

AUGUST 1977 75 CENTS

# Popular Mechanics

**A master craftsman's  
10 most ingenious  
workshop ideas**

**CARS:** How to care  
for a cooling system

**■ Is leasing for you?**

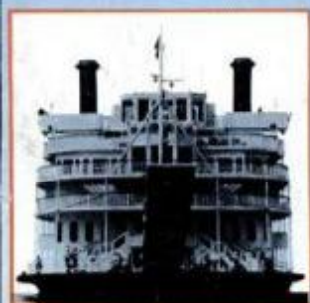
**PLUS:** Million-mile  
reports on Skyhawk  
and Grand Prix

**First look into  
Polaroid's instant  
movie cartridge**

**Easy step-by-step  
guide to fine  
DOVETAIL JOINERY**

**WEATHER RADIOS:  
Pushbutton reports  
when you want them!**

**Tomorrow's  
amazing trucks**



**Majestic  
new queen  
for the  
Mississippi**

**NEW:  
POWERED  
HANG GLIDING**

**Take off from  
your own back yard**





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cigarette. Taste Real...smoke natural.

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# Popular Mechanics®

AUGUST 1977

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VOLUME 148 NUMBER 2

INTERNATIONAL EDITIONS: AUSTRALIA, CARIBBEAN, MEXICO, SOUTHERN HEMISPHERE

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**On the cover**  
It's not as improbable as it might look. He's wearing a backpack powerplant that lets him fly his hang glider for many miles without landing and permits takeoffs from level ground without jumping off cliffs. It's the latest wrinkle in the wild and woolly sport of hang gliding.  
—Painting by Ed Valigursky.



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# HENRY MORGAN SAYS:

## "Good appliance repairmen are scarcer than doctors who make house calls."



Did you know that there are over a billion appliances in use in the United States today? And three repairmen. At least that's the way it seems when one of mine goes on the blink. With more than two dozen electrical gadgets in my house going snap, crackle and pop, I finally got tired of trying to locate a guy with enough ambition to take my money and I decided to learn how to make the repairs myself.

When a well-aged comic like me decides to go back to school, you can bet the family jewels it won't be back at P.S. 93. I'm going to learn at home, or not at all. So I sent away for NRI's home study course in Appliance Repair . . . and I took the course.

With a mechanical aptitude slightly below that of King Kong, I needed a course that started at the beginning and didn't move ahead too fast. Well, NRI did just that. They started with electricity—what it is and what it does—and went from there. You proceed at your own rate of speed. Whip through it if you want to, or take your time. What counts is the fact that you learn, in a way that it sticks with you.

You learn two things: how to repair appliances—from little one cylinder gas engines to refrigeration and air conditioning equipment; and how to get started in your own appliance business. That can mean money for you either way. If NRI can turn old ten thumbs Morgan into a reasonable facsimile of a repairman, think what they could do for you!

NRI's no fly-by-night outfit. They've been training men for more than sixty years . . . and they've had over a million students. It's the oldest and largest home study school in the field of electronics and electricity, so they know it better than anyone else around.

The NRI course is really easy to understand . . . with lots of pictures to show you what they're talking about. They even send you a professional appliance tester at no extra cost.

With the tester and a few basic tools you probably have already, you're ready to service most electrical appliances. After a few months, you'll be fixing your own appliances like I do, or you can start earning spare time money fixing them for your friends and neighbors. Before you know it, you can have your own full-time business and be independent.

Take my advice and clip the coupon. Even if you don't know which end of a screwdriver is the handle, they can give you real professional training that'll help you break into the appliance repair field. It's one of the few things I've ever sent for that was even better than they said it would be . . . so why not invest a postage stamp to see if it's right for you. The NRI catalog is free and there's no obligation. No one will knock at your door or bug you at home. NRI doesn't use salesmen. They don't need them.

Take it from Henry Morgan, the appliance repair field could sure use some good men. Now.

*Henry Morgan*

Henry Morgan

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ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

# "How a circular saw changed my life."

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

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

Like paneling to rip. Window cutouts to make. Shelves to trim. Studs to cut.

So he turns to one of our circular saws for help. To our Model 4511, for instance.

A lot of tool for \$32.99\*

7 1/4 in., 1 1/4 hp, 5,800 rpm, rugged. With ball-bearing construction for longer, smoother running. A big, wraparound base for extra support. Calibrated scales for fast, accurate depth-and-angle adjustments. Telescoping bladeguard and double insulation for maximum protection.

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

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

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

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

And a whole new way of living.

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

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

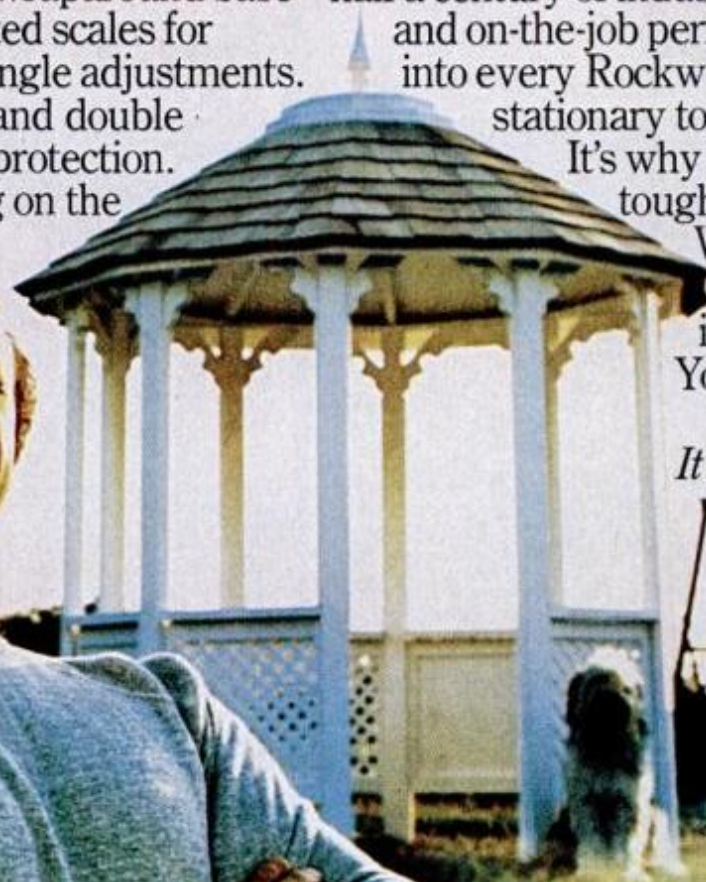
The reason is just plain good engineering. The kind that only comes with half a century of industrial experience and on-the-job performance. It goes into every Rockwell portable and stationary tool we make.

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

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

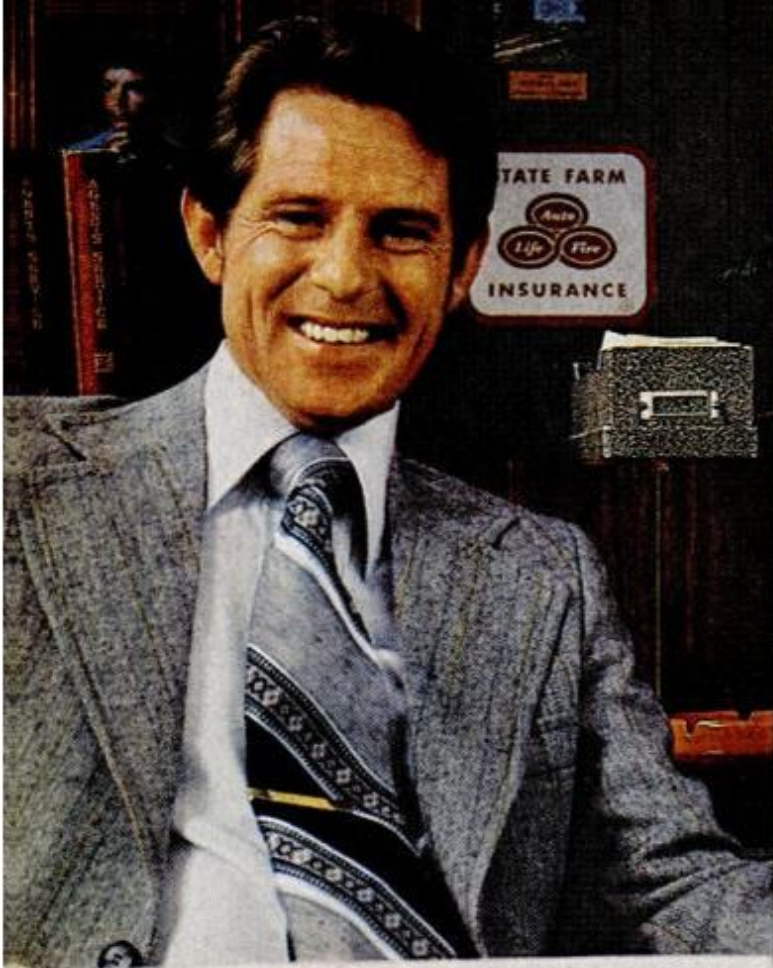
*Rockwell.*

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

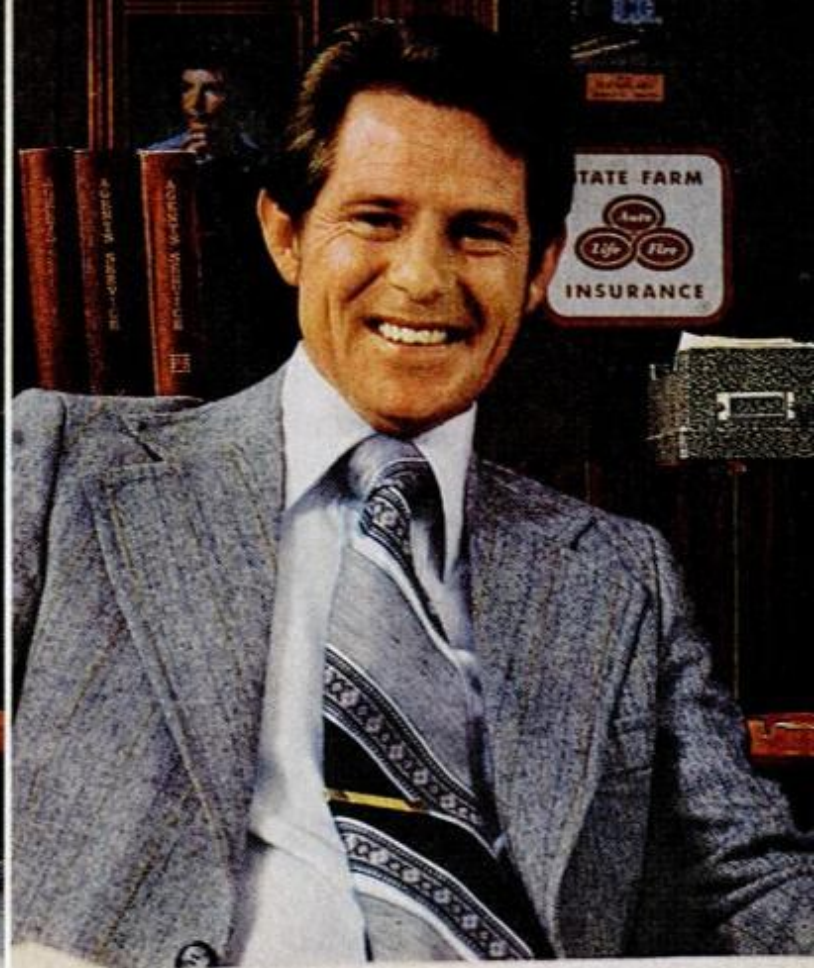


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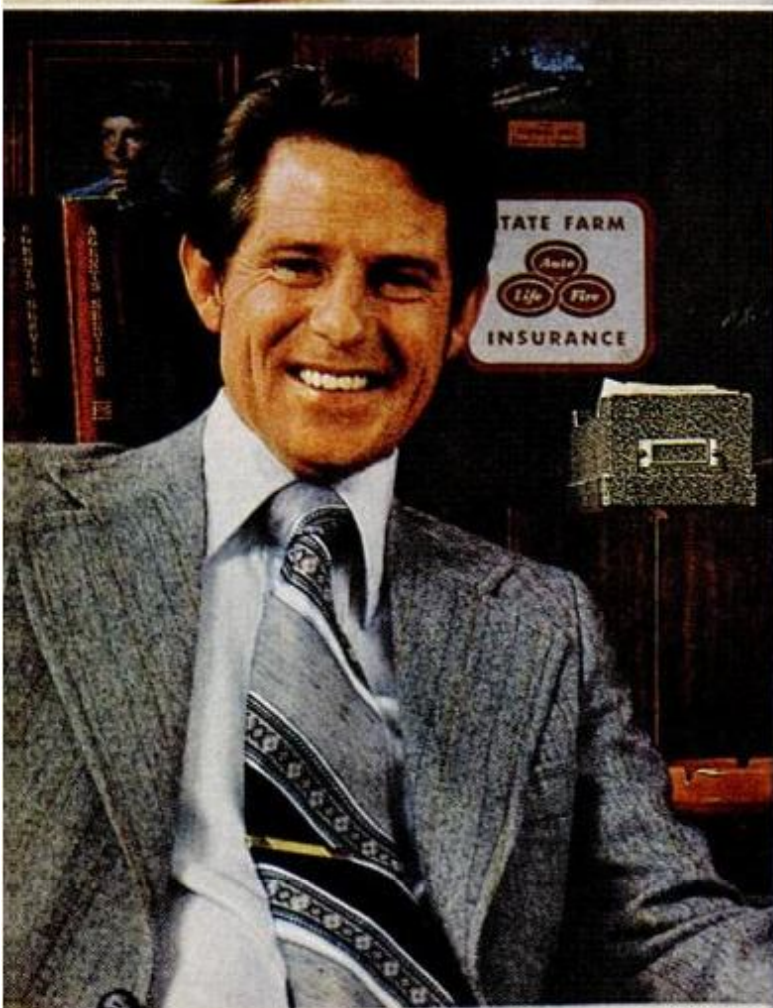
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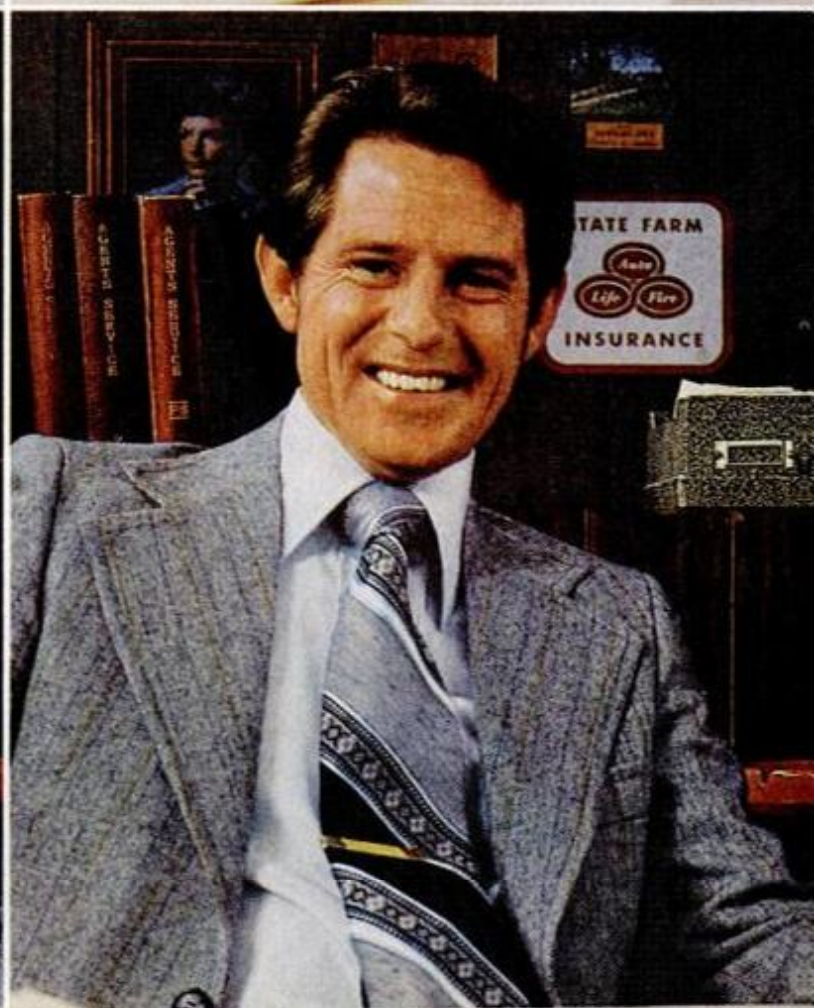
State Farm Life Agent Ken Clark



State Farm Auto Agent Ken Clark



State Farm Health Agent Ken Clark



State Farm Homeowners Agent Ken Clark



# There are four good reasons to see your good neighbor agent.

When Don and Vicki Cooper of Roseburg, Oregon, bought insurance for their home from State Farm agent Ken Clark, one thing led to another.

"I liked the coverages and felt good about being with State Farm," says Don. "But most of all, I liked the way he treated Vicki and me. We could tell he had our interests at heart."

Later, the Coopers decided to make Ken their life insurance agent. And then, their auto agent, too.

"It's a great convenience to have one agent handling the family insurance," says Vicki.



"If anything should happen, it's nice to know that all I have to remember is one name."

"And when you call him, you get a fast response," adds Don. "You know he's there, and you know he's working for you."

Ken says, "Knowing that families like the Coopers are well taken care of is very satisfying.

It's the most rewarding part of my job." There's a State Farm agent like Ken Clark in your neighborhood.

Check your Yellow Pages. And if you need help with your life, health, homeowners or auto insurance, call today. You'll be talking to four of the best insurance agents around.



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

STATE FARM INSURANCE COMPANIES Home Offices: Bloomington, Illinois

# HOW LONG HAS IT BEEN SINCE YOU FELT



# LIKE GETTING TO WORK ON TIME?

If you ever wake up thinking there must be a better way to make a living, you're right.

It's not just a matter of money. It's having a job you can look forward to in the morning. A job you can be proud of doing right, and that has some future to it.

That's where we at ICS come in.

We specialize in training you for challenging fields like air conditioning, auto mechanics, engineering, TV service, and electronics. Plus, we offer associate degrees in accounting, business, and various technologies.

We can train you for one of these fields at home. In about an hour a day. Without the hassle of a classroom. Without missing a paycheck.

Mind you, it won't be the easiest thing you've ever done. It takes motivation. It takes plain old-fashioned self-discipline.

But you get the texts it takes, plus help from our instructors every step of the way. Any special questions about your lessons, and you can call our Dial-a-Question® service from anywhere in the continental United States, any time. Toll-free.

Since 1890, millions have turned to ICS. We think we're good. And corporations like Bethlehem Steel, 3M, and Union Carbide think we're good enough to use in their own training programs.

We can't guarantee you a job or a raise. No school can. But if you see the value of having a solid skill you actually enjoy using, we'll send you a free career booklet and demonstration lesson, with no obligation.

Check the field that interests you. Or are you going to spend the rest of your life being turned off by your alarm clock?

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## College degree programs:

The ICS Center for Degree Studies is authorized by the Pennsylvania Department of Education to offer career programs leading to Associate in Specialized Business and Associate in Specialized Technology degrees.

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# LETTERS TO THE EDITOR

## Car Care comments

Congratulations! Your *Car Care Guide* (May '77) is comprehensive, well written and illustrated. This one and the four previous guides can help upgrade our worldwide maintenance and repair program.

L. CURTIS SMITH, CHIEF, VEHICLE  
PROCUREMENT, U.S. DEPT. OF STATE

My compliments to the editors and artists on an outstanding presentation of the *Car Care Guide*. I am a high school teacher in special education and I consider the section a terrific way in which to teach reading, math, spelling, etc. to high school students.

MRS. PATTI GAWNE  
GRAND HAVEN, MICH.

## That's the spirit!

Enjoyed your presentation of Lindbergh's *Flight to Remember* (page 81, May '77). The Long Island Early Fliers Club also has a Ryan replica of "The Spirit," used in the film *Spirit of St. Louis* starring Jimmy Stewart. Lindbergh was technical advisor and flew the replica on many occasions during the filming.

ANTHONY URAVITCH  
SOUTH FARMINGDALE, N.Y.

## Don't hang-glide the Dunford

Your item on the Dunford flying machine (page 28, May '77) says it "can be used for hang gliding." Such use would be dangerous as the product is designed to be controlled from the ground. To support the weight of a human is not recommended. As U.S. manufacturer of the Dunford, however, we appreciate the mention.

E.J. BIDERSON, PRODUCT MGR.  
COX HOBBIES, SANTA ANA, CALIF.

*Our information came from a foreign source and was misleading. It indicated that with accessories the kite could serve as a "mini-Rogallo hang glider." If you own a Dunford, however, DON'T try to hang-glide it.*

## PM carriage houses popular

We were surprised to see the picture of the carriage house that Jim Kauffman built in your June '73 issue. My name is Tom Kaufman and I also built a carriage house last year. With used lumber on the rough-in, and rough-cut cedar for

the siding, it cost me around \$950. We really enjoy the extra storage



Bob Hall's carriage house (top) is an oversized version. Tom Kaufman's is rough cedar; looks like Jim Kauffman's

space and have received a lot of compliments.

TOM KAUFMAN  
SHAWNEE MISSION, KANS.

Some time ago I purchased plans from you for a carriage house and I've enclosed a picture of the finished product. We chose gold siding and a black roof to match our home's colors. The only change we made was to increase the size to 12 by 20 feet. We enjoy our little house very much, have had many compliments from family, friends and neighbors, and wanted to share this experience with you.

ROBERT HALL JR.  
DOWAGIAC, MICH.

*For your own set of Carriage House Plans, send a check or money order for \$3.95 to: Popular Mechanics, Dept. JL, Box 1014, Radio City Station, New York, N.Y. 10019. If you need two sets of plans, one for your local building department, send \$5.49.*

## Setting racket record straight

Correction, please, in the article on tennis rackets (page 94, May '77).

Vic Braden does not own or operate a tennis complex known as Tennis-University. Dennis Van der Meer is the founder and president of the TennisUniversity, which is a registered trade name.

DONNA SHERMAN  
OPERATIONS MANAGER  
VAN DER MEER TENNISUNIVERSITY  
OAKLAND, CALIF.

*Sorry. Braden's establishment is the Vic Braden Tennis College.*

## Bouquets for space artists

Your article, *Energy From Outer Space* (page 98, June '77) sure made a spectacular spread. What's more, the article was really interesting. It's good to know that we are working on replacements for fossil fuel energy sources. Those pictures helped to explain how the systems will work. Does PM's art staff do that work? If so, they should be congratulated.

LOGAN BUSH  
SCRANTON, PA.

*Our art department does some of the illustrations you see in PM. In this case, congratulations are due the editors of Grumman Aerospace's Horizons Magazine, and of a booklet published by Boeing. They let us use photo copies of their original artwork, and they should have been credited. We regret the omission and are glad that you brought up the matter.*

## Watch those fingers

In your article *Chef's Knives You Can Make* (page 108, Feb. '77), the hand holding the sheet stock under the drill press reminds me of when I did that on my first machine shop job and wound up flat on the floor, backhanded away by an old-timer. He held up a hand with two fingers missing. I worked there only two years, but left with all my fingers. Clamping a piece of wood to the table as a backstop, or clamping the blade, will save fingers.

TARRELL N. TOWLE  
CHESTER, N.H.

*Mr Towle is correct. Sheet stock should be clamped in place before it is drilled—and knife blades in particular.*



**25** MPG | **17** MPG | **20** MPG  
 HIGHWAY | CITY | COMPOSITE

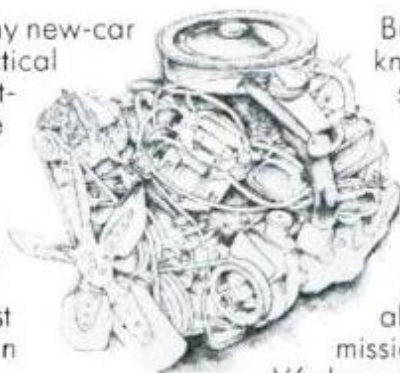


## Your friends may think you bought a Cutlass Supreme for looks. But in your heart, you knew it was for Supreme's practicality.

In a time when many new-car buyers are so practical minded, it's interesting to note that the stylish Cutlass became the best-selling mid-size car line in America during 1976 — and Supreme is the most popular Cutlass in history.

No question about it, Cutlass Supreme's head-turning style has a lot to do with its sales success. It's the first thing people notice. That classic profile. That formal roof. That handsome, distinctive grille.

Is it any wonder your friends may think you bought your Supreme for looks?



But you know better. You know there's a practical side to Supreme that's very appealing these days.

### Example #1: Gas mileage.

EPA mileage estimates for a Supreme with available automatic transmission and standard 231

V6 show an impressive 25 mpg on the highway, 17 mpg in the city. Of course, your mileage may vary, depending on how you drive, your car's condition and equipment. (EPA estimates are lower in California.)

### Example #2: Maneuverability.

Supreme's maneuverability makes it easy to get around in traffic. Easy to park. Easy on turns. To

put it another way, Supreme is just plain fun to drive.

### Example #3: Resale.

It's as simple as this. Currently, Supreme has been returning a higher percentage of its purchase price than any other competitive mid-size car in its field.

All that, in a car that's surprisingly easy to afford in the first place.

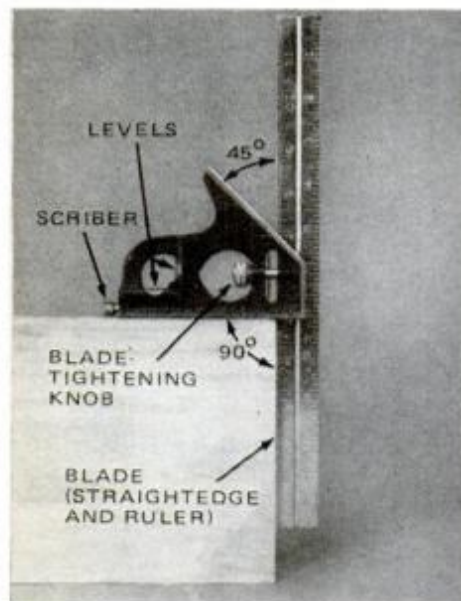
Olds Cutlass Supreme. You bought it for practicality instead of looks. Or was it vice versa?

*Oldsmobile*

**CUTLASS SUPREME**  
 Can we build one for you?

# WORKSHOP MINI-COURSE

## USING A COMBINATION SQUARE



Though there are a number of special-purpose squares now available, the combination type is the first you should buy for your toolbox. In fact, because of its versatility, it may even be the only square you'll ever need. Besides giving you instant ability to produce perfectly square 90° angles, as you would with a try square, a combination square will let you:

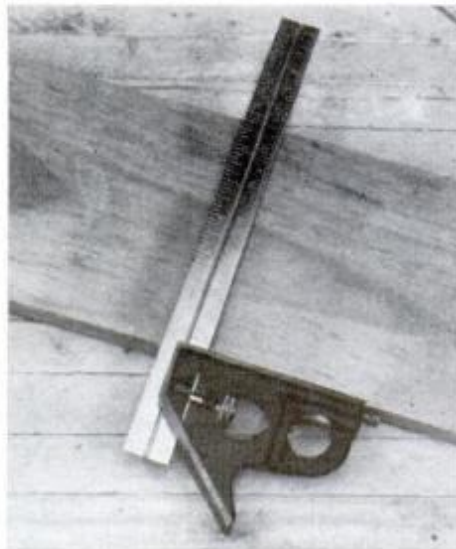
- Create 45° angles (see photo below) by butting its 45° shoulder against the workpiece.
- Use its blade as a ruler or metal straightedge (when making critical cuts with a utility knife).
- Mark accurately because the blade is adjustable. To do it, the



Versatile combination square performs many functions, including this more familiar one—the marking of a miter cut.

tightening knob is loosened, and the blade moved to the desired projection and locked there by re-tightening the knob. The 90° shoulder is then held firmly against the edge of the workpiece and, with a pencil run alongside the blade's outboard end, drawn along the workpiece to mark the desired width.

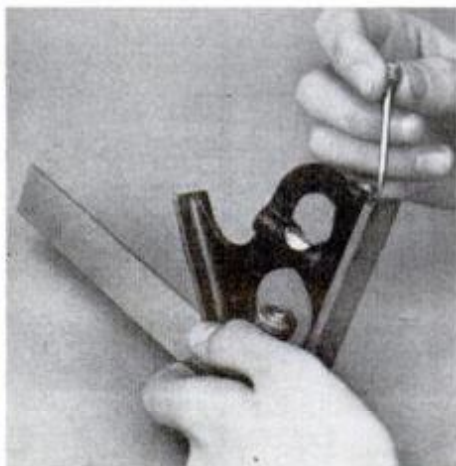
- Draw super-accurate marks, using the scriber that comes in the square's handle—instead of a pencil—to produce a same-width line along its entire length. The scriber is held in its pocket by force fit and is always at hand for such tasks.



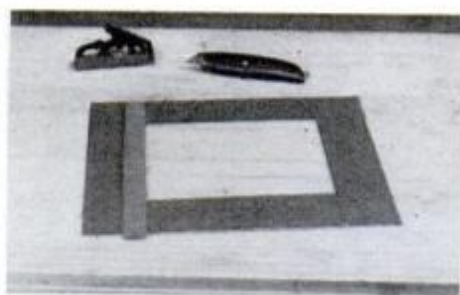
90° shoulder is butted against workpiece when a square cut is wanted. Movable blade is extended to suit board width.

- Though I would not recommend using the combination square's spirit levels for checking long work, such as a course of brick, they are useful for quick readings on small jobs. Since the two bubbles are placed at a 90° angle to each other, you can determine accuracy in either a vertical or horizontal plane (plumb and level).

Considering all that the tool can do, the combination square is—for roughly six bucks—indeed a buy.



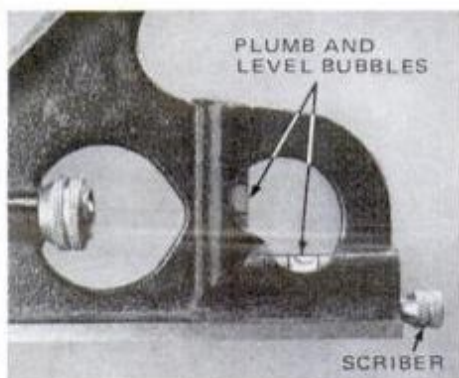
Scriber is neatly tucked into handle. It can be used, along with blade as a guide, to mark accurate lines on wood or metal.



Still another use: When removed from the handle portion, the blade becomes a steel straightedge for cutting matboard.

The first rule when buying a combination square is to choose only a well-made tool from a reliable manufacturer. Make no mistake about it, there are poorly made versions about—these frequently displayed as leader items with extra-low price tags. Avoid these “bargains”—in the long run you will be glad that you did.

The combination square needs very little care. Actually, avoiding abusive treatment and minimal



Pair of spirit level bubbles installed at a right angle to each other give plumb and level readings for small tasks.

cleaning is all that's required. An occasional wiping with a clean, lint-free cloth impregnated with several drops of light machine oil is adequate. If the square has been subjected to excessive amounts of sawdust—such as in a toolbox parked beneath a pair of sawhorses where you've been doing a lot of cutting with a circular saw—remove the blade from the handle and use a compressor to blow dust out of the blade-holding slot. Also, use the cloth to remove any dust accumulations in the blade's groove. Given care, a quality combination square will last for a lifetime.—Harry Wicks, Home and Shop Editor

Your light truck may be getting by on passenger car tires. Which are fine if you can avoid serious hauling jobs.

But long or heavy hauls have a way of popping up unexpectedly. That's why Firestone tire engineer Steve Petrasek rides on and recommends a truck tire like

Steeltex for you.

Steeltex gives you all the advantages of a steel belted radial: smooth ride, good hauling, long mileage, fuel economy and no "flat spotting." But Steeltex was designed especially for light trucks so it's got something extra: the same steel cords

we use in our heavy duty radial truck tires. And a body of polyester cords stronger than any we put on a passenger car tire.

Ask your Firestone Dealer if your light truck is approved for radials. If he says yes, then you'd do well to say yes to Steeltex.

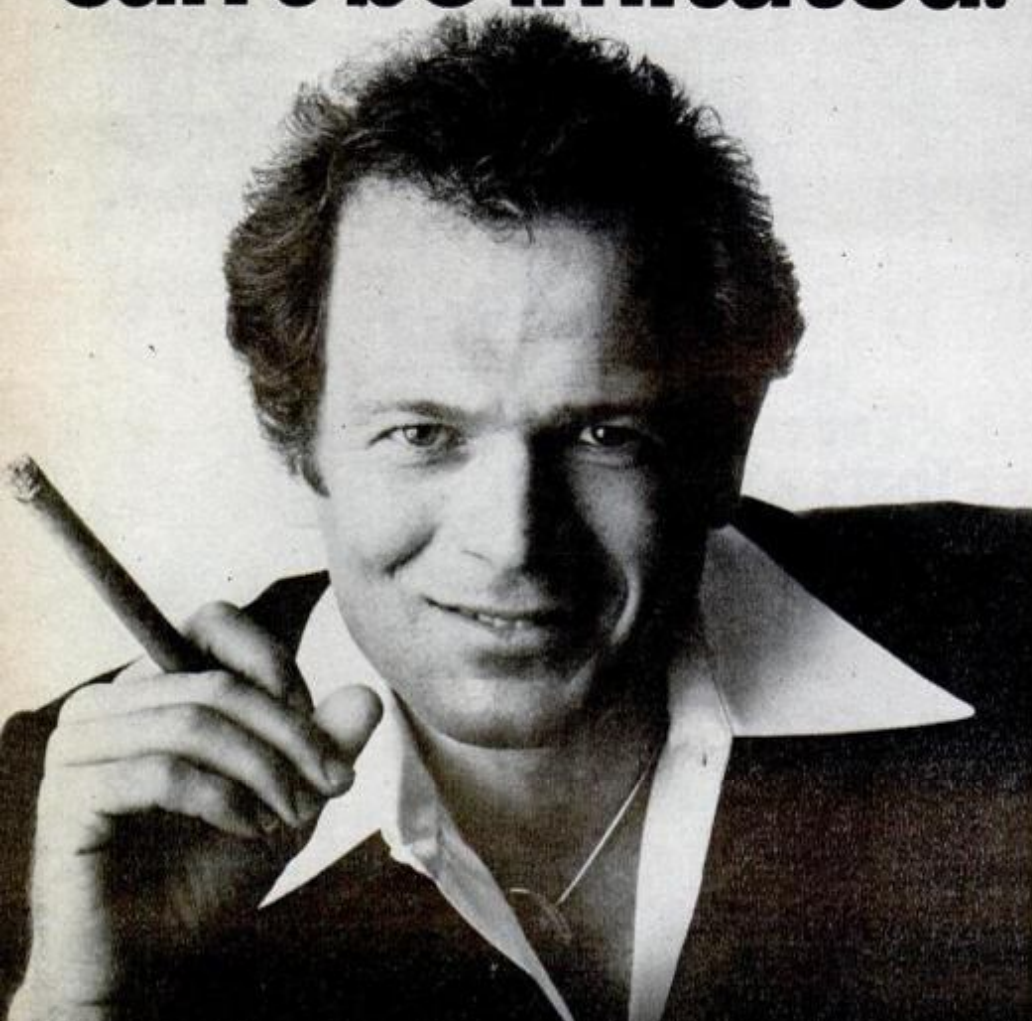
**Steve Petrasek  
never knows what  
he'll need his pick-up for.  
That's why he rides  
on Steeltex® Radials.**



**Firestone**  
STEELTEX® RADIAL

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STEEL BELTED RADIAL TRUCK TIRE BUILT  
ESPECIALLY FOR YOUR LIGHT TRUCK.**

# A&C Grenadiers can't be imitated.



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What makes A&C Grenadiers so special? Maybe it's the long, sleek shape. Or the time-tested blend of aged, rich-tasting tobaccos. Or the choice of imported wrappers: dark Cameroun or light. Try an A&C Grenadier and see for yourself.

One thing is for sure—there's only one beautiful smoking experience. A&C Grenadiers.



## Pull posts with your auto jack

**Y**our bumper jack can save you a lot of digging and back strain when you're pulling either wood or steel fence posts.

Fasten the center link of a short length of chain to one side of the wood post with a spike or small cold chisel. Snug the jack up close to the post, with its base resting on a sturdy piece of wood. Bring the ends of the chain around the post and hang them on the jack's lifting hook. Pull outward on the top of the jack as you lift the post until it's high enough to topple over.

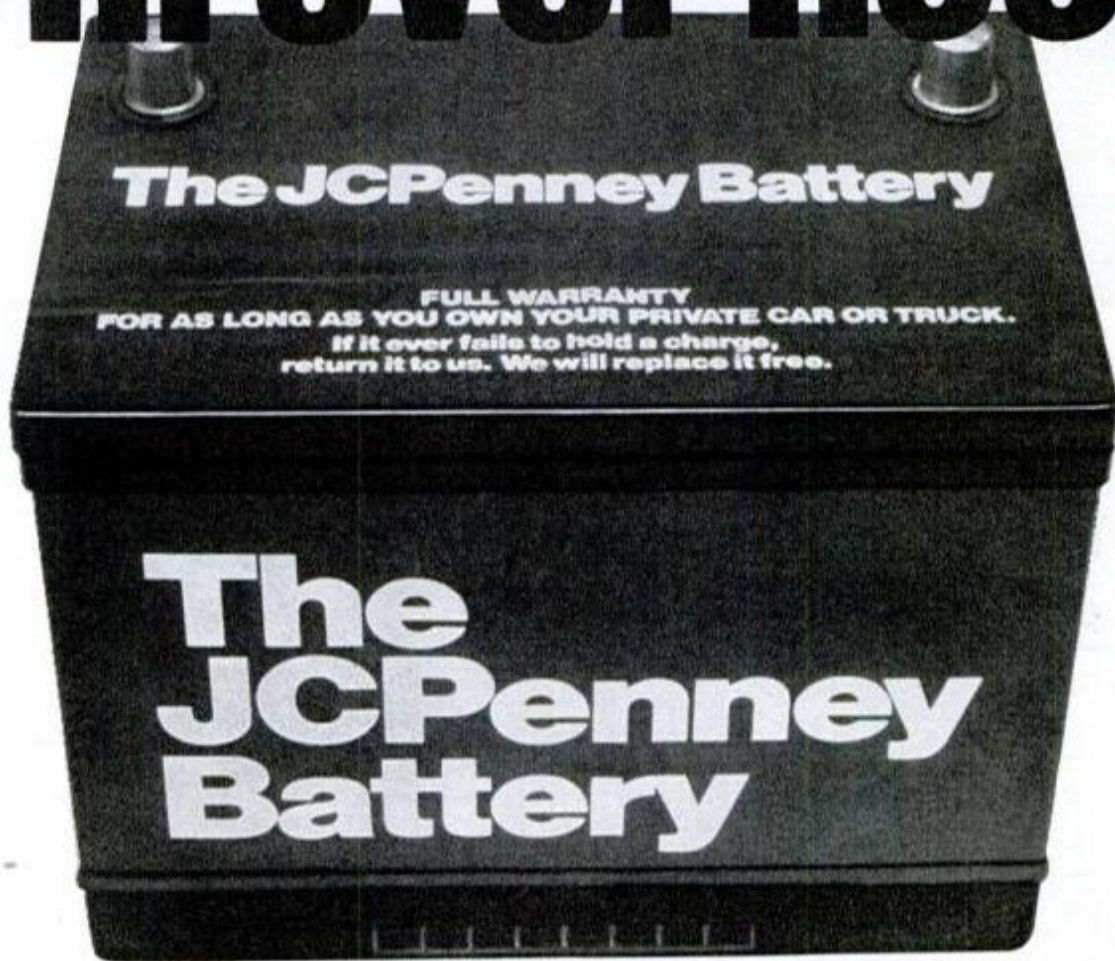
In hard ground, dig out around the post until you can loosen it. If you can't hook the links, fasten the chain ends with a nut and bolt and hang the chain on the jack. To lift a steel post, use chain with small links and wrap it around the post several times to provide a grip.—*E. J. Steward*



Chisel and chain—with links hung on the jack's lifting hook—connect post to jack.



# The last battery your car will ever need.



This is the JCPenney Battery. The one that started a revolution in car batteries.

It never needs water. It has more starting power than any other battery you can buy. And it's fully warranted for as

long as you own your car. If it fails, return it. We'll replace it free. Can your present battery match all that?

Available only at JCPenney Auto Centers or catalog desks, \$55.00 with trade-in.



The brick design flooring is from Armstrong's easy-to-install Premier Sundial group.

## Shoot down this new floor covering with a staple gun

**H**ere's a handsome flooring that's a cinch to install. And it has extra advantages: a shiny no-wax surface and a comfortable built-in cushion. The flexible flooring is Premier Sundial made by Armstrong Cork Co. It comes in 6 and 12-ft. widths in two patterns: brick and a Mediterranean design, and costs about \$13.50 a square yard.

You can fasten Premier Sundial to wood subfloors or even to other resilient floors just by stapling it with heavy-duty staples along the border

of the room. To secure it over concrete, simply apply a narrow band of special cement to its edges—no need to spread adhesive over the entire floor.

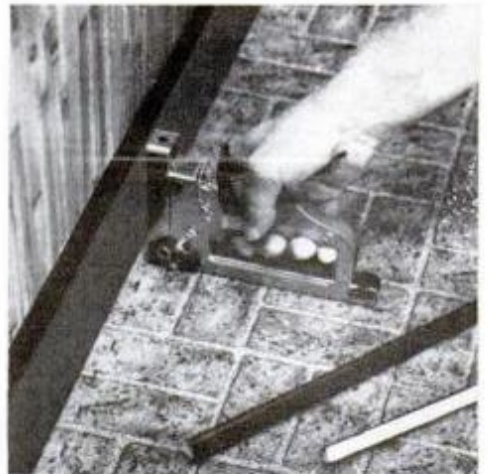
The maker claims other benefits for Premier Sundial over other flooring: 1. There's less subfloor preparation. The cushion eliminates the need for most subfloor sanding, patching and leveling. 2. Installation disruption to your room is briefer. Just position, cut and staple the covering in place. 3. If you install it over wood



The first step to install seamless flooring is to position it in the room.



Second, trim the material along the room edges with a knife and straightedge guide.



Third, staple the flooring every 3 in. Quarter-round molding hides the staples.

or particleboard subfloors that expand and contract from changes in humidity, Premier Sundial will move along with the subfloor to stay taut. A completely bonded floor will crack under severe stretching. 4. In most cases you can cover your subfloors with one piece of material. If two pieces are needed, Armstrong has a sealant to join them.

The covering is reported to hold a gloss longer than ordinary vinyl. A sponge mopping at regular intervals will keep it glowing ★★★

# Why it may be cheaper to spend a little more for a new John Deere Chain Saw.

If you know anything about John Deere, you know we never cut corners on quality.

So our new chain saws, like most John Deere products, cost a little more than some others.

But consider what you get. An isolated engine on 40V, 50V, 60V and 70V saws absorbs vibration, makes your cutting job easier and less tiring.

A sprocket-nose guidebar with chisel or semi-chisel chain that chews through even the hardest of woods. (You'd be surprised how quickly "bargain-priced" saws bog down when the going gets tough.)

Quality design and workmanship that helps keep John Deere Chain Saws running trouble-free.

A powerful air-cooled engine. An automatic oiler. And, on "V series" saws, extra safeguards like: a molded plastic handguard... a special "chain-catch" to protect you if the chain should break... and a throttle/trigger interlock lever that must be held down before the chain will engage.

Few manufacturers put so many pro-quality features into their saws.

Granted, it may cost you a few dollars more now.

But chances are you'll save money in the long run.



**Nothing Runs Like a Deere®**



Choose from 5 all new John Deere Chain Saws, ranging from lightweight to professional models.

For free folder, write John Deere, Box CS, Moline, IL 61265.

# Opel makes news.



## The results of the Buick Opel 5-Car Showdown are in! Opel finishes...uh...2nd.



A lot of car makers compare their car to other cars.

We compared our car *with* other cars.

In a daring, fender-to-fender competition called The Buick Opel 5-Car Showdown. In it, we pitted our Opel against four better known competitors in point-by-point, side-by-side, independently supervised tests of acceleration, cornering flatness, parking-lot maneuverability, pulling power, gradability, and a few other areas. In short, some of the things you'd like to know when you go out to shop for a car.

It was a bold move. After all, what if we didn't win?

Well, to make a long story short—we didn't. When all the tests were completed and all the figures tallied up, Opel finished second, right behind VW Rabbit. You can imagine how thrilled we were. But look at it this way: in order to finish second overall, we had to beat Toyota Corolla, Datsun B-210, and Subaru DL in a number of instances. (And in some areas, we beat VW, too, as you'll see.)

Which is a victory. And not just a moral one.

You see, we know Opel is a little dynamo of a car. But apparently no one else did. Because it seemed that whenever anyone went out looking for a practical little import, they looked real hard at the other cars in the Showdown. But hardly ever at ours.

So we wanted to show that Opel could hold its own against its famous

competitors. That it should definitely be considered when you wander out to shop.

In other words, we were confident Opel was good enough to take on this competition.

### Opel announces 4-doors.

Then we went one step further. And made Opel good enough to take on your family. By offering you our new, just-introduced-in-this-country Opel 4-door Sedan.

After all, if you've got a family (or maybe some friends you like taking along on spirited spins around the countryside), you need to carefully examine a car's ins and outs. So we gave you two more.

Easy come. Easy go.

Final Test Results	VW Rabbit	Buick Opel	Toyota Corolla	Subaru DL	Datsun B-210
(Showdown Point Summary)					
Interior Noise	5	5	5	5	5
EPA Interior Room Estimates	5	3	4	2	1
EPA Trunk Capacity Estimates	5	3	2	4	1
Pulling Power (30mph 3rd gear) (55mph 4th gear)	3	5	4	2	1
Parking Lot Maneuverability	3	5	4	2	1
EPA Mileage Estimates	3	2	4	4	5
Estimated Range	2	3	5	5	4
Maintenance Stops* (Recommended)	5	3	4	2	4
Acceleration (0-55mph) (30-70mph)	5	4	3	2	1
Gradability** (30mph 3rd gear) (55mph 4th gear)	5	4	3	3	2
Cornering Flatness**	4	5	3	4	5
Steering Quickness	5	5	5	4	5
<b>Grand Total</b>	<b>50</b>	<b>47</b>	<b>46</b>	<b>39</b>	<b>35</b>

\*The less frequent the number of visits over 37,500 miles of normal driving, the higher the score. The number and type of inspections, adjustments and replacements would vary by visit.  
\*\*Based upon opinion that less lean is preferable to more lean.  
\*\*\*Includes vehicle weight.  
In California, Opel placed second on an overall basis. Individual test results vary from those shown above.  
See your Buick Opel dealer for complete details.



# Opel makes sense.

## You can learn a lot from a test drive.

Or even a test-sit.

That will let you experience our body-contoured vinyl seats. Seats tailored for comfort and good lateral support. With seatbacks that adjust.



It'll show you—in one quick glance—how easy it is to read Opel's well thought-out instrument panel, and reach Opel's well-placed controls.

And it will reveal (most abundantly) Opel's thick, standard pile carpeting (one more way this small car lives up to its Buick name). Perhaps even startle you with an amazing sight in small cars these days: a real glove compartment... that locks.

What you will most certainly notice first, though—if you happen to be sitting in the driver's seat of an Opel Deluxe Coupe—is that you're not just looking at a bunch of warning lights. But gauges. A tachometer right next to the speedometer. An oil-pressure gauge. An ammeter. An electric clock with a second hand. All standard. To let the enthusiast in you keep a close eye on the kind of response you're getting from that gutsy 1.8 litre dynamo under the hood.

But to really feel how Opel goes on the road, you should really feel it. On the road.

And, oh, what a feeling.

## Opel performs.

Indeed it does. As the 5-Car Showdown will testify. First of all, in tests of cornering flatness and steering quickness, none of the competitors out-ran Opel. And in tests of acceleration and gradability, only the VW Rabbit (a car much-ballyhooed for its fuel-injected engine) was able to nose out our Opel for top honors.

Opel's strong showing in these areas isn't surprising when you consider its own accoutrements. Like the dynamic overhead-cam, 4-cylinder hemi engine. Four-coil-spring-suspension. Front stabilizer bar. Rear track bar. Floor-mounted, full-synchronized, short-throw, 4-speed manual transmission (with 5-speed and automatic available). Rack-and-pinion steering. And lots more.

Nevertheless, it still may surprise you. But then, up to this point, maybe you haven't considered Opel.

Maybe you should.

## More than just mileage: range.

When you do consider Opel, you'll find it quite considerate of you. With EPA mileage estimates of 36 mpg on the highway and 23 mpg in the city. (The actual mileage you get will vary depending on the type of driving you do, your driving habits, your car's condition and available equipment. Estimates lower in California.) But don't stop there.



You won't have to. Because with Opel's 13.7-gallon gas tank (largest of any of the cars in the Showdown, by the way), its estimated range is about 350 miles.

(By the way, this range estimate is a function of both gas tank capacity and miles per gallon, and is based on multiplying the EPA combined estimate, which is 27 mpg, by gas tank capacity. Actual range may vary.)

## The best news of all.

If by now our intrepid little Opel is beginning to sound like an intriguing proposition, let us suggest you hurry to your Buick Opel dealer for further consultation.

Not only will he give you a brochure with complete details on the 5-Car Showdown, he'll be happy to provide you with one of those revealing test-drives we mentioned.

And, of course, he'll show you how very affordable Opel is to buy.

Come on, now. Any car with this much going for it is at least worth considering, isn't it?



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FAST... THROUGH OUTSTANDING MERCHANDISE!

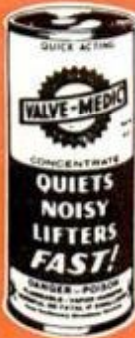


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Regular No. 1 — The Super Penetrant that loosens rusted nuts, bolts, and parts in seconds.

### BEARIN' SEAL

Stops oil leaks in front and rear main bearing seals. Add to crankcase oil... mixes with all motor oils... will not harm engine parts. Stops oil drip and waste.



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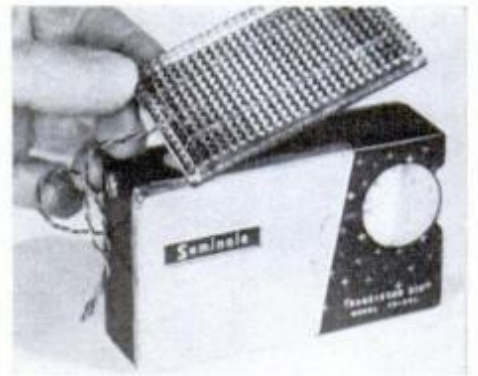


### Safety face guard

With his head surrounded by a protective grid of soft polyvinyl chloride, Junior's face is well insured against damage from football-shoe cleats, hockey sticks, flying pucks, foul baseballs, falls from bikes and similar mishaps to which the faces of active children are subject in the course of a day's normal rough and tumble. The helmet was designed by a Korean authority on karate who specializes in body protectors for a variety of sports. The strap-on unit is donned from the rear, like a mask. Cost is \$24, from Nor-Man Kung-Fu, Ltd., 6362 Stenton Ave., Philadelphia, Pa. 19138.

### Sun power for radios

Cardlike solar cell simply plugs into the snap terminals on your transistor radio. Then put it under a 100-watt or brighter bulb—or sunlight. \$21. Stock Sales, Box 606, Mineola, N.Y. 11501.



### Ultralight sleep rack

Mummy-style, six-foot quilted sleeping bag takes 22x72-inch air mattress that fits a 3 1/2 x 9-inch stuff pack. Total weighs less than five pounds. Bag is \$75; mattress, \$35. From Air Lift Co., 2217 Roosevelt Ave., Berkeley, Calif. 94703.



### Experimental super-cab

The ultimate in taxicabs, recently prototyped by Volvo engineers, includes right-side sliding door that won't block sidewalks, padded drop-bar for unbelted riders, bulletproof driver cabin, ramp and slot for wheelchair, luggage bin beside driver, and built-in desk, lamp and mini refrigerator. Vehicle has front-wheel drive, 40-foot turning radius, impact-cushion bumpers, side rub-strips.





# You can turn the CB boom into income... with NRI's Complete Communications Course

**NRI can train you at home for a part-time job or a full-time career in communications.**

The field of communications is bursting out all over. More than 25 million CB sets are in operation with millions more being sold annually. That means countless careers in design, installation, and maintenance. Start training at home now, the NRI way.

**Get your all-important FCC License.**

FCC rules require that CB transmitters be serviced only by the holder of a First or Second Class FCC Radiotelephone License, or under the supervision of a license holder when the transmitter is connected to a "radiating antenna." NRI will give you the necessary training to get that all-important First or Second Class FCC Radiotelephone License so that you can qualify for one of the many available openings.

**Learn on your own 400-channel digitally-synthesized VHF Transceiver.**

The 48-lesson NRI Complete Communications Course teaches you to service and adjust all types of two-way radio equipment (including CB), using the one unit that is best equipped to train you for CB, Commercial, and Amateur Communi-

cations...a "designed-for-learning," 400-channel, two-meter VHF Transceiver and AC power supply. Then we help you get your FCC Amateur License, with special instructions so you can go on the air. The unit can be mounted in your car, or you can use it as a base station.

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

TM McGraw Hill CEC



**CB Specialist's Course also available.**

NRI now offers a special 37-lesson course in CB Servicing. You get your own 40-Channel CB Transceiver, AC power supply and multimeter, for hands-on training. Also included are 8 reference texts and 14 coaching units to make it easy to get your Commercial Radio-tele-

phone FCC License—enabling you to test, install and service communications equipment.

**Over a million have enrolled with NRI.**

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



If insert card has been removed, write:



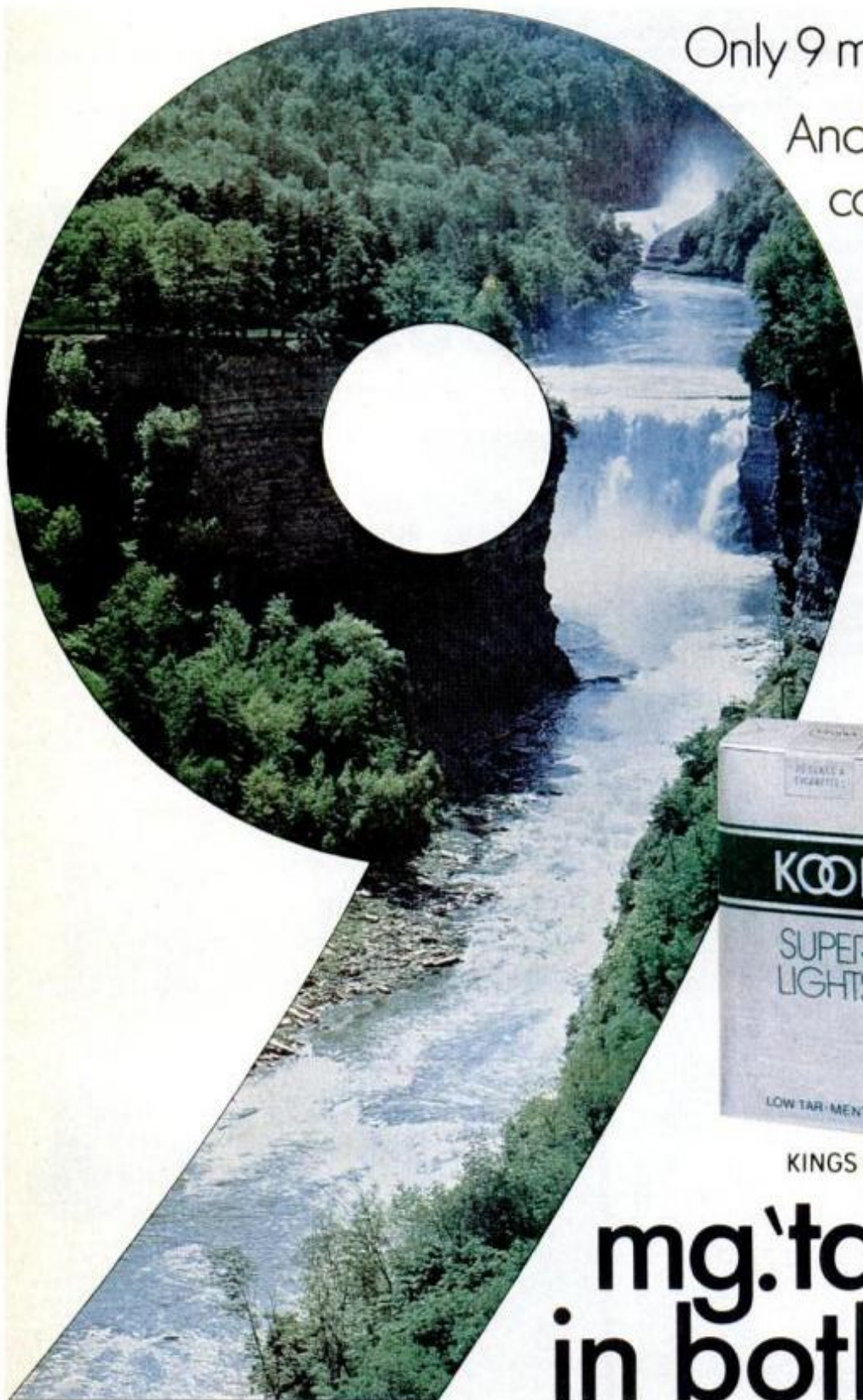
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Only 9 mg. "tar" in both sizes.

And KOOL's refreshing coolness, too.

At last, a low "tar" menthol cigarette with satisfying taste.



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## mg. 'tar' in both sizes.

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

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

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# HOMEOWNERS' CLINIC

## QUESTIONS ANSWERED

### Adding attic insulation

*My two-story home has 3 in. of blown-in insulation in the attic; I would like to add another 3 or 4 in. There's no vapor barrier, of course, and it was suggested that ceilings of rooms below be prime-painted with one coat of aluminum paint. Will this be effective?—R.H. Griffiths, Western Springs, Ill.*

Painting the ceiling is an alternative. So is removing the present insulation from half the ceiling, installing 3½-in. batts with vapor seals, replacing the loose material and treating the other ceiling half likewise. Both alternatives entail considerable labor and time. I tend to doubt the value of either.

Your present insulation should have an R-value of 6 to 11, depending on type. I'd suggest placing 6 in. of fiber blanket, over what you now have. It would give you a factor of about R-30 in your area. The R-value will be specified on the insulation package. Also be sure you have proper ventilation—vents on two sides of gable roofs.

### Blow insulation into walls

*To save heat I've considered having insulation blown into the walls of my home. Sound procedure?—Edward J. Godin, Attleboro, Mass.*

The method is widely practiced. However, the Energy Research and Development Administration questions the real value of blown-in wall insulation as there are always resulting gaps. It would be better to concentrate on ceiling insulation where the major heat loss occurs.

If you do decide to insulate the walls, be sure to get bids from two or three contractors. Getting a list of their customers will also help you check that the contractors are reputable and do good work.

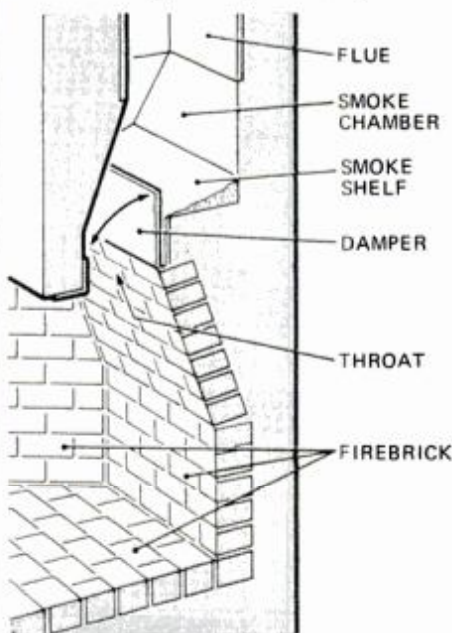
Also determine who will patch the holes after insulation is blown in and how complete the patch job will be.

### Do-it-yourself fireplace

*I plan to build a masonry fireplace by myself. I'm told it's only for the skilled craftsman, but I'm determined to try. All my questions have been answered except one—what is a smoke shelf and where is it located?—Edwin Love, Jefferson City, Mo.*

You've planned quite a chore. The smoke shelf can be located as in the drawing which shows a cutaway view of the conventional masonry fireplace. It's usually about 6 in. deep and extends the full damper width.

The design of your fireplace is



Conventional masonry fireplace.

all-important. It must be proportionally designed to assure you of a good draft. Size of the throat, effective flue area and firebox height, width and depth are all relative to each other. The flue should be about 1/12th the area of the firebox opening (height times width).

Chimney size should also be carefully considered. On a house with a peaked roof, the chimney should be at least 2 ft. above the ridge; for flat or slightly pitched roofs, the height should be 3 ft.

### Control of a hot situation

*The flow-control valve (Bell & Gossett) in my house hot-water heating system has two settings: One setting engages a valve so the hot water flows only through the heat-*

*ing system when the system circulator is on; the other setting opens the valve and the hot water is free to flow by "gravity" or circulator.*

*Which setting is more economical in the winter—the control setting or the gravity setting? (I know if I leave the valve open in the summer, I'll heat the house.) Hot water for the kitchen and bathrooms is heated by a hot-water coil in the furnace. Hot water will flow constantly either by "gravity" or by circulator pump when the valve is open.—Chris Heinbockel, Huntington Station, N.Y. 11746*

The gravity setting should be used only in emergencies when the circulator, thermostat, or relay malfunctions and the circulator becomes inoperative. If the gravity position is otherwise used, there will be no control of heat delivered and the result will be overheating and a waste of fuel.

The purpose of a flow-control valve is to prevent gravity circulation in a hot-water heating system. Circulation is only required when the room thermostat calls for heat and operates the circulator through a relay.

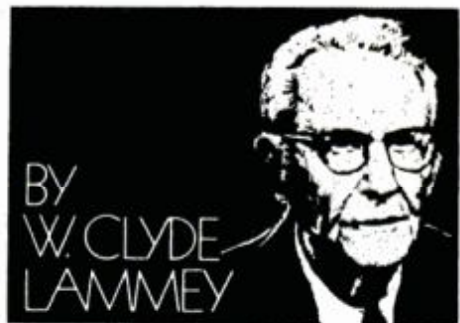
If a boiler includes a domestic hot-water heating coil, the flow-control valve prevents gravity circulation when no heating is required and also when the boiler is operating for domestic purposes only.

### Cleaning fireplace bricks

*How can I clean fireplace bricks that are discolored by smoke?—Paul Ryan, Walpole, Mass.*

Scrub them vigorously with a trisodium phosphate solution (a tablespoonful to a gallon of water). Use a stiff scrub brush and work in two directions. This may change the color slightly, so scrub the entire bricked area. Wear rubber gloves and goggles. ★★★

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



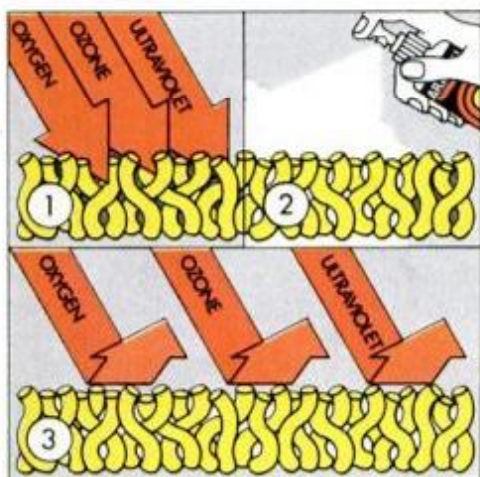


# FIGHT ROT.



Beneath the surface, in the underworld of things you own, a battle rages. It's a battle against Rot. Rot is a monster. He attacks anything made of vinyl, plastic, rubber, leather, wood. Any

polymer material. Rot deteriorates surfaces. He cracks. He fades. He discolors. He's as rotten as they come. And he comes from oxygen, ozone, the sun's ultraviolet rays. From heat, cold, soot and smog.



But nothing fights rot like ARMOR ALL Protectant. ARMOR ALL Protectant is a patented polymer liquid. It was developed by a scientist after 10 years of experiment and research.

It's a remarkable achievement, because ARMOR ALL Protectant is no mere cover-up coating.

Instead, ARMOR ALL Protectant penetrates surfaces and actually

intertwines and bonds with the fibers of any polymer material, forming a lasting shield of protection against Rot.

Where can you win the battle against Rot? Start with your car. If your tire walls, weather stripping, or wiper blades look prematurely grey, you're looking at Rot. Zap Him. If your vinyl top and vinyl interior look old before their time, they'll look young again with ARMOR ALL Protectant.

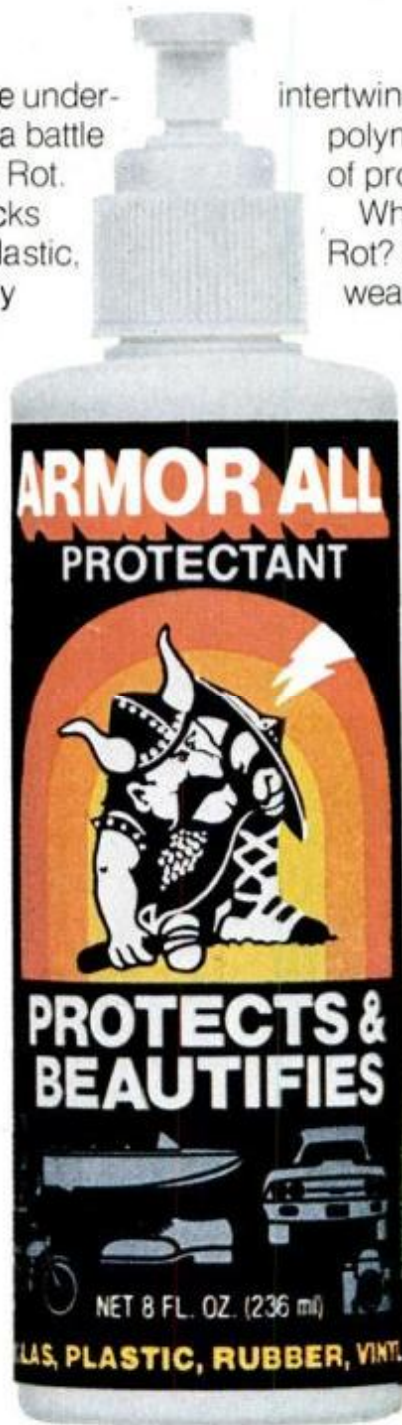


Guess which surface was a treat for Rot, and which surface was treated with ARMOR ALL Protectant.

Rot gets in your house, too. If your vinyl or leather furniture looks middle-aged, it's time for ARMOR ALL Protectant. If your favorite antique table has lost some luster, safe nontoxic ARMOR ALL Protectant will bring it right back, good as old. Appliances, luggage, shoes, and anything plastic — are all food for Rot, but ARMOR ALL Protectant starves Rot out.

Each treated surface — in the house, on the patio, in the garage — will fend off Rot and even take on a fresh, original look.

There's nothing — no wax, no polish or cover-up — that fights Rot like ARMOR ALL Protectant.



## ARMOR ALL PROTECTANT

### MAKES YOUR WORLD LESS ROTTEN



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# THE PM GARAGE

## CAPSULE REPORTS ON NEW AUTO PRODUCTS BY THE EDITORS

### Dream machine

Pressure washers have been, up until now, mainly heavy-duty units for industrial use. A far cry from the sponge and garden hose, the big blasters have been used for years to clean mud-clogged tractors, oil-drenched stationary engines and other heavy machinery, and the high-pressure rigs do even the biggest jobs in a matter of minutes. Not to be confused with steam

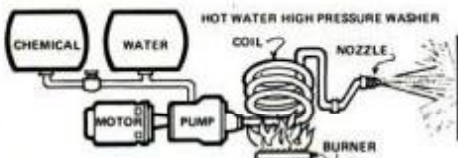


New pressure washer from Hotsy.

cleaners (which operate at low p.s.i.), these washers use a pump to boost operating pressure to many hundreds of p.s.i. (and they cost thousands).

The cleaning punch of the unit shown here is 90 gallons of water per hour, heated to 210° F. and delivered at 500 p.s.i., and that's a modest blast because this Hotsy Model 410 was designed to be used around the home at an "affordable" \$800.

As shown in the photo above, the 410 can be wheeled to where you need it (it weighs 182 pounds and stands 30 inches high). It works as shown below. Water is heated in the coil (kerosene is the fuel), cleaning chemical is added as needed, and the ½-hp motor drives the pump which boosts the pressure all the way up to 500 p.s.i.



The heart of the pressure washer is the positive-displacement pump which boosts the pressure to 500 p.s.i.

It's a perfect unit for small commercial outfits, but a luxury for most homeowners. Still, I can dream about what a quick cleaning job it would do on my car engine, garage floor, siding and shutters, everything! Hotsy Corp., 6757 South Emporia St., Englewood, Colo. 80110.—B.H.

### Super suds

To soap or not to soap, that is the question: Whether 'tis cleaner to lather your car, or, by using only water, suffer the fate of a less than shiny surface. If Hamlet had had wheels, he might have pondered this difficult question. But, personally, I don't often stew about it: I try to keep my car's finish clean and waxed so all that is ever necessary to clean it is plain water and a sponge. It works fine providing I wax the finish frequently.



Car wash from Turtle Wax. Ill. 60638.—B.H.

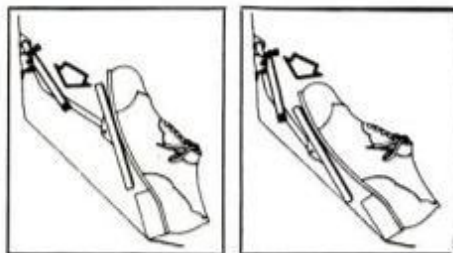
Otherwise, my water does have to be "lubricated" to get all the dirt off, and I admit to breaking out the "lubricant" from time to time. One of the best is Turtle Wax Car Wash, which, son of a gun, *does* "float away dirt and grime effortlessly." Turtle Wax, Inc., 5655 West 73rd St., Chicago, Ill. 60638.—B.H.

### Poor man's cruise control

Speed Setter bolts to the floor of your car, next to the gas pedal, and an adjustable spring detent helps you hold the 55-mph speed limit. Or you can establish any limit you want, because you can change the setting on this device with an Allen wrench.

For the price of \$9.95, it's about the least expensive speed control that you're likely to find. Among its advantages are easy installation (the job took me about 20 minutes), rugged construction and simplicity of operation. It can't interfere with your use of the brake pedal.

But the trouble with Speed Setter is that it takes 10 to 15 extra pounds of foot pressure to over-



Foot is rested on the Speed Setter which is adjusted for 55 mph (left). Extra pressure of 10 to 15 pounds (right) is applied to overcome setting.

come the spring. That means that you'll either accelerate very slowly, or you'll really have to shove down hard on the pedal to get going. If you don't mind a leisurely acceleration, you can and will save gas. Putting it another way, it's not ideal, but for \$9.95 it's not a *bad* deal.

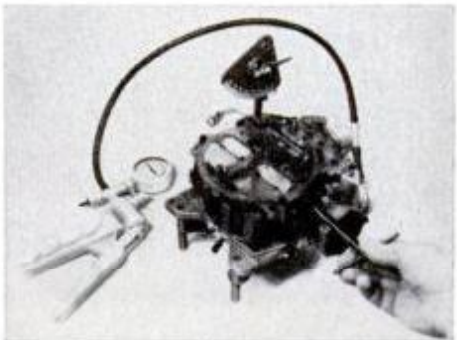
Speed Setter is available from Ohio Metrics, Box 22, Warren, Ohio 44482. —M.L.

### Choke-valve angle gauge

You still hear the old joke that "carburetor" is French for "leave it alone!" That's good advice for those who are all thumbs, but it hardly makes sense for those who want to fine-tune their carbs and have the tools and the touch to do it.

A new Kent-Moore gauge makes settings on choke rods, front and rear vacuum breaks and unloaders a snap. The gauge's magnetic base holds it in place and the sensitive bubble level insures accurate settings.

The J 26701 is \$15 (and the bending tool shown can be purchased for \$7). Kent-Moore Tool Div., 28635 Mound Rd., Warren, Mich. 48092.—B.H.



Magnet base holds Kent-Moore Carburetor Choke-Valve Angle Gauge on valve.

# ONLY DATSUN

has all three kinds.



**The standard kind.**



**The stretch kind.**



**One of a kind.**

There are trucks similar to the Li'l Hustler Standard and Li'l Hustler Stretch.

But there's only one King Cab.™

So Datsun is the only small truck maker who gives you a choice of sizes, both inside and out.

The regular Li'l Hustler has a six-foot bed. The Stretch has a bed over seven feet long. The King Cab practically gives you a bed inside, with its reclining bucket seats and up to 11.3 cubic feet of cargo space behind the seats. And all three Datsuns offer an optional 5-speed or automatic transmission.

One other thing to keep in mind:

Even though we said some trucks are similar to Li'l Hustlers, Datsun builds pickups as if they had to last forever. Which is probably why Datsun is America's best selling small pickup.

So, if you're not fussy about what you get, you can get a small pickup anywhere. But if you are, your Datsun Dealer is where it's at.

**Suddenly it's going to dawn on you.**

**DATSUN SAVES**



# APPLIANCE CLINIC

## QUESTIONS ANSWERED

### Arsenic poisoning?

I feel obliged to inform PM readers of a newspaper article sent *Appliance Clinic* by Charles E. Kunz Jr. of Shippack, Pa. The article, written by Richard Severo of the *New York Times News Service*, relates how one family became seriously ill because, the people contend, of a repair made to the inside of their dishwasher with silicone rubber sealant.

The article claims that some manufacturers have put "small amounts" of arsenic into the product as an antimildew agent. Manufacturers do not deny this. The persons who had been affected claim that specks of sealant had formed on dishes and had been consumed, making them ill. The manufacturer of the product does not admit the product was to blame. However, an out-of-court settlement of \$25,000 was offered.

I urge you to be wary of making repairs using a sealant or epoxy which may give off residue that could be ingested. If you have used one of them to make a repair and notice specks on dishes, rewash the dishes before using them. Then either write the company that made the product for data concerning the material's contents or have the product chemically analyzed. Don't take a chance.—*Paul Mann*

### Spring time

I have a Culligan Mark 20 automatic water conditioner that has worked well for five years. A few days ago I noticed that water hardness had increased. I checked the electro-timer mechanism, and it seems to work. However, the unit won't recharge automatically. But it can be set into operation manually. Can you tell me what's wrong? *Gilbert Nearhoof, Middletown, Pa.*

As you have learned, the timer motor is discounted as the cause of your problem, because you are able to engage the unit manually to the point that the timer takes over to operate the machine. Right?

So the trouble has to be with a component that starts the timer moving automatically. The most likely candidate is the timer dial. It possesses pins (six of them) that govern the period of regeneration. The dial face is attached to a gear on a spring-loaded clutch. I sug-

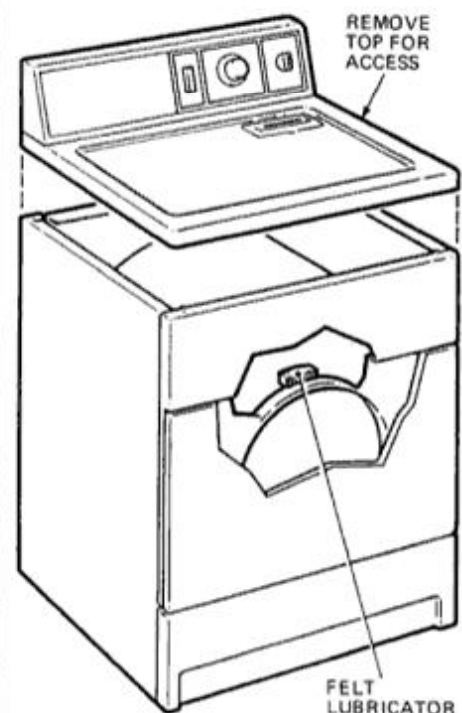
gest that your problem lies with that spring because, if it has slipped off or is broken, the dial face won't turn and the pins won't engage the gear that starts the timer, which allows regeneration.

Remove the small setcrew holding the dial pointer and take off the dial. You will see the spring. If it is broken, get a new one. If the spring has slipped from position on the small crimped piece that holds it in place, reset the spring and make the crimp more extreme so the problem doesn't recur.—*P.M.*

### Off-beat drum

Out of Seattle comes this valuable tip from W.L. Odlin about Kenmore clothes dryers that develop a case of chattering drums.

*There is a felt lubricating pad on*



Clothes dryer with felt lubricator.

*the inside of the door at the top. (See illustration). The pad is the bearing point and support for the front edge of the drum. When it gets dry, friction is created and drum chatter begins.*

*Open the top of the dryer, which is hinged at the back and fastened down by a clip on each end. You can now get to the felt lubricating pad, which should be treated with oil until it is saturated. Use household oil (medium weight, SAE 20).*

*W.L. concludes: "If Sears would include this information in the in-*

*structions for the machine and provide a small hole to oil the felt, it would save users a lot of money."*

*Agreed!*

### The fog lifts

*I have a Kenmore ceramic cooktop range, purchased in 1973. It developed a gray stain about six months after purchase that I haven't been able to get clean although I've followed instructions in the manual. Any suggestions?—Mrs. Emily Mori, Brandywine, Md.*

Get GE Corning Cleaner, especially made for the task. Use it as directed. You can buy the product at a GE distributor.

### SERVICE TIP

It's difficult for our handicapped population to make use of many household products that most of us take for granted. However, appliance makers are paying more attention to the special needs of the handicapped and modifying their appliances accordingly.

General Electric provides Braille-style knobs free of charge for any of its GE or Hotpoint-brand ranges, as well as Braille control panels for its home laundry equipment. They may be ordered by sending the model and serial number of the appliance to Jim Buxton for ranges, or Douglas Bailey for laundry equipment, at General Electric, Appliance Park, Louisville, Ky. 40225.

For the physically handicapped who may find it difficult to reach the controls at the back of many ranges, small portable appliances are often more convenient. However, GE has high/low ranges with controls up front and at eye level, as well as wall oven and surface units with more accessible controls.

Countertop microwave ovens offer a good alternative because they can be located almost anywhere and have up-front controls.

Appliance use-and-care manuals on all products now made by GE and Hotpoint are available on tape cassettes. You can get them by sending \$1.25 to: Center for Consumer Products Recordings, Associated Blind of Kentucky, Box 306, Louisville, Ky. 40201. In your request give the product, brand, model number and year purchased. ★★

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

## Pay & Benefits

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

## Direction.

"I always wanted to be a police officer. I think it's a chance to help people, and do something beneficial. I enlisted in the Army as an MP because it's a step in that direction. Military police work isn't exactly like its civilian counterpart — which is mainly concerned with law breaking and crime solving. Here, a great deal of our job is security and peace-keeping assignments. But I believe the demands of both jobs are the same. You've got to be committed, and professional. It's hard to be a policeman, from what I understand. This will help."

SP4 Joseph Ockwig, 8th Infantry Division, Bad Kreuznach, Germany

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

# TASTE THE GOOD TIMES. RALEIGH

NEW DOUBLE COUPONS ARE HERE!



## Now get gifts twice as fast!

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

Good news! Raleigh now packs twice the coupons — 2 on every pack, 8 extra in every carton. So, you get any of more than 1,000 Raleigh gifts twice as fast. Genuine tobacco flavor plus Double Gift Coupons. That's Raleigh. For free gift catalog, call now, toll free: (1-800) 626-5510. (Ky. residents call collect: (502) 774-7563.)

Filter Kings, 16 mg. "tar," 1.1 mg. nicotine; Longs, 18 mg. "tar," 1.3 mg. nicotine, av. per cigarette, FTC Report Dec. '76

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# CAR CLINIC

## SOLUTIONS FOR MECHANICAL HEADACHES

### BY MORT SCHULTZ



#### Getting to know Mac better

*How about giving us more information about shock-absorber cartridges for the MacPherson strut suspension system you mentioned in the March Car Clinic. Where can we buy them? How much are they? Are installation instructions included?—Fred C. Smith, Appomattox, Va.*

Sure, Fred. For the time being anyway, you can buy or order cartridges from a dealer selling Monroe shock absorbers. Suggested retail price is about \$40 each. Instructions are included.

#### Story teller

*I took delivery of a 1977 Buick Century with V6 engine in December. The car is solid and rides well, but I'm disappointed with the V6 which has a low-end vibration that the Buick dealer has not been able to fix. I read recently that the V6 engine has been redesigned with a different crankshaft and camshaft, and even-firing plug order. I believe my problem should be corrected by having this new engine placed in my car. Can you help me to help Buick keep the quality of its product high, and its warranty trusted and useful?—Donald R. Payne, Newark, Ohio*

By the time this gets into print, Buick has been in touch and your problem has been resolved, but not in the way you suggest. Although history to you, your story can benefit Buick and other GM car owners with the V6 engine—that's why I'm relating it here.

You are correct that a newly designed V6 engine is going to make a debut, but it won't be until the '78 models are introduced. However, now your 1977 V6 is functioning like a charm because some very basic adjustments and repairs were made.

It is critically important that there be no vacuum leak with this engine—otherwise vibration will be a pain. If vibration exists, every

vacuum hose should be inspected for damage and tightness. Pay heed, for example, to the heat tube from the manifold to the automatic choke, which is frequently overlooked, and also check the distributor vacuum advance line at both ends.

Then adjust the engine idle speed and the ignition timing by the book—the former to 600 rpm and the latter to 12° BTDC. There can be no compromise—not, that is, if you want to have a smooth-running engine.

#### Marathon effort

*Someone poured sugar into the fuel tank and oil filler (crankcase) of my daughter's 1966 Mustang (289-cu.-in. engine). The insurance company has sent me a dissertation of a study made by Marathon Oil Co. which contends that this trouble can be rectified without engine disassembly. Several mechanics I've spoken to contend that as long as sugar has been introduced into the crankcase the engine must be completely disassembled and cleaned.*

*Whom do you side with?—R.F. Erickson, West Des Moines, Iowa*

I side with the poor soul who has been victimized by some jerk who gets kicks by destroying someone else's property, but that's beside the point. I would like to agree with Marathon, and I see no reason why you shouldn't try what is suggested as long as the insurance company will assume responsibility if the solution doesn't pan out—no matter how long it takes for the ill effects to show up.

However, in every case of sugar in the crankcase that I've seen the engine had to be disassembled. Sugar forms stiff gum and varnish which will cause the engine to freeze up. The cleaning procedure outlined by Marathon may get all the substance out of the engine, but then again, it may not. If only a little remains, the engine will suffer.

Here is a rundown of procedures outlined in the Marathon Oil Co. letter. Sugar in the gas tank doesn't pose too much trouble, and the cleaning procedure usually works. And, certainly, trying to clear sugar from the crankcase the way that's recommended rather than disassembling the engine is worth a shot.

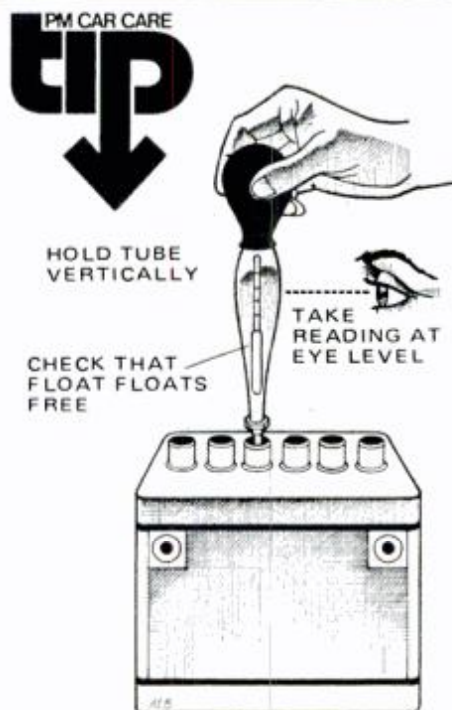
1. When sugar has been poured into the gas tank:

- Completely drain gasoline from the fuel tank and thoroughly flush the tank with hot water.
- Clean all filters, replacing with new ones where necessary.
- Blow out gas lines.

2. When sugar has been poured into the carburetor:

- Start engine, although it may

*(Please turn to page 34)*



#### Be specific

The specific gravity test using a hydrometer is the best way for a Saturday mechanic to determine the condition of a battery. Frequently, however, wrong results are obtained because of mistakes that may be made in using the tool. The illustration emphasizes four important rules to follow: 1. Don't suck in too much electrolyte. 2. Hold the tube vertical. 3. Make sure the float rides free. 4. Take readings at eye level. There is a fifth.

It's this:

Check the electrolyte level in the battery before making the test. If the level is low, add water. However, don't take readings immediately. First you should run the engine for a while or give the battery a high-rate charge for at least 15 minutes. New water and electrolyte have to be mixed thoroughly if accurate specific-gravity test results are to be obtained.

## CAR CLINIC

(Continued from page 33)

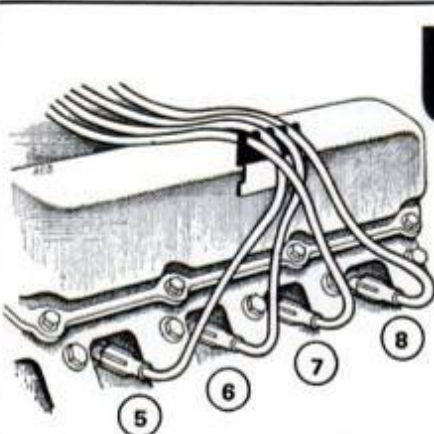
take a considerable amount of cranking time.

- Allow the engine to idle until black smoke no longer comes from the tailpipe. When the engine is idling normally, it indicates that all sugar has been purged.
- 3. When a sweet soft drink has been poured into the gas tank:
  - Thoroughly drain and flush the gas tank.
  - Clean or replace filters.
- 4. When sugar has been poured into the crankcase:
  - Drain the crankcase and remove sparkplugs.
  - Flood the inside of the engine with water having a temperature of 160-180°F. Repeat the flushing procedure at least three times.
  - Fill the crankcase with kerosene and let the engine run briefly. Drain.
  - Fill the crankcase with light flushing oil and let the engine run briefly. Drain.
  - Fill the crankcase with the recommended engine oil. Replace the oil filter.

## Sounding off

I purchased a 1976 Dodge Aspen station wagon last year. It is equipped with a 318-cu.-in. engine. I hadn't driven it but a few hundred miles when I discovered that the same trouble other Aspen owners were experiencing was now mine: stalling, hesitation and dying out when cold. After the car is

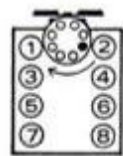
warmed up, it performs satisfactorily. In speaking with the dealer I was told that he knows all about these problems, but that he does not know what to do about them. It seems to me that Chrysler could be more responsible to its customers by keeping dealers posted through service bulletins.—R.M. Eastwood, Grayville, Ill.



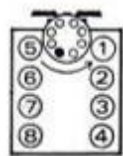
F.O.: 1-5-6-3-4-2-7-8



F.O.: 1-8-4-3-6-5-7-2



F.O.: 1-8-4-3-6-5-7-2



F.O.: 1-5-4-2-6-3-7-8



F.O.: 1-3-7-2-6-5-4-8



## PM CAR CARE Double-crossing crossfire

Proper routing of sparkplug wires is shown in this illustration of a late-model Ford engine having a firing order of 1-5-4-2-6-3-7-8.

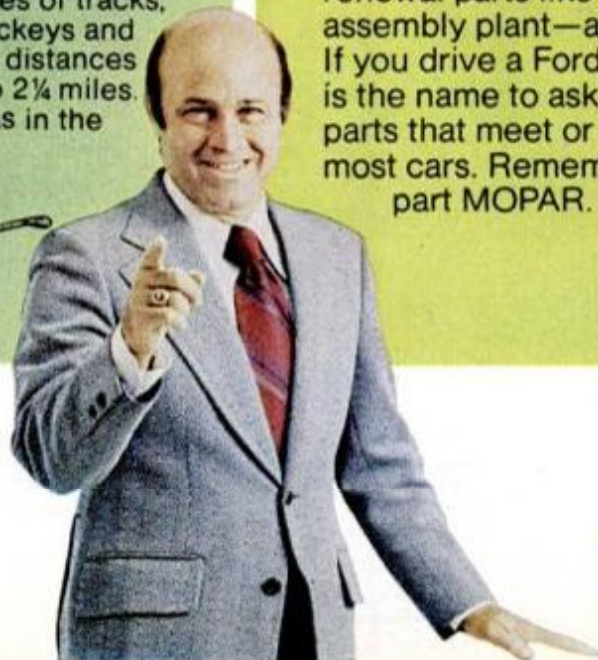
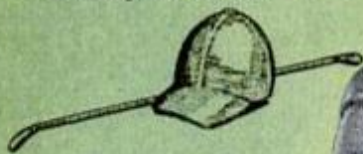
Cylinders 7 and 8 are side by side and fire one after the other. Notice how wires for 7 and 8 have been arranged to prevent crossfire. They are well separated by wires 5 and 6 all the way to the distributor.

Diagrams below show firing orders and cylinder arrangements for most U.S. V8 engines. Cylinders shown in a gray tone are the critical ones, and wires to them should be kept well apart in order to avoid crossfire.

## STAR PERFORMERS IN SPORTS

by Joe Garagiola

The test of a star performer is doing the job under all conditions. For example, from 1917 to 1924 the great race horse Exterminator ran on different types of tracks, had a number of jockeys and trainers and won at distances from 5½ furlongs to 2¼ miles. In 100 starts, he was in the money 84 times.



## “KEEP YOUR CHRYSLER-BUILT CAR A WINNER WITH MOPAR STAR PERFORMER PARTS.”

When your Chrysler, Dodge or Plymouth car or Dodge truck needs service, be sure and ask for MOPAR Star Performer parts. Only MOPAR has genuine renewal parts like those installed on your car at the assembly plant—and every one is a Star Performer. If you drive a Ford, GM, AMC or import—MOPAR is the name to ask for, too. Because MOPAR has parts that meet or exceed factory specifications for most cars. Remember, the best-kept cars are part MOPAR.



There are at least three service bulletins that apply to this problem. They are:

- 14-10-76 (4/19/77), Improving Hard Starting.
- 14-03A-77 (1/31/77), Drivability Improvement—Reducing Surge and Acceleration Sags.
- 14-10-77 (3/21/77), Carburetor Specification Update.

Ask the dealer to check his files.

### Ignition crossfire

*I would appreciate it very much if you would explain how to arrange sparkplug wires so they don't build up magnetism and cause firing out of time. I have been told to mix them up, but how?—Truman Vigen, East Grand Forks, Minn.*

Okay, let's discuss it here and check illustrations in the PM Car Care Tip on the facing page. The condition you describe is called ignition crossfire, and it occurs when a sparkplug fires out of time because of induced voltage. The consequence is roughness, back-firing, detonation, and possible sparkplug and engine damage.

An electrical field develops around a sparkplug wire as high voltage flows through it to the sparkplug. There is sufficient energy in this

field to induce voltage in an adjacent wire if these two conditions exist:

- If the adjacent wire is placed close enough and runs parallel to the wire carrying the voltage.
- If the adjacent wire runs to the cylinder that will be fired next in the firing order.

The result is that the sparkplug which isn't supposed to fire will fire out of time.

To guard against this problem, observe the following precautions:

- When you remove sparkplug wires, replace them in the same order that the manufacturer had them originally.
- If the plastic or metal loom holding sparkplug wires in place is damaged or lost, replace it. The loom helps maintain wiring in its correct arrangement and prevents wiring from being burned on a hot exhaust manifold.
- Never tape wires together in a nice, neat bundle.
- If the wiring arrangement has been fouled up, find out the firing order of your engine (consult the owner's or service manual). Now arrange wires properly to prevent crossfire. For help, locate your firing order in the illustrated tip at left.

### SERVICE TIPS

■ Chevrolet advises that paint repairs made to polycast wheels should be done only with a special elastomeric material, the only kind that will adhere satisfactorily. Called Chemglaze II, it is made by Highson Chemical Co., 27600 Farmington Rd., Farmington, Mich. 48024.

■ Ford Granadas and Mercury Monarchs, vintage 1976-77 with V8 engine, power steering and airconditioning, which have a rumbling noise at 500-800 rpm, are fixable. The noise is caused by the power-steering pump shaking in its bracket. Repairs call for installation of a new bracket assembly and are outlined in service bulletin 129, article 1736.

■ If the battery in your 1977 Cordoba, Charger, Monaco or Fury is running down for some unexplained reason, ask yourself: "Does my car have an electrically heated rear window defroster?" If so, take bets that the trouble is a defective defroster relay (internal short). You should have the relay replaced. Tell your dealer that service bulletin 08-14-77 is the authorization. ★★

### GOT A PROBLEM WITH YOUR CAR?

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

WHEN MOPAR PARTS ARE READY FOR REPLACEMENT, IT MAKES SENSE TO INSTALL NEW MOPAR PARTS. THEY'RE LIKE THE PARTS INSTALLED AT THE FACTORY.



MOPAR Star Performer Parts are available at Chrysler-Plymouth and Dodge Dealers, auto parts stores, many service stations, and independent garages.

### STAR PERFORMANCE TIP

Start your own safety and preventive maintenance program. Here are some easy checks you make yourself: windshield washer fluid; engine oil level; battery fluid level; automatic transmission fluid level; power steering fluid level; lights; tire pressure.



**Mopar**

STAR PERFORMERS

# DETROIT LISTENING POST

## CARTER ON CARS

The auto companies have now had the better part of four months to sort out and evaluate President Carter's energy conservation program. The industry's first reaction to the program was the predictable grumble.

But the shock waves have settled down since April and the companies are hunkering down to make the best of the situation. The question now is how. How to get the job done and how the President's proposals will impact on the kind of cars the industry turns out.

**Industry already on target.** Detroit was well on the way to accomplishing most of the goals the President called for before details of the program were disclosed. The companies will bring out the same cars over the next seven to eight years they planned to bring out before the Carter recommendations were made public. The only difference is that the government has put the whip to Detroit to move faster. So some timetables may be advanced, but the cars Detroit planned for the rest of this decade through 1985 will be the same basic machines the companies had in mind all along.

**More go for the gallon.** The whole idea of the Carter program is to reduce consumption of gasoline. One way or another.

One way: Get rid of the gas-guzzlers. Another: Improve the fuel economy of all cars.

There's nothing new in those approaches. The gas-guzzlers—the big Caddies, Lincolns, Chrysler New Yorkers, Ford LTDs and Mercury Marquis—were doomed even before Carter took office. Those are the makes that would carry the heaviest tax penalty—almost \$500 in the '78 model year—if Congress goes along with the President's plan to put a soak-and-sock-'em tax on cars giving poor gas mileage and the other side of that coin—a government rebate to buyers of cars giving good mileage. (That part of the program is expected to undergo extensive revision—mauling would be a better word—as Congress

works it over. Congress had not acted at the time PM went to press.)

The incentive to improve mileage of all cars existed long before the Presidential proposals were announced. Beginning in the '78 model year, cars must average 18 miles to the gallon, 19 to the gallon in 1979, 20 in 1980, up to a top of 27.5 mpg in 1985. The government says so. If the companies don't hit those numbers right on the button, they will be assessed heavy fines for every car sold that falls below the specified minimum. The penalties are so stiff they could bankrupt everybody in the business except GM.

So what's new? What's all the shouting about?

**The real target: You.** The real target of the President's message is you—Mr., Mrs. and Ms. He wasn't talking to Detroit. Detroit has been signed, sealed, delivered. He was talking to the 110,000,000 people in this country who drive private automobiles.

If that's the case, why not come right out and say so? The President did to the extent of asking for a standby gasoline tax. If gas consumption doesn't decrease, the price could go up as much as 50 cents a gallon.

But there's an easier way of getting the message across to car owners. By way of the carmakers. There are only six auto firms in the United States (including VW and Checker). It's easier to deal with six companies than to control the actions of 110 million individuals.

**Detroit's product plans.** Here's how Detroit will handle the force feeding:

You will still have a wide choice of makes, models and sizes—but they will be smaller, lighter and more fuel-efficient.

The smallest small jobs will weigh 2000 to 2200 pounds and give 50 miles to the gallon. The next size up, the intermediates, will weigh 2700 to 2900 pounds and give 30 to 35 miles to a gallon. The biggest cars will weigh 3100 to 3400 pounds and squeeze out 25 to 30 miles to a gallon. The "jumbos" will carry some type of penalty to discourage their sale.

There will be two changes in power trains. The V8 engine will

be phased out in favor of the V6, and an overdrive will be incorporated into automatic transmissions. Ford is now tooling an automatic overdrive for its '79 cars.

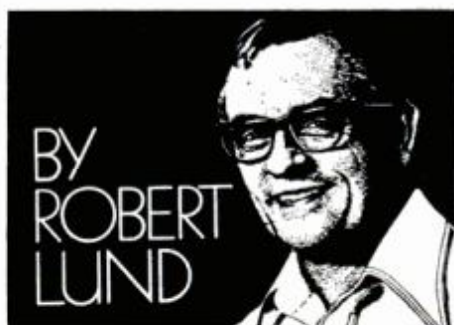
**The "new" engines.** There will be "new" types of engines. New in quotes because the engines were in the works before the President outlined his energy plan. These include the GM diesel, Ford's dual-displacement engine and VW diesels installed in Chrysler and AMC cars.

Electrics are still being worked on, but as GM says, don't look for a practical, mass-produced electric until the late '80s.

**Owner modifications loophole.** There's one big loophole in the President's plan. The owner can do anything he wants to the car after he takes delivery. Let's say you order a stripped, no-frills job to qualify for a rebate. If you take a six-cylinder engine instead of an eight and omit airconditioning and other power accessories that reduce gas mileage, you are entitled to a rebate. But you can hang on all the extras you want after you buy the car. And you might be able to pay for them out of the rebate. That's a dumb defect in a program that's supposed to encourage conservation of gasoline.

**P.S. to speeders.** There was a subtle message for speeders in the President's talk. So subtle you might have missed it. The individual states get millions of dollars in highway funds from the federal government. If the states don't do a better job of enforcing the 55-mph speed limit, the feds might cut highway appropriations. That would be a cruel cut for local politicians. No money, no improvements in roads, no jobs for voters. So the gendarmes better hand out more speeding tickets.

Slow down, brother. ★★★



# '77 FORD COURIER

## A tough new way to go truckin'..

The all-new Courier is coming on strong with unbeatable gas mileage! The biggest engine in its class! More new options, like a 7-foot bed and new interiors!

### 1. Unbeatable gas mileage. 41/28 MPG.

Based on EPA estimates, no other pickup in America gets better gas mileage ratings than Courier. With the 1.8 litre engine and optional 5-spd. trans., the EPA estimates 41 mpg hwy., 28 city. (Slightly lower in Calif.) Your mileage may vary due to how and where you drive, truck's condition, and optional equipment.

**2. Biggest engine in its class.** Courier's optional 2.3 litre engine is the largest engine available in any compact pickup.

**3. All-new interiors.** Courier's new XLT option offers a stylish exterior plus a new level of interior comfort in a compact truck.

And for '77, Ford offers an industry exclusive: The Free Wheeling Courier option. A tough machine that gives you everything from Accent Tape Stripes to Cast Styled Aluminum Wheels.



Free Wheeling Courier

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FORD DIVISION





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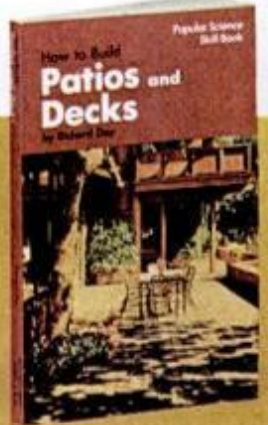
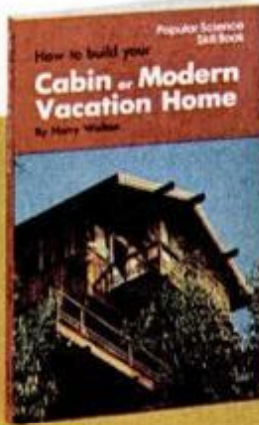
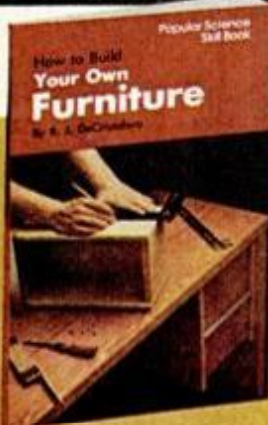
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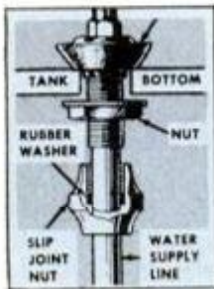
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Building details...



Finishing schedules...

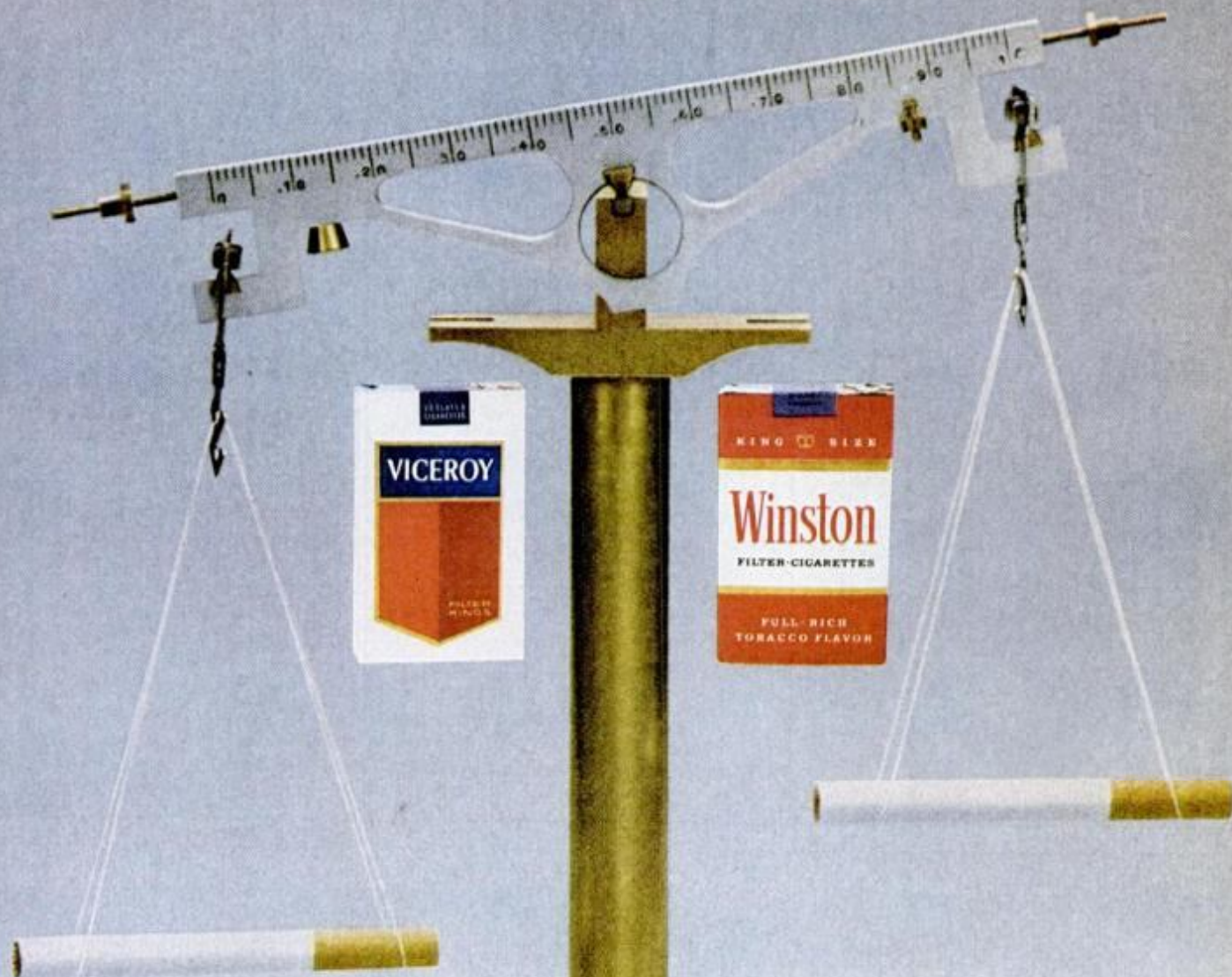
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# Viceroy

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That Cigarette Smoking Is Dangerous to Your Health.





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& Less 'Tar'

...than  
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The result is a mild, fully packed cigarette with an extra satisfying taste.

And yes, lower 'tar' than Winston or Marlboro.

1. DURING 1976, VICEROY KINGS HAD, BY WEIGHT, 22-35 MGS. MORE TOBACCO THAN WINSTON KINGS AND 40-52 MGS. MORE TOBACCO THAN MARLBORO KINGS (AVERAGE PER CIGARETTE).

2. VICEROY HAS A UNIQUE, AGED-BLEND OF NATURALLY LOW 'TAR' TOBACCOS AND A SPECIAL PROCESS THAT ALLOWS THE USE OF MORE PARTS OF THE TOBACCO LEAF THAT ARE LOW IN 'TAR'. (VICEROY 16 MGS. 'TAR'; WINSTON 19 MGS. 'TAR'; MARLBORO 18 MGS. 'TAR'; AVERAGE PER CIGARETTE, FTC REPORT, DECEMBER, 1976.)

# SCIENCE WORLDWIDE

## Cheaper coal gas

One drawback of most coal gasification plants is that they work only on high-grade coal. Now, scientists at General Electric have expanded a gasification plant's diet to include lower grades of coal—and even coal dust—to produce a cheaper synthetic gas.



Coal "logs" like toothpaste from a tube.

Key to the design is a special unit that compresses coal particles and a tar by-product of gasification. The coal-tar mix is then squeezed out of an extruder in compacted, 20-pound "coal logs."

Now in use at a pilot plant at GE's Development Center in Syracuse, N.Y., the extruder is part of a research effort to convert coal into a cheap gaseous fuel to power gas turbine generators.

## Earthquakes to order

Engineers at Washington University in St. Louis can switch their own private earthquake off or on as part of their research in designing tremor-proof buildings.

The university has its own earthquake machine, technically known as an inertial vibration system, installed on the top floor of an abandoned 11-story building in St. Louis.

Built by the Boeing Aerospace Co. under a grant from the National Science Foundation, the machine gets its quake effects by

using a huge piston to shove a steel box filled with up to 30 tons of lead back and forth.

When the machine is turned on, it can cause a 28-inch sway in the 11-story structure, and it effectively duplicates earthquake vibration patterns in the building which the engineers study as part of their building design research.

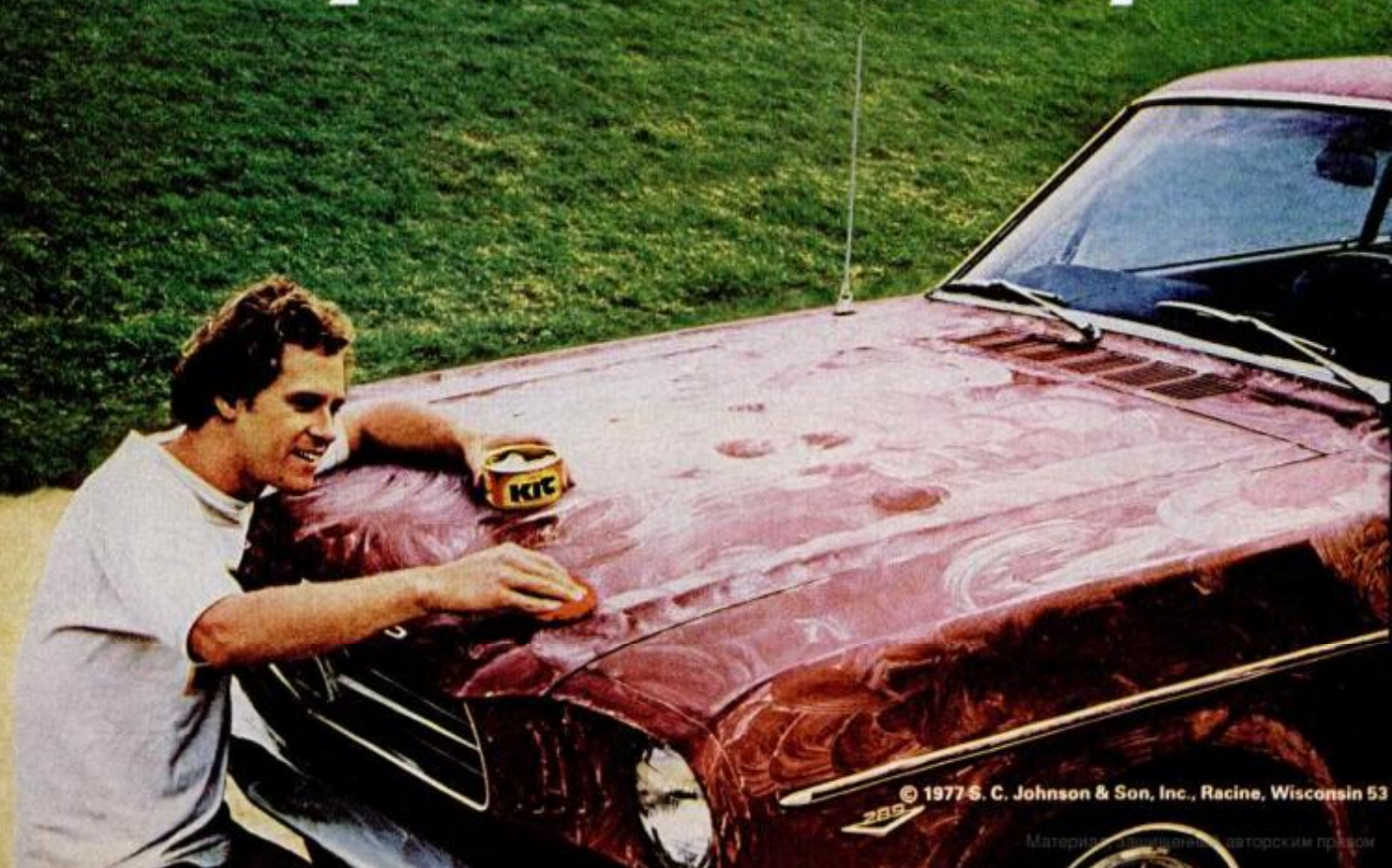
## Return of the rubber bush

A drab little desert bush could make a big comeback as a leading U.S. source of rubber, according to the National Academy of Sciences.

Called the guayule (pronounced wy-oo-lee) bush, the plant provided 50 percent of all the rubber used in this country back in 1910, and produced three million pounds of rubber during World War II when we were cut off from our Asian sources of hevea, or rubber-tree, rubber.

The Academy says guayule rubber has all the properties of hevea rubber and the bush could easily be grown and harvested by machine in

# It's easy to turn a heap into



the desert areas of Texas, New Mexico, Arizona and California where it is already a native plant.

Since the costs of hevea and synthetic, petroleum-based rubber are expected to go nowhere but up, the idea is getting serious attention. Congress is now studying bills that would allocate a total of \$60 million to bring back the guayule as a commercial rubber source.

### Rings around Uranus

Astronomers on board a flying observatory have now found that Saturn isn't the only planet that has rings around it. Uranus has them, too.

The discovery was made while the scientists studied Uranus as it made a rare pass between the Earth and a bright star. To get a close look, they boarded NASA's Kuiper Airborne Observatory, which took them for a ride over the Indian Ocean. Using the flying observatory's telescope and other observational instruments, astronomer James Elliot of Cornell University says he found about five bands of moonlets ringed around the planet—the first new Uranus moons discovered since 1948.



Super-mini Pacemaker power.

### The Pacemaker shrinks

Over 300,000 people live normal lives because of the Pacemaker, an electronic package that keeps a heart beating in a steady rhythm.

Now engineers at Medtronic, Inc., have made that package smaller and more efficient, using miniaturized circuitry and four button-sized lithium iodide batteries that will power a unit for 10 years.

As a result, the new models are 60 percent as large as most standard models and 25 percent lighter. Each has a special built-in feature that slows the pulse eight beats a minute to show power has been drained to replacement level.

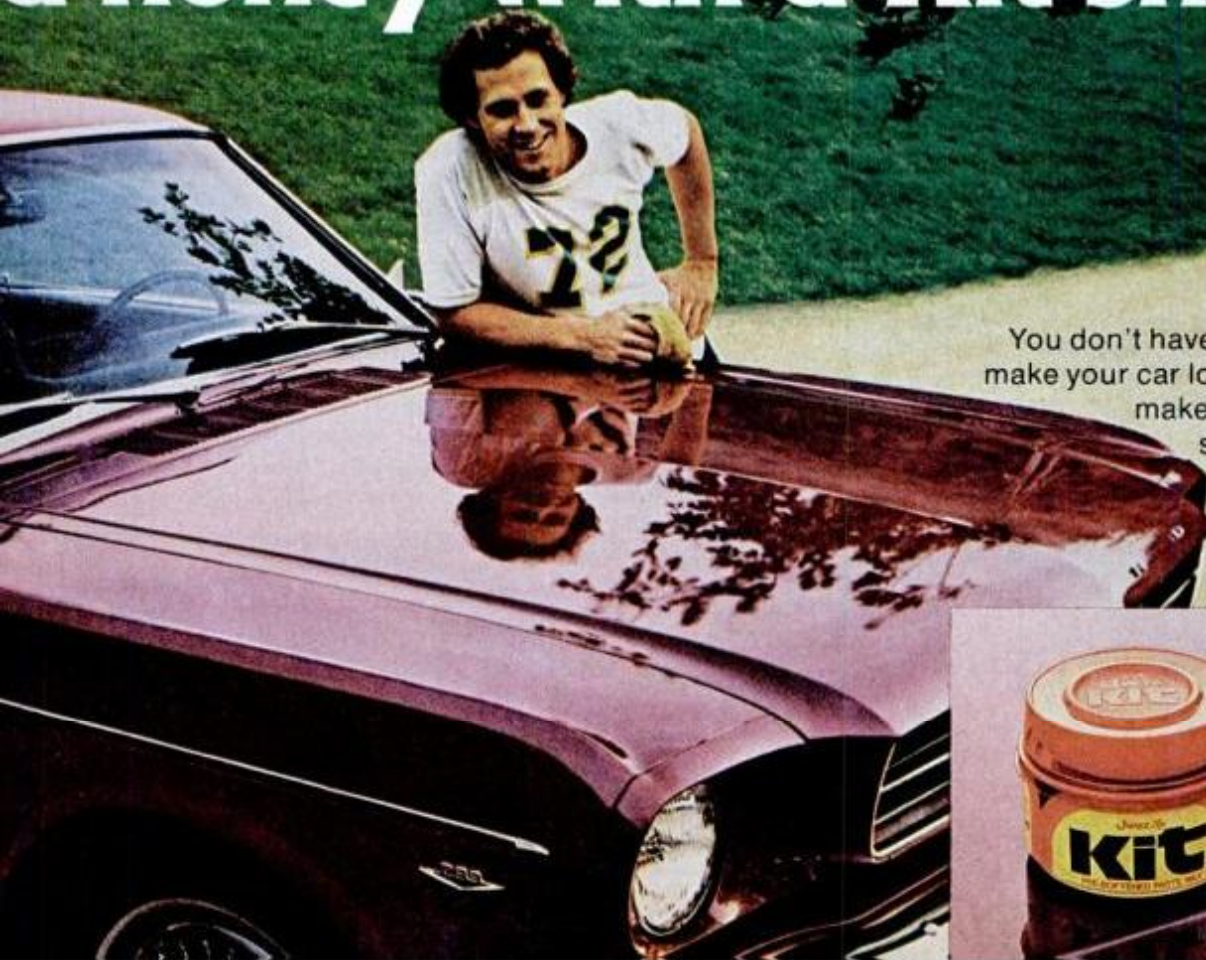
### Superthin solar panels

To get more watts per pound from solar panel arrays on NASA's spacecraft, engineers at Solarex Corp., Rockville, Md., have developed ultralight, paper-thin silicon solar cells under the sponsorship of NASA's Office of Aeronautics and Space Technology.

The 2½-inch-square units are 0.002-inch thick—one-sixth the thickness of solar cells now used in spacecraft. The new cells will allow larger solar arrays for multikilowatt electrical power needed for new spacecraft on extended exploratory missions. They may also provide the push to maneuver future solar power collectors orbiting Earth (*Energy From Outer Space*, page 98, June '77). ★★★



# a honey with a Kit shine.



You don't have to knock yourself out to make your car look terrific. J/Wax Kit will make it easy for you. Kit's pre-softened — it liquifies as it hits the finish. Deep cleans. Wipes off easy. There's no easier, faster way to get a long-lasting paste wax shine than with J/Wax Kit.



**No wonder  
it's #1.**

# ALL OUTDOORS

## Artistic rigs

Winners of our PM Paint-Job Photo Contest—and a creative crew they are—appear below. Their colorful handiwork, plus the vehicles of a number of almost-winners, will appear in all their gaudy glory next month in our September issue.

The motor Michaelangelos:

**Richard Davis**  
Brooklyn, Conn.

**James C. Edge**  
Lisbon Falls, Me.

**David Eschete**  
Houma, La.

**Gregg Glatkowski**  
Hanover Park, Ill.

**Kip Panko**  
Allentown, Pa.

**Richard Phillips**  
Raytown, Mo.

## Testing the testers

"Technology stops at the fish's mouth," ace fisherman Lew Childre has observed. It's then, he claims, that the quality of your gear or technique passes or flunks the final exam.

Lew should know. He has earned fame and fortune with the develop-



ment of his Fuji Speed Stick rods and Speed Spool reels. He knows his products are good, but the fish have to be convinced. Recently we had a chance to fish with Lew Childre and equally noted Jim Bagley of Bagley Bait Co. to see how fish who had never heard of them would react.

Both Lew and Jim believe the true test is to put their products on the line—a fishing line. Field-testing certainly seems the best and fairest way to find out the success

of a rod or reel or lure.

Our fields were the Seminole Indians' "Seas of Grass" in the Everglades that separate into the 10,000 Islands of Florida Bay south of Remuda Ranch Resort near Naples, Fla. Lew Childre came down from Foley, Ala., Jim Bagley from Win-



**Narrow spool and small hand-cupping size of new Speed Spool Reel from Lew Childre & Sons, helps give bait-caster distances equal to spinning, says Childre.**

ter Haven, Fla. I flew down from New York and the cold front must have moved in from Hudson's Bay. The guides told us the snook and tarpon we were looking for were much too smart to come up and chance chilblains, no matter who we were. But Jim and Lew proved that with know-how and top tackle they could make this fishing mecca live up to its name—and they caught the fish to prove it.

Careful target casting, concentration, precise action to match the lure, and delicate feel were among the techniques of these dedicated experts. In the process, Jim Bagley demonstrated the special appeal of some of his fat little Balsa Bs when properly cranked with an enticing wiggle, and Lew Childre proved that graphite expertly mounted in a grip can extend sensitivity from the rod tip right down into your hand.

Even more impressive to me was Lew's claim that he can outdistance a spinning cast with his Childre Speed Spool bait-casting reel when it's handled properly. The reel is narrow, can be cupped in the hand easily, and the level wind disengages completely for casting so the line can shoot out through the Fuji diamond-polished speed guide. We

made Lew demonstrate it, prove it and then show us how we or anyone else could do it, too.

The tackle we tested confirmed the trend to smaller, lighter, highly responsive gear that can make fishing more sporty and challenging.

## Family sport

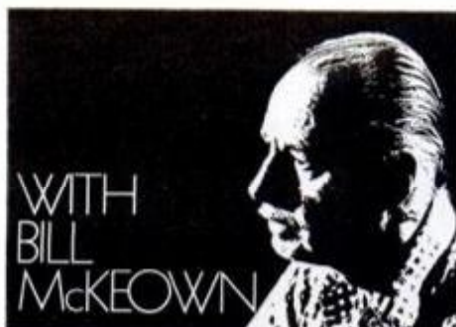
Proof that fisherman means women too comes from recent statistics (21 million women fished last year) plus new gear designed to make angling another family affair. Royal Red Ball's Bonnie Ackley has announced quality waders designed by women for women. They match men's models, but are hippy enough so that lady anglers can get them on and keep them on comfortably.

Red Ball foul-weather gear is being styled to keep outdoor girls dry and colorful (blue, white, yellow, red, green) while hunting and camping, too (1,501,000 female hunters and 15,439,000 campers last year, according to the Outdoor Women Assn. of Washington, D.C.).

## Maxi gear for minis

A new operation that calls itself the first accessory center exclusively for mini-trucks has opened in Connecticut. Off-road conversions, grille guards, winches, wheels, lights, roll bars and similar extras are intended for Japanese minipickups such as the Chevrolet Luv, Datsun, Ford Courier, Mazda and Toyota. Mail-order and drive-in customers are handled by Tolsdorf Industries, Putnam Industrial Park, Putnam, Conn. 06260.

Accessories for mobile homes, RVs, vans, off-roaders, recreational truckers and campers are now covered in a special Sears catalog. A good source for parts for old Jeeps or new vans is an additional catalog listing 4WD replacements and extras. Both specialty catalogs are available from Sears stores and catalog sales offices. ★ ★ ★





## Bring your family in for a fitting.

Is your family a crowd? Complete with kids, pets, luggage and endless awkward objects that need moving? Have we got an answer for you! It's the new 1977 Volkswagen Bus. When it comes to moving your family and trappings from here to there at low cost, there's nothing like the Bus.

You see, the VW Bus is not only lots bigger inside than a mere sedan, it even gives you almost 70 percent more interior room than a full-size domestic station wagon. The Bus is almost van-size inside, but comfortable and beautifully finished. Comfort to us is not an option.

The VW Bus is versatile with its space, too. For instance, if you want

to do some really serious hauling, that big sliding door makes loading easy. And the rear seat folds down to give you extra cargo space.

Yet for all its carrying capacity, the '77 Bus is pure Volkswagen when it comes to economy.

It gets an estimated 28 mpg on the highway, and 20 mpg in the city with standard transmission in the 1977 EPA tests. (Of course, your actual mileage may vary, depending on your driving habits, the condition of your

**Take the Bus.**  
**The '77  Bus.**

Bus, and whether you choose optional equipment such as an automatic transmission.)

That's what makes the VW Bus such a great choice. No other vehicle carries so much family for so little.

But that's still not all, by a long shot. Besides its practicality and its economy, the VW Bus is a lot of fun to own. And to drive. It has a spirited 2-liter engine with electronic fuel injection and independent suspension on all four wheels. And the '77 VW Bus comes equipped with radial tires.

So bring your family in to your Volkswagen Dealer for a fitting soon.

We think you'll find that on you, the Bus will look good.

# IMPORTS & MOTORSPORTS

## More efficient cars on deck

If you drive an import, chances are you value efficiency in an automobile—efficiency of fuel, of space, of materials—more than anything else. The size of most imports even allows you to get more efficient use of your garage!

For Mrs. Woolworth Donahue, however, it was the efficient use of her yacht that led her to one of the world's most efficient little cars. She hoists her Honda Civic on board on davits and sets it down on shore whenever she wants to get from A to B—in this case, B is various locations in the Bahamas. A golf cart or scooter would have been a little too basic for Mrs. Donahue and an Accord probably would have been too much car; that



Honda Civic is piped aboard *Hartline*.

made a Civic the obvious choice to carry on her yacht, the *Hartline*, out of Palm Beach, Fla.

While on the subject of Honda, here's a footnote to PM's Honda Accord Owners Report (page 114, May '77). The best measure of owner enthusiasm is, of course, the percent of owners who would buy another. That was a whopping 91.2 percent for the Accord, but also intriguing is the percent of questionnaires completed and returned to PM. For most cars it's 25 to 35 percent. For the Accord it was 60 percent! It's nice when an "efficient" car also has the unique character to inspire such enthusiasm on the part of its owners.

## Diesels—more efficient

Taking the opposite tack from Mrs. Donahue, I recently loaded my boat, a six-foot dinghy, into a VW Rabbit diesel (no davits needed). I didn't think it would fit, but darned if it didn't just slide into that big hatchback. I couldn't close the hatch, of course, but it was only a short ride to the beach. I spent a 250-mile weekend with the diesel before returning it to VW of Ameri-

ca. I was appreciative enough to top off the half-full tank down at the dockside diesel pump of my favorite fish market. Gallons: 5.5.



Rabbit diesel—this one on a 100,000-mile endurance run organized by the German magazine, *Auto Zeitung*—stops by oil-drilling rigs in California.

Price: 50 cents per gallon. Total miles: 244. Miles per gallon: 44.4. Sure beats having a tiger in your tank.

## Another diesel fan

I recently heard from an enthusiastic diesel owner and reader who's living in Bensheim, West Germany.



Robin Flood's 35-mpg diesel motor home.

His machine nets him "only" 35 mpg, but it's a giant Hymermobile 520 motor home! It's built on a front-wheel-drive Mercedes truck chassis. The conversion, done by the Hymer firm in southern Germany, is his pride and joy and, with the accompanying Polaroid of his wheels, he writes, "The diesel gives poor acceleration, but top speed—given a long enough road!—is around 65 mph." The owner, Robin A. Flood, says he "never could resist meddlin' around" and has added a CB and some other goodies. It's interesting that he doesn't complain about, or even mention, the price of diesel fuel in Germany. It's well over a buck a gallon.

## Electrics—coming closer?

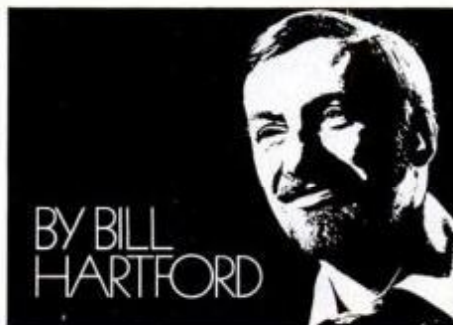
If the electric car shown here looks familiar, it's because it came off Fiat's Torino assembly line as a 128-3P hatchback. It was converted to electric by Sears, Roebuck and Co. to celebrate the 10th anniversary of the DieHard battery. The XDH-1, as it's called, uses five DieHards under the hood and another 15 in back. It can whoosh up to 75 mph, but it can't keep up that speed for long. About 90 miles at a steady 45 mph is the limit of its range. It's not in the Sears catalog, naturally. The "X" stands for experimental.

Still experimental, too, are General Motors' electric vehicles, but GM president Pete Estes is hoping



Sears' XDH-1 experimental electric car.

to have a Chevette-sized electric "widely enough used by the late '80s to make its energy impact felt." As he says, the electric car is the best way to use coal or nuclear energy to power personal transportation vehicles. Reminds me of the conclusion to a story about my die-hard, 1968 Volvo 145 that was part of PM's new-car issue in October 1973, just as the "first" energy crisis was beginning: I'm "riding it out in my present station wagon. Maybe when I need another car, the Atomic Energy Commission will be pumping the fuel." The clock on the old wagon just ticked over to 110,000 miles, but I'll keep hanging in there, with a plug-in Pontiac, perhaps, destined to be my next new car. ★ ★ ★



BY BILL HARTFORD



Armstrong Tredway is a cushioned vinyl flooring you can staple down right over a linoleum, plywood, even particle-board floor. Its natural elasticity results in easier handling plus minimal hassle and expense in subfloor preparation.

You can choose from six Tredway designs and more than twenty colors. Each featuring comfortable cushioning underfoot. Because Tredway is 12' wide, it will be seamless in most rooms.

**Armstrong Tredway<sup>®</sup>.**  
**The flexible, seamless do-it-yourself floor.**  
**It staples down**  
**right over your old floor.**

Because it is so flexible, Tredway handles easily. You can fold it up and carry it home under your arm. You can bend it up a wall or in a corner without its cracking or creasing. So Tredway is easy to fit and trim.



You can fasten Tredway quickly and easily . . . with a staple gun. Just staple down the edges, and hide the staples with your molding. Where staples won't work (as over concrete) a band of adhesive will.

**Armstrong**  
**7708 Church St.**  
**Lancaster, PA 17604**

I'm a do-it-yourselfer! Please send me free information on Tredway floors and the names of my nearest Tredway retailers.

Name \_\_\_\_\_

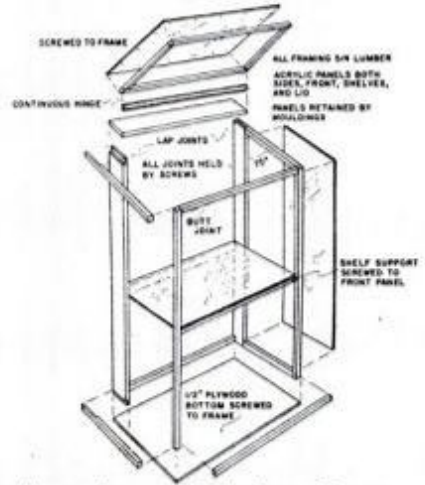
Street \_\_\_\_\_

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

**Armstrong**

CREATORS OF  THE INDOOR WORLD<sup>®</sup>

# Stanley drives screws easier, faster. Free plans prove it.



acrylic-and-wood Window Greenhouse. (You can enjoy it, by the way, without ever removing a double-hung window.)

To order the plans set, send name and address and 25¢ to cover postage to Stanley Tools, Dept. MW, New Britain, Conn. 06050

Is a screwdriver just a screwdriver? The moment you use a Stanley screwdriver — and you'll use one often while building this beautiful Window Greenhouse — you'll feel the difference, the quality.

There's quality in those Stanley handles. They're designed to give you more effortless driving power, help do the job easier. The big grip handle on the Stanley Handyman® screwdriver, shown here, puts

You'll find all kinds of good, strong, Stanley screwdrivers, for all kinds of different screw sizes and types, wherever better tools are sold. Try them out when making this



extra thrust into your palm. (Note the handy hole for pegboard hanging.)

There's quality in those steel blades. Bars are more firmly anchored. Tips are ground to size to keep them from slipping in the screw slot.



**STANLEY** helps you do things right.



# PM WORKBENCH

## PM EXAMINES PRODUCTS AND SERVICES

### Do-it-yourselfers active

According to sources in the home-building industry, homeowners these days are staying put and fixing up. Two probable reasons are: The high cost of new homes today and the wave of nostalgia sweeping the country. People want older homes that contain certain characteristics not available in new homes at any price. According to a recent release from Georgia-Pacific Corp., more than 1000 home (building supplies) centers opened last year—and more than 1300 are expected to open this year—to meet the needs of do-it-yourselfers.

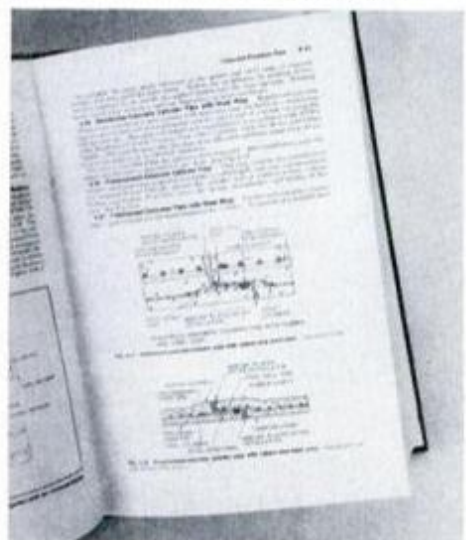
The National Home Improvement Council has translated this into dollars and cents. It projects that \$35 billion will be spent by do-it-yourselfers in 1977.

### On-the-job problem solver

Practical data for nearly all joining and fastening methods are covered in the *Standard Handbook of Fas-*



**Dust jacket makes it clear that this is a no-nonsense volume. Targeted primarily at professionals, the well-drawn illustrations make this an easy book for amateurs to understand as well.**



*tening and Joining*, edited by Robert O. Parmley; McGraw-Hill, \$23.75. The book, prepared by expert engineers from many fields, features easy-to-read drawings and diagrams.

### Fiberglass repair kit

All you need for repairing or restyling auto bodies, boats and the like is in this kit from Duro, Woodhill Chemical Co., 18731 Cranwood



**Kit is claimed to make holes disappear.**

Pky., Cleveland, Ohio 44128. Priced at \$5.98, the package contains resin, fiberglass cloth, liquid hardener, mixing tray and spatula—and step-by-step instructions. Maker claims the product can be used on metal, wood, plastic and fiberglass surfaces.

### Supertough wood finish

This high-quality gunstock finish from Birchwood-Casey, 7900 Fuller Rd., Eden Prairie, Minn. 55343, has a blend of linseed and natural oils



**Carving after two spray applications.**

that dries fast enough to apply several coats a day. It has superior resistance to discoloration or stains by water and sunlight. It's great for projects, too. At sporting goods stores, it's available for \$3.25 per 16-oz. aerosol can.

### Pistol-grip tool kit

The Metrifest travel toolkit, above right, is an economical collection of tools suited for a car, cycle or boat equipped with metric hardware. The pistol-grip handle has a

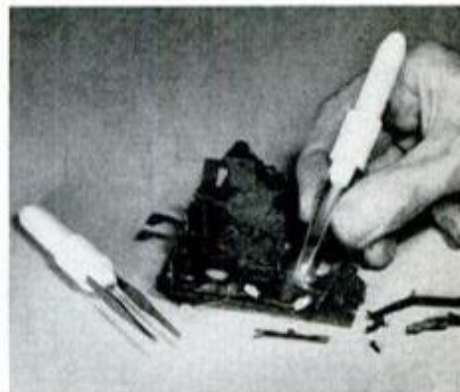


**21-piece kit has zippered vinyl case.**

one-finger, quick-tightening ring claimed to help minimize wrist fatigue. After you tighten the ring to lock the tool in the grip, one finger can rotate it right or left depending on position of the ratchet button. \$8.95 from Metrifest, 51 South Denton Ave., New Hyde Park, N.Y. 11040.

### See what you tweeze

Fingers don't block illumination when you work in dark areas with this spotlight-carrying tweezer. Its 4 $\frac{1}{8}$ -in. length includes a pair of 2-in.-long stainless-steel blades attached to a plastic head in which a flashlight lamp is fitted. The plastic barrel that's threaded into the head



**Built-in light stops squinting.**

holds an AAA penlight battery cell: A simple twist of the barrel activates the lamp. Labeled Tweezer-Lite, the tool is \$5.73 postpaid from Educational Products, Box 606, Mineola, N.Y. 11501.—*Harry Wicks, Home and Shop Editor*

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

# One answer to the pool debris problem

The tentlike arrangement below is our economical solution to the problem of leaves and twigs in our swimming pool from overhanging trees. Cost was \$350, instead of \$4000 or more for a commercial cover. Since the pool is adjacent to the house and surrounded on three sides by an 8-ft. brick wall, we were able

to anchor the cover's edges above head level; lines from trees support the center. Materials used were 18x-20-mesh fiberglass screen and 3/4-in. Dacron cord for the radial lines. Leaves that don't slide off the cover's slope are helped along with a broom pushed up against the cover from inside.—*Dr. Ralph R. Grams*



Fiberglass-screen cover admits plenty of sunlight to pool and deck. Below, snap hook and eye anchor support line to wall.



## Choosing the right shell is as easy as 1-2-3.



**Winchester and Western Super X.** The only high brass, one-piece plastic hunting load for full, dense, patterns at normal ranges. This is the optimum hunting shotshell. Available in all popular sizes and gauges.



**Winchester and Western Super-X Double-X.** The magnum load that'll give you 10-15 more yards of effective range. And the specially granulated polyethylene powder added to the shot column along with the Mark 5<sup>®</sup> collar result in harder hitting patterns that are right on target.



**Winchester and Western Upland Shotshells.** The only, low brass, one-piece shotshell specifically designed for upland game hunting where standard velocity loads are ideal. The right combination of power and pattern for game birds like: quail, dove, partridge and small game animals. In all popular gauges.

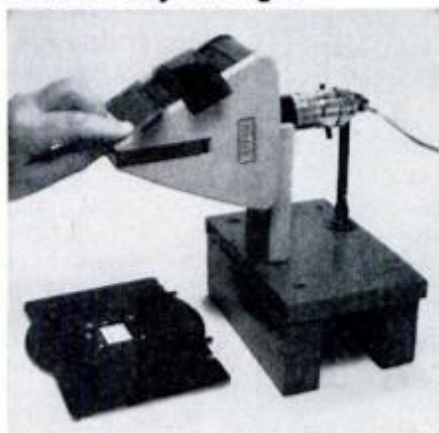


**WINCHESTER**  
*Western*

# PHOTO HINTS

FROM READERS

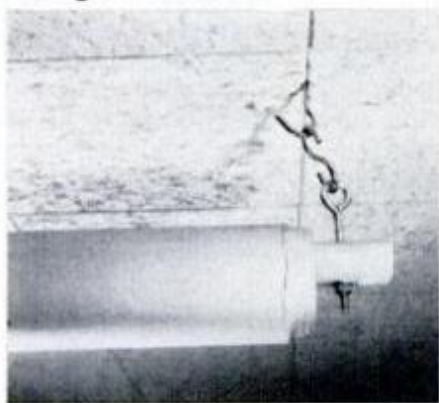
## Double-duty safelight



I use a two-sided darkroom safelight to double as a negative viewer. I support it in a simple jig made of wood scraps and a socket fixture. The bottom section still illuminates the worktable area in the usual manner, while the top permits quick and easy selection of those negative frames which I would like to enlarge.

—Robert Hertzberg

## Living-room studio

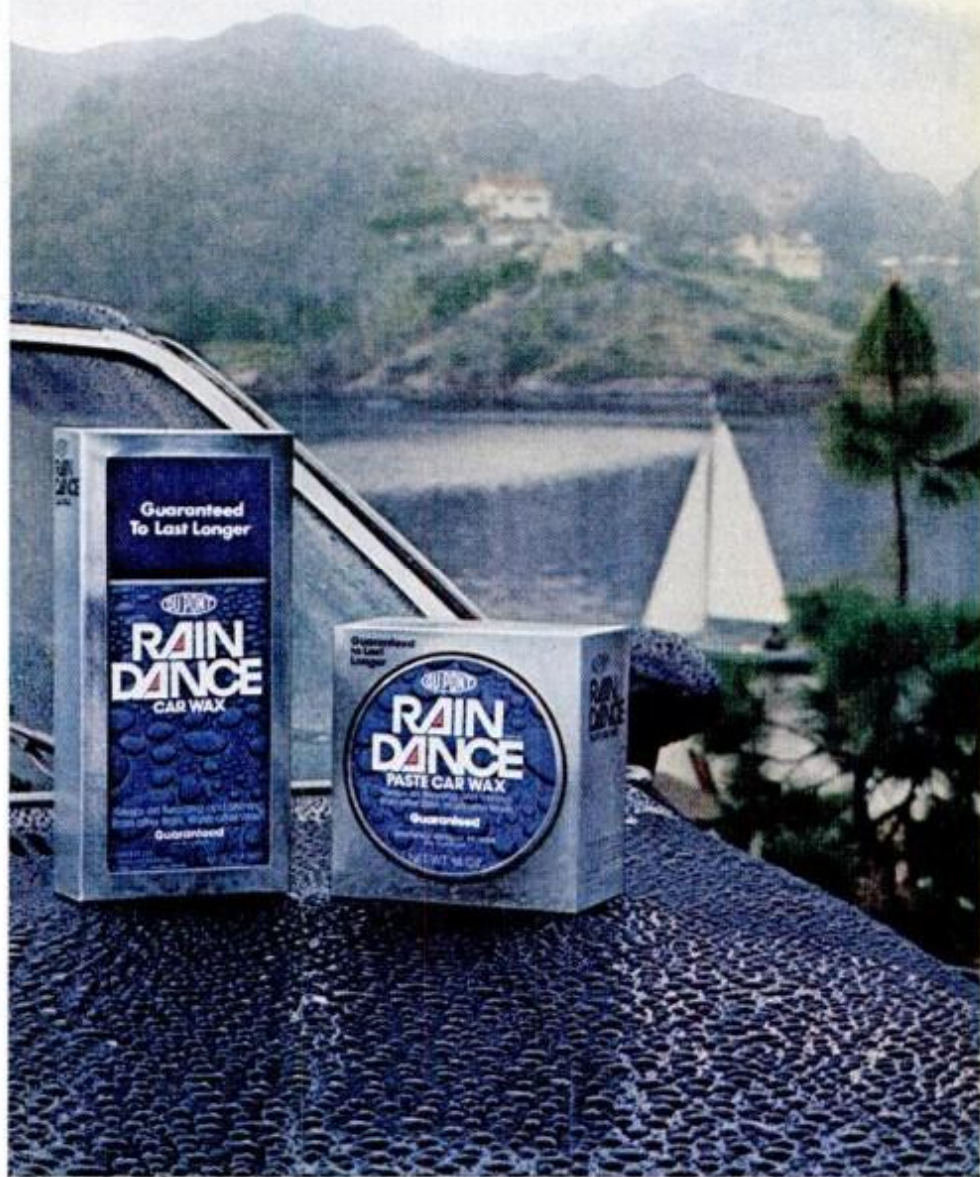


A family room or living room can be converted quickly into a photo studio if seamless background paper is hung from the ceiling using screw hooks fastened into joists (or expandable anchors for wall-board). The 9-foot-wide roll of seamless paper is supported on a 1¼-inch wood closet pole, available in 10-foot lengths. The pole is drilled to accept 3 or 4-inch-long eyebolts. You can use simple S hooks for hanging the roll of paper. And when you're not using the roll and supporting rod, store them in the original carton.

—Stephen Peterson

# Rain Dance<sup>®</sup> lasts longer than any leading car wax.

Water beading proves it. Du Pont guarantees it.

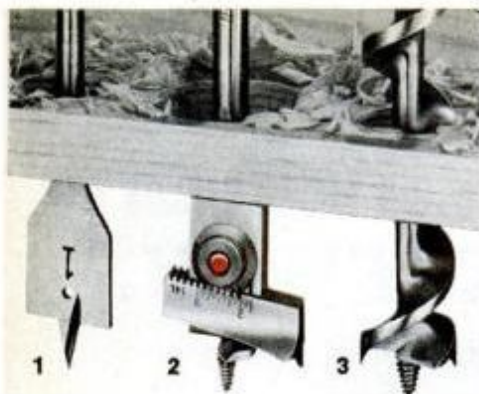


We tested 'Rain Dance' against all the leading car waxes...paste and liquid...and 'Rain Dance' keeps on shining longer, keeps on beading water longer, rain after rain, wash after wash. That's why we can guarantee it will last longer on your car. Premium-performance 'Rain Dance' is easy to use. It gives your car a fantastically brilliant shine because 'Rain Dance' cleans deep down as it waxes. And that shine lasts longer.

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**GUARANTEE:** "RAIN DANCE" is guaranteed to keep on beading and shining longer than any leading liquid or paste car wax. If not completely satisfied, return unused portion to B-4233, Du Pont Company, Wilmington, DE 19898, for full refund of actual purchase price and postage.



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- 1. Irwin Speedbor® "88"** wood bit for all electric drills. Spade-type head, original hollow ground point starts and cuts clean and fast in any wood. 17 sizes, 1/4" to 1 1/2". Available individually or in workshop sets.
- 2. Irwin No. 22 "Micro-Dial"®** hand brace expansive bit bores 35 standard holes 7/8" to 3". Just dial the size you need. No. 21 bores 19 standard holes, 5/8" to 1 1/4".
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**Speedbor "88" Sets**  
Get 6- or 13-bit sets in metal workshop organizer racks.

**New Protective Plastic Pouch!**  
Speedbor "88" 1/4" shank wood bits for electric drills are available individually in new easy-to-store protective pouches . . . to help you care for them as you do all your other fine, quality tools.



**Strait-Line® Chalk Line Reel Box.**  
Every serious do-it-yourselfer should have an Irwin 50 or 100 ft. self-chalking line box. Easy action reel. Leak-proof, damage-resistant aluminum alloy box fits hand or pocket.

### Irwin Screw Starter



Marks, starts and threads hole for screw to enter non-metal materials the easy way, with hardly any effort. Can also be used as a "marking tool" when drilling holes. Handiest tool in years for home and workshop. Available from your hardware or building supply dealer, and home center stores. All items above are available in metric sizes. ©Registered U.S. Patent Office

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# IT'S NEW NOW



### Bobsled runs for summertime fun

Bobsled buffs swoop down slopes all summer at Bromley ski area in Vermont, thanks to 4000-foot "Alpine slides." Giant runs come in concrete trough sections, with banked curves and long, steep straightaways. Lever controls speed by raising sled on its wheels and lowering brake runners. Alpine Slides, Box 1130, Manchester, Vt. 05255.

### Easing the grind with stereo entertainment

Patients who have their cavities filled by Chicago dentist Dr. Sherwin Laff can have their misery dampened a bit. Red glasses cut the glare of those dental spotlights, and stereo earphones provide distracting radio music or chatter. Volume and channel controls are adjustable by the patient according to choice. Dr. Laff's office is divided into circular modules because, he says, psychologically soothing curves give patients an anxiety-free environment.

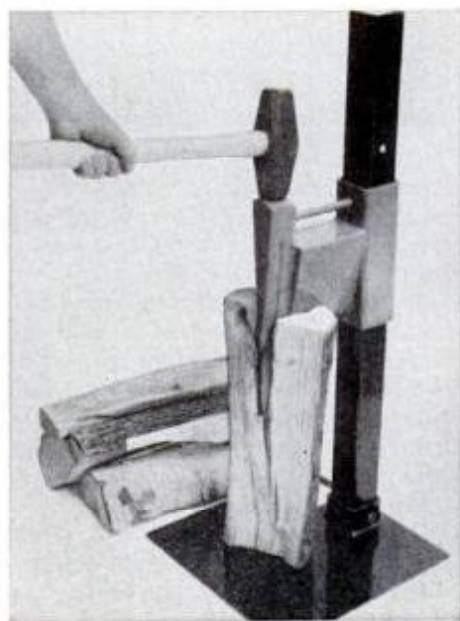


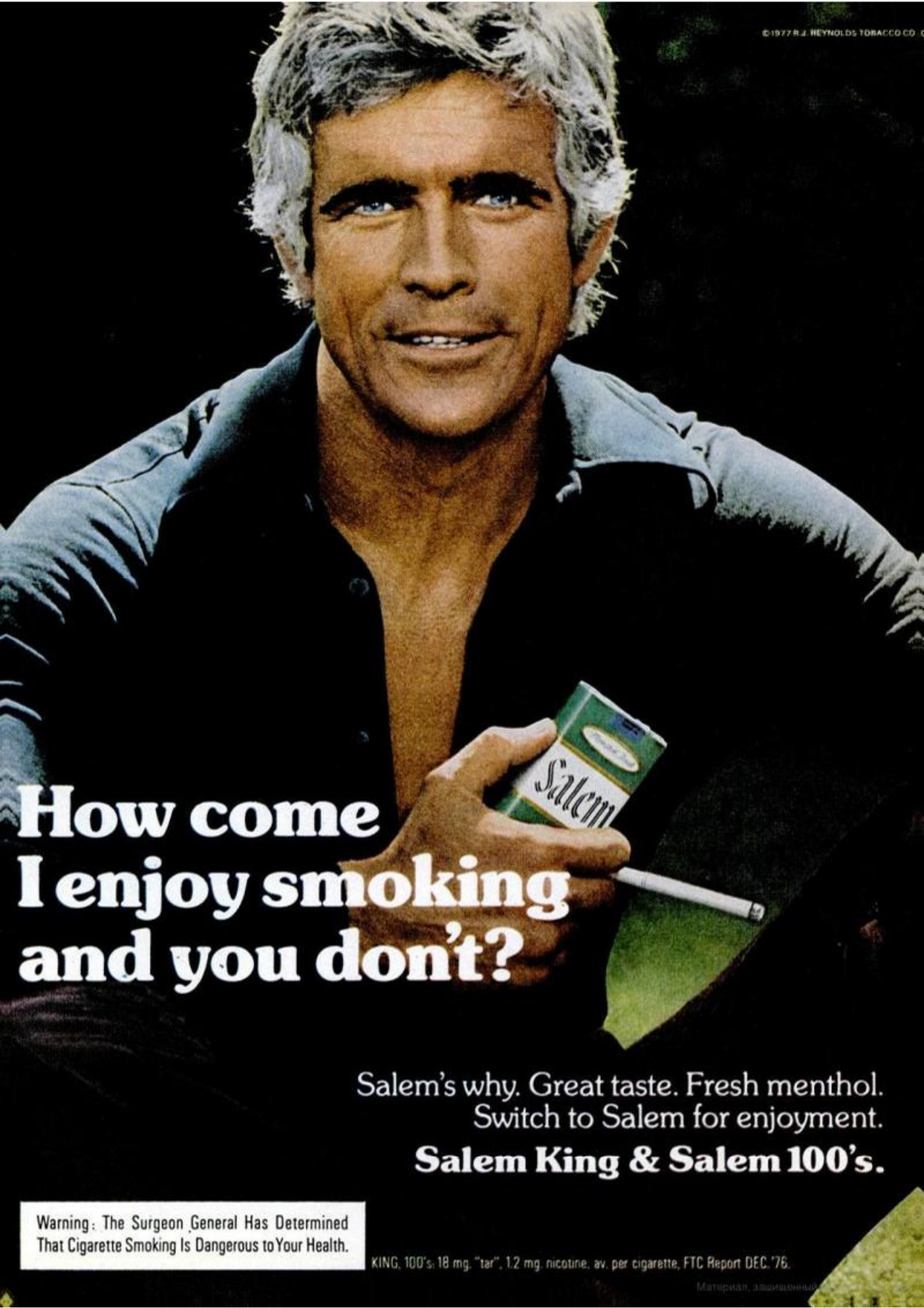
### Pushbutton shop salesman

Round-the-clock sales spiels describing displays in a Moosburg, Germany, shop window are triggered by passersby who push a button in the glass to get a taped message about items and prices.

### Finis for 'flying wedges'

Hands-off wood-splitter holds a wedge in position while you use both hands to swing sledge and split fireplace logs up to 30 inches long. \$89.95. Oak Grove Co., Box 47A, Foristell, Mo. 63348.





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

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

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

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

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

Материал, защищенный

**Traditionally smooth.  
Untraditionally priced.**

*Officer's sword of the Grenadier Guards  
from the battle of Waterloo-1815.*



*A rare combination of hearty Canadian grain and pure glacier-fed  
spring water; aged in the clean dry air of the Canadian Rockies.  
You can buy a more expensive Canadian, but not a smoother one.*

**Windsor. A rare breed of Canadian.**

# A NEW QUEEN FOR THE OLD MISSISSIPPI

I grew up in a river town. I have followed the call of freight trains to sit around twig fires with hoboes. I have traveled to many places. Always, I come home to the river where the call of riverboats stirs me to wander after them.

So it is that I follow the riverboats to New Orleans where I board the biggest and newest of them all.

As I watch Capt. Joe Van Gayle pilot this 379-foot riverboat, I realize he's seen many changes on the old Mississippi River, including the addition of this posh hotel afloat. Some of the changes he likes, but others he thinks are bilge swill.

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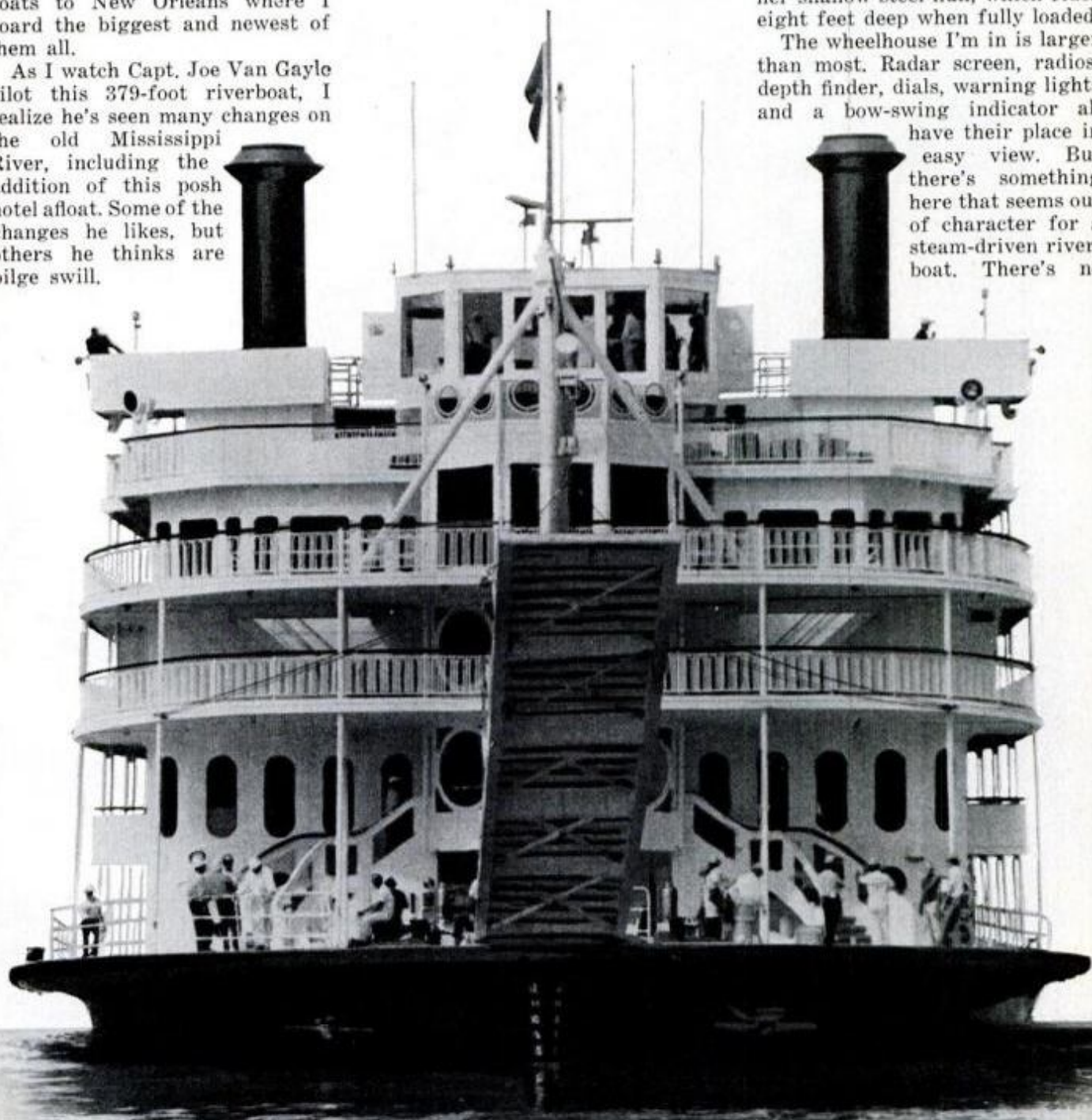
Modern gear and riverboat tales fill the pilothouse when you run the river in the new Mississippi Queen.

---

by John Hall

I'm aboard the *Mississippi Queen*, an ultramodern, \$24 million steamboat that's running the river this summer from New Orleans to Vicksburg and back. Not only is she run by steam, but she's pushed from the stern by a magnificent red paddlewheel. No hidden propellers spin secretly below her shallow steel hull, which rides eight feet deep when fully loaded.

The wheelhouse I'm in is larger than most. Radar screen, radios, depth finder, dials, warning lights and a bow-swing indicator all have their place in easy view. But there's something here that seems out of character for a steam-driven riverboat. There's no



# 'For all her luxury, she's still a riverboat.'

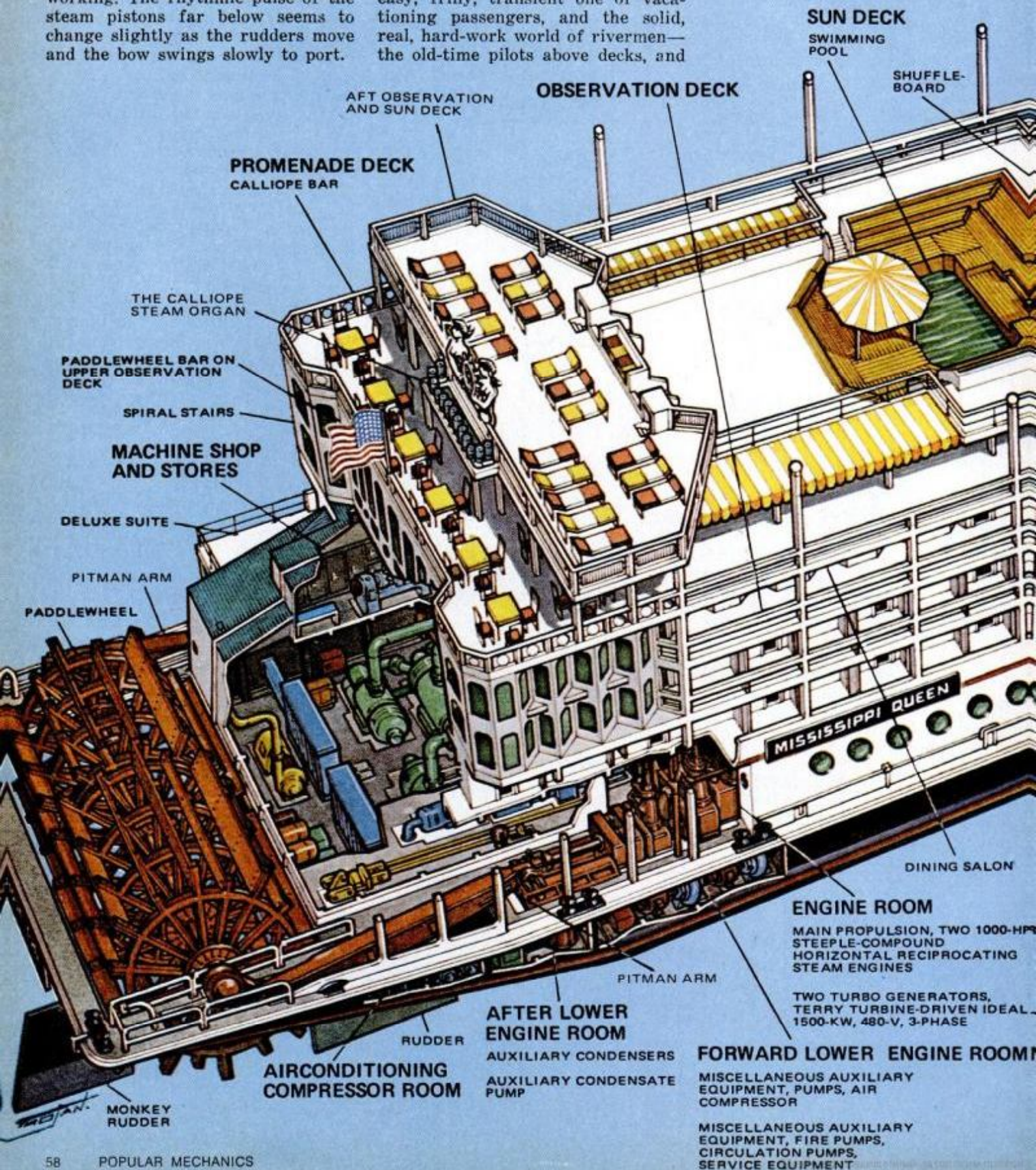
mammoth wheel worn by hands that are constantly turning it to steer. Instead, sticks are used as a helm. Steering sticks utilize air pressure to activate hydraulic pumps that move the *Queen's* five rudders. Sticks offer better control with less work than a wheel. As Capt. Gayle moves the sticks, I can hear the air system working. The rhythmic pulse of the steam pistons far below seems to change slightly as the rudders move and the bow swings slowly to port.

As I look back from the wheel-house across the sun deck, I see passengers lounging about the swimming pool, some reading, some sipping tall mint julips, others just watching the cotton fields and wooded banks slowly pass by.

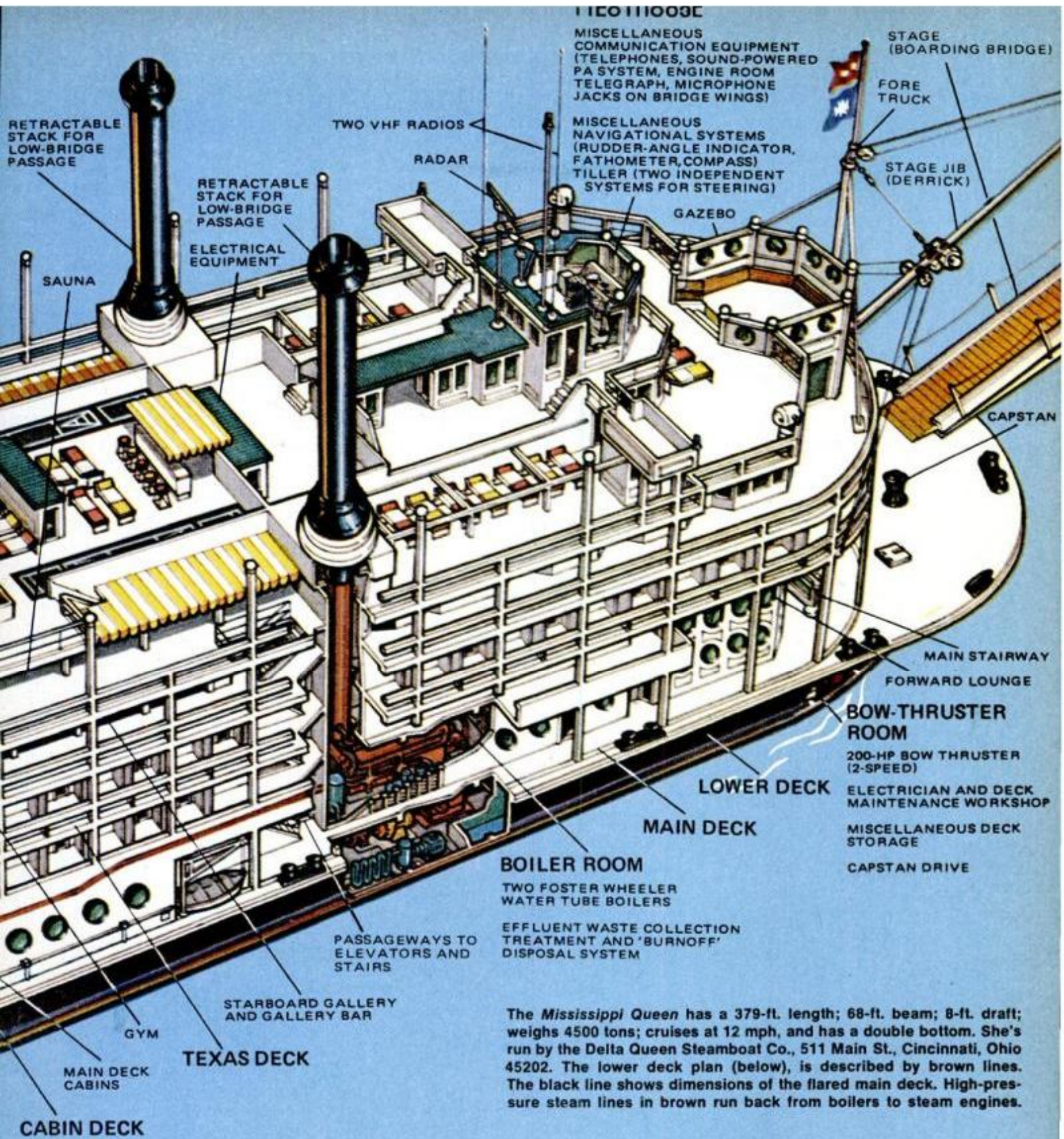
I realize I am on the new with the old. I am living in two worlds: the easy, frilly, transient one of vacationing passengers, and the solid, real, hard-work world of rivermen—the old-time pilots above decks, and

the precise engineers below decks.

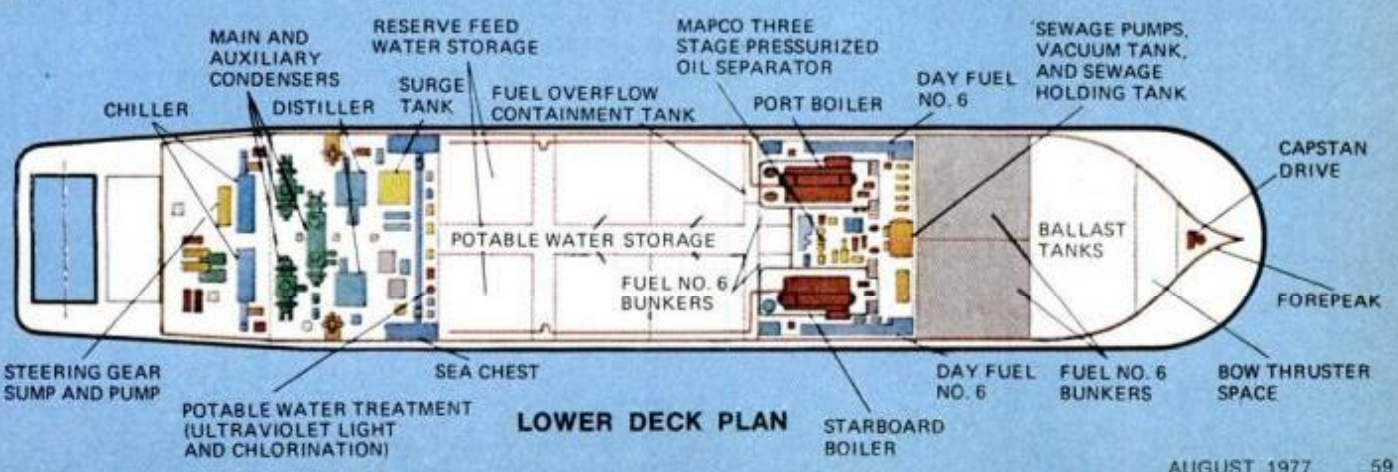
The *Mississippi Queen* has elevators, a beauty shop, a 150-seat theater, and the luxury of the *Queen Elizabeth II* for her 400 passengers. She has a fine jazz band, fresh strawberries every morning, filet mignon and a grand salon. But for all her luxury, the *Mississippi Queen*

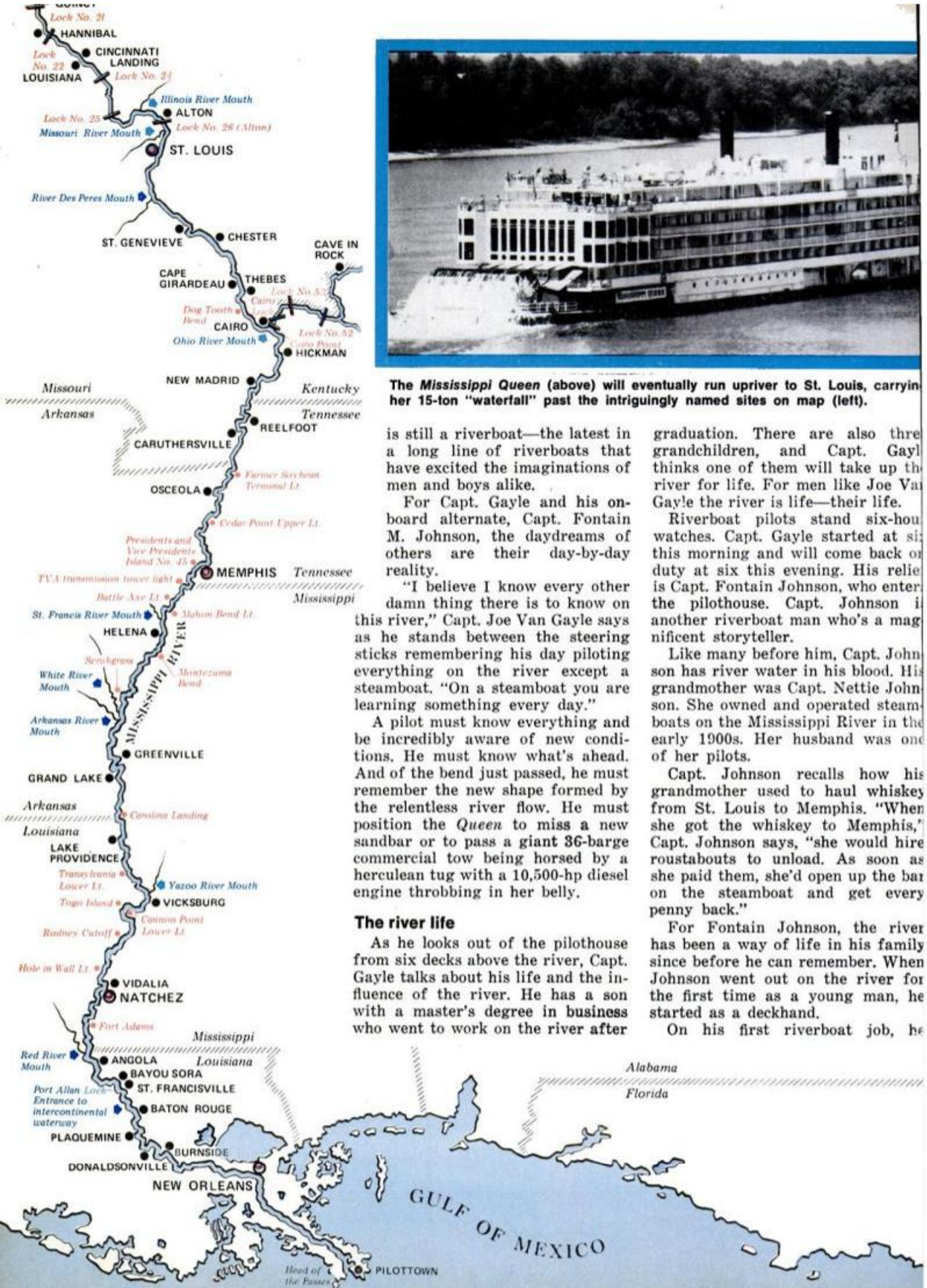






The *Mississippi Queen* has a 379-ft. length; 68-ft. beam; 8-ft. draft; weighs 4500 tons; cruises at 12 mph, and has a double bottom. She's run by the Delta Queen Steamboat Co., 511 Main St., Cincinnati, Ohio 45202. The lower deck plan (below), is described by brown lines. The black line shows dimensions of the flared main deck. High-pressure steam lines in brown run back from boilers to steam engines.





The *Mississippi Queen* (above) will eventually run upriver to St. Louis, carrying her 15-ton "waterfall" past the intriguingly named sites on map (left).

is still a riverboat—the latest in a long line of riverboats that have excited the imaginations of men and boys alike.

For Capt. Gayle and his on-board alternate, Capt. Fountain M. Johnson, the daydreams of others are their day-by-day reality.

"I believe I know every other damn thing there is to know on this river," Capt. Joe Van Gayle says as he stands between the steering sticks remembering his day piloting everything on the river except a steamboat. "On a steamboat you are learning something every day."

A pilot must know everything and be incredibly aware of new conditions. He must know what's ahead. And of the bend just passed, he must remember the new shape formed by the relentless river flow. He must position the *Queen* to miss a new sandbar or to pass a giant 36-barge commercial tow being horsed by a herculean tug with a 10,500-hp diesel engine throbbing in her belly.

### The river life

As he looks out of the pilothouse from six decks above the river, Capt. Gayle talks about his life and the influence of the river. He has a son with a master's degree in business who went to work on the river after

graduation. There are also three grandchildren, and Capt. Gayle thinks one of them will take up the river for life. For men like Joe Van Gayle the river is life—their life.

Riverboat pilots stand six-hour watches. Capt. Gayle started at six this morning and will come back on duty at six this evening. His relief is Capt. Fountain Johnson, who enters the pilothouse. Capt. Johnson is another riverboat man who's a magnificent storyteller.

Like many before him, Capt. Johnson has river water in his blood. His grandmother was Capt. Nettie Johnson. She owned and operated steamboats on the Mississippi River in the early 1900s. Her husband was one of her pilots.

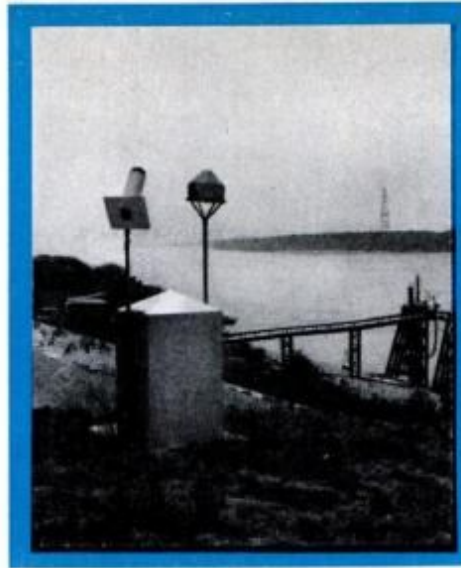
Capt. Johnson recalls how his grandmother used to haul whiskey from St. Louis to Memphis. "When she got the whiskey to Memphis," Capt. Johnson says, "she would hire roustabouts to unload. As soon as she paid them, she'd open up the bar on the steamboat and get every penny back."

For Fountain Johnson, the river has been a way of life in his family since before he can remember. When Johnson went out on the river for the first time as a young man, he started as a deckhand.

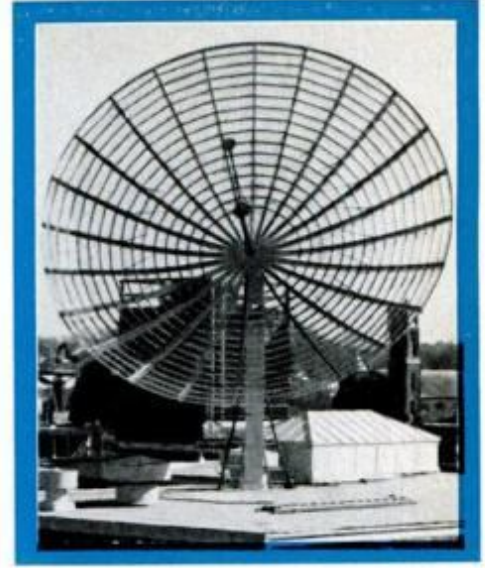
On his first riverboat job, he



A 48-barge tow plowing upstream is a rig that the riverboats must reckon with.



Water-level readings are transmitted through the tubular device to a satellite.



Corps' antenna in Vicksburg receives the satellite data for 1250 miles of river.

served under a captain who was a holdover from the packet steamboat days of passenger travel, Johnson says. The captain wore a white suit complete with white gloves. On that first day when he summoned young Johnson to the wheelhouse, they were about a day above New Orleans and it was starting to get chilly. The problem concerned the new oil-stove which had recently replaced the old wood burner.

The captain inquired whether young deckhand Johnson could light such a stove since none of the rest of them had had any luck. Johnson said he thought he could based on experience with such stoves as a boy.

"I didn't know they'd been pumpin' the damn thing since New Orleans," Johnson says in his finest Greenville, Miss., accent. So he proceeded to pump the stove and toss in the fire.

"It blew every window out of that wheelhouse," Johnson says, still laughing hard after all these years. "And the only thing that wasn't black in that wheelhouse was the insides of the captain's white gloves.

"Later that same day," Johnson relates, "the captain sent me out on the head barge to take a depth reading with a lead line. Nobody told me to tie it off. When I threw out the line, it went right in the river."

### Change of watch

Capt. Johnson takes over the controls of the *Mississippi Queen* after hearing a brief report on river traffic from Capt. Gayle. As the wheelhouse empties for the noon meal, Johnson gets on the two-way radio for talk with the pilot of a down-

river boat pushing a long string of barges. Between the two pilots, they figure out about where they will meet in the river and how they will pass: one whistle, port to port (left-hand side to left-hand side), or two whistles, starboard to starboard (right-hand side to right-hand side).

Riverboat whistles have long been used to communicate between vessels. But now modern radios are used constantly to transmit even more information. A pilot needs all the information he can get. Even with detailed charts and sophisticated equipment, a riverboat pilot needs experience, inner knowledge and intuition to read the river correctly.

The river buoys set out by the U.S. Coast Guard to mark the channel do not shift with the subtle river currents that move sandbars overnight. The river charts do not show the snags of giant logs that threaten serious trouble for any riverboat one minute and disappear with the cur-

rent as quickly as they appear.

A pilot must know the river as thoroughly as he knows the shape of hallways in his own home at night. The pilot of a towboat pushing a long string of barges downriver at night had better know the shape of the river. If he doesn't, he will feel the lead barges ripping up the bank and through the trees on a bend of the river he could not "feel."

### Lead lines and satellites

The Mississippi River is maintained by the Army Corps of Engineers at a minimum depth of 9 feet. This was even true late last year when the river was at its lowest in 20 years—5.7 feet below normal level and closed in some areas. Accurate measurements of river height are taken a little differently today than they were when writer Samuel Clemens threw a lead line off the bow of a riverboat to gauge river depth. As

*(Please turn to page 135)*



Running downriver, the *Mississippi Queen* has the style of a traditional riverboat.

Flex-wing Rogallo-type hang glider soars into the blue below, powered by small 12-hp engine on tail. Curved tailskid (right) protects prop on takeoffs and landings. Design is work of Jonathan Winsor.



# Now they're hanging engines



# on hang gliders



**S**ome will tell you they're re-inventing the airplane. Others will say it's just the next logical step in a fast-moving hobby long noted for the bold daring and innovation of its enthusiasts. In any case, the new-fangled fad of hanging engines on hang gliders may not be as incongruous as it first appears. There's no doubt that it vastly broadens the appeal of the sport, opens it up to many new participants and, with care, can contribute much to greater safety.

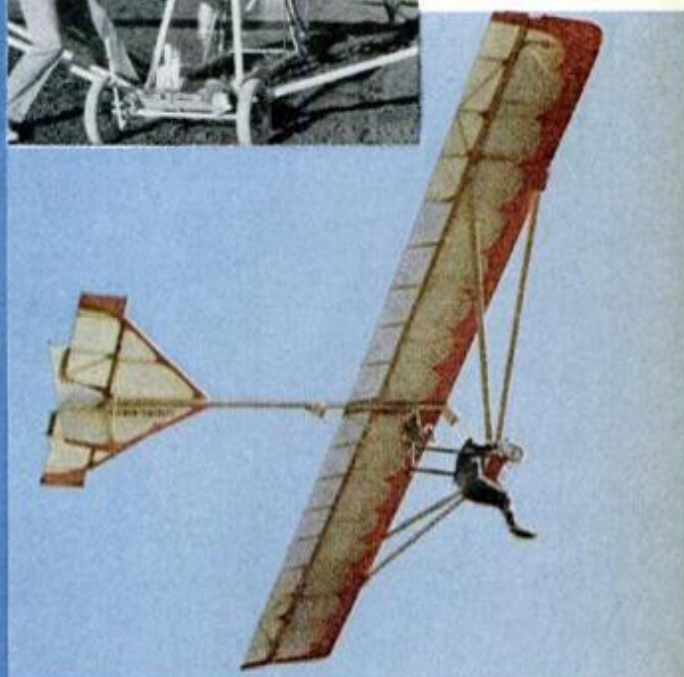
With power assist, you don't have to leap off cliffs or race down steep slopes to get airborne—a requirement that has tended to limit the activity to the strong of limb and stomach. You don't have to travel hours to a suitable launch site, then wait more hours for just the right weather conditions. You give the pull starter on your mini powerplant a casual yank, take a

---

Leery of jumping off cliffs? Take heart—help is on the way. Hitch a prop to your kite and you can take off from anywhere. It may even be the first step toward the airplane.

---

by Bill Allen



**Easy Riser** (immediately above) is rigid-wing biplane with power added by John Moody of Milwaukee. Moody pioneered motorized hang gliding in early 1975 when he put a small 12-hp kart engine on an Icarus-II, a similar biwing craft. At top is powered single-wing hang glider developed by Volmer Jensen of Glendale, Calif. Craft sports airplane-like tail, even wheels. The wheels, however, are used only for ease of ground handling, not as landing gear.

## 1000-mile glider flights?

few brisk steps forward and suddenly you're in the air, soaring gracefully skyward at climb rates of 100 to 350 feet per minute. Altitudes of 500 to as much as 5000 feet are not uncommon with power assist.

Once aloft, you press a kill switch to cut the engine and glide smoothly and silently for miles. When you need more altitude, you can restart the engine in flight and rise to new heights for more soaring or a safe return trip home. Your "runway" can be any nearby flat field or even a good-sized back yard.

The development of powered hang gliders couldn't be timelier. Early 1977 saw mountain flying sites nationwide closed because of deep snow

47.3 miles was set in an unpowered hang glider—a colossal feat. Today, such almost unbelievable achievements should become commonplace everywhere using engine launches. Inflight restarts to get past unfavorable weather conditions should help to extend flights even farther.

Beyond expanding recreational hang gliding, power opens up the prospects for more functional uses. Cattle ranch and border patrol work are being considered. Promoters have a 100-plus square feet of wing area for aerial billboards. Exciting airshow demonstrations are another possibility.

The more optimistic foresee the use of powered hang gliders for seri-



Backpack prop is easy way to add power to delicate Rogallo-type hang gliders that do not readily provide mounting points for engines. Above is Ron Renau's design with fiberglass shroud that offers both protection from prop and a ducted-fan effect to improve airflow. At right is typical caged prop without duct. One disadvantage of backpacks is that engine weight and thrust are on pilot, not the glider.



or the danger of fire from drought. Remaining launch areas often were crowded. And the Great Plains stayed as flat as ever.

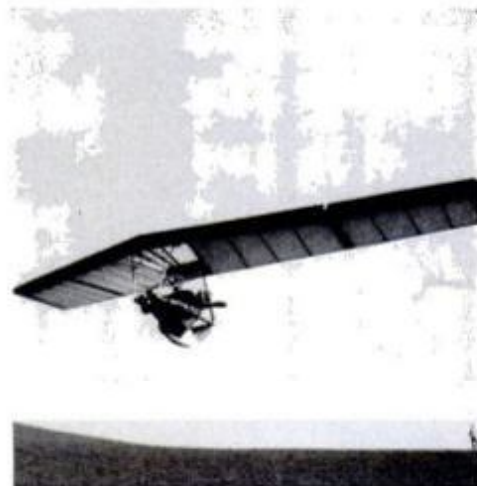
Engines liberate fliers from these problems. Long flights from level takeoffs become easy and routine. Last year a world distance record of

ous transportation. Wilderness campers could carry along a sleeping bag to lay out underwing at night. Designer Terry Sweeney of Wilton, N.H., envisions 1000-mile flights will be made over several days on 10 gallons of gas.

"The beginning of the motorcycles



Twin-tube kingpost mount was devised by Terry Sweeney to allow adding engines to flex-wing Rogallo-type hang gliders.



Flying wing, called 49er, is handiwork of Craig Catto of Cupertino, Calif. Unlike Jensen design on preceding page, it has no tail. Engine has hand throttle plus kill switch to cut power.

of aviation," says John Moody of Milwaukee, Wis. It was he who showed self-launching to be practical in early 1975 by putting a 12-hp McCulloch MC-101 kart engine on an Icarus-II tail-less biplane. Funding came from a pizza parlor in return for underwing advertising.

Today Moody is the largest provider of power packages (page 170, Feb. '77), and promotes Easy Risers, replacing the Icarus. Like the Icarus, the Easy Riser is also a fixed-wing tail-less biplane. Moody observes that more than half of his customers are licensed pilots—refugees from conventional aviation's increasing complexity and expense.

### More advanced designs

As with Moody, Volmer Jensen of Glendale, Calif., prefers "rigid wings" using mostly traditional aircraft construction. He and famed aerodynamicist Irv Culver, both in their 60s, designed and actively fly the VJ-24 Sunfun, a monoplane with an aircraft-type tail and controls. It's

*(Please turn to page 118)*

# New gear for easier camping

by Bill McKeown  
OUTDOORS EDITOR

**M**odern camping this summer means eating and sleeping with many of the comforts available at home. That requires rugged gear that is light to carry, easy to clean and maintain, convenient to set up and use—and much of the new equipment this season is just that.

For the backpacker who analyzes accessories by the ounce, there are expensive but very compact freeze-dried foods that keep the poundage down. Modern outdoor ethics require a portable stove in most areas so cooking does not rely on kindling. Even RV campers can consider an extra small stove for a pot of coffee or picnic tabletop preparations. For campsites having a fireplace, it's easy to use charcoal and set up a grill.

Often cooking, eating and even setting up camp must be completed in the dark. The Coleman lantern is still a standby for shedding light. New models are easier to get started, have better looks, and can be carried in improved shock-resistant cases. Electric lamps go camping too in a wide variety of new self-contained models. Also bring a couple candles.

No fires in tents, however. All new tent models are fire-retardant, but they still can be ignited by an open flame and carelessness. Today's tents are lighter, stronger, engineered to resist wind gusts, and usually designed without the obstruction of a center pole and the nuisance of guy lines and pegs. Internal framing holds the tent erect and often allows it to be picked up and moved around after assembly. Any modern tent more than a shelter should have a floor and bug-netting closures over doors and windows.

Anywhere outdoors any time of year can get cool at night, and the latest camp clothing can be used for summer outings and winter sports alike. Down is currently fashionable, and expensive, but synthetics like Polar-Guard and Dacron Fiberfill II are more useful due to their quick-drying properties in rainy weather.

And for all outdoor gear, quality almost always costs more—and is worth it. ★ ★ ★



Maximum heat from a mini source, Coleman's \$28 backpacker's Peak 1 stove, with wind shield to support pot, uses Coleman fuel, white gas.



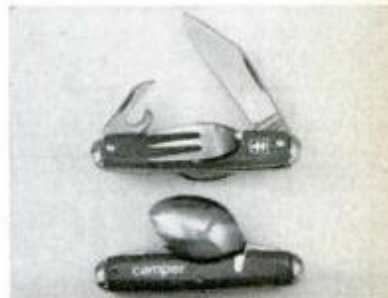
Tents that can stand on their own without stakes aid the backpacker. Hirsch-Weis \$184 High Country uses A-frames.



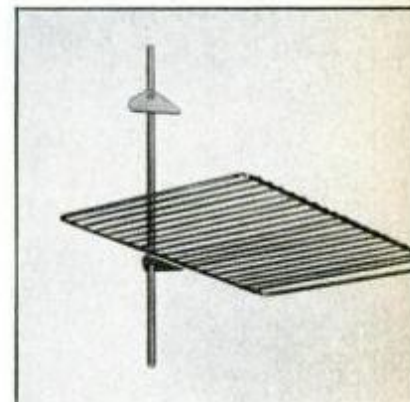
Down on top for added warmth, Du Pont Fiberfill II underneath, Woods Bag & Canvas \$90 Bunk Comforter aids sleep afloat, ashore.



Swim or boat float for anchoring off a shore cottage, the kit from Sheet Metal Specialty, Follansbee, W. Va., comes complete in 8x10 (\$300) and 10x10-foot (\$400) sizes ready for assembly.



Eating out is easier with fork and spoon built into Swisskraft knife, \$5.50 from Republic Ind., Box 3340, Providence, R.I.



Camp cooking specialties from Mirro Aluminum include new campfire grids like adjustable \$5 grill (upper right) and light Explorer's Grid \$3.85 (lower right) that folds for packing. New nesting pots and plates are also in line.

**O**verwhelmingly, the big reason for going Grand Prix is styling. That's what the GP owners we surveyed told us in 62.9 percent of the cases. And a whopping 73.2 percent listed styling as the one feature they like best about their cars.

"It's my idea of a poor man's Caddy," says an Illinois expediter, who also adds: "It's got the looks I've always wanted."

Notes an Iowa sportscaster, "This is my fourth Grand Prix since 1971, and I'm pleased with the styling, handling accessories and quality of the car."

A Michigan philosophy teacher: "I've just always liked their looks and thought the Grand Prix was the best value for the money. The standard GP costs about the same as the Monte Carlo Landau."

And a Texas steelworker: "I've been wanting a Grand Prix since 1974 because they're so pretty."

Past experience also entered into buying decisions, with some 20 percent of our respondents having owned a Grand Prix before. "I had a 1971 and loved it," enthuses a New York college professor. Another prof, this one from Florida, echoes, "I have always owned Pontiac cars, and the Grand Prix



was always the body type I wanted to have."

The Grand Prix's workmanship rates above average in our survey, with 72.5 percent marking it *good to excellent*. A self-employed Alabaman, for example, said, "It's tightly built and uses steel in many places where other makes use plastic."

A Texas postal clerk adds, "This is the first new car I've ever bought that has *not* had to have some minor adjustments and repairs in the first few miles. I really can't find a thing wrong with this one!"

In all, 62.5 percent of the owners we questioned said they'd had

no mechanical troubles to date. That's the best trouble-free record posted by any 1977 car—domestic or import—we've surveyed this year.

Of the minority who did have mechanical problems, 14.7 percent involved carburetion and the same number had to do with brakes. The brake complaint involved squeal—annoying but minor. The carburetor problem centered on cold starts and stumble before warmup—a failing common to many cars.

On the topic of dealer service, owners voted 65.7 percent to grade it *good to excellent*—an average rating at best when compared with other cars in our own-



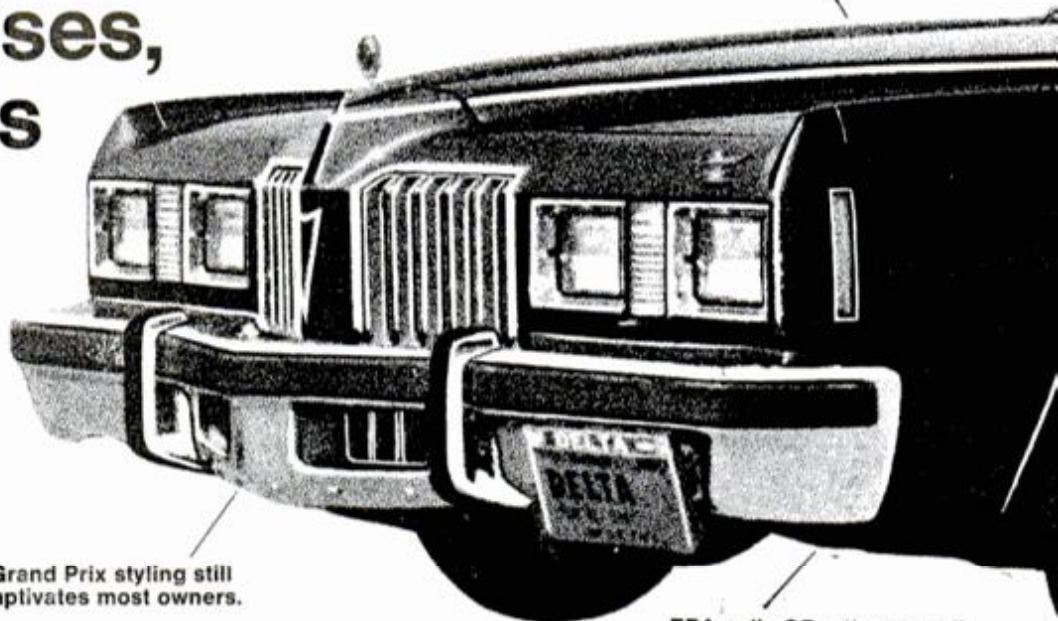
Owners report good rear vision, want better sealing of side windows.

er surveys. An Iowa restaurant manager who gave his dealer a mark of *excellent*, for instance, commented that, "... it takes only

BY MICHAEL LAMM WEST COAST EDITOR

## Terrific styling, but gas mileage falls below EPA promises, say owners

Pontiac's new 301 is one of America's lightest V8 engines.



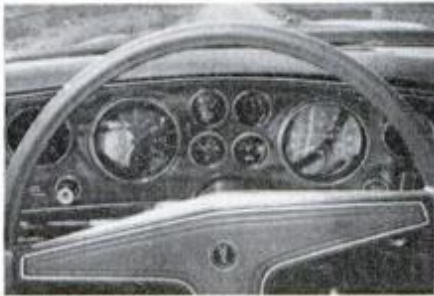
Grand Prix styling still captivates most owners.

EPA calls GP a "compact" yet it's on same 116-in. wheelbase as full-sized Pontiacs.



one or two days to get the car into the shop when something goes wrong."

"I've had my car back four times to have some rattles removed," says a Wisconsin production-con-



Please swap off clock and speedometer, plead a number of peeved owners.

rol manager, "and so far they're still there."

And a Kentucky furniture dealer: "The dealer's service department has been good except for some reluctance on their part to give us a copy of the work order." (This practice has led some states to legislate that dealers *have* to give customers copies of work orders.)

Styling, as we mentioned, ranks No. 1 as the GP's best-liked feature. Handling rates No. 2. A Michigan salesman avers, "I espe-

cially like what I see as the balance of the car. It all works smoothly and effortlessly."

A Montana rancher agrees, "The Grand Prix's ride and handling are superb."

"Very good handling," comments a Kentucky salesman, "and it feels very positive on the road."

"Handles great and corners very easily," says a Tennessee mechanical draftsman.

The Grand Prix's least-liked feature is its gas mileage, not so much because it's low but because owners were led to believe it would be higher.

Complains an Indiana book-  
(Please turn to page 124)

Comfortable seats and smooth, silent ride came in for high praise.



## What's a Grand Prix?

Grand Prix, loosely translated, means *great prize* in French. In English it means Pontiac—has since 1962. The GP became a distinct line (as opposed to a mere model) in 1969.

The 1977 Pontiac Grand Prix shares basic body sheet metal with the Chevrolet Monte Carlo coupe. Both span the GM A-SP body's 116-inch wheelbase. Roofs, doors and inner body panels are also used by the Buick Regal and Olds Cutlass coupes.

The Grand Prix competes in the "specialty coupe" or "personal luxury" category against such rivals as Thunderbird, Cordoba, Charger, Cougar coupe, and the high-series Matador.

This year's GP comes in three trim levels: base, LJ and SJ. Standard engine is the 301-c.i.d., two-barrel V8, with the 350, 400, and 403 optional. Prices start at \$5120 f.o.b. for the standard Grand Prix, while the LJ lists at \$5483 and the SJ at \$5753.

Next year's Grand Prix will be considerably smaller. Its 108.1-inch wheelbase will be the same as this year's Camaro/Firebird. It's all a part of the General Motors downsizing program.—M.L.

## A NATIONWIDE SURVEY BASED ON 917,442 OWNER-DRIVEN MILES



"More legroom in back seat," request 9.5 percent of respondents.

"Trunk might be larger," moan some owners.

Tires toss up lots of gravel, snow and mud on sides.

Grand Prix now comes with radials in all series—LJ, SJ and standard.

Tuck-under allows sandblasting and paint chipping by gravel.

Photos by the author

# Weather radio: Keep one

To get the earliest possible warning of a weather emergency, you'll need this gear and know-how.

by Anthony R. Curtis  
RADIO EDITOR

**T**ornado! The vicious monster touched down at Little River, Kans., just at the dinner hour. During that hour, it smashed its way 40 miles cross country to Salina, flattening 44 mobile homes in its path.

From Salina it gouged the countryside to Niles where it killed a woman by dumping a 40-foot grain bin on her home. By 8:00 p.m. it was in Clay Center injuring 20 persons and wreaking \$2 million havoc to the hospital building and equipment.

Moments later, at Greenleaf, the killer snuffed out the lives of two youngsters in a house with no basement, injured six other persons and broke up some \$3 million worth of the tiny hamlet. The storm roared across the Nebraska border to Blue Springs where its violence sputtered to an end at 10:35 p.m.

The deadly tornado was on the ground 70 percent of the 5½ hours it took to rip through 158 miles of towns and croplands, according to National Weather Service (NWS) investigators.

State, county and local government officials told investigators that deaths were held to three and injuries minimized because of the early advance warning from NWS.

Similar early warnings, flashed to the public by NWS, saved lives when 3.3 inches of rain fell in 90 minutes causing flash floods in Maryland—and when hurricanes smashed into Florida and the Gulf Coast. Now you can get early warning in your home, office,

camper, car or boat when foul weather threatens.

## Earliest possible warning

Weather Service forecasters talk directly to the public on more than 100 radio stations they operate. The stations broadcast weather information only. And, when unusually severe weather is near, they transmit coded signals which trigger alarms in alert receivers you can buy.

You can't receive NWS broadcasts on your regular AM-FM radio. Rather, you must have a receiver capable of tuning to one of three frequencies used by NWS: 162.400 MHz., 162.475 MHz. or 162.550 MHz. (Regular AM broadcasts are found between 0.540-1.600 MHz in the radio spectrum and FM is 88-108 MHz.)

Weather-frequency receivers are now available in a wide range of prices and with a variety of features.

## Weather receiver

Receivers which tune exact NWS frequencies only are available for \$10 to \$50. Cheaper sets can't be tuned easily between competing stations and aren't sensitive enough to hear weather broadcasts over long distances. Better radios are crystal-controlled on the weather channel in your area or on all three and are more sensitive to allow greater selectivity between two stations.

Good examples of weather receivers are the Pocket Weather-radio (\$11) and the Desk Weather-radio cube (\$16) from Radio Shack. A crystal-controlled set is the Forecaster (\$24) from Weatheralert (639 South Dearborn, Chicago, Ill. 60605).

## Alert receivers

Alert receivers not only are tuned to the specific weather frequencies for quick forecasts, but they also have internal circuits which respond to the emergency

alert tones transmitted by NWS.

To send out a weather emergency alert, NWS transmits two particular audio tones. Alert receivers hear and respond to these by turning on the weather report for you to hear and sounding a loud alarm beep.

With such radios you will have the choice of intentionally listening to weather forecasts or switching off the forecasts but not the radio so that it can monitor the emergency alerting tones.

Radios having this alert feature include the high-style Bearcat Alert Warning Radio (\$59) from Electra Co. (Cumberland, Ind. 46229); the Model 13907 (\$40) from Midland International, (Box 1903, Kansas City, Mo. 64141); the Model TA-3 (\$39) from Weatheralert; and the Weather Alarm Monitoradio (\$49) from Regency, (7707 Records St., Indianapolis, Ind. 46226).

## Tunable monitors

Public-service-band monitor radios, which are popular for tuning in police, fire and amateur radio calls, usually can be tuned in a range of 146 to 174 MHz, encompassing the 162-MHz weather broadcasts. Most monitors will let you hear forecasts, but you'll have to do your own listening for emergency announcements. You'll be able to hear special tones when they are transmitted by NWS.

Many tunable monitors are available for \$10 to \$300, including the Panasonic Model RF-1003 (\$39) and the Sony ICF-7800W (\$160.)

## Scanners

Scanners are special versions of police and fire monitors which listen silently until signals appear on your favorite frequencies that have been selected in advance. NWS broadcasts are continuous, 24 hours a day, so your scanner will play forecasts all day until you lock out the weather channel. As with tunable monitors, you'll

# Jump ahead of disasters

have to listen for emergency tones.

One exception is the new Regency model, called The Touch (\$329), which will keep one electronic ear tuned for emergency weather tones even as it scans other police and fire channels.

Scanners range in price from under \$100 up to \$400. Radio Shack has a pocket model Pro-4A (\$99). Electra is offering a computerized scanner, the Bearcat-210 (\$349).

## Marine radios

All VHF-FM marine radios on the market (from \$200 up) include a switch to change from two-way operation to weather reception. Even the popular new battery-powered hand-held portable marine radios can be used to hear NWS forecasts. In a high-performance model, such as the Model 1505 (\$449) from Wilson Electronics Corp. (4288 South Polaris, Las Vegas, Nev. 89103), you use one channel for weather-receive only while operating normal two-way transmit and receive in the other five channels.

Serving the majority of the U.S. population now, NWS expects to cover 90 percent of the population with 300 stations on the air by 1980.

NWS transmitter range is about 40 miles at best. Hills, tall buildings and other obstructions block signals. Antenna height is more important than transmitter power in improving signal reception in the very high frequency (VHF) portion of the radio spectrum around 162 MHz. Weather Service offices are elevating their antennas and upping output power to increase coverage.

## Get better reception

If you live within 10 or 15 miles of an NWS transmitter, you probably will be able to get acceptable reception using only a small whip antenna built into your receiver.

Farther out, you'll need what is

known as a "gain antenna." An inexpensive one is the Ringo Ranger Model ARX-2 (\$32) made by the Cushcraft Corp. (621 Hayward St., Manchester, N.H. 03103) designed for use in the two-meter ham radio band (144-148 MHz). Mount it as high as possible atop your house or garage for the best reception. Follow instructions to peak it for reception at 162 MHz.

A good gain antenna you could use on your automobile for drive-around reception in fringe areas is the Model 42123 (\$35) by Antenna, Inc. (23850 Commerce Park Rd., Cleveland, Ohio 44122). Mobile antennas are available with your choice of roof, trunk or magnetic mount for attachment to your car.

By the way, a magnetic-mount antenna will work well in your house if you place it on a metal file cabinet or other large metal surface.

These mobile antennas should be peaked for operation at 162 MHz using instructions furnished with them.

In deep-fringe areas, you might try improving reception of extremely weak signals through an amateur radio "beam" antenna, similar to a rooftop TV antenna. Cushcraft offers several for the two-meter ham band including the Model A147-11 (\$30). Point the beam at the NWS transmitting antenna.

If you live beyond 40 miles, you'll have to wait a few months until NWS puts a station on the air near you.

During nice weather, broadcasts are recorded at forecast offices and the four-to-six minute tapes are replayed on the air, over and over without pause, 24 hours a day, seven days a week. They are changed every two hours, more often when needed.

## Maggie's Drawers

When severe weather is threatening, forecasters interrupt their



National Weather Service code signal triggers Bearcat Alert Warning Radio alarm.

routine tapes and substitute storm warnings. Alerts are so fast and thorough that they have flagged down the system of storm signals used by the U.S. Coast Guard.

The storm warning system of square red flags, known as Maggie's Drawers, used for navigation since 1871, will be dropped this November in favor of the more efficient broadcasts by the NWS.

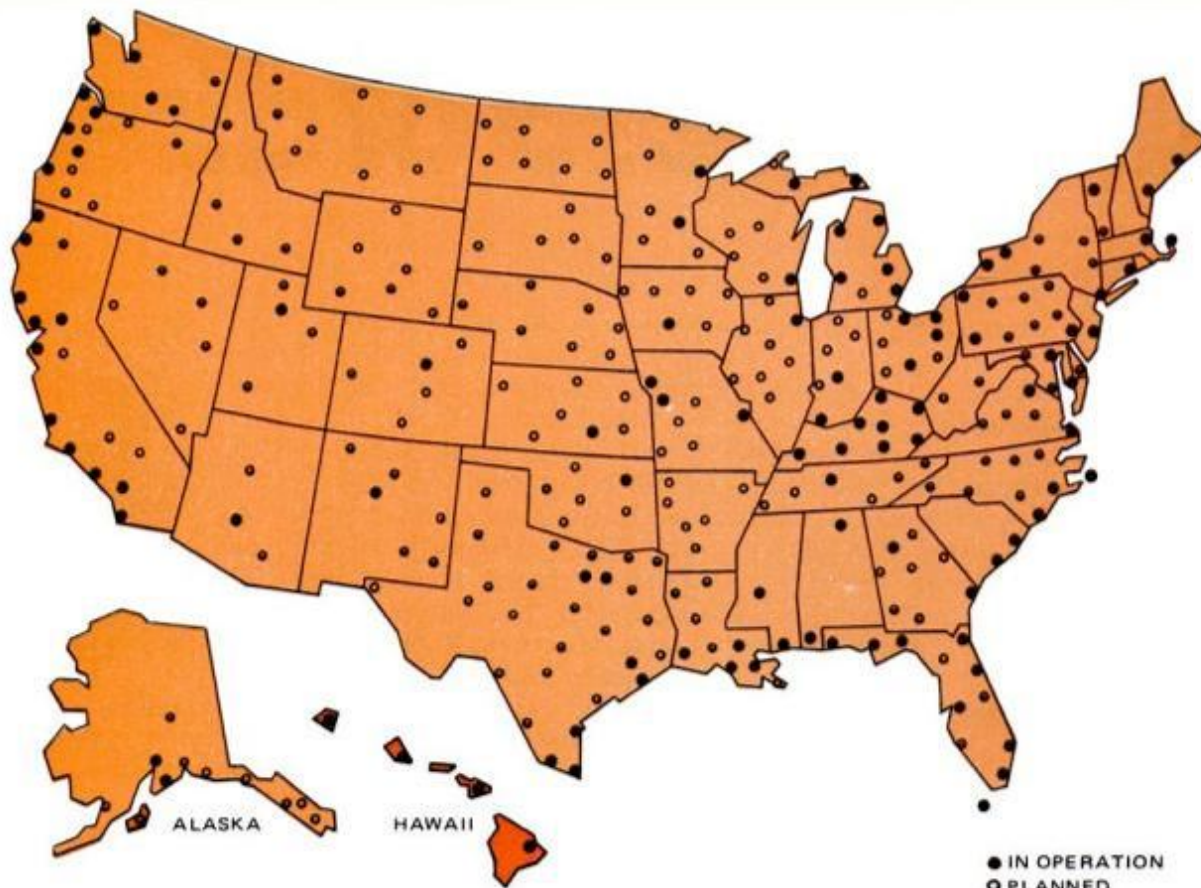
The small-craft advisory, gale, storm and hurricane warnings, were used by pleasure boatmen who had to look at special Coast Guard flagstuffs to get the message. When NWS broadcasts started, boatmen quickly switched to listening for foul-weather forecasts since they didn't have to remain in sight of Coast Guard bases and towers to get their warnings.

Interrupting their tapes and going live on the air, Weather Service announcers activate tone generators which send the special codes out over the air. Alert receivers are triggered and listeners hear the tones.

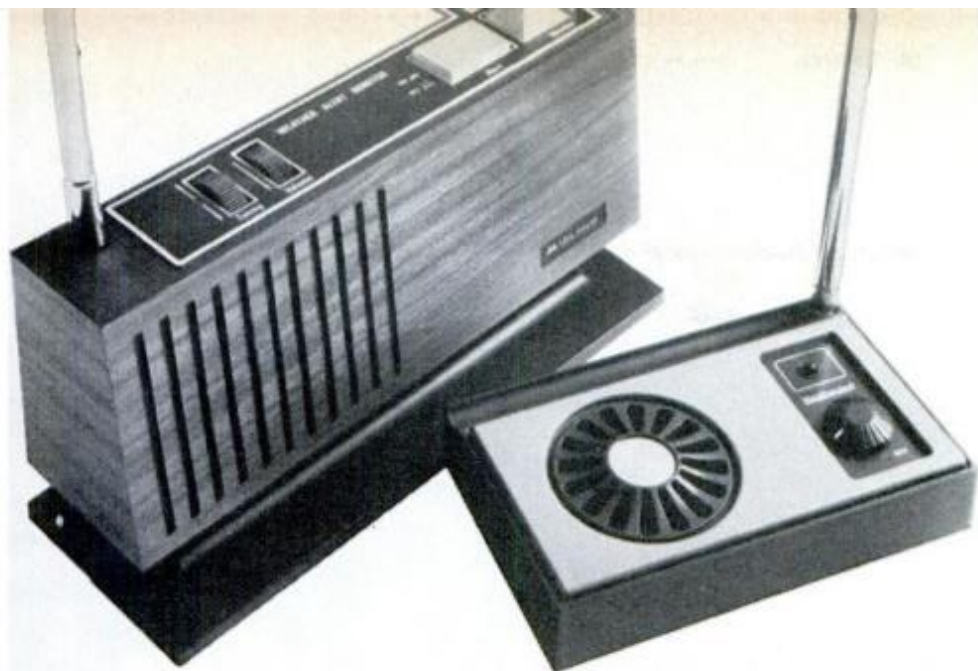
## Hospitals, schools, factories

Alert receivers are valuable in the home for advance notice of bad weather. And they are especially useful in hospitals, schools, factories, nursing homes and other places where large numbers of people congregate. They also

# LOCATIONS OF NATIONAL WEATHER SERVICE RADIO STATIONS



Transmitter Site	Call Letters	Frequency (MHz)	Power (Watts)	Transmitter Site	Call Letters	Frequency (MHz)	Power (Watts)	Transmitter Site	Call Letters	Frequency (MHz)	Power (Watts)
<b>ALABAMA</b>				<b>IOWA</b>				<b>NEW MEXICO</b>			
Birmingham	KIH-54	162.55	1000	Des Moines	KEC-75	162.55	330	Albuquerque	KIG-84	162.40	330
Cheaha Mtn.	KIH-58	162.475	100	<b>KANSAS</b>				<b>NEW YORK</b>			
Dozier	KIH-59	162.55	800	Wichita	KEC-59	162.55	330	Buffalo	KEB-98	162.55	330
Florence	KIH-57	162.475	800	<b>KENTUCKY</b>				New York City	KWO-35	162.55	500
Huntsville	KIH-20	162.40	1000	Ashland	KIH-39	162.55	1000	Rochester	KHA-53	162.40	300
Louisville	KIH-56	162.475	450	Bowling Green	KIH-45	162.40	1000	<b>NORTH CAROLINA</b>			
Mobile	KEC-61	162.55	330	Covington	KIH-42	162.55	1000	Cape Hatteras	KIG-77	162.55	1000
Montgomery	KIH-55	162.40	1000	Hazard	KIH-40	162.475	1000	New Bern	KEC-84	162.40	1000
Tuscaloosa	KIH-60	162.40	1000	Lexington	KIH-41	162.40	1000	Wilmington	KHB-31	162.55	500
<b>ALASKA</b>				Louisville	KIH-43	162.475	1000	<b>OHIO</b>			
Anchorage	KEC-43	162.55	330	Mayfield	KIH-45	162.475	1000	Akron	KDO-94	162.40	330
Homer	WXJ-24	162.40	1700	Somerset	KIH-44	162.55	1000	Cleveland	KHB-59	162.55	500
Juneau	WXJ-25	162.55	1000	<b>LOUISIANA</b>				Columbus	KIG-86	162.55	1000
Ketchikan	WXJ-26	162.55	1700	Baton Rouge	KHB-46	162.40	330	Sandusky	KHB-97	162.40	330
Seward	KEC-81	162.55	330	Lake Charles	KHB-42	162.55	500	<b>OKLAHOMA</b>			
<b>ARIZONA</b>				Morgan City	KIH-23	162.475	1000	Tulsa	KIH-27	162.55	330
Phoenix	KEC-94	162.55	300	New Orleans	KHB-43	162.55	1000	<b>OREGON</b>			
<b>CALIFORNIA</b>				<b>MAINE</b>				Astoria	KEC-91	162.40	330
Coachella	KIG-78	162.40	100	Ellsworth	KEC-93	162.40	1000	Coos Bay	KIH-32	162.40	330
Crescent City	KIH-37	162.55	1000	Portland	KDO-95	162.55	500	Eugene	KEC-42	162.40	80
Eureka	KEC-82	162.40	330	<b>MARYLAND</b>				Newport	KIH-33	162.55	1000
Fresno	KIH-62	162.40	1000	Baltimore	KEC-83	162.40	1700	Portland	KIG-98	162.55	330
Los Angeles	KWO-37	162.55	500	Salisbury	KEC-92	162.40	1000	<b>PENNSYLVANIA</b>			
Monterey	KEC-49	162.40	330	<b>MASSACHUSETTS</b>				Erie	KEC-58	162.40	330
Point Arena	KIH-30	162.40	1700	Boston	KHB-35	162.40	330	Philadelphia	KIH-28	162.475	1000
Sacramento	KEC-57	162.40	330	Hyannis	KEC-73	162.55	330	Pittsburgh	KIH-35	162.55	1000
San Diego	KEC-62	162.40	330	<b>MICHIGAN</b>				<b>RHODE ISLAND</b>			
San Francisco	KHB-49	162.55	500	Alpena	KIG-83	162.55	300	Providence	WXJ-39	162.40	500
San Luis Obispo	KIH-31	162.55	330	Clio	KIH-29	162.40	1000	<b>SOUTH CAROLINA</b>			
Santa Barbara	KIH-34	162.40	330	Detroit	KEC-69	162.55	330	Beaufort	WXJ-23	162.475	350
<b>COLORADO</b>				Grand Rapids	KIG-63	162.55	1000	Charleston	KHB-29	162.55	500
Denver	KEC-76	162.55	330	Marquette	KIG-66	162.55	300	Columbia	WXJ-20	162.40	1000
<b>CONNECTICUT</b>				Sault Ste. Marie	KIG-74	162.55	300	Florence	WXJ-22	162.55	1000
Meriden	WXJ-42	162.40	100	Traverse City	KIH-22	162.475	300	Greenville	WXJ-21	162.55	1000
New London	KHB-47	162.40	330	<b>MINNESOTA</b>				Myrtle Beach	KEC-95	162.40	330
Tolland	WXJ-41	162.475	500	Duluth	KIG-84	162.55	1000	<b>TENNESSEE</b>			
<b>FLORIDA</b>				Minneapolis	KEC-65	162.55	1000	Nashville	KIG-79	162.55	1000
Daytona Beach	KIH-26	162.40	1000	<b>MISSISSIPPI</b>				<b>TEXAS</b>			
Jacksonville	KHB-39	162.55	500	Ackerman	KIH-51	162.475	100	Brownsville	KHB-33	162.55	500
Key West	KIH-25	162.40	1000	Booneville	KIH-53	162.55	350	Corpus Christi	KHB-41	162.55	500
Miami	KHB-34	162.55	1000	Bude	KIH-48	162.55	100	Dallas	KEC-56	162.40	330
Orlando	KIH-63	162.475	500	Guilford	KIH-21	162.40	330	Fort Worth	KEC-55	162.55	330
Panama City	KGG-67	162.55	1000	Inverness	KIH-50	162.55	100	Galveston	KHB-40	162.55	500
Pensacola	KEC-86	162.40	330	Jackson	KIH-38	162.40	1000	Houston	KGG-68	162.40	330
Tallahassee	KIH-24	162.40	1000	McHenry	KIH-47	162.475	100	Pharr	KHB-33	162.40	330
Tampa	KHB-32	162.55	1700	Oxford	KIH-52	162.40	100	<b>UTAH</b>			
West Palm Beach	KEC-50	162.40	330	Rose Hill	KIH-49	162.55	100	Salt Lake City	KEC-78	162.55	330
<b>GEORGIA</b>				<b>MISSOURI</b>				<b>VERMONT</b>			
Atlanta	KEC-80	162.55	330	Kansas City	KID-77	162.55	1000	Burlington	KIG-60	162.40	1000
Savannah	KEC-85	162.40	330	St. Joseph	KEC-77	162.40	330	<b>VIRGINIA</b>			
<b>HAWAII</b>				St. Louis	KDO-89	162.55	1000	Manassas	KHB-36	162.55	1000
Hilo	KBA-99	162.55	1000	<b>MONTANA</b>				Norfolk	KHB-37	162.55	500
Honolulu	KBA-99	162.55	500	Great Falls	WXJ-43	162.55	330	<b>WASHINGTON</b>			
Kokee	KBA-99	162.40	330	<b>NEBRASKA</b>				Neah Bay	KIH-36	162.55	330
Mt. Haleakala	KBA-99	162.40	330	Omaha	KIH-61	162.40	1000	Seattle	KHB-60	162.55	330
<b>ILLINOIS</b>				<b>NEW HAMPSHIRE</b>				Yakima	KIG-75	162.55	300
Chicago	KWO-39	162.55	500	Concord	WXJ-40	162.475	330	<b>WISCONSIN</b>			
<b>INDIANA</b>				<b>NEW JERSEY</b>				Green Bay	KIG-65	162.55	1000
Evansville	KIG-76	162.55	1000	Atlantic City	KHB-38	162.40	330	Milwaukee	KEC-60	162.40	330
Indianapolis	KEC-74	162.55	330								



Inexpensive emergency-alerting receivers (above) are high-style for home yet durable for carrying along in car, boat or camper. Midland Model 13907 (above, left) and the Weatheralert Model TA-3 (above, right) operate on internal batteries or plug-in house current. Both emit loud screeches to warn you that a weather emergency is on the way.

Portable police monitors like Panasonic RF-1003 (below, right) can receive forecasts. Good combo for boatmen is Ray Jefferson CB-711 Saturn (below, left) with microphone, a two-way CB radio capable of receiving Weather Service broadcasts.



The Touch (right) signal-seeking scanner by Regency listens for coded weather-emergency signals as it scans police and fire calls; warns of extra-foul weather ahead.

are used in police, fire and news media offices to get quick word on impending emergencies without delay.

Because of its unique warning capability the NWS system was designated by the White House as the official government-operated radio service to provide warning of natural disaster and nuclear attack directly to homes. Weather radio warnings will supplement alerts by siren and commercial radio-TV broadcasters. Arrangements are being made with the Defense Civil Preparedness Agen-

cy (formerly known as Civil Defense) to include NWS transmitters in the national attack warning system.

#### Farmers and fishermen

Along with 24-hour-a-day weather reports, NWS is broadcasting specialized forecasts to boatmen, fishermen and surfers all along the seacoasts and on the Great Lakes. River forecasts are given where flooding could hamper safe navigation. Stations transmitting in agricultural areas are providing special information

to farmers, orchardists and ranchers.

The broadcasts are so popular that some states are supplementing the NWS system by adding extra state-run transmitters sending out NWS data.

Kentucky was the first state to do this, adding eight transmitters. Others have followed. Amateur radio operators have arranged to operate their own transmitters in some areas, rebroadcasting NWS forecasts. Cable TV operators are sending NWS audio down their lines into homes.

Whenever there is a threat to life, limb and property from tornado, flood, winter storm or hurricane, National Weather Service is your fastest means of keeping one jump ahead of disaster. Stay tuned! ★★

#### Thunderstorm detector reads lightning bolts



Killer thunderstorms stalk at night when victims are asleep. Now you can know in advance when strong electrical storms are near. Severe Storm Alarm, available from Sears, Roebuck and Co. catalog, tells the intensity of an approaching storm, flashes lights and sounds off as the storm nears your doorstep. It's not a weather radio. Rather, it measures energy in lightning flashes. You can use it anywhere—at home, in a car, boat or airplane—to get up to 20 minutes advance warning.

Tornadoes occur in all 50 states, most frequently from March through November in Tornado Alley: Texas to Ohio, Minnesota to Florida. Most move southwest to northeast at 25 mph. When your Sears Severe Storm Alarm gives warning, you have time to move northwest or southeast to get out of the tornado's path. Or to dive in your basement or a ditch if you can't escape. Storm Alarm's internal battery works one year.



# Tough new Coast Guard mission: Policing today's vast 200-mile limit

Patrolling an added 2 million square miles of ocean to enforce our strict new fishing laws is a rough assignment for our small coastal force. A PM reporter rides along on a search mission for a firsthand account.

by Richard Petrow

Coast Guardsmen in tender prepare to board a foreign trawler to check for possible violations of new fishing restrictions within 200-mile limit.

In these days of sleek futuristic ships with their sharp prows and flowing lines, the U.S. Coast Guard cutter *Chilula*, blunt of bow and broad of beam, stands out like a p'ow horse in a herd of thoroughbred racers. Built in 1945 for toughness, not speed, she gives off a no-nonsense air of a vessel that knows her job. Her mission—among the many duties that



PM reporter Richard Petrow flanked by Lt. Cmdr. Carl Helman (left), captain of Coast Guard cutter *Chilula*, and Ens. Garrett Tirpak (right), another ship's officer. At top is the *Chilula* that carried author on one of first search missions under new 200-mile-limit fishing law.

fall to the Coast Guard—is to enforce the strict new fishing law under which the government has taken control of all U. S. coastal waters up to 200 miles offshore.

It is good that the *Chilula* is tough—she needs to be—for she is one of a small force of ships and aircraft that must now police an additional 2 million square

mi'es of ocean resulting from the extension in March of the o'd 12-mile limit. Gradually, the force will be expanded over several years, but only by a relatively few new ships and planes.

To see for myself just what the Coast Guard is up against in enforcing the new fishing law, I boarded the *Chilula* early in March at her home port in Morehead City, N.C. Lt. Cmdr. Carl Helman, 36, welcomed me aboard. He would command the *Chilula* on our trip.

"This is the first time we have been at sea since the new law went into effect on March 1," Helman explained. "We have things to learn about the law. So do the masters of foreign vessels fishing in our waters."

With that he excused himself to attend to our departure. "Ahead one third," he ordered, as the lines were cast off, and the cutter (in reality she's an oceangoing tug) headed out of Beaufort Inlet for the open ocean. Our orders were to patrol an ocean area from just south of Cape Hatteras, N.C., to the vicinity of Cape May, N. J.

Coast Guard aircraft had reported a large fleet of Spanish trawlers operating in the area. We were sailing to find that fleet and board as many of the vessels as possible.

### Complicated law

The new 200-mile fishing law (its formal title is Public Law 94-265, Fisheries Conservation and Management Act) is a complicated piece of legislation.

"The law doesn't prevent foreign ships from fishing within 200 miles of our shores," Helman explained. "It does, however, set limits on where they can fish, what they can catch and how much they can catch."

The law was drafted after U.S. commercial fishermen had watched foreign trawlers deplete our once extraordinarily rich offshore fishing areas. Trawlers from Japan, South Korea, the Soviet Union, Italy, Bulgaria, Spain, Poland, East Germany and many other countries, regularly showed up off our shores to depart with holds bursting with fish—cleaned, processed, packed and frozen. They were picking our waters clean.

Haddock and cod, once so plentiful and cheap, are fast disappearing. Haddock already may have been so overfished that it is not certain if the species will be able to reproduce itself. Yellowtail flounder is endangered. So is mackerel—down more than 96 percent within a decade.

It was against these frightening developments that the new law was enacted.

"It's basically a conservation measure," Helman said. "Foreign ships will not be denied fishing rights, but will be permitted to harvest only those species we

## Foreign trawlers stopped and searched

have in excess. Quotas will be set for each nation and for each species." Such popular and endangered species as haddock, cod and flounder might have low quotas or not be permitted to be caught at all. Such species as hake and squid, most plentiful and less popular in the United States, will have relatively high quotas.

"And what are those Spanish boats fishing for?" I asked. "They're after squid—no doubt about it," Helman replied. "Few Americans eat squid, but to South Europeans, they're a delicacy."

As we moved out of Beaufort Inlet, the *Chilula* turned her bow to the northeast and started a slow, steady roll as she met the open sea.

### Rough going

Chief Boatswain's Mate Robert Viverette, who had watched me begin to get my sea legs, sidled over with some disquieting information. "She's the roughest-riding ship in the Coast Guard," he volunteered. Then he pointed a finger, adding. "If you need it, there's a pail."

We picked up the Spanish fleet on the morning of our second day at sea, first by radar, then visually. Eleven trawlers in all, stretched out neatly in line, each busy working part of the ocean.

Helman, summoned to the bridge from his cabin, quickly absorbed the situation and gave his orders.

"Let's run up the line to identify them all," he said. "That way," he

explained to me, "we'll know who they all are and whether they have been boarded before." We sailed north, past the trawlers. On each approach, we came close enough to read the ship's name and number, while making sure we stayed clear of her nets.

All the ships were Spanish, as we had expected. Their names brought a hint of the Mediterranean to the North Atlantic: *Puente Minor*, a stern trawler; *Pesca Puerta Tercero*, another stern trawler; *Puente Pedrina*, a side trawler; and *Xeitosino*, *Aera Cova*, *Toralla*, stern trawlers.

Lt. (j.g.) Robert Griffin, the ship's Spanish-speaking boarding officer, joined us on the bridge. He had boarding reports with him. Of the 11 Spanish trawlers, five had previously been boarded by other Coast Guard ships.

"Some of them have been bad boys indeed," he commented. One had been cited for keeping prohibited species. A previous boarding party had found 50 pounds of cod in the ship's freezer, all illegal. Another report read: "Improper retention of 28 pounds of mackerel, 107 pounds of hake, 3 pounds of striped bass, 37 pounds of pollack, one lobster." All were prohibited species for the vessel.

"Even if prohibited species are dead when they're hauled aboard," Griffin explained, "they must be returned to the sea. The dead fish help support the biological food chain. Besides, the regulation will keep everybody honest. There can be no excuse for any foreign vessel having any prohibited species aboard."

When all the Spanish trawlers had been identified, Helman and Griffin

**Boarding party at left is lowered from Coast Guard cutter *Chilula* to inspect a stopped fishing trawler. Below are Spanish trawlers operating in U.S. waters, some of which were boarded and searched while author was on mission with *Chilula*.**

conferred together. Then Helman announced: "Let's get the *Puente Pedrina*. She's never been boarded before."

The *Chilula* turned her bow toward the Spanish vessel, eased to a stop about 300 yards off her starboard side, and ran up a three-flag message. The first flag was International Code for the letter "S"; the second flag indicated the letter "Q"; the third the number "3"—"S Q 3", meaning, "Heave to. We're coming aboard."

Through our binoculars we could see the Spanish fishermen begin to haul in their net as their ship slowed to a stop in compliance with orders.

Before the boarding party took off, Helman drew me aside. "This is our very first boarding party under the new law," he explained. "I'm going to send only Coast Guardsmen on this trip. But *Popular Mechanics* can go on the next one."

We watched the boarding party, led by Griffin and Ens. John Albertine, climb into one of the ship's small boats, lowered over the side. Soon our men were clambering over the gunwale of the Spanish vessel.

### What boarders look for

While we waited for their return, Helman explained that all boarding parties were instructed to check on a series of questions such as: Did the fishing vessel hinder enforcement? Did it retain any fish or lobster it should not have kept on board? Were its logs properly maintained?

"It's a checklist for boarding officers," Helman said.

For three hours the ships floated easily on the calm Atlantic, almost within a stone's throw of each other. Suddenly the walkie-talkie linking the *Chilula* with the boarding party sputtered into life. "*Chilula*—this is *Chilula One*. We have finished our inspection and are returning."

Minutes later they were back on the *Chilula*. Both boarding officers were smiling as they made their report to Helman. "That Spanish cap-





tain was one cooperative guy," Albertine began. "He kept saying, 'My ship is at your disposal.'"

Albertine had observed the trawler haul in its net—the "haulback."

"It was a clean catch," he said. "About 1200 pounds of squid. The crew threw back some crabs and flounder and kept some anglerfish." Keeping anglerfish was legal, under the law's "incidental by-catch provisions."

"But we had to write up a citation nevertheless," Albertine continued. "He wasn't keeping his logs correctly. We spent a lot of time going through the law with him."

The law itself is complicated enough, but explaining it to foreign fishermen is compounded by the language problem. Griffin spoke some Spanish, but the Spanish captain spoke no English. As of next year

every foreign vessel fishing in our seas will be required to carry an English-speaking crew member.

Life at sea falls quickly into a routine. You stand your duty watch, put in your sack time, and pass the time as best you can. Pinochle is the big card game on the *Chilula*. And each evening there are movies—one for the crew, one for the chief petty officers and one for the officers.

And, of course, there are the meals. You eat well aboard a Coast Guard ship, especially if you're an enlisted man. For lunch one day, the enlisted

*(Please turn to page 140)*

**Aboard a typical trawler: Net is pulled in (lower left) and contents sorted for legal and illegal catches (right). Legal fish are carried by conveyor (center, below) down to processing room for freezing. Note large open stern well on trawler at lower right, used for hauling in catches.**



### WHAT NEW FISHING LAW MEANS TO COAST GUARD



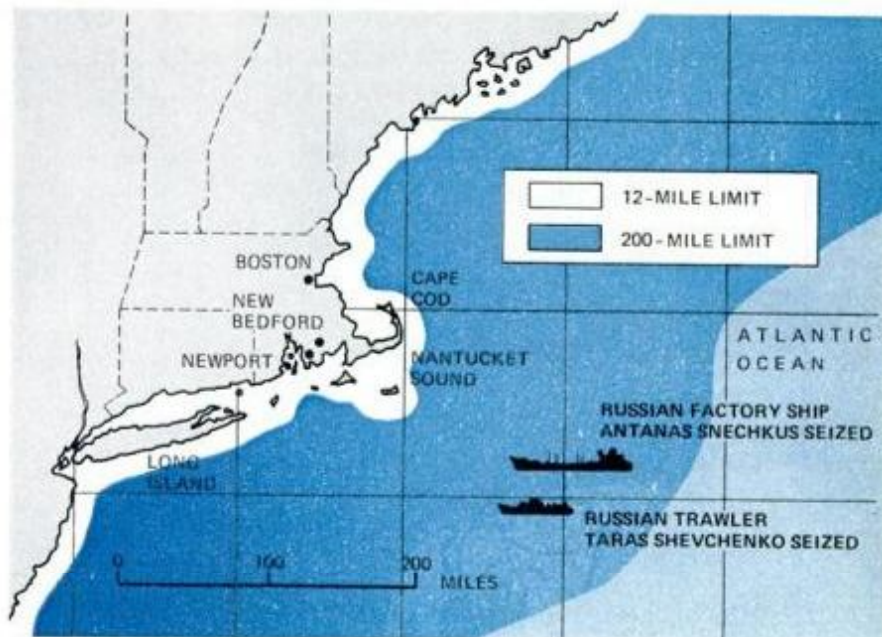
Russian trawler *Taras Shevchenko*.

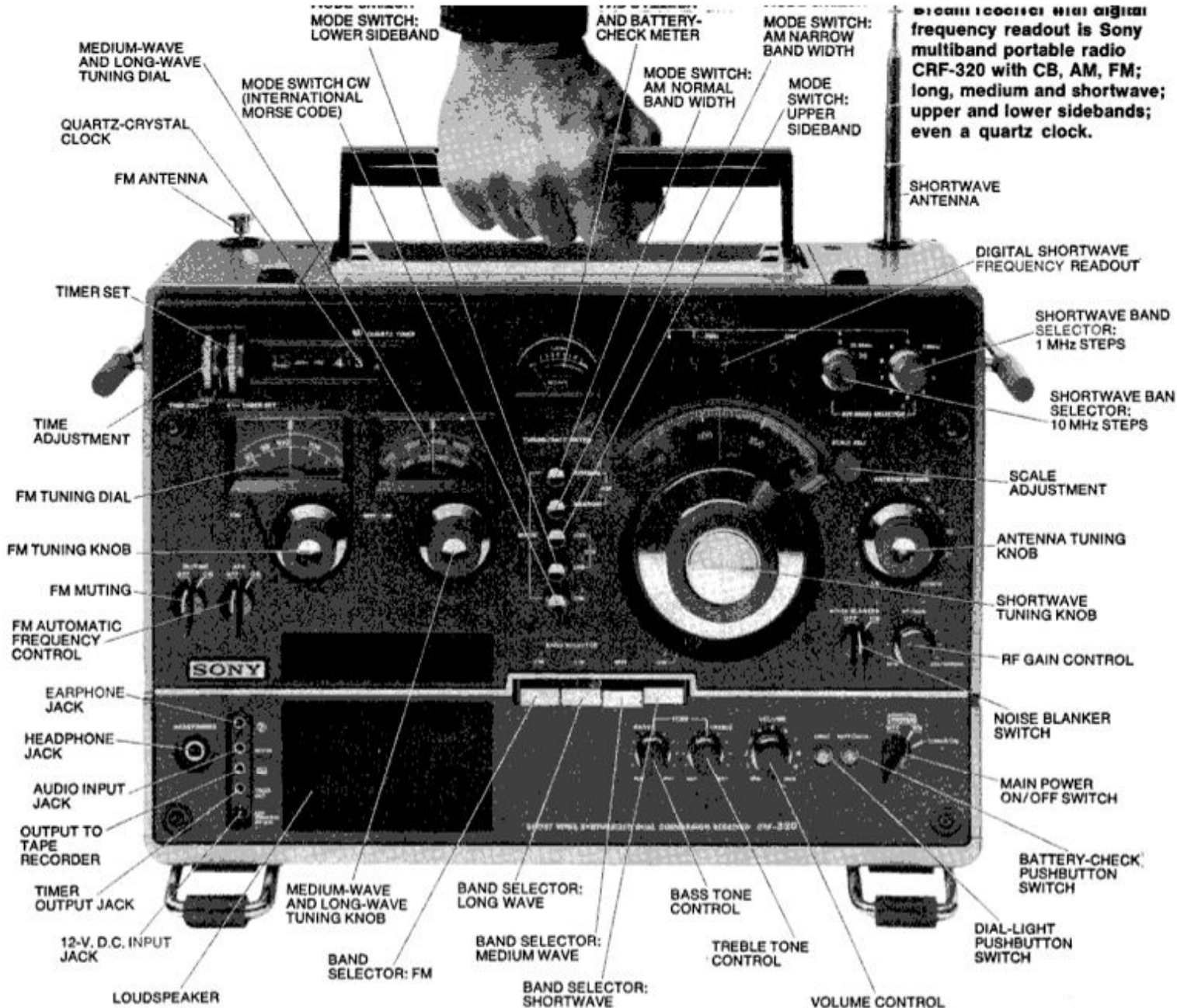


Soviet factory ship *Antanas Snechkus*.

Map below shows how vastly greater the Coast Guard's job has become under the new 200-mile fishing limit compared to the old 12-mile limit—a total of 2 million additional square miles of ocean to patrol. In early April—little more than a month after the law went into effect—the boom

was lowered on two Russian fishing vessels operating in U.S. waters. The first to be seized under the new provisions, the *Taras Shevchenko*, a trawler, and the *Antanas Snechkus*, a fish-processing factory ship, were taken into custody by Coast Guard cutters and herded into Boston Harbor (left) for alleged violations—proving the law has clout.





# STAY TUNED WITH GO-ANYWHERE HEAR-ANYTHING PORTABLES

Bug the cops, scan the ships or eavesdrop on worldwide broadcasts with new sensitive multiband portable radios.

by Gerald R. Patton

The weather was right for a picnic and I was enjoying corn and hot dogs, listening to a British Broadcasting Corp. (BBC) broadcast from London on my multiband portable radio. It's fascinating to get international news from foreign broadcast stations.

Suddenly, a scream of sirens and roar of fire engines brought my attention to the here-and-now. Ugly plumes of black smoke were climbing in the distance. I grabbed the radio, switched to a fire department radio band and tuned in the firefighters talking with their home base. Through the afternoon, I learned details of the catastrophic blaze before local news media could inform the public. That lightweight, portable radio tuned instantly from overseas entertainment to local emergency communications to keep me in touch with events as they happened.

## Different combos

Not all portables have the combination of shortwave and police-and-fire band. Some combine CB with TV sound or National Weather Service broadcasts with FM music. Before buying a radio, make sure it has the bands you want (see *How to Eavesdrop on Cloak-and-Dagger Radio*, page 72, Aug. '76).

The Sony CRF-320 at \$1695 is a good start on a dream



Boatmen won't get lost with direction-finding Ray Jefferson 640 (above) with five bands: CB, FM, AM, marine VHF and beacons. A "sense" feature lets the 640 pinpoint your position with only two readings, eliminating confusion. It can be used to monitor Coast Guard, weather broadcasts, marine-CB channel 13 or standard broadcasts of music and news for entertainment. Sony ICF-7800W (below) folds into purse or pack for overnight listening to police, fire, ham operators or AM and FM.



GE seven-band receiver (above) has instant weather; reception of all 40 CB channels; aircraft radio monitoring; sound from TV channels 2 to 13; cops, firemen and hams in the public-service high band; plus regular AM and FM music broadcasts. Royal D7000 Trans-Oceanic model made by Zenith (left) covers two weather bands, a navigation band, most of the shortwave bands, and both AM and FM bands for music and news.



Another dream receiver, Panasonic RF-8000 (below), bites a giant chunk of the radio spectrum from 150 kHz all the way to 230 MHz in 24 bands. Receiving AM, FM, SSB and CW, it features an eye-catching motorized dial changer, clock, meter, squelch and noise limiter.

receiver. It covers everything in the long, medium and shortwave portions of the radio spectrum from 150 kHz to 30 MHz, plus the FM broadcast band. Its shortwave coverage is synthesized like a professional set for extreme stability. Frequency is displayed in light-emitting diodes (LEDs). Reception of AM, FM, International Morse Code, upper or lower sideband, teletype, slow-scan television and other types of transmissions is easy.

### Rival dream

Any dream has a rival, of course. Sony's is Panasonic Model RF-8000. At \$2500 it does not have digital frequency readout, but it adds local police, fire, hams and others in the VHF and UHF portions of the radio spectrum up to 230 MHz.

The 11-band Zenith Trans-Oceanic Royal D7000 (\$350) is the current model in a long family chain, first introduced in 1941 and transistorized in 1957.

General Electric's seven-band radio (\$77) has AM, FM, police high band, television sound from channels 2 to 13, aircraft band, CB reception, and an instant weather feature.

For boatmen, the Model 640 by Ray Jefferson at \$210



*(Please turn to page 153)*



PM art: Don Trawin

# WILL THE CAR OF YOUR DREAMS BELONG TO SOMEBODY ELSE?

Leasing a car 'deprives' you of the pride of ownership . . . but, so what, if it saves you money!

by Al Burns

**C**hances are increasing that you will lease your next new car. Top auto industry executives believe 40 to 50 percent of all new cars built by 1985 will be leased. This is only seven short model-years away and carmakers are moving to promote leasing by their dealers.

General Motors has made car leasing an important part of its dealer sales agreement. Ford has several programs making it easy for dealers to lease cars as well as sell them. Chrysler will arrange customer leasing through its dealers or directly through its Chrysler Leasing Corp.

At present, more than 20 percent of all cars made are leased—mostly to large-corporation fleets. However,

leasing is expanding fastest at the retail or single-car level among people who formerly bought a car when they needed one. This is why about 25 percent of all Cadillacs made now are leased. For more expensive models, the rate is higher. A Mercedes-Benz spokesman said that while the company can be certain over 27 percent of all Mercedes U.S. imports are being leased, he is safe in speculating the actual percentage is 30 percent or more.

## Is leasing cheaper than buying?

Is lower cost the reason why more people are leasing? It depends greatly on why the car owner buys in the first place and partly on how the car

is to be used. Leasing has some clear advantages over buying that bear looking into. Leasing a car can be easier than buying one. The leasing company helps select the desired make and model, does the actual purchasing—often for hundreds of dollars less than the average buyer has to spend—arranged for financing and takes care of maintenance if the customer wants. The company will often dispose of the used car at the end of the lease for more than trade-in price.

Leasing, therefore, often makes economic sense. It is a better utilization of cash assets. Cash outlay on a lease is substantially less than it is in buying. Also, cash is not tied up in a depreciating asset as it is in automobile ownership.

Where a car buyer is at the mercy of a car salesman, the lease customer has the expertise of the leasing company working in his favor. The salesman couldn't care less what model you buy or how many accessories you attach to the car. He is working solely for his commission.

The lease salesman, on the other hand, must consider resale of the car when the lease ends. Therefore, he'll recommend a car, properly accessorized, to bring top value on the used-car market two or three years away. The lease customer still has a choice, but with advice of a specialist who will do all he can to help lower the lease rate.

## Finance rates and taxes

Savings to the lease customer are not always visible, but are real. The leasing company:

- Can buy the car at a fleet rate with savings in part passed on to the lease customer.

- Borrows money at a lower rate than the car buyer and passes on savings in the lease rate.

- Charges the lease customer sales tax only on the monthly rate. The buyer pays the full 6 to 8 percent, depending on city and state, in a lump sum.

- Will ask a credit-worthy lease customer to pay only about a month's lease rate in advance as security and a month's rent in advance. The car buyer will often have to pay \$1000 or more as down payment.

- May offer a customer the advantage of its group-insurance rate, saving him as much as \$300 a year in premiums over the term of the lease. The car buyer must shop for his own insurance.

An important consideration to see if a leased car is cheaper is the mileage to be driven over the term of the lease. Most leasing managers agree the ideal lease car is driven no more

than 20,000 miles a year and at least 12,000 miles. Hertz, which also leases cars to individuals, suggests that savings exceeding \$100 a year can be had based on mileage cost estimates.

### Types of leases

The simplest form to understand is the finance or open-end lease. Under it, the customer assumes the risk of disposing of the vehicle and all associated costs. This is where the ability of the leasing company to estimate the future used-car value is so important. Most leases are for two or three years, the more accurate the estimate, the more realistic the lease rate. If the company guesses the future used-car value on the nose, the customer comes off scot free. If the estimate is too low, the customer must make up the difference when he turns in the car. If it's too high, he gets a refund.

The second most popular lease is the closed-end type where the leasing company assumes all risk on the used-car sale at the end of the lease. Thus, this type is often called a walk-

month than an open-end arrangement.

A third type, a variation of the closed-end lease, includes all or part of required maintenance. It can include additional services and is priced accordingly.

The full-service or maintenance lease can include tune-ups, oil changes, snow tires, insurance, a free or discount-price loaner if the car is tied up for repairs or service, garaging and any other special service the customer needs or wants.

Many new-car dealers have shied away from leasing because they did not want to "get married" to the customer. They preferred to sell the car once and be done with it. This attitude has helped leasing. A number of leasing companies are willing to "specialize" in leasing and give the lease customer the service he wants. Growing numbers of prospective customers don't particularly want to own a car, but simply want to buy transportation that gives them the freedom and convenience of having a car.

Retail car leasing appears to be

## GLOSSARY OF LEASE TERMS:

<b>Acquisition cost</b>	Cost of the vehicle plus taxes.
<b>Bank leasing</b>	Lease sold by new-car dealer, then resold to bank or financial institution.
<b>Book value</b>	Depreciated value of a lease at any given time.
<b>Budget maintenance</b>	A leasing company collects a predetermined amount monthly for maintenance from customer to be reconciled against actual costs at regular intervals. If maintenance costs have been small, the lease customer is given an adjustment; if high, the maintenance charge is increased.
<b>Capitalized cost</b>	Vehicle's value to leasing company, on which the lease rate is determined.
<b>Closed-end lease</b>	Lease agreement in which the lease company assumes financial responsibility for the difference between depreciated value and actual cash value of the leased vehicle. Sometimes called "walk-away" lease.
<b>Commercial lease market</b>	Business and individual leases paid for by companies.
<b>Deficiency</b>	Amount the lease customer pays on termination of an open-end lease if the depreciation reserve is less than the actual depreciation of the vehicle.
<b>Equity lease</b>	See finance lease below.
<b>Estimated residual value</b>	Forecast used market value of the vehicle at lease end.
<b>Finance lease</b>	Open-end lease agreement where the customer assumes responsibility for residual value of the car at lease termination. Often called an equity lease.
<b>Full-service lease</b>	See maintenance lease below.
<b>Individual lease market</b>	Leasing to private individuals. Also called retail leasing.
<b>Lessee</b>	The lease customer.
<b>Lessor</b>	Owner of the vehicle; leasing company or dealer.
<b>Maintenance lease</b>	Lease where some or all maintenance is the responsibility of the leasing company. Sometimes called full-service lease.
<b>Net lease</b>	A closed-end lease.
<b>Open-end lease</b>	Basic lease where the lease customer assumes the responsibility for any difference between depreciation value and proceeds from used car's sale.
<b>Premature termination</b>	Provision in lease contract for equitable early ending of lease agreement.
<b>Residual value</b>	Actual value of leased vehicle at lease end. Can be called "as is" value.
<b>Security deposit</b>	Amount collected at start of the lease to help insure full compliance by the lease customer.
<b>Walk-away lease</b>	See closed-end lease.

away lease. However, the customer is responsible for other than normal wear and tear—he must pay for repair of excessive damage. If the car is driven more than 20,000 miles a year, the used-car value will be lower; most companies charge for excess mileage. The closed-end lease will average about \$20 more per

coming into its own. Financial pressures placed on carmakers to meet safety and emissions standards, plus inflation, have forced the average car price close to \$6000 before sales taxes. Many car users are wishing to pay only for the use of an asset whose purchase price shows signs of

(Please turn to page 141)

## COMPARE THE COST

Most leasing company executives decline to compare directly the costs of buying a car with leasing one. The most that they usually say without going into personal choice, use and probable annual mileage is that "it is often possible to lease more car for the same monthly cost than you can buy." There are just too many variables, they say, and they're right. Still, you can start your arithmetic for buy vs. lease by knowing the true cost of buying a car and how much this amounts to per month.

### Buy

Start with the new-car sticker price and go from there, adding on options you feel you want or need. Here's a sample you can follow, using the charges listed for a 1977 Chevrolet Caprice sedan as an example. These prices are subject to local variations, of course.

'77 Chevrolet Caprice Classic, 4-dr.	\$5237
Automatic transmission, power steering, power brakes	standard
Radio	\$73
Airconditioning	\$537
Vinyl roof	\$135
Total price with accessories	\$5982
Less probable 10 percent allowed dealer discount	\$598
Subtotal	\$5384
Plus freight, destination charge and dealer preparation	\$200
Subtotal	\$5584
Plus state and local sales tax (6% average)	\$335
Subtotal	\$5919
Plus finance cost—36 months @ 12.8%	\$1259
Total actual cost	\$7178
Actual monthly cost for 36 months	\$199.39

### Lease

For the bottom line on a lease contract for the identical Chevy Caprice Classic, you'll have to personally spell out your anticipated mileage needs, credit rating (they'll check it) and other variables in the office of your local leasing company. Only then will you get a hard dollar figure to compare against the cost of outright purchase.

Because you, the lease customer, pay only for the use you take out of the property and the leasing company recovers the balance of the car's cost from resale, the lease cost to you can be as much as \$50 a month less than the cost of an outright purchase.

For example, a closed-end lease on a Chevy Caprice Classic may be contracted at \$150 per month for 36 months which equals a total of \$5400. The contract you get depends, of course, on such factors as your credit rating and the intended number of miles you expect to drive over a 36-month period.

For \$5400 you'll get the use of the car for three years. If you purchase the car, however, you will get the use of it, and still own the car at the end of three years. If it's worth \$1778 (\$7178 minus \$5400) on the used-car market at that time, you break even. If it's worth less, you lose. If it's worth more, you win.

# IT'S NEW NOW



## Car-rack camper

There's no need to take along a tent on those weekend camping trips with this unique roof rack. Concealed in its 4-inch-deep false bottom is a collapsible canvas sleeping cubicle complete with zipper door and mosquito netting window. To turn from car rack to camper, all the driver has to do is release four wingnuts and the spring-loaded top pops up. The two-way rack-camper will fit just about any model car or van. It was developed by Anthony Koxsis, Ko-An Engineering Co., 209 South Terrace, Wingfield, South Australia 5013.



## Stackable laundry

For cramped quarters, Thin Twin washer-dryer units now can be mounted side-by-side in about 4 feet of floor space, or are stackable by using optional mounting stands or a wall-mounting kit. Latter arrangement requires only 25 to 30 inches of floor space, depending on the mount chosen. Stackables from Whirlpool are about \$530 a pair at local outlets.

## Tape from the hip

Invented by a painter who got tired of groping for his masking tape, the Hip Masker is a wearable dispenser that straps on the belt like a holster. It comes in two models for 1 or 2-inch tape, works with any kind of tape and is easy to use for right or left-handers. About \$6 up. Halco, 4102 D West Magnolia, Box 1621, Burbank, Calif. 91507.



## Larger buttons help keep in touch

With the addition of this big-button panel shown on the right-hand phone, you can change the face of your Touch-Tone telephone. It takes just a few seconds to attach and is ideal for those who have trouble reading the smaller keyboard, or who find the regular one too cramped. \$6.95, Touchables, Inc., 222 West Ontario St., Chicago, Ill. 60610.



## Science tries breaking the boredom barrier

Man at far left with wires on his face is supposed to look bored. He's part of an experiment by Great Britain's Ministry of Defense to find who's best qualified for monotonous jobs such as long-distance truck driving or watching radar scanners. An elaborate equipment array monitors how the subject responds to a dull three-hour film of unchanging landscapes and how quickly he reacts to the sudden appearance of a truck in the film.

**T**rucks really are a drag. Engineers want to get rid of that drag, and they're turning to wind-tunnel testing to do it.

The reason is obvious: Less drag means more fuel economy. With the pump price of diesel fuel having doubled between 1973 and 1974, a 100,000-mile-a-year hauler can save \$1300 on even a modest 10 percent fuel-cost reduction.

### Today's trucks

Many of today's trucks already have a number of gimmicks that make them more fuel-efficient: roof-mounted air dams, vortex stabilizers, faired tanks, gap seals between cab and trailer, thermatic fans, radial tires, higher axle ratios and lighter materials.

Tomorrow's trucks will go even farther into streamlining—*true* aerodynamic streamlining—to help save fuel. The boxy shapes of today will have to give way to some laid-back profiles and a lot rounder corners.

But with extremely high tooling costs for radical new designs, you

might not see the big streamliners on the highway right away. Sweeping changes always take time.

### Current state of the art

Meanwhile, what's the state of the art at the moment? We already know a lot more than we can do anything about.

For example, NASA began playing around with truck shapes in 1974 and found that a 40-inch gap between a normal tractor and trailer gives 10 percent better fuel mileage than does the normal 62-to-64-inch spacing.

NASA researchers went on to test the various drag foils now on the market. They discovered that the most common roof-mounted air dam cuts drag up to 24 percent at 55 mph in still air.

A gap seal between truck cab and trailer, NASA found, reduced drag up to 19 percent.

Translated into fuel savings, the figure for both the air dam and the gap seal came to about 10 percent.

NASA then went on to another set of

experiments involving not trucks but vans. They added aluminum exterior skins to a test van—first to make it a perfect box with 90° corners. They called this Configuration A. Then NASA commenced to round off the corners and seal the underbody. Proceeding down the alphabet, Configuration E proved the best streamlined, with a three-quarter-length bellypan and all corners rounded. Drag reduction of E came to 61 percent.

This isn't to say that all drag foilers work. Nor that those that work in still air do much good when there's a side wind. Experiments have shown that some types of truck roof spoilers actually *create* drag, and that others which do some good in still air lose their efficiency when they're bucking a moderate to heavy crosswind.

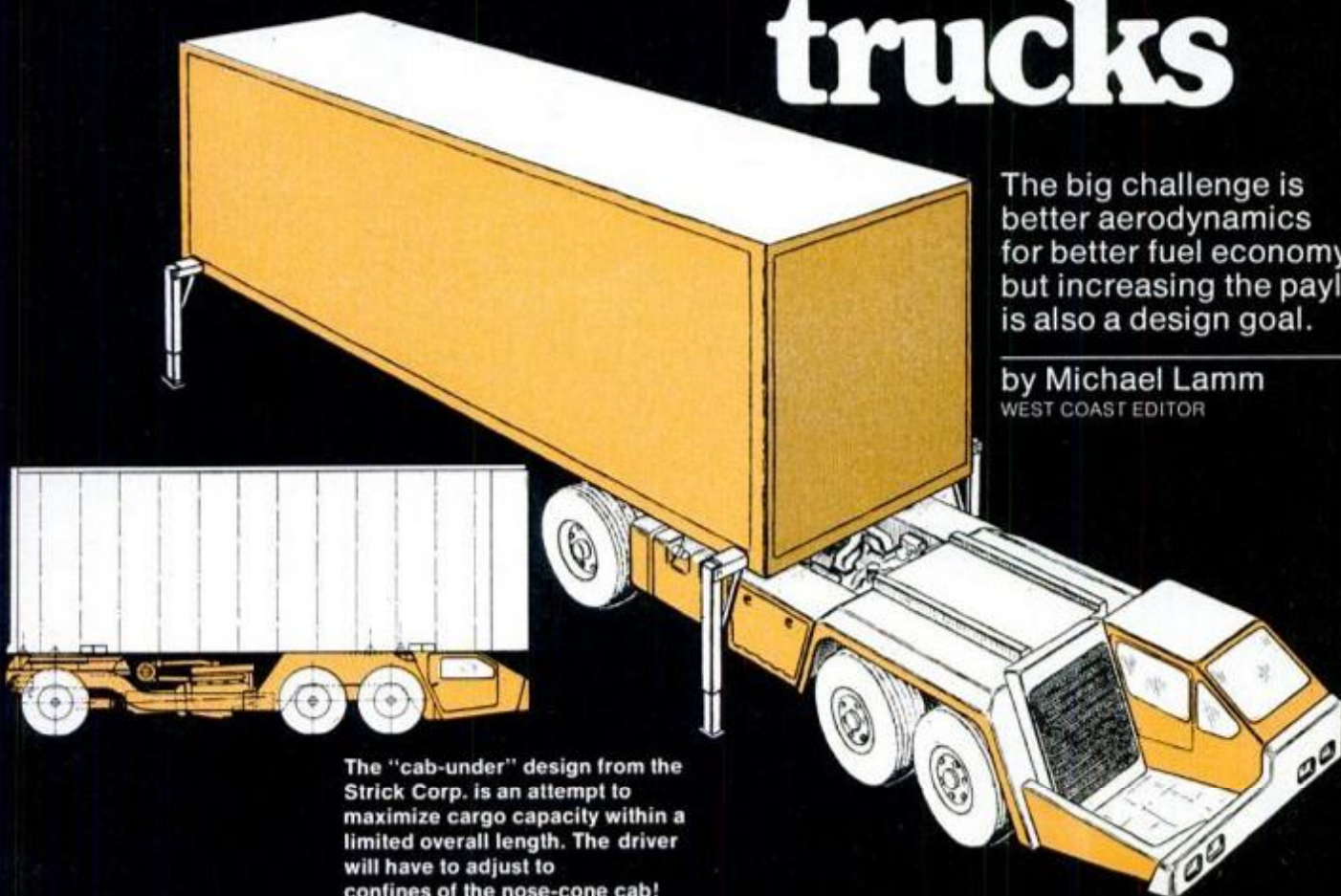
### Testing on the road

One of the most ambitious and impressive recent truck streamlining experiments involves Ryder Systems, Inc., the Miami-based leasing/trucking firm. In 1974, Ryder built 10 highly

# PM Previews Tomorrow's trucks

The big challenge is better aerodynamics for better fuel economy, but increasing the payload is also a design goal.

by Michael Lamm  
WEST COAST EDITOR



The "cab-under" design from the Strick Corp. is an attempt to maximize cargo capacity within a limited overall length. The driver will have to adjust to confines of the nose-cone cab!

# Tomorrow's trucks

streamlined COE (cab-over-engine) tractors. Ryder's idea was to test truck aerodynamics—to try to see in actual on-the-road practice how streamlining affects long-haul fuel economy.

Nine of Ryder's slope-nosed prototypes were put into service—three by Ryder and six in other companies. The tractors themselves were totally new, not just re-bodied versions of production tractors. They used stock Cummins diesel engines so fuel economy could be checked against conventional rigs with identical powerplants.

Oregon trucker Dean Hobbensiefken, working with one-eighth scale models, evolved the shape of these Ryder COEs. Ryder engineer Harleigh Holmes and University of Maryland researchers refined the original shape by placing scale-model trucks into the university's wind tunnel. In arriving at the final shape, they tried various fairings, spoilers, skirts, V'd trailer noses, seals between tractor and trailer and so forth.

In recent 290-mile-loop test runs in Indiana (240 miles on interstates and 50 miles on city streets), the Ryder protos posted 33.5 percent better gas mileage than equivalent "normal" trucks. The conventional trucks averaged 5.0 mpg; the streamlined Ryder rigs got 6.7 mpg. In terms of money, that's a saving of \$4100 a year based on 100,000 miles of driving and 50 cents a gallon for diesel fuel.

## Nose-cone tractor

Another very interesting concept has been developed by Strick, Inc., the trailer manufacturer in Fort Washington, Pa. Strick engineers have

attempted to maximize the carrying capacity of the largest legal tractor/trailer combinations by reducing the size of the tractor and thus upping the volume of the trailer.

They've tucked a small, streamlined, one-man tractor under the leading edge of a lengthened and lowered trailer. The driver, surrounded by glass in this small "nose cone," sits at about the same height as he would in a conventional car.

The Strick design puts the trailer pivot atop the cab roof, and the concept was originally proposed with four-wheel steering, high-flotation single tires and up to 80,000-pound GVW. The Strick truck puts primary emphasis on cargo capacity and only secondary stress on streamlining. Spokesman Ron Zubko says that Strick is now going into its second generation of the same basic idea.

What does all this activity mean? When and how will the truck revolution come?

## Economic incentive

It's hard to give an exact timetable, but during the Ford administration, there was talk suggesting that truckers "voluntarily" boost fuel economy by 18 to 25 percent. There's nothing the industry would rather do. Whether President Carter's energy policy will speed up fuel-economy measures remains to be seen.

You can bet, though, that either way whether brought about by government recommendations or not—the trucks that you see coming down the road in the future *will* be more streamlined. It's inevitable. ★ ★ ★

## SOME IDEAS YOU'LL SEE ON TRUCKS OF THE FUTURE

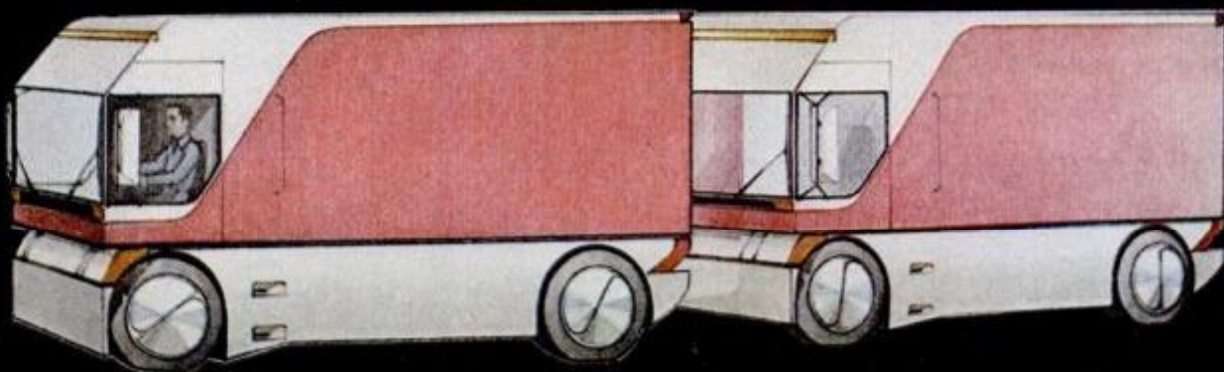
LONG, SLOPING WINDSHIELD OF ULTRATHIN TEMPERED GLASS GIVES GOOD VISIBILITY AND RACE-CAR AERODYNAMICS.



CAB TAPERS OR NARROWS TOWARD FRONT TO CUT THROUGH THE AIR MORE EFFICIENTLY. THIS REQUIRES THE FRONT AXLE TO BE MOVED AFT.

SEPARATE, SELF-POWERED TRUCKS ARE COUPLED TOGETHER WITH ONE DRIVER IN THE FRONT UNIT.

INDIVIDUAL UNITS ARE USED DURING THE DAY FOR CITY PICKUP AND DELIVERY. AT NIGHT, TWO OR MORE UNITS ARE DISPATCHED OVER THE ROAD WITH ONE DRIVER.





FLEXIBLE, LIGHTWEIGHT POLYPROPYLENE ACCORDION ELEMENT BETWEEN ALL UNITS CAN IMPROVE AERODYNAMICS 25 PERCENT.

FULL-LENGTH LOWER BODY SKIRTS ELIMINATE TURBULENCE UNDER TRAILER. EACH SKIRT CAN BE QUICKLY REMOVED FOR WHEEL, TIRE AND BRAKE SERVICE.

**CONVENTIONAL CAB:**

ENGINE-CAB POSITION IS REVERSED FOR IMPROVED VISIBILITY BY ELIMINATING LONG HOOD. GOOD FOR WESTERN STATES WHERE BRIDGE LAWS REQUIRE A LONG WHEELBASE.



CAB HAS ONLY TWO AXLES, BOTH DRIVEN. ELIMINATION OF SEPARATE STEERING AXLE REDUCES WEIGHT, TIRE FRICTION ON ROAD. TANDEM STEERING SYSTEM HAS BEEN USED IN EUROPE FOR MANY YEARS.

**LCF (LOW-CAB-FORWARD):**

GOOD FOR CHASSIS-CAB CITY TRUCKS AND MULTISTOP TRUCKS.



BACK-OF-CAB AREA HAS CLEAN SURFACES FOR IMPROVED AERODYNAMICS. TRAILER FITS SNUGLY AGAINST THESE SURFACES BY MEANS OF ACCORDION-PLEATED DIAPHRAGM.

**COE (CAB-OVER-ENGINE):**

GOOD FOR EASTERN STATES AND CITIES WHERE A SHORT WHEELBASE IS REQUIRED.



WHEN WHEELS ARE EXPOSED, DEEPLY RECESSED CENTERS ARE COVERED WITH FLUSH DISCS TO REDUCE TURBULENCE.

# New boats just for fun

Double or triple hulls may not surprise you—  
but how about one that walks out of the water?

by Bill McKeown

BOATING EDITOR

All pleasure craft can be fun, but some unique boats can give you an added measure of action, comfort in operation and convenience for getting in and out of the water. Some models will stow in a closet or car trunk, trailer behind a bicycle, strap on below a backpack. Many are small and not very safe in rough water, but offer a new way to get afloat. This selection of recent craft offers a boating bonus. Prices are less than for bigger hulls and some can be home-built. Most get speed from small engines, the wind or both.

Here's a boat that walks ashore! It's a 43-foot houseboat invented by Philip Dickerson, Surface Mobility Co., Crawfordsville, Ind. Hydraulically-powered pontoons "walk" the amphibious rig cross-country, OMC sterndrives power it afloat.

An offshore speedster that becomes a camper is this customized 24-footer from Banana Boat Co., Providence, R.I., which can be fitted with bimini top or complete canvas to enclose the cockpit for over-nighting. Cabin has V-bunks that convert to a double berth. Craft is trailerable.



are available in bright colors and several come with size and power options.

## The cats are coming

Are two hulls better than one? Under some conditions, catamarans are more stable, can sail shallows, carry a good-sized crew on the center trampoline deck, and offer a good fishing platform for craft like deck boats where a passenger can walk about without fear of rocking the boat.

Multihulls include the familiar twin hulls of the cat, three for the trimaran, and recently the main hull plus support float of the outrigger design updated for modern sailing.

Banshee International, 1000 Elwell Court, Palo Alto, Calif. 94303, calls its 16-foot Kalia CT 16 outrigger the largest cartop daysailer. The Great Outdoor Boat Co., San Rafael, Calif., has 12 and 15-foot outriggers called Go-12 and Go-15. With these, the eight-foot outrigger hull can be detached quickly and the main hull becomes a one or two-man kayak-type canoe.

More conventional catamarans for day sailing now include models like the Hobie Cat and Sol Cat; even inflatables like the KAT 416 Austrian import from Semperit-Leisure America, offer sailing fun from a compact 127-pound package. Most unconventional catamaran is a 43-foot houseboat model designed and built by Philip Dickerson of Crawfordsville, Ind. It runs on water with two OMC sterndrives and walks on land with pontoon "legs" hydraulically activated by a 16-hp engine. Pontoons extend, retract, move forward and back so this amphibian can crawl slowly ashore and head cross-country.

## Water scooters

Wet-sport motor scooters offer the most push from the smallest package. A cross between bicycles and boats, they are usually less than 8 feet long, use outboard or inboard power, propeller or jet drive, and are sometimes





Here's big action from the smallest of powered water craft! Little water scooters like the Peterson Water-Bronco with 20-hp Merc motor (above) provide wet and racy sport with one or two riders aboard.



Mini-runabout from Link-Leisure, Edwardsburg, Mich., the 11-foot Seafire (left) takes outboard power while a same-size Meteor model uses inboard jet and claims water-ski speeds up to 37 mph.

Inflatables may be the most versatile of fun boats. Small models, like the Zodiac (far left) can serve as swim platform for divers, explore shallows as a tender from a larger craft, tow water skiers when powered with a larger outboard, yet deflate and fold for easy portage, stowage.



Multipurpose rigs provide bonus action. From Stevenson Projects, Del Mar, Calif., the Hydrocat (left) is a 14½-foot catamaran that can be rigged for power or sail by changing decks. Rated for outboards up to 35 hp, the rig is available for kit building in plywood. Hulls are foam-filled for added flotation.

# New boats



Outriggers and catamarans often have a large stretched-canvas deck with room for group sailing. Kalia CT (above), from Banshee International, Palo Alto, Calif., is 16 feet long with a 17-foot outrigger, disassembles for cartopping. Kat 416 from Semperit-Leisure America (right) is an inflatable with 13½-foot hulls.

steered simply by leaning to one side or the other.

The Kawasaki Jet Ski from Kawasaki Motors, Santa Ana, Calif., is probably the best known; it speeds to over 33 mph. Similar rigs include the Wetbike and Power-Ski that ride on water-ski type skids, the Peterson Water-Bronco, and the Dynafoil that seems to fly just above water level on single front and rear hydrofoils.



## Extra attractions

Then there are the little extra action and multipurpose models that do double duty or more: sailboats that convert to rowboats or runabouts; inflatables that puff up from suitcase size into canoes, kayaks and catamarans; speedboats that can become campers with canvas covers added; and the surfboard that adds

*(Please turn to page 152)*



For a wet ride for up to five, the 16½-foot SeaSled from Bonaire Boats, Lenexa, Kans., inflates to carry seated swimmers. Towline, pump, boarding ladder are included.



Inflatable canoe for two or three paddlers, the Forelle III by Semperit-Leisure America, Fort Lauderdale, Fla., is a 33-pound 13-footer for touring, cruising.



Water scooters with built-in engines, like Wetbike (top) from Arctic Enterprises Corp., Thief River Falls, Minn., are designed to ride high on skis, skids or hydrofoils. Other types include Kawasaki's Jet Ski, Power-Ski and Dynafoil. For some, over 50 mph is claimed. Mini-sailing raft, the Semperit Waterflea (above) inflates to 7 feet to carry 220 pounds.

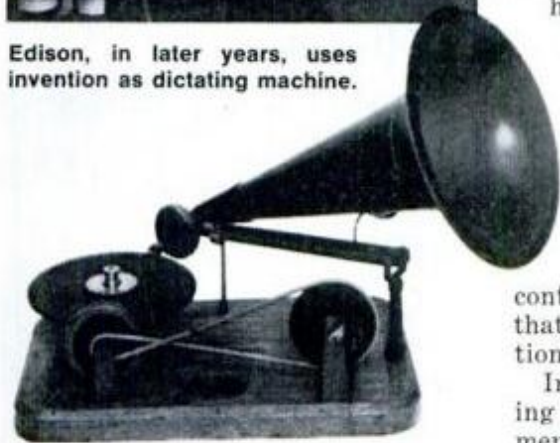
# The first 100 years of the phonograph

Thomas Edison invented the first practical recording machine a century ago this month.

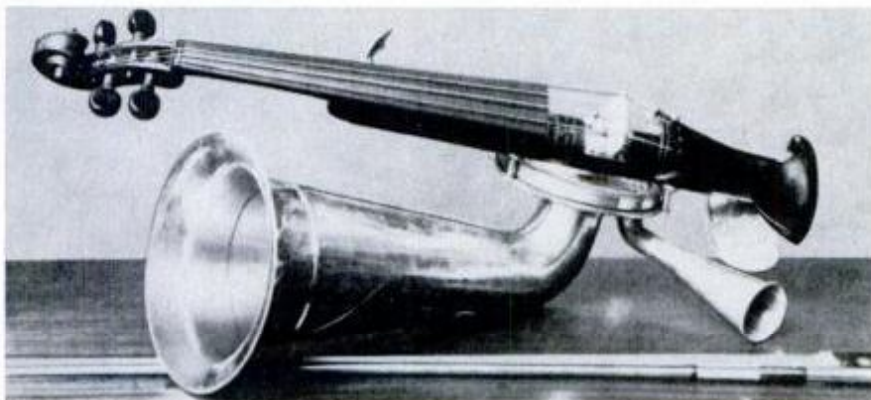
by Hans Fantel



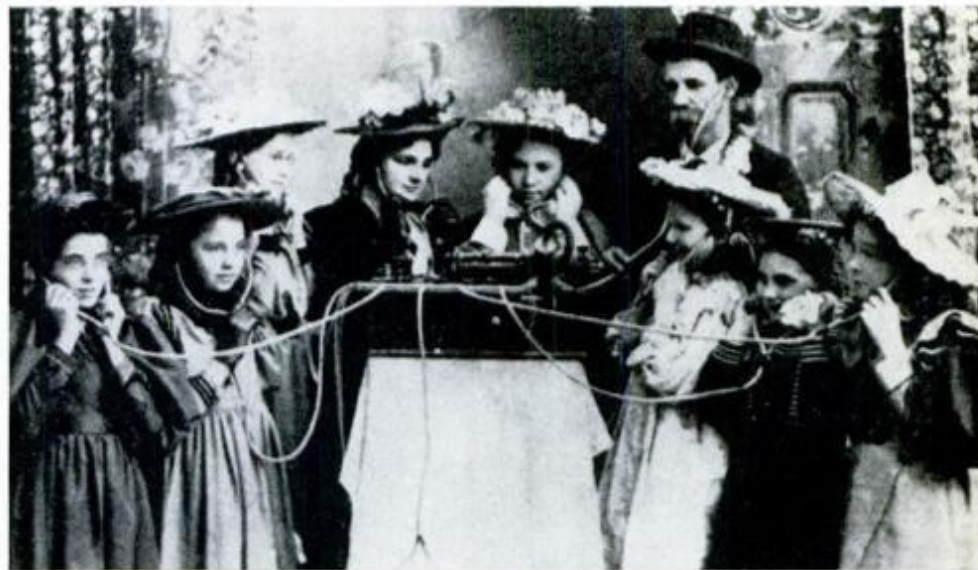
Edison, in later years, uses invention as dictating machine.



One of first commercial disc-type phonographs (1893) was cranked by hand.



Violins used in early recordings had to be fitted with a horn to project all sound energy into the recording machine. They sounded awful.



Individual ear-tubes provided better sound quality than the single big horn on the machine. Here a whole family enjoys the music through a maze of tubes.

Earlier this summer I went to Chicago to check out the latest audio equipment at the annual Consumer Electronics Show. Looking over acres of sound gear in the huge exhibition hall jutting out over Lake Michigan, I had a moment of reverie. I imagined Thomas Edison walking in to see what had become of his invention.

It would have been a timely return, for it was just 100 years ago that Edison was tinkering with his first tinfoil recorder. Neither he nor his contemporaries could have foreseen that the new device would revolutionize the world of music.

In fact, Edison wasn't even thinking about music during his experiments; he wasn't even thinking about sound recording. The idea of capturing sound—the most fleeting of all

sensations—and preserve it for later recall would have seemed too fantastic to the eminently practical Edison. What he had in mind was a device to speed up the transmission of telegrams over the recently laid transatlantic cable. The phonograph happened by chance.

## Code chatter

In the summer of 1877, Edison was fiddling in his wood-shack laboratory at Menlo Park, N.J., with a gadget to emboss the dot-dash patterns of Morse code on a sheet of tinfoil wrapped around a rotating cylinder. By working a telegraph key atop the cylinder, he would record messages. Later, spinning the cylinder rapidly while a contact arm traced the indentations with a stylus, the device would send out pulses at a much faster rate than was attainable by hand.

*(Please turn to page 126)*



Edison's first phonograph of 1877 still lacked the sound-amplifying horn. On this machine he recorded *Mary's Little Lamb*.

Bike No. 9, a Yamaha with Gary Nixon up, leans through one of the turns during the Long Beach International Road Race last April. He was seventh.



Ride for no pay?  
"I'd rather be on the beach,"  
growls Nixon.



Suiting up for the 76-mile race on the streets of Long Beach, Nixon basks in the glamorous side of the sport. He lifts a wheel, not for show, but upshifting out of a turn.

A close look at Gary Nixon, one of motorcycle racing's top riders, gives some clues.

by Ross R. Olney

**T**he sun is dodging in and out of clouds and you can hear them coming again on the 2.02-mile course. From a faint buzz to a louder whine to a blasting, one by one with a staccato snarl they zip past. No. 9 has lost a position, but races on.

No. 9 has lost before and will lose today. He has survived before and will survive today. But white-and-blue Gary Nixon has won before too—in *spades!*

Soft-spoken, polite, of average size in a sport of smaller men, with a set to his mouth and a hard glitter to his eyes that speaks of dangerous miles and painful crashes, Gary Nixon has seen it all. This ex-Oklahoman now living in Cockeysville, Md., has had fame and glory more than once, much more than comes to most racers. On this day, Apr. 3, 1977, he is racing with cracked bones in his wrist and a scab on his forehead from a too-recent crash at Daytona. It's the Long Beach International Road Race, worth \$22,000 to the winner.

He used to wear his hair in a tough crewcut since he's a tough guy. Now it is thinning on top and styles have changed, so he has a curly, reddish Prince Valiant that, on him, somehow looks right. It wouldn't matter—if he liked it, he'd wear it. Meanwhile, he's the only pro rider left who has been around through all the style changes in men's hair.

American Skip Aksland led from the second lap on and won this 1977 Long Beach International Invitational Motorcycle Grand Prix Classic. Gene Romero pushed him all the way for second, and handsome Englishman Barry Sheene took third. In England and Europe these riders are sports heroes, always on TV and endorsing anything they choose for a lot of cash. Sheene is a close pal of Nixon's, as are most other top riders. Nixon is something special to all of them.

"He has the guts, the grit . . . he epitomizes the pro motorcycle racer. He is one of the best five racers in the world," says one rider, naming them off on his fingers and including quiet Gary Nixon in fifth place, but not including himself at all.

Suzuki rider Barry Sheene, the current world champion and only non-Yamaha rider in the Long Beach Grand Prix, helps Gary Nixon get start money in Europe. Sheene has the clout, and Nixon goes *nowhere*

Photos by the author

# Racing on the ragged edge—why do they do it?

without a deal. Money is very important to him. He has worked his way to where he is, and he wouldn't race for nothing if it was the last motorcycle race in the world. He's been paid good money to race in Long Beach, win or lose. If you don't know that, he'll tell you quick enough. It seems almost a matter of pride with Nixon.

He values his friendship with

Sheene. "He lets me ride in his Rolls Royce and stay with him when I'm racing in Europe," says Nixon.

On this day he doesn't know where he'll be racing next. He was passed over for the upcoming Grand Prix in France. There is still a chance, but he doesn't really expect to hear from the French organizers. They think his wrist is still broken, that he can't put on a show, but he flexes the wrist and insists that the doctor said he could race without even a brace "if it doesn't hurt too much."

Again the Grand Prix bikes, the fastest motorcycles of all, thunder down Ocean Blvd. They have sleek wind fairings and every bolt is built for speed. They are two-wheeled bombs and nearly as dangerous.

Nixon has lost another place. But still his front wheel leaps off the track in a grand wheelie as he shifts and speeds away from the last turn of the course. It isn't in fun, or to show off, or really because he thinks he can catch up. It is just that he is a pro racer and he will race as fast as he can regardless of tired engine or hurting body until the checkered flag drops. He knows he isn't going to catch Aksland or Romero or his buddy Sheene, but he is a racer who has to race.

A "privateer" in motorcycle racing, Nixon is unsponsored, but for a few free and loaned parts. He pays his own way and that of his great tuner and good buddy, Erv Kanemoto. No cycle company, fuel supplier or parts maker picks up hotel bills for the Nixon team. Pride isn't involved. Nixon wishes they would. But sponsorship is hard to come by in modern motorcycle racing.

You'd think a champion wouldn't have that much trouble. Nixon was

**The engine seized, and he slid sideways down the track . . . breaking arms, ankle, ribs and other parts.**



AMA Champion in 1967 and 1968. He barely missed the World Championship as recently as 1976. He is *good* and *known*, exactly what sponsors are seeking. He attracts attention. Heads all turn when No. 9 strolls the pits. No press release goes out without Nixon's name on the top. You'd think sponsors would be fighting to get on the team.

They don't. Nixon makes it obvious that he would welcome some help, but none seems forthcoming. Maybe he's too tough, maybe he's too straight-arrow, maybe it's that his luck has been atrocious recently.

Gary Nixon can be the original man-of-few-words. How does he like the Long Beach course?

"If the people like it, it's great."

But what about *him*?

"Everybody has to ride the same course."

How did he get started in racing?

"I was a sports freak. Played football, baseball, basketball in school. But then everybody else got bigger."

So he turned to motorcycle racing, and once raced all types of bikes un-

Ride for no pay? "I'd rather be on the beach," growls Nixon.

From the grandstands, motorcycle racing is a glamorous, colorful, exciting panorama of sight and smell and sound. The riders are for the most part courteous, public-relations men who turn into crowd-pleasing daredevils on the track. Fans of motorcycle racing swear there is no better competition and no better competitors in any other sport.

Throughout his career he has survived horrendous crashes and injuries. In 1969 he was trying too hard at a track in Santa Rosa, Calif. Promoters had not set out hay bales. Nixon skidded, hit a post and broke several bones, including his hip. Doctors installed a pin, but in 1971 he was dirt riding for fun on a small bike. The engine froze, but instead of falling free he tried to catch the bike. Both he and the bike went down a rocky hill. The pin tore from his hip.

### Riding again in three weeks

Typically, he rode Daytona three weeks later.

In 1974, he was doing development work in Japan on a track he didn't know. He streaked into a fast left hand turn at 120 mph. As he backed off the throttle the engine leaned out, seized, and he slid sideways down the track. He crashed solidly into another bike, breaking arms, ankle, ribs and other parts.

This time he was out for a year.

Gary Nixon was AMA Grand National Champion in 1967 and 1968, before turning to road racing exclusively. He has won 19 AMA nationals (only four riders have won more) and he would have been world champion in 1976 but for Venezuela. He was chosen AMA Professional Athlete of the Year in 1976.

His career has been marked with extraordinary success, also with failure and injuries demanding fortitude and courage. If he were to announce his retirement from racing today, something he is not about to do, writers would immediately begin to refer to him as the "legendary" Gary Nixon.

### Still wants to win

But there in the dark coolness of the great domed "garage" that serves as an arena for other entertainment in Long Beach, Nixon looked less like a legend than a rider anxious to win a major race. It is something he hasn't done since the 75-mile road race in Loudon, N.H., in 1974. For a rider who was consistently on the top-10 list in Grand National standings, his name has been conspicuously absent since 1973.

Sitting in a corner of the roped-off area reserved for motorcycles, leathers tied around his waist, he watched Erv Kanemoto making a last-minute engine switch. Kanemoto worked his magic. But it will take more than magic this time. The engine just doesn't have the power to keep him near the front. By the end of the race that day, with drop-outs and some frantic riding, Nixon managed seventh place. The "Nixon-Kanemoto-Harris-Page"-sponsored Yamaha just didn't have it this day.

In Victory Circle, young Skip Aksland, a rider who gets considerable help from the Yamaha factory, is joyously spraying everybody with champagne while the Star-Spangled Banner blasts from a nearby, scratchy speaker. It is his first international victory, and he is overjoyed. Everybody else is happy for the youthful American rider since almost everybody else is also American.

### Could beat anybody

Steering around the jammed crowd, Nixon guides his idling bike back toward the garage.

Nobody notices.

Nor does he seem to notice the noisy ceremony.

Why does he do it? Because his skill today, in a sport where skill is everything but luck and courage, is at its highest point. He is a superb motorcycle racer. Given the equipment, he can beat anybody in the world today.

He *believes* he can win and the other riders *know* he can. With a self-amused, fleeting grin through clenched teeth, he points out it is a *hell* of a way to make a living. ★★



**Dangerous miles and painful crashes—Gary Nixon has seen it all.**

til he finally turned exclusively to world road racing. "I got a second in my first race," he adds.

Nixon looks at you with burning eyes, but they tell no story. It is impossible to see if he is pleased with himself, happy with what he is doing. You say to yourself he *must* be to continue to hang in there; motorcycle racing is not for the faint-hearted. It is a hard, dangerous way to make a living. He *must love* it, deep down.

He *does* love it deep down, insist other riders—riders who have an obvious respect for Nixon beyond the fact that he is another hard-riding competitor they can count on in a race. They seem to hold him in especially high esteem.

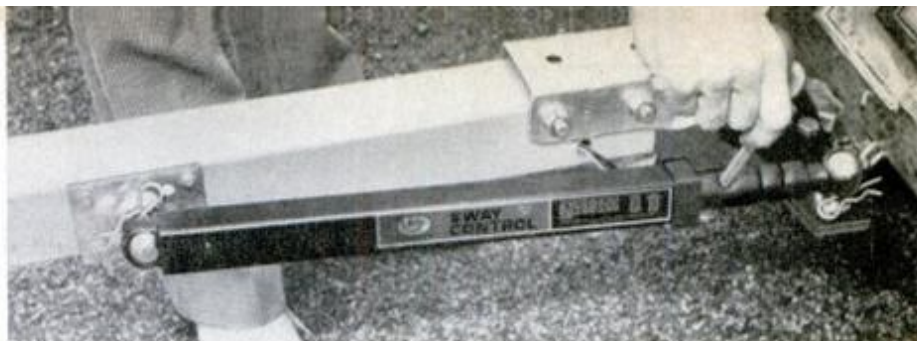
**He'll race as fast as he can, regardless of tired engine or hurting body, until the checkered flag drops.**





# New add-ons for RVs

by Bill McKeown  
OUTDOORS EDITOR



Single-tongue trailers can now have sway control by adding a \$13 adapter to the \$55 Sway Control hitch developed by Valley Tow-Rite, Lodi, Calif., for A-frames. Rig will adjust for load capacities of up to 8000 pounds.



Leveling an RV at campsite is simplified with R-U Level, by Ruwe Mfg., North Hollywood, Calif. Inches each wheel must be raised are shown on legs which slide under \$7.75 unit.



Protection for both grille and headlights, the custom \$60 Superguard Brushguard from Superwinch, Putnam, Conn., is now available for all the imported mini-pickup trucks.

Small gadgets, large systems and convenient refinements are all being added to the collection of gear for the rolling home away from home. Often it's the little improvements that can make a big difference in your comfort.

New mini-aids include handy plastic portable jerry-can size containers for wash water from small campers and vans without a holding tank. Rooftop luggage enclosures are now available in plastic with waterproof closures—Hellstar of Wahoo, Neb., has one, as well as an improvement for the bottom of your rig: swiveling rollers to replace rear skids for those



Versatile cap for pickups, the sliding telescoping Roll 'n Tilt cover from Odyssees Industries, Wahoo, Neb., can tilt forward (top) for stand-up loading, slide forward (center) or slide back (not shown), or extend back for full enclosure of cargo bed with rear window. Priced about \$549.

times you back down a steep incline or driveway.

RV heaters, ventilators, furnaces and winches are larger items that have become popular. Coleman now offers an improved rooftop cooler with a built-in electric "Chill Chaser" for cool-morning warmth as well, plus an improved water system pump and a miniaturized furnace. Power-leveling systems will let you even up your camper or van at a campsite



Ventilation can help prevent dry rot and mildew in RVs, tents and boats. Airlette Ventilator snaps into canvas covers quickly without adhesive to let in fresh air. Two units are \$10 postpaid from Airlette Corp., Pekin, Ind.



Tent Kapper by Carefree of Colorado, Broomfield, Colo., opens into four-sleeper with standing headroom or folds into a lockable utility cover. Models, \$680 to \$750, fit nearly all pickups.

before you leave the driver's seat.

Where plug-in current is not available, new 12-volt appliances can take over. Vents, fans, vacuum cleaners, searchlights, air compressors, TV sets, intercoms, fume detectors, burglar alarms and some kitchen utensils are wired for vehicle battery power operation. But be sure items are designed for RVs; some sun-filter window films may diminish visibility and are illegal. ★★★

**A**ctually the 1977 Skyhawk has more rear legroom than its principal rival, Ford's Mustang II—at least with the front seat pushed all the way forward. Yet rear-seat claustrophobia brings out a lot of squawks from Skyhawk owners.

"It's okay back there for a trip around town," says a Michigan clerk typist, "but too cramped for any long-distance driving."

An Illinois marketing manager echoes: "Only a child can get into the back seat, let alone stay there, but I knew this when I bought my Skyhawk, and I use it as a 2-place car."

"Too low and narrow in the rear," opines a California machinist.

"Even my two young children are uncomfortable in the rear seat," writes a New York music director.

But a Texas stock trader counters, "Front is excellent for a small car, and the rear is fine, too. If I had wanted a big back seat I would have bought a station wagon!"

While the back seat took its share of lumps, owners appreciate the large cargo deck with the seatback folded. Says an Indiana photographer: "We sleep in

## PM OWNERS REPORT: BUICK SKYHAWK

the car when camping." A Louisiana secretary: "Hatchback is practical, holds a lot." And a Tennessee interior designer: "In my business I need to haul a lot of bulky things—large paintings, furniture, and so on—and the Skyhawk handles almost everything a station wagon would."

The Skyhawk's best-liked feature, of course, is its styling. Styling proved the car's biggest buying incentive. A Florida Navy man confesses: "My wife first wanted a Datsun 240-Z. She likes a sporty car. So I bought this Skyhawk and we're both happy."

A Texas restaurateur agrees: "We wanted an economy car, but

one that looked more sporty than the usual." A Kentucky chemist calls her Skyhawk "my Corvette-station-wagon" and says she bought it because it's a "a sharp-looking hatchback with easy haul-in' room."

Looks weren't the only reason owners chose the Skyhawk. An Oregon University student avers: "I wanted a Buick—a sporty one with good gas mileage. I also liked its ride and looks."

A Louisiana teacher adds, "I found it the perfect combination of styling, economy, performance, handling and class, plus I was offered a fair deal."

Buick introduced its first V6 engine in 1962 and has refined it



Skyhawk's hatchback and its sloping nose give car the look of a Ferrari.

considerably since then. Owner opinion on the V6 ran both hot and cold. A Michigan college professor, for example, said, "The en-

BY MICHAEL LAMM WEST COAST EDITOR

# Owners love styling, but find rear seating claustrophobic

Husky aluminum bumpers have rubber facings.

Mod'd plastic front ensemble bothers some owners.

Sloping hood makes it easy to judge parking distances.

Antenna embedded in windshield annoys a few owners.



Photos by the author

gine is very responsive and runs well in spite of an inherent imbalance." An Arizona statistical analyst feels, "The V6 engine idles very rough, even when properly tuned." An Oregon engineer:



Front-seat comfort rates top marks, but the rear is suitable for kids only.

"Fun, very responsive car to drive." A Michigan accountant: "Performance of the V6 and five-speed transmission is phenomenal." And an Ohio merchandising manager: "When cold, the engine stutters and coughs and has caused many anxious moments. I also feel this engine lacks high-speed punch because of the five-speed's tall gearing."

Another owner—a Texas geologist—adds this explanation: "The

legal speed limit of 55 mph is too high for fourth gear, and in fifth the Skyhawk tends to run a little jerky. Optimum speed for easy running is 60-65 mph in fifth."

A relatively small percentage of our respondents (5.7 percent) complained of lack of power, but in most instances these owners had Skyhawks with automatic transmissions. Drivers of four- and five-speeds are almost all well pleased with their cars' performance.

The Skyhawk's workmanship drew a 68.1 percent *good-to-excellent* response, which is a little

*(Please turn to page 144)*

**Huge cargo floor can accommodate lots of luggage—even overnight campers.**



## Turbocharger on the way?

Buick's Skyhawk made its first public appearance on Sept. 27, 1974, the same day Chevrolet announced the Monza 2-plus-2 and Oldsmobile, the Starfire.

All three cars share GM's H-body, an outgrowth of the Vega's floorpan and 97-inch wheelbase. Brakes, front suspension, and steering are also Vega carryovers.

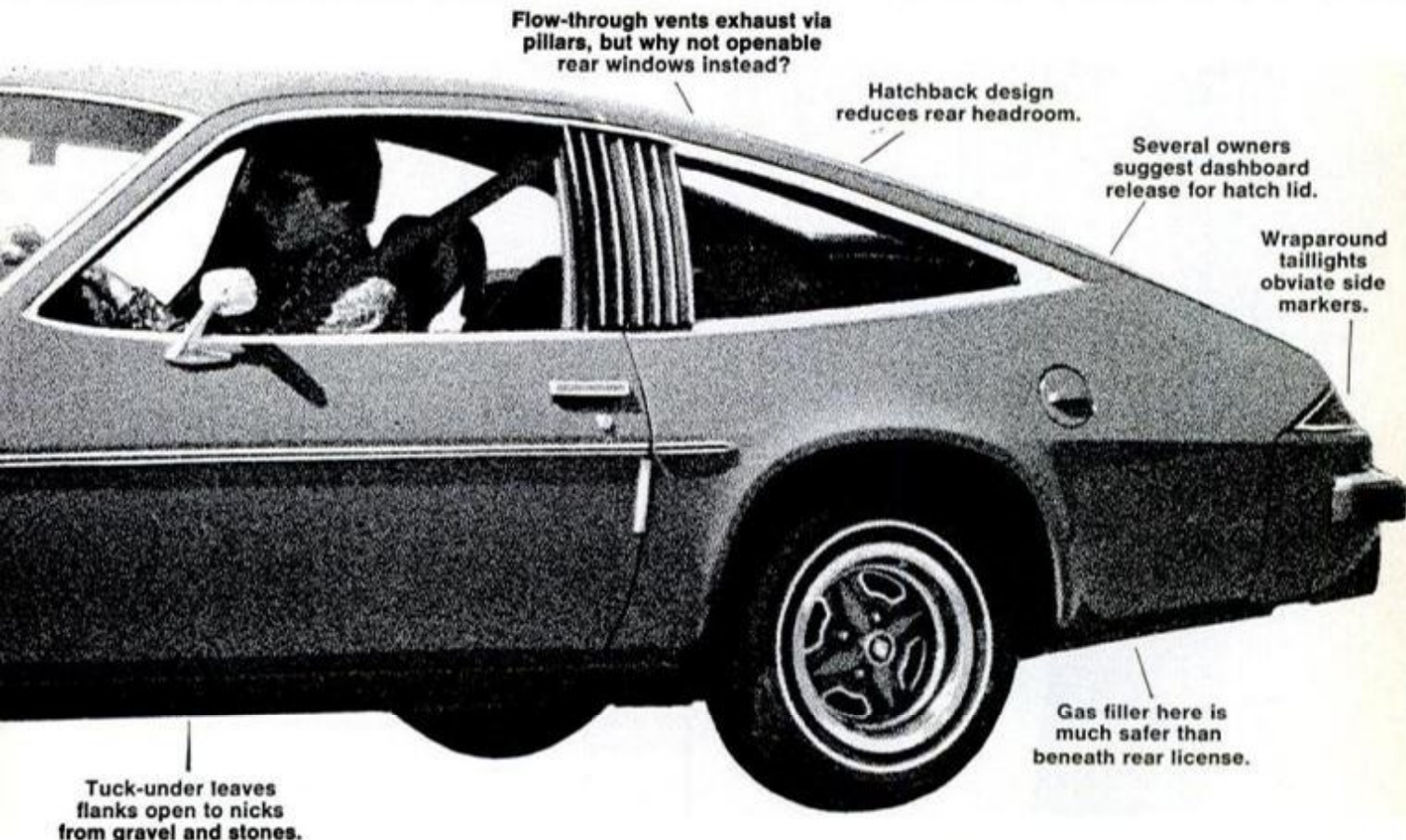
Styling of the H-body hatchback borrows heavily from the Ferrari, especially in roofline and rear aspect. (The H-body designation, by the way, also applies to the Monza Towne Coupe and Pontiac Sunbird.)

Initially engineered to accept GM's aborted rotary engine as an option, the H-body's driveshaft tunnel remains high to accept a rotary's output shaft.

The Skyhawk comes with Buick's 231-c.i.d. V6, as does the Starfire. The Monza 2-plus-2 uses the Vega ohc Four or 305-c.i.d. V8. All H-bodied cars are available with automatic or 4 and 5-speed manual gearboxes.

GM places the Monza/Skyhawk/Starfire in competition with Ford's Mustang II, and it's also aimed at a market that includes the Datsun Z-cars. Rumor has it that next year, the Skyhawk will get an optional turbocharger and might be called the Turbohawk V6.—M.L.

## A NATIONWIDE SURVEY BASED ON 1,258,389 OWNER-DRIVEN MILES



Flow-through vents exhaust via pillars, but why not openable rear windows instead?

Hatchback design reduces rear headroom.

Several owners suggest dashboard release for hatch lid.

Wraparound taillights obviate side markers.

Gas filler here is much safer than beneath rear license.

Tuck-under leaves flanks open to nicks from gravel and stones.



# Instant movies: Shoot now, see now

Here's your first look inside Polaroid's new instant movie film cassette system available this fall.

by Hans Fantel



Polavision camera, film and projector with built-in screen let you shoot movies now, see results in seconds. Film pops into camera for shooting, into projector for development and playback.

The scene looked like one of the whackier backdrops at a county fair, you'd never guess this was a momentous occasion: Dr. Edwin H. Land, chairman of the Polaroid Corp. and inventor of the Land camera and instant photography, was unveiling his latest invention. He and his staff had been working on it for 30 years. Now the clowns and dancers had come so we could try out the new gadget on them. We were taking instant movies.

The camera I held in my hand was as small and light as a Super-8 movie camera. I pointed it at a perky dancer in an attractive costume and pulled the trigger. The camera whirred discreetly, and I got three minutes' worth of the pretty girl. Then I took out the film cassette and walked over to the playback unit, which looked just like a 12-inch table TV but without control knobs. I dropped the cassette I had just filmed into a slot atop the playback set, like a slice of bread into a toaster. Something inside buzzed.

### Instant movies

About 90 seconds later the screen suddenly lit up and—to my astonishment—I saw the film I had just made. No Hollywood "rushes" had ever reached the projection room faster. And no motion picture had ever before been shown without first going to a developing lab.

"We have now done for living images what we had done for still photography in the past," Dr. Land proudly told some 4000 stockholders at the Polaroid plant outside Boston.

Dr. Land didn't spell out all the technical details of his new Polavision Instant Movies which will hit the market later this year at a still unannounced price upward of \$400. But he outlined the basic principles of the new system, which is an ingenious adaptation of his well-known process for instant still photography to the trickier requirements of moving film.

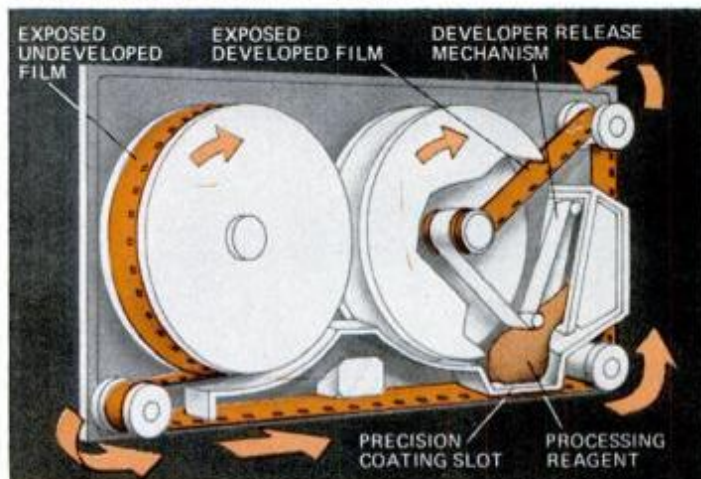
### Fully automatic

The compact camera is battery-driven and fully automated, with two focal settings—close-up and distant—and a 1:2 ratio zoom in either focal range. Exposure is automatically controlled, and a warning light in the viewer signals insufficient light levels.

What is unique is the film itself. It has a transparent front layer scored with a pattern of ultrafine lines—about 4000 per inch. Alternating in a repeated pattern of red,

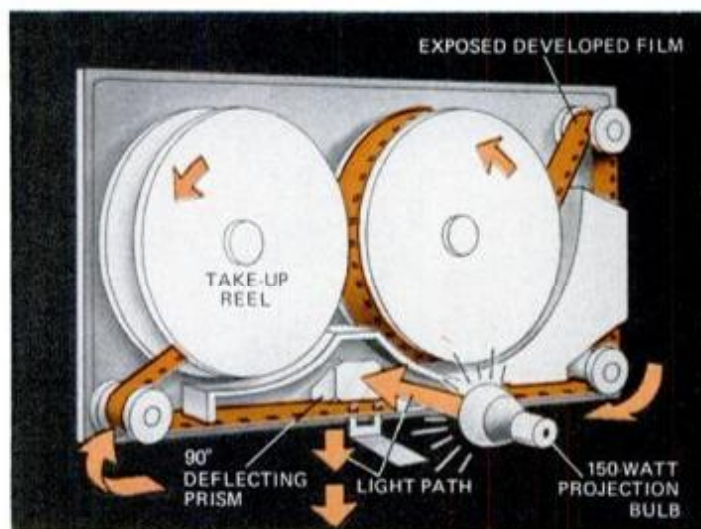
*(Please turn to page 146)*

### FILM DEVELOPS DURING REWIND

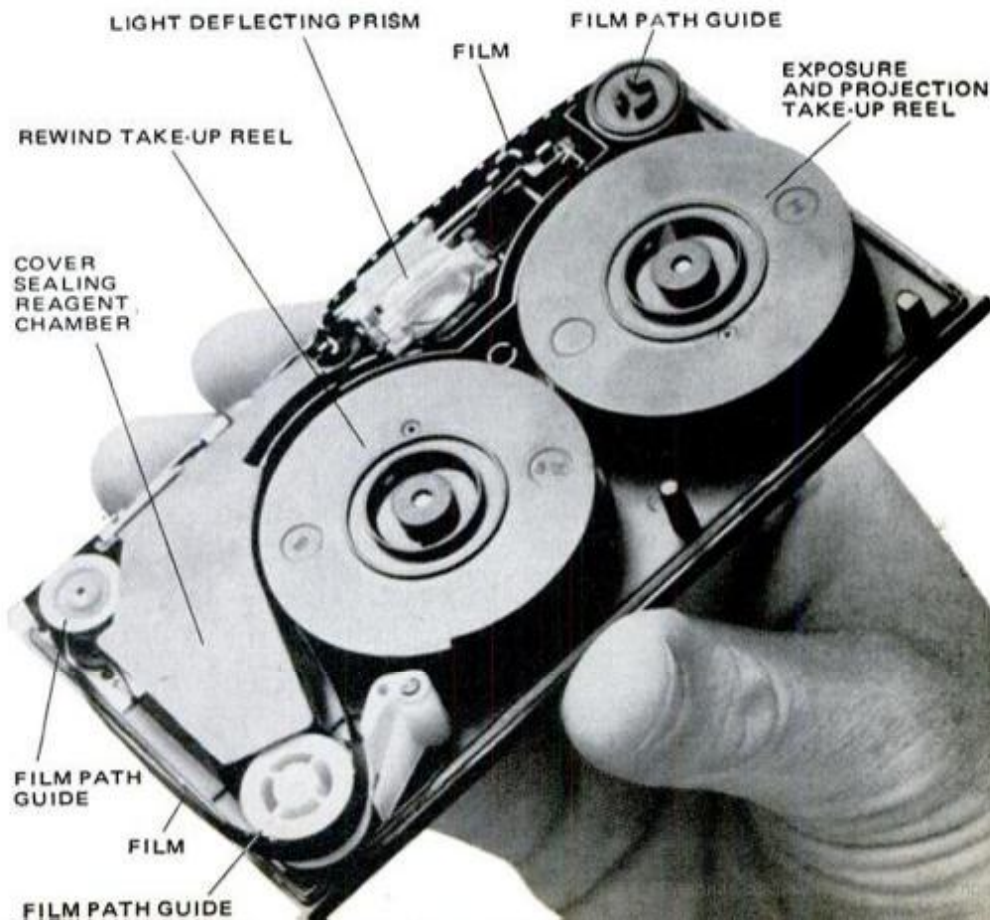



Film never leaves box (left), about the size of familiar audio tape cassette. The pack is popped into hand-held, battery-powered, 24-ounce movie camera, exposed and removed. Then the cassette is dropped into the viewing box where it is rewound and developed in 90 seconds and displayed on a built-in projection screen.

### LIGHT BENDS DURING PROJECTION



Fresh cassette has unexposed film on right-hand take-up reel. As film is exposed in camera, it moves to left. After the cassette is moved to projector, film develops as it rewinds on the right-hand reel. The film moves right to left as light is bent 90° to flash images on the 12-inch projection screen.

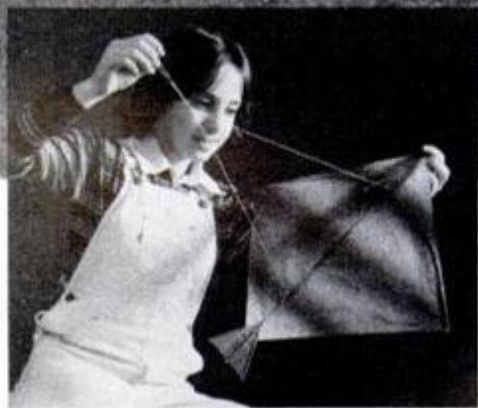




# Two exciting kites you can build from scratch

by Maxwell Eden

PM photos: Robert Golden



The Indian Fighter kite (above) is a sleek variation of the ones handcrafted in India. It is a highly maneuverable kite that needs very little wind to fly.

**Materials.** You'll need: two  $\frac{1}{8}$ -dia. hardwood dowels, one 18 $\frac{1}{4}$  in. long and one 30 in. long; heavy tissue paper (Crystal brand is a heavy-weight paper that comes striped in a variety of colors); two 4-in. dowel slivers the diameter of a flat tooth-

**E**xperience the exhilaration of flight by setting sail with your own kite. Both the Indian Fighter and the Marconi-Jib kites shown here have unique qualities that make them a pleasure to fly. The Fighter kite can streak and loop across an almost windless sky. The Marconi-Jib kite, named after the Marconi-rigged sailing yachts, allows you to set sail in gusty winds.

You can make the Fighter in less

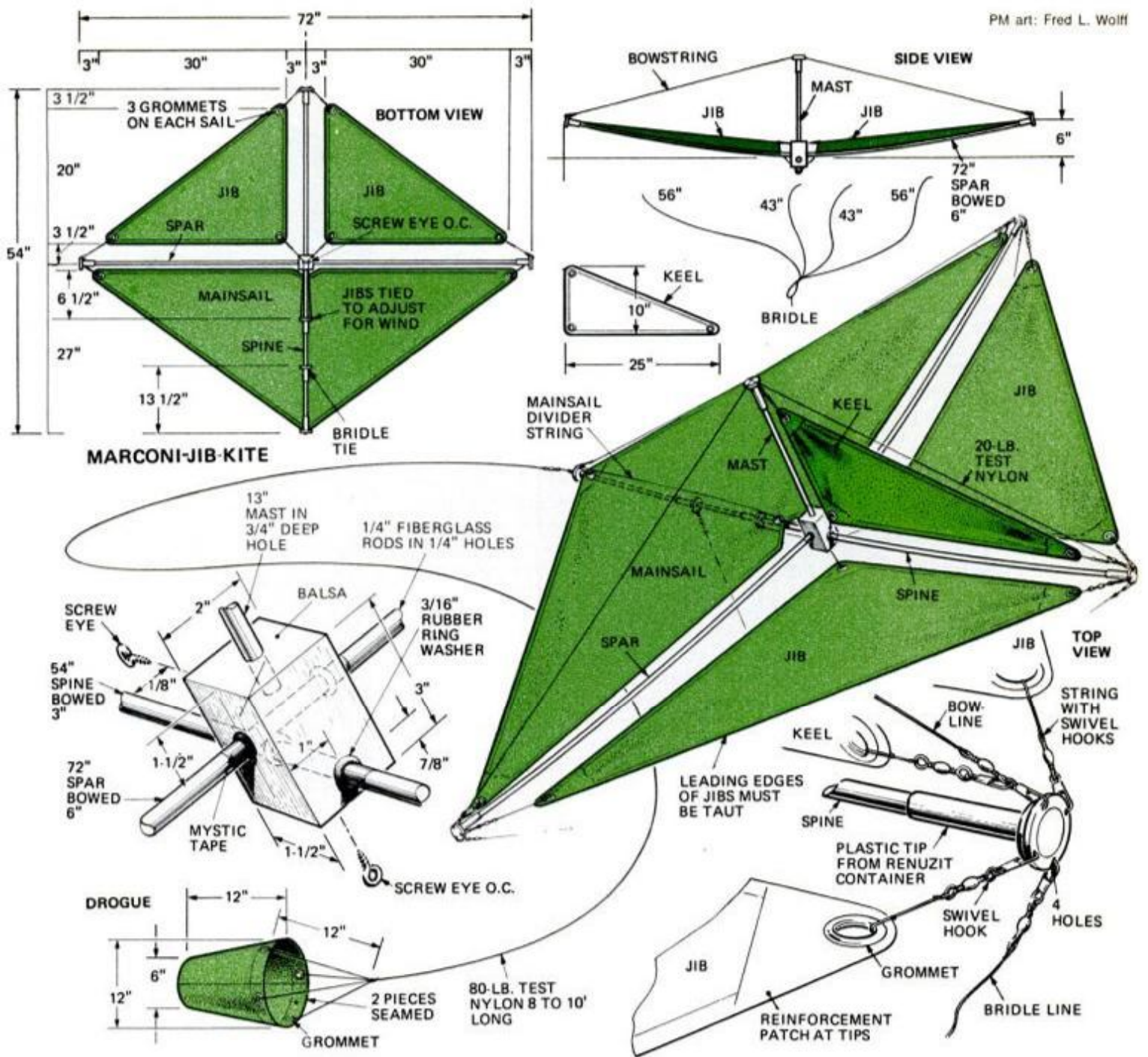
than an hour for about \$1. The Marconi-Jib, a good all-day project, will run you \$25 including material which is actually sail material. You can make it for under \$10 if you substitute nylon or tightly woven cotton.

As you work, remember that the key to a good kite is *symmetry*.

## The Indian Fighter kite

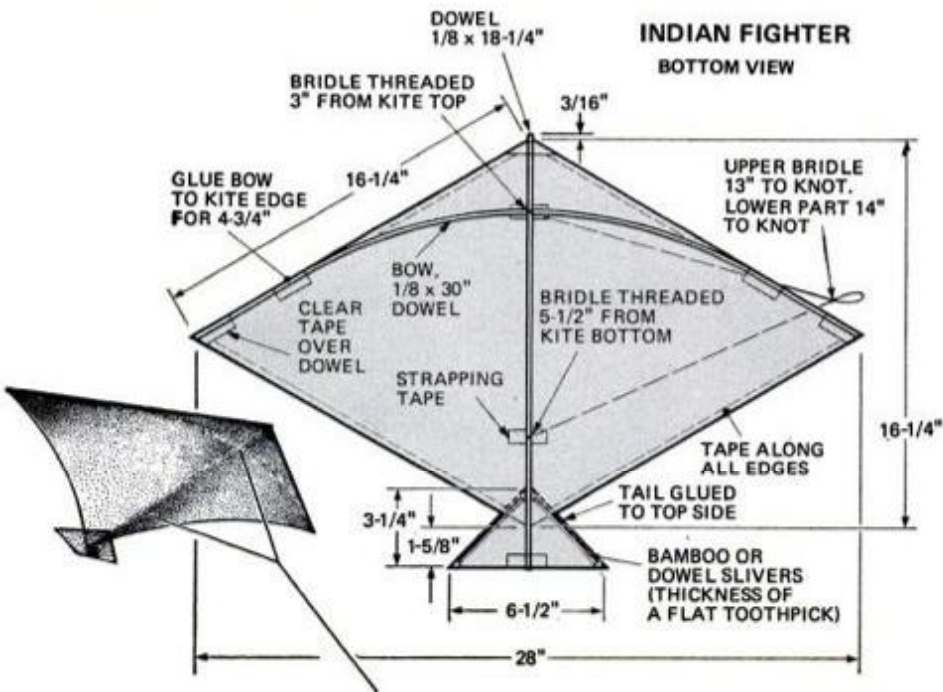
When other kites can't get off the ground, the Indian Fighter is the terror of the skies. In India (where this kite originated) combatants coat part of their kite string with ground glass then attempt to cut each other's flying line. Here's a variation of the Indian kite.

Kite buff Maxwell Eden's Marconi-Jib kite shown flying in photo above took first place in the Unique Design category at the 1976 New York City Kite Festival.



MARCONI-JIB-KITE

INDIAN FIGHTER  
BOTTOM VIEW



pick (or slivers from bamboo shoe trees can be used); clear tape; strapping tape; rubber cement and string for the bridle and flying line. Use a light kite line or carpet thread for the bridle and fly line.

**Construction.** Lightly fold the tissue paper in half to assure symmetry, then measure and cut out the diamond shape shown in the diagram. Cut the small triangle stabilizer and glue it to the front of the kite. Apply clear tape reinforcement along the kite edges.

Flex the longer dowel to be sure it bends evenly to form a symmetrical bow, then glue about 4 3/4 in. of both ends along the edge of the kite. Add two pieces of clear tape reinforcement to the bow.

Place strapping tape in both places where the bridle strings will go

through the paper. Then glue the spine dowel to the kite body, *between* paper and bow. Spine and bow should hold the tissue paper taut.

Glue both dowel slivers to the stabilizer on the same side as the bow. Attach bridle to the opposite side. The top bridle ties around the bow and spine. Finally, reinforce the tip and tail with clear tape.

**Flying the kite.** The Fighter flies best in winds of 1 to 5 mph. With practice you can launch it yourself. But begin by having a friend facing you, lightly holding kite pointed upward about 100 ft. downwind. *Pull* the kite out of his fingers with long, steady pulls of the string.

The Fighter will go in the direction its nose is pointed, as long as you pull its string hand over hand smoothly. Once you stop pulling, the kite will start to spin and seek a new direction. If you add a 10-15-ft. crepe-paper tail, the kite will be less frisky.

### Marconi-Jib kite

The Marconi-Jib kite is made for sky sailing. You can adjust both jibs to suit winds of 8 to 25 mph.

Set loosely in light winds, the jibs will luff and feed needed air to the mainsail. In heavier winds, you trim the sails by setting the jibs more tightly. The jibs are set properly if the flying line is at a 60° angle to the ground.

The kite pulls relatively hard, so you should use a sturdy reel such as that shown for full control.

**Materials.** You'll need three 1/4-in.-dia. fiberglass rods cut from bicycle safety flag poles (available at

bike and hobby shops); a 1 1/2 x 2 x 3-in. balsawood block; cloth tape such as Mystik; inner plastic cores from Renuzit Solid Air Freshener available at supermarkets (lightweight stainless-steel fishing rod tops can be used in place of five cores). If you can't find Renuzit in your supermarket, write for the nearest supplier to: Consumer Relations, Drac-kett Products, 5020 Spring Grove, Cincinnati, Ohio 45232. Sail material is Stabilkote III from Howe and Bainbridge, 220 Commerce St., Boston, Mass. 02109.

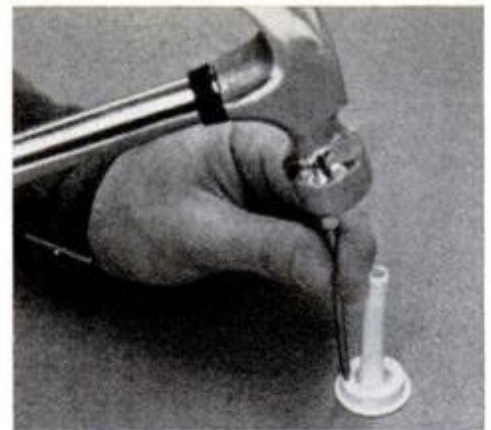
Hardware you'll need includes: 17 1/2-in.-dia. grommets; four 3/16-in. rubber washers; two lightweight 1-in.-dia. key rings; 21 No. 1 swivel hooks; and two 3/16-in. screw eyes.

Use 80-lb.-test nylon or Dacron string for the bridle and flying line. Lightweight 20-lb. nylon cord is best for bowstrings and sail attachments.

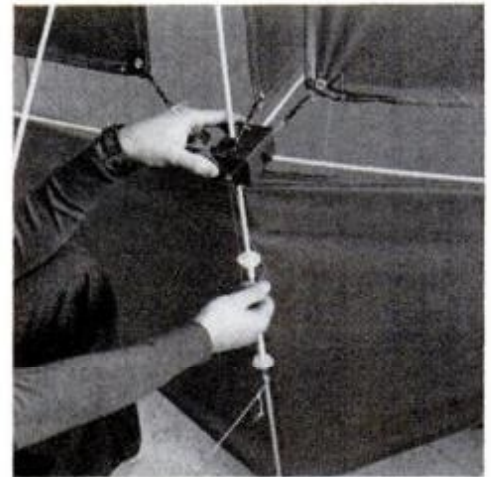
**Construction.** Wearing gloves and a filter mask, score then cut the fiberglass rods with a razor saw or fine-tooth hacksaw. Cut the balsa block and drill the needed holes. Put rods and washers in place on the wood block. A piece of colored Mystik tape behind each washer is a good visual check to keep the rods in alignment.

The plastic Renuzit cores serve to anchor swivel hooks and strings. With a 1/4-in. bit, drill center holes through the tops of two of the plastic

*(Please turn to page 155)*

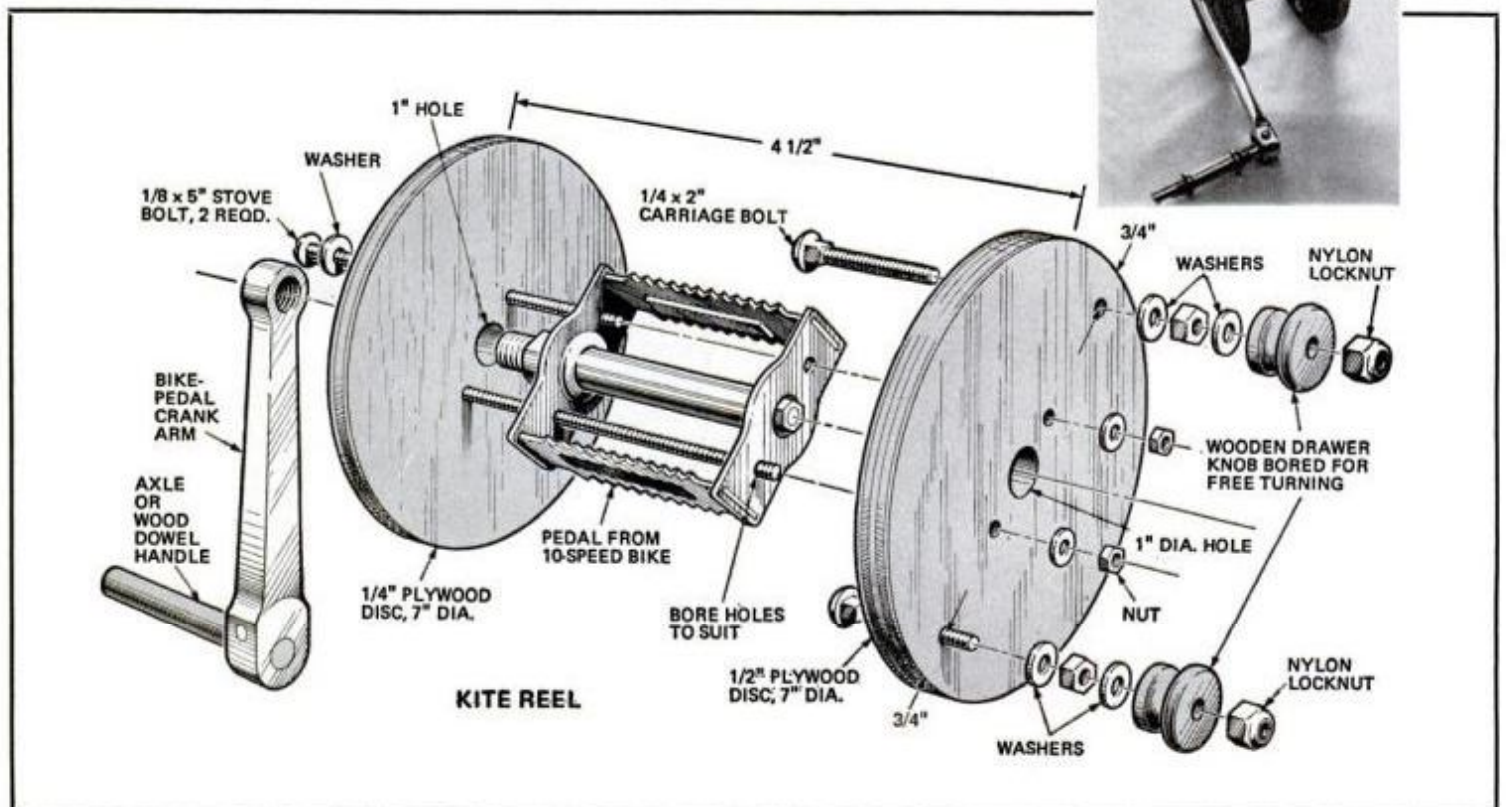


Use a hammer and nail to punch holes in the top of the plastic Renuzit cores. The holes anchor swivel hooks and strings.



A slip knot ties the jib strings to the top plastic core on the lower spine. Adjust the strings to wind conditions.

Hold the handle in your left hand and wind the string clockwise away from you onto the reel.

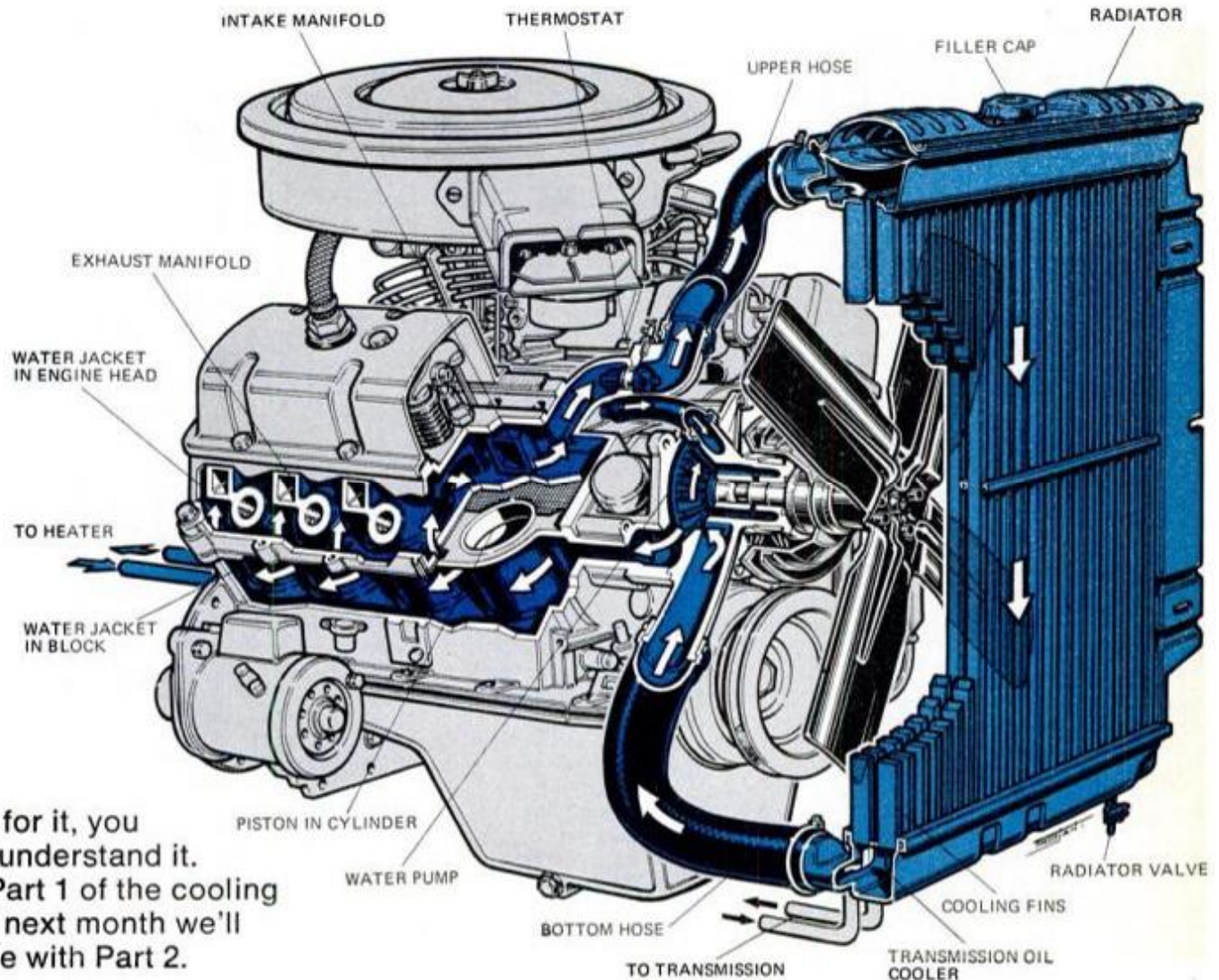




# Your cooling system:

## All you need to know about it

by Mort Schultz



To care for it, you have to understand it. Here's Part 1 of the cooling system; next month we'll conclude with Part 2.

**Y**ou don't need a course in thermal engineering to appreciate the necessity of keeping your car's cooling system in top-drawer condition. Combustion of the air-fuel mixture can raise temperatures inside an engine to 4500° F.

Iron melts at 2500° F., and steel starts breaking down at 1500° F. Runaway heat, therefore, can turn an engine to nothing more useful than an anchor weight in seconds.

Reducing heat to acceptable limits falls on the cooling system. It pumps a liquid coolant through passages cast around cylinder heads and the engine block. Coolant absorbs engine heat.

To get rid of heat, coolant is then pumped through the radiator, which is merely a heat exchanger. The coolant gives up its heat to the air that flows past the radiator. The fluid is then pumped back into the engine.

A cooling system using liquid coolant is composed of many key components: the coolant itself, radiator pressure cap, hoses, radiator, thermostat, drive belt, fan and water (coolant) pump. Some systems also have a coolant-recovery system, fan clutch and/or control-type components, such as a thermostatic vacuum switch or vacuum by-pass valve. Your car's heater also has to be included in the cooling system.

This month and next we will discuss the roles played by individual parts to keep engine temperatures stable and how to test and replace or repair these parts. We will outline important preventive maintenance practices (procedures you should do periodically to *prevent* breakdowns) and list key technical service bulletins issued recently by major U.S. automobile manufacturers that help overcome inherent cooling-system problems with particular models.

### Antifreeze coolant

According to the General Services Administration (GSA), "you really have little choice in selecting an anti-

freeze/coolant if you want year-round protection for a modern car. You buy ethylene glycol with rusting and corrosion inhibitors and with or without antileak additives."

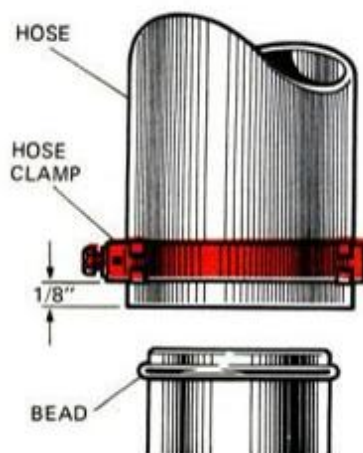
Water is cheaper than ethylene



Radiator upper hose delivers hot coolant from the engine to the radiator.

glycol and an effective cooling agent, but it has three major faults: 1. It freezes at 32° F. 2. It contributes to rusting and corrosion. 3. It has a comparatively low boiling point, even under pressure.

With a cooling system pressurized to 15 pounds per square inch (p.s.i.) above atmospheric pressure, water at sea level has a boiling point of 250° F., which is 11° below the boiling point of ethylene glycol under the same conditions. This 11° leeway is an important safety margin against



Bead on flange helps secure the hose. Place clamp 1/8 in. from end of hose.

overheating if you get trapped in heavy traffic on a 90° day.

If you must, use water as a coolant, but refrain from using methyl alcohol antifreeze. Although the latter has an adequate freezing point (-51°), its boiling point is 39° lower than water's.

Ethylene glycol is the best coolant. It consists of 93-percent ethylene glycol, 4-percent water, and 3-percent rusting and corrosion inhibitors and dye. Some brands contain antileak

## The role of the radiator pressure cap

For many years, radiator pressure caps have done more than cap the radiator. They have helped maintain pressure in the system, which raises the boiling point of coolant.

These caps let modern cooling systems work at pressures of 12 to 18 pounds per square inch (p.s.i.), depending on the system. Each pound of pressure raises the boiling point of coolant 2½°.

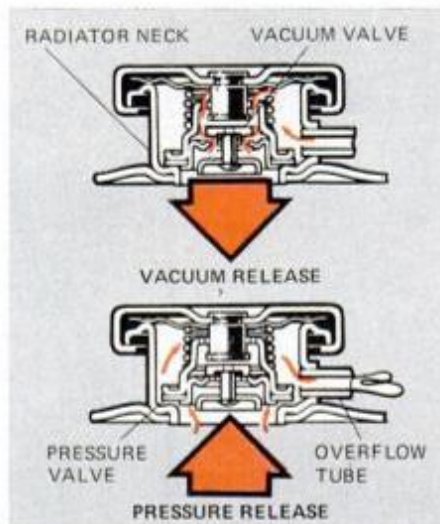
The radiator pressure cap has a heavy, specially calibrated spring that controls pressure and vacuum relief valves. When ex-

One in bad shape will cause overheating or unnecessary loss of coolant.

Testing this cap should be done at least every two years when the cooling system is drained and cleaned. A pressure tester, also used for uncovering



Check your radiator pressure cap with tester shown.



Radiator pressure cap relieves excessive pressure and excessive vacuum.

cess pressure builds up, spring resistance is overcome, the valve opens and pressure is relieved by coolant and steam escaping from the radiator. Coolant flows out of the cooling system through an overflow tube into a coolant-recovery tank or onto the pavement, depending on the system.

The vacuum valve is designed to prevent radiator damage if coolant boils, which creates a vacuum in the radiator that could crush the tanks. This valve is closed except for this condition.

The radiator pressure cap is a most important cooling-system component.

cooling-system leaks, is needed.

Pressure testers cost \$30 to \$50. If you don't have one, your service station attendant will test the cap for you, probably charging a nominal fee. However, if you buy a pressure tester, get the hand-operated pump type—not one needing an independent air pressure source.

To test the cap:

1. With the engine cold, remove the cap from the radiator.
2. Check the pressure rating stamped on the cap.

**Important:** This rating must be that recommended by the carmaker. A replacement cap must be rated at this same pressure—not higher or lower.

3. Wash the cap in water. Dry it.
4. Attach the cap to the adapter provided with the pressure tester.

5. Holding the tester so the gauge faces you, run the pump until the needle records the cap's rated pressure. If the needle fails to reach this reading, remove the cap from the adapter, reseal it, and try again. Repeat this several times before you reject the cap.

6. If the gauge needle holds steady or falls very slowly, but remains within 2 p.s.i. of the cap's rating for at least 30 seconds, the cap may be kept in use. If not, it should be discarded.

## Protection for various mixtures of ethylene glycol and water

Percent of ethylene glycol by volume*	Freezing point (Fahrenheit)	Boiling point with 15 p.s.i. pressurization (Fahrenheit)
33	0°	259°
40	-12°	261°
50	-34°	264°
60	-52°	269°
70	-85°	275°

\*Add water to make up 100% by volume

material that seals small radiator leaks.

A solution of half ethylene glycol and half water has a freezing point

of -34° and a boiling point of 264° if the radiator pressure cap is in good shape.

Selecting good-quality ethylene

glycol isn't as simple as taking a can off a shelf. Read the label on the container for the number of quarts of antifreeze/coolant you need in your car to protect against freezing. The GSA informs us that "if a half-and-half solution of ethylene glycol and water does *not* provide protection against freezing to  $-34^{\circ}$  the product is below standard."

*If you use a good-quality ethylene glycol product, you do not have to*

## Amount of ethylene glycol needed to bring protection to $-34^{\circ}$ F.

Cooling system capacity (qts.)	Quarts to drain and replace if hydrometer reading is		
	$10^{\circ}$ F.*	$0^{\circ}$ F.	$-10^{\circ}$ F.
10	3	2½	2
12	4	3	2
14	5	3½	2½
16	5½	4	3
18	6	4½	3
20	7	5	3½

\*If hydrometer reads  $11^{\circ}$  F. or more, drain the entire cooling system and replace with a 50:50 solution of ethylene glycol and water.

### Removing a radiator

1. Prevent accidents: Disconnect the battery. If the radiator or a tool accidentally touches a live terminal, damage will occur.

**Caution:** Engine should be cold.

2. Drain coolant. Removing the radiator cap will hasten drainage.

3. Disconnect radiator hoses.

4. If you have an automatic transmission, it may be cooled by a transmission oil cooler in the bottom tank of the radiator. Look for lines con-



Automatic transmission oil-cooler lines must be disconnected.

necting radiator to transmission and disconnect them at the radiator.

5. Remove screws holding shroud (shield) around radiator; remove the shroud or swing it out of the way to get maximum clearance.

6. Remove radiator attaching bolts (usually four—one in each corner of the radiator frame).

7. Lift radiator up and out. Angle it, if necessary; take care not to hit and damage radiator fins or fan.



Lift out radiator carefully so you don't damage the delicate core.

necting radiator to transmission and disconnect them at the radiator.

add an additive. The product contains the ingredients necessary to protect your car. As for the proper mixture to use, it is recommended that in most cases a 50:50 ethylene glycol/water ratio is best. For example, if the capacity of your car's cooling system is 16 quarts, mix eight quarts of ethylene glycol with eight quarts of water. However, if a different freezing or boiling point is desired, the accompanying mixture table will be helpful.

Checking antifreeze concentration occasionally with a hydrometer assures that protection against freezing and boiling is maintained. If you don't have an antifreeze hydrometer, service stations do. Many will check coolant free of charge.

To make the test, have the engine at normal operating temperature with ignition off. If your car is equipped with a coolant-recovery system, draw a sample of coolant into the hydrometer from the coolant-recovery tank. Do *not* remove the radiator pressure cap.

If the car has no coolant-recovery system, remove the radiator pressure cap carefully. Be sure pressure is relieved before the cap is removed to avoid painful scalding.

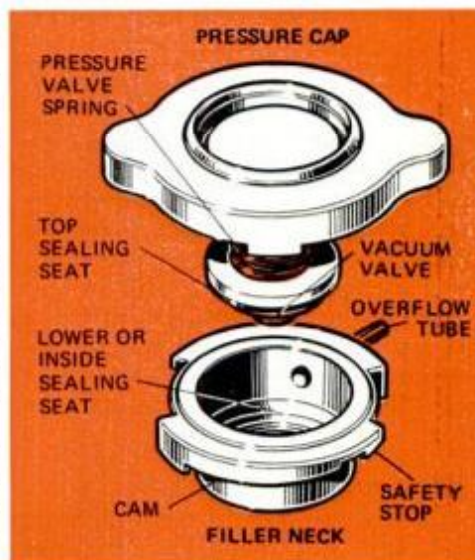
There are three ways you can relieve pressure, depending on the type of cap:

1. If the cap has a lever or push-button, lift the lever or push the button to depressurize the system. When

the sound of pressure escaping is no longer audible, it is safe to remove the cap.

2. If the cap has no visible pressure release, protect your hand with a wad of cloth and slowly twist the cap counterclockwise. Do not apply downward force. The cap will move about a half-turn and lock. Pressure will escape.

**Caution:** With this type of cap in particular, be ready to jump away from the car if there's a malfunction



Pressure loss around radiator cap may be caused by damage to the filler neck.

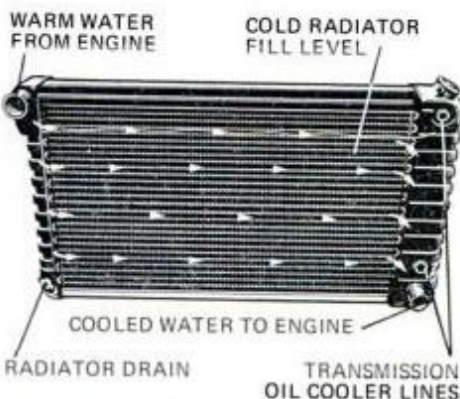
and hot coolant gushes from the radiator.

After pressure has been released, press downward on the cap and twist it off.

3. Since 1975, Chrysler Corp. has been using a swivel-type pressure cap. Pressure is relieved by turning the top of the cap. The top twists while the valve assembly beneath remains stationary. When pressure is relieved, press down on the cap to remove it.

The hydrometer reading indicates the concentration's freezing point. If the freezing point is not adequate, drain off some solution and replace it with pure, undiluted ethylene glycol. The accompanying chart outlines how much solution you should drain

(Please turn to page 143)



Crossflow radiator places inlet on one side, outlet on the other. Downflow type uses top/bottom inlet/outlet.

# How to make dovetail joints

By hand or with power tools—it's easier than you may think.

by Rosario Capotosto

**A** dovetail with its flared sections is one of the most attractive woodworking joints. Its interlocking parts along with resulting increased gluing surfaces also give this joint great strength.

Laying out the joint accurately is all important and takes careful attention—both with hand and power tools. But the results are worth the effort.

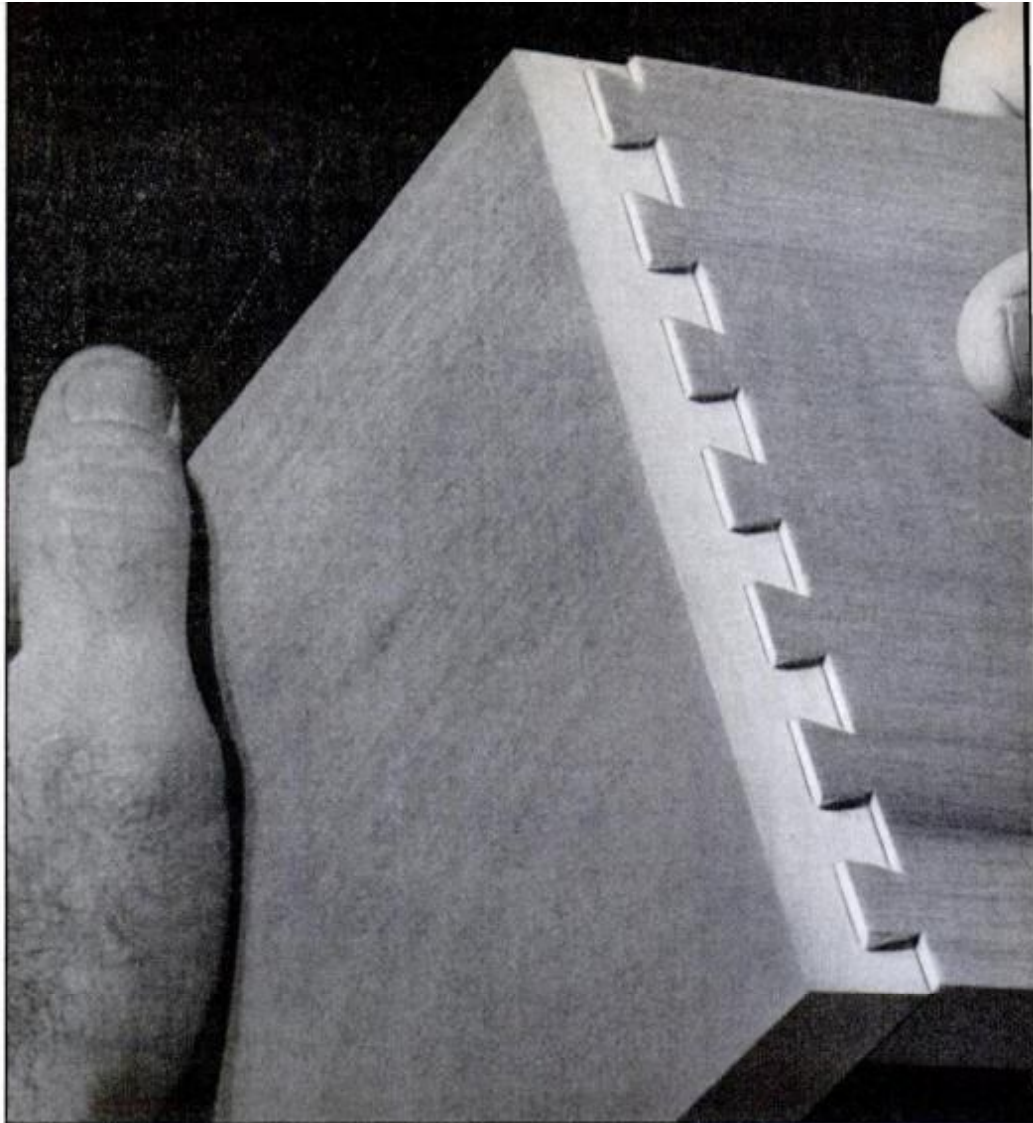
## Laying out the joint

It's best to draw the dovetails on the board, cut them out, then use the piece as a pattern for tracing the outline of the pins on the mating member.

(Note: Although most dovetail joints end with partial pins at the outsides, I've also made the joints ending with partial tails, and have observed no weakness due to the variation.)

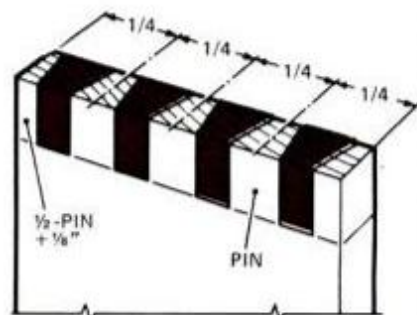
Use a sharp, hard lead pencil, or preferably a knife to mark the cutting lines. Make sure both boards are square.

Estimate the number of spaces needed on the first board to accommodate the pins in the second. To do this, first decide the width of the pins; a full pin should equal about a three-quarter thickness of the board. Multiply the pin width by  $2\frac{1}{2}$  to find the distance from center to center of the pins. Divide the board width by this distance and you will get the number of pins needed. However, since there are usually half

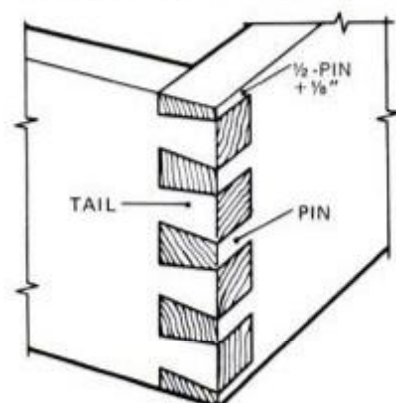


## Computing dovetail joints

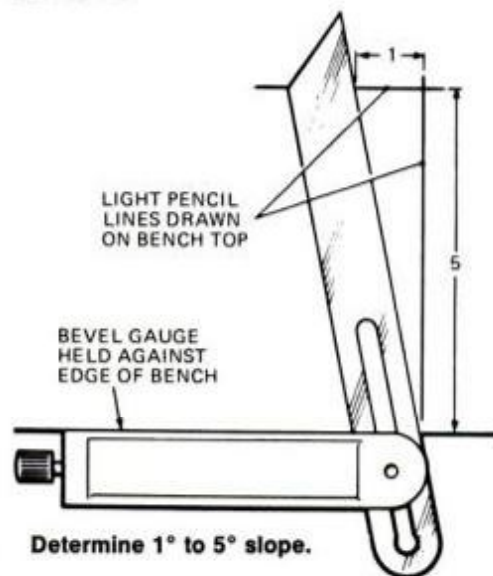
Certain proportions are best to assure sturdy dovetail joints: 1. Plan the widest point on the pin face to be about three-quarters of the wood thickness. 2. Make the distance from center-to-center of the pins about  $2\frac{1}{2}$  times the pin width. 3. The two end pins are usually half the width plus  $\frac{1}{8}$  in. for strength. 4. Pins and tails can be of equal width, but some craftsmen prefer pins about one-third the width of the wide end of the tail and not less than  $\frac{1}{4}$  in.

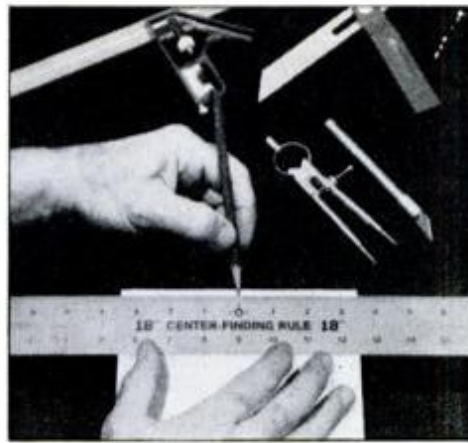


Board divided to make four tails.

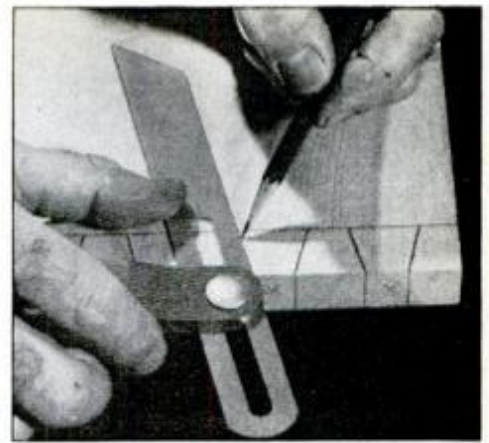


For strength, board with pins is drawer front, tails on sides.

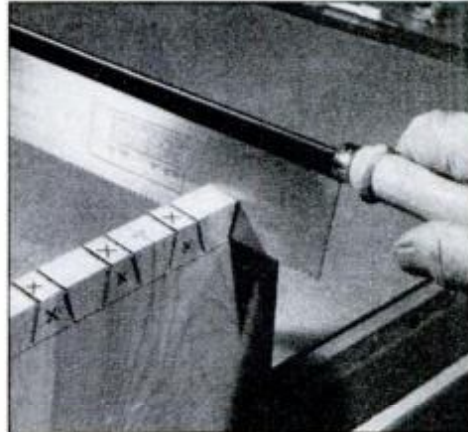




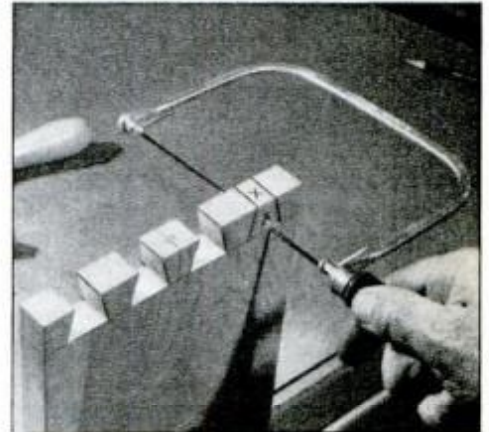
Make layout with a ruler, pencil, square, bevel square, sharp knife and dividers.



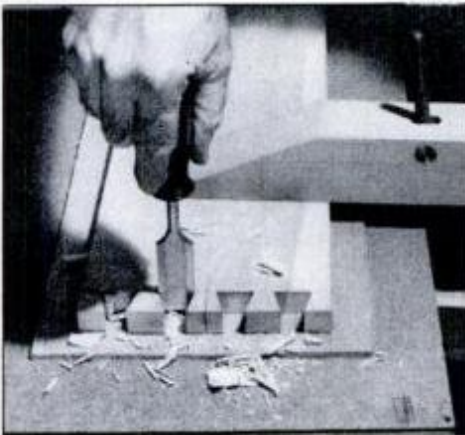
Hold the pencil at an angle so the point rides firmly against the straightedge.



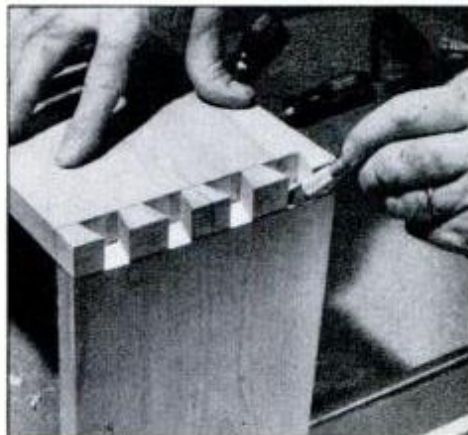
Use a fine-tooth dovetail saw to cut the joints. Cut on waste side of the lines.



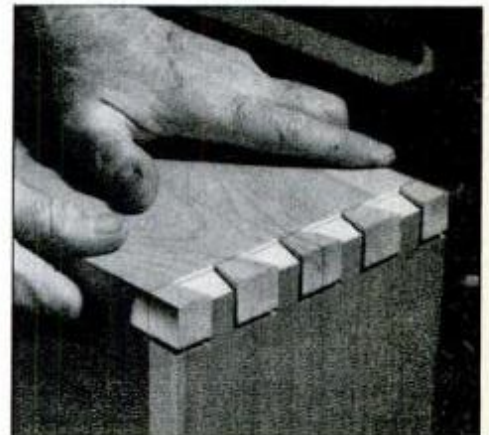
Use a coping saw to make the bottom cut that clears out the waste wood.



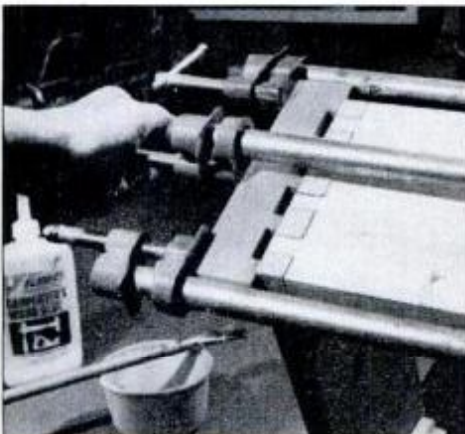
A sharp chisel dresses cuts to the lines. Clamp and work against a scrap board.



Trace tails with a knife to outline pins. With a square carry lines to board face.



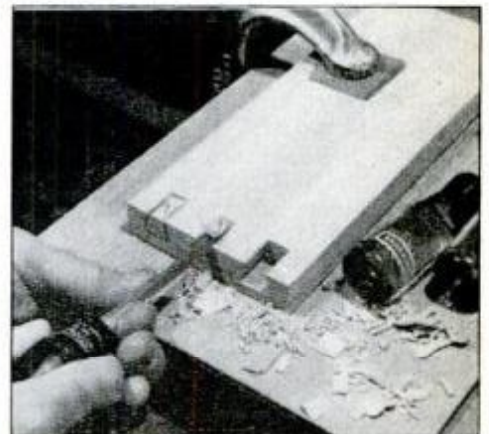
The finished joint should fit together snugly. Note the partial tails here.



A notched block bears clamp pressure only against the dovetails when gluing.



For half-blind doves, cut tails; then saw pins at upward angle as far as possible.



Clear waste with a chisel and a mallet on crossgrain and use chisel on endgrain.

pins (plus  $\frac{1}{8}$ -in. width) at the outside, subtract 1 from the answer you get to allow for them.

Begin by marking off the extra  $\frac{1}{8}$ -in. width of the partial pins on the board that will contain the tails. Depth of the cut-out spaces should equal the thickness of the mating board, so mark off that depth on edges and faces of the dovetail board. Actually, it's best to add  $\frac{1}{2}$  in. overall to allow for a final flush sanding to size.

To mark off the already determined center-to-center distance of the pins between the  $\frac{1}{8}$ -in. borders, lay a ruler diagonally across the space until the dimension is easily divisible by the number of pins you want. Then with a square at the joint (edge of the board) draw parallel lines to mark the centers of the pins. Continue the lines on the end of the board. (See photos on page 103.)

On the edge of the board mark off a  $\frac{1}{16}$ -in. width for each pin centered on the centering lines. Then set a bevel square to a  $1^\circ$  to  $5^\circ$  angle (as shown in the drawing on page 102). Draw the sides of the pin spaces (which are the tapered sides of the tails). Cut out the space for the pins as follows, leaving the tails.

### Dovetails cut by hand

Secure the piece in a vise and use a fine-tooth back or dovetail saw to cut the tapers as shown on page 103. Cut on the waste side of the line, leaving the line exposed. Next use a coping saw to cut across the grain to remove the waste.

Use a razor-sharp chisel—the largest one that fits the opening—to trim the tails. Then clamp this section to the mating piece and use a *knife* to outline the pins.

Cut out the spaces between the pins and finish off with the chisels. This phase will be more tedious because you'll have to work the chisel into the angled bottom corners, but be patient.

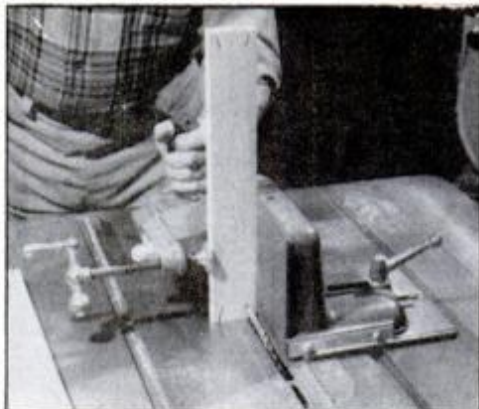
Test for fit frequently. A good joint will require light tapping with a hammer (over a scrap block). Apply glue to all surfaces and use a notched block that will bear pressure only over dovetail portions of the joint. Attach clamps. Sand surfaces flush after the glue has dried.

### Half-blind dovetails hand-cut

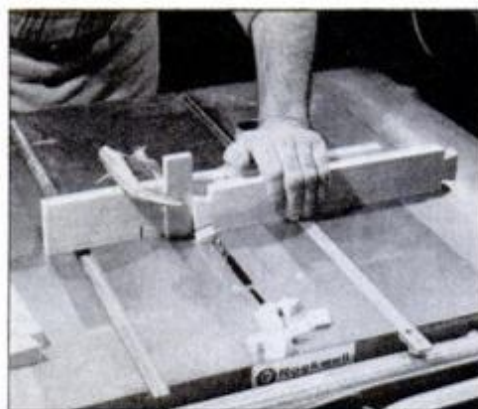
A half-blind or lap dovetail doesn't show on the front surface. It is used for drawer fronts or cabinet corners. The procedure for making a half-blind dovetail is similar to that for making a through dovetail. However, the tails are shallower—equal

*(Please turn to page 132)*

## Single dovetail made with table saw



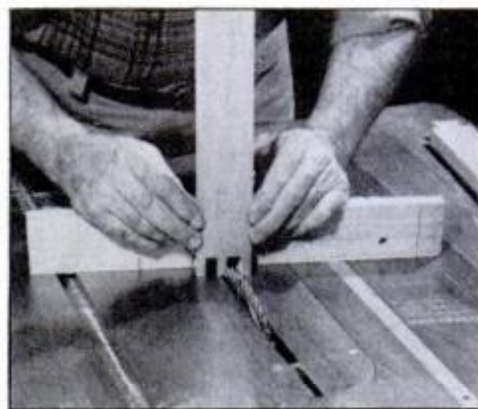
Use a tenoning jig to make many like cuts. Make first cut; reverse piece for second.



Turn work perpendicular. Use miter gauge and clamped stop block to saw out waste.

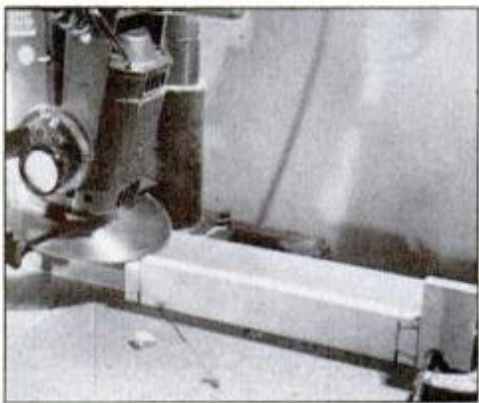


With a high stop block, set miter gauge at right then left angles for first pin cuts.

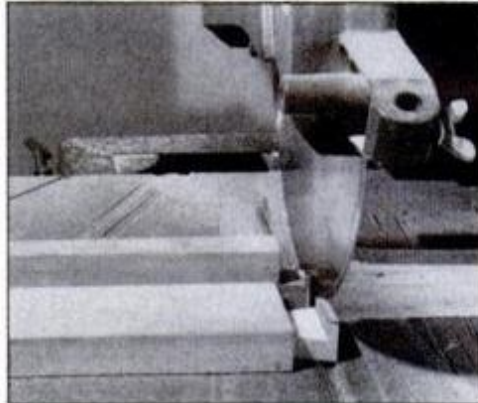


Remove waste between pins by repeated passes. Keep thumbs out of blade path.

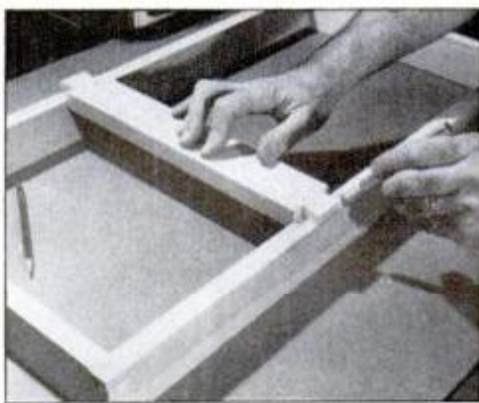
## Half-lap dovetail made with radial saw



Make two straight cuts into each end. Set the blade at an angle to cut off waste.



Reduce the face of the dovetail by making repeated passes of the saw.



Establish cutting lines by tracing them against the tail overlap with a knife.



Set the saw arm at the required angle; then make passes with an elevated blade.



## Build PM's couch and get a double bed, too



Lower flap door conceals a high-rise trundle bed and lifts for access to it. The lower bed snaps up to the same height as the upper bed and locks into position. The frame is made of poplar.



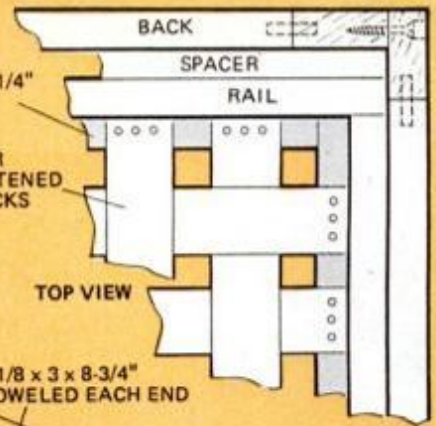
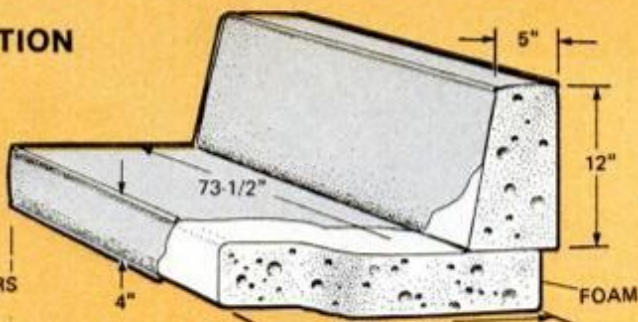
Mattresses butt together at the same level to provide for a full double-bed width. The unit also offers option of being made up and used as two separate beds.

**T**his guest bed that doubles as a sofa is basically a couch built around a purchased high-rise (pop-up) trundle-bed frame. The piece as a whole cost \$360 to build, but it's a stylish, unique item you can't buy. If you want to reduce the outlay, you can replace the cane—nearly \$85 of the prototype's cost—with loudspeaker or drapery cloth or with the same type of fabric that's used for cushion covers.

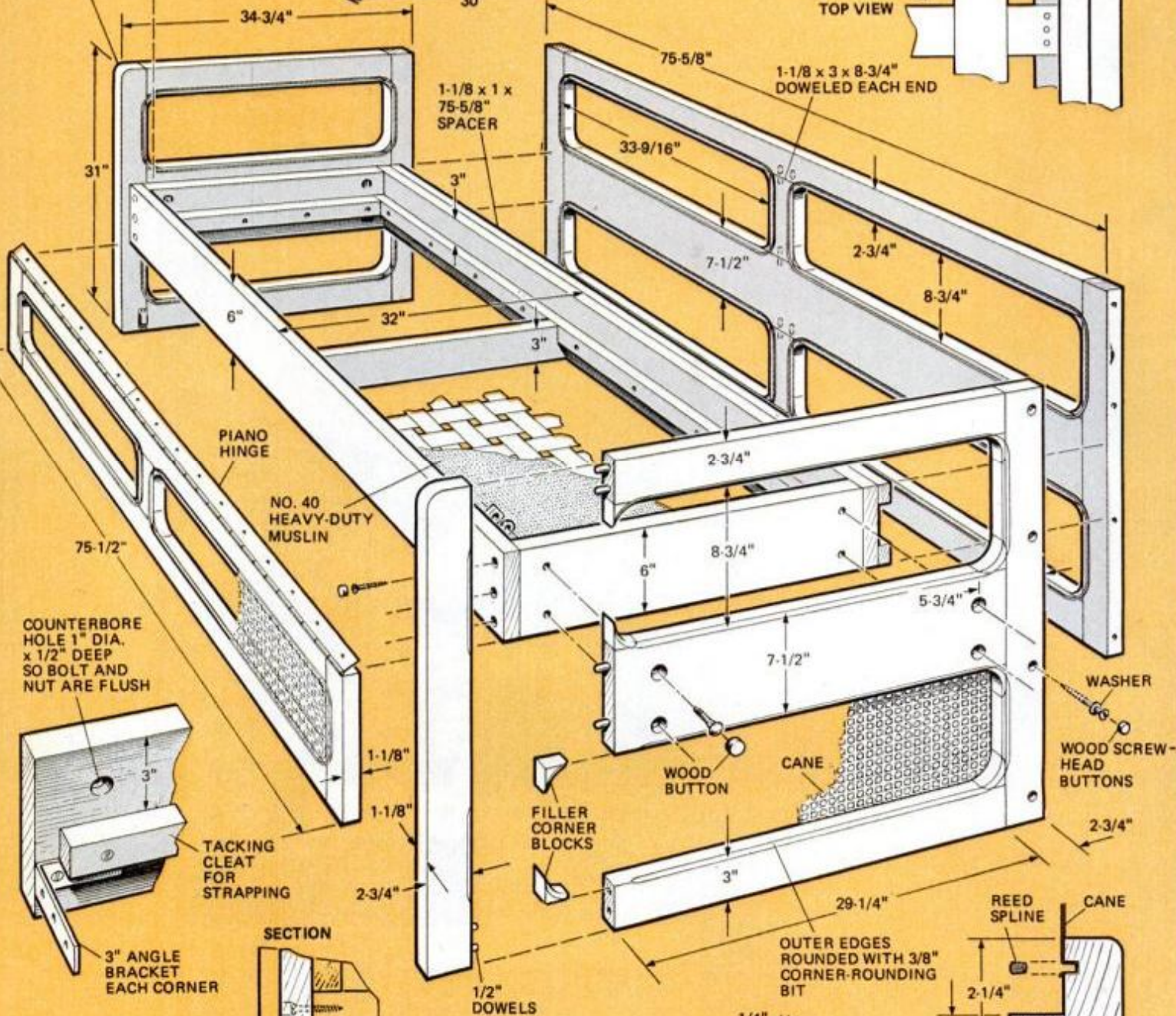
### Building the framework

The inner frame is built first, assembled with 2½-in. No. 10 flathead screws and reinforced with 3-in.

# SOFA-BED CONSTRUCTION



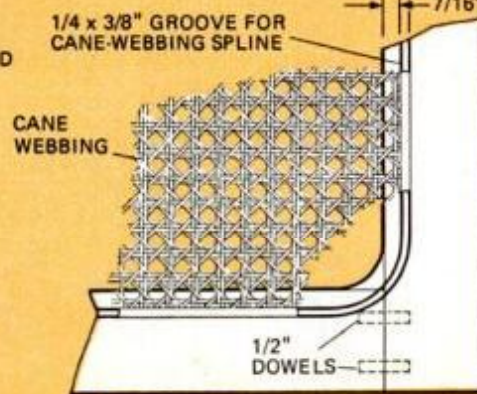
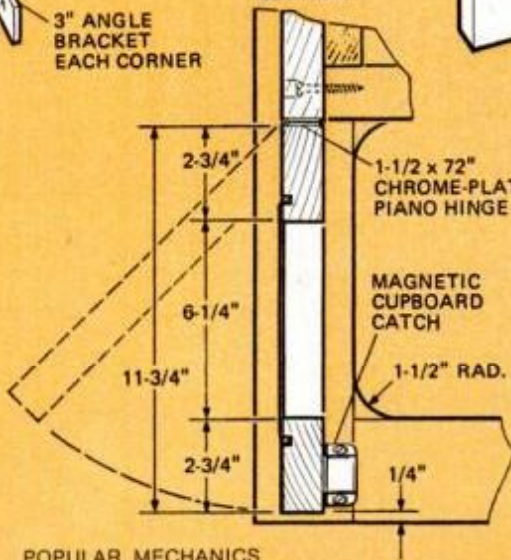
FRONT CORNERS ROUNDED



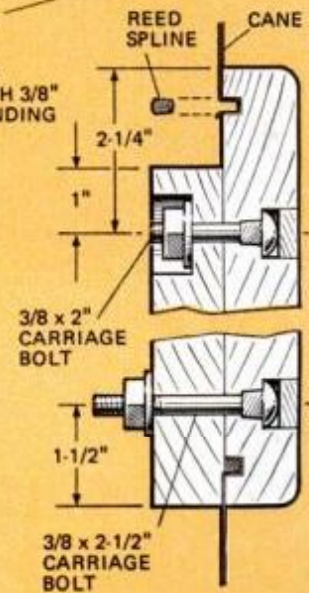
COUNTERBORE HOLE 1" DIA. x 1/2" DEEP SO BOLT AND NUT ARE FLUSH



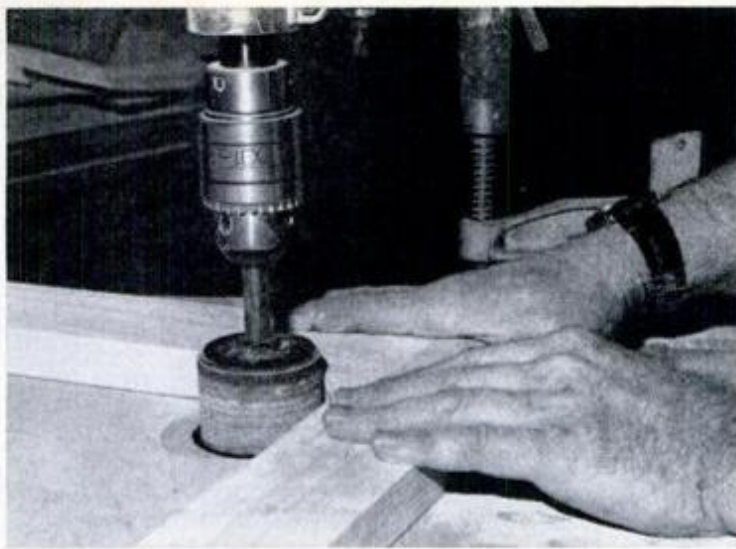
SECTION



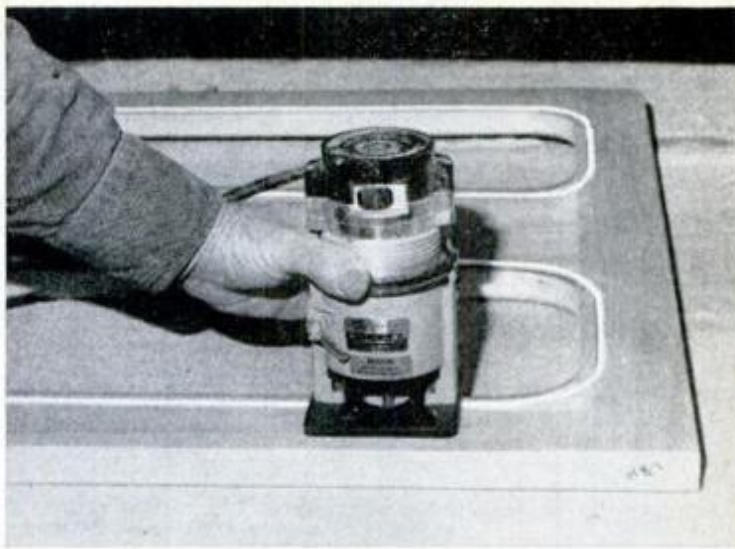
OUTER EDGES ROUNDED WITH 3/8" CORNER-ROUNDING BIT



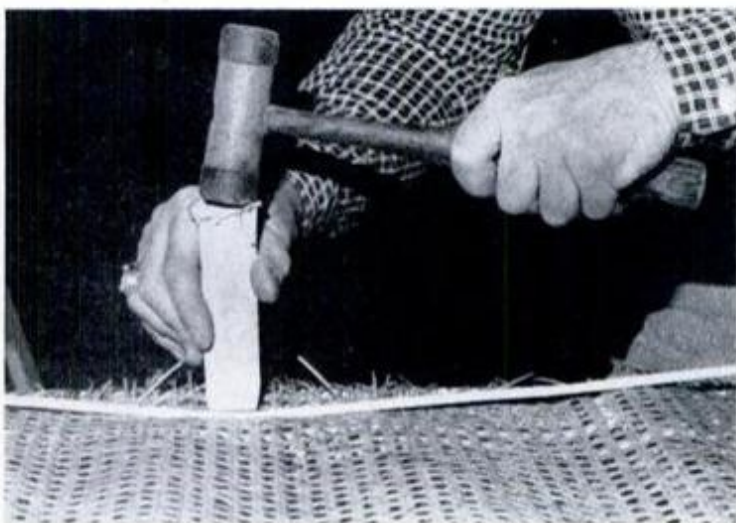




Drum sander attachment in a drill press or a portable electric drill is used to finish off the inside corner blocks after they're glued in place. Use drum less than 4-in. dia. to sand.



Rout a continuous  $\frac{1}{4} \times \frac{1}{4}$ -in. groove spaced  $\frac{7}{16}$  in. from each inside opening in the framework. For a good job, you should use an edge guide that helps you to follow inside-corner curves.



Drive reed spline into the glued groove with mallet and wedge while cane is wet, taking care to maintain a proper alignment of the cane pattern. Work with frame member on soft surface.



Trim off the excess with a razor knife when glue in the groove has dried and the cane has dried taut. A liberal allowance of excess cane— $1\frac{1}{2}$ -in. minimum—makes the installation easier.

corner braces. The crosspiece should be offset about 1-in. from center to allow for carriage bolts that will attach the back of the outer frame.

Web the completed inner frame next and staple No. 40 muslin on top of the webbing.

For the outer frame, cut stiles and rails as shown on the plan, then dowel, glue and clamp all joints to assemble each side of the frame and the back. To make the 40 curved filler blocks for the inside corners, rip a  $\frac{5}{4}$  board to 4-in. width and draw 10 4-in.-dia. circles just a kerf-width apart on it with a compass. Saw the board apart between the circles, then use a jigsaw or sabre saw to cut out circles. "Waste" around each circle will yield four corner blocks curved to a 2-in. radius. You can cut the circles in half and use these scrap pieces to clamp the glued-in blocks without marring them.

After the frame sides and back have been assembled and sanded, knock down the outward-facing edges of openings with a  $\frac{3}{8}$ -in. rounding-over bit in a router. On opposite sides, rout a  $\frac{1}{4} \times \frac{1}{4}$ -in. continuous groove around each opening,  $\frac{7}{16}$  in. from its edge. Use an edge guide to follow the curves of the corners—some of this work will be visible when the piece is finished.

### Installing cane and splines

Paint or varnish the frames. (The cane can be painted or varnished after installation, but varnish will darken it.) When the finish is completely dry, cut pieces of machine-woven (prewoven or "pressed") cane to fit the openings. Soak cane and reed splines in warm water for about two hours to soften them. Dribble a bead of white glue into the groove around the opening, carefully align the wet cane on it, then hammer in

the spline with a mallet and a hardwood wedge. If possible, use one spline for each opening, trimming the overlap just before you drive home the last bit; avoid using more than one piece of spline in a corner. Trim off excess cane when fully dry. Hang flap door on the front of the unit to complete basic assembly.

Mattresses are high-density polyurethane foam. Sears' lounge pads can be trimmed to fit with an electric carving knife; Sears also sells wedge bolsters. You might use ready-made, zippered cushion and bolster covers instead of making them.

Sources: You'll need to find a bed retailer willing to sell just the lower frame. An upholsterers' supply shop should carry webbing and muslin (foam, too), but if cane is hard to find locally, write to the Veterans' Caning Shop, 550 West 35th St., New York, N.Y. 10001, for mail-order prices. ★★★

# Fit the glove to the job



**1 Gardener's gloves** of cool and comfortable are vinyl plasticized. Result is a stretchy material giving a snug nonslip grip. \$1.99 a pair.



**2 All-purpose, low-cost cotton canvas gloves** with blue knit wrists, an American institution, protect hands from paint, dirt, occasional cuts and blisters. \$.99 a pair.



**3 Cold-weather leather gloves** for driving or for rugged outdoor work have a simulated shearling lining. The fold-over cuffs protect your wrists when it's necessary. \$10.95 a pair.



**4 General-use gloves** like this cotton flannel type are said to outwear the canvas ones. Inside layer of napping provides comfort; outside napping is protective when you clean, paint or build. These sell for \$1.69 a pair.



**5 Leather gloves** to guard against blisters and abrasions make rugged jobs—pruning and yardwork—easier. These unlined gloves have an elastic wristband for a snug fit, \$6.



**6 Extra-durable all-purpose gloves** are made with polyester blend to use in place of canvas ones. They have a knit wrist and an inner cotton lining. Price: \$1.59.



**7 Welder's gloves** made of heavy-duty leather resist sparks, moderate heat, provide some cushioning against blows. Gauntlet gives wrist protection. Gloves are \$9.99 a pair.



**8 Plywood or lumber handler's gloves** have leather to protect from splinters. With waterproof gauntlet, \$5.49.



**9 Asbestos gloves** to protect from heat and fire are used by barbecue chefs, fireplace attendants and campers. This Kool-Grip glove is wool-lined and has a D-ring hanger. \$10.91 a pair.

**A**s you work at the many handy-man tasks around your home, you will use a variety of tools and materials selected for specific jobs. It's just as logical, then, to choose workgloves designed to shield your hands from specific types of work. Each glove shown here can help you perform one or more household job comfortably and safely.

General-purpose gloves such as cotton canvas, flannel and polyester

blends are washable and shield your hands when you're cleaning and painting.

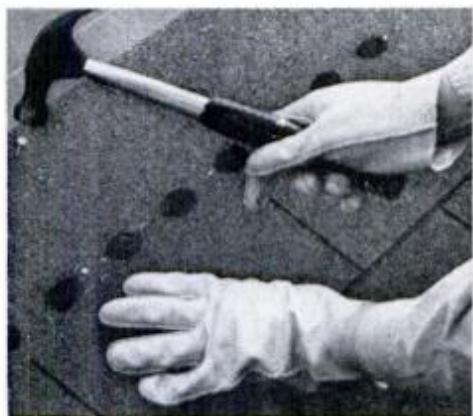
Leather gloves cushion hands and offer more protection against cuts and scratches than cotton ones. But they're more costly and nonwashable.

Gloves coated with vinyl, PVC plastic or neoprene (a synthetic rubber) are liquidproof and protect against oil, grease, caustics and many acids. Neoprene particularly

resists strong chemicals. The inner fabric of coated gloves absorbs hand perspiration for greater comfort.

Coated gloves wear longer if you fold the gauntlet cuff back (when there is one) to keep liquid from running down to the inner fabric. They should be wiped clean of residue that can make them slick. Store uncoated gloves right side out, unfolded in a cool, dry place.

Gloves do dull your sense of touch. But thin disposable gloves and protective foam keep the loss to a minimum. Foam is also good for working on moving machinery that might catch a glove.—*Penelope Angell, Assistant Home and Shop Editor*



**10** Abrasion-resistant Seams-rite pair helps you get a good grip. Outside is a sandpaper-textured vinyl, while inside is soft jersey; \$2.49 a pair.



**11** Liquidproof Snorkel gloves are vinyl-coated to protect your hands when scrubbing with strong cleaners or using acids and caustics; \$3.25 a pair.



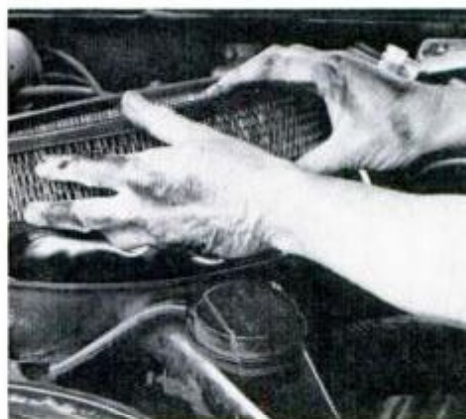
**12** PVC plastic-coated gloves aren't threatened by paint and varnish remover or detergents. The flexible gloves have a textured wet grip; \$2.59 per pair.



**13** Durable neoprene-coated gloves fill the need for hand protection when you're wood preserving, blacktop patching or cleaning with solvents. \$2.99.



**14** Disposable gloves can take the messy jobs like painting, epoxy gluing and staining. This Ambi glove fits either hand; 32 cents a pair.



**15** Foam Glove protects your hands without placing a barrier between you and your work. Spray it on (above, left) before you fix your car engine, or whenever your hands run risk of getting dirty. As you rub your hands the foam vanishes to seal out grease, chemicals, stains and dirt while you are working (center). Later wash it off with water (right). A 7-oz. can is available for \$3.99.

Gloves shown are sold in hardware and home center stores. If you don't find what you want, write the maker for the nearest retailer. Gloves 1, 2, 3, 5, 6, 8, 12, 13: Consumer Products Div., Boss Manufacturing Co., 221 West First St., Kewanee, Ill. 61443. Gloves 4, 7: Montgomery Ward stores. Glove 9: Steel Grip Safety Apparel, 700 Garfield St., Danville, Ill. 61832. Gloves 10, 11, 14: Marketing Communications Dept., Edmont-Wilson, 1300 Walnut, Coshocton, Ohio 43812. Glove 15: order from Valley Research Systems, Box 294, Hewlett, N.Y. 11557.

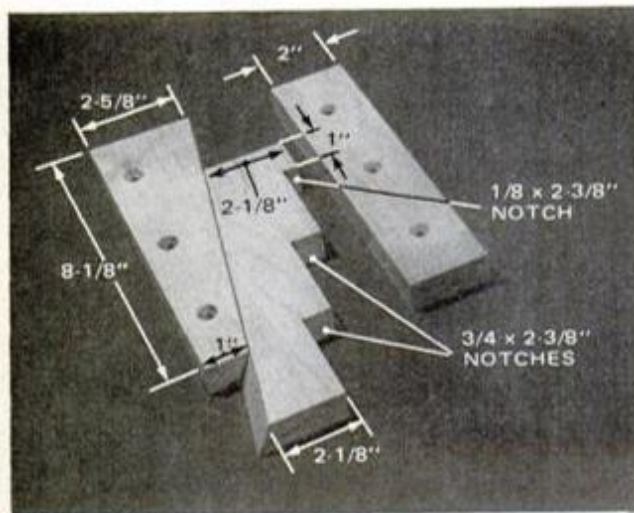
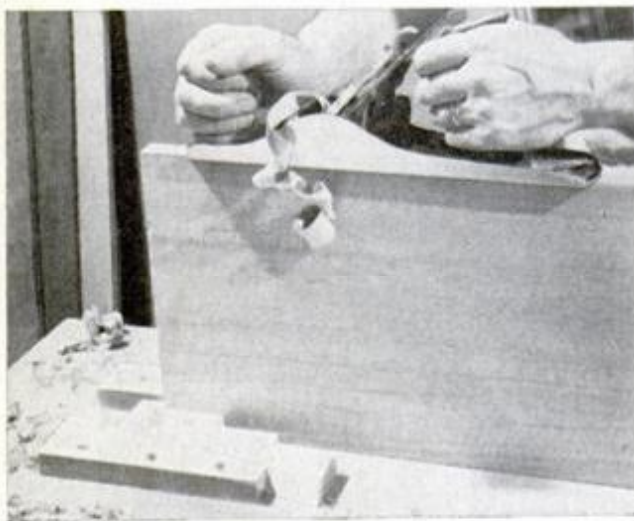
# 10 shop tricks from a pro



*This is the first in a series of PM articles by noted craftsmen who reveal their invaluable shop know-how, plus handy time and work-saving tips, to help you get better use—and more enjoyment—from your workshop and tools.*

*Shop professional Rosario Capotosto, whose work appears here, has designed, built and described original projects in magazine articles for more than 22 years. His *The Complete Book of Woodworking* is the culmination of his experience.*

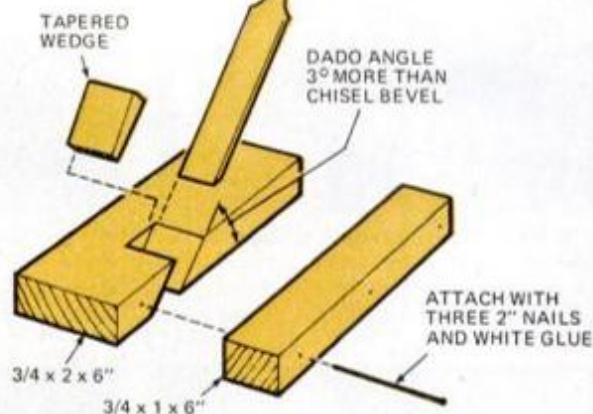
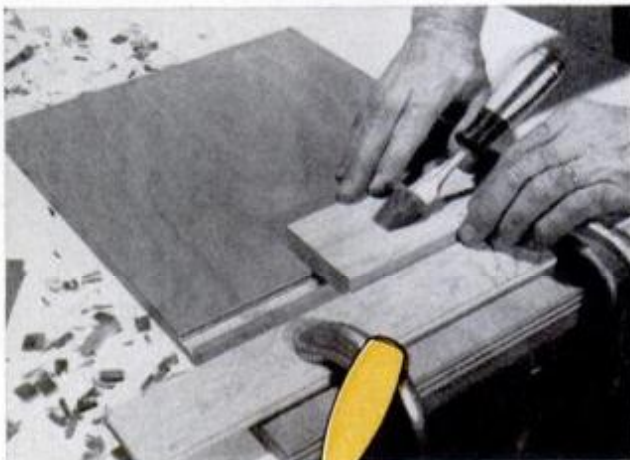
## Self-locking bench stop



The harder you push on the work in this unique planing bench stop, the tighter its hold. Yet the work is quickly released when you pull it back lightly. The jig shown holds  $\frac{1}{8}$  to  $2\frac{1}{2}$ -in. stock.

Make the stop of hardwood such as maple, oak or cherry for strength. Cut the right side of the left member and the left side of the center member with bevel angles. This helps prevent the sliding block from lifting during normal use. Use six countersunk  $1\frac{1}{4}$  in. No. 8 flathead screws to secure the jig to the benchtop.

## Chisel-routing jig



You can adapt a chisel to do a router's job of making the finish passes on a hand-cut dado or groove. Cut an angled notch or dado in a block of  $\frac{3}{4}$  x 2 x 6-in. hardwood to a depth that equals chisel width. The notch angle should be  $3^\circ$  greater than the chisel's bevel angle. Insert the chisel in the notch and determine the size to make the wedge. Then attach the  $\frac{3}{4}$  x 1 x 6-in. closure strip.

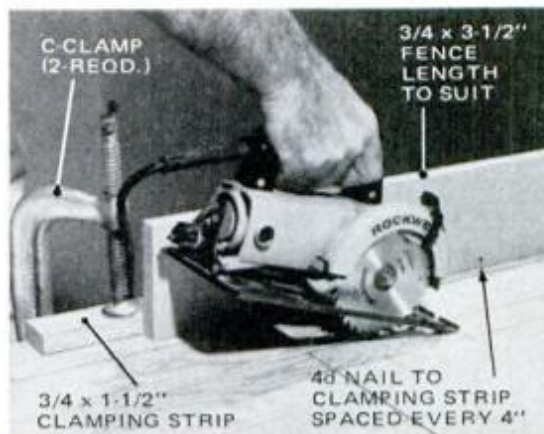
To use: Cut two saw kerfs for the borders of the dado to be finished. Working freehand, clear some waste with the chisel. Insert the chisel into the plane opening, let it project to the dado bottom and lock it into place with the wedge. Butt a guide strip against the plane, clamp it, then run the jig against the guide. Lower chisel as required.

## Rustproofing bolts



Apply a coat of shellac to bolt threads to prevent rust, and the nut won't "freeze" to the bolt. Just dip the bolt threads in shellac, remove and permit the excess to drain off slightly. Then run the nuts onto the bolts.

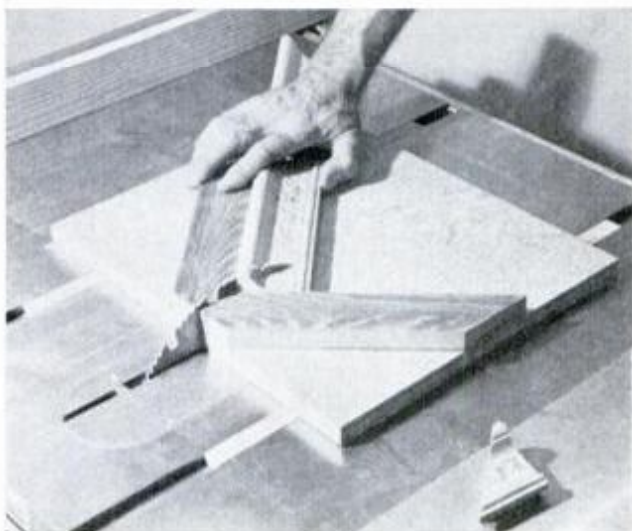
## High fence for precision plunge cutting



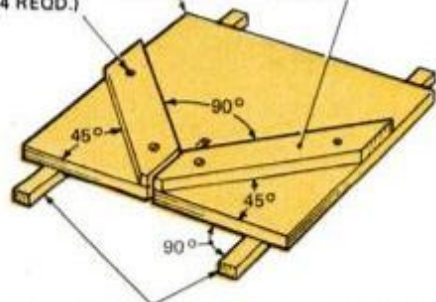
To make accurate internal cuts, use a high fence. Keep the saw base touching the fence and the blade will enter the work on target. Here's how: Situate and clamp the fence. Raise and tape the blade guard. Hold the saw base against the fence with the blade clear of the work.

Start the saw, slowly lower it until the base is flat on the work. Maintaining contact between shoe and fence, finish the cut. Turn off saw. When blade stops, remove the saw and use a handsaw to complete the cut to the corner.

## Table-saw mitering jig

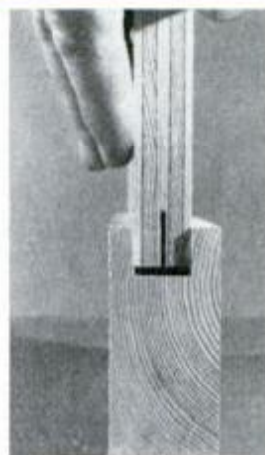


1 1/2" NO. 8 FH SCREW (4 REQD.)  
3/4 x 12 x 12" PLYWOOD  
3/4 x 1-1/2" TO FIT (2 REQD.)



TWO HARDWOOD STRIPS SIZED AND SPACED TO FIT SAW-TABLE GROOVES. FASTEN WITH 3/4" NO. 6 FH SCREWS (2 PER STRIP)

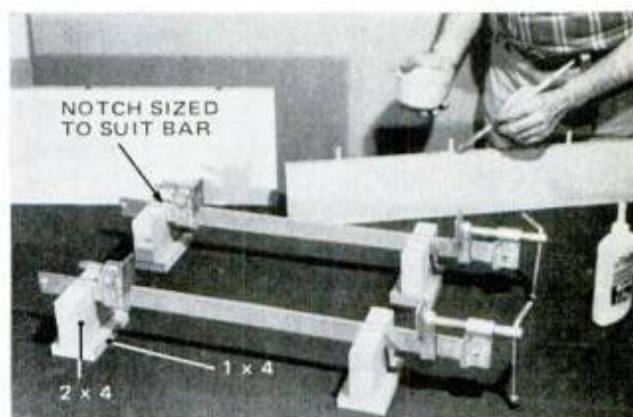
You can make perfect miters on your table saw with this jig. To the bottom of a board, fasten two strips spaced to ride in the miter gauge grooves. On top, using glue and screws, attach a pair of cleats so they form a 90° angle. Then push the jig into the spinning blade.



## Fitting a panel into a tight groove

Often, fitting a plywood panel in a grooved rail can be hard due to slight variations in the panel's thickness. To avoid splitting the rail, run a narrow saw kerf centered in the panel edge to a depth slightly more than groove's depth.

## Bar clamp stands



A pair of stands for a bar clamp keeps it in position and ready to go. The stands are a great help when you're gluing panels that require the use of both hands. Make them of 2x4 blocks notched at the top to a depth allowing 1/2 in. of the bar to project. Nail the blocks to their bases.

# 10 shop tricks

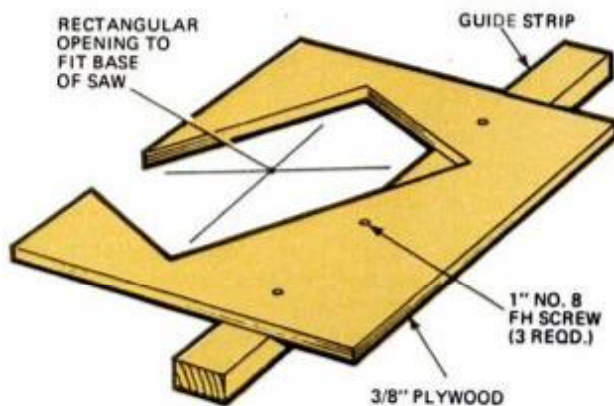
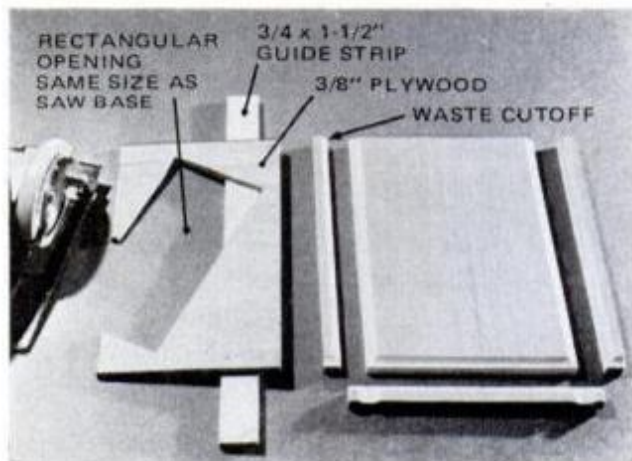
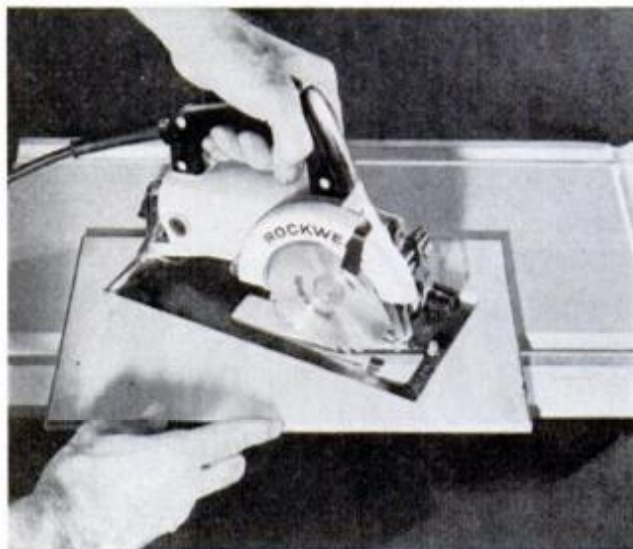
## Using shop powders



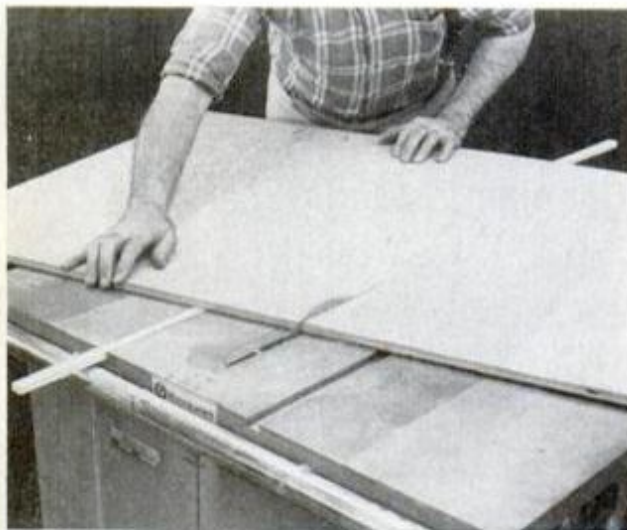
Dispense pumice, rottenstone, emery and other shop powders easily and evenly over your work surface with an oversize restaurant or barbecue-type salt shaker. Or, for greater economy, make your own shaker from a discarded glass jar and screw-on lid. Don't punch holes through the lid with an awl; instead, drill a series of 1/32-in. holes for uniform distribution of the powders.

## Panel raising with a circular saw

A rectangular opening in a panel that wraps around the base of a circular saw lets you cut concave grooves for panel raising or other decoration. A wood strip attached at an angle to the bottom does the trick. Press the guide strip firmly against the work while advancing the saw slowly. Groove is cut in stages, with the blade lowered about 1/16 in. for each pass. Angle of the guide strip relative to the blade governs the groove width. To create a raised panel, cut off the out-board waste after completing the grooves.



## Table-sawing wide panels



When straight or angle sawing of oversize panels prevents your using a miter gauge or rip fence, you can still handle the panels easily. Cut a strip of wood to suit the saw table miter gauge groove and about 2 ft. longer than the panel. Secure the strip to the underside of the work with brads, letting it project 1 ft. at both ends. Fasten the strip so it runs in the table groove as you feed the work. Wax the strip if needed. *Note: Blade guard is removed for photo clarity only.*



# Marlboro



18 mg. tar, 1.1 mg. nicotine av. per cigarette, FTC Report Dec. 78

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

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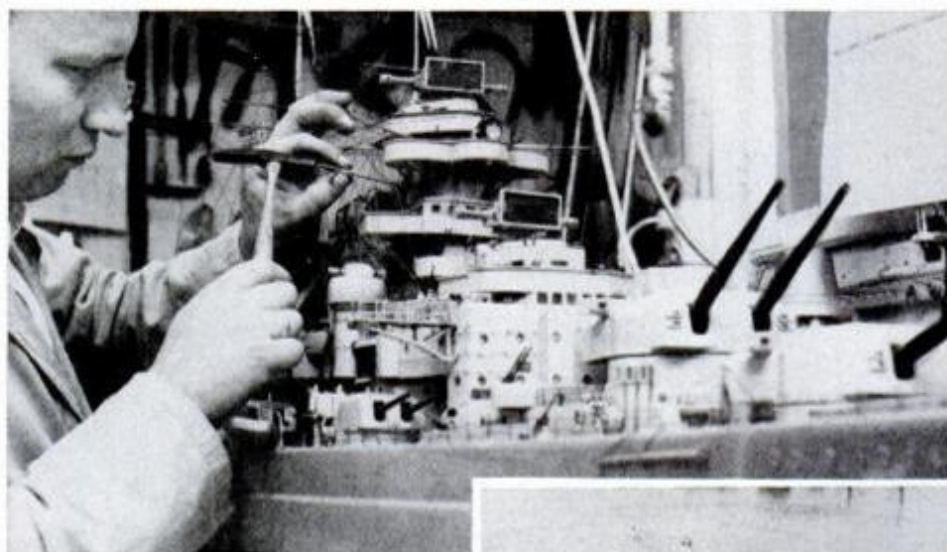
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### Baby Bismarck

Built to 1/100th scale from original plans, the mini battleship *Bismarck*, once the pride of the German fleet, was handcrafted by a Munich goldsmith. Model, about 6 feet long and 16 inches wide, has three remote-controlled electric motors that drive it at 6.3 knots; 2600 man-hours went into construction.



## "If your dog wears a flea collar and still scratches

—he may need the Vet's medicine made for dogs' skin problems."

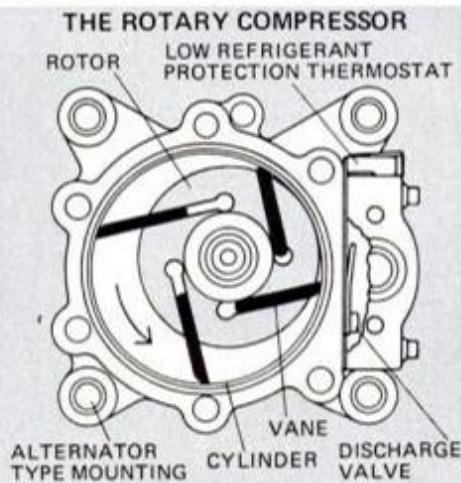
### "Catfish" Hunter

Expert Pitcher & Dog Breeder

"If your dog wears a flea collar and still scratches, odds are he's not scratching fleas, but an undetected cut, scrape, irritation, sore, even eczema. That's why a Vet developed *Sulfodene*—the skin medicine for dogs. Dogs have thinner skin than we do and special dog germs. *Sulfodene* kills dog germs, helps heal, stop scratching fast." *SULFODENE* proved effective in 9 of 10 cases tested. Also use *SULFODENE SHAMPOO*, medicated to help keep dogs' skin healthy.

## Sulfodene

©1977 Combe, Inc.



### Rotary compressor for a cool, quiet car

Compact new airconditioner compressor fits in tight engine compartments (left). Rotating vanes (right) compress refrigerant for quieter operation. The design also makes for easy mounting, lower weight, fewer parts and less vibration. The York unit is ideal for small cars, but will have capacity for trucks and heavy equipment, too.



### Highway trouble flag

Highway breakdowns are less hazardous with a new "CB Help!" flag. You stay in your locked car. Just hoist the flag out the window and passing CBers will radio your distress to highway police. You sit there until help comes. Flag costs about \$1 from O'Neill Enterprises, Box 301, Inkster, Mich. 48141.



# Why a small car demands more of an oil than a big car.

Just because small cars are easy on gas, easy to handle and have smaller engines, don't assume they're easy on oil.



## The heat in a small engine can drain the life out of an oil.

Smaller cars with their 4- or 6-cylinder engines circulate their oil twice as fast as big sixes or eights. And they run at 25 to 30% higher revs. So there's more friction and heat in the engine.

Then to add insult to injury, they have less engine surface and less room in the engine compartment to get rid of that extra heat.

All this causes increased wear, tear and shear (thinning out) on your oil. Which can keep it from lubricating and cleaning properly.

From there it's only a short step to preignition, power loss and premature engine wear.

## To solve this oil crisis, you need Castrol.

Castrol started out in Europe where small cars started out. So naturally it was Castrol that first added the additives a

motor oil needs to protect those high-revving engines.

And today's Castrol incorporates the costliest additives available anywhere. That keeps Castrol from thinning out under intense heats and pressures. It keeps sludge from forming as the oil cools down. And it gives Castrol the strength to keep lubricating and cleaning the narrow passages in smaller engines.

## Of the best selling oils, only Castrol has passed both U.S. and foreign car engine testing.

Since Castrol is designed to withstand the tortures of small car engines, we make sure it passes the engine tests for foreign cars set by the CCMC\* (on a Fiat 124, Ford Cortina and Mercedes-Benz diesel) as well as the engine tests set up by the SAE,\*\* (on a '67 Olds 425 cid V-8 and a Ford 302 cid V-8.)

Then to satisfy ourselves even further, we test Castrol on two additional small car engines: a 1302cc VW and a 1798cc MGB.

So naturally, all grades of Castrol exceed all U.S. and foreign car manufacturers' specifications.

Now if you have a smaller car, you have some big reasons to change your oil.

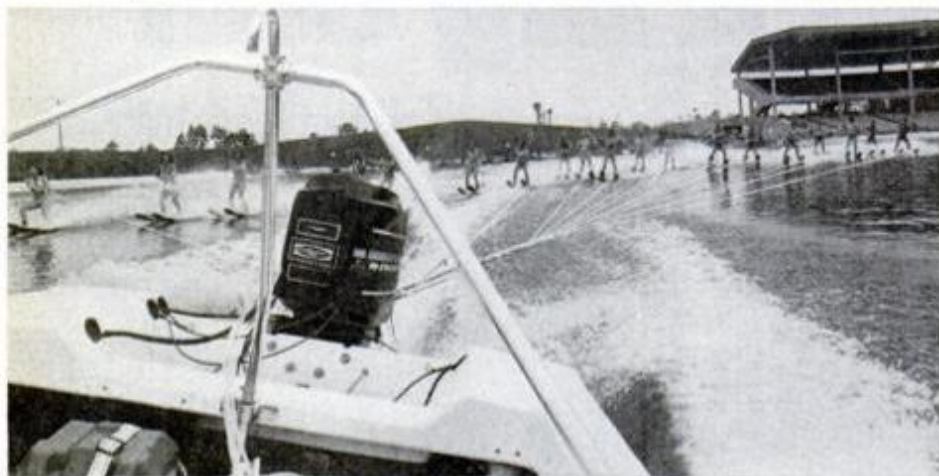


## Castrol

### The first oil engineered for smaller cars.

\*Organization of European Car Makers, Engineers and Oil Manufacturers.  
\*\*Society of Automotive Engineers.

# IT'S NEW NOW



## Outboard tows a record crowd

There were false starts and more than one tangled towline, but once they got going this group of 20 water skiers at the Orlando, Fla., Sea World set a new record for the largest number of skiers towed by a craft with a single outboard engine. The engine shown is a hard-working 175-hp Mercury powerplant. Sea World skiers beat an Australian record of 17 towed by a 200-hp outfit.

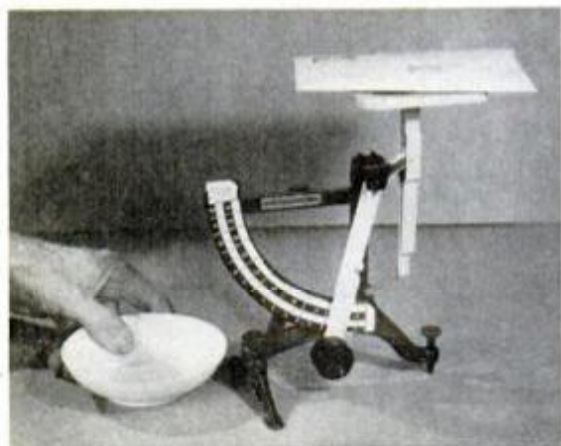
## High-voltage protection

Simple plug-in Voltage Spike Protector absorbs surges in home wiring circuits, protecting electrical equipment from damage. Made by GE, it's about \$10 in most electrical supply outlets.



## Cool, bugproof vehicle cabs

Easy-to-install screens help to keep a camper unstuffy on warm, buggy nights. Van-Venters fit most van windows. \$13.95 a pair from the Van-Camper Corp., Box 8883, Cleveland, Ohio 44136.



## Four-way hobby scale

Anyone from a mineral or jewelry hobbyist to a dedicated dieter can use this versatile counter-balance scale. It handles weights up to 10 ounces and is accurate to within one gram or .04 ounce. Four interchangeable indexes for grams, ounces, troy ounces and postal rates (so you won't pay the Post Office too much) come with each scale. There are interchangeable flat or bowl-shaped weighing trays. It's \$20.50 postpaid from Educational Products, Box 606, New Hyde Park, N.Y. 11501.

## 'Parking meter' bike rack

The lockable bike rack in the lower photo below is adaptable to public carriers, as shown on the San Diego bus hookup in the top photo. Called a Bike Bank, the unit uses a loop of case-hardened steel and a chain to secure a bike to a post or wall fixture. It can be secured by coin/key systems like those on luggage lockers, or with padlock or key lock. The single-bike rack is priced about \$60; other types range in cost up to \$1000. Sunshine Recreation, 22713 Ventura Blvd., Suite A, Woodland Hills, Calif. 91364.



## Speedy cassette rewinder

This geared hand crank rewinds cassette tapes twice as fast as a recorder can, also frees the machine to continue playing. \$4.59. Robins Industries, 75 Austin Blvd., Commack, N.Y. 11725.



# Toolpost holder for hand grinder

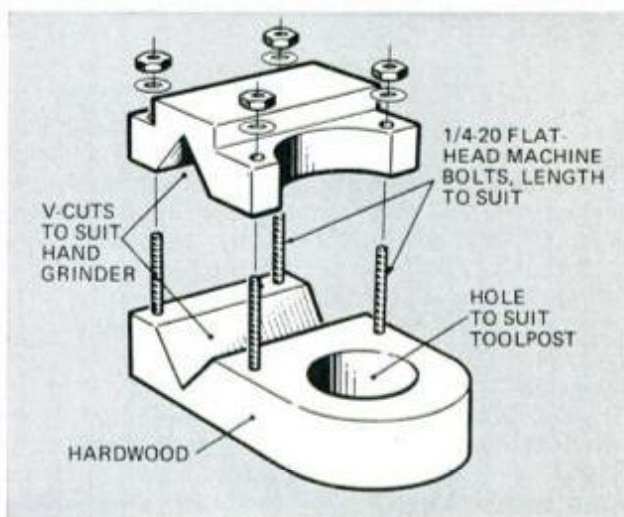
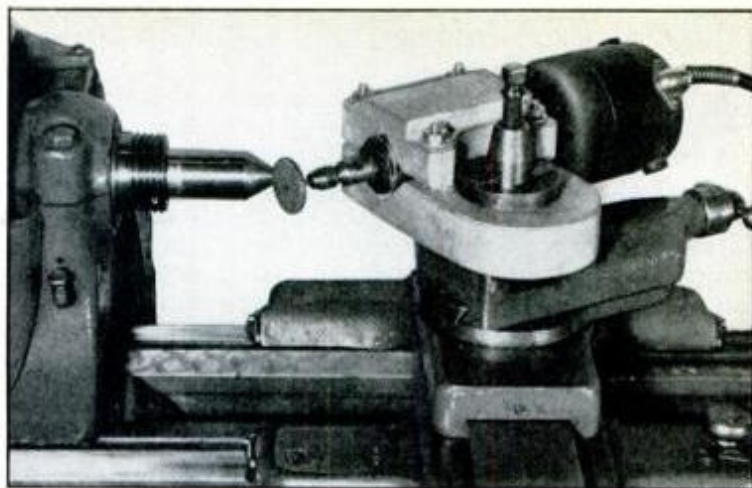
**F**or truing lathe centers, for sharpening some types of cutters and for doing cylindrical grinding on a lathe, a toolpost grinder is an invaluable aid. I gave myself one by making a simple mounting for my hand grinder.

I used maple for its excellent physical properties, but any hardwood—birch, beech or even oak—will do. Dimensions must suit the lathe and grinder used, so none are given on the drawing.

The only critical dimension is the depth of the V-notch in the lower block, because the grinder's centerline must be in the same horizontal plane as the lathe's centerline. Careful trial and error should produce the proper alignment. The lower block is countersunk for flush mounting of bolt heads.

In use, your toolpost clamps the mounting down in place of the toolholder. Accuracy of the final setup will be just as good as the accuracy of the hand grinder you use; mine has produced very satisfactory results. With such a setup you'll find it easy to accurately grind not only round shafts but tapers as well.

One last tip: Cover the exposed ways of your lathe with cloth or paper while you are grinding. This will keep the grinding grit from getting onto the delicate bearing surfaces.—*Carl A. Traub*



## The Winner II IMPORTED SPORT SHOE

Super Style For Trackin' & Truckin'



At larger  
Sears, Roebuck and Co.  
stores. And in the catalog.

**Sears**

At the Shoe Place

Split suede over choice of nylon or vinyl. Padded tongue and collar for comfort. Full cushioned insole for support. Sawtooth-tread rubber sole for traction.

## ENGINES ON HANG GLIDERS

(Continued from page 64)

already one of the sport's most sophisticated craft and soon there will be plans published for adding an MC-101 powerplant. Craig Catto of Cupertino, Calif., took the opposite approach. First coming out with an engine unit, he is now adding a rigid tail-less monoplane, the 49er.

These designs have climb rates of 250 to 350 f.p.m. Because of their rigid construction, they are more readily adaptable to the mounting of add-on power than the simpler "flex-wing" Rogallo-type hang glider with its few spars and kitelike fabric construction. Yet more Rogallos are around than any other glider types and thus these offer the greatest market for power kits.

In 1973, Bill Bennett of Van Nuys, Calif., approached powered Rogallos by mounting an MC-101 not on the glider but on the pilot. The idea did not catch on. Then Ron Renau of James Island, S.C., gave backpack powerplants a successful comeback in 1976. A fiberglass duct improved efficiency while blocking stray human anatomy. A climb rate of 75 f.p.m. is claimed.

Backpacks can be added quickly to

most flex and some rigid wings, but they do have disadvantages: There's airflow interference from the pilot's body that reduces power and operating efficiency. Engine weight and vibration are transferred directly to the flier's body instead of to the craft, increasing discomfort, strain and fatigue. And the thrust line is constantly changing relative to the glider, making it difficult to maintain optimum thrust.

### Mounting power on Rogallos

Terry Sweeney decided to tackle the problem of powering Rogallos head-on instead of resorting to backpacks. His first approach was to replace the single "kingpost" tube that braces the upper rigging with two shaped tubes for mounting an MC-101 engine in between. It worked moderately well. In southern California John Lake and Bob Watson reported good success with a like setup but with the engine mounted on just one tube.

Next Sweeney gave up the kingpost mount and placed the powerplant on two tubes farther back for better-balanced ground handling and improved thrust alignment. He also added an expansion chamber to tune exhaust back pressure and lower

noise. A climb rate of 150 f.p.m. was estimated.

Neighbor Jonathan Winsor observed Sweeney's results and simplified things by mounting the engine directly to the rear of the central "keel" tube. (The nose is unavailable as a glider rests on it.) It does require frame modifications but isn't as difficult balancewise as it seems. Easy adjustment of pilot suspension fore and aft trims things up with power on or off, and even with the engine removed.

Without an expansion chamber, Winsor reports a 150-f.p.m. climb rate. (Renau now has followed suit, abandoning backpacks.) Sweeney expects the best universal position to be over the keel midway between tail and kingpost, though he hasn't had a chance to try the arrangement.

### Increasing engine efficiency

Lake uses belt-drive reduction to increase engine speed to a higher, more efficient point on the power curve. Gear reduction is another possibility.

The MC-101 in direct drive runs at 6500 to 8000 rpm, giving 12.5 brake hp and around 60 pounds' thrust. Tuning the exhaust can add 1 hp and 10 pounds of thrust. Another such

# Believe it or not, this is the same car.



## The only difference is Star Brite.

the finish on Ditsy Garcia's 1965 Mustang looked like suede leather.

Oxidized by the sun, weathered and dulled by time, its original bright finish had turned to gloomy drab.

One application of Star Brite Car Polish turned it into a glittering jewel. In minutes, under scorching summer sun, off came the dead, powdery

surface paint to reveal the original sparkling finish and color it had in the showroom.

Her friends refused to believe it was the same car.

A second Star Brite application within 10 to 30 days after the first, will keep Ditsy's Mustang shielded from sun, oily airborne grime, bug acids, even road tar. After months,

a fast rinse will still take it all off and leave water beading.

Does your car have a middle aged finish? Make it young again with Star Brite.

Available in most auto, hardware, discount drug stores and many supermarkets.

**Star brite**  
Car Polish Miami, FL 33133



"My friends thought I repainted my car. They refused to believe I did it with Star Brite."

leap comes from winding the engine up to 10,000 to 12,000 rpm with a 2:1 to 3:1 reduction.

Propellers usually are solid birch or maple, 17 to 40 inches in diameter, jig cut and hand-finished. Some laminated ones are being made, along with fiberglass and metal.

Props vary considerably in design, but most seem to work about the same. Balance and thickness are important for safety. Holding tip speeds below 600 mph reduces noise.

Motorized hang gliding enthusiasts will have to learn some facts of life more common to airplanes, such as: vibration causing possible material fatigue and the loosening of bolts; having emergency kill switches, usually mouth-held; avoiding temptations to motor over areas without emergency landing sites; using fuel (regular or, better, 100-octane aviation gas) and lubrication (synthetic) that won't foul engines; performing periodic engine overhauls (around every 50 hours).

### New engines must be found

Add-on power kits are available for \$500 to \$600 (exclusive of the cost of the glider itself). Unfortunately, one problem that will eventually have to be faced is that the lovable, little, widely used MC-101 engine—affectionately known as the "Mac One-oh-one"—appears to be going out of production. While many are still in dealer stocks or can be obtained through other sources, the time will ultimately come when replacements will have to be found.

The ideal choice is a small, light, reliable two-stroker without either frills or a temperamental personality—which is what made the 30-pound, 12-hp MC-101 so eminently suitable for helping to usher in the new age of motorized hang gliding. One alternative powerplant that seems promising is a modified 13-pound, 150-cc Chrysler/West Bend engine.

For safety and ease of handling, it is important to avoid the temptation to overpower a hang glider—too much speed and weight could become hazardous. Lake hopes "we don't reinvent the airplane." Moody wants to leave climb rates at around 350 f.p.m. "We can have too much climb. It's safe, fun flight. It's not the idea to be a fighter plane." He prefers also leather landing gear for ground that wheels can't handle. "Foot launching is the key to the freedom of it."

But don't rule out other possibilities. Already there's talk of glider races, 1920s-style barnstorming, long-range 300-mile-per-gallon flights and such exotic power sources as catalytic prop-tip steam thrusters.

There is a sky, but seemingly no limit.

### Federal requirements

In May of this year, the Federal Aviation Administration decided not to regulate auxiliary-powered hang gliders, reversing its earlier stand that these should be dealt with as airplanes. Recognizing that engines are used as just another method of launching sport vehicles, the FAA now puts these craft in the same category as unpowered hang gliders, which they do not regulate. The FAA acknowledges the sport's extensive

self-regulation efforts, but does specify that hang gliders *must stay away* from airports and airways used by conventional aircraft.

### Self-regulation

The U.S. Hang Gliding Assn., a division of the National Aeronautic Assn., issues pilot and instructor ratings and establishes basic safety regulations. It also offers pilot liability insurance and publishes a monthly magazine, *Hang Gliding*.

The Hang Glider Manufacturers Assn. embarked earlier this year on

*(Please turn to page 122)*



## "Valvoline won me over!"

"I've put enough time and money into this machine to get it exactly the way I want it. Right down to the motor oil. I chose Valvoline because I want my van to run as smooth as it looks."

People were turning to Valvoline for lubrication and protection even before America had cars. In fact, Valvoline has been winning the world



over since 1866.

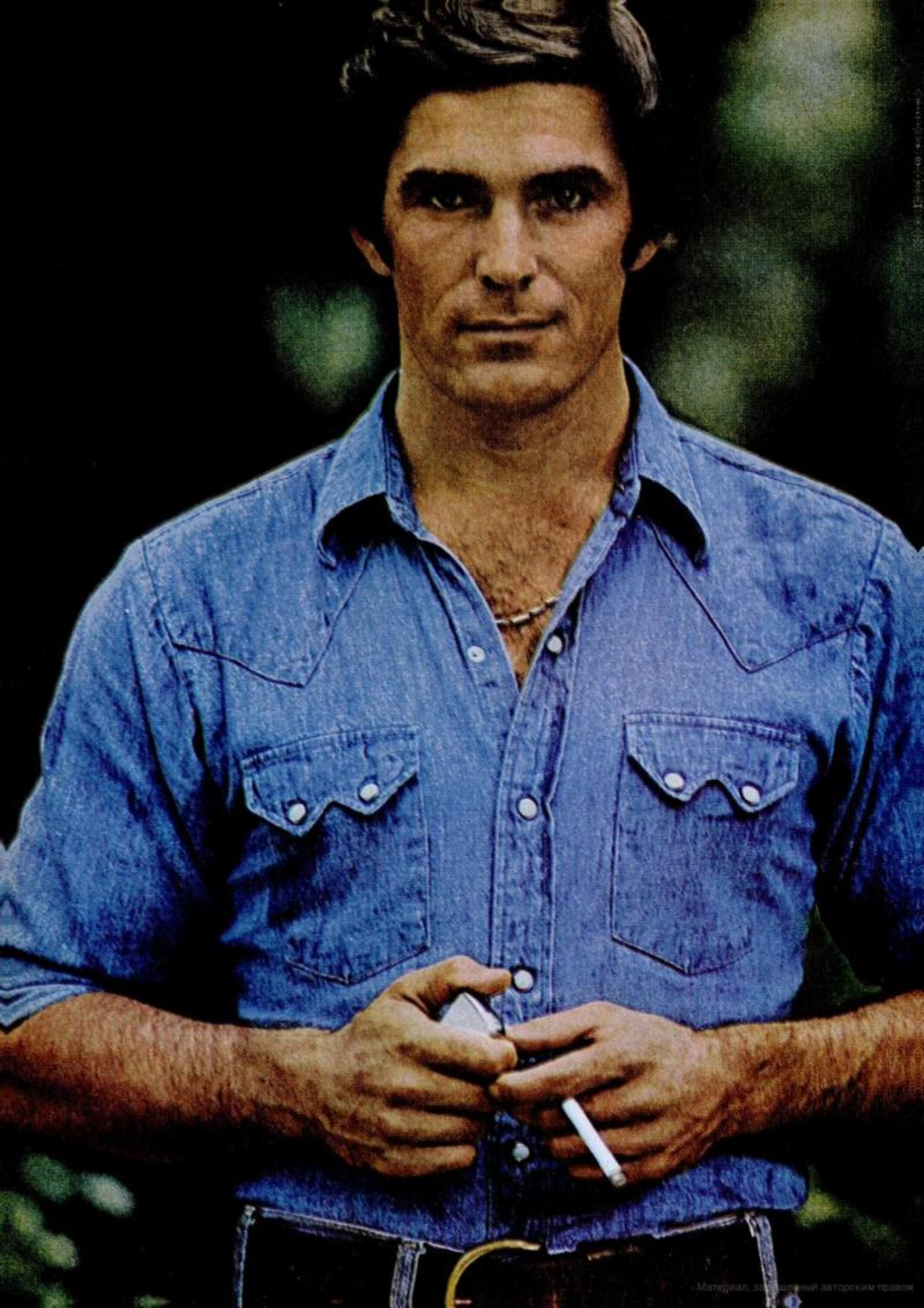
With winning performances from the international racing circuits to the interstate highways, and everywhere in between. It's

Valvoline. With unbeaten engine protection for whatever you drive, wherever you drive it. Millions of people prove it every day. Valvoline® Motor Oil is winning them over. With quality.

# Valvoline®

## Winning the world over since 1866.

Valvoline Oil Company, Ashland, Ky.  Division of Ashland Oil, Inc.



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A lot of cigarettes promise taste.

But for me, only one cigarette delivers. Winston.  
I get real taste and real pleasure every time I light up.  
I won't settle for less. Would you?



**Winston King. Winston 100's.**

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

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## ...go all the way.

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leatherette  
case \$4.95

## ENGINES ON HANG GLIDERS

(Continued from page 119)

a program for certifying the airworthiness of production hang gliders after stringent flight-testing before movie cameras.

USHGA issues "Hang Ratings" numbered I through IV. "I" merely signifies accomplishing a first flight. "II" is equivalent to a student license, "III" to solo sign-off, and "IV" to a private pilot license.

Last January USHGA added a sign-off category for power to its Hang III and IV Ratings. It requires an oral quiz and powered flight demonstration in addition to the written and proficiency tests plus experience requirements normal to all Hang Ratings. (The written test includes questions on Federal Aviation Regulations and aviation map reading).

The Hang Rating program is administered through appointees at schools and clubs nationwide. While without federal backing, the program gets its clout through controlled flying sites and organized activities that usually require ratings plus liability insurance.

### Hang glider schools

No one should ever try to teach himself how to fly any kind of aircraft. Locate a school with USHGA instructors who will teach you beyond Hang II (where many stop), using radios or dual instruction for advanced lessons. Some teach with motors from the start. Most presently prefer giving gliding lessons first. Don't gamble the sureness of training fees against the possibility of orthopedic bills! ★★★

### For more information

- U.S. Hang Gliding Assn., Inc., Box 66306, Los Angeles, Calif. 90066; \$15 yearly full-member dues; \$10 for associate membership; \$1 for information kit.
- *Glider Rider* tabloid, Box 6009, Chattanooga, Tenn. 37401; \$10 for 12 issues containing regular news on motor hang gliding.

### Hang glider kits with engines

- Catto Aircraft, Box 1619, Cupertino, Calif. 95014; \$3 for information kit on 49er.
- Ultralight Flying Machines, Box 59, Cupertino, Calif. 95014; \$1 for information kit on Easy Riser.
- John Moody, UFM of Wisconsin, Box 21867, Milwaukee, Wis. 53221; \$5 for information kit on power packs, parts, Easy Riser.

### Powered hang glider plans

- Volmer Aircraft, Box 5222, Glendale, Calif. 91201; \$4 for information kit on VJ-24E and parts.

### Engine packages and/or components

- Ron Renau, Bionic Flight, 1328 Relyea St., James Island, S.C. 29412; \$1 for information kit.
- Jeff Koch, Box 453, Petaluma, Calif. 94952; \$3.50 for information kit.
- Terry Sweeney's Glider Supplies, c/o Flight Resources Co-op, Wilton, N.H. 03086; \$1 for information kit.
- Jack Hutchinson, Hang-Em-High, 4211 North Orange Blossom Trail, No. 5A, Orlando, Fla. 32804; modified Chrysler/West Bend 820 engine for Quicksilver monoplane kits and other hang gliders; \$1 for information kit.



# CHEVY 4-WHEELERS.

## TOUGH IN THE RIGHT PLACES.

**Chevy 4X4s are tough enough to take you almost anywhere. With a ladder-type steel frame. Rugged multi-leaf front and rear springs and front stabilizer bar. And more.**

**Two kinds of 4-wheel drive available.** With Chevy's full-time 4-wheel drive, all controls are located conveniently inside the cab; you can move on or off the highway without getting out to lock or unlock the front hubs. You get full-time 4-wheel drive when you order a Chevy 4x4 with available Turbo Hydra-matic. You get conventional

4-wheel drive if you order a manual transmission.

**Chevy Pickups.** Smooth-riding Fleetside and Stepside pickups are available in ½-ton models with a 6½- or 8-foot pickup box; ¾-ton models with 8-foot boxes. New for '77: one-ton 4-wheel-drive Chevy Fleetsides.

**Chevy Blazer.** Blazer can carry up to five with available seating, hold up to 44 cu. ft. of gear. All Blazers

have a steel front half-top. A removable fiber-glass-reinforced plastic rear top or convertible folding rear top is available.

**Chevy Suburban.** Superwagon! Can seat, hold, tow more than any ordinary station wagon. Suburban can carry up to nine, with available seating. Or it can hold up to 144 cu. ft. of cargo with second seat folded down and third seat removed.

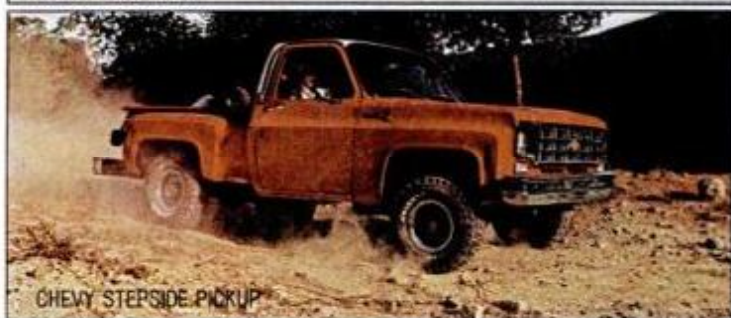
For more on toughness, the right place to go is your Chevy dealer.



CHEVY FLEETSIDE PICKUP



CHEVY SUBURBAN



CHEVY STEPSIDE PICKUP



CHEVY BLAZER

keeper, "I bought the car because it was advertised to get 17 mpg city and 23 highway driving. My Grand Prix doesn't come anywhere near that. I figure I get 12-13 mpg overall, using my cruise control."

This owner makes a good point, because we've found that the government's EPA gas-mileage figures are almost always quite idealized. The EPA qualifies its figures by saying they're "estimates." We've never yet, though, found an EPA estimate on the low side.

An Indiana housewife notes,

The 350 seems a good compromise between power and gasoline economy.



"I'd like better mileage, but I knew when I bought the car that I'd pay for the weight and large engine."

Says a Kentucky land surveyor: "The EPA rates my 301 V8 at 19 mpg combined. I think the EPA must be a bunch of kooks driving down hill in neutral. My previous Pontiac with 103,000 miles and the 350 V8 did better than this 1977 GP."

Other specific owner complaints include this cross section:

"Back seat is kinda short on legroom," observes a Tennessee fireman. "The car needs more trunk space," says a Michigan mechanic "The hood is too high," feels an Iowa salesman.

"To date, my only complaint is the finish detailing," says an Indiana mechanical engineer; "such things as blemishes, rough spots, and runs in the paint."

We also asked owners to list their suggestions for improving the Grand Prix. Here are items the respondents would like to see changed.

"Swap off the speedometer and



Trunk would be bigger if designers put some of the hood's length back here.

the clock. They're backward on the instrument panel," suggests a Utah electrician.

"More legroom for rear passengers," opines a Mississippi marine engineer.

A California food vendor: "Enlarge the trunk. The trunk is also impossible to open with one hand. If you're holding packages, you have to put them down before unlocking the trunk."

"Better gas mileage."—South Carolina cement worker.

A Kansas cosmetics rep: "The windows are hard to roll up and down, and the doors are so heavy that they're hard to pull shut if

## Fuel costs got you tied up in knots?

Fight back with  
**Holley's  
Economaster  
Carburetor!**

Colt Industries  **Holley  
Carburetor Division**

Dept. PM 8, P.O. Box 3257  
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Economaster carburetors are designed to improve your vehicle's miles-per-gallon. Such economy features as 2-stage power valves, redesigned booster venturii and improved fuel metering capabilities can show mileage gains in both highway and city driving conditions. And the Economaster carburetor is a direct bolt-on unit you can easily install yourself. In fact, between our carburetor's exceptional fuel savings and your mechanical skill, you could go pretty far together... for less. Holley economy carburetors are available at many fine automotive parts stores. For information on where to buy, write Holley today.



Actual economy gains may vary depending on individual application and condition of vehicle, driving conditions and driving habits.

you're parked on a down slope."

The lower body shouldn't slant inward so much, because rocks and dirt spray up and take off the paint. They ought to fix that after all these years."—Michigan office clerk.

"I wish they'd put more room in-

side such a big car."—Florida RN.

When asked whether they'd buy another GP next time, 78.4 percent of our respondents said yes. That figure would have been higher if the Grand Prix of 1978 were clearer in people's minds. A number of owners said they want to

stick with a big car, and a few even mentioned going to Cordobas or Mark Vs if the 1978 Grand Prix shrinks, as rumor says it will.

But for every owner defecting—if GM's downsizing history repeats—several more will join the Grand Prix ranks next year. ★★

## SUMMARY OF 1977 PONTIAC GRAND PRIX OWNERS REPORTS\*

Total miles driven .....917,442

### Average miles per gallon

301-cu.-in. V8  
In town (EPA autom. 16) .14.0  
Long trips (EPA autom. 23) 18.2  
350-cu.-in. V8  
In town (EPA autom. 14) .13.5  
Long trips (EPA autom. 21) 17.2  
400-cu.-in. V8  
In town (EPA autom. 14) .12.4  
Long trips (EPA autom. 21) 16.4

### Engine choices:

301-cu.-in. V8 .....25.8%  
350-cu.-in. V8 .....23.0%  
400-cu.-in. V8 .....51.1%

### Why did you choose Grand Prix?

Styling .....62.9%  
Past experience .....19.6%  
Price .....11.9%  
Size .....8.2%  
Handling .....8.2%

### Specific likes:

Styling .....73.2%  
Handling .....45.4%

Good ride .....34.0  
Comfort .....30.9  
Performance .....17.5

### Specific dislikes:

Gas mileage lower than expected .....14.9%  
Poor workmanship .....9.9  
Short on legroom .....6.6  
Short on trunk space .....6.6  
Poor paint & finish .....6.6

### What changes would you like?

More trunk room .....10.6%  
More legroom .....9.5  
Better gas mileage .....8.4  
Better workmanship .....7.3

### Workmanship opinion:

Excellent .....31.5%  
Good .....41.0  
Average .....13.5  
Fair .....9.0  
Poor .....5.0

### Comfort opinion, front seat:

Excellent .....48.2%  
Very good .....32.7

Good .....13.6  
Fair .....4.0  
Poor .....1.5

### Comfort opinion, rear seat:

Excellent .....15.5%  
Very good .....23.8  
Good .....29.5  
Fair .....23.3  
Poor .....7.8

### Had any mechanical trouble?

No .....62.5%  
Yes .....37.5

### What type of trouble?

Carburetor .....14.7%  
Brakes .....14.7  
Electrical .....10.7  
Transmission .....6.7

### Dealer repairs satisfactory?

Yes .....57.8%  
No .....42.2

### Dealer service opinion:

Excellent .....28.0%

Good .....37.7  
Average .....13.1  
Fair .....10.3  
Poor .....10.9

### Number of vehicles owned:

Grand Prix only .....37.3%  
Two cars .....49.3  
Three cars .....9.0  
Four cars .....2.5  
Five or more cars .....2.0

### Makes of other cars owned:

Chevrolet .....41.9%  
Pontiac .....16.1  
Ford .....11.3  
Oldsmobile .....11.3  
Volkswagen .....7.3

### Age distribution of owners:

15-29 years .....34.5%  
30-49 years .....42.8  
50-plus .....22.6

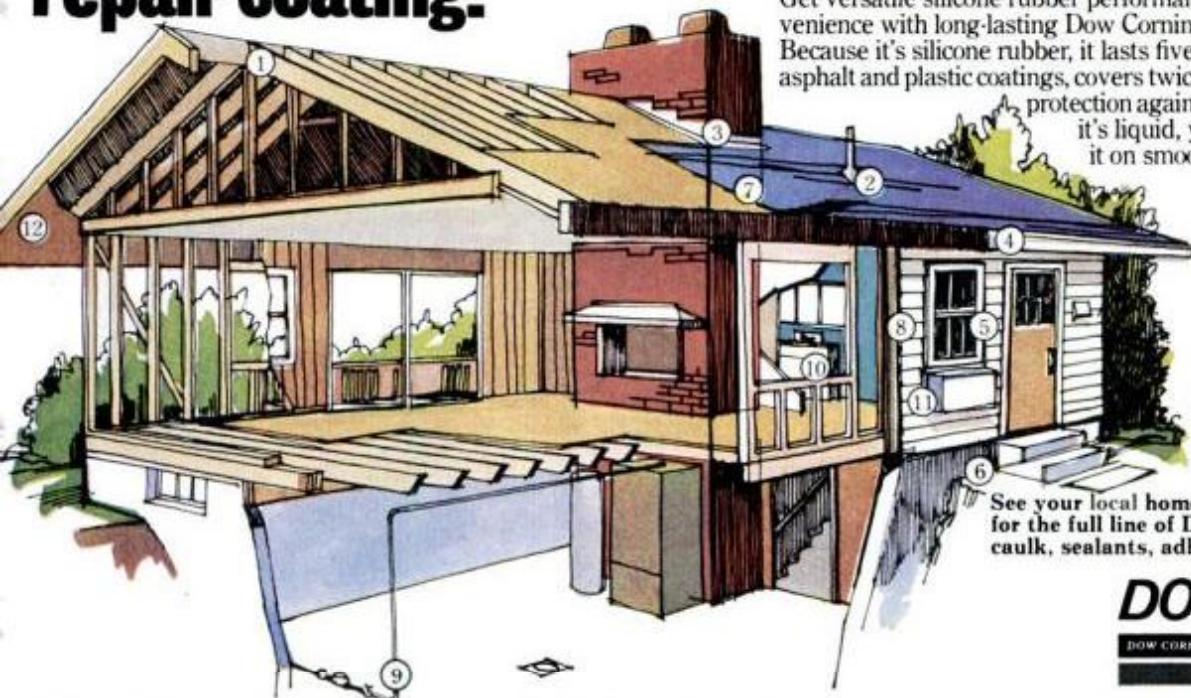
### Would you buy another Pontiac Grand Prix?

Yes .....78.4%  
No .....21.6

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

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See your local home center or hardware store for the full line of Dow Corning silicone rubber caulk, sealants, adhesives, and coating.

## DOW CORNING

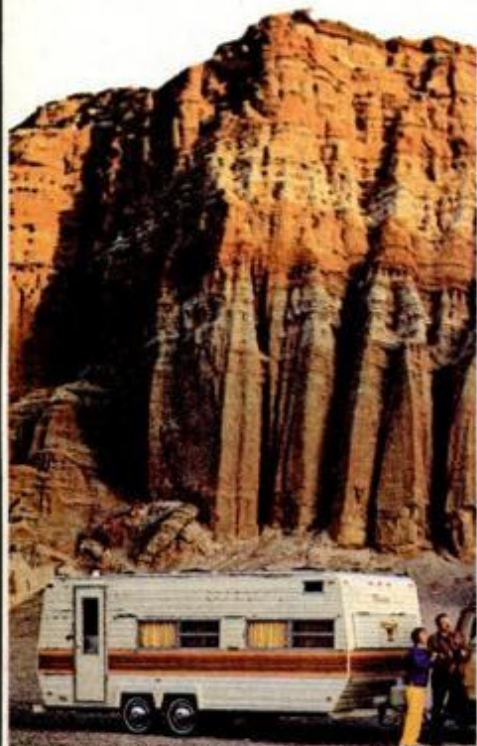


1. Seals roof, gable, and dormer additions.
2. Seals roof vents, air ducts, skylights, and eaves.
3. Seals flashings and chimney caps.
4. Seals gutters, troughs, roof valleys.

5. Seals door, casement windows.
6. Patches and repairs masonry, cement, concrete block.
7. Patches and repairs loose shingles.
8. Patches and repairs wood and aluminum siding.

9. Rustproofs drains, plumbing joints.
10. Rustproofs underside of sinks, dishwashers.
11. Weatherproofs air conditioner covers.
12. Rotproofs wood.

# THE 1977 TAURUS



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## PHONOGRAPH'S FIRST 100 YEARS

*(Continued from page 87)*

That way, Edison hoped to make more efficient use of the limited cable facilities of his day.

Whirling the cylinder, Edison discovered that dots and dashes, when speeded up into the range of audible frequencies, made the contact arm chatter in a way that reminded him of speech in some strange language. This purely accidental impression suggested the notion of a "talking machine" to record and recapture speech vibrations through a moving membrane attached to a tin horn.

### Nursery rhyme

Busy with other projects—mainly the design of a better mouthpiece for Alexander Graham Bell's newly invented telephone so you wouldn't always have to shout—Edison just made a rough pencil sketch of the intended talking machine and handed it to John Kruesi, one of his assistants. The instructions, scribbled on the drawing, were simple: "Kruesi: Make this.—Edison."

By Dec. 6, Kruesi had completed a working model, and Edison, turning the crank, yelled something about Mary's little lamb into the mouthpiece. Moments later, the machine recognizably repeated the nursery rhyme in Edison's voice. Kruesi turned pale and uttered a short prayer in German. Edison himself appeared shaken. "I was never so taken aback in all my life," he later admitted.

Others were equally amazed. The *(Please turn to page 128)*



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Dr. Peter Goldmark who invented the LP disc in 1948 holds LP albums equivalent to the stack of old 78-rpm records at left.

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Musicians had to cluster closely around primitive recording horn to project enough sound energy to the cylinder. Needless to say, results were less than sensational.

audience at early demonstrations believed they were witnessing some ventriloquist's trick until they heard their own voices coming back at them. Later the phonograph was widely exhibited at circus sideshows and tent meetings.

Countless people lined up to talk into the incredible machine for a nickel, and one newspaper reporter marveled at the ingenuity of a device that could be made to talk not only English but also German, French, Spanish and Hebrew.

Having solved the basic problem of sound recording, Edison turned his fertile attention to a new challenge—the electric light. It remained for others to accomplish the refinements necessary to make the phonograph an instrument fit for music—and it took a long time.

### Morning-glory horn

Not until Emile Berliner introduced the flat disc in the 1890s was it possible to mass-produce recordings by a simple pressing process. Before that, each cylinder had to be recorded individually. This opened the way for recordings to become a medium of mass entertainment, and after the turn of the century, the phonograph with its big morning-glory horn became a household item worldwide.

Yet for decades, its sound still remained scratchy, distorted and severely limited in frequency response. The great technical advance that enabled the phonograph to cope with a greater range of musical sound came in the late 1920s, when the new electronic principles of radio were combined with Edison's purely mechanical recording methods and

the horn gave way to the microphone and the loudspeaker.

Edison lived long enough—until 1931—to see the beginning of electrical recording, but he could hardly have imagined the marvels of high fidelity and stereo that grew from the advances in electronics after World War II.

### Digital sound

Had Edison been able to attend the Electronics Show in Chicago this year, he would have been even more amazed to see the first portent of what the future holds for his brainchild. For the first time, digital sound recording was demonstrated on a prototype recorder. In this process, the musical waveform picked up by the microphone is encoded into digital pulses.

The digital signal could be stored in highly compact computer-type memory devices. Hours of distortion-free music could be optically encoded by a sharply focused laser beam on a piece of film no bigger than a 35-mm slide. ★ ★ ★



Back in the Gay '90s, you could walk into phonograph parlors like this one to listen to music on ear-tubes for 5 cents.

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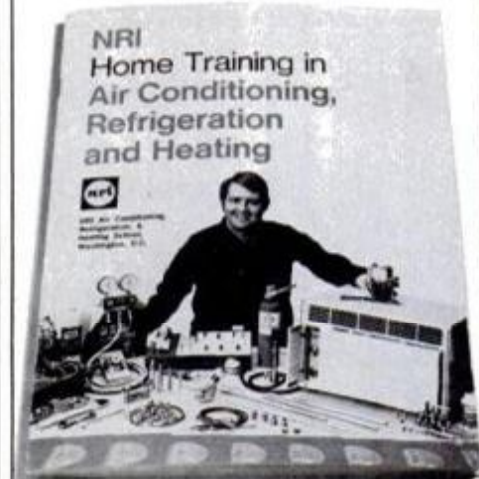
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the know-how to service auto electrical systems, carburetors and fuel systems, brakes, and cooling systems. You get eight important service items, including an Inductive Pick-Up DC Power Timing Light, Ignition and Electrical Systems Diagnostic Analysis and Tune-Up Instrument, tune-up tool kit, and more.

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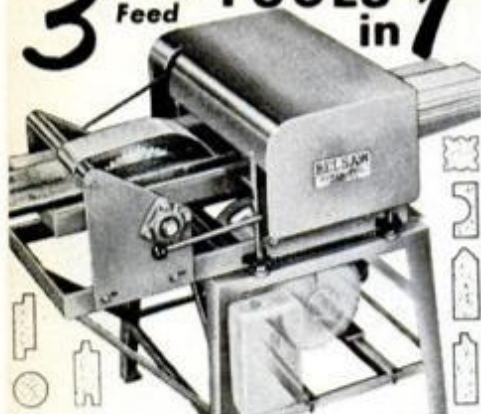
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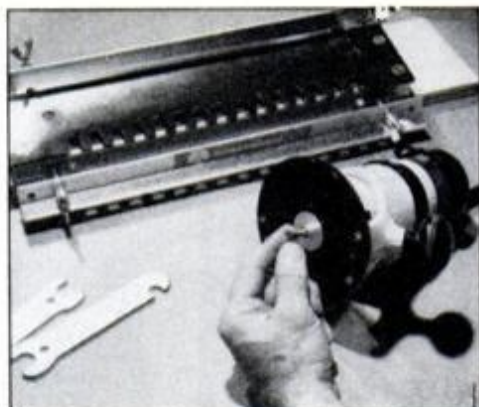
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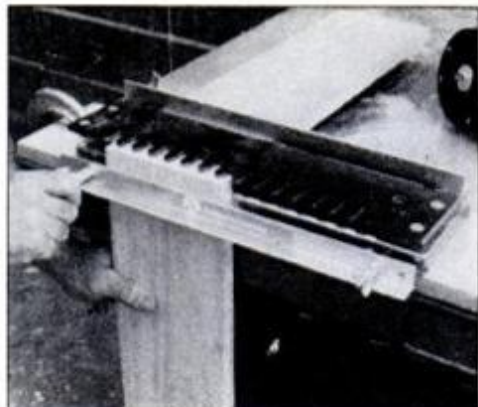
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## Half-blind dovetails made with router



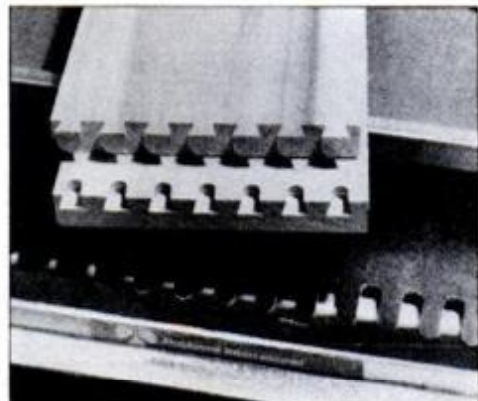
Cut half-blind doves with a router, template, base insert guide and dovetail bit.



Clamp a side and end member into the template with pieces butting each other.



Feed the router against the template finger to cut both joint parts together.



The result: a perfect-fitting dovetail that could hardly be duplicated by hand.

## HOW TO MAKE DOVETAIL JOINTS

(Continued from page 104)

to the amount of the lap dimension of the mating piece; and the pins aren't cut through to the front surface.

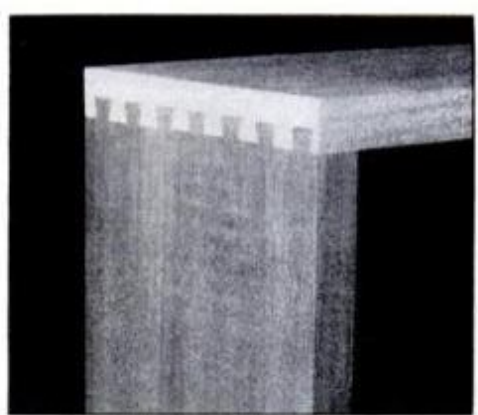
Cut dovetails, then place the board on the mating member, set back the required amount from the face. Scribe cutting lines. Pins are not cut through—saw them at an angle for a partial cut. Don't cut beyond the guide lines.

To remove waste between the pins, clamp work to the bench and hold a chisel perfectly perpendicular. Cut a V-notch at the back guide line. Then alternately chisel with and across the grain to remove the waste. Use a mallet when cutting across the grain.

### Dovetails on table, radial saws

A single through dovetail is used to join narrow-width framing members. A tenoning jig makes cutting the tails on a table saw easier, or you can use a miter gauge. Steps taken to make this joint are shown at the top of page 104.

Half-lap dovetails are used to join cross members. Steps for making a half-lap dovetail joint with a radial saw are also shown on page 104.



The assembled half-blind routed dovetail. It's excellent for drawers, cabinet work.

### Dovetailing with a router

A router is ideal for making dovetail joints. A guide (collar), dovetail bit and a relatively simple attachment that clamps the mating pieces together in a template reduces the task to its simplest form. Basic steps are shown above.

Set up the accessory attachment and insert the guide. Install bit and adjust cutting depth. Clamp butted pieces into the attachment. Run router from right to left to break the front edge of the stock so it won't split at edges. Then, working from left to right, guide it around the template. Check fit and adjust the bit elevation if needed. ★★★

## page alert 100

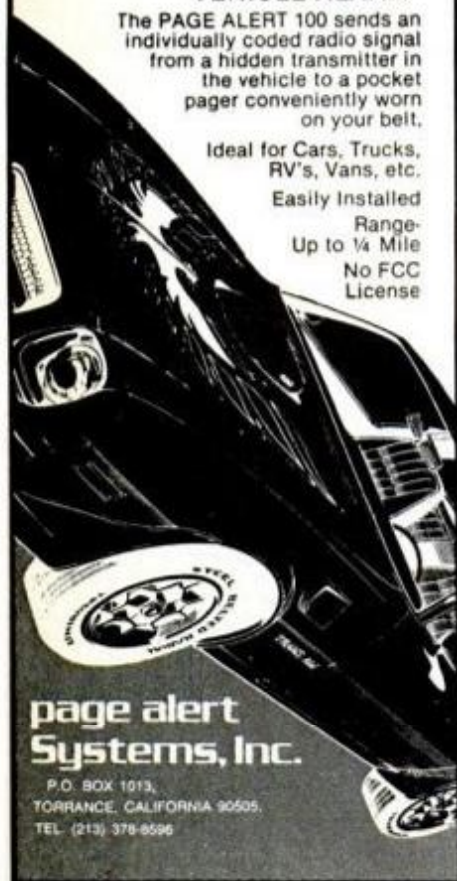
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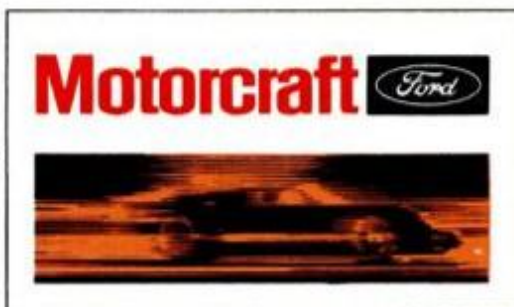
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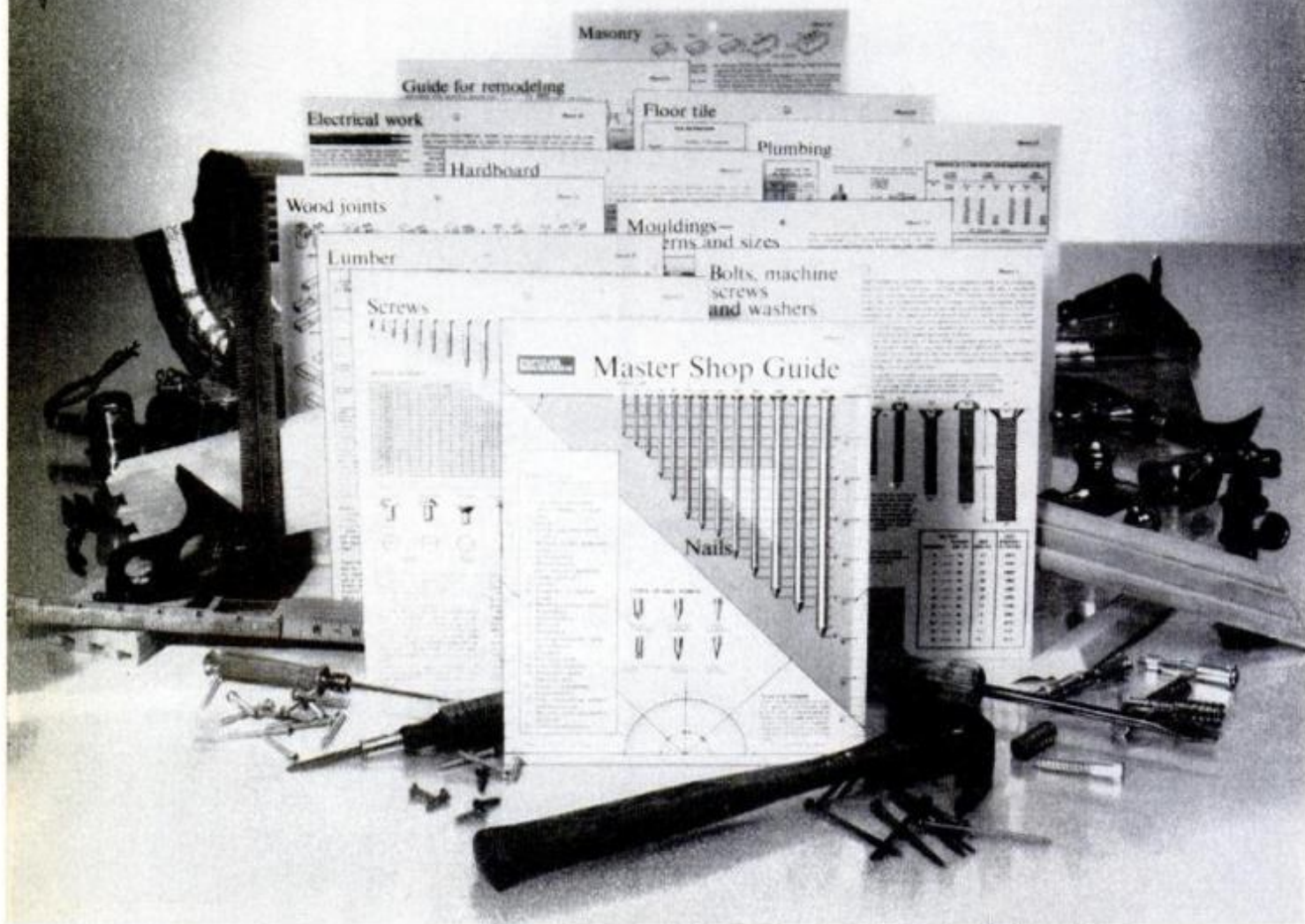


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the lead sank rapidly into the silt below, it dragged a hank of line behind it, marked every fathom (6 feet). In 12 feet of water when the lead hit bottom, the second mark would give the lead thrower the depth and thus he would sing out: "By the mark twain."

But today even Mark Twain would be astonished to see how the river is measured. From 22,800 miles in space a satellite receives and aims to a central computer display information from river-height meters spotted along 1250 miles of waterway from the Gulf of Mexico to a few miles above St. Louis.

While satellites monitor the river, short-range, static-free VHF radios let all the pilots on the river monitor and talk to each other.

"Meet you at two whistles, Cap. And thank you," Johnson says, using his radio to talk with the skipper of the downriver boat.

**A place of business**

With that, the wheelhouse is once again the place of business for the multi-million-dollar cargoes of river transportation. The passengers of the *Mississippi Queen* are already

seated at their tables for the noon meal in the grand dining room. For some, luncheon will be social chatter and choosing between mulligatawny and knickerbocker bean soup, between shrimp creole and fried filet of Arkansas catfish.

**Free entertainment**

The passengers of the *Mississippi Queen* can have the luxury accommodations and social activities of riverboat bingo and sleight-of-hand entertainment, courtesy of a man playing riverboat gambler. They can follow the public address announcements of the cruise director and his lovely wife to one entertainment after another.

Or they can have the river. Or a mixture of both. They have paid from \$504 to \$1162 a week for all of this and for rooms ranging from 8 by 8-foot inside studio doubles to deluxe suites outside like the Rio Grande Suite overlooking the paddlewheel.

It makes no difference to the passengers how the boat and river interact. But it does in the engine room of the *Mississippi Queen* where the million machine parts allow the river-

boat to successfully compete with the river. On her maiden voyage last summer the success was not complete. The *Mississippi Queen* proved to be underpowered for upriver travel. However, several million dollars worth of redesign seems to have worked. One main change is the modification of the paddlewheel. Part of every other paddle has been removed. This operation reduces by half the incredible 30 tons of water lifted from the river and constantly carried over the paddlewheel like a portable waterfall.

**Challenge against the water**

In any vessel, there is always the challenge of men and machines against water. George Mulford Adams, first assistant engineer, pursues this challenge as he moves among the gauges, the grease and the noise of his engine room. As you watch him climbing under and around the pipes and machines, checking first this gauge and then another, it is not hard to imagine that the *Mississippi Queen* churns up and down the river ahead of its red paddlewheel because it goes that

(Please turn to page 136)



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## A NEW QUEEN FOR THE OLD MISSISSIPPI (Continued from page 135)

way in the mind of George Adams, and engineers like him.

Adams, who went to sea for the first time with the Navy, sold an art gallery to go back to his love affair with engines. I watched him one morning, very early, as he knelt beside one of the steam engines listening for a strange popping noise out of time with the rhythms he knew.

As I stood in the door of the engine room with the river rushing by almost literally at my feet, Adams touched the open end of a long-handled wrench to the engine and placed the box end against his ear. When he found the noise in a valve linkage, he beat the wrench on the steel plate flooring of the engine room to overcome the noise and summon Dave Marks, who came and knelt down and took the wrench to listen.

### Enter, the pro

Marks is the port engineer for the Prudential Line, which operates oceangoing freighters and cruise ships out of San Francisco. He, along with several other Prudential professionals, supervises the operation of the *Mississippi Queen*, a new Prudential enterprise.

When Marks looked up from his listening, both men were smiling. He returned the wrench to Adams and went on to other matters. Adams went back to listening for a few more minutes. As he listened, oblivious to all other sounds, unaware of my watching, he kept a kind of time with his free hand as if he were a jazz drummer counting: "One. Two. One, two, three, four."

Watching George Adams timing the rhythms of those engines, I knew why men who love machines love this kind of work.

### Power for the Queen

The *Mississippi Queen* is powered by two tandem, compound reciprocating steam engines. A thick diesel fuel, called Bunker No. 6, is heated and then burned to fire the boiler to make steam which is piped into each engine, first entering a high-pressure cell, then passing into a low-pressure cell. In this way, pressure is applied to the giant pistons that reach from each engine to each side of the paddlewheel and turn the wheel in reciprocating strokes. From the low-pressure cell, the steam is exhausted through a condenser. The condensate is then run through a series of filters to remove any piston lubrication oil. Then it is run through an aerator to remove the oxygen in order to reduce corrosion in the boiler. The water

enters the boiler to begin the process all over again.

For George Adams and the men who work with him, the job is keeping those two engines reciprocating in perfect harmony, as if they were pedals on a bicycle. And mothering all the other moving parts in the steam turbine that supplies electricity, in the pumps that circulate the water, in the valves that open and close, open and close.

### Art in the engine room

George Adams seems closer to his art in the engine room than he could ever get in his art gallery. Maybe that is why he left for the sea and the river.

Lloyd Falcon Cottingham, second assistant engineer, also yielded to the call of the river. When you ask him why, Cottingham says simply: "I got dirty water in my blood."

Cottingham was born and raised in New Orleans. When he got married, he moved with his wife to a farm north of New Orleans. It was a river bank farm. At night, and during times when a man needs to get away and think things out, Cottingham would walk to the levee and sit listening to the river. He watched the riverboats working, but more than anything else, it was the sounds of the riverboats and the freighters that fascinated him. One night he yielded to those sounds calling him to sea.

Cottingham said he hired on the *Mississippi Queen* because he has been in love with riverboats since he was a boy.

### Peepholes into another world

For Lloyd Cottingham and George Adams, the world of the engine room is a place of gauges that let them know as much as gauges can what is going on inside those engines. Engine-room gauges are always finely polished metal faces of clean glass. For the engineers who watch over them, those gauges are the peepholes into another world.

Just as the pilot must use more than charts and electronic equipment, the engineers must use their eyes and ears and everything they know about machine rhythms to keep it all moving in harmony. It takes the finest kind of watching and listening.

High above the noise of the engines, the wheelhouse is quiet. Night has come to the river. The passengers are sleeping. The pilot switches on a remote-controlled arc light and scans the passing river bank looking for his next marker. ★★★

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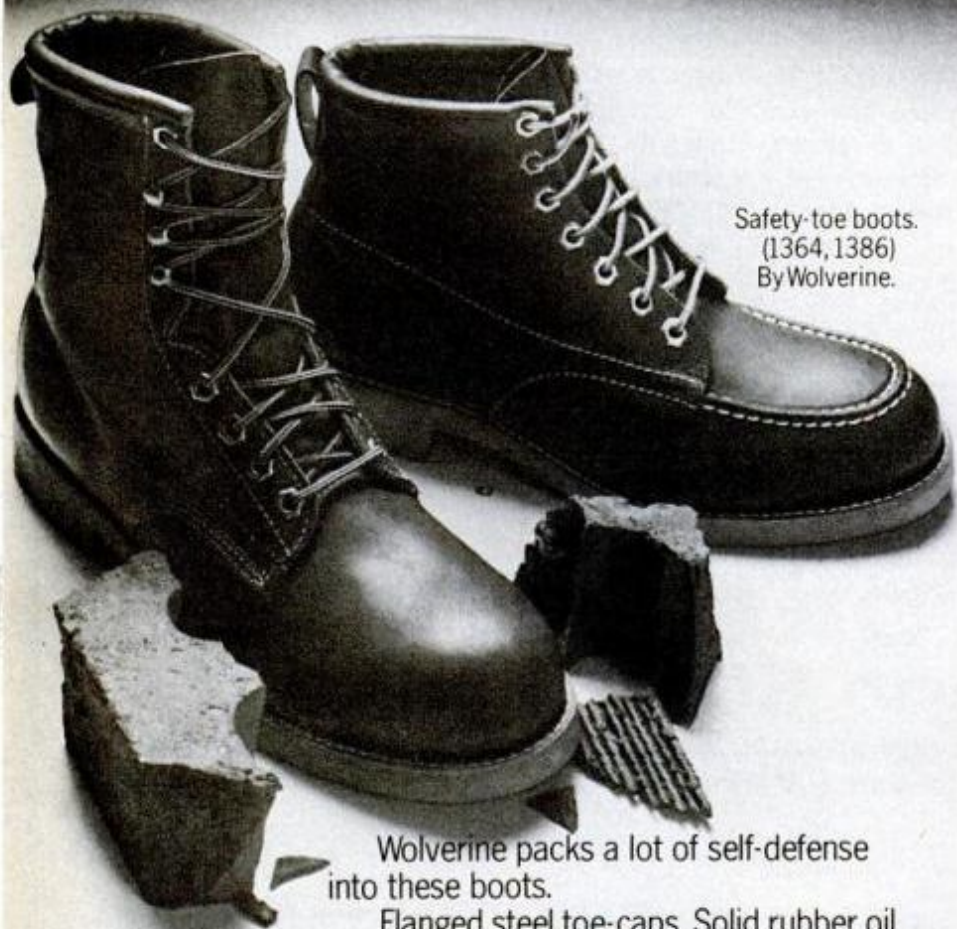
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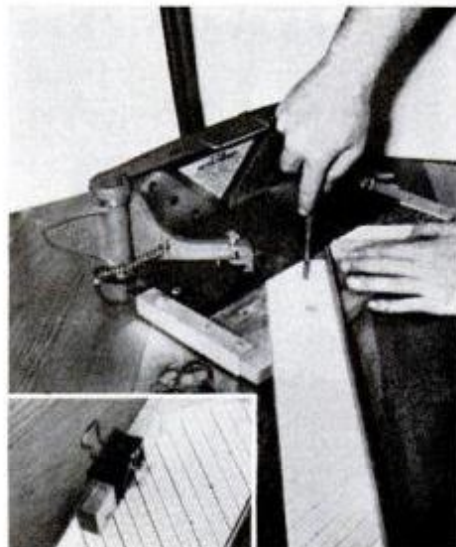
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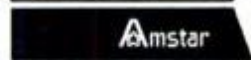
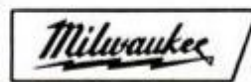
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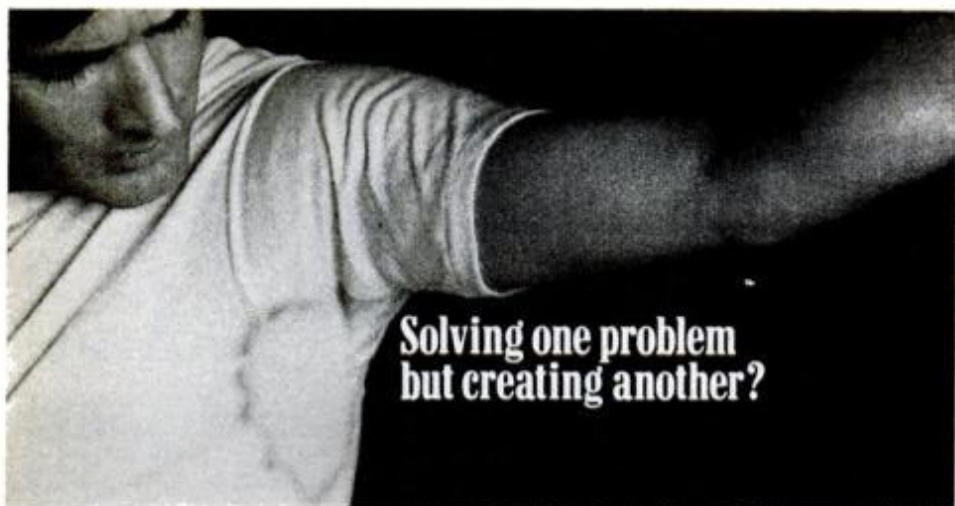
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### POLICING TODAY'S VAST 200-MILE LIMIT (Continued from page 75)

men, from the lowest seaman apprentice to the most grizzled chief, dined on crab rolls, fried and boiled shrimp, flounder filets, frogs' legs (yes, frogs' legs!), potatoes au gratin, fresh turnip greens, salad, and assorted pies and cheesecake. What were the officers eating? Fish chowder, and tuna sandwiches on toast.

Our third day at sea dawned cloudy and windy. Gusts to 30 knots kicked up the sea. I wondered if it were not too rough to board.

"It's borderline," Helman admitted, "but we're going to try to get one in this morning. Want to go?"

I nodded eagerly and, on instructions, clambered into the small boat. Chief Viverette, on deck, supervised our launching. We swayed precariously as lines were lowered and hit the water with a smack.

#### Crewmen are friendly

As we moved away from the shelter of the *Chilula*, the full force of the wind hit us, drenching those in the bow. Our quarry—the 129-foot Spanish stern trawler *Puente Minor*, out of Vigo, Spain—rocked about 400 yards away. We could see her crew gathering amidships as we neared.

Helping hands assisted us onto the deck, piled high with ropes and fishing gear. Friendly Spanish faces gazed at us with curiosity. For them, our arrival was a welcome break in their daily routine. As we later learned, the trawler had left Spain early in January and had been working at sea ever since.

"We'd like to see your logs and your haulback," Griffin said to the master. While Griffin and the Spanish skipper retired to the pilothouse to check the paperwork, I accompanied Albertine to the stern where, yard by yard, the net was being hauled aboard. Finally the bulging cod end of the net—"the money end where the fish are," Albertine explained—was on deck. A flood of wiggling fish gushed onto the working area.

Crewmen, clad in hip boots and thick sweaters, waded in and began sorting.

#### A dirty catch

"It's a dirty catch," Albertine said, with a disapproving frown. And indeed it was. In addition to the marine life, the net had also brought aboard an assortment of broken bot-

tles, beer cans and other debris—evidence that man had left signs of his polluting presence even this far out in the Atlantic.

"When your haulback is that dirty," Albertine explained, "it means your nets dragged bottom."

The catch itself was a mixed bag. Squid predominated, but an assortment of other species wiggled on deck—common eels as thick as a man's forearm, a few flat flounders and skates, white and spotted hake, plenty of crabs scurrying about, sharks, chain dogfish and ugly anglerfish with their disproportionately large mouths.

The fishermen sorted their catch briskly. Crabs, eels and hake were placed in separate buckets, as were other species, for return to the sea. The Spaniards were interested only in squid, their primary catch, and anglerfish, which they consider a delicacy. These species went to the hold of the ship, where another group of men were busy processing the catch. Later I accompanied Albertine down to the processing area.

We entered a cold, dark room where men in slickers worked hunched over low tables. One man hosed down buckets of squid to cleanse them of mud. Others grabbed the buckets and, with deft hands, separated the squid by size, and packed them neatly into freezing trays. Another worker whisked the trays into the flash freezer. Icy blasts billowed out whenever the freezer door opened.

The anglerfish were headed, gutted and placed in freezing trays.

"Within hours," Albertine said, "this whole haulback will be frozen and stored."

#### Catch provides lunch

Back on the bridge, Griffin was still examining the ship's logs. I took the opportunity to tour the ship's living quarters: single-berth rooms for officers, twin-bunk compartments for the crew.

I found the trawler's dining area on the starboard side. It came as no surprise when I saw what the chef was cooking for lunch. Dozens of delicate squid sizzled in a large pan. The chef jerked his thumb toward the stern, indicating in sign language that the *Puente Minor's* lunch that day was fresh from the sea, part of the catch I had watched come aboard only an hour before.

Albertine strode purposefully into the galley, looking for lobsters. "They have been known to hide a few for their own enjoyment," he said. But the *Puente Minor* was not guilty. Only the carcass of a skinned lamb peered back at Albertine from the freezer. So far as Albertine was



concerned, the trawler had passed inspection perfectly.

In the pilothouse, Griffin had discovered errors in the log and was writing a citation. "Failure to log each haulback . . . to maintain log of discards . . . to use code numbers for discards . . . to maintain a log of fishing activities."

"All minor violations," he said, "but I have to write them up."

### Trouble for repeat offenders

Under the new law, the Coast Guard has a series of sanctions it can enforce against violators, ranging from citations through civil penalties to seizure of the vessel and its catch. Even minor citations, like the one given the *Puente Minor*, can mean big trouble. Repeat offenders could lose their quotas, and that would hit them in their pocketbooks.

Our return to the *Chilula* was not a minute too soon. During our inspection, the wind had risen and was now gusting at 45 knots. Ten-foot waves hit us on our return, sending white water cascading over the bow. We were drenched by the time we were lifted aboard the cutter.

That evening, as Griffin made out his official boarding report, he noted the Spanish master's attitude. "There was an obvious attempt on the master's part to comply with the new law," Griffin wrote. "However, he had not been acquainted with certain portions of the law."

Handing me a copy, Griffin remarked, "We're not only law enforcement officers in the Coast Guard. We're educational officers as well, instructing everyone at sea about the new law and why it's important."

### Weather turns nasty

It was lucky for us that we had gotten in two boardings, for the weather turned nasty immediately afterward, making further boardings impossible. For 24 hours the ship bucked heavy seas and then, when the weather abated, the *Chilula* was ordered to escort another Coast Guard vessel with engine trouble to Newport, R.I. There I said goodbye to the *Chilula*. She was headed on a new mission into the North Atlantic; I headed home.

We had boarded only two Spanish trawlers, but all the Spanish captains knew what we had found, for they shared information by radio. And all knew the *Chilula*, or another Coast Guard cutter with the same mission, would be back to insure that our new national fisheries law was being observed and that our rich fishing grounds will not be completely depleted by fish-greedy trawlers in the years to come. ★★

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### WILL YOU LEASE YOUR NEXT NEW CAR? (Continued from page 79)

going beyond their reach. Leasing may be the way to drive a new car without going into debt.

#### New federal law to protect consumer car leasing

The Federal Reserve Board has proposed Regulation Z which would help assure that leasing companies comply with the new Consumer Leasing Act of 1976, effective March 23, 1977. Some states such as California have passed similar consumer protection laws governing consumer leasing transactions. Regulation Z specifically applies to this growing auto retail lease market. The FRB rules propose that many definitions and terms be fully disclosed in the contract. Here are some:

- Brief description of the lease property adequate to identify it to both parties to the lease.
- Total amount of any payments the lessor is to pay at the end of the lease, such as a refundable security deposit, advance payments or the like.
- Number, amount and due dates of periodic payments and their total.
- Total amount of taxes, fees and other charges involved.

- Identification of those responsible for maintaining or servicing the property.
- How any penalty or delinquency charge will be determined, and the amount.
- Statement whether the lessee has an option to buy the property at end of the lease, or earlier, and at what price.
- Statement of conditions under which either party to the lease may terminate it, and how any penalty or other charges will be determined.
- Statement that the lessee is responsible for the difference between estimated value of the property leased and its realized value at the end of the lease, or upon earlier termination, if liability exists.
- Statement that in an open-end lease the lessee may obtain a professional appraisal of the property by an independent third party at the end of the lease or upon earlier termination, and that this appraisal will be binding.
- Statement of the value of the property at the consummation of the lease, the itemized total lease obligation at the end of the lease, and the difference between them. ★★

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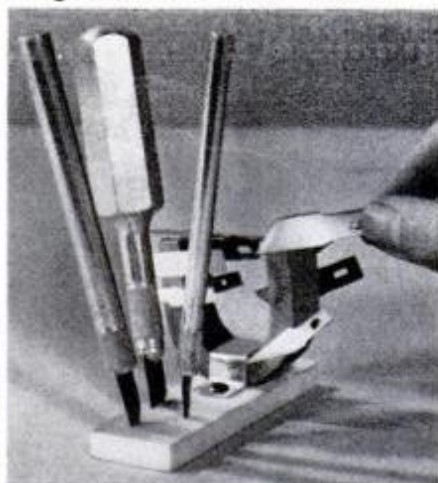
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## HINTS FROM READERS

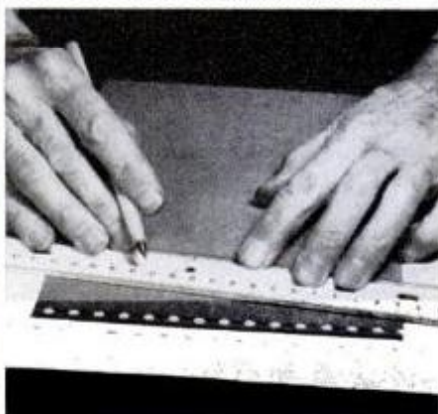
### Magnetic knife-blade holder



A small powerful magnet mounted on a wooden base is a handy holder for your hobby knife blades.

—Ken Patterson

### Make dotted or dashed lines



To make dotted or dashed guide lines, lay a notebook cover over paper with cover holes aligned where dots go. Use a ruler as a drawing guide.—W.E. Burton

### Time and labor-saving cart



To make a big-capacity, low-cost garden cart, mount a large piece of aluminum siding on a wheelbarrow frame. It's ideal for hauling dirt and yard debris, and adds little weight.—S. Clark



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## YOUR COOLING SYSTEM

(Continued from page 101)

and replace to lower the freezing point to  $-34^{\circ}$ .

**Important:** A fresh ethylene glycol solution will provide adequate protection against rust and corrosion for two years. If you drive your car 30,000 miles or more each year, replace the solution annually since the effectiveness of inhibitors is progressively reduced the more the car is operated.

### Hoses and clamps

Hoses to consider are two on the radiator (top and bottom) and two that serve the heater. In addition, some cars may have a water-pump bypass hose.

Bobcat, Mustang II, Pinto and Vega with two-barrel carburetors have hoses going to the automatic choke housing. The choke is a hot-water control. Check these hoses too. A ruptured hose, even one of these "small" ones, is a major reason for sudden loss of coolant.

To avoid the disheartening experience of being stuck on the highway with a dry cooling system, check all hoses at least once a year.

With the engine cold, squeeze each hose over its entire length. If it feels hard and brittle or shows cracks, replace the hose.

When the engine is hot and running, examine hoses for swelling. Replace a bulging hose as soon as possible.

Signs of rust stains around clamps indicate the hose is leaking, possibly because the clamp has eaten into the hose. Loosen the clamp, slide it back and check for cuts.

If a hose has to be replaced, unfasten and twist clamps off. Don't worry about damaging them. They should not be reused.

**Important:** Use *new* screw-type clamps. Avoid spring-type.

Remove the hose, cutting it off if necessary. Get a replacement of the same size.

Wire-brush connections clean and coat with waterproof gasket cement. Slide new clamps on hoses and install hoses on connections.

**Tip:** If hose is stiff and difficult to maneuver, soak its ends in hot water for two minutes. This will make it more pliable.

With the hose in place, set clamps  $\frac{1}{8}$  inch back from the ends of the hose—never at extreme ends since pressure can build up behind the clamp, causing bulging and possible rupture. Tighten the clamp securely; do not overtighten. If you have a torque wrench, a good setting is 20 inch-pounds. Start the engine and

check for leaks; tighten clamps a bit more if necessary.

### The radiator

The radiator is a heat exchanger that introduces a large volume of hot coolant to a large volume of cooling air. Hot coolant flows through a series of tubes in the radiator, which have been separated so air can flow between them. Tubes are connected by cooling fins that conduct heat away from the coolant. Air moves through passages from front to back, absorbing heat from the fins.

There are two basic types of radiators: downflow and crossflow. The downflow radiator has tanks on top and bottom (inlet at the top and outlet at the bottom). The crossflow radiator has tanks on the sides. The inlet tank has the top radiator hose attached to it. The outlet tank accommodates the bottom hose.

Damage to radiators takes two forms: leaking and restrictions.

A leaking radiator is often easy to spot without testing the cooling system with a pressure tester (see Part 2 next month). If the radiator is leaking, white corrosive deposits are frequently visible, especially around and on tanks.

Test for a clogged radiator, which will cause overheating, by warming up the engine and shutting it off. Run your hand from the inlet end of the radiator across or down the core to the outlet end. Feel every inch. If you hit a cold spot, the radiator is clogged at that point.

You can try cleaning with a commercially available acid solution and/or flushing (see next month), but if this doesn't work, the radiator should be removed and taken to a radiator shop for professional service (see below).

Similarly, you can try sealing a leak with a commercially available stop-leak solution or by installing ethylene glycol antifreeze having an antileak additive. If this doesn't solve the problem, the radiator should be removed and serviced by a professional.

Look for a damaged radiator filler neck that keeps the pressure cap from seating if the engine overheats. If the neck is bent, the radiator should be removed and taken to a professional shop which will cut off the damaged part and solder on a new one.

Although services noted here usually have to be done professionally, you save extra charges by removing the radiator yourself. If your old one proves unrepairable or the cost of refurbishing is excessive, you can usually get another at a low cost from an auto salvage yard. ★★

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# NEW RUBBER STAMP BUSINESS

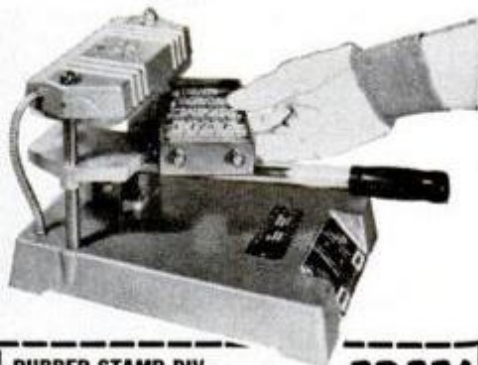
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below average for the 1977 American-made cars we've reported. Most others scored above 71 percent. Comments a New York computer engineer, "For the price I expected more metal and less plastic, although the car runs with tight control."

A Delaware research supervisor: "Plastic component beneath front bumper and hatchback door weren't centered properly when I took delivery." A Michigan teacher: "I feel that overall workmanship is acceptable, but I've had to tighten screws and still have three rattles." An Illinois secretary: "A very well built car and mechanically an excellent running car." And an Illinois warehouseman: "I'm very pleased with the Skyhawk's quality—first-rate among its competitors."

As for dealer service, 53.3 percent scored it as good to excellent, and another 25 percent said average. An Illinois telephone maintenance man noted, "We are well treated whenever we visit the dealer. The service department has late hours, and that's good." A North Carolina home economist: "They probably have competent mechanics, but they just don't take a woman seriously. My complaints may be minor to them, but a car costing \$6000 shouldn't have any bugs that can't be fixed promptly the first time. Mine has been returned three times to correct a spark knock and miss."

We asked owners to jot down their recommendations for making the Skyhawk a more practical car. Some representative suggestions:

"The rear side windows should open outward," proposes a Michigan floral designer. "An inside hood release would be a good addition," submits a West Virginia teacher. An Illinois sales manager: "Move the ashtray so it isn't blocked by the driver's knee." A Michigan supervisor: "A way to open the hatch from the inside." A Virginia naval officer: "The rear seat should be split so one or both sides can fold down independently." A Louisiana department store manager would like "a concealed compartment, lockable, for parcels and small pieces of luggage."

The Skyhawk's handling, roadability, and maneuverability came in for lavish praise. Says a Colorado wildlife biologist: "It rides

great on the open road." An Illinois sales rep: "It's a good highway car because of its excellent handling in high crosswinds." A California receiving clerk: "Good maneuverability makes it easy to drive in town."

The final summation comes from a Michigan merchandise

manager who does *not* work for Buick. He states: "I find the Skyhawk an extremely enjoyable car to drive. Despite minor manufacturing flaws, the car has a well-balanced feel, the V6 is more than enough engine, styling is excellent. I derive many admiring comments, which appeases my status-

seeking end of the purchase. Handling is great, even in the snow. I must admit I was surprised by the agility of this machine. Detroit is slowly beginning to wake up to what a portion of the market is looking for in small cars, which is more than basic transportation." ★★★

**SUMMARY OF 1977 BUICK SKYHAWK OWNERS REPORTS\***

<p><b>Total miles driven</b> ..... 1,258,389</p> <p><b>Average miles per gallon</b></p> <p>Automatic transmission</p> <p>In town (EPA 19) ..... 17.5</p> <p>Long trips (EPA 26) ..... 22.1</p> <p>Manual transmission</p> <p>In town (EPA 18) ..... 19.4</p> <p>Long trips (EPA 29) ..... 24.4</p> <p><b>Transmission choices:</b></p> <p>Automatic ..... 68.9%</p> <p>Manual four and five-speed 31.1</p> <p><b>Why did you choose the Skyhawk?</b></p> <p>Styling ..... 59.1%</p> <p>Economy ..... 37.2</p> <p>Size ..... 34.1</p> <p><b>Specific likes:</b></p> <p>Styling ..... 58.3%</p> <p>Handling, maneuverability 55.2</p> <p>Economy ..... 38.2</p> <p>Comfort ..... 20.8</p> <p>Power ..... 13.9</p>	<p><b>Specific dislikes:</b></p> <p>Mileage below expectations ..... 12.8%</p> <p>Rattles ..... 11.3</p> <p>Too little rear legroom ..... 6.4</p> <p>Choppy ride ..... 7.1</p> <p>Lack of power ..... 5.7</p> <p><b>What changes would you like?</b></p> <p>Different seat shape ..... 9.9%</p> <p>Relocate ashtray ..... 7.4</p> <p>Minor styling changes ..... 5.5</p> <p>Better gas mileage ..... 5.5</p> <p><b>Workmanship opinion:</b></p> <p>Excellent ..... 22.6%</p> <p>Good ..... 45.5</p> <p>Average ..... 19.9</p> <p>Fair ..... 7.7</p> <p>Poor ..... 4.4</p> <p><b>Comfort opinion (front seat):</b></p> <p>Excellent ..... 33.8%</p> <p>Very good ..... 34.4</p> <p>Good ..... 23.8</p> <p>Fair ..... 6.6</p> <p>Poor ..... 1.3</p>	<p><b>Comfort opinion (rear seat):</b></p> <p>Excellent ..... 1.8%</p> <p>Very good ..... 8.4</p> <p>Good ..... 20.9</p> <p>Fair ..... 27.1</p> <p>Poor ..... 41.8</p> <p><b>Had any mechanical trouble?</b></p> <p>Yes ..... 57.9%</p> <p>No ..... 42.1</p> <p><b>What type of trouble?</b></p> <p>Carburetor ..... 20.8%</p> <p>Electrical ..... 15.0</p> <p>Transmission ..... 12.7</p> <p>Oil leaks ..... 5.2</p> <p>Brakes ..... 5.2</p> <p><b>Dealer repairs satisfactory?</b></p> <p>Yes ..... 54.2%</p> <p>No ..... 45.8</p> <p><b>Dealer service opinion:</b></p> <p>Excellent ..... 22.5%</p> <p>Good ..... 30.8</p> <p>Average ..... 25.0</p>	<p>Fair ..... 9.4</p> <p>Poor ..... 12.3</p> <p><b>Number of vehicles owned:</b></p> <p>Skyhawk only ..... 39.5%</p> <p>Two cars ..... 44.2</p> <p>Three cars ..... 11.0</p> <p>Four cars ..... 4.0</p> <p>Five or more cars ..... 1.3</p> <p><b>Makes of other cars owned:</b></p> <p>Buick ..... 44.0%</p> <p>Chevrolet ..... 25.8</p> <p>Ford ..... 13.2</p> <p>Pontiac ..... 8.8</p> <p><b>Age distribution of owners:</b></p> <p>15-29 years ..... 41.7%</p> <p>30-49 years ..... 35.1</p> <p>50-plus ..... 23.3</p> <p><b>Would you buy another Skyhawk?</b></p> <p>Yes ..... 57.3%</p> <p>No ..... 42.7</p>
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\*Percentages might not equal 100% due to rounding or insufficient data.

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**INSTANT MOVIES**

*(Continued from page 95)*

green and blue, these microscopically thin colored stripes resolve the the incoming light into its primary color components and create three separate interlaced images on each frame of the film.

**Primary colors**

Each image represents one of the primary colors, just as in color TV the image is split up into three separate colors to be recombined later on the shadow-mask of the receiver screen. In fact, the new system is a hybrid between conventional photography and the color separation tech-



**Polavision Instant Movies film cassette slides into back of battery-run camera.**

niques used in TV. Ordinary color photography uses a triple-emulsion film whose layers are sensitized to the three different primary colors. Polavision, by putting the color-separating layer ahead of the light-sensitive emulsion, can record all three images in black-and-white and later restore the corresponding color for each image in playback. This simplifies the developing process and allows it to be done instantly.

Development starts the moment you slip the cassette into the playback unit, which is a rear-lighted projector with a ground-glass screen. When you insert the cassette, the film is automatically rolled back. During this rewind it is coated with a chemical reagent about which Dr. Land won't say much. This produces a negative image in one layer of the film and then builds up a positive image in an adjacent layer.

**Invisible negative**

But the chemical interaction between film and developer is such that the negative image becomes almost invisible. Though it remains in one layer of the film, it does not interfere with the showing of the positive "print."

Throughout the development process, taking little more than a min-

ute, the film never leaves the cassette. When it is finished, the development fluid—a mere 12 drops—has been coated onto the film, so there are no leftover chemicals to get rid of. Until the developer is needed, it remains sealed in a small pod near one corner of the cassette. Immediately after application it dries into a transparent layer on the film.

**Prism images**

The whole sequence is automatic. Not a single control need be touched. And now the film is ready for showing. The projection light flashes on by itself. Since it can't get into the closed cassette from the rear, the light beam enters through a prism at the side. Shining through the film, the beam picks up in each frame the three separate black-and-white images. As the light once again passes through the top layer of the

*(Please turn to page 150)*



**Instant film is never removed from its box. After exposure in the camera, the cassette drops into projector for rewind, developing and playback in 90 seconds.**



**Light can't get into the film cassette from the rear so it is beamed through a prism in the side of the cassette onto a bright 12-inch rear-projection screen on front of the viewing box. Projection starts automatically at end of 90-second rewind and development. Polavision systems may cost \$400 to \$500 this fall.**

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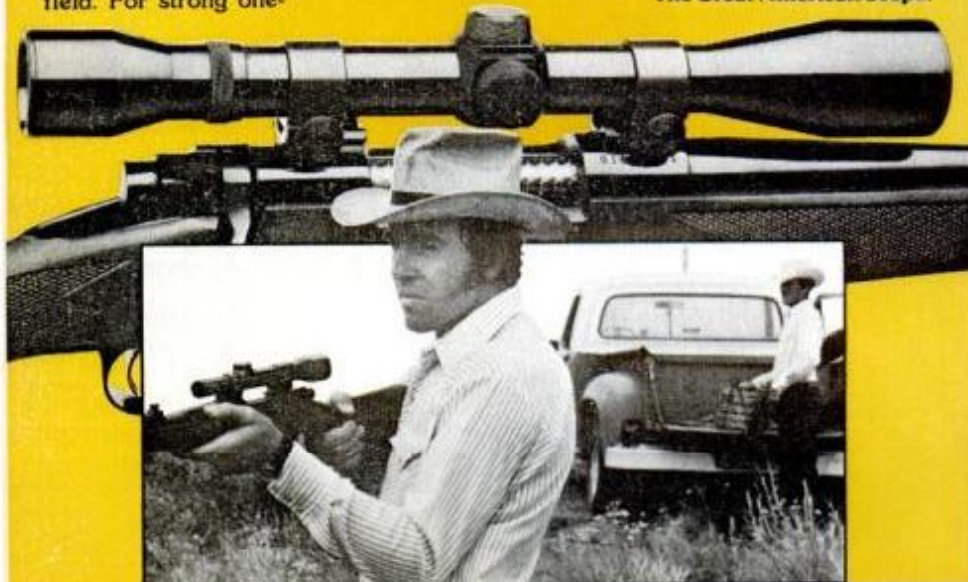
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## INSTANT MOVIES

(Continued from page 146)

film with the fine colored lines, the respective red, green and blue color values are restored to each image.

The full-color image is now focused from the rear onto the screen. Because the interlaced color lines are so close together, the eye does not distinguish the separate colors but blends them into the same color mix that originally came into the camera through the lens—exactly the way the eye blends the separate color dots on a TV screen. During the process, there is no threading or winding—everything is automatic, even the final rewind.

### It works

Does it really work? From what I have seen, the answer is a resounding yes. The image resolution isn't as sharp as you would expect on a fine photographic print. But it seemed better than what you normally get on even a very good TV set of comparable size. Colors were vivid and true, and motion seemed quite smooth even at the slow projection speed of 18 frames per second. Simplicity is the keynote of the whole design. Dr. Land hints that future Polavision camers may offer such features as the capability of recording sound. The present film has a magnetic track on the side in anticipation of later sound cameras and projectors.

He also hopes to increase film sensitivity from the present ASA 40 so that instant movies can be made indoors with available light. At present, outdoor light or a small floodlight for indoor illumination is required for best results.

Limited by the 12-inch screen size, which cannot be enlarged without impairing color blend, it aims at different uses and expresses different attitudes. Golfers and tennis players will enjoy the possibility of checking their stroke by having someone at the club take Polavision films. Industry may use it as a training tool a lot easier to handle than instant-playback videotape. But Dr. Land hopes that Polavision will mostly become part of the family life as a kind of living snapshot.

Even the length of each cassette—a maximum of three minutes—is geared to the casual catching of a single scene, a brief happening to be held fast and remembered. "People will be able to keep a motion-picture diary of their daily lives, just as they now have family albums of stills," says Dr. Land. "They can exchange cassettes with friends or distant family members." ★★★



# HINTS FROM READERS

## Cotter pins are chuck tools



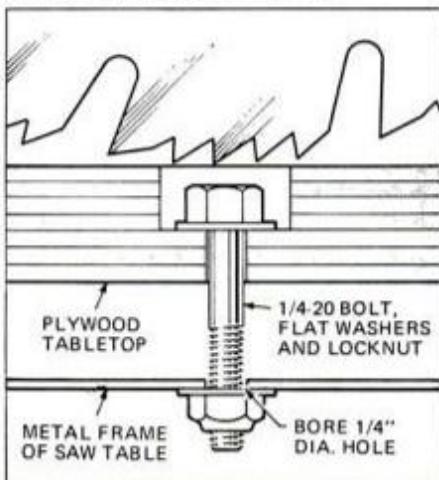
Small cotter keys of various sizes make ideal "chucks" for holding little pieces of emery cloth in a small hand grinder. Use them at a low speed.—Ken Patterson

## Plastic bag is glove



Plastic food bags will protect hands when you're handling steel wool or greasy objects. Roomy bags permit finger movement. Secure with rubber bands.—Walter E. Burton

## Warped radial saw table



To minimize warp on my radial saw table, I bored a hole in the tabletop and metal frame and installed a countersunk bolt with washer and locknut as shown. Make certain you locate hardware out of the blade travel area.

—Henry F. Baker

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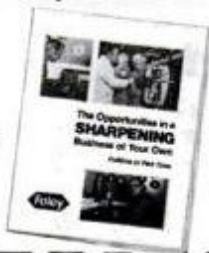
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**NEW BOATS JUST FOR FUN**

(Continued from page 86)

a sail and the name Windsurfer for stand-up skippering.

Paddleboats, airboats and fold-boats also add a bonus of small-craft fun. If you want to walk on water, Skimmer Manufacturing, Lansing, Mich., makes pontoons you ski along on—one for each foot. Want to sail on land? Star Landsailer from San Diego looks like an iceboat but rolls on wheels with no hull at all. ★★★



Kneeling or standing for speed, there's spray-cooled sport on Kawasaki's Jet Ski.



For take-your-pick action, the Sandpiper 72 made by Kransco, South San Francisco, has a 75-square-foot lateen sail that can be quickly unstepped so the boat becomes an outboard for motors up to 5 hp, or a rowboat for quiet fishing. The 11-footer has sail, dagger-board rudder, 515-pound BIA load capacity.

# HEAR-ANYTHING PORTABLES

(Continued from page 77)

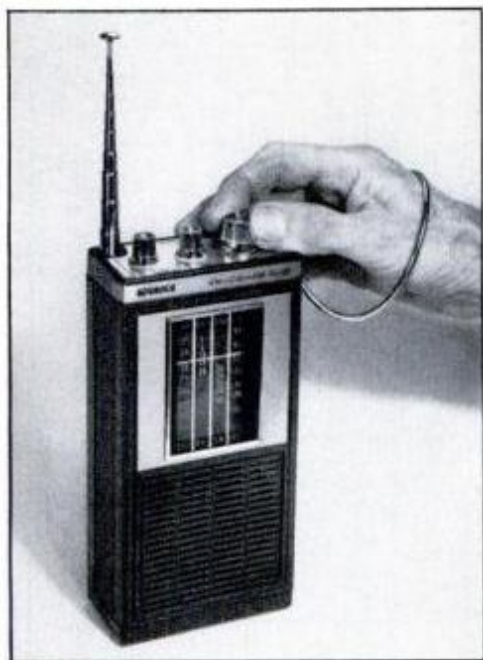


Built-in crystal frequency markers for accurate dial calibration are handy on Panasonic RF-2200 (above). It offers shortwave bands plus commercial AM FM broadcast bands for music, news.

includes a direction finder plus AM, FM, marine VHF and CB reception.

For camping, you can unfold your radio with your tent when you take the exciting little Sony three-band fold-up radio, which offers AM, FM, police and fire, and two-meter ham radio coverage from 147 to 174 MHz. The tiny ICF-7800W (\$160) includes an eight-hour timer to awaken you in the morning. Squelch for quiet monitoring, tone controls, and a large illuminated tuning meter are big-set features in this miniature receiver.

With AM, FM and shortwave coverage, the Panasonic RF-2200 (\$150) has a meter and crystal markers for calibrating the dial. These battery radios let you take the world with you wherever you go. ★★



All 40 CB channels plus AM and FM standard broadcasts are heard with the Advance portable (above). Price is \$22 from Stock Sales Co., Box 606, Mineola, N.Y. It has squelch, antenna, carrying chain.

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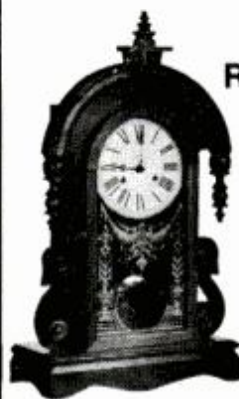
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## EXCITING KITES YOU CAN BUILD

(Continued from page 98)

cores so they can slide onto the spine. Using a hammer and nail, punch two equidistant holes on the top of one of these cores. String attached to the right angles of the jibs passes through a screw eye centered on the bottom of the balsa block and attaches to this core. Use a slip knot to attach the jib strings so they can be adjusted according to wind conditions. The second plastic core requires only one small hole to anchor the bridle.

Punch four equidistant holes on each of the remaining five plastic cores. These will be located at the tips of the fiberglass rods. Next add the bowstrings. They're attached with swivel hooks from the spar and spine tips and pass through holes at the mast tip where they intersect.

Cut and sew the sail and drogue material, allowing for 1/2-in. seams. Cut the small V on the mainsail 1/2-in. inward, fold back the material and seam it. Then sew small triangular reinforcements at each tip and on the mainsail V. Fasten grommets on the triangles and mainsail V.

Attach sails to the rods with string tied around the grommets and fastened to swivel hooks that attach to plastic cores. The right angle of the keel attaches to the screw eye that holds the jib lines with a string and swivel hook. The mainsail attaches to spar cores by key rings through the mainsail grommets.

Attach a line with swivel hooks on both ends from the lower spine tip, across the mainsail and hooked to the V-grommet and screw eye above the spine. This line should be relatively taut as it keeps the mainsail symmetrical in flight. Also check to see that the leading edges of the jibs are taut.

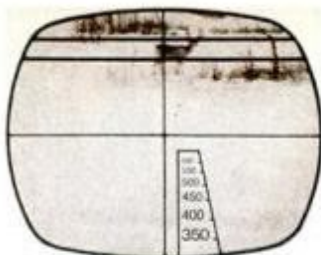
Set the bridle by attaching one line from the top tip of the spine to the other bridle point on the spine. Attach the other line from tip to tip of the spar. The two lines should meet roughly one-third down from the top of the spine. Tie a loop at that point so all lines are equally taut.

Attach your flying line with a swivel hook to the bridle tie. Then attach drogue with a swivel hook.

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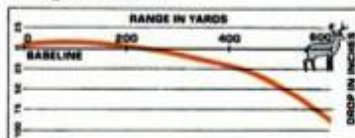
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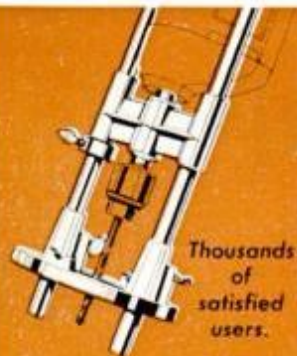
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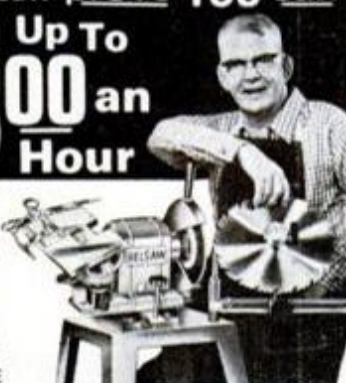
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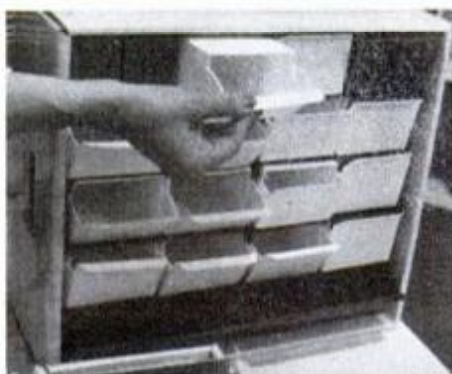
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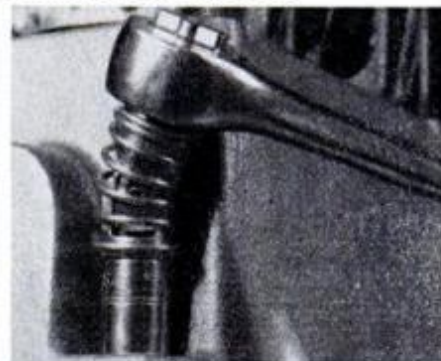
**CAMILLUS CUTLERY COMPANY**

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Dept. E, Camillus, New York 13031

## HINTS FROM READERS

### Socket tool improver



A spring or piece of rubber tubing that's slipped over a socket-drive universal joint prevents the joint from folding during use, but still lets it flex.—*Stephen Peterson*

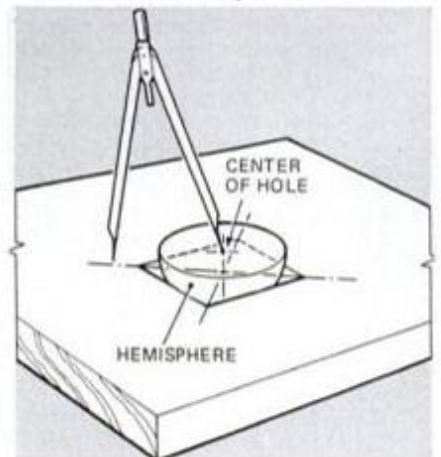
### Egg-carton parts bin



The bottom half of an egg carton can be used to keep nuts, bolts and other small parts organized. Simply glue or tack it to a scrap of 3/4-in. plywood or pine.

—*Walter E. Burton*

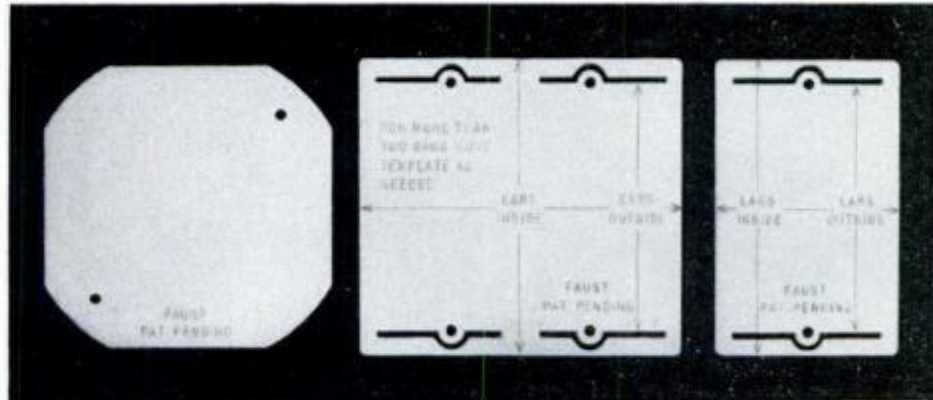
### Center for a compass



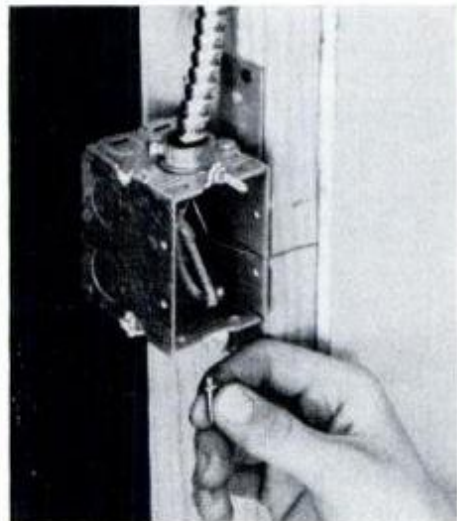
The center of the flat side of a hemisphere, placed in a hole so the round part rests on the hole's sides, will always be the center of the hole if the hole is a circle, square or any *regular* polygon (one with all sides and angles equal). The center is used to scribe a circle or arc and take measurements.—*Bob Tom*



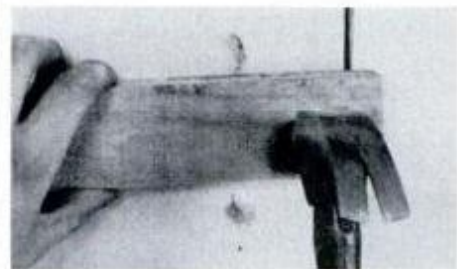
# PM tool test: Mistakeproof template for plasterboard cutouts



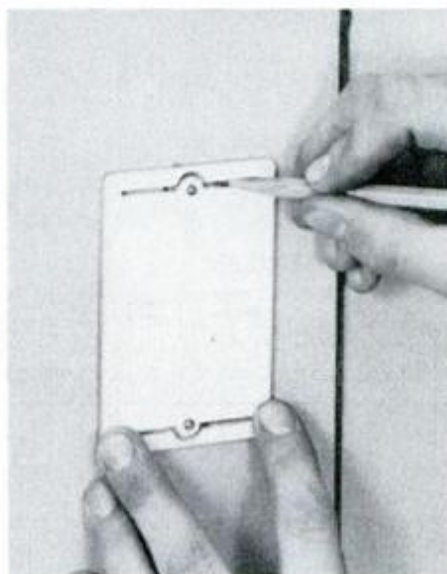
**M**any do-it-yourselfers—both fledgling and experienced—do not relish the chore of locating outlet boxes when covering a wall with wallboard or paneling. Consequently, many manufacturers now offer devices to make that task less awesome. One of the best I've tried is this template idea.—*Harry Wicks, Home and Shop Editor*



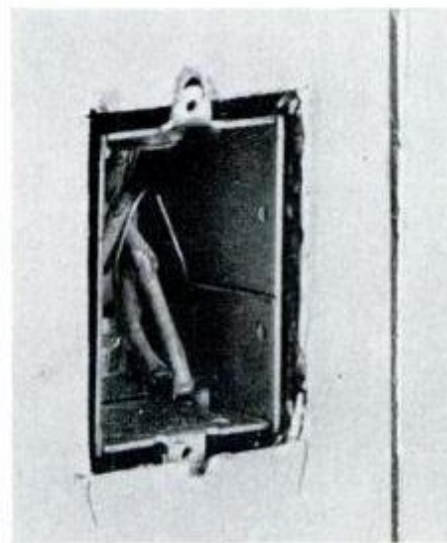
**1** Install the threaded pintles in the box ears. Three templates come in the kit—see photo at the top—to suit the single box, ganged box and gem box.



**2** Temporarily tack panel in finished position—nails should not be too close to box. Using scrap wood, tap in general area of box until pins break through.



**3** Place the correct template over the pins, mark box location. Remove template, pull panel from wall, bore starter hole. Cut with keyhole or sabre saw.



**4** Replace panel with cutout aligned over box, permanently fasten with nails. Panel-saver kit is \$3.95. Panel Saver Corp., Box 1234, Jamestown, N.Y. 14701.

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Electro-automatic focusing from five feet to infinity is accomplished by a scanning mirror system that drives a tiny electric motor controlling a focusing ring on two new Sankyo Seiki Super-8 movie cameras—silent (\$300), the other sound (\$450). Sankyo Seiki, 149 Fifth Ave., New York, N.Y. 10010.



**Artificial hand has sense of touch**

Myo-electric hands and arms for amputees are controlled by the brain via messages through electrical sensory contact with muscles of the stump. Now a muscle-electric limb has feedback, telling its user what type object it has grasped. Inventor is Dr. G.F. Shannon, Univ. of Queensland, Brisbane, Australia.

**Childproof plug lock**

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# June-up tips for midsummer bicycling

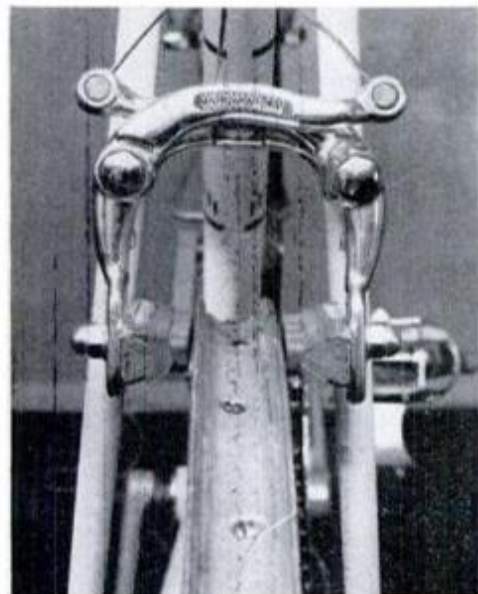
by Eugene A. Sloane

**W**hether you are planning an extended bike tour or nothing more than around-town jaunts, midsummer is a time to recheck your favorite steed. After all, the essence of summer is fun, and a reliable, safe bicycle can be an enjoyable ingredient of this pleasure.

Check over all working parts of your bicycle, adjusting, lubricating and replacing worn parts before any trip. Here's what to look for:

## Brakes

Before you adjust brakes, wheel rims must be true so brake shoes will grab evenly on both sides. Spin wheels, check especially for side-to-side out-of-roundness. True up rims by adjusting spokes, tightening to pull rim to one side, loosening to pull rim to the other side.



Brake shoes should be 3/16 in. from rim.

If brakes have an adjustment barrel (on levers or brakes) tighten the barrel so the cables are as loose as possible. Gripping brake calipers with a "third hand" tool, loosen cable attachment, pull up all cable slack and retighten cable holder. Brake shoes should be no more than 3/16 inch from rim, with front of shoes tilted inward slightly.

Check brake shoes for particles and wear. Replace worn shoes, making sure closed end of shoe holder

points forward. Check frayed or worn cables and replace if necessary. Squirt light oil down brake cables, or coat new cables with light grease before installation.

## Tires

Check tires for wear, foreign particles that could cause a flat, cuts and sidewall bruises from ruts and jumping curbs. Replace tires if necessary.

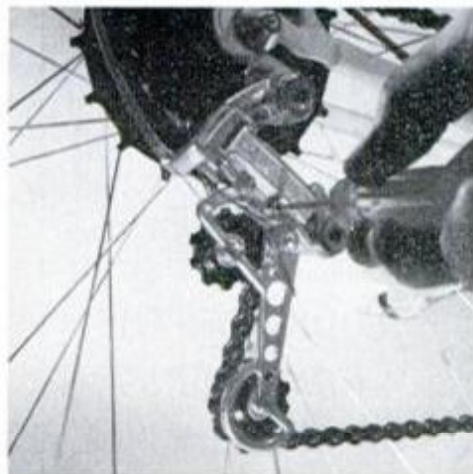
## Chain

If you have a couple thousand miles on the chain, it's time to replace it. Otherwise, remove the chain, dunk it in turpentine or other solvent to remove old grease and road dirt, reinstall and spray with Chainlube from a bike or motorcycle shop. Or clean the chain on the bike, being careful not to get solvent or Chainlube on the tires. It can eat away rubber. Lube the chain every few days on a long trip.

## Derailleurs

Push both levers all the way forward. Check for cable slack and remove slack by pulling excess through derailleur cable stops. Run through the gears and make sure the rear derailleur is adjusted so the chain does not overrun high or low gears and will shift to them smoothly. Adjust the front derailleur so the cage just clears the largest chainwheel and is parallel to it; also that

(Please turn to page 162)



Adjust derailleur limit screws so the chain does not override the gears.

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LOOK FOR THE "HOME ENERGY" SECTION IN OUR September 1977 ISSUE

### MIDSUMMER BICYCLING TIPS

(Continued from page 161)

the chain does not override either chainwheel.

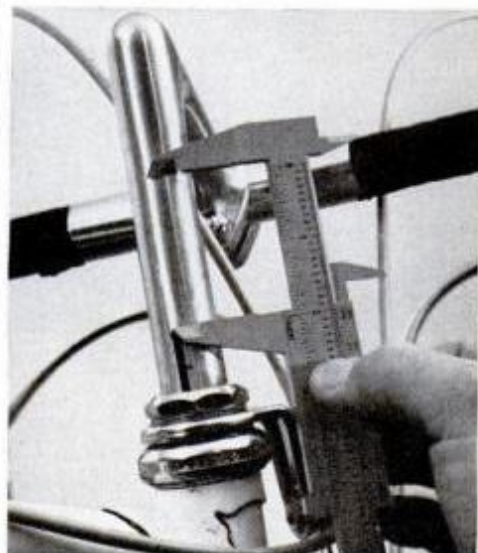
Eyeball rear derailleur cage to check alignment parallel to rear gears; adjust by bending derailleur body with an adjustable wrench carefully. Clean dérailleurs with solvent and lube moving points with light motor oil.

#### Bottom bracket

Grip cranks at pedal location and rock gently back and forth to check for play. Remove chain, spin and check for tightness. Adjust as necessary. If the bottom bracket spindle has not been serviced for two years, disassemble, clean and regrease using Lubriplate all-purpose grease; then reassemble. (Note: Detailed instructions for disassembly and reassembly and wheel truing can be found in my book *The New Complete Book of Bicycling*, 545 pages, \$12.50, Simon & Schuster.) Eyeball chainwheel alignment. If wavy or bent, true up by bending with an adjustable wrench, using cloth to prevent marking aluminum chainwheels. Check chainwheel binder bolts for tightness, using special tools for your make crankset from a bike shop.

#### Steering head

Grip handlebars firmly, lock front-wheel brake, rock the bike to check steering head looseness. A loose set of cones means up-and-down pounding as you bike. This can easily flat-



For safety, make sure the stem extends several inches inside head tube. A fast downhill run is no time for stem to break.

ten bearings, even ruin your headset. Adjust to take out any play. Lift front wheel, move bars to check for tightness; adjust if needed. Be sure the stem has at least 2 1/2 inches inside steering head for safety.

## Wheels

Pull wheels from side to side to check for bearing looseness. Remove wheels and twist spindles between thumb and forefingers to check for tightness. Adjust hub cones as needed. When you spin spindles, feel for roughness indicating sand or grit in wheel bearings. If necessary, disassemble hub, clean bearings and races, repack with Lubriplate grease and reassemble. Check axle when out; roll it on a flat surface or use a straightedge. Replace bent axles.

## Pedals

Twist or move pedals in and out to check for bearing play, spin to check for bearing tightness. Adjust the pedal cone by removing the cap, loosening the locknut and adjusting the cone nut with a screwdriver. If pedals have not been lubricated for two years, disassemble, clean, repack with Lubriplate and reassemble. Check toe straps for wear and replace if necessary.

## Finish

With matching spray paint, go over all nicks and scratches. Wait five days, then clean and wax the frame. Check it for gouges, dents and alignment of all frame members. Clean and polish all chrome, hubs, rims and spokes.

## Saddle

Check saddle height by measuring the distance from the top of the saddle down to the centerline of the pedal axle. This should equal your inseam measurement (in stocking feet) plus nine percent. Make sure the seat post extends at least two inches into the seat tube for safety. The saddle should have its nose tilted slightly downward for all-day comfort. Take swayback out of a leather saddle by adjusting at the saddle nose fixture.

## Carrier

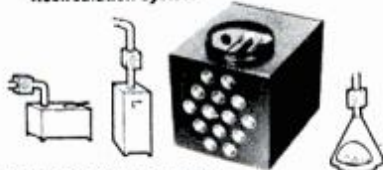
If you have a carrier over the rear wheel to support bike bags, check for tightness of holding bolts and nuts. If the carrier is the type that clamps to the seat stays, put a piece of 3/4-inch-thick aluminum plate (or equivalent) between the carrier and the brake bridge. Drill holes so the plate can fasten to the carrier clamp bolt and rear brake holding bolt. This will prevent the carrier from sliding down onto the brake or wheel.

If you have done all these maintenance chores, you can take off on that long tour with a light heart, sure that the bike will perform reliably and be trouble-free. Happy cycling! ★★

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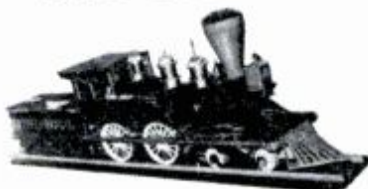
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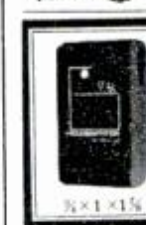


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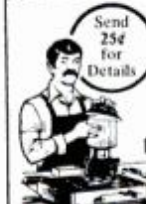
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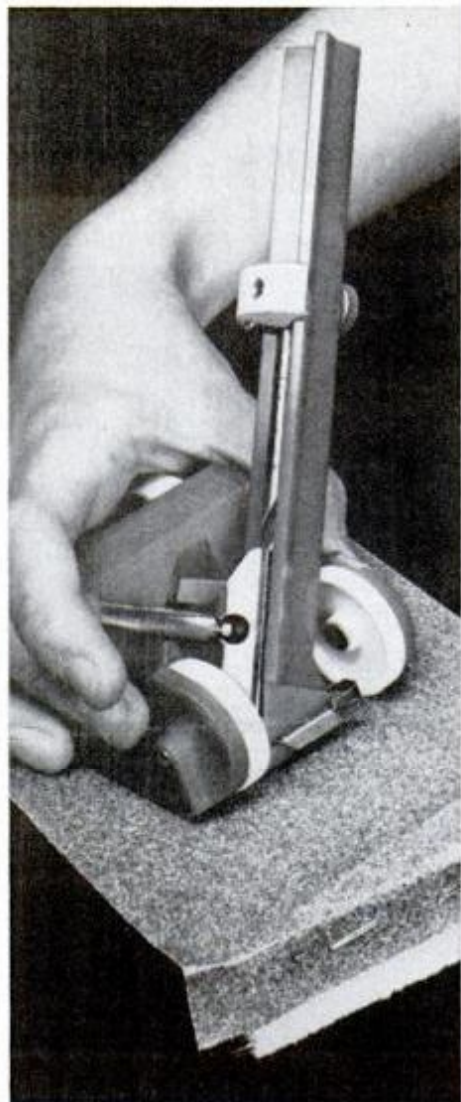
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# PM tool test: Twist-drill sharpening jig



**T**he two difficult tasks when you hand-sharpen twist drill bits are assuring that both cutting edges are being ground to exactly the same angle to the bit axis, and that both are of the same length.

The jig shown assures such accuracy, and though it is constructed mostly of plastic, with proper care I am certain it will be around my workshop for years to come. To use it, the bit is inserted in the V-channel with cutting edge aligned at bottom. Then the bit is held fast by tightening a clamping screw. After swinging a shim into place behind the bit—to advance it just the right distance for sharpening—you roll the jig back and forth over abrasive paper. Do the same to sharpen the second edge.

Though instructions for use are generally good, I didn't find any mention of what grit abrasive paper to use. A piece of what appeared to be 120-grit paper came packed with the test jig. A finer grit should be used for the smallest bits, however.—*Harry Wicks, Home and Shop Editor*

### SPECIFICATIONS: Twist-drill sharpening jig

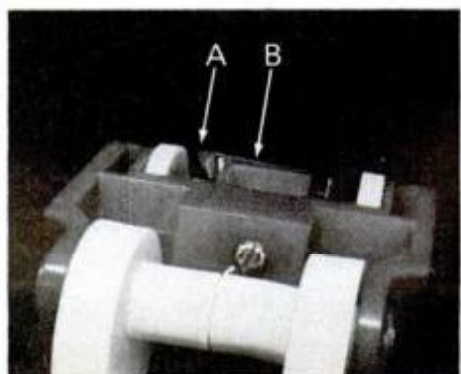
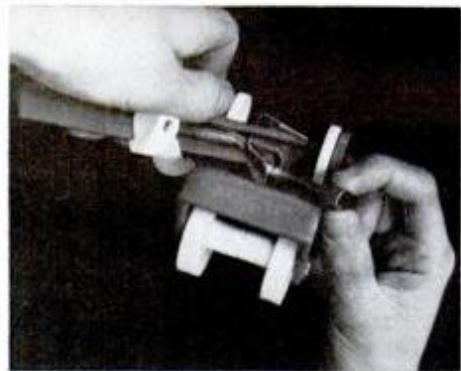
Bit capacity: 1/8" through 1/2"

Housing: Plastic

Eccentric wheels: Plastic

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Bit is inserted into jig's V-channel (upper left) and held there with thumb while bit cutting edge is aligned as at left. For proper sharpening, cutting edge "A" must be flush with and parallel to front gauge "B". After tightening clamping screw, shim shock is swung into V-channel (above) to advance bit exact distance required for sharpening.

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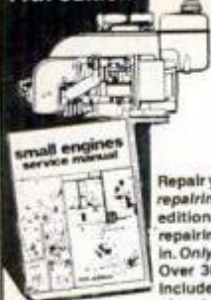
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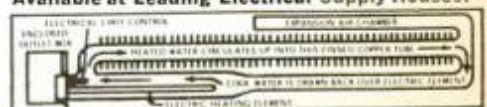
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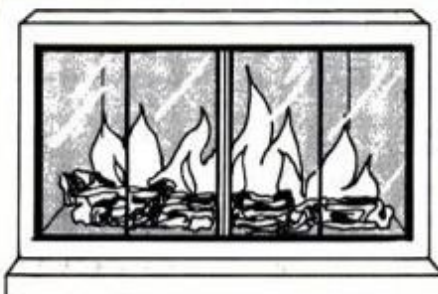
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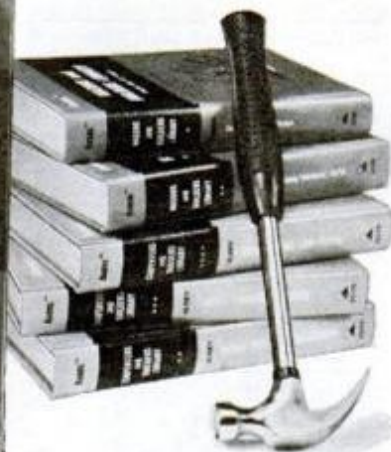
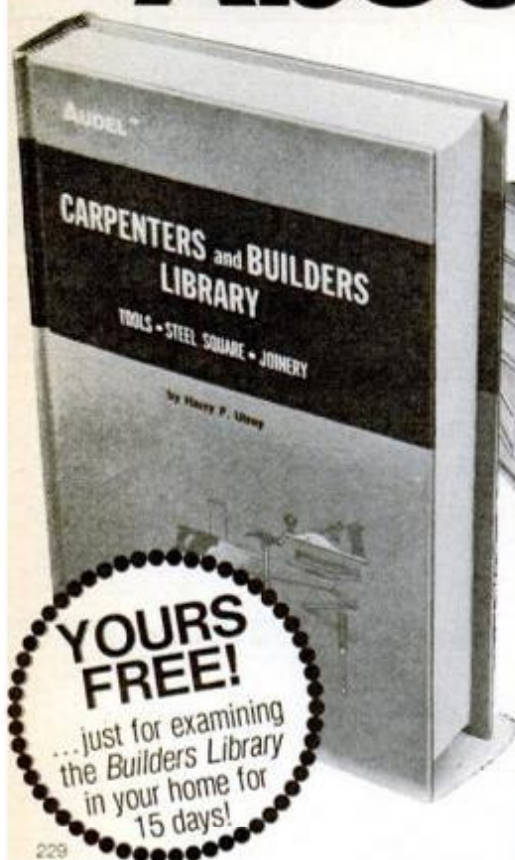
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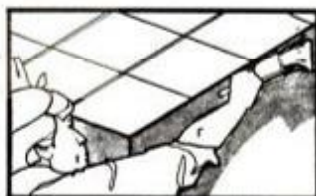
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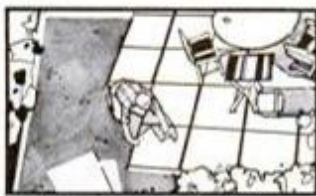
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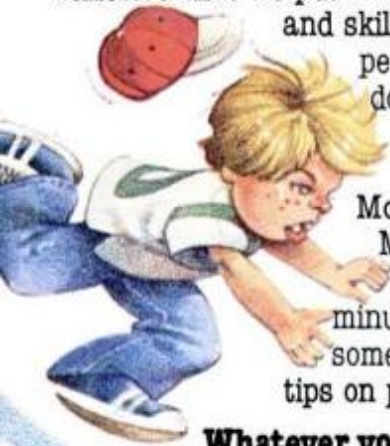
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# How to panel a room without climbing the walls.



HB Fuller just made paneling easier than ever. With Max Bond™ ... the new panel and construction adhesive that we put a lot of time

and skill into for people who don't have much of either. More about Max Bond in a minute. First, some general tips on paneling.



## Whatever you do, don't start at the beginning.

Start planning in advance of the time you begin the actual work. Figure a minimum of several hours for small rooms, more for larger rooms. Bundle the kids off to granny if need be so you'll be able to concentrate.

## Do one room at a time.

If you get the urge to start in on a second room before finishing the

one you're working on, lie down until the urge goes away. Get the one room done; then, no matter what happens you're finished with it.

## You can measure up ... and down.

To estimate how many panels you'll need, measure the length of each wall, then add the measurements together and divide the total by 4. Subtract about one-half panel for each door and a quarter of a panel for each window.

## Don't put up with anything less than Max Bond.

We made Max Bond to help people like you who want to panel a room without undergoing years of vocational training to do it.

Or spending hours repairing hammer dents around nails. Max Bond grabs fast and sets up

quick so you'll get the job done sooner. Yet panels can be repositioned for 20-30 minutes after Max Bond is applied - so if you make a mistake you've got time to

correct it. It's got excellent bridging qualities and is great for wood, polystyrene foam, urethane foam, concrete, drywall, steel, tile board, and much

more. Max Bond's light tan color blends well with many shades of wood. It's also thick enough to minimize oozing down vertical surfaces - or out the end of the tube, yet it flows on smoothly and easily. Max Bond cleans up easily with mineral spirits.

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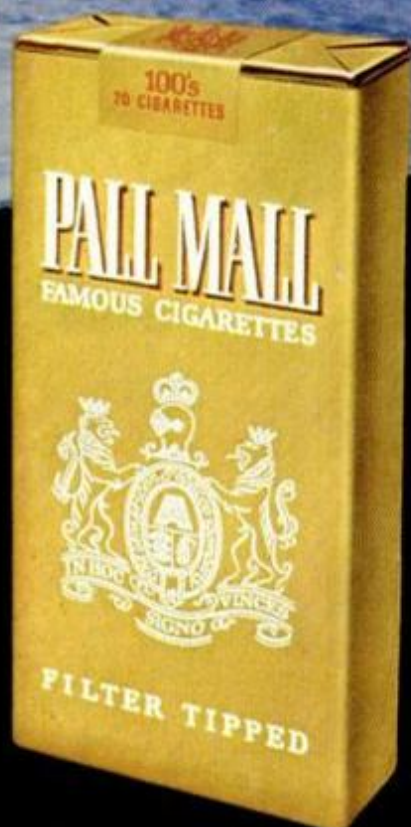
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