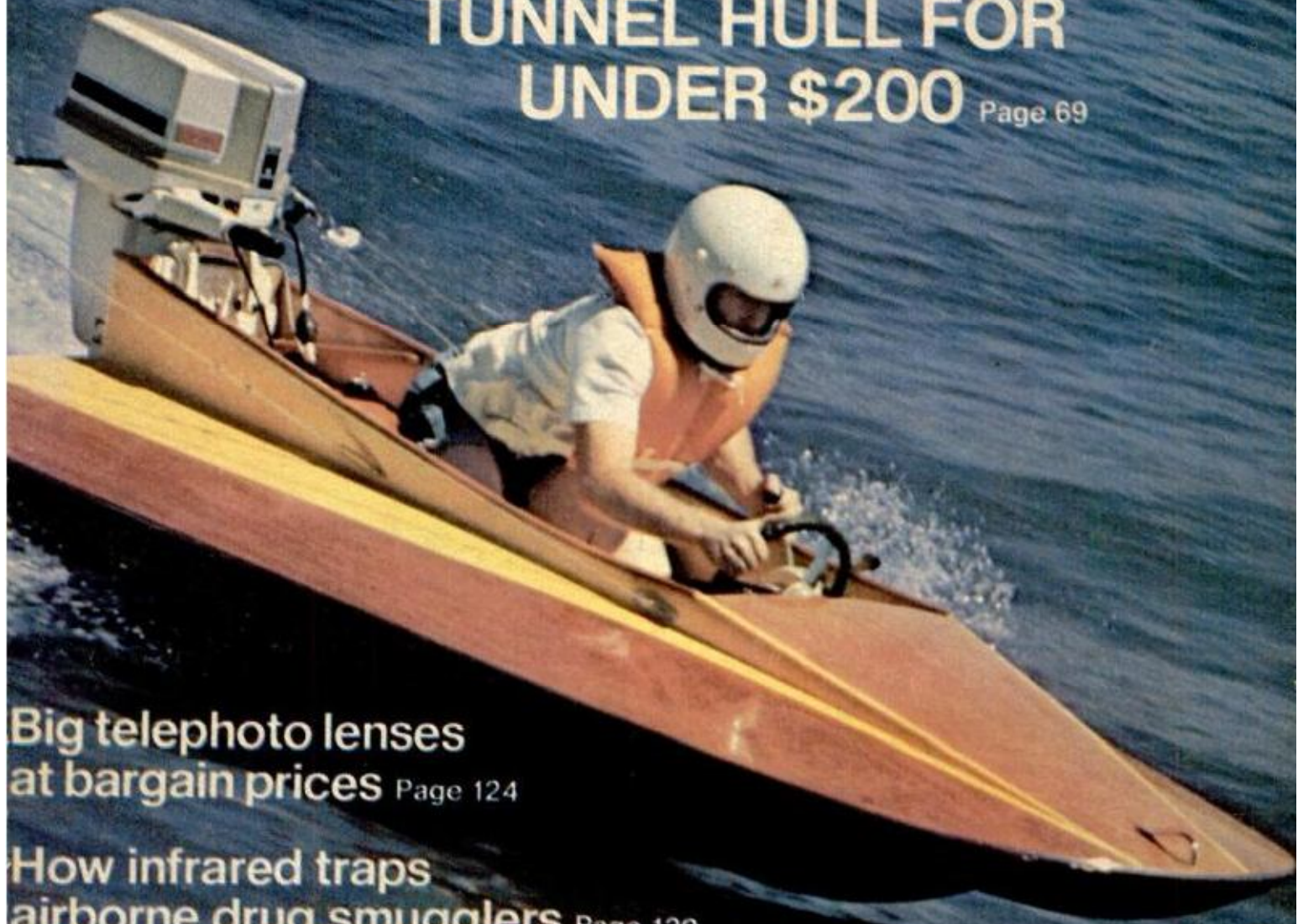


AUG. 1974 60 CENTS

# Popular Mechanics

**BUILD THIS HOT  
TUNNEL HULL FOR  
UNDER \$200** Page 69



**Big telephoto lenses  
at bargain prices** Page 124

**How infrared traps  
airborne drug smugglers** Page 120

**CLIP-AND-SAVE KNOW-HOW:**  
How to repair an electric iron  
How to make wood joints  
How to remove a bearing wall

**FIRST LOOK AT THE '75s:  
CARS GET EXCITING AGAIN** Page 90

# Can you spot the Camel Filters smoker?



CAMEL FILTERS. THEY'RE NOT FOR EVERYBODY

© 1974 R. J. Reynolds Tobacco Co.



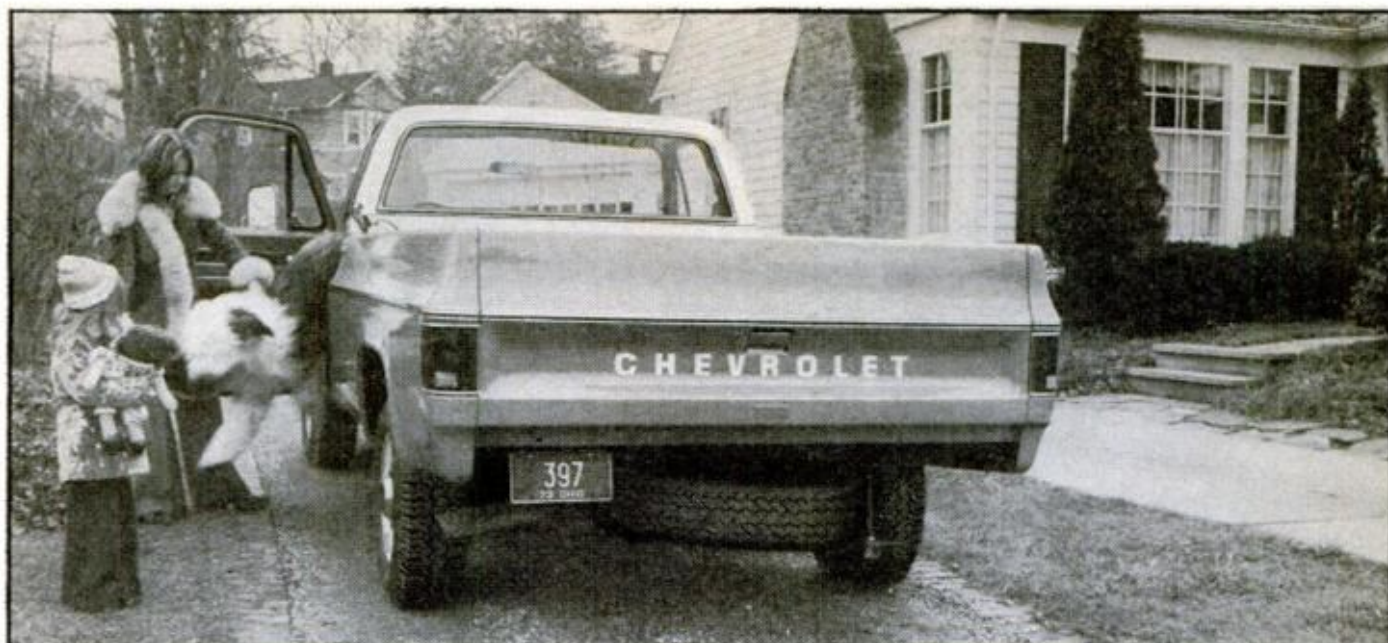
Almost everyone at the beach today has a gimmick. Find the one who doesn't. **1.** Nope. He's Harmon Nee. Gimmick: His singing voice, that sounds like two chalk slates mating. Even his cigarette sings—every time he inhales, its multiple filter whistles "Dixie." **2.** Not Laura Enertia, beach queen. Gimmick: More movable parts than a Swiss watch. Has a waiting list for crew when she surfs. Smokes *Ms.* feminist cigarettes—whose taste just msses, too. **3.** Not "Bull" Gene Biceps. Gimmick: His waterproof makeup. Doesn't always hold arms that way—this morning he mistook spray starch for his underarm deodorant. Smokes his fat cigars down so far, the ashes drop behind his teeth. **4.** No. He's Tyrone Shulace, beach pest. The "58" stands for his I.Q. (He thinks "off shore drilling" is something the Marines do.) Smokes *Huff 'N Puff* superfiltered cigarettes. You have to draw so hard, an art diploma comes with them. **5.** Right. He enjoys the beach, not the beach crowd. Needs no fads or gimmicks in his cigarette, either. Camel Filters. Honest tobacco. Good, rich flavor. **6.** Unidentified frying object.

**Camel Filters.**  
**They're not for everybody**  
 (but they could be for you).



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This One

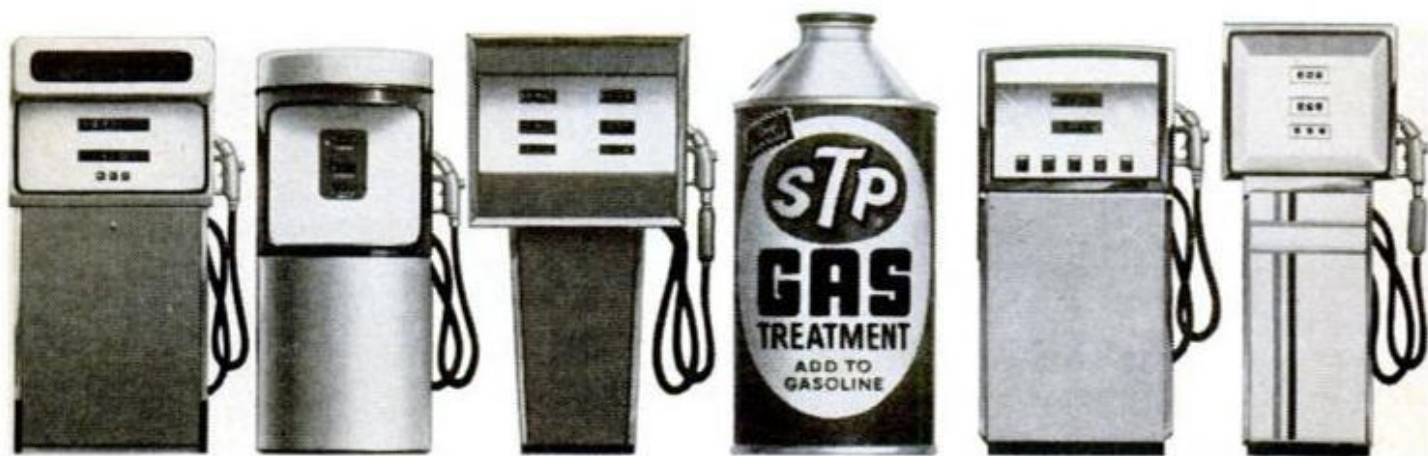


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# Popular Mechanics®

AUGUST 1974 • Vol. 142 No. 2

INTERNATIONAL EDITIONS

Australia, Caribbean,  
Mexico, Southern Hemisphere



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ON THE COVER: Build this 10-ft. flashy tunnel hull for less than \$200 from a \$12 plans-pattern package provided by Glen-L. Photo: Elbert W. Witt

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# LETTERS

## TO THE EDITOR

### Same language

In his April *All Outdoors* (page 56C) Bill McKeown mentions the Missouri Braille Trail with signs along the path "in both English and braille." Ever since your interesting and sometimes exciting magazine was first published in braille, I have been reading it, under the impression that I was reading English. The magazine is transcribed into braille, not translated. "Print" is the term we usually use for that smooth stuff read by you fellows who haven't yet learned to use your fingers.

Anyhow, I was happy to hear that there are braille trails for those who have transportation and guides to get there and back.  
SPOKANE, WASH. WILBUR LANE

### Why the cover-up?

The person responsible for siding that beautiful stucco house with aluminum (*How I Bought My Siding Job*, page 108, June *PM*) should have his deed revoked for desecration of a finely designed piece of property.

I get incensed when I see the number of beautiful homes decorated with fine ornamentation and showing real craftsmanship that get covered over with aluminum or vinyl.

A magazine like *PM*, presumably dedicated to craftsmanship, should hardly laud such an enterprise.

LAWRENCE, MASS. ROBERT K. HARVEY

*Owner John Pearson (PM science editor) explains: "Classic or not, my house needed a major overhaul. When a 3x3-foot hunk of stucco fell, I decided aluminum was safer."*

### Use epoxy, not a drill

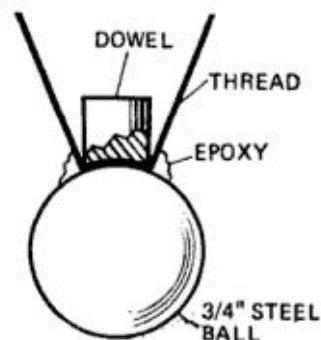
*A Surefire Conversation Piece* (page 152, June *PM*) calls for the drilling of a hole in each of several 3/4-inch steel balls. Presumably the balls are those used in ball

bearings. Such balls are hardened and polished and cannot be drilled using equipment found in most home workshops unless they are first annealed. If this is done, the balls must be rehardened after drilling if the device is to work properly.

SPRING HILL, FLA.

W. G. HENSEL

*Correct. In the case of hardened steel balls, the thread can be epoxied directly to the surface of the balls. Short pieces of dowel, cupped on the end to match the cur-*



*vature of the ball and coated with epoxy, would be placed over the thread to help anchor it. No need for a hole in the ball.*

### Light-traveling vet

As a veteran of over 45,000 miles on a bicycle, I would like to disagree with Eugene A. Sloane in his article, *Best Bicycles and Gear for Commuting, Shopping and Touring* (page 90, June *PM*).

First, bike trailers: I got rid of mine, fast. Too wide for use in traffic.

Second, stoves: a Sterno stove is my choice. No weight at all. Others were too cumbersome.

Third, bicycles: I prefer a Schwinn Sports Tourer. My bike has quick-release hubs. I rigged up a front basket by use of adjustable hose clamps, and I use a rear carrier with side baskets, rigged the same way.

Safety flags: If a crosswind bends one just as a car is about to pass, the car hits

*(Please turn to page 10)*

# Most automatic rifles are as accurate as you are...for at least the first shot. But what about the second? And the third?

Automatic rifle accuracy starts with your ability to recover from the first shot's recoil. Here's how the Remington Model 742 WOODSMaster helps...straight from the men who designed it.

The real key to hunting accuracy with an automatic is its speed of operation. If the rifle ejects and chambers cartridges too quickly (which is often the case), most hunters have a hard time recovering from recoil and barrel whip. If the rifle operates too slowly, a hunter may lose the extra-shot advantage he bought the rifle for in the first place. Somewhere between "too fast" and "too slow" is an optimum. So the Remington designers set out to build a truly automatic rifle with an optimum rate of operation...a rate that would let a hunter make the most of the accuracy built into the rifle. The result of their efforts is the Remington Model 742.

The 742's rate of operation is engineered to help a hunter fire several shots quickly and maintain his sight plane from shot to shot, without changing position or grip. This rate is fast enough to maintain the automatic advantage...yet slow enough to give the hunter a big edge in his recovery from recoil. Which leads up to the second big reason why a rifle's operating speed is important: recoil reduction.

If the rifle mechanism operates too fast, a recoil reduction system really doesn't have a chance to be effective. And if the rate is too slow, it isn't needed because the hunter has plenty of time to recover...at the expense, perhaps, of additional shots. Essentially, the system in the Model 742 operates like most other automatic rifles. But here's where Remington designers used some engineering imagination.

The recoil force is more than required to operate the mechanism...and more than enough to give you a jolt. So by capturing the peak of the recoil force in what Remington designers call an "Inertia Sleeve", that peak recoil force is split. This means you receive a softened initial recoil push.

Now the real advantage is obvious. You're set for your next shot quicker with the 742 than with other types of rifles. And the more experience you have with the 742, the steadier you should become. That means greater control. And greater control means you have a better chance of keeping your sight picture from shot to shot.

Like every Remington rifle and shotgun, the 742 has certain features we think you'll want to know about. Like the "Teflon"-S\*\* coating we've added to interior moving parts. The result is longer wear, smoother operation and easier cleaning. And the artillery-type bolt locks up safe and strong. In fact, the action is so safe and strong that the 742 and its moving parts perform effortlessly despite bad weather. The artillery-type bolt locks up tight with multiple lugs. Three rings of solid steel completely enclose the cartridge head.

A rich blueing, "vibra-honed" parts with a mirror-like finish, Du Pont RK-W wood finish (just about the most rugged finish available) make the 742 owner a proud one.

The 742 comes in five great calibers: 6mm Rem., 280 Rem., 30-06, 308 Win., 243 Win. And you have your choice of an ADL or BDL "Custom Deluxe". The BDL, incidentally, is available in right- and left-hand cheekpiece models. There's an 18½" barrel carbine that's great for hunting in brush, too. All feature black fore-end caps, white line spacers, clip magazines and receivers that are drilled and tapped for scope mounts. Priced from \$194.95\*, the 742 offers a hunter tremendous dollar value. Finally, you ought to know that we test and prove the Model 742 with Remington ammunition. So, if you're after top performance, it makes sense to use Remington ammunition.

This report about the Model 742 WOODSMaster and all other "Remington Reports" are based on information straight from the men who design and engineer every Remington product. For even more details, send a postcard to: Remington Arms Company, Inc., Dept. 694, Bridgeport, Conn. 06602, for a copy of our free 1974 full-color Remington catalog.

Get a great belt and buckle from the great ammunition people. In dark brown latigo leather by SWANK, 1¼ in. wide. Specify Small (30-32), Med. (34-36), Med. Large (38-40), Large (42-44). Send 2 box tops from any Remington ammunition and \$5.95 to: Remington Arms Company, Inc., Dept. 695, P.O. Box 9500, Bridgeport, Conn. 06602.

Offer good in U.S.A. only. Expires May 31, 1975.

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## LETTERS

(Continued from page 8)

it and the bicyclist winds up on the concrete. They're strictly no-no for me.

**Tent:** Not needed. A 6-mil tarp, 9x12 feet, can be rigged with use of aluminum sectional tent poles and pegs. A 6-mil tarpaulin can also be used as a sleeping bag. A double thickness can keep one warm in very cold weather; with a sleeping bag inside, the tarp is very comfortable.

**Mess kit:** You pictured too much mess kit. An old GI mess kit serves; I travel alone and don't need much. Water purification tablets are a must.

Most weight should be carried on the front of the bike. I broke a lot of spokes in my rear wheel before learning.

BILOXI, MISS.

MERLEN TERWILLIGER

### Don't sandbag your camera

In *Sandbag Steadies Tele Lens* (Photo Hints, page 62, May PM) you recommended a sandbag to help steady a telephoto lens. The idea is good, but the sandbag—never. Too much danger of a small leak in the bag, and sand can wreak havoc with a camera shutter. Use instead a bean-bag, corn-bag or lead-shot bag—anything that is too large to get into the camera mechanism.

GOSHEN, IND.

VIRGIL BRENNEMAN

### How to protect a speaker

In *Those Monster Power Amplifiers: Not Louder but Better* (page 133, April PM) you spoke of wiring a fuse in series with a speaker to protect the speaker.

I have an 80-watt amplifier with two 50-watt, 8-ohm speakers. I wired the speakers with the proper size fast-blow fuses, and the fuses would not blow. I then came on down the line to a 1-amp. fuse—and with volume at maximum, the fuse still would not blow.

I still would like to protect my speakers; what am I doing wrong?

SPRINGFIELD, ARK.

MICHAEL A. ROSSI

*Speaker line fuses—like those in house wiring—should seldom blow if all is well. The recommended fuses should blow only when the amplifier is delivering more power than the speakers can handle (which,*

*as the article pointed out, should seldom happen). If your "80-watt" amplifier is delivering 40 watts per channel and you have one speaker on each channel, it might well be impossible to blow your speakers or your fuses with it.*

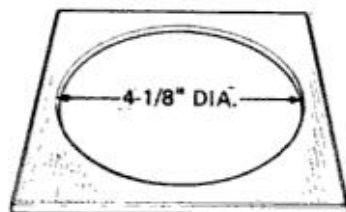
*But the fuses, even so, are a cheap precaution against a potentially expensive accident.*

### Enlarge that window

The window you show in *Patience . . . a Game to Test Your Cool* (page 162, May PM) is too small. It has to be  $4\frac{1}{8}$  inches in diameter, not  $3\frac{1}{8}$ . Otherwise, it's a cool game.

CHICAGO

E. PICKETT



*Yup, here's the way that drawing should look.*

### Don't use rubbing alcohol

In *How to Clean a Tape Head* (page S84, Car Care Guide, May PM) you instructed people to use rubbing alcohol to clean tape heads and capstans on car tape decks. Rubbing alcohol should not be used on capstans because it contains glycerine which can damage the rubber. Pure isopropyl alcohol can be obtained at druggists.

HUNTINGTON, N.Y.

KEITH THOMPSON

### Alive and well

I recently purchased, used, a Shopsmith power tool—combination power saw, drill, sander and so on.

I have been unable to locate the plant which manufactures these machines. I'd like to buy some accessories.

Do you know if the corporation is still in business? And the address?

EAST AMHERST, N.Y.

HAROLD A. MAY

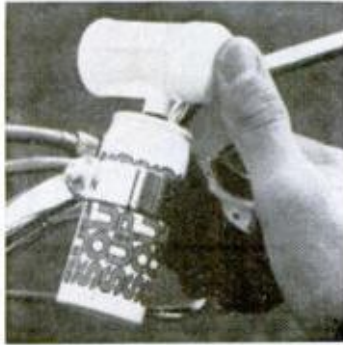
*This is a request we receive regularly. Apparently a lot of those handy convertible*

power tools are still going strong all over the country. You'll be glad to know that Shopsmith people are alive and well in Ohio—specifically at 320 North Second St., Box 32, Tipp City, Ohio 45731.

at local bicycle or sporting goods stores.  
A-M-S ADVERTISING STAN PEARLMAN  
NEW YORK

### Here's one that's ready-made

I noticed in *Hints From Readers* (page 154, June PM) a suggestion for using hose clamps to mount a SuperSound mini air horn on the handlebar of a bicycle.



Our client, Falcon Safety Products, the manufacturer, is already selling such a handlebar clamp, which should be available

### Hutch-table for his daughter



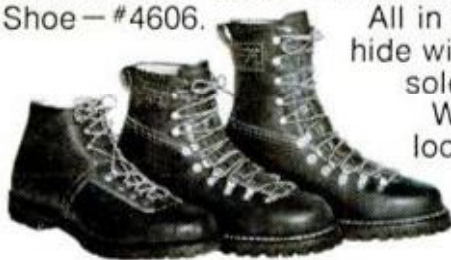
I made *An Early American Hutch-Table* (page 96, July '73 PM) from plans in the magazine. I made it smaller for my daughter, with little modifications like one drawer. I also made two little chairs. A great idea and a great plan!

ST. HUBERT, QUE.

FRANCOIS PAQUET

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FREE CATALOG

# Vortex film-washer swirls hypo away

by Robert E. Lewis



**Materials used** include a 50-ounce Tupperware container, marine epoxy resin, short length of 1/2-inch plastic pipe, 1/2-inch wash hose, hose coupler, two nails, silicone grease, top of pill vial and some Pliobond or similar waterproof cement.

**T**he longer you wash your just-developed negatives, the less hypo will be left to contaminate them—but the greater the chance will be that the wash-water's temperature will change, causing increased grain or reticulation. Here's a washer that's turbulent enough to shorten your wash time, and one you can build pretty quickly, too.

The shell of the washer is a 50-ounce Tupperware container, big enough to hold two 120-size, 3 1/2-inch stainless-steel reels—or about four 35-mm reels.

First step in construction is to drill a 3/4-inch-diameter hole in the container's side, with its center 5/8-inch above the container's bottom. Cut a 1/2-inch plastic pipe a bit longer than the container's diameter, and seal one end tightly (I used a medicine vial cap, cemented into place with Pliobond).

Now drill two 1/8-inch holes in the pipe, angled 90° apart, and separated by a distance of 1 5/8 inches (more, for larger con-

tainers). The holes should be positioned so as to be equidistant from the container's center when the tube is inserted, sealed-end first, through the 3/4-inch hole. With the Tupperware container I used, that means the first hole should be 3/4 inch from the sealed end, the second one 2 3/8 inches from that end. Now insert the tube, sealed-end first, into the hole.

Cut two 8d nails, 1 1/4 inches from their pointed ends. Coat each nail *thoroughly* with silicone grease or water pump grease, and insert them, point first, into the small holes in the pipe. Then position the pipe so that both nails point up at 45° angles, as shown on page 14. Once the pipe is positioned, seal the hole in the container wall with Pliobond.

The next step is to pour in marine epoxy (the type used with fiberglass boat covering), until it covers the top of the pipe to a depth of about 1/8 inch. Before doing so,

*(Please turn to page 14)*

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**WEAVER SCOPES**  
The Great American Scope.



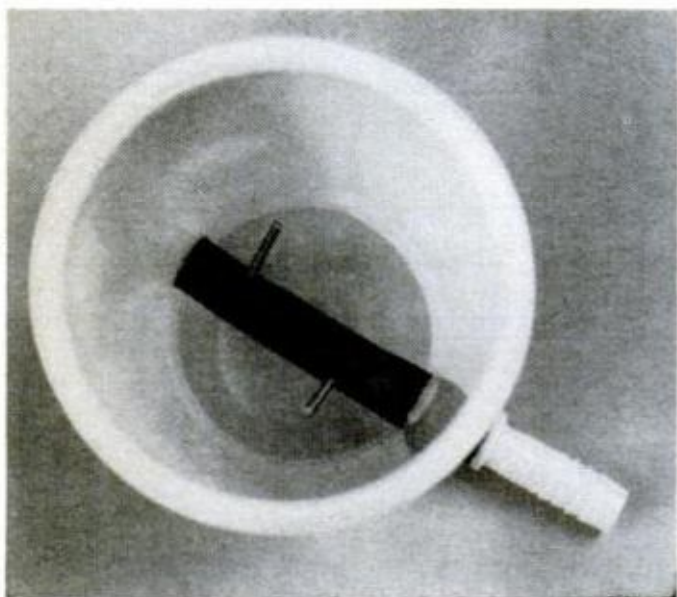
## VORTEX FILM-WASHER SWIRLS HYPO AWAY

(Continued from page 12)

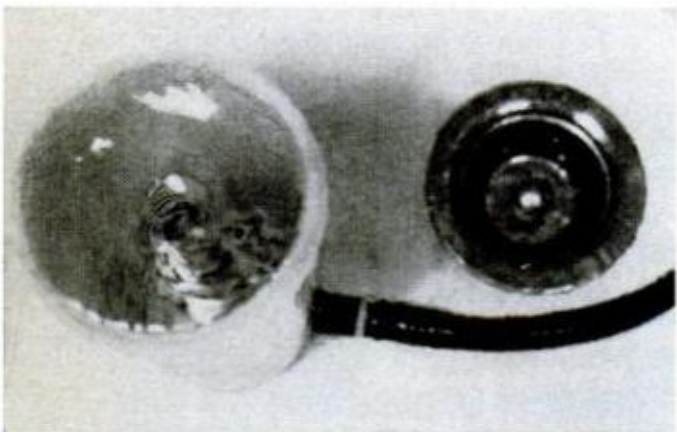
be sure that the pipe's sealed end and the hole in the container wall are thoroughly sealed, and that the nails are tightly seated in the holes, to keep epoxy from leaking into the tube assembly, or out of the container. It's also important that the nails be well greased, so that the epoxy won't stick.

Follow the epoxy's mixing directions carefully. If you use too much hardener, the epoxy will set before you have a chance to use it; if you use too little, it will never harden. Stir gently when mixing, to avoid beating air into the epoxy; some air will get in anyway, but won't affect the washer's utility.

It's best to pour the epoxy in several



Container here has pipe and nails installed and properly positioned, hole sealed and coupling inserted into pipe. Epoxy will later cover this assembly.



Epoxy should be poured in layers (right), eventually covering pipe to a depth of  $\frac{1}{8}$  inch, and should cure for several days before the greased nails are removed. Removing the nails leaves oppositely-angled  $45^\circ$  holes in the epoxy "floor" through which water swirls energetically (above) washing film free of hypo.

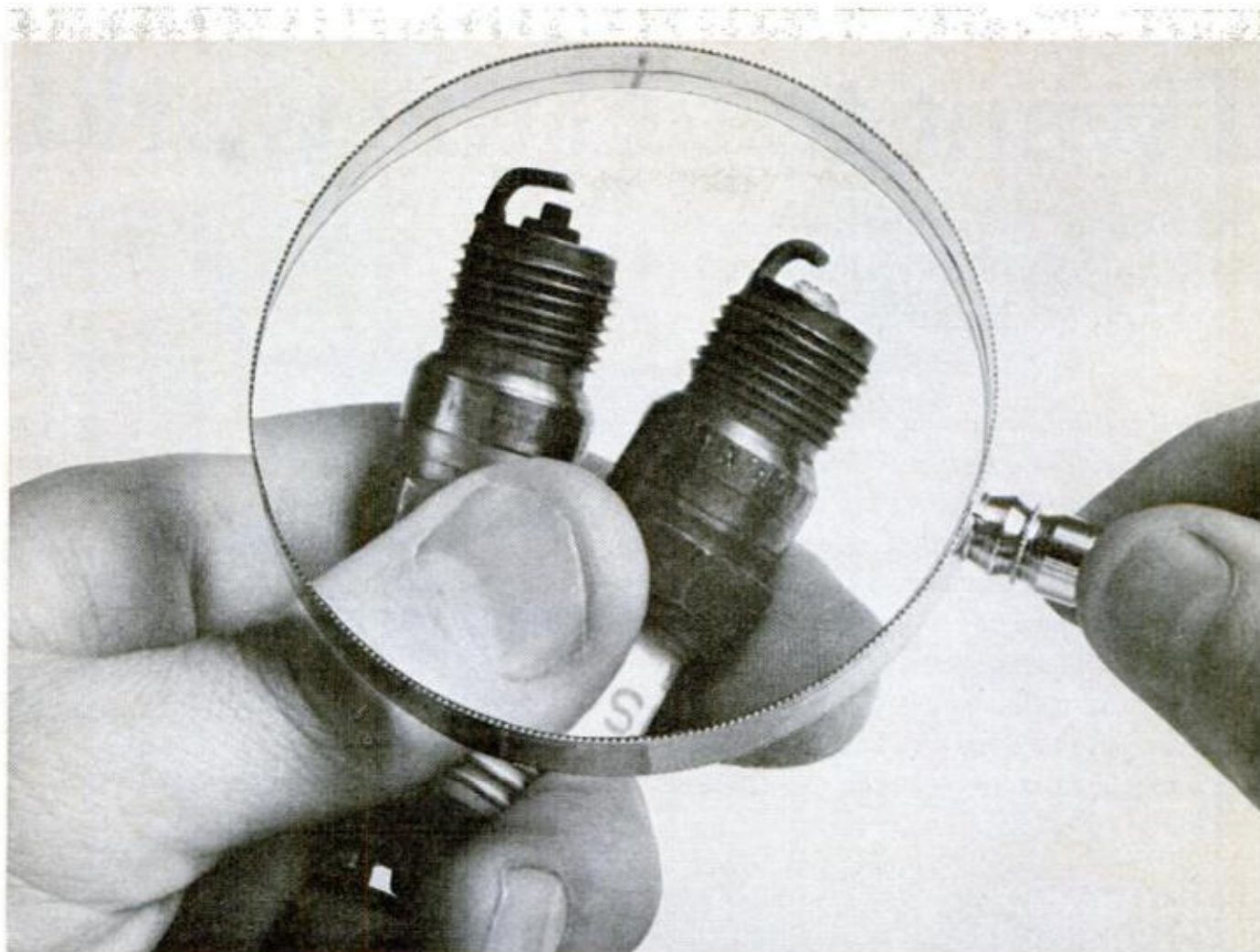
layers, allowing each to set before pouring the next. Keep adding layers till the plastic tube is covered. My particular unit required  $6\frac{1}{2}$  ounces of epoxy, applied in three layers.

When the last layer has had a few days to cure, grasp each nail with a pair of pliers, and work it out with a pulling, twisting motion. It may be necessary to deburr the openings of the nail holes, using a hand-held,  $\frac{1}{2}$ -inch high-speed drill bit.

Insert a  $\frac{1}{2}$ -inch nylon coupling into the open end of the plastic pipe, and connect a hose of appropriate length between the completed washer and your faucet. Before using your washer for the first time, it would be a good idea to run warm water through it for 15 or 20 minutes to remove dirt, epoxy shavings and other debris, which might otherwise be deposited on your first roll of film. Note how the two angled holes left in the epoxy by the nails' removal swirl the water around in a vortex, for maximum washing action effectiveness. ★★







## Take a good look at this pair of old gas robbers —and remember to tune up with AC Fire-Ring Spark Plugs

These robbers you see through the magnifying glass are both guilty of stealing gasoline. The one on the left ran too cold to burn off the carbon deposits. The one on the right ran too hot and rapidly eroded the electrodes.

But regardless of the reason for misfiring, each is guilty of wasting gasoline—perhaps as much as 12 percent in an eight-cylinder engine. And this figures out to nearly 2½ gallons in a 20-gallon tankful.

So, if you are plagued with gas-robbing spark plugs, look to AC. AC has the spark plug to match your kind of car and your kind of driving. Even if your kind of driving has changed, insist on AC Fire-Ring Spark Plugs. Beat the gas robbers, tune up today.

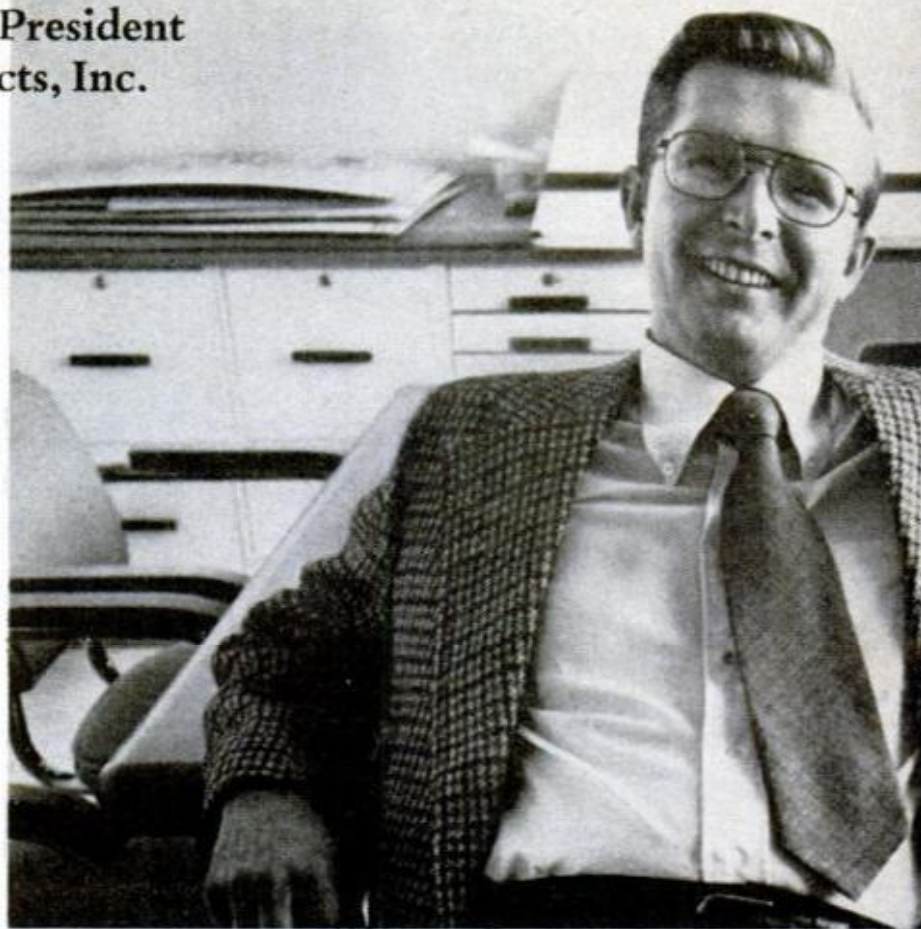


AC SPARK PLUG DIVISION OF GENERAL MOTORS CORPORATION

# "My success in business I want to tell the world"

By Ronald K. Jakubas, President  
Jackson Flexible Products, Inc.  
Jackson, Michigan

*Most successful men rarely take the time to thank those who helped them on the way up. But Ronald Jakubas wanted to do even more. He wanted to tell the world how he got started on his own personal road to success. And why he recommends that same road to anyone who wants to get ahead in life.*



Ten years ago, I never would have dreamed that I would be where I am today—President of my own manufacturing firm. And living the kind of life I've always wanted to lead.

It all started right in my own home, just eight years ago. When I made a decision that changed my life.

#### **He wanted to succeed**

Ever since I was a teenager I wanted a job that gave me recognition and responsibility. I wanted to be rewarded for my efforts. I wanted to be a leader, not a follower.

#### **College was no answer**

Like a lot of my friends, I felt that I needed a college diploma. But being in love with my high-school sweet-heart, I got married. And with a family to support, going back to school was out of the question.

I accepted a job that would take me a long time to get anywhere—and every morning as I drove to work, I told myself there had to be another way to get ahead.

#### **Picking the right career**

I started looking around and

saw that some career fields were better than others. Men who were Accountants, Electricians, Engineers—they all seemed to enjoy their work and make considerably more money. Due to my interests, I decided to be an Engineer. When I asked my boss how I could become an engineer without giving up my job, we had a long talk. And when he found out that I wasn't kidding around, he said there was a place for men like me—ICS. Because they had a reputation for training men who wanted to get started in a new career while holding down a full-time job.

#### **Getting the right training**

That was the first time I had ever heard of ICS, so I checked it out. I found that ICS training was respected by almost everyone I talked to. And after calling several companies in the Jackson area, I found that not only did most accept ICS diplomas, some actually preferred ICS graduates. So I enrolled. And ICS started teaching me Engineering—in my spare time. In my own home.

#### **The doors start to open**

Even before I finished my ICS home-study program, things started to happen. Doors began to open. I received two promotions. The promotions naturally got me raises and a chance for still further promotions. And by using my ICS course books as a guide, I passed the state examination in Michigan for Registered Professional Engineer.

I was really on my way, and I had earned my stripes in my spare time, without sacrificing my job or my family. Now I wanted to succeed in a business of my own.

Well, ICS had taught me Engineering inside-out, but what did I know about Accounting? Marketing? Advertising? Promotion? Billing and Computers? About all the things you need to succeed in today's business world? So of course I turned again to ICS for this much needed knowledge.

#### **Starts own business**

The ICS Business Management course helped instill confidence, knowledge, and self-assurance which

# started at home—and how I did it..”



enabled me to make my business a real success. My company, Jackson Flexible Products, Inc., specializes in custom molded rubber products and bonded rubber to metal parts for Aircraft Suppliers, Cylinder Manufacturers, and many other industries.

Now I enjoy life. I enjoy my freedom. I enjoy entertaining clients. In short, I enjoy having the kind of business that a man can be proud of. And I have almost everything I want. Respect. Vacations. Financial security.

### The road to success

You hear a lot these days about how bad it is in today's business world. That everything is going down the drain. And how things aren't what they used to be. Well, for some people that's true. Because some people want all the goodies in life without ever doing anything to deserve them.

But when I meet a man who really wants to get ahead, and is willing to work for it—even if he can't go to college, I tell him not to worry. America is still the greatest country on earth, where you can choose a career

you really like—and with ICS helping every step of the way, you have the same chance to make it that I had. It's so easy to get started. ICS even sends you a free career guidance booklet for the field of your choice. And a free demonstration lesson that shows you why getting started on your own road to success—the ICS way—may be easier than you think.

Yes, I'm proud that my success in business started at home—with ICS. And I want the world to know how I did it.

*Ronald Jakubas is just one of the more than eight million men and women ICS has started on the road to success, since 1890. His ticket was Engineering and Business Management. Yours may be Accounting, Auto Mechanics, Air-Conditioning, Electronics, TV Repair, etc.*

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## CAR CLINIC

BY MORT SCHULTZ

### Heat for a van

*I recently purchased a 1974 Chevrolet 12-passenger van. I can't get the heater to put out enough heat to keep people in the rear from freezing. I understand that Chevy does not make an auxiliary heater. Is one made by another company that I can use?—Don M. Breiner, Trenton, Ill.*

Chevrolet does make an auxiliary heater for your van, but your Chevy dealer may not have it listed in his parts book. The part number is 339860. If the parts person tells you he has no such number listed, explain that is a good number and he should use it to "special order" the auxiliary heater from Chevy.

### Oil-pressure loss

*My 1968 Plymouth Fury III (318-cu.-in. engine) has been giving me an oil-pressure problem. I replaced the oil-pressure sending unit and gauge, main and rod bearings, and oil pump, but nothing has made a difference. At idle, pressure is 0-5 pounds. At 60 mph, it's 20-30 pounds. Can you help me?—Garlan Hulbert, Lewiston, Minn.*

At the front of the engine, beneath the timing case cover, is a camshaft plate held by four bolts. The two top bolts extend into the main oil gallery. One of these has a hole drilled in its head so oil can feed to the camshaft sprocket. If the heads of these bolts have broken off (they are brass), there would be a sharp reduction in oil flow to the sprocket and, thus, in oil pressure. (Normal pressure for this engine is 20 pounds at 500 rpm and 45-65 pounds at 1000 rpm and above). If you have to replace the bolts, be sure you get the exact same type. Any other size could put a drag on the camshaft sprocket.

### Coolant catcher

*May I offer a word of advice to Buick Skylark owners who are losing coolant (Car*

*Clinic, March '74 PM)? I had the trouble and performed all tests you suggested. Nothing. Then I installed an overflow tank you can buy from a dealer or auto parts dealer. It "catches" overflow, which is apparently occurring because of a "normal" buildup of pressure. Tank and hoses are relatively inexpensive and can be installed easily by anyone.—D.C. Rieper, Altoona, Pa.*

A good tip, and one we should have mentioned in our reply.

### Hard panic stops

*I have a 1968 Plymouth Fury III with power brake. Under ordinary stopping conditions, the car brakes normally. However, if I push the pedal the least bit hard, the brakes lock up. I've been to garages, but no help. Can you tell me what's wrong?—Larry Trent, Easton, Pa.*

Several things are possible. You could have a weak brake line that is collapsing under pressure. The vacuum hose from the engine vacuum port to the brake power-assist unit may be collapsing or leaking. The power unit itself may have a vacuum leak, a plugged vacuum fitting or a diaphragm out of position. If you can't find something wrong on the "outside," you should have the power-assist unit removed and opened up for possible repair.

### The octane numbers game

*The octane numbers on gas pumps have me confused. My owner's manual tells me to use regular grades of gasoline having a 91-octane rating. Regular gasoline I've been using is posted at 90. If I want higher, I have to switch to premium. What gives?—Burt Mondale, Linden, N.J.*

The posted octane number is the average of the octane rating derived by two methods: research and motor. The result is a number lower in value than the research

*(Please turn to page 22)*



## Get in the swing to KOOL

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fashioned comfort of Kool's own Lawn Swing. Lightweight, sturdy and durable, it's made to last. And it's yours for only \$119.00 and an end flap from any carton of Kools.



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

Kings, 17 mg. "tar," 1.3 mg. nicotine; Longs, 17 mg. "tar," 1.2 mg. nicotine, av. per cigarette, FTC Report Mar. '74

## CAR CLINIC

(Continued from page 20)

octane number, which is the one that is commonly published in automobile owners manuals.

The research number defines the octane of gasoline according to laboratory test methods. The motor method defines octane rating by actual in-engine use and is lower numerically than the rating derived by the research method.

The posted octane rating is obtained by adding research and motor numbers and dividing by two. Hence, gasoline that has a research octane rating of 94 and a motor octane rating of 84 has a posted octane rating of 89 ( $94+84=178 \div 2=89$ ).

As for me, I will use the "old-fashioned" way of determining whether the gas I use is suitable. If it causes the engine to ping, I switch—if not, I stick with it.

### Buzzing Hornet

*The car is a 1972 Hornet Sportabout*

*with a 304-cu.-in. engine and automatic transmission. The problem is spit, sputter and stalling on cold mornings at slow speeds. Tune-ups by the dealer result in a fine-running car, except for severe ping on acceleration. A check of ignition timing shows the dealer advanced timing to 10° BTDC from a "book"-specified 5° BTDC. Must I live with either the ping or the stall? Is there no other way?—Len Kelly, West Caldwell, N.J.*

The first thing to do is check your engine code. Is it lower than 501 (H or N) 28? If it is, then the cure for your problem might be to have an improved thermostatically controlled air-cleaner system (part No. 8122125) installed. You should refer your dealer to service technical bulletin 4, 7200 series, group 4.000 (2/29/72).

If your car does not fall into this category, set the timing to specification and check for a sluggish distributor centrifugal-advance mechanism, a faulty distributor vacuum-advance mechanism, and a sticky or misadjusted automatic choke. The cause of your trouble probably is in these three areas.

## SERVICE TIPS

■ **If your car or truck overheats** and it's a 1971, 1972 or 1973 Chrysler Corp. model, return it to your dealer. As we reported in the past, radiator-solder corrosion, rust and scale are probably causing the trouble. Chrysler has issued a series of instructions to solve the problem. The primary step is to rod out the radiator core. However, if this had been done and overheating recurs, Chrysler dealers have new instructions that involve use of a more potent antifreeze-to-water ratio, addition of a rust resistor and installation of a coolant reserve tank.

■ **A fuel economy tip** comes from Ford and Mercury this month regarding the 1974 Mustang II, Pinto and Capri with model 5200 carburetor. The idle-air-bleed vent located adjacent and forward of the primary air-horn wall is the only air vent for this carburetor idle system. If you find fuel economy suffering, especially in stop-go city driving, see that this vent is *not* plugged.

■ **Clutch chatter in reverse gear** has been a problem on 1967-1972 Chevrolet light trucks equipped with small V8 engines, manual transmissions and

leaf spring suspensions. It can be alleviated by installing a new clutch lever and shaft assembly (part No. 326548).

■ **A rear-end problem** puzzled Fred Kazdin of the Bronx, N.Y. The rear spring shackles of his 1973 Chrysler Town and Country station wagon snapped forward when the rear wheels were lifted off the ground.

Although this is most common with station wagons, it could occur with any 1973 Plymouth, Dodge or Chrysler (except Imperial) with "C" bodies—that is, the big-size Monaco, Polara and Fury classes. The rear-spring rear shackles may go "over-center" when the car is raised on a frame-contact hoist or is lifted by the bumper. The shackles continue forward and up into the flooring when the car is lowered.

Chrysler has reported an engineering change that involves adding ½-inch steel or aluminum shims between the rear-spring shackle bracket and the attachment area. The shims keep the shackles from reversing themselves. This job is covered by warranty. Draw your dealer's attention to service bulletin 17-03-73C. ★★

**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.



## The Gas-Saving Marina. What's in it for you?



The Marina has a gas-saving, single carburetor version of our MGB engine, proven reliable in over 2 billion miles of driving. Economy's what's in it for you—over 20 miles per gallon.



The Marina has positive rack and pinion steering like our Jaguar. So responsive handling's what's in it for you.



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For the name of your nearest Austin Marina dealer, dial (800) 447-4700. In Illinois, (800) 322-4400. Toll free.

\*Manufacturer's suggested retail price P.O.E. Does not include inland transportation, local taxes and preparation charges. British Leyland Motors Inc., Leonia, N. J. 07605.

**Austin Marina. \$2,899\***  
The tough economy car from British Leyland.



## THE BICYCLE SHOP

BY EUGENE A. SLOANE

### Changing to a larger chainwheel

The easiest way to add wider range gear ratios to your bicycle, for easier cycling on hills and when "honking" over mountains with touring loads, is to add more gear teeth to the freewheel on the rear wheel. That's what we discussed in the last two issues. This month we will show you how to add still more favorable gear ratios by adding gears with fewer teeth on the chainwheel up front.

You may have, for example, a dual chainwheel with 48 teeth on the small ring and 52 on the large. That's a fairly close gear cluster which will give gear ratios with gear jump increments adequate for the flats but for many cyclists not wide enough for the hills. Even if you have changed the freewheel over to a 14 to 34-tooth cluster, with a 48-tooth small chain ring you still will not have truly wide-range gears for hill climbing. I recommend a small chain ring with 30, 32 or, at the most, 39 teeth. My own touring bicycle has a 30-tooth chain ring up front with the 14 to 34-tooth Shimano alternate gear freewheel at the rear, which will almost but not quite let me climb up a wall.

A word of caution about changing to a smaller chain ring. You must be sure to use only chain rings compatible with the chain set you now have, unless of course you wish to change to a new chain set, which can cost up to \$125. This outlay is not necessary if you simply add a smaller ring to your dual chainset, such as by substituting a 30 or 32-tooth ring for the 42 or 48-tooth ring. However, another problem now faces you. When you take off the 48 or whatever front ring and replace it with a ring with fewer teeth, you now have a big jump between gears. You will find it difficult to change gears on the flats in the fine increments you were used to, to compensate for small changes in hill grade, adverse or favorable wind conditions or how you feel at the moment. This is because the wide-ratio gears up front of-

fer too great a span, so you cannot shift conveniently to the gear you need by selecting a front and rear combination just right for the situation of the moment. You will either be in a gear just a bit too low so you are spinning the pedals faster than comfortable to keep up speed, or just a shade too high so you pedal harder than you need to.

The answer to a wide-range gear system with reasonably close gear increments is a triple plateau or three-ring or three-speed chain set (all these terms mean the same thing) so you wind up with a 15-speed bicycle. This you can do by adding a longer bottom-bracket axle and a third ring to your chain set. Since the method of changing *chain rings* is the same whether you switch to a small ring and keep just the two rings, or switch to a triple chain set, I will discuss only changing to a triple chain set. Then if you wish only to add a smaller chain ring, to replace just one ring, all you need do is pick up the ring change part of these instructions and remember you still use the same spacers and nuts and bolts as on the original ring set.

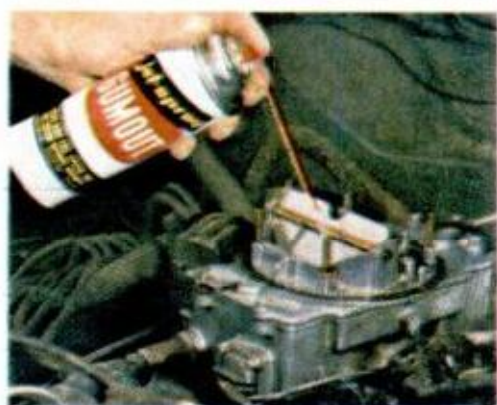
Remember, you must use only chain rings that fit the ones you have now. Campagnolo chain sets do not accept any other make, although some Stronglight sets are interchangeable with T.A. sets. In fact the T.A. 26-tooth ring will fit some Stronglight chain sets. I should also mention that these instructions apply mainly to cotterless aluminum alloy chain sets. You can, of course, change rings on cotted steel sets, but I would recommend changing the cotted sets to alloy cotterless cranksets to save weight and make pedaling easier. Bikes with one-piece crank sets you can forget; they aren't worth the trouble since they will be too heavy for touring in any case, so keep whatever gears they come with and use them for shopping.

To change rings you will need the tools shown in the photo (page 26), which include

*(Please turn to page 26)*



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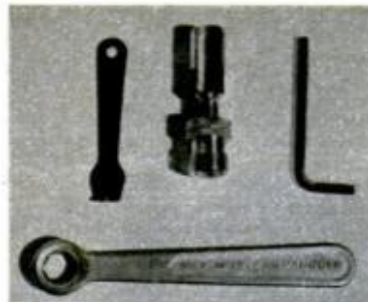
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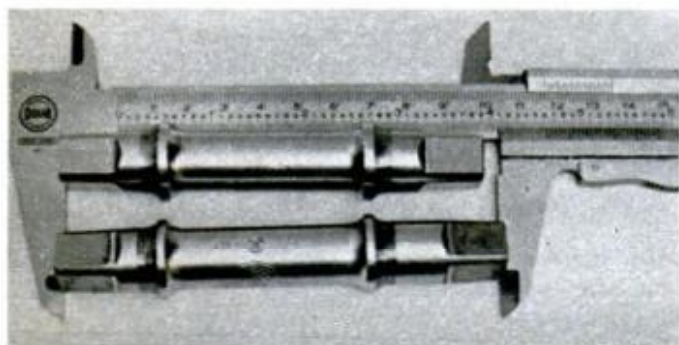
## THE BICYCLE SHOP

(Continued from page 24)



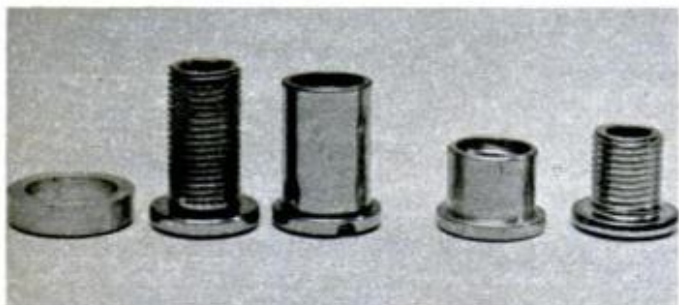
Tools you will need for changing chain rings are (top) slotted nut tool, crank puller and chain-bolt Allen wrench (the 5-mm size will fit most). At bottom is an axle nut wrench.

an axle nut wrench, a gear puller, Allen wrench and special slot tool for the rings. The triple chain set shown in the right-hand column was provided by Shimano, which will soon introduce a three-speed chain set similar in design to the one shown. Remember, you will need a longer axle that will



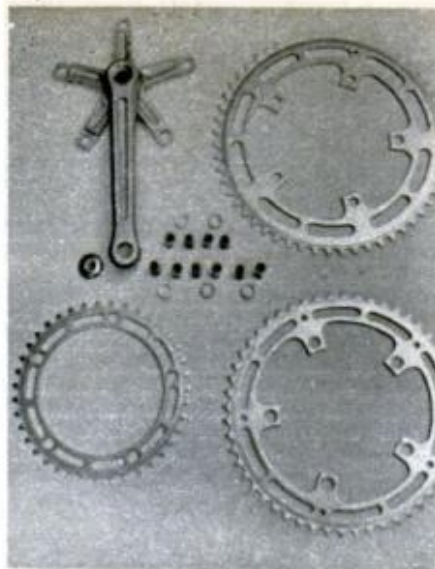
Axle shown at top is 112 mm long and is for dual chain ring sets. You'll need the longer 117-mm axle (shown at bottom) for a triple chain ring set to allow for clearance between small ring and chain stay.

accept the wider spacing of a triple ring set. The photo above shows a double and a triple-plateau axle. The shorter axle for the dual rings is 112-mm long and the triple ring axle is 117-mm long, which will give the inner ring of the triple set ample clearance from the chain stay. In addition to the



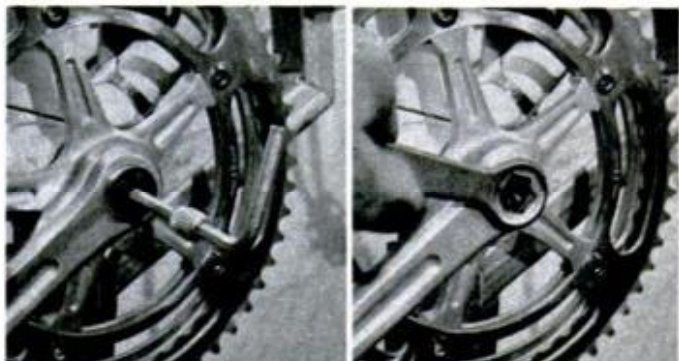
When converting a dual to a triple chain set, you will need the spacing washer and longer bolt and nut at left. The shorter bolt and nut shown at right for comparison are from a dual chain set.

longer axle you will also need longer bolts and spacing washers. In the photo above the longer bolts and nuts and the spacing washer are compared with the bolts and nuts of

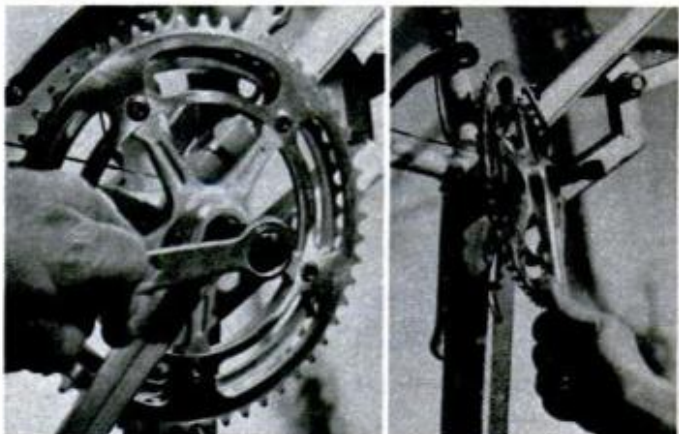


Parts of a triple chain set include crank and center ring (at the top of photo); dust cap, spacing washers, nuts and bolts (in the center) and small inner ring and outer chain ring (at bottom). This is a new design prototype Shimano triple chain set.

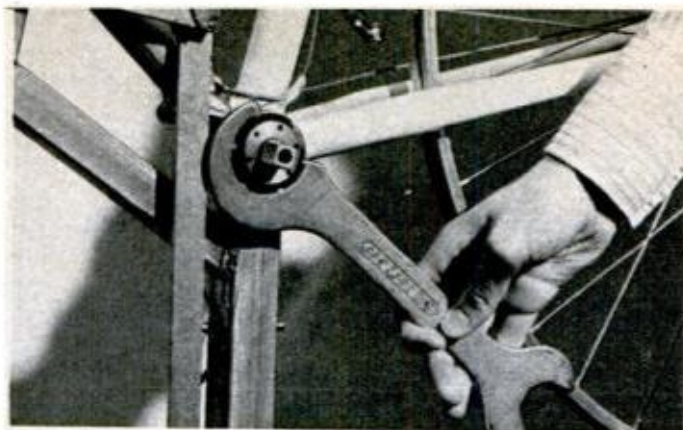
a dual chain set. And this photo shows a triple chain set before assembly. Here are steps in converting a dual to a triple cotterless chain set:



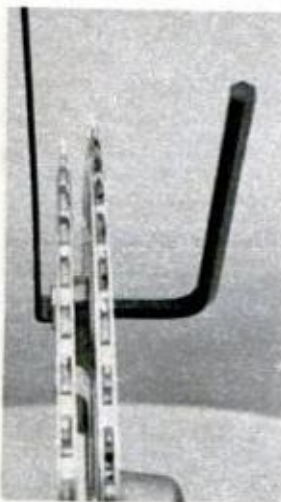
**Step 1:** Slip the chain off the chain rings. Remove dust cap and axle nuts from cranks.



**Step 2:** Insert crank-pulling tool into crank dust cap threads, turn until all the way into crank. Make sure rear section of tool is turned back far enough so front of tool can be fully inserted. With an adjustable wrench, turn rear section of crank puller clockwise until snug against axle end. Apply torque clockwise to wrench, carefully, an eighth turn at a time, until crank comes off axle shaft. If crank is on tight, tap the end of the crank puller with a ball-peen hammer sharply a few times with each turn of the tool. Remove crank. Remove tool from crank, and remove the other crank on the other side of the axle. Photos show Campagnolo chain set and wrench, but an adjustable wrench will do.



**Step 3:** Remove the axle lock ring as shown, and the adjustable cup. If bearings are loose and not in a retainer, be careful to catch them before they spill. Lock ring and adjustable cup thread out counterclockwise. Remove bearings and axle, clean out bottom bracket hanger and fixed (right side) cup races with kerosene. (This is a good time to consider installing a sealed bottom bracket axle and bearing set so you never have to take it apart again for maintenance—at least for five or six years.)



**Step 4:** With the Allen wrench and special slotted nut holder, remove the nuts from the dual chain set. Replace with the longer bolts you purchased. Add the new spacing washers to the bolts protruding from the (now) middle ring, slip on the small third ring and install and tighten the slotted head bolts, again using the slot tool and Allen wrench. Photo shows a dual chain set with tools in place, before disassembly. Make sure retainer bearing sets go back in correctly, with the part that's curved inward, like a bowl, facing toward the center of the axle shaft.

If you have loose bearings, pack them back in grease so they will stay in place while you finish reassembly. Take up on adjustable cup carefully, till snug, back off slightly, install and tighten lock ring. Rock axle side to side and up and down to check for sideplay, spin axle with fingers to check for binding. If cup is so loose you have sideplay, loosen lock ring, back off cup slightly, tighten lock ring, check and repeat again as necessary. Reverse procedure if axle binds. You will not need the special wrench shown to remove lock ring if you use a punch and hammer *carefully* so as not to damage lock ring, but I recommend the special tool or one like it that fits your own lock ring. You will now need to readjust the front derailleur so it will swing inward and outward far enough so it will move the chain from the smallest to the largest rings and not overshift so the chain rides off either of these rings. You may also have to add or remove spacing washers so the center (or third rear) gear cog teeth line up in the same plane (parallel) to the center front chain ring. Remember, if you do add or remove rear wheel axle spacing washers you will have to re-dish the rear wheel so it tracks accurately (see April '73 *Bicycle Shop*, page 40, for wheel truing instructions). If you want to add the Phil Wood sealed bottom bracket (mentioned in Step 3 above), you can purchase one for about \$60. Instructions will be found in the Oct. '73 *Bicycle Shop*, page 22. ★★

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## DETROIT LISTENING POST

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### GM readying new mini

The next all-new car from GM, after the '75s come out, will be a mini Chevrolet. Chevy is testing the car now at GM's Milford, Mich., proving grounds. From a distance, the test job resembles a scaled-down Opel. This car could be ready by fall of next year. Sources outside GM refer to it as the Chevette, but GM may use another name.

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### GM shooting for mass-market mini

GM concedes Ford beat it to the draw with Mustang II—the idea of a small car big on luxury, big on price. GM admits it is trying to catch up, but it has a different slant on size and price. Mustang II, when you add the trimmings, is a \$4000 car. GM feels the mass market is for a car a bit smaller and priced closed to \$3300 to \$3400 than \$4000. GM has two cars answering this description under development. One is the new Chevrolet mini. The second has not been assigned to a division.

---

### Vega spin-offs named

Buick and Olds have decided on the names Skyhawk and Starfire, respectively, for the compacts they are working up using the new Vega body. Chevrolet would like to call its version of the car Chaparral, but an individual outside GM has that name nailed down and Chev hasn't been able to buy rights to the name at the right price. All three cars will be out this year.

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### Parts makers told to diet down

The hundreds of companies that supply Detroit with parts and subassemblies are always complaining about car manufacturers trying to beat them down on price. The pressure to "make it cheaper" is unrelenting, suppliers say. Now there's a counter

pressure at work that may take some of the heat off suppliers to reduce prices. Without putting it in writing, carmakers are telling the parts companies if they can make it lighter, the car factories won't push as hard on prices. Use aluminum, plastics or, if you must stay with steel, engineer the item down in size or simplify it so it weighs less. The goal is obvious: The more weight you sweat out of the package, the more you improve gas mileage.

---

### Detroit sees easing of speed law

How long is the 55-mph speed-limit law going to last? The auto companies figure a couple years at most. Nobody will say as much for attribution, because Detroit thinks the 55 limit is a good thing right now. But cars the companies are working on for 1977 and beyond will easily be capable of speeds of 80 to 90-mph, so it's apparent automakers look for speeds to increase.

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### Toning down mileage claims

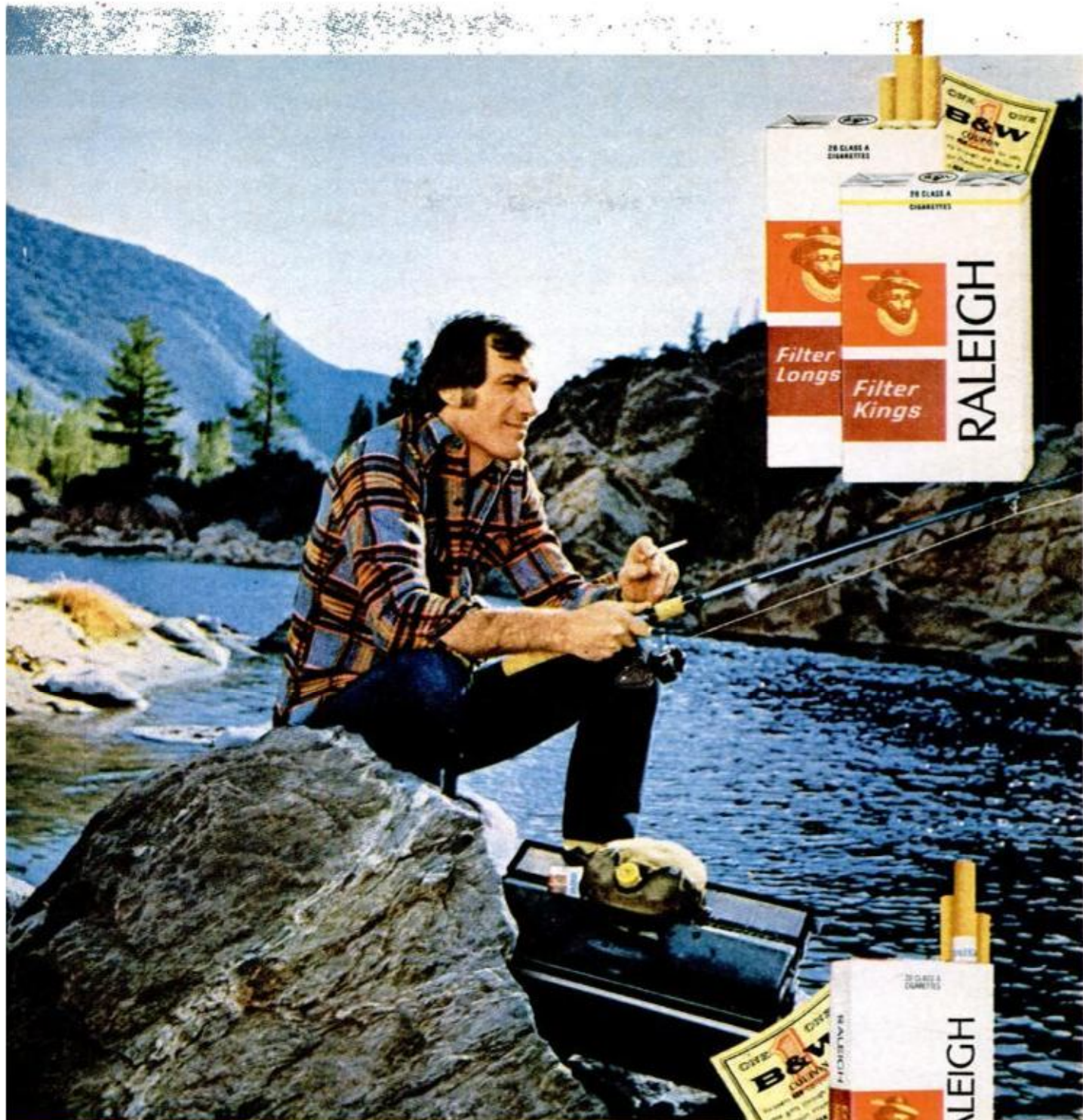
Working through the Society of Automotive Engineers, the car companies are trying to come up with a uniform method of measuring gas mileage that everybody concerned will agree to and that will be acceptable to the government. Now, each company has its own yardstick for "proving" whatever it wants to prove. Automakers fear if they don't work this out on their own and do it quick, the government will tie a can to all the claims and write a really tough code.

---

### Second chance for air bags

GM is determined to give air bags a fair shake as an option, despite the negative nod from car buyers so far. A year ago, GM set out to sample public interest in air cushions by offering them on three high-

*(Please turn to page 30)*



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## DETROIT LISTENING POST

*(Continued from page 28)*

price cars: Buick, Cadillac and Olds. If buyers wanted the bags, GM was ready to put them in 100,000 cars.

That project started slowly so the company pared back to 50,000 cars, but even that was high. If GM's lucky, it may put bags in 20,000 '74 model cars.

The bags are available only on big cars and this was a bum year for the big jobs. So GM is going to give the bags another go in '75. If they don't sell this time, you may still see air bags as standard on all cars. But it will be by government edict. Not as a take-it-or-leave-it item.

### New look for lights

If you like to play the car-spotting game, you should find the '75s easier to identify from a front-on view because of the shape of headlights and light housings. GM will have the new oblong lights on some cars. The three GM cars using the new Vega body will probably have rectangular lights.

Cadillac will have one car with squared-off lights arranged in a series of boxes starting at the grille and wrapping around into the fenders—three boxes each side of the grille. Pontiac's Ventura will have round lights recessed in a square box. Ditto the top-line Plymouth, except the housing will have a V bend in it. Dodge will have big saucer-shaped lights. Ford's full-size four-doors will have the parking lights and directional signals stacked three-high and wrapped around into the fenders.

### Short takes

The auto companies are talking to the oil companies about setting up an emergency phone service for buyers of '75 cars who run out of gas in areas where no-lead fuel is not available. . . . Volkswagen says it still hasn't made a decision on building cars in the United States, but the betting around Detroit is that VW will eventually have an American assembly plant. . . . Detroit's intrigued by a new five-cylinder—that's right, five cylinders—diesel model that's coming from Mercedes, and Motown engineers are very eager to get their hands on copies of the car for evaluation and what-makes-it-tick purposes. ★★★

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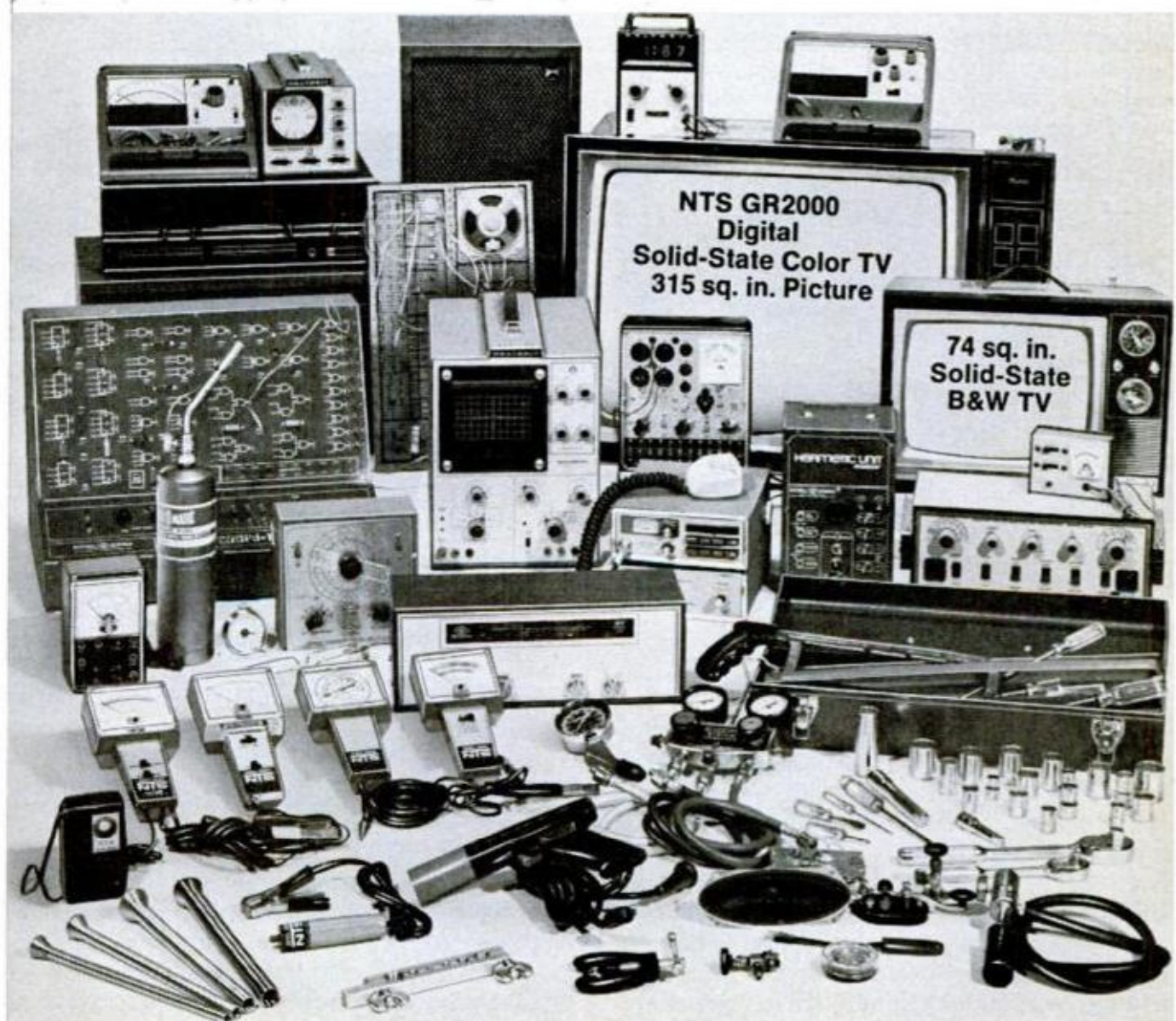
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## SCIENCE WORLDWIDE

### First photo map of United States

A new spin-off of our space program is a map of the "lower 48" made up of 595 cloud-free images returned by NASA's first Earth Resources Technology Satellite (ERTS-1). The photos were all taken from the same altitude—560 miles—and with the same angle of lighting. The photos were assembled into a map—called a controlled-base mosaic—that measures 10 by 16 feet. Launched in July 1972, the 1965-pound satellite carries three cameras, each viewing the same 115-mile-square area, but in a different spectral band—green, red and near-infrared. Cameras are triggered every 25 seconds to provide overlapping frames. Images are immediately relayed to Earth or stored on tape for later replay.



### Safe areas for high buildings

When fire breaks out, the modern high-rise building is a dangerous place to be. Too often, elevators stall, cutting off escape for many occupants. In many such emergencies, stairways have not proven to be practical escape routes. Now a new study by National Bureau of Standards researchers proposes that "safe areas" be established within buildings. These areas would be constructed to withstand fire and smoke, would be centrally located on various floors and have two-way communications with rescuers and others on the outside.



### Shroud tailored for Viking

The six-story aluminum shroud that will protect a Viking spacecraft during launch is undergoing final alignment checks at a Lockheed Missiles and Space Co. plant in Sunnyvale, Calif. Once free of Earth's atmosphere, the unmanned Viking will shed its 6000-pound cocoon and head for a Mars landing on July 4, 1976, at the peak of our nation's bicentennial celebrations. A primary objective of the Viking mission is to determine if there is life on the red planet. The craft will beam to Earth meteorological, seismological and biological data.

### No lead in new gasoline additives

New lead-free, antiknock additives for gasoline have been developed by scientists at Andrews Air Force Base, Maryland, according to a recent announcement. Instead of tetraethyl lead, the agent now mainly used

*(Please turn to page 36)*



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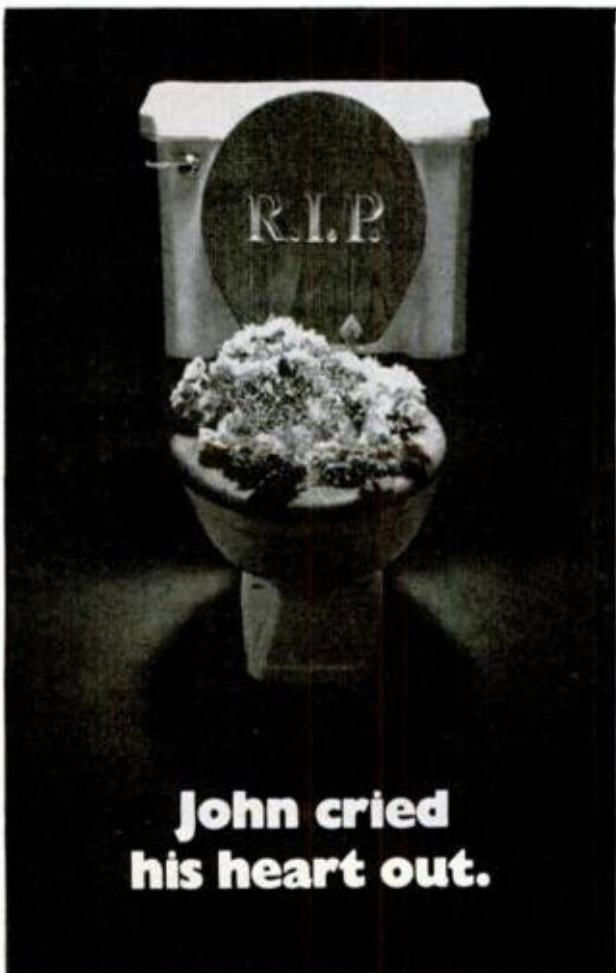
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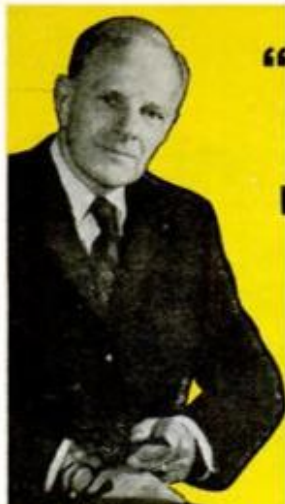


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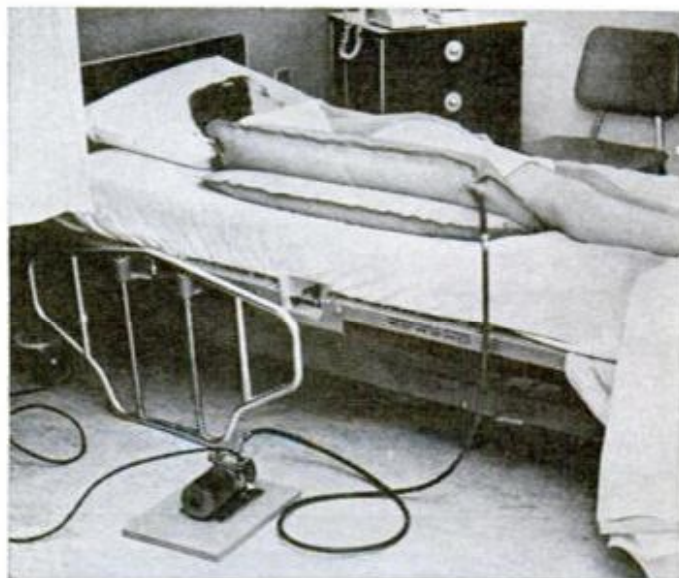
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## SCIENCE WORLDWIDE

*(Continued from page 34)*

to prevent engine knocks, the new additives contain some so-called rare-earth elements that are not really rare at all, explains Dr. Robert E. Sievers, head of the Andrews research group. "The most promising additive is based on cerium," he says, "which is more abundant in the Earth's crust than lead." The new additives are said to produce good engine performance while reducing pollutants in exhaust gases.



### When patient deserves a good turn

Burn victims and patients who tend to develop bed sores can easily be turned in bed by means of a newly developed inflatable mattress. Made by a New Jersey company specializing in inflatable products, the "patient turner" contains two large nylon cells inflated in sequence by a small pump. The turning action is slow and controlled, reportedly causing less pain than when patients are turned manually.

### Captioned TV for the deaf

A system for distilling dialogue on a television soundtrack into printed captions at the base of the screen has been developed by National Bureau of Standards scientists. Captions are transmitted in code with the picture signal but are not seen unless a special decoder circuit is activated. Decoders could be installed in TV sets during manufacture for under \$150, NBS researchers estimate. As yet, no captioned TV programs are available for the public. ★★★

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## IMPORTS AND MOTORSPORTS

### New Lotus position

Passengers have never fared well in a Lotus. The Colin Chapman-designed racing and sports machines are driver's cars—no sacrifice of handling and performance for riders. So, designing an all-new car with a comfortable spot for two passengers in the rear was a special challenge for the British automaker. The successful result is the Elite—all-new, even though the name has been recycled: The original Elite was introduced in 1959. The new Elite was designed from the ground up to meet all European and U.S. safety regs. The two-liter, twin-cam Four gives the Elite an over-100 mph cruising speed, and 25 to 40 mpg economy in normal driving. What a combination!



### Ditto for Datsun

The Z car, as it's come to be known, has a new four-passenger version. The 260-Z 2+2 could easily be mistaken for a 260-Z if you didn't look closely at the new roofline and note the longer wheelbase. Inside is the back



seat, of course, or, more exactly, two sculptured seating positions. The seat can be folded down. And like the 260-Z, the 2+2 is a hatchback. All the other good things about the Z car are retained, too: four-wheel independent suspension; front discs; and six-cylinder, ohc, 2.6-liter engine. The same no-cost extras like AM-FM, radial tires reclining seats, carpeting, are also part of the package. List? An attractive \$6089.

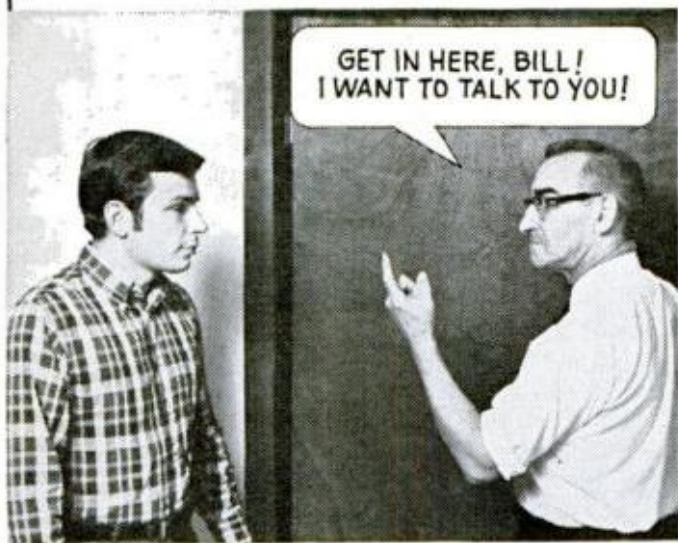
### Baby 'Kwacker'

The big Kawasaki 900-cc Z-1 is a tough act to follow. The four-stroke, four-cylinder, ohc machine was an instant hit when it was introduced (See *Imports and Motorsports*, page 26, Jan. '73 PM). Kawasaki knew there'd be a demand for a scaled-down version. Shown below is the new KZ-400, or The Commuter Special, as the company dubs it. The four-stroke twin is a 398-cc design, and, like the Z-1, has built-in positive crankcase ventilation. The 375-pound

*(Please turn to page 40)*



# The day Bill told off his boss



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## IMPORTS AND MOTORSPORTS

*(Continued from page 38)*

bike uses a disc brake up front and fits a 3.7-gallon fuel tank. Fuel consumption is said to be 54 mpg at 55-mph cruising speed.

## Racing family style

The hours of preparation and setting up of a racing car are the same for amateur Jon Farbman, shown here with his family, as they are for the professionals on the Roger Penske Racing Team. To show the parallels, Sears has sponsored a free-loan film called *Search*. Write Association-Sterling Films, 866 Third Ave., New York, N.Y. 10022.



## Rallying kid style

You'll be able to concentrate on the road ahead if your kids are busy in the back—playing this road rally game from Pirelli. Send a check for 50 cents to Pirally Game, Pirelli Performance Bureau, 600 Third Ave., New York, N.Y., 10016. ★★★



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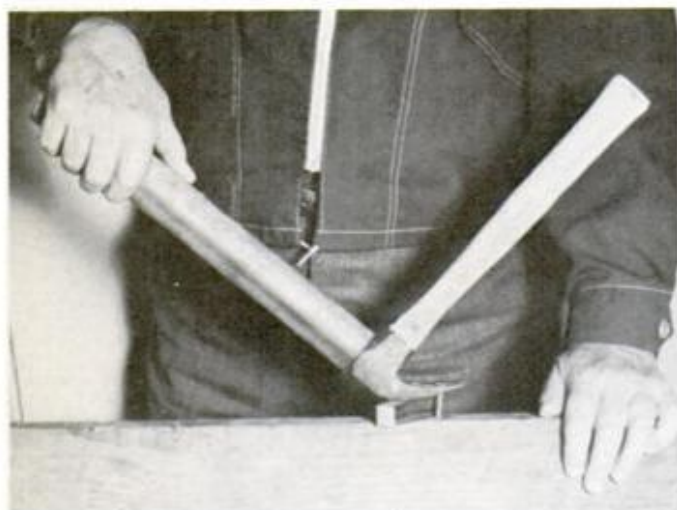


King or Super King

KING: 18 mg. "tar", 1.3 mg. nicotine, av. per cigarette, FTC Report MAR. '74.  
SUPER KING: 20 mg. "tar", 1.4 mg. nicotine, av. per cigarette, FTC Report MAR. '74.

# HINTS

## FROM READERS



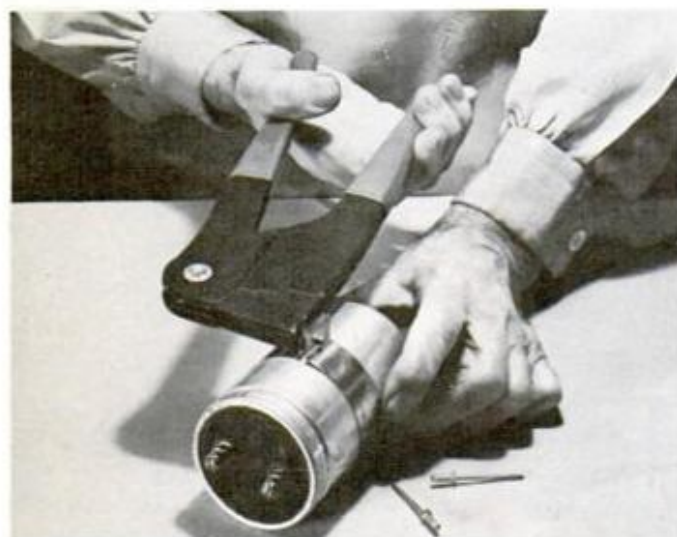
### Pipe saves hammer handle

When you're drawing rusty spikes and nails, iron pipe over the hammerhead increases leverage and avoids chance of breaking hammer handle.—*Henry Farr, Garnerville, N.Y.*



### Improved hammer holster

For a convenient hammer holster, clip a large metal shower-curtain ring, bent outward slightly as shown, to a belt loop.—*M.G. McMullen, Santa Margarita, Calif.*



### Banding round objects

A way to clamp a metal band tightly around a cylindrical object is to draw and fasten ends together with Pop rivets. If less tension is desired, rivet can be clinched part way and shank snapped off. Tin-plate band shown on condenser permits soldering to supports.—*Walter E. Burton, Akron, Ohio*



### 'Hangover' treatment for brushes

Paint-hardened brushes can be cleaned by dipping them in semi-paste paint remover, allowing them to hang over board edge overnight, with second application if bristles remain hard. Putty knife works out softened paint; rinse with mineral spirits completes treatment.—*Burt Web, Skokie, Ill.*



TOM McCAHILL says:

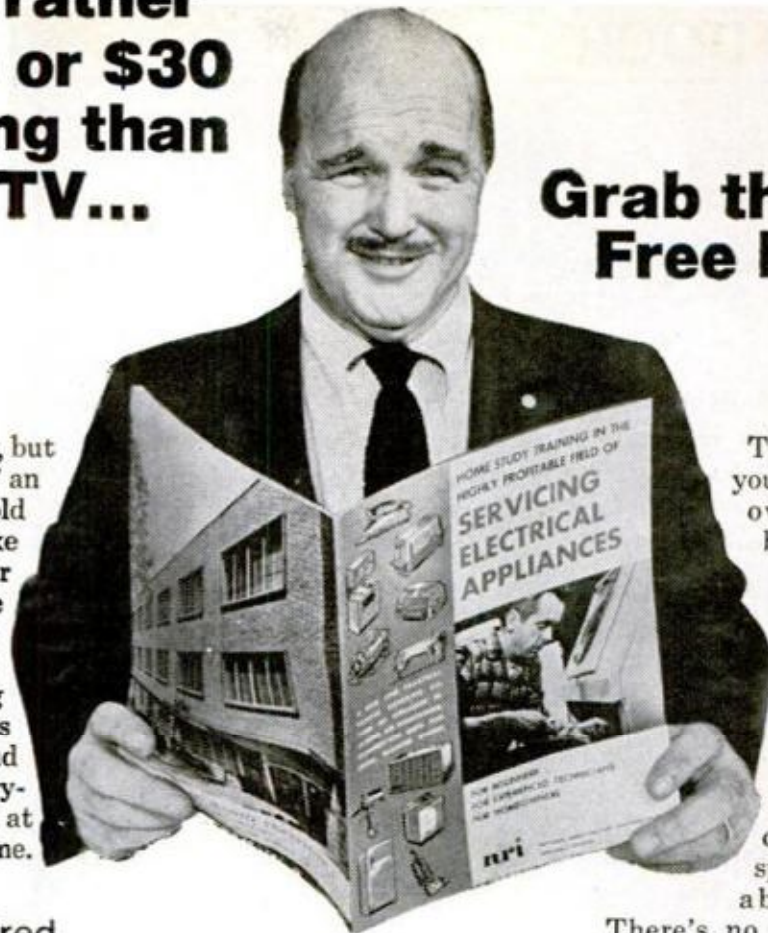
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*Tom McCahill*

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## ALL OUTDOORS

### Day to remember

Once again the last Saturday of September will be a chance for all outdoorsmen to get together to explain what our favorite pastimes are all about.

This is important. Recently a number of indoor types have wanted to make up new rules based on what they must have seen while looking out small and cloudy windows. Their view of the landscape and their idea of how to preserve it often make very little sense.

Conservation was being practiced by outdoorsmen long before newcomers learned about the latest catchword—ecology. Famous hunters like Theodore Roosevelt, Gifford Pinchot and James Audubon were naturalists who helped create the National Parks System and established environmental study and protection on a scientific basis in the late 1800s. Since then it has been the fishermen and hunters who have drafted laws to allocate license fees and excise taxes for the development of habitat and the scientific management of all game, hunted and protected alike. And then paid the costs.

There are about 45 million fishermen and 20 million hunters and shooters in America. Over the years we've spent \$2.3 billion on conservation and wildlife management. But we're not organized, and a few small groups who have put up no money are running around shouting about how we are endangering the countryside. National Hunting & Fishing Day is our essential chance to tell and show what we really do.

A quick look at statistics is enlightening.

In 1900 there were only about 500,000 deer left in the United States. Now there are 15 million in spite of our urban sprawl, and in some areas where they are overprotected they are threatened with starvation from overpopulation. Of 32 birds native to the 50 states that are now extinct, 24 succumbed to domestic cats and mongooses introduced on Hawaii and were never hunted. Of the remaining eight extinct species, only two were ever hunted for sport—the heath hen and the passenger pigeon. The heath hen was eradicated by spreading civilization and the passenger pigeon by market hunting of the early 1900s plus habitat change. Sportsmen were not involved, and market hunting has long been illegal. Sportsmen, in fact, have had no part in the extermination of any American wildlife species but, working with wildlife managers, have been responsible for the return of elk, wild turkey, deer, beaver and wood duck among others to healthy population levels. Only vegetarians are really in a position to argue with today's hunters who, restricted by seasons and bag limits, at least give game a sporting chance.

But hunting is only one outdoor sport. There are over 10,000 trap and skeet clubs throughout the country. Fishing and hunting preserves now are available near urban centers. Archery, hiking, camping, boating, cycling, sightseeing and nature study and photography are among other activities. Beginners should be introduced to safe handling of firearms, boatmanship, survival in the woods and outdoor crafts.

Sept. 28 will be our day to do it. Numer-



ous suggestions and open-house programs are offered by NHF Day, 1075 Post Rd., Riverside, Conn. 06878.



**Jeep owners** can come in out of the rain, keep from losing their heads, have it soft underfoot: new tops, roll bars, carpets from Whitco, Colorado Springs.

**Wind-speed** measurement of real accuracy is available from hand-held Sims anemometers made by R.A. Simerl Instruments, 238 West St., Annapolis, Md. (We've used one for years to check boat and vehicle speeds, also speedometers.) Latest unit, Model K/K shown here, reads in knots and kilometers up to 113 kph, 60 knots on high scale, and with conversion table for mph and Beaufort on back. Other models are now calibrated for sky divers, inshore, offshore yachtsmen. Hand models: \$49.50. Remote indicators available.



**Evinrudes for '75** will look like this 135-hp Strangler powering a hot 19-foot Wellcraft Kona. New engines will cover 2 to 135 hp in 38 outboard models.



**Pro Guide** sheath knife, new from the Imperial Knife Co., Providence, R.I., has alloy stainless blade hand-edged with flat-tapered feather grind claimed to make the re-edging easy when necessary. The blade tang has a finger groove and serrated spine for close cutting. Handle is rosewood; safety guard is of stainless steel, and sheath of fitted leather with a belt loop. The knife costs approximately \$13.



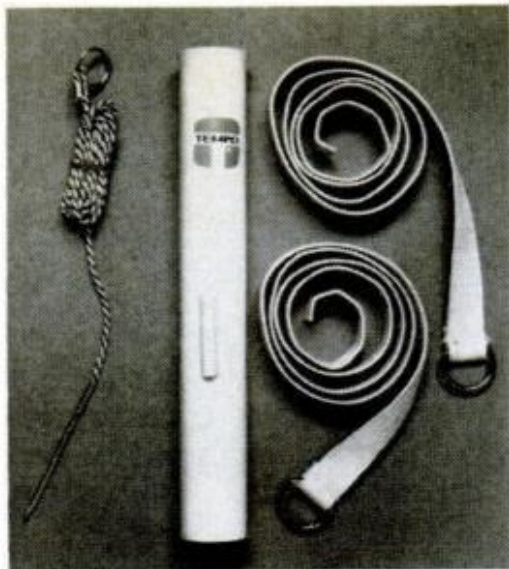
**Bullet display** of special interest to hand reloaders, hunters and gun collectors mounts 92 rifle, jacketed pistol, lead bullets: \$25. Hornady, Grand Island, Neb.



**Unpacking** is reported to be as easy as packing with new Stag Trail Haus 5+5 Expedition pack. It has "suitcase-opening" compartments for sleeping bag, cargo storage. [\(Please turn to page 46\)](#)

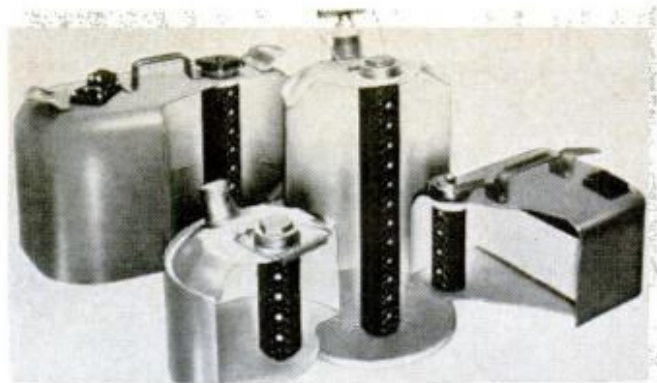
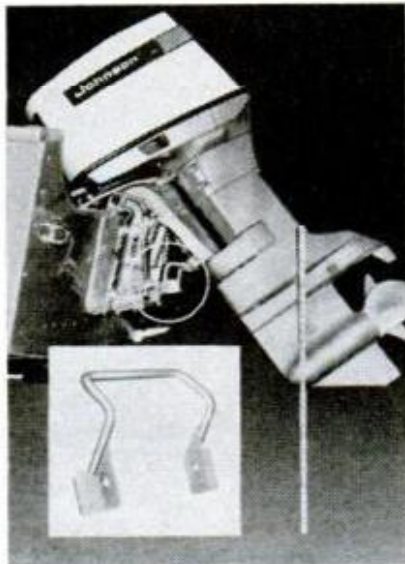
## ALL OUTDOORS

(Continued from page 45)

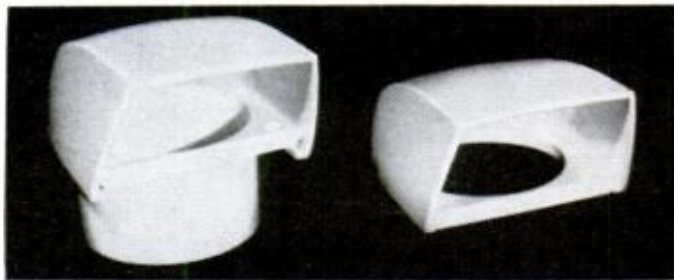


**Polester**, combination rod and stringer holder from Tempo Products, straps on like a six-shooter holster or secures to beach stake, boat stanchion. It's \$4.95.

**Added clearance** for outboard motors when trailering is claim for Hi-Lift outboard motor support bracket. About 18-in. road clearance can be provided with most trailers to protect motor skeg and prop plus tilt locks. Bracket is positioned on thrust pin; needs no bolting or welding. Fits most Evinrudes, Johnsons, Mercurys. \$12.95 plus \$1.50 postage. Chainmate, 2 Grant St., Binghamton, N.Y.



**Two-cycle gas-oil mix** is measured automatically, even with partially filled tank, using Easy-Filler insert. About \$10 from Young Rubber Co., Naperville, Ill.



**Clamshell cowls** can cram a lot of air below decks or attach to a 3-inch blower hose. Made of ABS plastic, they're \$3.50 in white, \$6 chrome. Zurn Ind., Erie, Pa.



**Sleek styling** that's become known as the California look, the 22-foot Leeward Stage II from Kona Boats, Westminster, Calif., has speeds to 53 with Berkeley Jet.



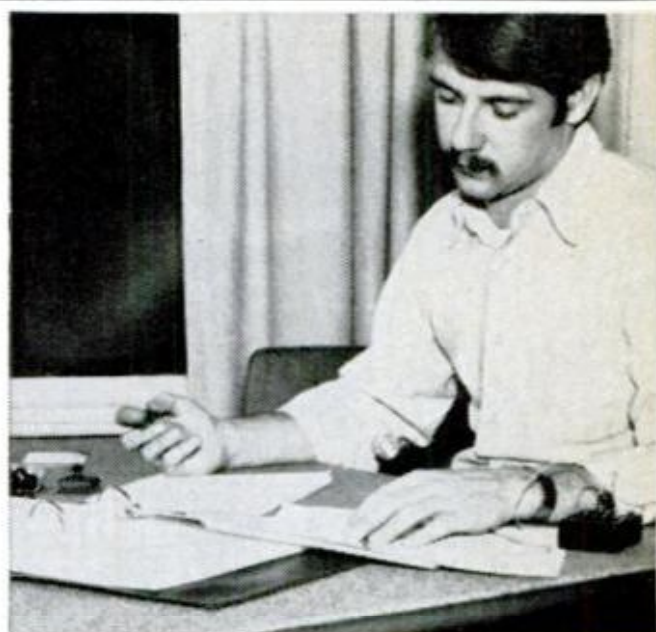
**Campertent**, new from Volkswagen, connects to 1974 VW's sliding door but is free-standing so unit can be left at campsite. New Sleeper adds rear bed to bus.



**Sew-it-yourself kits** from Frostline, of Broomfield, Colo., have added a Hatch Back Sack with no traditional flap on top. Pack opens with side zippers to allow access to any part of interior. Cinch straps compress weight to frame and lift for easier balance. Zippered side pockets hold small items. Of 7.5-oz. urethane-coated nylon in orange or green, it is 22x16x9 in., weighs 1 lb. 12 oz., fits adult frame up to a 16-in. width. \$19.95. ★★ ★

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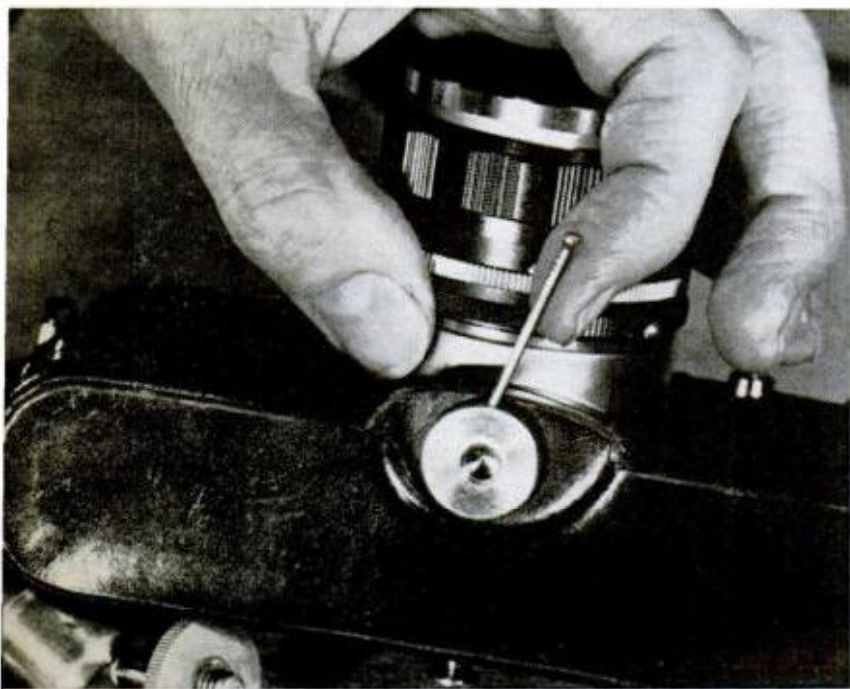
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# PHOTO HINTS

## FROM READERS



### Removing camera-case screw from tripod

If you keep your camera in its case when it's on a tripod, you've probably found that turning the tripod screw often just turns the case screw around and around, loosening the camera, but leaving the case stuck to the tripod. And you can seldom get tools in between the case and the tripod head to grip and hold the screw.

A preventive is to drill, beforehand, one or more holes in the case screw's knurled edge, to take a nail that can act as a gripping level. Try to position the hole so it will be accessible when the camera is screwed down, and angle it away from the tripod-screw hole.

—Walter Burton, Akron, Ohio.

### Key-chain tab makes zipper zipper

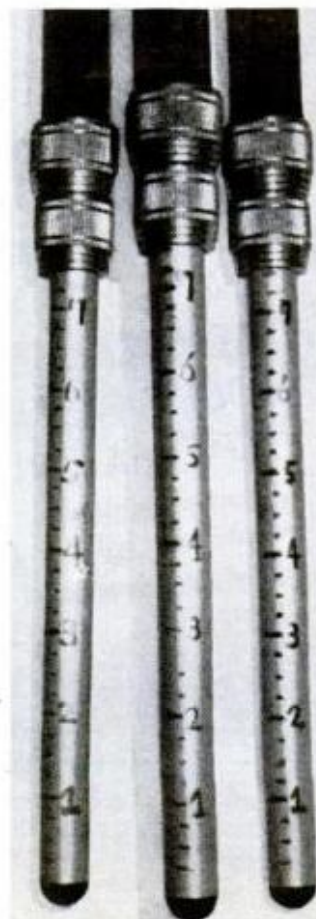
If the zipper on your gadget bag is sticking, stop fighting with it. Just attach a key chain with an ornamental tab of your choice, and you'll be able to get a good grip on the zipper tab for a strong pull without fumbling.—Grace Weinstein, Los Angeles.

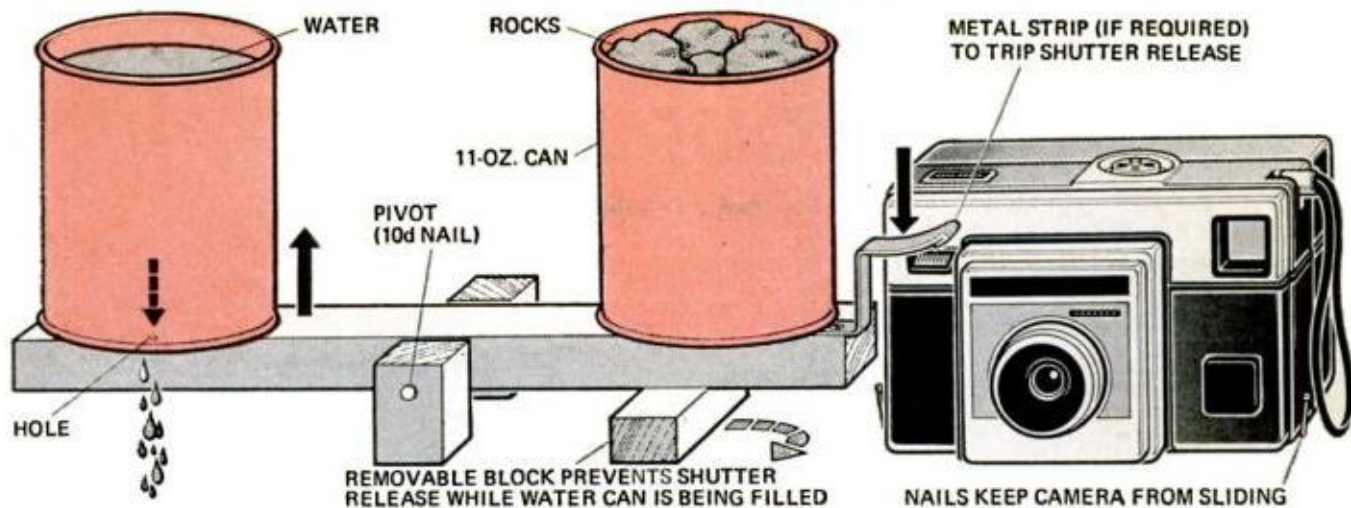


### Painted graduations help keep tripod level

Getting each tripod leg to come out exactly the same length can drive you up a wall. To eliminate this frustration, lay a ruler along your tripod's legs and lightly mark off measurements with a pencil. Using a small, pointed brush and quick-drying acrylic, paint each mark on permanently. If the legs are a tight fit, score the marks with a triangular file before painting; the paint will then be below the metal surface and won't rub off.

—J.D. Maxwell, Vancouver, Wash.





### Water-drip makes self-timer for a simple camera

Simple cameras don't have self-timers—and often lack cable-release sockets for accessory timer units. So I made this timer for mine. On one end of a 15-inch seesaw stick, I mounted a soup can filled with enough weight in pebbles to trip my camera's shutter. The other can holds a greater weight of water. A small hole in that can lets the water run out slowly until the balance shifts and the rocks trip the shutter. A block of wood under the can of stones

keeps the shutter from tripping accidentally until you remove it.

You can calibrate the water can for different delays, but I find that 10 seconds is best; too much more time, and the subjects get restless and change expressions—too little time, and you can't get into place before the shutter snaps. And many subjects are just too fascinated by my weird gizmo to think about getting stiff and self-conscious.—*Frank Rennie, Copiague, N.Y.*



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**Minolta SR-T 101/Minolta SR-T 102**



# This kill switch can save your life

Now required for racing and tournament fishing, this is boating's newest necessity.

by George Daniels



**Emergency shut off** of a boat engine is automatic if driver is thrown from helm position or flips overboard. Ignition safety switch (left) is Mercury Quicksilver accessory with spring-loaded cutoff that can stop a Merc outboard or MerCruiser stern drive or inboard engine if snap-off cap is disengaged by pull on lanyard attached to the driver.

**T**echnically, it's an ignition shutoff switch. Careless drivers used to refer to it as the "chicken switch." But this gadget that stops your engine in an emergency is a lifesaver every powerboat should have, and may eventually be required by law.

Already the switch is specified for racing boats in most sanctioned events, and on fishing boats in B.A.S.S. tournaments. A lanyard connects driver to switch; if he leaves the helm position the engine turns off.

Few boatmen are thrown overboard or away from wheel or tiller by rough seas, a steep wake or impact with a drifting log. But when it happens, the results can be tragic. Passengers may not know how to stop a driverless boat with the engine running wild. Worse still, too often the craft completes a perfect circle and comes back to strike and fatally injure the driver in the water. Very experienced boatmen have struck an unseen object, rough water dur-

ing a race or have had to make a sudden sharp turn—and have landed in the water with tragic results. Yet, if the boat had stopped, they probably could have swum to it and climbed back aboard.

Unfortunately, cobbling up your own makeshift switch can lead to problems. The moisture of your boat's floating environment, especially if there is salt in the air, can corrode and short out connections. And the new high-capacitance ignition systems used on many modern outboards, stern drives and inboards may be damaged (along with your warranty) if you cut into them to install an added shutoff. Offshore, a badly wired switch might shut down your engine during rough weather and leave you drifting helplessly in serious trouble. Using a made-to-order switch instead is recommended.

Several switch models are already avail-

*(Please turn to page 52)*



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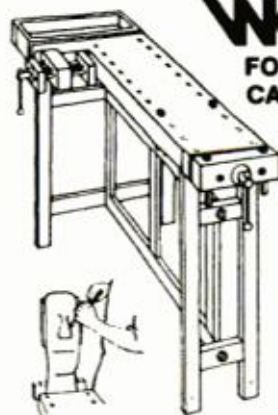
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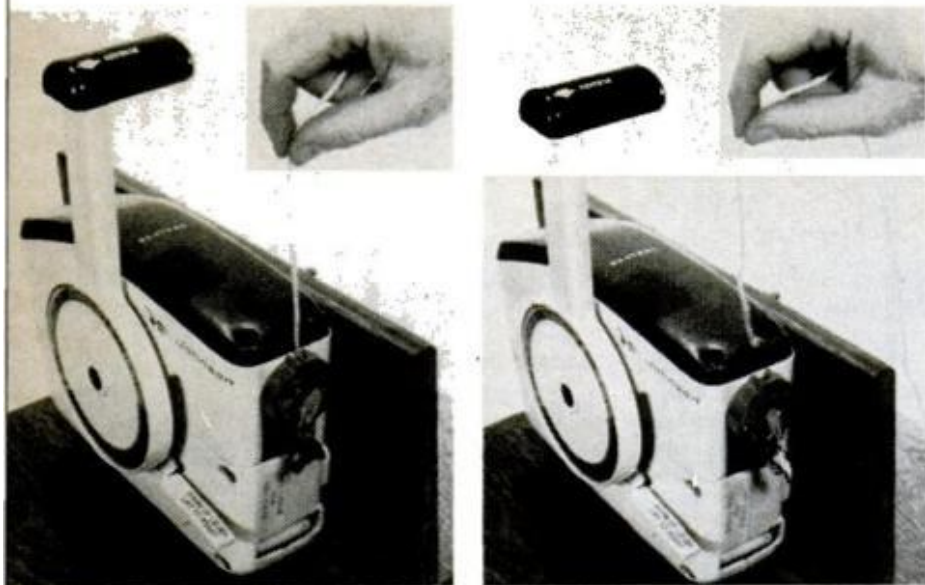
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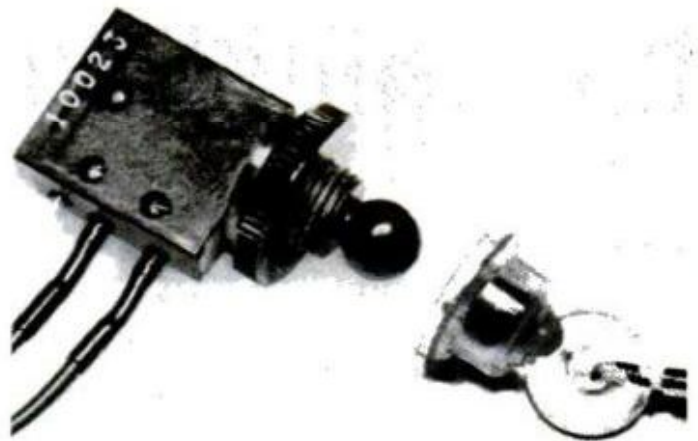
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## THIS KILL SWITCH CAN SAVE YOUR LIFE

(Continued from page 50)



**Mechanical and electrical switches** for instant engine shutoff are available. OMC Accessories will introduce a model (left) which winds around ignition key of Johnsons, Evinrudes, OMC stern drives to turn key, cut power, if lanyard is pulled out. If driver is thrown from boat, passengers can still turn key and restart engine to go back and rescue him. Power Pacifier (below) from NW Controls, has spring-loaded switch covered by a snap-off cap. When cap is pulled off, a contact on top of the switch is activated to stop the engine by closing magneto circuit or breaking it for conventional battery ignition, depending on type of wiring system.



able. Mercury's Ignition Safety Stop Switch, \$14.95, comes with 20 feet of wiring harness and an instruction sheet telling how to connect it to any Merc inboard, outboard or stern-drive engine. You provide your own tether cord from the switch to your belt or clothing. This "pulls the plug" if you are thrown away from the helm. Outboard Marine Parts & Accessories Div. will have a switch available this fall that operates mechanically. A lanyard wraps around the ignition key and revolves it to turn off your engine as the line pulls out. There are no electrical contacts to corrode, and a passenger can turn the key again to restart the engine and rescue the driver if he has been flipped overboard.

The Power Pacifier switch, \$9.95 from NW Controls Inc., Harleysville, Pa. 19438, is a spring-loaded type with a snap-off release cap that is attached by a cord to the driver. Used with snowmobiles and motor-

cycles as well, it has three terminals to allow hookup with various circuits. When wired with one pair, the switch closes the circuit as the cap is pulled off for magneto ignition where the magneto is shorted out. For battery ignition it breaks the circuit, just as an ignition key does when turned to off position.

Either way, your engine stops, but to prevent possible ignition component damage due to differences in circuitry, it is best to turn off your regular ignition switch as soon as possible after a kill switch is used. And don't use the emergency kill for normal engine shutoff.

Unless you're familiar with motor work, check with the engine manufacturer or a dealer's service department before you connect your kill switch to avoid possible problems with more sophisticated systems. With a test light you can determine which connections make and break the circuit. ★★★

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**Tom McCahill** Automotive Authority  
Noted Test Driver  
Journalist

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"After the first 10,000 miles, I checked my point wear and plugs. They were like new, so I decided to go another 10 grand. Now, I have just skipped my 40,000 mile tune-up and am close to 50,000 miles. I am convinced! Compu-Spark paid for itself on its first skipped tune-up—everything after that was cash in the bank. And talking of cash, I saved over 20 percent on my gas bill. At today's prices that's folding money in my pocket."

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Best wishes,  
Tom McCahill

*Tom McCahill*

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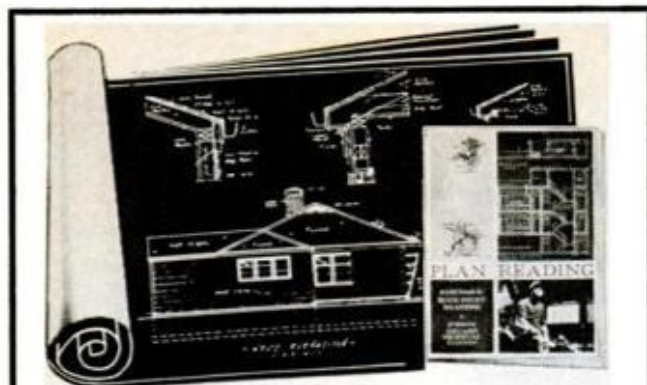
car \_\_\_\_\_ model \_\_\_\_\_ year \_\_\_\_\_

12 volt negative ground required

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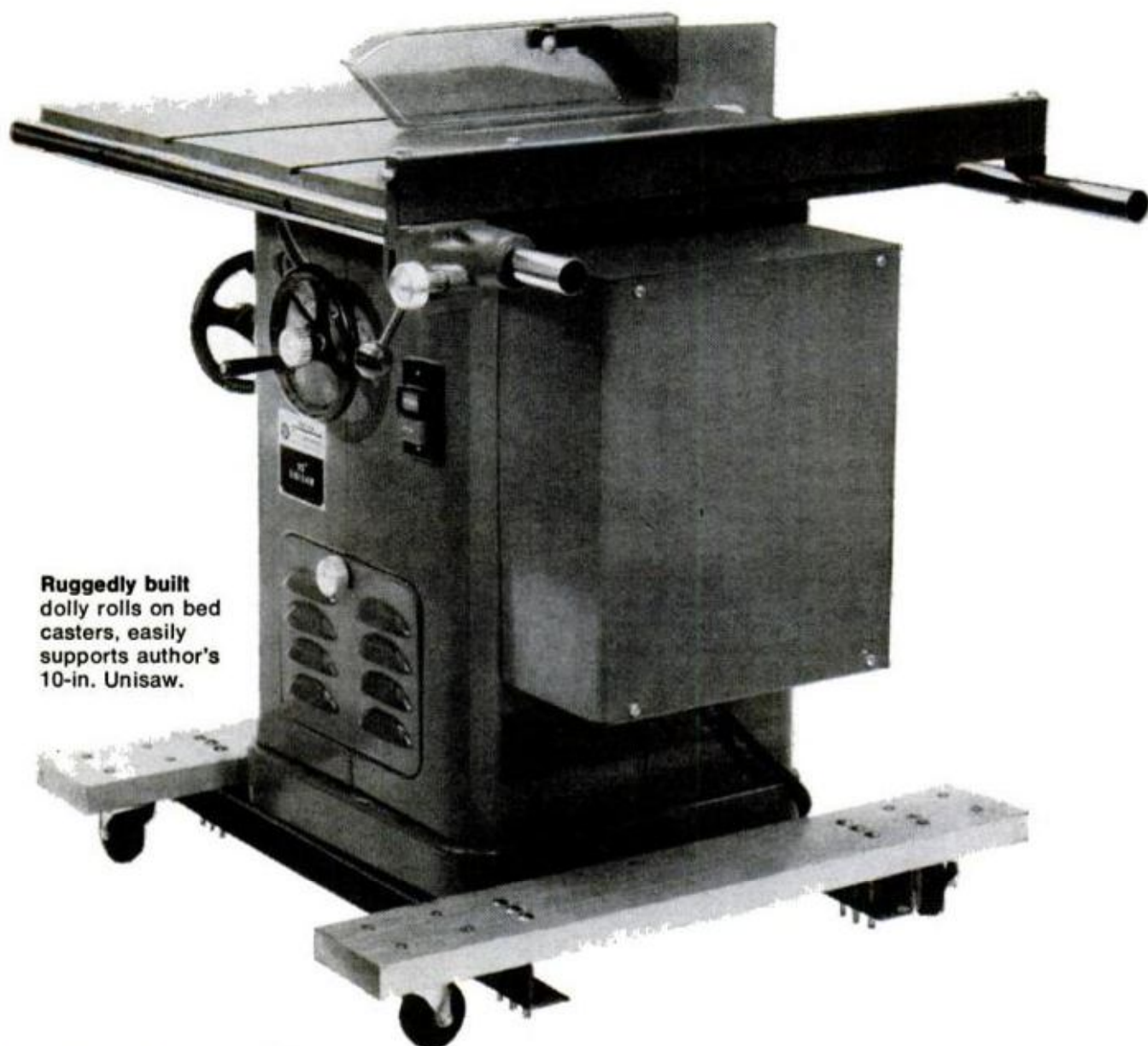
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by Harry Wicks  
WORKSHOP EDITOR

From time to time my table saw appears in photos accompanying workshop stories. Each time it does, I receive letters from readers requesting information about the dolly beneath the saw. Because of this interest in a shop-built accessory, we are publishing the construction details for readers who want to duplicate the setup.

Designed to suit the 10-in. Delta Unisaw shown below, the frame can be altered to accept any make of table saw that rests on a pedestal rather than on a four-legged stand. The dolly rolls on four casters with minimum effort. Yet, because of the saw and frame weight, you will not need to use lock-type casters. Regardless of the material being cut, the saw does not move. In the 18 years the dolly has been in use in my shop, I haven't noticed any wobbling or inaccurate cutting as a result of movement.

Before you begin to construct the dolly,



**Ruggedly built** dolly rolls on bed casters, easily supports author's 10-in. Unisaw.



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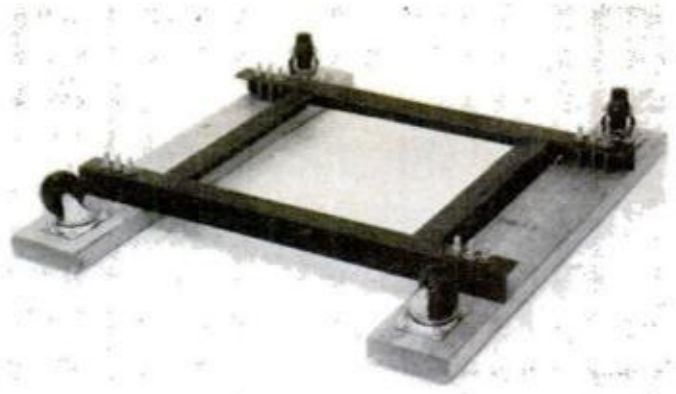
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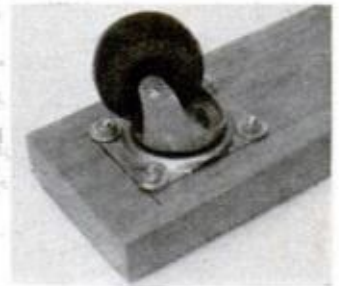
measure your saw's pedestal and, if necessary, alter the dimensions shown on the drawing below. If you lack welding equipment, have the frame made by a local iron-works shop. (Note: Current price for such a frame made in the New York area is about \$20. That's for all angle-iron, welding and bolt-hole cutting.)

Start the assembly by clamping the 2x6s to the frame and boring the holes for the 12 4½-in. bolts. Next, attach the casters. The ¼-in.-plywood bottom is not a must, but it does keep sawdust from piling up under the casters. Simply cut a piece to suit your frame.

For looks, the stand shown was finished by spraying the iron frame with flat black enamel; the 2x6s were sprayed with clear varnish. If you plan to spray-paint your saw dolly, do it after boring all necessary holes, but before final assembly. ★ ★ ★

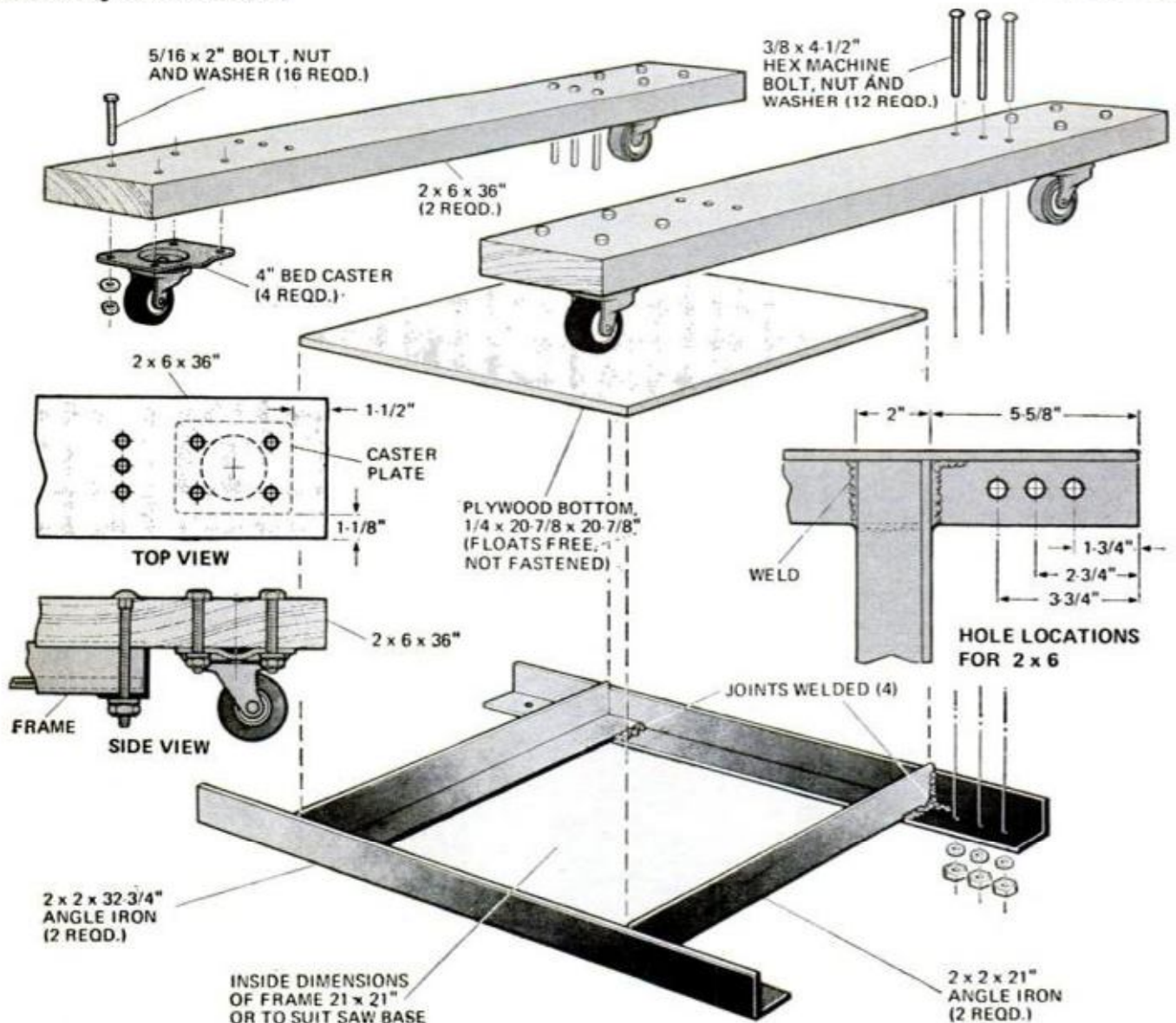


**Upside-down view** of the dolly (above) shows how frame and casters are positioned on underside of a pair of 2x6s. The closeup photo (right) shows how bed caster is fastened. The stand puts saw-table height at about 36½ in.



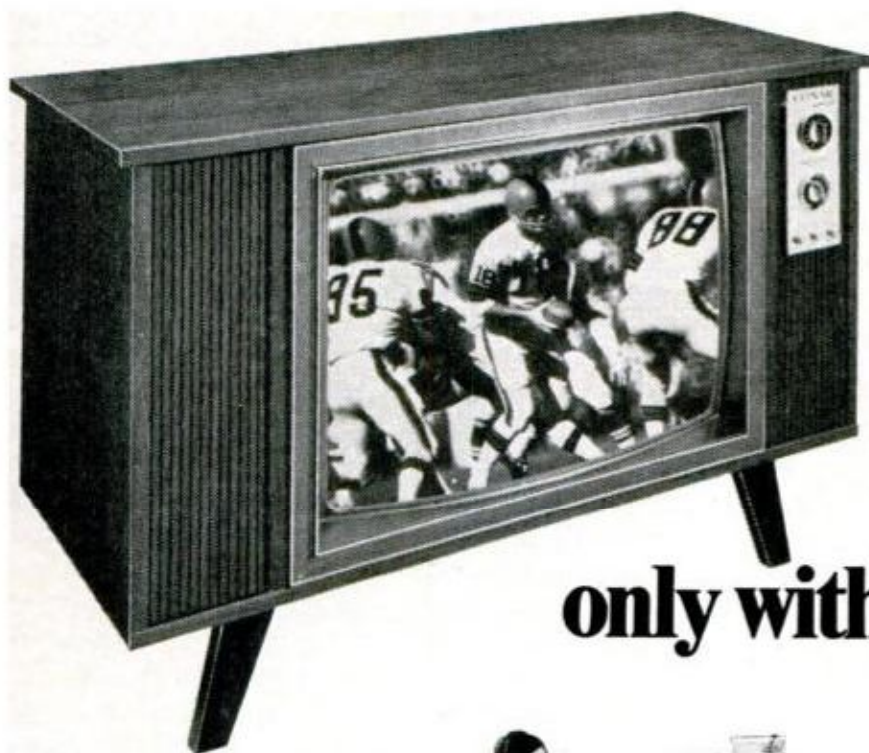
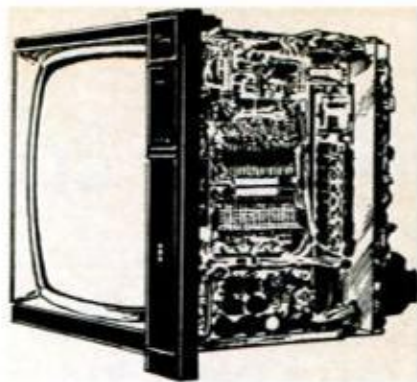
### Saw-dolly construction

Art: Peter Trojan





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## APPLIANCE CLINIC

BY PAUL MANN

### Noisy fans

*We recently purchased a new home that has two electric exhaust fans. One is part of the ceiling-light assembly in the bathroom. The other is a 36-in. fan in the hallway ceiling. Both are noisy to the point of absolute annoyance. Do you think that something may be wrong with them?—Leslie G. Bechter, Washburn, Mo.*

Although it is possible that something might be wrong with one, odds are against something being wrong with both. But it is worth the effort to find out. One of three things could be mechanically wrong: loose installation resulting in vibration, bad bearings or improper blade pitch.

With a fan running, put your hand on the case to determine if there is excessive vibration. If there is, the housing should be fastened more solidly to joists.

Turn the fan off and move the blades back and forth. If there is more than slight movement, bearings may be bad. If there is little or no movement, blade pitch may be off, but this is hard to establish without knowing what pitch the manufacturer allows in production. Perhaps the contractor who built your house can help. If not, a letter to the fan maker may produce results.

After all is said and done, you shouldn't overlook the possibility that the amount of noise produced is normal. These exhaust fans pull a great deal of air from an area, and the air moving out can sound like a subway tunnel during the rush hour.

### Stop-and-go dryer

*I have a General Electric clothes dryer that is giving me fits. When the appliance is turned on, the heating coils heat up for about 15 seconds. Then the motor seems to jump, and goes off. I have to wait about 15 minutes until it will run again. Then the same thing happens. I have tested all parts. Please, I need help.—Joseph P. Gribbin, Newburgh, N.Y.*

In saying "all parts," I assume you're including all the thermostats. There are two

or more—I can't tell you exactly how many because I don't have the model number of your machine. But if just one thermostat is faulty, it can kill operation. Consult the unit's wiring diagram and make sure that all thermostats have been tested.

Besides thermostats, another part that can give you fits when it goes bad is the centrifugal switch, which controls motor operation. If the switch is bad, it may allow the motor to start, but kick it off soon afterward. Perhaps you haven't tested this switch, because in some models it is inside the motor housing. To find out, examine this housing. If you see a plastic part with an arm entering the motor through an access hole, the dryer is equipped with an external centrifugal switch that can easily be removed for replacement. If no external switch exists, the motor must be disassembled for access to an internal switch.

Finally, there could be a malfunction of the motor itself. Check all wiring for looseness, which could also cause the trouble, and test the motor.

### Pop goes the fuse

*Every time we have a thunderstorm, the fuse protecting my refrigerator blows. What is wrong?—William Burke, Maple Heights, Ohio*

With the refrigerator? Nothing. There may, however, be a loose wire in the fuse box or a loose house ground wire which is causing a surge of electricity to pop the fuse. I think you need a professional electrician, not a refrigerator serviceman.

### Overactive percolator

*Our Universal Coffeematic percolator, model B4518, heats up and percolates, but does not light up or shut off when operating temperature has been reached. What is wrong?—N.R. Mendenhall, Richmond Heights, Mo.*

The thermostat has probably gone bad. If

*(Please turn to page 64)*



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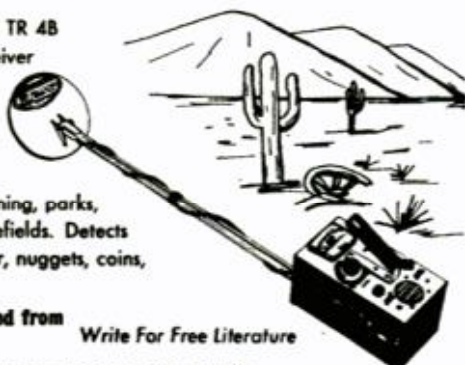
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**APPLIANCE CLINIC**

(Continued from page 62)

you can get a new one, repair is simple enough: Just drop the unit's base and detach the old thermostat.

This percolator is about 10 years old. Universal was bought by General Electric, and I have been informed that parts may be hard to come by. GE has suggested that if you can't get parts, the company will exchange this percolator for a new one on an exchange-price basis—about 35 or 40 percent of the suggested retail price of a new unit. Take the old one to a GE service center if this sounds interesting to you.

**Shaky situation**

*I have a General Electric refrigerator about 10 years old. For the past year, the compressor has shaken considerably when it starts and stops. The shake is getting worse with age. Any remedy?—J. L. Anderson, Seattle, Wash.*

External spring mounts have probably started to weaken, but the vibration can be damped by inserting rubber shims between coils. Rubber tape works well; force strips of it between coil turns with a screwdriver.

**Spin, wash or what?**

*My Kenmore washing machine tries to spin during the wash cycle. Water sometimes leaks from underneath. What do you think is wrong?—Ada Morris, Lookeba, Okla.*

Probably the clutch pulley is grabbing the spin tube during the wash cycle because of a misadjusted clutch, damaged pulley or bad spin tube. This pulley turns during the wash cycle, and if one of these malfunctions is present, it can lock onto the spin tube, which is supposed to remain stationary during the wash cycle. When the spin tube is inadvertently engaged, water can be spun right out of the machine. Have the clutch adjusted. If the problem persists, the clutch should be disassembled and all parts examined for misalignment, bends or other damage. ★★

*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.*

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## HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

### Kitchen fan size

*I want to install a kitchen ventilating fan in the wall, but I don't know how to determine the correct fan size. Can you tell me?—Edward Howe, San Jose, Calif.*

Don't go by fan size, but by its rating in cubic feet of air moved per minute (c.f.m.). Determine the volume of the kitchen in cubic feet and divide this figure by 4 to get the c.f.m. rating of a fan. This will give 15 air changes per hour—which is the Federal Housing Administration's standard for kitchen ventilation. You can use a larger fan than called for by the FHA standard, of course, but if you do, a variable-speed switch is recommended.

### Shellacking with cloth?

*I've been told that shellac can be applied with an ordinary cloth, the procedure being similar to what I think is called "French polishing." Is this true? Also, is there any difference between what is called "white" shellac and what is termed "clear" shellac?—Peter Voss, Pittsburgh.*

You can apply shellac with a cloth, but I wouldn't recommend it over the ordinary application with a brush. Shellac dries fast, much like brushing lacquer, and must be applied and spread quickly—otherwise you're in trouble. I'd stick with the brush application, or, if you want a somewhat smoother job on a small area, use the white shellac that comes in an aerosol can. "White" and "clear" shellac are generally the same. "Orange" shellac is colored with a pigment.

### Refinishing shingles

*My small home is sided with wood shingles which appear to have been stained a gray color. This finish is now weathered, showing the wood at the lower ends of the shingles. How about painting, either with oil or a latex paint?—H. Joy, Salem, Ore.*

If you're sure the present treatment is a stain, then I would stay with a stain—a staining job will go faster and last longer. If the shingles are as badly weathered as your description indicates, the walls will need thorough preparation. Go over the shingles with a wire brush to remove any loose material, accumulated dirt and grime. Replace any that are loose or curled, and stain replacements with the color you want. Renew caulking if necessary and be sure shingles are dry before you apply the stain to the entire area. Both oil and latex-based stains are now available.

### Closet condensation

*Walls in a clothes closet in one bedroom of my home, especially one outside wall, are sometimes wet and dripping near the ceiling. What causes this, and what can I do to prevent it?—Mrs. I. McClusker, Racine, Wis.*

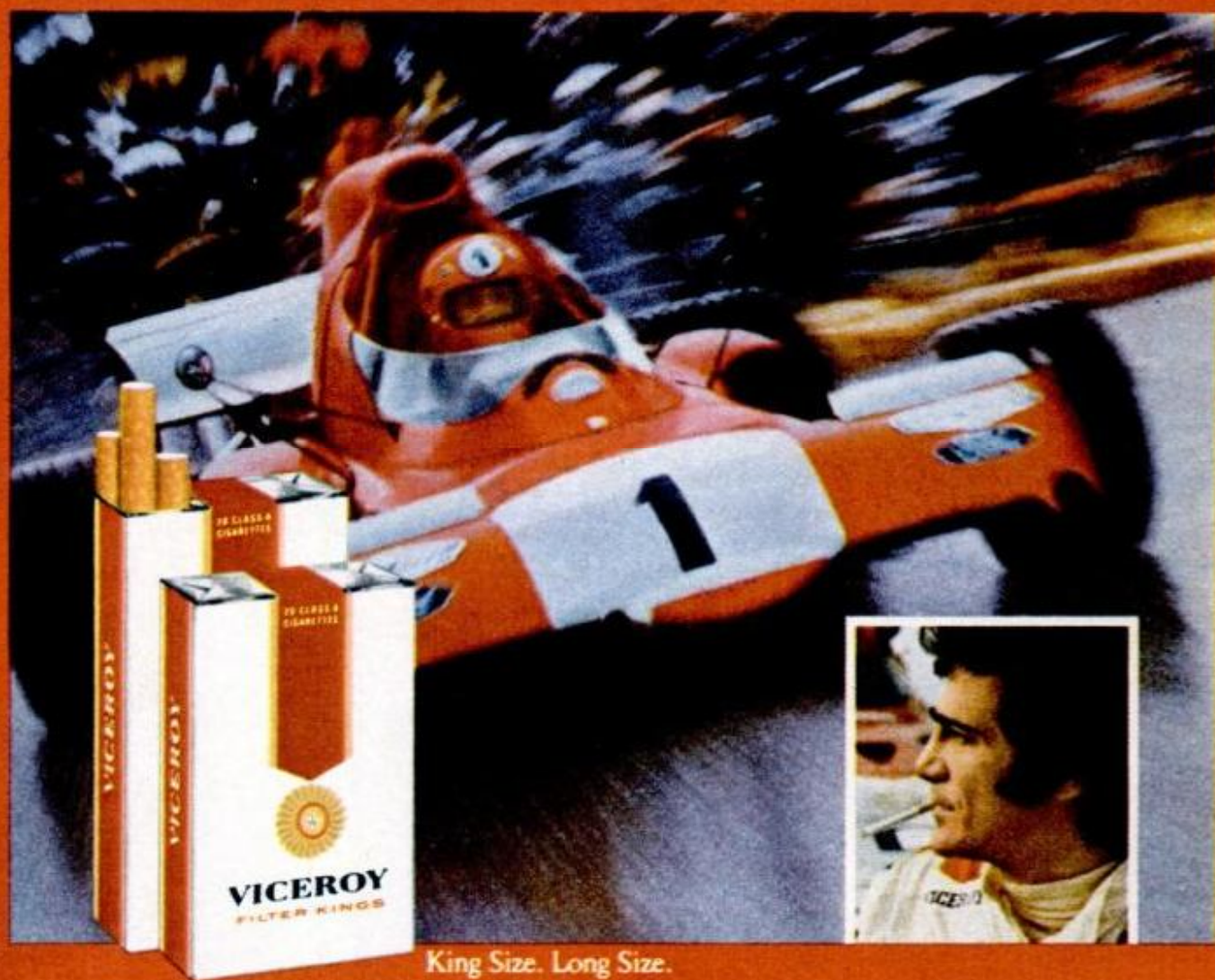
Walls are at a lower temperature than the air with which they are in contact. This causes the moisture in the air to condense on the colder surface, particularly on the outside walls, as you say. Often a cure can be effected simply by leaving the closet door or doors open. Just leaving the closet light on will sometimes do it.

For a better cure; you can insulate the outside wall by nailing furring strips horizontally on 16-in. centers, packing either blanket-type or polystyrene insulation between the strips, and then covering the wall with plasterboard. Seal the corners with Swedish putty.

Some homeowners install a wall outlet in the closet and use an electric strip heater to solve this problem. ★★★

*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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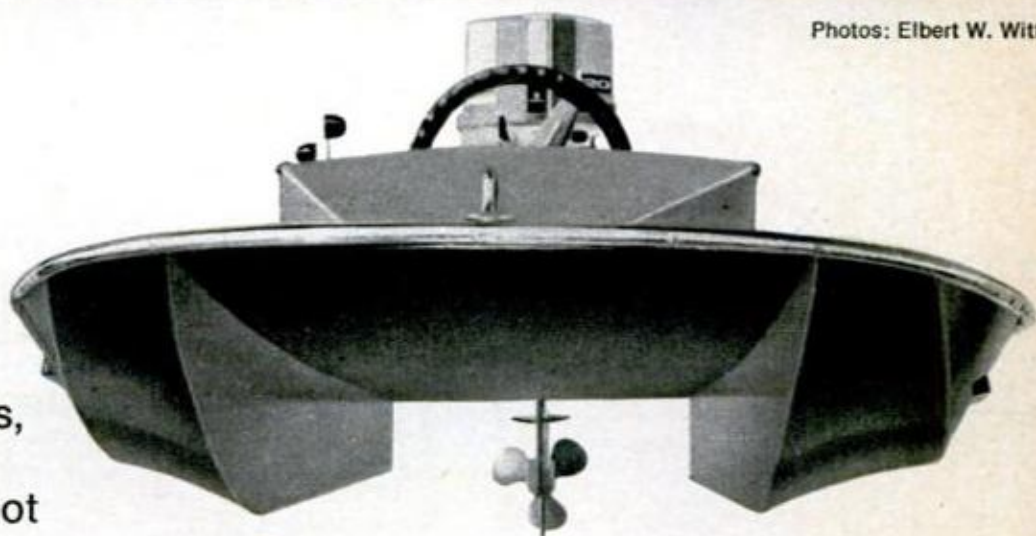


Photos: Elbert W. Witt

## Tunnel hull

A hot one for builders, this newest project from Glen-L is a 10-foot flashy performer for under \$200, ready for power.

by Bill McKeown  
BOATING EDITOR



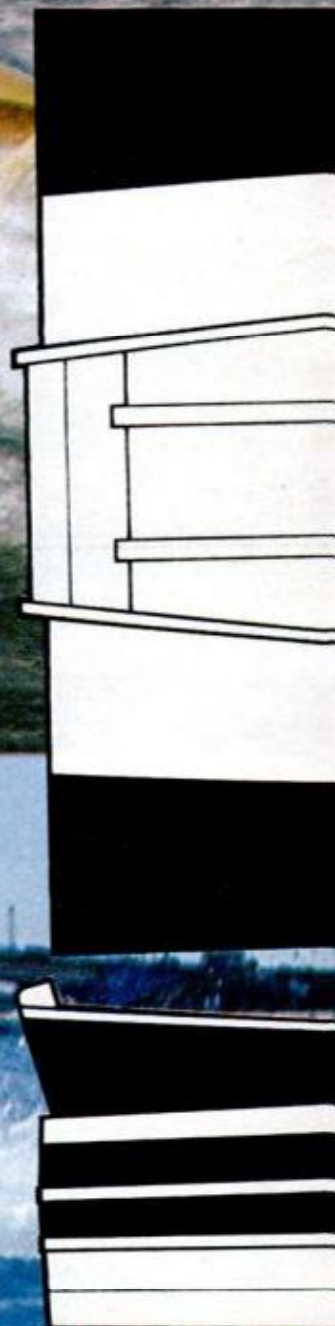
To make boats go faster, marine designers have been borrowing aircraft techniques. Latest to click with the racing crowd is a twin hull with airfoil between that reduces wetted surface friction and makes new top speeds possible.

Big unlimited-power outboard and inboard hulls have already proved the principle, and now a miniature is available for homebuilders. For under \$200 you can construct your own Tunnel-Mite from \$12 Glen-L plans.

This little speedster is 10 feet overall, has a beam



Slot-riding on a center channel of air, the tunnel hull planes on both hydro and aerodynamic lift for minimum wetted surface drag, maximum speed on flat water.

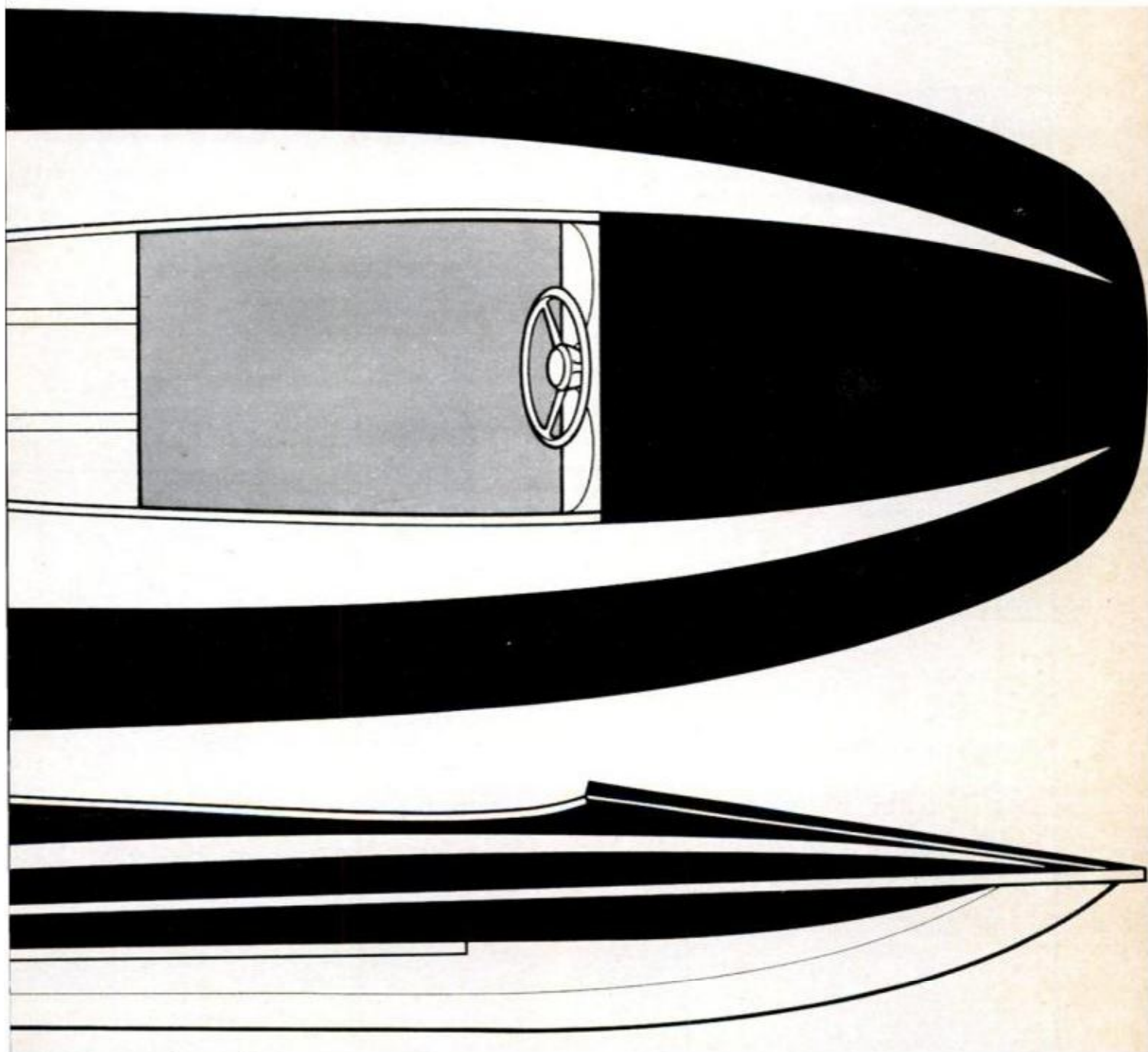


Skipping a wake or topping the chop of Long Beach, Calif., harbor where retired *Queen Mary* is berthed, the Tunnel-10 tests successfully. Turns proved smooth, flat.

of four feet ten inches, and is designed to carry outboards of up to 100 pounds on twin full-length sponsons. Hull weight is only 120 pounds, light enough to be carried by two men. The craft is easy to cartop and will fit in some station wagons. With a 150-pound test driver at the helm, she's already clocked a sporty 34 mph with a 20-horse Chrysler outboard. Recommended horsepower is 20 to 25, and a racing propeller

plus careful adjustment of motor mount height and tilt are required, of course, for best results. Trying to put another passenger aboard would ruin performance, and hanging too much power on Tunnel-Mite could prove dangerous.

Set up as designed, however, the prototype showed the tunnel hull characteristics of smooth flat runs as if on rails, flat turns, and good handling response. Skimming



#### How to purchase plans

Plans and full-size patterns for Tunnel-Mite, plus step-by-step pictorial and written instructions, bill of materials and fastening schedule are available from the designer. All frames, transom, motor board, bowpiece, runner, side planking, dash beam and coaming are shown full

size. Price is \$12 for complete plans and patterns package for Tunnel-Mite from Glen-L, Dept. PM, 9152 Rosecrans, Bellflower, Calif. 90706. Frame kits, fastening kits, steering system, fiberglass covering kits and accessory kits for Tunnel-Mite can also be ordered from Glen-L.

## Tunnel-Mite weighs under 125 pounds

dishes of this type should be run only on inland, protected calm waters where no waves or a sudden gust of wind through the tunnel could cause the hull to go airborne and kite. With proper conditions and kneeling low for best balance, the driver bombs



**Framing members** are cut out from full-size patterns, assembled and the assembly set on two sawhorses. No building jig is required. Battens reinforce tunnel.



**Tunnel planking** is next fitted into position. Tunnel sides are parallel and panel fit is easy. Apply glue and drive fastenings into the bowpiece and transom.



**Turn hull over** and notch bevels for chine and sheer members so they will mate flat when sprung around hull. Temporary forward spreader reinforces bowpiece.



**Sheer clamp** is secured to bowpiece and worked aft with end left long for final trimming to fit transom notch. With sheer, chine in place, remove bow spreader.



**For chine-log installation**, hull is reinverted. Then longitudinal members are all faired so the planking will mate flat. Chine log, sheer clamp join at bow.

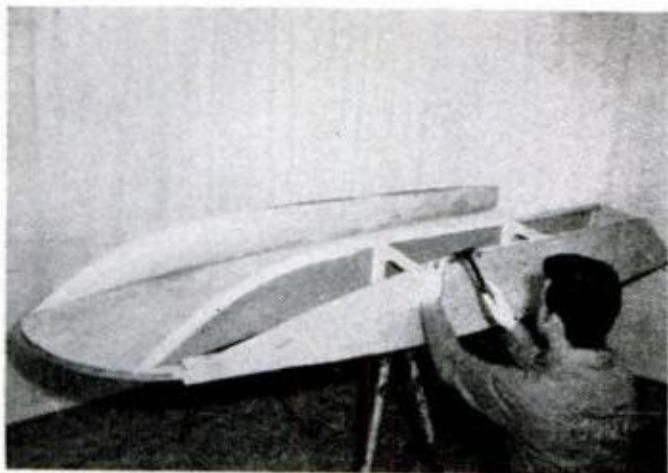


**Lean side panel against hull** and mark to shape. Cut plywood slightly oversize. Panel can be template for opposite side. Fitting is done with panel in place.

along at water level with a real sensation of speed.

Tunnel-Mite needs no jig for building, no lofting or layouts. To keep weight down, Sitka spruce is recommended and planking of 4-mm and 6-mm (about 1/8-in. and 3/16-in.)

plywood available in 10-foot lengths from Harbor Sales, Baltimore, Md.; M.L. Condon, White Plains, N.Y., and Spar Lumber, Long Beach, Calif. For the boatman-builder who likes high performance at a low price, here's the latest answer. ★★★



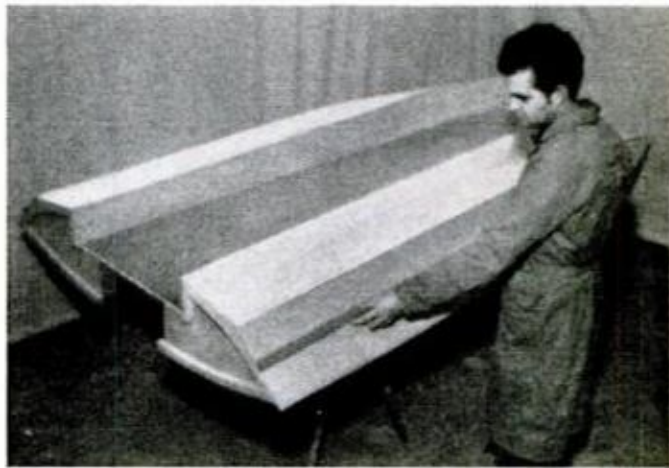
**Side planking panel** is fastened in place after mating surfaces are coated with glue. Nails are set as shown and overhanging edges can now be faired with plane.



**Bottom runner planking** is installed in same manner as side planking. Panels will be found to bend easily into place. Fastenings are used along longitudinals.



**Deck framing members** are installed after hull is planked and righted. Carling is positioned in notches in frames, transom. Note notches, blocking for battens.



**Spray rail**, a beveled member along side of hull, deflects water away from hull and adds side planking rigidity. Fasten from inside hull before decking.



**Cockpit coaming, dashboard and transom** are now installed. Before decking goes on, foam flotation material can be fitted into void areas for strength, safety.



**Final decking panels** are fitted in same manner as hull panels. Inner contour which butts cockpit coaming is marked to fit along carling before coaming goes on.

# Bicyclists, start your engines!

by Jake Grubb

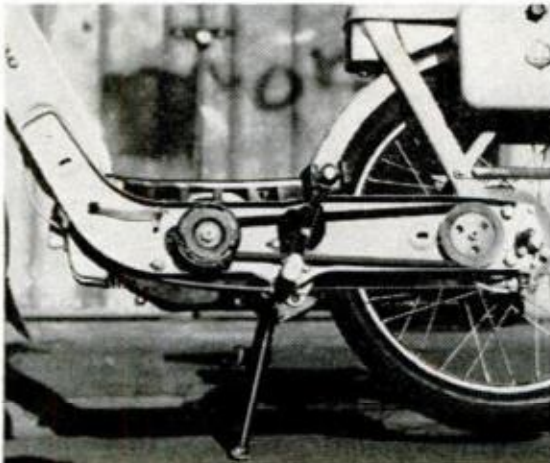
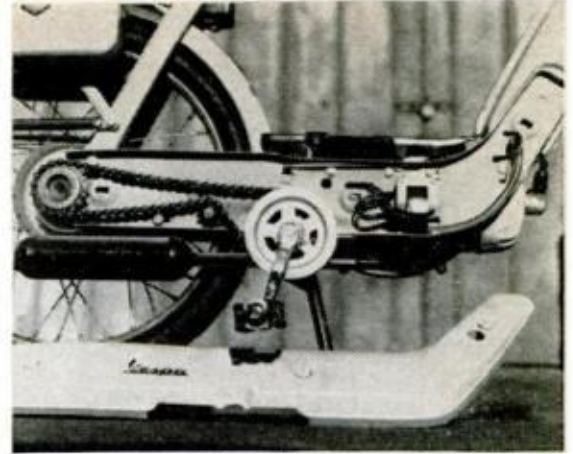
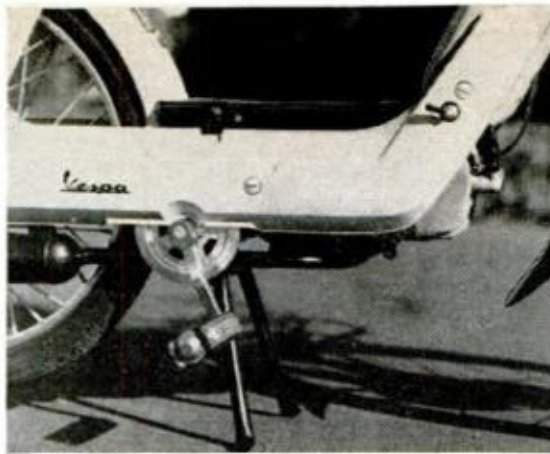
Two wheels, one minuscule engine with pedal assist, 25 miles per hour, 150 miles per gallon. Price: About \$250. This simple formula is the cheapest and most economical form of individual motorized transportation known to Europe. Motor plus pedals, the *moped* has existed for half a century and grows greater in popularity every year. Today there are about 12 million mopeds in use throughout the world, most of them in European countries. Very few are registered in the United States, about 55,000, and many dollar-conscious Americans are beginning to wonder why.

Mopeds are classified by the Department of Transportation as motorcycles. Because

Photos: David Gooley and Jake Grubb



**Ciao model**, made by Vespa, is shown at left zipping along at top speed of 25 mph. Details of the 150-mpg machine are shown in pictures at right. Enclosed chain on right side connects the pedal chainwheel to rear wheel. Belt on the left side transfers power from the one-lunger to rear wheel. Battery powers directional flashers, lights.



of this, they must meet federal safety standards for motorcycles which include: High/low beam headlight, (32,000 candle-power seal beam), taillight, brake light, turn signals (as of 1975), license-plate light, speedometer, battery that allows the lights to stay on with or without the engine, 24-watt electrical circuit and approved brake system. Most mopeds in production today do not meet these requirements.

State regulations are not necessarily consistent with those of the federal government. Nineteen states classify the moped as a "motor-driven cycle," as does the Department of Transportation; five states classify it independently as a "motor-assisted bicycle" and 26 states classify it in a variety of ways—most based on modified definitions of a motorcycle. Until 1973, law enforcement on the matter was left up to the individual states. Most mopeds were imported as bicycles and sold as bicycles with motor assist. Registration was left to the buyers, with dealers generally keeping owners and customers informed on matters of legality. In some states mopeds passed as bicycles and did not need to be licensed. In others they were considered motorcycles and in others they were flatly disallowed.

This kind of inconsistency proved beneficial to moped distributors in states where these vehicles could be freely imported, sold and licensed. Distributors in other states were at a disadvantage, however, and complaints to the DOT spurred federal rulemaking. Subsequent action proved negative; an embargo was placed on importation of mopeds unable to meet National Highway Traffic Safety Administration standards for motorcycle safety.

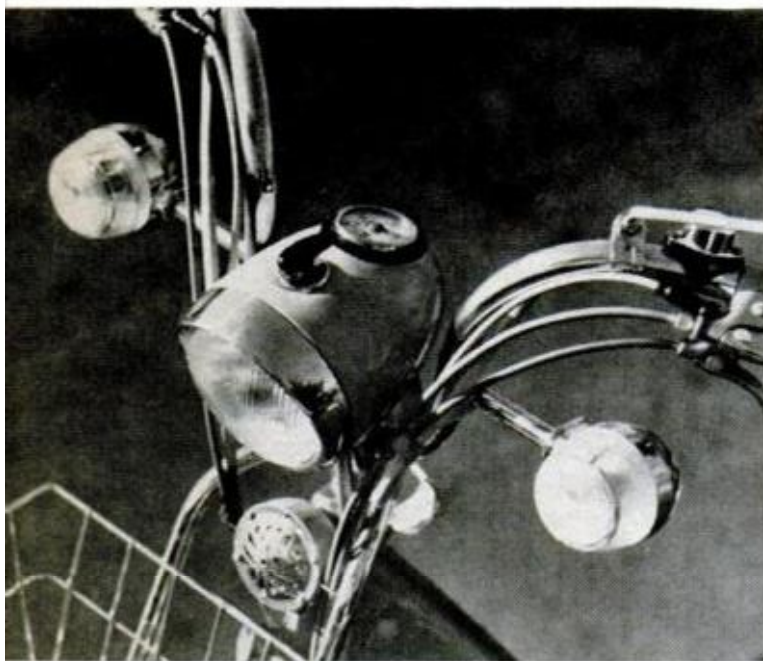
There are currently two mopeds available in the United States, the Italian Ciao, made by Vespa, and the Dutch Batavus, imported by Mitsubishi International Corp. These can be purchased and registered as motor-driven cycles.

The Ciao, an attractive lightweight cycle, looks like a cross between a beefy girl's bicycle and a plush motor-scooter. Fueled and ready for travel, it weighs about 100 pounds. The Ciao is powered by a 49.77-cc single-cylinder two-cycle engine, develops approximately 1½ hp and has a top speed of 25 mph. Because of its turn signals and heftier lighting, the American version is about 10 pounds heavier than its European equivalent. This hampers acceleration slightly. The model shown on these pages incorporates a simple leading link/rubber

## Batavus consumes more fuel . . . gets 'only' about 120 mpg!

bushing arrangement on the front forks which absorbs the shock of minor road irregularities. Rear suspension is nonexistent except for the fact that the seat is both thickly padded and also cushions the rider from bumps because it is mounted on a resilient coil spring.

Primary drive from the engine is transferred to the rear wheel by an automatic clutch and trapezoidal-shaped belt with fixed pulleys and a reduction gear unit.



Rubber bushing arrangement on front forks on the Ciao provides rudimentary suspension. Full lighting and horn fitted at the handlebars makes the moped street legal. Power is 1.5-hp, air-cooled two-stroke.

Power is applied with a twist grip on the handlebar. Levers at each grip activate drum brakes, front and rear. Pedals, sprocket with crank, roller chain and a free-spinning sprocket on the rear wheel compose the "ancillary transmission." Press a button on the rear hub, the engine disengages and the Ciao becomes a bicycle. Retail price for the model pictured here is \$368, less tax and license. This is about \$50 more than the non-U.S.-approved European version of the same moped.

Not unlike the Ciao, the well-known Dutch Batavus incorporates an automatic centrifugal clutch, primary drive to the rear wheel via V-belt, an air-cooled, single-cylinder two-cycle engine, central tube frame, drum brakes and a chain-driven pedal assist as a secondary transmission. The Batavus weighs 100 pounds (dry). Engine displacement is 48 cc with a maximum 1.54 hp at 4500 rpm. Top speed is 30 mph, somewhat better than that of the Ciao, but the Batavus consumes more fuel; it gets "only" about 120 miles to the gallon!

The Batavus's fuel capacity is .95 gallon; the Ciao's: .75 gallon. You can ride well over 100 miles on either before refueling. Both mopeds run low-octane pump gasoline mixed with two percent two-cycle oil. The most noticeable difference between the Ciao and Batavus is that the Dutch model has front telescopic suspension and independent rear shock absorbers. Technically this is an improvement over the Ciao's suspension system but in practice, both mopeds are of a comparable handling.

Early in 1973 three major French moped manufacturers, Peugeot, Motobecane and Velosolex, combined efforts in a petition to the U.S. Department of Transportation for reclassification of mopeds. Their aim was and is to have the moped given its own special definition, independent from motorcycles, bicycles and all other vehicles. The premise, of course, is that the moped is unique and holds great potential as practical transportation for millions of Americans.

The primary complaint of these manufacturers seems to be that U.S. government regulation impairs the essence of what a moped has to offer; that to embellish this featherweight transporter with items such as large-size running lights, turn signals, lead-acid battery and the complex electrical

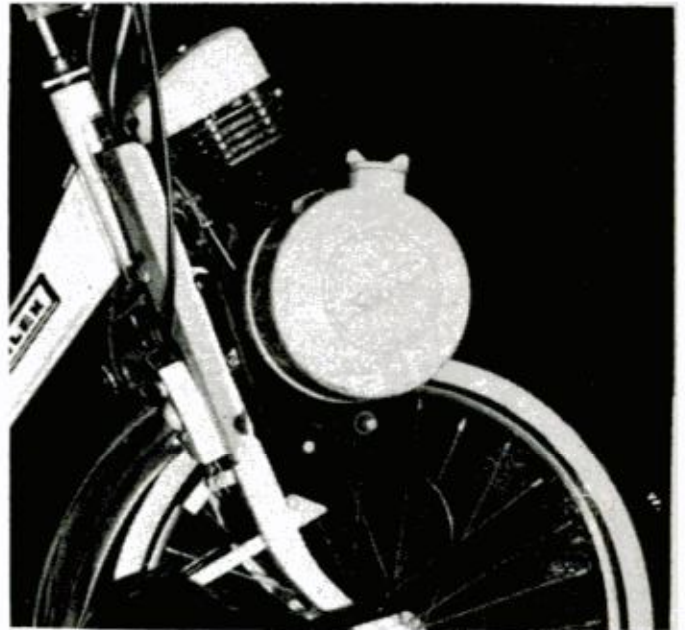


circuitry defeats its very purpose. It becomes heavier, physically more cumbersome, more expensive and in the process often develops the need for more horsepower. And with the added weight and bulk it becomes less convenient to pedal. "What you end up with," says Jim Niehl of National Inventions Inc., "is a small motorcycle when what you started with was a power-assisted bicycle—something you could ride and enjoy as a bicycle and yet propel with the motor when necessary." Niehl is a Michigan distributor of Velosolex mopeds, the oldest, simplest, cheapest and most popular in Europe. Under present U.S. federal law these cycles cannot possibly be imported without being completely re-engineered.

Designed primarily for short distance transportation, mopeds have a multiplicity of uses. In Europe, teen-agers and college students use them for transportation to school, men use them for getting to and from work, women use them for shopping, elderly persons use them for relaxing rides in the country, and all kinds of people use them for bicycling exercise. In terms of safety, fewer accidents take place per capita than do those that involve automobiles.

Ingredients common to nearly all conventional mopeds are a 50-cc (or less) two-

*(Please turn to page 170)*



**Famous French Velosolex** is the original moped. The 49-cc two-stroke is mounted at head tube, and friction roller rubs the tire. It's the simplest possible arrangement, and the bicycle can still be pedaled.



**Batavus moped** is made in Holland and imported to United States by Mitsubishi International Corp. Neat, lightweight machine has peppy performance plus such features as a telescopic front fork and swing-arm rear with double shock absorbers.

# Lots of joie de vivre

A nationwide survey based on 770,000 owner-driven miles.

By Michael Lamm  
WEST COAST EDITOR

Renault's reputation has been climbing steadily since the old Dauphine days. In those dog days of the late '50s dealers didn't care much for servicing the cars, and parts for Hupmobiles were easier to get.

Still, enthusiasm for the cars themselves persisted and a faithful following found a fun car in the R10 of the '60s—confirmed by the fact that the No. 4 reason for buying a 12 (15.7 percent of owners in our survey) was good past experience with Renault. Some who owned R16s felt the car, with its

Photos: Irv Dolin



# and too much whine!

wagon-back design, was ahead of its time.

The Renault 12 arrived on these shores in late 1971 (*Renault 12: Front-Wheel Drive to the Fore!*, page 126, Nov. '71 PM) and was followed by the sporty 15 and 17 models in 1972 (*Renault 15: It Won't Go Unnoticed . . . And Go It Does!*, page 142, Sept. '72 PM). The Gordini version of the 17, with its excellent blend of performance and fuel economy, is now available, too. Renault has increased its commitment to the American market with its growing line of mod-

els, and will be even more competitive next year when, despite no official confirmation, we guess the unique, little Renault 5 will be available here.

Still, the question remains, has the service and parts situation improved? On service, 25.8 percent of owners we surveyed rated it poor. Another 22.6 percent said good, 14.5 percent put down excellent (and another 14.5 percent ticked off fair). Remember that interpretations of good, poor, excellent, and so on vary from person to



**Front-wheel drive handling** is tops with owners who have lived with their cars for a while, but economy was the reason most decided to buy. All model 12s offer as standard: Rack-and-pinion steering, radial tires, disc/drum brakes. L and TL versions (12TL is shown here) offer more in the way of luxury: carpeting, reclining front seats, rear armrests. East Coast prices (as of last April) start at \$2795.



**Subtle wedge styling** of the 12 received no comments in the survey. No praise. No criticism. No desire to change it. This apparent total lack of concern about styling is unique in PM Owners Reports! We're at a loss to draw a conclusion!

person. In a nutshell, though, 54.8 percent felt that dealers' service ranged from average to poor, while 45.2 percent rated it good or better. That's not too different from ratings for other cars we've surveyed and a lot better than some—the Mustang II, for example.

The Renault's workmanship got good marks. Overall, 76.1 percent rated workmanship good to excellent. "Mechanically, workmanship is very good," said a Jersey furniture salesman, "but brightwork and trim are only fair." An Illinois pollution controller: "Workmanship is good, the car feels solid, but the doors sound tinny."

Specific likes include these. "I appreciate the front-wheel drive," writes a Montana custodian, "because it gets around well in snow and mud; I also like the Michelin tires, good gas mileage (but not so good as expected), and comfortable interior. It's a good road car."

A New Hampshire comptometer operator: "Front drive, steel-belted radials, rack-and-pinion steering—all these things are important to me. I do a lot of skiing and mountain climbing, and I need a car that can get me there." A New Jersey office manager: "Engine very flexible, steering very accurate, holds road well." And a New York broadcaster: "Having fwd gives admirable handling in snow. For a small car, its road-holding in crosswinds is surprisingly stable. Acceleration and performance are entirely adequate for my taste. Ample trunk space with excellent feature of spare being upright in well."

Here are some specific dislikes. "Hard to start in cold weather." (New owners may be unaccustomed to the manual choke in the 12.)

"Ventilation system when airconditioner isn't on has very limited capacity; also our gas mileage is not what I expected—20-23 mpg." "Squeaks and rattles in steering column; inadequate fresh air flow with windows closed." "Steering a bit sticky at freeway speeds." "More power would be nice, even if that means less mileage."

What about comfort? An Illinois airline pilot opines, "In comfort and efficient use of space, there is no comparable U.S. product." An Arkansas warehouseman: "All my passengers praise the car's ride—very comfortable front and back." An Iowa machinist: "I'm six feet and find the steering wheel too low." And a Florida retiree: "All seats are very comfortable; I'd just as soon sit in back as up front."

General comments from the driver's point of view include: "Rides, steers and corners well," says a California painter, "but there



**Comfort is greatly appreciated** by owners. Very handy is parcel shelf under dash running full width of car.

## Summary of 1974 Renault 12 Owners Reports\*

Total miles driven .....771,441

Average miles per gallon  
Local driving .....21.7  
Long trips .....25.5

Series:  
Renault 12 .....37.7%  
Renault 12L .....21.5%  
Renault 12TL .....40.8

Body styles:  
Four-door sedan .....65.2%  
Four-door wagon .....34.8

Transmissions:  
Four-speed manual .....75.0%  
Automatic .....25.0

Why the Renault?  
Economy .....55.1%  
Front-wheel drive .....27.3%  
Comfort .....16.2%  
Past experience .....15.7%  
Handling .....12.1

Specific likes:  
Handling .....61.4%  
Comfort .....47.2%  
Economy .....44.2%  
Front-wheel drive .....28.9%  
Ride .....20.8%  
Roominess .....14.7

Specific dislikes:  
Rattles, noises .....21.5%

Disappointing gas mileage ....15.1  
Cold starts .....10.8  
Seatbelt interlock .....10.2  
Dealer service and parts availability .....7.0

What changes would you like?  
Better vent system .....11.8%  
Lower noise levels .....6.6%  
Better windshield wipers .....6.6%  
More power .....5.9%  
Better workmanship .....5.9%  
Better manual choke .....5.9

Number of vehicles owned:  
Renault only .....31.7%  
Two cars .....47.2%  
Three cars .....16.1%  
Four cars .....3.0%  
Five or more cars .....2.0

Other makes of vehicles owned:  
Ford .....15.6%  
Chevrolet .....14.8%  
Plymouth .....11.9%  
Oldsmobile .....11.1%  
Renault .....10.4%  
Pontiac .....9.6%  
Dodge .....9.6

Comfort opinion:  
Good to excellent .....81.0%  
Average to poor .....19.1

Workmanship opinion:  
Good to excellent .....76.1%  
Average to poor .....24.0

Dealer service opinion:  
Good to excellent .....45.2%  
Average to poor .....54.8

Had any mechanical trouble?  
Yes .....51.8%  
No .....48.2

What type of trouble?  
Transmission .....12.9%  
Electrical .....8.9%  
Cold starts .....8.9%  
Oil leaks .....7.9%  
Seat belts .....7.9%  
Exhaust manifold .....6.9

Did you repair it yourself?  
No .....96.1%  
Yes .....3.9

Dealer repairs satisfactory?  
Yes .....69.1%  
No .....30.9

Age distribution of owners:  
15-29 years .....23.6%  
30-49 years .....45.9%  
50-plus .....30.4

Would you buy another Renault?  
Yes .....83.4%  
No .....16.6

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

seems to be excessive noise at speeds of 60-70 mph. The clutch doesn't seem very positive, especially shifting at high rpm, and the transmission doesn't shift positively either."

"Driving maneuverability is excellent," avers an Ohio driver's helper, "and it's easy to park—I like the way it handles."

However, owners of automatic-transmission-equipped Renaults complained about their car's lack of pep, and a few said this sluggishness made entering turnpikes dangerous. The owners of automatics also were most disappointed in gas mileage. (Most in

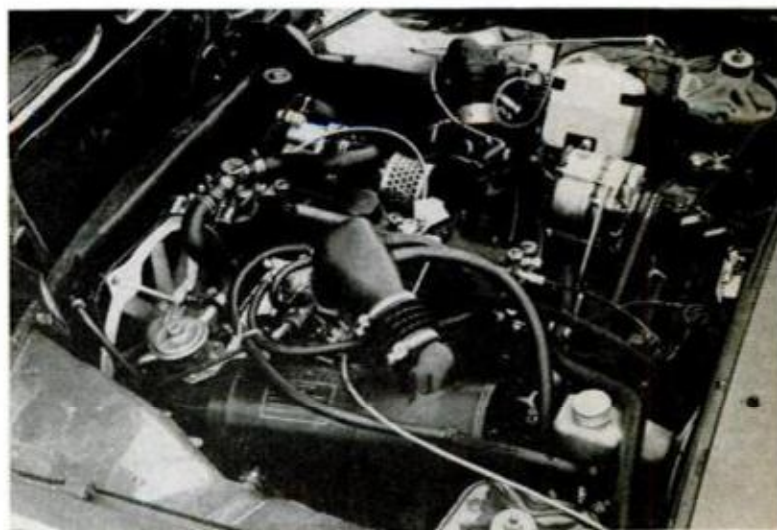
our survey had bought their cars at the height of last March's gasoline shortage).

Wagon owners voiced special problems, among them more rattles and a tendency for the rear window to pile up dust or snow. A couple complained that the tailgate becomes unlatched when the wagon hits a bump—even with the latch locked. (Renault take note. If this is caused by a design defect, a recall is in order.)

Would owners buy another one? A total of 83.4 percent said yes, which in the old school-grading system would give the Renault 12 a solid B. ★★★



Trunk is roomy with flat floor; spare stands upright and is neatly covered to keep luggage clean.



In-line Four is front-mounted ahead of drive wheels. Displacement of the ohv unit is 1647 cc (100.5 cu. in.).

# How to repair an electric iron

Electrically, an iron is simple; its electrical circuit consists of cord, thermostat and heating element. Iron thermostats are of two types: bimetal and base-expansion (see drawings on page 85). In the first, a bimetal strip makes and breaks contacts as temperature changes. In the second, a thin metal strip welded to the base of the thermostat falls and rises to make and break contacts as the base contracts and expands with temperature changes.

In either type of iron thermostat, the spring tension on thermostat elements is varied to give different temperature settings, and the iron, once hot, will cycle on and off within a few degrees of the desired temperature. Thermostat contact points may become pitted or corroded in time, and

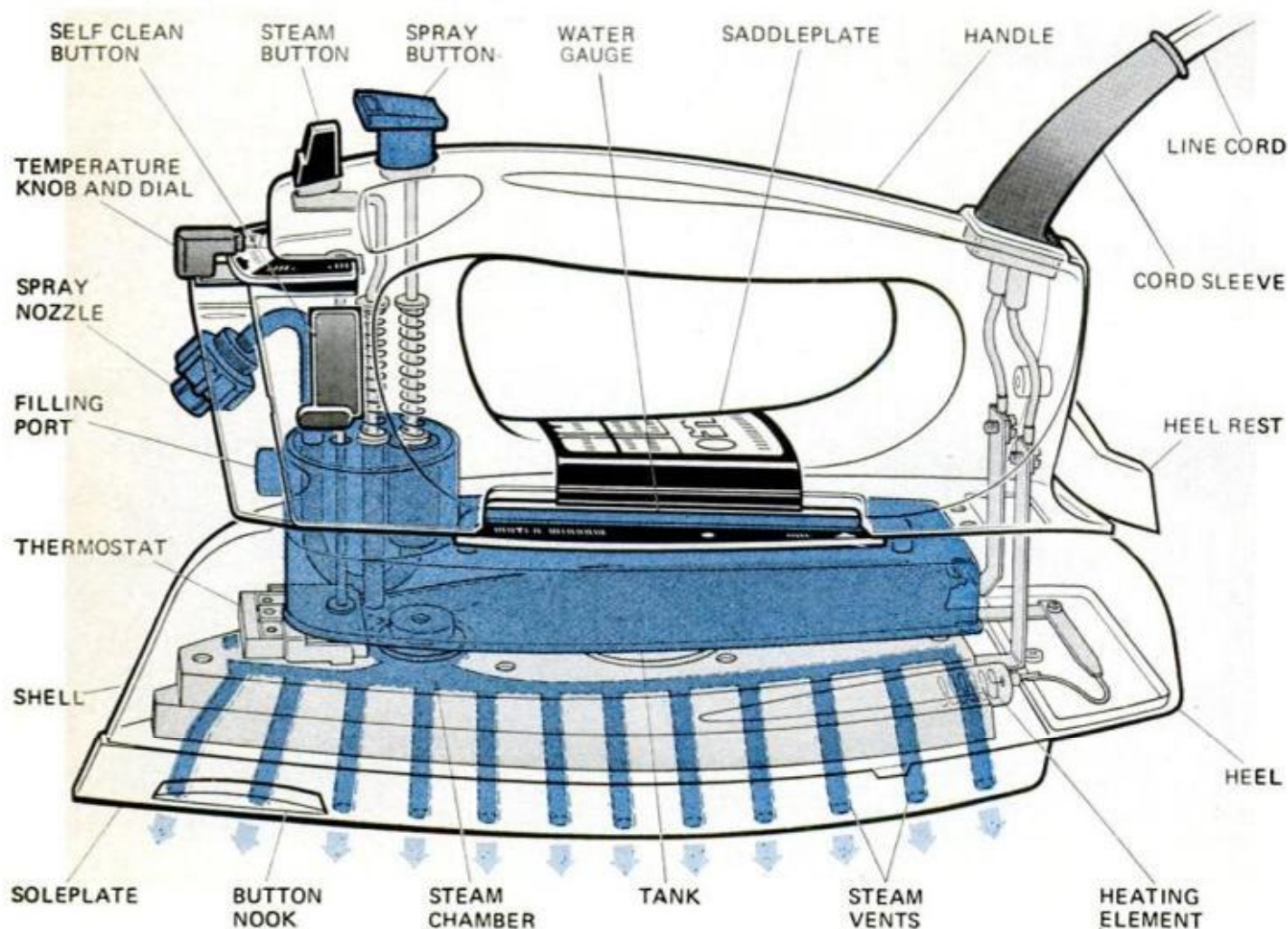
if an iron is dropped, insulators and bimetal may break.

It is usually better to replace a thermostat than to repair it. Thermostat calibration requires an iron tester; one may be worthwhile only if you plan to check a number of irons. One tester maker is Waage Manufacturing Co., 632 North Albany Ave., Chicago, Ill. 60612. Write for your local dealer's name.

Heating elements are chrome-nickel resistance wire, either a replaceable ribbon element wound on a sheet of mica, or a round wire element in a ceramic form cast into the iron's soleplate. The cast-in type is expensive to replace when found defective; you're better off buying a new iron than trying to replace such an element. Heating-element

Typical spray-steam iron components

Art: Peter Trojan



**Iron does not heat**

POSSIBLE CAUSES	WHAT TO TRY
1. Blown fuse or tripped circuit breaker.	Replace line fuse or reset circuit breaker. If blowing or tripping is repeated, check iron for shorts.
2. Defective cord or plug.	Inspect cord and plug for fraying or breaks. Disconnect cord from outlet and iron and test each wire for continuity. If either gives no reading, replace with cord of correct size.
3. Loose connections at iron terminals.	Tighten both connections at eyelet terminals on iron.
4. Loose thermostat-control knob.	Replace knob and tighten on shaft.
5. Defective thermostat.	Disassemble iron for access to thermostat. Replace thermostat if parts are broken.
6. Defective heating element.	Test element for continuity. If there is no reading, replace removable element; discard iron with cast-in element.

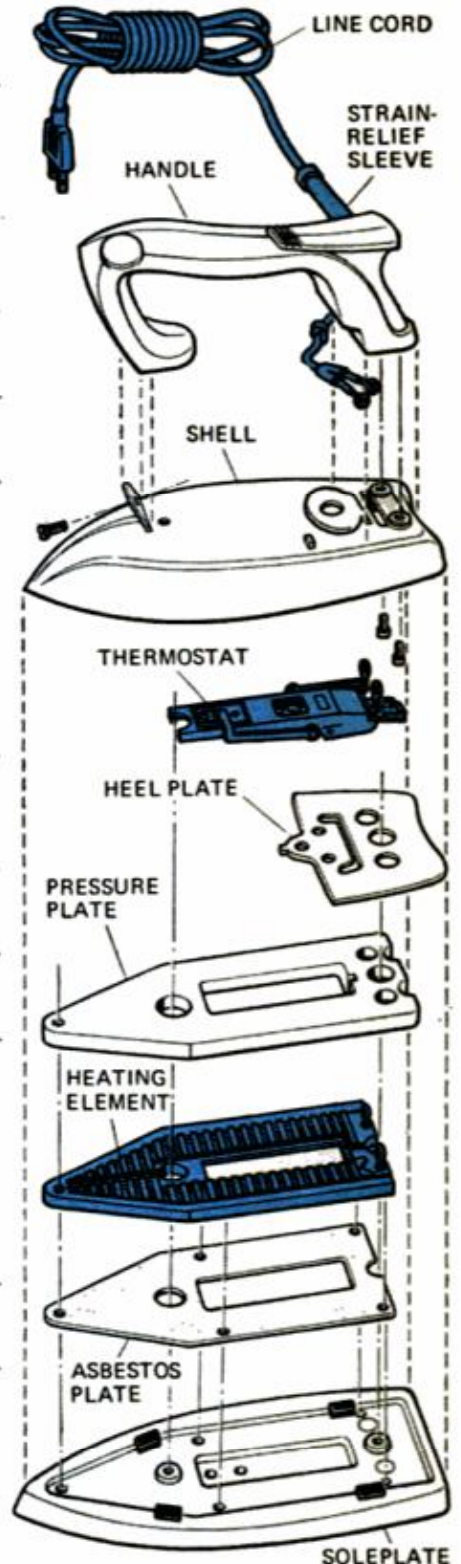
**Iron produces too little heat**

POSSIBLE CAUSES	WHAT TO TRY
1. Low voltage.	Test voltage at wall outlet with voltmeter. If not within 10 percent of normal, call local power company.
2. Thermostat out of calibration	Recalibrate iron only with an iron test stand. Set text for information on source.
3. Defective thermostat.	See preceding chart.
4. Loose connections at terminals.	See preceding chart.

**Iron produces too much heat**

POSSIBLE CAUSES	WHAT TO TRY
1. Thermostat out of calibration.	See preceding chart.
2. Defective thermostat.	See chart, "Iron does not heat" (top above).

**CAUTION:** Be sure power is turned off before you handle components. Make all continuity tests with power off. Use your manufacturer's manual to locate components, and use only replacement parts that meet his specifications.

**DRY IRON**

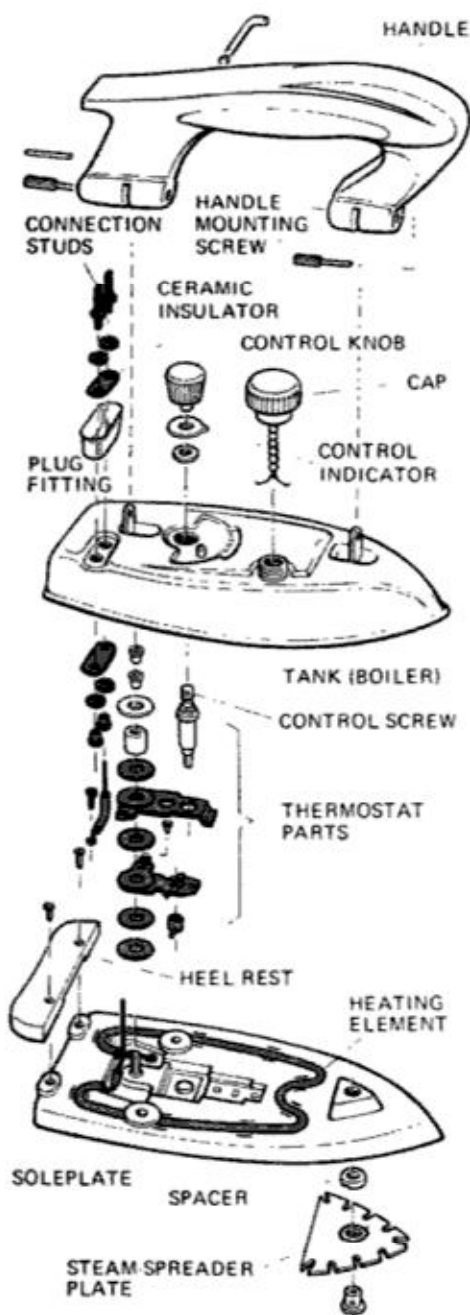
failures are opens (breaks), grounds and shorts. A shorted element will usually blow itself apart when it is turned on, in turn blowing the line fuse; afterward it will test as open.

Steam irons operate two ways: with a tank that also serves as a boiler or, in the flash type, with valving that drips water into a steam chamber—a recess in the hot soleplate—where it vaporizes. A spray feature adds a pump to the hardware. Hard

water is the enemy of steam irons, as it leaves mineral deposits that build up and clog valves and ports. Distilled water is recommended in its place.

When a steam-iron problem involves inaccessible parts, disassembly should be done with caution because of the complexity of valves and linkages. Get the manufacturer's service instructions, and take the iron apart only as far as necessary to gain access to the faulty component. ★ ★ ★

### BOILER-TYPE STEAM IRON



### Water leaks from iron

POSSIBLE CAUSES	WHAT TO TRY
1. Tank overfilled.	Do not fill tank completely. Water expands when heated.
2. Defective seam or tank weld.	Disassemble iron for access to tank, replace tank, reassemble iron.
3. Damaged tank gasket.	Disassemble iron for access to gasket, replace gasket, reassemble iron.

### Iron does not steam

POSSIBLE CAUSES	WHAT TO TRY
1. Tank nearly empty.	Refill tank.
2. Thermostat set low or out of calibration	Set thermostat higher or recalibrate if necessary. See chart, "Iron produces too little heat," page 83.
3. Valve OFF.	Turn valve to ON position.
4. Clogged valves or steam ports.	Clean iron by filling its tank with vinegar and turning it on.

### Iron spits

POSSIBLE CAUSES	WHAT TO TRY
1. Wrong setting of thermostat.	Set thermostat higher. Spitting usually is caused by low thermostat setting.
2. Internal mineral deposits.	Clean iron with vinegar as described in preceding chart.
3. Tank overfilled.	Do not fill tank completely.

### Spray does not work

POSSIBLE CAUSE	WHAT TO TRY
1. Defective plunger or assembly.	Disassemble iron for access to plunger and the plunger assembly. Replace any worn or broken parts.



## Iron stains clothes

POSSIBLE CAUSES	WHAT TO TRY
1. Starch on soleplate.	Clean soleplate with damp cloth, buff with steel wool and polish with dry cloth.
2. Minerals in water.	Use distilled water in iron.
3. Sediment in tank.	Clean with vinegar. See chart, "Iron does not steam," page 84.

## Iron tears or snags clothes

POSSIBLE CAUSE	WHAT TO TRY
1. Rough spot, nick or burr on soleplate.	Buff soleplate with fine emery, polish with dry cloth.

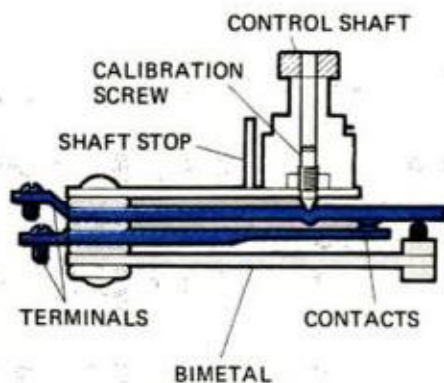
## Iron gives shocks

POSSIBLE CAUSES	WHAT TO TRY
1. Defective cord.	Check cord for frays, cracks, exposed bare wires. Replace with cord of correct size for iron.
2. Thermostat insulation break.	Disassemble iron to get at thermostat; look for broken porcelain or asbestos. Replace assembly.
3. Heating element grounded.	Test for ground with one lead of continuity tester on element, other on iron chassis. A reading indicates a ground. Replace removable element; discard iron with cast-in element.

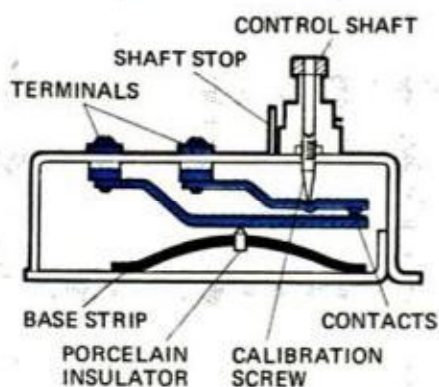
## Iron sticks to clothes

POSSIBLE CAUSES	WHAT TO TRY
1. Dirty soleplate.	Clean soleplate. See chart, "Iron stains clothes."
2. Excess starch in clothing.	Reduce amount of starch used and lower temperature setting.
3. Temperature too high for fabric.	Lower temperature setting. Consult manufacturer's instructions on fabric type involved.

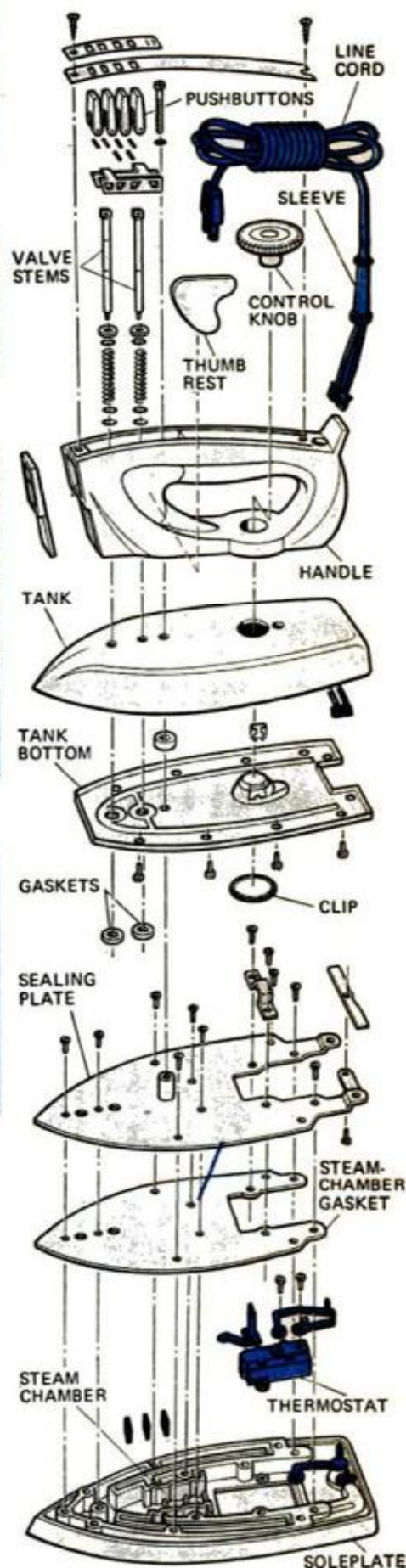
### BIMETAL THERMOSTAT



### BASE-EXPANSION THERMOSTAT



## FLASH-TYPE STEAM IRON



# New challenge—ocean heavyweights on a fly

In tests that can snap a line at any moment, anglers are tackling the biggest saltwater lunkers with the lightest of gear.

by Bob Stearns



World-record 41-pound cobia (above) taken by author Bob Stearns with 15-pound tippet. (Right) Miami fly expert Chico Fernandez hefts a 130-pound tarpon landed on 12-pound test line.



**J**ust about any fish that can be caught with casting equipment can be taken with a fly rod—and what a challenge! Striped bass and other gamefish have been landed from New England and mid-Atlantic surf. Recently a 50-pound striper was taken on fly tackle in Oregon. Sea trout, bluefish, channel bass, mackerel, cobia, bonito, dolphin (the fish) will all take a fly. And so, with some luck and skill, will tarpon, bonefish and even billfish and sharks!

Cost of adequate tackle can be quite modest. You can put together an outfit of good quality equipment that will serve your needs well for under \$40. Or you can buy the best and pay \$300 plus for a single rod, reel and line. The varieties available are tremendous, but here are some basics to consider when fitting out.

**The rod.** Most modern saltwater fly rods are of fiberglass. Bamboo used to be the traditional material for freshwater, but it doesn't stand up as well in marine use.

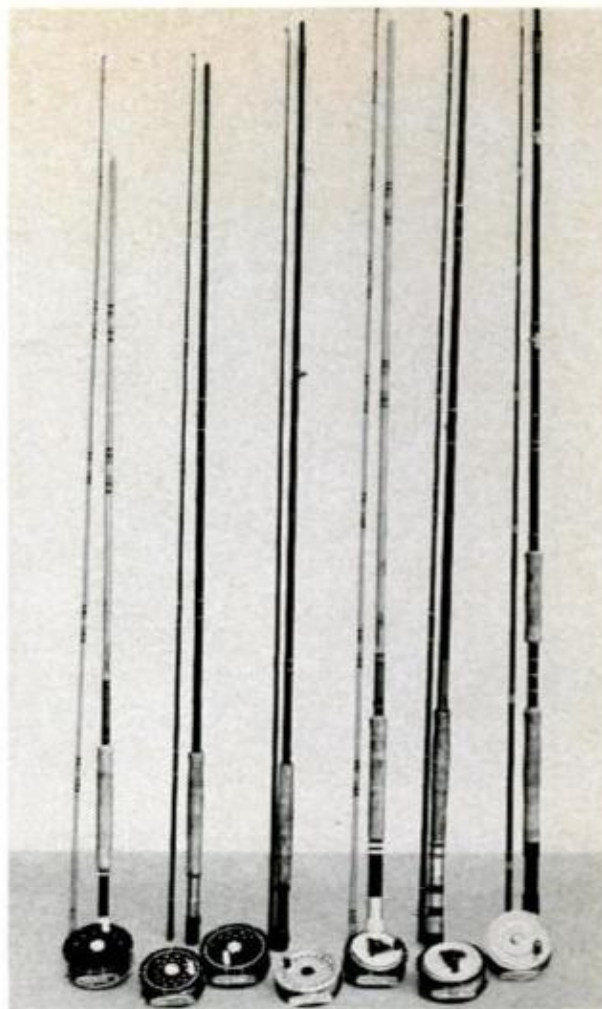
Most salt fly rods come in sections and are ferruled together, since one-piece 8 to 9½-footers are awkward to carry. The best ferrules are fiberglass; they don't break easily nor do they create "flat spots" in the rod's flexing action, and they won't corrode and freeze up as metal sometimes does. Both "tip over butt" and "insert" ferrules seem to perform equally well.

Probably the best rod for a first-time saltwater fly rodder is 8 to 9½ feet and 5 to 7 ounces in weight. The action should extend all the way down to the cork grip. It's called "slow action" and is an asset for casting against the windy conditions around saltwater. Most rods designated for saltwater or designed to handle No. 8. or heavier line are suitable. A "medium-size" class rod for 8, 9, or 10 line should handle most fish up to 40 or 50 pounds. Larger fish require big sticks of 7 to 10 ounces and 9 or 9½ feet. Fish of over 150 pounds have been boated with these.

**The reel.** For saltwater, nonrusting stainless steel and aluminum or, best and most expensive, anodized aluminum are tops. But there are also a number with quality components and baked-enamel finishes that will stand up for years if given proper care.

A saltwater reel should hold at least 100 yards of 20 to 30-pound test Dacron backing line plus the fly line. For large or fast runners, 200 yards is necessary.

The reel should have a smooth, readily adjustable drag; 0 to 4 pounds is more than



**Modern saltwater tackle** includes Pflueger 8-foot Supreme 101 (left), about \$20; Fenwick 8½ FF85, \$45; Scientific Anglers System 9, \$75; Pflueger 9½, \$35; Fenwick FF116, \$65; S.A. System 9, \$120. Reels are South Bend Finalist, \$15; Pflueger Medalist 1495½, \$15; 1498, \$17; S.A. System 9, \$47; Pflueger Supreme 577, \$50; 578, \$52; Fin-Nor 3, \$135.

sufficient. Single-action reels that turn the same speed as the handle are traditional; some tournaments ban multiplying reels.

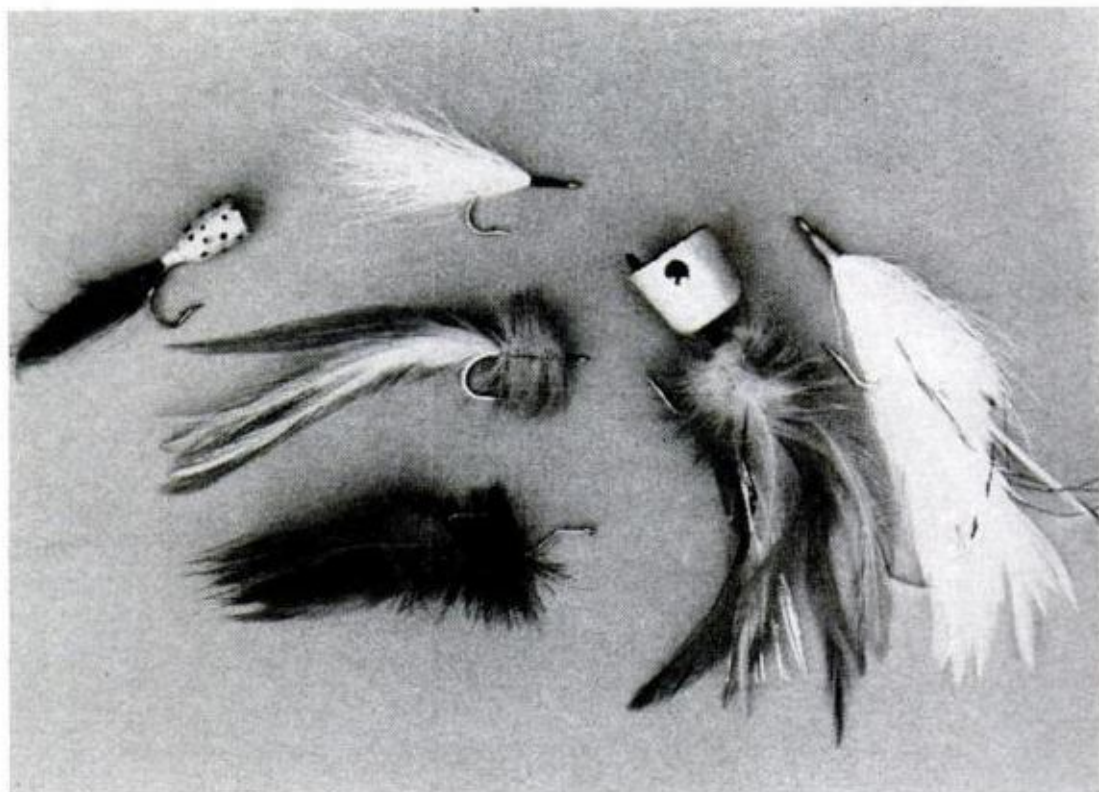
**The line.** This is the key to fly-fishing since the fly is virtually weightless and you must learn to make the line deliver it. False casting is the technique, and two recent books, *Fly Fishing With Lefty Kreh* and *Salt Water Fly Fishing* by Kreh give excellent explanations.

A fly line is labeled by shape, weight and whether it floats or sinks. A typical designation might be WF 9 F SWT, which means Weight Forward size 9 line that Floats and from a manufacturer who offers Salt Water Taper. There are other designations for Double Taper, Single Taper, Level and others, but the saltwater angler will be primarily interested in a weight forward taper that floats or sinks.

The true breaking strength of the system



**Fish** in fresh and brackish water channels can also be taken with salt fly tackle. Here author Stearns presents a home-tied streamer precisely to tarpon rolling through a cut in the Florida keys. An acrobatic battle can result.



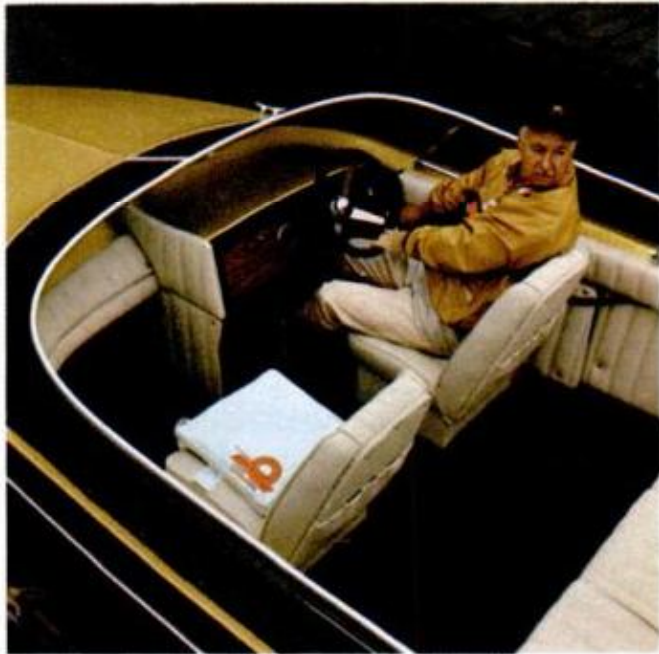
**Bargain** bait can cost 15 cents each when you tie your own. Popper is at left. Center flies are white bucktail streamer (top); yellow-orange hackle streamer; similar (below) on weedless keel hook. For big fish are popper and streamer at right.

—and the entire rod, reel and line is best thought of in terms of a casting system—is really determined by the leader strength (called the tippet). Most saltwatermen fly-fish with 8 to 15-pound test monofilament as their tippets.

Best choice for a beginner is the floating line. It is easier to pick up off the water for the next cast. A weight forward line has most of the casting weight in the first 20 to 30 feet, the “belly” section. This section

is larger in diameter than the running line, and once the belly section has been false cast beyond the rod tip, it is possible to “shoot” an additional 30 to 50 feet of running line without more false casting.

Practice is the key to accurate casting, plus patience for playing big fish on such light equipment. But by the time you land your first saltwater fish with fly gear, you’re likely to be firmly hooked by this challenging sport as well. ★ ★ ★



**Slick styling** and gold-fleck fiberglass instead of fish scales are notable on this first fast-performance boat from a famous fish-boat builder. The Lund Tempest II GT-118 showed solid speed, responsive control and smooth ride (above and below) in PM evaluation tests. Cockpit (left) provided well-planned helm and legroom, and comfortable upholstery. The hull is 18 feet overall with 86-inch beam.



## Newest look (from an old-time builder)

**W**hat happens when a company famous for fishing boats for nearly 100 years adds something racy to its line? Take a look!

Lund American, Inc., of New York Mills, Minn. (with branches in Shell Lake, Wis., and Steinbach, Man.), makes 20 skiffs and canoes in aluminum and 25 different fish boats and runabouts in fiberglass—but is probably best known for the aluminum fishing boats favored by so many boat rentals.

But Tempest II GT-118 comes from a dif-

ferent kettle. From gold color and wrap-around windshield to padded upholstery and outboard, I/O or jet options, our early model proved a solid but sporty runabout.

Rated for up to 160 hp and 930 pounds of load, it's a comfortable boat to drive. The vee hull gives a soft ride over chop and outstanding directional control for steering. Workmanship appears superior and performance lively. It has a lot more than good looks going for it.—*Bill McKeown*

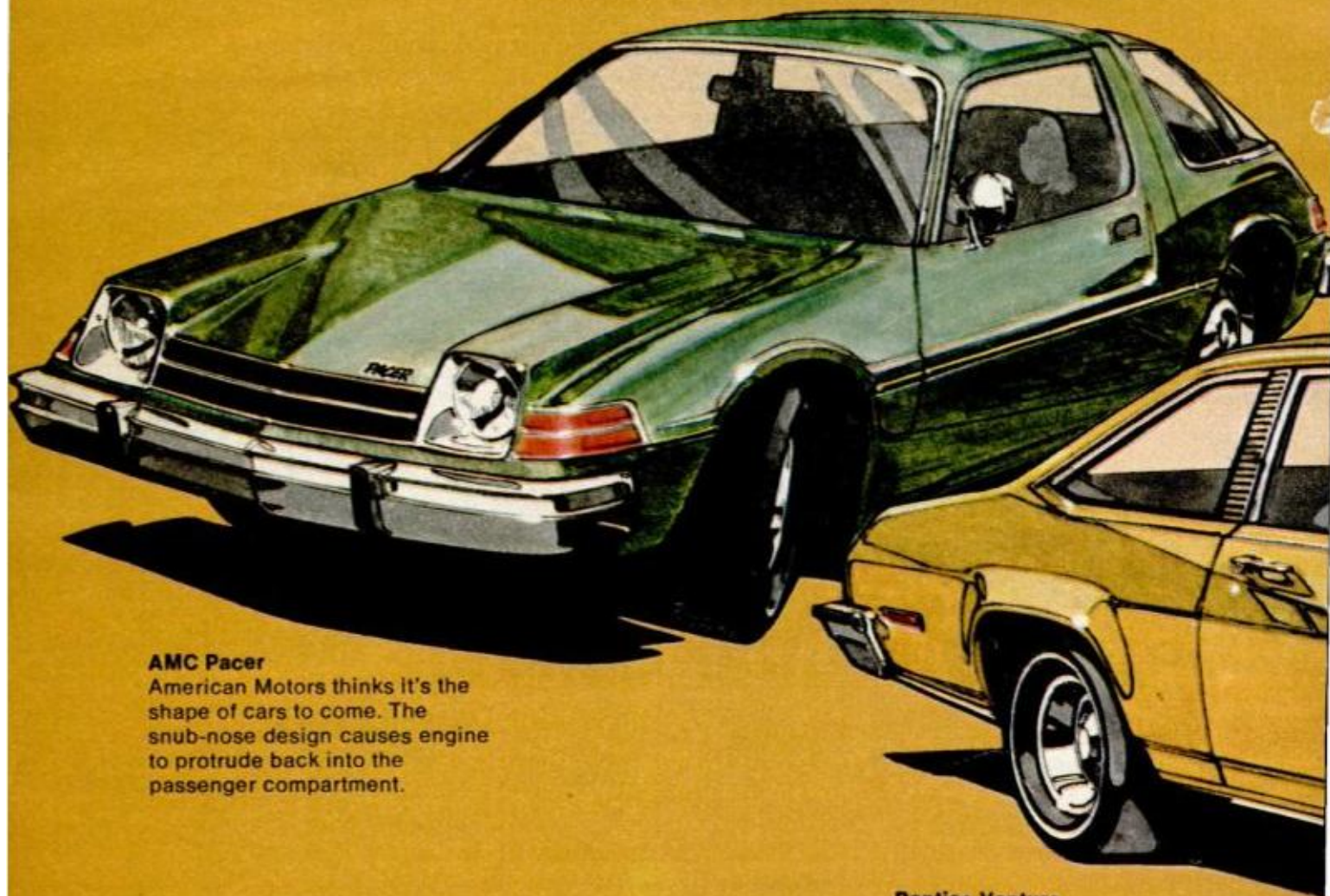
# PREVIEW

## of the 1975 cars

by Robert Lund  
DETROIT AUTO EDITOR

**T**he newest new car out of Detroit for 1975 won't be out this year and it won't be out of Detroit. Translation: The car will be the Pacer from American Motors. Pacer will be a '75 model, but won't go on sale this fall. It will be introduced early next year. And it will be built in Kenosha, Wis., where AMC has its manufacturing plants. More about Pacer later on.

Detroit has a lot of new stuff for 1975. New bodies, new engines, new options. New prices, too. The new cars—the intermediates in particular—are going to cost substantially more than counterpart cars of this year. If you thought medium price meant a car starting at around \$3500, you're in for a jolt when you see the windshield stickers on the '75s. You can figure on putting out at least \$4300 for a "medium-price" car next year.



### **AMC Pacer**

American Motors thinks it's the shape of cars to come. The snub-nose design causes engine to protrude back into the passenger compartment.

### **Pontiac Ventura**

All GM cars on the X body—Nova, Omega, Apollo and Ventura—have new metal for '75. Rear side glass is fixed.



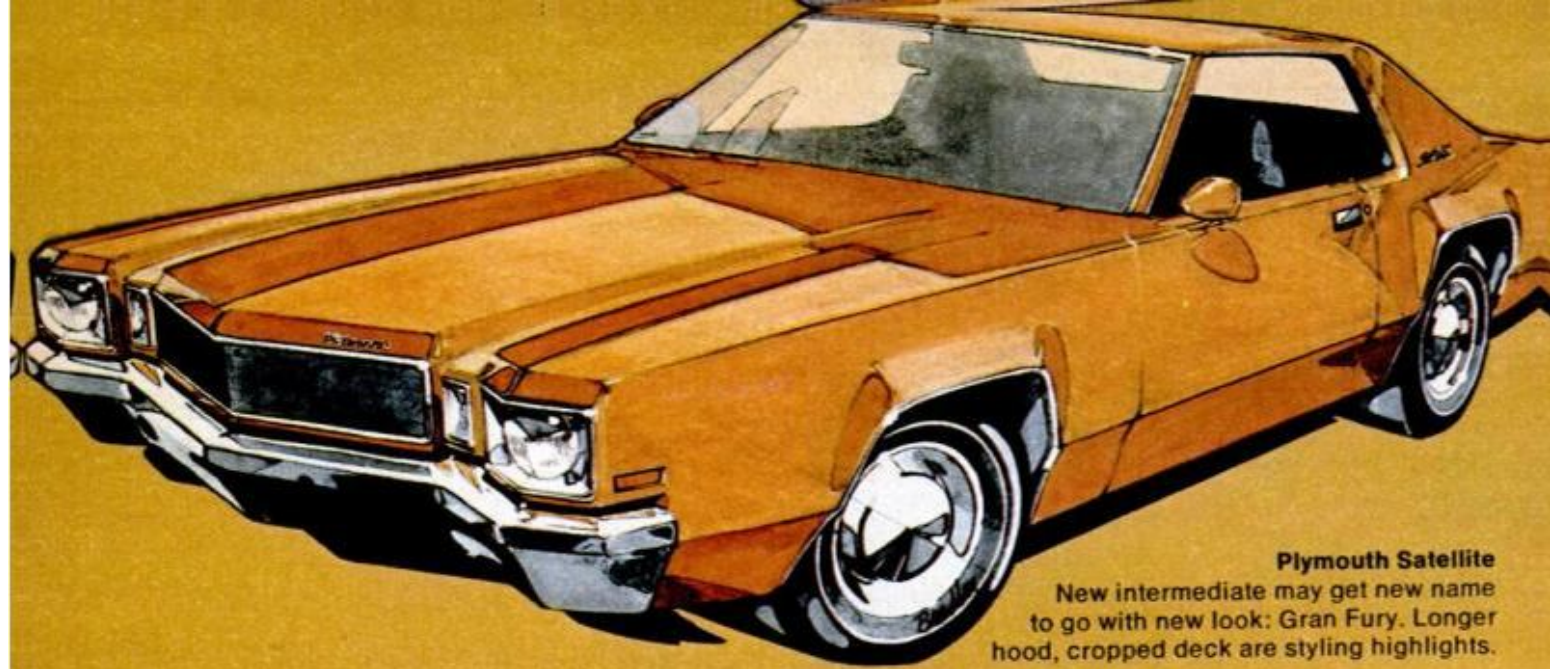
**Mercury Monarch**  
Already in production, Merc's new one is a medium-size car with a big-car price.



**Ford Granada**  
The new Ford and its Merc counterpart share the same body, differ in trim and details.

*(Preview continues on next page)*





**Plymouth Satellite**  
New intermediate may get new name to go with new look: Gran Fury. Longer hood, cropped deck are styling highlights.

Part of the price increases will go to cover catalytic converters—straining devices that fit on the exhaust system to reduce pollution. Automakers say the catalysts will add about \$150 to the price of a car.

Most cars, but not all, will be equipped with converters. GM is the only company going 100 percent. Ford, Chrysler and AMC will use the device where the law requires it.

You cannot use leaded gas in a car with a catalytic converter. Lead poisons the catalytic element. Not all gas stations will carry unleaded fuel. The government rule says all stations pumping more than 150,000 gallons of gas a year must carry no-lead fuel. That leaves out the little low-volume stations. So before you buy a '75 car with a catalytic converter, make sure you will be able to buy unleaded gas in your area.

GM says its cars equipped with converters will give better fuel mileage than '74 cars without the clean-air devices. An improvement of about 13 percent in fuel economy, GM estimates.

But all '75 cars, with or without converters, are expected to give better mileage as a result of adjustments automakers have made in engines and by going to lower axle ratios. Almost without exception, the '75 cars will give 8 to 10 percent more mileage than the same cars delivered this year.

Mileage will get another boost as a result of wider use of radial tires on the '75 cars. GM and Ford will install radials on 100 percent of production. Chrysler and AMC aren't planning to go that high, but they will put radials on most cars.

Every company, every division, will offer more economical engines for '75 than in '74. You will still be able to get a big engine, but if you prefer a small Six or Four, you won't have to wait three months. The same holds true if you want a small car. During the past nine months, the car companies have spent something like \$700 million to enable them to increase production of smaller engines and smaller cars during the '75 model run. The wait in '75 might be for *big* cars!



**Dodge Charger**  
Mid-size car in Dodge configuration is marked by bullet headlights. As in the Plymouth, short deck and elongated hood are prominent.



Here, by companies, is what Detroit hopes to sell you in 1975:

**American Motors:** AMC says Pacer will be so different it may take a couple of years to get used to the look of it. The company sees it as the forerunner of cars to come.

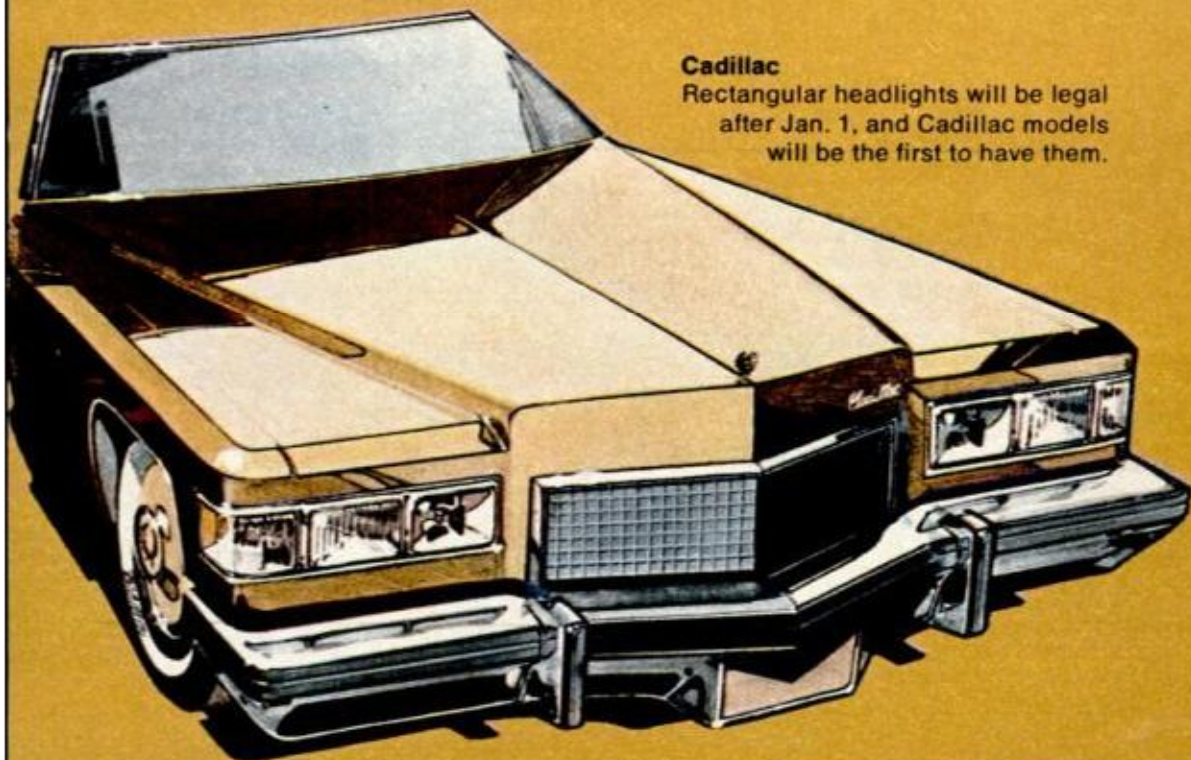
It will differ from anything around now on several counts: a short, tight hood with a fast slope down to the grille; a greenhouse top with more glass than any car of comparable size; a rounded rear with a door in the back, and an engine that sits back and projects—but only slightly—into the passenger compartment. The car will have wide side pillars wrapping up into the roof.

Size and weightwise, Pacer will fall between Gremlin and Hornet—a little larger than Gremlin, a little smaller than Hornet. It will be built on a 100-inch wheelbase and probably sport rack-and-pinion steering. It will seat four, driver included.

Pacer will not be a low-price car. Depending on what equipment AMC makes standard and what's optional, the price will be around \$3500.

Elsewhere in the AMC stable, Gremlin will get a new roof treatment with wraparound glass in the back for better visibility. The car will be an inch longer than this year. Gremlin will also get a five-speed manual

[\(Please turn to page 164\)](#)



**Cadillac**

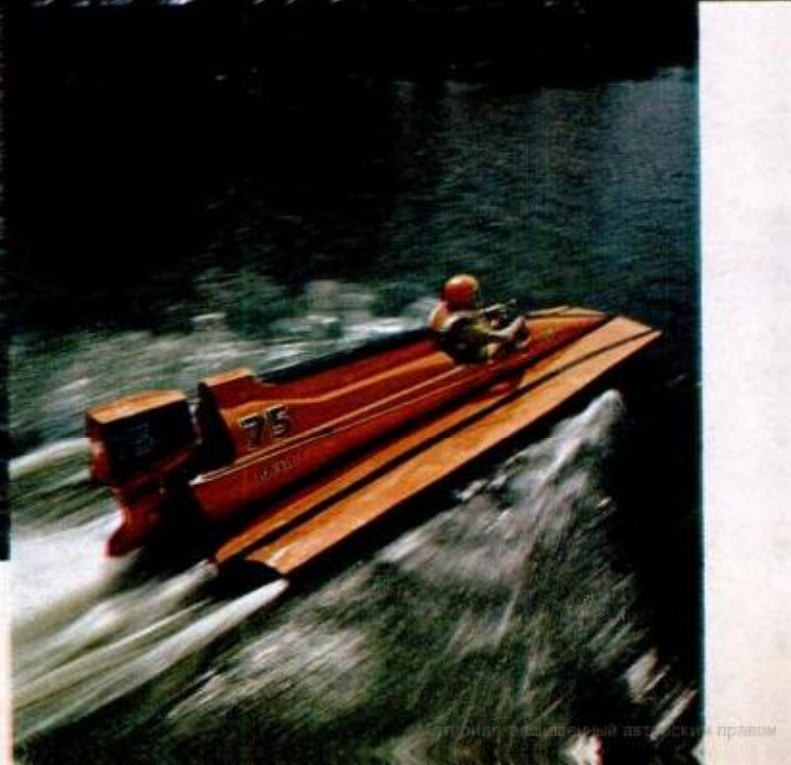
Rectangular headlights will be legal after Jan. 1, and Cadillac models will be the first to have them.

**Ford Van**

It's what's up front that counts and that's where Ford is putting the engine in its new van. Look for this '75 after the first of the year.



For  
runabouts . . .  
cruisers . . .  
racers . . .



# New multi-use outboard

Especially for sports, the newest Sea-Horse Stinger 75 for 1975 tests as a particularly peppy package.

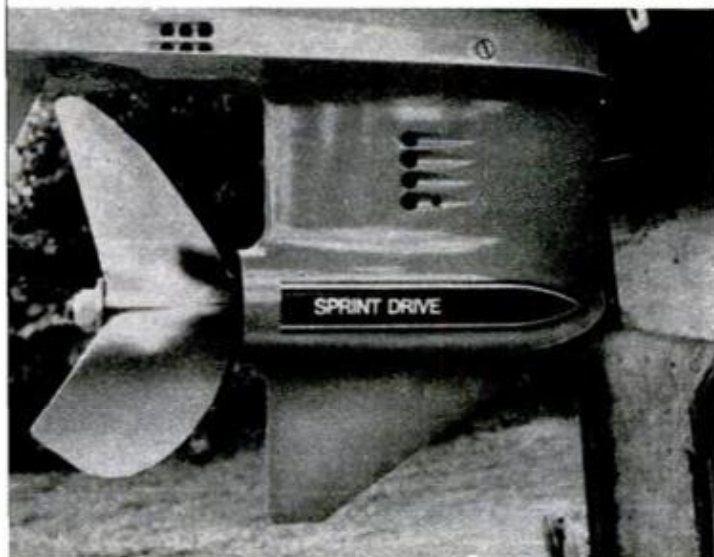
by Bill McKeown

BOATING EDITOR

**Versatile is one word** for Johnson's latest for next year. At left, we test the new 75-hp Stinger for powering a Baja racing tunnel hull, a Cobia runabout and a Viking deckboat. All showed impressive speed with push enough to tow water skiers easily behind the Cobia and Viking, acceleration aplenty to grab a lead in Class E racing. Lightweight powerplant is designed for fuel economy, but output efficiency ups horsepower of model to 75 over this year's 70. Baja raceboat has been timed at over 62 mph with new engine.

**Refined lower unit, gear case and housing show payoff** of high performance racing program. Detail as simple as chamfer angle of exhaust ports, developed from work with computer analysis, and competition-tested while winning European marathons, proved one key to increased torque. Special sports-ratio lower unit (below) will be available as 1975 option on the shorter-shaft Stinger Johnson 75s. Unit proved breakthrough for new high tolerances in shell casting. Stinger models will have distinctive orange styling.

Photos: Jerry Imber



Considering all the big-muscle 100-plus-horsepower outboard motors now available, what's the big deal about a new one that will spin out only 75? You'll have to drive it to believe.

Next year's Johnson Stinger, we found in our exclusive preview tests, has a punch that should make it popular with many boatmen. (Evinrude is said to have a similar model.)

Champion boat racer and water skier Mike Osborne, of Winter Haven, Fla., rigged one on his Baja tunnel hull. Here was a stock sport mill pushing a speed machine, but when we tromped down on the foot throttle she climbed right out on plane and felt like twice the power as Mike paced us in a hot little Cobia. When racing, Stinger hits speeds of over 60, Osborne reports.

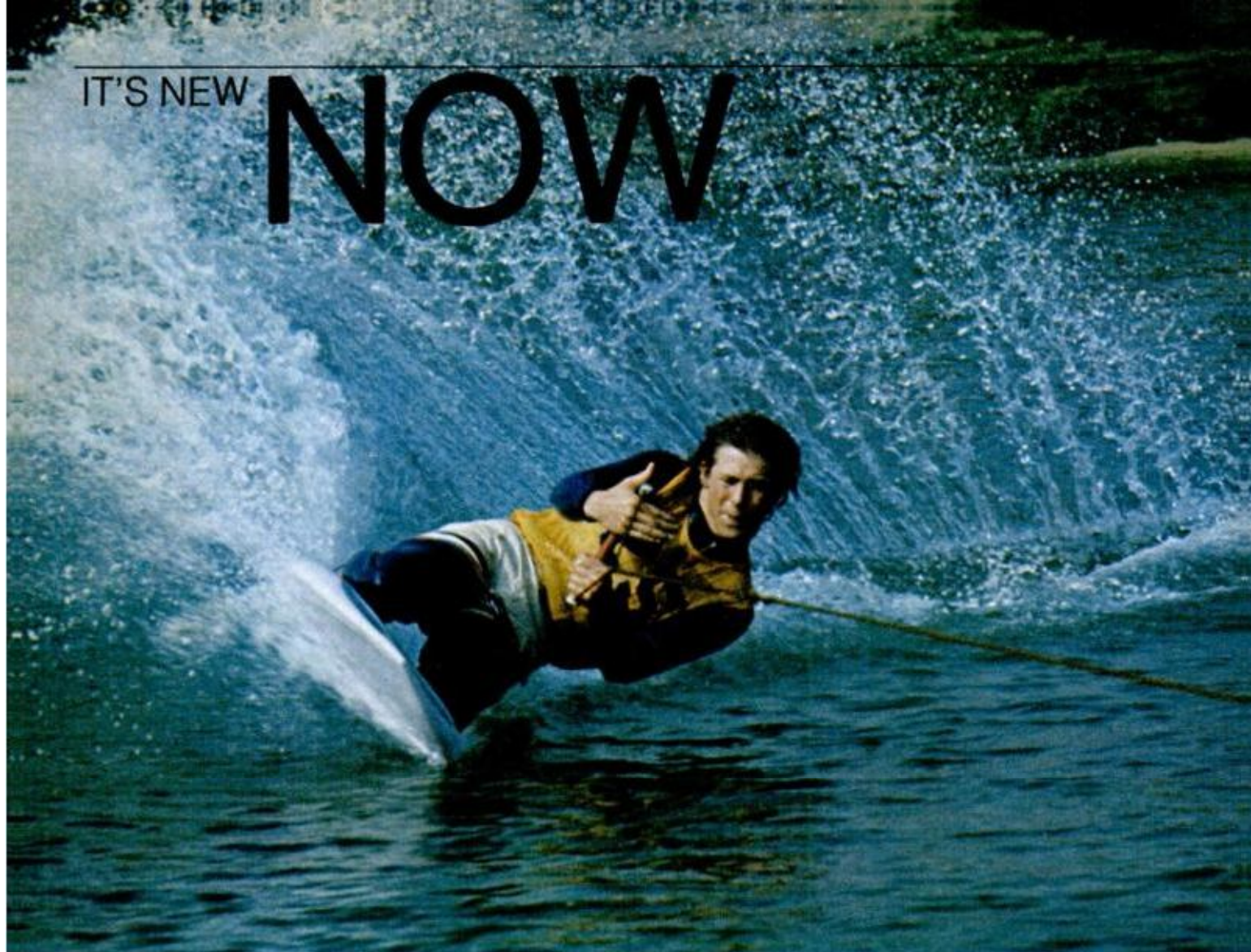
For pulling water skiers, this three-cylinder speedster provides the torque, plus pep to get fast to where the fishing action is. Yet its fuel consumption is reported to be as modest as this year's 70-hp motor it replaces, and the antifouling electronic ignition allows throttling back to hours of easy troll and low gas consumption.

One of the biggest surprises on our preview evaluations, however, was the go it gave to a Viking open-deck model. Again, water-ski speeds resulted, and reports confirmed the craft could be loaded down with family and still perform. Here we were, bombing along on a boat-type we had usually rated as a barge. Properly propped, the engine apparently handles a host of chores.

Johnson development engineer Don Kueny reports these results come from a combination of improvements that up compression, hold weight down, turn more combustion into torque, less into heat. He credits factors that include a winning racing program, use of computers, manufacturing advances, refined lower unit which combine to boost output. Boatmen aren't likely to care about the reasons, but are likely to brag next year about their 75's performance. ★★★

IT'S NEW

# NOW





### Old sport, new thrills

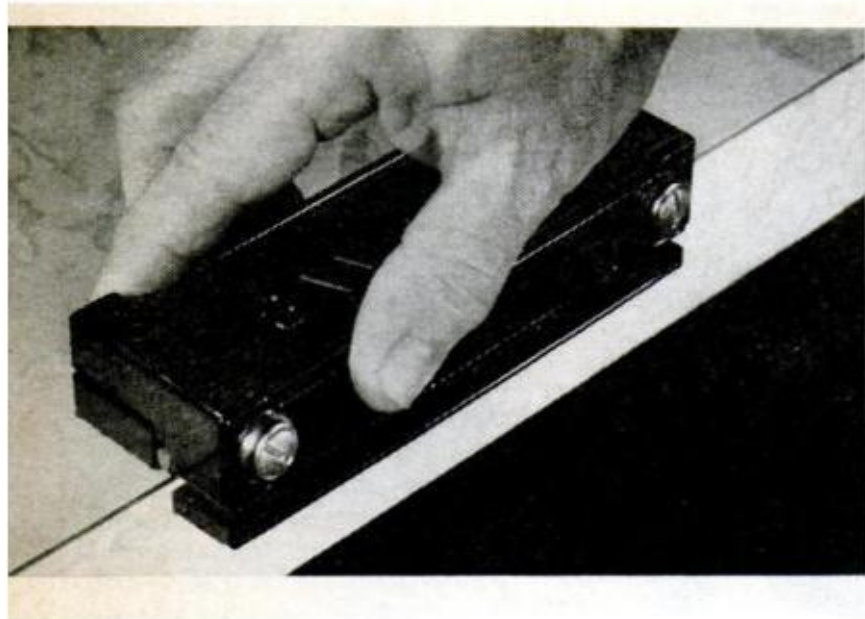
Remember the old aquaplane? It went out with long skirts, but now it's back again with a new name, new shape and new tricks. Instead of aquaplane, it's called a Glide Slide, and instead of riding it standing up, you kneel with a strap across your knees to hold you on. About four feet long, the slick, teardrop-shaped plastic board is said to provide the thrills of water skiing with less skill and danger. Pulled by a speedboat, a crack team of Glide Sliders sails over a jump four abreast (near left), while another nearly touches the water as he leans into a high-speed turn (far left). Jumps up to 100 feet long, speeds exceeding 70 mph and 360° turnabouts are all possible in this wild new sport. Glide Slides sell for about \$80 each from Thumbs Up, Inc., 2680 Dawson St., Long Beach, Calif. 90806.



### Scuba skimmer lets you dive in style

Designed especially for scuba divers, this classy fiberglass craft lets you paddle lazily out to sea, then serves as a handy floating base station and rest stop between dives. About 12 feet long, the Scuba Board incorporates a number of novel features: a built-in window for viewing the bottom as you skim along looking for choice diving spots, a forward well with lift-up lid for stowing air tanks and other scuba gear (lower photo, facing page), and a receptacle for a diving flag. The craft supports two persons, includes foam flotation to make it unsinkable, weighs 85 pounds and has two side handles for easy carrying. It can also be used for "dry snorkeling"—you just glide along watching the bottom without even getting wet. The Scuba Board is priced at about \$228 from Fiber Craft Concepts, 14233 Oxnard St., Van Nuys, Calif. 91401.

# NOW

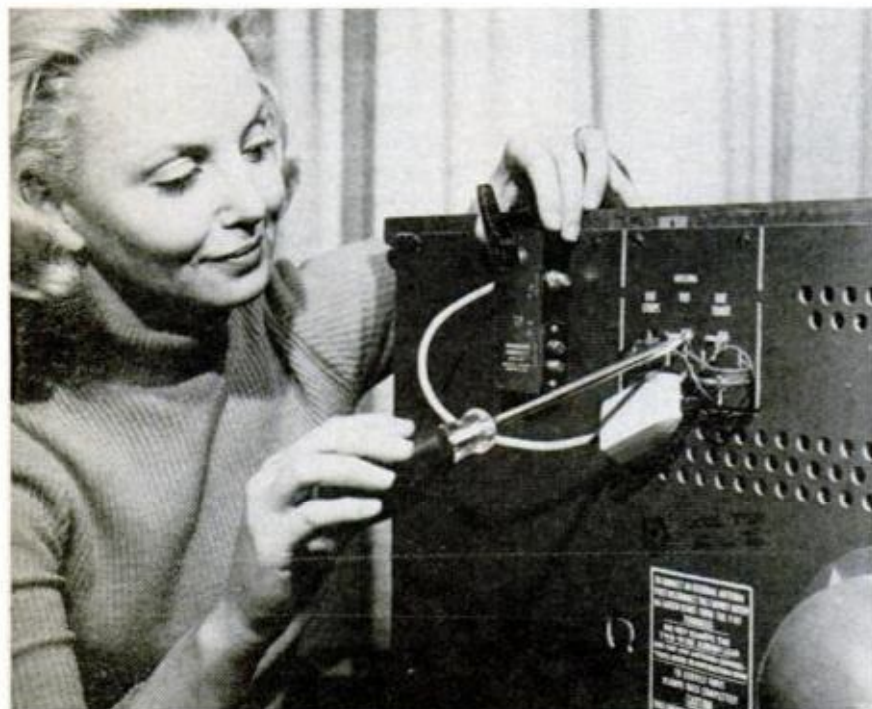
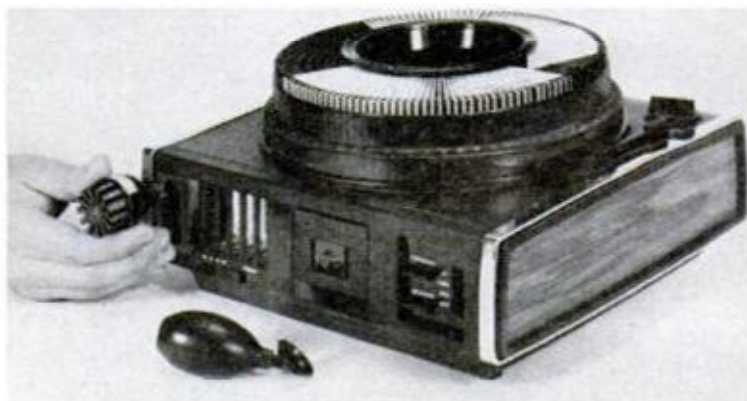


## Plastic laminate cutting tool

A compact tool designed for cutting and finishing plastic and plastic-laminate surfaces, the Arlyn-Cutter has adjustable solid carbide cutters for scoring the workpiece and beveling the edges. According to the manufacturer, the tool can cut in either direction, flush against a wall, and into a corner. It adjusts for various cutting thicknesses. For longer tool life and ease of operation, a light coat of silicone or soapy water is recommended. From Arlyn/Industries, 6921 Stride Ave., Burnaby 3, B. C.

## Cordless slide advance for Carousels

Squeeze a small air bulb and you can change slides in a Carousel projector from up to 50 feet away without trailing a long extension cord. The bulb emits a high-pitched sonic signal that triggers a tiny receiver plugged into projector's remote-control socket to advance the slide tray. Sonar/Matic fits standard and Pocket Carousels, \$19.50. Montage Productions, Inc., 9 Industrial Drive, Rutherford, N.J. 07070.



## Cable or antenna TV? Now you can have both

Cable-TV subscribers are no longer limited to cable-only broadcasts. With this handy switch mounted on the back of the set, you can flip quickly to either cable or your own outdoor antenna—whichever offers the best choice of programming or reception quality. The switch has a toggle that protrudes above the rear edge of the set so you can turn it from the front. It also incorporates a VHF-UHF band separator, isolation circuitry to prevent signal interference and inputs for either 75 or 300-ohm lead-in. \$16.95. Winegard Co., 3000 Kirkwood St., Burlington, Iowa 52601.

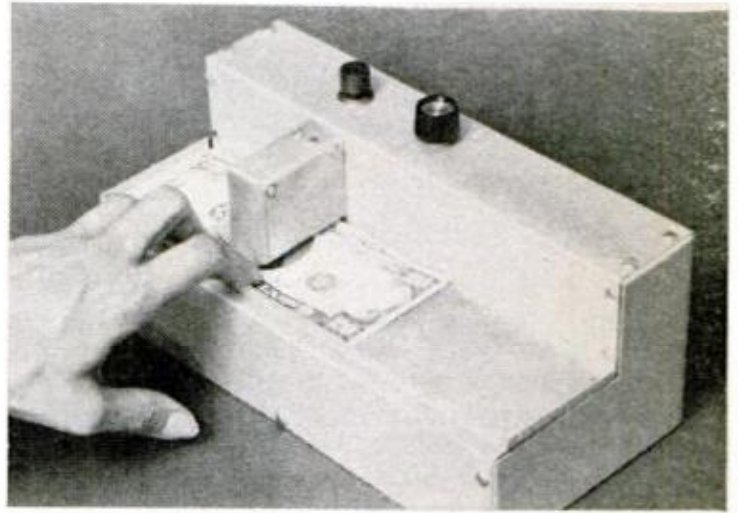


### **Vacuum attachment 'sounds off' until all dirt is removed**

A new vacuum cleaner attachment (shown above, top photo) from Sears, Roebuck and Co. lets you know exactly when your carpeting is completely clean. Called the "Ping Thing," the lightweight attachment gives an audible detection of embedded sandy grit. As grit is picked up, it hits a sonic disc (lower photo above), making a noise. When all of the dirt is removed, the noise stops. The attachment is designed with an electrical connection for use with a Sears Kenmore Powermate canister-type vacuum for \$7.95 or with a non-electrical connection for use with a standard Kenmore canister-type vacuum for \$6.95. Available with six extra sonic discs at most larger Sears retail stores.

### **Money identifier for the blind**

Originally developed by NASA, this machine enables a blind person to identify paper money by its sound "signature." To determine its denomination, a bill is passed under a light source; a phototransistor measures changes in the light patterns and a "beeping" tone is produced. From Applied Rehabilitation Systems, 3902 Idlewild, Austin, Tex.



### **'Flying' pickup has fuel-saving airfoil**

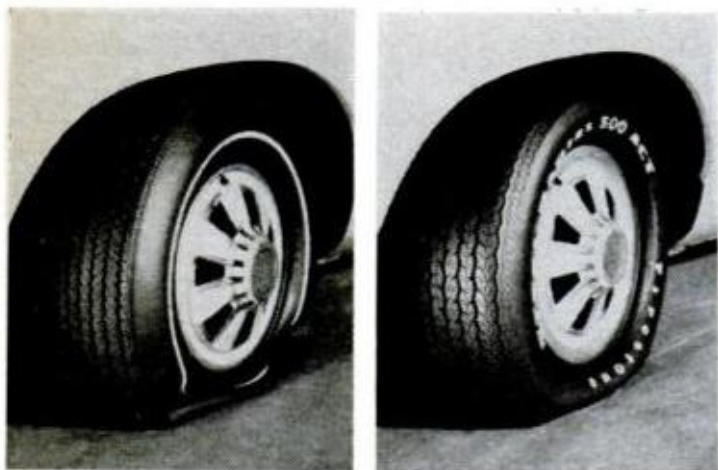
Can you boost gas mileage on a pickup truck by as much as 50 percent? Inventor Giles Lay of Sulphur, Okla., claims you can with this homemade airfoil mounted over the truck cab. The downward-curving fiberglass foil is said to reduce air turbulence, decreasing drag, saving fuel, and at the same time improving traction, steering and road stability.





## Hovercraft ferry for commuters

For the 85 percent of major U.S. cities with waterways through them, an answer to traffic congestion: A 51-foot, 60-passenger commuter ship, whose hull and superstructure are mostly glass-reinforced plastic, skimming on a cushion of air at speeds up to 40 mph. Twenty are already in use abroad. Under manufacture now in the United States, the HM.2 Hoverferry is made by Hovermarine Corp., Pittsburgh.



## New tire still goes when flat

Within two years you may be rid of your spare tire. Firestone Tire & Rubber Co. has developed a tire that can be driven without damage some 50 miles at 40 mph after going flat. If a flat occurs on a Steel Radial 500 ACT, the tire will settle firmly onto wheel rim (above, right), not wobbling as does a conventional tire (above, left) when air pressure is lost. The tire is expected to be available in 1976.

## Easier toting of photo gear

Contoured shoulder pad for camera bags (bottom photo) cushions the load of heavy equipment and keeps it from slipping off. It slides over straps that can be opened at one end, is about \$4 from Spiratone, 135-06 Northern Blvd., Flushing, N.Y. 11354 or from Porter's Camera Store, Inc., 2002 College St., Cedar Falls, Iowa 50613. Also shown are two new camera bags—Miida's (top), \$24.95 from Miida Photo, 14 Henderson Dr., West Caldwell, N.J. 07006; Samsonite's (bottom), \$29.95 at luggage shops.







### Solar-powered table lighter

This table lighter contains butane gas which is ignited by solar energy. Four solar cells on the Rowenta Solartronic lighter convert any light source into an electrical current which charges nickel-cadmium cells to create a spark. Fully charged, this novel table lighter can produce 1500 ignitions without further exposure to light. Price about \$300. P. H. Vogel, 10 Golden Sq., London.



### No-mess, dripless aerosol oil

No-drip lubricant comes in a four-ounce aerosol dispenser with a snorkel attachment for directing spray to a confined area. At press of the finger, lubricant is said to set up a dripless film when the special "carrier" evaporates. Suggested retail price, \$1.19. American Grease Stick Co., Box 729, Muskegon, Mich. 49443.

### Camera finder lets you shoot yourself

For those times when everyone wants to get into the picture, or when you're alone and want your own picture, Kalimar Mirror Self-Finder can be clipped to accessory shoe on camera and picture taken using a self-timer and tripod. Finder lets you check framing yourself from front of camera. Has frames for 35, 50 and 58-mm lenses. Porter's Camera Store, Inc., 2002 College St., Cedar Falls, Iowa 50613.



### Hot lather dispenser takes spray cans

Sunbeam's Lather Man, a hot lather dispenser, takes most leading shave cream aerosol cans up to an 11-oz. size (below, right). Signal lights indicate when unit is "on" and lather is ready to be dispensed at the touch of a button (below, left). Spout removes for cleaning; covered tray on front provides storage for razor and blades. Unit comes with 6-ft. cord and mounting bracket. Suggested price: \$19.98.



## Battery pads stop corrosion

Acid-Eater Pads are chemically treated fiberglass pads that slip over battery posts to absorb and neutralize corrosive acids before they interfere with electrical connections. As each pad works, it changes from yellow-green to bright red. When a pad turns completely red, it should be replaced. Two pads per package. For price, write AMP Special Industries, Valley Forge, Pa. 19481.



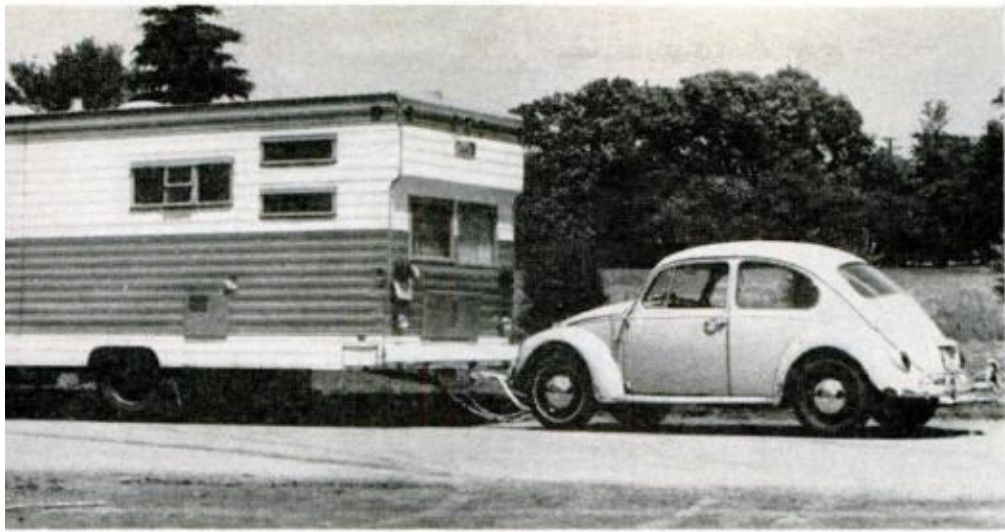
Tracing aid reads map distance

Ever try determining the shortest serpentine route on a map for a proposed trip? Pen-shaped instrument above simplifies all that. By setting mileage scale on device to same scale on map and tracing over route, you get an accurate reading of the exact mileage. Called Gas-Saver, device is sold by P.W. Hammond, Inc., 5719 Buxbriar Ave., Memphis, Tenn. 38117.

## Flying—without really flying at all

Sailing gracefully through the air behind a tow boat, this pontooned craft comes as close to real flying as you can get without a plane and pilot's license. Aircraft designer Tom Purcell originally built it as a test ship for a full-scale free-flight glider and eventually a powered amphibious version, but found it offered so much fun as is that he may manufacture it for sale or sell construction plans to others. Called Seasprite, the twin-hulled craft has hit more than 40 mph, lifts off the water at 25 mph and can glide to landings as slowly as 20 mph. Simple construction comprises Styrofoam floats with fabric-covered spars for wings and tail. Future plans will be announced later by Flight Dynamics, Inc., Box 5070, State College Station, Raleigh, N.C. 27607.

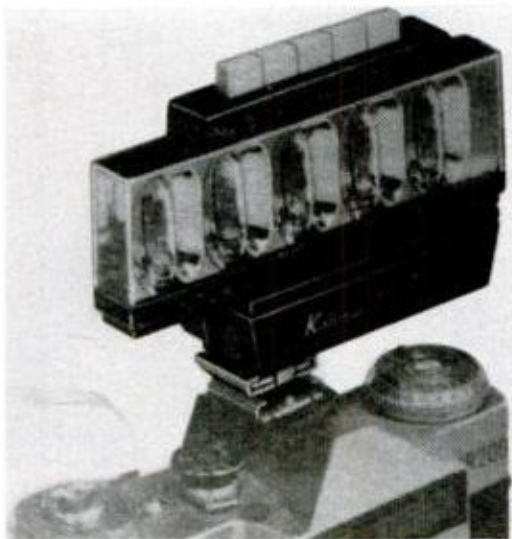




### Trailer pulls car—that's a switch!

With this special trailer hitch for VWs and dune buggies, you can tow auxiliary transportation along with you as you tour the country in your motor home or camper. Tow bar attaches to a VW's torsion bar (right, above) and has two 4-

foot safety chains and a coupler for up to a 2-inch hitch ball. It can be disassembled for compact storage. Suggested retail price is \$52.95 with assembly instructions from Valley Tow Rite, Inc., 27 East Vine St., Lodi, Calif. 95240.

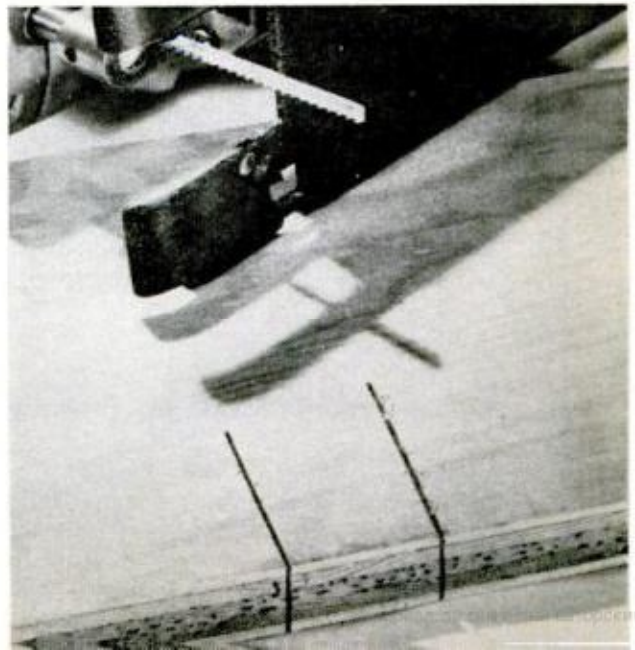


### Flash shoots up to five bulbs at once

By pressing buttons at top, flash attachment above lets you flash as many of the five bulbs as you want at one time for greater exposure control. Can be used on almost any camera with flash contact to shoot pictures up to 100 feet away. Suggested price of Select-O-Flash K-444 Universal Flash Bar Adapter is \$24. Kalimar, Inc., 5 Goddard Ave., Box 310, Chesterfield, Mo. 63017.

### Smooth-cutting sabre saw blades

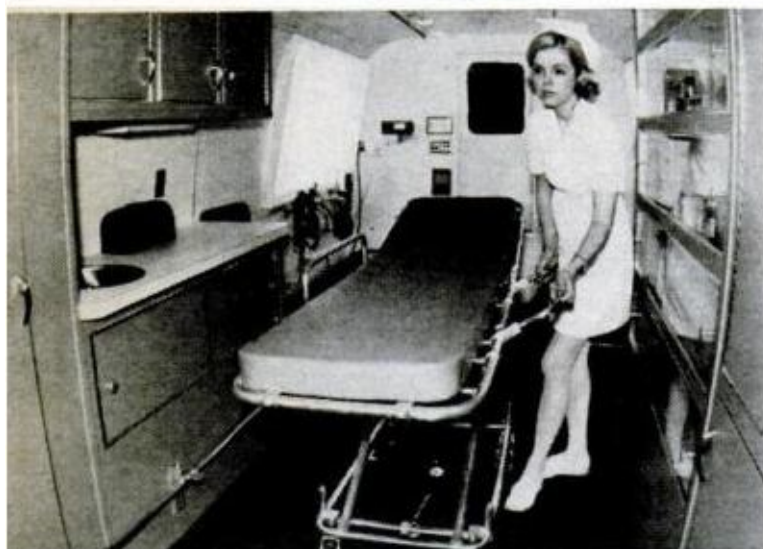
Extra-smooth sabre saw cuts in plywood and other materials are possible with new superfine Craftsman blades from Sears. Sample cuts, compared below, were made with standard plywood blade (right) and new Sears blade (left), revealing a marked reduction in edge splintering. Super Finish blades have several tooth patterns for different materials.





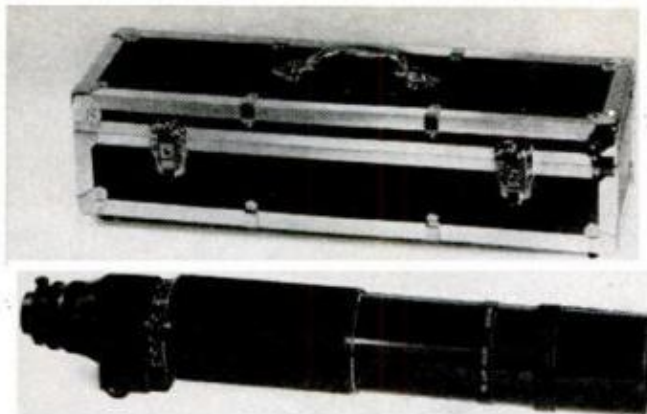
## Many vehicles from one

General Motors' multipurpose chassis and body design, introduced last year as a complete motor home (left, top photo), is also being used for several special-purpose vehicles. Currently under manufacture, these TransMode vehicles include (second from top to bottom) what GM calls a Jetney people carrier, a medical unit, and a mobile office. The GM design has front-wheel drive, a six-wheel braking system, aerodynamic styling, 455-cu.-in. engine, automatic transmission and molded fiberglass body with aluminum substructure.



## Dial-a-food blender

Panasonic's new Pana Blend Recipe Blender, Model MX-370, eliminates the need to set blender to a specific speed and time designation. The user simply dials the food desired from a wide range of recipes listed on four permanent recipe cards appearing in a window on the face of the blender, pushes the start button and the blender does the rest. Unit has what Panasonic calls a Short Spurt button for momentary re-blending. For price and further information, write Matsushita Electric Corp., 200 Park Ave., New York, N.Y. 10017.



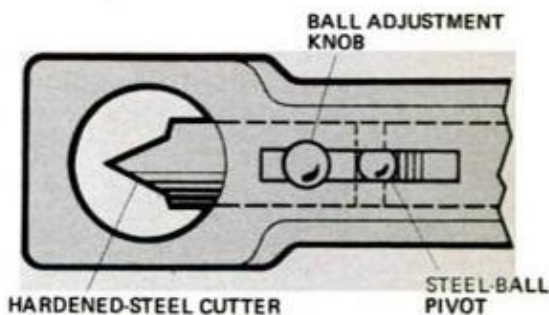
### Zoom lenses get longer—and longer

Extra-long zoom power is now available to 35-mm shooters in two new wide-range lenses fitting most SLR cameras. At top is Honeywell's 135-600-mm, f/6.7 zoom for about \$2000 from Honeywell, Box 1010, Littleton, Colo. 80120. Below it (in center of group) is Tamron's 200-500-mm, f/6.9 model, about \$500, from Berkey, 25-20 Brooklyn-Queens Expressway West, Woodside, N.Y. 11377.



### Splitter removes stuck nuts

A nut stuck from the cold, cross threading or rust can be difficult to remove. New nut splitter's head (below) fits over a stubborn nut, and a turn of the end screw with a wrench advances cutter to split the nut and remove it. The six-inch-long splitter works on nuts up to 13/16 inch wide. \$6.10 from Brookstone Co., Peterborough, N.H. 03458.



### Binoculars automatically take your compass bearing for you

You can spot a distant object and at the same time take its bearing with these special 7x50 binoculars having a built-in compass. As you look through the binoculars, you see the bearing scale (lower left) superimposed on the image in the right-hand eyepiece. The scale, projected onto the image by a prism, shows up clearly in normal daylight, but at night is illuminated by a built-in bulb and battery. Designed for soldiers, sailors, campers and explorers, the British-made Bino-Compass sells for about \$60 from Offshore Instruments, Ltd., 28 Blythe Rd., London W14, England.

# Frame your movies with a matte box

Here's a Hollywood special-effects device that you can adapt to almost any movie camera.

by James R. Oswald

Using some nearby object to put a frame around your movie shots can make a good shot even better, by adding depth and atmosphere to a pretty scene that might otherwise look flat and dull on your screen. Look carefully, and you'll find suitable objects all around you—overhanging trees, picturesque archways, portholes, windows—the list is limited only by your imagination, by what the subject of your particular shot calls for, and by the location of these natural frames.

But often the right object to silhouette in your foreground isn't quite in the right place to frame your subject. And sometimes you may want to spice a shot with a frame not naturally on the scene—a keyhole, per-

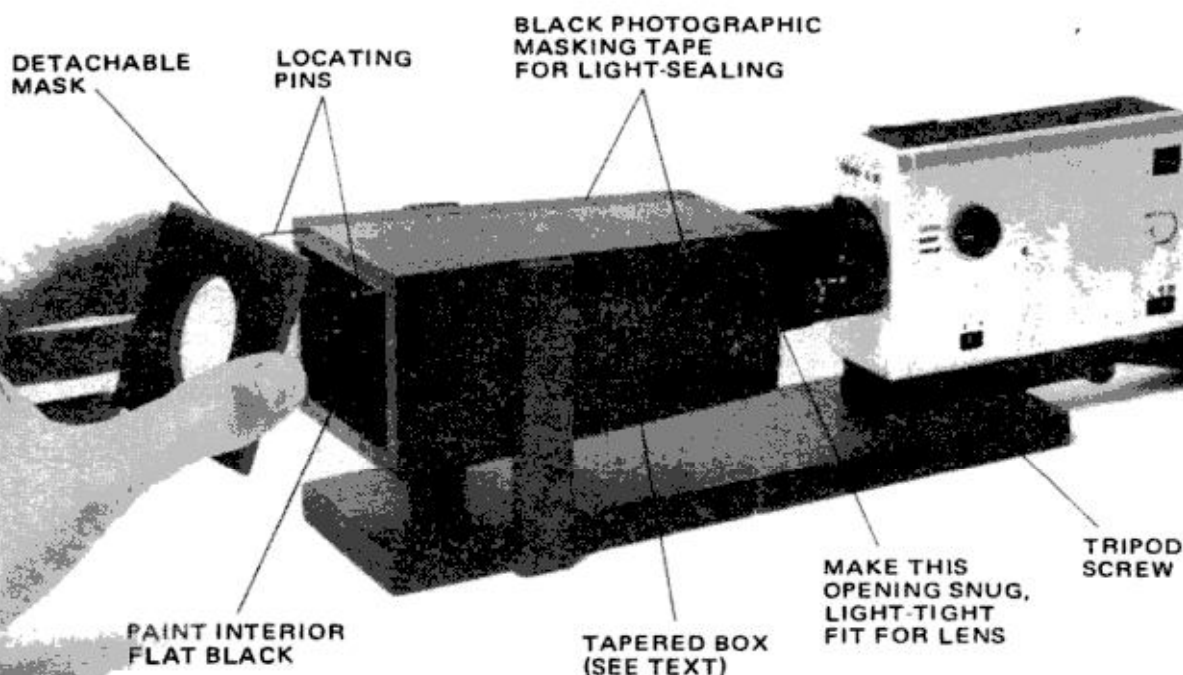
haps, or the overlapping circles of movie "binoculars" (real binoculars, of course, show more of a fuzzy oval than the sharp figure-8 pattern the movies show you).

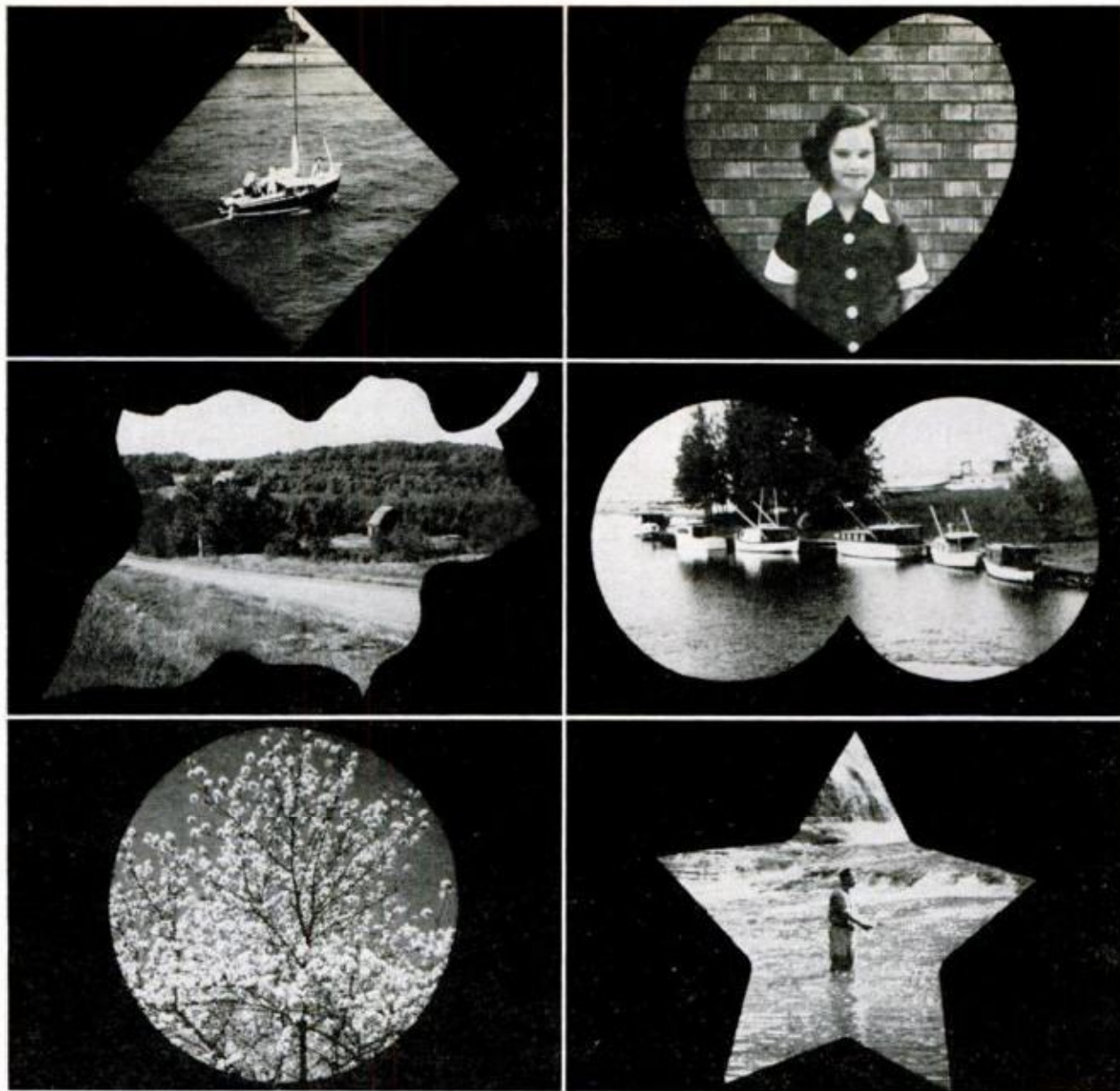
Professional filmmakers always have the frames they need, though, whenever they need them. Their frames are small cutouts called "mattes," attached to their cameras with simple devices called "matte boxes." The effect is quite professional—but the construction of a matte box is so simple that you can easily build your own.

It's basically just a tapered, light-tight box painted black inside, with a round hole at its small end to admit the camera lens, and provision for mounting interchangeable framing masks over the other end. Dimensions vary from camera to camera. The small end of the box should be just large enough to admit the front of your lens.

The dimensions of the other end will depend upon the type of lens you have: With a zoom lens, you should be able to see the edges of any mask in your finder when the lens is set to its shortest focal length, yet

Construction is simple, as seen here, but dimensions must be adapted individually for each camera model.





**Variety of mattes** is almost unlimited. Other shapes could be cut from photos of trees, and the like.

be unable to see the mask when the lens is zoomed to its telephoto position. With a nonzoom lens, you want the edges of the mask to be visible when the mask is mounted, but for the edges of the matte box to be out of the frame when the mask is off. The mask size also depends on the length of the box—and the length must be a compromise; the longer you make it, the more sharply outlined your matte frame will be—but the more ungainly and harder to handle the box will be, too.

Both the top and sides of the box should taper evenly and symmetrically, and the box's cross section should be a rectangle, approximately three quarters as high as it is wide.

With most cameras, the box will have to sit on struts above the baseboard, as mine does; again, the height of the struts depends on the camera. You can make your box

from  $\frac{1}{4}$ -inch hardboard, plywood, opaque plastic, or what have you. Suitable scraps of wood can usually be picked up from lumberyards for a song. For the base, use  $\frac{1}{2}$ -inch lumber. Drill the base below the tripod-screw socket, and let your tripod's screw hold both the camera and the matte box assembly.

The mattes themselves can be cut from  $\frac{1}{8}$ -inch hardboard, wood, cardboard, or similar material. Four  $\frac{3}{4}$ -inch brads in the corners of the box's "window" end mate with small holes in the matte's corners to hold them in place.

To finish, tape the corners of the box with black photographic tape to prevent light leaks, and kill interior reflections by painting the inside of the box with flat black paint.

A few of the possible effects are shown above. ★ ★ ★

# Flying twins: Your choice of one seat or two

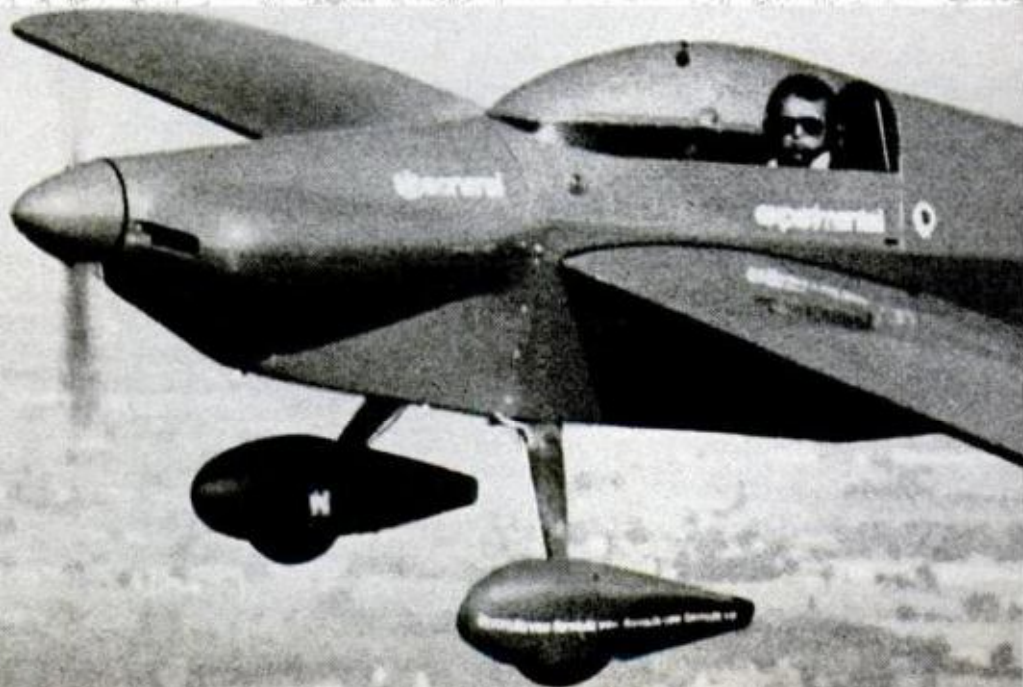
These sporty look-alike homebuilts, both VW-powered, offer single or dual control in two simple versions you can build from either plans or kits.

by Sheldon M. Gallager  
and Howard Levy

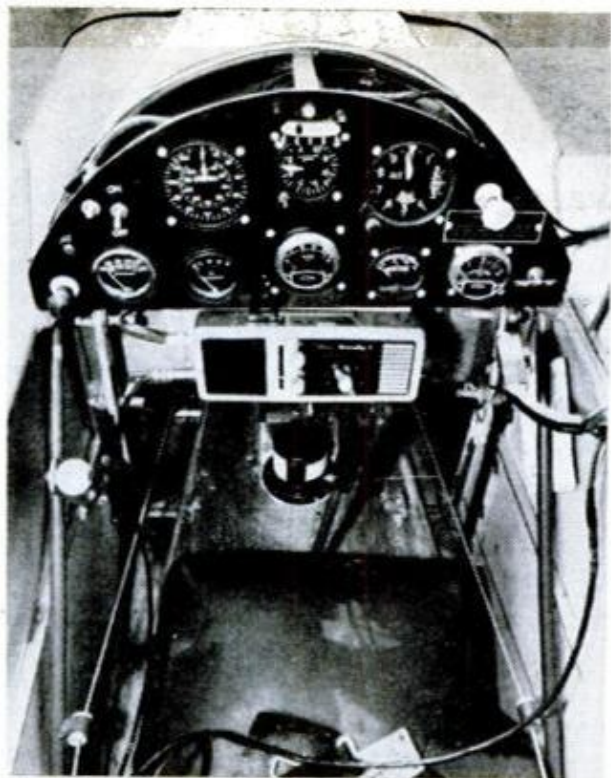
Take your choice. You want a single-seater? You can have it. Or you want a dual-control tandem two-seater? You can have that, too. It's just a matter of which of these nearly identical twins you pick. Designed by 30-year-old high school teacher John Monnett of Elgin, Ill., the look-alikes are shown below, the single-seater in the background and the newer two-place "stretched" version in the foreground.

Monnett originally developed the single-seater, called Sonerai I, to meet the requirements of the new VW-powered Formula Vee racing class two years ago. Then he added the two-place Sonerai II last year to give homebuilders a choice of single or dual con-

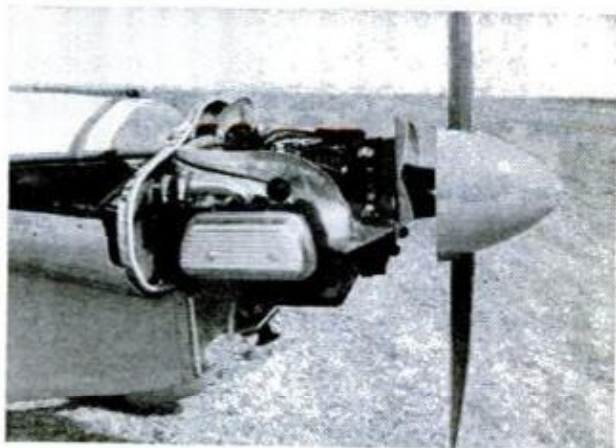
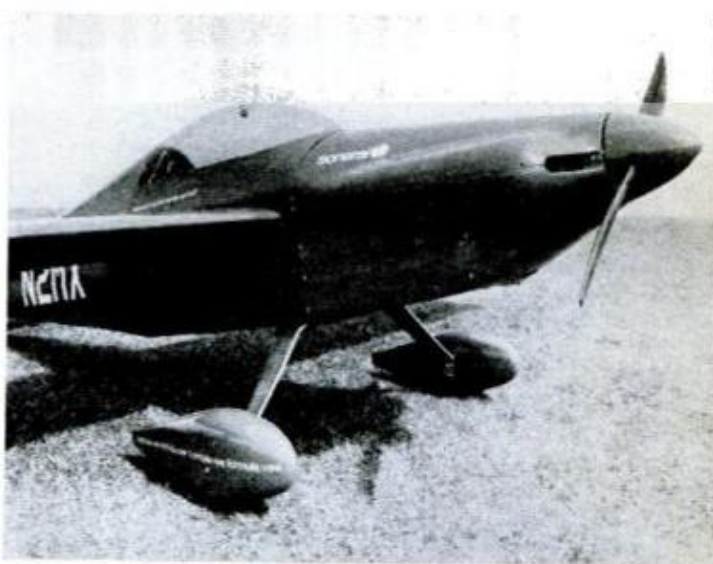
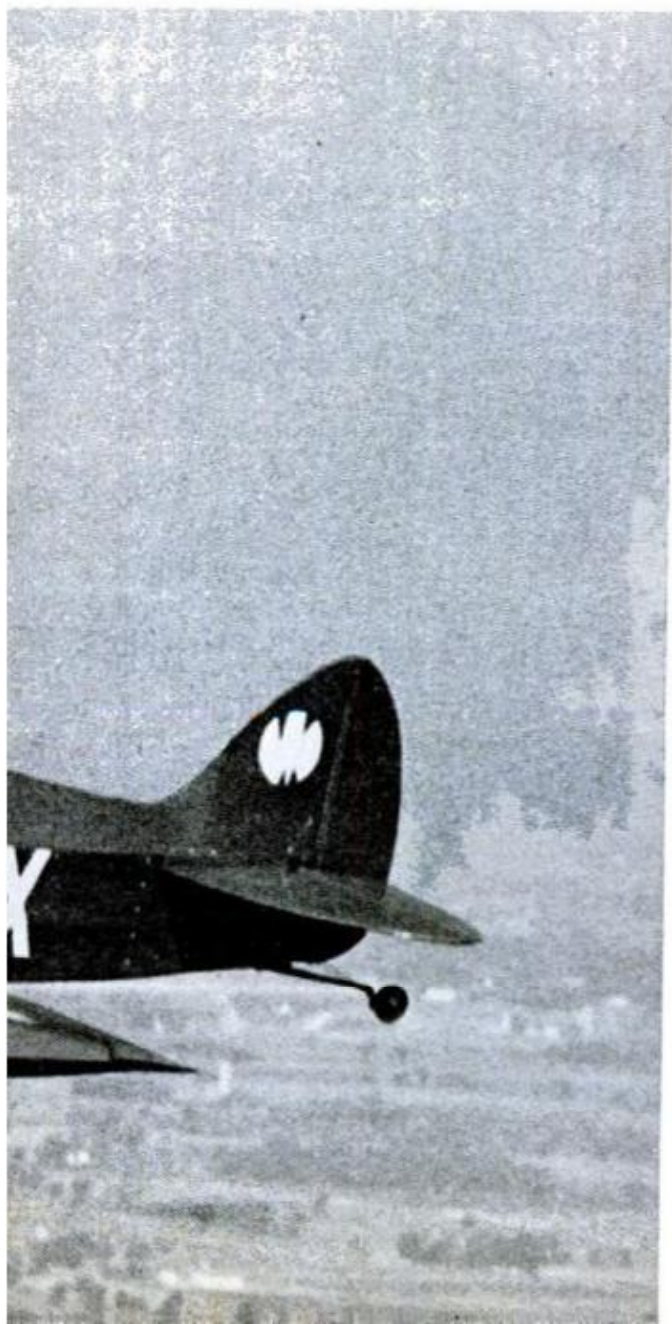
Photos: Howard Levy







Rear cockpit of two-seater version (above) has no instruments except radio. Ship is flown solo by pilot looking over bulkhead at front instrument panel. At left is single-seater cockpit.

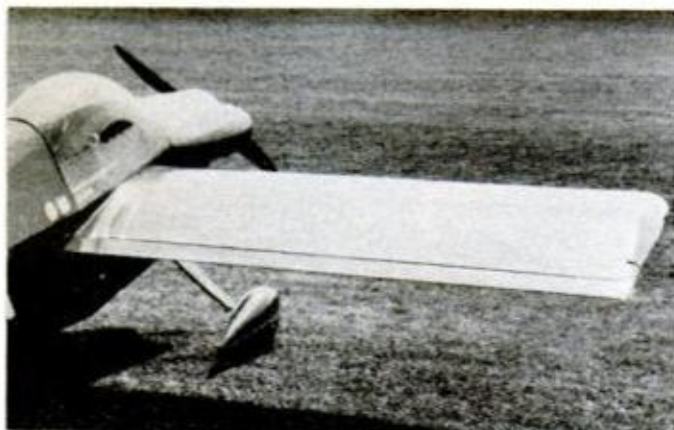


Removal of engine cowling reveals compact VW powerplant and prop extension. Extension beefs up prop support, taking load off VW's typically small front bearings. Engines are similar in both ships except single-seater uses 1600-cc size, while two-seater uses heftier 1700-cc.

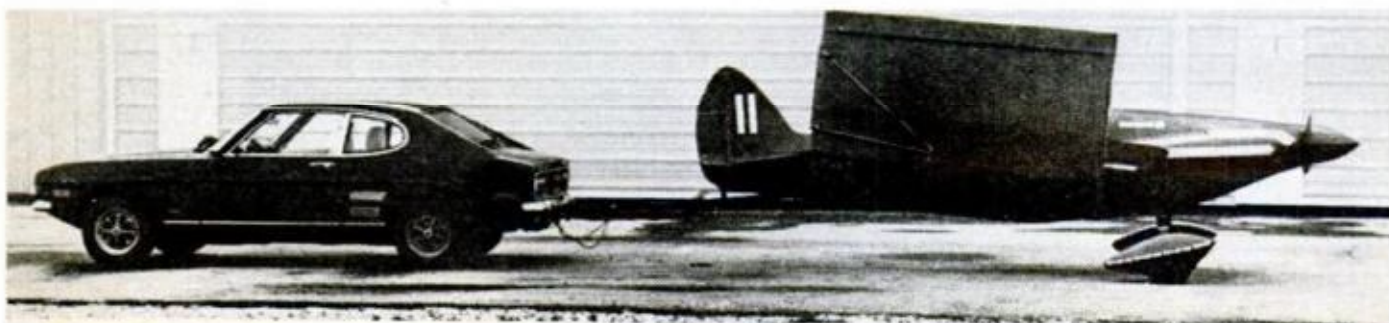
trol. Both ships are trim VW-powered mid-wing monoplanes combining sporty racing looks with economical construction. The single-place Sonerai I uses the 1600-cc VW engine, the two-place Sonerai II the 1700-cc size. Both incorporate such features as folding wings, full-span ailerons and a special Monnett-designed prop extension that strengthens front-end prop support. The folding wings enable the ships to be trailered on their own wheels and parked in a garage. The prop extension, unlike others of



**"Stretched" version** is only about two feet longer than single-seater job, yet manages to squeeze in second pilot behind first in tandem arrangement. Note how closely pilots sit together. This is what makes it possible for rear pilot to read instruments in the forward cockpit—he's so close he can see them right over the back of the front seat. In fact, when flown solo, ship is normally piloted from rear seat.



**Full-span ailerons** run entire length of wings, give smooth, positive control with only slight movement of stick. Planes need no flaps, have low enough stall speed—46 mph—without them. Photo below shows how wings fold back for trailering ship on its wheels.



its type, requires no machining or tapering of the VW's crankshaft. It's a simple four-inch ball-bearing casting that fits the standard VW keyway, bolts on in minutes and takes the load off the VW's typically small front-end bearings.

For simplicity and economy, the landing gear is fixed, and there are no flaps. At low stall speeds of 46 mph for Sonerai I and 45 mph for Sonerai II, no flaps are needed for safe, easy, low-speed landings. To save costly duplication of instruments, Monnett went to a somewhat unusual arrangement in his two-place Sonerai II. The rear cockpit has no instrument panel of its own. To fly from the rear seat, you read all your flight gauges from the forward instrument panel, looking over the back of the front seat. The cockpits are spaced so closely together that this isn't as difficult a feat as it may sound. In fact, Monnett insists on occupying the rear seat whenever flying solo. He prefers it.

Specifications for the two ships are similar. Cruising speed for Sonerai I is 150 mph; for Sonerai II, 140 mph. Both have a wing chord of 4½ feet and a range of 300 miles. Overall length for Sonerai I is 16 feet, 8 inches; for Sonerai II, 18 feet, 10½ inches. Wingspan is two feet longer for the tandem version—18 feet, 8 inches against 16 feet, 8 inches for the single-seater. Weight is 700 pounds gross for Sonerai I, 925 pounds gross for Sonerai II.

Construction involves a variety of materials. The wings and main airframe are metal, with a removable fiberglass engine cowling and fabric covering over the rear part of the fuselage and tail surfaces. Estimated building costs are \$2200 for Sonerai I and \$2500 for Sonerai II. Plans are \$50 for the former, \$57 for the latter. In addition, Monnett will offer some prefabricated parts in kit form for building both the Sonerai I and II. Further information and prices for parts can be obtained from Monnett Experimental Aircraft, Inc., 410 Adams St., Elgin, Ill. 60120. ★★★



## Outboards that go without gas

Not fast—but they win at the weigh-in station when you show off fish that didn't hear you coming.

by George Daniels

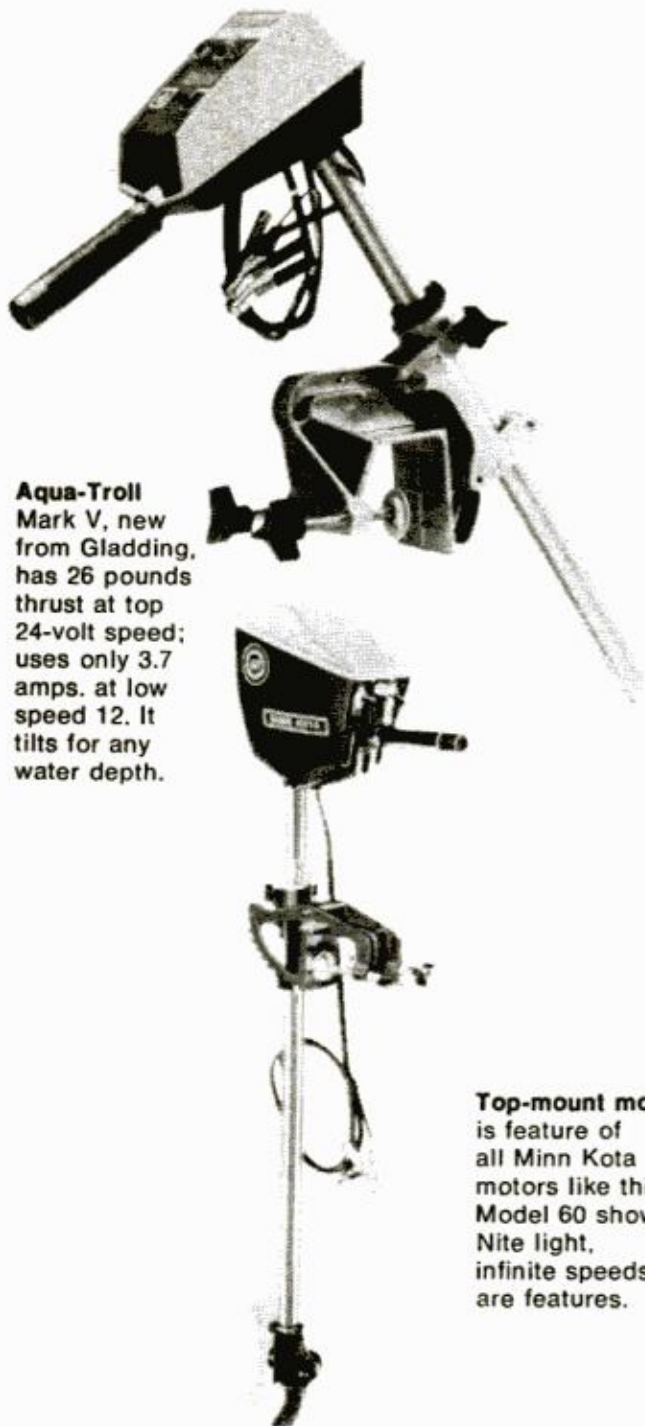


**Pushed and pulled** by Evinrude power, the Ouchita bass boat (top) runs out to a hot spot on gas, then lowers the electric foot-steered Scout up front and maneuvers by battery power. Speeds are controlled by pedal as well, and an indicator dial shows prop direction. Motor-Guide Magnum (above) a \$300 24-volt 21-pounder and Weightlifter electric anchor hoist behind it are from division of Herschede Hall, the grandfather's clockmaker.

**T**he little electric fans that run underwater are here to stay. Slow but quiet, they can sneak up on spots where the fishing should be best, and their gasoline consumption, of course, is zero.

Depending on what you want to do, you can spend from \$30 to \$300 on an electric outboard this year and still get your money's worth. Mostly, the difference is in the special features and equipment included in the price, plus the amount of power delivered. In the \$30 to \$40 range, you might pick a model with 4 or 5 pounds of thrust. A 12-

## 24-volt motors are new



**Aqua-Troll Mark V**, new from Gladding, has 26 pounds thrust at top 24-volt speed; uses only 3.7 amps. at low speed 12. It tilts for any water depth.

**Top-mount motor** is feature of all Minn-Kota motors like this Model 60 shown. Nite light, infinite speeds are features.

### MANUFACTURERS

AquaBug Intl. (AquaBug), Rockville Centre, N.Y.  
Byrd Industries (Lazi-trol), Ripley, Tenn.  
City Engineering (My-te), Indianapolis, Ind.  
Eska Co. (Eska, Seaco), Dubuque, Iowa  
Evinrude Motors (Scout), Milwaukee, Wis.  
Gladding Corp. (Aqua-Troll), Boston, Mass.  
Jetco Inc. (Electra Pal), El Paso, Tex.  
Johnson Outboards (Sea-Horse Electric), Waukegan, Ill.  
Minn-Kota Motors (Minn-Kota), Moorhead, Minn.  
Herschede Hall Clock Co. (Motor-Guide), Starkville, Miss.  
Pflueger Co. (Pflueger), Hallandale, Fla.  
Ramglas Products (Ram-Glide), Little Rock, Ark.  
Sears Roebuck (Ted Williams Fishing Motor), Chicago  
Shakespeare Co. (Shakespeare), Columbia, S.C.  
Silvertrol Co. (Silvertrol), Purdy, Mo.  
TrolMaster Co. (TrolMaster), Fort Smith, Ark.

volt Minn-Kota 10, for example, has two speeds controlled by a rocker switch, and a peak thrust of 4½ pounds. A Pflueger M-4, in the same general price range, offers only one speed but can use either a 6 or 12-volt battery and lists a top thrust of 5½ pounds. Both these budget models weigh under 10 pounds and have 360° steering rotation which allows backing up. Or, if you want a reversing switch plus 360° steering, you can have it in Silvertrol's Hunter, rated at 5 pounds thrust.

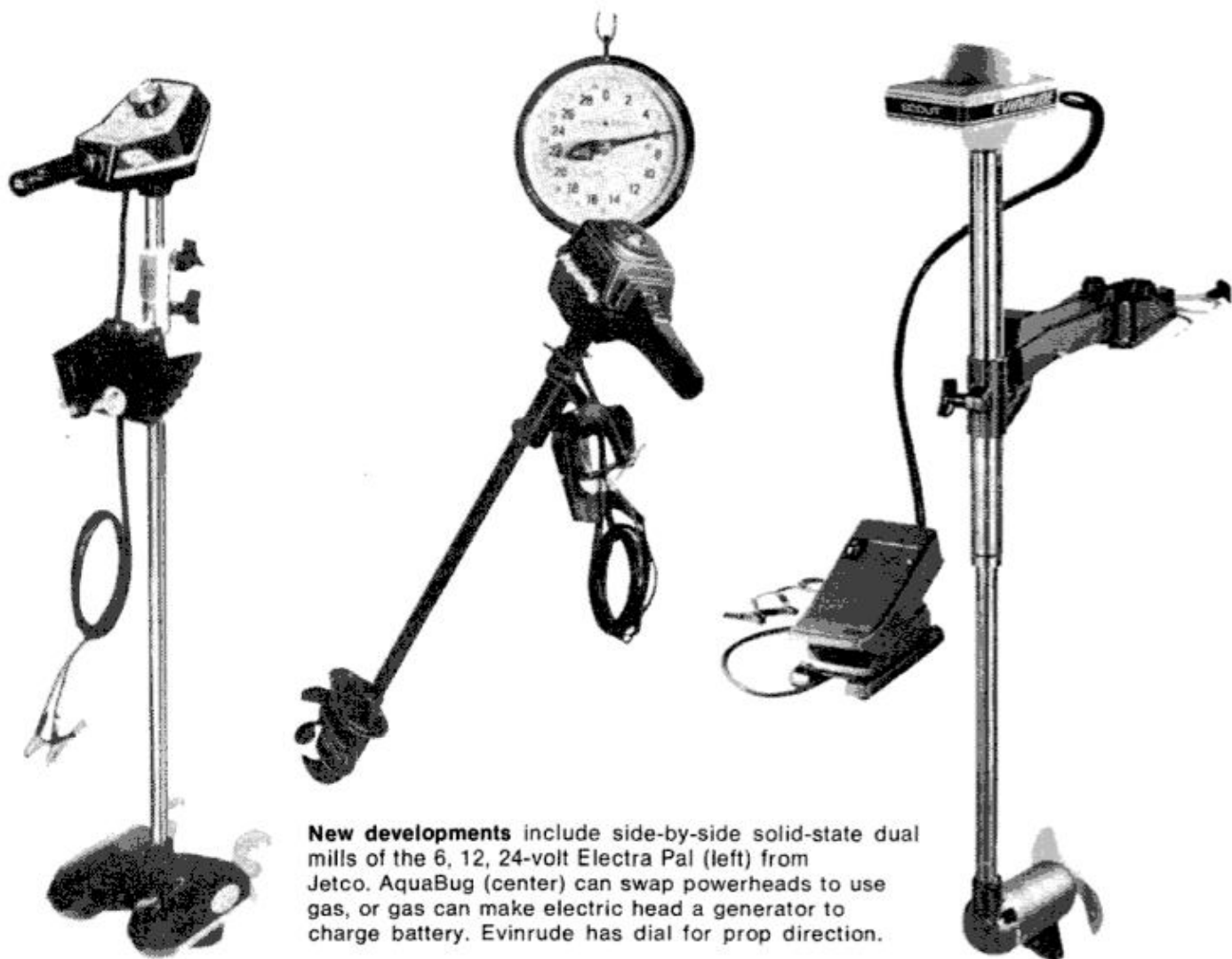
At the high end of the price range, you can have thrust up to 24 pounds and assorted extra features. Shakespeare's line leaders, for example, offer a sacrificial anode for saltwater use, battery charge indicator, night light, and jack for plugging in accessories.

**Remote control** is a popular accessory; foot-pedal steering leaves both hands free for fishing. Typically, toe down on the pedal makes a right turn, heel down is a left, and most can rotate the motor 180° for backing up if there is no reverse switch. Usually there is an on-off switch on the pedal and often a multispeed control as well. Top line motors may have 3 to 10 speeds or variable foot control, as on the new Evinrude and Johnson models.

Some B.A.S.S. tournament anglers swear by the remote foot control while others just use the hand tiller. A bow mount for your electric is essential; it can vary from a simple \$12 bracket up to elaborate cable-operated models priced to \$90. Or you can make your own.

**Motor mounting** of most models is underwater to eliminate gearing. The propeller shaft coming out of these compact permanent-magnet types runs through a bearing with seals good for many years. If you prefer an above-water motor, there are several makes at only slightly more cost. Some manufacturers, like Minn-Kota, make both types, and City Engineering's 12-volt My-te (about \$140) is made only in above-water form with a field-coil motor wired for four speeds.

Aquabug International's above-water single speed is the only convertible type that can change power heads from electric to gasoline. With a changing time of 60 seconds, the six-pound electric can turn into a 10-pound gas outboard. The electric alone is about \$75, the 1½-hp gasoline \$150, but for \$225 you can buy the motor with both heads and a coupling unit that lets the gas



**New developments** include side-by-side solid-state dual mills of the 6, 12, 24-volt Electra Pal (left) from Jetco. AquaBug (center) can swap powerheads to use gas, or gas can make electric head a generator to charge battery. Evinrude has dial for prop direction.

engine drive the electric motor as a generator to charge a battery as well.

**Running time** of an electric outboard on a single battery charge depends on the ampere/hour rating of the battery and the ampere draw of the motor. If you have an 80-amp./hour battery and your motor draws 10 amps., you'll run your battery down to zero in eight hours if you run full speed. Slower speeds provide less drain and longer operation between charges. With the rig described, unless you spend all your time trolling you should get a couple days of operation between charges.

When shopping for an electric, the specifications tell you if the motor operates on 6 volts, 12 volts or 12 and 24 as some of the latest models do with two 12-volt batteries hooked up in series. If complete specifications are provided, they may give number of speeds, pounds of thrust at each speed, amp. draw for each, and the rpm. Determining thrust isn't difficult if it is not given. Just mount the motor on your transom, tie a line from transom to a

straight-line scale and from it to the dock. Run, bow out, away from the dock and the scale will read static thrust. A reading up to 25 pounds is usually sufficient for electrics.

Slight differences in thrust and ampere draw are not too important. Variations in boats on which the electrics are used—hull design, size, load and water conditions—are likely to have more effect on overall performance.

A number of extra features now offered make operation considerably more convenient, however. Some have battery-charge gauges or red warning lights when amperage gets low. Adjustment for prop depth is also an advantage. Some remote-control motors with tops that do not rotate have indicators that show which way the underwater drive unit is pointed. Motor overload protection is provided on some makes with a circuit breaker that shuts off power if the propeller is stopped by an obstruction.

But the best feature of all old and new electrics? Probably the fact that you can hear nature instead of the engine. ★★★

# Owners would rather tank big than travel small

A nationwide survey  
based on 600,000  
owner-driven miles.

by **Michael Lamm**  
WEST COAST EDITOR

All owners consulted for this report had bought their cars just before the recent fuel crunch.

Asked whether their attitude toward cars in general and toward the Riviera in particular had changed as a result of the energy crisis, they gave these replies:

"No," said a Michigan insurance agent, "because I've driven small cars, and I would rather pay the extra money for gas and have the Riviera's safety and comfort."

Fully 64.3 percent shared that attitude. Here are more comments along the same line:

A Missouri newspaper publisher: "The energy crisis has not changed my attitude, other than to slow my driving."

A Houston stockbroker asserts: "No change. I would buy the same car again."

An Air Force vehicle maintenance officer: "No—I am definitely against the 55-mph speed limit. It makes cross-country driving much longer and more expensive due to ad-

Photos by the author



ditional expense for accommodations and food."

A retired Texan: "No change, because with good driving habits, the Riviera attains good mileage. I'm getting 12 to 15."

And an Ohio distributor's rep maintains, "I still want the comfort and safety that a big car gives."

Most owners, then, feel satisfied with their purchases and would rather spend a little more on gasoline than give up the security, ride, luxury and prestige of owning a new Riviera.

Roughly a third of them, though, had second thoughts, and typical comments include these:

An Illinois physician remarks, "Yes, with gasoline costing nearly double what it cost when we bought the car, I would like to get more miles per gallon."

A Georgia-based pilot declares, "Yes, because of perhaps taking a beating when I get ready to trade. Also I feel some pinch in the gasoline budget."

A Georgia pediatrician reports, "In view of the energy shortage, I have wished that this car used less gas. It's a real consideration now and will be for a long time to come."

On the topic of gas mileage, 30.2 percent placed it first among their "specific dislikes," and within that group, 20 percent put it at the top of their list of "things to change."

According to the owners themselves, the Riviera's mileage averages 10.1 mpg in the city and 13.3 mpg on longer trips.

Asked why they bought the Riviera, they gave these typical reasons:

"It's a sport type and a heavy car with lots of go." "I liked the body styling better than the Electra for 1974." "Comfort, ride styling and adequate or better repair record." "This is my third one." "Prestige, comfort, styling." "Impressed by its looks and performance." And an Ohio factory worker stated simply, "I have always wanted one."

According to our tabulations, styling led as the No. 1 reason for purchase. Past ownership ranked second—one owner said he'd bought Rivieras in 1965, '67, '68, '69, '70, '71 '73 and '74.

Comfort was the third choice and ride was fourth.

Despite an overwhelming satisfaction

with the Riviera's styling, 13.8 percent did suggest that the car's external appearance be changed. "The Riv was once *the* outstanding personal car on the market—it still could be with some innovative styling changes. I think the rear end now looks like an older model Dodge."

Switching to the subject of comfort, these were among the reactions: "Drives like velvet," purrs a Florida seamstress. A Michigan sales manager: "Front is excellent; rear somewhat cramped, but that is expected."

From a New York construction worker: "People always tell me how smooth the ride is." A Mississippi electronics sales manager: "Rear passengers nearly always complain of lack of knee room."

Seat belts and shoulder harnesses came in for their share of gripes. The fault, of course, isn't Buick's, and the complaints weren't directed at the Riviera so much as at the belts themselves. The ignition inter-

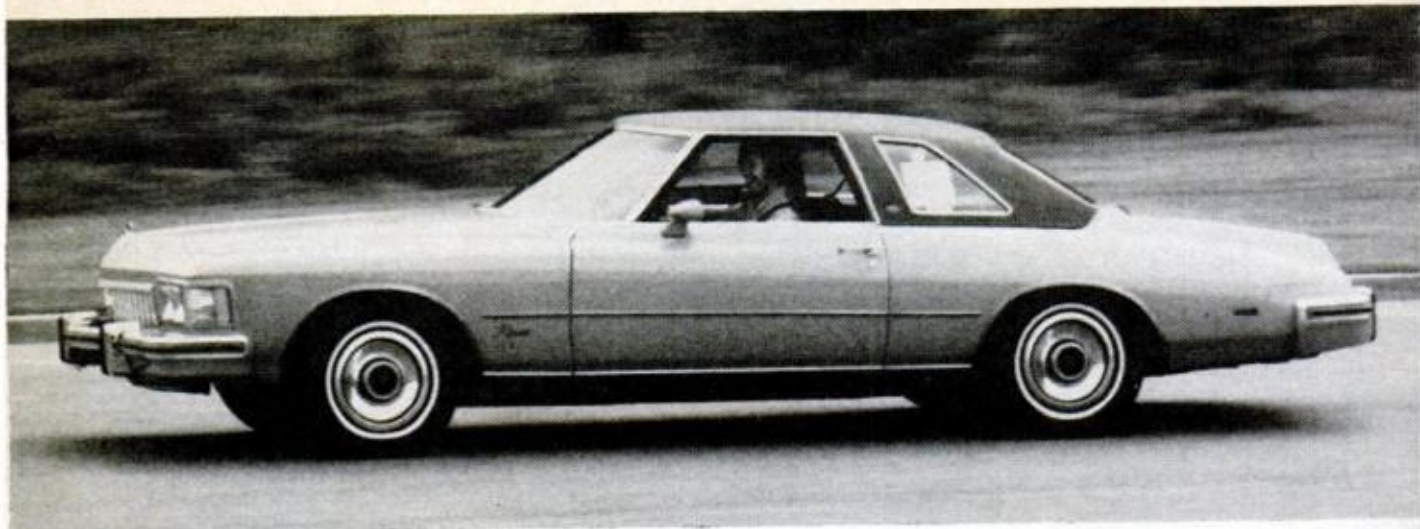


**Riviera's styling** attracted most buyers, but a minority hankered for the boattail. Drivers praise front legroom and general interior decor but curse the seat-belt interlock and lack of rear legroom. Most ordered their Rivieras equipped with factory airconditioning.



# Some look for smaller Riviera, but no less luxurious!

1



2



1. **Silence, comfort and ride** rate top marks, as do handling and general performance.
2. **Inner wallboard** protects electrical connections at the taillights and side markers.
3. **Riviera's 245-bhp, 455-cu.-in. V8** burns regular, gets 10-13.3 mpg according to survey.
4. **Scrunchable plastic body material** above the rear bumper resists dents and scratches.
5. **Thoughtful luxury touches** include lamps at either side of the visor vanity mirror.

3





## Summary of 1974 Buick Riviera Owners Reports\*

<b>Total miles driven</b> .....	616,416	<b>Did the energy crisis affect your outlook on car size?</b>		<b>Workmanship opinion:</b>	
<b>Average miles per gallon</b>		No .....	64.3%	Good to excellent .....	66.3%
Local driving .....	10.1	More gas-mileage-minded .....	21.4	Average to poor .....	33.8
Long trips .....	13.3	<b>Would you buy another Riviera?</b>		<b>Is the Riviera your only car?</b>	
<b>Why the Riviera?</b>		Yes .....	85.0%	No .....	58.9%
Styling .....	47.1%	No .....	15.0	Yes .....	41.1
Past experience .....	34.5	<b>Had any mechanical trouble?</b>		<b>Number of cars owned:</b>	
Comfort .....	16.1	No .....	60.2%	Riviera only .....	41.1
Ride .....	5.7	Yes .....	39.8	Two cars .....	47.8
<b>Specific likes:</b>		<b>What type of trouble?</b>		Three cars .....	5.6
Styling .....	63.5%	Electrical .....	17.1%	Four cars .....	4.4
Ride .....	45.9	Transmission .....	14.3	Five or more cars .....	1.1
Comfort .....	37.6	Carburetor .....	11.4	<b>Makes of other cars owned:</b>	
Handling .....	36.5	Ignition points .....	8.6	Buick .....	30.2%
Performance .....	23.5	Heater .....	8.6	Chevrolet .....	24.5
<b>Specific dislikes:</b>		<b>Did you repair it yourself?</b>		Ford .....	15.1
Low gas mileage .....	30.2%	No .....	94.3%	Cadillac .....	11.3
Seat-belt interlock .....	9.3	Yes .....	5.7	<b>Age distribution of owners:</b>	
Short legroom .....	7.0	<b>Dealer repairs satisfactory?</b>		15-29 years .....	10.5%
<b>What changes would you like to see?</b>		Yes .....	72.4%	30-49 years .....	44.1
Better gas mileage .....	20.0%	No .....	27.6	50-plus .....	45.4
Exterior styling .....	13.8	<b>Dealer service opinion:</b>		<b>Number of family members:</b>	
More rear legroom .....	12.5	Good to excellent .....	50.0%	Owner only .....	9.2%
Remove seat-belt interlock .....	10.0	Average to poor .....	50.0	Two in family .....	51.7
				Three in family .....	16.1
				Four in family .....	11.5
				Five in family .....	5.7
				Six or more in family .....	5.7

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

lock system irked a good many owners, but also cited were: "Shoulder straps get in way of rear entry." "The seat belts are troublesome—ruin the joy of driving. If the family is all strapped in, it's like being in jail." "I don't like the buzzers and the fact that the engine won't start until I buckle up."

How about quality and workmanship? Two-thirds of those questioned rated it good/excellent and the remainder gave it a mark of average/poor. Thin paint was mentioned several times, but otherwise fit and finish were in keeping with expectations of the owners.

Dealer opinion came down to a 50/50 split on service and about three to one on dealer policies in general. Roughly 75 percent think highly of their dealers' sales techniques, courtesy, attentiveness and fairness, but only half are fully satisfied when it comes to judging service. Says a California office manager: "My dealer is fine except for maintenance service, which is very poor since they don't fix things properly."

"I had a rear suspension problem due to the factory installing the wrong coil springs," says a California realtor. "The factory rep and dealer were very helpful in correcting this."

A New York housewife: "My Riviera was using oil at first. The dealer replaced the motor without question. I'm very satisfied."

"The dealer let me have a loan car while repairing mine."—New York computer programmer.

"I have bought seven Buicks from the same dealer since 1961," avers a Long Island contractor. "Any time I had to have work done, it was done right."

"Our car backfires and pulls back when climbing even slight hills. The Buick dealer doesn't seem to believe us. It seems everytime we go there, nothing happens."—Bayonne retiree.

Pollution-control devices were blamed, rightly or wrongly, for poor running, poor mileage and many repairs. This, though, is a common complaint aimed at most cars these days.

Looking ahead, 85 percent of all Riviera owners said they'd buy Rivieras again, energy crisis or no. Some of them considered the fuel crunch a cooked-up shortage anyway, staged by the oil companies to raise gasoline prices.

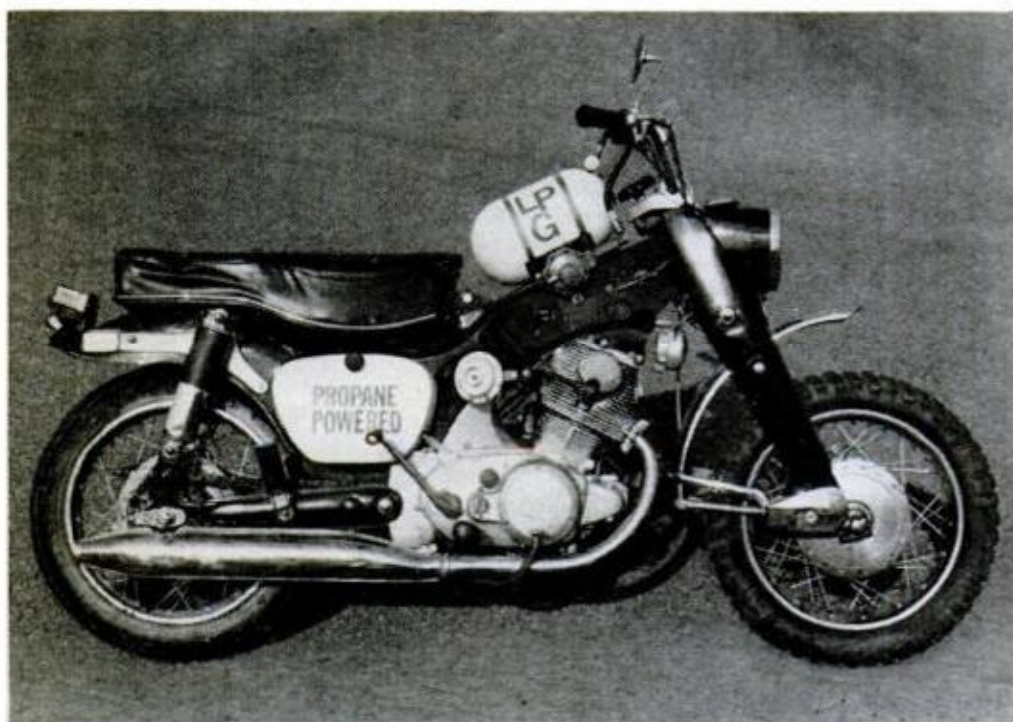
Some suggested that future Rivieras be made smaller and lighter but no less luxurious nor comfortable. A few did say that they'd be looking at compacts or subcompacts next time around. But the majority are willing to pay the extra price posted for gasoline.

As one of the owners describes it, "This car reaffirms my belief that you get what you pay for. Luxury is not an inexpensive feature." ★ ★ ★

# 'Clean' machine runs on propane

You've heard of electric motorcycles and propane-powered cars, but this propane motorcycle is a first!

by Ed Remitz



**Dick Gotelli's** clean machine started life as a conventional Honda street bike. Photo of the bike (left) shows propane tank where gasoline tank would normally be. Below: Dick removes tank from the cradle he fabricated for it.

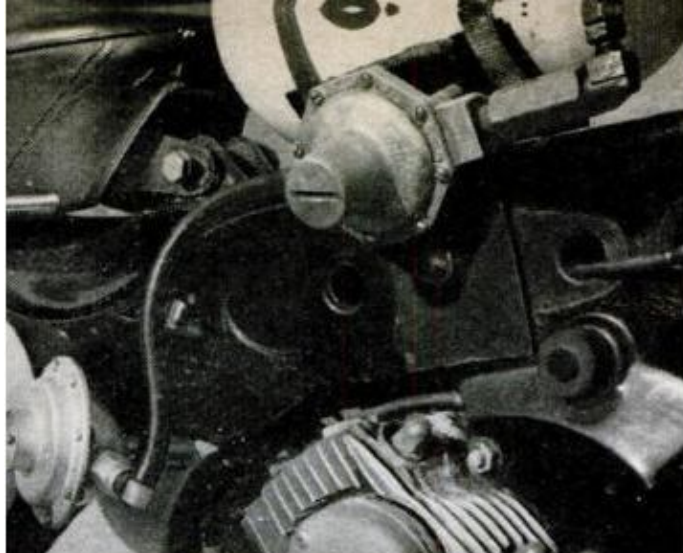
**P**ropane gas is something of a wonder fuel: It burns clean, produces no engine-punishing carbon deposits and it's cheap. That's why Dick Gotelli built his one-of-a-kind. He converted his 1963 300-cc Honda motorcycle to propane power.

Dick, a street and off-road motorcyclist, conceived the project to prove that propane conversions are relatively easy and inexpensive, and to show that motorcyclists do care for the environment.

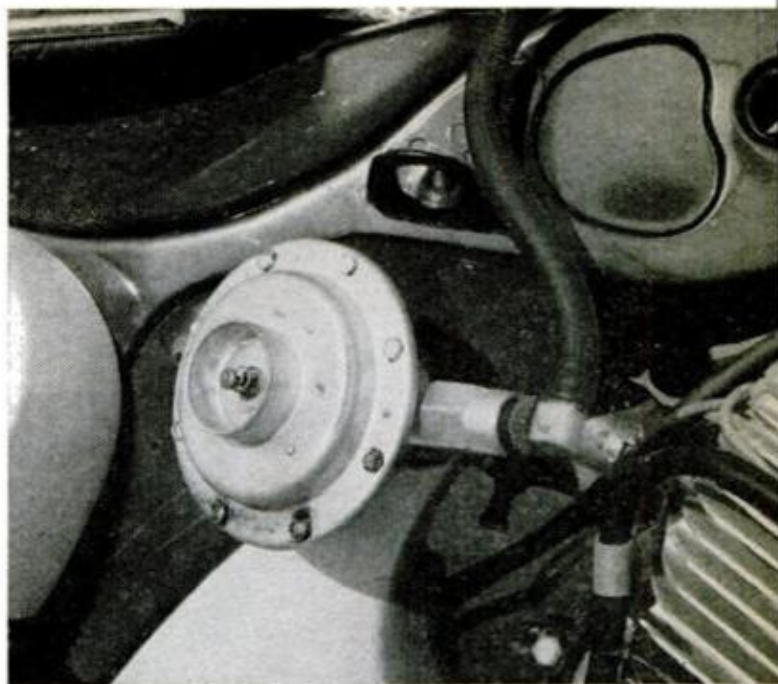
Gotelli operates an engine repair shop in San Rafael, Calif., where he also does propane conversions for cars, trucks and industrial engines.

For \$125, he bought the conversion parts: a regulator system and carburetor from Clinton and Wisconsin industrial propane engines, respectively, and the plumbing. The tank is the most expensive single item for a conversion. Dick bought a used 1½-gallon





**Propane tank and first stage** of the regulator (above) are mounted on bike in place of original fuel tank. First stage drops propane tank pressure of 180 p.s.i. to 30 p.s.i. Combined second and third stages of regulator (right) drop pressure to 3 p.s.i. and, finally, six ounces per square inch before propane goes to engine.



one. Propane is bottled under pressure as a liquid but becomes, with high temperature or low pressure, a gas. State agencies must inspect and approve propane tanks. As a reference point, Dick figures a five-gallon tank could cost over \$30.

Few modifications were needed. Sparkplugs two ranges colder had to be installed, then regapped to .035 in. Dick explains that propane is a "colder" fuel than gasoline, so it requires colder plugs. And it doesn't have polluting additives, as with gasoline, that contribute to plug fouling. He uses an exhaust analyzer to tune the engine because propane exhaust is nearly invisible (some motorcyclists tune by observing the amount of exhaust). Conversions will probably work only for four-cycle engines, Dick says, because of the lubrication problem.

The regulator system does most of the work. Its first stage reduces the propane's in-tank pressure from 180 to 30 pounds per square inch. The second stage reduces it to three pounds, and the third stage to six ounces. From there on, engine vacuum draws the fuel in through the carburetor.

Dick spent about 60 hours on the project. That includes time spent tracking down components. He feels even novice mechanics can accomplish a propane conversion. Most propane businesses, Dick says, have enough parts to get the job done.

A conversion should pay for itself within several years, says Dick. Here's why:

- Indefinite muffler life because propane produces no corrosive acids. Dick contends it burns cooler and even makes the engine run quieter.

- No carbon deposits, increasing engine life up to three times.

- No oil changes (after the engine is broken in); just clean the oil filter.

- No sparkplug fouling. Judging from propane cars' performance, Gotelli says plugs should last over 40,000 miles.


Propane's big plus is its "clean" emissions. Dick says, "Propane exhaust runs about 54 percent less nitrous oxides, 65-80 percent less hydrocarbons and 85 percent less carbon monoxide than gas . . . and gives up to a 10-percent power increase." He says it's easily available, too.

Propane is obtained two ways. Liquid petroleum gas (LPG) can be refined from natural gas. LPG is mostly butane and propane. Additional processing extracts the propane which burns more efficiently than LPG.

The second method is to subject crude petroleum in a "cracking tower" to high temperature and pressure. Propane will float to the tower's top while tars and "dirtier" fuels stratify lower in the tower. The higher up the tower the cleaner and lighter the fuel. But also the less of it.

Dick has his motor running on the subject of alternative fuels. He says a gasoline engine can be altered to run on water and a "white pill." The pill is calcium carbide which, when immersed in water, produces acetylene gas. He has a pickup truck nearly converted for "pill power" already. Acetylene, he adds, is as efficient as propane and can be tapped at pressures of 15 pounds per square inch—considerably lower than propane.

★★★



**Secretly tracking** the three planes on a special heat-imaging scope, flying narcotics agents follow the smugglers as they jump the border. At right below, police helicopters move in to make the capture.

.....PALOMINO IS JUMPING THE FENCE.....

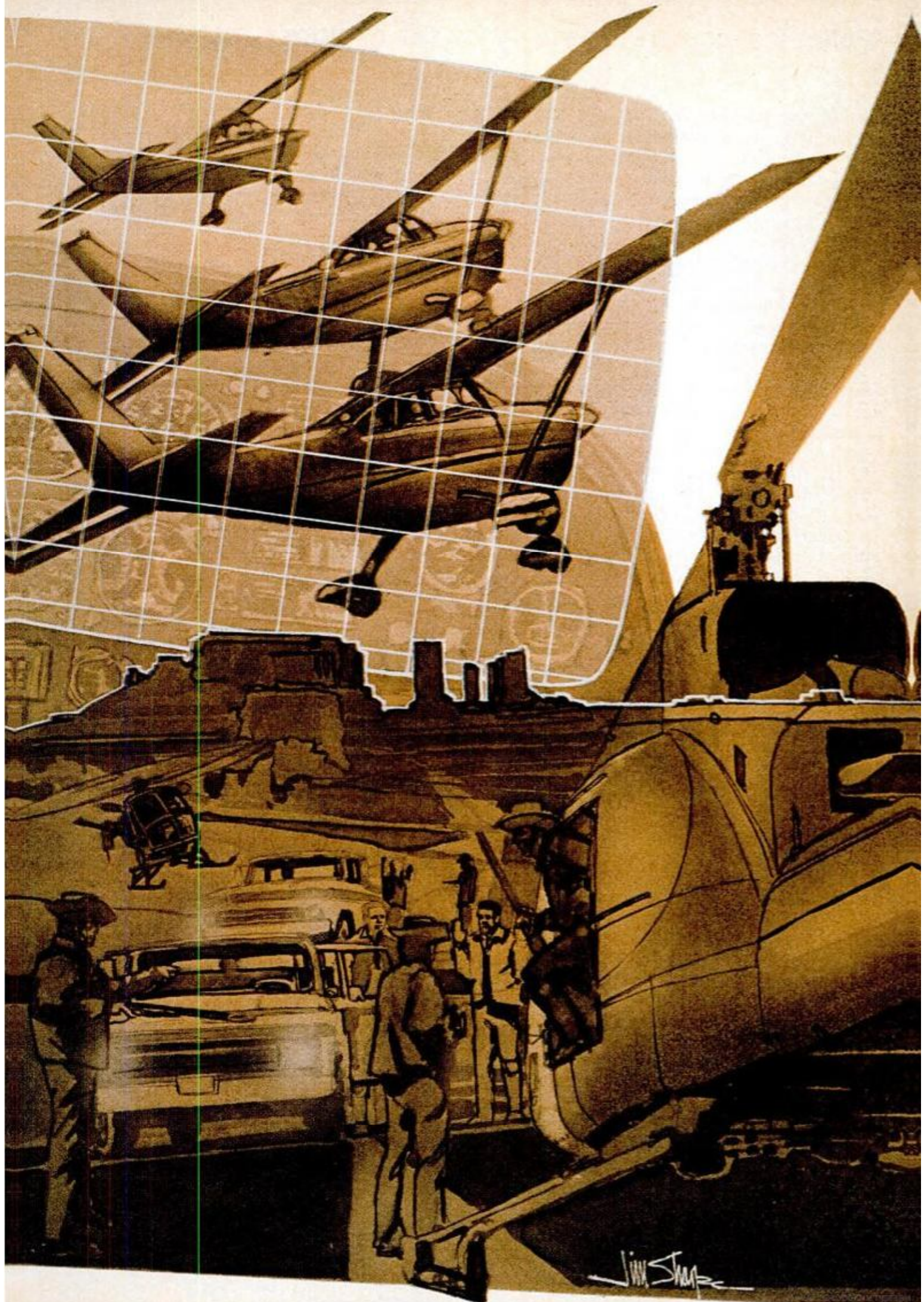
## It was going to be 'a piece of cake,' thought the dope smugglers—until...

New scientific weapons in the war on illicit drug traffic are at last paying off in this deadliest, most tragic of all criminal capers.

by Edward Hymoff

120 POPULAR MECHANICS

The three small planes took off cautiously one at a time, grouped smartly into formation, then streaked off through the darkened night sky, headed secretly for the U.S. border. The ships—fast, powerful turbocharged Cessna 206s—were part of a highly organized, well-equipped underworld “air force” used to smuggle marijuana, heroin and other dangerous and illegal drugs into the country from Mexico. The job



Jim Star

## Police helicopters closed in for the capture

would be "a piece of cake," thought the smugglers. They had done it many times before. Making as many as 18 trips a week, they'd fly down to Mexico, pick up their illicit cargo, then head back to some obscure delivery point inside the U.S. border. Operating from little-used or abandoned airstrips, running without lights and flying low to escape radar detection, they were virtually impossible to spot. This was just another routine mission, another valuable haul, another big laugh on the cops.

What the smugglers didn't reckon on was a crack team of airborne narcotics agents following unseen from behind. The agents were using a new type of aircraft-detection system, a thermal imaging device called FLIR for Forward Looking Infra Red. In the FLIR system, tiny amounts of heat given off by an otherwise invisible surface form an image on a TV-like screen, revealing the object's location and shape. Unlike radar, which can't detect signals close to the ground because of background "clutter," FLIR operates at any altitude and over great distances. Heat from an airplane's fuselage, even miles away, is sufficient to form an image on the scope.

As the smugglers were sneaking across the border seemingly unnoticed, patrolling agents in the air received a terse radio message: "Palomino is jumping the fence." Palomino was the Mexican nickname for 54-year-old Martin Haultin, a long-sought notorious drug trafficker who had been evading capture for years. The message "jumping the fence" was a tip-off from ground agents that Haultin and his partners were making another border hop. The airborne agents immediately switched on their FLIR scopes, picked up Haultin's planes on the screen and gave chase. By monitoring Haultin's radio frequencies, they learned his destination—a deserted stretch of back road in the New Mexico wilderness where trucks and cars were waiting to take over his deadly cargo. As the agents tracked the smugglers' flight on their screens, they began alerting police helicopters and ground units to proceed to the rendezvous point. By the time the planes touched down, using the road as a landing strip, the helicopters and police patrol cars were already converging on the scene.

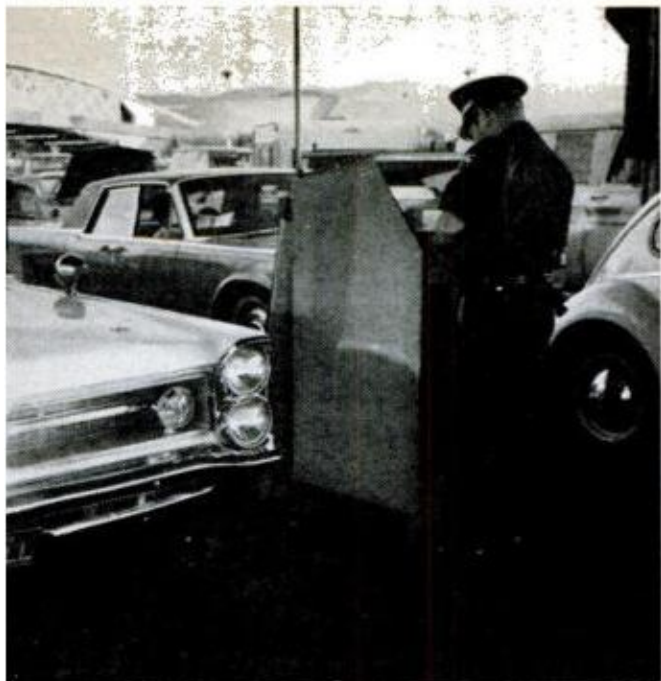
That was the end of Haultin and his gang.

Seized in the dramatic capture were 2300 pounds of marijuana—enough to put the not-so-smug smugglers out of business behind bars for many years. This was late last fall, one of the first uses of the new FLIR tracking system. Now, with FLIR's help, airborne smuggling, one of the most elusive forms of drug trafficking, is rapidly being brought under control.

But FLIR is only one of many modern, sophisticated weapons now in use in the war on smuggling. All over the country, Drug Enforcement Administration agents, U.S. Customs officials and state and local police are cooperating in an all-out massive attack on the drug menace. One inconspicuous aid seldom noticed by motorists passing through border checkpoints is helping to trap smugglers on the ground just as successfully as FLIR is doing in the air. Most drivers are never aware of its presence, but one in particular has good reason to remember it well. On a recent afternoon, Luis Alberto Ascarraga-Milmo was waiting calmly in a line of cars—one of more than 7 million vehicles that annually cross the International Bridge spanning the Rio Grande River between Nueva Laredo on the Mexican side and Laredo, Tex., on the U.S. side. Getting through the checkpoint would be a cinch, thought the Mexican. He had made many similar trips, each time carrying heroin carefully hidden in a different vehicle.

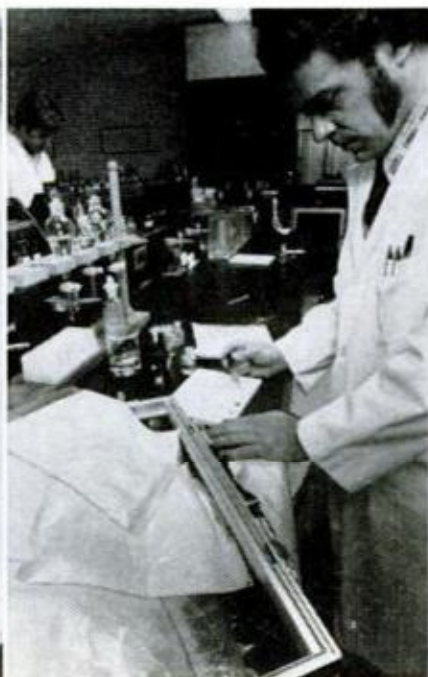
As the line of cars inched slowly through the border inspection station, a customs official would strike the keys of a small computer console concealed inside his booth out of motorists' view. He'd tap out a license-plate number on the keyboard, and from the computer's data bank 1350 miles away in San Diego, Calif., a reply would come back almost instantaneously. In most cases, the display on the computer's small screen would be negative, indicating that the vehicle was not suspect. As Ascarraga-Milmo rolled confidently up to the booth, a relaxed, friendly smile on his face, the agent's fingers moved swiftly over the keyboard. In a flash, the screen was alight and blinking with a "hit." Data from the central bank described a different vehicle but the same registration, signaling that the car was "hot." The Mexican had switched the plates to another vehicle, but hadn't fooled the computer. In-

*(Please turn to page 168)*



As cars stream across a checkpoint between Mexico and the United States, a customs official punches out license-plate numbers on a computer keyboard. If a car is "hot," the computer instantly flashes a warning, alerting inspectors to look for hidden drugs being smuggled illegally into the country. Using such advanced, modern equipment, narcotics agents regularly apprehend tons of illicit drugs each year before they can possibly get into circulation.

**Chopper**, a German shepherd trained to sniff out concealed narcotics, goes over a suspect's car at a border inspection station (near right). Checking bumpers, tires, door panels, ventilation ducts and other likely hiding spots, such dogs can complete a search in one to three minutes compared to half an hour for an inspector. At the far right, Chopper sits proudly with his "find"—several packets that contain 90 ounces of illicit heroin and cocaine.



Checking new samples of captured drugs against a "fingerprint" file of known samples (far left), a DEA forensic chemist can often quickly determine a drug's type and source of manufacture. At near left, another forensic expert runs chemical tests on a drug to detect certain key ingredients that may be a tip-off to its point of origin.

# Long, long lenses at low, low prices

Those under-\$50 400-mm telephoto "bombs" are a tempting buy—and surprisingly good for the money. But they do have some limitations. Here's what you should know before choosing and using one.

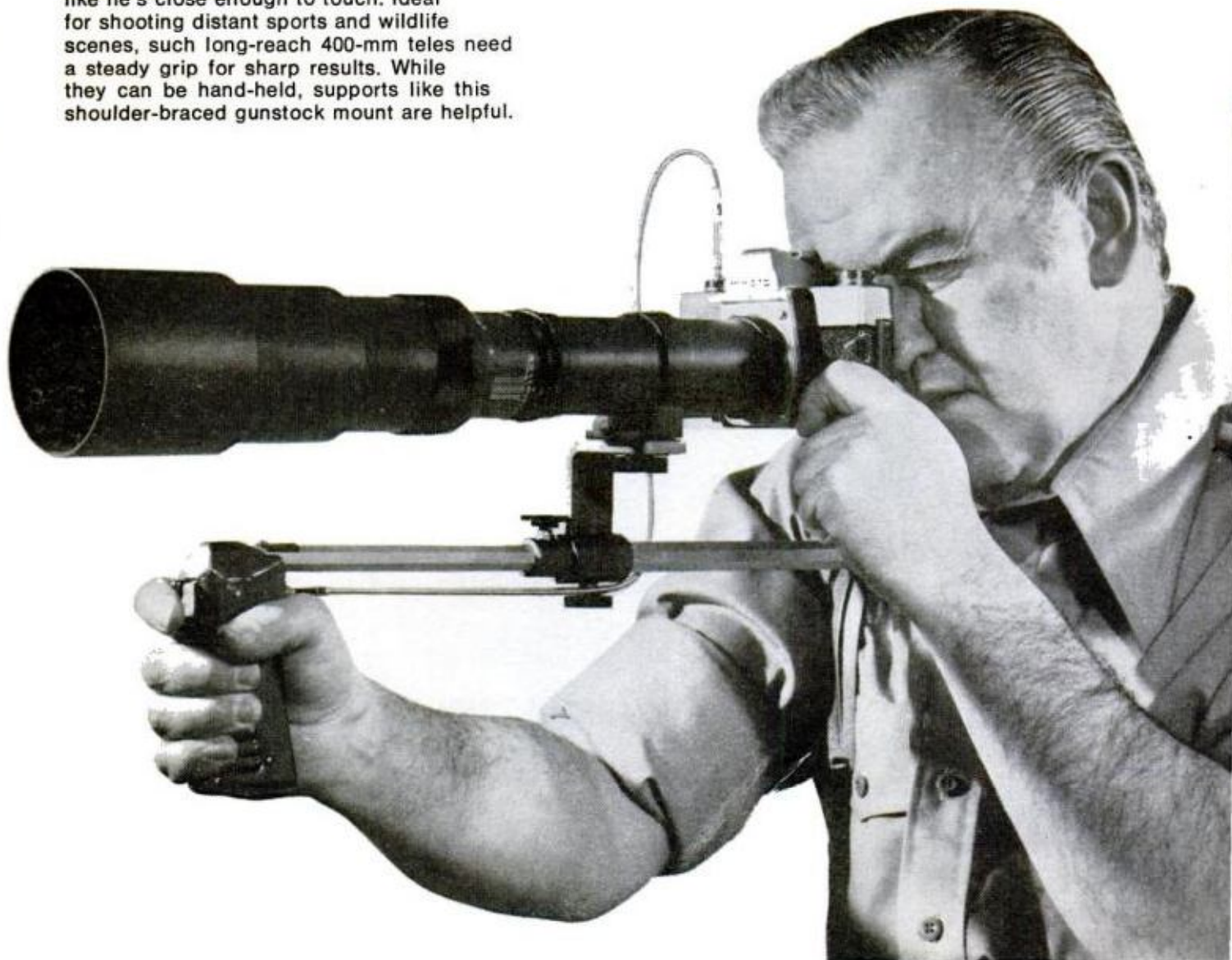
by Sheldon M. Gallager

Photos: Robert D. Borst

**More than a foot long**, this impressive rig will make a bird 100 yards away look like he's close enough to touch. Ideal for shooting distant sports and wildlife scenes, such long-reach 400-mm teles need a steady grip for sharp results. While they can be hand-held, supports like this shoulder-braced gunstock mount are helpful.

Can a 400-mm telephoto lens selling for \$35 to \$45 really be any good? The answer is yes—not only surprisingly good for the money you pay, but a lot of fun, too. With such a lens, you can reach out and capture dramatic close-ups of distant objects that often can't be photographed any other way. Take the water-ski shot shown on the opposite page. You couldn't catch such action with a normal lens unless you were standing in the water a few feet away—either not permitted or not practical in most cases. Actually, the shot was made with a 400-mm lens from viewing stands more than 100 yards away.

Compared with a normal 50-mm lens, a







**Water-ski jumpers** caught in mid-flight are good example of type of action shots you can get with a long lens that would not be possible any other way. Dramatic close-up at right was made with inexpensive 400-mm tele, while photo above shows how same scene appears when shot with a normal 50-mm lens, with skiers barely visible. Photos were cropped differently for aesthetic reasons, but image sizes were kept in correct proportion to illustrate startling change in magnification. Blurring in enlarged view is due to hand-holding camera, not lack of lens sharpness.



**Four of the most common** low-cost 400-mm teles on the market are shown below. All are f/6.3 preset types and have essentially the same features: adjustable swivel collars with tripod sockets, threaded lens barrels for filter and sunshade accessories, and universal T-mount adapter systems for fitting most 35-mm SLR cameras. All were tested by PM and found to give good results.



**ASTRANAR \$39.95**

**PRO \$47.65**

**SPIRATONE \$44.95**

**WOCO \$34.95**

400-mm telephoto gives you eight times magnification—the equivalent of looking through a pair of 8X binoculars. That's quite a boost in picture-taking power. Sporting events, boating, racing and air show scenes and birds and other wildlife—plus perhaps a bit of surreptitious “girl-watching”—are ideal subjects for long-range shooting; let your lens do the reaching when you can't do it yourself. If you bear in mind that you're getting a lot of lens for little money, you can live very happily with an inexpensive tele provided you understand and accept its limitations.

You've probably seen the ads for these long, low-priced “bombs” and been intrigued by them. So were PM editors, so we gathered together four of the most popular and put them to the test. The four selected were Spiratone's, Sterling-Howard's Tele-Astranar, Ritz's PRO and Wolk's WOCO. Their prices range from just under \$35 to about \$48. All are designed for use with 35-mm single-lens reflex cameras and can be adapted to fit some rangefinder types as well, though problems of exposure and focusing with the latter make them less practical here. For easiest operation, they're best used with SLRs having built-in light-metering systems that can automatically compensate for the increased exposure that long lenses require.

Why especially pick a 400-mm lens? First, it's about the longest-focal-length lens you can still hand-hold if you're careful—anything bigger demands a tripod and also tends to become cumbersome and unwieldy. Because you rarely have the time and facilities for setting up a tripod when grabbing action shots on the run, it's important to have a



**Can you tell which is which?** The two shots above and the one at the top of the facing page were all made with 400-mm lenses—but one lens cost four times as much as the others. Note that differences in sharpness and overall picture quality are virtually imperceptible. Give up? Believe



It or not, the bottom photo on the facing page was made with a \$200 tele, the other two with under-\$50 "cheapie" models. Chief difference: Expensive lens gives slightly more distinct background. Directly above is same scene shot with normal 50-mm lens to show image-size comparison.

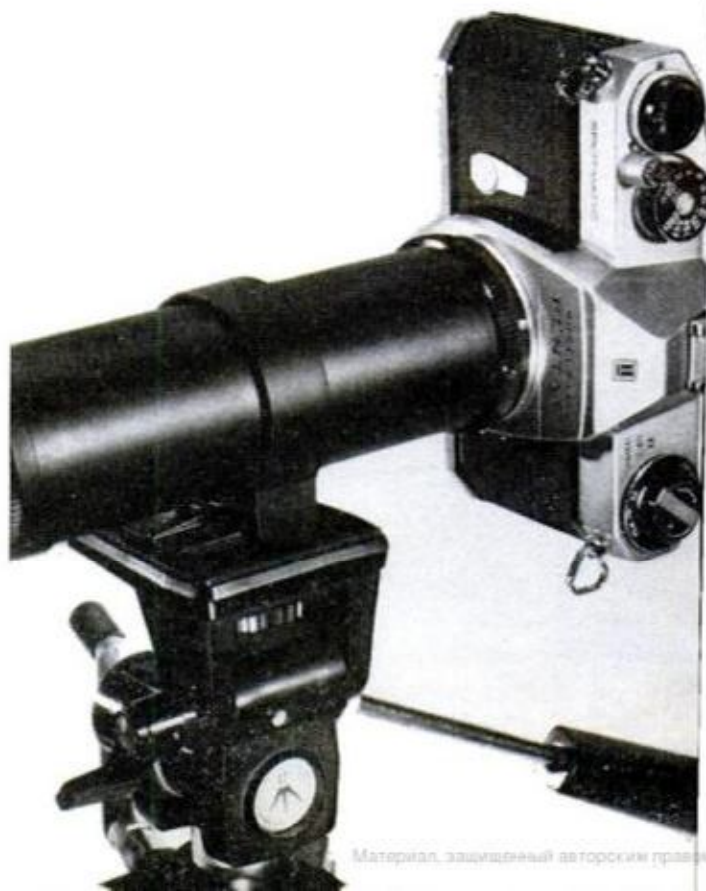
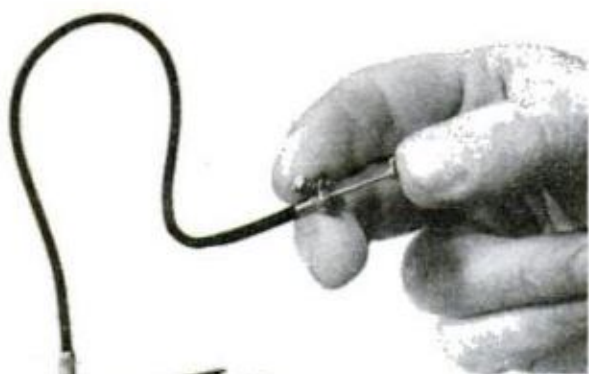
lens that permits freehand shooting. Secondly, the 400-mm size happens to be one that offers a wide selection of inexpensive choices. Because of its popularity, manufacturers have been able to mass-produce models at low cost while still retaining a reasonably high degree of quality. Obviously, you can't expect a \$40 lens to perform like a \$400 one, but for occasional, casual shooting the results it gives are pleasantly satisfying, and often downright amazing. Also, there's a good case for economizing on a high-powered tele for the simple reason that this is a specialized type of lens you probably won't use too often. There's little point in sinking a fortune into a luxury model that will sit around a lot of the time in its case. That's the big advantage of these "cheapie" 400s—you can have a long lens for those particular occasions when you need one without breaking the bank.

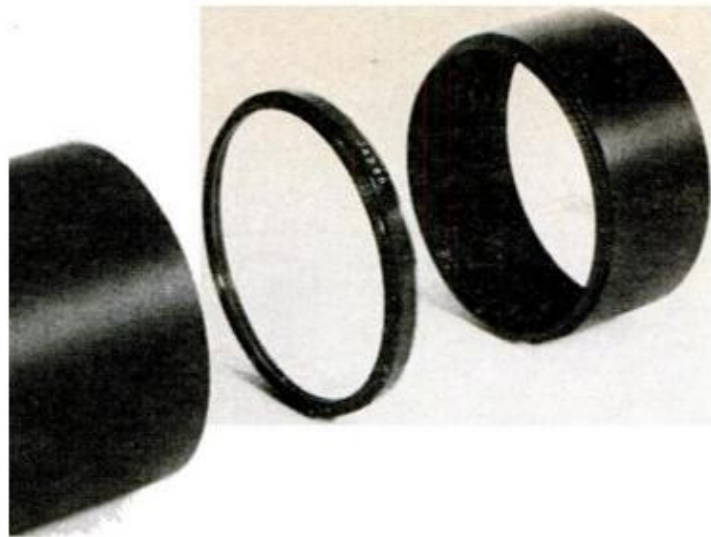
What you get for your \$40 or so is a basic, no-frills instrument with acceptable four-element optics, a manual preset diaphragm control and a speed of  $f/6.3$ . What you don't get are refinements like multicoated optics and automatic operation. The  $f/6.3$  speed is "slow" compared to the  $f/1.9$  and faster speeds of a normal 50-mm lens, but all long lenses are by nature slow anyway—it's just something you have to live with. Even the most expensive 400s go only to  $f/5.6$ —still pretty slow. Luckily, today's fast films, and the ability to push them to two and three times their normal ASA rating, largely make up for the disadvantage of using a slow lens.

If you're accustomed to an automatic lens, you'll find that



**Shake-free shooting** is important with long lenses. Accessory pistol grips like one above help steady camera, attach easily to tripod socket on lens barrel. Grip shown here incorporates trigger-operated cable release, is better than cheaper types lacking such a feature. When using a tripod for support, be sure also to use a cable release, as shown at left, to keep finger pressure on shutter button from moving camera. Photo below shows how rotating collar on lens lets you turn camera sideways for vertical-format shots—a valuable aid that saves awkward hand-holding.





**Haze filter**, inserted between lens and sunshade, cuts atmospheric blur, is handy for long-distance shots.

the preset diaphragm control takes a little getting used to. There's a separate ring on the lens barrel that opens and closes the diaphragm manually. First you set the diaphragm to the desired opening, then you turn the ring to stop the lens down to that opening to take your exposure reading. Next you flip the ring back to the open position to get full brightness for focusing and composing. Finally, you twist the ring closed again just before shooting to take the picture at the preset opening. That's a lot of remembering to do if you're shooting fast with an unfamiliar lens. The first few times you're likely to find yourself forgetting to stop down—it happens to all of us. Eventually you'll get the hang of it.

The real trick in learning to use a long lens is maintaining picture sharpness. A variety of factors—subject motion, camera movement and the characteristics of the lens itself—all combine to work against you on this. Because of the lens's long length, the tiniest movement of the camera is translated into a large movement along the lens barrel. To minimize camera shake and to freeze subject motion, you want to shoot at as fast a shutter speed as possible. Generally,  $1/250$ th of a second is about the slowest you can safely go on hand-held shots—and  $1/500$ th is even better. At the same time, all long lenses, especially the cheaper ones, are less sharp at the edges than at the center. Also, all long lenses suffer from a relatively shallow depth of field. For these reasons, you want to stop down to as small a diaphragm opening as possible so you're using the lens's sharpest

center portion for crisp results and maximum depth of field.

Often, however, light conditions, even with fast films, will not permit you to have both a fast shutter speed and a small lens opening at the same time—you'll find yourself constantly having to make compromises. If you're shooting action, go for a fast shutter speed, but try to close down at least one or two stops—no tele is at its best wide open. Wherever possible, use a tripod or other camera support for maximum steadiness (for two helpful reports on portable camera supports, see *Tripods Aren't Always Tripods*, page 142, June '74 *PM* and *Steady . . . Aim . . . Shoot!*, page 124, July '74 *PM*).

Panning with the action—swinging the camera to follow your subject as you shoot—is rarely a help with a long telephoto because you'll merely introduce additional motion by moving the camera. Your best bet is to aim the camera where you expect the action to take place, then shoot just as your subject enters the finder. You won't always hit it right on the button, but you'll be better off than trying to sweep a wobbling foot-long lens all over the horizon.

If your subject is stationary, you can sacrifice some shutter speed and go to a smaller lens opening to gain depth and sharpness. But here's where a tripod or other support becomes especially important. If you can't set up a tripod, at least use a pistol grip, chest pod, gunstock mount or similar steadying aid. And, wherever feasible, use a cable release to trip the shutter instead of your finger—this will also help to minimize camera movement.

All of the lenses *PM* tested produced good results, but this doesn't necessarily mean that all on the market are equally good. Because quality-control standards are not always applied uniformly on low-cost lenses, you may find variations in quality from one make to another or even between two lenses of the same make. Where you can, it's wise to try a lens before you buy it. Run a few test rolls through the camera in both color and black-and-white and check for sharpness, detail and contrast at various shutter speeds and *f*/stops. Do this on a tripod—you can't blame a lens for your own unsteadiness. Most reputable stores and mail-order houses will sell lenses on a money-back trial basis.

In general, telephotos give better results

*(Please turn to page 173)*

# 28 ways to make strong wood joints

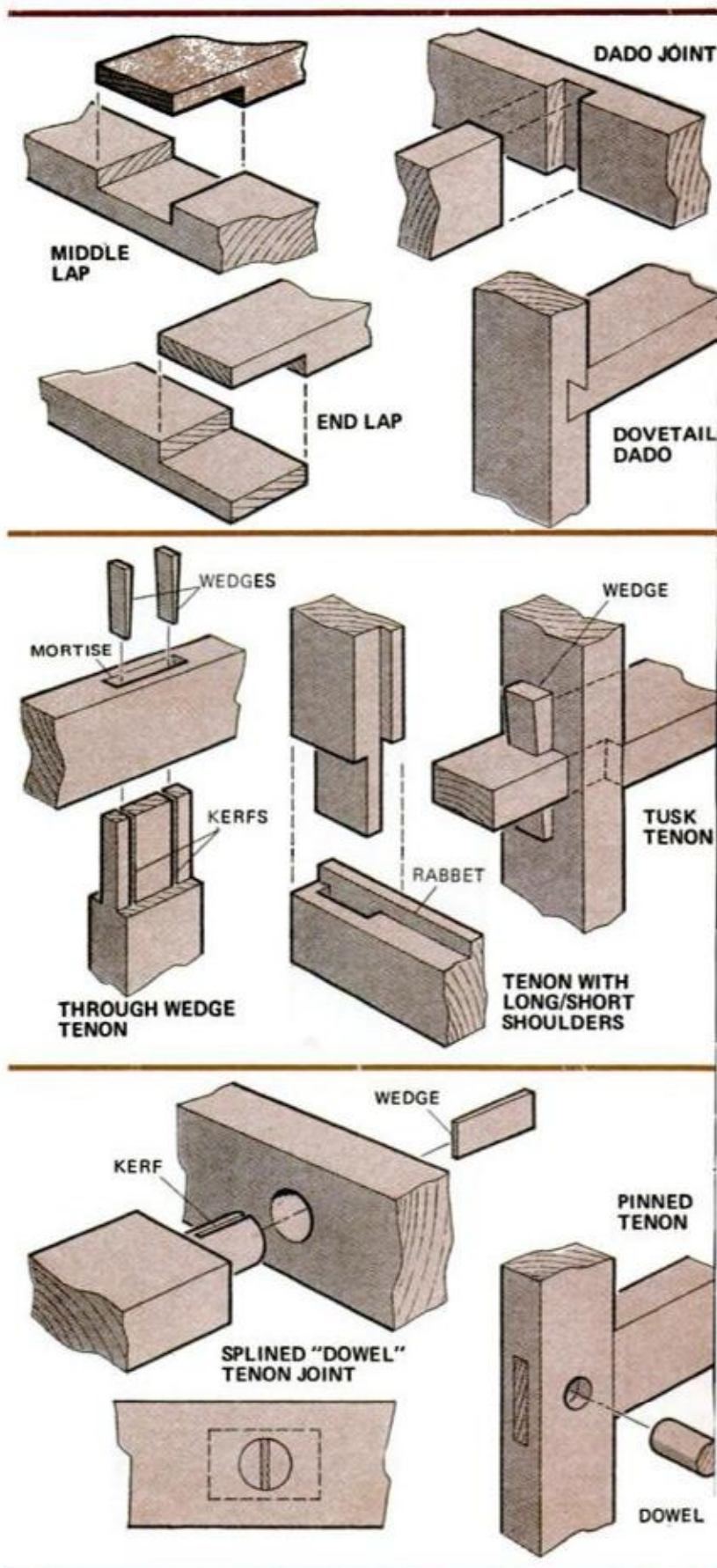
**D**o you know the difference between a cogged joint and a tusk joint, between a bare-face tenon and a dovetail dado?

A working knowledge of the many different ways wood members may be fitted to one another will help in determining the best, most practical joinery to use in assembling any project you build. Some of the joints shown here are simple to make; others are more involved. You'll notice that a few are partly self-fastening. All 28 have their place in good, sound furniture construction. The one you pick will depend on the project itself. Often you have a choice, one joint being as strong as the other.

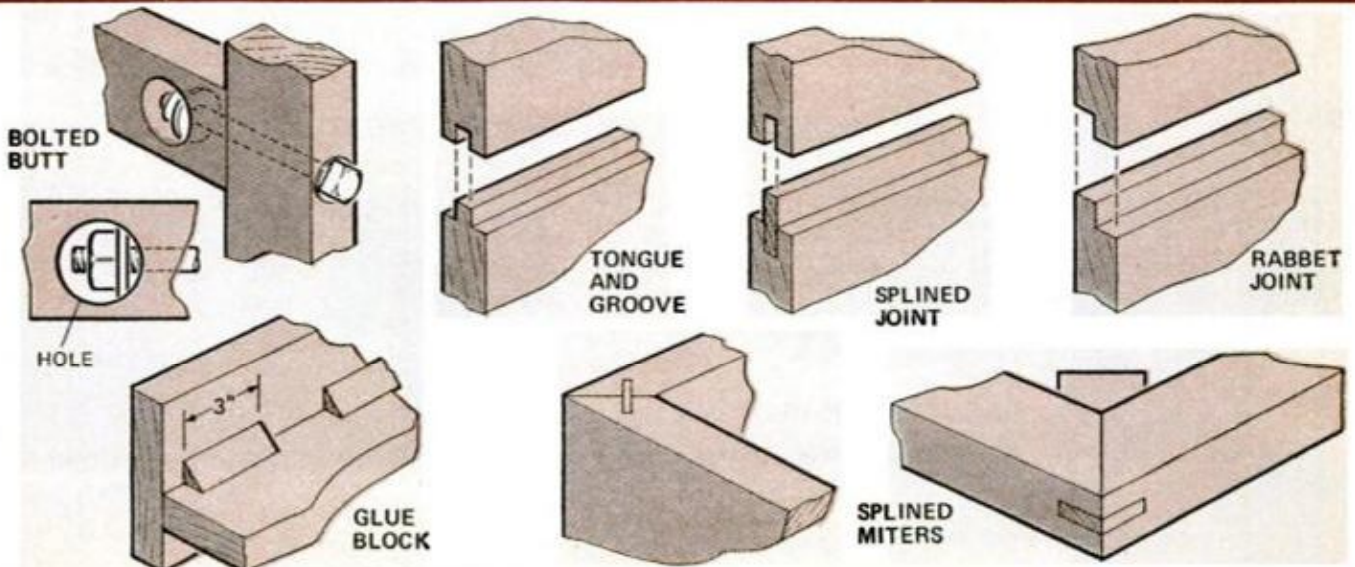
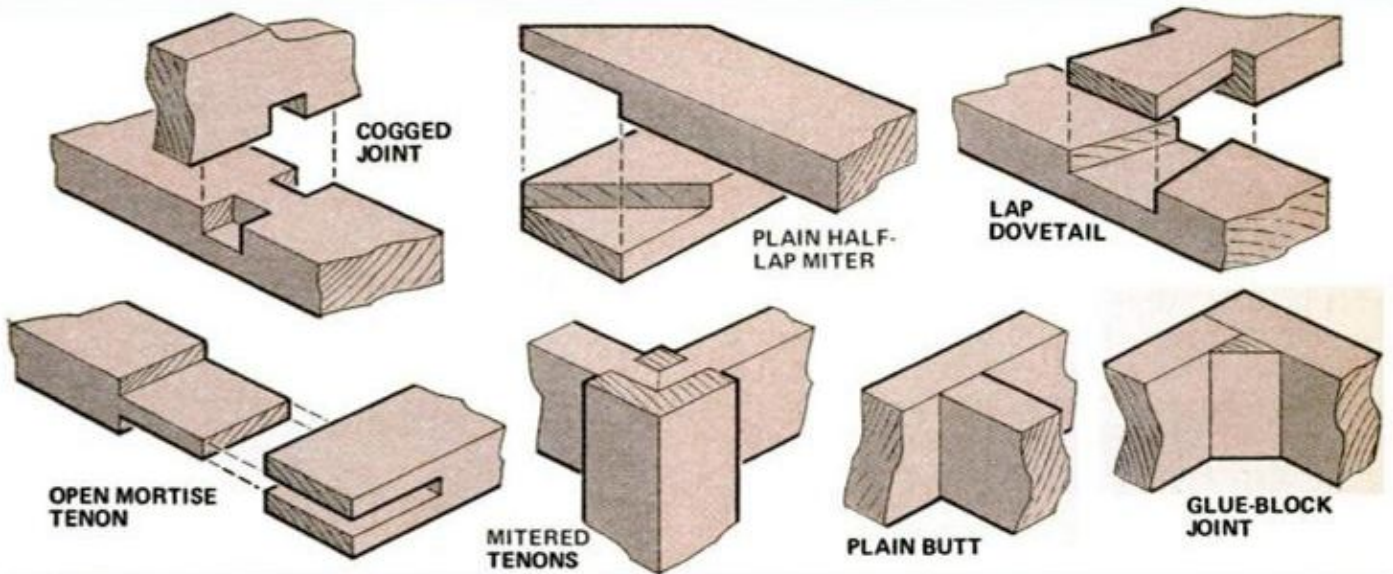
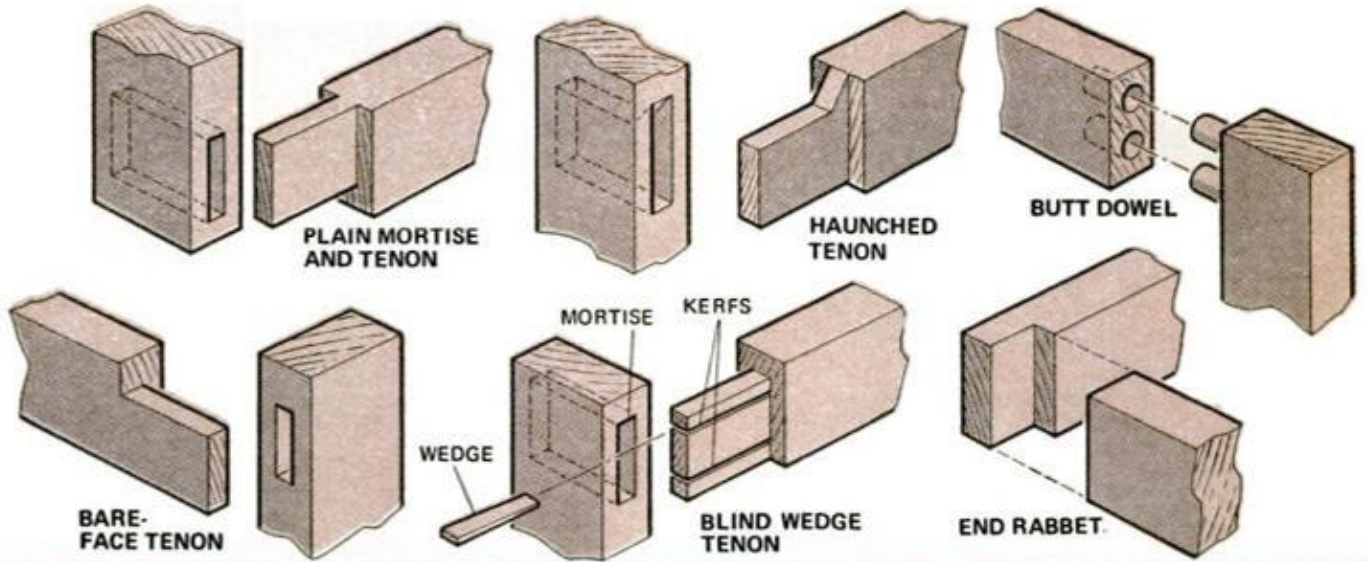
Many of the joints shown—half-lap, dado, rabbet, spline, open mortise and plain butt—can be made easily on a table saw alone. This is partly so also when making a mortise-and-tenon joint, except that the mortise part of the joint requires a drill press equipped with a mortising attachment. Here a bit turning inside a hollow square chisel removes the waste as the chisel squares up the corners.

A mortise, blind or exposed, is similarly formed when done by hand. A row of overlapping holes is first made within the mortise outlines, then a regular chisel and mallet are used to do the squaring. General practice in making a mortise-and-tenon joint is to cut the tenon first, then the mortise. Likewise, the cheek cuts on a tenon are generally made after the shoulder cuts.

Exact spacing of mating holes and square drilling are important steps in making strong dowel-fastened joints. Even greater strength is had when the dowels themselves have spiral grooves in them. Such grooves give glue additional holding power. ★★★



Art: Fred L. Wolff

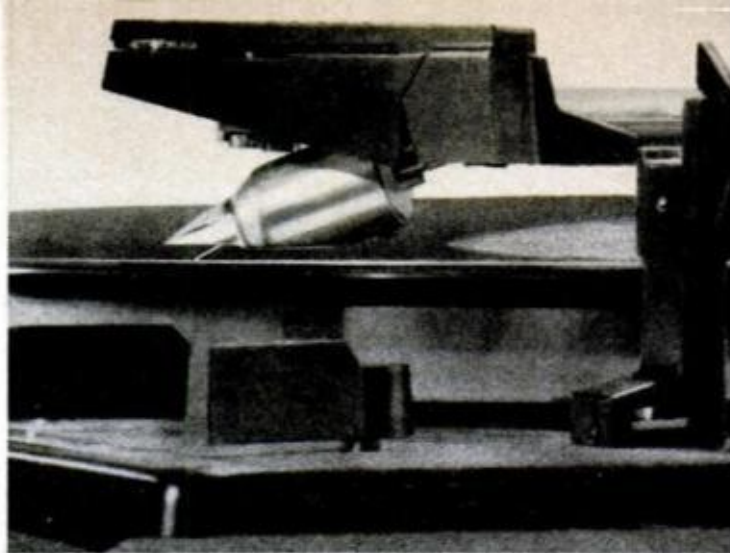


# Pick of the pickups

PM tests eight stereo phono cartridges in the most popular price range.

by Hans Fantel

The vital first link in any record-playing system is the phono cartridge, or "pickup," as it is sometimes called. Because it is very small and much less expensive than most other audio components, its importance is often underrated. But as the "originator" of the audio signal, the cartridge occupies a strategic position in your sound system. If it does not "read out" the sound correctly from the record groove, the music gets messed up at the source. No matter how good your other components are, they cannot correct faults introduced at the start by an inadequate cartridge.



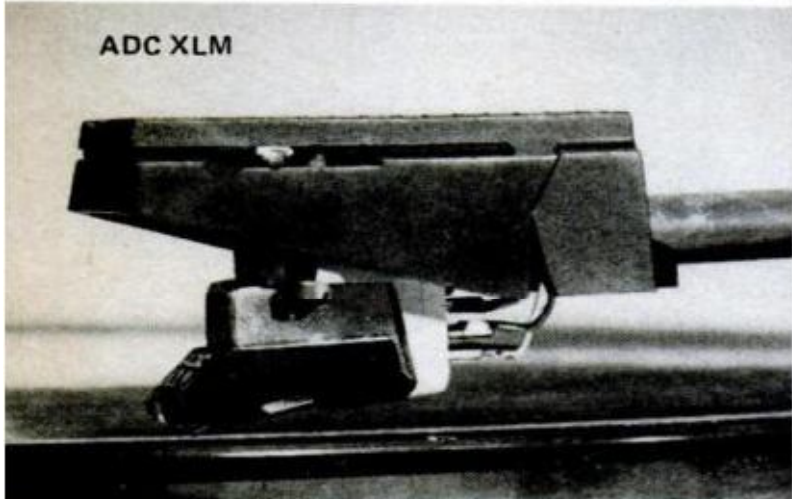
AUDIO-TECHNICA AT12S



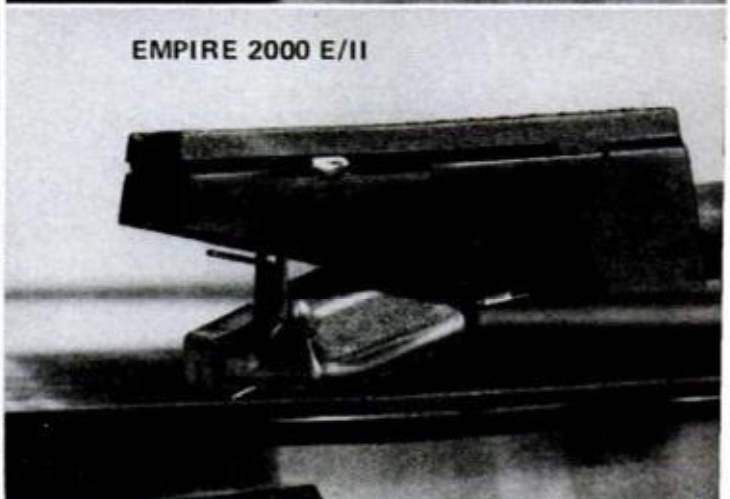
ELAC STS 344-17



ADC XLM

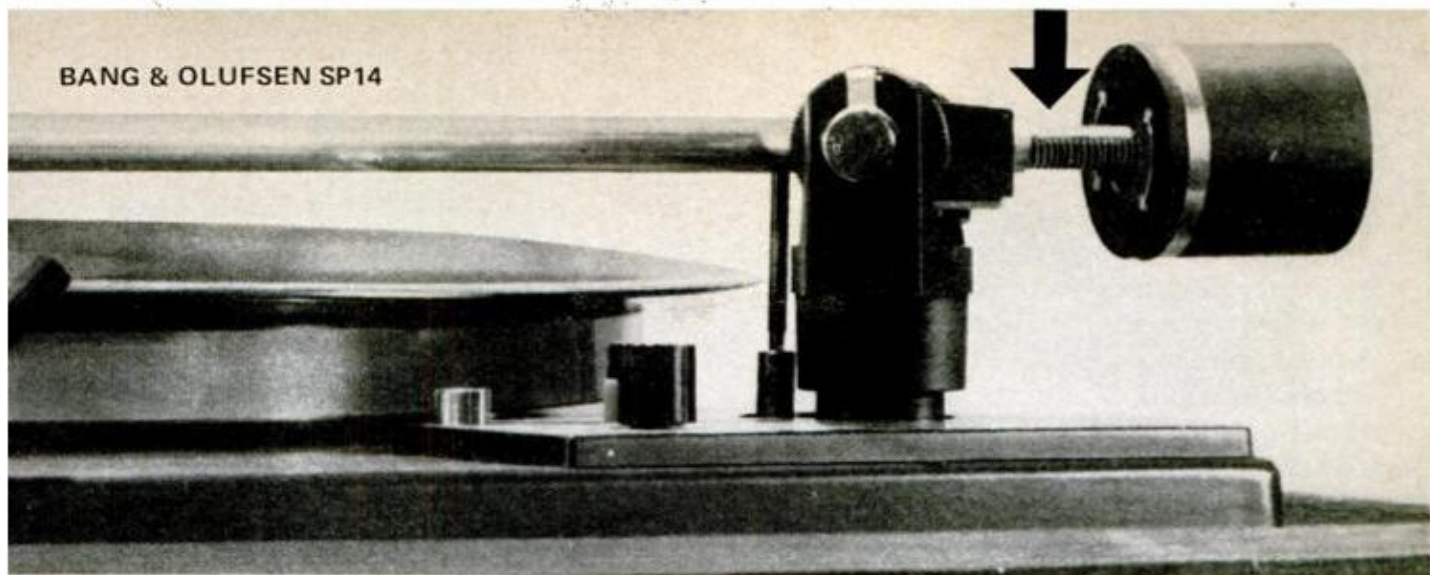


EMPIRE 2000 E/II

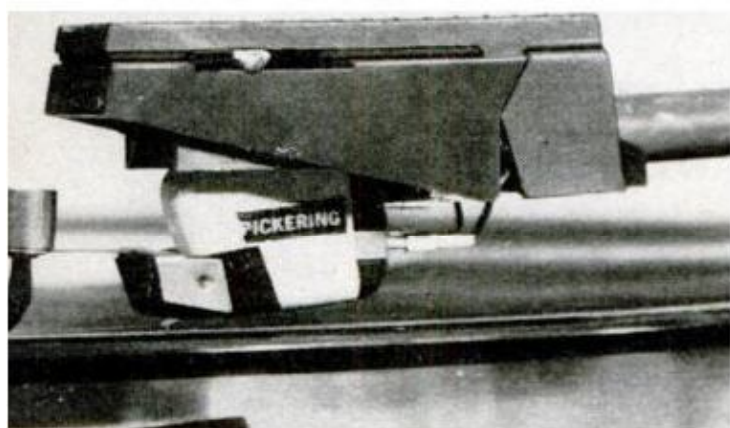




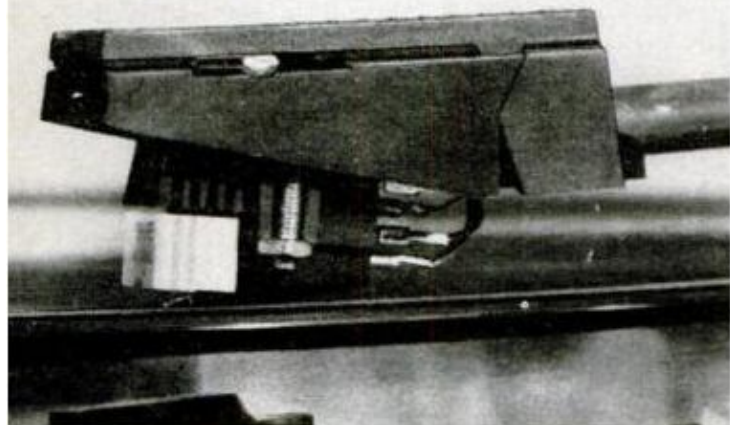
BANG & OLUFSEN SP14



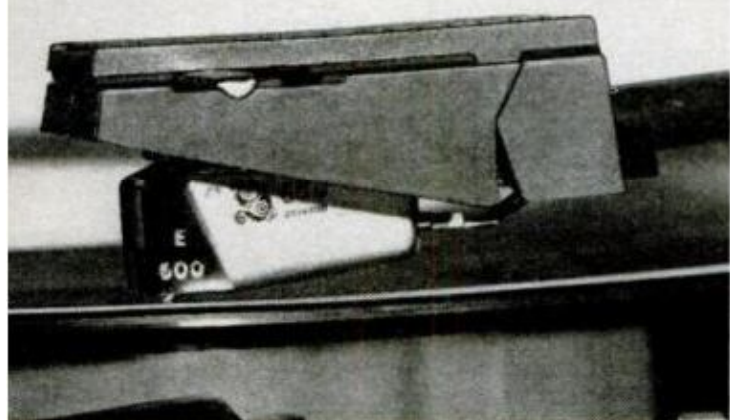
PICKERING XV-15



SHURE M91ED



STANTON 600E



**Cartridge weight** can be a problem if too high or too low for your tone arm to counterbalance. The 8.5-gram B&O cartridge unaccountably squeaked into our Dual 1216's 1 to 8-gram range, but required nearly the full extension of its tone-arm counterweight (arrow).

The choice of a cartridge is therefore a prime consideration in planning any audio system. Likewise, replacing a poor cartridge with a better one is a relatively inexpensive way to upgrade the total performance of a system.

Cartridges range in price from about \$20 to \$100. A poll of leading manufacturers and audio shops showed that most serious audio fans prefer the price class between \$35 and \$55. There's a sound reason for this: This group represents the optimum price/performance ratio. They are the "best buys." Below this price range, performance is not quite up to top standards of fidelity, though even many of the cheaper models are surprisingly good. Above \$55, the gain in sound quality is comparatively slight. (Note, by the way, that we are speaking here of official *list* prices: Many dealers will give you a hefty discount on any cartridge if you ask outright.)

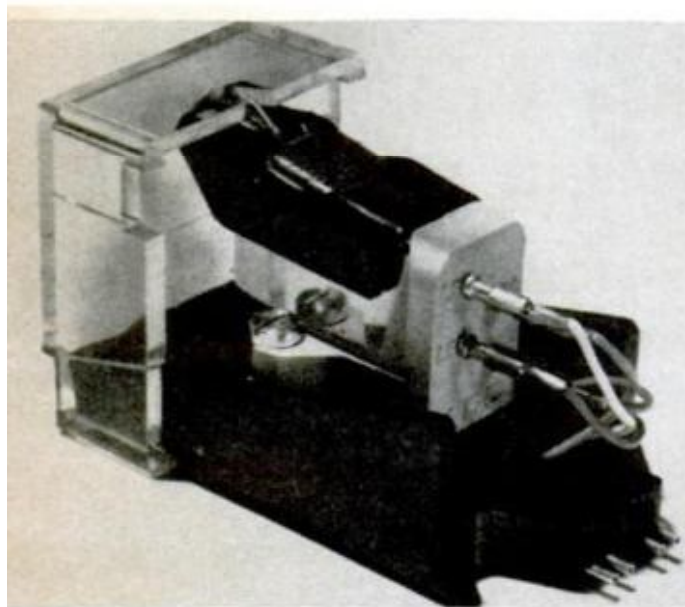
I zeroed in on the eight most popular cartridges in this group and ran them through a series of revealing tests. The results were surprising. They showed that cartridges in this group are marked more by similarities than by differences, especially in their technical measurements. Still, there were noticeable, if not too notable, differences in tone coloration. Some models had the kind of smooth, silky sound that lends both warmth and clarity to symphonic music, where the massive string sound of a large orchestra must be reproduced. Others had a brighter, sharper sound—good for brassy jazz—and more of the punchy bottom bass that gives driving force to hard rock. I'll

get into these differences in more detail later because your choice may well depend on suiting these characteristics to the kind of music you play most.

**Test setup:** For both listening tests and instrument measurements, I mounted the cartridges in Dual Model 1216 automatic turntables (since replaced by the similar Dual 1226). At \$155, this turntable falls into about the same medium price range as the cartridges tested, and is presumably typical of the equipment with which they will be used in most home installations. And the Dual's precision tone arm is capable of tracking any of these cartridges within their recommended tracking force ranges. By using two of these turntables, and iden-

## Comparing eight popular cartridges

Make and Model	Frequency Response (Hertz $\pm$ db)
ADC XLM	20-20,000 $\pm$ 2*
Audio Technica AT12S	20-18,000 $\pm$ 2
Bang & Olufsen SP14	20-20,000 $\pm$ 1
Elac STS 344-17	20-18,000 $\pm$ 3
Empire 2000 E /II	20-20,000 $\pm$ 2
Pickering XV-15 400E	20-20,000 $\pm$ 2
Shure M91ED	20-20,000 $\pm$ 3
Stanton 600E	20-18,000 $\pm$ 3



**Proper cartridge positioning** is important if stylus is to track at the correct 15° angle for minimum distortion. Most modern turntables have positioning gauges like this snap-on, transparent one for Dual 1216

**Test setup** used for trackability and frequency response checks included Shure Audio Obstacle Course records and cartridge analyzer, Pioneer SD-1100 oscilloscope and a pair of Dual 1216 automatic turntables.

tical records, I was able to switch back and forth for instant comparison between two cartridges.

I tried to mount the cartridges in the Dual's clip-in cartridge shell so that the diamond tip was located at exactly the correct point for optimum tracking. Even with Dual's convenient stylus position guide, this was far from easy, and if you have ever messed around with the tiny screws, nuts, spacers, shims and whatnot, you'll understand why some of my remarks on this part of the procedure are not printable in this magazine. I feel doubly grateful to Pickering and Stanton for furnishing snap-in mounts with their cartridges to fit the shells of all popular record changers. Those



Recommended Tracking Force Range (g)	Optimum Tracking Force (g)	Trackability in CM/Sec.			Stylus Dimensions (mils)	Price
		Low Frequency	High Frequency	Middle Frequency		
0.6-2	1.5	24	31.5	24	0.3 x 0.7	\$50
1.25-2	1.75	30	31.5	30	Shibata <sup>1</sup>	50
2-3	1.25	24	31.5	24	0.6 <sup>2</sup>	45
1-2	1.5	30	31.5	24	0.7 <sup>2</sup>	45
0.5-1.5	1.5	30	31.5	24	0.3 x 0.7	35
1-2 <sup>3</sup>	1.75	24	25	24	0.4 x 0.7 <sup>4,5</sup>	55
0.75-1.75	1.25	24	31.5	24	0.2 x 0.7 <sup>4</sup>	50
1.5-3	1.75	19	31.5	24	0.4 x 0.7 <sup>4,5</sup>	50

Notes: <sup>1</sup>Shibata stylus for CD-4 Quadradiscs. <sup>2</sup>Spherical, not elliptical. <sup>3</sup>Plus 1 gram to allow for lift of dust brush. <sup>4</sup>Optional stylus available for 78 rpm records. <sup>5</sup>Optional stylus available for mono LP records.

snap-ins certainly simplify the tricky task of installation (even though Stanton's snap-in did not position the cartridge at the exact recommended height). More good news for the fumble-fingered: You can buy Shure cartridges premounted in Dual record-changer shells (though again, not mounted at the correct height). And Empire's mounting-clip system is also fairly helpful. But the real question here is why tone-arm makers haven't yet agreed on standard clip-in or slide-in mountings for cartridges.

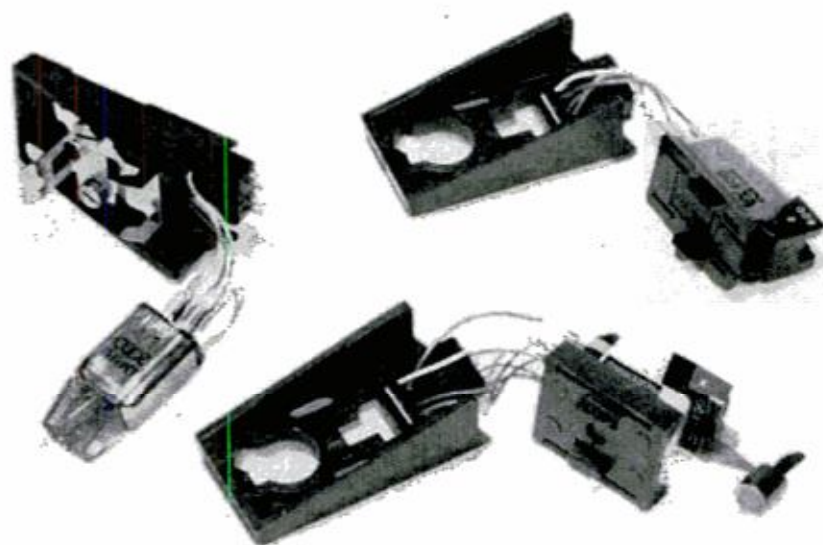
Once each cartridge was mounted, its output was fed to Shure's CPEK/3 cartridge test devices, which served mainly to switch the proper signals to a Pioneer

ST-1100 oscilloscope during the instrument tests, and to read output levels for the frequency response checks.

Tests concentrated on three important performance factors: "trackability," optimum tracking force, and frequency response. Other design factors (such as compliance and dynamic mass) are indirectly expressed through those three measurements. As for crosstalk between the two stereo channels, it is simply no longer a problem with modern cartridges since all of them have more than sufficient separation.

**Trackability.** This is perhaps the most crucial test of cartridge performance. It shows the ability of the cartridge to "track" —to faithfully follow the groove wiggles

(Please turn to page 166)



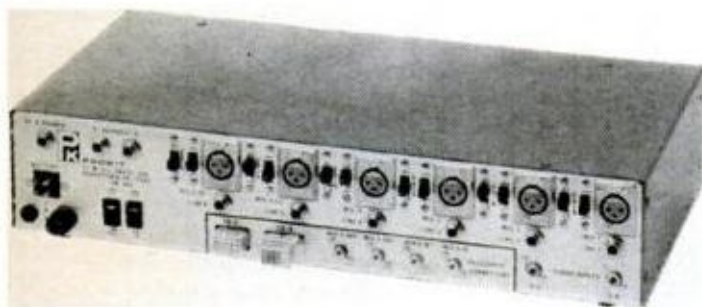
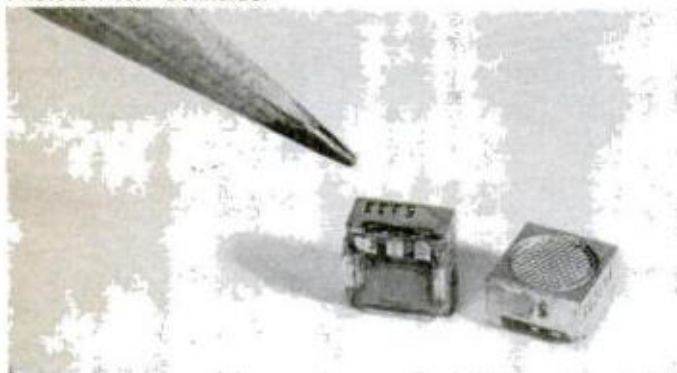
**Mounting aids**, like the gray, plastic, snap-in inserts of the Stanton (upper right) and the Pickering (foreground) proved to be a blessing. Empire's mounting plate (left), which snaps to the cartridge but must be attached with screws and spacers to the shell, was also helpful. Shure also offers the M91ED premounted for popular changers.

# Homebuilt kits for 'professional' recording



by Ivan Berger  
ELECTRONICS EDITOR

Photos: Peter Schneider

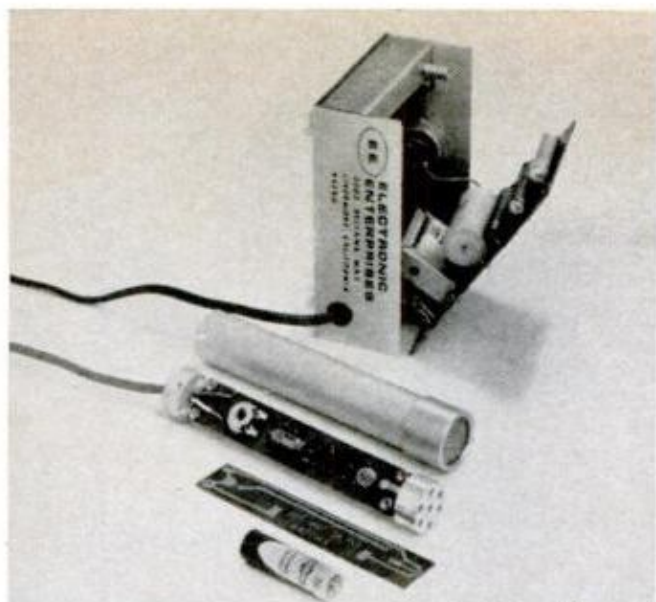


That condenser microphone (top), its power supply, and the professional-looking microphone mixer it's sitting on, were all built from kits. The microphone's tiny electret capsules (above center) gave good sound, but connecting the wires to their tiny solder pads takes a small iron and a delicate, sure touch. Back of the Gately Prokit mixer (above) shows professional-type Cannon microphone connectors (each with switches for bass roll-off and sensitivity); rectangular white multipin connectors at bottom edge are for accessory reverberation and equalizer kits.

Taping off the air or from a record, your home recording equipment may well do as good a job as a professional's studio gear. But recording live music often poses problems your equipment isn't built to handle.

Mixing the signals from several microphones is one such problem. Amateur mixers tend to be limited in control facilities and performance. Not so the new Prokit SM-6A mixer from Gately, a maker of professional recording gear. Its price, in kit form, is within reach of the serious amateur, at \$339 (assembled, it's \$200 more). Its facilities include six input channels, each switchable for use with microphone or line-level signals; two inputs are also switchable for use as phono cartridge inputs (one for each of the two stereo output channels), and the other four can be switched into either stereo channel or bridged as center channels across both to place soloists firmly in the center of the stereo "stage." The connections on the rear panel include low-impedance microphone jacks, allowing the use of long microphone cables.

The kit went together in 27 hours, and impressed us with the quality of its materials and components. Its performance is equally impressive, with flat response from 35 to 35,000 Hz, a noise level of about -70 db, and less than 0.1 percent distortion at normal output levels.



**A.c.-operated condenser mike** and its power supply were both fairly easy to build. But the "simpler" battery version was another story: You have to cut board (foreground) to fit the battery, then solder the battery.

Getting a good signal into your mixer, though, calls for good microphones. Studios have long used condenser microphones, while price restricted the amateur to ceramic or dynamic types. Now, inexpensive condenser mikes are also available, including some interesting kits from Electronic Enterprises; the No. PAC-1 mike kit with a.c. power supply kit costs \$79.50 and is simple to build (though soldering the mike capsule is a bit delicate). The simpler battery version (\$49.50) is harder to build since you must cut the circuit board carefully and solder in the battery. Sound is clear and smooth from 50 to 16,000 Hz, according to the manufacturer, with about a 5-db hump around 10 kHz; impedance is 250 ohms, unbalanced. The tiny microphone module is available separately for \$17.50 for installation in your own microphone housing or other projects; a wider-range (10-35k Hz) module is \$42. ★★★

## Airline X-rays: Will they ruin your film?



**W**orried about airline boarding-inspection X-rays fogging your vacation films? Most of the time—on single round-trips using major U.S. airlines and airports—your film is probably safe. And processed film is *always* safe. But the rest of the time—if you're using foreign airports or changing planes a lot—here's how you can protect your unexposed or exposed but undeveloped film:

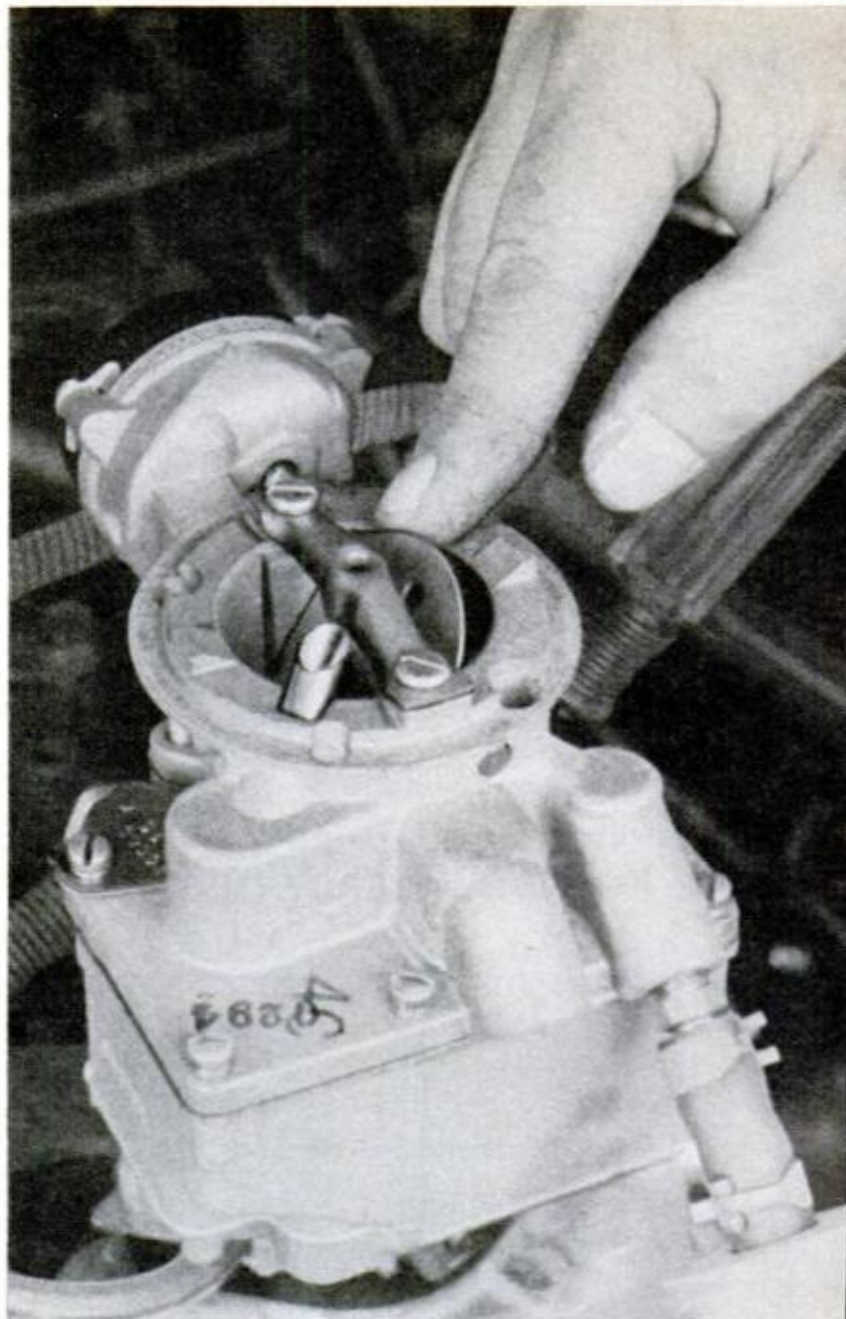
- Carry *all* your film (including film in loaded cameras) on board with you—some airlines X-ray checked baggage.
- Repack film between flights, so X-rays hit it from different directions.
- Take your film out of your bag before

it's X-rayed and insist on hand inspection (even if the guards or other passengers complain—it's *your* film, not theirs).

- Send your exposed film directly to the lab while you're away: you avoid X-rays and waiting for your pictures once home.
- X-ray-proof your film with one of Miida's camera bags (above left) with film-guard pocket, or a Sima FilmShield bag (above center), which holds about 20 rolls of film and is good for several uses before its corners fray. For bigger packages, use Film-Guard wrap. A stick-on X-ray caution label (above right, 12 for \$1.29 from Porter's Camera Store, Box 628, Cedar Falls, Iowa 50613) may help, too. ★★★

# The clean carb route to better mpg

by Mort Schultz



Some drivers accept excessive fuel consumption too readily, which is surprising since the price per gallon has gone out of sight. A misadjusted or defective carburetor wastes gas. And it's a needless waste since you can check your carburetor yourself.

But first, recheck your mileage. Inflate tires to specification. Underinflated tires don't help fuel economy.

Make sure brakes aren't dragging and that the ignition system is in good condition. Misfire or spark not delivered to cylinders on time wastes fuel.

Test for an exhaust system restriction. Accelerate the engine to high speed momentarily, then reduce speed. A hissing sound indicates a restriction.

If the tailpipe is clogged with mud, clean

it out with a screwdriver or other pointed instrument. Is the pipe kinked? It can be straightened by inserting a bar and gently pushing the kink out.

If the tailpipe is okay, then the restriction indicated by hissing may be caused by carbon in the muffler or a loosened baffle. Better fuel mileage may be obtained by replacing the muffler. (A restricted exhaust system reduces power, causing the engine to use more gasoline.)

See that the manifold heat control valve moves freely. You will find it, if one is on your car, beneath the exhaust manifold.

Inspect the carburetor air cleaner element before performing the mileage test. A dirty element can increase fuel consumption by up to one mile per gallon.

First, look for traces of leaks on the ground from the fuel tank forward to the engine. Check fuel lines at the fuel pump and at the carburetor inlet for tightness. If lines are tight, but gas is leaking, fittings may be damaged.

Examine the carburetor bowl. A bad or misaligned gasket will allow gasoline to escape. Replace it.

After looking for leaks, test the automatic choke. Release the choke unloader, if necessary, to free the choke and try to move the butterfly plate in the top of the carburetor. It should swivel freely. If not, clean pivots with carburetor solvent. The choke linkage must also be clean and undamaged.

Automatic chokes that are adjusted too rich use more gasoline than they should. Choke mechanisms are calibrated to make proper adjustment easy. To set your choke properly, determine the manufacturer's recommended setting by consulting a service manual. Set your choke two notches to the lean side of this.

Start your cold engine. If it starts smoothly and doesn't stall, keep the choke setting where it is. However, if the engine doesn't start or it stalls, set the choke one notch at a time toward the rich side until it performs flawlessly.

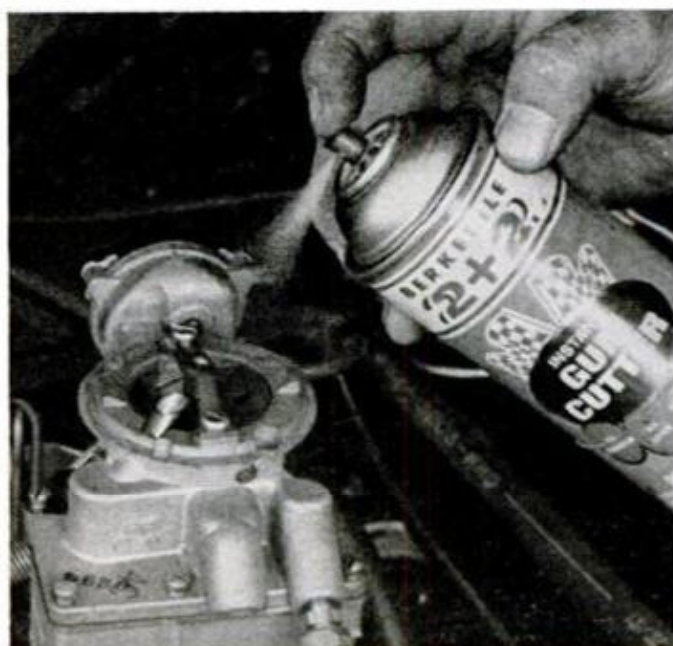
Chokes of some models since 1972 are equipped with an electric control to get the



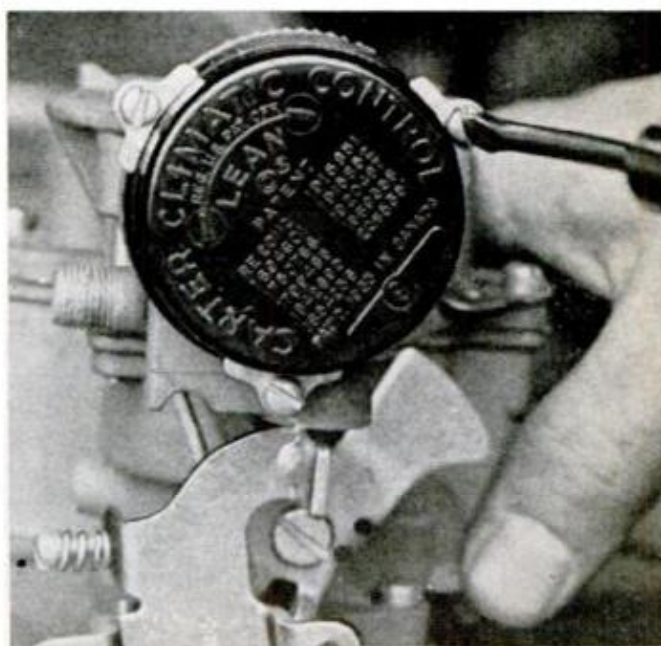
**Air cleaner** should be your first check, and, as shown on opposite page, choke plate should move freely.



**Choke plate** may not move because it is engaged by the choke unloader. Pull back on tang to check.



**Automatic choke cleaner** is an investment in greater miles per gallon. The mechanism must be kept clean.



**Automatic choke cover** is clearly marked as to the direction it should be turned for leaner setting.

## Basic idle-speed adjustments that save gasoline

choke plate open as quickly as possible, thereby reducing fuel richness that contributes to emissions. If the choke-assist unit is defective, the choke plate may stay closed longer than it should.

Make sure wires at the control switch are tightly connected—this seems to be one of the biggest problems with these units. With the engine cold, start it while keeping your eye on the choke plate.

The plate should open fully almost immediately (when engine temperature reaches about 110°F.). A suspicious looking electric-assist mechanism should be tested for continuity. A defective unit cannot be adjusted or repaired—it has to be replaced.

Some choke mechanisms are also equipped with a vacuum-break diaphragm that prevents flooding when a cold engine is cranked. The vacuum-break mechanism, which uses a vacuum-actuated diaphragm, pulls the choke valve partially open.

A bad vacuum break causes the choke valve to remain fully closed, which could result in flooding and excessive fuel usage.

Test the diaphragm when the engine is cold and the choke plate is closed. Keep the engine off and remove the hose going to the vacuum break unit at the source of the vacuum.

Apply suction to the hose by mouth. The choke plate should open partially. If it doesn't, replace the vacuum-break unit.

Basic carburetor adjustments that have an effect on fuel consumption are slow-idle speed, idle mixture and fast-idle speed.

If slow-idle (also called curb idle) speed is too fast, fuel will be consumed for no reason. Adjust it by using a tachometer.

Consult your owner's manual, service manual or tune-up specification decal in the engine compartment to determine the recommended slow-idle speed.

With the tach connected and engine idling, set slow-idle speed by turning the slow-idle-speed adjusting screw or lug on the idle-stop solenoid until the tach records the specified idle speed.

If the carburetor has both a slow-idle-speed adjusting screw and an idle-stop solenoid, the usual procedure is to adjust idle speed with the solenoid first. Then, disconnect the solenoid by pulling the wire from the quick-disconnect plug and turning the

slow-idle-speed screw until you get the specified reading on the tach. Don't forget to reconnect the solenoid.

If the idle-mixture screw(s) is not outfitted with a locking tab (the car is probably a pre-1968 model), turn the screw one-eighth of a turn at a time toward the lean side (clockwise). Wait 30 seconds for the engine to stabilize.

When the engine starts slowing down, turn the screw slowly in the opposite direction. When the point is reached where the engine stops speeding up and is running smoothly, the setting is correct.

Engines with two and four-barrel carburetors have two idle-mixture screws. Adjust one completely before adjusting the other. After adjusting idle mixture, recheck slow-idle speed to see that it has held.

Since 1968, idle-mixture screws have been capped to limit their range of travel and thereby prevent rich mixtures that contribute to excessive emissions. If your car has locking tabs over the screws, they can be turned for a limited distance, so turn the screw or screws until the engine is idling at the smoothest setting.

There is usually no reason to remove locking tabs from mixture screws unless the carburetor is overhauled or unless the factory setting was not done properly and idling is not smooth.

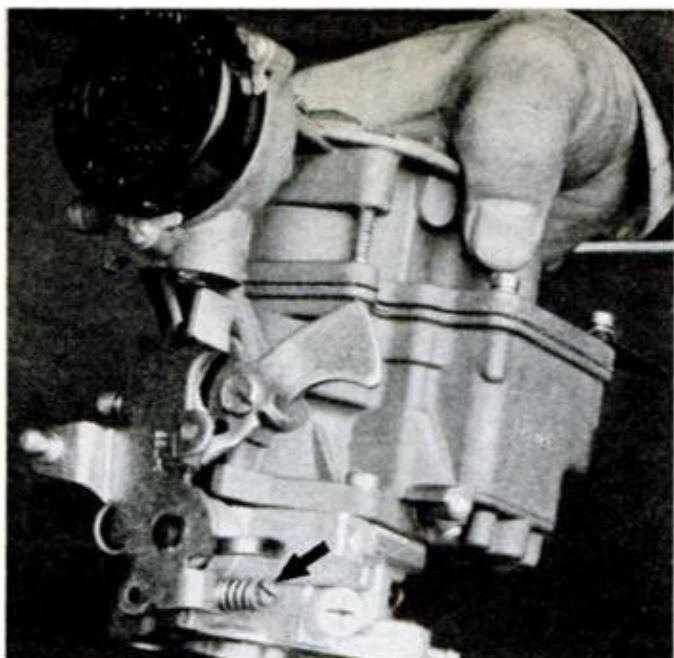
Some manufacturers give only one method of straightening out the idle of late-model cars—a preferred procedure. The locking tabs are removed, and the setting is made with an exhaust-gas analyzer.

However, other manufacturers have an alternate procedure that you can probably do yourself. Look in the service manual or on the tune-up decal to determine what your manufacturer suggests. This usually involves removing tabs, and adjusting slow-idle speed and idle mixture by turning the screws until the tachometer shows the desired reading.

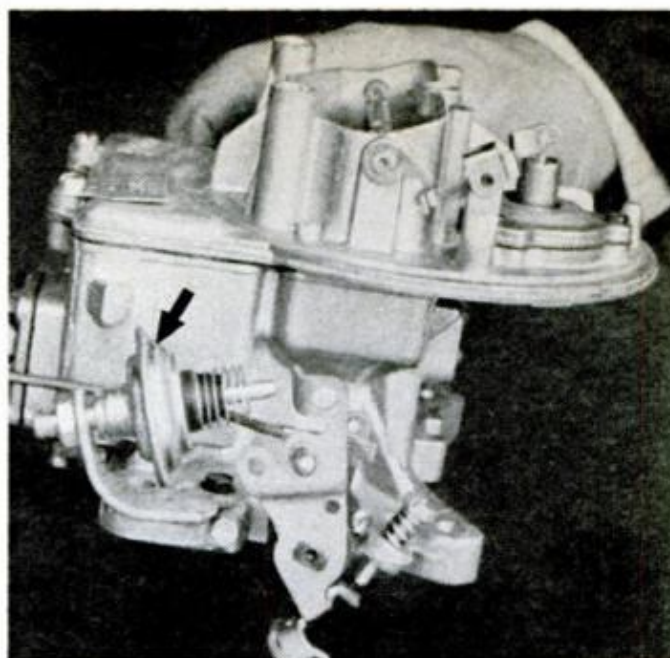
The fast-idle speed should also be set to help you conserve fuel. Rotate the fast idle cam until the fast-idle screw rests on the highest or second highest step, whichever one is specified in the manual.

Now, just turn the fast-idle screw until the tach records specified fast-idle speed. Open the throttle slightly and release it

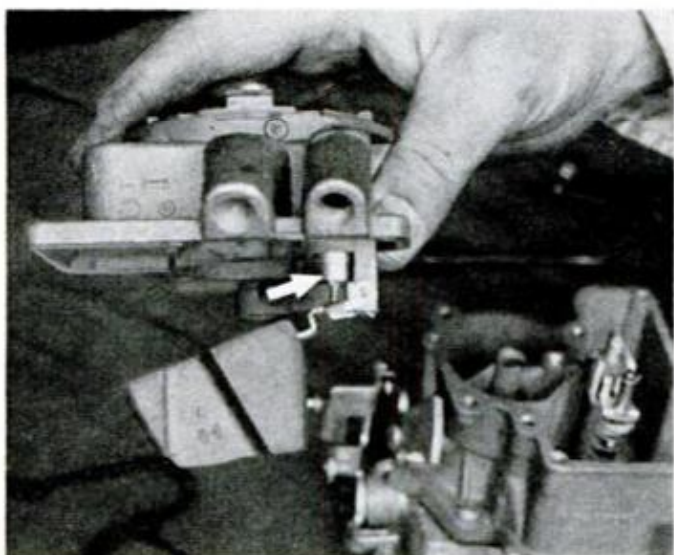




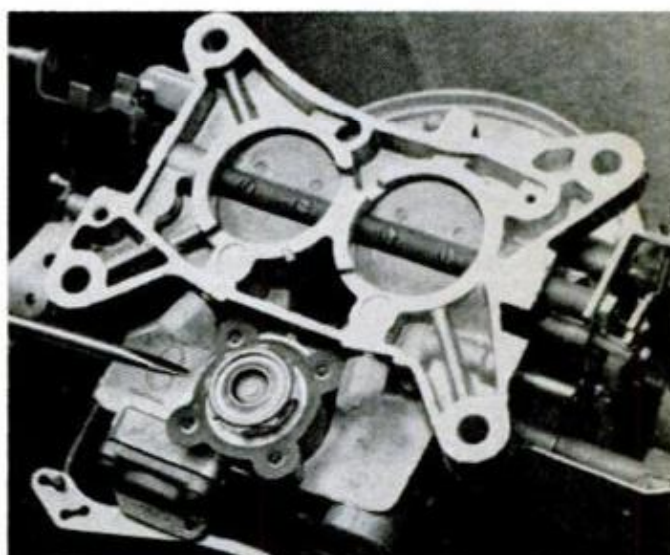
**Slow-idle-speed adjusting screw** is pointed out by arrow. Carburetor may also have idle-stop solenoid.



**Antistall dashpot** (arrow) should not be confused with choke vacuum break. Dashpot has no vacuum hose.



**Needle valve** (arrow) and the float can be tested after the float is removed by tapping out hinge pin.



**Power piston in carburetor** is pointed out by screwdriver tip. Remember to check the gasket, too.

to slow the engine down to slow-idle speed, which should be double checked.

If your carburetor is equipped with an antistall dashpot, you should also adjust it. Open the throttle and release it quickly. If the engine stalls or stumbles, loosen the dashpot locknut and turn the dashpot until its plunger lets the throttle lever close gently to slow-idle speed.

Another device that has a bearing on fuel usage is the deceleration valve which is used predominately on 2000, 2300 and 2800-cc Ford engines. It provides fuel-system deceleration. If engine idle is excessively high and no other adjustment can reduce it, the valve may be damaged or misadjusted.

Decel valves are usually tested by letting

the engine warm up for about 20 minutes and then disconnecting the hose between the valve and carburetor at the valve. Cap the nipple on the valve.

With ignition timing and slow-idle speed set properly, increase engine speed to about 3000 rpm and hold it for five seconds. Release the throttle. If engine doesn't return to normal slow-idle speed, the decel valve is probably damaged or misadjusted.

This can be verified by hooking a vacuum gauge between the valve and carburetor, accelerating the engine, releasing the throttle and seeing how long it takes for vacuum to drop to zero. It should be two to five seconds. If not, the valve should be replaced—

*(Please turn to page 173)*



A one-piece ceiling with no joints showing—that's what the job appears to be when it's finished, since Armstrong's Chandelier tiles have no edge, bevels and all of the supporting metal is concealed behind the tile.

## New channel furring: An easier, neater way to tile a ceiling

Self-leveling metal channels  
are concealed by tile.

by Wayne C. Leckey  
HOME AND SHOP EDITOR

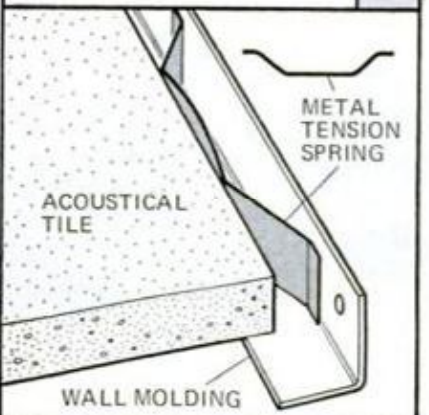
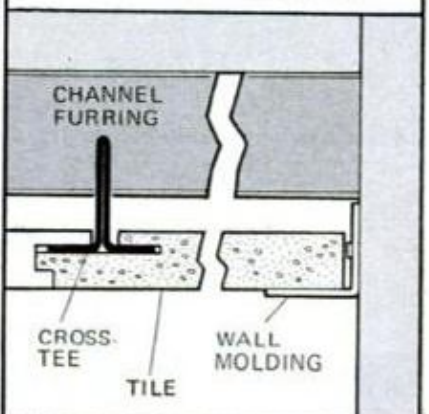
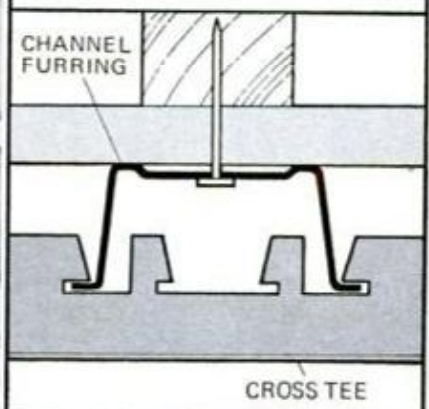
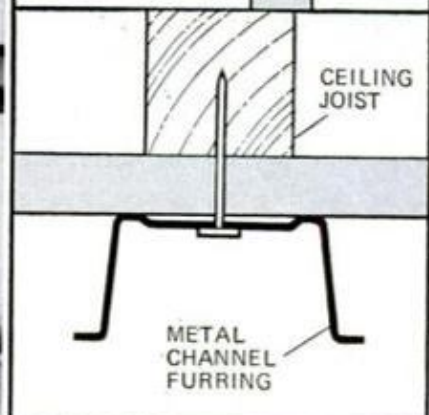
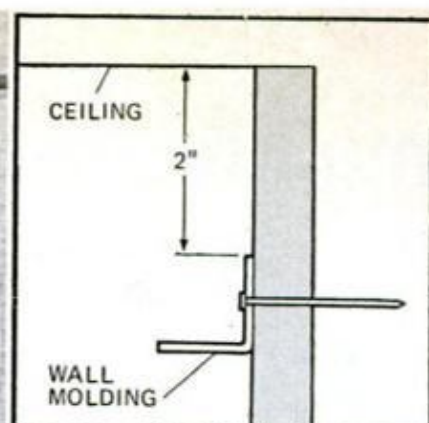
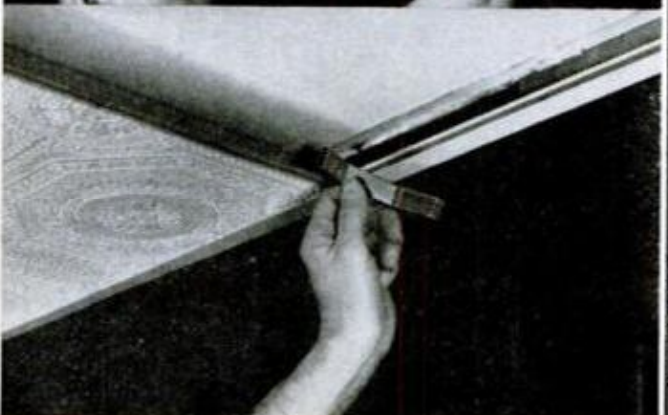
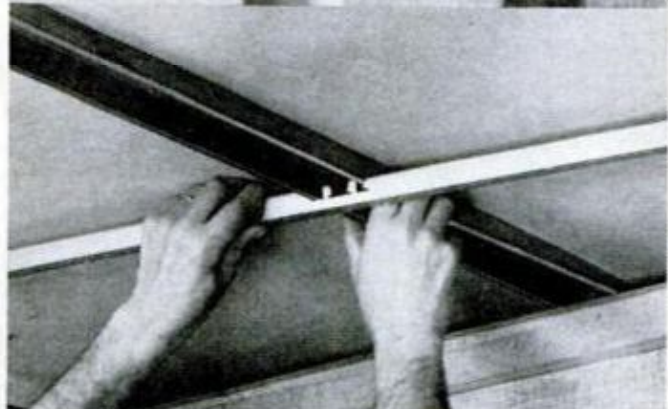
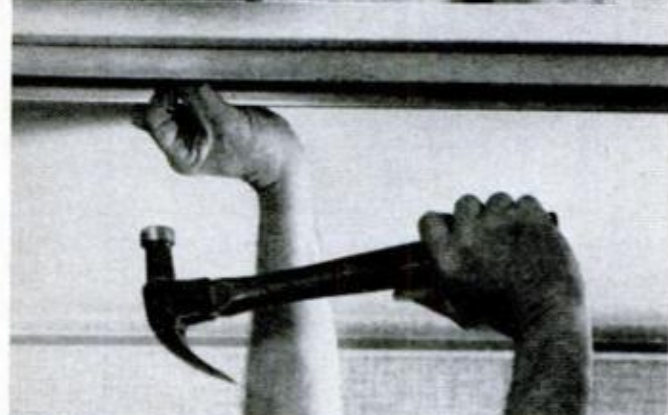
To conceal cracked or broken plaster or add a ceiling to an unfinished room, the standard method of installation has been to nail up wood furring strips on 12-in. centers and then staple the tongue-and-groove tiles to the strips. The difficulty with this method is that wood strips have a tendency to absorb moisture from the air and warp—or sometimes split with age—causing unevenness in the finished ceiling. Also, wood

strips are tedious to install. As many as 260 nails may be required to “fur out” an average 12x12-ft. room.

Armstrong Cork Co. has developed a clever new method of attaching its Chandelier ceiling tiles to plaster, drywall or exposed joists—eliminating wood furring strips altogether.

Called the “Integrid Furring Channel Method,” the new system is designed to accommodate either 12x12-in. Chandelier tiles or the larger 1x4-ft. units. The system is

*(Please turn to page 170)*



**First step** is to nail the L-shape metal wall molding around the perimeter of the room, approximately 2 in. below the level of the existing ceiling. Nail into wall studs.

**Next step** is to nail metal furring channels. Place first one 26 in. out from sidewall, the others 48 in. apart. Channels require only one nail every 48 in. driven into joists.

**Channels** are designed to receive sliding cross tees, which in turn support the ceiling tiles. To attach, bend the sides of the channels inward and clip on the cross tee.

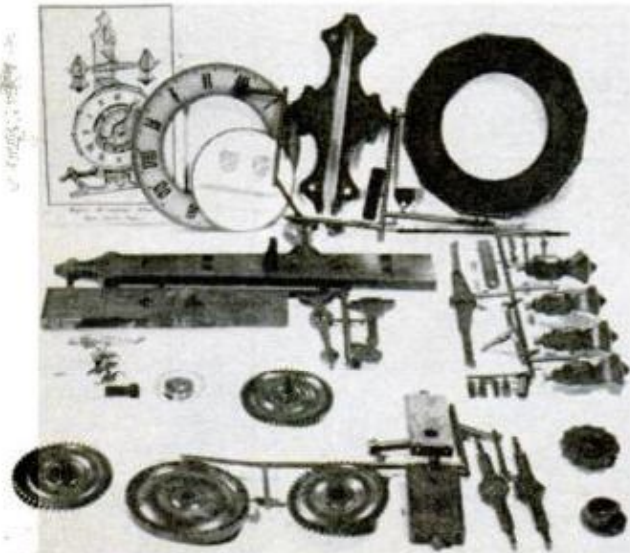
**Lay the first row** of tiles on the wall molding, then slide the cross tee forward until it is engaged in slot in the leading edge of the tiles. This completes the first row.

**At the completion** of each row, a metal tension spring is inserted between the wall and the last tile in order to hold joints tightly together and prevent separation of tiles.

# 1450 A.D. clock in a kit



Pendulum swings horizontally on this replica of a 15th century, spring-driven mantel clock. Below: parts in clock kit. The plastic gears and other items are numbered for identification to aid assembly.



Consisting mostly of plastic resembling old wood, this 15th century, one-hand, horizontal-pendulum mantel clock is powered by an interesting spring motor. The power unit consists of a tightly coiled, flat spring on a "storage drum" and a take-up drum on a ratchet-gear assembly. As the spring is wound on the take-up drum, it is coiled in the reverse direction. As it returns to its original coiled form, it exerts a force that rotates the ratchet-gear assembly to drive the clock, and feeds back on the storage drum.

Some of the plastic parts are assembled by snapping, or pressing, them together. Other joints are reinforced with self-tapping screws or wedges. There are two steps that might be labeled critical: Assembling the spring motor—the spring keeps trying to return to its original form—and getting the escapement to operate consistently and smoothly; this calls for proper installation of 25 small wire pins in the crown gear. Labeled Kit No. 341:600 in the Lindberg Line, the kit is available for \$7.95, plus postage, from Caldwell Industries, Dept. PM, Box 170, Luling, Tex. 78648.

—Walter E. Burton

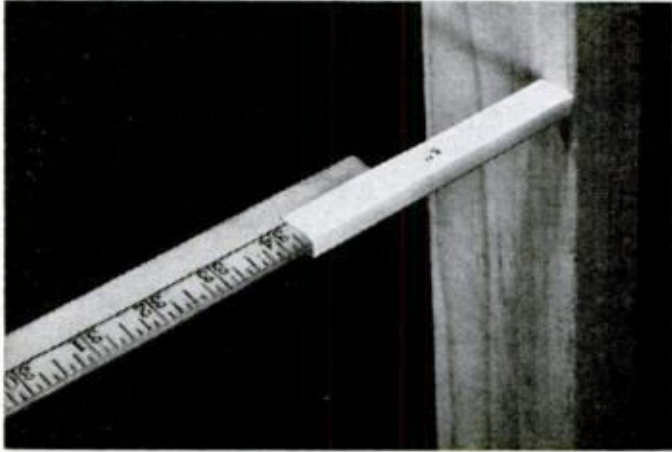


Decal strip is applied to end of clock spring; this serves as a signal to prevent winding the spring off storage drum. Below: Clock's powerplant in position on back plate; note template used for pin projection.



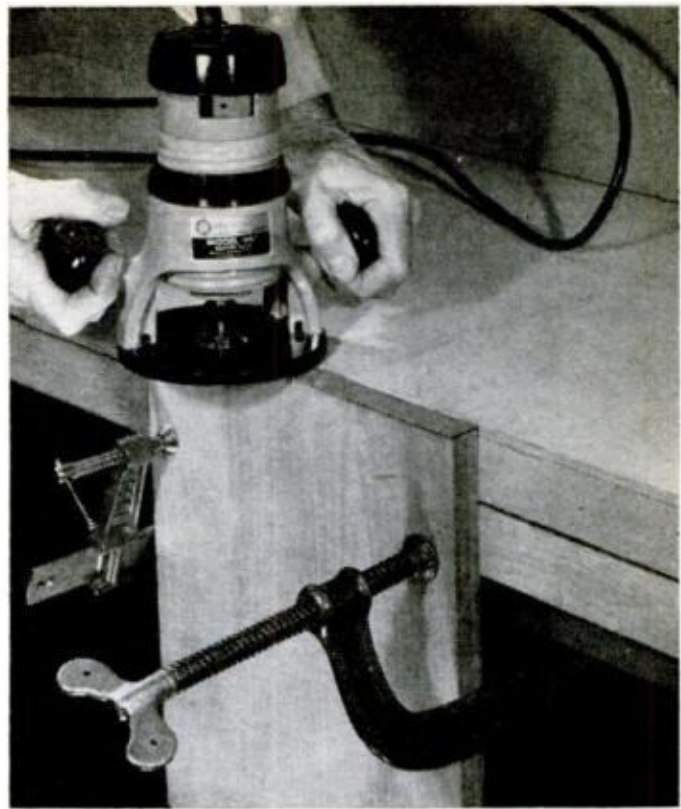
# HINTS

## FROM READERS



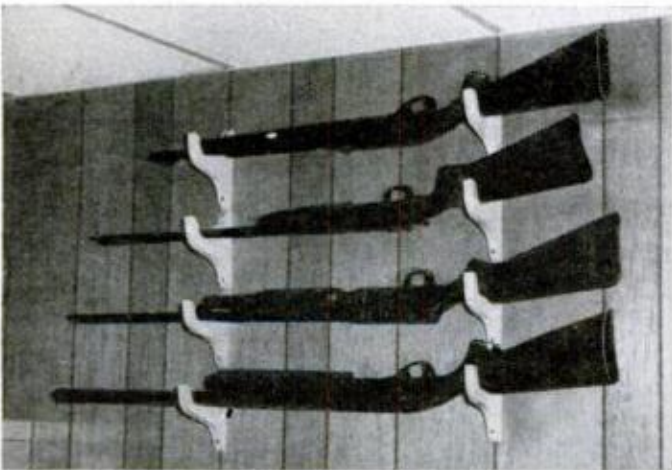
### Instant inside gauge

For exact inside measurements greater than 36 in., I slip a length of self-gripping plastic binder spine over the edge of a yardstick. It fits snugly enough to stay put, yet can be advanced easily to extend the useful length of the yardstick.—*Allen J. Park Sr., Signal Mountain, Tenn.*



### Steadying router to work edges

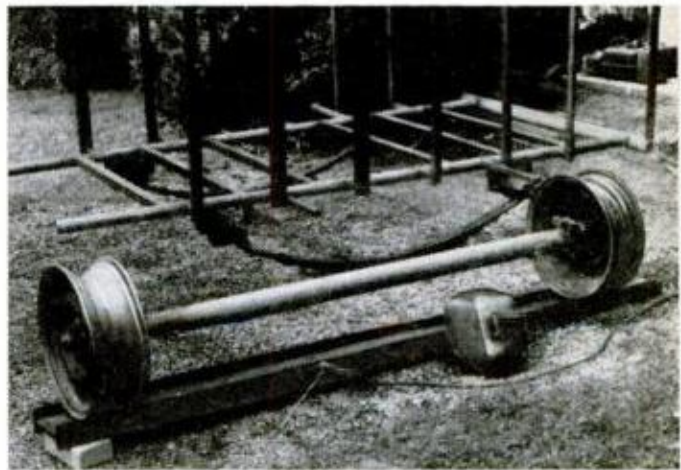
Finding it difficult to hold my router level to trim edges covered with laminate, I fastened a 2x2 to my workbench. It provides an apron to which workpieces are clamped flush with the benchtop, giving a wide surface for the router.—*H.C. Sorenson, Clear Lake Highlands, Calif.*



### Gun rack for \$10

Some types of wooden drapery-rod brackets can be used without modification to make a practical, inexpensive gun rack. Since the rack has no locks, put it up high if there are children in the house. Brackets used were Kirsch 5603 wood pole brackets, which sell unfinished for \$2.50 per pair.

—*R. C. Rask, Denver*



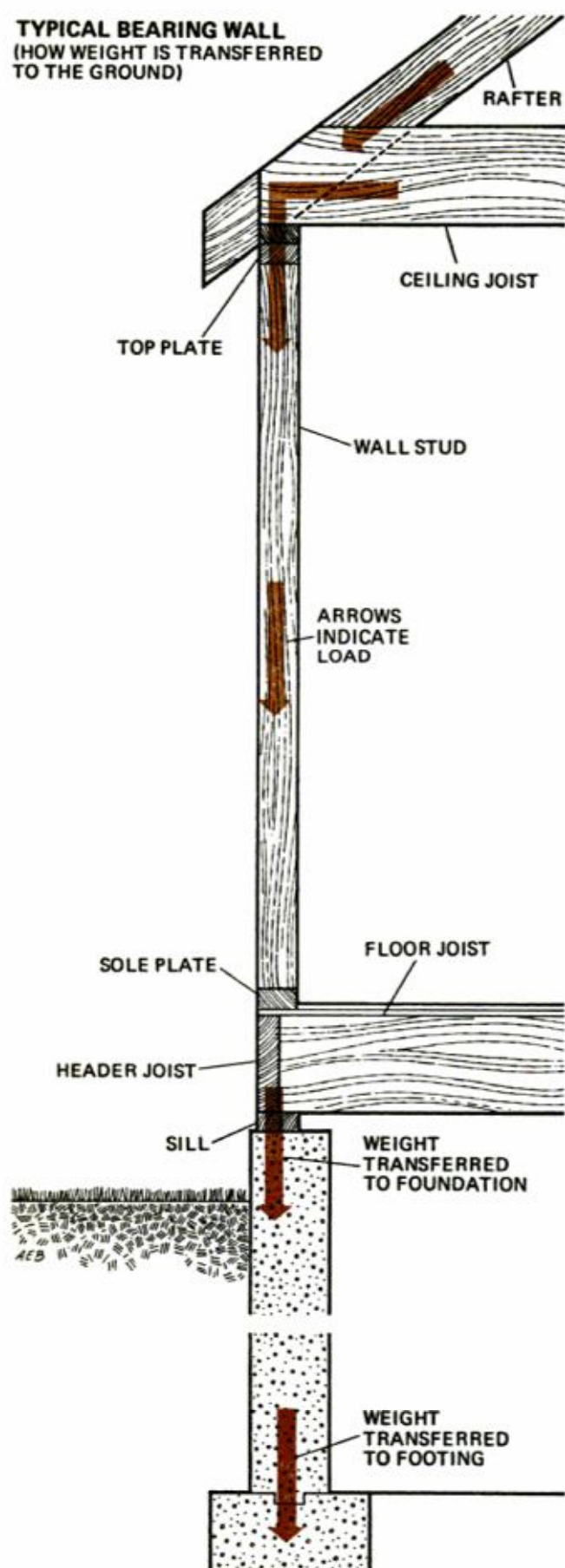
### Quick alignment trick

Lining up the spindle stubs for a homemade trailer axle could have been a problem without the special equipment found in factories, but with the tires removed and the wheels placed in a section of channel iron (or angle), as shown, they were perfectly aligned for welding with no trouble.

—*Tom McCanna, Woodstock, N.Y.*

# How to remove a bearing wall

**TYPICAL BEARING WALL**  
(HOW WEIGHT IS TRANSFERRED TO THE GROUND)



Often a major home-remodeling project requires the removal of an existing wall. The usual reasons are to create a one-room effect between dining and living rooms and to enlarge a room by knocking out the wall between it and an unused bedroom or garage. Often, however, wall removal is only partial: When redecorating plans call for installation of sliding doors, for instance, or making a wide-arched opening where a single door now exists.

If the wall to be removed is simply a partition wall—that is, nonload-bearing—the task is relatively simple. But if the wall supports weight from above (see drawing, left), it is a bearing wall. In this case, it's important that a proper-size header be installed over the new opening (span) to handle the load adequately from above—and its transfer to the foundation.

Though removing a large section of a bearing wall is a job usually best left to a pro, you will be well advised to have a working knowledge of just what this task involves. Most smaller jobs can be tackled with confidence by a knowledgeable home handyman; the information on these pages will help you do that. As can be seen in the drawings and text, the first big chore is to determine whether the wall is, in fact, a bearing wall. If it is, here's how you can remove it.

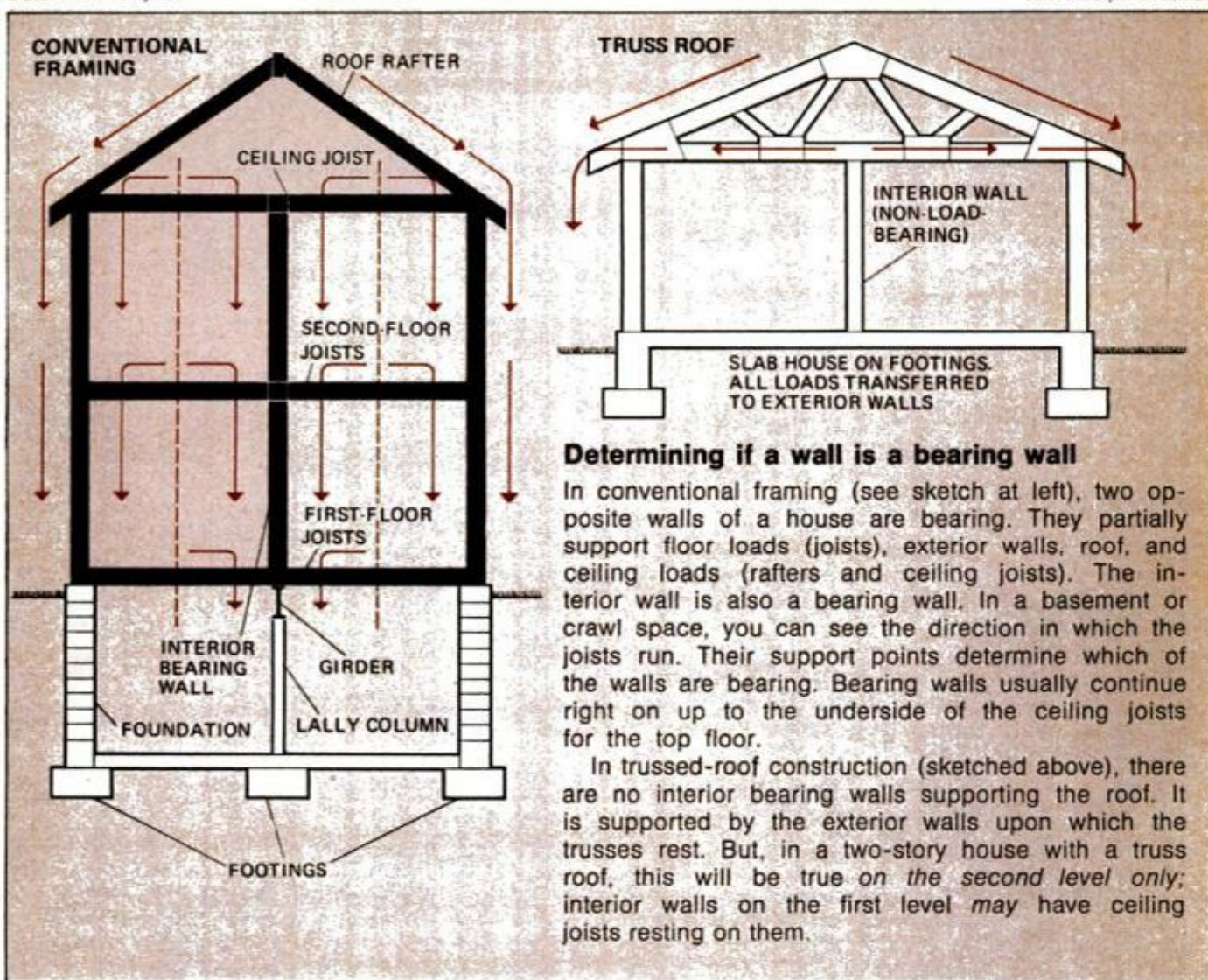
## Removing the wall finish

Before starting to remove the surface of any wall, determine where all electrical, heating and plumbing lines run. If any are in the wall, do not use power tools near the area. Turn off power to all outlets in the wall and use a hammer to remove plaster or drywall from these sections. Also, protect the floor with a dropcloth. Better yet, use a canvas tarp over the dropcloth. Tape the floor covering along all edges which will be walked over, or debris kicked beneath will scratch the floor. For safety, stop periodically and haul accumulated debris outside. If this is left underfoot, it can cause accidents.

The best way to remove a drywall is with a sabre saw. Simply run its blade alongside studs to make vertical cuts, and make horizontal passes to create the desired-size chunks. When all of the

Data: John Gaynor

Art: Adolph Brotman



### Determining if a wall is a bearing wall

In conventional framing (see sketch at left), two opposite walls of a house are bearing. They partially support floor loads (joists), exterior walls, roof, and ceiling loads (rafters and ceiling joists). The interior wall is also a bearing wall. In a basement or crawl space, you can see the direction in which the joists run. Their support points determine which of the walls are bearing. Bearing walls usually continue right on up to the underside of the ceiling joists for the top floor.

In trussed-roof construction (sketched above), there are no interior bearing walls supporting the roof. It is supported by the exterior walls upon which the trusses rest. But, in a two-story house with a truss roof, this will be true *on the second level only*; interior walls on the first level *may* have ceiling joists resting on them.

plasterboard is removed, clean the nails from all the studs you plan to save and reuse. If the studs are to be thrown out—rather foolish in these days of high lumber prices—drive home all nails before ripping out the studs.

Removing plaster and wood lath is a different—and dirtier—story. Besides protecting the floor, it's a good idea to drape dropcloths over doorways to keep white dust from spreading through the house. Open windows for ventilation and be sure to wear a face mask.

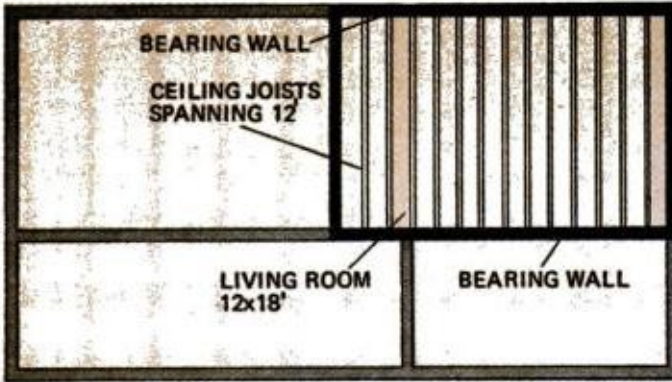
The handiest tool to have when removing a plaster wall is a bayonet-type power saw. A sabre saw does the job, too; it just takes a little longer. Use a plaster-cutting blade in either type of saw; an ordinary blade will soon become dulled and useless.

To start, make a plunge cut in one of the bays

between studs and run the saw horizontally until you come to a stud. Then turn the saw in a vertical position, either up or down, and continue cutting. After you've made both horizontal cuts and one vertical cut, you can start the last vertical cut. Here you'll find that as the tool cuts into the wood lath behind the plaster, the lath chatters. Thus, it is best to have a helper hold a board against the wall on the outboard side of the saw to minimize lath chatter.

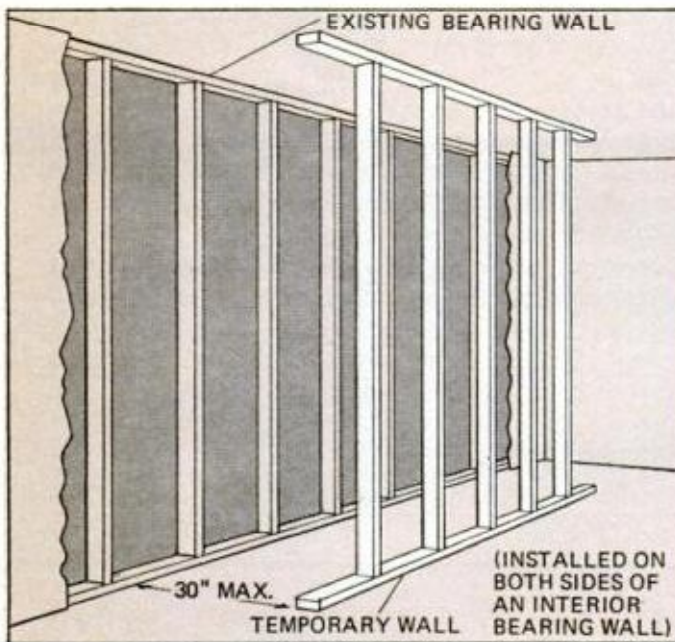
It's a good idea to give your power tool a thorough cleaning as soon as the job is completed. There will be a considerable accumulation of white dust in the tool's air ports, and unless it is completely blown out, excessive heat can build up and burn out the tool. You can blow out this dust using your gas station's air hose.

## Slab-house bearing walls



In a slab house where visual inspection of the joists above is impossible, the easiest way to check which walls are bearing is by living-room dimension. If, for example, your living room measures 12x18 ft., ceiling joists will normally run the shortest dimension—12 ft. The bearing walls will be the 18-ft.-long walls. Also, it is often easy to spot the plasterboard nails in joists—by the rows of dark spots on the ceiling.

## Temporarily supporting the load



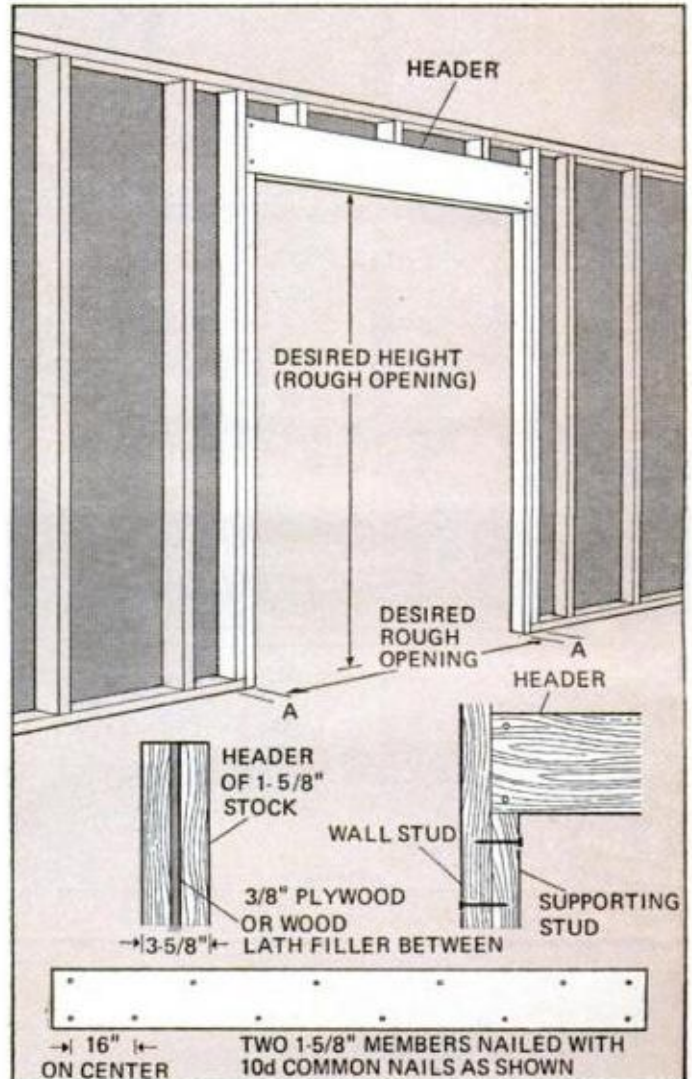
Since a bearing wall denotes a wall which is supporting some structure above, it should not be removed until a temporary wall is installed (about 30 in. away from the wall). If you are removing an interior bearing wall, construct a temporary wall on both sides. A temporary supporting wall is constructed in much the same manner as a permanent wall: Studs are positioned 16 in. on centers between top and bottom plates. The main difference is that the plates are *not* nailed to the floor and ceiling, and the stud-holding nails are not toenailed all the way home into the plates (so they can be easily removed later).

It is important that all temporary wall studs be cut so they are a tight fit. If either ceiling or floor are uneven, use shims (undercourse shingles) between these surfaces and plates.

## Installing a header

When wall studs and plates are removed, the header can be wedged up tightly under the ends of joists it will support. If required, use shims for a tight fit. If a lower header is desired, use cripple studs as shown below. The header must bear (rest) on solid wood—i.e., supporting studs, not plaster or dry wall. To make up your header, check the finished wall thickness. If the existing stud width is  $3\frac{5}{8}$  in., you'll need a  $\frac{3}{8}$ -in. filler (plywood or wood lath) in the header.

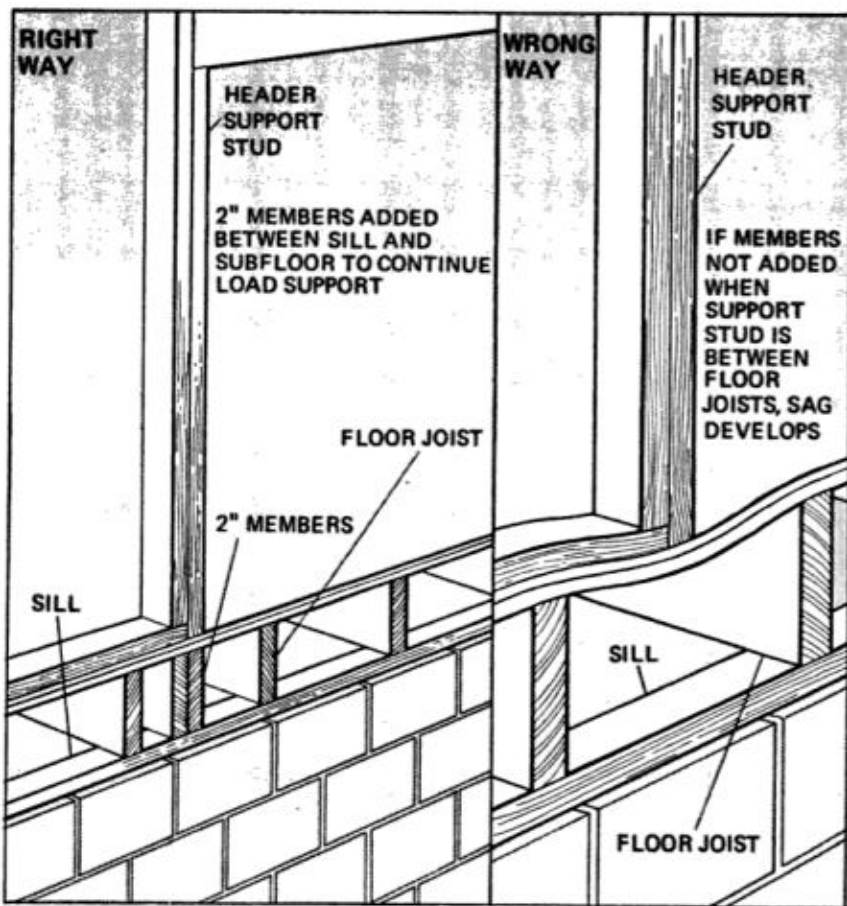
## Installing new rough opening



With wall finish removed and the exact location of the desired opening determined, intermediate studs (A) may have to be installed to provide a nailer for the supporting stud or studs. With these up, the appropriate-sized header is installed, supported by a stud at each end. For openings over 6 ft., double supporting studs are required at each end of the header. For openings over 8 ft., a contractor should be employed for the job.

The chart at bottom of the facing page is a guide for maximum loading conditions. If your room is narrower, which means less floor load, or your opening is less than that shown, your header size may be reduced. For these exact sizes, consult a professional engineer.





## Supporting new load from below

Studs supporting the newly installed header must also bear on solid structure; they must not simply rest on flooring and subflooring or a serious sag will develop. In this event, the easiest solution is to cut short lengths of 2-in. members (1½-in. actual dimension) equal in length to the width of the floor joists.

These "jacks" are then wedged—with grain running vertically—between the subflooring and the sill supporting the floor joists. If under an interior bearing wall, they're wedged between beam, or girder, and subflooring. Use at least two jack studs under each supporting stud and, when satisfied the fit is tight, secure jacks with 10d common nails.

In this way, the structure load is transferred from header to supporting studs through jack studs to the main support below. Once header and supports are installed and nailed, the temporary wall may be removed. The opening can now be finished both sides to match existing coverings.

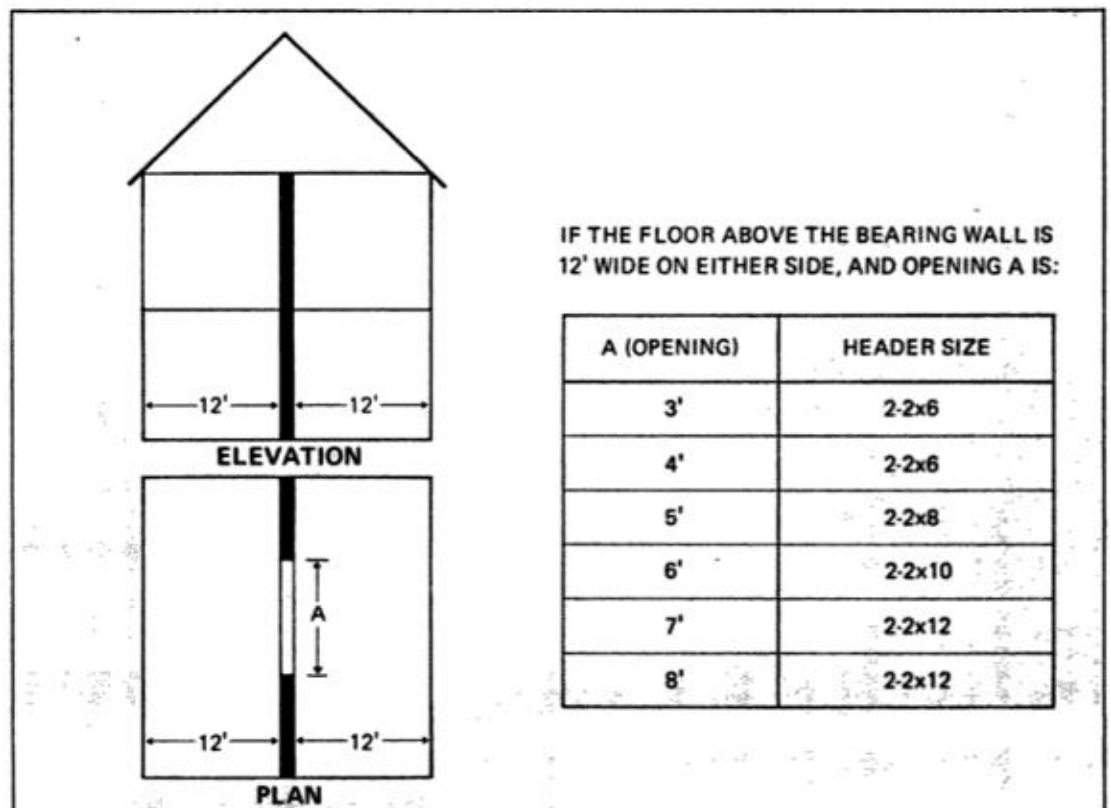
## Finishing the job

Use plasterboard to re-cover the exposed studs in walls. If matching up to plaster thickness, add shims of wood to stud faces so that the drywall surface will be flush with the plaster wall. Spackle joints and nailheads to finish. If your floor is of

wood, it will be necessary to custom-fit a piece in the hole (where the old soleplate was). Fit the piece and install it using glue and nails through predrilled holes. Sand surface and finish to match existing floor.

## What size header do you need?

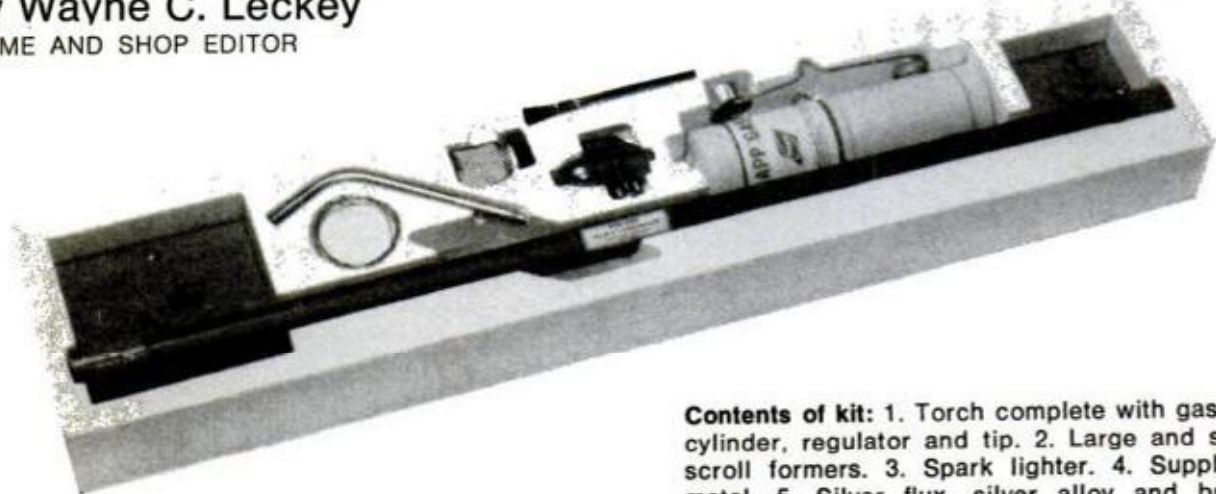
Header size is determined by span over the opening and weight it must support. In sketch of house at right, interior wall is a bearing wall. The chart lists header sizes needed for various widths in such a wall—with 12 ft. of floor on both sides. 2-in. stock now comes in 1½-in. actual dimension (old 1⅝-in. size is still in stock at some yards). Headers are made as shown on facing page. ★★



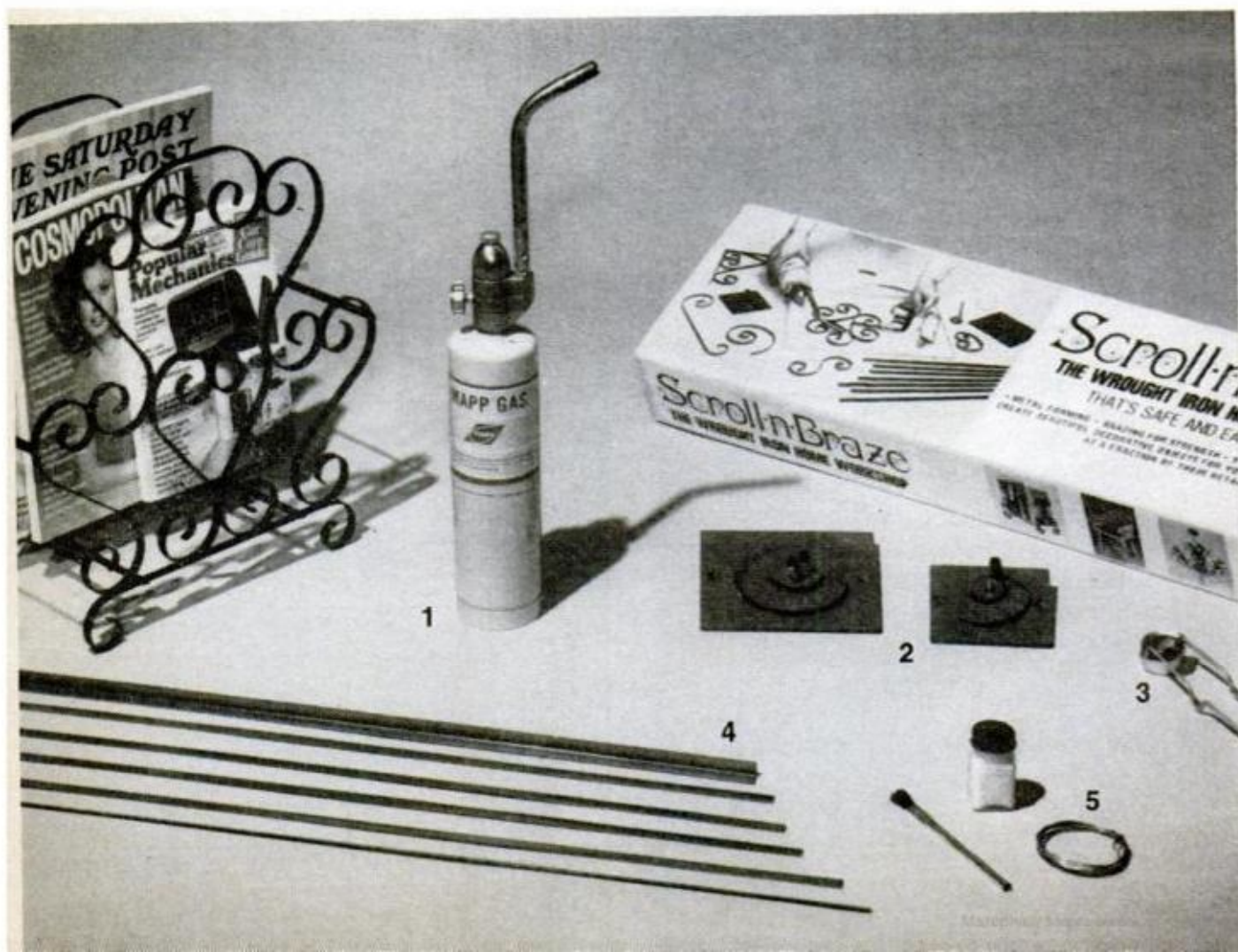
# Wrought-iron 'workshop' comes in a kit

It contains everything you need—metal, scroll formers and brazing torch—to create handsome pieces.

by Wayne C. Leckey  
HOME AND SHOP EDITOR



**Contents of kit:** 1. Torch complete with gas-fuel cylinder, regulator and tip. 2. Large and small scroll formers. 3. Spark lighter. 4. Supply of metal. 5. Silver flux, silver alloy and brush. Magazine rack is typical project made from kit.



**R**iveting the scrolled parts of wrought-iron work has been the biggest bugaboo for the do-it-yourselfer. Drilling and aligning holes, then backing up the rivets for peening was the only practical way it could be done in the home workshop. Now a kit, the Scroll-n-Braze, does away with drilling and riveting, thanks to a special torch which lets you silver-braze the joints neatly and rigidly in seconds.

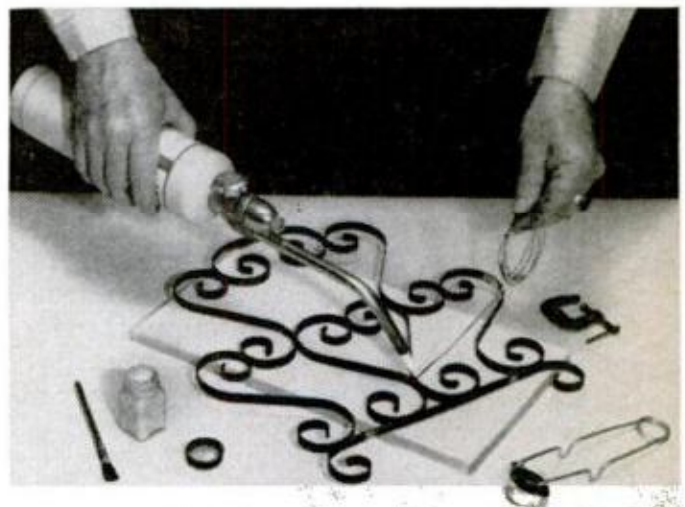
Operating on Mapp gas (methylacetylene and propadiene), an industrial fuel bottled for the hobbyist in one-pound disposable cylinders, the torch puts out an exceptionally high flame temperature, made possible by a pressure regulator and a special gas-air tip. I found you can spot-braze a joint in  $\frac{1}{16} \times \frac{1}{2}$ -in. stock in as little as 30 seconds, which makes the job go fast when the particular project might require as many as 25 or more welds. The torch is complete with a coil of silver alloy, bottle of silver flux, brush and spark lighter.

Also helping simplify making things of wrought iron are two unique scroll formers which make kid's play of forming graceful bends in metal. You merely pull the strip around a raised spiral guide.

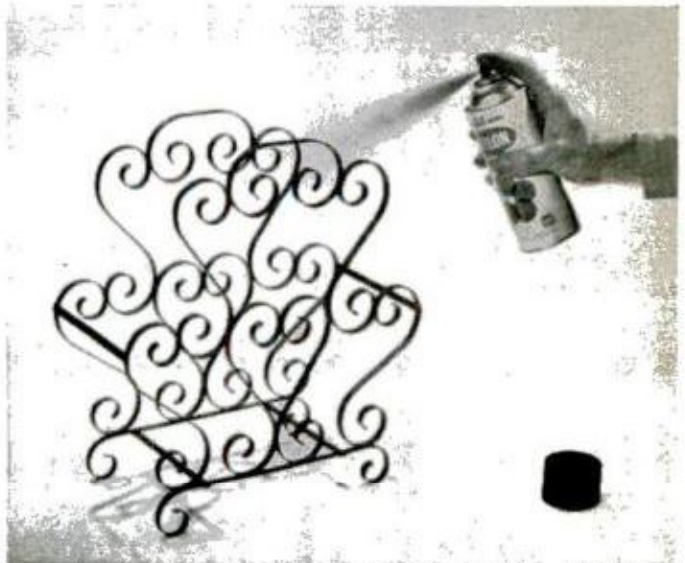
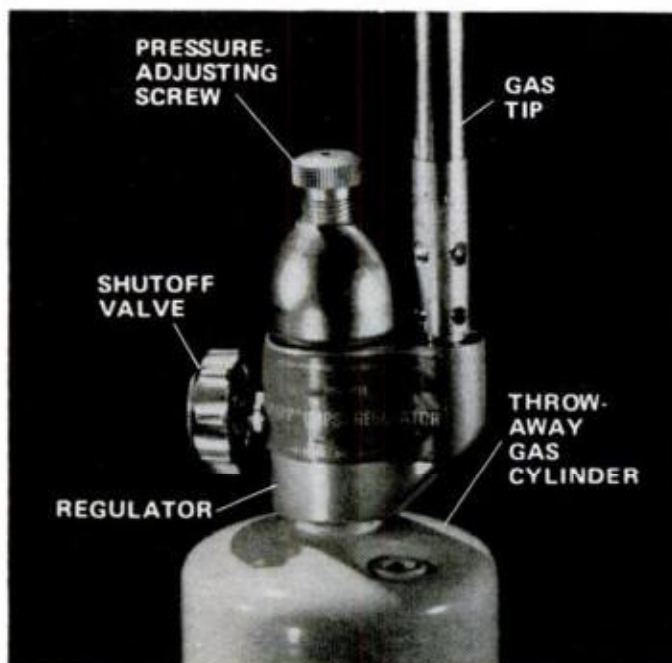
In addition to torch and scrollers the kit starts you off with a good supply of metal: 26 pieces of flat  $\frac{1}{16} \times \frac{3}{8} \times 36$  in., 1 piece of angle iron  $\frac{1}{16} \times \frac{1}{2} \times \frac{1}{2} \times 36$  in. and 2 pieces of wire  $\frac{1}{8}$ -in. dia.  $\times 36$  in. You receive a complete instruction book on how to use the kit, plus a booklet of project plans. The kit sells for \$59.95 postpaid. For more information write Scroll-n-Braze, 100 Mountain Ave., New Providence, N.J. 07974. ★★



**To form a scroll**, place very end of strip between knurled rollers of scroller, lock and pull strip around raised spiral guide. Repeat to curl opposite end.



**To braze**, wipe oil film from metal, apply flux to spot to be bonded. Heat each side of joint 15 seconds until slightly red, then touch silver-alloy wire to joint.



**After final braze**, place work in hot water and wire-brush welds to remove excess flux. Finish project with flat-drying spray paint, black or white.

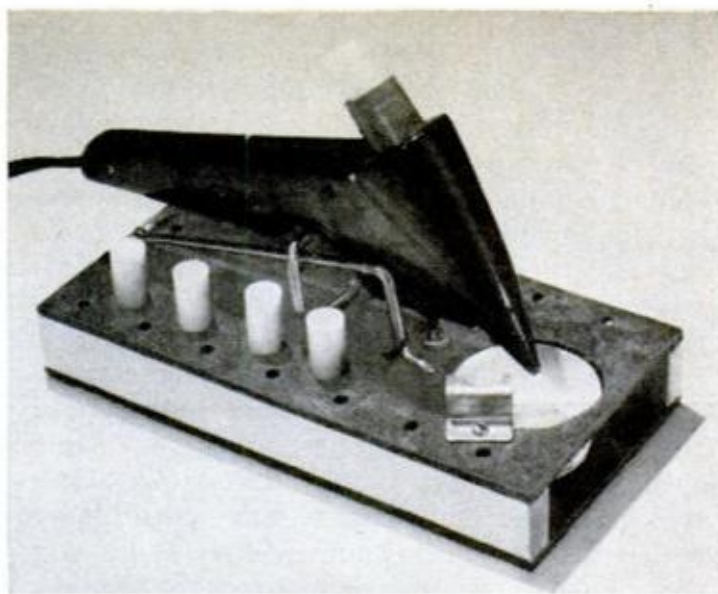
# Electric glue-gun caddy

by Charles Green

If you have used an electric glue gun, I'm sure you have been puzzled each time with where to rest it and how to keep the drips which ooze from the tip from messing up your bench. I solved those problems by making this holder. It lets me park my gun safely while hot, catch the drips from the tip, scrape off the leftovers to keep the tip clean and store a supply of glue-stick refills.

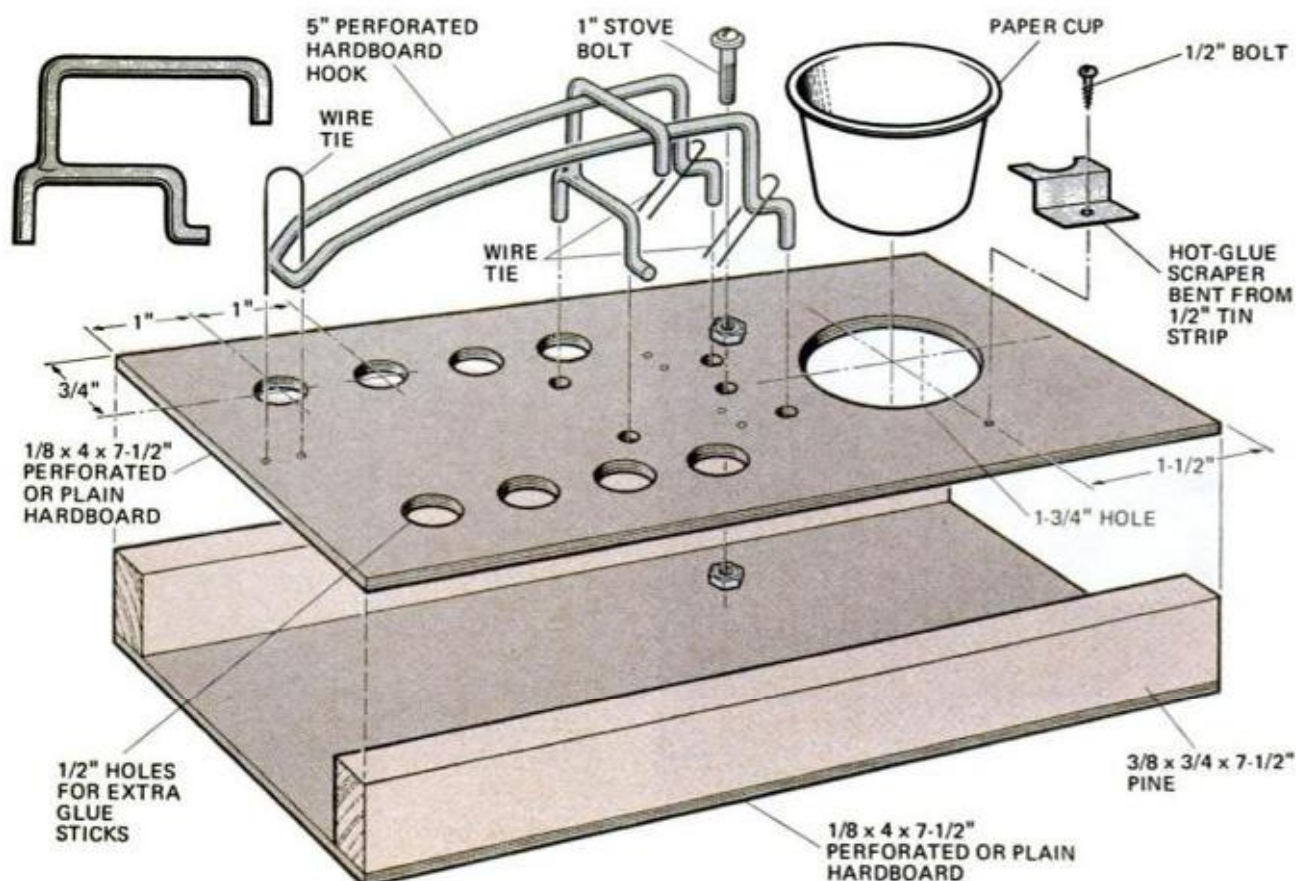
The drawing shows how it's made. The gun's cradle is a modified standard hook used with perforated hardboard. It's mounted upside down in holes and wired in place. A second hook, bent as shown, plus an adjustable stovebolt, supports the gun so its tip is centered over the disposable paper cup.

★★★



Photos: Robert D. Borst

Art: Peter Trojan



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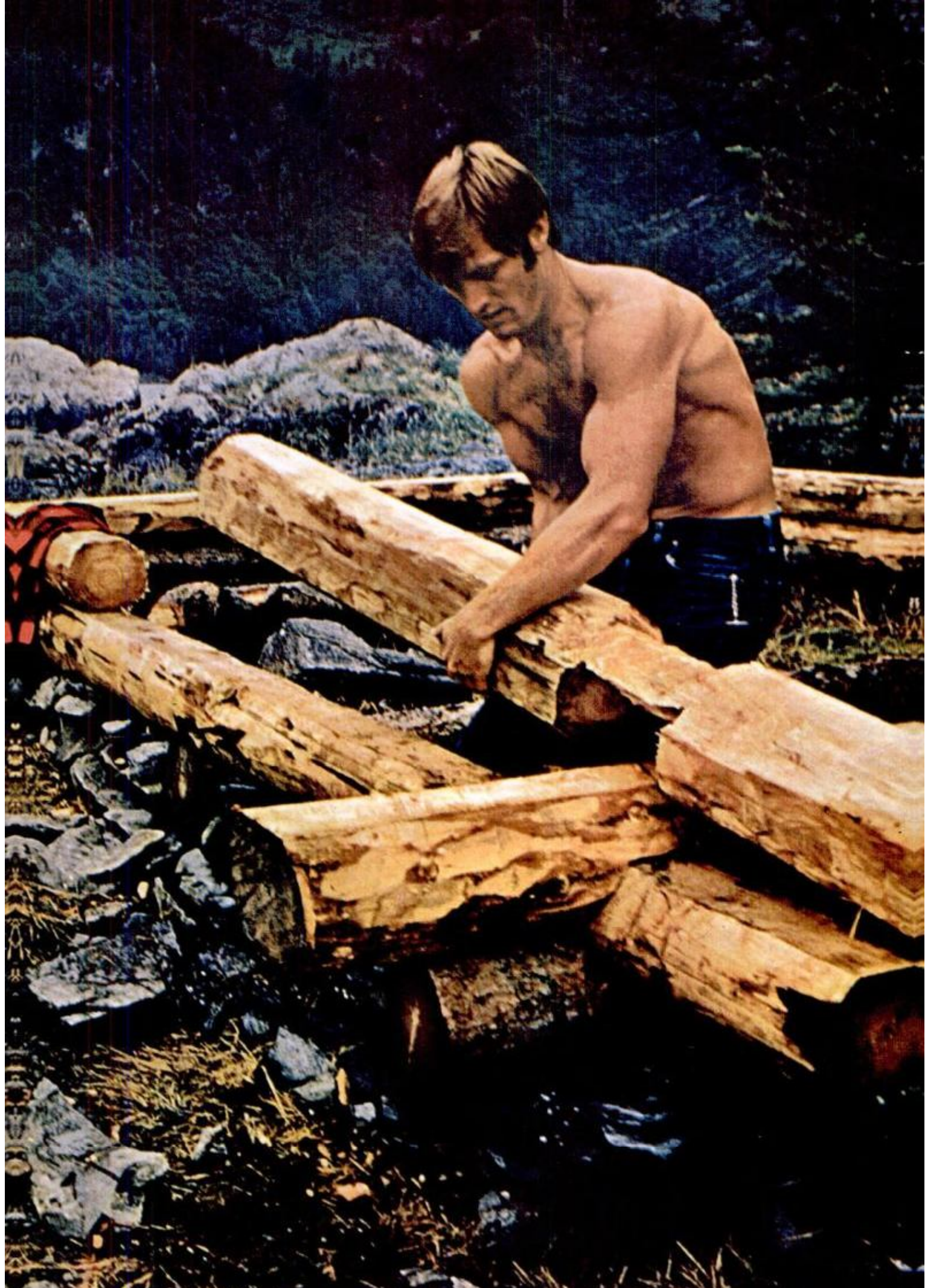
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# A modern workshop in the Old West

Arizonan Charles Kastl added on to his original shop to create room for turning out projects with almost factory-like ease.

by Harry Wicks  
WORKSHOP EDITOR

The views—inside and out—at Charles Kastl's workshop in Phoenix, Ariz., are something else. Inside, he has created a woodworking "plant" of more than 680 sq. ft. equipped with top-quality, modern power tools. Outside his shop windows, a bright Arizona sun warms the orange and lemon trees.

An experienced workshopper with more than 35 years of



Charles Kastl using patterns to lay out a sign in his shop.

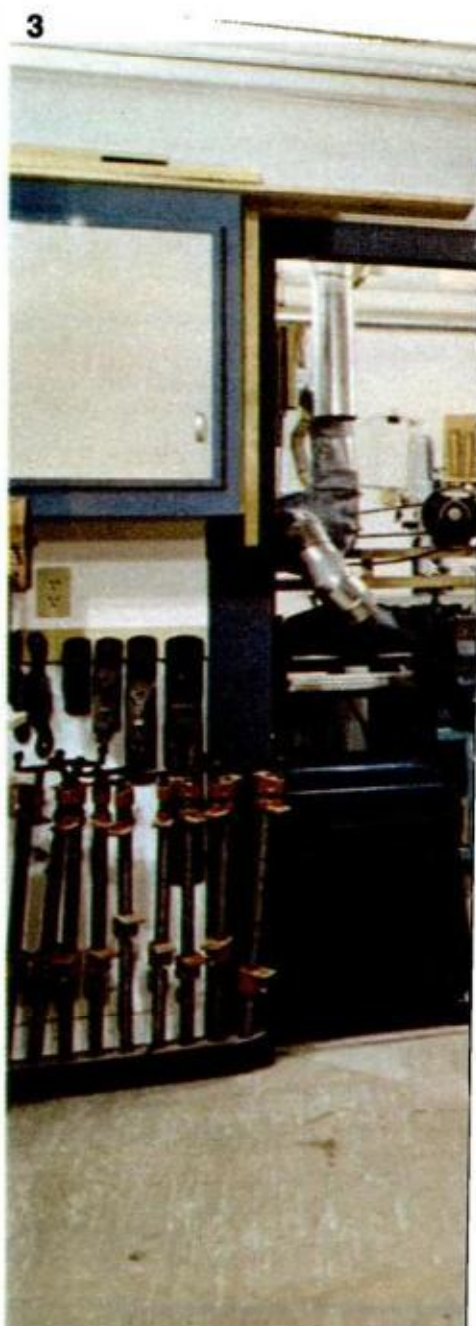


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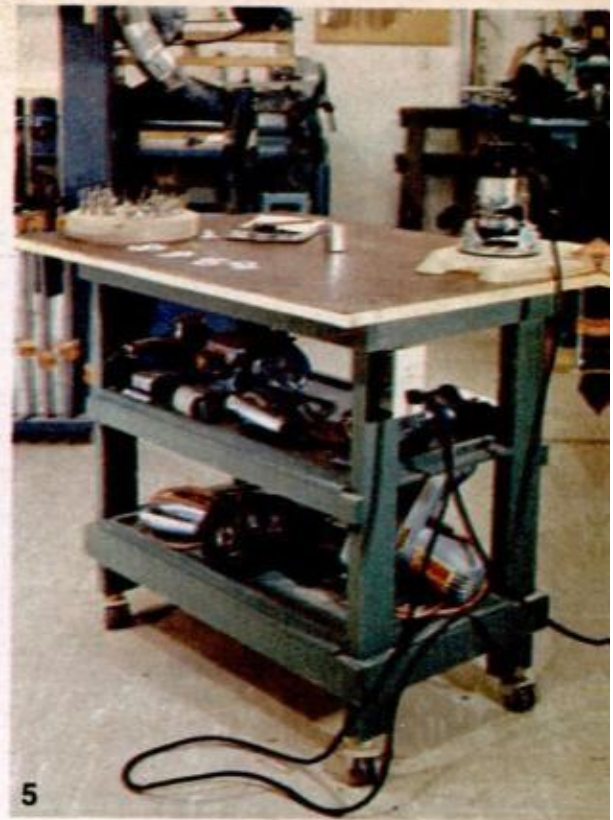
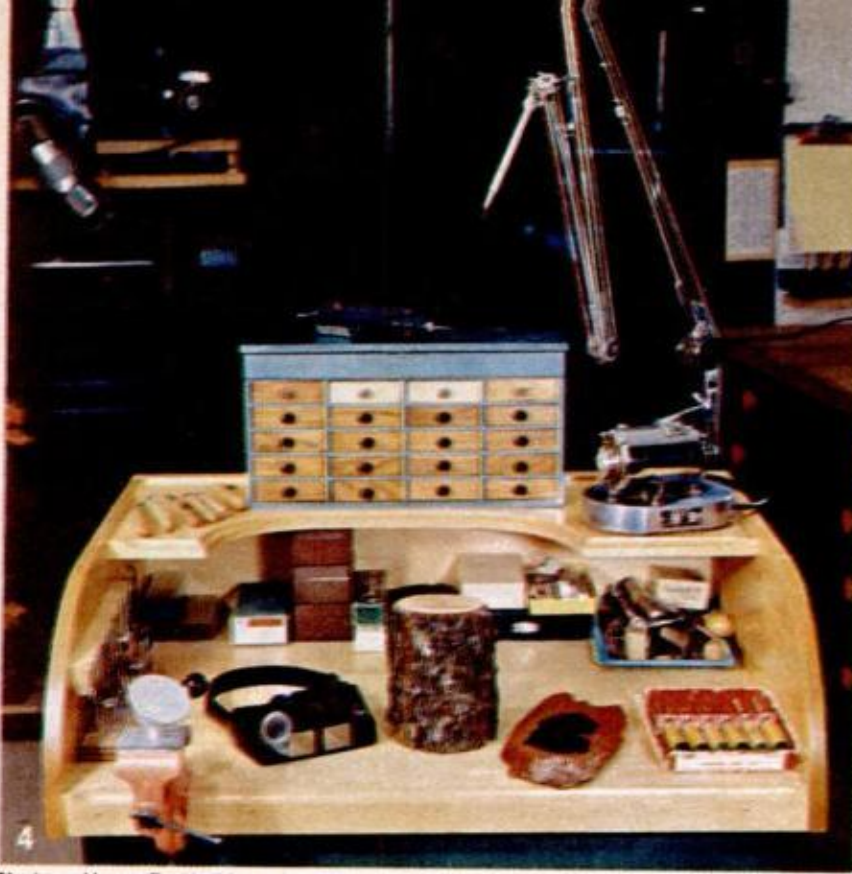


2

Shop-built boring machine (shown front and rear in photos 1 and 2) is foot-treadle-operated and extremely accurate. Elegant shop setup (facing page) spotlights primary workbench with 12 roomy storage drawers and a 96-drawer wall cabinet above. Woodcarving desk/bench in photo 4, pushed into center of room for the purpose of taking these pictures, displays small motor tool and dentist's drill Kastl uses to carve miniatures. Rolling workbench in photo 5 stores under radial-saw benchtop when not in use; portable tools are kept on its shelf. Shop floor plan is on page 172.



3



Photos: Harry Redl, Black Star



**Oak trinket chest (right)** is a typical example of Kastl's craftsmanship; the lustrous finish is hand-rubbed. The delicate oblong box (with carvings on top) and platter (below) are other favorite projects. The owner says these items sell as fast as they can be turned out.




woodworking behind him (some of it professionally), Charlie Kastl is quick to point out ("so beginning woodworkers don't get discouraged with their workshops") that he didn't build his setup and acquire the tools overnight. "In fact," he says, "I'm *still* building and improving." When asked, he admits he is infected with a sort of woodworker's virus; he is constantly "fiddling  
*(Please turn to page 158)*



**Would you believe** the "porcelain" vase above is actually of turned wood? Box, bowl and candlestand are also by the prolific Mr. Kastl. Decoupage items receive 30 or more coats of lacquer.

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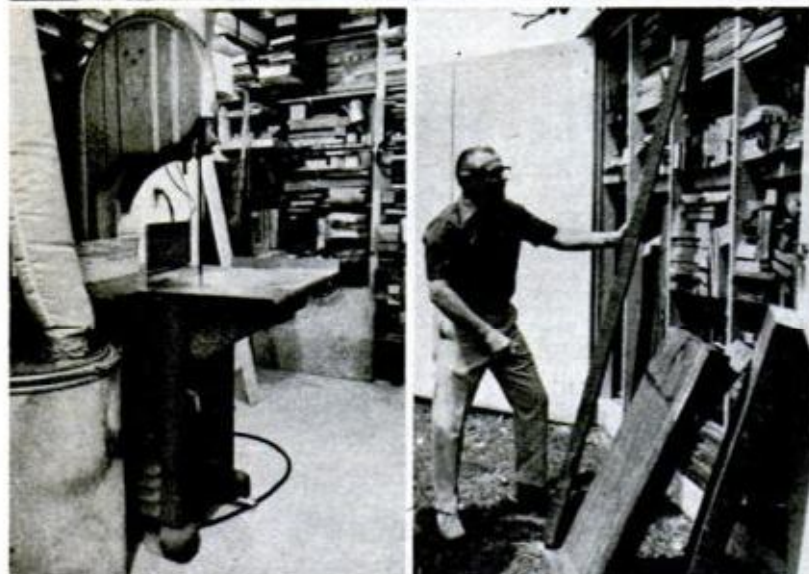


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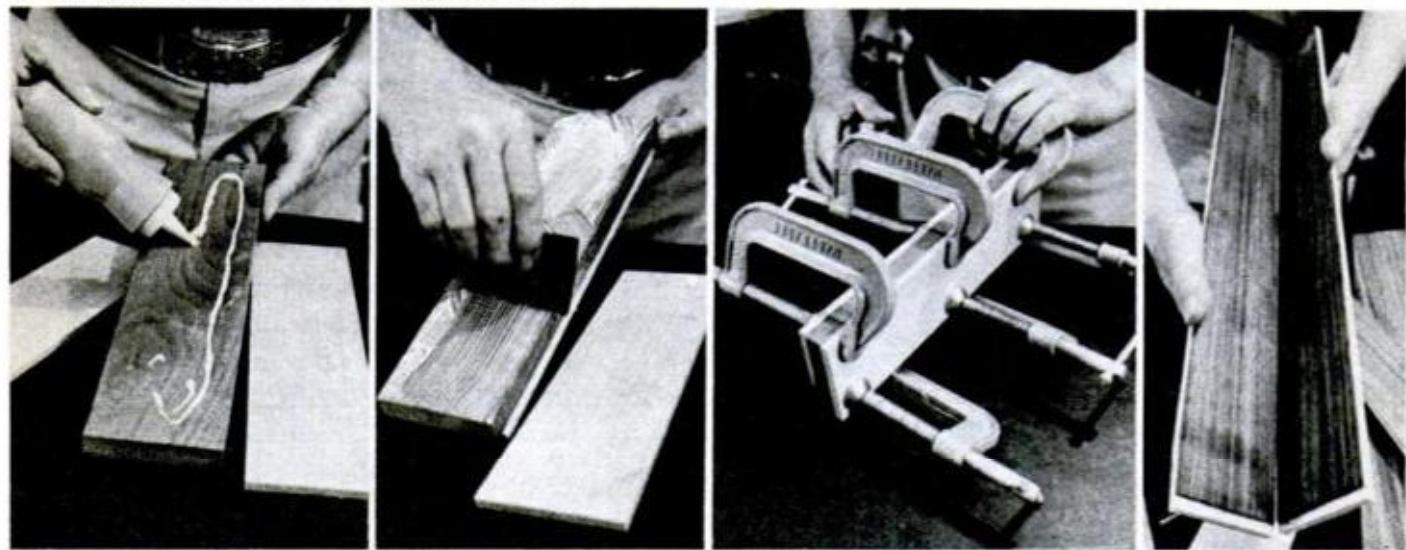
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## He 'mills' his own stock



**One-man sawmill operation** consists of gathering local woods, and storing logs behind shop (top). As stock is needed, Kastl uses a jig (fence) on a meat-cutter's bandsaw (above left) to mill logs into planks. Rough-sawn boards are then pushed through planer and stored in the "lumber shed" (above right).

## How Kastl 'stretches the good stuff'



**To get more mileage from expensive woods**, Kastl uses this technique: Glue is applied to both sides of wood (walnut shown). Next, glue is spread evenly over the surfaces. In third photo, lengths of 1/2-in. pine are

affixed to both sides of walnut and clamped. When dry, piece is ripped down the middle of edge on bandsaw to produce two lengths of veneer stock about 3/4 in. thick. A pass through the planer is the last step.

## ARIZONA WORKSHOP

*(Continued from page 156)*

around with a new shop technique or challenge." He points out that each time he attempts a new phase of shop work, inevitably he adds something to his shop. Having visited this shop, I can attest to his wide-ranging expertise—amazing skill in lapidary, silversmithing, carving and decoupage, as well as woodworking.

He uses this expertise to finance the annual Kastl vacation, which for several years has followed a clever and rewarding pattern. Typically, the Kastls motor to some spot in the United States or Mexico they have not visited before. Unlike most tourists, however, they start out with a car loaded with handicrafts—vases, bowls, jewelry boxes, silver belt buckles, carvings and the like, which Charlie made during the year.

It should be noted that Mrs. Kastl has a hand in this scheme, too. She's an expert at decoupage and her work is as beautifully finished as any I have seen.

As they travel their predetermined route, the Kastls stop frequently at gift shops and art stores to "peddle our wares." The fact that they have always returned with cash instead of the projects underscores the professional quality of

*(Please turn to page 160)*

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## ARIZONA WORKSHOP

(Continued from page 158)

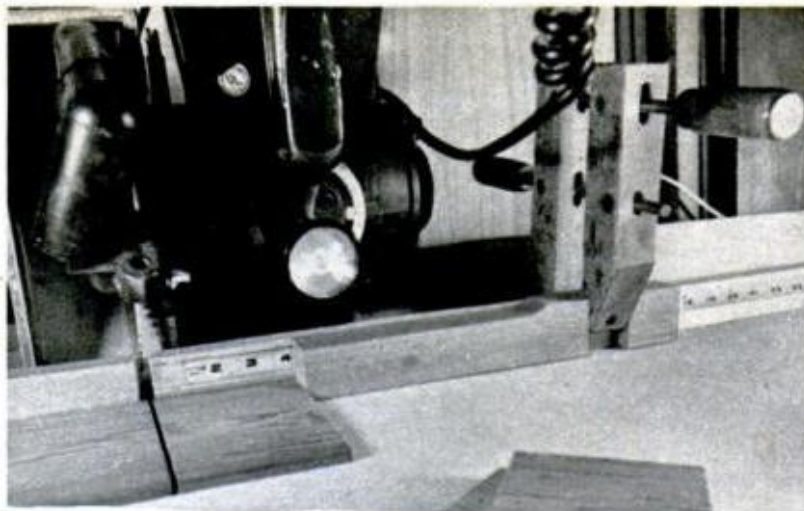
their work. Each year their sales cover the cost of the vacation. And, Kastl adds with a smile, "There's usually enough left for a tool or two to boot."

Currently in the design and installation end of the airconditioning business, Kastl has also worked in the cabinetmaking, model-building and patternmaking professions. (The last was with the Fisher Body Div. of General Motors.)

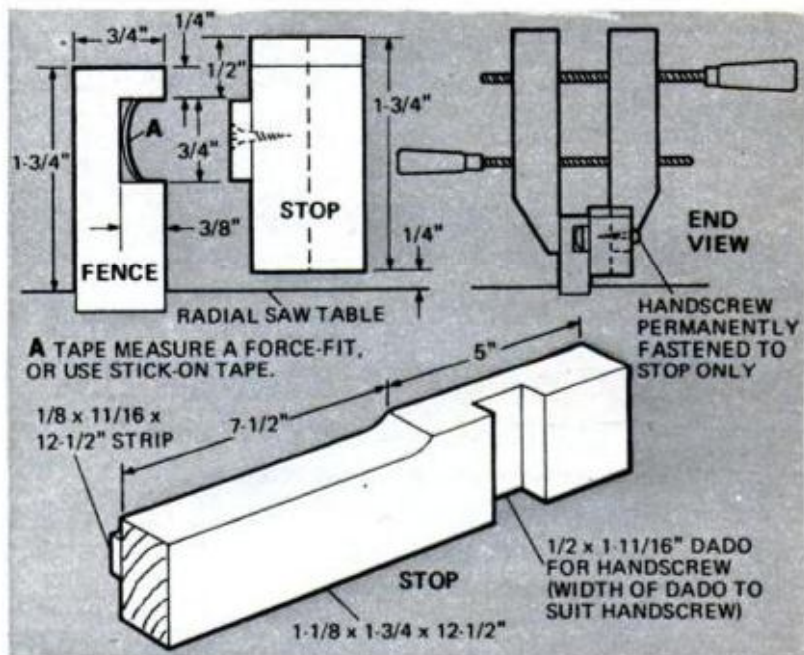
As with most workshopppers, his first shop was modest in size and amount of equipment, occupying a bedroom of his ranch home. As his experience widened and sales to gift shops increased, the need for a bigger shop became evident, so he erected a 14x20-ft. one-story detached building in his back yard. Within a year, he constructed the first of two additions and the shop grew to 476 sq. ft. The final "wing," a lumber shed, was added soon after.

Some good stunts used by Kastl are shown on these pages. One I particularly like is keeping lumber cost down by using local wood. "Besides saving cash," he says, "it helps the environment by using wood that would otherwise simply waste away. In Arizona there's an abundance of great stuff for the kind of work I do." He creates many carvings and

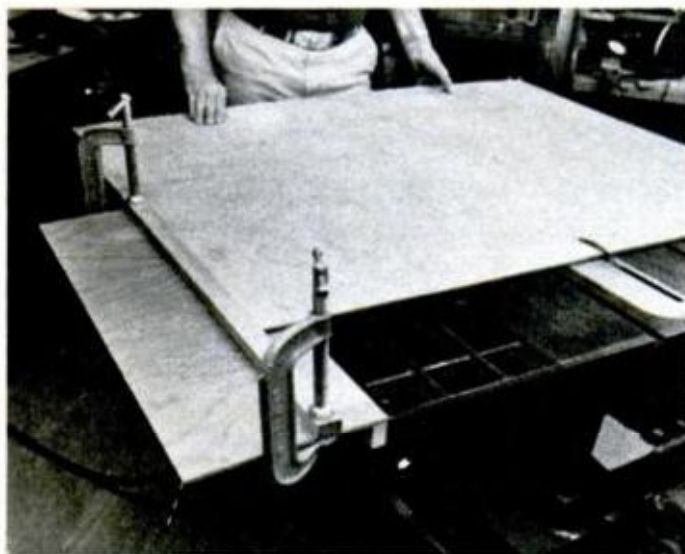
(Please turn to page 172)



Clamp-on board stop for radial-saw fence permits quick, repetitive cutting. Notice tape measure in the fence groove.



Hand screw is permanently fastened to the board stop. Hip fence is grooved to receive the  $\frac{1}{8}$  x 11/16-in. strip on the stop.



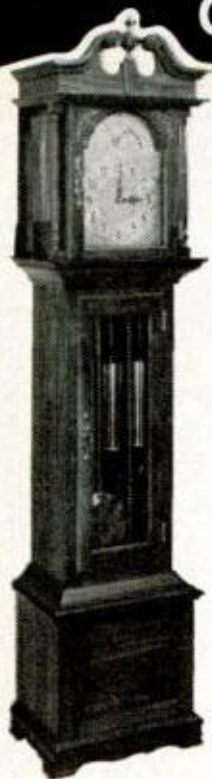
To cut oversize pieces on table saw, Kastl uses this technique. C-clamps (not visible) hold setup on saw.



Two storage tricks: Blades lined up in kerfs in shelf; dowels stored in wall-mounted cardboard mailers.



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## PREVIEW OF THE 1975 CARS

*(Continued from page 93)*

transmission. The top gear will be overdrive for better mileage in highway driving—maybe as much as a 15 percent improvement. Even without overdrive, buyers of AMC cars should get better mileage than they do this year if they order a car with the reworked version of the firm's 200-cu.-in., six-cylinder engine. The engine has been debored for 1975. That's *debored*, not re-bored. Not as peppy, but gas mileage should show significant improvement.

AMC is discontinuing Javelin and the four-door Ambassador, although the Ambassador name will survive as a model designation for the top-priced Matador.

**Chrysler:** Chrysler's intermediates will have all-new metal for '75. Probably new names too. There will be three of them and Chrysler has done a good job of disguising the relationship between cars sharing the same bodies, so a mid-size Plymouth won't look like a twin brother of a mid-size Dodge. Some specifics:

Plymouth Satellite, which will be re-named Fury while the present Fury becomes Gran Fury, will have a short, chopped-off rear and headlights set within a triangular-shape box. The two-door will have fixed side glass. Dodge's Charger SE, using the same shell, will have a shorter, tighter rear, opera windows in lieu of side glass and bullet headlights set in the grille—two big bullet lights on the outside flanked by two smaller bullets on the inside. Both cars will have more glass than this year with side windows extending higher in the direction of the roof.

Chrysler will pull a third intermediate from the same body used for Plymouth and Dodge—a two-door hardtop to be designated the Chrysler Cordoba. From a front-on view, the car resembles Pontiac's Grand Prix.

Chrysler isn't making major changes on its big cars and compacts this year. The big iron was new last year and the small cars get the works next year.

**Ford:** Ford will have more new cars and old-cars-transformed-to-look-new than any other automaker for 1975. The company has reworked its big cars. (Whoops, sorry—Ford says it no longer makes big cars. They are family-size.) The family-size two doors

will have three side windows, like GM's big cars. (GM still calls them big cars.) Four-door full-size cars will have checkerboard grilles, parking lights stacked three high in the front fenders and concealed headlights. Lincoln will take on more of a Cadillac look and shape except for a thicker center pillar.

Sometime during the model year, later on if not at the outset, Ford is expected to offer fuel injection for its family-sizers equipped with big engines. The interesting angle on this is that the Ford fuel injector provides more power without a fuel penalty. That's not the same as saving on gas, but if you're wheeling a big car loaded with accessories, you can have the extra power without paying through the nose in fuel consumption.

There will also be new engines for the smaller cars—a 2.8-liter V6 for Pinto and a V8 option for Mustang II.

Ford is introducing a new wrinkle to the business this year and other companies are watching the move like a hawk tracking a field mouse. It's bringing out two new cars: Granada, which will be marketed by Ford Div., and a companion (same body) Mercury called Monarch. They were originally intended to replace the current Maverick and Comet. The unusual twist is that Ford is not killing off the old cars to make room for the replacements. It will continue to sell the current cars along with the new machines. If the ploy works, the other car builders will try the same tactic in future years.

Except for different grille and tail treatments, there's a lot of look-alike between Granada and Monarch. They are boxy, formal, stand-up-straight cars and from a side-on silhouette they resemble Audi and Mercedes. Ford people refer to the cars as small jobs or subintermediates. They are not. They are more mid-size than small. And they will be right up there with the big cars in price. Over \$4000. That's so the carryover versions of Maverick and Comet can be priced under the newer Granada and Monarch.

Ford has done a major overhaul on its van, with the result it has more of a truck look. There's more overhang in front making for a larger engine compartment. The van may not be out until later in the year.

**General Motors:** The king of the car builders took a lot of lumps and criticism this year for not having anticipated the

market for smaller, more economical automobiles. But don't underestimate GM's ability to get turned around and back on the track. The turnaround will begin with the '75 cars, although it will take another year for the firm to do a complete about-face.

For '75 GM has a new X body. That's Chevrolet Nova, Pontiac Ventura, Oldsmobile Omega and Buick Apollo. These cars will have a very abbreviated deck and a hood that slices down to the grille in a continuous line. Rear side windows will be sealed in. The body will be trimmer and lighter than in the current cars.

There will be new-old and new-new versions of Vega. The new-old one will be a redo of the present Vega with a Pontiac nameplate. It'll be called Astre. There will also be a new Vega body GM will use for three cars: a Buick model to be called Skyhawk; an Oldsmobile model, the Starfire, and a Chevrolet, most likely to be called Monza 2 + 2. The new body is clean. Starting at the point where the roof meets the windshield, the roof flows back to the taillights in a gradual, smooth line. There's a strong center post with a louvered effect; windows behind the center post are wedge-shaped.

Sometime next year GM will offer the same car with a Wankel engine—under the Chevrolet label. At the time the Wankel comes out, GM will introduce a new automatic transmission designed for small cars.

GM's full-size four-door cars will get new grilles and roofs. Four-door hardtops will get the opera-window treatment. If the government approves, on GM's big cars with power windows, when the car doors are open you'll be able to roll up the windows without having the key in the ignition.

As part of its turnaround process, GM is taming down all its engines to give better gas mileage. Eventually you will even see a Six in a Cadillac! A 225-cu.-in. V6 GM sold to American Motors in 1968 and then bought back from AMC this year has been reworked and will be used in Buick's Apollo. Chevrolet will have a 262-cu.-in. V8 for '75. Olds, Pontiac and Buick are deboring their big V8s and going to lighter materials where possible to improve mileage. A new four-cylinder engine GM is developing won't be ready at the beginning of the '75 model run, but it should be along by the middle of the model year.

Another fuel-saving device that may not be ready until after the '75 cars have begun to roll is an improved carburetor GM calls the IFC—for integrated fuel control. The device makes automatic compensations for different operating conditions. The result, GM says, is maximum mileage and minimum pollution. GM still had some testing to do when this was written, so there was a question as to whether the item would be ready by the time the first '75s go on the line.

On government orders, GM will also have to wait until the first of the year to begin installing rectangular headlights. This will be the first change in headlight shape since the 1930s. GM won't use the lights on all cars, but you will be able to spot the makes that will get the new shape—after Jan. 1—by the light housing.

Finally, it's axiomatic in stories like this to throw in a mention of a compact Cadillac. Consider it mentioned. GM now says this car will be ready during the 1975 calendar year. ★★★

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## PICK OF THE PICKUPS

(Continued from page 135)

even on the loudest passages where the stylus has to follow the groove's widest swings. The speed of stylus movement (velocity) is stated in cm/sec and I made my trackability comparisons using the Shure "Audio Obstacle Course" test record containing test bands recorded at low, middle and high frequencies. The chart lists the highest velocity each cartridge could track without distortion, the Audio-Technica AT12S was the winner, here, followed closely by the Elac and Empire.

**Optimum tracking force.** Most manufacturers specify a range of recommended tracking forces, rather than a single figure, to allow for differences in tone arms, records, and the individual listener's tolerance for distortion. Many audio fans assume that the lowest tracking force within that recommended range is necessarily the best. But what actually matters is the lowest force at which the cartridge will accurately follow the undulations of the loudest record grooves. To determine this value, after having determined the most highly-modulated grooves each stylus would track, I reduced the tracking force gradually to find the minimum force at which the cartridge would maintain its trackability.

The *exact* optimum tracking force for each cartridge will still differ from one tone arm to another. But the *relative* measurements, all made with the same tone arm, show which cartridges can be tracked most lightly. All cartridges tracked well within their recommended ranges, with lowest forces in these ranges going to B&O and Shure.

**Frequency response.** While the overall response of most modern cartridges extends 'way beyond the limits of hearing, what really counts is not so much the range but the evenness of response. Using the CBS Laboratories Test Record STR-100, I checked this by noting the range covered by the cartridge with a deviation from "flat" response no greater than  $\pm 3$  db within the limits of the test record (20-20,000 Hz). The flattest measured response was that of the B&O. The Audio-Technica AT-12S, though it has a Shibata stylus and response to 50,000 Hz for CD-4 Quadradiscs, was not, surprisingly, among the five cartridges whose response was flat within  $\pm 3$  db or better all the way to 20,000 Hz.

**Listening tests.** But technical specs don't entirely define the tonal character of a cartridge. The proof is in the listening. So I checked out the sound of all cartridges on different types of music, ranging from massive symphonic scores and the detailed sound of chamber ensembles to the biting tonal thrust of hard rock.

To my ears, the standouts of the group were the B&O SP-14 and the Shure M91ED. Both combined silk-smooth highs with solid mid-range and bass impact. Even heavy orchestrations came through with astounding clarity and you could get a good, gutsy feeling from the plucked strings of the Spanish guitar without any false, metallic plink. When you have that kind of sound, any kind of musical arrangement comes across with conviction.

The only possible drawback of the B&O is its weight. At 8.5 grams it is much heavier than most cartridges, which may cause counterbalance problems in some tone arms—we're surprised it worked in the Dual's arm, which is rated only for cartridges of up to 8 grams.

Exceptional smoothness and clarity and plenty of highs without hardness also marked the fine performance of the Empire 2000E. As for the ADC-XLM, it had superb highs, cleanly defined transients and it tracked beautifully. But somehow it lacked gutsiness in mid-range and bass. It's a fine cartridge for classical music, but rock fans may find its cool, analytic sound a little too bloodless.

By contrast, the Stanton 600E had plenty of punch both at top and bottom and a kind of mid-range "presence" that puts the sound right out front—fine for rock and pop, but a bit flashy for symphonic music and a trifle strident for strings.

The Audio-Technica AT12S had a fine, natural quality on strings. Pickering's XV-15 400E and Elac's STS 344-17 sounded bright and smooth, though orchestral texture seemed less clearly defined than in the best of the group. The Pickering comes with a brush attached, which sweeps the dust from the grooves before the stylus plays them. (One gram extra tracking force has to be added to compensate for the elastic lift of the brush bristles.)

I'd like to emphasize once more that all these comments are based on small differences. As a group, all the cartridges tested deserve high marks, and I'd be quite happy to own any of them. ★★★

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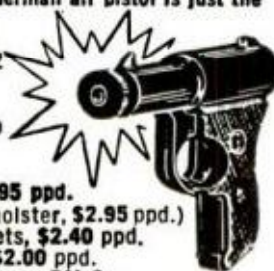
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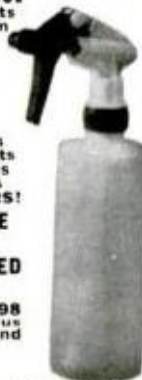
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## WAR ON DOPE SMUGGLERS

*(Continued from page 122)*

stantly, the inspector pressed a warning button and from out of nowhere armed narcotics agents suddenly swarmed over the Mexican's car. An intensive search turned up 19 packets of 85-percent pure heroin—nearly 24 pounds that, cut to 5-percent purity, would have an estimated street value of \$10 million. Ascarraga-Milmo was identified as a member of a huge international dope-smuggling syndicate that was subsequently broken—all as a result of one tiny computer's infallible memory.

Federal narcotics agents' bag of tricks contains a variety of aids ranging from dogs trained to sniff out drugs hidden in the tires and bumpers of automobiles to airborne cameras that can photograph opium-growing poppy fields from two or three miles in the sky. Highly specialized airborne surveillance systems are just beginning to pay off in ferreting out obscure sources of opium cultivation in inaccessible areas not easily reached or detected from the ground. One such piece of equipment currently in test use is the multispectral camera that, through aerial photos, can identify the particular "spectral signature" of drug-producing plants, pinpointing their exact location. In friendly nations cooperating with the United States, information gained through such photos is relayed to local authorities who then move in to destroy the killer crops before they can be harvested.

Insects, long used to detect chemical-biological warfare agents, are now being tested to see if they can spot poppy pollen in the same way. The insects react differently when exposed to different chemicals, and it's hoped that their particular reaction to poppy pollen and other drug-related substances may reveal the sources of the drugs. A modified version of the "people sniffer" used in Vietnam to sense the presence of enemy soldiers is also being tried to "smell out" chemical fumes given off by illicit narcotics-refining factories operating secretly in remote parts of the world. Eventually, an orbiting satellite may circle the earth, automatically transmitting drug-producing locations back to narcotics agents on the ground.

If all this sounds "far out," it's just the beginning—an example of the fantastic extent to which science and technology have been thrown into the battle against drugs.

And stopping drugs before they enter the country—either at their source of cultivation or at our borders and ports—is the biggest single job facing federal narcotics agents for one very simple but appalling reason—it's estimated that more than 90 percent of all drugs produced throughout the world are imported *into* the United States. Stopping them before they get in is thus the name of the game.

Heroin and cocaine are two of the biggest and most lethal imports—heroin from Europe, Mexico and Southeast Asia and cocaine from Latin America. Proof that narcotics agents are succeeding in their task is the fact that one and a third tons of heroin and nearly a ton of cocaine were seized during last year alone, along with a whopping 307 tons of marijuana and 19 tons of hashish, a refined form of "pot." Also confiscated last year were more than 35 million illegal narcotic pills and capsules with such colorful and exotic names as "Mexican reds," "red birds," "red devils," "pinks," "barbs," "goofballs," "speed" and "bennies."

Because of the importance of halting narcotics trafficking at the source, one method has been to increase the number of foreign law enforcement officers and narcotics experts through special training courses overseas. Within the past few years, more than 4300 police officers from 40 countries have participated in over 60 training programs conducted throughout the world. In addition, there are now 172 special U.S. narcotics agents assigned to 58 embassies and consulates in 39 countries to offer expert aid to local authorities.

Within the United States, the drug Enforcement Administration operates six regional forensic laboratories for the analysis, identification and classification of drug samples that may eventually provide vital clues to unknown sources or serve as important evidence in drug-prosecution cases. The DEA's labs employ 120 specialized chemists and last year alone analyzed more than 45,000 separate drug exhibits. The DEA maintains a file of more than 8000 known drug samples—much like a ballistics or fingerprint file—against which new samples can be compared for identification.

Because drugs are manufactured and packaged in different ways in different areas, matching up an unknown sample with one of known origin can often reveal its source and maker—like a fingerprint identifies its owner. In one such case, the DEA

successfully curtailed the flood of illegal amphetamines regularly smuggled into the United States from Mexico. DEA chemists tested the contents of red secobarbital capsules—"red devils"—and found that the drug itself matched up with a type known to be manufactured in Europe, but that the red capsules were obviously of a kind made and filled in Mexico. Thus, while the secobarbital was being legally imported into Mexico from Europe in bulk form, it was being packed into Mexican capsules and illegally smuggled into the United States. When informed, the Mexican government cooperated by halting secobarbital imports, cutting off the European supply.

Another part of the DEA's forensic work is to help provide positive evidence of drug possession in prosecution cases—a must in order to obtain a conviction and generally difficult to establish because the higher-ups in the trafficking trade are extremely careful never to be caught with any actual drugs themselves. In one recent case, a well-known heroin smuggler, Louis Cirillo, was under investigation, but authorities lacked sufficient proof of possession to link him definitely with the crime. Heroin shipments were known to have been made to his suburban home in New Jersey, but agents searching the house had never turned up any signs of the drug.

Then a DEA supervisor, scanning a report on the frustrated investigation, spotted something that caught his eye. An informant had tipped off agents that, during one of the shipments of heroin to Cirillo's home, a packet had fallen on the garage floor and broken open. The agents had checked the floor, but it had been too thoroughly scrubbed clean to reveal any traces of the drug. The DEA supervisor sent his forensic experts out to try more advanced techniques of detection. Taking scrapings of the floor and applying such sophisticated tests as thin-layer chromatography and mass spectrometry, the experts found enough evidence of heroin to definitely establish its existence in Cirillo's home—six months after the original spillage. As a result, Cirillo was later convicted and given a 25-year sentence.

Thus, in the war on drugs, science and technology are fast proving to be among our most effective weapons, often accomplishing in minutes or hours what no amount of endless sleuthing could hope to do. ★ ★ ★

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## BICYCLISTS, START YOUR ENGINES!

*(Continued from page 77)*

stroke engine mounted low in the frame under the rider's feet, an automatic clutch and, naturally, pedals. Motor power on most mopeds incorporates rear-wheel belt or chain drive. However, the best known and most common moped, Velosolex, features front-wheel friction drive. With this system the engine can be engaged or disengaged from the tire with a simple lever and in this regard the Velosolex is probably more like a bicycle than any other moped. Consistent with other mopeds, the Velosolex has levers at each handgrip that operate the brakes and also a center stand that holds the cycle upright and stationary while parked.

When you decide to go somewhere by engine power you pedal until the piston fires and then hold the throttle wide open while depressing the compression-release lever. When the engine winds up, the clutch engages automatically and away you go. Either the pedals or platform above the engine can be used as footrests. At traffic lights the engine idles with clutch automatically disengaged. To get a good break away from a standing start you pedal and apply the throttle at the same time to build up momentum. After that the powerplant takes over, though sometimes you hardly know because it comes on so gently and it makes very little noise.

Recently the U.S. Department of Transportation, the Motorcycle Industry Council and concerned manufacturers of mopeds have been in serious negotiation concerning the possibility of a separate vehicle category for mopeds. Representatives from both the MIC and DOT have intimated that a decision is near. The petition filed by Moto-becane, Velosolex and Peugeot recommends that the moped be considered a "power assisted" bicycle that follows these major parameters: maximum speed, 25 mph; maximum horsepower, 1.5; maximum displacement, 50 cc; capable of being pedaled; brakes on both wheels; headlamp and taillamp required; reflex reflectors required; no brake light and no turn signals. At least a dozen foreign manufacturers are considering U.S. distribution of their mopeds if federal reclassification so allows. Among them are: Flandria, Hercules, KTM, Monark, Moto-becane, Peugeot, Puch and Velosolex.

For information concerning the purchase of Batavus, contact: Mitsubishi International Corp., 277 Park Ave., New York, N.Y.,

10017. For Ciao, contact: Western Scooter Distributors, 1599 Custer Ave., San Francisco, Calif. Questions on current legal developments involving mopeds should be directed to the U.S. Department of Transportation, Washington, D.C., or Motorcycle Industry Council, Inc., 1001 Connecticut Ave., Washington, D.C. 20036. ★ ★ ★

## EASIER, NEATER WAY TO TILE A CEILING

*(Continued from page 143)*

not only easier to work with, but it requires no complicated room layout—and the only tools necessary are those that are commonly found around the home. A new Chandelier ceiling installed by this method requires only a 2-in. drop.

Key to the system is a new, lightweight steel furring channel that takes the place of conventional wood furring strips. Manufactured in 12-ft. lengths, the channels are specially fabricated to receive Integrid cross tees which, in turn, support the ceiling tiles. Wood or metal molding finishes off the ceiling around the perimeter of the room.

The installation method is simple and involves only three steps:

1. Molding is nailed to all four walls, 2 in. below the level of the existing ceiling.

2. Metal furring channels are installed perpendicular to the direction of the joists, starting 26 in. out from the side wall and spaced 48 in. on centers thereafter. The channels are simply nailed into the joists using one nail every 48 in. Because they are rigid enough to bridge high spots in the old ceiling surface, the channels are self-leveling. The need for braces, shims, or wedges is eliminated and, unlike wood furring strips, the channels will not warp or split, assuring a level ceiling indefinitely.

3. When all furring channels are in place, tile installation is begun in a corner of the room. The first row of tile is laid on the molding, a cross tee is snapped onto the furring channel, then slid into a special slot on the tile's leading edge. You continue across the room in this manner inserting tiles and cross tees. Because the Chandelier tiles butt tightly together, and all supporting metal is hidden from view, the finished ceiling produces a smooth, monolithic appearance.

Available through lumber and building materials dealers nationwide, the metal channel method costs only cents more per square foot than conventional wood furring strips. ★ ★ ★



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## ARIZONA WORKSHOP

(Continued from page 160)

bowl turnings from such local woods as ironwood, mesquite, eucalyptus, olive, ash, Chinaberry and mulberry.

Immediately after a heavy storm Charlie takes a chain saw and heads for the desert in his station wagon to collect a healthy supply of logs. Back in his shop, he stacks the logs to dry. Later he rough-saws them into planks on the meat-cutter's bandsaw he "picked up secondhand from a restaurant supply house." He surfaces these planks on his planer and stores them in his lumber shed. Arizona's dry climate is his "kiln"; he claims he has never had a moisture problem with a finished product.

Kastl's dream is to have a full-time business "making and selling things." He is now planning a shop-retail store-living quarters

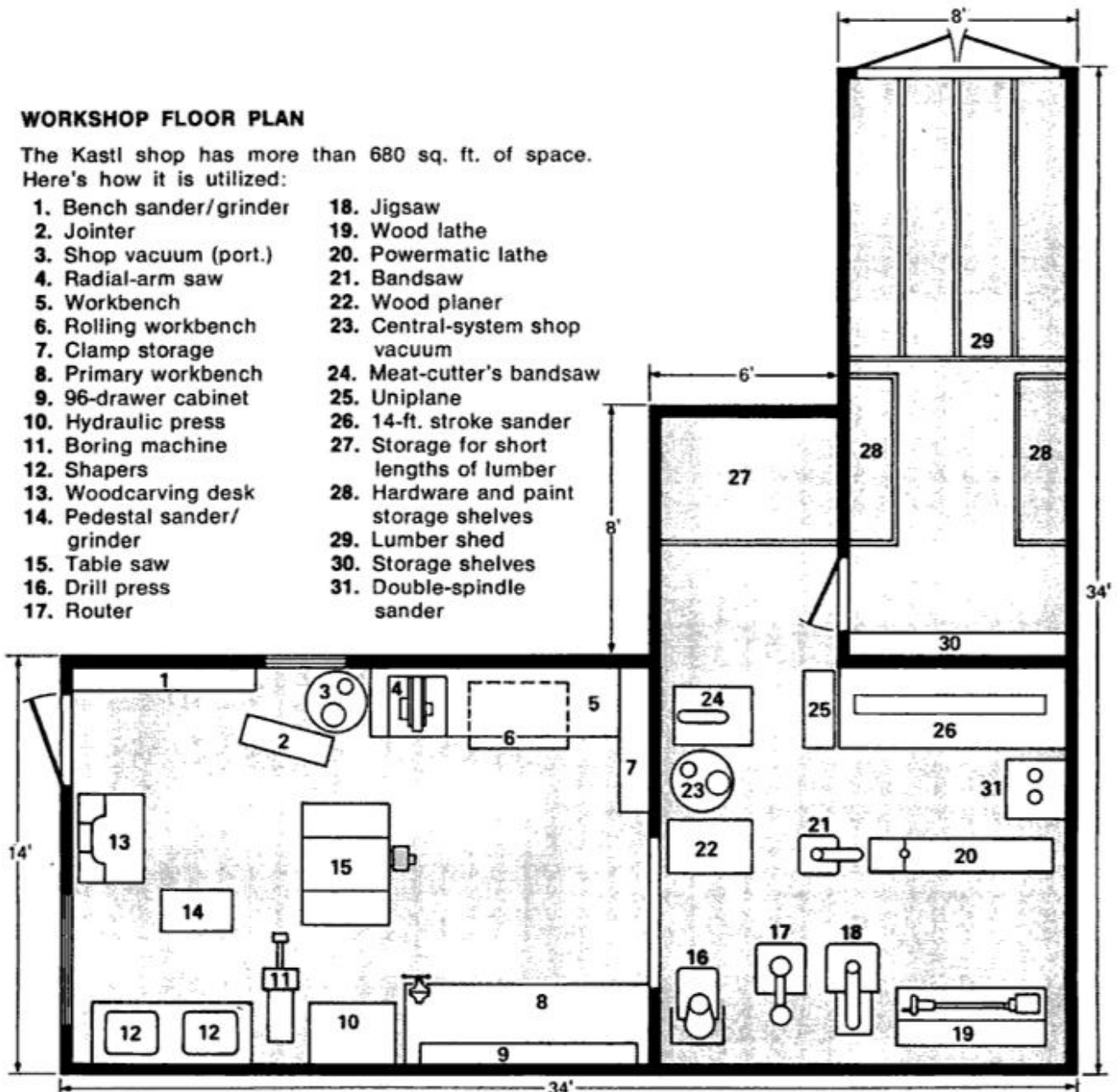
complex which he hopes will make that dream come true. He is also designing and installing a central vacuum system in his shop as "an honest effort on my part to cut down the hours I spend cleaning this place." The system consists of a ceiling-mounted stovepipe network that feeds dust from various locations to a collector. During my visit, it was operable but not completed. By now, the chances are that Charlie Kastl will be adding something else to his Great Shop. ★ ★ ★

**What about your shop?** Is it a candidate for PM's Great Shop series? Send snapshots and a brief description to Workshop Editor, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. If PM's editors agree, we will visit your shop to learn more about it. Snapshots cannot be returned unless a self-addressed, stamped envelope is enclosed.

### WORKSHOP FLOOR PLAN

The Kastl shop has more than 680 sq. ft. of space. Here's how it is utilized:

- |                             |   |
|-----------------------------|---|
| 1. Bench sander/grinder     | 18. Jigsaw                              |
| 2. Jointer                  | 19. Wood lathe                          |
| 3. Shop vacuum (port.)      | 20. Powermatic lathe                    |
| 4. Radial-arm saw           | 21. Bandsaw                             |
| 5. Workbench                | 22. Wood planer                         |
| 6. Rolling workbench        | 23. Central-system shop vacuum          |
| 7. Clamp storage            | 24. Meat-cutter's bandsaw               |
| 8. Primary workbench        | 25. Uniplane                            |
| 9. 96-drawer cabinet        | 26. 14-ft. stroke sander                |
| 10. Hydraulic press         | 27. Storage for short lengths of lumber |
| 11. Boring machine          | 28. Hardware and paint storage shelves  |
| 12. Shapers                 | 29. Lumber shed                         |
| 13. Woodcarving desk        | 30. Storage shelves                     |
| 14. Pedestal sander/grinder | 31. Double-spindle sander               |
| 15. Table saw               |   |
| 16. Drill press             |   |
| 17. Router                  |   |



## LONG LENSES AT LOW PRICES

*(Continued from page 129)*

in black-and-white than in color. This is because extremely long lenses tend to emphasize the blueness in outdoor shots, especially those made against or under a bright blue sky. Your slides and color prints will go slightly bluer than those made with the same film and a normal lens. The effect is not apparent in black-and-white—and may not necessarily be objectionable in color, either—but be prepared for it.

To help offset the effect, use warmer-toned films like Kodachrome and Kodacolor, rather than Ektachrome and Ektacolor (the latter offer higher ASA ratings—an advantage when you need speed—but they tend to produce cooler, bluer tones). A skylight filter will also help to reduce excessive blueness. On long-distance shots, a haze filter is another handy aid that will help to cut down the slight blurring effect caused by atmospheric haze to which long lenses are particularly vulnerable. Both types of filters—skylight and haze—can be used with either color or black-and-white, can be left on the lens at all times and will generally improve overall clarity, contrast and detail.

Manufacturers make a good deal of fuss about the size and weight of their lenses, each claiming to have the “smallest,” “shortest,” lightest,” “most compact,” etc. The fact is, PM found no significant differences to speak of. Weights range from 25 to 28 ounces—not exactly “light,” but not excessively heavy or clumsy either. All run around 12 to 13 inches long (fully retracted and without sunshade)—about average for a 400 of conventional optics. Only a few high-priced and mirror-type models are noticeably shorter and lighter.

The focusing ranges on inexpensive 400-mm lenses leave something to be desired, but this is to be expected. Most focus from infinity down only to about 22 to 26 feet. This isn't very close, but then you aren't likely to want or need to shoot much closer with a lens of such length. If your subject is that near, you might just as well walk up and shoot it with a normal lens or moderate tele. The main purpose of superlong teles is to pick off distant objects, not shoot at close range. While such lenses *can* be used for close-up photography with extension tubes or other adapters, they aren't really engineered for this use.

All of the lenses tested offer such convenient features as threaded tripod sockets,

depth of field scales and universal T-mount adapter rings that permit them to fit most 35-mm cameras. When ordering such a lens, specify the camera you want to use it with and it will be supplied with the appropriate adapter. In some cases, this is included in the price of the lens, but usually it will cost you an extra \$2 or \$3. Other extras available are carrying cases, filters, lens caps and sunshades. A sunshade is recommended for use in bright sun to keep stray light from entering the lens, but be sure to get a type designed specifically for the lens you buy. One that's too long or narrow may cut off part of your picture at the corners.

Sources for the lenses shown here are as follows: Spiratone, Inc., 135-06 Northern Blvd., Flushing, N.Y. 11354; Sterling-Howard Corp., 236-K South Station, Yonkers, N.Y. 10705; Wolk Camera, 133 North Wabash Ave., Chicago, Ill. 60602; and Ritz Camera, 3705 West St., Landover, Md. 20785. ★★★

## CLEAN CARB ROUTE TO BETTER MPG

*(Continued from page 141)*

although some have an adjustment screw that may bring the valve back into line.

A heavy float or a damaged needle valve which doesn't stay seated allows fuel to get to the cylinders where it is consumed needlessly. A heavy float is a float that has sprung a leak and loaded up with gasoline. When a float is heavy, it keeps the needle valve off its seat.

Remove the float and shake it. If it is filled with gas, you will hear it. Remove the needle valve, and check it and its seat for damage. Sometimes a small piece of dirt may be keeping the valve off its seat. Just get it out.

Floats should be adjusted to specification, so they open the needle valve at the right moment. This is done with a float gauge, usually by bending the float arm tang.

In reassembling the bowl, be sure the gasket is good and installed squarely.

In two and four-barrel carburetors, another part that can cause excessive fuel loss if it gets damaged is the power piston. A bad one allows gas to get into the cylinders after the engine is shut off. A strong gas or exhaust smell will be emitted.

The carburetor has to come off the car to check out the power piston, but that's not such a big job. By now, even a carburetor rebuild should be easy for you. ★★★

# Three quick projects to brighten your home

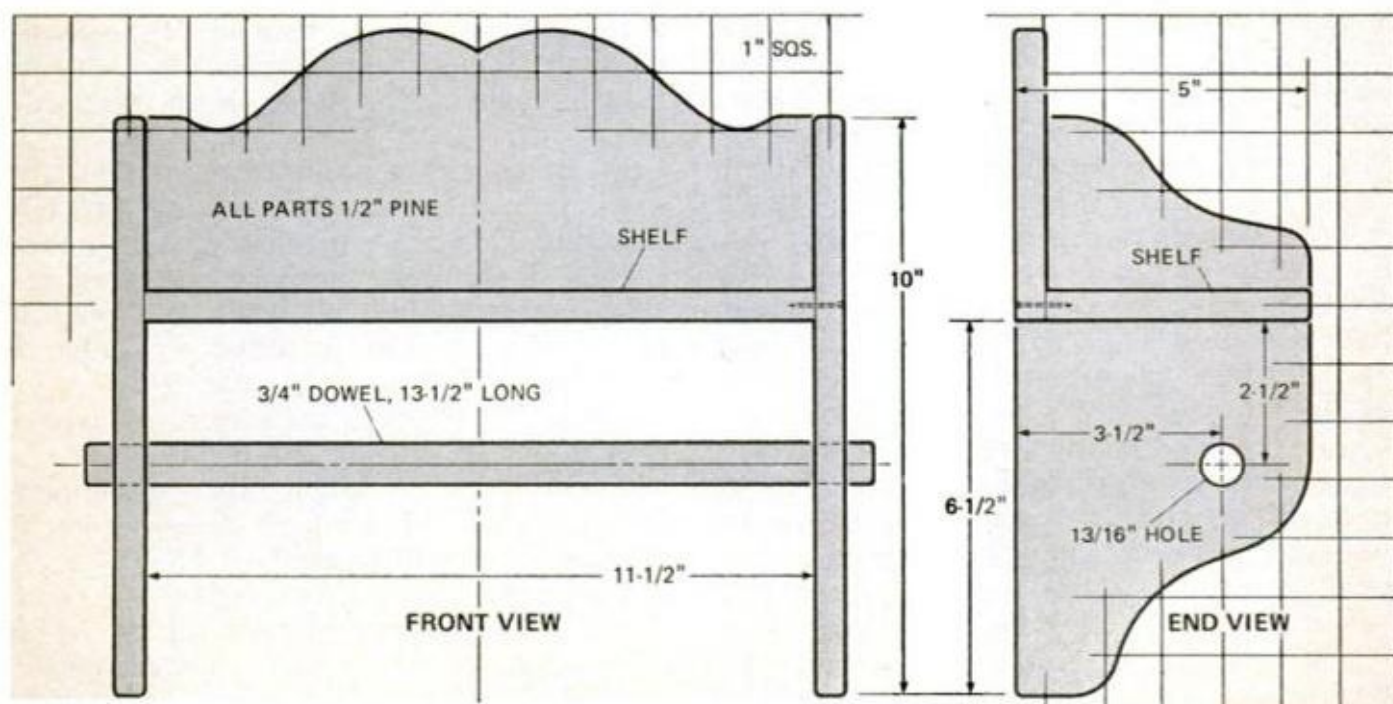
Art: Fred L. Wolff



## Paper-towel holder

The lowly paper-towel holder takes on a new look and usefulness in the form of a knickknack shelf. A length of dowel inserted through holes in the ends holds the roll, yet slips out easily for refilling. Material for the four parts can probably be found in your scrap box. The original was made from  $\frac{1}{2}$ -in. pine. If you have to buy a piece, pick second-grade lumber; you can usually get enough clear cuttings from between knots, and it will cost you less.

Cut the contours, drill the holes, sand the parts and assemble with glue and finishing nails. If you don't have a bit about  $\frac{1}{16}$  in. larger than the  $\frac{3}{4}$ -in. dowel, wrap the dowel with sandpaper and use it to enlarge the holes so the dowel will slide through freely. Finish the project by painting or treating it with a wood-graining kit.



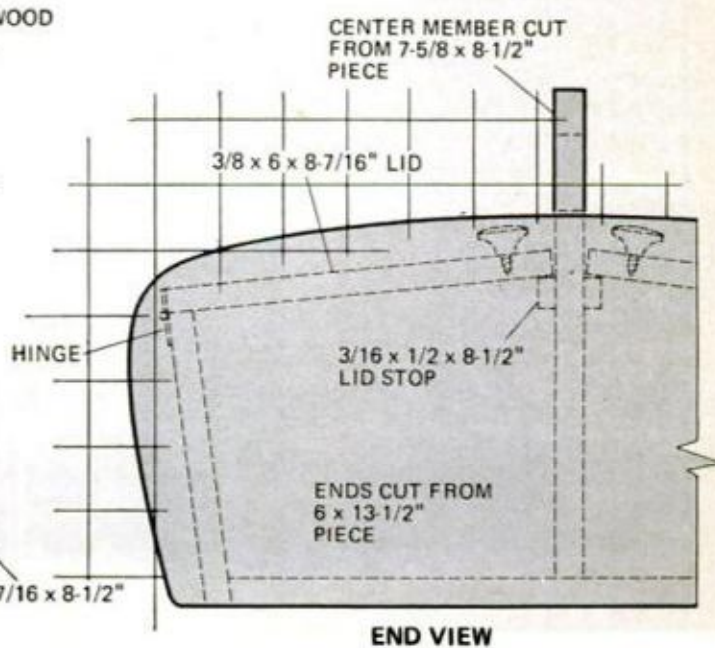
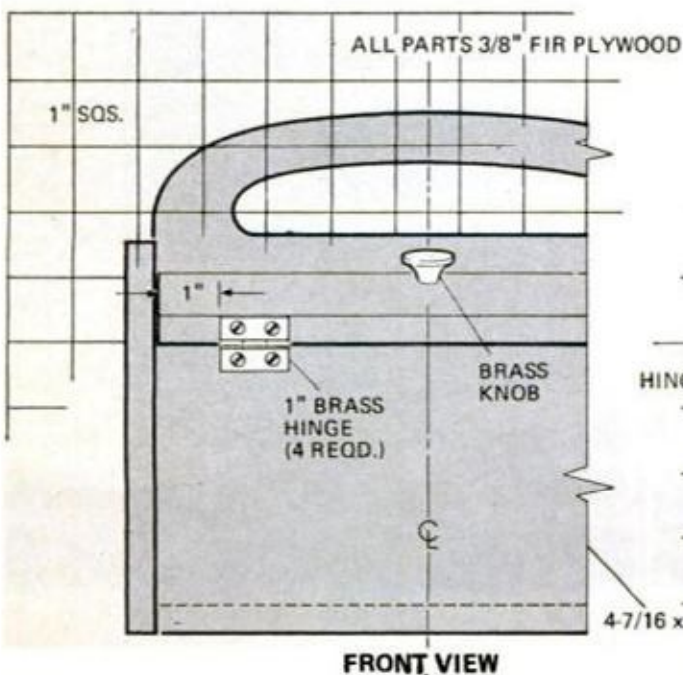
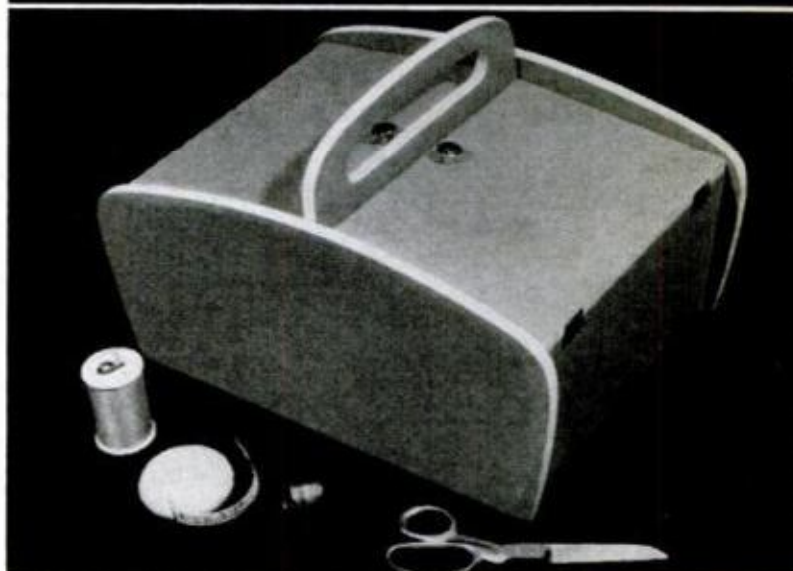
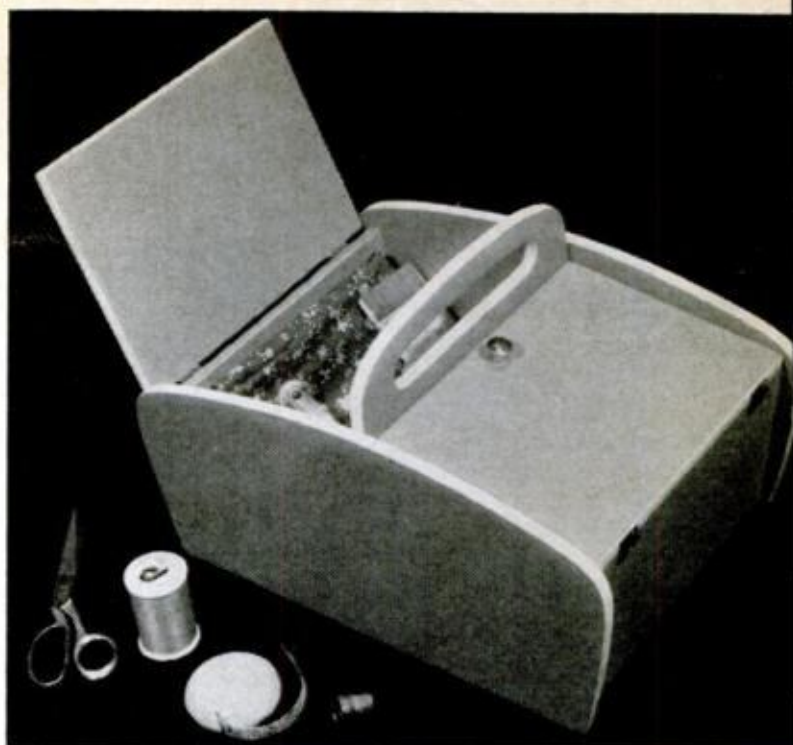
## Sewing caddy made from plywood

Sewing on a missing button or darning a hole in a sock is made a lot easier when needle and thread are kept handy in a little tote "basket" like this one. You can make it for about a dollar's worth of  $\frac{3}{8}$ -in. plywood, plus the cost of four brass hinges and a couple of screw-in knobs. Swing-up lids cover two roomy compartments which can be fitted with trays to corral pins, buttons, snaps and other elusive sewing essentials.

Bottom, ends and lids of the caddy are all of the same width, which simplifies the cutting and assures a perfect fit with the side members. The lids should be trimmed slightly less in width for paint and clearance. Both side members should be cut two at a time to assure identical size and shape.

A trick to follow when you're nailing the parts together is to drill pilot holes first in the side members for small nails. After you have the bottom glued and nailed in place, tack-nail a pair of temporary cleats to the inner surfaces of the sides to position and hold the center handle-divider and end members in place. Then apply glue to the parts, nail them together, remove the cleats before the glue sets and wipe off any excess glue remaining.

Apply the hinges and knobs for a trial fit, then remove them when you're ready to paint your caddy.



## Dominoes 'light up' centerpiece planter

This unique planter, which looks a little like a large building with lights on in its windows after dark, makes an attractive holder for a flower centerpiece—as well as a conversation piece in itself.

The "lights" are nothing more than the dots on dominoes that are attached with white glue in rows to the four sides of a cardboard or wood box.

You'll find that dominoes vary in size from brand to brand; the ones used here (Oragon) measure  $\frac{7}{8}$  x  $1\frac{3}{4}$  in. If you make a box following the dimensions given, it will require 24 dominoes to cover each face of the box, plus four more for legs.

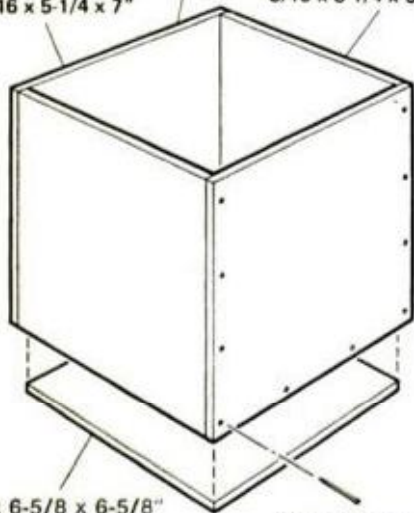
The edges and the four vertical corners of the box are covered first with black tape, such as Mystik, to keep them from showing. If you start out with a box made of thin plywood, the edges and corners can simply be painted black.

The dominoes are placed lengthwise in rows from corner to corner, but they are not lapped at the corners. A foil pieplate placed in the bottom of the planter will catch the drips if the planter is used to hold a live potted plant. ★★★



CORNERS AND TOP EDGES  
PAINTED BLACK

$\frac{3}{16}$  x  $5\frac{1}{4}$  x 7"       $\frac{3}{16}$  x  $5\frac{1}{4}$  x  $6\frac{5}{8}$ "



$\frac{3}{16}$  x  $6\frac{5}{8}$  x  $6\frac{5}{8}$ "  
BOTTOM

GLUED AND  
NAILED



Dominoes are placed in rows—three or six rows high and four or eight to a row. Corners are taped or painted black so the box won't show.

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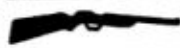
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**START.** Paying Business Small Capital. Free Information. Bayne, Box 321, North Hollywood, Calif. 91603.

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**BE COMPUTERIZED** Overseas For Very New Products Receive Details With Photos. House Of Russcar, 3908 West Franklin, Richmond, Virginia 23221.

**\$25,000.** Distributor—**GENERAL FOODS.** Write: Gourmet Products, 6601 Hillcroft, Suite 114, Houston, Texas 77036.

**HONG KONG** Manufacturer/Supplier List. New Compilation. \$5.00 Airmail. Eric Lee, Box 311 Tsatzemui Post Office, Hong Kong.

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**MAILORDER Opportunity!!** Operate own business using your imprinted catalogs. Instructions, sample catalog 25¢. Colvin House, Box 363PM, Lancaster, PA. 17604.

**PROSPEROUS Years Ahead!** Get a partner share; Write for brochure of item being manufactured. Dept. A-9, W.W. Mays, P.O. Box 1984, Philadelphia, Pa. 19105.

**MAKE MONEY** With Pantyhose. Guaranteed. Samples 2 pairs \$1.00, resell \$1.00 pair. Londons, 2017 Shafto, Ocean, New Jersey 07712.

**BIG PROFITS** Aerosol Compact Fire Extinguisher, Fix-A-Flat Details. Dunes 310-7A Southeast Parkway, Richmond, Indiana 47374.

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**EARN EXTRA MONEY** in your spare time mailing commission circulars. Free details. The Benmar Co., Dept. PM64, 216 South 23rd Street, Richmond, Ind. 47374.

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(Continued on next page)

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(Continued from preceding page)

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**BIG MAIL!** 25¢. Kennedy Mailing Service, Box 351, Selma, Alabama 36701.

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(Continued from preceding page)

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(Continued on next page)

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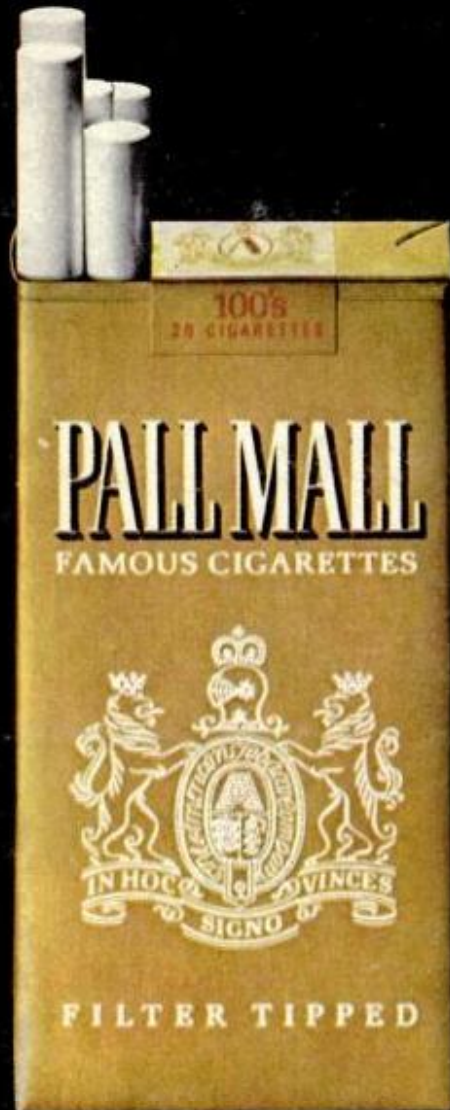


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