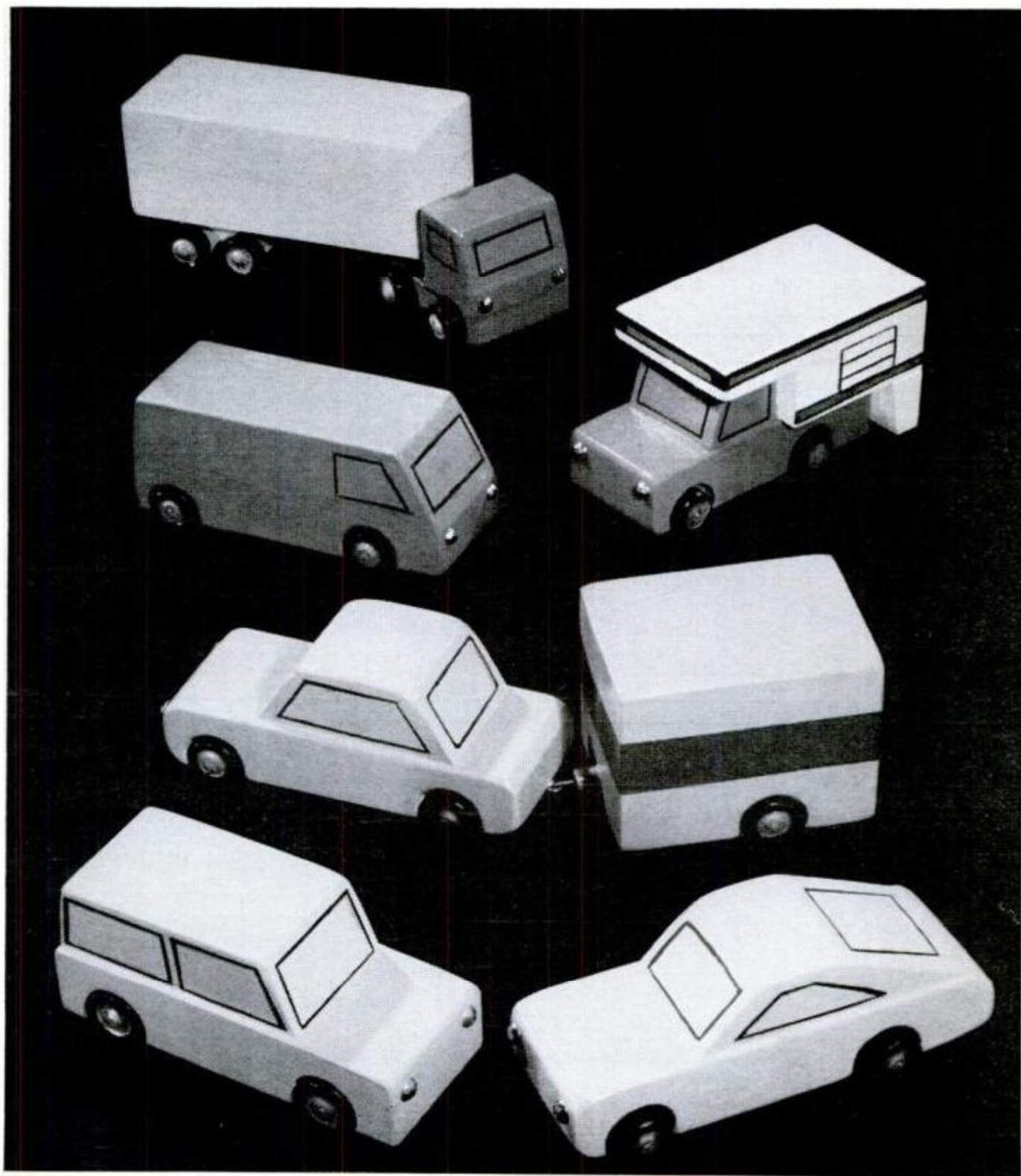
by Willard Waltner

A fleet of these classy blockmobiles will provide hours of fun for a 4-year-old, and they can be made for practically nothing from scraps of  $\frac{3}{4}$  and  $1\frac{1}{2}$ -in. pine found in your woodbox. They are also practically unbreakable.

All are made by first gluing up blocks of

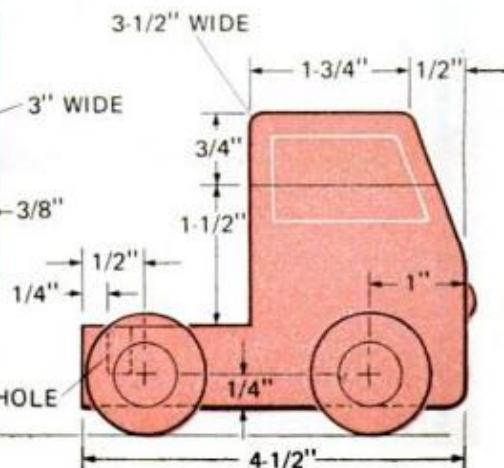
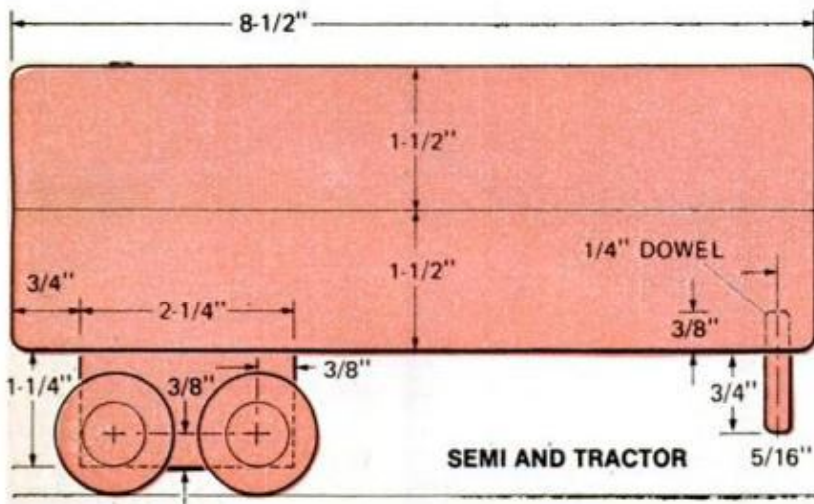
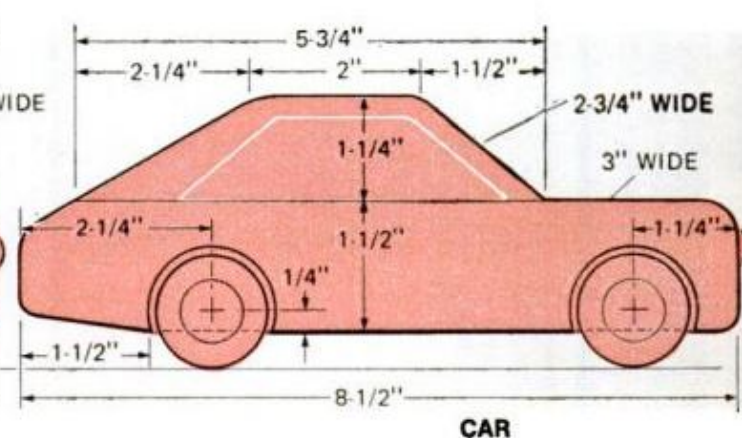
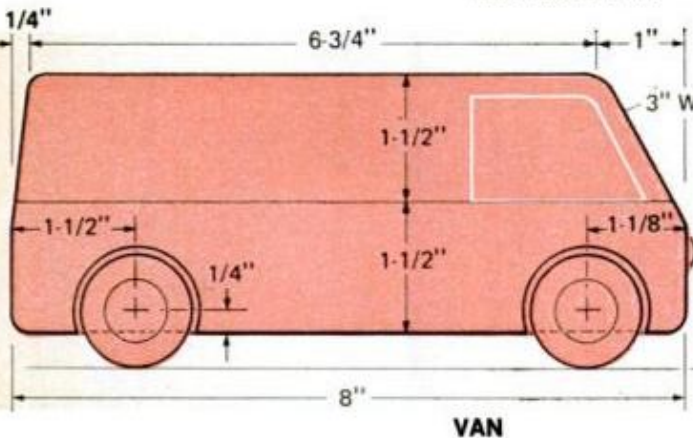
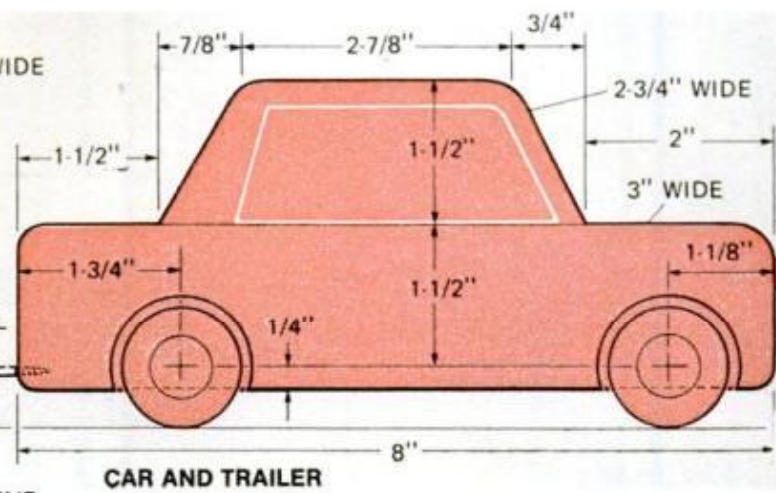
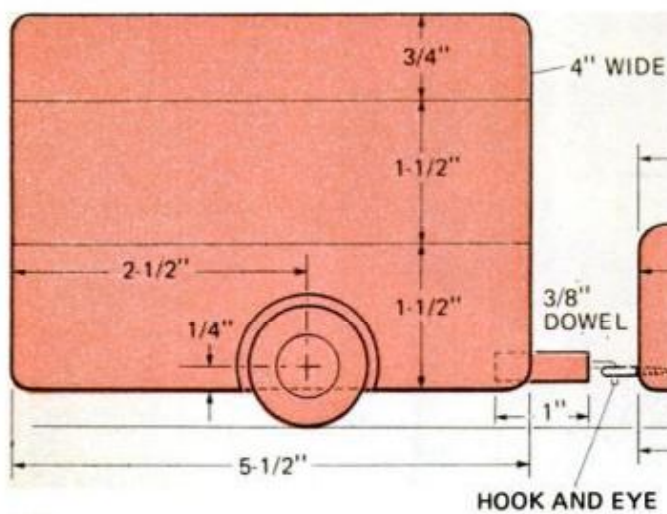
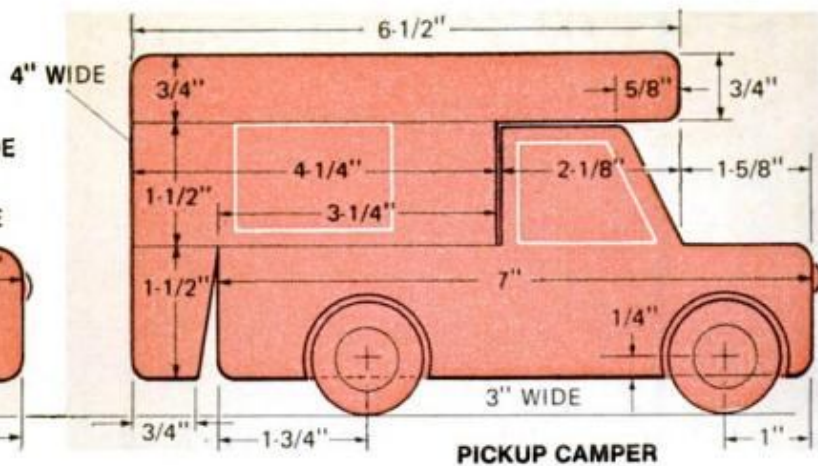
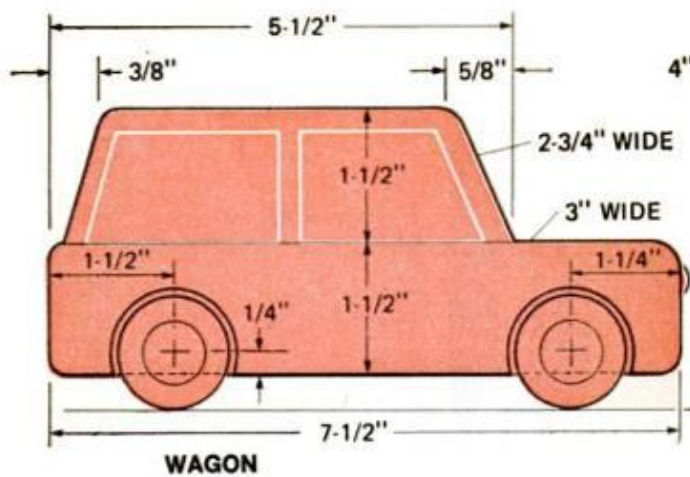
varying thicknesses after precutting them to shape. All fender "wells" are bored  $\frac{1}{2}$  in. deep with a  $1\frac{3}{8}$ -in. spade power bit. Then  $\frac{5}{16}$ -in. holes are drilled from each side for free-turning axles of  $\frac{1}{4}$ -in. dowel rod.

The wheels are easy to make if you own

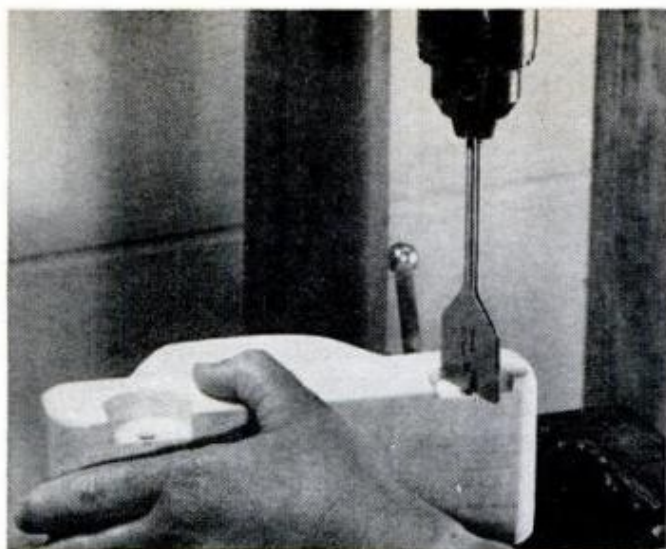




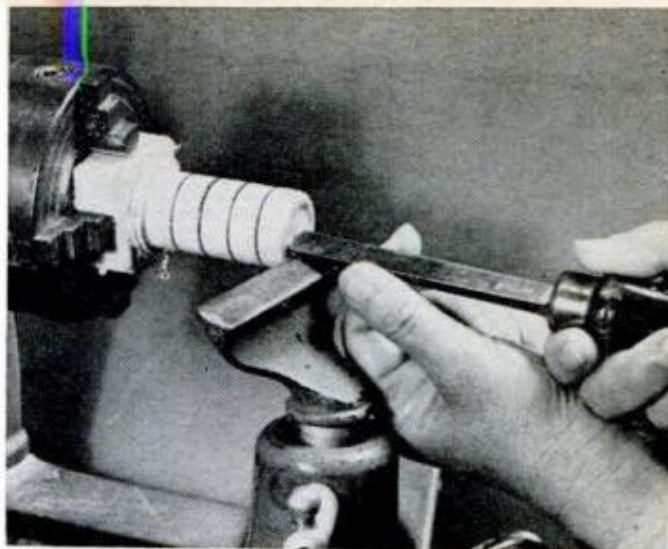
# Fun fleet for toddlers



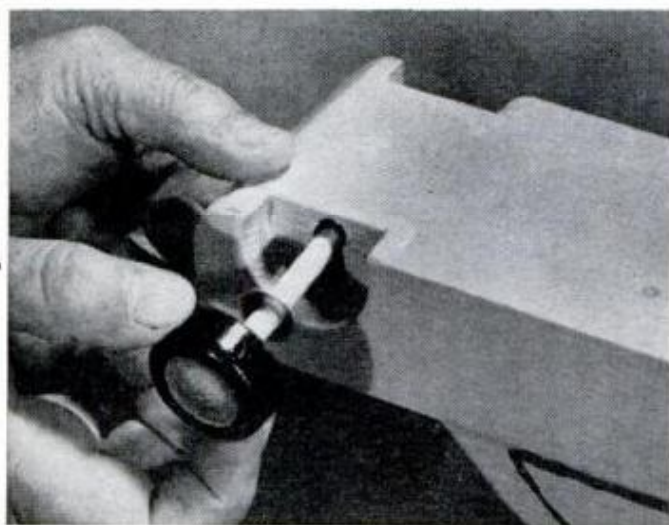




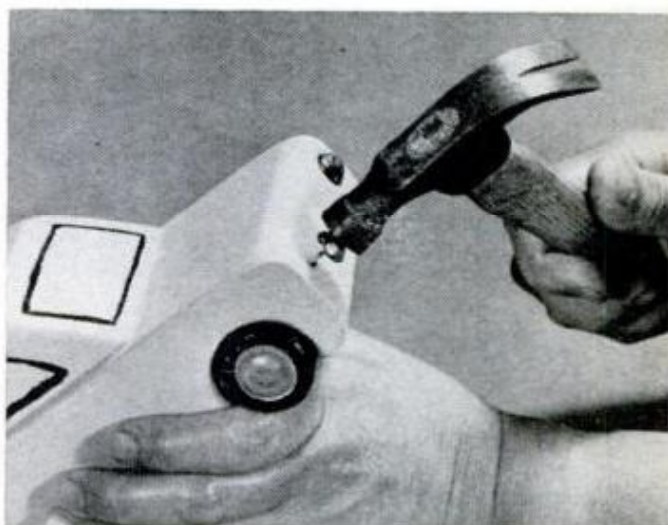
Fender wells for wheels are made  $\frac{1}{2}$  in. deep with  $1\frac{3}{8}$ -in. spade-type bit chucked in drill press.



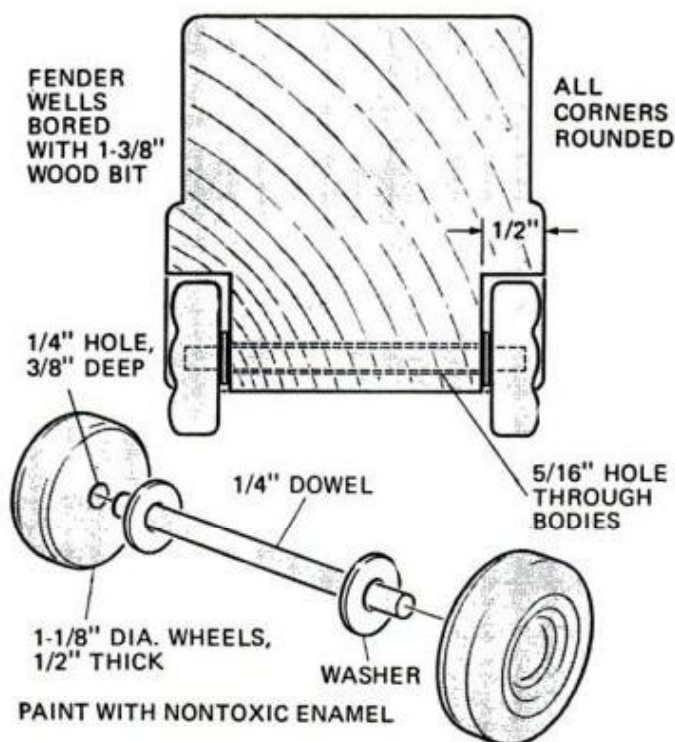
Wheels are turned one at a time from chucked turning. Shape hub and tire first, then cut off.



Glue wheels to dowel axles after inserting axles in their holes and slipping washers over the ends.



Fancy-head upholstery nails make perfect headlights. Wooden screw-hole buttons, painted, can also be used.



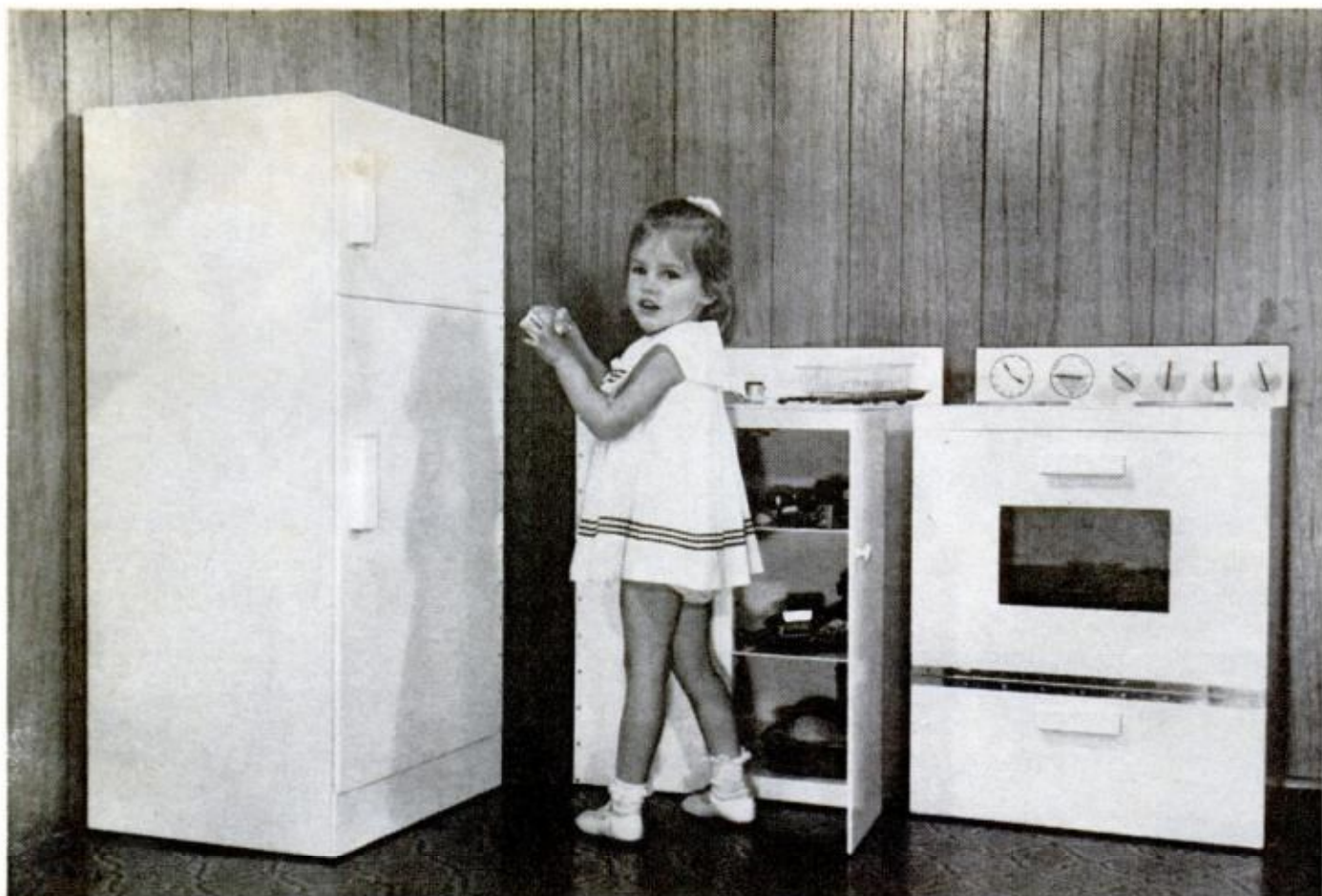
a lathe, but there are other ways to make them. One way is with a hole cutter in a drill press; another is with a pivot jig clamped to the table of a disc sander. In a pinch, checkers could be used for wheels.

The best way to turn the wheels is to gang-turn them from a single turning as shown in the photo above. Here the wheels are cut off one by one after you form a hub on the face of the wheels and round the edges to form a tire. The wheels are glued onto the ends of the dowel axles after being drilled  $\frac{3}{8}$  in. deep from the inside. Washers keep the wheels from rubbing and sticking. It's best to paint the wheels beforehand.

It's important, of course, to round all sharp edges, sand the wood smooth and paint the vehicles with a nontoxic paint.

Upholstery tacks are used for headlights, and a small L-hook and screw eye are used as a hitch for the car and trailer. ★★★





Christmas gifts  
you can make

## Kitchen play appliances

by Terence E. Hogan



**Miniature kitchen furniture** consists of two-door refrigerator, sink with faucet, and stove with play dials and oven. All are constructed alike— $\frac{1}{4}$ -in. chipboard over  $\frac{3}{4}$  x  $1\frac{1}{4}$ -in. framework. Appliances can be painted to match Mommy's; paint should be lead-free.

**S**turdy, realistic-looking and sure to please your little "doll" is this set of pint-sized kitchen appliances you can build in a weekend or two. Unlike the flimsy metal or corrugated cardboard counterparts available commercially, these scaled-down versions of Mommy's appliances have enough movable parts to keep the youngest lady of the house occupied for months.

Because the units are constructed of pine stock and skinned with just  $\frac{1}{4}$ -in. chip and hardboard, they are light enough to be easily moved, yet rugged enough to take the punishment small fry can dish out. All units were assembled using glue as well as nails. To fasten the outer covering, also use white glue and  $\frac{3}{4}$ -in. finishing nails.

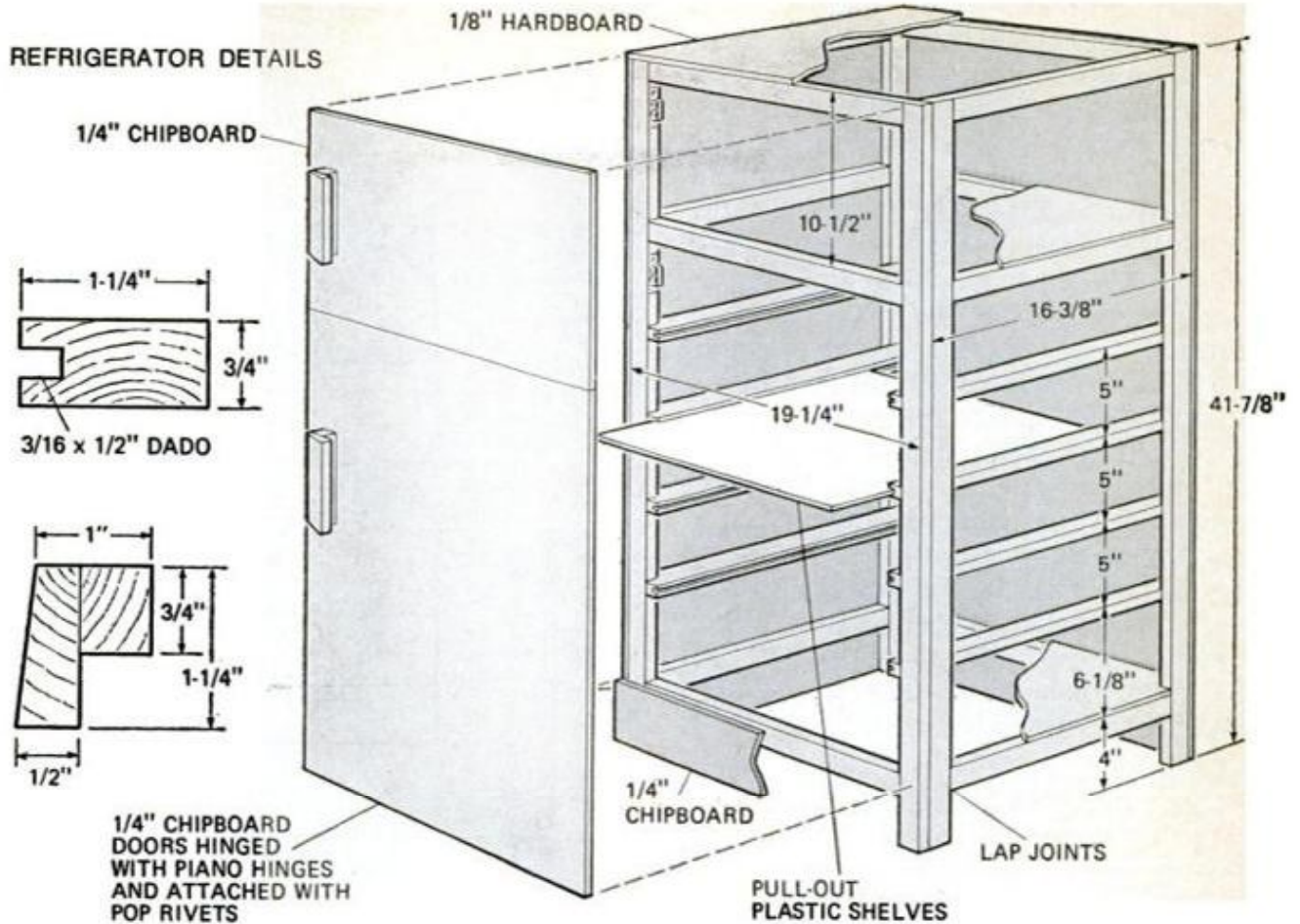
Since the three units are basically alike, you can save time by using jigs, gang-cutting and other production-like methods wherever possible. For example, after roughing out the hardboard and chipboard, all frame pieces of a given dimension can be clamped together and cut simultaneously on the table saw. To avoid confusion, mark all pieces as they are cut. With all pieces of the frames cut, these parts can be sanded and prime painted prior to assembly. But make certain you do not prime those areas that will be glue-joined.

**Range.** To mark the range for the clocks

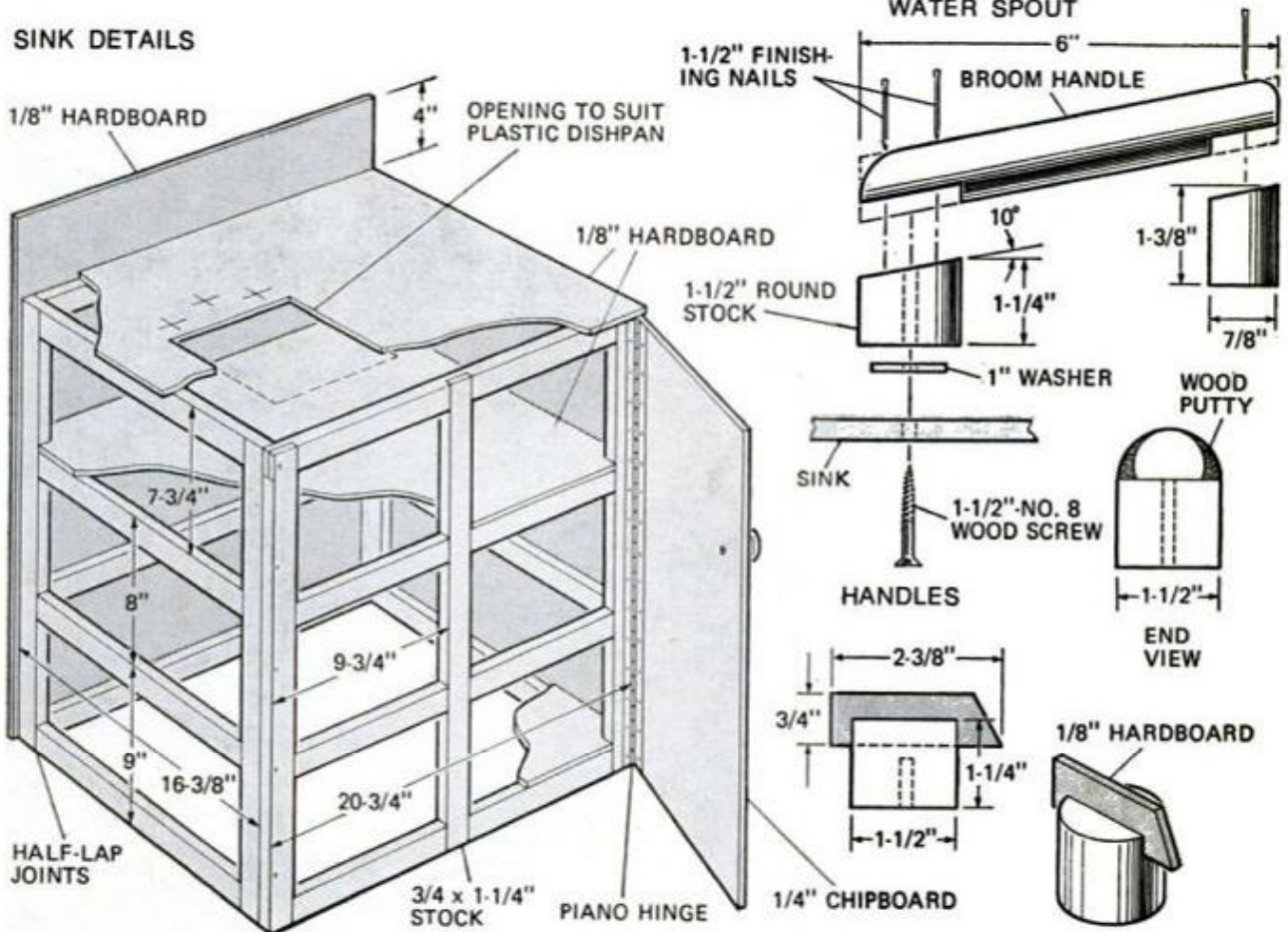


# Mini appliances you can't buy

## REFRIGERATOR DETAILS



## SINK DETAILS



## FAUCET DETAILS

### WATER SPOUT

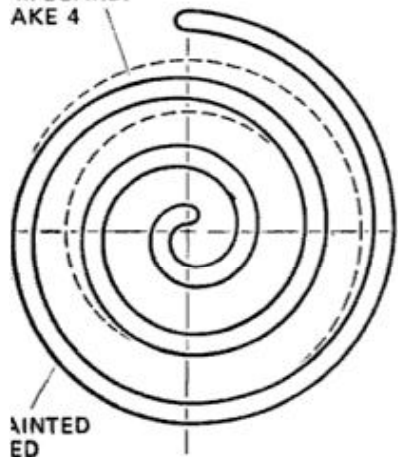
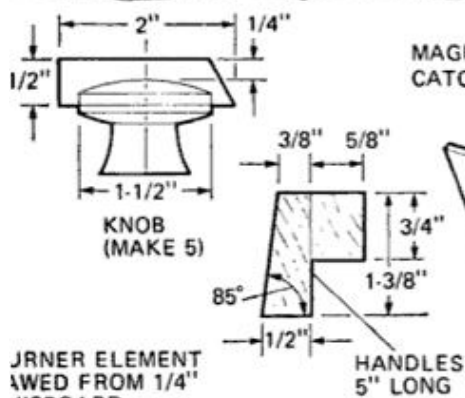
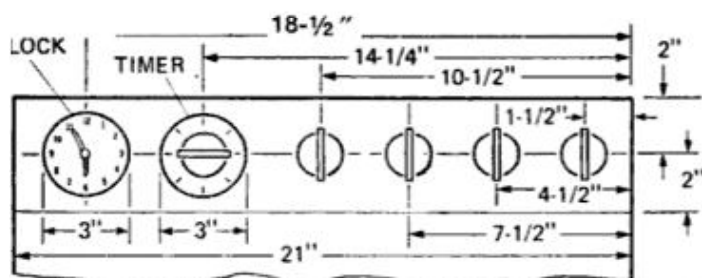
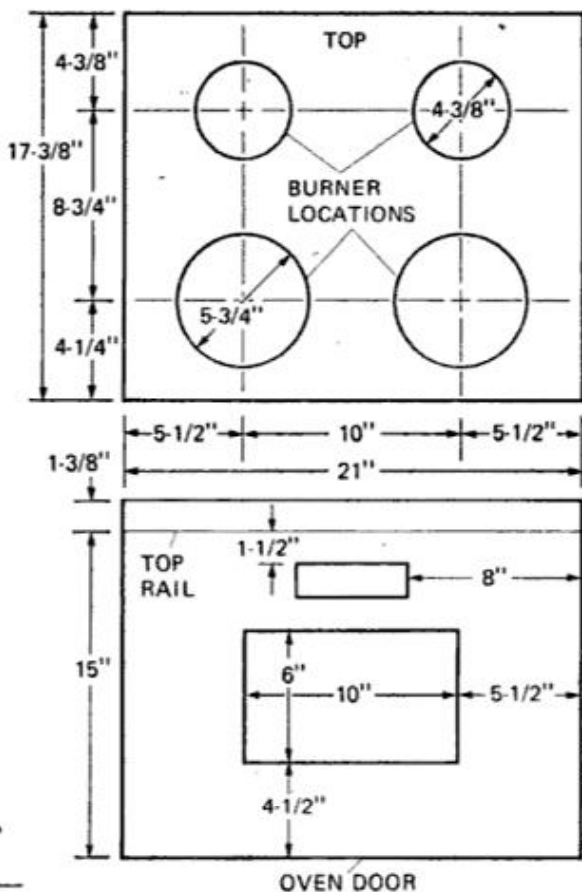
### END VIEW



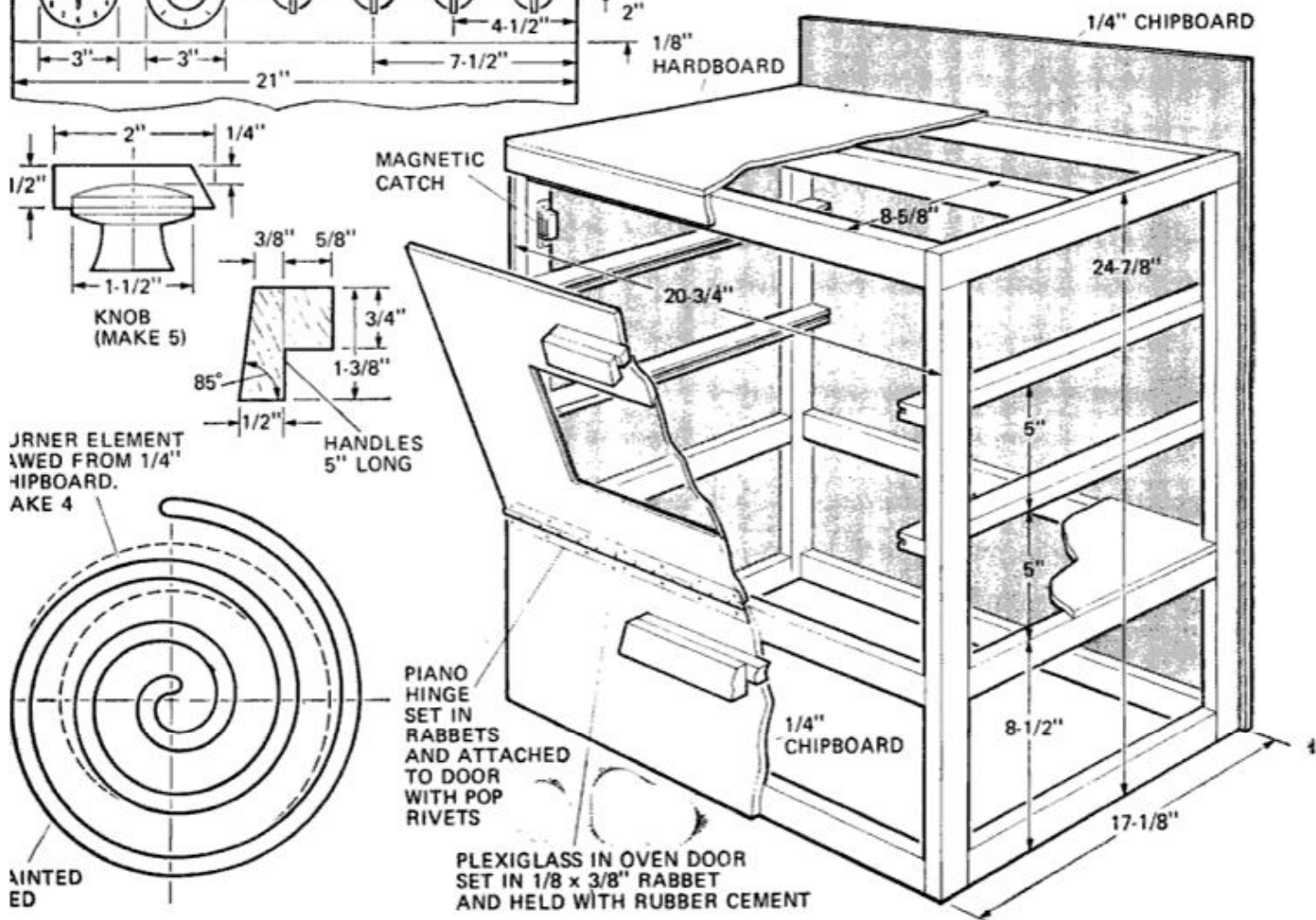
and dials as shown, use a center punch to locate exact centers. After painting the front, the circles, clock dials and other details can be applied using India ink and an artist's brush. When this "artwork" is dry, apply clear varnish. The window on the chipboard door is simply a piece of plexiglass set in the rabbet with bathtub caulk.

**Sink.** On the unit shown, the sink is a  $2\frac{1}{4} \times 7\frac{1}{2} \times 7\frac{1}{2}$ -in. bowl that came with a 19-cent vegetable grater. Before cutting out your sinktop, have your "sink" on hand to assure a neat fit. The sink trim requires a little effort using a chisel and coping saw to do the notching. After assembling these parts, fill any voids with a wood filler and sand smooth. Trim can be finish-painted with aluminum paint for realism.

**Refrigerator.** This is the easiest unit to construct because it is really just a box with two doors. As with all units, sand all surfaces and edges absolutely smooth before applying a nontoxic paint. ★★★



#### RANGE DETAILS

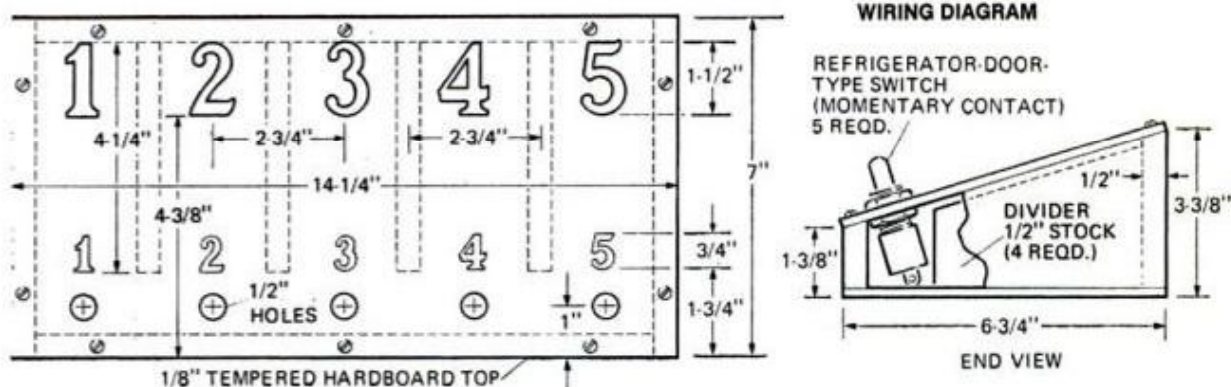
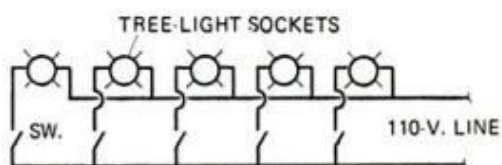




# Teaching box

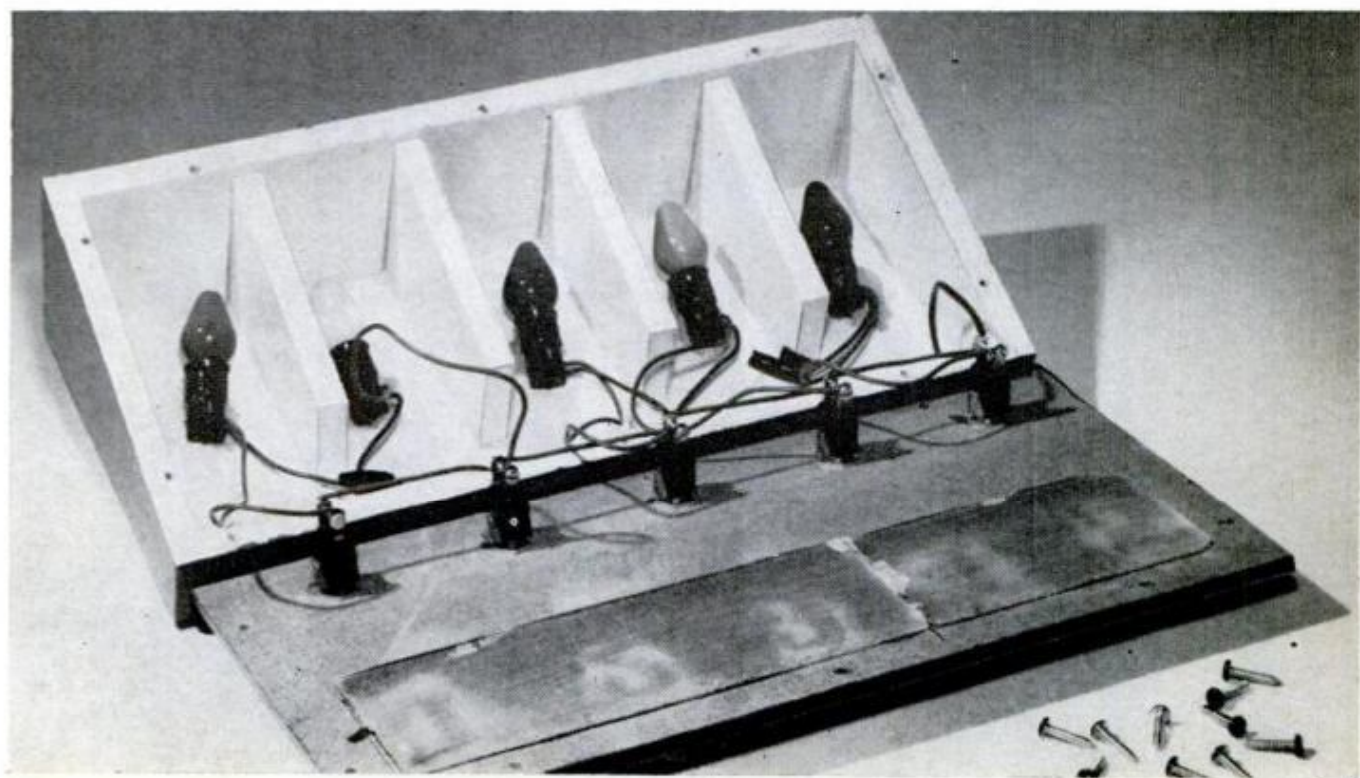
by Douglas Santy

By teaming up colors with numbers, learning to count from 1 to 5 becomes both fun and easy for any preschool tyke with this plug-in, pushbutton teaching box. Jigsawed numerals in the top of the box are illuminated from below by five Christmas-tree lights when refrigerator-door-type switches are depressed and held. Each switch is numbered and color-coded—red, white, blue, yellow and green—and each controls a bulb of the same color. The child learns to count quickly by associating a certain color with each lighted number. ★★

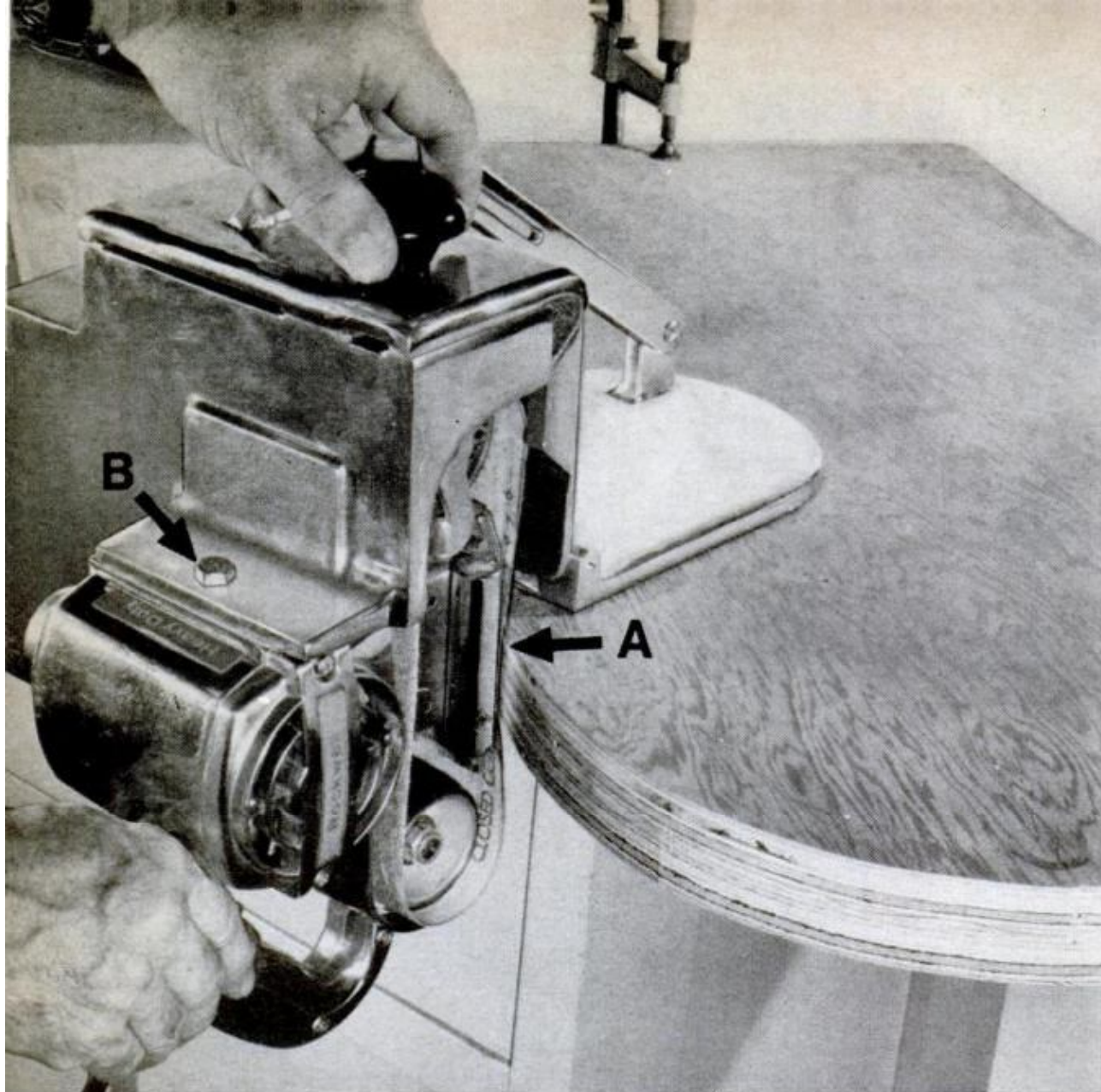


Sockets are cut apart from the light string, stuck to the bottom of the box with hot glue and the wires soldered to the switches following the diagram. A 2-in.-wide strip of 1/8-in. clear sheet plastic is cemented to the underside of the jigsawed numerals. The center

piece of the figure 4 is cemented to the plastic backing. The spring-loaded switches are identical to refrigerator-door switches except that they work just the opposite. The light goes on when the button is pushed in. Sold by Lafayette and Radio Shack.





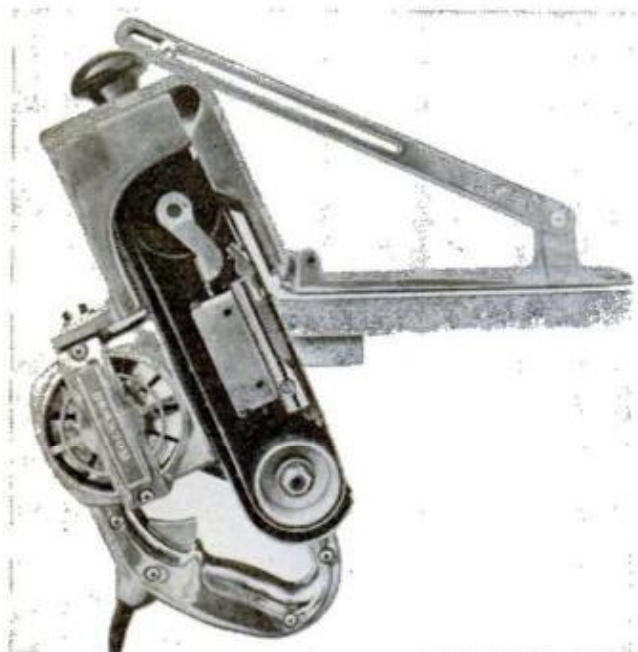


Round rod added to sander's shoe (A) supports belt when sanding inside radius as small as  $\frac{3}{4}$  in. Single capscrew (B) in original knob-mounting hole bolts attachment to sander. Below: Attachment is adjustable for sanding edges at angle.

#### SHOP TEST REPORT

## Belt sander becomes edge sander with new quick-change attachment

by Wayne C. Leckey  
HOME AND SHOP EDITOR

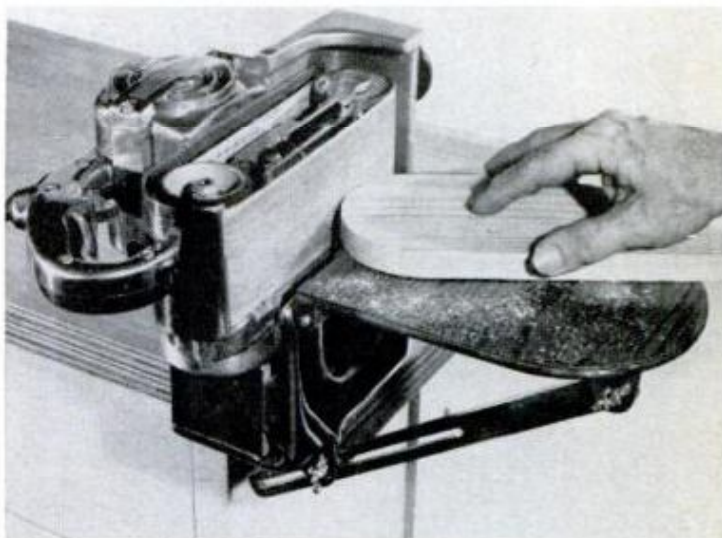
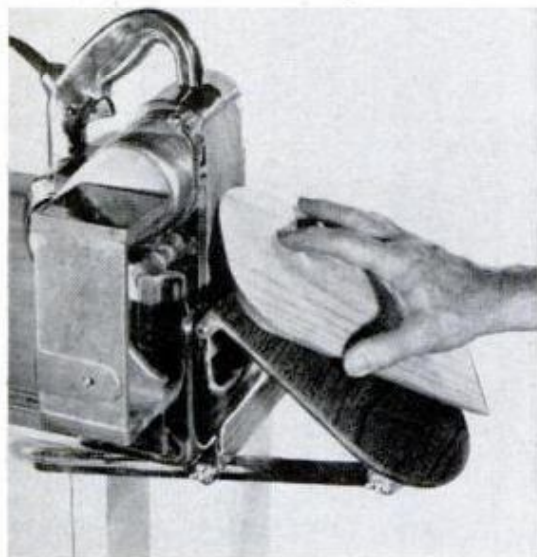
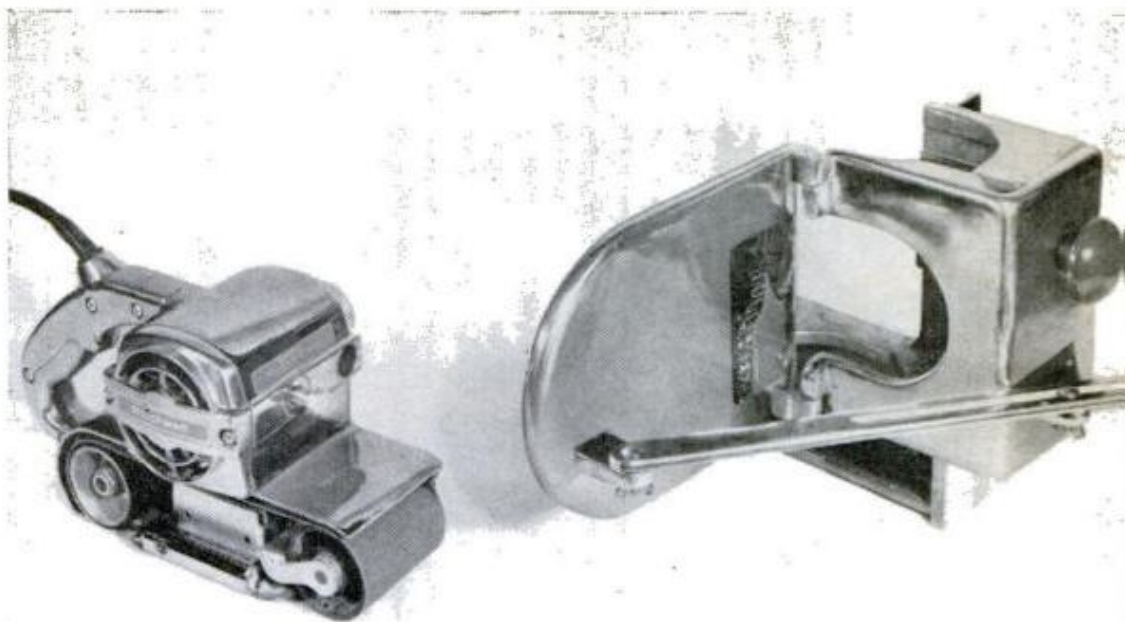




**Attachment is designed** to fit most any 3x21-in. belt sander (right), can be quickly detached when sander is needed for surface sanding.

**Bolted to workbench** (below), attachment converts sander to handy stationary bench model for edge sanding at various angles.

**Sander's position** can be switched from vertical to horizontal (below, right) by bolting attachment to the side of the sander.



**O**f all portable power tools, the belt sander is probably the least versatile. For the most part, it can do little more than sand plain flat surfaces. Now, thanks to an attachment called Edge-a-neer, I found the belt sander takes on new importance and usefulness, both in the shop and on the job.

Consisting of a two-piece aluminum casting, the attachment quickly converts an ordinary surface sander into an efficient edge sander in a matter of seconds. In use, a flat plate or fence rides the work surface and supports the sander at the desired angle as the machine is moved along the edge of the work. When the sander is supported vertically as shown in the upper photo at the left, you can sand the edges of irregular-shaped countertops or other thick work having inside radii as small as  $\frac{3}{4}$  in. This

is possible by the addition of a short section of round rod to the edge of the sander's shoe. By adjusting the belt so it tracks and overrides the shoe  $\frac{3}{4}$  in. or so, contact with the work causes the belt to conform to the curvature of the rod. To sand a bevel on irregular-shaped work, a wingnut and slotted bar let you adjust the plate angle.

When you wish to sand with the grain the edges of exterior doors or other thick straightedge work, you can quickly change belt rotation from vertical to horizontal by switching the attachment from the front of the sander to its side.

The attachment can be used with most any 3x21-in. sander; here it's with a Rockwell No. 153. The original sander knob is used to hold the two attachment parts to-

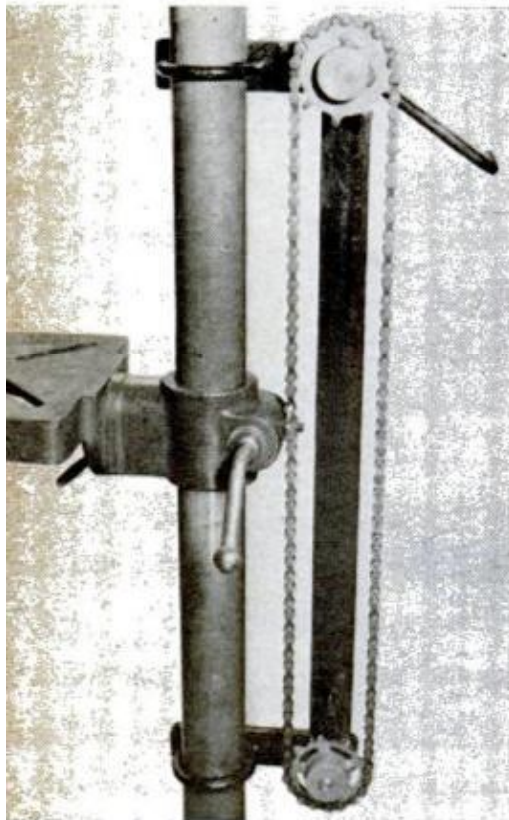
*(Please turn to page 206)*

NOVEMBER 1973 177

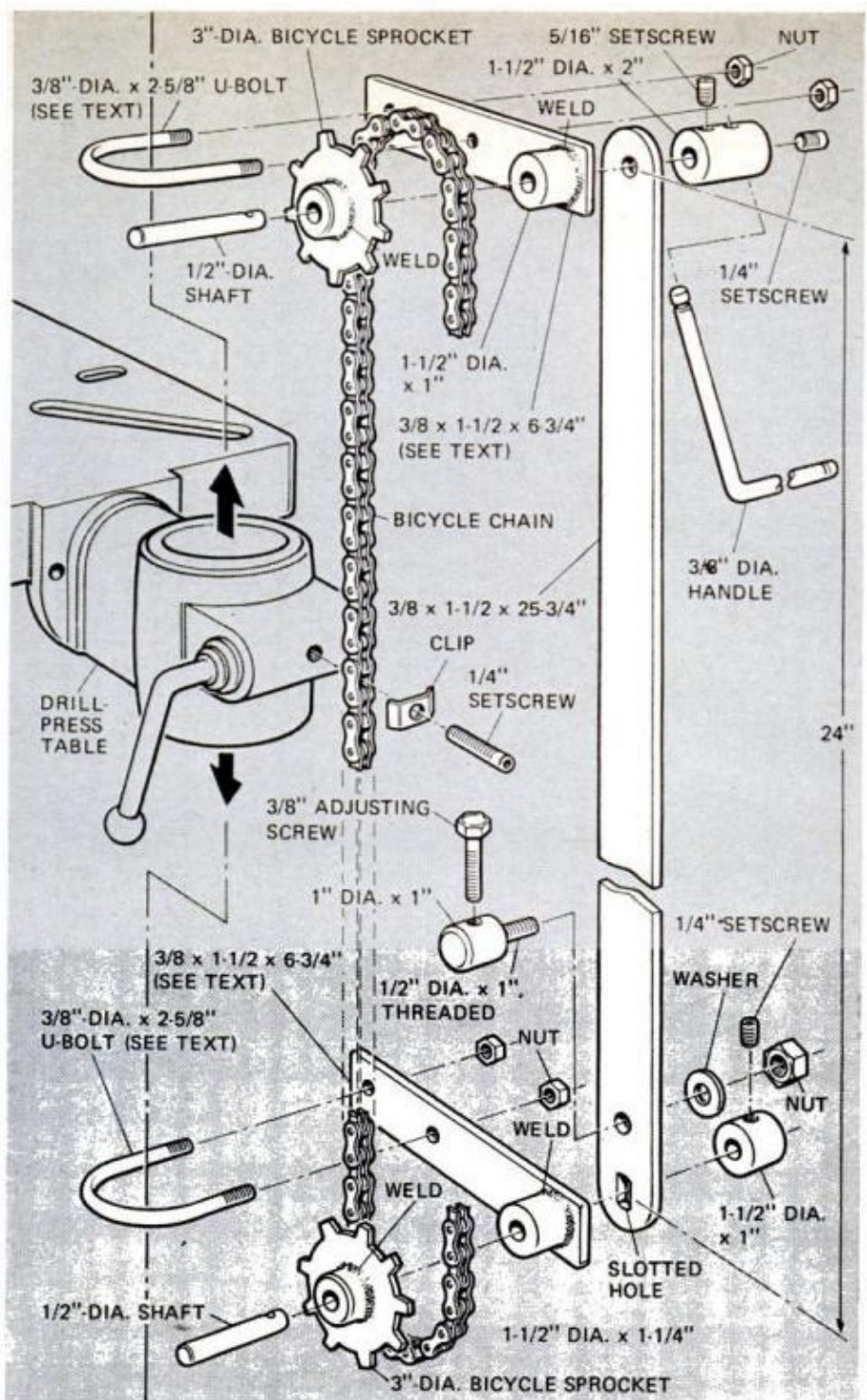


# Rapid travel for drill-press table

by R. K. Pedersen



Simple winch, using bicycle chain and sprockets, makes it easy to move heavy drill-press table up and down.



Art: Peter Trojan

To provide a solid work surface, a drill-press table has to be heavy. But because it's heavy, it can be difficult to lift—and too easy to drop. Add this chain winch, and you can crank your table up and down fast and with little effort.

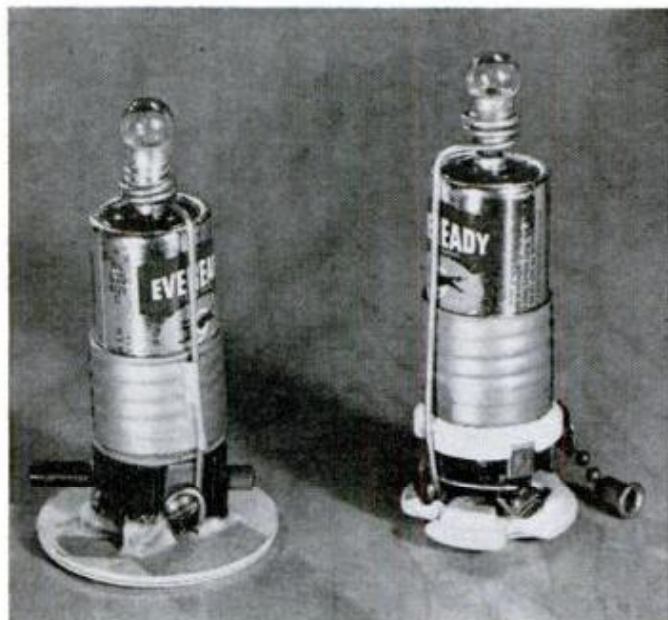
Use the dimensions shown above, with these possible variations: Length of the two horizontal crossbars must depend on the rearward extension of your table clamp. U-bolts should fit your drill-press column as closely as possible; U-bolts  $2\frac{5}{8}$  in. wide center-to-center were ideal for a  $2\frac{1}{4}$ -in.-diameter column. And you may need or wish to vary the nearly 24-in. travel indicated above.

A certain amount of play is normal in a bicycle chain. The adjusting screw and the slotted hole in the vertical bar will let you keep it at the right tension. ★★★



# HINTS

## FROM READERS



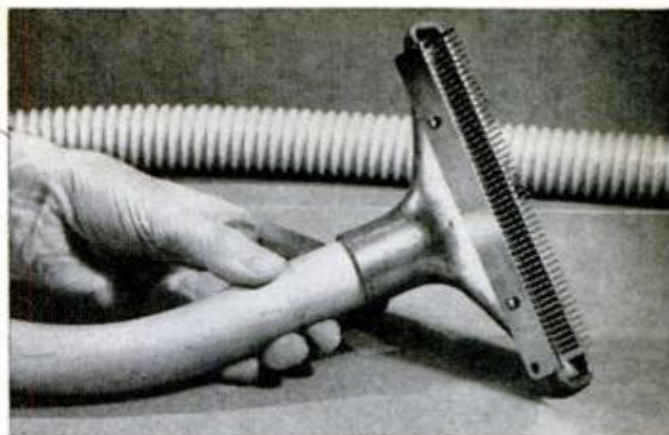
### Emergency night light

Handy night light is a C-cell in a push-button or pull-chain socket, its outside taped. Wire connected to terminals holds 1½-v. flashlight bulb, soldered to battery post. Cardboard base is added with hot-glue gun.—Wallace H. McClay, Pasadena, Calif.



### Widening spring clamps

Adapt spring clamps for wide work by making extension jaws of heavy-gauge aluminum or sheet steel, bent as shown. Mount by drilling and tapping extensions and original jaws for 8-32 machine screws. Dimensions depend on size of work to be clamped.—Louis Hochman, Sherman Oaks, Calif.



### Canine grooming aid

A metal pet comb attached with screws to a shop-vacuum nozzle makes it easy to remove loose hair and dirt from your dog's coat.—Charles Dayton, Akron, Ohio.



### Fabric hinges

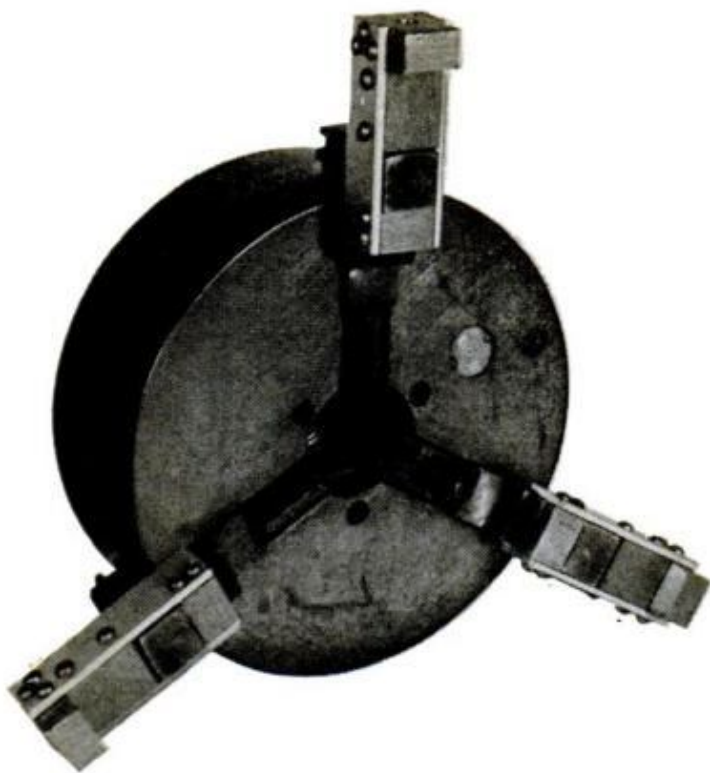
Vinyl upholstery fabric, fastened with wood or metal strips and nails or screws, makes a continuous hinge—here on insect-collecting cage.—E. B. Walters, Chicago.



### Taking pinch out of vise

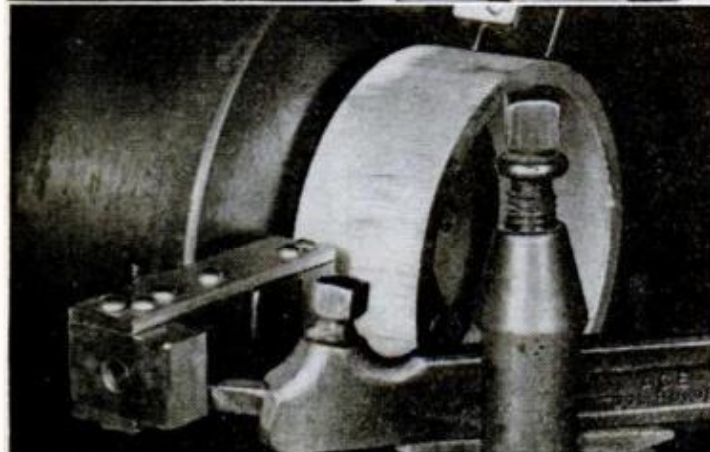
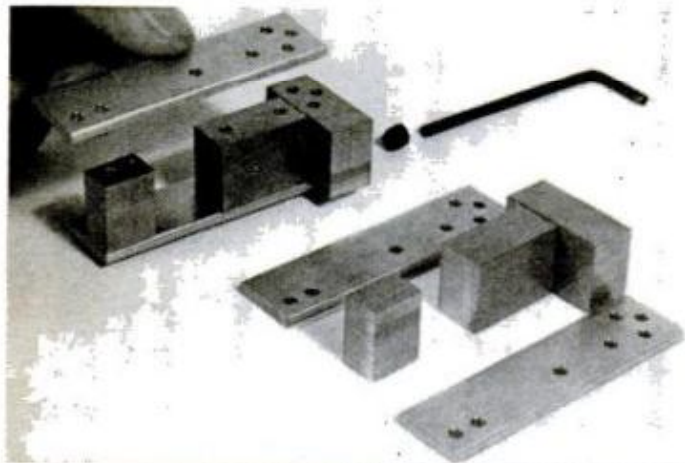
Wrap rubber bands at each end of the handle on a machinist's vise and you needn't worry about pinching fingers when handle drops.—Leonard Witkovsky, Avenel, N.J.





# Jaw stretchers give your lathe chuck a bigger bite

by Philip Duclos



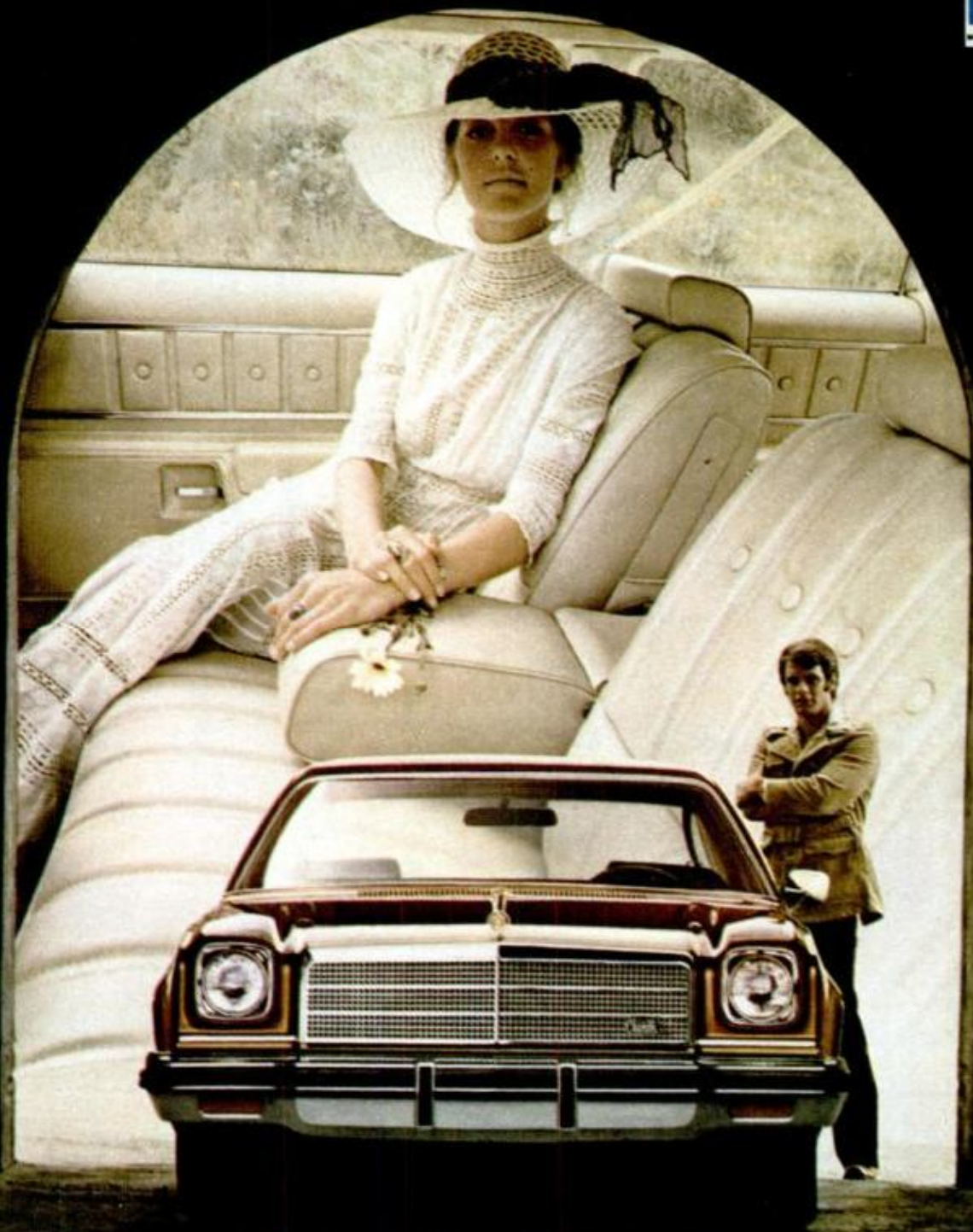
Here's a handy set of jaw stretchers for any lathe chuck. They will work on either a three or four-jaw chuck and let you handle large-diameter work. With them, my 6½-in. chuck now holds work up to 10 in. in diameter.

I used 5/16-in. No. 6 type-U, hardened drive screws to pin the stretcher parts together. These drive screws are easier to use than ordinary machine screws—because they require no tapping and are installed with a hammer—but if you cannot obtain them in local stores, you will have to tap (thread) each hole for a bolt or machine screw.

The stretchers are clamped to the chuck jaws with ¼-20 Allen setscrews. As the setscrew holes are deep (nearly equal to the distance the extensions give), it is advisable to counterdrill with a tap-clearance drill to about three-fourths the depth of each hole—otherwise, it may be too deep for a standard tap. ★★★

Because chuck sizes vary, the stretcher dimensions must be made to suit the chuck being used. Parts are cut from bar and sheet stock, drilled for hammer-driven, type-U self-tapping screws. Photo second from bottom shows how stretcher fits chuck jaw. At bottom, stretchers are clamped to jaws and a light cut is taken on them to make them run true; jaws are held rigid with a large piece of round scrap (a short section of large-diameter pipe was used here). Matching numbers should be scribed on stretchers and jaws to assure correct replacement each time.





## Introducing the Chevelle Malibu Classic inside out.

### Malibu Classic.

A luxury Chevelle, new this year.

Full foam seats. Fold-down front seat armrest. Tasteful fabrics. Cut-pile nylon carpeting. Wood-grain vinyl accents. Even the inner door panels are elegant.

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as it is inside.

Yet, so importantly, it remains mid-size. It remains mid-priced. It remains Chevelle, a truly fine-handling automobile.

The very new, very luxurious Chevelle Malibu Classic. Now that you've looked, come and see.

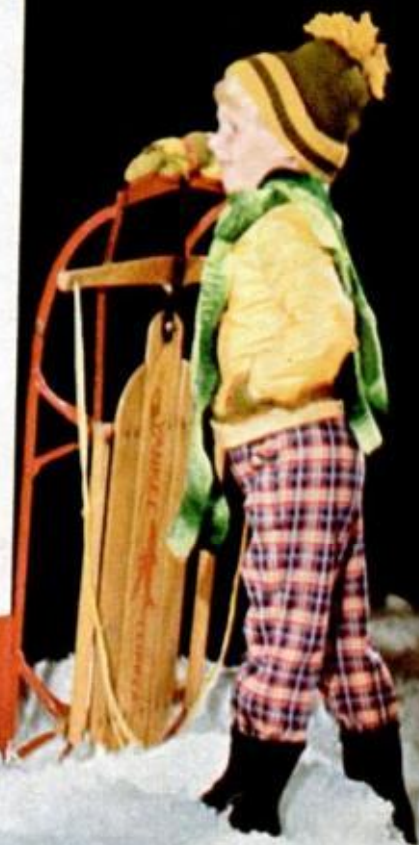
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*Chevrolet. Building a better way to see the U.S.A.*

**Chevrolet**



SEASON'S GREETINGS



## Outdoor greeting card with a new twist

Three merging posters provide endless action as triangular columns slowly rotate.

by Rosario Capotosto

A comical Christmas mouse gorging himself on a candy cane, a lost Santa and reindeers frantically looking at a road map and a quaint drummer boy and lamb are three ever-changing holiday scenes that will make passersby stop and take a second look at PM's outdoor greeting card for 1973.

Each scene, a 42x54-in. colorful poster, is mounted on five three-sided vertical columns that rotate simultaneously and continuously. As one scene comes into view, it slowly fades into another, then another. The sequence is repeated over and over as long as the unit is plugged in. The changing scenes are fascinating to watch.

A 7-rpm geared motor turns the five columns by a chain-and-sprocket drive that keeps them turning in perfect alignment.

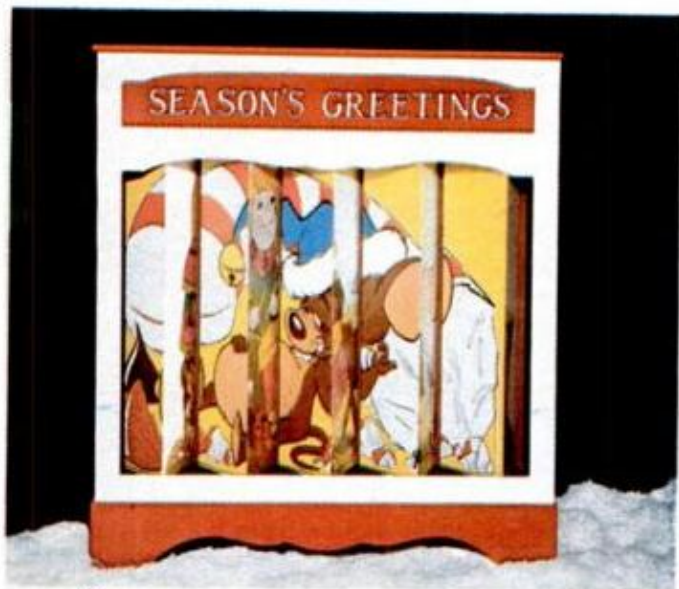


## How the three scenes change from one to another

First, full Drummer Boy scene appears.



Then, turning slowly, scene starts to merge . . .



. . . with oncoming Myron Mouse scene.



Mouse scene comes into full view . . .

The columns turn freely in ball bearings at top and bottom.

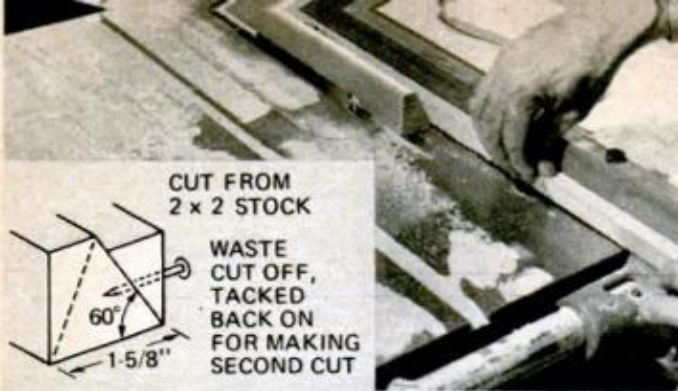
Start with the column corner posts, using four 8-ft. lengths of 2x4. Pick straight ones with minimal knots. Cut them in half and rip them down the middle so you have eight 4-ft. 2x2 pieces. Tilt the saw blade to 30°. Rip a bevel cut on one side of all the pieces. Use one of the angled cutoffs to help cut the other bevel. Nail the waste about 12-in. offset to the rear and flush to the bottom edge of the workpiece. This does two things: It provides a handle with which to push the work so the cut is complete while your hand is still at a safe distance. And the waste rides firmly against the rip fence

*(Please turn page for construction photos;  
text continues on page 186)*

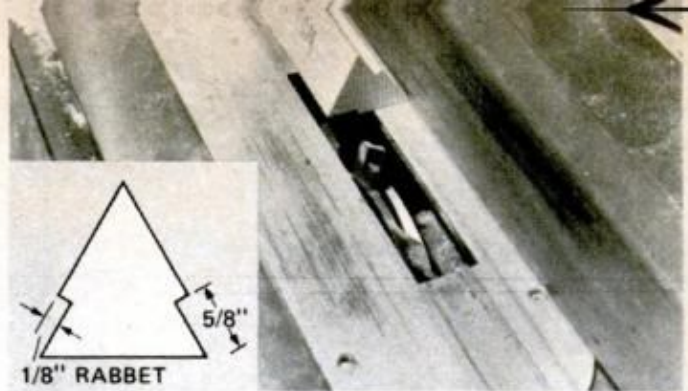
. . . and goes on to merge with Santa scene.



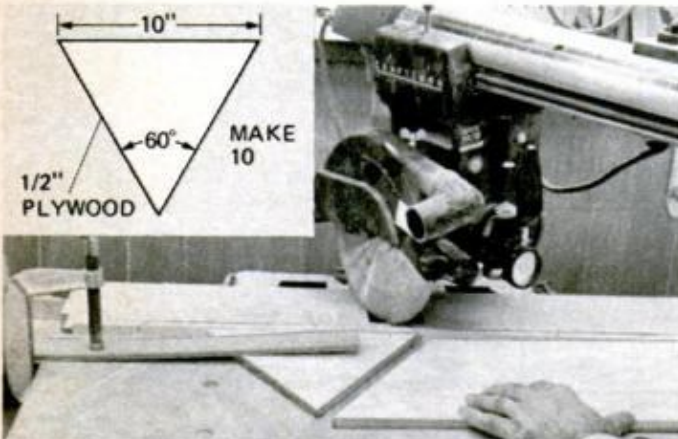




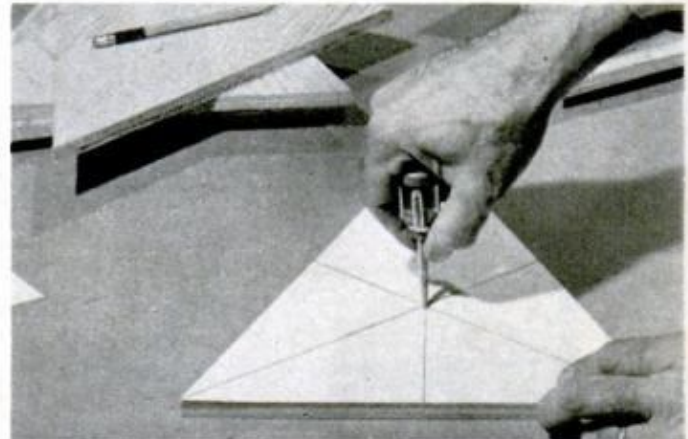
Blade is tilted 30° to cut triangular posts. For safety, tack on waste piece to push work for second cut.



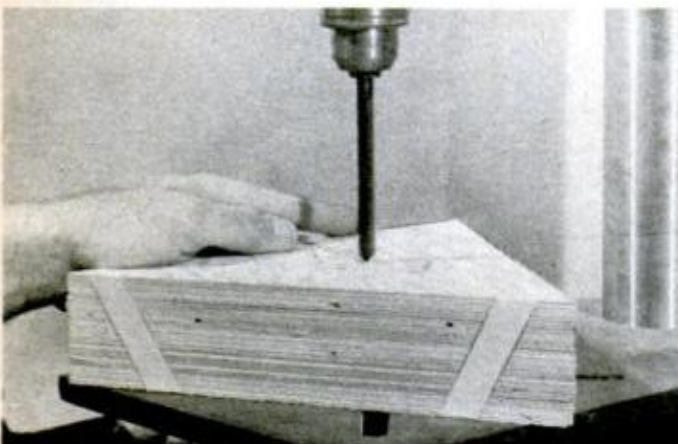
Wide rabbets are cut 1/8 in. deep along both sides of posts. Use push stick, mark "bottom" to avoid error.



Triangular sample of column bases is clamped to saw table, used as stop for cutting nine more duplicates.



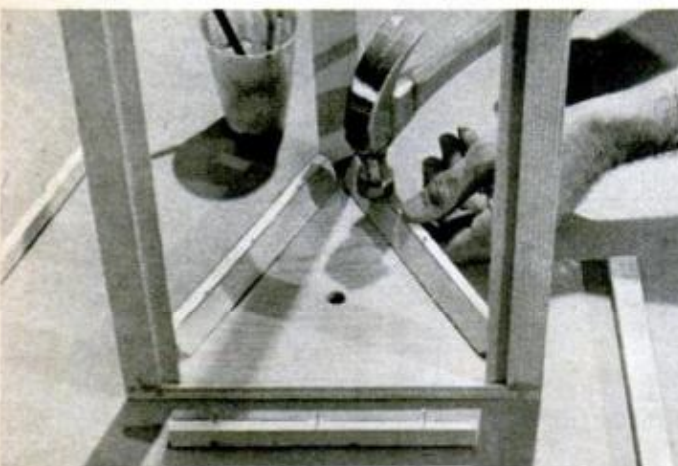
All axis holes must be bored dead-center in triangular pieces. Best to use template for accuracy in marking.



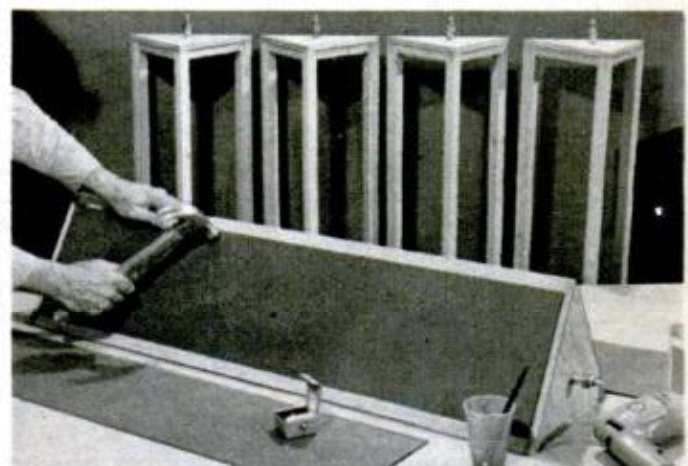
Triangular column pieces are stacked and taped together for gang-drilling five at a time on drill press.



Two finish nails and glue are used to anchor bases to corner posts. Check for alignment before applying glue.



Nailing cleats for hardboard panels are set even with setback of post rabbets, anchored with glue and nails.



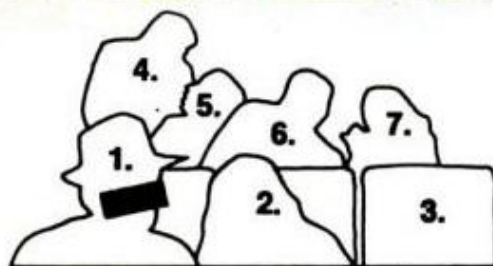
Bolt axes are installed before tempered hardboard panels are added. Use plastic resin glue, small nails.



# Can you spot the Camel Filters smoker?



© 1973 R. J. Reynolds Tobacco Co.



Everybody aboard this jet plane has a gimmick . . . almost everybody. Pick the one who doesn't. **1.** Nope. He's Húgo Slavia, impoverished secret agent. Gimmick: Sells "hot" watches as a sideline. His cigarettes smoke even hotter.

**2.** Mike L. Angelow. Gimmick: Artist who draws everything but attention. At last sidewalk exhibition he got a ticket for littering. Smokes decorator pack cigarettes.

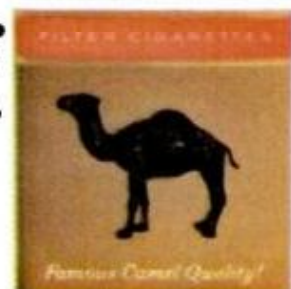
**3.** No. Ralph Knoshow (not pictured). Transistor radio salesman. Resigned when given new territory . . . Japan. His cigarette's taste is missing too. **4.** Right. Wherever he goes, he leaves the far-out gimmicks to others. Likes his cigarette no-nonsense too. Camel Filters. Honest.

Good tasting. **5.** Charles Chizlar. Gimmicks: 5 overcoats, 4 sweaters, 3 pairs of pants. Saves on overweight luggage. Drains tap in men's room for his water-filtered cigarettes. **6.** He's Vaseli Overaidt, wrestler. Gimmick: Demonstrating arm wrestling techniques to strangers. **7.** Helen Back, stranger. Also black belt karate expert.

**Camel Filters.**  
**They're not for everybody**  
(but they could be for you).



**CAMEL**



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

20 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report FEB. '73.

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## Dodge is America's Number 1 Builder of Mini Motor Home Chassis.

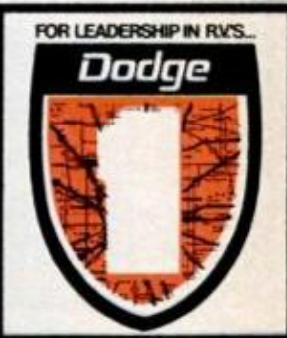
Dodge pioneered the development of the cutaway mini motor home chassis. Dodge offers all these benefits: dual rear wheels, the longest wheelbase—145," power front disc brakes, 360 V8 engine, Electronic Ignition, and "thumpless" polyester RV tires.



## The Club Cab. The Number 1 idea in pickups.

The exclusive Dodge Club Cab pickup gives you over 34 cubic feet of extra storage space inside for the things you don't want to leave outside. The Club Cab Camper Specials are equipped to accommodate most slide-on campers to haul you and your friends to your favorite snow trails.

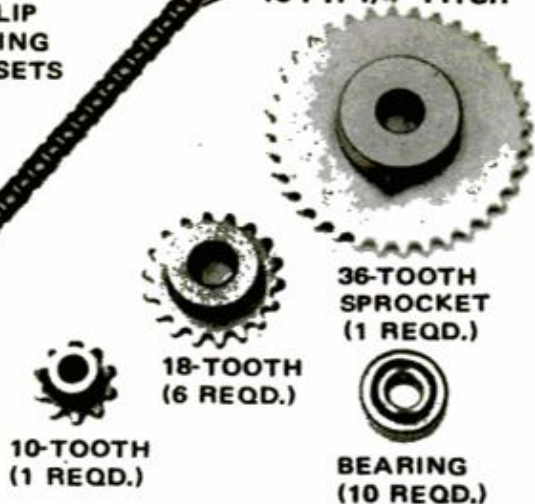
# Turn to Dodge for leadership in Recreational Vehicles.



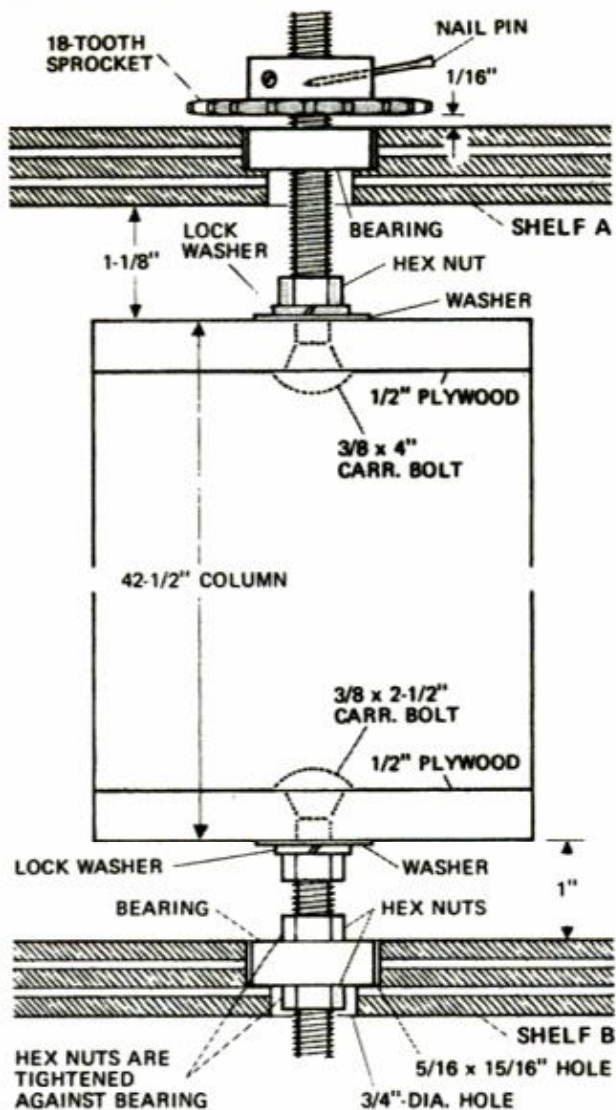


SPRING-CLIP  
CONNECTING  
LINKS (3 SETS  
EQU.)

ROLLER CHAIN  
10 FT. 1/4" PITCH



### COLUMN PIVOTS DETAIL



### WHERE TO BUY PARTS

Sprockets, bearings and chain (shown above) obtainable as a kit from The Armor Co., Box 290, Deer Park, N.Y. 11729. \$67 ppd.  
Posters of the Drummer Boy, Myron the sweet-toothed Christmas mouse and Lost Santa available from U-Bild Enterprises, Box 2383, Van Nuys, Calif. 91409. \$10 ppd. per set.  
Gear motor, 7 rpm, The Way-Mar Co., Box 164, Hartsdale, N.Y. 10530. \$15.50 ppd.

### OUTDOOR GREETING CARD

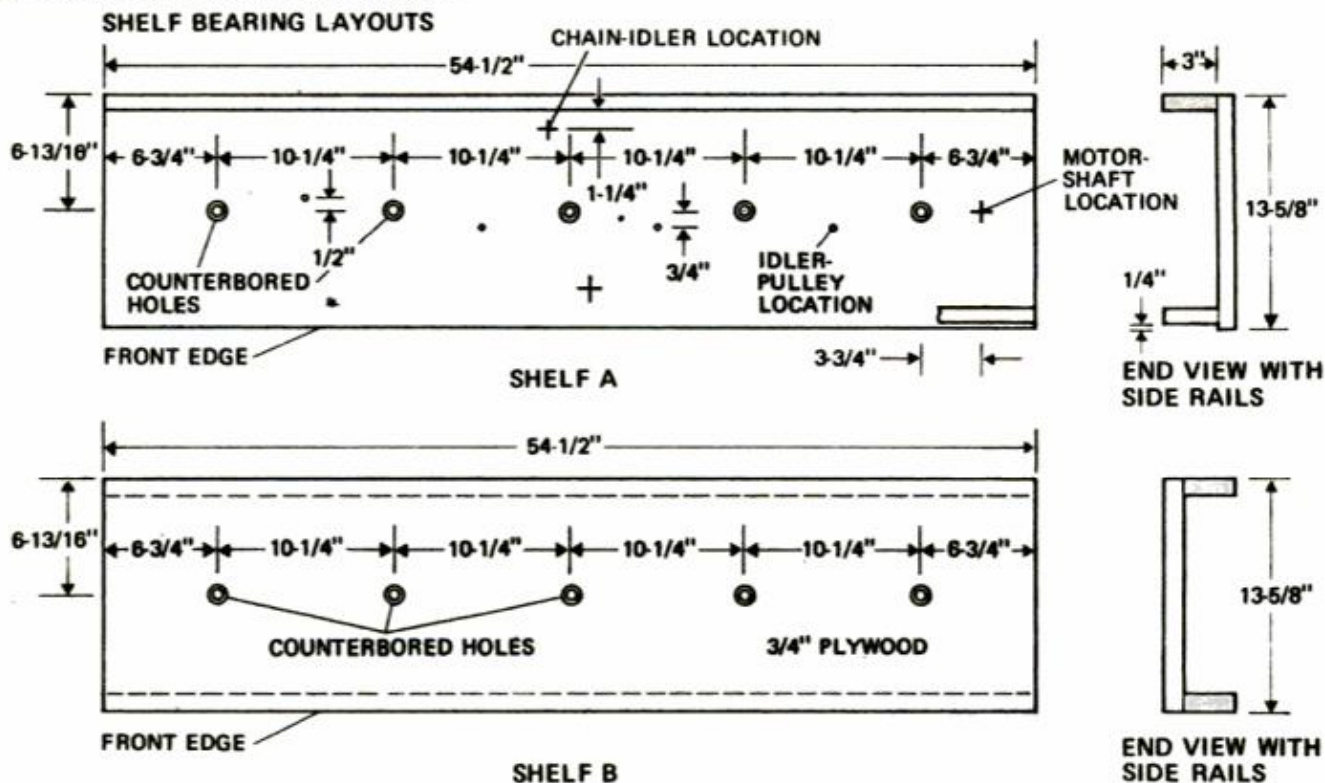
(Continued from page 186)

bored holes. Bore the larger holes first or you won't be able to center the drill for the second hole.

Glue and screw the sides to the bottom shelf and temporarily screw in the top to

(Please turn to page 202)

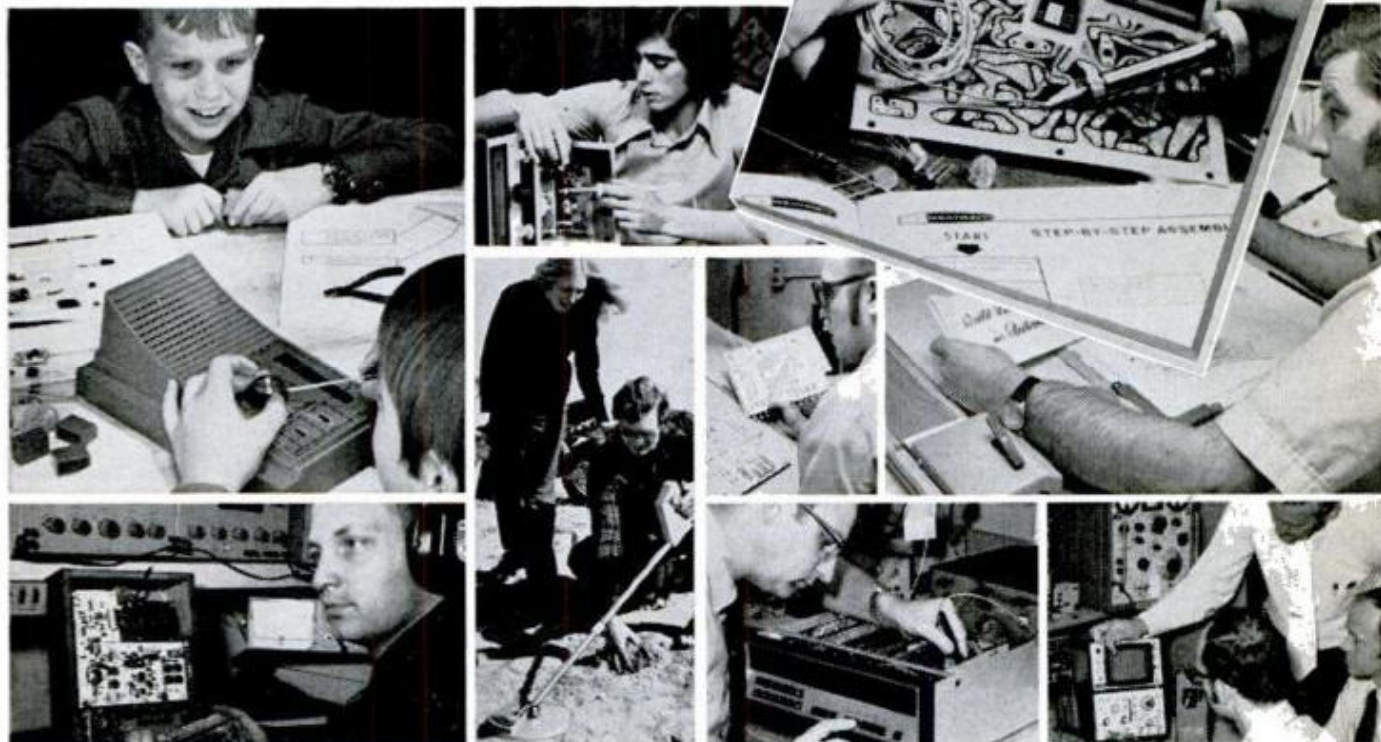
### BEARING AND IDLER LOCATIONS





# the FREE 1974 Heathkit catalog-

courtesy of the world's largest  
fraternity of electronic enthusiasts.



Pride of accomplishment. It begins in our design labs with the creation of new kit. It carries through to a cozy basement workshop where a customer's hand reaches to press the power button on a just-finished color television, digital calculator or home intrusion alarm. The inanimate device comes to life just like the assembly manual said it would. And at that moment another Heathkit builder feels the same thrill felt by the design engineer when he hit the switch on this piece of circuitry that up till then had worked only in his mind.

The engineer will experience a similar "kick" once again — when he reads the handwritten letter that says:

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The creative bond between Heath employees and Heathkit builders forms a proud fraternity. Ask around, there's probably a member in your neighborhood.

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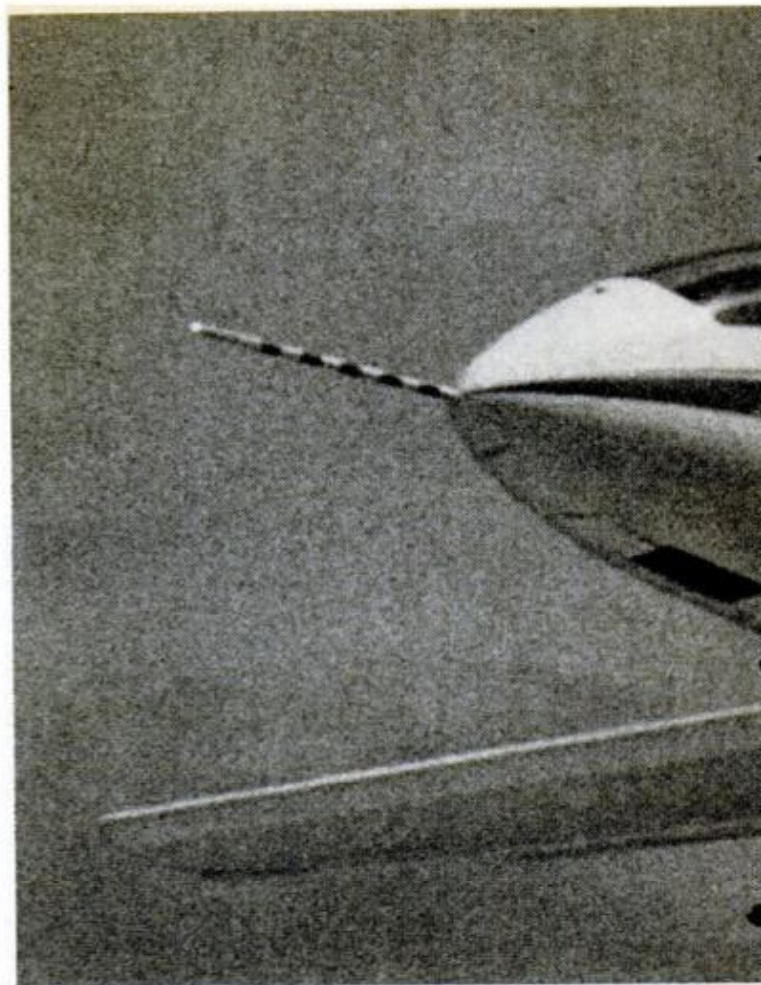


You expect a jet to be fast, but when it's a tiny blur streaking over the field at better than 300 mph, the sight is almost unbelievable. When it pulls up in a screaming vertical climb, then flips over into a series of corkscrew rolls, you rub your eyes in wonder—is it for real?

This remarkable little ship is the BD-5J, newest of several spectacular homebuilts by the famous Jim Bede and the first jet-powered craft designed especially for sport use and build-it-yourself construction. Less than 12½ feet long with a wingspan of 17 feet, the 5J is incredibly small. The top of the canopy barely comes up to your waist. To fit into the cockpit, a pilot must almost lie down. You don't just get into the plane—you put it on and wear it!

The BD-5J has the same sleek, bullet-nosed lines as its prop-driven cousin, the BD-5 (*Bullet-Nosed Beauty*, page 174, Nov. '72 PM), but beyond that the similarity ends. Powered by a 200-pound-thrust turbojet engine, it has a top speed of more than 330 mph, a phenomenal rate of climb of 2400 feet a minute, a service ceiling of 30,000 feet and a range of 550 miles. Yet stall speeds are surprisingly low for a jet—60 mph with flaps, 70 mph without flaps. Take-off run is 1100 feet, landing roll 800—also low by jet standards. Fully aerobatic, the ship is stressed for a whopping plus or minus 9 Gs. Special air brakes, called "thrust reversers," enable you to reduce flying speed without cutting engine power below a safe level. These clamshell plates close around the jet port on landing approaches to decrease thrust. If emergency "go-round" power is suddenly needed, plates can be quickly opened to give full thrust.

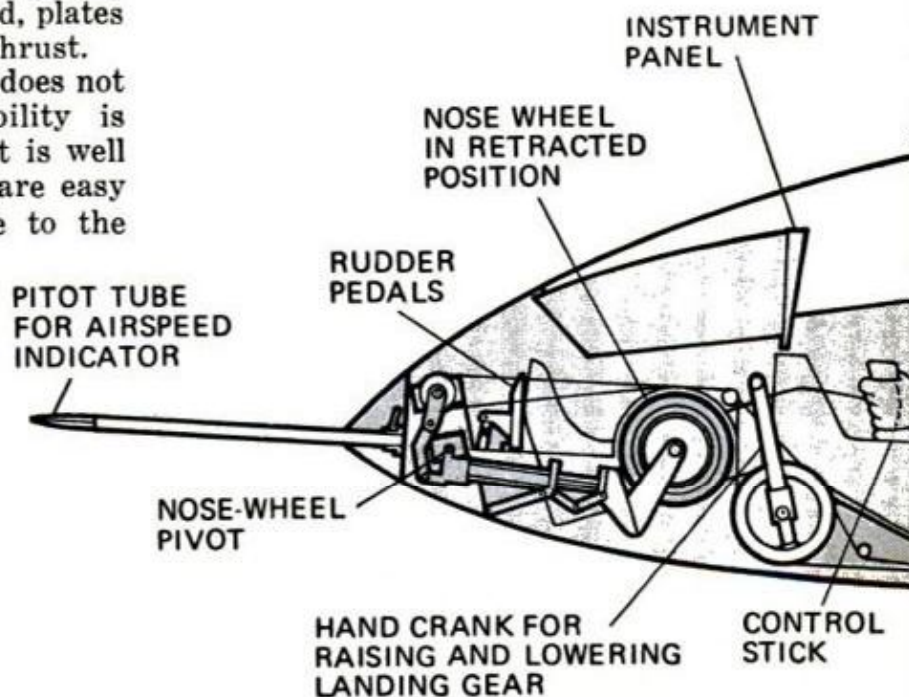
Despite its small size, the BD-5J does not feel cramped or confining. Visibility is excellent because your line of sight is well ahead of the wing line. Landings are easy because the ship is built so close to the



## Bede 5J: First

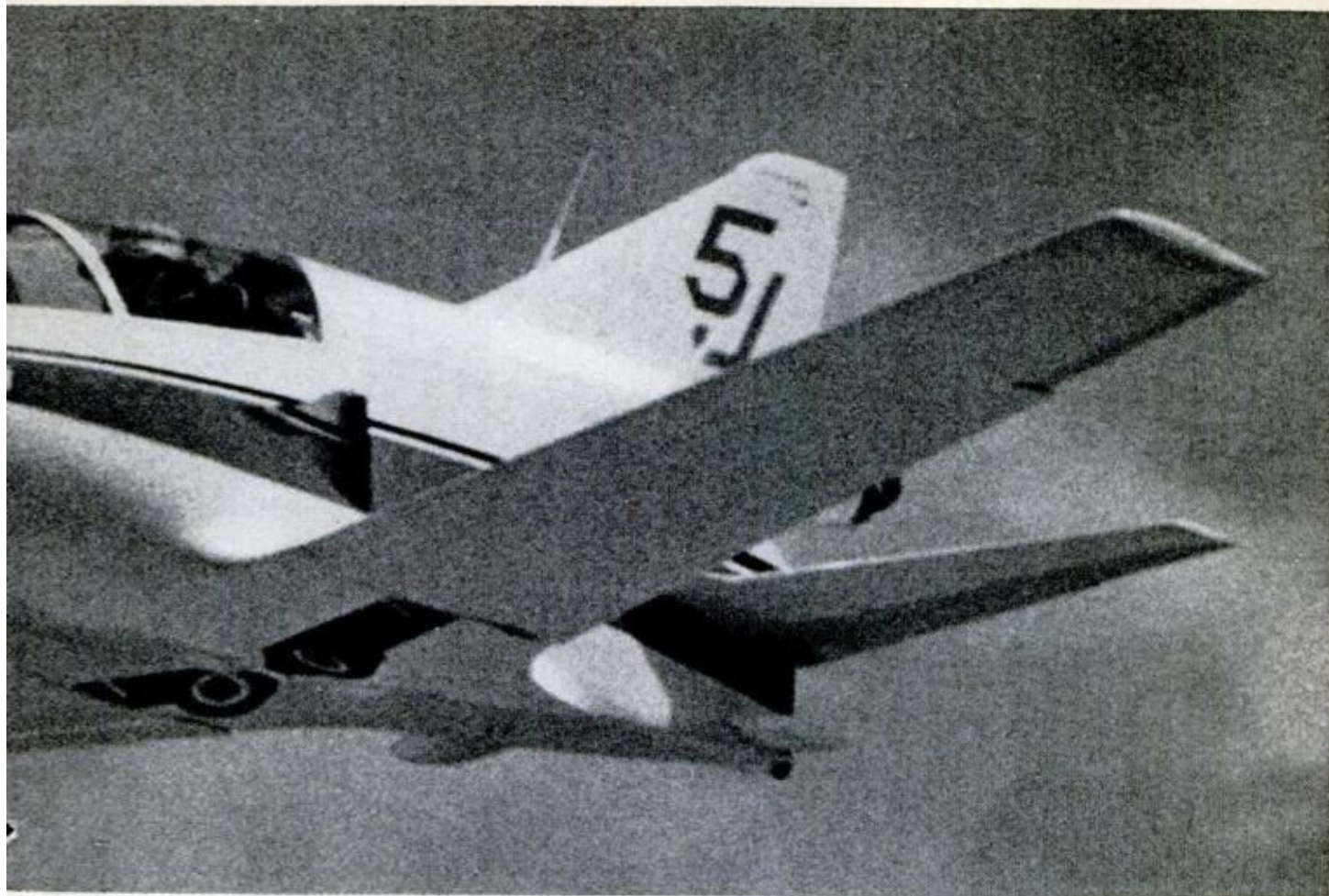
by Sheldon M. Gallager  
and Howard Levy

PHOTOS BY HOWARD LEVY

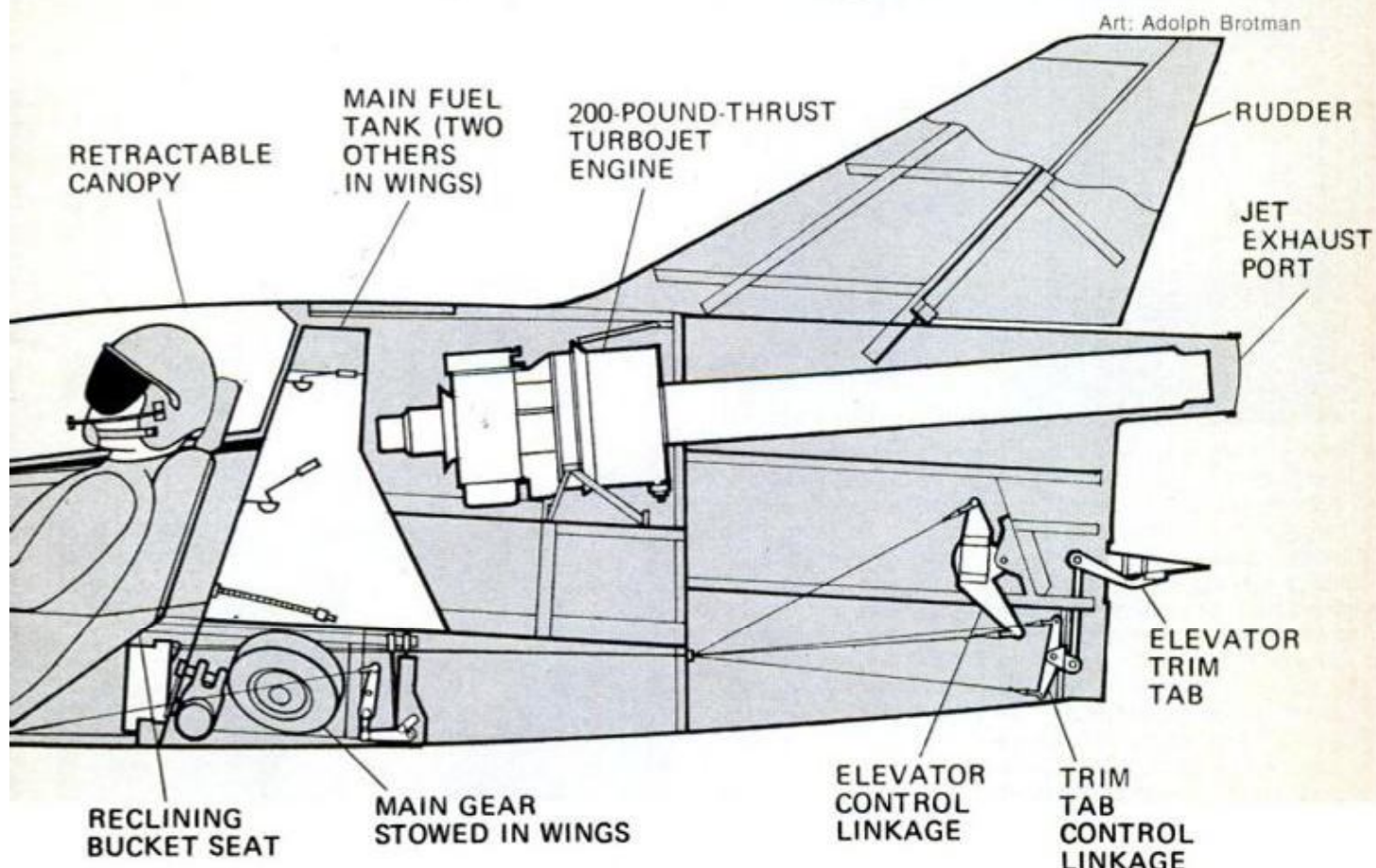


**Cutaway view** of BD-5J at right shows pilot snugly shoehorned into cockpit in reclining position similar to that of a Formula One racing driver. Nose wheel actually retracts up in space between pilot's feet. Space behind seat is taken up by main fuel tank and engine. To save weight and complexity, all controls are manually operated by hand crank or cable without hydraulics.



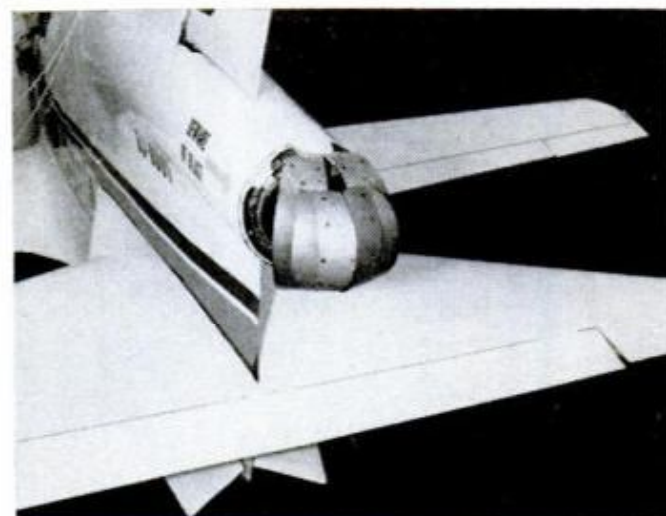
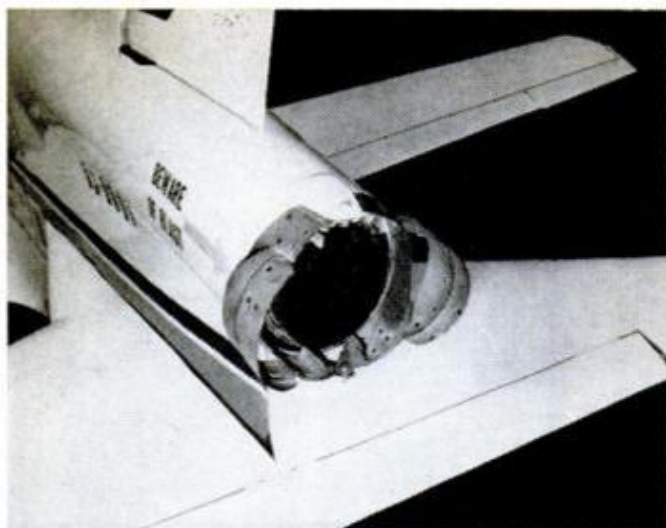


# build-it-yourself jet

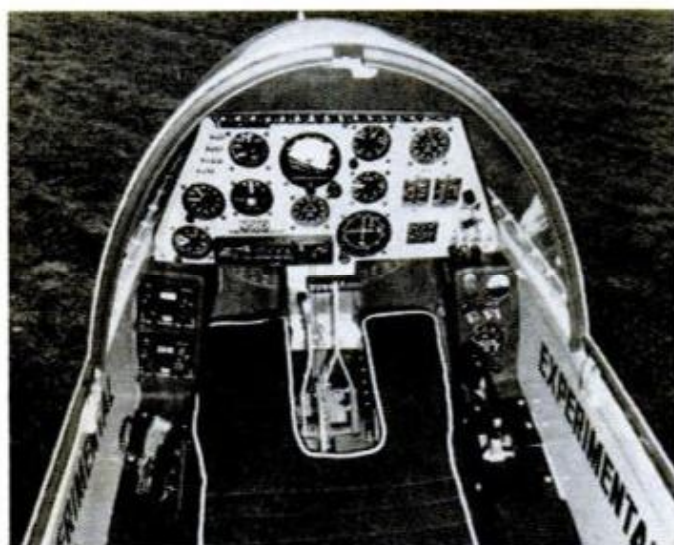




ground you always know exactly where the runway is as you come in—you can almost reach out and touch it. Complete kits for building the 5J will be available for \$21,400. Production models will also be sold ready to fly for \$29,000. At these prices, the midget jet is obviously not a “cheapie.” Nor is it intended for the inexperienced beginner. A high-performance ship requiring a skilled hand at the controls, it will appeal mainly to the advanced amateur who’s had considerable time in prop jobs and is now looking for something a bit hotter to try. But whatever its future, the Bede jet represents a bold new advance in sport aviation. ★★



**Clamshell thrust brakes** partially close off jet port on landing approaches to reduce speed by channeling some of thrust around to front like reversers on big jets. Brakes are shown open at top, closed at bottom.



**Entire horizontal stabilizer** (right) tilts on central pivot, serving as one-piece elevator. Called “all-flying tail,” it makes ship extremely responsive because of its large surface area—an important aid in executing quick aerobatic maneuvers. Narrow control surface along trailing edge functions as trim tab. Wings are fitted with both flaps and ailerons. Canopy, shown retracted above, swings up and backward for access to cockpit. Closed, it clears pilot’s head by a scant few inches. Cockpit view (top) shows sophisticated control panel including full instrumentation for IFR flying as well as VFR. Unusual offcenter control stick is stubby handgrip at right, located at side of cockpit instead of between pilot’s legs. Gear-retract handle is at center where stick would normally be, is merely pushed or pulled to raise and lower wheels.





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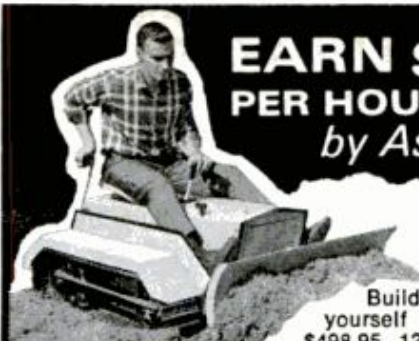
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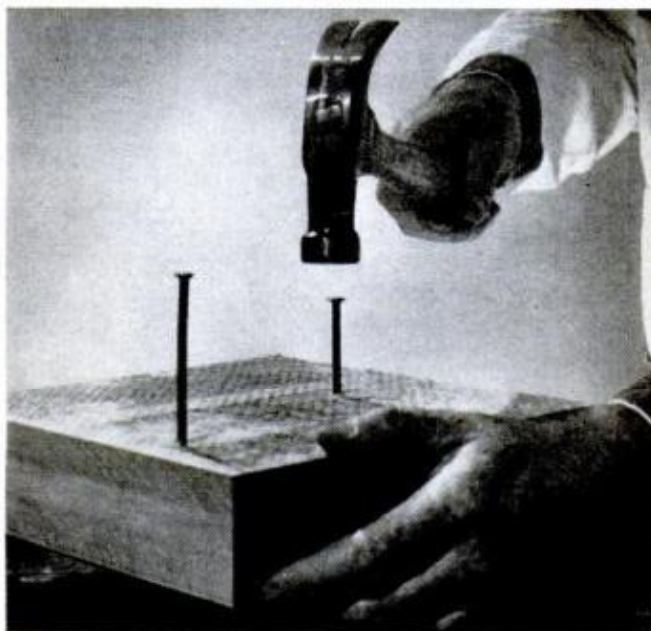


# From wood to paper—now it's back again to wood

Your next home may be built of old newspapers, magazines and telephone books. What's more, it may even be better than one constructed of conventional materials—its parts won't rot, leak, warp or burn.

After hundreds of years of making paper from wood, science is now finding a way to turn all that paper back into wood again—or at least a product very much like wood. The process is being developed by Meyer Steinberg, a research chemist at Brookhaven National Laboratory in Upton, N.Y. Used paper, like the telephone book in the upper photo at right, is first soaked in a chemical containing petroleum derivatives known as "monomers." It's then put under tremendous pressure in a hydraulic press and cured in an oven at high temperatures. During the pressure and curing treatments, the monomers fill the pores of the paper and are converted into a superhard, plastic-like substance called a polymer. The result is a product that saws and nails like wood, as shown in the lower photos at right, yet is much tougher and more stable than wood. It's impervious to rot and weathering, won't shrink or warp and can easily be made fireproof with noncombustible additives.

The paper can be compressed into slabs of any thickness—thin sheets for paneling, planks for decking, heavy timbers for structural use. A \$20,000 grant has already been received from the Federal Railway Administration to see if railroad ties can be produced by the method—ties that would be virtually indestructible. If the process proves practical on a large-scale commercial basis, it may succeed in getting rid of the millions of tons of paper waste produced annually in this country, while at the same time providing a usable substitute for our dwindling supplies of natural lumber, a neat ecological trick.—*Bernard Bard.*





# "I lost 5<sup>3</sup>/<sub>4</sub> inches off my waist, 25 pounds of excess weight... and shaped up... in just 14 days!"

One 5-Minute exercise, twice daily, lying on my back, without giving up the foods I love... Did It!"



Gordon as he looked the day he started.

After 7 Days — A remarkable transformation — pot almost gone — revitalized.

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## SEE AND FEEL AMAZING RESULTS IN JUST 3 DAYS!!

### WHAT IS THIS INGENIOUS PLAN?

The Weider "5" Minute Body Shaper plan is based on doing ONE CONTINUOUS RHYTHMIC CO-ORDINATED EXERCISE while still eating the foods you like. That's all you do! This one five-minute exercise is designed to attack the Waist and Hips (where fat accumulates quickest, giving your body a flabby, weak and distorted look) — as well as burn off excess body fat fast by speeding up your metabolism, burning up stored calories and releasing excess water—while reshaping your chest, abdomen, firming up your legs and arms — your total body!

It's safer than strenuous workouts, beats the time consumption and dangers of gym workouts... or any other vigorous sport.

The unit weighs about 16 oz. and fits any wallet-sized case. You can carry it and use it wherever there's floor space — anytime. Even while watching television.

### WHAT COMES OFF IN 14 DAYS?

Individual results vary, but during an average 14 day period, you can expect to lose up to four inches from your waistline and up to ten pounds off your present weight. It strengthens your heart and lungs, increases stamina and endurance, improves your digestive function and general health. IT TOUGHENS YOU UP. For a "5-Minute Exerciser" — it sure does a lot!

### WHAT SATISFIED CUSTOMERS SAY:

Results vary depending on how much overweight each of our students is. Nevertheless, this is a sampling from the impressive letters we receive: **Willie Ellis** — "I lost 3 inches off my waist and 9 pounds in 7 days." **Kent Christensen** — "I lost 5<sup>1</sup>/<sub>2</sub> inches off my waist and 20 pounds in 10 days." **Marino Zoller, M.D.** — "I lost 2 inches off my waist in 14 days." **Michael Benedict** — "I lost 6 inches off my waist and 22 pounds in 21 days." **Ken Waller** — "I lost 3 inches off my waist in 5 days."

### WHAT THE EXPERTS SAY:

Medical Doctors, Chiropractors, Osteopaths, Athletic Coaches... agree its the most successful Waistline-Weight Reducer and Shaping Up Plan ever invented!

Patent Pending. Copyright Joe Weider, 1973

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RICHARD TYLER, D.C.

"Beats jogging and working out in gyms — and much safer. I lost 4<sup>1</sup>/<sub>2</sub> inches off my waist in 14 days." — JIM HANLEY, famous athletic coach.

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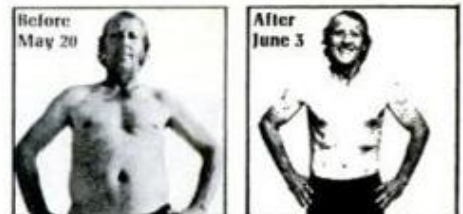
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# Compact 300-mm tele at a comfortable price

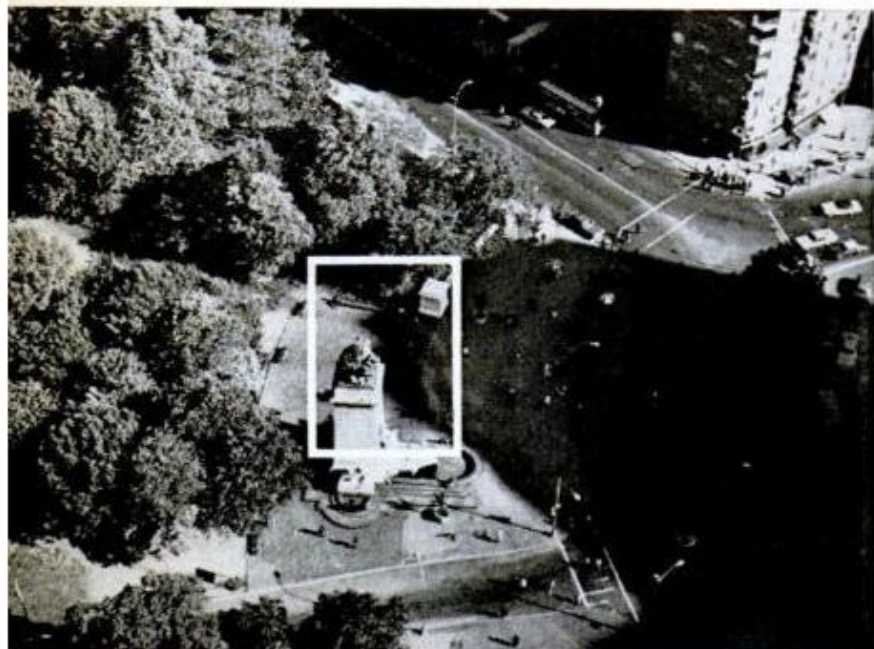
by Ivan Berger  
PHOTOGRAPHY EDITOR

Three hundred millimeters is a useful length for a telephoto lens—it brings you six times “closer” to your subject than a 50-mm normal lens, more than twice as close as a 135-mm telephoto, and it’s about the longest focal length you can shoot handheld. The trouble with most 300-mm telephotos is that they’re big, heavy, slow and expensive. Not this new Spiratone 300-mm, though: It’s comparatively small (7 inches), light (24 ounces) fast (f/4) and cheap, (\$119.95 for most popular SLRs, \$129.95 for electric-eye reflexes and the Canon F1 and FTb), and it’s given me good results during a month or two of shooting.



Interchangeable mounts (arrow) allow automatic diaphragm action on most popular reflex cameras; “T” mount adapters also fit, for preset use on other reflexes.

Accessories, of course, come extra: lens-hood (\$10), lens case (\$10.75), 77-mm filters (\$15), a case to hold a camera with the 300-mm and other lenses (\$15), and a pair of “FocusXtenders” which bring the lens’s minimum focusing distance from 15 feet to 3½ feet. ★★★

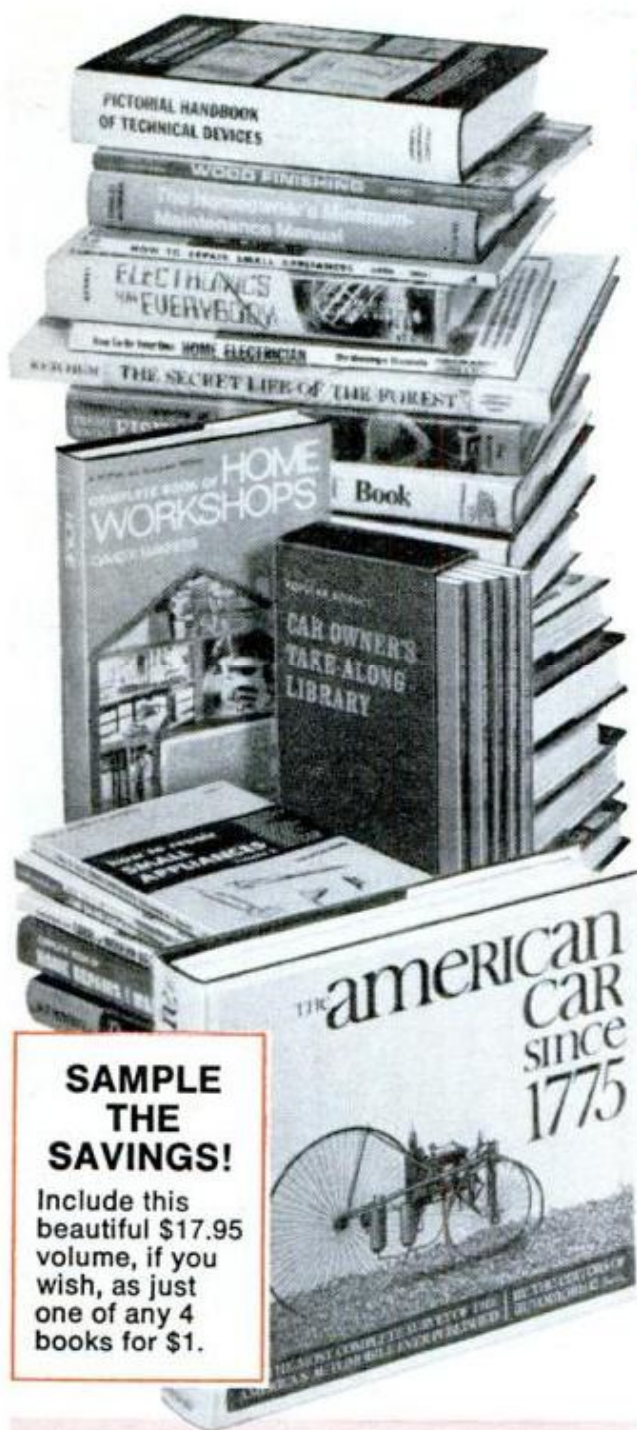


Multiply a lens’s focal length six times, as you do when switching from a 50-mm normal to a 300-mm telephoto lens, and it’s like moving six times closer; 300-mm shot (right) gives “close-up” view, compared with 50-mm shot (above). Equivalent area (box) of 50-mm shot would show same perspective if blown up to same size as 300-mm shot, but would also have less sharp detail and six times as much grain.





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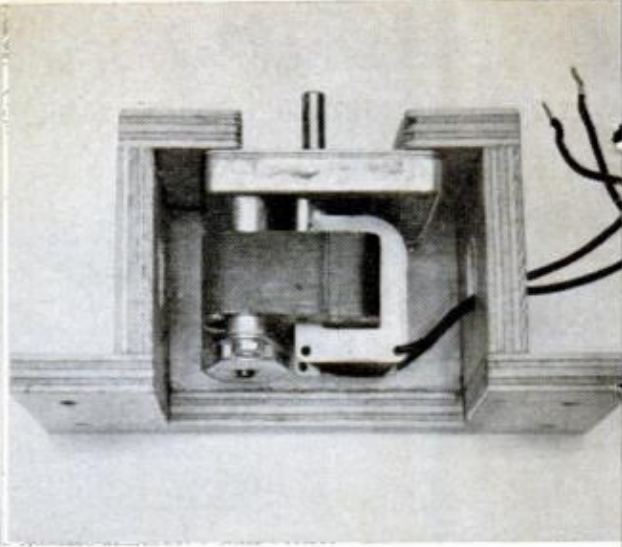
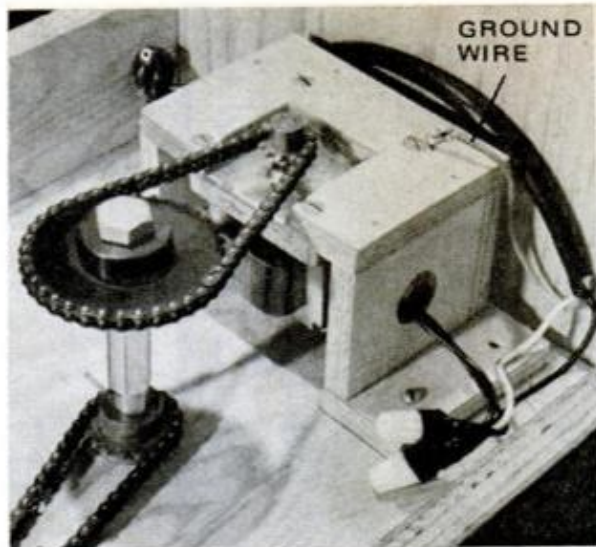
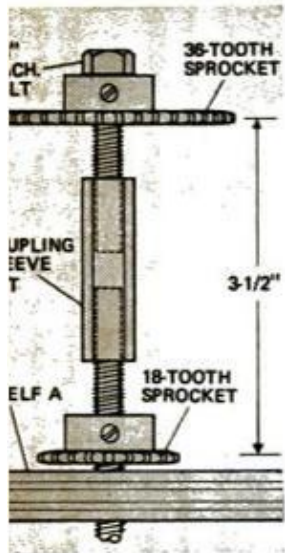
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Extension on axle of first column is fitted with 36-tooth sprocket to reduce motor speed, column rotation.

The 7-rpm motor is suspended in wooden holder by inserting four screws in tapped holes in gearbox frame.

## OUTDOOR GREETING CARD

(Continued from page 188)

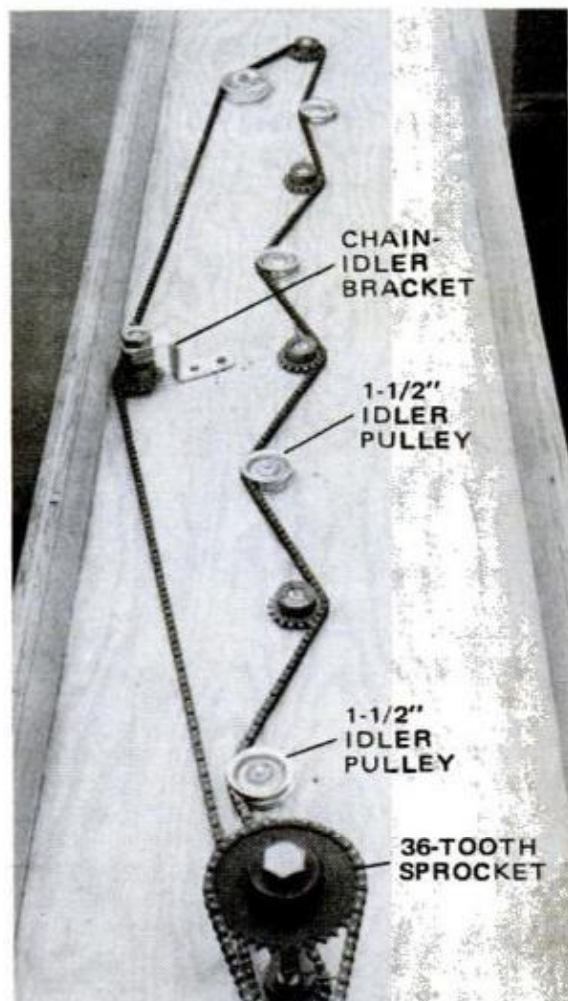
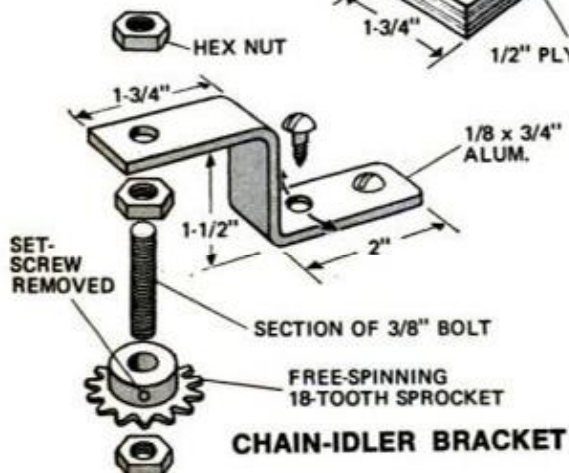
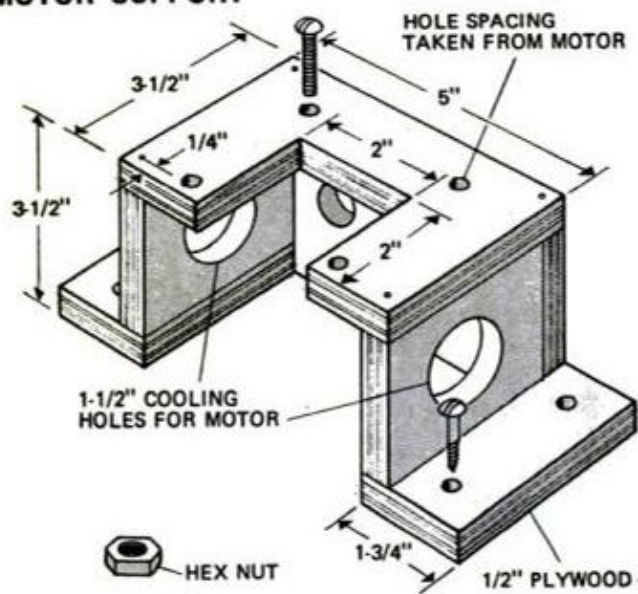
steady the unit. Attach cleats to the inside of the frame. Paint the inside walls black before inserting columns. To install the columns, you need only to drop the lower bolts with bearings secured into the recess.

The top shelf is then lowered into place over the upper bolts and upper bearings dropped into place.

The sprockets have setscrews that will grip the threaded surface of the bolts adequately for the initial setup, but for continued running it will be necessary to pin

(Please turn to page 204)

## MOTOR SUPPORT



Idler pulleys keep chain in place on sprockets. Idler sprocket on bracket controls chain tension.



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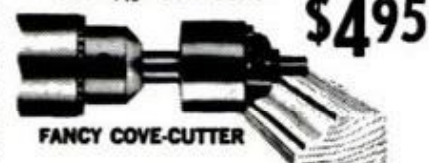
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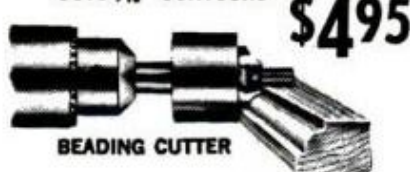
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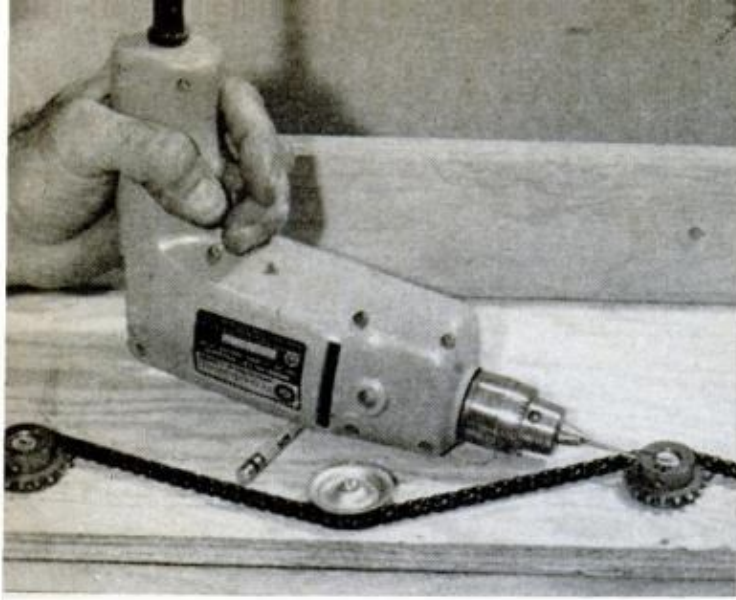
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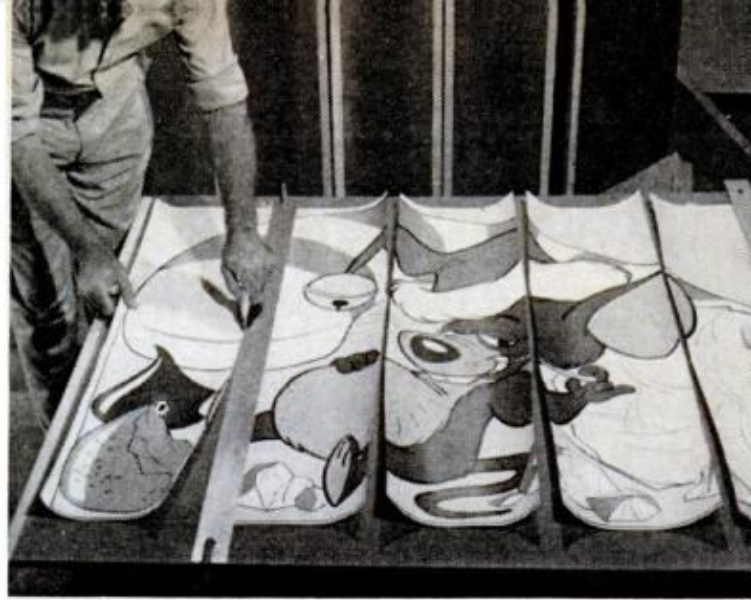
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When columns are lined up "in phase," a hole is bored in each sprocket and bolt, then locked with nail pin.



Posters are cut in 10-in.-wide strips on flat surface by running knife along clamped metal straightedge.

## OUTDOOR GREETING CARD

*(Continued from page 202)*

the sprockets to the bolts. This can be done with nails. Predrill  $\frac{1}{16}$ -in. holes in the sprocket hubs at a slight upward angle, using the drill press for best control. The angle is necessary to permit clearance for the portable drill which must be used to continue the holes "on location."

Use pressed metal pulleys for idlers which are removed from the casing of ordinary clothesline pulleys, obtainable at hardware stores. Try to get  $1\frac{1}{2}$ -in.-dia. pulleys; however, the size is not critical. The groove width must be large enough, though, so the chain will ride inside (about  $\frac{3}{8}$  in. will do). Weave the chain over and under as indicated, then grind off the rivet at one link to allow use of a connecting link. Set up the idler sprocket bracket with one screw temporarily to let the bracket swing in an arc for adjusting chain tension.

Line up all columns with one face parallel and hold them in place by resting a straight board against them. Tighten the setscrew on each sprocket. Test the column rotation by driving the chain by hand. If they check out okay, drill the pin holes through the sprockets into the bolts. Use a dab of thread-locking fluid or some adhesive to prevent loosening. Insert pins (nails are fine) of the proper size. Incidentally, the sprockets should not rest directly on the wood shelf surface; allow a space of at least  $\frac{1}{16}$  in.

Install the motor in its wood support box and attach the box with one screw temporarily to allow shifting while proper chain tension is achieved. The 10-tooth driver sprocket is available only with  $\frac{1}{4}$ -in. bore so you'll have to rebores the hole to  $\frac{3}{16}$  in. so it'll fit over the motor shaft. (I added a



Work carefully but quickly when applying strips to columns. Press out bubbles, wrinkles in paper as you go.

setscrew at right angles to the original one in the sprocket to prevent loosening.)

Since the 7-rpm motor is a bit too fast, a 36-tooth driven sprocket is utilized to further reduce rotation speed of the columns. This is connected to the shaft of the first column with the use of a coupling nut which allows insertion of an additional bolt. As an option, you can use a long piece of threaded rod for the first column.

The motor has two leads. For safety, connect these to a three-wire power cord with grounding plug. Connect the third wire to one of the motor mounting screws. Plug it in and test run the unit while observing the motions. If the movement is strained, the chain tension may be too tight. Adjust the idler sprocket to relieve it. If rocking occurs between columns, the

*(Please turn to page 206)*





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## OUTDOOR GREETING CARD

(Continued from page 204)

cause is most likely insufficient tension. There is a happy medium and you will find it only by experimentation. Too much tension puts a strain on the motor. When tension is corrected, insert the second screw and fix the position of the idler bracket.

Cut and mount the posters next. Since the width of the combined picture area of the columns is 50 in., you'll need the posters cut into five 10-in. strips. The Drummer Boy Poster is a bit taller and wider than the others; trim off the excess white on the top and bottom so it, too, measures 42½ in. high. To get the 50-in. width, you'll be cutting off about an inch of the scene at each end. Clamp a metal straightedge and cut the strips continuously. Do not remove any paper between strips!

The posters can be mounted as per the manufacturer's instructions using plastic resin glue. Line up the strips along one edge of the column, then press to make contact, working gradually toward the other end. Work out any wrinkles or bubbles with a padded cloth as you go along.

To finish the project, you'll need a facing frame which can be made in one piece with lap joints. Glue and nail this into place leaving 2¼ in. of the base exposed at the bottom. A strip of hardboard with message spelled out (or cut from posters) can be inserted while the top is removed. Replace top, then add the hardboard back panels, one piece for the large area, a separate one across the top. These are screw-fastened. The base is also made as a separate unit and attached with screws. ★★★

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(Continued from page 177)

gether; a single ⅜-in. capscrew is used to mount the attachment to the sander.

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**MOTOR HOMES**

(Continued from page 113)

range. The refrigerator is all-electric a.c./d.c. There is a 25x25-inch closet and three good-size wardrobe drawers. The molded fiberglass bath is 37 x 44 inches with a 42-inch vanity sink. The rear bedroom which converts to a dinette, has a 6-foot 6-inch bed, which is 48 inches wide (6 inches shy of standard double width.)

The GMC Motorhome comes in 23 and 26-foot models, six exterior colors, 15 different floor plans and a choice of four interior decors.

The base price for the 23-foot model is \$13,545; \$14,545 for the 26-footer. There is a long list of options, (most of which are "standard" on the FMC) but according to GMC "a very well-equipped" 26-footer costs about \$19,000.

We didn't have the GMC long enough to test it in anything but moderate crosswinds, but established that it doesn't shudder or wander when blasted by passing trucks and buses.

Averaging 50 mph on a windless day, but with the airconditioner running constantly we showed gas consumption of 10 mpg—by no means a bad showing since we had been accelerating freely on a number of steep grades without giving a thought to economizing on fuel.

Six-wheel braking—discs on the front, drums on the rear—makes this a sure-footed rig. The 455 engine makes it nimble and quick; the low center of gravity and suspension makes it stable—all in all, a delight to drive for hours at a time.

We found that the GMC has excessive rear overhang (technically, an acute angle of departure) that will cause a lot of scraping on parking-lot ramps and driveway entrances. The lowest point is the exhaust pipe of the motor generator; a lot of these will be dinged.

The bath lacks a skylight and is vented by a single fan. It may give some people a sauna, others claustrophobia.

Standard-size people will not be completely happy with the 48-inch-wide double bed.

But the shortcomings of both the FMC and GMC are few and easily corrected. Both have set new standards of performance and safety for the industry. It is to be hoped that both will soon produce smaller, lower-priced models that maintain these standards. ★ ★ ★

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## FOUR-CHANNEL HEADPHONES

(Continued from page 153)

speakers are mounted facing each other instead of aimed directly at the ear; and Fixler has included some electronic circuitry which produces a definite four-channel effect, including the location of instruments behind the listener. In fact, in a listening comparison between the Fixler phones and a good four-channel speaker setup, we found the placement of instruments virtually identical—well outside that narrow band inside one's head. The sensation was exactly that of listening to a good four-channel speaker array.

Fixler has no plans to manufacture the phones himself. Instead, he's been talking to most of the major headphone manufacturers about licensing them to produce their own models using his patents. One of the first to accept is Teledyne, whose product shortly will be available from Olson Electronics for about what you'd expect to pay for any other four-channel phones.

Are the four-channel phones worthwhile? Before laying down your hard-earned cash we'd suggest you try a listening test or two of your own. Find a dealer who's able to demonstrate the phones both with matrixed four-channel (Columbia or Vanguard SQ, or QS discs from Project 3, Command, Dunhill, Impulse and other labels) and CD-4 (RCA and Warner-Elektra-Atlantic). Pick a type of music with which you're familiar, if possible, and make sure that the CD-4 and matrix discs are of the same type. (For example, don't compare classical music on CD-4 with matrixed rock.) Don the headphones and listen. If there's a two-channel/four-channel switch, flip it once or twice to compare.

Can you locate the various instruments? Is there more spaciousness and life in four-channel than when the same music is heard in two-channel? How wide and how deep does the quadrasonic stage seem to be? Is the bass clean and natural, and is there plenty of it? Are the midrange and high frequencies clean and crisp? Finally, how does the headphone experience seem to compare with listening to the same music through four loudspeakers in the dealer's listening room?

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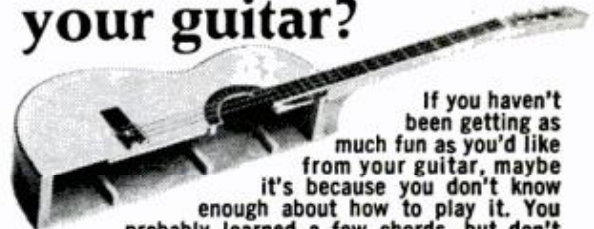


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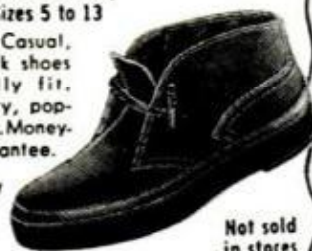
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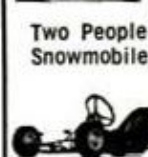
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(Continued on page 219)

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(Continued on next page)



## BUSINESS OPPORTUNITIES

(Continued from preceding page)

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**SELL Books by Mail 400% Profit!** Associated, Box 123 PM, Wenonah, New Jersey 08090.

**ROBOTS:** Rea' Talking. Sales Promotional money-makers. Free Details, Orben PR-11, 33 Parkview Ave., White Plains, N.Y. 10604.

**HOW TO EARN AT HOME ADDRESSING ENVELOPES.** Rush addressed/stamped envelope. Midland Gifts, 2047 East Main St., Billings, Montana 59101.

**GREAT NEW GOLDEN OPPORTUNITIES:** Goals getting success kit. Free Details. Orben PK-11, 33 Parkview Ave., White Plains, N.Y. 10604.

**AUTO PARTS STORES FOR SALE!** For Locations and Information Write: G. A. Millinger, 2754 Quincannon Lane, Houston, Texas. 77043.

**\$6,040.00 MONEY BACK PROGRAM.** Details 25¢. Wis. Box 188-PM, Birnamwood, Wisconsin 54414.

**SELL Simple Formula for Making One-Way Mirrors Via Cheap Classified Ads.** Big Orders From Men's Magazines. Formula: \$5.00. Lormail, 518 18th Street, Lorain, Ohio 44052

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**FREE Literature—Start Your Own Mail Order Business At Home.** The Tomlyn Co., Box 614 (K-3), Clifton, N.J. 07012.

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**ADDRESSERS—50 Companies want Addressers.** Send self-addressed envelope. Cal Enterprises, Box 4516-X, Compton, Calif. 90224.

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(Continued from preceding page)

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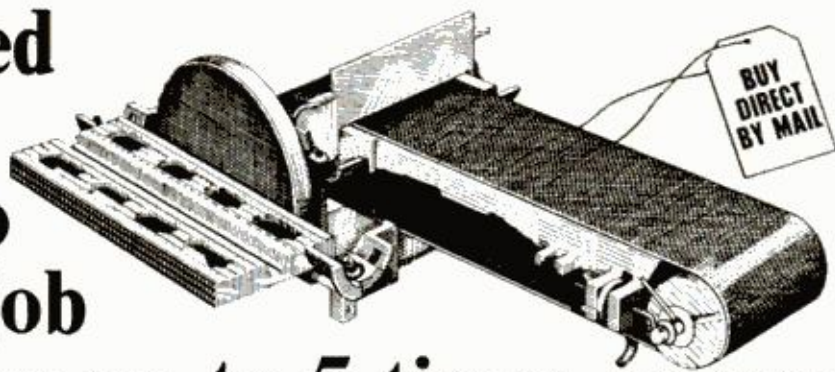
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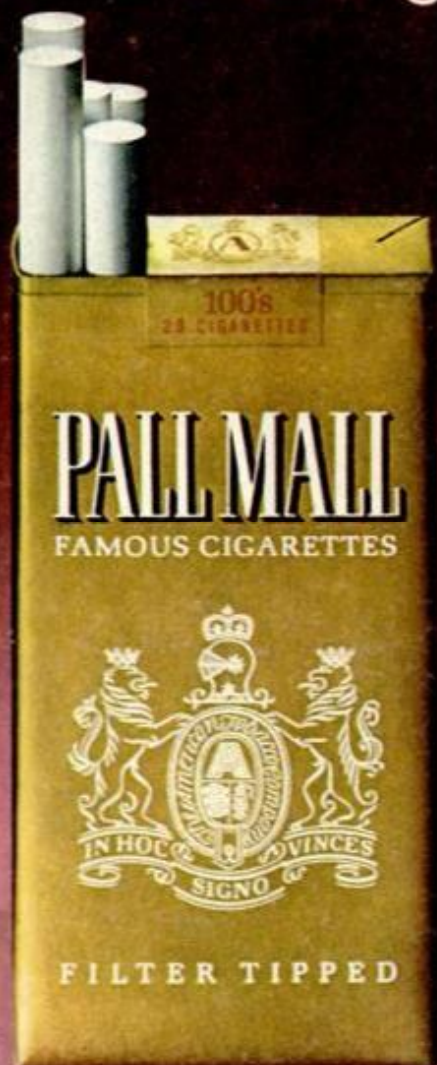
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